FLORA EUROPAEA

VOLUME 4

PLANTAGINACEAE TO COMPOSITAE
(AND RUBIACEAE)

EDITED BY

T. G. TUTIN V. H. HEYWOOD
N. A. BURGES D. M. MOORE D. H. VALENTINE
S. M. WALTERS D. A. WEBB

WITH THE ASSISTANCE OF

A. O. CHATER R. A. DEFILIPPS
I. B. K. RICHARDSON

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R. A. FINCH, Plant Breeding Institute, Trumpington
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A. JASIEWICZ, Polska Akademia Nauk, Kraków
Q. O. N. KAY, University of Wales, Swansea
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S. KOŽUHAROV, Bălgarska Akademija na Naukite, Sofija
F. KRENDL, Naturhistorisches Museum, Wien
B. KUZMANOV, Bălgarska Akademija na Naukite, Sofija
S. LIPSCHITZ, Akademija Nauk S.S.S.R., Leningrad
D. LÖVE, University of Colorado
J. B. MARSHALL, British Museum (Natural History), London
J. MCNEILL, Canada Agriculture, Ottawa
R. D. MEIKLE, Royal Botanic Gardens, Kew
H. MERXMÜLLER, Botanische Staatssammlung, München
D. M. MOORE, University of Reading
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C. PUFF, Universität Wien
D. RATCLIFFE, University of Leicester
A. J. RICHARDS, University of Newcastle-upon-Tyne
I. B. K. RICHARDSON, University of Reading

LIST OF CONTRIBUTORS TO VOLUME 4

M. L. ROCHA AFONSO, Instituto Superior de Agronomia, Lisboa
A. SCHREIBER, Botanische Staatssammlung, München
P. D. SELL, University of Cambridge
V. N. TIKHOMIROV, Moskovskij Gosudarstvennij Universitet im. M. V. Lomonosova, Moskva
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PREFACE

The publication of Volume 4 of *Flora Europaea* completes our account of the Dicotyledonous families, leaving a final fifth volume to cover the Monocotyledones. The present volume contains many genera of exceptional taxonomic difficulty and it is in no small measure due to the unfailing cooperation and advice we have received from our many friends and advisers who make up the *Flora Europaea* organization that we have been able to prepare it for publication within four years of the previous volume.

After a modest start nearly twenty years ago, the *Flora Europaea* organization is now a well-established feature of the botanical scene in Europe, and its significance has been widely appreciated in other continents. We are indebted to all our Regional Advisers and Advisory Editors for keeping faith with us year after year. To our authors we owe a special debt of gratitude for the way in which they have not only provided us with manuscripts but have accepted the very extensive modifications to which these have often been subjected during the various stages of editing. Problems of generic delimitation have been of special concern in some families in this volume and the willingness of our authors to accept, although not without extensive discussion and debate, proposals for the modification of their original generic disposition, in the interests of some degree of uniformity of treatment, has been testimony to their cooperation. As in the previous volumes, the Editorial Committee accepts full responsibility for the form in which the text appears.

Our team of Research Associates has remained unchanged during the preparation of this volume; Dr R. DeFilipps after five years' loyal service with us has now returned to the Smithsonian Institution, Washington.

There has been a major change in the pattern of financial support for the project during the past years. The United Kingdom Science Research Council has provided support continuously for the project since 1959 but its final grant expired in 1973. We wish to express our profound appreciation of this outstanding support, amounting to over £130,000, which made the realization of the *Flora Europaea* project possible. Since 1973 we have been fortunate in obtaining grants from European sources outside the United Kingdom. The contributing bodies have been Fundação Calouste Gulbenkian; Consiglio Nazionale delle Ricerche, Italy; Fonds national de la recherche scientifique, Switzerland; Natural Science Research Council, Sweden; Consejo Superior de Investigaciones Científicas, Spain; Trinity College, University of Dublin, Ireland; Royal Irish Academy; National Science Council, Ireland; National Research Council, Denmark; National Research Council, Iceland; M. Roger de Vilmorin, France; Goulandris Botanical Museum, Greece; Centre National de la Recherche Scientifique, France. At the time of writing £22,475 has been received or promised from these bodies and we are grateful to them and to our Advisers who have been instrumental in negotiating the grants. In particular we wish to acknowledge the role of the Natural Science Research Council of Sweden which has coordinated the work of seeking contributions within the West European Research Councils. A substantial grant has also been made by the *Flora Europaea* Trust Fund of the Linnean Society of London, which receives its income from the royalties from the Flora.

The seventh *Flora Europaea* symposium was held in Coimbra in May 1972 and was arranged through the courtesy of Professor A. Fernandes. Financial support for this very successful meeting was provided by the Instituto de Alta Cultura, the Ministry of National Education, the Mayor of Coimbra and the Sociedade Broteriana.

We have continued to enjoy unfailing courtesy and assistance from the Keeper and Staff of the Department of Botany, British Museum (Natural History), London, and from the Director and Staff of the Herbarium and Library, Royal Botanic Gardens, Kew. We are also grateful to many other European institutions for their help in lending us material.

Once again we wish to acknowledge the exceedingly valuable contribution to the Flora made by Mr J. E. Dandy, one of our Advisory Editors, who has checked the nomenclature of most of the accounts in this volume and has been unsparing in his advice and suggestions. Dr W. T. Stearn has also generously given much assistance with nomenclatural problems. Other botanists who have assisted us in special ways include Mr P. D. Sell who has been responsible for the painstaking labour needed to prepare the index for the press, and Professor G. Wagenitz and Dr W. Gutermann who made valuable comments on many genera.

The University of Reading has continued to provide accommodation for the Secretariat in the Plant Science Laboratories and has handled the financial accounts of the project without charge. The Universities of Cambridge, Dublin, Leicester, Manchester and Ulster have also supported the members of the Editorial Committee in making facilities available to them. We owe a special debt of gratitude to Mrs Rosa Husain who has run the office at the Secretariat with great efficiency and loyalty.

INTRODUCTION

The aim of the Flora is in general diagnostic, and the descriptions, while brief, are as far as possible comparable for related species. The Floras listed on pp. xix–xxi, and the monographs or revisions given when appropriate after the descriptions of families and genera, may assist the reader in obtaining more detailed information. Other references to published work are occasionally given in cases of special taxonomic difficulty.

All available evidence, morphological, geographical, ecological and cytogenetical, has been taken into consideration in delimiting species and subspecies, but they are in all cases definable in morphological terms. (Taxa below the rank of subspecies are not normally included.) The delimitation of genera is often controversial and the solution adopted in the Flora may be a somewhat arbitrary choice between conflicting opinions. We have endeavoured to weigh as fairly as possible the various opinions available, but there has been no consistent policy of 'lumping' or 'splitting' genera (or, for that matter, species). The order and circumscription of the families is that of Melchior in Engler, *Syllabus der Pflanzenfamilien* ed. 12 (1964). This volume contains the second part of the Sympetalae (Plantaginales–Campanulales), the first part having appeared in Volume 3 with the exception of the Rubiaceae, which is placed at the head of this volume.

All descriptions of taxa refer only to their representatives in Europe. In practice, we have relaxed this rule slightly for families and genera to avoid giving taxonomically misleading information, particularly in those cases where a large family or genus has only one or few, somewhat atypical, members in Europe. In such cases we have occasionally added 'in European members' or a similar phrase to emphasize the atypical representation. It should, however, never be assumed that the description is valid for all non-European taxa.

For the purpose of this Flora, we have tried as far as possible to interpret Europe in its traditional sense. The area covered is shown on the maps at the end of the volume.

Place-names used in the summaries of geographical distribution have been given in their English form when they refer to independent states (including the constituent republics of the U.S.S.R.) or to such geographical features of Europe as transcend national boundaries. All other place-names are given in the language of the country concerned. Thus we write *Sweden*, *Ukraine*, *Danube*, *Alps*, *Mediterranean* but *Corse*, *Kriti*, *Slovenija*, *Rodopi Planina*, *Ahvenanmaa*.

In *transliteration* from Cyrillic characters we have followed the ISO system recommended in the UNESCO *Bulletin for Libraries* **10:** 136–137 (1956) for place-names and titles of journals. With personal names, however, we have followed the list of transliterations given in the index-volume (1962) to *Not. Syst.* (*Leningrad*), and have transliterated personal names which do not occur in this list according to the conventions used there.

In transliterating place-names from Greek characters, we have, except for omitting the accents, followed *The Times Atlas of the World*, Mid-Century Edition, vol. 4 (London, 1956).

On pp. xix–xxi, we give a list of *Basic and Standard Floras*. Basic Floras have been chosen as widely known Floras covering large or important parts of Europe. Standard Floras are considered to represent those Floras in current use and likely to be familiar to a large

number of people in the particular country concerned; the list has been revised since the publication of Volume 3.

Synonyms, whether full or partial, are given in parentheses in the text only when they are used in one of the Basic Floras or when they are necessary to prevent confusion. (For primarily Iberian and Mediterranean species, synonyms used in the *Prodromus* of Willkomm & Lange, and the *Supplementum* by Willkomm (p. xxi) are also included.) Synonyms (or the basionym) are also usually given in the text when the combination has not previously been used in a Flora or monograph, or when the nomenclature is otherwise unfamiliar or in need of explanation. Otherwise, synonyms are given in the Index only; but it is important to note that no attempt has been made to give a complete synonymy. Even at the binomial level, the number of names for European plants is four or five times the number of accepted species, and to include all these would be impracticable. Thus, in addition to the binomials in the text, the Index contains all synonyms at specific rank which are used in the Basic and Standard Floras, or in cited monographs, with an indication of the species in the text under which they have been relegated to synonymy. Some subspecific names also appear in the Index. In this way, we hope that users of any Basic or Standard Flora will be able to relate the names used in their own Floras to those in *Flora Europaea*. In cases where the name of a familiar species has been changed, an explanation of this is usually published as a Notula (see p. xviii).

Citations have been abbreviated, and the abbreviations used for authors and places of publication have been standardized; lists of these abbreviations are given in Appendices I, II and III. These lists apply only to the abbreviations used in Volume 4.

Species descriptions attempt to give, within the limits of length set by the Flora, both the diagnostic characters of the plant and a general idea of its appearance. Where dimensions are given, a measurement without qualification refers to length. Two measurements connected by × indicate length followed by width. Further measurements in parentheses indicate exceptional sizes outside the normal ranges. In order to save space and facilitate identification, descriptions may sometimes take the form of a comparison with another description. The conventional way of setting this out is, to give an example (p. 11):

42. Asperula taygetea Boiss. & Heldr....Like **41** but...

This implies that the description with which it is being compared (in this example **41. Asperula incana** Sibth. & Sm.) applies to this taxon but for the differences noted. It does not necessarily mean that the two taxa are similar in general appearance. Additional descriptive information is sometimes also given, but in separate sentences.

The *diploid chromosome number* ($2n =$) is given where it has been possible to verify that the count was made on material of known wild European origin. For naturalized and cultivated species, the count is from material which is naturalized or is cultivated in the way which justifies its inclusion in the Flora. It is hoped to publish separately a list of references to the data on which the published numbers are based.

Ecological information is given sparingly, and only where the ecological characteristics of a species are clearly and concisely definable for its total European range. Sometimes a general statement, applicable to a whole genus or to a group of species, is made. There is an inevitable irregularity of treatment, as in a great many cases reliable ecological information is not available.

The description of each species is followed by an indication of its *distribution within Europe*. This falls into two parts: (1) a summary in a short phrase; (2) a list of abbreviations of 'territories' in which the species occurs. The summary phrase makes use of every-

day geographical phrases and concepts such as 'W. Europe', 'the Mediterranean region', 'the Balkan peninsula', etc. Maps IV and V and the legends accompanying them indicate the interpretation which is to be put on these phrases. We would emphasize that they are to be interpreted in a simple geographical sense, and do not attempt in any way to divide Europe phytogeographically.

Species believed to be endemic to Europe are distinguished by a symbol (●) before the summary of geographical distribution.

A more precise indication of distribution is given by the enumeration of the 'territories' (indicated by two-letter abbreviations) in which the plant occurs. The limits of these territories follow, with very few exceptions, existing political boundaries (see Map I). The territories, of course, vary greatly in size, and Ga, Hs or Ju gives very much less information than does Fa, Rs(K) or Tu. In all cases, however, the lists provide a guide to which national Floras should be searched for further detailed information, whether on taxonomy or on distribution. Occasionally, the list of territories is followed by a brief indication, in parentheses, of extra-European distribution. This is done only for plants of which the European range is but a small fraction of the total and for species not native in Europe.

In general the only infraspecific taxa described and keyed in the Flora are subspecies. Any formal treatment of variation below the level of subspecies would have been impossible in a Flora of this kind; the known variation of taxa is, however, covered in the descriptions. No 'experimental' categories, such as ecotypes, are used in the Flora in a formal systematic sense, though they are sometimes mentioned in notes.

Where it is difficult to distinguish between a number of closely similar species in a genus, an *ad hoc* 'group' has been made, and these groups, not the individual species, are keyed out in the main species key. They will serve for at least a partial identification. Following the description of a group in the text, a key to the component species is given, and they are then numbered and described, so that a more detailed study, or the availability of more adequate material, may enable the user to take the identification further. For example, in *Asperula* there is the *A. pyrenaica* group, which comprises the species *A. neilreichii* G. Beck, *A. beckiana* Degen, *A. neglecta* Guss., *A. rupicola* Jordan and *A. pyrenaica* L. Such groups have no nomenclatural status.

The genera *Taraxacum* and *Hieracium* have presented special problems in this volume, because they contain many apomictic species. As has been our practice in previous volumes, we have dealt with them in a pragmatic way. Complete accounts listing and describing all the named species, even if practicable, would have taken up too much space. What we have done is to provide a concise summary, indicating where further information can be sought. Thus in *Taraxacum* 4 species and 26 groups have been described and keyed. Under each group, a selection of its more widespread species is listed, with geographical distribution, and in each group (except the *T. officinale* group) all the species described from Europe are indexed. *Hieracium* is rather more complex, because of its two subgenera *Pilosella* and *Hieracium* which behave in rather different ways, e.g. with respect to hybridization, but here again a uniform treatment, along the lines indicated for *Taraxacum*, has been worked out.

Only those few *hybrids* which are frequent over a reasonably large area (e.g. *Galium* × *pomeranicum*) are described and keyed as for species. Other common hybrids may be mentioned individually in notes (e.g. in *Cirsium*) or collectively for the whole genus (e.g. in *Achillea*).

We have attempted to include the following categories of *alien species*:

(i) Aliens which are effectively naturalized. These include garden plants which have escaped to situations not immediately adjacent to those in which they are cultivated, as well as weeds and other plants which have been accidentally introduced; provided, in both cases, that the plant has been established in a single station for at least 25 years, or is reported as naturalized in a number of widely separated localities.

(ii) Trees or crop-plants which are planted or cultivated in continuous stands on a fairly extensive scale.

Casual aliens, i.e. those which do not persist without repeated re-introduction, are not included unless they have often been mistaken for a native or established species, or are for any other reason of special interest. In assessing the status of a species in any part of Europe we have, however, been dependent very largely on the information contained in the national Floras, and it is clear that the criteria used by different authors vary widely. All data on native, naturalized or casual status relating to synanthropic plants must, therefore, be regarded as only approximate.

It is the policy of the Committee not to publish new names in the Flora itself. To deal with the publication of much of this material, an arrangement has been made with our sponsor the Linnean Society of London, by which taxonomic and nomenclatural notes are being published as part of a series entitled *Notulae Systematicae ad Floram Europaeam spectantes* in the *Botanical Journal of the Linnean Society*. The *Notulae* corresponding to Volumes 1 and 2 were published in *Feddes Repertorium*.

LISTS OF BASIC AND STANDARD FLORAS

BASIC FLORAS

COSTE, H. *Flore descriptive et illustrée de la France, de la Corse et des Contrées limitrophes*. Vols. 1–3. Paris, 1900–1906.

HAYEK, A. VON. *Prodromus Florae Peninsulae balcanicae* (in *Feddes Repert.* (*Beih.*) **30**). Vols. 1–3. Berlin-Dahlem, 1924–1933.

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SYNOPSIS OF FAMILIES

KEY TO FAMILIES OF ANGIOSPERMAE

This key covers all the families of Angiospermae in volumes 1–4 and the great majority of those in volume 5, though some introduced families and, doubtless, some anomalous genera, may have been omitted. A comprehensive key will be included in volume 5.

1 Plant free-floating on or below surface of water, not rooted in mud
2 Plant with small bladders on leaves or on apparently leafless stems; leaves divided into filiform segments **CLXI. Lentibulariaceae**
2 Not as above
3 Plant without obvious differentiation into stems and leaves **Lemnaceae**
3 Plant with obvious stems and leaves
4 Leaves dichotomously divided into numerous filiform segments **LX. Ceratophyllaceae**
4 Leaves not as above
5 Leaves with a cuneate basal part, 4–6 setaceous segments and a terminal orbicular lobe **LXXI. Droseraceae**
5 Leaves not as above
6 Floating leaves sessile **Hydrocharitaceae**
6 Floating leaves long-petiolate
7 Floating leaves cordate-orbicular, entire **Hydrocharitaceae**
7 Floating leaves rhombic, dentate in upper ⅔ **CXX. Trapaceae**

1 Land-plant or aquatic rooted in mud
8 2- to 4-fid coloured staminodes present inside the sepals; leaves often fasciculate **LIII. Molluginaceae**
8 Not as above
9 Perianth not of 2 or more markedly different whorls
10 Perianth petaloid
11 Plant without chlorophyll
12 Flowers mostly unisexual; stamen 1 **XLVI. Balanophoraceae**
12 Flowers hermaphrodite; stamens 6–16
13 Filaments free **CXXXI. Pyrolaceae**
13 Filaments connate into a column **XLV. Rafflesiaceae**
11 Green plant
14 Perianth-segment 1, bract-like **Aponogetonaceae**
14 Perianth-segments more than 1, or perianth tubular
15 Stems succulent, leafless but with groups of spines **CXVIII. Cactaceae**
15 Not as above
16 Stamens more than 12
17 Herb or, rarely, woody climber with pinnate leaves **LXI. Ranunculaceae**
17 Tree with simple leaves **LXIV. Magnoliaceae**
16 Stamens 12 or fewer
18 Flowers in ovoid capitula; involucre absent **LXXX. Rosaceae**
18 Flowers not in capitula, or involucre present
19 Ovary superior
20 Perianth-segments 4
21 Flowers zygomorphic **XLI. Proteaceae**
21 Flowers actinomorphic
22 Perianth tubular below **CVII. Thymelaeaceae**
22 Perianth-segments free
23 Herb **Liliaceae**
23 Shrub **XLVII. Polygonaceae**
20 Perianth-segments more than 4
24 Carpels more than 1, free or nearly so
25 Leaves triquetrous, all basal **Butomaceae**
25 Leaves flat, cauline **LI. Phytolaccaceae**
24 Carpel 1, or carpels obviously united
26 Perianth-segments 6
27 Stem stout, woody; leaves crowded, rigid, very fibrous **Agavaceae**
27 Not as above **Liliaceae**
26 Perianth-segments 5
28 Stigmas 2–3; stipules sheathing, scarious **XLVII. Polygonaceae**
28 Stigma 1; stipules absent
29 Ovules numerous; perianth divided almost to base **CXXXV. Primulaceae**
29 Ovule 1; perianth with a long tube **L. Nyctaginaceae**
19 Ovary inferior, or flowers male
30 Leaves at least partly in whorls of 4 or more **CXLIV. Rubiaceae**
30 Leaves not in whorls
31 Flowers sessile, in capitula
32 Anthers cohering in a tube round the style, or flowers unisexual **CLXIX. Compositae**
32 Anthers free; flowers hermaphrodite **CLVXII. Dipsacaceae**
31 Flowers pedicellate, though pedicels sometimes short and flowers in compact umbels or cymes
33 Ovules numerous
34 Perianth-segments 3, or perianth tubular with a unilateral entire limb **XLIV. Aristolochiaceae**
34 Perianth-segments 6 or 8
35 Perianth-segments in 2 whorls of 4 **CXXIII. Onagraceae**
35 Perianth-segments in 2 whorls of 3
36 Stamens 3 **Iridaceae**
36 Stamens 6
37 Stock a bulb; scapose **Amaryllidaceae**
37 Stock a rhizome; stem leafy **Agavaceae**
33 Ovules 1 or 2
38 Leaves opposite **CLXVI. Valerianaceae**
38 Leaves alternate
39 Flowers in simple cymes or solitary **XLII. Santalaceae**
39 Flowers in umbels or superposed whorls **CXXIX. Umbelliferae**
10 Perianth dry and scarious (though sometimes brightly coloured) or sepaloid or absent
40 Tree or shrub, sometimes small
41 Parasitic on branches of trees and shrubs **XLIII. Loranthaceae**
41 Not parasitic
42 Stems creeping or climbing with adventitious roots; evergreen **CXXVIII. Araliaceae**
42 Not as above
43 Flowers borne on flattened evergreen cladodes; leaves small, brownish, scale-like **Liliaceae**
43 Not as above
44 Most leaves opposite or subopposite
45 Young stems or leaves fleshy **XLVIII. Chenopodiaceae**
45 Neither stems nor leaves fleshy
46 Styles 3 **CII. Buxaceae**
46 Styles 4 or 1
47 Flowers in catkins **XXXI. Salicaceae**
47 Flowers not in catkins
48 Leaves pinnate; stamens 2 **CXXXIX. Oleaceae**
48 Leaves simple; stamens 4 or more
49 Stamens 5, alternating with the sepals **CIII. Rhamnaceae**
49 Stamens 8; sepals 5 **XCV. Aceraceae**
44 Most leaves alternate
50 Leaves pinnate
51 Male flowers in catkins; styles 2; pith septate **XXXIII. Juglandaceae**
51 Flowers not in catkins; styles 3 or 1; pith not septate

52 Style 1; fruit a lomentum **LXXXI. Leguminosae**
52 Styles 3; fruit a dry, 1-seeded drupe **XCIV. Anacardiaceae**
50 Leaves simple
53 Leaves not more than 2 mm wide, oblong or linear
54 Stigma 1 **CVII. Thymelaeaceae**
54 Stigmas 2–9
55 Stamens 3 **CXXXIII. Empetraceae**
55 Stamens 5 **XLVIII. Chenopodiaceae**
53 Leaves more than 2 mm wide
56 Petiole-base enclosing the bud **LXXIX. Platanaceae**
56 Petiole-base not enclosing the bud
57 Anthers opening by transverse valves **LXV. Lauraceae**
57 Anthers opening by longitudinal slits
58 Flowers not in catkins or dense heads
59 Inflorescence of several male flowers, each of 1 stamen, and a female flower, appearing as a stalked ovary, all surrounded by 4–5 (–8) conspicuous glands; latex present **LXXXVII. Euphorbiaceae**
59 Inflorescence not as above; latex absent
60 Flowers unisexual
61 Peltate scale-like silvery or ferrugineous hairs present beneath the leaves and often elsewhere; ovary 1-locular; fruit fleshy **CVIII. Elaeagnaceae**
61 Peltate hairs absent; ovary 3-locular; fruit dry **LXXXVII. Enphorbiaceae**
60 Flowers hermaphrodite
62 Tree; perianth-tube short, with stamens inserted near its base **XXXVII. Ulmaceae**
62 Shrub; perianth-tube long, with stamens inserted near its apex **CVII. Thymelaeaceae**
58 At least the male flowers in catkins or dense heads
63 Latex present; fruit or false fruit fleshy **XXVIII. Moraceae**
63 Latex absent; fruit dry
64 Dioecious; perianth absent
65 Bracts (catkin-scales) fimbriate or lobed at apex; flowers with a cup-like disc **XXXI. Salicaceae**
65 Bracts (catkin-scales) entire; disc absent
66 Leaves without pellucid glands; stamens with long filaments; ovules numerous **XXXI. Salicaceae**
66 Leaves with pellucid glands; stamens with short filaments; ovules 1 **XXXII. Myricaceae**
64 Monoecious; perianth present in male or female flowers or both
67 Styles 3 or more; perianth present in flowers of both sexes **XXVI. Fagaceae**
67 Styles 2; perianth present in flowers of 1 sex only
68 Male flowers 3 to each bract; perianth present **XXXIV. Betulaceae**
68 Male flowers 1 to each bract; perianth absent **XXXV. Corylaceae**
40 Herb
69 Perianth absent or represented by scales or bristles, minute at anthesis; flowers in the axils of bracts, a number of which are usually closely imbricate on a rhachis, forming a spikelet; leaves usually linear, grass-like, sheathing below
70 Flowers usually with a bract above and below; sheaths usually open; stems usually with hollow internodes, not triquetrous **Gramineae**
70 Flowers with a bract below only; sheaths usually closed; stems usually with solid internodes, often triquetrous **Cyperaceae**
69 Perianth present, or flowers not arranged in spikelets
71 Aquatic plant with submerged or floating leaves; inflorescence sometimes emergent
72 Leaves divided into numerous filiform segments
73 Leaves pinnately divided; flowers in a terminal spike **CXXIV. Haloragaceae**
73 Leaves dichotomously divided; flowers solitary, axillary **LX. Ceratophyllaceae**
72 Leaves entire or minutely toothed
74 Flowers in spikes
75 Rhizome densely covered with rigid fibres; spike subtended by several leaf-like bracts (marine) **Posidoniaceae**
75 Rhizome without rigid fibres; spike not subtended by several leaf-like bracts (marine or fresh-water)
76 Flowers unisexual, arranged on one side of a flat rhachis (marine) **Zosteraceae**
76 Flowers hermaphrodite, arranged all round or on 2 sides of a terete rhachis (fresh or brackish water)
77 Spikes 2-flowered; carpels with stalks several times their own length in fruit **Rupplaceae**
77 Spikes more than 2-flowered; carpels sessile in fruit **Potamogetonaceae**
74 Flowers not in spikes
78 Flowers in heads on long peduncles or in compound inflorescences
79 Flowers hermaphrodite **Juncaceae**
79 Flowers unisexual
80 Leaves all basal; heads solitary on long scapes **Eriocaulaceae**
80 Some leaves cauline; inflorescence with female heads below and male heads above **Sparganiaceae**
78 At least the fertile flowers solitary or few, sessile or shortly pedicellate
81 Leaves in whorls of 8 or more **CXXVI. Hippuridaceae**
81 Leaves not in whorls of 8 or more
82 Carpels 2 or more, free **Zannichelliaceae**
82 Carpels connate or solitary
83 Perianth-segments 4–6; stamens 4 or more; leaves ovate to obovate
84 Perianth-segments 4; ovary inferior **CXXIII. Onagraceae**
84 Perianth-segments 6; ovary superior **CXIX. Lythraceae**
83 Perianth-segments fewer than 4, or perianth absent; stamens 1–3; leaves linear to lanceolate
85 Perianth with 3 segments; ovary inferior; stamens 2–3 **Hydrocharitaceae**
85 Perianth 2-lipped or absent; ovary superior; stamen 1
86 Leaves entire, without sheathing base; ovary compressed, deeply 4-lobed **CL. Callitrichaceae**
86 Leaves dentate or denticulate, with sheathing base; ovary terete, not lobed **Najadaceae**
71 Land-plant or aquatic with emergent stems or leaves
87 Climbing plant with unisexual flowers
88 Leaves opposite; perianth-segments 5 **XXXIX. Cannabaceae**
88 Leaves alternate; perianth-segments 6 **Dioscoreaceae**
87 Not climbing, or rarely climber with hermaphrodite flowers
89 Leaves linear
90 Flowers unisexual
91 Female flowers solitary; male flowers solitary or in short cymes **XLVIII. Chenopodiaceae**
91 Male and female flowers numerous, in dense heads or spikes
92 Male and female (and some hermaphrodite) flowers mixed together in the same spike; stamen 1 **Lilaeaceae**

92 Male and female flowers separate in the inflorescence; stamens 2 or more
93 Male and female flowers in separate globose heads **Sparganiaceae**
93 Flowers in a dense cylindrical spike, male above, female below, sometimes with a gap between them **Typhaceae**
90 Flowers hermaphrodite
94 Plant densely pubescent **XLVIII. Chenopodiaceae**
94 Plant glabrous to sparsely hairy
95 Flowers in a dense spike apparently lateral on a flattened leaf-like stem **Araceae**
95 Not as above
96 Carpel 1
97 Leaves not subverticillate; stipules absent **XLVIII. Chenopodiaceae**
97 Leaves subverticillate; small stipules present **LVII. Caryophyllaceae**
96 Carpels more than 1
98 Carpels free (except at base); leaves with a conspicuous pore at apex **Schenchzeriaceae**
98 Carpels ± completely united; leaves without a conspicuous pore at apex
99 Flowers in unbranched racemes; styles short or absent **Juncaginaceae**
99 Flowers in cymes, usually in a branched inflorescence; styles 3, distinct **Juncaceae**
89 Leaves lanceolate or wider, or small and scale-like, but not linear
100 Leaves compound
101 Flowers in compound umbels **CXXIX. Umbelliferae**
101 Flowers not in compound umbels
102 Flowers in capitula
103 Leaves pinnate; styles 1 or 2 **LXXX. Rosaceae**
103 Leaves ternate; styles 3–5 **CLXV. Adoxaceae**
102 Flowers not in capitula
104 Ovary inferior; styles 3, 2-fid **CXVI. Datiscaceae**
104 Ovary superior; styles 1, 4 or 5
105 Stamens numerous **LXI. Ranunculaceae**
105 Stamens 4–5(–10)
106 Epicalyx present **LXXX. Rosaceae**
106 Epicalyx absent **LXXXIII. Geraniaceae**
100 Leaves simple or apparently absent
107 Flowers small, usually numerous, arranged on an axis (spadix) subtended and often ± enclosed by a conspicuous bract (spathe) **Araceae**
107 Not as above
108 Inflorescence of several male flowers, each of 1 stamen, and a female flower, appearing as a stalked ovary, all surrounded by 4 or 5(8) conspicuous glands; latex present **LXXXVII. Enphorbiaceae**
108 Not as above
109 Leaves apparently absent; stem green and succulent **XLVIII. Chenopodiaceae**
109 Leaves obvious; stem not succulent
110 Lower leaves opposite, upper alternate; monoecious; male flowers with 2-partite perianth, the female with tubular perianth **CXXV. Theligonaceae**
110 Not as above
111 Plant densely clothed with stellate or peltate hairs; ovary 3-locular with 1 ovule in each loculus **LXXXVII. Euphorbiaceae**
111 Not as above
112 Plant densely papillose
113 Leaves oblong-lanceolate, not hastate; fruit dehiscing by 5 valves **LII. Aizoaceae**
113 Leaves ovate-rhombic, often hastate; fruit indehiscent **LIV. Tetragoniaceae**
112 Plant not densely papillose
114 Leaves in whorls
115 Stigma 1; stems hollow **CXXVI. Hippuridaceae**
115 Stigmas 3; stems solid **LIII. Molluginaceae**
114 Leaves not in whorls
116 Leaves opposite (rarely a few of the upper apparently alternate)
117 Leaves toothed or lobed
118 Flowers hermaphrodite
119 Ovary inferior or semi-inferior; stigmas 2 **LXXIII. Saxifragaceae**
119 Ovary superior; stigmas 5 **LXXXIII. Geraniaceae**
118 Flowers unisexual
120 Perianth-segments 4 or 2; style 1 **XL. Urticaceae**
120 Perianth-segments 3; styles 2 **LXXXVII. Euphorbiaceae**
117 Leaves entire
121 Perianth absent; ovary strongly compressed, deeply 4-lobed **CL. Callitrichaceae**
121 Perianth present; ovary not compressed and 4 lobed
122 Perianth-segments 3 **XLVII. Polygonaceae**
122 Perianth-segments 4 or more
123 Ovary inferior **CXXIII. Onagraceae**
123 Ovary superior
124 Perianth-segments 6 or 12; style and stigma 1 **CXIX. Lythraceae**
124 Perianth-segments 4 or 5; styles or stigmas 2 or more
125 Leaves with a long spinose apex; perianth-segments transversely winged in fruit **XLVIII. Chenopodiaceae**
125 Leaves without a long spinose apex; perianth-segments not winged in fruit **LVII. Caryophyllaceae**
116 Leaves alternate or all basal (rarely the lower opposite)
126 Stamens numerous; carpels free, except sometimes at base **LXI. Ranunculaceae**
126 Stamens 12 or fewer; carpels usually solitary or united
127 Carpels attached to a central axis, otherwise free **LI. Phytolaccaceae**
127 Carpel 1, or carpels obviously united
128 Stamens 12 **XLIV. Aristolochiaceae**
128 Stamens 10 or fewer
129 Stipules united into a sheath **XLVII. Polygonaceae**
129 Stipules free or absent
130 Leaves very large, palmately lobed, all basal; inflorescence of dense, many-flowered spikes much shorter than the leaves **CXXIV. Haloragaceae**
130 Not as above
131 Epicalyx present; stipules leaf-like **LXXX. Rosaceae**
131 Epicalyx absent; stipules small or absent
132 Ovary inferior
133 Leaves reniform, cordate **LXXIII. Saxifragaceae**
133 Leaves subulate to linear-lanceolate **XLII. Santalaceae**
132 Ovary superior
134 Perianth tubular below
135 Stamens 1–5; ovule basal **XLVIII. Chenopodiaceae**

135 Stamens 8; ovule pendent **CVII. Thymelaeaceae**
134 Perianth-segments, if present, free or nearly so
136 Perianth-segments 4
137 Flowers in ebracteate racemes **LXVIII. Cruciferae**
137 Flowers in axillary clusters **XL. Urticaceae**
136 Perianth-segments 5
138 Perianth herbaceous, or absent in female flowers **XLVIII. Chenopodiaceae**
138 Perianth scarious **XLIX. Amaranthaceae**
9 Perianth of 2 (rarely more) whorls differing markedly from each other in shape, size or colour
139 Petals all united at base into a longer or shorter tube
140 Ovary inferior
141 Stamens 8–10, or 4–5 with filaments divided to the base
142 Herb; anthers opening by longitudinal slits; leaves ternate **CLXV. Adoxaceae**
142 Woody; anthers opening by pores; leaves simple **CXXXII. Ericaceae**
141 Stamens 5 or fewer; filaments not divided
143 Leaves in whorls of 4 or more **CXLIV. Rubiaceae**
143 Leaves not in whorls
144 Stamens opposite the corolla-lobes **CXXV. Primulaceae**
144 Stamens alternating with the corolla-lobes
145 Stipules interpetiolar **CXLIV. Rubiaceae**
145 Stipules absent or not interpetiolar
146 Flowers in capitula surrounded by an involucre of more than 2 bracts
147 Anthers coherent in a ring round the style
148 Ovule 1; calyx represented by hairs, scales, a corona or auricle **CLXIX. Compositae**
148 Ovules numerous; calyx-lobes conspicuous, usually green **CLXVIII. Campanulaceae**
147 Anthers free
149 Ovules numerous; corolla-lobes longer than tube **CLXVIII. Campanulaceae**
149 Ovule 1; corolla-lobes usually much shorter than tube **CLXVII. Dipsacaceae**
146 Flowers not in capitula, or bracts 2
150 Anthers coherent in a tube round the style **CLXVIII. Campanulaceae**
150 Anthers free
151 Anthers sessile; pollen-grains cohering in pollinia **Orchidaceae**
151 Anthers with filaments; pollen-grains not in pollinia
152 Leaves more than 100 cm **Musaceae**
152 Leaves not more than *c.* 50 cm
153 Stamens 1–3(–4)
154 Corolla 4- to 5-merous **CLXVI. Valerianaceae**
154 Corolla 3-merous
155 Sepals connate into a tube **Zingiberaceae**
155 Sepals free **Cannaceae**
153 Stamens 4–5
156 Shrub (sometimes small and creeping), or woody climber **CLXIV. Caprifoliaceae**
156 Herb
157 Tendrils present **CXVII. Cucurbitaceae**
157 Tendrils absent
158 Leaves pinnate **CLXIV. Caprifoliaceae**
158 Leaves not pinnate
159 Flowers hermaphrodite; fruit a capsule **CLXVIII. Campanulaceae**
159 Flowers unisexual; fruit fleshy **CXVII. Cucurbitaceae**
140 Ovary superior
160 Flowers papilionaceous
161 Sepals free; stamens 8 **XCII. Polygalaceae**
161 Sepals connate; stamens 10 **LXXXI. Leguminosae**
160 Flowers not papilionaceous
162 Stamens at least twice as many as corolla-lobes
163 Herb with succulent leaves **LXXII. Crassulaceae**
163 Shrub or tree
164 Flowers unisexual **CXXXVII. Ebenaceae**
164 Flowers hermaphrodite
165 Anthers opening by pores; hairs simple or scale-like **CXXXII. Ericaceae**
165 Anthers opening by longitudinal slits; hairs stellate **CXXXVIII. Styracaceae**
162 Stamens as many as or fewer than corolla-lobes
166 Plant without chlorophyll; leaves scale-like
167 Flowers actinomorphic; stem slender, twining **CXLVI. Convolvulaceae**
167 Flowers ± zygomorphic; stem stout, erect
168 Leaves fleshy at anthesis; corolla with cylindrical tube and 2-lipped limb; upper lip entire, the lower entire or shortly 3-lobed **CLIV. Scrophulariaceae**
168 Leaves not fleshy at anthesis; corolla 5-lobed, 2-lipped or almost regular **CLX. Orobanchaceae**
166 Green plant
169 Ovary deeply (2–)4-lobed with 1 ovule in each lobe; fruit separating into nutlets when mature
170 Leaves alternate **CXLVIII. Boraginaceae**
170 Leaves opposite
171 Style gynobasic **CLI. Labiatae**
171 Style terminal **CXLIX. Verbenaceae**
169 Ovary not deeply (2–)4-lobed
172 Flowers distinctly zygomorphic
173 Anthers opening by pores **CXXXII. Ericaceae**
173 Anthers opening by longitudinal slits
174 Calyx with patent spines and erect, membranous, usually dark-spotted lobes **CXXXV. Primulaceae**
174 Calyx not as above
175 Flowers small, crowded in capitula **CLV. Globulariaceae**
175 Flowers not in capitula
176 Ovary 1-locular; carnivorous plants **CLXI. Lentibulariaceae**
176 Ovary 2-locular; not carnivorous plants
177 Ovules 4
178 Bracts and bracteoles shorter than calyx **CXLIX. Verbenaceae**
178 Bracts or bracteoles longer than calyx **CLXI. Acanthaceae**
177 Ovules numerous
179 Leaves all basal **CLIX. Gesneriaceae**
179 Cauline leaves present
180 Capsule not more than twice as long as wide **CLIV. Scrophulariaceae**
180 Capsule many times as long as wide
181 Capsule with a short beak **CLVII. Pedaliaceae**
181 Capsule with a horn 8–20 cm **CLVIII. Martyniaceae**
172 Flowers actinomorphic or nearly so
182 Sepals 2
183 Petals 2; leaves all basal **Eriocaulaceae**
183 Petals 5; leaves not all basal **LV. Portulacaceae**
182 Sepals more than 2
184 Carpels free
185 Carpels 4 or more; latex absent **LXXII. Crassulaceae**
185 Carpels 2; latex present
186 Corolla with a corona; styles 2, free but united by the stigma **CXLIII. Asclepiadaceae**
186 Corolla without a corona; styles 2, united except at the very base **CXLII. Apocynaceae**
184 Carpels united

187 Stamens fewer than corolla-lobes
188 Herb **CLIV. Scrophulariaceae**
188 Shrub or tree
189 Leaves opposite **CXXXIX. Oleaceae**
189 Leaves alternate
190 Leaves with numerous pellucid glands **CLXII. Myoporaceae**
190 Leaves without pellucid glands
191 Corolla yellow **CXXXIX. Oleaceae**
191 Corolla not yellow **CLIV. Scrophulariaceae**
187 Stamens as many as corolla-lobes
192 Stamens opposite the corolla-lobes
193 Styles or stigmas more than 1; ovule 1 **CXXXVI. Plumbaginaceae**
193 Style and stigma 1; ovules numerous
194 Herb **CXXXV. Primulaceae**
194 Shrub **CXXXIV. Myrsinaceae**
192 Stamens alternating with the corolla-lobes
195 Leaves opposite or verticillate
196 Herb
197 Aquatic plant; leaves petiolate **CXLI. Menyanthaceae**
197 Land-plant; leaves sessile
198 Corolla not scarious **CXL. Gentianaceae**
198 Corolla entirely scarious **CLXIII. Plantaginaceae**
196 Shrub
199 Plant small, procumbent; leaves evergreen, coriaceous **CXXXII. Ericaceae**
199 Plant large, erect; leaves deciduous, herbaceous
200 Leaves digitate **CXLIX. Verbenaceae**
200 Leaves simple
201 Flowers in long panicles; fruit a capsule **CLIII. Buddlejaceae**
201 Flowers in corymbs; fruit a drupe **CXLIX. Verbenaceae**
195 Leaves alternate or all basal
202 Corolla-lobes and stamens 4
203 Corolla scarious **CLXIII. Plantaginaceae**
203 Corolla not scarious **CLIX. Gesneriaceae**
202 Corolla-lobes and stamens 5
204 Ovary 3-celled; stigmas 3, or 1 but distinctly 3-lobed
205 Leaves herbaceous; corolla not white **CXLV. Polemoniaceae**
205 Leaves coriaceous; corolla white **CXXX. Diapensiaceae**
204 Ovary 2-celled; stigmas 2 or 1
206 Ovules 4 or fewer
207 Flowers numerous, in scorpioid cymes **CXLVII. Boraginaceae**
207 Flowers usually solitary or few, rarely in congested racemes **CXLVI. Convolvulaceae**
206 Ovules numerous
208 Aquatic or bog-plant; corolla-lobes fimbriate **CXLI. Menyanthaceae**
208 Land-plant; corolla-lobes not fimbriate
209 Leaves all basal **CLIX. Gesneriaceae**
209 Some leaves cauline
210 Style deeply divided **CXLVII. Hydrophyllaceae**
210 Style undivided
211 Corolla-lobes imbricate in bud; internal phloem absent **CLIV. Scrophulariaceae**
211 Corolla-lobes plicate or valvate in bud; internal phloem present **CLII. Solanaceae**
139 Petals not all united into a tube at base, very rarely cohering at apex
212 Ovary inferior or partly so
213 Petals numerous
214 Aquatic plant; leaves not succulent **LVIII. Nymphaeaceae**
214 Land-plant; leaves succulent **LII. Aizoaceae**
213 Petals 5 or fewer
215 Petals and sepals 3
216 Flowers zygomorphic
217 Style and filaments obvious **Iridaceae**
217 Stigma and anthers sessile **Orchidaceae**
216 Flowers actinomorphic
218 Outer perianth-whorl sepaloid **Hydrocharitaceae**
218 Both perianth-whorls petaloid
219 Stamens 6 **Amaryllidaceae**
219 Stamens 3 **Iridaceae**
215 Petals and sepals 2, 4 or 5
220 Stamens numerous
221 Leaves opposite, with pellucid glands **CXXI. Myrtaceae**
221 Leaves alternate, without pellucid glands
222 Leaves entire; seeds covered with pulp **CXXII. Punicaceae**
222 Leaves serrulate; seeds dry
223 Styles free; fruit fleshy **LXXX. Rosaceae**
223 Styles connate, except at apex; fruit a capsule **LXXV. Hydrangeaceae**
220 Stamens 10 or fewer
224 Aquatic; leaves pinnate, with filiform segments; flowers in spikes **CXXIV. Haloragaceae**
224 Not as above
225 Herb
226 Petals 5
227 Stamens 5 **CXXIX. Umbelliferae**
227 Stamens 10 **LXXIII. Saxifragaceae**
226 Petals 4 or 2
228 Flowers in umbels surrounded by 4 conspicuous white bracts **CXXVII. Cornaceae**
228 Flowers not in umbels; no conspicuous white bracts **CXXIII. Onagraceae**
225 Shrub or woody climber
229 Flowers in umbels
230 Climber **CXXVIII. Araliaceae**
230 Erect shrub
231 Evergreen; umbels flat **CXXIX. Umbelliferae**
231 Deciduous; umbels globose **CXXVII. Cornaceae**
229 Flowers not in umbels
232 Leaves palmately lobed **LXXVII. Grossulariaceae**
232 Leaves not lobed
233 Both perianth-whorls petaloid **CXXIII. Onagraceae**
233 Outer perianth-whorl sepaloid
234 Calyx-teeth very small; ovules 1 in each carpel; fruit a drupe **CXXVII. Cornaceae**
234 Calyx-teeth large; ovules numerous; fruit a capsule
235 Stamens 10 **LXXV. Hydrangeaceae**
235 Stamens 5 **LXXVI. Escalloniaceae**
212 Ovary superior
236 Carpels 2 or more, free, or united at the base only
237 Sepals and petals 3
238 Carpels more than 3
239 Leaves lobed **LXI. Ranunculaceae**
239 Leaves entire **Alismataceae**
238 Carpels 3
240 Leaves palmately or pinnately divided; petioles spiny **Palmae**
240 Leaves simple, sessile **LXXII. Crassulaceae**
237 Sepals or petals more than 3
241 Flowers zygomorphic; petals deeply divided **LXIX. Resedaceae**
241 Flowers actinomorphic; petals entire
242 Stamens more than twice as many as petals
243 Shrub or herb with stipulate leaves; flowers perigynous **LXXX. Rosaceae**

243 Herb; stipules absent, though leaf-bases sometimes sheathing; flowers hypogynous
244 Fruit a head of achenes; sepals deciduous **LXI. Ranunculaceae**
244 Fruit of 2–5 follicles; sepals persistent **LXII. Paeoniaceae**
242 Stamens not more than twice as many as petals
245 Leaves 3-foliate **LXXX. Rosaceae**
245 Leaves simple
246 Carpels spirally arranged on an elongated receptacle **LXI. Ranunculaceae**
246 Carpels in 1 whorl
247 Tree with palmately lobed leaves; flowers in globose capitula **LXXIX. Platanaceae**
247 Herb or shrub; leaves not palmately lobed; flowers not in globose capitula
248 Herb or dwarf shrub with terete stems; leaves ±succulent **LXXII. Crassulaceae**
248 Shrub with angular stems; leaves not succulent **XCIII. Coriariaceae**
236 Carpels obviously united for at least ½ their length, or carpel solitary
249 Flowers zygomorphic
250 1 or more perianth-segments saccate or spurred at base
251 Sepals 2, small **LXVI. Papaveraceae**
251 Sepals 3 or 5
252 Sepals 3, very unequal, 1 spurred; petals 3, not spurred **XCVIII. Balsaminaceae**
252 Sepals and petals 5
253 Leaves peltate **LXXXIV. Tropaeolaceae**
253 Leaves not peltate
254 Leaves alternate **CX. Violaceae**
254 Leaves opposite **LXXXIII. Geraniaceae**
250 Perianth not saccate or spurred at base
255 All, or all but one of the stamens with their filaments connate into a tube **LXXXI. Leguminosae**
255 All stamens free
256 Tree or shrub
257 Leaves compound
258 Leaves 3-foliolate or pinnate **LXXXI. Leguminosae**
258 Leaves palmate with more than 3 leaflets **XCVII. Hippocastanaceae**
257 Leaves simple
259 Ovary on a long gynophore **LXVII. Capparaceae**
259 Ovary sessile
260 Petals 4 **LXVIII. Cruciferae**
260 Petals 5 **LXXXI. Leguminosae**
256 Herb
261 Ovary and fruit deeply 5-lobed
262 Flowers in umbellate cymes; fruit with a long beak **LXXXIII. Geraniaceae**
262 Flowers in racemes; fruit not beaked **LXXXVIII. Rutaceae**
261 Ovary and fruit not deeply 5-lobed
263 Petals fimbriate or lobed **LXIX. Resedaceae**
263 Petals entire or emarginate
264 Stamens 10 **LXXXI. Leguminosae**
264 Stamens not more than 6
265 Sepals inserted on a cup-like hypanthium **LVII. Caryophyllaceae**
265 Sepals not inserted on a cup-like hypanthium
266 Ovary 2-locular; gynophore short or absent **LXVIII. Cruciferae**
266 Ovary 1-locular; gynophore long **LXVII. Capparaceae**
249 Flowers actinomorphic
267 Corona of long filaments present inside the petals **CXI. Passifloraceae**
267 Flowers without a corona
268 Petals more than 10
269 Aquatic herb with petiolate leaves
270 Leaves floating, usually with a deep basal sinus **LVIII. Nymphaeaceae**
270 Leaves not floating, peltate **LIX. Nelumbonaceae**
269 Terrestrial herbs or shrubs with sessile or subsessile leaves
271 Stamens 4–6 **LXIII. Berberidaceae**
271 Stamens numerous **LII. Aizoaceae**
268 Petals fewer than 10
272 Stamens more than twice as many as petals
273 Stamens with their filaments connate into a tube **CVI. Malvaceae**
273 Stamens free or connate in separate bundles
274 Perianth-segments persistent in fruit, 2 large and 2 small **XLVII. Polygonaceae**
274 Perianth-segments not as above
275 Ovary on a long gynophore **LXVII. Capparaceae**
275 Ovary sessile or nearly so
276 Ovary surrounded by a cup-shaped hypanthium; ovule 1 **LXXX. Rosaceae**
276 Flowers without a cup-shaped hypanthium; ovules 2 or more
277 Flowers small, in dense spikes or globose clusters, arranged in racemes or panicles **LXXXI. Leguminosae**
277 Flowers not as above
278 Carpel 1; leaves 2-ternate, the lower leaflets stalked **LXI. Ranunculaceae**
278 Carpels 2 or more; leaves not as above
279 Large tree; inflorescence with a conspicuous bract partly adnate to peduncle **CV. Tiliaceae**
279 Not as above
280 Styles more than 1, free
281 Most leaves alternate; outer perianth-segments petaloid **LXI. Ranunculaceae**
281 Leaves opposite or verticillate; outer perianth-segments sepaloid **CIX. Guttiferae**
280 Style 1 or 0
282 Petals 4 **LXVI. Papaveraceae**
282 Petals 5
283 Ovary 1-locular or septate at base only; stamens numerous **CXII. Cistaceae**
283 Ovary 3-locular; stamens 15 **LXXXV. Zygophyllaceae**
272 Stamens not more than twice as many as petals
284 Tree, shrub or woody climber
285 Flowers on tough leaf-like cladodes; leaves scale-like, brownish **Liliaceae**
285 Not as above
286 Leaves small, scale-like or ericoid
287 Perianth-segments in 2 whorls of 3; stamens 3 **CXXXIII. Empetraceae**
287 Perianth-segments and stamens more than 3 in a whorl
288 Leaves opposite **CXIV. Frankeniaceae**
288 Leaves alternate **CXIII. Tamaricaceae**
286 Leaves neither scale-like nor ericoid
289 Peduncles adnate to petioles; ovary on a short gynophore **LXXXIX. Cneoraceae**
289 Not as above
290 All leaves opposite
291 Leaves pinnate
292 Shrub; fruit a capsule **CI. Staphyleaceae**
292 Tree; fruit of 2 single-seeded samaras **XCV. Aceraceae**
291 Leaves entire or palmately lobed
293 Fruit of 2 single-seeded samaras; leaves usually palmately lobed **XCV. Aceraceae**
293 Fruit a fleshy capsule; leaves not palmately lobed **C. Celastraceae**
290 At least some leaves alternate
294 Stamens 8 **XCVI. Sapindaceae**
294 Stamens 4, 5, 6, 10 or 12
295 Stamens 10 or 12

296 Leaves entire **CXXXII. Ericaceae**
296 Leaves pinnate
297 Spiny tree **LXXXI. Leguminosae**
297 Unarmed shrub or tree
298 Stamens with connate filaments **XCI. Meliaceae**
298 Stamens free
299 Shrub or small tree; carpel 1; fruit a small drupe **XCIV. Anacardiaceae**
299 Large tree; carpels 5–6, ±free; fruit a group of samaras **XC. Simaroubaceae**
295 Stamens not more than 6
300 Stamens 6 **LXVIII. Cruciferae**
300 Stamens 4 or 5
301 Stamens opposite petals
302 Shrub or small tree; petals shorter than sepals **CIII. Rhamnaceae**
302 Woody climber; petals longer than sepals **CIV. Vitaceae**
301 Stamens alternating with petals
303 Very spiny shrub **C. Celastraceae**
303 Unarmed shrub or small tree
304 Bark resinous; ovule 1 **XCIV. Anacardiaceae**
304 Bark not resinous; ovules several
305 Leaf-margin usually spiny; fruit a bright red drupe **XCIX. Aquifoliaceae**
305 Leaf-margin not spiny; fruit a capsule **LXXVIII. Pittosporaceae**
284 Herb, sometimes ±woody at base
306 Sepals 2; petals 5
307 Stems erect or procumbent, not twining **LV. Portulacaceae**
307 Stems twining **LVI. Basellaceae**
306 Sepals as many as petals
308 Flowers 3-merous **Commelinaceae**
308 Flowers 4- or more-merous
309 Leaves forming long pitchers; stigma very large, peltate **LXX. Sarraceniaceae**
309 Not as above
310 Flowers strongly perigynous, with a tubular or campanulate hypanthium **CXIX. Lythraceae**
310 Flowers hypogynous or perigynous, with a flat or weakly concave hypanthium
311 Cauline leaves opposite or verticillate
312 Leaves divided or serrate
313 Petals 4 **LXVIII. Cruciferae**
313 Petals 5
314 Stamens without scales on the inner side of the filaments **LXXXIII. Geraniaceae**
314 Stamens with scales on the inner side of the filaments **LXXXV. Zygophyllaceae**
312 Leaves undivided and entire
315 Leaves in 1 whorl; flower solitary, terminal **Liliaceae**
315 Not as above
316 Stipules present
317 Stipules scarious; land-plant **LVII. Caryophyllaceae**
317 Stipules not scarious; usually submerged aquatic **CXV. Elatinaceae**
316 Stipules absent
318 Sepals united to more than half-way
319 Styles connate; placentation parietal **CXIV. Frankeniaceae**
319 Styles free; placentation free-central **LVII. Caryophyllaceae**
318 Sepals free or united at base only
320 Ovary 1-celled; placentation free-central **LVII. Caryophyllaceae**
320 Ovary 4- to 5-celled; placentation axile **LXXXVI. Linaceae**
311 Leaves alternate or all basal, rarely absent
321 Herbaceous climber; tendrils present **XCVI. Sapindaceae**
321 Not climbing; tendrils absent
322 Leaves 3- to 4-foliate **LXXXII. Oxalidaceae**
322 Leaves not 3- to 4-foliate
323 Sepals and petals 2–3 **XLVII. Polygonaceae**
323 Sepals and petals 4–5
324 Sepals and petals 4; stamens 4 or 6
325 Stipules absent; stamens usually 6 **LXVIII. Cruciferae**
325 Stipules present; stamens 4 **LVII. Caryophyllaceae**
324 Sepals and petals 5; stamens 5 or 10
326 Leaves with conspicuous, red, viscid glandular hairs **LXXI. Droseraceae**
326 Not as above
327 Leaves with numerous pellucid glands, strongly scented when crushed **LXXXVIII. Rutaceae**
327 Leaves without pellucid glands
328 Style 1; stigma entire or shallowly lobed; anthers opening by pores **CXXXI. Pyrolaceae**
328 Styles or stigmas more than 1; anthers opening by longitudinal slits
329 Stigmas 5
330 Leaves lobed or pinnate **LXXXIII. Geraniaceae**
330 Leaves entire or absent
331 Sepals connate; leaves basal or absent **CXXXVI. Plumbaginaceae**
331 Sepals free; leaves cauline **LXXXVI. Linaceae**
329 Stigmas 2–4
332 Flowers with conspicuous glandular-fimbriate staminodes **LXXIV. Parnassiaceae**
332 Glandular-fimbriate staminodes absent
333 Stamens 5 **LVII. Caryophyllaceae**
333 Stamens 10 **LXXIII. Saxifragaceae**

EXPLANATORY NOTES ON THE TEXT

Signs and abbreviations

c.	*circa*, approximately
C.	central
cm	centimetre(s)
E.	eastern, east
excl.	excluding
f.	forma
incl.	including
loc. cit.	*loco citato*, on the same page in the work cited above
m	metre(s)
mm	millimetre(s)
N.	northern, north
2*n*	the somatic chromosome number
op. cit.	*opere citato*, in the work cited above
S.	southern, south
Sect.	Sectio
sp. } spp. }	species
Subfam.	Subfamilia
Subgen.	Subgenus
Subsect.	Subsectio
subsp. } subspp. }	subspecies
var.	varietas
W.	western, west
±	more or less
0	absent
●	endemic to Europe
[ ]	naturalized, or cultivated on a field scale; not native
*	status doubtful; possibly native, possibly naturalized
?	(before a two-letter geographical abbreviation) occurrence doubtful
†	extinct

Abbreviations of geographical territories

(*For precise definitions of these territories, see map* I)

Al	Albania
Au	Austria
Az	Açores (Azores)
Be	Belgium and Luxembourg
Bl	Islas Baleares (Balearic Islands)
Br	Britain
Bu	Bulgaria
Co	Corse (Corsica)
Cr	Kriti (Crete)
Cz	Czechoslovakia
Da	Denmark
Fa	Færöer (Faeroes)
Fe	Finland
Ga	France
Ge	Germany
Gr	Greece
Hb	Ireland
He	Switzerland
Ho	Netherlands
Hs	Spain
Hu	Hungary
Is	Iceland
It	Italy
Ju	Jugoslavia
Lu	Portugal
No	Norway
Po	Poland
Rm	Romania
Rs	U.S.S.R. (European part), subdivided thus:
	(N) Northern region
	(B) Baltic region
	(C) Central region
	(W) South-western region
	(K) Krym (Crimea)
	(E) South-eastern region
Sa	Sardegna (Sardinia)
Sb	Svalbard (Spitsbergen)
Si	Sicilia (Sicily)
Su	Sweden
Tu	Turkey (European part)

General notes

The sequence of families is that of Melchior in Engler, *Syllabus der Pflanzenfamilien* ed. 12 (1964).

Descriptions of taxa refer only to the European populations of the taxon in question. If extra-European representatives differ substantially, an explanatory note is sometimes added.

Groups of species have been used in some genera where the species are very difficult to separate. These groups have no formal nomenclatural status and are simply a device to enable a partial identification to be made.

Taxa below the rank of subspecies are neither keyed nor described, and varieties are mentioned only when there are special reasons.

Aliens are included only when they appear to be effectively naturalized or when planted in continuous stands on a fairly large scale.

Hybrids are mentioned only when they occur frequently.

A measurement given without qualification refers to length. Two measurements connected by × indicate length followed by width. Further measurements in parentheses indicate exceptional cases outside the normal range.

Synonyms given in the text are principally those names under which the species or subspecies is described in the Basic Floras listed on p. xix. The index contains (in addition to these) names which occur in any of the Standard Floras (p. xix) or in well-known monographs.

Chromosome numbers are given only when the editors are satisfied that the count has been made on correctly identified material known to be of wild European origin. For naturalized and cultivated species the count is from material which is naturalized or is cultivated in the way which justifies its inclusion in the Flora.

Ecological information is provided only when the habitat-preference of a species is sufficiently uniform over its European range to permit it to be summed up in a short phrase.

Geographical terms such as 'W. Europe', 'Mediterranean region', etc., are to be interpreted as shown on maps IV and V. The statement that a plant occurs in one or more of these regions does not necessarily imply that it occurs throughout the region.

Extra-European distribution is indicated only for those plants whose European range is small and whose range outside Europe is considerably greater, or for species which are not native in Europe.

SPERMATOPHYTA

ANGIOSPERMAE

DICOTYLEDONES

(continued)

CXLIV. RUBIACEAE[1]

Herbs or dwarf shrubs. Leaves nearly always opposite, simple, entire; stipules separate, connate or divided, sometimes leaf-like and then forming whorls of 4–12 apparent leaves. Inflorescence thyrsoid, paniculate or corymbose, sometimes condensed to a spike or head, or reduced. Flowers actinomorphic, usually hermaphrodite. Sepals usually free, sometimes reduced or absent. Sympetalous; corolla hypocrateriform, infundibuliform, cup-shaped or rotate. Stamens epipetalous, alternating with the lobes of the corolla. Ovary inferior, usually 2-locular and with a disc; loculi with 1–numerous ovules. Style simple or 2-fid. Fruit dry, dividing into mericarps, or fleshy. Seeds endospermic.

This predominantly woody and tropical family is represented in Europe, apart from the genus *Putoria*, by more or less herbaceous plants with leaf-like stipules. For convenience, where leaves and leaf-like stipules form a whorl, the description is abbreviated to 'leaves in whorls . . .' etc.

In the habitat notes, the term *montane* refers to the upper part of the deciduous forest zone, the term *subalpine* to the zone of coniferous forest upwards to the tree-line and the term *alpine* to the treeless zone above the limits of the forest. The actual altitude indicated by these zones will, of course, vary with location, aspect, etc.

1 Leaves opposite, with small stipules; dwarf shrub **1. Putoria**
1 Leaves and leaf-like stipules in whorls of 4 or more
2 Corolla-tube longer than lobes
3 Flowers in dense spikes, usually with only 1 sessile flower in the axil of each bract **3. Crucianella**
3 Flowers in panicles, cymes or capitula
4 Flowers in capitula
5 Calyx 6-toothed, persistent in fruit **2. Sherardia**
5 Calyx absent **4. Asperula**
4 Flowers in cymes or panicles
6 Leaves in whorls of 4 **4. Asperula**
6 Leaves in whorls of more than 4
7 Pedicels with bracteoles; ovary and fruit oblong, truncate at apex **4. Asperula**
7 Pedicels without bracteoles; ovary and fruit ovoid **5. Galium**
2 Corolla-tube shorter than lobes
8 Corolla 5-lobed; fruit fleshy **9. Rubia**
8 Corolla 4-lobed; fruit dry
9 Central flower of cymes hermaphrodite; lateral flowers male (rarely absent)
10 Leaves in whorls of more than 4 **5. Galium**
10 Leaves in whorls of 4
11 Flowers yellow; peduncles and pedicels deflexed under the leaves, not enlarging in fruit nor encircling the fruit, without conspicuous bristles **7. Cruciata**
11 Flowers whitish; peduncles and pedicels deflexed between the leaves, enlarging in fruit and encircling the fruit, with conspicuous bristles or hooks on outside **8. Valantia**
9 All flowers hermaphrodite
12 Most flowers ± enclosed in white, membranous bracts; annual **6. Callipeltis**
12 Flowers not enclosed in membranous bracts; annual or perennial
13 Ultimate inflorescence-branches with bracts and often bracteoles **4. Asperula**
13 Ultimate inflorescence-branches without bracts or bracteoles **5. Galium**

[1] Edit. D. H. Valentine and A. O. Chater.
[2] By P. W. Ball.
[3] By F. Ehrendorfer.

1. Putoria Pers.[2]

Dwarf shrubs. Leaves opposite; stipules small, interpetiolar, more or less fused. Flowers in small fascicles. Calyx 4-toothed, persistent in fruit. Corolla infundibuliform with a long tube, 4-lobed. Style filiform, with short 2-lobed stigma. Ovary 2-locular with 1 ovule in each loculus. Fruit a drupe with 2 pyrenes.

1. P. calabrica (L. fil.) DC., *Prodr.* **4**: 577 (1830). Much branched, forming mats up to 1 m in diameter, foetid, glabrous to densely puberulent. Leaves 10–20 × *c.* 3 mm, obovate to elliptic-lanceolate, obtuse with revolute margin; stipules *c.* 1 mm, ovate. Corolla 10–15 mm, pink, the lobes 3–4 mm, linear-lanceolate. Fruit *c.* 5 mm, black. $2n = 22$. *Rocks and river-gravels. Mediterranean region.* Al Cr Gr Hs It Ju Si.

2. Sherardia L.[2]

Annuals. Leaves in whorls of 4–6. Flowers in small terminal heads, with up to 10 connate leaves forming an involucre. Calyx 4- to 6-toothed, persistent in fruit. Corolla infundibuliform with a long tube, 4-lobed. Style filiform, bifid; branches unequal; stigmas capitate. Ovary 2-locular with 1 ovule in each loculus. Fruit dry; mericarps 2, 1-seeded.

1. S. arvensis L., *Sp. Pl.* 102 (1753). Stems up to 40 cm, procumbent, somewhat scabrid with small deflexed prickles. Lower leaves obovate-cuspidate, soon withering; upper leaves 5–20 × 1–5 mm, oblanceolate, mucronate. Heads 4- to 10-flowered. Corolla 4–5 mm, lilac. Fruit 2–7 mm, scabrid. $2n = 22$. *Cultivated ground and dry grassland. Almost throughout Europe, but only casual in the extreme north.* All except Fa Is Sb.

3. Crucianella L.[3]

Woody or herbaceous perennials or annuals. Leaves in whorls of 4–8. Inflorescence a spike; flowers hermaphrodite, usually solitary, sessile or shortly pedicellate in the axil of a bract and subtended by two bracteoles at the base. Calyx reduced or absent. Corolla coloured, infundibuliform; tube narrow, 3–6 times as long as the 4–5 lobes; lobes usually with incurved awn at apex. Style bifid; branches unequal; stigmas capitate. Fruit dry, glabrous, smooth to tuberculate; mericarps usually 2, narrowly ovoid, 1-seeded.

All species grow in dry, open habitats.

1 Perennial, woody at base; leaves in whorls of 4, coriaceous, ± pungent **1. maritima**
1 Annual; leaves often in whorls of more than 4, herbaceous
2 Corolla 6–9·5 × 1·3–2 mm (excluding awn), distinctly exceeding bracts
3 Bracts acute; 1 flower to each bract **2. macrostachya**
3 Bracts aristate-acuminate; usually 2 flowers to each bract
4 Leaves in whorls of 6(–8) **4. graeca**
4 Leaves in whorls of 4 or less **3. bithynica**
2 Corolla 2–7·5 × 0·8 mm (excluding awn), not or only slightly exceeding bracts
5 Bracts up to 1 mm wide, linear-subulate; flowers shortly pedicellate; corolla 2–2·5 mm, 5-lobed **8. patula**
5 Bracts 1·5–3 mm wide, lanceolate; flowers sessile; corolla 3–7·5 mm, 4-lobed

6 Lowermost leaves linear-lanceolate; bracts narrowly lanceolate, free, similar to the bracteoles **5. angustifolia**
6 Lowermost leaves obovate-elliptical; bracts broadly lanceolate, often connate at base, much wider than the linear bracteoles
7 Corolla 3–4·5 mm, not exceeding bracts; bracts free **6. imbricata**
7 Corolla 5–7·5 mm, somewhat exceeding bracts; bracts mostly connate at base **7. latifolia**

1. C. maritima L., *Sp. Pl.* 109 (1753). Procumbent to ascending woody perennial; stems 10–50 cm, whitish, glabrous, smooth. Leaves 4–10 × 1–4 mm, in whorls of 4, ovate-lanceolate, mucronate, coriaceous and white-margined, often densely imbricate, somewhat pungent. Spike 1–3 cm; bracts 6–10 × 3–7 mm, ovate, free; bracteoles shorter than bracts, plicate, more or less connate at base. Corolla 10–13 × 2–3 mm, 5-lobed, yellow, exceeding the bract. $2n=22$. *Maritime sands and rocks. W. Mediterranean region and Iberian peninsula.* Bl Co Ga Hs It Lu Sa Si.

Variable in growth-form. Condensed plants from maritime rocks in Malta and Lampedusa have been called **C. rupestris** Guss., *Fl. Sic. Prodr., Suppl.* 44 (1832), but their status is very doubtful.

2. C. macrostachya Boiss., *Diagn. Pl. Or. Nov.* **1(3)**: 27 (1843). Annual. Stems up to 60 cm, slightly puberulent-scabrid to glabrous. Leaves 10–25(–35) × 1·5–3(–5) mm, in whorls of 6–8, the lower elliptical, the upper lanceolate to linear, with revolute margins. Spike 4–10 cm, somewhat distichous, rather lax; bracts 8–10 × 2·5–3·5 mm, lanceolate-acute, not revolute or indurate, free; flowers sessile, single. Corolla 7–9·5 × *c.* 1·5 mm, 5-lobed, yellow to greenish or reddish, exceeding the bract. *Kriti.* Cr. (*S.W. Asia.*)

3. C. bithynica Boiss., *op. cit.* **2(10)**: 58 (1849). Annual. Stems 10–25 cm, more or less scabrid. Leaves 15–25 × 0·5–1·5 mm, in whorls of not more than 4, the lowermost linear-lanceolate, the upper linear with revolute margins. Spike 4–10 cm, somewhat tetrastichous, dense; bracts 5–8 × 1·5–2·5 mm, ovate-acuminate, carinate and slightly scabrid outside; margin flat, broadly hyaline, ciliolate; flowers usually in pairs. Corolla 6–8 mm, 5-lobed, yellowish, exceeding the bract. *N.E. Greece, Turkey-in-Europe.* Gr Tu. (*W. Anatolia.*)

4. C. graeca Boiss., *op. cit.* **1(3)**: 25 (1843). Like **3** but leaves in whorls of 6–8, often shorter and wider; bracts less and more shortly ciliolate. $2n=22$. ● *S. half of Balkan peninsula.* Bu Gr Ju.

3 and **4** are vicarious species.

5. C. angustifolia L., *Sp. Pl.* 108 (1753). Annual. Stems up to 50 cm, glabrous. Leaves 5–15(–30) × 0·5–1(–2) mm, mostly in whorls of 6–8, the lowermost linear-lanceolate, the upper linear, with revolute margins, somewhat scabrid, bluish-green. Spike 2–8 cm; bracts 5–9 × 1·5–2 mm, lanceolate, acute or acuminate, free, with membranous margins; bracteoles like the bracts; flowers sessile, single. Corolla 3–5 × *c.* 0·6 mm, 4-lobed, pale yellow, not exceeding the bract. $2n=22$. *S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Rm Rs (K) Sa Si Tu.

Variants based on slight differences in the relative lengths of bracts and bracteoles do not merit taxonomic recognition.

6. C. imbricata Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 59 (1849). Annual. Stems 8–20 cm, slightly puberulent-scabrid. Leaves 10–25 × 1–4 mm, in whorls of 4–6, the lowermost obovate-elliptical, the upper lanceolate to linear, with revolute margins. Spike 2–8 cm × 2–3 mm, rather dense; internodes not more than 2·5 mm; bracts 5–8 × 2–3 mm, ovate-lanceolate, acuminate, loosely appressed, their base neither inflated nor with enlarged epidermal cells, free; bracteoles linear, much narrower and shorter than bracts; flowers sessile. Corolla 3–4·5 × *c.* 0·6 mm, 4-lobed, yellowish, scarcely exceeding the bract. *Kriti.* Cr. (*Anatolia, Syria.*)

7. C. latifolia L., *Sp. Pl.* 109 (1753). Like **6** but stems up to 30 cm; spike 15(–25) cm × 1·5–2·5 mm, more lax; internodes (3–)4–4·5(–5) mm; bracts strongly appressed, their base somewhat inflated and with enlarged epidermal cells, more or less connate by a hyaline membrane; corolla 5–7·5 × *c.* 0·8 mm, somewhat exceeding the bract. $2n=44$. *S. Europe.* Al Bl Bu Cr Ga Gr Hs It Ju Rs (K) Sa Si.

8. C. patula L., *Demonstr. Pl.* 4 (1753). Annual. Stems 15–25 cm, puberulent-scabrid. Leaves 7–10 × *c.* 1 mm, mostly in whorls of 6, linear, with revolute margins. Spike 1–2 cm; bracts 5–7 × 0·5–1 mm, linear-subulate; bracteoles like the bracts but slightly smaller; flowers shortly pedunculate. Corolla 2–2·5 mm, 5-lobed, pale yellow. *Spain.* Hs.

4. Asperula L.[1]

Dwarf shrubs, perennial herbs or annuals. Stems more or less distinctly 4-angled and not retrorsely aculeolate. Leaves in whorls of 4–8(–11) or in pairs. Inflorescence of panicles or capitula; ultimate branches with bracts and often bracteoles. Flowers hermaphrodite, (3–)4(–5)-merous. Calyx absent or consisting of short teeth. Corolla usually hypocrateriform to infundibuliform, rarely rotate. Stigmas capitate or clavate. Ovary and fruit oblong to globose, never with hooked hairs; fruit dry.

1 At least some leaves in whorls of more than 4
2 Flowers 3-merous **55. tinctoria**
2 Flowers 4(–5)-merous
3 Annual; flowers bluish-violet (Sect. *Asperula*) **56. arvensis**
3 Perennial; flowers not bluish-violet
4 Ovary and fruit oblong; flowers not in capitula; corolla infundibuliform to rotate (Sect. *Thliphthisa*)
5 Stigma oblong-clavate
6 Virgate dwarf shrub with caducous leaves, at least the upper linear; internodes mostly longer than leaves **57. rigida**
6 Shrub or dwarf shrub, not virgate, with persistent, linear-lanceolate or wider leaves; internodes as long as or shorter than leaves
7 Leaves glaucous, obovate **58. tournefortii**
7 Leaves green, linear-lanceolate to lanceolate or elliptical
8 Stems usually 10–16 cm; all leaves 9–12 mm, linear-lanceolate, not or obscurely scabrid **59. muscosa**
8 Stems usually 2–4 cm; lower leaves elliptical, distinctly scabrid, the upper 4–7 mm, broadly lanceolate, weakly scabrid **60. baenitzii**
5 Stigma globose
9 Corolla 2–3 mm, infundibuliform **61. chlorantha**
9 Corolla 0·7–2 mm, cup-shaped to ± rotate
10 Stems glabrous and smooth (rarely shortly hairy); corolla distinctly cup-shaped **62. scutellaris**
10 Stems ± hairy; corolla weakly cup-shaped to ± rotate
11 Fruit densely hairy **63. baldaccii**
11 Fruit glabrous (very rarely with short, stiff hairs)
12 Leaves narrowly lanceolate to filiform; corolla-lobes ± apiculate; stems up to 50 cm **66. purpurea**
12 Leaves ovate or elliptical to broadly lanceolate; corolla-lobes not apiculate; stems not more than 20(–25) cm
13 Corolla-lobes glabrous; bracts small, shorter than the pedicels and peduncles; inflorescence long and narrowly pyramidal **64. saxicola**
13 Corolla-lobes more or less shortly hairy; bracts leaf-like, exceeding the pedicels and peduncles; inflorescence broadly ovoid **65. boryana**
4 Ovary and fruit ovoid; flowers usually in capitula; corolla hypocrateriform to infundibuliform (Sect. *Hexaphylla*)
14 Stem stout, branched, more or less woody at base; internodes mostly more than 12, the upper distinctly longer
15 Flowers and fruit more or less hairy
16 Corolla-tube 4·5–8 mm; flowers reddish **41. incana**
16 Corolla-tube 2·5–4·5 mm; flowers whitish **42. taygetea**
15 Flowers and fruit glabrous
17 Leaves (1–)2–3 mm wide, thickish, ± black when dry **43. rupestris**
17 Leaves 0·5–1·2 mm wide, thin, green when dry **44. hirsuta**
14 Stem slender and often scarcely branched, usually herbaceous to the base; internodes mostly less than 12, the upper scarcely longer.
18 Pedicels mostly 2–5 mm; style shorter than corolla-tube **45. taurica**
18 Pedicels scarcely more than 2 mm, or flowers sessile; style usually exceeding corolla-tube
19 Corolla-tube more than 8 mm; leaves ± lanceolate, densely grey-hairy **46. arcadiensis**
19 Corolla-tube less than 6 mm; leaves narrowly lanceolate to linear, glabrous or only sparsely hairy
20 Middle cauline leaves hairy
21 Peduncles of capitula usually only half as long as the subtending cauline leaves; longest leaves not more than 8 mm **47. doerfleri**
21 Peduncles of capitula (1–)2–3 times as long as the subtending cauline leaves
22 Longest leaves mostly more than 15 mm; fruit *c.* 1·5 mm **49. hercegovina**
22 Longest leaves mostly less than 15 mm; fruit 2–2·5 mm **48. hirta**
20 Middle cauline leaves glabrous
23 Pedicels mostly 0·5–1·5 mm; corolla-tube 5–6 mm **51. hexaphylla**
23 Flowers ± sessile; corolla-tube 3–4 mm
24 Lower part of corolla narrowly tubular; leaves usually more than 1·5 mm wide, narrowly lanceolate **49. hercegovina**
24 Lower part of corolla broadly infundibuliform; leaves not more than 1·5 mm wide, linear-lanceolate **50. capitata**
1 Leaves never in whorls of more than 4
25 Leaves with a short cartilaginous point or muticous; flowers white or pale yellowish; ovary and fruit smooth (Sect. *Glabella* pro parte)
26 Flowers in dense capitula, surrounded by an involucre of leaves and long-ciliate bracts; foliage-leaves 10–25 mm wide **52. taurina**
26 Flowers in more or less lax cymes or in stalked capitula with shortly ciliate or eciliate bracts; foliage-leaves 3·5–10 mm wide
27 Partial inflorescences capitate; corolla 4–6 mm **53. involucrata**
27 Partial inflorescences laxly cymose, the flowers scarcely glomerate; corolla 1·3–2 mm **54. laevigata**
25 Leaves with a hyaline apex or awn; flowers purplish, reddish or yellowish; ovary and fruit papillose to tuberculate (Sect. *Cynanchicae*)
28 Fruit (1·7–)3–4·5 mm, with squamiform tubercles or hispidulous (rarely glabrescent); inflorescence-branches squarrosely divaricate after anthesis **(33–40). graveolens** group
28 Fruit 1·5–2(–4) mm, usually more or less distinctly papillose, sometimes shortly hairy; inflorescence-branches not or scarcely squarrosely divaricate after anthesis
29 Corolla-tube 1–2 times as long as lobes
30 Alpine or montane plants, usually up to *c.* 15 cm; basal leaves ovate to obovate, densely crowded **(20–24). pyrenaica** group
30 Plants of lower altitudes, usually more than 15 cm; basal leaves ± lanceolate, usually not densely crowded
31 Densely caespitose, distinctly woody at the base; cauline leaves rigid, usually linear to acicular or subulate **(25–29). cretacea** group
31 Laxly caespitose or not caespitose, usually scarcely woody at the base; cauline leaves relatively soft, lanceolate to linear
32 Stock creeping, with underground, rooting, orange stolons **30. occidentalis**
32 Stock ascending to erect, without rooting stolons
33 Laxly caespitose, with non-flowering shoots at anthesis; stems usually not more than 35 cm; inflorescence corymbose; corolla usually 2·5–3·5 mm **31. cynanchica**
33 Not caespitose, without non-flowering shoots at anthesis; stems robust, often more than 35 cm; inflorescence ovoid; corolla usually 2–2·5 mm **32. rumelica**
29 Corolla-tube 2–5 times as long as lobes
34 Cauline leaves with hyaline awn 0·3–1 mm
35 Inflorescence elongate, greatly exceeding the non-flowering shoots, with flowers in 3 to many ± capitate clusters
36 Stems procumbent to ascending, ± herbaceous; leaves (0·6–)0·8–1·8 mm wide, lanceolate to linear **14. oetaea**
36 Stems ± erect, usually woody at base; leaves 0·3–0·7 mm wide, linear to acicular **16. lutea**
35 Inflorescence compact, often scarcely exceeding the pulvinate non-flowering shoots, with flowers mostly in 1–2 ± capitate clusters
37 Non-flowering shoots glaucous-pruinose, especially when young, ± glabrous **19. boissieri**
37 Non-flowering shoots green, usually ± shortly hairy
38 Non-flowering shoots conspicuously falcate-incurved **15. nitida**
38 Non-flowering shoots ± straight
39 Corolla and fruit glabrous **17. abbreviata**
39 Corolla and fruit usually with dense, patent hairs **18. pulvinaris**
34 Cauline leaves with hyaline apex not more than 0·3 mm
40 Inflorescence with a solitary main axis (sometimes with a few lateral branches), with 1 terminal or a few laxly spicate, ± capitate partial inflorescences
41 Stems more than 15 cm; inflorescence mostly with 4 or more ± capitate flower-clusters
42 Shoots green; leaves flaccid, the midrib comprising less than ¾ of the width of the leaf **8. suffruticosa**
42 Shoots glaucous-pruinose; leaves rigid, the midrib comprising more than ¾ of the width of the leaf **9. ophiolithica**
41 Stems usually less than 15 cm; inflorescence usually with only 1–3 ± capitate flower-clusters
43 Plant caespitose or laxly pulvinate; internodes 1–2 times as long as leaves
44 Corolla 3·2–5 mm; plant with hairs up to 0·3 mm; fruit 1–1·5 mm **10. idaea**
44 Corolla 5–8 mm; plant with hairs *c.* 0·1 mm; fruit 2–3 mm **11. suberosa**
43 Plant densely pulvinate; internodes shorter (or rarely slightly longer) than leaves
45 Shoots ± glaucous-pruinose, almost glabrous **12. gussonii**
45 Shoots green, with sparse, patent hairs **13. pumila**
40 Inflorescence usually much-branched, with numerous corymbiform, capitate or ± spicate partial inflorescences
46 Shoots (at least in some individuals in each population) distinctly glaucous-pruinose
47 Leaves in whorls of 4, at least below the middle of the stem; young ovary green

[1] By F. Ehrendorfer and F. Krendl.

48 Corolla less than 7 mm, yellowish; leaves 15–40 mm **4. crassifolia**
48 Corolla more than 7 mm, purplish; leaves 7–15 mm **5. calabra**
47 Leaves in pairs, apart from some whorls towards the base of the stem; young ovary glaucous-pruinose; corolla pink
49 Leaves *c.* 0·5 mm wide, thin; partial inflorescences spicate **7. garganica**
49 Leaves more than 1·5 mm wide, thick; partial inflorescences ± capitate **6. staliana**
46 Shoots green (rarely very weakly glaucous-pruinose)
50 Partial inflorescences ± spicate to narrowly pyramidal **1. aristata**
50 Partial inflorescences corymbiform to capitate
51 Corolla papillose outside, narrowly hypocrateriform; stems distinctly woody at base **3. tenelia**
51 Corolla usually glabrous or hairy outside, broadly hypocrateriform; stems usually scarcely woody at base
52 Stems usually more than 15 cm; leaves glabrous or papillose; lower leaves lanceolate; inflorescence not leafy throughout **1. aristata**
52 Stems 3–15 cm; leaves usually patent-hairy; lower leaves ovate; inflorescence leafy throughout **2. wettsteinii**

Sect. CYNANCHICAE (DC.) Boiss. (Sect. *Cynanchica* Griseb.). Dwarf shrubs or perennial herbs with taproot, usually without rhizomes or stolons, caespitose. Leaves in whorls of up to 4, the cauline linear-lanceolate, 1-veined, with a hyaline point or awn. Inflorescence pyramidal, corymbiform, or spicate to capitate; flowers with short pedicels or sessile, subtended by bracts and bracteoles. Corolla 4-merous, hypocrateriform to infundibuliform, purplish, pink, greenish, yellowish or sometimes whitish, externally hairy, papillose or smooth; anthers and stigma included. Ovary and fruit ovoid, more or less papillose or tuberculate, rarely hairy, never entirely smooth.

Most species grow on dry, open rocky ground or in dry grassland; the majority are calcicole. Data on habitat are given only for those species in which the habitat is very restricted, or different from the above.

Sect. *Cynanchicae* includes many very polymorphic diploid and tetraploid races based on $x=10$, which are connected with each other by transitional (perhaps hybridogenous) populations. The taxa are frequently very closely related to one another and the present treatment is provisional. A comprehensive study of the section is urgently needed.

1. A. aristata L. fil., *Suppl.* 120 (1781). Non-flowering shoots green or grey-green, woody at base or herbaceous. Stems 10–60 cm, often shortly papillose-hairy below, usually subglabrous above. Leaves (10–)15–25(–40) × 0·5–2 mm, in whorls of 4, lanceolate to linear, with short hyaline apex usually 0·1–0·2 mm. Inflorescence freely branched; bracts free. Corolla hypocrateriform to narrowly infundibuliform; tube (1¾–)2–3(–4) times as long as lobes. Fruit papillose, rarely hairy. *S. Europe, extending northwards to S.E. Austria.* Al Au Bl Bu Ga Gr He Hs It Ju Lu Rm Si.

A very polymorphic complex. Since an accurate typification of *A. aristata* L. fil. is not possible, this epithet is not used for any of the following subspecies.

In Islas Baleares a variant occurs with leaves mostly in pairs; it has been called **A. paui** Font Quer, *Butll. Inst. Catalana Hist. Nat.* **20**: 188 (1920) and is probably worth specific or subspecific rank.

1 Corolla-lobes usually not or obscurely appendiculate
2 Pedicels not more than 0·5 mm, the partial inflorescences spicate-pyramidal; stems 35–60 cm, often rough with short hairs above; leaves usually shortly papillose **(b)** subsp. **nestia**
2 Pedicels usually 0·5–1·5 mm, the partial inflorescences ± corymbiform; stems 25–45 cm, glabrous at least above; leaves glabrous **(c)** subsp. **thessala**
1 Corolla-lobes distinctly appendiculate
3 Partial inflorescences spicate; stems often more than 30 cm, usually ± woody at base; middle internodes (2–)3–4 times as long as the leaves **(a)** subsp. **scabra**
3 Partial inflorescences corymbiform; stems usually not more than 30 cm, scarcely woody at base; middle internodes (1–)2–3 times as long as the leaves
4 Leaves linear; partial inflorescences scarcely capitate; bracts ± narrowly lanceolate; stems often more than 20 cm **(d)** subsp. **oreophila**
4 Leaves lanceolate or oblanceolate; partial inflorescences distinctly capitate; bracts broadly lanceolate-ovate; stem usually not more than 20 cm **(e)** subsp. **condensata**

(a) Subsp. **scabra** (J. & C. Presl) Nyman, *Consp.* 334 (1879) (*A. aristata* subsp. *longiflora* (Waldst. & Kit.) Hayek): Stems more or less erect. Leaf-margin not or only slightly revolute. Partial inflorescences more or less spicate; pedicels less than 1 mm. Corolla (3–)5·5–8 mm, greenish-purple, pale purplish or yellowish; lobes distinctly appendiculate; tube rough with short hairs or papillae outside, or rarely smooth. Fruit 1·5–2 mm. $2n=20$, 40. *Mediterranean to montane zones. S. Europe, northwards to S. France and N.W. Jugoslavia.*

(b) Subsp. **nestia** (Rech. fil.) Ehrend. & Krendl, *Bot. Jour. Linn. Soc.* **68**: 268 (1974) (*A. nestia* Rech. fil.): Like subsp. **(a)** but leaf-margin revolute to the midrib; corolla 5·5–9 mm, yellowish-red, lobes scarcely appendiculate; tube more or less rough with papillae outside. $2n=40$. *Mediterranean zone.* ● *N. Greece and S. Bulgaria.*

(c) Subsp. **thessala** (Boiss. & Heldr.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 452 (1930): Like subsp. **(a)** but partial inflorescences corymbiform; pedicels 0·5–1·5 mm; corolla 6·5–10(–12) mm, reddish, lobes scarcely appendiculate, glabrous outside, rarely shortly papillose; fruit *c.* 1·5 mm. *Montane to subalpine zones.* ● *Mountains of E. Greece.*

(d) Subsp. **oreophila** (Briq.) Hayek in Hegi, *Ill. Fl. Mitteleur.* **6(1)**: 205 (1914): Stems more or less ascending, slender, sparingly branched. Leaf-margin weakly revolute. Bracts narrowly lanceolate. Pedicels 0–1 mm. Corolla (4–)5–8 mm, pink, glabrous or sometimes more or less papillose outside. Fruit 1·5–2 mm. $2n=20$. *Montane zone.* ● *S. Alps, E. Pyrenees, Appennini.*

(e) Subsp. **condensata** (Heldr. ex Boiss.) Ehrend. & Krendl, *Bot. Jour. Linn. Soc.* **68**: 268 (1974) (*A. longiflora* var. *condensata* Heldr. ex Boiss.): Stems procumbent-ascending. Leaves 10–20 × 0·8–1·7 mm. Bracts lanceolate to ovate; flowers sessile. Corolla (4–)5–6(–7) mm, purplish, more or less papillose outside. Fruit *c.* 1·5 mm. $2n=20$. *Subalpine zone.* ● *W. & C. parts of Balkan peninsula.*

Subsp. **(a)** is very polymorphic, usually with stems hairy or roughly papillose at lower elevations (*A. scabra* J. & C. Presl, *A. canescens* Vis.), and more or less glabrescent at higher elevations (*A. longiflora* Waldst. & Kit.). Plants transitional towards **31** have been called **A. sublongiflora** Borbás, *Österr. Bot. Zeitschr.* **44**: 399 (1894).

Intermediates between **1(d)** and **31** have been called **A. jordanii** Perr. & Song., *Bull. Herb. Boiss.* **2**: 426 (1894), and are difficult to distinguish from **23** in the Alps and **24** in the Pyrenees.

1(e) is very near to **2, 14** and **31.**

2. A. wettsteinii Adamović, *Deutsche Bot. Monatsschr.* **7**: 117 (1889). Caespitose; shoots green, usually patent-hairy. Stems 3–15 cm, ascending; middle internodes not more than 1½(–2) times as long as the leaves. Leaves 10–20 × 1–1·5 mm, the cauline lanceolate to broadly linear, the basal ovate, acute; midrib comprising less than ¾ of the width of the leaf; margin somewhat revolute. Inflorescence corymbiform; partial inflorescences more or less capitate, surrounded by broadly lanceolate leaves. Corolla 5–6 mm, narrowly infundibuliform, usually sparsely hairy outside, pink; tube 1½–2 times as long as lobes; lobes distinctly appendiculate. Fruit 1·2–1·5 mm, densely hairy to subglabrous. *Alpine zone.* ● *Mountains of S.W. Jugoslavia.* Ju.

3. A. tenella Heuffel ex Degen in A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **8**: 43 (1899) (incl. *A. stevenii* V. Krecz., *A. bidentata* Klokov). Shoots woody at the base, usually green (rarely weakly glaucous-pruinose). Stems 35–45(–50) cm, more or less erect, usually shortly papillose-hairy especially below, often much-branched from base; middle internodes (1½–)2–3(–4) times as long as the leaves. Leaves 25–35 × 0·5–1 mm, linear to acicular; midrib comprising less than ¾ of the width of the leaf; margin distinctly revolute. Inflorescence ovoid, with somewhat patent branches; partial inflorescences corymbiform; bracts lanceolate; pedicels 0·5–0·8 mm. Corolla (3–)4–6 mm, narrowly hypocrateriform, reddish, finely papillose outside; tube 2–3 times as long as the lobes; lobes rather shortly appendiculate. Fruit 1·2–1·7 mm, papillose. *Plains and hills. S.E. Europe.* Bu Gr Ju Rm Rs (W, K, E) Tu.

Intermediates between this species and **32** occur.

4. A. crassifolia L., *Mantissa* 37 (1767) (*A. tomentosa* Ten.). Shoots woody at the base, usually glaucous-pruinose, often with long, patent hairs. Stems 15–45 cm, often solitary, erect or geniculate-ascending; middle internodes 1–3 times as long as the leaves. Leaves 15–30(–40) × 1·5–2 mm, lanceolate to broadly linear, usually brownish when dry, thickish, more or less obtuse, often conspicuously crowded at the base of the stem, often in pairs from middle of stem upwards; midrib comprising less than ¾ of width of leaf; margin distinctly revolute. Inflorescence pyramidal; partial inflorescences more or less capitate. Corolla 4·7–6·3 mm, hypocrateriform, yellowish, densely patent-hairy, sometimes subglabrous; tube 2–3 times as long as lobes. Fruit 1·5–2·5 mm, hairy. *Calcareous rocks near the coast.* ● *S. Italy (near Napoli); Sardegna (Tavolara).* It Sa.

Plants from Tavolara are entirely glabrous and may merit specific distinction as **A. deficiens** Viv., *Ann. Stor. Nat. (Bologna)* **4**: 231 (1830).

5. A. calabra (Fiori) Ehrend. & Krendl, *Bot. Jour. Linn. Soc.* **68**: 268 (1974) (*A. cynanchica* var. *calabra* Fiori). Like **4** but shoots glaucous or green; stems 10–25(–30) cm, more caespitose, only slightly woody at base; leaves 7–15 × 1–2 mm, narrowly oblanceolate, brownish to blackish when dry, rather thin, acute; margin weakly revolute; corolla 7–12 mm, pale purplish, glabrous outside or rarely more or less patent-hairy; fruit glabrous. ● *Mountains of S.W. Italy.* It.

6. A. staliana Vis., *Fl. Dalm.* **3**: 11 (1852). Shoots always glaucous-pruinose, laxly caespitose. Stems 10–35 cm, ascending, more or less woody and glabrous or shortly hairy at the base; middle internodes 1–2 times as long as the leaves. Leaves 10–30 × 1·5–3·5 mm, thickish, acute, in pairs on upper two-thirds of stem; midrib comprising less than ¾ of width of leaf; margin revolute. Inflorescence ovoid, moderately dense; partial inflorescences condensed to more or less capitate. Corolla 3–8 mm, hypocrateriform to narrowly infundibuliform, pink, glabrous outside; tube 2–3 times as long as the distinctly appendiculate lobes. Fruit *c.* 2 mm, papillose, otherwise glabrous, glaucous-pruinose. *Maritime rocks.* ● *Islands off the coast of N.W. Jugoslavia.* Ju.

7. A. garganica Huter, Porta & Rigo ex Ehrend. & Krendl, *Bot. Jour. Linn. Soc.* **68**: 268 (1974): Like **6** but stems 10–20 cm, glabrous; leaves 5–15 × *c.* 0·5 mm, thin; inflorescence lax, sparingly branched; partial inflorescences spicate; corolla *c.* 6 mm, hypocrateriform, the tube about twice as long as the lobes. *Calcareous rocks.* ● *S.E. Italy (Monte Gargano).* It.

8. A. suffruticosa Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 111 (1856). Shoots green, even when young. Stems 15–35 cm, laxly caespitose, woody at base, ascending, glabrous below or with short, sparse hairs; middle internodes mostly 3–5 times as long as the leaves. Leaves 10–20 × 0·5–1 mm, linear, mostly somewhat falcate, usually blackish when dry; midrib comprising less than ¾ of width of leaf; margin revolute. Inflorescence elongate, usually unbranched, laxly spicate, with 3–6 flower-clusters; bracts more or less connate. Corolla (3–)4–6·5 mm, more or less hypocrateriform, dirty yellow, glabrous outside; tube 2–2½ times as long as lobes; lobes obscurely appendiculate. Fruit papillose. *Rocks, montane to alpine zones.* ● *E. Greece (Dhirfis Oros, Evvoia).* Gr.

9. A. ophiolithica Ehrend., *Pl. Syst. Evol.* **123**: 153 (1975) (*A. stricta* auct. eur., non Boiss., *A. stricta* subsp. *pruinosa* Ehrend.). Shoots glaucous-pruinose, particularly when young. Stems 20–45 cm, woody at base, ascending, glabrous or with patent hairs up to 0·3 mm below. Leaves 8–15 × 0·5–0·8 mm, linear, usually straight and erect; midrib comprising more than ¾ of width of leaf; margin revolute. Inflorescence elongate, somewhat branched, laxly spicate, with 4–6 flower-clusters; bracts scarcely connate. Corolla 4·2–5·2 mm, hypocrateriform, brownish-yellow, more or less glabrous; tube 2–3 times as long as lobes. Fruit 2–3 mm, papillose. *Serpentine rocks.* ● *E. Greece (Evvoia).* Gr.

10. A. idaea Halácsy, *Consp. Fl. Graec.* **1**: 737 (1901). Shoots green, rarely glaucous-pruinose, with patent hairs up to 0·3 mm or sometimes subglabrous. Stems 3–15 cm, caespitose to pulvinate; middle internodes mostly 1–2 times as long as the leaves. Leaves 5–8 × 0·5–1·5 mm, narrowly oblanceolate to linear; midrib usually comprising more than ¾ of width of leaf; margin revolute. Inflorescence compact, rarely slightly elongate, unbranched, with (1–)2–3(–4) flower-clusters; bracts somewhat connate. Corolla 3·2–5 mm, hypocrateriform to narrowly infundibuliform, pink, with dense, patent, short hairs outside, sometimes subglabrous; tube 2–3 times as long as lobes; lobes sometimes subglabrous; tube 2–3 times as long as lobes; lobes obscurely appendiculate. Fruit 1–1·5 mm, with dense, short hairs or elongate papillae. *Subalpine zone.* ● *Mountains of Kriti.* Cr.

11. A. suberosa Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 89(1806) (incl. *A. pirinica* Stoj. & Acht.). Like **10** but shoots always glaucous-pruinose, with patent hairs *c.* 0·1 mm; leaves 4–10 × 0·5–0·8 mm, the midrib usually comprising less than ¾ of width of leaf; inflorescence with 1–3 flower-clusters; bracts not connate; corolla 5–8 mm, hypocrateriform, the tube 2½–3 times as long as

the lobes; fruit 2–3 mm. *Alpine zone.* ● *Mountains of N. Greece and S.W. Bulgaria.* Bu Gr.

12. A. gussonii Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 63 (1849). Shoots densely pulvinate, glaucous-pruinose, glabrous. Stems 3–9 cm; internodes shorter than the leaves. Leaves 4–9 × 1–1·8 mm, narrowly elliptical to broadly linear, often weakly incurved, thickish, shortly acute; midrib robust, but usually comprising less than ¾ of the width of leaf; margin flat or weakly revolute. Inflorescence compact, few-flowered, usually with a solitary, terminal cluster of 6–15 shortly pedicellate flowers; bracts leaf-like. Corolla 6–7 mm, hypocrateriform to narrowly infundibuliform, reddish, glabrous, smooth; tube 2–3 times as long as lobes; lobes obscurely appendiculate. Fruit 1·2–2 mm, finely papillose, glabrous. *Alpine zone.* ● *N. Sicilia* (*Madonie*). ?It Si.

13. A. pumila Moris, *Mém. Acad. Sci.* (*Turin*) **38**: 26 (1835). Like **12** but shoots green, with more or less sparse, patent hairs up to 0·3 mm; internodes of flowering stems sometimes slightly longer than the leaves; leaves thin, with distinct hyaline apex up to 0·3 mm; midrib usually comprising *c.* ¾ of width of leaf; flowers usually sessile; corolla-tube 3–3½ times as long as lobes; fruit sparsely hairy. *Calcareous mountain rocks.* ● *Sardegna* (*near Oliena*). Sa.

14. A. oetaea (Boiss.) Heldr. ex Halácsy, *Consp. Fl. Graec.* **1**: 739 (1901). Stems 5–26 cm, laxly caespitose, procumbent to ascending, slender and more or less herbaceous, with hairs less than 0.1 mm especially at the base, glabrous above; lower internodes more or less short, the middle ones 3–5 times as long as the leaves. Leaves (7–)10–25 × (0·6–)0·8–1·8 mm, lanceolate to linear, usually blackish when dry, more or less glabrous, with a hyaline awn 0·3–0·8 mm; midrib comprising less than ¾ of width of leaf; margin more or less flat, usually shortly ciliate. Inflorescence usually unbranched and elongate, with 3 (rarely more) more or less capitate flower-clusters; bracts distinctly longer than fruits, lanceolate. Corolla 5·7–6·9 mm, hypocrateriform to narrowly infundibuliform, pink, glabrous and smooth; tube 2–2½ times as long as lobes; lobes distinctly appendiculate. Fruit papillose, glabrous. *Damp places in the subalpine zone.* ● *S. Greece.* Gr.

15. A. nitida Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 89 (1806). Densely caespitose to pulvinate; young shoots green, usually conspicuously falcate-incurved. Stems 6–25 cm, usually with patent hairs up to 0·1 mm; lower internodes short, the upper (1–)2–3 times as long as the leaves. Leaves (5–)10–15 × 0·5–0·9 mm, narrowly lanceolate to acicular, straight or falcate, usually blackish when dry, with hyaline awn up to 1 mm; midrib comprising less than ¾ of width of leaf; margin weakly revolute, usually with distinct cilia *c.* 0·1 mm. Inflorescence compact or slightly elongate, with (2–)3–4(–10) flower-clusters; bracts usually ciliate. Corolla 5·5–8 mm, hypocrateriform to narrowly infundibuliform, pale purplish, glabrous and smooth; tube 2–3 times as long as lobes; lobes distinctly appendiculate. Fruit *c.* 2 mm, papillose, glabrous. *Alpine calcareous and siliceous soils. Mountains of C. Greece.* Gr.

16. A. lutea Sibth. & Sm., *op. cit.* 88 (1806). Stems 8–48 cm, caespitose to laxly pulvinate, erect or ascending, usually woody at base, usually with hairs 0·05–0·3 mm below, more or less subglabrous above; basal internodes very short, the middle ones 3–5 times as long as the leaves. Leaves 7–24 × 0·3–0·7 mm, with hyaline apex 0·3–1 mm. Inflorescence elongate, laxly spicate with 3-many more or less capitate flower-clusters. Corolla hypocrateriform; tube (1½–)2–3½ times as long as lobes; lobes distinctly appendiculate. ● *S. & S.C. Greece.* Gr.

Subsp. (a) and subsp. (b) are connected with **18** by intermediates, possibly of hybrid origin.

1 Leaves 5–15 mm, rigid, linear to acicular; hairs on stem 0·1–0·3 mm
2 Bracts connate for *c.* ½ their length; hairs on stem often more than 0·2 mm (a) subsp. **lutea**
2 Bracts free or only slightly connate; hairs on stem not more than 0·2 mm (b) subsp. **rigidula**
1 Leaves 10–24 mm, thin, acicular; hairs on stem not more than 0·1 mm
3 Leaves ± falcate, patent or recurved; flowers yellowish; fruit 2–2·5 mm (c) subsp. **euboea**
3 Leaves ± straight and appressed; flowers pink; fruit 1–2 mm (d) subsp. **mungieri**

(a) Subsp. **lutea**: Stems 12–30 cm. Leaves somewhat falcate, with more or less dense, patent hairs up to 0·3 mm, or glabrous, with awn up to 1 mm; midrib comprising less than ¾ of width of leaf; margin more or less weakly revolute. Inflorescence usually unbranched. Corolla 3·5–4 mm, yellowish to reddish, glabrous, rarely with sparse, short hairs. Fruit *c.* 2 mm, papillose, glabrous. *Montane to subalpine zones. S.C. Greece.*

(b) Subsp. **rigidula** (Halácsy) Ehrend., *Bot. Jahrb.* **80**: 402 (1961): Stems 18–45 cm, robust, with short, stiff hairs 0·1–0·2 mm, particularly towards base. Leaves robust, rigidly patent, more or less shortly hairy to glabrous, with awn *c.* 0·5 mm; midrib comprising more than ¾ of width of leaf; margin distinctly revolute. Inflorescence more or less branched. Corolla 3·5–5·5 mm, usually yellowish, glabrous or hairy. Fruit 1·5–2·5 mm, papillose, glabrous (rarely hairy). *Mediterranean zone, on calcareous and siliceous soils. S.E. Greece, Evvoia.*

(c) Subsp. **euboea** Ehrend., *op. cit.* 403 (1961): Stems 8–20 cm, slender, with some short hairs (up to 0·1 mm) at base. Leaves distinctly patent-falcate, glabrous or shortly hairy, with awn *c.* 0·5 mm; midrib comprising more than ¾ of width of leaf; margin distinctly revolute. Inflorescence scarcely branched. Corolla (3·5–)4–7 mm, dirty yellow, glabrous or weakly hairy. Fruit 2–2·5 mm, coarsely papillose, glabrous or hairy. *Calcareous rocks in montane zone. Evvoia.*

(d) Subsp. **mungieri** (Boiss. & Heldr.) Ehrend. & Krendl, *Bot. Jour. Linn. Soc.* **68**: 269 (1974) (*A. mungieri* Boiss. & Heldr.): Like subsp. (c) but stems 15–48 cm; leaves more or less straight and appressed; corolla (3–)4–8 mm, pink; fruit 1–2 mm, glabrous. *Montane to subalpine zones. S. Greece.*

17. A. abbreviata (Halácsy) Rech. fil., *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **105(2, 1)**: 132 (1943). Shoots green, straight. Stems 2–10 cm, pulvinate, with curved hairs up to 0·3 mm or glabrous; middle internodes 1–2(–3) times as long as the leaves. Leaves 7–15 × 0·5–0·8 mm, linear to acicular, more or less weakly patent-falcate, shortly hairy, sometimes glabrescent, with awn up to 0·6 mm; midrib comprising more than ¾ of width of leaf; margin distinctly revolute. Inflorescence unbranched, compactly spicate, with (1–)2(–3) clusters each of 3–5(–9) flowers. Corolla 3·5–4·5 mm, broadly hypocrateriform to narrowly infundibuliform, ?yellow, glabrous; tube 2–3 times as long as lobes; lobes shortly appendiculate. Fruit *c.* 1·5 mm, papillose, glabrous. ● *Mountains of the Kikladhes* (*Naxos, Amorgos*). Gr.

18. A. pulvinaris (Boiss.) Heldr. ex Boiss., *Fl. Or., Suppl.* 281 (1888). Like **17** but hairs on stems patent; internodes usually shorter than the leaves; leaves 5–10 × 0·5–0·8 mm, densely hairy, the midrib comprising less than ¾ of width of leaf and the margin weakly revolute; inflorescence with 1–2(–3) clusters each of (1–)2–4 flowers; corolla pink, usually densely patent-hairy, lobes

with appendages up to 0·3 mm; fruit papillose and patent-hairy. *Subalpine zone.* ● *Mountains of S. Greece.* Gr.

In areas of contact with *A. lutea*, intermediate populations occur.

19. A. boissieri Heldr. ex Boiss., *loc. cit.* (1888). Like **17** but young shoots and leaves glaucous-pruinose; stems up to 16 cm, glabrous; internodes scarcely longer than the leaves; leaves 4–10 × 0·5–0·7 mm, with awn (0·3–)0·7–1 mm; midrib comprising less than ¾ of width of leaf; margin weakly revolute; inflorescence with 1–2 clusters each of (1–)2–4(–6) flowers; corolla 3·7–5(–8) mm, pink. 2*n*=22. *Alpine zone.* ● *Mountains of S. Greece.* Gr.

(20–24). A. pyrenaica group. More or less densely caespitose. Stems 2–20(–30) cm, weak, herbaceous throughout. Midrib usually comprising less than ¾ of width of leaf; lower leaves ovate or obovate, densely crowded. Inflorescence corymbiform. Corolla pink; tube usually 1–1½ times as long as lobes.

A probably related group of disjunct mountain species. The delimitation of **23** and **24** is difficult, as is also the separation of both from **1(d)** and (particularly) **31** in areas of contact.

1 Corolla-tube glabrous and smooth outside
2 Cauline leaves in pairs above; corolla broadly infundibuliform **20. neilreichii**
2 Cauline leaves in whorls of 4 throughout; corolla narrowly infundibuliform **21. beckiana**
1 Corolla-tube usually shortly hairy or papillose outside
3 Cauline leaves lanceolate to oblanceolate; fruit 1–1·5 mm, hairy or papillose **22. neglecta**
3 Cauline leaves broadly linear to acicular; fruit usually more than 1·5 mm, papillose
4 Corolla 4–5 mm; leaves 20–30 × 1–1·5 mm; stems usually glabrous **23. rupicola**
4 Corolla 2·8–4 mm; leaves 8–16 × 0·3–1·3 mm; stems usually shortly hairy below **24. pyrenaica**

20. A. neilreichii G. Beck, *Verh. Zool.-Bot. Ges. Wien* **32**: 182 (1883). Shoots green. Stems (5–)7–20(–30) cm, glabrous; lower internodes very short, the middle ones shorter than or up to twice as long as leaves. Cauline leaves 10–20 × 1–1·5(–2) mm, in pairs above, lanceolate, acute, thickish, glabrous; margin flat or only slightly revolute; lower leaves very shiny above. Inflorescence rather lax, with broadly lanceolate, more or less free bracts; pedicels 0–2 mm. Corolla 3–4(–4·5) mm, broadly infundibuliform, glabrous and smooth outside; tube 1–1½ times as long as lobes; lobes distinctly appendiculate. Fruit 1·5–2 mm, papillose. 2*n*=20. *Subalpine zone.* ● *N.E. Alps*; *Carpathians.* Au Cz ?Rm ?Rs (W).

21. A. beckiana Degen, *Magyar Bot. Lapok* **7**: 105 (1908). Like **20** but leaves 8–22 × 0·8–2 mm, in whorls of 4 throughout, oblanceolate to linear, glabrous or shortly papillose-hairy beneath, scarcely shining; corolla hypocrateriform to narrowly infundibuliform. *Bare, calcareous places in the subalpine zone.* ● *Mountains of W. Jugoslavia.* Ju.

Sometimes difficult to distinguish from glabrescent variants of **2** (with longer corolla-tube).

22. A. neglecta Guss., *Pl. Rar.* 69 (1826). Young non-flowering shoots green. Stems 2–7(–10) cm, more or less hairy, sometimes subglabrous; lower internodes very short, the middle ones shorter than or scarcely longer than the leaves. Cauline leaves 5–20 × 1·3–1·5 mm, oblanceolate to lanceolate, acute, rather thin, shortly hairy or glabrous; margin weakly revolute; lower leaves rather coriaceous. Inflorescence with capitate partial inflorescences; bracts broadly lanceolate, free or slightly connate; pedicels 0–1 mm. Corolla 3–3·5 mm, narrowly infundibuliform, shortly hairy or glabrous outside; tube 1½–1¾ as long as lobes. Fruit 1–1·5 mm, patent-hairy or papillose. *Alpine zone.* ● *C. & S. Appennini.* It.

Glabrous variants (**A. nitens** Guss., *op. cit.* 70 (1826)) frequently occur.

23. A. rupicola Jordan, *Pug. Pl. Nov.* 76 (1852). Shoots green or glaucous-pruinose. Stems (5–)10–15(–20) cm, ascending, more or less glabrous; lower internodes short, the middle ones shorter than or only slightly longer than the leaves. Cauline leaves 20–30 × 1–1·5 mm, linear, subacute, more or less glabrous; margin revolute. Inflorescence rather lax, with more or less capitate partial inflorescences; bracts usually broadly lanceolate, free. Corolla 4–5 mm, externally rough with papillae; tube 1½–2 times as long as lobes. Fruit *c.* 2 mm, coarsely papillose. *Subalpine zone.* ● *S.W. Alps.* Ga It.

24. A. pyrenaica L., *Sp. Pl.* 104 (1753). Like **23** but stems 3–20(–30) cm, usually shortly papillose-hairy below, often glabrescent above; middle internodes 1–2(–3) times as long as the leaves; leaves 8–16 × 0·3–1·3 mm, the midrib often comprising more than ¾ of width of leaf, the margin weakly revolute, often shortly ciliate; bracts narrowly lanceolate; corolla 2·8–4 mm, the tube 1–1½(–2) times as long as lobes. *Upper montane to alpine zones.* ● *Pyrenees.* Ga Hs.

(25–29). A. cretacea group. Densely caespitose, woody at base. Stems 3–35 cm. Leaves rigid, linear to subulate (rarely narrowly oblanceolate), acute; midrib comprising more than ¾ of width of leaf; margin distinctly revolute. Corolla 2–4(–5) mm, infundibuliform, sometimes narrowly so, white to pale purplish; tube 1–2 times as long as lobes; lobes distinctly appendiculate. Fruit papillose.

1 Corolla-tube at least 1½ times as long as lobes **25. cretacea**
1 Corolla-tube about as long as lobes
2 Flowers ± sessile, in dense capitula, surrounded by ± dentate bracts 0·7–1·2 mm wide **26. supina**
2 At least some flowers shortly pedicellate, the partial inflorescences scarcely capitate; bracts not more than 1 mm wide, mostly entire
3 Corolla rough outside; fruit 1·7–2 mm **27. tephrocarpa**
3 Corolla smooth outside; fruit 2–4 mm
4 Stems ± rough with short hairs throughout; leaves dark green, the margins mostly rough **28. exasperata**
4 Stems smooth, or rough only below; leaves shining green, at least the upper with smooth margins **29. petraea**

25. A. cretacea Willd. in Roemer & Schultes, *Syst. Veg.* **3**: 529 (1818) (Ser. *Vestitae* Klokov; incl. *A. vestita* V. Krecz., *A. cimmerica* V. Krecz. ex Klokov, *A. praepilosa* V. Krecz. ex Klokov, *A. praevestita* Klokov, *A. kotovii* Klokov, *A. infracta* Klokov, *A. aemulans* V. Krecz. ex Klokov). Shoots grey-green. Stems (4–)7–35 cm, shortly hairy at least below; middle internodes 2–8 times as long as the leaves. Leaves 3·5–21 × 0·3–1·2 mm, more or less rough with short hairs. Inflorescence ovoid; partial inflorescences more or less capitate; bracts 0·2–1 mm wide, narrowly lanceolate; flowers more or less sessile. Corolla rough outside; tube 1½–2 times as long as lobes. Fruit 1·2–2·5 mm. *Stony slopes, maritime sands and saline steppes. Krym.* Rs (K).

26. A. supina Bieb., *Fl. Taur.-Cauc.* **1**: 101 (1808) (Ser. *Supinae* Klokov; incl. *A. caespitans* Juz., *A. tranzshelii* Klokov). Shoots green. Stems 10–20(–26) cm, more or less shortly hairy to gla-

brous; middle internodes 2–7 times as long as the leaves. Leaves 10–30 × 0·3–0·5 mm, with short awn. Inflorescence ovoid to corymbiform; partial inflorescences distinctly capitate; bracts 0·7–1·2 mm wide, broadly lanceolate, more or less dentate; flowers more or less sessile. Corolla 2–5 mm, mostly rough outside; tube about equalling lobes. Fruit 1·5–2 mm. $2n=20$. ● *Krym.* Rs (K).

27. A. tephrocarpa Czern. ex M. Popov & Chrshan., *Bull. Soc. Nat. Moscou* nov. ser., **50(5–6)**: 96 (1945) (incl. *A. creticola* Klokov). Shoots grey-green. Stems 3–20(–50) cm, rough with short hairs at least below, more or less branched only above the middle; middle internodes scarcely longer than the leaves. Leaves 5–17 × 0·2–0·7 mm, rough with short hairs. Inflorescence corymbiform; partial inflorescences somewhat compact; bracts up to 1 mm wide, mostly entire, lanceolate; pedicels 0–1 mm. Corolla 2–3·7 mm, rough outside; tube about equalling lobes. Fruit 1·7–2 mm. ● *S.C. Russia and E. Ukraine.* Rs (C, W, E).

28. A. exasperata V. Krecz. ex Klokov in Schischkin, *Fl. URSS* **23**: 695 (1958). Like **27** but shoots dark green; stems 2–25 cm, robust and rigid, more or less rough with short hairs throughout; leaves 5–17 × 0·5–1 mm, narrowly oblanceolate to linear, mostly more or less rough; bracts up to 1 mm wide, entire, lanceolate; pedicels 0–1 mm; corolla not more than 2·7 mm, smooth outside; tube about equalling lobes; fruit 2–3 mm. ● *S.C. Russia.* Rs (C, E).

29. A. petraea V. Krecz. ex Klokov, *op. cit.* 696 (1958). Like **27** but shoots shining green; stems 10–25 cm, rather delicate, glabrous and smooth or rough only below; middle internodes scarcely longer than the leaves; leaves 10–15(–20) × 0·5–0·7 mm, narrowly oblanceolate to linear, the lower more or less rough, the upper with more or less smooth margins; corolla 2–3·7 mm, smooth outside; tube about equalling lobes; fruit 3–4 mm. *E.C. Russia and S. Ural.* Rs (C, E).

30. A. occidentalis Rouy, *Fl. Fr.* **8**: 60 (1903). Laxly caespitose, green, with creeping, subterranean, orange stolons. Stems 3–16(–35) cm, procumbent-ascending, herbaceous throughout, shortly hairy below, glabrous above; middle internodes 1–2(–3) times as long as the leaves. Cauline leaves 3–20 × 1–2 mm, oblanceolate to linear-lanceolate, acute, more or less fleshy; midrib comprising less than ¾ of width of leaf; margin flat or slightly revolute; basal leaves broadly ovate. Inflorescence ovoid-corymbiform; flowers more or less glomerate, sessile. Corolla *c.* 3 mm, broadly infundibuliform, pink, somewhat rough outside; tube about equalling lobes; lobes obscurely appendiculate. Fruit 1·5–2·2 mm, papillose. *Maritime sands.* ● *N. Spain, S.W. France, S.W. Britain, Ireland.* Br Ga Hb Hs.

30 is not a hybrid between **31** and *Galium arenarium*, as was originally suggested. Intermediates between **30** and **31** evidently occur.

31. A. cynanchica L., *Sp. Pl.* 104 (1753) (incl. *A. papillosa* Lange, *A. capillacea* (Lange) Rouy, *A. tenuiflora* Jordan). Laxly or densely caespitose, green, sometimes glaucous-pruinose, with more or less numerous non-flowering shoots, but without subterranean stolons. Stems 10–50 cm, ascending to erect, herbaceous at base, usually rough with short hairs at base, subglabrous above; middle internodes 1–3 times as long as the leaves. Leaves (15–)20–35(–40) × 0·8–1·5 mm, in whorls of 4 throughout, narrowly lanceolate to linear, acute; midrib comprising less than ¾ of width of leaf; margin flat to weakly revolute. Inflorescence usually much-branched; pedicels 0–1 mm. Corolla 2·5–3·5(–4) mm, broadly infundibuliform, pale purplish to whitish, usually more or less rough; tube 1–1½(–2) times as long as lobes; lobes distinctly appendiculate. Fruit 1·5–2 mm, papillose, rarely hairy. $2n=20$, 40. *Most of Europe northwards to* 54° 30′ *N. in England and C. Russia.* Al Au Be Bl Br Bu Cr Ga Ge Gr Hb He Ho Hs Hu It Ju Po Rm Rs (C, W, E) Sa Si.

Very variable and comprising diploid and tetraploid cytotypes which it has not hitherto been possible to separate. The numerous local races need further study especially in the middle and western part of the range.

Plants transitional to **1, 23, 24** and **32** occur where these species meet with **31.**

32. A. rumelica Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 113 (1856) (*A. montana* auct. an Waldst. & Kit. ex Willd.?). Like **31** but not caespitose, more or less grey-green, without non-flowering shoots at anthesis; stems 10–90 cm, erect, robust, sometimes woody at base; leaves 0·5–1 mm wide, the midrib often comprising more than ¾ of width of leaf, the margin distinctly revolute; inflorescence elongate-ovoid; pedicels usually distinct and up to 2(–4·5) mm; corolla 2–2·5(–3) mm, narrowly infundibuliform, rough with dense, short hairs outside. ● *S.E. Europe.* Bu Gr ?Hu Rm Rs (W, K) Tu.

This very variable species is taken here in a broad sense.

A. barthae Pénzes, *Ann. Hist.-Nat. Mus. Hung.* (*Bot.*) **31**: 113 (1938) from S.E. Bulgaria (Strandža Pl.) may belong here. *A. graniticola* Klokov seems to represent populations intermediate between **32** and **27**. *A. attenuata* Klokov and *A. hypanica* Klokov tend towards **3**. There are further connections with the *A. suaveolens* group.

(33–40). A. graveolens group (Ser. *Graveolentes* Klokov). Inflorescence elongate-ovoid, the branches squarrosely divaricate after anthesis. Corolla 2–6·5 mm, pink to whitish. Fruit 1·7–4·5 mm, usually densely covered with squamiform tubercles or short setae (rarely glabrescent).

A group of geographically vicarious species closely related to each other and connected by transitional forms; all grow in dry sandy places.

1 Corolla-tube at least 1½ times as long as lobes
 2 Stems often rough at base; middle internodes 3–4 times as long as leaves; corolla-tube 2–2½ times as long as lobes **33. danilewskiana**
 2 Stems ± smooth at base; middle internodes 1½–2 times as long as leaves; corolla-tube 1½–2 times as long as lobes **34. laevissima**
1 Corolla-tube about as long as lobes
 3 Stems robust; leaves rigid, straight; corolla usually shortly hispid outside
  4 Fruit with dense squamiform tubercles; internodes on flowering stems usually fewer than 20, *c.* 3 times as long as leaves **39. setulosa**
  4 Fruit with dense, short setae; internodes on flowering stems usually more than 25, 1–2 times as long as leaves **40. littoralis**
 3 Stems slender; leaves somewhat flaccid, usually falcate; corolla finely hairy or glabrous outside
  5 Fruit almost without or with only a few squamiform tubercles **37. leiograveolens**
  5 Fruit with numerous squamiform tubercles
   6 Plant glaucous; stems usually glabrous and smooth **36. diminuta**
   6 Plant ± green; stems hispidulous and rough
    7 Stems hispidulous and rough only at base; leaves (15–)25–30(–40) mm **35. graveolens**
    7 Stems hispidulous and rough throughout; leaves 2–16 mm **38. savranica**

33. A. danilewskiana Basiner, *Bull. Phys.-Math. Acad. Pétersb.* **2**: 202 (1844). Shoots glaucous. Stems 20–60 cm, erect to geniculate-ascending, often rough with short hairs below, subglabrous above; middle internodes 3–4 times as long as the leaves. Leaves 7–20(–24) × 0·8–1 mm, linear, acute, weakly falcate, usually glabrous, rarely shortly ciliate; midrib comprising less than ¾ of width of leaf; margin distinctly revolute. Bracts narrowly lanceolate, usually not exceeding the fruits, usually glabrous; pedicels 0–2·5 mm. Corolla (4·5–)5·5–6·5 mm, broadly hypocrateriform to narrowly infundibuliform, pale purplish to whitish, nearly glabrous; tube about twice as long as lobes; lobes distinctly appendiculate. Fruit 2·5–4·5 mm, densely covered with acute squamiform tubercles. *W. Kazakhstan.* Rs (E). (*W.C. Asia.*)

34. A. laevissima Klokov in Schischkin, *Fl. URSS* **23**: 708 (1958). Like **33** but mostly glabrous (rarely more or less rough at base); middle internodes 1½–2 times as long as the leaves; leaves 10–40 × 0·5–1 mm, linear to acicular, glabrous, the margin more or less weakly revolute; pedicels not more than 1·5 mm; corolla 3–6 mm, the tube 1½–2 times as long as lobes, the lobes obscurely appendiculate; fruit (2·5–)3–4·5 mm, with more or less obtuse tubercles. ● *S.E. Russia, westwards to* 40° 30′ *E.* Rs (C, E).

35. A. graveolens Bieb. ex Schultes & Schultes fil., *Mantissa* **3**: 376 (1827). Shoots green. Stems 10–35 cm, geniculate-ascending, more or less weak, rough at the base, usually with conspicuous, short, non-flowering shoots at the nodes; middle internodes 1–3 times as long as the leaves. Leaves (15–)25–30(–40) × 0·4–1·2 mm, linear to acicular, acute, patent and falcate to recurved, usually shortly hairy; margin distinctly revolute. Bracts narrowly lanceolate, glabrous or ciliate, scarcely exceeding the fruits; pedicels 0–1·5(–3) mm. Corolla 3·5–4 mm, broadly hypocrateriform to narrowly infundibuliform; tube 1–1½ times as long as lobes; lobes distinctly appendiculate. Fruit (2–)3–4 mm, densely covered with squamiform tubercles. ● *E. Ukraine and S. Russia, from the Dnepr to E. of the Don.* Rs (C, W, E).

36. A. diminuta Klokov in Schischkin, *Fl. URSS* **23**: 707 (1958). Like **35** but shoots glaucous; stems 15–35 cm, usually glabrous and smooth throughout; leaves 6–20(–25) × 0·5–1·2 mm; pedicels not more than 1 mm; corolla 3·5–4·5 mm, the tube equalling the lobes; fruit with acute tubercles. *N.W. coast of Caspian Sea.* Rs (E).

37. A. leiograveolens M. Popov & Chrshan., *Bull. Soc. Nat. Moscou* nov. ser., **50(5–6)**: 96 (1945). Like **35** but leaves 10–25 × 0·3–0·7 mm, glabrous; bracts glabrous; fruit 2–3 mm, almost without or with only a few, scattered squamiform tubercles. ● *C. Ukraine* (*along the middle course of the Dnepr*). Rs (W).

38. A. savranica Klokov in Schischkin, *Fl. URSS* **23**: 707 (1958). Like **35** but stems 12–25 cm, densely leafy, hispid; leaves 2–16 × 0·5–0·7 mm, more or less straight, thickish, shortly hispid; corolla 3–3·5 mm; fruit 1·7–3 mm. ● *W.C. Ukraine* (*around Savran'*). Rs (W).

39. A. setulosa Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 61 (1849). Stems 26–65 cm, procumbent to arcuate-ascending, scarcely rooting, robust, rigid, more or less densely and shortly hispid below, subglabrous above; flowering stems usually with fewer than 20 internodes, which are *c.* 3 times as long as the leaves. Leaves (9–)15–20 × (0·5–)0·7–0·8 mm, linear to acicular, acute, rigid, more or less patent; midrib comprising more than ¾ of width of leaf; margin distinctly revolute, scabrid. Bracts coarsely ciliate; pedicels 0–2 mm. Corolla 3·5–5 mm, infundibuliform, usually shortly hispid outside; tube about equalling lobes; lobes distinctly appendiculate. Fruit (2·5–)3–4 mm, densely covered with squamiform tubercles. ● *W. & N.W. coasts of Black Sea* (*rarely inland*). Bu Rm Rs (W, ?K).

40. A. littoralis Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 89 (1806). Like **39** but stems 10–55 cm, procumbent and rooting at the base, almost always shortly hispid throughout; flowering stems usually with more than 25 internodes, which are 1–2 times as long as the leaves; leaves 3–10(–14) × 0·6–1·4 mm, more or less appressed, the margin weakly revolute; corolla 2–4 mm; fruit densely covered with short setae. *Maritime sands. N. coast of Turkey-in-Europe.* Tu. (*N. Anatolia.*)

Sect. HEXAPHYLLA Ehrend. Perennial herbs, with or without subterranean stolons. Leaves in whorls of 6(7); cauline broadly lanceolate to linear, 1-veined, without a distinct hyaline apex. Inflorescence pyramidal to corymbiform; partial inflorescences more or less capitate and involucrate; flowers with short pedicels or subsessile. Corolla 4-merous, hypocrateriform to infundibuliform, purplish or lilac to pink and whitish, glabrous and smooth or hairy outside; anthers and stigma often exserted. Ovary and fruit ovoid, hairy or glabrous, somewhat granulate.

41. A. incana Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 88 (1806). Stems (7–)10–40(–45) cm, more or less woody at base, ascending, rigid, robust, more or less branched, more or less hairy; internodes usually more than 12, the upper distinctly longer. Leaves (3–)8–15(–20) × (0·5–)0·8–1·2 mm, linear, more or less acute, densely hairy, sometimes glabrescent, the margin distinctly revolute. Inflorescences with sessile to long-pedunculate capitula. Corolla hypocrateriform, reddish, shortly hairy, sometimes glabrescent; tube (4·5–)5–6·5(–8) mm; lobes 2–3 mm, ovate, acuminate and more or less patent. Fruit *c.* 1·5 mm, shortly hairy. $2n=44$. *Stony places from the coast to the montane zone.* ● *Kriti.* Cr.

42. A. taygetea Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 60 (1849). Like **41** but stems velutinous; leaves 5–10 × 0·8–1 mm, subobtuse, velutinous; corolla whitish, densely hairy outside; tube (2·5–)3–4(–4·5) mm; lobes 1·5–2 mm, linear, somewhat apiculate and incurved. *Calcareous rocks from the coast to the subalpine zone.* ● *S. Greece and S.W. Aegean region.* Cr Gr.

43. A. rupestris Tineo, *Cat. Pl. Horti Panorm.* 276 (1827). Stems (10–)15–45(–50) cm, more or less woody at base, ascending, rigid, robust, usually glabrous, sometimes densely hairy; internodes usually more than 12, the upper distinctly longer. Leaves (10–)18–25(–30) × (1–)2–3 mm, oblanceolate, shortly acuminate, thickish, glabrous or hairy, blackening when dry. Inflorescences with one to several long-pedunculate capitula. Corolla narrowly infundibuliform, reddish, glabrous; tube 4–6(–8·5) mm; lobes 2–2·5 mm, ovate, more or less flat. Fruit 2–4 mm, glabrous. *Calcareous rocks.* ● *N.W. & S.E. Sicilia, Isole Egadi.* Si.

44. A. hirsuta Desf., *Fl. Atl.* **1**: 127 (1798). Stems (10–)15–50 (–60) cm, erect, rigid, robust, branched, hairy below or often subglabrous; internodes usually more than 12, the upper distinctly longer. Leaves (10–)12–20 × (0·5–)0·8–1(–1·2) mm, lanceolate to linear, long-acuminate, thin, more or less hairy beneath, mostly subglabrous above, green when dry. Inflorescences usually with several long-pedunculate capitula. Corolla hypocrateriform, brownish-red to pale pink, shortly hairy or glabrous; tube 5–7(–9) mm; lobes 2–3(–4) mm, ovate, flat. Fruit (2–)3–4 mm, glabrous. $2n=22$, 44. *Stony places and roadsides*

from the mediterranean to the montane zone. S. Spain, S. Portugal. Hs Lu.

A rather variable species, in which the relationship between morphological, cytological and eco-geographical differentiation is not yet understood.

45. A. taurica Pacz., *Zap. Novoross. Obšč. Estestv.* **15(1)**: 76 (1890) (*A. cretacea* auct., non Willd.). Stems (5–)10–20(–25) cm, densely caespitose, more or less erect, moderately robust; internodes usually fewer than 12. Leaves (10–)13–20(–25) × (1–)1·5–2 mm, linear, glabrous, the margin somewhat scabridulous. Inflorescences ovoid, more or less densely branched; partial inflorescences capitate; pedicels (1–)2–5(–7) mm. Corolla more or less infundibuliform, white or pale purplish, glabrous; tube 2–3 mm; lobes 1·5–2 mm, ovate, flat. Style shorter than corolla-tube. Fruit 1·5–2 mm, glabrous. *Calcareous rocky slopes. S. Krym.* Rs (K).

46. A. arcadiensis Sims, *Bot. Mag.* **47**: t. 2146 (1820). Stems (4–)8–15(–18) cm, pulvinate-caespitose, slender, woody at base, hairy. Leaves (4–)8–10(–12) × (1·2–)1·5–2·5(–3) mm, more or less broadly lanceolate, densely grey-hairy, the margin weakly revolute. Flowers sessile, in terminal, involucrate, few-flowered capitula. Corolla narrowly infundibuliform, pink, glabrous; tube 8–10(–12) mm; lobes (1·5–)2–3 mm, lanceolate, more or less incurved. Fruit *c.* 2 mm, glabrous. $2n=22$. *Calcareous mountain rocks.* ● *S. Greece (Peloponnisos).* Gr.

47. A. doerfleri Wettst., *Biblioth. Bot. (Stuttgart)* **26**: 59 (1892). Stems (1·5–)3–9(–10) cm, caespitose, glabrous or sometimes hairy at the base. Leaves 5–8 × 1–2 mm, lanceolate, sparsely patent-hairy especially on margin and midrib, the margin weakly revolute. Peduncles of capitula usually only half as long as the subtending leaves. Corolla broadly tubular-infundibuliform, pink; tube 2–3·5 mm; lobes 1–2 mm, hairy or glabrous, somewhat incurved. Fruit *c.* 2 mm, glabrous. $2n=22$. *Alpine screes and mountain pastures; calcicole.* ● *Crna Gora, N. Albania.* Al Ju.

48. A. hirta Ramond, *Bull. Soc. Philom. Paris* **2**: 131 (1800). Stems (5–)8–12(–15) cm, laxly caespitose, erect, slender, glabrous or hairy. Leaves (6–)9–15 × 1–2 mm, lanceolate, patent-hairy on margin and midrib, the margin weakly revolute. Peduncles of capitula 1–3 times as long as the subtending leaves. Corolla weakly infundibuliform, pink to whitish, glabrous; tube 3–4·5 (–5) mm; lobes 2–3 mm, flat. Fruit 2–2·5 mm, glabrous or sometimes hairy. $2n=22$. *Calcareous mountain rocks.* ● *C. & W. Pyrenees.* Ga Hs.

49. A. hercegovina Degen, *Österr. Bot. Zeitschr.* **40**: 15 (1890). Stems (4–)8–16(–20) cm, laxly caespitose, ascending to erect, slender, glabrous or hairy. Leaves (13–)15–20(–25) × (1·2–)1·5–2 mm, narrowly lanceolate, glabrous or more or less hairy, the margin weakly revolute. Peduncles of capitula 2–3 times as long as the subtending leaves; flowers more or less sessile. Corolla hypocrateriform, purplish-lilac, glabrous; tube (2·5–)3–4 mm; lobes 1·5–2·5 mm, oblong, more or less flat. Fruit *c.* 1·5 mm, glabrous. *Subalpine calcareous rocks.* ● *Mountains of Hercegovina and S. Bosna.* Ju.

A. pilosa Degen, *loc. cit.* (1890), described from the Prenj Planina (N. of Mostar), is a more or less strongly hairy variant of **49**.

50. A. capitata Kit. ex Schultes, *Österreichs Fl.* ed. 2, **1**: 312 (1814). Like **49** but stems (5–)10–20(–35) cm, shortly hairy only at base; leaves (15–)18–25(–30) × (0·5–)1–1·5 mm, linear-lanceolate, the lowest shortly hairy, the upper glabrous, the margin distinctly revolute; corolla more or less infundibuliform. $2n=22$. *Calcareous mountain rocks.* ● *S. & E. Carpathians; C. Bulgaria.* Bu Rm.

51. A. hexaphylla All., *Fl. Pedem.* **1**: 12 (1785). Like **49** but stems glabrous; leaves 14–25 × 1–1·5 mm, linear-lanceolate, glabrous, the margin scabridulous; pedicels 0·5–1·5(–3) mm; corolla-tube 5–6 mm; lobes 2–3 mm, more or less incurved. $2n=22$. *Calcareous mountain rocks.* ● *S.W. Alps, northwards to c.* 45° *N.* Ga It.

Sect. GLABELLA Griseb. Perennial herbs, often with rhizomes and subterranean stolons. Leaves in whorls of 4–6(–7), ovate, lanceolate or linear, 1- or 3-veined, rounded or very shortly acute, with cartilaginous apex. Inflorescence pyramidal to corymbiform; partial inflorescences cymose to capitate, bracteate to involucrate. Corolla 3- to 4-merous, narrowly to broadly infundibuliform, white or yellowish, sometimes tinged with pink, smooth outside, fragrant; tube 1½–4 times as long as the acute lobes; anthers and stigma included or exserted. Ovary and fruit ovoid, glabrous, smooth or weakly granulate.

52. A. taurina L., *Sp. Pl.* 103 (1753) (incl. *A. caucasica* Pobed., *A. propinqua* Pobed.). Stock with orange, more or less horizontal subterranean stolons. Stems (10–)20–50 cm, erect, stout, distinctly 4-angled, more or less patent-hairy. Leaves in whorls of 4, 30–60 × 10–25 cm, lanceolate to ovate, abruptly narrowed at base, pale beneath, with 3 main veins and distinct reticulate venation, patent-hairy especially on the veins and margin. Flowers in dense capitula, surrounded by involucral leaves and by long-ciliate bracts. Flowers 4-merous; corolla 10–14 mm, tubular to narrowly infundibuliform, white or pale yellowish; tube 6·5–10·5 mm; lobes 2–3·5 mm, much longer than wide. Filaments 2–3 mm; anthers 1·3–1·5 mm, oblong. Fruit 1–3 mm, glabrous and smooth. $2n=22$. *Deciduous woods and scrub up to the montane zone. S. & S.C. Europe.* Al Au Bu Ga Gr He Hs Hu It Ju Rm Rs (K) [Br Da Ge].

(a) Subsp. **taurina**: Corolla grey-brown or brown when dry. Anthers pale lilac to violet. *Throughout the range of the species except Hungary and Romania, and possibly Albania and Bulgaria.*
(b) Subsp. **leucanthera** (G. Beck) Hayek in Hegi, *Ill. Fl. Mitteleur.* **6(1)**: 201 (1914): Corolla yellowish when dry. Anthers white to pale yellowish. ● *N. part of Balkan peninsula, extending to Hungary and W. Romania; doubtfully elsewhere.*

The density of the indumentum on various parts of the plant varies greatly throughout the range of the species, and it is not possible to differentiate species on this basis.

53. A. involucrata Wahlenb. in Jakob Berggren, *Res. Eur. Österländ.* **2**: 21 (1827). Stock with more or less slender stolons. Stems (10–)15–50 cm, erect, branched from the base, 4-angled, shortly hairy below, glabrous above. Leaves in whorls of 4, 10–25(–30) × (2–)3–6(–6·5) mm, broadly elliptical to oblanceolate, obtuse, narrowed into a petiole-like base, thin, with 1 main vein and a distinct reticulate venation, glabrous but the lowest usually shortly hairy. Partial inflorescences capitate, terminal and lateral; bracts lanceolate, glabrous, smooth; pedicels 0–1·5 mm. Flowers 4-merous; corolla 4–6(–6·5) mm, infundibuliform, white, glabrous; tube 3–4 mm; lobes 1–2 mm, about as long as wide. Filaments 0·8–0·9 mm; anthers 0·6–0·7 mm, oblong, yellowish. Fruit 0·8–1·3 mm, glabrous, weakly granulate. *Deciduous woods. S.E. part of Balkan peninsula.* Bu Gr Tu.

54. A. laevigata L., *Mantissa* 38 (1767). Stock with slender stolons. Stems 15–80 cm, ascending to erect, more or less weak, scarcely branched from the base, 4-angled, glabrous. Leaves in whorls of 4, 9–25 × (3·5–)4–10(–11) mm, elliptical to ovate, more or less rounded at apex, narrowed into a petiole-like base, paler beneath, with 1 main vein and a distinct reticulate venation, glabrous; margin with fine scabridity in several rows. Inflorescence long-pyramidal; partial inflorescences laxly cymose; bracts lanceolate to filiform; pedicels 0·5–2 mm. Flowers 4-merous; corolla 1·3–2 mm, infundibuliform, white, glabrous; tube 0·7–1·2 mm; lobes 0·5–0·7 mm, about as long as wide. Filaments 0·2–0·4 mm; anthers 0·2–0·3 mm, ovoid to globose, yellowish. Fruit 1–1·5 mm, glabrous, granulate. $2n=44$. *Woods. Mediterranean region, ascending to montane zone.* Al Bl Co Ga Gr Hs It Ju Sa Si.

55. A. tinctoria L., *Sp. Pl.* 104 (1753) (*Galium triandrum* Hyl.). Stock with more or less horizontal, orange stolons; plants usually blackening on drying. Stems (20–)25–80 cm, erect, robust, more or less branched from the base, 4-angled, mostly glabrous. Leaves in whorls of 4–6(–7), 25–40(–50) × 1·2–3(–3·3) mm, lanceolate to linear, obtuse or acute, more or less 3-veined, glabrous or shortly hairy on the veins; margin with fine scabridity in several rows. Inflorescence broadly ovoid; partial inflorescences laxly cymose, with some ovate to elliptical, obtuse to acute, eciliate or shortly ciliate bracts; pedicels 0–2·5 mm. Flowers 3-merous; corolla (2–)3–4(–4·5) mm, narrowly infundibuliform, white; tube 1·2–2·5 mm; lobes (0·8–)1–2 mm, somewhat longer than wide, glabrous or shortly hairy. Filaments 0·4–0·5 mm; anthers 0·5–0·6 mm, yellowish. Fruit 1·5–2 mm, glabrous, finely granulate. $2n=22$, 44. *From N.C. France and S. Scandinavia southwards to C. Italy, S.W. Bulgaria and S. Ural.* Au Bu Cz *Da *Fe Ga Ge He Hu It Ju No Po Rm Rs (B, C, W, E) Su.

Very variable in colour on drying, in branching, and in leaf-shape and inflorescence; the typical plants have glabrous, ovate and obtuse bracts.

The relationship of this variability to the diploid and tetraploid condition remains to be studied. **A. hungarorum** Borbás, *Term. Füz.* **19**: 223 (1896) (*A. ciliata* Rochel, non Moench, *A. banatica* J. Holub), recorded from various parts of E.C. and S.E. Europe, is constantly black on drying and has relatively wide lanceolate leaves and ciliate, distinctly acute bracts; its status is uncertain, but it seems to be the most distinct of the variants.

Sect. ASPERULA. Annuals. Leaves mostly in whorls of 6–8, 1-veined, rounded at apex. Partial inflorescences capitate, enveloped by leaf-like, long-ciliate bracts. Corolla 4-merous, hypocrateriform, bluish-violet (rarely whitish), papillose-puberulent outside. Ovary and fruit more or less globose, smooth, glabrous.

56. A. arvensis L., *Sp. Pl.* 103 (1753). Stems (5–)10–55 cm. Leaves (4–)10–25(–35) × 0·6–4 mm, the lowest broadly lanceolate; cauline linear-lanceolate. Flowers 4-merous, equalling or shorter than the bracts. Corolla 5–6·5 mm, more or less salver-form, usually bluish-violet; tube 4–5·5 mm; lobes 0·5–1·7 mm. Filaments 0·2–0·3 mm; anthers 0·7–1 mm. Fruit 2–3 mm in diameter. *Fields and waste places. Most of Europe.* Al Au Bl Bu Co Ga *Ge Gr He Ho Hs Hu It Ju Lu Rm Rs (W, K, E) Sa Si Tu [Cz Da No Su.] (*S.W. Asia and N. Africa.*)

In most of N. Europe only casual, and in much of C. Europe a naturalized alien; the northern limit of its native range is, however, difficult to establish.

A. orientalis Boiss. & Hohen. in Boiss., *Diagn. Pl. Or. Nov.* **1(3)**: 30 (1843) (*A. azurea* Jaub. & Spach), from S.W. Asia, differs chiefly in its corolla 7–12(–14) mm, distinctly exceeding the bract, and its fruits only *c.* 1·5 mm in diameter. Cultivated for ornament, it has become a casual in S.C. Europe and more rarely elsewhere.

Sect. THLIPHTHISA (Griseb.) Ehrend. Dwarf shrubs or perennial herbs, with woody taproot, without rhizomes or stolons. Leaves in whorls of 6–8(–11), elliptical to linear, 1-veined, obtuse to acuminate at apex. Inflorescence pyramidal to ovoid, leafy more or less throughout; partial inflorescences with bracts and bracteoles. Corolla 4-merous, infundibuliform to rotate, purplish, reddish, brownish, greenish, yellowish or whitish, externally smooth and glabrous or hairy. Ovary and fruit oblong, truncate at apex, glabrous and more or less granulate, rarely hairy.

57. A. rigida Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 89 (1806) (*A. kritensis* Coust. & Gand.). Virgate dwarf shrub with squarrose branches; stems 7–30 cm, rigid, ascending, more or less sparsely and shortly hairy; internodes mostly longer than the leaves. Leaves 6–10 × 0·3–1·2 mm, in whorls of 6, the upper narrowly linear, the lower oblong-elliptical, often shortly hairy; vein prominent beneath; margin distinctly revolute. Inflorescence lax, the flowers sessile; bracts distinctly longer than the fruits, long-acuminate, keeled, ciliate, connate at the base. Corolla 2–3·5 mm, infundibuliform, reddish or yellowish, glabrous; tube 1·75–2·5 mm; lobes 0·5–1 mm, shortly acuminate. Style about as long as ovary; stigma oblong-clavate. Fruit *c.* 1·5 mm, glabrous. $2n=22$. *Dry, rocky places.* ● *Kriti.* Cr.

The closely related **Galium suberosum** Sibth. & Sm., *op. cit.* 91 (1806), differs from **57** in having a globose stigma, shallowly cup-shaped corolla and narrowly lanceolate leaves 10–15 mm; it is only known for certain from Cyprus and records from Kriti are evidently the result of confusion with **57**.

58. A. tournefortii Sieber ex Sprengel, *Syst. Veg.* **1**: 395 (1824) (incl. *A. majori* Barbey). Plant glaucous-pruinose; stems (10–)14–30(–35) cm, rigid, stout, more or less woody below, geniculately ascending to erect, glabrous below, puberulent above; internodes mostly as long as the leaves. Leaves 12–15 × 6–10 mm, in whorls of 6(–7), broadly obovate, obtuse, thick, coriaceous; vein scarcely prominent; margin weakly revolute. Inflorescence pyramidal, rather dense, many-flowered, the flowers subsessile; bracts about as long as the fruits, lanceolate, hairy, not connate at the base. Corolla 3–5 mm, infundibuliform, pale yellow, mostly long-hairy; tube *c.* 3·5 mm; lobes *c.* 0·7–1·5 mm, triangular. Style about as long as the ovary; stigma shortly clavate. Fruit 1·5–2 mm, puberulent. $2n=22$. *Calcareous cliffs. S. Aegean region.* Cr Gr.

59. A. muscosa Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 109 (1856). Stems (7–)10–16(–20) cm, herbaceous, ascending, slender, caespitose, mostly shortly hairy; internodes usually shorter than the leaves. Leaves 9–12 × 0·8–1·5 mm, in whorls of 6–8, narrowly lanceolate to linear, long-acuminate, not or scarcely scabrid; vein more or less prominent beneath; margin scarcely scabrid, vein more or less prominent beneath; margin plane, shortly ciliate. Flowers solitary in the leaf-whorls; pedicels 1–2 mm; bracts leaf-like, much longer than the fruits. Corolla 3–4·5 mm, infundibuliform, pale yellow; tube 2·5–3 mm; lobes 0·5–1·5 mm, ovate, glabrous. Style about as long as ovary; stigma shortly clavate. Fruit *c.* 1·5 mm, glabrous. $2n=22$. *Coniferous montane woods.* ● *E.C. Greece (Olimbos).* Gr.

60. A. baenitzii Heldr. ex Boiss., *Fl. Or., Suppl.* 280 (1888). Like **59** but stems 2–4 cm, laxly caespitose, procumbent to ascending; leaves 4–7 × 1·2–2 mm, in whorls of 6, the upper broadly lanceolate and weakly scabrid, the lower much shorter

and elliptical, coriaceous, shining, scabrid, very shortly acute; flowers sessile; corolla 2·5–3·5 mm, sparsely and shortly hairy; tube 2–2·5 mm; lobes *c.* 1·5 mm, linear-triangular, very shortly acuminate. *Rocks in the subalpine zone.* ● *S. Greece* (*Attiki*). Gr.

61. A. chlorantha Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(6)**: 90 (1859). Stems (15–)20–45(–55) cm, woody at base, ascending, slender, mostly scabrid with forwardly-directed teeth on the angles; internodes mostly longer than the leaves. Leaves 9–15(–20) × 0·3–1 mm, in whorls of up to 6, linear to filiform, more or less long-acuminate; vein scarcely prominent beneath; margin weakly revolute and scabridulous. Inflorescence lax; pedicels 0·5–3 mm, often recurved; bracts shorter than the fruits, broadly lanceolate, shortly acuminate, keeled, ciliate on the margin, shortly connate at the base. Corolla 2–3 mm, infundibuliform, glabrous, yellowish; tube 0·4–0·8 mm; lobes 1·2–2·1 mm, narrowly ligulate, shortly acuminate. Style much longer than ovary; stigma globose. Fruit *c.* 1·5 mm, glabrous. $2n=22$. *Rocky places in the montane zone.* ● *Albania and N.W. Greece.* Al Gr.

62. A. scutellaris Vis., *Fl. Dalm.* **3**: 12 (1852). Stems (10–)15–50(–60) cm, ascending, slender, glabrous, rarely shortly hairy; internodes mostly only slightly longer than the leaves. Leaves 15–30 × 0·5–2 mm, in whorls of (4–)6–7(–11), lanceolate to linear, more or less shortly acuminate; vein prominent beneath; margin revolute and shortly ciliate. Inflorescence lax, the pedicels 1–3 mm; bracts shorter than the fruits, ovate, navicular, connate at base. Corolla 1–1·8 mm, cup-shaped, white to reddish; tube 0·4–0·8 mm; lobes 0·7–1 mm, triangular, shortly acuminate, shortly hairy. Style much shorter than ovary; stigma globose. Fruit 1·5–1·8 mm, glabrous. $2n=22$. *Rocky places.* ● *Jugoslavia and Albania.* Al Ju ?Rm.

The variation within this species described by B. Korica, *Österr. Bot. Zeitschr.* **102**: 339–364 (1955) is scarcely worth taxonomic recognition.

63. A. baldaccii (Halácsy) Ehrend., *Bot. Jour. Linn. Soc.* **68**: 269 (1974) (*Galium baldaccii* Halácsy). Plant with sparse to dense, long, patent hairs; stems (5–)8–17(–20) cm, ascending to erect, slender; internodes mostly as long as the leaves. Leaves 3–8 × 0·6–1·5 mm, in whorls of 6–8(–9), narrowly lanceolate, acute; vein very prominent beneath; margin weakly revolute. Inflorescence ovoid, rather lax; pedicels 1–2 mm; bracts usually shorter than the fruits, ovate, navicular, shortly connate at base. Corolla 0·7–1 mm, slightly cup-shaped, dirty yellow, with long hairs outside; tube 0·2 mm; lobes 0·5–0·8 mm, triangular, acute. Style shorter than the ovary; stigma globose. Fruit *c.* 1·5 mm, densely hairy. *Rock-crevices*; *calcicole.* ● *Coastal mountains of S. Crna Gora* (*near Bar*). Ju.

64. A. saxicola Ehrend., *loc. cit.* (1974). Stems (5–)10–20(–25) cm, ascending to erect, sparingly branched, with short, patent hairs; internodes much longer than the leaves. Leaves 3–5 × 1·8–2·5 mm, in whorls of up to 6, ovate to obovate, more or less obtuse; vein scarcely prominent beneath; margin not or scarcely revolute. Inflorescence long and narrow, with rigidly erect and strict branches; pedicels 0·5–2 mm, often recurved; bracts shorter than the pedicels and peduncles, broadly pelviform, clasping the stem. Corolla 0·7–1 mm, slightly cup-shaped, yellowish; tube 0·1–0·2 mm; lobes 0·6–0·8 mm, triangular, acute, glabrous. Style shorter than the ovary; stigma globose. Fruit *c.* 1·5 mm, glabrous, shining. *Mountain rocks.* ● *S. Greece* (*E. Peloponnisos*). Gr.

65. A. boryana (Walpers) Ehrend., *Bot. Jour. Linn. Soc.* **68**: 269 (1974) (*Galium boryanum* Walpers). Stems (4–)5–15(–20) cm, slender, forming dense cushions up to 30 cm in diameter, shortly and stiffly hairy; internodes as long as or slightly longer than the leaves. Leaves 2·8–5 × 1–2 mm, in whorls of (4–)6(–8), elliptical to broadly lanceolate, more or less obtuse, scabrid and shortly and stiffly hairy; vein scarcely prominent beneath; margin weakly revolute. Inflorescence leafy throughout, lax, few-flowered; pedicels 1–3 mm, erect; bracts leaf-like, much longer than the fruits, not connate. Corolla 1–2 mm, slightly cup-shaped, orange; tube 0·1–0·4 mm; lobes 1–1·6 mm, triangular, acute, with short, stiff hairs. Style shorter than the ovary; stigma globose. Fruit 1·5–1·8 mm, glabrous (very rarely with short, stiff hairs). *Rocks in the montane and subalpine zones.* ● *S. Greece* (*Peloponnisos*). Gr.

66. A. purpurea (L.) Ehrend., *Österr. Bot. Zeitschr.* **122**: 260 (1973) (*Galium purpureum* L.). Stems ascending to erect, weakly 4-angled below, with short, more or less curved hairs; internodes mostly distinctly longer than the leaves. Leaves narrowly lanceolate to filiform, scabrid on the margin. Pedicels (1–)2–4(–7) mm, slender, often recurved; bracts keeled, ciliate on the margin, shortly connate at the base. Corolla 0·8–1·6 mm, slightly cup-shaped to more or less rotate; tube 0·1–0·3 mm, glabrous; lobes 0·7–1·3 mm, ovate to triangular, more or less apiculate. Style usually shorter than ovary; stigma globose. Fruit *c.* 2 mm, glabrous. *Dry places.* ● *S. Europe, eastwards from S.E. France, and extending northwards to S. Austria and N.C. Romania.* Al Au Bu Ga Gr He It Ju Rm.

(a) Subsp. **purpurea**: Stems (15–)20–50(–60) cm, with curved hairs. Leaves 10–20 × 0·4–1 mm, in whorls of (6–)7–10(–11), narrowly linear to filiform, gradually acuminate; margin distinctly revolute. Inflorescence-branches patent and curved; bracts lanceolate, long-acuminate. Corolla usually purple, sometimes yellowish; lobes distinctly apiculate, almost always glabrous. $2n=22$. *Throughout the range of the species except S.W. part of Balkan peninsula.*

(b) Subsp. **apiculata** (Sibth. & Sm.) Ehrend., *Bot. Jour. Linn. Soc.* **68**: 269 (1974) (*Galium apiculatum* Sibth. & Sm.): Stems (5–)8–30(–35) cm, with more or less crispate hairs. Leaves 4–10 × 0·5–1·5 mm, in whorls of (4–)6–8(–9), narrowly lanceolate to linear, abruptly acuminate; margin scarcely revolute. Inflorescence-branches strict to patent; bracts ovate. Corolla usually yellowish-green, often more or less tinged with red; lobes weakly apiculate, hairy above. $2n=22$. *S.W. part of Balkan peninsula.*

5. Galium L.[1]

Like *Asperula* but stems sometimes terete, sometimes retrorsely aculeolate; ultimate branches of inflorescence often without bracts, always without bracteoles; pedicels often longer than ovary or fruit; flowers usually hermaphrodite, (3–)4-merous; corolla rarely infundibuliform, usually cup-shaped or rotate; ovary and fruit ovoid, sometimes with hooked hairs; fruit dry, rarely somewhat fleshy.

Descriptions of leaves refer both to the leaves and the leaf-like stipules with which they are associated. Measurements of internode-length refer to middle parts of the stem. Numbers of leaves (including stipules) per whorl refer to the best-developed whorls. Measurements of leaves refer to the longest cauline leaves. Pedicel-length varies much, and the values given are based on averages. Where fruits consist of ovoid mericarps, the longest diameters are given, but hooks, hairs etc. are not included.

[1] By F. Ehrendorfer; Sect. *Platygalium, Trachygalium, Galium, Lelogalium, Jubogalium* and *Kolgyda* in collaboration with F. Krendl; Sect. *Aparinoides* in collaboration with Ch. Puff.

1 Annual (Sect. *Kolgyda & Jubogalium* pro parte)
2 Leaf-margin retrorsely aculeolate; fruits more than 2 mm
3 Peduncles and pedicels convergent and deflexed after anthesis; fruit verrucose; leaves glabrous above **133. tricornutum**
3 Peduncles or pedicels divaricate after anthesis, straight (or bent only just beneath the fruit); fruit with hooked bristles or smooth; leaves papillose-hairy above
4 Corolla 0·8–1·3 mm in diameter, greenish-yellow; fruit (excluding setae) 2–3 mm, with hooked setae or more or less smooth **131. spurium**
4 Corolla 1·5–1·7 mm in diameter, white; fruit 3–5 mm, always densely setose **132. aparine**
2 Leaf-margin antrorsely aculeolate
5 Fruit more than 2·5 mm; partial inflorescences few-flowered; leaves more than 1·5 mm wide; corolla whitish to pink
6 Fruit with hooked setae; leaves hairy above; flowers hermaphrodite, pink **130. monachinii**
6 Fruit verrucose; leaves glabrous above; flowers andromonoecious, whitish **134. verrucosum**
5 Fruit less than 2 mm; leaves often less than 1·5 mm wide; corolla usually yellowish to greenish or reddish
7 Peduncles equalling or shorter than pedicels; partial inflorescences 1- to 3(–5)-flowered
8 Mericarps cylindrical, ±curved, usually irregularly covered with hooked setae especially towards the apex **145. murale**
8 Mericarps ovoid, regularly covered with setae, rarely glabrous
9 Flowers 1–2 in each leaf-whorl; leaves in whorls of 4 **142. minutulum**
9 Flowers more than 4 in each leaf-whorl; leaves in whorls of more than 4
10 Some partial inflorescences 2(–3)-flowered, pedunculate; pedicels 1–3 mm, usually longer than the flowers and fruits; fruiting pedicels deflexed **143. recurvum**
10 Partial inflorescences 1-flowered; peduncles scarcely distinguishable; pedicels up to 1 mm, usually shorter than the flowers and fruits; fruiting pedicels erect **144. verticillatum**
7 Peduncles mostly longer than pedicels; partial inflorescences many-flowered
11 Bracts ±exceeding the partial inflorescences, filiform to linear (Sect. *Jubogalium* pro parte) **129. setaceum**
11 Bracts shorter than the partial inflorescences, linear-lanceolate
12 Corolla-lobes long-apiculate (appendages 0·1–0·2 mm); partial inflorescences lax, the pedicels in flower and fruit about twice as long as the flowers and fruits **135. intricatum**
12 Corolla-lobes acute or shortly apiculate (appendages less than 0·1 mm)
13 Partial inflorescences lax, few-flowered; the 2 nodes below the central flower often with fewer than 11 flowers
14 Pedicels filiform, many times as long as flowers and fruits **141. tenuissimum**
14 Pedicels less than 3 times as long as flowers and fruits
15 Peduncles 1–3 times as long as pedicels; pedicels relatively stout, divaricate after anthesis **139. parisiense**
15 Peduncles 3–7 times as long as pedicels; pedicels filiform, somewhat deflexed after anthesis **140. divaricatum**
13 Partial inflorescences dense, many-flowered; the 2 nodes below the central flower often with more than 11 flowers; pedicels 1–1½ times as long as flowers and fruits
16 Plant greenish-yellow when dry; fruit granulate, glabrous **138. viscosum**
16 At least the young leaves and flowers blackish when dry; fruit hairy or glabrous
17 Pedicels slender; partial inflorescences capitate, very dense **136. capitatum**
17 Pedicels stout, rigid; partial inflorescences comparatively lax **137. incrassatum**
1 Perennial
18 Leaves with 3 parallel veins from the base, without hyaline apex; never in whorls of more than 4; sometimes shrubby switch-plants (Sect. *Platygalium*)
19 Shrubby switch-plants; leaves indistinctly 3-veined, narrow
20 Leaves 20–26 mm; longest internodes of the lateral branches 3–6 cm **8. fruticosum**
20 Leaves 5–10 mm; longest internodes of the lateral branches 1–3(–4) cm **9. ephedroides**
19 Herbs; leaves with 3 or more distinct veins
21 Ovary and fruit with hooked hairs, the hairs ±equalling the width of the mericarps; leaves subacute, not more than twice as long as wide
22 Stipules distinctly smaller than the true leaves; corolla shallowly infundibuliform **1. paradoxum**
22 Stipules and true leaves similar; corolla rotate
23 Stems *c.* 20 cm, usually glabrous; inflorescence corymbose **2. rotundifolium**
23 Stems 30–50 cm, almost always with dense, patent hairs; inflorescence ovoid, elongate **3. scabrum**
21 Ovary and fruit usually glabrous or with appressed hairs, rarely with hooked hairs which are shorter than the width of the mericarps; leaves obtuse, more than twice as long as wide
24 Ultimate branches of inflorescence monochasial **4. baillonii**
24 Ultimate branches of inflorescence ±dichasial
25 Corolla shallowly infundibuliform **5. broterianum**
25 Corolla rotate
26 Leaves 15–40 × 2–8 mm; fruit with appressed pericarp, often with hooked hairs **6. boreale**
26 Leaves 35–80 × 9–25 mm; fruit with ±inflated pericarp, almost always glabrous **7. rubioides**
18 Leaves with only 1 main vein from the base, sometimes with hyaline apex; usually at least some leaves in whorls of more than 4; never shrubby switch-plants
27 Ovary and fruit with hooked hairs (Sect. *Hylaea*)
28 Corolla infundibuliform, white; inflorescence corymbose **10. odoratum**
28 Corolla rotate, greenish to whitish; inflorescence elongate-pyramidal **11. trifiorum**
27 Ovary and fruit glabrous, or with hairs which are not hooked
29 Fruit globose; leaves ±obtuse, blackish when dry; stems usually ±retrorsely aculeolate (Sect. *Aparinoides*)
30 Flowers 3-merous; partial inflorescences 1- to 3-flowered; leaves in whorls of 4 **18. trifidum**
30 Flowers predominantly 4-merous; partial inflorescences many-flowered; leaves in whorls of up to 6
31 Pedicels not divaricate in fruit; leaves linear to linear-lanceolate **15. debile**
31 Pedicels divaricate in fruit; leaves narrowly to broadly oblanceolate
32 Leaves not more than 20 mm; stems slender **16. palustre**
32 Leaves usually 20–35 mm; stems stout **17. elongatum**
29 Fruit ovoid; leaves often acute or sometimes with a hyaline apex
33 Ovary and fruit ±hairy
34 Pedicels filiform, usually reddish (Sect. *Jubogalium* pro parte)
35 Leaves linear; pedicels up to 2 mm; corolla *c.* 1·5 mm in diameter **127. graecum**
35 Leaves ovate; pedicels up to 4 mm; corolla 1·8–2·5 mm in diameter **128. canum**
34 Pedicels not filiform, usually green
36 Flowers sessile (Sect. *Galium* pro parte)
37 Corolla 4–6·5 mm long, deeply infundibuliform **20. boissieranum**
37 Corolla 1·5–3 mm long, shallowly infundibuliform

38 Leaves densely puberulent beneath; corolla-lobes at least 1·5 mm **21. baeticum**
38 Leaves glabrous or papillose beneath; corolla-lobes less than 1·3 mm **22. concatenatum**
36 Flowers pedicellate
39 Stems at least partially retrorsely aculeolate (Sect. *Trachygalium* pro parte)
40 Corolla rotate, greenish-yellow **14. viridiflorum**
40 Corolla ± infundibuliform, white **12. rivale**
39 Stems never retrorsely aculeolate
41 Internodes of inflorescence much longer than the leaves; partial inflorescences usually many-flowered (Sect. *Galium* pro parte)
42 Corolla usually reddish; both leaf-surfaces ± equally hairy **24. maritimum**
42 Corolla yellow, rarely whitish; lower leaf-surface much more densely hairy than upper **(25–27). verum** group
41 Internodes of inflorescence slightly longer or shorter than the leaves; partial inflorescences few-flowered
43 Leaves linear to linear-lanceolate, the margin recurved **30. degenii**
43 Leaves broadly lanceolate, the margin flat (Sect. *Leptogalium*) **125. stojanovii**
33 Ovary and fruit glabrous, smooth or papillose
44 Stems at least partially retrorsely aculeolate or with patent papillae
45 Corolla infundibuliform to cup-shaped; leaves shining above (Sect. *Trachygalium* pro parte)
46 Corolla-tube as long as or longer than the lobes; leaves mostly 30–40 × 4–8 mm **12. rivale**
46 Corolla-tube not more than half as long as the lobes; leaves mostly 10–20 × 2–3 mm **13. uliginosum**
45 Corolla rotate; leaves dull above
47 Leaves in whorls of 4–6; stems with patent papillae up to the ultimate inflorescence-branches (Sect. *Galium*) **19. saturejifolium**
47 Leaves usually in whorls of more than 6, ± retrorsely aculeolate on the main part of the stem, but not up to the ultimate inflorescence-branches (Sect. *Leptogalium* pro parte)
48 Corolla-lobes apiculate; flowers usually red, purple or yellow
49 Leaves mostly 6 in a whorl, usually 5–7 times as long as wide **86. corsicum**
49 Leaves mostly 7–8 in a whorl, often 7–10 times as long as wide
50 Flowers usually less than 2 mm in diameter, usually yellow or dark-purple; awn of corolla-lobe (⅓–)½–⅔ as long as lobe
51 Inflorescence broadly ovoid to pyramidal, with long lateral branches; flowers often yellow; pedicels often less than 1·5 mm **87. obliquum**
51 Inflorescence ovoid-oblong, with short lateral branches; flowers dark purple; pedicels often more than 1·5 mm **88. rubrum**
50 Flowers *c.* 2 mm or more in diameter, bright purple, pink or whitish; awn of corolla-lobe 1/10–½ as long as lobe
52 Plants more than 20 cm; inflorescence ovoid; leaves narrowly oblanceolate **89. × centroniae**
52 Plants less than 20 cm; inflorescence corymbose; leaves broadly oblanceolate **90. × carmineum**
48 Corolla-lobes acute, not apiculate; flowers often white
53 Corolla purple, pinkish or yellow; leaves mostly in whorls of up to 6, scarcely more than 6 times as long as wide
54 Corolla purple; fruit dull **91. balearicum**
54 Corolla yellow, partly suffused with red; fruit shining **92. valentinum**
53 Corolla white, rarely lightly suffused with yellow or red; leaves often in whorls of more than 6, usually more than 6 times as long as wide
55 Leaves in whorls of (7–)8–9(–10); pedicels mostly less than 1·2 mm **97. papillosum**
55 Leaves in whorls of (5–)6(–8); pedicels mostly more than 1·2 mm
56 Inflorescence broadly ovoid; stems often with patent hairs **95. rivulare**
56 Inflorescence broadly pyramidal; stems never with patent hairs
57 Plant not blackening on drying; stems less than 1 mm in diameter, slender **94. helodes**
57 Plant blackening on drying; stems more than 1 mm in diameter, stout **96. asturiocantabricum**
44 Stems not retrorsely aculeolate nor with patent papillae
58 Corolla ± infundibuliform to cup-shaped, the lobes scarcely apiculate
59 Plants ± caespitose, never glaucous-pruinose; stems usually less than 15 cm (Sect. *Orientigalium*)
60 Leaves 1–3 mm wide, obtuse or with a short apiculus *c.* 0·5 mm
61 Leaves on vegetative shoots shorter than those on flowering shoots, crowded, imbricate, with a short apiculum **82. incanum**
61 Leaves on vegetative and flowering shoots similar, without an apiculum
62 Leaves linear-lanceolate, acute; inflorescence ovoid, many-flowered **80. saxosum**
62 Leaves oblanceolate, obtuse; inflorescence with few, axillary flowers **81. cometerhizon**
60 Leaves 0·5–1 mm wide, with a long hyaline apex *c.* 1 mm
63 Corolla 1·2–1·8 mm long; leaves narrowly lanceolate, ciliate **83. cyllenium**
63 Corolla 1·9–2·2 mm long; leaves linear, usually not ciliate
64 Midrib prominent beneath; flowers ± sessile **84. palaeoitalicum**
64 Midrib indistinct beneath; pedicels 0·5–5 mm **85. pyrenaicum**
59 Plants scarcely caespitose, sometimes glaucous-pruinose; stems usually more than 30 cm
65 Partial inflorescences oblong, leafy up to the ultimate branches, divaricate after anthesis; leaves fresh green on both surfaces, ± hairy (Sect. *Galium*) **23. humifusum**
65 Partial inflorescences corymbiform, bracteate and not leafy, and usually ebracteate on the ultimate branches, not divaricate after anthesis; leaves usually ± glaucous
66 Upper surface of leaf usually fresh to dark green, the lower surface paler and often ± bluish green or glaucous-pruinose; leaves often more than 25 mm; pedicels ± capillary (Sect. *Leiogalium* Ser. *Nemoralia*)
67 Stems not rooting at the base; plants without stolons
68 Corolla subrotate, the lobes shortly apiculate
69 Leaves linear, 0·5–3 mm wide **68. kitaibelianum**
69 Leaves linear-lanceolate, 3–5 mm wide **70. aristatum**
68 Corolla ± cup-shaped, the lobes acute
70 Leaves pale green beneath; stems 4-angled below, often hairy **69. pseudaristatum**
70 Leaves bluish-green beneath, often pruinose; stems terete (or obscurely 4-angled) below, glabrous
71 Leaves membranous, elliptic-lanceolate, the margin with slender teeth **77. sylvaticum**
71 Leaves coriaceous, linear-lanceolate, the margin with more robust teeth
72 Young shoots and ovaries pruinose **78. longifolium**
72 Young shoots and ovaries green **79. bulgaricum**
67 Stems rooting at the base; plants with (sometimes short) stolons; corolla-lobes often apiculate

73 Plant not pruinose
74 Stems 4-angled below; corolla rotate
75 Corolla usually 3–4 mm in diameter **71. abaujense**
75 Corolla usually 4–5 mm in diameter **72. polonicum**
74 Stems ± terete below
76 Corolla distinctly cup-shaped, the lobes acute; stem usually hairy **73. laconicum**
76 Corolla rotate to slightly cup-shaped, the lobes ± apiculate; stem glabrous **75. laevigatum**
73 Plant pruinose at least on young shoots and ovaries
77 Corolla often more than 4 mm in diameter, rotate; leaves broadly oblanceolate to elliptical, usually black when dry **76. schultesii**
77 Corolla usually less than 3·5 mm in diameter; leaves linear-lanceolate, usually greenish when dry
78 Corolla distinctly cup-shaped, usually less than 2·6 mm in diameter **74. procurrens**
78 Corolla rotate to slightly cup-shaped, usually more than 2·5 mm in diameter **75. laevigatum**
66 Upper and lower surfaces of leaf concolorous, glaucous-pruinose throughout; leaves often less than 25 mm; pedicels never capillary (Sect. *Leiogalium* Ser. *Octonaria*)
79 Leaves elliptical to oblanceolate, 2–6 mm wide; stolons absent
80 Leaves ± elliptical, coriaceous **59. pruinosum**
80 Leaves ± oblanceolate, membranous **60. glaucophyllum**
79 Leaves linear-lanceolate to filiform, 0·3–2 mm wide; stolons often present
81 Flowers in dense clusters; inflorescence interrupted **61. murcicum**
81 Flowers not distinctly clustered; inflorescence scarcely interrupted
82 Partial inflorescences pyramidal; plants strongly stoloniferous, with remote stems
83 Stem hairy at base, glabrescent above; corolla 3–4 mm in diameter **66. volhynicum**
83 Stem glabrous at base, pubescent above; corolla *c.* 2 mm in diameter **67. moldavicum**
82 Partial inflorescences corymbiform; plants with or without stolons
84 Marginal teeth of leaves in 1–2 rows **63. glaucum**
84 Marginal teeth of leaves in many rows
85 Without rooting stolons; leaves usually more than 20 mm **62. octonarium**
85 With rooting stolons; leaves usually less than 20 mm
86 Stems glabrous **64. biebersteinii**
86 Stems hairy, especially below **65. xeroticum**
58 Corolla ± rotate, the lobes sometimes apiculate
87 Lower surface of leaf distinctly paler green than the upper and often bluish; leaves often more than 25 mm; partial inflorescences corymbiform; pedicels ± capillary (Sect. *Leiogalium* Ser. *Nemoralia*)
88 Stems not rooting at the base; plants without stolons
89 Corolla subrotate, the lobes shortly apiculate
90 Leaves linear, 0·5–3 mm wide **68. kitaibelianum**
90 Leaves linear-lanceolate, 3–5 mm wide **70. aristatum**
89 Corolla ± cup-shaped, the lobes acute
91 Leaves pale green beneath; stems 4-angled below, often hairy **69. pseudaristatum**
91 Leaves bluish-green beneath, often pruinose; stems terete (or obscurely 4-angled) below, glabrous
92 Leaves membranous, lanceolate-elliptical, the margins with slender teeth **77. sylvaticum**
92 Leaves coriaceous, linear-lanceolate, the margins with more robust teeth
93 Young shoots and ovaries pruinose **78. longifolium**
93 Young shoots and ovaries green **79. bulgaricum**
88 Stems rooting at the base; plants with (sometimes short) stolons; corolla-lobes often apiculate
94 Plant not pruinose
95 Stems 4-angled below; corolla rotate
96 Corolla usually 3–4 mm in diameter **71. abaujense**
96 Corolla usually 4–5 mm in diameter **72. polonicum**
95 Stems ± terete below
97 Corolla distinctly cup-shaped, the lobes acute; stem usually hairy **73. laconicum**
97 Corolla rotate to slightly cup-shaped, the lobes ± apiculate; stem glabrous **75. laevigatum**
94 Plant pruinose at least on young shoots and ovaries
98 Corolla often more than 4 mm in diameter, rotate; leaves broadly oblanceolate to elliptic, usually black when dry **76. schultesii**
98 Corolla usually less than 3·5 mm in diameter; leaves linear-lanceolate, usually greenish when dry
99 Corolla distinctly cup-shaped, usually less than 2·6 mm in diameter **74. procurrens**
99 Corolla rotate to slightly cup-shaped, usually more than 2·5 mm in diameter **75. laevigatum**
87 Lower and upper surface of leaf concolorous; leaves often less than 25 mm; pedicels not truly capillary
100 Stock or rhizome stout, ± woody, sometimes with stout stolons; stems often more than 30 cm, usually ± robust and erect; partial inflorescences oblong to pyramidal
101 Partial inflorescences not very dense, the ultimate branches usually ebracteate and glabrous, not or slightly divaricate after anthesis; corolla usually whitish and with apiculate lobes (Sect. *Leiogalium* Ser. *Erecta*)
102 Leaves lanceolate to linear or acicular, the longest more than 7 times as long as wide
103 Corolla slightly cup-shaped, with incurved apiculate lobes; anthers black when dry **(51–58). incurvum** group
103 Corolla rotate, with patent lobes; anthers brownish when dry
104 Longest leaves more than 3 mm wide, often somewhat falcate **50. crespianum**
104 Longest leaves less than 3 mm wide, usually straight **(41–49). lucidum** group
102 Leaves elliptical to oblanceolate, the longest not more than 7 times as long as wide
105 Plant glaucous **40. reiseri**
105 Plant green
106 Corolla 1–1·5 mm in diameter, yellow **35. firmum**
106 Corolla 2–5 mm in diameter, white to yellowish
107 Corolla somewhat hairy outside; fruit ± fleshy, blackish **33. litorale**
107 Corolla glabrous; fruit brownish
108 Leaves fleshy, scarcely longer than the middle internodes of the stem; corolla yellow, the lobes acute **34. arenarium**
108 Leaves not fleshy, longer than the middle internodes; corolla white to yellowish, the lobes apiculate **(36–39). mollugo** group
101 Partial inflorescences dense, bracteate and often hairy up to the ultimate branches, divaricate especially after anthesis; corolla usually yellow and often with acute lobes (Sect. *Galium* pro parte)
109 Internodes of inflorescence about as long as the leaves; partial inflorescences few-flowered
110 Plant hairy **31. erythrorrhizon**
110 Plant glabrous **32. pulvinatum**
109 Internodes of inflorescence much longer than the leaves; partial inflorescences usually many-flowered

111 Leaves more than 10 mm; inflorescence ovoid **(25–27). verum** group
111 Leaves less than 10 mm; inflorescence narrowly cylindrical
112 Leaves glabrous beneath; margin slightly recurved **28. thymifolium**
112 Leaves densely hairy beneath; margin recurved to the midrib **29. kerneri**
100 Stock or rhizome slender, scarcely woody, often with filiform stolons; stems often less than 30 cm, weak, ascending; partial inflorescences corymbiform, with ultimate branches usually ebracteate and not (or only slightly) divaricate after anthesis, or reduced and few-flowered (Sect. *Leptogalium*)
113 Leaves glabrous, smooth, shining, blackish-brown when dry; midrib not distinct, often without hyaline apex; low, caespitose alpine plants
114 Leaves linear, with a long hyaline apex **126. cespitosum**
114 Leaves ± oblanceolate, with a short, cartilaginous apex
115 Inflorescences small but many-flowered, bracteate; corolla yellowish-white **(119–123). baldense** group
115 Inflorescences few-flowered, leafy; corolla greenish or yellowish-brown **124. demissum**
113 Leaves usually ± hairy, or at least the margin scabrid with papilliform teeth or cilia, greenish or brownish when dry, with distinct mid-vein and hyaline apex
116 Corolla-lobes apiculate; flowers usually red or yellow
117 Leaves mostly 6 in a whorl, usually 5–7 times as long as wide; stems retrorsely aculeolate **86. corsicum**
117 Leaves mostly 7–8 in a whorl, often 7–10 times as long as wide; stems glabrous or occasionally hairy
118 Corolla usually less than 2 mm in diameter, usually yellow or dark purple; awn of corolla-lobe (⅓)–½–¾ as long as lobe
119 Inflorescence broadly ovoid to pyramidal, with long branches; flowers often yellow; pedicels commonly less than 1·5 mm **87. obliquum**
119 Inflorescence ovoid-oblong, with short branches; flowers dark purple; pedicels commonly more than 1·5 mm **88. rubrum**
118 Corolla *c.* 2 mm or more in diameter, bright purple, pink or whitish; awn of corolla-lobe ~~⅛–½~~ as long as lobe
120 Plants more than 20 cm; inflorescence ovoid; leaves narrowly oblanceolate **89. × centroniae**
120 Plants less than 20 cm; inflorescence corymbose; leaves broadly oblanceolate **90. × carmineum**
116 Corolla-lobes acute, not apiculate; flowers often white
121 Leaf-margin antrorsely ciliolate; leaves thin, blackish when dry; stem glabrous, smooth; ~~fruit acutely papillose~~ **118. saxatile**
121 Plants not with the above combination of characters
122 Corolla purple, or pinkish; leaves mostly in whorls of up to 6, scarcely more than 6 times as long as wide
123 Pedicels less than 0·5 mm; partial inflorescences dense; corolla pinkish **93. rosellum**
123 Pedicels more than 0·5 mm; partial inflorescences lax; corolla bright purple **91. balearicum**
122 Corolla white, rarely lightly suffused with yellow or red; leaves often in whorls of more than 6, usually more than 6 times as long as wide
124 Hyaline apex of leaf usually more than 0·5 mm, about equalling width of leaf; leaves coriaceous, often shining, linear-lanceolate, often more than 10 times as long as wide
125 Leaves linear-lanceolate, hairy, usually 7–8 times as long as wide, the margin ± revolute **116. brockmannii**
125 Leaves linear to acicular, more than 10 times as long as wide, the margin flat
126 Mid-vein occupying ~~⅓–½~~ width of leaf, strongly thickened **115. pusillum**
126 Mid-vein occupying *c.* ¼ width of leaf, not strongly thickened **117. idubedae**
124 Hyaline apex of leaf usually less than 0·5 mm, shorter than width of leaf; leaves often less than 10 times as long as wide
127 Pedicels deflexed in fruit **114. megalospermum**
127 Pedicels straight in fruit, patent
128 Fruit ± acutely papillose
129 Pedicels mostly more than 1 mm; plant darkening on drying
130 Inflorescence ± corymbose; partial inflorescences lax; basal leaves soon deciduous
131 Leaf-margin smooth **108. sudeticum**
131 Leaf-margin usually ± scabrid, ciliate or hairy **112. anisophyllon**
130 Inflorescence ± pyramidal; partial inflorescences somewhat crowded; basal leaves persistent
132 Middle internodes 2–3½ times as long as leaves; leaves mostly 6½–8½ times as long as wide **109. sterneri**
132 Middle internodes 1½–2½ times as long as leaves; leaves mostly 5–7 times as long as wide **110. normanii**
129 Pedicels mostly less than 1 mm; plant remaining green on drying
133 Stem often more than 15 cm, somewhat stout, more than 0·7 mm in diameter **104. valdepilosum**
133 Stem scarcely more than 20 cm, very slender, less than 0·6 mm in diameter
134 Middle internodes 4–6 cm **105. suecicum**
134 Middle internodes less than 4 cm
135 Leaves *c.* 9 in a whorl **106. oelandicum**
135 Leaves 6–7 in a whorl **107. cracoviense**
128 Fruit ± smooth or obtusely papillose
136 Distal part of the leaf-margin with only patent or retrorsely directed papilliform teeth or cilia
137 Inflorescence elongate-ovoid-pyramidal, mostly more than twice as long as wide
138 Laxly caespitose, with few stems; pedicels more than 1 mm **103. pumilum**
138 Rather densely caespitose, with many stems; pedicels often not more than ~~1 mm~~
139 Leaves usually 11–18 mm **104. valdepilosum**
139 Leaves usually 6–10 mm **102. fleurotii**
137 Inflorescence broadly ovoid to corymbose, mostly less than twice as long as wide
140 Stems reddish at base; leaves often linear-lanceolate and more than 12 times as long as wide
141 Pedicels not more than 1·1 mm; partial inflorescences rather dense **104. valdepilosum**
141 Pedicels more than 1 mm; partial inflorescences lax **111. austriacum**
140 Stems scarcely reddish at base; leaves usually oblanceolate and less than 12 times as long as wide
142 Leaf-margin smooth **108. sudeticum**
142 Leaf-margin mostly ± scabrid, ciliate or hairy **112. anisophyllon**
136 At least the distal part of the leaf-margin or the upper surface with antrorsely directed papilliform teeth or cilia
143 Leaves ± fleshy, ciliolate only at the non-revolute margin; fruit mostly more than 1·5 mm **113. pseudohelveticum**
143 Leaves thin to ± coriaceous, the margin ± revolute, the upper surface often papillose or hairy; fruit mostly less than 1·5 mm
144 Flowers less than 2 mm in diameter
145 Leaves linear, mostly less than 1 mm wide **101. timeroyi**
145 Leaves narrowly oblanceolate, mostly more than 1·2 mm wide **97. papillosum**
144 Flowers more than 2 mm in diameter; leaves oblanceolate to linear-lanceolate, often more than 1 mm wide
146 Pedicels mostly less than 1 mm; stem occasionally reddish at base; middle internodes often more than twice as long as the leaves
147 Leaves usually 1·2–2 mm wide **97. papillosum**
147 Leaves usually 0·9–1·2 mm wide **98. pinetorum**
146 Pedicels mostly more than 1 mm; stem not reddish at base; leaves often more than 1·1 mm wide
148 Middle internodes usually more than twice as long as the leaves
149 Plant green to brownish when dry; inflorescence broadly ovoid **95. rivulare**
149 Plant blackish when dry; inflorescence broadly pyramidal **96. asturiocantabricum**
148 Middle internodes usually less than twice as long as the leaves
150 Fruit *c.* 1·5 mm; leaves rather thick **99. marchandii**
150 Fruit *c.* 1·1 mm; leaves thin, membranous **100. nevadense**

Sect. PLATYGALIUM Koch. Perennial dwarf shrubs or herbs, with a taproot, or with a rhizome and stolons. Stems with patent hairs or glabrous and smooth, mostly 4-angled. Leaves in whorls of 4 (with the stipules sometimes clearly smaller), usually with 3 parallel veins, rather obtuse. Inflorescence many-flowered, pyramidal to corymbose; ultimate branches ebracteate. Corolla usually rotate, sometimes infundibuliform, white to yellowish; lobes acute. Fruit dry, often with hooked or curved hairs, or ~~lobes acute. Fruit dry, often with hooked or curved hairs, or~~ glabrous.

1. G. paradoxum Maxim., *Bull. Acad. Imp. Sci. Pétersb.* **19**: 281 (1874) (*G. syreitschikowii* Lipsch.). Stock with slender, rooting stolons. Stems (4–)10–20(–25) cm, slender, somewhat hairy. Leaves 10–25(–40) × 10–15(–20) mm, suborbicular to ovate, subacute, widest near the middle, narrowed into a distinct petiole, distinctly pinnately veined, delicate, membranous, with slender hairs particularly along margin. Stipules less than half as long as the leaves, the lower scale-like, the upper leaf-like. Inflorescence corymbose, 3- to few-flowered; bracts few. Corolla 2·5–3 mm in diameter, shallowly infundibuliform. Fruit *c.* 2 mm, with patent, hooked hairs. *Open coniferous woods. S. Ural (about half-way between Ufa and Zlatoust).* Rs (C). (*C. & E. Asia.*)

2. G. rotundifolium L., *Sp. Pl.* 108 (1753) (*G. scabrum* auct., non L.). Stolons slender, creeping, mostly rooting. Stems up to 20(–35) cm, slender, glabrous, or rarely with short, scattered hairs. Leaves 14–18 × 6–10(–12) mm, ovate to suborbicular, subacute, shortly petiolate, delicate, more or less glabrescent. Inflorescence corymbose, rather few-flowered; bracts few; pedicels (2–)5–15 mm. Corolla 3–3·5(–4) mm in diameter, rotate. Fruit *c.* 2 mm, with patent, hooked hairs. $2n=22$. *Woods. W., C. & S. Europe, extending northwards to Gotland and Latvia.* Al Au Bu Co Cr Cz Ga Ge Gr He Hs Hu It Ju Lu Po Rm Rs (B, W) Sa Si Su Tu [Da Ho No].

3. G. scabrum L., *Sp. Pl.* 108 (1753) (*G. ellipticum* Willd. ex Hornem.). Stock without or with scarcely rooting stolons. Stem 30–50 cm, stout, almost always with dense, patent hairs. Leaves 20–35 × 10–16 mm, broadly ovate, subacute, sessile. Inflorescence long, ovoid, many-flowered; bracts numerous; pedicels (2–)4–8(–9) mm. Corolla 2·5–3·5(–4) mm in diameter, rotate. Fruit *c.* 2 mm, with patent, hooked hairs. $2n=22$. *Mediterranean woods. S. Europe.* Co Hs It Sa Si.

4. G. baillonii Brandza, *Anal. Acad. Române* ser. 2, **2(2)**: 538 (1881). Stolons stout, rooting. Stems 15–30 cm, ascending, slender, usually glabrous, 4-angled. Leaves (13–)15–40(–45) × 5–16 mm, rhombic-lanceolate, usually widest in the lower half or in the middle, with a long, obtuse apex, hairy especially on the margins and the veins. Inflorescence broadly corymbose, few-flowered; partial inflorescences with monochasial ultimate branches; flowers subsessile. Corolla 2–3 mm in diameter. Fruit *c.* 2 mm; pericarp scarcely inflated, glabrous. $2n=22$. *Rocky woods.* ● *Foothills of the S. Carpathians.* Rm.

5. G. broterianum Boiss. & Reuter, *Diagn. Pl. Nov. Hisp.* 15 (1842). Stolons rooting. Stems 35–70 cm, more or less ascending, lax, 4-angled, glabrous or with long, scattered hairs especially below. Leaves (10–)18–30 × (3–)8–11(–15) mm, narrowly to broadly elliptical, obtuse, thin, with distinct veins, hairy, especially on the margin and the veins. Inflorescence pyramidal, interrupted, dense-flowered; partial inflorescences corymbose, with dichasial ultimate branches; pedicels (1–)2–3 mm. Corolla 3–3·5 mm in diameter, shallowly infundibuliform. Fruit *c.* 1·2 mm, finely papillose, otherwise glabrous. $2n=22$. *Damp or shady places in the mountains.* ● *C. Spain, Portugal.* Hs Lu.

6. G. boreale L., *Sp. Pl.* 108 (1753). Stolons rooting. Stems 30–65 cm, erect, stout, 4-angled, usually glabrous, rarely shortly hairy. Leaves 15–40 × (2–)3–5(–8) mm, elongate-lanceolate, widest at or below the middle, obtuse, somewhat coriaceous, usually glabrous (or somewhat rough or shortly hairy), with indistinct veins. Inflorescence oblong-pyramidal, dense-flowered; pedicels (1–)2–3 mm. Corolla 3–4 mm in diameter, rotate. Fruit ~~1·5–2 mm, with short, appressed (rarely patent) hooked hairs, or~~ 1·5–2 mm, with short, appressed (rarely patent) hooked hairs, or glabrous; pericarp more or less appressed. $2n=44$, (55), 66. *Grassy places. Most of Europe, but rare in the Mediterranean region.* Al Au Be Br Bu Cz Da Fe Ga Ge Hb He Ho Hs Hu Is It Ju Lu No Po Rm Rs (N, B, C, W, E) Su.

The tetraploids and hexaploids have widely overlapping distributions, and are morphologically indistinguishable.

7. G. rubioides L., *Sp. Pl.* 105 (1753). Stolons rooting. Stems 45–130 cm, erect, stout, weakly 4-angled below, distinctly 4-angled above, glabrous or hairy. Leaves 35–80 × 9–25 mm,

elliptical to ovate-oblong, usually widest below the middle, obtuse, usually coriaceous, glabrous or more or less hairy; veins conspicuous, especially beneath. Inflorescence broadly ovoid, many-flowered; pedicels (2–)3–5 mm. Corolla (3·5–)4·5(–6) mm in diameter, rotate. Fruit *c.* 3 mm, almost always glabrous, more or less inflated when ripe, withl oosening pericarp. $2n=66$. *Wet meadows and scrub. E. Europe, southwards to C. Bulgaria, and extending westwards to C. Austria.* Au Bu Cz Hu Ju ?Po Rs (N, B, C, W, K, E) [He].

6 and **7** are parts of a widespread polyploid complex, and there are many intermediates between them in E. Europe; in the U.S.S.R. many microspecies have been described on the basis of variation in the form of the leaf and in the indumentum of leaf and stem. In the European part of the U.S.S.R., the following may be mentioned: **G. articulatum** Lam., *Tabl. Encycl. Méth. Bot.* **1**: 260 (1792) (*G. geniculatum* Roemer & Schultes), **G. volgense** Pobed. in Schischkin, *Fl. URSS* **23**: 715 (1958), **G. mugodsharicum** Pobed., *op. cit.* 717 (1958), **G. exoletum** Klokov in Kotov, *Fl. RSS Ucr.* **10**: 458 (1961), **G. praeboreale** Klokov, *op. cit.* 459 (1961) and **G. pseudoboreale** Klokov, *op. cit.* 460 (1961), related to **6**; **G. pseudorubioides** Klokov, *op. cit.* 460 (1961), intermediate; **G. dasypodum** Klokov, *op. cit.* 461 (1961) and **G. salicifolium** Klokov, *op. cit.* 462 (1961), related to **7**. The status of these taxa as species remains uncertain without detailed cytotaxonomic analysis.

8. G. fruticosum Willd., *Sp. Pl.* **1**: 585 (1798). Switch-plant, woody at the base, with a strong tap-root but no stolons. Stems 35–90 cm, ascending, stiff, glabrous, 4-angled, much-branched at the base, forming a bush; internodes of the lateral branches 3–6 cm. Leaves 20–26 × (2–)4–5 mm, cuneate-oblong, widest above the middle, abruptly rounded at the apex, tough and more or less persistent, the 3 veins not distinct. Inflorescence broadly ovoid, interrupted, lax; pedicels 0·5–1(–2) mm, stout. Corolla 2·5–3 mm in diameter, whitish-yellow, rotate; apices of the lobes usually straight. Fruit *c.* 1·2 mm. $2n=22$. *Limestone cliffs.* ● *Kriti.* Cr.

9. G. ephedroides Willk., *Linnaea* **25**: 30 (1852). Like **8** but stems 35–50 cm; internodes of lateral branches mostly 1–3(–4) cm; leaves 5–10 × 2–3 mm, oblong-elliptical, very soon deciduous; apices of the corolla-lobes usually incurved; fruit *c.* 1·5 mm, very finely papillose. *Dry rock-crevices. S.E. Spain (Almería prov.).* Hs. (*N.W. Africa.*)

Sect. HYLAEA (Griseb.) Ehrend. Perennial herbs with slender rhizomes and subterranean stolons, often smelling of coumarin when dry. Stems smooth or hairy, sometimes aculeolate. Leaves in whorls of 6–9, membranous, with 1 main vein, the margins antrorsely or retrorsely scabrid, apex scarcely hyaline. Inflorescence elongate-pyramidal to corymbose, lax, few-flowered; ultimate branches bracteate or ebracteate. Corolla infundibuliform to rotate, greenish to white; lobes obtuse to apiculate. Fruit dry, ovoid, with hooked hairs.

10. G. odoratum (L.) Scop., *Fl. Carn.* ed. 2, **1**: 105 (1771) (*Asperula odorata* L.). Rhizome creeping. Stems (10–)15–25(–35) cm, erect, 4-angled, glabrous except for a ring of hairs at the nodes. Leaves 20–50 × 5–14 mm, (2–)3–5(–7) times as long as wide, widest at the middle or in the upper third. Partial inflorescences usually 3, terminal, with long peduncles. Pedicels 1–3 mm in flower, 3–10 mm in fruit; bracts reduced, the terminal branches usually ebracteate. Corolla infundibuliform, 4–7 mm in diameter; tube *c.* 1·5 mm; lobes 2–3·5 mm, not apiculate. Fruit 2–3 mm, with hooked hairs 0·5–1 mm. $2n=44$. *Base-rich, deciduous woods. Most of Europe, but rare in the Mediterranean region.* All except Az Bl Cr Fa Is Lu Sa Sb.

Asperula eugeniae K. Richter, *Verh. Zool.-Bot. Ges. Wien* **38**: 219 (1888) is a name given to odourless plants.

11. G. triflorum Michx, *Fl. Bor. Amer.* **1**: 80 (1803). Stems 30–80 cm, few, arising from a slender rhizome, decumbent to ascending, glabrous or with a few hairs, not hairy at the nodes. Leaves (12–)18–30(–45) × (4–)6–10(–14) mm, (2·5–)3–3·5(–4·5) times as long as wide, widest usually at or above the middle. Inflorescence narrowly pyramidal; partial inflorescences terminal and lateral, with long peduncles. Pedicels 1·5–10 mm in flower, up to 25 mm in fruit; bracts usually present throughout. Corolla 1·5–3·5 mm in diameter, greenish to whitish; lobes apiculate. Fruit 1·5–2 mm, with hooked hairs *c.* 0·5 mm. *Coniferous woods. Fennoscandia and N. half of U.S.S.R.; two stations in C. Alps.* Fe He No Rs (N, B, C) Su.

Sect. TRACHYGALIUM K. Schum. Perennial herbs with slender rooting rhizomes and subterranean stolons. Stem 4-angled, retrorsely aculeolate and rough on the angles. Leaves in whorls of 6–10, shortly awned, thinly coriaceous, shiny above, 1-veined, the margins antrorsely and retrorsely scabrid. Inflorescence ovoid or cylindrical, lax, the ultimate branches usually ebracteate. Corolla infundibuliform or cup-shaped, rarely rotate, white, reddish or greenish-yellow; lobes acute to shortly apiculate, usually papillose. Fruit mostly granulate and glabrous or hairy.

12. G. rivale (Sibth. & Sm.) Griseb., *Spicil. Fl. Rumel.* **2**: 156 (1844) (*Asperula rivalis* Sibth. & Sm., *A. aparine* Bieb.). Stem (70–)90–120 cm, ascending from a slender base, stout. Leaves (20–)30–40(–45) × 4–8(–10) mm, ovate to oblanceolate, abruptly or gradually narrowing to the awned apex, rather rough above. Inflorescence rather broadly ovoid; pedicels 0·5–3 mm, glabrous, rarely pubescent. Corolla 1·8–3 mm, infundibuliform, rarely crateriform; tube 0·9–1·5 mm; lobes 0·8–2 mm, broadly to narrowly ovate. Filaments 0·2–0·6 mm; anthers 0·3–0·5 mm, suborbicular to oblong. Fruit 1–1·2 mm, granulate, glabrous, rarely somewhat pubescent. $2n=66$. *Damp scrub and river-banks. S.E. & E.C. Europe, extending northwards to Estonia.* Au Bu ?Cr Cz Gr Hu Ju Po Rm Rs (B, C, W, K, E) Tu.

G. rivale forms a very variable polyploid complex. In the western and northern parts of its range the populations consist mainly of plants with relatively narrow leaves, long filaments and short anthers, while in the southern and eastern, the plants usually have wide leaves, short filaments and long anthers. In the Balkan peninsula especially, transitional populations with intermediate characteristics occur. Any question of distinguishing two species in E. Europe (cf. *Asperula rivalis* and *A. aparine* in *Fl. URSS* **23**: 274–275 (1958)) must be considered in the light of further investigation of populations in Asia.

13. G. uliginosum L., *Sp. Pl.* 106 (1753). Stem 10–100 cm, slender. Leaves (8–)10–20(–25) × 2–3(–4·5) mm, narrowly, rarely broadly lanceolate, gradually narrowed to the awned apex, smooth above. Inflorescence ovoid-oblong. Corolla 1·3–2 mm, broadly crateriform; tube 0·3–0·5 mm; lobes 1–1·5 mm, broadly ovate. Filaments 0·5–0·6 mm; anthers 0·2–0·3 mm, ovoid. Fruit 1–1·5 mm, granulate, glabrous. $2n=22$, 44. *Marshes, fens and other wet habitats. Most of Europe, but absent from most of the extreme north, south-east and many of the islands.* Au Be Br Bu Cz Da Fe Ga Ge Hb He Ho Hs Hu Is It Ju No Po Rm Rs (N, B, C, W) Su.

14. G. viridiflorum Boiss. & Reuter, *Pugillus* 51 (1852). Stem 40–80 cm, fairly stout. Leaves 13–30 × 4–6(–8) mm, broadly lanceolate to oblanceolate, mostly abruptly narrowed to the awned apex, rough above, with rather dense, patent long hairs beneath. Inflorescence long, cylindrical; partial inflorescences dense; pedicels 1–3 mm, slender. Corolla 2·5–3 mm in diameter, rotate, greenish-yellow; lobes 1–1·5 mm, more or less triangular, acute to apiculate. Filaments 0·4–0·5 mm; anthers 0·2–0·3 mm, subglobose to ovoid. Fruit 1–1·5 mm, granulate and with long, dense, patent hairs. *Shady river-banks.* ● *S.W. Spain (near Ronda).* Hs.

Sect. APARINOIDES (Jordan) Gren. Perennial herbs with slender creeping rhizomes. Stems 4-angled, usually more or less retrorsely aculeolate, never with patent hairs. Leaves usually in whorls of 4–6, 1-veined, more or less rounded or obtuse, without a hyaline point, usually blackish when dry. Inflorescence cylindrical to broadly pyramidal; partial inflorescences cymose, 1- to many-flowered, the ultimate branches usually ebracteate. Corolla 3- to 4-merous, shallowly infundibuliform, white, pink or greenish; lobes acute, not appendiculate. Fruit globose, dry, smooth to verrucose or tuberculate, never with hooked setae or hairs.

15. G. debile Desv., *Obs. Pl. Angers* 134 (1818) (*G. krymense* Pobed.). Stems (10–)20–60(–80) cm, more or less erect, smooth or somewhat retrorsely aculeolate on the 4 distinct, often whitish angles. Middle cauline leaves (7–)15–25(–30) × (0·5–)0·8–2(–3) mm, in whorls of 4–6, linear to linear-lanceolate, somewhat acute, erecto-patent or deflexed; margin usually revolute and smooth or slightly rough. Inflorescence many-flowered, more or less divaricately branched; partial inflorescences more or less glomerate; pedicels 2–4 mm, more or less convergent in fruit. Flowers (3–)4-merous. Fruit 2–3·5 mm, distinctly tuberculate. $2n=24$. *Marshes. S. & W. Europe, northwards to S. England.* Al ?Bl Br Bu Co Cr Ga Gr Hs It Ju ?Lu Rm Rs (K) Sa Si Tu.

16. G. palustre L., *Sp. Pl.* 105 (1753). Stems (5–)15–70(–80) cm, slender, procumbent to erect, smooth or usually more or less retrorsely aculeolate on the scarcely whitish angles. Middle cauline leaves 5–20 × 1–3 mm, in whorls of 4–6, narrowly to broadly oblanceolate, obtuse, more or less patent; margin more or less flat, often rough. Inflorescence many-flowered, cylindrical; partial inflorescences rather dense; pedicels 1–4 mm, slightly elongating after anthesis, divaricate in fruit. Flowers (3)4-merous; corolla (1·5–)2–3(–3·5) mm in diameter. Fruit 2–3 mm, more or less smooth. $2n=24$, 48. *Wet places. Almost throughout Europe.* All except ?Al Az ?Bl Cr ?Rs (K) Sb ?Tu.

Variable, closely related to **17**, and connected with it by intermediates.

17. G. elongatum C. Presl in J. & C. Presl, *Del. Prag.* 119 (1822). Stems (40–)50–100(–150) cm, stout, weak and diffuse, retrorsely aculeolate on the whitish angles. Middle cauline leaves (15–)20–35(–50) × (2–)2·5–5(–7) mm, in whorls of 4–6, broadly oblong-oblanceolate, usually rough on margin and midrib. Inflorescence broadly and interruptedly pyramidal; pedicels (3–)4–5·5 mm, elongating after anthesis, divaricate in fruit. Flowers (3–)4-merous; corolla 3–4(–4·5) mm in diameter. Fruit 2·5–3·5 mm, smooth to more or less tuberculate. $2n=96$, 144. *Wet places. Most of Europe, eastwards to Finland, W. Ukraine and Turkey.* All except Fa Is Rs (N, ?B, ?C, E) Sb.

18. G. trifidum L., *Sp. Pl.* 105 (1753). Stems (5–)10–30(–40) cm, delicate, low-growing, laxly caespitose, retrorsely aculeolate on the obscure angles; internodes long. Middle cauline leaves (5–)8–15 × (1–)1·5–2·5(–3) mm, in whorls of 4, linear to narrowly oblanceolate, with more or less flat margin; midrib and margin rough. Inflorescence few-flowered; partial inflorescences with (1–)2–3 flowers; pedicels 7–15(–20) mm, filiform, rough, elongating and somewhat deflexed after anthesis. Flowers 3-merous; corolla *c.* 1·5 mm in diameter. Fruit 1·5–2·5 mm, smooth. $2n=24$. *Bogs and other wet places. Fennoscandia, N.E. Poland, U.S.S.R. southwards to* 49° *N. in E. Ukraine; isolated stations in E. Pyrenees and E. Alps.* Au Fe Ga No Po Rs (N, B, C, W) Su.

Records of **G. brevipes** Fernald & Wieg., *Rhodora* **12**: 78 (1910) from Iceland may refer to **18**; it is native in North America, and is like **18** but mat-forming; internodes short; leaves 5–8(–12) × (0·8–)1–2(–3) mm, oblanceolate; partial inflorescences with 1–2 flowers; pedicels 1·5–5 mm, somewhat thicker, smooth, elongating slightly after anthesis and scarcely deflexed; corolla *c.* 1 mm in diameter. It has $2n=24$.

Sect. GALIUM. Perennial herbs with woody stock, without or with robust stolons, sometimes woody at the base. Stems 4-angled or rounded, often hairy, sometimes glabrous (rarely papillose or retrorsely aculeolate). Leaves in whorls of up to 12, 1-veined, acute or with short hyaline apex. Inflorescence often many-flowered, ovoid, and with patent branches, but sometimes reduced, bracteate up to the ultimate branches, usually divaricate after anthesis. Flowers sessile or with short pedicels. Corolla often yellow, infundibuliform to rotate; lobes acute to apiculate. Fruit ovoid, dry, hairy or glabrous, tuberculate or smooth.

19. G. saturejifolium Trev., *Ges. Naturf. Freunde Berlin Mag.* **7**: 146 (1815). Stems (30–)50–70(–80) cm, slender, erect; lateral non-flowering shoots, particularly in the middle, subterete and rather smooth below, with 4 whitish angles and rough with patent papillae above. Leaves (18–)25–28(–35) × (2–)3(–4) mm, in whorls of 4–6, linear-lanceolate, blackish when dried, dull, with short cartilaginous apex and rather smooth mid-vein, with antrorsely directed papilliform teeth on the revolute margin and upper surface. Inflorescence many-flowered, ovoid; branches bracteate, papillose, divaricate after anthesis. Pedicels 1–2(–3) mm. Corolla (1·8–)2(–2·2) mm in diameter, white, rotate; lobes shortly apiculate. Fruit 1–1·5 mm, ovoid, papillose. *Marshes. Volga delta.* Rs (E).

20. G. boissieranum Ehrend. & Krendl, *Bot. Jour. Linn. Soc.* **68**: 270 (1974) (*Asperula boissierana* Steudel, nom. illegit., *A. paniculata* Boiss., non Bunge, *A. effusa* Boiss., *A. asperrima* Boiss.). Stems 35–50 cm, erect to ascending, much-branched from the base, stout, 4-angled, shortly hairy. Leaves 9–15 × 0·8–1 mm, in whorls of 6–8, linear, awned, rigid, green and shining above, usually strongly antrorsely scabrid, densely puberulent beneath, margin recurved to the midrib. Inflorescence pyramidal, with capitate partial inflorescences in several groups along the branches; flowers sessile. Corolla 4–6·5 mm, broadly or narrowly infundibuliform, yellow or reddish, sparsely hairy on the outside; corolla-tube 2·5–5 mm; corolla-lobes 1·5–2 mm, longer than wide, apiculate. Fruit densely hairy. *Scrub and shady hillsides.* ● *Mountains of S. & S.C. Spain.* Hs.

21. G. baeticum (Rouy) Ehrend. & Krendl, *loc. cit.* (1974) (*Asperula baetica* Rouy, *A. pendula* Boiss.). Like **20** but stems 35–80 cm; leaves (10–)15–35(–40) × (0·5–)1–2 mm, in whorls of 6–10; corolla 2·3–3 mm, shallowly infundibuliform, yellow; tube 0·6–1·5 mm; lobes 1·5–1·7 mm, acute to apiculate. *Mountains of S.W. Spain.* Hs. (*Morocco.*)

22. G. concatenatum Cosson, *Not. Pl. Crit.* 38 (1849). Like **20** but stems 20–65 cm, more or less erect, not much branched at the base; leaves 15–22 × 1–3 mm, linear to narrowly lanceolate, acute, glabrous or scabrid above, glabrous or papillose beneath, the margin usually not recurved as far as the midrib; corolla 1·5–2·5 mm, shallowly infundibuliform; tube 0·4–1 mm; lobes 1–1·2 mm, acute. *Open habitats. S.W. Spain, S.E. Portugal.* Hs Lu. (*Morocco, Algeria.*)

23. G. humifusum Bieb., *Fl. Taur.-Cauc.* **1**: 104 (1808) (*Asperula humifusa* (Bieb.) Besser). Stems 40–150 cm, decumbent to ascending, usually branched from the base, 4-angled, hairy especially below, rarely glabrescent. Leaves 10–22 × (1·2–)1·5–4 mm, in whorls of (5–)6–7(–9), lanceolate to linear, acute or shortly awned, sparsely hairy and shining above, lighter and often hairy on the midrib beneath; margin slightly recurved, scabrid with antrorsely directed teeth. Inflorescence ovoid-elongate; partial inflorescences dense-flowered, leafy; pedicels 1–4 mm, divaricate, usually glabrous or slightly hairy. Corolla 1·5–2 mm, infundibuliform, white to yellowish-white; corolla-lobes slightly longer than wide, acute. Fruit glabrous. *Damp, bushy places. S.E. Europe, extending northwards to c.* 51° *N. in S.C. Russia.* Bu Gr Rm Rs (C, W, K, E) [Hu].

Very variable; the correctness of the recognition of some variants as species, e.g. **Asperula debilis** Ledeb., *Ind. Sem. Horti Dorpat., Suppl.* 2 (1824), **A. besserana** Klokov in Kotov, *Fl. RSS Ucr.* **10**: 456 (1961) and **A. cincinnata** Klokov, *loc. cit.* (1961) is very doubtful.

24. G. maritimum L., *Mantissa* 38 (1767). Stems 30–80 cm, erect to ascending, often decumbent, 4-angled, much-branched, densely hairy. Leaves 9–20 × 1–4 mm, in whorls of 6–8(–9), narrowly elliptical to linear-lanceolate, shortly awned, more or less equally hairy above and beneath; margin recurved but not to the midrib. Inflorescence broadly ovoid, much-branched; partial inflorescences dense-flowered, leafy; pedicels slender, divaricate, hairy. Corolla 2–2·5 mm in diameter, rotate, reddish-brown, rarely yellowish, sparsely hairy externally; lobes apiculate. Fruit densely hairy. *Dry places; calcifuge.* ● *E. Spain, S. France.* Ga Hs.

Variable and connected by hybrids with **26.** Records from N.W. Jugoslavia are erroneous.

(25–27). G. verum group. Caespitose, without or with stolons. Stems more or less terete below, usually finely puberulent. Leaves in whorls of (6–)8–12, more or less linear, acute or awned, usually darkening on drying, much more densely hairy beneath than above. Inflorescence ovoid, with relatively short branches; partial inflorescences squarrose; pedicels slender. Corolla 2–3·5 mm in diameter, rotate, yellow. Fruit 1–1·5 mm.

1 Stems ± 4-angled below; inflorescence rather lax and not very hairy; corolla-lobes ± apiculate **27. G. × pomeranicum**
1 Stems ± rounded below; inflorescence dense and usually densely hairy
2 Leaves awned; corolla sparsely hairy outside; lobes apiculate; fruit densely hairy **25. G. tunetanum**
2 Leaves not or rarely awned; corolla glabrous outside; lobes acute, scarcely apiculate; fruit usually glabrous **26. G. verum**

25. G. tunetanum Lam., *Encycl. Méth. Bot.* **2**: 583 (1788). Stems 30–80 cm, erect, not much branched. Leaves 20–25 × 1–1·5 mm, shortly awned, shining, shortly hairy and rough above, tomentose beneath; margin usually recurved to the midrib. Inflorescence ovoid-elongate. Corolla 3–3·5 mm in diameter, hairy externally; lobes apiculate. Fruit densely hairy, very rarely glabrous. *Dry places. S. Spain; Sicilia.* Hs Si. (*N.W. Africa.*)

26. G. verum L., *Sp. Pl.* 107 (1753). Stems (20–)50–120 cm, more or less terete with 4 raised lines, rarely glabrescent. Leaves 15–30(–40) × 0·5–2(–3) mm, acute, rarely awned, shining and usually hairy above, densely puberulent beneath; margin usually markedly recurved. Corolla almost always glabrous externally; lobes acute, scarcely apiculate. Fruit usually glabrous, rarely hairy. *Grassland, sand-dunes and open woodland. Most of Europe.* All except Az Bl ?Co Cr Fa Sb.

(a) Subsp. **verum**: Stems erect to ascending; internodes longer or shorter than the leaves. Leaves 15–30(–35) × 0·5–1(–2) mm; margin recurved to midrib. Branches of inflorescence longer than the corresponding internodes; inflorescence not interrupted. Corolla golden-yellow; flowers fragrant. $2n = 22, 44$. *Throughout the range of the species.*

(b) Subsp. **wirtgenii** (F. W. Schultz) Oborny, *Verh. Naturf. Ver. Brünn* **23(2)**: 735 (1885) (*G. praecox* (K. H. Lang) H. Braun): Stem erect; internodes longer than the leaves. Leaves 25–40 × 1–3 mm; margin usually not recurved as far as the midrib. Inflorescence branches usually shorter than the corresponding internodes; inflorescence interrupted. Corolla lemon-yellow; flowers odourless. Flowering earlier than subsp. (a). $2n = 22$. *Wet meadows.* ● *C. Europe.*

In the north, where subsp. (a) is tetraploid and subsp. (b) diploid, the distinction between them is obvious. In the south, where diploid plants of subsp. (a) occur, the distinction is less clear. *G. verum* hybridizes with several species of Sect. *Leiogalium*, and includes numerous ecological and geographical races which have still to be classified. The rank of many taxa which have been described from the U.S.S.R., e.g. **G. ruthenicum** Willd., *Sp. Pl.* **1**: 597 (1798) (*G. verum* subsp. *ruthenicum* (Willd.) P. Fourn.), **G. tomentellum** Klokov in Kotov, *Fl. RSS Ucr.* **10**: 470 (1961), **G. borysthenicum** Klokov, *op. cit.* 471 (1961), **G. tenderiense** Klokov, *loc. cit.* (1961), **G. densiflorum** Ledeb., *Fl. Altaica* **1**: 137 (1829), is doubtful.

27. G. × pomeranicum Retz., *Fl. Scand. Prodr.* ed. 2, 34 (1795) (*G. ochroleucum* Wolf ex Schweigger = *G. album* × *verum*). Like **26** but stems more or less 4-angled below; leaves usually more than 1·5 mm wide, narrowly lanceolate, usually not darkening on drying, usually less hairy beneath; margin less markedly recurved; inflorescence with longer branches, often less hairy; pedicels rather stouter; corolla often more than 3 mm in diameter, bright yellow to whitish; corolla-lobes more or less apiculate. *Meadows and roadsides. Most of Europe.* All except Az Bl ?Co Cr Fa ?Sa Sb ?Si.

Often forming large and variable populations which contain a series of intermediates connecting one parent with the other. It is usually found with the parents, but sometimes (e.g. in Finland and N. Russia) it may occur independently of them.

28. G. thymifolium Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 67 (1846–1847). Stems 10–30 cm, ascending from a creeping stoloniferous base, slender, faintly 4-angled, shortly hairy. Leaves 2–6 × 0·5–1·5 mm, in whorls of 6–8, elliptical to broadly linear, acute, shortly awned, black when dry, glabrous; margin flat or somewhat recurved. Inflorescence narrowly cylindrical, interrupted, with short, dense-flowered, squarrose, bracteate partial inflorescences; pedicels 0·5–2 mm. Corolla 3–4 mm in diameter, rotate, white, glabrous; lobes shortly apiculate. Fruit glabrous, finely granulate. *Rocky and gravelly places.* ● *Mountains of S. Greece.* Gr.

29. G. kerneri Degen & Dörfler, *Denkschr. Akad. Wiss. Math.-Nat. Kl. (Wien)* **64**: 723 (1897). Stems 5–15 cm, ascending to erect, slender, stiff, 4-angled, densely hairy. Leaves 3–5 × 0·5–1 mm, usually in whorls of 6, acicular, with a long awn, scarcely changing colour on drying, sparsely hairy above, densely puberulent beneath; margin recurved to the midrib. Inflorescence narrowly cylindrical, interrupted; partial inflorescences short, squarrose, more or less bracteate; pedicels 0·5–2 mm. Corolla 2–3 mm in diameter, rotate, yellowish, glabrous; lobes long-apiculate. Fruit glabrous, finely granulate. $2n = 22$. *Rock-crevices.* ● *W. Macedonia and S. Albania.* Al ?Gr Ju.

30. G. degenii Bald. ex Degen, *Österr. Bot. Zeitschr.* **45**: 131 (1895) (incl. *G. ossaeum* Halácsy). Forming a flat and lax cushion. Stems 5–20 cm, arising from a slender stock, 4-angled, densely hairy. Leaves 3–8 × 0·8–1 mm, in whorls of up to 6, linear to narrowly lanceolate, shortly awned, densely hairy; margin revolute. Inflorescence ovoid, compact, with few-flowered cymes, leafy; pedicels somewhat shorter to more than twice as long as flowers, divaricate. Corolla 3–4 mm in diameter, rotate, yellowish, hairy externally; lobes shortly apiculate. Fruit densely hairy. *Limestone rock-crevices.* ● *Mountains of Balkan peninsula, from S. Albania to E.C. Greece.* Al Gr Ju.

31. G. erythrorrhizon Boiss. & Reuter, *Pugillus* 51 (1852) (*G. debeauxii* Degen & Hervier). Caespitose; rhizome woody, branched. Stems 2·5–6 cm, ascending, slender, 4-angled, shortly hairy. Leaves 5–6 × 1–2 mm, in whorls of 4–6, widely to narrowly linear, acute, not awned, shining, coriaceous, sparsely and shortly hairy; margin more or less recurved. Inflorescence few-flowered, squarrose, leafy; pedicels 1–3 mm, deflexed after flowering. Corolla 2·5–3·5 mm in diameter, rotate, yellowish, glabrous; lobes shortly apiculate. Fruit shining, glabrous. *Mountain rocks and screes.* ● *S. Spain (Sierra Nevada, Sierra de Cazorla).* Hs.

32. G. pulvinatum Boiss., *Elenchus* 57 (1838). Like **31** but forming a more definite cushion, glabrous; leaves 3–5 × 1–1·2 mm, in whorls of (4–)5–6, ovate to broadly lanceolate, more or less flat; pedicels up to 5 mm. *Limestone rock-crevices.* ● *S. Spain (Prov. Málaga).* Hs.

Sect. LEIOGALIUM Ledeb. Perennial herbs with woody stock, without or with robust stolons, and rather stout stem-bases. Stems 4-angled or terete, glabrous or hairy, but never retrorsely aculeolate. Leaves in whorls of up to 10, 1-veined, normally with antrorsely directed papilliform teeth along the more or less revolute margin, and with a hyaline apiculum. Inflorescence many-flowered, oblong, ovoid or corymbiform, the ultimate branches mostly ebracteate. Flowers on short or long pedicels. Corolla often white, infundibuliform, cup-shaped or rotate, the lobes often apiculate. Fruit ovoid, mostly dry and glabrous.

Ser. *Erecta* Pobed. Plants green or glaucous-pruinose. Stems 4-angled. Leaves usually less than 25 mm, but sometimes up to 40 mm, elliptical to filiform, the two surfaces more or less concolorous. Inflorescence narrowly oblong to ovoid, with lower branches short or long; partial inflorescences usually pyramidal; pedicels sometimes stout, often somewhat divaricate after anthesis. Corolla often white, or greenish, yellowish and reddish, rotate (or slightly cup-shaped), with usually apiculate lobes. The three groups of species **(36–40)**, **(41–49)** and **(51–58)** included in this Series are each very polymorphic polyploid complexes with different ecological and geographical centres; there are also several close connections among these groups.

33. G. litorale Guss., *Fl. Sic. Prodr.* **1**: 172 (1827). Stock strongly stoloniferous. Stems usually hairy above; middle internodes about as long as leaves. Leaves 10–18 × 2–5 mm, oblanceolate, abruptly narrowed towards apex, rather thick and shiny; margin slightly scabrid to smooth. Inflorescence narrowly ovoid, with short branches; pedicels stout, shorter than diameter of corolla, strongly divaricate. Corolla 3–4 mm in diameter, white, somewhat hairy outside; lobes shortly apiculate. Anthers dark when dry. Fruits 2–3 mm in diameter, globose, dark to blackish, somewhat fleshy. *Maritime sands.* ● *W. Sicilia.* Si.

34. G. arenarium Loisel., *Fl. Gall.* 85 (1806). Stock with very long subterranean stolons. Stems glabrous or rarely with long hairs, procumbent, with numerous non-flowering branches; internodes 5–10(–20) mm. Leaves 3–8 × 1–3 mm, broadly lanceolate, with short, hyaline apiculum, fleshy, shining; midrib slender; margin flat, slightly scabrid. Inflorescence few-flowered, long and narrow, with very short branches; pedicels 1–3 mm, divaricate. Corolla 3–4 mm in diameter, yellow; lobes acute but not apiculate. Fruit *c.* 3 mm in diameter, globose, somewhat fleshy, rugose when dry. $2n = 66$. *Maritime sands.* ● *W. France, just extending into N. Spain.* Ga Hs.

Intermediates between *G. arenarium* and *G. album* occur near the coast; they may be of hybrid origin and have been called **G. neglectum** Le Gall ex Gren. in Gren. & Godron, *Fl. Fr.* **2**: 22 (1851) (*G. mollugo* subsp. *neglectum* (Le Gall ex Gren.) Nyman).

35. G. firmum Tausch, *Flora* (*Regensb.*) **14**: 222 (1831). Stolons absent. Stems numerous, mostly erect, robust, nearly always shortly hairy up to the inflorescence, with many, rather long branches. Leaves 15–25 × 2–5 mm, elliptical to broadly oblanceolate, somewhat coriaceous; midrib slender, inconspicuous; margin slightly revolute. Inflorescence broadly ovoid, dense, the branches long; pedicels short. Corolla 1–1·5 mm in diameter, yellow; lobes with long and mostly incurved apices. Anthers light brownish. Fruit brownish. $2n = 22$. *Dry places.* ● *W. part of Balkan peninsula.* Al Ju.

A rather isolated E. Adriatic endemic, formerly circumscribed to include **39(c)**, and even **52**, **54–55** and **57**.

(36–39). G. mollugo group. Stolons present or absent. Stems 30–150 cm, often robust, erect to procumbent, glabrous or with hairs 0·5–1·5 mm. Middle internodes of flowering stems longer than leaves. Leaves 10–40 × 1·5–7 mm, oblong to oblanceolate; midrib slender, less than half as wide as leaf; margin not or slightly revolute. Inflorescence broadly ovoid to oblong, with branches up to 40 cm. Corolla white to yellowish (rarely reddish), glabrous. Fruit brown.

1 Stolons present (sometimes short)
2 Corolla usually 2–3 mm in diameter; pedicels usually longer than the diameter of the flowers; inflorescences lax, the branches strongly divaricate after anthesis **38. mollugo**
2 Corolla usually 3–5 mm in diameter; pedicels usually shorter than the diameter of the flowers; inflorescences rather dense, the branches less divaricate after anthesis **39. album**
1 Stolons absent
1 Stolons absent
3 Corolla 2–3 mm in diameter; anthers dark brown to purplish **36. heldreichii**
3 Corolla 3–5 mm in diameter; anthers yellowish to light brown **37. protopycnotrichum**

36. G. heldreichii Halácsy, *Österr. Bot. Zeitschr.* **47**: 94 (1897). Stolons absent. Stems up to 150 cm, glabrous or often hairy, usually reddish at base, strongly branched, erect-ascending. Leaves 10–20(–30) × 1–5 mm, oblong to oblanceolate, rather coriaceous and sometimes reddish; midrib rather prominent. Inflorescence dense, narrowly ovoid, the primary branches long;

pedicels up to as long as the diameter of the corolla. Corolla 2–3(–3·5) mm in diameter, whitish to greenish or sometimes reddish. Anthers dark brown to purplish. $2n=22$. *Dry scrub. Aegean region.* Cr Gr. (*W. Anatolia.*)

In the mountains of the Aegean region plants are found with shorter stems and internodes, narrower and laxer inflorescences, longer pedicels and larger flowers. They have been called **G. samothracicum** Rech. fil., *Feddes Repert.* (*Beih.*) **100**: 134 (1938) and are possibly related to **36.**

37. G. protopycnotrichum Ehrend. & Krendl, *Bot. Jour. Linn. Soc.* **68**: 270 (1974). Stolons absent. Stems usually 60–80 cm, glabrous or often hairy, erect, with few weak branches. Leaves (15–)20–30 × 3–5 mm, broadly lanceolate, rather thin. Inflorescence relatively lax, oblong, the branches rather short and ascending; pedicels slender, shorter than the diameter of the corolla. Corolla 3–5 mm in diameter. Anthers yellowish to light brown. $2n=22$. *Open and dry scrub and woods.* ● *S.E. part of Balkan peninsula.* Bu Gr Ju.

38. G. mollugo L., *Sp. Pl.* 107 (1753) (*G. mollugo* subsp. *tyrolense* (Willd.) Hayek). Stock usually reddish, with long subterranean stolons. Stems 30–150 cm, usually glabrous, ascending to weakly procumbent, with numerous branches. Leaves 10–25 × 2–7 mm, oblong to broadly oblanceolate, abruptly narrowed towards apex, thin, light green. Inflorescence lax, broadly ovoid, much branched; pedicels 2–3(4) mm, slender, strongly divaricate after anthesis. Corolla 2–3 mm in diameter, white. $2n=22$. *Open woods, hedges and meadows.* ● *Throughout Europe, except some of the islands and parts of the north.* Al Au ?Be Br ?Bu Co Cz Ga Ge He Ho Hs Hu It Ju Lu Po Rm Rs (C, W) Sa Si ?Su.

38 and **39** have often been combined under *G. mollugo*; their distribution-data are still provisional.

39. G. album Miller, *Gard. Dict.* ed. 8, no. 7 (1768) (*G. erectum* Hudson 1778, non 1762). Stock with short or long subterranean stolons. Stems 50–150 cm, erect to procumbent, the branches ascending or patent, glabrous or with hairs 0·5–1·5 mm; internodes long. Leaves 10–40 × 1–7 mm, oblong to oblanceolate, thin to somewhat coriaceous. Inflorescence rather dense, broadly ovoid to oblong, mostly with rather long branches; pedicels mostly 1·5–3 mm but variable in length, less divaricate after anthesis than in **38**. Corolla (2·5–)3–5 mm in diameter, white or yellowish. *Open habitats. Much of Europe, but local in parts of the south and east, and only as an introduction in much of the north and north-east.* Al Au Be Br Bu Co Cr Cz Da Ga Ge Gr He Ho Hs Hu It Ju Lu Po Rm Rs (B, C, W, K, E) Sa Si ?Tu [Fe Hb Is No Rs(N) Su].

1 Corolla yellowish; inflorescence oblong and narrow; plants up to 80 cm — (c) subsp. **prusense**
1 Corolla whitish; inflorescence often broadly ovoid, with long branches; plants often more than 80 cm
2 Leaves oblong to broadly oblanceolate, abruptly narrowed towards apex; plant robust, usually hairy — (b) subsp. **pycnotrichum**
2 Leaves oblanceolate, gradually narrowed towards apex; plant often slender, predominantly glabrous — (a) subsp. **album**

(a) Subsp. **album** (*G. erectum* Hudson 1778, non 1762, *G. mollugo* subsp. *erectum* Syme): Stems up to 150 cm, often slender, predominantly glabrous, procumbent to erect, the non-flowering branches long or short. Leaves 10–30 × 1·5–5 mm, oblanceolate, gradually narrowed towards apex. Inflorescence broadly ovoid or oblong. Corolla whitish. $2n=44$. *Throughout the range of the species.*

(b) Subsp. **pycnotrichum** (H. Braun) Krendl, *Österr. Bot. Zeitschr.* **114**: 539 (1967): Stems up to 150 cm, robust, usually hairy, erect, the branches short. Leaves 10–40 × 2–7 mm, oblong to broadly oblanceolate, abruptly narrowed towards apex. Inflorescence usually broadly ovoid. Corolla whitish. $2n=44$. *E.C. & S.E. Europe.*

(c) Subsp. **prusense** (C. Koch) Ehrend. & Krendl, *Bot. Jour. Linn. Soc.* **68**: 270 (1974) (*G. prusense* C. Koch): Stems up to 80 cm, glabrous or hairy, erect, the non-flowering branches short. Leaves 10–25 × 2–5 mm, oblanceolate to lanceolate, gradually narrowed towards apex, usually coriaceous. Inflorescence oblong, narrow, dense. Corolla yellowish. $2n=44$. *S.E. Europe.*

G. album is very polymorphic in S.E. Europe, and many taxa have been described from Ukraine; it seems doubtful at present whether any of these can be maintained as species or even subspecies.

For hybrids with **26**, cf. **27.**

40. G. reiseri Halácsy, *Österr. Bot. Zeitschr.* **45**: 338 (1895). Glaucous, pruinose, glabrous; stolons absent. Stems 15–60 cm, ascending to erect; middle internodes about as long as leaves. Leaves 10–20 × 5–9 mm, obovate to broadly elliptical, coriaceous to somewhat fleshy; midrib wide; margin revolute. Inflorescence narrowly pyramidal, dense, with short erect branches; pedicels short and thick, scarcely divaricate. Corolla 2–3 mm in diameter, yellowish; lobes strongly apiculate. Anthers dark when dry. $2n=22$. *Rocky places.* ● *N. Sporades.* Gr.

(41–49). G. lucidum group. Green or glaucous and pruinose; stock with or without stolons. Stems 15–70 cm, ascending or erect, glabrous or with short papillae or somewhat long hairs. Leaves 5–30 × 0·5–2 mm, mostly remaining green when dry, linear-oblanceolate to acicular, straight, with revolute or flat, scabrid or smooth margin. Inflorescence usually oblong to ovoid, with numerous internodes. Corolla often white, sometimes yellowish, rarely greenish or reddish, rotate and flat; lobes patent. Anthers usually light brownish when dry.

1 Plant glaucous, pruinose
2 Partial inflorescences ± corymbose — **49. cinereum**
2 Partial inflorescences ovoid — **48. aetnicum**
1 Plant green
3 Leaf-margin smooth, without antrorsely-directed scabridity; stems smooth
4 Leaves usually less than 10 mm — **44. montis-arerae**
4 Leaves more than 10 mm
5 Leaves thin; stems erect; without stolons — **43. truniacum**
5 Leaves somewhat fleshy; stems ascending; usually with stolons — **45. meliodorum**
3 Leaf-margin with antrorsely-directed scabridity; stems often ± hairy or papillose
6 Inflorescence with branches from near the base of the stem — **41. fruticescens**
6 Inflorescence with branches only in upper half of stem
7 Midrib prominent, more than half as wide as leaf; stems mostly with papilliform hairs *c.* 0·1 mm — **42. corrudifolium**
7 Midrib slender, less than half as wide as leaf; stems glabrous or with hairs 0·5–1·5 mm
8 Corolla white, yellowish or greenish — **46. lucidum**
8 Corolla reddish — **47. bernardii**

41. G. fruticescens Cav., *Icon. Descr.* **3**: 3 (1795). Stolons absent. Stems 15–60 cm, usually numerous, rigid, erect, with short hairs at the base; internodes short, with prominent angles. Leaves 3–10(–15) × 0·5–2 mm, linear, coriaceous, with hyaline apiculum; midrib rather prominent; margin strongly scabrid and revolute. Inflorescence narrow, oblong, with rigid branches from near the base upwards; pedicels shorter than diameter of corolla. Corolla 2–3 mm in diameter, white to yellowish. Fruit 2–3 mm in diameter, dark brown. *Very dry places.* ● *E.C. & S. Spain.* Hs ?Lu.

The specific distinctness from **42** and **46** has yet to be studied.

42. G. corrudifolium Vill., *Prosp. Pl. Dauph.* 20 (1779) (*G. adriaticum* Ronniger). Stolons absent. Stems 20–40 cm, erect, nearly always with short papilliform hairs *c.* 0·1 mm at the base, with relatively few and short non-flowering branches. Leaves 5–11 × (0·3–)0·5–1 mm, narrowly linear, coriaceous; midrib prominent; margin revolute, strongly scabrid. Inflorescence oblong, dense, with short, erect branches from about the middle of the stem; pedicels 1–2·7 mm. Corolla 3–3·6 mm in diameter, cream to white or yellowish, very rarely reddish. $2n=22$. *Dry, rocky places.* ● *Mediterranean region.* Al Bl Co Ga Gr Hs It Ju.

43. G. truniacum (Ronniger) Ronniger in A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **10**: 52 (1913). Stolons usually absent. Stem 25–40 cm, erect, smooth and glabrous, reddish at base, with few non-flowering branches. Leaves 10–25 × 1–2 mm, linear-oblanceolate, widest in upper third, thin, with soft, hyaline apiculum; midrib slender; margin scarcely revolute, nearly always smooth. Inflorescence ovoid, lax; pedicels 2–7 mm. Corolla 3–5 mm in diameter, pale yellow. $2n=22$. *Montane calcareous screes.* ● *N.E. Alps.* Au Ge.

44. G. montis-arerae Merxm. & Ehrend., *Österr. Bot. Zeitschr.* **104**: 228 (1957). Stock long and robust, with long stolons. Stems 15–25 cm, numerous, procumbent at base, ascending-erect, slender, smooth. Leaves (5–)6–10(–15) × 1·1–1·5(–2·1) mm, linear-oblanceolate, somewhat fleshy, with short, soft, hyaline apiculum; margin slightly revolute, smooth. Inflorescence cylindrical, dense, with few branches; pedicels 1·4–1·7 mm, slender. Corolla 3–3·6 mm in diameter, pale yellowish. $2n=22$. *Alpine calcareous screes.* ● *Alpi Bergamasche.* It.

45. G. meliodorum (G. Beck) Fritsch, *Exkursionsfl. Österr.* ed. 2, 573 (1909). Stolons usually present. Stems 15–40 cm, procumbent to ascending, smooth and glabrous, mostly with long branches from the base. Leaves 10–25 × 1–2 mm, linear-oblanceolate, somewhat fleshy, with long, soft, hyaline apiculum; midrib not very prominent; margin nearly flat, smooth. Inflorescence broadly ovoid, rather dense, strongly branched; pedicels 1·5–4·5 mm. Corolla 3–5 mm in diameter, pale yellowish to greenish. $2n=44$. *Calcareous rocks and screes.* ● *N.E. Alps.* Au.

46. G. lucidum All., *Auct. Syn. Stirp. Horti Taur.* 5 (1773) (*G. rigidum* Vill.). Stolons usually present. Stems 25–70 cm, erect or ascending, glabrous or with hairs 0·1–1·5 mm, with relatively few and short, non-flowering branches. Leaves 10–30 × 1–2 mm, linear-lanceolate, with slender, hyaline apiculum; midrib narrow; margin somewhat revolute, scabrid. Inflorescence oblong or ovoid, dense, with ascending to patent branches; pedicels 1–3 mm. Corolla 3–5 mm in diameter, white, more rarely yellowish or greenish. Fruit dark brown. $2n=44$. *Dry places. S. & S.C. Europe.* Al Au Bl Bu Co Cz Ga Ge Gr He Hs Hu It Ju Lu Rm Sa Si.

Commonly connected by intermediate forms with **39** and **45** in zones of contact.

47. G. bernardii Gren. & Godron, *Fl. Fr.* **2**: 23 (1850). Like **46** but inflorescence rather lax; corolla reddish. *Rocky places.* ● *Corse, W. Italy.* Co It.

Possibly only a variant of **46.**

48. G. aetnicum Biv., *Stirp. Rar. Sic. Descr.* **4**: 21 (1816). Glaucous and pruinose; stolons present or absent. Stems usually 30–60 cm, numerous, slender, procumbent-ascending, glabrous and smooth, with few non-flowering branches; internodes up to 7 cm. Leaves 10–20 × 0·7–2 mm, linear-oblanceolate, with narrow midrib. Inflorescence narrowly oblong, the lateral branches erect, forming ovoid partial inflorescences. Corolla (2–)3–4 mm, white; lobes narrow, strongly apiculate. Fruit black, somewhat pruinose. $2n=44$. *Dry, rocky places.* ● *C. & S. Italy, Sicilia, Sardegna.* It Sa Si.

48 includes plants from Italy formerly called *G. cinereum.* On Monte Etna there is a continuous series from tall coastal to very short alpine variants. Populations from Sardegna may lack stolons and have more erect stems and shortly apiculate corolla-lobes; they have been described as **G. schmidii** Arrigoni, *Webbia* **27**: 507 (1972).

49. G. cinereum All., *Auct. Syn. Stirp. Horti Taur.* 5 (1773). Glaucous and pruinose; stolons long. Stems 40–80 cm, usually solitary, usually glabrous, robust and erect, with few, weak non-flowering branches; internodes short at base of stem, 8–10 cm above, obscurely angled. Leaves 8–15(–20) × 0·5–2 mm, linear, widest in upper third, with narrow midrib. Inflorescence relatively wide, the branches up to 30 cm, ascending, with basal internodes up to 7 cm, forming corymbose partial inflorescences. Corolla 3–5 mm in diameter, white; lobes wide, shortly apiculate. $2n=44$. *Dry places.* ● *W. Mediterranean region.* Bl Ga It.

50. G. crespianum J. J. Rodr., *Anal. Soc. Esp. Hist. Nat.* **8**: 55 (1879). Stolons absent. Stems glabrous (rarely somewhat hairy above), strongly branched, decumbent and ascending; internodes up to 5 cm at middle of stem, scarcely longer than the leaves. Leaves 30–40 × 2·5–5 mm, narrowly linear-lanceolate, often somewhat falcate, with narrow but prominent midrib and somewhat scabrid, revolute margin. Inflorescence broadly ovoid, dense, with long branches from above base of stem; pedicels 2–3 mm. Corolla 3–4 mm in diameter, white; lobes patent, strongly apiculate. Fruit somewhat fleshy. *Rocky places.* ● *Islas Baleares.* Bl.

(51–58). G. incurvum group. Green or rarely glaucous and pruinose; stock strongly woody, usually without stolons. Stems 10–80(–120) cm, shortly hairy or glabrous, more rarely with long hairs. Leaves 5–40 × 0·5–4 mm, usually blackening when dried, narrowly lanceolate to linear, acicular or filiform; midrib mostly prominent; margin usually strongly revolute and scabrid. Inflorescence usually long and narrow but often with only a few internodes. Corolla yellowish to greenish or purplish, rarely pure white, slightly cup-shaped; lobes incurved, strongly apiculate. Anthers usually darkening when dried. Fruit dark brown to blackish.

1 Stems robust, densely villous at base, with hairs more than 1 mm; lower cauline leaves oblong; corolla less than 2·5 mm in diameter — **51. mirum**
1 Stems scarcely robust, glabrous at base or with hairs less than 1 mm; lower cauline leaves ± linear
2 Inflorescence broadly ovoid, with long branches; leaves usually more than 15 mm
3 Midrib conspicuous, more than half as wide as leaf — **58. flavescens**
3 Midrib slender, much less than half as wide as leaf — **53. peloponnesiacum**
2 Inflorescence narrow, with usually short branches; leaves usually less than 15 mm
4 Middle internodes longer than leaves

5 Leaves not more than 10 × 0·8 mm, filiform **54. asparagifolium**
5 Leaves up to 15(–20) × 1–2 mm, linear
6 Pedicels often longer than diameter of corolla; corolla greenish-purple **55. melanantherum**
6 Pedicels shorter than diameter of corolla; corolla greenish-yellow to white **52. scabrifolium**
4 Middle internodes shorter than leaves
7 Longest leaves more than 10 mm, with a short hyaline apiculum **57. incurvum**
7 Longest leaves less than 10 mm, with a long hyaline apiculum **56. rhodopeum**

51. G. mirum Rech. fil., *Bot. Jahrb.* **69**: 512 (1939). Stems up to 120 cm, usually robust and strongly branched, densely villous at base with hairs more than 1 mm; internodes up to 10 cm with whitish angles. Middle cauline leaves 15–25 × 1–2 mm, linear, the lower oblong; leaves with a short hyaline apiculum, and the margin slightly revolute. Inflorescence very broadly ovoid, with very long and patent branches; pedicels *c.* 2–4(–6) mm, slender. Corolla 1·5–2·5 mm in diameter. $2n=22$. *Submediterranean scrub.* ● *S.E. part of Balkan peninsula.* Bu Gr Ju.

52. G. scabrifolium (Boiss.) Hausskn., *Mitt. Thür. Bot. Ver.* nov. ser., **5**: 120 (1893). Stems 50–80 cm, usually with short hairs at base (rarely with longer hairs), erect, usually strongly branched. Leaves 7–20 × 0·5–1·5(–2) mm, linear, with hyaline apiculum of medium length; midrib prominent; margin revolute. Inflorescence oblong or ovoid, with erect branches. Pedicels as long as or shorter than diameter of corolla. Corolla (2–)3–5 mm in diameter, yellowish-white. $2n=22$, 44. *Dry places. S. part of Balkan peninsula.* Bu Gr Ju.

This polymorphic species seems to contain a number of variants which may deserve taxonomic recognition. One, with stiffly erect and white-angled stems, short leaves and dense inflorescences ranges from S.E. Macedonia to W. Anatolia. Another has more patent branches and longer leaves; it is diploid and occurs in Macedonia and adjacent W. Bulgaria. In the higher mountains of Thraki and on Thásos there is a third, tetraploid variant with less branching, shorter internodes, slightly wider and shorter leaves, and less apiculate corolla-lobes.

53. G. peloponnesiacum Ehrend. & Krendl, *Bot. Jour. Linn. Soc.* **68**: 271 (1974). Stems 50–80 cm, with short or long hairs at base, slender; internodes long. Leaves 15–30 × 2–4 mm, lanceolate, relatively thin, with short, hyaline apiculum; midrib slender, comprising less than half the width of the leaf; margin slightly revolute and somewhat scabrid. Inflorescence broadly ovoid, lax, with long, patent to ascending branches; pedicels slender. Corolla 2–4 mm in diameter, usually yellowish. $2n=44$. ● *Mountains of S. Greece (Peloponnisos).* Gr.

Variable in habit and leaf-shape. A closely related plant with purplish flowers and longer, narrower, revolute leaves occurs in S.W. Peloponnisos; it appears to be diploid, and may merit specific rank.

54. G. asparagifolium Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(6)**: 91 (1859). Stems slender, ascending, with short hairs; internodes not more than 3 cm. Leaves 10 × 0·5–0·8 mm, filiform, with a short, hyaline apiculum; midrib slender; margin slightly scabrid. Inflorescence narrow, with patent to erect, relatively long branches; pedicels 2–3 mm. Corolla 2–3 mm in diameter. *Mountain rocks. S.C. & N. Greece.* Gr.

55. G. melanantherum Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 68 (1846–1847). Stems up to 50 cm, rigid, with prominent angles, nearly always with short hairs at base; internodes short below middle of stem, the upper longer. Leaves 10–15(–20) × 1(–2) mm, narrowly linear, coriaceous, shining; midrib prominent; margin strongly revolute, slightly scabrid. Inflorescence very lax, oblong, with short, erect branches; pedicels 5(–8) mm, slender. Corolla 5(–7) mm in diameter, greenish-purple. $2n=22$. *Dry, rocky places.* ● *S.E. Greece.* Gr.

56. G. rhodopeum Velen., *Sitz.-Ber. Böhm. Ges. Wiss. (Math.-Nat. Kl.)* **1893(37)**: 32 (1893). Laxly caespitose, with densely leafy non-flowering shoots. Flowering stems 10–35 cm, mostly with short hairs, rigid and erect, with prominent, white ridges; internodes (7–)10–30(–40) mm. Leaves (5–)7–12(–15) × 0·5–1 mm, about as long as or longer than internodes, linear, acicular, gradually narrowed into a long hyaline apiculum. Inflorescence few-flowered, lax, long and narrow, with short, rigid, erect branches; pedicels (2–)2·5–5(–6) mm, slender. Corolla 3·5–4·5 (–5) mm in diameter, pale yellowish or white; lobes shortly apiculate. $2n=22$, 44. *Calcareous mountain cliffs.* ● *C. part of E. Balkan peninsula.* Bu Gr Ju.

57. G. incurvum Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 92 (1806). Green or glaucous and pruinose. Stems 20–35(–40) cm, glabrous, ascending or erect; middle internodes usually shorter than leaves. Leaves 10–20(–30) × 2(–3) mm, linear-lanceolate, coriaceous or succulent, with short, hyaline apiculum; midrib prominent; margin revolute, slightly scabrid. Inflorescence often dense, with rigid, erect branches 3(–7) cm; pedicels 2–3 mm. Corolla up to 5 mm in diameter, yellowish or reddish; lobes shortly apiculate. $2n=44$. *Rocky places.* ● *S. Aegean region.* Cr Gr.

It may be possible to separate the typical species from the higher mountains of Kriti, with slender habit, and incurved, linear, non-succulent green leaves, from **G. amorginum** Halácsy, *Consp. Fl. Graec.* **1**: 712 (1901), comprising coastal populations of the S. Aegean with more robust growth, and linear-lanceolate, succulent, and often glaucous-pruinose leaves.

58. G. flavescens Borbás, *Akad. Közl.* **11(7)**: 266 (1874). Stems up to 80(–100) cm, robust, strongly branched from the base, glabrous or with short (very rarely long) hairs. Leaves 25–40 × 1 mm, narrowly linear; midrib prominent; margin strongly revolute, sharply scabrid. Inflorescence broadly ovoid, with numerous erect branches; pedicels up to 7 mm. Corolla up to 5 mm in diameter; lobes strongly apiculate. $2n=44$. *Dry places. From C. Romania to N. Macedonia.* Bu Ju Rm ?Tu.

Ser. *Octonaria* (Klokov) Pobed. Plants glaucous-pruinose. Stems terete to 4-angled. Leaves linear to filiform, more rarely elliptical or oblanceolate, not more than 45 mm and often less than 25 mm, uniformly glaucous on upper and lower surfaces. Inflorescences broadly ovoid to pyramidal, with long lower branches; partial inflorescences usually corymbiform; pedicels rather stout, not divaricate after anthesis. Corolla white, infundibuliform to cup-shaped, with tube somewhat longer to much shorter than lobes; lobes acute, rarely shortly apiculate.

Species **62–65** are very closely related and connected by intermediates.

59. G. pruinosum Boiss., *Elenchus* 57 (1838). Stolons absent. Stems 20–100 cm, more or less rounded, with 4 ridges, glabrous. Leaves 10–20 × 2–6 mm, in whorls of 5–7, elliptical to broadly lanceolate, somewhat coriaceous; margin with 1–2 rows of papillose teeth, revolute but not to the midrib. Inflorescence ovoid; partial inflorescences corymbiform, lax, few-flowered; pedicels shorter than diameter of corolla. Corolla 3–4 mm in diameter, infundibuliform; tube much shorter than lobes. *Crevices of limestone cliffs.* ● *Mountains of S. Spain.* Hs.

60. G. glaucophyllum E. Schmid, *Viert. Naturf. Ges. Zürich* **78**: 253 (1933). Stolons absent. Stems obscurely 4-angled, glabrous. Leaves (10–)15–20(–25) × (2·5–)3–4·5(–5) mm, in whorls of up to 6(–8), oblanceolate, membranous; margin with very few teeth, usually subrevolute. Inflorescence ovoid to broadly pyramidal; partial inflorescences corymbiform; pedicels shorter than diameter of corolla. Corolla 4–5 mm in diameter, broadly infundibuliform; tube *c.* ½ as long as lobes. *Cliffs and screes.* ● *Sardegna.* Sa.

61. G. murcicum Boiss. & Reuter in Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 114 (1856). Stolons present. Stems 40–90 cm, glabrous. Leaves 10–25 × 0·5–2 mm, in whorls of 6–7, linear, glabrous; margin slightly scabrid with 1 to 2 rows of teeth, revolute to the midrib. Inflorescence broadly ovoid, distinctly interrupted; flowers in dense clusters; pedicels much shorter than diameter of corolla. Corolla 3–4 mm in diameter, infundibuliform; tube shorter than lobes. *Calcareous, stony ground.* ● *S.E. Spain.* Hs.

62. G. octonarium (Klokov) Pobed., *Nov. Syst. Pl. Vasc. (Leningrad)* 7: 278 (1971) (*Asperula octonaria* Klokov). Stolons absent. Stems 25–90 cm, more or less 4-angled throughout, usually glabrous. Leaves 20–45 × 0·5–1 mm, in whorls of (6–)7–8(–10), linear to filiform, usually erect; margin very scabrid with many rows of teeth, revolute to the midrib. Inflorescence broadly ovoid, lax; partial inflorescences corymbiform; pedicels shorter than diameter of corolla. Corolla 2–3 mm in diameter, infundibuliform; tube usually longer than lobes. $2n=22$. *Dry grassland and steppes. S.E. Europe, extending northwards to 55° N. in C. Russia.* Bu ?Gr ?Po Rm Rs (C, W, K, E). (*S.W. Asia.*)

63. G. glaucum L., *Sp. Pl.* 107 (1753) (*Asperula glauca* (L.) Besser, *A. galioides* Bieb. pro parte). Stolons present or absent. Stems 40–80 cm, usually rounded, with 4 ridges, stout, glabrous or hairy. Leaves 20–40 × 0·5–2 mm, in whorls of (6–)8–10(–11), linear to acicular, glabrous or rarely hairy; margin weakly scabrid, with 1–2 rows of teeth, revolute to the midrib. Inflorescence ovoid, somewhat lax to dense; partial inflorescences corymbiform, usually many-flowered; pedicels usually shorter than diameter of corolla. Corolla 4–6 mm in diameter, broadly cup-shaped; tube usually much shorter than lobes. $2n=22$, 44. *Forest-margins, dry grassland and stony places.* ● *From Belgium and Czechoslovakia southwards to N. Portugal, S. Italy and Bulgaria; casual in S. Scandinavia and perhaps becoming naturalized.* Au Be Bu Cz Ga Ge He Hs Hu It Ju Lu ?Po Rm Rs (W).

In E. Europe the plants are predominantly without stolons; in W.C. Europe, most plants have stolons, with the stem rooting at the base. Many of the former have been shown to be tetraploid, and of the latter diploid. The eastern plants appear in Poland and elsewhere to be connected with **62** by intermediates; the exact boundary between **62** and **63** has yet to be established. The plants from the Iberian peninsula may represent a distinct taxon.

64. G. biebersteinii Ehrend., *Pl. Syst. Evol.* **124**: 174 (1975) (*Asperula galioides* Bieb. pro parte). Stolons present. Stems 20–60 cm, weakly 4-angled, ascending, glabrous. Leaves 7–20(–25) × 0·3–1·5 mm, in whorls of 6–8, linear to acicular; margin scabrid, with many rows of teeth, usually revolute to the midrib. Inflorescence ovoid, lax; partial inflorescences corymbiform, usually few-flowered; pedicels shorter than diameter of corolla. Corolla 3–4 mm in diameter, broadly infundibuliform; tube as long as or shorter than lobes. *Stony slopes. Krym.* Rs (K).

65. G. xeroticum (Klokov) Pobed., *Nov. Syst. Pl. Vasc. (Leningrad)* **7**: 278 (1971) (*Asperula xerotica* Klokov). Like **64** but stems densely hairy at least below; leaves glabrous or hairy, the margin usually revolute but not to the midrib. *Rocks and stony steppes.* ● *Krym.* Rs (K).

Doubtfully specifically distinct from **64.**

66. G. volhynicum Pobed., *loc. cit.* (1971) (*Asperula tyraica* Besser). Stolons present. Stems (20–)40–80(–100) cm, rounded below, with 4 ridges, stout, usually densely hairy at the base, glabrescent above. Leaves 20–40 × 0·5–1·5 mm, in whorls of 6–8, linear to acicular; margin scabrid with 1–2(–3) rows of teeth, revolute. Inflorescence ovoid to broadly pyramidal, rather dense; partial inflorescences pyramidal; pedicels shorter than diameter of corolla. Corolla 3–4 mm in diameter, cup-shaped; tube much shorter than lobes; apex of lobes more or less incurved. *Steppes.* ● *S.E. Europe from E. Jugoslavia to C. Ukraine.* Bu Ju Rm Rs (W).

67. G. moldavicum (Dobrescu) Franco, *Bot. Jour. Linn. Soc.* **71**: 50 (1975) (*Asperula moldavica* Dobrescu). Like **66** but stems glabrous at the base, pubescent above and on inflorescence-axes; leaves 20–30(–35) × 0·4–0·5 mm, in whorls of 6–10, filiform; margin scabrid, with 3(–4) rows of teeth; corolla *c.* 2 mm in diameter. *Dry grassland.* ● *Moldavia, N.E. Romania.* Rm Rs (W).

Ser. *Nemoralia* M. Popov. Young shoots green or glaucous and pruinose. Stems terete to 4-angled. Leaves elliptical to linear-lanceolate, usually 25–75 mm; lower surface paler green than the upper and often bluish. Inflorescence broadly ovoid, lax, with long lower branches; partial inflorescences corymbiform; pedicels often capillary, not divaricate after anthesis. Corolla white, cup-shaped to rotate; tube shorter than lobes; lobes acute to apiculate.

With the possible exception of **68**, the species of this Series are connected by critical intermediates, and form a closely knit polyploid complex which has differentiated in the deciduous woodlands of S. & C. Europe.

68. G. kitaibelianum Schultes & Schultes fil., *Mantissa* **3**: 163 (1827). Stolons absent. Stems 50–100 cm, much branched, 4-angled, usually glabrous, rarely hairy. Leaves 25–70 × 0·5–3 mm, linear-lanceolate, somewhat falcate, widest at the middle, very gradually narrowing to the apex, bright green, membranous; margin slightly revolute, scabrid with 1–2 rows of papilliform teeth; veins conspicuous. Inflorescence very lax, broadly ovoid; branches very slender, patent and usually pendent; bracts 3–10 mm, capillary, usually extending to the ultimate branches; pedicels usually much longer than diameter of corolla. Corolla 2–3 mm in diameter, subrotate; lobes shortly apiculate. $2n=22$. *Open woods, especially on rocky ground.* ● *S.W. & C. Romania.* ?Ju Rm.

69. G. pseudaristatum Schur, *Enum. Pl. Transs.* 282 (1866) (incl. *G. matteji* (Bald.) Hayek). Stolons absent. Stems usually 70–100 cm, 4-angled, glabrous to densely hairy below, often rough with short hairs above. Leaves (25–)30–50(–60) × 2–4(–6) mm, linear-lanceolate, often falcate, usually widest at the middle, narrowing gradually to a point, bright green, membranous; margin scabrid with several rows of teeth. Inflorescence relatively lax, ovoid to broadly pyramidal; flowers crowded towards the end of the branches; pedicels usually about as long as diameter of corolla. Corolla 2–3 mm in diameter, cup-shaped; lobes acute. Fruit glabrous (very rarely hairy). $2n=22$. *Dry and open* Quercus-*woods.* ● *From S.E. Czechoslovakia to Macedonia.* Al Bu Cz ?Gr Ju Rm.

70. G. aristatum L., *Sp. Pl.* ed. 2, 152 (1762). Stolons absent. Stems 50–80 cm, 4-angled, usually glabrous. Leaves 40–65 × 3–5 mm, lanceolate, somewhat falcate, widest at or below the middle, gradually narrowing to the apex, bright green, membranous; margin scabrid with few rows of teeth; veins inconspicuous. Inflorescence lax, ovoid; pedicels usually equalling diameter of corolla. Corolla 2–3(–4) mm in diameter, subrotate; lobes shortly apiculate. $2n=22$. *Open deciduous woods.* ● *From the Pyrenees to E. Alps.* Au Ga Ge ?He It.

71. G. abaujense Borbás, *Abauj-Torna Vármegye Fl.* 444 (1896). Stolons present, sometimes very short. Stems up to 90 cm, 4-angled, stout, hairy or glabrous. Leaves 30–50 × 2–9 mm, oblanceolate, often abruptly narrowed towards the apex, bright green; margin subscabrid, with few rows of teeth. Inflorescence lax to dense, broadly pyramidal; pedicels usually equalling diameter of corolla. Corolla (2·5–)3–4(–5) mm in diameter, rotate; lobes apiculate. $2n=44$. *Dry* Quercus *woods.* ● *From E. Czechoslovakia to C. Romania.* Cz Hu Rm Rs (W).

72. G. polonicum Błocki, *Österr. Bot. Zeitschr.* **37**: 189 (1887). Like **71** but stems up to 120 cm; leaves 15–40 × 2–4 mm; inflorescence usually dense, narrowly to broadly pyramidal. Corolla usually 4–5 mm in diameter. $2n=44$. *Woods.* ● *S.E. Poland, N.W. Ukraine.* Po Rs (W).

This species is doubtfully distinct from **71** and further investigation is needed. **71** and **72** connect **69** with the *G. mollugo* group and hybridize readily with **39.**

73. G. laconicum Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 66 (1846–1847). Stolons present. Stems up to *c.* 80 cm, terete at the base, with 4 ridges, hairy especially below. Leaves 25–40 × 3–7 mm, elliptical to broadly lanceolate, not falcate, widest at the middle, often rounded at the apex, rarely acute, bright green, membranous; margin scabrid with many rows of small papilliform teeth, also often hairy; veins conspicuous. Inflorescence lax, ovoid; flowers crowded towards the ends of the branches; pedicels often longer than diameter of corolla. Corolla 2–3 mm in diameter, cup-shaped; lobes acute. $2n=22$. *Mountain woods.* ● *S. part of Balkan peninsula* Bu Gr Ju ?Tu.

74. G. procurrens Ehrend., *Pl. Syst. Evol.* **124**: 1 (1975). Stolons present, usually long. Stems 40–80 cm, rather slender, more or less terete at base, otherwise 4-angled, nearly always glabrous; young shoots strongly glaucous-pruinose. Leaves (25–)30–40 (–50) × (2·5–)3·5–5·5(–7) mm, linear-oblanceolate, widest at or above the middle, gradually narrowed towards the base, somewhat more abruptly narrowed towards the acute apex, glaucous beneath, darker green above, remaining greenish when dry, membranous; margin subscabrid with 1–2 rows of small teeth; venation inconspicuous. Inflorescence rather lax, ovoid; pedicels usually shorter than the diameter of the corolla. Corolla (2–)2·2–2·6(–3) mm in diameter, cup-shaped; lobes acute to shortly apiculate. Ovary and fruit more or less pruinose. $2n=22$. *Open deciduous mountain woods.* ● *C. part of Balkan peninsula.* Al Bu Ju.

75. G. laevigatum L., *Sp. Pl.* ed. 2, 1667 (1763). Stolons present, but often short. Stems 70–110 cm, stout, subterete at the base, with 4 weak ridges, usually glabrous; young shoots green or somewhat glaucous-pruinose. Leaves 40–75 × (3–)4–6(–11) mm, linear-lanceolate to lanceolate, widest at the middle, gradually narrowed to the apex, bright green or somewhat glaucous, usually remaining greenish when dry, membranous; margin with few rows of teeth. Inflorescence lax to dense, ovoid; pedicels usually equalling diameter of corolla. Corolla (2–)2·4–3·5(–4) mm in diameter, slightly cup-shaped to rotate; lobes almost always more or less apiculate. $2n=44$. *Mountain woods.* ● *S. & S.W. Alps, Appennini, N.W. Jugoslavia.* Au Ga He ?Hs It Ju ?Lu.

Often confused with **70** or **77**. It is quite variable, combining characters of *G. procurrens* and *G. aristatum*, sometimes also approaching *G. sylvaticum*. It is possible that populations described from the Pyrenees as *G. sylvaticum* var. *pyrenaicum* Gren. & Godron (*G. atrovirens* Lapeyr.), and extending to the mountains of N. Portugal, also belong to this taxon.

76. G. schultesii Vest, *Flora* (*Regensb.*) **4**: 530 (1821). Stolons present. Stems 30–120 cm, stout, remote, subterete at the base, with 4 weak ridges, otherwise 4-angled, usually glabrous; young shoots glaucous-pruinose. Leaves 25–60 × (3–)4–8(–12) mm, broadly oblanceolate to elliptical, widest at or above the middle, narrowing abruptly at the apex, glaucous especially beneath, usually blackish when dry; margin with few rows of teeth. Inflorescence usually dense, broadly ovoid; pedicels usually longer than diameter of corolla. Corolla (3–)4–5 mm in diameter, rotate; lobes distinctly apiculate. Ovary and fruit more or less pruinose. $2n=44$, 66. *Open woodland.* ● *C. & S.E. Europe.* ?Al Au Bu Cz Ge Hu Ju Po Rm Rs (B, C, W) Tu.

A variable species; tetraploid and hexaploid plants are very similar and the former have so far been found only in W. Jugoslavia.

77. G. sylvaticum L., *Sp. Pl.* ed. 2, 155 (1762). Stolons absent. Stems 80–100 cm, stout, bushy, terete, often with faint ridges above, glabrous; young shoots glaucous-pruinose. Leaves 20–40 × 3–10 mm, broadly oblanceolate to elliptical, widest at or above the middle, glaucous especially beneath, usually not blackish when dry, rather membranous; margin subscabrid with few rows of slender teeth. Inflorescence lax, broadly ovoid; pedicels often longer than diameter of corolla. Corolla 2–3 mm in diameter, cup-shaped, often nodding before anthesis; lobes acute. Ovary and fruit more or less pruinose. $2n=22$. *Woodland and scrub.* ● *From the Netherlands, N. Germany and N.W. Poland southwards to S.E. France, N. Italy and N.W. Jugoslavia.* Au Be Cz †Da Ga Ge He Ho Hu It Ju Po.

78. G. longifolium (Sibth. & Sm.) Griseb., *Spicil. Fl. Rumel.* **2**: 157 (1844) (*Asperula longifolia* Sibth. & Sm.). Stolons absent. Stems up to 100 cm, rounded at the base, with 4 faint ridges above, stout, glabrous; young shoots glaucous-pruinose. Leaves 30–50 × 3–6 mm, linear-lanceolate, rather abruptly narrowed to the apex, glaucous especially beneath, usually not blackish when dry, somewhat coriaceous; margin scabrid with several rows of robust papilliform teeth. Inflorescence lax, broadly ovoid; pedicels often longer than diameter of corolla. Corolla (2–)3(–4) mm in diameter, cup-shaped; lobes acute. Ovary and fruit pruinose. $2n=22$. *Woods. Turkey-in-Europe.* ?Bu ?Gr Tu. (*W. & N. Anatolia.*)

79. G. bulgaricum Velen., *Fl. Bulg.* 231 (1891). Like **78** but stems with somewhat more prominent angles; young shoots green; leaves 30–50 × (2–)3–4(–5) mm, narrowed more gradually to the apex, dark-green above, pale bluish-green beneath; pedicels usually much longer than diameter of corolla; ovary and fruit green. $2n=22$. *Dry open woods.* ● *E. Bulgaria.* Bu ?Tu.

Sect. ORIENTIGALIUM Ehrend. Perennial herbs, often with filiform stolons. Stems 4-angled, glabrous or hairy but never retrorsely aculeolate. Leaves in whorls of (5–)6–7(–8), 1-veined, obtuse, acute or with a hyaline apex. Inflorescence few-flowered, with usually ebracteate ultimate branches, sometimes reduced to single axillary flowers; pedicels stout, erect and not divaricate in fruit. Corolla infundibuliform or cup-shaped, white or pink; lobes acute or obtuse. Ovary and fruit usually glabrous, smooth or finely granulate.

80. G. saxosum (Chaix) Breistr., *Procès-Verb. Mens. Soc. Dauph. Ethnol. Archéol.* **24(182–184)**: Séance 25 fév. 1948 (sine pag.) (1948) (*Asperula saxosa* Chaix, *Galium villarsii* Req.). Laxly caespitose. Stems 5–15 cm, lax, 4-angled, glabrous. Leaves 5–12 × 1–1·5 mm, in whorls of 5–6, lanceolate to linear, with a short, cartilaginous apiculum, rather thick, flat, black when dry, glabrous and smooth. Inflorescence ovoid, with small, dense-flowered partial inflorescences; pedicels 0·5–1 mm. Corolla 2–2·2 mm, broadly cup-shaped, white, glabrous; tube 0·5–0·6 mm; lobes 1·5 mm, triangular, slightly longer than wide. Filaments *c.* 0·5 mm; anthers *c.* 0·5 mm. Fruit 2–2·7 mm, glabrous, smooth. $2n=22$. *Calcareous screes.* ● *S.W. & S.C. Alps.* Ga It.

81. G. cometerhizon Lapeyr., *Hist. Abr. Pyr., Suppl.* 154 (1818). Caespitose. Stems (2–)5–10(–15) cm, ascending, glabrous. Leaves 5–15 × 1·4–3 mm, in whorls of 5–6(–7), oblanceolate, rather obtuse, blackening when dry, glabrous. Inflorescence with few axillary flowers; pedicels 0·5–3 mm. Corolla 1·5–2 mm, cup-shaped, white; tube 0·4 mm; lobes 1·4–1·6 mm, longer than wide. Filaments 0·5 mm; anthers 0·3–0·4 mm, ovate. Fruit *c.* 2·5 mm, glabrous, finely granulate. *Siliceous screes.* ● *C. & E. Pyrenees, Corse.* Co Ga Hs.

82. G. incanum Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 91 (1806). Caespitose. Stock more or less woody, with or without stolons. Stems 2–15 cm, erect to decumbent, usually shortly hairy. Leaves (3–)4–10(–30) × 0·4–1·2(1·6) mm, in whorls of (5–)6(–8), linear to linear-lanceolate, with a short hyaline apiculum, usually hairy and blackish when dry; margin more or less recurved. Inflorescence oval to elongate, few- or many-flowered. Corolla (1·5–)1·7–2·2(–3) mm, infundibuliform to cup-shaped, white or pink; lobes lanceolate. Fruit glabrous, rarely hairy. *Calcareous rocks, screes and open grassland. Mountains of Greece and Kriti.* Cr Gr.

(a) Subsp. **incanum**: Stems 4–10(–15) cm, erect or ascending. Leaves 4–10 × 0·5–0·8 mm, linear to linear-lanceolate, acute, shining, sparsely hairy or glabrescent. Corolla *c.* 2 mm. Fruit glabrous. $2n=44$. *Greece.*

(b) Subsp. **creticum** Ehrend., *Österr. Bot. Zeitschr.* **98**: 453 (1951): Stems 2–5(–7) cm. Leaves 4–7(–10) mm, narrowly oblanceolate, rather obtuse, dull, densely hairy. Corolla 1·5–2 mm. Fruit hairy or glabrous. ● *Kriti.*

83. G. cyllenium Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 117 (1856). Densely caespitose, with a slightly woody stock. Stem 3–5(–10) cm, slender, 4-angled, glabrous. Leaves 5–10 × 0·5–1 mm, in whorls of (5–)6, narrowly lanceolate, with a long hyaline apiculum, blackening when dry; midrib prominent beneath; margin and midrib with short, antrorsely directed cilia. Inflorescence few-flowered; pedicels 0–3 mm. Corolla 1·2–1·8 mm, cup-shaped, white; tube 1–1·3 mm; lobes 0·2–0·5 mm, oval, slightly longer than wide. Filaments 0·5 mm; anthers 0·4–0·5 mm. Fruit glabrous, finely granulate. $2n=22$. *Limestone crevices above* 2000 *m.* ● *S. Greece* (*Killini Oros*). Gr.

84. G. palaeoitalicum Ehrend., *Bot. Jour. Linn. Soc.* **68**: 271 (1974). Stems (1–)3–8 cm, weak, 4-angled, glabrous, forming a cushion up to 16 cm in diameter. Leaves 2·5–5 × 0·5–0·6 mm, in whorls of 5–6, densely imbricate, finely acicular, linear, with a distinct awn, green when dry; midrib prominent beneath. Inflorescence short, 2- to 6-flowered, leafy; flowers more or less sessile. Corolla *c.* 2 mm; tube 0·3–0·5 mm; lobes *c.* 1·5 mm, longer than wide. Filaments 0·6–0·7 mm; anthers 0·4 mm. Fruit 1·3–1·5 mm, glabrous, smooth. $2n=20$. *Rocks and open alpine grassland.* ● *S. Appennini* (*Mte. Pollino*); *Alpi Apuane.* It.

This plant has not hitherto been separated from *G. olympicum* Boiss., which is confined to N.W. Anatolia.

85. G. pyrenaicum Gouan, *Obs. Bot.* 5 (1773). Forming a cushion up to 20 cm in diameter. Stems 3–7 cm, erect to ascending, 4-angled, glabrous. Leaves 4·5–6 × 0·5–0·7 mm, in whorls of **6**, imbricate, linear, acicular, distinctly awned, often blackish when dry; midrib not distinct beneath. Inflorescence elongate, few-flowered, leafy; pedicels 0·5–5 mm. Corolla 1·9–2·2 mm, cup-shaped; tube 0·4–0·5 mm; lobes 1·5–1·7 mm, slightly longer than wide. Filaments 0·6–0·8 mm; anthers 0·3–0·5 mm. Fruit *c.* 1·5 mm, glabrous, finely granulate. $2n=22$, 44. *Rocks and open alpine grassland.* ● *Pyrenees, and high mountains of N., S.E. & S. Spain.* Ga Hs.

The diploids and tetraploids cannot yet be distinguished morphologically. This species hybridizes rather extensively with **126.**

Sect. LEPTOGALIUM Lange. Perennial herbs, laxly or sometimes densely caespitose, with slender stock and rhizome, and usually with long, filiform stolons. Stems slender, often less than 30 cm, 4-angled, hairy, glabrous or sometimes retrorsely aculeolate. Leaves usually in whorls of 6–10, 1-veined, with a short cartilaginous to long hyaline apex. Inflorescence rather lax, ovoid, pyramidal or corymbose, with corymbiform partial inflorescences and usually ebracteate ultimate branches, or reduced, few-flowered and more or less leafy. Corolla rotate, purple, pink, greenish, yellowish or white; lobes acute to apiculate. Fruit dry, acutely papillose or smooth, very rarely hairy, never glochidiate.

Apart from the *G. baldense* group (**119–123**), the species pair **124–125**, and the more isolated taxa **118** and **126**, the Section comprises the closely interrelated complex of species **86–88** around *G. rubrum* and **91–117** around *G. pusillum*, as well as the hybrids **89–90** linking them. Both the complex **86–88** and especially the complex **91–117** are extremely polymorphic and are highly intricate polyploid complexes. Because of the many intermediate allopolyploid forms, taxonomic treatment, construction of keys and determinations are difficult. It is helpful to recognize, within the complex **91–117**, several even more closely related (but again overlapping) clusters of species: **94–97**, **98–100**, **102–104**, **104–110** and **111–114.**

86. G. corsicum Sprengel, *Syst. Veg.* **4(2)**: 39 (1827). Plant not black when dry, with or without stolons. Stems (5–)10–20(–30) cm, slender, usually retrorsely aculeolate, rarely also with patent hairs or glabrescent. Leaves (5–)7–12(–18) × (0·8–)1·3–1·9(–2·3) mm, in whorls of (4–)6(–7), usually 5–7 (and never more than 9) times as long as wide, lanceolate, rarely linear; apex hyaline. Inflorescence somewhat depauperate, ovoid; pedicels 1·5–2 mm, becoming divaricate after anthesis. Corolla (1·2–)1·5–2·5(–3) mm in diameter, purple, greenish, yellow or white; lobes with awn ½–1 as long as lobe. Fruit 1–1·7 mm, more or less papillose. $2n=22$, 44. *Dry places from the coast to the high mountains.* ● *Corse, Sardegna.* Co Sa.

A polymorphic species, probably with high polyploid populations in addition to the diploids and tetraploids.

87. G. obliquum Vill., *Prosp. Pl. Dauph.* 19 (1779). Like **86** but often without stolons; stems (10–)20–40(–80) cm, usually with

patent hairs at the base, sometimes retrorsely aculeolate above, rarely glabrescent; leaves (6–)9–20(–25) × (0·6–)1–2(–4) mm, in whorls of (6–)7–10(–12), (6–)7–10(–11) times as long as wide, narrowly lanceolate to linear, thin to coriaceous; inflorescence many-flowered, broadly ovoid to pyramidal; pedicels (0·4–)0·8–1·8(–2·7) mm, scarcely elongating or squarrose after flowering; corolla 0·8–2(–2·7) mm in diameter, yellow, greenish or purple; lobes awned, the awn ⅓–⅔ as long as lobe. $2n=22$, 44. *Dry, stony places.* ● *Cévennes, Jura, S.W. Alps, Appennini and adjacent lowlands.* Ga It.

A variable polyploid complex, differentiated both ecologically and geographically, and composed of various diploid and tetraploid races. Several of the following supposed species might possibly be regarded as subspecies: **G. alpicola** Jordan, *Obs. Pl. Crit.* **3**: 131 (1846), **G. brachypodum** Jordan, *op. cit.* 130 (1846) (*G. corsicum* subsp. *brachypodum* (Jordan) Arcangeli), **G. gracilentum** Jordan, *op. cit.* 126 (1846), **G. luteolum** Jordan, *op. cit.* 128 (1846), **G. myrianthum** Jordan, *op. cit.* 126 (1846), **G. rubidum** Jordan, *op. cit.* 121 (1846), **G. leucophaeum** Gren. & Godron, *Fl. Fr.* **2**: 28 (1851). In zones of contact **87** is sometimes difficult to distinguish from **88**.

88. G. rubrum L., *Sp. Pl.* 107 (1753). Plant not black when dry, with stolons; stems usually 20–50 cm, slender, usually retrorsely aculeolate above, almost always with patent hairs at the base; internodes long. Leaves (12–)15–23(–28) × (1·5–)1·7–2·5(–3) mm, in whorls of 7–8(–9), 7–9(–10) times as long as wide, oblanceolate, thin; apex hyaline. Inflorescence ovoid-oblong, many-flowered; pedicels 1·5–2·2 mm, scarcely elongating or divaricate after anthesis. Corolla usually 1·5–2 mm in diameter, dark purple; lobes with awn at least ½ as long as lobe. Fruit *c.* 1·5 mm, more or less papillose. $2n=88$. *Woods; somewhat calcifuge.* ● *Foothills of S. Alps and N. Appennini.* He It.

89. G. × centroniae Cariot, *Ann. Soc. Bot. Lyon* **6**: 13 (1879) (*G. pumilum* × *rubrum*). Like **88** but stems 25–50 cm, often without patent hairs; inflorescences short; corolla *c.* 2 mm in diameter, purple to pink; lobes with shorter awn; fruit larger and smoother. $2n=88$. *Woods and grassland; often in the absence of one or both parent species.* ● *Alps.* Au Ga He It Ju.

Forms a continuous series between the parents and extends far beyond the area of **88**. It differs from **103** especially in the colour and form of the flower.

90. G. × carmineum Beauverd, *Bull. Soc. Bot. Genève* ser. 2, **27**: 92 (1937) (*G. anisophyllon* × *centroniae*). Like **88** but of compact habit; stems 10–15 cm, often without patent hairs; leaves broadly oblanceolate; inflorescence more or less corymbose; corolla reddish; lobes more or less awned; fruit more than 1·5 mm. *Alpine grassland; somewhat calcifuge.* ● *S. Alps.* Ga He It.

Links **88**, via **89**, with octoploid variants of **112**.

91. G. balearicum Briq., *Annu. Cons. Jard. Bot. Genève* **11–12**: 191 (1908). Densely caespitose with numerous filiform stolons. Stems 5–10 cm, slender, somewhat rough to almost smooth. Leaves (2·2–)2·5–5 × 0·6–0·9 mm, in whorls of 5–6, the lower ovate, the upper lanceolate, 4–6 times as long as wide; upper surface and margin antrorsely scabrid; hyaline apex short. Inflorescence few-flowered; pedicels 0·8–1·1 mm, more or less divaricate after flowering. Corolla 1·4–2 mm in diameter, bright purple; lobes not apiculate. Fruit *c.* 1·2 mm, dull, obtusely papillose. *Rocky grassland and scrub on limestone mountains.* ● *Mallorca.* Bl.

92. G. valentinum Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1881**: 95 (1882). Laxly caespitose, with filiform stolons. Stems 10–20 cm, slender, retrorsely aculeolate. Leaves (3·5–)5–6(–8) × (1·1–)1·3–1·6(–2·4) mm, in whorls of 6–7, 3–4 times as long as wide; upper surface and margin antrorsely scabridulous; hyaline apex short. Inflorescence relatively many-flowered, ovoid; pedicels 0·5–0·8 mm, divaricate after flowering. Corolla 1·7–2 mm in diameter, yellowish, or suffused with red; lobes not apiculate. Fruit *c.* 1 mm, shining, papillose. *Rocky places on limestone.* ● *Mountains of E. & S.E. Spain.* Hs.

93. G. rosellum (Boiss.) Boiss. & Reuter, *Pugillus* 52 (1852). Laxly caespitose, with long, filiform stolons. Stems (5–)8–15(–25) cm, slender, glabrous, smooth. Leaves (4–)6–10(–15) × (1–)1·2–2·4(–3) mm, in whorls of 6(–8), oblanceolate, 4–5 times as long as wide; upper surface and margin antrorsely scabrid; hyaline apex very short. Inflorescence ovoid; partial inflorescences dense; pedicels 0·3–0·5 mm, rather stout. Corolla 1·8–2·8 mm in diameter, flesh-coloured to pink; lobes not apiculate. Fruit 1·3–1·4 mm, scarcely shining, papillose. $2n=22$. *Screes.* ● *Mountains of S. Spain.* Hs.

94. G. helodes Hoffmanns. & Link, *Fl. Port.* **2**: 47 (1820–1824). Plant dark green when dry, with short, subterranean stolons. Stems (15–)20–30(–70) cm, less than 1·5 mm in diameter, arising singly, slender, weak, retrorsely aculeolate and quite rough; middle internodes 3–5 times as long as the leaves. Leaves (5–)9–15(–30) × (1–)1·2–2·2(–4) mm, in whorls of (5–)6(–7), narrowly oblanceolate, 6–8½ times as long as wide; upper surface and margin with dense antrorse scabridity; apex hyaline. Inflorescence broadly pyramidal, intricately branched, many-flowered. Pedicels 1–1·5 mm, capillary. Corolla *c.* 2·4 mm in diameter, white, rarely suffused with pink; lobes acute. Fruit *c.* 1·4 mm, obtusely papillose, more or less shining. $2n=22$. *Grassy places and open scrub.* ● *Portugal, N.W. Spain.* Hs Lu.

It is not always easy to distinguish this species from **95** and **96** in zones of contact.

95. G. rivulare Boiss. & Reuter, *Diagn. Pl. Nov. Hisp.* 15 (1842). Like **94** but green to brownish when dry, with long, subterranean stolons; stems (15–)20–60(–80) cm, often more than 1 mm in diameter, with white angles, mostly with patent hairs as well as retrorsely aculeolate, or subglabrous; middle internodes 1½–4 times as long as leaves; leaves (11–)14–25(–30) × (1·4–)1·6–2·8(–3·8) mm, in whorls of 6(–8), usually 7½–10 times as long as wide, very thin, somewhat paler beneath; inflorescence ovoid-oblong; pedicels *c.* 1·3 mm, slender; corolla 2–2·8 mm in diameter; fruit dull. $2n=22$. *Damp or shady places from the coast to the mountains.* ● *N. & C. Spain, N. Portugal.* Hs Lu.

Populations at high altitudes tend to be glabrous.

96. G. asturiocantabricum Ehrend., *Sitz.-Ber. Akad. Wiss. Wien (Math.-Nat. Kl., Abt. I)* **169**: 409 (1960). Like **94** but mostly blackish when dry, with long, subterranean stolons; stems 20–40 cm, more than 1 mm in diameter, retrorsely aculeolate or glabrescent; leaves 17–21 × 2–3 mm, in whorls of 6–7, scabridulous especially on margin; inflorescence broadly pyramidal; pedicels 1·5–2 mm, not particularly slender; corolla *c.* 3 mm in diameter; fruit 1·5–2 mm, dull. $2n=88$. *Damp shady places.* ● *Mountains of N.W. Spain.* Hs.

Hybrids with **99** have more or less smooth stems.

97. G. papillosum Lapeyr., *Hist. Abr. Pyr.* 66 (1813). Like **94** but dark green to brownish when dry, with short, subterranean stolons; stems (10–)20–60(–80) cm, more than 1 mm in diameter,

more or less retrorsely aculeolate, but also hairy in places, or sometimes entirely glabrous and smooth; middle internodes 2–4 times as long as the leaves; leaves (8–)10–25(–30) × (0·8–)1·2–2(2·8) mm, in whorls of (7–)8–9(–10), 9–14 times as long as wide, thin to somewhat coriaceous, upper surface and margin antrorsely scabrid or hairy; inflorescence broadly pyramidal, branches from lower third of stem; pedicels 0·5–1·2 mm, flowers crowded; corolla 1·5–2·5 mm in diameter; fruit *c.* 1·5 mm, smooth to obtusely papillose, more or less shining. $2n=22$, 44. *Dry places.* ● *N.E. Spain, E. Pyrenees.* Ga Hs.

Octoploid individuals ($2n=88$) with stems not retrorsely aculeolate form transitions to **99**, especially in the mountains and on the N. side of the Pyrenees.

98. G. pinetorum Ehrend., *Sitz.-Ber. Akad. Wiss. Wien (Math.-Nat. Kl., Abt. I)* **169**: 410 (1960). Plant greenish to brownish when dry, laxly caespitose, with stolons. Stems (5–)7–25(–40) cm, rather slender, usually glabrous and smooth, rarely hairy, never retrorsely aculeolate, usually reddish at the base; middle internodes 2–4 times as long as the leaves. Leaves (4–)5–12(–19) × (0·7–)0·9–1·2(–3·3) mm, in whorls of (6–)7–8(–10), lanceolate to linear-lanceolate, 5–12 times as long as wide, often somewhat coriaceous; upper surface and margin almost always antrorsely scabrid; hyaline apex 0·3–0·6 mm. Inflorescence pyramidal to ovoid-corymbose, many-flowered; pedicels 0·4–1 mm. Corolla (1·9–)2·1–2·8(–3·3) mm in diameter, white or pale yellow; lobes acute. Mean diameter of pollen grains 16–22 μ. Fruit 1·2–1·5 mm, more or less dull. $2n=22$, 44. *Dry places.* ● *Mountains of Spain, extending to S. France (Corbières).* Ga Hs.

Very polymorphic in relation to both habitat and location. In transitional habitats, intermediates, apparently hybrids with **92** and **117**, and with **97**, **99** and **100**, are found.

99. G. marchandii Roemer & Schultes, *Syst. Veg.* **3**: 528 (1818) (*G. lapeyrousianum* Jordan). Like **98** but usually dark grey-brown to blackish when dry, laxly to densely caespitose; stems (5–)7–20(–40) cm, rather stout, usually glabrous, scarcely reddish at the base; middle internodes often *c.* 1–2 times as long as the leaves; leaves (5–)7–17(–23) × (0·7)1·1–2·3(–2·9) mm, in whorls of (7–)8–9(–10), oblanceolate, widest in the distal quarter, 7–9 times as long as wide, thickish, antrorsely scabrid, rarely glabrescent or with patent hairs; inflorescence broadly pyramidal to corymbose; pedicels 1–1·5 mm; corolla (2–)2·5–3(–4) mm in diameter; mean diameter of pollen grains more than 22 μ; fruit *c.* 1·5 mm. $2n=88$. *Woods and grassland.* ● *Mountains of N. Spain and C. France.* Ga Hs.

Very polymorphic, and connected through transitional forms with **96**, **97** and **98** and especially with **103** north of the Pyrenees.

100. G. nevadense Boiss. & Reuter in Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 115 (1856). Like **98** but greenish when dry, caespitose; stems (5–)7–15(–20) cm, ascending, almost always glabrous and smooth, scarcely red at the base; middle internodes up to twice as long as the leaves; leaves (5–)6–10(–12) × (0·9–)1·1–1·9(–2·3) mm, in whorls of (6–)7(–9), oblanceolate, thin and membranous, 5–7 times as long as wide, usually antrorsely scabridulous on the margin only, or glabrescent; inflorescence ovoid to corymbose; pedicels 1–1·5 mm; corolla 2–2·6 mm in diameter, white to pale yellow; mean diameter of pollen grains less than 19 μ; fruit *c.* 1·1 mm. $2n=22$. *Damp shady, rocky places. High mountains of S. Spain.* Hs. (*N.W. Africa.*)

101. G. timeroyi Jordan, *Obs. Pl. Crit.* **3**: 138 (1846) (*G. jordanii* Loret & Barrandon). Plant greenish when dry; stock with short, scarcely rooting stolons. Stems (7–)15–30(–40) cm, bushy, rather slender, almost always glabrous and smooth, reddish at the base; middle internodes 2–3(–4) times as long as the leaves. Leaves (5–)7–10(–15) × (0·5–)0·7–0·9(–1·7) mm, in whorls of (8–)9–10(–12), linear to narrowly lanceolate, mostly 9–11 times as long as wide, more or less coriaceous; upper surface and margin antrorsely scabrid or glabrescent; hyaline apex shorter than leaf-width. Inflorescence ovoid-elongate to narrowly pyramidal, many-flowered; pedicels 0·8–1 mm, more or less divaricate after flowering. Corolla 1·5–2(–2·4) mm in diameter; lobes acute. Fruit 1–1·3 mm, brownish. $2n=22$. *Dry places; somewhat calcicole.* ● *S., C. & E. France.* Ga.

102. G. fleurotii Jordan, *Cat. Jard. Grenoble* **1849**: 2 (1849). Plant often dark or blackish when dry, densely caespitose, with numerous stolons. Stems 10–25(–50) cm, rather stout, glabrous, or with patent hairs, scarcely red at the base; basal internodes very short, with persistent leaves; middle internodes 2–4 times as long as the leaves. Leaves (5–)6–10(–13) × 0·5–1(–1·4) mm, in whorls of 8–9(–10), linear-lanceolate or narrowly oblanceolate and straight, 8–11 times as long as wide, more or less coriaceous, with patent or retrorse scabridity, or with patent hairs, or glabrescent. Inflorescence rather dense, ovoid-oblong to narrowly pyramidal, with short lateral branches; pedicels mostly 0·8–1 mm. Corolla 2·3–2·6 mm in diameter. Fruit *c.* 1·4 mm, more or less papillose. $2n=44$, 88. *Calcareous screes and cliffs.* ● *C. France to S. England.* Br Ga.

Close to **101**, and sometimes difficult to distinguish from **103**.

103. G. pumilum Murray, *Prodr. Stirp. Götting.* 44 (1770) (*G. asperum* Schreber, *G. laeve* Thuill., *G. sylvestre* Pollich, non Scop.). Like **102** but greenish-brown when dry, laxly caespitose, with few stolons; stems (10–)15–30(–70) cm, not red at the base; basal internodes very short, with deciduous leaves; middle internodes mostly 2–4 times as long as the leaves; leaves (8–)10–16 (–30) × (1–)1·2–1·6(–3) mm, in whorls of up to (7–)8–9(–10), usually narrowly oblanceolate and more or less falcate; inflorescence rather lax, usually with rather short branches for less than half its length; pedicels 1–1·5 mm; corolla 2–3 mm in diameter; fruit smooth to obtusely papillose. $2n=(66)$, 88. *Open woods and grassland.* ● *W. & C. Europe, extending eastwards to the Kaliningradskaja Oblast'.* Au Be Br Cz Da Ga Ge He Ho Hu It Ju Po Rm Rs (B) [Fe Su].

Rather variable, approaching **104**, and connected by hybrid intermediates with it, with **88**, **89**, **99** and with octoploid populations of **102** and **112**.

104. G. valdepilosum H. Braun in Form., *Beitr. Fl. Mittl. Südl. Mähr.* 43 (1886). Plant greenish when dry, somewhat caespitose, with few non-flowering shoots at anthesis, with stolons. Stems (9–)15–30(–40) cm, ascending to erect, mostly more than 0·7 mm in diameter, often with patent hairs, reddish at the base; basal internodes very short; middle internodes 1½–4½ times as long as the leaves. Leaves (9–)11–18(–24) × 0·8–2·3 mm, in whorls of (6–)7–8(–9), linear-lanceolate to narrowly oblanceolate, straight, (6–)8–16(–18) times as long as wide, rather thin. Inflorescence ovoid-elongate to broadly pyramidal, the partial inflorescences somewhat dense; pedicels 0·8–1·1 mm. Corolla 2–3·5 mm in diameter; lobes acute. Fruit 1–1·5 mm, obtusely to acutely papillose. $2n=22$, 44. *Dry grassland and open woods.* ● *From S.E. Germany to W. Ukraine; S. & C. Denmark.* Au Cz Da Ge Po Rs (W).

A variable species with a disjunct distribution. The populations from Denmark have been distinguished as subsp. **slesvicense** (Sterner) Ehrend., *Pl. Syst. Evol.* **124**: 177 (1975).

105. G. suecicum (Sterner) Ehrend., *Sitz.-Ber. Akad. Wiss. Wien* (*Math.-Nat. Kl., Abt. I*) **169**: 417 (1960) (*G. pumilum* subsp. *suecicum* Sterner). Plant greenish when dry, caespitose, with few non-flowering stems at anthesis. Stems 8–20(–30) cm, ascending to erect, slender, less than 0·7 mm in diameter, glabrous or with patent hairs; middle internodes 4–6 cm, 3–6 times as long as the leaves. Leaves 7–12(–15) × (0·6–)0·9–1·3(–1·7) mm, in whorls of (6–)7–8(–9), linear-oblanceolate, 7½–10½ times as long as wide. Inflorescence occupying more than half of the stem, laxly pyramidal, the partial inflorescences dense; pedicels *c.* 0·5 mm. Corolla 1–2·3(–3) mm in diameter. Fruit 1–1·2 mm, acutely papillose. $2n=22$. *Dry grassland and scrub.* ● *N.E. Germany; S. & C. Sweden.* Ge Su.

106. G. oelandicum (Sterner & Hyl.) Ehrend., *op. cit.* 418 (1960) (*G. pumilum* subsp. *oelandicum* Sterner & Hyl.). Plant metallic green when dry, densely caespitose, with many non-flowering stems at anthesis. Stems (4–)6–15(–20) cm, ascending, less than 0·6 mm in diameter, glabrous, red at the base; middle internodes up to 4 cm, 3–5 times as long as the leaves. Leaves (4–)10 × 0·9–1·5 mm, in whorls of (8–)9(–10), linear-oblanceolate, 6–8 times as long as wide. Inflorescence pyramidal, lax; partial inflorescences dense; pedicels *c.* 0·5 mm. Corolla 2·2–2·8 mm in diameter. Fruit *c.* 1 mm, acutely papillose. $2n=22$. *Stony and grassy places.* ● *Öland.* Su.

107. G. cracoviense Ehrend., *op. cit.* 419 (1960). Like **106** but the middle internodes up to 2·5 cm, 1½–2½ times as long as the leaves; leaves mostly in whorls of 6–7; inflorescence corymbose; pedicels up to 0·9 mm. $2n=22$. *Calcareous rocks.* ● *S. Poland* (*Olsztyn, near Krakow*). Po.

108. G. sudeticum Tausch, *Flora* (*Regensb.*) **18**: 347 (1835). Plant usually blackish when dry, laxly caespitose, with some non-flowering stems at anthesis. Stems (5–)7–20(–30) cm, ascending to erect, stout, glabrous; middle internodes mostly 1½–2½ times as long as the leaves. Leaves (5–)8–14(–23) × (0·8–)1–1·2(–3·5) mm, in whorls of (6–)7(–8), oblanceolate, 5½–8½ times as long as wide, widest just below the hyaline apex, rather thick, those at the base soon deciduous, the margin almost always smooth. Inflorescence broadly obovoid, corymbose; pedicels 1·5–2 mm, more or less divaricate after flowering. Corolla *c.* 3 mm in diameter. Fruit *c.* 1·3 mm, blackish, papillose. *Rocky places, often on basaltic or serpentine soils.* ● *Mountains of N.W. Czechoslovakia and adjacent territories.* Cz Ge Po.

The populations of the higher Sudeten mountains approximate to **112**.

109. G. sterneri Ehrend., *Sitz-Ber. Akad. Wiss. Wien* (*Math.-Nat. Kl., Abt. I*) **169**: 420 (1960). Plant usually dark to blackish when dry, caespitose, with many non-flowering stems at anthesis. Stems (5–)8–15(–25) cm, ascending, slender, usually glabrous, rarely with patent hairs, often red at the base; middle internodes 2–5 cm, usually 2–3½ times as long as the leaves. Leaves (5–)7–11 (–15) × 0·9–1·6(–2·3) mm, in whorls of (6–)7–8(–10), 6½–8½ times (–15) × 0·9–1·6(–2·3) mm, in whorls of (6–)7–8(–10), 6½–8½ times as long as wide, narrowly oblanceolate, widest above the middle, those at the base more or less persistent; apex hyaline. Inflorescence pyramidal; partial inflorescences lax; pedicels 1–2 mm. Corolla 2·3–3·3 mm in diameter. Fruit 1·1–1·4 mm, acutely papillose. $2n=22, 44$. *Dry grassland and rocky ground.* ● *N.W. Europe.* Br Da Fa Ge Hb No.

A variable species. Slender diploid plants are found on the W. coast of Britain and in Ireland; elsewhere only tetraploids are known. The compact plants of the Faeröer are connected with **110**. Hybrid intermediates with **104** are known from Denmark, and with **118** (with pentaploid and hexaploid chromosome numbers) from Britain.

110. G. normanii O. C. Dahl, *Skr. Vid.-Selsk. Kristiania* **1914(4)**: 136 (1915). Like **109** but habit more compact; internodes usually 1½–2½ times as long as the leaves; leaves (3·5–)5–10 (–18) × (0·6–)1–1·8(–2·3) mm, broadly oblanceolate, usually 5–7 times as long as wide; corolla 3–4 mm in diameter, yellowish-white. $2n=44$. *Heaths and dry grassland.* ● *Iceland; two stations in W. Norway.* Is No.

111. G. austriacum Jacq., *Fl. Austr.* **1**: 51 (1773). Plant shining metallic green when dry, caespitose, with stolons. Stems (8–)12–20(–30) cm, scarcely more than 0·8 mm in diameter, usually glabrous and smooth, sometimes with patent hairs, red at the base; middle internodes (2–)3–4(–5) cm, 1½–2½ times as long as the leaves. Leaves (7–)10–20(–28) × 0·5–1·2(–2·2) mm, usually in whorls of 7–9, linear-lanceolate to linear, (10–)11–24(–27) times as long as wide, somewhat coriaceous; margin more or less revolute, with some patent or retrorse scabridity, sometimes glabrescent or hairy. Inflorescence with long branches almost from the base, broadly ovoid, many-flowered, the partial inflorescences lax; pedicels 1–2 mm. Corolla 1–3 mm in diameter, whitish; lobes acute. Fruit 1–1·5 mm, smooth or obtusely papillose. $2n=22$, 44. *Grassland and coniferous woodland; calcicole.* ● *S.C. Europe, from the E. Alps to the W. Carpathians.* Au Cz Hu ?It Ju.

Various eco-geographical diploid and tetraploid races may deserve the rank of subspecies. Plants transitional to **112** occur in the Alps and Carpathians.

112. G. anisophyllon Vill., *Prosp. Pl. Dauph.* 20 (1779). Plant greenish, brownish or blackish when dry, often not shining, caespitose, with stolons. Stems (3–)7–15(–25) cm, slender to stout, glabrous and smooth, or with patent hairs, scarcely reddish at the base; middle internodes often less than 3 cm, 1–2 times as long as the leaves. Leaves (4–)7–16(–21) × (0·5–)1–2(–3) mm, usually in whorls of 7–9, oblanceolate, usually 6–12 times as long as wide, widest in the upper ⅓ to ½, usually abruptly contracted to a short hyaline apex; margin more or less revolute, with patent or retrorse (or rarely antrorse) scabridity, rarely glabrescent or with patent hairs. Inflorescence corymbose to broadly ovoid, few- to many-flowered; pedicels 1–2 mm. Corolla 2–4 mm in diameter, usually yellowish-white. Fruit 1·2–1·8 mm, nearly smooth to obtusely (rarely acutely) papillose. $2n=22$, 44, 66, 88, 110. ● *Mountains of S. & C. Europe from the Cévennes to Bulgaria and northwards to the C. Carpathians.* Al Au Bu Cz Ga Ge Gr He It Ju Po Rm Rs (W).

A polymorphic polyploid complex. The cytotypes replace one another vicariously both ecologically and geographically, but morphologically are often scarcely distinguishable. **G. tenue** Vill., *loc. cit.* (1779) (diploid), **G. alpestre** Gaudin in Roemer & Schultes, *Syst. Veg.* **3**: 225 (1818) (octoploid) and others have been described as species. It is possible that a classification into subspecies might be made. Separation is made additionally difficult by the occurrence of hybrid intermediates with other species, e.g. in the W. Alps with **113** and **115**, in the C. Alps with **103** and **90** and at lower altitudes of the E. Alps and the W. Carpathians with **111**. **99** is sometimes very similar.

113. G. pseudohelveticum Ehrend., *Sitz.-Ber. Akad. Wiss. Wien* (*Math.-Nat. Kl., Abt. I*) **169**: 415 (1960). Plant rather dirty green when dry, densely caespitose, with stolons, a tap-root and numerous ascending non-flowering and flowering stems. Stems (5–)8–12(–15) cm, glabrous and smooth; middle internodes

1–2·5 cm. Leaves (5–)7–11(–14) × 1–2(–2·2) mm, in whorls of 7–8, mostly 5–6½ times as long as wide, cuneate-oblanceolate, somewhat thick and fleshy, more or less dull; margin antrorsely ciliolate, flat; hyaline apex *c.* 0·3 mm. Inflorescence corymbose, rather few-flowered and with few bracts, the ultimate branches often ebracteate; pedicels 1·6–2·2 mm, more or less erect and scarcely elongating after flowering. Corolla 3–4 mm in diameter, yellowish-white; lobes acute. Fruit 1·4–1·7 mm, more or less smooth, reddish-brown. $2n=44$. *Calcareous and schistose screes.* ● *S.W. Alps.* Ga It.

An allopolyploid species, not always clearly separable from the diploid and tetraploid plants of **112** and **114**.

114. G. megalospermum All., *Pl. Pedem.* **1**: **9** (1785) (*G. helveticum* Weigel). Like **113** but flowering and non-flowering stems decumbent; flowering stems scarcely more than 10 cm; internodes usually less than 2 cm; leaves 4–11 × 1–2·1 mm, in whorls of 6–7(–8), 3½–5 times as long as wide, broadly oblanceolate to narrowly obovate, dull; hyaline apex less than 0·3 mm; inflorescence ovoid, bracteate to the ultimate branches; pedicels more than 2·2 mm, deflexed and elongated after flowering; fruit 2–2·5 mm. $2n=22, 44$. *Calcareous and schistose screes.* ● *Alps.* Au Ga Ge He It.

Diploid and tetraploid plants are morphologically almost indistinguishable; the tetraploids are at present known only from the W. Alps.

115. G. pusillum L., *Sp. Pl.* 106 (1753). Densely caespitose, with many stems, usually glabrous and shining (rarely more or less hairy), with or without stolons. Stems (3–)4–8(–12) cm, stiff; middle internodes short, up to as long as the leaves. Leaves 4–10(–13) × 0·3–0·9(–1·2) mm, linear to acicular, almost always more than 10 times as long as wide, coriaceous, smooth (rarely scabridulous or hairy); margin more or less flat, thickened; midrib thickened, occupying ⅓–½ of the width of the leaf; hyaline apex 0·5–0·9 mm. Inflorescence rather few-flowered, corymbose. Corolla 2–3 mm in diameter, white or yellowish; lobes acute. Fruit 1–1·5 mm, more or less smooth, dull. $2n=22, 88$. *Mountain rocks; calcicole.* ● *S.E. France, N.W. Italy.* Ga It.

Very variable. **G. hypnoides** Vill., *Hist. Pl. Dauph.* **2**: 323 (1787) and **G. jussiei** Vill., *Prosp. Pl. Dauph.* 20 (1779), which belong here, may deserve the rank of subspecies. When there is contact with **112**, intermediates may be found.

116. G. brockmannii Briq., *Annu. Cons. Jard. Bot. Genève* **10**: 107 (1907). Densely caespitose, densely hairy, without stolons. Stems 5–7 cm, stiff; middle internodes ¾–1½ times as long as the leaves. Leaves 4–7(–9) × 0·5–0·9(–1·4) mm, linear-lanceolate, mostly 7–8 times as long as wide, coriaceous; margins more or less revolute; midrib thickened, occupying *c.* ¼ of the width of the leaf; hyaline apex 0·6–0·8 mm. Inflorescence rather few-flowered, corymbose. Corolla 1·9–2·3 mm in diameter, white or suffused with pink. Fruit *c.* 1·5 mm, more or less smooth. $2n=22$. *Calcareous rock-crevices.* ● *N.E. Spain.* Hs.

117. G. idubedae (Pau ex Debeaux) Pau ex Ehrend., *Sitz.-Ber. Akad. Wiss. Wien* (*Math.-Nat. Kl., Abt. I*) **169**: 412 (1960) (*G. valentinum* var. *idubedae* Pau ex Debeaux). Caespitose, usually glabrous and shining, with short stolons. Stems (3–)5–25(–35) cm; middle internodes shorter than or up to twice as long as the leaves. Leaves 5–12(–16) × 0·3–0·6(–1·2) mm, acicular, 13–20 times as long as wide; margin more or less thickened, flat; midrib somewhat thickened, occupying *c.* ¼ of the width of the leaf; hyaline apex (0·3–)0·6–1 mm. Inflorescence few- to many-flowered, more or less corymbose. Corolla 2–2·5(–3·5) mm in diameter. Fruit 1–1·5 mm, weakly papillose. $2n=22$. *Rocks and screes.* ● *Mountains of C. Spain.* Hs.

Very variable in habit. Occasionally intermediates with **98** are found.

118. G. saxatile L., *Sp. Pl.* 106 (1753) (*G. harcynicum* Weigel). Laxly caespitose, blackish-brown when dry, with slender tap-root and filiform, more or less rooting stolons. Stems (8–)15–35(–40) cm, ascending, glabrous and smooth; middle internodes mostly 3–5 times as long as the leaves. Leaves 4–11(–15) × (0·5–)1·5–2·5 (–3·5) mm, in whorls of (5–)6–7(–8), the lower obovate, the upper oblanceolate, widest in the uppermost quarter, abruptly contracted into a short hyaline awn, thin; margin almost always antrorsely ciliolate, weakly revolute; midrib slender, distinct. Inflorescence elongate-interrupted, ovoid, with short branches. Pedicels 2–5 mm, divaricate after flowering. Corolla 2·5–4 mm in diameter, white, indistinctly infundibuliform at the base; lobes flat, patent, acute. Fruit 1–1·6 mm, acutely papillose. $2n=22$, 44. *Pastures, heaths and scrub; calcifuge.* ● *W. & W.C. Europe, extending eastwards very locally to N.W. Russia and C. Carpathians.* Au Az Be Br Cz Da Fa Ga Ge Hb He Ho Hs Ju Lu No Po Rs (C, W) Su [*Fe].

Diploid plants are smaller in all parts with internodes not more than 3 cm, leaves not more than 5 mm, and fruits *c.* 1 mm; they seem to be limited to the mountains of C. & N. Portugal and N.W. & C. Spain and have been separated as subsp. **vivianum** (Kliphuis) Ehrend., *Pl. Syst. Evol.* **124**: 176 (1975).

(119–123). G. baldense group. Plants blackish when dry, caespitose, glabrous and smooth. Tap-root and stock slender, with stolons. Stems not more than 15 cm, not much branched, with short internodes. Lower leaves in whorls of 5–10, broadly oblanceolate to linear, somewhat fleshy and rather thick, wrinkled and often shining when dry; margin more or less flat, not scabridulous; midrib scarcely visible; apex short, cartilaginous. Inflorescence small but relatively many-flowered, the branches with bracts which are not leaf-like. Corolla rotate, yellowish-white; lobes acute. Fruit nearly smooth to obtusely papillose.

1 Lower leaves ovate, densely papillose, upper linear-lanceolate, smooth **121. margaritaceum**
1 Upper and lower leaves similar, linear to lanceolate, smooth
2 Middle cauline leaves oblanceolate; inflorescence broadly ovoid; pedicels divaricate after flowering
3 Densely caespitose, with short stolons; inflorescence oblong; pedicels slender in fruit **119. tendae**
3 Laxly caespitose, with long stolons; inflorescence compact; pedicels thickened in fruit **120. magellense**
2 Middle cauline leaves narrowly lanceolate; inflorescence narrowly pyramidal; pedicels erect after flowering
4 Largest leaves less than 1 mm wide; mean diameter of pollen grains 20·5–21·5 μ **122. baldense**
4 Largest leaves more than 1 mm wide; mean diameter of pollen grains 22–24 μ **123. noricum**

119. G. tendae Reichenb. fil., *Icon. Fl. Germ.* **17**: 97 (1855). Densely caespitose; stolons very short. Stems 7–15 cm, slender. Leaves 6–10 × 1–1·5 mm, in whorls of (5–)6–8(–9), oblanceolate, smooth. Inflorescence ovoid-oblong, many-flowered; pedicels slender, divaricate. Corolla 2·5–3 mm in diameter. $2n=22$. *Siliceous rock-crevices.* ● *S.W. Alps.* Ga It.

120. G. magellense Ten., *Succ. Relaz. Viagg. Abruzzo* **48** (1832). More or less laxly caespitose; stolons very long. Stems 5–9 cm. Leaves (5–)6–8(–9) × 1–1·5 mm, in whorls of (6–)7–9 (–10), oblanceolate, smooth. Inflorescence broadly ovoid, compact, many-flowered; pedicels thickened, more or less divaricate.

Corolla 3–4 mm in diameter. $2n=22$. *Calcareous screes.* ● *C. & S. Appennini.* It.

121. G. margaritaceum A. Kerner, *Zeitschr. Ferdinand.* (*Innsbruck*) ser. 3, **15**: 252 (1870). Stems 4–7·5 cm. Leaves in whorls of 6–8(–9); lower leaves ovate, coriaceous, densely papillose, especially on the upper surface; upper leaves 3·5–5(–6) × 0·8–1·3 mm, linear-lanceolate, smooth. Inflorescence narrowly pyramidal, somewhat acute; pedicels slender, erect. Corolla 3–3·5(–4) mm in diameter. $2n=22$. *Calcareous screes.* ● *S.E. Alps from* 12° *to* 12° 30′ *E.* It.

122. G. baldense Sprengel, *Pugillus* **1**: 10 (1813). Stems 4·5–7 cm. Leaves 5–7(–10) × 0·5–0·8(–1·1) mm, in whorls of (6–)8–9(–10), linear-lanceolate, smooth. Inflorescence narrowly pyramidal, somewhat acute, many-flowered; pedicels slender, erect. Corolla 3–3·5 mm in diameter. Mean diameter of pollen grains 20·5–21·5 μ. $2n=22$. *Calcareous grassland.* ● *S.E. Alps from* 9° 45′ *to* 12° *E.* It.

123. G. noricum Ehrend., *Österr. Bot. Zeitschr.* **100**: 672 (1953). Like **122** but stems 4–14 cm, ascending; leaves 5–9(–12) × (0·9–)1·1–1·5(–2) mm; corolla 3·5–5 mm in diameter; mean diameter of pollen grains 22–24 μ. $2n=44$. *Calcareous grassland.* ● *E. Alps, extending to S. Slovenija.* Au Ge It Ju.

124. G. demissum Boiss., *Diagn. Pl. Or. Nov.* **1(3)**: 40 (1843) (*G. pedunculatum* Stoj. & Stefanov). Caespitose. Stems 3–8 cm, glabrous and smooth. Leaves (3–)5–6(–8) × (1–)1·3–2·5 mm, in whorls of (4–)5–6, flat, broadly oblanceolate, with short cartilaginous apex, smooth, scarcely decreasing in the inflorescence. Inflorescence very few-flowered; bracts leaf-like. Corolla 2·5–3 mm in diameter, yellowish-brown or greenish; lobes acute. Fruit smooth, glabrous. $2n=22$. *Snow-patches on calcareous soil. S. Bulgaria, N.E. Greece.* Bu Gr.

125. G. stojanovii Degen, *Magyar Bot. Lapok* **19**: 48 (1922). Like **124** but stems (1·5–)2–4(–8) cm, more or less densely hairy; leaves (2·5–)3–5(–6) × 1–3 mm, softly hairy; pedicels (1·3–)1·5–5(–7) mm, glabrous; corolla greenish-brown, hairy externally; fruit more or less densely hairy. $2n=22$. *Exposed calcareous rocks.* ● *S.W. Bulgaria (Pirin Pl.).* Bu.

Doubtfully distinct from **124**; intermediate individuals occur on the Pirin Planina.

126. G. cespitosum Lam., *Tabl. Encycl. Méth. Bot.* **1**: 262 (1792). Plant blackish-brown when dry, forming a flat cushion up to *c.* 25 cm in diameter, quite glabrous and smooth, with slender tap-root, filiform stock and stolons. Stems (2·5–)3–5(–8) cm, with short internodes. Leaves (3–)3·5–5(–7) × 0·4–0·6 mm, usually in whorls of 8–10, linear, rather thin, shining, smooth; margins flat, more or less thickened; midrib occupying *c.* ¼ of the width of leaf, indistinct; hyaline apex 0·5–1 mm. Inflorescence corymbose, leafy, very few-flowered; pedicels 1–3 mm. Corolla 2–4 mm in diameter, more or less flat, yellowish-white; lobes acute. Fruit *c.* 1·5 mm, faintly papillose, shining. $2n=22$. *Alpine schistose screes.* ● *Pyrenees.* Ga Hs.

In the zone of contact with **85** (*G. pyrenaicum*), tetraploid hybrids are not rare. They differ from **126** particularly in the coarser leaves which do not turn so dark on drying, and in the more shortly pedicellate flowers with more infundibuliform corolla.

Sect. JUBOGALIUM Ehrend. Perennial herbs, often woody at the base, often caespitose, or annuals. Leaves 5–8(–10) in a whorl, 1-veined, not awned. Inflorescence bracteate throughout; upper branches and pedicels slender, almost capillary, usually reddish. Corolla rotate, purple to greenish-yellow. Ovary hairy except for the commissural groove which is sometimes glabrous and covered with yellowish glandular tissue. Fruit dry, smooth, hairy.

127. G. graecum L., *Mantissa* 38 (1767). Perennial. Stems more or less woody at the base, with short basal internodes, usually erect, 4-angled, hairy. Leaves in whorls of 5–6, usually hairy. Inflorescence oblong; bracts 1·5–2 mm; pedicels 1–2 mm. Corolla *c.* 1·5 mm in diameter, purple-brownish-greenish; lobes acute. Fruit hairy. *Dry crevices in calcareous rocks. Kriti.* Cr. (*E. Aegean region and S.W. Anatolia.*)

(a) Subsp. **graecum**: Stems (4)8–15(–20) cm, with short hairs. Leaves (3·5–)4·5–6(–8) × 0·4–0·8 mm, narrowly linear, green, with more or less scattered short hairs. Inflorescence narrow, oblong. Fruit rather sparsely hairy; commissure glabrous. $2n=22$. *Kriti.*

(b) Subsp. **pseudocanum** Ehrend., *Österr. Bot. Zeitschr.* **105**: 254 (1958): Stems 6–8 cm, with long hairs. Leaves 4–6 × 1–1·7 mm, broadly linear, densely hairy. Inflorescence elongate-ovoid. Fruit densely hairy; commissure somewhat hairy. ● *Coastal areas of E. Kriti.*

128. G. canum Req. ex DC., *Prodr.* **4**: 602 (1830). Perennial. Stems (5–)10–25(–35) cm, often more or less woody at the base, frequently pendent, densely hairy; lower internodes usually more than 9 mm. Leaves in whorls of 5–6, (4–)6–10(–13) × (1·5–)2–4(–7) mm, ovate, densely hairy, grey; margin usually recurved. Inflorescence pyramidal; bracts 1·5–3 mm; pedicels 1–4 mm. Corolla 1·8–2·5 mm in diameter, purple, rarely yellowish; lobes apiculate. Fruit densely hairy; commissure more or less hairy. *Dry, calcareous cliffs. Karpathos.* Cr. (*S.W. Asia.*)

128 is represented in Europe by **subsp. ovatum** Ehrend., *Österr. Bot. Zeitschr.* **105**: 256 (1958).

129. G. setaceum Lam., *Encycl. Méth. Bot.* **2**: 584 (1788). Annual. Stems (2·5–)5–30(–35) cm, slender, more or less erect, finely retrorsely aculeolate or glabrous. Leaves 5–17(–20) × 0·4–0·9 mm, in whorls of (4–)6–8(–10), narrowly linear to filiform, glabrous or sparsely hairy; margin somewhat recurved, with papilliform teeth. Inflorescence lax, broadly ovoid, somewhat squarrose; bracts 3–5 mm, with hooked hairs on the upper surface; pedicels 1–3 mm. Corolla *c.* 0·5 mm in diameter, purple; lobes apiculate. Fruit with dense, hooked hairs, rarely glabrescent. $2n=22$. *Dry, open habitats. Mediterranean region.* Bl Bu Cr Ga Gr Hs It Ju Sa Si ?Tu.

(a) Subsp. **setaceum**: Corolla-lobes shortly apiculate. *Chiefly in the N. and W. parts of the range of the species.*

(b) Subsp. **decaisnei** (Boiss.) Ehrend., *Biol. Meddel. Kong. Danske Vid. Selsk.* **10**: 144 (1958): Corolla-lobes long-apiculate. *Chiefly in the S. and E. parts of the range of the species.*

Sect. KOLGYDA Dumort. (Sect. *Aparine* Koch). Annuals. Stems 4-angled, retrorsely aculeolate, otherwise glabrous or hairy. Leaves in whorls of 4–11, 1-veined, acute or awned. Inflorescence pyramidal or oblong, usually strongly bracteate; cymes few-flowered or reduced to solitary, axillary flowers. Flowers sometimes male (andromonoecious). Corolla usually rotate. Ovary without glandular commissure. Fruit dry, with patent, hooked setae, or more or less hispid or glabrous and papillose or smooth.

130. G. monachinii Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 67 (1849). Stems (2–)4–10(–16) cm, ascending, weak, retrorsely aculeolate especially below, almost smooth above, weakly 4-angled. Leaves 4–7 × 1·5–2 mm, in whorls of 5–6, broadly oblanceolate to narrowly obovate, shortly awned, with sparse, short hairs above; margin and midrib softly antrorsely scabrid, the margin scarcely revolute. Inflorescence ovoid; partial inflorescences 1- to 3-flowered; pedicels rather stout, straight, more or less erect. Corolla 1·5–2 mm in diameter, pinkish, glabrous; lobes shortly apiculate. Fruit (excluding setae) 2·5–3·5 mm, orbicular-ovoid, with rather dense hooked setae. $2n=22$. *Stony places in the mountains.* ● *S.E. Greece, Kriti, Karpathos.* Cr Gr.

131. G. spurium L., *Sp. Pl.* 106 (1753) (*G. vaillantii* DC.). Stems 10–100(–160) cm, scrambling, weak to rather stout, retrorsely aculeolate, usually hairy at the nodes. Leaves (5–)30–35 × 2·5–4 mm, in whorls of 6–10, narrowly oblanceolate, gradually narrowed into the long-awned apex, more or less hairy and setose above, the somewhat revolute margin and midrib retrorsely aculeolate. Inflorescence narrowly ovoid to cylindrical (rarely reduced); partial inflorescences 1- to 7-flowered, longer than the leaves; peduncles and pedicels patent, straight but often sharply bent just under the fruit. Corolla 0·8–1·3 mm in diameter, greenish-yellow, glabrous; lobes acute. Fruit 2–3 mm, densely setose or glabrous. $2n=20$. *Hedges, scrub, sand-dunes, cultivated and waste ground. Most of Europe, but rather rare in the west and only naturalized or casual in parts of the north.* Al Au Be Bu Co Cr Cz Da *Fe Ga Ge Gr He Ho Hs Hu It Ju Lu No Po Rm Rs (*N, B, C, W, K, E) Sa Si Su [Br].

Variants with glabrous and setose fruits often occur together, especially in cultivated ground; variants with setose fruits, apart from the flower-characters and the difference in chromosome number, are often not easy to distinguish from **132.**

132. G. aparine L., *Sp. Pl.* 108 (1753). Like **131** but stems (20–)80–180 cm, often stout and more hairy at the nodes; leaves 30–60 × 3–8 mm, in whorls of 6–9, narrowly to widely oblanceolate, abruptly contracted towards the apex; corolla 1·5–1·7 mm in diameter, whitish; fruit 3–5 mm, with dense, hooked setae. $2n=42$, 44, 48, 62, 66, 68. *Woods, scrub, hedges and cultivated ground. Europe, except N.E. Russia and parts of the Arctic.* All except Fa Is Sb, where it has been recorded as a casual.

A very variable cosmopolitan weed.

133. G. tricornutum Dandy, *Watsonia* **4**: 47 (1957) (*G. tricorne* Stokes pro parte). Stems 10–80(–100) cm, scrambling, stout, retrorsely aculeolate and very rough, without straight hairs below and above the nodes. Leaves 10–40 × 2·5–8 mm, in whorls of 6–8, narrowly oblanceolate, long-awned, glabrous above, the margin and midrib stiffly retrorsely scabrid; margin not revolute. Inflorescence long; partial inflorescences (1–)3- to 5(–7)-flowered, scarcely longer than the leaves; peduncles (5–)8–15(–20) mm; pedicels 1–8 mm, curved distinctly inwards and downwards after flowering. Flowers hermaphrodite, the lateral often male. Corolla 1–1·7 mm in diameter, glabrous, white; lobes long, acute. Fruit 3–5 mm, with numerous acute papillae. $2n=44$. *Cultivated and waste ground and other dry, open habitats. S., W. & C. Europe, and S.W. part of U.S.S.R.; casual in the north and east.* Al Au Be Bl Bu Co Cr Cz Ga Ge Gr He Ho Hs Hu It Ju Lu No Po Rm Rs (C, W, K) Sa Si Su Tu [Br].

134. G. verrucosum Hudson, *Philos. Trans. Roy. Soc. London* **56**: 251 (1767) (*G. saccharatum* All., *G. valantia* Weber). Stems 5–50 cm, erect to ascending, retrorsely aculeolate and scabrid. Leaves 5–17 × 1·5–5 mm, in whorls of 5–6(–7), lanceolate, awned, glabrous above; margin and midrib antrorsely scabrid; margin not revolute. Inflorescence oblong; partial inflorescences mostly 3-flowered, shorter than the leaves; pedicels 1–3 mm, deflexed after flowering. Central flowers of the cyme hermaphrodite, the lateral male. Corolla (1–)2–2·5 mm in diameter, greenish-white to white, glabrous; lobes acute. Fruit 4–6 mm, prominently verrucose. $2n=22$. *Cultivated fields and other open habitats. S. Europe; naturalized in C. Europe.* Al Bl Co Cr Ga Gr Hs It Ju Lu Sa Si [Au Cz Ge He Po].

135. G. intricatum Margot & Reuter, *Mém. Soc. Phys. Hist. Nat. Genève* **8**: 304 (1839) (*G. zacynthium* Margot & Reuter). Stems 7–35 cm, ascending, usually much-branched from the base, rather slender, retrorsely aculeolate below, usually more or less hairy above. Leaves 4–12 × 1–2·5 mm, in whorls of 6–8, oblanceolate, shortly awned, green, brownish or blackish when dry, glabrous or hairy; margin and midrib antrorsely scabrid; margin scarcely revolute. Inflorescence ovoid; partial inflorescences lax, many-flowered, with 8–12 flowers at the 2 nodes below the central flower; peduncles (1–)2–5 mm; pedicels 1–4 mm, about twice as long as flowers, slender, slightly divaricate. Corolla 1–2 mm in diameter, yellowish-red, glabrous or with sparse hairs externally; lobes apiculate, the appendages 0·1–0·2 mm, less than ½ as long as the lobes. Fruit 0·6–0·8 mm, with hooked patent hairs or glabrous and papillose. *Dry, open habitats.* ● *Greece and S. Albania.* Al Gr.

Records from Greece for the closely related *G. floribundum* Sibth. & Sm., native of W. Anatolia, are obviously erroneous.

136. G. capitatum Bory & Chaub. in Bory, *Expéd. Sci. Morée* **3(2)**: 54 (1832). Stems 9–35 cm, ascending, bifurcating from the base, retrorsely aculeolate below, hairy to glabrescent above. Leaves 5–13 × 0·6–3 mm, in whorls of 6–9, the lower oblanceolate, the upper narrowly lanceolate to linear, acute or with a short awn, blackish when dry, glabrous, or hairy (especially above); margin and midrib antrorsely scabrid, the margin somewhat revolute. Inflorescence broadly ovoid; partial inflorescences 5–8 mm in diameter, capitate, dense, many-flowered, with 10–15 flowers at the 2 nodes below the central flower; pedicels 0·5–1·5 mm, slender, more or less erect. Corolla 0·8–1·6 mm in diameter, reddish, glabrous (rarely hairy); lobes not or shortly apiculate (appendages less than 0·1 mm). Fruit 0·8–1·5 mm, glabrous, papillose, rarely with straight or curved hairs. *Cultivated and waste ground.* ● *S. & C. Greece.* Gr.

137. G. incrassatum Halácsy, *Consp. Fl. Graec.* **1**: 724 (1901). Like **136** but leaves in whorls of (5–)6(–7); partial inflorescences somewhat laxer; pedicels rather rigid, somewhat thickened after anthesis; fruit usually with patent, more or less curved hairs. *Dry places.* ● *Kriti.* Cr.

Perhaps not specifically distinct from **136**; connecting populations occur in S. Greece.

138. G. viscosum Vahl, *Symb. Bot.* **2**: 29 (1791) (*G. campestre* Schousboe ex Willd.). Like **136** but main stems distinct, scarcely bifurcating; leaves 5–18 × 1–3·5 mm, in whorls of 6–10, narrowly to widely oblanceolate, greenish-brown when dry; inflorescence ovoid to pyramidal; partial inflorescences with 14–21(–27) flowers at the 2 nodes below the central flower; corolla yellowish-white, glabrous, the lobes not or shortly apiculate; fruit glabrous, finely papillose, shining. *Dry places. S. Spain, S. Portugal.* Hs Lu.

Very variable in growth-form and floral characters.

139. G. parisiense L., *Sp. Pl.* 108 (1753). Stems 5–40 cm, procumbent to ascending, somewhat scrambling, retrorsely aculeolate, rough. Leaves 3–12 × 0·8–3 mm, in whorls of 5–7, lanceolate, shortly awned, pubescent or glabrous, the margin and midrib

antrorsely scabrid; margin not or slightly revolute. Inflorescence oblong, narrowly ovoid to pyramidal; partial inflorescences with 7–11(–16) flowers at the 2 nodes below the central flower; peduncles 2–7 mm, (½–)1–3(–4) times as long as the pedicels; pedicels 0·5–2·5 mm, widely divaricate after anthesis. Corolla 0·5–1 mm in diameter, greenish inside, reddish outside, more or less glabrous; lobes acute. Fruit 0·8–1 mm, glabrous or with curved hairs, finely papillose. $2n=44$, 66. *Cultivated fields, roadsides and other dry, open habitats. S., W. & C. Europe, northwards to E. England, and eastwards to S. Czechoslovakia and Bulgaria.* Al Au Az Be Bl Br Bu Co Cz Ga Ge He Hs Hu It Ju Lu Rm Sa Si.

Polymorphic. In S.W. Europe variants are found with few-flowered partial inflorescences and large fruits with hooked hairs (**G. decipiens** Jordan, *Obs. Pl. Crit.* **3**: 178 (1846)). In the same region populations transitional to **140** occur.

140. G. divaricatum Pourret ex Lam., *Encycl. Méth. Bot.* **2**: 580 (1788) (*G. parisiense* subsp. *divaricatum* (Pourret ex Lam.) Rouy & Camus). Stems 5–30 cm, erect, more slender and less strongly retrorsely aculeolate than **139**, nearly smooth above. Leaves 4–10 × 0·3–1·5(–2) mm, in whorls of 6–8, narrowly lanceolate to linear, the upper often slightly hispid above; the margin and midrib antrorsely scabrid; margin not or slightly revolute. Inflorescence broadly ovoid, lax; partial inflorescences with 5–13 flowers at the 2 nodes below the central flower; peduncles 5–20 mm, (2–)3–7(–10) times as long as the pedicels; pedicels 0·5–2·5 mm, filiform, somewhat deflexed after anthesis. Corolla 0·5–1 mm in diameter, yellowish-red, glabrous; lobes not or shortly apiculate. Fruit 0·5–0·7 mm, glabrous, finely papillose. $2n=44$. *Dry, open habitats. S. Europe, extending locally northwards to N.W. France and S.E. Czechoslovakia.* Al ?Az Bl Bu Co Cr Cz Ga Gr Hs Hu It Ju Lu Rm Sa Si Tu [Be He].

Not very variable, and usually quite distinct from **139** and **141**.

141. G. tenuissimum Bieb., *Fl. Taur.-Cauc.* **1**: 104 (1808). Stems 10–45 cm, rather stout, retrorsely aculeolate, not glabrescent above. Leaves 10–15 × 0·8–2 mm, in whorls of (6–)8–10, linear-lanceolate, glabrous or with short, scattered hairs above; margin not or slightly revolute, antrorsely scabrid. Inflorescence diffuse, ovoid to pyramidal; partial inflorescences usually with 7–11(–14) flowers at the 2 nodes below the central flower; peduncles 5–15 mm, filiform; pedicels 3–15 mm, filiform, elongating and more or less divaricate after anthesis. Corolla 1–1·7 mm in diameter, greenish-yellow, glabrous or more or less hairy. Fruit *c.* 1 mm, hairy or glabrous, papillose. $2n=22$, 44. *Dry, stony ground. E. & C. parts of Balkan peninsula, extending to W. Hungary and Krym.* Bu Gr Hu Ju Rm Rs (W, K) Tu [He]. (*W. & C. Asia.*)

142. G. minutulum Jordan, *Obs. Pl. Crit.* **3**: 182 (1846). Stems 2–10 cm, ascending, very delicate, more or less retrorsely aculeolate. Leaves 1·5–3 × 0·8–1 mm, in whorls of 4, obovate to elliptical, narrowing to the base, cuspidate, bright green, blackish when dry; margin antrorsely scabrid. Flowers solitary or in pairs, scarcely exceeding the leaf-whorls; pedicels short, straight, erect to patent. Corolla very small, whitish; lobes oblong-ovate, acute. Fruit less than 1 mm, ovoid, with hooked hairs. *Shady rocks, mediterranean coasts and hills.* ● *S.W. Europe, from S. Portugal to Arcipelago Toscano.* Ga Hs It Lu.

143. G. recurvum Req. ex DC., *Prodr.* **4**: 609 (1830). Stems 3–11 cm, slender, ascending to erect, much branched at the base, but without branches above, retrorsely aculeolate below, often with dense patent hairs above. Leaves 3–8 × 1–3·5 mm, in whorls of (4–)6–7, oblanceolate to ovate, acute, hairy to glabrescent; margin and midrib antrorsely scabrid, margin revolute. Inflorescence cylindrical; partial inflorescences short, scarcely exceeding the bracts, 2- to 3-flowered and distinctly pedunculate, or flowers solitary. Pedicels 1–3 mm, deflexed after anthesis. Corolla *c.* 1 mm in diameter, yellowish-red, usually hairy externally; lobes acute. Fruit 0·7–1 mm, ovoid; mericarps curved and separated from one another, densely covered with hooked setae (rarely glabrous). *Dry, stony places. N. Sporadhes, Kikladhes.* Gr. (*W. Anatolia, Cyprus.*)

Related to **144** and connected with it by intermediates.

144. G. verticillatum Danth. in Lam., *Encycl. Méth. Bot.* **2**: 585 (1788). Like **143** but stems 8–18 cm, erect, not very hairy to glabrescent; leaves 4–8 × 1–1·8 mm, lanceolate to oblong; flowers forming dense whorls in the leaf-axils; peduncles very short, hardly visible; pedicels usually less than 1 mm, straight and erect after anthesis; corolla 1–1·5 mm in diameter, pubescent or glabrous externally. $2n=22$, 44. *Dry places. Mediterranean region and S.E. Europe.* Al Bu Cr Ga Gr Hs It Ju Rm Rs (W, K) Si.

145. G. murale (L.) All., *Fl. Pedem.* **1**: 8 (1785). Stems 5–20 cm, procumbent or ascending from a much-branched base, but usually without branches above, smooth or retrorsely aculeolate (also with patent hairs above). Leaves 4–10 × 0·8–2·5 mm, in whorls of 4–6, widely to narrowly oblanceolate, shortly awned, hairy to glabrescent. Inflorescence cylindrical, few-flowered, with 1–4 flowers in each whorl, in 2-flowered partial inflorescences or solitary; pedicels 0·5–1·5 mm, shorter than the bracts, deflexed after anthesis. Corolla *c.* 0·7 mm in diameter, yellowish, glabrous or somewhat hairy externally; lobes acute. Fruit 1·3–1·5 mm, cylindrical; mericarps curved and separated from one another, often unequal, and with hooked setae especially towards the apex (rarely glabrous). $2n=44$. *Roadsides, rocky ground and other dry, open habitats. Mediterranean region and S.W. Europe.* Al Az Bl Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

6. Callipeltis Steven[1]

Annuals. Leaves in whorls of 4(–6). Inflorescences mono- or dichasial; cymes mostly 5- to 7-flowered, the central flower naked, the lateral subtended by a large, membranous, veined bracteole. Calyx absent. Corolla minute, yellowish-green, rotate, with 3 to 4 lobes. Stigmas capitate. Fruit dry, cylindrical; mericarp usually 1.

1. C. cucullaris (L.) Rothm., *Feddes Repert.* 50: 72 (1941) (*C. cuculllaria* DC.). Stems 5–20 cm, slightly scabrid or smooth. Leaves 3–12 × 1–4 mm, narrowly obovate to oblanceolate, obtuse, glabrous or sparsely puberulent, somewhat scabrid on the margin with points directed forward. Cymes sessile; bracteoles enlarging to 3–5 mm in fruit, obovate, narrowed towards base, usually plicate and folded lengthwise around fruit. Corolla *c.* 0·5 mm, cup-shaped. Fruit 1·2–1·8 mm, cylindrical, slightly curved, hispidulous mainly towards apex. *Dry places. C. & S. Spain.* Hs. (*N. Africa, S.W. & C. Asia.*)

7. Cruciata Miller[1]

Annual to perennial herbs, sometimes woody. Leaves in whorls of 4, 1- to 3-veined. Inflorescence narrow, with whorls of short axillary cymes; central flowers hermaphrodite, the lateral male or absent; peduncles and pedicels partly deflexed under the leaves, not coalescing nor encircling fruit. Calyx absent. Corolla yellow, rotate, 4-lobed; stigmas capitate. Fruit dry; mericarps 1–2, glabrous or hairy.

C. articulata (L.) Ehrend., *Notes Roy. Bot. Gard. Edinb.* **22**: 396 (1958), an annual species of the arid regions of S.W. Asia, with smooth stems and bracts and bracteoles greatly enlarged in fruit, has once been reported from Krym, but apparently only as a casual.

1 Peduncles with 2 bracts
2 Hairs of stem 1–2 mm; roots mainly adventitious **1. laevipes**
2 Stems glabrous or with hairs less than 1 mm; adventitious roots absent or few **2. taurica**
1 Peduncles without bracts
3 Annual **5. pedemontana**
3 Perennial
4 Stems mostly unbranched, glabrous or with slender hairs **3. glabra**
4 Stems branched, with coarse hairs **4. balcanica**

1. C. laevipes Opiz, *Seznam* 34 (1852) (*Galium cruciata* (L.) Scop., *Cruciata chersonensis* auct.). Herbaceous perennial with weak primary root, subterranean stolons, and slender rhizome with extensive adventitious roots. Stems 20–60 cm, slender; internodes 14–18, elongating to 4·5–8·5 cm, mostly with patent hairs 1–2 mm. Leaves 12–20 × 4–10 mm, rather thin, broadly lanceolate to ovate, acute, 3-veined, more or less hairy, yellowish in the flowering region, later green. Cymes usually with 5–9 flowers; peduncles and pedicels usually hairy, elongating in fruit, bracteoles enlarging slightly, but scarcely more than 8 mm. Flowers *c.* 2–3 mm; styles divided to the base. Fruit with 1–2 mericarps 1·8–2·7 mm in diameter, globose to ovoid, glabrous. $2n=22$. *Grassland and open woods. W., C. & S. Europe, extending to S.C. Russia.* Al Au Be Br Bu Co Cz Ga Ge Gr He Ho Hs Hu It Ju Lu Po Rm Rs (C, W, K, E) Sa Si Tu [Hb].

2. C. taurica (Pallas ex Willd.) Ehrend., *Notes Roy. Bot. Gard. Edinb.* **22**: 393 (1958) (*Galium coronatum* Sibth. & Sm.). Like **1** but usually rather woody, with strong primary root, few or no adventitious roots and few or no stolons; stems 10–30 cm, usually stout; internodes 8–13, elongating to 1·5–4·5 cm, glabrous or with hairs up to 0·8 mm; leaves 8–18 × 4–12 mm, somewhat coriaceous, narrowly elliptical to nearly orbicular, obtuse or acute, glabrous or hairy; bracteoles enlarging, often more than 10 mm; flowers *c.* 2·5–4 mm; fruit usually with 1 mericarp 3–4 mm, globose, glabrous or hairy. *Dry rocks and steppes. E. Greece; Krym.* Gr Rs (K). (*S.W. Asia.*)

This polymorphic polyploid complex is represented in Europe by two subspecies.

(a) Subsp. **euboea** (Ehrend.) Ehrend., *Pl. Syst. Evol.* **124**: 178 (1975) (*Galium coronatum* var. *euboeum* Ehrend.): Entirely glabrous. Leaves on vegetative shoots and base of flowering stems broadly elliptical to nearly orbicular. Cymes deflexed in fruit; bracteoles broadly obovate. ● *E. Greece* (*Evvoia*).

(b) Subsp. **taurica** (*Valantia taurica* Pallas ex Willd., *Cruciata coronata* (Sibth. & Sm.) Ehrend. subsp. *taurica* (Pallas ex Willd.) Ehrend., *Galium tauricum* (Pallas ex Willd.) Roemer & Schultes; incl. *G. chersonense* (Willd.) Roemer & Schultes, *G. braunii* Zelen., *G. decoronatum* Klokov, *G. neotauricum* Klokov): Usually hairy on stems, or at least on pedicels. Leaves on vegetative shoots and base of flowering stems usually narrowly oblong. Cymes strongly divaricate after flowering; bracteoles narrowly obovate. Fruit hairy, rarely glabrous. $2n=44$. *Krym.*

There is great variability in leaf-shape and hairiness within and between populations from Krym, but no reason for the recognition of several species.

3. C. glabra (L.) Ehrend., *Notes Roy. Bot. Gard. Edinb.* **22**: 393 (1958) (*Galium vernum* Scop.). Herbaceous perennial with subterranean stolons. Stems *c.* 5–20 cm, usually without lateral branches; longest internodes 1·5–3 cm, glabrous or sometimes with slender, patent hairs 0·4–0·8 mm. Leaves in flowering region 7–16 × 3–7 mm, yellowish, later green, narrowly to broadly ovate or elliptical, acute, 3-veined. Cymes 3- to 5-flowered, without bracteoles; peduncles and pedicels usually glabrous, scarcely elongating in fruit. Flowers *c.* 2·5–3·5 mm; styles divided to *c.* ½. Fruit usually with 1 mericarp 1·5–2·8 mm, pyriform, nearly always glabrous. $2n=22$, 44. *S. & S.C. Europe, extending northwards to C. Poland and S.C. Russia.* Al Au Bu Co Cz Ga *Ge Gr He Hs Hu It Ju Lu Po Rm Rs (C, W) Sa ?Si.

Rather variable. Hairy variants occur mainly in S.W. Europe. Diploid plants have been found in Portugal and the S.W. Alps. Tetraploids are widespread, but cannot yet be distinguished morphologically from the diploids.

4. C. balcanica Ehrend., *Bot. Jour. Linn. Soc.* **68**: 272 (1974). Like **3** but flowering stems 3–12 cm, with lateral branches; longest internodes 1–1·5 cm, with coarse hairs *c.* 0·5 mm; leaves 7–13 × 3–4 mm; peduncles and pedicels hairy. *Mountain screes.* ● *S.W. Jugoslavia.* Ju.

5. C. pedemontana (Bellardi) Ehrend., *Notes Roy. Bot. Gard. Edinb.* **22**: 396 (1958) (*Valantia pedemontana* Bellardi, *Galium pedemontanum* (Bellardi) All.). Annual. Stems 10–35 cm, simple or somewhat branched from the base, rough and adhesive, with patent hairs and small recurved prickles. Leaves 3–11 × 2–4 mm, uniformly green, ovate or elliptical, acute, slightly hairy, 1-veined; lateral veins obscure; margins revolute. Cymes without bracteoles, (1–)2- to 3-flowered, much shorter than subtending leaves. Flowers 0·5–1 mm, hermaphrodite; styles united in lower third. Fruit with 1 or 2 mericarps *c.* 1 mm, reniform, glabrous. $2n=18$. *Dry grassland and scrub. S. & S.C. Europe.* Al Au Bu Cz Ga Gr He Hs Hu It Ju Lu Rm Rs (W, K) Sa Si Tu.

8. Valantia L.[1]

Annual to perennial herbs. Leaves 1-veined, in whorls of 4. Inflorescence leafy, narrow, scarcely branched, with whorls of short, axillary 3-flowered cymes; central flower hermaphrodite, corolla 4-lobed; lateral flowers male, corolla 3-lobed. Peduncles and pedicels deflexed between leaves, coalescing, enlarging and encircling fruit, with bristles or hooks on outside. Calyx absent. Corolla cup-shaped to rotate; stigmas capitate. Fruit dry; mericarps 1–2, papillose or glabrous, usually remaining within peduncle and pedicel cavity.

1 Perennial; hermaphrodite flowers about 2·5 mm; fruit separating easily from peduncle and pedicel **1. aprica**
1 Annual; hermaphrodite flowers not more than 2 mm; fruit separating with difficulty from peduncle and pedicel
2 Scabrid-hispid; peduncle without dorsal horn **2. hispida**
2 Slightly hairy towards apex; peduncle with conspicuous dorsal horn **3. muralis**

1. V. aprica (Sibth. & Sm.) Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 72 (1849). Caespitose perennial. Stems 5–20 cm; internodes up to 20 mm, smooth, glabrous or with short hairs. Leaves 3–6 × 1·5–2·5 mm, somewhat fleshy, obovate, obtuse or mucronate. Peduncle and pedicels broadly coalescent, usually with dorsal bristles, not tightly encircling fruit. Hermaphrodite

[1] By F. Ehrendorfer.

[1] By F. Ehrendorfer.

flowers *c.* 2·5 mm in diameter, rotate, yellowish-white to pinkish. Mericarp 1, 1·4–1·6 mm, reniform. $2n=22$. *Mountain rocks and screes.* ● *S. Albania, S. & W. Greece, Kriti.* Al Cr Gr.

2. V. hispida L., *Syst. Nat.* ed. 10, **2**: 1307 (1759). Annual. Stems 6–20 cm; lower internodes up to 25 mm, much abbreviated in inflorescence, more or less scabrid-hispid, particularly above. Leaves 6–10 × 2–3·5 mm, narrowly obovate to oblanceolate, usually mucronate. Peduncle and pedicels broadly coalescent and strongly thickening, tightly encircling the fruit, dorsally with about 15–25 straight bristles. Hermaphrodite flowers 1·5–2 mm, more or less cup-shaped. Mericarps usually 2, 1·1–1·4 mm, papillose. $2n=18$. *Rocks and other dry places. Mediterranean region, S. Portugal.* Bl Co Cr *Ga Gr Hs It Lu Sa Si.

3. V. muralis L., *Sp. Pl.* 1051 (1753). Like **2** but smaller; stems usually not more than 15 cm, and internodes up to about 12 mm, glabrescent, more or less pubescent only above. Leaves 3–6·5 × 2–2·5 mm, obtuse. Peduncle and pedicels with conspicuous dorsal horn; horn and pedicels with hooked bristles. Hermaphrodite flowers 1–1·6 mm. Mericarp usually 1, 1–1·2 mm, smooth. $2n=18$. *Rocky ground, walls and dry waste places. Mediterranean region, C. & S. Portugal.* Al Bl Co Cr Ga Gr Hs It Ju Lu Sa Si.

9. Rubia L.[1]

Herbaceous or woody perennials. Leaves in whorls of 4–8, at least above, aculeolate on the margin and midrib beneath. Flowers in axillary cymes or panicles. Calyx minute or absent. Corolla with short tube and usually 5 lobes; stigmas capitate. Fruit fleshy, usually with only one, 1-seeded, mericarp developing.

1 Anthers 0·5–0·6 mm, linear-oblong, 5–6 times as long as wide **4. tinctorum**
1 Anthers 0·2–0·3 mm, orbicular-ovate to suborbicular, not more than twice as long as wide
2 Stems entirely herbaceous; lower leaves opposite **3. tatarica**
2 Stems woody below and persistent; all leaves in whorls of 4–8
3 Cymes 4–10 cm, distinctly exceeding the leaves; corolla-lobes 2–3 mm **1. peregrina**
3 Cymes 1–2 cm, shorter than or about equalling the leaves; corolla-lobes 3·5–4 mm **2. tenuifolia**

1. R. peregrina L., *Sp. Pl.* 109 (1753) (incl. *R. reiseri* Halácsy ex Hayek). Stem 30–120 cm, climbing, glabrous or retrorse-aculeolate; lower part of stem woody and persistent. Leaves 15–60 × 3–20 mm, in whorls of 4–8, linear to broadly ovate-elliptical, coriaceous, dark green, the lateral veins usually obscure. Cymes 4–10 cm, many-flowered, exceeding the leaves. Corolla 4–6 mm in diameter, yellowish-green; lobes 2–3 mm, cuspidate; anthers 0·2–0·3 mm, orbicular-ovate to suborbicular. $2n=44$. *Hedges, thickets and rocky ground. S. & W. Europe, northwards to c.* 53° 30′ *N. in W. Ireland.* Al Az Bl Br Co Cr Ga Gr Hb Hs It Ju Lu Sa Si Tu.

Extremely variable in the shape and size of the leaves.

R. angustifolia L., *Mantissa* 39 (1767) (*R. peregrina* var. *balearica* Willk.), from Islas Baleares, and perhaps also occurring in S. Spain, differs from **1** in being intricately caespitose, in having linear leaves 10–20 × 1–4 mm, scabrid, retrorse-aculeolate on both surfaces and with revolute margins, and in having shorter, scarcely cuspidate corolla-lobes. It has $2n=66$. Its status is uncertain, but it may be specifically distinct.

2. R. tenuifolia D'Urv., *Enum.* 17 (1822) (*R. olivieri* A. Richard). Like **1** but cymes 1–2 cm, shorter than or about equalling the leaves; corolla 7–8 mm in diameter; corolla-lobes 3·5–4 mm, acuminate. *Scrub and rocky ground. S. Greece and Aegean region.* Cr Gr Tu.

3. R. tatarica (Trev.) Friedrich Schmidt Petrop., *Mém. Acad. Sci. Pétersb.* ser. 7, **12(2)**: 143 (1868). Stem 15–30 cm, erect, herbaceous. Leaves 15–60 × 5–10 mm, the lower opposite, the middle and upper in whorls of 4, lanceolate, acuminate; lateral veins prominent beneath. Cymes 2–3 cm, usually not more than 10-flowered, shorter than or about equalling the leaves. Corolla *c.* 4 mm in diameter, greenish-yellow; lobes acuminate; anthers *c.* 0·2 mm, suborbicular. *Rocky, gravelly or sandy places. S.E. Ukraine, S.E. Russia.* Rs (W, E).

4. R. tinctorum L., *Sp. Pl.* 109 (1753) (incl. *R. iberica* (Fischer ex DC.) C. Koch). Stem up to 100 cm, climbing. Leaves 20–100 × 5–25 mm, in whorls of 4–6, lanceolate or oblong-elliptical, light green, with prominent lateral veins beneath. Cymes 5–30 cm, many-flowered, exceeding the leaves. Corolla 5–6 mm in diameter, pale yellow; lobes *c.* 3 mm, acuminate; anthers 0·5–0·6 mm, linear-oblong. *Hedges, thickets and waste places. Formerly cultivated for the dye (madder) extracted from its roots; widely naturalized in S. and C. Europe, and perhaps native in the E. Mediterranean region.* *Al *Cr *Gr *It *Ju *Si *Tu [Au Bl Bu Cz Ga Ge He Ho Hs Hu Lu Sa]. (*W. & C. Asia*).

PLANTAGINALES

CLXIII. PLANTAGINACEAE[2]

Herbs or dwarf shrubs. Leaves usually in basal rosettes, sometimes opposite or alternate, exstipulate. Flowers (2–)4-merous, actinomorphic, usually hermaphrodite, bracteate, usually in spikes. Sepals connate at base, persistent. Corolla gamopetalous, scarious. Filaments long; anthers conspicuous. Ovary superior, 1- to 4-locular; style 1; ovules 1 to many, axile or basal. Fruit a circumscissile capsule or indehiscent; seeds endospermic, with straight embryo, often mucilaginous when wet.

Terrestrial; stolons absent; flowers mostly hermaphrodite; fruit a circumscissile capsule **1. Plantago**
Aquatic; stolons present; flowers unisexual; fruit indehiscent **2. Littorella**

[1] By P. W. Ball. [2] Edit. D. M. Moore.
[3] By A. O. Chater and D. Cartier (spp. 4–10 and 15–17).

1. Plantago L.[3]

Terrestrial herbs or dwarf shrubs. Leaves in basal rosettes, or opposite or alternate on branched stems. Flowers 4-merous, in pedunculate spikes, usually hermaphrodite. Corolla-lobes usually patent or deflexed. Stamens inserted on corolla-tube. Ovary 2- to 4-locular; ovules 2–many. Capsule circumscissile, 2- to 4-locular.

Literature: R. Pilger in Engler, *Pflanzenreich* **102(IV.269)**: 39–432 (1937).

In the descriptions measurements of the leaves include the petiole, descriptions of bracts refer to those in the middle of the spike unless otherwise indicated, and measurements of scape-length include the spike.

P. aristata Michx, *Fl. Bor. Amer.* **1**: 95 (1803), an annual with linear or linear-lanceolate, entire leaves in basal rosettes, terete scapes 10–20 cm, and cylindrical spikes with the lower bracts 15–30 mm, is a native of North America and has been reported as a casual in various parts of Europe; it is perhaps becoming naturalized.

1 Leaves opposite
2 Dwarf shrub
3 Leaves 1–6 × *c.* 0·1 cm, linear, entire or remotely denticulate **34. sempervirens**
3 Leaves 1–2 × 0·2–0·5 cm, linear-lanceolate, strongly dentate to ±pinnatifid **35. asperrima**
2 Annual
4 Bracts all similar in shape, without lateral veins; plant usually strongly glandular-pubescent above **33. afra**
4 Lowest bracts very different in shape from the upper, with lateral veins at the base; plant not or minutely glandular
5 Stems with patent branches, deflexed-puberulent; lowest bracts lanceolate-caudate **31. squarrosa**
5 Stems with ascending branches, pubescent with patent or ascending hairs; lowest bracts with orbicular-ovate base and linear-subulate apex **32. arenaria**
1 Leaves in basal rosettes, or rarely alternate
6 Corolla-tube hairy **(4–10). coronopus** group
6 Corolla-tube glabrous
7 Anterior sepals connate for more than half their length
8 Bracts and sepals densely villous **23. lagopus**
8 Bracts and sepals glabrous or very shortly hairy
9 Roots not more than 0·75 mm thick; scapes usually strongly 5-sulcate; rosettes usually several **20. lanceolata**
9 Roots up to 2 mm thick; scapes 6- to 12-sulcate or -striate; rosettes usually solitary
10 Leaves subglabrous; spikes 3–5 cm; bracts 4·5–6 mm **21. altissima**
10 Leaves ±densely appressed-hairy; spikes 0·5–2 cm; bracts 2·5–4 mm **22. argentea**
7 Anterior sepals free for more than half their length
11 Anterior sepals almost entirely scarious, with midrib extending to not more than half-way
12 Perennial; corolla-lobes more than 2 mm **(15–17). atrata** group
12 Annual; corolla-lobes less than 2 mm
13 Bracts and sepals glabrous, not or scarcely ciliate **27. loeflingii**
13 Bracts villous and long-ciliate; sepals long-ciliate **28. notata**
11 Anterior sepals with midrib extending ± to apex
14 Perennial; leaves lanceolate or elliptical to suborbicular, usually at least 1 cm wide
15 Bracts not more than half as long as sepals **3. cornuti**
15 Bracts more than half as long as sepals
16 Seeds (4–)6–34, ellipsoid or ellipsoid-trigonous **1. major**
16 Seeds 2–5(–7), plano-convex or cymbiform
17 Leaves cordate or truncate at base; seeds 2 **14. reniformis**
17 Leaves narrowed at base; seeds usually more than 2
18 Petiole longer than lamina; plant blackening on drying **13. maxima**
18 Petiole not longer than lamina; plant not blackening on drying
19 Leaves ±densely hairy; stamens exserted for 8–13 mm; filaments lilac **12. media**
19 Leaves glabrous or sparsely hairy; stamens exserted for not more than 5 mm; filaments whitish
20 Spikes *c.* ⅓ as long as rest of scape at anthesis; seeds *c.* 1·25 mm, plano-convex **11. schwarzenbergiana**
20 Spikes less than ¼ as long as rest of scape at anthesis; seeds 2–2·5 mm, cymbiform **18. gentianoides**
14 Leaves linear or linear-lanceolate, usually less than 1 cm wide
21 Perennial, often with strongly branched stock
22 Spikes dense; scapes scarcely exceeding leaves; stamens exserted for not more than 1 mm **25. ovata**
22 Spikes usually lax below; scape about twice as long as leaves; stamens exserted for 4–7 mm **24. albicans**
21 Annual
23 Seeds 6–15, fusiform **2. tenuiflora**
23 Seeds 2, cymbiform
24 Seeds 4–5 mm; leaves usually alternate on a branched stem **19. amplexicaulis**
24 Seeds less than 4 mm; leaves in a basal rosette
25 Scapes with patent hairs usually more than 1 mm; sepals unequal, the anterior 4–5 mm
26 Corolla-lobes orbicular-ovate; scapes arcuate-recurved and thickened in fruit **30. cretica**
26 Corolla-lobes ovate-lanceolate; scapes erect or arcuate-recurved, but not thickened in fruit **29. bellardii**
25 Scapes with ± appressed hairs less than 1 mm; sepals 2·5–3 mm, subequal
27 Corolla-lobes orbicular-ovate; seeds 2–2·5 mm **25. ovata**
27 Corolla-lobes ovate-elliptical or elliptical; seeds 3–3·5 mm **26. minuta**

Subgen. **Plantago**. Leaves in basal rosettes or alternate.

1. P. major L., *Sp. Pl.* 112 (1753). Perennial with one or few rosettes. Leaves (1·5–)5–30(–40) × (0·5–)3–10(–15) cm; lamina ovate to elliptical, entire or irregularly dentate, 3- to 9-veined, glabrous or puberulent; petiole as long as lamina or shorter. Scapes equalling or exceeding leaves, striate or terete, with short, appressed or ascending hairs; spikes as long as or shorter than rest of scape, dense. Bracts 1–2 mm, ovate, glabrous. Sepals 1·5–2·5 mm, subequal, glabrous, green, with narrow scarious margins. Corolla-tube *c.* 2 mm, glabrous; lobes *c.* 1 mm, lanceolate to ovate, subobtuse, glabrous. Stamens exserted 2–3 mm. Capsule 2–4 mm; seeds (4–)6–34, 1–1·5 mm, ellipsoid or ellipsoid-trigonous. *Almost throughout Europe.* All except Sb, but only naturalized in Is.

1 Leaves 5- to 9-veined, ±cordate at base, thick, dark green, glabrescent; spikes narrowed above; seeds (4–)6–10(–13) (a) subsp. **major**
1 Leaves 3- to 5-veined, gradually narrowed into petiole, usually thin, yellowish-green, usually puberulent; spikes cylindrical; seeds 8–34
2 Seeds 8–11 (b) subsp. **winteri**
2 Seeds 14–34 (c) subsp. **intermedia**

(a) Subsp. **major**: $2n=12$. *Usually in fairly dry and non-saline habitats. Throughout the range of the species.*

(b) Subsp. **winteri** (Wirtgen.) W. Ludwig, *Jahrb. Nassau. Ver. Naturk.* **92**: 21 (1956). *Saline habitats. C. & N.E. Europe.*

(c) Subsp. **intermedia** (DC.) Arcangeli, *Comp. Fl. Ital.* 501 (1882) (*P. intermedia* DC., *P. major* subsp. *pleiosperma* Pilger): $2n=12$. *Damp, especially saline habitats. Most of Europe.*

2. P. tenuiflora Waldst. & Kit., *Pl. Rar. Hung.* **1**: 37 (1800–1801). Annual with one rosette. Leaves 2–15 × 0·05–0·2(–0·4) cm, linear, flat, entire or remotely dentate, 1-(to 3-)veined, glabrous or sparsely hairy. Scapes about equalling leaves, terete, subglabrous or with short ascending hairs; spikes up to about as long as rest of scape, lax, often interrupted at base. Bracts 1·5–2(–3·5) mm, ovate or ovate-lanceolate, glabrous. Sepals 1·5–2 mm, subequal, glabrous, green, with wide scarious margins. Corolla-tube *c.* 2 mm, glabrous; lobes *c.* 0·75 mm, ovate-lanceolate, subacute, glabrous. Stamens exserted 1–2 mm. Capsule 3–4 mm; seeds 6–10(–15), 1–1·5 mm, fusiform. $2n=24$. *Usually on saline or strongly alkaline soils. E.C. & S.E. Europe,*

extending north-eastwards to 52° 30′ *in S.C. Russia*; *Öland.* Au Bu Cz Hu Rm Rs (C, W, K, E) Su.

3. P. cornuti Gouan, *Obs. Bot.* 6 (1773). Perennial with one rosette. Leaves (7–)15–30(–35) × (2–)4–8(–13) cm; lamina elliptical or ovate-elliptical, entire, 5- to 7-veined, glabrous or sparsely appressed-hairy, gradually narrowed into a petiole half as long to as long as lamina. Scapes about twice as long as leaves, striate, glabrous or sparsely appressed-hairy; spikes usually somewhat shorter than rest of scape, lax or dense, interrupted at base. Bracts *c.* 1·5 mm, ovate-orbicular, glabrous, or with hairs on keel and ciliate above. Sepals 3–4 mm, subequal, glabrous, blackish, with narrow scarious margins. Corolla-tube 3–4 mm, glabrous; lobes *c.* 1·5 mm, ovate-orbicular, shortly acuminate, glabrous. Stamens exserted *c.* 4 mm. Capsule *c.* 4 mm; seeds 4, 2–3 mm, oblong-elliptical, plano-convex. $2n=12$. *Damp, often saline habitats. S. half of U.S.S.R., extending to coasts of Romania and Bulgaria*; *locally on coasts of W. & C. Mediterranean region.* Bu Ga Hs It Ju Rm Rs (C, W, K, E).

(4–10). P. coronopus group. Annuals, biennials or perennials with one to many rosettes. Leaves linear to lanceolate, entire to pinnatifid, somewhat contracted at the base. Scapes terete. Bracts ovate-lanceolate, with variably prominent keel and scarious, ciliate margin. Sepals unequal, free, keeled to the apex, with membranous margins. Corolla-tube pubescent. Capsule 2-(to 3-)locular; seeds 1–4(–6), ellipsoid, plano-convex, smooth.

In this group hybridization occurs between species having the same basic chromosome number, especially when they are at the same level of polyploidy, and this can often make the determination of material difficult, particularly since there can be considerable variation within taxa in relation to distribution and ecological conditions.

1 Leaves regularly and distinctly toothed to pinnatifid
2 Leaves serrate; ovules 2–3 — **6. serraria**
2 Leaves 1- to 2-pinnatifid or dentate; ovules 3–5
3 Annual, biennial or perennial; stock not or scarcely branched; capsule 3-locular; corolla-lobes *c.* 1 mm — **4. coronopus**
3 Perennial; stock usually distinctly branched; capsule 2-locular; corolla-lobes 1·6–2·2 mm — **5. macrorhiza**
1 Leaves entire or with a few, small, irregular teeth
4 Stock unbranched, with a solitary rosette; capsule 3-locular — **4. coronopus**
4 Stock branched, with several rosettes; capsule 2-locular
5 Leaves *c.* 1 mm wide, rigid, trigonous at least at apex; stock densely branched — **9. subulata**
5 Leaves more than 1 mm wide, not rigid, flat or semicircular in section; stock laxly branched
6 Posterior sepals with wing about half as wide as rest of sepal — **7. crassifolia**
6 Posterior sepals with very narrow wing
7 Leaves ± thick and rigid, not dimorphic — **8. maritima**
7 Leaves thin and flaccid, dimorphic: those subtending the scapes broadly triangular, the rest linear — **10. alpina**

4. P. coronopus L., *Sp. Pl.* 115 (1753). Annual, biennial or perennial with one or few rosettes. Leaves 3–20 × 0·5–2 cm, linear to lanceolate, dentate to 1- to 2-pinnatifid, rarely entire, glabrous or shortly hairy on both surfaces; lobes entire or dentate, more or less distant. Scapes usually numerous, shorter than or exceeding the leaves, decumbent or ascending. Bracts ovate and subacute, or abruptly attenuate into a long apex, shorter than or equalling calyx. Posterior sepals with weakly ciliate wing. Capsule 3-locular; seeds 3–6, *c.* 1 mm. *Coasts of Europe, eastwards to Poland and Krym, and northwards to the Faeröer and S. Sweden*; *inland in much of W. Europe and the Mediterranean region*; *casual elsewhere in N. & C. Europe.* Al Az Be Bl Br Bu Co Cr Da Fa Ga Ge Gr Hb Ho Hs It Ju Lu Po Rm Rs (K) Sa Si Su Tu.

1 Bracts abruptly attenuate into a long apex — (a) subsp. **coronopus**
1 Bracts ovate, ± acute
2 Spikes *c.* 0·3 cm wide, lax — (c) subsp. **cupanii**
2 Spikes *c.* 0·5 cm wide, dense
3 Leaves usually pinnatifid — (b) subsp. **commutata**
3 Leaves dentate — (d) subsp. **purpurascens**

(a) Subsp. **coronopus**: Annual, biennial or perennial. Leaves usually 1- to 2-pinnatifid, shortly hairy. Scapes numerous, exceeding the leaves, arcuate-ascending, slender. Spikes (1–)1·5–4(–7) × 0·3–0·4 cm. Bracts abruptly attenuate, with a broad base and long, narrow apex; keel narrow. $2n=10+0$–1B. *Throughout the range of the species.*

(b) Subsp. **commutata** (Guss.) Pilger, *Feddes Repert.* **28**: 287 (1930): Annual. Leaves usually pinnatifid, subglabrous or shortly hairy. Scapes numerous, shorter than or equalling the leaves, arcuate-ascending. Spikes 2–5 × 0·5 cm, dense. Bracts ovate, subacute, or slightly acuminate; keel wide, thickened. $2n=20$. *C. & E. parts of Mediterranean region.*

(c) Subsp. **cupanii** (Guss.) Nyman, *Consp.* 617 (1881): Biennial or perennial. Leaves usually 2-pinnatifid, shortly hairy. Scapes numerous, exceeding the leaves, arcuate-ascending or decumbent. Spikes (1–)2–4 × 0·3 cm, lax. Bracts ovate, subobtuse; keel wide. *Mountains of Sicilia.*

(d) Subsp. **purpurascens** Pilger, *Feddes Repert.* **28**: 303 (1930): Perennial. Leaves dentate, glabrous or shortly hairy. Scapes few, about equalling the leaves, decumbent. Spikes 1·5–3 × 0·5 cm, dense, reddish. Bracts ovate, subacute; keel wide. ● *Islas Baleares* (*Mallorca*).

5. P. macrorhiza Poiret, *Voy. Barb.* **2**: 114 (1789). Perennial with several rosettes. Leaves 4–10(–15) × 0·4–1(–1·5) cm, fleshy, rigid, linear-lanceolate to broadly oblanceolate-spathulate, dentate or pinnatifid, subglabrous or shortly hairy. Scapes few, exceeding the leaves, arcuate-ascending. Spikes 2–7 × 0·6–0·8 cm, dense. Bracts ovate, long-acuminate, equalling or exceeding calyx; keel prominent, thickened. Anterior sepals with the membranous margins of equal width; posterior sepals with a narrow, long-ciliate wing on the keel. Capsule 2-locular; seeds 2–4, 1–1·5 mm. $2n=10$. *Coastal habitats. Mediterranean region from Corse to S.E. Italy*; *one station in S.W. Spain.* Co Hs It ?Lu Si.

6. P. serraria L., *Syst. Nat.* ed. 10, **2**: 896 (1759). Perennial with one or few rosettes. Leaves (4–)8–15(–30) × 0·4–4 cm, lanceolate, acute, regularly serrate or incise-serrate, glabrous or pubescent. Scapes numerous, equalling or exceeding the leaves, arcuate-ascending. Spikes (5–)6–10 × 0·3–0·5 cm, dense. Bracts ovate, obtuse or subacute, much shorter than calyx, broadly scarious. Anterior sepals with the membranous margins of unequal width; posterior sepals with very wide, ciliate wing on the keel. Capsule 2-locular; seeds 2–4, 1–1·5 mm. $2n=10+0$–3B, 20+2B. *Mediterranean region, C. & S. Portugal.* ?Bl Gr Hs It Ju Lu Sa Si.

P. peloritana Lojac., *Fl. Sic.* **2(2)**: 35 (1907), from Sicilia, is a dwarf plant with irregularly dentate leaves and the posterior sepals very narrowly winged; it is probably a variant of **6.**

7. P. crassifolia Forskål, *Fl. Aegypt.* 31 (1775). Perennial with few rosettes. Leaves 5–20 × 0·3–0·5 cm, linear, usually sparsely dentate, fleshy, not rigid, glabrous or slightly hairy. Scapes numerous, exceeding the leaves, stout. Spikes 2–5 × 0·3–0·4 cm, dense. Bracts ovate, subacute, much shorter than the calyx, scarcely keeled. Anterior sepals with the narrow membranous margins of equal width; posterior sepals with a broad wing on the narrow keel. Capsule 2-locular; seeds 2–4, *c.* 2 mm. $2n=20$. *Maritime and other saline habitats. Mediterranean region*; *one station on W. coast of France.* Al Bl Co Ga Gr Hs It Ju Sa Si Tu.

8. P. maritima L., *Sp. Pl.* 114 (1753). Perennial with several or many rosettes; stock laxly branched, leafy only at the apex. Leaves (2–)3–25 × 0·2–1·5 cm, linear, usually entire, usually long-attenuate at the apex, slightly fleshy and coriaceous, not rigid, more or less canaliculate, glabrous or subglabrous except for sericeous hairs at the base. Scapes numerous, usually exceeding the leaves, stout. Spikes (1–)3–7(–10) × 0·3–0·4 cm, lax. Bracts ovate-lanceolate, acute, strongly keeled, narrowly scarious at margin, about equalling the calyx. Anterior sepals with the membranous margins of unequal width; posterior sepals with keel unwinged. Capsule 2-locular; seeds 2–4, 2–2·5 mm. $2n=12$, 18, 24. *Maritime habitats, and on saline or base-rich soils inland. Most of Europe, but rare in the extreme south.* All except Az Bl Bu Cr Gr Sb Tu.

Various attempts have been made to subdivide this rather variable species, but the taxa proposed have proved difficult to define morphologically. Plants from Arctic Europe have been assigned to subsp. **juncoides** (Lam.) Hultén, *Kungl. Svenska Vet.-Akad. Handl.* ser. 4, **8**: 15 (1958), which is considered to differ from the widespread subsp. **maritima** in having wide bracts, more ovoid to globose capsule, the scapes not exceeding the leaves and more numerous seeds per capsule, but these criteria have not proved very satisfactory.

Subsp. **serpentina** (All.) Arcangeli, *Comp. Fl. Ital.* 499 (1882) (*P. serpentina* All.), with long-acuminate bracts and the posterior sepal with the keel often narrowly winged, occurs in S. Europe, especially on mountains above 2000 m; it is probably only an ecological variant.

9. P. subulata L., *Sp. Pl.* 115 (1753). Like **8** but stock densely branched; leaves 0·1–0·2 cm wide, rigid, trigonous throughout most of their length, often apiculate at apex, sometimes distinctly hairy; scapes erect, usually not exceeding the leaves; spikes (1–)2–5 × 0·2–0·3 cm; bracts acuminate. $2n=12$. *S. & S.C. Europe.* Al *Au Bu Co Ga Gr Hs It Ju Lu Rm Sa Si Tu.

P. holosteum Scop. *Fl. Carn.* ed. 2, **1**: 108 (1771) (*P. acanthophylla* Decne, *P. carinata* Schrader ex Mert. & Koch, non Moench), with the stock leafy only at the apex and scapes often greatly exceeding the leaves, is probably a variant of **9**. It has $2n=12$.

Subsp. **insularis** (Gren. & Godron) Nyman, *Consp.* 618 (1881) (*P. insularis* Gren. & Godron, *P. humilis* Guss.), from high altitudes in Corse, Sardegna and Sicilia, is only a dwarf variant of **9**; it has $2n=24$.

10. P. alpina L., *Sp. Pl.* 114 (1753). Perennial with several or many rosettes; stock laxly branched. Leaves dimorphic; those subtending the scapes broadly triangular; the others 3–10 × 0·2–0·5 cm, linear, abruptly attenuate at the apex, not coriaceous, flat, glabrous or slightly hairy. Scapes numerous, exceeding the leaves, erect, stout. Spikes 1–3 × 0·3 cm, dense. Bracts broadly ovate, subacute, about equalling the sepals, with narrow keel and broadly scarious margins. Anterior sepals with the margins of equal width; posterior sepals with unwinged keel. Capsule 2-locular; seeds 2–4, 1·5–2 mm. $2n=12$, 24. ● *Mountains of C. & S. Europe, eastwards to* 12° 30′ *E.* Au Ga Ge He Hs It [Rs (W)].

11. P. schwarzenbergiana Schur, *Ver. Mitt. Siebenb. Ver. Naturw.* **6**: 3 (1855). Perennial usually with several rosettes. Leaves 3–15(–25) × 0·5–2·5 cm, in a basal rosette; lamina lanceolate to narrowly elliptical, entire or remotely dentate, 3-veined, glabrous or very sparsely hairy, gradually narrowed into a petiole ¾ as long to as long as lamina. Scapes exceeding leaves, weakly sulcate above, glabrous or sparsely hairy; spikes usually *c.* ½ as long as rest of scape, dense but sometimes interrupted at base. Bracts 1·5–2·5 mm, ovate-elliptical, glabrous. Sepals unequal, almost free, glabrous, the anterior *c.* 2·5 mm, keeled, with wide scarious margins, the posterior *c.* 1·5 mm, not keeled. Corolla-tube *c.* 2·5 mm, glabrous; lobes *c.* 1·5 mm, ovate, subacute. Stamens exserted *c.* 3 mm, whitish. Capsule 3·5–4·5 mm; seeds 4–5, *c.* 1·25 mm, oblong-elliptical, plano-convex. $2n=12$. *Saline soils.* ● *Hungary and Romania*; *one station in S. Ukraine.* Hu Rm Rs (W).

12. P. media L., *Sp. Pl.* 113 (1753). Perennial with one or few rosettes. Leaves (2–)5–15(–30) × (1·5–)2·5–8 cm, not blackening on drying; lamina elliptical to ovate-elliptical, entire or remotely crenate or dentate, (5- to)7- to 9-veined, more or less densely crispate-hairy, gradually narrowed into a petiole usually less than half as long as lamina. Scapes greatly exceeding leaves, striate, with subappressed or ascending hairs; spikes (1–)2–6(–10) cm, up to 15 cm in fruit, dense. Bracts 2–3 mm, ovate or ovate-lanceolate, glabrous or shortly hairy. Sepals *c.* 2 mm, subequal, almost free, glabrous, green or purplish with scarious margins. Corolla-tube *c.* 2 mm, glabrous; lobes 1·5–2 mm, ovate-lanceolate, subacute. Stamens exserted 8–13 mm; filaments lilac; anthers lilac or white. Capsule 3–4 mm; seeds 2–4(–6), *c.* 2 mm, oblong-elliptical, plano-convex. $2n=12$, 24. *Dry grassland. Europe, except most of the islands, but doubtfully native in parts of the north.* Al Au Be Br Bu Cz Da Fe Ga Ge Gr He Ho Hs Hu It Ju No Po Rm Rs (*N, B, C, W, K, E) Su ?Tu [Hb].

Dwarf plants, often with subvillous, narrow leaves, from serpentine areas above 1500 m in the Balkan peninsula have been described as var. *pindica* Hausskn. (subsp. *pindica* (Hausskn.) Rech. fil.), while similar plants from S. Spain (Sierra Nevada) have been called var. *nevadensis* Willk., and narrow-leaved plants from C. & E. Europe have been called var. *urvilleana* Rapin (*P. stepposa* Kuprian.); all are probably best considered as ecotypes.

13. P. maxima Juss. ex Jacq., *Collect. Bot.* **1**: 82 (1787). Perennial usually with several rosettes. Leaves 25–50 × 5–15 cm, blackening on drying; lamina broadly ovate to ovate-elliptical, entire or remotely denticulate, 9- to 11-veined, more or less sparsely hairy, more or less abruptly narrowed into a petiole longer than the lamina. Scapes somewhat exceeding leaves, striate, subglabrous or appressed-hairy above; spikes 5–20 cm, dense. Bracts 2·5–3·5 mm, ovate-elliptical, glabrous. Sepals 2·5–3 mm, subequal, almost free, glabrous, dark brown with scarious margins. Corolla-tube 2–2·5 mm, glabrous; lobes *c.* 2 mm, ovate-lanceolate, acute. Stamens 10–12 mm. Capsule *c.* 3 mm; seeds 4, *c.* 2 mm, oblong-ellipsoid, plano-convex. *Damp meadows. S.E. part of U.S.S.R., westwards to* 35° *E. and northwards to* 57° *N.*; *isolated stations in Romania and Hungary.* Hu Rm Rs (C, W, E).

14. P. reniformis G. Beck, *Ann. Naturh. Mus.* (*Wien*) **2**: 149 (1887). Perennial with usually one rosette. Leaves 5–17(–30) × 2·5–10 cm; lamina ovate-cordate or suborbicular and truncate at the base, irregularly undulate-crenate to dentate or almost digitate at the base, more or less crispate-hairy; petiole ½–2 times as long as lamina. Scapes exceeding leaves, striate, subglabrous below, more or less densely appressed-hairy above; spikes 2–6

cm, dense, sometimes lax at base. Bracts 2–2·5 mm, ovate-lanceolate, usually pubescent. Sepals 2–2·5 mm, subequal, almost free, subglabrous, greenish-brown or purplish with wide scarious margins. Corolla-tube *c.* 2 mm, glabrous; lobes 1–1·5 mm, ovate or ovate-lanceolate, acute or obtuse. Stamens exserted 4–8 mm. Capsule *c.* 3 mm; seeds 2, *c.* 2 mm, oblong-ellipsoid, plano-convex. $2n=12$. *Grassy places*, 1500–2300 *m.* ● *S.W. Jugoslavia and N. Albania.* Al Ju.

(15–17). P. atrata group. Perennials with several or many rosettes. Leaves in a basal rosette, linear-lanceolate, entire, slightly contracted at the base. Scapes terete. Bracts orbicular to suborbicular, with prominent keel and wide, membranous margin, with long hairs at apex. Sepals equal, free, almost entirely membranous, keeled to halfway or less. Corolla-tube glabrous; lobes at least 2 mm. Capsule 2-locular; seeds (1–)2–4, rugose, canaliculate on inner face.

The species of this group all occur at high altitudes (1200–3000 m). Artificial hybrids are readily made between species with the same chromosome number but with great difficulty between diploids and polyploids.

1 Leaves acute, mucronate **17. nivalis**
1 Leaves long-acuminate
2 Leaves glabrous or sparsely pubescent, green; bracts with glabrous or sparsely pubescent keel **15. atrata**
2 Leaves sericeous with dense, long, white hairs on both surfaces; bracts with ± densely pubescent keel **16. monosperma**

15. P. atrata Hoppe, *Bot. Taschenb.* **1799**: 85 (1799) (*P. montana* sensu Lam., non Hudson, *P. fuscescens* Jordan). Leaves 5–20 × 0·5–1·5 cm, flat or slightly canaliculate, long-acuminate, green, glabrous or sparsely pubescent. Scapes as long as or longer than leaves, erect or ascending, sparsely hairy. Spike 1·5–3 cm, oblong-ovoid. Bracts entire, long-ciliate, with glabrous or sparsely pubescent keel and brown or colourless margins. Sepals long-ciliate, with brownish margin. Anthers yellowish or violet. Capsule conical; seeds 3–5 mm. $2n=12$, 24+0–2B, 36. *Mountains of C. & S. Europe.* Al Au Bu Cz Ga Ge Gr He Hs It Ju Po Rm Rs (W).

A rather variable species, including interfertile variants which have been recognized as subspecies or species but which intergrade morphologically.

16. P. monosperma Pourret, *Mém. Acad. Sci. Toulouse* **3**: 325 (1788). Like **15** but leaves 5–10 × 0·5–1 cm, sericeous with dense, long, white hairs on both surfaces; scapes scarcely longer than leaves, pubescent; spike 1–2 cm; bracts slightly emarginate, with long, white hairs on the keel and colourless margins; sepals with colourless margin; anthers white; seeds (1–)2, *c.* 3 mm. $2n=12$. *C. & E. Pyrenees.* Ga Hs.

17. P. nivalis Boiss., *Voy. Bot. Midi Esp.* **2**: 533 (1841). Leaves 3–7 × 0·5–1 cm, flat, acute, mucronate, whitish-sericeous on both surfaces. Scapes shorter than to as long as leaves, sericeous. Spike less than 1 cm, globose. Bracts somewhat 2-lobed, long-ciliate, with long, white hairs on the keel and brownish margin. Sepals with brown margins, glabrous. Anthers yellow. Capsule subglobose; seeds 2, *c.* 2 mm. $2n=12$. ● *S. Spain* (*Sierra Nevada*). Hs.

18. P. gentianoides Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 101 (1806). Perennial usually with one rosette. Leaves 2–6(–10) × 1–3·5 cm; lamina ovate to elliptical, subentire or weakly dentate, 3- to 5-(to 7-)veined, glabrous or sparsely (rarely densely) hairy, gradually or abruptly narrowed into a petiole usually *c.* ½ as long as lamina, rarely sessile. Scapes much longer than leaves, striate; spikes 1–3·5 cm, up to 4 cm in fruit, dense. Bracts *c.* 2 mm, ovate-orbicular, glabrous, sometimes minutely ciliate. Sepals *c.* 2 mm, subequal, almost free, glabrous or minutely ciliate, not keeled, usually purplish-brown, with scarious margin. Corolla-tube *c.* 2 mm, glabrous; lobes 1–1·5 mm, ovate, obtuse. Stamens exserted 3–5 mm; filaments whitish; anthers yellowish. Capsule *c.* 3 mm; seeds 2–4(–7), 2–2·5 mm, cymbiform. $2n=12$. *Damp places in the mountains. C. part of Balkan peninsula; S. & E. Carpathians.* Al Bu Gr Ju Rm.

19. P. amplexicaulis Cav., *Icon. Descr.* **2**: 22 (1793). Annual; stems up to 5(–15) cm. Leaves 3–15 × 0·3–1·5 cm, alternate, linear-lanceolate, entire or remotely denticulate, 3- to 5-veined, with sparse or dense long, patent hairs. Scapes mostly exceeding the leaves, striate above, with usually sparse, long, patent hairs or glabrescent; spikes 1–2·5 cm, dense. Bracts 5–6 mm, orbicular or wider than long, glabrous. Sepals unequal, almost free, the anterior 3·5–4 mm, with prominent greenish- or purplish-brown, strongly hairy keel, the posterior 3–3·5 mm, obscurely keeled. Corolla-tube *c.* 4 mm, glabrous; lobes *c.* 3·5 mm, ovate, subacute. Stamens exserted *c.* 2 mm. Capsule 5–6·5 mm; seeds 2, 4–5 mm, cymbiform. $2n=10$. *Dry places. S. Spain*; *S. Italy*; *S. part of Aegean region.* Cr Gr Hs It.

20. P. lanceolata L., *Sp. Pl.* 113 (1753). Perennial with several rosettes; roots up to 0·75 mm thick. Leaves 2–30 × 0·5–3·5 cm, usually linear-lanceolate to lanceolate, entire or remotely and shallowly dentate, 3- to 5-(to 7-)veined, subglabrous, appressed-pubescent or villous, sessile or with a petiole up to as long as the lamina. Scapes about twice as long as leaves, strongly 5-sulcate, more or less appressed-hairy; spikes 0·5–5(–8) cm, very dense. Bracts 2·5–3·5 mm, ovate, glabrous or shortly hairy. Sepals 2·5–3 mm, the anterior connate for most of their length but their midribs separate, often shortly hairy, usually ciliate above. Corolla-tube 2–3 mm, glabrous; lobes 1·5–2·5 mm, lanceolate to ovate, acute or acuminate, glabrous. Stamens exserted 3–5 mm; anthers yellowish. Capsule 3–4 mm; seeds 2, *c.* 2 mm, cymbiform. $2n=12+0–1B$. *Europe, except the extreme north.* All except Sb.

Extremely variable; much of the variation reflects differences in habitat and some is of a clinal nature. Plants with tomentose-lanate leaves, shortly hairy bracts, often decumbent scapes and globose spikes (var. *sphaerostachya* Mert. & Koch) are common in dry habitats; although the hairiness appears to show some clinal variation, decumbent scapes and globose spikes are not associated with it in other populations, and formal recognition of this and any of the numerous other variants as subspecies seems impractical.

21. P. altissima L., *Sp. Pl.* ed. 2, 164 (1762). Like **20** but larger in all its parts and with one or few rosettes; roots 1–2 mm thick, fleshy; leaves subglabrous; scapes 6- to 12-sulcate; spikes 3–5 cm; bracts 4·5–6 mm; sepals 3·5–4·5 mm, always somewhat hairy and ciliate above; seeds *c.* 3·5 mm. $2n=72$. *Damp meadows or sandy places. E.C. Europe and Balkan peninsula.* Al Au Bu Cr Cz Gr Hu ?It Ju Rm ?Rs (W, E) [Ga Ge He].

22. P. argentea Chaix in Vill., *Hist. Pl. Dauph.* **1**: 376 (1786). Like **20** but with one or few rosettes; roots up to 1·5 mm thick; leaves (4–)10–30 × 0·5–1·5(–2) cm, linear-lanceolate, entire, shortly appressed-hairy, or sometimes sericeous especially beneath; scapes striate; spikes 0·5–2 cm; bracts up to 4 mm, shortly hairy; at least the anterior sepals more or less shortly appressed-hairy, the midribs often united; anthers white; seeds *c.* 3 mm. $2n=12$, 12+2B. *Dry places*; *usually calcicole.* ● *S. & S.C. Europe, from the E. Pyrenees to N. Greece and Romania.* ?Bl Bu Ga Gr Hs Hu It Ju Rm.

23. P. lagopus L., *Sp. Pl.* 114 (1753) (incl. *P. lusitanica* L.). Like **20** but sometimes annual with one rosette, sometimes with a stem up to 10(–20) cm and alternate leaves; leaves usually remotely dentate; scapes striate; bracts ovate-lanceolate, together with the sepals densely villous in apical half with long hairs so that whole spike appears villous; corolla-lobes long-acuminate, usually sparsely hairy; capsule *c.* 2·5 mm; seeds *c.* 1·5 mm. $2n=12+0–1B$. *Dry, stony and sandy ground. S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

24. P. albicans L., *Sp. Pl.* 114 (1753). Subcaespitose perennial; stock with branches 1–7 cm, covered with leaf-bases and with terminal rosettes. Leaves (2–)5–15(–20) × (0·2–)0·5–0·8 cm, linear-lanceolate to almost linear, entire, often undulate, obscurely 3-veined, sericeous-lanate. Scapes about twice as long as leaves, terete, tomentose; spikes (1–)3–10 cm, dense above, usually lax or interrupted below. Bracts 3·5–4·5 mm, ovate, shortly villous. Sepals 3–4 mm, subequal, almost free, weakly keeled to the apex, with wide scarious margins, villous at least towards apex. Corolla-tube 3–4 mm, glabrous; lobes 2·5–3·5 mm, ovate, abruptly acuminate, glabrous. Stamens exserted 4–7 mm; anthers white. Capsule *c.* 4 mm; seeds 2, 2·5–3 mm, cymbiform. $2n=20$, ?30. *Dry places. Iberian peninsula and Mediterranean region.* Bl Cr Ga Gr Hs It Lu Sa Si.

25. P. ovata Forskål, *Fl. Aegypt.* 31 (1775). Perennial with one or few rosettes. Leaves 2·5–12 × 0·1–0·8 cm, linear to linear-lanceolate, entire or remotely denticulate, sparsely to densely villous-lanate. Scapes only slightly exceeding leaves, terete, shortly villous; spikes 0·5–3·5 cm, dense. Bracts *c.* 3 mm, sub-orbicular to ovate, sometimes shortly hairy. Sepals *c.* 2·5 mm, subequal, almost free, keeled to the apex, with wide scarious margins, at least the anterior usually shortly hairy. Corolla-tube 1·5–2 mm, glabrous; lobes *c.* 2·5 mm, ovate-orbicular, subobtuse or very shortly acuminate. Stamens exserted up to **1** mm. Capsule *c.* 3 mm; seeds 2, 2–2·5 mm, cymbiform. $2n=8$. *Dry places. S.E. Spain.* Hs. (*N. Africa, S.W. Asia.*)

26. P. minuta Pallas, *Reise* **3**: 716 (1776). Like **25** but probably always annual; scapes often shorter than leaves; spikes up to 2 cm; bracts *c.* 2·5 mm; sepals *c.* 3 mm; corolla-tube 2·5–3 mm, the lobes 1–1·5 mm, elliptical or ovate-elliptical, acute; stamens usually included; capsule 4–5 mm; seeds 3–3·5 mm. *Saline or damp habitats. S.E. Russia, W. Kazakhstan.* Rs (E).

27. P. loeflingii L., *Sp. Pl.* 115 (1753). Annual with one or several rosettes. Leaves 2–7(–10) × 0·1–0·7 cm, linear to linear-lanceolate, entire or remotely dentate, 3-veined, with sparse to dense, patent, rather stiff hairs. Scapes mostly shorter than the leaves, terete, appressed-pubescent; spikes 0·5–2·5 cm, dense. Bracts 2·5–3 mm, wider than long, glabrous. Sepals 1·5–2 mm, equal, almost free, suborbicular, scarious, veined only in lower ¼, glabrous. Corolla-tube *c.* 1·5 mm, glabrous; lobes *c.* 1 mm, ovate-lanceolate, subacute. Stamens exserted 0·5–1 mm. Capsule *c.* 3 mm; seeds 2, 2–2·5 mm, very narrowly cymbiform. *Waste places or sandy ground. C. & S. parts of Iberian peninsula.* Hs Lu.

28. P. notata Lag., *Gen. Sp. Nov.* 7 (1816). Like **27** but bracts villous on keel and prominently long-ciliate at apex; sepals ovate-elliptical, long-ciliate at apex; corolla-lobes ovate-orbicular, obtuse. *Dry places. S.E. Spain* (*W. of Aguiles, Almeria Prov.*). Hs. (*S.W. Asia, N. Africa.*)

Other records for Spain appear to be referable to **25** or **27.**

29. P. bellardii All., *Fl. Pedem.* **1**: 82 (1785). Annual with one or few rosettes. Leaves 2–7(–10) × 0·1–0·5 cm, linear-lanceolate, entire or remotely denticulate, 3-veined, laxly to densely villous with more or less patent hairs. Scapes usually 1–7, terete, densely hairy with both long and short patent hairs; spikes 1–2(–4) cm, dense. Bracts 3–6 mm, the lower up to 8 mm, oblong-lanceolate, villous. Sepals unequal, almost free, the anterior 4–5 mm, with very narrow scarious margins, the posterior 3–4 mm, with wide scarious margins. Corolla-tube *c.* 3·5 mm, glabrous; lobes *c.* 2 mm, ovate-lanceolate, acuminate. Stamens exserted *c.* 2 mm. Capsule *c.* 2·5 mm; seeds 2, *c.* 1·75 mm, narrowly cymbiform. *Dry, sandy ground and waste places. S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

(a) Subsp. **bellardii**: Scapes 3–10(–15) cm, equalling or exceeding leaves, remaining erect or ascending in fruit. $2n=10$. *Throughout the range of the species.*
(b) Subsp. **deflexa** (Pilger) Rech. fil., *Fl. Iran.* **15**: 19 (1965): Scapes 1–5 cm, shorter than leaves, becoming arcuate-recurved in fruit. $2n=10$. *Balkan peninsula and Aegean region.*

30. P. cretica L., *Sp. Pl.* 114 (1753). Like **29** but scapes often more than 10, up to 2·5 cm, much shorter than leaves, with denser and longer hairs, becoming arcuate-recurved and thickened in fruit so that whole plant becomes a wind-dispersed ball; spikes up to 1 cm; sepals up to 3·5 mm; corolla-lobes orbicular-ovate, shortly acuminate; stamens exserted *c.* 5 mm. $2n=10$. *Dry, sandy and stony places. S. part of Aegean region.* Cr Gr.

Subgen. **Psyllium** (Miller) Harms. Leaves opposite on branched stems.

31. P. squarrosa Murray, *Comment. Gotting.* **4** (*Cl. Phys.*): 38 (1782). Annual; stems 2–25 cm, decumbent or ascending, usually with patent, flexuous branches as long as the main stem, more or less scabrid-puberulent with deflexed hairs, eglandular. Leaves 0·5–2 × 0·1–0·2 cm, linear, fleshy. Peduncles 1–5 cm; spikes 0·5–1·5 cm. Lowest 2 bracts 7–12 mm, herbaceous or with very narrow scarious margins, lanceolate-caudate, recurved, with divergent lateral veins at base; upper bracts 3–4 mm, obovate-oblong. Sepals unequal, the anterior like the upper bracts, the posterior 2·5–3 mm, ovate. Corolla-tube 3·5–4 mm; lobes *c.* 2 mm, ovate, acute. Capsule 2–2·5 mm; seeds *c.* 1·75 mm, cymbiform, ovate-elliptical in outline. *Dry, usually sandy places. Aegean region.* Cr Gr.

32. P. arenaria Waldst. & Kit., *Pl. Rar. Hung.* **1**: 51 (1801) (*P. ramosa* Ascherson, *P. psyllium* L., nom. ambig., *P. indica* L., nom. illegit.). Annual; stems up to 50(–80) cm, erect, usually with ascending, straight branches, pubescent with patent or ascending hairs, more or less minutely glandular above. Leaves 3–8 × 0·1–0·3(–0·4) cm, linear or linear-lanceolate, not fleshy. Peduncles 1–6 cm; spikes 0·5–1·5 cm. Lowest 2 bracts 6–10 mm, with herbaceous midrib and wide scarious margins, ovate-orbicular with linear-subulate apex, straight and suberect, with divergent lateral veins at base; upper bracts 3·5–4·5 mm, ovate-orbicular or wider than long. Sepals unequal, the anterior 3·5–4 mm, obovate-spathulate, the posterior 3–3·5 mm, ovate-lanceolate. Corolla-tube 3·5–4 mm; lobes *c.* 2 mm, ovate-lanceolate, acute. Capsule *c.* 2 mm; seeds *c.* 2·5 mm, cymbiform, oblong-elliptical in outline. $2n=12$. *Dry places. S., C. & E. Europe*; *a frequent casual in N. Europe and locally naturalized.* Al Au Bu Co Cr Cz Ga Ge Gr Hs Hu It Ju Po Rm Rs (C, W, K, E) Sa Tu [Be He Ho Rs (B)].

33. P. afra L., *Sp. Pl.* ed. 2, 168 (1762) (*P. psyllium* L. 1762, non L. 1753). Like **32** but usually strongly glandular-pubescent at least above; bracts 3·5–8 mm, all similar in shape, ovate-lanceolate to lanceolate, acute or acuminate, with wide scarious margin below, without lateral veins; sepals 3–4·5 mm, equal, oblanceolate; seeds narrowly oblong in outline. $2n=12$. *Dry places. S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

34. P. sempervirens Crantz, *Inst. Rei Herb.* **2**: 331 (1766) (*P. cynops* L. 1762, non L. 1753, *P. suffruticosa* Lam.). Dwarf shrub up to 40 cm with usually much-branched, shortly pubescent stems. Leaves 1–6 × *c.* 0·1 cm, linear or linear-subulate, entire or remotely denticulate, scabrid-puberulent. Peduncles 2–10 cm; spikes 0·5–1·5 cm, with (3–)5–12 flowers. Lower bracts 5–10 mm, ovate to ovate-orbicular with wide membranous margin, abruptly contracted into a linear apex or acute; upper bracts ovate to lanceolate. Sepals unequal. Corolla-tube 4–5 mm; lobes 2·5–3·5 mm, ovate-lanceolate, acuminate. Capsule 4–5 mm; seeds 3–4 mm, cymbiform, ovate to oblong-lanceolate in outline. *Dry places.* $2n=12$. *S.W. Europe, extending to C. Italy; locally naturalized in C. Europe.* Co Ga Hs It [Au ?Cz He].

35. P. asperrima (Gand.) Hervier, *Bull. Acad. Int. Géogr. Bot.* (*Le Mans*) **15**: 160 (1905). Like **34** but very intricately branched; leaves 1–2 × 0·2–0·5 cm, linear-lanceolate, strongly dentate or almost pinnatifid, scabrid-puberulent and more or less villous-asperous; spikes *c.* 0·5 cm, with 3–5 flowers; lower bracts *c.* 5 mm, ovate, acute or acuminate. *Dry places; calcicole.* ● *C., E. & S. Spain; very local.* Hs.

DIPSACALES

CLXIV. CAPRIFOLIACEAE[2]

Woody perennials (rarely herbaceous) with opposite, usually exstipulate leaves. Flowers (3-)5-merous, hermaphrodite, epigynous, usually actinomorphic. Calyx small; corolla-tube variously developed. Stamens (4–)5, epipetalous, alternating with corolla-lobes; anthers longitudinally dehiscent. Ovary 1- to 5-locular; style 1 or absent; stigmas free or connate. Ovules 1 to numerous, pendent, anatropous. Fruit a drupe, berry or nutlet. Seeds endospermic, with a small, straight embryo.

1 Leaves pinnate — **1. Sambucus**
1 Leaves simple (sometimes lobed)
2 Dwarf shrub with slender, procumbent stems — **4. Linnaea**
2 Erect shrub or woody climber
3 Inflorescence corymbose — **2. Viburnum**
3 Inflorescence not corymbose (flowers sometimes solitary)
4 Bracts 15–35 mm, leaf-like, purplish — **5. Leycesteria**
4 Bracts less than 15 mm, inconspicuous
5 Fruit a white drupe with 2 pyrenes — **3. Symphoricarpos**
5 Fruit a red, black or blue, few-seeded berry (sometimes connate in pairs) — **6. Lonicera**

1. Sambucus L.[3]

Small trees, shrubs or herbs. Stems with large pith. Leaves pinnate, deciduous, stipulate or exstipulate. Flowers (3-)5-merous, small, actinomorphic, in cymose corymbs or panicles. Calyx 5-lobed. Corolla rotate. Stamens 5. Stigma sessile, 3- to 5-lobed. Ovary 3- to 5-locular. Fruit a drupe with 3–5 compressed, cartilaginous pyrenes.

1 Herb; stipules conspicuous — **1. ebulus**
1 Shrub or small tree; stipules absent or very small
2 Inflorescence corymbose; fruit usually black; pith whitish — **2. nigra**
2 Inflorescence paniculate; fruit red; pith reddish-brown — **3. racemosa**

1. S. ebulus L., *Sp. Pl.* 269 (1753). Perennial herb 0·6–2 m, with a creeping rhizome. Stems stout, erect, usually simple. Leaflets 5–13, 5–16 × 1–4·5 cm, oblong to oblong-lanceolate, acuminate, acutely serrate. Stipules conspicuous, more or less ovate. Inflorescence 5–16 cm in diameter, corymbose, with 3(–4) primary rays. Corolla white, rarely pink outside. Anthers purple. Fruit globose, black. *Most of Europe from the Netherlands and N. Ukraine southwards; formerly cultivated as a medicinal plant and naturalized elsewhere.* Al Au Be Bl Bu Co Cr Cz Ga Ge Gr He Ho Hs Hu It Ju Lu Po Rm Rs (C, W, K) Sa Si Tu [*Br Da Hb Rs (B) Su].

2. S. nigra L., *Sp. Pl.* 269 (1753). Shrub or small tree up to 10 m, with brownish-grey, sulcate, corky bark and whitish pith. Stems often with vigorous, erect shoots from base; branches often arching. Leaflets 5–7(–9), 4·5–12(–18) × 2–6(–10) cm, ovate, ovate-lanceolate or ovate-elliptical, acuminate, serrate, sparsely pubescent beneath. Stipules absent or very small, subulate. Inflorescence 10–24 cm in diameter, corymbose, with (4–)5 primary rays. Corolla white. Anthers yellowish-white. Fruit globose, black (very rarely red). $2n=36$. *Most of Europe except the extreme north.* All except Bl Cr Fa Is Rs (N) Sb, but only naturalized in Fe No Su.

Although undoubtedly native in damp woods over a large part of Europe, this species has been widely cultivated for its fruits and in some districts is seen only near houses. Its precise limits as a native are difficult to establish.

3. S. racemosa L., *Sp. Pl.* 270 (1753). Shrub up to 4 m. Stems often arching; bark grey; pith reddish-brown. Leaflets 3–7, 4–12(–15) × 1·5–4(–6) cm, ovate, ovate-lanceolate or elliptical, acuminate, serrate, glabrous or sparsely pubescent when young. Stipules represented by paired glands 2–3 mm. Inflorescence a dense, ovoid panicle 2·5–6 cm in diameter. Corolla yellowish- to greenish-white. Anthers yellowish-white. Fruit globose, red. $2n=36$. *Woods, mainly in the mountains. From Belgium and Lithuania southwards to the Pyrenees and S. Bulgaria; cultivated for ornament in N. & E. Europe and naturalized.* Al Au Be Bu Cz Ga Ge He Ho Hs Hu It Ju Po Rm Rs (*B, C, W) [Br Da Fe No Su].

S. sibirica Nakai, *Bot. Mag.* (*Tokyo*) **40**: 478 (1926), from Siberia and N.E. Asia, and extending westwards to the E.C. part of European Russia, appears to differ only in its roughly hairy rhachis, petiole, petiolules and main veins on lower surface of the leaves; it does not seem to warrant specific rank.

2. Viburnum L.[1]

Shrubs or small trees. Leaves simple, deciduous or evergreen, stipulate or exstipulate. Flowers in cymose corymbs, actinomorphic, but sometimes the marginal flowers of the inflorescence enlarged, somewhat zygomorphic and sterile. Calyx 5-lobed. Corolla 5-lobed, rotate to campanulate. Stamens 5. Style short; stigma 3-lobed. Ovary 3-locular, with one fertile loculus with a single ovule and 2 sterile loculi. Fruit a drupe with a single, globose pyrene.

1 Leaves lobed; outer flowers sterile, much larger than inner — **1. opulus**
1 Leaves entire or serrulate; flowers uniform
2 Leaves deciduous, not coriaceous, serrulate; twigs with dense, greyish, stellate pubescence — **2. lantana**
2 Leaves coriaceous, evergreen, entire; twigs glabrous or sparsely pubescent — **3. tinus**

1. V. opulus L., *Sp. Pl.* 268 (1753). Deciduous shrub up to 4 m. Twigs greyish, glabrous, angled; buds with scales. Leaves 3–8(–12·5) × 4·5–9(–13) cm, with 3(–5) irregularly dentate lobes, acuminate, glabrous above, pubescent or glabrescent beneath; petioles 1–2·5(–3·5) cm, with discoid glands; stipules filiform, sometimes laciniate and glandular. Inflorescence 4·5–10·5 cm in diameter; peduncle 1–4 cm. Flowers white, the inner 4–7 mm in diameter, fertile, the outer (9–)15–20(–25) mm in diameter, sterile. Fruit *c.* 8 mm, subglobose, red. $2n=18$. *Europe, except for parts of the north and most of the Mediterranean region.* Al Au Be Br Bu Cz Da Fe Ga Ge Hb He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su.

2. V. lantana L., *Sp. Pl.* 268 (1753). Deciduous shrub up to 6 m. Twigs with dense, greyish, stellate pubescence, terete; buds naked. Leaves 4–14 × 3·5–9 cm, ovate-lanceolate, ovate or obovate, usually acute, serrulate, rugose and sparingly stellate-pubescent above, densely stellate-tomentose beneath; petioles 1–3·5 cm; stipules absent. Inflorescence 6–10 cm in diameter; peduncle 1–2·5 cm. Flowers 5–9 mm in diameter, uniform, fertile, creamy-white. Fruit *c.* 8 mm, compressed-ovoid, red at first, later black. $2n=18$. *C. & S. Europe, extending to C. Ukraine, and westwards to N. Spain and England.* Al Au Be Br Bu Cr Cz Ga Ge Gr He Hs Hu It Ju Rm Rs (W, K) [No Su].

3. V. tinus L., *Sp. Pl.* 267 (1753). Evergreen shrub up to 7 m. Twigs glabrous or sparsely pubescent, weakly angled. Leaves 3–10 × 1·5–7 cm, ovate-orbicular to ovate-lanceolate, entire, obtuse or acute, glabrous, shining, dark green above, sparsely pubescent or glabrescent beneath; petioles 0·5–1·5(–2) cm; stipules absent. Inflorescence 4–9 cm in diameter; peduncle 0·5–2·5 cm. Flowers 5–9 mm in diameter, uniform, fertile, pinkish outside, white inside. Fruit *c.* 8 mm, subglobose, dark blue. *S. Europe.* Al Az Bl Co Ga Gr Hs It Ju Lu Sa Si [Br].

(a) Subsp. **tinus**: Leaves oblong-ovate, ovate-lanceolate, lanceolate or elliptical, acute or subacute, very shortly tapered into petiole. *Throughout the range of the species except Açores.*

(b) Subsp. **subcordatum** (Trelease) P. Silva in Palhinha, *Cat. Pl. Vasc. Açores* 115 (1966): Leaves ovate or ovate-orbicular, obtuse, subcordate. *Açores.*

3. Symphoricarpos Duh.[1]

Shrubs. Leaves simple, deciduous, exstipulate. Flowers actinomorphic, in terminal, spike-like racemes or clusters, subtended by bracts and paired bracteoles. Calyx (4–)5-lobed. Corolla (4–)5-lobed, campanulate. Stamens (4–)5. Style slender; stigma capitate. Ovary 4-locular with 2 fertile loculi, each with a single ovule, and 2 sterile loculi. Fruit a drupe with 2 more or less compressed pyrenes.

1. S. albus (L.) S. F. Blake, *Rhodora* **16**: 118 (1914) (*S. racemosus* Michx). Shrub 1–3 m. Stems erect, slender; twigs yellowish-brown, glabrous. Leaves (2–)2·5–8(–9) × 1·5–6(–7·5) cm, ovate-orbicular or ovate, obtuse, entire or rarely sinuately lobed, glabrous or sparsely hairy beneath; petiole 2–5(–7) mm. Flowers 3–9 in terminal, spike-like racemes 1–2·5 cm; bracts and bracteoles 1–1·5 mm, ovate, acuminate, glabrous. Corolla 5–6 mm, campanulate, pink, hairy inside the throat. Style glabrous. Fruit 1–1·5 cm, globose, white. *Cultivated for ornament and for hedges throughout a large part of Europe and widely naturalized.* [Au Be Br Cz Da Fe Ga Ge Hb He Hu Ju No Su.] (*North America.*)

This description applies to var. *laevigatus* (Fernald) S. F. Blake, which appears to be the variety naturalized in Europe. It differs from the typical variety in its glabrous twigs and leaves and larger fruit.

4. Linnaea L.[1]

Procumbent dwarf shrubs. Leaves evergreen, exstipulate. Flowers in pairs on long peduncles which are terminal on short lateral branches. Calyx with 5 narrowly lanceolate lobes. Corolla 5-lobed, campanulate. Stamens 4, 2 shorter, inserted towards the base of the tube. Style filiform; stigma capitate. Ovary 3-locular with 1 fertile loculus with a single ovule and 2 sterile loculi. Fruit a nutlet enclosed by persistent bracteoles.

1. L. borealis L., *Sp. Pl.* 631 (1753). Stems slender, trailing. Leaves 5–16 × 4–10 mm, broadly ovate to orbicular, subobtuse, crenate-dentate in the upper half, tapered below into a petiole 2–3 mm. Peduncles 4·5–8 cm, glandular-pubescent; bracts 2, 1·5–2 mm, lanceolate, membranous. Pedicels 10–20 mm, glandular-pubescent; bracteoles 2, *c.* 1 mm, lanceolate, membranous. Corolla 5–9 mm, pinkish-white, often marked with pinkish-purple, hairy inside. Fruit *c.* 3 mm, densely glandular-pubescent. $2n=32$. *Woods, heaths and mossy tundra. N. Europe, extending locally southwards, mainly in the mountains, to the Alps, E. Carpathians and S. Ural.* Au Br Cz Da Fe Ga Ge He Ho It Ju No Po Rm Rs (N, B, C, W) Su.

5. Leycesteria Wall.[1]

Shrubs. Leaves simple, deciduous, stipulate or exstipulate. Flowers verticillate in the axils of large bracts in pendent, terminal inflorescences. Calyx unequally 5-lobed. Corolla infundibuliform, regularly 5-lobed. Stamens 5. Style slender; stigma capitate. Ovary 5(–8)-locular. Fruit a many-seeded berry.

[1] By D. M. Moore. [2] Edit. S. M. Walters. [3] By I. K. Ferguson.

[1] By I. K. Ferguson

1. L. formosa Wall. in Roxb., *Fl. Indica* **2**: 182 (1824). Stems up to 2 m, hollow, glabrous and pruinose when young. Leaves 5–15(–18) × 2·5–7·3 cm, broadly ovate to ovate-lanceolate, acuminate, entire or serrate; petiole 5–15 mm. Flowers sessile; bracts 15–35 mm, purplish. Corolla 15–20 mm, white or lilac. Fruit *c.* 10 mm in diameter, subglobose, glandular-pubescent, reddish-purple. *Cultivated in W. Europe and locally naturalized.* [Az Br Ga Hb.] (*India, S.W. China.*)

6. Lonicera L.[1]

Deciduous (rarely evergreen) shrubs or woody climbers. Leaves entire, exstipulate. Flowers in axillary pairs, terminal heads or whorls. Bracts usually present. Bracteoles free or connate, rarely absent. Calyx 5-lobed. Corolla 5-lobed, actinomorphic or 2-lipped with a 4-lobed upper lip; tube sometimes gibbous. Stamens 5. Stigma capitate. Ovary 2- to 3 (to 5)-locular, the walls of the ovaries of paired flowers sometimes united. Fruit a few-seeded berry.

Some species and hybrids are widely cultivated for ornament.

Literature: A. Rehder, *Ann. Rep. Missouri Bot. Gard.* **14**: 27–232 (1903).

1 Woody climbers
2 Flowers in axillary pairs
3 Mature leaves densely pubescent beneath; corolla-tube longer than limb **11. biflora**
3 Mature leaves glabrous or slightly pubescent beneath; corolla-tube not longer than limb **12. japonica**
2 Flowers in heads or whorls
4 Leaves below the inflorescence free **17. periclymenum**
4 At least the first pair of leaves below the inflorescence connate
5 Flower-heads pedunculate **16. etrusca**
5 Heads or whorls of flowers sessile
6 Leaves elliptical, deciduous **15. caprifolium**
6 Leaves ovate to oblong, evergreen
7 Corolla-tube 3–4 times as long as limb; style ±sericeous **13. implexa**
7 Corolla-tube about twice as long as limb; style glabrous **14. splendida**
1 Erect shrubs
8 Corolla actinomorphic or nearly so
9 More or less hairy; bracteoles connate **1. caerulea**
9 Glabrous; bracteoles free **2. pyrenaica**
8 Corolla 2-lipped
10 Bracts shorter than ovary; berries bluish-black **6. nigra**
10 Bracts at least as long as ovary; berries red or yellowish
11 Twigs and leaves glabrous or subglabrous
12 Leaves cuneate or rounded at base; twigs with solid pith **3. alpigena**
12 Leaves truncate or cordate at base; twigs with hollow pith **7. tatarica**
11 Twigs and leaves pubescent at least on lower surface
13 Peduncles very short or absent
14 Bracts longer than ovary; corolla-tube slightly gibbous **9. arborea**
14 Bracts shorter than ovary; corolla-tube not gibbous
14 Bracts shorter than ovary; corolla-tube not gibbous **10. nummulariifolia**
13 Peduncles 10–20 mm
15 Peduncles puberulent, eglandular **8. xylosteum**
15 Peduncles densely glandular-hairy
16 Leaves glandular-pubescent on both surfaces; ovaries and berries of paired flowers connate **4. glutinosa**
16 Leaves subglabrous above, eglandular-velutinous beneath; ovaries and berries of paired flowers free or almost so **5. hellenica**

[1] By K. Browicz.

Sect. LONICERA. Erect deciduous shrubs. Flowers in axillary pairs. Corolla actinomorphic or 2-lipped; tube short.

1. L. caerulea L., *Sp. Pl.* 174 (1753). Up to 2 m, glabrous or more or less hairy. Twigs with solid pith. Bark on the older branches yellowish-brown to reddish, flaking. Leaves 2·5–7 × 1·2–3 cm, usually elliptical, sometimes obovate, ovate or oblong, acute or subacute. Peduncle 7–11 mm. Corolla 12–16 mm, yellowish-white, infundibuliform, with a gibbous, pubescent tube. Bracts linear, longer than the bracteoles; bracteoles connate in a tubular cupule enclosing the ovaries, later developing and forming, with the paired ovaries, a succulent, dark blue, compound fruit. *N.E. Europe; also from the Pyrenees to Bulgaria & S.W. Czechoslovakia, mainly in the mountains.* Al Au Bu Cz Fe Ga Ge He Hs It Ju Rm Rs (N, B, C, W) Su [No].

Very variable in hairiness of twigs, leaves and corolla.

(a) Subsp. **caerulea**: Twigs glabrous or sparsely hairy. Leaves glabrous or slightly hairy beneath, mostly along midrib. Corolla-tube wide, about twice as long as the limb. $2n=18$. *Throughout the range of the species, but rare in the north-east.*

(b) Subsp. **pallasii** (Ledeb.) Browicz, *Bot. Jour. Linn. Soc.* **68**: 278 (1974) (*L. pallasii* Ledeb., *L. baltica* Pojark.): Twigs with a more or less dense, short tomentum, and with scattered long hairs up to 2 mm. Leaves more or less hairy on both surfaces, glabrescent above. Corolla-tube narrow, 2–3 times as long as limb. *N.E. Europe; a few stations in the Alps.*

L. altaica Pallas, *Fl. Ross.* **1(1)**: 58 (1784), recorded from N. & E. Russia, is probably only a variant of subsp. (a), differing in the narrower and longer corolla-tube and ellipsoid fruits.

2. L. pyrenaica L., *Sp. Pl.* 174 (1753). Up to 1 m, glabrous. Twigs with solid pith. Leaves 1·5–4 × 0·8–2 cm, somewhat coriaceous, narrowly obovate or oblanceolate, acute or acuminate, decurrent, bluish-green. Peduncle 10–20 mm. Bracts lanceolate, longer than ovary. Bracteoles ovate, free, much shorter than ovary. Corolla 12–20 mm, white, often tinged with red, infundibuliform-campanulate; tube scarcely gibbous, much longer than the limb, glabrous. Berries free, almost globose, red. *Limestone rocks. Pyrenees, mountains of N.E. Spain, Islas Baleares.* Bl Ga Hs.

(a) Subsp. **pyrenaica**: Leaves less than 3·5 × 1·5 cm. Corolla less than 15 mm. *Pyrenees and mountains of N.E. Spain.*

(b) Subsp. **majoricensis** (Gand.) Browicz, *Bot. Jour. Linn. Soc.* **68**: 279 (1974) (*L. majoricensis* Gand.): Leaves 3·5–4 × 1·5–2 cm. Corolla 15–20 mm. ● *Islas Baleares.*

3. L. alpigena L., *Sp. Pl.* 174 (1753). Up to 3 m, usually glabrous. Twigs with solid pith. Leaves 4–11 × 2–5·5 cm, oblong-obovate to elliptical, acute to long-acuminate, ciliate when young. Peduncle (20–)25–35(–50) mm. Bracts linear, usually longer than ovary. Bracteoles ovate, very small. Corolla 1·2–2 cm, 2-lipped, yellowish or greenish-yellow, tinged with reddish-brown; tube strongly gibbous, shorter than limb, glabrous or slightly glandular. Berries *c.* 10 mm, globose to ovoid, scarlet. *Usually calcicole.* ● *Mountains of S. & S.C. Europe.* Al Au Cz Ga Ge Gr He Hs It Ju Rm.

(a) Subsp. **alpigena**: Ovaries and berries connate. $2n=18$. *Throughout the range of the species except the S. part of Balkan peninsula.*

(b) Subsp. **formanekiana** (Halácsy) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 480 (1930): Ovaries and berries free or only slightly connate at the base. *Balkan peninsula.*

4. L. glutinosa Vis., *Fl. Dalm.* **3**: 18 (1852). Up to 2 m. Young twigs glandular-pubescent or glandular-puberulent; pith solid. Leaves 2·5–5·5 × 1·5–3·5 cm, elliptical to ovate, acute to acuminate, glandular-pubescent. Peduncle 12–16 mm. Bracts linear, longer than ovary. Bracteoles ovate, very small. Corolla 1–1·5 cm, 2-lipped, yellowish tinged with red; tube very short. Berries red, connate. *Rocky places.* ● *Mountains of W. Jugoslavia.* Ju.

5. L. hellenica Orph. ex Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 108 (1856). Like **4** but twigs and lower surface of leaves velutinous; upper surface of leaves almost glabrous; ovaries and berries free or almost free. ● *S. Greece and Aegean region.* Gr ?Tu.

6. L. nigra L., *Sp. Pl.* 173 (1753). Up to 2 m. Young twigs glabrous or puberulent; pith solid. Leaves 2–7 × 1–3 cm, narrowly elliptical to oblong-obovate, acute or subacute, bright green above, bluish-green and glabrous or villous along the veins beneath. Peduncle 15–40 mm. Bracts ovate-lanceolate, shorter than the ovary. Bracteoles connate, shorter than the ovary. Corolla 0·6–1 cm, 2-lipped, pale pink; tube distinctly gibbous, pubescent, equalling or a little longer than limb. Ovaries connate only at base. Berries black, bluish-pruinose. $2n=18$. ● *Mountains of S. & C. Europe, from the Pyrenees to the Carpathians and Bulgaria.* Au Bu Cz Ga Ge Gr He Hs Hu It Ju Po Rm Rs (W).

7. L. tatarica L., *Sp. Pl.* 173 (1753). Up to 3 m, glabrous. Twigs with hollow pith. Leaves 2·5–8 × 1·7–4·5 cm, ovate or ovate-lanceolate, acute or subacute (sometimes acuminate), truncate or cordate at base, usually glabrous, but sometimes with scattered hairs along the midrib beneath. Peduncle 15–30 mm. Bracts longer than ovary. Bracteoles ½–½ as long as ovary, ovate-elliptical. Corolla 1·5–2 cm, 2-lipped, white to red. Ovaries free. Berries globose, red, orange or yellow. *S.C. Russia, from c.* 42° *E. eastwards.* Rs (C, E) [Au Cz Ga Ge Ho Hs Hu Rm Rs (W, K)]. (*W. & C. Asia.*)

8. L. xylosteum L., *Sp. Pl.* 174 (1753). Up to 3 m. Young twigs grey-pubescent or almost glabrous; pith hollow. Leaves 3–7 × (1·5–)2–5 cm, broadly elliptic-ovate to suborbicular, sometimes narrowly elliptical or obovate, acute or subacute, sparingly pubescent above, usually distinctly pubescent beneath. Petiole 4–10 mm. Peduncle 12–20 mm. Bracts lanceolate, about as long as ovary. Bracteoles ovate, shorter than ovary. Corolla 0·8–1·2 cm, 2-lipped, yellowish-white; tube equalling or shorter than the limb, pubescent. Ovaries free, glandular. Berries globose, red. $2n=18$. *Woods. Europe except the extreme north, parts of the extreme south and the islands.* Al Au Be *Br Bu Cz Da Fe Ga Ge Gr He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, E) Si Su.

9. L. arborea Boiss., *Biblioth. Univ. Genève* ser. 2, **13**: 409 (1838). Erect shrub or small tree up to 9m. Young twigs reddish-violet, puberulent, the older whitish, with fibrous bark; pith hollow. Leaves (2–)2·5–4 × 1·2–2·5 cm, ovate or broadly ovate, rarely elliptical, obtuse or acute and shortly mucronulate, glabrous above, grey-pubescent beneath. Petiole 2–3 mm. Peduncle almost absent. Bracts subulate, longer than ovary. Bracteoles ovate, ½–½ as long as ovary. Corolla 1–2 cm, 2-lipped, pink; tube slightly gibbous, strigose, half as long as limb. Berries yellowish. *S. Spain.* Hs. (*N.W. Africa.*)

10. L. nummulariifolia Jaub. & Spach, *Ill. Pl. Or.* **1**: 133 (1843). Like **9** but leaves ovate to suborbicular, often pubescent or puberulent above; bracts shorter than ovary; corolla-tube not gibbous. *Rocky places in the mountains. S. Greece, Kriti.* Cr Gr. (*S.W. Asia.*)

Sect. NINTOOA (Spach) Maxim. Woody climbers. Flowers in axillary pairs. Corolla 2-lipped; tube long.

11. L. biflora Desf., *Fl. Atl.* **1**: 184 (1798) (*L. canescens* Schousboe). Deciduous. Twigs whitish-velutinous. Leaves 2·5–5(–6) × 1·8–3·5(–4·5) cm, ovate to ovate-elliptical, subobtuse, dark green and glabrous above, greyish-green and densely pubescent beneath. Peduncle 5–10 mm. Flowers in axillary pairs, crowded at ends of twigs. Bracts and bracteoles ovate, much shorter than ovary. Corolla 3–4 cm, yellowish; tube narrow, much longer than limb, grey-puberulent. Berries black. *S.E. Spain.* Hs [Si]. (*N.W. Africa.*)

12. L. japonica Thunb., *Fl. Jap.* 89 (1784). Semi-evergreen. Twigs hirsute. Leaves 4–8 × 2–4 cm, ovate to oblong-ovate, acute, rounded or subcordate at base, pubescent when young, later glabrous, ciliate. Peduncle 5–10 mm. Bracts leaf-like. Bracteoles very small. Corolla 3–5 cm, white tinged with purple; tube narrow, almost as long as limb, glandular-pubescent. Berries black. $2n=18$. *Cultivated for ornament and locally naturalized.* [Az Br Ga Ge He Hs It.] (*E. Asia.*)

Sect. CAPRIFOLIUM (Miller) DC. Woody climbers. Flowers in terminal heads or whorls. Corolla 2-lipped; tube long.

13. L. implexa Aiton, *Hort. Kew.* **1**: 231 (1789). Evergreen, much branched. Twigs glabrous, glaucous. Leaves 2–8 × (0·5–)2–4 cm, ovate to oblong, obtuse or subacute and mucronulate at apex, usually auriculate at base, sessile or connate on the upper part of the twigs, dark green and shining above, glaucous beneath, usually glabrous. Inflorescence sessile, with 2–6(–9) flowers. Corolla (1·8–)2·5–4·5 cm, whitish-yellow often tinged with red; tube 3–4 times as long as limb, glandular-puberulent outside and usually pubescent within. Style more or less sericeous. Berries red. *Mediterranean region, C. & S. Portugal.* Al Bl Co Ga Gr Hs It Ju Lu Sa Si.

Very variable in the shape and degree of fusion of the upper leaves.

14. L. splendida Boiss., *Elenchus* 54 (1838). Like **13** but corolla more glandular; tube about twice as long as limb; style glabrous; inflorescence with up to 30 flowers. ● *Mountains of S. Spain.* Hs.

15. L. caprifolium L., *Sp. Pl.* 173 (1753). Deciduous. Leaves and twigs subglabrous. Leaves 3–10 × 2–5 cm, elliptical to broadly elliptical, obtuse, rarely acute, dark green above, glaucous beneath, sessile or shortly petiolate, those of the upper pairs below the sessile inflorescence connate to form elliptical or orbicular discs. Corolla 3–5 cm, white or yellowish, sometimes tinged with purple; tube about 1½ times as long as limb, glabrous or sparsely hairy. Berries red or orange-red. $2n=18$. *E.C. & S. Europe westwards to Italy; widely naturalized from gardens elsewhere.* Al Au Cz ?Gr Hu It Ju Rm Tu [Be Br Ga Ge He Hs No Po Rs (K) Su].

16. L. etrusca G. Santi, *Viaggio Montam.* 113 (1795). Deciduous. Leaves 3–8 × 1·5–5 cm, broadly elliptical or obovate, obtuse or subacute at apex, glaucous or whitish-green and usually puberulent beneath, those of the upper pair connate, of the next sessile or shortly petiolate. Inflorescences solitary or 2–3 together at ends of branches. Peduncle (10–)30–50(–55) mm. Corolla 3·5–4·5 cm, yellowish-white, often tinged with purple; tube *c.* 1½ times as long as limb, narrow. Berries red. *S. Europe.* Al Bu Co Cr Ga Gr He Hs It Ju Lu Sa Si Tu [Rs (K)].

L. stabiana Guss. ex C. A. Pasquale, *Rendic. Reale Accad. Sci. (Napoli)* **14**: 142 (1875), described from S. Italy, differs in its evergreen leaves, shortly pedunculate inflorescences and yellow berries. It has been treated as a variety of both **15** and **16** but may be a hybrid of one of these species with **14**.

17. L. periclymenum L., *Sp. Pl.* 173 (1753). Deciduous. Glabrous or somewhat pubescent or glandular-pubescent. Leaves 3–9 × 1·5–5 cm, oblong to elliptical, acute or obtuse, dark green above, glaucous-green beneath, sometimes sinuate-dentate, never connate. Inflorescence a terminal head. Peduncles 25–40(–90) mm. Corolla 3·5–5·5 cm, creamy-white to yellow, often tinged with red; tube longer than limb, usually glandular-pubescent. Berries red. *W., C. & S. Europe, extending north-eastwards to S. Sweden.* Al Au Be Br Co Da Ga Ge Gr Hb He Ho Hs It Ju Lu No Po Su [Cz].

(a) Subsp. **periclymenum**: Leaves usually subacute, glabrous or slightly pubescent beneath, the upper pair usually sessile. $2n=18$, 36, 54. *Throughout the range of the species except S. Spain and S. Portugal.*

(b) Subsp. **hispanica** (Boiss. & Reuter) Nyman, *Consp.* 322 (1879) (*L. hispanica* Boiss. & Reuter, *L. periclymenum* var. *glaucohirta* G. Kunze): Leaves acute, more glaucous beneath, pubescent on both surfaces especially when young, the upper pair petiolate. *C. & S. Spain, S. Portugal.* (*N.W. Africa.*)

CLXV. ADOXACEAE[2]

Herbs. Inflorescence capitate, with one terminal and four lateral flowers. Calyx and corolla lobed; stamens epipetalous, inserted outside a nectariferous disk, and with filaments divided to the base, each half bearing a monothecous anther. Ovary 2- to 5-celled, semi-inferior; styles 4 or 5; ovules solitary in each loculus, anatropous. Fruit a small drupe; seed endospermic.

A monotypic family.

1. Adoxa L.[1]

Rhizomatous perennials with ternate, exstipulate leaves. Calyx and corolla pale green.

1. A. moschatellina L., *Sp. Pl.* 367 (1753). Delicate, glabrous plant with scaly, somewhat swollen rhizome, long slender stolons and simple, erect flowering stems 5–10 cm. Basal leaves usually 2-ternate with more or less lobed segments; cauline leaves 2, opposite, shortly petiolate, ternate, with a 3-lobed terminal leaflet. Inflorescence 6–8 mm in diameter; terminal flower with 2-lobed calyx and 4 stamens; lateral flowers with 3-lobed calyx and 5 stamens. Fruit *c.* 5 mm, globose, greenish. $2n=36$. *Woods and shady places. Most of Europe, southwards to S. France, S. Italy and Bulgaria; only on mountains in the south.* Al Au Be Br Bu Co Cz Da Fe Ga Ge *Hb He Ho ?Hs Hu It Ju No Po Rm Rs (N, B, C, W, E) Su.

CLXVI. VALERIANACEAE[2]

Annual to perennial herbs, sometimes woody at the base. Leaves opposite, whorled or basal, exstipulate. Flowers in bracteate, often dense cymes, hermaphrodite or unisexual, usually zygomorphic. Calyx variously developed, usually toothed. Corolla infundibuliform, the tube sometimes saccate or spurred below, the limb with (3–)5 more or less unequal lobes. Stamens 1–4, usually inserted near base of corolla-tube, alternating with the corolla-lobes. Ovary inferior, 3-locular, one loculus with 1 pendent ovule, the other two sterile, sometimes very small. Fruit dry, indehiscent, usually with a persistent, often accrescent calyx; seed endospermic, with straight embryo.

In descriptions, the term 'partial inflorescences' denotes the ultimate discrete portions of the whole inflorescence.

1 Corolla-tube spurred near the base or prominently gibbous near the middle; stamen 1 **5. Centranthus**
1 Corolla-tube not spurred, not or obscurely gibbous; stamens 2–4
2 Dichotomously branched annual
2 Dichotomously branched annual
3 Stamens 3, free; corolla-tube not more than twice as long as limb **2. Valerianella**
3 Stamens 2, or 3 of which 2 are connate; corolla-tube more than twice as long as limb **3. Fedia**
2 Perennial, not dichotomously branched
4 Calyx-teeth plumose in fruit; stamens 3 **4. Valeriana**
4 Calyx-teeth not plumose in fruit; stamens 4 **1. Patrinia**

[1] By S. M. Walters.
[2] Edit. S. M. Walters.
[3] By A. O. Chater.
[4] By D. Ernet and I. B. K. Richardson.

1. Patrinia Juss.[3]

Rhizomatous perennial herbs with erect, usually unbranched flowering stems. Flowers hermaphrodite, in corymbs or capitula in a terminal, dichasial inflorescence. Calyx very small, not accrescent, with ovate, obtuse teeth. Corolla with 5 subequal lobes; tube infundibuliform, obscurely gibbous near the base. Stamens 4. Stigma subentire. Sterile loculi of fruit much reduced.

1. P. sibirica (L.) Juss., *Ann. Mus. Hist. Nat. (Paris)* **10**: 312 (1807). Stems 10–35 cm, simple, with 2 lines of hairs, without or with one pair of cauline leaves. Basal leaves 3–10 cm, oblong-obovate to -lanceolate, subentire to pinnatisect with linear-lanceolate lobes, petiolate; cauline pinnatifid to pinnatisect. Inflorescence subcorymbose. Calyx-teeth *c.* 1 mm. Corolla *c.* 6 mm, yellow. Fruit 3–4 mm, with a persistent, accrescent, reddish, ovate bracteole 6–7 mm. *Rocks and bare mountain slopes. S. Ural from* 52° 30′ *to* 54° 45′ *N.* Rs (C). (*Temperate Asia.*)

2. Valerianella Miller[4]

Erect, dichotomously branched annuals. Flowers hermaphrodite, in terminal partial inflorescences (clusters) and sometimes also solitary in the dichotomies of the inflorescence. Calyx variously developed, with up to 6(–30) teeth, sometimes absent. Corolla small, with 5 slightly unequal lobes, bluish or pinkish; tube infundibuliform, not more than twice as long as limb, slightly gibbous. Stamens 3. Stigma 3-fid. Sterile loculi of fruit variously developed.

Measurements and characters of fruits exclude the calyx. Most species are rather similar vegetatively and the dimensions of the vegetative parts vary very much according to habitat.

All species grow on disturbed ground or in other dry, open habitats, many of them principally as weeds of cultivated ground. It is impossible to determine the northern limit of native distribution of many species, and no attempt has been made here to distinguish native from naturalized status. Several species are becoming rarer than formerly in N. & N.C. Europe.

Literature: M. J. E. Coode, *Notes Roy. Bot. Gard. Edinb.* **27**: 219–256 (1967). T. O. B. N. Krok, *Kungl. Svenska Vet.-Akad. Handl.* nov. ser., **5(1)**: 1–105 (1864). F. Weberling in G. Hegi, *Illustrierte Flora von Mitteleuropa* ed. 2, **6(2)**: 111–131. München. 1970. (Coode and Weberling both have useful illustrations of fruits.)

1 All bracts broadly lanceolate, ovate or cordate, acute or acuminate, with wide scarious margins, mostly with long, dense cilia
2 Calyx inflated, depressed-ovoid, contracted at mouth **9. vesicaria**
2 Calyx not inflated, not contracted at mouth
3 Calyx with long, filiform, ciliate teeth **5. hirsutissima**
3 Calyx not with long, filiform, ciliate teeth
4 Fruit hemispherical, obtusely 3-angled; fertile loculus *c.* ½ as wide as the combined width of the sterile loculi **4. pumila**
4 Fruit not hemispherical, obtusely 4-angled; fertile loculus about as wide as or wider than the combined width of the sterile loculi
5 Fruit oblong-ovoid, 1½–2 times as long as wide; sterile loculi not more than half as large as the fertile **(1–3). coronata** group
5 Fruit not oblong-ovoid, about as long as wide; sterile loculi about as large as the fertile
6 Calyx *c.* ½ as long as fruit; base of fruit obtuse **6. kotschyi**
6 Calyx at least as long as fruit; base of fruit more or less acute
7 Calyx about twice as long as fruit, each tooth usually with 3 uncinate spines **8. obtusiloba**
7 Calyx about as long as fruit, each tooth with only 1 uncinate spine **7. discoidea**
1 At least the lower bracts oblong to linear-spathulate, obtuse to subacute, with scarious margins narrow or absent, without or with usually short, sparse cilia.
8 Calyx absent or reduced to minute teeth or a narrow rim; fruit sometimes with horns at apex
9 Fruit with 1–3 stout horns at apex
10 Fruit with a single horn above the fertile loculus; internodes not or scarcely inflated in fruit **11. martinii**
10 Fruit with 3 horns, or with a single horn above one of the sterile loculi; internodes ± strongly inflated in fruit **15. echinata**
9 Fruit without horns
11 Fertile loculus with a thickened, spongy outer wall as thick as the cavity of the loculus
12 Pericarp with ± large, pellucid papillae, usually with prominent ribs on the sterile loculi **14. costata**
12 Pericarp smooth or transversely rugose, usually without prominent ribs **10. locusta**
11 Fertile loculus without a thickened, spongy outer wall
13 Sterile loculi reduced to slender ribs **(18–19). eriocarpa** group
13 Sterile loculi well-developed, often at least as large as the fertile
14 Fruit longer than wide, with an oblong groove between the sterile loculi **12. carinata**
14 Fruit as wide as long, with an ovate-orbicular flat area between the sterile loculi **13. turgida**
8 Calyx well-developed
15 Calyx divided almost to the base into rigid, narrowly triangular, recurved uncinate teeth **22. uncinata**
15 Calyx entire or with short, straight teeth
16 Sterile loculi reduced to slender ribs, separated by an ovate flat area
17 Calyx more than ¾ as long as, and as wide as fruit **(18–19). eriocarpa** group
17 Calyx less than ¾ as long as, and much narrower than fruit **16. dentata**
16 Sterile loculi well-developed, ± contiguous
18 Calyx obliquely truncate, entire or obscurely dentate; sterile loculi larger or only slightly smaller than the fertile **17. rimosa**
18 Calyx shortly 2-lipped; sterile loculi not more than half as large as the fertile
19 Fruit oblong-ovoid, 4-angled **21. pontica**
19 Fruit ovoid-globose, 3-angled **20. puberula**

(1–3). V. coronata group. Up to 30(–40) cm. Lower cauline leaves narrowly spathulate to ovate, obtuse, entire to sinuate-dentate; middle cauline spathulate-lanceolate, coarsely toothed; upper cauline linear-lanceolate, pinnatisect at base. Bracts ovate, scarious, setose. Fruits narrowly ovoid to oblong, 4-angled, more or less densely villous; sterile loculi smaller than the fertile, extending to base of fruit, separated by an ovate, flat area; calyx campanulate or coroniform, reticulately veined, glabrous, with distinct teeth, or reduced to an irregularly toothed rim.

A polymorphic group in which at least 3 species seem to be separable, but further investigation is required.

1 Sterile loculi reduced to slender ribs **3. lasiocarpa**
1 Sterile loculi well-developed
2 Fruit *c.* 2·5 mm; calyx-teeth with an uncinate arista **1. coronata**
2 Fruit *c.* 1·5 mm; calyx-teeth with a ± uncinate mucro **2. divaricata**

1. V. coronata (L.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 241 (1805). Fruits *c.* 2·5 mm, all in dense, globose, terminal clusters which fall as a whole; sterile loculi well developed. Calyx campanulate, at least as long as fruit, divided to less than halfway into 6 triangular-acuminate teeth, each with an uncinate arista at the apex. $2n=14$. *Europe, southwards from C. France, S.E. Czechoslovakia and N. Ukraine; an occasional casual elsewhere.* Al Bl Bu Co Cr Cz Ga Gr Hs Hu It Ju Lu Rm Rs (C, W, K) Sa Si Tu.

2. V. divaricata Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1861**: 61(1861). Fruits *c.* 1·5 mm, all in more or less dense, hemispherical, terminal clusters but falling separately; sterile loculi well developed. Calyx coroniform, shorter than the fruit, divided to about the middle into 6 shortly triangular teeth, each with a more or less uncinate mucro at the apex. ● *S.E. Spain.* Hs.

Variants with the calyx divided to more than halfway into triangular-acuminate teeth, each with an uncinate arista at the apex (var. *hispanica* Krok), are of uncertain status.

3. V. lasiocarpa (Steven) Betcke, *Animadv. Bot. Valer.* 26 (1826). Like 2 but fruits *c.* 1·7 mm, sometimes also solitary in the uppermost dichotomies; sterile loculi reduced to more or less slender ribs. Calyx usually reduced to an irregularly 3- to 5-toothed rim, or sometimes coroniform and more or less regularly divided to about the middle into 6 triangular-acuminate teeth. *Romania and S.W. part of U.S.S.R.* ?Bu Rm Rs (W, K).

4. V. pumila (L.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 242 (1805) (*V. tridentata* (Steven) Betcke). Up to 40 cm. Lower

cauline leaves narrowly spathulate to ovate, obtuse, entire to sinuate-dentate; middle cauline spathulate-lanceolate, usually coarsely toothed; upper cauline linear-lanceolate, pinnatisect at base. Bracts more or less narrowly ovate, scarious, setose. Fruits *c.* 3 mm, in more or less dense, hemispherical, terminal clusters and often also solitary in the dichotomies immediately below them, falling separately, hemispherical, obtusely 3-angled and the side with the sterile loculi flattened, usually glabrous, rarely villous; sterile loculi much larger than the fertile, extending to base of fruit, separated by an elliptical to ovate area, or an irregular groove. Calyx usually reduced to an indistinct, narrow rim, sometimes shortly cupuliform, irregularly 4- to 6-toothed, sometimes coroniform, shorter than or as long as the fruit, divided to about the middle into 6 triangular-acuminate teeth, each with an uncinate mucro or arista at the apex. $2n=14$. *S. Europe, extending northwards to Hungary.* Bu Co Ga Gr Hs Hu It Ju Lu Rm Rs (W, K) Si Tu.

Variable especially in the development of the calyx. Plants from various parts of Europe with the calyx shorter than the fruit and divided into 6 equal teeth, each tooth with an uncinate mucro at the apex, have been called **V. brachystephana** (Ten.) Bertol., *Fl. Ital.* **1**: 193 (1833) (*Fedia brachystephana* Ten.); plants from S. Italy (prov. Potenza) with the calyx shorter than the fruit and divided into 5 unequal teeth, each with a mucro at the apex, have been called **V. laticuspis** Bertol., *Fl. Ital.* **1**: 856 (1834); plants from E. France (Hautes-Alpes) with a very short cupuliform calyx divided into 4–6 unequal teeth have been called **V. cupulifera** Le Grand, *Bull. Soc. Bot. Fr.* **44**: 219 (1897); the status of these 3 taxa is obscure.

5. V. hirsutissima Link, *Linnaea* **9**: 580 (1835). Up to 15 cm. Lower cauline leaves narrowly spathulate to ovate, obtuse, entire to sinuate-dentate; middle spathulate-lanceolate, coarsely toothed; upper linear-lanceolate, pinnatisect at base. Bracts broadly ovate, scarious, ciliate. Fruits *c.* 3 mm, all in dense, globose, terminal clusters which fall as a whole, broadly ovoid, 4-angled, lanate; sterile loculi reduced to slender ribs extending to base of fruit, separated by an ovate, flat area. Calyx longer than fruit, hairy inside, divided almost to the base into 12–27 filiform, ciliate, uncinate teeth, united at the base by a broad, reticulately veined, hairy membrane. *E. Greece, Kriti; Turkey-in-Europe.* Cr Gr Tu.

6. V. kotschyi Boiss., *Diagn. Pl. Or. Nov.* **1(3)**: 60 (1843). Like **5** but bracts ovate; fruits all in more or less dense, hemispherical clusters, some of which fall as a whole, densely villous; sterile loculi about as large as the fertile, separated by an oblong groove; calyx about half as long as fruit, glabrous inside, coroniform, reticulately veined, divided to about the middle into 6 broadly triangular, indistinctly uncinate teeth. *S. Ukraine; S. Bulgaria.* Bu Rs (W, K). (*S.W. & S.C. Asia.*)

7. V. discoidea (L.) Loisel., *Not. Pl. Fr.* 148 (1810). Up to 30 cm. Lower cauline leaves narrowly spathulate to ovate, obtuse, entire to sinuate-dentate; middle cauline spathulate-lanceolate, coarsely toothed; upper linear-lanceolate, pinnatisect at base. Bracts ovate, scarious, ciliate. Fruits *c.* 2 mm, all in dense, globose, terminal clusters which fall as a whole, obconical to obpyramidal, obtusely 4-angled, densely villous; sterile loculi about as large as the fertile, not extending to base of fruit, separated by an oblong groove. Calyx somewhat longer than fruit, coroniform, reticulately veined, glabrous outside, usually densely hairy inside, divided to about the middle or almost to the base into 8–15 unequal, ovate-triangular teeth, each with an uncinate arista at the apex; rarely calyx with 6 subequal teeth. $2n=14$. *Mediterranean region, C. & S. Portugal.* Bl Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

Variable especially in the number of calyx-teeth and in the hairiness of the inside of the calyx at the base. Plants from N.E. Spain (Ebro valley) with the calyx glabrous inside at the base, divided to the base into 12–16 narrowly ovate to triangular-acuminate teeth have been called **V. multidentata** Loscos & Pardo, *Ser. Pl. Arag.* 49 (1863) (*V. coronata* subsp. *multidentata* (Loscos & Pardo) Nyman); their status is obscure.

V. platiloba Dufresne, *Hist. Nat. Méd. Fam. Valér.* 59 (1811), based on a single collection probably from Portugal, is like **7** but has only 6 transversely ovate, acuminate calyx-teeth, each with a more or less uncinate mucro; further information is required.

8. V. obtusiloba Boiss., *Diagn. Pl. Or. Nov.* **1(3)**: 59 (1843). Up to 20(–30) cm. Leaves ovate to lanceolate, entire to dentate, the uppermost more or less pinnatisect at the base. Bracts broadly ovate, scarious, ciliate. Fruits *c.* 2·5 mm, all in dense, globose, terminal clusters, broadly obconical to obpyramidal, obtusely 4-angled, densely lanate; sterile loculi about as large as the fertile. Calyx about twice as long as fruit, coroniform, reticulately veined, hairy on both surfaces at the base, divided to the middle into 6 more or less equal, broadly ovate teeth, each with usually 3 or more uncinate spines. *S. Greece, Aegean region.* Cr Gr.

9. V. vesicaria (L.) Moench, *Meth.* 493 (1794). Like **8** but calyx inflated, depressed-ovoid, contracted at mouth, reticulately veined, glabrous or sometimes sparsely hairy outside, the margin of the circular apical aperture with 6 equal teeth. *C. & E. Mediterranean region.* Cr Gr It Sa Si Tu.

10. V. locusta (L.) Laterrade, *Fl. Bordel.* ed. 2, 93 (1821) (*V. olitoria* (L.) Pollich). Up to 40 cm. Lower cauline leaves broadly spathulate to ovate, obtuse, entire to sinuate; middle and upper ovate-spathulate to lanceolate, entire to remotely sinuate-dentate. Bracts oblong-spathulate, obtuse, green, with scarious auricles. Fruits 1·5–2·5 mm, in dense, hemispherical, terminal clusters and usually also solitary in the lower dichotomies, falling separately, lenticular, as wide as or wider than long, glabrous to minutely puberulent; fertile loculus with a thickened, spongy outer wall as thick as the cavity of the loculus; sterile loculi as large as the fertile, separated by a shallow, longitudinal groove; pericarp smooth or transversely rugose. Calyx reduced to a minute tooth above each loculus. $2n=16$. *Most of Europe, but rarer in the north.* All except Az Bl ?Cr Fa Is Rs (N) Sb.

Variable mainly in size and shape of fruit and thickening of pericarp. Plants from Portugal with ovoid-oblong, less strongly flattened achenes and the pericarp with spongy thickening forming 8 more or less prominent ribs have been called **V. lusitanica** Pau ex Font Quer, *Trab. Mus. Ci. Nat. Barcelona (Sér. Bot.)* **5**: 39 (1924); their status is uncertain.

Larger plants with obtusely 3-angled fruit *c.* 4 mm and with prominent spongy thickening on the sterile loculi (var. *oleracea* (Schlecht.) Breistr.), as well as normal forms of the species, are cultivated for salad in various parts of Europe.

11. V. martinii Loscos, *Trat. Pl. Arag.* **1**: 23 (1876). Like **10** but fruits *c.* 4 mm, sometimes falling in clusters, glabrous, with a long horn at the apex above the fertile loculus. ● *E. Spain (prov. Teruel).* Hs.

12. V. carinata Loisel., *Not. Pl. Fr.* 149 (1810). Like **10** but fruits narrowly oblong-ovoid, obtusely 4-angled; fertile loculus without a thickened outer wall; sterile loculi usually smaller than the fertile, separated by an oblong, scarious groove; calyx reduced to an indistinct tooth above the fertile loculus. $2n=16$. *S., W. & C. Europe, extending north-eastwards to N. Ukraine.* Al Au Be Bl Br Bu Co ?Cr Cz Ga Ge Gr Hb He Ho Hs Hu It Ju Lu Po Rm Rs (C, W, K, E) Sa Si Tu.

13. V. turgida (Steven) Betcke, *Animadv. Bot. Valer.* 14 (1826). Up to 25(–40) cm. Lower cauline leaves broadly spathulate to ovate, obtuse, entire to sinuate; middle and upper ovate-spathulate to lanceolate, entire to remotely sinuate-dentate. Bracts oblong-spathulate, obtuse, green, with scarious auricles. Fruits *c.* 3 mm, usually all in dense, globose, terminal clusters, hemispherical, obtusely 3-angled, as wide as long, falling separately, sparsely hairy to pubescent; sterile loculi much larger than the fertile, separated by an ovate-orbicular, flat, scarious area. Calyx reduced to an indistinct tooth above the fertile loculus. *S.E. Europe.* Bu Cr Gr It Ju Rm Rs (W, K) Tu.

14. V. costata (Steven) Betcke, *op. cit.* 11 (1826). Like **13** but fruit-bearing internodes often thickened above; fruits 1·5–3 mm, in dense, hemispherical, terminal clusters and also usually solitary in the lower dichotomies, the clusters falling as a whole, lenticular; sterile loculi larger to smaller than the fertile; pericarp with more or less large, pellucid papillae and usually with prominent ribs on the sterile loculi; calyx absent. *S.E. Europe; Sicilia; Islas Baleares.* Bl Bu ?Cr Gr Ju Rm Rs (W, K) Si.

15. V. echinata (L.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 242 (1805). Up to 30 cm. Lower cauline leaves spathulate, obtuse, entire to remotely sinuate-dentate; middle and upper spathulate-lanceolate, obtuse, distinctly sinuate-dentate, the uppermost often pinnatifid at the base. Bracts green, auriculate, with a distinctly scarious margin, the lower linear-spathulate, obtuse, the upper narrowly triangular, acute. Lower fruit-bearing internodes usually distinctly thickened. Fruits in capitate, terminal clusters and also solitary in several of the lower dichotomies, connate with the preceding thickened internodes, glabrous, often papillose; solitary fruits 8–10 mm, falling attached to the thickened internodes, narrowly oblong, flattened, with 1 long horn at the apex, their sterile loculi reduced to slender ribs; clustered fruits 4–6 mm, falling in clusters with the thickened internodes, oblong-ovoid, 3- to 4-angled, with 3 unequal horns at the apex, their sterile loculi unequal, one larger and one smaller than the fertile loculus; pericarp with spongy thickening. Calyx reduced to an indistinct tooth at the apex of each horn. $2n=16$. *S. Europe.* Al Bl Co Cr Ga Gr Hs It Ju Lu Rs (K) Si Tu.

Variable in the degree of inflation of the internodes and in the development of spongy thickening of the pericarp, particularly in the S.E. part of the range of the species. Plants with relatively little thickening of the internodes, the fruits falling separately, and little spongy tissue, have been called **V. soyeri** Buchinger ex Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 74 (1849). A detailed study of the pattern of variation is required before the taxonomy can be elucidated.

16. V. dentata (L.) Pollich, *Hist. Pl. Palat.* **1**: 30 (1776) (*V. morisonii* (Sprengel) DC.). Up to 30(–50) cm. Lower cauline leaves ovate-spathulate, obtuse, entire to sinuate; middle and upper narrowly ovate to oblong-lanceolate, obtuse, entire to dentate, the uppermost coarsely toothed to pinnatifid at the base. Bracts toothed or auriculate at the base, green, with narrow, scarious margins, the lower linear-spathulate, obtuse, the upper narrowly triangular, acute. Fruits 1–2·5 mm, in numerous, small, fasciculate, terminal clusters and also solitary in the lower dichotomies, falling separately, obpyriform, the side with sterile loculi flattened, subglabrous to densely hairy; sterile loculi reduced to ribs, separated by an ovate flat area. Calyx obliquely truncate, much shorter and narrower than the fruit, with unequal teeth, that over the fertile loculus acute. $2n=16$. *Europe, northwards to N. England and S.E. Sweden, but absent from the U.S.S.R. except the south-west; casual elsewhere.* All except Az Cr Fa Fe ?Gr Is Lu Rs (N, B) Sb.

17. V. rimosa Bast. in Desv., *Jour. Bot. Appl.* **3**: 20 (1814) (*V. auricula* DC.). Like **16** but fruits ovoid-globose, obtusely 3-angled, the sterile loculi larger than (or rarely slightly smaller than) the fertile, separated by a groove; calyx usually scarcely toothed, the tooth over the fertile loculus usually obtuse. $2n=16$. *W., C. & S. Europe, extending northwards to Denmark and eastwards to E. Ukraine.* Al Au Be Br Bu Cz Da Ga Ge Gr Hb He Ho Hs Hu It Ju Po Rm Rs (C, W, K, E) Si.

(18–19). V. eriocarpa group. Up to 35(–45) cm. Lower cauline leaves ovate-spathulate, obtuse, entire to sinuate; middle and upper narrowly ovate to lanceolate, the uppermost coarsely toothed. Bracts more or less auriculate at base, green, with narrow, scarious margins, the lower linear-spathulate, obtuse, the upper narrowly triangular, acute. Lower fruit-bearing internodes somewhat thickened above, more or less winged, the uppermost short and broadly winged. Fruits in numerous, small, fasciculate terminal clusters, some of which fall as a whole, and also solitary in the lower dichotomies, ovoid, the side with sterile loculi flattened, subglabrous to densely hairy; sterile loculi reduced to ribs, separated by an ovate flat area.

Two species can be recognized, and there is considerable variation in the size of the fruits and development of the calyx especially in S. Europe; further investigation is required.

Fruit 1·5–2 mm; calyx well-developed	**18. eriocarpa**
Fruit *c.* 1 mm; calyx reduced to a narrow rim	**19. microcarpa**

18. V. eriocarpa Desv., *Jour. Bot. Rédigé* **2**: 314 (1809). Fruits 1·5–2 mm. Calyx obliquely coroniform, almost as wide and long as fruit, with 6 usually subequal teeth. $2n=16$. *S. & W. Europe, northwards to Scotland, but native only in S. Europe.* Al Be Bl Br Bu Co Cr Ga Ge Gr He Hs It Ju ?Rm Rs (K) Sa Si Tu.

Cultivated for salad in various parts of Europe.

Plants with obliquely truncate, auriculiform-acuminate calyx without or with few, more or less distinct teeth have been called **V. muricata** (Steven ex Bieb.) J. W. Loudon in Loudon, *Hort. Brit.* ed. 4, *Suppl.* 654 (1850) (*V. ibizae* Sennen & Elias, *V. truncata* (Reichenb.) Betcke); they have $2n=16$ and their status is uncertain.

19. V. microcarpa Loisel., *Not. Fl. Fr.* 151 (1810). Fruits *c.* 1 mm. Calyx reduced to an indistinctly dentate, narrow rim. $2n=16$. *Mediterranean region, C. & S. Portugal.* Az Bl Bu Co Cr Ga Gr Hs It Lu Sa Si Tu.

20. V. puberula (Bertol. ex Guss.) DC., *Prodr.* **4**: 627 (1830). Up to 40 cm. Lower cauline leaves ovate-spathulate, obtuse, entire to sinuate; middle and upper narrowly ovate to oblong-lanceolate, entire to dentate, the uppermost coarsely dentate to pinnatifid at base. Bracts dentate or auriculate at base, green, with narrow, scarious margins, the lower linear-spathulate, obtuse, the upper narrowly triangular, acute. Fruits *c.* 1·5 mm, in numerous, small, fasciculate, terminal clusters and also solitary in the lower dichotomies, falling separately, ovoid-globose, 3-angled, densely villous; sterile loculi smaller than the fertile,

contiguous. Calyx shortly 2-lipped, the lip above the fertile loculus broadly ovate-acuminate, entire to obscurely 3-dentate, the lip above the sterile loculi about half as long, crest-like, 3-dentate. *S. Italy* (*Calabria*), *Sicilia.* It Si. (*N. Africa.*)

21. V. pontica Lipsky, *Univ. Izv.* (*Kiev*) **32(2)** (*Ind. Sem.*): 11 (1892) (*V. bulgarica* Velen.). Like **20** but fruits *c.* 2 mm, oblong-ovoid, 4-angled; calyx with lip above fertile loculus broadly ovate, obtusely 3-dentate, the lip above the sterile loculi 2- to 3-dentate. *S. Bulgaria*; *E. Krym.* Bu Rs (K).

22. V. uncinata (Bieb.) Dufresne, *Hist. Nat. Méd. Fam. Valér.* 60 (1811). Up to 50 cm. Lower cauline leaves broadly spathulate-oblanceolate, obtuse, sinuate to dentate; middle pinnatifid; upper pinnatisect. Bracts green, the lower linear-spathulate, obtuse, auriculate at base, the upper narrowly triangular, acute. Fruits 3–5 mm, in lax, hemispherical to globose, terminal clusters, some of which fall as a whole, and also solitary in the lower dichotomies, oblong to flask-shaped, obtusely 4-angled, subglabrous to hirsute, with more or less clavate hairs; sterile loculi reduced to slender ribs inflated at the base, separated by an ovate flat area. Calyx about as long as fruit, deeply divided into 6 narrowly triangular, rigid, patent, uncinate teeth, the tooth above the fertile loculus broader and sometimes 2-fid. *E. Krym.* Rs (K). (*S.W. & S.C. Asia.*)

3. Fedia Gaertner[1]

Erect, dichotomously branched annuals. Flowers hermaphrodite, in terminal, usually paired capitula. Calyx usually very small, not or scarcely accrescent, with 2–4 teeth. Corolla with 5 unequal lobes; tube cylindrical, more than twice as long as limb, obscurely gibbous *c.* ⅓ of way from base. Stamens 2, or 3 with 2 connate. Stigma 2-fid. Sterile loculi of fruit well developed.

1. F. cornucopiae (L.) Gaertner, *Fruct. Sem. Pl.* **2**: 37 (1790) (incl. *F. graciliflora* Fischer & C. A. Meyer). Plant glabrous, somewhat succulent. Stems 3–30 cm, usually branched. Leaves spathulate to elliptical, the lower 2–15 cm, more or less petiolate, usually entire; the upper smaller, sessile, denticulate. Peduncles inflated in fruit. Calyx reduced to a rim. Corolla 8–16 mm, purple, with pink markings on the limb. Fruits mostly broadly ovoid; sterile loculi usually larger than fertile. *Fields and waste places. Mediterranean region, S. Portugal.* Bl Co Cr Ga Gr Hs It Lu Sa Si.

Several species have been described, mostly from N.W. Africa, based primarily on fruit-anatomy. Two of these, which can be distinguished from **1** by their small sterile loculi, have been doubtfully recorded from Portugal. They are **F. caput-bovis** Pomel, *Nouv. Mat. Fl. Atl.* 72 (1874), with usually 2 long calyx-teeth, and **F. scorpioides** Dufresne, *Hist. Nat. Méd. Fam. Valér.* 55 (1811), with indistinct calyx-teeth. This polymorphism extends into some other parts of the western European range of the genus, but is not well defined; the variation cannot be given formal recognition at present.

4. Valeriana L.[2]

Rhizomatous perennial herbs with erect, usually unbranched flowering stems. Flowers hermaphrodite or unisexual; inflorescence cymose, usually compound, with dense or lax partial inflorescences. Calyx-teeth 5–15, linear, inrolled in flower and accrescent and plumose in fruit. Corolla with (3)5 unequal lobes; tube infundibuliform, slightly gibbous near the base. Stamens 3. Stigma 3-fid. Sterile loculi of fruit usually very small.

[1] By I. B. K. Richardson. [2] By D. J. Ockendon.

The leaves of a single plant vary in size and shape, forming a series from the basal leaves to the bracts, the lower leaves being usually simple, wide, petiolate and entire, and the upper being divided, narrow, sessile and with toothed margins. Some species are strictly dioecious, some polygamous or occasionally dioecious, and others hermaphrodite. In several cases the breeding system is not fully known and cannot be ascertained with certainty from the floral morphology. In the strictly dioecious species the corollas of female plants are smaller than those of male plants. Measurements of corolla-tube refer to male or hermaphrodite flowers. Measurements of fruits exclude the calyx.

For an extensive review of the literature, see F. Weberling in G. Hegi, *Illustrierte Flora von Mitteleuropa* ed. 2, **6(2)**: 131–172. München. 1970.

1 Corolla-tube 1–2 mm
2 Flowers white or pink
3 Cauline leaves several pairs, pinnatifid, or simple and ovate to obovate; flowers usually pink **9. dioica**
3 Cauline leaves absent or 1 pair and linear; flowers white **15. saxatilis**
2 Flowers brownish, greenish or yellowish
4 Cauline leaves ovate-elliptical to deltate, crenate or with a few large, obtuse teeth **17. elongata**
4 Cauline leaves oblanceolate to linear, entire **16. celtica**
1 Corolla-tube more than 2 mm
5 Upper cauline leaves pinnatifid, pinnatisect or pinnate
6 Dioecious **9. dioica**
6 Hermaphrodite or polygamous
7 Plant with tubers
8 Basal leaves reniform to orbicular, cordate at base **4. asarifolia**
8 Basal leaves lanceolate to obovate, entire or pinnatifid, not cordate at base
9 Fruit glabrous or subglabrous on one surface, more than twice as long as wide **2. dioscoridis**
9 Fruit hairy on both surfaces, about twice as long as wide **3. tuberosa**
7 Plant without tubers
10 Basal leaves usually divided; bracteoles ± equalling fruit **1. officinalis**
10 Basal leaves simple; bracteoles exceeding fruit
11 Terminal lobe of middle cauline leaves less than 0·3 cm wide; fruit *c.* 1 mm wide, square in section **7. globulariifolia**
11 Terminal lobe of middle cauline leaves at least 0·3 cm wide; fruit *c.* 2 mm wide, elliptical in section **(10–14). montana** group
5 Upper cauline leaves simple, 3-fid or 3-foliolate
12 Inflorescence with fewer than 10 flowers; corolla-tube at least 6 mm **20. longiflora**
12 Inflorescence with at least 10 flowers; corolla-tube less than 6 mm
13 Stems at least 50 cm; basal leaves more than 5 cm wide
14 Upper cauline leaves with 1–2 pairs of leaflets, deeply and irregularly dentate **6. pyrenaica**
14 Upper cauline leaves simple, crenate or shallowly dentate **5. alliariifolia**
13 Stems less than 50 cm; basal leaves less than 4 cm wide
13 Stems less than 50 cm; basal leaves less than 4 cm wide
15 Cauline leaves absent, or linear to lanceolate; fruit 5–6 mm **19. saliunca**
15 Cauline leaves oblanceolate to ovate; fruit less than 5 mm
16 Stems usually less than 10 cm; calyx-teeth 6–12 mm, conspicuous **18. supina**
16 Stems usually at least 10 cm; calyx-teeth less than 6 mm, inconspicuous
17 Rhizome stout; fruit square in section **8. olenaea**
17 Rhizome slender; fruit elliptical in section
18 Dioecious **9. dioica**
18 Polygamous **(10–14). montana** group

1. V. officinalis L., *Sp. Pl.* 31 (1753). Rhizome simple, short, not very stout, sometimes stoloniferous. Stem (15–)30–150(–240) cm, usually solitary, robust, sulcate, pubescent or glabrous. All leaves usually pinnate or pinnatisect with 3–25 leaflets; leaflets linear, lanceolate or elliptical, entire or toothed. Inflorescence compound, the partial inflorescences dense. Flowers hermaphrodite, pink or white; corolla-tube 2·5–5 mm. Bracteoles about equalling fruit. Fruit 2–5 mm, hairy or glabrous. $2n=14$, 28, (49), 56. *Most of Europe, but rare in the extreme south.* All except Az Bl Co Cr Fa ?Gr Sb Si.

Extremely variable, many taxa having been described (see especially A. Maillefer, *Mém. Soc. Vaud. Sci. Nat.* **8**: 277–340 (1946), E. Walther, *Mitt. Thür. Bot. Ges.* **2**, *Beih.* **1**: 1–108 (1949)). Diploids, tetraploids and octoploids occur, but the level of ploidy is by no means constant within the taxa described. The following 3 subspecies can usually be distinguished, but intermediates occur and are common in certain regions; it is not certain how some of the described taxa should be accommodated.

1 Plant with epigeal stolons; middle cauline leaves with terminal leaflet distinctly wider than the middle lateral leaflets **(c)** subsp. **sambucifolia**
1 Plant without stolons, or with hypogeal stolons only; middle cauline leaves with terminal leaflet not wider than the middle lateral leaflets
2 Leaflets of middle cauline leaves lanceolate, dentate **(a)** subsp. **officinalis**
2 Leaflets of middle cauline leaves linear, entire **(b)** subsp. **collina**

(a) Subsp. **officinalis**: Plant without stolons. Stems glabrous, with 6–13 pairs of leaves. Middle cauline leaves with 11–19 lanceolate, dentate leaflets, the terminal not wider than the middle lateral leaflets. Corolla 2·5–5 mm. Fruit 2·5–4 mm. $2n=14$. *Damp or dry meadows, scrub and woods. E., S.E. & E.C. Europe, extending to S. Sweden and the S. Alps and perhaps locally further west.*

(b) Subsp. **collina** (Wallr.) Nyman, *Consp.* 336 (1879): Plants without stolons or with hypogeal stolons. Stems densely patent-hairy below, with 4–7 pairs of leaves. Middle cauline leaves with 15–27 linear, entire leaflets, the terminal not wider than the middle lateral leaflets. Corolla 3–6 mm. Fruit 2–4 mm. $2n=28$. *Dry, often calcareous meadows, scrub and woods. W. & C. Europe, extending locally eastwards to Ukraine and S.E. Russia.*

(c) Subsp. **sambucifolia** (Mikan fil.) Čelak., *Prodr. Fl. Böhm.* 270 (1871) (*V. sambucifolia* Mikan fil., *V. excelsa* Poiret): Plant with both epigeal and hypogeal stolons. Stems glabrous, with 4–9 pairs of leaves. Middle cauline leaves with 5–9 lanceolate to ovate-lanceolate, dentate leaflets, the terminal distinctly wider than the middle lateral leaflets. Corolla 4–8 mm. Fruit 4–5 mm. $2n=56$. *Damp, shady places. N., N.C. & E.C. Europe, extending locally to N. Italy and C. Jugoslavia.*

V. salina Pleijel, *Acta Horti Berg.* **8**: 80 (1925) (*V. murmanica* Orlova), from Fennoscandia (coastal except in the Arctic), is morphologically intermediate in some ways between subspp. (a) and (c), and has $2n=56$.

Several taxa, including **V. pratensis** Dierbach ex Walther, *Mitt. Thür. Bot. Ges.* **2**, *Beih.* **1**: 83 (1949), non (Bentham) Bentham ex Steudel, from the upper Rhine basin, and **V. stolonifera** Czern., *Bull. Soc. Nat. Moscou* **18(2)**: 133 (1845), from E.C. Europe and S.W. part of U.S.S.R., differ from subsp. **(b)** chiefly in having glabrous stems; their status is uncertain.

V. versifolia Brügger, *Jahresb. Naturf. Ges. Graubündens* **29**: 98 (1886), from the Alps, differing from subsp. **(b)** chiefly in having the middle cauline leaves with only 11–17, more or less lanceolate leaflets, the terminal slightly wider than the lateral, is somewhat intermediate between subspp. **(b)** and (c); similar plants from the E. Pyrenees, but more strongly pubescent and with simple (not compound) basal leaves have been called **V. hispidula** Boiss., *Diagn. Pl. Or. Nov.* **1(3)**: 56 (1843) (*V. officinalis* subsp. *hispidula* (Boiss.) Nyman).

V. repens Host, *Fl. Austr.* **1**: 35 (1827) (*V. procurrens* Wallr.), from W. & W.C. Europe, differs from subsp. (c) chiefly in having the stems hairy at least below and the middle cauline leaves with 5–17 leaflets; it has $2n=56$, and may perhaps be considered as a fourth subspecies.

1 is cultivated on a small scale in many parts of Europe for its rhizome which yields the drug valerian. This drug has also been obtained from **V. phu** L., *Sp. Pl.* 32 (1753), a species of uncertain origin but said to be native in N. Anatolia. It resembles **1**, but differs in having mostly undivided basal leaves and terete stems; it has been recorded in various parts of Europe as an escape from cultivation, but does not appear to be fully naturalized.

2. V. dioscoridis Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 21 (1806). Rhizome very short, with a cluster of fusiform tubers. Stem 25–75(–90) cm, solitary, slightly hairy. Basal leaves elliptical in outline, entire or pinnatifid; cauline leaves pinnate, with shallowly dentate leaflets. Inflorescence compound; partial inflorescences dense. Corolla-tube 4·5–6 mm, pink or white. Fruit 4–5 mm, more than twice as long as wide, hairy on one surface, glabrous or subglabrous on the other. $2n=16$. *Rock-crevices, rocky woods and damp grassland. Balkan peninsula, northwards to* 42° 30′ *N.* Al Bu Gr Ju Tu.

3. V. tuberosa L., *Sp. Pl.* 33 (1753). Rhizome short, simple, tuberous, emitting short stolons each with its own tuber. Stem (5–)10–40(–60) cm, solitary, glabrous. Basal leaves simple, elliptical or ovate, entire; lower cauline usually pinnatifid, occasionally 3-fid or entire; upper pinnatisect with more or less linear leaflets. Inflorescence simple or somewhat branched, dense. Flowers hermaphrodite, pink; corolla-tube 3·5–5 mm. Fruit 4–5 mm, about twice as long as wide, hairy on both surfaces. $2n=16$. *Dry grassland. S. Europe, extending northwards to* 47° 30′ *N. in France and* 52° *N. in S.E. Russia.* Al Bu Co Ga Gr Hs It Ju Lu Rs (C, W, K, E) Si.

4. V. asarifolia Dufresne, *Hist. Nat. Méd. Fam. Valér.* 44 (1811). Rhizome short, simple, tuberous. Stem 25–50 cm, solitary, glabrous. Basal leaves 3–12 cm wide, simple, reniform or orbicular, cordate, crenate, long-petiolate; cauline irregularly pinnatifid. Inflorescence compound; partial inflorescences dense. Corolla-tube 5–6·5 mm, pink. Fruit 4–5 mm, hairy. *Calcareous rocks*, 400–1300 *m.* ● *Kriti and Karpathos.* Cr.

5. V. alliariifolia Adams in Weber fil. & Mohr, *Beitr. Naturk.* **1**: 44 (1805). Rhizome simple, not very stout. Stem 50–90 cm, solitary, glabrous. All leaves simple; basal and lower cauline 5–20 cm wide, ovate, cordate, more or less entire, crenate or shallowly dentate, long-petiolate; upper ovate or lanceolate. Inflorescence compound; partial inflorescences dense. Flowers hermaphrodite, pink; corolla-tube 3–4 mm. Fruit 3·5–4 mm, glabrous. *Woods above* 1000 *m. E. Greece* (*Evvoia*). Gr. (*Caucasian region and Anatolia.*)

6. V. pyrenaica L., *Sp. Pl.* 33 (1753). Rhizome short, simple, stout. Stem 70–110 cm, solitary, robust, pubescent at nodes. Basal leaves 8–20 cm wide, simple, ovate or suborbicular, cordate, deeply and irregularly dentate, long-petiolate; upper cauline with 1 or 2 pairs of small lateral leaflets. Inflorescence

compound; partial inflorescences more or less dense. Flowers hermaphrodite, pink; corolla-tube 2·5–3 mm. Fruit 4·5–6 mm, glabrous. *Damp woods and meadows.* ● *Pyrenees and Cordillera Cantábrica.* Ga Hs [Br Hb].

7. V. globulariifolia Ramond ex DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**:236 (1805). Rhizome branched, woody, creeping. Stems 6–25 cm, several, glabrous. Basal leaves simple, rarely 3-fid, entire, oblanceolate, spathulate, elliptical or obovate; lower cauline pinnatifid, the upper pinnatisect with 1–2 pairs of more or less linear leaflets, the uppermost sometimes simple. Inflorescence simple or somewhat compound, dense. Corolla-tube 4–5 mm, pink. Bracteoles exceeding fruit. Fruit 3·5–4·5 × *c.* 1 mm, square in section, glabrous. $2n=16$. *Mountain rocks.* ● *Pyrenees and Cordillera Cantábrica; one station in S.E. Spain.* Ga Hs.

8. V. olenaea Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 118 (1856). Like **7** but basal leaves ovate to obovate, long-petiolate; cauline leaves simple or 3-fid, with elliptical or ovate segments. *Rocks*, 1500–2200 *m.* ● *S. Greece (N. Peloponnisos).* Gr.

9. V. dioica L., *Sp. Pl.* 31 (1753). Dioecious. Rhizome creeping, usually unbranched, stoloniferous. Stems 10–40(–60) cm, usually several, slightly hairy at the nodes. Basal leaves simple, ovate, oblong or elliptical, entire, long-petiolate. Inflorescence compound; partial inflorescences dense. Flowers usually pink, occasionally white; corolla-tube 1·5–2·5 mm. Fruit 2·5–3 mm, elliptical in section, glabrous. *Wet places. W. & C. Europe, extending northwards to S.E. Norway, eastwards to Macedonia and the western borders of the U.S.S.R., and locally southwards to S. Italy.* Au Be Br Bu Cz Da Ga Ge He Ho Hs Hu It Ju Lu No Po Rm Rs (B, C, W) Su ?Tu.

(a) Subsp. **dioica**: Cauline leaves pinnatifid. $2n=16$, 32. *Throughout the range of the species.*

(b) Subsp. **simplicifolia** (Reichenb.) Nyman, *Consp.* 336 (1879) (*V. simplicifolia* (Reichenb.) Kabath): Cauline leaves simple, ovate to obovate, entire or irregularly toothed. $2n=16$. *Mainly in the eastern part of the range of the species.*

(10–14). V. montana group. Polygamous. Rhizome creeping. Stems 5–50 cm. Basal leaves simple, orbicular to elliptical or cordate, entire to crenate, petiolate. Inflorescence compound; partial inflorescences lax or dense. Flowers pink, white or lilac; corolla-tube 2–5 mm. Fruit 3–5 mm, elliptical in section, glabrous.

The relationships of the species in this group are very close and are not completely understood. Intermediates between **10** and **11** are not infrequent and authors are not agreed as to the diagnostic characters, some even treating the two as a single species; both species are variable and have been divided into subspecies. The following key works with only a majority of specimens.

1 Middle cauline leaves mostly 3-foliolate, or with a pair of small basal lobes
2 Basal leaves crenate or shallowly dentate; stems several **10. tripteris**
2 Basal leaves entire; stems solitary **14. capitata**
1 Middle cauline leaves simple, sometimes pinnatifid
3 Upper cauline leaves pinnatifid at least near base of leaf; corolla-tube 4–5 mm **12. bertiscea**
3 Upper cauline leaves usually entire to dentate
4 Stems 5–12 cm; corolla-tube less than 3 mm **13. crinii**
4 Stems 12–50 cm; corolla-tube at least 3 mm **11. montana**

10. V. tripteris L., *Sp. Pl.* 32 (1753). Rhizome branched, bearing short non-flowering stems sometimes resembling stolons. Flowering stems 10–40(–60) cm, several, hairy at the nodes. Leaves of non-flowering shoots and mature basal leaves ovate, cordate, crenate or shallowly dentate, long-petiolate; middle and upper cauline leaves usually 3-foliolate or -fid with ovate or lanceolate terminal segments, sometimes pinnatifid. Flowers pink or white; corolla-tube 2–4 mm. Fruit 3–4 mm, glabrous. $2n=16$. *Woods, scrub and rocky ground, usually calcicole.* ● *From the Vosges and the Carpathians to N. Spain, S. Italy and N. Greece.* Au Bu Co Cz Ga Ge Gr He Hs Hu It Ju Po Rm Rs (W).

11. V. montana L., *Sp. Pl.* 32 (1753). Rhizome somewhat branched. Stems 12–50 cm, several, hairy or subglabrous. Basal leaves entire, ovate, orbicular or elliptical (rarely cordate), petiolate; cauline simple, rarely 3-fid, ovate, entire or toothed. Flowers lilac, pink or white; corolla-tube 3–5 mm. Fruit 4–5 mm, glabrous. $2n=32$. *Scrub and rocky ground, mainly in mountains; usually calcicole.* ● *From E.C. France and the E. Carpathians southwards to E.C. Spain, S. Italy and S. Bulgaria.* Al Au Bu Co Cz Ga Ge He Hs It Ju Lu Rm Sa.

12. V. bertiscea Pančić, *Elench. Pl. Vasc. Crna Gora* 42 (1875). Like **11** but stems 6–25 cm; lower cauline leaves sometimes pinnately lobed, the upper pinnatifid at least at the base of the leaf; corolla-tube 4–5 mm. *Mountain rocks.* ● *Balkan peninsula, from C. Jugoslavia to S.C. Greece.* Al Gr Ju.

13. V. crinii Orph. ex Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 119 (1856). Like **11** but stems 5–12 cm; leaves simple and entire or very obscurely repand-dentate; corolla-tube 2–2·5 mm. *Mountain cliffs.* ● *Greece and Albania.* Al Gr.

V. phitosiana Quézel & Contandr., *Candollea* **20**: 79 (1965), from N.E. Greece, differs from **13** in its basal leaves cordate at the base and 0–1 pair of cauline leaves. It may be a hybrid between **13** and **15(b)** and has $2n=32$.

14. V. capitata Link, *Jahrb. Gewächsk.* **1(3)**: 66 (1820). Like **11** but rhizome usually unbranched; stem 5–30 cm, usually solitary, pubescent; lower cauline leaves simple or with a pair of small basal lobes, the upper 3-fid with ovate or lanceolate segments, sometimes shallowly and irregularly dentate; partial inflorescences very dense, or inflorescence more or less simple. $2n=56$. *Wet places. Arctic Russia and N. Ural.* Rs (N). (*N. Asia.*)

15. V. saxatilis L., *Sp. Pl.* 33 (1753). Dioecious. Rhizome creeping, branched, covered with persistent leaf-bases. Stems several, glabrous. All leaves simple; basal elliptic-oblanceolate or lanceolate, tapering to a long petiole, entire or irregularly crenate; cauline 1 pair, linear, or absent. Inflorescence compound, with the lower branches often widely separated; partial inflorescences lax or dense. Flowers white; corolla-tube 1–2 mm. Fruit 3–4 mm. *Rocky ground; calcicole.* ● *E. & E.C. Alps and adjacent lowlands; N. Appennini; Crna Gora and Albania.* Al Au Ge He It Ju.

(a) Subsp. **saxatilis**: Persistent leaf-bases fibrous. Stems 7–30 cm. Basal leaves at least 0·8 cm wide, with 3–5 main veins, pubescent or glabrous but ciliate. $2n=24$. *Throughout the range of the species except the Balkan peninsula.*

Old records from the Carpathians have not been confirmed and are probably erroneous.

(b) Subsp. **pancicii** (Halácsy & Bald.) Ockendon, *Bot. Jour. Linn. Soc.* **71**: 274 (1976) (*V. pancicii* Halácsy & Bald.): Persistent leaf-bases membranous. Stems 5–15 cm. Basal leaves less than 0·8 cm wide, with a single main vein, glabrous. $2n=24$. *Crna Gora and Albania.*

16. V. celtica L., *Sp. Pl.* 32 (1753). Dioecious. Rhizome creeping, sparingly branched. Stems (2–)5–15(–25) cm, several, glabrous. All leaves simple; basal obovate, oblanceolate or more or less linear, entire; cauline 1–2 pairs, oblanceolate or linear. Inflorescence a narrow, usually elongate panicle with small, dense partial inflorescences. Flowers yellowish or brownish; corolla-tube 1–2 mm. Fruit 2·5–3 mm, pubescent or glabrous. $2n=c.\ 48$, *c.* 72, *c.* 96. *Alpine pastures*, 1800–2800 *m*; *calcifuge.* ● *Alps.* Au Ga He It.

The range of this species comprises two areas separated by a gap of over 300 km. One extends from 6° 50′ to 8° 15′ E. (mainly in Piemonte), the other from 12° 15′ to 15° 10′ E. (mainly in Kärnten and Steiermark). The plants of the eastern area have been distinguished as subsp. **norica** Vierh., *Veröff. Geobot. Inst. Rübel (Zürich)* **3**: 244 (1925), but the diagnostic characters appear to be too variable and ill-defined to justify subspecific status.

17. V. elongata Jacq., *Enum. Stirp. Vindob.* 205 (1762). Dioecious. Rhizome creeping, branched. Stems 5–25 cm, several, glabrous. All leaves simple; basal ovate or oblong, more or less entire; cauline 1–2 pairs, ovate-elliptical or deltate, crenate or with a few large, obtuse teeth. Inflorescence an elongate panicle with small, dense partial inflorescences. Flowers brownish or greenish; corolla-tube 1–2 mm. Fruit 2·5–3 mm, glabrous. $2n=24$. *Calcareous rocks and screes*, 1400–2200 *m.* ● *E. Alps.* Au It Ju.

18. V. supina Ard., *Animadv. Bot. Spec. Alt.* 13 (1763). Rhizome creeping, branched. Stems 2–12 cm, several, pubescent. All leaves simple; basal spathulate or more or less orbicular, entire or irregularly crenate; cauline 1–2 pairs, spathulate or oblanceolate. Inflorescence more or less simple, dense. Corolla-tube 3–4 mm, deep pink. Fruit 4–4·5 mm, glabrous. $2n=16$. *Calcareous screes*, 1800–2900 *m.* ● *E. & E.C. Alps.* Au Ge He It Ju.

19. V. saliunca All., *Fl. Pedem.* **1**: 3 (1785). Stock short, much-branched, woody, with a stout tap-root. Stems 2–15 cm, several, glabrous. Basal leaves simple, spathulate, oblanceolate or linear-lanceolate, entire; cauline 0–1(–2) pairs, simple, rarely 3-fid, lanceolate or linear. Inflorescence more or less simple, dense. Corolla-tube 3·5–4·5 mm, deep pink. Fruit 5–6 mm, glabrous, inflated. $2n=16$. *Rocks and stony slopes*, 1800–2700 *m. Alps; C. Appennini.* Au Ga He It.

20. V. longiflora Willk., *Flora (Regensb.)* **34**: 733 (1851). Stock short, branched. Stems 0–5 cm. All leaves simple, entire, orbicular, ovate or broadly elliptical, petiolate. Inflorescence with fewer than 10 flowers, often almost buried amongst the leaves. Corolla-tube 6–12 mm, pink. Fruit 3·5–4 mm, glabrous. *Rocks, c.* 1000 *m.* ● *Mountains of N.E. Spain.* Hs.

5. Centranthus DC.[1]

Glabrous, usually glaucous annual or rhizomatous perennial herbs with erect, usually unbranched flowering stems. Flowers hermaphrodite or unisexual; inflorescence cymose, usually compound, with dense partial inflorescences. Calyx-teeth 5–25, linear, inrolled in flower and accrescent in fruit to form a plumose pappus. Corolla with 5 usually unequal lobes; tube cylindrical or infundibuliform, gibbous near the middle, or spurred near the base and with an internal longitudinal membrane from the insertion of the spur to the mouth. Stamen 1. Stigma entire to 3-fid. Sterile loculi of fruit very small.

[1] By I. B. K. Richardson.

Literature: I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 211–234 (1976)

1 Annual; at least the upper leaves ±divided
2 Corolla-tube *c.* 2 mm, gibbous **7. calcitrapae**
2 Corolla-tube (4–)6–8 mm, spurred **8. macrosiphon**
1 Perennial; leaves entire
3 Corolla-tube (2–)3–4 mm, gibbous **6. trinervis**
3 Corolla-tube (5–)7–18 mm, spurred
4 Corolla-tube (11–)12–18 mm
5 Stems 40–200 cm, branched above; leaves 4–12 cm **4. longiflorus**
5 Stems not more than 40 cm, simple or branched only at base; leaves 1–4 cm **5. nevadensis**
4 Corolla-tube not more than 10(–11) mm
6 Leaves linear, mostly *c.* 2 mm wide; corolla-spur 2–4 mm **2. angustifolius**
6 Leaves ±lanceolate, (3–)4–30 mm wide; corolla-spur (2–)4–10(–12) mm
7 Leaves 4–6(–12) mm wide, erect or patent; inflorescence capitate; stems usually simple **3. lecoqii**
7 Leaves up to 60 mm wide, patent; partial inflorescences several; stems usually branched **1. ruber**

Sect. CENTRANTHUS. Perennial. Leaves undivided. Corolla spurred near the base. Stigma entire. Fruit glabrous.

1. C. ruber (L.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 239 (1805). Stems 30–80 cm, ascending, usually branched. Leaves 30–80(–120) × (5–)10–50(–60) mm, mostly lanceolate to ovate, obtuse to acuminate, patent, the uppermost sometimes irregularly dentate, amplexicaul. Partial inflorescences several, mostly oblong. Corolla red, pink or white; tube (5–)7–10(–11) mm; spur (2–)5–10(–12) mm. *Walls and rocky places. Mediterranean region, Portugal; cultivated for ornament and widely naturalized elsewhere.* Al Bl Co Ga Gr Hs It Ju Lu ?Sa Si Tu [Au Az Be Br Cr Ge Hb He Rs (K)].

(a) Subsp. **ruber**: Leaves ovate to lanceolate, the uppermost often dentate, acute. Corolla-tube (5–)7–10 mm; spur (2–)4–7 (–9) mm. $2n=32$. *Almost throughout the range of the species.*

(b) Subsp. **sibthorpii** (Heldr. & Sart. ex Boiss.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 491 (1930) (incl. *C. velenovskyi* Vandas): Leaves lanceolate, all entire, obtuse. Corolla-tube 5–11 mm; spur 2–12 mm. ● *Greece, S. Albania and Aegean region.*

2. C. angustifolius (Miller) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 239 (1805). Stems 30–80 cm, erect or ascending, much-branched above. Leaves 30–100 × 2–4 mm, linear, obtuse, entire, patent; axillary clusters of small leaves present. Inflorescence usually capitate. Corolla pink; tube 6–9 mm; spur 2–4 mm. *Screes and rocky places, mainly in the mountains.* ● *S. & E. France, N.W. Switzerland, N. & C. Italy.* Ga He It.
France, N.W. Switzerland, N. & C. Italy. Ga He It.

3. C. lecoqii Jordan, *Pug. Pl. Nov.* 76 (1852) (*C. angustifolius* var. *lecoqii* (Jordan) Lange, *C. angustifolius* auct., non (Miller) DC.). Stems 20–60 cm, erect, simple or scarcely branched above. Leaves 20–70(–100) × 4–7(–12) mm, lanceolate, acute or acuminate, entire, erecto-patent; axillary clusters of small leaves absent. Inflorescence usually capitate. Corolla pink or lilac; tube 5–8 mm; spur 4–5 mm. *Stony places on mountains. N. & E. Spain, S. France.* Ga Hs. (*N.W. Africa.*)

Hybridization occurs between **1**, **2** and **3** where the ranges overlap, making identification difficult.

4. C. longiflorus Steven, *Mém. Soc. Nat. Moscou* **7**: 272 (1829). Stems 40–200 cm, erect or ascending, branched above. Leaves 40–100(–120) × 2–35 mm, linear to ovate, entire. Partial inflorescences several, mostly oblong. Corolla pink or lilac; tube 12–18 mm; spur (8–)10–14 mm. *Greece and W. Bulgaria.* Bu Gr. (*S.W. Asia*; *N.W. Africa.*)

(a) Subsp. **junceus** (Boiss. & Heldr.) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 228 (1976) (*C. junceus* Boiss. & Heldr.): Plant 40–150 cm. Leaves mostly *c.* 2 mm wide, linear. *Mountain rocks.* ● *Greece.*

(b) Subsp. **kellereri** (Stoj., Stefanov & Georgiev) I. B. K. Richardson, *op. cit.* 227 (1976) (*C.longiflorus* var. *kellereri* Stoj., Stefanov & Georgiev): Plant usually *c.* 200 cm, very robust. Leaves 10–35 mm wide, ovate-lanceolate. *Calcareous screes.* ● *W. Bulgaria.*

5. C. nevadensis Boiss., *Diagn. Pl. Or. Nov.* **3(2)**: 120 (1856). Caespitose. Stems (7–)15–30(–40) cm, erect, simple or branched at base. Leaves (10–)20–40 × *c.* 5 mm, elliptical to spathulate, obtuse. Partial inflorescences several, mostly oblong. Corolla red or pink; tube (11–)12–14 mm. *Mountain rocks. S. Spain*; *Kriti.* Cr Hs.

(a) Subsp. **nevadensis**: Flowering stems with 4–12 cauline leaves. Corolla-spur 4–5 mm. *S. Spain.*

(b) Subsp. **sieberi** (Heldr.) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 229 (1976) (*C. sieberi* Heldr.): Flowering stems with 2–6 cauline leaves. Corolla-spur 13–17 mm. ● *Kriti.*

Sect. NERVOSAE Rouy. Perennial. Leaves undivided. Corolla gibbous near the middle. Stigma 3-fid. Fruit glabrous.

6. C. trinervis (Viv.) Béguinot in Fiori & Paol., *Fl. Anal. Ital.* **3**: 135 (1903) (*C. nervosus* Moris). Stems 20–40 cm, simple or branched. Leaves 40–70(–100) × 10–30 mm, ovate-lanceolate, obtuse. Inflorescence usually capitate. Corolla pink; tube (2–)3–4 mm. $2n=28$. *Rocky places.* ● *Corse* (*near Bonifacio*). Co ?Sa.

Sect. CALCITRAPA Lange. Annuals. At least the upper leaves lyrate-pinnatifid. Corolla gibbous or shortly spurred. Stigma 3-fid. Fruit glabrous or hairy.

7. C. calcitrapae (L.) Dufresne, *Hist. Nat. Méd. Fam. Valér.* 39 (1811). Stems 4–40(–75) cm, simple or branched. Leaves 10–90 × 6–40 mm, orbicular to obovate in outline, the lobes entire to incise-serrate. Partial inflorescences several, capitate. Corolla pink or white, gibbous or shortly spurred with the spur not exceeding the base of the tube; tube 1–2(–3) mm. $2n=32$. *Waste places. S. Europe.* Az Bl Co Cr Ga Gr Hs It Ju Lu Rs (K) Sa Si.

Very variable in characters of leaf and flower, but there is little correlation with geography. Two subspecies are recognized.

(a) Subsp. **calcitrapae**: Fruit glabrous. *Throughout the range of the species.*

(b) Subsp. **trichocarpus** I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 232 (1976): Fruit hirsute. ● *S. & S.E. Spain*; *Islas Baleares.*

8. C. macrosiphon Boiss., *Diagn. Pl. Or. Nov.* **1(3)**: 57 (1843). Stems 10–50 cm, branched. Leaves 30–50 × 10–30 mm, obovate to broadly elliptical in outline, the lobes entire or dentate. Partial inflorescences several, capitate. Corolla pink, red at mouth, the spur *c.* 1 mm; tube (4–)6–8 mm. Fruit glabrous, rarely hirsute. $2n=32$. *Rocky and waste places. S. & S.E. Spain.* Hs [It].

Variable in vegetative and floral characters, and division into several subspecies may be justified when more material is available.

CLXVII. DIPSACACEAE[1]

Annual to perennial herbs, rarely shrubs. Leaves opposite or verticillate, exstipulate. Florets in a dense, cymose capitulum subtended by involucral bracts, often with marginal flowers radiate, rarely in a spike of verticillasters. Florets hermaphrodite or female, usually zygomorphic, each with a basal epicalyx (*involucel*) of connate bracteoles which may be expanded distally into a *corona*, often subtended by a receptacular scale. Calyx small, cupuliform or divided into 4–5 teeth or of numerous teeth or setae. Corolla-lobes 4–5, subequal, or corolla 2-lipped. Stamens 2 or 4, epipetalous, alternating with corolla-lobes. Ovary inferior, 1-locular; ovule 1, pendent; stigma simple or 2-lobed. Fruit dry, indehiscent, enclosed in epicalyx and often surmounted by persistent calyx; seed 1, endospermic, with straight embryo.

1 Inflorescence a spike of verticillasters — **1. Morina**
1 Inflorescence a spike of verticillasters — **1. Morina**
1 Inflorescence of 1 or more capitula
2 Stems with prickles — **3. Dipsacus**
2 Stems without prickles
3 Involucral bracts connate in basal half; calyx-setae present only in central florets of capitulum — **10. Pycnocomon**
3 Involucral bracts free; calyx-setae present or absent in all florets
4 Calyx-setae plumose
5 Fruiting involucel with longitudinal furrows running the whole length — **7. Pterocephalus**
5 Fruiting involucel with 8 pits in distal half, furrowed below — **9. Tremastelma**
4 Calyx-setae absent or, if present, not plumose
6 Calyx-setae or -teeth (6–)8–16(–24); receptacle hairy, without scales — **6. Knautia**
6 Calyx-setae or -teeth 4–5 or absent; receptacle not hairy, with scales
7 Marginal florets radiate; corolla 5-lobed — **8. Scabiosa**
7 Marginal and central florets subequal; corolla 4-lobed
8 Involucral bracts in more than 3 rows — **2. Cephalaria**
8 Involucral bracts in 1–3 rows
9 Calyx-setae 4–5; involucel angled — **4. Succisa**
9 Calyx-setae absent; involucel ± terete — **5. Succisella**

[1] Edit. D. M. Moore.

1. Morina L.[2]

Perennial herbs. Leaves verticillate, spinose. Inflorescence a spike of many-flowered, bracteate verticillasters. Involucre long, infundibuliform, spiny. Calyx deeply 2-lobed. Corolla with curved tube, distinctly 2-lipped. Fertile stamens 2. Fruit with an oblique apex, rugose.

1. M. persica L., *Sp. Pl.* 28 (1753). Robust plant 30–90 cm. Leaves 15–20 × 1–2 cm, linear to elliptical, dentate to pinnatifid, glabrous. Verticillasters rather distant; bracts 2–4·5 × *c.* 1 cm, ovate-triangular, sometimes pinnatifid near base, with marginal spines up to *c.* 1 cm. Calyx-lobes subequal, entire or emarginate. Corolla-tube *c.* 3 cm, villous, the lips patent, pink. *Rocky places, mainly in the mountains. S. & E. parts of Balkan peninsula.* Al Bu Gr Ju Tu.

Plants from Macedonia, said to have short leaf-lobes, less conspicuous bracts with shorter spines, and rather globose verticillasters, have been recognized as subsp. **turcica** Halácsy, *Österr. Bot. Zeitschr.* **41**: 409 (1891), but probably do not merit recognition at this level.

[2] By J. F. M. Cannon.

2. Cephalaria Schrader[1]

Annual, biennial or perennial herbs, rarely shrubs. Capitulum ovoid or subglobose. Receptacular scales scarious. Involucel 4- or 8-angled, 8-ridged, usually with 4 or more setae. Calyx cupuliform. Corolla 4-fid, blue, lilac, white or yellow.

Literature: Z. Szabó, *Math. Term. Közl.* **38**: 1–352 (1940).

1 Shrub; leaves coriaceous — **1. squamiflora**
1 Herb; leaves not coriaceous
2 Involucel with minute teeth or entire
3 Involucel not constricted at throat, with a short scarious corona — **2. leucantha**
3 Involucel constricted at throat, without a scarious corona
4 Leaves pubescent — **3. radiata**
4 Leaves glabrous
5 Basal leaves entire or weakly lobed — **5. coriacea**
5 Basal leaves pinnatisect — **4. laevigata**
2 Involucel with 4 or 8 prominent setae or teeth
6 Involucral bracts with long spines at least as long as remainder of bract — **7. syriaca**
6 Involucral bracts with spines much shorter than remainder of bract
7 Receptacular scales sericeous or villous — **13. alpina**
7 Receptacular scales appressed-pubescent
8 Leaf-lobes glabrous or ciliate — **12. pastricensis**
8 Leaf-lobes pubescent or sericeous
9 Receptacular scales 4·5–6 mm — **9. joppica**
9 Receptacular scales 7–15 mm
10 Receptacular scales 12–15 mm; involucel with 4 setae ½–½ as long as tube — **10. ambrosioides**
10 Receptacular scales 7–12 mm; involucel with setae not more than ¼ as long as tube
11 Corolla 15–18 mm — **14. litvinovii**
11 Corolla less than 15 mm
12 Involucral bracts lanceolate, acute or acuminate — **8. transylvanica**
12 Involucral bracts ovate, obtuse
13 Leaves pinnatisect or lyrate; lobes ovate, elliptical or ovate-lanceolate, serrate-dentate — **11. flava**
13 Leaves entire or pinnatisect; lobes oblong or oblanceolate, entire or weakly lobed — **6. uralensis**

1. C. squamiflora (Sieber) W. Greuter, *Candollea* **22**: 235 (1967). Shrub up to 90 cm. Leaves 4–17 × 1·5–5 cm, ovate-lanceolate to oblanceolate, entire, crenate or rarely weakly lyrate, coriaceous, tapering to a distinct petiole. Involucral bracts 4–6 × 3–5 mm, ovate, appressed-pubescent. Receptacular scales 6–7 × 3–4 mm, obovate-lanceolate. Corolla 9–12 mm, yellow or white. Involucel *c.* 6 mm in fruit, 4-angled. *Crevices of calcareous rocks. Mediterranean islands.* Bl Co Cr Sa.

(a) Subsp. **balearica** (Willk.) W. Greuter, *op. cit.* 236 (1967). Young leaves ovate. Teeth of mature leaves often ciliate. Involucral bracts obtuse to subacute. Involucel with a scarious corona *c.* 1 mm, more or less dentate. *Islas Baleares, Corse, Sardegna.*

(b) Subsp. **squamiflora** (*C. sieberi* Szabó): Young leaves often orbicular. Teeth of mature leaves not ciliate. Involucral bracts acute. Involucel with 4 short teeth on the angles and 4 very short intermediate teeth. *Kriti, Karpathos.*

2. C. leucantha (L.) Roemer & Schultes, *Syst. Veg.* **3**: 47 (1818) (*C. boetica* Boiss.). Perennial herb up to 100 cm, with a woody stock. Leaves 5–20 × 3–8(–10) cm, pinnatisect, glabrous or sometimes hairy, with linear or lanceolate, dentate, crenate-dentate or lobed segments. Involucral bracts 5–7 × 2–5 mm, ovate, obtuse or subacute, appressed-pubescent. Receptacular scales 7–9 × 3–5 mm, obovate-lanceolate to spathulate, acute or subacute. Corolla 10–15 mm, yellow or white. Involucel *c.* 6 mm in fruit, 4-angled, with a dentate or entire, ciliate, scarious corona. $2n=18$. *Dry, stony places. Mediterranean region, S. Portugal.* Al Co Ga Gr Hs It Ju Lu Sa.

C. linearifolia Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1877–1878**: 226 (1878), from the mountains of S. Spain (Sierra Nevada), resembles **2** but has longer, more or less entire or weakly lyrate or pinnatisect leaves, with few, entire, linear-lanceolate lobes. It should perhaps be treated as a distinct species but more information is required.

3. C. radiata Griseb. & Schenk, *Arch. Naturgesch. (Berlin)* **18(1)**: 351 (1852). Perennial herb 60–120 cm. Leaves 12–40 × 4–10 cm, lyrate or more regularly pinnatisect, with up to 7 pairs of ovate-lanceolate lateral lobes and a larger lanceolate terminal lobe, the lobes dentate or serrate and pubescent; cauline leaves often linear, glabrous or ciliate, long-petiolate. Involucral bracts 4–7 × 3–5 mm, ovate, obtuse, puberulent or appressed-pubescent. Receptacular scales 7–9 × 3–4 mm, obovate-lanceolate to spathulate, acute or subacute. Corolla 12–17 mm, yellow. Involucel *c.* 5 mm in fruit, with distinct ribs, constricted at apex, with minute, straight teeth, without a distinct collar or aristae. *Dry pastures.* ● *Mountains of Romania.* Rm.

4. C. laevigata (Waldst. & Kit.) Schrader, *Ind. Sem. Horti Gotting.* **1821**: [2](1821). Like **3** but basal leaves pinnatisect with linear or linear-lanceolate, entire lobes, rarely entire, glabrous, subcoriaceous; cauline leaves minutely puberulent; receptacular scales lanceolate, acuminate; involucel with inconspicuous ribs, the teeth minute, incurved. *Dry rocky places, mainly in the mountains.* ● *C. & S.W. Romania, N.E. part of Balkan peninsula.* Bu Ju Rm.

5. C. coriacea (Willd.) Roemer & Schultes ex Steudel, *Nomencl. Bot.* ed. 2, **1**: 327 (1840). Like **3** but basal leaves elliptic- or linear-lanceolate, entire, very weakly lobed or obscurely crenate, glabrous; cauline leaves lyrate or pinnatisect, rarely entire; receptacular scales ovate or oblong-lanceolate, acute, cuspidate; involucel with inconspicuous ribs, the teeth minute, incurved. *Dry, stony slopes. Mountains of Krym.* Rs (K).

6. C. uralensis (Murray) Roemer & Schultes, *Syst. Veg.* **3**: 50 (1818) (incl. *C. demetrii* Bobrov). Perennial herb up to 100 cm. (1818) (incl. *C. demetrii* Bobrov). Perennial herb up to 100 cm. Basal leaves 10–21 × 3–5 cm, lyrate or pinnatisect, with 2 to 4 pairs of oblong or oblanceolate lateral lobes and a larger terminal lobe, entire or very weakly lobed, pubescent, long-petiolate; cauline leaves pinnatisect, the lobes oblong-linear. Involucral bracts 3·5–9 × 3–5 mm, ovate, obtuse, puberulent or appressed-pubescent. Receptacular scales 8–12 × 2·5–4 mm, lanceolate, acute or acuminate. Corolla 8–14 mm, yellow. Involucel *c.* 5 mm in fruit, 4-angled, with 4 teeth up to ¼ as long as tube and 4 very short intermediate teeth. $2n=18$. *Dry places. S.E. Europe, extending northwards to c.* 54° *N. in C. Russia.* Bu ?Gr Ju Rm Rs (C, W, K, E).

[1] By I. K. Ferguson.

7. C. syriaca (L.) Roemer & Schultes, *op. cit.* 45 (1818). Annual up to 90 cm, more or less setose. Leaves 3–15 × 1·5–3·5 cm, oblong-lanceolate to ovate-elliptical, entire, dentate to weakly lobed, sessile or shortly petiolate; cauline leaves sometimes connate at base. Involucral bracts 3–4 × 1·5–2·5 mm, ovate to broadly triangular, acuminate, appressed-pubescent or -puberulent. Receptacular scales 8–12 × 3–5 mm, oblong, with terminal spines as long as or longer than limb. Corolla 8–14 mm, blue or lilac. Involucel 4–5 mm in fruit, 8-angled, with 4 ridges produced into setae ½ as long as to as long as tube and 4 small intermediate ridges with short setae up to ¼ as long as tube. *Cultivated fields and waste places; a frequent casual in S. Europe and naturalized in France and Spain and perhaps elsewhere.* [?Bu Ga ?Gr Hs ?It ?Si.] (*S.W. Asia.*)

8. C. transylvanica (L.) Roemer & Schultes, *loc. cit.* (1818). Annual up to 120 cm. Leaves 5–12 × 1–5 cm, lyrate or pinnatisect, with elliptic- to linear-lanceolate or linear lobes, entire or serrate-dentate or irregularly lobed, more or less pubescent. Involucral bracts 5–8 × 2–3 mm, lanceolate, acute or acuminate. Receptacular scales 7–10 × 2·5–4 mm, ovate-lanceolate, acute or acuminate, with short spine and purple vein at apex, long-ciliate. Corolla 10–12 mm, blue or yellow. Involucel 5–6 mm in fruit, 8-angled, with 8 equal setae about ¼ as long as tube. $2n=18$. *S.E. Europe, extending westwards to Sicilia and S. France, and northwards to S. Czechoslovakia.* Al Bu Cz Ga Gr Hu It Ju Rm Rs (W, K, E) Si Tu [Au].

9. C. joppica (Sprengel) Béguinot in Fiori & Paol., *Fl. Anal. Ital.* **3**: 144 (1903). Annual up to 90 cm. Leaves 7–18 × 3–9 cm, lyrate, with oblong or oblong-ovate, dentate, crenate-dentate or serrate lobes, more or less pubescent; cauline leaves with linear lobes. Involucral bracts 2–3·5 × 1·5 mm, ovate or orbicular, obtuse, appressed-pubescent or puberulent. Receptacular scales 4·5–6 × 2–3 mm, spathulate, mucronate. Corolla *c.* 9 mm, white or pink. Involucel *c.* 4 mm in fruit, 8-angled, with 8 subequal setae ¼–½ as long as tube. *Roadsides. S. Italy, Sicilia.* It Si. (*S.W. Asia.*)

10. C. ambrosioides (Sibth. & Sm.) Roemer & Schultes, *Syst. Veg.* **3**: 45 (1818). Robust perennial herb up to 150 cm. Leaves 15–32(–40) × 5–11(–15) cm, pinnatisect or lyrate, with ovate-lanceolate or ovate, crenate-dentate or doubly dentate lobes, more or less pubescent or sericeous. Involucral bracts 4–9 × 3–4 mm, ovate-lanceolate, acute or obtuse. Receptacular scales 12–15 × 2·5–4 mm, lanceolate, acuminate, with short terminal spine. Corolla *c.* 12 mm, yellow. Involucel 8–10 mm in fruit, 8-angled, with 4 setae ¼–½ as long as tube and 4 very short intermediate teeth. *Rocky and bushy places.* ● *C. & N. Greece, S. Jugoslavia, S. Albania.* Al Gr Ju.

11. C. flava (Sibth. & Sm.) Szabó, *Magyar Bot. Lapok* **24**: 6 (1926). Perennial herb up to 90 cm, somewhat woody at base; stems pubescent, sericeous or glabrous. Leaves 7–16 × 2–5 cm, lyrate or pinnatisect, with ovate, elliptical or ovate-lanceolate, serrate-dentate lobes, more or less pubescent or sericeous. Involucral bracts 3–5 × 2–2·5 mm, ovate, obtuse. Receptacular scales 8–11 × 1·5–2·5 mm, oblong-lanceolate, acute or acuminate. Corolla *c.* 12 mm, yellow. Involucel 6–8 mm in fruit, 8-angled, with 4 teeth *c.* 1 mm and 4 shorter, intermediate teeth. ● *C. part of Balkan peninsula.* Bu Gr Ju.

C. setulifera Boiss. & Heldr. in Boiss., *Fl. Or.* **3**: 124 (1875), from E. Greece, which differs from **11** in its setose leaves and stems, lyrate leaves with small linear lateral lobes, and larger setae or teeth on the involucel, may be specifically distinct.

[1] By A. Hansen.

12. C. pastricensis Dörfler & Hayek, *Österr. Bot. Zeitschr.* **70**: 19 (1921). Robust perennial herb up to 200 cm. Leaves 18–30 × 8–15 cm, pinnatisect, glabrous or ciliate, with 4–7 pairs of lanceolate or oblong, serrate-dentate lobes, the upper lobes decurrent on the midrib. Involucral bracts 5–7 × 4–5 mm, ovate-lanceolate, acute or subacute, purplish-black at apex. Receptacular scales 6–8 × 3–4 mm, spathulate, acuminate, ciliate, glabrous or appressed-pubescent, purplish-black at apex. Corolla *c.* 14 mm, yellow. Involucel *c.* 8 mm in fruit, 8-angled, with 4 setae ¼ as long as tube and 4 shorter intermediate setae. *Mountain pastures.* ● *C. Jugoslavia, Albania.* Al Ju.

13. C. alpina (L.) Roemer & Schultes, *Syst. Veg.* **3**: 43 (1818). Robust perennial herb up to 200 cm. Leaves 15–42 × 8–18 cm, pinnate or lyrate, pubescent or villous on veins, with 3–8 pairs of oblong-lanceolate, serrate-dentate leaflets, the upper leaflets decurrent, the terminal leaflet often larger than the lateral. Involucral bracts 6–7 × 3·5–4 mm, triangular-lanceolate, acute, sericeous or villous. Receptacular scales 9–12 × 2–3 mm, oblong-spathulate, acuminate, sericeous or villous, with terminal spine. Corolla *c.* 12 mm, yellow. Involucel 9–12 mm in fruit, 8-angled, with 4 setae *c.* 1·5 mm and 4 intermediate setae *c.* 1 mm. ● *S.W. & C. Alps, Jura, N. Appennini.* Au Ga He It.

14. C. litvinovii Bobrov, *Bot. Žur.* **17**: 495 (1932). Robust perennial herb up to 200 cm; stems glabrous below, pubescent above. Leaves 15–50 × 8–20 cm, pinnatisect or lyrate, pubescent, with 4–6 pairs of lanceolate, serrate-dentate lobes, the upper lobes decurrent, the terminal lobe larger than the lateral. Involucral bracts *c.* 6 × 5 mm, ovate or ovate-lanceolate, acute or subacute, appressed-pubescent. Receptacular scales 8–10 × 3–4 mm, lanceolate or spathulate, long-acuminate, appressed-pubescent, ciliate. Corolla 15–18 mm, yellow. Involucel *c.* 9 mm in fruit, 8-angled, with 4 setae *c.* 1 mm and 4 slightly shorter intermediate setae. *In ravines, among scrub.* ● *S.C. Russia (very local).* Rs (C, ?E).

Doubtfully distinct from the Caucasian **C. gigantea** (Ledeb.) Bobrov, *op. cit.* 490 (1932) (*C. tatarica* auct., non Roemer & Schultes), which is sometimes cultivated for ornament and occasionally escapes.

3. Dipsacus L.[1]

Stout, biennial herbs, with prickly stems more or less branched above. Leaves opposite, often connate. Capitulum globose to subglobose, ovoid or cylindrical. Involucral bracts in 1–2 rows, linear or lanceolate, erect to patent, with apical spine. Receptacular scales more or less spine-tipped. Involucel more or less 4-angled, united with the ovary below and ending in a short, more or less 4-lobed cup. Calyx cupuliform, ciliate, persistent in fruit. Corolla with a long tube, unequally 4-fid. Achenes 4-angled, appressed-hairy.

1 Cauline leaves shortly petiolate; capitula globose; involucral bracts and receptacular scales similar
2 Capitula 1·5–2 cm: receptacular scales 10–12 mm **7. pilosus**
2 Capitula 1·5–2 cm; receptacular scales 10–12 mm **7. pilosus**
2 Capitula 2·5–4 cm; receptacular scales 15–20 mm **8. strigosus**
1 Cauline leaves sessile; capitula subglobose to ovoid or cylindrical; involucral bracts and receptacular scales dissimilar
3 Upper cauline leaves free at base **1. gmelinii**
3 Upper cauline leaves connate at base
4 Receptacular scales equalling florets, with recurved, rigid apical spine **2. sativus**
4 At least the lower receptacular scales exceeding florets, with straight or slightly recurved, flexible apical spine
5 Capitula subglobose to ovoid; involucral bracts ± patent or recurved **6. ferox**
5 Capitula ovoid-cylindrical; involucral bracts curved upwards
6 Cauline leaves crenate-serrate to entire; involucral bracts linear **3. fullonum**
6 Cauline leaves laciniate or pinnatifid; involucral bracts lanceolate-subulate
7 Involucral bracts shorter than florets; receptacular scales ciliate but otherwise glabrous **4. laciniatus**
7 Involucral bracts much longer than florets; receptacular scales densely arachnoid-hairy and ciliate **5. comosus**

1. D. gmelinii Bieb., *Fl. Taur.-Cauc.* **1**: 92 (1808). Stems 50–150 cm, densely covered with slender prickles. Basal leaves in a rosette, ovate-spathulate, narrowed to a long petiole, crenate-serrate; cauline leaves ovate-lanceolate, sessile, free at base, the lower deeply serrate-laciniate, the upper laciniate, with ascending, linear-lanceolate, acuminate segments. Capitula subglobose. Involucral bracts few, linear-lanceolate, spinose-ciliate, with apical spine curved upwards; receptacular scales linear-lanceolate, spinose-ciliate, exceeding florets. Corolla bluish. Achenes *c.* 4 mm, light brown. *Damp lake-shores and river-banks. S.E. Russia, S.E. Ukraine; one station in S.E. Romania.* Rm Rs (W, E). (*W.C. Asia.*)

2. D. sativus (L.) Honckeny, *Vollst. Syst. Verz.* **1**: 374 (1782) (*D. fullonum* sensu Miller, non L.). Stems 50–200 cm, stout, erect, prickly on the angles. Basal leaves in a rosette, oblong-elliptical or oblanceolate, entire; cauline leaves sessile, linear-lanceolate, distantly crenate-dentate, connate at base. Capitula 3–9 cm, ovoid. Involucral bracts lanceolate-subulate, unequal, more or less patent. Receptacular scales spinose-ciliate, with a rigid, recurved apical spine, equalling florets. Corolla pinkish-purple. Achenes 3–4 mm, light brown, sulcate. $2n=18$. *Cultivated, formerly widely and still locally, for the dried inflorescences used in preparing cloth; naturalized in parts of S., W. & C. Europe.* [Br Bu Cz Ga Ge Hs It Ju Lu Rm Rs (K).] (*Origin uncertain; probably derived from* **6.**)

3. D. fullonum L., *Sp. Pl.* 97 (1753) (*D. sylvestris* Hudson). Like **2** but cauline leaves crenate-serrate to entire; capitula ovoid-cylindrical; involucral bracts curved upwards, linear, unequal, the longest equalling or exceeding florets. $2n=18$. *Woods, stream-sides and waste places. S., W. & C. Europe, extending to N.E. Ukraine.* Al Au Be Bl Br Bu Co Cz Ga Ge Gr Hb He Ho Hs Hu It Ju Lu Po Rm Rs (C, W, K, E) Sa Si Tu [Da].

4. D. laciniatus L., *Sp. Pl.* 97 (1753). Like **2** but stems covered with slender prickles; cauline leaves pinnatifid with patent, obtuse lobes; capitula ovoid-cylindrical; involucral bracts lanceolate-subulate, unequal, curved upwards, not exceeding florets; receptacular scales with long, straight apical spine, exceeding florets; corolla pale pink; achenes *c.* 5 mm, blackish-brown. $2n=16$, 18. *Meadows, stream-sides and waste places. Europe northwards to C. France, N. Germany and N. Ukraine.* Al Au Bu Cz Ga Ge Gr He ?Hs Hu It Ju Po Rm Rs (W, K, E) Tu.

5. D. comosus Hoffmanns. & Link, *Fl. Port.* **2**: 81 (1820). Stems 30–270 cm, stout, erect, prickly on the angles. Basal leaves in a rosette, sessile, sinuate; cauline leaves sessile, pinnatipartite, the upper linear, entire, connate at base, prickly beneath. Capitula 4–6 cm, ovoid-cylindrical. Involucral bracts lanceolate-subulate, with apical spine, distantly prickly on margins and midrib beneath, somewhat curved upwards, much exceeding florets. Outer receptacular scales lanceolate, densely arachnoid-hairy and ciliate, with long, slightly curved, flexible apical spine, equalling florets; inner sometimes like the involucral bracts. Corolla pinkish. Achenes 4–5 mm, blackish-brown, sulcate. *Dry, stony places. S. half of Iberian peninsula.* Hs Lu.

6. D. ferox Loisel., *Fl. Gall.* 719 (1807) (incl. *D. bulgaricus* Hayek). Stems 20–60 cm, densely covered with stout prickles. Basal leaves oblong-lanceolate, crenate-sinuate; cauline leaves sessile, pinnatifid, the upper sometimes entire, with prickles above and beneath, connate at base. Capitula 3–4 cm, subglobose to ovoid. Involucral bracts linear-lanceolate, spiny, more or less patent or recurved. Outer receptacular scales shortly acuminate, exceeding florets, the inner like the involucral bracts, more or less patent. Corolla pale purplish. Achenes *c.* 4 mm, blackish-brown, sulcate. *Wet, stony places. Corse and Sardegna; a few stations in C. Italy.* Co It Sa [Bu].

7. D. pilosus L., *Sp. Pl.* 97 (1753) (*Cephalaria pilosa* (L.) Gren.). Stems 30–120 cm, erect, sparsely prickly. Basal leaves in a rosette, ovate, narrowed to a long petiole; cauline leaves shortly petiolate, ovate-elliptical, with a basal pair of unequal, elliptical leaflets, or sometimes simple. Capitula 1·5–2 cm, globose. Involucral bracts narrowly triangular, with apical spine, white-hispid, the receptacular scales 10–12 mm, similar. Corolla whitish. Achenes 4–5 mm, brown. $2n=18$. *Damp or shady places. W. & C. Europe, extending to Denmark, C. Italy, and locally eastwards to S.E. Russia.* Au Be Br Bu Cz Da Ga Ge He Ho Hs Hu It Ju Po Rm Rs (C, W, K, E).

8. D. strigosus Willd. in Roemer & Schultes, *Syst. Veg.* **3**: 520 (1818). Like **7** but generally larger in all its parts; stems up to 200 cm; capitula 2·5–4 cm; involucral bracts and receptacular scales less hairy, the latter 15–20 mm; corolla pale yellow; achenes 4–4·5 mm, greyish-brown, with black streaks. *S. Russia and Ukraine; introduced and more or less naturalized elsewhere in Europe.* Rs (C, W, K, E) [Br Cz Da Po Su].

4. Succisa Haller[1]

Perennial herbs. Capitula hemispherical, long-pedunculate. Involucel 4-angled. Calyx shallowly cupuliform, with (4–)5 persistent setae. Marginal and central florets subequal. Corolla-lobes subequal.

Literature: L. Baksay, *Ann. Hist.-Nat. Mus. Hung.* nov. ser., **2**: 237–259 (1952).

Basal and middle cauline leaves entire, or rarely slightly dentate **1. pratensis**
Basal leaves crenate-serrate, the middle cauline lobed **2. pinnatifida**

1. S. pratensis Moench, *Meth.* 489 (1794) (*Scabiosa succisa* L.). Glabrous to pubescent, with ascending to erect stems up to 100 cm. Basal leaves 5–30 cm, narrowly obovate to narrowly elliptical, entire or rarely slightly dentate. Capitula gynodioecious, the hermaphrodite up to 3 cm in diameter, terminal, the female smaller. Corolla 4–7 mm, lilac to dark violet-blue, rarely white or pinkish. Fruit *c.* 5 mm. $2n=20$. *Most of Europe except for the extreme north and parts of the Mediterranean region.* All except Az Bl Co Cr Rs (K) Sa Sb Si Tu.

2. S. pinnatifida Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1861**: 63 (1861). Like **1** but covered with rather long, appressed hairs; stems not more than 60 cm, rather rigid; basal leaves crenate-serrate; capitula *c.* 1·5 cm in diameter. *Heaths and rocky places.* ● *N.W. Spain, N. Portugal.* Hs Lu.

[1] By J. F. M. Cannon.

5. Succisella G. Beck[1]

Like *Succisa* but involucel urceolate; calyx 4-lobed, without setae.

Literature: L. Baksay, *Ann. Hist.-Nat. Mus. Hung.* nov. ser., **6**: 167–176 (1955).

Species **2–4** are very poorly known and their status must remain in doubt until more material is available for investigation.

1 Stems glabrous below (sometimes hairy at the nodes) **1. inflexa**
1 Stems hairy below
2 Cauline leaves distantly serrate-dentate **3. carvalhoana**
2 Cauline leaves entire or rarely distantly dentate
3 Peduncles hairy **2. petteri**
3 Peduncles glabrous or very sparsely hairy **4. microcephala**

1. S. inflexa (Kluk) G. Beck, *Fl. Nieder-Österr.* **2(2)**: 1145 (1893) (*Succisa australis* (Wulfen) Reichenb.). Subglabrous; stems (30–)60–80(–130) cm, ascending, glabrous below or sometimes hairy at the nodes. Basal leaves obovate, sometimes absent. Cauline leaves 6–20 cm, lanceolate, obtuse, subentire, sometimes slightly undulate, rarely distantly dentate, long-decurrent on petiole. Inflorescence branched; capitula 1–1·5 cm in diameter, hemispherical. Corolla pale lilac-blue. Receptacular scales shorter than the fruit. Involucel *c.* 4 mm, glabrous. $2n=20$. *Wet places.* ● *From N. Italy eastwards to White Russia and W. Romania; probably naturalized further west.* Al Au Cz Hu It Ju Po Rm Rs (C, W) [*Ga *Ge].

2. S. petteri (J. Kerner & Murb.) G. Beck, *loc. cit.* (1893). Like **1** but stems not more than 60 cm, more slender, pubescent below; all leaves linear-lanceolate to linear, entire or sometimes distantly dentate; peduncles hairy; capitula *c.* 1 cm in diameter; involucel puberulent on the ribs. *Meadows.* ● *S.W. Jugoslavia, just extending to N. Albania.* Al Ju.

3. S. carvalhoana (Mariz) Baksay, *Ann. Hist.-Nat. Mus. Hung.* nov. ser., **6**: 174 (1955). Like **1** but stems densely hairy below; cauline leaves linear or linear-lanceolate, distantly serrate-dentate, with scattered long hairs on the veins; involucel sparsely hairy on the ribs. *Wet places.* ● *W.C. Portugal (Porto to Coimbra).* Lu.

4. S. microcephala (Willk.) G. Beck, *Fl. Nieder-Österr.* **2(2)**: 1145 (1893) (*Succisa microcephala* Willk.). Like **1** but more slender; stems not more than 20 cm, subglabrous above, densely hispid below; basal leaves densely hispid; cauline leaves entire; inflorescence not or slightly branched; peduncles glabrous or very sparsely hairy; involucel with crispate hairs on the ribs. *Dry, sandy pastures.* ● *W.C. Spain.* Hs.

6. Knautia L.[2]

Annual to perennial. herbs Leaves opposite, undivided to pinnate. Capitula long-pedunculate, hemispherical to cylindrical, hermaphrodite or female. Involucral bracts numerous, herbaceous, free. Receptacle hemispherical, hairy, without scales. Involucel compressed, 4-angled, inconspicuous, entire to dentate in fruit. Calyx patelliform to cupuliform, with (6–)8–16(–24) minute apical awns or teeth, deciduous. Corolla-tube short; limb unequally 4-lobed, patent and often larger in marginal florets. Fruit ovoid, oblong or cylindrical, more or less hairy, with soft elaiosome at base.

[1] By J. F. M. Cannon. [2] By F. Ehrendorfer.

The perennial and biennial species (**1–44**) belong to Sect. *Trichera* and form an extremely polymorphic group of diploids, tetraploids and hexaploids ($x=10$). Hybridization is frequent and has given rise to many intermediate populations, as well as more or less autonomous races; taxonomic boundaries are, therefore, often obscured. It would be possible, for convenience, to assemble all these taxa into one species-group, but **8–15, 18–22, 23–24, 28–37, 38–41** and **42–43** form particularly closely inter-related subgroups.

The structure of the monopodial or sympodial stock and the colour of the corolla are diagnostic, and should be noted in the field. Several plants from each population should be examined, because of variation in the division of the leaves, hairiness, and presence or absence of glandular hairs on the peduncles. A double indumentum is sometimes present on stems or leaves, consisting of both pubescence and another kind of hairs.

Literature: Z. Szabó, *Math. Term. Közl.* **31**: 1–436 (1911); *Bot. Közl.* **31**: 115–141 (1934). F. Ehrendorfer, *Österr. Bot. Zeitschr.* **109**: 276–343 (1962). S. Breton-Sintes, *Étude Biosystématique du Genre* Knautia *(L.) Coult. en Auvergne*, Thèse Sér. E, no. 146, Univ. Clermont-Ferrand. 1971.

1 Annual, with a slender root
2 Calyx patelliform, 8- to 10-awned; involucral bracts with rigid cilia, eglandular **45. byzantina**
2 Calyx cupuliform, 12- to 24-dentate, the teeth rarely awned; involucral bracts ciliate-hirsute or shortly setose
3 Capitula with 20–40 florets; involucre patelliform, the bracts with inconspicuous veins; peduncles usually eglandular **46. integrifolia**
3 Capitula with 5–15 florets; involucre cyathiform to cylindrical, the bracts with prominent veins; peduncles glandular
4 Involucre cyathiform; capitula with 10–15 florets; corolla lilac to violet, the tube of the marginal florets usually 5–6 mm **47. degenii**
4 Involucre cylindrical; capitula with 5–10 florets; corolla purplish-red, the tube of the marginal florets usually 7–12 mm **48. orientalis**
1 Perennial or biennial with a monopodial or sympodial stock, or a taproot
5 Plant usually with a terminal, central, persistent leaf-rosette; flowering stems developed laterally from axils of previous season's rosette-leaves; stock usually monopodial; leaves always undivided
6 Lower cauline leaves subcoriaceous, glabrous, ±ciliate **4. sarajevensis**
6 Lower cauline leaves membranous, usually hairy
7 Lower cauline leaves narrowly elliptical to suborbicular, acute; base of stems usually with soft hairs **1. drymeia**
7 Lower cauline leaves narrowly elliptical to lanceolate, acuminate; base of stems glabrous or with ±rigid hairs
8 Stems glabrous below; upper internodes with soft hairs not more than 1 mm; stock monopodial **2. gussonei**
8 Stems with ±rigid hairs often more than 1 mm; stock sometimes sympodial **3. arvernensis**
5 Plant without a terminal, central, persistent leaf-rosette, sometimes with lateral leaf-rosettes; flowering stems developed terminally; stock sympodial or plant with a taproot; leaves sometimes pinnate.
9 Biennial with a thick taproot; cauline leaves subamplexicaul; flowers whitish **44. tatarica**
9 Perennial and with a sympodial stock, rarely biennial; leaves not subamplexicaul; flowers not whitish
10 Basal rosette-leaves ±pubescent and hispid with yellowish setae
11 Peduncles eglandular; corolla bluish-lilac **8. basaltica**
11 Peduncles glandular; corolla purple
12 Perennial not more than 80 cm; cauline leaves broadly or narrowly lanceolate, undivided or sublyrate with 1–4 lateral lobes **16. dinarica**

12 Biennial or short-lived perennial up to 150 cm; cauline leaves ovate-lanceolate, undivided or pinnate with up to 8 lateral lobes **17. lucana**
10 Basal rosette-leaves not pubescent and without yellowish setae
13 All cauline leaves undivided (and uniformly so in all plants of a population), usually widest at or below the middle
14 Lower internodes with numerous hairs more than 1 mm (often also with shorter hairs)
15 Leaves green
16 Stem with soft hairs **7. nevadensis**
16 Stem hispid, at least below
17 Upper cauline leaves attenuate or rounded towards the base; calyx 8- to 16-awned **3. arvernensis**
17 Upper cauline leaves cuneate, subauriculate or cordate-amplexicaul; calyx usually 8-awned **5. dipsacifolia**
15 Leaves ±greyish-white, especially beneath
18 Lower internodes densely long-villous, sometimes also sparsely pubescent; leaves ±entire **15. magnifica**
18 Lower internodes short-villous or tomentose, and densely pubescent
19 Leaves narrowly lanceolate, entire to subserrate, appressed-hirsute above **19. baldensis**
19 Leaves ovate to broadly lanceolate, crenate-serrate, sparsely pubescent above
20 Upper cauline leaves subcordate at base; peduncles usually glandular **18. subcanescens**
20 Upper cauline leaves cuneate to rounded at base; peduncles usually eglandular **24. norica**
14 Lower internodes glabrous, or (rarely) with hairs less than 1 mm
21 Lower cauline leaves ±hispid, mostly ±dentate, usually less than 5 times as long as wide
22 Fruit 5–6 × 2–2·5 mm, oblong-ovoid; lower internodes usually hispid **5. dipsacifolia**
22 Fruit *c.* 4–5 × 1·5–2 mm, cylindrical; lower internodes glabrous **6. ressmannii**
21 Lower cauline leaves glabrous or subglabrous, often subentire, usually more than 5 times as long as wide
23 Peduncles glandular
24 Upper cauline leaves broadly cuneate to rounded at base; lower cauline leaves usually 6–9 times as long as wide; calyx usually 8-awned **12. longifolia**
24 Upper cauline leaves often cordate and amplexicaul at base; lower cauline leaves usually 4–6 times as long as wide; calyx usually 8- to 12-awned **14. midzorensis**
23 Peduncles eglandular
25 Capitula 2–2·5 cm in diameter, 5–9 on each stem **13. pancicii**
25 Capitula 2·5–5 cm in diameter, fewer than 5 on each stem
26 Corolla pink **11. salvadoris**
26 Corolla bluish-lilac or -violet
27 Lower cauline leaves linear-lanceolate, 6–10 times as long as wide; upper cauline leaves with narrowly cuneate base **10. godetii**
27 Lower cauline leaves elliptic-lanceolate, 4½–7 times as long as wide
28 Middle cauline leaves broadly cuneate to rounded at base **9. foreziensis**
28 Middle cauline leaves ±amplexicaul and subcordate at base **8. basaltica**
13 Upper cauline leaves lyrate or pinnate (at least in some plants of each population); undivided leaves usually widest at or above the middle
29 Leaves ±greyish-tomentose, or rarely densely hirsute beneath; terminal lobe of divided cauline leaves usually as long as the divided part
30 Peduncles usually eglandular
31 Upper cauline leaves narrowly lanceolate, usually sublyrate with 1–4 lateral lobes **25. albanica**
31 Upper cauline leaves broadly lanceolate, usually lyrate-pinnate with (2–)4–12 lateral lobes
32 Corolla pale yellow **30. kitaibelii**
32 Corolla pink, red, violet or lilac
33 Leaves densely hirsute; upper cauline leaves narrow at base **26. velebitica**
33 Leaves tomentose-villous; upper cauline leaves broadly cuneate to subcordate at base
34 Corolla bright red; upper cauline leaves often subcordate at base **22. persicina**
34 Corolla pale lilac to violet; upper cauline leaves broadly cuneate to rounded at base
35 Lower leaves lanceolate-acuminate; corolla pale lilac **23. carinthiaca**
35 Lower leaves oblong-ovate; corolla violet **24. × norica**
30 Peduncles usually glandular
36 Corolla, at least in some plants of each population, pale yellow
37 Robust; capitula usually 3–4 cm in diameter **30. kitaibelii**
37 Slender; capitula usually 2–3 cm in diameter **31. ambigua**
36 Corolla purple, violet or lilac
38 Cauline leaves usually with 4–10 lateral lobes and a terminal lobe usually shorter than the divided part
39 Terminal lobe of cauline leaves ovate-lanceolate; corolla reddish-purple **27. mollis**
39 Terminal lobe of cauline leaves narrowly lanceolate; corolla purplish-violet **28. calycina**
38 Cauline leaves usually with 2–6 lateral lobes and a terminal lobe usually about as long as the divided part
40 Basal leaf-rosettes usually absent at anthesis **24. × norica**
40 Basal leaf-rosettes present at anthesis
41 Leaves densely velutinous with rather short hairs above; capitula mostly 2–3 cm in diameter; corolla purple **20. velutina**
41 Leaves sparsely velutinous with long hairs above; capitula mostly 3–4 cm in diameter; corolla pinkish-lilac **21. transalpina**
29 Leaves green, hirsute or pubescent beneath; terminal lobe of divided cauline leaves usually shorter than the divided part
42 Calyx (7–)9- to 18-awned or -dentate; divided lower cauline leaves with lanceolate terminal lobe scarcely longer than lateral lobes; rosette-leaves divided
43 Peduncles eglandular
44 Leaves uniformly pubescent, the lateral lobes usually 3·2–5 mm wide **38. pectinata**
44 Leaves pubescent on margin and veins, hirsute or subglabrous elsewhere, the lateral lobes usually 2–3·5 mm wide **39. clementii**
43 Peduncles glandular
45 Lateral leaf-lobes linear-lanceolate, usually 2–3·5 mm wide **40. adriatica**
45 Lateral leaf-lobes linear, 0·5–1·5 mm wide **41. dalmatica**
42 Calyx (6–)8- to 10-awned; divided lower cauline leaves with ovate, ovate-lanceolate or rhombic terminal lobe usually ±longer than lateral lobes; rosette-leaves usually ±longer than lateral lobes; rosette-leaves usually undivided
46 Leaves subcoriaceous, sparsely setose or glabrescent, shiny; peduncles usually eglandular
47 Stem hispid or subglabrous; lower leaves ovate-lanceolate; calyx up to 11(–15)-awned **42. travnicensis**
47 Stem usually subglabrous; lower leaves narrowly lanceolate; calyx 8-awned **43. fleischmannii**
46 Leaves membranous and ±densely hirsute, if ±subcoriaceous and glabrescent then peduncles glandular
48 Corolla, at least in some plants of each population, dark red, pale pink or pale yellow

49 Corolla, at least in some plants of each population, dark red; flowering stems usually without green basal leaves at anthesis, and with evenly distributed cauline leaves **32. macedonica**
49 Corolla pale yellow or pale pink; flowering stems usually with green basal leaves at anthesis, and with cauline leaves confined to the lower half of stem
50 Robust; corolla usually pale yellow; capitula usually 3–4 cm in diameter **30. kitaibelii**
50 Slender; corolla pale yellow or pale pink; capitula usually 2–3 cm in diameter **31. ambigua**
48 Corolla in all plants of a population bluish-violet, lilac or purple
51 Leaves finely papillose, nearly glabrous, subcoriacous; densely caespitose chasmophyte **35. rupicola**
51 Leaves hirsute, pubescent or glabrescent, not papillose, usually membranous; not caespitose
52 Corolla predominantly bluish-violet to lilac; underground stolons usually present **29. arvensis**
52 Corolla predominantly purple; underground stolons absent
53 Usually biennial; capitula often 1·8–2·5 cm in diameter **33. visianii**
53 Usually perennial; capitula usually more than 2·5 cm in diameter
54 Upper cauline leaves usually with 4–6 lateral lobes and a cuspidate terminal lobe about as long as the divided part **37. illyrica**
54 Upper cauline leaves usually with more than 6 lateral lobes and a non-cuspidate terminal lobe shorter than the divided part
55 Terminal lobe of upper cauline leaves lanceolate-rhombic; stem usually more than 20 cm, finely hirsute **34. purpurea**
55 Terminal lobe of upper cauline leaves ovate-suborbicular; stems usually not more than 20 cm, coarsely hirsute **36. subscaposa**

1. K. drymeia Heuffel, *Flora* (*Regensb.*) **39**: 53 (1856) (*Scabiosa sylvatica* L.). Perennial; stock usually monopodial, with terminal leaf-rosette and lateral flowering stems. Stem 30–100 cm, the base with soft greyish hairs or sometimes rigid yellowish setae, rarely subglabrous; peduncles glandular or eglandular. Leaves membranous, rather evenly distributed along the stem, undivided, crenate-serrate; lower cauline lanceolate to suborbicular, acute, petiolate; upper cauline more or less cordate, subacuminate, sessile. Capitula 1·5–3(–4) cm in diameter. Calyx patelliform, 8- to 16-awned. Corolla purple to pink. *Wood-margins.* ● *C. & S.E. Europe, N. Italy.* Al Au Bu Cz Ge Gr He Hu It Ju Rm.

Hybrids are common between tetraploids of **1(d)** and **29** (*K.* × *ramosissima* Szabó) and often form extensive swarms, even in the absence of the parents. Furthermore, **1**(e) is connected through **24** to **23.**

1 Rosette-leaves (and usually base of stem) with rigid, yellowish setae; cauline leaves oblong to elliptic-lanceolate; stems usually less than 50 cm, sparingly branched
(e) subsp. **intermedia**
1 Rosette-leaves and stems with soft, short, white or greyish hairs; cauline leaves usually suborbicular to ovate; stems more than 50 cm, usually with many branches
2 Stems densely hairy; cauline leaves bright green above, greyish-pubescent to subvillous beneath
3 Cauline leaves broadly ovate, deeply crenate-serrate
(a) subsp. **nympharum**
3 Cauline leaves ovate-lanceolate, crenate-serrate
(c) subsp. **centrifrons**
2 Stems sparsely hairy; cauline leaves dark green above, subpubescent to glabrous beneath
4 Cauline leaves ovate to ovate-lanceolate, crenate-serrate
(d) subsp. **drymeia**
4 Cauline leaves broadly ovate to suborbicular, deeply crenate-serrate
(b) subsp. **tergestina**

(a) Subsp. **nympharum** (Boiss. & Heldr.) Ehrend., *Bot. Jour. Linn. Soc.* **71**: 40 (1975) (*K. nympharum* Boiss. & Heldr.): Stems more than 50 cm, usually with many branches. Peduncles often glandular. Rosette-leaves and stems with dense, soft, short, white or greyish hairs. Cauline leaves broadly ovate, deeply crenate-serrate, bright green above, greyish-pubescent to subvillous beneath. $2n=20$. *Balkan peninsula, from Crna Gora to N. Greece.*

(b) Subsp. **tergestina** (G. Beck) Ehrend., *Österr. Bot. Zeitschr.* **122**: 263 (1973) (*K. sylvatica* var. *tergestina* G. Beck): Like subsp. (a) but rosette-leaves and stems with sparse hairs; cauline leaves broadly ovate to suborbicular, dark green above, subpubescent to glabrous beneath. $2n=20$. *Slovenija, just extending into N.E. Italy.*

(c) Subsp. **centrifrons** (Borbás) Ehrend., *loc. cit.* (1973) (*K. centrifrons* Borbás): Like subsp. (a) but cauline leaves ovate-lanceolate, crenate-serrate. $2n=20$. *N. Italy, S. Switzerland.*

(d) Subsp. **drymeia** (*K. pannonica* (Jacq.) Wettst., non Heuffel): Like subsp. (a) but rosette-leaves and stems with sparse hairs; cauline leaves ovate to ovate-lanceolate, crenate-serrate, dark green above, subpubescent to glabrous beneath. $2n=40$ (38, 42–44). *From S.E. Germany to Macedonia.*

(e) Subsp. **intermedia** (Pernh. & Wettst.) Ehrend., *Österr. Bot. Zeitschr.* **122**: 263 (1973) (*K. intermedia* Pernh. & Wettst., ?*K. dinarica* var. *croatica* Szabó, *K. croatica* (Szabó) Degen): Stems usually less than 50 cm, sparingly branched. Peduncles usually eglandular. Rosette-leaves (and usually base of stem) with rigid, yellowish setae. Cauline leaves oblong to elliptic-lanceolate, green, crenate-serrate. $2n=20$, 40. *E. Alps, N. Appennini.*

Local variants of subsp. (e) without a terminal leaf-rosette (e.g. in S.E. Alps), but otherwise not showing evidence of hybridity, sometimes make separation from **5** and **16** difficult.

2. K. gussonei Szabó, *Bot. Közl.* **31**: 136 (1934). Like **1**(e) but lower internodes glabrous; upper internodes with greyish hairs not more than 1 mm; leaves serrate, acuminate, petiolate, the rosette-leaves softly pubescent, the cauline ovate-lanceolate, acuminate-cuspidate, glabrescent, ciliate; calyx 8- to 10-awned. ● *C. Appennini.* It.

Known only from the type-locality, and close to **1**(e).

3. K. arvernensis (Briq.) Szabó, *op. cit.* 132 (1934) (*K. lacaitae* Szabó, ?*K. ovatifolia* (Lag.) G. Don, ?*K. legionensis* (Lag.) DC. pro parte). Like **1**(c) but stock sometimes sympodial and with central leaf-rosette developing into a flowering stem; stem hispid below with rigid hairs more than 1 mm, rarely glabrous; leaves elliptical to narrowly lanceolate, crenate-serrate to subentire, sparsely hairy, the rosette-leaves without rigid, yellowish setae, the lower cauline long-acuminate, the upper cauline attenuate or [illegible] rounded at base; capitula 3–5 cm in diameter; corolla purplish-violet to lilac. $2n=40$. *Wood-margins and mountain meadows; somewhat calcifuge.* ● *From S.C. France to C. Spain.* Ga Hs ?Lu.

Variable, especially in leaf-shape, and difficult to separate from **9** and tetraploid variants of **5**, especially in the Massif Central of France. Hybrid swarms with **29** are common.

4. K. sarajevensis (G. Beck) Szabó, *Bot. Jahrb.* **36**: 439 (1905). Like **1** but stem glabrous (rarely somewhat hispid) below; peduncles eglandular; leaves subcoriaceous, entire or subserrate, the rosette-leaves broadly lanceolate, acuminate, hispid with whitish hairs, rarely glabrescent, the cauline glabrous, ciliate, the lower cauline elliptical, the upper cauline lanceolate; capitula 3–4 cm in diameter; calyx 10- to 16-awned; corolla purplish. $2n=40$. *Wood-margins and meadows.* ● *Mountains of Bosna.* Ju.

5. K. dipsacifolia Kreutzer, *Anthochron. Pl. Eur. Med.* 223 (1840) (*Scabiosa dipsacifolia* Schrank, *Knautia sylvatica* (L.) Duby, nom. ambig.). Perennial; stock sympodial, with terminal and lateral buds developing into flowering stems (or leaf-rosettes). Stem 40–150 cm, usually hispid, the lower and middle internodes sometimes glabrous; peduncles glandular or eglandular. Leaves membranous to subcoriaceous, green, undivided, oblong-lanceolate or ovate-elliptical to narrowly lanceolate, more or less acuminate; upper cauline subdentate to serrate, cuneate, rounded, subauriculate or cordate-amplexicaul at base; lower cauline subdenticulate to serrate, hispid, subsetose (sometimes glabrescent), petiolate. Capitula 2·5–4 cm in diameter. Calyx patelliform, usually 8-awned. Fruit 5–6 × 2–2·5 mm, oblong-ovoid. *Wood-margins and tall-herb communities.* ● *Mountains of C. Europe, extending to E. Belgium and S.C. France.* Au Be Cz Ga Ge He Hu It Ju Po Rm Rs (W).

The tetraploid subspecies hybridize extensively with **29** at zones of contact. The taxonomic separation from related, geographically adjacent or sympatric polyploid species (e.g. **3, 6, 9, 18, 19**) is often difficult.

1 Corolla pinkish-purple
2 Upper cauline leaves distinctly cordate-amplexicaul, usually subdentate
(a) subsp. **lancifolia**
2 Upper cauline leaves dilated or subauriculate at base, usually dentate
3 Upper cauline leaves broadly cuneate or rounded at base, usually dentate
(b) subsp. **pocutica**
3 Upper cauline leaves mostly subauriculate at base, usually deeply serrate-dentate
(c) subsp. **turocensis**
1 Corolla predominantly bluish-violet to lilac
4 Leaves narrowly lanceolate, entire to subdentate; leaves and lower and middle internodes usually glabrescent
(e) subsp. **sixtina**
4 Leaves oblong-lanceolate to ovate-elliptical, dentate; at least the lower internodes setose
5 Peduncles eglandular; upper cauline leaves usually attenuate at base; middle internodes usually glabrescent; plants slender
(d) subsp. **gracilis**
5 Peduncles often glandular; upper cauline leaves broadly rounded, auriculate at base; middle internodes setose; plants robust
(f) subsp. **dipsacifolia**

(a) Subsp. **lancifolia** (Heuffel) Ehrend., *Bot. Jour. Linn. Soc.* **71**: 40 (1975) (*K. sylvatica* var. *lancifolia* Heuffel): Middle internodes usually glabrescent. Peduncles eglandular. Upper cauline leaves with more or less convex margin, usually subdentate, distinctly cordate-amplexicaul. Corolla pinkish-purple. *W. & C. Romania to E. Jugoslavia.*

(b) Subsp. **pocutica** (Szabó) Ehrend., *loc. cit.* (1975) (*K. sylvatica* var. *pocutica* Szabó): Middle internodes usually subsetose. Peduncles glandular or eglandular. Upper cauline leaves with convex margin, usually dentate, broadly cuneate or rounded at base. Corolla pinkish-purple. $2n=40$. *W. & E. Carpathians.*

(c) Subsp. **turocensis** (Borbás) Jáv. ex Kiss, *Tisia* **3**: 253 (1939) (*K. sylvatica* var. *turocensis* Borbás): Middle internodes glabrous or setose. Peduncles glandular or eglandular. Upper cauline leaves with more or less concave margin, usually deeply serrate-dentate, usually subauriculate at base. Corolla pinkish-purple. $2n=40$. *W. Carpathians, mountains of N. Hungary.*

(d) Subsp. **gracilis** (Szabó) Ehrend., *Österr. Bot. Zeitschr.* **122**: 264 (1973) (*K. gracilis* Szabó): Usually slender. Middle internodes often glabrescent. Peduncles usually eglandular. Upper cauline leaves dentate, usually attenuate at base. Corolla predominantly bluish-violet to lilac. $2n=40$. *From C. Germany to S.C. France.*

(e) Subsp. **sixtina** (Briq.) Ehrend., *op. cit.* 265 (1973) (*K. sixtina* Briq.): Middle internodes often glabrescent. Peduncles usually glandular. Upper cauline leaves narrowly lanceolate, entire to subdentate. Corolla predominantly bluish-violet to lilac. $2n=60$. *S.W. Alps* (S. of Lac Léman).

(f) Subsp. **dipsacifolia** (*K. sendtneri* Brügger): Usually robust. Middle internodes with purplish-based setae. Peduncles often glandular. Upper cauline leaves broadly rounded, auriculate at base. Corolla predominantly bluish-violet to lilac. $2n=60$. *Mountains of W.C. Europe, extending to W. Hungary and E. France.*

6. K. ressmannii (Pacher) Briq., *Annu. Cons. Jard. Bot. Genève* **6**: 130 (1902). Like **5(f)** but lower internodes glabrous; upper internodes subpuberulent and with intermixed long hairs, glabrescent; peduncles eglandular or subglandular; leaves subcoriaceous, shining, subentire to serrate, subglabrous, the basal elliptic-lanceolate, the cauline narrowly lanceolate, all amplexicaul; corolla purple; fruit 4–5 × 1·5–2 mm, cylindrical. $2n=60$. *Coniferous woods and grassy slopes.* ● *S.E. Alps.* It Ju.

7. K. nevadensis (M. Winkler ex Szabó) Szabó, *Math. Term. Közl.* **31**: 326 (1911). Perennial; stock sympodial, without leaf-rosettes at anthesis. Stem 35–60 cm, with short and long, soft hairs; peduncles eglandular. Leaves membranous, green, narrowly lanceolate, attenuate-acuminate, undivided, crenate to deeply serrate; upper ovate to subcordate, glabrescent above, softly hirsute beneath, ciliate. Capitula 3–4 cm in diameter. Calyx 8-awned. Corolla lilac. $2n=64$. *Mountain scrub.* ● *S. Spain; N.W. Portugal.* Hs Lu.

8. K. basaltica Chassagne & Szabó, *Bot. Közl.* **31**: 129 (1934). Perennial; stock sympodial, with terminal flowering stems and lateral leaf-rosettes. Stem 45–75 cm, with fewer than 5 capitula; lower internodes short, glabrous, shining; upper internodes hirsute; peduncles eglandular. Leaves subcoriaceous, somewhat shining, brown when dry, elliptic-lanceolate, dentate, cuspidate, undivided, glabrous except for some yellowish setae on basal rosette-leaves and ciliate margin; lower cauline 5–7 times as long as wide, petiolate; middle cauline shorter, subcordate, amplexicaul. Capitula 3–5 cm in diameter. Calyx patelliform, 8- to 11-awned. Corolla bluish-lilac. $2n=20$. *Grassland; calcifuge.* ● *Mountains of S.C. France.* Ga.

9. K. foreziensis Chassagne & Szabó, *op. cit.* 130 (1934). Like **8** but stem 50–100 cm, the lower internodes longer; leaves greenish when dry, the basal rosette-leaves without yellowish setae, the lower cauline 4½–7 times as long as wide, the middle and upper cauline broadly cuneate to rounded at base; corolla bluish-violet. $2n=40$. *Mountain scrub.* ● *C. France (Monts du Forez).* Ga. $2n=40$. *Mountain scrub.* ● *C. France (Monts du Forez).* Ga.

Closely related to and intermediate between **5(d)**, **8** and **10.**

10. K. godetii Reuter, *Cat. Gr. Jard. Bot. Genève* 4 (1857). Like **8** but stem 25–70 cm; peduncles rarely sparsely glandular; leaves linear-lanceolate, attenuate, the basal without yellowish setae (sometimes subhirsute when young), the lower cauline 6–10 times as long as wide, the middle and upper cauline cuneate at base; capitula 2·5–4 cm in diameter; calyx usually 7- to 9-awned; corolla bluish-violet. $2n=20$. *Damp meadows and bogs.* ● *Mountains of C. & E. France and N.W. Switzerland.* Ga He.

11. K. salvadoris Sennen ex Szabó, *Bot. Közl.* **31**: 136 (1934). Perennial; stock sympodial, with terminal flowering stems and lateral leaf-rosettes. Stem 35–90 cm, with fewer than 5 capitula; lower internodes glabrous, rarely pubescent; peduncles eglandular. Leaves subcoriaceous, greenish when dry, undivided, narrowly lanceolate, attenuate, entire to subdentate, glabrous except for ciliate margin at maturity; basal and lower cauline petiolate, the lower cauline 4–8 times as long as wide; middle and upper cauline sessile. Capitula 2·5–4·5 cm in diameter. Calyx patelliform, usually 8-awned. Corolla pink. $2n=20$. *Tall-herb communities and open coniferous woods; calcifuge.* ● *E. Pyrenees.* Ga Hs.

12. K. longifolia (Waldst. & Kit.) Koch, *Syn. Fl. Germ.* 343 (1835) (*K. arvensis* subsp. *kochii* (Brügger) Rouy, *K. brachytricha* Briq., *K. kochii* Brügger). Perennial; stock sympodial, with terminal flowering stems and lateral leaf-rosettes. Stem (20–)40–80(–120) cm, with fewer than 5 capitula; lower internodes short, glabrous, rarely puberulent, shining; upper internodes and peduncles puberulent and with long hairs, glandular. Leaves subcoriaceous, green when dry, shining above, undivided (rarely lobed), lanceolate, attenuate, entire to subcrenate, glabrous except for ciliate margin or puberulent; basal subhirsute when young, petiolate; cauline sessile, the lower (4½–)6–9 times as long as wide, attenuate at base, the upper usually 3–9 times as long as wide, somewhat widened at base. Capitula (2·5–)3·5–5(–6) cm in diameter. Calyx patelliform, usually 8-awned. Corolla pinkish-purple. $2n=20$. *Mountain meadows and wood-margins.* ● *S. & E. Alps; E. Carpathians; W.C. part of Balkan peninsula.* Al Au Gr He It Ju Rm Rs (W).

Plants from the E. Carpathians and from some parts of the Balkan peninsula have wider upper leaves and wider, less attenuate bracts than those from the Alps. Separation from **14** is difficult in parts of the Balkan peninsula.

13. K. pancicii Szabó, *Math. Term. Közl.* **31**: 376 (1911) (*K. midzorensis* var. *pancicii* (Szabó) Hayek). Like **12** but stem with 5–9 capitula; peduncles eglandular; leaves subentire, the lower cauline 7½–12 times as long as wide; capitula 2–2·5 cm in diameter. *Damp mountain meadows.* ● *C. Jugoslavia (Zlatibor Planina).* Ju.

Closely related to **12.**

14. K. midzorensis Form., *Deutsche Bot. Monatsschr.* **16**: 19 (1898). Like **12** but stem (40–)60–120(–150) cm; stem and leaves sometimes subtomentose, the lower cauline (3½–)4–6(–9) times as long as wide, broadly lanceolate, the upper cauline (1½–)2–4(–6) times as long as wide, ovate, cuspidate, sessile, often cordate and amplexicaul; calyx (6–)8- to 12(–14)-awned; corolla pale yellow, pink or light purple. $2n=20$. *Mountain meadows.* ● *E.C. part of Balkan peninsula.* ?Al Bu ?Gr Ju.

Populations from Albania and Greece approach **12.** Hairy variants which occur in S.W. Bulgaria (Rila Planina) resemble **15.** The specific status of **14** and **15** is, therefore, somewhat doubtful.

15. K. magnifica Boiss. & Orph., *Bull. Congr. Bot. Pétersb.* **1869**: 138 (1870). Like **12** but lower internodes densely long-villous, sometimes also sparsely pubescent; leaves narrowly lanceolate, acuminate, more or less entire, sericeous-sublanate, the lower cauline petiolate, the upper elongate, cuspidate, sessile and sometimes subcordate at base; calyx (6–)8(–9)-awned; corolla pink. *Mountain meadows.* ● *N. & C. Greece.* Gr.

16. K. dinarica (Murb.) Borbás, *Österr. Bot. Zeitschr.* **44**: 399 (1894). Perennial; stock sympodial, subcaespitose, usually with leaf-rosettes at anthesis which develop into flowering stems next year, without underground stolons. Stem 30–80 cm; lower internodes often short, shortly pubescent and with yellowish setae, rarely subvillous; upper internodes and peduncles hairy and usually glandular. Leaves of non-flowering rosettes elliptic- or oblong-lanceolate, undivided, crenate-serrate, yellowish-setose, petiolate; cauline leaves broadly or narrowly lanceolate, acuminate, undivided or sublyrate with 1–4 lateral lobes in the lower ⅓(–½), the lower petiolate, the upper entire or crenate-serrate, densely greyish-pubescent, subcordate and amplexicaul. Capitula 2·5–4 cm in diameter. Calyx cupuliform, usually 8-awned. Corolla purple. *Mountain meadows and open woods.* ● *C. part of Balkan peninsula; S.W. Italy.* Al Bu It Ju.

(a) Subsp. **dinarica**: Lower internodes hispid and densely pubescent. Petioles of rosette- and lower cauline leaves usually less than ½ as long as lamina. $2n=20$, 40. *From Bosna and N.E. Albania to S.W. Bulgaria.*

(b) Subsp. **silana** (Grande) Ehrend., *Bot. Jour. Linn. Soc.* **71**: 40 (1975) (*K. arvensis* var. *silana* Grande): Lower internodes hispid and usually not pubescent. Petioles of rosette- and lower cauline leaves as long as lamina. $2n=40$. *Siliceous soils. S.W. Italy (La Sila).*

Subspecies (a) is polymorphic in habit, division of the leaves and indumentum. It hybridizes with **1(d), 12, 25** and **29.**

17. K. lucana Lacaita & Szabó, *Nuovo Gior. Bot. Ital.* nov. ser., **29**: 179 (1923). Biennial or short-lived perennial; stock sympodial, usually without leaf-rosettes at anthesis. Stem up to 150 cm, fistular; lower internodes long, with brown-based setae up to 5 mm and sparsely pubescent; upper internodes hirsute and pubescent; peduncles glandular. Basal rosette-leaves soon withering, obovate-oblanceolate, hispid, yellowish-setose; cauline leaves ovate-lanceolate, crenate-serrate, undivided or pinnate with up to 8 lateral lobes in the lower ⅓–¾ and an ovate-acuminate terminal lobe, finely and sparsely hairy, the lower petiolate, the upper subamplexicaul. Capitula 2·5–3·5 cm in diameter. Calyx subpatelliform, 8-awned. Corolla purple. *Mountain woods.* ● *S. Italy (S.E. of Potenza).* It.

18. K. subcanescens Jordan, *Cat. Jard. Grenoble* **1853**: 12 (1853). Perennial; stock sympodial, with flowering stems often without basal leaves and usually without leaf-rosettes at anthesis. Stem 50–100 cm, the lower internodes rather long, villous and densely pubescent; peduncles usually glandular. Leaves undivided, ovate to broadly lanceolate, crenate-serrate; lower cauline petiolate; upper cauline acuminate, sparsely pubescent above, greyish-white and subvelutinous beneath, subcordate to cordate at base, sessile. Capitula 3·5–4·5 cm in diameter. Calyx subpatelliform, 8-dentate. Corolla violet-purple. $2n=40$. *Mountain meadows.* ● *S.W. Alps.* Ga ?It.

Closely related to **5(d)** and **1**, from which it is sometimes separated with difficulty.

19. K. baldensis A. Kerner ex Borbás, *Acta Inst. Bot. Kolozsvár* **1**: 37, 42 (1904). Like **18** but stem 20–80 cm, the lower internodes often very short, sometimes less densely hairy; peduncles glandular or eglandular; leaves narrowly lanceolate, long-acuminate, entire to subserrate, densely appressed-hairy (rarely glabrescent) beneath, the upper rounded at base, sessile; calyx usually 7- to 9-awned; corolla reddish-purple. $2n=40$. *Mountain meadows and woodland clearings.* ● *S. Alps (around Lago di Garda).* It.

Glabrescent variants (**K. decalvata** Borbás, *op. cit.* 42 (1904)) resemble **5** and **12.**

20. K. velutina Briq., *Annu. Cons. Jard. Bot. Genève* **6**: 94 (1902). Perennial; stock sympodial, rather caespitose, with basal leaf-rosettes and flowering stems. Stem (15–)25–40(–60) cm, patent-tomentose and pubescent; peduncles glandular. Leaves membranous, densely velutinous with rather short hairs above, greyish-subtomentose beneath; basal green at anthesis, broadly lanceolate, acuminate, undivided, crenate-serrate, petiolate; cauline undivided or sublyrate-pinnate with 2–4(–8) lateral lobes and a lanceolate, subcrenate-serrate terminal lobe about as long as the divided part, with a narrow, rounded base. Capitula (1·8–)2–3(–3·5) cm in diameter. Calyx patelliform, usually 8-awned. Corolla purple. $2n=20$. *Rocky limestone slopes.* ● *S. Alps, from c.* 9° 30′ *to* 12° 30′ *E.* It.

Hybridizes with **1**(c) & (e).

21. K. transalpina (Christ) Briq., *op. cit.* 91 (1902). Like **20** but stem 20–70 cm, the lower internodes subtomentose, sometimes glabrescent; leaves greyish-green, laxly velutinous with long hairs above, sometimes glabrescent, the basal oblong-lanceolate, subserrate, the cauline lyrate with 2–6(–10) lateral lobes and a broadly lanceolate terminal lobe; capitula (2·5–)3–4(–4·5) cm in diameter; corolla pinkish-lilac. $2n=40$. *Woodland-clearings and meadows.* ● *S. Alps, from c.* 8° 45′ *to* 9° 45′ *E.* He It.

22. K. persicina A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **6**: 99 (1893). Like **20** but peduncles eglandular; leaves subtomentose, usually lyrate-pinnate with (2–)4–6(–10) lateral lobes and an oblong, acuminate terminal lobe, or undivided and serrate, the upper cauline often subcordate at base; capitula (3–)3·5–4·5(–5) cm in diameter; calyx (8–)9- to 12(–15)-awned; corolla bright red. $2n=40$. *Grassland or scrub; calcicole.* ● *S. Alps (region E. of Lago di Garda).* It.

Transitional forms with the partly sympatric **19** occur.

23. K. carinthiaca Ehrend., *Österr. Bot. Zeitschr.* **109**: 335 (1962). Perennial; stock sympodial, rather caespitose, with leaf-rosettes at anthesis. Stem (10–)15–30(–50) cm, the lower internodes short, patent-tomentose and densely pubescent; peduncles usually eglandular. Leaves membranous, appressed-sericeous above, greyish-tomentose-villous beneath; basal lanceolate-acuminate, often undivided, subcrenate-serrate, petiolate; upper cauline usually lyrate with 2–6(–8) lateral lobes and a long-attenuate terminal lobe about as long as the divided part, cuneate to rounded at the base, sessile. Capitula 2–3 cm in diameter. Calyx subpatelliform, usually 6- to 8-awned. Corolla pale lilac. $2n=20$. *Limestone hills.* ● *S. Austria (N.E. Kärnten).* Au.

24. K. × norica Ehrend., *op. cit.* 336 (1962) (*K. carinthiaca* × *drymeia* subsp. *drymeia*). Like **23** but basal leaf-rosettes usually absent at anthesis; stem up to 50(–70) cm, the lower internodes usually longer than in **23**; basal leaves oblong-ovate, usually with laxer indumentum, the cauline often undivided or lyrate with an ovate-acuminate, crenate terminal lobe, sometimes pinnate; capitula up to 4 cm in diameter; calyx usually 8- to 10-awned; corolla violet. $2n=40$. *Scrub and grassland; calcicole and on serpentine.* ● *S.C. Austria (N.E. Kärnten and C. Steiermark).* Au.

Polymorphic and often growing without one or both parents. Certain plants from the W. & S. Carpathians are greenish-pubescent and have undivided, ovate-lanceolate rosette-leaves, usually lyrate-pinnate cauline leaves, glandular or eglandular peduncles and reddish-purple corolla. They would key out here, but are certainly not identical with **24**, and have usually been mistaken for **29**; their taxonomic position needs further attention.

25. K. albanica Briq., *Annu. Cons. Jard. Bot. Genève* **6**: 125 (1902). Perennial; stock sympodial, rather caespitose, with leaf-rosettes and flowering stems. Stem up to 50 cm; lower internodes rather short, whitish-tomentose and pubescent; peduncles eglandular. Leaves mostly basal, subcoriaceous, narrowly lanceolate, acuminate, entire or subserrate, with revolute margin, long-greyish-tomentose beneath, glabrescent and shining above; lower cauline undivided; upper cauline usually sublyrate with 1–4 lateral lobes in lower third, terminal lobe about as long as divided part, sessile. Capitula 3–3·5 cm in diameter. Calyx subpatelliform, (8–)10- to 12(–14)-awned. Corolla pink to light purplish. $2n=20$. *Stony mountain slopes.* ● *S.W. Jugoslavia, N. Albania.* Al Ju.

26. K. velebitica Szabó, *Magyar Bot. Lapok* 9: 50 (1910). Like **25** but leaves crenate-serrate, with rather flat margin, greyish-hirsute, broadly lanceolate-acuminate, undivided or the cauline lyrate-pinnate with (2–)4–8(–12) lateral lobes; capitula 2·5–3·5 cm in diameter; calyx cupuliform, 8- to 14-awned; corolla pink. $2n=20$. *Calcareous hillsides.* ● *N.W. Jugoslavia (E. of Velebit).* Ju.

27. K. mollis Jordan, *Cat. Jard. Dijon* 25 (1848). Perennial; stock sympodial. Stem (9·5–)25–40(–60) cm; lower internodes short, densely lanuginous and pubescent; peduncles glandular. Leaves membranous, greyish-tomentose, ciliate; basal broadly oblanceolate, usually undivided, crenate-serrate, petiolate; cauline pinnate with (2–)4–8(–10) lanceolate lateral lobes and an ovate-lanceolate, subacute, deeply crenate-serrate terminal lobe usually shorter than the divided part. Capitula (2–)3–4(–5) cm in diameter. Calyx cupuliform, 8- to 10-awned. Corolla reddish-purple. $2n=20$. *Dry, grassy mountain slopes.* ● *S.W. Alps.* Ga It.

28. K. calycina (C. Presl) Guss., *Fl. Sic. Syn.* **1**: 170 (1843). Like **27** but leaves rather coriaceous, usually less densely and more coarsely hirsute, sometimes glabrescent, the cauline with (4–)6–10(–12) linear-lanceolate lateral lobes and a narrowly lanceolate, long-attenuate terminal lobe; corolla purplish-violet. $2n=20$. *Grassy hillsides.* ● *Mountains of C. & S. Italy and Sicilia.* It Si.

29. K. arvensis (L.) Coulter, *Mém. Dipsac.* 41 (1823). Perennial or biennial; stock sympodial, laxly caespitose, with leaf-rosettes and flowering stems, usually with underground stolons. Stem (15–)25–75(–100) cm, the lower internodes long or short, sometimes with purplish spots, more or less hirsute or setose and puberulent; peduncles glandular or eglandular. Leaves membranous, usually subhirsute; basal green, undivided or lyrate-pinnate; cauline often confined to lower half of stem, lanceolate to narrowly ovate, usually lyrate-pinnate with (2–)4–12(–16) lateral lobes and an ovate-lanceolate, subacute, subdentate terminal lobe usually much shorter than the divided part. Hermaphrodite capitula (2·5–)3–4 cm in diameter; female capitula (1·5–)2–3 cm in diameter. Calyx cupuliform, (6–)8(–10)-awned. Corolla bluish-violet to lilac, rarely purple or pink. $2n=20$, 40, 43, 46. *Meadows, pastures and open woods. Most of Europe, but absent from parts of the Mediterranean region.* ?Al Au Be Br Bu Cz Da Fe Ga Ge Hb He Ho Hs Hu It Ju Lu No Po Rm Rs(N, B, C, W, K, E) Su [Fa Is].

A very polymorphic taxon, hybridizing with **1, 3, 5, 9, 16, 18, 21, 23–25, 30–34, 37, 39, 42, 43.** An often greyish-subtomentose diploid with deeply multi-pinnate leaves and bluish-lilac corolla is subsp. **pannonica** (Heuffel) O. Schwarz, *Mitt. Thür. Bot. Ges.* **1(1)**: 118 (1949) (*K. arvensis* var. *budensis* (Simonkai) Szabó), from E.C. Europe. Other diploid plants from E.C. Europe with

long stems, wide and undivided greenish leaves, and lilac-pink corolla, have been called subsp. **rosea** (Baumg.) Soó, *Feddes Repert.* **83**: 129 (1972) (*K. dumetorum* Heuffel). They link **29** with **32**.

Slender, sparsely hairy, occasionally biennial diploids are widespread from N. Italy to the N. part of the Balkan peninsula, connecting **29** to **34** in the west and to **31**, **33** and **37** in the south-east. Similar tetraploids in the S. Jura and foothills of the S.W. Alps have been called **K. timeroyi** Jordan, *Cat. Jard. Dijon* 25 (1848), and **K. leucophaea** Briq., *Annu. Cons. Jard. Bot. Genève* **6**: 75 (1902); they approach **34**.

Tetraploids, which are widespread from the Pyrenees, S. Alps and Carpathians northwards, are usually robust, with coarse indumentum, purplish-spotted lower internodes and large terminal leaf-lobes.

30. K. kitaibelii (Schultes) Borbás, *Acta Inst. Bot. Kolozsvár* **1**: 60 (1904). Like **29** but a robust perennial; stem usually not more than 50 cm, hirsute or greyish-subtomentose, the lower internodes without purplish spots; leaves elliptic-lanceolate, with dentate-crenate terminal lobe, subhirsute or greyish-subtomentose, broadly subamplexicaul; capitula (2–)3–4 cm in diameter; corolla pale yellow, rarely suffused with lilac. ● *E.C. Europe.* Au Cz Ge Hu Po.

Records from the E. & S. Carpathians (as **K. kitaibelii** subsp. **alpigena** (Schur) Soó, *Acta Bot. Acad. Sci. Hung.* **11**: 251 (1965)) possibly refer to albino variants of **29**.

(**a**) Subsp. **kitaibelii**: Stem green, hirsute with rigid hairs. Leaves green, subhirsute. $2n=40$. *Grassland and wood-margins. Throughout the range of the species.*

(**b**) Subsp. **tomentella** (Szabó) Baksay, *Ann. Hist.-Nat. Mus. Hung.* nov. ser., **7**: 325 (1956): Stem and leaves greyish-subtomentose and puberulent. $2n=40$. *Woodland-clearings on dolomite hills. Hungary* (*W. of Budapest*).

31. K. ambigua Boiss. & Orph. in Boiss., *Diagn. Pl. Or. Nov.* **3(6)**: 95 (1859). Like **29** but a slender perennial or, rarely, biennial, usually without underground stolons; peduncles usually glandular; leaves somewhat hairy to greyish-subvillous or pubescent, the lower cauline usually undivided, the upper cauline narrow at base or subamplexicaul; capitula (1·5–)2–3(–3·5) cm wide; corolla usually pale yellow or pale pink. $2n=20$. *Wood-margins.* ● *From S. Macedonia to C. Bulgaria.* Bu Gr Ju.

Variants from high elevation with less divided, often subvillous leaves, approach **15**, **16** and **25**.

32. K. macedonica Griseb., *Spicil. Fl. Rumel.* **2**: 178 (1846) (*K. atrorubens* Janka ex Brandza). Like **29** but leaves evenly distributed along the stem, the basal usually withered at anthesis, undivided, the cauline with ovate, crenate-serrate terminal lobe; capitula 1·5–3 cm in diameter; corolla usually dark red, sometimes lilac or pink. $2n=20$. *Scrub and open woods.* ● *C. part of Balkan peninsula, S.E. Romania.* Al Bu ?Gr Ju Rm.

Biennial variants with wide-based cauline leaves, from S.E. Romania, have been named **K. tulceanensis** E. I. Nyárády, *Bul. Grăd. Bot. Univ. Cluj* **19**: 82 (1939). Populations are often polymorphic in the colour of the corolla, possibly because of hybridization, and approach **29** and **31**.

33. K. visianii Szabó, *Magyar Bot. Lapok* **9**: 42 (1910) (*K. purpurea* var. *montenegrina* (G. Beck) Szabó). Like **29** but biennial, rarely short-lived perennial, without underground stolons; stem (25–)40–120(–250) cm; peduncles glandular; basal leaves lyrate, usually withered at anthesis; cauline pinnate, more or less crenate-serrate, with oblong-rhombic terminal lobe; capitula (1·3–)1·8–2·5(–3) cm in diameter; calyx usually 8-dentate; corolla purple. $2n=20$. *Scrub and grassland.* ● *S.W. & C. Jugoslavia, N. Albania.* Al Ju.

Short-lived perennial variants resemble **31** and diploids of **29**.

34. K. purpurea (Vill.) Borbás, *Acta Inst. Bot. Kolozsvár* **1**: 51 (1904) (*Trichera collina* (Req.) Reichenb.). Perennial, rarely short-lived; stock sympodial, with leaf-rosettes and flowering stems, without underground stolons. Stem (10–)15–50(–80) cm; lower internodes short, finely hirsute and pubescent; peduncles glandular. Leaves membranous to subcoriaceous, oblong-lanceolate, sparsely hirsute, subtomentose or subglabrous; lower sometimes undivided, subdentate; upper 1- to 2-pinnate, with (4–)8–16(–20) narrowly oblong or linear-lanceolate, often rather deeply dentate, lateral lobes and a lanceolate-rhombic terminal lobe shorter than the divided part. Capitula (1·5–)1·8–2·5(–3·5) cm in diameter. Calyx cupuliform, 8- to 10(–12)-awned. Corolla purple to violet. $2n=20$. *Dry grassland and rocky slopes. W. Mediterranean region, S.W. & S.C. Alps.* Ga He Hs It ?Si.

In S. Italy more robust, short-lived perennial plants with broadly rhombic-ovate terminal leaf-lobes occur; they appear related to **17** and are very similar to taxa described from N.W. Africa such as **K. numidica** (Debeaux & Reverchon) Szabó, *Bot. Jahrb.* **36**: 437 (1905). These and **34** are possibly conspecific.

In S.W. Europe and W. Italy delimitation from **29** seems to coincide with diploid-tetraploid differences but morphological separation is sometimes difficult. Close contacts are evident with parallel tomentose diploids; transitional variants occur between **34** and the tomentose, diploid **27** in the S.W. Alps and **28** in Italy and Sicilia.

A tetraploid population of small tomentose plants with narrowly lanceolate, predominantly undivided and subdentate, or sublyrate leaves with 2–4 small lateral lobes and eglandular peduncles, occurs in S.W. France (S. of Cahors); its status requires investigation.

35. K. rupicola (Willk.) Szabó, *Bot. Közl.* **31**: 124 (1934). Like **34** but densely caespitose from woody base; stem 10–20 cm, slender, papillose; leaves subcoriaceous, finely papillose, sparsely ciliate below and on midrib, the lower oblong, the upper lyrate with 2–6 lateral lobes and an ovate terminal lobe; capitula *c.* 2·5 cm in diameter; calyx usually 8-awned. *Rock-crevices.* ● *N.E. Spain* (*mountains near Tortosa*). Hs.

36. K. subscaposa Boiss. & Reuter, *Pugillus* 53 (1852) (?*K. legionensis* (Lag.) DC. pro parte). Like **34** but stem up to 20(–30) cm, coarsely hirsute and pubescent; leaves usually subcoriaceous, obovate to broadly oblanceolate, the upper usually lyrate-pinnate with (2–)4–10(–14) oblong-obovate, entire or subdentate lateral lobes and an ovate-suborbicular terminal lobe, coarsely appressed-hirsute and scabrid to pubescent; capitula (2–)2·5–3·5(–4) cm in diameter; calyx usually 8-awned. $2n=20$. *Grassy and rocky slopes.* ● *C. & S. Spain.* Hs.

Variants of **34** in E. Spain, and of **29** on the southern slopes of the C. Pyrenees sometimes approach **36** and make separation difficult.

37. K. illyrica G. Beck, *Ann. Naturh. Mus.* (*Wien*) **9**: 351 (1894) (*K. purpurea* var. *illyrica* (G. Beck) Szabó). Like **34** but stem sometimes with purplish spots; peduncles glandular or eglandular; leaves usually membranous, crenate-serrate, the basal ovate-lanceolate, undivided or lyrate, the upper usually pinnate with (2–)4–6(–10) ovate-oblong lateral lobes and a rhombic, cuspidate terminal lobe about as long as the divided part; capitula (2·5–)3–3·5(–4) cm in diameter; calyx (7–)8- to 10(–11)-awned. $2n=40$. *Scrub-margin and dry grassland.* ● *N.E. Italy, N.W. Jugoslavia.* It Ju.

Morphologically and geographically intermediate between **1(b)** and **26**.

38. K. pectinata Ehrend., *Österr. Bot. Zeitschr.* **109**: 336 (1962). Perennial; stock sympodial, with leaf-rosettes and flowering stems. Stem (10–)15–30(–60) cm, with short lower internodes, retrorsely hirsute, puberulent; peduncles eglandular. Leaves somewhat coriaceous, uniformly pubescent, pectinate-pinnate, with (10–)12–16(–22) lanceolate, acute, entire or subdentate lateral lobes (2·5–)3·2–5(–6) mm wide, and a slightly broader terminal lobe. Capitula 2–3 cm in diameter. Calyx cupuliform, (7–)9- to 12(–15)-dentate. Corolla lilac. $2n=20$. *Stony limestone slopes.* ● *N.W. Jugoslavia* (*W. slopes of Velebit*). Ju.

39. K. clementii (G. Beck) Ehrend., *op. cit.* 337 (1962). Like **38** but leaves heterotrichous, hirsute or glabrescent and pubescent on margin and veins, rather shiny, with linear-lanceolate lateral lobes (1·5–)2–3·5(–5) mm wide; calyx (9–)10- to 15(–18)-dentate; corolla purplish. $2n=40$. *Stony limestone slopes.* ● *Mountains of W. Jugoslavia, from c.* 43° *to c.* 45° *N.* Ju.

Morphological intermediates between **39** and **38** occur.

40. K. adriatica Ehrend., *Bot. Jour. Linn. Soc.* **71**: 40 (1975). Like **38** but peduncles glandular; leaves heterotrichous, densely long-hirsute and pubescent, with linear-lanceolate, obtuse lateral lobes (1·5–)2–3·5(–4) mm wide; calyx (10–)12- to 15(–16)-dentate; corolla pale lilac-purplish. $2n=40$. *Coastal limestone hills.* ● *W. Jugoslavia* (*between Zadar and Šibenik*). Ju.

41. K. dalmatica G. Beck, *Ann. Naturh. Mus.* (*Wien*) **9**: 352 (1894). Like **38** but stems up to 30 cm; peduncles glandular; leaves rather rigidly ciliate and pubescent, with linear lateral lobes 0·5–1·5 mm wide; calyx (12–)14- to 17(–18)-dentate; corolla purplish. $2n=20$. *Stony limestone slopes.* ● *W. Jugoslavia* (*near Split*). Ju.

42. K. travnicensis (G. Beck) Szabó, *Magyar Bot. Lapok* **9**: 51 (1910). Perennial; stock sympodial, with lateral leaf-rosettes and flowering stems. Stem (20–)30–60(–80) cm, usually robust, with a basal leaf-rosette, retrorsely hispid or subglabrous; peduncles usually eglandular. Leaves subcoriaceous, shining, sparsely setose or glabrescent; lower usually 3–6 times as long as wide, usually undivided, ovate-lanceolate, subacuminate, crenate-dentate, petiolate; upper usually lyrate-pinnate, with 1–8(–12) lanceolate lateral lobes and a larger, ovate-lanceolate terminal lobe. Capitula 2–4 cm in diameter. Calyx cupuliform, (7–)8- to 11(–15)-awned. Corolla purple. $2n=60$. *Limestone slopes.* ● *Mountains of W. Jugoslavia.* Ju.

43. K. fleischmannii (Hladnik ex Reichenb.) Pacher, *Jahrb. Naturh. Landes-Mus. Kärnten* **22**: 73 (1893) (*K. rigidiuscula* (Koch) Wettst.). Like **42** but stem usually more slender, often subglabrous; lower leaves usually 5–9 times as long as wide, usually narrowly lanceolate, long-acuminate, subcrenate; capitula *c.* 2 cm in diameter; calyx 8-awned. $2n=40$. *Coniferous woods on dolomite.* ● *N.W. Jugoslavia* (*mountains W. of Ljubljana*). Ju.

44. K. tatarica (L.) Szabó, *Bot. Közl.* **13**: 65 (1914) (?*K. montana* (Bieb.) DC.). Biennial with a thick taproot. Stem up to 200 × 2 cm, fistular, much-branched, with deflexed setae; peduncles glandular or eglandular. Leaves membranous, sparsely setose; basal narrowly elliptical, usually undivided, crenate, petiolate; cauline elliptic-lanceolate, undivided or sublyrate, repand-crenate, cuspidate, connate and subamplexicaul. Capitula 2–4 cm in diameter. Calyx cupuliform, 8- to 12-awned. Corolla pale yellow. $2n=20$. *Open woods.* ● *E. Russia, from the middle Volga to S. Ural.* Rs (C, E).

45. K. byzantina Fritsch, *Verh. Zool.-Bot. Ges. Wien* **45**: 429 (1896). Annual. Stem 20–30 cm, crispate-puberulent; peduncles eglandular. Leaves setose and puberulent, especially above; basal in a rosette, narrowly lanceolate, acuminate, entire or crenate-serrate; upper cauline linear to lanceolate, undivided or pinnate, entire to laciniate, more or less amplexicaul. Capitula 2–3 cm in diameter, with 35–40 florets. Involucre patelliform; bracts many, linear-deltate, puberulent and with conspicuous, rigid cilia, with whitish margin. Calyx patelliform, 8- to 10-awned. Corolla bluish-violet; marginal corollas with outer median lobe somewhat wider than the lateral, the tube *c.* 6 mm. Fruit with unequal involucel-teeth. *Scrub and cultivated fields. Turkey-in-Europe, S.E. Bulgaria.* Bu Tu. (*Anatolia.*)

46. K. integrifolia (L.) Bertol., *Fl. Ital.* **2**: 32 (1835) (*K. hybrida* (All.) Coulter). Annual. Stem 20–80 cm, hirsute below, subhirsute to subglabrous above; peduncles usually eglandular. Basal leaves in a rosette, dentate or crenate, glabrous or hirsute, undivided or lyrate-pinnate with obovate or lanceolate, obtuse lobes, petiolate; upper leaves linear to lanceolate, more or less amplexicaul. Hermaphrodite capitula *c.* 3 cm in diameter, with 30–40 florets; female capitula *c.* 1·5 cm in diameter, with 20–30 florets. Involucre patelliform; bracts in 2–3 rows, ovate at base, lanceolate-acuminate, with 3–5(–7) inconspicuous veins, greyish-velutinous, ciliate-hirsute, usually eglandular. Calyx cupuliform, 12- to 24-dentate, rarely with some teeth awned. Corolla violet; marginal corollas with outer median lobe somewhat wider than the lateral, the tube *c.* 3–5 mm. Fruit with equal involucel-teeth, or those on 2 angles much longer and distinctly 2-horned. $2n=20$. *Grassland, scrub and disturbed ground. Mediterranean region, Bulgaria.* Al Bl Bu Co Cr Ga Gr Hs It Ju Sa Si Tu.

47. K. degenii Borbás, *Verh. Naturf. Ver. Brünn* **33**: 29 (1895). Annual. Stem 20–60 cm, hirsute; peduncles glandular. Basal leaves in a rosette, denticulate, acute, hirsute, petiolate, undivided or pinnate; upper leaves linear to narrowly lanceolate. Capitula with 10–15 florets. Involucre more or less cyathiform or subcylindrical at anthesis; bracts (7–)8–10(–13) mm, 10–15, in 2–3 rows, lanceolate, with 7–9 prominent veins, shortly setose and with dark, long-stalked glands. Calyx cupuliform, 12- to 16-dentate. Corolla lilac to violet; marginal corollas with outer median lobe up to twice as wide as the lateral, the tube (4·5–)5–6(–6·5) mm. Fruit hairy, with prominent involucel-teeth. *Scrub and disturbed ground. Turkey-in-Europe* (*around Istanbul*). Tu. (*N.W. Anatolia.*)

48. K. orientalis L., *Sp. Pl.* 101 (1753). Like **47** but capitula with 5–10 florets; involucre cylindrical at anthesis, the bracts (9–)10–14(–15) mm, 8–10, in 1–2 rows; corolla purplish-red; marginal corollas with outer median lobe 2–5 times as wide as the lateral, the tube (5·5–)7–12(–13) mm; fruit glabrous, with short involucel-teeth. $2n=16$. *Scrub and disturbed ground. S.E. part of Balkan peninsula, N. Aegean region.* Bu Gr Tu.

7. Pterocephalus Adanson[1]

Annual or perennial herbs or shrubs with usually hairy stems. Capitula hemispherical; the outer florets sometimes radiate. Receptacular scales hairy or absent. Involucel sulcate, with terminal seta, minute teeth or a short corona. Calyx short, stipitate, with 5–24 plumose setae. Corolla 5-fid.

Literature: B. L. Burtt, *Notes Roy. Bot. Gard. Edinb.* **22**: 279–283 (1957).

1 Stems procumbent
2 Leaves entire — **5. spathulatus**
2 Leaves lyrate, crenate or dentate — **6. perennis**
1 Stems erect
3 Leaves 1- to 2-pinnatisect, with linear lobes
4 Annual; fruiting involucel with a long, flattened, curved seta up to 15 mm — **3. diandrus**
4 Perennial; fruiting involucel without a seta — **4. intermedius**
3 Leaves lyrate or pinnatisect, with ovate-lanceolate or lanceolate, crenate-dentate terminal lobes
5 Involucel with a narrow, scarious corona and an internal collar surrounding neck of ovary — **2. brevis**
5 Involucel with a toothed margin, the corona and internal collar absent — **1. papposus**

1. P. papposus (L.) Coulter, *Mém. Dipsac.* 32 (1823) (*P. plumosus* (L.) Coulter). Erect annual up to 60 cm, with long and short glandular and eglandular hairs. Leaves 3–15 × 0·5–5 cm, oblong, crenate-dentate, or lyrate or pinnatisect; terminal lobe large, lanceolate or ovate-lanceolate, dentate or crenate; lateral lobes small, linear. Involucral bracts 12–20 × 2·5–4 mm, linear, acute, equal to or longer than florets. Corolla 12–18 mm, pink or purplish. Involucel 4–6 mm in fruit, minutely dentate; corona and internal collar absent. Calyx 9–11 mm, with 11–12 setae free almost to base. *Dry places. E. Mediterranean region*; *Krym.* Al Bu Cr Gr Ju Rs (K) Tu.

2. P. brevis Coulter, *loc. cit.* (1823) (*P. papposus* sensu Hayek pro parte, non (L.) Coulter). Erect annual or biennial 15–20(–40) cm, with long, whitish eglandular and short glandular hairs. Leaves 3–9 × 0·5–2 cm, pinnatisect; lobes linear-oblong, decurrent, entire or divided. Involucral bracts 10–16 × 2–3 mm, linear, acute, equal to or longer than florets. Corolla 12–18 mm, whitish, usually purplish distally. Involucel 4–6 mm in fruit, with a narrow, scarious corona and an internal collar surrounding the neck of the ovary. Calyx 7–8 mm, with 11–16 setae free almost to base. *Karpathos.* Cr. (*S.W. Asia.*)

3. P. diandrus (Lag.) Lag., *Gen. Sp. Nov.* 9 (1816) (*P. papposus* Coulter pro parte et auct. iber.). Erect, pubescent or puberulent annual up to 45 cm. Leaves 2–5 × 0·8–1·5 cm, pinnatisect; lobes linear. Involucral bracts 6–10 mm, ovate, acuminate, shorter than florets. Corolla 5–7 mm, blue or lilac. Involucel 3–4 mm in fruit, with dentate corona and a long, flattened, curved seta up to 15 mm. Calyx 5–6 mm, with 20–24 setae united at base to form a distinct cup. *Dry places.* ● *C. Spain, Portugal.* Hs Lu.

4. P. intermedius (Lag.) Coutinho, *Fl. Port.* 594 (1913) (*P. broussonetii* Coulter ex DC.). Erect, pubescent or puberulent perennial up to 80 cm, woody below. Leaves 4–9 × 1·5–3·5 cm, 2-pinnatisect; lobes linear. Involucral bracts 6–9 mm, linear-lanceolate, equalling or rather shorter than florets. Corolla 7–9 mm, pale lilac. Involucel 4–5 mm in fruit, with a short, scarious corona. Calyx 5–6 mm, with 5–7 setae, free almost to the base. *Dry, sandy ground.* ● *S. Spain, S. & C. Portugal.* Hs Lu.

5. P. spathulatus (Lag.) Coulter, *Mém. Dipsac.* 32 (1823). Procumbent, rather woody, caespitose, densely white- or grey-lanate-tomentose perennial up to 5 cm. Leaves 6–20 × 4–5 mm, spathulate, entire. Capitulum with outer florets more or less radiate. Involucral bracts 6–10 mm, linear-lanceolate, shorter than florets. Corolla 15–18 mm, pink. Involucel 3–4 mm in fruit, densely sericeous, with a hairy corona. Calyx *c.* 12 mm, with 13–16 setae free almost to base. *Mountain rocks.* ● *S.E. Spain.* Hs.

6. P. perennis Coulter, *op. cit.* 33 (1823). Procumbent, rather woody, caespitose perennial up to 12 cm. Leaves 2–5 × 0·5–1·5 cm, lyrate or undivided, oblong-spathulate, crenate or dentate; terminal lobe ovate or ovate-oblong, crenate; lateral lobes small, linear. Involucral bracts 8–15 mm, lanceolate, shorter than florets. Corolla 12–20 mm, pink, or pale purplish. Capitulum with outer florets radiate. Involucel 3–4 mm in fruit, densely sericeous, with a corona of short plumose setae *c.* 2 mm. Calyx 12–14 mm, with 13–16 setae free almost to base. *Mountain rocks.* ● *Greece and Albania.* Al Gr.

(a) Subsp. **perennis** (*P. perennis* subsp. *parnassi* (Sprengel) Vierh.): Leaves more or less densely grey-pubescent or -tomentose, usually sparsely glandular, the veins on the lower surface hidden. *S. & E. Greece.*

(b) Subsp. **bellidifolius** (Boiss.) Vierh., *Verh. Zool.-Bot. Ges. Wien* **69**: 244 (1919): Leaves green, pubescent, usually densely glandular, the veins on the lower surface distinct. *N.W. Greece, Albania.*

[1] By I. K. Ferguson.

8. Scabiosa L.[2]

Annual to perennial herbs, rarely woody at base. Leaves opposite, simple or pinnate, often in non-flowering basal rosettes. Capitula long-pedunculate; involucral bracts herbaceous, in 1–3 rows. Receptacle hemispherical to cylindrical; receptacular bracts usually linear-lanceolate. Involucel-tube cylindrical, 8-ribbed, expanded above into an orbicular or infundibuliform, scarious corona with many, sometimes excurrent, veins. Calyx cupuliform below, the upper part usually prolonged into 5 setae. Corolla with 5 unequal lobes and a short tube, usually longer in marginal than central florets.

1 Involucel-tube longitudinally sulcate, but without pits
2 Corona with 8 veins; ribs of involucel-tube becoming wider and confluent at margin
3 All fruits in capitulum with long calyx-setae; corona broadly infundibuliform — **23. atropurpurea**
3 Outer fruits in capitulum without or with very short calyx-setae; corona very narrowly infundibuliform — **24. semipapposa**
2 Corona with 20–24 veins; ribs of involucel-tube of uniform width and not confluent at margin
4 Leaves of non-flowering rosettes and lower cauline leaves entire
5 Terminal segments of cauline leaves distinctly wider and longer than the lateral — **25. silenifolia**
5 Terminal segments of cauline leaves as wide as and slightly longer than the lateral
6 Calyx-setae 5–9 times as long as corona — **26. vestina**
6 Calyx-setae 2–2½ times as long as corona — **27. canescens**
4 Leaves of non-flowering rosettes and lower cauline leaves dentate or pinnatifid
7 Annual
8 Stems dichotomously branched — **28. parviflora**
8 Stem simple or not dichotomously branched — **29. tenuis**
7 Perennial or biennial
9 Corolla purple or reddish — **(30–38). columbaria** group
9 Corolla yellow or whitish — **(39–43). ochroleuca** group
1 Involucel-tube terete, with 8 pits
10 Annual
11 Corona more than 3·5 mm
12 Receptacular bracts narrowly oblanceolate — **18. rotata**
12 Receptacular bracts broadly ovate
13 Involucral bracts entire — **16. stellata**
13 Involucral bracts 3-fid or pinnatifid — **17. monspeliensis**
11 Corona not more than 3·5 mm
14 Corolla of marginal florets slightly longer than that of the central; fruiting capitula ellipsoid
15 Corona circular in outline, the veins slightly excurrent — **19. micrantha**
15 Corona square in outline, the veins distinctly excurrent — **20. sicula**
14 Corolla of marginal florets considerably longer than that of the central; fruiting capitula globose
16 Corolla dark violet; calyx-setae *c.* 6 times as long as corona — **22. cosmoides**
16 Corolla yellow; calyx-setae 4–5 times as long as corona — **21. hispidula**
10 Perennial or biennial
17 Leaves stellate-tomentose beneath
18 Leaves glabrous above — **1. limonifolia**
18 Leaves pubescent above — **2. saxatilis**
17 Leaves glabrous, or pubescent with simple hairs
19 Calyx-setae shorter than corona
20 At least some leaves 3- to 9-fid, obovate- to lanceolate-spathulate, the early ones glabrous
21 Leaves deeply 3- to 9-fid, densely sericeous — **7. hymettia**
21 Leaves entire or 3-fid, pubescent — **6. variifolia**
20 Leaves entire, lanceolate to elliptic-lanceolate, the early ones pubescent
22 Leaves with long, straight hairs — **4. albocincta**
22 Leaves with long hairs and with short, hooked hairs
23 Leaves oblanceolate, 3½–5 times as long as wide — **3. cretica**
23 Leaves elliptic-obovate, 1½–2¾ times as long as wide — **5. minoana**
19 Calyx-setae longer than corona
24 All leaves entire or serrate
25 Leaves elliptic-lanceolate — **8. epirota**
25 Leaves linear-lanceolate
26 Corolla blue — **13. graminifolia**
26 Corolla pale yellow — **14. rhodopensis**
24 Lower leaves 1- to 2-pinnatifid
27 Stem herbaceous; upper leaves entire — **15. argentea**
27 Stem woody at base; upper leaves pinnatifid
28 Involucel-tube less than 2 mm; capitulum 10–15 mm in diameter — **9. sphaciotica**
28 Involucel-tube more than 3 mm; capitulum more than 20 mm in diameter
29 Wider involucral bracts pinnatifid — **10. pulsatilloides**
29 Involucral bracts entire
30 Calyx-setae 2–3 times as long as corona; corona shorter than involucel-tube; corolla yellow — **11. isetensis**
30 Calyx-setae 1½ times as long as corona; corona longer than involucel-tube; corolla reddish — **12. crenata**

Sect. TROCHOCEPHALUS Mert. & Koch (Sect. *Asterocephalus* Coulter). Involucel-tube with 8 pits below the corona.

1. S. limonifolia Vahl, *Symb. Bot.* **2**: 27 (1791). Caespitose perennial, woody at base. Stem 20–50(–80) cm, whitish-lanate. Basal leaves 30–60 mm, spathulate to oblong-spathulate, obtuse, entire, glabrous above, densely stellate-tomentose beneath, fleshy-coriaceous; cauline leaves 1(–3) pairs, smaller than the basal. Capitula usually 3, globose. Involucral bracts triangular-ovate, obtuse, densely lanate, ½ as long as florets. Involucel-tube densely lanate; pits *c.* 1·5 mm; corona 3–4 mm, 28-veined, indistinctly 4- to 5-lobed, irregularly dentate. Calyx-setae twice as long as corona. Corolla 10–12 mm, slightly longer in marginal than in central florets, lilac. *Limestone rocks.* ● *Sicilia.* Si.

2. S. saxatilis Cav., *Icon. Descr.* **2**: 68 (1793). Caespitose perennial, woody at base. Stem 20–40 cm, procumbent, hirsute when young, becoming glabrous. Basal leaves 2–6 cm, broadly lanceolate, acute, entire, stellate-tomentose but green above, densely white-stellate-tomentose beneath, long-petiolate; cauline leaves 1–2(–3) pairs, smaller than the basal. Capitula usually (1–)3–5, globose. Involucral bracts *c.* 15 mm, lanceolate, obtuse, shorter than florets. Corona with 4 dentate or subentire lobes. Corolla *c.* 20 mm, slightly longer in marginal than in central florets, white. *Rock-crevices. E. & S. Spain.* Hs.

(a) Subsp. **saxatilis**: Corona with shallow, dentate lobes, shortly pubescent. ● *E. Spain.*

(b) Subsp. **grosii** Font Quer, *Arx. Secc. Ci. Inst. Est. Catalans* **18**: 27 (1950): Corona with deep, subentire lobes, sometimes divided to the base. ● *S. Spain.*

3. S. cretica L., *Sp. Pl.* 100 (1753). Caespitose perennial, woody at base. Stem 10–25(–30) cm, procumbent, white-lanate, often leafless. Basal leaves obovate-lanceolate, 3½–5 times as long as wide, subacute, appressed-sericeous and with short curved hairs, tapering into petiole. Capitula 35–50(–55) mm in diameter, globose, solitary; peduncle scarcely exceeding leaves. Involucral bracts ovate or narrowly ovate, obtuse, densely white-lanate, ⅓–⅔ as long as florets. Receptacular bracts linear, with narrow membranous margin. Involucel-tube 5–7 mm; pits 2–2·5 mm, narrowly elliptical, densely lanate; corona 7–9 mm, hirsute, irregular, with 24–35 veins. Calyx-setae shorter than corona. Corolla about twice as long in marginal as in central florets, lilac. *Rocky places. W. Mediterranean region.* Bl It Si.

4. S. albocincta W. Greuter, *Candollea* **22**: 242 (1967). Like **3** but leaves broadly elliptical, with longer straight hairs only, especially on the margin; peduncle 30–40 cm, much exceeding leaves. *Rock-crevices.* ● *Kriti.* Cr.

5. S. minoana (P. H. Davis) W. Greuter, *op. cit.* 241 (1967). Like **3** but leaves elliptic-obovate, 1½–2¾ times as long as wide, subobtuse, entire, appressed-sericeous and with short, curved hairs; involucral bracts 2¾–3 times as long as wide; corona with 27–33 veins. *Calcareous rocks.* ● *Kriti.* Cr.

6. S. variifolia Boiss., *Fl. Or.* **3**: 137 (1875). Like **3** but leaves obovate, 2–2¾ times as long as wide, subacute, sericeous when young, becoming glabrous, the outer and inner entire, the middle pinnatifid, with 2–5 lobes 10–25 mm; cauline leaves pinnatifid; corona with 27–38 veins. *Rocky places. Karpathos.* Cr. (*Rhodos.*)

7. S. hymettia Boiss. & Spruner in Boiss., *Diagn. Pl. Or. Nov.* **1(2)**: 111 (1843). Caespitose perennial, woody at base. Stem c.25 cm Leaves, except the lowest, 3- or 5-fid, densely silvery sericeous. Capitula 25–35(–40) mm in diameter. Involucral bracts ovate, obtuse, usually ⅓–½ as long as florets. Receptacular bracts ovate-lanceolate, widened and membranous towards base. ovate-lanceolate, widened and membranous towards base. *Rock-crevices.* ● *C. & S. Greece and N. Aegean region.* Gr.

Information on the florets is apparently not available.

8. S. epirota Halácsy & Bald., *Verh. Zool.-Bot. Ges. Wien* **42**: 577 (1893). Perennial, woody at base. Stem 15–40 cm, ascending, leafy in the lower half, densely hirsute, with 1–4 capitula. Leaves elliptic-lanceolate, entire or serrate, densely hirsute. Capitula 35–55 mm in diameter. Involucral bracts 12–20 mm, ¾ as long as flowers, linear-lanceolate, shortly acute, densely hirsute. Involucel-tube *c.* 4·5 mm; pits *c.* 2 mm, linear; corona

[2] By A. Jasiewicz.

c. 3·5 mm, with *c.* 25 veins. Calyx-setae *c.* 3 times as long as corona. Corolla of marginal florets 2–3 cm, about twice as long as that of the central, pink. Anthers *c.* 1·9–2·2 mm. *Limestone rocks.* ● *S. Albania, N.W. Greece.* Al Gr.

9. S. sphaciotica Roemer & Schultes, *Syst. Veg.* **3**: 86 (1818). Caespitose perennial, woody at base. Stem 3–10 cm, slender, leafless or with 1 pair of leaves at base. Leaves up to 20 × *c.* 5 mm, linear or linear-lanceolate, pinnatifid, with broadly elliptical lobes, white-lanate or green and densely hirsute. Capitula 10–15 mm in diameter, solitary, with *c.* 8(–13) florets. Involucral bracts 4–5 mm, *c.* ¾ as long as florets, ovate-lanceolate, obtuse, densely white-pubescent. Involucel-tube *c.* 1·5 mm; pits *c.* 0·6 mm; corona with 25–30 veins. Calyx-setae about twice as long as corona. Corolla of marginal florets 6–10 mm, distinctly longer than that of the central, lilac-pink. Anthers *c.* 1·5 mm. *Mountain screes.* ● *Kriti.* Cr.

10. S. pulsatilloides Boiss., *Elenchus* 58 (1838). Caespitose perennial, woody at base. Stem densely whitish-pubescent, with 1(–2) pairs of leaves at base. Basal leaves *c.* 1·5–4 cm, elliptic-oblong, 1- to 2-pinnatifid or 2-pinnatisect, the segments oblanceolate or obovate, entire or scarcely dentate. Capitula (20–)27–35(–40) mm in diameter. Involucral bracts 7–12(–20) mm, ½–¾ as long as florets, ovate-lanceolate, entire or the larger pinnatifid, pubescent. Corona 3–4 mm, slightly shorter than involucel-tube. Calyx-setae 2–3 times as long as corona. Corolla distinctly longer in marginal than central florets, purple or bluish. Anthers 2–3 mm. *Limestone rocks.* ● *N.E. & S. Spain.* Hs.

(a) Subsp. **pulsatilloides**: Stem 4–12(–20) cm, with one capitulum. Leaves silvery-lanate. Capitulum solitary. Corona with 16–20 veins. Calyx-setae purple. *S. Spain* (*Sierra Nevada*).

(b) Subsp. **macropoda** (Costa ex Willk.) Nyman, *Consp.* 342 (1879): Stem up to 35 cm. Leaves green, hirsute. Capitula 3. Corona with 24–25 veins. Calyx-setae pale. *N.E. Spain.*

11. S. isetensis L., *Mantissa* 37 (1767). Sparsely hirsute perennial, woody at base. Stem 25–45 cm, erect or ascending, leafy, slightly branched above. Leaves elliptic-ovate, pinnate or 2-pinnatisect, the segments 1–3 mm wide, linear-lanceolate. Capitula 1–3(–5), *c.* 23–25 mm. Involucral bracts 6–8 mm, ½–⅔ as long as florets, narrowly ovate, obtuse, densely white-hirsute. Corona 2–3·6 mm, shorter than involucel-tube, with 24–30 veins. Calyx-setae *c.* 1½ times as long as corona. Corolla of marginal florets 13–15 mm, about twice as long as that of the central, pale or pinkish-yellow. Anthers 1·8–1·9 mm. *Steppes. E.C. & S.E. Russia.* Rs (C, E).

12. S. crenata Cyr., *Pl. Rar. Neap.* **1**: 11 (1788). Caespitose perennial, woody at base. Stem 3–25(–80) cm, simple or branched towards base, leafy throughout or with leaves crowded towards base. Leaves oblong-ovate, the lower spathulate, dentate, the upper pinnatifid or 1- to 2-pinnatisect; segments broadly elliptical or linear-lanceolate, densely hirsute or glabrous. Capitula 2–4 cm in diameter, usually solitary. Involucral bracts *c.* 4 mm, ½ as long as florets, elliptic-ovate, densely white-lanate. Corona 3–5·2 mm, longer than involucel-tube, with 26–29 veins. Calyx-setae 2–3 times as long as corona. Corolla of marginal florets (10–)13–16(–20) mm, distinctly longer than the central, pinkish-lilac. Anthers (1·6–)1·7–2(–2·2) mm. *Rocky places. C. & E. Mediterranean region.* Al Gr It Ju Si.

1 Stem more than 8 cm — (a) subsp. **crenata**
1 Stem not more than 8 cm
2 Leaves ± glabrous — (b) subsp. **dallaportae**
2 Leaves densely hirsute — (c) subsp. **breviscapa**

(a) Subsp. **crenata**: Stem more than 8 cm. Leaves pinnatisect. *Throughout the range of the species.*

(b) Subsp. **dallaportae** (Heldr. ex Boiss.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 511 (1930): Stem not more than 8 cm. Leaves dentate to pinnatisect, more or less glabrous. ● *S.E. Italy and W. Greece.*

(c) Subsp. **breviscapa** (Boiss. & Heldr.) Hayek, *loc. cit.* (1930): Stem not more than 8 cm. Leaves 1- or 2-pinnatifid to -pinnatisect, densely hirsute. ● *S. Greece* (*Taÿetos*).

13. S. graminifolia L., *Cent. Pl.* **1**: 6 (1755). Densely silvery-sericeous, caespitose perennial, woody at base. Stem (10–)20–30(–40) cm, ascending, leafy for lower ⅓–⅔. Leaves (1·5–)2·5–3·5 mm wide, linear or linear-lanceolate, acute. Capitula (25–)30–40(–45) mm in diameter, solitary. Involucral bracts 7–10(–14) mm, triangular-ovate, ½–⅔ as long as florets. Involucel-tube 3·5–4(–4·2) mm; pits 1·5–2(–2·2) mm, narrowly elliptical, hirsute; corona 3–4 mm, about as long as or slightly shorter than tube, with 22–28(–30) veins. Calyx-setae about as long as corona. Corolla *c.* 20 mm in marginal florets, about twice as long as that of the central, bluish-violet. $2n = 16, 18$. *Rocks and stony places; calcicole. S. Europe.* Al Ga Gr He Hs It Ju.

14. S. rhodopensis Stoj. & Stefanov, *Kew Bull.* **1924**: 98 (1924). Like **13** but leaves 1–2(–2·7) mm wide; capitula 14–30 mm in diameter; corolla pale yellow. $2n = 18$. *Limestone rocks.* ● *Rodopi.* Bu Gr.

15. S. argentea L., *Sp. Pl.* 100 (1753) (*S. eburnea* Sibth. & Sm., *S. thracica* Velen., *S. ucranica* L.). Biennial or perennial, pubescent to subglabrous, with short curved hairs and long setae. Stem 30–70 cm, ascending, branched, pubescent at base. Lower and middle leaves 1- to 2-pinnatifid, with narrowly lanceolate to linear, entire or scarcely dentate segments; upper leaves linear, entire. Capitula 15–25 mm in diameter. Involucral bracts narrowly lanceolate to linear, widened at base. Involucel-tube (2·2–)2·6–3·3 mm; pits (0·7–)1–1·5(–1·7) mm, obovate, pubescent in the lower part; corona 1–1·8(–2·4) mm, shorter than tube, with 21–25 veins. Calyx-setae 2–4 times as long as corona, with short glandular hairs at the base. Corolla of marginal florets 12–15 mm, distinctly longer than that of the central, whitish-yellow, yellow or pinkish-yellow. Anthers (1·6–)1·7–2·2 mm. $2n = 16$. *S. Europe, extending northwards to c.* 51° 30′ *N. in S.C. Russia.* Al Bu Gr It Ju Rm Rs (W, K, E) Si Tu [Ga].

A very variable species, within which several taxa have been described, but these have very insignificant and inconstant characters and seem to be worthy of no more than varietal status.

16. S. stellata L., *Sp. Pl.* 100 (1753). Shortly pubescent annual, with scattered, long, erect hairs. Stem (10–)20–60 cm, erect, simple or branched. Middle leaves elliptic-oblong, dentate to pinnatifid with 4–6(–7) pairs of elliptic-lanceolate to linear segments. Involucral bracts (10–)12–20 mm, lanceolate, entire, shorter than to about equalling florets. Receptacular bracts broadly ovate, long-acuminate. Involucel-tube 5–8·5 mm; pits broadly ovate, long-acuminate. Involucel-tube 5–8·5 mm; pits 2·3–2·5 mm, hirsute and narrow in the lower part; corona 6–9·5 mm, distinctly longer than tube, with 30–39 veins. Calyx-setae 6·3–10 mm, slightly longer than corona, with very short 1- to 2-celled basal glandular hairs having globose glands. Corolla of marginal florets distinctly longer than that of the central, pale blue. Anthers 1·9–2·1 mm. *S.W. Europe.* Bl Ga Hs It Lu Sa.

(a) Subsp. **stellata**: Cauline leaves, except the upper, obovate-lanceolate, simple, dentate. Capitula 23–50 mm in diameter. Corolla of marginal florets 14–21 mm. Involucel-tube 6·7–8·5 mm. *Spain and Portugal.*

(b) Subsp. **simplex** (Desf.) Coutinho, *Fl. Port.* 595 (1913): Cauline leaves, except the lowest, pinnatifid. Capitula 19–25 mm in diameter. Marginal florets few, with corolla 12–16 mm. Involucel-tube 5·2–7·1 mm. *Throughout the range of the species.*

17. S. monspeliensis Jacq., *Misc. Austr. Bot.* **2**: 320 (1781). Like **16(b)** but capitula (10–)14–20(–27) mm in diameter; involucral bracts trifid or pinnatifid; involucel-tube 3·6–5·7 mm; pits (1·6–)1·8–2·4 mm, obovate; corona (3·6–)4–7 mm, with 32–36 veins; calyx-setae 8–16 mm, 2–2½ times as long as corona, with long 2- to 4-celled glandular hairs with obovoid glands; marginal florets with corolla (9·5–)12–13(–14) mm, scarcely longer than that of the central; anthers 0·7–1·1 mm. *S.W. Europe.* Ga Hs Lu.

18. S. rotata Bieb., *Fl. Taur.-Cauc.* **3**: 102 (1819). Densely pubescent annual with some long, erect hairs. Stem (10–)20–50 cm, erect, branched. Lower leaves oblong-lanceolate, entire or slightly dentate; upper leaves lyrate, pinnatifid or pinnatisect, with 1–2 pairs of narrowly lanceolate, entire segments. Capitula 15–20 mm in diameter. Involucral bracts lanceolate, distinctly longer than florets. Receptacular bracts oblanceolate. Involucel-tube (4·5–)5–6(–6·5) mm; pits 2–3 mm, obovate; corona (5–)6–8(–9·5) mm, longer than tube, with 27–35 veins. Calyx-setae *c.* 1½ times as long as corona, glabrous at base. Corolla of marginal florets 9–11(–12) mm, slightly longer than that of the central, reddish. $2n = 18$. *Dry, stony places. C. part of Balkan peninsula; Krym.* Al Bu Ju Rs (K).

19. S. micrantha Desf., *Ann. Mus. Hist. Nat.* (*Paris*) **11**: 168 (1808). Shortly hirsute annual, with some long, erect hairs. Stem 20–60 cm, erect, branched. Lower leaves oblong-spathulate, entire; upper leaves lyrate, pinnatisect, with linear-lanceolate segments. Capitula 20–30 mm in diameter, oblong-ovoid in fruit. Involucral bracts (10–)12–15(–20) mm, lanceolate, longer than florets. Involucel-tube 3–4 mm; pits 1–1·7 mm; corona (1·7–)2–3 mm, shorter than tube, circular in outline, with (20–)27–30(–33) very slightly excurrent veins. Calyx-setae 2–3 times as long as corona. Corolla of marginal florets 8·5–12 mm, slightly longer than that of the central, reddish. *C. part of Balkan peninsula; Krym.* Bu Ju Rs (K, ?E).

20. S. sicula L., *Mantissa Alt.* 196 (1771). Shortly pubescent annual, with some long, erect hairs. Stem (10–)20–40 cm, branched. Lower leaves oblong-lanceolate, spathulate, entire or slightly dentate; upper leaves lyrate-pinnatisect, with narrowly lanceolate or linear segments. Capitula 10–15 mm in diameter, ellipsoid or globose-ellipsoid in fruit. Involucral bracts 18–24 (–28) mm, narrowly lanceolate, about twice as long as florets. Involucel-tube 2·5–3·8 mm; pits 1·2–1·6 mm, glabrous; corona (1·6–)2–2·5(–2·7) mm, shorter than tube, square in outline, with (20–)23–25 veins, distinctly excurrent for *c.* 1–1·5 mm. Calyx-setae 2–4 times as long as corona. Corolla of marginal florets 6–8 mm, slightly longer than that of the central, reddish. *Dry, stony places. Mediterranean region and Macedonia.* Bu Cr Gr Hs Ju Si Tu.

21. S. hispidula Boiss., *Diagn. Pl. Or. Nov.* **1(2)**: 112 (1843). Densely pubescent annual. Stem 15–50 cm, branched. Leaves pinnatifid or pinnatisect, the upper slightly lyrate, with 1–7 pairs of segments, lanate, the terminal segments slightly wider than the lateral. Capitula 10–20 mm in diameter. Involucral bracts (8–)11–15(–17) mm, linear-lanceolate, as long as or longer than florets, rarely slightly shorter. Involucel-tube (1·2–)1·8–2·4 mm; pits 0·6–1(–1·3) mm, pubescent; corona (0·8–)1–1·2(–1·5) mm, with 17–24, distinctly excurrent veins. Calyx-setae 4–7 mm, 4–5 times as long as corona, with long white hairs and shorter glands at the base. Corolla of marginal florets 9–12(–14) mm, about twice as long as that of the central, yellow, pinkish towards apex. *Dry, stony places. E. Bulgaria.* Bu. (*Anatolia.*)

22. S. cosmoides Boiss., *op. cit.* 113 (1843). Like **21** but less densely pubescent; basal leaves obovate-lanceolate, dentate; cauline leaves lyrate, with 1–4 pairs of segments, the terminal 3–6(–10) mm wide, distinctly larger than the lateral, lanceolate. Capitula 15–25(–30) mm. Involucral bracts (12–)14–18(–23) mm. Calyx-setae *c.* 6 times as long as corona, with only short glandular hairs at base. Corolla of marginal florets 13–18 mm, deep reddish-purple. *Dry, stony places. S.E. Bulgaria.* Bu. (*W. Anatolia.*)

Sect. CYRTOSTEMMA Mert. & Koch. Ribs on involucel-tube becoming wider and confluent upwards; corona with 8 veins joining at margin.

23. S. atropurpurea L., *Sp. Pl.* 100 (1753) (*S. maritima* L.). Subglabrous or somewhat hirsute biennial. Stem 20–60 cm, branched. Lower leaves oblong-spathulate, entire or lyrate, long-petiolate; middle and upper leaves pinnatifid, with entire or dentate segments. Capitula 20–30 mm in diameter, oblong-ellipsoid in fruit. Involucral bracts narrowly lanceolate, wider towards base, as long as or shorter than florets. Corolla of marginal florets 12–18 mm, slightly longer than the central, lilac to dark purple. Involucel-tube hispid or subglabrous; corona about as long as tube, broadly infundibuliform; calyx-setae *c.* 3–5 times as long as corona, on long stipe. All fruits with long calyx-setae. $2n = 16$. *Dry places. S. Europe.* Al Az Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu [Br].

24. S. semipapposa Salzm. ex DC., *Prodr.* **4**: 658 (1830). Like **23** but more densely pubescent; corolla of marginal florets distinctly longer than the central; corona very narrowly infundibuliform; lowest and sometimes middle fruits in capitulum with the calyx-setae very short or absent. *Spain.* Hs.

Sect. SCLEROSTEMMA Mert. & Koch. Ribs on involucel-tube of uniform width and not confluent; corona with 20–24 veins.

25. S. silenifolia Waldst. & Kit., *Pl. Rar. Hung.* **2**: 170 (1803–1804). Perennial. Stem 3–10(–15) cm, simple or branched towards base, shortly pubescent, leafy towards base. Leaves of non-flowering rosettes and lower cauline leaves spathulate, obtuse to subacute, entire, ciliate, otherwise glabrous; upper cauline leaves lyrate, with lanceolate- to elliptic-lanceolate segments, the terminal distinctly wider than the lateral. Capitula 15–25 mm in diameter. Involucral bracts 6–10 mm, ovate-lanceolate, as long as or shorter than florets. Involucel-tube *c.* 3 mm; corona *c.* 0·7 mm. Calyx-setae 2–3 times as long as corona. Corolla of marginal florets *c.* 9–12 mm, distinctly longer than that of the central, lilac-blue. *Rocky mountain pastures.* ● *C. Appennini and N.W. part of Balkan peninsula.* Al It Ju.

26. S. vestina Facch. ex Koch, *Syn. Fl. Germ.* ed. 2, 447 (1843). Perennial. Stem 10–40 cm, simple or branched, shortly pubescent, leafy. Leaves on non-flowering rosettes narrowly spathulate, obtuse or subacute, entire, glabrous; cauline leaves, except the lowest, pinnatisect, the segments linear or linear-lanceolate. Capitula 20–32 mm in diameter. Involucral bracts (7–)10–16(–18) mm, narrowly lanceolate, shorter than to as long as florets. Involucel-tube 2–2·7 mm; corona 0·7–1·4 mm. Calyx-setae 6–7 mm, *c.* 5–9 times as long as corona. Corolla of marginal florets 10–15 mm, about twice as long as the central, purple. $2n = 16$. *Rocky places and scrub.* ● *S. Alps, N. Appennini.* It.

27. S. canescens Waldst. & Kit., *Pl. Rar. Hung.* **1**: 53 (1801) (*S. suaveolens* Desf. ex DC.). Perennial. Stem 15–60 cm, branched, shortly pubescent, leafy. Leaves of non-flowering rosettes and lower cauline leaves lanceolate, entire, acute; upper cauline leaves pinnatifid or pinnatisect, the segments linear or linear-lanceolate. Capitula 15–25 mm in diameter. Involucral bracts 4–6 mm, ovate-lanceolate, $\frac{1}{3}$–$\frac{1}{2}$ as long as florets. Involucel-tube 2·1–2·2 mm; corona 0·4–1 mm. Calyx-setae 1·4–1·6 mm, 2–2½ times as long as corona. Corolla of marginal florets 10–15 mm, about twice as long as the central, blue or lilac. $2n=16$. ● *C. & W. Europe, extending northwards to S. Sweden and southwards to C. Jugoslavia.* Au Be Cz Da Ga Ge He Hu Ju Po ?Rm Su.

28. S. parviflora Desf., *Fl. Atl.* **1**: 119 (1798) (*S. dichotoma* Ucria, non Lam.). Slightly pubescent annual. Stem 20–30 cm, dichotomously branched, with capitula in the angles. Leaves elliptic-obovate to lanceolate, obtuse, entire or dentate to pinnatifid. Capitula *c.* 10 mm in diameter, globose, sessile or very shortly pedunculate. Involucral bracts linear or linear-lanceolate, slightly longer than florets. Involucel-tube 1·7–2·3 mm; corona 1–1·3 mm. Calyx-setae shorter than corona. Corolla 4·5–7 mm, slightly longer in marginal than central florets, reddish-pink. Anthers 0·5–0·6 mm. *Cultivated fields.* ● *Sicilia.* Si.

29. S. tenuis Spruner ex Boiss., *Diagn. Pl. Or. Nov.* **1(2)**: 114 (1843). Slightly pubescent annual. Stem 10–70 cm, usually branched. Basal leaves oblanceolate, dentate, the upper 2-pinnatisect, with linear segments 0·5–1 mm wide. Capitula 25–30 mm in diameter. Involucral bracts 7–10 mm, linear-lanceolate, the outer ovate, shorter than florets. Involucel-tube 2·4–3·3 mm; corona 0·7–1·3 mm. Calyx-setae 5–12 mm, on stipe about as long as corona. Corolla 12–15 mm, slightly longer in marginal than central florets, purple. *Rocky places.* ● *Albania, N.W. & C. Greece.* Al Gr.

(30–38). S. columbaria group. Densely lanate, stellate-hairy, hispid or subglabrous perennials, rarely biennials. Basal leaves simple, lyrate or pinnatifid; cauline leaves 1- to 2-pinnatifid, pinnatisect or simple. Capitula 20–40 mm in diameter. Involucral bracts narrowly lanceolate, wider towards base, longer to shorter than florets. Corona shorter than tube, *c.* 24-veined. Calyx-setae up to 6 times as long as corona. Corolla of marginal florets slightly longer than the central, reddish-purple to lilac-blue.

A variable group in which many of the taxa perhaps merit only subspecific rank. Populations characteristic of the species are found in only a few areas. Populations intermediate between two or three species occur in often widely separated areas; they are not considered in the following key.

1 Leaves densely stellate-pubescent **30. cinerea**
1 Leaves without stellate hairs
2 Leaves densely lanate
3 Basal and lower cauline leaves 1- to 2-pinnatifid or slightly lyrate with terminal segment slightly longer than the lateral **31. turolensis**
3 Basal and lower cauline leaves simple, or slightly lyrate with terminal segment several times as long as the lateral
4 Leaves silvery-lanate; upper cauline leaves with narrow, lanceolate segments, the terminal segment slightly wider than the lateral **32. holosericea**
4 Leaves yellow- or greenish-lanate; upper cauline leaves with orbicular-ovate or elliptical terminal segment, several times as wide as the lateral **33. taygetea**
2 Leaves glabrous to shortly hispid
5 Calyx-setae much shorter than corona or absent
6 Leaves of non-flowering rosette and lower cauline leaves lyrate **34. triandra**
6 Leaves of non-flowering rosette and lower cauline leaves 2-pinnatisect **35. achaeta**
5 Calyx-setae 2–6 times as long as corona
7 Calyx-setae winged at base in fruit **36. lucida**
7 Calyx-setae not winged at base in fruit
8 Leaves glabrous, shiny; middle and upper cauline leaves usually simple **37. nitens**
8 Leaves hispid; middle and upper cauline leaves pinnatifid or lyrate **38. columbaria**

30. S. cinerea Lapeyr. ex Lam., *Tabl. Encycl. Méth. Bot.* **1**: 251 (1792). Stem simple or branched. Leaves whitish-stellate-pubescent; leaves of non-flowering rosettes and lower cauline leaves lanceolate, crenate-dentate; upper cauline leaves 1- to 2-pinnatifid or -pinnatisect, the terminal segments much larger than the lateral, lanceolate or ovate-lanceolate. Corolla bluish-violet. $2n=16$. ● *Pyrenees*; *E. Alps*; *Albania and W. Jugoslavia.* Al Ga Hs It Ju.

(a) Subsp. **cinerea** (*S. pyrenaica* auct., non All., *S. leucophylla* Borbás): Leaves whitish-stellate; cauline leaves, except the lowest, lyrate; stem usually leafy in the lower part. *Pyrenees*; *Balkan peninsula.*

(b) Subsp. **hladnikiana** (Host) Jasiewicz, *Bot. Jour. Linn. Soc.* **71**: 50 (1975) (*S. hladnikiana* Host): Leaves greenish, not so densely covered by stellate hairs; cauline leaves, except the lowest, 2-pinnatisect or lyrate; stem usually leafy for lower $\frac{2}{3}$–$\frac{3}{4}$. *E. Alps and N.W. Jugoslavia.*

Intermediate between **30(a)** and **36(b)**.

31. S. turolensis Pau ex Willk., *Suppl. Prodr. Fl. Hisp.* 74 (1893) (*S. tomentosa* Cav., non J. F. Gmelin). Leaves densely whitish-lanate, the basal and lower cauline 1- to 2-pinnatifid or -pinnatisect, with short, elliptic-ovate, entire or dentate segments, the obtuse terminal segment slightly longer than the lateral; upper cauline leaves pinnatisect, with narrow, linear, pubescent segments. Corolla reddish-purple. *S. & C. Spain.* Hs.

32. S. holosericea Bertol., *Rar. Lig. Pl.* **3**: 49 (1810) (?*S. pyrenaica* All.). Leaves densely silvery-lanate, the basal and lower cauline elliptic-lanceolate, acute, crenate or entire; upper cauline leaves pinnatifid or pinnatisect, with narrow, lanceolate segments, or absent. Corolla reddish-purple. ● *Italy, Sardegna.* It Sa.

Plants intermediate between **32** and **38** occur in S.E. & S.C. France.

33. S. taygetea Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 73 (1846). Leaves densely yellow- to greenish-lanate, with very long hairs, the basal obovate, simple or somewhat lyrate, long-petiolate; cauline leaves lyrate, with very large, orbicular-ovate or elliptical terminal segment and obovate-oblanceolate lateral segments. Corolla reddish. *Limestone rocks.* ● *S. & C. Greece*; *S. Jugoslavia*; *S.E. Italy.* Gr It Ju.

The most characteristic populations occur only in S. Greece (Taïyetos). The plants from Jugoslavia and Italy, which are sometimes given varietal status, are intermediate between **33** and **38**.

34. S. triandra L., *Sp. Pl.* 99 (1753) (*S. gramuntia* L.). Leaves densely hispid, the basal lyrate; cauline leaves 1- to 2(–3)-pinnatisect, with narrowly lanceolate or linear segments. Calyx-setae usually absent, sometimes 1–2. Corolla bluish-violet. $2n=16$. ● *S. & S.C. Europe.* Al Au Co Cz Ga He Hs Hu It Ju Lu Sa Si.

A very polymorphic species, with many variants intermediate between it and most other species of the group.

35. S. achaeta Vis. & Pančić, *Mem. Ist. Veneto* **12**: 465 (1866). Biennial, densely hispid towards base. Basal leaves pinnatisect, with narrowly linear, obtuse segments; cauline leaves 1- to 2-pinnatisect, with very narrow segments. Involucral bracts ovate-lanceolate. Calyx-setae absent. Corolla purple. ● *C. Jugoslavia.* Ju.

36. S. lucida Vill., *Prosp. Pl. Dauph.* 18 (1779). Stem usually simple, rarely branched. Leaves glabrous or subglabrous, the basal ovate-lanceolate or rhombic. Capitula usually solitary. Calyx-setae distinctly winged at base, 4–5 times as long as corona. Corolla reddish-purple. $2n=16$. ● *Mountains of C. & S. Europe, from the Vosges and Carpathians southwards to the Pyrenees, N. Appennini and S.W. Bulgaria.* Al Au Bu Cz Ga Ge He Hu It Ju Po Rm Rs (W).

(a) Subsp. **lucida**: Stem leafy for up to lower ¼. Leaves, except the lowest, 1- to 2-pinnatifid or -pinnatisect; basal rosettes of leaves always present. *Throughout the range of the species.*

(b) Subsp. **stricta** (Waldst. & Kit.) Jasiewicz, *Bot. Jour. Linn. Soc.* **71**: 50 (1975) (*S. stricta* Waldst. & Kit.): Stem leafy for the lower $\frac{2}{3}$–$\frac{3}{4}$. Leaves, except the upper, simple, ovate-lanceolate or rhombic, acute; basal leaves absent at flowering. *E. Alps and N.W. Jugoslavia.*

37. S. nitens Roemer & Schultes, *Syst. Veg.* **3**: 82 (1818). Glabrous or subglabrous perennial. Stem simple or branched. Leaves lanceolate, acute, deeply crenate-dentate, simple or rarely the upper lyrate, shiny. Calyx-setae 2½–4 times as long as corona. Corolla reddish-purple. ● *Açores.* Az.

38. S. columbaria L., *Sp. Pl.* 99 (1753) (*S. dubia* Velen., non Moench). Stem usually branched. Basal and non-flowering rosette-leaves ovate-lanceolate, obovate, lanceolate or lyrate-pinnatifid; cauline leaves 1- to 2-pinnatifid or pinnatisect, the segments lanceolate or linear, usually hispid, rarely subglabrous. Calyx-setae 3–6 times as long as corona. Corolla bluish-lilac. $2n=16$. *Europe, from S. Scotland and Estonia southwards, but absent from most of the islands.* Al Au Be Br Bu Co Cz Da Ga Ge He Ho Hs Hu It Ju Lu Po Rm Rs (B, C, W, K, E) Su.

1 Involucral bracts at least as long as florets, with long hairs **(b)** subsp. **pseudobanatica**
1 Involucral bracts shorter than florets, with short hairs
2 Leaves with long hairs **(c)** subsp. **portae**
2 Leaves with short hairs **(a)** subsp. **columbaria**

(a) Subsp. **columbaria**: Leaves with short hairs, the cauline with narrowly lanceolate terminal segments, not or scarcely wider than the lateral; involucral bracts shorter than florets, with short hairs. *Throughout the range of the species.*

(b) Subsp. **pseudobanatica** (Schur) Jáv. & Csapody, *Icon. Fl. Hung.* 496 (1933): Like subsp. **(a)** but involucral bracts at least as long as florets, with long hairs. ● *E. & C. Carpathians.*

(c) Subsp. **portae** (A. Kerner ex Huter) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 517 (1930): Leaves with dense, long hairs; cauline leaves with wide terminal segment, sometimes wider than the lateral. *Italy and N.W. part of Balkan peninsula.*

Intermediate between **38**(a) and **33**.

(39–43). S. ochroleuca group. Shortly hairy to lanate or subglabrous perennials. Basal leaves simple, lyrate or pinnatifid; cauline leaves 1-to 3-pinnatifid or pinnatisect. Capitula 15–25 mm in diameter. Involucral bracts narrowly lanceolate, wider at base, shorter to longer than florets. Corona shorter than tube, with *c.* 24 veins. Calyx-setae up to 6 times as long as corona. Corolla of marginal florets slightly to much longer than that of the central, yellow to whitish.

A very variable group in which many intermediates have been described as species. The intermediate populations are probably of hybrid origin and often grow in the absence of the parents; they are not considered in the following key.

1 Non-flowering rosette-leaves and lower cauline leaves 2- to 3-pinnatifid
2 Calyx-setae absent or shorter than corona **42. fumarioides**
2 Calyx-setae 2–5 times as long as corona **43. triniifolia**
1 Non-flowering rosette-leaves and lower cauline leaves entire, 1-pinnatifid or lyrate
3 Leaves glabrous or very slightly pubescent **39. balcanica**
3 Leaves pubescent or lanate
4 Leaves shortly pubescent **40. ochroleuca**
4 Leaves densely pubescent or lanate **41. webbiana**

39. S. balcanica Velen., *Fl. Bulg.* 243 (1891). Stem glabrous in the lower and middle part, shortly pubescent below the capitula. Leaves glabrous or slightly pubescent on veins and margins; leaves of non-flowering rosettes ovate-lanceolate, crenate-dentate, long-petiolate; basal leaves entire or lyrate; cauline leaves lyrate, pinnatisect or somewhat 2-pinnatisect, with linear segments. Involucral bracts narrowly lanceolate, as long as florets, pubescent. Calyx-setae up to 4 times as long as corona, dark brown. Corolla slightly longer in marginal than central florets. *Alpine meadows*; *calcifuge.* ● *S & E. Jugoslavia, W. Bulgaria.* Bu Ju.

40. S. ochroleuca L., *Sp. Pl.* 101 (1753). Stem pubescent. Leaves of non-flowering rosettes obovate-lanceolate, crenate; lower cauline leaves entire or lyrate; upper cauline leaves lyrate or 1-pinnatisect, pubescent. Involucral bracts shorter than florets. Calyx-setae 2–3 times as long as corona. Corolla distinctly longer in marginal than central florets. $2n=16$. *Dry meadows and stony places. S.E. & E.C. Europe, extending westwards to Italy and northwards to Latvia.* Al Au Bu Cz Ge Hu It Ju Po Rm Rs (B, C, W, E) Tu [Ga].

Subsp. **danubialis** Velen., *Fl. Bulg.* 243 (1891), and subsp. **rhodopea** Velen., *Sitz.-Ber. Böhm. Ges. Wiss.* **29**: 16 (1894), are intermediate between **40** and **43**. They are very polymorphic and occur particularly often in regions where the species are in contact.

41. S. webbiana D. Don, *Bot. Reg.* **9**: t. 717 (1823). Stem erect, simple or branched, glabrous at base, hirsute above. Leaves of non-flowering rosettes and lower cauline leaves ovate, dentate, lyrate or 1-pinnatifid, densely lanate; upper cauline leaves 2-pinnatifid or lyrate. Involucral bracts shorter than florets, densely white-hirsute. Calyx-setae 3–4 times as long as corona. Corolla slightly longer in marginal than central florets. *Dry, stony places and alpine meadows. Balkan peninsula.* Al Bu Gr Ju Tu.

42. S. fumarioides Vis. & Pančić, *Mem. Ist. Veneto* **12**: 466 (1866). Stem glabrous. Basal leaves oblanceolate, 2- to 3-pinnatisect, shortly pubescent, with linear-lanceolate segments 1–2 mm wide. Involucral bracts ⅔ as long as florets, densely pubescent. Calyx-setae absent or very short. Corolla slightly longer in marginal than central florets. *Dry, stony places.* ● *S. Jugoslavia.* Ju.

43. S. triniifolia Friv., *Flora* (*Regensb.*) **18**: 333 (1835) (*S. silaifolia* Velen.). Stem glabrous or slightly pubescent. Leaves of

non-flowering rosettes and lower cauline leaves 2- to 3-pinnatisect, with narrow, linear, slightly pubescent segments. Involucral bracts as long as florets. Calyx-setae 2–5 times as long as corona. Corolla slightly longer in marginal than central florets. $2n=16$. *Dry, stony places. Balkan peninsula.* Al Bu Gr Ju Tu.

9. Tremastelma Rafin.[1]

Like *Scabiosa* but calyx shortly stipitate, and with 10 plumose setae.

1. T. palaestinum (L.) Janchen, *Österr. Bot. Zeitschr.* **66**: 395 (1916). Annual up to 50 cm. Basal leaves 3·5–8 × 1–3 cm, oblong-oblanceolate, entire to pinnatisect or lyrate with a large, oblanceolate, terminal lobe and 4–6 small linear lateral lobes; cauline leaves smaller, often pinnatisect, with linear or linear-oblong lobes. Capitulum with outer florets radiate. Involucral bracts 9–17 × 3–5 mm, lanceolate. Corolla 9–14 mm, violet. Involucel 5–8 mm, sulcate for about half its length, with a many-veined, scarious corona 2–3 mm. Calyx 8–10 mm, with 10 setae; stalk *c.* 4 mm. $2n=16$. *S. & W. parts of Balkan peninsula, Aegean region, Istra.* Al Bu Cr Gr ?It Ju Tu.

10. Pycnocomon Hoffmanns. & Link[2]

Like *Scabiosa* but involucral bracts connate in the basal half; involucel 4-angled, with 4-lobed limb; capitulum with the outer florets radiate, the calyx with setae only in the central florets.

1. P. rutifolium (Vahl) Hoffmanns. & Link, *Fl. Port.* **2**: 94 (1825) (*Scabiosa rutifolia* Vahl). Glabrous to pubescent perennial; stems up to 1·75 m, erect, usually branched. Basal leaves up to 6·5 cm, linear-oblanceolate to obovate-spathulate, crenately lobed to 1- to 2-pinnatifid with entire to distally crenate-serrate, usually linear to oblong segments up to 8 × 3 mm; cauline leaves 1- to 2-pinnatisect, the uppermost linear and bract-like. Capitulum 5–20 mm in diameter; lobes of the involucre 2–7 mm, triangular-ovate, acute. Involucel with short limb, the lobes unequally denticulate. Corolla pink to yellowish or white. $2n=18$. *Maritime sands. W. Mediterranean region, S. Portugal.* Co Hs It Lu Sa Si.

CAMPANULALES

CLXVIII. CAMPANULACEAE[3]

Herbs or very rarely small shrubs, usually with latex. Leaves usually alternate, exstipulate. Flowers hermaphrodite. Calyx 3- to 5-fid. Corolla more or less deeply lobed; lobes valvate. Stamens free or connate. Disc sometimes present. Style 1; stigmas 2–5. Ovary inferior, 2- to 5-locular. Capsule dehiscing by pores, valves or irregularly, rarely indehiscent. Seeds numerous.

1 Flowers zygomorphic; filaments connate
2 Corolla-tube split dorsally for at least half its length **14. Lobelia**
2 Corolla-tube not or scarcely split dorsally **15. Laurentia**
1 Flowers actinomorphic; filaments free, though anthers sometimes connate
3 Corolla divided nearly to base into linear-lanceolate or oblong lobes
4 Leaves pinnate or pinnatisect **7. Petromarula**
4 Leaves entire, crenate or serrate
5 Flowers solitary or in small clusters in spicate or racemose inflorescences
6 Flowers distinctly pedicellate; capsule dehiscing by pores near the base **1. Campanula**
6 Flowers sessile or subsessile; capsule dehiscing by pores at or above the middle **8. Asyneuma**
5 Flowers in capitula, dense spikes or umbels
7 Flowers without bracts; flower-buds straight; capsule dehiscing by 2 apical valves **13. Jasione**
7 Each flower subtended by a bract; flower-buds usually curved; capsule dehiscing by pores near the middle
8 Corolla-lobes becoming free after anthesis; flowers sessile or subsessile **9. Phyteuma**
8 Corolla-lobes remaining coherent at apex; flowers distinctly pedicellate **10. Physoplexis**
3 Corolla lobed for not more than ½ its length
9 Ovary and capsule cylindrical **5. Legousia**
9 Ovary and capsule ovoid, globose or pyriform
10 Anthers connate in a tube round the style at anthesis **3. Symphyandra**
10 Anthers free at anthesis
11 Base of style surrounded by a conspicuous disc
12 Herb; corolla not constricted in the middle; disc tubular **4. Adenophora**
12 Dwarf shrub; corolla constricted in the middle; disc flat **2. Azorina**
11 Base of style not surrounded by a conspicuous disc
13 Corolla-tube not more than 2 mm wide; style much longer than corolla **6. Trachelium**
13 Corolla-tube more than 3 mm wide; style not or little longer than corolla
14 Capsule dehiscing by lateral pores, very rarely indehiscent **1. Campanula**
14 Capsule dehiscing by valves or irregularly at apex
15 Flowers sessile or shortly pedicellate; capsule dehiscing irregularly **12. Edraianthus**
15 Flowers with long pedicels; capsule dehiscing by apical valves **11. Wahlenbergia**

Subfam. CAMPANULOIDEAE

Flowers actinomorphic. Stamens free or rarely with connate anthers.

1. Campanula L.[4]

Herbs. Inflorescence 1- to many-flowered. Ovary usually obconical or oblong-obconical. Calyx-teeth often longer than the ovary, with or without appendages between the teeth. Corolla campanulate, tubular, infundibuliform or rotate, usually blue, purple or lilac. Ovary 3- to 5-locular. Style without a disc at its base. Capsule pendent or erect, dehiscing by pores or valves, rarely indehiscent.

The corolla is blue to violet, rarely white, in all species.

C. alliariifolia Willd., *Sp. Pl.* **1**: 910 (1798), from the Caucasus and Anatolia, is more or less naturalized in England. It is an erect perennial with broadly triangular-cordate basal leaves, secund racemes of cream or white flowers and appendages between the calyx-teeth.

[1] By I. K. Ferguson. [2] By D. M. Moore. [3] Edit. T. G. Tutin.
[4] By Andrey A. Fedorov (spp. 1–104) and M. Kovanda (spp. 105–143).

Literature: T. W. Böcher, *Svensk Bot. Tidskr.* **58**: 1–17 (1964). J. Contandriopoulos, *Bull. Soc. Bot. Fr.* **113**: 453–474 (1966). J. Damboldt, *Bot. Jahrb.* **84**: 302–358 (1965); *Österr. Bot. Zeitschr.* **112**: 392–406 (1965); *Bot. Jahrb.* **88**: 200–203 (1968). T. W. J. Gadella, *Wentia* **11**: 1–104 (1964); *Proc. Konikl. Nederl. Akad. Wetensch.* ser. C, **65**: 269–278 (1962); **66**: 270–283 (1963); **69**: 502–519 (1966). D. Phitos, *Österr. Bot. Zeitschr.* **111**: 208–230 (1964); *op. cit.* **112**: 449–498 (1965). D. Podlech & J. Damboldt, *Ber. Deutsch. Bot. Ges.* **76**: 360–369 (1964).

1 Capsule dehiscing by subapical or lateral pores or valves
2 Ovary and capsule clavate, dark blue, becoming blackish **2. uniflora**
2 Ovary and capsule not clavate, usually green or brown
3 Lower leaves broadly ovate to orbicular
4 Basal leaves sessile **3. cenisia**
4 Basal leaves petiolate
5 Stems decumbent to ascending
6 Basal leaves orbicular-spathulate, sinuate; ovary hirsute **16. decumbens**
6 Basal leaves ovate-cordate, dentate; ovary glabrous to pubescent **6. arvatica**
5 Stems erect
7 Corolla cylindrical, ventricose at the base **4. zoysii**
7 Corolla rotate, broadly campanulate or infundibuliform, not ventricose at the base **5. carpatica**
3 Lower leaves obovate, spathulate, lanceolate or linear
8 Stem hispid; lower leaves rugose **9. primulifolia**
8 Stem glabrous, pubescent or hirsute; leaves not rugose
9 Ovary and capsule 5-veined; calyx-teeth distinctly longer than the corolla after anthesis **1. fastigiata**
9 Ovary and capsule usually 10-veined; calyx-teeth shorter than the corolla
10 Stems 5–10 cm; flowers subsessile, solitary, terminal **7. raineri**
10 Stems 10–100 cm; flowers pedicellate, usually numerous
11 Stem 10–35 cm; pedicels filiform **10. lusitanica**
11 Stem (20–)40–100 cm; pedicels usually not filiform
12 Stem stout, sulcate **8. aizoon**
12 Stem comparatively slender, not sulcate
13 Annual
14 Calyx-teeth subulate **12. sparsa**
14 Calyx-teeth linear to lanceolate
15 Calyx-teeth 3-veined **13. ramosissima**
15 Calyx-teeth 1-veined **11. phrygia**
13 Perennial or biennial
16 Stem simple; corolla 30–40 mm, broadly campanulate **20. persicifolia**
16 Stem usually ± branched; corolla (10–)20–30 mm, campanulate or infundibuliform
17 Root thick, napiform
18 Short non-flowering stolons usually present; pedicels mostly more than 4 cm **14. spatulata**
18 Non-flowering stolons absent; pedicels mostly less than 1 cm **19. rapunculus**
17 Roots slender
19 Calyx-teeth not appressed to corolla; inflorescence usually many-flowered **15. patula**
19 Calyx-teeth appressed to corolla; inflorescence 1- to few-flowered
20 Biennial or perennial; rhizome short or absent; inflorescence dense **17. hemschinica**
20 Perennial; rhizome procumbent, more or less stoloniferous; inflorescence lax **18. stevenii**
1 Capsule dehiscing by basal valves or pores, rarely indehiscent
21 Capsule 5-locular; stigmas 5
22 Stems erect or ascending
23 Basal leaves *c.* 30 cm, laciniate **37. laciniata**
23 Basal leaves *c.* 20 cm, not laciniate
24 Corolla broadly tubular-campanulate to campanulate
25 Stems ascending, simple or sparsely branched **32. pelviformis**
25 Stems erect, paniculately branched **31. medium**
24 Corolla tubular
26 Petioles of basal leaves not lobulate **33. tubulosa**
26 Petioles of basal leaves lobulate **35. lyrata**
22 Stems ± pendent or diffuse (S. Greece and Aegean region)
27 Calyx-appendages about as long as ovary
28 Basal leaves usually glabrous
29 Basal leaves 3–5 cm; stems slender; flowers usually solitary **34. carpatha**
29 Basal leaves 9–16 cm; stems ± robust; flowers numerous
30 Basal leaves spathulate; corolla tubular **30. merxmuelleri**
30 Basal leaves sublyrate to ovate; corolla tubular-campanulate to infundibuliform **28. reiseri**
28 Basal leaves ± pubescent
31 Basal leaves ovate to ovate-spathulate; corolla velutinous **29. rechingeri**
31 Basal leaves cordate; corolla sparsely pubescent
32 Stems numerous, sparsely leafy **23. lavrensis**
32 Stems few, densely leafy **24. goulimyi**
27 Calyx-appendages much shorter than ovary
33 Basal leaves cordate **22. topaliana**
33 Basal leaves not cordate
34 Leaves coriaceous, sparsely pubescent to glabrous; stems *c.* 20 cm **36. saxatilis**
34 Leaves not coriaceous, pubescent to tomentose; stems usually *c.* 30 cm
35 Stems with long branches **21. andrewsii**
35 Stems usually simple or with short branches
36 Leaves softly whitish-tomentose **27. enboica**
36 Leaves pubescent or greyish-velutinous
37 Basal leaves 6 cm or more; terminal lobe cordate; corolla blue **26. anchusiflora**
37 Basal leaves usually not more than 5 cm; terminal lobe not cordate; corolla lilac or blue-lilac **25. celsii**
21 Capsule 3-locular; stigmas 3
38 Calyx with appendages between the teeth
39 Appendages tooth-like, much shorter than the ovary
40 Basal leaves lyrate **43. thessala**
40 Basal leaves entire, denticulate or crenulate
41 Leaves entire
42 Stems rather stout, branched **57. calaminthifolia**
42 Stems slender or filiform, simple
43 Plant subglabrous; corolla 6–7 mm **59. amorgina**
43 Plant velutinous; corolla 12–15 mm **58. hierapetrae**
41 Leaves denticulate or crenulate
44 Leaves subglabrous; corolla pubescent **60. heterophylla**
44 Leaves pubescent or velutinous; corolla glabrous to sparsely hairy
45 Basal leaves sessile, velutinous **61. mollis**
45 Basal leaves long-petiolate, not velutinous
46 Plant papillose and rather hispid; corolla papillose and slightly hispid **62. papillosa**
46 Plant pubescent; corolla glabrous or sparsely hairy
47 Calyx-teeth broadly ovate-oblong, obtuse **64. rupicola**
47 Calyx-teeth lanceolate, subacute **63. orphanidea**
39 Appendages about as long as the ovary, or somewhat shorter
48 Basal leaves distinctly petiolate
49 Inflorescence capitate **49. lingulata**
49 Inflorescence not capitate
50 Leaves not lobed; petioles not lobulate
51 Leaves sericeous-tomentose; flowers yellowish-white **53. lanata**
51 Leaves pubescent or hispid; flowers bluish-lilac or violet
52 Leaves pubescent, crenate **51. incurva**
52 Leaves hispid, coarsely 2-serrate **52. grossekii**
50 Leaves lobed or with lobulate petioles
53 Basal leaves ovate to obovate-spathulate or -elliptical
54 Corolla 50–60 mm **48. formanekiana**
54 Corolla not more than 22 mm
55 Corolla 6–11 mm; basal leaves 2–7 cm, grey-tomentose **40. constantini**

55 Corolla 16–22 mm; basal leaves 4–10 cm, greenish, pubescent **41. scopelia**
53 Basal leaves cordate or lyrate
56 Appendages lanceolate to triangular **38. rupestris**
56 Appendages ovate
57 Basal leaves cordate; corolla (14–)16–18(–20) mm, infundibuliform **39. cymaea**
57 Basal leaves usually lyrate; corolla (17–)20–24 mm, tubular-infundibuliform **42. sciathia**
48 Basal leaves sessile or subsessile
58 Annual or biennial, without non-flowering shoots at anthesis
59 Annual; stems dichotomously branched **54. dichotoma**
59 Biennial; stems not dichotomously branched
60 Appendages shorter than the calyx-teeth **50. sibirica**
60 Appendages as long as the calyx-teeth **47. affinis**
58 Perennial, usually with non-flowering shoots at anthesis
61 Stem slender, flexuous **56. oreadum**
61 Stem straight, erect, usually stout
62 Corolla 30–45 mm, distinctly narrowed at base **55. alpestris**
62 Corolla 15–32 mm, rounded at base
63 Leaves entire; corolla bearded at the mouth **44. barbata**
63 Leaves crenulate; corolla not bearded at the mouth
64 Ovary villous **45. alpina**
64 Ovary hispid **46. speciosa**
38 Calyx without appendages
65 Flowers sessile
66 Corolla 3–5 mm; annual **98. erinus**
66 Corolla at least 10 mm; perennial or biennial
67 Inflorescence thyrsiform or spicate
68 Calyx-teeth obtuse **73. macrostachya**
68 Calyx-teeth acuminate
69 Corolla bluish-violet; inflorescence long, lax, interrupted at the base **74. spicata**
69 Corolla yellowish-white; inflorescence ovoid or oblong, usually compact **75. thyrsoides**
67 Inflorescence capitate
70 Inflorescence 2- to 4-flowered
71 Plant glabrous or sparsely setulose **66. tymphaea**
71 Plant strongly setose-hispid **67. stenosiphon**
70 Inflorescence many-flowered
72 Lower leaves gradually narrowed at base or abruptly contracted into a winged petiole
73 Setose-hispid; stem sulcate **72. cervicaria**
73 Pubescent; stem ± terete
74 Corolla 15–25 mm, about twice as long as calyx-teeth, violet **68. transsilvanica**
74 Corolla 25–30 mm, more than twice as long as calyx-teeth, blue-lilac **69. moesiaca**
72 Lower leaves truncate or cordate at base, with unwinged petiole
75 Style exserted; corolla velutinous **65. petraea**
75 Style included; corolla not velutinous
76 Leaves broadly elliptical to ovate; calyx-teeth linear **71. foliosa**
76 Leaves oblong to elliptical; calyx-teeth lanceolate **70. glomerata**
65 Flowers pedicellate
77 Annual; branching ± dichotomous
77 Annual; branching ± dichotomous
78 Corolla not more than 1½ times as long as calyx-teeth **97. delicatula**
78 Corolla at least twice as long as calyx-teeth
79 Leaves conspicuously dentate **96. drabifolia**
79 Leaves obsoletely repand-dentate to entire
80 Plant glabrous; corolla *c.* 10 mm **94. specularioides**
80 Plant hispid; corolla 15–25 mm **95. scutellata**
77 Perennial; branching not dichotomous
81 Calyx-teeth lanceolate, triangular or oblong to ovate
82 Stem and midrib and margin of leaves retrorsely aculeolate; corolla 6–8 mm **103. aparinoides**
82 Stem and midrib and margin of leaves not retrorsely aculeolate; corolla more than 8 mm
83 Capsule pendent
84 Leaves greyish-tomentose beneath **102. bononiensis**
84 Leaves not greyish-tomentose beneath
85 Calyx-teeth patent to deflexed at anthesis **101. rapunculoides**
85 Calyx-teeth ± erect at anthesis
86 Cauline leaves linear-lanceolate to linear
87 Buds pendent; capsule distinctly longer than wide **139. scheuchzeri**
87 Buds erect; capsule at least as wide as long **142. giesekiana**
86 Cauline leaves ovate
88 Stem sharply angled, hispid; lower leaves deeply cordate at base, hispid **100. trachelium**
88 Stem obtusely angled, glabrous or pubescent; lower leaves rounded to cuneate at base, glabrous or pubescent **99. latifolia**
83 Capsule erect
89 Flowers 1–2 **78. morettiana**
89 Flowers numerous
90 Stem (20–)30–150 cm, erect
91 Leaves glandular-dentate **76. pyramidalis**
91 Leaves eglandular-dentate **77. versicolor**
90 Stem not more than 20(–30) cm, usually decumbent to ascending
92 Basal leaves oblong **79. radicosa**
92 Basal leaves broadly ovate to orbicular
93 Plant velutinous; pedicels as long as calyx **82. sartorii**
93 Plant pubescent or glabrous; pedicels longer than calyx
94 Basal leaves ovate, truncate or weakly cordate at base, serrate **80. secundiflora**
94 Basal leaves deeply cordate, usually suborbicular, crenate or sinuate
95 Stems arising from a slender, subterranean stock **81. hawkinsiana**
95 Stems arising from a stout stock at or above the surface of the ground
96 Corolla infundibuliform-campanulate, lobed for ¼ its length **90. portenschlagiana**
96 Corolla rotate to infundibuliform, lobed for ¼–½ its length
97 Corolla 20–40 mm in diameter; calyx-teeth 8–12 mm
98 Basal leaves 2-serrate **91. poscharskyana**
98 Basal leaves crenate-dentate or obtusely dentate
99 Basal leaves deciduous, shorter than the middle cauline; non-flowering shoots without rosettes **86. isophylla**
99 Basal leaves persistent, somewhat longer than the middle cauline; non-flowering shoots with rosettes **87. fragilis**
97 Corolla 7–20 mm in diameter; calyx-teeth 3–5 mm
100 Plant without non-flowering shoots
101 Velutinous; basal leaves oblong **88. elatinoides**
101 More or less pubescent; basal leaves orbicular, cordate **89. elatines**
101 More or less pubescent; basal leaves orbicular, cordate **89. elatines**
100 Plant with non-flowering shoots
102 Pollen yellow; corolla broadly infundibuliform **92. garganica**
102 Pollen blue; corolla rotate **93. fenestrellata**
81 Calyx-teeth linear to setaceous
103 Corolla divided to the base into linear lobes **104. trichocalycina**
103 Corolla divided for ⅓–½ its length into broad lobes
104 Plant velutinous (N. Italy) **88. elatinoides**
104 Plant not velutinous
105 Capsule ± erect

106 Ovary smooth
107 Calyx-teeth abruptly bent at base
108 Rhizome stout, unbranched; cauline leaves narrowly linear to setaceous **109. xylocarpa**
108 Rhizome elongate, sparsely branched; cauline leaves linear-lanceolate or wider **112. forsythii**
107 Calyx-teeth not abruptly bent at base
109 Calyx-teeth *c.* ½ as long as corolla; basal leaves present at anthesis **83. herminii**
109 Calyx-teeth *c.* ⅓ as long as corolla; basal leaves withered at anthesis
110 Corolla rotate, erect **84. waldsteiniana**
110 Corolla tubular-campanulate, nodding **85. tommasiniana**
106 Ovary papillose
111 Buds inclined to pendent; calyx-teeth patent to deflexed
112 Calyx-teeth straight, about as long as or longer than corolla; corolla (18–)22–26(–30) mm **107. carnica**
112 Calyx-teeth abruptly bent at base, much shorter than corolla; corolla 10–22 mm **108. tanfanii**
111 Buds erect; calyx-teeth appressed to patent
113 Stem pendent, much-branched **110. crassipes**
113 Stem erect to ascending, branched only in the inflorescence
114 Calyx-teeth abruptly bent at base
115 Rhizome slender, much-branched; capsule slightly narrowed above **111. praesignis**
115 Rhizome stout, unbranched or sparingly branched; capsule not narrowed above
116 Rhizome stout, unbranched; cauline leaves narrowly linear to setaceous **109. xylocarpa**
116 Rhizome elongate, sparingly branched; cauline leaves linear-lanceolate or wider
117 Basal leaves incise-serrate; corolla 15–18 (–20) mm **106. sabatia**
117 Basal leaves crenate; corolla 20–26(–30) mm **112. forsythii**
114 Calyx-teeth straight
118 Calyx-teeth at least ½ as long as corolla, patent **122. longisepala**
118 Calyx-teeth not more than ½ as long as corolla, appressed to patent
119 Inflorescence secund; corolla 10–12 mm **119. apennina**
119 Inflorescence not secund; corolla (12–)14–26 mm
120 Corolla narrowly tubular **126. pseudostenocodon**
120 Corolla campanulate **105. macrorhiza**
105 Capsule pendent
121 Capsule broadly turbinate to pelviform, usually at least as wide as long (Arctic Europe) **142. giesekiana**
121 Capsule conical or nearly cylindrical, distinctly longer than wide
122 Corolla narrowed at the mouth
123 Basal leaves crenate or entire, not decurrent; buds erect; ovary papillose **120. willkommii**
123 Basal leaves incise-serrate, decurrent; buds pendent; ovary smooth **134. cespitosa**
122 Corolla not narrowed at the mouth
124 Corolla with a deep, rounded sinus between the lobes (S. Alps) **136. excisa**
124 Corolla without a deep, rounded sinus between the lobes
125 Ovary papillose
126 Cauline leaves cordate to ovate, like those of the rosette, all distinctly petiolate **115. hercegovina**
126 Cauline leaves elliptical to setaceous, very different from those of the rosette, sessile except the lowest
127 Cauline leaves elliptical to lanceolate
128 Stem (6–)8–15(–24) cm; cauline leaves ± entire; flowers solitary or 2–3 **116. albanica**
128 Stem 12–35 cm; cauline leaves serrate; flowers rarely solitary
129 Stem erect, densely leafy below, leafless above; cauline leaves obtuse, obtusely serrate; corolla 18–22(–26) mm **121. fritschii**
129 Stem ascending, sparsely leafy up to the inflorescence; cauline leaves acute, acutely serrate; corolla 12–18 mm **114. justiniana**
127 Cauline leaves narrowly lanceolate to setaceous
130 Corolla 8–14(–16) mm
131 Rhizome slender; basal leaves suborbicular, reniform or shallowly cordate, crenate; capsule membranous **141. rotundifolia**
131 Rhizome stout; basal leaves cordate to suborbicular-cordate, serrate; capsule woody
132 Stem 20–40 cm; middle cauline leaves entire; style exceeding corolla-tube **113. hispanica**
132 Stem 18–30 cm; middle cauline leaves remotely serrate; style about as long as corolla-tube **117. romanica**
130 Corolla (10–)12–22(–30) mm
133 Stem densely leafy below, leafless above **118. moravica**
133 Stem sparsely leafy up to the inflorescence
134 Stem 20–40 cm; inflorescence many-flowered
135 Rhizome stout (up to 6 mm in diameter); stem usually densely hairy throughout **125. bertolae**
135 Rhizome slender; stem glabrous, at least above
136 Stem glabrous or hairy on the angles below; inflorescence dense; capsule woody **123. marchesettii**
136 Stem pubescent below; inflorescence lax; capsule membranous **141. rotundifolia**
134 Stem 8–25 cm; inflorescence 1- to few-flowered
137 Stem pubescent below; capsule membranous **141. rotundifolia**
137 Stem almost always glabrous below; capsule woody
138 Flowers solitary, rarely 2–3; corolla 14–18(–22) mm **116. albanica**
138 Inflorescence many-flowered; corolla (10–)16–20 mm **124. velebitica**
125 Ovary smooth
139 Rhizome stout
140 Calyx-teeth abruptly bent at base
140 Calyx-teeth abruptly bent at base
141 Rhizome short, unbranched; cauline leaves narrowly linear to setaceous; corolla (12–)14–18(–25) mm **109. xylocarpa**
141 Rhizome long, branched; cauline leaves ovate to narrowly lanceolate; corolla 20–26(–30) mm **112. forsythii**
140 Calyx-teeth straight
142 Stem pendent, much-branched, glabrous; capsule erect, coriaceous **110. crassipes**
142 Stem ascending to erect, unbranched (except in inflorescence), hairy below; capsule pendent, woody **113. hispanica**

139 Rhizome slender
143 Buds usually inclined
144 Stem pubescent below; lower cauline leaves pubescent; capsule 4–5(–7) mm **143. baumgartenii**
144 Stem glabrous or hairy on the angles; lower cauline leaves glabrous (except on the margin); capsule (5–)6–8(–9) mm **144. beckiana**
143 Buds erect or pendent
145 Buds erect
146 Stem ± terete, pubescent or glabrous
147 Basal leaves crenate; capsule membranous **141. rotundifolia**
147 Basal leaves incise-serrate to lobed; capsule cartilaginous to woody
148 Flowers solitary, rarely 2–3; corolla 14–18(–22) mm **116. albanica**
148 Inflorescence many-flowered; corolla (10–)16–20 mm **124. velebitica**
146 Stem angular, glabrous or hairy on the angles only
149 Rhizome with napiform tubercles; corolla 12–15 mm **128. cantabrica**
149 Rhizome without napiform tubercles; corolla (12–)16–24 mm
150 Main root napiform; cauline leaves ovate to broadly lanceolate **127. rhomboidalis**
150 Main root slender; cauline leaves lanceolate to linear-lanceolate **143. baumgartenii**
145 Buds pendent
151 Stems caespitose or cushion-forming; basal leaves present at anthesis
152 Basal leaves incise-serrate; ovary glabrous; corolla (10–)12–16(–18) mm; capsule conical **133. cochlearifolia**
152 Basal leaves crenate; ovary pubescent; corolla 8–12(–14) mm; capsule hemispherical **135. jaubertiana**
151 Stems solitary or few; basal leaves usually absent at anthesis
153 Stem ± terete, pubescent below; corolla narrowly infundibuliform **137. stenocodon**
153 Stem angular, glabrous or hairy on the angles; corolla campanulate to broadly tubular
154 Middle cauline leaves petiolate **138. pulla**
154 Middle cauline leaves sessile or subsessile
155 Main root moniliform; cauline leaves ± amplexicaul **131. precatoria**
155 Main root not moniliform; cauline leaves not amplexicaul
156 Plants without napiform roots or napiform tubercles on rhizome **139. scheuchzeri**
156 Plants with either napiform roots or napiform tubercles on rhizome
157 Main root ± cylindrical; tubercles present
158 Stem 8–15 cm; flowers solitary or few; calyx-teeth narrowly triangular; corolla 15–18 mm **140. ficarioides**
158 Stem 25–35 cm; inflorescence many-flowered; calyx-teeth linear; corolla 12–16 mm **132. witasekiana**
157 Main root napiform; tubercles absent
159 Middle cauline leaves entire, obtuse, pubescent; capsule slightly contracted at the top and abruptly narrowed at base **130. recta**
159 Middle cauline leaves serrate, acute, glabrous; capsule not contracted at the top and gradually narrowed at the base **129. serrata**

Sect. RAPUNCULUS Dumort. Capsule dehiscing by lateral or subapical pores or valves. Calyx without appendages.

1. C. fastigiata Dufour ex A. DC., *Monogr. Camp.* 340 (1830). Rather succulent and scabrid annual or biennial. Stem 3–5(–8) cm, with fastigiate branches. Leaves very small, pubescent or glabrous; lower ovate, entire, shortly petiolate; middle cauline oblong, cuneate, dentate; upper cauline linear-oblong. Flowers axillary, crowded at the apex of the branches. Calyx-teeth linear-lanceolate, obtuse, erect, equalling or longer than the ovary, distinctly longer than the corolla after anthesis. Corolla *c.* 1·5 mm, pale blue, obconical. Capsule *c.* 5 mm, obconical, papillose, 5-veined. *Dry places. C. Spain.* Hs. (*N. Africa, S.W. & C. Asia.*)

2. C. uniflora L., *Sp. Pl.* 163 (1753). Perennial. Stems 10–15 cm, simple, 1-flowered, glabrous, erect. Leaves glabrous, entire or crenulate; basal *c.* 2 cm, oblanceolate, obtuse, very shortly petiolate; middle cauline lanceolate, the upper linear-lanceolate, acute. Flower pendent. Calyx-teeth erect, acute, subglabrous. Ovary long, clavate, rather fistular, distally dark blue or almost black. Corolla 7–9 mm, infundibuliform, about as long as calyx-tube. Capsule *c.* 15 mm, erect, clavate, dark blue, becoming blackish. $2n=34$. *Stony places; calcicole. Arctic and subarctic Europe southwards to* 62° *N. in Norway.* Fe Is No Rs (N) Sb Su.

3. C. cenisia L., *Sp. Pl.* ed. 2, 1669 (1763). Laxly caespitose perennial. Stems and non-flowering shoots numerous, 3–5(–10) cm, ascending, slender, 1-flowered. Basal leaves obovate, obtuse, entire, sessile; cauline ovate, obovate or oblong, sessile. Calyx hirsute; teeth linear-lanceolate, half as long as corolla and 1½ times as long as ovary. Corolla 15 mm, blue, broadly campanulate, with acuminate lobes. Capsule ovoid. $2n=34$, $34+3B$. *Moraines and screes.* ● *Alps.* Au Ga He It.

4. C. zoysii Wulfen in Jacq., *Collect. Bot.* **2**: 122 (1789). Caespitose, glabrous perennial. Stems 5–10 cm, erect, few-flowered. Leaves entire; basal ovate to obovate, obtuse, petiolate; cauline ovate-lanceolate to linear. Pedicels terminal or axillary. Calyx-teeth linear, subulate, patent. Corolla 15–20 mm, cylindrical, ventricose at the base, 4 times as long as calyx-lobes, contracted at the mouth. Capsule ovoid-globose, angular, suberect. $2n=34$. *Limestone rocks.* ● *S.E. Alps.* Au It Ju.

5. C. carpatica Jacq., *Hort. Vindob.* **1**: 22 (1770). Perennial, with a fibrous, white root. Stems 15–50 cm, erect, branched, glabrous. Basal leaves glabrous, ovate-orbicular, cordate, crenate-dentate, long-petiolate; middle cauline ovate, acute, cordate at base, crenate, petiolate; upper cauline small, sessile. Pedicels 10–15 cm, erect. Calyx-teeth lanceolate, entire or with small teeth. Corolla *c.* 30 mm, broadly infundibuliform-rotate, as long as wide, pale blue, rarely white. Capsule ovoid-cylindrical, dehiscing by subapical pores. $2n=34$. *Mountain rocks; calcicole.* ● *Carpathians.* Cz Po Rm Rs (W) [Hu].

6. C. arvatica Lag., *Varied. Ci. Lit. Artes* (*Madrid*) **2(4)**: 40 (1805) (*Wahlenbergia hederacea* sensu Willk. pro parte). Glabrous or pubescent, caespitose perennial. Rhizome thick, irregular, with remains of dead leaves and petioles. Stems up to 20 cm. Leaves up to *c.* 8 mm, ovate, dentate, petiolate; upper cauline similar but rather smaller, sessile or subsessile. Inflorescence few-flowered. Calyx-teeth linear-subulate. Corolla 12–25 mm, rotate to broadly infundibuliform, pale blue or violet. Capsule 4 mm, turbinate, dehiscing by lateral pores. $2n=28$. *Mountain rocks; calcicole.* ● *N.W. Spain.* Hs.

(a) Subsp. **arvatica**: Rather sparsely pubescent. Calyx-teeth patent to deflexed. Corolla infundibuliform. *Prov. Oviedo and N. part of Prov. León.*

(b) Subsp. **adsurgens** (Leresche & Levier) Damboldt, *Ber. Deutsch. Bot. Ges.* **79**: 305 (1966): Densely papillose-pubescent. Calyx-teeth erect. Corolla rotate. *S.W. part of Prov. León.*

7. C. raineri Perpenti, *Bibliot. Ital.* **5**: 134 (1817). Perennial. Stems 5–10 cm, almost erect, branched. Branches 1- to 3-flowered. Basal leaves ovate to obovate, remotely serrate, subsessile; cauline oblong-ovate, crenate-serrate. Calyx-teeth broadly lanceolate to ovate, serrate, acuminate, ½ as long as corolla. Corolla 30–40 mm, broadly infundibuliform. $2n=32$. *Limestone rocks.* ● *S.E. Alps.* It.

8. C. aizoon Boiss. & Spruner in Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 34 (1844). Glabrous biennial. Root thick, napiform. Stem 15–30 cm, branched, rather stout, sulcate. Basal leaves rosulate, spathulate, mucronate, with cartilaginous margin; cauline acute, triangular, sessile. Flowers pedicellate, numerous. Inflorescence much-branched, thyrsiform. Calyx-teeth triangular, as long as the ovary. Corolla pale blue, longer than the calyx-teeth. Capsule erect, angular, rounded. $2n=16$. *Rocky places.* ● *Greece, Kriti.* Cr Gr.

(a) Subsp. **aizoon**: Calyx-teeth ¼ as long as corolla. Corolla 20–30 mm, campanulate. *Greece.*

(b) Subsp. **aizoides** (Zaffran) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. aizoides* Zaffran): Calyx-teeth ½ as long as corolla. Corolla 12–15 mm, tubular-campanulate. *Limestone rocks, c.* 1800 *m. W. Kriti* (*Levca Ori*).

9. C. primulifolia Brot., *Phyt. Lusit.* 9 (1800). Perennial. Stem 40–70 cm, hispid, simple, erect. Leaves hirsute, irregularly 2-crenate, rugose; basal oblong-lanceolate, subobtuse, with narrowly winged petiole; cauline ovate-oblong, acute. Flowers in axillary clusters of 1–3 in a branched inflorescence. Ovary obconical, hirsute; calyx-teeth acuminate, widened at the base, denticulate. Corolla *c.* 20 mm, campanulate-rotate, whitish at the base, twice as long as calyx-teeth. Capsule obconic-oblong. $2n=36$. *Damp or shady places.* ● *Portugal.* Lu.

10. C. lusitanica L. in Loefl., *Iter. Hisp.* 111 (1758). Glabrous or pubescent annual. Stem 10–35 cm, more or less branched. Leaves crenate, the uppermost entire or slightly serrate, ovate-oblong to ovate-lanceolate. Inflorescence divaricately branched or simple, few- to many-flowered; pedicels filiform. Calyx-teeth linear, 3–4 times as long as tube. Corolla 10–20 mm, infundibuliform-campanulate; lobes elongate, blue, paler at the base. Capsule erect. $2n=18$. *Sandy soils. Spain and Portugal.* Hs Lu.

(a) Subsp. **lusitanica**: Stem simple to much-branched, flexuous, erect. *Throughout the range of the species.*

(b) Subsp. **transtagana** (R. Fernandes) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. transtagana* R. Fernandes): Stem never simple, decumbent or ascending. ● *S. & S.C. Portugal.*

C. pyrenaica A. DC., *Monogr. Camp.* 324 (1830), from the Pyrenees, appears to have been collected once only and is imperfectly known. It is somewhat hirsute, with a simple, erect, 1-flowered stem, patent, entire, subulate calyx-teeth and corolla a little longer than the calyx. A record from Islas Baleares is an error.

11. C. phrygia Jaub. & Spach, *Ill. Pl. Or.* **3**: 42 (1848). Moderately papillose-pubescent annual. Stem 10–15 cm, slender, dichotomously branched from the base, flexuous. Leaves small; basal crenate, obovate, obtuse, subsessile; upper lanceolate or linear. Flowers terminal, long-pedicellate. Calyx-teeth lanceolate-subulate, 1-veined, sometimes denticulate at the base, twice as long as ovary. Corolla 6–7 mm, shortly obconical, twice as long as calyx; lobes patent. Capsule deeply sulcate. $2n=16$. *Grassy places.* ● *Balkan peninsula.* Al Bu Gr Ju.

12. C. sparsa Friv., *Magyar Tudós Társaság Évkönyvei* (*Budapest*) **1836–38**: 201 (1840). Annual. Stem 20–40 cm or more, hirsute, branched. Leaves hirsute or glabrous, oblong-lanceolate, crenate, sessile, the upper acuminate, linear. Inflorescence branched. Pedicels filiform. Calyx-teeth subulate, denticulate at the base, longer than the ovary. Corolla campanulate. Capsule obconical, long. *Woods and scrub.* ● *Balkan peninsula.* Al Bu Gr Ju Rm Tu.

1 Corolla *c.* 30 mm — (b) subsp. **frivaldskyi**
1 Corolla 12–23 mm
2 Corolla (16–)18–23 mm — (a) subsp. **sparsa**
2 Corolla 12–18 mm — (c) subsp. **sphaerothrix**

(a) Subsp. **sparsa**: Calyx-teeth more or less patent. Corolla (16–)18–23 mm. *Throughout most of the range of the species.*

(b) Subsp. **frivaldskyi** (Steudel) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 547 (1930) (*C. expansa* Friv., non J. H. Rudolph): Calyx-teeth erecto-patent. Corolla *c.* 30 mm. $2n=20$. *Albania, Bulgaria, Greece, Jugoslavia.*

(c) Subsp. **sphaerothrix** (Griseb.) Hayek, *loc. cit.* (1930): Calyx-teeth patent. Corolla 12–16 mm. $2n=20$. *Bulgaria, Greece, Jugoslavia.*

13. C. ramosissima Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 137 (1806). Annual. Stem 20–40 cm, erect, simple or branched, angular, many-flowered, hirsute. Leaves sparsely hirsute, ovate-lanceolate to spathulate, crenate; basal obtuse, petiolate; upper acute, sessile. Flowers long-pedicellate. Ovary obconical, hirsute or hispid. Calyx-teeth narrowly lanceolate, 3-veined, acuminate, entire, hirsute, mostly shorter than the wide, violet corolla. Corolla 10–30 mm. Capsule obconical, hirsute, sulcate. $2n=20$. *Grassy and stony places on mountains.* ● *W. part of Balkan peninsula; Italy.* Al Gr It Ju.

14. C. spatulata Sibth. & Sm., *loc. cit.* (1806). Perennial. Root usually napiform. Stolons short. Stems (5–)20–30(–50) cm, erect, 1- to 5-flowered. Leaves papillose or smooth, more or less crenate; basal oblanceolate, petiolate; cauline sessile or subsessile, lanceolate, acuminate. Calyx-teeth lanceolate, subulate, weakly carinate, with 2–4 small glandular teeth. Ovary long, narrowly obconical. Corolla blue, broadly infundibuliform, longer than the calyx-lobes. Capsule obconical, sulcate. *Subalpine meadows.* ● *S. part of Balkan peninsula, Kriti.* Al Bu Cr Gr Ju.

1 Middle cauline leaves usually lanceolate; calyx-teeth 3–6 times as long as ovary — (b) subsp. **sprunerana**
1 Middle cauline leaves oblong-elliptical to ovate or obovate; calyx-teeth 2–3 times as long as ovary
2 Middle cauline leaves sessile or subsessile — (a) subsp. **spatulata**
2 Middle cauline leaves ± petiolate — (c) subsp. **filicaulis**

(a) Subsp. **spatulata** (*C. sibthorpiana* Halácsy): Stems 5–25 cm, usually 1-flowered, not filiform and flexuous. Middle cauline leaves usually oblong-elliptical or obovate, sessile or subsessile. Corolla 12–25 mm. Calyx-teeth 2–3 times as long as ovary. $2n=20$. *Mountain grassland. S.W. Greece, S. Jugoslavia.*

(b) Subsp. **sprunerana** (Hampe) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 545 (1930): Stems 15–50 cm, 1- to 5-flowered, not filiform and flexuous. Middle cauline leaves usually lanceolate, sessile. Corolla 25–30 mm. Calyx-teeth 3–6 times as long as ovary. $2n=20$. *Scrub, mainly lowland. Throughout the range of the species, except Kriti.*

(c) Subsp. **filicaulis** (Halácsy) Phitos, *Verh. Zool.-Bot. Ges. Wien* **103–104**: 228 (1964): Stems 5–50 cm, 1-flowered, filiform, flexuous. Middle cauline leaves ovate or elliptical, more or less petiolate. Corolla *c.* 10 mm. Calyx-teeth 2–3 times as long as ovary. *Screes. Kriti.*

15. C. patula L., *Sp. Pl.* 163 (1753). Glabrous or more or less pubescent. Stems up to 70 cm, erect. Basal leaves obovate, petiolate; upper few, linear-lanceolate, sessile. Flowers in a more or less branched inflorescence, numerous or few, rarely solitary. Calyx-teeth acute, more or less patent, usually twice as long as capsule. Corolla (17–)20–25(–35) mm, infundibuliform, violet to pale blue or rarely white. Capsule erect, ovoid-cylindrical, with 10 prominent veins. *Grassy places, woods and scrub. Most of Europe, but local in the north-west and south.* Al Au Be Br Bu Cz Fe Ga Ge Gr He Ho Hs Hu It Ju Po Rm Rs (N, B, C, W, E) Sa [Da No Su].

1 Perennial, with non-flowering stolons — (d) subsp. **abietina**
1 Biennial, without stolons
2 Calyx-teeth entire; stem glabrous — (c) subsp. **epigaea**
2 Calyx-teeth dentate or serrate; stem ± pubescent
3 Calyx-teeth with 1–2 teeth at the base; stem slender — (a) subsp. **patula**
3 Calyx-teeth serrate; stem robust — (b) subsp. **costae**

(a) Subsp. **patula**: Biennial, without stolons. Stem erect or ascending, comparatively slender, more or less pubescent. Calyx-teeth a little longer than the ovary, with 1–2 teeth at the base. $2n=20, 40$. *Throughout the range of the species.*

(b) Subsp. **costae** (Willk.) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. costae* Willk.): Biennial, without stolons. Stem erect, robust, branched from the base, more or less pubescent. Calyx-teeth serrate, 4 times as long as ovary. *Woods.* ● *E. Pyrenees (Valle d'Aran).*

(c) Subsp. **epigaea** (Janka) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 546 (1930): Biennial without stolons. Stem simple or sparingly branched, glabrous; branches long, 1-flowered. Basal leaves shortly petiolate or almost sessile. Calyx-teeth entire, narrowly lanceolate. $2n=20$. *Mountain meadows.* ● *Jugoslavia, Bulgaria.*

(d) Subsp. **abietina** (Griseb.) Simonkai, *Enum. Fl. Transs.* 383 (1887) (*C. abietina* Griseb.): Perennial. Stem 15–40 cm. Stem and leaves glabrous, with slender non-flowering stolons. Flowers 3–5. Calyx-teeth entire. $2n=40$. *Mountain grassland.* Flowers 3–5. Calyx-teeth entire. $2n=40$. *Mountain grassland.* ● *E. & S. Carpathians, and mountains of Transsylvania and N. part of Balkan peninsula.*

Var. *vajdae* (Pénzes) Fedorov (*C. vajdae* Pénzes) is a dwarf mountain variant of subsp. (d).

16. C. decumbens A. DC., *Monogr. Camp.* 334 (1830). Pubescent or glabrous. Stem decumbent, almost simple, few-flowered. Pedicels axillary, longer than the leaves. Basal leaves orbicular-spathulate, petiolate, sinuate; cauline obovate, crenate-dentate, the upper sessile, lanceolate. Ovary ovoid, hirsute; calyx-teeth linear-lanceolate, erect, entire, acuminate, shorter than the campanulate corolla. Capsule subglobose. ● *C. Spain (near Aranjuez).* Hs.

Perhaps best regarded as a subspecies or even variety of **15** (*C. patula* var. *decumbens* (A. DC.) Cuatrec.), but the taxon is incompletely known and further investigation is required.

17. C. hemschinica C. Koch, *Linnaea* **23**: 644 (1851). Biennial or perennial. Stems 30–50 cm, erect, angular. Basal and lower cauline leaves oblong-ovate, petiolate; middle cauline oblong-lanceolate, sessile; uppermost acute, crenulate. Flowers in a compact terminal corymbose inflorescence. Calyx-teeth erect, ¼–½ as long as the blue corolla. Capsule obconical. *Mountain woods and meadows.* ● *Balkan peninsula.* Bu Ju.

18. C. stevenii Bieb., *Fl. Taur.-Cauc.* **3**: 138 (1819). Perennial. Rhizome procumbent, more or less stoloniferous. Stem 20–50 cm, erect, simple or with few branches, usually 1(to 4)-flowered. Basal leaves oblong-spathulate, acute or obtuse, petiolate; cauline oblong-lanceolate, petiolate, the upper linear-lanceolate, almost sessile. Flowers in a lax inflorescence. Calyx-teeth linear-lanceolate, as long as or longer than ovary. Corolla *c.* 25 mm, infundibuliform, twice as long as calyx-teeth. *S. part of U.S.S.R.* Rs (C, W, E).

(a) Subsp. **wolgensis** (P. Smirnov) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. wolgensis* P. Smirnov): Calyx-teeth longer than the ovary, flat. Corolla violet. *E. Russia (middle Volga).*

(b) Subsp. **altaica** (Ledeb.) Fedorov, *loc. cit.* (1973) (*C. altaica* Ledeb.): Calyx-teeth naviculiform, not flat. Corolla pale blue. *S.C. Russia and E. Ukraine.*

Subsp. *stevenii* occurs in the Caucasus and Anatolia.

19. C. rapunculus L., *Sp. Pl.* 164 (1753). Biennial. Root napiform. Stem up to 100 cm, erect, simple, glabrous to slightly hirsute. Basal leaves obovate, obtuse to acuminate, petiolate; cauline linear-lanceolate. Flowers sessile or pedicellate, in a branched inflorescence. Calyx-teeth very long, erect, setiform. Corolla 10–20 mm, white or pale blue, infundibuliform, a little longer than the calyx-teeth. Capsule obconical. $2n=20$. *Forest-margins, meadows and waste places. Europe, southwards from the Netherlands and S.C. Russia, but absent from most of the islands; formerly cultivated as a vegetable and naturalized in parts of the north.* Al Au Be Bu Co Cz Ga Ge Gr He Ho Hs Hu It Ju Lu Po Rm Rs (C, W, K, E) Tu [Br Da Su].

Very variable. Infraspecific taxa have been described by many authors but do not seem worth recognition.

C. lactiflora Bieb., *Fl. Taur.-Cauc.* **1**: 153 (1808), from the Caucasus and W. Asia, is more or less naturalized in Czechoslovakia and Britain (Aberdeenshire). It is a perennial up to 150 cm, with large, lax inflorescence and numerous white or pale blue flowers.

20. C. persicifolia L., *Sp. Pl.* 164 (1753). Glabrous perennial. Stem up to 70 cm, simple, erect. Basal leaves lanceolate to obovate, crenulate; cauline linear-lanceolate, crenulate. Flowers terminal or axillary, pedicellate. Pedicels comparatively short. Ovary glabrous, hispid or with transparent setulae. Calyx-teeth acuminate, broad at the base, entire, half as long as the broadly campanulate corolla. Corolla 30–40 mm. Capsule sulcate. $2n=16$. *Meadows and open woods. Europe, except the extreme north, the islands, and parts of the west.* Al Au Be Bu Cz Da Fe Ga Ge Gr He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Sa Su Tu [Br].

1 Ovary usually glabrous — (a) subsp. **persicifolia**
1 Ovary hispid or setulose
2 Flowers almost sessile — (b) subsp. **sessiliflora**
2 Flowers ± pedicellate — (c) subsp. **snbpyrenaica**

(a) Subsp. **persicifolia**: *Throughout the range of the species.*

(b) Subsp. **sessiliflora** (C. Koch) Velen., *Österr. Bot. Zeitschr.* **42**: 16 (1892). ● *Balkan peninsula.*

(c) Subsp. **subpyrenaica** (Timb.-Lagr.) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. subpyrenaica* Timb.-Lagr.). ● *Pyrenees.*

Sect. CAMPANULA. Capsule dehiscing by basal pores or valves. Calyx with or without appendages.

(a) Stigmas 5. Ovary 5-locular.

21. C. andrewsii A. DC., *Monogr. Camp.* 220 (1830). Biennial. Stems 20–30 cm, numerous. Basal leaves rosulate, pubescent or tomentose, more or less lyrate; lower cauline leaves similar, with an ovate, serrate terminal lobe, obtuse or rounded at apex and more or less cordate at base; upper cauline obovate to elliptical. Flowers axillary or terminal. Calyx-teeth ovate to triangular-lanceolate, usually more than half as long as corolla; appendages triangular-lanceolate. Corolla tubular, glabrous or pubescent, violet. $2n=34$. *Limestone rock-crevices.* ● *S. Greece (E. Peloponnisos).* Gr.

(a) Subsp. **andrewsii**: Appendages as long as ovary. Calyx pubescent. Corolla 15–23 mm. *N.E. Peloponnisos.*

(b) Subsp. **hirsutula** Phitos, *Österr. Bot. Zeitschr.* **112**: 455 (1965): Appendages very short, acuminate. Calyx hirsute. Corolla (12–)14–16(–19) mm. *S.E. Peloponnisos.*

22. C. topaliana Beauverd, *Candollea* **7**: 268 (1937). Stems 20–40 cm, numerous, pubescent, simple or branched. Basal leaves rosulate, sericeous, hirsute or tomentose, lyrate or lobed, cordate, serrate, acute or sometimes obtuse, with lobulate petioles; lower cauline similar, the upper ovate to elliptical, serrate. Flowers axillary or terminal. Calyx-teeth ovate, acuminate; appendages pubescent or ciliate, nearly or quite as long as the ovary. Corolla tubular, pubescent; lobes erect to somewhat patent. $2n=34$. *Limestone rocks.* ● *S. Greece.* Gr.

1 Basal leaves lyrate, the terminal lobe ovate; corolla (6–)8–10 (–12) mm — (a) subsp. **topaliana**
1 Basal leaves cordate or somewhat lyrate; corolla 10–19 mm
2 Greenish-grey; corolla (12–)13–15(–19) mm — (b) subsp. **cordifolia**
2 Greyish-sericeous; corolla 10–12 mm — (c) subsp. **delphica**

(a) Subsp. **topaliana**: Stems usually simple. Calyx-teeth usually remotely dentate. *N. Peloponnisos.*

(b) Subsp. **cordifolia** Phitos, *Österr. Bot. Zeitschr.* **112**: 458 (1965): Stems simple or branched. Calyx-teeth dentate or entire. *Almost throughout the range of the species.*

(c) Subsp. **delphica** Phitos, *op. cit.* 459 (1965): Stems racemosely or paniculately branched; branches long. Calyx-teeth entire. *Fokis prov. (near Dhelfoi).*

23. C. lavrensis (Tocl & Rohlena) Phitos, *op. cit.* 460 (1965). Greenish or greyish. Stems 20–40 cm, simple or branched, pubescent. Basal and lower cauline leaves suborbicular-cordate or triangular, crenate-serrate, with lobulate petioles; upper cauline sessile. Flowers terminal or axillary. Calyx-teeth acuminate, triangular-lanceolate; appendages ovate. Corolla (12–)15–18 mm, tubular, pubescent. $2n=34$. *Limestone rocks.* ● *N.E. Greece (Athos, Sithonia).* Gr.

24. C. goulimyi Turrill, *Kew Bull.* **10**: 354 (1955). Pubescent. Stems *c.* 40 cm, branched. Basal leaves rosulate, ovate-cordate, with lobulate petioles; lower cauline similar; upper cauline numerous, comparatively large, ovate to spathulate, rounded at the apex, sessile. Flowers in a branched inflorescence. Calyx-teeth large, broadly ovate to lanceolate, acuminate, pubescent, half as long as corolla-tube. Corolla *c.* 13 mm, tubular, pubescent; lobes erect to slightly patent. $2n=34$. *Limestone rocks.* ● *E. Greece (N. Evvoia).* Gr.

25. C. celsii A. DC., *Monogr. Camp.* 217 (1830). Velutinous biennial. Stem 20–30 cm, ascending, branched, flexuous. Basal leaves irregularly lobed, with crenate, ovate, acute terminal lobes; upper cauline sessile, obovate, crenate. Flowers erect, terminal and axillary. Calyx-teeth triangular to lanceolate, acuminate; appendages very small, tooth-like. Corolla 18–30 mm, tubular, velutinous, lilac or blue-lilac; lobes 4 times as long as calyx. Capsule obconical, ribbed. $2n=34$. *Rocks.* ● *S.E. Greece.* Gr.

1 Basal leaves spathulate; petioles not or scarcely lobulate
2 Basal leaves spathulate, crenulate, tomentose, greyish; petioles without lobules — (c) subsp. **spathulifolia**
2 Basal leaves ovate-spathulate, serrate-crenate, greenish, pubescent; petioles sparsely lobulate — (b) subsp. **parnesia**
1 Basal leaves sublyrate; petioles usually lobulate
3 Basal leaves sublyrate, incise-crenate, lanate; calyx-teeth lanceolate — (d) subsp. **carystea**
3 Basal leaves spathulate or sublyrate, crenate to denticulate, scabrid-pubescent; calyx-teeth triangular to ovate — (a) subsp. **celsii**

(a) Subsp. **celsii**: Basal leaves green, pubescent, rather scabrid. Calyx-teeth ovate, acuminate. *Hills around Athinai.*

(b) Subsp. **parnesia** Phitos, *Österr. Bot. Zeitschr.* **112**: 464 (1965): Basal leaves green, sparsely pubescent. Calyx-teeth lanceolate, acute. *Parnis Oros.*

(c) Subsp. **spathulifolia** (Turrill) Phitos, *loc. cit.* (1965): Basal leaves greyish-tomentose. Calyx-teeth triangular-lanceolate, acuminate. *Kithairon Oros.*

(d) Subsp. **carystea** Phitos, *op. cit.* 465 (1965): Basal leaves green, softly pubescent. Calyx-teeth lanceolate, acute, long. *Evvoia.*

26. C. anchusiflora Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 141 (1806). Shortly pubescent biennial, the central stem very long, robust, erect, the lateral stems diffuse, branched. Basal leaves rosulate, large, lyrate, serrate, petiolate, with cordate, ovate terminal lobe; lower cauline similar; upper cauline obovate to elliptical, sessile. Flowers in a branched inflorescence. Calyx-teeth triangular-lanceolate, acute; appendages very small. Corolla 12–15 mm, tubular, slightly pubescent, blue. $2n=34$. *Limestone rocks.* ● *E. Greece, ?Kikladhes.* Gr.

27. C. euboica Phitos, *Österr. Bot. Zeitschr.* **112**: 467 (1965). Softly whitish-tomentose biennial or perennial. Stems simple or with short branches. Basal leaves rosulate, ovate-elliptical to subspathulate, crenate-serrate; cauline similar but smaller. Flowers axillary and terminal. Calyx-teeth lanceolate-ovate; appendages very short, ovate, ciliate. Ovary ribbed. Corolla *c.* 13 mm, narrowly tubular; lobes oblong, erecto-patent. $2n=34$. *Limestone rocks.* ● *E. Greece (Evvoia).* Gr.

28. C. reiseri Halácsy, *Österr. Bot. Zeitschr.* **46**: 15 (1896). Pubescent or glabrous. Stems 15–45 cm, mostly simple or somewhat branched. Basal leaves sublyrate to ovate, obtuse or rounded at the apex, serrate or incise-crenate, with very long, lobulate petiole; cauline oblong-spathulate, the uppermost sessile. Flowers axillary and terminal. Calyx-teeth triangular, rather short; appendages ovate to suborbicular, ciliate, as long as the ovary.

Corolla 18–20 mm, tubular to narrowly infundibuliform, slightly pubescent. $2n=34$. *Limestone rocks.* ● *Islands of W. Aegean region.* Gr.

29. C. rechingeri Phitos, *Österr. Bot. Zeitschr.* **112**: 470 (1965). Sparsely pubescent biennial or perennial. Stems numerous, simple or somewhat branched, diffuse, flexuous. Basal leaves rosulate, ovate to ovate-spathulate, serrate-crenate, with long, lobulate petiole; cauline similar but the uppermost sessile, elliptical. Flowers numerous, axillary and terminal. Calyx-teeth triangular, acuminate, greyish-pubescent; appendages ovate, softly hairy, ciliate, as long as or longer than the ovary. Corolla 9–11 mm, narrowly infundibuliform or tubular, greyish-velutinous; lobes lanceolate-obovate, patent. $2n=34$. *Limestone rock-crevices.* ● *C. Aegean region* (*Piperi*). Gr.

30. C. merxmuelleri Phitos, *Mitt. Bot. Staatssamm.* (*München*) **5**: 121 (1963). Glabrous perennial. Stems numerous, slender, diffuse, simple or somewhat branched. Basal leaves 9–16 cm, spathulate or elliptical, acutely dentate; lower cauline spathulate to obovate, petiolate, the uppermost sessile, orbicular to elliptical. Flowers terminal and axillary. Calyx-teeth triangular; appendages oblong-elliptical to ovate, pubescent, as long as or longer than the ovary. Corolla *c.* 14 mm, tubular, somewhat pubescent; lobes elliptic-ovate, suberect. $2n=34$. *Limestone rocks and sandy places.* ● *C. Aegean region* (*Skiros*). Gr.

31. C. medium L., *Sp. Pl.* 167 (1753). Biennial. Stem up to 60 cm, erect, more or less branched, hispid. Leaves hirsute, crenate-dentate or serrate; basal ovate-oblong, petiolate; middle and upper cauline sessile, lanceolate. Flowers solitary, terminal or axillary in a lax inflorescence. Calyx-teeth lanceolate-ovate, acuminate, shorter than the corolla; appendages broadly ovate, obtuse, deflexed, longer than the ovary and as long as or shorter than the teeth. Corolla 30–40 mm, campanulate, ventricose in the middle, blue-lilac or whitish. $2n=34$. *Dry, open habitats.* ● *N. & C. Italy, S.E. France; cultivated for ornament and frequently naturalized elsewhere.* Ga It [Au Br Ge Hs Hu Rm].

32. C. pelviformis Lam., *Encycl. Méth. Bot.* **1**: 586 (1785) (*C. corymbosa* Desf.). Biennial. Stem 20–30 cm, ascending, simple or somewhat branched, hispid. Leaves hispid, ovate, acute, serrate, the basal petiolate, the cauline sessile. Calyx-teeth oblong-ovate, acuminate, 3 times as long as ovary; appendages ovate-orbicular, almost as long as teeth, deflexed. Corolla *c.* 30 mm, broadly campanulate, ventricose, blue-lilac, sometimes white. $2n=34$. *Stony slopes and thickets.* ● *C. & E. Kriti.* Cr.

33. C. tubulosa Lam., *loc. cit.* (1785). Hirsute biennial. Stem dichotomously branched, ascending, pubescent. Leaves hirsute; basal and middle cauline oblong-ovate, crenate-dentate, long-petiolate; upper cauline ovate-lanceolate, serrate-dentate, sessile. Flowers few, axillary or terminal. Calyx-teeth ovate-lanceolate, twice as long as ovary; appendages shortly hirsute, ovate-orbicular, longer than the ovary. Corolla *c.* 20 mm, tubular, blue-lilac, velutinous, twice as long as calyx. $2n=34$. *Damp rock-crevices.* ● *W. Kriti.* Cr.

34. C. carpatha Halácsy, *Consp. Fl. Graec.* **2**: 252 (1902). Pubescent to subglabrous. Stems numerous, slender, usually simple, ascending or decumbent. Basal leaves 3–5 cm, elliptical to ovate, serrate, petiolate; cauline similar but sessile. Flowers terminal or sometimes axillary, usually solitary. Calyx-teeth triangular, acute, ciliate; appendages ovate to elliptical, sericeous, as long as or longer than the ovary. Corolla 15–17 mm, tubular; lobes erecto-patent. $2n=34$. *Shady rocks.* ● *Karpathos.* Cr.

35. C. lyrata Lam., *Encycl. Méth. Bot.* **1**: 588 (1785). Hispid biennial. Stems erect, more or less branched. Basal leaves ovate, acute, irregularly lobed, crenate, with winged petiole and acute lobules; cauline sessile, ovate-lanceolate, serrate-dentate, acute. Inflorescence lax, elongate, many-flowered. Flowers sessile. Calyx-teeth acute, lanceolate, twice as long as ovary; appendages ovate, obtuse, longer than the ovary. Corolla 13–15 mm, twice as long as calyx-teeth, tubular, blue, pubescent on the veins. $2n=34$. *Dry hillsides. Turkey-in-Europe.* Tu. (*S.W. Asia.*)

36. C. saxatilis L., *Sp. Pl.* 167 (1753). Perennial. Rhizome thick. Stems *c.* 20 cm, erect or ascending, very flexuous, fragile, simple or branched. Basal leaves rosulate, spathulate to oblanceolate, coriaceous, glabrous or sparsely pubescent, crenate-serrate or entire, petiolate; cauline similar but the uppermost sessile. Flowers few, inflorescence short. Calyx-teeth acuminate; appendages very short. Corolla (10–)14–19(–23) mm, tubular, velutinous; lobes erecto-patent. $2n=34$. *Limestone rock-crevices.* ● *S. Aegean region.* Cr Gr.

(a) Subsp. **saxatilis**: Basal leaves usually spathulate. Corolla narrowly tubular. Calyx-teeth triangular-lanceolate. *W. Kriti.*

(b) Subsp. **cytherea** Rech. fil. & Phitos, *Österr. Bot. Zeitschr.* **112**: 483 (1965): Basal leaves usually oblanceolate. Corolla broadly tubular. Calyx-teeth almost obovate. *Kithira and Andikithira.*

37. C. laciniata L., *Sp. Pl.* 165 (1753) (*C. erucifolia* Feer). Pubescent, greenish perennial. Stock very thick, rugose. Stem 20–60 cm, erect, simple or somewhat branched. Basal leaves *c.* 30 cm, ovate, laciniate and dentate; cauline ovate, slightly laciniate or dentate, sessile or subsessile. Inflorescence many-flowered. Calyx-teeth triangular, acute; appendages ovate, rounded, deflexed, as long as the ovary. Corolla 40–50 mm wide, 3 times as long as calyx-lobes, broadly campanulate, velutinous; lobes broadly ovate, acute, erecto-patent. $2n=34$. *Limestone rocks.* ● *S. Aegean region.* Cr Gr.

(b) Stigmas 3. Ovary 3-locular.

(i) Calyx with appendages between the teeth.

38. C. rupestris Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 142 (1806). Biennial. Stems ascending or procumbent, branched, pubescent or villous. Leaves greyish-tomentose or -velutinous; basal lyrate or ovate, petiolate, with orbicular terminal lobe; cauline sessile, orbicular-ovate, dentate. Flowers numerous, in a paniculate or racemose inflorescence. Calyx-teeth triangular-lanceolate, 2–4 times as long as the ovary; appendages lanceolate to triangular, as long as the ovary, hispid. Corolla (12–)13–15(–16) mm, 3 times as long as calyx, blue-lilac, velutinous. $2n=34$. *Limestone rocks.* ● *S.C. Greece* (*near Levadhia*). Gr.

39. C. cymaea Phitos, *Österr. Bot. Zeitschr.* **111**: 212 (1964). Greenish biennial or perennial. Stems slender, diffuse, simple or somewhat branched, pubescent, flexuous. Basal leaves tomentose, cordate, crenate or serrate-crenate, sometimes undulate, the long petioles with narrow, oblong lobules; lower cauline petiolate, broadly ovate, the upper cauline sessile, oblong-ovate. Flowers numerous, terminal or axillary. Calyx-teeth triangular-lanceolate, acuminate, half as long as corolla-tube; appendages ovate, pubescent, deflexed, longer than the tube. Corolla (14–)16–18(–20) mm, infundibuliform, lilac; lobes elliptical, patent. $2n=34$. *Limestone rocks.* ● *E. Greece* (*Evvoia*). Gr.

40. C. constantini Beauverd & Top., *Candollea* **7**: 266 (1937). Greyish-tomentose perennial. Stems numerous, diffuse, simple or somewhat branched, usually decumbent. Basal leaves 2–7 cm, ovate to ovate-elliptical, crenate-serrate, with lobulate petioles; upper cauline sessile. Flowers terminal or axillary; inflorescence branched. Calyx-teeth triangular to ovate, acuminate, shorter than the corolla-tube; appendages elliptic-ovate, pubescent or tomentose, longer than the ovary. Corolla 6–11 mm, tubular, widened at the base, pubescent, pale blue; lobes elliptic-lanceolate, suberect. $2n=34$. ● *E. Greece* (*Evvoia*). Gr.

41. C. scopelia Phitos, *Österr. Bot. Zeitschr.* **111**: 214 (1964). Greenish-pubescent perennial. Stems slender, diffuse, simple or branched, flexuous, ascending. Basal leaves 4–10 cm, ovate to ovate-spathulate, very rarely weakly cordate, rounded at the apex, serrate-crenate, with lobulate petioles; lower cauline spathulate, petiolate; upper cauline sessile, elliptical to oblanceolate. Flowers terminal or axillary, numerous. Calyx-teeth narrowly lanceolate, acuminate, half as long as corolla; appendages oblong-ovate, pubescent, longer than the ovary. Corolla 16–22 mm, narrowly tubular, pubescent, pale violet; lobes elliptical, patent. $2n=34$. *Rocks.* ● *W. Aegean region* (*Skopelos*). Gr.

42. C. sciathia Phitos, *op. cit.* 215 (1964). Greenish-pubescent biennial or perennial. Stems usually long, very diffuse, simple or somewhat branched, erecto-patent or flexuous. Basal leaves usually lyrate, with large, triangular, serrate-crenate terminal lobe, which is sometimes cordate at base, oblong, obtuse lateral lobes and long petioles; lower cauline petiolate, oblong-spathulate, the upper sessile, ovate, serrate. Flowers numerous; inflorescence branched. Calyx-teeth oblong-lanceolate, half as long as corolla; appendages broadly ovate, deflexed, hairy, as long as or longer than the ovary. Corolla (17–)20–24 mm, tubular-infundibuliform, pubescent, lilac; lobes almost elliptical, patent. $2n=34$. *Limestone rocks.* ● *W. Aegean region* (*Skiathos*). Gr.

43. C. thessala Maire, *Bull. Soc. Bot. Fr.* **68**: 376 (1921). Greyish-tomentose or lanate perennial. Stems numerous, diffuse, flexuous, simple or somewhat branched; branches slender, 1-flowered. Basal leaves irregularly lyrate, with large, ovate or ovate-cordate, serrate or 2-serrate terminal lobe and suborbicular lateral lobes; cauline subsessile. Flowers terminal or axillary, pedicellate. Calyx-teeth triangular-lanceolate, irregularly serrate or entire, usually longer than the corolla; appendages absent or very short and acute. Corolla 15–22 mm, tubular or infundibuliform, slightly pubescent, pale violet; lobes elliptic-ovate. $2n=34$. *Rocks.* ● *C. Greece* (*Thessalia*). Gr.

44. C. barbata L., *Syst. Nat.* ed. 10, **2**: 926 (1759). Perennial. Rhizome stout, with stolons. Stem 10–30 cm, erect, almost simple, hirsute. Basal leaves rosulate, lanceolate to oblong, entire, narrowed at the base, hispid; cauline few, liguliform. Inflorescence few-flowered. Flowers usually pendent. Calyx-teeth acute, ⅓ as long as corolla; appendages ovate, obtuse, shorter than the teeth. Corolla 20–30 mm, tubular-campanulate, bearded inside; lobes short. $2n=34$. *Grassland and scrub; calcifuge.* ● *Alps; E. Sudeten mountains; one small area in S. Norway.* Au Cz Ga Ge He It Ju No Po.

45. C. alpina Jacq., *Enum. Stirp. Vindob.* 36 (1762). Perennial. Rhizome stout, without stolons. Stem (5–)10–20 cm, erect, simple or somewhat branched, sulcate. Leaves linear-lanceolate, crenulate, lanate; basal rosulate, narrowed at the base; cauline liguliform. Flowers numerous or few, sometimes solitary. Ovary villous. Calyx-teeth long-acuminate, villous, distinctly shorter than the corolla; appendages ovate, acute, lanate, shorter than the ovary and the calyx-teeth. Corolla 15–20 mm, campanulate.

$2n=34$. ● *E. Alps, Carpathians, and mountains of Balkan peninsula.* Al Au Bu Cz Ge It Ju Po Rm Rs (W).

(a) Subsp. **alpina**: Flowers several. Stem 10–20 cm. *E. Alps and Carpathians.*

(b) Subsp. **orbelica** (Pančić) Urum., *Spis. Bălg. Akad. Nauk.* **28**: 147 (1923) (*C. orbelica* Pančić): Flowers solitary. Stem very short. *Balkan peninsula.*

46. C. speciosa Pourret, *Mém. Acad. Sci. Toulouse* **3**: 309 (1788). Perennial. Rhizome stout. Stem erect, angular, fistular, hispid, leafy. Leaves 5–10 cm, crenulate, hispid; basal linear-lanceolate, crowded, attenuate at the base; cauline linear. Inflorescence usually pyramidal. Ovary hispid. Calyx-teeth acute; appendages ovate-triangular, ciliate, shorter than the teeth. Corolla 15–32 mm, cylindric-campanulate; lobes very short. $2n=34$. *Limestone rocks.* ● *C. & E. Pyrenees, Corbières, Cévennes.* Ga Hs.

47. C. affinis Schultes in Roemer & Schultes, *Syst. Veg.* **5**: 140 (1819). Biennial. Stem simple, erect, rather robust, setose-hispid, leafy. Leaves 10–15 cm, linear-lanceolate, subglabrous above, with setose-ciliate margin; basal attenuate at the base, sessile; cauline sessile, sometimes semiamplexicaul. Flowers violet, axillary and terminal. Pedicels setose-hispid. Calyx-teeth half as long as corolla; appendages deflexed, as long as the teeth and ovary. Corolla 20–40 mm, broadly campanulate; lobes rather short. ● *Mountains of E. Spain.* Hs.

(a) Subsp. **affinis**: Stem erect, not flexuous. Corolla broadly campanulate. *Throughout the range of the species.*

(b) Subsp. **bolosii** (Vayr.) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. bolosii* Vayr.): Stem somewhat flexuous but robust. Corolla inflated-campanulate, setose-ciliate. *Montserrat.*

Very like **31** but the ovary and capsule are 3-locular.

48. C. formanekiana Degen & Dörfler, *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **54**: 728 (1899). More or less pubescent biennial. Stem 10–20 cm, erect, branched from the base. Leaves with winged, dentate petiole; basal ovate-spathulate, crenate-dentate; cauline spathulate. Flowers terminal. Calyx-teeth triangular-ovate, denticulate, 3 times as long as the ovary. Corolla 50–60 mm, broadly campanulate, white or blue-lilac, sparsely pubescent outside, glabrous inside. $2n=24$. *Rock-crevices.* ● *Macedonia.* Gr Ju.

49. C. lingulata Waldst. & Kit., *Pl. Rar. Hung.* **1**: 65 (1801). Hispid biennial. Stems 1 to numerous, 20–30 cm, simple. Basal leaves crenate-serrate, oblong-spathulate, narrowed at the base, petiolate; upper oblong to lanceolate, crenate-serrate, sessile. Inflorescence capitate, terminal, sometimes with some axillary clusters, with lanceolate involucral leaves. Flowers sessile. Calyx-teeth oblong, obtuse; appendages ovate, longer than the ovary. Corolla 20–25 mm, tubular-infundibuliform, violet. $2n=34$. *Grassy places and scrub.* ● *Balkan peninsula, S.W. Romania; S. Italy.* Al Bu Gr It Ju Rm Tu.

50. C. sibirica L., *Sp. Pl.* 167 (1753). Hirsute biennial. Stems 1 to numerous, 20–50 cm, erect, simple, branched at the apex, many-flowered. Inflorescence paniculate. Leaves crenulate; lower obovate, obtuse, petiolate; cauline sessile, lanceolate, acuminate. Calyx setose; teeth long-acuminate, setose-ciliate; appendages as long as or shorter than the ovary and shorter than the teeth. Corolla infundibuliform, more or less hairy inside; lobes 2–4 times as long as calyx. $2n=34$. *From N.E. Germany and N.W. Russia southwards to C. Italy, S. Bulgaria and Krym.* Al Au Bu Cz Ge Hu It Ju Po Rm Rs (B, C, W, K, E).

A very variable species in which the following subspecies can be recognized:

1 Appendages of the calyx lanceolate, usually shorter than the ovary; corolla 15–25 mm
2 Appendages reticulate and ciliate — (a) subsp. **sibirica**
2 Appendages not reticulate — (b) subsp. **taurica**
1 Appendages of the calyx broadly lanceolate, as long as or longer than the ovary; corolla (20–)30–40 mm
3 Stem 5–10(–20) cm — (c) subsp. **talievii**
3 Stem (20–)30–60 cm
4 Stem 15–20 mm in diameter — (f) subsp. **charkeviczii**
4 Stem 3–5 mm in diameter
5 Corolla (20–)30–40 mm — (e) subsp. **divergentiformis**
5 Corolla 20–30 mm — (d) subsp. **elatior**

(a) Subsp. **sibirica**: Stems simple, solitary, branched at the apex. Appendages lanceolate, reticulate and ciliate, usually shorter than the ovary. Corolla 17–25 mm. *Throughout the range of the species.*

(b) Subsp. **taurica** (Juz.) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. taurica* Juz.): Stems numerous, the central thicker and more robust than the others. Appendages lanceolate, not reticulate, usually shorter than the ovary. Corolla 15–20 mm. *Krym.*

(c) Subsp. **talievii** (Juz.) Fedorov, *loc. cit.* (1973) (*C. talievii* Juz.): Stems 5–10(–20) cm, ascending. Appendages broadly lanceolate, as long as or longer than the ovary. Corolla *c.* 30 mm. ● *Mountains of Krym.*

(d) Subsp. **elatior** (Fomin) Fedorov, *loc. cit.* (1973) (*C. sibirica* f. *elatior* Fomin): Stem 30–60 cm, simple, solitary, 3–5 mm in diameter, setose-hairy. Appendages broadly lanceolate, as long as or longer than the ovary. Corolla 20–30 mm, tubular-infundibuliform. *Ukraine and S. Russia.*

(e) Subsp. **divergentiformis** (Ják.) Domin, *Preslia* **13–15**: 222 (1936): Stem *c.* 60 cm, hairy, 3–5 mm in diameter. Appendages broadly lanceolate, as long as or longer than the ovary. Corolla 20–40 mm, campanulate. ● *Balkan peninsula, Italy, Hungary, Czechoslovakia.*

(f) Subsp. **charkeviczii** (Fedorov) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. charkeviczii* Fedorov): Stems numerous, 20–40 cm, 15–20 mm in diameter, hairy, striate, purple. Appendages broadly lanceolate, as long as or longer than the ovary. Corolla *c.* 30 mm. ● *Mountains of Krym.*

51. C. incurva Aucher ex A. DC. in DC., *Prodr.* **7**: 464 (1839). Biennial. Stem erect, pubescent, usually paniculately branched. Leaves pubescent, ovate or ovate-oblong, crenate; basal cordate at the base, petiolate; cauline shortly petiolate, the uppermost sessile. Calyx-teeth broadly triangular-ovate. Appendages ovate, as long as the ovary. Corolla up to 40 mm, pale blue-lilac. $2n=32$. *Scrub and rocky places.* ● *E. Greece.* Gr.

52. C. grossekii Heuffel, *Flora* (*Regensb.*) **16**: 353 (1833). Hispid perennial. Stem up to 70 cm, simple or sometimes branched, angular. Basal leaves cordate, triangular, coarsely 2-serrate, long-petiolate; cauline shortly petiolate, narrower, the uppermost lanceolate, rounded at the base, sessile. Flowers pedicellate in a paniculately branched inflorescence. Calyx-teeth setose-ciliate, lanceolate; appendages lanceolate, shorter than the teeth. Corolla 20–30 mm, hirsute, campanulate, violet, 2–3 times as long as calyx-teeth. *Rocky places in woods.* ● *C. part of Balkan peninsula and S. Romania.* Bu Ju Rm.

Very like **100** but the appendages of the calyx are clearly developed.

53. C. lanata Friv., *Flora* (*Regensb.*) **19**: 434 (1836). Biennial. Stems numerous, 30–70 cm, villous, erect or flexuous, branched from the base. Leaves broadly ovate-cordate, serrate, sericeous-tomentose; basal subacute, long-petiolate; upper cauline very small, almost sessile. Flowers subsessile in a many-flowered inflorescence. Calyx-teeth wide, triangular, acuminate; appendages as long as the ovary. Corolla 20–25 mm, broadly campanulate, yellowish-white. Corolla-lobes bearded inside, about twice as long as calyx. *Mountain rocks.* ● *W. & C. Bulgaria, S.E. Jugoslavia.* Bu Ju.

54. C. dichotoma L., *Cent. Pl.* **2**: 10 (1756). Patent-hispid annual. Stem *c.* 10–15 cm, erect, dichotomously branched. Leaves oblong to ovate, acute, denticulate or entire, sessile. Flowers axillary, solitary. Pedicels short. Calyx-teeth triangular-lanceolate, acuminate, widened at the base, longer than the ovary; appendages lanceolate, longer than the ovary. Corolla *c.* 20 mm, tubular-campanulate, subglabrous, blue-lilac, twice as long as calyx. *Mediterranean region.* Bl ?Gr Hs It Si.

55. C. alpestris All., *Auct. Syn. Stirp. Horti Taur.* 11 (1773) (*C. allionii* Vill.). Perennial. Stem simple, usually 1-flowered, sparsely hairy. Basal leaves rosulate, ciliate, linear-lanceolate, subentire, obtuse; cauline linear. Calyx-teeth linear, acuminate, half as long as corolla; appendages ovate, acute, ciliate, ¼ as long as the teeth. Corolla 30–45 mm, campanulate, distinctly narrowed at base; lobes short, suborbicular, shortly acuminate. $2n=34$. *Stony places.* ● *S.W. Alps.* Ga It.

56. C. oreadum Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 107 (1856). Caespitose, appressed-hispid, greyish perennial. Stem *c.* 10 cm, slender, flexuous, fragile, 1-flowered or sparsely branched and 2- to 5-flowered. Basal leaves oblong-spathulate, entire, obtuse, petiolate; cauline oblong-linear, sessile, acute. Flowers long-pedicellate. Calyx-teeth velutinous, lanceolate, acute; appendages very short. Corolla 20–35 mm, blue, narrowly campanulate, hirsute on the veins, 3 times as long as calyx. $2n=34$. *Mountain rocks.* ● *E. Greece (Olimbos).* Gr.

57. C. calaminthifolia Lam., *Encycl. Méth. Bot.* **1**: 585 (1785). Shortly appressed-pubescent, greyish perennial. Rhizome stout. Stems 10–15 cm, decumbent, numerous, leafy, 3- to 5-flowered, simple, or shortly branched from the middle; branches 1- to 3-flowered. Leaves somewhat succulent; basal rosulate, oblong-spathulate, obtuse, subentire, shortly petiolate; cauline subsessile, ovate-orbicular, usually weakly undulate and obsoletely crenate-dentate. Leaves of the branches very small, elliptical. Flowers shortly pedicellate. Calyx-teeth triangular, subacute; appendages triangular, acute, ⅓ as long as the ovary. Corolla *c.* 10 mm, blue, tomentose, tubular-infundibuliform, 2½ times as long as calyx. Style exserted. ● *Aegean region.* Gr.

58. C. hierapetrae Rech. fil., *Österr. Bot. Zeitschr.* **84**: 170 (1935). Velutinous perennial. Stock stout. Stems *c.* 5–10 cm, ascending or decumbent, filiform, leafy. Basal leaves 8–10 mm, ovate-spathulate, petiolate; cauline ovate or suborbicular, shortly petiolate. Flowers 1–4. Calyx-teeth triangular, twice as long as the ovary; appendages very short. Corolla 12–15 mm, 2–3 times as long as calyx, infundibuliform. Style exserted. *Rocks.* ● *E. Kriti.* Cr.

59. C. amorgina Rech. fil., *Beih. Bot. Centr.* **54(B)**: 646 (1936). Almost glabrous perennial. Stock stout. Stems 3–10 cm, slender, ascending or decumbent, leafy. Leaves 4–6 mm, obovate, shortly petiolate or sessile. Flowers few, terminal. Calyx-teeth triangular, acute, twice as long as the obconical, ribbed ovary; appendages very short. Corolla 6–7 mm, tubular-infundibuliform, 3–4 times as long as calyx. Style exserted. *Limestone rock-crevices.* ● *Kikladhes (Amorgos).* Gr.

60. C. heterophylla L., *Sp. Pl.* [1231] (1753). Subglabrous perennial. Rhizome thick, vertical. Stems numerous, *c.* 10–20 cm, leafy, simple, decumbent, slender. Basal leaves oblong-lanceolate, obtuse, shortly petiolate; cauline almost sessile, suborbicular. Flowers axillary, shortly pedicellate, solitary or 2–3 together. Calyx-teeth triangular-lanceolate, subacute; appendages very short. Corolla 10–15 mm, twice as long as calyx, pubescent, blue, tubular-infundibuliform; lobes weakly deflexed. Style exserted. *Rock-crevices.* ● *Kikladhes.* Gr.

61. C. mollis L., *Sp. Pl.* ed. 2, 237 (1762). Velutinous, greyish perennial. Stem ascending. Leaves sessile, subentire; basal obovate to spathulate; cauline ovate to suborbicular, patent. Flowers few, terminal or axillary. Calyx-teeth lanceolate, erect, shorter than the campanulate, subglabrous corolla; appendages acute, shorter than the ovary. Corolla 15–25 mm. $2n=26$. *Limestone rock-crevices. S. & S.E. Spain.* Hs.

62. C. papillosa Halácsy, *Consp. Fl. Graec., Suppl.* 70 (1908). Dwarf, caespitose perennial, papillose and rather hispid. Rhizome stout, woody, branched. Stems with leaf-rosettes. Leaves oblong-spathulate, crenate, shortly petiolate. Flowers subsessile in the centre of the leaf-rosettes. Calyx-teeth oblong, obtuse, about as long as the ovary; appendages very small. Corolla 12–14 mm, papillose and slightly hispid, twice as long as calyx. *Limestone mountain rocks.* ● *S. Greece (Taïyetos).* Gr.

63. C. orphanidea Boiss., *Fl. Or.* **3**: 897 (1875). Biennial. Pale green, translucent, appressed-hirsute. Root vertical. Stems short, rather thick, procumbent and ascending, 1-flowered or sometimes with 3- to 9-flowered branches. Basal leaves rosulate, oblong, obtuse, obsoletely repand-crenate, truncate or rounded at the base, with petioles longer than the lamina; cauline small, elliptical, subsessile. Pedicels rather shorter than the calyx, with linear bracts. Calyx-teeth lanceolate, subacute, 1½ times as long as the obconical, retrorse-setulose ovary, patent after flowering; appendages setulose, very small. Corolla 20–25 mm, violet, narrowly campanulate, almost 3 times as long as calyx. Capsule pendent. *Rocks.* ● *S. Bulgaria and N.E. Greece.* Bu Gr.

64. C. rupicola Boiss. & Spruner in Boiss., *Diagn. Pl. Or. Nov.* **1(7)**: 17 (1846). Pubescent, greyish perennial. Stems *c.* 10 cm, slender, ascending or decumbent, fragile, somewhat branched, 1- to 3-flowered. Basal leaves ovate, denticulate, cuneate at the base, long-petiolate; cauline small, oblong-rhombic, subsessile, the uppermost linear-lanceolate, shorter than the pedicels. Calyx-teeth broadly ovate-oblong, obtuse, ciliate and more or less distinctly denticulate. Corolla *c.* 30 mm, bluish-purple, narrowly campanulate, glabrous, 4 times as long as calyx. Appendages very short, deflexed, obtuse. $2n=32$. *Rocks.* ● *Mountains of S.C. Greece.* Gr.

(ii) Calyx without appendages between the teeth.

65. C. petraea L., *Syst. Nat.* ed. 10, **2**: 926 (1759). Sparsely pubescent perennial. Stem 10–45 cm, almost woody, simple or somewhat branched. Leaves crenulate-sinuate or sinuate-serrate, tomentose beneath; lower ovate-lanceolate, petiolate; upper cauline sessile, oblong-lanceolate. Inflorescence compact, capitate, at the apex of the stem or branches. Calyx villous; teeth linear, obtuse, ½ as long as the corolla. Corolla *c.* 12 mm, campanulate, velutinous. $2n=34$. *Limestone rocks.* ● *S. Alps (very local).* Ga It.

66. C. tymphaea Hausskn., *Mitt. Thür. Bot. Ver.* **5**: 87 (1887). Glabrous or sparsely setulose perennial. Stems 10–35 cm, leafy. Basal leaves rosulate, oblong-spathulate, crenulate, petiolate; cauline oblong to ovate-lanceolate, sessile. Flowers axillary or terminal. Inflorescence 4- to 7-flowered. Calyx-teeth ciliate, a little longer than the ovary. Corolla *c.* 10 mm, infundibuliform, violet, glabrous, 2–3 times as long as calyx-teeth. $2n=34$. *Mountain meadows.* ● *Albania and N. Greece.* Al Gr.

67. C. stenosiphon Boiss. & Heldr. in Boiss., *Diagn. Pl. Or Nov.* **1(7)**: 18 (1846). Setose-hispid perennial. Stems 15–30 cm, numerous, erect or ascending. Basal leaves oblong to lanceolate, petiolate; upper cauline oblong-ovate, cordate at the base, sessile. Inflorescence capitate, 2- to 7-flowered. Axillary inflorescences 2- to 3-flowered. Calyx-teeth lanceolate. Corolla *c.* 20 mm, violet, twice as long as calyx and a little longer than the uppermost leaves. $2n=34$. *Mountain rocks.* ● *S. Greece (Peloponnisos).* Gr.

68. C. transsilvanica Schur ex Andrae, *Bot. Zeit.* **13**: 328 (1855). Lanate biennial. Stem 20–40 cm, erect, simple, leafy to the apex. Basal leaves oblong-spathulate, serrate, petiolate; cauline lanceolate, sessile, the uppermost cordate at the base. Inflorescence terminal, capitate, many-flowered. Calyx-teeth lanceolate, ciliate. Corolla 15–25 mm, about twice as long as calyx, violet. *Alpine meadows and pastures.* ● *E. & S. Carpathians and mountains of S.W. Bulgaria.* Bu Rm.

69. C. moesiaca Velen., *Sitz.-Ber. Böhm. Ges. Wiss.* (*Math.-Nat. Kl.*) **1892**: 385 (1893). Hairy biennial. Stem up to 40 cm, erect. Basal leaves serrate, oblong, petiolate; cauline leaves lanceolate, shortly petiolate, the uppermost lanceolate-acuminate, cordate at the base, sessile. Inflorescences capitate, the terminal many-flowered, the axillary 2- to 4-flowered. Calyx-teeth broadly triangular-lanceolate. Corolla *c.* 30 mm, blue-lilac, much longer than calyx-teeth. *Mountain meadows.* ● *C. & N.W. parts of Balkan peninsula.* Al Bu Ju.

70. C. glomerata L., *Sp. Pl.* 166 (1753). Pubescent, hispid or subglabrous perennial. Stem 15–80 cm, erect, simple or somewhat branched, obsoletely angular, reddish. Leaves crenulate; basal and lower cauline ovate-lanceolate or oblong to elliptical, cordate or rounded at the base, acuminate to obtuse, long-petiolate; upper cauline sessile. Flowers in a dense capitulum or fascicles, numerous. Calyx-teeth lanceolate, acuminate, ¼–½ as long as the glabrous or pubescent, violet corolla. Corolla up to 25(–40) mm; lobes acuminate or obtuse, ⅓ as long as tube. $2n=30$. *Meadows, scrub and forest-margins. Most of Europe, except the extreme north, the extreme south and many of the islands.* Al Au Be Br Bu Cz Da Fe Ga Ge Gr He Ho Hs Hu It Ju Po Rm Rs (N, B, C, W, E) Su [No].

1 Stem 2–8(–15) cm; inflorescence capitate; lower leaves not much shorter than the decumbent stem — (b) subsp. **serotina**
1 Stem 20–40(–80) cm; lower leaves much shorter than the erect stem
2 Inflorescence mostly terminal, capitate
3 Leaves tomentose and greyish beneath — (c) subsp. **farinosa**
3 Leaves hirsute, pubescent beneath or glabrous
4 Capitula many-flowered — (d) subsp. **elliptica**
4 Capitula many-flowered — (d) subsp. **elliptica**
4 Capitula few-flowered — (e) subsp. **subcapitata**
2 Inflorescence interrupted, the branches with fascicles of flowers at the apex
5 Pubescent or hirsute — (a) subsp. **glomerata**
5 Hispid or setose
6 Leaves lanceolate — (f) subsp. **cervicarioides**
6 Leaves ovate — (g) subsp. **hispida**

(a) Subsp. **glomerata**: Stem 20–40(–80) cm. Lower leaves much shorter than the erect stem, pubescent or hirsute. Inflorescence interrupted, the branches with fascicles of flowers at the apex. *Throughout the range of the species.*

(b) Subsp. **serotina** (Wettst.) O. Schwarz, *Mitt. Thür. Bot. Ges.* **1(1)**: 118 (1949): Stem 2–8(–15) cm. Lower leaves not much shorter than the decumbent stem. Inflorescence capitate. ● *Alps and Balkan peninsula.*

(c) Subsp. **farinosa** (Rochel) Kirschleger, *Fl. Alsace* **1**: 378 (1852) (*C. farinosa* (Rochel) Andrz.): Stem 20–40(–80) cm. Lower leaves usually oblong, much shorter than the erect stem, tomentose and greyish beneath. Inflorescence mostly terminal, capitate. $2n=30$. *E. & E.C. Europe, extending locally westwards to Italy and W. Switzerland.*

(d) Subsp. **elliptica** (Kit. ex Schultes) O. Schwarz, *Mitt. Thür. Bot. Ges.* **1(1)**: 118 (1949): Like (c) but leaves hirsute, pubescent beneath or glabrous; capitula many-flowered. ● *From the Carpathians to C. Italy and C. Jugoslavia.*

(e) Subsp. **subcapitata** (M. Popov) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. subcapitata* M. Popov): Like (c) but leaves hirsute, pubescent beneath or glabrous; capitula few-flowered. ● *Carpathians.*

(f) Subsp. **cervicarioides** (Schultes) P. Fourn., *Quatre Fl. Fr.* 914 (1939): Like (c) but leaves lanceolate, hispid or setose; inflorescence interrupted, the branches with fascicles of flowers at the apex. ● *S. Europe.*

(g) Subsp. **hispida** (Witasek) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 532 (1930): Like (c) but leaves ovate, hispid or setose; inflorescence interrupted, the branches with fascicles of flowers at the apex. *Balkan peninsula.*

71. C. foliosa Ten., *Fl. Nap.* **1**, *Prodr.*: 16 (1811). Perennial. Stem 30–50 cm, erect, simple, terete, pubescent below. Leaves more or less pubescent; basal broadly ovate, cordate or rounded at the base, with long, narrowly winged petioles; cauline usually contracted at the base, elliptic-ovate, serrate, as long as the flowers, shortly petiolate, the uppermost almost sessile. Inflorescence capitate, terminal. Calyx-teeth narrowly linear, ciliate, shorter than the tubular corolla. Corolla 20–35 mm. $2n=34$. *Mountain meadows and woods.* ● *Balkan peninsula, from C. Jugoslavia to C. Greece; C. & S. Appennini.* Al ?Bu Gr It Ju.

72. C. cervicaria L., *Sp. Pl.* 167 (1753). Biennial. Stem solitary, up to 70 cm or more, erect, simple, sulcate, setose-hispid. Leaves setose; basal oblong, withered at anthesis, more or less obtuse; cauline oblong-lanceolate, petiolate, the uppermost oblong, widened at the base, sessile. Flowers in a usually terminal, capitate inflorescence. Calyx-teeth ovate, obtuse, shorter than the infundibuliform corolla. Corolla 13–16 mm, pale blue-lilac, hispid. $2n=34$. *Meadows and woods. Much of Europe northwards to c. 64° N. in Fennoscandia, but absent from the islands and rare in the Mediterranean region.* Al Au Be Bu Cz Da Fe Ga Ge Gr He ?Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su.

73. C. macrostachya Waldst. & Kit. ex Willd., *Enum. Pl. Horti Berol.* 213 (1809) (*C. multiflora* Waldst. & Kit.). Setose-hispid biennial. Stem up to 70 cm, erect, simple, striate. Basal leaves crenate or entire, withered at anthesis; cauline lanceolate, sessile, the uppermost ovate-lanceolate, cordate. Flowers in clusters of 3–5. Inflorescence branched, interrupted-spicate. Calyx-teeth lanceolate, $\frac{1}{3}$ as long as corolla. Corolla 15–20 mm, violet, infundibuliform. $2n=18$. *Thickets, rocky places. E.C. Europe and Balkan peninsula, extending locally eastwards to E. Ukraine.* Al Bu Cz Gr Hu Ju Rm Rs (W, E) Tu.

74. C. spicata L., *Sp. Pl.* 166 (1753). Hairy biennial. Stem up to 70 cm or more, erect, striate. Basal leaves entire, linear-lanceolate; cauline linear, acuminate. Inflorescence long, interrupted at the base, many-flowered. Calyx-teeth ovate-acuminate, *c.* $\frac{1}{3}$ as long as the infundibuliform corolla. Corolla 17–22 mm. $2n=34$. ● *Alps, extending southwards to C. Italy and Crna Gora.* Au Ga He It Ju.

Variable in size and shape of leaves.

75. C. thyrsoides L., *Sp. Pl.* 167 (1753). Hispid biennial. Stem 30–50 cm or more, sulcate, erect, simple. Leaves entire, rather undulate; basal oblong-lanceolate, cuneate; cauline linear-lanceolate to lingulate, acute. Inflorescence compact, unbranched, ovoid to oblong, dense. Calyx-teeth setose, linear. Corolla 17–22 mm, lanate, yellowish-white, tubular-campanulate. $2n=34$. *Meadows.* ● *Jura, Alps and mountains of Balkan peninsula.* Au Bu Ga Ge He It Ju.

(a) Subsp. **thyrsoides**: Stem 30–40 cm. Inflorescence compact, ovoid or oblong, dense. Bracts as long as flowers. *Subalpine limestone rocks and meadows.* ● *Jura, Alps and mountains of Balkan peninsula.*

(b) Subsp. **carniolica** (Sünd.) Podl., *Ber. Bayer. Bot. Ges.* **37**: 111 (1964): Stem 40–100 cm. Inflorescence up to 60 cm, lax. Bracts twice as long as flowers. *Forest-margins, scrub.* ● *E. Alps, mountains of Jugoslavia.*

76. C. pyramidalis L., *Sp. Pl.* 164 (1753). Glabrous perennial. Stem up to 150 cm. Basal leaves glandular-dentate, petiolate, ovate-oblong, subcordate; cauline sessile, ovate-lanceolate. Inflorescence pyramidal, many-flowered. Calyx-teeth acuminate, patent, $\frac{1}{2}$ as long as the broadly campanulate corolla. Corolla up to 30 mm in diameter. Capsule subglobose, sulcate. $2n=34$. *Rocks and walls.* ● *N. Italy and N.W. part of Balkan peninsula.* Al It Ju.

77. C. versicolor Andrews, *Bot. Reposit.* **6**: t. 396 (1804). Usually glabrous perennial. Stem 20–40 cm or more, stout, ascending or erect, paniculately branched above or sometimes simple. Basal leaves coriaceous, crenate or dentate, ovate to cordate-ovate, petiolate; uppermost cauline almost sessile, cuneate at the base. Flowers fasciculate. Inflorescence branched, terminal. Calyx-teeth narrowly lanceolate. Corolla 15–25 mm, pale lilac or pale blue, violet inside. $2n=34$. *Rocky places.* ● *Balkan peninsula, S.E. Italy.* Al Bu Gr It Ju.

Very variable. It is impossible to enumerate any infraspecific taxa without further investigation.

78. C. morettiana Reichenb., *Pl. Crit.* **4**: 18 (1826). Perennial. Rhizome branched, with remains of dead petioles. Stems short, ascending, slender, 1- to 2-flowered. Basal leaves broadly ovate, dentate, pubescent, long-petiolate; cauline ovate, cuneate at the base, petiolate, the uppermost sessile. Calyx-teeth lanceolate, patent, $\frac{1}{3}$–$\frac{1}{4}$ as long as corolla. Ovary obconical, short. Corolla 20–30 mm, infundibuliform. Capsule indehiscent. $2n=34$. *Rock-crevices.* ● *Alpi Dolomitiche.* It.

79. C. radicosa Bory & Chaub., *Nouv. Fl. Pélop.* 14 (1838). Slightly pubescent or glabrous perennial. Stems 5–10 cm, numerous, short, decumbent, leafy. Basal leaves rosulate, oblong, obtuse, crenate-serrate, long-attenuate at the base, more or less petiolate; cauline very small, subsessile, elliptic-oblong. Flowers small, axillary, pendent. Calyx almost glabrous or hairy; teeth lanceolate, subacute, as long as the ovary. Corolla *c.* 5 mm, violet, almost glabrous, obconical, twice as long as the calyx. $2n=34$. *Alpine pastures.* ● *S. & C. Greece.* Gr.

80. C. secundiflora Vis. & Pančić, *Mem. Ist. Veneto* **10**: 442 (1863). Glabrous perennial. Stems 15–20 cm, numerous, lax.

Basal leaves ovate, serrate, truncate to subcordate at the base, long-petiolate; cauline ovate to lanceolate, serrate, shortly petiolate, the uppermost sessile. Inflorescence branched; flowers long-pedicellate. Corolla *c.* 30 mm in diameter, rotate, violet. *Mountain rocks.* ● *E. Jugoslavia.* Ju.

81. C. hawkinsiana Hausskn. & Heldr., *Mitt. Thür. Bot. Ver.* **5**: 87 (1887). Perennial. Stems 10–20 cm, numerous, arising from a slender, subterranean stock, decumbent or ascending, flexuous, leafy, simple or branched, glabrous or sometimes more or less papillose. Basal leaves suborbicular to ovate, entire to crenulate, glabrous, petiolate; upper cauline sessile. Flowers with long, slender pedicels. Calyx-teeth lanceolate, erecto-patent, *c.* 3 times as long as the papillose ovary. Corolla 10–12 mm, almost rotate, glabrous, blue-violet; lobes ovate, 2–3 times as long as the calyx. $2n=22$. *Crevices in serpentine rocks.* ● *Mountains of N. Greece and Albania.* Al Gr.

82. C. sartorii Boiss. & Heldr. in Boiss., *Fl. Or.* **3**: 919 (1875). Velutinous, fragile perennial. Rhizome stout, fleshy. Stems 10–15 cm, procumbent, flexuous, laxly branched, leafy. Leaves small, orbicular, subcordate, obtuse and with 5–7 wide crenations; basal with petioles as long as lamina; cauline shortly petiolate. Pedicels as long as ovary; calyx-teeth lanceolate, $\frac{1}{2}$ as long as the hemispherical ovary. Corolla *c.* 10 mm, white, hairy, infundibuliform-campanulate, 4 times as long as calyx. Style somewhat exserted. $2n=34$. *Mountain rocks.* ● *Kikladhes* (*Andros*). Gr.

83. C. herminii Hoffmanns. & Link, *Fl. Port.* **2**: 9 (1820). Laxly caespitose, subglabrous perennial. Rhizome woody, creeping. Stems erect or ascending, simple or with few branches, 1- to few-flowered. Basal leaves rosulate, suborbicular to ovate, cuneate at the base, obsoletely crenate to entire, present at anthesis, long-petiolate; cauline lanceolate to linear, subentire. Calyx-teeth linear-subulate, patent, *c.* $\frac{1}{2}$ as long as corolla, entire, 3–4 times as long as the ovary. Corolla 10–20 mm, infundibular-campanulate; lobes patent, broadly ovate, mucronate. $2n=32$. *Damp alpine meadows.* ● *Mountains of C. & S. Spain and C. Portugal.* Hs Lu.

84. C. waldsteiniana Schultes in Roemer & Schultes, *Syst. Veg.* **5**: 99 (1819). Perennial. Rhizome short or creeping. Stems 20–30 cm, numerous. Basal leaves very small, orbicular-ovate, sometimes obscurely cordate, withered at anthesis; cauline elliptical to rhombic or ovate, denticulate, petiolate, the upper small, lanceolate, sessile. Flowers in a few- to many-flowered inflorescence. Calyx-teeth linear, patent to deflexed, *c.* $\frac{1}{2}$ as long as corolla. Corolla 20 mm in diameter, blue, rotate. Capsule erect, turbinate, opening by two pores. $2n=34$. *Limestone rocks.* ● *Mountains of W. Jugoslavia.* Ju.

85. C. tommasiniana Koch in F. W. Schultz, *Arch. Fl. Fr. Allem.* 229 (1852). Like **84** but corolla tubular-campanulate. $2n=34$. *Rocky* Fagus-*woods.* ● *N.W. Jugoslavia* (*Istra*: *Mala Učka*). Ju.

86. C. isophylla Moretti, *Gior. Fis.* (*Brugnat.*) ser. 2, **7**: 44 (1824). Perennial. Stems 10–15 cm, procumbent to ascending; non-flowering shoots without rosettes. Leaves suborbicular, cordate, crenate-dentate, petiolate, the basal deciduous. Flowers in a corymb. Calyx-teeth acuminate, $\frac{1}{2}$ as long as the corolla. Corolla 15–20 mm, broadly campanulate to infundibuliform. Style exserted. Capsule ovoid. $2n=32$. *Limestone rock-crevices.* ● *N.W. Italy* (*a small strip of coast S.W. of Savona*). It.

87. C. fragilis Cyr., *Pl. Rar. Neap.* **1**: 32 (1788). Perennial. Stems 7–15 cm, diffuse-ascending; non-flowering shoots with rosettes. Basal leaves suborbicular to cordate, obtusely dentate to crenate-lobed, long-petiolate, persistent, the cauline smaller, ovate to lanceolate. Inflorescence lax, corymbose. Calyx-teeth linear-lanceolate, acuminate, patent, half as long as the broadly campanulate to rotate corolla. $2n=32$. *Limestone rocks.* ● *C. & S. Italy.* It.

(a) Subsp. **fragilis**: Basal leaves usually suborbicular, crenate. Calyx-teeth 9–12 mm, lanceolate. Corolla 35–40 mm in diameter. *Coastal region.*

(b) Subsp. **cavolinii** (Ten.) Damboldt, *Bot. Jahrb.* **84**: 331 (1965): Basal leaves usually cordate, ovate, serrate. Calyx-teeth 8–15 mm, lanceolate. Corolla 25–30 mm in diameter. *Appennini.*

88. C. elatinoides Moretti, *Gior. Fis.* (*Brugnat.*) ser. 2, **5**: 110 (1822). Velutinous perennial. Stem 10–15 cm, almost erect, simple. Leaves acutely dentate, petiolate; basal oblong; cauline ovate, acute. Inflorescence dense. Ovary obconical. Calyx-teeth linear-subulate, patent, as long as the rotate, deeply lobed corolla. Corolla *c.* 8 mm; lobes pubescent. $2n=34$. *Calcareous rocks.* ● *Italy* (*mountains between Lago di Como and Lago di Garda*). It.

89. C. elatines L., *Syst. Nat.* ed. 10, **2**: 927 (1759). More or less pubescent perennial. Stem 10–15 cm, ascending. Leaves cordate, acutely dentate; basal orbicular; cauline ovate, acute. Inflorescence lax. Ovary globose. Calyx-teeth patent, linear-lanceolate, shorter than to almost as long as corolla. Corolla 8–10 mm, blue or sometimes white; lobes patent or deflexed. $2n=34$. *Shady rocks and walls.* ● *N.W. Italy.* It.

90. C. portenschlagiana Schultes in Roemer & Schultes, *Syst. Veg.* **5**: 93 (1819). Sparsely pubescent perennial. Stems 15–20 cm, lax, numerous, ascending, procumbent or pendent. Leaves pubescent to subglabrous, orbicular-cordate, sinuate-crenate, petiolate. Flowers numerous, in a branched, lax inflorescence. Pedicels rather long. Calyx-teeth lanceolate, much shorter than the corolla. Corolla *c.* 20 mm, infundibuliform-campanulate, blue-lilac. $2n=34$. *Mountain rocks.* ● *W. Jugoslavia.* Ju.

91. C. poscharskyana Degen, *Magyar Bot. Lapok* **7**: 103 (1908). Appressed-pubescent perennial. Stems usually numerous, 15–20(–30) cm, lax. Leaves densely grey-hispid at first, glabrescent; basal cordate-ovate, 2-serrate, petiolate; cauline serrate or entire, shortly petiolate. Flowers long-pedicellate, in a lax, branched inflorescence. Calyx-teeth lanceolate, setose-ciliate, 4 times as long as the ovary. Corolla 20–25 mm, violet, broadly infundibuliform. $2n=34$. *Rocks and stony places.* ● *W. Jugoslavia.* Ju.

92. C. garganica Ten., *Cat. Sem. Horti Nap.* (1827). Slightly pubescent to subglabrous perennial. Stems 10–15 cm, diffuse. Basal leaves orbicular, cordate, crenate-dentate; upper ovate, acute, dentate. Inflorescence lax; branches 1- to 2-flowered. Ovary globose. Calyx-teeth patent, lanceolate, subequal, $\frac{1}{3}$ as long as the subglabrous corolla. Corolla 10–20 mm. Pollen long as the subglabrous corolla. Corolla 10–20 mm. Pollen yellow. $2n=34$. *Shady rocks.* ● *S.E. Italy* (*Monte Gargano*); *W. Greece* (*Kephallinia*). ?Al Gr It.

1 Calyx-teeth erect; corolla divided for $\frac{1}{3}$–$\frac{2}{3}$ (c) subsp. **acarnanica**
1 Calyx-teeth patent to deflexed; corolla divided for $\frac{2}{3}$–$\frac{3}{4}$
2 Calyx-teeth 1 mm wide; base of filaments with long, acute hairs; seeds 0·7 × 0·4 mm (b) subsp. **cephallenica**
2 Calyx-teeth more than 1 mm wide; base of filaments with short, obtuse hairs; seeds 0·5 × 0·45 mm (a) subsp. **garganica**

(a) Subsp. **garganica**: Slightly pubescent or glabrous. Basal leaves serrate. *Monte Gargano.*

(b) Subsp. **cephallenica** (Feer) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 534 (1930) (*C. cephallenica* Feer): More or less pubescent. Basal leaves serrate. *Kephallinia.*

(c) Subsp. **acarnanica** (Damboldt) Damboldt, *Bot. Jahrb.* **84**: 358 (1965) (*C. acarnanica* Damboldt): Tomentose. Basal leaves serrate-crenate. *Kephallinia.*

93. C. fenestrellata Feer, *Jour. Bot.* (*London*) **28**: 272 (1890) (*C. garganica* subsp. *fenestrellata* (Feer) Hayek). Perennial. Stems 15–20 cm, ascending or pendent. Rhizome usually branched. Basal leaves cordate, serrate or dentate, petiolate; cauline similar but smaller, with shorter petioles. Flowers numerous. Corolla 12–20 mm, rotate. Pollen blue. *Limestone rock-crevices.* ● *W. Jugoslavia and E. Albania.* Al Ju.

1 Calyx-teeth deflexed (c) subsp. **debarensis**
1 Calyx-teeth usually erect
2 Plant glabrous, rarely pubescent above; corolla 15 mm (a) subsp. **fenestrellata**
2 Plant tomentose; corolla 20 mm (b) subsp. **istriaca**

(a) Subsp. **fenestrellata**: Plant glabrous, rarely pubescent above. Basal leaves 2-serrate or -dentate. *N.W. Jugoslavia.*

(b) Subsp. **istriaca** (Feer) Fedorov, *Bot. Jour. Linn. Soc.* **70**: 17 (1975) (*C. istriaca* Feer): Plant tomentose. Basal leaves serrate. *N.W. Jugoslavia and adjacent islands.*

(c) Subsp. **debarensis** (Rech. fil.) Damboldt, *Bot. Jahrb.* **84**: 358 (1965) (*C. debarensis* Rech. fil.): Plant more or less pubescent. Basal leaves 2-serrate or -dentate. $2n=34$. *W. Makedonija and E. Albania.*

94. C. specularioides Cosson, *Not. Pl. Crit.* 41 (1849). Glabrous annual. Stem 10–20 cm, flexuous, slender, subdichotomously branched. Leaves ovate, acuminate or obtuse, repand-sinuate, sessile or shortly petiolate. Flowers shortly pedicellate. Calyx-teeth broadly lanceolate, acuminate, erect or somewhat patent, twice as long as the ovary and distinctly shorter than the corolla. Corolla *c.* 10 mm, broadly campanulate. *Limestone rocks.* ● *Mountains of S. Spain.* Hs.

95. C. scutellata Griseb., *Spicil. Fl. Rumel.* **2**: 282 (1846). Hispid annual. Stem 10–15 cm, dichotomously branched above or from the base. Basal leaves oblong-lanceolate, entire, subacute, cuneate at the base, sessile; upper cauline similar but distinctly smaller. Flowers with rather short, patent pedicels. Inflorescence lax, cymose. Calyx-teeth triangular-lanceolate-acuminate, patent, much longer than the ovary. Corolla 15–25 mm, almost rotate, lilac-blue, twice as long as calyx. Capsule obconical, with persistent, widened and elongated stellate-patent calyx-teeth at apex. $2n=14$. *Shady places.* ● *Balkan peninsula, from S.C. Jugoslavia to C. Greece.* Bu Gr Ju.

96. C. drabifolia Sibth. & Sm., *Fl. Graec. Prodr.* **1**: 142 (1806). Hispid-strigose annual. Stems dichotomously and divaricately branched. Leaves dentate, oblong; basal shortly petiolate; cauline small, sessile, more deeply dentate or 3-fid. Flowers shortly pedicellate. Calyx hispid; teeth lanceolate, acute, much longer than the obconical ovary, accrescent and usually stellate-patent after anthesis. Corolla blue, twice as long as calyx. Capsule pendent. $2n=28$. *S. Greece and Aegean region.* Cr Gr.

1 Calyx-teeth convergent in fruit (c) subsp. **pinatzii**
1 Calyx-teeth patent in fruit
2 Corolla 10–16 mm; calyx-teeth in fruit 3–4 times as long as wide (a) subsp. **drabifolia**
2 Corolla *c.* 8 mm; calyx-teeth in fruit *c.* twice as long as wide (b) subsp. **creutzburgii**

(a) Subsp. **drabifolia**: Ovary long-setose. Sinus between the calyx-teeth acute. Corolla infundibuliform-campanulate. *S. & E. Greece.*

(b) Subsp. **creutzburgii** (W. Greuter) Fedorov, *Bot. Jour. Linn. Soc.* **67**: 281 (1973) (*C. creutzburgii* W. Greuter): Ovary shortly subappressed-setose. Sinus between the calyx-teeth acute. Corolla narrowly tubular-campanulate. ● *Kriti.*

(c) Subsp. **pinatzii** (W. Greuter & Phitos) Fedorov, *loc. cit.* (1973) (*C. pinatzii* W. Greuter & Phitos): Ovary hirsute. Sinus between the calyx-teeth rounded. Corolla more or less ventricose-campanulate. ● *Karpathos and adjacent islets.*

97. C. delicatula Boiss., *Diagn. Pl. Or. Nov.* **2(11)**: 67 (1849). Canescent, patent-hispid annual. Stems 5–10 cm, filiform, slender, dichotomously branched, flexuous. Leaves ovate, obtuse, attenuate at the base, entire or obsoletely repand-dentate, the uppermost very small, elliptical, acute, entire. Flowers terminal, shortly pedicellate. Ovary hispid. Calyx-teeth lanceolate, acute, 4 times as long as the ovary, accrescent and patent after anthesis. Corolla *c.* 10 mm, bluish, hirsute outside, scarcely longer than the calyx. Capsule pendent. *N.E. Greece; S. Aegean region.* Cr Gr. (*Anatolia, Cyprus.*)

98. C. erinus L., *Sp. Pl.* 169 (1753). Hispid annual. Stem 3–10(–30) cm, dichotomously branched, weakly angular and striate. Leaves 1–2 cm, alternate or opposite, setose, ovate or obovate, crenate-dentate, sometimes slightly lobed, sessile. Flowers terminal and axillary, sessile. Calyx-teeth erect, acute, patent after anthesis, shorter than the pale blue corolla. Corolla 3–5 mm. Capsule urceolate, pendent. $2n=28$. *Dry places. S. Europe.* Al Az Bl Co Cr Ga Gr Hs It Ju Lu Rs (K) Sa Si Tu.

99. C. latifolia L., *Sp. Pl.* 165 (1753). Perennial. Stem up to 100 cm or more, erect, simple, obtusely angled, glabrous or somewhat pubescent. Leaves 7–12 × 3–6 cm, glabrous, sometimes rather scabrid, irregularly 2-serrate; basal ovate-oblong, cordate, strongly serrate, long-petiolate; lower cauline ovate, shortly petiolate; the upper almost entire, sessile. Flowers axillary, numerous. Calyx-teeth long-acuminate, usually serrate, shorter than the corolla. Corolla 40–55 mm, infundibuliform-campanulate, blue, rarely white, hirsute inside. Capsule ovoid, pendent. $2n=34$, $34+5B$. *Woods, river-banks and mountain meadows. Most of Europe, but absent from parts of the north, much of the south-west and most of the Mediterranean region.* Au Br Bu Cz Da Fe Ga Ge He Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su [Be Ho].

100. C. trachelium L., *Sp. Pl.* 166 (1753). Perennial. Stem up to 100 cm or more, erect, simple or branched, sharply angled, reddish, hispid. Leaves scabrid, pale beneath, acuminate, dentate or doubly dentate or 2-crenate; lower leaves 8–10 × 6–7 cm, ovate-cordate, petiolate; upper sessile. Flowers 1–4 at the apex of branches. Pedicels short, recurved or erect. Calyx-teeth triangular, acuminate, ½ as long as the bluish-violet or pale blue corolla. Capsule pendent, ovoid. $2n=34$. *Woods and scrub. Most of Europe northwards to c.* 62° 30′ *in Sweden, but absent from most of the islands.* Al Au Be Br Bu Cz Da Fe Ga Ge Gr Hb He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Si Su Tu.

(a) Subsp. **trachelium**: Flowers shortly pedicellate. Corolla 30–50 mm, pubescent inside. *Throughout the range of the species.*

(b) Subsp. **athoa** (Boiss. & Heldr.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 541 (1930): Flowers subsessile. Corolla 15–20 mm, glabrous. *Balkan peninsula.*

101. C. rapunculoides L., *Sp. Pl.* 165 (1753). Perennial. Root stout, branched, sometimes with long stolons. Stem 30–100 cm,

simple, erect, somewhat striate, glabrous or hirsute, scabrid. Basal and lower cauline leaves cordate, ovate to oblong-ovate, dentate, long-petiolate; middle cauline ovate; upper lanceolate, sessile, dentate. Inflorescence branched, racemose, secund. Pedicels short, recurved. Calyx-teeth oblong to triangular-lanceolate, deflexed at anthesis, much shorter than the corolla. Corolla 20–30 mm, infundibuliform-campanulate, ciliate, bluish-violet. $2n=68$, 102. *Forest-margins, meadows, rocky places and cultivated ground. Most of Europe, except the arctic and the islands.* Al Au Be Bu Cz Da Fe Ga Ge He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su [Br Hb].

102. C. bononiensis L., *Sp. Pl.* 165 (1753). Perennial. Stem up to 70 cm, erect, scabrid and pubescent, simple or somewhat branched. Leaves ovate, acuminate, greyish-tomentose beneath, serrate; basal petiolate; cauline sessile. Flowers pendent; pedicels very short. Inflorescence long, spike-like, sometimes sparingly branched. Calyx-teeth scabrid, triangular-lanceolate, patent, much shorter than the corolla. Corolla pendent, globose. $2n=34$. *Meadows, scrub and forest-margins. C. & E. Europe, extending westwards to S.E. France and southwards to Albania.* Al Au Bu Cz Ga Ge He Hu It Ju Po Rm Rs (N, C, W, K, E).

103. C. aparinoides Pursh, *Fl. Amer. Sept.* **1**: 159 (1814). Perennial, with slender subterranean runners. Stems 20–60 cm, slender, more or less 3-angled, retrorsely aculeolate on the angles. Leaves linear-lanceolate to lanceolate, dentate, retrorsely aculeolate on midrib and margin, sessile. Flowers mostly terminal on divaricate, leafy branches; pedicels 0·3–3·5 cm. Calyx-teeth triangular-lanceolate, about as long as the ovary. Corolla 5–9 mm, broadly campanulate, whitish. Capsule pendent, subglobose. *Damp places. Naturalized in Finland.* [Fe.] (*North America.*)

104. C. trichocalycina Ten., *Fl. Nap.* **1**, *Prodr.*: 15 (1811) (*Asyneuma trichocalycinum* (Ten.) K. Malý). Subglabrous perennial. Stems slender, long, leafy, simple or sparingly branched. Leaves ovate to oblong, irregularly acutely serrate-dentate, subsessile. Inflorescence racemose, short, usually terminal. Pedicels slender, recurved, with linear or setiform bracts. Calyx-teeth linear, patent or deflexed, 3 times as long as the ovoid ovary. Corolla *c.* 15 mm, divided to the base into linear lobes, twice as long as the calyx-teeth. Capsule ovoid, pendent, sulcate. $2n=32$. *Woods; calcicole. C. & S. Italy, Sicilia, Balkan peninsula, Kriti.* Al Bu Cr Gr It Ju Si.

105. C. macrorhiza Gay ex A. DC., *Monogr. Camp.* 301 (1830). Perennial. Rhizome stout, woody, with few branches. Stems (10–)15–30 cm, ascending to erect, glabrous (rarely pubescent in the lower part), sparsely leafy up to the inflorescence. Basal leaves cordate, incise-serrate, usually absent at anthesis; cauline elliptical to narrowly lanceolate, remotely serrate to entire. Inflorescence usually with several flowers. Buds erect. Ovary papillose. Calyx-teeth linear, patent to deflexed. Corolla (12–)16–22(–26) mm, campanulate. Capsule 4–6 mm, turbinate, erect to inclined, woody. $2n=34$. *Limestone rock-crevices.* ● *S.E. France, Corse, N.W. Italy.* Co Ga It.

C. gracillima Podl., *Feddes Repert.* **71**: 78 (1965), from S. France (Mt. Lozère) is like **105** but has a slender rhizome, shorter stems and the corolla only 8–15 mm. It is also a diploid with $2n=34$.

106. C. sabatia De Not., *Prosp. Fl. Ligust.* 52 (1846). Rhizome stout, short, sparingly branched. Stems 20–40(–50) cm, ascending to erect, glabrous, leafy up to the inflorescence. Basal leaves cordate, incise-serrate, usually absent at anthesis; cauline linear-lanceolate to linear, remotely serrate to entire. Inflorescence few-flowered, lax. Buds erect. Ovary papillose. Calyx-teeth linear, abruptly bent at the base. Corolla 15–18(–20) mm. Capsule 4–5 mm, hemispherical, erect to slightly inclined, woody. $2n=34$. *Limestone rock-crevices.* ● *N.W. Italy* (*around Alassio*). It.

107. C. carnica Schiede ex Mert. & Koch in Röhling, *Deutschl. Fl.* ed. 3, **2**: 158 (1826) (*C. linifolia* Scop., non L.). Rhizome stout, woody, with few branches. Stems (12–)20–35 cm, ascending, glabrous, rarely hairy. Basal leaves cordate, incise-serrate, usually absent at anthesis; cauline narrowly lanceolate to linear, serrate to entire. Inflorescence few-flowered. Buds inclined to pendent. Ovary papillose. Calyx-teeth linear-triangular, about as long as or longer than corolla, deflexed. Corolla (18–)22–26(–30) mm, broadly campanulate. Capsule 5–6(–7) mm, turbinate, erect, woody. $2n=34$. *Limestone rock-crevices.* ● *S. Alps, westwards to* 9° 30′ *E.* Au It Ju.

(a) Subsp. **carnica**: Stems glabrous, rarely hairy on the angles. *From Lago d'Idro eastwards.*

(b) Subsp. **puberula** Podl., *Feddes Repert.* **71**: 95 (1965): Stems densely hairy below. *Alpi Bergamasche.*

C. kladniana (Schur) Witasek, *Abh. Zool.-Bot. Ges. Wien* **1(3)**: 39 (1902), which occurs in the S. Carpathians, is probably identical with this species.

108. C. tanfanii Podl., *Feddes Repert.* **71**: 95 (1965). Like **107** but flowers mostly solitary; calyx-teeth abruptly bent at base, much shorter than the corolla; corolla 10–22 mm. $2n=34$. ● *C. Appennini.* It.

109. C. xylocarpa Kovanda, *Folia Geobot. Phytotax.* (*Praha*) **1**: 183 (1966). Perennial. Rhizome stout, woody, short, unbranched or rarely with 1 or 2 short branches. Stems 20–35(–50) cm, erect, glabrous, leafy up to the inflorescence. Basal leaves cordate to cordate-reniform, serrate to lobed, absent at anthesis; cauline narrowly linear to setaceous, entire, the lower linear-lanceolate, remotely serrate. Inflorescence many-flowered, with lower branches from the leaf-axils. Buds erect. Ovary sparsely papillose to more or less smooth. Calyx-teeth linear, appressed to patent, abruptly bent at base. Corolla (12–)14–18(–25) mm. Capsule 3–5(–6) mm, turbinate, narrowing abruptly at the base, erect to slightly inclined, woody. $2n=34$. *Limestone rock-crevices.* ● *E. Czechoslovakia, from* 19° 30′ *E. to* 21° 15′ *E.* Cz.

110. C. crassipes Heuffel, *Österr. Bot. Zeitschr.* **8**: 27 (1858). Perennial. Rhizome stout, short, unbranched. Stems (20–)30–50(–70) cm, pendent, glabrous, branched and leafy up to the inflorescence. Basal leaves cordate, serrate, absent at anthesis; cauline linear-lanceolate to linear, remotely serrate to entire. Inflorescence many-flowered, lax. Buds erect. Ovary papillose, rarely smooth. Calyx-teeth linear to setaceous. Corolla (10–)12–16(–20) mm. Capsule 4–6 mm, turbinate, erect, coriaceous. $2n=34$. *Limestone rock-crevices.* ● *By the Danube at the Iron Gates* (22° 15′ *E.*) *and immediately adjoining parts of S.W. Romania and E. Jugoslavia.* Ju Rm.

111. C. praesignis G. Beck, *Fl. Nieder-Österr.* **2(2)**: 1105 (1893). Perennial. Rhizome slender, much-branched. Stems (15–)20–35 cm, ascending to erect, hairy below, leafy up to the inflorescence. Basal leaves cordate, serrate, absent at anthesis; cauline linear-lanceolate to linear, entire. Flowers in a lax, more or less branched inflorescence. Buds erect. Ovary papillose.

Calyx-teeth linear, patent to deflexed, abruptly bent at base. Corolla (10–)12–16(–20) mm. Capsule 4–5 mm, broadly turbinate, slightly narrowed above, erect, woody. $2n=34$. *Limestone rocks.* ● *N.E. Alps and adjacent foothills.* Au.

112. C. forsythii (Arcangeli) Podl., *Feddes Repert.* **71**: 81 (1965). Perennial. Rhizome stout, woody, with few branches. Stems 10–30 cm, glabrous. Basal leaves rounded to cordate, crenate, absent at anthesis; cauline ovate to narrowly lanceolate, remotely serrate to entire. Flowers solitary or few. Buds erect. Ovary papillose, rarely smooth. Calyx-teeth linear, patent to deflexed, abruptly bent at base. Corolla 20–26(–30) mm. Capsule 4–5 mm, turbinate, woody. $2n=34$. *Limestone rocks.* ● *Sardegna.* Sa.

113. C. hispanica Willk. in Willk. & Lange, *Prodr. Fl. Hisp.* **2**: 291 (1868). Perennial. Rhizome usually stout, with few branches. Stems (15–)20–40(–75) cm, ascending to erect, hairy below. Basal leaves cordate, serrate, absent at anthesis; cauline narrowly lanceolate to linear, usually crowded in the lower part of stem, the lower serrate, the others entire. Inflorescence lax or contracted, rather few-flowered. Buds erect. Ovary papillose, rarely smooth. Calyx-teeth linear, appressed. Corolla (8–)10–14(–16) mm, infundibuliform. Capsule 5–7 mm, turbinate to conical, pendent, woody. *Rocks and stony or sandy places.* ● *N., C. & E. Spain, just extending into France.* Ga Hs.

(a) Subsp. **hispanica**: Stems not more than 40 cm. Inflorescence more or less contracted. $2n=34$. *Throughout most of the range of the species.*

(b) Subsp. **catalanica** Podl., *Feddes Repert.* **71**: 70 (1965): Stems up to 75 cm. Inflorescence lax. *E. Pyrenees.*

C. ruscinonensis Timb.-Lagr., *Mém. Acad. Sci. Toulouse* ser. 7, **5**: 275 (1873), from the E. Pyrenees, resembles **113** but has stems only 10–20 cm, in dense tufts and leafy up to the inflorescence, and the ovary is smooth. It has $2n=34$.

114. C. justiniana Witasek, *Magyar Bot. Lapok* **5**: 245 (1906). Perennial. Rhizome usually slender, creeping, branched. Stems 12–20(–25) cm, ascending, angular, glabrous. Basal leaves cordate, serrate, absent at anthesis; cauline ovate-lanceolate to narrowly lanceolate, acute, remotely and acutely serrate, more or less distinctly petiolate. Inflorescence few-flowered. Buds erect. Ovary papillose. Calyx-teeth linear to setaceous, patent to deflexed. Corolla 12–18 mm. Capsule 4–5 mm, turbinate, pendent, woody. $2n=34$. *Limestone rocks.* ● *W. Jugoslavia.* Ju.

115. C. hercegovina Degen & Fiala, *Österr. Bot. Zeitschr.* **44**: 303 (1894). Perennial. Rhizome stout, woody, with few branches. Stems (8–)12–20(–40) cm, branched, ascending to pendent, angular, ciliate to hairy in the lower part. Basal leaves cordate to ovate, incise-serrate, absent at anthesis; cauline rhombic to ovate, serrate to entire, petiolate. Inflorescence more or less branched. Buds erect. Ovary papillose. Calyx-teeth linear to setaceous. Corolla (14–)16–20(–22) mm. Capsule turbinate, pendent, woody. $2n=34$. *Limestone rock-crevices.* ● *S.W. Jugoslavia.*

woody. $2n=34$. *Limestone rock-crevices.* ● *S.W. Jugoslavia.*
Ju.

116. C. albanica Witasek, *Magyar Bot. Lapok* **5**: 246 (1906). Perennial. Rhizome slender, with few branches. Stems (6–)8–15(–24) cm, ascending to erect, glabrous. Basal leaves cordate, serrate, absent at anthesis; cauline narrowly elliptical to linear, more or less entire, obtuse to acute. Flowers solitary, rarely 2–3. Buds erect. Ovary papillose, rarely smooth. Calyx-teeth narrowly triangular to linear. Corolla 14–18(–22) mm. Capsule (6–)7–8 mm, turbinate, pendent, woody. *Rocks and stony places.* ● *S. & W. parts of Balkan peninsula.* Al Gr Ju.

(a) Subsp. **albanica**: Cauline leaves narrowly lanceolate to linear, mostly acute. Calyx-teeth up to 12 mm. $2n=34$. *Throughout the range of the species.*

(b) Subsp. **sancta** (Hayek) Podl., *Feddes Repert.* **71**: 85 (1965): Cauline leaves narrowly elliptical to narrowly lanceolate, mostly obtuse. Calyx-teeth up to 7 mm. $2n=34$. *N.E. Greece* (*Athos*).

117. C. romanica Săvul., *Teze Fac. Şti. Bucureşti* **11(1)**: 60 (1916). Perennial. Rhizome stout, woody, with few branches. Stems (10–)18–30(–40) cm, erect to ascending, pubescent in the lower part. Basal leaves cordate to suborbicular-cordate, serrate, absent at anthesis; cauline linear-lanceolate to linear, remotely serrate, the uppermost entire. Inflorescence more or less branched. Buds erect. Ovary papillose. Calyx-teeth linear to setaceous, appressed. Corolla 8–10(–14) mm, narrowly campanulate. Capsule 4–7 mm, conical, pendent, coriaceous. *Rock-crevices.* ● *S.E. Romania* (*Dobrogea*). Rm.

118. C. moravica (Spitzner) Kovanda, *Folia Geobot. Phytotax.* (*Praha*) **3**: 409 (1968). Perennial. Rhizome stout, woody, with few branches. Stems (15–)25–45(–70) cm, ascending, stiff, hairy below or glabrous. Basal leaves cordate, incise-serrate to lobed, absent at anthesis; cauline crowded in the lower part of stem, linear-lanceolate to linear or setaceous, entire. Inflorescence many-flowered, more or less contracted. Buds erect. Ovary papillose. Calyx-teeth linear to setaceous. Corolla (14–)16–22(–25) mm. Capsule 4–8 mm, turbinate to conical, pendent, woody. *Rocks, stony places and dry pastures.* ● *C. Europe, from C. Czechoslovakia to N.W. Romania.* Au Cz Hu Ju Rm.

(a) Subsp. **moravica**: Rhizome *c.* 6–10 mm in diameter. Pollen-grains 33–39 μ in diameter. $2n=68$. *Throughout the range of the species.*

(b) Subsp. **xylorrhiza** (O. Schwarz) Kovanda, *op. cit.* 410 (1968): Rhizome up to 15 mm in diameter. Pollen-grains 36–42(–45) μ in diameter. $2n=102$. *S.C. Czechoslovakia, E. Austria, N.W. Jugoslavia and probably elsewhere.*

C. gentilis Kovanda, *op. cit.* 407 (1968), from W. Czechoslovakia and S.E. Germany, is a closely related diploid. It has a slender rhizome, shorter stems, corolla 12–18 mm, pollen-grains 30–36 μ in diameter and a cartilaginous capsule 3–5 mm.

119. C. apennina (Podl.) Podl., *Mitt. Bot. Staatssamm.* (*München*) **8**: 216 (1970). Perennial. Rhizome stout. Stems 40–60 cm, erect to ascending, glabrous, densely leafy up to the inflorescence. Basal leaves cordate, incise-serrate, absent at anthesis; cauline narrowly lanceolate to linear, entire. Inflorescence more or less branched, secund. Pedicels very slender. Buds erect. Ovary papillose. Calyx-teeth setaceous. Corolla 10–12 mm. Capsule 5–6 mm, turbinate, erect, woody. $2n=34$. ● *C. Appennini.* It.

120. C. willkommii Witasek, *Abh. Zool.-Bot. Ges. Wien* **1(3)**: 75 (1902). Perennial. Rhizome slender to stout, creeping, branched. Stems (5–)8–15(–25) cm, glabrous or hairy below. Basal leaves suborbicular to ovate, crenate to entire; cauline elliptical to narrowly lanceolate, mostly crowded in the lower part of the stem, entire, obtuse. Inflorescence few-flowered. Buds erect. Ovary papillose. Calyx-teeth narrowly triangular, appressed. Corolla (10–)12–15 mm, narrowed at the mouth. Capsule broadly turbinate to almost hemispherical, pendent. $2n=68$. *Limestone rocks.* ● *S. Spain* (*Sierra Nevada*). Hs.

121. C. fritschii Witasek, *op. cit.* 90 (1902). Perennial. Rhizome slender, creeping, branched. Stems (12–)20–35 cm, erect, densely hairy below, glabrous and leafless above. Basal leaves

cordate, serrate, absent at anthesis; cauline elliptical to narrowly lanceolate, obtuse, obtusely serrate, hairy beneath. Inflorescence with few branches. Buds erect. Ovary papillose. Calyx-teeth narrowly triangular. Corolla 18–22(–26) mm. Capsule turbinate to conical, pendent. $2n=68$. *Stony slopes.* ● *S.E. France* (*Alpes de Provence*). Ga.

122. C. longisepala Podl., *Feddes Repert.* **71**: 97 (1965). Perennial. Rhizome slender, branched. Stems 30–40 cm, ascending, glabrous, sparsely leafy. Basal leaves reniform, incise-serrate; cauline lanceolate to narrowly lanceolate, remotely serrate to entire. Inflorescence few-flowered. Buds erect. Ovary papillose. Calyx-teeth at least half as long as corolla, linear to setaceous, patent. Corolla 22–25 mm. $2n=34$, 68. ● *S.E. France* (*Mt. Ventoux*). Ga.

123. C. marchesettii Witasek, *Abh. Zool.-Bot. Ges. Wien* **1(3)**: 32 (1902). Perennial. Rhizome slender, branched. Stems (15–)20–40(–60) cm, ascending to erect, stiff, angular, glabrous or hairy on the angles below, leafy up to the inflorescence. Basal leaves cordate to rounded, serrate, absent at anthesis; cauline narrowly linear to setaceous, entire. Inflorescence more or less branched. Buds erect. Ovary papillose. Calyx-teeth setaceous, usually appressed. Corolla 12–18(–20) mm. Capsule 4–6 mm, turbinate, pendent, woody. $2n=68$. *Rocks and stony places.* ● *N.W. Jugoslavia; C. Appennini.* It Ju.

124. C. velebitica Borbás, *Math. Term. Értesitő* **1**: 81 (1883). Perennial. Rhizome slender to slightly thickened, creeping, branched. Stems 15–25(–35) cm, ascending to erect, glabrous (rarely hairy below). Basal leaves cordate to reniform, serrate, usually absent at anthesis; cauline lanceolate to linear, remotely serrate to entire, the lower petiolate. Inflorescence lax, many-flowered. Buds erect. Ovary papillose, rarely smooth. Calyx-teeth setaceous, appressed. Corolla (10–)16–20 mm. Capsule 6–8 mm, conical, pendent, woody. *Rocks and stony places.* ● *Mountains of N. part of Balkan peninsula.* Al Bu Ju.

The plants from Bulgaria (C. Stara Planina) have hairy stems and have been separated as **C. bulgarica** Witasek, *Magyar Bot. Lapok* **5**: 244 (1906).

125. C. bertolae Colla, *Herb. Pedem.* **4**: 24 (1835). Perennial. Rhizome stout, woody, unbranched. Stems 20–40(–60) cm, stiff, leafy up to the inflorescence and densely hairy throughout (rarely glabrous). Basal leaves cordate, crenate to serrate, absent at anthesis; cauline linear-lanceolate to linear, entire, hairy on both surfaces. Inflorescence paniculate, lax to contracted. Buds erect. Ovary papillose, hairy, rarely glabrous. Calyx-teeth linear. Corolla 12–18(–22) mm. Capsule 5–7 mm, conical, pendent, woody. $2n=102$. ● *S.W. Alps*; ?*Appennini.* It.

126. C. pseudostenocodon Lacaita, *Nuovo Gior. Bot. Ital.* nov. ser., **25**: 22 (1918). Perennial. Rhizome stout, with few branches. Stems 15–30 cm, glabrous or hairy below. Basal leaves cordate, serrate to crenate, absent at anthesis; cauline ovate to narrowly lanceolate or linear, crenate to entire. Inflorescence few-flowered. Buds erect. Ovary papillose. Calyx-teeth linear. Corolla 14–18(–22) mm, narrowly tubular, with patent lobes. Capsule 4–6 mm, turbinate to conical, erect, woody. $2n=102$. ● *S. Appennini.* It.

127. C. rhomboidalis L., *Sp. Pl.* 165 (1753). Perennial. Root napiform. Rhizome slender, sparingly branched, without tubercles. Stems (10–)20–40(–60) cm, erect, angular, ciliate or glabrous. Basal leaves suborbicular, serrate, absent at anthesis; cauline ovate to broadly lanceolate, acute, bluntly serrate. Inflorescence few-flowered. Buds erect. Ovary smooth. Calyx-teeth linear. Corolla (12–)16–22(–24) mm. Capsule 6–7 mm, turbinate, pendent, membranous. $2n=34$. *Mountain meadows.* ● *S.W. & C. Alps, Jura; locally naturalized elsewhere.* Ga He It [Au Be Cz Ge Ho].

128. C. cantabrica Feer, *Jour. Bot.* (*London*) **28**: 273 (1890). Perennial. Root napiform. Rhizome slender, branched, with small napiform tubercles. Stems 5–15(–20) cm, erect, angular, glabrous, leafless above. Basal leaves rounded to cordate, finely crenate, absent at anthesis; cauline ovate to narrowly lanceolate, remotely crenate to entire. Flowers solitary, rarely 2–3. Buds erect. Ovary smooth. Calyx-teeth narrowly triangular to linear. Corolla 12–15 mm. Capsule 5–6 mm, turbinate, pendent, membranous. $2n=34$. ● *N. Spain* (*Cordillera Cantábrica*). Hs.

129. C. serrata (Kit.) Hendrych, *Taxon* **11**: 123 (1962) (*C. napuligera* Schur, *C. pseudolanceolata* Pant.). Perennial. Root napiform. Rhizome slender, short, unbranched. Stems (10–)20–40(–60) cm, erect, angular, glabrous or ciliate, densely leafy. Basal leaves suborbicular to ovate, crenate, absent at anthesis; cauline ovate to narrowly lanceolate, serrate, glabrous on both surfaces, ciliate at base. Inflorescence few-flowered, contracted. Buds pendent. Ovary smooth. Calyx-teeth linear to narrowly triangular. Corolla (13–)15–22(–25) mm. Capsule (5–)6–8(–10) mm, conical, gradually narrowed at base, pendent, membranous. $2n=34+0$–2 B. *Mountain meadows and pastures.* ● *Carpathians.* Cz Po Rm Rs (W).

130. C. recta Dulac, *Fl. Dép. Hautes-Pyr.* 458 (1867) (*C. lanceolata* Lapeyr. pro parte). Like **129** but leaves entire, obtuse, pubescent on both surfaces; capsule slightly contracted at the top and shortly narrowed at base. $2n=34$. ● *Pyrenees and mountains of S.C. France.* Ga Hs.

131. C. precatoria Timb.-Lagr., *Mém. Acad. Sci. Toulouse* ser. 7, **5**: 271 (1873). Perennial. Root moniliform. Rhizome slender, branched. Stems (15–)20–40 cm, erect, angular, hairy on the angles below, leafless above. Basal leaves suborbicular, crenate, absent at anthesis; cauline ovate to lanceolate, crenate to entire, amplexicaul or nearly so. Inflorescence few-flowered. Buds pendent. Ovary smooth. Calyx-teeth narrowly triangular, appressed. Corolla 16–20(–24) mm. Capsule pendent. *Mountain meadows and pastures.* ● *E. Pyrenees.* Ga Hs.

132. C. witasekiana Vierh., *Mitt. Naturw. Ver. Univ. Wien* **4**: 72 (1906) (?*C. inconcessa* Schott, Nyman & Kotschy). Perennial. Rhizome slender, creeping, branched, with napiform tubercles. Stems (18–)25–35(–50) cm, erect, angular, glabrous or ciliate in the lower part, leafy up to the inflorescence. Basal leaves suborbicular to reniform, crenate, absent at anthesis; cauline narrowly lanceolate to linear-lanceolate, entire. Inflorescence more or less branched. Buds pendent. Ovary smooth. Calyx-teeth narrowly triangular. Corolla (10–)12–16 mm. Capsule 5–7(–9) mm, turbinate, pendent, membranous. $2n=34$. *Mountain meadows.* ● *E. Alps and mountains of N. half of Balkan peninsula.* Au Bu It Ju.

133. C. cochlearifolia Lam., *Encycl. Méth. Bot.* **1**: 578 (1785) (*C. pusilla* Haenke). Perennial. Rhizome slender, creeping, branched. Stems (3–)5–10(–20) cm, ascending, hairy or glabrous. Basal leaves cordate to rounded, truncate to shallowly cordate at base, incise-serrate, present at anthesis; cauline elliptical to lanceolate, remotely serrate. Flowers few or solitary. Buds pendent. Ovary smooth. Calyx-teeth linear to narrowly triangular. Corolla (10)13–16(–18) mm, not narrowed at the mouth. Cap-

sule 3–6 mm, conical, pendent, coriaceous. $2n=34$. *Rocks, screes and stony ground, mainly in the mountains; somewhat calcicole.* ● *From the Vosges and Carpathians southwards to N. Spain, C. Appennini and S. Bulgaria.* Al Au Bu Cz Ga Ge He Hs It Ju Po Rm.

Several microspecies have been described, based mainly on floral characters, but further work is necessary to understand their range and taxonomic status.

134. C. cespitosa Scop., *Fl. Carn.* ed. 2, **1**: 143 (1771). Like **133** but basal leaves ovate to rhombic, cuneate at base and decurrent on petiole; corolla narrowed at the mouth. $2n=34$. *Limestone rocks and screes.* ● *E. Alps and mountains of N.W. Jugoslavia.* Au It Ju.

135. C. jaubertiana Timb.-Lagr., *Bull. Soc. Bot. Fr.* **15**: xcviii (1868). Perennial. Rhizome slender, creeping, branched. Stems (2–)3–6(–8) cm, ascending to erect, densely hairy. Basal leaves suborbicular to elliptical, irregularly crenate, cuneate at base; cauline ovate to elliptical, irregularly crenate to serrate, usually obtuse. Flowers solitary, rarely 2–4. Buds pendent. Ovary smooth, pubescent. Calyx-teeth sublinear to narrowly triangular. Corolla 8–12(–14) mm, narrowly infundibuliform. Capsule 3–4(–5) mm, hemispherical, pendent, coriaceous. *Limestone rocks.* ● *C. & E. Pyrenees.* Ga Hs.

(a) Subsp. **jaubertiana**: Basal leaves cordate at base. The vein ending in the sinus arising near the base of the calyx-tube. Calyx-teeth sublinear. *C. Pyrenees.*

(b) Subsp. **andorrana** (Br.-Bl.) P. Monts. in Losa & P. Monts., *Aport. Conoc. Fl. Andorra* 115 (1950): Basal leaves truncate at base. The vein ending in the sinus arising near the middle of the calyx-tube. Calyx-teeth narrowly triangular. *E. Pyrenees.*

136. C. excisa Schleicher ex Murith, *Guide Bot. Valais* 57 (1810). Perennial. Rhizome slender, creeping, branched. Stems 5–9(–15) cm, ascending to erect, hairy. Basal leaves cordate to suborbicular, serrate, absent at anthesis; cauline linear-lanceolate to linear, entire. Flowers solitary, rarely 2–3. Buds pendent. Ovary smooth. Calyx-teeth linear-triangular. Corolla 10–16(–18) mm, with a deep, rounded sinus between the lobes. Capsule 4–6 mm, broadly turbinate, pendent, coriaceous. $2n=34$. *Mountain rocks and screes; calcifuge.* ● *S.W. & S.C. Alps.* ?Ga He It.

137. C. stenocodon Boiss. & Reuter in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 112 (1856). Perennial. Rhizome slender, creeping, branched. Stems (7–)12–20(–30) cm, ascending, pubescent below. Basal leaves rounded to cordate, serrate, absent at anthesis; cauline linear-lanceolate to linear, remotely serrate to entire. Inflorescence few-flowered, simple or with long divaricate branches. Buds pendent, Ovary smooth. Calyx-teeth linear. Corolla 12–18(–22) mm, narrowly tubular, with patent lobes. Capsule 5–7 mm, turbinate, pendent, coriaceous. $2n=34$. *Mountain rocks and stony places.* ● *S.W. Alps, from 44° to 45° N.* Ga It. *rocks and stony places.* ● *S.W. Alps, from 44° to 45° N.* Ga It.

138. C. pulla L., *Sp. Pl.* 163 (1753). Perennial. Rhizome slender, creeping, branched. Stems (5–)7–15(–20) cm, ascending to erect, glabrous or hairy on the angles. Basal leaves suborbicular to ovate, crenate, shortly cuneate at base, absent at anthesis; cauline ovate to elliptical, crenate to obtusely serrate, more or less distinctly petiolate. Flowers solitary. Buds pendent. Ovary smooth. Calyx-teeth narrowly triangular. Corolla (15–)18–24(–28) mm. Capsule 5–7 mm, conical, pendent, coriaceous. $2n=34$. *Screes, stony slopes and mountain pastures; somewhat calcicole.* ● *N.E. Alps, westwards to 12° 45′ E.* Au.

139. C. scheuchzeri Vill., *Prosp. Pl. Dauph.* 22 (1779). Perennial. Rhizome slender, creeping, branched. Stems (5–)10–25(–40) cm, erect to ascending, ciliate or glabrous, rarely hairy. Basal leaves suborbicular to cordate, crenate, absent at anthesis; cauline narrowly lanceolate to linear-lanceolate, acute, more or less sessile, ciliate at base. Flowers solitary or few. Buds pendent. Ovary smooth. Calyx-teeth narrowly triangular. Corolla (16–)18–24(–28) mm, campanulate, narrowed at base, with patent lobes. Capsule 5–8(–10) mm, conical, pendent, membranous. $2n=68$, 102. *Mountain meadows.* ● *C. & S. Europe, from the Pyrenees eastwards to the W. Carpathians and Bulgaria.* Al Au Bu Ga Ge He Hs It Ju Po Si.

C. bohemica Hruby in Domin & Podp., *Klíč Úplné Květ. Rep. Česk.* 534 (1928), and **C. gelida** Kovanda, *Folia Geobot. Phytotax. (Praha)* **3**: 408 (1968), are well-marked geographical variants of **139**. They occur in the W. & E. Sudeten Mts. respectively and both have erect buds. The former has the corolla campanulate and rounded at the base and the capsule 6–8(–10) mm, while the latter has a tubular corolla gradually narrowed at the base and the capsule 5–6 mm. Both have $2n=68$.

C. pollinensis Podl., *Mitt. Bot. Staatssamm. (München)* **8**: 211 (1970), from S. Italy (Prov. Cosenza), resembles **139** but is probably more closely related to spp. **105–126**. It has a papillose ovary and glabrous cauline leaves.

140. C. ficarioides Timb.-Lagr., *Mém. Acad. Sci. Toulouse* ser. 5, 6: 33 (1862). Like **139** but rhizome with napiform tubercles; stems 8–15 cm; corolla 15–18 mm. $2n=102$. *Mountain meadows.* ● *Pyrenees.* Ga Hs.

141. C. rotundifolia L., *Sp. Pl.* 163 (1753). Perennial. Rhizome slender, creeping, branched. Stems (5–)20–40(–70) cm, shortly ascending to erect (rarely procumbent or pendent), mostly pubescent below, sparsely leafy up to the inflorescence. Basal leaves suborbicular, reniform to shallowly cordate, crenate, sometimes present at anthesis; cauline narrowly lanceolate to linear, the lower petiolate, remotely serrate, the others sessile, entire. Inflorescence more or less branched, lax. Buds erect. Ovary smooth, rarely papillose. Calyx-teeth linear to narrowly triangular. Corolla (10–)12–20(–30) mm. Capsule (2–)3–5(–12) mm, turbinate to conical, pendent, membranous. $2n=34$, 68, 102. *Dry grassland, sand-dunes and rocky ground. Much of Europe, but rare in the south.* Au Be Br Bu Cz Da Fa Fe Ga Ge Hb He Ho ?Hs Hu Is It Ju No Po Rm Rs (N, B, C, W, E) Su.

Extremely variable; in addition to an array of infraspecific taxa, numerous variants have been described as distinct species. However, a great deal of the variation is continuous and there is little correlation between the different characters.

Polyploids differ from the diploids in having larger corolla, capsule, seeds, stomata and pollen grains, but there is considerable intergradation and there does not seem to be any definite geographical pattern, so a clear-cut separation is not possible. The European mountain plants (subsp. *polymorpha* (Witasek) Tacik, subsp. *sudetica* (Hruby) Soó and var. *alpicola* Hayek) are tetraploid and have the following features in common: stems (5–)10–15 cm; flowers solitary or few; calyx-teeth narrowly triangular; corolla 16–25(–30) mm; capsule 5–9(–12) mm. Dwarf northern tetraploids, very similar morphologically, are known as **C. groenlandica** Berlin, *Öfvers. Kongl. Vet.-Akad. Förhandl.* **41**(7): 50 (1884).

Variants with a papillose ovary require further study; they are absent in the north but become gradually more common southwards, and at least some of them may in fact be referable to the

group of saxicolous species **105–126**, or may have arisen from introgressive hybridization. Many of the records of *C. rotundifolia* in south Europe are doubtful, and the limits of distribution in the Balkan peninsula and in S. France are not known with any accuracy. Plants from N. Spain have been separated as **C. asturica** Podl., *Mitt. Bot. Staatssamm. (München)* **8**: 213 (1970), and **C. wiedmannii** Podl., *loc. cit.* (1970).

142. C. giesekiana Vest in Roemer & Schultes, *Syst. Veg.* **5**: 89 (1819). Perennial. Rhizome slender, creeping, branched. Stems 5–10(–20) cm, shortly ascending, usually hairy below and leafless above. Basal leaves suborbicular to bluntly cordate, finely crenate to entire; cauline linear-lanceolate to linear, usually obtuse, entire, nearly all more or less distinctly petiolate. Flowers solitary or few. Buds erect. Ovary smooth. Calyx-teeth linear to narrowly triangular. Corolla 12–20 mm, broadly campanulate, hemispherical at base. Capsule 3–4 mm, broadly turbinate to pelviform, pendent, membranous. $2n=34$. *Dry grassland and stony or gravelly places. N. Europe.* ?Fe No ?Rs (N) Sb ?Su.

143. C. baumgartenii J. Becker, *Fl. Frankfurt* 264 (1828). Perennial. Rhizome slender, branched. Stems (20–)30–50(–70) cm, ascending to erect, angular, pubescent below, leafy up to the inflorescence. Basal leaves suborbicular to reniform, crenate, usually present at anthesis; cauline lanceolate to linear-lanceolate, finely serrate to entire, the lower pubescent. Inflorescence paniculate, many-flowered. Buds erect to inclined. Ovary smooth. Calyx-teeth linear to setaceous. Corolla (12–)14–18(–22) mm. Capsule 4–5(–7) mm, turbinate, pendent, membranous. $2n=68$. *Dry grassland.* ● *S.W. Germany and E. France.* Ga Ge.

144. C. beckiana Hayek, *Fl. Steierm.* **2(1)**: 455 (1912). Perennial. Rhizome slender, short, with few branches. Stems (15–)30–45(–60) cm, erect, angular, glabrous or hairy on the angles below, leafy up to the inflorescence. Basal leaves suborbicular to cordate, crenate to serrate, absent at anthesis; cauline ovate-lanceolate to linear-lanceolate, remotely serrate to entire, the lower glabrous but ciliate. Inflorescence paniculate, many-flowered. Buds inclined. Ovary smooth. Calyx-teeth linear to setaceous. Corolla 12–16(–18) mm. Capsule 5–9 mm, conical, pendent, membranous. $2n=68$. *Meadows and open woods.* ● *N.E. Alps; one station in Slovenija.* Au Ju.

2. Azorina Feer[1]

Dwarf shrub. Flowers in a lax, leafless inflorescence. Bracts at the base of the pedicels small. Calyx without appendages between the teeth. Corolla constricted in the middle, ventricose at the base; lobes very short. Stamens 5; filaments broadly triangular at the base. Style with an annular disc at the base; stigmas 3. Ovary 3-locular, broadly obconic-cupuliform. Capsule dehiscing by wide valves. Seeds flat, margined.

1. A. vidalii (H. C. Watson) Feer, *Bot. Jahrb.* **12**: 612 (1890). Glabrous, viscid, symmetrical dwarf shrub with a terminal leaf-rosette, below which arises a whorl of axillary branches each ending in a simple or branched inflorescence. Stems up to 200 cm. Leaves 30–80 × 3–8 mm, oblong-cuneate, entire to crenate-dentate, rather succulent and coriaceous. Corolla 2·5–3·5 cm, white, often tinged with pink outside, hirsute inside. Ovary ribbed; calyx-teeth $\frac{1}{4}$–$\frac{1}{3}$ as long as the tube. Capsule erect or slightly nodding. $2n=56$. *Sea-cliffs.* ● *Açores.* Az.

[1] By Andrey A. Fedorov.

3. Symphyandra A. DC.[2]

Flowers in racemes or panicles. Calyx deeply 5-fid. Corolla 5-lobed or -fid, campanulate. Stamens 5; filaments ciliate; anthers connate in a tube. Ovary 3-locular. Style included, hairy; stigmas 3, filiform. Capsule dehiscing by 3 valves near the base.

Literature: D. Phitos, *Ber. Deutsch. Bot. Ges.* **79**: 246–249 (1966).

1 Calyx with a deflexed appendage in each sinus — **3. hofmannii**
1 Calyx without a deflexed appendage in each sinus
2 Basal leaves cordate — **1. cretica**
2 Basal leaves gradually narrowed below — **2. wanneri**

1. S. cretica A. DC., *Monogr. Camp.* 366 (1830). Glabrous perennial. Lower leaves petiolate; lamina cordate or reniform, crenate; uppermost leaves sessile. Flowers pendent, in a few-flowered, secund raceme. Calyx-lobes *c.* 15 mm, linear-lanceolate, without a deflexed appendage in each sinus. Corolla *c.* 30 mm, blue or white. *Rocks and walls at low altitudes.* ● *Aegean region.* Cr Gr.

1 Calyx-lobes erect, usually serrate — (a) subsp. **cretica**
1 Calyx-lobes erecto-patent, entire
2 Bracts lanceolate, as long as or longer than the pedicel — (b) subsp. **samothracica**
2 Bracts subulate, shorter than the pedicel — (c) subsp. **sporadum**

(a) Subsp. **cretica**: Up to 45 cm. Lamina of basal leaves 3·5–14 cm. Bracts lanceolate, serrate, longer than the pedicel. Calyx-lobes erect, usually serrate. Corolla usually white. $2n=36$. *Kriti.*

(b) Subsp. **samothracica** (Degen) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 549 (1930): Like subsp. (a) but smaller; lamina of basal leaves 2·5–4 cm; calyx-lobes erecto-patent, entire; corolla usually blue. $2n=36$. *Samothraki.*

(c) Subsp. **sporadum** (Halácsy) Hayek, *loc. cit.* (1930): Up to 25 cm. Lamina of basal leaves 1–3 cm. Bracts subulate, usually entire, shorter than the pedicel. Calyx-lobes erecto-patent, entire. Corolla usually blue. $2n=36$. *Voriai Sporadhes.*

2. S. wanneri (Rochel) Heuffel, *Verh. Zool.-Bot. Ges. Wien* **8**: 156 (1858). Pubescent perennial 10–40 cm. Leaves 2–11 cm, linear-oblong to lanceolate, gradually narrowed at base, serrate, the lower with a winged petiole, the upper sessile. Flowers in a branched, secund inflorescence. Calyx-lobes 15–20 mm, linear-lanceolate to ovate-lanceolate, acute, without a deflexed appendage in each sinus. Corolla 20–35 mm, violet. *Shady cliffs and rocks.* ● *Mountains of Bulgaria, Romania and E. Jugoslavia.* Bu Ju Rm.

3. S. hofmannii Pant., *Österr. Bot. Zeitschr.* **31**: 347 (1881). Pubescent biennial. Leaves 5–10 cm, ovate to lanceolate, gradually narrowed at base, coarsely serrate, hairy at least on the veins beneath when young, the lower with a winged petiole, the upper sessile. Flowers pendent, in a branched secund inflorescence. Calyx-lobes 15–20 mm, ovate, obtuse, with a conspicuous, deflexed appendage in each sinus. Corolla 20–30 mm, yellowish-white. *Rocky places.* ● *Jugoslavia (Bosna).* Ju.

4. Adenophora Fischer[2]

Flowers in racemes or panicles. Calyx 5-fid. Corolla 5-fid, campanulate or infundibuliform. Stamens 5; filaments ciliate; anthers free. Ovary 3-locular. Style exserted, pubescent; stigmas

[2] By T. G. Tutin.

3, connate at their base to form a tube or disc; base of style surrounded by a conspicuous tubular disc. Capsule dehiscing by 3 pores near the base.

Corolla about as wide as long — **1. lilifolia**
Corolla about ½ as wide as long — **2. taurica**

1. A. lilifolia (L.) Ledeb. ex A. DC., *Monogr. Camp.* 358 (1830). Slightly pubescent, erect perennial. Stems (30–)50–100 cm. Basal leaves suborbicular, cordate, coarsely serrate, long-petiolate, dead at flowering time; cauline leaves lanceolate to linear-lanceolate, cuneate at base, serrate, the lower shortly petiolate, the upper sessile. Flowers usually in a spreading panicle. Calyx-lobes 3–4 mm, lanceolate, erecto-patent. Corolla 12–20 mm, broadly campanulate, about as wide as long, pale blue. Style nearly twice as long as the corolla. Capsule 8–12 mm, recurved. $2n=34$. *Woods and damp meadows. E.C. & E. Europe, from E. Austria to C. Romania and N.C. Russia, extending locally southwards to C. Jugoslavia and S. Switzerland.* Au Cz Ge He Hu It Ju Po Rm Rs (B, C, W, E).

2. A. taurica (Suk.) Juz., *Not. Syst. (Leningrad)* **13**: 301 (1950). Like **1** but inflorescence with short branches; corolla *c.* ½ as wide as long; style not more than 1½ times as long as the corolla. *Mountain meadows.* ● *Krym.* Rs (K).

5. Legousia Durande[1]
(*Specularia* A. DC.)

Flowers in racemes or panicles. Calyx 5-fid. Corolla 5-fid, rotate or broadly campanulate. Stamens 5; filaments not or scarcely dilated at base; anthers free. Ovary cylindrical, many times longer than wide. Style puberulent; stigmas 3. Capsule dehiscing by 3 upward-curving valves near the apex.

All species are found mainly in cultivated fields and other dry, open habitats.

1 Flowers in a lax spike forming at least ½ the total length of the stem
2 Calyx-lobes almost as long as the ovary at anthesis; corolla ½ as long as calyx-lobes; plant smooth — **1. falcata**
2 Calyx-lobes ½–½ as long as the ovary at anthesis; corolla about as long as calyx-lobes; plant scabrid — **2. castellana**
1 Flowers in panicles or small, terminal corymbs
3 Corolla about half as long as calyx-lobes; calyx-lobes ± erect in fruit — **3. hybrida**
3 Corolla at least as long as calyx-lobes; calyx-lobes patent or recurved in fruit
4 Calyx-lobes almost as long as the ovary at anthesis; capsule 10–15 mm, narrowed at apex — **4. speculum-veneris**
4 Calyx-lobes ½–½ as long as the ovary at anthesis; capsule 20–30 mm, not narrowed at apex — **5. pentagonia**

1. L. falcata (Ten.) Fritsch, *Mitt. Naturw. Ver. Univ. Wien* **5**: 100 (1907) (*Specularia falcata* (Ten.) A. DC.). More or less pubescent annual up to 50 cm. Leaves obovate, weakly undulate, the lower shortly petiolate, the upper sessile. Flowers solitary or in pairs in the leaf-axils, in a lax spike forming at least ½ the total length of the stem. Calyx-lobes almost as long as the ovary at anthesis, linear-lanceolate, long-acuminate, patent or recurved. Corolla *c.* ½ as long as calyx-lobes, violet. Capsule 15–20 mm, not narrowed at apex. *Mediterranean region.* Bl Co Cr Ga Gr Hs It Ju Sa Si.

2. L. castellana (Lange) Samp., *Lista Esp. Herb. Port.* 127 (1913) (*Specularia castellana* Lange). Like **1** but very scabrid; calyx-lobes ½–½ as long as ovary at anthesis, linear, erecto-patent, scarcely curved; corolla about as long as the calyx-lobes. *S.W. Europe.* Co Ga Hs Lu.

3. L. hybrida (L.) Delarbre, *Fl. Auvergne* ed. 2, 47 (1800) (*Specularia hybrida* (L.) A. DC.). Shortly hispid annual 10–35 cm. Leaves oblong or oblong-obovate, strongly undulate, the lower petiolate, the upper sessile. Flowers few, sessile, mostly in small terminal clusters. Calyx-lobes *c.* ½ as long as the ovary at anthesis, linear-lanceolate, acute or obtuse, erect or erecto-patent. Corolla *c.* ½ as long as calyx-lobes, reddish-purple to lilac. Capsule 15–30 mm, narrowed at apex. $2n=20$. *W. & S. Europe; casual in parts of N. & C. Europe.* Al Be Bl Br Co Cr Ga Ge Gr He Ho Hs It Ju Lu Rm Rs (W, K) Sa Si Tu.

4. L. speculum-veneris (L.) Chaix in Vill., *Hist. Pl. Dauph.* **1**: 338 (1786) (*Specularia speculum-veneris* (L.) A. DC.). More or less pubescent annual 10–40 cm, usually much-branched. Leaves obovate or oblong, scarcely undulate, the lower sometimes petiolate, the upper sessile. Flowers numerous, subsessile, forming an often large panicle. Calyx-lobes somewhat shorter than to about as long as the ovary at anthesis, linear, acuminate, patent. Corolla *c.* 10 mm, at least as long as the calyx-lobes, violet. Capsule 10–15 mm, narrowed at apex. $2n=20$. *S.W. & S.C. Europe, northwards to the Netherlands.* Al Au Be Bu Co Cr Ga Ge Gr He Ho Hs Hu It Ju Lu Rm Sa Si Tu.

5. L. pentagonia (L.) Druce, *List Brit. Pl.* 46 (1908) (*Specularia pentagonia* (L.) A. DC.). Like **4** but calyx-lobes ½–½ as long as the ovary at anthesis; corolla 15–18 mm; capsule 20–30 mm, not narrowed at apex. *Aegean region and E. part of Balkan peninsula.* Bu Cr Gr Tu [Ga Hs].

6. Trachelium L.[1]
(incl. *Diosphaera* Buser)

Flowers in corymbs, rarely solitary and axillary. Calyx 5-fid. Corolla tubular, with 5 lobes. Stamens 5; filaments glabrous; anthers free. Style long-exserted, thickened towards the apex; stigmas 2–3. Capsule dehiscing by 2–3 pores near the base.

1 Stems less than 5 cm; flowers 1–5 in the axils of the upper leaves — **3. asperuloides**
1 Stems more than 5 cm; flowers in corymbs
2 Stems leafless for some distance below the inflorescence; leaves mostly petiolate — **1. caeruleum**
2 Stems leafy up to the inflorescence; leaves mostly sessile — **2. jacquinii**

1. T. caeruleum L., *Sp. Pl.* 171 (1753). Almost glabrous perennial up to 100 cm, woody at base. Leaves 2-serrate, usually ciliolate, all but the uppermost petiolate. Inflorescence a rather lax corymb. Corolla blue, rarely white; tube 4–6 mm, very slender, much longer than the lobes. Capsule broadly pyriform. *Damp or shady places. W. Mediterranean region and Portugal; often cultivated for ornament and locally naturalized elsewhere.* Hs It Lu Si [Az Ga].

(a) Subsp. **caeruleum**: Leaves ovate to broadly lanceolate, with acute, ciliolate teeth; petioles not winged. $2n=32$. *Throughout the range of the species.*

(b) Subsp. **lanceolatum** (Guss.) Arcangeli, *Comp. Fl. Ital.* 457 (1882): Leaves narrowly lanceolate, with obtuse, not ciliolate teeth; petioles winged. ● *Sicilia.*

2. T. jacquinii (Sieber) Boiss., *Fl. Or.* **3**: 961 (1875) (*Diosphaera jacquinii* (Sieber) Buser). Glabrous or shortly hairy perennial with a stout stock. Leaves oblong to ovate, crenulate to serrate, the lowest shortly petiolate, the rest sessile. Inflorescence a dense terminal corymb. Corolla bluish-lilac; tube *c.* 5 mm, about as long as the lobes. Capsule ovoid-turbinate. *Rock-crevices.* ● *S. Bulgaria, Greece and Aegean region.* Bu Cr Gr.

(a) Subsp. **jacquinii**: Not more than 15 cm; leaves 2·5–5 cm, coriaceous, crenulate or serrate. *Kriti; N.E. Greece (Athos).*

(b) Subsp. **rumelianum** (Hampe) Tutin, *Bot. Jour. Linn. Soc.* **71**: 274 (1976) (*T. rumelianum* Hampe, *Diosphaera rumeliana* (Hampe) Bornm.): 15–35 cm; leaves scarcely coriaceous, acutely serrate. $2n=32, 34$. *Bulgaria, Greece, Sporadhes.*

3. T. asperuloides Boiss. & Orph. in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 117 (1856) (*Diosphaera asperuloides* (Boiss. & Orph.) Buser). Pulvinate perennial up to 3 cm, with a stout stock. Leaves up to 5 mm, entire, crowded, suborbicular to ovate-spathulate, shining, sessile. Flowers 1–5 in the axils of the upper leaves. Corolla pink; tube *c.* 6 mm, about twice as long as the lobes. $2n=34$. *Rock-crevices.* ● *S. Greece (Aroania Oros, Akhaia).* Gr.

7. Petromarula Vent. ex Hedwig fil.[1]

Flowers in panicles. Calyx deeply 5-fid. Corolla infundibuliform, divided nearly to the base into 5 linear lobes. Stamens 5; filaments dilated at base; anthers free. Ovary 3-locular. Style exserted, glabrous; stigma large, capitate. Capsule dehiscing by 3 pores in the middle.

1. P. pinnata (L.) A. DC., *Monogr. Camp.* 209 (1830). Robust perennial. Stems glabrous below, puberulent above. Leaves up to 30 cm, glabrous, pinnate or pinnatisect, the lower long-petiolate; segments coarsely dentate or lobed. Flowers in small clusters. Corolla *c.* 10 mm, pale blue. $2n=30$. *Rocks.* ● *Kriti.* Cr.

8. Asyneuma Griseb. & Schenk[2]

Perennial herbs with simple leaves. Inflorescence simple or branched. Corolla deeply divided into narrow lobes connate only at the base, blue. Stigmas 3. Capsule cylindrical or ovoid, opening by 3 apical pores.

Literature: J. Bornmüller, *Beih. Bot. Centr.* **38(2)**: 333–351 (1921). J. Damboldt, *Boissiera* **17**: 1–128 (1970); *Willdenowia* **5**: 35–54 (1968).

1 Leaves rosulate; stem almost leafless
2 Pedicels 1–4 mm; calyx-teeth 4–5 mm — **1. anthericoides**
2 Pedicels absent or rarely up to 1 mm; calyx-teeth 1·5–2(–3) mm — **2. limonifolium**
1 Stem ± leafy throughout
3 Stem 8–15 cm, flexuous; pedicels 5–6 mm; calyx-teeth 4–5 mm, serrulate — **3. comosiforme**
3 Stem (30–)40–70(–100) cm, erect; pedicels 0(–1) mm; calyx-teeth 2–3(–4) mm, entire — **4. canescens**

1. A. anthericoides (Janka) Bornm., *Beih. Bot. Centr.* **38(2)**: 339 (1921) (*A. grandiflorum* (Velen.) Bornm.). Stem 25–40 cm, erect, branched. Rosette-leaves 4–6 cm, linear to linear-oblanceolate, narrowed into the petiole; cauline leaves few, small. Flowers in a lax panicle, solitary or in clusters of 2–3; pedicels 1–4 mm. Calyx-teeth 4–5 mm. Corolla-lobes 10–12 mm. Capsule 6–10 mm, cylindrical. *Dry, stony places; usually calcicole.* ● *Bulgaria, extending to S.E. Jugoslavia and S.E. Romania.* ?Al Bu Ju Rm.

2. A. limonifolium (L.) Janchen, *Mitt. Naturw. Ver. Univ. Wien* **4**: 35 (1906) (*A. parviflorum* Turrill, *A. tenuifolium* (A. DC.) Bornm.). Stem 10–100 cm, erect, usually simple. Rosette-leaves 3–6 cm, oblong to linear-oblanceolate, undulate. Flowers usually in a rather dense, long inflorescence, solitary or in clusters of 2–4; pedicels 0(–1) mm. Calyx-teeth 1·5–2(–3) mm. Corolla-lobes 8–9 mm. Capsule (3–)5–6(–7) mm, ovoid or oblong. $2n=24$, $24+B$. *Stony slopes and rocky ground; calcicole. Balkan peninsula; S.E. Italy.* Al Bu Gr It Ju Tu.

Very variable in the shape and size of the leaves and capsule, and in the development of the inflorescence. Numerous local populations have been given specific rank, but they seem to be no more than ecotypes or edaphic variants.

3. A. comosiforme Hayek & Janchen, *Österr. Bot. Zeitschr.* **70**: 20 (1921). Stem 8–15 cm, flexuous. Cauline leaves 8–15 mm, ovate-rhombic, toothed, glabrous. Flowers in a few-flowered, dense inflorescence; pedicels 5–6 mm. Calyx-teeth 4–5 mm, serrulate. *Rock-crevices.* ● *N.E. Albania (near Bicaj).* Al.

Since the capsule is unknown, it is not certain that this species is correctly placed in *Asyneuma.*

4. A. canescens (Waldst. & Kit.) Griseb. & Schenk, *Arch. Naturgesch. (Berlin)* **18(1)**: 335 (1852). Stem (30–)40–70(–100) cm, erect. Cauline leaves 4–6 cm, usually petiolate, crenate-serrate. Flowers in a long, paniculate inflorescence, in clusters of 2–4; pedicels 0(–1) mm. Calyx-teeth 2–3(–4) mm, entire. Corolla-lobes 7–9 mm. Capsule 5–6 mm, ellipsoid. *Steppes and mountain grassland. S.E. Europe, extending northwards to S.E. Czechoslovakia.* Al Bu Cz Gr Hu Ju Rm Rs (W, K, E).

Very variable in the shape of the cauline leaves. Two subspecies can be recognized.

(a) Subsp. **canescens**: Cauline leaves elliptic-obovate, more or less petiolate, crowded in the lower part of the stem, becoming abruptly smaller in the upper part. $2n=32$, $32+B$. *Throughout the range of the species.*

(b) Subsp. **cordifolium** (Bornm.) Damboldt, *Boissiera* **17**: 57 (1970) (*A. cordifolium* Bornm.): Cauline leaves broadly ovate, sessile, cordate at base, evenly distributed and becoming gradually smaller upwards. ● *S. Makedonija (near Rožden).*

Somewhat similar variants, connected by intermediates with subsp. (a) occur in S. Bosna and S. Bulgaria.

9. Phyteuma L.[2]

Perennial herbs. Stock thick, fleshy. Stem simple, leafy. Leaves undivided. Inflorescence solitary, usually densely capitate or spicate, subtended by an involucre of often conspicuous bracts. Flowers sessile or subsessile, (4–)5-merous, solitary in the axils of bracteoles. Corolla deeply lobed; lobes narrowly linear, at first coherent in the upper ⅓, later patent. Filaments greatly widened at base. Stigmas 2–3(–4). Capsule globose, dehiscing by 2–3 pores near the middle.

Literature: R. Schulz, *Monographische Bearbeitung der Gattung* Phyteuma. Geisenheim a. Rh. 1904.

1 Flowers 4-merous — **7. tetramerum**
1 Flowers 5-merous
2 Stem flexuous; basal leaves orbicular, rarely reniform; most cauline leaves rounded or cordate at base — **12. cordatum**
2 Stem usually straight; basal leaves linear to obovate, rarely orbicular; cauline leaves all narrowed at base or only the lowest cordate

[1] By T. G. Tutin.

[2] By J. Damboldt.

3 Flowers in ovoid or cylindrical spikes
4 Corolla nearly straight in bud; basal leaves (2–)3–many times as long as wide; bracts inconspicuous
5 All or nearly all flowers with 3 stigmas; seeds 0·4 × 0·2 mm **11. betonicifolium**
5 All or nearly all flowers with 2 stigmas; seeds 0·7 × 0·3 mm **(8–10). michelii** group
4 Corolla curved in bud; basal leaves as long to twice as long as wide; bracts conspicuous
6 Middle and upper cauline leaves with greatly reduced lamina; lower cauline leaves narrowed at base
7 Basal leaves 3–5 cm, present at anthesis; cauline leaves not crowded, ± horizontal **5. nigrum**
7 Basal leaves 2–2·5 cm, mostly absent at anthesis; cauline leaves crowded, suberect **6. gallicum**
6 Middle and upper cauline leaves with well-developed lamina; lower cauline leaves cordate at base
8 Corolla whitish to pale yellowish-green or blue, somewhat curved in bud; stigmas yellow, yellowish-brown or blue **1. spicatum**
8 Corolla bluish to violet-black, strongly curved in bud; stigmas dark brown to violet-brown or blue
9 Basal leaves mostly absent at anthesis; corolla bluish **3. pyrenaicum**
9 Basal leaves mostly present at anthesis; corolla blackish-violet
10 Basal leaves subobtuse, crenate-serrate; inflorescence often subglobose **2. vagneri**
10 Basal leaves subacute, serrate; inflorescence ovoid to cylindrical **4. ovatum**
3 Flowers in globose capitula
11 Basal and lower cauline leaves about as wide as long, deeply cordate **2. vagneri**
11 Basal and lower cauline leaves mostly longer than wide, rarely deeply cordate
12 Basal leaves linear, lingulate or spathulate, cuneately narrowed at base
13 Leaves widest near the apex
14 Basal leaves ± long-petiolate; all leaves thin **19. hemisphaericum**
14 Basal leaves shortly petiolate to sessile; all leaves rather thick
15 Leaves linear to oblong-spathulate, the apex projecting well beyond the uppermost pair of teeth **24. confusum**
15 Leaves usually obovate to oblanceolate, the apex not projecting beyond the uppermost pair of teeth, or leaves entire **22. globulariifolium**
13 Leaves widest near the middle
16 Bracts linear-lanceolate to linear, acute, usually denticulate **20. hedraianthifolium**
16 Bracts ovate to lanceolate, acuminate
17 Bracts long-acuminate, often longer than the inflorescence, often serrate at base **21. humile**
17 Bracts shortly acuminate, usually shorter than the inflorescence, rarely with few, obtuse teeth at base **19. hemisphaericum**
12 Basal leaves lanceolate to ovate, usually rounded to cordate at base
18 Basal leaves gradually narrowed into the petiole
19 Corolla strongly curved in bud **13. orbiculare**
19 Corolla strongly curved in bud **13. orbiculare**
19 Corolla nearly straight in bud
20 Bracts lanceolate to ovate, usually not or little longer than the inflorescence **18. serratum**
20 Bracts linear, one or more usually much longer than the inflorescence **16. scheuchzeri**
18 At least some basal leaves rounded or cordate at base
21 Bracts lanceolate to linear, usually longer than the inflorescence
22 Corolla nearly straight in bud; stigmas 3 **16. scheuchzeri**
22 Corolla distinctly curved in bud; stigmas 2 **17. charmelii**
21 Bracts ovate to lanceolate with a wide base, usually not longer than the inflorescence
23 Bracts ovate-lanceolate, ± acuminate; cauline leaves lanceolate **13. orbiculare**
23 Bracts broadly ovate to suborbicular, often cordate at base; cauline leaves ovate-lanceolate to ovate or obovate
24 Stems 2–8 cm; inflorescence with 4–6 flowers; cauline leaves obovate **23. rupicola**
24 Stems (2–)5–50 cm; inflorescence with 5-many flowers; cauline leaves ovate-lanceolate to ovate
25 Bracts ovate; upper cauline leaves sessile **15. sieberi**
25 Bracts broadly ovate; upper cauline leaves ± petiolate **14. pseudorbiculare**

1. P. spicatum L., *Sp. Pl.* 171 (1753). Stem 30–80(–100) cm, erect, glabrous. Basal and lower cauline leaves usually ovate, deeply cordate, obtuse, 1- to 2-crenate to serrate, long-petiolate; basal leaves present at anthesis. Inflorescence dense, at first ovoid to more or less globose, later up to 6(–20) cm, cylindrical. Bracts linear, usually not longer than the width of the inflorescence, more or less conspicuous. Corolla somewhat curved in bud. Stigmas 2. *Meadows and woods.* ● *From S. Norway and Estonia southwards to N. Spain and Crna Gora.* Au Be Br Cz Da Ga Ge He Ho Hs Hu It Ju No Po Rm Rs (B, C, W) [Fe Su].

(a) Subsp. **spicatum**: Flowers whitish to pale yellowish-green. Style and stigmas yellow to yellowish-brown. $2n=22+0$–4B. *Throughout the range of the species.*

(b) Subsp. **coeruleum** R. Schulz, *Monogr. Phyteuma* 69 (1904): Flowers bluish; stigmas yellowish-brown to blue. $2n=22$. *S.C. Europe and N. part of Balkan peninsula.*

2. P. vagneri A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **3**: 107 (1884). Like **1** but inflorescence shortly ovoid to almost globose, not elongating; bracts linear-lanceolate, as long as or longer than the width of the inflorescence; corolla blackish-violet; stigmas 2–3. *Alpine pastures.* ● *E. & S. Carpathians.* Rm Rs (W).

3. P. pyrenaicum R. Schulz, *Monogr. Phyteuma* 79 (1904). Like **1** but basal leaves mostly absent at anthesis; lower cauline leaves longer than wide, less toothed; inflorescence ovoid-cylindrical; corolla bluish, very strongly curved in bud; stigmas often 3. ● *Pyrenees and mountains of N. & C. Spain.* Ga Hs.

4. P. ovatum Honckeny, *Vollst. Syst. Verz.* **1**: 653 (1782) (*P. halleri* All.). Like **1** but bracts ovate, usually longer than the width of the inflorescence; corolla blackish-violet (rarely nearly white), strongly curved in bud. $2n=22$, ?26. *Mountain meadows.* ● *S. & S.C. Europe, from the Pyrenees to N.W. Jugoslavia.* Au Ga Ge He It Ju.

5. P. nigrum F. W. Schmidt, *Fl. Boëm.* **2**: 87 (1794). Stem 20–60 cm, erect, glabrous, usually more or less leafless in upper third. Basal leaves 3–5 cm, present at anthesis, usually twice as long as wide, obtuse, cordate, crenate, very rarely serrate; middle and upper cauline leaves with greatly reduced lamina, narrowed at base, not crowded, more or less patent. Inflorescence at first ovoid, later cylindrical. Bracts linear, acute, about as long as the width of the spike, more or less conspicuous. Corolla blackish-violet, rarely blue or white, curved in bud. Stigmas 3, rarely 2. $2n=22$. *Mountain meadows and woods.* ● *From Belgium to E. Austria.* Au Be Cz Ga Ge.

6. P. gallicum R. Schulz, *Monogr. Phyteuma* 88 (1904). Like **5** but basal leaves 2–2·5 cm, mostly absent at anthesis; middle and upper cauline crowded, suberect; corolla sky blue, nearly straight in bud; stigmas 2. *Mountain pastures.* ● *S.C. France.* Ga.

7. P. tetramerum Schur, *Sert. Fl. Transs.* 47 (1853). Stem 40–80 cm, erect. Basal leaves up to twice as long as wide, ovate, cordate, long-petiolate; cauline ovate to lanceolate, crenate-serrate. Inflorescence ovoid-cylindrical. Flowers 4-merous. Corolla blue. Stigmas 2. *Meadows and open woods.* ● *E. & S. Carpathians.* Rm Rs (W).

(8–10). P. michelii group. Stem erect, more or less uniformly leafy up to the inflorescence. Basal leaves entire to crenate-serrate, petiolate. Inflorescence cylindrical. Bracts inconspicuous. Corolla nearly straight in bud. Stigmas 2, rarely 3. Seeds 0·7 × 0·3 mm.

1 Basal leaves usually present at anthesis, rounded to shallowly cordate at base; corolla deep blue **10. zahlbruckneri**
1 Basal leaves usually absent at anthesis, cuneate at base; corolla bluish-lilac
2 Leaves usually ciliate at base; inflorescence dense, usually shortly cylindrical, obtuse **8. michelii**
2 Leaves usually entirely glabrous; inflorescence often lax, cylindrical, acute **9. scorzonerifolium**

8. P. michelii All., *Fl. Pedem.* **1**: 115 (1785). Stem 25–40(–50) cm. Basal leaves more than twice as long as wide, linear-lanceolate to linear, usually absent at anthesis, shortly petiolate, usually crispate-ciliate near the base; cauline leaves similar. Inflorescence shortly cylindrical, dense, obtuse. Corolla clear bluish-lilac. *Meadows, rarely screes; calcifuge.* ● *S. Alps, eastwards to* 9° *E.* Ga It.

Records for Switzerland appear to be erroneous.

9. P. scorzonerifolium Vill., *Hist. Pl. Dauph.* **2**: 519 (1787). Stem 30–90 cm. Basal leaves usually absent at anthesis, narrowly lanceolate to elliptical, usually narrowed gradually to the petiole; lower cauline leaves up to 15 × 1·5 cm, narrowly lanceolate to linear, few. Inflorescence usually cylindrical and lax, acute. Corolla pale bluish-lilac, rarely white. *Meadows and wood-margins.* ● *S.W. & S.C. Alps, N. & C. Appennini.* Ga He It.

10. P. zahlbruckneri Vest, *Steyerm. Zeitschr.* **3**: 159 (1821) (*P. betonicifolium* subsp. *zahlbruckneri* (Vest) Hayek). Stem 25–90 cm. Basal leaves mostly present at anthesis, lanceolate to ovate-lanceolate, rounded to shallowly cordate at base, long-petiolate; cauline leaves similar, but cuneate at base. Inflorescence cylindrical, rarely ovoid, eventually elongating and lax. Corolla deep blue. $2n=24$. *Meadows and wood-margins; calcifuge.* ● *E. Alps and N.W. Jugoslavia.* Au Ju.

11. P. betonicifolium Vill., *Hist. Pl. Dauph.* **2**: 518 (1787) (incl. *P. scaposum* R. Schulz). Stem 20–70 cm, erect, usually nearly leafless in the upper third. Basal leaves ovate-lanceolate to lanceolate, usually cordate, 1- to 2-crenate or crenate-serrate, long-petiolate, sometimes rosulate; cauline leaves similar but narrower. Spike cylindrical. Bracts setaceous, rarely lanceolate, inconspicuous. Corolla deep blue, nearly straight in bud. Stigmas 3, sometimes 4, rarely single flowers with 2. Seeds 0·4 × 0·2 mm. $2n=24$. *Meadows and woods.* ● *Alps and mountains of N. Italy.* Au Ga Ge He It.

12. P. cordatum Balbis, *Mém. Acad. Sci.* (*Turin*) **16**: 208 (1809) (*P. balbisii* A. DC.). Stem 15–25 cm, flexuous. Basal leaves orbicular to reniform, long-petiolate; cauline leaves 4–7, rhombic to cordate-ovate, sharply and remotely serrate. Inflorescence more or less globose to oblong. Bracts very small. Corolla bluish-white. Stigmas 3. $2n=24$. *Calcareous rocks.* ● *Maritime Alps.* Ga It.

13. P. orbiculare L., *Sp. Pl.* 170 (1753). Stem (5–)10–50 cm, erect, rarely ascending, sparsely leafy. Basal leaves linear-lanceolate to elliptical, rounded to cordate, or narrowed into the petiole, crenate-serrate, petiolate; lower cauline leaves similar, the upper subsessile, serrate to entire. Inflorescence 1–2·5 cm across, more or less globose, with 15–30 flowers. Bracts more or less acuminate, ovate-lanceolate, entire or serrate, shorter to longer than the capitulum. Corolla blue to blue-violet, rarely white, strongly curved in bud. Stigmas 2–3. $2n=22+0$–2B. *Dry grassland and rocky ground; somewhat calcicole.* ● *From S. England and Latvia southwards to S. Spain and Albania.* Al Au Be Br Cz Ga Ge He Hs Hu It Ju Po Rm Rs (B, C, W).

Very variable in size, shape and development of leaves and shape, indumentum and length of bracts. Numerous variants have been described by R. Schulz, but these are connected by many intermediates and lack a clear geographical basis.

Among the more distinct variants are **P. hispanicum** R. Schulz, *Monogr. Phyteuma* 127 (1904), from S. Spain, with broadly elliptical to suborbicular basal leaves and bracts with regular, straight cilia, and **P. tenerum** R. Schulz, *op. cit.* 122 (1904), from W.C. and S.W. Europe, with densely leafy stems, finely and sharply serrate leaves and small, triangular bracts. The taxonomic value of these variants requires further investigation.

14. P. pseudorbiculare Pant., *Verh. Ver. Nat. Heilk. Presburg* nov. ser., **2**: 53 (1874). Like **13** but basal leaves more or less suborbicular, shortly petiolate; cauline broadly elliptical to suborbicular, diminishing in size less rapidly upwards, the upper more or less petiolate; bracts broadly ovate, often cordate at base, not abruptly acuminate, serrate. *Pastures and rocks.* ● *W. part of Balkan peninsula.* Al Ju.

15. P. sieberi Sprengel, *Pugillus* **1**: 15 (1813). Like **13** but upper cauline leaves sessile, ovate-lanceolate to ovate; bracts ovate, acuminate, acutely serrate; stigmas 3. $2n=20$. *Rocky and stony slopes; calcicole.* ● *S.E. Alps.* Au It Ju.

16. P. scheuchzeri All., *Auct. Syn. Stirp. Horti Taur.* 11 (1773). Stem 12–45 cm, erect or decumbent, glabrous. Basal leaves usually present at anthesis, linear- to ovate-lanceolate, acuminate, deeply cordate to cuneate, long-petiolate, serrate to crenate; cauline leaves petiolate to sessile, linear-lanceolate to linear, remotely serrate to entire; all leaves thick, usually bluish-green. Inflorescence shortly ovoid to globose. Bracts more or less narrowly linear, one or several of the outer usually much longer than the inflorescence. Corolla deep blue, nearly straight in bud. Stigmas 3. $2n=26$. *Rocky slopes.* ● *S. Alps, N. Appennini.* Ga He It Ju.

(a) Subsp. **scheuchzeri**: Basal leaves linear-lanceolate, truncate to cuneate at base. Outer bracts often much longer than the inflorescence. *From c.* 6° 45′ *to* 11° *E.; usually calcifuge.*

(b) Subsp. **columnae** (Gaudin) Becherer, *Viert. Naturf. Ges. Zürich* **68**: 471 (1923) (subsp. *charmelioides* (Biroli) Hayek): Basal leaves ovate-lanceolate, cordate at base. Outer bracts usually not longer than the inflorescence. *Throughout the range of the species except the extreme west; usually calcicole.*

17. P. charmelii Vill., *Hist. Pl. Dauph.* **2**: 516 (1787). Like **16** but all leaves thin, bright green; basal leaves usually absent at anthesis; cauline leaves entire to remotely serrate, with long, acute, incurved teeth; corolla curved in bud; stigmas 2. $2n=26$. *Mountain rocks.* ● *Mountains of S.W. Europe, extending eastwards to S.C. Alps; one station in S. Appennini.* Ga Hs It.

P. villarsii R. Schulz, *Monogr. Phyteuma* 143 (1904), from rock-crevices in the mountains of S.E. France and N.W. Italy, has slender, decumbent stems and more numerous, grey-green leaves, with deeper, unequal teeth. The middle cauline leaves are truncate or shortly cuneate at base. It has $2n=26$.

18. P. serratum Viv., *Fl. Cors., App.* **1**: 1 (1825). Stem 2–20 cm, erect. Basal leaves lanceolate or elliptical to more or less linear, weakly serrate to entire, usually petiolate; cauline leaves linear-lanceolate, widest in the middle, finely serrate to subentire, narrowed into a petiole or sessile. Inflorescence depressed-globose. Bracts ovate to lanceolate, usually not or little longer than the inflorescence, the outer deflexed. Corolla nearly straight in bud. Stigmas 3. $2n=28$. *Mountain rocks.* ● *Corse.* Co.

19. P. hemisphaericum L., *Sp. Pl.* 170 (1753). Stem (1–)5–15(–30) cm, erect or ascending, with 0–3 leaves. Basal leaves 1–2 mm wide, linear to lanceolate, rarely widened towards the apex (var. *platyphyllum* R. Schulz, from the Pyrenees), usually entire, very rarely remotely and shallowly serrate; cauline leaves narrowly linear to linear-lanceolate. Inflorescence 1–2 cm in diameter, globose. Bracts ovate, acuminate, shorter than to somewhat longer than the inflorescence, entire, rarely more or less dentate at base, glabrous or ciliate. Corolla dark blue, curved in bud. Stigmas 3. $2n=28$. *Stony mountain pastures and screes; calcifuge.* ● *S. & S.C. Europe, eastwards to E. Austria.* Au Ga Ge He Hs It.

Polymorphic. Plants from the Pyrenees with wide upper cauline leaves have been described as **P. serratoides** Chouard, *Bull. Soc. Bot. Fr.* **99**: 28 (1952) and others with long stems and longer bracts as **P. gaussenii** Chouard, *op. cit.* 26 (1952). The taxonomic value of such variants requires further investigation.

20. P. hedraianthifolium R. Schulz, *Monogr. Phyteuma* 150 (1904). Stem 2–18 cm, ascending to erect, glabrous, leafy. Basal leaves almost linear, somewhat widened in the middle or towards the apex, usually remotely and shallowly serrate. Inflorescence globose. Bracts linear-lanceolate to narrowly linear, acute, the outer 20–40 × 1·5–3 mm, usually twice as long as the inflorescence, similar to the upper cauline leaves, denticulate, deflexed in fruit. Corolla dark blue-violet, nearly straight in bud. $2n=28$. *Rocks and stony pastures.* ● *E.C. & E. Alps, eastwards to c.* 12° *E.* He It.

21. P. humile Schleicher ex Gaudin in Murith, *Guide Bot. Valais* 84 (1810). Stem 1–13 cm, erect, glabrous. Basal leaves 10–60 × 2–4 mm, numerous, linear but slightly widened towards the apex, more or less entire; cauline leaves narrowly linear, widened towards the apex, often with a few acute teeth near the base; all leaves glabrous, shiny when dry, the upper reaching or exceeding the inflorescence. Inflorescence 1·5–3 cm in diameter, globose. Outer bracts ovate, often serrate, long-acuminate, as long as or longer than the inflorescence, usually shortly and densely hairy at the margins. Corolla dark blue-violet, strongly curved in bud. Stigmas 3. $2n=28$. *Rocks and stony pastures; calcifuge.* ● *S.W. & W.C. Alps, from* 6° 45′ *to* 8° *E.* ?Ga He It.

22. P. globulariifolium Sternb. & Hoppe, *Denkschr. Bayer. Bot. Ges. Regensb.* **1(2)**: 100 (1818) (*P. pauciflorum* auct., non L.). Stock much-branched. Stem 1–12 cm, erect, glabrous, with few or no leaves. Basal leaves numerous, rosulate, obovate to oblanceolate or rarely linear-elliptical, narrowed into the petiole, widest near the apex; cauline leaves similar; all leaves glabrous or ciliate, obscurely crenate-serrate, with the apex not projecting beyond the uppermost pair of teeth, or entire. Inflorescence 2- to 7(–12)-flowered, globose. Outer bracts orbicular to ovate or all, or the inner only, lanceolate, acuminate to obtuse, sometimes crenate at the apex, ciliate, shorter or longer than the inflorescence. Corolla deep blue-violet, curved in bud. Stigmas 3. *Rocks and screes; calcifuge.* ● *Alps and Pyrenees.* Au Ga He Hs It.

Polymorphic. The following treatment is only provisional as further study, particularly of subsp. *pedemontanum*, is needed.

(a) Subsp. **globulariifolium**: Stem 1–5 cm; leaves obtuse, often crenate towards the apex. Outer bracts suborbicular, often wider than long, obtuse. $2n=28$. *E. Alps, westwards to c.* 10° 30′ *E.*

(b) Subsp. **pedemontanum** (R. Schulz) Becherer, *Denkschr. Schweiz. Naturf. Ges.* **81**: 417 (1956) (*P. pedemontanum* R. Schulz): Stem 5–12 cm; leaves acute, often 3-dentate at apex, longer than in subsp. (a). Outer bracts more or less lanceolate, shortly acuminate. $2n=28$. *Pyrenees and Alps, eastwards to c.* 11° *E.*

Connected with subsp. (a) by numerous intermediates in the eastern part of its range. In the S. part of the S.W. Alps variants with longer stems and leaves seem to approach *P. hemisphaericum* var. *platyphyllum*. They may represent a vicariant taxon of **24.**

23. P. rupicola Br.-Bl., *Commun. Stat. Int. Géobot. Médit. Alp.* **87**: 231 (1945). Like **22**(a) but basal leaves orbicular, abruptly contracted into the petiole; cauline leaves 3–4, obovate; inflorescence 4- to 6-flowered. *Granite rocks.* ● *E. Pyrenees.* Ga.

24. P. confusum A. Kerner, *Zeitschr. Ferdinand.* (*Innsbruck*) ser. 3, **15**: 247 (1870). Like **22**(a) but stem 1–15 cm; leaves linear to oblong-spathulate, usually more or less abruptly narrowed to the usually regularly serrulate or crenulate, obtuse base and apex, the apex projecting well beyond the uppermost pair of teeth; bracts orbicular to ovate, entire or sometimes with few small teeth in the distal part; corolla dark blue-violet, rarely white. $2n=28+0$–$1B$. *Rocks and stony pastures; calcifuge.* ● *Mountains of E.C. & S.E. Europe southwards to C. Bulgaria.* Al Au Bu Ju Rm.

10. Physoplexis (Endl.) Schur[1]

Like *Phyteuma* but the flowers distinctly pedicellate; corolla-lobes connate in the upper third and at the base throughout anthesis; filaments linear.

1. P. comosa (L.) Schur, *Sert. Fl. Transs.* 47 (1853) (*Phyteuma comosum* L.). Usually glabrous. Stem 5–15 cm, flexuous. Basal leaves reniform to oblong-elliptical, incise-dentate, long-petiolate; cauline leaves obovate-oblong to elliptical, remotely, irregularly and acutely toothed. Umbel hemispherical, with 8–20 flowers; pedicels 2–5 mm. Corolla 16–20 mm, ventricose and pale pinkish-lilac below, the connate lobes forming a blackish-violet beak. Stigmas 2. $2n=34$. *Rock-crevices; calcicole.* ● *S. Alps.* Au It Ju.

11. Wahlenbergia Schrader ex Roth[2]

Flowers solitary or in lax panicles. Calyx 3- to 5-fid. Corolla 3- to 5-lobed, campanulate or infundibuliform. Stamens 3–5; filaments somewhat dilated at base; anthers free. Ovary (2–)3- to 5-locular. Style included, hairy, especially above; stigmas (2–)3–5, short. Capsule dehiscing by (2–)3–5 apical valves.

[1] By J. Damboldt. [2] By T. G. Tutin.

Slender, procumbent perennial; flowers solitary, axillary **1. hederacea**
Erect annual; flowers in a lax panicle **2. nutabunda**

1. W. hederacea (L.) Reichenb., *Pl. Crit.* **5**: 47 (1827). Slender, glabrous, procumbent perennial. Stems up to 30 cm. Leaves petiolate; lamina 5–15 mm, orbicular-reniform in outline, angled or shallowly lobed. Flowers solitary, axillary; pedicels up to 10 cm, filiform, much exceeding the subtending leaf. Calyx 2–3 mm; lobes subulate, erect. Corolla 6–10 mm, campanulate, pale blue; lobes equalling or shorter than tube, acute. Capsule *c.* 3 mm, erect. *Damp places; calcifuge.* ● *W. Europe, northwards to c.* 56° *N. in Scotland.* Be Br Ga Ge Hb †Ho Hs Lu.

2. W. nutabunda (Guss.) A. DC., *Monogr. Camp.* 151 (1830). Erect, glabrous annual. Stems up to 50 cm, freely branched. Leaves narrowed at base into a winged petiole; lamina 20–50 mm, oblanceolate to oblong, entire or dentate. Flowers in a large, cymose panicle; pedicels 1–5 cm, subtended by small, linear bracts. Calyx *c.* 2 mm; lobes narrowly triangular, obtuse, erect. Corolla 2–3 mm, infundibuliform, pale blue, pink or white; lobes longer than tube, obtuse or subacute. Capsule 5–9 mm, erect. *Dry places. W. Mediterranean region; very local.* ?Co Hs It Sa Si.

12. Edraianthus A. DC.[1]

(*Hedraianthus* auct.)

Like *Campanula* but capsule splitting irregularly at the apex; flowers in terminal clusters or solitary, closely subtended by leaf-like bracts.

All species are found in calcareous, rocky habitats, mainly in the mountains.

Literature: G. Beck, *Wiener Illustr. Gartenzeit.* **18**: 287–299 (1893). E. Janchen, *Mitt. Naturw. Ver. Univ. Wien* **8**: 1–39 (1910). E. Mayer & V. Blečić, *Phyton* (*Austria*) **13**: 241–247 (1969). R. Wettstein, *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **53** (**2**): 185–212 (1887).

1 Leaves not ciliate, irregularly crenate; basal oblong-lanceolate to spathulate, petiolate; cauline narrowly lanceolate, sessile **1. parnassicus**
1 Leaves ciliate, not crenate, basal and cauline similar
2 Leaves spathulate **6. serpyllifolius**
2 Leaves linear to linear-lanceolate
3 Leaves flat, glabrous or rarely sparsely to densely hirsute above **(2–5). graminifolius** group
3 Leaves with ± involute margins, ± densely appressed-greyish-hirsute above **(7–9). pumilio** group

1. E. parnassicus (Boiss. & Spruner) Halácsy, *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **61**: 247 (1894). Caespitose, shortly pubescent perennial. Rhizome stout, woody, branched. Stems (1·5–)10–13(–20) cm, ascending to erect, simple or rarely branched above. Basal leaves 10–40(–60) × 5–10 mm, oblong-lanceolate to obovate-spathulate, petiolate, the cauline smaller, ovate-lanceolate to narrowly lanceolate, sessile, rounded at the base; all irregularly crenate. Flowers (1–)3–4(–5), shortly pedunculate, in terminal globose clusters. Bracts ovate, cuspidate-acuminate, shorter than to as long as the flowers. Ovary densely and shortly pubescent, rarely glabrous; calyx-teeth narrowly lanceolate, twice as long as the ovary. Corolla 10–15(–20) mm, glabrous or rarely sparsely hirsute on the veins, violet. $2n=32$. ● *Mountains of S., C. & N.W. Greece.* Gr.

[1] By B. Kuzmanov.

(2–5). E. graminifolius group. Caespitose perennials. Rhizome stout, woody, branched. Leaves ciliate, more or less flat, glabrous, sparsely and softly hairy, or rarely shortly hirsute above, glabrous or rarely sparsely hairy beneath. Flowers 3–6(–12), rarely solitary.

1 Calyx-teeth linear to triangular-lanceolate, longer than ovary
2 Calyx-teeth triangular-lanceolate; bracts acuminate to attenuate, usually shorter than the flowers; leaves mostly ciliate only at base **2. graminifolius**
2 Calyx-teeth linear; bracts abruptly long-attenuate, equalling or longer than the flowers; leaves ciliate up to the apex **3. tenuifolius**
1 Calyx-teeth broadly triangular, shorter than ovary
3 Bracts long-attenuate, the outer up to twice as long as the flowers **4. dalmaticus**
3 Bracts shortly acuminate, the outer shorter than to as long as the flowers **5. serbicus**

2. E. graminifolius (L.) A. DC. in DC., *Prodr.* **7**: 448 (1839). Stems (2–)5–10(–25) cm, ascending to erect, more or less hairy, simple. Basal leaves (1–)3–10(–20) × 0·5–4 mm, linear to linear-lanceolate, subacute to obtuse, flat, entire, ciliate only at the base; cauline few, smaller, but like the basal. Bracts ovate-acuminate to attenuate, shorter than to as long as the flowers. Flowers (1–)3–6(–8), subsessile, in terminal clusters. Ovary glabrous, rarely sparsely hairy on the veins, or shortly hairy all over; calyx-teeth triangular-lanceolate to linear-lanceolate, about as long to twice as long as the ovary, very rarely with short appendages in the sinus. Corolla 12–20(–35) mm, glabrous or rarely sparsely hirsute on the veins. $2n=32$. ● *Balkan peninsula, extending to Slovenija and W.C. Romania; S. & C. Italy, Sicilia.* Al Gr It Ju Rm Si.

Extremely variable in habit, indumentum, shape and length of bracts, colour and length of corolla, and number of flowers. Numerous infraspecific taxa have been described, mostly dwarf variants from the alpine regions. Their ecological and geographical range is not well known and a satisfactory subspecific delimitation is not possible. The following two subspecies can, however, be recognized.

(a) Subsp. **graminifolius**: Stems 10–20 cm; corolla bluish-violet. *Throughout the range of the species.*

(b) Subsp. **niveus** (G. Beck) Janchen, *Mitt. Naturw. Ver. Univ. Wien* **8**: 27 (1910): Stems 3–10(–15) cm; corolla white. *Mountains of W.C. Jugoslavia* (*S. Bosna*).

3. E. tenuifolius (Waldst. & Kit.) A. DC. in DC., *Prodr.* **7**: 449 (1839). Like **2** but leaves 0·4–1·5 mm wide, narrowly linear, usually ciliate up to the apex; bracts broadly ovate, abruptly long-attenuate, as long as or longer than the flowers; ovary hirsute; calyx-teeth linear; flowers up to 15; corolla *c.* 20 mm. $2n=32$. ● *W. half of Balkan peninsula.* Al Gr Ju.

4. E. dalmaticus (A. DC.) A. DC., *loc. cit.* (1839). Stems 3–7 cm, ascending to erect, glabrous, simple. Basal leaves (10–)30–50(–100) × 20–30(–40) mm, linear-lanceolate, acute, sessile, subamplexicaul, usually long-ciliate at the base, glabrous; cauline few, like the basal but smaller. Bracts broadly ovate, linear-attenuate, the outer up to twice as long as the flowers, ciliate, glabrous. Flowers (3–)4–6(–10), subsessile. Ovary glabrous, very rarely sparsely hairy; calyx-teeth broadly triangular, ciliate, much shorter than the ovary, not appendiculate. Corolla 15–20 mm, blue-violet, glabrous. ● *W. Jugoslavia.* Ju.

5. E. serbicus Petrović, *Fl. Agri Nyss.* 549 (1882). Like **4** but the stems 12–18 cm, pubescent; leaves 50–90 mm; outer bracts

shorter than to as long as the 6–12 flowers; ovary more or less sparsely to densely pubescent; corolla *c.* 30 mm. $2n=32$. ● *Mountains of E.C. Srbija and W.C. Bulgaria.* Bu Ju.

6. E. serpyllifolius (Vis.) A. DC. in DC., *Prodr.* **7**: 449 (1839). Caespitose perennial. Rhizome stout, woody, branched. Stems 2–5(–8) cm, procumbent to ascending, sparsely leafy, more or less glabrous, simple. Leaves 7–30(–40) × 1·5–4 mm, spathulate, glabrous (rarely sparsely hairy above), ciliate, entire, obtuse or emarginate, the basal petiolate, the cauline subsessile. Bracts ovate-oblong to lanceolate, obtuse, shorter than the flowers, glabrous, ciliate. Ovary glabrous; calyx-teeth oblong-lanceolate, obtuse, about as long as the ovary, ciliate, not appendiculate. Flowers solitary. Corolla 15–20(–30) mm, glabrous, dark violet. ● *W. Jugoslavia, N. Albania.* Al Ju.

(7–9). E. pumilio group. Dwarf, caespitose perennials. Rhizome stout, woody, branched. Leaves with more or less involute margin, more or less densely appressed-hirsute and greyish above, glabrous beneath, entire, ciliate. Flowers solitary, very rarely 2–3.

1 Corolla ± densely hirsute **9. wettsteinii**
1 Corolla glabrous, very rarely sparsely hirsute on the veins
2 Stem 1–3 cm, densely leafy **7. pumilio**
2 Stem (1·5–)2–6(–10) cm, sparsely leafy above **8. dinaricus**

7. E. pumilio (Portenschl.) A. DC. in DC., *Prodr.* **7**: 449 (1839). Stems 1–3 cm, ascending to erect, densely leafy, simple. Leaves (0·5–)8–20(–25) × 1(–2) mm, linear, sessile. Bracts subovate-lanceolate, linear-attenuate, shorter than the flowers, ciliate, hirsute above. Flowers solitary, sessile. Ovary glabrous; calyx-teeth lanceolate, 1½–2 times as long as the ovary, sparsely hirsute, not appendiculate. Corolla (11–)14–18(–24) mm, blue-violet, rarely white, glabrous or very rarely sparsely and shortly hirsute on the veins. ● *W. Jugoslavia* (*Biokovo Planina*). Ju.

8. E. dinaricus (A. Kerner) Wettst., *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **53** (**2**): 192 (1887). Like **7** but flowering stems (1·5–)2–6(–10) cm, sparsely leafy above; leaves (10–)25–35 (–40) × (0·5–)1·5–2·5 mm; bracts oblong-lanceolate; corolla 12–15(–20) mm. ● *W. & C. Jugoslavia.* Ju.

9. E. wettsteinii Halácsy & Bald., *Österr. Bot. Zeitschr.* **41**: 371 (1891). Like **7** but leaves up to (1–)2 mm wide; calyx-teeth 2–3 times as long as the ovary; flowers solitary, rarely 2–3(–5); corolla (8–)10–12 mm, more or less densely hirsute. ● *Mountains of Crna Gora and N. Albania.* Al Ju.

13. Jasione L.[1]

Annual, biennial or perennial herbs. Flowers small, sessile to shortly pedicellate, not subtended by bracts, in capitula surrounded by 1 or more rows of involucral bracts. Calyx 5-toothed. Corolla splitting into 5 linear-lanceolate lobes from the base towards the apex. Stamens 5; filaments subulate; anthers usually connate at base. Style hairy in upper half; stigmas 2. Capsule dehiscing by 2 short, apical valves.

Descriptions of leaves refer to those on the flowering stems.

1 Basal leaves much longer than the cauline **9. foliosa**
1 Basal leaves not or little longer than the cauline
2 Calyx-teeth villous, lanate or ciliate
3 Perennial, with stout stock and non-flowering shoots **5. crispa**
3 Annual, with slender root and no non-flowering shoots
4 Stems leafless in upper half **1. montana**
4 Stems leafy almost to apex
5 Stems erect, usually branched near apex; calyx-teeth subulate, villous throughout **3. corymbosa**
5 Stems decumbent, unbranched; calyx-teeth linear-spathulate, villous near apex only **2. penicillata**
2 Calyx-teeth glabrous, not ciliate
6 Outer involucral bracts entire or shallowly toothed
7 Perennial; margin of leaves and involucral bracts strongly thickened and papillose
8 Longest leaves at least 20 mm; pedicels at least twice as long as ovary **6. laevis**
8 Longest leaves not more than 10 mm; pedicels shorter than ovary
9 Stems usually 2–10 cm; calyx-teeth subulate **5. crispa**
9 Stems usually 20–70 cm; calyx-teeth linear-lanceolate **4. lusitanica**
7 Annual or biennial; margin of leaves and involucral bracts not or weakly papillose
10 Stem usually leafless in upper half; involucral bracts shorter than the flowers **1. montana**
10 Stem leafy almost to apex; involucral bracts at least as long as the flowers **3. corymbosa**
6 Outer involucral bracts deeply toothed; teeth aristate
11 Leaves glabrous and not ciliate **7. bulgarica**
11 Leaves villous or ciliate
12 Outer involucral bracts lanceolate **8. heldreichii**
12 Outer involucral bracts ovate, suborbicular or broadly triangular
13 Perennial, with non-flowering shoots; leaves not undulate **6. laevis**
13 Annual or biennial, without non-flowering shoots; leaves undulate **1. montana**

1. J. montana L., *Sp. Pl.* 928 (1753). More or less villous biennial or annual. Stems 5–50 cm, erect or ascending, leafless in the upper half, simple or branched in the lower part. Leaves linear-oblong to -lanceolate, undulate, entire or remotely crenate; margin usually thin and not or weakly papillose, ciliate. Outer involucral bracts ovate to triangular, rarely lanceolate, entire, crenate or serrate, usually shorter than the flowers. Calyx-teeth subulate, green, glabrous or rarely ciliate. Corolla blue, rarely pink or white. $2n=12$. *Most of Europe, northwards to c.* 62° *N. in Finland.* *Az Be Br Bu Co Cz Da Fe Ga Ge Hb He Ho Hs Hu It Ju Lu No Po Rm Rs (N, B, C, W, E) Sa Si Su.

Very variable, though apparently with little geographical or ecological differentiation. Subsp. **echinata** (Boiss. & Reuter) Rivas Martínez, *Publ. Inst. Biol. Apl.* (*Barcelona*) **42**: 122 (1967) is a fairly well-marked variant occurring in S. E. Spain and perhaps S. Italy and Sicilia. It is a large, robust, white-hispid plant, with involucral bracts with thickened margins. In other parts of the range of the species the correlation between these characters breaks down, so it does not seem possible to maintain it at subspecific rank.

A small, annual variant from S. Spain, with thickened leaf-margins, long involucral bracts and ciliate calyx-teeth has been described as **J. blepharodon** Boiss. & Reuter, *Pugillus* 72 (1852). It is connected by numerous intermediates with typical *J. montana*.

It is connected by numerous intermediates with typical *J. montana*, and also has $2n=12$.

2. J. penicillata Boiss., *Elenchus* 63 (1838). Slender, pubescent annual. Stems up to *c.* 10 cm, decumbent, leafy almost to apex. Leaves linear-lanceolate, remotely serrate; margin thin. Outer involucral bracts ovate, coarsely and remotely serrate. Calyx-teeth linear-spathulate, villous at apex only. *Mountain rocks, c.* 900 *m.* ● *S. Spain* (*Sierra Tejeda*). Hs.

3. J. corymbosa Poiret ex Schultes in Roemer & Schultes, *Syst. Veg.* **5**: 474 (1819). Stout, usually hispidulous annual. Stems 10–15 cm, erect, with short fastigiate branches in the upper part, leafy almost to apex, sulcate. Leaves linear-lanceolate, undulate; margin somewhat thickened and papillose. Involucral bracts at least as long as the flowers. Calyx-teeth subulate, villous. *Sandy places at low altitudes. S. Portugal, S. Spain.* Hs Lu.

4. J. lusitanica A. DC., *Monogr. Camp.* 105 (1830). Subglabrous or shortly villous perennial. Stems (5–)20–70 cm, numerous, ascending, leafless and glabrous in the upper ⅓–½, usually simple. Leaves 3–6 mm, very numerous, obovate to obovate-oblong; margin thick and papillose. Outer involucral bracts shorter than the flowers, ovate, crenate or subentire, shortly villous, with thick, papillose margins. Calyx-teeth linear-lanceolate, glabrous. Corolla blue. *Maritime sands.* ● *N.W. Portugal.* Lu.

5. J. crispa (Pourret) Samp., *Ann. Sci. Acad. Polyt. Porto* **14**: 161 (1921). More or less hairy perennial with a stout woody stock and usually short non-flowering shoots. Flowering stems 2–10(–40) cm, erect or ascending. Leaves linear-oblong to linear-lanceolate or rarely obovate, usually flat, entire or remotely toothed, rather coriaceous; margin thick, strongly papillose, often ciliate. Outer involucral bracts lanceolate to ovate, entire to crenate-serrate or deeply and sharply serrate; margin thick, cartilaginous and strongly papillose. Calyx-teeth subulate to narrowly triangular, often purplish, glabrous to densely lanate. Corolla blue. *Mountain rocks and screes; rarely on maritime sands. S.W. Europe.* Ga Hs Lu.

1 Involucral bracts not imbricate **(j)** subsp. **cavanillesii**
1 Involucral bracts closely imbricate
2 Calyx-teeth glabrous
3 Leaves with very thick, white margins; bracts whitish **(e)** subsp. **serpentinica**
3 Leaf-margins not very thick and white; bracts purplish **(a)** subsp. **amethystina**
2 Calyx-teeth ciliate, villous or lanate
4 Involucral bracts whitish and membranous, at least in the basal half
5 Stems and leaves glabrous to softly hairy; leaves thin **(f)** subsp. **mariana**
5 Stems and leaves hispidulous; leaves thick **(g)** subsp. **maritima**
4 Involucral bracts entirely herbaceous or coriaceous
6 Involucral bracts entire, or nearly entire **(b)** subsp. **centralis**
6 Involucral bracts crenate-serrate to serrate
7 Involucral bracts and upper part of stem lanate **(i)** subsp. **tomentosa**
7 Involucral bracts and upper part of stem glabrous or thinly villous
8 Flowering stems usually 20–30 cm; plant laxly caespitose **(h)** subsp. **sessiliflora**
8 Flowering stems usually 5–10 cm; plant ± densely caespitose
9 Flowering stems very densely leafy; leaves *c.* 2 mm wide; involucral bracts usually green **(c)** subsp. **arvernensis**
9 Flowering stems rather sparsely leafy; leaves *c.* 1 mm wide
10 Stems crispate-villous near the apex; involucral bracts ovate, usually purplish-blue **(d)** subsp. **crispa**
10 Stems usually glabrous or sparsely villous near the apex; involucral bracts lanceolate to elliptical, whitish **(e)** subsp. **serpentinica**

(a) Subsp. **amethystina** (Lag. & Rodr.) Tutin, *Bot. Jour. Linn. Soc.* **67**: 278 (1973) (*J. amethystina* Lag. & Rodr.): Densely caespitose, with a stout stock. Flowering stems 2–10 cm, usually leafless for some distance below the capitulum. Leaves up to 7 × 2 mm. Involucral bracts ovate, entire or shallowly toothed, purplish. Calyx-teeth linear-lanceolate, glabrous, purplish. $2n=36$. ● *S. Spain* (*Sierra Nevada*).

(b) Subsp. **centralis** (Rivas Martínez) Rivas Martínez, *Anal. Inst. Bot. Cavanilles* **27**: 154 (1970) (*J. humilis* subsp. *centralis* Rivas Martínez): Like **(a)** but leaves usually less than 5 × 1 mm; involucral bracts triangular-lanceolate; calyx-teeth villous in lower part. ● *C. & E. Spain.*

(c) Subsp. **arvernensis** Tutin, *Bot. Jour. Linn. Soc.* **67**: 278 (1973). Densely caespitose, with a slender stock. Flowering stems 5–10 cm, densely leafy, usually almost up to the capitulum. Leaves 8–12 × *c.* 2 mm, widest just below the apex. Involucral bracts ovate, coriaceous, obtusely serrate, usually green. Calyx-teeth villous. ● *S.C. France* (*near le Mont-Dore*).

(d) Subsp. **crispa** (*J. humilis* (Pers.) Loisel.): Densely caespitose, with a rather slender stock. Flowering stems 5–10 cm, crispate-villous near apex, rather sparsely leafy and usually leafless for a short distance below the capitulum. Leaves 5–10 × 1–2 mm, usually widest at or below the middle. Involucral bracts ovate, coriaceous, crenate-serrate, usually purplish. Calyx-teeth villous. $2n=36$. *E. Pyrenees, N.E. Spain.*

(e) Subsp. **serpentinica** P. Silva, *Agron. Lusit.* **30**: 225 (1970): Like subsp. **(d)** but flowering stems leafless in the upper half; margin of leaves very thick, white, papillose; involucral bracts coriaceous, whitish; calyx-teeth glabrous or ciliate. *On serpentine.* ● *N.E. Portugal.*

(f) Subsp. **mariana** (Willk.) Rivas Martínez, *Anal. Inst. Bot. Cavanilles* **28**: 45 (1972) (*J. mariana* Willk.): Like subsp. **(d)** but stock often very stout; leaves 2–3 mm wide; involucral bracts membranous, at least below. ● *C. Spain* (*Sierra Morena, Montes de Toledo*).

(g) Subsp. **maritima** (Duby) Tutin, *Bot. Jour. Linn. Soc.* **67**: 278 (1973) (*J. montana* var. *maritima* Duby): Stock stout. Flowering stems 5–12 cm, procumbent, leafy almost up to the capitulum, hispidulous throughout. Leaves 3–5 × 0·5–1·5 mm, usually widest about the middle, hispidulous. Involucral bracts ovate, membranous, entire to slightly toothed. Calyx-teeth villous. *Maritime sands.* ● *Coast of S.W. France and N.W. Spain.*

(h) Subsp. **sessiliflora** (Boiss. & Reuter) Rivas Martínez, *Anal. Inst. Bot. Cavanilles* **27**: 154 (1970) (*J. sessiliflora* Boiss. & Reuter): Laxly caespitose, with a stout stock. Flowering stems (10–)20–40 cm, decumbent, leafless for some distance below the capitulum. Leaves 7–15(–25) × 1·5–3 mm, oblong, often sinuate-crenate, glabrous or sparsely pubescent, usually widest above the middle. Involucral bracts ovate to lanceolate, green, crenate-serrate. Calyx-teeth glabrous or villous. ● *C. Spain, N. & C. Portugal.*

(i) Subsp. **tomentosa** (A. DC.) Rivas Martínez, *op. cit.* **28**: 45 (1972) (*J. humilis* var. *tomentosa* A. DC.): Laxly caespitose, with a stout stock. Flowering stems 5–10 cm, decumbent, tomentose near the apex, often leafy almost up to the capitulum. Leaves 5–15 × 1–3 mm, oblanceolate, usually entire, more or less pubescent. Involucral bracts ovate, crenate-serrate to serrate, lanate. Calyx-teeth densely villous. ● *W.C. Spain.*

(j) Subsp. **cavanillesii** (C. Vicioso) Tutin, *Bot. Jour. Linn. Soc.* **67**: 278 (1973) (*J. cavanillesii* C. Vicioso): Laxly caespitose. Flowering stems 2–11 cm, decumbent, usually sparsely leafy almost up to the capitulum. Leaves 2–5 × *c.* 1·5 mm, oblanceolate, entire, nearly glabrous. Involucral bracts elliptical, entire, not imbricate. Calyx-teeth glabrous or sparsely ciliate. ● *Mountains of N.W. Spain.*

J. brevisepala Rothm., *Cavanillesia* **7**: 121 (1935) is probably a high mountain variant of subsp. **(h)**.

6. J. laevis Lam., *Fl. Fr.* **2**: 3 (1779) (*J. perennis* Lam.). Nearly glabrous to moderately villous perennial with numerous non-flowering shoots. Flowering stems erect or ascending, leafless above. Leaves linear-oblong to linear-oblanceolate, not undulate, nearly entire; margin thin, not or weakly papillose. Outer involu-

[1] By T. G. Tutin.

cral bracts numerous, ovate to triangular, ciliate near the base, deeply toothed; teeth aristate. Calyx-teeth subulate, green, glabrous. Corolla blue. $2n=12$, 24. ● *W. & W.C. Europe, northwards to Luxembourg*; *Balkan peninsula, extending to S.W. Romania and S. Italy.* Al Be Bu Co Ga Ge Gr Hs It Ju Rm [Fe].

1 Flowering stems (15–)20–50 cm; cauline leaves (7–)12–30
2 Largest leaves not more than 3(–4) mm wide, linear-oblong **(a)** subsp. **laevis**
2 Largest leaves (4–)5–8 mm wide, oblanceolate **(d)** subsp. **rosularis**
1 Flowering stems 5–15 cm; cauline leaves 2–10(–15)
3 Densely caespitose, with stout stock; cauline leaves 8–15; bracts usually green **(c)** subsp. **orbiculata**
3 Laxly caespitose, with slender stock; cauline leaves 2–10; bracts usually purplish
4 Flowering stems 0·25–0·4 mm in diameter at apex, with 2–3(–4) cauline leaves **(b)** subsp. **carpetana**
4 Flowering stems 0·8–1 mm in diameter at apex, with (4–)5–10(–15) cauline leaves **(a)** subsp. **laevis**

(a) Subsp. **laevis**: Flowering stems usually 20–40 cm, *c.* 1 mm in diameter at apex, with (7–)12–17(–25) cauline leaves; leaves linear-oblong, ciliate, the largest not more than 3(–4) mm wide. Bracts usually green. *Mountains of W. & W.C. Europe from Luxembourg to the E. Pyrenees.*

(b) Subsp. **carpetana** (Boiss. & Reuter) Rivas Martínez, *Publ. Inst. Biol. Apl.* (*Barcelona*) **42**: 122 (1967): Flowering stems usually 10–15 cm, 0·25–0·4 mm in diameter at apex, with 2–3(–4) cauline leaves; leaves linear-oblanceolate, sparsely ciliate, the largest 1–2 mm wide. Bracts usually purplish. *Mountains of C. Spain.*

(c) Subsp. **orbiculata** (Griseb. ex Velen.) Tutin, *Bot. Jour. Linn. Soc.* **70**: 18 (1975) (*J. orbiculata* Griseb. ex Velen.): Flowering stems usually 5–10 cm, 0·8–1 mm in diameter at apex, with 8–15 cauline leaves; leaves linear-oblanceolate, not or sparsely ciliate, the largest 1·5–3 mm wide. Bracts usually green. *Balkan peninsula*; *Romania*; *S. Italy.*

(d) Subsp. **rosularis** (Boiss. & Reuter) Tutin, *loc. cit.* (1973) (*J. rosularis* Boiss. & Reuter): Flowering stems (20–)30–50 cm, *c.* 1 mm in diameter at apex, with 20–30 cauline leaves; leaves oblanceolate, ciliate or not, the largest (4–)5–8 mm wide, those of the non-flowering shoots rosulate. Bracts usually green. *S.W. Spain* (*Sierra Carbonera*).

7. J. bulgarica Stoj. & Stefanov, *Österr. Bot. Zeitschr.* **70**: 105 (1921). Like **6** (c) but stems, leaves and involucral bracts glabrous; leaves oblanceolate; corolla bluish-lilac. *Mountain pastures and* Pinus-*scrub.* ● *Bulgaria.* Bu.

8. J. heldreichii Boiss. & Orph. in Boiss., *Diagn. Pl. Or. Nov.* **3 (6)**: 120 (1859) (incl. *J. jankae* Neilr.). Like **6** (c) but often biennial; outer involucral bracts lanceolate to linear-lanceolate, very deeply toothed. $2n=12$. *Rocky places, usually on mountains.* ● *Balkan peninsula, extending to S.W. Romania.* Al Bu Gr Ju Rm.

9. J. foliosa Cav., *Icon. Descr.* **2**: 38 (1793). Glabrous perennial with a stout stock and tap-root. Stems up to 15 cm, leafy almost up to capitulum. Basal leaves 10–30 mm, rosulate, oblong-spathulate, remotely crenate-serrate, rarely entire, petiolate; cauline leaves *c.* 5 mm, sessile or subsessile, entire. Involucral bracts like the upper leaves. Pedicels longer than the calyx. Calyx-teeth lanceolate. Corolla deep violet. *Rock-crevices on mountains.* ● *S. & S.E. Spain.* Hs.

(a) Subsp. **foliosa**: Stems stout, ascending; cauline leaves linear-lanceolate. *N.E. part of the range of the species.*

(b) Subsp. **minuta** (Agardh ex Roemer & Schultes) Font Quer, *Cavanillesia* **7**: 78 (1935): Stems filiform, procumbent; cauline leaves spathulate. *S.W. part of the range of the species.*

Subfam. LOBELIOIDEAE

Flowers zygomorphic. Stamens connate by the anthers and by the filaments nearly to their base.

14. Lobelia L.[1]

Flowers in simple or branched racemes. Calyx 5-fid. Corolla-tube deeply split dorsally; limb 2-lipped, the upper 2 lobes rather smaller than the 3 lower. Stamens 5, 2 with setulose anthers. Style slender; stigma capitate, weakly 2-lobed. Capsule dehiscing by 2 apical valves.

L. erinus L., *Sp. Pl.* 932 (1753), a perennial species from South Africa with ascending stems *c.* 15 cm and blue (rarely pink or white) flowers, is commonly cultivated for ornament and may escape.

Terrestrial; stems leafy; leaves serrate **1. urens**
Aquatic; stems almost leafless; leaves entire, in a basal rosette **2. dortmanna**

1. L. urens L., *Sp. Pl.* 931 (1753). Nearly glabrous, erect perennial 20–60 cm. Stems solid, leafy. Leaves linear-lanceolate to oblong or oblong-obovate, remotely serrate, sessile. Raceme many-flowered, often branched. Bracts linear, about as long as or longer than the pedicels. Flowers 10–15 mm, erect or patent. Calyx-teeth narrowly triangular, acute, scabrid. Corolla blue or purplish. *Damp grassy places. W. Europe, northwards to S. England and Belgium.* Az Be Br Ga Hs Lu.

2. L. dortmanna L., *Sp. Pl.* 929 (1753). Glabrous, erect perennial 20–60 cm. Stems hollow, with few, very small leaves. Basal leaves in a rosette, oblong, obtuse, entire, sessile, with 2 longitudinal air-canals. Raceme few-flowered, simple. Bracts ovate, obtuse, much shorter than the pedicels. Flowers 15–20 mm, pendent. Calyx-teeth oblong, obtuse, smooth. Corolla pale lilac. $2n=14$. *In still, usually acid waters. N. & N.C. Europe, extending locally to S.W. France and White Russia.* Be Br Da Fa Fe Ga Ge Hb Ho No Po Rs (N, B, C) Su.

15. Laurentia Adanson[1]

Flowers solitary, axillary or terminal, long-pedicellate. Calyx 5-fid. Corolla-tube not or scarcely split dorsally; limb 2-lipped, the upper 2 lobes rather smaller than the 3 lower. Stamens 5; anthers unequal, the 2 smaller setulose at apex. Style slender; stigmas 2. Capsule dehiscing by 2 apical valves.

1. L. gasparrinii (Tineo) Strobl, *Flora* (*Regensb.*) **66**: 547 (1883) (*L. michelii* A. DC.). Slender, glabrous or puberulent annual or perennial up to 25 cm. Leaves obovate to oblong-spathulate, crenulate or entire, in a basal rosette in perennial plants. Flowers 4–11 mm; pedicels with 1–2 bracteoles near the middle. Corolla blue, lilac or white. *Mediterranean region, Portugal.* Bl Co Cr Ga Gr Hs It Lu Sa Si Tu.

Annual and perennial plants have been regarded as different species, but none of the morphological differences between them seems to be constant. Perennial plants (**L. tenella** A. DC. in DC., *Prodr.* **7**: 410 (1839)) are commoner in the eastern than in the western part of the range of the species, though both occur together on the islands.

[1] By T. G. Tutin.

CLXIX. COMPOSITAE[1]

Herbs or shrubs. Leaves alternate, opposite or rosulate, exstipulate. Flowers small (*florets*), hermaphrodite, functionally male, female, or sterile, in terminal or axillary, usually pedunculate capitula, surrounded by an involucre of bracts. Capitula solitary or in corymbose, less frequently racemose, inflorescences. Calyx-limb (*pappus*) absent or represented by a corona, auricle, scales, setae or simple or plumose hairs. Corolla of 3 main types: (*a*) tubular, with (3–)4- to 5-lobed limb, actinomorphic or rarely weakly zygomorphic; (*b*) tubular, with a 2-lipped limb; (*c*) ligulate, with a short tube and the limb prolonged on one side into a usually 3- or 5-toothed ligule; female florets sometimes without a corolla or with a filiform corolla. Stamens 5, epipetalous; anthers usually connate into a tube round the style, often caudate or sagittate at base and with apical appendages. Ovary inferior, 1-locular; ovule solitary, basal, anatropous; style solitary, with 2 stigmatic branches. Fruit a cypsela (*achene*).

The capitula vary greatly in size, but attempts to give measurements of the diameter or length are often subject to uncertainty owing to the tendency of ligules to be variously developed, to curl up in the live state or to be distorted in pressing. In the following account the terms 'small' 'medium' and 'large' are used, except where the diameter can be unambiguously measured. Examples of a small, medium and large capitulum are those of *Filago*, *Taraxacum* and *Helianthus* respectively. The length of the involucre is measured from the base of the capitulum. Pappus-hairs are described as plumose when the length of the branches is at least 3 times the diameter of the main hair but much shorter than it.

1 Plant with latex; florets all ligulate (Subfam. *Cichorioideae*)
2 Scapose (all leaves basal, though flowering stems sometimes with a few small bracts or scales)
3 Pappus absent
4 Annual; scapes strongly inflated above after anthesis; involucre 3–6 mm **151. Arnoseris**
4 Perennial; scapes not inflated above; involucre 10–12 mm **156. Aposeris**
3 At least some achenes with a pappus of hairs or scales
5 Receptacle with scales **158. Hypochoeris**
5 Receptacle without scales (though sometimes with rigid hairs)
6 At least some pappus-hairs plumose
7 Pappus-hairs in 1–2 rows **159. Leontodon**
7 Pappus-hairs in more than 2 rows **161. Scorzonera**
6 Pappus entirely of simple hairs, or scales, or both
8 At least some achenes with pappus partially or entirely of scales **153. Hyoseris**
8 Pappus entirely of simple hairs
9 Scapes unbranched, usually without bracts; achenes usually muricate above **173. Taraxacum**
9 Scapes branched or unbranched, usually with bracts; achenes not muricate
10 Achenes with a collar of scales below the beak
11 Capitula with fewer than 15 florets; involucre 2·5–5 mm wide **174. Chondrilla**
11 Capitula with more than 15 florets; involucre 7–12 mm wide **175. Calycocorsus**
10 Achenes without a collar of scales
12 Involucral bracts in 2 rows, the outer much shorter than the inner
13 At least some pappus-hairs thickened at base; ligules usually turning greenish on drying **150. Tolpis**
13 Pappus-hairs not thickened at base; ligules not turning greenish on drying **178. Crepis**
12 Involucral bracts in several rows
14 Rhizomes long and slender, often bearing whitish, subglobose tubers; achenes ± attenuate at apex **165. Aetheorhiza**
14 Rhizomes thick, never bearing tubers; achenes obconical **181. Hieracium**
2 Flowering stems with at least 1 well-developed cauline leaf
15 Achenes longer than involucre, incurved, with hooks **152. Koelpinia**
15 Achenes shorter than involucre, straight, without hooks
16 Leaves spiny
17 Receptacle with scales which enfold the achenes **145. Scolymus**
17 Receptacle without scales
18 Achenes compressed; spines on leaves not bulbous-based **166. Sonchus**
18 Achenes not compressed; spines on leaves bulbous-based **160. Picris**
16 Leaves not spiny
19 At least some achenes without pappus
20 Outer involucral bracts enfolding achenes, patent and stellate in fruit **155. Rhagadiolus**
20 Outer involucral bracts not enfolding achenes, not patent in fruit
21 Receptacle with scales **158. Hypochoeris**
21 Receptacle without scales
22 Achenes beaked **176. Heteracia**
22 Achenes not beaked
23 Stems with a solitary capitulum **179. Hispidella**
23 Stems with numerous capitula **177. Lapsana**
19 All achenes with a pappus of scales or hairs
24 Achenes strongly compressed
25 Achenes beaked
26 Pappus of 2 equal rows of hairs **169. Lactuca**
26 Pappus of 2 unequal rows of hairs
27 Involucral bracts in several rows, the outer not clearly demarcated from the inner **168. Steptorhamphus**
27 Involucral bracts in 2 rows, the outer smaller and patent **172. Mycelis**
25 Achenes not beaked
28 Ligules yellow
29 Pappus of uniform deciduous or persistent hairs; at least the outer involucral bracts with a scarious margin **164. Launaea**
29 Pappus of a few scabrid deciduous hairs and ± persistent softer hairs in fascicles; involucral bracts without a scarious margin **166. Sonchus**
28 Ligules purplish or blue
30 Capitula with *c.* 5 florets; involucre 3–5 mm wide **171. Prenanthes**
30 Capitula with *c.* 10 florets; involucre 7–12 mm wide **170. Cicerbita**
24 Achenes not compressed
31 At least some achenes with a pappus of scales
32 Receptacle with scales, at least near the margin
33 Achenes beaked **158. Hypochoeris**
33 Achenes not beaked
34 Involucral bracts silvery and shiny **147. Catananche**
34 Involucral bracts neither silvery nor shiny
35 All achenes with a pappus of 5–6 scales **148. Rothmaleria**
35 At least the inner achenes with a pappus of 10–20 scales or hairs **149. Hymenonema**
32 Receptacle without scales
36 Ligules purple or blue **146. Cichorium**
36 Ligules yellow
37 Achenes 0·5–4 mm **150. Tolpis**
37 Achenes 5–9 mm **154. Hedypnois**
31 All achenes with a pappus of hairs

[1] Edit. D. M. Moore, T. G. Tutin and S. M. Walters.

38 Receptacle with scales
39 At least some pappus-hairs plumose **158. Hypochoeris**
39 Pappus-hairs not plumose
40 Receptacular scales enclosing the florets **180. Andryala**
40 Receptacular scales not enclosing the florets **178. Crepis**

38 Receptacle without scales
41 At least some pappus-hairs plumose
42 Involucral bracts in 1 row
43 Leaves lobed **157. Urospermum**
43 Leaves entire **162. Tragopogon**
42 Involucral bracts in 2 or more rows
44 Pappus of 1 row of hairs **162. Tragopogon**
44 Pappus of 2 or more rows of hairs
45 Pappus of 2 rows of deciduous hairs; plant ± hispid **160. Picris**
45 Pappus of more than 2 rows of persistent hairs; plant glabrous or softly hairy **161. Scorzonera**
41 All pappus-hairs simple
46 Achenes with a corona below the beak
47 Capitula with 6–15 florets; involucre 2·5–5 mm wide **174. Chondrilla**
47 Capitula with more than 15 florets; involucre 7–12 mm wide **175. Calycocorsus**
46 Achenes without a corona
48 Achenes densely villous **161. Scorzonera**
48 Achenes not villous
49 Pappus of rigid hairs somewhat expanded at base **150. Tolpis**
49 Pappus of usually soft hairs not expanded at base
50 Receptacle with long, silky hairs equalling or exceeding the florets **180. Andryala**
50 Receptacle glabrous or with short hairs
51 Achenes strongly rugose **163. Reichardia**
51 Achenes smooth or weakly rugose
52 Achenes all unbeaked
53 Achenes somewhat attenuate above; plant without stellate hairs **178. Crepis**
53 Achenes obconical; usually at least some part of plant with stellate hairs **181. Hieracium**
52 At least the inner achenes beaked
54 Outer achenes with wings near apex; inner achenes with filiform beak at least twice as long as body **176. Heteracia**
54 Achenes without wings and with beak less than twice as long as body
55 Roots ± tuberous; involucral bracts in several rows **167. Cephalorrhynchus**
55 Roots not tuberous; involucral bracts in 2 rows, the outer clearly demarcated from the inner **178. Crepis**

1 Plant usually without latex; at least the inner florets not ligulate (Subfam. *Asteroideae*)
56 Leaves and involucral bracts often spiny; style thickened or hairy below the branches; ligulate florets absent
57 Capitula with 1 floret, grouped into globose heads **110. Echinops**
57 Capitula usually with many florets, not grouped into heads
58 Dwarf shrub
59 Leaves with a spinose-dentate margin
60 Outer involucral bracts leaf-like **143. Carthamus**
60 Outer involucral bracts not leaf-like **138. Centaurea**
59 Leaves unarmed
61 Pappus-hairs with branches about as long as the hair; achenes oblong, ± ribbed **115. Staehelina**
61 Pappus-hairs with branches much shorter than the hair (plumose); achenes obliquely obovoid, smooth **121. Ptilostemon**
58 Herb, often woody at base
62 Leaves spiny
63 Pappus not of plumose hairs, sometimes absent
64 Receptacle without scales or setae **125. Onopordum**
64 Receptacle with scales or setae
65 Pappus a short, dentate corona; anthers with pinnate basal appendages **113. Cousinia**
65 Pappus not a short, dentate corona; anthers without pinnate basal appendages
66 Achenes densely sericeous-villous **109. Cardopatum**
66 Achenes glabrous
67 At least the outer achenes without a pappus **143. Carthamus**
67 All achenes with a pappus
68 Leaves white-veined or variegated above; pappus-hairs in 1 row **127. Silybum**
68 Leaves usually uniformly coloured above; pappus-hairs in 2 or more rows
69 Inner involucral bracts acute or with a simple apical spine
70 Receptacle with setae; all florets hermaphrodite **117. Carduus**
70 Receptacle with scales; outer florets usually sterile **124. Tyrimnus**
69 Inner involucral bracts with a pectinate, spine-like or semicircular to ovate appendage at apex
71 Perennial; florets blue or purple, all hermaphrodite **144. Carduncellus**
71 Annual; florets yellow, the outer very small, sterile **142. Cnicus**
63 At least some achenes with plumose pappus-hairs
72 Achenes hairy
73 Inner involucral bracts shiny, radiating when dry and simulating ligules **106. Carlina**
73 Inner involucral bracts not shiny, erect **107. Atractylis**
72 Achenes glabrous
74 Receptacle densely hairy; outer florets much enlarged **123. Galactites**
74 Receptacle with scales; florets subequal
75 Receptacle fleshy **126. Cynara**
75 Receptacle not fleshy
76 Inner involucral bracts with a semicircular to ovate, lacerate to fimbriate apical appendage **138. Centaurea**
76 Involucral bracts without an apical appendage
77 Leaves not spinulose on upper surface or margin between the large marginal spines
78 Achenes oblong, compressed, with distinct margin and central projection at apex **122. Lamyropsis**
78 Achenes obliquely obovoid, scarcely compressed, with a slight margin and no central projection at apex **121. Ptilostemon**
77 Leaves spinulose on upper surface or margin and usually with spinose teeth or lobes
79 Leaves white-veined above; achenes obliquely obovoid-globose, without apical projection **120. Notobasis**
79 Leaves green above; achenes ± oblong, with apical projection
80 Involucral bracts with deflexed, pinnate apical spine **119. Picnomon**
80 Involucral bracts with simple apical spine or unarmed **118. Cirsium**
62 Leaves unarmed
81 At least the inner involucral bracts with an apical appendage
82 Inner involucral bracts white or pink, simulating ligules **108. Xeranthemum**
82 Inner involucral bracts not white or pink
83 Pappus absent
84 Bracts without distinct veins on the dorsal surface **138. Centaurea**
84 Bracts with (3–)5–7 ± distinct veins on the dorsal surface
85 Stem simple or sparingly branched; leaves entire; middle involucral bracts with appendage decurrent for half their length **137. Phalacrachena**

85 Stem freely branched; at least some leaves dentate to pinnatisect; middle involucral bracts with very shortly decurrent appendage **138. Centaurea**
83 Pappus present
86 Pappus at least partly of plumose hairs
87 Receptacle fleshy **126. Cynara**
87 Receptacle not fleshy
88 Outer involucral bracts leaf-like **144. Carduncellus**
88 Outer involucral bracts not leaf-like
89 Florets yellow
90 Pappus of 2 rows of plumose hairs **141. Wagenitzia**
90 Pappus of an outer row of plumose hairs and an inner row of very short, ciliate setae **140. Chartolepis**
89 Florets not yellow
91 Filaments glabrous and smooth; pappus-hairs free **130. Serratula**
91 Filaments hairy or papillose; pappus-hairs connate at base **131. Leuzea**
86 Pappus of simple hairs or scales
92 Achenes hairy
93 Achenes with entire apex **138. Centaurea**
93 Achenes with denticulate apex or denticulate apical ring
94 Capitula without an involucre of leaves **132. Amberboa**
94 Capitula subtended by an involucre of leaves **142. Cnicus**
92 Achenes glabrous
95 Appendages decurrent on the bracts
96 Outer achenes without pappus, the inner with a pappus of setae **129. Cheirolophus**
96 All achenes with a pappus of setae or scales or both **138. Centaurea**
95 Appendages not decurrent on the bracts
97 Pappus of several rows of scales **134. Cyanopsis**
97 Pappus of setae or setae and scales
98 Outer florets sterile; middle bracts with lacerate- to pectinate-fimbriate or spinose appendage **138. Centaurea**
98 All florets hermaphrodite; middle bracts with an entire or lacerate but not fimbriate appendage
99 Filaments papillose or hairy; stem thickened below the capitulum **131. Leuzea**
99 Filaments smooth and glabrous; stem not thickened below the capitulum
100 Cauline leaves entire or remotely dentate **136. Acroptilon**
100 Cauline leaves deeply pinnatifid **130. Serratula**
81 All involucral bracts without an apical appendage
101 At least some pappus-hairs plumose
102 Inner bracts shiny, radiating when dry and simulating ligules **106. Carlina**
102 Inner bracts not shiny, erect
103 Pappus-hairs in 1(–2) rows **114. Saussurea**
103 Pappus-hairs in several rows
104 Achenes with transverse basal attachment-scar **118. Cirsium**
104 Achenes with oblique lateral attachment-scar **130. Serratula**
101 Pappus without plumose hairs
105 Inner bracts white or pink, simulating ligules **108. Xeranthemum**
105 Inner bracts not white or pink
106 Outer bracts hooked at the apex **112. Arctium**
106 Outer bracts not hooked at the apex
107 Achenes hairy
108 All florets hermaphrodite; achenes usually with corona **116. Jurinea**
108 Outer florets sterile or female; achenes without corona
109 Middle bracts acuminate, spinulose-mucronate at apex **133. Volutaria**
109 Middle bracts obtuse, not apiculate or spinulose at apex
110 Outer achenes without pappus; inner achenes with an outer row of unequal, scabridulous setae and an inner row of 5–10 short scales **139. Crupina**
110 All achenes with 1 row of *c.* 10 linear scales **105. Amphoricarpos**
107 Achenes glabrous
111 Middle bracts obtuse, not apiculate or spinulose at apex
112 Pappus of 1 row of *c.* 10 linear scales **105. Amphoricarpos**
112 Pappus of 2 or more rows of setae, the inner sometimes scale-like
113 Leaves entire, nearly all basal **128. Palaeocyanus**
113 Leaves pinnatifid to pinnatisect, rarely entire, ± evenly distributed along the stem **138. Centaurea**
111 Middle bracts with an acute to spinulose or spinose apex
114 Pappus of long, subacuminate scales surrounded by long setae **135. Mantisalca**
114 Pappus of several rows of simple, sometimes scale-like hairs
115 Pappus-hairs free
116 All florets hermaphrodite; innermost row of pappus-hairs longer than the outer
117 Capitula at least 50 mm; pappus twisted at base **111. Berardia**
117 Capitula not more than 40(–50) mm; pappus not twisted **130. Serratula**
116 Outer florets sterile; innermost row of pappus-hairs shorter than the outer **138. Centaurea**
115 Pappus-hairs connate into a ring at base
118 Achenes terete
119 All florets hermaphrodite; innermost row of pappus-hairs longer than the outer **117. Carduus**
119 Outer florets sterile; innermost row of pappus-hairs shorter than the outer **138. Centaurea**
118 Achenes distinctly 4- to 5-angled
120 Achenes with transverse basal attachment-scar, usually with corona **116. Jurinea**
120 Achenes with oblique lateral attachment-scar, without corona **131. Leuzea**
56 Leaves and involucral bracts very rarely spiny; style neither thickened nor hairy below the branches; ligulate florets often present
121 At least some leaves opposite
122 Pappus of numerous hairs
123 Florets yellow; ligules present **93. Arnica**
123 Florets pinkish; ligules absent **1. Enpatorium**
122 Pappus not of numerous hairs
124 Pappus of 2–4 setae
125 All leaves opposite; ligules often absent **41. Bidens**
125 Upper leaves alternate; ligules always present
126 Upper leaves auriculate at base of petiole **46. Verbesina**
126 Upper leaves not auriculate at base of petiole **45. Helianthus**
124 Pappus absent, or of scales, teeth or a corona
127 Fertile florets in 1 row, completely enclosed by inner involucral bracts **18. Micropus**
127 Fertile florets in several rows, not completely enclosed by inner involucral bracts
128 Pappus a small, scarious corona
129 Ligules white; stems terete **72. Phalacrocarpum**
129 Ligules yellow; stems 4-angled **47. Silphium**
128 Pappus absent, or of small teeth or scales
130 Receptacle strongly conical **44. Rudbeckia**

130 Receptacle flat or nearly so
131 Pappus of several scales
132 Ligules white **52. Galinsoga**
132 Ligules yellow
133 Leaves dentate or serrate **45. Helianthus**
133 Leaves pinnatisect
134 Involucral bracts connate almost to apex; ligules 3–4 **55. Tagetes**
134 Involucral bracts free; ligule 1 **53. Schkuhria**
131 Pappus absent, or of few small scales
135 Plant glandular-hairy
136 Ligules present; capitula hermaphrodite **42. Sigesbeckia**
136 Ligules absent; capitula unisexual **49. Ambrosia**
135 Plant without glandular hairs
137 Ligules absent
138 Capitula in pulvinate clusters **16. Evax**
138 Capitula not in pulvinate clusters
139 Capitula unisexual, the male in terminal leafless racemes, the female axillary **49. Ambrosia**
139 Capitula hermaphrodite, all in spikes or panicles **48. Iva**
137 Ligules present
140 Perennial; capitula large
141 Stems terete; leaves not perfoliate **51. Heliopsis**
141 Stems 4-angled; leaves perfoliate **47. Silphium**
140 Annual; capitula small to medium
142 Ligules white **43. Eclipta**
142 Ligules yellow **40. Guizotia**
121 All leaves alternate or basal
143 Capitula unisexual
144 Monoecious; annual **50. Xanthium**
144 Dioecious; perennial
145 Glabrous shrub **11. Baccharis**
145 Herb, usually with lanate or arachnoid indumentum
146 Flowers usually appearing before the leaves; basal leaves long-petiolate **90. Petasites**
146 Flowers appearing after the leaves; all leaves sessile
147 Cauline leaves 5–12 cm, patent; inflorescence corymbose, with numerous capitula **28. Anaphalis**
147 Cauline leaves not more than 2 cm, ±erect; inflorescence ±capitate, with few capitula
148 Inflorescence not subtended by an involucre of leaves **26. Antennaria**
148 Inflorescence subtended by an involucre of leaves **27. Leontopodium**
143 Capitula hermaphrodite
149 Ligules absent
150 Receptacular scales present, or involucral bracts subtending the outer florets
151 Involucral bracts subtending the outer florets only
152 Pappus-hairs of inner achenes plumose above **14. Ifloga**
152 Pappus-hairs not plumose, or absent
153 Outer female florets ±enclosed by the bracts; achenes curved, falling enclosed by the bracts
154 Pappus present; style of outer female florets terminal **15. Logfia**
154 Pappus absent; style of outer female florets lateral **17. Bombycilaena**
153 Outer female florets not enclosed by bracts; achenes straight, falling separately from the bracts
155 Clusters of capitula pulvinate; involucral bracts usually more than 30; pappus absent **16. Evax**
155 Clusters of capitula subglobose; involucral bracts usually not more than 25; pappus usually present
156 Involucral bracts usually acuminate, ±erect in fruit; receptacle not or scarcely dilated at apex **13. Filago**
156 Involucral bracts obtuse to subacute, stellate in fruit; receptacle strongly dilated at apex **15. Logfia**
151 Scales subtending at least the inner florets
157 Corolla-tube not saccate or spurred at base
158 Lower leaves 1- to 2-pinnatisect **57. Anthemis**
158 Lower leaves 3-fid, the lobes ±toothed **64. Lonas**
157 Corolla-tube saccate or spurred at base
159 Leaves entire; plant not aromatic **65. Otanthus**
159 At least some leaves toothed to pinnatisect; plant usually aromatic
160 Herb; leaves 2- to 3-pinnatisect **59. Chamaemelum**
160 Small shrub; leaves toothed to 1-pinnatisect **56. Santolina**
150 Receptacular scales absent
161 Achenes with a pappus of numerous hairs
162 Involucral bracts in 1 row, sometimes with usually small, supplementary bracts at the base of the capitulum
163 Leaves fleshy, ±cylindrical **98. Kleinia**
163 Leaves not fleshy, flat
164 Leaves deeply lobed **96. Senecio**
164 Leaves not deeply lobed
165 Leaves cuneate to rounded at base
166 Annual; lower leaves much smaller than those above **95. Erechtites**
166 Perennial; lower leaves not much smaller than those above **96. Senecio**
165 Leaves cordate to hastate at base
167 Capitula 1(–3) **91. Homogyne**
167 Capitula numerous
168 Stems not more than 2 mm in diameter **96. Senecio**
168 Stems 4–6 mm in diameter
169 Style-branches tapering gradually from base to apex **92. Adenostyles**
169 Style-branches ±parallel-sided, with a short, acute apex **99. Cacalia**
162 Involucral bracts in (2–)3 or more rows
170 Anthers not sagittate and without filiform appendages at base
171 Plant glabrous
172 Florets pink **12. Karelinia**
172 Florets yellow or brownish
173 Capitula in corymbs; involucral bracts mostly herbaceous; achenes hairy **7. Aster**
173 Capitula solitary or in small clusters at ends of branches; involucral bracts entirely scarious or coriaceous; achenes glabrous **29. Phagnalon**
171 Plant pubescent to tomentose
174 Plant tomentose or lanate **29. Phagnalon**
174 Plant not tomentose or lanate
175 Outer florets tubular, hermaphrodite **7. Aster**
175 Outer florets filiform, female
176 Most leaves basal; florets purplish **8. Erigeron**
176 Stems leafy throughout; florets yellow or white
177 Patent-hirsute annual **9. Conyza**
177 Appressed-pubescent perennial **10. Nolletia**
170 Anthers sagittate, with 2 filiform appendages at base
178 Pappus-hairs plumose **25. Lasiopogon**
178 Pappus-hairs smooth or denticulate
179 Plant with numerous short glandular hairs **35. Jasonia**
179 Plant eglandular
180 Pappus-hairs thickened towards apex, at least in functionally male florets
181 Capitula numerous, in a corymbose inflorescence **28. Anaphalis**
181 Capitula few, in a cluster or umbellate inflorescence
182 Capitula subtended by an involucre of leaves **27. Leontopodium**
182 Capitula not subtended by an involucre of leaves **26. Antennaria**
180 Pappus-hairs not thickened towards apex

183 Capitula solitary or corymbose, rarely in dense clusters; female florets usually few, the hermaphrodite usually numerous; involucral bracts usually bright yellow, white or red **24. Helichrysum**
183 Capitula usually in dense clusters, very rarely solitary; female florets usually numerous, the hermaphrodite usually few; involucral bracts usually greenish or brownish
184 Clusters of capitula not subtended by leaves; involucral bracts uniformly white to yellow **23. Gnaphalium**
184 Clusters of capitula subtended by leaves; involucral bracts mottled, brownish
185 Perennial with non-flowering shoots; achenes (0·7–)1–2 mm, not mucilaginous when wet **20. Omalotheca**
185 Annual, or perennial without non-flowering shoots; achenes 0·4–0·9 mm, mucilaginous when wet
186 Clusters of capitula each subtended by several leaves; pappus-hairs free, falling separately **22. Filaginella**
186 Clusters of capitula each subtended by 1 leaf; pappus-hairs connate at base, falling as a unit **21. Gamochaeta**
161 Achenes without a pappus of numerous hairs
187 Leaves not pinnatifid to pinnatisect
188 Capitula in 1 cluster subtended by leaves; dwarf, lanate annual **19. Evacidium**
188 Capitula solitary or in panicles or corymbs
189 Upper leaves lyrate, with a large terminal lobe **4. Dichrocephala**
189 Upper leaves not lyrate
190 Capitula in large panicles; involucre not more than 3 mm **88. Artemisia**
190 Capitula solitary or in corymbs; involucre usually more than 3 mm
191 Capitula sessile in the leaf-axils, or pedunculate and subtended by an involucre of small leaves **34. Carpesium**
191 Capitula long-pedunculate, not subtended by an involucre of small leaves
192 Achenes strongly compressed **83. Cotula**
192 Achenes subterete or variously angled
193 Small annual; achenes stipitate **84. Chlamydophora**
193 Usually perennial; achenes sessile
194 Leaves strongly glandular-punctate; plant aromatic **71. Balsamita**
194 Leaves not glandular-punctate; plant not aromatic
195 Capitula solitary, rarely 2–4, 2–4 cm in diameter **81. Leucanthemum**
195 Capitula in corymbs of 4–10, 1–2 cm in diameter **82. Plagius**
187 At least some leaves pinnatifid to pinnatisect
196 Plant often grey- or white-lanate or sericeous, at least in part; inflorescence not corymbose; involucre usually less than 4 mm; corolla usually reddish- or brownish-yellow **88. Artemisia**
196 Plant not grey- or white-lanate or sericeous; inflorescence corymbose or capitula solitary; involucre usually more than 4 mm; corolla usually pure yellow
197 Capitula sessile; style persistent in fruit
198 Achenes villous at apex; wings thick **87. Gymnostyles**
198 Achenes glabrous; wings thin **86. Soliva**
197 Capitula pedunculate; style deciduous in fruit
199 Achenes strongly compressed, at least the outer stipitate **83. Cotula**
199 Achenes subterete or variously angled, sessile
200 At least some leaves 2- to 3-pinnatisect
201 Cauline leaves usually less than 1 cm, 1-pinnatifid **69. Tanacetum**
201 Cauline leaves usually more than 1 cm, mostly 2- to 3-pinnatisect
202 Capitula less than 5 mm in diameter **69. Tanacetum**
202 Capitula more than 5 mm in diameter
203 Achenes with an oblique lateral attachment-scar, weakly 3- to 5-ribbed, without apical resin-glands **61. Chamomilla**
203 Achenes with a transverse basal attachment-scar, strongly 3-ribbed, with apical resin-glands **60. Matricaria**
200 All leaves 1-pinnatisect, or some simple
204 Upper leaves lyrate, with a large terminal lobe **4. Dichrocephala**
204 Upper leaves not lyrate
205 Inflorescence corymbose **69. Tanacetum**
205 Capitula solitary
206 Achenes with a scarious corona or auricle **57. Anthemis**
206 Achenes without a corona or auricle **85. Nananthea**
149 Ligules present, though sometimes small
207 Shrub; achenes 5–7 mm, globose, woody **101. Chrysanthemoides**
207 Herb; achenes less than 5 mm, usually elongate, not woody
208 Receptacular scales present
209 Ligules white or purplish
210 Capitula small, usually in corymbs **58. Achillea**
210 Capitula medium, solitary
211 Plant with multicellular hairs; pappus of long-aristate scales **54. Gaillardia**
211 Plant glabrous or with unicellular hairs; pappus not of long-aristate scales
212 At least the outer achenes strongly winged; tubular florets often with 2 corolla-lobes longer than the others **63. Anacyclus**
212 Achenes not winged; corolla-lobes of tubular florets equal
213 Corolla of tubular florets saccate or spurred at base **59. Chamaemelum**
213 Corolla of tubular florets not saccate or spurred at base
214 Achenes ±terete **57. Anthemis**
214 Achenes strongly compressed **58. Achillea**
209 Ligules yellow
215 Capitula small, usually in corymbs **58. Achillea**
215 Capitula medium, usually solitary
216 Pappus of long-aristate scales **54. Gaillardia**
216 Pappus not of long-aristate scales
217 At least some leaves pinnatisect
218 Branches in a whorl below the primary capitulum; capitula sessile **62. Cladanthus**
218 Branches not whorled; capitula pedunculate
219 Plant softly hairy; outer involucral bracts broadly scarious **57. Anthemis**
219 Plant usually scabrid; outer involucral bracts leaf-like **44. Rudbeckia**
217 Leaves not pinnatisect
220 Pappus of ligulate florets of 4 scales **76. Lepidophorum**
220 Pappus of numerous scales or a small corona
221 Ligules in 2 rows; pappus of numerous small scales
222 Corolla-tube of inner florets terete; outer achenes ±triquetrous **39. Asteriscus**
222 Corolla-tube of inner florets compressed and sometimes winged; outer achenes flat, winged **38. Pallenis**
221 Ligules in 1 row; pappus a small corona, denticulate or with few longer teeth

223 Plant usually scabrid; receptacle strongly conical **44. Rudbeckia**
223 Plant not scabrid; receptacle hemispherical
224 Outer achenes 3-angled; anthers not bearded at base **36. Buphthalmum**
224 Outer achenes terete; anthers bearded at base **37. Telekia**
208 Receptacular scales absent
225 Inner achenes strongly arcuate to annular, muricate on the back **100. Calendula**
225 Inner achenes straight or weakly curved, not muricate on the back
226 Ligules with a conspicuous basal black patch with a white spot in the centre **104. Gazania**
226 Ligules without a conspicuous basal black patch with a white spot in the centre
227 Achenes densely lanate or villous
228 Achenes winged; pappus of 2 rows of scales **102. Arctotis**
228 Achenes unwinged; pappus of 1 row of scales **103. Arctotheca**
227 Achenes glabrous or pubescent
229 Involucral bracts in 1 row, sometimes with supplementary bracts at the base of the capitulum
230 Capitula with 3–5 florets, 1 ligulate **53. Schkuhria**
230 Capitula with numerous florets, more than one ligulate
231 Scapes with numerous purplish scales; ligules in several rows **89. Tussilago**
231 Scapes without numerous purplish scales; ligules in 1 row
232 Ligules white, at least above; pappus of mixed hairs and scales **6. Bellium**
232 Ligules yellow, less frequently reddish or lilac above; pappus of numerous hairs
233 Petioles of basal and lower cauline leaves not or scarcely sheathing at base; capitula solitary or in corymbose inflorescences **96. Senecio**
233 Petioles of basal and lower cauline leaves broadly sheathing at base; capitula usually in long panicles or spikes, rarely corymbose **97. Ligularia**
229 Involucral bracts in 2 or more rows
234 Pappus with long hairs
235 Pappus-hairs of inner achenes plumose above **30. Leysera**
235 Pappus-hairs not plumose
236 Ligules not yellow
237 Scapose **7. Aster**
237 Flowering stems leafy
238 Ligules distinctly longer than involucre
239 Ligules usually in 2 or more rows, filiform; pappus-hairs in 1 row **8. Erigeron**
239 Ligules in 1 row, not filiform; pappus-hairs in 2 or more rows **7. Aster**
238 Ligules shorter than involucre
240 Plant glabrous; leaves fleshy **7. Aster**
240 Plant hairy, at least on stems or involucre; leaves usually not fleshy
241 Capitula usually 1 or few, with several rows of female florets and numerous hermaphrodite florets **8. Erigeron**
241 Capitula usually numerous, with many rows of female florets and few hermaphrodite florets **9. Conyza**
236 Ligules yellow
242 Anthers without filiform appendages at their base
243 Involucre 10–20 mm; capitula usually solitary **94. Doronicum**
243 Involucre not more than 6 mm; capitula in a paniculate or corymbose inflorescence **3. Solidago**
242 Anthers with filiform appendages at their base
244 Pappus of long hairs surrounded by a row of small, ±connate scales **33. Pulicaria**
244 Pappus without an outer row of small, ± connate scales
245 Pappus-hairs connate near base, forming a brownish cup; achene abruptly contracted at apex **32. Dittrichia**
245 Pappus-hairs free at base; achene not contracted at apex
246 Pappus-hairs ± equal **31. Inula**
246 Outer pappus-hairs much shorter than inner **35. Jasonia**
234 Pappus without long hairs
247 Leaves not pinnatifid to pinnatisect
248 At least the achenes of the ligulate florets strongly compressed **5. Bellis**
248 Achenes not strongly compressed
249 Ligules white, sometimes pink- or purplish-tinged
250 Corolla-lobes of tubular florets unequal **79. Hymenostemma**
250 Corolla-lobes of tubular florets equal
251 Corolla of tubular florets compressed and winged below; pericarp with resin-canals **81. Leucanthemum**
251 Corolla of tubular florets unwinged; pericarp without resin-canals
252 Stems not more than 20 cm; leaves eglandular **74. Leucanthemopsis**
252 Stems at least 30 cm; leaves glandular
253 Ligules 4–6 mm **71. Balsamita**
253 Ligules 10–25 mm **70. Leucanthemella**
249 Ligules yellow
254 Pappus of 2–8 caducous setae **2. Grindelia**
254 Pappus a scarious corona or auricle, or absent
255 Outer achenes 2- to 3-winged, the inner 1- to 2-winged or unwinged; pappus absent
256 Plant not viscid-hairy **66. Chrysanthemum**
256 Plant viscid-hairy **67. Heteranthemis**
255 Achenes all similar; pappus usually conspicuous
257 Tubular florets actinomorphic; pappus of ligulate florets not longer than the corolla-tube **80. Coleostephus**
257 Tubular florets zygomorphic; pappus of ligulate florets twice as long as the corolla-tube **78. Glossopappus**
247 Leaves pinnatifid to pinnatisect
258 Leaves 1-pinnatifid to 1-pinnatisect
259 Ligules yellow, at least at base
260 Caespitose perennial **74. Leucanthemopsis**
260 Annual
261 Plant viscid-hairy **67. Heteranthemis**
261 Plant not viscid-hairy
262 Ligules entirely yellow **75. Prolongoa**
262 Ligules white, with yellow base **79. Hymenostemma**
259 Ligules white or pinkish, without a yellow base
263 Involucral bracts 3–9 **85. Nananthea**
263 Involucral bracts numerous
264 Achenes of ligulate florets strongly compressed and winged, those of tubular florets subcylindrical **77. Daveaua**
264 Achenes all similar, not winged or strongly compressed
265 Pericarp with resin-canals **81. Leucanthemum**
265 Pericarp without resin-canals
266 Caespitose perennials **74. Leucanthemopsis**
266 Annuals
267 Basal rosette absent; achenes with stout, prominent ribs **79. Hymenostemma**
267 Basal rosette present; achenes very weakly ribbed **57. Anthemis**
258 At least some leaves 2- to 3-pinnatisect
268 Ligules yellow, at least towards the base
269 Outer achenes 3-angled, winged on the angles, the inner with an adaxial wing or cylindrical **66. Chrysanthemum**
269 Achenes all similar, unwinged **69. Tanacetum**
268 Ligules white, rarely pink or purplish
270 Leaf-lobes subulate
271 Outer achenes curved, transversely lamellate, with a conspicuous auricle **73. Otospermum**
271 Outer achenes neither curved nor lamellate, without an auricle
272 Achenes with a transverse basal attachment-scar, strongly 3-ribbed, with apical resin-glands **60. Matricaria**
272 Achenes with an oblique lateral attachment scar, weakly 3- to 5-ribbed, without apical resin-glands **61. Chamomilla**
270 Leaf-lobes flat
273 Pericarp with resin-canals **81. Leucanthemum**
273 Pericarp without resin-canals
274 Pappus a corona; capitula usually in corymbs **69. Tanacetum**
274 Pappus absent; capitula usually solitary **68. Dendranthema**

Subfam. ASTEROIDEAE

Plant usually without latex. At least some inner florets without a ligulate corolla. Pollen-grains usually with uniformly distributed spines.

Tribe **Eupatorieae** Cass.[1]

Leaves usually opposite, simple. Capitula without ligules; florets all hermaphrodite; corolla not yellow. Receptacle without scales. Anthers obtuse at base. Style-branches obtuse or clavate, finely papillose. Pappus of hairs.

Ageratum houstonianum Miller, *Gard. Dict.* ed. 8, no. 2 (1768), from Mexico, is frequently cultivated for ornament and occurs as a casual. It is an annual up to *c.* 60 cm, with usually cordate leaves, densely puberulent and somewhat glandular involucral bracts and blue florets.

1. **Eupatorium** L.[2]

Perennial herbs or shrubs. Leaves usually opposite. Capitula in terminal corymbs or panicles. Involucral bracts in few rows. Receptacle flat or convex, without scales. All florets tubular, hermaphrodite, 5-lobed or -dentate, white, pink or purplish. Achenes oblong or fusiform, 5-angled, truncate at apex; pappus hairs in 1 row, denticulate.

Stems and petioles puberulent but eglandular; leaves usually 3- to 5-fid **1. cannabinum**
Stems and petioles densely glandular-pubescent; leaves simple **2. adenophorum**

1. E. cannabinum L., *Sp. Pl.* 838 (1753). Erect, puberulent herb 30–175 cm. Most leaves palmately 3- to 5-fid (rarely all simple), the lobes lanceolate to ovate, acuminate, coarsely serrate, shortly petiolate. Capitula 2–5 mm in diameter; involucre cylindrical to campanulate; outer bracts much shorter than inner; inner *c.* 6 mm, ovate, broadly scarious and often purplish. Achenes *c.* 3 mm, black; pappus-hairs numerous. *Damp places. Most of Europe northwards to c.* 63° *N. in Finland.* All except Az Cr Fa Is Sb.

(a) Subsp. **cannabinum**: Plant usually robust and tall; middle cauline leaves almost always 3- to 5-fid; pappus longer than achene. $2n=20$, 40. *Throughout the range of the species, except Corse.*

(b) Subsp. **corsicum** (Req. ex Loisel.) P. Fourn., *Quatre Fl. Fr.* 937 (1939): Plant slender and small; all leaves often undivided; pappus not longer than achene. ● *Corse, Sardegna, S. Italy.*

2. E. adenophorum Sprengel, *Syst. Veg.* **3**: 420 (1826). Erect or scrambling perennial up to 200 cm. Stems, petioles and peduncles with short glandular hairs. Leaves unlobed, rhombic or triangular, crenate-serrate except for the cuneate or truncate basal portion; petiole *c.* ½ as long as lamina. Capitula 5–10 mm in diameter; involucre campanulate; bracts broadly scarious, reddish, acute or acuminate, glandular-serrulate above, and with scattered purplish glandular hairs; outer bracts about as long as the inner. Achenes *c.* 2 mm, black; pappus hairs 5–10. $2n=51$. *Sometimes cultivated for ornament and naturalized in S. Europe.* [Az Co Cr Hs Lu.] (*Mexico.*)

Tribe **Astereae** Cass.[1]

Leaves alternate, simple. Capitula with or without ligules; outer florets female or sterile, the inner hermaphrodite or functionally male; ligules yellow, white or purple; tubular florets usually yellow. Receptacle without scales. Anthers usually obtuse at base. Style-branches flattened, acute or subobtuse; stigmatic surface marginal, usually not reaching apex. Pappus usually of hairs.

2. **Grindelia** Willd.[3]

Biennial or perennial. Leaves simple, alternate. Capitula medium to large. Involucral bracts in several rows. Receptacle flat or convex, without scales. Outer florets ligulate, female; inner florets tubular, hermaphrodite or sterile. Achenes compressed-subquadrangular, glabrous. Pappus of 2–10 more or less serrulate, deciduous awns.

Literature: J. A. Steyermark, *Ann. Rep. Missouri Bot. Gard.* **21**: 433–608 (1934).

1. G. squarrosa (Pursh) Dunal, *Mém. Mus. Hist. Nat. (Paris)* **5**: 50 (1819). Erect biennial or perennial up to 100 cm, often branched above. Leaves 3–7 cm, ovate-oblong, amplexicaul, resinous-punctate, serrate-crenate or entire. Capitula several, 2–3 cm in diameter, terminating leafy branches. Involucral bracts 3–8 × 0·5–1 mm, with cylindrical, squarrose-deflexed apex, very viscid. Ligules numerous, 7–15 mm, yellow, rarely absent. Inner florets yellow. Achenes 2–3 mm, oblong, brown. Pappus-awns 2–8, 3–5 mm, usually finely serrulate. *Formerly cultivated as a medicinal plant, and naturalized in waste places in Ukraine.* [Rs (W, E).] (*North America.*)

[1] Edit. T. G. Tutin. [2] By T. G. Tutin. [3] By A. Hansen.

3. Solidago L.[1]

Perennial herbs with rhizome or short stock. Stems simple up to the inflorescence; non-flowering leaf-rosettes often present. Leaves alternate, often toothed. Inflorescence fasciculate, thyrsoid, or forming scorpioid or sometimes corymbose panicles; capitula usually numerous, small; florets yellow. Involucre more or less cylindrical, with many rows of imbricate bracts. Ligules 3–20(–25), female; tubular florets hermaphrodite. Achenes many-veined, subterete or angled; pappus-hairs in 1–2 rows, more or less equal, shortly ciliate.

Species of Subgen. *Solidago* from North America have been grown extensively in gardens and some of these, in addition to those given below, have been reported as naturalized.

Literature: J. R. Beaudry, *Naturaliste Canad.* **97**: 35–42 (1970). J. R. Beaudry & D. L. Chabot, *Contr. Inst. Bot. Univ. Montreal* **70**: 65–72 (1957). B. M. Kapoor & J. R. Beaudry, *Canad. Jour. Genet. Cytol.* **8**: 422–443 (1966). G. E. Schultz, *Nov. Syst. Pl. Vasc.* (*Leningrad*) **10**: 248–257 (1973).

1 Leaves rather fleshy, the lower ± amplexicaul; leaf-margins not ciliate, smooth or very minutely scabrid **2. sempervirens**
1 Leaves not fleshy and amplexicaul; leaf-margins ciliate or prominently scabrid
2 All but the lowermost capitula sessile or subsessile in terminal clusters, forming corymbose panicles; receptacular pits minutely fimbriate **5. graminifolia**
2 All capitula with peduncles at least ½ as long as the involucre, not forming corymbose panicles; receptacular pits not fimbriate
3 Inflorescence thyrsoid or a terminal panicle with ascending branches; capitula not secund; involucre 4·5–8 mm; leaves with numerous divergent, often indistinct, lateral veins **1. virgaurea**
3 Inflorescence a terminal panicle with patent branches; capitula secund; involucre 2–4(–5) mm; leaves with two lateral veins running almost parallel to the midrib for most of its length and distinct beneath
4 Stems densely pubescent or scabrid at least in the upper ½; involucre 2–2·8 mm **3. canadensis**
4 Stems glabrous, often glaucous except in the inflorescence; involucre 3·2–5 mm **4. gigantea**

Subgen. **Solidago.** Inflorescence fasciculate, thyrsoid or paniculate, with all capitula pedunculate. Ligules usually fewer than tubular florets. Filaments becoming free within the corolla-tube. Receptacular pits not fimbriate.

1. S. virgaurea L., *Sp. Pl.* 880 (1753) (incl. *S. taurica* Juz.). Stems 5–100 cm, arising from a short, stout stock, glabrous or pubescent. Leaves glabrous above, usually pubescent beneath, usually serrate; basal 2–10 cm, oblanceolate to obovate; cauline 5–30, decreasing in size upwards, linear-lanceolate to elliptical, acute. Inflorescence thyrsoid, or a panicle with ascending, racemose branches. Capitula not secund. Involucre 4·5–8 mm, greenish. Ligules 6–12, 4–9 mm. Tubular florets 10–30. Achenes *c.* 3 mm, pubescent; pappus *c.* 5 mm. 2*n*=18. *Almost throughout Europe.* All except Az Cr Fa Is Sb Si.

The variant known as subsp. **minuta** (L.) Arcangeli, *Comp. Fl. Ital.* 339 (1882) (subsp. *alpestris* (Waldst. & Kit. ex Willd.) Hayek, *S. lapponica* With., *S. jailarum* Juz.), from the Arctic, the mountains of E., C. & N. Europe and some coastal localities in W. Europe, is 5–20 cm, with usually glabrous, rather coriaceous leaves and few large capitula usually in compact, spike-like racemes with the involucre 6–8 mm; it has 2*n*=18.

By J. McNeill.

S. macrorrhiza Lange in Willk. & Lange, *Prodr. Fl. Hisp.* **2**: 39 (1865), from coastal localities in S.W. France and N.W. Spain, may also be referable to this subspecies.

Plants known as **S. litoralis** Savi, *Due Cent. Piante Etrusc.* 182 (1804), from Italy, and **S. virgaurea** subsp. **centiflora** Velen., *Fl. Bulg.* 278 (1891), from N. Bulgaria, have a dense, appressed, greyish indumentum and thick leaves. The status of these and other variants has yet to be satisfactorily resolved.

2. S. sempervirens L., *Sp. Pl.* 878 (1753). Stems 30–200 cm, arising from a short stock. Leaves somewhat fleshy, entire, obtuse, apiculate; basal 10–30 × 2–6 cm, elliptic-lanceolate to ovate, with wide petioles; cauline 10–35, largest in the middle of the stem, linear-lanceolate to ovate, sessile, more or less amplexicaul; margins smooth, rarely very minutely scabrid. Panicle thyrsoid or the lower branches patent with more or less secund capitula, glabrous. Involucre 3–5 mm. Ligules 7–11, 3–5 mm. Tubular florets 12–40; corolla 4–5·5 mm. Achenes 2·2–3·5 mm, sparsely pubescent; pappus 3·5–5·5 mm. *Açores.* *Az. (*E. North America.*)

The description applies to the plants from the Açores, which appear to be referable to var. *sempervirens*, although the basal leaves are often wider and the capitula smaller than in the American plants; they have been called var. *azorica* (Hochst.) St John.

3. S. canadensis L., *Sp. Pl.* 878 (1753). Rhizomatous. Stems 30–150 cm, glabrous at the base, pubescent or scabrid at least in the upper ½, with 40–110 leaves scarcely decreasing in size upwards. Leaves lanceolate, long-attenuate, pubescent or scabrid on the margin and veins beneath or occasionally throughout, sharply serrate, with 2 prominent lateral veins; basal soon deciduous; middle cauline 6–13 × 0·5–1·8 cm. Panicle broadly pyramidal, the branches patent, with strongly secund capitula. Involucre 2–2·8 mm. Ligules 10–17, 1–1·5 mm. Tubular florets usually fewer than the ligules; corolla 2·4–2·8 mm. Achenes 0·9–1·2 mm, shortly pubescent; pappus 2–2·5 mm. *Cultivated for ornament and widely naturalized in Europe.* [Au Be Br ?Bu Cz Da Ga Ge Hb He Ho Hs Hu No Po Rm Rs (B, C, W).] (*North America.*)

The plants naturalized in Europe all appear to be referable to var. *canadensis*; the very similar **S. altissima** L., *Sp. Pl.* 878 (1753) (*S. canadensis* var. *scabra* Torrey & A. Gray) is cultivated and may also be naturalized. It is 70–200 cm, has more hairy leaves and stem, and larger capitula with involucre 3·2–5 mm and corolla of tubular florets 3–4 mm.

4. S. gigantea Aiton, *Hort. Kew.* **3**: 211 (1789). Like **3** but stems 50–250 cm, glabrous, often glaucous except in the inflorescence; leaves usually glabrous; involucre usually 3·5–5 mm. 2*n*=36. *Naturalized from gardens throughout much of Europe.* [Au Az Be Br Bu Cz Da Ga Ge Hb He Ho Hs Hu It Ju Po Rm Rs (W) Su.] (*North America.*)

The naturalized plants in Europe are mostly referable to subsp. **serotina** (O. Kuntze) McNeill, *Bot. Jour. Linn. Soc.* **67**: 280 (1973), which is said always to be tetraploid, but the diploid subsp. **gigantea**, with the leaves pubescent on the veins beneath, the involucre 3·2–4 mm, and the achenes usually glabrous, may also occur.

Subgen. **Euthamia** Nutt. Inflorescence corymbose, with all but the lowest capitula sessile. Ligules always more numerous than tubular florets. Filaments becoming free only at apex of corolla-tube. Receptacular pits minutely fimbriate.

5. S. graminifolia (L.) Salisb., *Prodr.* 199 (1796). Rhizomatous. Stems 30–150 cm, glabrous to sparsely pubescent. Leaves linear-lanceolate, entire, scabrid on the margins and usually on the veins beneath, with 2 or 4 lateral veins more or less parallel to the midrib; lower soon deciduous; cauline 4–15 × 0·4–1·2 cm. Panicle corymbose. Involucre 2·5–5 mm, yellowish. Ligules 15–25, 0·8–1 mm. Tubular florets 5–10. Achenes 0·5–0·7 mm, pubescent; pappus *c.* 2·5 mm. *Cultivated for ornament and occasionally naturalized, mainly in C. Europe.* [Au Br Cz Ga Ge He Po Rm Rs (W).] (*North America.*)

4. Dichrocephala L'Hér. ex DC.[1]

Annual herbs. Leaves alternate, toothed, lyrate or pinnatifid. Inflorescence paniculate, with several small capitula. Involucral bracts in 1–2 rows. Receptacle raised, contracted at base and flat above, without scales. Florets all tubular, the outer female, the inner hermaphrodite. Achenes compressed, with marginal veins; pappus absent, rarely of 2 small setae in hermaphrodite flowers.

1. D. integrifolia (L. fil.) O. Kuntze, *Revis. Gen.* **1**: 333 (1891) (*D. latifolia* DC.). 20–40 cm, shortly papillose-pubescent. Leaves very variable, the lower often ovate-cordate, petiolate, the upper usually lyrate, with an ovate, toothed terminal lobe. Capitula globose; involucral bracts *c.* 5 mm, lanceolate, erecto-patent; florets yellow, the female very slender, sometimes green and persistent. Achenes *c.* 1 mm. 2*n*=18. *Naturalized in Italy and Turkey-in-Europe.* [It Tu.] (*Tropical and subtropical Asia and Africa.*)

5. Bellis L.[2]

Small annual or perennial herbs, often scapose. Leaves alternate or basal, entire to serrate-crenate. Capitula solitary, pedunculate. Involucral bracts in 2 rows, subequal, herbaceous. Receptacle conical to nearly flat; scales absent. Outer florets ligulate, female; ligules entire or subentire, patent, white, often tinged with purplish-crimson. Inner florets 4- or 5-lobed, yellow; corolla-tube campanulate. Achenes compressed, with thickened margin; pappus absent, rarely represented by a ring of very short bristles.

In several species the development of the stem varies greatly with environmental conditions; normally scapose species can show well-developed leafy stems in damp, shady habitats, and the opposite tendency can be seen under the influence of drought or heavy grazing.

Literature: E. Caramo & V. Bambacioni, *Ann. Bot.* (*Roma*) **16**: 9–70 (1926).

1 Annual, usually with leafy stems; roots very slender **1. annua**
1 Perennial; roots fleshy
2 Stems up to 15 cm, leafy, decumbent to ascending; receptacle nearly flat; achenes glandular **4. azorica**
2 Plant normally scapose; receptacle conical; achenes not glandular
3 Lamina cordate, truncate or shortly cuneate at base, passing ± abruptly into a distinct petiole
4 Leaves reniform-orbicular to broadly oblong-ovate; petiole 4–18 cm, usually much longer than lamina **7. rotundifolia**
4 Leaves oblanceolate to broadly obovate-spathulate; petiole not more than 3·5 cm, usually equalling or shorter than lamina
5 Leaves not more than 10 × 6 mm, usually entire; peduncles 1–6 cm; achenes glabrous **3. bernardi**
5 Leaves 10–60 × 4–25 mm; peduncles 4–15(–25) cm; achenes pubescent **2. perennis**
3 Lamina cuneate, passing gradually into a scarcely distinct petiole
6 Leaves up to 25 mm wide, dark green, 3-veined; involucral bracts (5–)7–12 mm, ± acute **6. sylvestris**
6 Leaves not more than 15 mm wide, bright green, 1-veined; involucral bracts 3–6 mm, usually obtuse
7 Leaves conspicuously crenate-serrate; achenes glabrous **5. longifolia**
7 Leaves subentire to obscurely crenate-serrate; achenes pubescent **2. perennis**

1. B. annua L., *Sp. Pl.* 887 (1753). Subglabrous to hispid annual (2·5–)5–12(–20) cm. Stem usually apparent, ascending or suberect. Leaves 6–25(–50) × 3–15(–20) mm, oblanceolate-lingulate to broadly obovate-spathulate, crenate-serrate to entire; petiole usually distinct in lower leaves, less so in the upper. Peduncles 1·5–10 cm, slender. Capitula 5–15(–20) mm in diameter. Involucral bracts 2·5–3·5 mm, subacute. Ligules 4·5–8 mm, often tinged with purplish-red beneath. Achenes pubescent. *Mediterranean region, Portugal, Bulgaria.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

(a) Subsp. **annua**: Leaves not more than 25 × 15 mm; capitula not more than 15 mm in diameter. 2*n*=18. *Dry, open habitats. Mediterranean region, Portugal.*

(b) Subsp. **vandasii** (Velen.) D. A. Webb, *Bot. Jour. Linn. Soc.* **70**: 18 (1975) (*B. vandasii* Velen.): Leaves up to 50 × 20 mm; capitula 12–20 mm in diameter. *Damp, shady places. C. Bulgaria* (*Stara Planina*).

Variants with entire leaves, capitula 5–10 mm in diameter, and acute, usually hispid involucral bracts, have been distinguished as **B. microcephala** Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1861**: 66 (1861) (*B. annua* subsp. *microcephala* (Lange) Nyman). In S. & S.E. Spain they are fairly distinct, but elsewhere in S. Europe intermediates are found which show only one of these distinctive characters.

In the Islas Baleares plants occur whose ligules turn blue on drying. Such plants have been confused with **B. caerulescens** Cosson ex Ball, *Jour. Linn. Soc. London* (*Bot.*) **16**: 495 (1878), a perennial species endemic to Morocco.

2. B. perennis L., *Sp. Pl.* 886 (1753). Perennial, usually scapose, spreading by short stolons. Leaves 10–60 × 4–25 mm, oblanceolate to broadly obovate-spathulate, subentire to crenate-serrate, appressed-pubescent at least when young, 1-veined, bright green, narrowed usually rather abruptly to a petiole usually about as long as lamina. Peduncles 4–15(–25) cm, slender, thickened below the capitulum. Capitula usually 15–30 mm in diameter; receptacle conical. Involucral bracts 3–5(–7) mm, oblong, usually obtuse. Ligules 4–8(–11) mm, often purplish-red beneath. Achenes 1–1·5 mm, pubescent. 2*n*=18. *Pastures, roadsides and other grassy habitats. S., W. & C. Europe, extending northwards to Denmark and eastwards to White Russia and Krym; naturalized or casual further north.* All except Bl Rs (N, E) Sb, but only naturalized in Fa Fe Is and perhaps also in Az No Su and Rs (B).

naturalized in Fa Fe Is and perhaps also in Az No Su and Rs (B).

Very variable, some variants being difficult to distinguish from **6**. A robust variant, **B. hybrida** Ten., *Fl. Nap.* **5**: 233 (1835–1838) (*B. perennis* subsp. *hybrida* (Ten.) Nyman), usually with leafy stem, from the mountains of S. Europe, has been variously interpreted as a hybrid between **2** and **6** or as a distinct species, but is probably best treated as an ecotype or environmental variant of **2**.

3. B. bernardii Boiss. & Reuter, *Pugillus* 56 (1852). Like **2** but leaves not more than 10 × 6 mm, glabrous, entire or rarely with

[1] By T. G. Tutin. [2] By D. A. Webb.

1–3 obtuse teeth on each side; peduncles 1–6 cm, very slender; capitula not more than 12 mm in diameter; involucral bracts 2–3 mm; ligules 4–6 mm; achenes 1 mm, glabrous. $2n=18$. *Damp, grassy places.* ● *Mountains of Corse.* Co.

4. B. azorica Hochst. in Seub., *Fl. Azor.* 31 (1844). Like **2** but with decumbent to ascending, leafy stems up to 15 cm; capitula not more than 13 mm in diameter; receptacle nearly flat, irregularly tuberculate between the florets; involucral bracts 3–4 mm, acute or obtuse; ligules 5–6 mm, not more than 1½ times as long as bracts; achenes subglabrous, but with numerous subsessile glands. *Mountain pastures.* ● *Açores.* Az.

5. B. longifolia Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **2 (11)**: 1 (1849). Scapose perennial. Leaves 30–50 × 6–12 mm, oblong-oblanceolate, narrowed very gradually to a scarcely distinct petiole shorter than the lamina, 1-veined, conspicuously crenate-serrate with 4–5 teeth on each side, appressed-pubescent. Peduncles 5–20 cm, slender. Capitula 12–18 mm in diameter. Involucral bracts 4–6 mm, obtuse. Ligules 6–8 mm. Achenes glabrous. *Mountain rocks.* ● *Kriti.* Cr.

6. B. sylvestris Cyr., *Pl. Rar. Neap.* **2**: 22 (1792). Perennial, usually scapose. Leaves (15–)30–180 × 5–25 mm, linear-oblong to narrowly obovate, remotely serrate to subentire, appressed-pubescent at least when young, dark green, 3-veined, narrowed very gradually to a short, scarcely distinct petiole. Peduncles 10–45 cm, stout. Capitula 20–40 mm in diameter; receptacle conical to hemispherical. Involucral bracts (5–)7–12 mm, oblong-lanceolate, more or less acute. Ligules 8–14 mm, tinged with purplish-red beneath and often also above. Achenes pubescent, sometimes with a rudimentary pappus of short bristles. $2n=36$, 54. *Grassland. S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

No single character can be relied on to distinguish this species with certainty from **2**, and by some authors it is treated as a subspecies. The distinctive facies of the great majority of plants, however, seems to make specific status more appropriate.

7. B. rotundifolia (Desf.) Boiss. & Reuter, *Pugillus* 55 (1852) (*B. cordifolia* (G. Kunze) Willk.). Scapose perennial. Leaves 25–90 × 18–110 mm, orbicular-reniform to broadly oblong-ovate, sinuate-crenate, cordate, truncate or rarely cuneate at the base, appressed-pubescent; petiole up to 18 cm, usually 2–5 times as long as lamina. Peduncles 15–50 cm, stout. Capitula 25–40 mm in diameter. Involucral bracts 7–10 mm, lanceolate, obtuse, villous. Ligules 8–17 mm, usually tinged with purplish-red. Achenes with glabrous faces but ciliate on the margins and with a pappus of bristles about ¼ as long as the achene. *Damp or shady places. S.W. Spain.* Hs. (*N.W. Africa.*)

6. Bellium L.[1]

Small, annual or perennial herbs. Leaves basal, alternate or subverticillate, petiolate, entire. Capitula small, solitary, pedunculate. Involucral bracts in one row, herbaceous or partly scarious. Receptacle hemispherical to conical; scales absent. Outer florets ligulate, female; ligules entire or subentire, white, sometimes tinged with red beneath. Inner florets 4- or 5-lobed, yellow; corolla-tube campanulate. Achenes slightly compressed, pubescent; pappus of an outer ring of 4–6(–10) hyaline scales ¼–½ as long as the achene and an inner ring of the same number of bristles as long as the achene or longer.

[1] By D. A. Webb.

[2] Native species by H. Merxmüller and A. Schreiber; naturalized species by P. F. Yeo.

1 Scapose annual; capitula with 7–10 involucral bracts **2. minutum**
1 Perennial, usually with leafy stems or epigeal stolons; capitula with more than 10 involucral bracts
2 Stoloniferous; all leaves basal; involucral bracts *c.* 3 mm **1. bellidioides**
2 Not stoloniferous; cauline leaves usually present; involucral bracts 5–6 mm **3. crassifolium**

1. B. bellidioides L., *Mantissa Alt.* 285 (1771). Pubescent to subglabrous perennial with leafless, filiform, epigeal stolons. Leaves 6–12 × 3–7 mm, all basal, elliptical, narrowed to a petiole usually much longer than the lamina. Peduncles 2–14 cm, very slender. Capitula 9–15 mm in diameter, with 11–14(–20) involucral bracts and ligules. Involucral bracts 3 mm, obtuse or subacute, hairy. Ligules 3–4 mm, often tinged with red beneath. Achenes *c.* 0·8 mm. $2n=18$. *Damp or shady, open habitats.* ● *Islands of W. Mediterranean region.* Bl Co Sa.
Records for Spain are erroneous.

2. B. minutum (L.) L., *op. cit.* 286 (1771). Sparsely pubescent, scapose annual. Leaves 5–8 × 3–5 mm, elliptic-obovate; petiole about as long as the lamina. Peduncles 2–5 cm, very slender, numerous. Capitula 6–7 mm in diameter, with 7–10 involucral bracts and ligules. Involucral bracts 2–2·5 mm, elliptic-oblong, acute. Ligules scarcely exceeding the bracts. *Maritime rocks. Mediterranean islands, westwards to Lampedusa; very local.* Cr Gr Si.

3. B. crassifolium Moris, *Stirp. Sard.* **1**: 26 (1827). Perennial. Stem 0–10 cm, rather woody, decumbent to suberect, sparingly branched. Leaves 9–15 mm, alternate or subverticillate, orbicular to elliptic-spathulate, fleshy, glabrous or pubescent; petiole 15–40 mm. Capitula 15–20 mm in diameter, terminal or pseudo-terminal, usually with 20–30 involucral bracts and ligules. Peduncles 5–18 cm, stout. Involucral bracts 5–6 mm, subacute. Ligules 4–6 mm. *Maritime rocks.* ● *Sardegna.* Sa.

7. Aster L.[2]

Herbs, usually perennial. Leaves alternate or basal, simple. Capitula small to medium, solitary or in corymbs or panicles. Involucral bracts in 2 nearly equal rows, or imbricate in 3–several rows with the outer much shorter than the inner. Receptacle flat or convex. Outer florets ligulate, female or sterile, in 1 row; ligules blue, violet, purple, pink or white, sometimes absent. Inner florets tubular, hermaphrodite, yellow, often becoming purple. Achenes oblong, usually compressed, more or less hairy and often glandular. Pappus-hairs scabrid, whitish to yellowish or reddish, often unequal, in 1–2 indistinct rows.

The recognition as a separate genus of Sect. *Galatella* (**20–23**), possibly also including Sect. *Aegaeaster* (**24**) and *Linosyris* (**25–27**), though probably desirable, requires thorough investigation of the whole genus.

Many species have been introduced into cultivation in Europe from North America. From European gardens some of the original introductions and their accidental or deliberately raised hybrids have escaped, and continue to do so. Such escapes have long been established on river-banks or in fens, where they are fully naturalized and may form quite uniform populations, though not necessarily easily matched with North American species. Populations on waste ground, railway-banks etc. are often much more variable and here the delimitation of taxa is necessarily arbitrary and the identification of specimens sometimes impossible.

Literature: I. Novopokrovsky, *Not. Syst.* (*Leningrad*) **11**: 211–233 (1949). M. Onno, *Biblioth. Bot.* (*Stuttgart*) **106**: 1–83 (1932). R. von Soó, *Bot. Közl.* **22**: 56–64 (1925). A. Thellung, *Allgem. Bot. Zeitschr.* **19**: 87–89, 101–112, 132–140 (1913). F. N. Williams, *Jour. Bot.* (*London*) **43**: 78–89 (1905).

1 Ligules absent
2 Leaves and outer involucral bracts densely grey-tomentose **26. oleifolius**
2 Leaves not densely grey-tomentose
3 Leaves glandular-punctate
4 Lower leaves petiolate; plant densely greyish-setulose **16. willkommii**
4 All leaves sessile; plant glabrous, scabrid or arachnoid-hairy
5 Inner involucral bracts acuminate **25. linosyris**
5 Inner involucral bracts subacute to rounded
6 Involucral bracts glabrous, viscid-shining; leaves distinctly 3-veined at least near the base **20. sedifolius**
6 Outer involucral bracts lanate; leaves 1-veined **27. tarbagatensis**
3 Leaves eglandular
7 Inner involucral bracts subobtuse to rounded; stem glabrous; leaves ± succulent, the lower long-petiolate **19. tripolium**
7 Inner involucral bracts subacute to acuminate; leaves not succulent, all sessile
8 Leaves 1-veined, acicular or linear to linear-lanceolate
9 Capitula solitary or few; stem floccose **24. creticus**
9 Capitula numerous, in dense corymbs; stem weakly scabrid **25. linosyris**
8 Leaves conspicuously 3-veined at least near the base, linear-lanceolate to lanceolate
10 Outer and middle involucral bracts abruptly contracted into a long subulate apex, somewhat lanate; leaves arachnoid-hairy **22. kirghisorum**
10 Outer and middle involucral bracts subacute; leaves scabrid **20. sedifolius**
1 Ligules present
11 Stems leafless **18. bellidiastrum**
11 Stems leafy, at least in the lower half
12 Ligules sterile, with undivided styles usually shorter than the corolla-tube
13 Involucral bracts in up to 8 rows; leaves strongly dimorphic, the basal oblanceolate to spathulate, the cauline acicular **23. aragonensis**
13 Involucral bracts in 3–5 rows; leaves not strongly dimorphic
14 Leaves glandular-punctate at least above
15 Lower leaves petiolate; outer and middle involucral bracts with a subulate apex **21. albanicus**
15 All leaves sessile; involucral bracts all subacute or the inner obtuse **20. sedifolius**
14 Leaves eglandular
16 Outer and middle involucral bracts abruptly contracted into a long, subulate apex; leaves arachnoid-hairy **22. kirghisorum**
16 Involucral bracts all subacute or the inner obtuse; leaves scabrid to subglabrous **20. sedifolius**
12 Ligules female, fertile, with 2 style-branches; styles always exceeding the corolla-tube
17 Involucral bracts in 2(–3) indistinct rows, all nearly equal
18 Basal and lower cauline leaves petiolate, the upper sessile, entire **17. alpinus**
18 All leaves sessile, auriculate at base, remotely and coarsely toothed **14. pyrenaeus**
17 Involucral bracts in (2–)3–5 rows, often very unequal
19 Basal and usually some of the cauline leaves petiolate and with the base of the lamina cordate to subcordate
20 Inflorescence glandular-puberulent **1. macrophyllus**
20 Inflorescence eglandular
21 Lower leaves 6–14 cm wide; outer involucral bracts more than 1 mm wide **2. schreberi**
21 Lower leaves 3–6(–7) cm wide; outer involucral bracts not more than 1 mm wide **3. divaricatus**
19 Basal and lower cauline leaves petiolate and with the base of the lamina not cordate, or sometimes sessile
22 Capitula usually 10 or fewer
23 Plant with numerous sessile glands; leaves entire **16. willkommii**
23 Plant eglandular, or with a few scattered glands; leaves toothed or entire
24 Outer involucral bracts subobtuse to rounded, subspathulate; middle and upper cauline leaves narrowed at base **15. amellus**
24 All involucral bracts acute; cauline leaves somewhat auriculate, semiamplexicaul **13. sibiricus**
22 Capitula more than 10
25 Ligules about as long as pappus; annual or biennial **12. squamatus**
25 Ligules much longer than pappus; usually perennial
26 Involucral bracts subobtuse to rounded
27 Leaves glabrous and ± succulent **19. tripolium**
27 Leaves hairy, not succulent **15. amellus**
26 Involucral bracts acute or rarely mucronate
28 Inflorescence glandular
29 Leaves auriculate **4. novae-angliae**
29 Leaves not auriculate **16. willkommii**
28 Inflorescence eglandular
30 Most cauline leaves not more than 1 cm wide
31 Outer involucral bracts with subulate, green apex **11. pilosus**
31 Outer involucral bracts without subulate, green apex **10. lanceolatus**
30 Most cauline leaves more than 1 cm wide
32 Leaf-bases not auriculate or semiamplexicaul; longest involucral bracts 4–5·5 mm; ligules usually white **10. lanceolatus**
32 Leaf-bases auriculate or semiamplexicaul; longest involucral bracts 5–12 mm; ligules violet-blue
33 Leaves glaucous above; involucral bracts very unequal, appressed, green only in the middle **6. laevis**
33 Leaves not glaucous above; outer involucral bracts about as long as inner, with lax or recurved apex, green throughout
34 Stem uniformly hispid, except sometimes at base **5. puniceus**
34 Stem glabrous or with hairs in longitudinal bands **(7–9). novi-belgii** group

1. A. macrophyllus L., *Sp. Pl.* ed. 2, 1232 (1763). Perennial 30–80 cm, with non-flowering rosettes. Stem glandular-puberulent above, green or purple-tinged. Lower leaves petiolate, the lamina 6–14 cm wide, cordate; upper leaves ovate. Capitula in corymbs. Involucral bracts in several rows, ovate to ovate-lanceolate, acute or the outer obtuse, the longest 6–10 mm, the outer 1·25–1·75 mm wide, much shorter than the inner, the apex with green zone fading gradually below, appressed. Ligules 9–20, pale violet, sometimes fading to white. *Locally naturalized in N. Europe.* [Ge Ho Po.] (*North America.*)

2. A. schreberi Nees, *Syn. Spec. Gen. Aster. Herb.* 16 (1818). Like **1** but eglandular; basal leaves tending to have a wide rectangular sinus; inner row of involucral bracts usually much longer than the others; ligules white. *Naturalized in Scotland* (*Lochside Station, Renfrewshire*). [Br.] (*North America.*)

3. A. divaricatus L., *Sp. Pl.* 873 (1753). Perennial 20–60 cm, without non-flowering rosettes. Stem eglandular, flexuous above, blackish-purple. Lower leaves petiolate, the lamina 4–6 cm wide, cordate to cordate-ovate; upper leaves cordate-ovate to narrowly triangular. Capitula in a cyme. Involucral bracts in *c.* 3 rows, elliptic-oblong to oblong, obtuse to subacute, the longest 5–8 mm, the outer 0·75–1 mm wide, the apex with green

zone fading gradually below, appressed. Ligules 5–10(–12), white. *Naturalized in the Netherlands.* [Ho.] (*North America.*)

4. A. novae-angliae L., *Sp. Pl.* 875 (1753). Perennial 30–200 cm. Stem hairy, glandular above. Leaves lanceolate to ovate-lanceolate, auriculate, entire. Capitula in corymbs. Involucral bracts in *c.* 3 rows, glandular-hairy, the inner aristate, the outer acute, nearly as long as the inner, lax or recurved. *Waste ground and river-banks. Widely naturalized, mainly in C. Europe.* [Au Be Br Cz Ga Ge He Ho Hu It Po Rm.] (*North America.*)

5. A. puniceus L., *Sp. Pl.* 875 (1753). Perennial 40–130 cm. Stem hispid all round except sometimes at the base, purplish-red. Leaves ovate-lanceolate to lanceolate, at least 1 cm wide, scabrid, auriculate at base, with apically directed teeth. Capitula in a divaricately branched panicle. Involucral bracts in several rows, acute, the longest 6–12 mm, the outer as long as the inner, mainly herbaceous, with a recurved attenuate apex. Ligules violet-blue, *c.* 1·5 mm wide. *Locally naturalized in N. Europe.* [Br Po.] (*North America.*)

6. A. laevis L., *Sp. Pl.* 876 (1753). Perennial 30–100 cm. Stem glabrous or nearly so, reddish-purple. Leaves ovate-lanceolate to lanceolate, the lower petiolate, glabrous, glaucous, auriculate at base, entire or obscurely toothed, sometimes scabrid. Capitula in a long panicle. Involucral bracts in several rows, acute, very unequal, the longest 5–7 mm, with appressed, shortly tapered apex and a rhombic to lanceolate green patch in the centre. Ligules violet-blue, *c.* 2 mm wide. *Scrub, damp woods and river-banks. Naturalized, mainly in N. & C. Europe.* [Au Be Br Cz Ga Ge He Ho Ju No Po Rm.] (*North America.*)

(7–9). A. novi-belgii group. Perennial 20–200 cm. Stem erect, often purplish, glabrous or with hairs in longitudinal bands. Leaves ovate to linear-lanceolate, with auriculate base, remotely toothed. Involucral bracts in several rows, acute. Ligules at least 1·5 mm wide.

Because of the hybrid origin of some members of this group, certain identification is often impossible.

1 Middle cauline leaves 2½–5 times as long as wide; branches of each order in the inflorescence usually with a long series of nearly equal leaves **9. ×versicolor**
1 Middle cauline leaves mostly 4–10 times as long as wide; branches of each order in the inflorescence with few nearly equal leaves
2 Outer involucral bracts tapered only near the apex, mainly green **7. novi-belgii**
2 Outer involucral bracts tapered for most of their length, often scarious at the sides towards the base **8. ×salignus**

7. A. novi-belgii L., *Sp. Pl.* 877 (1753) (*A. brumalis* Nees). Stem 40–120 cm. Leaves ovate-lanceolate to linear-lanceolate, (3–)4–10 times as long as wide, auriculate at base, remotely toothed. Capitula in a symmetrical, sometimes corymbiform, panicle. Involucral bracts acute, the longest 5·5–7 mm, the outer as long as the inner and largely herbaceous, lax or with a recurved apex, shortly tapered. Ligules at least 1·5 mm wide, violet-blue or (in cultivars) white, violet or purple. *In fens and on river-banks and railway-banks; also occurring on waste ground. Widely naturalized in C. & N.W. Europe.* [Au Be Br Cz Da Ga Ge Gr Hb He Ho Hu It Ju No Po Rm ?Rs Su.] (*North America.*)

A. dumosus ×novi-belgii, of garden origin, has stems usually 20–40 cm and unequal involucral bracts with short green apex. It may occur in the same area as **7.**

8. A. ×salignus Willd., *Sp. Pl.* **3**: 2040 (1803) (*A. lanceolatus ×novi-belgii*). Like **7** but the leaves sometimes not or scarcely auriculate; outer involucral bracts not, or less distinctly, lax, enlarged and herbaceous; ligules light violet-blue. *River-banks, railway-banks and waste places. Widely naturalized, mainly in N. & C. Europe.* [Au Be Br Cz Da Fe Ga Ge He Ho Hu It Ju No Po Rm Rs (N, B, C, W) Su.] (*Garden origin.*)

9. A. ×versicolor Willd., *op. cit.* 2045 (1803) (*A. laevis ×novi-belgii* ; ? an *A. novi-belgii* subsp. *laevigatus* (Lam.) Thell. pro parte). Stem 100–200 cm. Leaves subglaucous beneath, the middle mostly ovate, 2½–5 times as long as wide, the lowest more or less petiolate, with auriculate base. Capitula on more or less elongated peduncles with numerous uniform bracts. Involucral bracts sometimes more unequal than in **7** and with more sharply defined green apex and scarious base. Ligules violet-blue. *Locally naturalized.* [Au Br Cz Ga Ge He Ho Hu It Po Rm.] (*Garden origin.*)

10. A. lanceolatus Willd., *op. cit.* 2050 (1803) (incl. *A. tradescantii* auct. eur., non L.). Perennial 50–130 cm. Stem green, sometimes tinged with purple. Leaves lanceolate to linear-lanceolate, glabrous, not auriculate at base, entire or obscurely toothed. Capitula in a rather narrow panicle, often arranged unilaterally on the branches. Involucral bracts in several rows, the longest 4–5·5 mm, the outer shorter than the inner, not mostly herbaceous, appressed. Ligules white or sometimes violet-blue, not more than 1 mm wide. *River-banks and waste ground. Naturalized in C. & W. Europe.* [Au Be Br Cz Ga Ge He Ho Hs Hu It Ju Lu No Po Rm.] (*North America.*)

Very variable in habit; variants with numerous small leaves in the inflorescence and small capitula have often been incorrectly assigned to *A. tradescantii* L.

The following two species from North America, closely related to **10**, have been reported to occur in France but are perhaps not established: **A. lateriflorus** (L.) Britton, *Trans. New York Acad. Sci.* **9**: 11 (1889), with patent or recurved inflorescence-branches and very unequal involucral bracts; and **A. dumosus** L., *Sp. Pl.* 873 (1753), with a much-branched inflorescence and the longest involucral bracts 3·5–5 mm.

A. patulus Lam., *Encycl. Méth. Bot.* **1**: 308 (1783), said to be like **7** but with the leaves entire, not amplexicaul, and the involucral bracts as in **10**, is also reported as doubtfully established in France. It is presumably derived from species from North America.

11. A. pilosus Willd., *Sp. Pl.* **3**: 2025 (1803). Perennial 30–60 cm. Stem erect or oblique, branched from near the base, glabrous to densely hirsute. Leaves linear to linear-lanceolate, the lowest petiolate and sometimes lanceolate, glabrous to hirsute, not auriculate at base, entire or obscurely toothed. Capitula in a wide panicle, on long peduncles with linear leaves, sometimes arranged unilaterally along the branches. Involucral bracts in several rows, acute, the largest 4·5–7 mm, the outer shorter than the inner, lax, with a subulate, green apex inrolled at the margin. Ligules white, often becoming purplish, *c.* 1·5 mm wide. *Locally naturalized.* [Ho Hs It.] (*North America.*)

This has often been mistaken for **A. ericoides** L., *Sp. Pl.* 875 (1753), which is similar in habit but has smaller, more oblong leaves in the inflorescence, the longest involucral bracts only 3–5 mm and the outer involucral bracts spinulose-mucronate and recurved. A native of North America, it is probably nowhere established in Europe.

12. A. squamatus (Sprengel) Hieron., *Bot. Jahrb.* **29**: 19 (1900). Annual or biennial 30–100 cm. Stem erect or ascending, glabrous. Leaves mostly linear or linear-lanceolate, entire. Capitula in symmetrical panicles. Involucral bracts in 3 rows, oblong to oblanceolate, tapered near the purplish, serrulate apex to an acute or mucronate point, appressed, the longest 5–6 mm. Ligules violet-blue, about as long as the pappus, more numerous than the tubular florets. $2n=20$. *Near the sea, usually on saline soil. Widely naturalized in S.W. Europe; recently also in C. & E. Mediterranean region, and still spreading.* [Az Bl Co Cr Ga Gr Hs It Ju Lu Sa.] (*Central and South America; widely naturalized elsewhere.*)

Recently recorded from Sicilia, and likely to become established there.

13. A. sibiricus L., *Sp. Pl.* 872 (1753) (incl. *A. subintegerrimus* (Trautv.) Ostenf. & T. Resvoll). Perennial (5–)20–40 cm. Stem erect or ascending, often purplish. Leaves ovate-lanceolate to oblong, the lower often panduriform or narrowed into a petiole, nearly glabrous above, setulose beneath and on the margin, more or less serrate-dentate; the upper somewhat auriculate and semiamplexicaul. Capitula in very lax corymbs or solitary. Involucral bracts in 3 rows, acute, often purplish. Ligules 15–30, violet. Pappus-hairs unequal. *N. Russia; one station in Norway.* No Rs (N, C). (*Siberia and E. Asia.*)

14. A. pyrenaeus Desf. ex DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 146 (1805). Perennial 40–90 cm. Stem stout, erect. Leaves oblong-lanceolate, sessile, distinctly auriculate at base, setulose on the surfaces and margin, remotely and coarsely toothed. Capitula in lax corymbs or few or solitary. Involucral bracts in 2 rows, equal or subequal. Ligules 20–30, bluish-lilac. Pappus-hairs unequal. $2n=18$. ● *W. & C. Pyrenees.* Ga.

15. A. amellus L., *Sp. Pl.* 873 (1753) (incl. *A. amelloides* Besser). Perennial 10–70 cm. Stem erect, often decumbent at base. Basal and lower cauline leaves broadly lanceolate to obovate, narrowed into a petiole, sometimes remotely crenate; middle and upper cauline leaves oblong to lanceolate, narrowed at base, sessile. Capitula in corymbs, rarely solitary. Involucral bracts in *c.* 3 rows, the outer short and subspathulate. Ligules 10–40, blue, rarely red or white. Pappus-hairs unequal. $2n=18$, 36, 54. *Scrub and wood-margins. From N.C. France and Lithuania southwards to N. Italy and Macedonia.* Al Au Bu Cz Ga Ge ?Gr He Hu It Ju Po Rm Rs (B, C, W, K, E).

A polymorphic species in need of further investigation.

16. A. willkommii Schultz Bip., *Flora* (*Regensb.*) **34**: 742 (1851). Densely greyish-setulose and glandular perennial 5–45 cm. Basal and lower cauline leaves lanceolate-spathulate, entire, petiolate, the upper sessile. Capitula in lax corymbs or panicles, or solitary. Involucral bracts in 3 rows, the outer more shortly acute than the inner. Ligules 10–20, violet, sometimes absent. Pappus-hairs unequal. ● *Mountains of E. & S.E. Spain.* Hs.

Less hairy plants from the N. part of the range, which have numerous capitula, have been separated as **A. catalaunicus** Willk. & Costa, *Linnaea* **30**: 104 (1859), but they are connected by intermediates with typical *A. willkommii* with 1 or few capitula.

17. A. alpinus L., *Sp. Pl.* 872 (1753) (incl. *A. korshinskyi* Tamamsch.). Perennial 5–20(–50) cm. Stem ascending or erect, appressed-pubescent to lanate or subglabrous. Leaves entire, the basal and lower cauline spathulate to nearly elliptical, narrowed into a wide petiole; middle and upper cauline oblong-lanceolate to linear-lanceolate, sessile. Involucral bracts in 2(–3) indistinct rows, about equal in length, acute to obtuse, glabrous or hairy, fimbriate or ciliate. Ligules 20–40, violet-blue, very rarely pink or white, sometimes absent. Pappus-hairs unequal. $2n=18$, 36. *Mountains of Europe from C. Germany southwards; also at lower altitudes in E. Russia.* Al Au Bu Cz Ga Ge Gr He Hs It Ju Po Rm Rs (N, C, W, ?E).

The range of variation is considerable, but appears not to be correlated with geographical distribution.

18. A. bellidiastrum (L.) Scop., *Annus Hist.-Nat.* **2**: 64 (1769) (*Bellidiastrum michelii* Cass.). Scapose perennial 10–30 cm. Stem erect, crispate-pubescent, rarely subglabrous. Leaves suborbicular, spathulate, obovate or elliptical, entire or coarsely crenate distally, petiolate, sparsely hairy above, more densely hairy, particularly on the veins, beneath. Capitula solitary; receptacle conical. Involucral bracts in 2 equal rows, narrow, long-acute, sparsely hairy. Ligules up to 50, white or pink. Pappus-hairs unequal. $2n=18$. *Mountain regions of C. & S. Europe, from the Jura and W. Carpathians to S.E. France, S.E. Italy and Albania.* Al Au Cz Ga Ge He It Ju Po ?Rm [Hu].

19. A. tripolium L., *Sp. Pl.* 872 (1753) (*Tripolium vulgare* Nees). Annual or short-lived perennial (5–)20–60(–115) cm. Stem erect or ascending, branched from the base upwards, often reddish, glabrous or nearly so. Leaves lanceolate to linear, moderately to strongly succulent and then more or less terete, the lower narrowed into a long petiole and semiamplexicaul, the upper sessile, with a wide base. Capitula in corymbs or panicles. Involucral bracts in 2–3 rows, oblong, subobtuse to rounded, ciliate or not. Ligules 10–30, bright blue or lilac, often absent. Pappus elongating strongly after anthesis; hairs nearly equal. *Sea-coasts and saline places inland. Most of Europe.* All except Az Fa He Is Sb.

(a) Subsp. **tripolium**: Plant usually rather strongly succulent. Ligules sometimes absent. Achenes of outer florets as long as those of the inner. $2n=18$. *Coasts of N. & W. Europe.*

(b) Subsp. **pannonicus** (Jacq.) Soó, *Bot. Közl.* **22**: 64 (1925): Plant moderately succulent. Ligules always present. Achenes of outer florets shorter and thicker than those of the inner. $2n=18$. *S., C. & E. Europe.*

20. A. sedifolius L., *Sp. Pl.* 874 (1753) (*A. acris* L.). Perennial or rarely annual 25–120 cm. Stem erect, scabrid. Leaves sessile, entire, narrowly linear to broadly lanceolate or elliptical, the lower usually 3-veined, the upper usually 1-veined. Capitula in corymbs or panicles, rarely solitary. Involucral bracts in 3–5 rows, subacute, the inner sometimes more or less obtuse to nearly rounded. Ligules blue to pinkish-lilac, sometimes few or absent. Pappus-hairs unequal. *S., E.C. & E. Europe.* Al Au Bu Cz Ga Hs Hu It Ju Lu Rm Rs (B, C, W, K, E).

A very variable species in which there does not appear to be any clear correlation of characters; the separation at specific rank of a western taxon (*A. sedifolius*) from an eastern one (*A. punctatus* Waldst. & Kit.) is scarcely feasible. The following is a provisional attempt to account for the main variants at subspecific level.

1 Capitula usually with 6–15 florets; ligules few or absent; leaves ± glandular-punctate **(b)** subsp. **dracunculoides**
1 Capitula usually with 15–30 florets; ligules always present
2 Leaves glandular-punctate
3 Leaves scabrid, setulose **(a)** subsp. **sedifolius**
3 Leaves densely arachnoid-hairy **(c)** subsp. **canus**
2 Leaves eglandular, usually subglabrous

4 Middle cauline leaves (6–)8–11 mm wide; capitula few, crowded (d) subsp. **illyricus**
4 Middle cauline leaves 1–4(–6) mm wide; inflorescence lax
5 Involucral bracts glabrous, not ciliate; capitula several to many (e) subsp. **trinervis**
5 Involucral bracts ciliate; capitula few (f) subsp. **angustissimus**

(a) Subsp. **sedifolius** (incl. *A. punctatus* Waldst. & Kit., *Galatella punctata* (Waldst. & Kit.) Nees, *G. pastuchovii* (Kem.-Nat.) Tzvelev): Leaves glandular-punctate, scabrid at least near the margin and often also on the surfaces. Involucral bracts glabrous, usually viscid-shining. Ligules 5–10. $2n=36$. *Throughout the range of the species.*

(b) Subsp. **dracunculoides** (Lam.) Merxm., *Bot. Jour. Linn. Soc.* **68**: 279 (1974) (*A. dracunculoides* Lam., *Galatella dracunculoides* (Lam.) Nees; incl. *G. biflora* (L.) Nees, *G. trinervifolia* (Less.) Novopokr.): Leaves glandular-punctate or more or less eglandular, scabrid to nearly smooth. Involucral bracts viscid-shining, the outer sometimes shortly hairy. Ligules 0–6. *S. Russia to S.E. Romania.*

(c) Subsp. **canus** (Waldst. & Kit.) Merxm., *loc. cit.* (1974) (*A. canus* Waldst. & Kit.): Leaves grey, with arachnoid, often somewhat floccose indumentum, glandular-punctate and scabrid at least at the margin. Outer involucral bracts arachnoid-hairy, the inner often viscid-shining. Ligules 8–12. ● *E.C. & S.E. Europe.*

(d) Subsp. **illyricus** (Murb.) Merxm., *op. cit.* 280 (1974) (*A. illyricus* (Murb.) K. Malý, *Galatella rigida* subsp. *illyrica* Murb.): Leaves eglandular, scabrid at the margin and sometimes also on the veins, the lower with 3–5, the upper with 3 veins. Involucral bracts viscid-shining. Ligules 6–10. ● *N.W. part of Balkan peninsula.*

(e) Subsp. **trinervis** (Pers.) Thell., *Allgem. Bot. Zeitschr.* **19**: 107 (1913) (*A. trinervis* (Pers.) Nees): Leaves eglandular, glabrous, with a weakly scabrid margin. Involucral bracts glabrous. Ligules 6–10. ● *Mountains of S. France and N. part of Iberian peninsula.*

(f) Subsp. **angustissimus** (Tausch) Merxm., *Bot. Jour. Linn. Soc.* **68**: 279 (1974) (*A. angustissimus* Tausch, *Galatella angustissima* (Tausch) Novopokr.): Leaves eglandular, scabrid beneath and at the margin. Involucral bracts distinctly ciliate. Ligules 5–10. *C. & S.E. parts of U.S.S.R.*

21. A. albanicus Degen, *Term.-Tud. Közl.* (*Pótfüz.*) **5**: 219 (1901). Perennial 15–35 cm. Stem ascending to erect, arachnoid-floccose below. Leaves oblanceolate to spathulate, glandular and weakly arachnoid-hairy. Capitula in lax corymbs or solitary, long-pedunculate. Involucral bracts in 3 rows, the outer and middle linear-lanceolate, with subulate apex, the inner acute, with wide scarious margin. Ligules 12–14, violet. Pappus-hairs unequal. ● *Mountains on the border of Jugoslavia and Albania.* Al Ju.

22. A. kirghisorum (Fischer ex Bieb.) Korsh., *Tent. Fl. Ross. Or.* 205 (1898) (*Galatella divaricata* (Fischer ex Bieb.) Novopokr.). Perennial 10–35 cm. Stem erect, arachnoid-hairy. Leaves lanceolate to linear-lanceolate, semiamplexicaul, eglandular, arachnoid-hairy. Capitula few, very long-pedunculate. Involucral bracts in 3–5 rows, the outer and middle with a long, subulate apex, the inner acute. Ligules 0–5, white or bright blue. Pappus-hairs unequal. *S.E. part of U.S.S.R.* Rs (C, E).

23. A. aragonensis Asso, *Syn. Stirp. Arag.* 121 (1779). Perennial 10–50 cm. Stem slender, erect, arachnoid-floccose. Basal leaves oblanceolate to spathulate, glandular-punctate, entire or remotely and coarsely crenate; cauline acicular. Capitula in a lax corymb. Involucral bracts in up to 8 rows, arachnoid-hairy, the outer narrow, long-acute, the inner subacute to subobtuse. Ligules 6–8, bright blue or violet. Pappus-hairs unequal. $2n=20$. ● *E. & C. Spain; W.C. Portugal.* Hs Lu.

24. A. creticus (Gand.) Rech. fil., *Phyton* (*Austria*) **1**: 211 (1949). Perennial 15–40 cm. Stem decumbent to erect, rigid, arachnoid-floccose, subglabrous above, leafy up to the capitula. Leaves linear-lanceolate, rigid, mucronate, eglandular, 1-veined. Capitula in pairs or few. Involucral bracts in 2–3 rows, the outer lanceolate, acute, the inner oblong-linear, subacute, reddish. Ligules absent. Pappus-hairs nearly equal. ● *E. Kriti, Karpathos.* Cr.

25. A. linosyris (L.) Bernh., *Syst. Verz. Erfurt* 151 (1800) (*Linosyris vulgaris* Cass. ex DC.). Perennial 10–70 cm. Stem decumbent to erect, weakly scabrid, densely leafy. Leaves narrow, sessile, often glandular-punctate above, scabrid at margin, 1-veined. Capitula small, narrowly infundibuliform, in dense corymbs. Involucral bracts in several rows, long and narrow, the outer and middle often with curved apex, the inner acuminate, with a wide scarious margin. Ligules absent. Pappus-hairs unequal. $2n=18$, 36. *Rocky places and open grassland. S. & S.C. Europe, extending locally northwards to England, S.E. Sweden and C. Russia.* Al Au Be Br Bu Cz Ga Ge Gr He Hs Hu It Ju Po Rm Rs (C, W, K) Su Tu [Ho].

26. A. oleifolius (Lam.) Wagenitz, *Bot. Jahrb.* **83**: 329 (1964) (*A. villosus* (L.) Schultz Bip., non Thunb., *Linosyris villosa* (L.) DC.). Perennial 15–35 cm. Stem erect, soon leafless and glabrous below, with oblanceolate, greyish-white-tomentose leaves above. Capitula shortly pedunculate, narrowly infundibuliform, in dense corymbs. Involucral bracts in several rows, subacute to subobtuse, long-ciliate, the outer tomentose, the inner somewhat lanate at the apex. Ligules absent. Pappus-hairs unequal. *E. & E.C. Europe, from N. Hungary and S. Ural to Bulgaria and Krym.* Bu ?Cz Hu Rm Rs (C, W, K, E).

27. A. tarbagatensis (C. Koch) Merxm., *Bot. Jour. Linn. Soc.* **68**: 280 (1974) (*Linosyris tarbagatensis* C. Koch, *L. tatarica* (Less.) C. A. Meyer). Perennial 10–35 cm. Stem erect or somewhat ascending. Leaves linear-lanceolate, 1-veined, glandular, scabrid and somewhat arachnoid-hairy. Capitula narrowly infundibuliform, in corymbs. Involucral bracts in several rows, somewhat lanate, ciliate, the outer triangular, acute, the inner broadly oblanceolate, obtuse or rounded. Ligules absent. Pappus-hairs unequal. *S.E. Russia, W. Kazakhstan.* Rs (E).

8. Erigeron L.[1]

(incl. *Stenactis* Cass.)

Annual, biennial or perennial herbs. Flowering stems usually with long eglandular hairs, the pubescence increasing progressively from below upwards. Leaves usually entire, the basal obovate-spathulate, somewhat petiolate, the cauline lanceolate to linear-lanceolate. Flowering stems with 1 to several capitula in a lax, corymbiform or elongate panicle. Ligulate florets female, usually exceeding the involucre; tubular florets yellow, either all similar, hermaphrodite or the outer florets female, filiform, the inner hermaphrodite. Achenes pubescent, sometimes dimorphic; pappus of hairs, or of short scales in ligulate florets and an outer row of scales and an inner row of long hairs in tubular florets.

[1] By G. Halliday.

Most of the montane species (**5–17**) have isolated local variants which do not appear to merit the specific or subspecific status accorded them in the past. Intermediates exist between many of the species recognized here; to what extent this is caused by hybridization is unknown. Much confusion has resulted from lack of attention to the pubescence and shape of the oldest basal leaves, and from a reluctance to search for the filiform female florets in trimorphic species. Considerable importance has been attached to this character, but it is not known whether plants of trimorphic species can occasionally produce dimorphic progeny, or *vice versa*, nor how the character is inherited. Ligulate florets with the ligules broken off can be mistaken for filiform florets.

Literature: F. Vierhapper, *Beih. Bot. Centr.* **19** (**2**): 385–560 (1906).

The following three perennial species from North America occasionally escape from cultivation:

E. glaucus Ker-Gawler, *Bot. Reg.* **1**: t. 10 (1815), has basal rosettes of somewhat fleshy, glabrescent leaves and ascending to erect flowering stems with 1–4 large capitula with lilac or white ligules. The flowering stems, cauline leaves and involucre have dense, long eglandular and short glandular hairs.

E. speciosus (Lindley) DC., *Prodr.* **5**: 284 (1836) (*Stenactis speciosa* Lindley), lacks basal rosettes at anthesis and has tall, slender, glabrous, ridged stems with 1–4 large capitula with violet or blue ligules. The cauline leaves are ciliate, the lower oblanceolate, the upper lanceolate.

E. philadelphicus L., *Sp. Pl.* 863 (1753) (*Stenactis philadelphica* (L.) Hayek), is similar to *E. speciosus* but often biennial; the stems and cauline leaves are pubescent, the upper cauline leaves are semi-amplexicaul and there are 4–15 capitula. The ligules are deep purplish, rarely white.

1 Stems procumbent to ascending; lower cauline leaves usually 3-lobed **2. karvinskianus**
1 Stems erect; lower cauline leaves entire or serrate, not 3-lobed
2 Lower cauline leaves ovate-lanceolate, often serrate; ligules white or pale blue **1. annuus**
2 Lower cauline leaves narrowly spathulate or almost linear, entire; ligules lilac, less commonly white
3 Capitula without filiform female florets between the tubular and ligulate florets (florets dimorphic)
4 Capitulum more than 2 cm wide; ligules 7–13 mm, remaining flat on drying (N. Ural) **17. silenifolius**
4 Capitulum less than 2 cm wide; ligules less than 8 mm, becoming involute on drying
5 Flowering stems and involucral bracts with dense, short glandular and longer eglandular hairs (Sierra Nevada) **13. major**
5 Indumentum variable but short glandular hairs absent
6 Involucral bracts sparsely pubescent to almost glabrous, usually green to the apex **12. glabratus**
6 Involucral bracts usually densely pubescent; apex lilac
7 Basal rosettes densely caespitose; whole plant densely pubescent; ligules deep lilac **16. frigidus**
7 Basal rosettes laxly caespitose; basal leaves glabrous to sparsely pubescent; ligules white or pale lilac
8 Involucral bracts with long white hairs; flowering stems usually well exserted from basal rosettes **14. uniflorus**
8 Involucral bracts with purple hairs; flowering stems often scarcely exserted from the basal rosettes **15. humilis**
3 Capitula with filiform female florets between the tubular and ligulate florets (florets trimorphic)
9 Flowering stems with conspicuous glandular hairs at least above
10 Flowering stems erect, branched in the upper ¼; capitula 3–10 **5. atticus**
10 Flowering stems ascending, branched at or below the middle; capitula 1–5 **6. gaudinii**
9 Flowering stems without conspicuous glandular hairs
11 Annual or short-lived perennial; basal rosette usually absent at anthesis; cauline leaves usually more than 10; capitula usually more than 8
12 Ligules 1–1½ times as long as the involucral bracts **3. acer**
12 Ligules 1½–2 times as long as involucral bracts **4. orientalis**
11 Perennial; basal rosette present at anthesis; cauline leaves usually fewer than 10; capitula rarely more than 8
13 Basal leaves with usually short, dense, crispate hairs
14 Flowering stems usually more than 10 cm; capitula 1 to several **7. alpinus**
14 Flowering stems usually less than 10 cm; capitula solitary **8. epiroticus**
13 Basal leaves ciliate, otherwise glabrous or very sparsely pubescent
15 Flowering stems not stiffly erect; youngest basal leaves sparsely pubescent **11. borealis**
15 Flowering stems stiffly erect; basal leaves ciliate, otherwise glabrous or almost so
16 Basal leaves usually less than 6 mm wide; involucral bracts up to 1 mm wide, moderately pubescent **9. neglectus**
16 Basal leaves up to 14 mm wide; involucral bracts usually more than 1 mm wide, densely pubescent **10. nanus**

1. E. annuus (L.) Pers., *Syn. Pl.* **2**: 431 (1807) (*Stenactis annua* (L.) Less.). Annual, biennial or perennial, glabrous or pubescent. Stem up to 80(–150) cm, erect, leafy, lacking basal rosettes at anthesis. Basal leaves up to 6 × 2·5 cm, broadly ovate or obovate, narrowly petiolate, dentate or subentire, usually with sparse, appressed hairs; lower cauline ovate-lanceolate, the upper lanceolate. Flowering stems branched above, with 3 to many capitula in a corymbiform panicle. Capitula medium-sized; florets dimorphic; ligules twice as long as the involucral bracts, white or pale blue. $2n=26$, 27, 36. *Waste places and disturbed ground. Formerly cultivated for ornament; now widely naturalized, especially in C. Europe.* [Au Be Cz Da Ga Ge He Hs Hu It Ju Po Rm Rs (N, B, C, W).] (*North America.*)

A very variable apomictic species. European taxonomists have distinguished three subspecies, and subsp. (c) has often been given specific status.

1 Stem with short, appressed hairs (c) subsp. **strigosus**
1 Stem with patent hairs, at least below, or glabrous
2 Middle and lower cauline leaves strongly dentate; ligules usually pale blue (a) subsp. **annuus**
2 Middle and lower cauline leaves entire or weakly dentate; ligules white (b) subsp. **septentrionalis**

(a) Subsp. **annuus**: Middle and lower cauline leaves strongly dentate. Stem, except for the panicle, with long, sparse, patent hairs. Ligules *c.* 8 mm, pale blue, rarely white.

(b) Subsp. **septentrionalis** (Fernald & Wieg.) Wagenitz in Hegi, *Ill. Fl. Mitteleur.* ed. 2, **6** (**3**): 96 (1965): Middle and lower cauline leaves entire or very weakly toothed. Stem, except for the panicle, leaves entire or very weakly toothed. Stem, except for the panicle, with sparse, patent hairs or glabrous. Ligules *c.* 6 mm, white.

(c) Subsp. **strigosus** (Muhl. ex Willd.) Wagenitz, *loc. cit.* (1965): Middle cauline leaves entire or very weakly toothed. Stem with short, appressed hairs. Ligules *c.* 6 mm, usually white.

The distribution of the three subspecies is obscure but **(b)** appears to be the commonest and (c) the rarest.

2. E. karvinskianus DC., *Prodr.* **5**: 285 (1836). Perennial. Stems 15–50 cm, woody below, procumbent to ascending,

sparsely pubescent at least above, lacking basal rosettes at anthesis. Lower cauline leaves 1–3·5 cm, obovate to cuneate, shortly petiolate, usually 3-lobed, cuspidate; very short axillary shoots often present and leaves then appearing verticillate. Upper leaves narrowly elliptical, entire. Capitula towards the ends of the branches on peduncles 3–8 cm, forming a lax, leafy corymb. Involucral bracts 2–4 mm, linear-lanceolate, green with brown centre and scarious margin. Florets dimorphic; ligules white or lilac above, purple beneath. $2n=36$. *Cultivated for ornament and widely naturalized on walls and rocks in S. & W. Europe.* [Az Bl Br Ga He Hs It Lu.] (*Mexico.*)

Apomictic.

3. E. acer L., *Sp. Pl.* 863 (1753). Annual, biennial or rarely perennial. Stem 10–60(–100) cm, usually with dense, grey crispate hairs. Basal leaves 2–10 × 0·3–1 cm, narrowly elliptical to obovate, petiolate, entire or rarely slightly serrate. Flowering stems usually erect and solitary, branched above, forming a corymbose or elongate panicle of up to 70 capitula, rarely with one capitulum; cauline leaves numerous, becoming lanceolate and sessile above; upper parts of stem and capitula with short, inconspicuous glandular hairs. Involucral bracts 5–7 mm, linear, with brown centre and scarious margin. Florets trimorphic; ligules scarcely exceeding the tubular florets, lilac. *Dry, stony or sandy places. Almost throughout Europe.* All except Az Bl Cr Fa Is Sa Sb Si ?Tu.

Very variable; at least five subspecies can be recognized.

1 Leaves and involucral bracts usually with dense, crispate hairs **(a)** subsp. **acer**
1 Leaves glabrous or subglabrous; involucral bracts glabrous to moderately hairy
2 Involucral bracts with sparse to moderately dense long hairs **(b)** subsp. **angulosus**
2 Involucral bracts glabrous or almost so
3 Involucral bracts uniformly purplish **(e)** subsp. **politus**
3 Involucral bracts green, with lilac apex
4 Upper cauline leaves distinctly smaller than the basal; capitula up to 30; ligules scarcely exceeding the involucral bracts **(c)** subsp. **droebachiensis**
4 Upper cauline leaves not markedly smaller than the basal; capitula usually 30–70; ligules distinctly longer than the involucral bracts **(d)** subsp. **macrophyllus**

(a) Subsp. **acer**: Whole plant usually with dense, crispate hairs. $2n=18$. *Throughout most of the range of the species.*

(b) Subsp. **angulosus** (Gaudin) Vacc., *Cat. Rais. Pl. Vasc. Aoste* **1**: 350 (1909): Leaves glabrous. Involucral bracts sparsely to moderately hairy, green with lilac apex. *C. Europe.*

(c) Subsp. **droebachiensis** (O. F. Mueller) Arcangeli, *Comp. Fl. Ital.* 340 (1882): Leaves glabrous. Upper cauline leaves appreciably smaller than the basal, not ciliate. Capitula up to 30. Involucral bracts glabrous or almost so, about equalling the ligules. *N.C. Europe, extending northwards to S. Norway.*

(d) Subsp. **macrophyllus** (Herbich) Guterm., *Phyton (Austria)* **15**: 268 (1973): Leaves glabrous, the upper cauline not appreciably smaller than the basal, ciliate. Capitula usually 30–70. Involucral bracts glabrous or almost so, distinctly exceeding the ligules. *Carpathians and E. Austria.*

(e) Subsp. **politus** (Fries) H. Lindb. fil., *Enum. Pl. Fennoscand. Or.* 56 (1901) (*E. elongatus* Ledeb., non Moench): Leaves glabrous, usually shiny. Involucral bracts with a few eglandular hairs at the base, purplish. $2n=18$. *Fennoscandia and U.S.S.R., southwards to N. Ukraine.*

Plants from the C. Alps have a weak, ascending habit quite unlike the normal erect habit; their status is uncertain.

Two other subspecies have been reported from Finland and N. Russia: subsp. **brachypetalus** (H. Lindb. fil.) Hiitonen, *Ann. Bot. Fenn.* **8**: 78 (1971), with small white capitula, and subsp. **decoloratus** (H. Lindb. fil.) Hiitonen, *op. cit.* 77 (1971), with white ligules. Both require further study.

There are scattered records, chiefly from N.C. Europe, of the sterile hybrid with *Conyza canadensis* (*E. huelsenii* Vatke).

4. E. orientalis Boiss., *Diagn. Pl. Or. Nov.* **3 (3)**: 7 (1856). Like **3 (a)** but always perennial; basal leaves narrowly oblong-spathulate; capitula up to 2·5 cm wide; panicle larger, subcapitate; involucral bracts up to 8·5 mm; ligules up to 0·6 mm wide, distinctly exceeding the bracts, pink. *Krym.* Rs (K). (*C. & S.W. Asia.*)

5. E. atticus Vill., *Hist. Pl. Dauph.* **3**: 237 (1788). Robust perennial 15–50 cm. Whole plant with short, dense, glandular and longer scattered, eglandular hairs. Basal leaves up to 15(–25) × 2(–2·5) cm, obovate, narrowly petiolate, mucronulate. Flowering stems erect; capitula usually 3–10; panicle corymbose, branched in the upper ½; cauline leaves numerous. Involucre 1·75–3 cm wide; involucral bracts lilac distally; florets trimorphic; ligules purple. $2n=18$. *Mountain grassland and rocky places.* ● *Alps, Carpathians, mountains of Jugoslavia and Bulgaria; E. Pyrenees.* Au Bu Cz Ga Ge He It Ju Po Rm.

6. E. gaudinii Brügger, *Jahresb. Naturf. Ges. Graubündens* **29**: 105 (1886) (*E. glandulosus* Hegetschw.). Like **5** but flowering stems ascending, usually branched at or below the middle, with 1–5 capitula; involucre usually less than 2 cm wide. $2n=18$. ● *Alps, S.W. Germany (Schwarzwald).* Au Ga Ge He It.

Intermediates between this species and **5** occur and hybrids have been reported with **7**.

7. E. alpinus L., *Sp. Pl.* 864 (1753). Perennial up to 25–(35) cm. Basal leaves 3–8 × 0·3–1·2 cm, narrowly elliptical to spathulate, petiolate, more or less acute. Leaves ciliate and with dense crispate hairs on both surfaces; occasionally the oldest basal leaves glabrescent. Flowering stems ascending to erect, with 1–3(–10) capitula; cauline leaves up to 11(–16), lanceolate. Involucral bracts somewhat pubescent, lilac distally; florets trimorphic; ligules lilac. $2n=18$. *Mountain grassland and rocky places. Mountains of S. & C. Europe.* Al Au Bu Cz Ga Ge Gr He Hs It Ju Po Rm Rs (W).

Variable, particularly in height, indumentum and number of capitula. Tall plants, mostly from the Alps, like **5** in their numerous cauline leaves and several capitula are sometimes referred to subsp. **intermedius** (Schleicher) Pawł., *Acta Bot. Croat.* **28**: 285 (1969). Regional variants from the Pyrenees (with dwarf habit and narrow leaves) and from the Appennini (with dense indumentum) have also been recognized. In the Balkan peninsula other regional variants occur. In Srbija and Bulgaria rather densely hairy plants with solitary capitula are found; these have been called **E. rhodopaeus** (Vierh.) Hayek, found; these have been called **E. rhodopaeus** (Vierh.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 587 (1931). In Greece more robust plants with large leaves and 2 or more capitula, resembling plants from Romania, occur, while in the mountains of Albania and Macedonia plants intermediate between **7** and **12** are found, though in this area the commonest species is **8**.

E. alpinus has been confused with **9** and **12** and intermediates with both these occur. Like **9** it is closely related to **11**, from which it is best distinguished by the usually dense crispate indumentum and acute basal leaves. Records of **7** from S. Spain (Sierra Nevada) mostly refer to **13**.

8. E. epiroticus (Vierh.) Halácsy, *Consp. Fl. Graec., Suppl.* 53 (1908). Like **7** but usually less than 10 cm; capitula solitary; ligules purplish; involucral bracts strongly pubescent; filiform female florets rather few. ● *S.W. part of Balkan peninsula; C. Appennini.* Al Gr It Ju.

Plants occur in Italy which apparently intergrade with **7**.

9. E. neglectus A. Kerner, *Österr. Bot. Zeitschr.* **21**: 253 (1871). Perennial up to 20(–25) cm. Basal leaves 2–5·5 × 0·4–0·6(–0·8) cm, narrowly spathulate, petiolate, rounded at the apex, ciliate, otherwise nearly or quite glabrous. Flowering stems stiffly erect; cauline leaves 5–10, lanceolate, sparsely pubescent. Capitula solitary; involucral bracts 0·7–1 mm wide, pubescent, lilac distally. Florets trimorphic; ligules lilac. *Base-rich, stony ground above* 1800 *m.* ● *Alps, eastwards to c.* 13° *E. in Austria.* Au Ga Ge He It.

Records of this species from the Carpathians probably refer to **10**.

10. E. nanus Schur, *Enum. Pl. Transs.* 309 (1866). Like **9** but usually not more than 15 cm; basal leaves 0·6–1·4 cm wide, spathulate; capitula very occasionally 2(–3); involucral bracts often more than 1 mm wide, usually densely pubescent. $2n=18$. *Rocks and mountain grassland,* 1400–2100 *m; calcicole.* ● *Carpathians.* Cz Po Rm.

11. E. borealis (Vierh.) Simmons, *Lunds Univ. Årsskr.* nov. ser., **9 (19)**: 127 (1913). Like **9** but sometimes up to 30 cm; the oldest basal leaves glabrous, the younger very sparsely hairy; flowering stems less robust, erect or slightly flexuous; capitula usually solitary but sometimes 2 or 3, rarely more; involucral bracts usually more densely hairy. $2n=18$. *Meadows and stony ground, mainly in the mountains; calcicole. N. Europe southwards to C. Scotland.* Br Fe Is No Rs (N) Su.

Somewhat intermediate between **7** and **9**, and often scarcely distinguishable from **9**, it might perhaps best be treated as a subspecies.

12. E. glabratus Hoppe & Hornsch. ex Bluff & Fingerh., *Comp. Fl. Germ.* **2**: 364 (1825) (*E. polymorphus* Scop. pro parte). Perennial up to 20(–35) cm. Basal leaves up to 5(–7) × 0·6(–0·8) cm, narrowly spathulate with an attenuate petiole, sparsely ciliate but otherwise glabrous or almost so. Flowering stems ascending to erect, often weak; cauline leaves up to 10. Capitula 1–2(–7). Involucral bracts rarely more than 0·7 mm wide, with a sparse indumentum, usually green with a brown centre, rarely lilac distally. Florets dimorphic; ligules usually lilac, rarely white. $2n=18$. *Mountain grassland and rocks. Mountains of S. & C. Europe.* Al Au Bu Cz Ga Ge Gr He Hs It Ju Po Rm.

Variable but usually readily recognizable. Plants from the S. part of the Balkan peninsula usually have densely pubescent and purplish involucral bracts and occasionally trimorphic florets. They have been called **E. polymorphus** subsp. **graecus** Vierh., *Beih. Bot. Centr.* **19 (2)**: 488 (1906). It is possible that they arise from hybridization with **7**, as also may problematical plants from the Pyrenees.

13. E. major (Boiss.) Vierh., *Beih. Bot. Centr.* **19 (2)**: 489 (1906). Pubescent perennial up to 15(–30) cm. Basal leaves narrowly spathulate. Flowering stems and involucral bracts with dense, short glandular and long eglandular hairs. Flowering stems ascending, slender. Capitula 1–4. Florets dimorphic. Ligules violet. *Mountain grassland and rocks.* ● *S. Spain (Sierra Nevada).* Hs.

Small, densely hairy, eglandular plants, apparently occurring over the same altitudinal range, and with solitary capitula up to 10 mm wide, have been called *E. alpinus* var. *'nevadensis'*. Intermediates are common and the question whether there is one single polymorphic taxon (*E. major*) or two cannot at present be answered.

14. E. uniflorus L., *Sp. Pl.* 864 (1753). Perennial not more than 15 cm. Basal leaves 2–5 × 0·4–0·9 cm, spathulate, narrowly petiolate, rounded at the apex, ciliate, sparsely pubescent when young. Flowering stems ascending to erect; cauline leaves 2–5(–8). Capitula solitary. Involucral bracts moderately to densely pubescent, lilac distally, sometimes slightly recurved. Florets dimorphic; ligules white or pale lilac. $2n=18$. *Snow-patches, stony slopes and alpine pastures. Arctic and subarctic Europe and W. Fennoscandia; mountains of C. & S. Europe southwards to the Pyrenees, C. Appennini and S. Carpathians; S.W. Bulgaria.* Au Bu Co Cz Fe Ga Ge He Hs Is It Ju No Po Rm Rs (N) Sb Su.

Very variable. The plants from Bulgaria (Pirin Planina) have been described as **E. vichrenensis** Pawł., *Acta Bot. Croat.* **28**: 287 (1969). They have densely pubescent and purplish involucral bracts and purple ligules. The most distinct regional taxon is **E. uniflorus** subsp. **eriocephalus** (J. Vahl) Cronq., *Brittonia* **6**: 236 (1947). It has densely hairy involucral bracts, with hairs up to 2 mm, the outer bracts being distinctly recurved, and has $2n=18$. It occurs here and there with subsp. *uniflorus* in the mountains of N. Fennoscandia and Iceland and largely replaces it in the Arctic. It is, however, difficult to distinguish it from certain plants from S. and C. Europe.

E. aragonensis Vierh., *Beih. Bot. Centr.* **19(2)**: 518 (1906), from the Pyrenees, which similarly has densely hairy involucral bracts but also narrow basal leaves (up to 0·3 cm wide) and ligules (4–)5–8 mm, is possibly worthy of specific rank. It has $2n=18$. Long ligules are also characteristic of plants from Corse.

E. candidus Widder, *Ber. Deutsch. Bot. Ges.* **50**: 77 (1932), described from S.E. Austria (Koralpe), is of uncertain status. It resembles both **12** and **14**, which are absent from this area, and is distinguished from both mainly by having larger, wider leaves, more densely pubescent flowering stems, solitary capitula and always white ligules.

15. E. humilis R. C. Graham, *Edinb. New Philos. Jour.* **6**: 175 (1829). Perennial up to 12 cm but usually much less, with flowering stems scarcely emerging from the basal leaves. Basal leaves 1·5–3·5 × 0·3–0·6 cm, spathulate, narrowly petiolate, rounded at the apex, ciliate, sparsely pubescent when young. Cauline leaves 1–4. Upper part of flowering stem and involucre with dense, long, patent, deep purple hairs. Capitula solitary; involucral bracts deep purple. Florets dimorphic; ligules white to purplish. $2n=36$. *Damp, stony hillsides and tundra. Arctic and subarctic Europe, eastwards to N.W. Finland.* Fe Is No Sb Su.

While this species is usually quite distinct from **14** when fresh, the contraction to the cell walls of the pigment in the involucral hairs on drying can lead to misidentification. The base of the involucre is said to be cuneate (truncate in **14**), but this character is unreliable. Sterile triploid hybrids between **14** and **15** are common in N. Norway and Sweden; they are most readily recognized by their failure to produce pollen.

16. E. frigidus Boiss. ex DC., *Prodr.* **7**: 274 (1838). Densely caespitose, densely pubescent perennial up to 7 cm, with a shortly creeping branched stock. Basal leaves up to 2·5(–3·5) × 0·4(–0·6)

cm, narrowly spathulate. Leaves strongly ciliate and with long, dense hairs and underlying short, glandular hairs. Flowering stems erect; cauline leaves small, linear-lanceolate. Capitula solitary, 1–1·3 cm wide; involucral bracts lilac distally; florets dimorphic; ligules 0·6–0·8 mm wide, lilac. $2n=18$. *Screes, mostly above* 3000 *m.* ● *S. Spain* (*Sierra Nevada*). Hs.

A very distinct species; records from the Pyrenees probably refer to **14**.

17. E. silenifolius (Turcz. ex DC.) Botsch., *Not. Syst.* (*Leningrad*) **16**: 392 (1954). Robust perennial up to 15(–25) cm. Whole plant usually with long eglandular and short glandular hairs, rarely glabrous below. Basal leaves not more than 6(–12) × 0·3 (–0·9) cm, linear-oblanceolate, with a long-attenuate petiole. Flowering stems stiffly erect; cauline leaves 3–11. Capitula 2–3(–3·5) cm wide, solitary. Involucral bracts linear-lanceolate, lilac distally, sometimes uniformly purplish. Florets dimorphic; ligules 7–13 × 0·9–1·7(–2·7) mm, with 2 or 3 small teeth at the apex, white or lilac. *N. Ural* (*basin of Kožim river*). Rs (N). (*E. Siberia.*)

The European station is separated from the main area of the species by more than 1500 km.

9. Conyza Less.[1]

Herbs, rarely shrubs. Leaves alternate, simple. Involucral bracts imbricate, scarcely herbaceous. Receptacle flat, without scales. Female florets numerous, in several rows, with a slender, tubular-filiform corolla, which, in European members, is apically produced into a very short, narrow, white or rarely pinkish ligule up to 1 mm. Hermaphrodite florets few, fertile, mostly yellow. Achenes flattened, with 0–2 veins. Pappus of hairs.

C. ivifolia (L.) Less., *Linnaea* **6**: 138 (1831), a shrub up to 100 cm, sparsely scabrid-puberulent and densely covered with sessile glands, is more or less naturalized in C. Portugal (near Oeiras). It is native in S. Africa.

Female florets usually 25–45, the ligule 0·5–1 mm; involucre glabrous or nearly so **1. canadensis**
Female florets usually 50–120, the ligule not more than 0·5 mm; involucre usually hirsute **2. bonariensis**

1. C. canadensis (L.) Cronq., *Bull. Torrey Bot. Club* **70**: 632 (1943) (*Erigeron canadensis* L.). Annual 10–150 cm, patent-hirsute. Leaves numerous, narrow, the lower up to 10 × 1 cm, oblanceolate, petiolate, often deciduous, the others linear, at least the upper sessile. Capitula less than 1 cm wide, generally numerous, in a long, paniculate inflorescence with a single axis. Involucre 3–4 mm, glabrous or nearly so. Female florets usually 25–45; ligules 0·5–1 mm, equalling or slightly exceeding the style and pappus. $2n=18$. *Cultivated ground and waste places. Naturalized almost throughout Europe.* [All except Fa Hb Is Rs (N) Sb.] (*North America.*)

2. C. bonariensis (L.) Cronq., *loc. cit.* (1943) (*C. ambigua* DC., *Erigeron bonariensis* L., *E. crispus* Pourret). Like **1** but up to 250 cm, usually more densely hairy; inflorescence sometimes with elongate branches overtopping the main axis; capitula often 1 cm or more wide; involucre 4–6 mm, hirsute throughout, rarely glabrous or nearly so (var. *leiotheca* (Blake) Cuatrec.); female florets 50–120 or more; ligules up to 0·5 mm, shorter than the style and usually also than the pappus. $2n=36$, 54. *Cultivated ground and waste places. Naturalized in the Mediterranean region and S.W. Europe.* [Al Az Bl Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.] (*Tropical America.*)

In Europe two variants are often recognized, one with a pyramidal inflorescence, dirty white to reddish-brown pappus and greyish-green involucral bracts, often with reddish apex, and the other with a more or less cylindrical inflorescence, yellowish pappus and greenish-brown involucral bracts. The latter is known as C. **floribunda** Kunth in Humb., Bonpl. & Kunth, *Nov. Gen. Sp.* **4**: 73 (1820) (*C. naudinii* Bonnet). Other variants have sometimes been interpreted as **1** × **2** and have been called C. × **flahaultiana** (Thell.) Sennen, *Bol. Soc. Aragon. Ci. Nat.* **15**: 98 (1916). Study of native populations does not support the taxonomic recognition of these variants, even at subspecific rank, though they often form colonies of distinctive facies in Europe.

10. Nolletia Cass.[2]

Perennials. Leaves alternate. Capitula small, solitary at the ends of branches. Involucral bracts in 2–3 rows. Receptacle flat or slightly convex, without scales, alveolate; alveoles surrounded by a membranous rim. Outer florets filiform, female, the inner tubular, hermaphrodite. Achenes compressed; pappus-hairs in 1 row, denticulate, caducous.

1. N. chrysocomoides (Desf.) Cass. ex Less., *Syn. Gen. Comp.* 187 (1832). Appressed-grey-pubescent. Stems 15–30 cm, much-branched, leafy, woody below. Leaves 10–25 × *c.* 1 mm, entire, obtuse, sessile. Capitula hemispherical; involucre *c.* 6 mm; bracts linear-lanceolate, acuminate, the outer much shorter than the inner, all ultimately deflexed. Florets yellow. Achenes *c.* 1 mm, scabrid-puberulent. *S. Spain* (*Sierra Bermeja*). Hs. (*N. Africa.*)

11. Baccharis L.[2]

Dioecious shrubs. Leaves alternate, simple. Capitula in panicles. Involucral bracts in many rows, more or less coriaceous. Receptacle flat or convex, without scales. Florets yellow, all tubular, the female very slender. Achenes ellipsoid, somewhat compressed, 10-ribbed; pappus of numerous slender setae.

1. B. halimifolia L., *Sp. Pl.* 860 (1753). Glabrous, somewhat viscid shrub up to 3 m. Leaves up to 6 × 4 cm, rather thick, rhombic to oblanceolate, long-cuneate, remotely and coarsely dentate or the upper entire, shortly petiolate, minutely punctate beneath. Capitula *c.* 2 mm in diameter, numerous; involucre 3–6 mm, campanulate. Achenes *c.* 1 mm; pappus white, much longer than the involucre in female capitula. *Naturalized near the coast in W. France and N.W. Spain.* [Ga Hs.] (*E. North America.*)

Tribe Inuleae Cass.[3]

Leaves usually alternate, simple. Capitula with or without ligules; outer florets usually female, the inner hermaphrodite or male; ligules usually yellow. Receptacle with or without scales. Anthers sagittate and caudate at base. Style-branches flattened, rounded at apex, with stigmatic surface marginal and apical, or truncate to subacute, with marginal stigmatic surface only. Pappus usually of hairs.

Strongly divergent views are held about generic limits in genera **13–23** and the treatment adopted here represents a compromise between these extremes. The rank of various taxa, especially in *Filago* and *Evax*, is also a subject of debate; these problems can only be solved by further biosystematic work.

[1] By A. Cronquist. [2] By T. G. Tutin. [3] Edit. T. G. Tutin.

12. Karelinia Less.[1]

Perennial herbs. Leaves simple, alternate. Capitula 2–9 in a corymbose inflorescence. Involucral bracts imbricate, rigid, in many rows. Receptacle flat, with long hairs. Florets tubular, the outer female, filiform, in many rows, with 4-dentate corolla, the 10–20 innermost hermaphrodite, with 5-dentate corolla. Achenes cylindrical, 3- to 4-ribbed. Pappus-hairs numerous, in 1 row, denticulate, *c.* 6 times as long as the achene.

1. K. caspia (Pallas) Less., *Linnaea* **9**: 187 (1834). Erect, scabrid perennial up to 1·5 m. Leaves sessile, oblong, the upper semiamplexicaul. Capitula 8–20 mm in diameter; involucre *c.* 10 mm in diameter, cylindric-campanulate; bracts brownish, the outer ovate, the inner nearly linear, with short, appressed hairs, ciliate. Florets pink, slightly exceeding the involucre. Achenes 1·5–2 mm, nearly cylindrical, narrowed to the base, slightly curved. *Saline or sandy soils. S.E. Russia, W. Kazakhstan.* Rs (E). (*C. Asia.*)

13. Filago L.[2]

Tomentose to lanate annuals. Leaves alternate. Capitula in axillary and terminal or basal subglobose clusters, very rarely solitary. Involucral bracts usually 15–25, often acuminate or aristate. Florets all tubular, the outer and sometimes some of the inner female, filiform, some or all of the inner hermaphrodite, or sometimes functionally male. Achenes slightly compressed laterally, the outer subtended by but not enclosed in bracts; pappus usually present.

Literature: J. Holub & J. Chrtek, *Taxon* **11**: 195–201 (1962). J. Chrtek & J. Holub, *Preslia* **35**: 1–17 (1963). G. Buchheim & G. Wagenitz, *Regn. Veg.* **34**: 61–62 (1964). G. Wagenitz, *Willdenowia* **4**: 37–59 (1965); 283–298 (1968); **5**: 55–66 (1968); 395–444 (1969); **6**: 115–138 (1970); *Ber. Deutsch. Bot. Ges.* **79**: 336–342 (1966); *Israel Jour. Bot.* **19**: 260–265 (1970); *Feddes Repert.* **81**: 107–117 (1970). P. Myrzakulov, *Not. Syst. Herb. Inst. Bot. Acad. Kasachst.* **5**: 31–41 (1968).

Descriptions of bracts refer to the middle bracts, unless otherwise stated. Dwarf variants occur in some species; they have not been included in the key and descriptions. Hybrids between some taxa of *Filago* L. and *Logfia* Cass. occur, though very rarely.

Most species grow in dry, open habitats, such as cultivated fields, open grassland, roadsides and sand-dunes.

1 Receptacle flat **16. hispanica**
1 Receptacle conical to filiform
2 Pappus absent; receptacle conical
3 Stem 4–13 cm, erect, with fewer than 10 clusters of capitula; achenes shortly hairy **14. filaginoides**
3 Stem very short, much-branched, with more than 10 clusters of capitula; achenes slightly papillose **15. eriosphaera**
2 Pappus present, sometimes only of 1–5 hairs, rarely completely absent; receptacle filiform
4 Capitula solitary, forming ± unilateral spikes **13. mareotica**
4 Capitula usually in clusters, very rarely solitary in lower part of plant
5 Some capitula solitary, some in clusters of 2–5 in the upper part of plant **9. ramosissima**
5 All capitula in clusters of 3–60
6 Inner involucral bracts ciliate, rigid and strongly divergent in fruit **8. desertorum**
6 Inner involucral bracts not ciliate, not very rigid, and not strongly divergent in fruit
7 Inner florets hermaphrodite or functionally male; pappus absent or of 1–5 caducous hairs
8 Outer and middle involucral bracts aristate, the middle glabrous on the back, long-hairy only on margin; capitula hairy only in the furrows **10. congesta**
8 Outer and middle involucral bracts acute, not aristate, the middle hairy on the back; capitula hairy all over
9 Involucral bracts appressed-tomentose; capitula distinct **11. duriaei**
9 Involucral bracts patent-lanate; capitula almost covered by the indumentum, not distinct; bracts with only the apex protruding **12. micropodioides**
7 Inner florets female and hermaphrodite, very rarely all hermaphrodite, all fertile and with well-developed pappus
10 Leaves linear- to oblong-lanceolate, widest at the base or in the lower half; capitula in dense clusters of (15–)20–50(–60)
11 Outer and middle involucral bracts 4–4·5 mm, long-aristate, the inner nearly always reddish-tinged on margin; capitula in globose clusters of (15–)20–35(–40) **1. vulgaris**
11 Involucral bracts 3 mm, acute, without a long arista and reddish colouration; capitula in ovoid or oblong clusters of (20–)30–50(–60) **2. eriocephala**
10 Leaves linear-oblong to broadly obovate, widest in the upper half; capitula in ± lax clusters of 3–30
12 Involucral bracts not in 5 distinct rows; capitula ± terete (Aegean region)
13 Involucral bracts ± rigid, the middle ones tomentose all over, incurved in fruit **3. aegaea**
13 Bracts not rigid, the middle ones tomentose, with glabrous margins, diverging or ± erect in fruit, not incurved **4. cretensis**
12 Bracts in 5 distinct vertical rows; capitula ± 5-angled
14 Bracts 4–6 in each vertical row, not reddish, with recurved apex; hermaphrodite florets 4–10; inner female florets (0–)5–7 **7. pyramidata**
14 Bracts 3(–4) in each vertical row, usually reddish-tinged, with a straight arista; hermaphrodite florets (2–)3–4(–7); inner female florets 12–20
15 Capitula in clusters of 10–25, overtopped by a single subtending leaf; bracts yellowish to yellow **5. lutescens**
15 Capitula in clusters of 3–8(–10), not overtopped by subtending leaves; bracts brownish **6. fuscescens**

1. F. vulgaris Lam., *Fl. Fr.* **2**: 61 (1779) (*F. germanica* L., non Hudson, *F. canescens* Jordan, *F. eriocephala* auct., non Guss.). Plant greyish-white. Stem 5–35(–40) cm, erect, more or less regularly branched above the middle. Leaves 12–20(–30) × 1–3 (–4) mm, linear-lanceolate to lanceolate, more or less undulate. Capitula 5 × 1·6 mm, more or less terete, in dense, globose clusters of (15–)20–35(–40); clusters 10–12 mm wide, not overtopped by subtending leaves. Involucral bracts 4–4·5 × 1·1 mm, lanceolate, straight in fruit, yellowish, usually red-tinged, with a long yellow arista. Inner female florets 20–25; hermaphrodite (1–)2–3(–4). Achene 0·5–0·8 × 0·2 mm, oblong to ovoid, brown. *S., W. & C. Europe, extending north-eastwards to S. Sweden and White Russia.* All except Fa Fe Hb Is Lu No Rs (N, B, E) Sb; casual in some of these.

2. F. eriocephala Guss., *Pl. Rar.* 344 (1826). Plant greyish-white. Stem (5–)10–20(–35) cm, erect or rarely procumbent, usually branched above the middle. Leaves 8–24 × 2–5(–8) mm. Capitula 4 × 2 mm, the upper half protruding from the lanate indumentum, in very dense ovoid to oblong clusters of (20–)30–50(–60); clusters 9–17 × 10–12 mm, not overtopped by subtending leaves. Involucral bracts 3 × 1 mm, broadly lanceolate, strami-

[1] By V. N. Tikhomirov. [2] By J. Holub.

neous, distinctly keeled at the apex, shortly aristate. Inner female florets 10–20; hermaphrodite 2–4. Achenes 0·5–0·8 mm, oblong-obovoid, brownish. $2n=28$. *Mediterranean region, eastwards from France.* Al Co Cr Ga Gr It Ju Sa Si.

3. F. aegaea Wagenitz, *Willdenowia* **6**: 126 (1970). Plant greyish-white. Stem up to 6 cm. Capitula ovoid, subterete, in clusters of 5–15; clusters 7–10 × 8–12 mm, not or scarcely overtopped by subtending leaves. Involucral bracts ovate-lanceolate, more or less rigid, completely tomentose in the upper part, curved obliquely inwards in fruit. Female florets 12–15, all but 0–5 marginal, the hermaphrodite 5–8. Achenes 0·7–0·9 × 0·4 mm, brown. Pappus 1·5 mm. *Ionioi Nisoi*; *S. Aegean region.* Cr Gr.

(a) Subsp. **aegaea**: Stem very short. Leaves spathulate to suborbicular. Involucral bracts acute or with an arista 0·2–0·5 mm. $2n=28$. ● *S. Aegean region.*

(b) Subsp. **aristata** Wagenitz, *op. cit.* 129 (1970): Stem 1–6 cm. Leaves oblanceolate to spathulate. Involucral bracts with an arista 0·5–1 mm. $2n=28$. *Throughout the range of the species.*

4. F. cretensis Gand., *Fl. Cret.* 58 (1916). Stem up to 6(–12) cm. Leaves 10–15 × 1–3·5 mm, oblanceolate to spathulate, glabrescent above, the lower petiolate. Capitula subterete, in terminal clusters of 5–7; clusters 4–6 mm wide, more or less overtopped by several subtending leaves. Involucral bracts ovate-lanceolate, soft, purplish to brownish, suberect or slightly divergent in fruit. Inner female florets 8–12; hermaphrodite 3–6(–8). Achenes *c.* 0·7 mm, brown. Pappus 1–1·2 mm. *S. Aegean region.* Cr Gr.

(a) Subsp. **cretensis**: Stem usually 2–6 cm. Involucral bracts with wide glabrous margins, and with an arista 0·5–1 mm. $2n=28$. *Throughout the range of the species.*

(b) Subsp. **cycladum** Wagenitz, *Willdenowia* **6**: 124 (1970): Like subsp. (a) but stem very short; involucral bracts more densely tomentose, acute or with an arista 0·1–0·4 mm. $2n=28$. ● *Kikhlades.*

5. F. lutescens Jordan, *Obs. Pl. Crit.* **3**: 201 (1846) (*F. apiculata* G. E. Sm. ex Bab., *F. germanica* auct., non L., nec Hudson). Stem 10–25 cm, rather irregularly branched. Leaves 15–20 × 3–6 mm, oblong-lanceolate to spathulate. Capitula 5 × 2·5 mm, conical-ovoid, weakly 5-angled, in clusters of 10–25; clusters overtopped by 1–2 subtending leaves. Involucral bracts *c.* 4·2 × 1·3 mm, 3(–4) in each vertical row, oblong-ovate to lanceolate, with a straight arista 1·5 mm. Inner florets *c.* 3 mm, the female 12–20, the hermaphrodite (2–)3–4(–5). Achenes oblong-cylindrical. $2n=28$. *From S.E. England and S. Sweden southwards to C. Spain, Sicilia and Bulgaria.* Al Au Az Be Br Bu ?Co Cz Da Ga Ge He Hs Hu It Ju Lu Po Rm Si Su.

(a) Subsp. **lutescens**: Plant yellowish-green. Clusters of capitula (8–)10–14 mm wide; involucral bracts yellowish, reddish-purple before anthesis. *Throughout the range of the species except the Açores.*

(b) Subsp. **atlantica** Wagenitz, *Willdenowia* **5**: 56 (1968): Plant whitish. Clusters of capitula 6–9(–10) mm wide; involucral bracts purplish at base only or entirely yellow, with the arista yellow before anthesis. *Portugal, Açores.*

6. F. fuscescens Pomel, *Nouv. Mat. Fl. Atl.* 44 (1874). Plant greyish. Stem 5–12(–15) cm. Leaves 10–15 × 2·5–3·5 mm, oblong-obovate. Capitula 4–4·5 × 2·5 mm, shortly pyramidal-ovoid, 5-angled, in clusters of 3–8(–10); clusters 7–8 × 6–7 mm, not overtopped by subtending leaves. Involucral bracts *c.* 4 × 1·5 mm, 3(–4) in each vertical row, ovate-lanceolate, patent-lanate in the upper half, brownish, with a purple spot below the apex, with a straight, often reddish-purple arista 1·5 mm. Inner female florets 15–20; hermaphrodite 4–7. Achenes 0·8 × 0·3 mm, obovoid, pale brown. *S.E. Spain.* Hs. (*N.W. Africa.*)

7. F. pyramidata L., *Sp. Pl.* 1199, [1230] (1753). Plant greyish-white. Stem (2–)5–30(–40) cm. Leaves (5–)10–15 mm, linear-oblong to spathulate. Capitula 3·5–6 × 2–2·5 mm, pyramidal, sharply 5-angled, in clusters of 5–20; clusters 5–12 mm wide, sometimes overtopped by subtending leaves. Involucral bracts 2·5–4·5 × 1–1·3 mm, 4–6 in each vertical row, keeled, stramineous, without reddish colouration, softly lanate on the back, distinctly divergent in fruit, with a recurved arista 1–1·5 mm. Inner female florets (0–)5–7; hermaphrodite 4–7. Achenes 0·5–0·8 mm, cylindrical to oblong-ovoid. $2n=28$. *S. & W. Europe, northwards to S. England.* Al ?Az Be Bl Br Bu Co Cr Ga Ge Gr He Ho Hs It Ju Lu Sa Si Rs (K) Tu.

Polymorphic. Several variants have been described at specific rank, but intermediates occur and much of the variation seems to be phenotypic. Three fairly well-marked variants, var. *prostrata* (Fiori) Wagenitz, var. *gussonei* (Nyman) Wagenitz and var. *obovata* (Pomel) Wagenitz, are perhaps worth subspecific rank (see Wagenitz, *Willdenowia* **5**: 404–406 (1969)).

8. F. desertorum Pomel, *Nouv. Mat. Fl. Atl.* 46 (1874). Stem with procumbent or obliquely ascending branches from the base. Leaves oblong-spathulate to narrowly lanceolate, those subtending the clusters about as long as the clusters. Capitula 4–5 mm, slightly 5-angled, in clusters of 6–12. Involucral bracts with long stiff hairs on margin and in the upper part, otherwise glabrous, with a more or less recurved arista 1–1·5 mm; inner bracts long-ciliate on margin, strongly divergent, rigid and purplish-brown in fruit. Hermaphrodite florets (3–)5–7(–8). Achenes 0·8 mm. Pappus 2–2·5 mm. *S. Spain.* Hs. (*N. Africa, S.W. Asia.*)

9. F. ramosissima Lange, *Ind. Sem. Horto Haun.* **1855**: 24 (1855). Stem 5–10 cm, with slender branches. Leaves greyish-tomentose, the lower ovate-lanceolate, the upper obovate. Capitula 2·5–3 mm, ovoid-cylindrical, 5-angled, solitary below, in clusters of 2–5 above; clusters 6 mm wide, not or only slightly overtopped by 3–5 subtending leaves. Involucral bracts 3(–4) in each vertical row, aristate, stramineous. Inner female florets several, the hermaphrodite (3–)4–7(–8). Achenes obovoid-conical. *S.E. Spain.* Hs. (*N.W. Africa.*)

10. F. congesta Guss. ex DC., *Prodr.* **6**: 248 (1838). Stem 10–16 cm, usually procumbent or ascending, with many clusters of capitula. Leaves 8–16 × 1·5–2 mm, lanceolate- to linear-spathulate. Capitula 5–6 × 2·5 mm, pyramidal, sharply 5-angled, hairy only in the furrows, in clusters of (2–)3–6(–18). Involucral bracts 4–5 × 1·3 mm, closely appressed in 5 very distinct rows, hairy only on margin, with an arista 0·5–1·2 mm; middle bracts not longer than the inner, the inner obtuse. Hermaphrodite florets 4–6, without pappus or with 1–4 hairs. Achenes 1–1·2 × 0·4–0·5 mm. *W. Mediterranean region.* Bl Ga Hs It Sa Si.

11. F. duriaei Cosson ex Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1861**: 70 (1861). Stem (2–)3–8(–12) cm, erect, rigid. Leaves 5–10 × 0·6–3·5 mm, linear-lanceolate to -spathulate, those subtending the clusters about as long as clusters. Capitula 5 × 3 mm, pyramidal-ovoid, 5-angled, hairy all over, clearly distinct, in clusters of 8–10. Involucral bracts *c.* 4 × 1·3 mm, densely appressed-tomentose on the back, often purplish at the apex, acute, the inner subobtuse. Female florets 2·6–2·7 mm; hermaphrodite 2·5–2·6 mm, 3–5, without pappus or with 1–4 hairs. Achenes 1 × 0·25 mm. *S. Spain.* Hs. (*N.W. Africa.*)

12. F. micropodioides Lange, *op. cit.* 71 (1861). Plant much-branched, the main stem very short, branches procumbent or obliquely ascending. Leaves 12–15 × 2–2·5 mm, oblong- to linear-lanceolate, those subtending the clusters oblong-lanceolate, overtopping clusters. Clusters of capitula 6–9 mm wide, almost covered by brownish-grey indumentum, with 8–10 not clearly distinct capitula. Involucral bracts *c.* 3 × 1·2 mm, patent-lanate on the back, acute, with an arista 0·2 mm; inner bracts obtuse. Hermaphrodite florets 4–5; pappus of few hairs, caducous. Achene *c.* 0·9 mm. *E. & S.E. Spain.* Hs.

A rare plant resembling *Bombycilaena erecta.*

13. F. mareotica Delile, *Descr. Égypte, Hist. Nat.* **2**: 274 (1813). Stem 3–15(–20) cm, simple or branched, appressed-lanate. Leaves 3–5 × 0·5–1 mm, linear-lanceolate; leaves subtending the capitula 3–3·5 × 0·6–1·2 mm, 3, oblong-lanceolate, shorter than the capitula. Capitula 3–4 × 1·5 mm, oblong-cylindrical, brownish. Involucral bracts 2·7 × 0·7 mm, in (4–)5 rows, parallel before flowering, hardening and slightly divergent in fruit, the middle lanceolate, acuminate. Female florets *c.* 1·4 mm; hermaphrodite 1·1–1·2 mm, (1–)3–5, with well-developed pappus. Achenes 0·7 × 0·25 mm, oblong-obovoid, greenish-brown. *Saline soils. S.E. Spain.* Hs. (*N. Africa.*)

14. F. filaginoides (Kar. & Kir.) Wagenitz, *Willdenowia* **5**: 417 (1969) (*Evax filaginoides* Kar. & Kir.). Stem 4–13(–17) cm, erect, simple or furcate above, with 1–8 clusters of capitula. Leaves 12–18 × 2–2·5(–3·5) mm, linear-lanceolate, those subtending the clusters up to as long as clusters, subacute. Clusters of capitula 8–10 mm wide, solitary. Involucral bracts 3 × 1 mm, with a straight or recurved arista 1 mm, the inner subacute. Achenes 1 × 0·3–0·5 mm, oblong-obovoid, shortly hairy. *S.E. Russia, W. Kazakhstan.* Rs (E). (*C. Asia.*)

15. F. eriosphaera (Boiss. & Heldr.) Chrtek & J. Holub, *Preslia* **35**: 3 (1963) (*Evax exigua* auct., non (Sibth. & Sm.) DC.). Much-branched, caespitose, densely lanate cushion-plant with up to 50 clusters of capitula. Stem very short. Cauline leaves *c.* 6 × 1 mm, remote, those subtending the clusters oblong to obovate or spathulate, subobtuse, about as long as the clusters. Clusters of capitula 5–10 mm wide, often aggregated into secondary clusters. Involucral bracts *c.* 3 × 1 mm, with a short, slightly recurved arista. Achenes 0·8–1 × 0·3 mm, oblong-obovoid, slightly papillose. *Kriti and Karpathos.* Cr. (*S.W. Asia.*)

16. F. hispanica (Degen & Hervier) Chrtek & J. Holub, *loc. cit.* (1963) (*Evax anatolica* forma *hispanica* Degen & Hervier). Appressed-greyish-tomentose. Stem *c.* 1 cm, branched from the base; branches procumbent. Leaves oblong-spathulate, mucronate. Clusters of capitula overtopped by patent rosette-leaves. Capitula covered by the lanate indumentum. Involucral bracts contracted into a cucullate cartilaginous apex. Hermaphrodite florets 2–3. Achenes *c.* 1·5 mm, oblong, brown, papillose. florets 2–3. Achenes *c.* 1·5 mm, oblong, brown, papillose. *Snow-patches. S.E. Spain* (*Sierra de Segura*). Hs. (*N.W. Africa.*)

14. Ifloga Cass.[1]

Like *Filago* but capitula solitary or in clusters of 2–5 in the leaf-axils throughout most of the stem and branches; female florets 4–6, without pappus; functionally male florets *c.* 12, with pappus; pappus-hairs plumose above, deciduous.

[1] By J. Holub.

Literature: R. Pampanini, *Nuovo Gior. Bot. Ital.* nov. ser., **36**: 242–248 (1929). J. Chrtek, *Preslia* **41**: 241–244 (1969).

1. I. spicata (Forskål) Schultz Bip. in Webb & Berth., *Phyt. Canar.* **2**: 310 (1845). Stems 3–12 cm, with rigid, procumbent or ascending branches. Leaves (5–)8–14(–20) × 1–1·5 mm, filiform-subulate, patent, shiny green above, greyish-lanate beneath, longer than the clusters of capitula. Capitula 3–4 × *c.* 2 mm, subglobose to cylindrical. Involucral bracts *c.* 3 × 1·4 mm, reddish-brown, scarious, ovate to ovate-lanceolate, shortly acuminate. Functionally male florets 1·4 mm, yellowish-orange above. Achenes 0·8 × 0·3 mm, ovoid, glabrous, brownish-green. *S.E. Spain* (*near Almería*). Hs. (*N. Africa, S.W. Asia.*)

Very polymorphic. The above description applies to subsp. **spicata**, the only one found in Europe.

15. Logfia Cass.[1]

Like *Filago* but capitula in small clusters or sometimes solitary; involucral bracts 15–20, subobtuse to acute, never acuminate, stellate in fruit; outer achenes usually enclosed in bracts and falling with them.

All species occur in dry, open, often sandy habitats.

Literature: vide *Filago*.

1 Plant racemosely branched; clusters of capitula and single capitula in a racemose, spicate or paniculate inflorescence
2 Clusters with 3–12 ± sessile capitula; middle involucral bracts slightly saccate at base; plant usually whitish-lanate **2. arvensis**
2 Clusters with 2–5 capitula; some capitula solitary, pedunculate; middle involucral bracts saccate at base; plant greyish-tomentose **1. heterantha**
1 Plant furcately branched; clusters of capitula terminal and in the axils of the branches
3 Capitula broadly cylindrical; involucral bracts brownish, the outer similar in length and shape to the inner **6. neglecta**
3 Capitula ovoid-pyramidal; involucral bracts pale, the outer much shorter than and differing in shape from the inner
4 Lower leaves linear-lanceolate, the upper oblong-lanceolate; inner female florets *c.* 1·5 mm; hermaphrodite florets 1·7–2 mm **4. clementei**
4 All leaves similar; inner female florets 1·8–2·5 mm; hermaphrodite florets 2·2–2·5 mm
5 Leaves 4–10 mm, oblong-linear to linear, flat; clusters of capitula longer than the subtending leaves; middle involucral bracts weakly saccate at base **3. minima**
5 Leaves 15–25 mm, linear to filiform, often with involute margin; clusters of capitula usually much shorter than the subtending leaves; middle involucral bracts strongly saccate at base **5. gallica**

1. L. heterantha (Rafin.) J. Holub, *Bot. Jour. Linn. Soc.* **71**: 271 (1976) (*Gnaphalium heteranthum* Rafin., *Filago heterantha* (Rafin.) Guss.). Plant greyish-tomentose. Stem 8–30 cm. Leaves 8–15 × 1–2·5 mm, oblong-lanceolate to linear. Capitula Leaves 8–15 × 1–2·5 mm, oblong-lanceolate to linear. Capitula 4 × 3 mm, broadly ovoid, narrowed at apex, solitary below, in clusters of 2–5 above; some of the lower capitula pedunculate; peduncles very slender. Involucral bracts *c.* 4 × 1·4 mm, densely lanate, the outer very short, the middle saccate at the base, subacute. Inner female florets 10–15, the hermaphrodite 3–4. Achenes 0·8–0·9 × 0·2–0·3 mm, oblong-ovoid, pale brown. *C. & S. Italy, Sicilia, Sardegna.* It Sa Si.

2. L. arvensis (L.) J. Holub, *Notes Roy. Bot. Gard. Edinb.* **33**: 432 (1975) (*Filago arvensis* L., *F. montana* L. pro parte). Plant patent-lanate. Stem 5–70 cm, usually racemosely branched.

Leaves (6–)10–20 × 1–4 mm, oblong to linear-lanceolate. Capitula 2·5–6 × 2·5–5 mm, broadly ovoid, terete, in clusters of (1–)3–12 in a racemose or paniculate inflorescence, not overtopped by subtending leaves. Involucral bracts only slightly saccate at the base, with a short, glabrous, hyaline apex. Inner female florets 15–18; hermaphrodite *c.* 3. Pappus 2·5–3·5 mm. Achenes 0·6–1·1 × 0·2–0·3 mm, pale brown, the outer obliquely oblong, the inner oblong-obovoid. $2n=28$. *Most of Europe.* Al Au Be Bu Co Cr Cz Da Fe Ga Ge Gr He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Si Su Tu [Br].

Plants with denser and more patent indumentum (especially on the bracts), sparingly branched stem, larger capitula and bracts with more acute apex, occurring on mountains in the Mediterranean region, have been called **Filago arvensis** subsp. **lagopus** (Stephan ex Willd.) Nyman, *Consp.* 385 (1879); their taxonomic status and name require further investigation.

3. L. minima (Sm.) Dumort., *Fl. Belg.* 68 (1827) (*Filago minima* (Sm.) Pers.). Plant greyish. Stem 5–15(–30) cm, furcate. Leaves 4–10 × 0·5–1·2 mm, oblong-linear to linear, flat. Capitula 2·5–3·5 × 1·5–2 mm, pyramidal-ovoid, 5-angled, in clusters of 3–7, terminal and in the forks of the stem, not overtopped by subtending leaves. Middle involucral bracts 3 × 0·7 mm, strongly saccate at base. Inner female florets 8–12, 1·8–2·5 mm; hermaphrodite 2–3, 2·2–2·5 mm. Achenes of the outer florets 0·8–0·9 × 0·4 mm, those of the inner florets *c.* 0·6 × 0·25 mm; pappus 2–2·5 mm. $2n=28$. *S., W. & W.C. Europe, northwards to S. England.* Al Az Be Bl Br Bu Co Cr Ga Ge Gr He Hs It Ju Lu Sa Si Tu.

Very variable, especially in the southern part of its range.

6. L. neglecta (Soyer-Willemet) J. Holub, *Bot. Jour. Linn. Soc.* **71**: 271 (1976) (*Gnaphalium neglectum* Soyer-Willemet, *Filago neglecta* (Soyer-Willemet) DC.). Stem 5–15 cm, usually branched from the base. Leaves 10–30 × 0·8–2 mm, linear-lanceolate. Capitula *c.* 4 × 3 mm, broadly cylindrical, brownish, in clusters of 2–6; clusters 8–10 mm wide, terminal and in forks of the stem, overtopped by subtending leaves. Involucral bracts more or less equal, the middle *c.* 4 × 0·7 mm, linear-lanceolate, subglabrous, obtuse. Inner female florets many; hermaphrodite 5–6, reddish-brown above. Achenes 0·8–0·9 × 0·3 mm, oblong-obovoid, pale brown; pappus 2·5 mm. ● *France, Belgium, Corse.* Be Co Ga.

Very probably the hybrid *Filaginella uliginosa* × *Logfia gallica* and not recently collected.

16. Evax Gaertner[1]

Like *Filago* but clusters of capitula usually pulvinate; involucral bracts usually very numerous; inner florets functionally male; achenes dorsally compressed; pappus always absent.

All species grow in dry, open habitats.

Literature: J. Chrtek & J. Holub, *Preslia* **35**: 1–17 (1963). G. Wagenitz, *Willdenowia* **5**: 395–444 (1969). R. B. Fernandes & I. Nogueira, *Bol. Soc. Brot.* ser. 2, **45**: 317–347 (1971).

1 Involucral bracts 15–20, acute, not acuminate or cuspidate; receptacle short
2 Stem 0·5–2 cm; cauline leaves very few and crowded or absent **7. perpusilla**
2 Stem 1–5 cm; cauline leaves several, remote **8. nevadensis**
1 Involucral bracts more than 30, acuminate or cuspidate, rarely acute; receptacle elongated
3 Achenes papillose to smooth, rarely with short hairs at the base
4 Rosette-leaves very broadly obovate to suborbicular; lamina about as long as wide; involucral bracts very shortly pointed, not cuspidate, curved on the back **6. rotundata**
4 Rosette-leaves oblanceolate- to obovate-spathulate; lamina distinctly longer than wide; involucral bracts long-acuminate or cuspidate, ±straight on the back
5 Rosette-leaves 15–30 mm, narrowed into a long, sheathing petiole, erect, *c.* 4 times as long as the clusters of capitula; involucral bracts 3 mm, with arista 0·5 mm **2. contracta**
5 Rosette-leaves 5–16 mm, not narrowed into a long, sheathing petiole, patent, 2–3 times as long as the clusters of capitula; involucral bracts 3–4·3 mm, with arista 1–1·5 mm **1. pygmaea**
3 Achenes hairy (sometimes only sparsely)
6 Stem very short or absent
7 Rosette-leaves 7–8 mm wide, rounded at apex, greyish-green **5. lusitanica**
7 Rosette-leaves 1–2·5 mm wide, subacute to acuminate, whitish **4. carpetana**
6 Stem distinct
8 Rosette-leaves 15–40 × 3–7 mm, oblong-lanceolate, *c.* 4 times as long as the cluster of capitula **3. asterisciflora**
8 Rosette-leaves 5–15 × 1–5 mm, linear-lanceolate to oblong-obovate, about twice as long as the cluster of capitula
9 Rosette-leaves 1–2·5 mm wide, whitish to greyish, ±firm; achenes ± densely hairy **4. carpetana**
9 Rosette-leaves 2–5 mm wide, greyish-green, soft; achenes sparsely hairy or subglabrous **1. pygmaea**

1. E. pygmaea (L.) Brot., *Fl. Lusit.* **1**: 363 (1804). Stem 2–4(–5) cm. Cauline leaves 7–10 × 3 mm; rosette-leaves 5–15 × 2–5 mm, 2–3 times as long as the cluster, oblong-obovate, rounded, obtuse or shortly acute, patent. Clusters of capitula 5–35 mm wide, very compact, subglabrous. Involucral bracts (3–)4–4·3 × 1·5–1·8 mm, lanceolate-obovate to obovate, straight on the back, glabrous, brownish-yellow, cuspidate, with arista *c.* 1 mm. Achenes obovoid, papillose, rarely sparsely hairy. *Mediterranean region, S.E. Portugal.* Al Bl Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

[1] By J. Holub.

(a) Subsp. **pygmaea**: Lateral branches short, ascending; indumentum whitish; rosette-leaves somewhat rigid. Achenes 1·2–1·4 mm, dark brown, glabrous. *Throughout most of the range of the species.*

(b) Subsp. **ramosissima** (Mariz) R. Fernandes & Nogueira, *Bol. Soc. Brot.* ser. 2, **45**: 323 (1971): Lateral branches long, procumbent, then ascending; indumentum greyish; rosette-leaves soft. Achenes 0·7–1 mm, greenish-brown to pale brown, sometimes sparsely hairy. *S.E. Portugal, S. Spain.*

2. E. contracta Boiss., *Diagn. Pl. Or. Nov.* **2 (11)**: 3 (1849). Appressed-greyish-tomentose. Stem 1–4 cm. Rosette-leaves 15–30 × 3–5 mm, oblong- to oblanceolate-spathulate, acute, gradually narrowed and sheathing at base, erect, *c.* 4 times as long as the cluster. Clusters of capitula 5–15 mm wide, compact, rigid, embraced by narrow bases of rosette-leaves. Involucral bracts *c.* 3 × 1·2 mm, obovate or oblong-ovate, nearly straight on the back, subglabrous, brownish-yellow, cuspidate, with arista 0·5 mm. Achenes 1·1 × 0·5 mm, obovoid, pale brown, densely papillose. *S. Aegean region.* Cr Gr. (*N. Africa, S.W. Asia.*)

3. E. asterisciflora (Lam.) Pers., *Syn. Pl.* **2**: 422 (1807). Stem 3–13 cm, rigid, simple or branched. Cauline leaves 12–25 × 4–5 mm, linear-oblong to oblanceolate, spathulate, subopposite; rosette-leaves 15–40 × 3–7 mm, oblong-lanceolate, acuminate, subcoriaceous, appressed-hairy, *c.* 4 times as long as the cluster. Capitula numerous, in clusters 12–28 mm wide. Involucral bracts *c.* 3·5 × 1 mm, ovate-lanceolate, subglabrous, brownish-yellow, cuspidate or somewhat acuminate, with recurved arista *c.* 1 mm. Achenes *c.* 1 × 0·3 mm, narrowly obovoid, sparsely hairy, brown, emarginate at apex. *W. Mediterranean region, extending eastwards to S.E. Italy.* Hs It Sa Si. (*N.W. Africa.*)

This species has been so very often confused with others that the geographical data in the literature are unreliable.

4. E. carpetana Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1861**.: 69 (1861). Stem 0–7 cm, simple or with ascending lateral branches from the base. Cauline leaves 5–14 × 1–2·5 mm, lanceolate to oblong; rosette-leaves 7–18 × 1–2·5 mm, about twice as long as the cluster, linear-lanceolate to oblong-spathulate, subacute to acuminate, more or less rigid, whitish- to greyish-tomentose. Clusters of capitula 5–20 mm wide. Involucral bracts 4–4·5 mm, ovate-lanceolate to ovate, hairy on the back, stramineous, cuspidate, with arista 1·5–2 mm. Achenes *c.* 1 mm, oblong-obovoid, strongly compressed, more or less densely hairy with long, appressed hairs. ● *Spain and Portugal; one station in W. France.* Ga Hs Lu.

5. E. lusitanica Samp., *Ann. Sci. Acad. Polyt. Porto* **14**: 161 (1921). Very dwarf, greyish-tomentose. Rosette-leaves 15–18 × 7–8 mm, broadly obovate-spathulate, rounded at apex, mucronate or emarginate, patent, much longer than the cluster. Cluster of capitula 8–16 mm wide, compact; individual capitula 4–5 mm, not distinct. Involucral bracts *c.* 4 mm, obovate, stramineous, hairy, with a green spot on the back below the apex, cuspidate, with arista 1·5–2 mm. Achenes *c.* 1 mm, patent-villous, brown. *S. Spain, S.E. Portugal.* Hs Lu.

6. E. rotundata Moris, *Atti Riun. Sci. Ital.* **3**: 481 (1841). Stem 1–4 cm, usually with procumbent lateral branches spreading in a circle. Rosette-leaves in several rows, broadly obovate to suborbicular, slightly overtopping the cluster. Cluster of capitula 2–8 mm wide. Involucral bracts *c.* 3 × 0·6 mm, curved on the back, densely lanate above with only the very shortly pointed apex protruding. Achenes 0·8 × 0·3 mm, obovoid, pale brown, smooth or sparsely papillose. $2n=26$. *Maritime sands.* ● *Corse, Sardegna.* Co Sa.

7. E. perpusilla Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3 (3)**: 18 (1856). Lanate. Stem 0·5–2 cm, simple or branched from the base. Cauline leaves very few, crowded or absent; rosette-leaves 7–10 × 2·5–3 mm, oblong to ovate-lanceolate, about as long as the cluster. Capitula densely crowded, pyramidal-conical, in clusters 7–12 mm wide. Involucral bracts 15–20, 3–3·5 × 1–1·5 mm, oblong to lanceolate-obovate, patent-lanate with only the brownish apex protruding. Achenes 1·4 × 0·5–0·6 mm, oblong to obovoid, brown, long-papillose. ● *Mountains of S. & C. Greece.* Gr.

8. E. nevadensis Boiss., *Fl. Or.* **3**: 245 (1875) (*E. micropodioides* (Willk.) Willk.). Like **7** but stem 1–5 cm, simple or branched; cauline leaves several, not crowded; rosette-leaves oblong to obovate; involucral bracts more or less appressed-tomentose; achenes densely papillose. ● *Mountains of S. & E. Spain.* Hs.

17. Bombycilaena (DC.) Smolj.[1]

Lanate annuals. Leaves alternate, narrowed to the apex. Capitula 2–3, aggregated in terminal or axillary clusters, subglobose. Receptacle cylindrical. Bracts in 2(–3) rows, the outer small, the inner saccate, strongly compressed laterally, densely patent-lanate, coriaceous in fruit, each enclosing one female floret and falling together with the achene. Female florets with a filiform, 2-dentate corolla attached laterally to the ovary; inner florets sterile, with 5-dentate, broadly tubular corolla. Achenes obovoid, compressed; pappus absent.

Literature: L. A. Smoljaninova, *Not. Syst.* (*Leningrad*) **17**: 447–454 (1955).

The two species have been very often confused; both grow in dry, open habitats.

Clusters of capitula 8–10 mm wide, greyish-white-lanate, usually overtopped by subtending leaves; inner bracts 5–8, 2–3 mm in fruit; leaves 1·4–2·5 mm wide, ±undulate **1. erecta**
Clusters of capitula 10–16 mm wide, brownish-lanate, usually not overtopped by subtending leaves; inner bracts 4–5, 3–4 mm in fruit; leaves 2–5 mm wide, flat **2. discolor**

1. B. erecta (L.) Smolj., *Not. Syst.* (*Leningrad*) **17**: 450 (1955) (*Micropus erectus* L.). Plant greyish-white. Stems (1–)5–20 (–30) cm. Leaves 10–18 × 1·4–2·5(–3) mm, linear to oblong-lanceolate, more or less undulate at margin. Clusters of capitula 8–10 mm wide, subglobose, usually overtopped by subtending leaves. Inner bracts 5–8, 2–3 mm in fruit. Hermaphrodite florets 3–5. Achenes 1·3 × 1 mm, pale brown to grey. *Europe, southwards from N.C. France, S. Czechoslovakia and S. Moldavia.* ?Al Au Bu ?Cr Cz Ga ?Gr He Hs Hu It Ju *Lu Rm Rs (W, K, E) Sa Si.

2. B. discolor (Pers.) Laínz, *Bol. Inst. Estud. Astur.* (*Supl. Ci.*) **16**: 194 (1973) (*Micropus discolor* Pers., *M. bombicinus* Lag.). Plant whitish, except for the brownish clusters of capitula. Stem 5–20 cm. Leaves 12–17 × 2–5 mm, linear-oblong to oblong, flat. Clusters of capitula 10–16 mm wide, globose, not overtopped by subtending leaves. Inner bracts (2–)4–5(–6), 3–4 mm in fruit. Hermaphrodite florets 1–3. Achenes 1·5 × 1 mm, greenish. *Mediterranean region.* Bl Ga Gr Hs It.

[1] By J. Holub.

18. Micropus L.[1]

Like *Bombycilaena* but sericeous-tomentose; leaves opposite, widest near the apex; capitula solitary in the leaf-axils; bracts in 2 rows, the outer small, the inner saccate, connate at the base, crested on the keel.

1. M. supinus L., *Sp. Pl.* 927 (1753). Stem 2–20 cm, procumbent or ascending, rigid. Leaves 12–20 × 4–11 mm, oblong-obovate to obovate-spathulate, rounded to subacute at apex, flat. Capitula 5–7 mm wide. Outer bracts 1–1·2 mm, membranous, the inner 4–5, 5–8 mm in fruit, densely appressed-hairy. Female florets 4–5; hermaphrodite florets purplish, glabrous above. Achenes 2·3–2·5 × 1–1·3 mm, obliquely obovoid, pale brown, glabrous, shining. *Dry, open habitats. C. & S. Spain, S.E. Portugal; casual elsewhere in the Mediterranean region.* Hs Lu.

19. Evacidium Pomel[1]

Dwarf, tomentose annuals. Leaves alternate to subopposite. Capitula in terminal clusters subtended by leaves, immersed for ¾ of their length in lanate indumentum, pyramidal-conical, 5-angled. Receptacle obconical, convex at apex. Involucral bracts in 3 rows, keeled, the outer acute, the inner obtuse to emarginate at the apex. Florets not subtended by scales, the female filiform, in several rows at the margin, the functionally male few, in the middle of the receptacle. Achenes slightly compressed; pappus absent.

1. E. discolor (DC.) Maire, *Bull. Soc. Sci. Nat. Maroc* **11**: 101 (1931) (*Evax discolor* DC., *E. heldreichii* Parl.). Stems 1–3 cm, simple or branched from the base; branches ascending or erect. Cauline leaves 5–8 × 1·5–2 mm, linear-oblanceolate, greyish; leaves subtending the cluster about as long as the cluster, oblanceolate to obovate-spathulate, subacute. Cluster of capitula 7–15 mm wide, lanate, not dense. Involucral bracts 4·5–5 × 1 mm, rigid, dark green on the back, brownish and whitish at the apex. Achenes *c.* 1·4 × 0·6 mm, oblong-obovoid, greyish-brown, shining, minutely papillose. *Dry places. N. Sicilia (Madonie).* Si. (*N.W. Africa.*)

20. Omalotheca Cass.[1]

Tomentose perennials with non-flowering shoots. Leaves alternate. Capitula in a racemose or spicate terminal inflorescence, very rarely solitary. Receptacle without scales. Involucral bracts mottled, usually brownish; indurated tissue of the inner bracts entire. Florets tubular, fertile, the outer female, the inner hermaphrodite; hermaphrodite florets reddish-purple at apex. Achenes 1–2 mm, with imbricate papillae and hairs 6–7 times as long as wide, not emitting mucilage in water; pappus present. Pollen-grains with broad furrows, orbicular pores and slender spinules.

Literature: vide *Gnaphalium*.

1 Inflorescence with 10–150 capitula; stem 15–50 cm; pappus-hairs connate at base, falling as a unit
2 Plant sericeous-tomentose; cauline leaves 1-veined, lanceolate to linear, diminishing steadily in size upwards, the lower 3–8 mm wide, the upper 2–3 mm wide; bracts brownish or stramineous **1. sylvatica**
2 Plant ± floccose-tomentose; cauline leaves 3-veined, lanceolate, not diminishing in size until well above the middle of the stem, the lower 8–18 mm wide, the upper 4–8 mm wide; bracts dark brown **2. norvegica**
1 Inflorescence with (1–)2–10(–12) capitula; stem 2–20 cm; pappus-hairs free, falling separately
3 Outer bracts ⅓–¾ as long as the involucre; involucre broadly campanulate, with 2(–3) rows of bracts; hairs on achene 2-fid at apex **6. supina**
3 Outer bracts ⅓(–½) as long as the involucre; involucre broadly ovoid, with 3 rows of bracts; hairs on achene rounded at apex
4 Involucral bracts not stellate in fruit; lobes of the corolla in hermaphrodite florets little longer than wide; achenes sparsely patent-hairy, the hairs not covering the base of the pappus **3. hoppeana**
4 Involucral bracts stellate in fruit; lobes of the corolla in hermaphrodite florets much longer than wide; achenes densely appressed-hairy, the hairs covering the base of the pappus
5 Cauline leaves ± abruptly tapered to the apex; inflorescence rather compact; peduncles not longer than capitula; involucral bracts rounded above **4. roeseri**
5 Cauline leaves very gradually tapered to the apex; inflorescence very lax; peduncles of lower capitula longer than the capitula; involucral bracts subacute **5. pichleri**

Subgen. **Gamochaetiopsis** F. W. Schultz. Inflorescence with 10–150 capitula. Female florets in several rows. Achenes cylindrical; pappus-hairs slender, connate at base, falling as a unit.

1. O. sylvatica (L.) Schultz Bip. & F. W. Schultz in F. W. Schultz, *Arch. Fl. Jour. Bot.* 311 (1861) (*Gnaphalium sylvaticum* L.). Plant greyish-sericeous-tomentose, with several non-flowering shoots. Stem (5–)20–50(–70) cm, densely leafy. Leaves 2–8 × 0·2–0·8 cm, lanceolate to linear, 1 (or indistinctly 3)-veined, diminishing steadily in size up the stem, tomentose beneath, glabrescent above, erecto-patent. Inflorescence occupying ⅓–⅝ of the length of the stem, lax, interrupted below. Capitula 5–7 × 1·5–2 mm. Involucral bracts 5–5·5 mm, linear-oblong, the inner about equalling the florets. Florets 3·5 mm, the female *c.* 70, the hermaphrodite 3–4. Achenes 1·5 mm, hispid; pappus 3·5–3·8 mm, reddish. $2n = 56$. *Open woods, heaths and grassland; somewhat calcifuge. Most of Europe except many of the islands.* Al Au Be Br Bu Co Cz Da Fe Ga Ge Gr Hb He Ho Hs Hu Is It Ju No Po Rm Rs (N, B, C, W, K, E) Su.

Mountain variants with short stems, wider, shorter leaves, dense and short inflorescences, dark brown involucral bracts and leaves tomentose on both surfaces resemble **2**, but differ in the basal leaves with petiole shorter than the lamina, the cauline 1-veined, gradually diminishing in size up the stem, several non-flowering shoots, etc.

2. O. norvegica (Gunn.) Schultz Bip. & F. W. Schultz, *loc. cit.* (1861) (*Gnaphalium norvegicum* Gunn.). Plant more or less whitish-floccose-tomentose, usually with 1 non-flowering shoot. Stem (5–)15–30(–40) cm. Leaves 5–12 × 0·4–1·8 cm, lanceolate, few, 3(–5)-veined, patent, tomentose on both surfaces, the basal with petiole about as long as the lamina. Inflorescence occupying $\frac{1}{10}$–$\frac{1}{4}$ of the length of the stem, compact, its subtending leaves as long as or longer than the inflorescence. Capitula 6–7 mm. Involucral bracts subelliptical, the inner shorter than the florets. Florets 3·5 mm, the female 35–45. Achenes 1·5 mm, hispid; pappus up to 4 mm, white. $2n = 56$. *Woods, heaths and grassland; only on mountains except in the north. Europe, southwards to the Pyrenees, Alps, Bulgaria and C. Ural.* Al Au Br Bu Cz Fe Ga Ge He Hs Is It Ju No Po Rm Rs (N, C, W) Su.

Subgen. **Omalotheca.** Inflorescence with 1–10 capitula. Female florets in 1(–2) rows. Achenes obovoid, compressed; pappus-hairs stout, free, falling separately.

[1] By J. Holub.

3. O. hoppeana (Koch) Schultz Bip. & F. W. Schultz, *loc. cit.* (1861) (*Gnaphalium hoppeanum* Koch). Stem 3–15 cm. Leaves 2–4 mm wide, lanceolate-spathulate to linear-lanceolate, abruptly contracted at the apex, 1(–3)-veined. Capitula 5–7 mm, very shortly pedunculate. Involucre broadly ovoid at anthesis, campanulate in fruit; bracts in 3 rows, the outer ⅓(–½) as long as involucre. Florets 3·5 mm; lobes of the corolla in hermaphrodite florets little longer than wide. Achenes 1·5–2 mm, shortly and sparsely patent-hairy, the hairs rounded at apex and not covering the base of the pappus. *Rocky and grassy places in the mountains; calcicole.* ● *C. Europe, from the W. Alps and Jura to the W. Carpathians; Italy and N.W. part of Balkan peninsula.* Al Au Cz Ga Ge He It Ju Po.

4. O. roeseri (Boiss. & Heldr.) J. Holub, *Bot. Jour. Linn. Soc.* **71**: 271 (1976) (*Gnaphalium roeseri* Boiss. & Heldr.). Stem 2–12 cm. Leaves oblong to linear-lanceolate, the cauline 30–60 × 2–5 mm, 3-veined, abruptly contracted at the apex. Inflorescence rather compact at anthesis. Capitula 3 mm, very shortly pedunculate. Involucral bracts obtuse, the outer ⅓ as long as the involucre, the inner sparsely tomentose on the back, stellate in fruit. Female florets few, the hermaphrodite 3–3·5 mm, many, with corolla-lobes up to 0·5 mm. Achenes 1·5 mm, densely appressed-hairy, the hairs rounded at apex, covering the base of the pappus. *Mountain rocks.* ● *C. & S. Greece.* Gr.

5. O. pichleri (Murb.) J. Holub, *loc. cit.* (1976) (*Gnaphalium pichleri* Murb.). Like **4** but stem 5–20 cm; cauline leaves 40–100 × 2–4 mm, 1-veined, very gradually tapered to the apex; inflorescence very lax and interrupted; capitula 4 mm, the lower with peduncules longer than the capitulum; outer bracts acute, the inner densely tomentose on the back. *Mountain rocks.* ● *S.W. Jugoslavia and N. Albania.* Al Ju.

6. O. supina (L.) DC., *Prodr.* **6**: 245 (1838) (*Gnaphalium supinum* L.). Plant with numerous non-flowering shoots. Stem 2–12(–20) cm. Leaves 5–20(–25) × 1–3 mm, linear-oblanceolate to linear-lanceolate, 1-veined, greyish-tomentose. Capitula 5–6 × 7–8 mm, shortly pedunculate, broadly campanulate. Involucral bracts in 2(–3) rows, soon stellate-patent, the outer (½–)⅔ as long as involucre. Female florets *c.* 3·4 mm, few, in 1(–2) rows; hermaphrodite florets 3 mm, with short corolla-lobes. Achenes 1–1·5 mm, shortly hairy, the hairs 2-fid at apex, not covering the base of the pappus. $2n = 28$. *Snow-patches and other wet, open habitats; calcifuge. N. Europe and mountains of C. and S. Europe.* Al Au Br Bu Co Cz Fa Fe Ga Ge Gr He Hs Is It Ju No Po Rm Rs (N, C, W) Sa Su.

Plants from the southernmost part of the range of the species have a white-lanate, lax indumentum, often solitary capitula and less hairy, smaller achenes. They may represent a subspecies, but further investigation is required.

21. Gamochaeta Weddell[1]

Appressed-tomentose annuals to perennials, without non-flowering shoots. Basal leaves in a rosette. Capitula in groups subtended by 1 leaf, forming a terminal, spicate, more or less leafy inflorescence. Receptacle without scales. Involucral bracts imbricate, brownish; indurated middle portion of the inner bracts not sulcate. Hermaphrodite florets reddish-purple at apex. Achenes 0·4–0·9 mm, smooth, without papillae, mucilaginous when wet; pappus-hairs not ciliate at base, connate in a basal ring, falling as a unit.

[1] By J. Holub.

Literature: D. G. Drury, *New Zealand Jour. Bot.* **9**: 157–185 (1971).

Dead basal leaves usually absent at anthesis; cauline leaves ± equally hairy on both surfaces, the upper folded and falcate; inflorescence occupying (⅓–)½ of the length of the stem; capitula 3–3·5 mm **1. subfalcata**
Dead basal leaves persisting in a rosette at anthesis; cauline leaves subglabrous above, tomentose beneath, plane and straight; inflorescence occupying at most ¼ of the length of the stem; capitula 4–5 mm **2. purpurea**

1. G. subfalcata (Cabrera) Cabrera, *Bol. Soc. Argent. Bot.* **9**: 383 (1961) (*Gnaphalium subfalcatum* Cabrera, *G. falcatum* auct., non Lam.). Stem 10–35 cm, branched only at base; branches ascending. Basal leaves oblanceolate, not persisting at anthesis; cauline leaves 1·5–5 × 0·3–1·2 cm, linear to linear-oblanceolate, the lower plane, the upper folded and falcate, all more or less equally hairy on both surfaces. Inflorescence interrupted below, occupying (⅓–)½ of the length of the stem. Capitula 3–3·5 × 2–2·5 mm, glabrescent. Outer involucral bracts ovate, acute. *Rice-fields and roadsides. Naturalized in C. & S. Portugal.* [Lu.] (*North & South America.*)

2. G. purpurea (L.) Cabrera, *op. cit.* 377 (1961) (*Gnaphalium purpureum* L.). Stem 10–40 cm, erect, usually simple. Basal leaves spathulate to oblanceolate, dead but persisting at anthesis; cauline leaves 1–4 × 0·5–1·5 cm, plane and straight, lanceolate-spathulate, subglabrous above, tomentose beneath. Inflorescence *c.* 4 cm, occupying at most ¼ of the length of the stem, sometimes interrupted below. Capitula 4–5 × 4–5 mm. Outer involucral bracts ovate-lanceolate, acuminate. $2n = 28$. *Wet places. Naturalized in Açores and Portugal.* [Az Lu.] (*North America.*)

22. Filaginella Opiz[1]

Annuals without non-flowering shoots. Leaves alternate. Clusters of capitula terminal and axillary, subtended by leaves. Receptacle without scales. Involucral bracts herbaceous and scarious, mottled; indurated tissue of inner bracts in irregular patches. All florets tubular, fertile. Achenes 0·4–0·7 mm, terete, not papillose, glabrous or hairy; hairs 2–4 times as long as wide, emitting mucilage in water. Pappus-hairs filiform, fragile, free, not ciliate at base, falling separately. Pollen-grains with narrow, shallow furrows, ovate pores and short, broadly conical spinules.

Literature: vide *Gnaphalium*.

1. F. uliginosa (L.) Opiz, *Abh. Böhm. Ges. Wiss.* ser. 5, **8** (Sitzungsber. Sect.): 52 (1854) (*Gnaphalium uliginosum* L.). Stem (1–)5–20 cm. Leaves 10–50 × 2–5(–8) mm, linear-lanceolate to oblong-obovate. Capitula 3–4 × 5 mm, sessile, in clusters of 3–10, overtopped by subtending leaves. Involucral bracts oblong to linear, brownish. Female florets 50–150, the hermaphrodite 5–8. Achene 0·5 mm, oblong-cylindrical; pappus 1·5 mm. $2n = 14$. *Damp places. Most of Europe.* ?Al Au Be Br Bu ?Cr Cz Da Fe Ga Ge Gr Hb He Ho Hs Hu Is It Ju Lu No Po Rm Rs (N, B, C, W, K, E) Su Tu.

1 Stems 1–3 mm thick at base, with a dense, continuous, appressed white-lanate indumentum, often woody; leaves oblong-obovate to oblong-spathulate; female florets more than 100 in each capitulum **(d)** subsp. **rossica**
1 Stems 0·5–2 mm thick at base, rather patent-tomentose, ± herbaceous; leaves linear-lanceolate to oblong-lanceolate; female florets not more than 100 in each capitulum
2 Lower leaves in a rosette, persistent when dead; lateral branches ascending to erect, ± parallel to the main stem **(c)** subsp. **kasachstanica**

2 Lower leaves not in a rosette, not persistent when dead; lateral branches patent to suberect
3 Plant light green; stems glabrous below; dense, white-lanate indumentum restricted to bases of clusters of capitula **(b)** subsp. **sibirica**
3 Plant greyish or whitish; stems usually lanate ± throughout; indumentum of the bases of clusters of capitula similar to that of the other parts of the plant **(a)** subsp. **uliginosa**

(a) Subsp. **uliginosa**: Stem usually much-branched; branches divaricate, patent, the plant normally orbicular to ovate in outline. All clusters similar in size. *Throughout the range of the species, except the S. part of U.S.S.R.*

(b) Subsp. **sibirica** (Kirp.) J. Holub, *Bot. Jour. Linn. Soc.* **71**: 271 (1976) (*Gnaphalium sibiricum* Kirp.): Stem usually branched from the base; branches divaricate, patent to suberect, the plant ovate, cylindrical or obovate in outline. Terminal cluster much larger than other clusters. Capitula sometimes very dark coloured. *N. & N.E. Russia.*

(c) Subsp. **kasachstanica** (Kirp.) J. Holub, *loc. cit.* (1976) (*Gnaphalium kasachstanicum* Kirp.): Stem greyish-tomentose; branches ascending to erect, more or less parallel to the main stem, the plant cylindrical in outline. *W. Kazakhstan.* (*Kazakhstan.*)

(d) Subsp. **rossica** (Kirp.) J. Holub, *loc. cit.* (1976) (*Gnaphalium rossicum* Kirp.): Stem usually much-branched; branches divaricate, patent, the plant orbicular to ovate in outline. *S. part of U.S.S.R., E.C. Europe.*

Subsp. **(a)** is a very polymorphic taxon, with mostly phenotypic variation. Plants with hairy achenes have been called **Gnaphalium uliginosum** subsp. **pilulare** (Wahlenb.) Nyman, *Consp.* 382 (1879), but this character seems not to be correlated with any other. Glabrous plants with glabrous achenes and smaller capitula have been called subsp. **nudum** (Hoffm.) Nyman, *loc. cit.* (1879). Their status requires further investigation.

23. Gnaphalium L.[1]

Tomentose annuals without non-flowering shoots. Leaves alternate, semiamplexicaul. Clusters of capitula without subtending leaves, in a terminal corymbose to paniculate or cymose inflorescence. Capitula ovoid to cylindrical. Receptacle flat, without scales. Involucral bracts imbricate, scarious, entirely white or yellow, shining; indurated middle portion of the inner bracts sulcate. Florets tubular, the outer female, in 2–4 rows, the inner hermaphrodite. Achenes short, subterete; pappus-hairs filiform, fragile, free, ciliate at the base, falling in small groups. Pollen-grains with narrow, shallow furrows, ovate pores and short, broadly conical spinules.

Literature: M. E. Kirpicznikov & L. A. Kuprianova, *Acta Inst. Bot. Acad. Sci. URSS* (*Ser.* 1) **9**: 7–37 (1950).

Leaves not decurrent, white-tomentose on both surfaces, not asperous above; stem 8–40 cm **1. luteo-album**
Leaves decurrent, green and asperous above, white-tomentose beneath; stem 30–80 cm **2. undulatum**

1. G. luteo-album L., *Sp. Pl.* 851 (1753). Stem 8–40(–50) cm, erect or ascending, simple or branched. Cauline leaves (1–)2–5(–7) cm, oblong to linear, not decurrent, white-tomentose on both surfaces, the lower obtuse. Corymb small, dense. Capitula sessile, ovoid, in semiglobose clusters of 4–12. Involucral bracts yellowish, glabrous, obtuse, the outer broadly ovate, the inner oblong. Florets *c.* 3 mm, yellowish, reddish above, the hermaphrodite 4–7(–10). Achenes 0·5 mm, tuberculate, glabrous or hairy; pappus 2–2·5 mm. $2n=14$. *Damp, usually sandy places. Europe, northwards to S. England, S. Sweden and Latvia.* Au Az Be Bl Br Bu Co Cr Cz Da Ga Ge Gr He Ho Hs Hu It Ju Lu Po Rm Rs (B, C, W, E) Sa Si Su Tu.

2. G. undulatum L., *Sp. Pl.* 852 (1753). Stem (20–)30–80(–90) cm, robust, erect, branched; branches divaricate or erect. Leaves 2–5 cm, oblong-lanceolate, decurrent, acute, green and asperous above, white-tomentose beneath. Corymb large, lax, sometimes paniculate. Capitula lanate at the base, white or yellow, subsessile, in often globose clusters. Involucral bracts white, glabrous, obtuse. Florets *c.* 3 mm. Achenes 0·5–0·6 mm, minutely papillose; pappus *c.* 3 mm. *Roadsides and waste places. Naturalized in N.W. France, Channel Islands and S. Italy.* [Ga It.] (*South Africa.*)

24. Helichrysum Miller[2]

Herbs or dwarf shrubs, often lanate or tomentose. Leaves alternate, simple, entire. Capitula small to medium, solitary or aggregated into compound corymbs. Involucre cylindrical-campanulate to hemispherical; involucral bracts numerous, imbricate, scarious, white or coloured at least distally. Florets yellow, all tubular, the outer usually female, the inner hermaphrodite, more numerous; rarely all hermaphrodite. Pappus of scabrid or shortly plumose hairs.

The distinction from *Gnaphalium*, in which female florets outnumber the hermaphrodite, is not clear-cut.

1 Involucre about equalling the florets, remaining erect or nearly so throughout anthesis
2 All or most of the leaves with revolute margins
3 Herbaceous perennial; upper leaves narrowly linear **13. arenarium**
3 Dwarf shrub **(5–10). stoechas** group
2 All or most of the leaves flat, their margins not revolute
4 Involucre 7–10 mm in diameter **11. orientale**
4 Involucre 4–5 mm in diameter
5 Stem and leaves densely glandular **12. plicatum**
5 Stem and leaves eglandular
6 Indumentum of leaves and stems appressed-tomentose, greyish-white; all florets hermaphrodite **13. arenarium**
6 Indumentum often yellowish-green, sparsely to densely villous-lanate; outer florets female **14. graveolens**
1 Involucre greatly exceeding the florets, becoming patent
7 Annual or biennial herb
8 Cauline leaves sessile, amplexicaul, white-tomentose beneath; capitula clustered **15. foetidum**
8 Cauline leaves shortly petiolate, green beneath; capitula solitary **16. bracteatum**
7 Caespitose or woody perennial
9 Involucre yellow **11. orientale**
9 Involucre white
10 Leaves not more than 5 mm, all linear-oblong, closely imbricate **4. frigidum**
10 Some leaves more than 15 mm, oblong-spathulate to narrowly oblanceolate
11 Flowering stems 10–30 cm; capitula at least 5 **1. amorginum**
11 Flowering stems 5–10 cm; capitula 1–4
12 Rosette-leaves and lower cauline leaves 15–60 × 5–10 mm **2. sibthorpii**
12 Rosette-leaves 5–10(–15) mm; lower cauline leaves 20–30 × 2–4 mm **3. doerfleri**

Sect. VIRGINEA (DC.) Fiori. Capitula solitary, terminal, or in a more or less compact corymb; involucre much exceeding the florets; bracts white, at first erecto-patent, then patent, the middle usually the longest.

[1] By J. Holub.

[2] By A. R. Clapham.

1. H. amorginum Boiss. & Orph. in Boiss., *Diagn. Pl. Or. Nov.* **3(5)**: 110 (1856). Perennial 10–30 cm. Stems white-tomentose, erect or ascending from the branched woody stock. Leaves white-tomentose, flat, or the uppermost with revolute margins; lower 20–40 mm, crowded, oblong-spathulate; upper distant, smaller, linear, subsessile, suberect or arcuate. Inflorescence 3–5 cm across, compact; involucre 10–15 mm in diameter; bracts white, ovate-oblong, rounded at the apex, laxly imbricate. *Cliffs.* ● *Kikladhes* (*Amorgos*). Gr.

H. taenari Rothm., *Bot. Jahrb.* **73**: 443 (1944), described from near the southernmost point of Greece (Akr. Tainaron), is like **1** but has narrower leaves which are sparsely hairy and dark green and smaller capitula. It is probably not specifically distinct.

2. H. sibthorpii Rouy, *Ill. Pl. Eur. Rar.* **13**: 103 (1900) (*H. virgineum* (Sibth. & Sm.) Griseb., non DC.). Caespitose perennial 5–10 cm. Stems decumbent or ascending from the woody base, white-tomentose. Leaves white-tomentose; basal 15–60 × 5–10 mm, oblong-spathulate; upper shorter, linear-spathulate. Capitula 1–3, shortly pedunculate; involucre *c.* 15 mm in diameter; bracts white, ovate-oblong, obtuse, laxly imbricate. *Mountain cliffs.* ● *N.E. Greece* (*Athos*). Gr.

3. H. doerfleri Rech. fil., *Magyar Bot. Lapok* **33**: 15 (1934). Like **2** but more densely pulvinate-caespitose, with flowering stems not more than 8 cm, often much less; basal leaves 5–10(–15) × 2–3 mm; cauline leaves numerous, the lower 20–30 × 2–4 mm, oblanceolate-spathulate, acute, the upper narrowly linear; capitula (1–)2–4; outer involucral bracts ovate, the inner lanceolate, becoming erose or lacerate at apex. *Mountain cliffs.* ● *E. Kriti.* Cr.

4. H. frigidum (Labill.) Willd., *Sp. Pl.* **3**: 1908 (1803). Caespitose mat-forming perennial 5–15 cm, with numerous short non-flowering shoots and longer flowering stems, all decumbent or ascending. Leaves 2–5 mm, crowded, closely imbricate, linear-oblong, obtuse, flat, white-tomentose on both surfaces. Capitula solitary at the ends of main stems and branches; involucre 8–15 mm in diameter; bracts white, ovate-elliptical to oblong-lanceolate, subacute. Achenes sericeous. $2n=28$. *Rock-crevices.* ● *Mountains of Corse and Sardegna.* Co Sa.

Sect. HELICHRYSUM. Capitula in a more or less compact terminal corymb; involucre about equalling the florets; bracts yellow, rarely white, erect during anthesis, the innermost the longest.

(5–10). H. stoechas group. Woody perennials with more or less densely tomentose, erect, ascending or decumbent stems. Leaves linear, rarely spathulate; margins revolute. Inflorescence of 5 to many capitula in a more or less dense cluster. Involucre globose to cylindric-campanulate or cylindrical before anthesis, shining, yellow. Achenes dark brown.

1 Involucre cylindric-campanulate to cylindrical just before anthesis; bracts closely and regularly imbricate, the outer ± coriaceous; aromatic
2 Lower leaves usually less than 30 mm, linear-filiform; inner involucral bracts at least 5 times as long as the outer; involucre narrowly campanulate at anthesis **10. italicum**
2 Lower leaves 30–70 mm, linear to linear-spathulate; inner involucral bracts *c.* 3 times as long as the outer; involucre cylindric-campanulate at anthesis **9. saxatile**
1 Involucre ovoid to globose before anthesis; bracts rather laxly imbricate, the outer entirely scarious
3 Leaves usually less than 25 mm, linear to narrowly spathulate, sometimes aromatic **5. stoechas**
3 Leaves usually more than 30 mm, often much longer, linear to lanceolate or spathulate, not aromatic
4 Involucre 3–4 mm in diameter; leaves linear **7. heldreichii**
4 Involucre 4–7 mm in diameter
5 Lower leaves usually *c.* 7 mm wide, spathulate **8. ambiguum**
5 Lower leaves usually 2–3 mm wide, linear to lanceolate **6. rupestre**

5. H. stoechas (L.) Moench, *Meth.* 575 (1794). Stems (5–)10–50(–100) cm. Leaves (3–)10–25(–50) mm, narrowly linear to linear-spathulate, white-tomentose to lanate, sometimes glabrescent above, rarely also beneath. Inflorescence 1·5–3(–6) cm across; involucre 4–6 mm in diameter, globose to broadly ovoid in bud, bracts laxly imbricate, eglandular or nearly so; outer shortest and widest, scarious, glabrous or somewhat lanate at base; middle narrower and coriaceous in lower half, abruptly widened and scarious above; inner narrowest. Achenes with numerous shining white glands. $2n=28$. *Dry places. S. & W. Europe, northwards to N.W. France.* Al Bl Cr Ga Gr Hs It Ju Lu Sa Si Tu.

Very variable, from dwarf, caespitose, short-leaved to more or less erect, long-leaved variants up to 100 cm. Many local taxa have been described and named but for the most part they intergrade and seem not to merit subspecific rank. The following subspecies are recognized provisionally.

(a) Subsp. **stoechas**: Leaves usually more than 20 mm, narrowly linear, strongly aromatic. Inflorescence lax to compact. Inner involucral bracts usually at least 3 times as long as the obtuse outer bracts. *From W. Jugoslavia westwards.*

(b) Subsp. **barrelieri** (Ten.) Nyman, *Consp.* 381 (1879) (*Gnaphalium barrelieri* Ten.; incl. *H. siculum* (Sprengel) Boiss., non Jordan & Fourr., *H. scandens* Guss.): Leaves usually less than 20 mm, usually broadly linear to narrowly spathulate, not or scarcely aromatic. Inflorescence compact. Inner involucral bracts rarely more than twice as long as the acute outer bracts. *From Sicilia eastwards to Turkey.*

Usually less robust and more densely tomentose than subsp. **(a)** and rarely more than 30 cm. Small caespitose variants from Kriti and Greece have spathulate lower leaves only 3–5 mm (*H. decumbens* var. *spathulatum* Raulin). Plants from S. Spain, Islas Baleares and S. France which have been named **H. decumbens** Camb., *Mém. Mus. Hist. Nat.* (*Paris*) **14**: 271 (1827), or **H. cespitosum** DC., *Prodr.* **6**: 182 (1838), non (Lam.) DC., resemble subsp. **(b)** in not being aromatic and often also in their leaves and capitula. Their taxonomic status requires investigation.

6. H. rupestre (Rafin.) DC., *Prodr.* **6**: 182 (1838). Not aromatic. Stems 10–60 cm, angular. Basal leaves 30–80(–120) mm, linear to narrowly lanceolate or oblanceolate, rarely more than 3 mm wide, narrowest just above the base, white-tomentose on both surfaces. Inflorescence (2–)3–7 cm across; involucre 4–7 mm in diameter, broadly ovoid in bud, becoming patent; bracts laxly imbricate, glabrous, or sparsely lanate at base, the inner usually not more than twice as long as the outer, oblong, acute, scarious. Achenes minutely tuberculate. *Calcareous cliffs and walls. W. & C. Mediterranean region.* Bl Hs It Sa Si.

More robust and with longer leaves than **5** but resembling subsp. **(b)** in the not very unequal involucral bracts and in not being aromatic. Local populations differing in the length and breadth of the leaves, the form of the inflorescence and the shape of the unopened capitula have often been given specific or subspecific rank. Among these are **H. panormitanum** Tineo ex Guss., *Fl. Sic. Syn.* **2**: 467 (1844), **H. nebrodense** Heldr., *Flora* (*Regensb.*) **27**: 67 (1844), **H. pendulum** (C. Presl) C. Presl, *Fl. Sic.* xxix (1826),

and **H. stramineum** Guss., *Fl. Sic. Syn.* **2**: 467 (1844), all from Sicilia, **H. fontanesii** Camb., *Mém. Mus. Hist. Nat.* (*Paris*) **14**: 270 (1827), from Islas Baleares, and **H. boissieri** Nyman, *Consp.* 381 (1879), from Gibraltar. The status of these taxa is uncertain.

7. H. heldreichii Boiss., *Fl. Or.* **3**: 229 (1875). Like **6** but leaves linear; inflorescence compact; involucre 3–4 mm in diameter; bracts narrowly ovate, lanate at base. *Cliffs.* ● *W. Kriti.* Cr.

8. H. ambiguum (Pers.) C. Presl, *Fl. Sic.* xxix (1826) (*H. lamarckii* Camb.). Like **6** but basal leaves and those of non-flowering shoots usually 20–60 mm, oblong-spathulate to spathulate, rarely less than 7 mm wide; involucre ovoid in bud, becoming campanulate; bracts fairly closely imbricate, the inner *c.* 4 times as long as the outer, ovate-oblong, obtuse; achenes covered with white glands. $2n=28$. *Calcareous cliffs.* ● *Islas Baleares.* Bl.

9. H. saxatile Moris, *Fl. Sard.* **2**: 387 (1840–1843). Aromatic. Stems 15–60 cm, not or slightly angular. Lower leaves 20–70 mm, linear-spathulate to linear-oblanceolate, obtuse, tomentose on both surfaces or glabrescent and greenish above. Inflorescence 2–10 cm across; involucre 4–5 mm in diameter, cylindric-campanulate, later widening; bracts fairly closely imbricate, obtuse, the inner not more than 3 times as long as the outer, the outer ovate, coriaceous throughout or scarious above, the inner narrower and more completely scarious. Achenes minutely papillose. *Calcareous rocks and cliffs.* ● *Sardegna*; *Pantelleria.* Sa Si.

(a) Subsp. **saxatile**: Outer involucral bracts sparsely lanate. *Sardegna.*

(b) Subsp. **errerae** (Tineo) Nyman, *Consp.* 381 (1879): Outer involucral bracts densely tomentose. *Pantelleria.*

10. H. italicum (Roth) G. Don fil. in Loudon, *Hort. Brit.* 342 (1830). Aromatic. Stems (10–)20–50 cm, angular. Leaves (5–)10–30(–40) mm, narrowly linear, greenish and sparsely tomentose to glabrescent or rarely white-tomentose. Inflorescence 1·5–8 cm across; involucre 2–4 mm in diameter, oblong-cylindrical to narrowly campanulate; bracts closely and regularly imbricate, all, except usually the outermost, glandular, the inner at least 5 times as long as the outer, narrowly oblong to linear, scarious, the outer broadly rounded, coriaceous, usually tomentose. Achenes with scattered shining white glands or eglandular. $2n=28$. *Dry places. S. Europe.* Bl Co Cr Ga Gr Hs It Ju Lu Sa Si.

1 Achenes eglandular; involucre 3–4 mm in diameter
(c) subsp. **serotinum**
1 Achenes with scattered white glands; involucre 2–3 mm in diameter
2 Involucre 2–3 mm in diameter; outer bracts eglandular; lower leaves usually 20–50 mm (a) subsp. **italicum**
2 Involucre 2 mm in diameter; outer bracts glandular on the outside; leaves rarely more than 10 mm
(b) subsp. **microphyllum**

(a) Subsp. **italicum**: Up to 50 cm. Lower leaves usually 20–50 mm. Non-flowering shoots without axillary fascicles of leaves. Involucre 2–3 mm in diameter; outer bracts eglandular. Achenes with scattered white glands. *Almost throughout the range of the species.*

(b) Subsp. **microphyllum** (Willd.) Nyman, *Consp.* 382 (1879): 10–30(–40) cm, less robust. Lower leaves 5–10 mm. Non-flowering shoots with numerous axillary fascicles of leaves. Involucre *c.* 2 mm in diameter; outer bracts glandular. Achenes with scattered white glands. *Coastal cliffs and rocks. Islands of the Mediterranean region.*

(c) Subsp. **serotinum** (Boiss.) P. Fourn., *Quatre Fl. Fr.* 952 (1940): Usually not more than 40 cm. Lower leaves up to 40 mm. Non-flowering shoots without axillary fascicles of leaves. Involucre 3–4 mm in diameter; outer bracts eglandular. Achenes eglandular. $2n=28$. *S.W. Europe.*

Flowers later than subspp. (a) and (b).

H. litoreum Guss., *Fl. Sic. Syn.* **2**: 468 (1844) combines the 30–60 mm long, linear leaves of some variants of **6** with the small cylindrical capitula of **10**, but the involucral bracts are less regularly imbricate, and the outer bracts are often subacute and somewhat longer than in **10**. It occurs on coastal cliffs and rocks in S. Italy and the Sicilian archipelago, but not in Sicilia itself.

11. H. orientale (L.) Gaertner, *Fruct. Sem. Pl.* **2**: 404 (1791). Perennial 12–30 cm. Stems erect or ascending from the branched woody stock, densely lanate. Leaves densely white-lanate; basal 20–60 mm, usually crowded, oblong-spathulate, obtuse, narrowed into the long petiole; upper shorter and narrower. Inflorescence 2–8 cm across; involucre 7–10 mm in diameter, hemispherical, shining yellow; inner bracts at least 3 times as long as the outer, linear-spathulate, the outer ovate-orbicular, glabrous. *Lowland cliffs. Greece and Aegean region.* Cr Gr [Rm].

H. zivojinii Černjavski & Soška, *Feddes Repert.* **49**: 282 (1940), is intermediate between **11** and **12** and has greyish-white-tomentose, sparsely glandular stems and leaves, the lower leaves *c.* 70 × 6 mm, narrowly spathulate-lanceolate, and subglobose capitula 7–8 mm in diameter. It occurs on calcareous cliffs at 1000–1700 m in S. Jugoslavia (S. of Ohrid).

12. H. plicatum DC., *Prodr.* **6**: 183 (1838). Perennial 20–40 cm. Stems erect or ascending from the branched woody stock, glandular-puberulent. Leaves green, glandular and viscid, somewhat lanate on the margin and on the veins beneath; basal crowded, oblong-spathulate, narrowed into the petiole, withering early; lower cauline 30–40 mm, oblong-spathulate, obtuse, sessile, shortly decurrent; upper cauline smaller, linear-lanceolate, acute to acuminate, with somewhat revolute margin. Inflorescence 2–6 cm across; involucre *c.* 5 mm in diameter, subglobose to widely campanulate; bracts shining yellow, glabrous, often longitudinally plicate, rather laxly imbricate, the inner *c.* 3 times as long as the outer, linear-oblong, subacute, the outer ovate, obtuse. Achenes brown, minutely white-tuberculate. *Dry mountain pastures. S. part of Balkan peninsula.* Al Gr Ju.

13. H. arenarium (L.) Moench, *Meth.* 575 (1794). Herbaceous perennial 8–30(–50) cm. Plant not sweet-smelling. Stems erect or ascending from the stout, branched stock, appressed-lanate, greyish-white. Leaves more or less densely whitish-tomentose; lower 50–70 mm, obovate-oblong, obtuse, 1-veined, narrowed into the petiole; upper narrowly oblong-lanceolate to filiform, subacute, not apiculate. Non-flowering shoots with rosettes of broadly spathulate, petiolate leaves. Inflorescence 2–5 cm across; involucre 4–5 mm in diameter, subglobose, becoming hemispherical, yellow to reddish-orange, shining; bracts closely imbricate, the inner 5 times as long as the outer, narrowly spathulate, the outer suborbicular, somewhat tomentose at base. Outer florets hermaphrodite. Achenes scabrid. $2n=$?14, 28. *Dry, sandy places. From the Netherlands, S. Sweden and Estonia southwards to S. Germany, S. Bulgaria and W. Kazakhstan.* Au Be Bu Cz Da Ga Ge Ho Hu Ju Po Rm Rs (B, C, W, K, E) Su.

(a) Subsp. **arenarium**: Upper leaves oblong-lanceolate to broadly linear; margin usually flat. *Throughout the range of the species.*

(b) Subsp. **ponticum** (Velen.) Clapham; *Bot. Jour. Linn. Soc.* **70**: 18 (1975) (*H. arenarium* var. *ponticum* Velen.): Upper leaves narrowly linear to filiform; margin strongly revolute. *W. shore of Black Sea.*

Intermediates between subspp. (a) and (b) have been reported, and **H. buschii** Juz., *Spisok Rast. Gerb. Fl. SSSR* **13**: 97 (1955), is stated to be a hybrid between subsp. (a) and **14**.

14. H. graveolens (Bieb.) Sweet, *Hort. Brit.* 223 (1826). Like **13** but sweet-smelling; stems arising from slender, creeping underground stolons; indumentum laxer, villous-lanate and plant often yellowish-green; basal leaves distinctly 3-veined, the upper cauline often apiculate; outer florets female. *Damp mountain grassland and open pine forest. Krym.* Rs (K). (*S.W. Asia.*)

Sect. XEROCHLAENA (DC.) Bentham. Herbs; leaves with flat margin; capitula medium, solitary or in a terminal cluster; involucre exceeding the florets; bracts variously coloured, erecto-patent at first, later patent, the middle the longest.

15. H. foetidum (L.) Cass., *Dict. Sci. Nat.* **25**: 469 (1822). Foetid biennial 20–100 cm. Leaves 30–70 mm, green and sparsely pubescent above, white-tomentose beneath, the lowest oblong, narrowed into a long petiole; middle and upper broadly lanceolate-cordate, sessile and amplexicaul. Inflorescence compact; involucre 15–20 mm in diameter when open; bracts stramineous, shining, ovate, acute. Achenes minutely tuberculate. $2n=14$. *Naturalized on maritime rocks and sands and on roadsides in W. Europe.* [Ga Hs Lu.] (*S. Africa.*)

16. H. bracteatum (Vent.) Andrews, *Bot. Reposit.* **6**: sub t. 428 (1805). Annual 40–120 cm, not aromatic. Stems erect, robust, branched, scabrid. Leaves 50–120 cm, oblong-lanceolate, acuminate, shortly petiolate, green and more or less glabrous on both surfaces. Capitula solitary, 25–70 mm in diameter; involucral bracts coriaceous below, scarious and shining above; outer short, suborbicular; middle lanceolate; inner narrow, acuminate. Achenes glabrous. *Cultivated for ornament and locally naturalized in Spain.* [Hs.] (*Australia.*)

Some variants have golden-yellow involucral bracts and others have the outer bracts red and the rest white.

H. petiolare Hilliard & B. L. Burtt, *Notes Roy. Bot. Gard. Edinb.* **32**: 357 (1973) (*H. petiolatum* auct., non (L.) DC.), a white-tomentose woody perennial 20–40 cm, with ovate leaves 15–25 mm, abruptly narrowed into the petiole, and terminal corymbs of creamy-white capitula 3 mm in diameter, is more or less naturalized in hedges and by roads in W.C. Portugal. It is commonly cultivated for its ornamental foliage under the name of *Gnaphalium lanatum* hort. and is native of S. Africa.

25. Lasiopogon Cass.[1]

Annuals, much-branched from base; lateral stems procumbent, spreading in a circle. Leaves alternate. Capitula small, 3–6 aggregated in terminal clusters. Receptacle flat, without scales. Involucral bracts in 1–2 rows, the inner scarious, longer than the florets, patent in fruit. Florets all tubular; female in 1 or more rows, filiform, the corolla entire; hermaphrodite few, in the middle of the receptacle, the corolla widening upwards, 4-dentate. Achenes slightly compressed; pappus hairs plumose, deciduous.

1. L. muscoides (Desf.) DC., *Prodr.* **6**: 246 (1838). Whitish-tomentose, pulvinate herb. Lateral stems 5–12 cm, slender. Cauline leaves 1–3 × 0·4–0·7 mm, oblanceolate, obtuse, remote; leaves subtending clusters of capitula 3–7 × 1–2 mm, oblong-spathulate. Inner involucral bracts *c.* 2·2 × 0·5 mm, lanate on the back, with scarious margin, glabrous and rounded at the apex, pale brown, shining in fruit. Female florets more than 10, the hermaphrodite 3–4. Achenes 0·5 × 0·15 mm, oblong-obovoid, brown, minutely papillose. *Dry, sandy places. C. & S.E. Spain.* Hs. (*N. Africa, S.W. Asia.*)

26. Antennaria Gaertner[2]

Dioecious, usually tomentose perennial herbs, with basal leaf-rosettes and erect, simple, leafy, flowering stems with a terminal cluster of 1–8(–12) shortly pedunculate, small capitula. Involucral bracts in several rows, erect in fruit. Receptacle flat, without scales. Female florets filiform-tubular; functionally male florets tubular; pappus-hairs in several rows, those of the functionally male florets conspicuously thickened above.

Sexual or apomictic; in the latter case often only the female plants are known. In the sexual species **1** and **5**, little taxonomic importance is usually attached to widely differing amounts of tomentum on the leaves; in the apomictic species **3** and **4** such variation appears to have a phytogeographical and cytological significance.

Short glandular hairs are usually present but are often concealed by the tomentum.

Literature: K. Urbańska-Worytkiewicz, *Ber. Geobot. Inst. Rübel* (*Zürich*) **40**: 79–166 (1970).

1 Caespitose; stolons absent; basal leaves oblanceolate to linear
2 Male florets cream-coloured, with purple anthers; pappus exceeding styles by less than 1·75 mm at maturity
5. carpatica
2 Male florets purplish, with yellow anthers; pappus exceeding styles by more than 1·75 mm at maturity **6. villifera**
1 Mat-forming; short stolons present; basal leaves obovate to oblanceolate-spathulate
3 Basal leaves densely tomentose beneath
4 Upper half of involucral bracts broadly obovate or oblong-obovate, white or pink, petaloid **1. dioica**
4 Upper half of involucral bracts lanceolate, dark greenish-brown **3. alpina**
3 Basal leaves not densely tomentose beneath
5 Upper half of involucral bracts broadly obovate or oblong-obovate, white or yellowish, petaloid **2. nordhageniana**
5 Upper half of involucral bracts lanceolate, dark greenish-brown **4. porsildii**

1. A. dioica (L.) Gaertner, *Fruct. Sem. Pl.* **2**: 410 (1791). Mat-forming, tomentose perennial up to 20(–30) cm, with woody stock and slender, branched stolons with numerous leaf-rosettes. Basal leaves up to 35 × 8 mm, obovate-spathulate, obtuse, apiculate or emarginate; lower surface densely tomentose, upper surface usually glabrous or subglabrous. Upper cauline leaves with a short, green, glabrous mucro. Capitula 2–8(–12), usually subsessile but peduncles occasionally up to 4 cm. Upper half of involucral bracts white or pink, broadly obovate in male plants, oblong-obovate in female plants. $2n=28$. *Heaths, dry grassland and sandy or stony places. Much of Europe, but local in the south and only on mountains.* Al Au Be Br Bu Cz Da Fe Ga Ge Hb He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su.

[1] By J. Holub.

[2] By G. Halliday.

Sexual, the male and female plants being about equally frequent.

Plants from Scotland with slightly wider leaves densely tomentose on both surfaces, at least when young, have been called var. *hyperborea* (D. Don) DC. They usually grow with typical plants and their status requires investigation. Similar plants occur elsewhere, particularly in the Alps.

A. hibernica Br.-Bl., *Vegetatio* **3**: 298 (1951), originally described from Ireland and since reported from several places in N. & N.W. Europe, cannot be satisfactorily separated from **1** on any of its several supposedly diagnostic characters.

2. A. nordhageniana Rune & Rönning, *Svensk Bot. Tidskr.* **50**: 118 (1956). Like **1** but of a laxer habit, not tomentose and usually not more than 6 cm; lower surface of leaves, flowering stem and lower half of involucral bracts purplish; upper cauline leaves with a relatively wide, scarious apex; capitula 1–3(–4); upper half of involucral bracts often with yellowish-brown spots. $2n=28$. *Snow-patches.* ● *Mountains of N. Norway, known only from a few localities at c.* 70° *N.* ?Fe No.

3. A. alpina (L.) Gaertner, *Fruct. Sem. Pl.* **2**: 410 (1791). Mat-forming, tomentose perennial up to 15 cm, with woody stock and slender, branching stolons. Basal leaves 8–15(–20) × 1·5–3·5 mm, narrowly obovate-spathulate to oblanceolate, acute and apiculate, densely tomentose beneath, subglabrous or glabrous above. Upper cauline leaves with a relatively wide scarious apex. Capitula 3–5, usually more or less sessile. Upper half of involucral bracts in female plants lanceolate, dark greenish-brown, erose above. $2n=70$, 84, 85. *Mountain rocks and heaths; calcicole.* ● *N. & W. Fennoscandia, just extending to N.W. Russia.* Fe No Rs (N) Su.

Apomictic. Male plants are known only from scattered localities in Norway and W. Sweden; they do not produce functional pollen.

The closely related **A. boecherana** A. E. Porsild, *Bot. Tidsskr.* **61**: 36 (1965), from Iceland (and from Greenland and N. Canada), differs in having leaves which are nearly always densely tomentose on the upper surface and in having $2n=56$; only female plants are known.

4. A. porsildii Elis. Ekman, *Svensk Bot. Tidskr.* **21**: 51 (1927). Like **3** but not more than 10 cm; basal leaves more or less glabrous on both surfaces but flowering stems and cauline leaves somewhat tomentose. $2n=63$, 70. *Damp mountain heaths. N.W. Fennoscandia.* Fe No Su.

5. A. carpatica (Wahlenb.) Bluff & Fingerh., *Comp. Fl. Germ.* **1**: 348 (1825). Tomentose perennial up to 15(–24) cm, with vertical woody stock without stolons and producing a few basal leaf-rosettes. Basal leaves up to 90 × 11 mm, oblanceolate to linear, acute. Cauline leaves few, the upper with a brown scarious apex. Capitula (6–)7–9(–11). Involucral bracts lanceolate in female plants, broadly elliptical to obovate in male plants, with a dark centre, pale brown above; apex erose. Male florets cream-coloured, sometimes purplish above; anthers purple. Pappus less than 1·75 mm longer than the style at maturity. Achenes frequently produced. $2n=56$. *Grassy or stony slopes.* ● *Pyrenees, Alps, Carpathians.* Au Cz Ga Ge He Hs It Ju Po Rm Rs (W).

Sexual, the male and female plants being about equally frequent. This octoploid species can produce hexaploid progeny when crossed with **1** but such hybrids are very rare in nature.

There is considerable variation in leaf-width and the upper surface varies from subglabrous to densely tomentose.

6. A. villifera Boriss., *Not. Syst.* (*Leningrad*) **20**: 292 (1960). Like **5** but with (3–)4–6(–9) capitula; involucral bracts with a darker, purplish centre; male florets purplish, at least above; anthers yellow; pappus more than 1·75 mm longer than the style at maturity; achenes very rarely produced. $2n=28$, 42. *Snow-patches and other damp places; calcicole. Arctic Europe and N. Ural.* Fe No Rs (N) Su. (*Siberia.*)

Pollen-formation in the hexaploid ($2n=42$) is irregular and neither this nor the tetraploid normally produces mature achenes in Europe. The stigmatic lobes of the tetraploids are shorter (*c.* 0·3 mm) than those of the hexaploids (*c.* 0·8 mm).

The contrasting colours of the male florets and the anthers in this species and **5** are not always evident in dried material.

27. Leontopodium (Pers.) R. Br.[1]

Perennial herbs. Leaves alternate, entire. Inflorescence of several small capitula crowded together at the apex of the stem and subtended by an involucre of leaves. Involucral bracts in several rows. Receptacle convex, without scales. Florets all tubular, the outer female, the inner functionally male, or the capitulum consisting entirely or nearly entirely of one or the other type. Achenes subterete, unribbed; pappus-hairs in 1 row, denticulate, connate at base.

Literature: H. von Handel-Mazzetti, *Beih. Bot. Centr.* **44** (**2**): 1–178 (1927).

1. L. alpinum Cass., *Dict. Sci. Nat.* **25**: 474 (1822). Flowering stems (1–)5–20(–30) cm, erect, simple. Leaves 1·5–4 cm. Leaves subtending the inflorescence patent, densely white-lanate. Capitula subglobose; involucre 4–6 mm; outer bracts oblanceolate, acute, lanate, with brown scarious margin and apex. Florets yellowish-white. Achenes *c.* 0·5 mm. $2n=52$. *Rocky and grassy slopes. Mountains of Europe, from the Jura and Carpathians to the Pyrenees, C. Appennini and S.W. Bulgaria.* Al Au Bu Cz Ga Ge He Hs It Ju Po Rm Rs (W).

(a) Subsp. **alpinum**: Indumentum appressed; stems usually more than 5 cm. Leaves, except those subtending the inflorescence, greenish above, linear-lanceolate or the basal spathulate. Leaves subtending the inflorescence linear-oblong, much exceeding the capitula. *Throughout the range of the species, except S.W. Bulgaria and C. Appennini.*

(b) Subsp. **nivale** (Ten.) Tutin, *Bot. Jour. Linn. Soc.* **67**: 283 (1973) (*Gnaphalium nivale* Ten.): Indumentum patent; stems up to 5 cm. All leaves densely white-lanate on both surfaces, usually spathulate. Leaves subtending the inflorescence spathulate, about as long as the capitula. *C. Appennini; Jugoslavia (near Peć); S.W. Bulgaria (Pirin Planina).*

28. Anaphalis DC.[2]

Lanate, dioecious or polygamous perennials. Leaves simple, alternate. Capitula small. Involucral bracts imbricate, in several rows, scarious. Receptacle flat or convex, without scales. Male florets tubular; female florets filiform. Achenes fusiform; pappus of one row of hairs.

1. A. margaritacea (L.) Bentham in Bentham & Hooker fil., *Gen. Pl.* **2**: 303 (1873). Stems 30–100 cm. Leaves 5–12 × 1–1·5 cm, lanceolate to linear, with revolute margin, glabrescent above. Capitula numerous, crowded in terminal corymbs. Involucral bracts oblong, with rounded apex, pearly-white. Corolla yellowish. Achenes 0·5–1 mm, brown, papillose; pappus-hairs thickened near the apex in male florets. $2n=28$. *Cultivated for ornament and naturalized in waste places, damp woods and on river-banks, mainly in N. & C. Europe.* [Au Br Cz Da Ga Ge Ho No Po Rm Su.] (*North America, N.E. Asia.*)

[1] By T. G. Tutin. [2] By A. Hansen.

29. Phagnalon Cass.[1]

Dwarf shrubs. Leaves simple, alternate; margins entire, erose or remotely toothed. Capitula usually solitary at the ends of branches. Involucral bracts imbricate, in up to 5 rows. Receptacle flat; scales absent. Florets yellowish, all tubular, the outer female, the inner hermaphrodite. Achenes cylindrical, somewhat compressed or angled, unbeaked, usually hairy. Pappus-hairs in 1–2 rows, simple, free.

Putative hybrids between **1**, **2** and **5** have frequently been recorded and many of them have been given binomials. Occasional glabrous variants of all the species occur.

1 Capitula in clusters of 2–6 — **1. sordidum**
1 Capitula solitary
2 Leaves glabrous
3 Leaves entire — **6. pumilum**
3 Leaves sinuate-dentate — **3. metlesicsii**
2 Leaves densely lanate, at least beneath
4 Margin of middle involucral bracts undulate — **5. saxatile**
4 Margin of middle involucral bracts flat
5 Outer involucral bracts ovate to triangular, obtuse — **2. rupestre**
5 Outer involucral bracts narrowly triangular to linear-lanceolate, acute
6 Leaves oblong-spathulate; margin entire — **6. pumilum**
6 Leaves oblanceolate to obovate; margin irregularly sinuate-dentate or strongly erose — **4. graecum**

1. P. sordidum (L.) Reichenb., *Fl. Germ. Excurs.* 224 (1831). Dwarf shrub up to 30 cm. Stems lanate, densely leafy. Leaves 1–3 cm, linear, densely lanate on both surfaces, entire; margin strongly revolute. Flowering stems with 2–6 small, sessile to shortly pedunculate, clustered capitula. Involucral bracts ovate, acute, brownish, all more or less similar, denticulate. *Rocks and walls. S.W. Europe, extending eastwards to C. Italy.* Bl Co Ga Hs It Sa.

2. P. rupestre (L.) DC., *Prodr.* **5**: 396 (1836). Dwarf shrub up to 50 cm. Stems erect, lanate. Leaves 1–4 cm, oblanceolate to obovate, densely lanate beneath, glabrescent or with occasional arachnoid hairs above, erose to remotely erose-dentate; margin somewhat revolute. Capitula solitary. Outer involucral bracts ovate to triangular, obtuse; inner lanceolate, cuspidate, entire to erose. $2n=18$. *Dry places. W. & C. Mediterranean region, C. & S. Portugal.* Bl Co Ga Hs It Ju Lu Sa Si.

3. P. metlesicsii Pignatti, *Gior. Bot. Ital.* **103**: 291 (1969). Like **2** but 5–10 cm; leaves spathulate to oblanceolate, glabrous, white-punctate beneath; margin sinuate-dentate. ● *Sicilia.* Si.

4. P. graecum Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **2(11)**: 6 (1849) (*P. rupestre* subsp. *graecum* (Boiss. & Heldr.) Hayek). Dwarf shrub up to 30 cm. Stems ascending to erect, lanate. Leaves 1·5–2·5 cm, oblanceolate to obovate, densely lanate beneath, lanate to subglabrous above, irregularly sinuate-dentate to strongly erose-undulate. Capitula solitary. Outer involucral bracts narrowly triangular to lanceolate, acute, brownish; inner bracts linear-lanceolate, subacute, entire. *Rocky places.* ● *S.E. Europe, extending westwards to Lampedusa.* Al Cr Gr It Si.

5. P. saxatile (L.) Cass., *Bull. Soc. Philom. Paris* **1819**: 174 (1819) (incl. *P. methanaeum* Hausskn.). Dwarf shrub up to 60 cm. Stems ascending to erect, lanate. Leaves 2·5–3·5 cm, linear to linear-oblanceolate, greenish and sparsely lanate above, densely lanate beneath, erose or rarely remotely dentate; margin sometimes revolute. Capitula solitary. Middle involucral bracts linear-lanceolate, acute; margin undulate; inner bracts linear. $2n=18$. *Rocks and walls. Mediterranean region and S.W. Europe.* Bl Co Ga Gr Hs It Lu Sa Si.

6. P. pumilum (Sibth. & Sm.) DC., *Prodr.* **5**: 397 (1836). Caespitose, dwarf perennial up to 15 cm. Leaves 1·5–2·5 cm, oblong-spathulate, glabrous or densely tomentose, entire. Capitula solitary. Involucral bracts lanceolate, acuminate, entire. *Rock-crevices.* ● *Mountains of Kriti.* Cr.

30. Leysera L.[2]

Annual herbs. Leaves alternate, entire. Involucral bracts in several rows, very unequal, increasing in length inwards. Receptacle flat, alveolate. Florets yellow, the outer ligulate, female, the inner tubular, hermaphrodite. Achenes narrowly cylindrical, hairy; pappus of short scales and, in the inner achenes, a few long hairs, plumose in the distal third.

1. L. leyseroides (Desf.) Maire, *Bull. Soc. Hist. Nat. Afr. Nord* **20**: 186 (1929). Stems 5–15 cm, branched, glandular-pubescent. Leaves linear, glandular-pubescent. Peduncles *c.* 4 cm, slender, axillary, erecto-patent, becoming erect just below the capitulum. Involucre 8–9 mm, glabrous; bracts mostly scarious, obtuse. Ligules *c.* 1 mm. *Dry, sandy places. S.E. Spain (near Almería).* Hs. (*North Africa.*)

31. Inula L.[3]

Perennial, rarely biennial herbs or small shrubs. Leaves simple, alternate. Capitula solitary or in a corymbose or paniculate inflorescence. Involucral bracts imbricate, in many rows. Receptacle flat or slightly convex, without scales. Florets yellow, the outer ligulate, female, the ligule often very short. Tubular florets hermaphrodite. Achenes angled, not abruptly contracted below the pappus. Pappus-hairs simple, free.

Literature: G. Beck, *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **44**: 283–339 (1882). K. H. Rechinger fil., *Österr. Bot. Zeitschr.* **87**: 81–100 (1938).

Putative hybrids between **2**–**7** have been recorded from areas where any two of these species grow together. In many cases the morphological evidence strongly supports the view that these plants are of hybrid origin, but in others they appear to be variants of one or other of the alleged parents.

1 Outer involucral bracts 4 mm or more wide, ovate; ligules 30–40 mm; achenes 3–5 mm — **1. helenium**
1 Outer involucral bracts less than 4 mm wide, linear or lanceolate, rarely triangular to ovate; ligules less than 30 mm; achenes 1–3 mm
2 Ligules not more than 12 mm, not more than 1½ times as long as the involucre

[1] By D. Bramwell. [2] By T. G. Tutin.
[3] By P. W. Ball and T. G. Tutin.

3 Middle and upper cauline leaves cuneate at base, not amplexicaul or decurrent
4 Pappus 3–4 times as long as the achene, with *c.* 30 setae; leaves puberulent to thinly grey-tomentose beneath **16. conyza**
4 Pappus about twice as long as the achene, with 10–15 setae; leaves densely white-tomentose or -lanate beneath **(13–15). candida** group
3 Middle and upper cauline leaves amplexicaul or decurrent, usually ±cordate at base
5 Cauline leaves decurrent
6 Stem and leaves glabrous or with sparse, long, patent hairs **18. bifrons**
6 Stem and leaves densely villous with appressed hairs **17. thapsoides**
5 Cauline leaves amplexicaul, but not decurrent
7 Achenes glabrous; capitula 7–11 mm in diameter **3. germanica**
7 Achenes hairy; capitula at least 15 mm in diameter **9. caspica**
2 Ligules 12 mm or more, more than 1½ times as long as the involucre
8 Leaves with 3–7 parallel veins **7. ensifolia**
8 Leaves pinnately veined or the veins obscure
9 Small shrub; leaves not more than 5(–8) mm wide, fleshy, with obscure lateral veins **19. crithmoides**
9 Herbs; leaves usually more than 5 mm wide, not fleshy, with distinct lateral veins
10 Upper surface of leaves with prominent reticulate venation
11 Outer involucral bracts about as long as inner, all linear to lanceolate; lower surface of leaves and involucral bracts ±densely hairy **6. hirta**
11 Outer involucral bracts ovate to oblong-lanceolate, ± spathulate at apex, shorter than inner, the inner linear; lower surface of leaves and involucral bracts glabrous or sparsely hairy
12 Upper cauline leaves cordate at base and distinctly amplexicaul **4. salicina**
12 Upper cauline leaves cuneate at base, not amplexicaul **5. spiraeifolia**
10 Upper surface of leaves without prominent reticulate venation
13 Cauline leaves cuneate at base, not amplexicaul
14 Stem 30–60 cm; outer involucral bracts ovate-lanceolate, with recurved apex **2. helvetica**
14 Stem 10–25(–35) cm; outer involucral bracts lanceolate, with appressed apex **12. montana**
13 Cauline leaves ±cordate at base and amplexicaul
15 Outer involucral bracts patent or deflexed
16 Outer involucral bracts 0·5–0·8 mm wide, longer than inner; ligules 15–25 mm **8. britannica**
16 Outer involucral bracts 1–1·3 mm wide, shorter than inner; ligules 9–14 mm **9. caspica**
15 Outer involucral bracts usually erect
17 Outer involucral bracts 5–7 mm, distinctly shorter than inner; capitula 25–30 mm in diameter **10. oculus-christi**
17 Outer involucral bracts *c.* 10 mm, almost as long as inner; capitula 50–80 mm in diameter **11. helenioides**

1. I. helenium L., *Sp. Pl.* 881 (1753). Erect, robust, tomentose perennial 60–250 cm. Leaves grey-tomentose beneath, the lower 40–70 × 10–25 cm, ovate-elliptical, the upper cordate-amplexicaul. Capitula large; involucre 15–20 mm, hemispherical; bracts tomentose, the outer 10–13 × 4–5 mm, ovate, recurved, the inner 13–18 × 1·5–2·5 mm, lanceolate. Ligules 30–40 mm, much exceeding the involucre. Achenes 3–5 mm, glabrous; pappus with *c.* 30 setae. $2n=20$. *Probably native in S.E. Europe; formerly widely cultivated elsewhere as a medicinal plant and for ornament, and naturalized almost throughout Europe.* *Bu *Gr It Ju Rm *Rs (W, K, E) Sa [Au Be Br Co Cz Da Fe Ga Ge Hb He Ho Hs Hu It No Po Rs (N, B, C) Su]. (*W. & C. Asia.*)

2. I. helvetica Weber, *Pl. Min. Cogn. Dec.* 17 (1784) (*I. vaillantii* (All.) Vill.). Erect, grey-tomentose perennial up to 150 cm. Leaves entire to serrate-dentate, puberulent above, grey-tomentose beneath, the lower 8–12 × 1·5–2·5 cm, lanceolate or elliptic-lanceolate, the upper sessile, cuneate at base. Capitula medium to large; involucre 10–13 mm, hemispherical; bracts tomentose, the outer 6–7 × 1·5–2 mm, ovate-lanceolate with recurved apex, the inner 8–10 × 0·7–1 mm, linear. Ligules 15–20 mm, much exceeding the involucre. Achenes 2–2·5 mm, glabrous or sparsely hairy at apex; pappus with *c.* 30 setae. *Woods and streamsides.* ● *From E. Spain to S.W. Germany and N.W. Italy.* Ga Ge He Hs It.

3. I. germanica L., *Sp. Pl.* 883 (1753). Erect, somewhat tomentose perennial 30–60 cm. Leaves denticulate, sparsely hairy above, moderately densely hairy beneath, the lower 4·5–10 × 1–3 cm, oblong to ovate, the upper sessile, cordate, amplexicaul. Capitula 7–11 mm in diameter; involucre 7–10 mm, cylindrical; bracts tomentose, the outer *c.* 3 × 2 mm, ovate with recurved apex, the inner 5–8 × 0·5–0·7 mm, linear. Ligules 8–11 mm, not or only slightly exceeding the involucre. Achenes *c.* 1·5 mm, glabrous; pappus with *c.* 30 setae. $2n=16$. *C. & S.E. Europe, extending northwards to c.* 54° *N. in C. Russia.* Al Au Bu Cz Ge Gr Hu Ju Po Rm Rs (C, W, K, E) Tu.

4. I. salicina L., *Sp. Pl.* 882 (1753). Erect, glabrous or sparsely hairy perennial 25–75 cm. Leaves with prominent reticulate venation above, the lower 2–6(–10) × 0·5–3(–4·5) cm, linear-lanceolate to ovate, the upper sessile, cordate, amplexicaul. Capitula medium to large; involucre 8–12 mm, hemispherical; bracts glabrous but ciliate, the outer 5–7 × 2–2·5 mm, lanceolate with patent apex, the inner 7–11 × 1–2 mm, linear. Ligules 15–25 mm, much exceeding the involucre. Achenes 1·5–2 mm, glabrous; pappus with 30–35 setae. *Most of Europe, but very rare in the islands and the extreme north.* Al Au Be Bu Co Cz Da Fe Ga Ge Gr Hb He Ho Hs Hu It Ju Lu No Po Rm Rs (N, B, C, W, K, E) Sa Su Tu.

(a) Subsp. **salicina**: Stem setose at base, otherwise glabrous; leaves entire or remotely denticulate, glabrous or subglabrous. $2n=16$. *Throughout the range of the species except parts of the south-east.*

(b) Subsp. **aspera** (Poiret) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 602 (1931) (*I. aspera* Poiret; incl. *I. sabuletorum* Czern. ex Lavrenko): Stem sparsely hairy; leaves denticulate, sparsely hairy on the veins beneath. *S. Europe, extending northwards to C. Russia.*

5. I. spiraeifolia L., *Syst. Nat.* ed. 10, **2**: 1219 (1759) (*I. squarrosa* L.). Erect perennial 30–80 cm, pubescent below, glabrous above. Leaves with prominent reticulate venation above, sparsely hairy at least on the margin and veins beneath, the lower 5–8 × 1·2–2 cm, lanceolate to ovate, denticulate or serrulate, the upper sessile, cuneate and slightly rounded at base. Capitula medium; involucre 10–12 mm, hemispherical; bracts glabrous, the outer 4–6 × 2–3 mm, ovate-spathulate with recurved apex, the inner 8–10 × 1–1·5 mm, linear. Ligules 14–17 mm, much exceeding the involucre. Achenes 1·5–2 mm, glabrous; pappus with *c.* 30 setae. $2n=16$. ● *From W.C. France to Bulgaria.* Al Bu Co Ga He Hu It Ju ?Rm ?Tu.

6. I. hirta L., *Sp. Pl.* 883 (1753). Erect, hirsute perennial 15–50 cm. Leaves with prominent reticulate venation on both surfaces, hirsute, entire or denticulate, the lower 4–8 × 1–2 cm, obovate- or oblanceolate-oblong, the upper sessile, not or slightly amplexicaul. Capitula medium to large; involucre 10–13 mm, hemispherical; bracts hirsute, the outer 10–12 × 1·2–2 mm, lanceolate, the inner 10–12 × 0·7–1 mm, linear. Ligules 15–30 mm, much exceeding the involucre. Achenes *c.* 2 mm, glabrous; pappus with *c.* 30 setae. $2n=16$. *S., C. & E. Europe, northwards to* 57° *N. in Russia.* Au Bu Cz Ga Ge He Hs Hu It Ju Po Rm Rs (C, W, E) [Rs (N)].

7. I. ensifolia L., *Sp. Pl.* 883 (1753). Erect, glabrous or floccose-tomentose perennial 10–60 cm. Leaves glabrous except for the ciliate margin, with 3–7(–13) prominent parallel veins, entire, the lower 3·5–9 × 0·2–1 cm, linear-lanceolate or lanceolate, the upper sessile, not or slightly amplexicaul. Capitula medium to large; involucre 10–13 mm, hemispherical; bracts sericeous-lanate at base, the outer 8–10 × 1·3–3·5 mm, triangular-ovate with patent apex, the inner 8–10 × 1–1·5 mm, linear-lanceolate. Ligules 15–22 mm, much exceeding the involucre. Achenes *c.* 2 mm, glabrous or setulose near apex; pappus with *c.* 30 setae. $2n=16$. *E. & E.C. Europe, extending westwards to N. Italy; Gotland.* Al Au Bu Cz Gr Hu It Ju Po Rm Rs (C, W, K, E) Su Tu.

I. serpentinica Rech. fil. & Goulimy, *Anzeig. Akad. Wiss. (Wien)* **94**: 26 (1957), from W. Makedhonia, is like **7** but has leaves with 7–12 prominent veins, a denser and longer indumentum in all parts, and never more than one capitulum on a stem. It is probably best regarded as a subspecies of **7**.

8. I. britannica L., *Sp. Pl.* 882 (1753). Erect, pubescent biennial 15–75 cm. Leaves sparsely pubescent above, densely pubescent beneath, rarely almost sericeous, entire or serrulate, the lower 4–15 × (0·5–)1–2·5(–4) cm, elliptical or ovate-elliptical, the upper sessile and slightly amplexicaul. Capitula medium to large; involucre 7–9 mm, hemispherical; bracts sericeous at the base, the outer 7–12 × 0·5–0·8 mm, linear-lanceolate, patent or deflexed, the inner 5–8 × 0·4–0·6 mm, linear-lanceolate. Ligules 15–25 mm, much exceeding the involucre. Achenes 1–1·5 mm, hairy or subglabrous; pappus with 15–25 setae. $2n=32$. *Europe except the islands and much of the north and west.* Al Au Be Bu Cz Da Ga Ge Gr He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su Tu [Fe].

9. I. caspica Blume in Ledeb., *Ind. Sem. Horti Dorpat.* 10 (1822). Erect biennial 20–70 cm. Leaves glabrous or sparsely hispid, entire, the lower 8–15 × 1–2·5 cm, narrowly oblong or lanceolate, the upper more or less amplexicaul. Capitula at least 15 mm in diameter; involucre 10–13 mm, hemispherical; bracts sparsely scabrid-hirsute, the outer 5–8 × 1–1·3 mm, linear or linear-lanceolate, with recurved apex, the inner 7–10 × *c.* 1 mm, linear. Ligules 9–14 mm, equalling or slightly exceeding the involucre. Achenes 1–1·5 mm, hairy; pappus with 20–25 setae. *Shores of the Caspian Sea. S.E. Russia and W. Kazakhstan.* Rs (E). (*W. & C. Asia.*)

10. I. oculus-christi L., *Sp. Pl.* 881 (1753). Erect, sericeous-lanate perennial 15–60 cm. Leaves sericeous-lanate, entire or denticulate, the lower 7–14 × 1·5–3·5(–4·5) cm, oblong or oblong-lanceolate to obovate-elliptical, the upper more or less amplexicaul. Capitula 25–30 mm in diameter; involucre 10–15 mm, hemispherical; bracts sericeous-lanate, the outer 5–7 × *c.* 1 mm, lanceolate, erect, the inner 10–12 × 0·3–0·7 mm, linear. Ligules 16–20 mm, much exceeding the involucre. Achenes 2–3 mm, hairy; pappus with *c.* 30 setae. $2n=32$. *S.E. & E.C. Europe, extending northwards to c.* 53° *N. in S.C. Russia.* Al Au Bu Cz Gr Hu Ju Rm Rs (C, W, K, E) Tu.

I. auriculata Boiss. & Balansa in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 13 (1856), from Anatolia, has been once recorded from Turkey-in-Europe. It is like **10** but has the stem and leaves relatively sparsely tomentose, the involucre *c.* 10 mm, the outer bracts recurved at the apex, the inner *c.* 8 × 1 mm and the ligules 12–14 mm, only slightly exceeding the involucre.

11. I. helenioides DC. in Lam. & DC., *Fl. Fr.* ed. 3, **5**: 470 (1815). Erect, sericeous-villous perennial 15–50 cm. Leaves sericeous-villous, entire or denticulate, the lower 10–18 × 1·5–3 cm, oblong-oblanceolate, the upper amplexicaul. Capitula 50–80 mm in diameter; involucre 12–15 mm, hemispherical; bracts villous, rarely subglabrous, the outer *c.* 10 × 1·5–2 mm, linear-lanceolate, erect, the inner 10–12 × *c.* 1 mm, linear. Ligules 18–25 mm, much exceeding the involucre. Achenes *c.* 2 mm, hairy; pappus with *c.* 30 setae. ● *S. France, N.C. & E. Spain.* Ga Hs.

12. I. montana L., *Sp. Pl.* 884 (1753). Like **11** but stems 10–35 cm, sericeous-villous or -lanate; lower leaves 5–12 × 1–1·5 cm, the upper cuneate at base; outer involucral bracts 6–7 × 1–1·2 mm, lanceolate, the inner *c.* 10 × 0·6–0·8 mm, linear; achenes 2–3 mm. $2n=16$. *Dry places; calcicole. W. Mediterranean region, extending to W.C. France and E. Italy.* Ga Hs It Lu Si.

(13–15). I. candida group. Usually densely white-tomentose or -lanate perennials. Lower leaves lanceolate to orbicular-ovate, the upper more or less cuneate at base. Capitula medium; involucre hemispherical to almost cylindrical. Ligules shorter than or slightly exceeding the involucre. Achenes *c.* 2 mm, hairy; pappus about twice as long as achene, with 10–15 setae.

1 Leaves floccose when mature, densely glandular **15. subfloccosa**
1 Leaves persistently lanate, eglandular or rarely with a few glands
2 Ligules at least 2 mm longer than involucre **14. verbascifolia**
2 Ligules not or scarcely longer than involucre
3 Outer involucral bracts less than ½ as long as inner; most capitula subtended by 0–2 bracts **14. verbascifolia**
3 Outer involucral bracts more than ½ as long as inner; most capitula subtended by 2 or more bracts
4 Stem and leaves more or less densely appressed-sericeous-tomentose; leaves entire **13. candida**
4 Stem and leaves lanate, the indumentum not sericeous or closely appressed; leaves often crenate or toothed **14. verbascifolia**

13. I. candida (L.) Cass., *Dict. Sci. Nat.* **23**: 554 (1822) (*I. candida* subsp. *limonifolia* (Sibth. & Sm.) Hayek). Stems up to *c.* 30 cm, slender, simple or with few short branches in the upper ⅓. Indumentum dense or moderately dense, appressed-sericeous-tomentose. Basal leaves (1·5–)4–9 cm, usually lanceolate and gradually narrowed into the petiole, obtuse, entire; veins not prominent beneath. Involucre (6–)8–9 mm. Ligules shorter than the involucre. ● *C., S. & E. Greece, Kriti.* Cr Gr.

1 Involucral bracts appressed to erecto-patent; involucre 6–8 mm **(c)** subsp. **limonella**
1 Involucral bracts recurved near the usually elongate apex; involucre 8–9(–11) mm
2 Indumentum very dense; basal leaves 3–9 cm **(a)** subsp. **candida**
2 Indumentum moderately dense; basal leaves 1·5–3·5 cm **(b)** subsp. **decalvans**

(a) Subsp. **candida**: Stem up to 30 cm. Indumentum very dense, white. Basal leaves 3–9 cm, ovate to lanceolate. Capitula usually subtended by several bracts. Involucre 8–9 mm; bracts recurved, usually with an elongate apex. *W. Kriti, Kithira.*

(b) Subsp. **decalvans** (Halácsy) P. W. Ball ex Tutin, *Bot. Jour. Linn. Soc.* **67**: 282 (1973) (*I. limonifolia* var. *decalvans* Halácsy): Like subsp. **(a)** but stems usually not more than 10 cm; indumentum less dense; basal leaves 1·5–3·5 cm. *E. Kriti.*

(c) Subsp. **limonella** (Heldr.) Rech. fil., *Beih. Bot. Centr.* **54(B)**:

635 (1936): Stems up to 30 cm. Indumentum very dense, white. Basal leaves 3–9 cm, lanceolate. Capitula subtended by 0–1(–2) bracts. Involucre 6–8 mm; bracts appressed to erecto-patent, not elongate. *C., S. & E. Greece.*

I. rotundifolia (Halácsy) W. Greuter, *Boissiera* **13**: 140 (1967) (*I. candida* var. *rotundifolia* Halácsy), with almost orbicular basal leaves, long woody stems densely clothed with sericeous persistent leaf-bases and flowering stems shorter than the leaves, occurs on maritime rocks in S. Greece (Malea). Its status requires further investigation.

14. I. verbascifolia (Willd.) Hausskn., *Mitt. Thür. Bot. Ver.* nov. ser., 7: 32 (1895) (*I. candida* subsp. *verbascifolia* (Willd.) Hayek). Like **13** but stems up to 50 cm; indumentum lanate, not sericeous, often rather sparse; basal leaves usually ovate-lanceolate and shortly cuneate at base, often acute, crenate-serrate to entire; veins usually prominent beneath; involucre 7–12 mm; ligules shorter or longer than involucre. *Balkan peninsula and S.E. Italy.* Al Bu Cr Gr It Ju.

1 Ligules exceeding involucre by 2 mm or more
2 Involucre (8–)10–12 mm — (a) subsp. **verbascifolia**
2 Involucre 7–10 mm
3 Outer involucral bracts not more than ½ as long as inner — (b) subsp. **aschersoniana**
3 Outer involucral bracts at least ½ as long as inner — (c) subsp. **parnassica**
1 Ligules shorter to slightly longer than involucre
4 Outer involucral bracts less than ½ as long as inner; most capitula subtended by 0–2 bracts — (d) subsp. **methanea**
4 Outer involucral bracts at least ½ as long as inner; most capitula subtended by 2 or more bracts
5 Ligules slightly exceeding involucre — (c) subsp. **parnassica**
5 Ligules shorter than involucre — (e) subsp. **heterolepis**

(a) Subsp. **verbascifolia**: Stems 20–50 cm, stout. Basal leaves 6–9 × 2·5–4 cm. Capitula subtended by numerous linear-spathulate bracts which pass gradually into the outer involucral bracts. Involucre (8–)10–12 mm; bracts obtuse, except the innermost. Ligules exceeding the involucre by 2 mm or more. $2n=16$. ● *From W. Jugoslavia to N.W. Greece; S.E. Italy (Monte Gargano).*

(b) Subsp. **aschersoniana** (Janka) Tutin, *Bot. Jour. Linn. Soc.* **67**: 283 (1973) (*I. aschersoniana* Janka, *I. candida* subsp. *aschersoniana* (Janka) Hayek): Stem 25–45 cm, rather slender. Basal leaves 4–8 × 1·5–2·5(–3) cm. Capitula usually subtended by several ovate to elliptical bracts. Involucre 7–8 mm; outer bracts *c.* ½ as long as inner, obtuse, the inner acute. Ligules exceeding the involucre by 2 mm or more. ● *N., C. & E. Greece, S. & E. Bulgaria, S. Jugoslavia (Makedonija).*

(c) Subsp. **parnassica** (Boiss. & Heldr.) Tutin, *loc. cit.* (1973) (*I. parnassica* Boiss. & Heldr.): Like subsp. (b) but capitula subtended by 2–4 lanceolate bracts; involucre 7–10 mm; outer bracts at least ½ as long as inner, all acute; ligules exceeding the involucre by less than 2 mm. ● *C. & S. Greece.*

(d) Subsp. **methanea** (Hausskn.) Tutin, *loc. cit.* (1973) (*I. methanea* Hausskn., *I. candida* subsp. *methanea* (Hausskn.) Hayek): Stems 15–30 cm, slender. Basal leaves 3–4·5 × 1·5–2 cm Capitula subtended by 0–2 small, narrow bracts. Involucre *c.* 7 mm; outer bracts less than ½ as long as inner, all acute. Ligules not exceeding the involucre. ● *C. & S. Greece.*

(e) Subsp. **heterolepis** (Boiss.) Tutin, *loc. cit.* (1973) (*I. heterolepis* Boiss.): Stems 12–25 cm, stout. Basal leaves 3·5–5(–7) × 2·5–3·5 cm. Capitula subtended by several ovate bracts. Involucre *c.* 8 mm; outer bracts at least ½ as long as inner, obtuse. Ligules not exceeding the involucre. *Karpathos.* (*E. Aegean region, Anatolia*).

15. I. subfloccosa Rech. fil., *Anzeig. Akad. Wiss.* (*Wien*) **93**: 101 (1956). Like **13** but plant densely glandular; stems usually with branches 5–15 cm; indumentum of young leaves dense and lanate, becoming floccose; veins very prominent beneath; involucre 11–12 mm; bracts very numerous, gradually increasing in length from the outer inwards, white-tomentellous and glandular; ligules 2–3 mm longer than the involucre. ● *E. Greece (S. Evvoia).* Gr.

16. I. conyza DC., *Prodr.* **5**: 464 (1836) (*I. vulgaris* Trevisan). Erect, puberulent to tomentose perennial 30–120 cm. Lower leaves 9–15 × 2–6 cm, elliptical or oblong-lanceolate, serrulate, the upper sessile, cuneate at base. Involucre 9–15 mm, cylindrical; bracts puberulent, the outer 4–6 × 1 mm, triangular, with recurved apex, the inner 9–11 × 0·4–0·7 mm, linear. Ligules 7–9 mm, shorter than the involucre. Achenes 2–2·5 mm, hairy; pappus 3–4 times as long as achene, with *c.* 30 setae. $2n=32$. *W., C. & S. Europe extending to E. Denmark and N.W. Ukraine.* Al Au Be Bl Br Bu Co Cz Da Ga Ge Gr He Ho Hs Hu It Ju Lu Po Rm Rs (W, K) Sa Si Tu.

17. I. thapsoides Sprengel, *Ind. Sem. Horti Halensis* 16 (1810). Erect, densely villous perennial 30–85 cm. Lower leaves 18–22 × 5·5–8 cm, ovate, serrate, the upper decurrent. Involucre 8–15 mm, cylindrical; bracts densely hairy, the outer 4–7 × *c.* 1·5 mm, lanceolate, erect, the inner 8–10 × 0·5–0·7 mm, linear. Ligules 7–9 mm, not exceeding the involucre. Achenes 2–2·5 mm, hairy; pappus with *c.* 30 setae. *Damp, shady places. Krym.* Rs (K). (*Caucasian region.*)

18. I. bifrons (L.) L., *Sp. Pl.* ed. 2, 1236 (1763). Erect, glabrous to glandular-hairy perennial 30–100 cm. Lower leaves 10–30 × 2–6 cm, oblong, entire to coarsely dentate, the upper decurrent. Involucre 9–12 mm, cylindrical; bracts sparsely glandular or hairy, the outer 3–4 × *c.* 1 mm, linear-lanceolate, erect or with slightly recurved apex, the inner 8–10 × 0·7–1 mm, linear. Ligules 8–10 mm, not exceeding the involucre. Achenes *c.* 2 mm, hairy; pappus with *c.* 30 setae. ● *From S.C. France to Romania and Bulgaria.* Al Bu Ga It Ju Rm.

I. thapsoides subsp. **urumoffii** (Degen) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 605 (1931), from S. Bulgaria, appears to be a variant of **18**. It has long patent hairs on the upper part of the stem, the leaves and involucral bracts appressed-hairy, and the upper leaves only shortly decurrent. *I. bifrons* forma *pubescens* Velen., also from S. Bulgaria, is probably identical with this taxon.

19. I. crithmoides L., *Sp. Pl.* 883 (1753). Glabrous, rarely somewhat glandular small shrub up to 100 cm. Leaves 2–4·5(–6) × 0·2–0·4(–0·9) cm, linear to linear-lanceolate, fleshy, entire or 3-toothed at apex. Capitula medium. Involucre hemispherical; outer bracts 3–4 × 0·5–1 mm, linear, erect, the inner 5–10 × 0·5–1 mm, linear-subulate. Ligules 14–25 mm, exceeding the involucre. Achenes 2–3 mm, hairy; pappus with *c.* 30 setae. $2n=18$. *Coasts of S. & W. Europe northwards to c.* 55° *N. in Britain; inland in E. Spain.* Al Bl Br Co Cr Ga Gr Hb Hs It Ju Lu Sa Si.

32. Dittrichia W. Greuter[1]

(*Cupularia* Gren. & Godron, non Link)

Like *Inula* but capitula medium to small; achenes cylindrical, abruptly contracted below the pappus; pappus-hairs connate near base.

[1] By P. W. Ball.

Ligules 10–12 mm, distinctly exceeding the involucre — **1. viscosa**
Ligules 4–7 mm, not or scarcely exceeding the involucre — **2. graveolens**

1. D. viscosa (L.) W. Greuter, *Exsicc. Genav.* **4**: 71 (1973) (*Inula viscosa* (L.) Aiton). Densely glandular, viscid perennial 40–130 cm; stems woody at base. Lower leaves 30–70 × 2–30 mm, linear to oblong-lanceolate, acute, remotely denticulate; upper sessile, semiamplexicaul. Capitula medium; involucre 6–8 mm; outer bracts 1–2 × 0·5–0·7 mm, linear-lanceolate, acute, erect; inner 6–8 × 0·6–0·8 mm. Ligules 10–12 mm, distinctly exceeding the involucre. Achenes *c.* 2 mm, hairy; pappus with 15 setae. $2n=18$, 34. *Waste places. S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

(a) Subsp. **viscosa**: Stems erect; leaves 30–60 × 4–30 mm, oblong-lanceolate; margin flat. *Throughout the range of the species, except S.W. Portugal.*

(b) Subsp. **revoluta** (Hoffmanns. & Link) P. Silva & Tutin, *Bot. Jour. Linn. Soc.* **67**: 282 (1973) (*Inula revoluta* Hoffmanns. & Link): Stems often procumbent; leaves 60–70 × 2–3 mm, linear; margin revolute. ● *S.W. Portugal.*

2. D. graveolens (L.) W. Greuter, *Exsicc. Genav.* **4**: 71 (1973) (*Inula graveolens* (L.) Desf.). Erect, densely glandular annual 20–50 cm, smelling of camphor. Lower leaves 20–75 × 2–13 mm, lanceolate to oblong-lanceolate, entire or remotely denticulate; upper sessile, semiamplexicaul. Capitula small; involucre 4–7 mm; outer bracts *c.* 3 × 0·5–1 mm, linear-triangular; inner 4–7 × 0·7–1 mm, linear-lanceolate. Ligules 4–7 mm, not or scarcely exceeding the involucre. Achenes *c.* 2 mm, hairy; pappus with *c.* 30 setae. $2n=18$, 20+0–2 B. *S. & W. Europe, northwards to N.C. France.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu [He].

33. Pulicaria Gaertner[1]

Like *Inula* but the pappus with an outer row of more or less connate scales.

1 Perennial; ligules exceeding the involucre by 5 mm or more, patent
2 Basal leaves green at anthesis; stolons absent; capitula few — **1. odora**
2 Basal leaves withered at anthesis; stolons present; capitula usually numerous — **2. dysenterica**
1 Usually annual; ligules not exceeding the involucre by more than 3 mm, usually erect
3 Pappus with 18–25 hairs, the surrounding scales connate at base only — **5. sicula**
3 Pappus with 8–10 hairs, the surrounding scales connate for at least ½ their length
4 Leaves lanceolate to elliptical, soft, usually undulate; hairs on achenes appressed — **3. vulgaris**
4 Leaves, except the lowest, linear to narrowly oblong, rigid, not or scarcely undulate; hairs on achenes erecto-patent — **4. paludosa**

1. P. odora (L.) Reichenb., *Fl. Germ. Excurs.* 239 (1831). Perennial with a short stock. Stems 20–70 cm, villous or lanate, simple or sparingly branched. Basal leaves ovate to ovate-lanceolate, shortly petiolate, green at anthesis; cauline leaves oblong-lanceolate, semiamplexicaul, the lower auriculate, glandular-denticulate, green and scabrid above, greyish-lanate beneath. Capitula 1 to few, 2–3 cm in diameter, hemispherical; peduncles 3–15 cm, thickened above, usually with several bracts. Involucral bracts linear, long-acuminate, more or less lanate and glandular. Ligules *c.* 8 mm longer than the involucre, patent. Pappus of scales free almost to the base, surrounding 10–12 hairs. Achenes *c.* 2 mm, hairy. $2n=18+0–6$ B. *Mediterranean region, Portugal.* Al Bl Co Cr Ga Hs It Ju Lu Sa Si Tu.

2. P. dysenterica (L.) Bernh., *Syst. Verz. Erfurt* 153 (1800). Perennial with scaly stolons. Stems 20–60 cm, lanate or tomentose, freely branched. Leaves oblong-lanceolate, the lowest petiolate, withered at anthesis, the others sessile, usually widest near the semiamplexicaul, auriculate base; all undulate, remotely serrate, green and scabrid above, greyish-tomentose beneath. Capitula usually numerous, 1·5–3 cm in diameter, hemispherical; peduncles 1·5–2·5 cm, not thickened above, without or with 1 bract. Involucral bracts linear to subulate, more or less lanate and glandular. Ligules *c.* 5 mm longer than the involucre, patent. Pappus of scales connate for more than ½ their length, surrounding 14–20 hairs. Achenes *c.* 1·5 mm, hairy. $2n=18$, 20. *Damp places. S., W. & C. Europe, extending northwards to Denmark.* All except Az Fa Fe Is No Rs (N, B, ?C, E) Sb; extinct (except as a casual) in Su.

3. P. vulgaris Gaertner, *Fruct. Sem. Pl.* **2**: 461 (1791) (*P. prostrata* Ascherson). Annual, more or less hairy, often with glandular hairs. Stems 7–30(–45) cm, greenish or brownish, pubescent; branches erecto-patent, overtopping the main stem. Basal leaves oblanceolate, petiolate, withered at anthesis; middle and upper leaves lanceolate to elliptical, gradually narrowed to the semiamplexicaul but not auriculate base, soft and usually undulate. Capitula usually numerous, 0·8–1 cm in diameter, hemispherical; peduncles up to *c.* 1·5 cm, scarcely thickened after anthesis, usually with several bracts. Involucral bracts linear to linear-lanceolate, villous and glandular, the inner with setaceous apex. Ligules about equalling the involucre, erect. Pappus of scales, connate for at least ½ their length, surrounding 8–10 hairs. Achene *c.* 1·5 mm, with sparse, appressed hairs. $2n=18$. *Seasonally wet places. Most of Europe, from S. England, S. Sweden and C. Russia southwards.* Al Au Be Br Bu ?Cr Cz †Da Ga Ge Gr He Ho Hs Hu It Ju Lu Po Rm Rs (B, C, W, K, E) Sa Si Su Tu.

4. P. paludosa Link in Schrader, *Neues Jour. Bot.* **1**(3): 142 (1806). Like **3** but middle and upper leaves linear to narrowly oblong, rigid, not or scarcely undulate; inner involucral bracts acute; ligules up to 3 mm longer than the involucre, sometimes patent; achene *c.* 1 mm, with erecto-patent hairs. $2n=18+0–1$ B. *Seasonally wet places.* ● *Iberian peninsula.* Hs Lu.

P. paludosa may be conspecific with **P. arabica** (L.) Cass., *Dict. Sci. Nat.* **44**: 94 (1826), from N. Africa, which has once been collected in Kriti.

P. microcephala Lange, *Bol. Soc. Brot.* **1**: 42, 50 (1883), described from W. Portugal (Ilha Berlenga), is a dwarf much-branched plant with leaves mostly less than 5 mm long and very numerous capitula 0·4–0·5 cm in diameter; it is probably a variant of **4**, but further investigation is needed. A similar variant has been collected once in S.W. Spain (S.W. of Cádiz).

5. P. sicula (L.) Moris, *Fl. Sard.* **2**: 363 (1840–1843). Like **3** but middle and upper leaves linear, rigid, not undulate; peduncles up to 4 cm, thickened after anthesis; involucral bracts rather sparsely pubescent and glandular, the inner subacute; pappus-hairs 18–25, the scales connate at the base only; achene rather densely appressed-hairy. *Seasonally damp places. Mediterranean region.* Al Bl Co Cr Ga Hs It Sa Si Tu.

[1] By D. Ratcliffe.

34. **Carpesium** L.[1]

Annual to perennial herbs. Leaves simple, alternate. Capitula often nodding, terminal or axillary, sessile or shortly pedunculate. Involucral bracts in few rows, the outer herbaceous, the others coriaceous, obtuse. Receptacle flat, without scales. All florets tubular, the outer female, the inner hermaphrodite, yellow. Achenes fusiform, costate, shortly beaked, with a cartilaginous rim; pappus absent.

Capitula all pedunculate; outer involucral bracts leaf-like **1. cernuum**
Capitula subsessile; outer involucral bracts not leaf-like **2. abrotanoides**

1. C. cernuum L., *Sp. Pl.* 859 (1753). Annual or biennial 20–80 cm. Leaves elliptical to narrowly rhombic, narrowed into a petiole, appressed-hairy and glandular on both surfaces, but more densely so beneath and on the veins, repand-dentate or -denticulate, the lower 10–20 cm. Capitula 15–25 mm in diameter; involucre hemispherical; outer involucral bracts leaf-like, patent or recurved. Achenes *c.* 5 mm; beak glandular. *S. & S.C. Europe, extending eastwards to W.C. Ukraine.* Au Bu Cz Ga †Ge He Hs Hu It Ju Rm Rs (W).

2. C. abrotanoides L., *Sp. Pl.* 860 (1753). Like **1** but perennial; leaves shortly petiolate or sessile, entire or remotely serrulate, sparsely pubescent; capitula *c.* 5 mm in diameter, sessile, solitary or in pairs in the leaf-axils; outer involucral bracts not leaf-like. $2n=40$. *N.E. Italy, N.W. Jugoslavia, S.W. Hungary.* Hu It Ju.

35. **Jasonia** Cass.[1]

Perennials. Leaves simple, alternate. Capitula medium, in a cymose-paniculate or corymbose inflorescence. Involucral bracts in several rows. Receptacle flat or slightly convex, without scales. Florets yellow, the outer sometimes ligulate. Tubular florets hermaphrodite. Achenes fusiform. Pappus-hairs in 2 rows, the outer short, the inner long, denticulate.

Leaves erecto-patent, acute; ligules absent **1. glutinosa**
Leaves patent, obtuse; ligules usually present **2. tuberosa**

1. J. glutinosa (L.) DC., *Prodr.* **5**: 476 (1836). Plant with numerous short glandular and long flexuous eglandular hairs. Stem 10–45 cm, simple or branched. Leaves 1·5–3 cm, lanceolate, acute, erecto-patent, sessile. Inflorescence cymose-paniculate or corymbose, or sometimes of a single capitulum; capitula medium; involucre *c.* 6 mm; outer bracts much shorter than inner, herbaceous, glandular; inner bracts scarious, eglandular, ciliate. Ligules absent; florets yellow. Achenes villous, glandular at the apex; pappus reddish-brown. *Stony slopes and rock-crevices. S., C. & E. Spain, S. France, Islas Baleares, Malta.* *crevices. S., C. & E. Spain, S. France, Islas Baleares, Malta.* Bl Ga Hs Si.

2. J. tuberosa (L.) DC., *loc. cit.* (1836). Like **1** but usually with few long hairs; leaves up to 5 cm, linear to linear-lanceolate, patent, obtuse; inner involucral bracts glandular near apex, not ciliate; ligules usually present, yellow; achenes sericeous, eglandular. $2n=18$. *Rock-crevices and river-gravels.* ● *S.W. Europe.* Ga Hs Lu.

[1] By T. G. Tutin.

36. **Buphthalmum** L.[1]

Perennials. Leaves simple, alternate. Capitula medium to large, solitary on long, leafy peduncles. Involucral bracts in several rows. Receptacle convex, with numerous scales which are folded round the achenes. Ligulate florets in one row, female, yellow. Tubular florets hermaphrodite, yellow. Anthers not bearded at base. Achenes of the ligulate florets 3-angled, more or less compressed; achenes of the inner florets with several angles. Pappus a scarious rim, denticulate or with few, longer teeth.

Lower leaves petiolate, others sessile; pappus denticulate **1. salicifolium**
All leaves, except the uppermost, petiolate; pappus with 2–3 long, aristate teeth **2. inuloides**

1. B. salicifolium L., *Sp. Pl.* 904 (1753) (incl. *B. grandiflorum* L.). Somewhat hairy perennial 15–70(–150) cm. Stem simple or branched, with 1 or more capitula. Lower leaves 5–10 cm, obovate-lanceolate, obtuse, petiolate; upper leaves oblong to linear-lanceolate, usually acute or acuminate, sessile; all entire or remotely denticulate and more or less appressed-pubescent. Involucre 15–30 mm in diameter, hemispherical; bracts lanceolate, acuminate, somewhat sericeous. Ligules 7–20 × 2–3 mm. Achenes 3–4 mm, glabrous; pappus denticulate. $2n=20$. *Mainly in hilly or mountainous country; somewhat calcicole.* ● *C. Europe, extending to E. & S.E. France, N. Italy and C. Jugoslavia.* Au Cz Ga Ge He Hu It Ju.

2. B. inuloides Moris, *Stirp. Sard., App.* [1] (1828). Like **1** but stems woody at the base; all leaves, except the uppermost bract-like ones, obovate or spathulate, petiolate, repand-dentate; pappus with 2–3 long, aristate teeth. *Calcareous rocks.* ● *Extreme north of Sardegna, and adjacent islets.* Sa.

37. **Telekia** Baumg.[1]

Like *Buphthalmum* but anthers bearded at base; achenes of ligulate and tubular florets similar, terete or slightly compressed, with several angles.

Upper cauline leaves with rounded or shortly cuneate base; capitula several **1. speciosa**
Upper cauline leaves cordate and semiamplexicaul; capitulum solitary **2. speciosissima**

1. T. speciosa (Schreber) Baumg., *Enum. Stirp. Transs.* **3**: 150 (1816). Somewhat hairy perennial up to 200 cm. Stem branched above, forming a corymbose inflorescence of 2–8 capitula. Lower leaves *c.* 30 cm, broadly ovate or rhombic, coarsely crenate-serrate, nearly glabrous above, pubescent beneath, the lower shortly petiolate, cordate, the upper sessile, rounded or broadly cuneate at base. Capitula 50–60 mm in diameter; involucre *c.* 15 mm in diameter, hemispherical; bracts ovate to ovate-lanceolate, obtuse, the outer with a deflexed herbaceous apex. Ligules 10–15 × *c.* 1 mm, deep yellow; tubular florets brownish-yellow. Achenes 6 mm, glabrous. $2n=20$. *Mountains of E.C. Europe and the Balkan peninsula; cultivated for ornament and sometimes naturalized elsewhere.* Al Bu Cz Hu Ju Po Rm Rs (W) [Au Be Br Ga Ge Rs (C)].

2. T. speciosissima (L.) Less., *Syn. Gen. Comp.* 209 (1832). Like **1** but up to 50 cm; stem unbranched, with 1 capitulum; upper cauline leaves sessile, cordate, semiamplexicaul; involucral bracts lanceolate, acuminate; achenes 4 mm, pubescent. $2n=20$. *Rocky places; calcicole.* ● *N. Italy (between Lago di Lugano and Lago di Garda).* It.

38. **Pallenis** (Cass.) Cass.[1]

Annual to biennial herbs. Stems leafy. Capitula medium, terminating the branches. Involucral bracts in 2–3 rows. Receptacle convex, with scales. Ligulate florets in 2 rows, female, yellow; tubular florets numerous, the tube compressed and sometimes with 1–2 narrow wings. Outer achenes flat, winged; inner slightly compressed, not or scarcely winged; pappus of numerous short hyaline scales.

1. P. spinosa (L.) Cass., *Dict. Sci. Nat.* **37**: 276 (1825). Up to 60 cm, softly hairy. Stems hard, woody at the base, usually branched, the branches overtopping the main stem. Leaves lanceolate to elliptical, obtuse, mucronate; basal petiolate; cauline sessile and semi-amplexicaul. Outer involucral bracts 1·5–3·5 cm, ovate, coriaceous below, with a long, patent, spine-tipped, leaf-like apex exceeding the ligules; inner ovate, coriaceous, with or without a short, narrow, green apex. Ligules deeply 3-toothed at apex; tubular florets 5-lobed. Achenes 2–2·5 mm. *S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Rs (K) Sa Si Tu.

(a) Subsp. **spinosa**: Stem equally hairy throughout, usually branched in upper ⅓; branches erecto-patent. Disc of capitulum at anthesis 1·5–2 cm across; ligules deep yellow. $2n=10$. *Throughout the range of the species.*

(b) Subsp. **microcephala** (Halácsy) Rech. fil., *Österr. Bot. Zeitschr.* **85**: 62 (1936): Stem with sparse, short hairs above, usually branched from below the middle; branches divaricate. Disc of capitulum at anthesis smaller; ligules pale yellow, often suffused with purple. *Aegean region.*

39. **Asteriscus** Miller[1]

Like *Pallenis* but sometimes perennial; inner florets with a terete tube; outer achenes more or less triquetrous or somewhat compressed, the remainder terete.

Perennial; ligules as long as involucral bracts **2. maritimus**
Annual; ligules much shorter than involucral bracts **1. aquaticus**

1. A. aquaticus (L.) Less., *Syn. Gen. Comp.* 210 (1832) (*A. citriodorus* Heldr. & Halácsy). Annual. Stem (2–)10–50 cm, simple or with erecto-patent branches, usually near the apex. Leaves oblanceolate, entire, obtuse, the lower usually petiolate, the upper sessile. Outer involucral bracts 1–2 cm, ovate and coriaceous below, with a long, leaf-like apex, much exceeding the ligules; inner ovate, coriaceous, with or without a short green apex. Ligules deeply 3-toothed at apex; tubular florets 5-lobed. Achenes 1·5–2 mm; pappus 0·75–1 mm. $2n=14$. *Damp or sandy places. Mediterranean region, extending to Portugal and S. Bulgaria.* Al Bl Bu Cr Ga Gr Hs It Ju Lu Sa Si Tu.

2. A. maritimus (L.) Less., *loc. cit.* (1832). Scabrid, hispid perennial. Stems rarely more than 20 cm, woody, much-branched, ascending. Leaves oblong to oblong-spathulate, petiolate. Outer involucral bracts *c.* 1 cm, coriaceous below, with an obtuse, spathulate apex, equalling or shorter than the ligules. Ligules deeply 3-toothed; tubular florets 5-lobed. Achenes *c.* 1·5 mm; pappus 1–1·5 mm. $2n=12$. *Maritime rocks. W. part of the Mediterranean region, S. Portugal; W. & S. Greece.* Bl Co Ga Gr Hs It Lu Sa Si.

Tribe **Heliantheae** Cass.[2]

Leaves usually opposite and simple. Capitula usually with ligules; outer florets female or sterile, the inner hermaphrodite or functionally male; corolla usually yellow. Receptacle with scales. Anthers obtuse or sagittate at base, but not caudate. Style-branches truncate or with a non-stigmatic apex. Pappus of scales, a corona, few setae or absent.

40. **Guizotia** Cass.[3]

Annuals. Leaves simple, the lower opposite, the uppermost alternate. Capitula medium. Involucral bracts imbricate, in 2 rows, the outer herbaceous, the inner scarious. Receptacle convex, with scales. Outer florets ligulate, female, yellow; inner hermaphrodite; corolla shortly 5-lobed. Achenes compressed, 3- to 4-angled; pappus absent.

1. G. abyssinica (L. fil.) Cass., *Dict. Sci. Nat.* **59**: 248 (1829). Stems up to 2 m, erect, divaricately branched, glandular-hairy above. Leaves 3–10 cm, oblong-lanceolate, serrate to subentire, sessile, amplexicaul. Capitula numerous. Outer involucral bracts 5, ovate to ovate-lanceolate, the inner hairy. Ligules 11–15 mm, usually 8. Outer florets subtended by scales resembling the inner involucral bracts. Achenes *c.* 4 mm, widened upwards, shining brown or black. *Cultivated for the oil obtained from the achenes and for bird-seed. Casual in most parts of Europe and locally naturalized.* [Cz Ge Hs It.] (*E. Africa.*)

41. **Bidens** L.[1]

Annual or perennial herbs. Leaves opposite, entire to 2-pinnatisect. Capitula solitary, usually pedunculate. Involucral bracts in 2 rows, the outer usually herbaceous and often leaf-like, the inner membranous, often with a scarious margin. Receptacle flat or slightly convex, with scales. Ligulate florets usually absent, rarely in 1 row, sterile; tubular florets hermaphrodite. Achenes obovoid-oblong or linear, compressed or somewhat 4-angled, usually with setose margins; pappus of 2–5, usually retrorsely hispidulous or aculeate setae.

Literature: E. E. Sherff, *Publ. Field Mus. Bot. (Chicago)* **16(1)**: 1–346; **16(2)**: 347–709 (1937).

1 At least the lower leaves pinnate, with petiolulate pinnae
2 Pinnae lobed almost to the midrib; achenes longer than the inner involucral bracts
3 Leaf-lobes rhombic to broadly lanceolate; pappus-bristles 2–4 mm, erecto-patent at maturity **8. bipinnata**
3 Leaf-lobes mostly linear-lanceolate; pappus-bristles 1–2·5 mm, erect at maturity **9. subalternans**
2 Pinnae unlobed; achenes about equalling the inner involucral bracts, rarely longer
4 Capitula *c.* 20 mm in diameter; achenes oblong **6. frondosa**
4 Capitula *c.* 10 mm in diameter; achenes fusiform **7. pilosa**
1 Lower leaves simple or lobed, but lobes not petiolulate
5 Peduncles recurved just below the capitula; achenes with a convex, cartilaginous apex **5. cernua**
5 Peduncles not recurved; achenes with a flat or concave, not
5 Peduncles not recurved; achenes with a flat or concave, not cartilaginous apex
6 Outer involucral bracts never leaf-like; ligules 10–30 mm, always present; marginal setae of achenes erect **4. aurea**
6 Outer involucral bracts usually leaf-like; ligules not more than 10 mm, usually absent; marginal setae of achenes deflexed
7 Capitula with 10–12 outer involucral bracts; achenes 3–4 mm, with 2 bristles **3. radiata**
7 Capitula with (2–)5–8 outer involucral bracts; achenes with (2)3–5 bristles
8 Central achenes flat **1. tripartita**
8 Central achenes strongly 4-angled **2. connata**

[1] By T. G. Tutin. [2] Edit. T. G. Tutin. [3] By A. Hansen.

1. B. tripartita L., *Sp. Pl.* 831 (1753) (incl. *B. bullata* L., *B. orientalis* Velen.). Almost glabrous to hirsute annual (3–)10–60(–100) cm. Leaves usually 3-lobed, less frequently 5-lobed or unlobed, coarsely serrate; petiole short, winged. Capitula 10–25 mm in diameter, wider than long; outer involucral bracts 5–8, usually leaf-like, the inner ovate, brownish with a green margin. Receptacular scales as long as the achenes, oblong-lanceolate, scarious, with dark lines. Achenes (4–)5–6 mm, cuneiform; marginal setae deflexed; bristles (2)3–4. $2n=48$. *Damp places. Most of Europe, but rare in the extreme north and extreme south.* All except Az Bl Cr Fa Is Sb.

Very variable in size, dissection of leaves and length of outer involucral bracts. Much of the variation appears to depend on time of germination and edaphic factors, but a single plant can exhibit considerable variation.

2. B. connata Muhl. ex Willd., *Sp. Pl.* **3**: 1718 (1803). Like **1** but leaves usually unlobed, the lower sometimes with 1–2 pairs of decurrent lobes; achenes verrucose, with 4–5 bristles, the central strongly 4-angled. *Naturalized in W. & C. Europe.* [Be Cz Ga He Ho Po.] (*North America.*)

3. B. radiata Thuill., *Fl. Paris* ed. 2, 422 (1800). Like **1** but outer involucral bracts 10–12; receptacular scales about as long as the achenes together with their bristles, narrowly oblong; achenes 3–4 mm; bristles 2. $2n=48$. *Damp places. N.E. & N.C. Europe, extending westwards to E. Denmark and N.C. France and southwards to S. Russia.* Au Cz Da Fe Ga Ge He Po Rs (N, B, C, W, ?K, E) Su.

4. B. aurea (Aiton) Sherff, *Bot. Gaz.* **59**: 313 (1915). Nearly glabrous perennial 50–180 cm. Leaves linear-lanceolate, lanceolate or deeply divided into linear lobes, acuminate, coarsely and irregularly serrate. Capitula with involucral bracts all about equal, the outer not leaf-like. Ligules 10–30 mm, 5–6, yellow, with purplish lines. Receptacular scales about as long as the achenes, oblong-lanceolate. Achenes 4–7 mm, cuneiform; marginal setae erect; bristles 2. $2n=72$. *Damp places. Naturalized in S.W. Europe.* [Ga Hs It Lu.] (*Central America.*)

5. B. cernua L., *Sp. Pl.* 832 (1753). Glabrous or somewhat pubescent annual (4–)10–90 cm. Leaves linear-lanceolate to lanceolate, acuminate, coarsely and remotely serrate, unlobed, sessile. Capitula 15–25 mm in diameter (without ligules), nodding, wider than long; outer involucral bracts 5–8, leaf-like, the inner ovate, scarious with dark lines. Ligules often present. Receptacular scales as long as the achenes, oblanceolate, scarious, with dark lines. Achenes 6–8 mm, cuneiform; marginal setae deflexed; bristles 3–4. $2n=24$. *Damp places. Much of Europe, but absent from the extreme north and much of the Mediterranean region.* Al Au Be Br Bu Cz Da Fe Ga Ge Gr Hb He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su.

6. B. frondosa L., *Sp. Pl.* 832 (1753) (*B. melanocarpa* Wieg.). Almost glabrous annual 10–100 cm. Leaves petiolate, pinnate, with 1(–2) pairs of petiolate pinnae and a larger, terminal pinna; pinnae oblong-lanceolate to ovate, acute or acuminate, coarsely serrate. Capitula 10–20 mm in diameter, erect, wider than long; outer involucral bracts 5–8, herbaceous, sometimes leaf-like, somewhat villous near the base, the inner ovate-oblong, blackish, with a scarious margin. Receptacular scales as long as the achenes, oblong, scarious, with dark lines. Achenes 5–8 mm, cuneiform, rugose, with erect hairs on the face and margins; bristles 2, erect. $2n=48$. *Widely naturalized in W., S. & C. Europe.* [Au Be Br Cz Ga Ge He Ho Hs Hu It Ju Lu Po Rs (W) Si.] (*America.*)

7. B. pilosa L., *Sp. Pl.* 832 (1753). Like **6** but capitula 5–15 mm in diameter, longer than wide, at least in fruit; outer involucral bracts little longer than inner, greenish; receptacular scales shorter than the achenes; achenes 6–8(–12) mm, fusiform, papillose, glabrous except for a few erect setae on the ribs; bristles 2–3, erecto-patent. $2n=72$. *Roadsides, cultivated ground and damp places. Naturalized, mainly in S.W. Europe.* [Az Cz Hs Lu.] (*South America.*)

B. vulgata E. L. Greene, *Pittonia* **4**: 72 (1899) has recently been recorded from France and Romania. It is like **6** but has 10–16, hispid-ciliate outer involucral bracts and achenes with the marginal bristles erect or patent in the lower ¾ and deflexed in the upper ¼. It is a native of North America.

8. B. bipinnata L., *Sp. Pl.* 832 (1753). Almost glabrous annual 10–100 cm. Leaves petiolate, pinnate, with up to 4 pairs of pinnae, the lower of which are lobed almost to the midrib; lobes rhombic to broadly lanceolate, entire or coarsely toothed, sparsely hairy on the veins beneath. Capitula 5–10 mm in diameter, longer than wide; outer involucral bracts shorter than inner, herbaceous, all lanceolate to oblong. Receptacular scales shorter than the achenes, linear, scarious, with dark lines. Outer achenes 8–10 mm, the inner 10–18 mm, linear, papillose, with few, short, erect setae; bristles 2–3, 2–4 mm, erecto-patent at maturity. *Fields and roadsides. Naturalized in S. & S.C. Europe.* [Ga He It Ju.] (*South America.*)

9. B. subalternans DC., *Prodr.* **5**: 600 (1836). Like **8** but leaf-lobes linear-lanceolate, more or less hairy on and between the veins beneath; outer achenes 6–8 mm, the inner 8–14 mm; bristles 1–2·5 mm, erect at maturity. *Damp places. Naturalized in S.W. Europe.* [Ga Hs.] (*South America.*)

Often confused with **8** and probably overlooked.

42. Sigesbeckia L.[1]

Annual herbs; stems erect, usually dichotomously much-branched. Leaves opposite. Capitula small, in lax panicles or rarely solitary; outer involucral bracts linear to linear-spathulate, patent, usually much longer than the inner, with stipitate glands. Outer florets with short ligules, female, yellow; inner florets tubular, hermaphrodite, subtended by receptacular scales; pappus absent.

Literature: H. Henker, *Arch. Freunde Naturgesch. Mecklenb.* **11**: 7–54 (1965).

Leaves triangular-hastate, irregularly dentate or lobed, the petiole tapering from above and ±unwinged in its lower part, not amplexicaul **1. orientalis**

Leaves broadly ovate to cordate, shallowly and regularly crenate or serrate, the petiole broadly winged to the base and ±amplexicaul **2. jorullensis**

1. S. orientalis L., *Sp. Pl.* 900 (1753). Up to 120(–190) cm, pubescent. Leaves triangular-hastate, acute at apex, cuneate at base, irregularly dentate or lobed, the petiole tapering from above and more or less unwinged in its lower part, not amplexicaul. Capitula 6–9 mm across (excluding outer involucral bracts); outer involucral bracts 7–15 mm, linear-spathulate; stalked glands present on outer and inner involucral bracts and often on peduncle. $2n=60$. *Naturalized in waste places and by railways in S. Romania; casual elsewhere.* [?It Rm.] (*Warm temperate and tropical regions of the Old World.*)

[1] By R. K. Brummitt.

2. S. jorullensis Kunth in Humb., Bonpl. & Kunth, *Nov. Gen. Sp.* **4**: 284 (1820) (*S. cordifolia* Kunth). Up to 120 cm, pubescent. Leaves broadly ovate to cordate, acute to subobtuse at apex, cuneate at base, shallowly and regularly crenate or serrate, the petiole broadly winged to the base and more or less amplexicaul. Capitula 5–8 mm across (excluding outer involucral bracts); outer involucral bracts (6–)10–20 mm, linear-spathulate; stalked glands present on inner and outer involucral bracts and often on upper part of stem. *Naturalized in Britain and Germany; casual elsewhere.* [Br Ge.] (*Tropical America.*)

S. microcephala DC., *Prodr.* **5**: 496 (1836), native of Australia, with narrowly elliptical to lanceolate, sessile leaves and outer involucral bracts not exceeding the inner, also occurs as a casual.

43. Eclipta L.[1]

Annual or perennial herbs. Leaves opposite, entire or toothed. Inflorescence of several small, pedunculate capitula. Involucral bracts in 2 rows. Receptacle flat or slightly convex, with scales. Outer florets ligulate, female; the inner tubular, shortly 4(–5)-lobed, hermaphrodite. Outer achenes triangular in section, the inner subterete; pappus absent or of few small teeth.

1. E. prostrata (L.) L., *Mantissa Alt.* 286 (1771). Strigose, much-branched annual 20–90 cm. Leaves 4–13 × 0·8–2 cm, oblong to lanceolate, remotely serrate, acute, sessile or the lower petiolate. Capitula hemispherical; involucral bracts *c.* 5 mm, herbaceous; receptacular scales setaceous, ciliate at apex. Ligules *c.* 6 mm, white. $2n=22$. *Rice-fields and other wet places. Naturalized locally in S. Europe.* [Hs It Lu.] (*Tropical and warm-temperate America.*)

44. Rudbeckia L.[2]

Biennial or perennial herbs. Leaves simple to 2-pinnatifid, alternate. Capitula medium to large. Involucral bracts in 2–3 rows. Receptacle conical, with scales which partly enclose the achenes. Outer florets ligulate, sterile; inner florets tubular, hermaphrodite; corolla 5-lobed. Achenes prismatic, more or less 4-angular, glabrous; pappus a short corona or absent.

Stem and leaves hairy; leaves simple, ±entire; pappus absent **1. hirta**

Stem and upper surface of leaves glabrous or nearly so; leaves pinnatifid or 2- to 3-lobed; pappus present **2. laciniata**

1. R. hirta L., *Sp. Pl.* 907 (1753). Erect, hispid or hirsute, branched biennial or short-lived perennial 30–100 cm. Lower leaves elliptic-oblanceolate, long-petiolate, the others linear-lanceolate to ovate, subsessile, entire or remotely toothed. Capitula long-pedunculate. Involucral bracts 10–15 × 2–3 mm, linear-lanceolate, subequal, hispid. Ligules 2–4 cm, pale yellow, darker at base. Inner florets purplish-brownish-black. Pappus absent. *Cultivated for ornament and naturalized in waste places, in woods and on river-banks, mainly in C. Europe.* [Au Be Cz Ga Ge He Hu Ju Po Rs (C, W, E).] (*North America.*)

2. R. laciniata L., *Sp. Pl.* 906 (1753). Glaucous perennial up to 300 cm. Stem and upper surface of leaves glabrous or nearly so. Lower leaves 2-pinnatifid, petiolate; middle leaves deeply 2- to 3-lobed, the lobes more or less pinnatifid; upper leaves simple, ovate, sessile; all entire or coarsely toothed. Capitula long-pedunculate. Involucral bracts ovate-oblong, with deflexed apex. Ligules 3–6 cm, yellow, soon deflexed. Inner florets yellow-green. Pappus a short, usually toothed corona. $2n=76$. *Cultivated for ornament and naturalized on river-banks, mainly in C. Europe.* [Au Be Br Cz Ga Ge He Ho Hu It Ju Po Rm Rs (W).] (*North America.*)

45. Helianthus L.[2]

Stout annual or perennial herbs. Leaves simple, the lower opposite, the others usually alternate. Capitula large. Involucral bracts imbricate, in 2 to several rows, herbaceous. Receptacle flat or slightly convex, with scales which partly enclose the achenes. Outer florets ligulate, sterile, yellow. Inner florets hermaphrodite; corolla shortly 5-lobed. Achenes somewhat compressed and angled; pappus of 2 deciduous setae and rarely some small scales.

Some species and hybrids, in addition to those described below, occur as escapes from cultivation, and may be in process of becoming naturalized. The commonest of these are the annuals **H. debilis** Nutt., *Trans. Amer. Philos. Soc.* nov. ser., **7**: 367 (1841) and **H. petiolaris** Nutt., *Jour. Acad. Nat. Sci. Philad.* **2**: 115 (1821) and the perennials **H. decapetalus** L., *Sp. Pl.* 905 (1753), **H. rigidus** (Cass.) Desf., *Cat. Pl. Horti Paris.* ed. 3, 184 (1829), **H. strumosus** L., *Sp. Pl.* 905 (1753), and *H. annuus* × *decapetalus.*

Literature: C. B. Heiser, *Mem. Torrey Bot. Club* **22(3)**: 1–218 (1969).

1 Annual; receptacle flat or nearly so **1. annuus**

1 Perennial; receptacle convex

2 Involucral bracts at least as long as the diameter of the disc, narrow, ±patent; upper leaves not much smaller than lower; rhizomes tuberous **2. tuberosus**

2 Involucral bracts shorter than the diameter of the disc, wide, appressed; upper leaves usually much smaller than lower; rhizomes not tuberous **3. ×laetiflorus**

1. H. annuus L., *Sp. Pl.* 904 (1753). Coarse, scabrid-hairy, usually unbranched annual up to 3 m. Leaves 10–40 × 5–35 cm, broadly ovate, the lower cordate at base, usually toothed, 3-veined, petiolate. Capitula up to 30 cm in diameter, usually solitary, more or less nodding. Involucral bracts ovate-oblong, acuminate, ciliate. Receptacle flat or nearly so. Ligules at least 25 mm. Inner florets brownish. Achenes 5–15 mm, hairy. *Widely cultivated in E.C. & S.E. Europe for the oil obtained from the achenes; locally naturalized elsewhere from gardens.* [Al Au Bu Cz Gr He Hs Hu Ju Rm Rs (W, K, E) Tu.] (*North America.*)

2. H. tuberosus L., *Sp. Pl.* 905 (1753). Perennial; stems 1–2·8 m, scabrid-hispid or glabrous, usually branched above. Rhizomes tuberous. Leaves 10–25 × 7–15 cm, ovate, acuminate, coarsely serrate, scabrid above, whitish-pubescent beneath, narrowed into a winged petiole, the upper not much smaller. Capitula 4–8 cm in diameter, several, erect. Involucral bracts at least as long as the diameter of the disc, more or less patent, lanceolate, acuminate, ciliate, dark green. Receptacle convex. Ligules 30–40 mm. Inner florets yellow. Achenes 5–6 mm, glabrous or hairy. *Cultivated for its edible tubers (Jerusalem artichokes) and naturalized, mainly in C. Europe.* [Al Au Cz Ge He Ho Hs Hu It Ju Rm Rs (C).] (*North America.*)

3. H. ×laetiflorus Pers., *Syn. Pl.* **2**: 476 (1807) (*H. rigidus* × *tuberosus*). Like **2** but rhizomes not tuberous; leaves broadly lanceolate, conspicuously 3-veined below, very scabrid on both surfaces, the upper usually much smaller; capitula 6–10 cm in diameter; involucral bracts shorter than the diameter of the disc,

[1] By T. G. Tutin. [2] By A. Hansen.

appressed, elliptical. *Cultivated for ornament and naturalized in waste places.* [Da Ga Ge Ho Hu Rs (C).] (*North America.*)

Some records may be referable to *H. rigidus*, from W. North America.

46. Verbesina L.[1]

Annual or perennial herbs with simple leaves. Capitula medium. Involucral bracts in 3–4 rows. Ligulate florets yellow or white, female or sterile; tubular florets hermaphrodite. Receptacle with scales. Achenes flattened, more or less winged. Pappus usually of 2 awns.

Literature: J. R. Coleman, *Amer. Midl. Nat.* **76**: 475–481 (1966).

1. V. encelioides (Cav.) Bentham & Hooker fil. ex A. Gray in Brewer, S. Watson & A. Gray, *Bot. Calif.* **1**: 350 (1876). Erect, appressed-pubescent, branched annual up to 130 cm. Leaves 8–10 cm, opposite below, alternate above, ovate or deltate-ovate, coarsely serrate, usually with broadly auriculate, winged petioles. Capitula terminal, solitary; peduncles up to 12 cm. Involucral bracts linear, acute, subequal. Ligules 10–15, 15–25 mm, orange-yellow, 3-lobed at apex. Achenes of ligulate florets 3 mm, 3-angled, tuberculate, blackish, awnless. Achenes of tubular florets 4–7 mm, oblong-cuneate, white-winged, blackish, hairy; pappus of 2 scabrid, filiform awns; receptacular scales membranous, as long as the achenes. *Locally naturalized.* [?Da ?Ge ?He ?Su.] (*North America.*)

(a) Subsp. **encelioides**: Leaves usually densely pubescent and all auriculate. Involucral bracts usually more than 12 mm. *Scattered throughout the European range of the species.*

(b) Subsp. **exauriculata** (Robinson & Greenman) J. R. Coleman, *Amer. Midl. Nat.* **76**: 478 (1966): Leaves not densely pubescent, the lower without auricles. Involucral bracts usually less than 12 mm. *Scattered throughout the European range of the species.*

47. Silphium L.[2]

Perennials. Leaves simple, opposite. Capitula medium. Involucral bracts in several rows. Receptacle flat, with numerous scales which are folded round the achenes. Ligulate florets in 2–3 rows, female, yellow. Tubular florets functionally male, yellow. Achenes strongly compressed and winged above. Pappus almost obsolete.

1. S. perfoliatum L., *Syst. Nat.* ed. 10, **2**: 1232 (1759). Stems up to 250 cm, 4-angled, glabrous. Leaves triangular-ovate, coarsely toothed, acute, the lower up to 30 cm, long-petiolate, the upper abruptly contracted into a winged petiole; wings of pairs of petioles connate to form a cup round the stem. Capitula pedunculate, in a corymbose inflorescence. Involucre 15–25 × 12–25 mm; bracts ovate, glabrous. *Cultivated for ornament; occurs as a casual and locally naturalized, on river-banks and in damp meadows in C. Europe.* [Cz Ge He.] (*North America.*)

48. Iva L.[1]

Annual or perennial herbs or shrubs. Leaves alternate or opposite. Capitula small, in spikes or panicles. Involucral bracts 5, in one row. Receptacle with scales. All florets tubular. Marginal florets female, few; inner male. Achenes cuneate-obovate, somewhat compressed; pappus absent.

[1] By A. Hansen. [2] By T. G. Tutin.

Literature: R. C. Jackson, *Univ. Kansas Sci. Bull.* **41**: 793–876 (1960).

1. I. xanthifolia Nutt., *Gen. N. Amer. Pl.* **2**: 185 (1818). Annual, with erect, branched stems up to 200 cm, glabrous or hairy. Leaves 7–30 cm, more or less opposite, petiolate, 3-veined, broadly obovate-subcordate to rhombic, sometimes 3- to 5-lobed, coarsely serrate, scabrid above, hairy beneath. Capitula numerous, greenish-white, sessile or on short peduncles, in axillary and terminal, leafless spikes or panicles. Involucre turbinate. Functionally male florets 8–20, with filiform scales; female florets usually 5, with obovate, ciliate scales. Corolla of functionally male florets *c.* 2·5 mm; of female *c.* 0·5 mm or obsolete. Achenes *c.* 3 mm, muricate, dark brown. $2n=36$. *Cultivated ground, railway-lines and waste places. Naturalized in E.C. & S.E. Europe and in France; casual elsewhere.* [Au Cz Ga Ge Hu Po Rm Rs (C, W, E).] (*North America.*)

49. Ambrosia L.[1]

Annual or perennial herbs. Leaves mostly opposite. Capitula unisexual, inconspicuous; male hemispherical, drooping, in terminal, ebracteate racemes; female in axils of the uppermost leaves, each with a single floret. All florets tubular. Achene enclosed by the nut-like involucre; pappus absent; involucre usually with small spines or tubercles near apex.

Literature: A. Lawalrée, *Bull. Jard. Bot. Bruxelles* **18**: 305–315 (1947); *Bull. Soc. Bot. Belg.* **87**: 207–208 (1955). E.-J. Bonnot, *Bull. Mens. Soc. Linn. Lyon* **36**: 348–359 (1967).

1 Leaves palmately 3- to 5-lobed or entire, all opposite; involucre 6–10 mm in fruit **5. trifida**
1 Leaves pinnatifid, sometimes alternate; involucre 3–5 mm in fruit
2 Perennial; involucre in fruit unarmed or with short, blunt teeth **4. coronopifolia**
2 Annual; involucre in fruit with 4–7 acute, spinose teeth or conical tubercles
3 Plant aromatic; involucre in fruit 5-angled, glandular-pubescent, with 5 conical tubercles; beak 0·5 mm **1. maritima**
3 Plant not aromatic; involucre in fruit fusiform-obovoid, weakly angled, wrinkled, ±glabrous, with spinose teeth; beak 1–1·5 mm
4 Female capitula in clusters of 2–4 **2. artemisiifolia**
4 Female capitula solitary **3. tenuifolia**

1. A. maritima L., *Sp. Pl.* 988 (1753). Erect, branched, aromatic annual up to 125 cm. Stems often woody below. Leaves petiolate, deeply 2-pinnate, densely grey-hairy beneath; lobes ovate to lanceolate. Male involucre 3 mm in diameter, cup-shaped; bracts connate and crenately lobed, usually pubescent; male flowers 10–15; corolla present. Female capitula in axillary clusters; involucre 3–5 mm, 5-angled in fruit, glandular-pubescent, with 5 conical tubercles; beak 0·5 mm; female flowers without corolla. Achenes obovoid, smooth. *Maritime sands. Mediterranean region.* Al Co Cr Ga Gr Hs It Ju Si.

2. A. artemisiifolia L., *Sp. Pl.* 988 (1753). Like **1** but not aromatic; leaves often 1-pinnatisect, green beneath; lobes lanceolate; involucre in fruit fusiform-obovoid, weakly angled, wrinkled, more or less glabrous, with 5–7 spinose teeth; beak 1–1·5 mm. $2n=36$. *Locally naturalized, mainly in C. & S. Europe.* [Au Be Cz Ga Ge Hu It Ju Lu Po Rm Rs (W).] (*North America.*)

3. A. tenuifolia Sprengel, *Syst. Veg.* **3**: 851 (1826). Like **1** but not aromatic; leaves somewhat grey-hairy beneath; lobes linear-oblong; female capitula usually solitary; involucre in fruit fusiform-obovoid, weakly angled, wrinkled, more or less glabrous, with spinose teeth; beak 1–1·5 mm. *Naturalized in S. France and N.E. Spain.* [Ga Hs.] (*Temperate South America.*)

4. A. coronopifolia Torrey & A. Gray, *Fl. N. Amer.* **2**: 291 (1842). Like **1** but perennial, with a creeping rhizome; leaves often subsessile, usually 1-pinnatisect; lobes oblong; involucre in fruit unarmed or with short, blunt teeth. $2n=72$. *Locally naturalized, but distribution uncertain owing to confusion with other species.* [Be Da Ga Ge He Ho Hs Hu It Po Rs (W).] (*North America.*)

5. A. trifida L., *Sp. Pl.* 987 (1753). Annual up to 200 cm. Stems patent-hirsute or hispid above, glabrous below. Leaves petiolate, opposite, scabrid, broadly elliptical to ovate-orbicular, palmately 3- to 5-lobed, sometimes entire. Male involucre *c.* 1 mm, cup-shaped; bracts tuberculate; male flowers 10–15; corolla present. Female involucre 6–10 mm in fruit, many-ribbed, each rib ending in a short spine. $2n=24$. *Cultivated ground and waste places. Naturalized in a number of European countries.* [Cz Ga Ge It Rs (B, W, E).] (*North America.*)

50. Xanthium L.[1]

Annual herbs. Leaves alternate, entire or variously lobed. Capitula solitary or in axillary clusters, unisexual, the male above the female. Male capitula subglobose; involucral bracts in 1 row; receptacle cylindrical, with scales; florets numerous; stamens 5; anthers free and hooked at apex; filaments connate; style and ovary rudimentary. Female capitula ovoid; involucral bracts in 2 rows, the outer small, free, the inner connate, coriaceous, prickly, ending in 2 (rarely 1) beaks and forming a 2-locular structure containing 2 florets; corolla absent; styles exserted through a hole on the inside of the beak near its base. Achenes ovoid; pappus absent.

Literature: F. J. Widder, *Feddes Repert.* (*Beih.*) **20**: 1–223 (1923); **21**: 273–305 (1925); *Phyton* (*Austria*) **11**: 69–82 (1964); **12**: 182–190 (1967). A. Cronquist, *Rhodora* **47**: 402–403 (1945). D. Löve & P. Dansereau, *Canad. Jour. Bot.* **37**: 173–208 (1959).

Leaves long-petiolate, green beneath, without spines at base of petiole **1. strumarium**
Leaves sessile or shortly petiolate, white- or grey-tomentose beneath, with 1–2, 3-fid, yellow spines at base (rarely replaced by small leaves) **2. spinosum**

1. X. strumarium L., *Sp. Pl.* 987 (1753). Stem 20–120 cm, sometimes more, usually branched, unarmed. Leaves long-petiolate; lamina broadly ovate to triangular, with a cordate or rarely cuneate base, entire, or with 3–5 wide, coarsely serrate lobes, green and with short, stiff hairs on both surfaces. Capitula in axillary clusters and sometimes also in a terminal, leafless inflorescence, the male above the female. Involucre in fruit with straight or hooked spines and distinct beaks. *River-banks, lake-shores, pastures and disturbed ground. E., C. & S. Europe; casual in the north and west.* Al Au Az Bl Bu Co Cr Cz Ga Ge Gr He Hs Hu It Ju Lu Po Rm Rs (B, C, W, K, E) Sa Si Tu.

(a) Subsp. **strumarium**: Not aromatic. Stems and branches green. Involucre 12–15 × 6–10 mm in fruit, green or greyish-green when ripe, covered with dense but slender spines. $2n=36$. *Throughout the range of the species; native.*

(b) Subsp. **italicum** (Moretti) D. Löve, *Bot. Jour. Linn. Soc.* **71**: 271 (1976) (*X. californicum* E. L. Greene, *X. echinatum* Murray, *X. italicum* Moretti, *X. strumarium* subsp. *cavanillesii* (Schouw ex Didr.) D. Löve & Dansereau): Aromatic. Stems and branches often with violet or brownish lines or dots. Involucre 15–35 × 6–25 mm in fruit, yellow or brown when ripe, covered with stout spines. $2n=36$. *Chiefly in the southern part of the range of the species; probably an early introduction from South and North America.*

Introgressive hybrid populations between the two subspecies are found and are very variable in appearance, with the involucre small to large with short, fine and dense to coarse and distant spines (*X. albinum* (Widder) H. Scholz; incl. subsp. *riparium* (Čelak.) Widder & Wagenitz, *X. brasilicum* Velloso, *X. orientale* L. (*X. macrocarpum* DC.), *X. riparium* Itz. & Hertsch, *X. saccharatum* Wallr.)

2. X. spinosum L., *Sp. Pl.* 987 (1753). Stems 15–100 cm, much-branched, with 1–2 stout, 3-fid, yellow spines in the leaf-axils, the spines rarely more or less connate at the base or replaced by leaf-fascicles. Leaves sessile or shortly petiolate; lamina entire or 3- to 5-fid, dark green above, white- or grey-tomentose beneath. Male capitula in terminal inflorescences, the female axillary. Involucre 10–12 × 6–8 mm in fruit, covered with slender spines. $2n=36$. *Ruderal. Naturalized in C. & S. Europe; casual further north.* [Al Au Az Bl Bu Co Cr Cz Ga Ge Gr He Hs Hu It Ju Lu Po Rm Rs (W, K, E) Sa Si Tu.] (*South America.*)

51. Heliopsis Pers.[2]

Perennials. Leaves opposite. Capitula solitary, large. Involucral bracts in 2–3 rows. Receptacle conical, with numerous scales. Ligulate florets in 1 row, female, yellow. Tubular florets hermaphrodite. Achenes obtusely 3- to 4-angled; pappus absent or a small, more or less toothed rim.

Literature: T. R. Fisher, *Ohio Jour. Sci.* **57**: 171–191 (1957).

1. H. helianthoides (L.) Sweet, *Hort. Brit.* 487 (1827). Stems 30–150 cm, simple or branched. Leaves lanceolate to deltate-ovate, smooth or scabrid, coarsely serrate or dentate, petiolate. Peduncles 10–25 cm; involucral bracts ovate-lanceolate, the outer usually leaf-like. Ligules *c.* 25 × 6 mm. Achenes 3–3·5 mm, glabrous, truncate, those of the ligules 3-angled, those of the tubular florets 4-angled above, rounded below. *Cultivated for ornament and locally naturalized in Europe.* [Da Ge Hu Po.] (*North America.*)

(a) Subsp. **scabra** (Dunal) Fisher, *Ohio Jour. Sci.* **57**: 190 (1957): Leaves lanceolate to ovate-lanceolate; petioles 2–2·5 cm. Disc of capitulum 12–14 mm. *Scattered throughout the European range of the species.*

(b) Subsp. **occidentalis** Fisher, *op. cit.* 189 (1957): Leaves deltate-ovate; petioles not more than 1·5 cm. Disc of capitulum 15–25 mm. *Scattered throughout the European range of the species.*

Subsp. *helianthoides* is not known to occur in Europe.

52. Galinsoga Ruiz & Pavón[3]

Annual herbs. Leaves opposite. Capitula small, in dichasial cymes. Involucral bracts few, in 1–2 rows. Receptacle conical, with scales. Ligulate florets female; tubular florets hermaphrodite. Achenes obovoid-prismatic, the outer somewhat compressed dorsally; pappus of several scales.

[1] By D. Löve. [2] By A. Hansen. [3] By T. G. Tutin.

Peduncles with erecto-patent hairs less than 0·5 mm and few, short patent glandular hairs; receptacular scales 3-fid; pappus-scales not aristate **1. parviflora**
Peduncles with numerous, long patent glandular hairs more than 0·5 mm; receptacular scales entire; pappus-scales aristate **2. ciliata**

1. G. parviflora Cav., *Icon. Descr.* **3**: 41 (1795). Stem up to 80 cm, branched, glabrous below. Leaves up to 5(–9) cm, ovate, acute to acuminate, serrate; petiole shorter than lamina, slender. Peduncles with erecto-patent hairs less than 0·5 mm and few, short patent glandular hairs. Capitula subglobose; involucral bracts *c.* 4 mm, broadly ovate; receptacular scales 3-fid. Ligules *c.* 1 mm, about as wide as long, usually 5, white, 3-toothed; tubular florets yellow. Achenes 1–1·5 mm, with short ascending setae; pappus-scales not aristate. $2n=16$. *Waste places and cultivated ground. Widely naturalized in Europe.* [Au Az Be Br Bu Cz Da Fe Ga Ge He Ho Hu It Ju Lu No Po Rm Rs (B, C, W, ?E) Su.] (*South America.*)

2. G. ciliata (Rafin.) S. F. Blake, *Rhodora* **24**: 35 (1922) (*G. quadriradiata* auct., non Ruiz & Pavón). Like **1** but stems hairy below; peduncles with numerous long, patent, flexuous glandular hairs more than 0·5 mm; receptacular scales not 3-fid; pappus-scales aristate. $2n=32$, 36. *Waste places and cultivated ground. Apparently less common than* **1**, *but probably often overlooked.* [Au Az Be Br Bu Cz Da Fe Ga Ge He Ho Hu It Ju Lu No Po Rm Rs (B, C, W) Su.] (*Mexico to Chile.*)

Tribe **Helenieae** Bentham[1]

Leaves alternate or opposite, simple or pinnatisect. Capitula usually with ligules; outer florets female or sterile, the inner hermaphrodite or functionally male; corolla usually yellow. Receptacle without scales. Anthers obtuse at base. Style-branches truncate or with a non-stigmatic apex. Pappus of scales.

53. **Schkuhria** Roth[2]

Annual herbs. Leaves pinnatifid, glandular-punctate, alternate or opposite. Capitula small. Involucral bracts 5–8, in one row or with 2–3 small outer bracts, free. Receptacle concave, without scales. Florets (3–)4(–5), one ligulate and female, the others tubular, hermaphrodite. Achenes 4-angled, pubescent. Pappus of 8 scales.

1. S. pinnata (Lam.) O. Kuntze, *Revis. Gen.* **3**: 170 (1898). Erect, freely branched annual 25–75 cm, appressed-pubescent at least above. Leaves 1- to 2-pinnatisect, with linear segments. Capitula very numerous, in a more or less corymbose panicle. Involucre 5–6 × 3–4 mm, obconical, with 2 linear bracts at its base; involucral bracts purplish with yellow scarious margin in fruit. Ligule *c.* 1·5 mm, yellow. Achenes attenuate below, appressed-pubescent. Pappus-scales alternately acuminate-aristate and obtuse. *Cultivated or disturbed ground. Naturalized in E. Spain*; *an occasional casual elsewhere.* [Hs.] (*South America.*)

54. **Gaillardia** Foug.[3]

Annuals or short-lived perennials. Leaves entire or pinnatifid, alternate. Capitula large. Involucral bracts in 2–3 rows. Receptacle convex-subglobose, with numerous scales or setae. Outer florets ligulate, usually female; inner florets tubular, hermaphrodite. Achenes obovoid, usually covered by a basal tuft of long hairs. Pappus of 5–10 long-awned scales.

Literature: S. F. Biddulph, *Res. Stud. State Coll. Washington* **12**: 195–256 (1944).

1. G. aristata Pursh, *Fl. Amer. Sept.* **2**: 573 (1814). Erect, hairy perennial 20–70 cm. Leaves 5–15 × 0·5–2·5 cm, linear-oblong to lanceolate-ovate, the lower often oblanceolate, entire (often serrate) or pinnatifid. Capitula solitary or few, long-pedunculate. Involucral bracts 6–13 × 2–3 mm, herbaceous, narrow, often hairy, patent, deflexed in fruit. Ligules numerous, 1–3·5 cm, yellow, often with purplish base. Tubular florets purple or brownish-purple. Achenes *c.* 4 mm, covered by the appressed basal hairs, shorter than the setae on the receptacle. Pappus 2–3 mm (excluding awn), white, membranous, abruptly contracted into an awn. *Cultivated for ornament and naturalized in the Açores.* [Az.] (*North America.*)

G. pulchella Foug., *Mém. Acad. Sci.* (*Paris*) **1786**: 5 (1788), also from North America, is perhaps becoming naturalized in C. Europe. It is an annual with purple ligules with a yellow apex.

55. **Tagetes** L.[3]

Aromatic annual herbs. Leaves pinnatifid, glandular-punctate, mostly opposite. Capitula medium. Involucral bracts 5–10, in one row, connate nearly to apex. Receptacle flat, small, without scales. Outer florets ligulate, female; inner florets tubular, hermaphrodite. Achenes linear, 4-angled, slightly compressed, pubescent. Pappus of 5–10 membranous, often connate scales, one or more of them awned.

1. T. minuta L., *Sp. Pl.* 887 (1753). Erect, glabrous, strong-smelling annual up to 100 cm, with short branches. Leaves 3–15 × 3–10 cm, pinnatisect; segments 3–7, 2–8 × 0·2–0·6 cm, linear-lanceolate; only the lower leaves opposite. Capitula numerous in dense terminal corymbs. Involucre 8–12 × 1·5–2 mm, cylindrical, of 3–4 yellowish-green bracts. Ligules usually 1–3 mm, obovate-spathulate, yellowish-green. Tubular florets 4–5, 3–4 mm, green. Achenes 4–6 × 0·5–1 mm, linear, black, with appressed white hairs. Pappus of 5 scales 0·5–3 mm. *Waste places and cultivated ground. Locally naturalized in S. Europe, casual elsewhere.* [Ga It Ju.] (*South America.*)

Tribe **Anthemideae** Cass.[1]

Leaves alternate, very rarely opposite, simple or pinnatisect. Capitula with or without ligules; outer florets usually female or sterile, the inner hermaphrodite or functionally male; corolla usually white or yellow. Receptacle with or without scales. Anthers usually obtuse at base. Style-branches truncate and papillose at apex. Pappus absent or a corona or auricle.

56. **Santolina** L.[4]

Aromatic dwarf shrubs. Leaves alternate, entire or dentate to pinnately lobed. Capitula small to medium, pedunculate. Involucral bracts in several rows, gradually increasing in length inwards. Receptacle slightly convex; scales present, half surrounding the achenes. Florets tubular, usually all hermaphrodite, yellow to whitish; tube often compressed and more or less winged, spurred at base or saccate and enclosing the apex of the achene. Achenes oblong, weakly 3- to 4(–5)-angled; pappus absent.

[1] Edit. T. G. Tutin. [2] By T. G. Tutin. [3] By A. Hansen. [4] By E. Guinea and T. G. Tutin.

1 Plant glandular-viscid; stem leafy almost up to capitulum **3. viscosa**
1 Plant not glandular-viscid; stem leafless for some distance below capitulum
2 Plant sericeous **1. oblongifolia**
2 Plant tomentose to subglabrous, not sericeous
3 Most leaves flat; stock slender **2. elegans**
3 Most leaves subcylindrical; stock stout
4 Leaves entire, tuberculate-dentate or pinnatifid to pinnatisect, with lobes less than 1·5 mm
5 Pinnae or teeth remote, or leaves apparently entire but with closely appressed teeth **4. rosmarinifolia**
5 Pinnae or teeth crowded **5. chamaecyparissus**
4 Leaves pinnatisect; lobes more than 1·5 mm
6 Leaves grey-tomentose **5. chamaecyparissus**
6 Leaves not tomentose
7 Lobes of leaves crowded; peduncles not thickened above **5. chamaecyparissus**
7 Lobes of leaves remote; peduncles thickened above **4. rosmarinifolia**

1. S. oblongifolia Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 18 (1856). Plant sericeous. Non-flowering shoots long, semi-procumbent from a branched, woody stock, with short axillary shoots; flowering stems 15–30 cm, ascending, sparsely leafy below, leafless above, thickened below the solitary capitulum. Leaves erecto-patent, oblong-spathulate, flat, some pinnatifid with obtuse lobes, the upper on the flowering stems entire and softly mucronate, all narrowed into the petiole. Involucre 15–18 mm wide, subglabrous; bracts lanceolate, weakly carinate, the inner with rounded, lacerate-denticulate, scarious apex. Florets bright yellow. ● *Mountains of W.C. Spain.* Hs.

2. S. elegans Boiss. ex DC., *Prodr.* **7**: 296 (1838). Plant grey-tomentose. Stems (5–)10–20 cm, from a slender, creeping, branched stock; non-flowering shoots short, densely leafy; flowering stems erect, sparsely leafy. Leaves oblong-linear to oblong-spathulate, obtuse, the lower incise-crenate to pinnatisect, plicate, shortly petiolate, the upper entire, flat, sessile. Involucre 7–10 mm wide, subglobose, villous; bracts ecarinate, the outer ovate-lanceolate, the inner oblong, with scarious apex. Florets yellow. ● *S. Spain* (*Sierra Nevada*). Hs.

3. S. viscosa Lag., *Gen. Sp. Nov.* 25 (1816). Plant glabrous or sparsely puberulent, glandular-viscid. Stems 15–40 cm, from a stout, ascending, much-branched stock; non-flowering shoots short, densely leafy; flowering stems paniculately branched, leafy almost up to the capitula, scarcely thickened at apex. Leaves crowded below, nearly all pectinate-pinnatisect, the lobes 2-ranked; uppermost leaves small, entire. Involucre 10–15 mm wide, subglobose; outer bracts ecarinate, ovate-lanceolate, acute or acuminate; inner oblong, with wide, lacerate, scarious apex. *Gypsaceous soils.* ● *S.E. Spain.* Hs.

4. S. rosmarinifolia L., *Sp. Pl.* 842 (1753) (incl. *S. pectinata* Lag., *S. viridis* Willd.). Stems (15–)35–45(–60) cm, erect or ascending from a procumbent, branched stock; non-flowering shoots with greyish-glaucous leaves and short axillary shoots; flowering stems usually simple, leafless above. Juvenile leaves erect to erecto-patent, narrowly linear, acute, very shortly and remotely tuberculate-denticulate to pectinate-pinnatifid; adult leaves with closely appressed teeth, the uppermost entire. Peduncles thickened above. Involucre 7–12 mm wide, hemispherical, subtruncate and umbilicate at the base; bracts lanceolate, acuminate, strongly carinate, the inner with wide, scarious, lacerate apex. Florets bright yellow. $2n=18$, 36. *Iberian peninsula, S. France.* Ga Hs Lu.

[1] By R. Fernandes.

(a) Subsp. **rosmarinifolia**: Plant glabrous to sparsely tomentulose. *Throughout most of the range of the species.*

(b) Subsp. **canescens** (Lag.) Nyman, *Consp.* 369 (1879): Plant densely whitish- or greyish-tomentose. *S.E. Spain, above* 800 *m.*

5. S. chamaecyparissus L., *Sp. Pl.* 842 (1753). Stems 10–50 cm, erect or ascending; non-flowering shoots green to grey-tomentose; flowering stems usually simple, leafless for some distance below the capitulum. Leaves densely pectinate-dentate to pinnatisect. Involucre 6–10 mm wide, hemispherical, subtruncate and not or weakly umbilicate at base; bracts lanceolate to ovate, carinate, the inner with rounded, lacerate, scarious apex. Florets cream to bright yellow. *W. & C. Mediterranean region.* Bl Co Ga Hs It Ju Sa Si [He Lu].

1 Lobes of leaves not more than 2 mm
2 Involucre usually tomentose; florets deep yellow (a) subsp. **chamaecyparissus**
2 Involucre usually glabrous; florets pale yellow (b) subsp. **squarrosa**
1 Lobes of some leaves at least 2·5 mm
3 Leaves often glabrous; peduncles not thickened above (c) subsp. **tomentosa**
3 Leaves grey-tomentose; peduncles thickened above (d) subsp. **insularis**

(a) Subsp. **chamaecyparissus**: Very variable in habit. Leaves grey- to white-tomentose; lobes not more than 2 mm. Involucre usually tomentose; florets deep yellow. *Pyrenees to N.W. Italy.*

(b) Subsp. **squarrosa** (DC.) Nyman, *Consp.* 368 (1879): Dwarf. Leaves glabrous to tomentose; lobes not more than 2 mm. Involucre usually glabrous; florets pale yellow. *Spain, Islas Baleares, S. France.*

(c) Subsp. **tomentosa** (Pers.) Arcangeli, *Comp. Fl. Ital.* 363 (1882): Usually tall. Some or all leaves usually glabrous or glabrescent; lobes 2·5–7 mm. Involucre usually glabrous; florets usually whitish or pale yellow. *Pyrenees to C. Italy.*

(d) Subsp. **insularis** (Genn. ex Fiori) Yeo, *Bot. Jour. Linn. Soc.* **70**: 18 (1975) (*S. chamaecyparissus* var. *insularis* Genn. ex Fiori): Usually tall. Leaves grey-tomentose; lobes more than 2·5 mm. Involucre usually tomentose; florets yellow. *C. Mediterranean region.*

57. **Anthemis** L.[1]

Herbs or dwarf shrubs, more or less hairy. Leaves alternate, usually divided. Capitula small to medium, solitary, terminal, pedunculate. Involucre usually more or less hemispherical; involucral bracts in several rows. Receptacle conical, hemispherical or ovoid; scales usually present, at least in upper part of receptacle. Outer florets usually ligulate and female, with compressed tube and patent, usually 2- to 3-dentate ligule. Inner florets hermaphrodite, tubular, 5-dentate, numerous, yellow; tube not saccate. Achenes terete or more or less compressed; pappus absent or represented by a corona or auricle.

Measurements of length of stem include the peduncle; length of leaves includes both petiole and lamina; length of peduncle is taken from the uppermost divided cauline leaf to the base of the capitulum; length of ligules is that of the limb; measurements of achenes refer to the achenes of the tubular florets and include the corona or auricle unless the contrary is stated; number of striations on the achene (Subgen. *Cota*) refers to those of outer and inner sides (not to each of four faces of achenes), including also that corresponding to the median angle of each side.

The primary divisions of the leaves are referred to as *segments* and the ultimate divisions as *lobes*. Unless the contrary is stated the involucre is not umbonate and the ligules are white.

Mature achenes are essential for the identification of most species.

1 Receptacle without scales
2 Leaves fleshy, the lobes obtuse; achenes all similar, obconical-turbinate, distinctly ribbed, caducous **61. ammanthus**
2 Leaves not fleshy, the lobes acute; outer achenes cylindrical, obscurely ribbed, persistent, the inner cylindric-obconical, distinctly ribbed, caducous **59. filicaulis**
1 Receptacle with scales at least in the upper half
3 Receptacle without scales in the lower part; scales narrowly lanceolate to linear-subulate; annual
4 Outer achenes cylindrical, persistent; pappus present; ligules absent **60. tomentella**
4 Achenes turbinate, caducous; pappus absent; ligules usually present
5 Achenes tuberculate or verruculose; leaf-lobes narrowly linear **39. cotula**
5 Achenes slightly ribbed, the ribs nearly or quite smooth; leaf-lobes filiform **40. lithuanica**
3 Receptacle with scales all over; scales usually wider; annual, biennial or perennial
6 Achenes usually somewhat compressed, rhombic in transverse section; receptacular scales ±rigid; leaf-segments usually pectinately divided
7 Annual; ligules white
8 Branches divaricate; involucre nearly flat **55. syriaca**
8 Branches erect to erecto-patent; involucre ±hemispherical
9 Peduncles clavate in fruit; acumen of receptacular scales about as long as the scale
10 Receptacular scales abruptly contracted above; achenes with 7–11 ribs on each side; leaves 2- to 3-pinnati-partite **53. altissima**
10 Receptacular scales gradually narrowed above; achenes with 2–4 ribs on each side; leaves 1-pinnati-sect, with pectinate segments **54. coelopoda**
9 Peduncles not clavate in fruit; acumen of receptacular scales less than ½ as long as the scale
11 Achenes 2·5–3 mm, slightly compressed, indistinctly ribbed; stems not more than 30 cm **58. brachmannii**
11 Achenes (1·5–)2–2·5 mm, distinctly compressed and ± ribbed; stems up to 60 cm
12 Achenes with (3–)5–7 distinct ribs on each side; corona up to 1 mm; involucre finally umbonate **56. segetalis**
12 Achenes with 2–3 obscure ribs on each side; corona absent or very short; involucre not umbonate **57. austriaca**
7 Perennial
13 Ligules absent
14 Corona usually less than ¼ as long as achene; receptacular scales oblong-lanceolate, attenuate-acuminate **42. tinctoria**
14 Corona ¼–½ as long as achene; receptacular scales obovate-cuneate, ±abruptly contracted into the acumen
15 Inner involucral bracts oblong-lanceolate, acute; stems 30–90 cm, erect, corymbosely branched **49. triumfetti**
15 Inner involucral bracts oblong or elliptic-oblong, obtuse or rounded; stems 10–40(–60) cm, usually simple **47. parnassica**
13 Ligules present
16 Ligules pure white or cream
17 Ligules 13–30×2–4 mm, oblong to linear; all involucral bracts with blackish margin and apex
18 Stems 50–105 cm, corymbosely branched above; leaves up to 15×10 cm, soft, green, sparsely hairy beneath; capitula up to 65 mm in diameter; corona ¼–⅓ as long as achene **51. macrantha**
18 Stems 20–50 cm, simple or once branched at middle; leaves not more than 5×2·5 cm, rigid, greyish, sericeous beneath; capitula not more than 50 mm in diameter; corona more than half as long as achene **52. jailensis**
17 Ligules 6–20×2·5–6·5 mm, oblong to broadly elliptical; inner and sometimes middle involucral bracts brownish at margin and apex
19 Stems up to 90 cm, erect, corymbosely branched; involucral bracts acute or subacute
20 Capitula (25–)30–50 mm in diameter; ligules up to 20 mm, pure white **49. triumfetti**
20 Capitula 25–30(–35) mm in diameter; ligules not more than 12 mm, cream **50. dumetorum**
19 Stems 10–40(–60) cm, decumbent or ascending; involucral bracts obtuse
21 Stems usually branched; leaves often 2-pinnatisect; inner involucral bracts *c.* 2 mm wide; corona *c.* ⅓ as long as achene **48. dubia**
21 Stems usually simple; leaves pinnatifid; inner involucral bracts less than 2 mm wide; corona ¼–½ as long as achene **47. parnassica**
16 Ligules yellow or orange
22 Ligules pale- to lemon-yellow
23 Stems 25–30(–40) cm, usually simple and with 1 capitulum; leaves green, with very sparse indumentum and flat teeth **46. monantha**
23 Stems 30–50(–70) cm, usually branched, with many capitula; leaves densely greyish- or whitish-lanate beneath, with inflexed teeth **42. tinctoria**
22 Ligules golden-yellow to orange
24 Involucral bracts acute or subacute, all or most with dark brown or blackish margin and apex; ligules orange
25 Capitula 40–50 mm in diameter with disc 15–25 mm in diameter; achenes up to 2·5 mm; corona *c.* 1 mm **44. sancti-johannis**
25 Capitula less than 40 mm in diameter with disc 11–18 mm in diameter; achenes up to 2 mm; corona *c.* 0·5 mm **42. tinctoria**
24 Outer involucral bracts acute, the inner obtuse to subacute, all with hyaline or pale margin and apex or only the inner diffusely brownish at apex; ligules golden-yellow
26 Capitula 25–50 mm in diameter; leaves usually sparsely hairy
27 Corona not more than 0·5 mm; capitula 25–45 mm in diameter; stems up to 60(–80) cm, not very robust **42. tinctoria**
27 Corona *c.* 1 mm; capitula 40–50 mm in diameter; stems up to 90 cm, rather robust **43. gaudium-solis**
26 Capitula not more than 30 mm in diameter; plants densely greyish- or whitish-lanate
28 Stems 10–25 cm, procumbent; capitula 12–20(–25) mm in diameter **45. cretacea**
28 Stems usually up to 60 cm, erect; capitula 20–25 (–30) mm in diameter **42. tinctoria**
6 Achenes not compressed, orbicular or subquadrate in transverse section; receptacular scales not or scarcely rigid; leaf-segments not pectinately divided
29 Annual, rarely slender biennial, without non-flowering shoots; peduncles sometimes clavate in fruit
30 Receptacular scales with rather dense white hairs **61. ammanthus**
30 Receptacular scales glabrous
31 Ligules yellow **35. chrysantha**
31 Ligules white, rarely pink or absent
32 Achenes cylindrical, the outer persistent, the inner caducous; receptacular scales linear or setaceous; caducous; receptacular scales linear or setaceous; ligules absent **60. tomentella**
32 Achenes turbinate or subpyramidal, rarely subcylindrical, all persistent or all caducous; receptacular scales usually linear-lanceolate or oblong; ligules usually present
33 Achenes of at least the outer tubular florets granulate or tuberculate
34 Ribs of achenes prominent and strongly tuberculate
35 All achenes with a denticulate rim; peduncles not clavate in fruit; ligules often present **17. tuberculata**

35 At least the outer achenes with auricle up to 1 mm; peduncles clavate in fruit; ligules absent **37. muricata**
34 Ribs of achenes not very prominent, granulate or rugulose
36 Ligules *c.* 2 mm, sterile, pink; ribs of achenes interrupted, rugulose; receptacle nearly flat **62. glaberrima**
36 Ligules more than 2 mm, fertile, white, rarely absent; ribs of achenes continuous, granulate; receptacle conical or almost hemispherical
37 Peduncles clavate in fruit **36. secundiramea**
37 Peduncles not clavate in fruit
38 Corona up to nearly ½ as long as achene; branches slender, straight, somewhat rigid; peduncles long; stems 15–35 cm **38. macedonica**
38 Corona absent or a very short rim; branches flexuous, not rigid; peduncles short; stems usually not more than 15 cm **36. secundiramea**
33 Achenes of the tubular florets not tuberculate or granulate
39 Ligulate florets absent or sterile
40 Involucre cylindrical-obconical; all involucral bracts acute, without or with a very narrow hyaline margin; stems not more than 15 cm, simple or with short branches above; ligules usually absent **34. rigida**
40 Involucre hemispherical or hemispherical-obconical; inner involucral bracts with a ±wide hyaline margin; stems usually more than 15 cm, ± branched, frequently from the base; ligules usually present
41 Peduncles not clavate in fruit; capitula 30–40 mm in diameter; achenes 2–2·25 mm (excl. auricle) **32. scopulorum**
41 Peduncles usually ±clavate in fruit; capitula 15–37 mm in diameter; achenes 1·5–2 mm (excl. auricle) **33. tomentosa**
39 Ligulate florets fertile
42 Receptacle hemispherical to hemispherical-ovoid; achenes of ligules and sometimes of the outer tubular florets with a large hyaline auricle up to as long as the achene, the others with a very short thick corona; involucral bracts usually with dark brown or black margin **41. chia**
42 Receptacle conical; achenes without pappus or with an auricle; involucral bracts with hyaline or pale brown margin
43 Peduncles ±clavate in fruit
44 Leaves subpalmately divided, fleshy, finally glabrescent **31. flexicaulis**
44 Leaves pinnately divided, usually not fleshy, ± persistently hairy
45 Ligules up to 11×4 mm; receptacle at least 5·5×3 mm **27. arvensis**
45 Ligules not more than 6×3 mm; receptacle not more than 5·5×3 mm
46 Outer achenes nearly as wide as or wider than long, with very thick ribs; hyaline, lacerate auricle sometimes present; ligules up to 6×3 mm **27. arvensis**
6×3 mm **27. arvensis**
46 All achenes distinctly longer than wide, with obscure ribs; auricle opaque; ligules *c.* 3×2 mm **30. werneri**
43 Peduncles not clavate in fruit
47 Biennial or perennial with a woody stock; ligules 3·5–6·5×2·25–3 mm; receptacle 2–5×2–3 mm, shortly conical **27. arvensis**
47 Annual; ligules up to 17×7·5 mm; receptacle up to 10×3·5 mm, elongate-conical in fruit
48 Achenes with an auricle 0·55–1·75 mm; ribs slightly thickened; rim not thickened **29. auriculata**
48 Achenes without or with an auricle not more than 0·25 mm; ribs thick and raised; rim thick, obtuse
49 Receptacular scales linear-subulate to oblanceolate, entire; outer achenes at least ⅔ as wide as long; tube of florets not swollen **27. arvensis**
49 Receptacular scales oblanceolate to obovate, cuneate at base, dentate-lacerate at apex; outer achenes not more than ½ as wide as long; tube of florets spongy and swollen in the lower half **28. ruthenica**
29 Perennial, usually with non-flowering shoots, rarely very robust biennial; peduncles not clavate in fruit
50 Leaves spathulate-cuneate, entire or 3- to 5-lobed at apex, sericeous **10. argyrophylla**
50 At least the lower leaves 1- to 2-pinnatifid to -pinnatisect, not sericeous
51 Ligules yellow
52 Stems 9–16(–30) cm, ascending, usually simple; ligules 3·5–6 mm wide; achenes *c.* 2 mm, not granulate; young leaves densely lanate **1. trotzkiana**
52 Stems 40–60 cm, erect, corymbosely branched; ligules up to 3 mm wide; achenes 1–1·5 mm, granulate, mainly on the angles; leaves sparsely hairy **14. virescens**
51 Ligules white, rarely pink or absent
53 Ligules purplish-pink at least at base; stems usually not more than 12 cm **4. aetnensis**
53 Ligules white or absent; stems usually more than 12 cm
54 Leaves sessile, pectinate; segments linear to setaceous, with subulate mucro **22. orientalis**
54 At least the lower leaves petiolate, not pectinate; segments usually narrowly oblong to elliptical
55 At least the achenes of the outer tubular florets tuberculate
56 Stems *c.* 5 mm in diameter at base; capitula up to 60 mm in diameter; ligules present; achenes auriculate **18. ismelia**
56 Stems less than 5 mm in diameter at base; capitula 22–45 mm in diameter; ligules sometimes absent; pappus absent **17. tuberculata**
55 Achenes of tubular florets not tuberculate, though sometimes granulate
57 At least the outer receptacular scales ±3-dentate and dark brown to blackish towards the apex; all involucral bracts with dark brown to black margin and apex, clearly distinct from inner part of bract
58 Ligules absent; plant glabrous **3. sibthorpii**
58 Ligules present
59 Receptacle conical, acute or subacute; segments and lobes of leaves not more than 1 mm wide, linear
60 Biennial with non-flowering shoots absent at anthesis; involucre deeply umbonate; achenes 1·5–1·75 mm **15. orbelica**
60 Perennial with non-flowering shoots present at anthesis; involucre not or slightly umbonate; achenes 2 mm **23. pindicola**
59 Receptacle hemispherical or hemispherical-conical, obtuse or subobtuse; segments and conical, obtuse or subobtuse; segments and lobes of leaves more than 1 mm wide
61 Stems (20–)30–60 cm, up to 6 mm in diameter at base, frequently branched; capitula up to 63 mm in diameter **5. punctata**
61 Stems up to 35 cm, rather thinner at base, usually simple; capitula 20–50 mm in diameter **2. carpatica**
57 Receptacular scales not or indistinctly 3-dentate, usually not brown or with only the apex of acumen brown; involucral bracts with hyaline or brownish margin not clearly distinct from inner part of bract

62 Leaves fleshy, sparsely hairy to glabrous; stem stout, procumbent or ascending, ±branched, rooting at base; ligules present; involucral bracts with hyaline margin **13. maritima**
62 Not as above
63 Receptacle hemispherical or shortly ovoid, rounded at apex
64 Ligules present
65 Non-flowering shoots ±pulvinate; stems 12–30 (–40) cm, less than 5 times as long as non-flowering shoots, usually ascending, not in groups, rather stout; involucral bracts usually with brownish scarious margin **6. cretica**
65 Non-flowering shoots not pulvinate; stems 20–55 cm, 4½–10 times as long as non-flowering shoots, erect, in groups, slender; involucral bracts with hyaline margin **11. gerardiana**
64 Ligules absent
66 Achenes not ribbed; pappus absent or very short; stems simple **6. cretica**
66 Achenes ribbed; pappus present; stems often branched
67 Leaves densely greyish- or brownish-tomentose; achenes 2·5–3 mm, with a short auricle **21. spruneri**
67 Leaves green, sparsely hairy; achenes (1·5–) 2–2·5 mm, usually with a short corona **12. alpestris**
63 Receptacle conical (sometimes short), or distinctly narrowed to the apex
68 Stems branched, the branches again branched; ligules present
69 Stems not more than 22 cm, slender; disc 6–9 mm in diameter; ligules 4–5 × 3 mm **24. meteorica**
69 Stems up to 80 cm, stout; disc 9–13 mm in diameter; ligules 11–17 × 3·5–4·5 mm
70 Biennial; non-flowering shoots absent at anthesis; involucre deeply umbonate; achenes 1·5–1·75 mm **15. orbelica**
70 Perennial; non-flowering shoots present at anthesis; involucre not or slightly umbonate; achenes 2 mm **23. pindicola**
68 Stems simple or with simple branches; ligules present or absent
71 Young leaves usually densely hairy; achenes usually with pappus
72 Non-flowering shoots numerous, dense, pulvinate; indumentum whitish-lanate; ligules present **7. sterilis**
72 Non-flowering shoots not pulvinate; indumentum greyish or brownish; ligules present or absent
73 Cauline leaves up to *c.* 1·5 × 0·7 cm, with ±flabellate, very crowded segments; lobes obtuse; achenes subprismatic, distinctly ribbed **20. anatolica**
73 Cauline leaves up to 3 × 2 cm or more; lobes acute; achenes obconical or obpyramidal, not or slightly ribbed
74 Outer receptacular scales sparsely hairy on back; involucral bracts usually without a brownish margin; cauline leaves not more than 3 × 2 cm **19. teauiloba**
74 Outer receptacular scales not hairy on back; involucral bracts with brownish margin and apex; cauline leaves up to 6 cm **23. pindicola**
71 Young leaves ±sparsely hairy; pappus absent or an auricle not more than 0·25 mm
75 Achenes 1·25–1·5 mm; disc 4–8(–9) mm in diameter; involucre not umbonate
76 Ligules absent; stems 3–15 cm, simple **8. abrotanifolia**
76 Ligules present; stems often more than 15 cm, simple or with 1–3 branches **26. stribrnyi**
75 Achenes 1·5–2·5 mm; disc often more than 8 mm in diameter, at least in fruit
77 Stems not more than 20 cm; involucre not or slightly umbonate
78 Ligules absent; disc up to 13 mm in diameter; achenes (1·5–)2–2·5 mm **12. alpestris**
78 Ligules present; disc not more than 10 mm in diameter; achenes 1·5–2 mm
79 Receptacle not or scarcely higher than wide **9. panachaica**
79 Receptacle distinctly higher than wide **25. rumelica**
77 Stems 20–55 cm; involucre usually umbonate
80 Ligules present **11. gerardiana**
80 Ligules absent
81 Stems 24–45 cm, erect, rigid; capitula 5–8 mm in diameter at anthesis; achenes 1·5–1·75 mm **16. hydruntina**
81 Stems 10–35(–40) cm, ascending, not rigid; capitula 8–13 mm in diameter at anthesis; achenes (1·5–)2–2·5 mm **12. alpestris**

Subgen. **Anthemis**. Perennial or annual, rarely biennial. Receptacle with obovate-cuneate to linear, not or scarcely rigid scales at least above. Achenes not compressed, turbinate, subpyramidal or obconical, orbicular or subquadrate in transverse section.

Sect. HIORTHIA (DC.) R. Fernandes. Usually perennial herbs or dwarf shrubs with non-flowering shoots. Peduncles not clavate in fruit. Involucral bracts with hyaline to black scarious margin and apex. Receptacular scales usually more or less persistent, concolorous or brown to black at apex. Ligules white, yellow or frequently absent. Receptacle hemispherical, ovoid or shortly conical. Achenes with smooth, tuberculate or often granulate ribs, or the ribs obsolete.

1. A. trotzkiana Claus ex Bunge, *Del. Sem. Horti Dorpat.* 3 (1847). Very dense dwarf shrub; flowering stems with withered remains of leaves at base. Stems 9–16(–30) cm, simple or with few erect branches. Leaves up to 5·5 cm, 1- to 2-pinnatisect, white-lanate, glabrescent; lobes linear; mucro long, acute. Capitula *c.* 20 mm in diameter. Involucre campanulate; bracts lanate, the outer ovate-triangular, acute, the others with a wide hyaline apex. Ligules 7·5–13 × 3·5–6 mm, yellow. Disc 10–13 mm in diameter. Receptacle shortly conical; receptacular scales oblong-cuneate, abruptly acuminate, shorter than the florets. Achenes *c.* 2 mm, obpyramidal, ribbed on the adaxial side, not granulate, with or without a short corona. *Calcicole. S.E. Russia, W. Kazakhstan.* Rs (E).

2. A. carpatica Willd., *Sp. Pl.* **3**: 2179 (1803). Stock woody. Stems usually simple, densely appressed-hairy to glabrous. Leaves densely appressed-hairy to glabrous, 1- to 2-pinnatisect or pinnatipartite, with entire, dentate or lobed segments, the lower cauline long-petiolate; lobes linear-lanceolate or obovate-lanceolate. Capitula usually long-pedunculate. Involucre subhemispherical, not umbonate; bracts subequal, ovate-lanceolate to oblong-lanceolate, acute to subobtuse, green with rather wide, black or brown margins and apex. Ligules usually longer than the diameter of the disc; corolla-tube swollen and spongy at base. Receptacle hemispherical-conical; scales oblong or oblong-cuneate, frequently brown towards the dentate or lacerate apex, acuminate, shorter than the florets. Achenes cylindrical-obconical, subquadrangular, obsoletely ribbed, not or slightly granulate; corona up to 0·5 mm. *Grassy and stony places. Mountains of S. & S.C. Europe, from the Pyrenees to the E. Carpathians and N. Greece.* Al Au Bu Gr He Hs It Ju Po Rm Rs (W).

Very variable in habit, indumentum, size of leaves, shape and width of leaf-lobes, size of capitula, etc. Some plants from S.E. Europe and E. Pyrenees are more or less whitish-sericeous, sometimes have stems with 1–2 branches, and a slightly higher receptacle. These have been called **A. cinerea** Pančić, *Nov. Elem. Fl. Bulg.* **39** (1886), and may merit subspecific rank.

1 Stems usually not more than 10 cm; leaves pinnatipartite, with cuneate, entire or 2- to 3-lobed segments, the lobes up to 3 mm wide **(b)** subsp. **pyrethriformis**
1 Stems usually more than 10 cm; leaves 1- to 2-pinnatisect, usually with narrower, not cuneate lobes
2 Glabrous; stems usually more than 3½ times as long as the non-flowering shoots; capitula 20–30(–40) mm in diameter **(c)** subsp. **petraea**
2 Sparsely hairy to ±whitish-sericeous, rarely glabrous; stems usually less than 3½ times as long as the non-flowering shoots; capitula (20–)30–50 mm in diameter **(a)** subsp. **carpatica**

(a) Subsp. **carpatica** (*A. orientalis* subsp. *carpatica* (Willd.) Hayek): Stems (6–)10–35(–40) cm. Leaves up to 6 × 2·8 cm, light green, more or less sparsely hairy to whitish-sericeous, rarely glabrous. Capitula (20–)30–40(–50) mm in diameter; peduncles (1–)3–11 cm. Involucre glabrous to densely hairy; outer bracts at least half as long as the inner, all usually with dark scarious margin and apex. Ligules up to 20 × 8·5 mm; disc 10–18 mm in diameter. Achenes 2·5–3 mm. $2n = 36$, 54. *Pyrenees; E. Alps; Carpathians and mountains of Balkan peninsula.*

(b) Subsp. **pyrethriformis** (Schur) Beldie, *Fl. Veg. Munț. Bucegi* 270 (1967) (*A. pyrethriformis* Schur, *A. carpatica* var. *sericea* Heuffel): Stems usually not more than 10 cm; leaves with short, cuneate lobes, 1–3 mm wide, obtuse or rounded at apex, sericeous when young. ● *S. Carpathians.*

(c) Subsp. **petraea** (Ten.) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 7 (1975) (*A. petraea* Ten.): Stems usually 16–35 cm. Leaves up to 5 × 2 cm, somewhat thicker and more densely glandular-punctate than in subspp. **(a)** and **(b)**; peduncles 7–25 cm; involucre somewhat umbonate; ligules up to 12(–16) × 5(–7) mm. Disc 8–13 mm in diameter. Achenes 2·5–3 mm, rather attenuate to the base, with a distinct, hyaline oblique corona *c.* 0·5 mm. ● *C. Appennini, ?E. Pyrenees.*

Some plants from Albania, Greece and Bulgaria which have been referred to *A. orientalis* var. *macedonia* (Griseb.) Hayek are like sericeous variants of subsp. **(a)**, but have more numerous and crowded stems, less hairy leaves, an umbonate and more convex involucre, with sometimes almost obtuse bracts with a less distinct black margin; the receptacle is usually conical and acute and the scales less distinctly 3-dentate. They approach **19(b)** but differ from it in several characters and may prove to be a distinct species.

Plants from Austria (Steiermark), sometimes known as **A. styriaca** Vest, *Syll. Pl. Nov. Ratisbon.* (*Königl. Baier. Bot. Ges.*) **1**: 12 (1824), have stout stems usually 11–16 cm, wide leaf-lobes and large capitula with wide ligules. They may, perhaps, represent another subspecies, but similar variants occur sporadically elsewhere.

Plants from the E. Pyrenees, sometimes referred to **2(c)**, are somewhat intermediate between this and sericeous variants of **2(a)**.

3. A. sibthorpii Griseb., *Spicil. Fl. Rumel.* **2**: 210 (1846) (*A. orientalis* subsp. *sibthorpii* (Griseb.) Hayek). Like **2(c)** but ligules absent; involucral bracts with paler margin, the outer contracted (not attenuate) to the apex; receptacular scales shorter, not so dark at apex or only the outer brown towards apex; receptacle more distinctly conical; florets slightly shorter, with swollen tube in lower ¼; achenes 2–2·5 mm. *Mountain rocks.* ● *N. Greece (Athos).* Gr.

Perhaps not specifically distinct from **2**, but a local variant, which might be reduced to subspecific level.

4. A. aetnensis Schouw in Sprengel, *Syst. Veg.* **3**: 595 (1826). Perennial, forming low, rounded tussocks. Stock woody, much-branched. Stems 4·5–12(–20) cm, densely leafy below. Lower leaves up to 2·5 cm, pinnatisect, fleshy, dull green, sparsely to densely hairy; segments partite or lobed; lobes oblong, mucronate. Capitula up to 22 mm in diameter; peduncles 1·5–7 cm. Involucral bracts with hyaline or purplish margin, the outer and middle lanceolate, acute, the inner oblong, subacute. Ligules 3·5–6·5(–8) × 2·25–3 mm, purplish-pink at least at base. Disc 7–9 mm in diameter at anthesis, up to 13 mm in fruit. Receptacular scales oblong, hyaline, purplish-pink mainly at the apex. Achenes 2·5–2·75 mm, obconical-pyramidal, with distinct, slightly raised ribs; corona 0·25–0·5 mm, obliquely truncate. $2n = 36$. *Volcanic debris, c.* 2000 *m.* ● *Sicilia (Etna).* Si.

5. A. punctata Vahl, *Symb. Bot.* **2**: 91 (1791). Robust, glabrescent to whitish-sericeous perennial with a woody stock. Stems (20–)30–60 cm and up to 6 mm thick at base, several, usually corymbosely branched. Leaves up to 12 × 5·5 cm, 1- to 2(3)-pinnatisect or pinnatipartite, glandular-punctate beneath, with patent segments, the lobes linear to oblong, up to 7 mm wide. Capitula up to 63 mm in diameter; peduncles up to 24 cm. Involucre depressed-subhemispherical at anthesis, more or less umbonate in fruit; bracts green, the outer and middle triangular-lanceolate, acute, with dark brown scarious margin and apex, the inner ovate-oblong, with wider and sometimes paler apex. Ligules up to 24 × 8 mm; disc 12–20 mm in diameter. Receptacle hemispherical-conical with obtuse apex; scales oblong, at least the outer 3-dentate, dark brown towards apex, equalling the florets. Achenes 2–3 mm, obpyramidal, not or slightly ribbed, not granulate; corona up to 1 mm. *Sicilia.* Si.

The above description applies to subsp. **cupaniana** (Tod. ex Nyman) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 7 (1975), the only subspecies occurring in Europe. The typical subspecies occurs in N.W. Africa and has distinctly ribbed and granulate achenes. Plants from Spain, referred by Willkomm to *A. punctata*, are **17(a)**.

6. A. cretica L., *Sp. Pl.* 895 (1753) (non *A. cretica* (L.) Nyman). Perennial. Non-flowering shoots forming more or less dense cushions. Stems usually simple, leafy up to about the middle. Leaves 1-pinnatisect, frequently folded along rhachis; petiole ½–¾ of the leaf-length. Peduncles long. Involucre hemispherical, more or less persistently lanate. Receptacle hemispherical or shortly ovoid; scales oblong, about equalling the florets. Achenes obpyramidal to turbinate, sometimes slightly ribbed, mainly on inner face, smooth or granulate, with acute rim or a very short corona. *Mountains of S. Europe; W. Czechoslovakia.* Al Bu Cz Ga Gr ?Hs It Ju Rm ?Si Tu.

Very polymorphic. Further subspecies, in addition to the following, should perhaps be recognized.

1 Involucre strongly umbonate; involucral bracts with hyaline margin and apex; ligules usually absent; achenes *c.* 2·25 mm **(d)** subsp. **alpina**

1 Involucre not or slightly umbonate; involucral bracts usually with brown margin and apex; ligules present or absent
2 Achenes 1·25–1·75 mm; stems sometimes branched; leaf-segments somewhat distant and patent (c) subsp. **saxatilis**
2 Achenes at least 1·5 mm; stems simple; leaf-segments crowded and ascending
3 Capitula 25–45 mm in diameter; ligules present; disc 10–15 mm in diameter; achenes 1·75–2·5 mm (a) subsp. **cretica**
3 Capitula up to 23 mm in diameter; ligules present or absent; disc 7–11 mm in diameter; achenes 1·5–1·75 mm (b) subsp. **calabrica**

(a) Subsp. **cretica** (*A. orientalis* subsp. *montana* Hayek, *A. montana* L.): Stems 12–30(–40) cm, erect from the slightly curved base, usually less than 5 times as long as the non-flowering shoots. Leaves glandular-punctate, at first with dense, appressed, whitish indumentum, then glabrescent or subglabrous; lower leaves 4–8 cm, with (2–)3–4(–5) segments on each side; segments obovate-oblong to linear-cuneate. Capitula 25–45 mm in diameter. Involucre not or scarcely umbonate; outer bracts ovate-triangular, acute, the inner oblong, subacute to obtuse, with wide, brown to brownish-scarious margin and apex. Ligules up to 17 × 7 mm. Receptacular scales oblong-cuneate to lanceolate, abruptly acuminate. *Throughout most of the range of the species.*

(b) Subsp. **calabrica** (Arcangeli) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 8 (1975) (*A. montana* subsp. *calabrica* Arcangeli): Like subsp. (a) but stems 6–18 cm, ascending and more slender; leaves 1·3–2·7 cm, with shorter and less divided segments. Capitula smaller. ● *S. Italy* (*Calabria*).

(c) Subsp. **saxatilis** (DC.) R. Fernandes, *loc. cit.* (1975) (*A. saxatilis* DC., *A. montana* subsp. *saxatilis* (DC.) Rouy): Like subsp. (a) but stems 4–25 cm; leaves green, sparsely hairy, with more or less patent, sometimes subdeflexed segments; capitula up to *c.* 30 mm in diameter; involucral bracts with narrower hyaline or brown scarious margin. *Calcifuge.* ● *Mountains of S.C. France.*

(d) Subsp. **alpina** (L.) R. Fernandes, *loc. cit.* (1975) (*Santolina alpina* L.): Like subsp. (a) but stems usually at least 20 cm, and generally more than five times as long as the non-flowering shoots; leaves densely greyish-tomentose; segments 2(–3) on each side, shorter, wider, less divided; capitula up to 17 mm in diameter, subglobose in fruit. *Calcicole.* ● *C. Appennini.*

Considered by some authors as merely a variant of (a), but differing considerably in the constant characters given above, and in being calcicole.

Subsp. (c) is somewhat intermediate between subsp. (a) and **11**.

Some plants from Romania, referred by authors to *A. cretica*, with lax indumentum of very thin hairs, leaves with 1–2(–3) distant, patent, narrowly linear or linear-spathulate, usually entire segments up to 2·3 cm on each side, capitula 20–30 mm in diameter, involucral bracts with hyaline or narrowly scarious margin, and achenes 2·5–3 mm, belong perhaps to another subspecies of *A. cretica* or represent a distinct species (**A. kitaibelii** Sprengel, *Syst. Veg.* **3**: 592 (1826)).

7. A. sterilis Steven, *Bull. Soc. Nat. Moscou* **29(2)**: 379 (1856). Perennial, perhaps sometimes biennial, with stout stock and non-flowering shoots forming dense, low cushions. Stems up to 15 cm, simple or with few branches, leafy up to about the middle. Leaves pinnatisect, glandular-punctate, very densely white-lanate at first; segments entire or 2- to 3-fid to subpinnatisect; lobes linear or oblong, obtuse or subobtuse, mucronulate. Capitula 15–20 mm in diameter. Ligules present. Involucre hemispherical-campanulate; bracts triangular to oblong, the inner with broad hyaline margin and apex. Disc 5–7 mm in diameter; florets pale yellow, the tube swollen and spongy in the lower half. Receptacle conical. Achenes 1·75–2 mm, not or very slightly ribbed, not granulate; corona 0·25–0·5 mm, white, opaque, somewhat rigid, erose-denticulate. *Dry, stony places.* ● *Krym.* Rs (K).

A. tranzcheliana Fedorov in Schischkin & Bobrov, *Fl. URSS* **26**: 866 (1961), also from Krym, is like **7** but has stems 20–40 cm, longer and wider leaves with wider segments, the capitula 30–40 mm and the disc 8–15 mm in diameter, achenes 1·75–2·5 mm, the outer with low, flat, somewhat rugose ribs and a translucent, yellowish, tubular corona 1–1·5 mm enclosing the swollen lower half of the corolla-tube.

8. A. abrotanifolia (Willd.) Guss., *Fl. Sic. Syn.* **2**: 490 (1844). Caespitose dwarf shrub. Flowering stems 3–15 cm, with old petiole-bases at base. Leaves up to 2·2(–3·5) cm, oblong, 1- to 2-pinnatisect, glandular-punctate, subappressed-hairy; lobes linear to oblong-obovate, mucronate. Capitula 4–7(–9) mm in diameter; ligules 3 × 1·75 mm, usually absent. Involucre hemispherical, sericeous; outer bracts ovate-lanceolate, attenuate to the acute apex, without hyaline margin, the rest oblong, with hyaline or pale brownish-scarious margin and apex. Receptacle shortly conical; scales reaching the base of corolla-lobes, shortly acuminate. Achenes 1·25(–1·4) × 0·75 mm, obconical-pyramidal, scarcely ribbed; pappus absent or sometimes a very short and denticulate rim. *c.* 1900 *m.* ● *Kriti.* Cr.

9. A. panachaica Halácsy, *Consp. Fl. Graec.* **2**: 57 (1902). Like **8** but stems up to 20 cm; leaf-lobes narrowly linear; ligules 5·5–6·5 × 2·5–3 mm, always present; achenes at least 1·5 mm, slightly attenuate towards the base; pappus slightly longer. *Stony places on mountains*, 1000–1600 *m.* ● *S. Greece* (*Panakhaikon Oros*). Gr.

Perhaps not specifically distinct from **8**.

10. A. argyrophylla (Halácsy & Georgiev) Velen., *Fl. Bulg., Suppl.* **1**: 153 (1898) (*Achillea argyrophylla* Halácsy & Georgiev). Densely appressed-sericeous, with branched stock. Stems up to 20 cm, simple, leafy up to the middle. Leaves spathulate-cuneate, the lower and middle with 3–5 terminal, wide, roundish or obtuse lobes, attenuate into the petiole, the upper entire and sessile. Capitula 20–25 mm in diameter; ligules present. Involucral bracts acute to obtuse, with narrow, hyaline to brownish-scarious margin. Receptacle conical; scales caducous. Achenes *c.* 1·5 mm, obpyramidal, smooth, with very short corona. *Calcicole.* ● *S. Bulgaria* (*Rodopi*). Bu.

11. A. gerardiana Jordan, *Obs. Pl. Crit.* **7**: 31 (1849). Perennial with few non-flowering shoots. Stems 20–40(–55) cm, 4½–10 times as long as the non-flowering shoots, often numerous, erect, straight, slender, rigid, simple or sometimes with 1–2(–3) branches below the middle. Leaves 1·5–4 cm, 1-to 2-pinnatisect, somewhat fleshy, glandular-punctate, green, more or less subappressed-hairy; segments more or less patent; lobes linear, acute, 0·5–1 mm wide; petiole very slender, pectinate at base. Peduncles 7–21 cm. Capitula up to 25 mm in diameter. Involucre hemispherical, umbonate, floccose-lanate; outer bracts ovate-triangular to ovate-lanceolate, acute, without scarious margin, the others oblong, obtuse, with wide hyaline margin and apex. Ligules 2–8 × 1·5–3 mm. Disc up to 10 mm in diameter in fruit. Receptacle usually conical; scales oblong-cuneate, shortly acuminate, shorter than florets. Achenes 1·5–2 mm, obpyramidal, not or slightly ribbed on the adaxial side, without tubercules or granules and with an acute rim or corona usually less than 0·25 mm. *Stony places; calcifuge.* ● *S.E. France.* Ga.

12. A. alpestris (Hoffmanns. & Link) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 9 (1975) (*Chamaemelum alpestre* Hoffmanns. & Link). Like **11** but stems 10–35(–40) cm, more numerous, often branched; leaf-lobes usually wider; ligules usually absent; disc 8–13 mm in diameter at anthesis; involucre less convex, the bracts usually all acute, with narrower, often brown scarious margin; receptacle usually hemispherical; achenes (1·5–)2–2·5 mm, more strongly angled, usually with a short corona. *Mountains of C. & W. Spain and N. Portugal.* Hs Lu.

13. A. maritima L., *Sp. Pl.* 893 (1753). Subglabrous to more or less pubescent dwarf shrub. Stems 12–70 cm, stout, rooting at base, corymbosely branched or simple, sometimes with dead petioles at base, densely leafy upwards. Leaves 1·3–4 × 0·7–2 cm, 1(–2)-pinnatifid, fleshy, glandular-punctate; segments obovate-cuneate. Peduncles (2–)3·5–10(–13) cm. Capitula (17–)24–40 mm in diameter. Involucre hemispherical, more or less lanate to glabrous; outer bracts triangular, acute, the inner oblong, obtuse, with wide hyaline margin. Ligules (5–)6·5–15 × (3·5–)4–7·5 mm, broadly elliptical to oblong. Disc 6–16 mm in diameter; lower half of corolla-tube subglobose, swollen and spongy in fruit. Receptacle conical or ovoid-oblong with obtuse apex; scales cuneate-oblong, attenuate or truncate at apex, with stiff, short acumen, about equalling the florets. Achenes 1·75–2 mm, with more or less prominent ribs, and acute rim prolonged on the adaxial side into an auricle up to 1 mm. $2n=36$. *Maritime sands. W. Mediterranean region, S. Portugal.* Bl Co Ga Hs It Lu Sa Si.

A. aeolica Lojac., *Fl. Sic.* **2(1)**: 84 (1902), from Sicilia, considered by some authors as a variant of **13** with 2-pinnatifid leaves, but distinct in its taller, annual stem, leafy to the capitulum, requires further study.

14. A. virescens Velen., *Sitz.-Ber. Böhm. Ges. Wiss.* (*Math.-Nat. Kl.*) **1903(28)**: 5 (1904) (*A. georgieviana* Davidov). Probably biennial. Stems 40–60 cm, numerous, corymbosely branched above, glabrous. Leaves 2-pinnatisect, obovate in outline, very sparsely hairy, the middle *c.* 5 × 4·5 cm; lobes narrowly linear, mucronate. Involucre deeply umbonate, glabrous; bracts coriaceous, the outer oblong-triangular, acute, without a hyaline margin, the others oblong-lanceolate to elliptic-oblong, with lacerate margin and rather lacerate-hyaline apex. Ligules 10–12 × 2·75–3 mm, yellow, sterile. Disc 11–13 mm in diameter; corolla-tube conical or subcylindrical, swollen and spongy in the lower half. Receptacle hemispherical-conical, short, acute; receptacular scales oblong-lanceolate, with rigid keel and acumen, shorter than florets. Achenes 1–1·5 mm, weakly 4-angled to subcylindrical, granulate-scabrid on the angles, with an acute rim. *Grassy places, cultivated ground and wood-margins.* ● *S.E. Bulgaria.* Bu.

15. A. orbelica Pančić, *Nov. Elem. Fl. Bulg.* 27 (1886). Biennial, sparsely hairy to subglabrous. Stems 30–80 cm, numerous, stout, branched above the middle, the branches sometimes again branched, all rather sulcate-striate. Leaves up to 8 cm, 1- to 3-pinnatisect; segments and lobes narrowly linear. Peduncles slender. Involucre deeply umbonate; bracts pale yellowish-green, glandular, the outer triangular-lanceolate, the others oblong-lanceolate to lanceolate, all acute and with narrow, pale brown scarious margin. Ligules 10–12 × 4–4·5 mm. Disc 10–11 mm, rather convex in fruit; tubular florets swollen and spongy below the middle. Receptacle 7 × 4 mm, distinctly conical; receptacular scales oblong-cuneate or attenuate into the acumen, shorter than to about as long as the florets. Achenes 1·5–1·75 mm, the outer trigonous, curved, ribbed, distinctly granulate along ribs, the others sub-obpyramidal, 4-angular, straight, thinner, less granulate, all with an acute rim. ● *Woods. S. Bulgaria* (*Rodopi*). Bu.

16. A. hydruntina Groves, *Jour. Linn. Soc. London* (*Bot.*) **21**: 523 (1885). Perennial with a woody base. Stems 25–45 cm, often caespitose, simple, furcate, or with 3–6 corymbose branches above the middle, rigid, appressed-whitish-hirsute or -lanate towards the base. Leaves up to 4 × 2 cm, oblong, 2-pinnatisect, glandular-punctate, lanate to sparsely hirsute; lobes linear to oblong, acute. Capitula (5–)7–8 mm in diameter at anthesis, up to 12 mm and subglobose in fruit. Involucre umbonate, pale yellowish-green, glabrous or sparsely pubescent below; bracts ovate to oblong, more or less acute, with hyaline margin and apex. Receptacle finally conical; scales oblong, obtuse, with a short acumen, glandular, shorter than florets. Tubular florets swollen and spongy below the middle. Achenes 1·5–1·75 mm, obconical, slightly ribbed, somewhat granulate, with acute rim, higher on the adaxial side. *Dry, open habitats.* ● *S. Italy.* It.

17. A. tuberculata Boiss., *Elenchus* 59 (1838). More or less lanate to glabrescent perennial (sometimes biennial or annual). Stems (7–)13–33(–45) cm, many, frequently branched above the middle. Leaves 1- to 2-pinnatifid, glandular-punctate, at least the lower petiolate; lobes linear to elliptical. Capitula 22–30(–45) mm in diameter with ligules, or ligules absent; peduncles (3·5–)7–16 mm. Involucral bracts triangular-lanceolate to oblong, acute, with brown margin and apex. Receptacle hemispherical. Achenes subprismatic, with more or less prominent, tuberculate ribs and denticulate rim which is sometimes a little higher on the adaxial side. *Mountains of C. & S. Spain.* Hs.

(a) Subsp. **tuberculata**: Leaves up to 5 cm. Ligules present or not. Disc 8–13 mm in diameter, rather convex and up to 16 mm in diameter in fruit. Receptacular scales linear-lanceolate to narrowly linear, attenuate-subulate, blackish at the apex of the acumen. Achenes 1·75–2·25 mm. *Throughout most of the range of the species.*

(b) Subsp. **turolensis** (Pau ex A. Caballero) R. Fernandes & Borja, *Bot. Jour. Linn. Soc.* **70**: 10 (1975) (*A. turolensis* Pau ex A. Caballero): Like subsp. (a) but rather densely lanate; leaves up to 2·5 cm; capitula not more than 3 cm in diameter, with ligules; receptacular scales somewhat shorter, frequently not blackish at apex; achenes not more than *c.* 1·75 mm. ● *Serrania de Cuenca.*

18. A. ismelia Lojac., *Fl. Sic.* **2(1)**: 78 (1902). Robust biennial. Stems 20–60 cm and up to 5 mm thick at base, corymbosely branched above. Leaves up to 13 × 6 cm, 1- to 2-pinnatisect, glandular-punctate beneath, with patent segments, the lobes obtuse or rounded. Capitula up to 60 mm in diameter; peduncles 4·5–12·5 cm, bracteate nearly to the apex. Involucre more or less umbonate in fruit; outer and middle bracts triangular-lanceolate, acute, with brown margin, the inner ovate-oblong, with a wider margin and a lacerate, obtuse apex. Ligules up to 27 × 8·5 mm; disc 12–20 mm in diameter. Receptacle obtuse; scales narrowly oblong, attenuate to the dark brown acumen, equalling the florets. Achenes 2·5–2·75 mm, obpyramidal, with prominent, rather tuberculate ribs; corona up to 0·75 mm.
Stony or rocky ground. ● *W. Sicilia.* Si.
Stony or rocky ground. ● *W. Sicilia.* Si.

19. A. tenuiloba (DC.) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 10 (1975) (*A. byzantina* C. Koch, *Lyonnetia tenuiloba* DC.). Caespitose perennial. Stems (2·5–)6–30(–40) cm, ascending, with 0–3(–4) branches. Leaves 1-pinnatisect to almost 2-pinnatisect, more or less densely appressed-hairy and greyish, the cauline up to 3 × 2 cm; lobes linear-lanceolate or oblong, 0·5–2 mm wide, acute. Peduncles up to 15 cm. Capitula up to 25 mm in diameter with ligules, or ligules absent; disc 6–11(–13) mm in diameter. Involucre hemispherical; bracts acute or the inner obtuse, with or without a hyaline or sometimes brownish

narrow margin. Receptacle shortly conical, acute; scales obovate-oblong to oblanceolate, obtuse, the outer sparsely hairy on the back, about equalling the florets. Achenes obconical, not or slightly ribbed, not or slightly granulate at the base; corona up to 0·5 mm on the adaxial side, hyaline, or absent. *Balkan peninsula.* Al Bu Gr Ju Tu.

(a) Subsp. **tenuiloba** (*A. montana* subsp. *tenuiloba* (DC.) Nyman, *A. orientalis* var. *tenuiloba* (DC.) Hayek): Capitula distinctly umbonate. Achenes 1–1·5(–1·75) mm; corona absent or very short. *Dry, open habitats. E. & S. parts of Balkan peninsula.*

(b) Subsp. **cronia** (Boiss. & Heldr.) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 10 (1975) (*A. cronia* Boiss. & Heldr., *A. orientalis* subsp. *cronia* (Boiss. & Heldr.) Hayek): Capitula not or somewhat umbonate. Achenes 1·5–2·5 mm; corona up to 0·5 mm on the adaxial side, hyaline. *Stony and grassy places on mountains.* ● *W. & S. parts of Balkan peninsula.*

A. jordanovii Stoj. & Acht., *Notizbl. Bot. Gart. Berlin* **13**: 518 (1937), described from S.E. Bulgaria (Strandža Pl.), has capitula *c.* 12 mm in diameter, with ligules, involucral bracts not hyaline at margin, receptacular scales oblong or narrowly lanceolate, shortly mucronate, hirsute on the back and achenes *c.* 1·8 mm, obconical-pyramidal, with corona *c.* 0·3 mm; it is perhaps a local variant of **19**.

20. A. anatolica Boiss., *Diagn. Pl. Or. Nov.* **2(11)**: 10 (1849). Caespitose, densely appressed-greyish-yellow-hairy perennial. Stems up to 20 cm, slender, simple or sparingly branched. Cauline leaves *c.* 1·5 × 0·7 cm, patent or deflexed, ovate, 1- to 2-pinnatifid; segments very crowded, subflabellate; lobes obtuse. Capitula 19–30 mm in diameter with ligules, or ligules absent; peduncles 4·5–6 cm. Involucre hemispherical; bracts acute, with narrowly brown-scarious or sometimes hyaline margin and apex. Receptacle shortly conical; scales obovate, shortly acuminate. Achenes *c.* 2 mm, subprismatic, distinctly ribbed, the peripheral granulate; auricle up to 0·5 mm, hyaline. *Stony places on mountains. N.E. Greece.* Gr.

21. A. spruneri Boiss. & Heldr. in Boiss., *op. cit.* **3(3)**: 24 (1856) (*A. orientalis* var. *spruneri* (Boiss. & Heldr.) Hayek). Densely sericeous perennial. Stems up to 42 cm, simple or branched. Leaves 2-pinnatisect, densely sericeous-tomentose; lobes ovate-oblong to oblong-linear, obtuse. Capitula up to 14 mm in diameter; ligules absent. Involucre not very convex; outer bracts ovate, acute, the inner oblong, obtuse or subobtuse, with narrow, hyaline margin. Receptacle convex; scales truncate or attenuate to a short acumen, shorter than the florets. *Stony places on mountains.* ● *S. Greece.* Gr.

Like discoid variants of **19** but with denser, slightly crispate indumentum, wider lobes of leaves, obtuse inner involucral bracts with wider scarious margin, roundish receptacle and larger, distinctly ribbed achenes with shorter auricle.

22. A. orientalis (L.) Degen, *Iter Turc.* (*Exsicc.*) (1890) (*A. pectinata* (Bory & Chaub.) Boiss. & Reuter, *A. complanata* auct., non (Sibth. & Sm.) Halácsy). Stock woody, branched. Stems (7–)11–27(–36) cm, usually numerous, caespitose, with 0–5 branches. Leaves oblong to linear-oblong, glandular-punctate, sparsely hairy, pectinate, sessile; segments entire or rarely pinnatisect, narrowly linear to setaceous, mucronate-subulate, distant or more or less approximate, frequently with 1–2(–3) short lobes in their axils. Involucral bracts glabrous, triangular to oblong, the inner with wide hyaline margin and apex. Ligules 6·5–10 × 3–4 mm, rarely present. Disc 6–12 mm in diameter, conical-convex; florets rather glandular, with the tube constricted at the middle, swollen only at base or not at all. Receptacle conical; scales hyaline, obovate or broadly elliptical, obtuse, with somewhat rigid acumen, reaching the base of the corolla-lobes. Achenes granulate, not or obsoletely ribbed, with acute rim, the peripheral *c.* 1·25 mm, cylindrical-turbinate, the inner *c.* 1·5 mm, obconical. *Greece, Turkey-in-Europe.* Gr Tu.

23. A. pindicola Heldr. ex Halácsy, *Consp. Fl. Graec.* **2**: 57 (1902). Subcanescent or sparsely hairy to glabrescent perennial. Stems up to 40 cm, with erect branches. Leaves 1- to 2(–3)-pinnatisect, the cauline up to 6·5 cm; segments narrowly linear, acute, patent or nearly so; petiole very narrow, long. Capitula up to 45 mm in diameter. Involucre hemispherical, slightly umbonate; outer involucral bracts ovate-lanceolate, very acute, with narrow brown margin; inner oblong-lanceolate, subacute, with a wider scarious brown margin. Ligules up to 17 × 4·5 mm. Disc 9–13 mm in diameter; corolla-tube swollen and spongy below the middle. Receptacle conical; scales oblong, equalling the florets. Achenes *c.* 2 mm, not ribbed, with short, erose corona; those of ligules minutely tuberculate at the angles, those of disc obpyramidal, somewhat granulate. *Mountain rocks.* ● *C. Greece.* Gr.

24. A. meteorica Hausskn., *Mitt. Thür. Bot. Ver.* nov. ser., **15**: 25 (1896). Glabrescent, without leaf-rosettes. Stems up to 22 cm, somewhat branched from the base, the main branches with erecto-patent lateral branches, straight, slender, rigid. Leaves 1-pinnatisect, strongly glandular-punctate; segments patent, linear to oblong, mucronate-subulate, entire or 2-fid. Involucre finally flattish, glabrous; outer bracts triangular, without hyaline margin, the others oblong, with wide hyaline margin. Ligules 4–5 × 3 mm, deflexed. Disc 6–9 mm in diameter; corolla-tube swollen and spongy in the lower half. Receptacle conical, acute; scales obovate-cuneate, attenuate to a somewhat rigid acumen, shorter than the florets. Achenes *c.* 1·5 mm, obpyramidal, with granulate ribs and acute rim, higher on the adaxial side particularly in those of ligules. *Dry, stony slopes.* ● *N. & C. Greece, S. Jugoslavia.* Gr Ju.

25. A. rumelica (Velen.) Stoj. & Acht., *Notizbl. Bot. Gart. Berlin* **13**: 516 (1937) (*A. tenuiloba* var. *rumelica* (Velen.) Stoj. & Acht.). More or less hairy, caespitose perennial (rarely biennial). Stems 8–20 cm, numerous, erect or ascending, simple or with 1–3 branches from below the middle. Leaves green or greyish, 1-pinnatisect with entire or 2- to 3-fid segments; lobes linear-spathulate to oblong-ovate, obtuse, mucronulate. Capitula up to 25 mm in diameter; peduncles 4–13 cm. Involucre hemispherical-subcampanulate, appressed-hairy; outer bracts ovate-triangular, subacute, the inner oblong, obtuse, with hyaline margin and apex. Ligules up to 10 mm. Disc up to 10 mm in diameter, convex-conical in fruit. Receptacle conical, acute; scales oblong to oblong-obovate, truncate, shortly apiculate, about equalling the florets. Achenes 1·5–2 mm, obpyramidal, scarcely ribbed; auricle hyaline, very short. *Dry hillsides.* ● *S.E. Bulgaria.* Bu.

A. regis-borisii Stoj. & Acht., *op. cit.* 519 (1937), described from N.E. Bulgaria, is like **25** in most characters, but approaches **19** in its hairy involucral bracts and in having a hyaline corona.

26. A. stribrnyi Velen., *Sitz.-Ber. Böhm. Ges. Wiss.* (*Math.-Nat. Kl.*) **1895(37)**: 6 (1895). Like **25** but stems subglabrous, simple or branched above the middle; leaves very sparsely hairy to glabrous, with narrower segments, the lobes subacute; capitula slightly smaller; disc up to 8 mm in diameter; achenes smaller. ● *S. Bulgaria* (*Rodopi*). Bu.

Distinguished from **24**, with which it is sometimes confused, by the habit, the more divided leaves with lobes with a short, sometimes indistinct mucro and by the longer ligules.

Sect. ANTHEMIS (Ser. *Arvenses* Fedorov). Annual or biennial with much-branched stems. Peduncles sometimes clavate in fruit. Inner involucral bracts with hyaline or sometimes brownish-scarious margin and apex. Receptacle conical or sometimes hemispherical; receptacular scales subpersistent, ending in a short and slightly rigid point. Ligules white, rarely yellow, pink or absent. Achenes with smooth, granulate or rarely tuberculate ribs.

27. A. arvensis L., *Sp. Pl.* 894 (1753). Sparsely hairy to densely pubescent annual or biennial, perhaps sometimes perennating. Stem (4·5–)10–50(–80) cm, usually more or less branched, often from the base, the basal branches as long as or longer than the main stem. Leaves obovate-oblong to obovate, 1- to 3-pinnatipartite or pinnatisect, not glandular-punctate, more or less hairy; lobes acute, mucronate. Involucral bracts hairy, oblong or oblong-obovate, obtuse, with hyaline to brown scarious margin and apex. Receptacular scales acuminate. Achenes turbinate, (9–)10(–11)-ribbed; ribs obtuse, separated by narrow, deep furrows, smooth. *Most of Europe except the extreme north.* All except Az Fa Sb.

Probably native only in S. Europe, but so long established elsewhere as a cornfield weed that the original limits of distribution cannot be ascertained.

1 Biennial or perennial; achenes with ribs and rim not or slightly thickened; peduncles not clavate in fruit **(d)** subsp. **sphacelata**
1 Annual; at least the achenes of the outer tubular florets with rather thickened ribs and wide, obtuse rim
2 Peduncles usually distinctly clavate in fruit **(b)** subsp. **incrassata**
2 Peduncles not or slightly clavate in fruit
3 Capitula 20–40 mm in diameter; receptacle 5–7 × 3–4 mm, attenuate to the apex; achenes 1·5–2·5(–3) × 0·7–1·5 mm; pappus absent **(a)** subsp. **arvensis**
3 Capitula up to *c.* 20 mm in diameter; receptacle 3–5·5 × 2–3 mm, ±contracted to a very acute apex; achenes up to 1·75 mm, the peripheral nearly as long as wide, sometimes with a lacerate hyaline auricle up to 0·5 mm **(c)** subsp. **cyllenea**

(a) Subsp. **arvensis**: Stems up to 80 cm, usually much branched. Leaves 1·5–5 × 0·6–1·5 cm; lobes oblong or linear. Peduncles not or scarcely clavate. Ligules 5–14 × 2·5–5 mm, rarely pink. Outer receptacular scales linear-subulate, the inner oblanceolate. Tubular florets *c.* 4 mm. $2n=18$. *Cultivated ground and waste places. Throughout the range of the species.*

(b) Subsp. **incrassata** (Loisel.) Nyman, *Consp.* 361 (1879): Like subsp. (a) but leaves with wider, elliptical lobes; peduncles more or less clavate and somewhat arcuate; receptacle more elongate in fruit; receptacular scales somewhat wider, abruptly acuminate; ligules up to 11 × 4 mm; tubular florets 3–3·5 mm. *Waste places. S. Europe.*

(c) Subsp. **cyllenea** (Halácsy) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 11 (1975) (*A. cyllenea* Halácsy): Stems up to 22 cm, intricately branched, sometimes slightly thickened upwards. Leaves up to 2 cm. Ligules up to 6 × 3 mm. Receptacular scales oblanceolate, more rigid than in subsp. (a). Tubular florets *c.* 2·5 mm. *Cultivated ground and roadsides.* ● *Greece.*

(d) Subsp. **sphacelata** (C. Presl) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 12 (1975) (*A. sphacelata* C. Presl): Biennial (or perhaps sometimes perennial). Stems up to 30 cm, from a woody stock, rigid, simple or more or less branched. Leaves not more than 2(–4·5) cm, pectinate-laciniate at base. Involucral bracts often with brown scarious margin and apex. Receptacle 2–5 × 2–3 mm, shortly conical; scales oblanceolate, abruptly acuminate, rigid. Ligules 3·5–6·5 × 2·25–3 mm. Tubular florets sometimes purple. *Mountain pastures.* ● *S. Italy, Sicilia.*

Plants from Corse referred to subsp. *arvensis* var. *humilis* Gay ex Rouy perhaps belong to subsp. **(d)**.

A. brevifolia Lojac., *Fl. Sic.* **2(1)**: 81 (1902), described from Sicilia, is probably only a variant of **27(d)** with longer, diffuse stems, leafy to the apex.

28. A. ruthenica Bieb., *Fl. Taur.-Cauc.* **2**: 330, 465 (1808). Lanate to pubescent annual. Stem 10–50 cm, frequently branched from the base. Leaves oblong, 1- to 2-pinnatisect; lobes triangular, acute. Capitula 15–35(–40) mm in diameter; peduncles not clavate in fruit. Involucral bracts more or less lanate, the outer lanceolate, acute, the inner oblong, obtuse, with a wide hyaline margin and apex. Ligules 8–17 × 3–7·5 mm. Receptacle in fruit up to 9 × 3·5 mm, very acute; scales oblanceolate to obovate-cuneate, lacerate or dentate at apex, acuminate. Corolla-tube strongly swollen and spongy below the middle in fruit. Achenes 1·5–2 mm; achenes of outer tubular florets subcylindrical, usually not more than ½ as wide as long, with rather thick, obtuse ribs and obtuse, but not thickened rim slightly higher or with a short auricle on the adaxial side. $2n=18$. *Dry places and cultivated ground. E.C. & S.E. Europe.* Au Bu Cz Ge ?Gr Hu Ju Po Rm Rs (C, W, K) Tu.

29. A. auriculata Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 5 (1844) (*A. sismondaeana* G. C. Clementi). Appressed-hairy. Stems 8–35 cm, 1 to many, usually branched. Leaves oblong, 1- to 2-pinnatisect; lobes lanceolate to shortly oblong, acute to obtuse, mucronate. Capitula 15–35 mm in diameter; peduncles long, not clavate in fruit. Involucre hemispherical; outer bracts triangular to lanceolate, the inner oblong, rounded, with hyaline or pale brown scarious margin and apex. Ligules up to 12 mm. Disc up to 12 × 13 mm in fruit; tubular florets swollen and spongy below the middle. Receptacle up to 10 × 3 mm, elongate-conical in fruit; scales oblanceolate- to obovate-cuneate, lacerate at apex with somewhat rigid acumen. Achenes 1·5–2 mm (excl. auricle), subcylindrical-obconical, with somewhat raised to nearly obsolete ribs; auricle 0·5–1·75 mm, oblong or rounded, spongy at the base, shorter in the inner achenes. *Dry hillsides and Pinus-woods. S. part of Balkan peninsula, N. Aegean region.* Bu Gr ?Ju Tu.

A. parnesia Boiss. & Heldr. in Boiss., *Fl. Or.* **3**: 305 (1875), from S. Greece, is perhaps a variant of **29**. It is distinguished by the more slender stems up to 10 cm, involucral bracts with brownish-scarious margin and apex, less swollen corolla-tube, and auricle up to 1 mm.

30. A. werneri Stoj. & Acht., *Sborn. Bălg. Akad. Nauk.* **61**: 85 (1941). Greyish-green appressed-hairy. Stems up to 20 cm, many, branched below the middle. Leaves oblong, pinnatisect to pinnatifid or entire and spathulate; segments 2–3 on each side, linear-lanceolate to oblong, obtuse, callose-mucronulate. Peduncles clavate in fruit. Involucre obconical; outer bracts triangular-lanceolate, the inner oblong, with hyaline margin and apex. Ligules deflexed, up to 3 × 2 mm. Disc 4–8 mm in diameter; tubular florets swollen and spongy below the middle. Receptacle 3 × 2·2 mm, acutely conical; scales spathulate-lanceolate, about as long as or slightly longer than florets. Achenes 1·8–2 mm, turbinate-obconical, scarcely striate, with a short auricle. ● *N. Aegean region* (*Ayios Evstratios*). Gr.

Similar in general aspect to **33(b)** but with more slender peduncles, smaller capitula, more acute receptacle, narrower achenes with obsolete ribs and shorter, thicker auricle.

31. A. flexicaulis Rech. fil., *Bot. Jahrb.* **80**: 415 (1961). Annual. Stems 5–35 cm, numerous, more or less branched, appressed-hairy, glabrescent. Leaves up to 4 × 2 cm, fleshy, more or less pubescent to glabrescent, the lower broadly obovate-spathulate to spathulate, attenuate into the petiole, with subpalmately partite to more or less lobed lamina, the segments or lobes dentate, the uppermost lanceolate- or linear-spathulate, sessile. Peduncles arcuate-ascending, clavate in fruit. Involucre hemispherical-obconical; bracts acute, the inner more or less hyaline-margined. Ligules deflexed, shorter than the diameter of the disc. Disc 6–10 mm in diameter; corolla-tube swollen in the lower ¾. Receptacle conical; scales hyaline. Achenes 1·5–1·75 mm, subconical-cylindrical, obliquely truncate, without or with an auricle up to 0·5 mm. *Stony or rocky places near the sea.* ● *W. Aegean region* (*Evvoia, Skiros*). Gr.

32. A. scopulorum Rech. fil., *Österr. Bot. Zeitschr.* **85**: 61 (1936). Annual, branched from the base or with 1–many stems up to 30 cm, more or less branched, densely leafy, glabrescent towards the purplish, usually robust base, whitish-tomentose above, like the young leaves, peduncles and involucres. Leaves up to 6 cm, 2-pinnatisect, glabrescent; segments patent or subdeflexed; lobes shortly obovate-cuneate, entire or 2- to 3-dentate at apex, the ultimate divisions obtuse, callose-mucronulate. Capitula 30–40 mm in diameter; peduncles not clavate in fruit. Involucre more or less hemispherical; bracts soft, the outer oblong-lanceolate, the inner oblong, subacute to roundish, with wide hyaline margin and apex. Ligules 13 × 6 mm, sometimes absent. Disc up to 17 mm in diameter. Receptacle conical, very acute; scales hyaline, truncate and dentate at the apex or attenuate into a short, soft acumen. Achenes 2–2·25 mm (excl. auricle), subobpyramidal, the outer conspicuously ribbed; auricle up to 1·25 mm. *Calcareous rocks.* ● *Kikladhes.* Gr.

33. A. tomentosa L., *Sp. Pl.* 893 (1753). Stems 2–30(–45) cm, 1–many, the central erect and rather shorter than the lateral, simple or divaricately branched. Leaves up to 4·5 cm, 1- to 2-pinnatifid with cuneate-ovate to oblong, sometimes linear lobes. Capitula 15–37 mm in diameter. Involucre hemispherical or obconical at anthesis; bracts lanate or more or less densely hairy; outer bracts triangular-lanceolate, acute; inner oblong or oblong-lanceolate, acute or subacute, with a hyaline margin and apex. Ligules shorter than the diameter of the disc, sometimes absent. Corolla-tube not swollen. Receptacle 4–5 × 2·5–4 mm, shortly conical; scales oblong to oblanceolate, shortly acuminate. Achenes 1·5–2 mm (excl. auricle), obconical or obscurely obpyramidal, with more or less prominent ribs. *C. & E. Mediterranean region.* Gr It Si Tu.

(a) Subsp. **tomentosa** (*A. tomentosa* subsp. *peregrina* (L.) Hayek; incl.? *A. guicciardii* Heldr. & Sart., *A. muenterana* Heldr. ex Boiss.): Usually tomentose or lanate. Peduncles clavate. Disc [illegible] (8–)9·5–13 mm in diameter. Outer achenes very obliquely truncate, with the rim acute on the adaxial side and obtuse on the abaxial side, or sometimes with an auricle 0·3–1 mm. $2n=18$. *Throughout the range of the species.*

(b) Subsp. **heracleotica** (Boiss. & Heldr.) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 12 (1975) (*A. peregrina* var. *heracleotica* Boiss. & Heldr.): Like subsp. (a) but appressed-pubescent, with rigid, sometimes purplish stems; involucral bracts more appressed, indurate and thicker at base; peduncle less clavate; disc 6–8 mm in diameter; auricle relatively longer and wider. ● *Mountains of Greece and Aegean region.*

Many specimens with narrow leaf-lobes and rather long rim or auricle of the achenes have been referred to **A. peregrina** L., *Syst. Nat.* ed. 10, **2**: 1223 (1759), a very obscure species, but variation in width of leaf-lobes is not well correlated with variation in length of auricle.

34. A. rigida (Sibth. & Sm.) Boiss. & Heldr. in Heldr., *Sched. Herb. Graec. Norm.* **1856**: no. 1503 (1857) (*A. cretica* (L.) Nyman, non L.). More or less hairy annual. Stems thick, finally rigid, up to 13(–15) cm, usually numerous and simple. Leaves oblong, 1- to 2-pinnatifid; lobes lanceolate, linear-spathulate to oblong-cuneate, acute or obtuse. Peduncles somewhat thickened and frequently arcuate, the 1–2 central ones very short, scape-like. Involucre usually obconical; bracts triangular-lanceolate, subequal, indurate-thickened at the base, more or less hairy, without or the inner with a narrow scarious margin. Ligules rarely present. Disc 3–9 mm in diameter; tubular florets yellow, rarely whitish suffused with pink, not swollen below. Receptacle 1–3·5 × 3–3·5 mm, shortly conical; scales lanceolate to obovate-cuneate, mucronate, shortly acuminate. Achenes 1·25–1·5 mm (excl. auricle), obconical, not or obscurely ribbed, with an auricle up to 0·5 mm, or sometimes an acute rim. *Maritime sands and other dry places. Aegean region.* Cr Gr Tu.

Plants from Sicilia referred to this species belong to a variant of **36** without ligules. Perhaps **A. asperula** Bertol., *Fl. Ital.* **9**: 368 (1854), an obscure species described from Corse, might also be ascribed to the Sicilian variant.

35. A. chrysantha Gay in Durieu, *Expl. Sci. Algérie* (*Bot.*) t. 60, fig. 1 (1846–1849). A much-branched, densely tomentose annual. Main stem up to 25 cm, usually corymbosely branched, densely leafy. Leaves fleshy, broadly ovate, 1- to 2-pinnatisect, the segments 2- to 3-lobed or -partite, the lobes usually oblong to obovate, obtuse or rounded, not mucronate. Peduncles somewhat clavate in fruit. Involucre slightly convex, lanate-tomentose; disc rather convex; outer bracts linear-lanceolate, acute, without scarious margin, the inner oblong, subacute, scarious and ciliate at the margin. Receptacle hemispherical to oblong-ovoid, rounded at the apex; scales elliptical to obovate or oblong-obovate, mucronate, shorter than florets. Ligules subrectangular, yellow, usually rather shorter than the diameter of the disc. Achenes 1·5–1·75 mm, obconical, with 10 granulate ribs, and a denticulate rim or sometimes a short crenulate auricle. *S.E. Spain* (*near Cartagena*). Hs. (*Algeria.*)

36. A. secundiramea Biv., *Sic. Pl. Cent.* **2**: 10 (1806). Usually much-branched, somewhat shiny annual. Leaves 1- to 2-pinnatisect, thick, glandular-punctate beneath. Involucre hemispherical, glabrous or sparsely hairy; bracts lanceolate, acute, the outer more than half as long as the middle. Receptacular scales obovate-oblong to obovate, cuneate, very shortly mucronate, hyaline, shorter than or equalling the florets. Ligules usually present. Tubular florets swollen and spongy in the lower ¾. Outer achenes obconical, distinctly ribbed, more or less granulate, with a very short crenulate rim, the others nearly smooth, denticulate at apex. *Grassy, sandy or stony places near the sea. C. Mediterranean region.* Co Ga It Sa Si.

1 Peduncles rather elongate and clavate; receptacle conical, rather long in fruit; disc conical or subconical in fruit
(a) subsp. **secundiramea**

1 Peduncles not or slightly elongate, usually not clavate in fruit; receptacle shortly conical or hemispherical-conical; disc hemispherical in fruit
2 Stems ascending or erect, sparingly branched, and not leafy to the apex; receptacular scales obovate-cuneate
(b) subsp. **intermedia**

2 Stems procumbent, diffuse, much-branched, leafy to the apex; receptacular scales broadly obovate
(c) subsp. **urvilleana**

(a) Subsp. **secundiramea**: Stems (3·5–)10–40(–55) cm, numerous, purple or reddish below, glabrous or sometimes hairy upwards. Leaves up to 4·5 × 1·7 cm, light green to glaucescent, glabrous; lobes usually oblong to obovate, obtuse. Peduncles up to 10 cm in fruit, pale green and shining. Capitula 17–22 mm in diameter; ligules 5–9 × 2·5–4 mm. Disc 6–9 mm in diameter, rather elongate in fruit. Achenes 1–1·5 mm. *Throughout the range of the species.*

(b) Subsp. **intermedia** (Guss.) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 13 (1975) (*A. intermedia* Guss.): Like subsp. (a) but stems 3–15(–25) cm, usually glabrous, deeper red; capitula up to 25 mm in diameter; disc up to 10 mm in diameter; receptacle hemispherical-conical; achenes *c.* 1·5 mm. ● *N.E. & E. coast of Sicilia and adjacent islets.*

(c) Subsp. **urvilleana** (DC.) R. Fernandes, *loc. cit.* (1975) (*A. secundiramea* var. *urvilleana* DC.): Much-branched from the base. Capitula smaller than in subspp. (a) and (b). Receptacle hemispherical-conical or nearly hemispherical, with obovate scales, wider than in subspp. (a) and (b). Achenes *c.* 1·5 mm. ● *Malta, ?Pantelleria, ?Lampedusa.*

37. A. muricata (DC.) Guss., *Fl. Sic. Syn.* **2**: 490 (1844) (*Lyonnetia muricata* DC.). Like **36(a)** but stems and branches not more than 25 cm; lower involucral bracts relatively longer, the inner with wider hyaline margin; ligules absent; achenes 1·5–2 × 1·25–1·5 mm, subprismatic, with very conspicuous and prominently tuberculate-verruculose ribs; the outer with an oblique or nearly horizontal, lobed or crenate, rather thick auricle up to 1 mm, becoming progressively shorter and only a denticulate margin on the inner achenes. $2n=18$. *Grassy hillsides.* ● *W. Sicilia.* Si.

38. A. macedonica Boiss. & Orph. in Boiss., *Diagn. Pl. Or. Nov.* **3(6)**: 97 (1859). Glabrescent annual or biennial with more or less numerous rigid stems. Stems 15–32 cm, usually more or less branched, the branches erect. Leaves up to 2 cm, 1- to 2-pinnatisect, with more or less patent segments, glandular-punctate, sparsely hairy to glabrous; lobes linear, mucronate. Capitula 15–25 mm in diameter; peduncles long, slender, not clavate in fruit. Involucre hemispherical, glabrous; outer bracts triangular-ovate, acute, the inner oblong, obtuse, with hyaline margin and apex. Ligules equalling or slightly longer than the diameter of the disc. Disc 7–9 mm in diameter, convex to subovoid. Receptacle oblong-ovoid to elongate-conical, subacute or acute; scales oblong-subcuneate, about equalling florets. Achenes 1–1·75 mm, turbinate, subquadrangular with distinct to obscure ribs, at least the outer conspicuously granulate, with acute rim or with a corona up to *c.* 0·5 mm. *Stony slopes and roadsides.* ● *C. & S. Bulgaria, N.E. Greece.* Bu Gr.

Sect. MARUTA (Cass.) Griseb. Annuals with branched stems. Involucral bracts with pale brown or hyaline margin. Receptacle conical to hemispherical; receptacular scales narrowly lanceolate to linear-subulate, sometimes absent in the lower part, more or less caducous. Achenes turbinate, circular in transverse section, with or without ribs.

39. A. cotula L., *Sp. Pl.* 894 (1753). Fetid annual (7–)20–50(–70) cm, thinly tomentose to glabrescent. Stems corymbosely branched above. Leaves 1·5–6·5 × 0·5–3 cm, ovate or ovate-oblong in outline, irregularly 2- to 3-pinnatisect, the lobes narrowly linear, acuminate, with hyaline mucro, sparsely hairy, sometimes fleshy. Capitula 12–30 mm in diameter; peduncles (2·5–)6–15 cm, not clavate. Involucre hemispherical; bracts more or less oblong, acute to obtuse, with pale brown, scarious margin. Receptacle 5–8 × 1·5–3 mm, narrowly conical, without scales in the lower half; scales linear-subulate, shorter than to equalling the florets. Ligules 5–14 mm, sterile, sometimes absent. Achenes (1–)1·3–1·8 mm, turbinate, slightly constricted at the apex, 8- to 11-ribbed, the ribs tuberculate or verruculose; pappus absent. $2n=18$. *Waste places and disturbed ground. Most of Europe northwards to England and S. Finland; casual further north.* All except Fa Is Rs (N) Sb; not native in Fe.

A. pseudocotula Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 86 (1846) has been doubtfully recorded from Karpathos. It is like **39** but has the peduncles clavate in fruit and the outer achenes persistent and with an auricle up to ½ as long as the achene.

A. bourgaei Boiss. & Reuter, *Pugillus* 56 (1852) appears to be known only from the original collection from S.W. Spain. It is characterized by the receptacle with scales throughout and the strongly tuberculate, turbinate achenes which are only 1 mm long.

40. A. lithuanica (DC.) Besser ex Trautv., *Acta Horti Petrop.* **8**: 448 (1883). Like **39** but usually taller; leaves with narrow segments; capitula not more than 16 mm in diameter, with narrower scales; corolla-tube not swollen but constricted in the lower half; achenes slightly longer, distinctly constricted and obtuse above, nearly or quite smooth, with more protruding base. ● *Lithuania and White Russia.* Rs (B, C).

Sect. CHIA Yavin. Annuals. All involucral bracts with wide dark brown or blackish scarious margin and apex. Receptacle hemispherical or ovoid; receptacular scales caducous, thinly membranous, brown or blackish towards apex. Ligules white. Achenes with smooth ribs, those of ligules and sometimes those of the outer tubular florets with a large hyaline auricle, the others with a short, thick corona.

41. A. chia L., *Sp. Pl.* 894 (1753). Caespitose, sparsely pubescent. Stems 5–40 cm, many, simple or sparingly branched, erect or ascending. Leaves petiolate or sessile, 1- to 2-pinnatisect, with patent segments; lobes triangular or ovate, acute or obtuse, mucronate. Capitula up to 45 mm in diameter; peduncles long, not clavate. Involucre nearly flat, subglabrous; outer bracts triangular-lanceolate, acute, the inner oblanceolate or oblong to obovate, obtuse to acute. Ligules longer than the diameter of the disc. Tubular florets swollen and spongy in the lower ¼ in fruit. Receptacular scales oblong to lanceolate, subobtuse to acute, but not mucronate. Achenes 2–2·5 mm (excl. auricle), subcylindrical to obconical, with 7–10 rather prominent, narrow ribs. *Cultivated ground and waste places. C. & E. Mediterranean region.* Al Cr Gr It Ju Si Tu.

Subgen. **Cota** (Gay ex Guss.) Rouy. Receptacle hemispherical or subhemispherical; scales all over the receptacle, persistent, more or less rigid, acuminate. Achenes more or less compressed, triangular or triangular-oblong in outline, rhombic in transverse section, usually more or less acute at the lateral angles.

Sect. ANTHEMARIA Dumort. Perennials. Involucral bracts with or without a dark brown or blackish margin and apex. Ligules yellow or white. Achenes more or less compressed.

42. A. tinctoria L., *Sp. Pl.* 896 (1753) (*Cota tinctoria* (L.) Gay). Sparsely hairy to white-lanate. Stems usually more or less branched. Leaves 2-pinnatisect with oblong to linear segments.

Outer involucral bracts triangular, acute, the others oblong to oblong-lanceolate, obtuse to subacute, rarely acute, with scarious, pale brownish or dark brown, fimbriate-ciliate apex. Ligules female, yellow, rarely absent. Disc hemispherical. Receptacular scales oblong-lanceolate, attenuate-acuminate. Achenes 1·75–2 mm, slightly striate on the faces; corona very short, usually less than ¼ as long as achene. *Dry places. Most of Europe, but absent from much of the west and north and most of the islands.* Al Au Be Bu Cz Da Ga Ge Gr He Ho Hu It Ju No Po Rm Rs (C, W, K, E) Si Su Tu [Br Fe].

A very variable species. Perhaps at least some of the taxa with yellow ligules, considered in recent Russian floras as independent species, will prove to be local variants either of subsp. *tinctoria* or of subsp. *subtinctoria*.

1 All or most involucral bracts with a distinct dark brown or blackish margin and apex; corona *c.* 0·5 mm **(d)** subsp. **fussii**
1 All involucral bracts without a distinct dark brown margin and apex or the inner diffusely brownish at apex; corona usually less than 0·5 mm
2 Leaves green, usually sparsely lanate beneath, frequently with flat teeth; capitula 25–45 mm in diameter **(a)** subsp. **tinctoria**
2 Leaves densely greyish- or whitish-lanate beneath, with inflexed teeth; capitula 19–30(–35) mm in diameter
3 Ligules golden-yellow; leaves 1·5–2·5(–3·5) cm **(c)** subsp. **australis**
3 Ligules pale yellow; leaves often more than 2·5 cm **(b)** subsp. **subtinctoria**

(a) Subsp. **tinctoria**: Stems (20–)40–60(–90) cm, often subcorymbosely branched above the middle. Leaves subglabrous above; segments pectinate-pinnatifid or -dentate, the lobes acutely mucronate, flat or sometimes inflexed. Involucre umbonate, more or less lanate. Ligules 5–15 mm, rarely absent. Disc (10–)13–18 mm in diameter. Receptacular scales usually slightly longer than the florets. $2n=18$. *Mainly in C. & S. Europe.*

(b) Subsp. **subtinctoria** (Dobrocz.) Soó, *Acta Bot. Acad. Sci. Hung.* **12**: 366 (1966) (*A. subtinctoria* Dobrocz.): Like subsp. **(a)** but stems, leaves beneath and involucre greyish- or whitish-lanate; segments narrower and relatively longer, with teeth ending in a longer mucro; capitula smaller, with the involucral bracts paler at apex; ligules pale yellow; receptacular scales about as long as the florets. *E. Europe.*

(c) Subsp. **australis** R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 14 (1975): Stems up to 45 cm, frequently simple, densely lanate like the leaves and involucre. Leaves appressed to the stem, less divided than in subspp. **(a)** and **(b)** and more rigid, often with the teeth inflexed. Disc 11–15 mm. Involucre not or slightly umbonate, with thicker and wider bracts than in subspp. **(a)** and **(b)**. *S.C. Europe.*

(d) Subsp. **fussii** (Griseb.) Beldie, *Fl. Veg. Munț. Bucegi* 270 (1967) (*A. tinctoria* var. *fussii* Griseb.): Like subsp. **(a)** but the involucral bracts all acute or subacute with a distinct dark-brown or blackish margin and apex; outer receptacular scales suffused with brown towards the apex; corona longer. ● *S. Carpathians.*
mians.

Somewhat intermediate between **42(a)** and **44** and perhaps a local variant of the latter.

Plants from E.C. Europe have leaves with long, narrow segments and sometimes also dense greyish indumentum and pale yellow ligules (at least in the dry state) as in subsp. **(b)**.

A. markhotensis Fedorov in Schischkin & Bobrov, *Fl. URSS* **26**: 867 (1961) and **A. zephyrovii** Dobrocz., *Ukr. Bot. Žur.* **18(2)**: 70 (1961) are taxa of uncertain status closely related to **42(b)**. The former has leaves 3–4 cm, with wide segments and flat lobes and capitula 20–25(–30) mm in diameter with golden-yellow ligules, and the latter has leaves of similar size but crowded near the middle of the stem, and capitula 15–17(–25) mm in diameter with pale yellow ligules. Both occur in Krym.

43. A. gaudium-solis Velen., *Fl. Bulg., Suppl.* **1**: 152 (1898). Sparsely lanate, robust perennial. Stems 40–90 cm, 1–few, simple or with 2–4 branches at or above middle. Leaves oblong, pinnatipartite; segments oblong-linear, deeply pectinate-dentate, the teeth or lobes ovate to linear-lanceolate, thickened and whitish-mucronate at apex; rhachis dentate. Capitula 40–50 mm in diameter; peduncles long. Involucral bracts without a dark margin, the outer lanceolate, subacute, the inner oblong-linear with scarious, obtuse apex. Ligules up to 12×4–5 mm, deep yellow. Disc up to 20 mm in diameter. Receptacle hemispherical; scales oblong-linear, gradually acuminate, the acumen nearly as long as the scale. Achenes *c.* 2 mm, very narrowly winged at lateral angles, striate, with an entire hyaline corona *c.* 1 mm. ● *S. Bulgaria* (*E. Rodopi*). Bu.

44. A. sancti-johannis Turrill, *Gard. Chron.* ser. 3, **80**: 270 (1926) (*A. gaudium-solis* var. *sancti-johannis* (Turrill) Hayek). Like **43** but caespitose; leaves pinnatisect with pinnatipartite segments; all involucral bracts acute, with green back and black-brown, ciliate-incised margin and apex; ligules up to 15×6 mm, orange-yellow; disc 15–25 mm in diameter; achenes up to 2·5 mm, with an irregularly dentate corona *c.* 1 mm. *Clearings in woods.* ● *S.W. Bulgaria* (*Rila Planina*). Bu.

45. A. cretacea Zefirov, *Not. Syst.* (*Leningrad*) **16**: 371 (1954). Greyish- or whitish-lanate perennial. Stems 10–25 cm, decumbent, numerous, simple or branched. Leaves up to 3·5 cm, oblong, pinnatisect; segments oblong, pectinate-dentate, somewhat distant; teeth mucronate. Capitula 12–20(–25) mm in diameter; peduncles 2–8 cm. Involucre hemispherical-subcampanulate, whitish-lanate; bracts rigid and rather thick at base, the outer lanceolate, very acute, without a scarious margin, the inner ovate-oblong to oblong with obtuse or subobtuse hyaline apex, narrowly edged with pale brown, fimbriate. Ligules 4–7×2·25 mm, bright yellow. Disc 7–13 mm in diameter, deeper yellow than ligules. Receptacle subhemispherical; scales about equalling the florets. Corona *c.* ¼ as long as achene. *Stony calcareous slopes. S.W. Krym.* Rs (K). (*Caucasus.*)

A. parviceps Dobrocz. & Fedorov in Zerov *et al.*, *Vyzn. Rosl. Ukr.* 676 (1965), from Krym, is like **45** but has erect or ascending stems 25–50 cm and pale yellow ligules. Its taxonomic rank is uncertain.

46. A. monantha Willd., *Sp. Pl.* **3**: 2187 (1803). Green perennial with very sparse indumentum. Stems 25–40 cm, usually solitary, simple or with few branches at base, leafy below the middle. Leaves 1–4×0·5–1·5 cm, oblong-ovate, with flat segments. Capitula 25–30 mm in diameter. Ligules pale yellow. $2n=18$. *Grassy or stony slopes and roadsides.* ● *Mountains of Krym.* Rs (K).
Krym. Rs (K).

47. A. parnassica (Boiss. & Heldr.) R. Fernandes, *Bot. Jour. Linn. Soc.* **70**: 15 (1975) (*Cota parnassica* Boiss. & Heldr., *A. tinctoria* var. *parnassica* (Boiss. & Heldr.) Boiss., *A. tinctoria* var. *pallida* DC.). Perennial with a woody rhizome. Stems 10–40(–60) cm, numerous, simple or with 1–2(–4) branches, canescent-hairy to lanate, rather leafy towards the apex. Leaves 1·5–2·5(–4) cm, oblong, pinnatipartite, sparsely hairy above, sericeous to lanate beneath; segments linear-oblong, pectinate or dentate; lobes or teeth contiguous, ascending, frequently inflexed. Capitula up to *c.* 40 mm in diameter. Inner involucral

bracts oblong or oblong-elliptical, subobtuse to rounded, with narrowly brown-edged, ciliate hyaline margin and apex. Ligules up to 13×3·5(–4·2) mm, frequently absent. Disc 5–13 mm in diameter. Receptacle subhemispherical; scales oblong, abruptly acuminate, shorter than to about equalling the florets. Achenes 1·5–2 mm (excl. corona), rather compressed, with acute, almost winged lateral angles and striate faces; corona ¼–½ as long as achene, erose, hyaline. *S.E. Europe.* Al Bu Gr Ju Rm Rs (K) Tu.

48. A. dubia Steven, *Bull. Soc. Nat. Moscou* **29(2)**: 380 (1856). Greyish-lanate. Stems (6–)10–30(–40) cm, numerous, usually much-branched, leafy in the lower ⅓–½. Leaves up to 4×2 cm, obovate, more or less 2-pinnatisect, lanate, mainly beneath; segments ascending, elliptical, somewhat distant; lobes dentate, the teeth contiguous, inflexed, mucronate. Capitula 25–35 mm in diameter; peduncles up to 15 cm. Involucre lanate, slightly umbonate; outer bracts ovate-triangular, acute, ciliate at apex, the inner ones oblong or elliptical, *c.* 2 mm wide, with hyaline, rounded apex, narrowly brown-edged and long-ciliate. Ligules up to 11×4 mm; disc 10–14 mm in diameter. Receptacle subhemispherical; scales contracted into a short acumen, shorter than the florets. Achenes *c.* 1·5 mm (excl. corona), obsoletely striate, with acute, almost winged lateral angles; corona *c.* ⅓ as long as rest of achene. *Meadows,* Quercus-*woods and dry hillsides.* ● *Krym.* Rs (K).

49. A. triumfetti (L.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **5**: 483 (1815) (*Cota triumfetti* (L.) Gay). Sparsely hairy to grey-hairy, stout. Stem 30–90 cm, usually single, corymbosely branched at or below the middle. Leaves up to 14 cm, ovate-oblong to broadly ovate, 2-pinnatisect; segments more or less patent, distant, oblong, pectinate or dentate; lobes oblong, mucronate-subulate; rhachis dentate. Capitula (25–)30–50 mm in diameter; peduncles long. Involucre hemispherical, at first umbonate, finally flat, pubescent or villous; bracts elliptic-oblong to oblong-lanceolate, acute, with scarious margin and scarious-ferruginous, ciliate apex. Ligules (11–)13–20 mm, frequently absent. Disc 12–17 mm in diameter, subglobose in fruit. Receptacle hemispherical; scales oblong-obovate or obovate-cuneate, with a short, rigid acumen about equalling florets. Achenes *c.* 2 mm (excl. corona), oblong, narrowly winged at lateral angles, 3- to 4(5)-striate on each face; corona (¼–)½–¾ as long as achene, oblique, erose, crenulate. *Woods, rocky places on mountains. S. Europe.* Al Bu Ga Gr He Hs It Ju Lu Rm Si Tu.

A. cossoniana Reichenb. fil., *Icon. Fl. Germ.* **16**: 63 (1854), described from E. Spain, with linear-lanceolate leaf-lobes, relatively longer ligules and corona may be considered, perhaps, as a subspecies of **49**.

A. palumbi Lojac., *Fl. Sic.* **2(1)**: 91 (1902), from Sicilia, which has been considered as a probable synonym of **49**, requires further study.

50. A. dumetorum D. Sosn., *Monit. Jard. Bot. Tiflis* **3(2)**: 160 (1927) (*A. rigescens* auct., non Willd.). Perennial, greyish-green, not very densely hairy. Stems 40–80 cm, numerous, corymbosely branched above the middle or simple. Leaves oblong-obovate, with oblong to linear segments, lanceolate, acute lobes and narrow, dentate rhachis, green above, greyish beneath. Capitula 25–30(–35) mm in diameter; peduncles long. Outer involucral bracts triangular, the inner oblong, with obtuse, brownish-scarious, ciliate apex. Ligules 9–12×2·5–5 mm, cream-white. Receptacle hemispherical; scales oblong, attenuate-acuminate, equalling or longer than the florets. *Stony slopes. Krym.* Rs (K). (*Caucasus.*)

51. A. macrantha Heuffel, *Flora* (*Regensb.*) **16**: 362 (1833) (*A. triumfetti* var. *rigescens* sensu Hayek, non (Willd.) Fiori). Robust, sparsely hairy to subglabrous. Stems 50–105 cm, usually corymbosely branched above middle. Leaves pinnatisect, green, thin, the basal up to 15×10 cm, the middle cauline up to 9×4 cm; segments oblong, distant, pinnatipartite to pinnatisect; lobes distant, mucronate-subulate; rhachis dentate. Capitula (45–)50–65 mm in diameter; peduncles 7–16 cm. Involucre not very convex, umbonate; bracts ovate to oblong-lanceolate, acute, with blackish margin and apex. Ligules (15–)20–30×2–4 mm, attenuate at apex. Disc up to 20 mm in diameter in fruit. Receptacle subhemispherical; scales lanceolate to oblong, brownish towards apex, shortly acuminate, slightly shorter than the florets. Achenes 2–2·5 mm, not very acute at lateral angles, not or weakly striate; corona ¼–½ as long as achene, hyaline, sometimes purple. ● *Mountains of Bulgaria and Romania.* Bu Rm.

52. A. jailensis Zefirov, *Not. Syst.* (*Leningrad*) **18**: 251 (1957). Stems 20–50 cm, more or less numerous, simple or with 1 branch near the middle, rather leafy. Leaves up to 5×2·5 cm, obovate-oblong, glabrous above, appressed-hairy beneath, pinnatisect; segments more or less distant, narrowly oblong or linear, pinnatipartite or subpinnatisect; teeth mucronate-subulate. Capitula 30–50 mm in diameter; peduncles 5·5–14·5 cm. Involucre more or less umbonate, sparsely hairy; bracts elongate-triangular and acute to oblong-lanceolate and subacute, with median green vein and narrow, dark brown, fimbriate margin and apex. Ligules (13–)19–25×2·5–3·75 mm. Disc 13–17 mm in diameter, subglobose. Receptacular scales attenuate into an elongate, stiff point, about equalling florets. Achenes *c.* 2·75 mm, compressed, narrowly winged at lateral angles; corona *c.* 0·75 mm, hyaline, crenulate. $2n=18$. *Meadows and wood-margins.* ● *Krym.* Rs (K).

Sect. COTA (Ser. *Altissimae* Fedorov). Annuals or biennials. Involucral bracts not or narrowly brownish-edged at the hyaline margin. Ligules white. Achenes usually compressed and quadrangular.

53. A. altissima L., *Sp. Pl.* 893 (1753) (*A. cota* auct., ? an L., *Cota altissima* (L.) Gay). Robust, pubescent to nearly glabrous annual. Stem 20–120 cm, with sometimes subcorymbose branches. Leaves ovate, 2- to 3-pinnatipartite; segments patent; lobes linear, mucronate-spinulose. Capitula (20–)25–40(–50) mm in diameter; peduncles 1·5–4 cm at anthesis, up to 7·5 cm and somewhat clavate in fruit. Involucre hemispherical, finally umbonate; outer involucral bracts ovate-lanceolate, acute, without scarious margin, the inner oblong-lanceolate to elliptic-oblong, obtuse and with hyaline or brownish-scarious margin and apex. Ligules up to 20 mm. Disc up to 20 mm in diameter. Receptacle hemispherical; scales oblong-spathulate, truncate or emarginate, contracted into a rigid point as long as the scale, longer than florets. Achenes 2–2·5 mm, obpyramidal-subcompressed, very narrowly winged, (7–)8- to 10(–11)-striate on each side, those of ligules triangular, those of disc quadrangular; rim acute or a very short corona. $2n=18$. *Cultivated land and waste places. S. Europe; a frequent casual in C. Europe.* Al Bu ?Co Cr Ga Gr Hs It Ju Rs (K) Tu.

54. A. coelopoda Boiss., *Diagn. Pl. Or. Nov.* **2(11)**: 12 (1849). Like **53** but leaves with regularly pectinate segments and more patent lobes with a shorter and less acute mucro; receptacular scales attenuate or less abruptly contracted into a point usually shorter than the scale; achenes (2–)3(–4)-striate. *Macedonia.* Bu Gr Ju.

55. A. syriaca Bornm., *Feddes Repert.* **10**: 470 (1912). Annual, sparsely hairy or subglabrous, with divaricate, decumbent branches from the base. Leaves sessile, oblong, 1- to 2-pinnatipartite; lobes ovate to oblong, mucronate. Peduncles not or slightly clavate in fruit. Involucre nearly flat; bracts subglabrous, the outer ovate-lanceolate, acute, the others oblong-lanceolate, with narrow scarious margin and acute or subacute apex. Ligules 10 × 2·5 mm, oblong-linear, sometimes suffused with red or purple, deflexed. Disc up to 13 mm in diameter. Receptacle depressed-hemispherical; scales brownish-purple towards the apex, cuneate, attenuate to a rigid, curved or flexuous subulate point slightly shorter than the scale, equalling or shorter than the florets. Achenes 2–2·5 × 1·5 mm, compressed, with acute angles, 7- to 9-striate at each side, those of ligules triangular, those of tubular florets quadrangular; corona short, whitish. *Stony places and cultivated land. Kriti.* Cr ?Gr. (*Lebanon.*)

56. A. segetalis Ten., *Fl. Neap. Syll. App. Quinta* 54 (1842) (*A. brachycentros* Gay ex Koch). Puberulent or glabrous annual up to 50 cm. Stem more or less branched. Leaves ovate-oblong, 1- to 2-pinnatipartite; lobes narrowly linear to oblong. Capitula (15–)22–40(–50) mm in diameter; peduncles up to 15 cm, not clavate in fruit. Involucre hemispherical, finally umbonate; outer bracts ovate-lanceolate, acute, the inner oblong-lanceolate, with fimbriate-ciliate scarious margin and apex. Ligules 10–16 × 3·5–6 mm, oblong to broadly elliptical. Disc (7–)9–16 mm in diameter. Receptacle hemispherical; scales oblong-cuneate, with a rigid acumen less than half as long as the scale, as long as or shorter than the florets. Achenes (1·5–)2–2·5 mm, compressed, with acute lateral angles, (3–)5- to 7-striate on each side, those of ligules sub-triangular, those of tubular florets sub-quadrangular; corona up to 0·5 mm, paler than achene, entire or crenulate. $2n = 18$. *Cultivated land and waste places.* ● *Balkan peninsula, Italy.* Al Gr It Ju.

A. dalmatica Scheele, *Linnaea* **18**: 464 (1845) (?*A. coronata* H. Lindb. fil., *A. brachycentros* var. *coronata* (H. Lindb. fil.) Hayek), from the coast of Jugoslavia, seems to be only a variant or subspecies of **56**, differing in the softer leaves and slightly larger achenes with a longer (0·5–1 mm), lacerate, brownish corona.

57. A. austriaca Jacq., *Fl. Austr.* **5**: 22 (1778) (*A. cotiformis* Velen.). Erect, usually much-branched annual or biennial (7·5–)10–60 cm. Leaves sparsely to densely hairy, obovate to oblong, regularly pinnatipartite; segments linear, pectinate; lobes oblong-linear to lanceolate, acute, mucronate-cuspidate. Capitula (10–)20–40 mm in diameter; peduncles 6–12 cm, not clavate in fruit. Involucre subhemispherical; bracts subhirsute, the outer lanceolate or ovate-lanceolate, the inner oblong to elliptic-oblong, acute, with wide, hyaline, sometimes brownish-scarious, ciliate margin and apex. Ligules (9–)10–15 × 3–4 mm, sometimes more or less deeply 2- to 3-fid. Disc 9–15 mm in diameter. Receptacle subhemispherical; scales oblong, attenuate into a short acumen, subequalling the florets. Achenes 1·75–2·5 mm, with acute lateral angles, obsoletely (2–)3-striate at each side, with acute rim or very short corona. $2n = 18$. *E.C. & S.E. Europe; casual further north and west.* Al Au Bu Cz ?Gr Hu It Ju Rm Rs (C, W, K) Tu.

58. A. brachmannii Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 84 (1846). Annual, appressed-hairy. Stem 20–30 cm, simple or branched. Leaves oblong, pinnatipartite; segments subpectinate, the basal short, sometimes entire; lobes oblong-linear, mucronate. Capitula 30–40 mm in diameter; peduncles 4·5–8 cm, not clavate in fruit. Involucre hemispherical; bracts sparsely hairy, with narrow, brown, scarious, fimbriate margin and apex, the outer ovate, acute, the others ovate to oblong, acute or subacute. Ligules up to 17 × *c.* 8 mm. Receptacle hemispherical; scales oblong-cuneate, contracted into a rigid point less than half as long as scale, shorter than florets. Achenes 2·5–3 × 1 mm, subconical, obtusely 4-angular, weakly striate; corona *c.* ⅓ as long as and the same colour as achene, rigid, crenulate. *Stony places on mountains.* ● *S. Greece.* Gr.

Subgen. **Ammanthus** (Boiss. & Heldr.) R. Fernandes. Slender annuals, with numerous simple or branched stems from a basal rosette. Receptacular scales hyaline, narrowly lanceolate or linear, caducous, or absent. Ligules, if present, very short, white. Achenes cylindrical, curved, the peripheral persistent and with obscure ribs, the inner caducous, distinctly ribbed.

59. A. filicaulis (Boiss. & Heldr.) W. Greuter, *Candollea* **23**: 148 (1968) (*Ammanthus filicaulis* Boiss. & Heldr.). Appressed-hairy. Stems 2–14 cm, ascending or decumbent, very slender, usually simple, purplish. Basal leaves up to 3 cm, pinnatipartite; segments 2 on each side, lanceolate or elliptical, entire to 3-fid; lobes shortly mucronate; cauline leaves pinnatipartite, with entire to 3-fid segments, or spathulate and 3- to 5-lobed or entire and linear. Peduncles slightly clavate in fruit. Involucre hemispherical or hemispherical-conical, appressed-hairy; outer bracts linear-oblong, subacute, with narrow hyaline margin, the others oblong-ovate, obtuse, with wide hyaline, long-ciliate margin. Ligules 5–7, *c.* 3 × 2·5 mm, broadly elliptical to suborbicular, sometimes absent. Disc 4–8 mm in diameter. Receptacle shortly ovoid, roundish at apex, without scales. Outer achenes up to 3 mm, cylindrical, slightly curved, persistent, with erose-denticulate corona *c.* 1 mm; inner achenes *c.* 2·5 mm, cylindrical-obconical, with corona 0·75–1 mm, caducous. *Calcareous maritime rocks.* ● *E. Kriti.* Cr.

60. A. tomentella W. Greuter, *loc. cit.* (1968) (? non *Ammanthus tomentellus* auct., ? an Gandoger). Like **59** but involucral bracts acute, the outer ovate-triangular, the inner ovate-lanceolate; receptacle shortly ovoid, obtuse, with hyaline, glabrous, narrowly linear or setaceous, caducous scales about equalling the florets, sometimes absent in the outer florets; ligules absent; achenes longer; corona opaque, thicker, undulate, saucer-shaped. *Stony calcareous slopes.* ● *Kriti.* Cr.

Incertae Sedis

61. A. ammanthus W. Greuter, *op. cit.* 145 (1968) (*Ammanthus maritimus* Boiss. & Heldr.). Diffuse, appressed-hairy to glabrescent annual. Stems 1·5–24(–36) cm, usually numerous, radiating from the axils of basal leaves, decumbent, more or less branched, rather slender, rigid. Leaves fleshy, the basal and lower cauline up to 2·5 × 0·8 cm, long-petiolate, pinnatipartite, the others shortly petiolate to sessile, obovate- or ovate- to linear-spathulate, and 3- to 7-lobed to entire, the lobes usually obtuse, with or without a very short mucro. Capitula 4–7(–12) mm in diameter; peduncles not clavate. Involucre obconical to hemispherical; bracts oblong, with sometimes pink, scarious margin and apex. Receptacle low, convex. Ligules absent. Florets at first yellow, finally purplish, with the lower half of tube cylindrical, swollen and spongy. Achenes *c.* 1·75 mm, obconical-turbinate, distinctly 10-ribbed; corona 0·3–0·5 mm, hyaline, more or less erose-lacerate. *Maritime sands and grassy places near the sea.* ● *S. Aegean region.* Cr Gr.

(a) Subsp. **ammanthus**: Receptacle without scales. Achenes caducous. *Throughout the range of the species.*

(b) Subsp. **paleacea** W. Greuter, *op. cit.* 146 (1968): Receptacle with hyaline, spathulate-lanceolate, acute, long-hairy scales. Achenes more or less persistent. *E. coast of Kriti.*

62. A. glaberrima (Rech. fil.) W. Greuter, *op. cit.* 148 (1968) (*Ammanthus glaberrimus* Rech. fil.). Glabrous or sparsely hairy annual. Stems 2–30 cm, flexuous. Leaves pinnatisect to 3-fid or entire, more or less petiolate, fleshy; segments distant, ovate-cuneate, more or less deeply divided or entire; lobes subobtuse to acute. Capitula up to 10 mm in diameter. Involucre appressed-hairy; bracts obtuse, the outer ovate to oblong, the inner broadly elliptical, with wide hyaline margin. Ligules *c.* 2 mm, broadly elliptical, pink. Receptacle shortly conical, acute; scales lanceolate-cuneate to narrowly linear, acute, hyaline, rather shorter than florets, glabrous, caducous. Achenes 1–1·25 mm (excluding corona) and nearly as wide as long, obsoletely ribbed, cylindrical-turbinate; corona up to 0·5 mm on the adaxial side, rather shorter to almost absent on abaxial side, erose-lacerate, hyaline. *Calcareous rocks.* ● *N.W. Kriti* (*island of Gramvousa*). Cr.

58. Achillea L.[1]

Perennial herbs. Leaves entire to 3-pinnatifid, alternate. Capitula usually small, pedunculate, rarely shortly so. Involucral bracts in few rows, the outer somewhat shorter than the inner, with a scarious margin. Receptacle convex or conical; scales present. Outer florets ligulate, female, the ligules more or less 3-dentate, patent or rarely short and erect. Inner florets hermaphrodite, 5-lobed, white, yellow or pink; corolla-tube compressed. Achenes compressed, oblong or obovate; pappus absent.

Literature: F. Ehrendorfer, *Cold Spring Harbor Symp. Quant. Biol.* **24**: 141–152 (1959). A. Heimerl, *Monographia Sectionis 'Ptarmica' Achilleae Generis.* Wien. 1884. W. M. Hiesey & M. A. Nobs, *Bot. Gaz.* **131**: 245–259 (1970). J. Prodan, *Achileele României.* Cluj. 1931.

Interspecific hybridization is common throughout the genus so that identification is often difficult.

In this account, divided leaves are said to be terete when the lobes are directed in more than one plane. Corymbs are considered as several when the stem branches near the top, even though the corymbs may be contiguous. Measurements of involucre and capitulum refer to flowering material, and characters of involucral bracts refer to those in the middle of the involucre.

1 Ligules yellow; inflorescences usually with more than 15 capitula
2 Middle cauline leaves ± terete
3 Lobes of leaves suborbicular **51. santolinoides**
3 Lobes of leaves ovate to linear
4 Involucre *c.* 2 mm in diameter; ligules pale yellow **(31–34). nobilis** group
4 Involucre 3–5 mm in diameter; ligules bright yellow
5 Involucre *c.* 3 mm in diameter; ligules *c.* 2 mm **36. tomentosa**
5 Involucre 3·5–5 mm in diameter; ligules *c.* 3 mm **37. chrysocoma**
2 Middle cauline leaves plane
6 Middle cauline leaves simple, serrate **42. ageratum**
6 Middle cauline leaves simple, serrate **42. ageratum**
6 Middle cauline leaves divided
7 Ligules *c.* 3 mm **39. absinthoides**
7 Ligules not more than 2·5 mm
8 Involucral bracts at least 3 mm; ligules 1·5–2·5 mm
9 Involucre 2–3 mm in diameter; leaves pinnatisect, ± pubescent **30. crithmifolia**
9 Involucre *c.* 5 mm in diameter; leaves pinnatifid, usually sericeous **38. holosericea**
8 Involucral bracts not more than 2·8 mm; ligules not more than 1·7 mm
10 Inflorescences with not more than 15 capitula
11 Leaves ± pubescent **40. leptophylla**
11 Leaves glabrous **41. glaberrima**
10 Inflorescences mostly with more than 15 capitula
12 Middle cauline leaves pectinate
13 Leaves pinnatisect, those on non-flowering shoots linear and entire in lower half **43. ochroleuca**
13 Leaves pinnatifid, rarely entire in lower part of leaf **44. depressa**
12 Middle cauline leaves variously divided, but not pectinate
14 Leaves grey **45. aegyptiaca**
14 Leaves green
15 Involucre 2·8–4 mm in diameter
16 Ligules pale yellow **30. crithmifolia**
16 Ligules deep yellow
17 Lobes of basal leaves 1- to 2-pinnatifid with ± lanceolate, obtuse teeth **48. coarctata**
17 Lobes of basal leaves serrate or 1-pinnatifid with ovate, acute teeth
18 Leaves weakly glandular-punctate, the cauline about twice as long as internodes **46. clypeolata**
18 Leaves distinctly glandular-punctate, the cauline 4–5 times as long as internodes **47. thracica**
15 Involucre not more than 2·5 mm in diameter
19 Leaves tomentose; ligules deep yellow
20 Ligules 0·5–1 mm **49. micrantha**
20 Ligules *c.* 1·5 mm **50. biebersteinii**
19 Leaves puberulent to pubescent; ligules pale yellow
21 Involucral bracts glabrous, shiny **30. crithmifolia**
21 Involucral bracts ± hairy, dull **(31–34). nobilis** group
1 Ligules white to pink or purplish-red; inflorescences with 1 to many capitula
22 Capitula usually solitary
23 Leaves entire or crenate **1. ageratifolia**
23 Leaves divided
24 Leaves grey, sericeous **7. umbellata**
24 Leaves green, subglabrous to sericeous-tomentose
25 Leaves sericeous-tomentose **4. barrelieri**
25 Leaves subglabrous to pubescent **3. oxyloba**
22 Capitula mostly in clusters
26 Leaves entire or divided less than ½-way to midrib
27 Leaves spathulate to obtriangular; stems simple
28 Stems densely brown-hairy above **16. lingulata**
28 Stems glabrous or with white hairs above
29 Leaves ± glabrous; involucre *c.* 5 mm in diameter **5. erba-rotta**
29 Leaves ± grey-tomentose; involucre 5–8(–10) mm in diameter **2. serbica**
27 Leaves linear-lanceolate to lanceolate; stem usually branched
30 Leaves not more than 0·3 cm wide, entire **5. erba-rotta**
30 Leaves more than 0·3 cm wide, serrate
31 Leaves not glandular-punctate **17. ptarmica**
31 Leaves glandular-punctate
32 Leaves up to 9 cm, acute; involucre 4–8 mm in diameter **18. cartilaginea**
32 Leaves not more than 5 cm, usually subobtuse; involucre *c.* 12 mm in diameter **19. pyrenaica**
26 Leaves divided more than ½-way to midrib
33 Primary segments of cauline leaves mostly undivided, sometimes serrate
33 Primary segments of cauline leaves mostly undivided, sometimes serrate
34 Primary segments of middle cauline leaves serrate
35 Involucre 5–8 mm in diameter; ligules 4–6 mm; rhachis entire **15. macrophylla**
35 Involucre 3–4 mm in diameter; ligules 2–4 mm; rhachis ± toothed **(22–29). millefolium** group
34 Primary segments of middle cauline leaves mostly entire
36 Involucre 2–3 mm in diameter
37 Middle cauline leaves ovate in outline, glabrous **35. chamaemelifolia**
37 Middle cauline leaves lanceolate to linear in outline, ± pubescent **43. ochroleuca**

[1] By I. B. K. Richardson.

36 Involucre 4–8 mm in diameter
38 Leaves ±glabrous, green **5. erba-rotta**
38 Leaves hairy, usually greyish
39 Involucral bracts with a narrow, pale brown margin **13. abrotanoides**
39 Involucral bracts with a wide, dark brown margin
40 Stems up to 40 cm; ligule *c.* 6 mm; inflorescences with 6–25 capitula **11. clavennae**
40 Stems not more than 10(–15) cm; ligules not more than 5 mm; inflorescences with 3–6(–20) capitula
41 Involucral bracts sparsely pubescent; leaves whitish, with spathulate lobes **7. umbellata**
41 Involucral bracts densely hairy; leaves grey-green, with lanceolate lobes
42 Plant not caespitose; leaves tomentose **6. nana**
42 Plant caespitose; leaves sericeous **8. barbeyana**
33 Primary segments of middle cauline leaves divided
43 Middle cauline leaves *c.* 5 cm wide **21. grandifolia**
43 Middle cauline leaves not more than 2 cm wide
44 Inflorescences mostly with more than 25 capitula
45 Involucral bracts glabrous, shiny **30. crithmifolia**
45 Involucral bracts ±hairy, dull
46 Middle cauline leaves lanceolate to linear in outline, usually terete and with more than 15 pairs of lobes **(22–29). millefolium** group
46 Middle cauline leaves elliptical to ovate in outline, usually plane and with not more than 10 pairs of lobes **(31–34). nobilis** group
44 Inflorescences with 2–25(–30) capitula
47 Primary segments of cauline leaves mostly with a single, distally directed tooth near the base **20. impatiens**
47 Primary segments of cauline leaves not as above
48 Leaves with suborbicular lobes (Kriti) **52. cretica**
48 Leaves with lanceolate to linear lobes
49 Ligules 5–6 mm
50 Leaves ±tomentose; lobes ±obtuse **11. clavennae**
50 Leaves subglabrous; lobes acute
51 Peduncles with brown hairs; plant not strongly aromatic; involucre 8–12 mm in diameter **9. atrata**
51 Peduncles with white hairs; plant strongly aromatic; involucre 5–7 mm in diameter **10. clusiana**
49 Ligules 2–4 mm
52 Leaves appressed-pubescent; lobes linear-lanceolate; involucral bracts with a pale brown margin **13. abrotanoides**
52 Leaves ±tomentose; lobes lanceolate; involucral bracts with a pale or dark brown margin
53 Involucral bracts lanceolate, with a pale brown margin **14. fraasii**
53 Involucral bracts ovate, with a dark brown margin
54 Ligules *c.* 4 mm; leaves with few, obtuse lobes **11. clavennae**
54 Ligules *c.* 2 mm; leaves with many, acute lobes **12. ambrosiaca**

1. A. ageratifolia (Sibth. & Sm.) Boiss., *Fl. Or.* **3**: 275 (1875) (*A. ageratifolia* subsp. *aizoon* (Griseb.) Heimerl). Caespitose. Stems up to 30 cm, erect, each bearing a solitary capitulum. Leaves grey-tomentose; basal 2–4 cm, spathulate, entire or crenulate, rarely pectinate-pinnatifid at the base; cauline *c.* 1 × 0·2 cm, few. Involucre (5–)8–12(–15) mm in diameter; bracts *c.* 5 mm, sericeous, with a wide, pale margin. Ligules 7–9 mm, ovate, white. $2n=18$. *Mountain rocks.* ● *C. part of Balkan peninsula.* Al Bu Gr Ju.

2. A. serbica Nyman, *Consp.* 364 (1879) (*A. ageratifolia* var. *serbica* (Nyman) Hayek). Like **1** but involucre 5–8(–10) mm in diameter; corymbs mostly with 2–5 capitula; ligules 5–7 mm. $2n=18$. ● *From E. Albania to W. Bulgaria.* Al Bu Ju.

3. A. oxyloba (DC.) Schultz Bip., *Flora* (*Regensb.*) **38**: 15 (1855). Subglabrous to pubescent. Stems up to 20 cm, ascending. Leaves oblong-elliptical in outline, 1(–2)-pinnatifid; basal 3–5 cm, petiolate; cauline 1–3 × 0·5–1·5 cm, sessile. Corymbs with 1(–3) capitula. Involucre *c.* 10 mm in diameter; bracts with a wide, brown margin. Ligules 6–10 mm, ovate, white. $2n=18$. *Mountain rocks, pastures and screes.* ● *S.E. Alps; Appennini; E. & S. Carpathians.* Au ?Cz It Rm Rs (W).

1 Cauline leaves 1-pinnatifid; involucral bracts 6–8 mm **(a)** subsp. **oxyloba**
1 Cauline leaves 2-pinnatifid or almost absent; involucral bracts 4–6 mm
2 Leaves mostly basal, the lobes linear **(b)** subsp. **mucronulata**
2 Leaves mostly cauline, the lobes lanceolate **(c)** subsp. **schurii**

(a) Subsp. **oxyloba**: At least the cauline leaves 1-pinnatifid, the lobes linear. Involucral bracts 6–8 mm, lanceolate. *S.E. Alps.*

(b) Subsp. **mucronulata** (Bertol.) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 271 (1976) (*Anthemis mucronulata* Bertol.): Leaves mostly basal, 2-pinnatifid, the lobes linear. Involucral bracts 4–6 mm, ovate. *Appennini.*

(c) Subsp. **schurii** (Schultz Bip.) Heimerl, *Monogr. Ptarm.* 25 (1884) (*Anthemis schurii* Schultz Bip.): Leaves mostly cauline, 2-pinnatifid, the lobes lanceolate. Involucral bracts 4–5 mm, ovate. *E. & S. Carpathians.*

4. A. barrelieri (Ten.) Schultz Bip., *Flora* (*Regensb.*) **38**: 15 (1855). Sericeous-tomentose. Stems up to 15 cm, ascending, each bearing a solitary capitulum. Leaves elliptical to lanceolate in outline, 2-pinnatifid; basal 2–7 cm, petiolate; cauline 1–2 × *c.* 0·4 cm, sessile, the lobes lanceolate. Involucre *c.* 10 mm in diameter; bracts *c.* 4 mm, ovate, obtuse, with a wide, brown margin. Ligules 7–9 mm, broadly ovate, white. *Mountain rocks, pastures and screes.* ● *C. & S. Appennini.* It.

5. A. erba-rotta All., *Auct. Syn. Stirp. Horti Taur.* 17 (1773). Sub-glabrous to glabrous. Stems simple, erect or ascending. Leaves simple or divided, ovate to spathulate, rarely lanceolate in outline. Corymbs with 3–15 capitula. Involucre 5–6 mm in diameter; bracts 2·5–4 mm, ovate to lanceolate, with a brown margin. Ligules 4–5 mm, suborbicular to obovate, white. $2n=18$. *Mountain rocks, screes and stony pastures.* ● *Alps; S. Appennini; E.C. Greece.* Au Ga Gr He It.

Polymorphic, particularly in division of the leaves. Six subspecies are recognized, but intermediate populations are frequent, particularly in the W. Alps and Appennini.

1 Plant caespitose
2 Leaves simple, entire **(f)** subsp. **rupestris**
2 Leaves dentate to pinnatifid **(e)** subsp. **calcarea**
1 Plant not caespitose
3 Leaves dentate **(d)** subsp. **erba-rotta**
3 Leaves pinnatifid
4 Leaves divided to *c.* ½-way **(c)** subsp. **ambigua**
4 Leaves divided almost to midrib
5 Cauline leaves shortly petiolate or sessile; peduncles somewhat glandular **(b)** subsp. **moschata**
5 Cauline leaves long-petiolate; peduncles densely glandular **(a)** subsp. **olympica**

(a) Subsp. **olympica** (Heimerl) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 271 (1976) (*A. moschata* subsp. *olympica* Heimerl): Plant not caespitose. Upper part of stem densely glandular-hairy. Leaves deeply 1-pinnatifid, the cauline long-petiolate. Peduncles 10–20 mm. *Calcicole. E.C. Greece* (*Olimbos*).

(b) Subsp. **moschata** (Wulfen) I. B. K. Richardson, *loc. cit.* (1976) (*A. moschata* Wulfen): Plant not caespitose. Upper part of stem more or less glandular. Leaves deeply 1-pinnatifid, the cauline shortly petiolate or sessile. Peduncles 10–20 mm. *Calcifuge. C. Alps; Appennini.*

(c) Subsp. **ambigua** (Heimerl) I. B. K. Richardson, *op. cit.* 272 (1976) (*A. erba-rotta* var. *ambigua* Heimerl): Plant not caespitose. Leaves pinnatifid, divided to about ½-way to midrib, the cauline shortly petiolate. Peduncles 10–15 mm. *Calcifuge. W. Alps; Appennini.*

(d) Subsp. **erba-rotta**: Plant not caespitose. Leaves simple, dentate at apex, the cauline shortly petiolate. Peduncles 3–15 mm. $2n=18$. *Calcifuge. S.W. Alps.*

(e) Subsp. **calcarea** (Porta) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 272 (1976) (*A. moschata* var. *calcarea* Porta): Plant caespitose. Leaves pinnatifid or dentate. *Calcicole. Appennini.*

(f) Subsp. **rupestris** (Porta) I. B. K. Richardson, *loc. cit.* (1976) (*A. rupestris* Porta): Plant caespitose. Leaves simple, entire. *Calcicole. Appennini.*

Plants similar to **5(b)** but with brown hairs on the peduncles have been called **Ptarmica laggeri** Schultz Bip. ex Ascherson, *Festschr. Ges. Naturf. Freunde Berlin* 245 (1873). They are probably hybrids between **6** and **9**.

6. A. nana L., *Sp. Pl.* 899 (1753). Tomentose. Stems up to 15 cm, simple, erect. Leaves 1–3(–4·5) cm; basal long-petiolate, oblong-lanceolate to -spathulate, 1(–2)-pinnatifid, the lobes lanceolate to linear-lanceolate, acute or subobtuse, crowded, entire. Corymbs with 4–8 capitula; peduncles 1–3(–10) mm. Involucre 5–7 mm in diameter; bracts *c.* 4 mm, lanceolate, acute, tomentose, with a wide, brown margin. Ligules 2–3·5 mm, obovate, white. $2n=18$. *Mountain rocks and screes; calcifuge.* ● *Alps, eastwards to c.* 11° *E.; C. Appennini.* Ga He It.

7. A. umbellata Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 192 (1813). Subcaespitose, whitish-tomentose. Stems up to 15 cm, simple, erect. Leaves 1–2 cm, mostly basal, ovate, pinnatisect, the lobes spathulate, obtuse, entire. Corymbs with (1–)3–6(–8) capitula, subumbellate; peduncles 2–20 mm. Involucre 4–6 mm in diameter; bracts *c.* 3 mm, ovate, obtuse, sparsely pubescent, with a wide, brown margin. Ligules 3–5 mm, oblong, white. $2n=18+1$–3 B. *Mountain rocks.* ● *S.C. & S. Greece.* Gr.

Plants with solitary capitula *c.* 10 mm in diameter probably belong here, but further study is required.

8. A. barbeyana Heldr. & Heimerl in Heimerl, *Monogr. Ptarm.* 49 (1884). Caespitose, sericeous. Stems up to 10(–15) cm, erect or ascending. Leaves *c.* 1 cm, mostly basal, long-petiolate, elliptical to lanceolate in outline, pinnatisect, the lobes lanceolate, acute, entire. Corymbs with 5–20 capitula; peduncles 1–2 mm. Involucre *c.* 4 mm in diameter; bracts *c.* 4 mm, lanceolate, subacute, sericeous, with a wide, brown margin. Ligules *c.* 3 mm, broadly obovate, white. *Mountain rocks.* ● *S.C. Greece* (*Korax*). Gr.

9. A. atrata L., *Sp. Pl.* 899 (1753). Plant odourless. Stems up to 30 cm, simple, erect, at least the upper part densely brown-pubescent. Leaves 1–4 cm, usually 2-pinnatifid; primary segments with not more than 3 lanceolate, acute, distant lobes, subglabrous, not punctate. Corymbs with 2–10 capitula; peduncles 3–15 mm, usually brown-pubescent. Involucre 8–12 mm in diameter; bracts *c.* 5 mm, lanceolate, with a wide, darkish brown margin. Ligules *c.* 6 mm, obovate, white. $2n=18$. *Rock-crevices, screes and stony pastures; usually calcicole.* ● *Alps.* Au Ga Ge He It Ju.

Hybrids with **3**(a) are frequent.

10. A. clusiana Tausch, *Flora* (*Regensb.*) **2**: 546 (1821) (*A. atrata* subsp. *clusiana* (Tausch) Heimerl). Like **9** but plant strongly aromatic; hairs on upper part of stem and peduncles white; primary segments of leaves mostly with 4–10 lobes; involucre 5–7 mm in diameter; bracts ovate to lanceolate. $2n=18$. *Screes and stony pastures.* ● *E. Alps; mountains of Bulgaria and S. Jugoslavia.* Al Au Bu Gr Ju ?Rm.

11. A. clavennae L., *Sp. Pl.* 898 (1753). More or less sericeous-tomentose. Stems up to 40 cm, simple, erect or ascending. Leaves pinnatifid, the lobes few, mostly entire, obtuse; basal leaves up to 8 cm, long-petiolate; cauline *c.* 2 × 1 cm, sessile. Corymbs with 6–25 capitula; peduncles 5–20 mm. Involucre 4–6(–8) mm in diameter; bracts 3–5 mm, ovate, obtuse or acute, with a wide, brown margin. Ligules 4–6 mm, ovate, white. $2n=18$. *Mountain rocks.* ● *Alps, eastwards from* 9° *E.; mountains of W. half of Balkan peninsula.* Al Au Ge Gr He It Ju ?Rm.

The considerable variation in density of indumentum and size of inflorescence does not seem to warrant formal recognition at present.

12. A. ambrosiaca (Boiss. & Heldr.) Boiss., *Fl. Or.* **3**: 276 (1875). Grey-tomentose. Stems up to 20 cm, ascending, simple. Leaves 1–2 × *c.* 0·7 cm, mostly 2-pinnatifid; lobes numerous, lanceolate, more or less acute. Corymbs with 4–10 capitula; peduncles 2–6 mm. Involucre 5–6 mm in diameter; bracts 2–3 mm, obtuse, ovate, with a wide, brown margin. Ligules *c.* 2 mm, *c.* ½ as long as involucre, suborbicular, white. $2n=18$. *Mountain rocks.* ● *E.C. Greece* (*Olimbos*). Gr.

13. A. abrotanoides (Vis.) Vis., *Fl. Dalm.* **2**: 81 (1847). Stems up to 40 cm, simple or branched above, erect or ascending, glabrescent. Leaves 1–3 cm, 1(–2)-pinnatifid, mostly cauline, appressed-pubescent; lobes linear to lanceolate, acute, entire. Corymbs with 12–30 capitula; peduncles 6–10 mm. Involucre 5–7 mm in diameter; bracts *c.* 3 mm, ovate, obtuse, with a narrow, pale brown margin. Ligules *c.* 4 mm, obovate, white. $2n=18$. *Mountain rocks and screes. W. part of Balkan peninsula.* Al Gr Ju.

14. A. fraasii Schultz Bip., *Flora* (*Regensb.*) **25**: 159 (1855) (?incl. *A. canescens* Form.). Sericeous-tomentose. Stems up to 50 cm, erect, simple. Leaves 2-pinnatifid, the lobes lanceolate; basal 2–10 cm, petiolate; cauline 1–3 × 0·3–0·8 cm, sessile, few. Corymbs with *c.* 15 capitula; peduncles 3–10 mm. Involucre 4–6(–9) mm in diameter; bracts 4–5 mm, lanceolate, obtuse, with a pale brown margin. Ligules 2–3 mm, wider than long, white. $2n=18$. *Mountain rocks.* ● *S. & W. Greece, Albania, Crna Gora.* Al Gr Ju.

15. A. macrophylla L., *Sp. Pl.* 898 (1753). Stems 40–75 cm, erect, simple. Leaves *c.* 7 cm, 1(–2)-pinnatifid to pinnatisect, the lobes deeply and irregularly serrate, acute, more or less glabrous; rhachis entire. Corymbs with 5–40 capitula; peduncles 10–20 mm. Involucre 5–8 mm in diameter; bracts 3–4 mm, ovate, obtuse, with a brown margin. Ligules 4–6 mm, obovate, white. *Damp or shady places in the mountains. Alps, N. Appennini.* Au Ga Ge He It [Cz].

Hybrids with several small-leaved species occur; they are intermediate in leaf-characters and recognition is difficult.

16. A. lingulata Waldst. & Kit., *Pl. Rar. Hung.* **1**: 2 (1799). Stems 10–40 cm, simple, erect, densely brownish-pubescent above. Leaves 2–5 cm, simple, spathulate, serrulate, glandular-punctate, glabrous to pubescent, sessile. Corymbs with 10–30 capitula; peduncles *c.* 5 mm. Involucre 5–8 mm in diameter; bracts *c.* 3 mm, ovate, subacute, with a dark brown margin. Ligules *c.* 3

mm, suborbicular, white. *Alpine meadows and rocky slopes.* ● *E. & S. Carpathians; mountains of Balkan peninsula from C. Jugoslavia to N. Greece.* Al Bu Gr Ju Rm Rs (W) ?Tu.

17. A. ptarmica L., *Sp. Pl.* 898 (1753). Stem 30–150 cm, single, usually branched, glabrous below, puberulent above. Leaves 3–9 × 0·4–0·8 cm, lanceolate, acute, undivided, regularly serrate, more or less glabrous, at least above, sessile, all cauline. Corymbs with (1–)3–10(–15) capitula; peduncles 10–80 mm. Involucre 8–12 mm in diameter; bracts *c.* 3 mm, ovate, obtuse, more or less pubescent, with a brown margin. Ligules *c.* 5 mm, orbicular, white. $2n=18$. *Damp grassland. Europe southwards to N. Spain, N. Italy, S.W. Romania and S.C. Russia.* Au Be Br Cz Da Fa Fe Ga Ge ?Gr Hb He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W) Su [Is].

18. A. cartilaginea Ledeb. ex Reichenb., *Fl. Germ. Excurs.* 849 (1832) (incl. *A. salicifolia* Besser, *A. septentrionalis* (Serg.) Botsch.). Like **17** but leaves up to 1·7 cm wide, usually 2-serrate, densely puberulent and glandular-punctate on both surfaces; involucre 4–8 mm in diameter; bracts often subglabrous; ligules *c.* 3 mm. $2n=18$. *Damp grassland, river-banks and scrub. U.S.S.R., extending locally westwards to E. Germany and S.W. Romania.* Ge Po Rm Rs (N, B, C, W, K, E) [Fe].

19. A. pyrenaica Sibth. ex Godron in Gren. & Godron, *Fl. Fr.* **2**: 166 (1851). Stems 20–60 cm, usually branched and puberulent above. Leaves up to 5 × 0·8 cm, lanceolate, acute to subobtuse, undivided, regularly serrate, puberulent, glandular-punctate, sessile, all cauline. Corymbs with (1–)2–6 capitula; peduncles 10–40 mm. Involucre *c.* 12 mm in diameter; bracts *c.* 4 mm, ovate, pubescent, with a brown margin. Ligules *c.* 5 mm, orbicular, white. $2n=18$. *Damp grassland.* ● *Pyrenees and mountains of S.C. France.* Ga Hs.

20. A. inpatiens L., *Sp. Pl.* 898 (1753). Stems 45–100 cm, erect, branched and puberulent above, glabrous below. Leaves up to 8 cm, lanceolate and acute in outline, pinnatifid, the lobes serrulate; middle cauline 2-pinnatifid, the primary lobes usually each with a single distally directed tooth near the base; lower usually 2-pinnatifid, upper 1-pinnatifid. Corymbs with (1–)3–10 capitula; peduncles 10–30 mm. Involucre 6–8 mm in diameter; bracts *c.* 4 mm, lanceolate, subobtuse, with an indistinct brownish margin. Ligules 4–5 mm, obovate, white. *Damp grassland. C. Romania.* Rm. (*Siberia.*)

European plants probably represent a different subspecies from the typical, less robust plants from Siberia.

Plants from the W. Alps (*A. alpina* auct. plur., ?an L., *Ptarmica serrata* DC.) which are like **20** but with the lower leaves 1-pinnatifid and the lobes more or less serrate, are hybrids, such as **17 × 20** or **17 × 15**, which escape from cultivation.

21. A. grandifolia Friv., *Flora* (*Regensb.*) **19**: 433 (1836). Stems 30–100 cm, erect, branched above. Middle cauline leaves *c.* 10 × 5 cm, ovate, plane, deeply pinnatifid to pinnatisect with pinnatifid segments, pubescent; primary segments 20–40 mm, lanceolate, the rhachis *c.* 2 mm wide; secondary segments shortly lanceolate, subacute. Corymbs with many capitula. Involucre *c.* 4 × 3 mm; inner bracts pubescent. Ligules white. $2n=18$. *Mountain woods.* ● *S. & C. parts of Balkan peninsula.* Al Bu Gr Ju Tu.

(22–29). A. millefolium group. Cauline leaves lanceolate to linear in outline, usually more or less terete and with more than 15 pairs of primary segments. Corymbs usually with many capitula. Ligules 1–2 mm, white or pink to purplish-red.

In the key, leaf-characters refer to middle cauline leaves.

1 Leaves plane — **22. distans**
1 Leaves terete
2 Leaf-rhachis 1–1·5 mm wide, often distinctly toothed
3 Leaves pubescent; involucre 4–5 mm — **23. stricta**
3 Leaves glabrous; involucre 2·5–3·5 mm — **27. asplenifolia**
2 Leaf-rhachis 0·5–1 mm wide, rarely toothed
4 Upper surface of leaves glabrous
5 Leaves hairy beneath — **29. collina**
5 Leaves glabrous beneath
6 Internodes 4–9(–12); leaf-rhachis 0·8–1·5 mm wide — **27. asplenifolia**
6 Internodes (4–)9–13(–20); leaf-rhachis 0·6–0·8 mm wide — **28. roseo-alba**
4 Upper surface of leaves hairy
7 Leaves (2–)3-pinnatifid — **28. roseo-alba**
7 Leaves 2- to 3-pinnatisect
8 Leaves 0·5–1·2(–2·5) cm wide, ±pubescent; involucral bracts usually subglabrous — **24. millefolium**
8 Leaves 0·4–0·6(–1) cm wide, usually sericeous; involucral bracts pubescent at least near the margins
9 Leaves 2(–3)-pinnatisect, the rhachis 0·6–1 mm wide; involucre *c.* 4 mm, the bracts often pubescent near the margins only — **25. pannonica**
9 Leaves 3-pinnatisect, the rhachis *c.* 0·5 mm wide; involucre *c.* 3 mm, the bracts ±evenly pubescent — **26. setacea**

22. A. distans Waldst. & Kit. ex Willd., *Sp. Pl.* **3**: 2207 (1803). Stems up to 120 cm, erect, simple or branched above. Middle cauline leaves up to 8 × 2 cm, lanceolate in outline, plane, deeply pinnatifid, more or less pubescent, the rhachis dentate; primary segments 10–20 mm, ovate to lanceolate, 1(–2)-serrate or pinnatifid, the rhachis 1–2 mm wide. Involucre 4–7 × 3–4 mm; bracts more or less pubescent near the margins. Ligules 1–4 mm. *Wood-margins, scrub and mountain pastures.* ● *From the S.W. Alps eastwards to the E. Carpathians and Bulgaria.* Al Au Bu Cz Ga ?He Hu It Ju Po Rm Rs (W).

(a) Subsp. **distans** (*A. dentifera* DC.): Leaf-segments separated by a sinus, the rhachis dentate. Ligules 1–2·5(–3) mm, white, rarely pink. $2n=54$. *Almost throughout the range of the species.*
(b) Subsp. **tanacetifolia** Janchen, *Österr. Bot. Zeitschr.* **91**: 292 (1942): Leaf-segments contiguous. Ligules 2·5–4 mm, pink. *S. Alps; Albania; Bulgaria.*

23. A. stricta (Koch) Schleicher ex Gremli, *Excurs. Fl. Schweiz* ed. 4, 236 (1881) (*A. tanacetifolia* var. *stricta* Koch) (**22 × 24**). Stems 15–100 cm, erect, simple or branched above. Middle cauline leaves 5–10 cm, lanceolate in outline, deeply pinnatifid, more or less pubescent, the rhachis 1–1·5 mm wide, distinctly toothed; primary segments broadly lanceolate in outline, (1–)2-pinnatifid, the rhachis 0·5–1(–1·5) mm. Involucre 4–5 × 2·5–3·5 mm; bracts subglabrous. Ligules white or pink. $2n=54$. *Grassland and disturbed ground.* ● *Carpathians, Alps, N. & C. Appennini.* Au Cz He Hu It Ju Po Rm Rs (W).

Introgression with **22(a)** occurs, often making identification difficult.

24. A. millefolium L., *Sp. Pl.* 899 (1753). Stems 8–60 cm, erect or ascending, usually simple. Middle cauline leaves 3–5 × 0·5–1·2 cm, lanceolate in outline, 2(–3)-pinnatisect, more or less pubescent, the rhachis 0·5–1 mm wide, entire. Involucral bracts subglabrous, rarely pubescent. *Grassland and waste places. Most of Europe, but rare in the Mediterranean region.* All except Bl Cr Sb Si ?Tu; naturalized in Az.

A very polymorphic species in which 2 subspecies are recognized here.

(a) Subsp. **millefolium**: Leaves more or less pubescent; ultimate segments of upper leaves ovate to lanceolate. Involucre 3–4 × 2–3 mm; bracts with a pale to dark brown margin. Ligules usually white. $2n=54$. *Throughout the lowland range of the species.*
(b) Subsp. **sudetica** (Opiz) Weiss in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1404 (1895) (*A. sudetica* Opiz): Leaves velutinous-pubescent; ultimate segments of upper leaves linear. Involucre *c.* 5 × 3 mm; bracts with a dark brown to blackish margin. Ligules usually pink. $2n=54$. *Mountains of C. Europe.*

Robust plants from C. & S.W. France have been called **A. monticola** Martrin-Donos, *Pl. Crit. Tarn* 31 (1862). They have $2n=72$.

A. inundata Kondrat. in Wissjul., *Fl. RSS Ucr.* **11**: 553 (1962), from wet meadows in C. & S. Ukraine, may merit recognition. It is like **24(a)** but has stems 60–100 cm; middle cauline leaves *c.* 7 × 1·5 cm, lanceolate, plane, deeply 2-pinnatifid; involucre 4–5 × *c.* 3 mm with pubescent bracts. It is perhaps an ecological variant of **25**.

25. A. pannonica Scheele, *Linnaea* **18**: 471 (1845) (*A. millefolium* subsp. *pannonica* (Scheele) Hayek, subsp. *collina* var. *lanata* Koch). Stems 25–70 cm, erect, simple or branched above. Middle cauline leaves 3–6 × 0·4–0·6(–1) cm, narrowly lanceolate to linear in outline, 2(–3)-pinnatisect, pubescent to sericeous, the rhachis 0·6–1 mm wide, entire; primary segments 2·5–4 mm, ovate in outline, the rhachis 0·5–1 mm wide; secondary segments 1- to 3-fid with setaceous lobes. Involucre *c.* 4 × 2–3 mm; bracts often pubescent near the margins. Ligules white. $2n=72$. *Dry, stony places.* ● *C. & S.E. Europe.* Al Au Bu Cz ?Ge Gr Hu Ju Rm Rs (W, K).

26. A. setacea Waldst. & Kit., *Pl. Rar. Hung.* **1**: 82 (1801–1802). Stems 15–30(–45) cm, erect or ascending, simple, with 12–20 internodes. Middle cauline leaves *c.* 3 × 0·5 cm, narrowly lanceolate in outline, 3-pinnatisect, pubescent to sericeous, the rhachis *c.* 0·5 mm wide, entire; primary segments *c.* 2 mm, more or less orbicular in outline, the rhachis *c.* 0·4 mm wide; lobes filiform, patent. Involucre *c.* 3 × 1·5–2·5 mm; bracts more or less evenly pubescent. Ligules white. $2n=18$. *Dry places. S., S.E. & S.C. Europe, westwards to S.W. Switzerland, and extending northwards to 56° N. in C. Russia.* Au Bu Cz Ge Gr He ?Hs Hu It Ju Po ?Rm Rs (C, W, K, E).

Records from the Iberian peninsula probably all refer to **24 (a)**, **31** and hybrids described under **33**.

27. A. asplenifolia Vent., *Descr. Pl. Jard. Cels* t. 95 (1803). Stems (30–)40–100 cm, erect, usually branched above, with 4–9(–12) internodes. Middle cauline leaves 4–8(–10) × *c.* 1 cm, lanceolate in outline, (2–)3-pinnatifid, more or less glabrous, glandular-punctate, the rhachis 0·8–1·5 mm wide, somewhat toothed; primary segments *c.* 5 mm, ovate in outline, the rhachis 0·5–1 mm wide. Involucre 2·5–3·5 × 2–3·5 mm; bracts more or less glabrous. Ligules pink to purplish-red, rarely white. $2n=18$. *Wet lowland meadows.* ● *From Czechoslovakia southwards to C. Jugoslavia and S. Romania.* Au Cz Hu Ju Rm.

28. A. roseo-alba Ehrend., *Österr. Bot. Zeitschr.* **106**: 368 (1959) (**26 × 27**). Stems (15–)30–50(–100) cm, erect, simple or branched, with (4–)9–13(–20) internodes. Middle cauline leaves 1–4 × 0·4–0·8 cm, narrowly lanceolate to linear in outline, (2–)3-pinnatifid, pubescent to subglabrous, the rhachis 0·6–0·8 mm wide, entire; primary segments *c.* 5 mm, ovate to lanceolate in outline, the rhachis *c.* 0·6 mm wide. Involucre (2·5–)3–4 × 2·5 mm; bracts subglabrous. Ligules pale pink or white. $2n=18, 36$. *Waste places and disturbed ground.* ● *S. & C. Europe from N. Italy to Jugoslavia.* Au Ge He It Ju.

Introgression with **27** occurs. Plants like **28** also occur elsewhere in Europe. They are probably transient hybrids between **26** and **27**.

29. A. collina J. Becker ex Reichenb., *Fl. Germ. Excurs.* 850 (1832) (*A. millefolium* subsp. *collina* (J. Becker ex Reichenb.) Weiss). Stems 30–70 cm, erect, usually branched above. Middle cauline leaves 3–5 × 0·5–1 cm, lanceolate in outline, 2- to 3-pinnatisect, sericeous beneath, more or less glabrous above, the rhachis *c.* 0·8 mm wide, entire; primary segments 2·5–4 mm, ovate in outline, the rhachis 0·3–0·5 mm wide. Involucre *c.* 4 × 2 mm; bracts pubescent. Ligules white. $2n=36$. *Waste places and disturbed ground.* ● *From Czechoslovakia southwards to N. Italy, and Macedonia.* Al Au Bu Cz Ge Gr He Hu It Ju Rm.

Allopolyploid, probably involving **26** and **27**.

30. A. crithmifolia Waldst. & Kit., *Pl. Rar. Hung.* **1**: 68 (1801). Stems 20–60 cm, simple, erect. Middle cauline leaves 4–6 × 0·8–2 cm, ovate to lanceolate in outline, plane, pinnatisect, more or less pubescent, the rhachis entire; primary segments 5–10 mm, lanceolate to linear in outline, mostly with a few lanceolate teeth. Leaves on non-flowering shoots much dissected, with linear ultimate lobes. Corymbs with many capitula. Involucre 3·5–5 × 2–3 mm; bracts glabrous, shiny. Ligules *c.* 2 mm, white to pale yellow. $2n=18$. *Mountain scrub and meadows.* ● *Balkan peninsula, extending northwards to S.E. Czechoslovakia.* Al Bu Cz Gr Hu Ju Rm Tu.

Plants from S. Romania with primary leaf-segments with numerous linear lobes have been called **A. getica** Grec., *Consp. Fl. Roman.* 310 (1898). Similar plants have also been found in Bulgaria, but their taxonomic status is uncertain.

Specimens from Macedonia with leaves more like those of **33** may warrant taxonomic recognition. Further investigation is required.

(31–34). A. nobilis group. Cauline leaves elliptical to ovate in outline, usually plane and with not more than 10 pairs of primary segments. Corymbs with many capitula. Ligules white or pale yellow.

For a discussion of the taxonomy of this group, see M. Bässler, *Feddes Repert.* **68**: 139–162 (1963).

1 Middle cauline leaves not more than 0·6 cm wide — **31. odorata**
1 Middle cauline leaves more than 1 cm wide
2 Plant with stolons; rhachis usually entire — **33. virescens**
2 Plant without stolons; rhachis toothed
3 Primary segments of middle cauline leaves elliptical in outline, regularly pinnatifid to pinnatisect — **32. nobilis**
3 Primary segments of middle cauline leaves lanceolate in outline, irregularly pinnatifid — **34. ligustica**

31. A. odorata L., *Syst. Nat.* ed. 10, **2**: 1225 (1759). Plant without stolons. Stems up to 20(–30) cm, erect or ascending, simple. Middle cauline leaves *c.* 1 × 0·3–0·6 cm, elliptical in outline, 1- to 2-pinnatisect, more or less plane, pubescent, the rhachis *c.* 0·7 mm wide, entire; primary segments 1·5–3(–4) mm, ovate to lanceolate in outline, regularly serrate to pinnatifid. Involucre 2–3 × 1·5–2 mm; bracts pubescent. Ligules *c.* 1 mm. $2n=18$. *Dry, stony places. Mountains of S.W. Europe.* Ga Hs It.

32. A. nobilis L., *Sp. Pl.* 899 (1753). Plant without stolons. Stems (10–)15–60 cm, erect, usually simple. Leaves 1·5–3 × 1–1·5 cm, ovate in outline, pinnatisect, more or less plane, pubescent, the rhachis toothed; primary segments (4–)6–8 mm, elliptical in

outline, usually regularly pinnatifid to pinnatisect. Involucre *c.* 2·5 × 1·5 mm; bracts pubescent. Ligules *c.* 1 mm. *Dry places. S. & C. Europe and S. half of U.S.S.R.* Al Au Bu ?Co Cz Ga Ge Gr He Hs Hu It Ju Po Rm Rs (C, W, K, E).

(a) Subsp. **nobilis**: Ligules white. 2*n*=18. *Throughout the range of the species, except the Balkan peninsula and the S.E. part of C. Europe.*

(b) Subsp. **neilreichii** (A. Kerner) Velen., *Fl. Bulg.* 263 (1891) (*A. neilreichii* A. Kerner): Ligules pale yellow. 2*n*=45. *Balkan peninsula and E.C. Europe, extending to N. Italy; Krym.*

33. A. virescens (Fenzl) Heimerl in A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **3**: 123 (1884). Plant with stolons. Stems (10–)20–60 cm, simple, erect. Middle cauline leaves *c.* 2 × 1 cm, elliptical in outline, somewhat terete, pinnatisect, pubescent, the rhachis entire; primary segments 5–8 mm, lanceolate in outline, usually irregularly 1(–2)-pinnatifid. Involucre *c.* 3 × 2 mm; bracts not more than 2·5 mm, shortly tomentose, dull. Ligules *c.* 1·5 mm. 2*n*=36. *Dry waste places.* ● *N. Italy; Jugoslavia.* It Ju.

A somewhat ill-defined species, probably of allopolyploid origin, involving **32** and members of the *A. millefolium* group. Similar hybrids occur elsewhere in S. Europe, from Spain to Romania. **A. kotschyi** Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 19 (1856) (incl. *A. urumofii* Halácsy), described from S.W. Asia, has been recorded from Bulgaria and Greece. It is like **33** but is lanate and has a more or less toothed rhachis and may merit subspecific status.

34. A. ligustica All., *Auct. Syn. Stirp. Horti Taur.* 17 (1773). Plant without stolons. Stems (30–)50–100 cm, simple, erect. Middle cauline leaves 2–3 × *c.* 1·5 cm, ovate in outline, plane, 2-pinnatifid to -pinnatisect, pubescent, the rhachis somewhat toothed; primary segments lanceolate in outline, irregularly pinnatifid. Involucre 2·5–3(–4) × 1·5–2 mm; bracts appressed-pubescent. Ligules *c.* 1·5 mm. 2*n*=18, *c.* 54. *Dry grassland and scrub. Mediterranean region.* Co Cr Ga Gr Hs It Ju Sa Si.

35. A. chamaemelifolia Pourret, *Mém. Acad. Sci. Toulouse* **3**: 305 (1788). Stems up to 50 cm, branched at the base, erect or ascending. Middle cauline leaves 2–3 × 1·5–2 cm, ovate in outline, plane, pinnatisect, glabrous, the rhachis entire; primary segments up to 12 mm, linear, entire. Corymbs with 15 to many capitula. Involucre 3–4 × 2–3 mm; bracts subglabrous. Ligules 1·8–2·5 mm, white. *Mountain rocks.* ● *E. Pyrenees.* Ga Hs.

36. A. tomentosa L., *Sp. Pl.* 897 (1753). Tomentose to sericeous. Stems up to 40 cm, simple, erect. Leaves (except the uppermost) more or less terete; basal up to 8 cm, shortly petiolate, 2-pinnatisect, the lobes linear; upper cauline sessile, mostly 1-pinnatisect. Corymbs with (12–)15 to many capitula; peduncles 2–5 mm. Involucre *c.* 3 mm in diameter; bracts 2·5–3 mm, with a pale brown margin. Ligules (1·2–)2 mm, bright yellow. *Dry hillsides and waste places.* ● *S.W. Europe, extending eastwards to C. Italy.* Ga He Hs It [Cz].

37. A. chrysocoma Friv., *Flora* (*Regensb.*) **18**: 336 (1835). Like **36** but involucre 3·5–5 mm in diameter, the bracts 3–4 mm, with a dark brown margin; ligules *c.* 3 mm. *Mountain pastures.* ● *Albania and Macedonia.* Al Bu Gr Ju.

38. A. holosericea Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 194 (1813). Stems 15–60 cm, erect, simple, pubescent. Leaves 1-pinnatifid, more or less sericeous; basal 3–20 cm, petiolate, lanceolate in outline, the lobes ovate to lanceolate, more or less serrate; cauline 1–3 cm, plane, sessile, the lobes with more or less entire margins. Corymbs with 10 to many capitula; peduncles 2–5 mm. Involucre *c.* 5 mm in diameter; bracts *c.* 4 mm, ovate, obtuse, with a narrow brown margin. Ligules 1·5–2·5 mm, broadly orbicular, yellow. 2*n*=18. *Mountain rocks.* ● *S. & S.W. parts of Balkan peninsula.* Al Gr Ju.

39. A. absinthoides Halácsy, *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **61**: 243 (1894). Shortly sericeous. Stems 30–70 cm, simple or branched, erect. Leaves plane, pinnatisect, the lobes entire to 5-fid, linear. Corymbs with 15 to many capitula; peduncles 8–12 mm. Involucre 3–4 mm in diameter; bracts *c.* 2·5 mm, ovate. Ligules *c.* 3 mm, pale yellow. *Mountain rocks.* ● *N.W. Greece* (*Tzoumerka, N. of Arta*). Gr.

40. A. leptophylla Bieb., *Fl. Taur.-Cauc.* **2**: 335 (1808). Pubescent to lanate, somewhat caespitose. Stems up to 25 cm, simple or branched from a woody stock, erect or ascending. Leaves pinnatisect, plane; basal up to 5 cm, petiolate, the lobes 3-fid; upper cauline sessile, with simple lobes. Corymbs with 3–15 capitula; peduncles 2–10 mm. Involucre 4–5 mm in diameter; bracts *c.* 2·5 mm, with a pale scarious margin. Ligules *c.* 1·5 mm, yellow. *Dry places. S.E. Europe, from N.E. Bulgaria to W. Kazakhstan, and extending northwards to c.* 53° *N. in S.E. Russia.* Bu Rm Rs (W, K, E).

41. A. glaberrima Klokov, *Ind. Sem. Hort. Bot. Charkov.* 6 (1925). Like **40** but glabrous; stems up to 35 cm; lobes of basal leaves mostly simple, ovate to lanceolate. *Granite rocks.* ● *S.E. Ukraine* (*near Donets*). Rs(W).

42. A. ageratum L., *Sp. Pl.* 897 (1753). Stems 10–80 cm, erect, simple or branched, woody at base, hirsute. Leaves up to 5 × 1·2 cm, glabrous or hirsute, glandular-punctate; middle and upper cauline plane, simple, serrate, obtuse, sessile; basal more or less pinnatifid, petiolate. Corymbs with 15 to many capitula; peduncles 1–5 mm. Involucre *c.* 3 mm in diameter; bracts *c.* 2 mm, ovate, subobtuse, with a more or less scarious margin. Ligules *c.* 1 mm, yellow. 2*n*=18. *Damp places. W. Mediterranean region, Portugal.* Bl Co Ga ?Gr Hs It ?Ju Lu Sa [Rm].

43. A. ochroleuca Ehrh., *Beitr. Naturk.* **7**: 166 (1792) (*A. pectinata* Willd., non Lam.). Stems up to 50 cm, erect, simple or branched, woody at base, hirsute. Leaves up to 4 cm, lanceolate to linear in outline, plane, more or less pubescent, glandular-punctate, sessile, pectinate-pinnatisect; those of non-flowering shoots divided only in the distal half, the lower part linear, entire. Corymbs with many capitula; peduncles *c.* 2 mm. Involucre *c.* 2 mm in diameter; bracts *c.* 1·5 mm, with a somewhat scarious margin. Ligules 1–1·5 mm, yellow or whitish. 2*n*=18. *Dry places. E.C. Europe, E. Romania and S. Ukraine.* Cz Hu Ju Rm Rs (W).

44. A. depressa Janka, *Österr. Bot. Zeitschr.* **23**: 204 (1873). Like **43** but stems up to 30 cm, usually branched; leaves 1–2(–3) cm, pectinate-pinnatifid throughout most or all of their length; corymbs with 15 to many capitula; involucre 2–3 mm in diameter; bracts *c.* 2 mm; ligules yellowish. ● *E.C. Europe and Balkan peninsula.* Bu Cz Gr Ju Rm.

45. A. aegyptiaca L., *Sp. Pl.* 900 (1753). Greyish-tomentose. Stems up to 20(–50) cm, usually simple, erect. Leaves plane; basal up to 10 cm, pinnatisect with deeply crenate or serrate lobes, petiolate; upper cauline 1-pinnatisect, sessile. Corymbs with 15 to many capitula; peduncles 1–2 mm. Involucre 2·5–4 mm in diameter; bracts *c.* 2·5 mm, lanceolate, acute. Ligules 0·5–1 mm, reniform, yellow. 2*n*=18. *Rocky places. S. Greece and S. Aegean region.* Gr.

46. A. clypeolata Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 193 (1813). Shortly tomentose. Stems up to 60 cm, erect, simple. Leaves pinnatisect, plane, weakly glandular-punctate; basal up to 15 cm, petiolate, the lobes ovate, serrate to pinnatifid, with acute teeth; cauline all more or less distant, about twice as long as the internodes, the upper 1–2 cm, sessile. Corymbs with many capitula; peduncles *c.* 2 mm, tomentose. Involucre *c.* 3 mm in diameter; bracts *c.* 1·5 mm. Ligules *c.* 1 mm, yellow. 2*n*=18+0–1 B. ● *Balkan peninsula, extending to S.E. Romania.* Al Bu Gr Ju Rm Tu.

Several species described from Bulgaria are close to **46** and are probably of hybrid origin. **A. vandasii** Velen., *Fl. Bulg.* 265 (1891) (?**46** × **48**), is sometimes smaller in the vegetative parts; **A. stojanoffii** Prodan, *Bul. Acad. Stud. Agron. Cluj* **1**: 48 (1930), has larger involucres and sometimes white ligules; **A. serbanii** Prodan, *op. cit.* **2**: 30 (1931) is the hybrid *A. stojanoffii* × **32(b)**.

47. A. thracica Velen., *Fl. Bulg.* 264 (1891). Like **46** but leaves puberulent, distinctly glandular-punctate; cauline leaves crowded above, 4–5 times as long as the internodes; lobes oblong. *Dry places.* ● *S. Bulgaria.* Bu [Cz].

Perhaps conspecific with **46**.

48. A. coarctata Poiret in Lam., *Encycl. Méth. Bot., Suppl.* **1**: 94 (1810). Sericeous-tomentose. Stems 25–70 cm, erect, usually simple. Leaves pinnatisect; basal up to 30 cm, petiolate, the lobes 1- to 2-pinnatifid; middle cauline up to 8 cm, plane, with 1-pinnatifid lobes and usually dentate rhachis; upper cauline with simple, lanceolate lobes. Corymbs with many capitula; peduncles 2–4 mm, densely brown-villous. Involucre 3–4 mm in diameter; bracts 1–2 mm, brown-tomentose to villous. Ligules 0·5–1 mm, yellow. 2*n*=18, 36. *Dry hillsides and sandy soils. S.E. Europe, eastwards to S.W. Ukraine.* Al Bu Gr Ju Rm Rs(W) Tu.

49. A. micrantha Willd., *Tract. Achilleis* 33 (1789). More or less tomentose. Stems up to 50 cm, simple or branched, erect. Leaves pinnatisect with pinnatifid, mucronate lobes, lanceolate to linear in outline; basal up to 12 cm, petiolate; cauline plane, sessile, the uppermost pinnatifid with entire lobes. Corymbs with 15 to many capitula; peduncles 2–4 mm. Involucre *c.* 2 mm in diameter; bracts *c.* 2 mm, with a scarious margin. Ligules 0·5–1 mm, yellow. *Dry grassland and sandy places. S. part of U.S.S.R.* Rs (C, W, E).

50. A. biebersteinii C. Afan., *Not. Syst.* (*Leningrad*) **19**: 361 (1959) (*A. micrantha* sensu Bieb., non Willd.). Like **49** but stems simple; peduncles up to 2 mm; ligules *c.* 1·5 mm. *S. Bulgaria* (*Rodopi*); *perhaps on the borders of Europe in the Caucasian region.* Bu Rs (E). (*S.W. & S.C. Asia.*)

51. A. santolinoides Lag., *Gen. Sp. Nov.* 30 (1816). Tomentose, more or less glabrescent dwarf shrub. Stems up to 40(–60) cm, ascending, much-branched above. Leaves up to 1·5 × 0·3 cm, terete, sessile, patent, rarely glabrous, 1- to 2-pinnatifid, the lobes suborbicular, spinulose. Corymbs with 4–9 capitula; peduncles 3–15 mm. Involucre 4·5–6 mm in diameter; bracts 2–3 mm, ovate, obtuse, usually tomentose, with a scarious margin. Ligules 1–2 mm, orbicular or wider than long, yellow. *Waste ground. S.E. Spain.* Hs. (*N. Africa.*)

52. A. cretica L., *Sp. Pl.* 899 (1753). Like **51** but leaves 2–8 cm; peduncles (5–)10–15(–25) mm; ligules 3–4 mm, ovate-oblong, white. 2*n*=18. *Rocky places. Aegean region.* Cr Gr.

[1] By T. G. Tutin. [2] By Q. O. N. Kay.

59. Chamaemelum Miller[1]

Annual or perennial herbs. Leaves 1- to 3-pinnatisect, alternate. Capitula medium, pedunculate. Involucral bracts in 2 to several rows, gradually decreasing in size outwards. Receptacle hemispherical to conical, with scales. Outer florets usually ligulate, female or sterile; ligulate florets with a compressed, 2-winged tube and white, patent, entire or minutely 2- to 3-dentate ligule; inner florets hermaphrodite, tubular, yellow, the tube saccate at base and enclosing the apex of the achene. Achenes slightly compressed, weakly striate on inner face; pappus absent.

1 Most of the cauline leaves 1-pinnatisect **2. mixtum**
1 Most of the cauline leaves 2- to 3-pinnatisect
2 Perennial; involucral bracts greenish or hyaline; receptacular scales hyaline **1. nobile**
2 Annual; involucral bracts and receptacular scales with dark brown margin and apex **3. fuscatum**

1. C. nobile (L.) All., *Fl. Pedem.* **1**: 185 (1785) (*Anthemis nobilis* L.). More or less pubescent, decumbent, aromatic perennial (5–)10–30 cm. Leaves oblong in outline, sessile, 2- to 3-pinnatisect, with linear, mucronate lobes. Involucre 4–6 mm; bracts oblong to obovate, largely scarious, shining and sparsely hairy. Ligules *c.* 10 mm, sometimes absent. Achenes *c.* 1 mm. *Roadsides and damp grassland. W. Europe northwards to N. Ireland; formerly frequently cultivated for lawns, for ornament and for infusions and locally naturalized.* Az Br Ga Hb Hs Lu [Au Be Bu Ge He It Po Rs (B, C, W, K)].

2. C. mixtum (L.) All., *loc. cit.* (1785) (*Anthemis mixta* L., *Ormenis mixta* (L.) Dumort.). Somewhat pubescent annual 10–60 cm, often much-branched, with divaricate branches. Leaves oblong in outline, the lower 1- to 2-pinnatisect, the upper 1-pinnatisect to serrate, sessile; lobes linear-lanceolate, entire or serrate, mucronate. Involucre 3–5 mm; bracts oblong, obtuse, greenish, with a wide scarious margin, somewhat lanate. Ligules *c.* 10 mm. Achenes *c.* 1 mm. *Cultivated fields, roadsides and maritime sands. Mediterranean region and S.W. Europe, extending northwards to W.C. France.* Al Co Cr Ga Gr Hs It Lu Sa Si.

3. C. fuscatum (Brot.) Vasc., *Anais Inst. Vinho Porto* **20**: 276 (1967) (*Anthemis fuscata* Brot.). Glabrous annual 5–30 cm, simple or sparingly branched, with ascending branches. Leaves oblong in outline, usually 2-pinnatisect, the lower petiolate, the upper sessile and sometimes 1-pinnatisect; lobes acute. Involucre 3–4 mm; bracts ovate, with dark brown margin and apex, deflexed in fruit. Ligules 7–10 mm. Achenes *c.* 1 mm. *W. Mediterranean region, extending to Portugal and N.W. Spain.* Co Ga Hs It Lu Sa Si.

60. Matricaria L.[2] (*Tripleurospermum* Schultz Bip.)

Herbs. Leaves alternate, irregularly 2- to 3-pinnatisect, with numerous linear segments. Capitula medium, pedunculate. Involucral bracts in several rows, with a scarious margin. Receptacle hemispherical to conical, more or less solid; scales absent. Outer florets usually ligulate, female, white or rarely pink; inner florets tubular, 5-lobed, hermaphrodite, yellow. Achenes more or less compressed laterally, with 3 conspicuous, smooth ribs on the adaxial face and 1–2, rarely more, resin-glands at the apex of the abaxial face; pappus a small corona, sometimes absent.

1 Lateral ribs of achene distinctly longer than the median rib, strongly incurved above; pappus absent
2 Abaxial face of achene pale to medium brown, smooth or weakly rugose; capitula (4–)10–60 **1. trichophylla**

2 Abaxial face of achene blackish-brown, strongly rugose; capitula 3–10 **2. conoclinia**
1 Lateral ribs of achene about as long as the median rib, not or slightly incurved above; pappus present
3 Ligules less than ⅔ the diameter of the involucre, sometimes absent
4 Ligules present; basal and lower cauline leaves with lobes at base and in distal ¼ only **6. rosella**
4 Ligules absent or very short; basal and lower cauline leaves with lobes throughout their length **7. tempskyana**
3 Ligules at least ⅔ the diameter of the involucre
5 Annual; achene with strongly inflated ribs; pappus *c.* ½ as long as achene, 3-lobed **8. parviflora**
5 Ribs of achene not strongly inflated; pappus not more than ¼ as long as achene, usually truncate
6 Annual; achene with well-separated ribs; resin-glands ± orbicular **5. perforata**
6 Biennial or perennial; achene with contiguous or slightly separated ribs
7 Flowering stems unbranched; resin-glands of achene ± orbicular **3. caucasica**
7 Flowering stems usually corymbosely branched above; resin-glands of achene elongated
8 Plant eglandular, usually glabrous; resin-glands of achene 2, longitudinally elongated **4. maritima**
8 Plant usually glandular-puberulent; resin-gland of achene 1, transversely elongated **1. trichophylla**

1. M. trichophylla (Boiss.) Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 88 (1846) (*Tripleurospermum tenuifolium* (Kit.) Freyn). Biennial, rarely perennial. Stems 50–150 cm, erect, more or less corymbosely branched above; stems and leaves usually with numerous capitate glands, sometimes with scattered hairs. Leaf-segments long, narrow, acutely apiculate. Capitula (4–)10–60, 3–5 cm in diameter; ligules 1–1·7 cm; involucral bracts with a wide, colourless to pale brown scarious margin. Achenes with abaxial face pale or medium brown, smooth or weakly rugose; ribs stramineous, thick, the lateral usually distinctly longer than the median, strongly incurved above; pappus usually absent; resin-gland solitary, transversely elongated. *Hedges, roadsides and cultivated fields. S.E. & E.C. Europe.* Al Au Bu Gr Hu Ju Rm Tu.

2. M. conoclinia (Boiss. & Balansa) Nyman, *Consp.* 374 (1879) *T. conoclinium* (Boiss. & Balansa) Hayek). Like **1** but smaller and more frequently perennial; stems 30–50 cm; stems and leaves sparsely hairy but not glandular; capitula 3–10; involucral bracts with a dark brown margin; achenes with abaxial face blackish-brown, strongly rugose, the lateral ribs always distinctly longer than the median; pappus absent. *Scrub. Near Istanbul.* Tu. (*N.W. Anatolia.*)

Closely related to **1** but apparently distinct. Some plants of **1** from Albania resemble **2** in involucre and indumentum.

3. M. caucasica (Willd.) Poiret in Lam., *Encycl. Méth. Bot.*, *Suppl.* **3**: 604 (1814) (*T. caucasicum* (Willd.) Hayek). Perennial. Stems 15–50 cm, simple, subglabrous, erect or ascending from a short fibrous creeping rhizome. Leaves glabrous; lower cauline 4–7 × 1·5–2·5 cm, 2-pinnatisect into fairly long acute segments. Capitulum 1(–3), 3–5 cm in diameter; ligules 1·5–2 cm; involucral bracts narrowly triangular to oblong, with a wide, blackish-brown scarious margin. Achenes *c.* 2·5 × 1 mm; 1–2 slender supernumerary ribs often present; abaxial surface dark brown and smooth or somewhat rugose; resin-glands 2, small, orbicular; pappus 0·3–0·5 mm, pale, membranous, entire or somewhat lobed. *Alpine meadows. Mountains of W. & C. Bulgaria and E. Albania.* Al Bu ?Ju. (*Caucasian region.*)

4. M. maritima L., *Sp. Pl.* 891 (1753) (*T. maritimum* (L.) Koch). Biennial to perennial. Stems 10–80 cm, procumbent, ascending or erect, usually corymbosely branched above. Stems and leaves glabrous or with a few scattered hairs. Leaf-segments usually relatively short and fleshy, obtuse or shortly mucronate. Capitula (3–)10–50, 3–5 cm in diameter. Achenes 1·8–3·5 × 1–2 mm; ribs inflated and more or less contiguous, pale to dark blackish-brown; 1–2 supernumerary ribs often present; resin-glands large and longitudinally elongated; abaxial face blackish-brown and transversely rugose; pappus truncate, short. *Open habitats, usually near the sea. Coasts of W. & N. Europe.* Be Br Da Fa Fe Ga Ge Hb Hs Is Lu No Po Rs (N, B) Sb Su.

Variable in size, habit and characters of leaf and involucre.

1 Ligules 1·8–2 cm; involucral bracts oblong, all ± equal in length, with a pale to medium brown scarious margin at least 0·5 mm wide (b) subsp. **subpolaris**
1 Ligules 1–1·6 cm; outer involucral bracts much shorter than inner
2 Involucral bracts broadly triangular, with a blackish-brown scarious margin 0·4–1 mm wide (c) subsp. **phaeocephala**
2 Involucral bracts oblong or narrowly triangular, with a pale or dark brown scarious margin not more than 0·3 mm wide (a) subsp. **maritima**

(a) Subsp. **maritima**: Stems 15–80 cm. Resin-glands on achene usually much more than twice as long as wide. $2n = 18+$ 0–4 B. *Coasts of W. & N.W. Europe.*

(b) Subsp. **subpolaris** (Pobed.) Rauschert, *Folia Geobot. Phytotax.* (*Praha*) **9**: 257 (1974) (*T. subpolare* Pobed.): Stems 30–60 cm. Resin-glands on achene 1½–2 times as long as wide. *Seashores, waste places and cultivated land. N. Fennoscandia and N.W. Russia.*

(c) Subsp. **phaeocephala** (Rupr.) Rauschert, *loc. cit.* (1974) (*T. phaeocephalum* (Rupr.) Pobed.): Stems 10–40 cm. Resin-glands on achene usually more than twice as long as wide. $2n = 18$. *Arctic Europe.*

5. M. perforata Mérat, *Nouv. Fl. Env. Paris* 332 (1812) (*M. inodora* L., nom. illegit., *T. inodorum* Schultz Bip.). Annual. Stems 30–80 cm, erect or ascending, corymbosely branched above and sometimes also branching from base. Stems and leaves glabrous when mature, sometimes sparsely pubescent when young. Leaf-segments narrow and acutely apiculate, thin, not fleshy. Capitula (1–)10–200, 3–4·5 cm in diameter; ligules 1–1·8 cm; involucral bracts oblong or narrowly triangular with a narrow, colourless to dark brown scarious margin. Achenes 1·3–2·2 × 0·5–1·1 mm; ribs separated by at least ½ of their width; resin-glands more or less orbicular or bluntly angled (but not longitudinally elongated); abaxial face blackish-brown and transversely rugose; pappus very short and truncate. $2n = 18+0$–1 B, 36. *Cultivated land, waste places and saline steppes. Most of Europe.* All except Az Bl Co Cr Fa Is Sa Sb Si.

6. M. rosella (Boiss. & Orph.) Nyman, *Consp.* 374 (1879) (*T. rosellum* (Boiss. & Orph.) Hayek). Perennial. Stems 15–40 cm, subglabrous, ascending from a short rhizome, leafy only in lower ⅓–½. Leaves subglabrous; basal and lower cauline leaves 5–10 cm, pinnatisect only at base and in distal ¼, with rhachis 0·7–1 mm wide extending for *c.* ⅓ of length of leaf; basal segments very narrow, pectinate and amplexicaul; distal segments 12–25, 0·5–1 cm, acute. Capitulum 1(–2), *c.* 2·5 cm in diameter; ligules *c.* 0·7 cm, pink; involucral bracts with a narrow pale brown scarious margin, the outer *c.* ⅔ as long as the inner. Achenes *c.* 2 mm; ribs pale and slightly separated; abaxial surface brown and somewhat rugose; resin-glands 2, of medium size, separate or laterally connate; pappus *c.* 0·4 mm. *Mountain slopes, c.* 900 *m.* ● *S. Greece* (*Parnon Oros*). Gr.

7. M. tempskyana (Freyn & Sint.) Rauschert, *Folia Geobot. Phytotax.* (*Praha*) **9**: 258 (1974) (*T. tempskyanum* (Freyn & Sint.) Hayek). Perennial. Stems 30–65 cm, glabrous, erect or ascending, branching corymbosely in upper ½, leafy in lower ⅘. Leaves glabrous, with numerous short, narrow segments; lower cauline leaves 3–4 × 1·5–2 cm. Capitula 4–8(–20), the terminal 1–1·3 cm in diameter; ligules absent or very short; involucral bracts with a narrow, colourless or pale brown scarious margin; outer bracts about equalling the inner. Achenes 1·8–2 mm; ribs distinctly separated; abaxial face brown and rugose; resin-glands usually laterally connate; pappus 0·2–0·4 mm, entire or lobed. *Scrub.* ● *Mountains of C. Greece.* Gr.

M. disciformis (C. A. Meyer) DC., *Prodr.* **6**: 51 (1838), is recorded from Bulgaria, where its status is uncertain. It is like **7** but has numerous capitula and smooth or almost smooth achenes less than 1·4 mm, without a pappus or with 3–4 short lobes. It is native from the S. Caucasus to Afghanistan.

8. M. parviflora (Willd.) Poiret in Lam., *Encycl. Méth. Bot., Suppl.* **3**: 608 (1814) (*T. parviflorum* (Willd.) Pobed.). Annual. Stems 10–50 cm, erect or ascending, simple or branched from the base. Stems and leaves sparsely hairy. Capitula 1–8, 2–2·5 cm in diameter; ligules 0·6–0·8 cm; involucral bracts oblong, with a pale to dark brown scarious margin 0·25–0·5 mm wide. Achenes 1·9–2·3 mm; ribs whitish and strongly inflated; abaxial surface pale brown and smooth, sometimes with thin supernumerary ribs or longitudinal striations; pappus 0·7–0·9 mm, membranous and reticulately veined, 3-lobed. *Semi-deserts. S.E. Russia.* Rs (E). (*C. & S.W. Asia.*)

61. **Chamomilla** S. F. Gray[1]

Annuals. Leaves alternate, irregularly 2- to 3-pinnatisect, with numerous linear segments. Capitula small to medium, pedunculate or subsessile. Involucral bracts in two or more rows, with a scarious margin. Receptacle conical, hollow; scales absent. Ligulate florets, when present, female, white; inner florets hermaphrodite, tubular, 4- or 5-lobed. Achenes mucilaginous when wet, slightly compressed, obliquely truncate above; dorsal face convex; ventral face with 3–5 narrow, whitish, longitudinal ribs; pappus absent, or a small corona or auricle.

1 Ligules usually present; tubular florets 5-lobed
2 Stems (2–)10–60 cm; capitula 10–25 mm in diameter (including ligules); plant glabrous **1. recutita**
2 Stems 8–15 cm; capitula 7–10 mm in diameter (including ligules); plant ± hairy **2. tzvelevii**
1 Ligules absent; florets 4-lobed
3 Florets greenish; involucral bracts with a colourless or pale margin; mature achenes at least 1·2 mm **3. suaveolens**
3 Florets yellow; involucral bracts with a brown margin; mature achenes not more than 0·9 mm (excluding auricle, if present) **4. aurea**

1. C. recutita (L.) Rauschert, *Folia Geobot. Phytotax.* (*Praha*) **9**: 255 (1974) (*Matricaria recutita* L., *M. chamomilla* L. pro parte). Glabrous. Stems (2–)10–60 cm, erect or ascending, much-branched above. Leaves 4–7 cm; segments acute, well-separated. Peduncles 3–10 cm; capitula (1–)8–120(–900), 10–25 mm in diameter; involucral bracts with a pale margin. Ligules 6–9 × 2–3 mm, soon deflexed, rarely absent; tubular florets 5-lobed, yellow; upper part of tube campanulate above a marked constriction. Achenes *c.* 1 mm, pale greyish-brown, with 4–5 ribs on the ventral face; pappus usually very small or absent, but sometimes, especially in achenes of the ligulate florets, a conspicuous, irregularly toothed auricle, as long as or longer than the achene. $2n = 18$. *Cultivated fields, waste places and saline steppes; sometimes cultivated as a medicinal plant. Most of Europe, but probably native only in the south and east.* All except Az Fa Hb Is Rs (N) Sb; casual in some of these.

2. C. tzvelevii (Pobed.) Rauschert, *op. cit.* 256 (1974) (*Matricaria tzvelevii* Pobed.). More or less hairy. Stems 8–15 cm, much-branched from the base, wiry. Leaves 1·5–2 cm; segments few, rather fleshy, shortly cylindrical and mucronate. Capitula numerous, 7–10 mm in diameter; involucral bracts with a pale scarious margin. Ligulate florets female; ligules 1·5–3 × 1·5 mm, 3-dentate; tubular florets 5-lobed, yellowish; tube constricted below. Achenes *c.* 1·5 mm, with 5 ribs on the ventral face; pappus absent. *Roadsides and sandy or saline soils.* ● *Krym.* Rs (K).

3. C. suaveolens (Pursh) Rydb., *N. Amer. Fl.* **34**: 232 (1916) (*Matricaria matricarioides* (Less.) Porter pro parte). Stems (2–)8–45 cm, erect or ascending, rather fleshy, branched above and often also from the base; branches rigid, glabrous below, sometimes sparsely pubescent below the capitulum. Leaves 2–6 × 1–2 cm, rather crowded, glabrous; segments numerous, flattened, acute and aristate. Peduncles 0·2–3 cm; capitula 5–40(–300), 5–9(–12) mm in diameter, enlarging as they mature; involucral bracts with a colourless margin. Florets all tubular, 4-lobed, greenish; corolla 1·1–1·4 mm. Achenes 1·2–1·5 mm, pale brown, with 3–4 ribs on the ventral face; pappus a short membranous rim. $2n = 18$. *Farmyards, roadsides and cultivated ground. Widespread in Europe but absent from much of the south.* [Au Be Br Bu Cz Da Fa Fe Ga Ge Hb He Ho Hu Is It Ju Lu No Po Rm Rs (N, B, C, W, E) Su.] (*N.E. Asia, ?W. North America.*)

4 C. aurea (Loefl.) Gay ex Cosson & Kralik, *Cat. Pl. Syrie Palaest.* 10 (1854) (*Matricaria aurea* (Loefl.) Schultz Bip., *Perideraea aurea* (Loefl.) Willk.). Stems 4–25 cm, slender, decumbent or ascending and often flexuous, branched from the base, glabrous below, sometimes very sparsely pubescent below the capitulum. Leaves 0·5–2·5 × 0·3–1 cm; segments numerous, capillary, mucronulate. Peduncles 0·5–2·5 cm; capitula 1–60, 4–7 mm in diameter; involucral bracts with a brown margin. Florets all tubular, 4-lobed, yellow; corolla 0·7–0·9 mm (slightly exceeding the auricle, if present). Achenes 0·6 – 0·9 × 0·15 – 0·2 mm (excluding auricle), pale to dark brown, with 3–5 ribs on the ventral face; pappus either a short membranous rim, or a conspicuous irregularly toothed, scarious auricle 0·6–0·8 mm. $2n = 18$. *Roadsides, waste places and cultivated ground. S. Portugal, C. & S.E. Spain, Lampedusa, Malta.* Hs Lu Si.

A variable species. Plants with auriculate achenes are recorded from Malta, Lampedusa and Cyprus, and have not been observed elsewhere.

62. **Cladanthus** Cass.[2]

Annual herbs. Leaves alternate, 1- to 2-pinnatisect. Capitula medium to large, sessile. Involucral bracts in 2 rows. Receptacle conical to oblong, with scales and hairs. Outer florets ligulate, sterile; inner florets tubular, gibbous at base and with a shortly 5-lobed limb, hermaphrodite. Achenes obovoid-oblong, subterete; pappus absent.

1. C. arabicus (L.) Cass., *Dict. Sci. Nat.* **9**: 343 (1817). Puberulent and strong-smelling. Leaves 2–3 cm, with linear lobes, petiolate, the upper in a whorl, closely subtending the capitula. Primary stem short, with 2–6 branches arising immediately below the capitulum, each terminated by a capitulum and again branching. Capitula hemispherical; involucral bracts 7–10 mm, ovate-oblong, with a wide scarious appendage; receptacular scales folded

[1] By Q. O. N. Kay. [2] By T. G. Tutin.

round the florets, villous on the inside. Ligules yellow. *Cultivated fields and other open habitats. S. Spain.* Hs. (*North Africa.*)

63. Anacyclus L.[1]

Annual or perennial herbs. Leaves (1–)2- to 3-pinnatisect, alternate. Capitula pedunculate. Involucral bracts in few rows, the outer shorter than the inner. Receptacle convex or conical; scales present. Outer florets ligulate, female or sterile, the ligules entire or minutely 3-dentate, patent or rarely short and erect. Inner florets 5-lobed, yellow, sometimes weakly zygomorphic; corolla-tube compressed or winged. Achenes compressed, obovate, the outer 2-winged, the inner often unwinged; pappus absent, or scarious and denticulate, or of distinct scarious scales.

1 Ligules short, erect, not exceeding the involucre
 2 Outer achenes with divaricate lobes at top of wings **3. valentinus**
 2 Outer achenes with erect lobes at top of wings **1. clavatus**
1 Ligules 10–15 mm, patent, exceeding the involucre
 3 Ligules yellow; inner involucral bracts with a conspicuous scarious appendage at the apex **2. radiatus**
 3 Ligules white or purple beneath; inner involucral bracts without a conspicuous scarious appendage at the apex
  4 Annual; ligules white; wings extending beyond apex of achenes **1. clavatus**
  4 Perennial; ligules purplish beneath; wings shorter than achenes **4. pyrethrum**

1. A. clavatus (Desf.) Pers., *Syn. Pl.* **2**: 465 (1807) (*A. tomentosus* DC.). More or less villous annual up to 50 cm. Leaves oblong or oblanceolate in outline, with linear, mucronulate lobes. Capitula 15–20 mm in diameter (excluding ligules). Peduncles clavate after flowering. Involucral bracts lanceolate to ovate-lanceolate, acute or acuminate, without an appendage, greenish, with a narrow white or purplish scarious margin, sericeous-villous. Ligules usually 7–14 mm, white, oblanceolate, rarely very short. Outer achenes broadly winged, each wing with an erect, rounded lobe projecting beyond the apex of the achene; inner achenes unwinged; pappus absent. $2n=18$. *Disturbed ground. Mediterranean region, extending to Portugal and N.W. Spain.* Bl Co Ga Gr Hs It Ju Lu Sa Si Tu.

2. A. radiatus Loisel., *Fl. Gall.* 582 (1807). Like **1** but up to 60 cm; involucral bracts oblong, the inner with a large, scarious, fimbriate appendage at apex; ligules yellow, sometimes purplish beneath; outer achenes with acute lobes at the top of the wings; inner very narrowly winged. $2n=18$. *Sandy or stony ground. Mediterranean region, extending to Portugal.* Co Ga Gr Hs It Ju Lu Sa Si.

3. A. valentinus L., *Sp. Pl.* 892 (1753). Like **1** but ligules very short, erect, not exceeding the involucre; outer achenes broadly winged, the wings with rounded, divaricate lobes at the top; pappus a small, scarious, denticulate rim. *E., C. & S. Spain, S. France.* Ga Hs.

4. A. pyrethrum (L.) Link, *Enum. Horti Berol. Alt.* **2**: 344 (1822). More or less villous perennial with a stout stock and rosettes of leaves from the axils of which arise decumbent stems 10–45 cm. Leaves oblong to ovate in outline; lobes oblong, obtuse, mucronulate; cauline leaves much smaller than basal. Capitula *c.* 15 mm in diameter (excluding ligules). Involucral bracts oblong-ovate, obtuse, sparsely villous; margin purplish or whitish. Ligules white, purple beneath. Outer achenes with wings not reaching their apex; inner very narrowly winged. *S.E. Spain.* Hs. (*North Africa.*)

[1] By T. G. Tutin. [2] By V. H. Heywood.

64. Lonas Adanson[1]

Annual herbs. Leaves alternate. Capitula small, in dense terminal corymbs. Involucral bracts in many rows. Receptacle elongate, with scales. All florets tubular, hermaphrodite. Achenes prismatic, with 5 prominent ribs and a gland near the apex; pappus cyathiform, lacerate-dentate.

1. L. annua (L.) Vines & Druce, *Acc. Morison. Herb.* 71 (1914). Glabrous. Stem usually 10–30 cm. Lower leaves 3-fid, petiolate, the lobes more or less toothed; upper pinnatifid, with linear, acuminate segments, sessile or shortly petiolate. Inflorescence of 2–10 shortly pedunculate capitula. Involucre campanulate; bracts with scarious margins; receptacular scales like the bracts. Florets yellow. *Dry places. Sicilia, S.E. Italy.* It Si [Ga]. (*North Africa.*)

65. Otanthus Hoffmanns. & Link[1]

Perennial herbs. Leaves alternate. Inflorescence corymbose, with several medium capitula. Involucral bracts in few rows. Receptacle subconical, with scales. Florets all tubular and hermaphrodite, the tube prolonged downwards into 2 spurs which almost enclose the ovary. Achenes compressed, 4- to 5-ribbed, partly enclosed by the thick, corky, persistent corolla; pappus absent.

1. O. maritimus (L.) Hoffmanns. & Link, *Fl. Port.* **2**: 365 (1834) (*Diotis maritima* (L.) Desf. ex Cass.). Densely white-lanate; stems up to 50 cm, ascending, stout, woody. Leaves 5–17 mm, oblong to oblong-lanceolate, entire or crenulate, fleshy, sessile. Capitula globose; involucral bracts 4–5 mm, numerous, ovate, the outer lanate, the inner glabrous with lanate apex; florets yellow. Achenes *c.* 4 mm, curved. $2n=18$. *Maritime sands. S. & W. Europe, northwards to S.E. Ireland.* Al Bl †Br Co Cr Ga Gr Hb Hs It Ju Lu Sa Si Tu [Bu].

66. Chrysanthemum L.[2]

Annuals. Capitula pedunculate, solitary or 2–5 on branches. Involucral bracts in 2–3 rows. Receptacle convex, without scales. Ligulate florets female. Tubular florets hermaphrodite; corolla-tube laterally expanded and 2-winged. Achenes without vallecular secretory canals or epicarpic mucilaginous cells, those of ligulate florets 3-angled with the ribs often winged, those of tubular florets cylindrical to cylindrical-triquetrous, ribbed, the posterior rib sometimes winged. Pappus absent.

C. carinatum Schousboe, *Vextr. Marokko* 198 (1800), with yellow ligules, reddish, dark-coloured or whitish at the base, and achenes of the ligulate florets lacerate at the apex, is cultivated for ornament in a large part of Europe and has occasionally been reported as an escape.

Leaves (except the upper) deeply incise-dentate; achenes of ligulate florets without adaxial wing **1. segetum**
Leaves (except the lower) 2-pinnatisect; achenes of ligulate florets with adaxial wing **2. coronarium**

1. C. segetum L., *Sp. Pl.* 889 (1753). Glabrous, blue-green, somewhat fleshy. Stems 20–60(–80) cm, simple or branched. Leaves oblong to obovate-oblong, the lower and middle cauline deeply incise-dentate, the upper subentire, somewhat amplexicaul. Involucre 13–20 mm in diameter; outer bracts ovate, obtuse, yellowish-green, with pale brown marginal band, the apex scarious; inner bracts similar but widened at the appendage. Florets yellow. Inner achenes 10-ribbed; outer achenes with 2 lateral wings; lateral faces with 1–2 ribs; adaxial face with 3 prominent, whitish ribs. $2n=18$. *Cultivated fields and waste places; somewhat calcifuge. Perhaps native in the Aegean region; extensively naturalized in W. and parts of N. Europe and more locally elsewhere; now becoming rarer in many districts.* *Cr *Gr [Az Be Bl Br Co Da Ga Ge Hb Ho Hs Hu It Ju Lu No Po Rs (B, C, W, E) Sa Si Su Tu]. (*S.W. Asia.*)

2. C. coronarium L., *Sp. Pl.* 890 (1753). Glabrous or slightly hairy. Stems 20–70(–80) cm, branched. Leaves oblong to obovate, mostly 2-pinnatisect with oblong or lanceolate, incise-dentate segments, semi-amplexicaul. Involucre (13–)15–18(–20) mm in diameter; outer bracts ovate, with a brownish marginal band and a narrow, whitish scarious margin; inner without marginal band but with a wider scarious margin and rounded scarious apical appendage. Florets yellow, or ligules yellow at base and white distally. Inner achenes laterally compressed, with adaxial wing, prominent ribs on abaxial face and rounded superficial ribs on lateral faces, sometimes the central achenes cylindrical, unwinged; outer achenes 3-angled, with the angles winged; abaxial face with 3 slender ribs; lateral faces without ribs. All achenes covered with sessile, non-mucilaginous glands. $2n=18$. *Cultivated ground and waste places. Mediterranean region, C. & S. Portugal; widely cultivated for ornament and occasionally naturalized elsewhere.* Bl Co Cr Gr Hs It Ju Lu Sa Si Tu [Au Az Cz Ga Rm].

67. Heteranthemis Schott[1]

Like *Chrysanthemum* but whole plant more or less covered with viscid, glandular hairs; corolla-tube not laterally expanded and 2-winged; outer achenes 3-winged, the wings with apical spines; inner achenes laterally compressed, 1- to 2-winged, with apical spines, the adaxial wing strongly developed.

1. H. viscidehirta Schott, *Isis* **1818(5)**: 822 (1818) (*Chrysanthemum viscidehirtum* (Schott) Thell., *Pinardia anisocephala* Cass.). Annual. Stems up to 50 cm, very hairy, with glandular and eglandular hairs. Leaves obovate to oblong, densely to sparsely viscid-hairy; basal and lower cauline shallowly pinnatifid or toothed; middle cauline sometimes pinnatifid. Involucre 25–40 mm in diameter; outer bracts ovate; inner bracts obovate, incurved, obtuse. Florets yellow. *Damp, sandy places. S.W. Spain, S. Portugal.* Hs Lu. (*N.W. Africa.*)

68. Dendranthema (DC.) Desmoulins[1]

Herbaceous perennials, sometimes woody at base. Capitula solitary or in lax corymbs. Involucral bracts in 3 rows. Receptacle strongly convex, slightly punctate-tuberculate. Ligulate florets female, white or purplish; inner florets hermaphrodite, tubular-obconical; tube unwinged. Achenes all similar, cylindrical-obconical, 5- to 8-ribbed, without vallecular secretory canals, with or without epicarpic mucilaginous cells. Pappus absent.

Somewhat woody at base; leaves conspicuously glandular-punctate, the lower cauline ovate, (1–)2-pinnatisect **1. zawadskii**
Herbaceous; leaves not conspicuously glandular-punctate, the lower cauline oblong to suborbicular, subpinnatifid **2. arcticum**

1. D. zawadskii (Herbich) Tzvelev in Schischkin & Bobrov, *Fl. URSS* **26**: 376 (1961) (*Chrysanthemum zawadskii* Herbich). Rhizomatous perennial, somewhat woody at base. Stems 15–60 cm, simple or branched, densely leafy, appressed-hairy. Leaves densely glandular-punctate, sparsely appressed-hairy to glabrous; basal and lower cauline (1–)2-pinnatisect, the lamina 10–35 × 10–40 mm, the lobes entire or toothed, acute or obtuse, the petiole 30–80 mm, narrowly winged; middle cauline similar to lower but petiole broadly winged. Capitula 10–20 mm in diameter, solitary, or 2–5 in a lax corymb. Ligulate florets 15–30 mm, white or purplish. Achenes 1·8–2·5 mm, with epicarpic mucilage-cells. $2n=54$. *Stony slopes; somewhat calcicole. Carpathians; Ural; a few stations in N. & C. Russia.* Cz Po Rs (N, C, W, E).

2. D. arcticum (L.) Tzvelev, *op. cit.* 386 (1961) (*Chrysanthemum arcticum* L.). Herbaceous, with creeping woody rhizome. Stems 10–25 cm, erect or ascending, simple, leafy, glabrous below, somewhat pubescent above. Leaves fleshy, not markedly glandular-punctate, glabrous or subglabrous; basal and lower cauline subpinnatifid, the lamina 35–45 × 25–30 mm, cuneate, with 3–5 apical lobes or teeth, the petiole 50–80 mm, narrowly winged; upper cauline reduced, subentire, sessile. Capitula 12–25 mm in diameter, solitary. Ligulate florets 8–20 mm, white. Achenes 1·5–2·2 mm, without epicarpic mucilage-cells. *Stony tundra and seashores. Arctic Russia.* Rs (N).

The European plant is subsp. **polare** (Hultén) Heywood, *Bot. Jour. Linn. Soc.* **71**: 272 (1976) (*Chrysanthemum arcticum* subsp. *polare* Hultén, *Dendranthema hultenii* (A. & D. Löve) Tzvelev), which differs from subsp. *arcticum* in its smaller stature, simple stems, cuneate basal leaves glabrous at the base and shorter ligules with 4–5 veins.

Related species which are widely cultivated for ornament are **D. indicum** (L.) Desmoulins, *Actes Soc. Linn. Bordeaux* **20**: 562 (1855) and **D. morifolium** (Ramat.) Tzvelev in Schischkin & Bobrov, *Fl. URSS* **26**: 373 (1961) and numerous cultivars derived from them. These are the autumn-flowering chrysanthemums of horticulture.

69. Tanacetum L.[2]

Annuals or herbaceous perennials, often aromatic. Leaves pinnately divided, alternate. Capitula in terminal corymbs, rarely solitary, with or without ligulate florets. Involucral bracts in 3 rows. Receptacle convex to subglobose, usually punctate-tuberculate. Outer florets ligulate, usually female, white or yellow, or tubular, hermaphrodite or female, yellow. Inner florets hermaphrodite, tubular. Achenes all similar, usually 3- to 10-ribbed, without epicarpic mucilaginous cells or vallecular secretory canals, very rarely with secretory lacunae. Pappus usually a corona.

1 All florets tubular
 2 Perennial; leaves more than 5 cm **1. vulgare**
 2 Annual; leaves less than 3 cm
  3 Greyish-sublanate, much-branched; lower cauline leaves 0·5–1 cm, the lobes obtuse **2. microphyllum**
  3 Greenish-pubescent; cauline leaves more than 1 cm, the lobes acute **3. annuum**
1 Outer florets ligulate, the ligules sometimes very short
 4 Ligules yellow
  5 Capitula usually solitary; involucre 10–18 mm in diameter **7. bipinnatum**
  5 Capitula few to numerous; involucre 4–7(–10) mm in diameter
   6 Ligulate florets few, the ligules 0·5–1(–1·5) mm
    7 Capitula hemispherical; leaves white-tomentose **8. santolina**
    7 Capitula elongate-subglobose; leaves glabrous to subglabrous **5. paczoskii**

[1] By V. H. Heywood.
[2] By V. H. Heywood, partly based on data provided by S. A. Alavi.

6 Ligulate florets numerous, the ligules 1–3 mm
8 Involucre 4–7 mm in diameter, glabrous or sparsely hairy; outer bracts ovate-lanceolate **4. achilleifolium**
8 Involucre 7–10 mm in diameter, lanate, rarely glabrous; outer bracts broadly ovate **6. millefolium**
4 Ligules white
9 Involucre 4–7 mm in diameter; capitula very numerous in a dense, compound corymb **13. macrophyllum**
9 Involucre more than 8 mm in diameter; capitula 1–30 in a lax corymb
10 Cauline leaves sessile
11 Capitula long-pedunculate, forming a regular, lax corymb; leaves pubescent to glabrous **9. corymbosum**
11 Capitula shortly pedunculate, forming an irregular corymb; leaves densely villous-lanate **10. mucronulatum**
10 Cauline leaves petiolate
12 Involucre 12–18 mm in diameter; capitula solitary; leaf-segments narrowly lanceolate to oblong-lanceolate, densely silvery-sericeous **14. cinerariifolium**
12 Involucre 6–8 mm in diameter; capitula 3–30 in a lax corymb; leaf-segments oblong or oblong-elliptical to ovate, pubescent to subglabrous
13 Stems ridged; leaf-segments oblong-elliptical to ovate; ligules 2·5–7 mm **11. parthenium**
13 Stems terete; leaf-segments oblong; ligules 7–10 mm **12. parthenifolium**

Sect. TANACETUM. Ligules yellow or absent. Achenes without secretory lacunae.

1. T. vulgare L., *Sp. Pl.* 844 (1753) (*Chrysanthemum vulgare* (L.) Bernh., non (Lam.) Gaterau, *C. tanacetum* Karsch, non Vis.; incl. *T. audibertii* (Req.) DC.). Aromatic perennial. Stems 30–150 cm, branched above. Leaves pinnatipartite to pinnatisect, glabrous to sparsely hairy, glandular-punctate; lower cauline leaves more than 5 cm, petiolate, oblong to oblong-ovate, the segments pinnatisect to pinnatilobed, linear-lanceolate to oblong-elliptical; upper cauline leaves similar but sessile. Capitula (5–)10–70(–100) in a dense, compound corymb; involucre 5–8 mm in diameter. Outer row of florets tubular, female, zygomorphic, 3-toothed, rarely shortly ligulate, or actinomorphic, 5-toothed, hermaphrodite; inner florets tubular, 5-toothed. Achenes 1·2–1·8 mm, 5-ribbed, with scattered epicarpic, sessile, transparent, non-mucilaginous glands; pappus 0·2–0·4 mm. $2n=18$. *Roadsides, river-gravels and waste places; extensively cultivated for ornament and as a pot-herb, and in some regions naturalized. Almost throughout Europe.* All except Az Bl Cr Sb; not native in Hb.

Plants with finely dissected leaves occur in Corse, Sardegna and Sicilia and are sometimes recognized as separate species or varieties. Their status requires further study.

T. funkii Schultz Bip. ex Willk. in Willk. & Lange, *Prodr. Fl. Hisp.* **2**: 102 (1865), described from a single collection from S. Spain (Sierra Nevada), needs further study. It is described as a much-branched, pubescent, caespitose annual with very small solitary capitula at the ends of branches.

2. T. microphyllum DC., *Prodr.* **6**: 131 (1838). Greyish-sublanate annual. Stems 20–60 cm, much-branched. Basal leaves 2-pinnatisect; cauline leaves less than 1 cm, 1-pinnatisect; segments all approximate, linear, obtuse, more or less hirsute. Capitula 5–20 in a dense corymb. All florets hermaphrodite, tubular, 4- to 5-toothed. Achenes 5-ribbed. *C. & S. Spain, N.E. & E.C. Portugal.* Hs Lu.

3. T. annuum L., *Sp. Pl.* 844 (1753). Greenish-pubescent annual. Stems 20–80 cm, branched. Leaves pinnatisect, the cauline 1–3 cm; segments linear, acute or acuminate, sparsely pubescent to glabrous. Capitula 6–40 in a dense corymb. All florets hermaphrodite, tubular, 5-toothed. Achenes 5-ribbed. $2n=18$. *Cultivated ground and waste places. S.W. Europe.* Ga Hs Lu.

4. T. achilleifolium (Bieb.) Schultz Bip., *Tanacet.* 47 (1844). Perennial. Stems 10–40 cm, pubescent. Leaves 2-pinnatisect; basal 10–12(–15) cm, linear, petiolate; all greyish-green-pubescent. Capitula hemispherical, 2–15(–20) in a lax, irregular corymb; involucre 4–7 mm in diameter. Ligulate florets yellow, female; ligules 1–2 mm. Achenes 1·5–2 mm, 5- to 6(–8)-ribbed; pappus a corona 0·3–0·5 mm. *Steppes and semi-deserts. S.E. part of U.S.S.R.* ?Bu ?Rm Rs (W, K, E).

Not always clearly separable from **6.**

5. T. paczoskii (Zefirov) Tzvelev in Schischkin & Bobrov, *Fl. URSS* **26**: 349 (1961). Like **4** but leaves subglabrous or glabrous; capitula elongate-subglobose, with the ligulate florets *c.* 0·5 mm, not exceeding the inner involucral bracts. *Stony slopes and steppes.* ● *Krym.* Rs (K).

6. T. millefolium (L.) Tzvelev, *op. cit.* 348 (1961) (*T. kittaryanum* (C. A. Meyer) Tzvelev, *Chrysanthemum millefoliatum* L.). Perennial, woody at the base. Stems 20–50 cm, branched above or simple. Leaves 2-pinnatisect; basal 10–15 cm, petiolate, all pubescent when young, often later subglabrous. Capitula 2–10(–15) in a lax, irregular corymb; involucre 7–10 mm in diameter. Ligulate florets yellow, female; ligules (1·5–)1·8–3 mm. Achenes 2–2·5 mm, 5- to 8(–10)-ribbed; pappus a corona 0·3–0·8 mm. *Dry, stony ground. From Bulgaria to S.C. Russia.* Bu Rm Rs (W, K, E).

Several closely related plants have been described from the U.S.S.R. but do not appear to warrant specific status, e.g. **T. uralense** (Krasch.) Tzvelev, *op. cit.* 346 (1961), from S.E. Russia and S. Ural, said to differ in its oblique rhizome and its more dissected leaves with a broader lamina, **T. sclerophyllum** (Krasch.) Tzvelev, *op. cit.* 347 (1961), from the middle Volga basin, with rigid leaves and 2–4(–6) capitula, and **T. odessanum** (Klokov) Tzvelev, *op. cit.* 348 (1961), from S. Ukraine and Moldavia, with shorter peduncles and larger capitula.

7. T. bipinnatum (L.) Schultz Bip., *Tanacet.* 48 (1844). Perennial. Stems 6–40 cm, solitary, simple or branched above. Leaves 2- or 3-pinnatisect; basal 25–30 cm, oblong to linear-oblong, petiolate; all more or less villous. Capitula solitary or rarely 2–4 in a lax corymb; involucre 10–18 mm in diameter. Ligulate florets yellow, female; ligules 3–7 mm. Achenes 2·5–3·5 mm, 5- to 7-ribbed; pappus 0·3–0·8 mm, conspicuous. $2n=54$. *River-gravels and stony slopes. Arctic and subarctic Russia.* Rs (N). (*Circumpolar.*)

8. T. santolina Winkler, *Acta Horti Petrop.* **11**: 375 (1891). Perennial, woody at base. Stems 10–35 cm, subtomentose. Leaves 2-pinnatifid, whitish-tomentose; lower cauline 3–6 cm, linear, with 14–20 segments, linear-lanceolate, with linear-lanceolate lobes, petiolate. Capitula 2–10(–15) in a lax corymb; involucre 4–7 mm in diameter. Ligulate florets yellow, female; ligules 0·5–1(–1·5) mm. Achenes 1·8–2·2 mm; pappus a corona 0·2–0·4 mm. *Saline steppes. W. Kazakhstan, ?S.E. Russia.* Rs (E). (*C. Asia.*)

Sect. PYRETHRUM (Zinn) Reichenb. fil. Ligules white, always present. Achenes without secretory lacunae.

9. T. corymbosum (L.) Schultz Bip., *Tanacet.* 57 (1844) (*Chrysanthemum corymbosum* L., *Leucanthemum corymbosum* (L.) Gren. & Godron, *Pyrethrum corymbosum* (L.) Scop.). Perennial. Stems 30–120(–150) cm, more or less branched; leaves pinnatisect to pinnatipartite, pubescent or glabrous (rarely densely hairy above, white-sericeous beneath), the segments toothed; basal 30–40 mm, oblong to linear-oblong, with 16–40 segments, the segments oblong to oblanceolate, petiolate; cauline leaves similar but smaller and sessile. Capitula 3–15(–20) in a lax corymb, long-pedunculate; involucre 8–14 mm in diameter. Ligulate florets white, female; ligules 10–16 mm. Achenes 2–2·5(–3) mm; ribs 5–7, very prominent; pappus a shortly toothed corona 0·5–0·8 mm. *Open woodland, scrub and meadows. Europe northwards to N.C. France and C. Russia; some isolated stations in N. Russia (by Onežskoe Ozero) and locally naturalized.* Al Au Bu Co Cz Ga Ge Gr He Hs Hu Ju Lu Po Rm Rs (N, C, W, K, E) Sa Si Tu [Da It Su].,

(a) Subsp. **corymbosum**: Leaves shining green beneath, the segments dentate; involucral bracts with a narrow, light brown margin; ligules 10–15 mm. $2n=36$. *Throughout the range of the species.*

(b) Subsp. **clusii** (Fischer ex Reichenb.) Heywood, *Bot. Jour. Linn. Soc.* **71**: 272 (1976) (*Pyrethrum clusii* Fischer ex Reichenb. *Chrysanthemum subcorymbosum* Schur, *Tanacetum corymbosum* var. *subcorymbosum* (Schur) Simonkai): Leaves shining green on both surfaces, the segments serrate; involucral bracts with a broad, blackish-brown margin; ligules 15–20 mm. $2n=18$. *Carpathians, E. Alps and probably Balkan peninsula.*

10. T. mucronulatum (Hoffmanns. & Link) Heywood, *Agron. Lusit.* **20**: 214 (1958) (*Pyrethrum mucronulatum* Hoffmanns. & Link). Like **9** but stems not more than 60 cm; leaves densely villous-lanate beneath; capitula shortly pedunculate, forming an irregular corymb. *Scrub and rocky places.* ● *N.E. & E.C. Portugal.* Lu.

11. T. parthenium (L.) Schultz Bip., *Tanacet.* 55 (1844) (*Chrysanthemum parthenium* (L.) Bernh., *Leucanthemum parthenium* (L.) Gren. & Godron, *Pyrethrum parthenium* (L.) Sm.). Strongly aromatic perennial. Stems ridged. Leaves pinnatisect to pinnatipartite, yellowish-green; basal and lower cauline more or less ovate, with 3–7 oblong-elliptical to ovate segments which are subpinnately divided, crenate or entire. Capitula 5–20(–30) in a dense corymb; involucre 6–8 mm in diameter. Ligulate florets white, female; ligules 2·5–7 mm. Achenes 1·2–1·5 mm, 5- to 8-ribbed; pappus an irregularly lobed corona 0·2 mm. $2n=18$. *Mountain scrub and rocky places. Balkan peninsula. Long cultivated for ornament and as a medicinal plant and naturalized in hedges and waste places throughout a large part of Europe.* Al Bu Gr Ju [Au Az Be Br Co Cr Cz Da Ga Ge Hb He Ho Hs Hu It Lu Po Rm Rs (C, W, K, E) Sa Si Su Tu].

T. vahlii DC., *Prodr.* **6**: 129 (1838), believed to have been collected in Spain, and the apparently related **T. willkommii** Schultz Bip., *Flora* (*Regensb.*) **34**: 748 (1851), collected in E. Spain, are plants about which further information is needed.

12. T. parthenifolium (Willd.) Schultz Bip., *Tanacet.* 56 (1844) (*Pyrethrum parthenifolium* Willd.). Like **11** but stems terete; leaf-segments oblong-elliptical to ovate, incise-dentate; ligules 7–10 mm; pappus entire. *Mountain woods and scrub. Krym.* Rs (K). (*S.W. & C. Asia.*)

13. T. macrophyllum (Waldst. & Kit.) Schultz Bip., *Tanacet.* 53 (1844) (*Chrysanthemum macrophyllum* Waldst. & Kit., *Pyrethrum macrophyllum* (Waldst. & Kit.) Willd.). Perennial. Stems 40–100(–150) cm, usually solitary, simple or branched above. Leaves pinnatipartite to pinnatilobed, glabrous above, densely hairy beneath; cauline leaves subsessile, with 8–16 lanceolate, acute, doubly crenate segments. Capitula (20–)40–100(–150) in very dense, compound corymbs; involucre 4–7 mm in diameter. Ligulate florets white, female; ligules 2–4 mm. Achenes 1·6–2 mm, 5-ribbed; pappus a denticulate corona 0·2–0·3 mm. *Mountain woods. From N.W. Jugoslavia and the E. Carpathians southwards to Macedonia; cultivated for ornament and locally naturalized in C. Europe.* Al Bu Gr Ju Rm [Cz Da Ge Hu Rs (W)].

Very variable in leaf-width and degree of dissection.

Sect. CINERARIIFOLIA (Heywood) Alavi. Ligules white. Achenes with secretory lacunae.

14. T. cinerariifolium (Trev.) Schultz Bip., *Tanacet.* 58 (1844) (*Pyrethrum cinerariifolium* Trev.). Caespitose, silvery-grey, sericeous perennial. Stems 15–45 cm. Leaves pinnatipartite, glandular-punctate; basal 10–20 cm, petiolate, lanceolate to oblong, the segments pinnatisect to palmatisect, narrowly lanceolate to oblong-lanceolate; cauline similar but shortly petiolate. Capitula solitary; involucre 12–18 mm. Ligulate florets white, female; ligules 8–16 mm. Achenes 2·5–3·5 mm, 5- to 7-ribbed. Pappus an irregularly lobed corona 0·6–1 mm. *Rocky ground.* ● *W. Jugoslavia and Albania; cultivated elsewhere in S.E. & E.C. Europe as an insecticide, and locally naturalized.* Al Ju [Au Hs Hu It Rs (W, K, E)].

70. Leucanthemella Tzvelev[1]

Herbaceous perennials. Leaves simple, alternate, glandular-punctate. Capitula solitary or 2–8 in a lax corymb. Involucral bracts in 2–3 rows. Receptacle strongly convex, without scales. Ligulate florets in 1 row, sterile; tube strongly compressed but unwinged. Inner florets hermaphrodite, tubular or tubular-campanulate. Achenes all similar, without mucilaginous cells or vallecular secretory canals. Pappus minute or absent.

1. L. serotina (L.) Tzvelev in Schischkin & Bobrov, *Fl. URSS* **26**: 139 (1961) (*Tanacetum serotinum* (L.) Schultz Bip.). Stems 30–150 cm, usually hairy. Leaves lanceolate to oblong-lanceolate, 2- to 4-lobed at the base, sessile; middle cauline with forwardly directed teeth. Ligules 10–25 mm, white or reddish. Achenes 2–3 mm, with thick, white, obtuse ribs. $2n=18$. *Wet places. From S.E. Czechoslovakia and E.C. Jugoslavia eastwards to N. Ukraine and N.E. Bulgaria.* Bu Cz Hu Ju Rm Rs (C, W) [He Po].

71. Balsamita Miller[1]

Perennial herbs. Leaves simple, strongly glandular-punctate, alternate. Capitula in a corymbose inflorescence. Involucral bracts in several rows. Receptacle plano-convex. Outer florets female, tubular or with white ligules, rarely absent. Inner florets hermaphrodite, tubular-obconical. Achenes all similar, 5- to 8-ribbed, with epicarpic non-mucilaginous glands; mucilage-cells and vallecular resin-canals absent; pappus short, irregularly toothed or lobed.

1. B. major Desf., *Actes Soc. Hist. Nat. Paris* **1**: 3 (1792) (*Chrysanthemum balsamita* (L.) Baillon, non L., *Pyrethrum majus* (Desf.) Tzvelev). Dull green, densely hairy. Stems 30–120 cm, simple or branched, densely leafy. Basal and lower cauline leaves oblong, cuneate, crenate-dentate, petiolate; upper reduced.

[1] By V. H. Heywood.

Capitula 6–10 mm in diameter (without ligules), 10–16 mm (with ligules), 10–60; ligules 4–6 mm. *Widely cultivated for ornament and locally naturalized.* [Cz Ga Hs It Rs (C, W).] (*S.W. Asia.*)

72. **Phalacrocarpum** Willk.[1]

Perennials, woody at base. Leaves opposite. Capitula solitary. Involucral bracts in 3 rows. Receptacle convex, without scales. Ligulate florets female, white or purplish; other florets tubular-campanulate, the marginal hermaphrodite, fertile, the central mostly male or petaloid and sterile. Achenes obconical-cylindrical, slightly compressed, with small, obtuse basal callus; ribs 6–7, narrow, white; secretory canals and mucilaginous cells absent.

Leaves pinnatipartite to pinnatisect or 2-pinnatisect, the segmen's linear to lanceolate; whole plant greyish-tomentose or -sericeous **1. oppositifolium**

Leaves narrowly cuneate, entire at the base, spathulate, and with 4–5 pairs of teeth towards the apex; whole plant shining silvery-sericeous **2. hoffmannseggii**

1. P. oppositifolium (Brot.) Willk., *Bot. Zeit.* **22**: 252 (1864). Greyish-tomentose or -sericeous. Stems ascending, simple or branched at base. Leaves obovate, pinnatipartite to pinnatisect with linear-lanceolate to lanceolate segments, or 2-pinnatisect with linear segments. Peduncles up to 20 cm. Capitula (including ligules) 2·5–5·5 cm in diameter. $2n=18$. *Rocks and stony slopes in the mountains.* ● *N. & N.W. Spain, N. & C. Portugal.* Hs Lu.

Extremely variable in the form and dissection of the leaves and in the diameter of capitula.

2. P. hoffmannseggii (Samp.) Laínz, *Bol. Inst. Estud. Astur. (Supl. Ci.)* **1**: 34 (1960) (*P. sericeum* Henriq.). Silvery-sericeous. Stems ascending, branched. Leaves narrowly cuneate, entire at base, spathulate, with 4–5 pairs of straight teeth towards the apex. Peduncles up to 15 cm. Capitula (including ligules) 2·5–3 cm in diameter. $2n=18$. *Rocks and stony slopes in the mountains.* ● *N.W. Spain, N. Portugal.* Hs Lu.

73. **Otospermum** Willk.[1]

Annuals. Leaves 2–3 times 3-partite, alternate. Capitula subcorymbose. Involucral bracts in 3 rows, with dark margins. Receptacle subconical in fruit, without scales. Ligulate florets female, white; tubular florets hermaphrodite, the tube compressed, slightly winged. Achenes of ligulate florets connate with the inner involucral bracts; ribs 5–6 (1 anterior, 2 lateral and 2–3 posterior), prominent, rugose, separated by deep furrows. Achenes of tubular florets with 5 shallow ribs. Epicarp mucilaginous, without secretory canals. Pappus a membranous auricle.

1. O. glabrum (Lag.) Willk., *Bot. Zeit.* **22**: 251 (1864). Glabrous, bright green. Stems 10–40 cm, erect or ascending. Leaf-lobes linear, subulate, mucronate. Capitula *c.* 2·5 cm in diameter. [illegible] $2n=18$. *S.W. Spain, C. & S. Portugal.* Hs Lu.

74. **Leucanthemopsis** (Giroux) Heywood[1]

Dwarf, caespitose, subscapose perennials. Leaves pinnatilobed to pinnatisect, eglandular. Capitula solitary. Receptacle convex. Ligulate florets female; ligules yellow, or white, sometimes yellowish at base or becoming pink. Inner florets hermaphrodite; corolla tubular-campanulate. Achenes all similar, 3- to 10-ribbed, the ribs not prominent, the surface with one or several rows of mucilaginous cells on and around each rib; vallecular secretory canals absent.

Literature: V. H. Heywood, *Anal. Inst. Bot. Cavanilles* **12(2)**: 313–374 (1954); **32(2)**: 175-187 (1975).

1 Ligules white
2 Leaves oblong-linear, pinnatifid with 7–15 lobes; ligules yellowish towards the base **5. pulverulenta**
2 Leaves ovate, linear-spathulate or spathulate with 5–7 apical or lateral lobes or crenations; ligules not yellowish towards the base
3 Leaves linear-spathulate, with 3–7 forwardly directed lanceolate lobes **2. pallida**
3 Leaves ovate to spathulate, with 5 crenations at the apex or pinnatifid to palmatifid with 5–7 lobes **1. alpina**
1 Ligules yellow
4 Leaves linear-spathulate, 2- to 7-fid at the apex or with numerous forwardly directed shallow incisions, or cuneate to orbicular-spathulate, incise-dentate **2. pallida**
4 Leaves oblong to oblong-linear, pinnatifid to pinnatipartite, with 5–15 lobes
5 Densely caespitose, ±procumbent; leaf-lobes 5–9, oblong-linear, approximate; outer involucral bracts subglabrous, ciliate **4. radicans**
5 Laxly caespitose, ascending; leaf-lobes (5–)7–15, lanceolate, distant; outer involucral bracts pubescent **3. flaveola**

1. L. alpina (L.) Heywood, *Anal. Inst. Bot. Cavanilles* **32(2)**: 182 (1975) (*Chrysanthemum alpinum* L., *Pyrethrum alpinum* (L.) Schrank, *Tanacetum alpinum* (L.) Schultz Bip.). Caespitose, more or less hairy to subglabrous. Stems 3–15 cm, ascending, usually more or less leafless. Basal leaves ovate to spathulate, crenate to pinnatifid or palmatifid, grey-tomentose to greenish-subglabrous. Capitula 2–4 cm in diameter, solitary. Ligules white, sometimes becoming pink at least after anthesis. Pappus a corona. ● *Mountains of Europe, from the Carpathians southwards to N.C. Spain, C. Appennini, and C. Jugoslavia.* Au Co Cz Ga Ge He Hs It Ju Po Rm Rs (W).

Highly variable in leaf-shape, indumentum, flower-colour and chromosome number. The following can be recognized as subspecies; other small-scale variants occur, often with a distinctive chromosome number, particularly in subsp. (a).

1 Leaves spathulate, with 5 crenations at the apex **(c) subsp. cuneata**
1 Leaves ovate, pinnatifid to palmatifid, with 5–7 lobes
2 Extremely dwarf; leaves palmatifid with the lobes very closely approximate **(b) subsp. tomentosa**
2 Caespitose; leaves pinnatifid, the lobes ± separate **(a) subsp. alpina**

(a) Subsp. **alpina**: $2n=18$, 36, 54. *Almost throughout the range of the species.*

(b) Subsp. **tomentosa** (Loisel.) Heywood, *loc. cit.* (1975) (*Chrysanthemum tomentosum* Loisel., *Leucanthemum tomentosum* (Loisel.) Gren. & Godron): $2n=18$. *Corse.*
(Loisel.) Gren. & Godron): $2n=18$. *Corse.*

(c) Subsp. **cuneata** (Pau) Heywood, *loc. cit.* (1975) (*Pyrethrum cuneatum* Pau): $2n=54$. *N.C. Spain* (*Sierra de Urbión*).

2. L. pallida (Miller) Heywood, *loc. cit.* (1975) (*Chrysanthemum pallidum* Miller, *Pyrethrum hispanicum* var. *laciniatum* Willk., *Tanacetum pallidum* (Miller) Maire; incl. *Pyrethrum leucanthemifolium* Porta & Rigo). Plant greenish to silvery-white-sericeous or whitish-tomentose. Stems 5–20 cm, several, simple, ascending, with few cauline leaves. Basal and lower cauline leaves long-petiolate, linear-spathulate to obovate-spathulate, variable in shape and dissection of lamina. Capitula 2·5–3·5 cm in diameter. Outer involucral bracts lanceolate, acute, sericeous or tomentose to subglabrous, with a dark membranous margin. Ligules yellow, or white with a yellow or purplish base. Achenes with 5–7 ribs. Pappus a short, crenulate corona. $2n=36$. *Rocks, screes and stony slopes.* ● *Mountains of C. & E. Spain.* Hs.

1 Leaves cuneate- to orbicular-spathulate, incise-dentate; involucral bracts long-pubescent; ligules yellow **(c) subsp. spathulifolia**
1 Leaves linear-spathulate; ligules yellow or white
2 Lamina with 3–7 forwardly directed lanceolate lobes; involucral bracts sericeous **(a) subsp. pallida**
2 Lamina with numerous shallow forwardly directed teeth; involucral bracts subglabrous **(b) subsp. virescens**

(a) Subsp. **pallida**: *Calcifuge. C. Spain.*

(b) Subsp. **virescens** (Pau) Heywood, *op. cit.* 183 (1975) (*Pyrethrum pallidum* var. *virescens* Pau): *Calcicole. E. & E.C. Spain.*

(c) Subsp. **spathulifolia** (Gay) Heywood, *op. cit.* 183 (1975) (*Pyrethrum spathulifolium* Gay): *Calcicole. S.E. Spain.*

Variants of subsp. (a) with yellow ligules and white ligules are sympatric, but the latter usually occur at higher altitudes than the former. Variants of subsp. (b) with yellow ligules and white ligules also occur, the former in most of the range of the species, the latter only in the southern part.

3. L. flaveola (Hoffmanns. & Link) Heywood, *op. cit.* 184 (1975) (*Pyrethrum flaveolum* Hoffmanns. & Link, *Tanacetum flaveolum* (Hoffmanns. & Link) Rothm.). Plant laxly caespitose, greyish- to greenish-sericeous or pubescent. Stems 10–20 cm, ascending, leafy below. Basal and lower cauline leaves pinnatifid to pinnatilobed with (5–)7–14 distant, lanceolate, mucronate lobes. Capitula 2–3 cm in diameter. Outer involucral bracts ovate, acute, pubescent, with a narrow brown scarious margin. Ligules yellow. Achenes with 5 ribs. Pappus a corona. $2n=36$. ● *N.W. Spain, Portugal.* Hs Lu.

4. L. radicans (Cav.) Heywood, *op. cit.* 185 (1975) (*Pyrethrum hispanicum* var. *pinnatifidum* Willk. pro parte, *P. radicans* Cav., *Tanacetum radicans* (Cav.) Schultz Bip.). Densely caespitose, procumbent, with numerous runners, greyish- to greenish-sericeous or tomentose. Stems ascending, with few cauline leaves at the base. Basal and lower cauline leaves pinnatipartite with 5–9 approximate, oblong-linear, acute lobes. Capitula 1·5–2 cm in diameter. Outer involucral bracts ovate, acute, subglabrous, ciliate, with a wide reddish-brown scarious margin. Ligules yellow, becoming orange-red after anthesis. Achenes with 3–6 ribs. Pappus a corona. $2n=18$. *Schistose screes above* 2500 *m.* ● *S. Spain* (*Sierra Nevada*). Hs.

A disjunct population comprising plants more or less identical with those from Sierra Nevada and plants somewhat transitional to **2** or **5** occurs on calcareous mountains of E.C. Spain (Serranía de Cuenca).

5. L. pulverulenta (Lag.) Heywood, *op. cit.* 184 (1975) (*Pyrethrum* [illegible] *hispanicum* var. *pinnatifidum* Willk. pro parte, *P. pulverulentum* Lag., *Tanacetum pulverulentum* (Lag.) Schultz Bip.). Greyish- to whitish-tomentose. Stems 10–20 cm, numerous, crowded, erect or ascending. Basal and lower cauline leaves oblong-linear, pinnatifid with 7–15 approximate, linear, mucronate lobes. Outer involucral bracts ovate, acute, tomentose, with a narrow, dark membranous margin. Capitula 1·5–2·5 cm in diameter. Ligules white, yellowish towards the base. Achenes with 7–10 ribs. Pappus a corona. ● *Spain and Portugal.* Hs Lu.

(a) Subsp. **pulverulenta**: Plant short-lived, laxly caespitose. Leaf-lamina oblong in outline. Ligules yellow at the base or to half-way. *N. & C. Spain, Portugal.*

(b) Subsp. **pseudopulverulenta** (Heywood) Heywood, *op. cit.* 185 (1975) (*Tanacetum pulverulentum* subsp. *pseudopulverulentum* Heywood): Plant long-lived, densely caespitose. Leaf-lamina orbicular in outline. Ligules yellow at the very base. *E. & S.E. Spain.*

75. **Prolongoa** Boiss.[1]

Annuals. Leaves alternate. Capitula solitary. Involucral bracts in 2–3 rows, the margin widely scarious. Receptacle convex, without scales. Ligulate florets sterile; inner florets hermaphrodite, actinomorphic, tubular-conical; tube slightly compressed at base, but not winged. Achenes all similar, trigonous, incurved, the outer with 2 lateral and 1 adaxial ribs, and 2 thick abaxial ribs; epicarp mucilaginous; vallecular secretory canals absent.

1. P. pectinata (L.) Boiss., *Voy. Bot. Midi Esp.* **2**: 320 (1840). Stems 10–25(–30) cm, usually hairy. Leaves pectinate-pinnatifid, the lobes acute to acuminate, appressed-hairy. Capitula 2–2·5 cm in diameter. Ligules 5–6·5 mm, yellow. Pappus an auricle 1·5–2 mm at anthesis. Achene 2–2·5 mm. *Sandy places and cultivated fields.* ● *C. & S. Spain.* Hs.

76. **Lepidophorum** Cass.[1]

Annuals or biennials. Leaves simple, alternate. Capitula solitary. Involucral bracts in 2–3 rows. Receptacle plano-convex; scales present. Ligulate florets female; inner florets hermaphrodite, tubular, actinomorphic; corolla-tube compressed at base and slightly winged. Achenes of ligulate florets oblong, 3- to 4-angled, inviable; pappus of 4 free, triangular, acute to acuminate scales. Achenes of tubular florets oblong, 5-angled, without ribs; angles covered with longitudinal rows of mucilage-secreting cells; vallecular secretory canals absent; pappus absent.

1. L. repandum (L.) DC., *Prodr.* **6**: 19 (1838). Stems 20–50 cm, simple or branched above, glabrous. Basal leaves 2–6 × 1–2 cm, spathulate to oblong-spathulate, obtuse, serrate, long-petiolate; middle and upper cauline leaves sessile. Capitula 20–40 mm in diameter. Ligules 6–12 mm, yellow. $2n=18$. ● *Portugal, S.W. & N.W. Spain.* Hs Lu.

77. **Daveaua** Willk. ex Mariz[1]

Annuals. Leaves alternate. Capitula solitary. Involucral bracts in 2–3 rows, with a wide, brownish-scarious margin. Receptacle conical, without scales. Ligulate florets female, white; inner florets hermaphrodite, the tube greatly dilated at the base. Achenes of ligulate florets compressed, broadly 2-winged, smooth [illegible] dorsally, 3-ribbed ventrally; epicarpic mucilaginous cells sometimes present on the ribs; pappus tubular-auriculiform, longer than the achene. Achenes of tubular florets subcylindrical, without wings or distinct ribs; 3 resin-canals and epicarpic mucilaginous cells present; pappus rudimentary.

1. D. anthemoides Mariz, *Bol. Soc. Brot.* **9**: 220 (1891) (*Matricaria anthemoides* (Mariz) Coutinho). Glabrous. Stems 10–40 cm, erect, simple or branched. Leaves pinnatisect, the segments linear, filiform. Capitula 2·5–3·5 cm in diameter. *Waste places and cultivated ground. S. Portugal.* Lu. (*N.W. Africa.*)

[1] By V. H. Heywood.

[1] By V. H. Heywood.

78. Glossopappus G. Kunze[1]

Annuals. Leaves simple, alternate. Capitula solitary. Involucral bracts in 2–3 rows, with a dark brown margin, the inner with a wide scarious wing and appendage. Receptacle conical, without scales. Ligulate florets female, fertile or sterile. Inner florets hermaphrodite, tubular-campanulate, slightly zygomorphic; corolla-tube strongly compressed at base and slightly winged. Achenes all similar, cylindrical, with 8–10 more or less projecting white ribs and basal callus. Epicarpic mucilaginous cells on some ribs and vallecular secretory canals present. Pappus an auricle longer than the achene.

1. G. macrotus (Durieu) Briq. in Burnat, *Fl. Alp. Marit.* **6**: 77 (1916) (*G. chrysanthemoides* G. Kunze). Glabrous. Stems 10–40 cm. Basal leaves 2–4 cm, obovate, obtuse, remotely toothed, petiolate; middle cauline leaves sparse, spathulate-oblong, subentire to dentate, sessile. Capitula solitary, 2·5–3 cm in diameter. Ligules 7–8 mm, yellow or sometimes whitish outside. Achenes 2–2·5 mm; pappus 4·5–6 mm. *Dry, stony places. S.W. Spain, S. Portugal.* Hs Lu.

Represented in Europe by subsp. **chrysanthemoides** (G. Kunze) Maire in Jahandiez & Maire, *Cat. Pl. Maroc* **3**: 778 (1934), which differs from subsp. *macrotus* from N. Africa by the zygomorphic corollas of the tubular florets, with 2 teeth markedly longer than the others.

79. Hymenostemma (G. Kunze) Willk.[1]

Annuals. Leaves pinnately toothed or divided, alternate. Capitula solitary. Involucral bracts in 2–3 rows, unequal, the inner with a wide scarious margin. Receptacle conical, without scales. Ligulate florets female, usually sterile, white; inner florets hermaphrodite, tubular-campanulate; corolla-tube compressed, 2-winged; lobes unequal. Achenes all similar, oblong-ovoid, somewhat curved, with 5–6 whitish ribs and longitudinal rows of mucilage-cells parallel to the ribs. Pappus cupuliform, *c.* ½ as long as achene.

1. H. pseudanthemis (G. Kunze) Willk., *Bot. Zeit.* **22**: 253 (1864). Slender, pubescent. Stems (5–)10–20 cm, simple or branched. Leaves 5–20 × 2–3 mm, pectinate-pinnatifid, the segments oblong, obtuse, mucronate; petiole long. Capitula 10–20 mm in diameter. Ligules white, yellowish at base; tubular florets yellow. *Dry, shady places.* ● *S.W. Spain (Prov. Cádiz).* Hs.

80. Coleostephus Cass.[1]

Annuals. Leaves simple, alternate. Capitula solitary or 2–5 on branches. Involucral bracts in 2–3 rows, brownish with a narrow, scarious apical border. Receptacle plano-convex, without scales. Ligulate florets female, fertile or sterile. Inner florets hermaphrodite, tubular-campanulate, actinomorphic; corolla-tube strongly compressed at base and slightly winged. Achenes all strongly compressed at base and slightly winged. Achenes all similar, cylindrical, with 8–10 more or less projecting white ribs and a basal callus. Epicarpic mucilaginous cells on some ribs and vallecular secretory canals present. Pappus prominent, oblique, sheathing or a corona, as long as or shorter than achene, sometimes absent.

Leaves ± regularly toothed; corolla-teeth of tubular florets subacute; pappus an auricle subequalling achene, sheathing **1. myconis**
Leaves irregularly toothed; corolla-teeth of tubular florets truncate; pappus a corona or absent **2. clausonis**

[1] By V. H. Heywood.

1. C. myconis (L.) Reichenb. fil., *Icon. Fl. Germ.* **16**: 49 (1853) (*Chrysanthemum myconis* L., *Myconia myconis* (L.) Briq.). Stems 10–45 cm, sparingly branched, suberect, glabrous or slightly hairy. Basal leaves 2–5 cm, obovate to obovate-spathulate, broadly obtuse, more or less regularly toothed, petiolate; middle cauline leaves ovate-oblong, subamplexicaul. Capitula 2 cm in diameter. Ligules 6–15 mm, yellow, whitish or discolorous. Corolla-teeth of tubular florets subacute. Achenes of ligulate florets 3 mm, compressed, sterile, with an elongate, membranous, tubular pappus enveloping the corolla-tube. Achenes of tubular florets *c.* 2 mm, cylindrical, with an auricle 1·2–1·8 mm enveloping the lower half of the corolla-tube. $2n=18$. *Cultivated ground and waste places. S. Europe.* Az Co Cr Ga Gr Hs It Ju Lu Sa Si.

2. C. clausonis Pomel, *Nouv. Mat. Fl. Atl.* 59 (1874) (*C. hybridus* Lange, non *Chrysanthemum hybridum* Guss.). Like **1** but leaves irregularly toothed; stems procumbent; corolla-teeth of tubular florets truncate; achenes less than 2 mm; pappus a corona or absent. *W. Mediterranean region, Portugal.* Co Hs It Lu Sa Si.

81. Leucanthemum Miller[1]

Perennial, rarely annual herbs. Leaves entire to pinnately divided, alternate. Capitula solitary, rarely 2–6, terminal. Involucral bracts in 2–3 rows. Receptacle usually convex, without scales. Outer florets ligulate, female, white or pinkish, rarely tubular-campanulate and hermaphrodite or female, yellow. Inner florets hermaphrodite, tubular-campanulate. Achenes all similar, obconical-cylindrical, with usually 10 prominent ribs and epicarpic mucilaginous cells on most ribs; vallecular secretory canals present. Pappus a corona or auricle, sometimes rudimentary or absent.

Literature: S. Horvatić, *Acta Bot. Inst. Bot. Univ. Zagreb.* **3**: 1–80 (1928); *Acta Bot. Croat.* **22**: 203–218 (1963).

1 Ligules absent; all florets usually hermaphrodite
2 Apex, margin and usually median vein of outer involucral bracts reddish; lower half of corolla-tube weakly 2-winged **10. discoideum**
2 Apex, margin and median vein of outer involucral bracts concolorous; lower half of corolla-tube strongly 2-winged **1. vulgare**
1 Ligules present; outer florets female
3 Ligules 5·5–6(–8) mm, yellow at least at base
4 Perennial; ligules yellow throughout **10. discoideum**
4 Annual; ligules pale yellow or whitish with a yellowish base **12. paludosum**
3 Ligules usually more than 8 mm, white or pinkish
5 Densely caespitose; leaves mostly basal; stems up to 5 cm **11. arundanum**
5 Not or laxly caespitose; cauline leaves present; stems usually more than 10 cm
6 Base of stems covered with persistent white, scarious sheathing petioles **4. burnatii**
6 Base of stems not covered with persistent petioles
7 Basal leaves ± orbicular, cordate; all leaves regularly crenate-dentate **9. rotundifolium**
7 Basal leaves obovate, spathulate to oblanceolate, cuneate; all leaves ± irregularly lobed, crenate or dentate
8 Lower cauline leaves 2-pinnatipartite; lobes linear, entire
9 Pappus of ligulate florets a usually complete corona at least ½ as long as corolla-tube **8. corsicum**
9 Pappus of ligulate florets usually an auricle, rarely up to ½ as long as corolla-tube **5. monspeliense**
8 Lower cauline leaves not 2-pinnatipartite
10 Cauline leaves linear to linear-lanceolate, entire or with a few teeth
11 Base of stem reddish; lower cauline leaves with setaceous teeth at base and reddish spots; peduncles 5–8 cm **2. graminifolium**
11 Base of stem green; lower cauline leaves without setaceous teeth at base or reddish spots; peduncles 11–14 cm **7. chloroticum**
10 Cauline leaves oblong-lanceolate to elliptical, with numerous teeth or lobes
12 Involucral bracts with a prominent, broadly ovate to spathulate, obtuse scarious apical appendage
13 Pappus of ligulate florets an auricle, equalling or longer than corolla-tube **3. gracilicaule**
13 Pappus of ligulate florets a corona, shorter than corolla-tube
14 Stems much-branched; cauline leaves obovate-spathulate, shortly auriculate, crenate or crenate-dentate in upper part **1. vulgare**
14 Stems sparingly branched; cauline leaves oblong to linear, the margins regularly dentate **6. atratum**
12 Involucral bracts without a distinct apical appendage
15 Pappus of ligulate florets an auricle, equalling or longer than corolla-tube **3. gracilicaule**
15 Pappus of ligulate florets, when present, a corona, shorter than corolla-tube
16 Leaf-segments obtuse to acute **1. vulgare**
16 Leaf-segments acuminate, mucronate or aristate **8. corsicum**

1. L. vulgare Lam., *Fl. Fr.* **2**: 137 (1779) (*Chrysanthemum leucanthemum* L.). Stems 6–100 cm, simple or branched, glabrous or hairy. Basal leaves 1·5–10(–12) cm, obovate-spathulate to oblong-obovate, long-petiolate; margins usually crenate; cauline leaves variable, oblong to oblong-lanceolate, entire, crenate, serrate or deeply lobed to pinnatifid, the lower and middle petiolate, the upper sessile; all leaves green or glaucous. Capitula (2–)2·5–4(–9) cm in diameter, solitary or 2–10. Involucral bracts ovate-oblong to lanceolate, with a usually dark scarious margin. Ligules white, rarely very short or absent. Achenes of ligulate florets with or without a pappus; those of tubular florets without a pappus; pappus, when present, a corona or auricle. *In a wide range of natural habitats and also common as a roadside and field weed. Almost throughout Europe, but only as a casual in the extreme north.* All except Az Bl Cr Sb; only as an alien in Fa Is.

An extremely variable species or species-complex which has been divided into a large number of taxa (given the rank of variety, subspecies or species) many of which are of restricted occurrence. The discovery of extensive cytological variation has led to intensive cytotaxonomic studies of the populations in various parts of Europe. Although some regional and local correlations between chromosome number and morphological variation can be detected, no overall treatment is at present possible and the recent tendency to recognize the various components of this complex as species is certainly premature and cannot be justified on practical grounds with our present knowledge. Since, however, it is desirable to draw attention to the main variants which deserve some recognition they are listed below.

Literature: C. Favarger & M. Villard, *Ber. Schweiz. Bot. Ges.* **75**: 57–79 (1965). D. Mirković, *Acta Bot. Croat.* **25**: 137–152 (1966); *op. cit.* **28**: 245–252 (1969). D. Papeš, *Acta Bot. Croat.* **31**: 81–86 (1972). A. Polatschek, *Österr. Bot. Zeitschr.* **113**: 101–147 (1966); L. Przywara & J. Schmager, *Acta Biol. Cracov. (Bot.)* **11**: 105–116 (1968). L. Przywara, *op. cit.* **13**: 133–142 (1970). M. Villard, *Bull. Soc. Neuchâtel Sci. Nat.* **91**: 119–126 (1968); *Ber. Schweiz. Bot. Ges.* **80**: 96–188 (1970).

L. praecox (Horvatić) Horvatić, *Acta Bot. Croat.* **22**: 212 (1963) (*L. ircutianum* (Turcz.) DC., *L. vulgare* subsp. *triviale* (Gaudin) Briq. & Cavillier pro parte; incl. *L. gaudinii* Dalla Torre) is an early-flowering (April–June) race or series of races which are diploid ($2n=18$) and occur throughout much of the range of the tetraploid ($2n=36$) or hexaploid ($2n=54$) *L. vulgare*, from which it is sometimes separable by its narrower leaves (at least 6 times as long as wide) and auricles with long teeth, although intermediates occur in several areas. Dwarf alpine variants also occur.

L. leucolepis (Briq. & Cavillier) Horvatić, *op. cit.* 214 (1963), from the W. & C. Mediterranean region, is diploid ($2n=18$) or tetraploid ($2n=36$), sometimes hexaploid ($2n=54$), with crenate to deeply lobed basal leaves with incised auricles, involucral bracts with pale or whitish margins, and pappus usually absent. **L. rohlenae** (Horvatić) Horvatić, *loc. cit.* (1963) probably belongs here, though the ligulate florets have a pappus.

L. adustum (Koch) Gremli, *Fl. Anal. Suisse* ed. 2, 272 (1898) (*Chrysanthemum leucanthemum* subsp. *saxicola* (Koch) Hayek, *L. montanum* DC. pro parte, *L. maximum* auct., non (Ramond) DC.; incl. *L. margaritae* (Gáyer ex Ják.) Soó), from S. Sweden to S.E. France, S. Italy and Romania, is hexaploid ($2n=54$), with crenate or entire basal leaves with 4–6 small teeth at base and capitula 3·5–6(–9) cm in diameter. It is often confused with *L. heterophyllum* (Willd.) DC. and *L. maximum* (Ramond) DC.; dwarf variants occur in the mountains of C. Europe.

L. heterophyllum (Willd.) DC., *Prodr.* **6**: 47 (1838) (*L. montanum* DC. pro parte, *L. maximum* auct., non (Ramond) DC.), from the S. Alps and C. Appennini, is octoploid ($2n=72$) or occasionally pentaploid ($2n=45$) or hexaploid ($2n=54$), and is characterized by having serrate basal leaves, numerous cauline leaves, capitula 4–5(–6) cm in diameter, and ligulate florets sometimes with a pappus.

L. cuneifolium Le Grand ex Coste, *Fl. Fr.* **2**: 341 (1903), from S.E. France (Hautes-Alpes), is an octoploid ($2n=72$) with basal and cauline leaves obovate to spathulate, sometimes long-petiolate, cuneiform, deeply and regularly toothed, capitula up to 6 cm in diameter, and well developed pappus on ligulate florets.

L. maximum (Ramond) DC., *Prodr.* **6**: 46 (1838), from the Pyrenees, is decaploid ($2n=90$) or dodecaploid ($2n=108$), with entire to dentate basal leaves and capitula (6–)7–9 cm in diameter. It is widely cultivated for ornament in gardens.

L. pallens (Gay) DC., *loc. cit.* (1838), found in the mountains of S. Europe from the S. Alps to C. Spain and Albania, is hexaploid ($2n=54$) with crenate-dentate basal leaves, petioles winged at base, and capitula 1·5–5 cm in diameter.

L. crassifolium (Lange) Willk. in Willk. & Lange, *Prodr. Fl. Hisp.* **2**: 96 (1865), from N.W. Portugal and N. Spain, just extending into S.W. France, has broadly crenate-dentate basal leaves and capitula 2–3 cm in diameter.

L. subglaucum De Laramb., *Bull. Soc. Litt. Sci. Castres* **1861**: 446 (1861) (*L. vulgare* subsp. *glaucophyllum* Briq. & Cavillier), which comprises two races, a hexaploid ($2n=54$) from the limestone plateaux of S.C. France and a decaploid ($2n=90$) from S.E. France (Alpes-Maritimes), is somewhat glaucous, with basal leaves crenate-dentate only distally, and capitula 4–7 cm in diameter. Plants with $2n=72+1B$ have been reported from N. Spain.

L. meridionale Le Grand, *Bull. Soc. Bot. Fr.* **28**: 56 (1881), from S.C. France, has pinnatifid basal leaves, and capitula 2–3 cm in diameter, and the achenes of the ligulate florets without pappus.

L. laciniatum Huter, Porta & Rigo, *Itin. Ital. III* (*Exsicc.*) no. 617 (1878), from S. Italy (Calabria), has 2-pinnatifid basal leaves,

capitula 2·5–4·5 cm in diameter and the achenes of the ligulate florets with a prominent corona.

L. delarbrei Timb.-Lagr. in Lamotte, *Prodr. Fl. Centr. Fr.* 404 (1881), from the Pyrenees, S.C. France and probably N. Italy, has pinnatifid to subpinnatifid basal leaves, capitula 1·5–2·5 cm in diameter, and the achenes of the ligulate florets without a pappus.

L. lacustre (Brot.) Samp., *Lista Esp. Herb. Port.* 132 (1913), from W.C. Portugal (Estremadura), has toothed basal leaves, capitula 4·5–6 cm in diameter and the achenes of the ligulate florets with auricles.

L. sylvaticum (Hoffmanns. & Link) Nyman, *Syll.* 11 (1854–1855), from N. & C. Portugal and N. Spain, is tetraploid ($2n=36$) or hexaploid ($2n=54$), with toothed basal leaves, capitula 3·5–5 cm in diameter, involucral bracts pale brown to colourless, and the achenes of the ligulate florets with mucronate, scarious pappus.

L. pluriflorum Pau, *Bol. Soc. Aragon Ci. Nat.* **1**: 31 (1902), from N.W. Spain, is said to have stems decumbent for 20–40 cm then ascending and much branched above. Several other variants of this complex occur in Spain but have not been adequately studied either taxonomically or cytologically.

2. L. graminifolium (L.) Lam., *Fl. Fr.* **2**: 137 (1779) (*L. montanum* (L.) DC.). Stems (10–)15–30(–40) cm, simple, somewhat woody at base, finely pubescent and often reddish below. Basal leaves obovate-spathulate or oblong-lanceolate, toothed; apex 3- to 5-toothed; petiole long, finely pubescent and reddish at the base. Cauline leaves oblong to linear, the lower ones with setaceous teeth at base, the others entire or sparsely toothed. Capitula 3–3·5 cm in diameter, solitary. Involucral bracts lanceolate to oblong-lanceolate, with a wide, membranous, dark brown margin. Achenes of ligulate florets with a well developed corona. $2n=18$. ● *S., C. & W. France.* Ga.

3. L. gracilicaule (Dufour) Alavi & Heywood, *Bot. Jour. Linn. Soc.* **71**: 274 (1976) (*Chrysanthemum gracilicaule* Dufour). Rhizomatous; stems 35–50 cm, woody at base, branched. Basal leaves cuneiform-spathulate, the apex broadly obtuse, with 3–4(–6) teeth; lower cauline leaves linear- to obovate-spathulate, incise-dentate, sessile. Capitula 3–4·5 cm in diameter, solitary. Involucral bracts ovate-oblong to oblong, with a wide, pale brown scarious margin, often with a distinct, scarious, apical appendage. Achenes of ligulate florets with an auricle at least as long as the corolla-tube. ● *E. Spain.* Hs.

4. L. burnatii Briq. & Cavillier in Burnat, *Fl. Alpes Marit.* **6**: 108 (1916). Stems erect or ascending. Basal leaves linear-oblong, cuneiform, entire, the apex sometimes 2- to 3-toothed; cauline leaves linear to filiform, entire or remotely toothed; petiole-base sheathing, whitish, scarious, persistent. Capitula 2–4 cm in diameter, solitary. Involucral bracts oblong-ovate, obtuse, with a scarious, fimbriate, dark brown or blackish margin. Achenes of ligulate florets with a fimbriate auricle. $2n=18$. *Calcicole. Rocks and slopes*, 900–1650 *m.* ● *S.E. France* (*Alpes-Maritimes and adjacent mountains*). Ga.

5. L. monspeliense (L.) Coste, *Fl. Fr.* **2**: 342 (1903). Stems 30–60 cm, simple or branched. Basal and lower cauline leaves ovate, 2-pinnatipartite; middle and upper cauline leaves pinnatipartite, sessile. Capitula 2–4 cm in diameter, solitary. Involucral bracts lanceolate, acute, with a blackish, membranous margin. Achenes of ligulate florets usually with an auricle, rarely ½ as long as the corolla-tube. $2n=36$. ● *S. & S.C. France; N.E. Spain.* Ga Hs.

6. L. atratum (Jacq.) DC., *Prodr.* **6**: 48 (1838) (*Chrysanthemum atratum* Jacq.). Stems 10–50 cm, simple or branched, glabrous or hairy. Basal leaves spathulate, long-petiolate, crenate to lobed or with 3–5 apical teeth; cauline leaves oblong to linear, deeply toothed to pinnatifid. Capitula 2–5 cm in diameter, solitary. Involucral bracts lanceolate to oblong, the outer with a wide scarious apical appendage; ligules white. Achenes usually all with a pappus. ● *Alps, Appennini, mountains of N.W. & C. Jugoslavia.* Au Ga Ge He It Ju.

A complex species showing, like *L. vulgare*, a great deal of cytological variation but divisible into a number of fairly well characterized subspecies.

1 Outer involucral bracts pale green, with a blackish-brown to nearly hyaline margin 0·1–0·2 mm wide **(f)** subsp. **platylepis**
1 Outer involucral bracts dark green, with a dark brown or black margin more than 0·2 mm wide
2 Involucral bracts with a dark marginal band and a ± hyaline, scarious border; middle cauline leaves deeply 3-lobed at apex, otherwise entire **(e)** subsp. **tridactylites**
2 Involucral bracts with dark brown or black margin, without a hyaline border; middle cauline leaves pinnatifid, toothed or lobed
3 Stem 5–20 cm; capitula 3 cm in diameter
4 Stem leafy for ⅘ of its length; basal and lower cauline leaves shortly petiolate **(b)** subsp. **halleri**
4 Stem leafy for ⅔–¾ of its length; basal and lower cauline leaves long-petiolate **(g)** subsp. **lithopolitanicum**
3 Stem (15–)20–35(–50) cm; capitula 4 cm in diameter
5 Middle cauline leaves pinnatifid or 2-pinnatifid with linear segments; achenes of tubular florets with rudimentary pappus **(d)** subsp. **ceratophylloides**
5 Middle cauline leaves incised, toothed or lobed; achenes of tubular florets with well-developed pappus
6 Stem leafy for ⅔–⅘ of its length; basal leaves shallowly lobed at apex; cauline leaves sessile, with ± incurved teeth **(a)** subsp. **atratum**
6 Stem leafy for ⅓–½ of its length; basal leaves deeply lobed at apex; cauline leaves petiolate, with ± out-curved teeth **(c)** subsp. **coronopifolium**

(a) Subsp. **atratum**: Stems 10–20 cm. Basal leaves oblong-cuneate or -spathulate, with (3–)5–7 lobes or teeth at apex; middle cauline leaves oblong-lanceolate, incise-dentate, the teeth incurved. $2n=54$. *N.E. Alps.*

(b) Subsp. **halleri** (Suter) Heywood, *Bot. Jour. Linn. Soc.* **71**: 272 (1976) (*Chrysanthemum halleri* Suter): Stems 10–20 cm. Basal leaves like **(a)** but middle cauline dentate with 10–16 teeth. $2n=18$. *C. & E. Alps.*

(c) Subsp. **coronopifolium** (Vill.) Horvatić, *Acta Bot. Inst. Univ. Zagreb.* **10**: 65 (1935) (*L. coronopifolium* (Vill.) Gren. & Godron, *Chrysanthemum coronopifolium* Vill.): Stems 20–30(–50) cm. Basal leaves spathulate-cuneate, incise-dentate. $2n=54$. *S.W. Alps.*

(d) Subsp. **ceratophylloides** (All.) Horvatić, *op. cit.* 66 (1935) (*L. ceratophylloides* (All.) Nyman, *Chrysanthemum ceratophylloides* All.): Stems (15–)20–30(–50) cm. Basal leaves spathulate-cuneate; middle cauline leaves pinnatifid to 2-pinnatifid. $2n=54$. *S.W. Alps, N. & C. Appennini, Alpi Apuane.*

(e) Subsp. **tridactylites** (A. Kerner & Huter ex Rigo) Heywood, *Bot. Jour. Linn. Soc.* **71**: 272 (1976) (*L. tridactylites* A. Kerner & Huter ex Rigo): Stems up to 30 cm. Basal leaves obovate-spathulate, obtuse or truncate, 3- to 5-lobed at apex; cauline leaves narrowly obovate-oblong, deeply 3-fid at apex. *C. & S. Appennini.*

(f) Subsp. **platylepis** (Borbás) Heywood, *loc. cit.* (1975) (*L. platylepis* Borbás, *L. ceratophylloides* subsp. *platylepis* (Borbás) Hayek; incl. *L. liburnicum* (Horvatić) Horvatić, *L. croaticum* (Horvatić) Horvatić): Stems 10–50 cm. Basal leaves oblong to obovate-cuneate, truncate or rounded at apex, incise-crenate, serrate or pinnatilobed; cauline leaves oblong-lanceolate, incise-dentate to pinnatilobed. $2n=27$, 36, 45, 54, 108. *W. & C. Jugoslavia.*

(g) Subsp. **lithopolitanicum** (E. Mayer) Horvatić, *Acta Bot. Croat.* **22**: 208 (1963) (*Chrysanthemum atratum* subsp. *lithopolitanicum* E. Mayer): Basal leaves linear-cuneate with 3(–5) teeth at apex. Cauline leaves narrowly lanceolate to linear, remotely toothed. $2n=18$, 72. *S.E. Alps* (*N. of Ljubljana*).

7. L. chloroticum A. Kerner & Murb., *Lunds Univ. Årsskr.* **27**: 109 (1891) (*L. graminifolium* auct. balcan., non (L.) Lam.). Stems 20–35 cm, simple or with 2–3 branches. Basal leaves narrowly cuneate, long-petiolate, with 3–7 teeth at apex; lower cauline leaves entire below; middle cauline leaves 1–3 mm wide, shortly petiolate or sessile, remotely toothed, the teeth acute, erect. Capitula 3–5 cm in diameter; involucral bracts usually pale green, with a pale, scarious margin. *Grassland and pastures up to* 1800 *m.* ● *W. & C. Jugoslavia.* Ju.

8. L. corsicum (Less.) DC., *Prodr.* **6**: 47 (1838). Stems 20–60 cm, usually simple, somewhat pubescent. Basal and lower cauline leaves lobed to pinnatipartite; middle cauline leaves pinnatilobed to 2-pinnatisect, with ovate to linear, mucronate to aristate segments. Capitula 2–3 cm in diameter; involucral bracts with a brownish-black margin. Pappus of ligulate florets a corona at least ½ as long as the corolla-tube. $2n=36$. *Rocks and rocky slopes.* ● *Corse.* Co.

Extremely variable in leaf-shape. J. Gamisans (*Candollea* **27**: 189–209 (1972)) recognizes two subspecies based on different degrees of leaf-dissection, but intermediates occur and varietal status seems preferable.

9. L. waldsteinii (Schultz Bip.) Pouzar, *Preslia* **47**: 158 (1975) (*L. rotundifolium* (Waldst. & Kit. ex Willd.) DC., non Opiz). Stems 20–70 cm, very leafy, simple or sparingly branched. Basal and lower cauline leaves suborbicular to broadly ovate, uniformly crenate-dentate, cordate, petiolate; middle cauline leaves cuneiform to ovate-oblong, shortly petiolate, uniformly crenate-dentate. Capitula 4–6 cm in diameter, solitary or 2–5 in a lax corymb; involucral bracts with a dark margin. $2n=18$. *Carpathians*; *one locality in C. Jugoslavia.* Cz Ju Po Rm Rs (W).

10. L. discoideum (All.) Coste, *Fl. Fr.* **2**: 340 (1903). Rhizomatous; stems 40–60 cm, woody at base, simple or branched. Basal leaves obovate-oblong, cuneiform, incise-dentate at apex, the teeth rounded; middle leaves oblong-lanceolate to linear, serrate-dentate (including the petiole-base); teeth remote, acute. Capitula 2–2·5 cm in diameter, solitary or 2–4, usually without ligules; ligules up to 8 mm, yellow, when present. $2n=18$. ● *S.E. France, N.W. Italy.* Ga It.

11. L. arundanum (Boiss.) Cuatrec., *Cavanillesia* **1**: 40 (1928) (*Pyrethrum arundanum* Boiss.). Densely caespitose, villous to subglabrous; stems up to 5 cm, ascending. Leaves all in a basal rosette, 2- to 3-pinnatifid, with linear-lanceolate, usually acute lobes. Capitula 2–2·5 cm in diameter, solitary. Ligules whitish-pink, becoming darker after anthesis. Achenes with 5 or 6 prolonged, winged ribs as wide as the body of the fruit. Pappus a membranous corona. *Calcareous mountains of S. & S.E. Spain.* Hs.

An unusual species related to species from N. Africa.

12. L. paludosum (Poiret) Bonnet & Barratte, *Cat. Rais. Pl. Vasc. Tunisie* 221 (1896) (*Chrysanthemum paludosum* Poiret, *Hymenostemma fontanesii* Willk.). Glabrous annual. Stems 5–15(–20) cm, branched. Basal leaves obovate-spathulate; lower cauline leaves oblong-cuneate, petiolate, the petiole-base auriculate; middle and upper cauline leaves oblong to lanceolate; all leaves incise-dentate to pinnatifid. Capitula 2–3 cm in diameter; ligules pale yellow or whitish with a yellowish base; tubular florets zygomorphic, 2- to 3-lobed. Achenes with 7–10 slender ribs, those of ligulate florets with a corona. *S. & S.E. Spain*; *S. Portugal*; *Islas Baleares.* Bl Hs Lu.

Anomalous in the genus in Europe by its habit and flower-colour, showing affinities with a group of species from N. Africa.

82. Plagius L'Hér. ex DC.[1]

Somewhat woody perennials. Leaves simple, alternate. Capitula in terminal corymbs of 4–10. Involucral bracts in 2–3 rows, keeled on the back. Receptacle convex. All florets hermaphrodite, tubular, obconical, yellow; corolla-tube unwinged. Achenes all similar, obconical, ribbed, with a thick basal callus and a distinct epigynous disc; epicarpic mucilaginous cells and vallecular secretory canals present. Pappus an auricle, more developed on the adaxial side.

1. P. flosculosus (L.) Alavi & Heywood, *Bot. Jour. Linn. Soc.* **71**: 273 (1976) (*Chrysanthemum flosculosum* L.). Stems 40–100 cm, much-branched, glabrous. Leaves ovate-oblong to obovate, regularly toothed, auriculate at the base. Capitula 1–2 cm in diameter, shortly pedunculate. Achenes *c.* 2 mm; ribs narrow, white, prominent. $2n=18$. *Meadows and pastures.* ● *Corse, Sardegna.* Co Sa.

83. Cotula L.[2]

Annual or perennial herbs. Leaves entire or pinnatisect, alternate. Capitula terminal and axillary, pedunculate. Involucral bracts in 2 rows. Receptacle flat; scales absent. Florets pedicellate, the pedicels persistent after the achenes have fallen. Outer florets female; corolla small or absent. Inner florets hermaphrodite or functionally male; corolla tubular, compressed, 4-dentate. Achenes of female florets compressed, those of hermaphrodite florets plano-convex; pappus absent.

Glabrous; leaves entire or with few teeth or lobes **1. coronopifolia**
Villous; leaves usually 2-pinnatifid **2. australis**

1. C. coronopifolia L., *Sp. Pl.* 892 (1753). Glabrous annual up to 30 cm. Leaves linear, entire, or with few, remote teeth or lobes, sessile and sheathing at base. Capitula 5–10 mm in diameter; involucral bracts *c.* 2 mm, ovate, rounded, purplish with a scarious margin. Outer florets without corolla, long-pedicellate; inner florets with yellow corolla, shortly pedicellate. Outer achenes 1·5 mm, strongly compressed and winged; inner achenes 1·75 mm, unwinged. $2n=20$. *Damp, often saline places. Naturalized in W. Europe.* [Br Da Ga Ge Hb Hs Lu No Sa.] (*South Africa.*)

2. C. australis (Sieber ex Sprengel) Hooker fil., *Bot. Antarct. Voy.* **2(1)**: 128 (1852). Like **1** but villous; leaves usually 2-pinnatifid; capitula 4–5 mm in diameter. *Naturalized in Portugal* (*near Porto*). [Lu.] (*Australia, New Zealand.*)

[1] By V. H. Heywood. [2] By T. G. Tutin.

C. anthemoides L., *Sp. Pl.* 891 (1753), native of Africa and S.W. Asia, has been recorded from Albania, but probably only as a casual.

84. **Chlamydophora** Ehrenb. ex Less.[1]

Like *Cotula* but florets all hermaphrodite, with 4- to 5-lobed tubular corolla; receptacle convex; achenes all similar; pappus an obliquely truncate or unilateral membranous corona.

1. C. tridentata (Delile) Ehrenb. ex Less., *Syn. Gen. Comp.* 266 (1832). Glabrous annual up to 15 cm. Leaves linear to oblong, entire or toothed, often 3-dentate near the apex. Capitula 5–8 mm in diameter; involucre hemispherical; bracts *c.* 2 mm, oblong, rounded at apex, broadly scarious. Achenes *c.* 1 mm, fusiform, costate, shortly pedicellate; corona about as long as the achene, obliquely truncate and lobed. *Gavdhos.* Cr. (*N. Africa.*)

85. **Nananthea** DC.[1]

Like *Cotula* but outer florets usually ligulate; involucral bracts 3–9, in 1 row; achenes all similar.

1. N. perpusilla (Loisel.) DC., *Prodr.* **6**: 45 (1838). Slender, glabrous annual 3–6 cm. Leaves rather succulent, with 3–5 ovate, obtuse lobes, the lowest simple; petiole about twice as long as lamina. Capitula 2–5 mm in diameter; involucral bracts 0·75–1 mm, obovate, broadly scarious. Ligules *c.* 0·5 mm, white; tubular florets yellow. Achenes *c.* 0·5 mm, pyriform, somewhat compressed, finely striate. $2n=18$. *Maritime rocks and sands.* ● *N.W. coast of Sardegna, S.E. coast of Corse and islets adjacent to Sardegna and Corse.* Co Sa.

86. **Soliva** Ruiz & Pavón[1]

Herbs. Leaves pinnatisect, alternate. Capitula sessile, surrounded by leaves. Involucral bracts in 2 subequal rows. Receptacle flat, without scales. Outer florets female; corolla absent. Inner florets usually functionally male; corolla tubular, 4-, rarely 2- or 3-dentate. Achenes glabrous, compressed, with a smooth, thin wing; style persistent; pappus absent.

Literature: A. L. Cabrera, *Notas Mus. La Plata* (*Bot.*) **14**: 123–139 (1949).

1. S. pterosperma (Juss.) Less., *Syn. Gen. Comp.* 268 (1832) (*S. sessilis* auct., non Ruiz & Pavón). More or less villous annual, with procumbent stems up to 20 cm. Leaves 2-pinnatisect; segments 3–5; lobes linear-lanceolate, acute; petioles flattened, enlarged and scarious at base. Capitula 5–8 mm in diameter. Achenes 3–3·5 mm, with a wide wing, deeply lobed near the base; persistent styles erect, long-exserted from the capitulum in fruit. $2n=$ c. 110. *Roadsides, pinewoods and damp places. Naturalized in Portugal and N.W. Spain.* [Hs Lu.] (*South America.*)

S. sessilis Ruiz & Pavón, *Fl. Peruv. Chil. Prodr.* 113 (1794), has been recorded from Portugal, probably in error. The two species have been confused by many authors, but can be readily distinguished by the entire (not deeply lobed) wings of the achenes in *S. sessilis.*

87. **Gymnostyles** Juss.[1]

Like *Soliva* but achenes villous, with a transversely sulcate, thick wing.

1. G. stolonifera (Brot.) Tutin, *Bot. Jour. Linn. Soc.* **70**:18 (1975) (*G. nasturtiifolia* Juss. pro parte). More or less villous annual, with procumbent stems 2–5 cm, rooting at the nodes. Leaves 1-pinnatisect, with 5–9 oblong or lanceolate, entire or toothed, obtuse lobes; petioles flattened, enlarged and scarious at base, longer than the lamina. Capitula 5–8 mm in diameter. Achenes *c.* 2 × 2 mm, villous, with a wing the two upper angles of which extend beyond the achene; persistent styles about as long as the achene, recurved. *Roadsides and damp places. Naturalized in S.W. Europe.* [Az Bl Hs Lu.] (*South America.*)

[1] By T. G. Tutin.

88. **Artemisia** L.[2]

Herbs or small shrubs, frequently aromatic. Leaves alternate. Capitula small, usually pendent, in racemose, paniculate or capitate inflorescences, rarely solitary. Involucral bracts in few rows. Receptacle flat to hemispherical, without scales, sometimes hirsute. Florets all tubular. Achenes obovoid, subterete or compressed, smooth, finely striate or 2-ribbed; pappus absent or sometimes a small scarious ring.

Literature: T. G. Leonova, *Nov. Syst. Pl. Vasc.* (*Leningrad*) **7**: 280–294 (1971). K. Persson, *Op. Bot.* (*Lund*) **35**: 1–188 (1974).

1 Most leaves on the flowering stems undivided
2 Leaves glabrous, except for the lowest **49. dracunculus**
2 Leaves ±hairy
3 Leaves thinly lanate, often glabrescent **10. caerulescens**
3 Leaves densely stellate-tomentose **50. glauca**
1 Most leaves on the flowering stems divided
4 Annual or biennial
5 Cauline leaves with rather dense, appressed hairs **5. siversiana**
5 Cauline leaves glabrous
6 Cauline leaves with filiform lobes **57. scoparia**
6 Cauline leaves with linear-lanceolate lobes **48. annua**
4 Perennial
7 All florets hermaphrodite and fertile
8 Leaves rarely more than 10 mm, mostly in axillary fascicles on the flowering stems
9 Leaves *c.* 5 mm, usually 1-pinnatisect, all but the lowest sessile **45. herba-alba**
9 Leaves *c.* 10 mm, 2-pinnatisect, all but the upper long-petiolate **44. barrelieri**
8 Most leaves more than 10 mm, not in axillary fascicles on the flowering stems
10 Lower cauline leaves 1(–2)-pinnatisect
11 Panicle-branches 1–2(–3) cm, erect to erecto-patent **18. lessingiana**
11 At least some panicle-branches more than 3 cm, erecto-patent, sometimes distally pendent **(9–15). maritima** group
10 Lower cauline leaves 2- to 4-pinnatisect
12 Panicle wide, with erecto-patent to patent branches **(9–15). maritima** group
12 Panicle narrow, with erect branches
13 Not or slightly caespitose; flowering stems not very slender; involucre usually more than 2·5 mm **(9–15). maritima** group
13 Caespitose, with numerous, very slender flowering stems; involucre 2–2·5 mm
14 Glabrescent; leaf-lobes linear to somewhat spathulate; involucre subglabrous to glabrous, shiny **16. pauciflora**
14 Grey-tomentose; leaf-lobes linear to filiform; involucre grey- to white-tomentose with distinct glandular dots **17. gracilescens**
7 Outer florets female, with filiform perianth
15 Inner florets functionally male
16 Outer involucral bracts hairy
17 Stems and leaves persistently sericeous; outer involucral bracts sparsely hairy **56. campestris**
17 Stems and leaves glabrescent; outer involucral bracts densely hairy **51. trautvetterana**
16 Outer involucral bracts glabrous
18 Involucre not more than 3(–3·5) mm
19 Panicle narrow; branches erect **54. commutata**
19 Panicle wide; branches erecto-patent
20 Outermost involucral bracts with wide scarious margins **56. campestris**
20 Outermost involucral bracts almost entirely herbaceous **53. tschernieviana**
18 Involucre at least 4 mm
21 Leaves almost all basal **55. bargusinensis**
21 Leaves almost all cauline
22 Middle cauline leaves pinnatisect **56. campestris**
22 Middle cauline leaves palmately 3-fid **52. salsoloides**
15 Inner florets hermaphrodite and fertile
23 Receptacle hairy
24 Inflorescence paniculate; stems usually at least 30 cm
25 Leaf-lobes mostly 0·5 mm wide
26 Inner involucral bracts with wide glabrous margins **8. alba**
26 Inner involucral bracts hairy all over **41. frigida**
25 Leaf-lobes mostly at least 1 mm wide
27 Corolla-lobes hairy **42. sericea**
27 Corolla-lobes glabrous
28 Involucre 2–3 mm; capitula *c.* 3 mm across **4. absinthium**
28 Involucre 3·5–4 mm; capitula 6–7 mm across **6. arborescens**
24 Inflorescence racemose or capitate, sometimes with a few short branches; stems usually less than 30 cm
29 Involucral bracts not hairy all over
30 Involucral bracts hairy, but with a glabrous scarious margin **8. alba**
30 Involucral bracts nearly or quite glabrous
31 Involucral bracts strongly ciliate **47. rupestris**
31 Involucral bracts glabrous **32. chamaemelifolia**
29 Involucral bracts hairy all over
32 Corolla glabrous
33 Cauline leaves sessile or subsessile **41. frigida**
33 Cauline leaves long-petiolate **38. glacialis**
32 Corolla hairy at least in the upper part
34 Capitula erect, with *c.* 15 florets; corolla-lobes sparsely hairy **34. umbelliformis**
34 Capitula nodding (at least when mature), with more than 20 florets; corolla-lobes densely hairy
35 Plant silvery-sericeous; involucral bracts with closely appressed hairs and dark margin; receptacle shortly hairy **35. nitida**
35 Plant whitish villous-lanate; involucral bracts villous-lanate with pale margin; receptacle with long hairs **40. pedemontana**
23 Receptacle glabrous
36 Leaves *c.* 5 mm, mostly in axillary fascicles on the flowering stems **43. reptans**
36 Leaves usually 10 mm or more, not in axillary fascicles on the flowering stems
37 Terminal lobe of cauline leaves at least 2 mm wide at the base
38 Capitula 10 or fewer **26. norvegica**
38 Capitula numerous
39 Leaves not white-lanate beneath
40 Leaves appressed-pubescent beneath **20. armeniaca**
40 Leaves glabrous or nearly so **21. latifolia**
39 Leaves white-lanate beneath
41 Leaves white-lanate above **7. stellerana**
41 Leaves green and glabrous to sparsely hairy above
42 Panicle usually sparingly branched; involucre 4–5 mm **3. tilesii**
42 Panicle usually much-branched; involucre 2·5–3 mm
43 Leaves with an obscure network of small veins; flowering July–September **1. vulgaris**
43 Leaves with a conspicuous network of small veins; flowering October–November **2. verlotiorum**
37 Terminal lobe of cauline leaves less than 2 mm wide at base
44 Capitula 10 or fewer
45 Capitula *c.* 10 mm across, long-pedunculate; involucral bracts more than 5 mm **26. norvegica**
45 Capitula up to 7 mm across, shortly pedunculate; involucral bracts 3–4·5 mm
46 Corolla glabrous; involucral bracts with a conspicuous dark margin; capitula with 10–15 florets **37. genipi**
46 Corolla hairy, at least in the upper part; involucral bracts without a conspicuous brown margin; capitula with at least 25 florets
47 Capitula usually more than 6, in a narrow raceme; corolla yellow; hairs on corolla-lobes flexuous, the longest more than 0·5 mm; achenes hairy **36. eriantha**
47 Capitula 1–4, in a corymb; corolla purplish; hairs on corolla-lobes thick, the longest less than 0·5 mm; achenes glabrous **39. granatensis**
44 Capitula more than 10
48 Capitula in a simple or very slightly branched racemose inflorescence
49 Lower cauline leaves 2-pinnatisect
50 Involucre *c.* 4 mm; capitula 6–8 mm across **25. atrata**
50 Involucre *c.* 3 mm; capitula 3–5 mm across **19. laciniata**
49 Lower cauline leaves simple, ±pinnatifid or digitate
51 Capitula with at least 25 florets; corolla villous **36. eriantha**
51 Capitula with 10–15 florets; corolla usually glabrous **37. genipi**
48 Capitula in a much-branched panicle; branches sometimes short but numerous
52 Lower cauline leaves sessile, the lowest pair of segments usually ±amplexicaul
53 Involucre glabrous **32. chamaemelifolia**
53 Involucre pubescent
54 Leaves subglabrous above; lobes 0·5–1·5 mm wide
55 Involucre *c.* 2·5 mm; corolla-lobes glabrous **29. santolinifolia**
55 Involucre 3·5–4·5 mm; corolla-lobes arachnoid-pubescent beneath **33. macrantha**
54 Leaves densely pubescent on both surfaces; lobes up to 0·5 mm wide
56 Leaves matt; lobes up to 5 mm; corolla glabrous **30. pontica**
56 Leaves sericeous; lobes 5–12 mm; corolla pubescent **31. austriaca**
52 Lower cauline leaves distinctly petiolate
57 Plant densely white-tomentose **46. hololeuca**
57 Plant green or grey-green
58 Leaf-lobes filiform
59 Involucre 3–4 mm; inner bracts ovate **27. abrotanum**
59 Involucre 2·5 mm; inner bracts lanceolate-spathulate **28. molinieri**
58 Leaf-lobes linear to linear-lanceolate
60 Lower leaves with 1–2 small, ±amplexicaul lobes at base of petiole **8. alba**
60 Lower leaves without lobes at base of petiole
61 Leaves usually with sparse, patent hairs
61 Leaves usually with sparse, patent hairs beneath, often glabrescent; lamina usually more than 3 times as long as the longest segment
62 Inflorescence usually freely branched, with numerous capitula; involucral bracts usually with a pale margin **19. laciniata**
62 Inflorescence with few or no short branches and few capitula; involucral bracts with a dark brown margin **25. atrata**
61 Leaves usually appressed-pubescent beneath; lamina usually less than 3 times as long as the longest segment

[2] By T. G. Tutin, K. Persson (spp. 9–18) and W. Gutermann (spp. 34–40).

63 Leaf-lobes making an angle of less than 45° with the segment **20. armeniaca**
63 Leaf-lobes making an angle of more than 45° with the segment
64 Leaves not sericeous beneath **24. oelandica**
64 Leaves sericeous beneath
65 Terminal lobes of leaves usually more than 1·5 mm wide at base **22. pancicii**
65 Terminal lobe of leaves usually *c.* 1 mm wide at base **23. insipida**

Sect. ARTEMISIA (incl. Sect. *Absinthium* (Miller) DC. and Sect. *Seriphidium* Besser). Receptacle glabrous or hirsute; outer florets female (rarely absent), with filiform perianth, the rest hermaphrodite, all fertile.

1. A. vulgaris L., *Sp. Pl.* 848 (1753). Perennial, caespitose, aromatic herb without overwintering rosettes. Stems (30–)60–120(–210) cm, sparsely pubescent, often glabrescent, usually red or purplish. Leaves 1-pinnatifid, auriculate at base, the segments sometimes deeply lobed, with an obscure network of small veins, usually glabrous above, whitish-tomentose beneath. Lower leaves shortly petiolate, upper sessile. Capitula numerous, subsessile, erect or slightly recurved, crowded on the branches of a large panicle. Bracts leaf-like, the upper small and simple. Involucre 2·5–3 mm, campanulate or ovoid; bracts greyish-arachnoid-pubescent, the outer lanceolate, acute, broadly scarious, the inner longer, oblong, obtuse. Receptacle glabrous. Corolla usually reddish-brown. $2n=16$. *Most of Europe, but rare in the extreme north and extreme south.* All except Az Bl Cr Fa Is Sb Si.

2. A. verlotiorum Lamotte, *Compt.-Rend. Assoc. Fr. Avancem. Sci.* **5** (*Clerm.-Ferr.*) 513 (1877). Like **1** but not caespitose, with long rhizomes and overwintering rosettes; stem more densely pubescent; leaves with a conspicuous network of small veins; bracts conspicuous, leaf-like even at the ends of branches, usually 3-fid; outer involucral bracts linear; flowering later. $2n=54$. *Naturalized on roadsides and waste places. W. & C. Europe.* [Au Be Br Cz Ga Ge He Hs It Ju.] (*S.W. China.*)

3. A. tilesii Ledeb., *Mém. Acad. Sci. Pétersb.* **5**: 568 (1815). Like **1** but inflorescence usually sparingly branched; involucre 4–5 mm, hemispherical. *Arctic Russia.* Rs (N). (*N. Asia, Arctic America.*)

4. A. absinthium L., *Sp. Pl.* 848 (1753). Aromatic, more or less sericeous perennial 30–90 cm. Leaves 2- to 3-pinnatisect, petiolate; lobes 5–20 × 1–6 mm, usually obtuse. Capitula *c.* 3 mm across, hemispherical, nodding, in a paniculate inflorescence. Involucre 2–3 mm; outer bracts oblong, herbaceous; inner ovate, herbaceous, with a wide scarious margin. Receptacle hairy. Corolla glabrous. $2n=18$. *Most of Europe; widely cultivated for flavouring and perhaps not native in some districts.* All except Az Bl Cr Fa Is Sa Sb Si Tu; introduced in Hb.

5. A. siversiana Ehrh. ex Willd., *Sp. Pl.* **3**: 1845 (1803). Like **4** but annual or biennial; involucre 4–5 mm; outer bracts ovate, with a wide scarious margin; inner coriaceous, with a wide scarious margin. *C. & S. Ural and adjacent lowlands.* Rs (C, *E) [Rs (B)]. (*N. & C. Asia.*)

6. A. arborescens L., *Sp. Pl.* ed. 2, 1188 (1763). White-tomentose, aromatic perennial; stems 50–100 cm, woody below. Leaves 1- to 2-pinnatisect or the upper sometimes simple, petiolate; lobes 5–25 × 1–2 mm, obtuse. Capitula 6–7 mm across, hemispherical, nodding or erect, in a large, paniculate inflorescence. Involucre 3·5–4 mm; bracts ovate, tomentose, with a wide, glabrous, scarious margin. Receptacle hairy. Corolla glabrous. $2n=18$. *Mediterranean region, S. Portugal.* Bl Co Cr Gr Hs It Ju Lu Sa Si [Ga].

7. A. stellerana Besser, *Nouv. Mém. Soc. Nat. Moscou* **3**: 79 (1834). Densely white-lanate, not aromatic, rhizomatous perennial 30–60 cm. Lower leaves pinnately lobed or deeply toothed, cuneate, petiolate; lobes obtuse; upper leaves sessile, sometimes entire. Capitula broadly campanulate, shortly pedunculate, erect or recurved, crowded in a racemose panicle. Bracts leaf-like, the upper small. Involucre 8–9 mm; bracts oblong to ovate, obtuse; margin scarious. Receptacle glabrous. Corolla yellow. *Cultivated for ornament and locally naturalized in N. Europe.* [Br Da Su.] (*N.E. Asia.*)

8. A. alba Turra, *Gior. Ital. Sci. Nat. Agric. Arti Commerc.* **1**: 144 (1764) (*A. camphorata* Vill., *A. lobelii* All.; incl. *A. incanescens* Jordan, *A. suavis* Jordan). Glabrous to white-tomentose, aromatic perennial with a stout, branched stock; stems 30–100 cm, woody below. Lower leaves 2(–3)-pinnatisect, the middle 1-pinnatisect and the upper usually simple; lower and middle leaves petiolate, with 1 or more pairs of small, more or less amplexicaul lobes at the base of the petiole; lobes 3–10 × 0·25–0·75 mm, obtuse. Capitula hemispherical, nodding, in a usually simple or slightly branched inflorescence. Involucre 3–4 mm; outer bracts lanceolate, with a narrow scarious margin, the inner ovate, with a wide, glabrous, scarious margin. Receptacle glabrous or hairy. Corolla glabrous but glandular. $2n=36$. *S. & S.C. Europe.* Al †Au Be Bu †Cz Ga Gr Hs Hu It Ju Rm Si.

Very variable in indumentum, leaf-size and in smell. Several taxa distinguished by one or more of these characters have been described at specific, subspecific and varietal rank. These appear to be largely sympatric and plants with every degree of pubescence are of common occurrence. In view of this it seems scarcely possible, on the available information, to recognize subspecies, but further investigation is desirable.

(9–15). A. maritima group. More or less densely tomentose to glabrescent, aromatic perennials, not or slightly caespitose; flowering stems 5–60 cm, more or less woody below. Lower leaves usually 2- to 4-pinnatisect, often auriculate, sometimes 3-fid to 1-pinnatisect, or entire. Capitula oblong to ovoid, nodding or erect, in a paniculate to almost racemose inflorescence. Outer (female) florets absent. Involucre (2–)2·5–6 mm; bracts tomentose to subglabrous or glabrous, the inner somewhat to much longer than the outer, with a glabrous, scarious margin. Corolla glabrous, glandular.

A highly polymorphic and widespread group in Europe and temperate Asia. Numerous taxa have been described at varietal, subspecific and specific rank. Variation is particularly great in **9**, **10** and **15** which have a fairly wide range of distribution. The other species occupy disjunct areas, often of a relict nature, and are characterized both morphologically and cytologically by a moderate degree of variability.

1 Lower leaves entire or 3-fid to 1-pinnatisect **10. caerulescens**
1 Lower leaves 2- to 4-pinnatisect
2 Stem and leaves at anthesis more or less densely tomentose
3 Stock slender, horizontal to slightly ascending, with few to many leaf-rosettes **9. maritima**
3 Stock stout and woody, vertical to ascending, with numerous short leaf-rosettes

4 Persistently grey- to white-tomentose; leaves persistent at anthesis; branches and capitula always erect **11. vallesiaca**
4 Stems towards fruiting stage more or less glabrescent, often in patches; leaves withering at anthesis; branches sometimes erecto-patent with patent to nodding capitula **12. lerchiana**
2 Stem and leaves at anthesis almost glabrous to sparsely pubescent
5 Stock stout and woody, vertical to ascending
6 Capitula oblong to narrowly ellipsoid; involucral bracts oblong with a basally prominent, linear midrib; leaves 2-pinnatisect, with remote linear lobes **10. caerulescens**
6 Capitula ovoid; involucral bracts narrowly elliptical to obovate with a linear to slightly spathulate midrib; leaves 3-pinnatisect with crowded linear to filiform lobes **14. taurica**
5 Stock ± slender, horizontal to slightly ascending
7 Capitula ellipsoid to broadly ovoid; outer bracts overlapping ⅓–½ of the inner; inner bracts sparsely to moderately pubescent **9. maritima**
7 Capitula oblong to narrowly ellipsoid; outer bracts much shorter than the inner; inner bracts glabrescent
8 Leaf-lobes narrowly linear; panicle always narrow, with erect branches and sessile to subsessile capitula **13. nitrosa**
8 Leaf-lobes linear to slightly spathulate; panicle usually wide, with ascending to almost horizontal branches and more or less pedunculate capitula **15. santonicum**

9. A. maritima L., *Sp. Pl.* 846 (1753) (incl. *A. salina* Willd.). Grey- to white-tomentose, rarely glabrescent, strongly aromatic perennial with a horizontal to slightly ascending, usually rather slender stock; flowering stems 5–60 cm, often woody below. Lower cauline leaves withering at or soon after anthesis, 2- to 3-pinnatisect, petiolate, often with small entire to moderately segmented auricles, the lobes 3–15 × 0·4–0·9(–1·2) mm, spathulate to linear, subacute to obtuse; upper leaves sessile, the uppermost undivided or with a few lobes basally. Capitula ellipsoid to broadly ovoid, subsessile to shortly pedunculate, nodding or erect. Involucre 3–6 mm; bracts somewhat patent, the outer tomentose, the inner somewhat longer than the outer, pubescent, elliptical, with a usually spathulate midrib region and a glabrous, scarious margin. *Coasts of W. & N. Europe, from S.W. France to S.E. Norway and Estonia; inland on saline soils in C. Germany.* Be Br Da Ga Ge Hb Ho No Rs (B) Su.

(a) Subsp. **maritima**: Usually with a moderate number of rather long non-flowering shoots. Stems usually 20–60 cm, ascending, moderately to densely tomentose, sometimes glabrescent, woody at base. Inflorescence mostly wide, paniculate, the branches usually 5–10 cm. Lamina of lower cauline leaves 10–45 × 7–30 mm. Corolla 2·5–3·2 mm; style-branches 0·6–0·9 mm. $2n=36$, 54 (50–56). *Throughout the range of the species except the extreme east.*

(b) Subsp. **humifusa** (Fries ex Hartman) K. Persson, *Op. Bot.* (*Lund*) **35**: 150 (1974): Many short non-flowering shoots. Stems usually 5–25 cm, decumbent to ascending, densely tomentose, scarcely woody at base. Inflorescence mostly narrow, racemose, often simple; branches usually not exceeding 3 cm. Lamina of lower cauline leaves 5–18 × 4–13 mm. Corolla 2·4–2·8(–3) mm; style-branches 0·4–0·7 mm. *Baltic islands* (*Öland, Gotland, Saarema*).

10. A. caerulescens L., *Sp. Pl.* 848 (1753). Like **9** but stock stout and woody; flowering stems woody for most of their length, sparsely pubescent, greyish-green, or glabrescent at anthesis; leaves of the flowering stems entire, lanceolate to linear, or sparsely pinnatifid to pinnatisect; branches and capitula mostly erect; involucre 2·5–5 mm, narrow, the inner bracts much longer than the outer, scarious except for the basally prominent, linear midrib. *W. & C. Mediterranean region, S.W. Portugal.* Al Bl Co Ga Hs It Ju Lu Sa.

(a) Subsp. **caerulescens**: Flowering stems 20–60 cm. Lower cauline leaves entire to sparsely pinnatifid or 1- to 2-pinnatisect with primary segments usually 5–15 mm; ultimate segments of pinnatisect leaves elongate, generally more than 0·7 mm wide. Branches and capitula erect to erecto-patent or pendent. Involucre 3–5 mm. $2n=18$. *Salt-marshes and maritime cliffs; inland on calcareous soils in C. Italy. S. Portugal and S.W. Spain; Mediterranean region from Corse to Albania.*

(b) Subsp. **gallica** (Willd.) K. Persson, *Op. Bot.* (*Lund*) **35**: 173 (1974) (*A. gallica* Willd.): Flowering stems 15–40 cm. Lower cauline leaves 2-pinnatisect with primary segments usually 3–6 mm; ultimate segments very short, 0·4–0·7 mm wide. Branches and capitula erect to erecto-patent, very rarely pendent. Involucre 2·5–4 mm. $2n=18$. *Salt-marshes. From E. Spain to Corse and Sardegna.*

11. A. vallesiaca All., *Auct. Syn. Stirp. Horti Taur.* 16 (1773). Densely grey- to white-tomentose, strongly aromatic perennial with an ascending to vertical, much branched, very stout and woody stock and numerous short non-flowering shoots; flowering stems (10–)20–40(–50) cm, woody below. Lower cauline leaves persistent at anthesis, 3- to 4-pinnatisect, petiolate or subsessile with often large, pinnatisect auricles, the lobes 1–5 × 0·3–0·5 mm, linear, subacute to acute; upper leaves sessile, uppermost with pinnatisect lobes basally, seldom entire. Capitula oblong to ellipsoid, subsessile to sessile, erect, in a narrow paniculate inflorescence with erect branches 0·5–6 cm. Involucre 3–4(–5) mm; bracts slightly patent, the outer tomentose, the inner often much longer than the outer, pubescent at least in the upper half, elliptical, with a linear to slightly spathulate midrib region and a glabrous, scarious margin abruptly narrowing towards the base. $2n=36$. *Dry, calcareous hillsides* (500–1000 *m*). *S.W. Switzerland, S.E. France and N.W. Italy.* Ga He It.

12. A. lerchiana Weber in Stechm., *Artem.* 24 (1775). Like **11** but glabrescent and the leaves withering at anthesis; leaf-lobes often longer and narrower, 2–6 × 0·2–0·4(–0·5) mm; branches often longer, sometimes erecto-patent, with patent to nodding capitula; involucral bracts oblong to narrowly elliptical, with narrowly linear midrib. *Seashores and dry saline or alkaline soils. S.E. Europe, from E. Bulgaria to W. Kazakhstan.* Bu Rm Rs (K, E).

A. dzevanovskyi Leonova in Wulf, *Fl. Kryma* **3(3)**: 222 (1969), described as nearly related to **12** but distinguished by its denser and more persistent foliage and pubescence, taller stature, wider leaf-lobes and larger capitula, is endemic to Krym, on calcareous cliffs near the sea. It is perhaps only a subspecies of **12**.

13. A. nitrosa Weber in Stechm., *Artem.* 24 (1775). Greyish-tomentose to glabrescent woody perennial with a horizontal to ascending, rather slender stock and few, rather long non-flowering shoots; flowering stems 30–50(–60) cm, rigid, glabrous or nearly so at anthesis. Lower cauline leaves withering at anthesis, 2-pinnatisect, petiolate, the lobes 3–5 mm, narrowly linear, subacute to acute; upper leaves sessile, uppermost undivided, spathulate to linear. Capitula oblong to ellipsoid, subsessile to sessile, often glomerate, erect, in a narrow paniculate inflorescence with erect branches. Involucre 3–4 mm; bracts slightly patent, the outer greyish-tomentose to sparsely pubescent, the inner distinctly longer than the outer, glabrescent,

narrowly elliptical, with a glabrous, scarious margin. *Dry, saline or alkaline soils. S.E. Russia, W. Kazakhstan.* Rs (E). (*C. Asia.*)

14. A. taurica Willd., *Sp. Pl.* **3**: 1837 (1803). Like **13** but stock ascending to vertical, stout; lower cauline leaves 3-pinnatisect, the lobes up to 7 mm, linear to filiform; uppermost leaves entire or with a few basal lobes; capitula ovoid, in a wide, paniculate inflorescence; involucre 2·5–3·5 mm, the bracts narrowly elliptical to obovate. *Dry places. S. part of U.S.S.R.* Rs (W, K, E).

15. A. santonicum L., *Sp. Pl.* 845 (1753) (*A. monogyna* Waldst. & Kit.). Stems woody below, glabrous, at least at base. Lower cauline leaves withering at or before anthesis, 2- to 3-pinnatisect, sometimes with small auricles, the lobes up to 8 mm, linear to subspathulate, subacute to acute; uppermost leaves entire or with 2 basal lobes. Capitula usually pedunculate, nodding or erect in a mostly wide paniculate inflorescence; involucral bracts closely imbricate, the outer sparsely pubescent to glabrous, the inner much longer, glabrous, oblong to elliptical. *Seasonally wet saline or alkaline soils.* ● *From E. Austria to W. Kazakhstan, and southwards to N.E. Greece.* Au Bu Cz Gr Hu Ju Rm Rs (W, K, E) Tu.

(a) Subsp. **santonicum**: Stems pubescent at anthesis (at least above). Branches erect to horizontal, often distally pendent. Lamina of lower cauline leaves (15–)20–35(–45) × (10–)15–20(–25) mm. Inner involucral bracts (0·9–)1·2–1·6(–1·8) mm wide. Florets (2–)3–6; corolla 2·2–2·8 mm, reddish or yellow. *Throughout the range of the species except Austria and Czechoslovakia.*

(b) Subsp. **patens** (Neilr.) K. Persson, *Op. Bot.* (*Lund*) **35**: 162 (1974) (*A. maritima* var. *patens* Neilr., *A. salina* subsp. *patens* (Neilr.) Sagorski): Stems subglabrous to glabrous at anthesis. Branches erect to erecto-patent, rarely distally pendent. Lamina of lower cauline leaves 10–20(–25) × 7–15 mm. Inner involucral bracts 0·9–1·4(–1·5) mm wide. Florets (1–)2–4(–5); corolla 1·9–2·4(–2·5) mm, usually reddish. $2n=18$. *From E. Austria to W. Romania.*

A. nutans Willd., *Sp. Pl.* **3**: 1831 (1803) (*A. cretacea* Kotov), from S. E. Russia, seems to have smaller capitula and grows in different habitats (on chalky soils) but is otherwise very similar to **15**. It may represent a distinct species but further living material needs to be studied.

16. A. pauciflora Weber in Stechm., *Artem.* 26 (1775). Caespitose dwarf shrub, with a thick, woody, branched stock; flowering stems 10–20(–25) cm, numerous, slender, glabrescent. Leaves very small, usually tomentose, withering at anthesis; lower 2- to 3-pinnatisect, petiolate, sometimes with very small auricles, the middle 1- to 2-pinnatisect, sessile, the uppermost simple; lobes 0·5–2 mm, linear to somewhat spathulate, subacute to obtuse. Capitula oblong, sessile or shortly pedunculate, erect, in a narrow paniculate inflorescence with erect, very slender branches; outer (female) florets absent. Involucre 2–2·5 mm; bracts oblong, the outer puberulent, the inner much longer than the outer, often recurved, glabrous, shiny, very narrow, with a distinct, narrow midrib and a scarious margin. Florets 2–3; corolla glabrous, glandular. *S.E. Russia, W. Kazakhstan.* Rs (E). (*S.C. Asia.*)

17. A. gracilescens Krasch. & Iljin, *Animadv. Syst. Herb. Univ. Tomsk.* **1949 (1–2)**: 2 (1949). Like **16** but flowering stems 15–30 cm, grey-tomentose; leaf-lobes linear to filiform, acute to subacute; involucral bracts oblong to elliptical, the outer grey- to white-tomentose with distinct glands, the inner sparsely pubescent; florets 2–5. *S.E. Russia.* Rs (?C, E).

18. A. lessingiana Besser, *Linnaea* **15**: 90 (1841). Greyish-tomentose, soon glabrescent, caespitose perennial with a thick woody stock; flowering stems 15–30(–40) cm, numerous. Leaves mostly sparsely pubescent to glabrous, sometimes greyish-arachnoid-tomentose. Lower leaves 1- (to 2-)pinnatisect, long-petiolate, not auriculate, the lobes 5–10 mm, linear to filiform; upper leaves sessile, uppermost with two lobes basally or simple. Capitula narrowly ovoid, sessile to subsessile, erect, in a narrow paniculate or almost racemose inflorescence with erect to erecto-patent branches 1–2(–3) cm; outer (female) florets absent. Involucre 3–4 mm; bracts oblong to elliptical, the outer greyish-pubescent to tomentose, the inner distinctly longer than the outer, glabrous, broadly scarious. Corolla glabrous. *S.E. Russia (Obščij Syrt, S.E. of Kujbyšev).* Rs (E). (*N.W. Kazakhstan.*)

19. A. laciniata Willd., *Sp. Pl.* **3**: 1843 (1803). Not aromatic, rhizomatous perennial 5–50(–90) cm, glabrous or sparsely pubescent above. Lower leaves 2-pinnatifid, not auriculate at base, the lobes *c.* 5 × 1 mm, often deeply toothed, glabrous or sparsely sericeous; petiole long. Upper leaves less divided, shortly petiolate. Capitula broadly campanulate, shortly pedunculate, recurved, in a shortly branched, more or less secund, racemose panicle. Bracts small, pinnatifid or simple, linear. Involucre 2–3 mm; bracts ovate-oblong, obtuse, glabrous; margin scarious. Receptacle glabrous. Corolla yellow. $2n=18$. *Isolated stations in E. Austria, S.E. Czechoslovakia and S.C. Russia.* Au Cz †Ge Rs (C). (*Temperate Asia.*)

20. A. armeniaca Lam., *Encycl. Méth. Bot.* **1**: 263 (1783). Perennial 40–100 cm. Rhizome creeping; stems solitary or few together. Lower leaves 2-pinnatisect, long-petiolate, the upper 1-pinnatisect, sessile; lobes 3–10 × 1–2(–4) mm, sparsely pubescent above, whitish-lanate beneath, serrate, acute. Capitula hemispherical, shortly pedunculate, usually nodding, in a narrow paniculate inflorescence. Bracts simple, usually shorter than the peduncle. Involucre 4–5 mm; bracts glabrous or the outer more or less pubescent, ovate, obtuse, herbaceous, with a wide scarious margin. Receptacle glabrous. Corolla yellowish; lobes sparsely ciliate; tube glandular. *S.E. part of U.S.S.R., northwards to c.* 60°*N. and westwards to c.* 33°*E.* Rs (C, W, E).

21. A. latifolia Ledeb., *Mém. Acad. Sci. Pétersb.* **5**: 569 (1815). Glabrous, rarely slightly puberulent perennial 15–80 cm, with a branched, woody stock. Leaves 1- to 2-pinnatisect, the lower long-petiolate, the upper sessile; lobes 2–15 × 1–3 mm, glandular-punctate, acuminate, entire or with few large teeth; terminal segment usually 1·8–4·2 mm wide at base. Capitula hemispherical, nodding, shortly pedunculate, in a narrow paniculate inflorescence. Bracts simple, lanceolate. Involucre *c.* 3 mm; bracts glabrous, ovate, obtuse, herbaceous, with a wide scarious margin. Receptacle glabrous. Corolla glabrous, glandular. *E. & C. Russia.* Rs (N, C, E).

22. A. pancicii (Janka) Ronniger *Samen-Tauschliste Bot. Gart. Univ. Wien* **1938**: 5 1938. Pubescent, not aromatic perennial 10–70 cm, with long rhizomes and numerous vegetative shoots. Leaves 1- to 2-pinnatisect, sericeous beneath, the lower long-petiolate, the upper auriculate; lobes of lower leaves linear-lanceolate, obtuse or subobtuse, of others linear, acuminate; terminal lobe usually more than 1·5 mm wide at base. Capitula nodding, shortly pedunculate, in a narrow paniculate, more or less secund inflorescence. Bracts sessile, auriculate, with short lobes. Involucre *c.* 3 mm; bracts broadly ovate, obtuse, with a wide scarious margin, densely pubescent to subglabrous. Receptacle glabrous. Corolla pubescent. $2n=54$. ● *S.C. Czechoslovakia and N.E. Austria; N.E. Jugoslavia.* Au Cz Ju.

23. A. insipida Vill., *Prosp. Pl. Dauph.* 32 (1779). Like **22** but with the terminal lobe of the leaves usually less than 1 mm wide at base and the inflorescence laxer, with fewer capitula. ● *Formerly in S.W. Alps (N.W. of Gap).* †Ga.

24. A. oelandica (Besser) Komarov., *Mat. Hist. Fl. Veg. USSR* **2**: 126 (1946). Like **22** but leaves more sericeous and often glabrescent beneath; terminal lobe usually 1–1·5 mm wide at base; corolla glabrous. $2n=54$. *Limestone pavement.* ● *S.E. Sweden (Öland).* Su.

25. A. atrata Lam., *Encycl. Méth. Bot.* **1**: 263 (1783). More or less pubescent, not aromatic perennial 10–40 cm. Leaves 2- to 3-pinnatifid, glandular-punctate, petiolate, not auriculate; segments making a right angle with the rhachis. Capitula hemispherical, shortly pedunculate, recurved, in a raceme or narrow panicle. Bracts usually linear and shorter than the capitula. Involucre 3·5–4 mm; bracts obtuse, somewhat pubescent on the back, very broadly scarious, the outer oblong, the inner ovate. Receptacle glabrous. Corolla yellow; lobes patent-pubescent; tube glabrous and glandular. $2n=18$. *Rocks and dry pastures.* ● *W. & S. Alps, very local.* Ga It Ju.

26. A. norvegica Fries, *Nov. Fl. Suec.* 56 (1817). Pubescent, caespitose perennial (3–)5–20(–30) cm. Leaves mostly basal, 2-pinnate or the lowest almost digitate, petiolate; lobes 2–15 × 1–2 mm, acute or subobtuse, entire, or with few large teeth; upper leaves 1- to 2-pinnate, sessile. Capitula 1–10, *c.* 10 mm across, hemispherical, long-pedunculate, nodding. Involucre 8–9 mm; bracts ovate, obtuse, with a wide, brown scarious margin. Receptacle glabrous. Corolla yellow, villous, eglandular. $2n=18$. *Sandy, gravelly or dry, peaty places in the mountains. N.W. Scotland; C. Norway; N. Ural.* Br No Rs (N).

27. A. abrotanum L., *Sp. Pl.* 845 (1753) (*A. paniculata* Lam.). Strongly aromatic shrub *c.* 100 cm. Leaves 1- to 3-pinnatifid, with filiform, glandular-punctuate lobes, glabrous above and greyish-pubescent beneath; petioles short, not auriculate. Capitula 3–4 × 3–4 mm, globose, shortly pedunculate, in the axils of simple, leaf-like bracts, 1–3 times as long as the capitula. Inner involucral bracts ovate. Receptacle glabrous. Capitula with 25–30 florets; corolla yellowish. $2n=18$. *Widely cultivated for ornament and flavouring, and naturalized in E., S. & S.C. Europe.* [Au Cz Ga Ge He Hs Hu It Ju Rm Rs (N, C, W, E).] (*Native country uncertain.*)

28. A. molinieri Quézel, Barbero & R. Loisel, *Bull. Soc. Bot. Fr.* **113**: 524 (1966). Like **27** but not more than 60 cm; capitula 2·5 × 2–2·5 mm, ovoid, very densely crowded in spicate inflorescences; inner involucral bracts lanceolate-spathulate; capitula with 10–15 florets. ● *S. France (near Flassans, Var).* *Ga.

29. A. santolinifolia Turcz. ex Krasch. in Krylov, *Fl. Zap. Sibir.* **11**: 2791 (1949). Caespitose, suffruticose perennial 12–45(–80) cm. Lower leaves 3-pinnatisect, the lowest segments forming pinnatisect auricles; those in the inflorescence sessile, simple and entire or 1- to 2-pinnatisect; lobes 1–4 × *c.* 0·5 mm, glabrous or sparsely pubescent above, thinly arachnoid-pubescent beneath, glandular-punctate, acute, entire or with few large teeth. Capitula hemispherical, nodding, with short, slender peduncles, in a leafy, paniculate inflorescence. Bracts simple, linear, usually longer than the peduncle. Involucre *c.* 2·5 mm; bracts thinly arachnoid-pubescent, ovate, obtuse, herbaceous, with a wide scarious margin. Receptacle glabrous. Corolla glabrous, glandular. *S. Ural.* Rs (C, ?E). (*Siberia and C. Asia.*)

30. A. pontica L., *Sp. Pl.* 847 (1753). Somewhat aromatic, rhizomatous perennial 40–80 cm, greyish-tomentose, glabrescent below. Leaves 3–4 cm, 1- to 2-pinnatifid, sessile, auriculate at base, densely pubescent on both surfaces; lobes up to 0·5 mm wide, linear-lanceolate, mucronate. Capitula ovoid, pedunculate, recurved, in a narrow racemose panicle. Bracts simple or 1-pinnatifid, about as long as the capitula. Involucre *c.* 2·5 mm; bracts ovate-oblong, broadly scarious, tomentose in the middle, obtuse. Receptacle glabrous. Corolla yellow, with glabrous lobes. $2n=18$. *C. & E. Europe; casual and locally naturalized elsewhere.* Au Bu Cz Ge Hu Ju Po Rm Rs (C, W, K, E) [Ga He It].

31. A. austriaca Jacq., *Fl. Austr.* **1**: 61 (1773). Rhizomatous perennial, somewhat woody at base. Stems greyish-hairy, often tinged with red, freely branched above, with erecto-patent branches. Leaves 2-pinnatifid, greyish above, white beneath, somewhat sericeous; lobes 5–12 × *c.* 0·5 mm, linear, obtuse; lower leaves long-petiolate, the petioles auriculate at base; upper leaves sessile. Capitula broadly ovoid, shortly pedunculate, recurved, crowded on the branches of a spreading panicle. Bracts simple or the lower pinnatisect. Involucre *c.* 2 mm; bracts obtuse, shortly patent-pubescent on the outside, the outer linear, herbaceous, the inner oblong or ovate-oblong, nearly entirely scarious, reddish-grey. Receptacle glabrous. Corolla reddish-yellow, with densely patent-pubescent lobes. $2n=16$. *E. & E.C. Europe.* Au Bu Cz Hu Po Rm Rs (N, B, C, W, K, E) [Ga Ge].

32. A. chamaemelifolia Vill., *Prosp. Pl. Dauph.* 32 (1779). Almost or quite glabrous, aromatic perennial (15–)30–50 cm, somewhat woody at base. Leaves 2- to 3-pinnatifid, not glandular-punctate, the cauline sessile, with the lowest segments amplexicaul. Capitula hemispherical, shortly pedunculate, recurved, crowded in a narrow panicle. Lower bracts large, leaf-like, upper small and simple. Involucre 2·5–3 mm; bracts obtuse, glabrous or slightly hairy, the outer linear, herbaceous, the inner oblong, nearly entirely scarious. Receptacle glabrous or hairy. Corolla yellow, glabrous, glandular. *Mountain rocks. S.W. Alps, Pyrenees, Cordillera Cantábrica; N.W. Bulgaria.* Bu Ga Hs It.

(a) Subsp. **chamaemelifolia**: Stems usually 30–50 cm; inflorescence with numerous, sometimes short branches; receptacle glabrous. $2n=18$. *Throughout most of the range of the species.*

(b) Subsp. **cantabrica** Laínz, *Bol. Inst. Estud. Astur.* (*Supl. Ci.*) **10**: 207 (1964): Stems usually less than 30 cm; inflorescence sparingly branched; receptacle hairy. *N.W. Spain (Peña Ubiña, S. of Oviedo).*

33. A. macrantha Ledeb., *Mém. Acad. Sci. Pétersb.* **5**: 573 (1815). Perennial 20–100 cm. Rhizome creeping; stems solitary or few together. Leaves 2-pinnatisect, all but the lowest sessile, with the basal segments more or less clasping the stem; lobes 2–10 × 0·5–1·5 mm, sparsely pubescent above, grey-tomentose beneath. Capitula hemispherical, shortly pedunculate, nodding, in a narrow, paniculate inflorescence. Lower bracts leaf-like, the upper simple. Involucre 3·5–4·5 mm, arachnoid-tomentose; outer bracts oblong-lanceolate, herbaceous; inner broadly ovate, obtuse, with a wide, brownish, scarious margin. Receptacle glabrous. Corolla yellowish; lobes arachnoid-tomentose beneath; tube glandular but glabrous. *E. Russia.* Rs (C, E). (*Siberia.*)

34. A. umbelliformis Lam., *Encycl. Méth. Bot.* **1**: 262 (1783) (*A. mutellina* Vill., non S. G. Gmelin, *A. laxa* Fritsch). Caespitose, whitish-sericeous, aromatic perennial up to 25 cm. Leaves petiolate, palmately divided, the segments twice 3-fid (simple in the uppermost leaves); lobes linear, subacute. Capitula 3–5 mm across, ovoid, more or less erect, the lower pedunculate, distant,

the upper nearly sessile in a usually simple, rather lax raceme; lower bracts like the cauline leaves, the upper mostly simple. Involucral bracts villous-sericeous, oblong-lanceolate, obtuse, the outer with a scarious, the inner with a brown margin. Receptacle shortly and sometimes sparsely hairy. Florets 10–20, the female more numerous than the hermaphrodite; corolla yellowish, the lobes slightly hairy. Achenes with sessile glands and some hairs. $2n=34$. *Mountain rocks, moraines and river-gravels.* ● *Alps, N. Appennini.* Au Ga Ge He ?Hs It.

A. gabriellae Br.-Bl., *Trav. Soc. Pharm. Montpellier* **4**: 233 (1945), from the E. Pyrenees, is like **34** but has a more dense, silvery indumentum, leaves with wider and more obtuse segments, capitula fewer and more crowded in a terminal corymb, and glabrous achenes. It has $2n=34$ and is perhaps best regarded as a subspecies of **34**.

The identity of plants from the C. Pyrenees and Sierra Nevada which have been referred to **34**, is uncertain.

35. A. nitida Bertol., *Mant. Pl. Fl. Alp. Apuan.* 53 (1832). Like **34** but up to 40 cm, with a densely appressed silvery indumentum; leaf-lobes linear, acute; largest capitula at least 6 mm across, hemispherical, nodding when mature; involucral bracts ovate, sericeous; receptacle densely hairy; florets more than 20, the female fewer than the hermaphrodite; corolla-lobes densely hairy; achenes glabrous. $2n=54$. *Rock-crevices*, 1200–2400 *m*; *calcicole.* ● *S.E. Alps; Alpi Apuane.* Au It Ju.

36. A. eriantha Ten., *Sem.* 1830 *Coll. Horti Bot. Neap.* 14 (1831) (*A. petrosa* Fritsch). Caespitose, sericeous-tomentose perennial up to 25 cm. Basal leaves petiolate, usually 2-ternate, with linear-lanceolate, acute lobes; upper cauline more or less sessile, digitate to pinnatifid, rarely simple. Capitula up to 7mm across, hemispherical, usually in a simple, rather dense raceme, the lower shortly pedunculate, nodding when mature, the upper nearly sessile; lower bracts like the cauline leaves, the upper often simple. Involucral bracts 3–4.5 mm, ovate to oblanceolate, obtuse, largely scarious, the inner with a brown margin. Receptacle glabrous. Florets 25–50; corolla densely hairy, especially above. Achenes hairy. $2n=18$. *Mountain rocks; calcifuge in the west.* ● *Pyrenees, S.W. Alps, C. Appennini, mountains of the Balkan peninsula, Carpathians.* Al Bu Cz Ga Gr Hs It Ju Po Rm.

37. A. genipi Weber in Stechm., *Artem.* 17 (1775) (*A. spicata* Wulfen). Like **36** but less densely greyish-hairy; cauline leaves pinnately lobed or deeply toothed; inflorescence dense, nodding before anthesis; capitula not more than 4·5 mm across, erect; florets 10–15; corolla nearly glabrous. $2n=18$. *Rocks and screes above* 2000 *m.* ● *Alps.* Au Ga He It.

A completely glabrous variant, **A. nivalis** Br.-Bl., *Verh. Schweiz. Naturf. Ges.* **1919**: 117 (1920), occurs on a few mountain-tops in S.W. Switzerland.

38. A. glacialis L., *Sp. Pl.* ed. 2, 1187 (1763). Densely caespitose, silvery-sericeous perennial up to 18 cm. Leaves petiolate, 5-partite, with 3-fid segments, the lobes narrowly linear, subobtuse; upper cauline less divided. Capitula 4–7 mm across, broadly hemispherical, mostly crowded in a terminal corymb. Involucral bracts villous-sericeous, ovate, obtuse, with a green centre and brown scarious margin. Receptacle densely hairy. Florets 25–50, the female 10 or fewer; corolla bright yellow, glabrous. Achenes glabrous. $2n=16$. *Schistose rocks and screes*, 2000–3100 *m.* ● *S.W. Alps.* Ga He It.

39. A. granatensis Boiss., *Biblioth. Univ. Genève* ser. 2, **13**: 409 (1838). Like **38** but capitula often solitary, sometimes larger, with up to 80 florets; involucral bracts ovate-lanceolate, acute, the centre often reddish; receptacle glabrous; corolla dark purplish, the lobes with dense short hairs. *Stony places above* 2500 *m.* ● *S. Spain* (*Sierra Nevada*). Hs.

40. A. pedemontana Balbis, *Horti Acad. Taur. Stirp.* **1**: 19 (1810) (*A. lanata* Willd., non Lam., *A. caucasica* auct., ?an Willd., *A. assoana* Willk.). Caespitose, whitish-lanate perennial up to 30 cm; non-flowering shoots often rooting at the nodes. Leaves petiolate, twice 3-fid to pinnatifid, with linear, acute lobes; upper cauline pinnately lobed, subsessile. Capitula 4–6 mm across, hemispherical, strongly recurved when mature, the lower shortly pedunculate, the upper sessile, often in dense groups of 2–5(–9) forming a simple or branched raceme; bracts usually pinnately lobed. Involucral bracts densely villous-lanate, obovate, rarely lanceolate, the inner obtuse, broadly scarious, with a pale brown margin. Receptacle with dense, long hairs. Florets 20–35, the female few; corolla yellowish, densely villous, at least in the upper part. Achenes glabrous. $2n=16$. *Rocks, up to* 1500 *m; calcicole. S. Europe, from C. Spain to S.E. Ukraine; very local.* Bu Hs It Rm Rs (W, K, ?E).

Perhaps conspecific with *A. alpina* Pallas ex Willd. (*A. caucasica* Willd.), from the Caucasus.

41. A. frigida Willd., *Sp. Pl.* **3**: 1838 (1803). More or less caespitose, sericeous perennial 5–50 cm. Stems woody below. Leaves 1- to 2-pinnatisect, sessile or shortly petiolate, the lowest segments distant from the others; lobes 2–5 × 0·5–1 mm, linear, acute; uppermost leaves small, sessile, palmately divided. Capitula hemispherical, patent or nodding, in a usually narrow, paniculate inflorescence. Involucre 3–4 mm, lanate; outer bracts lanceolate, the inner ovate, obtuse or subacute, almost entirely scarious but lanate. Receptacle hairy. Corolla glandular. *S.E. & E. Russia, northwards to* 59° 30′ *N. in C. Ural.* Rs (C, E).

42. A. sericea Weber in Stechm., *Artem.* 16 (1775). Perennial 40–70 cm; rhizome creeping; stems solitary or few together. Leaves sericeous on both surfaces; the lower dead at flowering; the middle 2-pinnatisect, with 1–2 pairs of segments and usually 1–2 simple or less divided segments at the base; the upper 1-pinnatisect or simple; lobes 10–17 × 1–2 mm, acute, entire. Capitula hemispherical, nodding, in a narrow, or rarely lax, paniculate inflorescence. Involucre 3–4 mm, sericeous; bracts ovate, obtuse, with a scarious margin. Receptacle hairy. Corolla glandular; lobes densely hairy. *S.C. & E. Russia, northwards to c.* 62° 30′ *N. in N. Ural.* Rs (N, C, E).

43. A. reptans C. Sm. ex Link in Buch, *Phys. Beschr. Canar.* 148 (1825) (*A. hispanica* Lam., non Weber). Strongly aromatic small shrub 12–30 cm. Leaves *c.* 5 mm, simple or palmately 3- to 5-sect, grey-tomentose, fasciculate, sessile, not auriculate at base. Capitula shortly pedunculate, recurved, in a racemose or paniculate inflorescence. Bracts simple, lanceolate, acute, about as long as the capitula. Involucre 1·5–2 mm; bracts greenish, with a scarious margin, puberulent, obtuse, the outer oblong-lanceolate, the inner obovate. Receptacle glabrous. Corolla yellow, glabrous. *S. & S.E. Spain.* Hs.

43 appears to differ from **45** only in the larger number of florets, the outer of which are female. This may well be a nutritional effect and the taxonomic separation of the two consequently unjustified, but further investigation is required.

44. A. barrelieri Besser, *Bull. Soc. Nat. Moscou* **9**: 87 (1836). Aromatic woody perennial up to 60 cm, divaricately branched from the base. Branches usually erect. Leaves and stems grey-tomentose, becoming subglabrous. Lower leaves *c.* 10 mm, 2-pinnatisect, fleshy, with oblong-spathulate lobes 1–2 mm, long-petiolate, auriculate, usually in fascicles on the flowering stems; uppermost leaves simple, sessile. Capitula ovoid, sessile, erect, in a freely branched panicle. Outer (female) florets absent. Involucre 2·5–3 mm; bracts ovate, brown, arachnoid-tomentose, usually eglandular, the inner with a scarious margin. Receptacle hairy. Corolla glabrous. *Dry places.* ● *S. & E. Spain.* Hs.

45. A. herba-alba Asso, *Syn. Stirp. Arag.* 117 (1779). Like **44** but branches usually patent; leaves 2–5 mm, 1- (to 2-) pinnatisect, the lower shortly petiolate, the others sessile; involucral bracts usually glandular. *Dry places. C., E. & S. Spain, just extending into S. France.* Ga Hs.

46. A. hololeuca Bieb. ex Besser, *Nouv. Mém. Soc. Nat. Moscou* **3**: 46 (1834). White-tomentose, caespitose perennial, with a stout, woody stock and numerous densely leafy non-flowering shoots. Stems (5–)20–35 cm, ascending. Leaves long-petiolate, 2-pinnatisect; lobes entire, obtuse or subacute. Capitula campanulate, in panicles. Most of the bracts entire. Involucre 3·5–4 mm, arachnoid-pubescent; bracts ovate, with a scarious margin. Receptacle glabrous. Corolla yellowish; tube glabrous and glandular. ● *S.C. Russia and E. Ukraine.* Rs (C, W, E).

47. A. rupestris L., *Sp. Pl.* 847 (1753). Small shrub, with numerous procumbent, non-flowering shoots and ascending flowering stems 7–45 cm. Leaves 1- to 2-pinnatisect, sessile, glabrous or villous; lobes 2–6 × 0·5–1 mm, acute. Capitula hemispherical, nodding, in a racemose or paniculate inflorescence. Involucre 3–4 mm; outer bracts oblong, herbaceous, the inner lanceolate to ovate, with brown, scarious, long-ciliate margin. Receptacle hairy. Corolla glandular. $2n=18$. *Baltic region and N.W. Russia; S. Ural and adjacent lowlands; formerly in C. Germany.* †Ge Rs (N, B, C, E) Su. (*Siberia and C. Asia.*)

48. A. annua L., *Sp. Pl.* 847 (1753). Glabrous annual 5–150 cm. Lower and middle leaves 3-pinnatisect, sessile, the basal segments remote from the next pair and smaller than them; lobes 1–5 × 0·5–1 mm, linear-lanceolate, acute, entire or with few teeth; upper leaves 1- to 2-pinnatisect. Capitula hemispherical, nodding, in a lax, paniculate or (in small plants) racemose inflorescence. Involucre 1·5–2 mm, shining; outer bracts lanceolate, with a narrow scarious margin; inner ovate, with a wide scarious margin. Receptacle glabrous. Corolla glabrous. $2n=18$. *S.E. Europe; widely naturalized in C. & S. Europe.* Al Bu Ju Rm Rs (C, W, K, E) Tu [Au Cz Ga Ge He Hu It Po].

Sect. DRACUNCULUS Besser. Capitula with glabrous receptacle; outer florets female, with filiform perianth, the rest functionally male.

49. A. dracunculus L., *Sp. Pl.* 849 (1753). Aromatic, much-branched glabrous perennial 60–120 cm. Basal leaves 3-fid at apex, the rest 2–10 × 0·2–1 cm, linear to lanceolate, entire or weakly toothed. Capitula globose, pedunculate, recurved. Involucre 2–3 mm; outer bracts oblong-elliptical, almost entirely herbaceous; inner ovate, with a wide, scarious margin. Corolla yellowish. $2n=18$, 36, 90. *S. & E. parts of U.S.S.R.; widely cultivated for flavouring* (*tarragon*) *and locally naturalized.* Rs (C, W, E) [Au Cz Ga Ge He Ju Rm Rs (?B, K)].

50. A. glauca Pallas ex Willd., *Sp. Pl.* **3**: 1831 (1803). More or less densely stellate-tomentose perennial (15–)25–70 cm, with creeping or ascending stock. Leaves 1–7 × 0·1–0·7 cm, entire, linear to linear-lanceolate, rarely a few (particularly on non-flowering shoots) 1- to 2-ternatisect. Capitula globose, pedunculate, patent or recurved. Involucre 1·5–2 mm, glabrous; outer bracts lanceolate; inner ovate-oblong, with a wide scarious margin. Corolla yellowish. *E. Russia* (*Baškirskaja A.S.S.R.*). Rs (C, E). (*Siberia, North America.*)

51. A. trautvetterana Besser, *Mém. Sav. Étr. Pétersb.* **4**: 464 (1845). Small shrub. Stems up to 65 cm, appressed-pubescent, glabrescent. Leaves pinnatisect, densely appressed-pubescent, glabrescent, the basal 5–8 cm, petiolate; cauline sessile, with 3–7 segments 1·5–5 cm, narrowly linear, mucronate, flat, uppermost leaves simple. Capitula ovoid, sessile or subsessile on the panicle-branches. Involucre *c.* 3 mm; outer bracts ovate, densely hairy; inner somewhat larger, ovate, broadly scarious, hairy in the middle. Corolla yellowish. *S.E. Russia, S. Ukraine.* Rs (W, E).

52. A. salsoloides Willd., *Sp. Pl.* **3**: 1832 (1803). Like **51** but stems usually 20–30 cm, nearly or quite glabrous; leaves glabrous or sometimes with short hairs, glaucous; middle cauline palmately 3-fid; segments 1–2 cm, subacute; capitula long-pedunculate, in a narrow, sparingly branched inflorescence; involucre 4–5 mm, glabrous; outer bracts much shorter than inner. *S.C. & S.E. Russia, S. Ukraine.* Rs (C, W, E).

53. A. tschernieviana Besser, *Bull. Soc. Nat. Moscou* **8**: 33 (1835) (*A. arenaria* DC.). Suffruticose. Stems (35–)50–75(–100) cm, more or less hairy, soon glabrescent, with long, patent branches above. Leaves 1- to 2-pinnatisect, pubescent at first, glabrescent; lower cauline 2–5(–6) cm, petiolate, deciduous, the middle usually sessile, and the uppermost usually simple; lobes 5–15 mm, narrowly linear, mucronate. Capitula ovoid, shortly pedunculate, patent or recurved, in a diffuse panicle. Involucre 2·5–3·5 mm, glabrous; bracts elliptical, the inner longer than the outer, broadly scarious. Corolla purple or yellowish. *S. part of U.S.S.R., E. Romania.* Rm Rs (C, W, K, E).

54. A. commutata Besser, *Bull. Soc. Nat. Moscou* **8**: 70 (1835). Stems 35–60(–70) cm, herbaceous, glabrous or hairy. Lower leaves 4–8(–12) cm, 2-pinnatisect, glabrous or hairy beneath when young, long-petiolate; lobes 10–30 × 0·5–1·5 mm, linear to linear-lanceolate, acute; middle cauline leaves 1-pinnatisect, sessile, the uppermost simple. Capitula oblong or broadly ovoid, pedunculate, patent or recurved, usually in a narrow panicle. Involucre 2·5–3 mm, glabrous; outer bracts broadly ovate, acute, the inner elliptical, broadly scarious. Corolla purplish or brownish. *E. Russia.* Rs (C, ?E). (*Siberia.*)

55. A. bargusinensis Sprengel, *Syst. Veg.* **3**: 493 (1826). Like **54** but leaves usually glabrous, the basal 10–15 cm, with lobes 10–15 × 1–2 mm; capitula narrowly ovoid; involucre 4–5 mm; bracts shiny, white-scarious at margin, the outer short, ovate, the inner elliptical to lanceolate, obtuse. *E. Russia* (*S. Ural*). Rs (C). (*Siberia.*)

56. A. campestris L., *Sp. Pl.* 846 (1753). Scarcely aromatic. Stock stout, woody, branched, with numerous non-flowering shoots. Stems (10–)20–80(–150) cm, ascending or erect, usually brownish-red and glabrous. Leaves sericeous when young, often glabrescent; basal 2- to 3-pinnatisect, petiolate; middle cauline 1- to 2-pinnatisect, sessile, uppermost simple. Capitula ovoid to globose, usually shortly pedunculate, erect or erecto-patent, rarely recurved. Involucre 1·5–3·5(–6) mm, glabrous or rarely hairy; bracts with a wide scarious margin, the outer ovate, the inner oblong. Corolla yellowish or reddish. *Dry places. Most*

of Europe, but absent from many islands and much of the north. All except Az Bl Co Cr Fa Hb Is Sa Sb ?Tu.

1 Panicle-branches viscid (b) subsp. **glutinosa**
1 Panicle-branches not viscid
2 Leaf-lobes short, fleshy, convex but not keeled beneath (c) subsp. **maritima**
2 Leaf-lobes not fleshy, keeled beneath
3 Involucre 1·5–2·5 mm; panicle usually wide (a) subsp. **campestris**
3 Involucre 3–6 mm; panicle narrow
4 Involucre usually 5–6 mm; most panicle-branches with 1–3 capitula (f) subsp. **borealis**
4 Involucre usually 3–4·5 mm; most panicle-branches with 3 or more capitula
5 Outer involucral bracts almost entirely herbaceous (e) subsp. **bottnica**
5 Outer involucral bracts broadly scarious (d) subsp. **alpina**

(a) Subsp. **campestris**: Stems and leaves glabrescent to persistently sericeous; stems usually more than 25 cm. Leaf-lobes not fleshy, keeled beneath, thinly lanate when young. Panicle usually wide. Capitula shortly pedunculate. Involucre 1·5–2·5 mm, rarely hairy. $2n=36$. *Almost throughout the range of the species.*

(b) Subsp. **glutinosa** (Gay ex Besser) Batt. in Batt. & Trabut, *Fl. Algér., Dicot.* 469 (1889) (*A. glutinosa* Gay ex Besser): Like subsp. (a) but panicle-branches and involucral bracts viscid; capitula sessile or subsessile. *From Portugal to Italy and Sicilia.*

(c) Subsp. **maritima** Arcangeli, *Comp. Fl. Ital.* 366 (1882): Stems and leaves glabrescent; stems usually more than 25 cm. Leaf-lobes fleshy, convex but not keeled beneath, velutinous when young. Panicle usually wide. Capitula shortly pedunculate, often recurved. Involucre 3–5 mm, glabrous. $2n=54$. *Maritime sands.* ● *W. coast of Europe, northwards to the Netherlands.*

(d) Subsp. **alpina** (DC.) Arcangeli, *loc. cit.* (1882): Stems and leaves glabrescent; stems usually 20–40 cm. Leaf-lobes not fleshy, keeled beneath, thinly lanate when young. Panicle narrow; most branches with *c.* 6 capitula. Capitula shortly pedunculate. Involucre 3–4 mm; outer bracts broadly scarious. $2n=36$. ● *Alps*, 1000–2000 *m*; *local.*

(e) Subsp. **bottnica** A. N. Lundström ex Kindb., *Svensk Fl.* 301 (1877) Intermediate between subspp. (a) and (f). Panicle usually narrow; most branches with 3–6 capitula. Involucre 3–4·5 mm; bracts and florets usually hairy; outer bracts almost entirely herbaceous. ● *Shores of the north part of the Gulf of Bothnia.*

(f) Subsp. **borealis** (Pallas) H. M. Hall & Clements, *Carnegie Inst. Washington Publ.* **326**: 122 (1923) (*A. nana* Gaudin): Like subsp. (d) but stems up to 25 cm; most panicle-branches with 1–3 capitula; involucre 5–6 mm; outer bracts almost entirely herbaceous. $2n=18$, 36. *Alps, Arctic Russia.* (*Circumpolar.*)

57. A. scoparia Waldst. & Kit., *Pl. Rar. Hung.* **1**: 66 (1801). Like **56 (a)** but biennial with slender stock and 1 flowering stem 30–60 cm; stem and leaves with sparse, sericeous, patent hairs or sometimes glabrous; capitula subglobose, recurved; involucre 1·5–2 mm. *C. & E. Europe.* Al Au Bu Cz Ge Hu Ju Po Rm Rs 1·5–2 mm. *C. & E. Europe.* Al Au Bu Cz Ge Hu Ju Po Rm Rs (C, W, K, E) Tu [Ga].

Tribe **Senecioneae** Cass.[1]

Leaves alternate, very rarely opposite, simple or pinnatisect. Capitula with or without ligules; outer florets usually female, the inner hermaphrodite or functionally male; corolla usually yellow.

[1] Edit. T. G. Tutin. [2] By T. G. Tutin. [3] By I. Dingwall.

Receptacle without scales. Anthers usually sagittate but not caudate at base. Style-branches truncate and papillose at apex, sometimes with a non-stigmatic apex. Pappus of hairs.

89. Tussilago L.[2]

Perennial herbs. Leaves all basal. Scapes numerous, each with one medium capitulum. Involucral bracts in 1 row. Receptacle slightly convex, without scales. Ligulate florets in many rows, female, yellow; tubular florets few, functionally male. Achenes narrowly cylindrical, with 5 ribs, truncate at apex; pappus-hairs numerous, in 1 row, denticulate.

1. T. farfara L., *Sp. Pl.* 865 (1753). Rhizomes long, whitish, scaly, bearing rosettes of leaves. Leaves 10–20(–30) cm, suborbicular, shallowly sinuately lobed and irregularly denticulate, cordate at base, green but thinly floccose above when young, persistently whitish-lanate beneath; petiole sulcate on adaxial surface. Scapes 4–15 cm, elongating in fruit, axillary, with numerous purplish scales, floccose, appearing before the leaves, erect in bud, nodding after anthesis. Involucre *c.* 10 mm; bracts numerous, linear-lanceolate, obtuse, purplish and with a scarious margin. Achenes *c.* 3 mm. $2n=60$. *Damp places, particularly on clay soils. Almost throughout Europe.* All except Az Bl Cr Lu.

90. Petasites Miller[3]
(incl. *Nardosmia* Cass.)

Dioecious perennial herbs. Leaves usually basal. Scapes with few to numerous scale-leaves and 1-many capitula, greatly elongating in fruit. Involucral bracts in 1–2 rows. Receptacle flat, without scales. Male capitula with numerous tubular, functionally male florets, usually with a peripheral ring of 1–5 (–10) sterile ligulate or tubular female florets; female capitula with numerous fertile ligulate or tubular female florets and 0–5(–8) sterile tubular florets in the centre. Achenes cylindrical, glabrous; pappus-hairs numerous in female, few in male florets, simple.

The key is divided into two parts, one for vegetative and one for flowering material. Vegetative characters refer to mature leaves; cauline scale-leaves comprise those up to the lowest branch of the inflorescence.

Literature: J. Toman, *Folia Geobot. Phytotax.* (*Praha*) **7**: 381–406 (1972).

KEY TO VEGETATIVE PLANTS

1 At least some leaves with lamina cuneate at base **11. sibiricus**
1 Lamina cordate to somewhat truncate at base
2 Mature leaves tomentose above **10. doerfleri**
2 Mature leaves ±glabrous above
3 Leaves glabrous beneath **5. radiatus**
3 Leaves tomentose or lanate beneath, or pubescent on the veins
4 Leaves regularly lobed, with the lobes dentate
5 Lamina without or with 1 lateral vein bordering the sinus **1. albus**
5 Lamina with 2–5 lateral veins bordering the sinus **2. hybridus**
4 Leaves not with regular, dentate lobes
6 Leaves reniform-cordate, not angular in outline
7 Leaves regularly dentate **8. fragrans**
7 Leaves irregularly dentate **9. japonicus**
6 Leaves somewhat angular in outline
8 Leaves coarsely dentate or lobed; apices of teeth or lobes (8–)10–20 mm apart **7. frigidus**
8 Leaves dentate; apices of teeth 2–6(–10) mm apart
9 Outer scales of leaf-buds strap-shaped, without a rudimentary lamina; leaves almost always 2(–5)-lobed on each side at the base **6. spurius**
9 Outer scales of leaf-buds ± ovate, or with a rudimentary lamina; leaves not or very rarely 2-lobed on each side at the base
10 Leaves ± triangular-cordate to hastate, densely white-tomentose beneath **3. paradoxus**
10 Leaves usually orbicular-cordate, greyish or greenish beneath, not or sparsely tomentose
11 Leaves sparsely tomentose beneath; petiole-furrow winged **2. hybridus**
11 Leaves glabrous beneath except on the veins; petiole-furrow not winged **4. kablikianus**

KEY TO PLANTS WITH INFLORESCENCES

1 Bract subtending the lowest inflorescence-branch 1·7–4 cm wide, and almost as long as the scale-leaves near the base of the scape
2 Scape with more than 7 scale-leaves **9. japonicus**
2 Scape with 2–7 scale-leaves **8. fragrans**
1 Bract subtending the lowest inflorescence-branch 0·5–1·6 cm wide, usually much shorter than the scale-leaves near the base of the scape
3 Marginal florets ligulate
4 Involucral bracts glabrous except for the minutely ciliate apex
5 Middle scale-leaves of scape 2·5–4(–7) cm **5. radiatus**
5 Middle scale-leaves of scape 5–10·5 cm **6. spurius**
4 Involucral bracts pubescent or with a few long hairs
6 Middle scale-leaves of scape 1–2 cm
7 Scapes with 1–3 capitula; involucre 6–7 mm **11. sibiricus**
7 Scapes with 3–10 capitula; involucre 8–10 mm **10. doerfleri**
6 Middle scale-leaves of scape 2·5–7 cm
8 Involucral bracts pubescent; apex ciliate or somewhat fimbriate **7. frigidus**
8 Involucral bracts with a few long hairs; apex not ciliate or fimbriate **8. fragrans**
3 Marginal florets tubular
9 Involucral bracts glabrous except for a few hairs round the base and sometimes at apex
10 Middle scale-leaves of scape of male 2–5·5 cm, of female 1·5–4·5 cm; apex of involucral bracts entire, not ciliate **2. hybridus**
10 Middle scale-leaves of scape of male 5·5–10·5 cm, of female 5–10 cm; apex of involucral bracts minutely ciliate or fimbriate **6. spurius**
9 Involucral bracts minutely pubescent (sometimes glabrescent in fruit)
11 Involucral bracts purplish **3. paradoxus**
11 Involucral bracts pale green
12 Heads of glandular hairs on involucral bracts not more than twice as wide as their stalks **1. albus**
12 Heads of glandular hairs on involucral bracts 3 times as wide as their stalks **4. kablikianus**

1. P. albus (L.) Gaertner, *Fruct. Sem. Pl.* **2**: 406 (1791). Leaves orbicular-cordate, lanate beneath, more or less glabrous above when mature, without or with 1 lateral vein bordering the sinus; basal lobes usually divergent; margin regularly lobed, the lobes toothed, the teeth acute. Scapes with 5–26 scale-leaves, rarely sheathing at the base, the middle 1·8–5·5 cm, fewer than half with a rudimentary lamina. Capitula 5–40 in the male, 13–45 in the female. Involucre 6–12 mm; bracts pale green, with entire apex, minutely hairy, with glandular hairs with heads not more than twice as wide as their stalks. Florets yellowish-white, all tubular; corolla-lobes 2–4 mm. Stigma of male florets 1·5–2·8 mm, divided almost to the base. $2n=60$. *Damp shady places, mainly in the mountains. From S. Norway southwards to S.C. France, S. Italy and Bulgaria.* Al Au Bu Co Cz Da Ga Ge He Hu It Ju No Po Rm Rs (W) Su [Br Fa Rs (B)].

2. P. hybridus (L.) P. Gaertner, B. Meyer & Scherb., *Fl. Wett.* **3**: 184 (1801) (*P. officinalis* Moench). Leaves orbicular-cordate, somewhat angular, sparsely tomentose beneath, with 2–5 lateral veins bordering the sinus; basal lobes convergent; margin irregularly toothed, the teeth obtuse; apices of teeth 2–6(–10) mm apart. Scapes with 6–21 scale-leaves in the male, 17–38 in the female, not sheathing at the base, the middle 2–5·5 cm, fewer than half with a rudimentary lamina. Capitula 16–55 in the male, (25–)32–130 in the female. Involucre of male 5·5–8·5 mm, of female 2·5–6 mm; bracts purplish, with entire apex, glabrous except for a few hairs at base. Florets pale lilac-pink or yellowish, all tubular. Stigma of male florets 0·5–1·3 mm, divided only at the apex. $2n=60$. *River-banks and other damp places. Europe, northwards to Scotland, N.C. Germany and C. Russia; naturalized in the Baltic region and Fennoscandia.* Al Au Be Br Bu Co Cz Ga Ge Gr Hb He Ho Hs Hu It Ju Po Rm Rs (C, W, K, E) Tu [Da Fe No Rs (B) Su].

In parts of N. Europe the female plant is rare or absent; these are mainly regions in which the species has been introduced.

(a) Subsp. **hybridus**: Involucral bracts purplish; florets pinkish. *Throughout most of the range of the species.*

(b) Subsp. **ochroleucus** (Boiss. & Huet) Šourek, *Rozpr. Česk. Akad. Věd.* **72(5)**: 26 (1962): Involucral bracts greenish; florets yellowish. *S. part of Balkan peninsula.*

3. P. paradoxus (Retz.) Baumg., *Enum. Stirp. Transs.* **3**: 94 (1816) (*P. niveus* (Vill.) Baumg.). Leaves triangular-cordate to hastate, rarely somewhat 2-lobed at the base, densely white-tomentose beneath, with 1–3 lateral veins bordering the sinus; basal lobes usually divergent; margin usually regularly toothed, the teeth obtuse; apices of teeth 2–6(–10) mm apart. Scapes with 5–22 scale-leaves, not sheathing at the base, the middle 2–5(–6) cm, fewer than half with a rudimentary lamina. Capitula 5–26 in the male, 11–32 in the female. Involucre of male 5·5–10 mm, of female 3·5–8 mm; bracts reddish, with entire apex, minutely glandular-pubescent. Florets reddish-pink to white, all tubular. Stigma of male florets 1·5–3 mm. $2n=60$. *Stream-banks and wet stony ground; calcicole.* ● *Mountain regions of Europe, from the Pyrenees to the E. Carpathians and C. Jugoslavia.* Au Ga Ge He Hs It Ju Rm.

Hybrids between **1** and **3** and between **2** and **3** are recorded from a number of countries, chiefly in C. Europe.

4. P. kablikianus Tausch ex Berchtold, *Lotos* **1**: 120 (1851) (*P. glabratus* (J. Maly) Borbás). Leaves orbicular to triangular-cordate, somewhat angular in outline, glabrous beneath, except on the veins; basal lobes usually convergent, with 3–5 lateral veins bordering the sinus; margin regularly to irregularly toothed; apices of teeth 2–6(–10) mm apart. Scapes with 4–16 scale-leaves, the lower almost sheathing at the base, the middle 2·2–5·5 cm, fewer than half with a rudimentary lamina. Capitula 5–22 in the male, 18–33 in the female. Involucre of male 6–10 mm, of female 6–7·5 mm; bracts pale green, with a usually entire apex, minutely hairy, with glandular hairs with heads 3 times as wide as their stalks. Florets white or pale yellow, all tubular; corolla-lobes 1–2 mm. Stigma of male florets 1·7–3 mm, divided for more than half its length. $2n=60$. *Wet gravel, stream-banks and wooded gorges.* ● *Sudeten Mts; Carpathians; N. & C. parts of Balkan peninsula.* Al Bu Cz Ju Po Rm Rs (W).

The hybrid **1 × 3** is often confused with this species, but has the leaves tomentose beneath, with 1–2 lateral veins bordering the sinus, purplish florets and corolla-lobes 2–4 mm.

5. P. radiatus (J. F. Gmelin) J. Toman, *Folia Geobot. Phytotax.* (*Praha*) **7**: 388 (1972) (*P. laevigatus* Reichenb., *Nardosmia*

laevigata (Reichenb.) DC.). Leaves triangular-hastate to reniform; basal lobes divergent; margin regularly toothed; lamina glabrous. Scapes with 4–5(–8) scale-leaves, the lowest completely sheathing the stem at the base, rarely with a rudimentary lamina, the middle 2·5–4(–7) cm. Capitula *c.* 5 in the male, *c.* 10 in the female. Involucre 5·5–6 mm; bracts purplish or green, glabrous, with a minutely ciliate or shortly fimbriate apex. Florets yellowish or pinkish. Ligules in the male 2·8–4 mm, in the female *c.* 1·5 mm. Stigma of male florets *c.* 1·3 mm. *Wet river-gravels. N. & E. Russia, southwards to* 52° *N. in S. Ural.* Rs (N, C).

6. P. spurius (Retz.) Reichenb., *Fl. Germ. Excurs.* 279 (1831). Leaves triangular-hastate, 2- to 3(–5)-lobed on each side at the base, glabrous above, hairy beneath, with 2–5 lateral veins bordering the sinus; margin regularly toothed. Scapes with 2–12 scale-leaves, the lower sheathing at the base, few or none with a rudimentary lamina, the middle 5–10·5 cm. Capitula 10–45. Involucre of male 5·5–8 mm, of female 4–6 mm; bracts pale green, glabrous, with a minutely ciliate or shortly fimbriate apex. Florets yellowish. Ligules in the male 2·2–4·5 mm, in the female 0·5–3 mm, convolute except in fully opened florets. Stigma of male florets 0·3–1 mm. $2n=60$. *Sandy sea-shores and river-banks. U.S.S.R. and E. Romania, extending very locally north-westwards to N.W. Germany and formerly to S.W. Finland* (*Ahvenanmaa*). Da †Fe Ge Po Rm Rs (N, B, C, W, E) Su.

7. P. frigidus (L.) Fries, *Summa Veg. Scand.* 182 (1846) (*Nardosmia frigida* (L.) Hooker, *N. angulosa* Cass.). Leaves triangular-cordate, glabrous above, hairy beneath; basal lobes divergent, with 1–2 lateral veins bordering the sinus; margin coarsely dentate or lobed; apices of teeth (8–)10–20 mm apart. Scapes with 4–11 scale-leaves, the lower usually sheathing at the base, the middle in the male 3·1–6·2 cm, in the female 2·5–4·8 cm, usually fewer than half with a rudimentary lamina. Capitula 5–9 in the male, 8–12 in the female. Involucre 6–9 mm; bracts purplish or green, pubescent. Florets whitish-yellow or reddish. Ligules in the male 3–5·5 mm, in the female 2–2·5 mm. Stigma of male florets 1–1·8 mm. $2n=60$. *Stream-sides, bogs and other wet places. N. Europe, southwards to S. Norway and C. Ural.* Fe No Rs (N, C) Sb Su.

8. P. fragrans (Vill.) C. Presl, *Fl. Sic.* **1**: xxviii (1826). Leaves reniform-cordate, glabrous above, hairy beneath; basal lobes slightly convergent to divergent, with 2–5 lateral veins bordering the sinus; margin regularly dentate. Scapes often appearing while the previous season's leaves are green, with 2–7 scale-leaves, the lower usually sheathing at the base, the middle 3–7 cm, more than half with a rudimentary lamina. Capitula 6–20. Involucre 7–10·5 mm; bracts pale green or purplish, glabrous except for a few long hairs. Florets whitish-pink, vanilla-scented. Ligules 4–5·5 mm. Stigma of male florets 1·5–2·5 mm. $2n=58, 59, 60, 61$. *Damp, shady places. C. Mediterranean region; cultivated for ornament in W. Europe and widely naturalized.* It Sa Si [Az Be Bl Br Co Da Ga Hb He Hs Lu].

Only the male plant is known
Only the male plant is known.

9. P. japonicus (Siebold & Zucc.) Maxim., *Razb. Rukop. Sočin. F. Schmidta Reis. Amurl.* 17 (1866) (*Nardosmia japonica* Siebold & Zucc.). Leaves reniform-cordate, glabrous above, hairy beneath; basal lobes convergent, with *c.* 5 lateral veins bordering the sinus; margin irregularly dentate. Scapes with 15–25 scale-leaves, the lower almost cordate at the base, the middle 5–7 cm, rarely with a rudimentary lamina. Capitula *c.* 35. Involucre 8–10 mm; bracts pale green, sparsely pubescent, with usually entire apex; bract subtending the lowest inflorescence-branch 1·7–4 cm wide. Florets all tubular. Stigma of male florets 1·6–1·8 mm. $2n=84–87$. *Stream-banks. Locally naturalized from gardens in N.W. & C. Europe.* [Br Cz Da Ho.] (*Japan, Sakhalin.*)

Only the male plant is naturalized in Europe.

10. P. doerfleri Hayek, *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **94**: 196 (1917). Leaves orbicular-cordate, tomentose above; basal lobes divergent, without lateral vein-branches bordering the sinus; margin regularly toothed. Scapes with 4 or more scale-leaves, the lower almost sheathing at the base, the middle *c.* 1·5 cm, fewer than half with a rudimentary lamina. Capitula 3–10; involucre 8–10 mm; bracts purplish, pubescent, with an entire to somewhat fimbriate apex. Stigma of male florets 1·5–2 mm, not bifid to the base. Florets pale yellow or reddish. Ligules in the male 5–6 mm. *Wet screes.* ● *N. Albania* (*Bjeshkët e Nemura*). Al ?Ju.

11. P. sibiricus (J. F. Gmelin) Dingwall, *Bot. Jour. Linn. Soc.* **71**: 273 (1975) (*P. gmelinii* Polunin, *Tussilago sibirica* J. F. Gmelin). Leaves elliptical to ovate, cuneate to truncate at the base, without a sinus; margin weakly and remotely toothed. Scapes with 3–4 scale-leaves, the lower sheathing the stem at the base, the middle 1·3–2 cm, none with a rudimentary lamina. Capitula 1–3; involucre 6–7 mm; bracts purplish, sparsely tomentose, with an entire to somewhat ciliate apex. Florets whitish. Ligules in the female *c.* 3·5 mm. *Stony tundra. N. Ural.* Rs (N). (*N. Asia and North America.*)

91. Homogyne Cass.[1]

Perennial herbs. Leaves mostly basal. Stems with 1 to few medium capitula. Involucral bracts in 1 row. Receptacle flat, without scales. Outer row of florets with short ligules, female, purplish; tubular florets numerous, hermaphrodite. Achenes narrowly cylindrical, 5- to 10-ribbed, truncate at apex; pappus-hairs numerous, in 1 row, denticulate.

1 Leaves whitish-lanate beneath **2. discolor**
1 Leaves green or grey-green and glabrous or thinly floccose beneath
2 Leaves crenate-dentate; stems always with 1 capitulum **1. alpina**
2 Leaves shallowly lobed, the lobes with mucronate teeth; stems with more than 1 capitulum **3. sylvestris**

1. H. alpina (L.) Cass., *Dict. Sci. Nat.* **21**: 412 (1821). Rhizomes slender, with numerous lanate scales. Basal leaves usually 2–4 cm, orbicular, crenate-dentate, cordate at base, thinly floccose on the veins beneath, glabrescent, coriaceous; petiole 2–10 cm, hairy. Stems 10–40 cm, each with 1 capitulum, with thin arachnoid indumentum below, lanate above; cauline leaves few, small, sessile, the upper lanceolate, entire. Involucre 8–10 mm; bracts linear-lanceolate, obtuse, purplish; florets purplish-red. Achenes 4–5 mm; pappus pure white. $2n=120, 160$. *Damp or shady places.* ● *Mountains and hill-country of W., C. & S. Europe, from C. France and the Sudeten Mountains southwards to the Pyrenees, C. Appennini and S. Bulgaria.* Al Au Bu Cz Ga Ge He Hs It Ju Po Rm Rs (W) [Br].

2. H. discolor (Jacq.) Cass., *op. cit.* 413 (1821). Like **1** but basal leaves 1–3 cm, whitish-lanate beneath; stems up to 25 cm, distinctly thickened upwards, with usually 2 amplexicaul scale-leaves; florets bright purple; pappus dirty white. $2n=60$. *Stony slopes and screes; calcicole.* ● *E. Alps; mountains of C. Jugoslavia.* Au Ge It Ju.

[1] By T. G. Tutin.

3. H. sylvestris Cass., *loc. cit.* (1821). Like **1** but basal leaves 3–7 cm, with 5–9 shallow lobes, each lobe with usually 3 mucronate teeth, sparsely and shortly hairy on the veins beneath, thin; lower cauline leaves usually petiolate; stems often branched, with glandular arachnoid indumentum above; involucre 10–12 mm. $2n=58$. *Woods and scrub.* ● *S.E. Alps; mountains of W. & C. Jugoslavia.* Au It Ju.

92. Adenostyles Cass.[1]

Perennial herbs. Leaves alternate. Inflorescence corymbose, with numerous small capitula. Florets all tubular and hermaphrodite. Involucral bracts 3–8, with few small supplementary bracts. Receptacle flat, without scales. Achenes subterete, 10-ribbed; pappus-hairs numerous, in 2–3 rows, denticulate.

1 Leaves white-floccose-lanate, at least beneath **3. leucophylla**
1 Leaves green on both surfaces, glabrous to rather sparsely arachnoid-pubescent beneath
2 Upper cauline leaves sessile and semi-amplexicaul, or petiolate, with semi-amplexicaul auricles; teeth very unequal; ultimate veins forming an indistinct, lax reticulum beneath **1. alliariae**
2 Upper cauline leaves usually petiolate, without semi-amplexicaul auricles; teeth ±equal; ultimate veins forming a prominent, close reticulum beneath **2. alpina**

1. A. alliariae (Gouan) A. Kerner, *Österr. Bot. Zeitschr.* **21**: 12 (1871) (*A. albifrons* Reichenb.). Stem 60–200 cm, erect, stout, branched, often floccose. Lower leaves 20–50 cm wide, triangular-cordate to reniform, usually somewhat arachnoid-pubescent beneath, with coarse, very unequal teeth; ultimate veins forming an indistinct, lax reticulum beneath; upper cauline leaves small, sessile and semi-amplexicaul or petiolate, with semi-amplexicaul auricles. Capitula cylindrical; involucral bracts oblong, acute, glabrous, usually purplish. Florets reddish-purple, rarely white. Achenes *c.* 3 mm. $2n=38$. *Wood- and stream-margins, scrub and damp rocky slopes.* ● *Mountains of Europe, from the Vosges and the Carpathians southwards to C. Spain, Corse and N. Greece.* Al Au Bu Co Cz Ga Ge Gr He Hs It Ju Po Rm Rs (W).

(a) Subsp. **alliariae**: Capitula with 3–4(–6) florets; involucre 4–6 mm. *Throughout most of the range of the species.*

(b) Subsp. **hybrida** (Vill.) Tutin, *Bot. Jour. Linn. Soc.* **67**: 282 (1973) (*A. hybrida* (Vill.) DC., *A. pyrenaica* Lange, *A. orientalis* Boiss.): Capitula with (10–)12–15(–18) florets; involucre 7–10 mm. *From the Pyrenees and Romania southwards.*

2. A. alpina (L.) Bluff & Fingerh., *Comp. Fl. Germ.* **2**: 329 (1825) (*A. glabra* (Miller) DC.). Like **1** but stem 30–50(–80) cm, branched only in the inflorescence; lower leaves usually 10–15 cm wide, reniform, usually glabrous or nearly so beneath, with almost equal teeth; ultimate veins forming a prominent, close reticulum beneath; upper cauline leaves usually petiolate, neither amplexicaul nor auriculate; involucral bracts 4–5 mm, widened towards the apex, obtuse. $2n=38$. *Wood- and stream-margins, scrub and damp rocky slopes.* ● *Alps, Appennini, Jura, Corse.* Au Co Ga Ge He It Ju.

(a) Subsp. **alpina**: Stems and branches of the inflorescence floccose; capitula with 3–5 bracts and 3–6 florets; corolla-lobes 2·5–3·2 mm. *Throughout the range of the species, except Corse.*

(b) Subsp. **briquetii** (Gamisans) Tutin, *Bot. Jour. Linn. Soc.* **70**: 18 (1975) (*A. briquetii* Gamisans): Stems and branches of the inflorescence glabrous; capitula with 4–8(–10) bracts and (5–)6–12(–19) florets; corolla-lobes 0·7–1·7 mm. *Corse.*

[1] By T. G. Tutin. [2] By I. K. Ferguson.

3. A. leucophylla (Willd.) Reichenb., *Fl. Germ. Excurs.* 278 (1831) (*A. tomentosa* Schinz & Thell.). Like **1** but stem usually *c.* 30 cm, whitish-floccose; lower leaves usually less than 10 cm wide, white-floccose-lanate, at least beneath, with nearly equal teeth; ultimate veins inconspicuous beneath; upper cauline leaves petiolate, without auricles; capitula with 12–15(–32) florets; involucral bracts 4–5 mm, oblanceolate to obovate, obtuse or subacute, floccose. $2n=38$. *Screes and rocky slopes.* ● *Alps, eastwards to c.* 11° *E.* Au Ga He It.

A. × intermedia Hegetschw., *Fl. Schweiz* 812 (1840) (*A. alliariae* × *leucophylla*), occurs with the parents and sometimes in the absence of *A. leucophylla*. It is more or less intermediate between them and rather variable.

93. Arnica L.[2]

Herbaceous, rhizomatous perennials. Leaves simple, usually mainly basal; cauline few, opposite. Florets yellow. Involucral bracts herbaceous, usually in 2 rows. Receptacle convex, hairy. Ligulate florets female; tubular florets hermaphrodite. Achenes ribbed; pappus of 1 row of simple hairs.

Literature: B. Maguire, *Brittonia* **4**: 386–510 (1943).

Leaves 0·5–2 cm wide, narrowly oblanceolate to elliptic-lanceolate; cauline usually scattered on stem **1. angustifolia**
Leaves 2–4 cm wide, obovate or elliptical to oblanceolate; cauline usually crowded near base of stem **2. montana**

1. A. angustifolia Vahl in Hornem., *Fl. Dan.* **9(26)**: 5 (1816) (*A. alpina* (L.) Olin, non Salisb.). Stems 10–45 cm. Basal leaves 5–15 × 0·5–2 cm, narrowly or rarely broadly oblanceolate to elliptic-lanceolate, entire, pubescent or glandular-pubescent; cauline leaves (0–)1–3(–5) pairs, smaller. Capitula solitary (seldom 3), 3·5–4·5 cm in diameter; peduncles usually without bracts, densely villous and with glandular hairs. Involucral bracts 10–16 × 1·5–2·5 mm, lanceolate. Ligules 15–25(–30) × (4–)5–7 mm, with 2–3 teeth 2–4 mm. Achenes 5–7 mm; pappus about as long as the corolla. *Meadows; calcicole. Arctic Europe.* Fe No Rs (N) Sb Su.

(a) Subsp. **alpina** (L.) I. K. Ferguson, *Bot. Jour. Linn. Soc.* **67**: 282 (1973) (*A. montana* var. *alpina* L.): Stems 10–25(–30) cm. Cauline leaves usually 1–2 pairs. Peduncle with short glandular hairs obscured by long eglandular hairs. $2n=76$. *N. Fennoscandia and Svalbard.*

(b) Subsp. **iljinii** (Maguire) I. K. Ferguson, *loc. cit.* (1973) (*A. alpina* subsp. *iljinii* Maguire, *A. iljinii* (Maguire) Iljin): Stems 15–45 cm. Cauline leaves usually 3 pairs. Peduncle with long glandular hairs intermixed with eglandular hairs. $2n=56$. *N.E. Russia.* (*N. Siberia.*)

Subsp. *angustifolia* occurs in Greenland and arctic America.

2. A. montana L., *Sp. Pl.* 884 (1753). Stems (15–)25–60 cm. Basal and lower cauline leaves 6–17 × (1·2–)2–4(–5) cm, obovate or elliptical to oblanceolate, densely glandular-pubescent or -puberulent on the upper surface. Capitula 1–3(–7); peduncles with usually 2 alternate, linear-lanceolate bracts, and with glandular and long eglandular hairs. Involucral bracts (12–)14–17 × 2–3 mm, lanceolate. Ligules 18–25(–30) × (4–)5–8 mm, with 2–3 teeth 2–3 mm. Achenes 6·5–9 mm; pappus about as long as the corolla. $2n=38$. *Meadows, pastures and heaths, mainly in the mountains; somewhat calcifuge.* ● *From S. Norway and Latvia southwards to S. Portugal, N. Appennini and S. Carpathians.* Au Be Cz Da Ga Ge He Ho Hs Hu It Ju Lu No Po Rm Rs (B. C. W) Su.

(a) Subsp. **montana**: Lower leaves obovate to elliptical, 2–5 cm wide, subsessile. Involucral bracts 18–24; capitula 5–8 cm in diameter. *Throughout the range of the species except Portugal.*

(b) Subsp. **atlantica** A. Bolós, *Agron. Lusit.* **10**: 113 (1948): Lower leaves oblanceolate, (1·2–)1·7–2·5 cm wide, shortly petiolate. Involucral bracts 11–18; capitula 4–5 cm in diameter. *From S.W. France to S. Portugal.*

94. Doronicum L.[1]

Herbaceous perennials, usually with tubers or stolons. Leaves simple, alternate. Flowers yellow. Involucral bracts in 2–3 rows, herbaceous. Receptacle convex, often hairy. Ligulate florets female, in 1 row; tubular florets hermaphrodite. Achenes ribbed; pappus of 1–2 rows of simple hairs or sometimes absent in ligulate florets.

Literature: F. Cavillier, *Annu. Cons. Jard. Bot. Genève* **10**: 177–251 (1907); **13–14**: 195–368 (1911). G. Rouy, *Rev. Bot. Syst. Géogr. Bot.* **1**: 17–22, 33–40, 49–56 (1903).

1 Basal leaves narrowed at base
2 Ligulate florets without a pappus
3 Rhizome ±glabrous; cauline leaves oblong to narrowly elliptical **7. hungaricum**
3 Rhizome with tufts of sericeous hairs; cauline leaves ovate-elliptical **6. plantagineum**
2 Ligulate florets with a pappus
4 Inflorescence with 3–8 capitula **1. corsicum**
4 Inflorescence with 1 capitulum
5 Rhizome with tufts of sericeous hairs; basal leaves ovate **10. grandiflorum**
5 Rhizome ±glabrous; basal leaves elliptic-oblong
6 Leaves thick, somewhat fleshy, with short glandular hairs on margins **11. glaciale**
6 Leaves thin, with eglandular hairs on margins **12. clusii**
1 Basal leaves cordate or subcordate, not or scarcely narrowed at base
7 Ligulate florets with a pappus **10. grandiflorum**
7 Ligulate florets without a pappus
8 Inflorescence with 4–12(–17) capitula
9 Lower cauline leaves panduriform, amplexicaul **2. austriacum**
9 Lower cauline leaves ±petiolate
10 Robust, up to 130 cm; basal leaves (10–)15–20 × 10–18 cm, glabrous or glabrescent **9. cataractarum**
10 Smaller, up to 90 cm; basal leaves (6–)7–12(–15) × (5–)7–11(–14) cm, pubescent **8. pardalianches**
8 Inflorescence with 1–3 capitula
11 Petioles densely villous **8. pardalianches**
11 Petioles glabrous or sparsely hairy
12 Rhizome with very conspicuous tufts of sericeous hairs
13 Capitula solitary; cauline leaves 1–2(–3) **4. orientale**
13 Capitula (1–)2–3; cauline leaves 6–8 **5. carpetanum**
12 Rhizome glabrous or with very small sparse tufts of sericeous hairs
14 Lower cauline leaves sessile, amplexicaul **3. columnae**
14 Lower cauline leaves distinctly petiolate, not amplexicaul **5. carpetanum**

1. D. corsicum (Loisel.) Poiret in Lam., *Encycl. Méth. Bot., Suppl.* **2**: 517 (1812) (*Aronicum corsicum* (Loisel.) DC.). Stems up to 120 cm, glandular-hairy above, more or less glabrous below. Basal leaves 9–16 × 3–7 cm, ovate, shortly petiolate; cauline leaves ovate-lanceolate to lanceolate, acute or acuminate, amplexicaul, sinuate-dentate, glabrous or sparsely pubescent. Capitula 2·5–4·5(–5) cm in diameter, 3–8 in a terminal corymb; peduncles glandular-pubescent. Involucral bracts 7–11(–15) mm, lanceolate, glandular-pubescent, shortly ciliate. All achenes with a pappus. $2n=60$. *By mountain streams.* ● *Corse.* Co.

2. D. austriacum Jacq., *Fl. Austr.* **2**: 18 (1774) (*D. orphanidis* Boiss.). Stems up to 100 cm, glabrous, or hairy with long crispate hairs. Basal leaves 9–13 × 6–8 cm, ovate, obtuse, somewhat cordate, petiolate; lower cauline leaves ovate to lanceolate, panduriform, amplexicaul; upper cauline leaves ovate-lanceolate, pubescent or more or less glandular-puberulent, entire or denticulate. Capitula 3·5–6 cm in diameter, 5–12(–17) in a terminal corymb; peduncles glandular-pubescent. Involucral bracts 11–15 mm, linear-lanceolate, more or less pubescent. Achenes of marginal florets without a pappus. $2n=60$. *Damp or shady places. Mountains of C. & S. Europe, from C. France and the Carpathians southwards to N.W. Spain, N. Appennini and N. Greece.* Al Au Bu Cz Ga Ge Gr Hs Hu It Ju Po Rm Rs (W).

3. D. columnae Ten., *Fl. Nap.* **1**, *Prodr.*: 49 (1811) (*D. cordatum* auct., non Lam.). Stems 12–60 cm, glabrous or sparsely pubescent. Rhizome glabrous or sparsely pubescent. Basal leaves 3–7(–8) × 3–6·5(–7·5) cm, ovate-orbicular or cordate, long-petiolate, glabrous or pubescent, especially on the margin, crenate-dentate; cauline leaves 3–4, the lower elliptical to ovate-lanceolate, sometimes weakly panduriform, amplexicaul, the upper ovate-lanceolate, amplexicaul. Capitula solitary, (2–)2·5–5(–6) cm in diameter; peduncles glandular-pubescent. Involucral bracts 8–14(–18) mm, linear-lanceolate, *c.* ½ as long as ligules, densely glandular-pubescent. Achenes of marginal florets without a pappus. *Shady mountain rocks. E. Alps, Appennini, mountains of Romania and Balkan peninsula.* Al Au Bu Ge Gr It Ju Rm Rs (W).

4. D. orientale Hoffm., *Comment. Soc. Phys.-Med. Univ. Mosq.* **1**: 8 (1808) (*D. caucasicum* Bieb.). Like **3** but rhizome with conspicuous tufts of sericeous hairs; cauline leaves 1–2(–3), usually weakly crenate. $2n=60$. *Woods and shady mountain rocks. S.E. Europe, extending to the Carpathians and C. Italy.* Al Bu Gr Hu It Ju Rm Rs (W) Si Tu.

Plants from the E. & S. Carpathians with all the achenes with a pappus have been described as **D. carpaticum** (Griseb. & Schenk) Nyman, *Syll., Suppl.* 1 (1865) but are doubtfully distinct from **4.**

5. D. carpetanum Boiss. & Reuter ex Willk. in Willk. & Lange, *Prodr. Fl. Hisp.* **2**: 108 (1865). Stems (15–)40–80 cm. Rhizome glabrous or with sparse tufts of sericeous hairs. Basal and lower cauline leaves 4–7 × 3–6 cm, ovate-orbicular, cordate, long-petiolate, crenate-dentate to subentire; cauline leaves 6–8, the middle ovate, shortly petiolate with expanded petioles clasping the stem, or leaves sub-panduriform; the upper lanceolate, sessile, amplexicaul. Capitula (1–)2–3, 4–5 cm in diameter; peduncles glandular-pubescent. Involucral bracts 8–14 mm, linear-lanceolate, glandular-pubescent. Achenes of marginal florets without a pappus. $2n=60$, 120. *Mountain pastures and rocky places.* ● *N. & C. Spain, N. Portugal.* ?Ga Hs Lu.

6. D. plantagineum L., *Sp. Pl.* 885 (1753). Stems up to 80 cm, glabrous below, pubescent above. Rhizome with tufts of sericeous hairs at nodes. Basal leaves 5–11 × 3–5(–6) cm, ovate-elliptical, narrowed to a long petiole, entire or weakly dentate; lower cauline leaves ovate-elliptical, amplexicaul; upper lanceolate. Capitula usually solitary, 3–5 cm in diameter; peduncles glandular-pubescent. Involucral bracts 14–20 mm, linear, ciliate, *c.* ⅔ as long as ligules. Achenes of marginal florets without a pappus. $2n=120$. *Woods, pastures and heaths.* ● *W. Europe, northwards to N. France.* Ga Hs It Lu [Br Ho].

[1] By I. K. Ferguson.

7. D. hungaricum Reichenb. fil., *Icon. Fl. Germ.* **16**: 34 (1853) (*D. longifolium* sensu Griseb., non Reichenb.). Like **6** but more or less entirely glandular-pubescent; rhizome glabrous or sparsely sericeous; basal leaves 2–3·5(–6) × 0·5–1·5(–2) cm, oblong to narrowly elliptical, narrowed to an often indistinct petiole. $2n=60$. ● *Balkan peninsula and E.C. Europe.* Bu Cz ?Gr Hu ?It Ju Rm Rs (W).

8. D. pardalianches L., *Sp. Pl.* 885 (1753) (*D. cordatum* Lam.). Stems up to 90 cm, more or less pubescent. Rhizome with tufts of sericeous hairs. Basal leaves (6–)7–12(–15) × (5–)7–11(–14) cm, ovate-orbicular, cordate, pubescent, long-petiolate, dentate to subentire; lower cauline leaves ovate, cordate, petiolate; middle cauline panduriform; upper cauline ovate-lanceolate to lanceolate, amplexicaul. Capitula 3–5(–6) cm in diameter, (1–)2–6(–8) in a terminal corymb; peduncles glandular-pubescent. Involucral bracts (8–)12–18 mm, linear, *c.* ⅔ as long as ligules. Achenes of marginal florets without a pappus. $2n=60$. *Woods.* ● *W. Europe, northwards to c.* 51° *N. and extending eastwards to S.E. Germany and Italy; cultivated for ornament and naturalized elsewhere.* *Be Co Ga Ge *Ho Hs It [Au Br Cz].

Records from Romania and the Ukranian Carpathians are apparently errors, or refer to short-lived escapes from cultivation.

9. D. cataractarum Widder, *Feddes Repert.* **22**: 115 (1925). Like **8** but more robust, 80–130 cm; basal leaves (10–)15–20 × 10–18 cm, glabrous or glabrescent; capitula 4–10, 4–7(–10) cm in diameter; involucral bracts *c.* ½ as long as the ligules. *Streamsides and other shady places,* 1250–2000 *m.* ● *S.E. Austria* (*Koralpe*). Au.

10. D. grandiflorum Lam., *Encycl. Méth. Bot.* **2**: 313 (1786) (*Arnica scorpioides* sensu Jacq.). Stems up to 35 cm, pubescent. Rhizome with axillary tufts of sericeous hairs. Basal leaves 3·5–9 × 3–7 cm, ovate, more or less abruptly narrowed to a long petiole *c.* 6 cm, dentate or subentire, pubescent; lower cauline leaves long-petiolate; middle cauline more or less panduriform; upper lanceolate, amplexicaul. Capitula solitary, 3·5–6·5 cm in diameter; peduncles densely glandular-pubescent. Involucral bracts (13–)15–22 mm, linear-lanceolate, densely glandular-pubescent, *c.* ⅔ as long as ligules. All achenes with a pappus. $2n=60$. *Mountain rocks and screes; usually calcicole.* ● *From the Alps southwards to N. Spain, Corse and Albania.* Al Au Co Ga Ge He Hs It Ju ?Rm.

11. D. glaciale (Wulfen) Nyman, *Syll.* 1 (1854–55). Stems up to 20 cm. Rhizome more or less glabrous. Basal leaves 2–4·5 × 1·2–2 cm, elliptic-oblong to -ovate, thick, tapered to a petiole 2–5 cm, entire or sinuate-dentate to weakly lobed; lower cauline leaves similar but more shortly petiolate; middle cauline elliptic-lanceolate, amplexicaul; upper cauline lanceolate. Capitula solitary, 3·5–4·5 cm in diameter. Involucral bracts 8–14 mm, *c.* ½ as long as ligules, linear-lanceolate. All achenes with a pappus. *Screes and stony slopes.* ● *E. Alps.* Au Ge It Ju.

(a) Subsp. **glaciale**: Leaf-margin with long eglandular and short glandular hairs. Involucral bracts with short glandular hairs on the margin, occasionally intermixed with long hairs. *Throughout the range of the species except for part of N.E. Alps.*

(b) Subsp. **calcareum** (Vierh.) Hegi, *Ill. Fl. Mitteleur.* **6(2)**: 723 (1928) (*D. calcareum* Vierh.): Leaf-margin hairy, but short glandular hairs absent. Involucral bracts with long glandular hairs on the margin and few or no eglandular hairs. $2n=60$. *Calcicole. N.E. Alps.*

12. D. clusii (All.) Tausch, *Flora* (*Regensb.*) **11**: 178 (1828) (*D. stiriacum* (Vill.) Dalla Torre, *Aronicum clusii* (All.) Koch). Like **11** but stems up to 35 cm; leaves thin, more or less densely villous, eglandular on the margin; involucral bracts villous with some long glandular hairs on the margin; capitula 4·5–7·5 cm in diameter. $2n=60$, 120. *Alps, Carpathians, Pyrenees, Cordillera Cantábrica.* Au Cz Ga He Hs It Ju Po Rm Rs (W).

Plants from the E. Alps and Carpathians have densely villous leaves and may warrant being separated as subsp. **villosum** (Tausch) Vierh., *Österr. Bot. Zeitschr.* **50**: 205 (1900).

95. Erechtites Rafin.[1]

Annual or perennial herbs. Leaves simple, alternate. Capitula in terminal panicles. Involucral bracts in 1 row, with a few supplementary bracts below. Receptacle flat, without scales. All florets tubular, yellow, the outer female, the rest hermaphrodite or functionally male. Achenes linear-oblong, costate; pappus of numerous hairs.

1. E. hieracifolia (L.) Rafin. ex DC., *Prodr.* **6**: 294 (1838). More or less pubescent annual 50–100(–180) cm. Leaves *c.* 10 cm, those at the bottom and top of the stem much smaller, oblanceolate, acute, gradually narrowed at base, sessile, coarsely and irregularly serrate. Capitula 6–7 mm in diameter; involucre campanulate to almost cylindrical; bracts *c.* 15 mm, linear-lanceolate. Achenes 2·5 mm, sparsely puberulent; pappus 12–14 mm, white, silky. *Naturalized in E.C. Europe.* [Au Cz Hu Ju Po Rm.] (*Temperate N. & S. America.*)

96. Senecio L.[2]

Herbs or dwarf shrubs with alternate leaves. Leaves not or scarcely sheathing at the base. Capitula in corymbs, more rarely solitary; involucral bracts in one row, sometimes with shorter supplementary bracts at the base of the capitulum. Receptacle flat, without scales. Outer florets usually ligulate and female; inner florets hermaphrodite, tubular, yellow. Achenes usually more or less cylindrical, ribbed; pappus usually present, of simple or denticulate (rarely sub-plumose) hairs.

One of the largest genera in the world, of cosmopolitan distribution.

The leaf-shape of many species is very variable and identification on this character alone is unreliable. In the descriptions leaf-measurements include the petiole and measurements of diameter of capitulum include the ligules at anthesis.

S. farfarifolius Boiss. & Kotschy in Boiss., *Fl. Or.* **3**: 400 (1875), from S. Anatolia, has been doubtfully recorded from Greece. It is a perennial with erect, leafless stems and cordate-reniform, palmately veined basal leaves which are densely white-tomentose beneath, and has solitary capitula *c.* 20 mm in diameter with 8–14 orange-yellow ligules and 2–5 supplementary bracts.

1 Leaves palmately veined
2 Scrambling, glabrous plant; supplementary bracts present **1. mikanioides**
2 Erect plant, hairy at least in part; supplementary bracts absent
3 Ligules 5–6, 10–12 mm, yellow **32. petasitis**
3 Ligules 7–12, 4–9 mm, purple or bluish **31. malvifolius**
1 Leaves pinnately veined
4 Ligules absent
5 Glabrous annual **67. flavus**
5 Perennial, usually obviously hairy, or hairy annual

By T. G. Tutin. By A. O. Chater and S. M. Walters.

6 Supplementary bracts absent **(33–39). integrifolius** group
6 Supplementary bracts present
7 Scapose, with solitary capitulum **10. boissieri**
7 Not scapose, the capitula several or many
8 Stems and lower surface of leaves densely white-tomentose
9 Achenes 3–4 mm, glabrous **5. thapsoides**
9 Achenes *c.* 2 mm, hairy **7. persoonii**
8 Stems and leaves glabrous or sparsely hairy
10 Biennial to perennial; at least the marginal achenes glabrous
11 Cauline leaves ±pinnatifid; inner achenes hairy **44. jacobaea**
11 Cauline leaves dentate; all achenes glabrous **18. cacaliaster**
10 Annual; all achenes hairy
12 Supplementary bracts 1–3; cauline leaves usually at least as wide as long **67. flavus**
12 Supplementary bracts at least 4; cauline leaves usually longer than wide
13 Supplementary bracts 8–10 **65. vulgaris**
13 Supplementary bracts 4–6 **59. leucanthemifolius**
4 Ligules present (sometimes small and revolute)
14 Supplementary bracts absent
15 Stems 1–4 cm thick, hollow; achenes with ±winged ribs **40. congestus**
15 Stems less than 1 cm thick; achenes terete or with obtuse ribs
16 Annual
17 Leaves unlobed or the cauline shallowly lobed **61. petraeus**
17 At least the cauline leaves deeply lobed or pinnatisect
18 Achenes compressed, elliptical **57. minutus**
18 Achenes subcylindrical **58. gallicus**
16 Perennial (rarely biennial)
19 Leaves unlobed; plant glabrous to arachnoid-tomentose **(33–39). integrifolius** group
19 Cauline leaves usually lobed to pinnatifid; plant ±sericeous-lanate
20 Capitulum solitary **9. halleri**
20 Capitula in a dense corymb **6. incanus**
14 Supplementary bracts present
21 Dwarf shrub
22 Sparsely hairy or glabrescent throughout
23 Ligules 5; achenes glabrous **14. quinqueradiatus**
23 Ligules 10–15; achenes hairy
24 Leaves 3–7 mm wide, obtuse; stems ascending, usually without axillary fascicles of leaves **13. nevadensis**
24 Leaves 1–3(–4) mm wide, acute; stems erect, usually with axillary fascicles of leaves
25 Supplementary bracts 3–6(–12), entirely herbaceous **11. linifolius**
25 Supplementary bracts 10–20, with a conspicuous, white-scarious, fimbriate margin **12. inaequidens**
22 Densely white-tomentose, at least on stems and lower surface of leaves
26 Leaves linear, entire or with up to 4 distant lobes on each side **2. gnaphalodes**
26 Leaves lanceolate to ovate, pinnatifid to pinnate with ±approximate lobes
27 Stems with few, slender branches at the base, ±equally leafy throughout **3. ambiguus**
27 Stems with many, stout branches from the base, with leaves crowded at the base and sparse above **4. bicolor**
21 Herb, sometimes with a woody stock
28 Achenes strongly compressed, elliptical **56. delphinifolius**
28 Achenes subcylindrical
29 All achenes glabrous
30 Capitula 1–2
31 Supplementary bracts fewer than 10
32 Annual, without non-flowering shoots at anthesis **58. gallicus**
32 Perennial, with non-flowering shoots at anthesis
33 Lower leaves 2- to 3-pinnatisect **53. abrotanifolius**
33 Lower leaves entire to lyrate-pinnatifid
34 Plant 3–20 cm; involucre green **55. resedifolius**
34 Plant 25–50 cm; involucre purplish **43. pancicii**
31 Supplementary bracts 12–20
35 Stems usually more than 30 cm; cauline leaves well-developed at least below **(26–28). doronicum** group
35 Stems usually less than 30 cm; cauline leaves very few and small **29. eriopus**
30 Capitula 3 or more
36 Very viscid; ligules often becoming revolute **64. viscosus**
36 Not viscid (but sometimes glandular in inflorescence); ligules not revolute
37 Basal and lower cauline leaves 2- to 3-pinnatisect, with linear segments
38 Ligules *c.* 13, 10–15 mm **53. abrotanifolius**
38 Ligules 3–6, 3–6 mm **54. adonidifolius**
37 Basal and lower cauline leaves entire to pinnatisect, the segments not linear
39 Basal leaves oblanceolate-spathulate, fleshy, glaucous (Sicilia) **51. aethnensis**
39 Basal leaves not spathulate, thin, green
40 Ligules 1–8
41 Plant ±sericeous-lanate; some leaves usually lobed **6. incanus**
41 Plant not sericeous-lanate; leaves not lobed
42 Cauline leaves rapidly decreasing in size up the stem, merging into the bracts **19. doria**
42 Cauline leaves ±uniform, similar to the basal, very distinct from the bracts
43 Ligules 1–3 **18. cacaliaster**
43 Ligules 5–8
44 Leaves with outer margin of teeth convex; supplementary bracts usually not more than ½ as long as involucre **16. fluviatilis**
44 Leaves with outer margin of teeth straight or concave; supplementary bracts often about as long as involucre **17. nemorensis**
40 Ligules 10–22
45 Ligules white or purple
46 Ligules white; perennial, with dentate leaves **30. smithii**
46 Ligules purple; annual, with pinnatipartite leaves **66. elegans**
45 Ligules yellow to orange
47 Involucre purplish **43. pancicii**
47 Involucre green
48 Capitula less than 25 mm in diameter
49 Leaves entire or finely dentate; achenes 3·5–5 mm **25. pyrenaicus**
49 At least some leaves ±pinnatifid; achenes 2–3 mm
50 Supplementary bracts 5–13, usually black-tipped **48. squalidus**
50 Supplemenatry bracts 2–5(–6), usually greenish throughout
51 Robust biennial or perennial; leaf-segments wide **45. aquaticus**
51 Annual, often slender; leaf-segments very narrow **58. gallicus**
48 Capitula at least 25 mm in diameter
52 Supplementary bracts 2–5 **45. aquaticus**
52 Supplementary bracts 5–20
53 Basal leaves ovate to triangular-ovate, cordate or rounded at base
54 Basal leaves about as long as wide; upper cauline leaves laciniate to pinnatisect **42. subalpinus**
54 Basal leaves longer than wide; upper cauline leaves dentate, crenate-dentate or doubly dentate, sometimes sub-pinnatifid at base **41. cordatus**

53 Basal leaves ovate-lanceolate or narrower, rounded or cuneate at base
55 Leaves mostly basal, persistent at anthesis; involucre 8–15 mm **(26–28). doronicum** group
55 Stems ± densely leafy, at least in the middle; basal leaves usually withered at anthesis; involucre 6–8 mm
56 Leaves with patent teeth or entire, glabrous or sparsely crispate-hairy beneath **25. pyrenaicus**
56 Leaves serrate, usually lanate or tomentose beneath **21. paludosus**
29 At least some achenes hairy
57 Marginal achenes glabrous
58 Inner achenes sparsely hairy; basal leaves lyrate or undivided, ±persistent at anthesis **45. aquaticus**
58 Inner achenes densely hairy; basal leaves usually pinnatifid, withered at anthesis **44. jacobaea**
57 Marginal achenes hairy
59 All leaves entire to dentate
60 Ligules 5–6 **19. doria**
60 Ligules more than 6
61 Annual
62 Ligules not more than 5 mm, revolute immediately after anthesis **63. lividus**
62 Ligules more than 5 mm, not revolute
63 Plant ±fleshy; basal leaves obovate-spathulate **59. leucanthemifolius**
63 Plant not fleshy; basal leaves not obovate-spathulate **48. squalidus**
61 Perennial
64 Plant sericeous-lanate; capitula solitary **9. halleri**
64 Plant not sericeous-lanate; capitula usually several
65 Upper cauline leaves more strongly toothed than the lower **47. carpetanus**
65 Leaves entire, or the upper cauline less strongly toothed than the lower
66 Leaves closely and evenly serrate **21. paludosus**
66 Leaves entire or with ±remote, patent teeth
67 Stems branched from the base or the middle; supplementary bracts black-tipped **48. squalidus**
67 Stems branched only in inflorescence; supplementary bracts concolorous, usually green
68 Involucre ±arachnoid-lanate **22. eubaeus**
68 Involucre sparsely hairy or glabrous
69 Supplementary bracts 2–6
70 Basal leaves 3–10 cm, fleshy-coriaceous, glabrous or glabrescent **24. auricula**
70 Basal leaves more than 10 cm, not fleshy-coriaceous, crispate-pubescent beneath **19. doria**
69 Supplementary bracts 10–15
71 Upper cauline leaves very few, linear-lanceolate **20. lopezii**
71 Upper cauline leaves numerous, lanceolate **23. macedonicus**
59 At least some leaves pinnatifid or pinnatisect
72 Plant ±grey, with dense, appressed, ±lanate tomentum
73 Capitula solitary **9. halleri**
73 Capitula several, in corymbs
74 Involucral bracts 12–15; supplementary bracts 2–4 **8. leucophyllus**
74 Involucral bracts 6–10; supplementary bracts 1–2 **6. incanus**
72 Plant not grey, subglabrous to floccose or arachnoid-lanate
75 Ligules 1–2; basal leaves 30–60 cm **15. othonnae**
75 Ligules 5 or more; basal leaves not more than 30 cm
76 Perennial (more rarely biennial); stems erect, robust, usually branched only in inflorescence
77 Glandular-hairy at least in inflorescence **52. nebrodensis**
77 Eglandular
78 Supplementary bracts 10–12, ⅓–⅔ as long as involucre **23. macedonicus**
78 Supplementary bracts usually fewer than 10, usually less than ⅓ as long as involucre
79 Middle cauline leaves 2-pinnatifid, with distant, linear lobes **49. siculus**
79 Middle cauline leaves entire to pinnatifid, with wider lobes
80 Ligules revolute immediately after anthesis (Britain) **50. cambrensis**
80 Ligules not revolute
81 Ligules *c.* 8 **47. carpetanus**
81 Ligules 12–18
82 Supplementary bracts *c.* ½ as long as involucre **46. erucifolius**
82 Supplementary bracts *c.* ¼ as long as involucre **48. squalidus**
76 Annual; stems relatively weak (sometimes succulent), often branched in lower half
83 Ligules not more than 5 mm, revolute immediately after anthesis
84 Achenes 3–4 mm
85 Stems usually simple, ±glandular-hairy above **63. lividus**
85 Stems usually branched, not glandular-hairy **50. cambrensis**
84 Achenes less than 3 mm
86 Glandular at least in inflorescence **62. sylvaticus**
86 Eglandular **65. vulgaris**
83 Ligules more than 5 mm, not revolute
87 Ligules purple **66. elegans**
87 Ligules yellow
88 Subglabrous, usually fleshy, with unlobed, ±obovate basal leaves; auricles of upper cauline leaves entire or shallowly dentate **59. leucanthemifolius**
88 Usually hairy, rarely fleshy; basal leaves often lobed, elliptical to ovate in outline; auricles of upper cauline leaves dentate to laciniate
89 Supplementary bracts few (rarely up to 6); all leaves ±pinnatisect, with linear-oblong, often patent, remote segments **58. gallicus**
89 Supplementary bracts 5–13; leaves variably dissected, but rarely with linear-oblong, patent, remote segments
90 Young shoots usually arachnoid-lanate; branches of inflorescence ±erect **60. vernalis**
90 Young shoots subglabrous to floccose; branches of inflorescence ±patent **48. squalidus**

Sect. DELAIRIA (Lemaire) Bentham. Scrambling, glabrous perennials with more or less woody stems. Leaves more or less angled or reniform, palmately veined. Involucre with supplementary bracts. Florets yellow. Achenes subcylindrical, glabrous or hairy.

1. S. mikanioides Otto ex Walpers, *Allgem. Gartenz.* **13**: 41 (1845). Up to 300(–600) cm. Stems climbing, woody at least below and rather fleshy, much-branched, slender. Leaves 3–10 cm, orbicular- or triangular-reniform, fleshy, with 3–11 triangular, acute lobes or angles; petioles mostly longer than leaves, often with small auricles at the base. Capitula many, 5–7 mm in diameter, in dense axillary and terminal panicles. Involucre 3–4 mm, with 2–4 supplementary bracts ½–½ as long as the involucre. Ligules absent; florets yellow. $2n=20$. *Cultivated for ornament and naturalized in S. & W. Europe.* [Az Br Co Ga Hs It Lu.] (*South Africa.*)

S. angulatus L. fil., *Suppl.* 369 (1781), from South Africa, is also cultivated for ornament and is perhaps naturalized in N. Italy and S. Spain; it is a scrambling, glabrous perennial with ovate to lanceolate leaves 3–5 × 2·5–3 cm which are cuneate at the base, angled or weakly lobed and petiolate; the capitula are 12–25 mm in diameter, in compound corymbs or panicles, the involucre is 4–8 mm, with 3–7 supplementary bracts, and there are 4–6 yellow ligules 5–10 mm.

Sect. INCANAE (DC.) O. Hoffm. Dwarf shrubs or perennial herbs, tomentose or sericeous at least in part. Leaves usually more or less divided, pinnately veined. Involucre usually with small supplementary bracts. Achenes subcylindrical, glabrous or hairy.

2. S. gnaphalodes Sieber, *Reise Kreta* **1**: 352 (1823). Dwarf shrub 20–50 cm. Stems branched at base, densely white-tomentose. Leaves 5–15 × 0·3–0·8 cm (excluding lobes), linear, entire or with up to 4 distant, entire lobes on each side, densely white-tomentose beneath, arachnoid-lanate, greenish and more or less glabrescent above. Capitula many, 12–15 mm in diameter, in compound corymbs. Involucre *c.* 7 mm, glabrous or arachnoid-lanate and glabrescent, reddish-tinged, with up to 5 supplementary bracts 1–2 mm. Ligules 10–13, 3–5 mm, yellow. *Rock-crevices and stony slopes.* ?● *Kriti, Karpathos.* Cr.

3. S. ambiguus (Biv.) DC., *Prodr.* **6**: 356 (1838). Dwarf shrub 25–50 cm. Stems with a few branches at the base, slender, equally leafy throughout, the non-flowering shoots without distinct rosettes. Leaves 5–15 × 1·5–4(–7) cm, ovate-lanceolate to lanceolate, variously dissected. Capitula many, 10–12 mm in diameter, in lax or dense compound corymbs. Involucre 5–7 mm, with up to 5 supplementary bracts *c.* 1·5 mm. Ligules *c.* 10, 3–5 mm, yellow. *Rocky and sandy places. S. Italy, Sicilia; S. Greece.* Gr It Si. (*N. Africa.*)

(a) Subsp. **ambiguus** (incl. *S. taygeteus* Boiss. & Heldr.): Stems and involucre densely white-tomentose, sometimes somewhat glabrescent above. Leaves more or less lyrate-pinnatifid with the lobes irregularly dentate to pinnatifid, densely white-tomentose beneath, persistently arachnoid-tomentose or somewhat glabrescent above. *Sicilia and Lipari; S. Greece.*

(b) Subsp. **gibbosus** (Guss.) Chater, *Bot. Jour. Linn. Soc.* **68**: 274 (1974) (*Cineraria gibbosa* Guss.): Stems and involucre glabrous or glabrescent throughout. Leaves pinnatifid or pinnatisect with dentate to pinnatifid lobes, not or scarcely lyrate, densely white-tomentose beneath, glabrous above at maturity. ● *Sicilia, Calabria.*

4. S. bicolor (Willd.) Tod., *Ind. Sem. Horti Panorm.* **1859**: 30 (1860). Dwarf shrub 25–50(–100) cm. Stems much-branched at the base and sometimes also above, stout, densely white-tomentose, with the leaves mostly crowded towards the base of the flowering stems and forming rosettes on the non-flowering shoots. Leaves 4–15 × 2·5–7 cm, ovate to lanceolate, dentate to pinnate, densely whitish-tomentose beneath, more or less arachnoid-tomentose, greenish and glabrescent above. Capitula many, tomentose, greenish and glabrescent above. Capitula many, 12–15 mm in diameter, in dense, compound corymbs. Involucre 5–8 mm, with up to 5 supplementary bracts 1–2 mm. Ligules 10–13, 3–6 mm, yellow. *Rocky and sandy places. Mediterranean region; locally naturalized elsewhere.* Co Ga Gr Hs It Ju Sa Si [Bl Br Hb Lu Rs (K)].

1 Leaves ovate-lanceolate, lyrate-pinnatifid to irregularly sinuate-dentate; involucre subglabrous, or whitish-tomentose and more or less glabrescent (b) subsp. **nebrodensis**

1 Leaves pinnate, pinnatisect, or lyrate-pinnate or -pinnatisect; involucre densely and usually persistently whitish-tomentose

2 Leaves ovate, often lyrate, with the ultimate lobes usually as wide as long and obtuse; peduncles long (a) subsp. **bicolor**

2 Leaves ovate or ovate-lanceolate, not lyrate, with the ultimate lobes usually longer than wide and subacute; peduncles short (c) subsp. **cineraria**

(a) Subsp. **bicolor**: *Limestone cliffs. C. & E. parts of Mediterranean region; naturalized in Krym.*

(b) Subsp. **nebrodensis** (Guss.) Chater, *Bot. Jour. Linn. Soc.* **68**: 273 (1974) (*Cineraria nebrodensis* Guss.): *Mountain rocks.* ● *N. Sicilia* (*Madonie*).

(c) Subsp. **cineraria** (DC.) Chater, *loc. cit.* (1974) (*Senecio cineraria* DC.): 2*n*=40. *Rocky and sandy places. W. & C. parts of Mediterranean region.*

The plants widely cultivated for ornament and locally naturalized in W. Europe correspond to subspecies **(c)** in some respects, but vary greatly in the distribution of leaves on the stems.

Plants from the Kikladhes (Amorgos) with very broadly ovate, strongly lyrate leaves and glabrescent involucre, but otherwise like subsp. **(a)**, may represent another subspecies.

5. S. thapsoides DC., *Prodr.* 7: 301 (1838). Perennial 20–70 cm. Stems stout, woody at the base, erect, simple or somewhat branched, densely white-tomentose. Basal and lower cauline leaves 7–25 × 2–4·5 cm, oblong to oblong-ovate, gradually narrowed at base and more or less petiolate, subentire to crenate or weakly crenate-dentate, densely and persistently white-tomentose beneath, more or less sparsely arachnoid-tomentose, greenish and often glabrescent above; middle and upper cauline oblong to linear-lanceolate, widened and amplexicaul at base. Capitula usually many, *c.* 8 mm in diameter, in oblong panicles. Involucre 10–15 mm, with 1–8 supplementary bracts *c.* 2 mm. Ligules absent. Achenes 3–4 mm, glabrous. *Mountain rocks. S. & W. parts of Balkan peninsula.* Al Gr Ju.

(a) Subsp. **thapsoides**: Middle and upper cauline leaves oblong to oblong-lanceolate, almost as large as the basal. Involucre 10–12 mm, more or less persistently white-tomentose, with 1–5 supplementary bracts. *Greece and Albania.*

(b) Subsp. **visianianus** (Papaf. ex Vis.) Vandas, *Reliq. Formánek.* 279 (1909): Middle and upper cauline leaves oblong- to linear-lanceolate, more or less abruptly decreasing in size up the stem and mostly distinctly smaller than the basal. Involucre 12–15 mm, glabrous or subglabrous, with up to 8 supplementary bracts. ● *W. Jugoslavia and Albania.*

6. S. incanus L., *Sp. Pl.* 869 (1753). Perennial 5–15 cm, more or less densely greyish- or whitish-sericeous-lanate, with short, woody, branched stock. Stems erect, branched only in inflorescence. Leaves sericeous-lanate at least on lower surface (rarely subglabrous), the basal 3–10 cm, usually lobed or pinnatifid, long-petiolate, the cauline pinnatisect or (uppermost) simple. Capitula several, in a dense corymb. Involucral bracts 6–10, 5–6 mm; supplementary bracts 0–2, often on the peduncle below the involucre. Ligules 3–6, 5–6 mm, ovate, yellow. Achenes *c.* 2 mm, glabrous or hairy. *Pastures and rocky ground on mountains; calcifuge.* ● *Alps and N. Appennini; Carpathians.* Au Cz Ga Ge He It Ju Po Rm Rs (W).

(a) Subsp. **incanus**: Lamina of basal leaves more or less broadly ovate in outline. Achenes hairy, at least above. 2*n*=40. *S.W. & S.C. Alps; N. Appennini.*

(b) Subsp. **carniolicus** (Willd.) Br.-Bl., *Neue Denkschr. Schweiz. Naturf. Ges.* **48**: 300 (1913): Lamina of basal leaves oblanceolate or narrowly obovate in outline. Achenes glabrous. 2*n*=*c.* 120, *c.* 160. *C. & E. Alps; Carpathians.*

Typical plants of subsp. **(a)** have more or less deeply pinnatifid leaves which are usually densely sericeous-lanate, whilst those of subsp. **(b)** have shallowly lobed or crenate leaves much less densely hairy and sometimes subglabrous. There is much variation in hairiness, however, and many intermediates occur; one of these, in the E. Alps, has been called subsp. **insubricus** (Chenevard) Br.-Bl., *loc. cit.* (1913).

7. S. persoonii De Not., *Repert. Fl. Ligust.* 229 (1844). Like **6** but capitula few and relatively large; involucral bracts 8–12, 9–10 mm; ligules absent; achenes always hairy. 2*n*=40. *Rocks, between* 1500 *and* 2400 *m.* ● *Alpi Marittime* (*region of Ormea*). It.

8. S. leucophyllus DC., *Cat. Pl. Horti Monsp.* 114 (1813). Like **6** but more robust, up to 20 cm; basal leaves thick in texture, pinnatifid, with more or less cuneate lobes; cauline always pinnatifid; capitula larger, with 12–15 involucral bracts and 2–4 supplementary bracts; ligules 5–7; achenes always hairy. 2*n*=40. *Mountain screes.* ● *E. Pyrenees and S.C. France.* Ga Hs.

9. S. halleri Dandy, *Taxon* **19**: 625 (1970) (*S. uniflorus* (All.) All., non Retz.). Perennial 3–10 cm, whitish-sericeous-lanate, with short, branched woody stock, and erect, unbranched stems bearing a single large capitulum. Basal leaves up to 5 cm, long-petiolate, entire, dentate or incised, oblong-obovate in outline; cauline simple, linear to lanceolate, semi-amplexicaul. Capitulum 20–25 mm in diameter. Involucral bracts *c.* 20, 7–10 mm; supplementary bracts (0)1–3. Ligules 10–16, 8–10 mm, narrowly elliptical, orange-yellow. Achenes *c.* 2·5 mm, hairy. *Pastures and rocky ground on mountains; calcifuge.* ● *S.W. & S.C. Alps.* Ga He It.

Plants otherwise resembling **9** but with 2–4 capitula occur rarely throughout the range of the species; they are probably hybrids between **9** and **6**.

10. S. boissieri DC., *Prodr.* 7: 300 (1838). Dwarf, caespitose perennial with branched, woody stock and simple, slender, sericeous scapose stems 5–12 cm, each with few, distant, linear bracts and a single capitulum. Leaves up to 3 cm, with cuneate-obovate lamina attenuate into a petiole, distally incise-crenate, more or less sericeous especially beneath. Capitula 12–15 mm in diameter; involucral bracts 12–15, lanceolate, obtuse; supplementary bracts few and small. Ligules absent; tubular florets reddish. Achenes *c.* 2 mm, hairy. 2*n*=40. *Mountain rocks.* ● *S. Spain* (*Sierra Nevada, Sierra de Segura*). Hs.

Sect. FRUTICULOSI DC. Shrubs or dwarf shrubs, usually sparsely hairy or glabrescent. Leaves usually narrow, undivided. Involucre with small supplementary bracts. Achenes subcylindrical, glabrous or hairy.

11. S. linifolius L., *Syst. Nat.* ed. 10, **2**: 1215 (1759). Sparsely hairy or glabrescent dwarf shrub 20–50 cm. Stems erect, usually branched throughout, densely leafy and usually with axillary fascicles of leaves. Leaves 2–5(–7) × 0·1–0·3(–0·4) cm, linear to linear-lanceolate, acute, entire or obscurely dentate, grey-green, fleshy. Capitula many, 10–15 mm in diameter, in compound corymbs or panicles. Involucre 6–8 mm, with 3–6(–12) linear supplementary bracts *c.* ½ as long as the involucre and herbaceous throughout; involucral bracts 2-carinate on the back. Ligules 10–15, 5–8 mm, golden-yellow. Achenes *c.* 3 mm, shortly and densely hairy. 2*n*=40. *Dry, rocky and stony places. S. & S.E. Spain, Islas Baleares.* Bl Hs.

12. S. inaequidens DC., *Prodr.* **6**: 401 (1837). Like **11** but stems less densely leafy; leaves mostly *c.* 0·1 cm wide, linear, usually entire; supplementary bracts 10–20, with conspicuous, white, scarious, fimbriate margins. *Naturalized in N. Italy and parts of W. Europe.* [Be Ga It.] (*South Africa.*)

The identity of the plant naturalized in Europe has long been in doubt; it has been called *S. harveianus* MacOwan, and, quite erroneously, *S. lautus* Solander ex Willd. It now seems most probable that it is *S. inaequidens* DC., although further work on the group in South Africa may lead to some change of opinion.

S. longifolius L., *Sp. Pl.* ed. 2, 1222 (1763), also from South Africa, is perhaps becoming naturalized in S.E. France; it is similar to **11** but has the involucre *c.* 4 mm and only 5 ligules *c.* 4 mm long.

13. S. nevadensis Boiss. & Reuter, *Pugillus* 60 (1852). Like **11** but up to 25 cm; stems ascending, less branched and less leafy, usually without axillary fascicles of leaves; leaves 2–5 × 0·3–0·7 cm, oblong- to linear-lanceolate, obtuse; capitula usually fewer; involucral bracts not carinate; achenes sparsely hairy. *Stony places,* 2100–3450 *m.* ● *S. Spain* (*Sierra Nevada*). Hs.

14. S. quinqueradiatus Boiss. ex DC., *Prodr.* 7: 300 (1838). Subglabrous dwarf shrub 20–50 cm. Stems erect, sparsely leafy, divaricately branched throughout with long, slender internodes. Leaves 3–7 × 0·3–0·7(–1) cm, linear-oblong to -lanceolate, entire to sinuate-dentate, not fleshy. Capitula 10–15 mm in diameter, solitary on long peduncles. Involucre 5–7 mm, with 1–3 supplementary bracts *c.* ½ as long as the involucre. Ligules 5, 5–6 mm, yellow. Achenes *c.* 4 mm, glabrous. *Rocks and screes,* 2000–3450 *m.* ● *S. Spain* (*Sierra Nevada*). Hs.

Sect. DORIA (Fabr.) Reichenb. Perennial herbs, usually subglabrous or sparsely hairy, usually with stolons. Leaves usually undivided, usually not strongly decreasing in size up the stem. Involucre with supplementary bracts. Ligules few or absent, never more than 13, rather short. Achenes subcylindrical, glabrous or hairy.

15. S. othonnae Bieb., *Fl. Taur.-Cauc.* **2**: 308 (1808). Perennial 80–200 cm. Stock short, with long stolons. Stems erect, branched only in inflorescence, glabrous. Basal and lower cauline leaves 30–60 × 12–35 cm, pinnatisect, with oblong-lanceolate, incise-serrate segments, glabrous above, crispate-puberulent beneath; upper cauline leaves with more or less dentate segments. Capitula many, 5–15 mm in diameter, in compound corymbs. Involucre 5–7 mm, sparsely tomentose, with 1–4 supplementary bracts; bracts often black-tipped. Ligules 1–2, 8–12 mm, yellow. Achenes 3–6 mm, with dense, appressed hairs. *Woods and mountain grassland. C. part of Balkan peninsula.* Al Bu Gr Ju Tu.

16. S. fluviatilis Wallr., *Linnaea* **14**: 646 (1841). Perennial 60–200 cm. Stock short, with long, fleshy stolons up to 60 cm. Stems erect, branched above or only in inflorescence, glabrous above, puberulent below, densely leafy. Leaves 10–20 × 2–4 cm, elliptical to linear-lanceolate, glabrous, narrowed at the base, acute, serrate or 2-serrate with the outer margin of the teeth convex. Capitula many, 15–30 mm in diameter, in more or less compound corymbs. Involucre 5–8 mm, sparsely tomentose, with 3–5 supplementary bracts up to ½ as long as the involucre; bracts sometimes black-tipped. Ligules 6–8, 8–12 mm, yellow. Achenes 3–4 mm, glabrous. 2*n*=40. *Damp meadows and woods. C. & E. Europe, extending to the Netherlands and C. Jugoslavia; naturalized locally in N.W. Europe.* Au Cz Ga Ge Ho Hu Ju Po Rm Rs (N, B, C, W, E) [Br Da Hb].

17. S. nemorensis L., *Sp. Pl.* 870 (1753). Perennial 50–200 cm. Stock short, with stolons absent or up to 10(–20) cm. Stems erect, branched above or only in inflorescence, densely leafy. Leaves 5–20 × 1–7 cm, not much decreasing in size up the stem, glabrous above, often hairy beneath, acute, more or less dentate or rarely almost doubly dentate, with the outer margin of the teeth straight or concave. Capitula many, 20–35 mm in diameter, in more or less compound corymbs; peduncles eglandular. Involucre 5–9 mm, glabrous or very sparsely hairy, eglandular, with 3–6 supplementary bracts; bracts often black-tipped. Ligules 5–6(–8), 12–15 mm, yellow. Achenes *c.* 4 mm, glabrous. *Damp meadows and woods. Much of Europe, but absent from most of Fennoscandia and from much of the Mediterranean region and the south-east.* Al Au Be Bu Co Cz Ga Ge He Ho Hs Hu It Ju Lu Po Rm Rs (N, B, C, W, E) Tu [Su].

(a) Subsp. **nemorensis** (incl. *S. bulgaricus* Velen., *S. jacquinianus* Reichenb.): Not purplish-tinged. Stems usually pubescent above. Leaves ovate to elliptic-lanceolate, *c.* 3 times as long as wide, usually hairy beneath, the lower narrowed at the base and petiolate, the upper sessile, amplexicaul. Supplementary bracts 3–5, about as long as the involucre. $2n=40$. *C. & E. Europe, extending to N. Italy.*

(b) Subsp. **fuchsii** (C. C. Gmelin) Čelak., *Prodr. Fl. Böhm.* 241 (1871) (*S. fuchsii* C. C. Gmelin; incl. *S. fuchsii* var. *expansus* (Boiss. & Heldr.) Hayek): Often purplish-tinged, usually glabrous. Leaves lanceolate or elliptic-lanceolate, 5–7 times as long as wide, all narrowed at the base, at least the middle and upper shortly petiolate, not amplexicaul. Supplementary bracts usually 5–6, often only *c.* ½ as long as the involucre. $2n=40$. *C. & S. Europe.*

18. S. cacaliaster Lam., *Fl. Fr.* **2**: 132 (1779). Like **17(a)** but stock often shortly creeping, without stolons; leaves lanceolate to elliptic-lanceolate, 4–6 times as long as wide, all narrowed to the base, the middle ones shortly petiolate, the upper sessile, not amplexicaul; peduncles and usually involucre glandular-hairy; supplementary bracts 1–3; ligules absent (rarely 1–3 and then whitish-yellow). *Mountain meadows and woods.* ● *S.C. France; S.E. Alps; from Albania to S.W. Romania.* Al Au Ga ?Hs It Ju Rm.

In areas where **17** and **18** overlap hybrid populations often occur.

19. S. doria L., *Syst. Nat.* ed. 10, **2**: 1215 (1759). Perennial 40–100(–150) cm. Stock short, without stolons. Stems erect, branched only in inflorescence. Leaves rapidly decreasing in size and usually becoming sparser up the stem; basal and lower cauline 10–40 × 3–18 cm, ovate to linear-elliptical, obtuse or acute, long-petiolate, glaucous, rather thick, subentire or patent-dentate with the outer margin of the teeth straight or concave; upper cauline usually ovate-lanceolate, amplexicaul, entire. Capitula many, 12–25 mm in diameter, in compound corymbs. Involucre 5–6(–9) mm, glabrous or sparsely hairy, with 2–4 supplementary bracts; bracts pale greenish throughout. Ligules 5–13, 7–10 mm, yellow. Achenes 3–4 mm. *From E. France, C. Czechoslovakia and S.C. Russia southwards to S. Spain, Sicilia Czechoslovakia and S.C. Russia southwards to S. Spain, Sicilia and Bulgaria.* Au Bu Cz Ga Hs Hu It Ju ?Po Rm Rs (C, W, E) Sa Si [Br].

1 Stems or leaves hairy; ligules 8–13
2 Achenes glabrous; leaves up to 18 cm wide **(b)** subsp. **umbrosus**
2 Achenes hairy; leaves not more than 8 cm wide **(c)** subsp. **kirghisicus**
1 Stems and leaves glabrous; ligules 5–6
3 Basal leaves oblong-spathulate, entire; achenes ± hairy **(d)** subsp. **legionensis**
3 Basal leaves linear-elliptical to oblong-obovate, usually dentate; achenes glabrous **(a)** subsp. **doria**

(a) Subsp. **doria** (incl. *S. schvetzovii* Korsh., *S. macrophyllus* Bieb.): Stems and leaves glabrous. Basal and lower cauline leaves 3–7(–11) cm wide, linear-elliptical to oblong-obovate, usually dentate. Supplementary bracts *c.* ½ as long as the involucre. Ligules 5–6. Achenes glabrous. *Damp meadows and woods. Throughout most of the range of the species.*

(b) Subsp. **umbrosus** (Waldst. & Kit.) Soó, *Erd. Kisérl.* **46**: 282 (1946) (*S. umbrosus* Waldst. & Kit.): Stems more or less sparsely lanate. Basal and lower cauline leaves up to 18 cm wide, ovate to oblong-ovate, dentate, usually crispate-hairy at least on the veins beneath. Supplementary bracts *c.* ¼ as long as the involucre. Ligules usually 8. Achenes glabrous. $2n=40$. *Open woodland and scrub.* ● *From Czechoslovakia to Bulgaria and W. Ukraine.*

(c) Subsp. **kirghisicus** (DC.) Chater, *Bot. Jour. Linn. Soc.* **68**: 276 (1974) (*S. kirghisicus* DC., *S. paucifolius* sensu Schischkin, non S. G. Gmelin): Stems often sparsely pubescent above. Basal and lower cauline leaves 1–8 cm wide, ovate to linear-lanceolate, dentate, crispate-hairy beneath. Supplementary bracts *c.* ½ as long as the involucre. Ligules 8–13. Achenes hairy. *Saline steppes. S. part of U.S.S.R.*

(d) Subsp. **legionensis** (Lange) Chater, *loc. cit.* (1974) (*S. legionensis* Lange): Stems and leaves glabrous. Basal and lower cauline leaves 3–5 cm wide, oblong-spathulate, entire. Supplementary bracts *c.* ¼ as long as the involucre. Ligules 5–6. Achenes more or less hairy. *Meadows and marshes.* ● *N.W. Spain.*

More or less tomentose-lanate plants of subsp. (a) from Spain have been called var. *incanescens* Lange; their status is uncertain.

Sect. CROCISERIS Reichenb. Perennial herbs, usually subglabrous or sparsely hairy, without stolons. Leaves usually undivided, usually decreasing in size up the stem. Involucre with supplementary bracts. Ligules (10–)12–22, rather long. Achenes subcylindrical, glabrous or hairy.

20. S. lopezii Boiss., *Elenchus* 60 (1838) (*S. grandiflorus* Hoffmanns. & Link, non Bergius). Perennial 30–100 cm. Stock short. Stems erect, simple or branched only in inflorescence, sparsely pubescent. Leaves rapidly decreasing in size and becoming very sparse up the stem; basal and lower cauline 20–30 × 2·5–7 cm, lanceolate or oblong-lanceolate, sparsely crispate-pubescent at least beneath, subentire or dentate with more or less patent teeth, more or less petiolate; upper cauline linear-lanceolate, sessile, more or less amplexicaul. Capitula 1–8, 40–55 mm in diameter, in a lax corymb. Involucre 10–14 mm, sparsely crispate-pubescent, with 10–15 supplementary bracts ⅓–½ as long as the involucre. Ligules 12–20, 15–20 mm, yellow. Achenes 5–6 mm, scabrid-puberulent. *Woods and other shady places.* ● *S.W. Spain, S.W. Portugal.* Hs Lu.

21. S. paludosus L., *Sp. Pl.* 870 (1753) (*S. racemosus* auct. eur., non (Bieb.) DC.; incl. *S. auratus* DC., *S. tataricus* Less.). Perennial 50–200 cm. Stock short. Stems erect, branched above or only in inflorescence, sparsely to densely arachnoid-lanate, [illegible] sometimes glabrescent. Leaves gradually decreasing in size up the stem; basal and lower cauline 10–20 × 1–2·5 cm, linear-lanceolate to lanceolate, acute, serrate, shortly petiolate, sparsely to densely arachnoid-lanate or -tomentose or rarely glabrous beneath, usually glabrous above; upper cauline sessile, subamplexicaul. Capitula many, 30–40 mm in diameter, in a panicle or corymb. Involucre 6–8 mm, more or less arachnoid-lanate at base, with 5–10 supplementary bracts *c.* ½ as long as the involucre. Ligules 12–20, 10–14 mm, yellow. Achenes *c.* 3 mm, glabrous or sparsely hairy. $2n=40$. *Damp places. Much of Europe, but absent from parts of the north-west and the Mediterranean region.*

Au Be Br Bu Cz †Da Ga Ge He Ho Hs Hu It Ju Po Rm Rs (N, B, C, W, E) Su.

Subspecies have been described, but are too poorly differentiated both morphologically and geographically to be worth maintaining.

22. S. eubaeus Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 36 (1856). Perennial 20–60 cm. Stock short. Stems erect, branched only in inflorescence, white-arachnoid-lanate at least above. Basal and lower cauline leaves 7–15 × 2–3 cm, oblong-lanceolate, sparsely to densely arachnoid-lanate, more or less petiolate, entire or obscurely repand-dentate; upper sessile, subamplexicaul. Capitula 3–6, *c.* 40 mm in diameter, in a lax corymb. Involucre 12–18 mm, densely white-lanate, with 8–15 supplementary bracts ⅓–½ as long as the involucre. Ligules 12–18, 12–18 mm, yellow. Achenes *c.* 6 mm, the inner glabrous, the outer hairy. *Mountain rocks.* ● *E. Greece (Evvoia).* Gr.

S. castagneanus DC., *Prodr.* **6**: 354 (1838), from S.W. Asia, has once been recorded from Turkey-in-Europe; it is like **22** but has less densely lanate or glabrescent stems, glabrous leaves, sparsely lanate, greenish involucre with 15–20 supplementary bracts, ligules 10–14 mm and sometimes all the achenes hairy.

23. S. macedonicus Griseb., *Spicil. Fl. Rumel.* **2**: 221 (1846). Glabrous or subglabrous perennial 50–80 cm. Stock short. Stems erect, branched only in inflorescence. Leaves rapidly diminishing in size up the stem; basal and lower cauline 15–30 × 2·5–5 cm, broadly elliptical to oblong-lanceolate, gradually narrowed at base, petiolate, subentire or remotely dentate (rarely almost pinnatifid); upper cauline numerous, lanceolate, sessile, subamplexicaul. Capitula 4–12(–20), 25–40 mm in diameter, in a simple corymb. Involucre 8–11 mm, with 10–12 supplementary bracts *c.* ⅔ as long as the involucre. Ligules 13–14, 13–17 mm, yellow. Achenes shortly hairy. *Mountain woods and rocky slopes. E. part of Balkan peninsula.* Bu Gr ?Ju Tu.

S. longipedunculatus Halácsy, *Verh. Zool.-Bot. Ges. Wien* **54**: 484 (1904), described from S.E. Greece (Parnassos), has the supplementary bracts *c.* ½ as long as the inner and almost subulate (not linear); it is probably conspecific with **23**.

S. barckhausiifolius Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(6)**: 101 (1859), from S.W. Asia, has once been recorded from S. Greece (Pateras Oros); it differs from **23** chiefly in having the basal and lower cauline leaves 5–7 × 1·5–2 cm, runcinate-pinnatifid and with 2–3 pairs of triangular, dentate lobes, and supplementary bracts *c.* ⅓ as long as the involucre.

24. S. auricula Bourgeau ex Cosson, *Not. Pl. Crit.* 169 (1852). Perennial 10–40 cm. Stock short, stout, densely lanate. Stems erect, simple or branched only in inflorescence, sparsely arachnoid-lanate or glabrous. Leaves 3–10 × 0·8–3 cm, mostly in a basal rosette, ovate-spathulate to linear-cuneate, subentire or 3-dentate at apex, glaucous, fleshy-coriaceous, glabrous or [illegible] glabrescent; cauline up to 6, 1–3 cm, oblong to linear-lanceolate. Capitula (1–)2–8, 25–35 mm in diameter, in a corymb. Involucre 7–12 mm, subglabrous, with 4–6 supplementary bracts ½–1 as long as the involucre. Ligules 10–13, 10–12 mm, yellow. Achenes 4–5 mm, shortly hairy. *Rocky and marshy places; calcicole. C., S. & E. Spain.* Hs.

25. S. pyrenaicus L. in Loefl., *Iter. Hisp.* 304 (1758) (*S. tournefortii* Lapeyr.). Perennial 15–60 cm. Stock shortly creeping. Stems ascending to erect, branched above or only in inflorescence, glabrous or shortly appressed-hairy above. Leaves crowded at the middle of the stem, glabrous or sparsely crispate-hairy beneath, entire or dentate, more or less petiolate; upper cauline rapidly decreasing in size, linear to linear-lanceolate, sessile. Capitula 3–8(–15), 20–40 mm in diameter, in a corymb. Involucre 6–8 mm, sparsely crispate-hairy, with 5–8 supplementary bracts *c.* ½ as long as the involucre. Ligules 10–16, 10–15 mm, yellow. Achenes 3·5–5 mm, glabrous. $2n=40$. *Grassy and rocky places.* ● *Mountains of S.W. Europe.* Ga Hs Lu.

Very variable; plants from the Sierra Nevada and Sierra Tejeda (*S. tournefortii* var. *granatensis* Boiss.) have rather coriaceous, often entire, obtuse leaves, plants from the Sierra de Guadarrama and Sierra de Gredos (*S. tournefortii* var. *carpetanus* Willk.) are usually entirely glabrous and have more strongly dentate leaves, while plants from the Serra da Estrêla (**S. cespitosus** Brot., *Fl. Lusit.* **1**: 390 (1804)) have acute, often entire leaves and capitula 20–25 mm in diameter. This variation does not seem to be sufficiently distinct for subspecies to be recognized.

(26–28). S. doronicum group. Perennial 20–60 cm. Stock short. Stems erect, simple, or branched only in inflorescence, arachnoid-lanate or glabrescent. Basal leaves 10–25 × 2·5–6 cm, elliptical to ovate, finely repand-dentate to subentire, subacute; lower cauline similar, narrowed at base; upper cauline few, oblong- to linear-lanceolate, sessile, subamplexicaul. Capitula 25–60 mm in diameter, solitary or in a lax corymb. Ligules 12–20 mm, yellow or orange. Achenes 5–7 mm, glabrous.

A very critical group in need of further investigation.

1 Ligules pale yellow
2 Leaves thin, soft **27. scopolii**
2 Leaves thick, somewhat coriaceous **26. doronicum**
1 Ligules golden-yellow or orange
3 Plant stout; involucre 10–15 mm, with 12–20 supplementary bracts **26. doronicum**
3 Plant slender; involucre 8–10 mm, with 10–12 supplementary bracts **28. lagascanus**

26. S. doronicum (L.) L., *Syst. Nat.* ed. 10, **2**: 1215 (1759). Stems stout. Basal leaves usually rounded or cuneate at base and more or less abruptly contracted into the petiole, glabrescent above, usually arachnoid-lanate beneath, thick and somewhat coriaceous. Capitula 30–60 mm in diameter, solitary or up to 4(–7) in a lax corymb. Involucre 10–15 mm, more or less arachnoid-lanate, with 12–20 supplementary bracts. Ligules 12–20 mm. *Grassy and rocky places.* ?● *Mountains of C. & S. Europe.* Al Au Bu Ga Ge Gr He Hs It Ju Rm.

1 Supplementary bracts about as long as involucre; capitula 1–3; ligules 12–22, deep yellow or orange-yellow; basal leaves rounded or cuneate at base **(a)** subsp. **doronicum**
1 Supplementary bracts *c.* ¼ as long as involucre
2 Capitula 3–7; ligules 10–15, deep or orange-yellow; basal leaves lanceolate, gradually narrowed into the petiole **(b)** subsp. **ruthenensis**
2 Capitula solitary (rarely 2); ligules 12–17, pale yellow; basal leaves ± ovate, abruptly contracted into the petiole **(c)** subsp. **gerardii**

(a) Subsp. **doronicum**: $2n=40$, 80. *Throughout the range of the species.*

(b) Subsp. **ruthenensis** (Mazuc & Timb.-Lagr.) Nyman, *Consp., Suppl.* **2**: 163 (1889) (*S. ruthenensis* Mazuc & Timb.-Lagr.): ● *S.W. France.*

(c) Subsp. **gerardii** (Godron & Gren.) Nyman, *Consp.* 354 (1879) (*S. gerardii* Godron & Gren.): $2n=40$. ● *S. Spain, S. France, N. Italy.*

Plants from the eastern part of the range which are glabrous or subglabrous (except sometimes for the involucre) have been called **S. glaberrimus** (Rochel) Simonkai, *Enum. Fl. Transs.* 329 (1887) (*S. doronicum* subsp. *transylvanicus* (Boiss.) Nyman, *S. transylvanicus* Boiss.), but similar plants occur in other parts of the range, especially in Spain, and they do not seem to merit even subspecific status.

27. S. scopolii Hoppe & Hornsch. ex Bluff & Fingerh., *Comp. Fl. Germ.* **2**: 380 (1825) (*S. lanatus* Scop., non L., *S. arachnoideus* Sieber ex DC.). Stems stout. Basal leaves ovate, rounded or cuneate at base, more or less abruptly contracted into the petiole, glabrescent above, arachnoid-lanate beneath, thin and soft. Capitula 30–60 mm in diameter, solitary. Involucre 10–15 mm, arachnoid-lanate, with 12–20 supplementary bracts *c.* ½ as long as the involucre. Ligules 12–17, pale yellow. *Dry places; calcicole.* ● *Italy and W. part of Balkan peninsula.* Al Gr It Ju.

28. S. lagascanus DC., *Prodr.* **6**: 357 (1838). Stems slender. Basal leaves elliptical to ovate, gradually narrowed into the petiole, sparsely hairy, but more or less villous on midrib beneath, thick and somewhat coriaceous. Capitula 1–4, *c.* 25 mm in diameter, solitary. Involucre 8–10 mm, sparsely hairy, with (5–)10–12 supplementary bracts ⅓–⅔ as long as the involucre. Ligules 10–13, golden-yellow. *Dry places; calcicole.* ● *Mountains of N. & E. Spain.* Hs ?Lu.

Plants from C. Portugal, known as **S. doronicum** subsp. **lusitanicus** Coutinho, *Fl. Port.* 641 (1913), are probably referable to this species.

29. S. eriopus Willk. in Willk. & Lange, *Prodr. Fl. Hisp.* **2**: 116 (1865). Like **26(a)** but up to 30 cm; lower part of stems and petioles densely arachnoid-lanate; basal leaves in a distinct rosette, ovate to ovate-oblong, cordate or rounded at base; cauline leaves few, small, linear-lanceolate, sessile; capitula 1–2; supplementary bracts *c.* ½ as long as involucre. *Rocky places*, 800–1300 *m.* ● *Mountains of S.W. Spain.* Hs.

Sect. HUALTATA Cabrera. Perennial herbs, more or less floccose. Leaves more or less ovate, undivided. Involucre with small supplementary bracts. Achenes cylindrical, glabrous.

30. S. smithii DC., *Prodr.* **6**: 412 (1838). Perennial 60–120 cm. Stems erect, stout, usually branched only in inflorescence, floccose-lanate to glabrescent. Basal leaves (10–)20–35 cm, oblong-ovate, truncate to subcordate at base, dentate, densely floccose-lanate beneath, sparsely so above, with petiole about equalling lamina; lower cauline similar but smaller; upper cauline ovate-triangular, sessile. Capitula many, 40–50 mm in diameter, in a lax or dense corymb. Involucre 10–13 mm, sparsely arachnoid-lanate, dark green or blackish, with 8–20 supplementary bracts ¼–½ as long as involucre. Ligules 15–20, 15–25 mm, white. Achenes 5–9 mm. *Naturalized in Scotland.* [Br.] (*Temperate South America.*)
[Br.] (*Temperate South America.*)

Sect. PERICALLIS (Webb) O. Hoffm. Perennial herbs, glabrous or variously hairy. Leaves broad, more or less palmately lobed, palmately veined. Involucre without supplementary bracts. Ligules usually purple. Achenes subcylindrical, usually hairy.

31. S. malvifolius (L'Hér.) DC., *Prodr.* **6**: 410 (1838). Perennial up to 120 cm. Stems erect, branched, glabrous. Basal and lower cauline leaves 10–15 cm, suborbicular, subcordate at base and long-petiolate, often with lobes on the petiole and large auricles, callose-denticulate, at least the upper shallowly and obtusely palmately lobed, glabrous, or sparsely glandular above, densely grey-tomentose beneath; upper cauline ovate to ovate-lanceolate, cuneate at base. Capitula many, 10–15 mm in diameter, in a rather dense, compound corymb. Involucre 4–5 mm, glabrous. Ligules 7–9, 4–5 mm, pale purple or bluish. *Ravines and roadsides.* ● *Açores.* Az.

Sect. PALMATINERVII O. Hoffm. Perennial herbs or shrubs, glabrous or variously hairy. Leaves broad, more or less palmately lobed, palmately veined. Involucre with or without small supplementary bracts. Achenes subcylindrical, glabrous.

32. S. petasitis (Sims) DC., *Prodr.* **6**: 431 (1838). Perennial up to 120 cm. Stems erect, rather fleshy, branched, densely pubescent. Basal and lower cauline leaves 5–20 cm, suborbicular, more or less cordate at base and long-petiolate, shallowly palmately lobed, sparsely callose-denticulate but otherwise entire, sparsely tomentose-pubescent above, more densely so beneath. Capitula many, 20–30 mm in diameter, in an ovoid panicle. Involucre 9–11 mm, pubescent, without supplementary bracts. Ligules 5–6, 10–12 mm, bright yellow. *Cultivated for ornament and naturalized in S. Europe.* [Az It Si.] (*Mexico.*)

Sect. TEPHROSERIS (Reichenb.) Hallier, Wohlf. & Koch. Perennial herbs, usually more or less floccose. Leaves undivided, usually entire. Involucre without supplementary bracts. Achenes subcylindrical, glabrous or hairy.

(33–39). S. integrifolius group. Perennial (rarely biennial) herbs. Stock usually short and erect or oblique, with one rosette (rarely rhizomatous and branched); stolons absent. Stems less than 1 cm in diameter, erect, branched only in inflorescence. Leaves in a basal rosette and few or many on the stem, entire to dentate. Capitula solitary or in a simple or compound usually more or less umbelliform corymb.

An extremely difficult group, in which most of the taxa are very variable. The following treatment is conservative, and an attempt has been made to evaluate most of the more commonly recognized taxa; it is not, however, possible to key more than a proportion of the material involved and the treatment must be regarded as very provisional.

Literature: G. Cufodontis, *Feddes Repert.* (*Beih.*) **70**: 1–266 (1933). L. Brunerye, *Les Seneçons du Groupe* Helenitis. Paris. 1969.

1 Basal leaves ± appressed to the ground, persistent at anthesis, with petiole not longer than lamina; cauline leaves few, small **33. integrifolius**
1 Basal leaves not appressed to the ground, usually withered at anthesis, with petiole usually longer than lamina; cauline leaves usually many, well-developed
2 Achenes hairy
3 Leaves entire or remotely denticulate **36. helenitis**
3 Leaves coarsely dentate
4 Plant glandular ± throughout **38. ovirensis**
4 Plant eglandular except in inflorescence **37. rivularis**
2 Achenes glabrous
5 Basal leaves more than 20 cm
6 Basal leaves strongly and irregularly dentate **34. balbisianus**
6 Basal leaves entire or obscurely repand-dentate **35. elodes**
5 Basal leaves not more than 20 cm
7 Basal leaves persistently arachnoid-tomentose beneath; ligules *c.* 15 **39. papposus**
7 Basal leaves glabrescent; ligules usually more than 15
8 Plant glandular ± throughout **38. ovirensis**
8 Plant eglandular except in inflorescence
9 Basal leaves cordate at base, strongly dentate **37. rivularis**
9 Basal leaves not or scarcely cordate at base, subentire or weakly dentate
10 Basal leaves not more than 10 cm, ± fleshy; bracts green **39. papposus**
10 Basal leaves at least 10 cm, not fleshy; bracts reddish at least at apex **36. helenitis**

33. S. integrifolius (L.) Clairv., *Man. Herb. Suisse* 241 (1811). Perennial (2–)15–70(–100) cm. Stock short, erect. Basal leaves (1–)2–10(–15) × (1–)2–5 cm, more or less appressed to the ground, suborbicular to oblong-elliptical, more or less petiolate; lower cauline ovate-lanceolate to lanceolate, sessile or narrowed into a short, winged petiole; middle and upper cauline lanceolate to linear, entire, sessile, subamplexicaul. Capitula 15–25 mm in diameter, solitary or up to 15 in a corymb; peduncles usually not more than twice as long as involucre. Involucre 5–8 mm. Achenes 2·5–4 mm. *Much of Europe, but with discontinuous range, and absent from large areas.* Al Au Br Cz Da Ga Ge Gr He Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su.

1 Basal and lower cauline leaves gradually narrowed into petiole
2 Plant with ± persistent, dark purplish or brownish tomentum at least above **(h)** subsp. **atropurpureus**
2 Plant without persistent, dark tomentum
3 Ligules *c.* 20 mm; involucre *c.* 7 mm **(g)** subsp. **tundricola**
3 Ligules 7–11 mm; involucre *c.* 5 mm **(f)** subsp. **czernjaevii**
1 Basal and lower cauline leaves abruptly contracted into petiole
4 Plant densely and persistently whitish-tomentose or -lanate, especially above **(d)** subsp. **capitatus**
4 Plant more or less glabrescent
5 Ligules orange or brownish-red (or sometimes absent) **(e)** subsp. **aurantiacus**
5 Ligules yellow or golden-yellow, always present
6 Involucral bracts purplish throughout; basal leaves sinuate-dentate **(c)** subsp. **serpentini**
6 Involucral bracts usually green throughout
7 Basal leaves entire or remotely denticulate; involucre 6–8 mm **(a)** subsp. **integrifolius**
7 Basal leaves coarsely dentate; involucre 8–12 mm **(b)** subsp. **maritimus**

(a) Subsp. **integrifolius** (incl. *S. aucheri* DC., *S. campestris* (Retz.) DC., *S. heldreichii* Boiss., *S. jailicola* Juz.): Stems 8–100 cm, arachnoid-lanate but glabrescent. Basal leaves ovate-lanceolate to suborbicular, usually abruptly contracted into a petiole which is not longer than the lamina, entire or remotely denticulate, greyish- or whitish-arachnoid-lanate, equally hairy on both surfaces but glabrescent; cauline leaves few. Capitula 3–15. Involucre 6–8 mm, glabrous or somewhat hairy at base; bracts green, sometimes reddish at apex. Ligules 12–15, 10–20 mm, yellow or golden yellow. Achenes shortly and usually densely hairy, rarely glabrous. $2n=48$, *c.* 90. *Dry grassy places. Almost throughout the range of the species.*

(b) Subsp. **maritimus** (Syme) Chater, *Bot. Jour. Linn. Soc.* **68**: 275 (1974) (*S. campestris* var. *maritimus* Syme): Like subsp. **(a)** but basal leaves coarsely dentate; cauline leaves more numerous; involucre 8–12 mm. *Coastal cliffs.* ● *N. Wales* (*Holyhead Island*).

(c) Subsp. **serpentini** (Gáyer) Ják. in Ják. & Csapody, *Icon. Fl. Hung.* 529 (1933): Like subsp. **(a)** but basal leaves oblong-elliptical, sinuate-dentate, floccose-lanate but glabrescent; capitula 2–10; involucral bracts purplish, usually throughout. *Grassy places on serpentine.* ● *E. Austria* (*Burgenland*).

(d) Subsp. **capitatus** (Wahlenb.) Cuf., *Feddes Repert.* (*Beih.*) **70**: 14 (1933) (*S. capitatus* (Wahlenb.) Steudel, *S. aurantiacus* auct., non (Willd.) Less.): Like subsp. **(a)** but up to 30(–40) cm, usually densely and persistently greyish-white-lanate or -tomentose especially above; basal leaves ovate-oblong or elliptical; cauline leaves numerous; involucral bracts usually purplish; ligules 5–12 mm, yellow to red, but often absent. $2n=64$, $96+0–4$ B. *Mountain pastures.* ● *Alps, Carpathians; Albania.*

(e) Subsp. **aurantiacus** (Hoppe ex Willd.) Briq. & Cavillier in Burnat, *Fl. Alp. Marit.* **6**: 42 (1916) (*S. aurantiacus* (Willd.) Less.; incl. *S. besseranus* Minder.): Like subsp. **(a)** but usually glabrous or sparsely hairy even when young, or sometimes floccose; capitula 2–6(–10); involucral bracts purplish usually throughout; ligules orange or brownish-red, sometimes absent. *Grassy places and open woods.* ● *Mountains of E.C. Europe.*

(f) Subsp. **czernjaevii** (Minder.) Chater, *Bot. Jour. Linn. Soc.* **68**: 276 (1974) (*S. czernjaevii* Minder.): Like subsp. **(a)** but basal leaves gradually narrowed into a petiole 1–2 times as long as the lamina; involucre *c.* 5 mm, arachnoid-lanate, sometimes glabrescent; ligules 10–15, 7–11 mm. *Grassy places and scrub. N. & C. parts of U.S.S.R.*

(g) Subsp. **tundricola** (Tolm.) Chater, *loc. cit.* (1974) (*S. tundricola* Tolm.): Like subsp. **(a)** but 15–40 cm; basal leaves 1–4 × 1–2 cm, gradually narrowed at base; capitula 1–5(–10); involucral bracts brownish-purple above; ligules *c.* 20 mm; achenes often glabrous. *Tundra and stony slopes. Arctic Russia.*

(h) Subsp. **atropurpureus** (Ledeb.) Cuf., *Feddes Repert.* (*Beih.*) **70**: 43 (1933) (*S. atropurpureus* (Ledeb.) B. Fedtsch.): Like subsp. **(a)** but 2–10(–20) cm, with more or less persistent, dark purplish or brownish tomentum at least above; basal leaves 1–6 × 0·5–2 cm, oblong-ovate to lanceolate, gradually narrowed into petiole; capitula solitary (rarely 2–3); achenes glabrous or sparsely hairy. *Tundra. N.E. Russia.*

Subsp. **(h)** shows some approach to *S. helenitis* subsp. *candidus* but is distinguished especially by the leaves being equally hairy or glabrescent on both surfaces, not strongly discolorous.

34. S. balbisianus DC., *Prodr.* **6**: 360 (1838). Perennial (20–)50–100 cm. Stock short, erect. Stems very stout, sparsely floccose and more or less glabrescent. Basal leaves 20–45 × 3·5–9 cm, erect, ovate to oblong, usually rounded to cordate at base, very coarsely dentate, floccose and glabrescent; petiole 1½–4 times as long as lamina, often winged; middle cauline becoming oblong-ovate to linear-lanceolate, shortly petiolate or sessile and narrowed at base; upper cauline sessile, amplexicaul. Capitula 8–30, 25–35 mm in diameter, in a lax, sometimes compound corymb. Involucre 8–12 mm, more or less floccose-lanate at least below. Ligules 15–18, 10–15 mm, yellow. Achenes 3–4 mm, glabrous. *Damp places.* ● *Mountains of S.E. France and N.W. Italy.* Ga It.

Small plants from Alpi Marittime (Pizzo d'Ormea) approach **33** and **39**.

35. S. elodes Boiss. ex DC., *Prodr.* **7**: 301 (1838) (*Cineraria elodes* (Boiss. ex DC.) Nyman). Like **34** but up to 170 cm; stems and leaves more completely glabrescent; basal leaves elliptic-oblong, entire or obscurely repand-dentate. *Damp places*, 2300–2700 *m.* ● *S. Spain* (*Sierra Nevada*). Hs.

Perhaps not specifically distinct from **34**.
Perhaps not specifically distinct from **34**.

S. coincyi Rouy, *Bull. Soc. Bot. Fr.* **37**: 163 (1890) (*Cineraria coincyi* (Rouy) Willk.), described from C. Spain (near Ávila), is like **34** but has the leaves more or less lanate beneath, the upper cauline leaves smaller and fewer, and the marginal achenes sometimes hairy; further information is required.

36. S. helenitis (L.) Schinz & Thell., *Viert. Naturf. Ges. Zürich* **53**: 569 (1908). Perennial 30–70(–120) cm. Stems slender. Basal leaves 5–20 × 1–4 cm, more or less erect and not appressed to the ground, ovate to spathulate or elliptic-oblong, petiolate;

cauline leaves few, oblanceolate to linear, sessile or scarcely petiolate, subamplexicaul. Capitula 3–12(–20), 20–25 mm in diameter, in a rather lax corymb; peduncles mostly 2–3 times as long as involucre. Involucre 8–12 mm. Ligules yellow or golden yellow (rarely orange). Achenes *c.* 3 mm. ● *From N. Spain and N.W. France eastwards to C. Austria and E.C. Germany.* Au Be Ga Ge He Hs.

1 Achenes usually glabrous; basal leaves up to 7(–10) cm; stems and leaves sparsely hairy, glabrescent **(d)** subsp. **salisburgensis**
1 Achenes hairy; basal leaves up to 20 cm; stems and leaves more or less arachnoid-hairy, the leaves usually densely so beneath
2 Basal leaves fleshy, subcordate at base; ligules 6–8 mm **(b)** subsp. **candidus**
2 Basal leaves not fleshy, abruptly or gradually narrowed at base; ligules 8–15 mm, or absent
3 Basal leaves regularly and finely dentate; bracts arachnoid-lanate in lower ¼, otherwise glabrous **(c)** subsp. **macrochaetus**
3 Basal leaves subentire or irregularly dentate; bracts arachnoid-lanate throughout **(a)** subsp. **helenitis**

(a) Subsp. **helenitis** (*S. spathulifolius* Griesselich, *S. lanceolatus* (Lam.) Gren., non Burm. fil.): Stock erect, usually simple. Stem sparsely arachnoid-lanate, with some sessile glands and eglandular straight hairs. Basal leaves not fleshy, abruptly or gradually narrowed at base into a winged petiole longer than the lamina, subentire or irregularly dentate, persistently greyish- or whitish-arachnoid-tomentose beneath, sparsely so above. Involucre arachnoid-lanate more or less throughout; bracts green. Ligules *c.* 13 (or sometimes absent), 8–12 mm. Achenes densely hairy (very rarely glabrous). $2n=48$. *Damp, grassy or stony places. Throughout most of the range of the species.*

(b) Subsp. **candidus** (Corb.) Brunerye, *Les Séneçons* 225 (1969): Like subsp. **(a)** but up to 45 cm, densely white-lanate throughout except for upper surface of leaves which is green and sparsely arachnoid; basal leaves 5–9 cm, fleshy, subcordate at base with petiole usually not longer than lamina and very broadly winged; ligules 13–26, 6–8 mm. *Grassy and stony slopes by the sea. N. France.*

(c) Subsp. **macrochaetus** (Willk.) Brunerye, *op. cit.* 253 (1969): Like subsp. **(a)** but stock rhizomatous and branched, with several non-flowering rosettes; basal leaves regularly and finely dentate, glabrous above, sparsely arachnoid-lanate and often glabrescent beneath; involucral bracts arachnoid-lanate only in lower ¼; ligules 12–15 mm. *Usually on damp, clayey soils. W. Pyrenees and adjacent coastal regions.*

(d) Subsp. **salisburgensis** Cuf., *Feddes Repert.* (*Beih.*) **70**: 129 (1933): Like subsp. **(a)** but stems and leaves more or less sparsely hairy but glabrescent on both surfaces; basal leaves up to 7(–10) cm; involucral bracts reddish at least at apex; ligules 15–18 (sometimes absent); achenes usually glabrous. *Damp grassy places. S.E. Germany and N.C. Austria.*

Rather variable and showing similarities to both subsp. **(a)** and **37**.

Plants from the Pyrenees with the basal leaves oblong to ovate-oblong and no ligules have been called **S. lapeyrousii** Rothm., *Feddes Repert.* **49**: 276 (1940) (*S. pyrenaicus* Gren. & Godron, non L., *S. spathulifolius* subsp. *pyrenaicus* (Nyman) Rouy, *Cineraria pyrenaica* Nyman), but are best considered as variants of subsp. **(a)**.

Plants from subalpine habitats in S.C. France with densely arachnoid-lanate stems and leaves, elliptic- or ovate-oblong, slightly fleshy basal leaves and 13–19 ligules have been called subsp. **arvernensis** (Rouy) Cuf., *Feddes Repert.* (*Beih.*) **70**: 115 (1933) (*S. spathulifolius* subsp. *arvernensis* (Rouy) Rouy, *Cineraria longifolia* subsp. *arvernensis* (Rouy) Nyman); they show some approach to subsp. **(b)**.

37. S. rivularis (Waldst. & Kit.) DC., *Prodr.* **6**: 359 (1838). Perennial 20–80 cm. Stock erect, short. Stems subglabrous to arachnoid-tomentose and glabrescent. Basal and lower cauline leaves 5–15 × 2–6 cm, more or less erect, ovate, more or less cordate at base with winged petiole 1–2 times as long as lamina, strongly dentate or crenate-dentate, more or less floccose on both surfaces but glabrescent; middle and upper cauline ovate to linear-lanceolate, sessile, subamplexicaul. Capitula 5–15, 25–35(–40) mm in diameter, in a lax corymb; peduncles several times as long as involucre. Involucre 8–12 mm, glandular-hairy and sparsely arachnoid-tomentose or subglabrous, green, rarely purplish. Ligules 15–21, 10–12(–20) mm, yellow to orange. Achenes 3–4 mm. *Damp places in the mountains.* ● *C. Europe, westwards to c.* 10° 30′ *E. in C. Germany.* Au Cz Ge Hu It Ju Po Rm Rs (W).

(a) Subsp. **rivularis** (incl. *S. crispatus* DC.): Basal leaves with broadly winged petiole, often undulate-crispate at the margin. Capitula 5–15. Achenes glabrous; pappus at anthesis about as long as corolla-tube. *Throughout most of the range of the species.*

(b) Subsp. **pseudocrispus** (Fiori) E. Mayer in Lazar, *Ad Annum Horti Bot. Labac. Solemn. CL* 40 (1960) (*S. alpestris* var. *pseudocrispus* Fiori): Basal leaves with unwinged or very narrowly winged petiole, not undulate-crispate. Capitula 3–10. Achenes densely hairy; pappus at anthesis not more than half as long as corolla-tube. *N.E. Italy, N.W. Jugoslavia.*

38. S. ovirensis (Koch) DC., *Prodr.* **6**: 360 (1838). Perennial 20–80 cm. Stock oblique, short. Stems more or less arachnoid-tomentose, rarely subglabrous. Basal leaves 4–20 × 1·5–3·5 cm, erect, mostly withered at anthesis, ovate to elliptic-lanceolate, gradually narrowed to subcordate at base, coarsely dentate, with broadly winged, long or short petiole. Capitula 3–15, 30–40 mm in diameter, in a corymb; peduncles mostly at least twice as long as involucre. Involucre 8–12 mm, arachnoid-tomentose but often glabrescent. Ligules 18–21, yellow or golden yellow. Achenes 3–4 mm. ● *S. & E. Alps, extending to W. Hungary and N. Jugoslavia; N. & C. Appennini; Pyrenees.* Al Au Ga Ge He Hu It Ju.

(a) Subsp. **ovirensis**: Up to 60 cm, more or less glandular throughout. Basal leaves usually oblong to elliptic-lanceolate, arachnoid-tomentose and usually glabrescent. Capitula 3–10 in a usually lax corymb. Involucral bracts *c.* 21, often purplish at apex. Ligules 12–15 mm. Achenes glabrous (or rarely sparsely hairy and glabrescent). *S.C. & E. Alps, extending to W. Hungary and N. Jugoslavia.*

(b) Subsp. **gaudinii** (Gremli) Cuf., *Feddes Repert.* (*Beih.*) **70**: 152 (1933) (incl. *S. brachychaetus* DC.): Up to 80 cm, not or very sparsely glandular. Basal leaves oblong to linear-lanceolate, arachnoid-tomentose and more or less glabrescent. Capitula 5–15 in a dense corymb. Involucral bracts *c.* 13, green throughout. Ligules 6–12 mm. Achenes densely hairy. *Throughout the range of the species except the extreme east.*

Intermediates between subspp. **(a)** and **(b)** have been called subsp. **alpestris** (Hoppe) Beger in Hegi, *Ill. Fl. Mitteleur.* **6(2)**: 738 (1928).

39. S. papposus (Reichenb.) Less., *Linnaea* **6**: 244 (1831) (*S. spathulifolius* sensu Hayek, non Griesselich). Perennial 30–130 cm. Stock erect to horizontal, short. Basal leaves 10–25

× 2–5 cm, ovate to elliptic-oblong, sinuate-dentate to subentire, usually gradually narrowed into a petiole which is usually longer than the lamina; cauline linear-lanceolate, sessile, sometimes amplexicaul. Capitula 5–15, 30–40(–50) mm in diameter, in a lax corymb. Involucre 8–10 mm. Ligules *c.* 15, 10–15 mm, yellow or golden yellow, sometimes absent. Achenes 3–3·5 mm, glabrous. $2n=40$. *Stony or grassy, usually dry places.* ?● *N. & C. parts of Balkan peninsula, extending to N.E. Italy; E. & S. Carpathians, W. Ukraine.* Al Bu Cz Gr It Ju Po Rm Rs (C, W) ?Tu.

Extremely variable, especially in leaf-shape and indumentum. The following subspecies may be recognized, but most of the rest of the variation follows no very clear pattern.

1 Ligules absent; involucral bracts purplish-brown **(b)** subsp. **wagneri**
1 Ligules present; involucral bracts usually greenish
2 Plant glabrescent before anthesis; basal leaves rather fleshy **(c)** subsp. **kitaibelii**
2 Plant persistently arachnoid-tomentose at least on lower surface of leaves; basal leaves not fleshy **(a)** subsp. **papposus**

(a) Subsp. **papposus** (incl. *S. procerus* (Griseb.) Boiss., non Salisb., *S. bosniacus* G. Beck): Stems arachnoid-tomentose, often glabrous or glabrescent below. Basal leaves ovate-lanceolate to elliptic-oblong, subglabrous above, persistently arachnoid-tomentose beneath, not fleshy. Capitula up to 15. Involucral bracts green, rarely purplish. *Throughout most of the range of the species.*

(b) Subsp. **wagneri** (Degen) Cuf., *Feddes Repert.* (*Beih.*) **70**: 210 (1933) (*S. wagneri* Degen): Like subsp. **(a)** but involucral bracts purplish-brown; ligules absent. ● *C. part of Balkan peninsula.*

(c) Subsp. **kitaibelii** (Ják.) Cuf., *loc. cit.* (1933): Stems, leaves and involucre arachnoid-tomentose but glabrescent before anthesis. Basal leaves ovate to elliptical, rather fleshy. Capitula 5–7. Involucral bracts brownish-green. ● *N.W. Jugoslavia (Velebit).*

S. igoschinae Schischkin in Schischkin & Bobrov, *Fl. URSS* **26**: 885 (1961), from C. Ural, is a more or less glabrous plant with narrow leaves and involucre *c.* 5 mm; it is probably related to subsp. **(a)** but its status is uncertain.

Sect. ERIOPAPPUS (Dumort.) Schischkin. Annual, biennial or perennial herbs, more or less pubescent. Leaves entire to pinnatifid. Involucre without supplementary bracts. Achenes subcylindrical, glabrous.

40. S. congestus (R. Br.) DC., *Prodr.* **6**: 363 (1838) (*S. palustris* (L.) Hooker, non Velloso, *S. tubicaulis* Mansfeld; incl. *S. arcticus* Rupr.). Annual, biennial or perennial 15–200 cm; stems erect, branched above or only in inflorescence, 1–4 cm in diameter, hollow, pubescent, sometimes glabrescent, leafy throughout. Leaves 5–15 × 1–5 cm, oblong- or ovate- to linear-lanceolate, entire to coarsely dentate, rarely almost pinnatifid, usually undulate, pubescent or subglabrous; upper cauline leaves subentire, amplexicaul. Capitula many, 20–30 mm in diameter, in a lax or dense corymb or panicle. Involucre 10–12(–13) mm, arachnoid-villous at least below, green. Ligules *c.* 21, 7–10 mm, yellow. Achenes 2–3 mm, with almost winged ribs. *Damp meadows and marshes. From Belgium, Denmark and arctic Russia southwards to C. France and C. Ukraine.* Be †Br Cz Da Ga Ge Ho Po ?Rm Rs (N, B, C, W, E) Su.

Sect. JACOBAEA (Miller) Dumort. Perennial, rarely biennial herbs, subglabrous or more or less floccose. Leaves, especially the cauline, more or less pinnatifid. Supplementary bracts usually more than ¼ as long as involucre. Achenes subcylindrical, hairy or glabrous.

41. S. cordatus Koch, *Flora* (*Regensb.*) **17**: 613 (1834) (*S. alpinus* auct., non Scop.). Perennial 30–70 cm. Stems erect, usually branched only in inflorescence, leafy throughout, subglabrous. Leaves very gradually decreasing in size up the stem; basal and lower cauline 5–15 × 3–10 cm, ovate, cordate or rounded at the base, petiolate, sometimes with a pair of small lobes on the petiole, glabrous above, more or less greyish-arachnoid-tomentose beneath, strongly dentate or crenate-dentate, or doubly dentate; upper cauline ovate to ovate-lanceolate, narrowed at base, dentate, crenate-dentate or doubly dentate, sometimes subpinnatifid at base. Capitula (3–)5–20, 25–40 mm in diameter, in a corymb. Involucre 6–8 mm, arachnoid-lanate or subglabrous, with 5–10 supplementary bracts *c.* ¼ as long as the involucre. Ligules 12–21, 10–15 mm, yellow or orange-yellow. Achenes *c.* 3·5 mm, glabrous. $2n=40$. *Meadows, open woods and damp places.* ● *Alps; N. & C. Appennini.* Au Ga Ge He It ?Ju.

42. S. subalpinus Koch, *Flora* (*Regensb.*) **17**: 614 (1834) (*S. alpinus* subsp. *subalpinus* (Koch) Hayek). Like **41** but basal and lower cauline leaves 3–6(–10) × 3–6(–8) cm, cordate- to triangular-ovate, glabrous or sparsely hairy and green beneath; middle cauline often with one or more pairs of lobes on the petiole or more or less lyrate; upper cauline laciniate or almost pinnatisect and auriculate at base. $2n=40$. *Damp places.* ● *Carpathians, E. Alps and mountains of W. part of Balkan peninsula.* Al Au Cz Ge ?Gr Po Rm Rs (W).

43. S. pancicii Degen, *Magyar Bot. Lapok* **1**: 92 (1902) (*S. alpinus* subsp. *arnautorum* (Velen.) Hayek). Perennial 25–50 cm. Stems erect, branched only in inflorescence, leafy more or less throughout, sparsely arachnoid-lanate. Leaves rather abruptly decreasing in size up the stem; basal and lower cauline 5–9 × 2·5–5 cm, ovate to oblong-elliptical, dentate, or almost laciniate at base, petiolate, sparsely arachnoid-lanate or subglabrous; upper cauline lanceolate, more or less laciniate, auriculate at base. Capitula (1–)2–8, 30–40 mm in diameter, in a lax corymb. Involucre 7–9 mm, purplish, arachnoid-lanate to subglabrous, with 5–8 supplementary bracts ½–⅔ as long as the involucre. Ligules 12–15, 7–10 mm, orange-yellow. Achenes *c.* 3 mm, glabrous. $2n=100$. *Damp meadows.* ● *Mountains of Bulgaria and Srbija.* Bu Ju.

44. S. jacobaea L., *Sp. Pl.* 870 (1753). Biennial or perennial 30–150 cm. Stock short, erect. Stems subglabrous to floccose, branched only in inflorescence. Basal and lower cauline leaves 10–20 cm, lyrate-pinnatifid, petiolate, usually withered at anthesis; middle and upper cauline 1- to 2-pinnatifid, with segments at right angles to rhachis, semi-amplexicaul, usually sparsely floccose beneath. Capitula 15–20 mm in diameter, numerous, in a rather dense corymb. Involucre 7–10 mm, subglabrous, with 2–5 supplementary bracts *c.* ¼ as long as the narrowly ovate, acute involucral bracts. Ligules 12–15, yellow, rarely (var. *flosculosus* DC.) absent. Achenes *c.* 2 mm, the outer glabrous, the inner shortly hairy; pappus *c.* 4 mm, caducous. $2n=40$, 80. *Most of Europe, but rare in the extreme south and north.* Al Au Be Br Bu Co Cz Da Ga Ge Gr Hb He Ho Hs Hu It Ju Lu No Po Rm Rs (*N, B, C, W, K, E) Su [Fe].

S. borysthenicus (DC.) Stankov in Stankov & Taliev, *Opred. Vyšš. Rast. Evrop. SSSR* 651 (1949), widespread in the C. & S. parts of the U.S.S.R., differs from **44** mainly in the 2- to 3-pinnatifid leaves, and may be worthy of subspecific rank.

45. S. aquaticus Hill, *Veg. Syst.* **2**: 120 (1761). Like **44** but more constantly biennial; stems often branched in lower part; basal leaves often undivided, more persistent at anthesis; corymb less dense; capitula 12–30 mm in diameter; achenes all glabrous or the inner with rather sparse hairs confined to the ribs. $2n=40$. *Wet places. S., W. & C. Europe, extending to S. Sweden and the western margin of the U.S.S.R.* All except Bl Cr Fa Fe Is Rs (N, C, K, E).

(a) Subsp. **aquaticus**: Segments of upper cauline leaves forwardly-directed. Branches of inflorescence ascending. Capitula few, (20–)25–30 mm in diameter. *Marshes, fens and wet meadows. W. & C. Europe.*

(b) Subsp. **barbareifolius** (Wimmer & Grab.) Walters, *Bot. Jour. Linn. Soc.* **71**: 273 (1976) (*S. erraticus* Bertol., *S. aquaticus* var. *barbareifolius* Wimmer & Grab.): Segments of upper cauline leaves at right angles to rhachis. Branches of stem and inflorescence widely divaricate. Capitula numerous, 12–20(–25) mm in diameter. $2n=40$. *Ditches, roadsides and other disturbed, seasonally wet habitats. Throughout the range of the species except the north-west and north.*

Hybrids between **44** and **45**, which have intermediate characters and are apparently fertile, occur occasionally in W. & C. Europe.

46. S. erucifolius L., *Sp. Pl.* [1231] (1753). Perennial 30–120 cm. Stock short, creeping, producing short stolons with terminal leaf-rosettes. Stems floccose, branched above the middle. Basal and lower cauline leaves petiolate, more or less pinnatifid, usually persistent to anthesis; middle and upper cauline pinnatisect with a small, narrow terminal lobe and sub-parallel, linear, forwardly-directed lateral lobes; all leaves with somewhat revolute margins, and floccose at least beneath. Capitula 12–15 mm in diameter, numerous, in a narrow corymb. Involucre 6–8 mm, floccose, with 4–6 supplementary bracts about $\frac{1}{4}$ as long as the ovate-lanceolate, acute involucral bracts. Ligules 12–15, yellow. Achenes *c.* 2 mm, all shortly hairy; pappus *c.* 6 mm, persistent. *Much of Europe, but absent from most of the north and parts of the west.* ?Al Au Be Br Bu ?Co Cz Da Ga Ge Gr Hb He Ho Hs Hu It Ju Po Rm Rs (N, B, C, W, K, E) Si Su.

S. grandidentatus Ledeb., *Fl. Ross.* **2**: 636 (1845) (*S. velenovskyi* Borbás, *S. arenarius* Bieb., non Thunb.), from S.E. Europe (especially the Black Sea coast), and **S. lycopifolius** Desf. ex Poiret in Lam., *Encycl. Méth. Bot., Suppl.* **5**: 131 (1817), from Sicilia, are densely grey-tomentose variants with less deeply dissected leaves. Such variants may be worthy of subspecific rank, but further information is required.

47. S. carpetanus Boiss. & Reuter, *Pugillus* 59 (1852) (incl. *S. celtibericus* Pau). Perennial 20–45 cm. Stock shortly creeping, without stolons. Stems erect, branched only in inflorescence, densely leafy throughout, sparsely arachnoid-villous. Basal and lowest cauline leaves 5–10 × 1·5–2·5 cm, oblong-lanceolate, narrowed at base, scarcely petiolate, obtuse, crispate-hairy to villous, entire to crenate-dentate; middle and upper cauline very gradually decreasing in size, strongly crenate-dentate, becoming more or less pinnatifid towards the apex of the stem and subamplexicaul. Capitula 3–15, 10–15 mm in diameter, in a corymb. Involucre 5–9 mm, sparsely hairy, with 5–8 supplementary bracts $\frac{1}{3}$–$\frac{1}{2}$ as long as the involucre. Ligules *c.* 8, 5–7 mm, yellow. Achenes shortly hairy. *Damp places.* ● *C. Spain.* Hs.

48. S. squalidus L., *Sp. Pl.* 869 (1753) (*S. nebrodensis* auct., non L.). Subglabrous to more or less floccose short-lived perennial, biennial or annual up to 60 cm, with erect, branching stems. Leaves glabrescent above, the lower usually deeply pinnatifid with rather distant lobes, attenuate into a winged petiole, the upper cauline more or less pinnatifid, auriculate-amplexicaul (more rarely all leaves merely dentate.) Capitula 15–25 mm in diameter, few to numerous in a lax, irregular corymb. Involucral bracts *c.* 20, 7–10 mm; supplementary bracts 5–13, 2–3 mm; all lanceolate, black-tipped. Ligules *c.* 13, 10–12 mm, bright yellow. Achenes 2–3 mm, usually hairy. $2n=20$. *Woodland and scrub, and also on disturbed rocky ground, especially in the northern part of the range.* ● *C. & S. Europe, mainly in the mountains; abundantly naturalized in Britain and locally elsewhere in N. & C. Europe.* Al Au Bu Cr Cz Ge Gr He It Ju Rm Sa Si [Br Da Ga Hb Hu].

The plant naturalized in Britain is very variable in leaf-shape, but the native plant of C. Europe (which was described as **S. rupestris** Waldst. & Kit., *Pl. Rar. Hung.* **2**: 136 (1803)) is much less variable. Variants indistinguishable from typical *S. rupestris* are often found in Britain, and the plants are completely interfertile. The species was described from Oxford, where it was already naturalized on old walls in the seventeenth century.

S. fruticulosus Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 178 (1813), from mountains in Kriti, is a rather dwarf, glabrous perennial with a woody stock, differing from small variants of **48** mainly in its undivided, remotely dentate leaves. It may merit subspecific rank.

49. S. siculus All., *Auct. Syn. Stirp. Horti Taur.* 18 (1773). Like **48** but perennial, slightly glaucous, sparsely hairy with long, whitish hairs on young shoots; lower and middle cauline leaves 2-pinnatifid, with distant, linear, ascending lobes; ligules *c.* 8 mm, often revolute soon after anthesis. $2n=20$. *Open, sandy ground; lowland.* ?● *Sicilia.* Si.

The relationships of this species to **48** are obscure; they have often been treated as conspecific, but typical plants are quite distinct.

50. S. cambrensis Rosser, *Watsonia* **3**: 228 (1955). More or less floccose, short-lived perennial (more rarely annual) up to 50 cm, with erect, branched stems from a slightly woody stock. Lower leaves petiolate; middle and upper cauline leaves auriculate-amplexicaul; all deeply and irregularly pinnatifid with distant, more or less lanceolate, toothed lobes. Inflorescence branched, leafy. Capitula numerous, *c.* 12 mm in diameter. Involucre broadly cylindrical; involucral bracts *c.* 10 mm; supplementary bracts several, 3–4 mm; all black-tipped. Ligules *c.* 13, *c.* 5 mm, yellow, ovate, revolute immediately after anthesis. Achenes 3–3·5 mm, hairy in grooves; pappus caducous. $2n=60$. *Roadsides and waste ground.* ● *Britain* (*N. Wales*). Br.

A natural allopolyploid derived from **48** and **65**. The triploid hybrid is rare and highly sterile.

51. S. aethnensis Jan ex DC., *Prodr.* **6**: 345 (1838). Subglabrous, glaucous perennial up to 40 cm, with erect stems from a branched, woody stock. Leaves fleshy, entire or dentate, the lowest oblanceolate-spathulate, more or less petiolate, the middle and upper cauline lanceolate, auriculate-amplexicaul. Capitula (20–)25–40 mm in diameter, few, in a terminal corymb. Involucral bracts *c.* 20, 8–10 mm, usually green; supplementary bracts several, 3–4 mm, often black-tipped. Ligules 8–12, *c.* 15 mm, bright yellow. Achenes (3–)3·5–4 mm, glabrous. *Lava-slopes, mainly above* 1000 *m.* ● *Sicilia* (*Etna*). Si.

Typical plants occur frequently on the higher parts of the mountain; in the intermediate zones (500–1500 m) there are many variants with more or less dissected leaves, smaller capitula and

smaller, hairy achenes (**S. incisus** (C. Presl) C. Presl, *Fl. Sic.* xxviii (1826)). Such plants are probably hybrids with **49**; some closely resemble **48** (differing mainly in their glaucous colour), and the specific distinction between **51** and **48** is thereby confused.

52. S. nebrodensis L., *Sp. Pl.* ed. 2, 1217 (1763) (*S. duriaei* Gay). Glandular-hairy perennial up to 50 cm, viscid in inflorescence, with erect, rather narrowly branching, deeply striate stems. Lowest leaves petiolate, withering early; cauline leaves up to 10 cm, sessile, amplexicaul, sinuate-pinnatifid with wide, often toothed lobes. Capitula (15–)20–25 mm in diameter, laxly corymbose on long peduncles. Involucral bracts 10–12 mm, linear, more or less densely glandular-hairy; supplementary bracts 1 or 2, 2–4 mm; all bracts concolorous. Ligules 15–20, 6–8 mm, yellow, revolute soon after anthesis. Achenes *c.* 2·5 mm, hairy. *Rocky places.* ● *Mountains of Spain.* Hs.

Said by Linnaeus to grow in Sicilia also, but apparently in error.

53. S. abrotanifolius L., *Sp. Pl.* 869 (1753). Perennial (10–)15–30 cm, with thin, branched rhizome and erect, leafy stems subglabrous or sparsely floccose in upper part. Basal and lower cauline leaves subglabrous, 2- to 3-pinnatisect, with linear ultimate segments and narrow rhachis; upper cauline 1-pinnatisect with linear segments, or small, simple and bract-like. Capitula few or solitary, very showy, up to 40 mm in diameter. Involucre 6–7 mm; bracts ovate-lanceolate; supplementary bracts few, linear-lanceolate, up to half as long as bracts. Ligules *c.* 13, 10–15 mm, lanceolate, yellow to orange-red with brownish stripes. Achenes (2·5–)3–4 mm, glabrous, with prominent ribs. *Rocky mountain slopes.* ● *C. & E. Alps; Carpathians; mountains of Balkan peninsula.* Al Au Bu Cz Ge He It Ju Po Rm Rs (W).

(a) Subsp. **abrotanifolius**: Capitula 2–5(–8) on long peduncles. Upper cauline leaves pinnatisect. $2n=c.\ 40$. *C. & E. Alps; N.W. Jugoslavia.*

(b) Subsp. **carpathicus** (Herbich) Nyman, *Consp.* 356 (1879) (*S. carpathicus* Herbich): Capitula solitary. Uppermost cauline leaves small, simple, bract-like. $2n=40$. *Carpathians; mountains of Balkan peninsula.*

54. S. adonidifolius Loisel., *Fl. Gall.* 566 (1807). Subglabrous perennial 30–70 cm, with thin, branched rhizome and erect, leafy stems. Basal and lower cauline leaves 3-pinnatisect with linear ultimate segments and rhachis not more than 2 mm wide; upper cauline leaves 1-pinnatisect with linear segments. Inflorescence a terminal compound corymb with numerous small capitula. Involucre 4–5 mm; bracts lanceolate, keeled, each closely enclosing an achene of a ligulate floret in fruit; supplementary bracts 2–3, very short. Ligules 3–6, 3–6 mm, ovate, bright yellow. Achenes *c.* 2 mm, glabrous, with prominent ribs. $2n=40$. *Rocky ground, mainly in the mountains; calcifuge.* ● *S., C. & E. France, N.E. & C. Spain.* Ga Hs.

55. S. resedifolius Less., *Linnaea* **6**: 243 (1831). Dwarf, subglabrous perennial 3–20 cm, with branched rhizome. Stems usually simple. Basal and lower cauline leaves elliptical to obovate in outline, entire to lyrate-pinnatifid, petiolate; upper cauline sessile, pinnatifid, or reduced to lanceolate, entire bracts. Capitula usually solitary. Involucre *c.* 8 mm; bracts lanceolate; supplementary bracts few, linear, grading into upper cauline leaves. Ligules *c.* 13, *c.* 10 mm, yellow, often with violet stripes. Achenes 3·5–4 mm, glabrous. *Tundra. Arctic Russia.* Rs (N). (*N. Asia, arctic America.*)

Sect. DELPHINIFOLIUS Reichenb. Annuals (or biennials), glabrous to more or less villous. At least the cauline leaves pinnatifid. Supplementary bracts small or absent. Achenes elliptic-obovate, compressed, papillose.

Perhaps closely related to species from South Africa which are usually placed in the genus *Cineraria* L.

56. S. delphinifolius Vahl, *Symb. Bot.* **2**: 91 (1791). Sparsely hairy, erect annual up to 60 cm. Stem simple or branched only in inflorescence, slender, striate. Basal and lower cauline leaves withering early, ovate or lyrate, dentate, long-petiolate; middle and upper cauline leaves deeply 1- to 2-pinnatisect with more or less linear, often 3-fid segments. Inflorescence terminal, subcorymbose. Capitula 12–20 mm in diameter on long, slender peduncles. Involucral bracts 6–8 mm, pale; supplementary bracts 2–3 mm, filiform, grading into rather distant bracts on peduncles. Ligules *c.* 12, 8–10 mm, linear, pale yellow. Achenes 1–1·2 mm, covered with glandular tubercles. *Sandy ground. W. & S. Italy, Sicilia, Sardegna.* It Sa Si. (*N.W. Africa.*)

57. S. minutus (Cav.) DC., *Prodr.* **6**: 346 (1838). Annual up to 25 cm, simple or branched near base, with a very variably developed indumentum of long, whitish hairs, usually very obvious in the lower part of the stem. Stems slender, leafless in upper half, with a single capitulum. Basal leaves subspathulate, attenuate into petiole, coarsely dentate; middle cauline leaves more or less pinnatisect; uppermost cauline leaves simple, linear. Capitula (10–)20–35 mm in diameter. Involucral bracts 12–15, 6–8 mm, ovate-lanceolate with a scarious margin; supplementary bracts absent. Ligules *c.* 13, (4–)8–10 mm, linear, yellow (sometimes purplish). Achenes 1·5–2 mm, covered with rather long papillae. *Sandy or rocky ground.* ● *S. & C. Spain.* Hs.

Sect. SENECIO (incl. Sect. *Obaejaceae* DC., Sect. *Obaejacoideae* DC.). Annuals, glabrous or variously hairy. Leaves subentire to pinnatisect. Involucre usually with small supplementary bracts. Achenes subcylindrical, glabrous or hairy.

58. S. gallicus Chaix in Vill., *Hist. Pl. Dauph.* **1**: 371 (1786) (incl. *S. coronopifolius* Desf., non Burm. fil.). Subglabrous or sparsely floccose annual up to 40 cm, usually with several branches from the base. Leaves rather thick, more or less pinnatisect, with linear-oblong, often patent, remote, entire to pinnatifid segments; basal leaves petiolate; middle and upper cauline sessile, amplexicaul with dentate to laciniate auricles. Inflorescence subcorymbose with few capitula. Capitulum 15–22 mm in diameter. Involucral bracts 5–7 mm, linear-lanceolate, glabrous, concolorous; supplementary bracts often absent, sometimes 1–6, 1–2 mm, grading into few, remote bracts on the peduncle. Ligules *c.* 13, *c.* 8 mm, yellow. Achenes 2–2·5 mm, usually shortly subappressed-hairy on ridges. $2n=20$. *Maritime sands, cultivated ground and other open habitats. S. Europe, extending to C. France; casual further north.* ?Al Bl Bu ?Co Cr Ga Gr Hs It Ju Lu Si.

S. noeanus Rupr., *Bull. Phys.-Math. Acad. Pétersb.* **14**: 231 (1856), recorded from the European part of Kazakhstan, is very similar to **58** but has thicker roots, scarcely fleshy leaves and smaller achenes, and has often been treated as conspecific with it; it is widespread in S.W. & W.C. Asia.

59. S. leucanthemifolius Poiret, *Voy. Barb.* **2**: 238 (1789). Like **58** but often very fleshy; basal leaves usually obovate, dentate; cauline leaves variously dissected, often coarsely pinnatifid, with entire to shallowly dentate auricles; involucral bracts often black-tipped; supplementary bracts several, up to 2 mm, usually

blackish. $2n=20$. *Maritime sands and rocks; rarely inland. W. & C. Mediterranean region, S. Portugal.* Al Bl Co Ga ?Hs It Ju Lu Sa Si.

Very variable. Robust plants with thick, fleshy, unlobed or only slightly lobed leaves have been called **S. crassifolius** Willd., *Sp. Pl.* **3**: 1982 (1803), and contrast very strongly with small, spring-flowering ephemerals with only slightly fleshy leaves. Nevertheless, a series of intermediates seems to connect all the variants.

Variants occur with poorly developed ligules (e.g. **S. carolimalyi** Horvatić, *Biol. Glas.* (*Zagreb*) **8**: 37 (1955), described from N.W. Jugoslavia (Kverneri Otoki)), or with small capitula wholly without ligules (e.g. **S. pygmaeus** DC., *Prodr.* **6**: 341 (1838) from Sicilia, Malta and Lampedusa).

S. rodriguezii Willk. ex Rodr., *Anal. Soc. Esp. Hist. Nat.* **3**: 36 (1874), a dwarf, fleshy, almost entire-leaved plant from Islas Baleares (Mallorca and Menorca), differs strikingly from **59** in its pale lilac ligules. It is nevertheless not clearly distinguishable on any other character, has $2n=20$, and seems best treated as a local variant of **59**, typical yellow-flowered plants of which are recorded from Ibiza.

60. S. vernalis Waldst. & Kit., *Pl. Rar. Hung.* **1**: 23 (1800). Erect annual up to 50 cm, unbranched or with suberect branches above. Young stems and leaves usually arachnoid-lanate, but variably glabrescent at maturity. Basal leaves oblong in outline, more or less pinnatifid with wide, dentate rhachis, petiolate; middle and upper cauline similar in shape, but amplexicaul with dentate auricles. Capitula 20–25 mm in diameter in a laxly subcorymbose, terminal inflorescence. Involucral bracts 8–10 mm, glabrous, concolorous or black-tipped; supplementary bracts several, up to 3 mm, usually black-tipped. Ligules *c.* 13, *c.* 10 mm, yellow. Achenes 2–3 mm, appressed-hairy. $2n=40$. *Cultivated and waste ground and open, sandy or stony habitats. Native in E. & E.C. Europe; introduced in the nineteenth century to W.C. & W. Europe and Fennoscandia, and still extending its range.* Al Au Bu Gr Hu Ju Po Rm Rs (B, C, W, K, E) Tu [Be Cz Da Ga Ge He Ho No Su].

Although typical plants are very different in habit from **59** there are no clear characters unequivocally separating the two species, and the taxonomic position of some populations in parts of S. & E. Europe is very uncertain.

61. S. petraeus Boiss. & Reuter, *Pugillus* 59 (1852). Subglabrous, erect annual up to 50 cm with ascending branches mainly in the upper half. Basal leaves ovate, entire or dentate, shortly petiolate; cauline ovate-lanceolate, obtuse, dentate to shallowly lobed, auriculate-amplexicaul. Capitula few, 20–30 mm in diameter. Involucre *c.* 10 mm; supplementary bracts absent. Ligules *c.* 13, 8–10 mm, yellow. Achenes *c.* 3 mm, hairy. *Limestone rocks.* ● *S.W. Spain.* Hs.

62. S. sylvaticus L., *Sp. Pl.* 868 (1753). Erect annual up to 70 cm, with sulcate stem and ascending branches, usually somewhat floccose, glandular-hairy at least in inflorescence but not viscid. Leaves irregularly pinnatifid; basal and lower cauline leaves oblanceolate in outline, shortly petiolate; middle and upper cauline leaves oblong in outline, auriculate-amplexicaul. Capitula numerous, 4–6 mm in diameter, in a large terminal corymb. Involucral bracts 7–10 mm, concolorous or slightly dark-tipped, glandular-hairy; supplementary bracts 2 or 3, 1–2 mm. Ligules 8–15, very short and revolute immediately after anthesis, yellow. Achenes *c.* 2·5 mm, rather sparsely subappressed-hairy. $2n=40$. *Wood-margins and disturbed ground, especially on sandy soils. From C. Fennoscandia and N.C. Russia southwards to C. Portugal, C. Italy and Bulgaria.* Au Be Br Bu Cz Da Fe Ga Ge Hb He Ho Hs Hu It Ju Lu No Po Rm Rs (B, C, W) Su.

63. S. lividus L., *Sp. Pl.* 867 (1753). Erect, usually unbranched annual up to 40 cm, with sparse, eglandular hairs in lower half, more or less glandular-hairy in inflorescence. Leaves glabrous or somewhat glandular; basal leaves oblong-obovate, sinuate-lobed or pinnatifid, petiolate; middle and upper cauline leaves oblong, dentate, sometimes lobed, amplexicaul, with large, more or less dentate auricles. Capitula numerous, 6–10 mm in diameter, in a terminal corymb. Involucral bracts 8–10 mm, glabrous or subglabrous; supplementary bracts 4–6, 2–3 mm; all more or less dark-tipped. Ligules yellow, very short, revolute immediately after anthesis. Achenes 3–4 mm, covered with stiff, dense, erecto-patent or subappressed hairs. $2n=40$. *W. & C. Mediterranean region, Portugal.* Bl Co Ga Gr Hs It Lu Sa Si.

64. S. viscosus L., *Sp. Pl.* 868 (1753). Very viscid, foetid annual up to 60 cm, usually freely branched, with somewhat flexuous stems. Leaves dark green, densely glandular-hairy, deeply and regularly pinnatifid; basal and lower cauline obovate in outline, shortly petiolate; middle and upper cauline oblong in outline, sessile but not or scarcely amplexicaul. Capitula numerous, 6–10(–12) mm in diameter, in a large, irregular terminal corymb. Involucral bracts 8–11 mm, densely glandular; supplementary bracts 3 or 4, 2–4 mm; all usually concolorous. Ligules *c.* 13, short and often becoming revolute, yellow. Achenes 3–4 mm, glabrous. $2n=40$. *Waste ground, railway-lines and other open sandy or gravelly habitats. From the Netherlands and N.C. Russia southwards to C. Spain and Greece, but absent from most of the south-east; recently naturalized in parts of N. & W. Europe.* Al Au Be Bl *Br Bu Cz Ga Ge Gr He Ho Hs Hu It Ju Po Rm Rs (B, C, W) Si [Da Fe Hb No Rs (N) Su].

65. S. vulgaris L., *Sp. Pl.* 867 (1753). Subglabrous or somewhat floccose, rather succulent annual up to 40 cm, with weak, irregularly-branched stems. Leaves coarsely pinnatifid with distant, obtuse, toothed lobes; basal and lower cauline leaves oblanceolate in outline, shortly petiolate; middle and upper cauline leaves oblong in outline, auriculate-amplexicaul. Capitula numerous, 4–5 mm in diameter (in common discoid variant), subsessile in dense, subcorymbose clusters at anthesis; peduncles elongating in fruit. Involucre cylindrical; involucral bracts 5–8 mm, usually glabrous and often black-tipped; supplementary bracts 8–10, 1–2 mm, usually black-tipped, sometimes blackish throughout. Ligules usually absent, sometimes 6–12, yellow, short, revolute immediately after anthesis. Achenes 1·5–2(–2·5) mm, appressed-hairy between the ribs. $2n=40$. *Cultivated ground, waste places and maritime sands. Throughout Europe, but only as a casual in the extreme north.* All except Sb.

Very variable in habit, leaf-shape and hairiness. Populations with ligulate capitula (subsp. **denticulatus** (O. F. Mueller) P. D. Sell, *Watsonia* **6**: 303 (1967)) have a mainly coastal distribution in W. Europe and may be native. Ligulate variants are rare inland, except in Britain, where recent experimental evidence suggests that they may arise by introgressive hybridization with **48**.

In coastal parts of the Mediterranean region plants occur which are somewhat intermediate between **65** and **59**. Such plants may be of hybrid origin, but experimental evidence is lacking.

S. dubius Ledeb., *Fl. Alt.* **4**: 112 (1833), an Asiatic species recorded from S.E. Russia (Kamyšin), differs from **65** mainly in

the smaller size of all its parts and its usually unlobed leaves. It has often been treated as conspecific with **65**.

66. S. elegans L., *Sp. Pl.* 869 (1753). Subglabrous or sparsely floccose annual (?sometimes perennial) up to 60 cm. Stems ridged, usually branched only in the inflorescence. Leaves (except sometimes the basal) pinnatipartite, with 2–4 pairs of obtuse, crenate or shallowly lobed segments; lower cauline petiolate, upper sessile, auriculate-amplexicaul. Inflorescence subcorymbose with few capitula on long, sparsely bracteate peduncles. Capitulum 20–25 mm in diameter. Involucre 6–10 mm; supplementary bracts 8–15, 2–4 mm, more or less ovate. Ligules *c.* 13, 6–8 mm, purple. Achenes *c.* 2·5 mm, usually hairy. *Locally naturalized from gardens in S.W. Europe.* [Az ?Bl ?Hs Lu.] (*South Africa.*)

67. S. flavus (Decne) Schultz Bip. in Webb & Berth., *Phyt. Canar.* **2**: 319 (1845) (*S. decaisnei* DC.). Glabrous, somewhat fleshy annual up to 30 cm; stems much branched. Leaves simple, dentate; basal and lower cauline leaves broadly ovate, often cordate, purplish beneath, petiolate; middle and upper cauline auriculate-amplexicaul, often wider than long. Capitula 4–6 mm in diameter, in a lax corymb. Involucre 7–9 mm; supplementary bracts 0–3, *c.* 1 mm. Ligules absent. Achenes 2–3 mm, strongly subappressed-hairy. *Sandy soils and coastal rocks; rare. S. Spain (Prov. Almería).* Hs. (*Africa, S.W. Asia.*)

97. Ligularia Cass.[1]

(*Senecillis* Gaertner)

Like *Senecio* but basal and lower cauline leaves with petioles broadly sheathing at the base.

A large genus, mainly of temperate Asia, differentiated from *Senecio* by a number of inconstant characters. The presence or absence of a leaf-sheath is the only convenient character for separating the 2 genera as they are represented in Europe.

1 Inflorescence corymbose, bracteate only at base **3. dentata**
1 Inflorescence spicate, bracteate throughout
2 Basal leaves narrowed at base; pappus shorter than achene **2. glauca**
2 Basal leaves cordate or sagittate at base; pappus longer than achene **1. sibirica**

1. L. sibirica (L.) Cass., *Dict. Sci. Nat.* **26**: 402 (1823). Green or sometimes purplish-tinged perennial (15–)30–150 cm, with a stout, fibrous stock. Stems erect, usually simple, glabrous or hairy. Basal leaves (3–)10–25 × (3–)7–20 cm, triangular-reniform to subsagittate, dentate, subglabrous to densely hairy beneath, with petiole usually several times as long as lamina; cauline few, smaller, the upper narrower and subsessile. Capitula shortly pedunculate, in lax, bracteate spikes. Involucre 15–20 mm, with (6–)8–10 lanceolate bracts; supplementary bracts 2, linear, about as long as involucre. Ligules (5–)7–11, 8–20 × 1–5 mm, yellow. Achenes 4–6 mm; pappus longer than achene, dirty white. $2n=60$. *Damp meadows and woods. E. & E.C. Europe southwards to E. Austria, Bulgaria and S. Ural; mountains of C. & S. France.* Au Bu Cz Ga Hu Po Rm Rs (N, B, C, W, E).

More or less densely hairy plants with few ligules from N. & C. Russia have been called **L. lydiae** Minder., *Ukr. Bot. Žur.* **14(2)**: 48 (1957), and dwarf plants with very slender stems have been called **L. arctica** Pojark. in Schischkin & Bobrov, *Fl. URSS* **26**: 891 (1961) (described from Arctic Russia), or **L. bucovinensis** Nakai, *Jour. Jap. Bot.* **20**: 135 (1944) (described from the E. Carpathians), but these all seem to be no more than ecological variants.

2. L. glauca (L.) O. Hoffm. in Engler & Prantl, *Natürl. Pflanzenfam.* **4 (5)**: 288 (1892) (*Senecillis glauca* (L.) Gaertner; incl. *L. carpathica* (Schott, Nyman & Kotschy) Pojark.). Glaucous perennial 50–150 cm, with a stout, fibrous stock. Stems erect, simple, glabrous. Basal leaves 5–25 × 3–15 cm, oblong-ovate to -elliptical, entire or weakly denticulate, glabrous, narrowed at base into a petiole up to as long as the lamina; cauline smaller, the upper subsessile. Capitula several to many, shortly pedunculate in short, dense, bracteate spikes. Involucre 8–10 mm, with 10–12 linear-lanceolate bracts; supplementary bracts 1–2, linear, *c.* ½ as long as involucre. Ligules 6–12, 10–13 × 5–6 mm, yellow. Achenes 4–6 mm; pappus less than half as long as achene, dirty white. $2n=60$. *Steppe and mountain grassland. Carpathians, W. Ukraine and mountains of S.W. Bulgaria.* Bu Cz Rm Rs (W).

3. L. dentata (A. Gray) Hara, *Jour. Jap. Bot.* **15**: 318 (1939) (*L. clivorum* Maxim.). Green, often purplish-tinged perennial 25–100 cm, with a stout, fibrous stock. Stems erect, simple, glabrous or hairy above. Basal leaves 20–30 × 25–40 cm, reniform to cordate-orbicular, dentate, sparsely pubescent above, with petiole about as long as lamina; cauline smaller, shortly petiolate. Capitula few to many, long-pedunculate in a lax corymb bracteate at the base. Involucre 15–20 mm, with 9–13 oblong-lanceolate bracts; supplementary bracts absent. Ligules 10–14, 20–40 × 5–8 mm, orange-yellow. Achenes 8–10 mm; pappus longer than achene, reddish. *Widely cultivated for ornament; naturalized in E. England.* [Br.] (*E. Asia.*)

98. Kleinia Miller[1]

Succulent perennial herbs or dwarf shrubs, glabrous (or with hairs only in leaf-axils). Leaves more or less fleshy, fusiform or compressed. Capitula solitary or in corymbs or panicles. Involucral bracts in one row; supplementary bracts usually present. Receptacle flat, without scales. Florets tubular, white, usually all hermaphrodite. Anthers obtuse at base. Style-branches conical at apex. Achenes subcylindrical, glabrous or shortly hairy; pappus of several rows of weakly dentate hairs.

Leaves terete or laterally compressed **1. mandraliscae**
Leaves flattened or sulcate on the adaxial surface, rounded on the abaxial surface **2. repens**

1. K. mandraliscae Tineo, *Ann. Agric. Sic.* ser. 2, **3**: 315 (1855). Glabrous, pruinose perennial up to 150 cm. Stems erect, branched, stout, fleshy. Leaves 7–15 × 0·8–1·3 cm, usually crowded towards base of stem, terete, fusiform, very fleshy, with a long mucro. Capitula 5–9 mm in diameter, in a compound corymb or panicle. Involucre 9–12 mm, with 2–5 supplementary bracts. *Isole Lipari.* *Si.
bracts. *Isole Lipari.* *Si.

The origin of this plant is uncertain and it may be a garden hybrid.

K. ficoides (L.) Haw., *Syn. Pl. Succ.* 313 (1812), from South Africa, which has been reported as naturalized in N.W. Spain, is like **1** but its leaves are more or less compressed and ensiform rather than fusiform. Similar plants but with small, slightly compressed leaves 4–7 × 0·2–0·5 cm are perhaps becoming naturalized in Açores (Faial), where they are cultivated for ornament; they are probably referable to **K. aizoides** DC., *Prodr.* **6**: 337 (1838), also from South Africa.

[1] By A. O. Chater.

2. K. repens (L.) Haw., *Syn. Pl. Succ.* 313 (1812). Like **1** but not more than 30 cm, more pruinose and glaucous; leaves 3–4 × *c.* 0·75 cm, more or less crowded at apex of stem, flattened or sulcate on the adaxial surface, rounded on the abaxial surface, subobtuse, with a short mucro; capitula usually 2–3. *Naturalized in Açores* (*Terceira*). [Az.] (*South Africa.*)

99. Cacalia L.[1]

Perennial herbs with alternate leaves. Leaves not or shortly sheathing at the base. Capitula in a raceme or panicle; involucral bracts in one row, usually without supplementary bracts. Receptacle usually flat, without scales. Florets 1–20, all tubular, hermaphrodite and fertile. Style-branches long, subclavate. Achenes more or less cylindrical, unbeaked, ribbed; pappus of simple, scabrid hairs.

1. C. hastata L., *Sp. Pl.* 835 (1753). Stems 40–150 cm, erect, simple, subglabrous below, densely glandular-pubescent above. Cauline leaves 5–25 × 5–25 cm, hastate to triangular-reniform, acutely dentate, glabrous or hairy beneath, with broadly winged, more or less amplexicaul petiole; upper cauline leaves smaller, sometimes lanceolate. Capitula many, 5–8 mm in diameter, in a lax panicle. Involucre 9–13 mm, glandular-pubescent, with usually 2–4 minute supplementary bracts; bracts 8–10. Florets whitish. Achenes 6–8 mm; pappus about as long as achene. *Damp woods and meadows. E. half of Russia.* Rs (N, C, E).

Tribe **Calenduleae** Cass.[2]

Leaves alternate, simple. Capitula with ligules; outer florets female, the inner hermaphrodite or functionally male; corolla yellow or orange. Receptacle without scales. Anthers sagittate but not caudate at base. Style of female and functionally male flowers undivided, the style-branches of the hermaphrodite flowers flattened, truncate and papillose at apex. Pappus absent.

100. Calendula L.[3]

Annual or perennial herbs, sometimes woody at the base, often glandular and aromatic. Leaves alternate, simple. Inflorescence sometimes branched. Involucral bracts in 1–2 rows, linear, acuminate, subequal, with a narrow scarious margin. Receptacle flat, without scales. Capitula medium. Outer florets ligulate, yellow or orange, female, fertile. Inner florets tubular, yellow, orange, brown or violet-purple, functionally male. Anthers sagittate-caudate; filaments free. Outer achenes with a narrow beak, sometimes cymbiform, or 3-winged; inner smaller, strongly falcate or almost annular, tuberculate-rugose on dorsal surface, usually unwinged; pappus absent.

Literature: D. Lanza, *Monografia del Genere* Calendula *L.* Palermo. 1919; *Atti Accad. Sci. Palermo* ser. 3, **12**: 1–166 (1923). H. Meusel & H. Ohle, *Österr. Bot. Zeitschr.* **113**: 191–210 (1966). H. Meusel & H. Ohle, *Österr. Bot. Zeitschr.* **113**: 191–210 (1966). H. Ohle, *Feddes Repert.* **85**: 245–283 (1974).

1 Ligules usually less than twice as long as involucral bracts
2 Outer achenes with a narrow beak or cymbiform, not 3-winged **4. arvensis**
2 Outer achenes without a beak, broadly 3-winged **5. tripterocarpa**
1 Ligules usually twice as long as involucral bracts
3 Perennial, sometimes woody; florets normally concolorous; outer (beaked) achenes often conspicuously long, patent or weakly incurved **1. suffruticosa**
3 Usually annual; stems herbaceous or woody only at the base
4 Ligules yellow or orange; tubular florets yellow, orange or brownish; outer achenes usually strongly incurved **2. officinalis**
4 Ligules violet at apex; tubular florets violet-purple; outer achenes patent **3. stellata**

1. C. suffruticosa Vahl, *Symb. Bot.* **2**: 94 (1791). Perennial 20–50 cm or more, usually woody for some distance above base. Leaves (1·5–)2·5–7(–12) × (0·3–)0·8–3(–4) cm. Ligules often 2 cm, usually more than twice as long as involucral bracts, yellow or orange; tubular florets more or less concolorous with ligules. Capitula in fruit with an outer row of patent (occasionally deflexed) or weakly incurved, narrowly beaked achenes up to 3 cm, alternating with much shorter cymbiform (rarely 3-winged) achenes. *Rock-crevices, maritime sands and other dry habitats, usually near the coast. Mediterranean region, Portugal.* Gr Hs It Lu Si Tu.

An extremely variable species which includes the following subspecies; these are frequently treated as species, but they are connected by numerous intermediates.

1 Stems procumbent to decumbent; leaves usually rather fleshy
2 Capitula 3–5 cm in diameter; leaves densely and conspicuously glandular-pubescent **(e)** subsp. **maritima**
2 Capitula 2–3·5 cm in diameter; leaves minutely but ± densely glandular-pubescent **(f)** subsp. **algarbiensis**
1 Stems erect or diffuse; leaves not fleshy
3 Leaves and stems whitish-floccose-tomentose **(d)** subsp. **tomentosa**
3 Leaves and stems pubescent, green
4 Flowering stems simple or sparingly branched; peduncles often long and naked or with a few small, subulate bracts; leaves narrowly oblong-lanceolate, usually acute, often conspicuously repand-dentate **(a)** subsp. **suffruticosa**
4 Flowering stems usually much-branched; peduncles rather short, with well-developed, leaf-like bracts; leaves often broadly oblanceolate or spathulate, obtuse, often subentire or obscurely toothed
5 Ligules yellow, about twice as long as involucral bracts **(b)** subsp. **lusitanica**
5 Ligules orange, usually more than twice as long as involucral bracts **(c)** subsp. **fulgida**

(a) Subsp. **suffruticosa** (incl. *C. noeana* Boiss., *C. suffruticosa* subsp. *gussonii* Lanza): Stems usually erect. Leaves linear-lanceolate to narrowly oblanceolate, acuminate, often conspicuously repand-dentate, glandular-pubsecent. Capitula 3–4 cm in diameter. Beaked achenes usually 3 cm, almost straight, patent or deflexed. *Almost throughout the range of the species.*

(b) Subsp. **lusitanica** (Boiss.) Ohle, *Feddes Repert.* **85**: 270 (1974) (*C. lusitanica* Boiss.): Stems erect or diffuse. Leaves sparsely glandular-pubescent or subglabrous, often remotely denticulate. Capitula (1·5–)2–4(–5) cm in diameter; ligules yellow, sometimes tipped with red. Outer achenes sometimes long-beaked, patent or weakly incurved, subglabrous or glandular-pubescent. $2n=32$. *Rocky ground; calcicole.* ● *Spain and Portugal.*

(c) Subsp. **fulgida** (Rafin.) Ohle, *op. cit.* 265 (1974) (*C. fulgida* Rafin.): Stems erect or diffuse. Leaves sometimes sparsely arachnoid-floccose, especially at margins, undulate or repand-dentate. Capitula 2·5–5(–6) cm in diameter; ligules orange, sometimes red at apex. Outer achenes usually long-beaked, weakly incurved, glabrous or subglabrous. $2n=32$. *Dry grassy and stony places; calcicole. Sicilia and small islands of C. Mediterranean region.*

(d) Subsp. **tomentosa** Murb., *Lunds Univ. Årsskr.* nov. ser., **1(4)**: 9 (1905) (incl. *C. tomentosa* Desf., non L. fil., *C. incana* Willd.): Stems often diffuse or ascending, whitish-floccose-tomentose. Leaves narrowly obovate-spathulate, shortly acute or obtuse, sometimes subentire, more or less densely floccose-tomentose. Capitula usually 4–5 cm in diameter. Outer achenes as in subsp. **(a)**. *S.W. Spain, S.W. Portugal.*

(e) Subsp. **maritima** (Guss.) Meikle, *Bot. Jour. Linn. Soc.* **71**: 274 (1976) (*C. maritima* Guss.): Stems procumbent or decumbent, leafy; leaves densely and conspicuously glandular-pubescent, rather fleshy, entire or rarely sparsely denticulate. Capitula 3–5 cm in diameter; ligules yellow (rarely orange). Outer achenes usually shortly beaked, rather strongly incurved, scabrid-pubescent. *Maritime sands and gravels.* ● *W. Sicilia.*

(f) Subsp. **algarbiensis** (Boiss.) Nyman, *Consp.* 398 (1879) (*C. algarbiensis* Boiss., *C. microphylla* Lange ex Ficalho): Stems procumbent or decumbent; leaves up to 7 cm, minutely but more or less densely glandular-pubescent, often rather fleshy, subentire or remotely toothed. Capitula 2–3·5 cm in diameter; ligules yellow, sometimes red at apex. Outer achenes often long-beaked, patent or weakly incurved, subglabrous or glandular-pubescent. $2n=32$, $32+2B$. *Rocky and sandy sea-shores.* ● *S. Spain, C. & S. Portugal.*

2. C. officinalis L., *Sp. Pl.* 921 (1753). Annual to perennial, woody only at the base. Stems (17–)20–50(–70) cm, erect, diffuse or procumbent, much-branched, generally leafy almost to apex. Leaves (3–)7–14(–17) × 1–4(–6) cm, oblanceolate, narrowly obovate, oblong or spathulate, shortly acute or obtuse, glandular-pubescent to sparsely arachnoid-floccose, usually subentire to obscurely repand-dentate. Capitula usually 4–7 cm in diameter. Ligules often 2 cm, at least twice as long as the involucral bracts, yellow or orange; tubular florets usually more or less concolorous with ligules, sometimes brownish. Capitula in fruit with or without an outer row of incurved (or rarely patent) narrowly beaked achenes 2–2·5 cm, alternating with much shorter, cymbiform (rarely 3-winged) achenes. *Cultivated for ornament throughout Europe; locally naturalized in S. & W. Europe and a frequent casual elsewhere.* [Az Br Hs It.] (*Origin unknown.*)

3. C. stellata Cav., *Icon. Descr.* **1**: 3 (1791) (*C. algeriensis* Boiss. & Reuter). Annual (6–)14–40(–50) cm, erect or diffuse, usually much-branched. Leaves 1·5–10(–14) × 0·8–3(–4) cm, oblong-lanceolate to narrowly obovate, subglabrous to sparsely arachnoid-floccose, subentire or remotely denticulate. Capitula (2·3–)3–4(–5) cm in diameter. Ligules usually more than twice as long as involucral bracts, golden-yellow or orange, violet at apex. Tubular florets violet-purple or nearly black. Capitula in fruit with an outer row of patent, narrowly beaked achenes 1·5–3 cm, or sometimes with rather shorter, broadly winged and coarsely serrate achenes; cymbiform and annular achenes frequently few or none. *Cultivated and waste ground. Sicilia.* Si. (*North Africa.*)

C. bicolor Rafin., *Caratteri* 82 (1810), with smaller capitula, ligules usually less than twice as long as involucral bracts, thinly arachnoid-floccose leaves and short, narrow, incurved achenes (like those of **4**) is very probably a hybrid between **3** and **4**. It occurs in S. Spain, Sicilia, Greece and perhaps elsewhere, though many records are referable to variants of **4** with discolorous florets.

4. C. arvensis L., *Sp. Pl.* ed. 2, 1303 (1763). Annual (5–)15–25(–30) cm, often thinly arachnoid-floccose, erect or diffuse, usually much-branched. Leaves (1–)3–8(–10) × 0·4–1·4(–2) cm, pubescent or thinly floccose, oblong or narrowly obovate, acute or obtuse, with subentire or obscurely denticulate margins. Capitula 1–2(–3·5) cm in diameter. Ligules yellow or orange, usually less than 1·8 cm, often distinctly exceeding, but not twice as long as involucral bracts. Tubular florets concolorous with ligules or sometimes brown or violet-purple. Capitula in fruit usually with an outer row of incurved, narrowly beaked achenes 1·3–2 cm, alternating with broadly cymbiform achenes 0·6–1 cm, the beaked achenes occasionally up to 2·5 cm and conspicuous (var. *malacitana* (Boiss. & Reuter) Coutinho) or rarely wholly replaced by cymbiform or annular achenes. $2n=44$. *Cultivated and waste ground. S. & S.C. Europe; naturalized or casual further north.* Al Az Bl Co Cr Ga Ge Gr He Hs Hu It Ju Lu Rm Rs (W, K) Sa Si Tu [*Bu Po].

A polymorphic species in which the variants are so interconnected that attempts to separate them, at any rank, are unsatisfactory.

5. C. tripterocarpa Rupr., *Bull. Phys.-Math. Acad. Pétersb.* **14**: 231 (1856). Like **4** but usually smaller, with slender, much-branched, diffuse or decumbent stems; leaves sparsely glandular-pubescent, linear-oblong, acute, usually with distinctly repand-dentate margins, rarely subentire; capitula 0·5–1·2 cm in diameter; florets concolorous, yellow or orange, the ligules usually less than 1 cm and not much exceeding the involucral bracts; capitula in fruit with an outer row of broadly 3-winged, toothed or lacerate, unbeaked achenes; beaked achenes usually absent. *Cultivated and waste ground. W. Mediterranean region.* Bl Co Ga Hs It.

101. Chrysanthemoides Fabr.[1]

Shrubs. Leaves alternate, simple. Capitula in a terminal corymb; tubular florets, 5-lobed, functionally male; ligules female. Involucral bracts 2- to 3-seriate, free, herbaceous.

1. C. monilifera (L.) T. Norlindh, *Stud. Calend.* **1**: 374 (1943). Up to 1 m. Leaves 15–60 × 7–20 mm, ovate-lanceolate, subacute to obtuse, mucronate, cuneate at base, coarsely serrate, shortly petiolate. Capitula 15–25 mm in diameter; ligules 5–6 in 1 row, bright yellow. Achenes 5–7 mm, globose to ovoid, the wall fleshy when young, hard at maturity, black. *Cliffs and screes. Naturalized in S. France and Sicilia.* [Ga Si.] (*South Africa.*)

Tribe **Arctotideae** Cass.[2]

Leaves alternate, simple or pinnatifid. Capitula with ligules; outer florets female, the inner hermaphrodite; corolla variously coloured. Receptacle without scales. Anthers sagittate but not caudate at base. Style-branches usually short; style thickened upwards. Pappus of scales.

102. Arctotis L.[3]

Annual or perennial herbs, often woody at the base. Leaves alternate, entire to lyrate-pinnatifid. Capitula solitary, axillary, pedunculate. Involucral bracts imbricate, in several rows, free. Receptacle flat, alveolate, without scales. Outer florets ligulate, female. Inner florets hermaphrodite; corolla 5-lobed. Achenes obovoid, with 3 wing-like ridges on one side; pappus of 2 rows of oblong scales, those of the inner row larger.

Literature: T. Norlindh, *Svensk Bot. Tidskr.* **58**: 193–203 (1964).

1. A. stoechadifolia Bergius, *Descr. Pl. Cap. Bonae Spei* 324 (1767). White-tomentose perennial; stems up to 100 cm, decumbent, woody below. Leaves 3–10 × 0·5–3 cm, obovate to linear-

[1] By A. O. Chater. [2] Edit. T. G. Tutin. [3] By R. D. Meikle.

[1] By D. M. Moore. [2] Edit. T. G. Tutin. [3] By D. A. Webb.

oblong, entire to lyrate-pinnatifid. Capitula 4–7 cm in diameter. Involucral bracts more or less scarious, tomentose in centre but with a wide glabrous margin, the outermost very small and with a subulate, tomentose apical appendage. Ligules 15–25(–35) mm, creamy white above, purple beneath. Inner florets yellow. Achenes densely villous with brownish hairs. *Cultivated for ornament in S. & W. Europe, and more or less naturalized in sandy waste places in S. Portugal.* [Lu.] (*South Africa.*)

103. Arctotheca Wendl.[1]

Like *Arctotis* but outer florets sterile; achenes without ridges; pappus of a single row of 4–8 short scales.

1. A. calendula (L.) Levyns, *Jour. S. Afr. Bot.* **8**: 284 (1942). Annual, scapose or with decumbent, leafy stems up to 40 cm. Leaves 7–20 cm, lyrate-pinnatisect, scabrid-pubescent above, white-tomentose beneath. Capitula 3–5 cm in diameter. Outer involucral bracts mainly herbaceous, but with a scarious margin and often with a terminal, pinnatisect, scarious appendage; inner bracts mainly scarious, obtuse. Ligules 15–20 mm, pale yellow above, purplish beneath. Inner florets greenish-black. Achenes densely lanate. $2n=18$. *Dry, open habitats. Widely naturalized in C. & S. Portugal and S.W. Spain.* [Hs Lu.] (*South Africa.*)

104. Gazania Gaertner[1]

Like *Arctotis* but involucral bracts in 2–3 rows, connate at the base so as to form a cupuliform involucre; outer florets sterile; achenes without ridges; pappus-scales linear-subulate, about equal in length.

Literature: H. Roessler, *Mitt. Bot. Staatssamm.* (*München*) **3**: 71–500 (1959).

1. G. rigens (L.) Gaertner, *Fruct. Sem. Pl.* **2**: 451 (1791). Perennial; stems up to 50 cm, decumbent, woody at the base. Leaves 30–80 × 6–15 cm, oblanceolate to oblong, entire, narrowed very gradually to a petiole about as long as the lamina, green and sparsely floccose-tomentose above, densely white-tomentose beneath; rarely a few leaves pinnatifid with 2–4 oblong lobes. Peduncles 8–25 cm, erect, usually with 1–2 linear bracts. Capitula 5–8 cm in diameter. Ligules bright orange, with a basal black patch with a white spot in the centre. Inner florets orange. Achenes *c.* 4 mm, densely sericeous; pappus *c.* 6 mm. *Cultivated for ornament in S. Europe and naturalized on roadsides in S. Portugal* [Lu.] (*South Africa.*)

The description applies to var. *rigens*, which is known only in cultivation and as an escape. Other varieties, found wild in South Africa, have smaller capitula and yellow ligules without a black and white patch.

Tribe **Cardueae** Cass.[2]

Leaves alternate, often spiny. Capitula without ligules, though marginal florets often enlarged and with 2-lipped corolla; florets marginal florets often enlarged and with 2-lipped corolla; florets mostly hermaphrodite; corolla variously coloured. Receptacle with or without scales or setae. Anthers usually with appendages. Style thickened or hairy below the branches. Pappus usually of hairs.

105. Amphoricarpos Vis.[1]

Perennial herbs. Leaves alternate, entire, not spiny. Capitula solitary (rarely 2) on long peduncles. Involucral bracts in several rows, herbaceous with scarious margin, entire, without appendages. Receptacle convex, with entire or lacerate scales. Outermost florets female, the remainder hermaphrodite. Corolla shortly 5-lobed. Anthers caudate. Achenes hairy to subglabrous, the outer compressed, the inner cylindrical; pappus of *c.* 10 linear scales.

1. A. neumayeri Vis., *Fl. Dalm.* **2**: 28 (1847). Stock short, woody; stems 2–4 cm, with 1-3 small leaves. Basal leaves 5–18 cm, linear to elliptic-oblong, shortly acuminate to subobtuse, narrowed gradually to a short petiole, green above, white-tomentose beneath. Capitula 2–3 cm in diameter. Inner involucral bracts *c.* 13 mm, linear-oblong. Achenes 5–6 mm; pappus 5–8 mm. *Mountain rocks.* ● *W. half of Balkan peninsula, from C. Bosna to N.W. Greece.* Al Gr Ju.

(a) Subsp. **neumayeri**: Leaves 4–8(–10) mm wide, linear; margin revolute. Outer involucral bracts oblong-ovate, usually mucronate. Florets pink. $2n=24$. *S.W. Crna Gora and adjacent part of Hercegovina.*

(b) Subsp. **murbeckii** Bošnjak, *Glasn. Hrvatsk. Prir. Društva* **41–48**: 62 (1936): Leaves (6–)10–25 mm wide, lanceolate to elliptic-oblong; margin usually flat. Outer involucral bracts ovate-orbicular, usually obtuse. Florets pink or white. *Almost throughout the range of the species.*

106. Carlina L.[1]

(incl. *Lyrolepis* Rech. fil.)

Annual to perennial herbs, sometimes woody at the base. Leaves alternate or basal, entire to deeply pinnatisect, usually with spinose-dentate margins. Capitula sessile to shortly pedunculate, solitary or in cymose, often corymbose inflorescences. Receptacle flat, with scales and sometimes also with bristles, the scales divided at the apex, or almost to the base, into linear segments. Involucral bracts in several rows, the outer usually similar to the upper leaves, the inner entire, scarious, shining, rigid, radiating when dry. Florets all hermaphrodite; corolla 5-lobed; anthers caudate. Achenes oblong, hairy; pappus of a ring of plumose hairs, usually united into groups at the base.

Measurements of the diameter of capitula refer to the florets only and exclude the involucral bracts. Measurements of leaves include the spines.

Literature: H. Meusel & A. Kästner, *Feddes Repert.* **83**: 213–232 (1972). H. Meusel & K. Werner, *Wiss. Zeitschr. Univ. Halle* (*Math.-Nat.*) **11**: 279–292 (1962).

1 Plant entirely without spines (Kriti) **1. diae**
1 At least the upper leaves and outer involucral bracts spiny
2 Plant acaulescent, with a single, sessile capitulum
3 Inner involucral bracts silvery-white or pinkish; pappus *c.* 13 mm **10. acaulis**
3 Inner involucral bracts yellowish; pappus 18–25 mm **11. acanthifolia**
2 Plant caulescent, usually with more than 1 capitulum
4 Cushion-plant with much-branched, woody stock and spreading branches (Karpathos) **2. tragacanthifolia**
4 Stem erect, scarcely woody, simple or with erecto-patent branches
5 Inner involucral bracts bright yellow or brownish-yellow
6 Annual to short-lived perennial; capitula ±sessile, the terminal greatly overtopped by 1–2 axillary branches which arise immediately below it **13. racemosa**
6 Perennial; capitula mostly pedunculate, in a ±corymbose inflorescence
7 Middle cauline internodes 12–15 mm; upper leaves widest at base, amplexicaul **3. corymbosa**
7 Middle cauline internodes 4–8 mm; upper leaves widest near the middle or parallel-sided, scarcely amplexicaul **8. fiumensis**
5 Inner involucral bracts reddish-purple, pink, white or pale yellow
8 Inner involucral bracts reddish-purple above, at least towards the apex
9 Perennial, not more than 10 cm; leaves glabrescent **5. barnebiana**
9 Annual or biennial, up to 40 cm; leaves persistently arachnoid-tomentose, at least beneath
10 Annual; outer involucral bracts 10–12 mm wide (including spines); inner involucral bracts reddish-purple above for most of their length **12. lanata**
10 Biennial; outer involucral bracts 15–20 mm wide (including spines); inner involucral bracts mainly white above, purplish-red only towards the apex **9. macrocephala**
8 Inner involucral bracts white, pale pink or pale yellow above (sometimes purplish beneath)
11 Inner involucral bracts at least 30 mm; receptacle bearing stout, clavate hairs as well as scales **10. acaulis**
11 Inner involucral bracts not more than 20 mm; receptacle without stout, clavate hairs
12 Inner involucral bracts white above, white or purplish beneath
13 Perennial; inner involucral bracts 2·5–3 mm wide **4. sicula**
13 Biennial; inner involucral bracts 1·5–2 mm wide **9. macrocephala**
12 Inner involucral bracts pale yellow or straw-coloured above and beneath
14 Outer involucral bracts 20–25 mm wide, pinnatisect, greatly exceeding the inner **7. frigida**
14 Outer involucral bracts 4–9 mm wide, spinose-dentate, shorter than or only slightly exceeding the inner
15 Biennial; leaves spinose-dentate, the spines shorter than the width of the remainder of the leaf **6. vulgaris**
15 Perennial; leaves deeply spinose-pinnatifid, the segments longer than the width of the remainder of the leaf **8. fiumensis**

Subgen. **Lyrolepis** (Rech. fil.) Meusel & Kästner. Perennial, with procumbent, much-branched, woody stock; at least some of the leaves without spines. Inner involucral bracts bright yellow.

1. C. diae (Rech. fil.) Meusel & Kästner, *Feddes Repert.* **83**: 228 (1972) (*Lyrolepis diae* Rech. fil.). Plant densely white-tomentose throughout. Flowering stems 40–60 cm, erect, sparsely leafy. Leaves mostly crowded on short non-flowering branches, oblanceolate, obtuse to acute, entire. Capitula 15–20 mm in diameter, in small corymbs of 2–4. Outer involucral bracts 10–15 × 3–5 mm, entire or pinnatifid; inner bracts 10–16 mm. Florets yellow. *Calcareous maritime cliffs.* ● *Small islands off the N. coast of Kriti.* Cr.

2. C. tragacanthifolia Klatt, *Leopoldina* **20**: 94 (1884) (*Atractylis conformis* W. Barbey & Major). Plant white-tomentose throughout. Stems 15–20 cm, branched from the base, forming a fairly dense cushion. Leaves dimorphic, the earliest of each year's growth oblanceolate, entire or somewhat pinnatifid, soft, without spines, the remainder *c.* 5 cm, narrowly linear, coriaceous, canaliculate, with a terminal spine and 2–3 lateral spines 12–15 mm on each side. Capitula 8–20 mm in diameter, terminal. Outer involucral bracts 20–50 mm, similar to the upper leaves; inner bracts *c.* 10 mm. Florets pale yellow. *Karpathos.* Cr. (*Rhodos.*)

Subgen. **Carlina**. Annual to perennial, monocarpic or with subterranean stock. All leaves spiny. Inner involucral bracts variously coloured.

3. C. corymbosa L., *Sp. Pl.* 828, [1231] (1753). Subglabrous to sparsely arachnoid-tomentose perennial (10–)20–50(–80) cm, with one or more stems arising from an underground rhizome. Leaves up to 9 × 3 cm, oblong-lanceolate to ovate, dentate to pinnatisect, undulate, with strongly spinose margin. Capitula 12–20 mm in diameter, solitary on short branches, forming a rather dense corymb. Inner involucral bracts 10–16 × 1·5–2·5 mm, bright or brownish yellow. Florets yellow. Achenes *c.* 2·5 mm; pappus *c.* 8 mm. $2n=18$, 20. *S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

Very variable, but not easily divided into subspecies. Of those recognized below, subsp. (c), of very limited distribution, is fairly distinct; subsp. (b) is distinct from (a) in the E. Mediterranean region, but some variants of the latter in S.W. Europe, especially Corse and Mallorca, come very close to subsp. (b).

1 Outer involucral bracts not exceeding the inner, or exceeding them by not more than 10(–15) mm (a) subsp. **corymbosa**
1 Outer involucral bracts exceeding the inner by 15–20(–60) mm
2 Leaves and outer involucral bracts spinose-dentate to -pinnatifid, with the margin between the principal spines usually finely spinose-dentate (b) subsp. **graeca**
2 Leaves and outer involucral bracts deeply and remotely spinose-pinnatisect, with the margin between the principal spines usually ±entire (c) subsp. **curetum**

(a) Subsp. **corymbosa** (incl. *C. thracica* Velen.): Somewhat tomentose. Leaves dentate to pinnatifid, with segments shorter than or about equalling the width of the undivided portion; margin between the principal spines usually finely spinose-dentate. Outer involucral bracts not exceeding the inner, or exceeding them by 10(–15) mm. *Throughout the range of the species except for most of the Aegean region.*

(b) Subsp. **graeca** (Boiss.) Nyman, *Consp.* 400 (1879) (*C. graeca* (Boiss.) Heldr.; incl. *C. rothii* (Boiss.) Halácsy): Like subsp. (a) but usually subglabrous; outer involucral bracts exceeding the inner by 15–20 mm. *Balkan peninsula and Aegean region.*

(c) Subsp. **curetum** (Heldr. ex Halácsy) Rech. fil., *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **105(1)**: 644 (1943) (*C. curetum* Heldr. ex Halácsy): Subglabrous. Capitula rather few and small. Leaves remotely spinose-pinnatisect, with segments much longer than the width of the undivided portion; margin between the principal spines usually more or less entire. Outer involucral bracts exceeding the inner by up to 60 mm. ● *Kriti and Karpathos.*

C. sitiensis Rech. fil., *Feddes Repert.* **43**: 147 (1938), described from a single gathering from E. Kriti, is perhaps related to 3; it is said, however, to have straw-coloured inner involucral bracts and the surface of the leaves minutely spinose and glandular. It requires further investigation.

4. C. sicula Ten., *Cat. Pl. Horti Neap., App.* ed. 2, 74 (1819). Subglabrous perennial; stem 20–70 cm, simple or with very short branches. Leaves *c.* 7 × 2 cm, oblong, pinnatisect, spiny. Capitula 25–35 mm in diameter, in a crowded terminal cluster of 2–4; sometimes 1–2 capitula subsessile in leaf-axils lower down. Outer involucral bracts up to 45 mm, exceeding the inner; inner bracts 12–15 × 2·5–3 mm, silvery-white above, white or purplish beneath. Florets yellow. Achenes *c.* 3 mm; pappus *c.* 9 mm. *S.E. Italy, Sicilia and smaller islands of C. Mediterranean region.* It Si.

[1] By D. A. Webb. [2] Edit. D. M. Moore.

5. C. barnebiana B. L. Burtt & P. H. Davis, *Kew Bull.* **4**: 103 (1949). Sparsely arachnoid-villous to glabrescent perennial; stems *c.* 8 cm, simple. Leaves up to 9 × 2 cm, linear-oblanceolate, pinnatisect, undulate, with spinose margin. Capitula 15–20 mm in diameter, solitary. Outer involucral bracts 6 mm; inner bracts reddish-purple above and beneath, at least in apical part (sometimes white towards the base). Achenes *c.* 3 mm; pappus *c.* 8 mm. ● *E. Kriti.* Cr.

6. C. vulgaris L., *Sp. Pl.* 828, [1231] (1753). Biennial 10–70 cm, subglabrous or with sparsely arachnoid indumentum. Leaves up to 15 cm, linear-oblong to narrowly ovate, more or less spinose-dentate, the lower tapered to a short petiole. Capitula 15–30 mm in diameter, solitary or in terminal groups of 2–3. Outer involucral bracts 10–35(–50) × 4–9 mm, linear-oblong to lanceolate, with spiny margin but scarcely lobed, shorter than or slightly exceeding the inner; inner bracts 12–20 × 1–1·5 mm, straw-coloured. Achenes 3–4 mm; pappus 8 mm. $2n = 20$. *Most of Europe, northwards to* 62° 30′ *N. in Finland.* Al Au Be Br Bu Cz Da Fe Ga Ge Gr Hb He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Si Su Tu.

1 Upper cauline leaves flat, with rather weak spines, and with the lateral veins running parallel to the margin; outer involucral bracts 20–35 mm, exceeding the inner (c) subsp. **longifolia**
1 Upper cauline leaves undulate, at least in proximal half, with strong spines in which the lateral veins terminate; outer involucral bracts 10–20(–25) mm, not or scarcely exceeding the inner
2 Usually less than 30 cm; all leaves more or less undulate throughout and with strong spines (a) subsp. **vulgaris**
2 Usually more than 30 cm; lower leaves and distal half of upper leaves flat, with weak spines (b) subsp. **intermedia**

(a) Subsp. **vulgaris**: Stem usually 15–30 cm, simple or variously branched. Cauline leaves lanceolate to narrowly ovate, undulate, with strong spines in which the lateral veins terminate. Capitula 15–25 mm in diameter, usually numerous. Outer involucral bracts lanceolate, shorter than the inner. *Throughout the range of the species except for most of the U.S.S.R.*

(b) Subsp. **intermedia** (Schur) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 694 (1931) (*C. biebersteinii* Bernh. ex Hornem.): Like subsp. (a) but stem usually 30–70 cm, branched above; cauline leaves lanceolate, the lower and the distal part of the upper more or less flat, with weak spines, the proximal part of the upper undulate, with strong spines; outer involucral bracts linear-oblong, slightly shorter than or equalling the inner. *E.C. & E. Europe and S. Fennoscandia.*

Intermediate between subspp. (a) and (c), and often difficult to delimit satisfactorily.

(c) Subsp. **longifolia** Nyman, *Consp.* 400 (1879) (*C. longifolia* Reichenb., non Viv., *C. nebrodensis* auct., non Guss. ex DC.): Stem simple or sparingly branched. Leaves linear-oblong, flat, with weakly spiny margin; lateral veins running parallel to the margin and not terminating in teeth. Capitula 20–30 mm in diameter. Outer involucral bracts linear-oblong, somewhat exceeding the inner. *Usually in rather damp grassland. Mainly in the mountain districts of C. Europe, but extending locally to N.E. Spain, N. Appennini, C. Jugoslavia and S. Fennoscandia.*

7. C. frigida Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 109 (1846) (incl. *C. acanthophylla* Hausskn.). Biennial 15–50 cm. Leaves 8–10 × 2–4 cm, deeply pinnatisect with long spines, usually glabrous, rarely tomentose beneath. Capitula 13–20 mm in diameter, in crowded corymbs of 2–6. Outer involucral bracts 35–40 × 20–25 mm, spinose-pinnatisect, much exceeding the inner; inner bracts 12–15 × 1·5 mm, pale yellow or whitish. Florets yellow. ● *Mountains of Greece, Albania and W. Jugoslavia.* Al Gr Ju.

8. C. fiumensis Simonkai, *Magyar Bot. Lapok* **6**: 15 (1907). Perennial 12–20 cm, with several stems arising from a short, vertical stock. Leaves 5–12 × 2–3 cm, oblong to oblanceolate, pinnatifid to pinnatisect, narrowed to the base, very crowded. Outer involucral bracts 15–20 × 5–8 mm, spinose-dentate, about equalling the inner; inner bracts 12–15 × 1·5 mm, pale to clear yellow. Florets yellow. ● *N.W. Jugoslavia.* Ju.

A little-known species, which has characters in common with **3**, **6** and **7**, and has been, by different authors, related to each of these.

9. C. macrocephala Moris, *Stirp. Sard.* **2**: 5 (1827). Arachnoid-tomentose to subglabrous biennial 15–40 cm; stem simple or sparingly branched. Leaves 7–11 × 2–3 cm, lanceolate, dentate to pinnatifid, undulate, spiny. Capitula terminal. Outer involucral bracts 25–40 × 15–20 mm; inner bracts 13–17 × 1·5–2 mm, white above (rarely purple at apex), purplish beneath. Achenes *c.* 4 mm; pappus *c.* 8 mm. ● *C. Mediterranean region.* Co It Sa Si.

(a) Subsp. **macrocephala**: Capitula 1–4, 25–30 mm in diameter. Outer involucral bracts distinctly exceeding the inner. $2n = 20$. *Corse, Sardegna.*

(b) Subsp. **nebrodensis** (Guss. ex DC.) D. A. Webb, *Bot. Jour. Linn. Soc.* **68**: 279 (1974) (*C. nebrodensis* Guss. ex DC.): Capitula usually more than 4, *c.* 18 mm in diameter. Outer involucral bracts scarcely exceeding the inner. *Italy, Sicilia, ?Corse.*

10. C. acaulis L., *Sp. Pl.* 828 (1753). Monocarpic perennial. Leaves up to 30 × 6 cm, elliptic-oblong, pinnatifid to pinnatisect with spinose-dentate to -pinnatisect segments, petiolate or subsessile, glabrous or with sparsely arachnoid indumentum beneath. Capitula 25–50 mm in diameter, terminal. Outer involucral bracts 30–50 mm, not or only slightly exceeding the inner; inner bracts 35–45 × 3 mm, silvery-white or pale pink above, tinged with purplish-brown beneath. Florets white to purplish-brown. Receptacular scales with some of the segments clavate at apex. Achenes 4–5 mm; pappus *c.* 13 mm. ● *From C. France and White Russia southwards to C. Spain and N. Greece.* Al Au Cz Ga Ge Gr He Hs Hu It Ju Po Rm Rs (C, W).

(a) Subsp. **acaulis**: Usually acaulescent, rarely with a simple stem up to 15 cm. Leaves usually more or less flat, pinnatifid to pinnatisect; segments dentate to pinnatifid. *Throughout the range of the species.*

(b) Subsp. **simplex** (Waldst. & Kit.) Nyman, *Consp.* 400 (1879) (subsp. *aggregata* (Waldst. & Kit.) Hegi): Stem usually 15–60 cm, simple or branched, with up to 6 capitula, rarely short or absent. Leaves undulate-pinnatisect; segments pinnatisect. $2n = 20$. *Throughout the range of the species except parts of the north and north-east.*

11. C. acanthifolia All., *Auct. Syn. Stirp. Horti Taur.* 15 (1773). Acaulescent, monocarpic perennial. Leaves 10–30 × 6–15 cm, ovate- to oblong-elliptical, 1½–2½ times as long as wide, pinnatifid to pinnatisect, spinose-dentate, arachnoid-tomentose at least beneath, the lower petiolate, the upper usually sessile. Capitulum 30–70 mm in diameter. Outer involucral bracts 25–30 mm; inner bracts 35–55 mm, yellowish. Florets lilac. Achenes *c.* 5 mm; pappus 20–25 mm. $2n = 20$. ● *S. & E.C. Europe, mainly in the mountains, from C. France and S. Poland to the Pyrenees, S. Italy and N. Greece.* Al Bu Ga Gr Hs It Ju Po Rm Rs (C, W).

(a) Subsp. **acanthifolia** (*C. utzka* Hacq.): Leaves usually pinnatifid, less than twice as long as wide, sometimes hairy above. Spines on middle involucral bracts mostly branched. Inner involucral bracts straw-coloured. *Throughout the range of the species.*

(b) Subsp. **cynara** (Pourret ex Duby) Rouy, *Fl. Fr.* **8**: 363 (1903) (*C. cynara* Pourret ex Duby): Leaves usually pinnatisect, at least twice as long as wide, glabrous above. Spines on middle involucral bracts mostly simple. Inner involucral bracts clear yellow. *Pyrenees, S. France, N. Appennini.*

The plants of Poland and the U.S.S.R. are usually distinguished as **C. onopordifolia** Besser ex Szafer, Kulcz. & Pawł., *Rósl. Polskie* 641 (1924), but except for a minute difference in the grouping of the pappus-hairs no distinctive characters have been ascribed to the taxon.

12. C. lanata L., *Sp. Pl.* 828 (1753). Annual; stem 5–40 cm, simple or sympodially branched. Leaves up to 7·5 × 2·5 cm, oblong, pinnatifid, spinose-undulate, persistently tomentose beneath, more or less glabrescent above. Capitula up to 40 mm in diameter, but often much smaller. Outer involucral bracts 25–40 × 15–20 mm, exceeding the inner; inner bracts *c.* 12 × 1·5 mm, reddish-purple on both surfaces. Florets purplish-pink. Achenes 3 mm; pappus 12–15 mm. $2n = 20$. *Mediterranean region, S. Bulgaria.* Al Bl Bu Co Cr Ga Gr Hs It Ju Sa Si Tu.

13. C. racemosa L., *Sp. Pl.* 829 (1753). Annual to short-lived perennial, usually somewhat arachnoid-floccose; stem 10–40(–60) cm, freely and sympodially branched. Leaves up to 10 × 2 cm, narrowly lanceolate, strongly but remotely undulate-spinose-dentate. Capitula 8–15 mm in diameter, numerous, terminating the branches and subsessile in the apparent dichotomies of the stem. Outer involucral bracts 25–60 × 8–15 mm, much exceeding the inner; inner bracts 10–12 × 1–2 mm, bright yellow. Achenes 2 mm; pappus *c.* 6 mm. $2n = 20$. *Portugal, S. Spain, Sardegna.* Hs Lu Sa.

107. Atractylis L.[1]

Annual or rhizomatous perennial herbs. Leaves in a basal rosette, usually also some cauline and alternate, coriaceous, with spiny lobes or teeth. Capitula solitary. Involucre campanulate to subglobose; bracts spiny, imbricate, the outer pectinate-bipinnatisect, the inner entire, scarious and with a slender apical spine. Receptacular bracts laciniate, scarious. Florets all hermaphrodite. Corolla purple or purplish-pink, 5-lobed. Achenes cylindrical, sericeous to villous. Pappus of 1–3 rows of plumose setae.

All species grow in open, usually dry habitats.

1 Stems absent; involucre 30–70 mm, the middle bracts with 3 patent apical spines much longer than the lateral spines **1. gummifera**
1 Stems present; involucre 5–22 mm, the middle bracts with all spines similar
2 Annual; upper cauline leaves shorter than to slightly longer than involucre **4. cancellata**
than involucre **4. cancellata**
2 Perennial; upper cauline leaves much longer than involucre
3 Outer involucral bracts not similar to upper cauline leaves **2. tutinii**
3 Outer involucral bracts similar to upper cauline leaves **3. humilis**

1. A. gummifera L., *Sp. Pl.* 829 (1753) (*Carlina gummifera* (L.) Less.). Stout perennial; stems absent. Leaves 15–40 × 5–12 cm, oblong-lanceolate in outline, pinnatipartite; segments 5–8 pairs, oblong, pinnatifid, acuminate, spinose-dentate; petiole 8–14 cm, sheathing at the base. Involucre 30–70 mm, arachnoid-lanate; middle involucral bracts ligulate, with 3 patent apical spines 10–25 mm and much shorter lateral spines; inner bracts somewhat glaucous, with a brown apical spine 3–5 mm. Achenes 5–6 × 2·5–3 mm; pappus 20–25 mm, white. $2n = 20$. *Mediterranean region, Portugal.* Co Cr Gr Hs It Lu Sa Si.

2. A. tutinii Franco, *Bot. Jour. Linn. Soc.* **71**: 47 (1975). Stout perennial; stems 5–12 cm, whitish floccose-tomentose. Leaves light green, glabrous beneath, densely papillose above; lower up to 50 × 15 mm, oblanceolate-oblong, pinnatifid, with slender spines; upper wider (up to 18 mm), broadly oblanceolate, pinnately lobed or incise-dentate, spiny. Involucre 12–20 mm, subglobose, surrounded by upper leaves which are up to 3 times its length; outer bracts erecto-patent, not similar to upper leaves; middle bracts rounded but abruptly subulate, the lower ovate-oblong, the remainder orbicular-ovate. Achenes unknown; pappus 12–15 mm, white. *Dry, calcareous stony slopes.* ● *S.E. Spain (Cabo de Gata).* Hs.

3. A. humilis L., *Sp. Pl.* 829 (1753). Slender perennial; stems 5–30 cm, glabrous to floccose-tomentose. Leaves 25–50 × 5–8 mm; basal leaves oblanceolate-oblong, sinuate-serrate, shortly spiny, shortly petiolate; cauline leaves lanceolate-oblong, pinnatifid, spiny, sessile. Involucre 15–22 × 10–25 mm, surrounded by upper leaves which are up to twice its length; outer involucral bracts erecto-arcuate, pectinate-bipinnatisect at least at base and then leaf-like distally; middle bracts truncate or emarginate, abruptly subulate, the lower orbicular-obovate, the upper oblong. Achenes 5–7 × 2–3 mm; pappus slightly longer than the achene, white, brownish at base. *Usually calcicole.* ● *From S.C. Spain to S.E. France.* Bl Ga Hs.

4. A. cancellata L., *Sp. Pl.* 830 (1753). Slender annual; stems 3–30 cm, white-lanate, glabrescent. Leaves greenish, arachnoid-pubescent; basal up to 50 × 8 mm, oblong-obovate to spathulate, dentate, shortly spiny; cauline up to 30 × 6 mm, oblong-lanceolate, dentate, spiny. Involucre 5–20 × 5–15 mm, surrounded by upper leaves; outer involucral bracts erect, with acicular-subulate, excurrent rhachis; middle and inner bracts very unequal, lanceolate, acute, subulate, more or less lanate. Achenes 3–4 × 1·5–2 mm; pappus 8–10 mm, white. *Mediterranean region, S. Portugal.* Bl Cr Ga Gr Hs It Ju Lu Sa Si.

(a) Subsp. **cancellata**: Involucre 5–15 × 5–12 mm, slightly exceeded by upper leaves. *Usually on calcareous or gypsaceous soils. Throughout the range of the species.*

(b) Subsp. **gaditana** Franco, *Bot. Jour. Linn. Soc.* **71**: 47 (1975): Involucre 15–20 × 12–15 mm, exceeding upper leaves. *Wet, sandy habitats.* ● *S.W. Spain.*

108. Xeranthemum L.[2]

Erect annuals. Leaves alternate, entire, not spiny. Capitula terminal, solitary, pedunculate. Receptacular scales narrow, acute, simple, shorter than the florets. Involucre hemispherical to ovoid; bracts scarious, the outermost short, brown, the intermediate similar but longer, imbricate, the innermost coloured, simulating ligules. Outermost florets sterile, with unequally 5-lobed corolla, the remainder hermaphrodite, with equally and very shortly 5-lobed corolla. Achenes obovoid, sericeous; pappus of 5–15 unequal, acuminate scales.

1 Outer involucral bracts obtuse or emarginate, with a whitish patch of appressed hairs on the lower surface **3. cylindraceum**
1 Outer involucral bracts mucronate, glabrous, without a whitish patch

[1] By J. do Amaral Franco. [2] By D. A. Webb.

2 Inner involucral bracts patent (at least in fine weather), twice as long as the intermediate bracts; capitulum usually with 70–120 florets **1. annuum**
2 Inner involucral bracts suberect, not more than 1½ times as long as the intermediate bracts; capitulum with not more than 50 florets **2. inapertum**

1. X. annuum L., *Sp. Pl.* 857 (1753). Stem 25–75 cm, erect, branched from near the base with few (rarely numerous) suberect branches. Leaves 20–60 × 2–8 mm, linear to oblong, densely white-tomentose beneath, more sparsely above. Capitula 30–50 mm in diameter, long-pedunculate. Outer and intermediate involucral bracts mucronate, glabrous; inner bracts 17–25 mm, oblong, patent, bright pink (rarely white). Fertile florets usually 70–120. Achenes 4–5 mm; pappus-scales 5, about equalling achene. $2n=12$. *Dry places. S.E. & E.C. Europe, westwards to E. Austria and extending northwards to 52° N. in S.E. Russia; cultivated for ornament and occasionally naturalized or casual elsewhere.* Al Au Bu Cz Gr Hu Ju Rm Rs (C, W, K, E) [Hs It].

2. X. inapertum (L.) Miller, *Gard. Dict.* ed. 8, no. 2 (1768). Like **1** but stem 10–40 cm; capitula 10–20 mm in diameter; inner involucral bracts 13–17 mm, suberect, usually pale pink; fertile florets 25–50. *Dry places. S.W. Europe and Mediterranean region, extending northwards to W.C. France and S. Switzerland.* Al Bl Cr Ga Gr He Hs It Ju Sa Si Tu.

3. X. cylindraceum Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 172 (1813) (*X. foetidum* auct., non Moench, *X. inapertum* auct., non (L.) Miller). Stem 15–65 cm, with erecto-patent branches. Leaves 15–40 × 2–5(–12) mm, linear to elliptic-oblong, densely white-tomentose beneath, more sparsely so above. Capitula 8–15 mm in diameter, ovoid, long-pedunculate. Outer involucral bracts obtuse or emarginate, with a whitish patch of appressed hairs in centre of lower surface, the intermediate subacute, and sometimes glabrous, the inner 10–13 mm, pink, suberect. Fertile florets 10–15. Achenes 5–6 mm; pappus-scales 10–15, very unequal, shorter than achene. $2n=20$. *Cultivated ground and other dry, open habitats. S. Europe, extending northwards to c.* 47° *N. in W. France and to c.* 48° *N. in S.E. Czechoslovakia.* Al Bu Cz Ga Gr Hs Hu It Ju Lu Rm Rs (W, K) Tu.

109. Cardopatum Pers.[1]

(*Brotera* Willd., non Cav.)

Perennial, very spiny herbs. Leaves alternate, pinnatisect. Capitula numerous, few-flowered, subsessile in clusters in a corymbose inflorescence. Involucral bracts in several rows, the outer herbaceous, with marginal and terminal spines, the inner scarious, scarcely spiny. Receptacle flat, with linear scales shorter than the florets. Florets all hermaphrodite; corolla deeply 5-lobed. Achenes densely sericeous-villous; pappus of 5–8 acuminate scales.

Literature: E. Spach, *Ann. Sci. Nat.* ser. 3, **5**: 233–247 (1846).

1. C. corymbosum (L.) Pers., *Syn. Pl.* **2**: 500 (1807). Stem 8–25 cm, erect, spiny, profusely and corymbosely branched above, so that the plant is often as wide as high. Leaves 7–35 × 3–12 cm, oblong-oblanceolate in outline, glabrous; segments spinose-pinnatifid. Capitula 5–10 mm in diameter, with 7–10 florets. Involucre with sparse arachnoid indumentum; outer bracts 12–18 mm. Corolla *c.* 10 mm, bright blue (rarely white); lobes much longer than tube. Achene 3 mm; pappus about as long as achene. *Dry, open habitats. E. Mediterranean region.* Cr Gr It Tu.

Plants from a single gathering from S. Greece, which are said to differ in having inside the ordinary pappus a second ring of much shorter scales united at the base, have been distinguished as **C. boryi** Spach, *Ann. Sci. Nat.* ser. 3, **5**: 245 (1846). In other characters they differ only slightly from **1**, and are best included in it until more material is available.

[1] By D. A. Webb.

110. Echinops L.[2]

Perennial, rarely annual herbs with erect, sulcate stems. Leaves 1- to 2-pinnatifid. Capitula with 1 floret, grouped into 1 or more globose inflorescences with laciniate basal bracts. Involucral bracts in 3–5 rows, with branched or simple, white setae outside them; inner bracts linear, fimbriate, of intermediate length between the shorter outer and the middle bracts. Florets hermaphrodite; corolla tubular, blue or greyish to white; anthers bluish-grey. Achenes cylindrical, angled, densely hairy; pappus of free to connate, scale-like setae.

All species are found in dry, often rocky habitats.

1 Leaves with dense, patent, rigid hairs above; involucral bracts 28–36 **4. strigosus**
1 Leaves glabrous or indumentum not as above; involucral bracts 12–25
2 Middle involucral bracts with spines at least twice as long as the rest of the involucre
3 Leaves with arachnoid indumentum above; involucral bracts puberulent **1. spinosus**
3 Leaves with simple glandular hairs above; involucral bracts glabrous **2. spinosissimus**
2 Spines of middle involucral bracts less than twice as long as the rest of the involucre or absent
4 Inner involucral bracts connate for at least the basal third
5 Stem eglandular **5. graecus**
5 Stem glandular
6 Outer involucral bracts narrowly linear to linear-lanceolate, more than ½ as long as involucre **6. fontqueri**
6 Outer involucral bracts spathulate, not more than ½ as long as involucre
7 Involucral setae not exceeding outer involucral bracts **2. spinosissimus**
7 Involucral setae exceeding outer involucral bracts **3. orientalis**
4 Inner involucral bracts free to base
8 Involucral setae up to ⅕ as long as capitulum, not more than ½ as long as outer involucral bracts
9 Stem densely glandular-hairy; inflorescence purplish **12. oxyodontus**
9 Stem arachnoid-tomentose, sometimes also with a few glandular hairs; inflorescence blue **11. microcephalus**
8 Involucral setae at least ½ as long as capitulum, slightly shorter to much longer than outer involucral bracts
10 Inflorescence bluish
11 Involucral setae connate at base; leaves flat, with densely scabridulous margin, the lobes with slender apical spine 2–4 mm **9. bannaticus**
11 Involucral setae connate at least in basal half; leaf-margin revolute, with stout apical spines 3–15 mm **10. ritro**
10 Inflorescence white or greyish
12 Involucral setae connate at base or free; upper surface of leaves with glandular hairs not more than 0·5 mm, the margin never scabridulous **7. sphaerocephalus**
12 Involucral setae connate for basal half; upper surface of leaves with rigid hairs more than 0·5 mm, the margin densely scabridulous **8. exaltatus**

[2] By S. Kožuharov.

Sect. RYTRODES Bunge. Involucral bracts 16–34, in 4–5 rows, the inner connate to form a membranous tube.

1. E. spinosus L., *Mantissa* 119 (1767). Stem 40–70 cm, branched, glabrous or with arachnoid indumentum. Leaves elliptic-lanceolate in outline, green and with arachnoid indumentum above, white-tomentose beneath, the basal 2-pinnatisect, the cauline pinnatifid or pinnatisect; segments linear-lanceolate, with long, stout, marginal spines. Inflorescence 8–16 cm in diameter, pale blue. Involucre 30–70 mm; setae as long as the outer involucral bracts; bracts 20, puberulent; outer bracts spathulate, dentate; middle bracts lanceolate, subulate distally, 1–2(–3) with hairy spines at least twice as long as capitulum. Corolla blue. Pappus-setae connate at base. *Lampedusa.* Si. (*N. Africa.*)

Plants like **1** but differing in the much smaller, free, linear-lanceolate involucral bracts are reported from Spain. They are sterile and apparently of hybrid origin, but the parents have not yet been determined.

2. E. spinosissimus Turra, *Farset. Nov. Gen.* 13 (1765) (*E. viscosus* DC., non Schrader ex Reichenb.). Stem 50–80 cm, branched, densely arachnoid-tomentose and glandular-hairy. Leaves ovate-lanceolate in outline, usually 2-pinnatisect, with simple, glandular hairs above, white-tomentose and often glandular-hairy on the veins beneath; segments triangular to broadly lanceolate, with short, slender marginal spines. Inflorescence 3·5–7 cm in diameter, greyish to greenish or greenish-blue. Involucre 15–40 mm; setae equalling or slightly shorter than the outer bracts; bracts 20, glabrous; outer bracts spathulate, acuminate or subulate distally, dentate, not more than ½ as long as capitulum; middle bracts lanceolate, equalling or twice as long as the outer, with marginal spines twice as long as the capitulum or absent. Corolla white or pale blue. Pappus-setae connate at base. *E. Mediterranean region, extending westwards to Sicilia.* Al Cr Gr Ju Si.

1 Middle involucral bracts twice as long as the outer; corolla white (c) subsp. **neumayeri**
1 Middle involucral bracts less than twice as long as the outer; corolla pale blue
2 Involucre 15–25 mm, greenish; middle involucral bracts shortly spinose or long-acuminate (a) subsp. **spinosissimus**
2 Involucre 25–40 mm, blue or greenish-blue; middle involucral bracts long-subulate (b) subsp. **bithynicus**

(a) Subsp. **spinosissimus**: Leaves glandular-hairy on the veins beneath. Inflorescence 3·5–5·5 cm in diameter, greenish. Involucre 15–25 mm; bracts acuminate or shortly spinose, patent, the middle equalling the outer. Corolla pale blue. *Sicilia, Greece.*

(b) Subsp. **bithynicus** (Boiss.) Kožuharov, *Bot. Jour. Linn. Soc.* **71**: 41 (1975) (*E. bithynicus* Boiss., *E. viscosus* subsp. *bithynicus* (Boiss.) Rech. fil., *E. spinosus* sensu Hayek, non L.): Leaves more or less glandular-hairy on the veins beneath. Inflorescence 4–7 cm in diameter, blue or greenish-blue. Involucre 25–40 mm. Middle bracts long-spinose, equalling the outer. Corolla pale blue. *S. Aegean region.*

(c) Subsp. **neumayeri** (Vis.) Kožuharov, *loc. cit.* (1975) (*E. neumayeri* Vis.): Inflorescence 4–7 cm in diameter, greenish. Involucre 25–40 mm; bracts acuminate, not spinose, the middle twice as long as the outer. Corolla white. *W. Jugoslavia, Albania.*

Plants from Sicilia and the Aegean region with the inner involucral bracts free may either be of hybrid origin or have been collected in an immature state, and field study is necessary.

3. E. orientalis Trautv., *Echin. Gen.* 22 (1833). Stem 50–80 cm, simple or branched, with glandular, arachnoid indumentum. Leaves broadly oblong in outline, deeply 2-pinnatisect, densely glandular-pubescent above, white-tomentose beneath; segments narrowly triangular to linear-lanceolate, dentate, with stout marginal spines. Inflorescence 4·5–7 cm in diameter, greyish-green. Involucre 25–30 mm; setae exceeding the outer bracts; bracts 18–20, glabrous; outer bracts spathulate, dentate, not more than ½ as long as the capitulum; middle bracts lanceolate, subulate. Corolla greenish-white. Pappus-setae connate at base. *Turkey-in-Europe.* *Tu. (*Caspian region.*)

The European plant belongs to subsp. **byzantinus** (Form.) Kožuharov, *Bot. Jour. Linn. Soc.* **71**: 41 (1975) (*E. byzantinus* Form.). Subsp. **orientalis** differs in its broadly triangular leaf-segments with soft marginal spines, its rather longer, white capitula *c.* 30 mm and in the involucral setae much exceeding the outer involucral bracts.

4. E. strigosus L., *Sp. Pl.* 815 (1753). Stem 20–100 cm, simple or branched, arachnoid-tomentose. Leaves elliptical in outline, deeply pinnatisect, with dense, patent, rigid hairs above, white-tomentose beneath; segments linear. Inflorescence 2·5–7 cm in diameter, bluish. Involucre 20–25 mm; setae as long as the outer bracts; bracts 28–36, lanceolate, long-acuminate, long-fimbriate, otherwise glabrous, the innermost with bluish apex. Corolla blue. Pappus-setae free. $2n=32$. *C. & S. Spain, C. & S. Portugal.* Hs Lu.

Sect. OLIGOLEPIS Bunge. Involucral bracts 12–20, in 3 rows, the inner connate to form a coriaceous tube.

5. E. graecus Miller, *Gard. Dict.* ed. 8, no. 4 (1768). Stem 25–70 cm, branched, glabrous or arachnoid-tomentose. Leaves elliptical in outline, 2-pinnatisect, glabrous or with arachnoid indumentum above, white-tomentose beneath; segments linear-lanceolate, with short, slender spines. Inflorescence 3–4 cm in diameter, shiny silver-white. Involucre 15–20 mm; setae shorter than the outer bracts; bracts 12–15, rigid, setulose or subglabrous; outer bracts broadly spathulate, acuminate, long-ciliate; middle bracts lanceolate, ciliate. Corolla blue. Pappus-setae connate at base. ● *E. Greece, Kikladhes.* Gr.

6. E. fontqueri Pau in Font Quer, *Iter. Maroc.* (*Sched.*) 409 (1928). Stem 40–70 cm, simple, with glandular, arachnoid indumentum. Leaves lanceolate or elliptical in outline, pinnatifid, glandular-hairy; segments triangular or lanceolate, with short, slender spines. Inflorescence 4–7 cm in diameter, bluish. Involucre 22–26 mm; setae much shorter than the outer bracts; bracts 15–20, soft, serrulate, ciliate, more than ½ as long as the capitulum; outer bracts linear to linear-lanceolate, brownish; middle bracts green, with arachnoid indumentum. Corolla blue. Pappus-setae connate for basal half. *S.E. Spain.* Hs. (*N. Africa.*)

Sect. ECHINOPS. Involucral bracts 16–25, in 3 rows, the inner free.

7. E. sphaerocephalus L., *Sp. Pl.* 814 (1753). Stem 50–160(–200) cm, simple or branched, arachnoid-tomentose, sometimes glandular-hairy. Leaves oblong-elliptical to ovate in outline, 1- to 2-pinnatifid, amplexicaul, glandular-pubescent or with eglandular and glandular hairs above and white-tomentose beneath, the margin revolute; segments triangular to lanceolate, with short, slender spines. Inflorescence 3–6 cm in diameter, greyish or white. Involucre 15–25 mm; setae equalling or somewhat shorter than the outer bracts, ½ as long as the involucre, free or connate at base; bracts 16–20, long-acuminate, long-ciliate; outer bracts oblanceolate, *c.* ½ as long as the involucre; middle

bracts linear-lanceolate, acuminate. Corolla white or greyish. Pappus-setae connate for basal ⅔. $2n=32$. *S. & C. Europe, extending northwards to C. France and C. Russia; frequently naturalized or casual further north.* Al Au Bu Cz Ga Gr He Hs Hu It Ju Po Rm Rs (C, W, K, E) Tu [?Be Ge Su].

1 Involucral bracts glabrous **(b) subsp. albidus**
1 At least outer involucral bracts glandular-hairy
2 All involucral bracts glandular-hairy **(c) subsp. taygeteus**
2 Inner involucral bracts glabrous or puberulent, eglandular **(a) subsp. sphaerocephalus**

(a) Subsp. **sphaerocephalus**: Stem, middle and outer involucral bracts glandular-hairy; inner bracts glabrous or puberulent, eglandular. Leaf-segments broadly triangular. Involucre 18–25 mm. *Throughout the range of the species.*

(b) Subsp. **albidus** (Boiss. & Spruner) Kožuharov, *Bot. Jour. Linn. Soc.* **71**: 41 (1975) (*E. albidus* Boiss. & Spruner): Stem with simple eglandular or both eglandular and glandular hairs. Involucral bracts glabrous. Leaf-segments linear-triangular to lanceolate. Involucre 15–18 mm. *Balkan peninsula, S.E. Italy.*

(c) Subsp. **taygeteus** (Boiss. & Heldr.) Kožuharov, *loc. cit.* (1975) (*E. taygeteus* Boiss. & Heldr.): Stem and involucral bracts densely glandular-hairy. Leaf-segments linear-triangular. Involucre 18–25 mm. *S. Greece (Taïyetos).*

E. pungens Trautv., *Echin. Gen.* 18 (1833), described from the Caucasus and also reported from Krym, appears to be a hybrid between **7(a)** and **3.**

8. E. exaltatus Schrader, *Hort. Gotting.* 15 (1809) (*E. commutatus* Juratzka). Stem 40–150 cm, branched, arachnoid-tomentose, sometimes subglabrous. Leaves ovate or elliptical in outline, flat, 1- to 2-pinnatifid, sparsely strigose above, tomentose beneath, with densely scabridulous margin; segments triangular, with few, short, slender spines. Inflorescence 3·5–6 cm in diameter, white or greyish, rarely greenish. Involucre 20–30 mm; setae equalling the outer bracts, ½ as long as involucre, connate for basal half; bracts *c.* 20, long-acuminate, ciliate; outer bracts spathulate; middle bracts lanceolate-subulate. Corolla white or greyish. Pappus-setae connate for basal half. *E.C. Europe, N.E. Italy and N. part of Balkan peninsula.* Bu It Ju Po Rm Rs (W) [Au Da Ge].

9. E. bannaticus Rochel ex Schrader, *Blumenbachia* 48 (1827). Stem 50–120 cm, simple or branched, with eglandular hairs, sometimes subglabrous. Leaves ovate or elliptical in outline, flat, 2-pinnatisect, pinnatifid or subentire, glandular-hairy, sparsely strigose and with slightly arachnoid indumentum above, densely scabridulous on the margin, white-tomentose beneath; segments triangular, with few, slender spines 2–4 mm. Inflorescence 2·5–5 cm in diameter, blue or greyish-blue. Involucre 14–17 mm; setae equalling or shorter than the outer bracts, ½ as long as involucre, connate at base. Involucral bracts 20–21, usually lanceolate, long-acuminate, ciliate; outer bracts triangular-lanceolate, ½ as long as the capitulum and rather wider than the others. Corolla greyish-blue. Pappus-setae connate at base. *S.E. Europe, extending north-westwards to Slovenija.* Al Bu Gr ?It Ju Rm Rs (K).

10. E. ritro L., *Sp. Pl.* 815 (1753). Stem 20–60 cm, usually branched, white-tomentose or subglabrous, often with glandular hairs. Leaves elliptical in outline, 1- to 2-pinnatisect, glabrous, glandular-hairy, with few, simple hairs or slightly arachnoid indumentum above, white-tomentose beneath, the margin revolute; segments linear to oblong-lanceolate, triangular or oblong, with spines 3–15 mm. Inflorescence 3·5–4·5 cm in diameter, bluish. Involucre 12–17 mm; setae slightly shorter than the outer bracts, ⅓–½ as long as involucre; bracts 20–22, long-acuminate, ciliate; outer bracts linear-lanceolate. Corolla blue, rarely white. Pappus-setae connate at least in basal half. $2n=32$. *S., S.E. & E.C. Europe, extending northwards to c. 58° N. in E. Russia.* Al Au Bu Cz Ga Gr Hs Hu It Ju Rm Rs (C, W, K, E) Si Tu.

1 Leaves 2-pinnatifid; segments not more than 2 mm wide **(e) subsp. ruthenicus**
1 Leaves 1- to 2-pinnatifid; segments more than 2 mm wide
2 Pappus-setae connate for whole length **(c) subsp. sartorianus**
2 Pappus-setae connate for basal half
3 Stem and leaves with eglandular hairs **(a) subsp. ritro**
3 Stem and leaves with both eglandular and glandular hairs
4 Leaves glandular-hairy above **(b) subsp. thracicus**
4 Leaves glabrous or slightly arachnoid-tomentose above **(d) subsp. meyeri**

(a) Subsp. **ritro**: Stem and leaves with eglandular hairs; leaf-segments more than 4 mm wide at base, linear-triangular. Pappus-setae connate for basal half. *Throughout most of the range of the species.*

(b) Subsp. **thracicus** (Velen.) Kožuharov, *Bot. Jour. Linn. Soc.* **71**: 42 (1975) (*E. thracicus* Velen.): Stem with eglandular hairs, glandular-hairy in basal half. Leaves glandular-hairy above; segments more than 3 mm wide, oblong-triangular. Pappus-setae connate for basal half. *Bulgaria.*

(c) Subsp. **sartorianus** (Boiss. & Heldr.) Kožuharov, *loc. cit.* (1975) (*E. sartorianus* Boiss. & Heldr.): Stem glandular-hairy, with few eglandular hairs. Leaves glabrous above; segments more than 3 mm wide, oblong-triangular. Pappus-setae connate for whole length. *Greece.*

(d) Subsp. **meyeri** (DC.) Kožuharov, *loc.. cit.* (1975) (*E. ritro* var. *meyeri* DC., *E. meyeri* (DC.) Iljin): Stem glandular-hairy, with few eglandular hairs. Leaves glabrous or slightly arachnoid-tomentose above; segments 3 mm wide, oblong. Pappus-setae connate for basal half. *S.E. Russia.*

(e) Subsp. **ruthenicus** (Bieb.) Nyman, *Consp.* 399 (1879) (*E. ruthenicus* Bieb., *E. virgatus* Lam.): Stem and leaves with eglandular hairs; leaves deeply and narrowly pinnatifid; segments not more than 2 mm wide. Pappus-setae connate for basal half. *From Italy and Austria eastwards.*

11. E. microcephalus Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 209 (1813). Stem 40–60 cm, branched, arachnoid-tomentose, sometimes with a few glandular hairs. Leaves lanceolate or linear-lanceolate in outline, pinnatisect, glabrous above, white-tomentose beneath; segments triangular, with short, slender spines. Inflorescence 1·5–4·5 cm in diameter, blue. Involucre 15–25 mm; setae *c.* ½ as long as and adnate to the outer bracts, up to ¾ as long as involucre; bracts 20–22, long-acuminate, ciliate; inner bracts lanceolate-elliptical; middle bracts lanceolate, 2–4 times as long as the triangular, denticulate outer bracts. Corolla blue. Pappus-setae connate for basal half. *S. & E. parts of Balkan peninsula, just extending to S.E. Romania.* Al Bu Gr Ju Rm Tu.

12. E. oxyodontus Bornm. & Diels, *Magyar Bot. Lapok* **17**: 42 (1919). Stem 30–80 cm, branched, densely glandular-hairy. Leaves lanceolate in outline, pinnatisect, glabrous above, white-tomentose beneath, with glandular hairs on veins; segments triangular, with short, slender spines. Inflorescence 4–5 cm in diameter, purplish. Involucre 15–18 mm; setae *c.* ½ as long as and adnate to the outer bracts, up to ¾ as long as involucre; bracts 20, lanceolate, acuminate. Corolla blue. Pappus-setae connate for basal half. ● *Macedonia.* Bu Ju.

111. Berardia Vill.[1]

Perennial herbs. Capitulum solitary; receptacle fleshy. Involucral bracts subequal, in 3–4 rows, herbaceous, entire, without appendages. Florets hermaphrodite, cream to pale yellow or pinkish. Stamens with winged filaments, without bristles at the base. Achenes sub-cylindrical, with very short distal corona; pappus-hairs unequal, simple, twisted at base.

1. B. subacaulis Vill., *Prosp. Pl. Dauph.* 28 (1779). Stem absent or up to 15 cm, coarsely sulcate, densely arachnoid-tomentose, covered with short, brown, membranous sheaths at the base. Leaves obovate to suborbicular, entire or slightly dentate, slightly decurrent at base, petiolate, coriaceous, with arachnoid indumentum above, densely arachnoid-tomentose beneath. Capitulum 50–70 mm, hemispherical. Involucral bracts cuneate, arachnoid-tomentose, the inner almost as long as the florets. Achenes brown or yellow; pappus 12–20 mm, yellowish. $2n=36$. *Rocks and screes above* 1500 *m.* ● *S.W. Alps.* Ga It.

112. Arctium L.[2]

Erect biennials, with long, stout taproots. Leaves alternate, tomentose, entire or remotely dentate. Capitula solitary or in corymbose to racemose clusters, ovoid-conical to globose or hemispherical. Involucre glabrous or with arachnoid indumentum; bracts numerous, imbricate, subulate, with appressed bases, the outer long, rigid, patent, with hooked apices. Receptacle flat, with numerous, rigid, subulate scales. Florets tubular, hermaphrodite, purple or white. Anthers acuminate above, sagittate below. Style swollen at base, the branches cuneate. Achenes oblong, compressed, rugose; pappus-hairs scabrid, golden-yellow, free to base.

Specific limits within this genus cannot be clearly defined, each species showing great variation in hairiness of leaves and capitula, length of peduncles, and colour of capitula and florets. All taxa are interfertile and, although they are normally autogamous, outbreeding sometimes occurs. This has resulted in innumerable intermediates which are fully fertile and breed true from seed.

All species occur in waste places, on roadsides or, occasionally, in woodland.

Literature: J. Arènes, *Bull. Jard. Bot. Bruxelles* **20**: 67–156 (1950).

1 Each main branch of inflorescence corymbose; peduncles 3–10 cm; petioles solid
2 Involucre 12–20 × 15–25 mm in fruit, with dense arachnoid indumentum, rarely ± glabrous **1. tomentosum**
2 Involucre 20–25 × 35–42 mm in fruit, glabrous or subglabrous **2. lappa**
1 Each main branch of inflorescence not corymbose; peduncles absent or up to 4 cm; petioles hollow
3 Involucre 15–18 × 15–25 mm in fruit; florets longer than involucral bracts **4. minus**
3 Involucre 20–25 × 30–35 mm in fruit; florets about as long as involucral bracts
4 Involucre straw-coloured; peduncles 1–4 cm **3. pubens**
4 Involucre green or tinged with dark purple; peduncles less than 1 cm **5. nemorosum**

1. A. tomentosum Miller, *Gard. Dict.* ed. 8, no. 3 (1768) (*Lappa tomentosa* (Miller) Lam.). Plant 50–150 cm; petioles and peduncles slightly farinose and floccose. Basal leaves up to 50 cm, broadly ovate, cordate; petioles solid. Each main branch of inflorescence corymbose, occasionally elongate. Peduncles 3–10 cm. Involucre 12–20 × 15–25 mm in fruit, usually with dense arachnoid indumentum, rarely more or less glabrous. Florets longer than involucral bracts. Achenes 5–6 mm, pale brownish; pappus 1–3·5 mm. $2n=36$. *Most of Europe, but rarer in the north and west.* Au Be Bl Bu Co Cz Da Fe Ga Ge Gr He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su [Br].

2. A. lappa L., *Sp. Pl.* 816 (1753) (*A. majus* Bernh., *Lappa officinalis* All., *L. major* Gaertner). Plant 90–150 cm. Stems, petioles and peduncles pubescent to subglabrous. Each main branch of inflorescence corymbose. Basal leaves up to 50 cm, broadly ovate, cordate, usually obtuse; petioles solid. Peduncles 3–10 cm. Involucre 20–25 × 35–42 mm in fruit, globose in bud, hemispherical and widely open above in fruit, shiny golden-green, glabrous or subglabrous. Florets about as long as involucral bracts. Achenes 6–7 mm; pappus 1–3·5 mm. $2n=36$. *Most of Europe except the extreme north.* All except Az ?Cr Fa Is Lu Sb ?Si.

3. A. pubens Bab., *Ann. Nat. Hist.* ser. 2, **17**: 376 (1856). Plant 60–150 cm; stems, petioles and peduncles farinose. Basal leaves up to 40 cm, broadly ovate, cordate; petioles hollow. Each main branch of inflorescence racemose; peduncles 1–4 cm, the lower longest. Involucre 20–25 × 30–35 mm in fruit, hemispherical, straw-coloured, with dense arachnoid indumentum when young, becoming subglabrous and open above in fruit. Florets about as long as involucral bracts. Achenes 5–7 mm, brownish; pappus 1–3·5 mm. *W., C. & S. Europe; distribution incompletely known.* Be Br Co Da Ga He Ho Hs Hu It Rm Sa.

Probably originated by hybridization between **2** and **4.**

4. A. minus Bernh., *Syst. Verz. Erfurt* 154 (1800) (*Lappa minor* Hill). Plant 50–150 cm. Basal leaves up to 50 cm, broadly ovate, cordate; petioles hollow. Each main branch of inflorescence racemose, the terminal capitula usually solitary. Involucre 15–18 × 15–25 mm in fruit, globose, green or purple-tinged, often with dense arachnoid indumentum when young, becoming subglabrous, closed in fruit. Florets longer than involucral bracts. Achenes 5–7 mm, brownish; pappus 1–3·5 mm. $2n=36$. *Most of Europe except the arctic.* All except Az Cr Fa Is Sb.

5. A. nemorosum Lej., *Mag. Hort.* (*Liège*) **1**: 289 (1833). Plant 100–250 cm. Basal leaves up to 50 cm, broadly ovate, cordate; petioles hollow. Each main branch of inflorescence racemose, often terminating in a cluster of three capitula. Involucre 20–25 × 30–35 mm in fruit, ovoid, subsessile, green or tinged with dark purple, usually with sparse arachnoid indumentum, closed in fruit. Florets about as long as involucral bracts. Achenes 6–9 mm, dark brown; pappus 1–3·5 mm. $2n=36$. *Much of Europe, but rare in the south and parts of the north.* Au Be Br Bu Cz Da Fe Ga Ge Hb He Hu It Ju No Po Rm Rs (C, W, K, E) Su.

113. Cousinia Cass.[3]

Perennial herbs. Leaves alternate, simple. Capitula few. Involucral bracts imbricate, the outer with recurved apical spines. Receptacular scales scarious, twisted, glabrous. Florets all tubular, hermaphrodite. Anthers with pinnate basal appendages. Achenes obpyramidal, with 4 narrowly winged angles; pappus a short, dentate corona.

1. C. astracanica (Sprengel) Tamamsch., *Not. Syst.* (*Leningrad*) **16**: 468 (1954). Stem 10–30 cm, erect, arachnoid-tomentose,

[1] By S. Kožuharov. [2] By F. H. Perring. [3] By D. M. Moore.

with few short branches above. Leaves 2–10 × 0·5–4 cm, oblong to ovate, serrate-dentate, the teeth with apical spines; basal and lower cauline attenuate into short petiole; upper cauline semi-amplexicaul, sessile. Involucre 10–12 mm wide, ovoid; bracts ovate to oblong, with arachnoid indumentum, the inner acuminate, with short, slender apical spine and scabrid margin. Corolla whitish or yellowish. Achenes *c.* 3 mm. *Once reported in S.E. Russia (S. of Volgograd).* Rs (E). *(Transcaspian region.)*

114. Saussurea DC.[1]

Unarmed perennial herbs. Leaves alternate, entire to pinnatisect. Capitula solitary, or in corymbs or panicles. Involucre ovoid, campanulate or cylindrical; bracts in many rows, imbricate, rarely with membranous apical appendages. Receptacular scales numerous, paleaceous, rarely absent. Florets hermaphrodite, tubular; corolla narrow below, cupuliform distally, 5-fid. Anthers with entire or divided basal appendages. Achenes cylindrical, 4-ribbed, smooth or rugose, glabrous. Pappus in (1–)2 rows; outer setae short, free, simple and scabrid or slightly plumose, deciduous, the inner longer, connate at base into a ring, plumose, persistent.

Literature: O. Mattirolo, *Malpighia* **3**: 468–478 (1890). J. Briquet & F. Cavillier in E. Burnat, *Flore des Alpes Maritimes* **7**: 245–252. Genève. 1931. E. I. Nyárády, *Verh. Mitt. Siebenb. Ver. Naturw.* **89–90**: 231–241 (1940).

1 Median and inner involucral bracts expanded at apex into rounded, pink, membranous appendages **1. amara**
1 Involucral bracts without apical appendages
2 Capitula solitary; anther-appendages lanate **4. pygmaea**
2 Capitula 2 to many, in corymbs or panicles; anther-appendages not lanate
3 At least the lower leaves pinnatisect
4 Middle leaves entire **2. salsa**
4 All leaves (1–)2-pinnatisect **3. turgaiensis**
3 Leaves entire to dentate
5 Stem winged
6 Basal and lower cauline leaves long-petiolate, elliptical to broadly lanceolate, serrate, glabrous **5. parviflora**
6 Basal and lower cauline leaves shortly petiolate, linear-lanceolate, entire or slightly dentate, arachnoid- or crispate-puberulent beneath **6. porcii**
5 Stem not winged
7 Leaves sparsely greyish-arachnoid-villous to glabrous; basal and lower leaves linear- to ovate-lanceolate, rounded or cuneate at base; petiole narrowly winged **7. alpina**
7 Leaves densely whitish-tomentose beneath; basal and lower leaves ovate- to lanceolate-triangular, broadly truncate or cordate at base; petiole not winged
8 Stems 10–20(–45) cm, ascending near base; lower leaves triangular-lanceolate, up to 60 mm wide **8. discolor**
8 Stems 25–80 cm, erect; lower leaves triangular-ovate, 40–85 mm wide **9. controversa**

1. S. amara (L.) DC., *Ann. Mus. Hist. Nat. (Paris)* **16**: 200 (1810). Stems 15–60 cm, not winged. Lower leaves long-petiolate, elliptical or oblong-elliptical, sinuate-dentate, rarely entire, strongly scabrid above. Capitula 1–1·5 cm in diameter, campanulate, in a corymbose panicle. Outer involucral bracts with dentate or trifid green apical appendages; median and inner bracts with rounded, pink, membranous appendages. *Saline grassland. S. & C. Russia, N.E. Ukraine.* Rs (C, W, E).

2. S. salsa (Pallas) Sprengel, *Syst. Veg.* **3**: 381 (1826). Stems 15–50 cm, often winged. Leaves 20–40 mm wide, rather thick, scabrid or glabrous, the lower lyrate-pinnatisect, the median entire. Capitula 1–1·2 cm, cylindrical, numerous, in corymbs grouped into a lax panicle. Involucral bracts without apical appendages. *Saline steppes and grassland. S. Ukraine, S.E. Russia, W. Kazakhstan.* Rs (C, W, K, E).

3. S. turgaiensis B. Fedtsch., *Feddes Repert.* **8**: 497 (1910). Stems 15–40 cm, not winged. Leaves (1–)2-pinnatisect, with linear to ovate-triangular lobes, glaucescent, more or less pubescent. Capitula 1–1·2 cm, cylindrical, numerous, in corymbs grouped into a lax panicle. Involucral bracts without apical appendages. *Calcareous or saline steppes and grassland. W. Kazakhstan (near Ural'sk); ?S.E. Russia.* Rs (E). *(C. Asia.)*

4. S. pygmaea (Jacq.) Sprengel, *Syst. Veg.* **3**: 381 (1826). Stems 2–12 cm, not winged, densely leafy. Leaves sessile, 3–5(–12) mm wide, linear to linear-lanceolate, usually entire, rarely obscurely dentate. Capitula 2–3 × up to 2·5 cm, solitary, ovoid. Involucral bracts without apical appendages. $2n = 52$. *Mountain rocks and screes.* ● *E. Alps, W. Carpathians.* Au Cz Ge It Ju Po.

5. S. parviflora (Poiret) DC., *Ann. Mus. Hist. Nat. (Paris)* **16**: 200 (1810). Stems 20–100 cm, narrowly winged. Basal and lower cauline leaves 20–45 mm wide, elliptical or broadly lanceolate, long-acuminate, serrate, glabrous, long-petiolate, the upper narrower and sessile. Capitula 1–1·3 cm, cylindrical, in a panicle or compact terminal corymb. Involucral bracts without apical appendages, often arachnoid-ciliate. *Wet places. E. Russia.* Rs (N, C, E). *(Siberia.)*

6. S. porcii Degen, *Magyar Bot. Lapok* **3**: 311 (1904). Stems 30–80 cm, broadly winged, densely leafy. Basal and lower cauline leaves shortly petiolate, linear-lanceolate, acute, entire to slightly dentate, arachnoid- or crispate-puberulent beneath. Capitula cylindrical, in compact terminal corymbs. Involucral bracts without apical appendages, villous. *Subalpine meadows.* ● *E. Carpathians.* Rm Rs (W).

7. S. alpina (L.) DC., *Ann. Mus. Hist. Nat. (Paris)* **16**: 198 (1810). Stems 2–50 cm, not winged, sparsely to densely leafy. Basal and lower cauline leaves ovate- to linear-lanceolate, rounded to cuneate at base, entire or somewhat dentate, with narrowly winged petiole, the upper linear to lanceolate, sessile. Capitula 1·5–2 × 0·7–1 cm, ovoid-cylindrical, in more or less contracted terminal corymbs or a corymbiform panicle. Involucral bracts without apical appendages, densely pubescent, rarely subglabrous. Corolla purple. *Europe, southwards to the Pyrenees, S. Alps and S. Carpathians; mainly in the mountains but in the north and north-east also at low altitudes.* Au Br Cz Fe Ga Ge Hb He Hs It Ju No Po Rm Rs (N, B, C, W) Sb Su.

An extremely polymorphic species, showing variation especially in length of stem, in the shape, size, pubescence and margin of the leaves, in inflorescence-type, and in shape and pubescence of the involucre. The polymorphism of plants from W. Europe results partly from environmental variation, but also from hybridization, probably with **8**.

1 Stems 2–8(–10) cm, procumbent at base; upper leaves equalling or exceeding inflorescence; leaves arachnoid-villous above **(c) subsp. depressa**
1 Stems usually 10–50 cm, erect; upper leaves not exceeding inflorescence; leaves glabrous above
2 Leaves glabrous or subglabrous beneath; inflorescence a lax panicle **(d) subsp. esthonica**
2 Leaves greyish-arachnoid-villous beneath; inflorescence usually a compact corymb
3 Lower leaves cuneate at base, gradually narrowed into petiole **(a) subsp. alpina**
3 Lower leaves rounded or inconspicuously cordate at base, abruptly narrowed into petiole **(b) subsp. macrophylla**

(a) Subsp. alpina: Stems usually 10–50 cm, erect. Leaves glabrous above, greyish-arachnoid-villous beneath, the upper not exceeding the inflorescence, the lower ovate- to broadly lanceolate, cuneate at base, gradually narrowed into petiole. Inflorescence usually a compact corymb. $2n = 52, 54$. *Almost throughout the range of the species.*

(b) Subsp. macrophylla (Sauter) Nyman, *Consp.* 414 (1879) (*S. macrophylla* Sauter): Stems usually 10–50 cm, erect. Leaves glabrous above, greyish-arachnoid-villous beneath, the upper not exceeding the inflorescence, the lower ovate- to broadly lanceolate, rounded or inconspicuously cordate at base, abruptly narrowed into petiole. Inflorescence usually a compact corymb. ● *Carpathians, E. Alps.*

(c) Subsp. depressa (Gren.) Nyman, *loc. cit.* (1879) (*S. depressa* Gren.): Stems 2–8(–10) cm, procumbent at base. Leaves arachnoid-villous, more densely so beneath, the upper equalling or exceeding the inflorescence, the lower oblong-lanceolate, cuneate at base, gradually to abruptly narrowed into petiole. Inflorescence a compact corymb. $2n = 50–54$. ● *Alps.*

(d) Subsp. esthonica (Baer ex Rupr.) Kupffer, *Korrespondenzbl. Naturf.-Ver. Riga* **45**: 94 (1902) (*S. esthonica* Baer ex Rupr.): Stems usually 10–50 cm, erect. Leaves glabrous or subglabrous, the upper not exceeding the inflorescence, the lower linear-lanceolate, narrowly cuneate at base. Inflorescence a lax panicle. ● *Estonia, ?N.W. Russia.*

8. S. discolor (Willd.) DC., *Ann. Mus. Hist. Nat. (Paris)* **16**: 199 (1810). Stems 10–20(–45) cm, erect, ascending near base, not winged. Lower leaves up to 60 mm wide, triangular-lanceolate, truncate to cordate at base, dentate, densely whitish-tomentose beneath; petiole not winged. Capitula 1·5–2 × 0·8–1 cm, ovoid-campanulate, few, in a compact terminal corymb. Involucral bracts without apical appendages. Corolla bluish-violet. $2n = 26$. *Mountain rocks and stony slopes.* ● *Alps, Carpathians, Appennini; one station in Bulgaria.* Au Bu Cz Ga Ge He It Ju Rm Rs (W).

S. × hybrida Degen & Gáyer, *Magyar Bot. Lapok* **27**: 94 (1928), a hybrid between **8** and **4**, has been reported from Austria.

9. S. controversa DC., *Ann. Mus. Hist. Nat. (Paris)* **16**: 199 (1810). Stems 25–80 cm, erect, not winged. Lower leaves 40–85 mm wide, ovate-triangular, truncate to cordate at base, dentate, densely whitish-tomentose beneath; petiole not winged. Capitula 1·5–2 × 0·8–1 cm, ovoid-campanulate, many, in a lax corymbose panicle. Involucral bracts without apical appendages. Corolla bluish-violet. *E. Russia.* Rs (N, C). *(N.C. Asia.)*

S. × uralensis Lipsch., *Bull. Soc. Nat. Moscou* nov. ser., **59(6)**: 75 (1954), a hybrid between **9** and **7**, has been reported from the Urals.

115. Staehelina L.[1]

Small caespitose shrubs. Leaves alternate, often crowded in rosettes near apices of branches, entire to pinnatifid, coriaceous. Capitula in terminal corymbose cymes, rarely solitary. Involucre more or less cylindrical; bracts imbricate, unequal, oblong to ovate, mucronate. Receptacular scales narrow, multifid. Florets all hermaphrodite. Corolla pink to purple, tubular, 5-fid. Achenes oblong, more or less costate, brown; pappus of one row of white hairs with branches about as long as the hair.

[1] By J. do Amaral Franco.

[1] By S. J. Lipschitz.

1 Leaves glabrous; ovary and achenes white-villous **1. fruticosa**
1 Leaves sericeous or tomentose beneath; ovary and achenes glabrous
2 Leaves sericeous beneath; rosette-leaves 50–80 × 35–55 mm **3. arborea**
2 Leaves tomentose beneath; leaves not more than 40 × 18 mm, not in rosettes
3 Leaves ovate; involucre 8–10 × 2 mm **2. unifloscula**
3 Leaves obovate-oblong to linear; involucre 15–20 × 3–8 mm
4 Leaves 8–15 × 4–8 mm, dentate to pinnatifid; involucre 7–8 mm wide **4. baetica**
4 Leaves 15–35 × 2–3 mm, sinuate-dentate to entire; involucre 3–5 mm wide **5. dubia**

1. S. fruticosa (L.) L., *Syst. Nat.* ed. 12, **2**: 538 (1767). Stems up to 150 cm, the branches slightly glandular-pubescent, with rosettes of leaves at the apices. Leaves 35–55 × 8–15 mm, lanceolate, acute, subpungent, entire, glabrous, glaucescent, sessile; rosette-leaves oblong-spathulate, obtuse, shortly petiolate. Capitula in corymbose cymes; involucre 10–12 × 4–5 mm; involucral bracts acute, glabrous, light brown, the lower green at apex. Corolla whitish. Achenes 5–6 × 1–1·5 mm, white-villous; pappus 10–12 mm. *Limestone cliffs. S. Aegean region.* Cr Gr.

2. S. unifloscula Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 162 (1813). Stems up to 50 cm, with white-tomentose branches. Leaves 15–40 × 10–18 mm, ovate, acute, denticulate, dark green and glabrescent above, white-tomentose beneath; petiole 5–10 mm. Capitula 1- to 2-flowered, in simple or compound corymbose cymes; involucre 8–10 × 2 mm, linear-oblong; involucral bracts purple, the lower shortly tomentose, the upper glabrous. Corolla pink. Achenes *c.* 3 × 1·5 mm, glabrous; pappus 8–10 mm. *Mountain rocks.* ● *S. & W. parts of Balkan peninsula.* Al Gr Ju.

3. S. arborea Schreber, *Icon. Descr. Pl.* 1 (1766) (*S. arborescens* L.). Stems up to 100 cm, the branches silvery-sericeous, with rosettes of leaves at the apices. Leaves ovate, entire, obtuse or subobtuse, dark green and glabrescent above, silvery-sericeous beneath; rosette-leaves 50–80 × 35–55 mm, the petiole 25–40 mm; other leaves smaller, with shorter petioles or the upper sessile. Capitula in simple or compound corymbose cymes; involucre 15–20 × 5–7 mm; involucral bracts glabrous to sericeous, brown. Corolla pink. Achenes *c.* 4 × 2 mm, glabrous; pappus *c.* 15 mm. *Limestone cliffs.* ● *Kriti.* Cr.

4. S. baetica DC., *Prodr.* **6**: 544 (1838). Stems up to 15 cm, the branches white-tomentose. Leaves 8–15 × 4–8 mm, obovate-oblong, dentate to pinnatifid, with usually 2 pairs of lobes, cuneate at base, dark green above and white-tomentose beneath, the lobes and apex mucronate; petiole short. Capitula solitary; involucre 15–20 × 7–8 mm; involucral bracts glabrous, red. Corolla purple. Achenes *c.* 4 × 1 mm, glabrous; pappus 15–20 mm. *Shady places.* ● *S. Spain (mountains W. of Málaga).* Hs.

5. S. dubia L., *Sp. Pl.* 840 (1753). Stems 20–40 cm, with white-tomentose branches. Leaves dark green and arachnoid-pubescent above, white-tomentose beneath, acute and mucronate; leaves on vegetative shoots 15–35(–40) × 2–3 mm, linear-lanceolate, sinuate-dentate, narrowly cuneate at base, petiolate, those on flowering shoots narrower, remote and entire. Capitula solitary or 2–4 in a cyme; involucre 15–20 × 3–5 mm; involucral bracts shortly tomentose, green, with reddish apex, the inner entirely reddish, all becoming reddish-brown, with yellowish apex. Corolla purple. Achenes 4–5 × 1 mm, glabrous; pappus 20–25 mm. $2n = 30$. *Dry, rocky or stony places. S.W. Europe, extending eastwards to C. Italy.* Bl Co Ga Hs It Lu.

116. **Jurinea** Cass.[1]

Perennial herbs, sometimes woody at base. Leaves simple, entire or pinnatifid. Capitula solitary or in a corymbose inflorescence. Involucral bracts linear to lanceolate, straight to recurved, appressed to lax. Receptacular scales numerous. Florets tubular, hermaphrodite, pink, red or purplish. Anthers caudate, with free filaments. Stigma-lobes short, patent, hairy at the base. Achene usually with a distal membranous corona around base of pappus; pappus-hairs in several rows, unequal, simple, scabrid.

1 Stems absent or not more than 4 cm
 2 Capitula obconical; involucral bracts recurved or patent **15. humilis**
 2 Capitula globose; involucral bracts appressed
  3 Leaves entire **17. fontqueri**
  3 Leaves pinnatifid **16. taygetea**
1 Stems more than 5 cm
 4 Capitula cylindrical to obconical, longer than wide
  5 Involucral bracts not appressed **6. albicaulis**
  5 Involucral bracts appressed
   6 Basal leaves pinnatifid to pinnatisect
    7 Inner involucral bracts much shorter than florets **4. pinnata**
    7 Inner involucral bracts longer than florets **5. tanaitica**
   6 Basal leaves entire
    8 Capitula 27–30 mm **2. stoechadifolia**
    8 Capitula 5–20 mm
     9 Involucral bracts pink or reddish-purple distally **1. linearifolia**
     9 Involucral bracts white or pale green distally **3. tzar-ferdinandii**
 4 Capitula globose or hemispherical, not longer than wide
  10 Involucral bracts appressed or lax but not recurved or patent
   11 Stems woody at base; leaves entire, oblong-lanceolate to spathulate **7. kirghisorum**
   11 Stems not woody; leaves pinnatifid or at least some entire and linear to lanceolate
    12 Achenes tuberculate, ribbed or acutely verrucose, often glandular-hairy **13. consanguinea**
    12 Achenes longitudinally ribbed, otherwise smooth
     13 Achenes 3–4 mm, with entire distal corona; basal leaves green above **8. cyanoides**
     13 Achenes 6–7 mm, with distal corona represented by small teeth; basal leaves grey or white above **6. albicaulis**
  10 Involucral bracts recurved or straight and patent
   14 Achenes tuberculate, especially on angles, sometimes faintly ribbed
    15 Capitula 4·5–7·5 cm; cauline leaves not decurrent, or absent **14. glycacantha**
    15 Capitula 2–4 cm; cauline leaves long-decurrent **12. ledebourii**
   14 Achenes ribbed or longitudinally rugose, not tuberculate
    16 Involucral bracts lanceolate to elliptic-lanceolate; leaves not auriculate, the basal with segments more than 3 mm wide **10. mollis**
    16 Involucral bracts linear to cuneate; leaves auriculate, the basal with segments less than 3 mm wide
     17 Capitula 1–4(–5), 1–3 cm in diameter; achenes 5–6 mm **9. ewersmanii**
     17 Capitula 5–many, up to 1·5(–2) cm in diameter; achenes 1–2 mm **11. polyclonos**

1. J. linearifolia DC., *Prodr.* **6**: 675 (1838) (*J. multiflora* (L.) B. Fedtsch.). Stems (12–)15–35(–40) cm, woody at base, leafy throughout. Basal leaves (2–)3–8(–10) × (0·1–)0·2–0·6(–0·9) cm, lanceolate or linear-lanceolate, shortly acuminate, usually with revolute margin, arachnoid-tomentose. Capitula (5–)7–15(–18) × 4–6 mm, cylindrical. Involucral bracts lanceolate to linear-lanceolate, shortly acuminate, straight and appressed, herbaceous, the inner longer, glabrous or slightly tomentose, white or pale green below, pink or reddish-purple distally, with scarious apex. Achenes 3·5–4·5 mm, tetragonal, ribbed, glabrous; corona conspicuous; pappus *c.* 3 times as long as achene. *Steppes and semi-deserts. S. & S.E. parts of U.S.S.R., S.E. Romania.* Rm Rs (C, W, K, E).

2. J. stoechadifolia (Bieb.) DC., *op. cit.* 674 (1838). Stems (10–)20–35(–40) cm, leafy throughout. Basal leaves 5–6(–7) × 0·2–0·3 cm, with revolute margin, setose and tuberculate above, arachnoid-hairy beneath. Capitula 3–many, 27–30 × 5–7 mm, cylindrical or obconical. Involucral bracts lanceolate, straight and appressed, herbaceous, with dense arachnoid indumentum, white or pink distally, the inner longer and narrower. Achenes 3·5–4·5 mm, tetragonal or conical, ribbed, glabrous; corona conspicuous; pappus about twice as long as achene. *Dry grassland; calcicole. From N.E. Bulgaria to S.E. Russia.* Bu Rm Rs (W, K, E).

3. J. tzar-ferdinandii Davidov, *Sborn. Bălg. Akad. Nauk.* **15**: 28–44 (1909). Stems 15–30 cm, from a thick woody rhizome, leafy throughout. Basal leaves 4–15 cm, with entire, revolute margin, green and setose above, with arachnoid indumentum beneath; non-flowering rosettes sometimes present. Capitula 4–8, 15–20 × 4·5–7 mm, obconical. Involucral bracts narrowly linear-lanceolate, long-acuminate, straight and appressed, scabrid on margin, subglabrous or with arachnoid indumentum, purple below, white or pale green distally, the inner longer. Achenes 3–4 mm, tetragonal, finely ribbed, glabrous; corona conspicuous; pappus 3–4 times as long as achene, with 3–4 of the inner hairs twice as long as the outer. *Calcareous slopes.* ● *Bulgaria.* Bu.

4. J. pinnata (Lag.) DC., *Prodr.* **6**: 676 (1838). Stem (4–)6–10(–13) cm, caespitose, woody at base, usually leafy in basal half. Leaves deeply pinnatisect, whitish-grey-tomentose, with linear or linear-lanceolate segments *c.* 1 mm wide; non-flowering rosettes usually present. Capitula 2(–3), 15–23 × 6–15 mm, obovoid-obconical. Involucral bracts lanceolate, acuminate, straight and appressed, unequal, the outer shorter, shortly tomentose, the inner usually subglabrous, finely ribbed near base and with a yellow vein, purple or reddish distally. Achenes 3–4·5 mm, obscurely tetragonal, tuberculate or smooth, glandular, glabrous; corona conspicuous; pappus 3–4 times as long as achene. *Dry places. C. & S. Spain.* Hs.

5. J. tanaitica Klokov in Schischkin & Bobrov, *Fl. URSS* **27**: 719 (1962). Stems 15–50(–60) cm, leafy throughout. Basal leaves deeply pinnatifid, arachnoid-hairy; segments 2–5, entire, 10 or more times as long as wide; cauline leaves with short auricles, the uppermost entire. Capitula 2–10 or more, 12–15 × 7–12 mm, obconical. Involucral bracts lanceolate, unequal, straight and appressed, coriaceous, with arachnoid indumentum or subglabrous, the inner exceeding florets, purple, yellowish or brown. Achenes (3·5–)4–4·5 mm, finely ribbed, glabrous; corona inconspicuous; pappus 2–2½ times as long as achene. *Sandy ground.* ● *S.E. Russia (basin of the lower Don).* Rs (E).

6. J. albicaulis Bunge, *Flora* (*Regensb.*) **24**: 156 (1841). Stems 30–75 cm, woody at base, with few small leaves. Basal leaves 18–22 × (0·2–)0·3–0·6(–0·8) cm, linear or linear-lanceolate, the lower sometimes weakly pinnate with linear or linear-lanceolate, acuminate segments, with dense tomentose or tomentose-arachnoid indumentum, white beneath. Capitula 18–25 × 7–18 mm, globose or cylindrical. Involucral bracts subequal, linear-lanceolate, long-acuminate, the outer with arachnoid indumentum, the inner longer, glabrous, with scabrid margin. Achenes 6–7 mm, prismatic, ribbed, glabrous; corona represented by small teeth; pappus longer than achene. *Sandy ground. S. Ukraine; E. part of Balkan peninsula.* Bu Gr Rs (W, K) Tu.

(a) Subsp. **kilaea** (Aznav.) Kožuharov, *Izv. Bot. Inst.* (*Sofia*) **18**: 68 (1968) (*J. kilaea* Aznav.): Stems 30–50 cm, simple. Leaves grey above; cauline more or less auriculate at the base. Capitula 1–3, on very short peduncles; inner involucral bracts flat, with coriaceous appendages at apex. $2n=30$. *E. part of Balkan peninsula.*

(b) Subsp. **laxa** (Fischer ex Iljin) Kožuharov, *Bot. Jour. Linn. Soc.* **71**: 42 (1975) (*J. laxa* Fischer ex Iljin, *J. paczoskiana* Iljin): Stems 40–75 cm, much-branched. Leaves greenish above; cauline long-decurrent. Capitula numerous; inner involucral bracts canaliculate distally, without coriaceous appendages at apex. ● *S. Ukraine.*

Subsp. *albicaulis* is confined to C. Asia.

7. J. kirghisorum Janisch., *Trudy Obšč. Estestv. Imp. Kazansk. Univ.* **40(1)**: 5 (1905). Stems 10–25 cm, woody at base, with sublinear leaves towards the base; non-flowering rosettes present. Basal leaves oblong-lanceolate to spathulate, acuminate, entire, with revolute margin, densely arachnoid-tomentose. Capitula 1–3, 11–13 × 10–12(–14) mm, hemispherical. Involucral bracts unequal, oblong-lanceolate, straight and appressed, the outer subobtuse, herbaceous, the inner longer, acuminate, scabrid. Achenes 4–5 mm, ribbed and distinctly tuberculate; corona inconspicuous; pappus slightly longer than achene. *Limestone hills. W. Kazakhstan* (*W. of Ural'sk*). Rs (E). (*N.W. Kazakhstan.*)

8. J. cyanoides (L.) Reichenb., *Fl. Germ. Excurs.* 290 (1831). Stems 20–60(–70) cm, leafy throughout. Basal leaves deeply 1- or 2-pinnatifid, sometimes entire and linear, glabrous above, white-tomentose beneath, the segments 1–2 mm wide, linear. Capitula 1-several, 1–3 cm, subglobose. Involucral bracts lax, straight or slightly incurved, herbaceous, the inner glabrous, the outer with arachnoid indumentum. Achenes 3–4 mm, obpyramidal, smooth or finely ribbed, glabrous; corona inconspicuous; pappus 2–2½ times as long as achene. *Dry, usually sandy ground. C. Europe; U.S.S.R. northwards to c.* 58° *N.* Cz Ge Rs (C, W, E).

(a) Subsp. **cyanoides**: Basal leaves with 5 pairs of linear segments, up to 5 times as long as wide. Involucral bracts 15–18(–20) mm, equal, linear-cuneate. ● *Throughout the range of the species except E. Russia and W. Kazakhstan.*

(b) Subsp. **tenuiloba** (Bunge) Nyman, *Consp.* 415 (1879) (*J. tenuiloba* Bunge; incl. *J. creticola* Iljin, *J. transuralensis* Iljin, *J. pseudocyanoides* Klokov): Basal leaves with 1–2 pairs of segments, or entire and 10 or more times as long as wide. Involucral bracts 10–15 mm, unequal, lanceolate-cuneate. *Semi-deserts and grass steppes. E. Russia, W. Kazakhstan.*

9. J. ewersmanii Bunge, *Flora* (*Regensb.*) **24**: 155 (1841) (*J. charcoviensis* Klokov, *J. granitica* Klokov). Like **8** but leaves auriculate; outer involucral bracts strongly recurved, often purple at least distally; achenes 5–6 mm, prismatic, subcylindrical. *Sandy steppes. S. part of U.S.S.R.* Rs (C, W, E).

10. J. mollis (L.) Reichenb., *Fl. Germ. Excurs.* 290 (1831). Stems 30–70 cm, leafy at least at base. Basal leaves variably pinnatifid; segments lanceolate, oblong-lanceolate or ovate, with revolute or undulate margin, usually grey; cauline leaves pinnatifid, or entire and linear to linear-lanceolate, setose. Capitula 2–5 × (2–)3·5–4·5(–6) cm, globose or hemispherical. Involucral bracts lanceolate to elliptic-lanceolate, recurved and purple distally, the inner much longer than the outer, scabrid. Achenes 3–5 mm, glabrous; corona conspicuous; pappus as long as achene. $2n=30$, 34, 35, 36. *E.C. & S.E. Europe, extending westwards to Italy.* Al Au Bu Cz Gr Hu It Ju Rm Tu.

1 Stems much-branched, leafy throughout; inflorescence with 5 or more capitula **(b)** subsp. **moschata**
1 Stems simple, leafy in basal half; inflorescence with 1–3 capitula
 2 Achenes obscurely tuberculate, sometimes ribbed; leaves densely greyish-pubescent above **(d)** subsp. **anatolica**
 2 Achenes longitudinally rugose; leaves rather pubescent and greenish above
  3 Leaves and involucral bracts glabrous **(c)** subsp. **transylvanica**
  3 Leaves and involucral bracts with arachnoid indumentum **(a)** subsp. **mollis**

(a) Subsp. **mollis**: Stems simple, with arachnoid indumentum, leafy in basal half. Leaves with arachnoid indumentum. Capitula 1–3, 2–5 cm. Involucral bracts with arachnoid indumentum. Achenes longitudinally rugose. ● *E.C. Europe, N. Italy.*

(b) Subsp. **moschata** (DC.) Nyman, *Consp.* 415 (1879) (*J. moschata* DC.): Stems much-branched, with arachnoid or densely arachnoid-tomentose indumentum, leafy throughout. Leaves with arachnoid indumentum. Capitula 5 or more, 4–5 cm. Involucral bracts with dense arachnoid indumentum, herbaceous. Achenes finely ribbed. ● *Appennini; N.W. part of Balkan peninsula.*

(c) Subsp. **transylvanica** (Sprengel) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 701 (1931) (*J. transylvanica* (Sprengel) Simonkai): Stems simple, glabrous, leafy in basal half. Leaves glabrous or subglabrous. Capitula 1–3, 2–3 cm. Involucral bracts glabrous, herbaceous. Achenes ribbed. ● *C. Romania.*

(d) Subsp. **anatolica** (Boiss.) Stoj. & Stefanov, *Fl. Bălg.* 1156 (1925) (*J. anatolica* Boiss.): Stems simple, arachnoid-tomentose, leafy at the base. Leaves with arachnoid indumentum. Capitula up to 3 cm. Involucral bracts with arachnoid indumentum, coriaceous. Achenes obscurely tuberculate, sometimes ribbed. $2n=30$. *Bulgaria and Aegean region.*

11. J. polyclonos (L.) DC., *Prodr.* **6**: 675 (1838) (*J. salicifolia* Gruner, *J. amplexicaulis* Bobrov, *J. thyrsiflora* Klokov). Stems 40–80 cm, leafy throughout. Basal leaves narrowly pinnatifid, the segments linear, with revolute margin, glabrous and green above, arachnoid-hairy beneath; cauline leaves entire or shallowly pinnatifid, lanceolate or linear-lanceolate, auriculate or amplexicaul. Capitula 5–many, (0·5–)0·8–1·5(–2) cm, subglobose. Involucral bracts cuneate, the outer shorter, strongly recurved or straight and patent, glabrous, herbaceous, purple. Achenes 1–2 mm, longitudinally ribbed; corona inconspicuous; pappus slightly shorter than achene. *Dry steppes and sandy ground.* ● *C. & E. Ukraine, S.C. & S.E. Russia.* Rs (C, W, E).

12. J. ledebourii Bunge, *Flora* (*Regensb.*) **24**: 157 (1841) (*J. calcarea* Klokov, *J. cretacea* Bunge, *J. michelsonii* Iljin, *J. mollissima* Klokov, *J. sordida* Steven). Stems 15–80 cm, finely sulcate, leafy towards base. Basal leaves linear-lanceolate in outline, pinnatifid, sometimes simple, amplexicaul, decurrent, with oblong-lanceolate to linear segments, the margin often undulate or revolute, puberulent above, arachnoid-hairy or tomentose beneath. Capitula 1–3, 2–3·5(–4) cm, globose. Involucral bracts lanceolate to subulate, the inner ovate, acuminate, subequal, subglabrous or with dense arachnoid indumentum, ciliate, recurved or hooked at the apex, the outer herbaceous. Achenes 3–4 mm, deeply tuberculate, puberulent; corona inconspicuous;

[1] By S. Kožuharov.

pappus as long as achene. $2n=36$. ● *From Bulgaria to E. Russia.* Bu Rm Rs (C, W, ?K, E).

13. J. consanguinea DC., *Prodr.* **6**: 676 (1838). Stem 20–35 cm, leafy in basal half. Basal leaves *c.* ½ as long as stem, shallowly pinnatifid, green and subglabrous above, arachnoid-tomentose beneath, long-petiolate, the segments lanceolate; cauline leaves linear, linear-lanceolate or setaceous. Capitula 2–7 cm in diameter, hemispherical. Involucral bracts straight, the inner longer and long-acuminate, slightly scabrid on margin. Achenes with inconspicuous corona; pappus as long as achene. *S.E. Europe, from Macedonia to W. Kazakhstan.* Bu ?Gr Ju Rm Rs (C, W, E) ?Tu.

1 Involucral bracts subequal, linear to cuneate; leaf-segments with strongly revolute margins **(b)** subsp. **neicevii**
1 Involucral bracts unequal, lanceolate or elliptic-lanceolate; leaf-segments flat or with slightly revolute margins
2 Involucral bracts glabrous, strongly appressed; achenes obscurely tuberculate **(a)** subsp. **consanguinea**
2 Involucral bracts arachnoid-tomentose, lax; achenes acutely verrucose, or ribbed and tuberculate
3 Capitula 3–7 cm in diameter; involucral bracts flat at the base; achenes pale yellowish, slightly glandular-hairy or glabrous **(d)** subsp. **bulgarica**
3 Capitula 2–4 cm in diameter; involucral bracts convex at the base; achenes brown, glandular-hairy **(c)** subsp. **arachnoidea**

(a) Subsp. **consanguinea**: Leaf-segments with flat or slightly revolute margins. Capitula 2–4 cm in diameter. Involucral bracts unequal, the outer less than half as long as the inner, strongly appressed, convex at the base, coriaceous, glabrous, or hairy at the base only. Achenes tuberculate, glabrous when mature, brown. *Mountains of Balkan peninsula.*

(b) Subsp. **neicevii** Kožuharov, *Izv. Bot. Inst.* (*Sofia*) **18**: 71 (1968): Leaf-segments strongly revolute. Capitula 2–4 cm in diameter. Involucral bracts subequal, cuneate or cuneate-linear, lax distally, flat at the base, herbaceous, with arachnoid indumentum. Achenes obscurely tuberculate and slightly ribbed, glabrous, brown. ● *Higher mountains of Bulgaria.*

(c) Subsp. **arachnoidea** (Bunge) Kožuharov, *loc. cit.* (1968) (*J. arachnoidea* Bunge; incl. *J. gilliatii* Turrill, *J. kasakorum* Iljin, *J. bipinnata* Adamović, *J. talijevii* Klokov): Leaf-segments with slightly revolute margins. Capitula 2–4 cm in diameter. Involucral bracts unequal, the outer more than ½ as long as the inner, lax distally, convex at the base, coriaceous, arachnoid. Achenes acutely verrucose, glandular-hairy, brown. $2n=36$. *Almost throughout the range of the species.*

(d) Subsp. **bulgarica** (Velen.) Kožuharov, *loc. cit.* (1968) (*J. bulgarica* Velen.): Leaf-segments with slightly revolute margins. Capitula 3–7 cm in diameter. Involucral bracts flat at the base, with arachnoid indumentum, the outer herbaceous, less than ½ as long as the inner. Achenes tuberculate, ribbed, slightly glandular-hairy, pale yellowish. *Calcicole.* ● *C. part of Balkan peninsula.*

14. J. glycacantha (Sibth. & Sm.) DC., *Prodr.* **6**: 674 (1838) (*J. mollis* subsp. *glycacantha* (Sibth. & Sm.) Hayek). Stems 30–60 cm, usually with leaves only at base. Basal leaves shallowly pinnatifid; segments oblong-lanceolate or oblong, with undulate margin, arachnoid-tomentose above, densely tomentose beneath; cauline leaves linear, dentate at base. Capitula 4–5·5(–7·5) cm, hemispherical. Involucral bracts linear to linear-lanceolate, long-acuminate; outer strongly recurved and slightly hooked at apex, densely arachnoid-tomentose; inner cristate, glabrous. Achenes 4–5 mm, conical, tuberculate, indistinctly ribbed; corona inconspicuous; pappus slightly longer than achene. $2n=30$. *Balkan peninsula and E.C. Europe.* Al Bu Gr Hu Ju Rm.

15. J. humilis (Desf.) DC., *op. cit.* 677 (1838) (*J. monardii* (Dufour) DC.). Rhizome thick, often producing non-flowering leafy shoots. Acaulescent or stems up to 4 cm and bearing 2–7 pinnatifid leaves. Leaves (1·5–)2–3·5(–4) cm, entire and oblong-obovate, or pinnatifid, long-petiolate, with arachnoid pubescence, the segments short, linear-lanceolate or oblong, with revolute margin. Capitula 2–2·5 cm, obconical. Involucral bracts linear-lanceolate, straight and patent or recurved, subglabrous or arachnoid-tomentose, green, herbaceous. Achenes 3–7 mm, ribbed, hairy, brown; corona inconspicuous; pappus 5–7 times as long as achene. $2n=34$. *Dry, rocky places in mountains. S.W. Europe, Sicilia.* Ga Hs Lu Si.

16. J. taygetea Halácsy, *Magyar Bot. Lapok* **11**: 163 (1912). Like **15** but leaves always pinnatifid; capitula globose; involucral bracts oblong-lanceolate to broadly lanceolate, shortly acuminate, straight and appressed, strongly keeled at base, purple distally and green at base. ● *Mountains of Greece and Bulgaria.* Bu Gr.

Perhaps a subspecies of **15** or of **J. cadmea** Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 22 (1844), from Asia, but the achene is unknown.

17. J. fontqueri Cuatrec., *Bol. Soc. Esp. Hist. Nat.* **27 (2)**: 223 (1927). Rhizome thickened distally, somewhat creeping, scaly. Acaulescent or stems up to 4 cm, leafless. Leaves ovate or ovate-oblong, petiolate, shortly pubescent or subglabrous above, arachnoid-tomentose beneath. Capitula 3–4 cm, globose or ovoid-globose. Involucral bracts lanceolate, acuminate, unequal, straight and appressed, smooth or finely veined, shortly pubescent, green, herbaceous. Achenes 4–6 mm, finely and closely ribbed or almost smooth; corona absent; pappus up to twice as long as achene. *Limestone rocks, c.* 2000 *m.* ● *S. Spain* (*Sierra de Mágina*). Hs.

117. Carduus L.[1]

Annuals to perennials with spiny-winged stems. Leaves spinose-dentate, subentire to pinnatisect. Capitula depressed-globose to cylindrical; involucral bracts usually in many rows, more or less densely imbricate, spine-tipped, glabrous to densely arachnoid-hairy; receptacle densely setose. Florets purple, rarely pink or white; corolla with slender tube and the limb with 1 lobe more or less longer than the others. Anthers sagittate, with slender, entire or lacerate basal appendages. Achenes 3–10 mm, glabrous, smooth or with 5–10 ribs; pappus of many rows of setae which are united at base into a ring, unequal, the inner the longest.

Literature: J. Briquet & F. Cavillier in E. Burnat, *Flore des Alpes Maritimes* **7**: 69–83. Genève. 1931. C. Favarger & P. Küpfer, *Ber. Schweiz. Bot. Ges.* **80**: 269–280 (1970). W. Gugler, *Mitt. Bayer. Bot. Ges.* **2**: 136–140; 145–156; 158–172 (1908). S. M. A. Kazmi, *Mitt. Bot. Staatssamm.* (*München*) **5**: 279–550 (1964). H. Niklefeld, *Mitteilungsbl. Naturw. Ver. Steierm. Florist. Arbeitsgem.* **14**: 1–6 (1969).

Descriptions of leaves, unless otherwise stated, refer to the middle cauline. The 1–2 outer rows of involucral bracts are termed *outer bracts*, then follow 2–4 rows of *middle bracts* and inside these are 1–2 rows of *inner bracts*, the latter always thinner and more intensely coloured than the remainder. Descriptions of bracts, unless otherwise stated, refer to the middle bracts.

1 Corolla-tube widened above into an ellipsoid cup up to 2(–3) mm; involucre oblong or cylindrical
2 Peduncle more than 3 cm
3 Corolla at least 15 mm; stem with both stout and slender ribs **40. corymbosus**
3 Corolla not more than 15 mm; stem with stout ribs only
4 Involucral bracts distinctly contracted at middle, without thickened margin **42. argentatus**
4 Involucral bracts tapering from at least their basal ⅓, with thickened margin
5 Involucral bracts widened in basal ¼, not more than 0·5 mm wide above **41. acicularis**
5 Involucral bracts widened in basal ⅓, at least 1·5 mm wide above **45. pycnocephalus**
2 Peduncle absent or not more than 3 cm
6 Leaves glabrous or with very sparse unicellular hairs only beneath
7 Leaf-veins raised beneath throughout their length; involucral bracts not scarious **47. cephalanthus**
7 Leaf-veins raised beneath only in their distal ½; involucral bracts scarious at margin **48. fasciculiflorus**
6 Leaves arachnoid-hairy with both multicellular and unicellular hairs beneath
8 Leaves with 6–10 pairs of lobes
9 Stem subglabrous; bracts not more than 1·25 mm wide **43. meonanthus**
9 Stem arachnoid-hairy; bracts at least 1·5 mm wide **44. tenuiflorus**
8 Leaves with 2–5 pairs of lobes
10 Inner involucral bracts shorter than the inner middle **41. acicularis**
10 Inner involucral bracts longer than the inner middle
11 Apical spine of leaf-lobes up to 12 mm; involucral bracts with mid-vein raised at least in distal ½ **45. pycnocephalus**
11 Apical spine of leaf-lobes up to 30 mm; involucral bracts with mid-vein raised only in the distal ½ **46. australis**
1 Corolla-tube widened above into an oblong cup at least 2 mm; involucre globose to campanulate, very rarely cylindrical
12 Plant with most spines more than 5 mm
13 Stem glabrous or subglabrous
14 Outer and middle involucral bracts curled in an S-shape **9. platypus**
14 Outer and middle involucral bracts not curled in an S-shape
15 Corolla less than 15 mm **34. argyroa**
15 Corolla at least 15 mm
16 Involucral bracts at least 2 mm wide **(1–8). nutans** group
16 Involucral bracts not more than 2 mm wide
17 Peduncles absent or not more than 3 cm **(14–16). tmoleus** group
17 Peduncles more than 3 cm **(25–27). defloratus** group
13 Stem arachnoid-hairy to tomentose
18 Stem with unicellular hairs only
19 Capitula cylindrical, not more than 10 mm in diameter **37. asturicus**
19 Capitula campanulate, usually more than 10 mm in diameter
20 Leaves with 6–8 pairs of lobes **38. carpetanus**
20 Leaves with 10–20 pairs of lobes **39. carlinoides**
18 Stem with multicellular and unicellular hairs, or only with multicellular hairs
21 Stem with multicellular hairs only **(1–8). nutans** group
21 Stem with multicellular and unicellular hairs
22 Involucral bracts at least 2 mm wide
23 Veins of leaf raised throughout their length
24 Outer and middle involucral bracts not curled in an S-shape **(1–8). nutans** group
24 Outer and middle involucral bracts curled in an S-shape **9. platypus**
23 Veins of leaf raised only in the distal ½ of their length
25 Pappus 20–25 mm **(1–8). nutans** group
25 Pappus 12–18 mm **10. chrysacanthus**
22 Involucral bracts up to 2 mm wide
26 Leaves with 8–14 pairs of lobes
27 Capitula sessile, usually clustered **13. ramosissimus**
27 Capitula pedunculate, usually corymbosely arranged **32. affinis**
26 Leaves with 6–8 pairs of lobes
28 Leaves sparsely hairy to lanuginous beneath; involucral bracts gradually acuminate **(1–8). nutans** group
28 Leaves densely tomentose or lanate beneath; involucral bracts acuminate-subulate
29 Leaf-lobes caudate with oblong to oblong-linear lobules **(14–16). tmoleus** group
29 Leaf-lobes with ovate-obtuse lobules **19. litigiosus**
12 Plant with most spines less than 5 mm
30 Stem glabrous or subglabrous
31 Outer involucral bracts curled in an S-shape
32 Middle involucral bracts at least 1·5 mm wide **9. platypus**
32 Middle involucral bracts not more than 1·5 mm wide
33 Pappus 13–16 mm **23. hamulosus**
33 Pappus 8–13 mm
34 Middle involucral bracts about as long as the inner; capitula mostly sessile and clustered **17. personata**
34 Middle involucral bracts shorter than the inner; capitula solitary and mostly long-pedunculate
35 Leaves with 6–8 distant pairs of lobes **30. carduelis**
35 Leaves with 8–10(–15) approximate pairs of lobes, or entire to dentate **(25–27). defloratus** group
31 Outer involucral bracts not curled in an S-shape
36 Outer and middle involucral bracts 2–8 mm wide
37 Peduncle more than 3 cm **(1–8). nutans** group
37 Peduncle absent **11. aurosicus**
36 Outer and middle involucral bracts 0·2–2 mm wide
38 Pappus 8–13 mm
39 Capitula solitary, distinctly pedunculate **(25–27). defloratus** group
39 Capitula clustered, usually sessile
40 Leaves with 10–14 pairs of lobes **13. ramosissimus**
40 Leaves with 6–8 pairs of lobes **18. crispus**
38 Pappus 13–15 mm
41 Leaves with both multicellular and unicellular hairs beneath **31. kerneri**
41 Leaves with only unicellular hairs beneath, or glabrous
42 Involucral bracts with mid-vein raised only in the distal ½ **21. vivariensis**
42 Involucral bracts with mid-vein raised throughout its length **(25–27). defloratus** group
30 Stem arachnoid-hairy to tomentose
43 Leaves glabrous to subglabrous beneath
44 Pappus 9–13 mm
45 Capitula sessile; leaves with 6–8 pairs of lobes **12. acanthoides**
45 Capitula long-pedunculate; leaves with 8–10 pairs of lobes **33. adpressus**
44 Pappus 13–16 mm
46 Leaves with 2–5 pairs of lobes **29. collinus**
46 Leaves with 8–12 pairs of lobes
47 Capitula long-pedunculate **(25–27). defloratus** group
47 Capitula sessile **36. myriacanthus**
43 Leaves distinctly hairy beneath
48 Corolla 12–16 mm
48 Corolla 12–16 mm
49 Middle involucral bracts about as long as the inner; cauline leaves serrate **17. personata**
49 Middle involucral bracts shorter than the inner; cauline leaves lobed
50 Stem with multicellular and unicellular hairs; capitula at least 10 mm in diameter, campanulate **35. bourgeanus**
50 Stem with unicellular hairs; capitula not more than 10 mm in diameter, cylindrical **37. asturicus**
48 Corolla 16–30 mm
51 Involucral bracts with scarious margin **38. carpetanus**
51 Involucral bracts without scarious margin

[1] By J. do Amaral Franco; key prepared by M. L. Rocha Afonso.

52 Corolla 16–20 mm
53 Involucral bracts at least 1·5 mm wide **(1–8). nutans** group
53 Involucral bracts not more than 1·5 mm wide
54 Leaves with both multicellular and unicellular hairs beneath; peduncle absent or not more than 2 cm **19. litigiosus**
54 Leaves with only unicellular hairs beneath; peduncle 2–15 cm
55 Inner bracts abruptly contracted above middle **28. candicans**
55 Inner bracts not contracted above middle **29. collinus**
52 Corolla 20–30 mm
56 Leaves densely hairy above
57 Stem only with multicellular hairs; leaves with at least 12 pairs of lobes **20. euboicus**
57 Stem with both multicellular and unicellular hairs; leaves with not more than 12 pairs of lobes
58 Leaves with only multicellular hairs beneath; inner bracts 5-veined **(1–8). nutans** group
58 Leaves with both multicellular and unicellular hairs beneath; inner bracts 1-veined **24. uncinatus**
56 Leaves subglabrous above
59 Outer and middle involucral bracts strongly recurved at middle **22. nigrescens**
59 Outer and middle involucral bracts imbricate or slightly recurved
60 Leaves with crispate hairs beneath; capitula mostly pedunculate **(1–8). nutans** group
60 Leaves with straight hairs beneath; capitula mostly sessile **10. chrysacanthus**

Sect. CARDUUS. Capitula depressed-globose to campanulate, often large and pedunculate, persistent; corolla-tube widened above into an oblong cup (2–)2·5–5 mm.

(1–8). C. nutans group. Perennials or biennials up to 150 cm. Stem glabrous to densely arachnoid-hairy; wings triangular or palmate, with an apical spine up to 12 mm. Leaves pinnatifid or pinnatisect, glabrous to densely arachnoid-hairy on both surfaces. Capitula large or medium, subglobose or depressed-globose. Peduncles up to 22 cm, stout or slender. Involucral bracts often distinctly constricted in the proximal part, deflexed to erect and imbricate; inner bracts 1- to 5-veined. Corolla (16–)20–30 mm. Achenes 3–5 mm; pappus 13–25 mm.

A difficult group in need of further study. Though a few extreme taxa are easily recognized, there is considerable variation in hairiness, leaf-size, spine-length, peduncle-diameter, width and shape of bracts, and corolla-length. This variation is almost continuous and intermediates between taxa can be found.

1 Appendages of bracts 4–8 mm wide, distinctly wider than the claw, velvet-puberulent dorsally; peduncles up to 22 cm **4. thoermeri**
1 Appendages of bracts 1·5–5 mm wide, not wider than the claw, glabrous or very sparsely puberulent dorsally; peduncles up to 15 cm
2 Pappus 13–18 mm
3 Leaves with 8–12 pairs of lobes; involucral bracts with mid-
3 Leaves with 8–12 pairs of lobes; involucral bracts with mid-vein raised in the distal $\frac{5}{6}$ **6. micropterus**
3 Leaves with 6–8 pairs of lobes; involucral bracts with mid-vein raised in the distal $\frac{1}{2}$–$\frac{3}{4}$
4 Capitula umbilicate at base; peduncle *c.* 3 mm in diameter **5. nutans**
4 Capitula truncate at base; peduncle not more than 1·5 mm in diameter **8. sandwithii**
2 Pappus 18–24 mm
5 Involucral bracts with an obscure mid-vein **5. nutans**
5 Involucral bracts with a raised mid-vein
6 Corolla 20–25 mm; peduncle 1–2 mm in diameter **7. broteroi**
6 Corolla 25–30 mm; peduncle 2–4 mm in diameter
7 Veins of leaf raised throughout their length **1. macrocephalus**
7 Veins of leaf raised only in distal $\frac{1}{2}$ of their length
8 Outer and middle involucral bracts usually arcuate-recurved **2. granatensis**
8 Outer and middle involucral bracts strongly deflexed **3. taygeteus**

1. C. macrocephalus Desf., *Fl. Atl.* **2**: 245 (1799). Biennial. Stem greyish-arachnoid-hairy; wings up to 5 mm, triangular-acute. Leaves more or less densely arachnoid-hairy, with short, crispate multicellular hairs, with 6–10(–12) pairs of lobes, each with an apical spine up to 12 mm. Outer and middle involucral bracts recurved or patent in their distal $\frac{2}{3}$, 3–5 mm wide at base, with a prominent mid-vein above the constriction, tapering to a rigid spine up to 7 mm; inner bracts as long as inner middle. Achenes compressed, rugulose; apical prominence shortly stipitate. *Roadsides and waste places. C. & E. Mediterranean region.* Gr It Ju Sa Si.

1 Involucral bracts 15–25 mm, distinctly shorter than florets; wings of stem entire, with apical spine not more than 5 mm **(c)** subsp. **siculus**
1 Involucral bracts 25–45 mm, as long as or longer than florets; wings of stem usually 3-partite, with apical spine not more than 10 mm
2 Involucral bracts recurved, conduplicate-canaliculate in distal $\frac{2}{3}$ **(a)** subsp. **macrocephalus**
2 Involucral bracts appressed-patent, flat **(b)** subsp. **sporadum**

(a) Subsp. **macrocephalus**: Plant up to 150 cm. Capitula 30–40 × 40–50 mm; peduncles with scattered clusters of spines; involucral bracts longer than florets, constricted $\frac{1}{4}$ of way from base, ovate-lanceolate, long-subulate; inner bracts 3-veined. *Sardegna, S. Italy, W. Jugoslavia.*

(b) Subsp. **sporadum** (Halácsy) Franco, *Bot. Jour. Linn. Soc.* **71**: 48 (1975) (*C. nutans* var. *sporadum* Halácsy): Like **(a)** but capitula 40–55 × 60–80 mm, with bracts not longer than florets. ● *N.W. Aegean region* (*Yioura*).

(c) Subsp. **siculus** Franco, *loc. cit.* (1975): Plant up to 50 cm. Capitula 25–40 × 30–45 mm; peduncles smooth; involucral bracts shorter than florets, constricted $\frac{1}{3}$ of way from base, lanceolate-acuminate, more or less patent; inner bracts 5-veined. *Dolomitic soils.* ● *Sicilia.*

2. C. granatensis Willk., *Linnaea* **30**: 113 (1859). Perennial up to 70 cm. Stem arachnoid-hairy; wings up to 6 mm wide, palmate, with an apical spine up to 10 mm. Leaves with sinuate multicellular hairs beneath, with 8–10 pairs of triangular lobes, each ending in a spine up to 12 mm. Capitula 30–50 × 40–80 mm, distinctly umbilicate at base; peduncles smooth; outer and middle involucral bracts usually more or less imbricate downwards, slightly constricted $\frac{1}{3}$ of way from base, 2–4 mm wide and orbicular-ovate at the base, lanceolate-subulate above, with the mid-vein raised in the distal $\frac{4}{5}$ and tapering into a spine up to 4 mm; inner bracts longer than inner middle; middle bracts 12–20 mm. Achenes swollen, rugulose; apical prominence shortly stipitate. *Mountain slopes*; *calcicole.* ● *S. & S.E. Spain.* Hs.

3. C. taygeteus Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 42 (1856). Like **2** but capitula 30–40 × 40–50 mm; peduncles with scattered clusters of spines; outer and middle involucral bracts strongly deflexed and imbricate downwards, long-attenuate-subulate, flattened or more or less conduplicate distally; middle bracts not constricted; corolla 23–30 mm. *Rocky places. Greece and N. Aegean region.* Gr.

(a) Subsp. **taygeteus** (*C. nutans* subsp. *taygeteus* (Boiss. & Heldr.) Hayek): Outer and middle involucral bracts deflexing at the top of their proximal $\frac{1}{3}$, the appendage 10–18 mm and ending

in a spine 2–4 mm; inner bracts slightly exceeding the upper middle. *Throughout the range of the species except the islands of the N. Aegean region.*

(b) Subsp. **insularis** Franco, *Bot. Jour. Linn. Soc.* **71**: 48 (1975): Outer and middle involucral bracts recurved at the top of their proximal $\frac{1}{4}$, the appendage 20–30 mm, ending in a spine 4–7 mm; inner bracts shorter than upper middle. *N. Aegean region* (*Limnos and Samothraki*).

4. C. thoermeri Weinm., *Bull. Soc. Nat. Moscou* **10(7)**: 69 (1837) (*C. nutans* auct., non L., *C. leiophyllus* Petrović). Up to 150 cm; stem glabrous to sparsely arachnoid-hairy; wings up to 12 mm, triangular-dentate, with an apical spine up to 10 mm. Leaves glabrous, or with sparse, short, crispate multicellular hairs beneath, with 4–8 pairs of broadly triangular lobes, each with an apical spine up to 8 mm. Capitula 35–50 × 60–80 mm, depressed-globose; involucral bracts oblong below and distinctly widened into a flat, ovate-lanceolate to ovate appendage 10–22 × 4–8 mm, with apical spine 1·5–6 mm; inner bracts 1- to 3-veined, as long as or slightly longer than inner middle. Corolla 24–36 mm. Achenes 5–6 mm, compressed; pappus 18–26 mm. *Dry pastures and waste places. E.C., E. & S.E. Europe*; *casual in N. Europe and perhaps becoming naturalized.* Al Bu Gr Hu Ju Rm Rs (C, W, ?K, ?E) Tu.

5. C. nutans L., *Sp. Pl.* 821 (1753). Up to 150 cm; stem more or less arachnoid-hairy; wings up to 10 mm, triangular or palmate, with an apical spine up to 8 mm. Leaves more or less sparsely hairy to lanuginous beneath, with crispate multicellular hairs, with 6–10 pairs of usually palmate lobes. Capitula 20–45 × 20–65 mm, depressed-globose; inner involucral bracts slightly longer than the inner middle, obscurely 3-veined. Corolla 16–24(–28) mm. Achenes 4–5 mm, swollen; pappus 13–24 mm. $2n = 16$. *W. & C. Europe, northwards to Scotland, and extending to Sicilia, C. Jugoslavia and Ukraine.* Au Be Br Cz Ga Ge He Ho Hs It Ju Rs (W, ?K) Si [Da Su].

1 Spines on wings of stem and leaf-lobes not more than 4 mm; pappus 18–24 mm **(c)** subsp. **platylepis**
1 Spines on wings of stem and leaf-lobes not more than 8 mm; pappus 13–18 mm
2 Leaves deeply lobed, with distant and usually palmate lobes; capitula 20–40(–50) mm in diameter **(a)** subsp. **nutans**
2 Leaves lobed $\frac{1}{3}$ (rarely $\frac{2}{3}$) of way to midrib, with ovate, obtuse, not palmate, contiguous lobes; capitula 40–60 mm in diameter **(b)** subsp. **alpicola**

(a) Subsp. **nutans**: Leaves 6- to 8-lobed, with strongly raised veins beneath. Capitula 20–40(–50) mm in diameter; involucral bracts 1·5–3(–4) mm wide, with the mid-vein raised in the distal $\frac{2}{3}$; outer and middle bracts suberect to deflexed. *Throughout the range of the species.*

(b) Subsp. **alpicola** (Gillot) Chassagne & J. Arènes, *Bull. Soc. Bot. Fr.* **83**: 411 (1936): Leaves 6- to 8-lobed, the veins raised for only the distal half of their length beneath. Capitula 40–60 mm in diameter; involucral bracts 3–5 mm wide, the mid-vein raised on the lanceolate appendage; outer and middle bracts usually appressed. ● *S.W. Alps.*

(c) Subsp. **platylepis** (Reichenb. & Sauter) Nyman, *Consp.* 411 (1879) (*C. platylepis* Reichenb. & Sauter): Leaves 8- to 10-lobed, the veins raised for only the distal half of their length beneath. Capitula 40–65 mm in diameter; involucral bracts 2–4 mm wide, with an obscure mid-vein in the distal $\frac{1}{3}$. ● *E., W. & S.C. Alps.*

6. C. micropterus (Borbás) Teyber, *Österr. Bot. Zeitschr.* **60**: 308 (1910). Up to 80 cm; stem densely arachnoid-hairy; wings up to 5 mm wide, undulate, triangular, with an apical spine up to 4 mm. Leaves densely arachnoid-hairy beneath, with crispate multicellular and a few unicellular hairs, with 8–12 approximate pairs of lobes, each with an apical spine up to 5 mm. Capitula 25–35 × 30–55 mm, subglobose; involucral bracts lanceolate-subulate, smooth; inner bracts obscurely 3- to 5-veined. Corolla 20–25 (–30) mm. Achenes 3–4 mm, compressed; pappus 13–18 mm. *Dry places.* ● *W. Jugoslavia and Albania*; *C. & S. Italy.* Al It Ju.

(a) Subsp. **micropterus** (*C. nutans* subsp. *micropterus* (Borbás) Hayek): Lower leaves up to 12 × 2·5 cm, with distant lobes; cauline with 8–10 patent, ovate-lanceolate, entire or slightly lobulate lobes. Outer involucral bracts 1·5–2 mm wide, usually with 4–8 pairs of setae; middle bracts $1\frac{1}{4}$ times as long as inner. *W. Jugoslavia and Albania.*

(b) Subsp. **perspinosus** (Fiori) Kazmi, *Mitt. Bot. Staatssamm.* (*München*) **5**: 337 (1964): Lower leaves up to 14 × 4 cm, with approximate but not overlapping lobes; cauline with 10–12 oblique lobes deeply lobulate on the upper margin into narrow oblong-lanceolate lobules. Outer involucral bracts *c.* 1 mm wide, without setae; middle bracts $\frac{3}{4}$ as long as inner. *C. & S. Italy.*

7. C. broteroi Welw. ex Coutinho, *Fl. Port.* 647 (1913). Like **6** but stem less densely arachnoid-hairy, with flat, palmate wings, their lobes with apical spines up to 7 mm; leaves oblanceolate to lanceolate, sparsely arachnoid-hairy beneath, with 8–10 distant pairs of palmate lobes with acute lobules, each with an apical spine up to 10 mm; capitula 30–50 × 35–60 mm, deeply umbilicate at base; peduncles 1–2 mm in diameter; involucral bracts suberect to erect and recurved, not constricted, densely arachnoid-hairy, without setae, the outer 1–1·5 mm wide, the middle 2–2·5 mm wide, with mid-vein throughout, minutely verruculose in the proximal $\frac{1}{3}$–$\frac{1}{2}$; inner bracts $1\frac{1}{2}$ times as long as the inner middle; achenes 4–5 mm; pappus 18–22 mm. $2n = 20$. *Dry pastures and scrub*; *calcicole.* ● *C. & S. Portugal, S.W. Spain.* Hs Lu.

8. C. sandwithii Kazmi, *Mitt. Bot. Staatssamm.* (*München*) **5**: 350 (1964). Like **6** but stem less densely arachnoid-hairy; leaves arachnoid-hairy, with a few unicellular hairs beneath, with 5–8 pairs of semi-palmate short lobes, each with an apical spine up to 4 mm and lateral spinules set at 45°; capitula 25–30 × 40–45 mm, truncate at base; peduncles up to 1·5 mm in diameter; involucral bracts 1·5–2·5 mm wide, minutely verruculose in the proximal $\frac{1}{2}$, the mid-vein raised in the distal $\frac{1}{2}$; inner bracts $1\frac{1}{2}$ times as long as the inner middle; achenes 4–5 mm, minutely rugulose-punctulate. *Dry waste places.* ● *C. Spain, N.E. Portugal.* Hs Lu.

9. C. platypus Lange, *Ind. Sem. Horto Haun.* **1857**: 26 (1857). Biennial up to 85 cm. Stem sparsely arachnoid-hairy; wings up to 8 mm wide, with wide triangular lobes with an apical spine up to 7 mm. Leaves oblong or oblong-lanceolate, glabrous or glabrescent above, with sparse, crispate multicellular hairs on the veins beneath, with 6–8 pairs of ovate, subobtuse lobes, each with an apical spine up to 7 mm. Capitula 30–40 × 30–60 mm, subglobose, not or scarcely umbilicate at base; peduncles up to 15 cm and 3 mm in diameter; outer and middle involucral bracts not constricted, the patent distal $\frac{2}{3}$ usually curled in an S-shape, lanceolate, acute; middle bracts 2–3 mm wide, with the mid-vein raised in the upper $\frac{2}{3}$; inner bracts 3-veined, slightly longer than inner middle; all bracts glabrescent. Corolla 18–25 mm. Achenes 5–6 mm, swollen, minutely rugulose-punctulate; apical prominence sessile, subentire; pappus 15–20 mm. *Cultivated ground, waste places and streamsides.* ● *N.W. & C. Spain*; *E.C. & N.E. Portugal.* Hs Lu.

Variable, even within the same population, in lobing and hairiness of leaves, size of plants etc. See R. Fernandes, *Mem. Soc. Brot.* **9**: 101 (1953).

10. C. chrysacanthus Ten., *Ind. Sem. Horti Neap.* **1825**: 12 (1825). Perennial up to 40 cm. Stem more or less arachnoid-hairy; wings palmate with lobes up to 10 mm, with a rigid apical spine. Leaves oblong-lanceolate, glabrous or sparsely hairy above, densely arachnoid-hairy beneath with long, straight multicellular hairs. Capitula 30–50 × 40–60 mm, depressed-globose, usually sessile, or peduncles up to 6 cm and 3 mm in diameter; outer and middle involucral bracts 2–4 mm wide, lanceolate-subulate, the mid-vein raised in the distal ¾, tapering into a long-acuminate apex, arachnoid-hairy; inner bracts not exceeding the inner middle bracts. Corolla 20–25 mm. Achenes 3–4 mm, swollen, smooth; apical prominence sessile, 5-lobed; pappus 12–18 mm. *Stony places and dry pastures.* ● *C. & S. Appennini*; *E. Spain.* Hs It.

(a) Subsp. **chrysacanthus**: Lobes of wings of stem with a spine up to 5 mm. Leaves with 10–12 pairs of falcate-lanceolate lobes usually 2- to 3-partite on the upper margin, the main lobe with an apical spine up to 5 mm. Involucral bracts imbricate or the outer usually recurved for their distal ¾, sparsely to densely arachnoid-hairy; inner bracts 3-veined in the distal ¾. *C. & S. Appennini.*

(b) Subsp. **hispanicus** Franco, *Bot. Jour. Linn. Soc.* **71**: 48 (1975): Lobes of wings of stem with an apical spine up to 10 mm. Leaves with 6–8 pairs of palmate lobes deeply partite into lanceolate-acuminate lobules, the main lobules with an apical spine up to 10 mm. Involucral bracts imbricate and laxly arcuate-recurved, glabrous or very sparsely arachnoid-hairy; inner bracts 1-veined in the distal ¼. *E. Spain.*

11. C. aurosicus Vill., *Hist. Pl. Dauph.* **1**: 364 (1786). Perennial up to 40 cm. Stem sparsely arachnoid-hairy; wings up to 4 mm wide with wide palmate or broadly triangular lobes with an apical spine up to 5 mm. Leaves oblong-lanceolate, glabrous or with a few scattered multicellular, sinuate hairs beneath, with 8–10 pairs of patent, distant palmate or triangular lobes, each with an apical spine up to 5 mm. Capitula 25–30 × 25–40 mm, subglobose, sessile, solitary or in clusters of up to 3; outer and middle involucral bracts more or less patent in their distal ⅔, 2–3 mm wide, lanceolate-subulate, constricted into a long-acuminate apex, with mid-vein raised throughout its length, glabrescent, minutely verruculose in the lower ¼; inner bracts shorter than inner middle, 3-veined in the distal ⅚. Corolla 17–19 mm. Achenes 5–6 mm, swollen, minutely rugulose-punctulate; apical prominence very short, sessile, 5-lobed; pappus 11–17 mm. *Calcareous rocks and screes*, 1800–2100 *m.* ● *S.E. France (near Barcelonette and N.W. of Gap).* Ga.

12. C. acantholdes L., *Sp. Pl.* 821 (1753) (incl. *C. fortior* Klokov). Biennial up to 150 cm. Stem sparsely arachnoid-hairy; wings up to 8 mm wide, palmate to broadly triangular, with an apical spine up to 5 mm. Leaves oblong to oblong-lanceolate, glabrescent above, glabrous except for sinuate multicellular hairs on the veins beneath, with 6–8 pairs of palmate lobes, the lobules with apical spines up to 5 mm. Capitula 20–25 × 25–35 mm, subglobose, sessile and solitary or in small clusters; outer and middle involucral bracts imbricate or patent to slightly deflexed, up to 2 mm wide, linear-lanceolate, long-acuminate; inner middle bracts obtuse, contracted into the spine, with mid-vein raised throughout its length, arachnoid-ciliate, minutely verruculose on the back; inner bracts longer than middle, 1-veined in the distal ¼. Corolla 16–18 mm. Achenes 3–4 mm, compressed, minutely rugulose-punctulate; apical prominence small, sessile, sinuate-lobed; pappus 11–13 mm. $2n = 16, 20, 22$. *Much of Europe, but absent from most of the south-west, and only as an introduction in most of the north.* Al Au *Be Br Bu Cz Da Ga Ge Gr Hb Ho Hu It Ju Po Rm Rs (C, W, K, E) Su Tu [He No Rs (B)].

13. C. ramosissimus Pančić, *Elench. Pl. Vasc. Crna Gora* 51 (1875). Biennial up to 75 cm. Stem sparsely arachnoid-hairy; wings up to 10 mm wide, triangular-dentate, with an apical spine up to 7 mm. Leaves oblong-lanceolate to -oblanceolate, glabrous above, with very sparse multicellular hairs beneath, with 10–14 pairs of triangular-dentate lobes, each with an apical spine up to 8 mm. Capitula 15–25 × 10–20 mm, sessile, usually in terminal clusters of 3–5; outer and middle involucral bracts patent or recurved, 1–1·5 mm wide, linear-subulate, the mid-vein raised in the distal ¾, smooth, glabrous; inner bracts 1¼ times as long as the inner middle, 3-veined at apex. Corolla 15–17 mm. Achenes 3–4 mm; pappus 11–13 mm. *Serpentine rocks.* ● *Mountains of S.W. Jugoslavia and N. Albania.* Al Ju.

(14–16). C. tmoleus group. Perennials up to 100 cm. Leaves lanceolate to oblong-lanceolate, subpinnatisect with oblong-triangular to -linear, acuminate or caudate lobules. Capitula 15–25 × 15–25 mm, mostly sessile and in clusters; involucral bracts imbricate or the outer and middle slightly patent. Corolla 15–20 mm. Achenes 3–5 mm, swollen or compressed; apical prominence short, sessile, entire; pappus 13–16 mm.

Three closely related species may be recognized in the S. half of the Balkan peninsula but they are in need of further investigation.

1 Stem arachnoid-hairy to tomentose **16. cronius**
1 Stem subglabrous
2 Outer involucral bracts subulate, with mid-vein raised throughout its length **14. tmoleus**
2 Outer involucral bracts lanceolate-triangular, subobtuse, with mid-vein raised only in the distal ½ **15. thessalus**

14. C. tmoleus Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 21 (1844). Stem-wings palmate. Leaves glabrescent above, glabrous except for multicellular hairs on the veins beneath (but the rhachis more densely arachnoid-hairy). Capitula subglobose to broadly campanulate; outer involucral bracts 1–1·5 mm wide, subulate, the middle 1·5–2 mm wide, lanceolate; outer and middle bracts contracted at the middle and 0·5–1 mm wide, with mid-vein raised throughout its length; inner bracts 3-veined, but 1-veined in the acuminate apical part. Corolla 15–17 mm. Achenes 4–5 mm, swollen, smooth. *S. half of Balkan peninsula.* Al Bu Gr Ju.

(a) Subsp. **tmoleus**: Wings up to 8 mm wide, with an apical spine up to 10 mm. Leaves with 8–12 pairs of lobes each with an apical spine up to 12 mm. All involucral bracts subequal, arachnoid-ciliate to glabrescent, smooth on the back. *S. Albania and N. Greece.*

(b) Subsp. **armatus** (Boiss. & Heldr.) Franco, *Bot. Jour. Linn. Soc.* **71**: 48 (1975) (*C. armatus* Boiss. & Heldr.): Wings of stem up to 12 mm wide, with an apical spine up to 15 mm. Leaves with 6–8 pairs of lobes each with an apical spine up to 15 mm. Inner involucral bracts longer than the middle, glabrous, verruculose on the back. ● *Greece, S. Jugoslavia and Bulgaria.*

15. C. thessalus Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov* **3** (**2**): 46 (1856). Like **14(a)** but capitula campanulate, solitary, sessile or with peduncles up to 2 cm and 1·2 mm in diameter, corymbosely arranged; involucral bracts densely imbricate, the inner larger, the outer lanceolate-triangular, subobtuse, 1 mm wide at base, the middle 1·5 mm wide at base, more strongly attenuate at apex, all glabrous, verruculose on the back and distinctly ciliate-serrulate on the margin, with mid-vein raised only in the distal ½; inner bracts minutely verruculose, ciliate-serrulate, with a more or less distinct mid-vein only in the purplish distal ½; achenes 3–4 mm, compressed, minutely verruculose on both surfaces. *Rocky slopes or forest margins.* ● *Mountains of N.W. Greece.* Gr.

16. C. cronius Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 105 (1846). Perennial up to 100 cm. Stem arachnoid-hairy to tomentose; wings up to 15 mm wide, triangular or oblong-acute with an apical spine up to 10 mm. Leaves hairy, the hairs unicellular and sinuate, with 6–8 pairs of palmate, caudate lobes with oblong to oblong-linear lobules, with an apical spine up to 15 mm. Capitula 20–25 × 20–25 mm, ovoid to campanulate, usually sessile and in clusters of 2–5; involucral bracts imbricate, the outer and middle 1·5–2 mm wide at the base, 1 mm wide at the middle, lanceolate-subulate, with mid-vein raised throughout its length; inner bracts 3-veined (1-veined at apex). Corolla 18–20 mm. Achenes 3–4 mm, compressed, minutely verruculose; apical prominence short, sessile, entire; pappus 13–16 mm. *Bare hillsides.* ● *Mountains of Greece and S. Albania.* Al Gr.

(a) Subsp. **cronius**: Stem greyish- to whitish-arachnoid-hairy. Leaves densely greyish-arachnoid-hairy above and densely whitish-tomentose beneath. Inner involucral bracts longer than middle, slightly arachnoid-hairy. *Greece.*

(b) Subsp. **baldaccii** Kazmi, *Mitt. Bot. Staatssamm.* (*München*) **5**: 379 (1964): Stem densely white-tomentose. Leaves greyish-green above and white beneath, tomentose. Outer and middle involucral bracts subequal, arachnoid-hairy. *S. Albania.*

17. C. personata (L.) Jacq., *Fl. Austr.* **4**: 25 (1776). Perennial up to 120 cm. Stem with narrow wings, the teeth with an apical spinule up to 1·5 mm. Leaves glabrous or sparsely hairy above, with more numerous hairs beneath, dimorphic; basal oblanceolate to lanceolate, lyrate-pinnatipartite, with 4–6 pairs of lobulate lobes; cauline lanceolate, acuminate, distinctly cuneate, more or less irregularly serrate with teeth up to 3 mm, each with an apical spine up to 2 mm. Capitula 15–25 × 15–35 mm, subglobose, mostly sessile and in clusters on a very narrowly ciliate-winged common peduncle up to 8 cm and 1·5 mm in diameter; involucral bracts imbricate at base but usually free and curling in an S-shape in their distal ⅔, the outer bracts half as long as the middle bracts; middle bracts almost as long as the inner, linear-setaceous, up to 1·2 mm wide at the base, slightly arachnoid-hairy, with the mid-vein raised in the distal ⅔; inner bracts wider, 3-veined in the distal ⅓. Corolla 14–16 mm. Achenes 3–4 mm, swollen, almost smooth; apical prominence small, sessile, 5-lobed; pappus 8–12 mm. $2n = 18$. *Streamsides, meadows and woods.* ● *Mountains of Europe, from the Vosges and Carpathians southwards to C. Italy and S.W. Bulgaria.* ?Al Au Bu Cz Ga Ge ?Gr He It Ju Po Rm Rs (W).

(a) Subsp. **personata**: Stem slightly arachnoid-hairy to glabrescent, with wings up to 2 mm wide. Leaves slightly discolorous, greyish and with sparse multicellular hairs on midrib and lax, slender, straight unicellular hairs near the margin beneath. Capitula usually in clusters of 2–3; involucral bracts minutely serrulate in the proximal ⅔, with apical spine up to 1 mm. *Throughout the range of the species except parts of the south and east.*

(b) Subsp. **albidus** (Adamović) Kazmi, *Mitt. Bot. Staatssamm.* (*München*) **5**: 376 (1964): Stem densely whitish-arachnoid-hairy, with wings up to 1 mm wide. Leaves distinctly discolorous, densely white-tomentose with only unicellular straight hairs beneath. Capitula usually in clusters of 3–5(–8); involucral bracts ciliate-serrulate, with apical spine 2–2·5 mm. *Balkan peninsula, S. & E. Carpathians, Transylvania.*

18. C. crispus L., *Sp. Pl.* 821 (1753). Biennial up to 125 cm. Stem sparsely arachnoid-hairy; wings up to 6 mm wide, triangular, with an apical spinule up to 3 mm. Leaves lanceolate to oblanceolate, glabrescent above, with scattered short, multicellular, sinuate hairs and very sparse unicellular, arachnoid hairs and glabrescent beneath, lobed or crenate-dentate. Capitula 15–25 mm in diameter, subglobose, usually in clusters of 2–4 on narrowly winged peduncles up to 8 cm and 1·5 mm in diameter; involucral bracts imbricate or the outer and middle slightly recurved at apex, the inner larger, the outer and middle up to 1·2 mm wide at the base, linear-subulate, verruculose in the proximal ⅓, arachnoid-ciliate, with the mid-vein raised in the distal ⅔; inner bracts faintly 3-veined in the distal ½. Corolla 12–15 mm. Achenes 3–4 mm, swollen, almost smooth; apical prominence small, sessile, sinuately lobed; pappus 8–12 mm. *Roadsides, waste places and streamsides. Europe, except the islands and parts of the south.* Au Be Bu Cz Da Fe Ga Ge He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su.

(a) Subsp. **crispus**: Wings of stem broadly triangular, dentate and obtuse, only the mid-vein raised beneath in its distal ½. Cauline leaves lobed for ⅓(–½) of way to midrib, with 4–6 pairs of shallow lobes each with an apical spine up to 2 mm, the veins not raised, more or less densely greyish-arachnoid-hairy beneath. Inner involucral bracts yellowish. $2n = 16$. *C., E. & S. Europe.*

(b) Subsp. **multiflorus** (Gaudin) Franco, *Bot. Jour. Linn. Soc.* **71**: 48 (1975) (*C. multiflorus* Gaudin): Wings of stem with triangular lobes, the veins distinctly raised beneath. Cauline leaves lobed for up to ¾ of way to midrib, with 6–8 pairs of lobes, each with an apical spine up to 3 mm, the veins more or less raised, greenish and sparsely hairy beneath. Inner involucral bracts purplish. ● *W. & N.W. Europe.*

19. C. litigiosus Nocca & Balbis, *Fl. Ticin.* **2**: 99 (1821). Biennial up to 70 cm. Stem densely arachnoid-lanate; wings broadly triangular. Leaves oblanceolate or lanceolate, with wide lobes, densely arachnoid-hairy above, densely arachnoid-lanate beneath, with sinuate multicellular hairs on veins and unicellular sinuate and long hairs above. Capitula 20–30 mm in diameter, subglobose, rounded to slightly umbilicate at base, usually sessile and in clusters of 2–5; involucral bracts imbricate, the outer and middle sometimes slightly erecto-patent or slightly recurved at apex, the inner larger, the outer 1 mm wide, the middle 1·5 mm wide at base, lanceolate-subulate, arachnoid-ciliate, with the mid-vein raised in the distal ¾; inner bracts 1·2–1·7 mm wide, acuminate-subulate, 3-veined except in the distal ¼. Corolla 17–19 mm. Achenes 3–4 mm, flattened, minutely verruculose-wrinkled; apical prominence sessile, 5-lobed; pappus 12–16 mm. ● *S.E. France, N. Italy.* Ga It.

(a) Subsp. **litigiosus** (*C. sanctae-balmae* Loisel.): Wings of stem dentate, up to 6 mm wide, with an apical spine up to 4 mm. Lower leaves up to 15 × 3·5 cm; leaves with 10–12 pairs of triangular-dentate lobes each with an apical spine up to 4 mm. Outer involucral bracts *c.* 6 mm. *Throughout the range of the species.*

(b) Subsp. **horridissimus** (Briq. & Cavillier) Franco, *Bot. Jour. Linn. Soc.* **71**: 49 (1975) (*C. litigiosus* var. *horridissimus* Briq. & Cavillier): Wings of stem broadly triangular to subpalmate, up to 12 mm wide, with an apical spine up to 12 mm. Lower leaves up to 25 × 5 cm; leaves with 6–8 pairs of palmate lobes with acute lobules each with an apical subulate spine up to 15 mm. Outer involucral bracts *c.* 10 mm. *S.E. France* (*Alpes Maritimes*).

20. C. euboicus Franco, *loc. cit.* (1975). Like **19(a)** but perennial; stem densely greyish-arachnoid-hairy, with the wings usually deeply 3-partite into narrowly triangular lobes up to 6 mm, each with an apical spine up to 5 mm; leaves oblong-lanceolate, with 12–14 pairs of 2- to 3-fid symmetrical lobes with narrowly triangular acuminate lobules. Capitula 25–30 × 30–45 mm, depressed-globose, distinctly umbilicate at

base, solitary on a peduncle 1–3 cm and 2 mm in diameter; involucral bracts minutely but densely verruculose on the proximal ⅓, glabrous or nearly so, the middle 1·5–2 mm wide and distinctly narrowed from middle into a subulate apex. Corolla 21–23 mm. Pappus 16–18 mm. *E. Greece* (*Evvoia*). Gr.

21. C. vivariensis Jordan, *Obs. Pl. Crit.* **3**: 212 (1846). Biennial up to 100 cm. Stem sparsely arachnoid-hairy; wings up to 6 mm wide, flat, triangular-dentate or -lobed with an apical spine up to 8 mm. Leaves oblanceolate to oblong-lanceolate, glabrous, or with crispate, short multicellular hairs beneath, with 6–8 pairs of triangular-palmate lobes, the veins raised beneath in their distal ½. Capitula 25–35 mm in diameter, subglobose, pedunculate or sessile; involucral bracts usually free at apex and more or less recurved, glabrous or nearly so, the outer and middle linear-subulate, the mid-vein raised in the distal ½ only; inner bracts veinless. Corolla 18–20 mm. Achenes 3–4 mm, compressed, smooth; apical prominence lobed; pappus 13–15 mm. *Dry, stony places and roadsides.* ● *S., C. & E. Spain, S. & S.C. France.* Ga Hs.

1 Capitula sessile or on a glabrescent peduncle not more than 3 cm; spines on wings of stem and leaf-lobes up to 8 mm **(c)** subsp. **assoi**
1 Capitula on greyish-tomentose peduncles more than 3 cm; spines on wings of stem and leaf-lobes not more than 4 mm
2 Leaves with abundant hairs beneath; outer involucral bracts shorter than middle **(a)** subsp. **vivariensis**
2 Leaves sparsely hairy beneath; outer involucral bracts almost as long as or slightly longer than middle **(b)** subsp. **australis**

(a) Subsp. **vivariensis** (*C. nigrescens* subsp. *vivariensis* (Jordan) Bonnier & Layens): Leaves with abundant hairs beneath. Involucral bracts 1·5–2 mm wide, smooth, tapering into a spine 0·5–1·5 mm, the outer shorter than the middle; inner bracts twice as long as the inner middle bracts. Apical prominence of achene sessile. *N.E. Spain, S. & S.C. France.*

(b) Subsp. **australis** Nyman, *Consp.* 412 (1879): Leaves sparsely hairy beneath. Involucral bracts 1·5–2 mm wide, smooth, tapering into a spine 1 mm, the outer nearly as long as or slightly longer than the middle; inner bracts not more than 1⅓ times as long as the middle bracts. Apical prominence of achene sessile. *N.E. Spain, S. France.*

(c) Subsp. **assoi** (Willk.) Kazmi, *Mitt. Bot. Staatssamm.* (*München*) **5**: 400 (1964) (*C. acanthoides* auct. hisp., non L., *C. nigrescens* subsp. *assoi* Willk.): Leaves glabrous or with a few scattered hairs on veins beneath. Involucral bracts 1–1·5 mm wide, minutely verruculose, tapering into a spine 2–3 mm, the outer 1½–1⅔ times as long as the middle bracts which are ⅔ as long as the inner. Apical prominence of achene stipitate. *S., C. & E. Spain.*

22. C. nigrescens Vill., *Prosp. Pl. Dauph.* 30 (1779). Biennial up to 65 cm. Stem arachnoid-hairy; wings up to 6 mm, triangular, with an apical spine up to 4 mm. Leaves oblanceolate to lal, with an apical spine up to 4 mm. Leaves oblanceolate to oblong, sparsely hairy above, with numerous multicellular and a few straight unicellular hairs beneath, with 8–10 pairs of ovate, subobtuse lobes, each with an apical spine up to 2 mm. Capitula 25–40 mm in diameter, subglobose, usually on naked peduncles up to 12 cm and 2 mm in diameter; outer and middle involucral bracts strongly recurved at the middle, 1·5–2 mm wide at the base, linear-subulate, glabrous or almost so, the mid-vein raised in the distal ¾; inner bracts not more than 1¼ times as long as the inner middle bracts, 1-veined in the distal ⅓. Corolla 22–25 mm. Achenes 3–4 mm, compressed, nearly smooth; apical prominence sessile, wide, 5-lobed; pappus 15–18 mm. *Waste places and disturbed ground.* ● *S. & S.C. France, N.W. Italy, N.E. Spain.* Ga Hs It.

23. C. hamulosus Ehrh., *Beitr. Naturk.* **7**: 166 (1792) (*C. seminudus* auct. eur., non Bieb. ex Willd.). Biennial up to 100 cm. Stem sparsely arachnoid-hairy; wings up to 5 mm, undulate, with wide, triangular lobes with an apical spine up to 2·5 mm. Leaves oblanceolate to oblong-lanceolate, sparsely hairy above, more densely hairy beneath, with 8–10 pairs of distant, oblong, sublobulate lobes, each with an apical spine up to 2 mm. Capitula 25–40 mm in diameter, subglobose, mostly on peduncles up to 10 cm and 2·5 mm in diameter, which terminate long simple branches; involucral bracts usually recurved in an S-shape, 1–1·5 mm wide, linear-subulate, smooth, with a raised mid-vein throughout their length; inner bracts 1⅓ times as long as the inner middle bracts, deflexed at apex, purplish, veinless, puberulent. Corolla 18–25 mm. Achenes 3–4 mm, compressed, minutely verruculose; apical prominence sessile, truncate-globose, entire; pappus 13–15 mm. *Dry grassland and waste places. S.E. & E.C. Europe.* Bu ?Cz Gr Hu Ju Rm Rs (W, K, E).

(a) Subsp. **hamulosus** (*C. pseudocollinus* (Schmalh.) Klokov): Leaves with numerous multicellular and a few unicellular hairs beneath. Involucral bracts glabrous or nearly so. *Throughout the range of the species.*

(b) Subsp. **hystrix** (C. A. Meyer) Kazmi, *Mitt. Bot. Staatssamm.* (*München*) **5**: 402 (1964) (*C. stenocephalus* Tamamsch.): Leaves with dense unicellular hairs beneath. Involucral bracts more or less densely arachnoid-hairy. *S.E. Russia.* (*Caucasian region.*)

C. thracicus (Velen.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 705 (1931), from C. & E. Bulgaria, seems very close to **23(a)**, from which it differs mainly in its smaller capitula (*c.* 10 mm in diameter) and subpruinose involucral bracts. Further investigation is needed to determine its true status.

24. C. uncinatus Bieb., *Fl. Taur.-Cauc.* **3**: 553 (1819). Biennial up to 50 cm. Stem white-tomentose; wings up to 7 mm, palmate, with an apical spine up to 5 mm. Leaves oblong-lanceolate, densely hairy above, greyish-tomentose beneath, with straight unicellular hairs, with 6–8 pairs of oblong lobes, each with an apical spine up to 3 mm. Capitula 30–40 mm in diameter, subglobose, mostly with peduncles up to 10 cm and 2 mm in diameter; outer and middle involucral bracts more or less recurved in distal ½, 1·5–2 mm wide at the base, linear-lanceolate, flat, arachnoid-hairy, the mid-vein raised throughout its length; inner bracts 1¼ times as long as the inner middle bracts, 1-veined. Corolla 21–23 mm. Achenes 3–4 mm, compressed, rugose; apical prominence sessile, entire; pappus 10–13 mm. *Dry grassland. S. part of U.S.S.R., S.E. Romania.* ?Bu Rm Rs (W, K, E) ?Tu.

C. uncinatus subsp. **davisii** Kazmi, *Mitt. Bot. Staatssamm.* (*München*) **5**: 404 (1964), was described from a single specimen collected on calcareous rocks in Krym (above Nikita). It is collected on calcareous rocks in Krym (above Nikita). It is readily distinguished from **24** by the glabrescent leaves, longer peduncles, outer and middle involucral bracts strongly deflexed at the middle and abruptly narrowed into a long subulate apex, corolla 26–28 mm and pappus 20–22 mm. It seems related to **23** but further investigation is needed.

(25–27). C. defloratus group. Perennials up to 100 cm. Stem glabrous to more or less arachnoid-hairy; wings palmate or triangular, dentate. Leaves obovate to oblong-lanceolate, glabrous or with very sparse, crispate multicellular hairs. Capitula 20–30 mm in diameter, subglobose; peduncles up to 35 cm and

2·5 mm in diameter; involucral bracts 1–2 mm wide at the base, imbricate but the outer and sometimes the middle patent to deflexed, glabrous or slightly arachnoid-hairy, the mid-vein more or less distinctly raised; inner bracts longer than the inner middle, mostly obscurely 3-veined in the distal ⅓, the mid-vein distinctly raised or obscure throughout. Corolla 13–20 mm. Achenes 3–5 mm, compressed and rugulose, or swollen and smooth.

An extremely difficult group in need of further detailed study. Although some taxa are easily recognized, there is considerable variation in leaf-dissection, spine-length, peduncle-length, capitulum-diameter, prominence of the mid-veins and the shape of the apex of the involucral bracts. This variation is almost continuous in the centre of the range and intermediates between taxa can be found. The greatest difficulties are encountered in the Alps where hybrids seem to occur not only between members of this group but also with such taxa as **12**, **17(a)** and **18(b)**. Plants with scattered multicellular hairs on leaves and stem-wings, thicker, more spiny leaves and appressed, acute, spiny, subequal outer and middle involucral bracts are probably hybrids involving **12**; plants with slightly lobed or dentate leaves with both unicellular and multicellular hairs beneath and slender, acute, lax involucral bracts are probably hybrids involving **17(a)**, while those with rather thin discolorous leaves with unicellular and multicellular hairs beneath and appressed, unequal involucral bracts slightly recurved at apex probably involve **18(b)**. To some of these hybrids, found in the S.W. Alps, the chromosome numbers $2n=20$, $20+1$–3B, 21 and $23+0$–3B may be referred. The taxa described below, most having glabrous leaves, were selected as the most distinct and plants with other combinations of characters may be suspected to be of hybrid origin.

1 Leaves entire and spinulose-ciliate or dentate with numerous spinose teeth; achenes with ovoid-globose apical prominence **25. defloratus**
1 Leaves lobed to pinnatisect; achenes with oblong apical prominence
2 Leaves thin; leaf-lobes and stem-wings with spine not more than 2(–3) mm; pappus 10–13 mm **26. argemone**
2 Leaves thick; leaf-lobes and stem-wings with spine not more than 10 mm; pappus 13–16 mm **27. carlinifolius**

25. C. defloratus L., *Syst. Nat.* ed. 10, **2**: 1200 (1759). Stem-wings palmate. Leaves thickish, glaucous beneath, entire and spinulose-ciliate or dentate with numerous spinose teeth, the spines up to 5 mm; petiole up to ¼ as long as lamina. Capitula 25–40 mm in diameter; outer involucral bracts sometimes patent and curled in an S-shape; inner bracts acuminate-subulate, slightly wider than the inner middle, minutely puberulent. Corolla 16–18 mm. Achenes 4–5 mm, compressed; apical prominence ovoid-globose; pappus 10–13 mm. *Open woods and stony ground; somewhat calcicole.* ● *Mountains of C. Europe, from C. Germany southwards to the N. Appennini and S. Carpathians.* Au Cz Ge He Hu It Ju Po Rm.

(a) Subsp. **defloratus** (*C. crassifolius* Willd., *C. summanus* Pollini): Leaves entire and spinulose-ciliate or dentate with 12–25 pairs of spinose teeth up to 5 mm. Outer and middle involucral bracts 0·5–0·75 mm wide at the middle, linear-subulate, subacute, mucronate; inner 1¼ times as long as the inner middle. Achenes with a 5-lobed apical prominence. $2n=18$. *N. Appennini, S. & E. Alps.*

(b) Subsp. **glaucus** Nyman, *Consp.* 412 (1879) (*C. crassifolius* subsp. *glaucus* (Nyman) Kazmi, *C. glaucus* Baumg., non Cav.): Leaves entire but spinulose-ciliate with 25–50 pairs of main spines up to 2 mm. Outer and middle involucral bracts contracted at or below the middle into an oblong, obtuse apex; inner twice as long as the inner middle. Achenes with an entire apical prominence. $2n=22$. *From C. Germany to the S. Carpathians.*

Material from the western and southern parts of the range usually has more slender, acute outer and middle involucral bracts.

Plants from E. Switzerland, Austria and S. Bavaria, which are probably hybrids between **25(b)** and **30** have been called **C. viridis** A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **1**: 74 (1881) (*C. defloratus* subsp. *viridis* (A. Kerner) Nyman). They differ from **25(b)** principally in having the leaves with scattered multicellular hairs, the lower and sometimes a few cauline leaves more or less lobed, the outer and middle involucral bracts subulate and distinctly narrower than the inner and the compressed, verruculose achenes.

C. rhaeticus (DC.) A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **1**: 75 (1881) (*C. defloratus* subsp. *rhaeticus* (DC.) Rothm., subsp. *tridentinus* (Evers) Lad.), which is common at high altitudes in the C. & E. Alps, is probably a hybrid between **25(a)** and **27**. It is very spiny, with thick, oblong, more or less lobed leaves, peduncle up to 20 cm, rather obtuse to acute involucral bracts 1–1·5 mm wide and swollen, smooth achenes.

26. C. argemone Pourret ex Lam., *Encycl. Méth. Bot.* **1**: 700 (1785). Stem-wings up to 15 mm wide, semi-hastate or triangular, with an apical spine up to 2(–3) mm. Leaves rather thin, pale green beneath, deeply lobed to pinnatisect, with 8–10(–15) pairs of palmate, dentate or semi-hastate lobes with oblong, subobtuse, spinulose-ciliate lobules, the lobules with an apical spine up to 2(–3) mm; basal leaves cuneate, the petiole up to ¼ as long as the lamina. Capitula 20–40 mm in diameter; involucral bracts linear-subulate to linear-oblong and obtuse, with apical spine 0·2–1 mm; inner bracts acute, slightly wider than the inner middle, densely puberulent distally. Corolla 14–20 mm. Achenes 3–4 mm; apical prominence small, sessile, sinuately 5-lobed. *Meadows and shady rocks.* ● *Pyrenees, Corbières, Cordillera Cantábrica; Jura and W. Alps.* Ga He Hs It.

(a) Subsp. **argemone** (*C. arctioides* auct. pyren., non Vill., *C. medius* auct., non Gouan): Leaf-lobules with 5–7 pairs of main spinules; veins well-raised on lower leaf-surface. Outer and middle involucral bracts 1–1·5 mm wide at base, laxly imbricate, linear-subulate, gradually narrowing into a mucro. Corolla 14–16 mm. Achenes swollen, smooth. $2n=22$. *From the Corbières westwards.*

(b) Subsp. **obtusisquamus** Franco, *Bot. Jour. Linn. Soc.* **71**: 49 (1975) (*C. defloratus* auct. gall., non L.): Leaf-lobules with 3–5 pairs of main spinules; veins slightly raised or indistinct on lower leaf-surface. Outer and middle involucral bracts 1·5–2 mm wide at base, appressed, linear, obtuse, mucronate. Corolla 16–18 mm. Achenes compressed, rugulose. $2n=22$. *S.W. Alps and Jura.*

In the higher parts of the Pyrenees **26(a)** and **27** are sympatric and their hybrid has been called **C. medius** Gouan, *Obs. Bot.* 62 (1773) (*C. defloratus* subsp. *medius* (Gouan) Bonnier). It differs from **26(a)** in the longer spines (3–7 mm) on stem-wings and leaf-lobes, shorter peduncle (not more than 20 cm) and the outer and middle involucral bracts with apical spine 1–3 mm.

Plants similar to **26(a)** but with involucral bracts of similar shape to **26(b)** occur in parts of the Pyrenees and the Cordillera Cantábrica. They have been named *C. defloratus* prol. *mediofformis* Rouy and require further study.

Hybrids between **26(b)** and **12**, **17(a)** and **18(b)** occur frequently in E. France and W. Switzerland. The hybrid between **26(b)** and **5(a)** is also found.

C. lobulatus Borbás, *Magyar Bot. Lapok* **1**: 318 (1902), from woods in N.E. Czechoslovakia, looks similar to **26(b)**. It differs mainly in its narrower (up to 5 mm wide), triangular stem-wings with a spine up to 1·5 mm, the cauline leaves lobed for ⅓–½(–⅔) way to the midrib into obtuse or subobtuse lobes with an apical spine up to 1 mm, the peduncle 6–15 cm, with a few small bract-like leaves below, the outer and middle involucral bracts with an obscure mid-vein only in the distal ½, the inner bracts about twice as long as inner middle, and corolla 14–16 mm. Further study is needed to determine its status.

27. C. carlinifolius Lam., *Encycl. Méth. Bot.* **1**: 700 (1785). Stem up to 50 cm, usually corymbosely branched above; wings up to 8 mm wide, palmate, with an apical spine up to 10 mm. Leaves with 6–10 pairs of 3-lobulate lobes, each lobule with an apical spine up to 10 mm, the central lobule the largest. Capitula 18–25 mm in diameter; peduncle up to 15 cm and 1·5 mm in diameter; involucral bracts 1–1·5 mm wide, linear, subacute, more or less contracted into a spine up to 5 mm; inner bracts 1½–1½ times as long as and twice as wide as the inner middle. Corolla 16–20 mm. Achenes 4–5 mm, swollen, smooth; apical prominence small, sessile, 5-lobed; pappus 13–16 mm. $2n=22$. ● *Mountains of N.E. Spain, Pyrenees, Alps, Appennini.* Ga He Hs It.

27 seems to hybridize with **12** in the W. and C. Alps, and with **18(b)** in the C. Alps and Appennini.

28. C. candicans Waldst. & Kit., *Pl. Rar. Hung.* **1**: 85 (1801–1802). Biennial up to 110 cm. Stem arachnoid-hairy; wings up to 15 mm wide, triangular, lobulate on the upper margin, each lobule with an apical spine up to 3 mm. Leaves oblanceolate or lanceolate, glabrescent above, white-tomentose beneath with sinuate, unicellular hairs, with broadly triangular lobes which are usually lobulate on the upper margin, each lobe with an apical spine up to 3 mm. Capitula 20–30 × 15–20 mm, subglobose; peduncle up to 15 cm and 2 mm in diameter; involucral bracts 1–1·5 mm wide, imbricate, but the outer usually patent, linear-subulate, the outer gradually tapering into a spine *c.* 1 mm, the middle usually contracted into a spine *c.* 0·5 mm, more or less arachnoid-hairy, the mid-vein raised for only its distal ½–⅔; inner bracts slightly longer than the middle bracts, obscurely 1-veined, abruptly narrowed above the middle, minutely verruculose, acuminate, with an apical spine 0·5 mm. Corolla 17–20 mm. Achenes 3–4 mm, swollen, nearly smooth; apical prominence sessile, subglobose, 5-lobed; pappus 13–16 mm. *Meadows and rocky slopes.* ● *Balkan peninsula; C. & W. Romania.* Al Bu Gr Ju Rm Tu.

(a) Subsp. **candicans**: Outer and middle involucral bracts in 3–5 rows, the mid-vein raised in its distal ½; inner bracts scabrid on margins. *Throughout the range of the species, except parts of the south-east.*

(b) Subsp. **globifer** (Velen.) Kazmi, *Mitt. Bot. Staatssamm. (München)* **5**: 411 (1964) (*C. globifer* Velen.): Outer and middle involucral bracts in 2 rows, the mid-vein raised in its distal ⅔; inner bracts distinctly ciliate. *Bulgaria and Turkey-in-Europe.*

29. C. collinus Waldst. & Kit., *Pl. Rar. Hung.* **3**: 257 (1807). Biennial up to 100 cm. Stem arachnoid-hairy; wings up to 10 mm wide, crispate or sinuate, triangular with an apical spine up to 1·5 mm. Leaves oblanceolate or oblong, glabrescent above, lanuginous beneath with straight, unicellular, slender hairs. Capitula 20–25 × 15–20 mm, subglobose; peduncle up to 8 cm and 2 mm in diameter; involucral bracts 1–1·5 mm wide, closely imbricate or the outer patent, linear-subulate, glabrous or almost so, the mid-vein raised throughout its length; inner bracts slightly longer than the middle bracts, 1-veined in the distal ½, not contracted above the middle. Corolla 15–18 mm. Achenes 3–4 mm; pappus 13–15 mm. $2n=16$, 32. *Grassy or stony hillsides.* ● *From the Carpathians to S. Italy and C. Jugoslavia.* ?Au Cz Hu It Ju Po Rm.

1 Lower leaves with petiole *c.* ⅓ as long as lamina
(c) subsp. **glabrescens**
1 Lower leaves with petiole about as long as lamina
2 Cauline leaves white-lanuginous beneath, the lobes with an apical spine 2–5 mm (b) subsp. **cylindricus**
2 Cauline leaves grey-lanuginous beneath, the lobes with an apical spine not more than 1 mm (a) subsp. **collinus**

(a) Subsp. **collinus**: Lower leaves *c.* 20 × 3 cm, with petiole about as long as lamina; cauline leaves deeply lobed with 6–8 pairs of long, distant lobes each with an apical spine up to 1 mm, grey-lanuginous beneath. Inner bracts slightly contracted at apex into a short spine. *Mainly in the S. & W. parts of the range of the species.*

(b) Subsp. **cylindricus** (Borbás) Soó, *Feddes Repert.* **85**: 453 (1974) (*C. cylindricus* Borbás, *C. candicans* subsp. *cylindricus* (Borbás) Hayek): Like subsp. (a) but cauline leaves pinnatisect, white-lanuginous beneath, each lobe with an apical spine 2–5 mm. Inner bracts tapering at apex. *N.E. Italy, Jugoslavia.*

(c) Subsp. **glabrescens** (Sagorski) Kazmi, *Mitt. Bot. Staatssamm. (München)* **5**: 412 (1964): Lower leaves up to 30 × 9 cm, with petiole *c.* ⅓ as long as lamina; cauline leaves lobed for up to ⅔ way to midrib, with 2–5 pairs of ovate, lobulate lobes each with an apical spine up to 2 mm, glaucescent and with a sparse indumentum beneath. Inner bracts tapering at apex. *Carpathians.*

30. C. carduelis (L.) Gren., *Billotia* **1**: 14 (1864) (*C. defloratus* subsp. *carduelis* (L.) Gugler). Perennial up to 80 cm. Stem subglabrous or very sparsely hairy; wings up to 6 mm wide, triangular-ovate, with an apical spine up to 1 mm. Leaves oblanceolate or lanceolate, glabrous above, sparsely arachnoid-hairy with fine unicellular sinuate hairs beneath, with 6–8 pairs of lobes each with an apical spine up to 1·5 mm. Capitula 15–30 mm in diameter, subglobose; peduncle up to 25 cm and 1·5 mm in diameter, tomentulose; involucral bracts 1–1·5 mm wide, imbricate, but the outer usually deflexed and curled in an S-shape, linear-subulate, glabrous, with the mid-vein obscure; inner bracts 1¼–1½ times as long as and twice as wide as the middle bracts, subulate, veinless. Corolla 13–15 mm. Achenes 3–4 mm, compressed, minutely verruculose; apical prominence sessile, cylindrical, 5-lobed; pappus 8–12 mm. *Mountain meadows.* ● *E. Alps and mountains of N.W. Jugoslavia.* ?Al Au It Ju.

31. C. kerneri Simonkai, *Term. Füz.* **10**: 181 (1886). Perennial up to 100 cm. Stem subglabrous; wings up to 7 mm wide. Leaves oblanceolate or oblong, glabrous or glabrescent above, laxly arachnoid-hairy with sinuate multicellular and unicellular hairs beneath, with numerous deeply lobulate lobes. Capitula subglobose or ovoid; peduncle 1·5–2 mm in diameter; involucral bracts 1–1·5 mm wide, closely imbricate, linear-subulate, glabrous or almost so; inner bracts as wide as and twice as long as the middle bracts, veinless in the distal ½. Corolla 15–17 mm. Achenes 3–4 mm, compressed, smooth; apical prominence small, sessile, cylindrical, entire; pappus 13–15 mm. *Mountain meadows and pastures. S.E. Carpathians; C. & N.E. parts of Balkan peninsula.* Al Bu Gr Ju Rm Rs (W).

1 Wings of stem with apical spines not more than 1 mm; cauline leaves with 8–12 pairs of obtuse or rounded lobes
(a) subsp. **lobulatiformis**
1 Wings of stem with apical spines 1–2 mm; cauline leaves with 10–20 pairs of acute lobes
2 Wings of stem triangular or palmate, with an apical spine 1·5–2 mm; cauline leaves with 8–14 pairs of semi-hastate lobes; capitula 20–40 mm in diameter; peduncles more than 10 cm (b) subsp. **kerneri**
2 Wings of stem semi-hastate, with an apical spine 1–1·5 mm; cauline leaves with 14–20 pairs of 3-partite lobes; capitula 10–15 mm in diameter; peduncles less than 10 cm
3 Lower leaves with 22–25 pairs of lobes; involucral bracts with mid-vein raised only in the distal ½; inner bracts acute
(c) subsp. **scardicus**
3 Lower leaves with 18–22 pairs of lobes; involucral bracts with mid-vein raised throughout its length; inner bracts subulate (d) subsp. **austro-orientalis**

(a) Subsp. **lobulatiformis** (Csűrös & E. I. Nyárády) Soó, *Feddes Repert.* **85**: 454 (1974) (*C. lobulatiformis* Csűrös & E. I. Nyárády): Wings of stem narrow, confluent or slightly lobed, the spines up to 1 mm. Lower leaves up to 12 × 6·5 cm, with 8–12 pairs of obtuse or rounded lobes each with an apical spine 1·5–2·5 mm. Peduncle 10–25 cm, sparsely arachnoid-hairy; capitula 15–20 × 15–30 mm, subglobose; involucral bracts gradually tapered into a spine 0·3–0·5 mm, with the mid-vein raised throughout its length; inner bracts acute. *S. Carpathians.*

(b) Subsp. **kerneri**: Wings of stem triangular or palmate, with an apical spine 1·5–2 mm. Lower leaves up to 14 × 3 cm, with *c.* 14 pairs of semi-hastate lobes each with an apical spine 1·5–2·5 mm. Peduncle 15–30 cm, sparsely arachnoid-hairy; capitula 20–25 × 20–40 mm, subglobose; involucral bracts subacute to subobtuse, with a spine 0·3–0·5 mm, with the mid-vein raised throughout its length; inner bracts acute. *Up to* 1800 *m. S. & E. Carpathians.*

(c) Subsp. **scardicus** (Griseb.) Kazmi, *Mitt. Bot. Staatssamm. (München)* **5**: 417 (1964) (*C. scardicus* (Griseb.) Wettst.): Wings of stem semi-hastate, with an apical spine 1–1·5 mm. Lower leaves up to 20 × 3·5 cm, with 22–25 pairs of 3-partite lobes; cauline with 15–20 pairs of 3-partite lobes each with an apical spine 1–1·5 mm. Peduncle 3–8 cm, densely arachnoid-hairy; capitula 15–25 × 10–15 mm, ovoid; involucral bracts slightly contracted at the middle and also at the subobtuse apex, with an apical spine 0·1–0·3 mm, with the mid-vein raised in the distal ½ only; inner bracts acute. *Above* 2000 *m. S.W. Jugoslavia, N.E. Albania.*

(d) Subsp. **austro-orientalis** Franco, *Bot. Jour. Linn. Soc.* **71**: 49 (1975): Wings of stem semi-hastate, with an apical spine 1–1·5 mm. Lower leaves up to 20 × 5·5 cm, with (8–)14–20 pairs of 3-partite lobes; cauline with 14–20 pairs of 3-partite lobes and with an apical spine 1–1·5 mm. Peduncle 1·5–5 cm, greyish-tomentose; capitula 15–25 × 10–15 mm, ovoid; involucral bracts contracted only at the subobtuse apex, with an apical spine 0·1–0·3 mm, with the mid-vein raised throughout its length; inner bracts subulate. *N. & W. Bulgaria, Macedonia.*

32. C. affinis Guss., *Pl. Rar.* 334 (1826). Perennial up to 100 cm. Stem more or less hairy; wings small, triangular, with an apical spine up to 10 mm. Leaves oblanceolate or oblong-lanceolate, glabrous or glabrescent above, hairy with sinuate unicellular hairs beneath, with 8–10 pairs of lanceolate-acuminate lobes, each with an apical spine up to 7 mm. Capitula 10–25 × 10–20 mm, globose-ovoid, corymbosely arranged in the upper ⅓ of the stem; peduncles up to 18 cm and 3 mm in diameter; involucral bracts 0·75–1·5 mm wide, imbricate or the outer somewhat patent, linear-subulate, with the mid-vein raised throughout its length; inner bracts 1½ times as long as the inner middle bracts. Corolla 18–20 mm. Achenes 3–4 mm, more or less swollen, nearly smooth; apical prominence distinct, sessile, subglobose-cylindrical, 5-lobed; pappus 9–13 mm. *Mountain woods and grassland.* ● *C. & S. Appennini.* It.

(a) Subsp. **affinis**: Stem arachnoid-hairy. Leaves white-tomentose beneath. Involucral bracts with apical spine 0·3–0·5 mm; inner bracts veinless. *Throughout the range of the species.*

(b) Subsp. **brutius** (Porta) Kazmi, *Mitt. Bot. Staatssamm. (München)* **5**: 423 (1964): Stem subglabrous. Leaves greyish-green and very sparsely arachnoid-hairy beneath. Involucral bracts with apical spine 0·5–1 mm; inner bracts 1-veined. *Calabria.*

33. C. adpressus C. A. Meyer, *Verz. Pfl. Cauc.* 71 (1831) (*C. rhodopaeus* Velen.). Perennial up to 100 cm. Stem glabrous or sparsely hairy; wings up to 10 mm wide, triangular, lobed, with an apical spine up to 2 mm. Leaves oblanceolate or oblong-lanceolate, glabrous or glabrescent above, with multicellular hairs along the mid-vein and sparsely arachnoid-hairy on the margins beneath, with 8–10 pairs of irregularly palmate-lobulate lobes, each with an apical spine 2–3 mm. Capitula 20–30 mm in diameter, globose-ovoid; peduncles up to 18 cm and 3 mm in diameter; involucral bracts 0·75–1·5 mm wide, imbricate, linear-subulate, subacute but slightly contracted into a spine 0·5–1 mm, with the mid-vein raised in the proximal ⅔; inner bracts 1½ times as long as the inner middle, with the mid-vein raised in the proximal ⅔. Corolla 16–18 mm. Achenes 4–5 mm, swollen, rugose; apical prominence sessile, subglobose-cylindrical, 5-lobed; pappus 9–13 mm. *Mountain rocks. S. Bulgaria* (*C. Rodopi*). Bu. (*Anatolia, W. Caucasus.*)

34. C. argyroa Biv., *Stirp. Rar. Sic. Descr.* **1**: 7 (1813). Annual up to 75 cm. Stem sparsely arachnoid-hairy; wings up to 12 mm wide, triangular, lobed, with an apical spine up to 7 mm. Leaves oblanceolate to lanceolate, glabrescent above, arachnoid-hairy with sinuate unicellular hairs beneath, with 3–5 pairs of more or less triangular lobes, lobulate on the upper margin, each with an apical spine up to 7 mm. Capitula 10–20 × 10–15 mm, campanulate, subsessile or with peduncle up to 2·5 cm and 2 mm in diameter, mostly in clusters of 3; involucral bracts closely imbricate, the outer and middle 0·75–1·5 mm wide, linear-subulate, glabrous or subglabrous, the margin narrowly scarious, the mid-vein raised in the distal ½; inner bracts 1½ times as long as the inner middle, 3-veined at the widened scarious, acuminate apex. Corolla 10–14 mm. Achenes 3–4 mm, swollen, rugulose; apical prominence shortly stipitate, 5-lobed; pappus 13–15 mm. $2n=26$. *Waste places. S. Italy, Sicilia, S. Sardegna.* It Sa Si.

35. C. bourgeanus Boiss. & Reuter, *Pugillus* 62 (1852). Annual up to 40 cm. Stem arachnoid-hairy; wings up to 4 mm wide, triangular-dentate with an apical spine up to 5 mm. Leaves oblanceolate or lanceolate, sparsely hairy above, greyish-arachnoid-hairy beneath, with straight unicellular hairs and a few multicellular hairs, with 6–8 pairs of broadly triangular, usually lobulate lobes, each with an apical spine up to 5 mm. Capitula 15–20 × 10–20 mm, campanulate, subsessile, or with peduncle up to 1 cm and 2 mm in diameter; involucral bracts closely imbricate, the outer and middle 0·5–1·25 mm wide, linear-subulate, with narrowly scarious margin, the mid-vein raised in the distal ⅔; inner bracts 3-veined. Corolla 12–15 mm. Achenes 3–4 mm, swollen, nearly smooth; apical prominence sessile, cylindrical, entire; pappus 11–13 mm. *Roadsides and waste places.* ● *C., S. & S.E. Spain, S.E. Portugal.* Hs Lu.

(a) Subsp. **bourgeanus**: Wings of stem and spines of leaves up to 5 mm. Capitula 3–7 together at the apex of branches. Outer and middle involucral bracts with an apical spine 1–2 mm, glabrous or almost so; inner bracts twice as long as the outer. *Almost throughout the range of the species.*

(b) Subsp. **valentinus** (Boiss. & Reuter) Franco, *Bot. Jour. Linn. Soc.* **71**: 49 (1975) (*C. valentinus* Boiss. & Reuter). Wings of stem and spines of leaves up to 3 mm. Capitula solitary. Outer and middle involucral bracts with an apical spine 2–3 mm, distinctly but sparsely arachnoid-hairy; inner bracts 1½ times as long as the outer. *S.E. Spain.*

36. C. myriacanthus Salzm. ex DC., *Prodr.* **6**: 624 (1838) (*C. baeticus* Boiss. & Reuter). Annual up to 30 cm. Stem arachnoid-hairy, usually simple; wings up to 2 mm wide, narrow, with numerous slender spines up to 3 mm. Leaves oblanceolate or oblong-lanceolate, glabrescent above, greyish-arachnoid-hairy and with straight unicellular hairs beneath, with 10–12 pairs of ovate-oblong lobes, each with an apical spine up to 1·5 mm. Capitula 20–25 × 15–25 mm, campanulate, sessile, solitary on winged branches, or sometimes in clusters of 3; involucral bracts closely imbricate, the outer and middle 0·75–1 mm wide, narrowly and faintly scarious, more or less arachnoid-hairy, with the mid-vein raised in the distal ¾; inner bracts 1¼ times as long as the inner middle, veinless, scarious on the margin and irregularly serrulate. Corolla 14–17 mm. Achenes 4–5 mm, compressed, smooth; apical prominence sessile, 5-lobed; pappus 14–16 mm. *Maritime sands. S.W. Spain (near Cádiz).* Hs. (*N. Africa.*)

This species closely resembles **43** but is easily distinguished by the larger, campanulate and usually solitary capitulum with closely imbricate bracts and larger corolla.

37. C. asturicus Franco, *Bot. Jour. Linn. Soc.* **71**: 49 (1975). Perennial up to 40 cm. Stem greyish-tomentose; wings up to 4 mm wide, triangular, with an apical spine up to 8 mm. Leaves oblanceolate or lanceolate, glabrous or glabrescent above, greyish-tomentose beneath, with sinuate unicellular hairs, with 3–5 pairs of palmate, triangular lobes, each with an apical spine up to 10 mm. Capitula 10–18 × 3·5–8 mm, cylindrical, subsessile, in clusters of 3–5; involucral bracts 0·5–1·5 mm wide, closely imbricate, linear-subulate, glabrous, with scarious margin, the mid-vein raised in the distal ¾; inner bracts 1½ times as long as the inner middle, scarious in the distal ½. Corolla 14–16 mm. Achenes 4–5 mm, compressed, rugulose; apical prominence sessile, convex, small, unlobed; pappus 11–13 mm. *Mountain pastures, 600–1600 m.* ● *N.W. Portugal, N.W. Spain.* Hs Lu.

38. C. carpetanus Boiss. & Reuter, *Diagn. Pl. Nov. Hisp.* 19 (1842) (*C. gayanus* Durieu ex Willk.). Perennial up to 50 cm. Stem white-tomentose; wings up to 6 mm wide, triangular, with an apical spine up to 6 mm. Leaves oblanceolate- or lanceolate-oblong, sparsely lanate above, white-tomentose beneath with sinuate unicellular hairs, with 6–8 pairs of palmate lobes, each with an apical spine up to 10 mm. Capitula 20–30 × 10–20 mm, campanulate, subsessile or on peduncles up to 4 cm and 1·5 mm in diameter, usually in clusters of 3–5; involucral bracts 1–2 mm wide, closely imbricate, linear-lanceolate, glabrous or almost so, with scarious margin, the mid-vein raised throughout its length in outer bracts but only in distal ½ in middle bracts; inner bracts 1½–1⅔ times as long as the adjacent middle bracts, usually constricted distally into a lanceolate, acuminate apex, faintly scarious at the margin. Corolla 16–20 mm. Achenes 5–6 mm, compressed, almost smooth; apical prominence sessile, slightly lobed; pappus 13–16 mm. $2n=16$. *Uncultivated fields and waste places.* ● *N.E. Portugal, N.C. Spain.* Hs Lu.

39. C. carlinoides Gouan, *Obs. Bot.* 62 (1773) (*C. pyrenaicus* (L.) F. W. Schultz, non Gouan). Perennial up to 40 cm. Stem densely white-tomentose; wings up to 6 mm wide, triangular, with an apical spine up to 5 mm. Leaves oblong-lanceolate, with floccose-arachnoid hairs above, densely white-tomentose beneath with long, sinuate unicellular hairs, with palmate lobes. Capitula 18–25 × 12–15 mm, subsessile, in dense clusters of 5–15; involucral bracts closely imbricate, the outer and middle gradually tapering into a spiny apex, arachnoid-hairy, with entire and faintly scarious margin, the mid-vein raised throughout its length; inner bracts veinless, scarious at apex. Corolla 14–16 mm. Achenes 4–5 mm, swollen, smooth; apical prominence sessile, entire; pappus 13–16 mm. $2n=18$. *Screes and stony slopes.* ● *Pyrenees and mountains of Spain.* Ga Hs.

(a) Subsp. **carlinoides**: Leaves with 10–14 pairs of large lobes. Involucral bracts 1·5–2·5 mm wide, oblong-lanceolate, with an apical spine 1·5–2·5 mm, the inner 1½ times as long as the inner middle bracts. *Pyrenees, Cordillera Cantábrica.*

(b) Subsp. **hispanicus** (Kazmi) Franco, *Bot. Jour. Linn. Soc.* **71**: 50 (1975) (*C. pyrenaicus* subsp. *hispanicus* Kazmi): Leaves with 14–20 pairs of small lobes. Involucral bracts 1–2 mm wide, linear-lanceolate, with an apical spine 2·5–5 mm, the inner 1⅛ times as long as the inner middle bracts. *Sierra Nevada.*

Sect. LEPTOCEPHALI Reichenb. fil. Capitula oblong or cylindrical, deciduous when ripe. Corolla-tube widened above into an ellipsoid cup 1–1·5(–2) mm.

40. C. corymbosus Ten., *Fl. Nap.* **1**, *Prodr.*: 48 (1811). Annual up to 60 cm. Stem arachnoid-hairy; wings up to 4 mm wide, palmate, with an apical spine up to 2 mm. Leaves oblanceolate to oblong-lanceolate, glabrescent above, densely lanate beneath with sinuate, mostly unicellular hairs, with 6–8 pairs of palmate lobes with triangular-acute lobules, each with an apical spine up to 3 mm. Capitula 15–25 × 10–15 mm, oblong; peduncles up to 15 cm and 1 mm in diameter; involucral bracts 0·5–1 mm wide, imbricate though distally slightly squarrose, linear-lanceolate, nearly glabrous, with ciliate margins, the mid-vein raised in the distal ¾; inner bracts 1½ times as long as the inner middle, contracted at the scarious apex, faintly 1-veined in the distal ½. Corolla 15–20 mm. Achenes 4–5 mm, compressed, smooth; apical prominence small, shortly stipitate, 5-lobed; pappus 13–17 mm. *Cultivated fields and roadsides. C. & S. Italy, Sicilia, Sardegna.* It Sa Si.

41. C. acicularis Bertol., *Ann. Stor. Nat.* (*Bologna*) **1**: 274 (1829) (*C. bicolor* Vis.). Annual up to 70 cm. Stem arachnoid-hairy; wings very narrow, dentate with teeth up to 4 mm wide, with an apical spine up to 2 mm. Leaves obovate-lanceolate to lanceolate, sparsely arachnoid-hairy above, arachnoid-tomentose beneath with straight unicellular and very few multicellular hairs, with 2–5 pairs of triangular-acute lobes, each with an apical spine 1–3 mm. Capitula 15–20 × 10–15 mm, oblong; peduncles up to 15 cm and 1 mm in diameter; involucral bracts imbricate but becoming erecto-patent, the outer subulate, the middle oblong-lanceolate and 0·5–1 mm wide in the proximal ½, contracted above into an apex 0·5 mm wide at its base, linear-subulate, with the mid-vein raised in the distal ¾; inner bracts ¾ as long as the inner middle, 3-veined above. Corolla 10–12 mm. Achenes 3·5–4·5 mm, compressed, rugulose; apical prominence slender, sessile, entire; pappus 10–13 mm. *Waste places. C. & E. Mediterranean region, S. Bulgaria.* Bu Ga Gr It Ju Si Tu.

42. C. argentatus L., *Mantissa Alt.* 280 (1771). Annual up to 100 cm. Stem arachnoid-hairy; wings very narrow, sinuate to

lobed with rounded lobes each with an apical spine up to 2 mm. Leaves glabrous or sparsely hairy above, greyish-tomentose beneath, with straight unicellular hairs and very few multicellular hairs on the veins, with rounded dentate lobes, each with an apical spine up to 1 mm. Capitula 15–18 × 10–13 mm, oblong; peduncles up to 12 cm and 1 mm in diameter; involucral bracts closely imbricate or slightly squarrose, the middle with an oblong-ovate, veinless, verruculose proximal part 1·5–2 mm wide and contracted in the distal ⅓ of the bract into a smooth, obtuse, shortly spinose apex with the mid-vein raised in the distal ⅓, slightly arachnoid-hairy; inner bracts 2–3 mm wide, 1½ times as long as the inner middle, broadly lanceolate, with scarious margins, 3-veined in the distal ½. Corolla 9–11 mm. Achenes 2·5–3 mm, compressed, rugulose; apical prominence shortly stipitate, cylindrical, 5-lobed; pappus 7–9 mm. *Rocky ground. Kriti, Karpathos.* Cr. (*S.W. Asia.*)

43. C. meonanthus Hoffmanns. & Link, *Fl. Port.* **2**: 186 (1820–1828). Annual to biennial up to 65 cm. Stem arachnoid-hairy and glabrescent; wings up to 7 mm wide, palmate, with a slender apical spine up to 5 mm. Leaves oblanceolate to oblong, glabrescent above, arachnoid-hairy beneath with multicellular and sinuate unicellular hairs, with 8–10 pairs of palmate, acutely lobulate lobes, each with an apical spine up to 4 mm. Capitula 15–20 × 8–12 mm, subsessile, usually in clusters of 2–8; involucral bracts 0·75–1·25 mm wide, imbricate but usually squarrose, linear-lanceolate, smooth on the back, glabrous or nearly so, with scarious margin, the mid-vein raised in the distal ½; inner bracts 1½ times as long as the inner middle, with scarious margins, 3-veined in the distal ½. Corolla 11–16 mm. Achenes 3–4 mm, compressed, smooth; apical prominence small, sessile or shortly stipitate, entire; pappus 10–13 mm. $2n=16$. *Sandy ground, usually near the sea.* ● *C. & S. Portugal, S.W. Spain.* Hs Lu.

Closely resembling **36** in vegetative characters but easily distinguished by the smaller, cylindrical, usually congested capitula with more or less recurved free apices to the involucral bracts and smaller florets.

44. C. tenuiflorus Curtis, *Fl. Lond.* **2(6)**: t. 55 (1793). Annual or biennial up to 75 cm. Stem more or less arachnoid-hairy; wings up to 10 mm wide, triangular, with an apical spine up to 5 mm. Leaves oblanceolate to lanceolate, sparsely hairy above, arachnoid-hairy beneath, with mostly unicellular hairs, with 6–8 pairs of broadly triangular, acute lobes, each with an apical spine up to 5 mm. Capitula 15–20 × 5–10 mm, cylindrical, sessile, in compact clusters of 3–8(–12); involucral bracts imbricate but with suberect or patent apices 1·5–2 mm wide, ovate-lanceolate, more or less contracted at the apex, glabrous, smooth, with scarious entire margin, the mid-vein raised in the distal ½; inner bracts 1¼ times as long as the middle bracts, veinless, subulate, with scarious, entire margin and apex. Corolla 10–14 mm. Achenes 4–5 mm, swollen, smooth; apical prominence shortly stipitate, clavate, entire; pappus 11–13 mm. $2n=54$. *Dry, open habitats. W. Europe.* Az Be Bl Br Co Ga Hb He Ho Hs It Lu Sa [No Su].

45. C. pycnocephalus L., *Sp. Pl.* ed. 2, 1151 (1763). Annual up to 80 cm. Stem arachnoid-hairy but greyish-tomentulose above; wings up to 5 mm wide, triangular, with an apical spine up to 5 mm. Leaves oblanceolate to oblong-lanceolate, sparsely hairy above, arachnoid-lanuginous beneath with mostly unicellular hairs, with 2–5 pairs of palmate lobes, each with an apical spine up to 12 mm. Capitula 15–20 × 7–13 mm, cylindrical, subsessile or on peduncles up to 10 cm and 2 mm in diameter, solitary or in clusters of 2–3; involucral bracts imbricate, arachnoid-hairy; inner bracts up to 1¼ times as long as the middle, faintly 3-veined in the distal ½, not scarious at margin distally. Corolla 10–14 mm. Achenes 4–5 mm, compressed, smooth; apical prominence small, shortly stipitate, clavate, entire; pappus 10–14 mm. $2n=62–64$. *Waste places. S. & S.E. Europe; casual further north.* Al Bl Bu Co Cr Ga Gr Hs It Ju Rs (K, E) Sa Si Tu.

Throughout the range of this species there is much variation in the wings of the peduncles but none of this variation is correlated with other characters or with distribution. The following subspecies, based on other characters, may, however, be recognized.

(a) Subsp. **pycnocephalus**: Apices of involucral bracts 2–3 mm wide, erecto-patent, ovate-lanceolate, more or less contracted into a spine, with the mid-vein raised in the distal ¾. *Throughout the range of the species except S. Greece and U.S.S.R.*

(b) Subsp. **albidus** (Bieb.) Kazmi, *Mitt. Bot. Staatssamm.* (*München*) **5**: 446 (1964) (*C. albidus* Bieb., *C. argentatus* auct., non L., *C. arabicus* auct. ross., non Jacq. ex Murray, *C. cinereus* sensu Tamamsch., ? an Bieb.): Apices of involucral bracts 1·5–2 mm wide, oblong-lanceolate, suberect, gradually tapering at apex, with the mid-vein raised only in the distal ½. *S. half of Balkan peninsula; Krym to W. Kazakhstan.*

46. C. australis L. fil., *Suppl.* 348 (1781) (*C. marmoratus* Boiss. & Heldr.). Annual up to 60 cm. Stem more or less arachnoid-hairy; wings up to 8 mm wide, triangular, with a stout apical spine up to 12 mm. Leaves glabrescent above, arachnoid-hairy beneath with multicellular and unicellular hairs, lyrate-pinnatipartite with 2–5 pairs of triangular lobes, each with a stout apical spine up to 30 mm. Capitula 15–20 × 5–10 mm, cylindrical, subsessile and mostly in clusters of 2–5; involucral bracts imbricate, usually suberect at apex, 1·5–3 mm wide, ovate-lanceolate, more or less contracted into a spiny apex, glabrous or almost so, minutely serrulate but not scarious at the margin, with the mid-vein raised only in the distal ½; inner bracts 1¼ times as long as the inner middle bracts, veinless, with scarious margin. Corolla 10–12 mm. Achenes 4–5 mm, compressed, smooth; apical prominence absent; pappus 10–13 mm. *Waste places. C. & E. Mediterranean region.* Al Co Gr It Ju Si Tu.

47. C. cephalanthus Viv., *Fl. Cors.* 14 (1824). Annual or biennial up to 100 cm. Stem arachnoid-hairy; branches greyish-tomentose; wings very narrow, with triangular projections up to 5 mm, each with an apical spine up to 7 mm. Leaves oblanceolate or lanceolate, subglabrous above, very sparsely arachnoid-hairy beneath, with unicellular hairs, with 6–8 pairs of palmate lobes, each with 1–3 pairs of triangular-acute lobules. Capitula 13–20 × 7–10 mm, subsessile, in dense clusters of 5–20; involucral bracts 2–2·5 mm wide, closely imbricate, more or less contracted into a spine 1–2 mm, the mid-vein raised only in the distal ½, arachnoid, smooth, the outer bracts ovate, the middle ovate-lanceolate; inner bracts 1½ times as long as the inner middle, veinless. Corolla 13–16 mm. Achenes 2·5–3·5 mm, swollen, rugulose; apical prominence shortly stipitate, 5-lobed; pappus 8–12 mm. $2n=22$. *Rocky places, usually near the sea. W. Mediterranean region.* Co Hs It Sa Si.

48. C. fasciculiflorus Viv., *Fl. Cors., App.* **1**: 6 (1825). Annual or biennial. Stem glabrous or sparsely hairy; wings palmate-triangular, divided into oblong-lanceolate lobs, each with an apical spine up to 7 mm. Leaves lanceolate or oblong, glabrous, with 8–10 pairs of palmate lobes divided into triangular-acute lobules, each with an apical spine up to 7 mm. Capitula 12–20 × 6–12 mm, subsessile, in dense clusters of (3–)5–15; involucral

bracts closely imbricate, the outer 0·5–1 mm wide and lanceolate, the middle 1·5–2 mm wide and ovate-lanceolate, all more or less contracted into a spine 2–4 mm, with slightly scarious margin, the mid-vein glabrous near the apex; inner bracts about as long as the inner middle, veinless. Corolla 10–12 mm. Achenes 2–3 mm, compressed, rugulose; apical prominence small, shortly stipitate, clavate, slightly 5-lobed, mucronate; pappus 12–14 mm. $2n=22$. *Scrub and waste places. Corse, Sardegna, Montecristo.* Co It Sa.

118. Cirsium Miller[1]

Spiny, biennial or perennial herbs, rarely annuals. Leaves alternate, entire to pinnatisect, with spinulose margin or upper surface and usually spiny teeth or lobes. Involucral bracts imbricate, often with a vitta, usually with a simple apical spine. Receptacular scales numerous, setaceous. Florets hermaphrodite, rarely unisexual, purple or yellowish, rarely white. Anthers with basal appendages 0·3–1·5 mm. Achenes oblong, gibbous, compressed, the truncate apex with a distinct, annular margin surrounding a subconical central projection; pappus of several rows of plumose setae, the inner somewhat longer than the outer and simple, often flattened, lanceolate and ciliate towards apex, the pappus of the outermost florets often with fewer, simple setae.

Literature: F. Petrak, *Biblioth. Bot.* (*Stuttgart*) **78**: 1–92 (1912).

Morphological intermediates, which are probably hybrids, are frequent in the genus. In Sect. *Cirsium* they occur as individual plants in the presence of the parents and there is much experimental information to confirm their hybrid status. In Sect. *Eriolepis* the intermediates may occur as populations in the absence of either presumed parent. They may result from some form of introgression but no convincing data are available on this.

Measurements of the diameter of the involucre refer to the middle of the capitulum, excluding the patent apices of the bracts.

In most of the species with purple florets, white variants are occasionally found.

1 Leaves with rigid, rather pungent setae on upper surface
2 Stem winged
3 Lower and middle cauline leaves decurrent for the whole internode; involucre (25–)30–40 × 20–40 mm **28. vulgare**
3 Cauline leaves decurrent for about half of the internode; involucre 13–20 × 8–15 mm **29. italicum**
2 Stem not winged; rarely leaves decurrent for not more than 1 cm
4 Middle and inner involucral bracts with a concave, scarious, fimbriate to laciniate apical appendage more than 1·5 mm wide
5 Narrow distal part of involucral bracts with patent marginal spines 0·5–2 mm and usually longer than width of bract
6 Appendage of involucral bracts 1·5–3·5 mm wide, brown to blackish-purple, usually with some spinules on inner surface **19. grecescui**
6 Appendage of involucral bracts 1–2 mm wide, purple, smooth on inner surface at apex **20. decussatum**
5 Narrow distal part of involucral bracts with smooth margin, or rarely with some marginal spinules shorter than width of bract
7 Middle involucral bracts narrow above the wide basal part, gradually widened towards the apex **18. ligulare**
7 Narrow part of middle involucral bracts with parallel margins, abruptly widened at apex into a spathulate or rhombic appendage
8 Outer involucral bracts suberect; leaves with long, rigid setae on upper surface **16. odontolepis**
8 Outer involucral bracts patent to recurved; leaves shortly setose on upper surface
9 Involucre densely arachnoid-lanate, rarely sparsely arachnoid-lanate to subglabrous; appendage of bracts without spinules on inner surface **15. eriophorum**
9 Involucre glabrous or scarcely arachnoid-hairy; appendage of middle bracts with a narrow, spiny wing or a row of short spinules on inner surface **17. spathulatum**
4 Middle involucral bracts less than 1·5 mm wide at apex, the apical part flat, with margin not or indistinctly scarious-fimbriate
10 Involucral bracts with marginal spines more than 0·5 mm, usually as long as or longer than width of bract
11 Involucral bracts gradually narrowed from base to apex, the distal part with marginal spines which are longer towards the apex
12 Outer and middle involucral bracts with pectinate, rigid marginal spines 1–1·5 mm; outer bracts sharply deflexed **23. ciliatum**
12 Outer and middle involucral bracts with soft marginal spinules 0·2–0·8 mm; outer bracts erecto-patent or rarely patent-recurved **24. serrulatum**
11 Involucral bracts divided into a wide basal and a narrow apical part; marginal spines ± equal or becoming shorter towards the apex
13 Involucral bracts with dense marginal spines 0·5–3 mm, and with dense, pale, spinulose bristles 0·3–1(–1·8) mm on inner surface of curved part
14 Involucre sparsely arachnoid-hairy to -lanate; bracts with marginal spines 1–2(–3) times as long as width of bract; corolla purple **21. boujartii**
14 Involucre glabrous or sparsely arachnoid-hairy; bracts with marginal spines 3–5 times as long as width of bract; corolla white or red **22. furiens**
13 Involucral bracts with remote marginal spines up to 1(–1·7) mm; inner surface not setose, at most minutely scabrid
15 Leaves pinnatisect; segments divided to the base into 2 narrow lobes; involucre 30–50 × 40–70 mm, the middle bracts slightly widened towards apex **20. decussatum**
15 Leaves pinnatifid; segments broadly 2- to 3-lobed; involucre 20–30 × 20–30 mm, the bracts with subulate apex **25. laniflorum**
10 Involucral bracts without marginal spines in the narrow distal part, or at most spinulose-denticulate to -ciliate or with some spinules at apex
16 Apical part of middle involucral bracts more than 0·5 mm wide, with a narrow appendage or ± abruptly contracted into the apical spine
17 Outer involucral bracts patent to recurved
18 Corolla usually white
19 Capitula with 10–20 linear, pectinate-spiny subtending leaves, equalling or somewhat exceeding capitulum; involucre 35–45 mm; middle bracts with apical spine 4–7 mm **1. ferox**
19 Capitula with 8–12 squarrose-spiny subtending leaves, 2–4 times as long as capitulum; involucre (15–)20–25 mm; middle bracts with apical spine 1–2 mm **5. morinifolium**
18 Corolla usually purple
20 Involucre (17–)20–25(–30) × 12–30 mm; corolla-tube as long as limb **9. tenoreanum**
20 Involucre 30–50 × 30–70 mm; corolla-tube longer than limb
21 Involucre ovoid to ovoid-cylindric, usually sparsely arachnoid-hairy; middle bracts suberect to erecto-patent **8. lacaitae**
21 Involucre globose, densely, rarely sparsely, arachnoid-lanate; middle bracts patent **15. eriophorum**
17 Outer involucral bracts suberect
22 Capitula numerous, in a much-branched, narrow, distally dense panicle; involucre not more than 27 mm; corolla not more than 25 mm; pappus not more than 20 mm **6. hypopsilum**
22 Capitula usually few in a lax corymb or a raceme; involucre usually more than 30 mm; corolla usually more than 25 mm; pappus usually more than 20 mm
23 Stem up to 50 cm; capitula with 3–6 outer subtending leaves equalling or exceeding capitulum and numerous inner subtending leaves shorter than capitulum; involucre densely, rarely sparsely, arachnoid-lanate **10. lobelii**
23 Stem usually more than 50 cm; capitula either with 5–20 subtending leaves equalling to exceeding capitulum or with 1–7 subtending leaves shorter than to equalling capitulum; involucre usually subglabrous to sparsely arachnoid-lanate
24 Leaves shortly setose above; capitula with up to 7(–9) subtending leaves, shorter than to equalling capitulum
25 Narrow distal part of involucral bracts with spinulose margin; pappus 19–22 mm **3. bulgaricum**
25 Narrow distal part of involucral bracts with smooth margin; pappus 25–30 mm **8. lacaitae**
24 Leaves with long, patent bristles above; capitula with usually more than 8 subtending leaves, equalling or exceeding capitulum
26 Middle involucral bracts distinctly widened into a lanceolate to rhombic appendage with slightly scarious-fimbriate to ciliate, not spinulose margin **16. odontolepis**
26 Middle involucral bracts slightly widened into a narrow appendage with spinulose-ciliate to spinose-denticulate margin
27 Leaves broadly auriculate-semiamplexicaul; middle involucral bracts with apical spine 4–7 mm; corolla 30–38 mm **1. ferox**
27 Leaves narrowly auriculate-semiamplexicaul; middle involucral bracts with apical spine 1·5–3·5 mm; corolla 23–31 mm **7. vallis-demonis**
16 Apex of involucral bracts usually less than 0·5 mm wide, gradually narrowed into the apical spine
28 Apex of involucral bracts with spinulose-denticulate or -ciliate margin
29 Involucral bracts gradually narrowed from base to apex
30 Capitula with 6–12 subtending leaves equalling or exceeding capitulum; involucre 10–15 mm wide **4. polycephalum**
30 Capitula with 1–3 subtending leaves shorter than capitulum; involucre 20–35 mm wide **24. serrulatum**
29 Involucral bracts obviously divided into a wide basal part and a narrow apical part
31 Leaves ± herbaceous, pinnatifid, the segments with 2–3 wide lobes; involucral bracts not spinulose-setose on inner surface **25. laniflorum**
31 Leaves coriaceous, pinnatisect, the segments divided to the base into 2 narrow lobes; involucral bracts minutely spinulose-setose on inner surface of the curved part
32 Involucre 35–42 × 35–45(–50) mm; corolla 34–38 mm, purple **13. costae**
32 Involucre 25–35 × 20–40(–60) mm; corolla 27–30 mm, white, rarely pink or purplish **2. heldreichii**
28 Apex of involucral bracts with glabrous, or rarely softly ciliate margin
33 Involucral bracts with apical spine more than 4 mm
34 Involucral bracts with rigidly squarrose-patent to recurved apical spine 10–30 mm; leaves narrowly auriculate-semiamplexicaul **11. morisianum**
34 Involucral bracts with erecto-patent to patent apical spine 4–8 mm; leaves broadly auriculate-semi-amplexicaul
35 Capitula subtended by 10–20 linear, pectinate-spiny leaves equalling or somewhat exceeding capitulum; involucre sparsely arachnoid-hairy to subglabrous; corolla usually white **1. ferox**
35 Capitula subtended by 5–10 pinnatifid, squarrose-spiny leaves usually much longer than capitulum; involucre arachnoid-lanate; corolla usually purple **12. richteranum**
33 Involucral bracts with apical spine less than 4 mm
36 Plant (60–)100–200(–400) cm; involucral bracts appressed, with erecto-patent apical spine, gradually narrowed towards the apex **26. scabrum**
36 Plant not more than 100 cm; involucral bracts erecto-patent to recurved, obviously divided into a wide basal and a narrow apical part
37 Involucre (15–)20–30 × 15–30 mm; mature pappus 15–20 mm
38 Leaves strongly undulate; capitula with 8–12 squarrose-spiny subtending leaves 2–4 times as long as capitulum; corolla white **5. morinifolium**
38 Leaves almost flat; capitula not subtended by leaves, or subtended by 1–2 very small leaves; corolla purple or pink **25. laniflorum**
37 Involucre 25–40 × 25–40(–45) mm; mature pappus 21–40 mm
39 Cauline leaves not decurrent, sparsely arachnoid-hairy to glabrous beneath; corolla longer than the pappus; pappus 21–30 mm **14. giraudiasii**
39 Middle cauline leaves decurrent for *c.* 1 cm, sparsely to densely arachnoid-lanate beneath; corolla as long as the mature pappus; pappus (25–)32–40 mm **27. echinatum**
1 Leaves without rigid setae on upper surface
40 Stem leafy up to the apex
41 Stem with spiny wings, at least in the basal half
42 Leaves pubescent to villous above, sparsely arachnoid-lanate to -tomentose beneath
43 Perennial; involucral bracts without vittae **59. creticum**
43 Biennial; involucral bracts with conspicuous vittae
44 Stem winged up to the apex; leaves herbaceous **57. palustre**
44 Stem not winged towards the apex; leaves coriaceous **58. flavispina**
42 Leaves glabrous or subglabrous
45 Biennial; leaves with spines 2–4 mm; involucre 7–12 mm
46 Leaves elliptic-lanceolate to elliptical; involucral bracts glabrous, with weak apical spinule 0·3–0·5 mm **56. bourgaeanum**
46 Leaves narrowly oblong- to linear-lanceolate; involucral bracts sparsely arachnoid-hairy, with pungent apical spine 1–3 mm **55. brachycephalum**
45 Perennial; leaves with spines 4–15 mm; involucre 10–17 mm
47 Roots without tubers; stem-wings flat, with slender, flexuous spines **52. monspessulanum**
47 Roots with fusiform tubers; stem-wings undulate, with stout, rigid spines **54. alatum**
41 Stem without wings or leaves decurrent for not more than 2 cm
48 Corolla yellowish or white; capitula subtended by leaves
48 Corolla yellowish or white; capitula subtended by leaves
49 Leaves herbaceous, flat, with slender marginal spinules usually less than 6 mm; involucral bracts with slender apical spine
50 Plant villous with reddish-brown flexuous hairs; capitula subtended by narrowly lanceolate leaves with long, reddish-brown, subspinose fimbriae **39. carniolicum**
50 Stem sparsely greyish-arachnoid-hairy near apex; leaves subglabrous; capitula subtended by ovate, pale, weakly spinulose-ciliate leaves **40. oleraceum**
49 Leaves ± coriaceous, undulate, with stout marginal spines usually more than 6 mm; involucral bracts with stout apical spine

[1] By K. Werner.

51 Biennial; stem more than 150 cm, much-branched; involucre 7–13 mm in diameter **43. candelabrum**
51 Perennial; stem not more than 120 cm, simple or sparingly branched; involucre 15–30 mm in diameter
52 Capitula in apical clusters of (1–)2–10; leaves auriculate-semiamplexicaul, shortly decurrent; apical part of involucral bracts as long as or longer than basal part, with apical spine 3–10 mm; pappus 12–18 mm **41. spinosissimum**
52 Capitula usually solitary, pedunculate; leaves attenuate at base and sessile; apical part of involucral bracts much shorter than basal part, with apical spine 1·5–4 mm; pappus 18–23 mm **42. glabrum**
48 Corolla purple, rarely white; capitula usually not subtended by leaves
53 Involucral bracts with patent apex
54 Upper leaves oblong-lanceolate, somewhat coriaceous and undulate, with stout marginal spines (3–)5–13 mm **36. appendiculatum**
54 Upper leaves elliptical to ovate-orbicular, herbaceous, flat, with slender marginal spines up to 2 mm
55 Leaves subglabrous, elliptical, pinnatifid, with narrowly triangular to oblong, lobed segments **34. montanum**
55 Leaves pubescent above, sparsely arachnoid-lanate beneath, broadly ovate to ovate-orbicular, lobed or doubly dentate **37. waldsteinii**
53 Middle involucral bracts ±appressed
56 Stem usually much-branched in upper half, with numerous capitula; florets unisexual; corolla-limb 5-partite almost to its base; mature pappus much longer than corolla **60. arvense**
56 Stem not or sparingly branched, with one or few capitula; florets hermaphrodite; corolla-limb 5-fid to about halfway; pappus not longer than corolla
57 Leaves subglabrous or with patent hairs, without arachnoid hairs (or rarely on the veins beneath)
58 Plant acaulescent or rarely with a stem 5–15(–35) cm; involucral bracts without vittae **44. acaule**
58 Stem 20–70 cm; involucral bracts with conspicuous vittae **46. valentinum**
57 Leaves sparsely arachnoid-lanate to -tomentose beneath
59 Leaves herbaceous, flat, with marginal spinules less than 2 mm; capitula not subtended by leaves; middle involucral bracts with obtuse to suborbicular apex **47. helenioides**
59 Leaves ±coriaceous, undulate, with marginal spines 5–10 mm; capitula subtended by spiny leaves; involucral bracts acute **45. mairei**
40 Stem without leaves towards the apex (except bracteoles)
60 Lower leaves ±decurrent
61 Leaves glabrous, or sparsely puberulent to arachnoid-hairy on the veins
62 Leaves somewhat coriaceous, rigid, undulate, lobed to pinnatifid **51. tymphaeum**
62 Leaves herbaceous, flat, entire to dentate or rarely lobed
63 Involucre 10–15 × 8–15 mm, the middle bracts obtuse **52. monspessulanum**
63 Involucre 15–20 × 20–25 mm, the middle bracts acute **53. welwitschii**
61 Leaves pubescent to tomentose, especially beneath
64 Leaves pinnatifid, with stout spines 4–8 mm; involucral bracts with stout apical spine **46. valentinum**
64 Leaves entire, dentate or lobed (very rarely pinnatifid), with slender spines up to 5 mm; involucral bracts with slender apical spine
65 Leaves sparsely to densely arachnoid-lanate beneath; capitula subtended by 1–5 leaves; involucral bracts without or with indistinct vittae **49. heterotrichum**
65 Leaves sparsely arachnoid-hairy beneath; capitula not subtended by leaves; involucral bracts with conspicuous vittae
66 Leaves entire or denticulate; involucral bracts appressed, acute; inner pappus-setae not expanded at apex **48. pannonicum**
66 Leaves coarsely dentate to lobed (rarely pinnatifid); involucral bracts patent at apex, the middle with an oblong-suborbicular, ciliate apex; inner pappus-setae expanded at apex **50. canum**
60 Leaves not decurrent
67 Leaves sparsely arachnoid-hairy to -tomentose especially beneath, and with patent hairs
68 Involucre (18–)20–28(–32) × (17–)20–35(–40) mm; middle involucral bracts with obtuse to suborbicular, fimbriate-ciliate apex, the inner with lanceolate appendage **47. helenioides**
68 Involucre 15–23(–25) × 11–22(–25) mm; middle and inner involucral bracts acute, the apex neither fimbriate-ciliate nor appendiculate
69 Lower cauline leaves more than 10 cm wide, broadly ovate to ovate-orbicular; capitula in apical clusters of 3–8, ±nodding **37. waldsteinii**
69 Leaves less than 10 cm wide, oblong-lanceolate to elliptical; capitula solitary on long peduncles, rarely in clusters of 2–3, erect
70 Stem usually more than 80 cm, ±purple; leaves with large auricles, amplexicaul, white-tomentose beneath **38. hypoleucum**
70 Stem usually less than 80 cm, greyish; leaves sessile or narrowly auriculate-semiamplexicaul, sparsely arachnoid-hairy to greyish-lanate-tomentose beneath **(30–32). tuberosum** group
67 Leaves subglabrous to patent-pubescent, but at most scarcely arachnoid-hairy on the veins
71 Leaves somewhat undulate, with stout spines (3–)5–13 mm
72 Leaves subglabrous; involucral bracts with patent apex **36. appendiculatum**
72 Leaves with long crispate hairs on both surfaces; involucral bracts ±appressed **46. valentinum**
71 Leaves flat, with slender spinules up to 2 mm
73 Corolla yellow, rarely purple; stem with crispate hairs only; leaves pinnatisect; capitula nodding **35. erisithales**
73 Corolla purple, rarely white; stem arachnoid-tomentose towards the apex; leaves pinnatifid or rarely entire; capitula usually erect
74 Cauline leaves not more than 9 cm wide; involucral bracts ±erect **33. rivulare**
74 Cauline leaves more than 9 cm wide; involucral bracts with patent to deflexed apex **34. montanum**

Sect. ERIOLEPIS (Cass.) Dumort. Leaves usually coriaceous, pinnatisect, with segments divided to base into 2 divaricate lobes, with rigid, rather pungent setae on the upper surface. Florets hermaphrodite or the outermost functionally male or sterile. Corolla-limb 5-fid to about halfway, about as long as tube. Pappus shorter than or equalling corolla.

All species usually occur in dry, open habitats.

An extremely difficult group in which most taxa are very variable and many of them are connected by intermediates. Most of the diagnostic characters are quantitative and appear in various taxa. It is not easy to establish correlations between characters and consequently the delimitation of taxa is difficult, and the assessment of their status is often doubtful. In the following treatment, which must be regarded as provisional, an attempt has been made in the key and descriptions to take into account the variability of the species, but intermediates have been excluded.

1. C. ferox (L.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 120 (1805). Biennial 60–100(–120) cm. Leaves broadly auriculate-semiamplexicaul, with patent setae 1–7 mm above, sparsely

arachnoid-lanate to -tomentose beneath; lobes linear-oblong to triangular-oblong, with rigid apical spine (4–)6–10(–15) mm. Capitula in a corymb, with 10–20 linear, pectinate-spiny subtending leaves equalling or somewhat exceeding capitulum. Involucre 35–45 × 25–40 mm, sparsely arachnoid-hairy to subglabrous; middle bracts gradually narrowed or slightly widened to the spinulose-denticulate or minutely ciliate apex, with weak, patent to erecto-patent apical spine 4–7 mm. Corolla 30–38 mm, usually white. Achenes 4·5–6 mm; pappus 24–29 mm. ● *C. & S. France, just extending into N.W. Italy.* Ga ?Hs It.

2. C. heldreichii Halácsy, *Österr. Bot. Zeitschr.* **40**: 114 (1890). Biennial 15–100 cm. Stem sparsely arachnoid-lanate to lanate-floccose. Leaf-lobes linear-lanceolate to oblong-lanceolate, with strong apical spine 6–25 mm. Capitula solitary or in a sparingly branched corymb, with 2–6 narrow subtending leaves equalling or somewhat exceeding capitulum. Involucre 25–35 × 20–40(–60) mm; middle bracts gradually narrowed to the cartilaginous, densely spinose-serrulate apex, with slender apical spine 2–6 mm. Corolla 27–30 mm, usually white. Achenes 5–6 mm; pappus 19–25 mm. ● *Mountains of Greece.* Gr.

A rather variable species; the following subspecies seem doubtfully distinct.

(a) Subsp. **heldreichii**: Leaves attenuate at the base and sessile to narrowly auriculate-semiamplexicaul, not decurrent, arachnoid-lanate to -tomentose beneath. Involucre glabrous to sparsely arachnoid-hairy. Corolla white or pink. *C. Greece.*

(b) Subsp. **euboicum** Petrak, *Bot. Jahrb.* **80**: 420 (1961): Leaves broadly auriculate-semiamplexicaul, the middle often decurrent for up to 1 cm, sparsely arachnoid-lanate beneath. Involucre arachnoid-lanate. Corolla purplish. *Evvoia.*

3. C. bulgaricum DC., *Prodr.* **6**: 639 (1838). Biennial 60–100 cm. Leaves arachnoid-lanate beneath; lobes lanceolate to narrowly triangular, with rigid apical spine 3–10(–16) mm. Capitula 3–10 in a lax to dense raceme or corymb, with 2–6(–9) subtending leaves shorter than to equalling capitulum. Involucre 24–35 × 22–35 mm, ovoid-globose, sparsely arachnoid-hairy to subglabrous; outer bracts suberect; middle erecto-patent, slightly widened to the spinose-serrulate apex, with rigid apical spine 1–3·5 mm. Corolla 23–30 mm, purple. Achenes 5–6 mm; pappus 19–22 mm. *Woods. Near S.W. coast of Black Sea.* Bu Tu. (*Anatolia.*)

C. baytopae P. H. Davis & Parris, *Notes Roy. Bot. Gard. Edinb.* **33**: 415 (1975), described from a single gathering from the southern margin of the range of **3** (near Saray), is related to **3** and **4** but has the numerous capitula in a corymb, 1–3 subtending leaves shorter than the capitulum, the involucre 15–20 × 17–23 mm and with patent bracts gradually narrowed to a smooth apex, the corolla 17–18 mm and the pappus 9–14 mm.

4. C. polycephalum DC., *Prod.* **6**: 639 (1838). Like **3** but capitula more than 10, in a dense panicle or corymb, with 6–12 subtending leaves equalling or exceeding capitulum; involucre 15–23 × 10–15 mm, subcylindrical; bracts erect, gradually narrowed to the subpatent apex; corolla 13–16 mm, usually white; achenes 3·5–4·5 mm; pappus 13–14 mm. *Turkey-in-Europe* (*near Istanbul*). Tu. (*Anatolia.*)

5. C. morinifolium Boiss. & Heldr. in Boiss., *Fl. Or.* **3**: 530 (1875). Biennial 30–100 cm. Stem much-branched, crispate-pubescent. Leaves glabrous or sparsely arachnoid-hairy beneath; lobes narrowly triangular to linear-triangular, with stout apical spine 7–11(–15) mm. Capitula numerous, in a much-branched panicle or corymb, with 8–12 squarrose-spiny subtending leaves 2–4 times as long as capitulum. Involucre (15–)20–25 × 17–30 (–35) mm, sparsely arachnoid-hairy to -lanate, rarely subglabrous; bracts patent, the middle ones gradually narrowed to the nearly smooth apex, with apical spine 1–2 mm. Corolla 20–26 mm, white. Pappus 16–20 mm. ● *Kriti.* Cr.

6. C. hypopsilum Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 101 (1846) (*C. cylleneum* Halácsy). Biennial 40–100 cm. Stem much-branched, with crispate hairs, arachnoid-lanate towards the apex. Leaves glabrous to arachnoid-lanate beneath; lobes linear-triangular to linear-lanceolate, with rigid apical spine (5–)10–20 mm. Capitula numerous, in a much-branched, narrow, distally dense panicle, with 3–5(–8) pinnatifid, squarrose-spiny subtending leaves 1½–3 times as long as capitulum. Involucre 20–27 × 17–30 mm, sparsely arachnoid-hairy to -lanate or rarely subglabrous; bracts with spinulose-denticulate margin, the outer erect, the middle erecto-patent, distinctly widened into a lanceolate spinescent-ciliate appendage with apical spine 1·5–4 mm. Corolla 18–25 mm, whitish; limb divided to halfway. Achenes 4·5–5·5 mm; pappus 16–20 mm. ● *Mountains of C. & S. Greece.* Gr.

7. C. vallis-demonis Lojac., *Nat. Sicil.* **3**: 267 (1884). Like **6** but stem scarcely arachnoid-hairy; capitula fewer, in a terminal corymb, subtended by more than 10 linear, pectinate-spiny leaves; involucre 25–40 × 20–40 mm; middle bracts with fimbriate and spinulose-ciliate apex; corolla 23–31 mm, white or purple, the limb divided for ⅓ of its length; achenes 5·5–6·5 mm; pappus 20–29 mm. ● *Sicilia, S.W. Italy.* It Si.

8. C. lacaitae Petrak, *Österr. Bot. Zeitschr.* **64**: 456 (1914). Biennial (60–)100–150 cm. Leaves sparsely arachnoid-hairy to -lanate or rarely glabrescent beneath; lobes linear to linear-lanceolate, with strong apical spine 4–13 mm. Capitula few, in a lax corymb, with 1–4 subtending leaves shorter than capitulum. Involucre 30–40 × 30–45(–50) mm, sparsely arachnoid-hairy to subglabrous (rarely villous); bracts erecto-patent to suberect; middle somewhat widened to the purple, sparsely denticulate-ciliate or weakly spinescent apex, with apical spine 2–5 mm. Corolla 29–35 mm, purple; tube longer than limb. Achenes 5–6 mm; pappus 25–30 mm. ● *S. Italy* (*hills N. of Amalfi*). It.

9. C. tenoreanum Petrak, *Cirsiotheca Universa* **17**: n. 168 (1921). Biennial 15–60(–100) cm. Leaves arachnoid-lanate to -tomentose beneath; lobes linear-triangular to linear-lanceolate, with rigid apical spine 3–10(–15) mm. Capitula usually numerous, in a dense corymb, with 2–8 subtending leaves equalling or somewhat exceeding capitulum. Involucre (17–)20–25(–30) × 12–30 mm, densely, rarely sparsely, arachnoid-lanate; bracts patent; middle with a rhombic, purple, fimbriate-ciliate appendage and weak apical spine 1·5–3·5 mm. Corolla 17–28 mm, purple; tube as long as limb. Achenes 5–6 mm; pappus 16–22 mm. ● *C. & S. Italy.* It.

10. C. lobelii Ten., *Ind. Sem. Horti Neap.* **1830**: 16 (1830). Biennial (20–)30–50 cm. Leaves arachnoid-lanate beneath; lobes linear-triangular to -lanceolate, with stout apical spine 4–12(–20) mm. Capitula solitary or few, crowded at apex of stem, with 3–6 subtending leaves equalling or exceeding capitulum and numerous others shorter than capitulum. Involucre 30–50 × 30–50 mm, arachnoid-lanate; outer bracts suberect; middle erecto-patent, widened into a somewhat lanceolate, pale, irregularly denticulate-fimbriate appendage with slender apical spine 2·5–5 mm. Corolla 25–35 mm, purple; tube longer than limb. Achenes *c.* 5 mm; pappus 21–31 mm. ● *C. Italy.* It.

11. C. morisianum Reichenb. fil., *Icon. Fl. Germ.* **15**: 59 (1852). Biennial (20–)60–100(–150) cm. Leaves narrowly auriculate-semiamplexicaul, sparsely arachnoid-lanate or glabrescent beneath; lobes linear- to lanceolate-triangular, with stout apical spine 5–15(–23) mm. Capitula in a sparingly to much-branched raceme, with 1–5 subtending leaves equalling or slightly exceeding capitulum. Involucre 35–50 × 35–50(–60) mm, sparsely, rarely densely, arachnoid-lanate to glabrescent; bracts narrowing gradually into the stout, patent to recurved, compressed-subulate apical spine 10–30 mm. Corolla 30–35 mm, purple. Achenes 5–6 mm; pappus 20–26 mm. ● *S.W. Alps, Appennini.* Ga It.

12. C. richteranum Gillot, *Bull. Soc. Bot. Fr.* **27**: li (1880) (*C. turbinatum* Gillot). Like **11** but plant 15–50(–60) cm; leaves broadly auriculate-semiamplexicaul; capitula crowded in a corymbose panicle, rarely solitary on few branches, with 5–10 pinnatifid, squarrose-spiny, subtending leaves 1½–3 times as long as capitulum; involucre arachnoid-lanate, the bracts with rather stout, erecto-patent to patent apical spine 4–8 mm; corolla 25–31 mm. ● *Pyrenees, Corbières.* Ga ?Hs.

13. C. costae (Sennen & Pau) Petrak, *Biblioth. Bot. (Stuttgart)* **78**: 41 (1912). Biennial 20–80 cm. Leaves broadly auriculate-semiamplexicaul, very shortly setose above, sparsely arachnoid-lanate to -tomentose beneath; lobes narrowly triangular to linear-triangular, with rather stout apical spine 3–12 mm. Capitula in a sparingly branched raceme, with 3–10 squarrose-spiny subtending leaves shorter to slightly longer than capitulum. Involucre 35–45 × (35–)40–50 mm, glabrous or sparsely arachnoid-hairy, rarely sparsely arachnoid-lanate; middle bracts slightly widened to the spinulose-denticulate apex, with apical spine 2–4 mm. Corolla 34–38 mm, purple. Achenes 5–6 mm; pappus 21–30 mm. ● *N.E. Spain.* Hs.

14. C. giraudiasii Sennen & Pau, *Bull. Acad. Int. Géogr. Bot. (Le Mans)* **18**: 475 (1908). Like **13** but leaves attenuate-sessile or narrowly auriculate-semiamplexicaul, sparsely arachnoid-hairy to glabrous beneath; lobes oblong to lanceolate or narrowly triangular; capitula in a much-branched panicle, with 5–12 subtending leaves usually much longer than capitulum; involucre 25–40 × 25–40(–45) mm; middle bracts with ciliate apex; corolla 24–35 mm. ● *C. Spain.* Hs.

15. C. eriophorum (L.) Scop., *Fl. Carn.* ed. 2, **2**: 130 (1772) (incl. *C. chatenieri* Le Grand, *C. vandasii* Petrak). Biennial (40–)60–150(–250) cm. Leaves shortly setose above, sparsely arachnoid-lanate to -tomentose beneath; lobes lanceolate, with stout to slender, rigid apical spine (1–)5–12(–25) mm. Capitula usually few, more or less long-pedunculate, in a lax raceme or corymb, with few to numerous subtending leaves shorter than to twice as long as capitulum. Involucre 30–50 × (30–)40–70 mm, usually densely arachnoid-lanate, rarely subglabrous; bracts smooth or with short marginal spinules distally; outer patent to recurved; middle with or without a rhombic to lanceolate apical appendage and a usually weak apical spine (0·5–)1–4(–5) mm. Corolla 25–44 mm, purple. Achenes 4·5–6 mm; pappus 20–33 mm. $2n = 34$. ● *W. & C. Europe, northwards to N. England, and extending to N. Italy and W. & S. parts of Balkan peninsula.* Al Au Be Br Cz Ga Ge Gr He Ho Hs Hu It Ju Po Rm.

A very variable species in which many subordinate taxa have been described, particularly in the Balkan peninsula. Most of them refer to various intermediates between **15** and **18** and no subdivision seems advisable in the present stage of knowledge.

16. C. odontolepis Boiss. ex DC., *Prodr.* **7**: 305 (1838). Biennial (20–)40–100(–150) cm. Leaves with long, patent setae above, sparsely arachnoid-lanate to arachnoid-hairy beneath; lobes narrowly triangular to oblong, with stout apical spine 5–15 mm. Capitula several, shortly pedunculate, rarely solitary, with 5–16 erect, squarrose-spiny subtending leaves exceeding capitulum. Involucre 30–45 × (25–)30–50 mm, sparsely arachnoid-hairy to -lanate; bracts with smooth margin; outer suberect; middle with rhombic to lanceolate, scarious-fimbriate appendage and weak apical spine 1–4 mm; spines absent on inner surface. Corolla 33–42 mm, white or purple. Achenes 4·5–6 mm; pappus 25–31 mm. *C., E. & S. Spain, S. France.* Ga Hs.

17. C. spathulatum (Moretti) Gaudin, *Fl. Helv.* **5**: 202 (1829). Biennial 50–100 cm. Leaves shortly setose above, sparsely arachnoid-hairy to -lanate beneath; lobes lanceolate, with rather stout apical spine 3–12 mm. Capitula few, shortly pedunculate, with 3–8 subtending leaves shorter than to equalling capitulum. Involucre 30–40 × 30–40 mm, glabrous or rarely sparsely arachnoid-hairy; bracts with smooth margin; outer recurved; middle patent, with rhombic, broadly scarious-margined, fimbriate appendage and weak apical spine 1–2 mm, the curved part spinulose on inner surface, the appendage with a narrow, spiny wing or a row of short spinules on inner surface. Corolla 29–33 mm, purple. Achenes 5–5·5 mm; pappus 24–27 mm. ● *S.W. & S. Alps, eastwards to c.* 11° 30′ *E.* ?Ga He It.

18. C. ligulare Boiss., *Fl. Or.* **3**: 529 (1875). Biennial 20–150 (–200) cm. Leaves sparsely to densely arachnoid-lanate, rarely tomentose or sparsely arachnoid-hairy beneath; lobes narrowly lanceolate to oblong-triangular, with apical spine 3–20 mm. Capitula usually few in a lax raceme or corymb, with short to long peduncles, usually with 1–10 subtending leaves. Involucre 25–45 × 25–50(–60) mm, glabrous to arachnoid-lanate; bracts sometimes with short marginal spinules, the curved part spinulose-scabrid on inner surface; outer recurved to patent; middle to inner patent, gradually widened towards the apex, with rather cochleariform or galeate, more or less scarious-fimbriate to -laciniate appendage 1·5–5·5 mm wide and apical spine 1–6(–10) mm, the appendage often with short spinules scattered or in rows or rarely forming a narrow wing on inner surface. Corolla 24–35(–39) mm, purple. Achenes 4·5–5·5(–6·5) mm; pappus 22–32 mm. *Balkan peninsula, S. Romania.* Al Bu Gr Ju Rm.

A very variable species showing a series of altitudinal variants, differing in height, degree of spininess and size of involucral appendages, which are sometimes treated as infraspecific taxa.

C. sintenisii Freyn, *Bull. Herb. Boiss.* **3**: 466 (1895), from Anatolia, has been recorded from S. Romania, probably in error for **18**, from which it differs in the involucral bracts having flat, lanceolate, spinose-dentate to -fimbriate appendages 1–1·8 mm wide.

19. C. grecescui Rouy, *Bull. Soc. Bot. Fr.* **37**: 164 (1890). Like **18** but leaf-lobes oblong-elliptical to broadly lanceolate, more or less obtuse; involucre lanate-floccose (rarely subglabrous); middle bracts with patent marginal spines up to 1·2 mm and rhombic to elliptical appendage 1·5–3·5 mm wide, with apical spine 1–4 mm. ● *S. & E. Romania, N.E. Jugoslavia.* Ju Rm.

20. C. decussatum Janka, *Linnaea* **30**: 582 (1860) (incl. *C. polonicum* (Petrak) Iljin). Biennial 60–150(–200) cm. Leaves sparsely arachnoid-lanate beneath; lobes linear-lanceolate to oblong, with strong apical spine 2–12 mm. Capitula solitary or few, long-pedunculate, with 5–16 subtending leaves equalling or exceeding capitulum. Involucre 30–50 × 40–60(–70) mm, densely arachnoid-lanate to sparsely arachnoid-hairy; bracts patent, divided into wide basal and narrow distal part, with remote

marginal spines 0·5–1·7 mm, the curved part minutely spinulose-scabrid on inner surface, the apex smooth; middle bracts slightly widened in apical part or with purple apical appendage 1–2 mm wide, with spinose-ciliate to subscarious-fimbriate margin and usually weak apical spine 1·5–4(–7) mm. Corolla 27–42 mm, purple. Achenes 5–7 mm; pappus 22–34 mm. ● *E.C. Europe and S. & W. parts of U.S.S.R.* Cz Po Rm Rs (C, W, E).

21. C. boujartii (Piller & Mitterp.) Schultz Bip., *Österr. Bot. Wochenbl.* **6**: 205 (1856). Biennial. Leaves sparsely arachnoid-lanate to -tomentose beneath; lobes oblong- to triangular-lanceolate. Capitula few, with usually 1–4 subtending leaves shorter than to slightly exceeding capitulum. Involucre 25–35 × 30–40(–50) mm, sparsely arachnoid-hairy to -lanate; outer bracts recurved; middle patent, with dense marginal spines 0·5–2 mm, with distinct setose spinules up to 0·7 mm on inner surface of the curved part. Corolla 20–26 mm, purple. Achenes 5–5·5 mm; pappus 20–24 mm. ● *Romania; Crna Gora and N. Albania.* Al †Hu Ju Rm.

(a) Subsp. **boujartii**: Stem 80–150 cm. Leaf-lobes with slender apical spine 4–10 mm. Capitula usually solitary on long branches. Middle involucral bracts with marginal spines longer than the width of the bract, slightly widened distally, with weak apical spine 2–3·5 mm. *Romania.*

(b) Subsp. **wettsteinii** Petrak, *Österr. Bot. Zeitschr.* **60**: 351 (1910) (*C. intraspinulosum* Jáv.): Stem 40–100 cm. Leaf-lobes with stout apical spine 6–15 mm. Capitula solitary or in clusters of 2–3 on short branches. Middle involucral bracts with somewhat dense marginal spines about as long as the width of the bract, scarcely widened distally, with strong apical spine 3–5 mm. *Mountains of Crna Gora and N. Albania.*

22. C. furiens Griseb. & Schenk, *Arch. Naturgesch.* (*Berlin*) **18 (1)**: 348 (1852). Biennial 80–150 cm. Leaves arachnoid-lanate to -tomentose beneath; lobes oblong to lanceolate or elliptical, with slender apical spine 4–10(–15) mm. Capitula in a rather dense corymb, with 1–5(–8) subtending leaves shorter than to exceeding capitulum. Involucre 20–32 × 25–35 mm, glabrous or sparsely arachnoid-hairy; outer bracts erecto-patent to recurved, the middle suberect to patent, with dense, soft marginal spines 1·5–3 mm, 3–5 times as long as width of bract, with setose spinules up to 1·8 mm on inner surface of the curved part, the apex not widened, with weak apical spine 2–4·5 mm. Corolla 19–26 mm, white or red. Achenes 4–5·5 mm; pappus 17–24 mm. ● *Romania and E. Hungary.* Hu Rm.

23. C. ciliatum Moench, *Meth., Suppl.* 227 (1802). Biennial or perennial (50–)100–150 cm. Middle leaves broadly auriculate-semiamplexicaul, decurrent for *c.* 1 cm, sparsely to densely arachnoid-lanate beneath; lobes narrowly oblong to linear-lanceolate, with slender apical spine 2–7(–10) mm. Capitula few, long-pedunculate to subsessile, with 1–3 subtending leaves shorter than capitulum. Involucre 30–35 × (20–)30–40 mm, glabrous or subglabrous; bracts gradually narrowed from base to apex, with densely pectinate, rigid marginal spines 1–1·5 mm and slender apical spine 2–7 mm; outer numerous, in many rows, sharply deflexed; middle patent to erecto-patent, without ventral spinules. Corolla 24–30 mm, purple. Achenes 4·5–5·5 mm; pappus 20–26 mm. *S. part of U.S.S.R.* Rs (C, W, E).

C. ukranicum Besser ex DC., *Prodr.* **6**: 635 (1838), recorded from the S.W. part of U.S.S.R., is of doubtful status. It is intermediate between **23** and **24** in many characters and may be a hybrid between **23** (or **24**) and **20**.

24. C. serrulatum (Bieb.) Fischer, *Cat. Jard. Gorenki* ed. 2, 35 (1812). Like **23** but leaves not decurrent or at most decurrent for 0·5 cm; lobes of middle leaves oblong-elliptical to lanceolate; capitula clustered on short branches, in a corymb; involucre 20–35 × 20–35 mm; bracts with less dense, soft marginal spinules 0·2–0·8 mm and slender apical spine 2–4·5 mm, the outer less numerous, erecto-patent or rarely patent-recurved. *S. part of U.S.S.R., extending to E. Romania.* Rm Rs (C, W, K, E).

25. C. laniflorum (Bieb.) Fischer, *loc. cit.* (1812) (incl. *C. sublaniflorum* Soják, *C. tauricum* Soják). Perennial 30–80 cm. Leaves not decurrent, subcoriaceous, flat or slightly undulate, sparsely to densely arachnoid-lanate beneath; middle pinnatifid up to ¾ of way to midrib; segments with 1–3 unequal, ovate to oblong or broadly triangular lobes or teeth and slender apical spine 1–7(–10) mm. Capitula solitary or 2–4 clustered on rather short branches, usually with 1–3(–5) subtending leaves much shorter than capitulum. Involucre 20–30 × 20–30 mm, sparsely arachnoid-hairy to -lanate; bracts divided into a wide basal and a narrow acicular to subulate, usually patent apical part, smooth or with remote marginal spinules 0·2–0·8 mm, with rigid apical spine 2–3·5 mm, without spinules on inner surface. Corolla 20–30 mm, purple or pink. Achenes 5–5·5 mm; pappus 15–22 mm. ● *S. Krym; Turkey-in-Europe.* Rs (K) Tu.

A variable species in which leaf-division, and the size of leaf-segments and involucral bracts have been used for delimiting several taxa of doubtful validity.

26. C. scabrum (Poiret) Bonnet & Barratte, *Cat. Rais. Pl. Vasc. Tunisie* 238 (1896). Perennial (60–)100–200(–400) cm. Leaves very large, decurrent for *c.* 1 cm, flat, sparsely arachnoid-lanate to -tomentose beneath, pinnatifid for up to ½-way to midrib; segments broadly triangular, with 2–3 shortly triangular lobes or teeth and strong apical spines 3–10 mm. Capitula 1–3 at apex of long branches, in a lax panicle, with 3–6 subtending leaves shorter than to equalling capitulum. Involucre 23–30(–35) × 18–26 mm, sparsely arachnoid-hairy to -lanate; bracts appressed, gradually narrowed into the erecto-patent apical spine 0·5–1(–2) mm. Corolla 22–28 mm, usually pink. Achenes 4·5–5 mm; pappus 17–22 mm. *W. Mediterranean region.* Hs It Sa Si.

27. C. echinatum (Desf.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **5**: 465 (1815). Perennial (15–)20–40 cm. Middle leaves decurrent for *c.* 1 cm, arachnoid-lanate beneath, pinnatisect; segments deeply divided into 2 slightly divaricate, narrowly to broadly triangular or oblong-triangular lobes with stout apical spines (4–)6–12(–15) mm. Capitula in a corymb, with 2–8 subtending leaves usually exceeding capitulum. Involucre 30–40 × 25–40(–45) mm, sparsely arachnoid-lanate to sparsely arachnoid-hairy; bracts with patent apex and strong apical spine 2–4 mm. Corolla (25–)32–40 mm, purple. Achenes 5–6·5 mm; pappus as long as corolla. *W. Mediterranean region.* Bl Ga Hs Si.

28. C. vulgare (Savi) Ten., *Fl. Nap.* **5**: 209 (1835–1838) (*C. lanceolatum* (L.) Scop., non Hill; incl. *C. crinitum* Boiss. ex DC.). Biennial (20–)50–150(–300) cm; stem winged. Leaves decurrent for the whole internode, or the upper less so, sparsely arachnoid-hairy to -tomentose beneath; lobes narrowly lanceolate or narrowly triangular to elliptic-lanceolate, with weak to strong apical spine 2–10(–15) mm. Capitula shortly to long-pedunculate, in a panicle or corymb, usually without subtending leaves. Involucre (25–)30–40 × 20–40 mm, sparsely arachnoid-hairy to -lanate, rarely subglabrous; bracts gradually narrowed into the pungent apical spine 2–3·5 mm. Corolla 26–36 mm, purple. Achenes 3·5–5 mm; pappus 20–30 mm. $2n = 68, 102$. *Almost throughout Europe.* All except Cr Fa Is Sb.

Variable in size and texture of leaves, indumentum, branching, and attitude of involucral bracts. On the basis of these

characters several taxa have been described but there is insufficient morphological and chorological delimitation to give them subspecific rank.

29. C. italicum (Savi) DC., *Cat. Pl. Horti Monsp.* 96 (1813). Biennial or annual (15–)20–45(–60) cm, usually much-branched; stem winged. Leaves decurrent for about half the length of the internode, sparsely arachnoid-lanate to -tomentose or rarely glabrescent beneath; lobes linear-triangular to narrowly triangular, with slender apical spine 4–12 mm. Capitula crowded at apex of stems and branches, with 3–8 subtending leaves much exceeding capitulum. Involucre 13–20 × 8–15 mm, sparsely arachnoid-hairy to subglabrous; bracts appressed, oblong, with conspicuous vittae, obtuse, with rigid, patent apical spine 2·5–7 mm, the inner with scarious, minutely setulose appendage. Corolla 12–14 mm, purple; tube half as long as limb. Achenes 2·5–3 mm; pappus 9–11 mm. *C. & E. Mediterranean region.* Al Bu Co ?Ga Gr It Sa Si Tu.

An isolated species, in appearance and distribution somewhat resembling **59.**

Sect. CIRSIUM (Sect. *Chamaeleon* DC.). Leaves without rigid setae on the upper surface. Florets hermaphrodite, or the outermost functionally male or sterile. Corolla-limb 5-fid to about halfway, about as long as tube. Pappus shorter than, rarely equalling, corolla.

(30–32). C. tuberosum group. Perennial (10–)30–80(–140) cm. Stem simple or sparingly branched, usually leafless above the middle, greyish. Leaves herbaceous, lanceolate or oblong to oblong-elliptical, patent-pubescent above and particularly on the veins beneath, also with arachnoid hairs; lobes with soft (rarely pungent) spines up to 2(–7) mm. Capitula usually solitary, long-pedunculate, rarely in clusters of 2–3, shortly pedunculate to subsessile. Involucre (14–)15–20(–25) × 11–25 mm; bracts with indistinct vittae and weak spinule. Corolla 15–25 mm, purple. Achenes 3–5 mm; pappus 13–21 mm.

The 3 species are closely related and sometimes difficult to distinguish, especially in France and N. Spain, and could probably be treated as subspecies.

1 Roots without tubers; leaves usually lobed, with broadly triangular lobes **30. dissectum**
1 Roots with fusiform tubers; leaves usually pinnatifid to pinnatisect, with oblong, divaricate lobes
2 Involucral bracts usually with patent apex, acute **31. filipendulum**
2 Involucral bracts erect, the outer obtuse **32. tuberosum**

30. C. dissectum (L.) Hill, *Hort. Kew.* 63 (1768) (*C. anglicum* (Lam.) DC.). Plant with short rhizome and short stolons; roots cylindrical (rarely somewhat fusiform). Stem usually simple. Leaves semiamplexicaul, lobed or entire (rarely pinnatifid), sparsely arachnoid-hairy above, sparsely to densely arachnoid-lanate-tomentose beneath; segments broadly triangular, dentate to lobed. Capitula 1(–3), pedunculate or subsessile. Involucral bracts appressed, acute. *Wet places, usually on peaty soils.* ● *W. Europe.* Be Br Ga Ge Hb Ho Hs ?It [Hu No].

31. C. filipendulum Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1861**: 92 (1861). Plant with long subterranean stolons; some roots with fusiform tubers. Stem usually simple. Leaves auriculate-semiamplexicaul, pinnatifid to pinnatisect, rarely lobed, sparsely arachnoid-hairy above, sparsely arachnoid-hairy to -lanate beneath; segments with 3–5 triangular to oblong, dentate lobes, often with pungent spines. Capitula 1–3, pedunculate or rarely subsessile. Involucral bracts acute, usually with patent apex, rarely erect. $2n=34$. *Grassland and heaths.* ● *S.W. Europe.* Ga Hs Lu.

32. C. tuberosum (L.) All., *Fl. Pedem.* **1**: 151 (1785). Plant with short rhizome; roots with fusiform tubers. Stem with 2–3(–6) long branches or simple. Leaves sessile to semiamplexicaul, deeply pinnatifid to pinnatisect, scarcely arachnoid-hairy above, sparsely arachnoid-hairy beneath; segments with 2–3(–5) oblong to elliptic-lanceolate, dentate lobes. Capitula solitary. Involucral bracts erect; outer obtuse; middle obtuse to acute. $2n=34$. *Usually in rather damp grassland; calcicole.* ● *W. & W.C. Europe, extending to N. Italy.* †Au Br Ga Ge He Hs It *Ju [Be Cz].

33. C. rivulare (Jacq.) All., *Auct. Fl. Pedem.* 10 (1789) (*C. tricephalodes* (Lam.) DC.). Perennial (20–)40–100(–120) cm, with fibrous roots. Stem simple or sparingly branched, leafless above the middle or with few small bract-like leaves. Leaves herbaceous, elliptical to oblong-lanceolate, pinnatifid or rarely entire, flat, often incised only at the base, patent-puberulent; segments narrowly oblong to narrowly triangular, lobed or dentate, with weak spinules up to 2 mm. Capitula solitary or in apical clusters of 2–5, sometimes shortly pedunculate, erect. Involucre (13–)15–20(–23) × 15–20(–25) mm; bracts suberect, with distinct vittae; outer with weak spinule; middle usually unarmed. Corolla 14–21 mm, purple; limb divided to more than halfway. Achenes 3·5–5·5 mm; pappus 14–20 mm. $2n=34$. *Damp places; somewhat calcifuge.* ● *C. Europe, extending to W. part of U.S.S.R., S. Romania, C. Jugoslavia, N. Italy and locally westwards to the Pyrenees.* Al Au Cz Ga Ge He Hs Hu It Ju Po Rm Rs (B, C, W) [Su].

34. C. montanum (Waldst. & Kit. ex Willd.) Sprengel, *Syst. Veg.* **3**: 376 (1826) (*C. tricephalodes* auct., non (Lam.) DC.). Perennial (40–)80–180(–200) cm. Stem simple or sparingly branched above, usually leafless just below apex. Leaves herbaceous, elliptical, pinnatifid, flat, subglabrous; segments narrowly triangular to oblong, dentate to shortly lobed, with weak marginal spinules up to 2 mm. Capitula in apical clusters of 2–8, rarely solitary, usually erect, sometimes exceeded by 1–3 upper leaves. Involucre 15–20 × 14–18(–21) mm; bracts with patent to deflexed apex and conspicuous vittae, with pungent spinule. Corolla 16–25 mm, purple; limb divided to halfway. Achenes 4–5·5 mm; pappus 15–22 mm. *Damp woods and meadows.* ● *S. Alps, N. & C. Appennini, mountains of N. Jugoslavia.* Ga It Ju.

35. C. erisithales (Jacq.) Scop., *Annus Hist.-Nat.* **2**: 62 (1769). Perennial (30–)60–120(–150) cm. Stem usually sparingly branched, leafless above the middle or with few small, bract-like leaves. Leaves herbaceous, oblong-elliptical to elliptical, pinnatisect, flat, pubescent; segments oblong to elliptical, dentate to lobed, with weak spinules up to 2 mm. Capitula solitary or in apical clusters of 2–3(–5), nodding. Involucre (13–)15–20 × 16–22 mm; bracts with conspicuous vittae and a usually patent apex, spinulose. Corolla 14–20(–22) mm, usually yellow. Achenes 4–5 mm; pappus 15–20 mm. $2n=34$. *Damp grassland, stony slopes and open woodland; calcicole.* ● *Mountain regions of Europe, from S.C. France and the Carpathians southwards to C. Appennini and E.C. Greece; also in the lowlands of W. margin of U.S.S.R.* Al Au Cz Ga Gr He Hu It Ju Po Rm Rs (C, W).

36. C. appendiculatum Griseb., *Spicil. Fl. Rumel.* **2**: 250 (1846). Perennial (50–)100–190 cm. Stem simple or rarely sparingly branched above, usually leafy up to the apex. Lower leaves

elliptical; upper somewhat coriaceous, oblong-lanceolate, undulate, deeply pinnatifid, subglabrous; segments 3- to 5-lobed; lobes narrowly triangular to oblong, with stout spines (3–)5–13 mm. Capitula in apical clusters of (3–)6–8(–10), usually erect. Involucre 15–20 × (12–)15–20 mm; bracts with patent apex and conspicuous vittae, with pungent spine 1–3 mm. Corolla 18–30 mm, purple. Achenes 4–6 mm; pappus 15–20 mm. $2n=68$. *Damp, shady places.* ● *Balkan peninsula.* Al Bu Gr Ju.

37. C. waldsteinii Rouy, *Fl. Fr.* **9**: 84 (1905) (*C. pauciflorum* (Waldst. & Kit.) Sprengel, non Lam.). Perennial 50–150(–200) cm. Stem simple or rarely sparingly branched, usually leafy up to the apex. Leaves herbaceous, flat, more than 10 cm wide, broadly ovate to ovate-orbicular, lobed or doubly dentate, with weak spinules up to 2 mm, pubescent above, sparsely arachnoid-lanate beneath. Capitula in apical clusters of 3–8, more or less nodding. Involucre (15–)17–23 × 15–22 mm; bracts with patent apex and distinct vittae; outer often with a slender spinule; middle spineless. Corolla 18–27(–30) mm, purple. Achenes 5–6 mm; pappus 15–20 mm. $2n=68$. *Damp or shady places; calcifuge.* ● *E. Alps, E. & S. Carpathians, mountains of N. & C. Jugoslavia.* Au Cz Ju Po Rm Rs (W).

38. C. hypoleucum DC., *Prodr.* **6**: 645 (1838). Perennial (70–)80–150 cm. Stem with long branches above the middle, purplish, usually leafless towards the apex. Leaves herbaceous, flat, elliptical to lanceolate, pinnatifid, sometimes incised only at the base and lobed towards the apex, amplexicaul, crispate-pubescent above, white-tomentose beneath; segments broadly triangular, lobed or dentate, with soft to pungent spines 2–4 mm. Capitula 1–4 on short to long peduncles or in apical clusters of 2–3, erect. Involucre 17–21 × (12–)15–22 mm; bracts with shortly patent or rarely deflexed apex and more or less distinct vittae; outer with weak spinule; middle acute, unarmed. Corolla 16–20 mm, purple. Achenes *c.* 4 mm; pappus 13–16 mm. *Woods. Turkey-in-Europe* (*Belgrad forest, near Istanbul*). Tu. (*S.W. Asia.*)

39. C. carniolicum Scop., *Fl. Carn.* ed. 2, **2**: 128 (1772). Perennial (30–)60–100(–120) cm, villous, with long reddish-brown, flexuous hairs. Stem usually sparingly branched towards the apex. Leaves herbaceous, flat, often shortly decurrent, broadly ovate to elliptical, lobed (rarely lobed only at the base); lobes broadly triangular, dentate, with weak spines 2–8 mm. Capitula in apical clusters of 2–7 or solitary and shortly pedunculate, subtended by narrowly lanceolate leaves with reddish-brown long-spinose fimbriae. Involucral bracts with patent, weakly spiny apex, the vittae absent or very indistinct. Corolla 17–21 mm, pale yellow. Achenes 5–7 mm; pappus 14–21 mm. *Grassland and scrub; calcicole.* ● *E. Alps; W. & C. Pyrenees.* Au Ga Hs It Ju.

(a) Subsp. **carniolicum**: Capitula with 2–5(–8) subtending leaves about as long as capitulum. Involucre 16–20 × (15–)18–28(–30) mm; outer bracts shorter than middle and inner, with short, erecto-patent apex; inner with fimbriate-ciliate, scarious apex. $2n=16$. *E. Alps.*

(b) Subsp. **rufescens** (Ramond ex DC.) P. Fourn., *Quatre Fl. Fr.* 1006 (1940): Capitula with at least 10 subtending leaves much longer than capitulum. Involucre 20–24 × 18–26 mm; bracts subequal, with long, patent apex; inner not or scarcely scarious-ciliate, spinescent. *W. & C. Pyrenees.*

40. C. oleraceum (L.) Scop., *Annus Hist.-Nat.* **2**: 61 (1769). Perennial (20–)50–150(–170) cm. Stem simple or sparingly branched, sparsely greyish-arachnoid-hairy above. Leaves herbaceous, flat, sessile, elliptic-lanceolate to ovate-elliptical, pinnatifid to dentate, subglabrous; segments oblong-lanceolate, dentate, weakly spinulose-ciliate. Capitula in apical clusters of 2–6 or solitary, pedunculate, with 2–10 large, ovate, pale, weakly spinulose-ciliate subtending leaves exceeding capitulum. Involucre 18–23(–26) × (13–)15–24 mm; bracts appressed, with indistinct vittae and weak spinule 1–3 mm. Corolla (14–)18–25 mm, usually pale yellow. Achenes 4–5·5 mm; pappus (12–)15–21 mm. $2n=34$. *Damp meadows and woods. Throughout a large part of Europe, but absent from the islands, most of the Mediterranean region and much of the north.* Au Be Bu Cz Da Ga Ge He Ho *Hs Hu It Ju No Po Rm Rs (N, B, C, W, E) Su [Fe Hb].

41. C. spinosissimum (L.) Scop., *op. cit.* 62 (1769). Perennial (15–)20–50(–120) cm. Stem simple or sparingly branched, patent-pubescent to -villous. Leaves subcoriaceous, undulate, auriculate-semiamplexicaul, shortly decurrent, broadly oblong to oblong-lanceolate or elliptical, pinnatifid, patent-pubescent to subglabrous; segments suborbicular to broadly triangular, lobed, with rather strong spines 3–10(–15) mm. Capitula in apical clusters of (1–)2–10, with lanceolate, spinose-pinnatifid, undulate subtending leaves. Involucre 18–25(–28) × 15–26 mm; bracts with apical part as long as or longer than basal part, with apical spine (3–)5–10 mm, without vittae. Corolla 13–19 mm, pale yellow. Achenes 3–5 mm; pappus 12–18 mm. *Wet mountain pastures and screes.* ● *Alps, N. & C. Appennini, Alpi Apuane.* Au Ga Ge He It Ju.

(a) Subsp. **spinosissimum**: Capitula with at least 8 herbaceous subtending leaves much longer than capitulum. Outer involucral bracts much shorter than the middle and inner, suberect; middle with erecto-patent apex; inner erect, not ciliate. $2n=34$. *Alps.*

(b) Subsp. **bertolonii** (Sprengel) Werner, *Bot. Jour. Linn. Soc.* **70**: 18 (1975) (*C. bertolonii* Sprengel): Capitula with 2–5 coriaceous subtending leaves scarcely longer than capitulum. Outer and middle involucral bracts subequal, with patent apex; inner suberect, with fimbriate-ciliate apex. $2n=34$. *Appennini, Alpi Apuane.*

C. obvallatum (Bieb.) Bieb., *Fl. Taur.-Cauc.* **3**: 559 (1819), from S.W. Asia, has been recorded from the mountains of E. Jugoslavia, probably in error. It is like **41** but has the stem 40–100(–150) cm, leaves pinnatifid to pinnatisect, glabrous above, crispate-villous to glabrescent beneath, the capitula subtended and exceeded by numerous narrow, pectinate leaves which are nearly reduced to long spines, the involucre 15–20 × 15–20 mm, with appressed bracts having an apical spine 1–2·5 mm and distinct vittae.

42. C. glabrum DC. in Lam. & DC., *Fl. Fr.* ed. 3, **5**: 463 (1815). Perennial (10–)20–40(–60) cm. Stem simple or sparingly branched, patent-puberulent. Leaves coriaceous, undulate, attenuate-sessile, not decurrent, oblong, pinnatifid, subglabrous; segments suborbicular to broadly triangular, lobed, with stout spines (7–)9–13(–16) mm. Capitula usually solitary, pedunculate, with 5 or more, linear-lanceolate, long-spiny, undulate subtending leaves exceeding capitulum. Involucre 17–25 × (18–)20–25(–30) mm; bracts with erecto-patent to suberect apical part much shorter than the basal part and a spine 1·5–4 mm, the vittae absent or indistinct. Corolla 18–22 mm, pale yellow. Achenes 5–7 mm; pappus 18–23 mm. $2n=34$. *Damp screes and streamsides.* ● *Pyrenees.* Ga Hs.

C. albicans Willk., *Linnaea* **30**: 109 (1859), described from S. Spain (prov. Granada), is a little-known species or possibly a hybrid, which is like **42** but has the stem 30–100 cm, subglabrous, leaves with spines 3–5 mm, capitula smaller, 1–3 in a dense corymb or cluster, the uppermost leaves shorter than the capitulum, involucral bracts with a weak spine up to 2 mm and distinct vittae and whitish corolla.

43. C. candelabrum Griseb., *Spicil. Fl. Rumel.* **2**: 251 (1846). Glabrous biennial 150–200(–300) cm. Stem much-branched. Leaves coriaceous, undulate, lanceolate to oblong, pinnatifid; segments triangular, lobed; lobes dentate, with stout spines (6–)10–15(–25) mm. Capitula in clusters of 4–12, subsessile at apex of short branches, forming a long panicle, with 2–8 narrow, rigid, undulate, spiny subtending leaves about as long as capitulum. Involucre 14–19 × 7–13 mm; bracts appressed, with distinct vittae; outer with rather stout, erecto-patent spine 1–3 mm; middle to inner somewhat expanded and spinescent-ciliate at apex. Corolla 13–17 mm, white or whitish-yellow. Achenes 3·5–5 mm; pappus 13–16 mm. *Grassland, scrub, stony places.* ● *Balkan peninsula, S.W. Romania.* Al Bu Gr Ju Rm.

C. echinus (Bieb.) Hand.-Mazz., *Ann. Naturh. Mus. (Wien)* **23**: 197 (1909) (*C. scleranthum* Bieb.), from Anatolia, has been recorded from Turkey-in-Europe and Czechoslovakia, but probably only as a casual. It is like **43** but differs in the pubescent stem 40–60(–130) cm, leaves whitish-arachnoid-tomentose beneath, the capitula solitary or in clusters of 2–3 on short branches, the outer involucral bracts with an ovate, whitish-fimbriate appendage and an apical spine 4–6 mm, and the corolla 17–20 mm.

44. C. acaule Scop., *Annus Hist.-Nat.* **2**: 62 (1769). Perennial, acaulescent or rarely with stem 5–15(–35) cm. Leaves herbaceous, undulate, oblong to oblong-lanceolate, pinnatisect; segments ovate to suborbicular, with 2–5 spinose-dentate lobes. Involucre 20–32 × (10–)16–25(–30) mm; bracts appressed, the vittae absent or indistinct. Corolla 23–35 mm, purple. Achenes 3–5 mm. *From N. England and Estonia southwards to S. Spain, C. Jugoslavia and S.E. Russia.* Au Be Br Cz Da Ga Ge He Ho Hs It Ju No Po Rm Rs (B, C, W, E) Su.

1 Leaf-lobes with slender, pungent spines 2–5(–7) mm; middle involucral bracts obtuse, not spiny **(a) subsp. acaule**
1 Leaf-lobes with stout, yellowish spines (3–)6–12 mm; middle involucral bracts usually acute, with pungent spinules
2 Capitula 1–5; pappus 18–22 mm, much shorter than the corolla **(b) subsp. gregarium**
2 Capitula usually (3–)5–12; pappus 24–30 mm, about equalling the corolla **(c) subsp. esculentum**

(a) Subsp. **acaule**: Acaulescent, rarely with stem up to 15(–35) cm. Leaves patent-pubescent beneath especially on the veins; lobes with slender, pungent spines 2–5(–7) mm. Capitula usually solitary, rarely 2–3(–8), shortly pedunculate, with 1–3 subtending leaves about as long as capitulum. Involucral bracts obtuse; outer with spinule up to 1 mm. Pappus 21–27 mm, slightly shorter than the corolla. $2n = 34$. *Dry grassland; calcicole.* ● *Throughout the range of the species except S. Spain and most of U.S.S.R.*

(b) Subsp. **gregarium** (Boiss. ex DC.) Werner, *Bot. Jour. Linn. Soc.* **70**: 19 (1975) (*C. acaule* var. *gregarium* Boiss. ex DC.): Stem 0–11(–15) cm. Leaves patent-pubescent beneath, especially on the veins; lobes with stout spines 6–12 mm. Capitula usually solitary, rarely 2–5, crowded or shortly pedunculate, with 1–3 subtending leaves equalling or exceeding capitulum. Outer involucral bracts usually obtuse, with spine 1–2 mm; middle usually acute, with pungent spinule. Pappus 18–22 mm, much shorter than the corolla. $2n = 34 + 2B$. *Damp pastures and screes.* ● *Mountains of S. Spain.*

(c) Subsp. **esculentum** (Sievers) Werner, *loc. cit.* (1975) (*Cnicus esculentus* Sievers, *Cirsium esculentum* (Sievers) C. A. Meyer): Stem (0–)5–10(–35) cm. Leaves patent-pubescent beneath, sparsely arachnoid-hairy especially on the veins; lobes with stout spines 3–10 mm. Capitula usually (3–)5–12 crowded at apex or rarely shortly pedunculate, with 2–8 subtending leaves about as long as capitulum. Involucral bracts long; outer rather obtuse, with spine 2–4 mm; middle acute, with spines up to 1 mm. Pappus 24–30 mm, about equalling corolla. *Steppes and saline soils. U.S.S.R., northwards to* c. 56° *N. and westwards to* c. 34° *E.*

45. C. mairei Halácsy, *Consp. Fl. Graec., Suppl.* 59 (1908). Perennial 20–40 cm. Stem simple, leafy up to the apex. Leaves coriaceous, undulate, oblong, pinnatisect, pubescent above, sparsely arachnoid-lanate beneath; segments triangular, lobed, with strong spines 5–10 mm. Capitulum solitary, with 2–7 narrow, undulate-spiny subtending leaves shorter or rarely slightly longer than capitulum. Involucre 20–22 × 20–23 mm; bracts acute, erect, with pungent spine 1–5 mm; vittae absent. Corolla purple. *Damp meadows.* ● *S.C. Greece (Giona Oros).* Gr.

A little-known species of doubtful affinity.

C. epiroticum Petrak, *Mitt. Thür. Bot. Ges.* **2(1)**: 13 (1960), described from a single specimen from N.W. Greece (Pindhos Oros), is perhaps related to **45** but has the stem *c.* 70 cm, with *c.* 5 capitula crowded at the apex, the lower leaves shortly decurrent, lanceolate, pinnatifid, with 2-lobed segments and involucral bracts with a weak spinule 1–2 mm.

46. C. valentinum Porta & Rigo, *Atti Accad. Agiati* **9**: 38 (1892). Perennial 20–70 cm. Stem usually branched, leafless just below the apex. Leaves herbaceous, somewhat undulate, semi-amplexicaul, sometimes shortly decurrent, oblong to oblong-lanceolate, pinnatifid, with long flexuous hairs on both sides especially on the veins; segments triangular, lobed, with strong spines 4–8 mm. Capitula solitary, usually long-pedunculate, usually not subtended by leaves. Involucre 15–21(–24) × 13–20 mm; bracts acute, with conspicuous vittae and pungent spine 1–2 mm; outer erect; middle with erecto-patent apex. Corolla 23–26 mm, purple. Pappus 16–20 mm. ● *E. Spain (S.W. of Valencia).* Hs.

A species of doubtful affinity.

47. C. helenioides (L.) Hill, *Hort. Kew.* 64 (1768) (*C. heterophyllum* (L.) Hill). Perennial (30–)40–100(–150) cm, with subterranean stolons. Stem simple or sparingly branched above, usually leafless towards the apex. Leaves herbaceous, flat, auriculate-semiamplexicaul, not decurrent, lanceolate to broadly oblong, entire or lobed to pinnatifid, glabrous or subglabrous above, white-arachnoid-tomentose beneath; segments narrowly triangular to oblong-lanceolate, entire to dentate, with soft spinules up to 2 mm. Capitula solitary, pedunculate, rarely in apical clusters of 2–4(–6), subsessile. Involucre (18–)20–28(–32) × (17–)20–35(–40) mm; bracts erect, with weak spinule up to 1 mm and distinct vittae; outermost acute; middle with obtuse to suborbicular, appendiculate, scarious-margined apex; inner with lanceolate, membranous appendage. Corolla (20–)25–30 mm, purple. Achenes 3–5 mm; pappus (18–)22–26(–32) mm, inner setae expanded at apex. $2n = c.\ 34$. *Damp grassland and scrub; somewhat calcifuge. At low altitudes in N. Europe and E. part of U.S.S.R.; mountain ranges of Europe southwards to the Pyrenees and Transylvania.* Au Br Cz Da Fe Ga Ge Hb He ?Hs It ?Ju No Po Rm Rs (N, B, C, W, E) Su [Is].

48. C. pannonicum (L. fil.) Link, *Enum. Horti Berol. Alt.* **2**: 229 (1822). Perennial (25–)40–80(–120) cm, with short rhizome and cylindrical roots. Stem simple or with 1–3 branches, leafless above. Leaves herbaceous, flat, shortly decurrent, lanceolate, entire or denticulate, usually contracted above the base, patent-pubescent to -villous and sparsely arachnoid-hairy especially on the veins, with rigid spinules 1–5 mm. Capitula solitary, long-pedunculate. Involucre 12–16(–18) × 13–17(–19) mm; bracts appressed, acute, without scarious margins, with pungent spinule up to 2 mm and conspicuous vittae. Corolla 14–20 mm, purple. Achenes 3–4·5 mm; pappus 13–16(–20) mm, inner setae not expanded at apex. $2n = 34$. *Grassland and scrub.* ● *E.C. & S.E. Europe, extending to N. Italy and northwards to* 55° *N. in C. Russia.* Au Bu Cz Hu It Ju Po Rm Rs (C, W).

49. C. heterotrichum Pančić, *Elem. Fl. Bulg.* 42 (1883). Like **48** but roots with fusiform tubers; leaves linear to narrowly oblong-lanceolate, dentate, sparsely to densely arachnoid-lanate beneath, with weak spinules *c.* 5 mm; capitula (1–)2–5, shortly pedunculate or crowded at apex, with 1–5 narrow subtending leaves shorter than capitulum; involucre 15–18 × 15–18 mm; bracts with weak spinule 1–2 mm, the vittae absent or indistinct. *Damp mountain meadows.* ● *C. part of Balkan peninsula.* Al Bu Ju ?Rm.

50. C. canum (L.) All., *Fl. Pedem.* **1**: 151 (1785). Perennial (30–)50–150(–250) cm; roots with fusiform tubers. Stem simple or sparingly branched, leafless or with few, small bract-like leaves in upper half, spinulose-winged below. Leaves herbaceous, flat, the lower decurrent for at least half the internode, all lanceolate to oblong-lanceolate or lanceolate-elliptical, usually coarsely dentate to lobed (rarely pinnatifid), patent-pubescent and scarcely arachnoid-hairy, often glabrescent, with soft spinules 1–5 mm. Capitula solitary, long-pedunculate. Involucre (12–)17–21 × (12–)20–25 mm; bracts with conspicuous vittae, obtuse (only the outermost acute); outer with patent spinule up to 1·5 mm; middle with patent, oblong-suborbicular, scarious-margined appendage, spinulose; inner with lanceolate, membranous, ciliate appendage. Corolla 15–22 mm, purple. Achenes 3–4·5 mm; pappus 14–17 mm, the inner setae expanded at apex. $2n = 34$. *Damp meadows and river-banks. C. & S.E. Europe, extending to C. Italy and northwards to* 55° *N. in C. Russia.* Al Au Bu Cz Ge Hu It Ju Po Rm Rs (C, W, E).

51. C. tymphaeum Hausskn., *Mitt. Thür. Bot. Ver.* nov. ser., **7**: 38 (1895). Like **50** but leaves somewhat coriaceous, rigid, undulate, usually only shortly decurrent, lobed to pinnatifid, glabrous, usually sparsely arachnoid-hairy only on the veins; segments ovate-triangular, lobed or dentate, with strong spines (6–)8–16(–20) mm; capitula solitary or rarely in apical clusters of 2–3, shortly pedunculate; involucre (19–)22–25 × (21–)25–30 mm; corolla 23–24 mm; achenes *c.* 4 mm; pappus (15–)18–19 mm. *By springs and other damp places.* ● *N. & C. Greece, S. Albania.* Al Gr.

52. C. monspessulanum (L.) Hill, *Hort. Kew.* 63 (1768). Perennial (20–)30–150 cm, with short stolons; tubers absent. Stem usually much-branched and leafless above, with flat wings having slender, flexible spines below. Leaves herbaceous, flat, decurrent, lanceolate to oblong-lanceolate, usually glabrous, shiny, entire to dentate (rarely lobed), with slender, soft to strong spines 4–10(–15) mm. Capitula solitary or 2–5(–10), shortly pedunculate or clustered at apex of stems and branches. Involucre 10–15 × 8–15 mm; bracts with distinct vittae and patent apex; outer acute, with weak spinule 0·5–2 mm; middle with oblong-suborbicular, scarious-ciliate apex, spinulose; inner with lanceolate, membranous appendage. Corolla 13–20 mm, purple. Achenes 2·5–4 mm; pappus 9–14 mm, the inner setae slightly expanded at apex. *Damp places. S.W. Europe, extending to C. Italy.* Ga Hs It ?Lu.

53. C. welwitschii Cosson, *Not. Pl. Crit.* 118 (1851). Like **52** but stem simple or sparingly branched; capitula solitary or rarely 2–3, shortly pedunculate; leaves only shortly decurrent, with soft spines up to 8 mm; involucre 15–20 × 20–25 mm; bracts acute, the outer erect, the middle with erecto-patent apex; corolla 18–20 mm; pappus 13–17 mm. $2n = 34$. *Damp places.* ● *W.C. Portugal; S.E. Spain.* Hs Lu.

54. C. alatum (S. G. Gmelin) Bobrov, *Bot. Žur.* **43**: 1547 (1958) (*C. desertorum* Fischer ex Link). Perennial 30–100 cm; roots with fusiform tubers. Stem usually branched above, with undulate wings bearing stout, rigid spines up to the apex. Leaves coriaceous, somewhat undulate, decurrent, narrowly lanceolate to elliptical, coarsely dentate to pinnatifid, subglabrous; segments broadly triangular, dentate, with stout, rigid spines 4–9 mm. Capitula 1–5, shortly pedunculate to subsessile. Involucre 12–17 × 9–13 mm; bracts erect, with patent, pungent spine 1–2·5 mm and usually distinct vittae; outer acute; middle subobtuse; inner with narrowly lanceolate, membranous appendage. Corolla 12–16(–20) mm, purple. Achenes 3–3·5 mm; pappus 10–13 mm. *Dry, saline steppes and maritime sands. S. & S.E. parts of U.S.S.R., and coasts of Romania and Bulgaria.* Bu Rm Rs (C, W, E).

The degree of branching and the size and division of the leaves have been used to delimit several species and subspecies. However, no satisfactory subdivision of the species seems possible on present information.

55. C. brachycephalum Juratzka, *Verh. Zool.-Bot. Ges. Wien* **7**: 99 (1857). Biennial (30–)80–110(–200) cm, with fibrous roots. Stem usually branched above, spiny-winged up to above the middle. Leaves herbaceous, undulate, glabrous; lower and middle long-decurrent, narrowly oblong- to linear-lanceolate, lobed to pinnatifid; upper shortly decurrent, linear, lobed only at the base; segments triangular, dentate to lobed, with weak to pungent spines 2–4 mm. Capitula usually numerous, crowded at apex, sessile or shortly pedunculate. Involucre 7–10 × 6–10 mm; bracts erect, sparsely arachnoid-hairy, with indistinct vittae; outer and middle with pungent, erecto-patent apical spine 1–3 mm; outer rather obtuse; middle acute; inner with suborbicular to lanceolate, membranous appendage. Corolla 7–10(–15) mm, purple. Achenes 2·5–3 mm; pappus 5–8 mm. $2n = 68$. *Fens.* ● *E.C. Europe, from E. Austria to C. Romania.* Au Cz Hu Ju Rm.

56. C. bourgaeanum Willk. in Willk. & Lange, *Prodr. Fl. Hisp.* **2**: 191 (1865). Like **55** but leaves nearly flat, elliptic-lanceolate to elliptical, pinnatifid; segments 2- to 3-lobed, with soft spines 2–3 mm; capitula 2–8, crowded at apex of stems and branches; involucre 10–12 × 7–9 mm; bracts erect, glabrous, with conspicuous vittae, the outer obtuse, with weak spinule 0·3–0·5 mm, the middle with suborbicular, membranous-ciliate appendage; achenes *c.* 4 mm; pappus *c.* 10 mm. *Marshes.* ● *C. Spain (near Ávila).* Hs.

A little-known species closely related to **57**. It requires further investigation.

57. C. palustre (L.) Scop., *Fl. Carn.* ed. 2, **2**: 128 (1772). Biennial (30–)50–120(–250) cm, with fibrous roots. Stem usually branched above the middle, spiny-winged up to the apex. Leaves herbaceous, undulate, long-decurrent, patent-pubescent above, patent-pubescent and sparsely arachnoid-lanate beneath, lanceolate to linear-lanceolate, pinnatifid, the upper lobed; segments triangular to oblong, lobed, with pungent spines 2–6(–13) mm. Capitula (1–)2–8, crowded at apex, sessile or shortly pedunculate. Involucre 9–14(–17) × 7–10(–13) mm; bracts erect, with conspicuous vittae and patent, weak spine 1–2 mm; outer and middle obtuse; inner with suborbicular to lanceolate, membranous-ciliate appendage. Corolla 10–15 mm, purple. Achenes 3–4 mm;

pappus 8–12 mm. $2n=34$. *Marshes, wet meadows and woods. Most of Europe, but rare in the Mediterranean region.* Al Au Be Br Cz Da Fa Fe Ga Ge Hb He Ho Hs Hu It Ju Lu No Po Rm Rs (N, B, C, W, E) Su.

58. C. flavispina Boiss. ex DC., *Prodr.* 7: 305 (1838). Biennial 30–100 cm, with fibrous roots. Stems much-branched above the middle, spiny-winged up to about the middle. Leaves coriaceous, undulate, oblong-lanceolate to broadly oblong, lobed to pinnatifid, sparsely arachnoid-lanate above, arachnoid-lanate to -tomentose beneath, the lower long-decurrent, the upper shortly decurrent; segments triangular to linear-triangular, dentate, with very stout spines (6–)8–12(–20) mm. Capitula 3–8(–12), crowded at apex of stems and branches, sessile or shortly pedunculate, rarely solitary and long-pedunculate. Involucre 10–16 × 7–16 mm; bracts erect, with conspicuous vittae and patent, pungent spine 1–2(–4) mm; outer obtuse; middle acute; inner without appendage. Corolla 14–18 mm, purple. Achenes 3–4 mm; pappus 11–14 mm. *Wet places. C., E. & S. Spain, N. Portugal.* Hs Lu.

59. C. creticum (Lam.) D'Urv., *Mém. Soc. Linn. Paris* **1**: 363 (1822) (*C. polyanthemum* auct., non (L.) Sprengel). Perennial 50–100(–120) cm, with some fusiform roots. Stem much-branched above the middle, spiny-winged up to the apex. Leaves coriaceous, strongly undulate, long-decurrent, with revolute margin, patent-hirsute and sparsely arachnoid-hairy above, patent-pubescent and sparsely to densely arachnoid-lanate beneath; lobes with very stout spines (2–)5–15(–20) mm. Involucre 12–17 × 7–10 mm; bracts erect, with patent spine, without vittae; outer obtuse; middle rounded or with suborbicular appendage. Corolla (10–)14–17 mm, purple. Achenes 2·5–3·5 mm; pappus 10–13 mm. *Wet meadows and marshes. C. & E. Mediterranean region.* Al Bu Co Cr Gr It Ju Rm Si Tu.

(a) Subsp. **creticum**: Leaves narrowly oblong to linear-lanceolate, pinnatifid to pinnatisect (rarely entire, dentate); segments linear-triangular, divaricately lobed. Capitula solitary, shortly pedunculate to subsessile or 2–4, crowded at apex of stems and branches. Outer involucral bracts with pungent spine 0·5–2 mm; middle with weak spine 0–1(–2) mm. *Balkan peninsula, S. Italy, Sicilia.*

(b) Subsp. **triumfetti** (Lacaita) Werner, *Bot. Jour. Linn. Soc.* **70**: 19 (1975) (*C. creticum* var. *triumfetti* Lacaita): Leaves oblong-lanceolate to elliptic-lanceolate, lobed to pinnatifid (rarely entire or dentate), with broadly to narrowly triangular, lobed segments; upper pinnatisect, with linear-triangular divaricately lobed segments. Capitula 3–12, crowded at apex of stems and branches. Outer involucral bracts with strong spine 1–3(–5) mm; middle with stout, flattened spine (2·5–)4–7(–11) mm, almost as long as bract. ● *From Corse and Sicilia eastwards to S.W. Jugoslavia.*

Sect. CEPHALONOPLOS DC. (Sect. *Breea* (Less.) Koch). Leaves without rigid setae on the upper surface. Florets unisexual; plant incompletely dioecious. Corolla-limb 5-partite almost to the base, less than ½ as long as tube. Mature pappus much longer than corolla.

60. C. arvense (L.) Scop., *Fl. Carn.* ed. 2, **2**: 126 (1772) (incl. *C. setosum* (Willd.) Bieb., *C. incanum* (S. G. Gmelin) Fischer). Perennial (30–)50–120(–150) cm, with far-creeping roots bearing adventitious shoots. Stem usually paniculately much-branched, leafy up to the apex. Leaves with attenuate base, sessile to semi-amplexicaul, rarely shortly decurrent, lanceolate to oblong, entire to pinnatifid, glabrous to sparsely arachnoid-hairy above, glabrous to arachnoid-tomentose beneath; segments broadly to narrowly triangular, entire to lobed, rounded to acute, with weak to stout spines 1–10 mm. Capitula 1–5, shortly pedunculate at apex of branches. Involucre (9–)12–17(–20) × (6–)8–12(–15) mm; bracts appressed, with distinct vittae and short spinule; outer obtuse; middle acute. Corolla (10–)13–18 mm, pale purple. Achenes 3–4 mm; pappus (15–)20–30 mm. $2n=34$. *Cultivated ground, waste places, pastures and open woodland. Almost throughout Europe.* All except Az Cr Sb, but not native in Fa Is.

An extremely variable species in which leaf-division, size of segments and indumentum have been used for delimiting several specific or infraspecific taxa of widely differing status. Because there are gradual transitions and no evident eco-geographical differences between them they are best treated as varieties.

119. Picnomon Adanson[1]

Like *Cirsium* but involucral bracts without vittae and with a recurved, pinnate, spinose apical appendage; florets purple; achenes obovoid-oblong, compressed, the truncate apex indistinctly marginate and with a rounded central projection; pappus-setae subequal, the inner not expanded at the apex.

1. P. acarna (L.) Cass., *Dict. Sci. Nat.* **40**: 188 (1826). Annual (10–)20–50(–70) cm, with greyish-arachnoid-lanate indumentum. Stem much-branched, with spinulose wings. Leaves decurrent, narrowly oblong to lanceolate, remotely pinnatifid, with slender marginal spines 4–15 mm. Inflorescence corymbose; capitula numerous, in dense terminal clusters or solitary, surrounded and exceeded by upper leaves. Involucre 22–30 × 8–15 mm, cylindrical. Achenes 5–6 mm, pale brown, shiny; pappus 14–19 mm. $2n=32$, 34. *Cultivated ground and dry waste places. S. Europe.* Al Bl Bu Cr Ga Gr Hs It Ju Lu Rm Rs (K) Sa Tu.

120. Notobasis Cass.[1]

Spiny annuals. Leaves alternate, white-veined above, sparsely grey-arachnoid-hairy beneath, with spinulose margin and spiniform segments. Involucral bracts imbricate, with a vitta and a very short apical spine. Florets hermaphrodite, purple, rarely white. Anthers with basal appendages *c.* 0·3 mm. Achenes obliquely obovoid-globose, compressed, smooth, woody, with indistinctly marginate, truncate apex; pappus of numerous plumose outer setae and an inner ring of short hairs connate at base.

1. N. syriaca (L.) Cass., *Dict. Sci. Nat.* **35**: 171 (1825). Stem 20–60(–150) cm, usually branched and bluish above. Basal leaves herbaceous, elliptical, dentate to lobed, petiolate; cauline leaves coriaceous, lanceolate to oblong-lanceolate, pinnatifid, broadly auriculate-amplexicaul, the uppermost rigid, pinnatisect, nearly reduced to strong spines, surrounding and exceeding the capitula. Capitula in racemose clusters or solitary. Involucre 17–23 × 15–25 mm, globose-campanulate. Achenes 5–6 mm, brown; outer pappus-setae 13–15 mm, the inner hairs 1–2 mm. $2n=34$. *Cultivated ground and dry waste places. Mediterranean region, C. & S. Portugal.* Al Bl Co Cr Gr Hs It Ju Lu Sa Si Tu.

121. Ptilostemon Cass.[1]

(incl. *Lamyra* (Cass.) Cass., *Chamaepeuce* DC.)

Unarmed dwarf shrubs or spiny herbs. Leaves alternate, entire to pinnatifid, usually coriaceous, subglabrous above, unarmed or with stout marginal spines. Involucral bracts imbricate, rarely

[1] By K. Werner.

with vittae, the apex usually long, rigid, patent, with a pungent spine, rarely spinulose. Receptacular scales numerous, setaceous. Florets hermaphrodite, purple, rarely white. Anthers with basal appendages 2–4 mm. Achenes obliquely obovoid, usually scarcely compressed, smooth, woody, the truncate apex indistinctly marginate; pappus-hairs in several rows, plumose, subequal, connate at base, deciduous, often fewer and simple in outermost florets.

Literature: S. Tamamschian, *Not. Syst.* (*Leningrad*) **16**: 470–478 (1954). W. Greuter, *Boissiera* **13**: 145–147 (1967); **22**: 1–215 (1973).

Measurements of the diameter of the involucre refer to the middle of the capitulum excluding the patent apices of the bracts.

1 Dwarf shrub; leaves narrowly linear, without spines; involucral bracts appressed or with short patent to deflexed apex, unarmed to weakly spinescent
2 Leaves on flowering branches not expanded or laciniate at the base, with acute apex **4. chamaepeuce**
2 Leaves on flowering branches with the base somewhat expanded, with 1–2, often minute, narrow laciniae on each side, the apex acuminate, spinulose **5. gnaphaloides**
1 Herb, sometimes woody at base; leaves linear to oblong-lanceolate, with stout spines at least at the base; involucral bracts with long, patent to erecto-patent, pungent apex
3 Stem with narrow spiny wings; leaves decurrent, sparsely arachnoid-lanate to glabrescent beneath **1. strictus**
3 Stem not winged; leaves not decurrent, densely tomentose beneath
4 Annual; leaves with 1–3 stout basal spines on each side **9. stellatus**
4 Biennial or perennial; leaves regularly spiny up to the apex
5 Leaves entire or slightly sinuate; marginal spines in clusters of 2–4(–7), arising from a common insertion; capitula subsessile, in a spike **8. casabonae**
5 Leaves lobed to pinnatisect, sometimes sinuate-dentate; marginal spines borne singly on the lobes or teeth; capitula pedunculate, in a corymb or raceme
6 Leaves lobed or sinuate-dentate, with broadly triangular lobes bearing 2–4(–5) somewhat approximate spines **7. hispanicus**
6 Leaves pinnately divided for at least ½ their width, with narrow, spine-tipped lobes
7 Leaves pinnatisect; involucral bracts without marginal spines **6. echinocephalus**
7 Leaves pinnatifid; outer involucral bracts usually with marginal spines
8 Usually biennial; leaves subglabrous above; corolla 22–27(–30) mm **3. afer**
8 Perennial; leaves sparsely arachnoid-hairy above; corolla (28–)30–33(–36) mm **2. niveus**

1. P. strictus (Ten.) W. Greuter, *Boissiera* **13**: 147 (1967) (*Cirsium strictum* (Ten.) Link). Perennial herb (30–)60–100(–120) cm. Stem sparsely arachnoid-hairy, glabrescent towards the base, with narrow spinose wings. Leaves decurrent, narrowly oblong to oblong-lanceolate, lobed to pinnatifid, sparsely arachnoid-lanate to glabrescent beneath; segments 2-lobed, with stout spines 2–5(–11) mm. Capitula in dense clusters on stems and branches. Involucre 17–24 × 12–17 mm; outer and middle bracts with white ventral swelling, the apex patent, subulate-spinose. Corolla 16–21 mm. Achenes 3·5–5 mm; pappus 13–18 mm. *Deciduous woods and scrub.* ● *C. & S. Italy; W. & S. parts of Balkan peninsula.* Al Gr It Ju.

2. P. niveus (C. Presl) W. Greuter, *loc. cit.* (1967) (*Cirsium niveum* (C. Presl) Sprengel). Perennial herb 20–65 cm. Stem white-arachnoid-tomentose. Leaves lanceolate to oblong-lanceolate, pinnatifid, sparsely arachnoid-hairy above; segments 2- to 3-lobed, the lobes narrowly triangular, with stout spines 5–9 mm. Capitula 1–5, in a lax corymb. Involucre 37–50 × 32–40(–45) mm; base of outer and middle bracts with 0–4(–7) fine marginal spines 1·5–2·5 mm on each side, with inconspicuous, white ventral swelling, the apex flat, with a slender spine, deflexed in outer and erecto-patent in middle bracts. Corolla (28–)30–33(–36) mm. Achenes (4·5–)5–5·5 mm; pappus 22–27 mm. *Rocky slopes; calcicole.* ● *Mountains of S.W. Italy and N.E. Sicilia.* It Si.

3. P. afer (Jacq.) W. Greuter, *loc. cit.* (1967) (*Cirsium afrum* (Jacq.) Fischer). Usually biennial 40–75(–100) cm. Stem white-arachnoid-tomentose to subglabrous. Leaves oblong-lanceolate, pinnatifid, subglabrous above; segments deeply 2- to 3-lobed, the lobes narrowly triangular, with stout spines 5–12(–15) mm. Capitula (4–)10–16(–20), in a dense terminal corymb or cylindrical raceme. Involucre 20–40(–50) × 35–45 mm; base of outer bracts with 0–2(–4) stout marginal spines 3–6 mm on each side, the apex flat, with a stout spine, deflexed in outer and erecto-patent in middle bracts. Corolla 22–27(–30) mm. Achenes (3·5–)4–4·5(–5) mm; pappus 15–20(–23) mm. *Rocks and stony slopes; calcicole. Mountains of Balkan peninsula; one station in S.W. Romania.* Al Bu Gr Ju Rm.

4. P. chamaepeuce (L.) Less., *Gen. Cynaroceph. Spec. Arctot.* 5 (1832) (*Cirsium chamaepeuce* (L.) Ten.). Dwarf shrub 30–100 cm. Flowering branches tomentose, occasionally glabrescent, with leaves as long as those on the main stem. Leaves narrowly linear, acute, densely white-tomentose beneath, the margin conspicuously revolute. Capitula usually few, in corymbs, rarely solitary. Involucre 14–18(–22) × 13–20(–23) mm; bracts lanceolate-triangular, with inconspicuous vittae, appressed to arcuate-deflexed, or the apex erecto-patent and the outer bracts shortly deflexed, unarmed or with spines less than 1 mm. Corolla 20–25 mm. Achenes 3·5–5 mm; pappus 14–17 mm. *Rocks. Greece and Aegean region.* Cr Gr.

5. P. gnaphaloides (Cyr.) Soják, *Novit. Bot. Horti Bot. Univ. Carol. Prag.* **1962**: 46 (1962). Like **4** but upper leaves much shorter, spinulose-mucronate at the apex, with the base somewhat expanded and with 1–2 narrow laciniae on each side; involucral bracts triangular-subulate, without vittae; achenes 4–6 mm. *Rocks. S. Italy, Greece, Kriti.* Cr Gr It [Ga].

(a) Subsp. **gnaphaloides** (*Cirsium gnaphalodes* Sprengel): Leaf-base with laciniae 0·3–2(–4) mm. Involucre 16–22 × 15–18(–25) mm; inner and middle bracts appressed, unarmed, the outer with patent to deflexed apex having a soft spinule up to 1 mm. *S. Italy, N.W. Greece (Kerkira); locally naturalized in S.E. France.*

(b) Subsp. **pseudofruticosus** (Pamp.) W. Greuter, *Candollea* **24**: 48 (1969) (*Cirsium fruticosum* auct. & *Chamaepeuce fruticosa* auct., non *Cnicus fruticosus* Desf.): Leaf-base with laciniae 1–5(–9) mm. Involucre 18–25 × 18–26 mm; bracts with erecto-patent apex, the middle and outer with an apical spinule 1–3 mm. *S. Greece, Kriti.*

6. P. echinocephalus (Willd.) W. Greuter, *Boissiera* **13**: 146 (1967) (*Lamyra echinocephala* (Willd.) Tamamsch.). Perennial herb (20–)30–50(–60) cm, woody at base. Stem white-tomentose. Leaves oblong, pinnatisect; segments linear to linear-triangular, with one lobe at the base, the spines 3–6 mm. Capitula solitary or few in a terminal corymb. Involucre 20–30 × 18–25(–30) mm; bracts with conspicuous white ventral swelling, the apex patent, subulate-spiny. Corolla (22–)25–31 mm. Achenes 4–6 mm; pappus (16–)19–25 mm. *Rocks. Krym.* Rs (K).

7. P. hispanicus (Lam.) W. Greuter, *loc. cit.* (1967) (*Chamaepeuce hispanica* (Lam.) DC.). Perennial (30–)60–100 cm, woody

at base. Stem white-tomentose. Leaves oblong- to ovate-lanceolate, lobed to sinuate-dentate, the broadly triangular lobes or teeth with stout marginal spines (5–)10–20(–30) mm in lax groups of 2–4(–5). Capitula pedunculate, in a terminal corymb. Involucre 20–30(–35) × (20–)25–33 mm; bracts with inconspicuous white ventral swelling, the apex patent, with a stout spine. Corolla 22–32 mm. Achenes 4–5·5 mm; pappus 16–25 mm. *Rocky, stony or sandy places.* ● *S. Spain.* Hs.

8. P. casabonae (L.) W. Greuter, *loc. cit.* (1967) (*Chamaepeuce casabonae* (L.) DC.). Monocarpic perennial 40–100(–150) cm. Stem sparsely arachnoid-hairy to glabrescent. Leaves lanceolate to linear-lanceolate, entire or very slightly sinuate, the marginal spines (2–)5–15 mm, slender, in clusters of 2–4(–7) which arise from a common insertion. Capitula subsessile, in a terminal spike. Involucre 15–25 × 14–20 mm; bracts with a slender apical spine. Corolla 18–22 mm. Achenes 3–4 mm; pappus 13–18 mm. $2n = 32$. *Dry, open habitats.* ● *W. Mediterranean region.* Co Ga It Sa [Lu].

9. P. stellatus (L.) W. Greuter, *loc. cit.* (1967) (*Cirsium stellatum* (L.) All.). Annual (6–)15–30(–70) cm. Leaves linear to linear-lanceolate, entire, sparsely arachnoid-hairy to glabrescent and scabrid above, with 1–3 stout basal spines (5–)10–20(–35) mm on each side, and an apical spine 1–1·5 mm. Capitula few, in racemes or corymbs, rarely solitary. Involucre 15–25 × 10–15 mm; outer and middle bracts with conspicuous white ventral swelling, the apex patent, subulate-spinose. Corolla 12–18 mm. Achenes 4–5 mm; pappus 11–15 mm. $2n = 24$. *Waste places and stony ground.* ● *E. Mediterranean region, extending westwards to Sicilia.* Al Cr Gr It Ju Si.

122. Lamyropsis (Charadze) Dittrich[1]

Like *Ptilostemon* but achenes oblong, compressed, coriaceous, the truncate apex with a distinct, raised margin surrounding a cylindrical central projection.

Literature: M. Dittrich, *Candollea* **26**: 97–102 (1971). W. Greuter & M. Dittrich, *Ann. Mus. Goulandris* **1**: 85–98 (1973).

Involucre 27–35 × 25–30 mm, the bracts with long, patent to deflexed apex **1. cynaroides**
Involucre 14–18 × 12–15 mm, the bracts with short, erecto-patent apex **2. microcephala**

1. L. cynaroides (Lam.) Dittrich, *Candollea* **26**: 98 (1971) (*Cirsium cynaroides* (Lam.) Sprengel). Perennial 20–50 cm. Stem white-arachnoid-lanate. Leaves broadly oblong, pinnatifid to pinnatisect, villous on the veins above, white-tomentose beneath; segments 3- to 5-lobed, the lobes triangular, with spines 1·5–4 mm. Capitula pedunculate, solitary or few in clusters. Involucre 27–35 × 25–30 mm; bracts with a long, patent to deflexed, subulate apex bearing a stout spine. Corolla 26–34 mm, purplish-pink. Achenes 5–6 mm; pappus 17–21 mm. *Waste places and open* Pinus-*woods. S. Greece, Kriti.* Cr Gr.

2. L. microcephala (Moris) Dittrich & W. Greuter, *Exsicc. Genav.* **3**: 47 (1972) (*Cirsium microcephalum* Moris). Perennial 20–50 cm. Stem white-arachnoid-lanate. Leaves broadly oblong-lanceolate, pinnatifid, lanate on the veins and sparsely arachnoid-hairy above, white-tomentose beneath; segments deeply 2- to 3-lobed, the lobes narrowly triangular, with stout spines 7–12 mm. Capitula solitary or few in terminal racemose clusters, surrounded and exceeded by the upper leaves. Involucre 14–18 × 12–15 mm; bracts with a short, erecto-patent apex bearing a stout spine 2–6 mm. Corolla 15–17 mm, whitish. Achenes 4·5–5·5 mm; pappus *c.* 12 mm. *Stony slopes.* ● *Sardegna.* Sa.

[1] By K. Werner.

123. Galactites Moench[2]

White-tomentose, annual herbs. Leaves alternate, with spiny lobes or teeth. Capitula solitary or in corymbose cymes or clusters. Involucre ovoid; involucral bracts imbricate, the outer and middle with a rigid, erecto-patent apical spine. Receptacle densely hairy. Inner florets small, tubular, hermaphrodite; outer florets large, infundibuliform, sterile. Corolla purple to white. Achenes subcylindrical, striate, glabrous; pappus-hairs plumose, white.

Cauline leaves with spines 1·5–6(–8) mm; spines of involucral bracts 5–10 × 0·3–0·5 mm, greenish **1. tomentosa**
Cauline leaves with spines 6–15 mm; spines of involucral bracts 10–25 × 0·5–1 mm, yellow **2. duriaei**

1. G. tomentosa Moench, *Meth.* 558 (1794) (*G. pumila* Porta). Stems (8–)15–100 cm. Leaves white-veined or variegated above, white-tomentose beneath; basal oblanceolate, serrate, petiolate, soon decaying; cauline 4–18 × 1–8 cm, pinnatifid, rarely undivided, sessile and shortly decurrent, the spines 1·5–6(–8) mm. Capitula pedunculate, solitary or in a corymbose cyme; involucre 10–15 mm, arachnoid-pubescent, the bracts with greenish spines 5–10 × 0·3–0·5 mm. Achenes 3–5 × 1–1·5 mm, yellowish; pappus 3–4 times as long as the achene. $2n = 22$. *Mediterranean region and S.W. Europe.* Az Bl Co Cr Ga Gr Hs It Ju Lu Sa Si.

2. G. duriaei Spach ex Durieu in Duchartre, *Rev. Bot.* **1**: 363 (1846). Like **1** but cauline leaves with spines 6–15 mm; capitula subsessile, in terminal clusters on stems and branches; involucre 10–20 mm, arachnoid-tomentose and whitish, the bracts with stout, yellow spines 10–25 × 0·5–1 mm; achenes 5–6 × 2 mm; pappus twice as long as the achene. $2n = 22$. *S.E. Spain.* Hs. (*N.W. Africa.*)

124. Tyrimnus (Cass.) Cass.[2]

Slender, erect, lanate annual or biennial herbs. Leaves alternate. Capitula solitary, on long, naked peduncles. Involucre hemispherical; involucral bracts imbricate, appressed, entire, mucronate-spinose. Receptacular scales numerous, setaceous. Inner florets hermaphrodite; outer florets usually sterile. Corolla purplish-pink, rarely white, regularly 5-fid, with a short tube. Achenes oblong, tetragonal, compressed, glabrous; pappus of many rows of white hairs which are minutely scabrid distally.

1. T. leucographus (L.) Cass., *Dict. Sci. Nat.* **56**: 207 (1828). Stems 20–60 cm. Leaves thin, decurrent, white-veined, sinuate-dentate, with spinulose margin, green and slightly lanate above, greyish-lanate beneath; lower leaves obovate-oblong, attenuate into a short petiole; cauline leaves smaller, lanceolate-oblong, acute, sessile. Capitula 14–16 mm; involucral bracts lanceolate, acuminate. Achenes *c.* 4 mm, blackish-red; pappus *c.* 12 mm. *Waste places and open, sandy or stony habitats. Mediterranean region.* Al Bl Bu Co Cr Ga Gr Hs It Ju Sa ?Si Tu.

125. Onopordum L.[2]

Biennials. Stems spinose-winged, or absent. Leaves spinose-dentate, pinnatifid to pinnatisect or almost pinnate, rarely subentire. Capitula globose to ovoid. Involucral bracts in several rows, coriaceous, densely imbricate at least near the base, spine-tipped, glabrous to puberulent, sometimes glandular. Receptacle glabrous, with deep pits having dentate margins. Florets reddish-purple, rarely pink or white; corolla-tube slender; limb actinomorphic or saccate. Anthers with subulate apical appendages. Achenes 4–6 mm, subtetragonal, 4- to 5-ribbed, glabrous, dull; pappus-hairs scabrid or plumose, united into a ring at base, deciduous.

[2] By J. do Amaral Franco.

Unless otherwise stated, all species grow in rocky or stony ground, roadsides, waste places and similar dry, open habitats.

Unless otherwise indicated, descriptions apply to middle cauline leaves. The 2 outermost rows of bracts are referred to as *outer bracts*, the next 2–4 rows as *middle bracts*, followed by 1–2 rows of *inner bracts*, which are always erect, thinner and more obviously serrulate. The descriptions apply to the middle bracts, unless otherwise indicated.

Literature: G. Rouy, *Bull. Soc. Bot. Fr.* **43**: 577–599 (1896). W. J. Drees, *Baileya* **14**: 75–86 (1966).

1 Acaulescent; pappus at least 20 mm **1. acaulon**
1 Stems present; pappus not more than 15 mm
2 Outer and middle involucral bracts expanded into a wide fimbriate-spiny apex **13. majorii**
2 Involucral bracts without a fimbriate-spiny apex
3 Stem and mature leaves not tomentose or lanate, usually ± green, with multicellular hairs
4 Involucral bracts erect and closely imbricate
5 Stem-wings up to 7 mm wide; capitula ovoid-globose **3. laconicum**
5 Stem-wings up to 20 mm wide; capitula conical-ovoid **4. nervosum**
4 Involucral bracts with long, ± divergent spiny processes
6 Leaves with at least 10 pairs of lobes; capitula with ± dense arachnoid indumentum **7. argolicum**
6 Leaves with not more than 8 pairs of lobes; capitula glabrous or with very sparse arachnoid indumentum
7 Capitula 35–50 mm in diameter; stem-wings with spines up to 15 mm **5. corymbosum**
7 Capitula 55–70 mm in diameter; stem-wings with spines up to 5 mm **6. tauricum**
3 Stem and leaves ± densely white- or greyish-tomentose or lanate, with unicellular hairs
8 Involucral bracts linear-subulate; corolla-lobes eglandular **2. acanthium**
8 Involucral bracts lanceolate to ovate, often with a rigid spiny apical process; corolla-lobes glandular
9 Longest involucral bracts exceeding florets **8. caulescens**
9 Involucral bracts not exceeding florets
10 Leaves pinnatisect, with oblong-linear lobes **9. messeniacum**
10 Leaves pinnatifid, with triangular to palmate lobes
11 Stem sparsely spiny; leaves with fewer than 8 pairs of lobes **10. macracanthum**
11 Stem densely spiny; leaves with at least 8 pairs of lobes
12 Capitula 50–70 mm in diameter; corolla 30–40 mm **11. bracteatum**
12 Capitula 40–60 mm in diameter; corolla 25–35 mm **12. illyricum**

Subgen. **Acaulon** Franco. Acaulescent. Capitula sessile or shortly pedunculate in the centre of the basal rosette of leaves. Pappus-hairs scabrid.

1. O. acaulon L., *Sp. Pl.* ed. 2, 1159 (1763). Stock sometimes divided and with several rosettes. Leaves up to 40 × 12 cm, oblong-oblanceolate to elliptic-lanceolate, shallowly lobed to pinnatisect, whitish- or grey-lanate with sparse unicellular hairs above, densely whitish-tomentose beneath; lobes with apical spine up to 10 mm; petiole flat. Capitula rounded at base, solitary or in clusters of 2–6; peduncles up to 30 mm, white-tomentose. Involucral bracts 3–4 mm wide at base, ovate-lanceolate, with an acuminate spiny apex 6–12 mm, glabrous, smooth dorsally. Corolla 22–25 mm, white. Achenes 4–5 mm; pappus 20–30 mm, whitish. *Mountains of S. & E. Spain, Pyrenees, Corbières.* Ga Hs.

(a) Subsp. **acaulon**: Leaves more than 3 times as long as capitula, pinnatisect, with 4–6 pairs of distant, broadly triangular lobes; lobes with 2–3 pairs of palmately arranged rigid, yellowish spines. Capitula 40–60 × 50–70 mm, globose-campanulate; involucral bracts curved or patent in distal half. 600–1300 *m. Throughout the range of the species except E. Spain.*

(b) Subsp. **uniflorum** (Cav.) Franco, *Bot. Jour. Linn. Soc.* **71**: 45 (1975) (*O. uniflorum* Cav.): Leaves not more than 3 times as long as capitula, elliptic-lanceolate, shallowly lobed or pinnatifid, with 6–8 pairs of approximate lobes; lobes dentate. Capitula 30–50 mm in diameter, ovoid-campanulate; involucral bracts closely appressed or the outer and middle slightly recurved at apex. 1300–1800 *m.* ● *S. & E. Spain, C. Pyrenees.*

Subgen. **Onopordum.** Stem present, erect. Leaves alternate. Capitula sessile on stem or lateral branches. Pappus-hairs scabrid or plumose.

Sect. ONOPORDUM. Plant lanate or tomentose, with unicellular hairs. Leaves not reticulately veined beneath. Involucral bracts linear-subulate, erecto-patent, shorter than florets. Corolla-lobes eglandular. Pappus-hairs scabrid.

2. O. acanthium L., *Sp. Pl.* 827 (1753). Plant up to 300 cm. Stem yellowish, more or less hairy, the wings not reticulate-veined, with spines up to 5 mm. Leaves up to 35 × 20 cm, oblong-ovate to broadly lanceolate or ovate, sessile, sinuate-dentate or with 6–8 pairs of broadly triangular teeth with an apical spine 5–10 mm, greyish-green and sparsely lanate above. Capitula subglobose, solitary or in terminal clusters of 2–5; involucral bracts gradually tapering into a spine up to 5 mm, not keeled, puberulent outside. Corolla 14–25 mm, purplish or white. Achenes 4–5 mm, marbled greyish-black; pappus 7–9 mm, pale reddish. *Europe northwards to N. France and C. Russia, but local in the extreme south; naturalized or casual in the north.* Al Au *Be Bu Co Cz Ga Ge Gr He *Ho Hs Hu It Ju Lu Rm Rs (C, W, K, E) [Br Da Rs (B) Su].

The boundaries between native, naturalized and casual occurrence are hard to define.

1 Capitula in clusters of 3–5; corolla up to 20 mm (b) subsp. **gautieri**
1 Capitula solitary or in clusters of 2–3; corolla more than 20 mm
2 Stem-wings up to 15 mm wide; capitula with sparse arachnoid indumentum (a) subsp. **acanthium**
2 Stem-wings up to 7 mm wide; capitula with dense arachnoid indumentum (c) subsp. **parnassicum**

(a) Subsp. **acanthium**: Stem appressed-hairy; wings up to 15 mm wide. Leaves densely tomentose or lanate beneath. Capitula 35–50 mm in diameter, sparsely arachnoid-hairy; involucral bracts 2–2·5 mm wide at base, glabrous inside. Corolla 22–25 mm. Achenes transversely rugose. $2n = 34$. *Throughout the range of the species.*

Dwarf plants up to 50 cm, with more tomentose and undulate, crispate leaves up to 10 × 4 cm, have been called var. *schultesii* Koch.

(b) Subsp. **gautieri** (Rouy) Franco, *Bot. Jour. Linn. Soc.* **71**: 45 (1975) (*O. gautieri* Rouy): Like subsp. (a) but capitula 25–40 mm in diameter, in clusters of 3–5 in dense terminal corymbs;

involucral bracts 1·5–2 mm wide at base; corolla 14–20 mm; achenes transversely foveolate. ● *C. & E. Pyrenees.*

(c) Subsp. **parnassicum** (Boiss. & Heldr.) Nyman, *Consp.* 403 (1879): Like subsp. (a) but stem glabrescent; wings not more than 7 mm wide; leaves subglabrous beneath; capitula densely arachnoid-hairy; involucral bracts with arachnoid indumentum inside. ● *S.C. Greece* (*Parnassos*).

Sect. ERECTA Rouy. Plant with numerous small glands and short multicellular hairs. Leaves strongly reticulately veined beneath. Involucral bracts flat, ovate to lanceolate, closely appressed, shorter than florets. Corolla-lobes glandular. Pappus-hairs plumose.

3. O. laconicum Heldr. & Sart. ex Rouy, *Bull. Soc. Bot. Fr.* **43**: 585 (1896). Plant up to 70 cm. Stem whitish, sparsely whitish-flocculose-tomentose; wings up to 7 mm wide, not reticulate-veined, with spines up to 5 mm. Leaves up to 20 × 5 cm, oblong-lanceolate, sessile, deeply pinnatifid, with 8–10 pairs of lobes, greyish-green, laxly arachnoid-hairy, with numerous minute glands; lobes triangular, longer than wide, palmate or 3-lobulate, the lobules with apical spine up to 4 mm. Capitula 40–50 × 40–70 mm, ovoid-globose; involucral bracts 4–7 mm wide in basal ⅓, usually narrowing to the apical ⅔, somewhat triquetrous with an acute keel. Corolla 30–35 mm. Achenes 4–5 mm, brownish; pappus 8–10 mm. ● *S. Greece.* Gr.

4. O. nervosum Boiss., *Voy. Bot. Midi Esp.* **2**: 357 (1841). Plant up to 270 cm. Stem yellowish, with rather dense short hairs; wings up to 20 mm wide, densely reticulate-veined, with spines up to 10 mm. Leaves up to 50 × 20 cm, oblong-lanceolate, sessile, green, with whitish veins, subglabrous above, sparsely arachnoid-hairy beneath, pinnatifid, with 6–8 pairs of lobes; lobes triangular, longer than wide, with apical spine up to 10 mm. Capitula 35–50 × 30–50 mm, conical-ovoid, subglabrous; involucral bracts 4–6 mm wide, acuminate, with a rigid apical spine up to 4 mm. Corolla 32–35 mm, pink. Achenes 4–5 mm, greyish-brown; pappus 8–10 mm. $2n = 34$. ● *S. & C. Portugal, S. & C. Spain.* Hs Lu.

O. glomeratum Costa, *Introd. Fl. Cataluña* 135 (1864), from E. Spain, appears to be a hybrid between **2** and **4**. It has the indumentum, narrower bracts and smaller corolla of **2**, but resembles **4** in the reticulate venation of wings and leaf and in the shape of the capitulum and involucral bracts.

Sect. ECHINATA Franco. Plant with multicellular or unicellular hairs. Leaves not reticulately veined beneath. Involucral bracts cochleariform or ovate-lanceolate, abruptly or gradually narrowing into long, rigid, more or less radiate, pungent processes longer or shorter than florets. Corolla-lobes glandular. Pappus-hairs scabrid.

5. O. corymbosum Willk., *Linnaea* **30**: 108 (1859). Plant up to 120 cm, with multicellular hairs, more or less viscid. Stem yellowish; wings up to 6 mm wide, not reticulate-veined, with spines up to 15 mm. Leaves up to 40 × 10 cm, oblong-lanceolate, sessile, pinnatifid or sinuately lobed, with 6–8 pairs of lobes or teeth, with an apical spine 5–10 mm, dark green, sparsely hairy above, with numerous minute hairs on the raised veins beneath. Capitula 30–40 × 35–50 mm, subglobose, slightly arachnoid-hairy; involucral bracts 3–4 mm wide in basal ½, acuminate-triquetrous with an apical spine up to 5 mm, puberulent in the distal ½ along the keel. Corolla 20–25 mm, purple. Achenes 4–5 mm, dark greyish-brown; pappus 8–10 mm. ● *E. Spain*; *C. Jugoslavia.* Hs Ju.

(a) Subsp. **corymbosum**: Leaves pinnatifid; segments lanceolate-triangular or lobulate. Involucral bracts usually contracted and recurved in apical ⅔. *E. Spain.*

(b) Subsp. **visegradense** Franco, *Bot. Jour. Linn. Soc.* **71**: 45 (1975): Leaves sinuate-lobed or -dentate. Involucral bracts tapering into the spine, usually erect, appressed, but the outermost deflexed. *Meadows. E. Bosna* (*near Višegrad*).

O. humile Loscos, *Trat. Pl. Arag.* **3**: 77 (1883–1886) (*O. tauricum* var. *canescens* Pau, *O. corymbosum* var. *humile* (Loscos) Willk.), from E.C. and S.E. Spain, is probably the hybrid **2** × **5(a)**. It has wide stem-wings and a dense whitish-grey leaf-indumentum which suggests relationship with **2**, while it resembles **5(a)** in the short multicellular hairs, leaf-spines up to 12 mm and the capitula.

6. O. tauricum Willd., *Sp. Pl.* **3**: 1687 (1803). Plant up to 200 cm, with multicellular hairs, more or less viscid. Stem yellowish-brown; wings up to 15 mm wide, not reticulate-veined, with spines up to 5 mm. Leaves up to 25 × 10 cm, oblong-lanceolate, sessile, pinnatifid, with 6–8 pairs of remote lobes, dark green, very sparsely hairy above, more densely so beneath especially on veins; lobes triangular, longer than wide, with an apical spine up to 8 mm. Capitula 35–45 × 55–70 mm, subglobose; involucral bracts 4–7 mm wide at base, tapering into a rigid spine up to 4 mm, smooth, with the midrib slightly raised in the apical ⅔; middle bracts usually erecto-patent, the outer usually deflexed. Corolla 25–30 mm, purplish-pink. Achenes 5–6 mm, shiny- or greyish-brown; pappus 8–10 mm. *S.E. Europe.* Bu Cr Gr Rm Rs (K) Tu [Ga It].

7. O. argolicum Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 91 (1849). Plant up to 150 cm, with multicellular hairs, more or less viscid. Stem brownish, sparsely hairy, densely and minutely glandular in the grooves; wings up to 8 mm wide, subpalmate, with spines up to 6 mm. Leaves up to 25 × 6 cm, oblong-lanceolate, sessile, pinnatisect, with 10–12 pairs of lobes, dark green, sparsely hairy and densely glandular above, greyish-arachnoid-hairy beneath; lobes triangular or palmate, with raised, somewhat reticulate yellowish veins beneath, tapering into a spine up to 5 mm. Capitula 40–60 × 60–80 mm, subglobose, densely arachnoid-hairy; involucral bracts 35–45 mm, 5–7 mm wide near base, tapering to a coriaceous, semicylindrical, patent or deflexed process. Corolla 25–30 mm. Achenes 4–5 mm, brownish-grey; pappus 8–10 mm. *Sardegna*; *Malta, Linosa*; *S. Greece.* Gr Sa Si.

8. O. caulescens D'Urv., *Enum.* 105 (1822) (*O. sibthorpianum* Boiss. & Heldr.). Plant up to 50 cm, with unicellular hairs, not viscid. Stem yellowish, usually with a dense arachnoid indumentum; wings dentate-spiny, not reticulate-veined, with an apical spine up to 6 mm. Leaves up to 20 × 6 cm, lanceolate or oblong-lanceolate, sessile, pinnatifid, with 6–8 pairs of lobes, greyish-green and sparsely arachnoid-hairy above, whitish-tomentose beneath; lobes with an apical spine up to 6 mm. Capitula 30–35 × 25–35 mm; involucral bracts appressed in basal ½, the outer and middle bracts with long, free, coriaceous, semi-conical, patent or recurved points, 3–5 mm wide at their base, tapering to a spine up to 5 mm. Corolla 22–25 mm. Achenes 4–5 mm, brownish; pappus 11–13 mm, the hairs shortly plumose. *Aegean region.* Gr *Tu.

(a) Subsp. **caulescens**: Stem-wings up to 10 mm wide. Leaf-lobes lanceolate-oblong, entire or rarely with 1–2 pairs of basal teeth. Capitula ovoid-globose; involucral bracts gradually narrowing to a spiny process 25–35 mm, the lower bracts arachnoid-hairy. ● *Kikladhes.*

(b) Subsp. **atticum** Franco, *Bot. Jour. Linn. Soc.* **71**: 45 (1975): Stem-wings up to 6 mm wide. Leaf-lobes narrowly triangular, with 2–4 pairs of spiny teeth. Capitula subglobose; involucral bracts rather abruptly contracted into a spiny process 15–20 mm, the bracts glabrous. *S. & C. Greece*; *Turkey-in-Europe.*

9. O. messeniacum Halácsy, *Consp. Fl. Graec.* **2**: 122 (1902). Plant up to 100 cm, with unicellular hairs, not viscid. Stem yellowish, usually sparsely arachnoid-hairy to glabrous; wings up to 10 mm wide, palmatifid, with linear or oblong lobes with a spine up to 3 mm. Leaves up to 20 × 6 cm, oblong-lanceolate, sessile, pinnatisect, with 6–8 pairs of distant lobes, glabrous above, greyish-arachnoid-hairy beneath; segments oblong-linear, with apical spine up to 3 mm. Capitula 40–50 mm in diameter, subglobose, sparsely arachnoid-hairy at base when young; involucral bracts 3–5 mm wide near base, ovate-lanceolate, acuminate, flat below, triquetrous above, glabrous, appressed in basal ½, the outer and middle gradually narrowing into a spiny patent or deflexed process 24–32 mm with an apical spine 4–6 mm. Corolla 25–30 mm, purple. Achenes 4–5 mm, brown; pappus 8–10 mm. ● *S. Greece* (*near Kalamai*). Gr.

10. O. macracanthum Schousboe, *Vextr. Marokko* 198 (1800). Plant up to 150 cm, with unicellular hairs, not viscid. Stem white-lanate; wings up to 10 mm wide, not reticulate-veined, with apical spine up to 5 mm. Leaves up to 40 × 20 cm, ovate-lanceolate to lanceolate, sessile, pinnatifid, with 5–7 pairs of lobes, densely tomentose, greyish above, white beneath; lobes triangular-acute, with an apical spine up to 6 mm. Capitula 30–60 mm in diameter, subglobose, arachnoid-hairy at base; involucral bracts imbricate near base, the outer and lower middle patent or deflexed, the basal part 5–6 mm wide, cochleariform, glabrous, ovate-lanceolate, acuminate, with a rigid apex 15–30 mm having involute margin and spine 6–7 mm. Corolla *c.* 30 mm, purple. Achenes 4–5 mm, greyish-brown; pappus 7–9 mm, reddish. *S.E. Portugal, S. & S.E. Spain.* Hs Lu.

Sect. RECURVATA Franco. Plant with unicellular hairs. Leaves not reticulately veined beneath. Involucral bracts wide, flat, acuminate, shorter than florets, the outer and lower middle usually strongly deflexed in the apical ½–¾. Corolla-lobes glandular. Pappus-hairs scabrid or shortly plumose.

11. O. bracteatum Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 91 (1849). Plant up to 180 cm. Stem yellowish or white, hairy; wings palmately spiny. Leaves up to 30 × 8 cm, oblong-lanceolate, sessile, pinnatisect or almost pinnate, with 10–12 pairs of lobes; lobes palmate to dentate. Capitula 50–70 mm in diameter, ovoid-globose, glabrous; involucral bracts broadly lanceolate, long-acuminate, with a stout pungent apex. Corolla 30–40 mm, purple. Achenes 5–6 mm, brown; pappus 8–10 mm. *Calcicole. S. part of Balkan peninsula and Aegean region, mainly in the mountains.* Bu Cr Gr.

1 Plant white at first, lanate; capitula surrounded by upper leaves (a) subsp. **bracteatum**
1 Plant greyish-green, not lanate; capitula not surrounded by upper leaves
2 Stem-wings up to 5 mm wide; involucral bracts with apical spine up to 5 mm (d) subsp. **myriacanthum**
2 Stem-wings up to 15 mm wide; involucral bracts with apical spine up to 12 mm
3 Leaves greyish-green and glabrescent beneath; involucral bracts 5–8 mm wide (b) subsp. **illex**
3 Leaves densely whitish-tomentose beneath; involucral bracts 8–10 mm wide (c) subsp. **creticum**

(a) Subsp. **bracteatum**: Stem white-lanate, becoming brownish, glabrescent and sparsely glandular below; wings up to 8 mm wide, with a spine up to 10 mm. Leaves white, lanate; lobes with apical spine up to 12 mm. Involucral bracts 5–8 mm wide, with apical spine up to 10 mm. *Karpathos.* (*Anatolia.*)

(b) Subsp. **ilex** (Janka) Franco, *Bot. Jour. Linn. Soc.* **71**: 46 (1975) (*O. ilex* Janka, *O. dirphyum* Halácsy): Stem sparsely arachnoid-hairy, eglandular; wings up to 15 mm wide, with a spine up to 15 mm. Leaves glabrescent, bright green above, greyish-green beneath; lobes with apical spine up to 10 mm. Involucral bracts 5–8 mm wide, with apical spine up to 10 mm. *Almost throughout the range of the species.*

(c) Subsp. **creticum** Franco, *loc. cit.* (1975): Stem with sparse multicellular hairs; wings up to 12 mm wide, with a spine up to 13 mm. Leaves greyish-green above, densely whitish-tomentose beneath; lobes with apical spine up to 20 mm. Involucral bracts 8–10 mm wide, with apical spine up to 12 mm. *Kriti.*

(d) Subsp. **myriacanthum** (Boiss.) Franco, *loc. cit.* (1975) (*O. myriacanthum* Boiss.): Stem with sparse multicellular hairs; wings up to 5 mm wide, with spines up to 10 mm. Leaves greyish-green and densely whitish-tomentose beneath; lobes with apical spine up to 4 mm. Involucral bracts 5–8 mm wide, with apical spine up to 5 mm. ● *S.E. Peloponnisos* (*Parnon Oros*).

12. O. illyricum L., *Sp. Pl.* 827 (1753). Plant up to 130 cm. Stem yellowish, hairy; wings not reticulate-veined. Leaves up to 55 × 15 cm, oblong-lanceolate, sessile, pinnatifid or pinnatisect, with 8–10 pairs of remote lobes; lobes triangular-cuneate, entire or lobulate. Capitula 30–50 × 40–60 mm, globose-ovoid, arachnoid-hairy below; involucral bracts 5–7 mm wide, imbricate, subappressed, or the outer and middle recurved in apical half, flat, slightly convex distally, the outer bracts shorter than the others. Corolla 25–35 mm, purplish. Achenes 4–5 mm; pappus 10–12 mm, the hairs plumose. $2n = 34$. *Mediterranean region, Portugal, S. Bulgaria.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si.

1 Stem glabrescent; leaves sparsely hairy, with prominent veins beneath (c) subsp. **horridum**
1 Stem white- or grey-tomentose; leaves densely greyish-tomentose, with indistinct veins beneath
2 Lower middle and outer involucral bracts recurved or patent; corolla not more than 30 mm (a) subsp. **illyricum**
2 Involucral bracts appressed and erect or the outermost slightly erecto-patent at apex; corolla more than 30 mm (b) subsp. **cardunculus**

(a) Subsp. **illyricum**: Stem white- or grey-tomentose; wings up to 10 mm wide, with a spine up to 5 mm. Leaves white- or greyish-tomentose, with indistinct veins beneath. Involucral bracts narrowed into spine up to 3 mm, the lower middle and the outer recurved or patent. Corolla 25–30 mm. *From E. Italy westwards.*

(b) Subsp. **cardunculus** (Boiss.) Franco, *Bot. Jour. Linn. Soc.* **71**: 46 (1957) (*O. cardunculus* Boiss.): Like subsp. (a) but involucral bracts contracted into a spine up to 2 mm, appressed and erect or sometimes the outermost with an erecto-patent apex; corolla 30–35 mm. *E. Mediterranean region, S. Bulgaria.*

(c) Subsp. **horridum** (Viv.) Franco, *loc. cit.* (1975) (*O. horridum* Viv.): Stem glabrescent; wings up to 15 mm wide, with a spine up to 8 mm. Leaves green, very sparsely arachnoid-hairy and with prominent veins beneath. Involucral bracts narrowing into a spine up to 3 mm, usually appressed, though recurved in apical ⅓. Corolla 25–30 mm. ● *C. Mediterranean region.*

Sect. PSEUDOCARLINA Franco. Plant with long, appressed unicellular hairs. Leaves not reticulately veined beneath. Involucral bracts flat, shorter than florets, the outer and middle widening into

a deflexed, triangular-acuminate, fimbriate-spinose apex. Corolla-lobes eglandular.

13. O. majorii Beauverd, *Bull. Soc. Bot. Genève* ser. 2, **6**: 152 (1914). Plant up to 150 cm. Stem whitish-arachnoid-hairy; wings up to 8 mm wide, triangular-acuminate, with 3- to 5-palmate spines, with apical spine up to 15 mm. Leaves up to 45 × 15 cm, lanceolate, sessile, pinnatisect or almost pinnate, greyish-green, sparsely hairy and glandular above, densely greyish-tomentulose beneath; lobes triangular-acute, deeply lobulate, with apical spine up to 10 mm. Capitula 45–50 × 70–80 mm, hemispherical, glabrous; involucral bracts 5–8 mm wide at base, the outer and middle deflexed, with wide fimbriate-spiny apex, the apical spine up to 10 mm, caudate, the other spines 1–3 mm. Corolla 35–50 mm, purple. Achenes 6–7 mm; pappus 9–14 mm. *Karpathos, E. Kriti.* Cr.

126. Cynara L.[1]

Perennial herbs; stems erect, striate to ribbed, sometimes absent. Leaves in a basal rosette or alternate, usually deeply divided and with spiny segments. Capitula solitary or in a sparingly branched, corymbose cyme. Involucre ovoid to globose; involucral bracts imbricate, glabrous, the outer and middle with a stout spine or an ovate to triangular appendage at the apex. Receptacle fleshy, the scales setaceous. Florets all hermaphrodite. Corolla purplish, blue or white, tubular, 5-fid; style long-exserted. Achenes obpyramidal or obovoid-cylindrical, glabrous; pappus of many rows of plumose, dirty white hairs connate at the base.

1 Leaf-segments unarmed or mucronulate; involucral bracts with large, cuspidate, apical appendage **6. scolymus**
1 Leaf-segments spiny; involucral bracts with apical spine or spiny appendage
2 Stems absent; apical spine of middle involucral bracts not more than 7 mm, slender **7. tournefortii**
2 Stems present; apical spine of middle involucral bracts at least 10 mm, stout
3 Cauline leaves 1- to 2-pinnatisect, with linear, revolute segments; achenes winged on angles **1. humilis**
3 Cauline leaves 1- to 2-pinnatifid, with lanceolate to oblong, flat segments; achenes not winged
4 Leaves up to 50 × 35 cm, with spines 15–35 mm, clustered at base of each segment; achenes 6–8 × 3–4 cm **5. cardunculus**
4 Leaves up to 40 × 32 cm, with spines 2–20 mm, not in clusters; achenes 3–5 × 2–3 mm
5 Involucre 40–50 mm, subglobose; middle involucral bracts with cochleariform appendages, abruptly contracted into a spine 20–50 mm **4. cornigera**
5 Involucre 15–35 mm, ovoid; middle involucral bracts with ovate to ovate-lanceolate appendages, tapering into a spine 10–30 mm
6 Leaves sparsely and shortly tomentose to lanate, glabrescent, with a distinct reticulum of veins beneath; corolla white **2. alba**
6 Leaves white-tomentose beneath, with indistinct reticulum of veins; corolla purplish-blue **3. algarbiensis**

Sect. BOURGAEA (Cosson) Franco. Stems present. Cauline leaves 1- to 2-pinnatisect, with linear, spinose, revolute segments. Involucre ovoid; middle and upper involucral bracts tapering into a pungent, triangular-subulate spine. Achenes tetragonal, winged on angles.

1. C. humilis L., *Sp. Pl.* 828 (1753) (*Bourgaea humilis* (L.) Cosson). Stems 15–80 cm, usually white-tomentose. Leaves lanceolate in outline, glabrous above, white-tomentose beneath; lower leaves up to 40 × 15 cm, 2-pinnatisect, shortly petiolate, the middle and upper smaller and sessile, the uppermost pinnatisect. Involucre 30–60 × 20–45 mm, the bracts purplish, becoming brownish. Corolla purplish-blue, sometimes white. Achenes 6–8 × 4–6 mm, dull, pale brown; pappus 20–35 mm. $2n = 34$. *Dry, waste places. C. & S. parts of Iberian peninsula.* Hs Lu.

Sect. CYNARA. Stems present. Cauline leaves 1- to 2-pinnatifid, with lanceolate to oblong, flat, dentate to pinnatifid segments. Involucre ovoid to globose; involucral bracts with a stout, pungent apical spine or an ovate to triangular, mucronate appendage. Achenes not winged.

2. C. alba Boiss. ex DC., *Prodr.* **7**: 304 (1838). Stems 40–70 cm, floccose-lanate. Leaves sparsely and shortly tomentose to lanate, glabrescent, with a distinct reticulum of veins beneath; segments lanceolate, deeply spinose-dentate; basal leaves up to 35 × 32 cm, petiolate, with spines *c.* 5 mm, the cauline smaller, sessile, with spines 7–20 mm. Involucre 20–40 mm, ovoid; involucral bracts pale green, the outer spinose, recurved, the middle with an ovate appendage tapering into an erecto-patent spine 20–25 × 5–7 mm. Corolla white. *Dry hillsides.* ● *S. Spain.* Hs.

3. C. algarbiensis Cosson ex Mariz, *Bol. Soc. Brot.* **10**: 236 (1893). Stems 10–50 cm, white-tomentose. Leaves with arachnoid indumentum and glaucous above, white-tomentose beneath, the marginal spines 4–6 mm, yellow, mixed with shorter spines; basal leaves 5–8 × 2·8–3·5 cm, elliptic-lanceolate, spinose-dentate, shortly petiolate; cauline leaves 7–20 × 3·5–12 cm, lanceolate, with ovate-lanceolate, pinnatifid segments, sessile. Involucre 15–35 mm, ovoid; involucral bracts greenish or purplish, the outer spinose, recurved, the middle with an ovate-lanceolate appendage tapering into an erecto-patent spine 10–30 × 3–5 mm. Corolla purplish-blue. Achenes 3–5 × 2–3 mm, shiny, brown; pappus 20–25 mm. *Cultivated or waste ground.* ● *S. Portugal.* Lu.

4. C. cornigera Lindley in Sibth. & Sm., *Fl. Graeca* **9**: 25 (1837) (*C. sibthorpiana* Boiss. & Heldr.). Stems up to 30 cm, arachnoid-lanate. Leaves mostly basal, up to 40 × 16 cm, broadly oblong, pinnatifid, coriaceous, glabrous and bright green with pale veins above, white-tomentose with prominent veins beneath, petiolate; cauline leaves sessile; segments caudate, with triangular lobes having terminal yellow spines 2–6 mm. Involucre 40–50 mm, subglobose; outer involucral bracts with a slender apical spine *c.* 5 mm; middle bracts with a cochleariform appendage 8–10 × 10–15 mm, abruptly narrowed into an erecto-patent spine 20–50 × 2–4 mm. Corolla yellowish. Achenes 4–5 × 2·5–3 mm; pappus 20–25 mm. *S. Greece and Aegean region.* Cr Gr.

5. C. cardunculus L., *Sp. Pl.* 827 (1753). Stems 20–100 cm, lanate. Leaves up to 50 × 35 cm, subcoriaceous, bright green and shortly tomentose above, white-tomentose beneath; segments ovate to linear-lanceolate, with rigid, yellow spines 15–35 mm at apex and clustered at base; lower leaves petiolate, the uppermost sessile. Involucre 45–60 × 40–55 mm, ovoid-globose; involucral bracts ovate to elliptical, gradually or abruptly narrowed into an erecto-patent spine 10–50 × 2–6 mm, glaucescent or purplish. Corolla blue, lilac or whitish. Achenes 6–8 × 3–4 mm, shiny, brown-spotted; pappus 25–40 mm. $2n = 34$. *Stony or waste places and dry grassland, mainly on clay soils. S. & W. parts of Mediterranean region and S. Portugal; occasionally cultivated elsewhere for the leaves which are blanched and eaten as a vegetable (cardoon).* Bl Co Cr Ga Gr Hs It Lu Sa Si.

[1] By J. do Amaral Franco.

6. C. scolymus L., *Sp. Pl.* 827 (1753). Like **5** but stems up to 200 cm, glabrescent; leaves up to 80 × 40 cm, soft, glabrescent above and greyish-tomentose beneath, with wide, unarmed or mucronulate segments; involucre 60–70 × 70–80 mm, the bracts fleshy, with a flattish apical appendage; appendage 15–40 × 12–35 mm, ovate to triangular, truncate, cuspidate or sinuate-truncate. *Unknown in the wild state, but widely cultivated on a large scale in S., W. & C. Europe, and in gardens elsewhere, for the immature capitula, which are eaten as a vegetable (artichoke).* [Au Be Co Cr Cz Ga Gr He Ho Hs It Ju Lu Rm Rs (W) Sa Si.] (*Derived from* **5**, *perhaps originally in S.W. Europe or N. Africa.*)

Sect. ACAULON Franco. Stems absent. Leaves pinnatifid, with flat, shortly spiny segments. Involucre globose; appendages of involucral bracts with a short, slender apical spine. Achenes not winged.

7. C. tournefortii Boiss. & Reuter, *Diagn. Pl. Nov. Hisp.* 18 (1842). Leaves 15–35 × 4–20 cm, oblong-lanceolate, with arachnoid indumentum above, greyish-tomentose beneath; segments oblong-lanceolate, the apical entire, the basal dentate, with teeth having yellow spines up to 5 mm; petiole short, tomentose. Capitulum solitary; peduncle very short, stout. Involucre 40–80 mm; outer involucral bracts orbicular-ovate; middle bracts ovate-oblong, with a patent, concave, ovate-triangular apical appendage 8–15 × 8–15 mm, tapering into a spine 4–7 mm; inner bracts 20–30 mm, spinose. Corolla blue. Achenes 7–8 × 3–4 mm, brown-spotted; pappus 40–50 mm. *Waste ground on clay soils.* ● *C. & S. Spain, S. Portugal.* Hs Lu.

127. Silybum Adanson[1]

Robust annual or biennial herbs. Leaves alternate, white-veined or variegated, with strongly spiny margin. Capitula solitary. Involucre ovoid; bracts imbricate, the outer and middle with an apical, setose-dentate appendage terminating (at least in the middle) in a long spine. Receptacle densely hairy. Florets all hermaphrodite. Corolla purple, deeply 5-fid, with a long tube. Achenes obovoid-oblong, compressed, glabrous; pappus of white, scabrid hairs united below into a ring.

Cauline leaves with spines up to 8 mm; outer involucral bracts with appendage tapering into a recurved spine **1. marianum**
Cauline leaves with spines 7–15 mm; outer involucral bracts without a spine **2. eburneum**

1. S. marianum (L.) Gaertner, *Fruct. Sem. Pl.* **2**: 378 (1791). Stem 20–150 cm, rarely shorter, glabrous or slightly arachnoid-pubescent, green. Basal leaves 25–50 × 12–25 cm, pinnatifid, glabrous or glabrescent, petiolate; cauline leaves smaller, less deeply divided, auriculate-amplexicaul, sessile, with yellowish-white spines up to 8 mm. Capitula 2·5–4 cm; peduncles long, erect, ebracteate or with few, small, leaf-like bracts; outer and middle involucral bracts with appendages 8–15 × 6–10 mm, gradually tapered into recurved, canaliculate spines 20–50 mm. Achenes 6–8 × 2·5–4 mm, shiny, black, with grey spots; pappus 15–20 mm. $2n = 34$. *Roadsides, waste places and cultivated ground. Mediterranean region and S.W. Europe; cultivated for ornament and naturalized or casual throughout a large part of Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu [Be Br Cz He Ho Rm Rs (C, W, K, E)].

2. S. eburneum Cosson & Durieu, *Bull. Soc. Bot. Fr.* **2**: 366 (1855). Like **1** but stem whitish; basal leaves hispid; cauline leaves with yellowish-brown spines 7–15 mm; peduncles with more numerous and longer, oblong-lanceolate, leaf-like bracts; capitula 4–6 cm; involucral bracts with appendages 4–5 × 7–8 mm, the middle bracts abruptly contracted into an erect or erecto-patent, triquetrous-subulate spine 20–70 mm; pappus 20–30 mm. *Field-margins. N.E. & C. Spain.* Hs. (*N.W. Africa.*)

128. Palaeocyanus Dostál[2]

Erect, perennial herbs. Leaves undivided. Capitula terminal, long-pedunculate. Involucre ovoid; bracts entire, coriaceous, without appendage. Florets all tubular, the marginal sterile. Anthers with acuminate apical appendage. Pappus of 2 rows of equal, scabrid setae, the inner row scale-like.

1. P. crassifolius (Bertol.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 192 (1976) (*Centaurea crassifolia* Bertol.). Glabrous. Stem up to 50 cm, branched above. Leaves up to 6 × 1·5 cm, almost all in a basal rosette, oblanceolate-spathulate, fleshy. Involucre 20–25 mm in diameter; middle bracts ovate, obtuse, finely striate. Florets purple or white. Achenes 6–8 mm, glabrous; pappus slightly longer than the achene, white. $2n = 30$. *Maritime cliffs.* ● *Malta and Gozo.* Si.

129. Cheirolophus Cass.[2]

Perennial herbs. Leaves entire or lobed. Capitula solitary on stems and branches; peduncles long, swollen below capitula. Involucre ovoid to subglobose; bracts in several rows, imbricate, appressed, coriaceous, with palmately fimbriate apical appendages, the fimbriae 7–9, subequal. All florets tubular, equal, the inner hermaphrodite, the outer female. Achenes compressed, somewhat curved, with transverse, glabrous attachment-scar; pappus of several rows of filiform, rather barbellate hairs on inner achenes, absent on outer achenes.

1 Branches leafy throughout; involucral appendages with long flexuous fimbriae **1. sempervirens**
1 Branches leafless for some distance below capitula; involucral appendages with short, rigid fimbriae
2 Leaves dentate to subentire, the lower lanceolate; pappus much shorter than achene **2. uliginosus**
2 Leaves lyrate-pinnatifid, the lower lyrate; pappus as long as achene **3. intybaceus**

1. C. sempervirens (L.) Pomel, *Nouv. Mat. Fl. Atl.* 32 (1874) (*Centaurea sempervirens* L.). Plant scabrid-pubescent; stems 30–60 cm, somewhat woody at base; branches leafy throughout. Leaves lanceolate, acute, denticulate below, sessile, the lower hastate, the upper with narrowly cuneate base and 2 stipuliform lobes. Involucre 15–20 mm; bracts distally striate and glabrous; appendages semi-lunate or broadly triangular, the fimbriae twice as long as the width of the appendages, flexuous. Florets purple. Achenes *c.* 4·5 mm, subclavate, shiny; pappus very short. $2n = 30$. *C. & S. Portugal; a few stations in Spain and S. Italy.* Hs It Lu [*Ga]. [*Ga].

2. C. uliginosus (Brot.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 193 (1976) (*Centaurea uliginosa* Brot.). Plant pubescent to subglabrous; stems up to 150 cm, simple or sparingly branched; branches sparsely leafy, the upper leafless. Lower leaves lanceolate, acute, dentate, long-petiolate; upper leaves linear-lanceolate to linear, subentire. Involucre 15–20 mm; bracts with semicircular appendages, the fimbriae few, short, rigid, the apical fimbria curved. Florets bluish. Achenes 4–5 mm, oblong, dull, minutely striate; pappus ¼–⅓ as long as achene. $2n = 24, 32$. *Marshes. Portugal.* ?Hs Lu.

[1] By J. do Amaral Franco. [2] By J. Dostál.

3. C. intybaceus (Lam.) Dostál, *op. cit.* 274 (1976) (*Centaurea intybacea* Lam.). Plant glabrous to pubescent; stems 30–60 cm, often woody at base; branches leafless for some distance below capitula. Lower leaves lyrate, with linear segments, petiolate, the upper sessile and the uppermost entire, linear-lanceolate, acuminate. Involucre 12–16 mm; bracts with short, semi-lunate appendages, the fimbriae short, rigid. Florets purple, rarely white. Achenes *c.* 4·5 mm, striate; pappus as long as achene. $2n=32$. *Rocks and cliffs.* ● *E. Spain, S. France, Islas Baleares.* Bl Ga Hs.

130. Serratula L.[1]

Perennial herbs with unarmed leaves. Capitula solitary or 2-many in a paniculate, rarely a compact, corymbose inflorescence. Usually with all florets hermaphrodite, rarely gynodioecious or more or less dioecious. Involucral bracts usually without appendages. Florets tubular; anther-appendages short or absent. Achenes glabrous. Pappus of several rows of free, finely serrulate or plumose hairs.

1 Florets yellow or cream to white, rarely pale pink
2 Outer involucral bracts 1·5–2 mm wide, with acicular apical spines; florets yellow **9. flavescens**
2 Outer involucral bracts *c.* 3 mm wide, with subulate apical spines; florets cream to white (rarely pale pink) **10. leucantha**
1 Florets pink to purple, rarely yellowish-purple
3 Outer involucral bracts with conspicuous membranous apical appendages, distinctly keeled, with dark coloured marginal band **13. bulgarica**
3 Outer involucral bracts usually without conspicuous membranous apical appendages, very rarely slightly developed and ± flat with the whole apex dark coloured
4 Capitula 5–many in a paniculate or compact corymbose inflorescence
5 Involucral bracts with an apical spine **17. erucifolia**
5 Involucral bracts acute, not obviously spiny
6 Capitula (20–)25–30 mm; involucral bracts distinctly velutinous **2. wolffii**
6 Capitula 15–20 mm; involucral bracts slightly floccose at the margin **1. tinctoria**
4 Capitula 1–3(–4)
7 Leaves regularly scalariform-pinnatifid, with segments at least 4 times as long as wide **14. radiata**
7 Leaves subentire to pinnatifid, with often irregular segments not more than 3 times as long as wide
8 Stem leafy almost up to the capitulum
9 Involucral bracts up to 3 mm wide, gradually narrowed to fine, rigid, apical spines **6. alcalae**
9 Involucral bracts 2–5 mm wide, often abruptly contracted to shortly subulate, rather weak apical spines
10 Leaf-margins denticulate (rarely slightly pinnatifid); leaves pale green when dry **7. pauana**
10 Leaf-margins strongly dentate to pinnatifid; leaves greenish-black when dry **4. abulensis**
8 Stem leafless above (or with a very few greatly reduced bracts)
11 Involucral bracts gradually narrowed into long, acute, rigid apex **5. baetica**
11 Involucral bracts abruptly contracted into fine apical spines or almost without spines
12 Involucral bracts with long spines
13 Cauline leaves denticulate, linear-lanceolate, sometimes long-decurrent on the stem **11. cichoracea**
13 Cauline leaves pinnatifid, rarely denticulate and broadly elliptical, not decurrent **3. pinnatifida**
12 Involucral bracts with apical spines inconspicuous or almost absent
14 Basal leaves pinnatifid
15 Capitula 10–20 mm in diameter; outer involucral bracts with short, rigid spines **14. radiata**
15 Capitula *c.* 20 mm in diameter; outer involucral bracts with soft, deciduous mucros **15. gmelinii**
14 Basal leaves subentire to serrate
16 Capitula 15–17 mm, 2–3 in a branched inflorescence **16. carduncul**us
16 Capitula 20–30 mm, solitary
17 All or most leaves in a basal rosette, sometimes with reduced cauline leaves **8. nudicaulis**
17 Basal rosette of leaves absent; cauline leaves present **12. lycopifolia**

1. S. tinctoria L., *Sp. Pl.* 816 (1753). Stems 4–100 cm, erect, subglabrous to puberulent. Leaves ovate-lanceolate, finely to coarsely and irregularly serrate to very deeply pinnatifid. Capitula 15–20 mm, in a rather lax panicle or subsessile in a compact cluster. Involucral bracts greenish or often deeply purple-tinted, the outer acute, slightly floccose at the margin; inner bracts long-attenuate, slightly floccose. Florets purple, rarely white. More or less dioecious. $2n=22$. *Much of Europe, but absent from the north-east, much of Fennoscandia and much of the Mediterranean region.* Al Au Be Br Bu Cz Da Ga Ge Gr Hb He Ho Hs Hu It Ju Lu No Po Rm Rs (B, C, W, E) Su.

An extremely variable species in which numerous taxa have been described at the species level and below. Two subspecies have been widely recognized: subsp. **tinctoria**, with cylindrical capitula *c.* 6 mm wide in a spreading inflorescence, and subsp. **macrocephala** (Bertol.) Rouy ex Hegi, *Ill. Fl. Mitteleur.* 6(2): 929 (1928), with fewer, subsessile, campanulate capitula 6–12 mm wide in a compact group. The former has been recorded over a very wide range, while the latter is said to occur characteristically in mountainous regions. However, examination of herbarium material casts strong doubts as to the validity of these taxa and their supposed distributions. A small variant with very narrow leaf-segments, which occurs in N. Portugal, N.W. Spain and S.W. France, has been recognized as **S. seoanei** Willk., *Österr. Bot. Zeitschr.* **39**: 317 (1889).

2. S. wolffii Andrae, *Bot. Zeit.* **13**: 321 (1855) (*S. coronata* L. pro parte). Stems 80–150 cm, stout, erect, subglabrous. Basal leaves rather irregularly pinnatifid, the segments usually elliptic-lanceolate, sometimes pinnately lobed to subentire, the leaflets irregularly serrate with setulae on the margin and veins; cauline leaves similar, becoming reduced upwards and grading into the bracts. Capitula 25–30 mm, campanulate, up to 15 in a lax, irregular panicle. Outer involucral bracts acute, velutinous; inner bracts rather rigid, long-attenuate, sometimes slightly geniculate and hooked at apex. Florets purple. Gynodioecious. *S. & C. parts of U.S.S.R., Romania.* Rm Rs (C, W, E).

3. S. pinnatifida (Cav.) Poiret in Lam., *Encycl. Méth. Bot.* **6**: 561 (1805). Stems 7–25(–45) cm, erect, pubescent. Leaves with lateral veins more or less prominent, often floccose beneath, usually pale green when dry; basal broadly lanceolate, denticulate to deeply pinnatifid, often with a large terminal lobe; cauline pinnatifid, rarely denticulate and broadly elliptical, absent from upper part of stem. Capitula 20–30 mm, more or less cylindrical, solitary or a few together. Outer involucral bracts yellow-green, abruptly contracted into a long, yellow apical spine (rarely almost spineless); inner bracts chartaceous, sometimes with geniculate apex. Florets pinkish-purple. *C. & S. Spain, W.C. Portugal.* Hs Lu.

[1] By J. F. M. Cannon and J. B. Marshall.

S. legionensis Lacaita, *Cavanillesia* **3**: 37 (1930), recorded from two localities in N.W. Spain and said to be related to **12**, appears to be a minor geographic variant of **3**.

4. S. abulensis Pau, *Bol. Soc. Esp. Hist. Nat.* **21**: 150 (1921) (?*S. pinnatifida* sensu Coutinho, non (Cav.) Poiret). Like **3** but leaves with rather obscure lateral veins, distinctly dentate to pinnatifid, usually only hairy on the veins beneath and greenish-black when dry; capitula 25–40 mm, campanulate; outer involucral bracts 2–5 mm wide, usually purplish, with shortly subulate, rather weak apical spine. $2n=90$. ● *W.C. Spain, C. & S. Portugal.* Hs Lu.

5. S. baetica Boiss. ex DC., *Prodr.* **7**: 306 (1838). Stems up to 50 cm, puberulent. Basal leaves entire to dentate, the petiole as long as or longer than lamina; cauline entire to somewhat pinnatifid, usually absent from the upper part of the stem or rarely represented by bracts. Capitula 30–40 mm, campanulate, solitary or 2–4 together. Outer involucral bracts long, up to 3 mm wide, rigid, gradually narrowed into a stout apical spine; inner bracts chartaceous, long-attenuate. Florets purplish. ● *Mountains of S.W. Spain, W.C. Portugal.* Hs Lu.

6. S. alcalae Cosson, *Not. Pl. Crit.* 40 (1849) (*S. baetica* var. *pinnatifida* Willk.). Like **5** but often smaller; stem leafy almost up to the capitulum; leaves all pinnatifid; outer involucral bracts up to 3 mm wide, the inner somewhat erose and slightly ciliate at apex. Florets pinkish-purple. *Mountains of S.W. Spain, S. Portugal.* Hs Lu.

7. S. pauana Iljin, *Feddes Repert.* **35**: 354 (1934). Stems 8–30 cm, puberulent. Leaves broadly ovate to narrowly lanceolate, denticulate, rarely slightly pinnatifid, pale green when dry, long-petiolate. Capitula 30–50 mm, up to 40 mm in diameter, broadly campanulate, solitary. Outer involucral bracts 2–5 mm wide, gibbous, with rather short apical spine. Florets yellowish-purple. ● *C. & S.E. Spain.* Hs.

8. S. nudicaulis (L.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 86 (1805) (*S. albarracinensis* Pau). Stems 13–25(–70) cm, glabrescent, usually with some leaves towards the base, with a few small bracts above. Leaves in a basal rosette, narrowly elliptical to narrowly lanceolate, subentire to coarsely serrate. Capitula 20–25 mm, broadly campanulate, solitary. Outer involucral bracts mucronate, purplish at apex and margin; middle bracts sometimes with apical appendages; inner bracts chartaceous, crispate, erose at apex. Florets pinkish-purple. $2n=30$. *Mountains of S.W. Europe.* Ga He Hs It.

9. S. flavescens (L.) Poiret in Lam., *Encycl. Méth. Bot.* **6**: 562 (1805). Stems up to 70 cm, stout, erect, glabrescent. Leaves narrowly elliptical to elliptical, serrate-dentate, rarely subentire. Capitula 25–40 mm, campanulate, solitary or 2–5. Outer involucral bracts 1·5–2 mm wide, with apical spines which often become recurved; inner bracts chartaceous, long-attenuate, sometimes slightly geniculate and erose at apex. Florets yellow. *C., E. & S. Spain, S. Portugal.* Hs Lu.

S. neglecta Iljin, *Feddes Repert.* **35**: 353 (1934), from S.E. Spain (Sierra de Cartama, prov. Málaga), is closely related to **9**, and very probably conspecific with it. It appears to be less stout, with the leaf-margin somewhat shallowly dentate to subentire.

10. S. leucantha (Cav.) DC., *Prodr.* **6**: 670 (1838). Like **9** but leaves finely and regularly serrate-dentate, darker green when dry; capitula rather ventricose; outer involucral bracts *c.* 3 mm wide, few, with subulate apical spine; florets cream to white, rarely pale pink. ● *E. Spain.* Hs.

11. S. cichoracea (L.) DC., *loc. cit.* (1838). Plant up to 70 cm, stout, puberulent. Leaves denticulate, the basal oblanceolate to elliptical, rarely entire, the cauline linear-lanceolate, sometimes long-decurrent on stem, absent from upper part of stem. Capitula 30–40 mm, ventricose, solitary or occasionally a few together. Outer involucral bracts glabrous, shining, with long, rigid apical spine, the spine usually strongly recurved at maturity; inner bracts rather rigid, somewhat geniculate or recurved at apex. Florets purple. *Mediterranean region.* Cr Hs It Si.

1 Leaf-bases not, or only very slightly, decurrent **(b)** subsp. **mucronata**
1 Leaf-bases clearly decurrent
2 Outer involucral bracts velutinous **(a)** subsp. **cichoracea**
2 Outer involucral bracts sparsely ciliate **(c)** subsp. **cretica**

(a) Subsp. cichoracea: Leaf-bases decurrent on the stem which sometimes appears winged. Outer involucral bracts velutinous, the apical spine 5–8 mm. ● *C. & S. Italy.*

(b) Subsp. mucronata (Desf.) Jahandiez & Maire, *Cat. Pl. Maroc* **3**: 805 (1934): Stems scapose, with few small bracts. Leaf-bases not, or only very slightly decurrent on stem. Outer involucral bracts sparsely ciliate, the apical spine 4–5 mm. *Sicilia, S.E. Spain.* (*N. Africa.*)

(c) Subsp. cretica Turrill, *Kew Bull.* **12**: 391 (1957): Cauline leaves numerous. Leaf-bases decurrent. Outer involucral bracts with a few marginal papillae and cilia, the apical spine 2·5–3 mm. ● *E. Kriti.*

12. S. lycopifolia (Vill.) A. Kerner, *Österr. Bot. Zeitschr.* **22**: 13 (1872) (*S. heterophylla* auct. ross., non (L.) Desf.). Plant up to *c.* 100 cm, puberulent. Basal leaves broadly lanceolate, coarsely dentate-serrate, sometimes with a few deeply pinnatifid basal lobes, with conspicuous veins; cauline leaves very deeply pinnatifid, scalariform, with linear lobes, sometimes with a large terminal lobe, absent from upper part of stem. Capitulum 20–30 mm, campanulate, solitary. Outer involucral bracts inconspicuously mucronate, with purplish apex and margin; inner bracts chartaceous, crispate, sometimes more or less geniculate at apex. Florets purplish. $2n=60$. ● *E.C. Europe and S. part of U.S.S.R., northwards to c. 56° N.; mountains of S.E. France.* Au Cz Ga Hu Ju Rm Rs (C, W, E).

13. S. bulgarica Acht. & Stoj., *Bull. Soc. Bot. Bulg.* **5**: 111 (1932). Plant 40–100 cm, slender, erect, very slightly asperous. Basal leaves lanceolate-ovate, dentate, the teeth coarse near base, becoming finer towards apex; cauline leaves lanceolate, long-cuneate at base, deeply or shallowly dentate, the uppermost becoming progressively more deeply cut and markedly apiculate and merging into the dentate bracts; rarely all leaves more or less entire. Capitulum *c.* 30 mm, campanulate, solitary. Outer involucral bracts broadly ovate, with conspicuous, irregular, membranous appendages; inner bracts acute, chartaceous, with crispate, membranous margin. Florets pinkish-purple. ● *N.E. Bulgaria and E. Romania.* Bu Rm.

14. S. radiata (Waldst. & Kit.) Bieb., *Fl. Taur.-Cauc.* **3**: 545 (1819). Plant up to 60 cm, slender, scabrid. Leaves deeply pinnatifid, scalariform, the lobes entire or with occasional irregularly spaced teeth, scabrid to almost smooth. Capitula (20–)25–30 × 10–20 mm, campanulate, solitary or 2–4 in subcorymbose clusters. Outer involucral bracts abruptly contracted into a short rigid spine, the lower floccose; inner bracts rather rigid, with rather geniculate, occasionally almost hooked, spiny apex. Florets purplish. $2n=30$. *S.E. Europe, extending to Hungary and S.C. Russia.* Al Bu Hu Ju Rm Rs (C, W, K, E).

(a) Subsp. radiata: Stems leafy almost to apex. Leaves distinctly scabrid, with terminal lobes usually larger than the lateral.

Throughout the range of the species except Albania and W. Jugoslavia.

(b) Subsp. **cetingensis** (Rohlena) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 734 (1931): Stems leafless above or nearly so. Leaves scabrid at margin and on the veins only, rarely almost smooth, the terminal lobe scarcely larger than the lateral. *Albania and W. Jugoslavia.*

15. S. gmelinii Tausch, *Flora* (*Regensb.*) **11**: 485 (1828). Plant 60–100 cm, stout, erect, scabrid-pubescent, rarely subglabrous. Basal leaves deeply and somewhat irregularly pinnatifid, the lobes remotely and irregularly dentate; cauline leaves similar or the upper entire, absent from upper part of stem. Capitulum (15–)20–25 × *c.* 20 mm, subglobose, solitary. Outer involucral bracts subglabrous, shining or with sparse tomentum, with very short, soft, deciduous mucro at apex; inner bracts linear-lanceolate, with apical appendage. Florets purplish. *C. & S.E. Russia.* Rs (C, E).

S. tanaitica Smirnov, *Bull. Soc. Nat. Moscou* nov. ser., **49(1)**: 92 (1940), from S.E. Russia, appears closely related to **15**, from which it is said to differ in its glabrous stem, rather regular, narrow leaf-lobes, smaller capitula and paler florets. It may perhaps also be related to **14(b)**.

S. donetzica Dubovik in Wissjul., *Fl. RSS Ucr.* **12**: 560 (1965), from S.E. Russia and E. Ukraine, is said to be intermediate between **15** and *S. tanaitica*, differing from both in its shorter, densely pubescent stem and longer spines of the outer involucral bracts.

16. S. cardunculus (Pallas) Schischkin in Krylov, *Fl. Zap. Sibir.* **11**: 2937 (1949). Plant 40–60 cm, slender, erect, sparingly branched, glabrous. Leaves narrowly lanceolate, the basal entire or remotely dentate, the cauline sometimes deeply and irregularly pinnatifid. Capitula 15–17 mm, campanulate, 2–3 in a branched inflorescence. Outer involucral bracts ovate, acute, strongly mucronate but scarcely spiny at apex; inner bracts chartaceous, long-attenuate, with sometimes geniculate or rather hooked-mucronate apex. Florets purplish. *S.E. Russia and E. Ukraine.* Rs (C, W, E).

17. S. erucifolia (L.) Boriss. in Bobrov & Czerep., *Fl. URSS* **28**: 270 (1963). Plant 20–60 cm, with many patent branches, scabrid. Leaves deeply, often irregularly, pinnatifid, the basal sometimes only shallowly so; cauline leaves becoming reduced and bract-like towards apex, dentate to entire. Capitula 10–15 × 4–6 mm, cylindrical, numerous in a corymbose inflorescence. Outer involucral bracts glabrous, with short apical spine; inner bracts chartaceous, with distinct midrib prolonged into short mucro. Florets purplish. *S. part of U.S.S.R.* Rs (C, W, K, E).

131. Leuzea DC.[1]

(*Rhaponticum* Adanson, non Ludwig)

Biennials or perennials. Stem simple, rarely sparingly branched. Leaves entire to lyrate or pinnatifid. Capitula solitary, terminal. Involucre ovoid-globose or globose; bracts imbricate, with membranous, entire or lacerate appendages. Florets all hermaphrodite. Anthers with obtuse basal appendages. Achenes ovoid or turbinate, sometimes compressed, glabrous; pappus-hairs in several rows, plumose or barbellate, connate into an annulus at the base.

Literature: J. Holub, *Folia Geobot. Phytotax.* (*Praha*) **8**: 377–395 (1973).

[1] By J. Dostál.

1 Pappus-hairs barbellate, the cilia not or scarcely longer than the width of the hair
2 Bracts narrowly lanceolate, acuminate, without a distinct appendage; basal leaves pinnatisect **1. centauroides**
2 Bracts broadly ovate, obtuse or subacute, with an orbicular appendage up to 10 mm wide; basal leaves undivided, lyrate or pinnatisect **2. rhapontica**
1 Pappus-hairs plumose, the cilia at least 3 times as long as the width of the hair
3 Stem 5–30 cm; involucre ovoid-globose; achenes densely tuberculate, without an apical collar; pappus *c.* 6 times as long as achene, the cilia 10–20 times as long as the width of the hair **4. conifera**
3 Stem 20–150 cm; involucre globose; achenes ±smooth, with a small apical collar; pappus 2–3 times as long as achene, the cilia not more than 8 times as long as the width of the hair
4 Stem 20–80 cm, leafless above; leaves white-tomentose beneath **6. longifolia**
4 Stem 40–150 cm, with a few leaves above; leaves green on both surfaces or arachnoid-hairy beneath
5 Stem 100–150 cm; leaves pinnatifid; involucre 6–8 cm in diameter; appendages of involucral bracts suborbicular, the outer lanceolate **5. rhaponticoides**
5 Stem 40–100 cm; leaves undivided or with 1–3 pairs of lobes at the base; involucre 3–6 cm in diameter; appendages of involucral bracts ovate, long-acuminate **3. altaica**

1. L. centauroides (L.) J. Holub, *Folia Geobot. Phytotax.* (*Praha*) **8**: 391 (1973) (*Cnicus centauroides* L.). Stem up to 100 cm, arachnoid-tomentose. Basal leaves 30 × 20 cm, pinnatisect, with lanceolate, acute, serrate-dentate segments, petiolate; cauline leaves smaller, pinnatifid or incise-dentate, sessile, the uppermost surrounding the capitulum; all leaves green above, white-tomentose beneath. Involucre up to 5 cm in diameter, globose; bracts narrowly lanceolate, acuminate, lacerate, with brown margin, the appendage absent. Corolla purple. Achenes 8–10 mm, dark brown; pappus barbellate, brownish, 4 times as long as achene. $2n=26$. *Mountain rocks and pastures.* ● *Pyrenees.* Ga Hs.

2. L. rhapontica (L.) J. Holub, *op. cit.* 392 (1973) (*Rhaponticum scariosum* Lam., *Centaurea rhapontica* L.). Stem up to 100 cm, lanate. Basal leaves 20–60 × 12–15 cm, acute, subcordate at base, petiolate; cauline leaves attenuate or sublyrate at base, undivided or lyrate, dentate, sessile; all leaves green, glabrous above, grey- or white-tomentose beneath. Involucre up to 11 cm in diameter, globose; bracts oblong or ovate, the appendages *c.* 10 mm wide, orbicular, lacerate, brown. Corolla red or purple. Achenes brown; pappus barbellate, twice as long as achene, purplish-brown. $2n=26$. *Subalpine and alpine meadows.* ● *Alps.* Au Ga He It Ju.

1 Involucre 5–6(–7) cm in diameter; bracts subacute; cauline leaves gradually narrowed to base, undivided, grey-tomentose beneath; stem leafless below the capitulum **(a)** subsp. **rhapontica**
1 Involucre 7–11 cm in diameter; bracts obtuse; cauline leaves abruptly narrowed to base, undivided, lyrate or pinnatisect, distinctly white-tomentose beneath; stem leafy up to the capitulum
2 Basal leaves undivided or lyrate, with one pair of lobes at the base **(b)** subsp. **heleniifolia**
2 Basal leaves deeply pinnatisect into lanceolate, serrate-dentate segments **(c)** subsp. **bicknellii**

(a) Subsp. **rhapontica**: Stem up to 70 cm, leafy only at the base. Basal leaves lanceolate to ovate, undivided, grey-tomentose beneath. Capitula long-pedunculate. Involucre 5–6(–7) cm in diameter; bracts subacute, densely ciliate. *Calcifuge. S.W. & C. Alps.*

(b) Subsp. **heleniifolia** (Gren. & Godron) J. Holub, *loc. cit.* (1973) (*Rhaponticum scariosum* subsp. *lyratum* (Bellardi) Hayek, *Centaurea lyrata* Bellardi): Stem up to 100 cm, sparingly leafy up to the capitulum. Basal leaves oblong, undivided or lyrate, with one pair of lobes at the base. Capitula sessile. Involucre 6–10 cm in diameter; bracts obtuse, sparsely to densely ciliate. *Calcicole. Throughout most of the range of the species.*

(c) Subsp. **bicknellii** (Briq.) J. Holub, *loc. cit.* (1973): Stem leafy up to the capitulum. Basal leaves oblong-lanceolate, deeply pinnatisect into lanceolate, serrate-dentate segments. Capitula sessile. Involucre 8–11 cm in diameter; bracts obtuse, sparsely ciliate. *Calcicole. Maritime Alps, Alpi Liguri.*

3. L. altaica (Fischer ex Sprengel) Link, *Enum. Horti Berol. Alt.* **2**: 356 (1822) (*Rhaponticum serratuloides* (Georgi) Bobrov, *Centaurea serratuloides* Georgi). Stem up to 100 cm, arachnoid-tomentose. Basal leaves 30 × 15 cm, undivided or lyrately pinnatipartite with 1(–3) pairs of lobes at the base, dentate, petiolate; cauline undivided, entire or shallowly dentate, sessile; all leaves green on both surfaces, arachnoid-lanate beneath. Involucre 3–6 cm in diameter, globose; middle bracts with an oblong-ovate, long-acuminate, indistinctly lacerate, brown appendage with a recurved apex; inner bracts with a narrow, acute appendage. Corolla purple. Achenes 6–8 mm, pale brown; pappus plumose, 2–3 times as long as the achene, creamy-white. *Meadows and saline steppes. S. part of U.S.S.R., E. Romania.* Rm Rs (?C, W, E).

4. L. conifera (L.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 109 (1805) (*Centaurea conifera* L.). Stem 5–30 cm, white-lanate, leafy up to the capitulum. Leaves white-tomentose beneath; lower leaves ovate-lanceolate, entire or lyrate-pinnatifid, petiolate. Involucre up to 4 cm in diameter, ovoid-globose; middle bracts puberulent, with reddish-brown appendages. Corolla purple to whitish. Achenes up to 4 mm, turbinate, densely tuberculate, black; pappus *c.* 6 times as long as achene, snow-white. $2n=26$. *Dry places. W. Mediterranean region, Portugal.* Bl Co Ga Hs It Lu Sa Si.

5. L. rhaponticoides Graells, *Mem. Real Acad. Ci. Madrid* **2**: 468 (1859). Stem 100–150 cm, with a few leaves above. Leaves pinnatifid, sparsely arachnoid-pubescent beneath, the lower petiolate, the cauline sessile; uppermost leaves sinuately lobed. Involucre 6–8 cm in diameter, globose; middle bracts sparsely puberulent, with reddish-brown appendages. Corolla violet-purple. Achenes *c.* 4·5 mm, ovoid, indistinctly costate, dark brown; pappus *c.* 3 times as long as achene, ivory-white. $2n=26$. *Mountain woods.* ● *C. Spain, N.E. Portugal.* Hs Lu.

6. L. longifolia Hoffmanns. & Link, *Fl. Port.* **2**: 217 (1825). Stem 20–80 cm, leafless above. Leaves white-lanate beneath; lower leaves lanceolate, entire, the base with falcate, lyrate lobes, petiolate; cauline leaves lyrate-pinnatifid. Involucre up to 3 cm in diameter, globose; middle bracts glabrous, with brown appendages. Corolla purple. Achenes quadrangular; pappus *c.* 3 times as long as achene, ivory-white. $2n=26$. *Damp scrub.* ● *Portugal.* Lu.

132. Amberboa (Pers.) Less.[1]

Annuals or biennials. Capitula medium, solitary, sessile to long-pedunculate. Involucre ovoid; bracts imbricate, appressed, ovate or oblong, the inner row with appendage. Marginal florets sterile, radiate. Anthers long-caudate at base. Achenes oblong, compressed, villous, the apex denticulate, the centre umbilicate; pappus of several rows of scale-like hairs, persistent, shorter than to about as long as the achene.

[1] By J. Dostál.

1. A. turanica Iljin, *Bull. Jard. Bot. URSS* **30**: 110 (1932). Annual. Stem 20(–50) cm, branched from the base. Basal leaves undivided, rarely lobed, remotely dentate, petiolate; upper pinnately lobed to pinnatisect, dentate, sessile. Capitula sessile in the centre of a basal rosette of leaves, or sessile or shortly pedunculate at the apices of branches. Involucre *c.* 12 mm wide; appendage lanceolate. Corolla pale yellow, 5- to 10-fid. Achenes 4–5 mm. *Gravelly and sandy places. S.E. Russia, W. Kazakhstan.* Rs (E). (*W. & C. Asia.*)

A. moschata (L.) DC., *Prodr.* **6**: 560 (1838) (*Centaurea moschata* L.), from S.W. Asia, is cultivated for ornament and has been reported as a casual or perhaps naturalized in the Mediterranean region. It is a sparingly branched annual or biennial up to 70 cm and can be distinguished from **1** by the long-pedunculate capitula, the involucre *c.* 20 mm in diameter, the inner bracts having a broadly ovate appendage, and the pink, multifid corolla. The achenes often lack a pappus.

133. Volutaria Cass.[1]

Annuals. Capitula solitary or in pairs at apex of branches, small. Involucre ovoid; bracts imbricate, in few rows, with shortly decurrent, acute, mucronate apical appendage. Marginal florets sterile, radiate. Filaments hairy. Achenes ribbed, pitted between the ribs, pubescent, the apex with a denticulate margin; pappus in 2 subequal rows, the outer of setae, the inner of scales.

1. V. lippii (L.) Maire in Jahandiez & Maire, *Cat. Pl. Maroc* **3**: 817 (1934) (*Centaurea lippii* L.). Plant crispate-papillose; stems 20–40 cm, erect, divaricately branched, sulcate, leafy up to the capitula. Basal leaves more or less in a rosette, obovate, lyrate or pinnatipartite, long-petiolate; segments oblong, remotely dentate; cauline leaves pinnatipartite, shortly decurrent, with short, winged petiole. Involucre 10–12 mm; middle bracts villous, with appendage *c.* 3 mm, lanceolate, yellow, brown at base. Florets bright pink. Achenes 3–4 mm; pappus *c.* 2·5 mm. *Cultivated and waste ground. Naturalized in S.E. Spain and Linosa.* [Hs Si.] (*N. Africa, S.W. Asia.*)

V. maroccana (Barratte & Murb.) Maire, *op. cit.* 818 (1934) (*Amberboa maroccana* Barratte & Murb.), from Morocco, which is like **1** but has pinnatisect leaves with linear, entire segments, the upper leaves as long as the basal, and the middle involucral bracts with a minute, black appendage, has been reported from S.E. Spain, and is perhaps naturalized.

134. Cyanopsis Cass.[1]

Annuals. Capitula solitary on stems or branches. Involucre ovoid; bracts ovate-lanceolate, setulose-punctate on outer surface, with narrow black margin and apical spine. Outer florets sterile, radiate. Achenes somewhat compressed, ribbed; pappus of many rows of scales.

1. C. muricata (L.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 193 (1976) (*Centaurea muricata* L., *Amberboa muricata* (L.) DC.). Plant arachnoid-hairy; stems up to 50 cm, erect, sulcate; upper branches leafless. Leaves oblong or oblong-lanceolate, entire to pinnatipartite, the segments remotely dentate; lower leaves petiolate, the middle sessile, the upper mucronulate at apex and auriculate at base. Capitula up to 5 cm in diameter. Involucre

c. 15 mm in diameter; bracts appressed, villous, the spine up to 5 mm, erect to deflexed, straw-coloured. Florets pink, the outer up to 2 cm. Achenes up to 4 mm; pappus-scales ⅔ as long as achene, oblong-lanceolate, with serrulate apex, ivory-white. *Roadsides and vineyards.* ● *S. Spain* (*Málaga Prov.*). Hs.

135. Mantisalca Cass.[1]

Biennials or perennials. Capitula solitary on branches. Involucre ovoid-globose; bracts appressed, coriaceous, the appendage a short, erect to deflexed, deciduous spine. Anthers caudate at base. Achenes subcompressed, transversely rugose, 10- to 15-ribbed, the ribs anastomosing at base and apex; pappus of long, subacuminate scales, surrounded by setae as long as or longer than the achene.

1. M. salmantica (L.) Briq. & Cavillier, *Arch. Sci. Phys. Nat.* (*Genève*) ser. 5, **12**: 111 (1930) (*Centaurea salmantica* L.). Plant glabrous above, arachnoid-pubescent below; stems up to 100 cm, with slender branches, leafless above. Lower leaves up to 25 cm, oblong, pinnately lobed; cauline linear-lanceolate to narrowly oblong, remotely dentate to pinnatisect, decreasing in size upwards. Involucre 10–15 mm in diameter; bracts ovate, acute, yellowish-green, black distally, with apical spine 1–3 mm. Marginal florets more or less radiate. Corolla purple, rarely white. Achenes *c.* 3 mm, dark brown; pappus brownish-white or reddish. $2n=18$, 20, 22. *Cultivated ground, roadsides and other dry habitats. Mediterranean region, Portugal.* Bl ?Co Ga Gr Hs It Ju Lu Sa Si.

136. Acroptilon Cass.[1]

Rhizomatous perennials. Capitula small to medium, solitary on branches. Involucre oblong-ovoid to cylindrical; bracts imbricate, the outer with broadly ovate to lunulate appendage, the inner with oblong appendage. Florets tubular, hermaphrodite. Anthers shortly caudate at base. Achenes obovoid, indistinctly striate; pappus simple, caducous, the hairs barbellate, not connate into an annulus at base.

1. A. repens (L.) DC., *Prodr.* **6**: 663 (1838) (*Centaurea picris* Pallas ex Willd., *C. repens* L.). Stem erect, branched, densely leafy. Leaves oblong-lanceolate, entire or remotely dentate. Involucre 5–15 mm in diameter; bracts villous on outer surface, with entire or lacerate margin, the outer orbicular, the middle ovate, the inner lanceolate. Florets pink or lilac-pink, longer than the involucre. Achenes 3–4 mm; pappus twice as long as achene. *Cultivated fields and dry pastures. S. Ukraine, S.E. Russia, W. Kazakhstan.* Rs (W, K, E).

137. Phalacrachena Iljin[1]

Perennial herbs with long rhizomes. Leaves simple. Capitula medium, solitary on branches. Involucre subglobose; bracts with membranous appendages. Inner florets tubular, hermaphrodite, the outer sterile, radiate. Anthers with short, basal appendages, the apical appendages free. Stigmas with long hairs at base. Achenes somewhat compressed; pappus absent.

1. P. inuloides (Fischer ex Janka) Iljin, *Not. Syst.* (*Leningrad*) **7**: 51 (1937). Stem simple or sparingly branched. Leaves lanceolate, entire, acute, pale green. Involucral bracts subcoriaceous; middle with ovate, shortly mucronate, shortly decurrent appendages, having long, white, pectinate fimbriae; inner with large, oblong-ovate, recurved, irregularly fimbriate appendages. Florets pinkish-purple. Achenes 5·5–6 mm, glabrous. *Saline soils.* ● *S.E. Russia, E. Ukraine.* Rs (W, E).

[1] By J. Dostál.

138. Centaurea L.[1]

Annual to perennial herbs, rarely dwarf shrubs. Leaves undivided to pinnatisect. Capitula solitary or in groups of 2–3 at apex of branches. Involucre cylindrical to globose; bracts often with a fimbriate or spiny appendage. Inner florets hermaphrodite; outer sterile, often radiate; corolla tubular, 5(–8)-fid. Achenes somewhat compressed. Pappus usually present, persistent or rarely caducous, of 2 or several rows of scabrid to plumose setae or oblong to linear scales; innermost row short, the setae or scales sometimes connate at the base, usually differing in shape or texture from the outer; outer rows imbricate, the inner the longest.

The problem of a practical and natural division of this vast genus still remains to be solved. Some subgenera and sections stand clearly apart and seem comparable to other genera already recognized within the Centaureineae, but the status of others is still uncertain. A very thorough study, involving many lines of evidence, may well provide a basis for further division of *Centaurea*, but there is little general agreement that this can be done with the present information. In view of the prevailing uncertainty and the drastic nomenclatural consequences which would result from further generic splitting, it has been decided to adopt here a relatively conservative circumscription.

Descriptions of leaves refer to the lower cauline, and of appendages and fimbriae to those of the middle involucral bracts, unless otherwise stated. Diameter of involucre is measured at anthesis and is exclusive of spines.

In order to assist with identification, the names of subgenera have in many cases been included in the key, even though sometimes these leads also include some species of other subgenera.

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1 Middle bracts without an appendage (the inner sometimes with an appendage), the margin coriaceous, not scarious or membranous (Subgen. *Centaurea*)
2 Florets purple or pink
3 Middle bracts with scarious margin *c.* 1 mm wide near apex; pappus much longer than achene **1. centaurium**
3 Middle bracts with scarious margin 2–4 mm wide near apex; pappus shorter than or almost as long as achene
4 Leaves glabrous, all pinnatisect, the upper with broadly ovate segments **2. amplifolia**
4 Leaves lanuginous-villous, the lower undivided or lyrate, the upper pinnatisect with linear-lanceolate segments **3. fraylensis**
2 Florets yellow
5 Basal leaves undivided; cauline leaves undivided or lyrate **4. africana**
5 All leaves pinnatisect
6 Middle bracts with scarious margin 1·5–2·5 mm wide near apex
7 Leaf-segments ovate-oblong; stems not more than 70 cm, glabrous **7. kasakorum**
7 Leaf-segments linear or linear-lanceolate
8 Stems 80–100 cm, villous below **8. taliewii**
8 Stems 100–150 cm, lanate below **5. ruthenica**
6 Middle bracts with scarious margin 0·5–1 mm wide near apex
9 Leaves pale green, the segments oblong-lanceolate, entire at base, sometimes serrate at apex **9. alpina**
9 Leaves deep green, the segments linear-lanceolate, serrate from base to apex
10 Stems lanate at the nodes below; leaves ovate-oblong in outline **5. ruthenica**
10 Stems villous at the nodes below; leaves linear- or oblong-lanceolate in outline **6. linaresii**
1 Middle bracts usually with a scarious or membranous margin, or with a spinose appendage
11 Middle bracts with an entire, denticulate or lacerate, but not fimbriate, appendage (Subgen. *Jacea*, *Phalolepis*, *Lopholoma* Sect. *Hyaleoloma*)
12 Lower and middle leaves 1- to 2(–3)-pinnate, with linear, lanceolate or oblong segments, rarely undivided or lyrate
13 Appendages hyaline throughout **10. jankae**
13 Appendages coriaceous at least in centre
14 Biennial; appendages with the margin scarcely demarcated from the centre **164. margaritacea**
14 Biennial or perennial; appendages with the margin distinct from the centre
15 Stems 10–100 cm, erect, rarely ascending or procumbent, with many branches
16 Capitula not more than 10; appendages with brownish to reddish centre, with spine 0·5–3 mm **166. sterilis**
16 Capitula usually more than 10; appendages concolorous or with a yellowish, brownish or black centre, with a setaceous spine, or muticous
17 Appendages with a brown, reddish or blackish central spot, or entirely whitish **167. alba**
17 Appendages with a yellow central spot
18 Leaves lanate and scabrid; florets purple **165. transcaucasica**
18 Leaves puberulent; florets pink or white **167. alba**
15 Stems 5–50 cm, erect or procumbent, ascending distally, simple or sparingly branched
19 Lower leaves pinnatifid or lobed, the segments lanceolate to ovate
20 Involucre 8–15 mm in diameter; florets purple **168. deustiformis**
20 Involucre 20–25 mm in diameter; florets yellow **170. inusarum**
19 Lower leaves pinnatisect, the segments linear to setiform
21 Segments of lower leaves numerous, setiform; involucre 18–20 mm in diameter **169. ferulacea**
21 Segments of lower leaves few, remote, linear; involucre 7–8 mm in diameter **167. alba**
12 Lower and middle leaves undivided, or pinnately lobed with triangular-lanceolate or oblong segments
22 Involucre 6–7(–10) mm in diameter, obconical; leaves linear-lanceolate **177. dracunculifolia**
22 Involucre 9–22 mm in diameter, ovoid to globose or ovoid-cylindrical; basal leaves ovate to lanceolate
23 Upper leaves densely crowded; involucre 18–22 mm in diameter; appendages 7–10 mm wide **171. haynaldii**
23 Upper leaves not crowded; involucre 9–20 mm in diameter; involucral appendages 4–8 mm wide
24 Appendages orbicular, (4–)5–8 mm wide, with yellowish-brown or pale reddish-brown centre; florets pinkish-orange
25 Involucre (12–)14–20 mm in diameter, globose; appendages 6–8 mm wide **172. bracteata**
25 Involucre *c.* 10 mm in diameter, ovoid-cylindrical; appendages (4–)5–7 mm wide
26 Upper leaves longer than internodes, narrowed below **173. weldeniana**
26 Upper leaves shorter than internodes, auriculate-semiamplexicaul **174. rocheliana**
24 Appendages ovate to orbicular, 4(–5) mm wide, with yellowish-brown, brown or blackish-brown centre
27 Florets pinkish-orange; bracts mucronate **174. rocheliana**
27 Florets pink or purple; bracts muticous
28 Stems with short branches; basal leaves lanceolate to ovate; involucre ovoid; florets purple **178. jacea**
28 Stems with long branches; basal leaves lanceolate; involucre ovoid-globose or ovoid-cylindrical; florets pink
29 Leaves green and sparsely hairy, often glabrescent, the cauline lanceolate to linear, entire to pinnately or sinuately lobed **175. pannonica**
29 Leaves lanate-pubescent or arachnoid-hairy, hastate to auriculate **176. vinyalsii**
11 Middle bracts with a lacerate- to pectinate-fimbriate or spinose appendage
30 Appendage of middle bracts with palmately, pinnately or pectinately arranged spines
31 Biennial; leaves not decurrent; pappus about as long as achene, or absent (Subgen. *Calcitrapa*)
32 Florets yellow **146. hyalolepis**
32 Florets purple
33 Capitula long-pedunculate; appendages with basal spines up to 15 mm **149. pontica**
33 Capitula sessile or almost so; appendages with basal spines not more than 5 mm
34 Young leaves green, hispidulous; involucre 8–14 mm in diameter **147. iberica**
34 Young leaves lanate; involucre 6–8 mm in diameter **148. calcitrapa**
31 Annual, biennial or perennial; upper leaves usually decurrent; pappus shorter than to twice as long as achene, or absent
35 Pappus usually shorter than achene, or absent; apical spine of appendage not or slightly longer than the others; all spines of appendage palmately arranged (Subgen. *Seridia*)
36 Florets orange; pappus about twice as long as achene **156. hermannii**
36 Florets purple; pappus shorter than achene, or absent
37 Appendages narrowed at base, broadly semilunate
38 Lower leaves broadly ovate to lyrate; capitula solitary; involucre *c.* 10 mm in diameter; appendages with 5–9(–11) slender spines **154. napifolia**
38 Lower leaves pinnately lobed; capitula in clusters; involucre *c.* 8 mm in diameter; appendages with *c.* 5 spines, the apical stouter **155. micracantha**
37 Appendages not narrowed at base, narrowly ovate-semilunate to ovate
39 Appendages with spines not more than 3 mm, rarely muticous; outer florets scarcely patent **153. aspera**
39 Appendages with spines 3–5 mm or more; outer florets patent
40 Stems not winged **152. sphaerocephala**
40 Stems winged
41 Stems corymbosely branched; appendages with 5–7 spines; pappus *c.* 2 mm **150. sonchifolia**

41 Stems simple or branched; appendages with (5–) 7–11 spines; pappus absent on outer achenes **151. seridis**

35 Pappus about twice as long as achene or shorter; apical spine of appendage simple or pinnate, usually much longer than the others (Subgen. *Solstitiaria*)

42 Appendages decurrent, with entire filiform spine; florets purple **163. diluta**

42 Appendages not decurrent, with pinnate spine; florets yellow, rarely purple

43 Upper leaves not decurrent; pappus shorter than achene **161. nicaeensis**

43 Upper leaves decurrent

44 Achenes *c.* 4·5 mm, about twice as long as pappus; involucre (12–)15–20 mm in diameter

45 Bracts very densely arachnoid; lateral spines of appendages less than 5 mm **162. eriophora**

45 Bracts sparsely lanate to subglabrous; lateral spines of appendages 5–6 mm **160. sulphurea**

44 Achenes *c.* 2·5 mm, shorter than to as long as pappus; involucre 7–12 mm in diameter

46 Leaves lanate or greyish-tomentose; florets eglandular; pappus twice as long as achene **157. solstitialis**

46 Leaves with arachnoid indumentum or crispate-puberulent and greenish; florets glandular; pappus as long as achene

47 Stem up to 80 cm; involucre glabrous or puberulent; apical spine of appendages 5–8 mm **159. melitensis**

47 Stem up to 15 cm; involucre tomentose; apical spine of appendages 15–30 mm **158. idaea**

30 Appendage of middle bracts unarmed or with a solitary spine, lacerate- to pectinate-fimbriate

48 Appendages not decurrent on the bracts

49 Florets yellow

50 Appendage of middle bracts small, lanceolate, with a patent, deciduous apical spine (Subgen. *Microlophus*) **68. thracica**

50 Appendage of middle bracts large, ovate-lanceolate, with a rigid, persistent apical spine (Subgen. *Cynaroides*) **69. charrelii**

49 Florets pink or purple, very rarely white or yellow

51 Leaves linear-lanceolate, entire; appendage not clearly separated from the bract; pappus-setae very numerous (Subgen. *Odontolophus*) **209. trinervia**

51 Basal and lower cauline leaves lanceolate or wider, often divided; appendage clearly separated from the bract; pappus-setae few or absent

52 Lower leaves white- or grey-tomentose beneath

53 Marginal florets with staminodes; style-branches of inner florets short; pappus caducous, of 2 rows of scabrid setae (Subgen. *Psephellus*)

54 Appendages ovate-orbicular, covering bracts; involucre 30–40 mm in diameter; lower leaves with acute segments **204. dealbata**

54 Appendages triangular-lanceolate, not covering bracts; involucre not more than 20 mm in diameter; lower leaves with obtuse segments

55 Involucre not more than 15 mm in diameter; appendages yellow or pale brown **202. leucophylla**

55 Involucre 15–20 mm in diameter; appendages brown **203. declinata**

53 Marginal florets without staminodes; style-branches of inner florets long; pappus persistent, the inner row of connate, lanceolate scales (Subgen. *Heterolophus*)

56 Bracts covered by appendages; appendage of middle bracts 5–9 mm, broadly ovate, with 6–12 fimbriae on each side

57 Stems up to 60 cm, erect; appendage of middle bracts yellowish-brown **205. sibirica**

57 Stems not more than 20 cm, procumbent; appendage of middle bracts brown at base, blackish-brown towards apex **206. carbonata**

56 Bracts not covered by appendages; appendage of middle bracts not more than 3 mm, oblong or lanceolate, entire or with 1–4 fimbriae on each side

58 Appendage of middle bracts oblong, with 3–4 fimbriae on each side, brown **207. marschalliana**

58 Appendage of middle bracts narrowly lanceolate or triangular-lanceolate, entire or with 1–3 fimbriae on each side, blackish-brown **208. sumensis**

52 Lower leaves not white- or grey-tomentose beneath (Subgen. *Jacea*, *Phalolepis*)

59 Lower and middle leaves 1- to 2(–3)-pinnate, with linear, lanceolate or oblong segments, rarely undivided or lyrate

60 Capitula not more than 10; involucral appendages with brownish to reddish centre, with spine 0·5–3 mm **166. sterilis**

60 Capitula usually more than 10; involucral appendages concolorous or with a brownish to black centre, with a setaceous spine, or muticous **167. alba**

59 Lower and middle leaves undivided, or pinnately lobed with triangular-lanceolate or oblong segments

61 Appendages triangular or ovate-triangular, lanceolate or ovate-lanceolate, with short fimbriae; pappus usually absent

62 Appendages not more than 2 mm, with 5–12 fimbriae on each side, the terminal fimbria shorter than the lateral

63 Involucre 12–15 mm in diameter, globose or ovoid-globose; appendages ±covering bracts; stems stout **183. transalpina**

63 Involucre 6–12 mm in diameter, ovoid-cylindrical to narrowly cylindrical; appendages not covering bracts; stems slender

64 Lower leaves orbicular-ovate, the cauline broadly amplexicaul, dentate; involucre not more than 8 mm in diameter **185. carniolica**

64 Lower leaves oblong, lanceolate or elliptical, rarely ovate, the cauline ±attenuate at base; involucre up to 12 mm in diameter **184. nigrescens**

62 Appendages more than 2 mm, mostly covering bracts, with 7–15 fimbriae on each side, the terminal fimbria mostly longer than the lateral

65 Appendages ovate-triangular to ovate-lanceolate, erect, not recurved

66 Appendages brown, the fimbriae 9–10 on each side, pale brown **179. decipiens**

66 Appendages blackish-brown, the fimbriae 10–15 on each side, blackish-brown **180. subjacea**

65 Appendages lanceolate, rarely ovate-triangular, recurved or rarely erect

67 Involucre 12–14 mm in diameter; leaves scabrid **181. macroptilon**

67 Involucre 3–10 mm in diameter; leaves not scabrid **182. microptilon**

61 Appendages linear to lanceolate or triangular-lanceolate, rarely orbicular, with long fimbriae; pappus usually present

68 Appendages erect or somewhat recurved at apex, not attenuate into a narrow acumen; pappus much shorter than achene or absent

69 Involucre 9–14 mm in diameter; appendages brown, not recurved at apex; pappus absent or very short **186. debeauxii**

69 Involucre 15–20 mm in diameter; appendages black or blackish-brown, somewhat recurved at apex; pappus ⅓–½ as long as achene **187. nigra**

68 Appendages attenuate into a subulate-filiform or linear-lanceolate, recurved, rarely erect, acumen; pappus much shorter than to as long as achene

70 All leaves linear or filiform

71 Leaves filiform, glabrous; pappus *c.* 1 mm **199. parilica**

71 Leaves 2–3 mm wide, linear, scabrid or scabrid-puberulent; pappus 1·5–2 mm

72 Involucre 10–12 mm in diameter; stem simple or sparingly branched; appendages blackish-brown at base, reddish-brown at apex **197. linifolia**

72 Involucre 6–8 mm in diameter; stem much-branched from the base; appendages pale brown throughout **198. hyssopifolia**

70 Basal and middle leaves lanceolate to ovate, oblong or elliptical

73 Appendages linear or linear-lanceolate, attenuate into a subulate-filiform acumen, not covering the bracts

74 Involucre 8–18 mm in diameter

75 Stems up to 40 cm, erect or ascending; involucre 13–18 mm in diameter, ovoid or subglobose; appendages black below; pappus *c.* 0·5 cm **193. pectinata**

75 Stems not more than 18 cm, procumbent; involucre 8–10 mm in diameter, obovoid-obconical; appendages brown below; pappus *c.* 1 mm **194. antennata**

74 Involucre 6–12 mm in diameter

76 Stems 40–60 cm, erect, corymbosely branched; leaves yellowish-green or green, scabrid; involucre 6–10 mm in diameter; bracts lanate, the appendage brown or yellow **195. trichocephala**

76 Stems 5–10 cm, ascending, simple; leaves greyish-white, lanate; involucre *c.* 12 mm in diameter; bracts tomentellous, the appendage reddish-brown **196. janeri**

73 Appendages narrowly lanceolate or triangular-lanceolate, attenuate into a linear-lanceolate acumen, covering the bracts

77 Involucre 12–25 mm in diameter; stems simple

78 Upper leaves linear-lanceolate; pappus ⅓–¼ as long as achene **191. uniflora**

78 Upper leaves oblong to ovate-lanceolate; pappus ½ as long to as long as achene **192. kernerana**

77 Involucre 8–20 mm in diameter; stems usually branched

79 Involucre 10–20 mm in diameter; appendages with 12–25 fimbriae on each side **188. phrygia**

79 Involucre 8–14 mm in diameter; appendages with 8–12 fimbriae on each side

80 Involucre 8–10 mm in diameter, ovoid or ovoid-cylindrical; appendages with an acumen 6–7 mm **190. indurata**

80 Involucre 9–14 mm in diameter, oblong-ovoid or ovoid-cylindrical; appendages with an acumen 8–10 mm **189. stenolepis**

48 Appendages decurrent on the bracts

81 Appendages forming a narrow margin decurrent to the base of the bract

82 Middle bracts with a slender, remotely pinnate-spinulose, recurved spine; pappus of spirally arranged scales (Subgen. *Melanoloma*) **221. pullata**

82 Middle bracts muticous; pappus of filiform, barbellate setae, the inner row connate at the base (Subgen. *Cyanus*)

83 Teeth or fimbriae not longer than the width of the entire part of the margin of appendage, black or blackish-brown at least at apex

84 Appendages with teeth shorter than the width of the margin

85 Leaves somewhat rigid, gradually acuminate, grey-tomentose beneath; involucre ovoid **211. mollis**

85 Leaves thin, soft, abruptly acuminate, subglabrous and green beneath; involucre subcylindrical **212. maramarosiensis**

84 Appendages with fimbriae as long as the width of the margin

86 Leaves ovate to oblong, usually entire; stem broadly winged; fimbriae dark brown; achene 5–6 mm **210. montana**

86 Leaves oblong to narrowly lanceolate, entire or pinnate; stem narrowly or broadly but shortly winged; fimbriae brown to white; achene 3–5 mm

87 Leaves patent, lanceolate; stem not more than 20 cm, simple, narrowly winged; capitula long-pedunculate **213. pinnatifida**

87 Leaves erect, ovate or oblong to lanceolate; stem up to 80(–100) cm, simple or branched, broadly or narrowly winged; capitula not long-pedunculate **216. triumfetti**

83 Fimbriae 2–3 times as long as the width of the entire part of the margin of appendage, white or silvery at least at apex

88 Annual (rarely biennial)

89 Stems 8–20 cm, erect or procumbent, simple or sparingly branched; lower leaves obovate to oblanceolate **219. pinardii**

89 Stems 20–80 cm, erect, branched; lower leaves oblong to lanceolate

90 Lower leaves oblong, obtuse; appendages reddish-black, the fimbriae *c.* 2 mm; pappus 6–8 mm **218. depressa**

90 Lower leaves lanceolate, acute; appendages brown, the fimbriae *c.* 1 mm; pappus 3–4 mm **220. cyanus**

88 Perennial

91 Roots fusiform or napiform; inner florets purple or lilac **217. napulifera**

91 Roots not swollen

92 Inner florets violet, outer blue **216. triumfetti**

92 Inner and outer florets cream

93 Leaves linear-lanceolate in outline, entire or lyrate-lobed; involucre 6–8 mm in diameter **214. baldaccii**

93 Leaves oblong in outline, lyrate-pinnatisect; involucre *c.* 18 mm in diameter **215. pindicola**

81 Appendages shortly decurrent

94 Perennial, rarely biennial; stems usually sparingly branched or absent; capitula usually comparatively large; bracts usually without or with very indistinct veins on the dorsal surface (Subgen. *Lopholoma*, *Jacea*)

95 Appendages linear or triangular

96 Leaves membranous, usually white-tomentose; involucre 12–20 mm in diameter **200. procumbens**

96 Leaves subcoriaceous, glabrous; involucre 8–15 mm in diameter **201. rhaetica**

95 Appendages usually semilunate

97 Stems 0–5(–10) cm

98 At least the outer bracts with fimbriate appendages

99 Florets pink or purple

100 Leaves lanate **64. amblensis**

100 Leaves glabrous or scabrid-puberulent **57. raphanina**

99 Florets yellowish or orange

101 Leaves white-lanate or arachnoid-lanate

102 Pappus twice as long as achene **17. granatensis**

102 Pappus equalling or shorter than achene

102 Pappus equalling or shorter than achene

103 Florets orange; pappus much shorter than achene **60. macrorrhiza**

103 Florets pale yellow; pappus about as long as achene **19. macedonica**

101 Leaves floccose-tomentose or sublanate, often subglabrous or ±glabrescent

104 Leaves undivided **63. argecillensis**

104 Leaves mostly divided

105 Stems at least 5 cm

106 Pappus 2–3 times as long as achene **22. rupestris**

106 Pappus less than twice as long as achene **19. macedonica**

105 Acaulescent or stems not more than 3 cm
107 Florets orange-yellow **62. haenseleri**
107 Florets pale yellow
108 Leaves lyrate-pinnatisect with ovate segments **66. acaulis**
108 Leaves pinnatisect with oblong segments
109 Bracts oblong-ovate; pappus much shorter than achene **61. toletana**
109 Bracts orbicular to ovate; pappus about as long as achene **19. macedonica**
98 At least the outer bracts subentire or indistinctly denticulate
110 Florets purple
111 Leaves interruptedly pinnatisect **67. loscosii**
111 Leaves undivided or lyrate
112 Apical spine of appendages 1–3 mm **58. aegialophila**
112 Apical spine of appendages 5–9 mm **59. pumilio**
110 Florets yellow
113 Appendages with apical spine up to 16 mm; capitula 1–10 **65. lagascana**
113 Appendages with apical spine 4–8 mm; capitula solitary
114 Involucre 15–18 mm in diameter; outer florets slightly longer than the inner **65. lagascana**
114 Involucre 18–25 mm in diameter; outer florets distinctly longer than the inner **67. loscosii**
97 Stems at least 10 cm
115 Appendages mostly covering the bracts, usually mucronate or spinulose-mucronate at apex
116 Florets cream, yellow or orange
117 Older leaves white-tomentose or white-lanate
118 Basal leaves pinnatisect; involucre *c.* 25 mm in diameter **24. clementei**
118 Basal leaves entire; involucre 15–20 mm in diameter **17. granatensis**
117 Older leaves ±glabrous
119 Involucre 15–18 mm in diameter; florets golden yellow or orange **29. prolongi**
119 Involucre 20–40 mm in diameter; florets cream or yellow
120 Appendages triangular-lanceolate
121 Appendages gradually attenuate into an apical spine, straw-yellow **28. chrysolepis**
121 Appendages not spinose at apex, dark brown **31. atropurpurea**
120 Appendages ovate or suborbicular
122 Involucre 30–40 mm in diameter; florets yellow **27. tauromenitana**
122 Involucre *c.* 20 mm in diameter; florets cream
123 Appendages pale brown, mucronate **25. orientalis**
123 Appendages dark brown, with an apical spine **26. neiceffii**
116 Florets pink to dark purple
124 Leaves 2-pinnatifid, with narrowly linear segments; florets pink to purple **116. filiformis**
124 At least the basal leaves undivided or lyrate-pinnate, rarely pinnatisect with broad segments; florets dark purple
125 Stems much-branched above **34. candelabrum**
125 Stems simple or sparingly branched above
126 Stem leafless above
127 Leaves subglabrous; involucre 15–20 mm in diameter; appendages not covering bracts **35. immanuelis-loewii**
127 Leaves densely arachnoid-lanate; involucre 25–30 mm in diameter; appendages covering bracts **36. grbavacensis**
126 Stem leafy above
128 Appendages long-decurrent; fimbriae dark brown **51. alpestris**
128 Appendages shortly decurrent; fimbriae whitish at least at apex
129 Basal leaves pinnatisect; fimbriae arising abruptly from appendages **31. atropurpurea**
129 Basal leaves undivided; fimbriae arising gradually from appendages
130 Lower cauline leaves lyrate; involucre 20–30 mm in diameter **32. kotschyana**
130 Lower cauline leaves not lyrate; involucre *c.* 40 mm in diameter **33. murbeckii**
115 Appendages not covering the bracts, usually spinose at apex
131 Appendages with a spine at least 7 mm
132 Appendages orbicular, ovate or triangular
133 Appendages orbicular **42. achaia**
133 Appendages ovate or triangular
134 Florets purple or pink
135 Pappus twice as long as achene; involucre 20–30 mm in diameter **43. sibthorpii**
135 Pappus less than twice as long as achene; involucre 13–30 mm in diameter
136 Involucre 13–17 mm in diameter; leaf-rhachis not winged **11. collina**
136 Involucre 15–30 mm in diameter; leaf-rhachis winged **12. salonitana**
134 Florets yellow or orange
137 Pappus 2–3 times as long as achene
138 Involucre more than 20 mm in diameter **16. ornata**
138 Involucre less than 20 mm in diameter **22. rupestris**
137 Pappus less than twice as long as achene
139 Leaf-segments *c.* 2 mm wide; involucre *c.* 12 mm in diameter **19. macedonica**
139 Leaf-segments at least 3 mm wide; involucre more than 12 mm in diameter
140 Leaf-rhachis winged **12. salonitana**
140 Leaf-rhachis not winged
141 Leaves ±glabrous, the lower undivided **16. ornata**
141 Leaves scabrid to white-tomentose, the lower usually divided
142 Florets without black veins; involucre 13–17 mm in diameter; spine of appendage 5–13 mm **11. collina**
142 Florets with black veins; involucre up to 25 mm in diameter; spine of appendage up to 20 mm **13. centauroides**
132 Appendages semilunate
143 Appendages black or dark brown
144 Stems and leaves glabrous; stems 30–100 cm **46. cytherea**
144 Stems and leaves arachnoid-hairy or lanate; stems not more than 20 cm
145 Involucre 30–40 mm in diameter **45. redempta**
145 Involucre *c.* 15 mm in diameter **47. ebenoides**
143 Appendages light brown or yellow, rarely dark brown
146 Basal leaves undivided or pinnate
147 Appendages with patent apical spine 3–20 mm **40. graeca**
147 Appendages with erecto-patent apical spine (20–)25–50 mm **48. spruneri**
146 Basal leaves ±2-pinnatifid
148 Involucre 20–30 mm in diameter, globose **41. laconica**
148 Involucre 10–15 mm in diameter, ovoid **44. psilacantha**
131 Appendages mucronate or with a spine less than 7 mm
149 Appendages distinctly, often broadly, decurrent, mucronate or with a slender apical spine not more than 5 mm
150 Appendages of inner bracts large and conspicuous, whitish, with a black centre **52. sadlerana**

150 Appendages of inner bracts brown or yellow throughout, not large and conspicuous, not black in the centre
151 Leaves smooth **53. badensis**
151 Leaves scabrid at least on the veins or margin
152 Appendages broadly decurrent, fimbriate
153 Bracts 3–4 mm wide, ovate, numerous **49. scabiosa**
153 Bracts *c.* 6 mm wide, orbicular, few **50. cephalariifolia**
152 Appendages usually narrowly decurrent, shortly fimbriate to subentire
154 Involucre 7–10 mm in diameter; appendages 2–4 mm **56. stereophylla**
154 Involucre (10–)14–20 mm in diameter; appendages 0·5–2 mm
155 Appendages not mucronate or spinulose at apex; achenes glabrous **54. grinensis**
155 Appendages mucronate or spinulose at apex; achenes hairy **55. apiculata**
149 Appendages indistinctly and narrowly decurrent, usually with a stout apical spine
156 Florets pink to red or purple
157 Leaf-segments not more than 1 mm wide, narrowly linear; florets violet or dark red **23. kosaninii**
157 Leaf-segments at least 2 mm wide, oblong to ovate; florets purple
158 Involucre *c.* 12 mm in diameter **21. dichroantha**
158 Involucre 15–40 mm in diameter
159 Involucre 30–40 mm in diameter **45. redempta**
159 Involucre 15–25 mm in diameter
160 Appendages yellow
161 Leaves not confined to a basal rosette **12. salonitana**
161 Leaves mostly confined to a basal rosette **40. graeca**
160 Appendages black or brown
162 Pappus 3 times as long as achene **47. ebenoides**
162 Pappus less than twice as long as achene
163 Leaves subglabrous **35. immanuelis-loewii**
163 Leaves lanate to pubescent at least beneath
164 Achenes sericeous; pappus slightly shorter than achene **30. polymorpha**
164 Achenes puberulent; pappus as long as achene
165 Leaves subglabrous above **37. oliverana**
165 Leaves white-tomentose above **39. rechingeri**
156 Florets cream, yellow or orange
166 Florets orange or deep golden yellow
167 Involucre *c.* 25 mm in diameter **16. ornata**
167 Involucre 12–20 mm in diameter
168 Lower cauline leaves pinnatisect with numerous segments
169 Involucre 15–20 mm in diameter; leaves 1-pinnatisect **15. nicolai**
169 Involucre 12–15 mm in diameter; leaves usually 2-pinnatisect **22. rupestris**
168 Lower cauline leaves lyrate-pinnatifid with few segments
170 Involucre 12–15 mm in diameter **22. rupestris**
170 Involucre 15–20 mm in diameter
171 Leaves white-lanate **17. granatensis**
171 Leaves subglabrous **29. prolongi**
166 Florets cream or pale yellow, rarely bright yellow
172 Appendages ±mucronulate at apex
173 Lower leaves undivided or lyrate-pinnatifid **14. rumelica**
173 Lower leaves 2-pinnatifid **22. rupestris**
172 Appendages mucronate or spinose at apex
174 Basal leaves 2-pinnatisect, the segments not more than 2 mm wide
175 Leaf-segments narrowly linear, awned **20. mannagettae**
175 Leaf-segments linear to oblong, not awned
176 Involucre 15–20 mm in diameter
177 Florets bright yellow; pappus 7–9 mm, reddish **12. salonitana**
177 Florets pale yellow; pappus *c.* 4 mm, white **38. ragusina**
176 Involucre 12–15 mm in diameter
178 Leaves glabrous, with mucronulate segments *c.* 1 mm wide; florets yellow or purple, the outer distinctly longer than the inner **21. dichroantha**
178 Leaves arachnoid-hairy or sublanate, with segments *c.* 2 mm wide; florets yellow, the outer scarcely longer than the inner
179 Appendages with fimbriae joined by a hyaline membrane below; florets pale to deep yellow **22. rupestris**
179 Appendages with fimbriae free to the base; florets pale yellow **19. macedonica**
174 Basal leaves undivided, pinnatisect, or lyrate-pinnatifid, the segments at least 3 mm wide
180 Leaf-segments lanceolate to linear
181 Involucre 20–30 mm in diameter; leaf-rhachis winged **12. salonitana**
181 Involucre (13–)15–25(–30) mm in diameter; leaf-rhachis not winged
182 Bracts orbicular, the apical spine erecto-patent **16. ornata**
182 Bracts oblong-ovate, the apical spine patent or recurved
183 Involucre 13–17 mm in diameter **11. collina**
183 Involucre *c.* 25 mm in diameter **16. ornata**
180 Leaf-segments ovate-oblong to narrowly oblong
184 Involucre *c.* 12 mm in diameter **19. macedonica**
184 Involucre (13–)15–25 mm in diameter
185 Involucre up to 25 mm in diameter, globose
186 Apical spine of appendage more than 4 mm; florets yellow, with black veins **13. centauroides**
186 Apical spine of appendage not more than *c.* 4 mm; florets pale yellow **38. ragusina**
185 Involucre not more than 20 mm in diameter, usually ovoid
187 Florets pale yellow; apical spine of appendages spinulose at base **11. collina**
187 Florets cream; apical spine of appendages entire at base **18. tuntasia**
94 Annual, biennial or perennial; stems usually much-branched and erect; capitula comparatively small; bracts usually with (3–)5–7 more or less distinct veins on the dorsal surface (Subgen. *Acrolophus*)
188 Spiny dwarf shrub or herb with woody base
189 Stems spiny, woody above; pappus absent **145. spinosa**
189 Stems unarmed, herbaceous or woody only at base; pappus present
190 Florets pink; leaves all pinnatisect, the terminal segment with a single spine **87. horrida**
190 Florets yellow; spring leaves undivided; summer leaves divided, the terminal segment with three spines **88. balearica**

188 Unarmed herb, sometimes woody at base
191 Appendages of bracts filiform and plumose-fimbriate at apex **144. zuccariniana**
191 Appendages of bracts neither filiform nor plumose-fimbriate at apex
192 Apical spine of appendages (1·5–)2–5 mm, usually longer than lateral fimbriae
193 Lower fimbriae confluent into a hyaline margin or forming auricles
194 Lower fimbriae not forming auricles
195 Pappus about as long as achene
196 Perennial 10–20 cm; lower leaves lyrate, with oblong segments **130. lagascae**
196 Biennial 30–60 cm; lower leaves 2-pinnatisect, with linear to narrowly oblong or lanceolate segments
197 Stems sparingly branched; lower leaves with linear to narrowly oblong segments **108. spinabadia**
197 Stems paniculately much-branched; lower leaves with narrowly lanceolate segments **127. peucedanifolia**
195 Pappus not more than ½ as long as achene
198 Pappus *c.* ⅛ as long as achene **131. bombycina**
198 Pappus ¼–½ as long as achene
199 Leaves greyish-tomentose beneath **129. boissieri**
199 Leaves green beneath
200 Leaf-segments narrowly linear **129. boissieri**
200 Leaf-segments lanceolate to elliptical
201 Leaves glabrous beneath **105. dalmatica**
201 Leaves ±arachnoid beneath **102. attica**
194 Lower fimbriae forming auricles
202 Leaves with segments *c.* 0·5 mm wide **98. gracilenta**
202 Leaves with segments more than 1 mm wide
203 Apical spines of appendages erecto-patent to recurved
204 Perennial; appendages blackish **102. attica**
204 Annual or biennial; appendages yellow or brown
205 Pappus *c.* ⅔ as long as achene; leaves arachnoid-tomentose **91. tenuiflora**
205 Pappus very short or absent; leaves green **92. spinosociliata**
203 Apical spines of appendages ±erect
206 Pappus ¼–½ as long as achene
207 Basal leaves lyrate or almost undivided **100. transiens**
207 Basal leaves pinnatisect
208 Stem with few branches; florets pink **101. subsericans**
208 Stem much-branched; florets purple **102. attica**
206 Pappus about as long as achene
209 Leaves glabrous **99. kalambakensis**
209 Leaves tomentose or arachnoid-hairy
210 Involucre 15 mm; florets yellow **103. soskae**
210 Involucre 10–16 mm; florets pink or purple
211 Leaves arachnoid-lanate; appendages yellowish- or purplish-brown **79. ipsaria**
211 Leaves tomentose; appendages dark brown or black **102. attica**
193 Lower fimbriae free, neither confluent into a hyaline margin nor forming auricles
212 Involucre not more than 5(–6) mm in diameter, ovoid-cylindrical
213 Pappus absent
214 Florets pale pink; involucre 4–5 mm in diameter **141. diffusa**
214 Florets purple, rarely white; involucre 3–3·5 mm in diameter
215 Involucre 6–7 mm, ovoid **142. bovina**
215 Involucre 10–12 mm, cylindrical **143. aemulans**
213 Pappus present
216 Pappus about as long as achene
217 Florets yellow **137. pelia**
217 Florets purple **140. orphanidea**
216 Pappus not more than ½ as long as achene
218 Perennial; bracts with prominent veins
219 Capitula solitary; appendages triangular-lanceolate **129. boissieri**
219 Capitula in clusters of 2–3; appendages triangular **81. varnensis**
218 Biennial; bracts with indistinct veins
220 Involucre 5–6 mm in diameter; bracts puberulent; appendages reddish-brown, covering the bracts **138. rufidula**
220 Involucre 3–5 mm in diameter; bracts glabrous; appendages pale brown, not covering the bracts **139. tymphaea**
212 Involucre usually 5 mm or more in diameter, ovoid-globose or -oblong
221 Florets white or yellow
222 Pappus *c.* ⅛ as long as achene **131. bombycina**
222 Pappus at least ½ as long as achene
223 Florets white or cream; pappus ½ as long as achene **135. lactiflora**
223 Florets yellow or cream; pappus about as long as achene
224 Florets yellow; involucre 10×4–6 mm; appendages pale brown **137. pelia**
224 Florets cream; involucre 12×6–7 mm; appendages reddish-brown **136. laureotica**
221 Florets pink or purple, rarely white
225 Pappus absent **80. rutifolia**
225 Pappus present
226 Involucre 18–20 mm in diameter **72. niederi**
226 Involucre not more than 14 mm in diameter
227 Apical spine of appendages subulate, with spines or fimbriae at base
228 Lower leaves undivided or lyrate **131. bombycina**
228 Lower leaves pinnatisect
229 Stem short, usually ascending or procumbent
230 Non-flowering rosettes absent at anthesis **129. boissieri**
230 Non-flowering rosettes present at anthesis **131. bombycina**
229 Stem long, ±erect
231 Cauline leaves pinnatisect, crowded **129. boissieri**
231 Cauline leaves undivided, not crowded **132. monticola**
227 Apical spine of appendages without spines or fimbriae at base
232 Lower leaves 1-pinnatisect or lyrate
233 Capitula solitary; pappus not more than ¼ as long as achene **80. rutifolia**
233 Capitula in clusters or solitary; pappus at least ¼ as long as achene
234 Branches with 3–5 capitula; appendages with 3–4 fimbriae on each side **76. pannosa**
234 Branches with 1–3 capitula; appendages with (4–)5–9 fimbriae on each side
235 Apical spine of appendages up to 5 mm **140. orphanidea**
235 Apical spine of appendages not more than 2·5 mm
236 Leaves with elliptical to lanceolate segments **78. cuneifolia**
236 Leaves with linear to oblong segments **128. biebersteinii**
232 Lower leaves 2-pinnatisect
237 Involucre 7–11 mm in diameter

238 Leaves green, with narrowly linear segments **124. triniifolia**
238 Leaves grey-green, with narrowly oblong-lanceolate segments **108. spinabadia**
237 Involucre 4–8 mm in diameter
239 Stems with short branches; lower leaves with lanceolate, dentate or divided segments **81. varnensis**
239 Stems with long branches; lower leaves with linear, entire segments **128. biebersteinii**
192 Apical spine of appendages absent or not more than 1·5 mm, usually shorter than lateral fimbriae
240 Appendages scarcely distinct from main part of bracts, or absent
241 Biennial **115. leucophaea**
241 Perennial
242 Florets purple **134. aplolepa**
242 Florets cream **136. laureotica**
240 Appendages distinct from main part of bracts
243 Lower leaves whitish-lanate or -tomentose at least beneath, rarely glabrescent on upper surface; capitula often comparatively large
244 Lower leaves undivided or lyrate
245 Lower leaves appressed-yellow-tomentose **77. nicopolitana**
245 Lower leaves not appressed-yellow-tomentose
246 Florets yellow **75. argentea**
246 Florets purple, pink or white
247 Appendages of outer bracts with distinct hyaline margins or auricles
248 Appendages recurved **71. cuspidata**
248 Appendages appressed **133. carratracensis**
247 Appendages of outer bracts without distinct hyaline margins or auricles
249 Appendages dark brown or black
250 Bracts broadly ovate; pappus *c.* ⅔ as long as achene **70. cineraria**
250 Bracts ovate-oblong; pappus ¼–⅓ as long as achene **84. affinis**
249 Appendages pale brown
251 Pappus as long as achene **73. kilaea**
251 Pappus not more than ½ as long as achene
252 Pappus not more than ¼ as long as achene; upper leaves not mucronate **80. rutifolia**
252 Pappus ¼–½ as long as achene; upper leaves mucronate **78. cuneifolia**
244 Lower leaves 1- to 2-pinnatifid or -pinnatisect, with terminal segment scarcely larger than laterals
253 Lower fimbriae forming hyaline auricles
254 Stems 30–120 cm; pappus at least ½ as long as achene **89. arenaria**
254 Stems not more than 30 cm; pappus ⅓–½ as long as achene **94. chalcidicaea**
253 Lower fimbriae not forming hyaline auricles
255 Pappus not more than ⅓ as long as achene
256 Involucre 3–9 mm in diameter
257 Involucre 3–4 mm in diameter **113. paniculata**
257 Involucre 5–9 mm in diameter
258 Leaves usually green, glabrescent **122. rhenana**
258 Leaves white-tomentose or arachnoid-lanate
259 Fimbriae of appendages not more than 0·5 mm **80. rutifolia**
259 Fimbriae of appendages *c.* 2 mm **85. pallidior**
256 Involucre (9–)10–25 mm in diameter
260 Appendages spinose at apex
261 Spine erect **118. subtilis**
261 Spine recurved **129. boissieri**
260 Appendages acute or acuminate
262 Appendages pale brown, acute **83. friderici**
262 Appendages dark brown to blackish, acuminate
263 Perennial; leaves usually white- or grey-tomentose **70. cineraria**
263 Usually biennial; leaves usually green, glabrescent **122. rhenana**
255 Pappus about as long as or longer than the achene
264 Segments of lower leaves linear **86. parlatoris**
264 Segments of lower leaves lanceolate to oblong
265 Lower fimbriae of appendages confluent into a hyaline margin **122. rhenana**
265 Lower fimbriae of appendages not confluent into a hyaline margin
266 Appendages blackish **74. wettsteinii**
266 Appendages brown
267 Appendages distinctly spinose at apex
268 Appendages short, not covering bracts **76. pannosa**
268 Appendages long, ±covering bracts **72. niederi**
267 Appendages acute to acuminate
269 Florets purple or white; fimbriae of appendages 3–4 on each side **83. friderici**
269 Florets pink; fimbriae of appendages 5–9 on each side **84. affinis**
243 Lower leaves greenish, or greyish-tomentose but often glabrescent; capitula often comparatively small
270 Lower fimbriae confluent into a hyaline margin or forming auricles
271 Lower fimbriae usually not forming auricles
272 Appendages acuminate or mucronulate **106. brachtii**
272 Appendages with an apical spine 1–1·5 mm
273 Involucre 3–6 mm in diameter **90. ovina**
273 Involucre 8–10 mm in diameter
274 Pappus longer than achene **104. kartschiana**
274 Pappus *c.* ½ as long as achene **121. vallesiaca**
271 Lower fimbriae usually forming auricles
275 Pappus absent
276 Apical spine of appendages *c.* 1 mm; florets lilac **90. ovina**
276 Apical spine of appendages 1–3 mm; florets pink **92. spinosociliata**
275 Pappus present
277 Stem simple or with few branches
278 Lower leaves undivided, entire or dentate; fimbriae 4–6 on each side **71. cuspidata**
278 Lower leaves divided; fimbriae 2–3 on each side **93. incompta**
277 Stems paniculately branched
279 Appendages yellow or pale brown
280 Involucre 8–10 mm in diameter; appendages with apical mucro not more than 0·5 mm **121. vallesiaca**
280 Involucre 3–8 mm in diameter; appendages often with a short apical spine
281 Leaves greenish- or whitish-tomentose **89. arenaria**
281 Leaves greenish, sparsely to densely arachnoid-hairy **90. ovina**
279 Appendages darkish brown
282 Involucre 7–8×3–4 mm **91. tenuiflora**
282 Involucre 10–14×5–12 mm
283 Older leaves smooth, glandular-punctate, glabrous **97. biokovensis**
283 Older leaves scabrid or pubescent
284 Involucre 5–8 mm in diameter; florets purple; achenes puberulent **95. grisebachii**

284 Involucre 9 mm in diameter; florets pink; achenes glabrous **96. tauscheri**
270 Lower fimbriae neither confluent into a hyaline margin nor forming auricles
285 Bracts with slender or indistinct veins on dorsal surface
286 Appendages unarmed, ± acuminate, or with a mucro not more than 0·5 mm
287 Pappus about as long as achene
288 Involucre 10–14 mm in diameter; capitula solitary **82. crithmifolia**
288 Involucre 4–10 mm in diameter; capitula few **112. aristata**
287 Pappus not more than ½ as long as achene
289 Appendages mucronate
290 Involucre 5 mm in diameter; pappus ½ as long as achene **113. paniculata**
290 Involucre (5–)6–13 mm in diameter; pappus not more than ⅓ as long as achene
291 Leaves tomentose, the lower usually 1-pinnatisect **115. leucophaea**
291 Leaves glabrous, the lower 2-pinnatisect **123. glaberrima**
289 Appendages acuminate
292 Florets pink; involucre 9–10 mm in diameter **115. leucophaea**
292 Florets purple; involucre 3–8 mm in diameter
293 Involucre 3–5(–8) mm in diameter; stems much-branched **113. paniculata**
293 Involucre 5–8 mm in diameter; stems sparingly branched **114. micrantha**
286 Appendages with apical spine at least 0·5 mm
294 Involucre 3–5 mm in diameter
295 Pappus absent; appendages with apical spine 1–4 mm **143. aemulans**
295 Pappus present; appendages with apical spine not more than 1·5 mm
296 Pappus *c.* ½ as long as achene **113. paniculata**
296 Pappus not more than ½ as long as achene
297 Apical spine 1–1·5 mm **112. aristata**
297 Apical spine 0·7–0·8 mm **113. paniculata**
294 Involucre 5–9 mm in diameter
298 Pappus as long as achene **107. schousboei**
298 Pappus shorter than achene
299 Appendages with apical spine recurved
300 Apical spine 2–3 mm; fimbriae 2 mm **108. spinabadia**
300 Apical spine 0·5–1·5 mm; fimbriae not more than 1·2 mm
301 Perennial; leaves grey-tomentose **109. limbata**
301 Biennial; leaves green **112. aristata**
299 Appendages with apical spine erect or patent, not recurved
302 Apical spine 0·5 mm; involucre 8–13 mm in diameter
303 Appendages with 3–4 fimbriae on each side; pappus *c.* ⅓ as long as achene **110. urgellensis**
303 Appendages with 5–7 fimbriae on each side; pappus ⅛–⅓ as long as achene, or absent **115. leucophaea**
302 Apical spine 0·8–1·5 mm; involucre 5–8(–9) mm in diameter
304 Apical spine 0·8–1 mm **112. aristata**
304 Apical spine 1·5 mm
305 Capitula in clusters of 2–3(–6) **113. paniculata**
305 Capitula solitary
306 Appendages with 6–8 fimbriae on each side **108. spinabadia**
306 Appendages with 4–6 fimbriae on each side **111. rothmalerana**
285 Bracts with prominent raised veins on dorsal surface
307 Pappus about as long as achene
308 Involucre 18–20 mm **117. corymbosa**
308 Involucre (8–)12–15 mm
309 Lower leaves 1-pinnatisect
310 Leaf-segments 3–5 mm wide **84. affinis**
310 Leaf-segments 1–3 mm wide **86. parlatoris**
309 Lower leaves 2-pinnatisect
311 Appendages brown, with 4–5(–6) fimbriae on each side **127. peucedanifolia**
311 Appendages brown or black, with 6–8 fimbriae on each side
312 Biennial; involucre 8–10 mm in diameter; appendages blackish, erect **124. triniifolia**
312 Perennial; involucre 12–15 mm in diameter; appendages reddish-brown, somewhat recurved **116. filiformis**
307 Pappus shorter than achene, sometimes absent
313 Pappus absent, or not more than 0·5(–1) mm
314 Leaves glabrous or sparsely tomentose **126. calvescens**
314 Leaves arachnoid-hairy
315 Pappus ⅓–½ as long as achene; appendages brown or blackish-brown **120. maculosa**
315 Pappus absent; appendages black **125. reichenbachii**
313 Pappus 1–3 mm
316 Leaves glabrous or sparsely tomentose
317 Appendages blackish
318 Involucre 5–6 mm in diameter **122. rhenana**
318 Involucre 7–8 mm in diameter
319 Appendages large, semiorbicular, rounded at apex; leaf-segments linear, acute **86. parlatoris**
319 Appendages small, shortly triangular, acuminate at apex; leaf-segments oblong, obtuse **78. cuneifolia**
317 Appendages brown
320 Lower leaves with narrowly linear segments; appendages mucronate, with fimbriae 0·5 mm **123. glaberrima**
320 Lower leaves with linear to oblong segments; appendages acute, with fimbriae 1–3 mm
321 Appendages with fimbriae 1–2 mm, 4–6 on each side **95. grisebachii**
321 Appendages with fimbriae 2·5–3 mm, 6–12 on each side **120. maculosa**
316 Leaves tomentose or arachnoid, at least when young
322 Apical spine of appendages absent **108. spinabadia**
322 Apical spine of appendages present, sometimes reduced to a mucro
323 Apical spine of appendages more than 1 mm
324 Pappus *c.* ⅓ as long as achene **128. biebersteinii**
324 Pappus *c.* ½ as long as achene
325 Leaves 2-pinnatisect **108. spinabadia**
325 Leaves entire **119. exarata**
323 Apical spine or mucro of appendages not more than 1 mm
326 Appendages with a black spot at base **120. maculosa**
326 Appendages without a black spot
327 Involucre ovoid-conical, narrowed at base **114. micrantha**
327 Involucre ovoid-globose, rounded at base
328 Appendages with mucro 0·3–0·5 mm **122. rhenana**
328 Appendages with apical spine or mucro 0·5–1 mm **128. biebersteinii**

Subgen. **Centaurea.** Perennial. Leaves usually lyrate or pinnatisect. Bracts entire, with coriaceous margin, the middle bracts without an appendage, the inner bracts sometimes with an appendage. Pappus present.

1. C. centaurium L., *Sp. Pl.* 910 (1753). Glabrous. Stems up to 100 cm, erect, sparingly branched above, sparsely leafy. Leaves pinnatisect; lower 50 × 25 cm, petiolate; segments 12–15 × 5–8 cm, oblong-obovate, serrate, broadly winged. Involucre 15–17 mm in diameter, globose; middle bracts with scarious margin *c.* 1 mm wide near apex, subacute. Florets dark purple. Achenes 6–8 mm; pappus much longer than achene, brown. *Mountain woods.* ● *S.C. Italy.* It.

2. C. amplifolia Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 68 (1856). Like **1** but stems densely leafy; lower leaves larger, the segments 20 × 10 cm, broadly ovate, sometimes 2- to 3-partite; middle bracts with scarious, sometimes lacerate margin 2–4 mm wide near apex, obtuse; florets pink; pappus *c.* 8 mm, about as long as achene, dark brown. *Shady places.* ● *S. part of Balkan peninsula.* ?Al Bu Gr.

3. C. fraylensis Schultz Bip. ex Nyman, *Consp.* 420 (1879) (*C. vicentina* Welw. ex Mariz). Stems up to 50 cm, procumbent or ascending, simple. Leaves lanate-villous, petiolate; lower 15–22 × 7–10 cm, undivided or lyrate, obovate-lanceolate; upper pinnatisect with linear-lanceolate segments. Involucre up to 25 mm in diameter, ovoid-globose; middle bracts with scarious margin 2–3 mm wide near apex. Florets purple. Pappus shorter than achene. ● *S.W. Portugal.* Lu.

4. C. africana Lam., *Encycl. Méth. Bot.* **1**: 664 (1785) (*C. tagana* Brot.). Stems 50–100(–150) cm, simple, rarely sparingly branched above. Basal leaves 18–22 × 8–12 cm, undivided, ovate-lanceolate, erose-dentate, long-petiolate; cauline undivided or lyrate, sessile. Involucre 20–25 mm in diameter, ovoid-globose; bracts dark-striate, the middle with narrow scarious margin near apex, broadly ovate, the inner with wide scarious margin near apex. Florets pale yellow. Achenes *c.* 8 mm; pappus longer than achene, brown. $2n = 30$. *Dry woods and scrub. C. & S. Portugal, S.W. Spain.* Hs Lu *Si. (*N. Africa.*)*

5. C. ruthenica Lam., *op. cit.* 663 (1785). Stems 100–150 cm, from a woody rhizome, simple or sparingly branched above, lanate at the nodes below, glabrous above. Leaves 20–25 × 10–13 cm, deep green, glabrous, ovate-oblong in outline; lower pinnatipartite, long-petiolate; upper pinnate, with linear-lanceolate segments, serrate from base to apex, broadly decurrent. Involucre 10–20 mm in diameter, cylindrical-ovoid; bracts obscurely striate, the middle oblong, without or with scarious margin *c.* 0·5 mm wide near apex, the inner linear, with orbicular appendage. Florets pale yellow. Pappus shorter than to as long as achene. *Steppes and stony grassland. S. part of U.S.S.R., extending locally westwards to C. Romania.* Rm Rs (C, W, E).

Very variable; **6–8** perhaps may prove to be subspecies of **5** upon further investigation.

6. C. linaresii Laz.-Ibiza, *Anal. Soc. Esp. Hist. Nat.* **29**: 152 (1900). Like **5** but stems villous at the nodes below; leaves pinnatisect, oblong- or linear-lanceolate in outline; segments linear-lanceolate, denticulate, with subspinose, cartilaginous teeth; involucre *c.* 20 mm in diameter, ovoid-globose, the middle bracts broadly ovate. ● *N.W. Spain.* Hs.

7. C. kasakorum Iljin, *Not. Syst.* (*Leningrad*) **7**: 66 (1937). Like **5** but stems up to 70 cm, glabrous; leaf-segments ovate-oblong; middle bracts with wide scarious margin near apex; inner bracts with oblong-ovate appendage; florets deep golden-yellow. *Stony slopes. S.E. Russia, W. Kazakhstan.* Rs (E).

8. C. taliewii Kleopow, *Bull. Jard. Bot. Kieff* **5–6**: 87 (1927). Like **5** but stems 80–100 cm, sparsely villous below; leaf-segments linear to oblong-linear, serrulate to pinnately lobed; involucre 10–15 mm in diameter; middle bracts with scarious margin *c.* 2 mm wide near apex; inner bracts with ovate appendage; florets golden-yellow. *Steppes. S. & E. Ukraine, S.E. Russia, W. Kazakhstan.* Rs (W, K, E).

9. C. alpina L., *Sp. Pl.* 910 (1753). Glabrous. Stems up to 70 cm, erect, simple or sparingly branched above. Leaves pale green, pinnate, the lower *c.* 35 × 12 cm; segments oblong- to linear-lanceolate, often deeply 2-fid, entire at the base, sometimes serrate at the apex. Involucre (15–)18–20 mm in diameter, ovoid; middle bracts ovate, obtuse, dark-striate, with narrow scarious margin near apex; inner bracts narrowly oblong, with orbicular appendage. Florets pale yellow. Pappus slightly shorter than achene. *Mountain woods.* ● *S. Alps; some isolated stations in S.E. Spain and C. Jugoslavia.* Ga Hs It Ju.

Subgen. **Lopholoma** (Cass.) Dobrocz. (*Sagmen* Hill, *Colymbada* Hill). Perennial, rarely biennial. Stems usually erect and sparingly branched, or absent. Lower leaves usually pinnatisect; uppermost undivided. Capitula comparatively large. Bracts usually without or with indistinct veins on dorsal surface; appendages usually semilunate, shortly decurrent, fimbriate, spiny or mucronate at apex. Pappus present.

Sect. HYALEOLOMA Dostál. Involucre globose to ovoid; bracts ovate to ovate-oblong, not spinose; appendages hyaline.

10. C. jankae Brandza, *Anal. Acad. Române* ser. 2, **4**: 446 (1884). Perennial. Stems up to 70 cm, often corymbosely branched in upper half. Leaves 1(–2)-pinnatisect, petiolate; segments entire, arachnoid-pubescent, glabrescent. Involucre (15–)20 mm in diameter; bracts appressed; appendages entire or lacerate. Florets purple, the outer rather longer than the inner. Achenes *c.* 3 mm; pappus *c.* 6 mm. *Dry grassland.* ● *S.E. Romania.* Rm.

C. crocodylium L., *Sp. Pl.* 919 (1753), from S.W. Asia, an annual with the lower leaves entire and the upper pinnatisect, long-pedunculate capitula and bracts with hyaline appendages and a long spine, has been recorded, probably in error, from Kriti.

Sect. ACROCENTRON (Cass.) DC. Involucre ovoid, rarely globose; bracts ovate to suborbicular; appendages triangular, narrowly decurrent, pectinate-fimbriate, spinose or mucronate, yellow or brown.

11. C. collina L., *Sp. Pl.* 918 (1753). Stems 20–60 cm, simple or sparingly branched above. Leaves scabrid, sometimes floccose, lower pinnatipartite or 2-pinnatisect, rarely undivided; rhachis and petiole not winged; segments at least 3 mm wide, oblong or linear, mucronate; upper leaves undivided. Involucre 13–17 mm in diameter; bracts oblong-ovate; appendages covering the bracts, with an apical spine with a somewhat spinulose base. Florets

yellow or purple, the outer longer than the inner. Achenes *c.* 4 mm, blackish; pappus *c.* 4 mm. $2n=20$. *Open hillsides.* ● *S.W. Europe.* ?Bl Co Ga Hs It Lu.

(a) Subsp. **collina**: Leaf-segments linear, entire. Appendages of outer bracts brown, more or less patent, the spine 5–13 mm. Florets pale yellow. *Corse, S. France, N.W. Italy.*

(b) Subsp. **serratulifolia** (Sennen & Pau ex Hayek) Hayek, *Feddes Repert.* **12**: 123 (1913): Leaf-segments oblong, irregularly serrate. Appendages of outer bracts blackish, the spine 3–5 mm, erecto-patent. Florets purple. *Spain, S. Portugal.*

12. C. salonitana Vis., *Flora* (*Regensb.*) **12** (Ergänz. 1): 23 (1829) (*C. collina* sensu Sibth. & Sm., non L.). Stems up to 100 cm, sparingly branched. Lower leaves 1- to 2-pinnatisect; middle cauline pinnatifid, with obovate to lanceolate, mucronulate segments; rhachis winged. Involucral bracts broadly ovate; appendages pale yellow, with an apical spine *c.* 3 mm (up to 40 mm in var. *macracantha* DC.). Florets bright yellow, rarely purple, the outer slightly longer than the inner. Achenes *c.* 5 mm, pubescent; pappus 7–9 mm, reddish. $2n=20, 40$. *Stony places and grassland. S.E. & E.C. Europe.* Al Bu ?Cr Gr Hu Ju Rm Rs (K).

(a) Subsp. **salonitana**: Leaves scabrid; segments lanceolate to oblong, entire or dentate. Involucre 15–20 mm in diameter; appendages acute or obtuse; fimbriae *c.* 1 mm. *Throughout the range of the species.*

(b) Subsp. **ognianoffii** (Urum.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 195 (1976) (*C. ognianoffii* Urum.): Leaves arachnoid-pubescent, glabrescent; segments linear-lanceolate, entire. Involucre 20–30 mm in diameter; appendages acute; fimbriae 2–3 mm. *Jugoslavia and Bulgaria.*

13. C. centauroides L., *Sp. Pl.* 918 (1753). Stems up to 100 cm, sparingly branched above. Leaves white-tomentose, glabrescent, lyrate; lateral segments at least 3 mm wide, ovate-oblong, the terminal up to 7 × 10 mm, broadly ovate. Involucre up to 25 mm in diameter, globose; bracts broadly ovate; appendages broadly decurrent, with margin *c.* 0·5 mm wide, with an apical spine up to 20 mm; fimbriae *c.* 2 mm. Florets yellow with black veins. Achenes 4 mm; pappus about as long as achene. *Mountain woods.* ● *S. Italy.* It.

14. C. rumelica Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 78 (1856). Stems 30–50 cm. Leaves with somewhat arachnoid indumentum, glabrescent; lower undivided; upper lyrate-pinnatifid; lateral segments lanceolate, the terminal oblong-lanceolate. Involucre 17–20 mm in diameter; appendages long-acuminate. Florets pale yellow, the outer as long as the inner. Achenes 3 times as long as pappus. *Dry grassland.* ● *From E. Jugoslavia to S.E. Romania.* Bu Ju Rm.

15. C. nicolai Bald., *Malpighia* **5**: 74 (1891) (*C. lanceolata* (Vis.) Hayek). Stems 20–60 cm, simple or sparingly branched. Leaves glabrous, pinnatisect; segments numerous, lanceolate, entire. Involucre 15–20 mm in diameter; appendages obtuse, [illegible] yellow, with short apical spine. Florets bright orange, the outer slightly longer than the inner. Achene 3 mm; pappus twice as long as achene, white. *Rocky places in mountains.* ● *S.W. Jugoslavia, Albania.* Al Ju.

16. C. ornata Willd., *Sp. Pl.* **3**: 2320 (1803). Stems up to 80 cm, sparingly branched. Leaves undivided or 1(–2)-pinnatisect; segments 0·5–3 mm wide, few, oblong to linear; rhachis not winged. Involucre 10–25 mm in diameter, ovoid-globose; bracts ovate; appendages reddish-brown; apical spine up to 35 mm, pinnate below. Florets yellow, bright orange or rarely purple. Achenes 4·5 mm, sericeous. *Dry places.* ● *C., S. & E. Spain, N. Portugal.* Hs Lu.

(a) Subsp. **ornata**: Leaves arachnoid to puberulent, the lower divided. Capitula shortly pedunculate. Appendages pectinate-fimbriate, with patent or recurved apical spine. Pappus about twice as long as achene. $2n=20, 40$. *Almost throughout the range of the species.*

(b) Subsp. **saxicola** (Lag.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 195 (1976) (*C. saxicola* Lag.): Leaves more or less glabrous, the lower undivided. Capitula long-pedunculate. Appendages shortly fimbriate, with erect apical spine. Pappus about as long as achene. $2n=60$. *Calcareous mountain rocks. S.E. Spain.*

17. C. granatensis Boiss. ex DC., *Prodr.* **7**: 303 (1838). Stems 5–30 cm, simple. Leaves white-lanate; basal undivided, the petiole white-lanate at base; lower cauline sublyrate-pinnatisect; segments at least 3 mm wide, oblong; appendages sometimes covering the broadly ovate bracts, with an erecto-patent or recurved apical spine 3–6 mm, spinose below. Florets golden yellow, the outer somewhat longer than the inner. Achenes 3·5 mm, pale brown; pappus twice as long as achene. *Calcareous mountain rocks.* ● *S. & S.E. Spain.* Hs.

Very variable in length of stem and division of the leaves.

C. omphalotricha Cosson & Durieu ex Batt. in Batt. & Trabut, *Fl. Algér. Dicot.* 497 (1889), from Algeria and Tunisia, has been recorded from S.E. Spain, but only as a casual; it is like **17** but the stem is branched from the base, the involucre is *c.* 15 mm in diameter and the appendages have a yellow apical spine.

18. C. tuntasia Heldr. ex Halácsy, *Bull. Herb. Boiss.* **6**: 646 (1898). Like **17** but stems up to 60 cm, somewhat branched; leaves grey-puberulent, scabrid, the basal with petiole not white-lanate at base; appendages of involucral bracts with apical spine entire below; florets cream; pappus 4 times as long as achene. *Cultivated ground.* ● *S.E. Greece* (*Attiki*). Gr.

19. C. macedonica Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 130 (1846) (*C. thessalonica* Halácsy). Stems up to 50 cm. Leaves arachnoid-lanate to scabrid, pinnatisect; segments *c.* 2 mm wide. Involucre *c.* 12 mm in diameter; bracts puberulent; appendages shortly pectinate-fimbriate, the fimbriae not confluent below, reddish-brown, with a slender apical spine 1–6(–10) mm. Florets pale yellow, the outer somewhat longer than the inner. Achenes puberulent; pappus about as long as or slightly longer than achene. *Rocky places.* ● *Greece and Albania.* Al Gr.

(a) Subsp. **macedonica**: Stems 20–50 cm, sparingly branched above. Leaves with numerous linear-lanceolate segments, scabrid and sparsely arachnoid. *N. Greece; C. Albania.*

(b) Subsp. **parnonia** (Halácsy) Dostál, *Bot. Jour. Linn. Soc.* **71**: 195 (1976) (*C. parnonia* Halácsy): Stems 1–3 cm, simple. Leaves with few, narrowly oblong segments, arachnoid-lanate. *S. Greece* (*Parnon Oros*).

20. C. mannagettae Podp., *Verh. Zool.-Bot. Ges. Wien* **52**: 661 (1902). Like **19(a)** but stems shorter; leaves 2-pinnatisect, the segments up to 2 mm wide, narrowly linear, aristate; involucral bracts with long pectinate-fimbriate, brown or blackish appendages. *Rocky places; calcicole.* ● *S. Bulgaria.* Bu.

21. C. dichroantha A. Kerner, *Österr. Bot. Zeitschr.* **24**: 104 (1874). Like **19(a)** but leaves glabrous, with linear, pinnatisect mucronulate segments; appendages with fimbriae joined by a hyaline membrane below, and with spines not more than 5 mm;

florets pale yellow or purple, the outer longer than the inner. $2n=20$. ● *S.E. Alps.* It Ju.

Probably a hybrid between **22** and **54(a)**.

22. C. rupestris L., *Sp. Pl.* ed. 2, 1298 (1763). Stems 5–50(–70) cm, simple or sparingly branched above. Leaves sublanate, glabrescent, scabrid, (1–)2-pinnatisect, rarely undivided or lyrate; segments up to 2 mm wide, acute, numerous. Involucre 12–15 mm in diameter; bracts ovate; appendages brown, often with an apical spine. Florets pale yellow to orange, the outer slightly longer than the inner. Achenes *c.* 4 mm; pappus ⅓–½ as long as achene. $2n=20$. *Dry grassland and rocky places.* ● *Italy; W. & C. parts of Balkan peninsula.* Bu Gr It Ju.

1 Stem leafy above; leaf-segments broadly linear to lanceolate; plant grey-tomentose — (b) subsp. **ceratophylla**
1 Stems with few or no leaves above; leaf-segments narrowly linear; plant subglabrous
2 Appendages with 5–8 fimbriae on each side, the lower not confluent; basal leaves 2-pinnatisect — (a) subsp. **rupestris**
2 Appendages with fewer than 5 fimbriae on each side, the lower joined by a white or hyaline membrane
3 Basal leaves ± regularly pinnatisect — (c) subsp. **finazzeri**
3 Basal leaves undivided or lyrate — (d) subsp. **athoa**

(a) Subsp. **rupestris**: Stems erect, simple. Capitula long-pedunculate. Appendages long-fimbriate, the apical fimbria stouter or replaced by a spine 5–20 mm. *Italy, W. Jugoslavia.*

(b) Subsp. **ceratophylla** (Ten.) Gugler, *Centaur. Ung. Nationalmus.* 194 (1907): Stems erect, sparingly branched. Capitula shortly pedunculate or sessile. Appendages long-fimbriate, spinulose at apex. *N. & C. Appennini.*

(c) Subsp. **finazzeri** (Adamović) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 754 (1931) (*C. finazzeri* Adamović): Stems more or less simple, erect or ascending. Capitula shortly pedunculate. Involucral bracts hairy; appendages with few fimbriae. Achenes hairy. *S. Jugoslavia, W. Bulgaria, N. Greece.*

(d) Subsp. **athoa** (DC.) Gugler, *Centaur. Ung. Nationalmus.* 194 (1907) (*C. athoa* DC.): Stems procumbent or erect, branched. Capitula long-pedunculate. Involucral bracts glabrous; appendages with few or no fimbriae. Achenes glabrous. *N. Greece* (*Athos*).

23. C. kosaninii Hayek, *Österr. Bot. Zeitschr.* **64**: 359 (1914). Stems up to 70 cm, sparingly branched above. Leaves glabrous, usually 2-pinnatifid; segments not more than 1 mm wide, narrowly linear. Involucre *c.* 15 mm in diameter; appendages narrow, shortly fimbriate-denticulate, yellowish. Florets violet or dark red. Achenes 3·5 mm, ½ as long as pappus. *Mountain pastures and rocks; calcicole.* ● *Albania.* Al.

Sect. ORIENTALES (Hayek) Tzvelev. Involucre ovoid to globose; bracts coriaceous, ovate to oblong; appendages large, usually covering the bracts, shortly decurrent, mucronulate to shortly spinose at apex, yellow, brown or black, the margin fimbriate.

24. C. clementei Boiss. ex DC., *Prodr.* **7**: 303 (1838). Stems 30–50 cm, simple or sparingly branched at apex, lanate. Leaves white-tomentose, pinnatisect; lower with broadly ovate, irregularly lobed and denticulate segments, petiolate; upper sessile, often simple, lobed. Involucre *c.* 25 mm in diameter, globose; bracts broadly ovate, glabrous to sparsely lanate; appendages ovate-triangular, the fimbriae 3–5 mm. Florets yellow, the outer as long as the inner. Achenes *c.* 5 mm; pappus *c.* 5 mm. *Calcareous rocks.* ● *Mountains of S.W. Spain.* Hs.

25. C. orientalis L., *Sp. Pl.* 913 (1753). Stems 80–120 cm, sparingly branched. Leaves glabrescent, scabrid; basal undivided; lower cauline pinnatisect, with narrowly oblong to linear, entire to lobed segments. Involucre 20–25 mm in diameter, globose; bracts broadly ovate, glabrous; appendages ovate, with a brown central spot, mucronate at apex; marginal florets patent; fimbriae 1–3 mm. Florets cream, the outer longer than the inner, radiate. Achenes 4–5 mm, appressed-hairy, black; pappus 4–5 mm. $2n=20$. *Dry pastures. S.E. Europe.* Bu Ju Rm Rs (W, K, E).

26. C. neiceffii Degen & H. Wagner, *Period. Spis. Bălg. Kniž. Druž.* **49**: 4 (1908). Stems up to 100 cm, branched above. Leaves glabrescent, scabrid; basal pinnate with lanceolate, entire to lobed segments; cauline pinnatisect with long terminal segment; upper leaves entire. Involucre 10–15(–20) mm in diameter, globose to ovoid-globose; bracts covered by the appendages; appendages ovate to orbicular, pale brown; fimbriae *c.* 4 mm. Florets yellow, the outer longer than the inner. Achenes 3–4 mm; pappus *c.* 5 mm. ● *Romania, Bulgaria.* Bu Rm.

Perhaps a hybrid between **25** and **55(b)**.

27. C. tauromenitana Guss., *Fl. Sic. Syn.* **2**: 512 (1844). Stems 50–100 cm, branched above. Leaves arachnoid-floccose, glabrescent; lower lyrate-pinnatisect, with oblong to lanceolate, entire to dentate segments; upper pinnatisect, with linear-lanceolate segments. Involucre 30–40 mm in diameter, globose; bracts orbicular; appendages suborbicular, reddish-brown, mucronate; fimbriae *c.* 3 mm. Florets pale yellow. Achenes 5–6 mm, white-villous; pappus 10–12 mm, brownish. *Maritime rocks.* ● *Sicilia.* Si.

28. C. chrysolepis Vis., *Mem. Ist. Veneto* **9**: 172 (1860). Stems 30–60 cm, simple, or with few short branches. Leaves glabrous; basal lanceolate, entire; lower cauline pinnatisect with narrowly oblong to lanceolate, entire segments. Involucre 25–40 mm in diameter, globose; bracts ovate, fully covered by the appendages; appendages *c.* 13 mm, triangular-lanceolate, straw-yellow, gradually attenuate into an apical spine; fimbriae *c.* 3 mm. Florets pale yellow, the outer as long as the inner. Achenes puberulent; pappus about as long as achene, brownish. *Mountain rocks.* ● *C. & S. Jugoslavia, S.W. Bulgaria.* Bu Ju.

29. C. prolongi Boiss. ex DC., *Prodr.* **7**: 303 (1838). Stems 20–50 cm, simple or sparingly branched. Leaves subglabrous; basal lanceolate, entire; lower cauline lyrate-pinnatifid, acute, long-petiolate, with few linear-lanceolate, mucronulate, entire segments. Involucre 15–18 mm in diameter, ovoid; appendages broadly triangular, semilunate at base, not completely covering the broadly ovate bracts, with a brown apical spine up to 4 mm; fimbriae *c.* 2 mm. Florets deep golden or orange. Achenes *c.* 3 mm, sericeous, rarely glabrous; pappus 2–5 mm, white. *Rocky ground and heaths.* ● *S.W. Spain, S. Portugal.* Hs Lu.

30. C. polymorpha Lag., *Gen. Sp. Nov.* 32 (1816). Stems 20–40 cm, branched. Leaves lanate to pubescent; lower lyrate, upper pinnatifid, with oblong-lanceolate to lanceolate, entire segments. Involucre 15–25 mm in diameter; bracts ovate, floccose-arachnoid; appendages triangular, dark brown, with a short apical spine. Florets purple. Achenes sericeous, slightly longer than pappus. $2n=40$. *Vineyards.* ● *N.E. Spain* (*prov. Zaragoza*). Hs.

31. C. atropurpurea Waldst. & Kit., *Pl. Rar. Hung.* **2**: 121 (1802–1803). Stems (30–)100–150(–200) cm, sparingly branched

in upper half, leafy above. Leaves 1(–2)-pinnatisect; segments 2–3(–20) mm wide. Involucre 20–30 mm in diameter, globose; appendages triangular-lanceolate, dark brown, completely covering the bracts; fimbriae whitish, arising abruptly. Florets dark purple, rarely yellow, the outer scarcely longer than the inner. Achenes *c.* 4 mm, puberulent, brown; pappus *c.* 4 mm, pale brown. $2n=18$. *Rocky mountain slopes.* ● *C. part of Balkan peninsula*; *Romania.* Al ?Bu Ju Rm.

(a) Subsp. **atropurpurea**: Leaves subglabrous, not lyrate; segments linear-lanceolate. Involucral bracts with appendages *c.* 10 mm. *Throughout the range of the species.*

(b) Subsp. **soskae** (Stoj. & Acht.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 195 (1976) (*C. atropurpurea* var. *soskae* Stoj. & Acht.): Leaves arachnoid-lanate, lyrate; segments oblong. Involucral bracts with appendages 5–8 mm. *S. Jugoslavia* (*Makedonija*).

C. globurensis E. I. Nyárády, *Bul. Grăd. Bot. Univ. Cluj* **14**: 218 (1934), from S.W. Romania (Banat), is like **31** but has simple stems, subglabrous leaves, involucre *c.* 16 mm in diameter and brown fimbriae on the triangular, mucronate appendages; its status is uncertain and further study is required.

32. C. kotschyana Heuffel ex Koch, *Syn. Fl. Germ.* ed. 2, 473 (1844). Stems 50–100 cm, usually simple. Leaves crispate-hairy; basal lanceolate, remotely dentate; cauline lyrate-pinnatisect, the segments oblong to linear-lanceolate, dentate or lobed. Involucre 20–30 mm in diameter; appendages ovate-triangular, dark brown or black, completely covering the bracts; fimbriae 3–5 mm, white at apex, arising gradually. Florets dark purple, the outer as long as the inner. Achenes 4–5 mm, puberulent; pappus 4–5 mm. *Mountain grassland.* ● *From the E. Carpathians to Macedonia.* Bu Ju Rm Rs (W).

33. C. murbeckii Hayek, *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **70**: 639 (1901). Like **32** but stems always simple; cauline leaves not lyrate, the segments entire or deeply dentate; involucre *c.* 40 mm in diameter. ● *Mountains of C. Jugoslavia* (*Bosna*). Ju.

34. C. candelabrum Hayek & Košanin in Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 746 (1931). Stems up to 200 cm, paniculately branched, leafless above. Leaves pinnatifid, glabrous; segments 2–4 mm wide, linear-lanceolate, remotely lobed. Involucre *c.* 20 mm in diameter, ovoid-globose; appendages small, triangular, often not covering bracts, black, with short apical spine. Florets dark purple, the outer as long as the inner. Achenes puberulent, slightly shorter than pappus. *Serpentine rocks.* ● *N. Albania.* Al.

35. C. immanuelis-loewii Degen, *Magyar Bot. Lapok* **16**: 117 (1917). Stems 30–50 cm, usually simple, leafless above. Leaves pinnatifid, oblong-lanceolate in outline, subglabrous; segments 2–4 mm wide, entire to remotely dentate. Involucre 15–20 mm in diameter, ovoid; appendages triangular, not completely covering the glabrous bracts, dark brown, with 4–6 silvery fimbriae on each side. Florets dark purple, the outer longer than the inner. Achenes puberulent, as long as pappus. *Mountain rocks.* ● *Macedonia.* Bu Gr.

36. C. grbavacensis (Rohlena) Stoj. & Acht., *Stud. Centaur. Bulg.* 39 (1935) (*C. immanuelis-loewii* var. *grbavacensis* Rohlena). Stems 30–60 cm, simple, leafless above. Leaves densely arachnoid-lanate; basal pinnatifid, with linear segments; cauline 1–2, pinnatisect, with filiform segments. Involucre 25–30 mm in diameter, globose; appendages broadly triangular, covering the lanate bracts, black, with 15–20 fimbriae on each side; fimbriae dark brown at base, silvery above. Florets dark purple, the outer slightly longer than the inner. ● *N.C. Macedonia* (*near Prilep*). Ju.

Sect. CARDUIFORMES (Tzvelev) Dostál. Involucre ovoid to globose; bracts orbicular; appendages pectinate-fimbriate, not covering the bracts, usually with apical spine at least 3 mm, yellow, brown or black, the margins narrowly and shortly decurrent.

37. C. oliverana DC., *Prodr.* **6**: 590 (1838). Stems 30–60 cm, simple or sparingly branched above, white-velutinous at the base. Leaves white-lanate beneath, subglabrous above; lower in a basal rosette, petiolate, lyrate or undivided; lower cauline sessile, ovate to elliptical, often lyrate, with linear-lanceolate segments; upper lyrate-dentate. Involucre *c.* 25 mm in diameter, ovoid-globose; bracts glabrous; appendages triangular, dark brown, mucronulate or with apical spine 2–3 mm. Florets brownish-purple, the outer as long as the inner. Achenes 4 mm, puberulent; pappus as long as achene, dirty white. $2n=22$. *Rocky places.* ● *Kikladhes.* Gr.

C. armoracifolia Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 205 (1813), described from S. Greece (Peloponnisos), is like **37** but has the appendages not fimbriate; it has not been found again.

38. C. ragusina L., *Sp. Pl.* 912 (1753). Plant white-tomentose. Stems 30–60 cm. Leaves mostly basal, petiolate; segments ovate to oblong, obtuse, entire to sinuate-dentate or lobed. Involucre 20–25 mm in diameter, globose; bracts white-tomentose; appendages triangular, brownish; apical spine *c.* 4 mm, recurved. Florets yellow, the outer as long as the inner. Achenes 4–5 mm, puberulent; pappus 4–5 mm, white. *Maritime rocks and walls.* ● *W. Jugoslavia.* Ju.

(a) Subsp. **ragusina**: Stems usually simple. Basal leaves pinnatifid, with 4–7 pairs of entire or pinnatifid segments. *C. part of W. coast of Jugoslavia, mainly on the islands.*

(b) Subsp. **lungensis** (Ginzberger) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 756 (1931) (*C. lungensis* Ginzberger): Stems usually branched. At least some basal leaves undivided, entire. *N.W. Jugoslavia* (*island of Dugi and adjacent islets*).

39. C. rechingeri Phitos, *Ann. Naturh. Mus.* (*Wien*) **67**: 165 (1964). Like **38**(a) but involucre 15–25 mm in diameter; appendages with apical mucro *c.* 1 mm and with sparse, short setae on the margin; florets brownish-purple. $2n=22$. *Maritime limestone cliffs.* ● *N. Aegean region* (*Skiros*). Gr.

40. C. graeca Griseb., *Spicil. Fl. Rumel.* **2**: 242 (1846) (*C. guicciardii* sensu Halácsy, non Boiss.). Stems 50–180 cm, paniculately branched. Leaves mostly in a basal rosette, pinnate, rarely undivided, arachnoid-tomentose, glabrescent; segments oblong to obovate, acute, entire, rarely dentate. Involucre 18–20 mm, ovoid; bracts glabrous; appendages narrowly semilunate, straw-yellow, shortly fimbriate-dentate, the apical spine 3–20 mm, patent, yellowish. Florets pinkish-purple, the outer as long as the inner. Achenes puberulent, about half as long as pappus. $2n=20$. *Rocky places on mountains.* ● *N. & C. Greece, Albania.* Al Gr.

(a) Subsp. **graeca**: Appendages of involucral bracts with slender spine 3–10(–15) mm. *N. Greece, Albania.*

(b) Subsp. **ceccariniana** (Boiss. & Heldr.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 195 (1976) (*C. ceccariniana* Boiss. & Heldr.): Appendages of involucral bracts with stout spine 15–20 mm. *C. Greece.*

41. C. laconica Boiss., *Fl. Or.* **3**: 660 (1875). Stems 30–50 cm, simple or sparingly branched above, arachnoid-lanate at base. Lower leaves petiolate, interruptedly 2-pinnatisect, more or less lyrate; segments ovate-oblong to linear-lanceolate, acute; upper sessile, lyrate. Involucre 20–30 mm in diameter, globose; bracts ovate-orbicular, glabrous; appendages semilunate, not covering the bracts, dark brown, with stout apical spine 10–20 mm. Florets pinkish-purple. Achenes *c.* 4 mm, puberulent, about half as long as pappus. *Rocky places.* ● *S. Greece.* Gr.

42. C. achaia Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 79 (1856). Like **41** but lower leaves interruptedly pinnatipartite, segments lyrate-pinnatisect, mucronate; bracts orbicular; appendages covering the bracts, straw-coloured, with apical spine 20–35 mm, rarely mucronate; florets pink. ● *S. Greece.* Gr.

43. C. sibthorpii Halácsy, *Bull. Herb. Boiss.* **6**: 635 (1898) (incl. *C. euboica* Rech. fil.). Like **41** but basal leaves 1- to 2-pinnatisect; segments lanceolate, entire or pinnately lobed; involucral bracts with ovate appendages with an apical spine 15–20 mm; florets pink. *Cultivated ground.* ● *S.E. Greece.* Gr.

44. C. psilacantha Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 82 (1856). Stems 50–80 cm, corymbosely branched above. Leaves with sparse arachnoid indumentum, more or less glabrescent; lower petiolate, 2-pinnatifid; segments ovate-oblong, mucronate; upper sessile, pinnatifid. Involucre 10–15 mm in diameter, ovoid; bracts puberulent; appendages semilunate, light brown, the apical spine 10–30 mm. Florets purple. Achenes *c.* 4 mm, puberulent; pappus twice as long as achene. *Mountain scrub.* ● *N. & C. Greece.* Gr.

45. C. redempta Heldr., *Bull. Soc. Bot. Fr.* **37**: 243 (1890). Stems 10–20 cm, erect, simple or sparingly branched, arachnoid-lanate. Leaves with arachnoid indumentum, glabrescent; lower petiolate, pinnatifid; segments ovate-lanceolate, dentate to lobed; upper sessile. Involucre 30–40 mm in diameter, globose; bracts subglabrous; appendages semilunate, black, the apical spine 15–30 mm, sometimes unarmed. Florets dark purple, the outer as long as the inner. Achenes *c.* 4 mm; pappus twice as long as achene. $2n=20$. *Rocky places on mountains.* ● *Kriti.* Cr.

46. C. cytherea Rech. fil., *Boissiera* **13**: 149 (1967). Like **45** but stems 30–60(–100) cm, much-branched from the base, glabrous; leaves glabrous; basal in rosettes, 2-pinnatisect; involucre 25–30 mm in diameter; bracts glabrous. ● *S. Greece* (*Kithira*). Gr.

47. C. ebenoides Heldr. ex S. Moore, *Jour. Bot.* (*London*) **16**: 133 (1878). Stems up to 10 cm, ascending, simple. Leaves lanate, glabrescent above, lyrate; segments triangular-ovate to lanceolate. Involucre *c.* 15 mm in diameter, narrowly ovoid; bracts glabrous; appendages semilunate, black or dark brown, the apical spine 6–10 mm, deflexed. Florets pink, the outer scarcely longer than the inner. Achenes *c.* 3 mm, puberulent; pappus 3 times as long as achene. *Woods.* ● *E. Greece* (*Evvoia*). Gr.

48. C. spruneri Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 132 (1846). Stems 10–50 cm, erect, branched above. Leaves scabrid, arachnoid-lanate; basal interruptedly lyrate-pinnatifid or pinnatifid, rarely undivided; upper entire. Involucre 15–40 mm in diameter, ovoid to globose; bracts glabrous; appendages semilunate, yellowish-brown, the apical spine erecto-patent. Florets pink to purple, the outer longer than the inner. Achenes *c.* 3 mm, puberulent; pappus 3 times as long as achene. *Cultivated and waste ground and dry hillsides.* ● *S. Albania, S. & W. Greece, S. Aegean region.* Al Cr Gr.

1 Leaves pinnatifid with narrowly lanceolate, entire segments (d) subsp. **lineariloba**
1 Leaves lyrate-pinnatifid with oblong to suborbicular segments
2 Stems not more than 20 cm; at least some basal leaves undivided (b) subsp. **minoa**
2 Stems 20–50 cm; basal leaves all divided
3 Involucre 30–35(–40) mm in diameter, globose (a) subsp. **spruneri**
3 Involucre 15–20 mm in diameter, ovoid (c) subsp. **guicciardii**

(a) Subsp. **spruneri**: Stems 20–40 cm. Basal leaves lyrate-pinnatifid with oblong to suborbicular lobed segments, withered at anthesis. Involucre 30–35(–40) mm in diameter, globose; appendages with apical spine 30–50 mm. $2n=110$. *S.E. Greece* (*Attiki*).

(b) Subsp. **minoa** (Heldr. ex Boiss.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 195 (1976) (*C. minoa* Heldr. ex Boiss.): Stems 10–30 cm. Basal leaves undivided, obovate, or lyrate-pinnatifid. Involucre *c.* 20 mm in diameter, ovoid; appendages with apical spine 10–20 mm. *Kriti.*

(c) Subsp. **guicciardii** (Boiss.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 749 (1931) (*C. guicciardii* Boiss.): Stems 30–50 cm. Basal leaves lyrate-pinnatifid with oblong to suborbicular, lobed segments, green at anthesis. Involucre 15–20 mm in diameter, ovoid; appendages with apical spine 20–30 mm. $2n=20$, 100, 110. *S. & W. Greece, Kikladhes, S. Albania.*

(d) Subsp. **lineariloba** (Halácsy & Dörfler) Dostál, *Bot. Jour. Linn. Soc.* **71**: 195 (1976) (*C. guicciardii* var. *lineariloba* Halácsy & Dörfler): Like subsp. (c) but leaves pinnatifid with linear-lanceolate to narrowly linear, entire segments. $2n=20$. *Kikladhes.*

Sect. LOPHOLOMA. Involucre ovoid to ovoid-globose; bracts lanceolate to ovate or oblong; appendages conspicuous, coloured, pectinate-fimbriate, long-decurrent, with apical spines not more than 5 mm.

Plants intermediate between species in this Section are common.

49. C. scabiosa L., *Sp. Pl.* 913 (1753). Stems (15–)30–150(–200) cm, corymbosely branched. Leaves scabrid; lower petiolate, 1(–2)-pinnatisect, rarely undivided and entire or dentate; segments oblong to linear, entire to dentate or lobed; upper pinnatisect, sessile. Involucre 18–25 mm in diameter, ovoid-globose; bracts 3–4 mm wide, ovate, numerous, glabrous or with arachnoid indumentum; appendages 1–2(–3) × 1–2 mm, not covering the bracts, triangular-ovate, brown or black, decurrent, with light brown fimbriae, inconspicuous and paler on inner bracts. Florets purple, the outer slightly longer to much longer than the inner. Achenes 4–5·5 mm, puberulent, brown; pappus 4–5 mm, greyish- or brownish-white. $2n=20+0$–$2B$, **40**. *Europe, from C. Spain, C. Italy and Bulgaria northwards.* Au Be Br Cz Da Fe Ga Ge Hb He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su [Fa].

Very variable in branching, leaf-shape, and the size of the appendages.

C. integrifolia Tausch, *Flora* (*Regensb.*) **11**: 485 (1828), from S. Ural, is similar to **49** but has all leaves undivided and entire. It may merit subspecific status.

50. C. cephalariifolia Willk., *Flora* (*Regensb.*) **34**: 762 (1851). Like **49** but stems 30–50 cm, sparingly branched above; involucre 15–20 mm in diameter, ovoid; bracts 6–7 mm wide, orbicular, few, the appendages *c.* 1 mm; florets pinkish-orange. *Cultivated ground.* ● *E. Spain.* Hs.

51. C. alpestris Hegetschw., *Fl. Schweiz* 854 (1840) (*C. alpina* auct., non L.). Stems 30–50 cm, simple, rarely sparingly branched

above. Leaves pinnatifid, rarely undivided; segments narrowly elliptical to ovate, obtuse, crenate-dentate. Involucre 20–40 mm in diameter, ovoid-globose; appendages *c.* 5 mm, ovate, completely covering bracts, broadly decurrent, the fimbriae dark brown. Florets purple, the outer longer than the inner. Achenes *c.* 4 mm, puberulent, brown; pappus 4–6 mm, brown. $2n=20$. ● *Pyrenees*; *Alps*, *Jura*; *W. Carpathians*. Au Cz Ga He ?Hs It Ju Po.

52. C. sadlerana Janka, *Term. Füz.* **2**: 142 (1878). Stems up to 120 cm, sparingly branched above. Leaves glabrous above; lower ovate-lanceolate in outline, pinnatifid, with entire, mucronate segments; upper lanceolate, entire. Involucre 16–18 mm in diameter, ovoid-globose; bracts oblong or ovate, not covered by appendages; inner appendages orbicular, white with a triangular, often black, centre; middle appendages semilunate, brown, with white fimbriae. Florets purple, the outer longer than the inner. Achenes *c.* 4·5 mm, brown; pappus *c.* 4·5 mm, pale brown. $2n=20$. *Dry scrub on hillsides.* ● *E. Austria, N. Hungary, S.E. Czechoslovakia.* Au Cz Hu.

53. C. badensis Tratt., *Arch. Gewächsk.* **1**: 28 (1812) (*C. scabiosa* subsp. *badensis* (Tratt.) Gugler). Stems 60–100 cm, simple, glabrous. Leaves shiny, smooth, sometimes subscabrid on margin; lower pinnate, with entire, lanceolate segments; upper pinnatifid, with linear-lanceolate segments. Involucre 15–18 mm, ovoid-globose; bracts not covered by the appendages; appendages triangular-semilunate, the outer black, the inner brown or yellow; fimbriae white. Florets purple, the outer longer than the inner. Achenes *c.* 5 mm; pappus *c.* 5 mm, dirty white. *Dry scrub on hillsides.* ● *E. Austria, S.E. Czechoslovakia.* Au Cz.

Plants from W. Czechoslovakia and N. Hungary intermediate between **49** and **53** have been called **C. scabiosa** subsp. **tematinensis** (Domin) Domin, *Preslia* **13–15**: 246 (1936) (subsp. *vertesensis* (Boros) Soó, *C. vertesensis* Boros); they have $2n=20$.

54. C. grinensis Reuter, *Cat. Sem. Jard. Bot. Genève* **1857**: 4 (1858) (*C. coriacea* auct., non Waldst. & Kit. ex Willd.). Leaves 1(–2)-pinnatifid or entire, floccose, glabrescent, scabrid on the veins beneath. Involucre ovoid; bracts ovate, not covered by appendages, sparsely tomentose; appendages 1–2 mm, triangular, black, the margin narrowly (0·5 mm) and long-decurrent, shortly pectinate-fimbriate; inner appendages brown or yellow. Florets purple. Achenes *c.* 4·5 mm, brown, glabrous; pappus pale brown. ● *S.C. Europe and W. part of Balkan peninsula.* Al Au Bu Cz He Hu It Ju ?Rm.

(a) Subsp. **grinensis** (*C. tenuifolia* auct., non Dufour, nec Salisb.): Stems up to 100 cm, sparingly branched. Leaf-segments lanceolate. Involucre 14–15 mm in diameter; appendages with 3–5 fimbriae on each side. Outer florets slightly longer than the inner. Pappus slightly shorter than achene. *S. Alps.*

(b) Subsp. **fritschii** (Hayek) Dostál, *Bot. Jour. Linn. Soc.* **71**: 195 (1976) (*C. fritschii* Hayek): Stems up to 200 cm, corymbosely branched. Leaf-segments oblong-lanceolate. Involucre 15–18 mm in diameter; appendages with 5–7 fimbriae on each side. Outer florets distinctly longer than the inner. Pappus as long as achene. $2n=20$. *From S. Czechoslovakia to Bulgaria and N. Albania.*

55. C. apiculata Ledeb., *Ind. Sem. Horti Dorpat., Suppl.* 3 (1824). Stems branched above. Leaves with arachnoid indumentum or glabrous, more or less scabrid, pinnatifid. Involucre 10–20 mm in diameter, ovoid-globose; bracts ovate, not covered by appendages; appendages 0·5–2 mm, triangular, blackish, narrowly and sometimes indistinctly decurrent, with up to 12 fimbriae on each side, the apex mucronulate or with a spine up to 5 mm; inner bracts with suborbicular, brown appendages about as long as the bracts. Achenes hairy. *Dry places. S.E. Europe, extending northwards to Hungary and to c.* 55° *N. in E.C. Russia.* Al Bu Hu Ju Rm Rs (C, W, K, E) Tu.

1 Appendages with apical spine 3–5 mm, with 8–12 fimbriae 1–2 mm on each side; florets purple, the outer distinctly longer than the inner **(b)** subsp. **spinulosa**

1 Appendages mucronate or with apical spine up to 2 mm, with few, indistinct fimbriae not more than 1 mm on each side, sometimes absent; florets pink, the outer slightly longer than the inner

2 Bracts thin, not appressed; appendages very narrowly but distinctly decurrent, the fimbriae *c.* 1 mm **(a)** subsp. **apiculata**

2 Bracts coriaceous, firmly appressed; appendages not or very narrowly decurrent, the fimbriae 0–0·5 mm **(c)** subsp. **adpressa**

(a) Subsp. **apiculata**: Stems 80–100 cm, sparsely lanate, somewhat scabrid. Leaf-segments linear-oblong or oblong. Involucre 10–17 mm in diameter; bracts not appressed; appendages very narrowly but distinctly decurrent, the fimbriae *c.* 1 mm, the apex mucronate or with spine up to 2 mm. Florets pink. Achenes 3·5–4·5 mm; pappus 3·5–4·5 mm. *S. part of U.S.S.R.*

(b) Subsp. **spinulosa** (Rochel ex Sprengel) Dostál, *Bot. Jour. Linn. Soc.* **71**: 196 (1976) (*C. spinulosa* Rochel ex Sprengel): Stems up to 150 cm, glabrous to somewhat scabrid. Leaf-segments lanceolate. Involucre 15–20 mm in diameter; bracts not appressed; appendages black, narrowly but distinctly decurrent, the fimbriae 1–2 mm, the apex with spine 3–5 mm. Florets purple. Achenes *c.* 5 mm; pappus *c.* 5 mm. *E.C. Europe, Balkan peninsula and Romania.*

(c) Subsp. **adpressa** (Ledeb.) Dostál, *loc. cit.* (1976) (*C. adpressa* Ledeb.): Stems 50–80(–100) cm, with appressed arachnoid indumentum. Leaf-segments linear to narrowly oblong. Bracts firmly appressed; appendages indistinct, not or very narrowly decurrent, the fimbriae 0–0·5 mm, the apex mucronate or with spine up to 2 mm. Florets pink. Achenes 4–6 mm; pappus 4–6 mm. *S. part of U.S.S.R., E. Romania.*

56. C. stereophylla Besser, *Enum. Pl. Volhyn.* 35 (1822). Stems 80–100 cm, virgately branched above, with sparse arachnoid indumentum. Leaves arachnoid-pubescent, scabrid, pinnatifid, rarely entire; segments oblong-linear. Involucre 7–10 mm in diameter, narrowly ovoid; bracts appressed, lanceolate, subglabrous, not covered by appendages; appendages 2–4 mm, triangular-lanceolate, brown, shortly and narrowly decurrent, shortly pectinate-fimbriate, usually with apical spine up to 2 mm; inner bracts brown or yellow. Florets pale pink, rarely white or pale yellow, the outer slightly longer than the inner. Achenes 3–4 mm, puberulent; pappus slightly shorter than achene, brownish. *Dry grassland. From Macedonia to S. Ukraine.* Bu Gr Rm Rs (W).

Sect. RHIZANTHAE Boiss. Stems short, or absent. Leaves usually in a basal rosette. Involucre ovoid; bracts ovate to oblong, with dorsal veins; appendages very narrowly decurrent, fimbriate or denticulate, spinose at apex.

57. C. raphanina Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 205 (1813). Acaulescent, or rarely with stem up to 5(–20) cm. Leaves oblong-lanceolate and undivided or lyrate-pinnatifid; segments oblong-lanceolate. Capitula usually in groups of 2–4, subsessile or shortly pedunculate. Involucre 12–20 mm in diameter; bracts oblong to ovate; appendages triangular or semilunate, subentire or with 1–3 fimbriae 0·5–3 mm long on each side, mucronate or with apical spine up to 25 mm. Florets pink or purple, the outer

slightly longer than the inner. Achenes 3–5 mm, sericeous; pappus as long as or slightly longer than achene. ● *S. & S.E. Greece, S. Aegean region.* Cr Gr.

(a) Subsp. **raphanina**: Leaves dull, scabrid-puberulent; segments entire. Involucre ovoid-oblong, narrowed at base. Appendages with simple apical spine 2–9 mm. $2n=20$. *Kriti, Karpathos, Kasos.*

(b) Subsp. **mixta** (DC.) Runemark, *Bot. Not.* **120**: 175 (1967) (*C. mixta* DC.): Leaves shiny, glabrous; at least the larger segments dentate. Involucre ovoid-globose, truncate at base. Appendages with the apical spine 9–25 mm and pinnate towards base. $2n=20$. *S. & E. Greece, Kikladhes.*

C. halacsyi Dörfler, *Österr. Bot. Zeitschr.* **51**: 204 (1901), and **C. nigrotriangulata** Rech. fil., *Magyar Bot. Lapok* **33**: 14 (1934), are the hybrid **37** × **57(a)**; **C. eriopoda** Rech. fil., *op. cit.* 13 (1934), represents material intermediate between **57(a)** and **(b)**.

Records of *C. exscapa* D'Urv. from Naxos are erroneous.

Sect. AEGIALOPHILA (Boiss. & Heldr.) O. Hoffm. Stems very short. Leaves in a basal rosette. Involucre ovoid; bracts broadly ovate, coriaceous, with dorsal veins; appendages narrowly decurrent, with hyaline margin, spinose at apex.

58. C. aegialophila Wagenitz, *Notes Roy. Bot. Gard. Edinb.* **33**: 230 (1974) (*Aegialophila cretica* Boiss. & Heldr., *C. cretica* (Boiss. & Heldr.) Nyman, non (L.) Sprengel). Stem very short, simple or branched. Leaves arachnoid-canescent, undivided and cordate-ovate, or lyrate. Capitula solitary or in pairs. Involucre *c.* 20 mm in diameter, ovoid; bracts broadly ovate, with an indistinctly denticulate hyaline margin; apical spine 1–3 mm. Florets purple, the outer slightly longer than the inner. Achenes 3–4 mm; pappus 3 times as long as achene, reddish, the outer hairs plumose, the innermost row consisting of entire, smooth, subulate setae. $2n=22$. *Maritime sands. E. Kriti, Karpathos.* Cr.

59. C. pumilio L., *Cent. Pl.* **1**: 30 (1755). Like **58** but appendages of bracts with spine 5–9 mm; pappus with the outer hairs scabrid and the innermost row consisting of papillose, linear-oblanceolate scales. *Maritime sands. W. Kriti.* Cr. (*N.E. Africa, S.W. Asia.*)

Sect. CHAMAECYANUS Willk. Stems short or absent. Leaves usually in a basal rosette. Involucre oblong-ovoid to ovoid-globose; bracts lanceolate-oblong to ovate or oblong-ovate; appendages pectinate-fimbriate or lacerate, spinose at apex.

60. C. macrorrhiza Willk., *Linnaea* **25**: 38 (1852). Acaulescent, or stems up to 6 cm. Leaves white-lanate, the outer ovate-lanceolate, entire or lobed, the rest very long, lyrate-pinnatifid, with few oblong segments. Capitula 1–3. Involucre 15–20 mm in diameter, ovoid; bracts ovate, tomentose to glabrous; appendages triangular, fimbriate, with spinose apex. Florets orange, the outer slightly longer than the inner. Achenes *c.* 5 mm; pappus much shorter than achene. $2n=20$. *Calcareous rock-crevices and screes.* ● *S.E. Spain* (*prov. Almería*). Hs.

61. C. toletana Boiss. & Reuter, *Diagn. Pl. Nov. Hisp.* 18 (1842) (*C. cavanillesiana* Graells). Acaulescent or stems up to 5 cm. Leaves floccose-tomentose at least when young, mostly pinnate; segments cordate to narrowly lanceolate, often shallowly lobed. Capitula usually several. Involucre *c.* 20 mm in diameter, ovoid; bracts oblong-ovate; appendages (8–)10–12 mm, triangular-lanceolate, remotely long-fimbriate, with spinescent apex. Florets pale yellow, the outer as long as the inner. Achenes *c.* 6 mm, blackish-brown, *c.* 6 times as long as pappus. *Scrub.* ● *C. & S.E. Spain.* Hs.

Subsp. **tentudaica** Rivas Goday, *Veg. Fl. Cuenca Extr. Guadiana* 666 (1964), from W.C. Spain (Sierra Tudia), is acaulescent, has leaves with spinulose-mucronate segments, solitary capitula, involucre *c.* 30 mm in diameter and pinkish-orange florets; it is in some ways intermediate between **61** and **62** and the relationship between these three taxa is uncertain.

62. C. haenseleri (Boiss.) Boiss., *Voy. Bot. Midi Esp.* **2**: 349 (1840). Acaulescent. Leaves greyish-tomentose, mostly pinnatisect; segments ovate-oblong to linear-lanceolate, entire to denticulate. Capitula 1–3. Involucre *c.* 25 mm in diameter, ovoid; bracts orbicular-triangular, glabrous; appendages up to 8 mm, triangular-lanceolate, fimbriate-serrate, with a brown, fimbriate, apical spine. Florets orange-yellow. ● *S.W. Spain* (*Sierra Bermeja*). Hs.

63. C. argecillensis Gredilla, *Bol. Soc. Esp. Hist. Nat.* **3**: 431 (1903). Acaulescent. Leaves floccose-subtomentose, glabrescent, undivided, ovate or lanceolate, entire or mucronate-dentate. Capitula 1, pedunculate. Involucre 18–20 mm in diameter, ovoid; bracts oblong; appendages lanceolate, fimbriate, with spinescent apex. Florets pale yellow, with orange veins. Achenes whitish, puberulent; pappus white. *Hillsides.* ● *E.C. Spain* (*N. of Brihuega*). Hs.

64. C. amblensis Graells, *Mem. Real Acad. Ci. Madrid* **2**: 462 (1859). Stems 1–5 cm, corymbosely branched towards apex. Leaves lanate, mostly pinnatisect or pinnatifid; segments broadly ovate, serrate. Capitula 8–12. Involucre *c.* 16 mm in diameter, oblong-ovoid; bracts oblong-lanceolate, glabrous; appendages long, lanceolate, recurved, with apical spine 5 mm. Florets pink. ● *C. Spain* (*prov. Ávila*). Hs.

65. C. lagascana Graells, *op. cit.* 465 (1859). Usually acaulescent. Leaves lanate, glabrescent above, interruptedly pinnatisect; segments oblong, remotely denticulate. Involucral bracts with subentire appendages, spinose. Florets yellow. Achenes brown, black-striped. ● *N. & N.E. Spain.* Hs.

(a) Subsp. **lagascana**: Acaulescent. Leaves shortly petiolate. Capitula 1–10. Involucre *c.* 15 mm in diameter, ovoid; appendages with apical spine up to 16 mm. Florets yellow. Pappus very short. *N. Spain* (*provs. Santander and Valencia*).

(b) Subsp. **podospermifolia** (Loscos & Pardo) Dostál, *Bot. Jour. Linn. Soc.* **71**: 196 (1976) (*C. podospermifolia* Loscos & Pardo): Acaulescent, or with stem up to 8 cm. Leaves long-petiolate. Capitula solitary. Involucre 15–18 mm in diameter, ovoid-globose; appendages with apical spine 4–8 mm. Florets pale yellow. Pappus $\frac{1}{2}$–$\frac{1}{3}$ as long as achene. *N.E. Spain* (*provs. Teruel and Tarragona*).

66. C. acaulis L., *Sp. Pl.* 914 (1753). Like **65(a)** but leaves sparsely grey-tomentose, lyrate-pinnatisect with ovate segments, diminishing in size towards the base of the leaf; capitula solitary; appendages with long fimbriae and slightly patent apical spine. *Naturalized in Lampedusa and perhaps in S. Spain.* [?Hs It.] (*N. Africa.*)

67. C. loscosii Willk., *Ill. Fl. Hisp.* **1(9)**: 133 (1884). Like **65(a)** but involucre 18–25 mm in diameter, ovoid-globose; apical spine of appendages short; florets yellow or purple, the outer longer than the inner; pappus $\frac{1}{3}$ as long as achene. ● *N.E. Spain* (*W. of Tortosa*). Hs.

Perhaps the hybrid between **65(b)** and **50**.

Subgen. **Microlophus** (Cass.) Dostál. Perennial or biennial. Lower leaves lyrately lobed. Appendages of middle bracts with a patent, deciduous apical spine. Pappus present.

68. C. thracica (Janka) Hayek in Stoj. & Stefanov, *Fl. Bălg.* 1194 (1925) (*Serratula thracica* Janka). Stems up to 50 cm, simple or sparingly branched. Leaves coriaceous, decurrent; lower runcinate-lyrate, with few triangular lobes, the terminal one hastate; upper oblong-lanceolate, with auriculate base, the uppermost surrounding the capitula. Involucre *c.* 20 mm in diameter; outer bracts ovate, the inner oblong-lanceolate; appendages fimbriate, with patent apical spine 2–5 mm. Florets yellow. Achenes 3 mm; pappus as long as or slightly longer than achene. *E. part of Balkan peninsula, S.E. Romania.* Bu Gr Rm Tu.

Subgen. **Cynaroides** Dostál. Biennial, rarely perennial. Leaves undivided, rarely the basal lyrate-pinnatipartite. Appendages of middle bracts with a persistent, rigid apical spine. Pappus present.

69. C. charrelii Halácsy & Dörfler, *Jahres-Kat. Wien. Bot. Tauschver.* **1894**: 6 (1894). Stems 50–70 cm, erect, with short branches, broadly winged. Leaves oblong-lanceolate, the upper decurrent, surrounding the capitula. Involucre 40–55 mm in diameter; bracts coriaceous, the middle with ovate-lanceolate, stramineous appendages with a short, rigid, apical spine. Florets yellow. Achenes 3·5 mm, glabrous; pappus about twice as long as achene. *Rocks.* ● *N. Greece (near Edhessa).* Gr.

Subgen. **Acrolophus** (Cass.) Dobrocz. (Sect. *Acrolophus* (Cass.) DC.; *Acosta* Adanson). Annual to perennial herbs, rarely dwarf shrubs; stems usually erect and much-branched. Leaves usually pinnatisect with narrow segments. Capitula comparatively small. Bracts usually with prominent veins on the back. Appendages, if present, shortly decurrent at base, usually fimbriate, usually spiny at apex. Pappus usually present.

The species of this large subgenus all tend to have the same characteristic habit which enables them to be fairly readily recognized. The constituent species are, however, extremely difficult to separate, the diagnostic characters are slight and variable, and intermediates (often considered to be hybrids) are frequent. Identification is often only possible after many specimens of a population have been studied. Further experimental study of the subgenus is required.

Sect. PANNOPHYLLUM Hayek. Stems herbaceous, the branches not spiny. Leaf-segments elliptical to lanceolate, not rigid or spiny. Involucre usually ovoid; appendages sometimes with a short spine, not filiform and plumose-fimbriate at apex, the lower fimbriae usually free. Florets pink, rarely purple, yellow or white.

70. C. cineraria L., *Sp. Pl.* 912 (1753). Perennial. Stems up to 80 cm, erect, rarely procumbent, with few branches above. Leaves more or less tomentose, rarely glabrescent; lower lyrate to 2-pinnatisect. Capitula solitary. Bracts broadly ovate; appendages usually dark brown, the apex acuminate, not spinose; fimbriae 0·5–2 mm. Florets purple. Pappus ⅔ as long as achene, rarely absent. $2n=18$. *Rocks, mainly near the sea. W. coast of Italy, Sicilia.* It Si.

A polymorphic species. Many taxa intermediate between the following subspecies have been described.

1 Plant densely white-tomentose
2 Lower leaves 1–(2–)pinnatisect with 8–12 ovate segments on each side; sinuses obtuse — (a) subsp. **cineraria**
2 Lower leaves lyrate with 4–7 oblong segments on each side; sinuses acute — (b) subsp. **busambarensis**
1 Plant ± grey-tomentose or glabrescent
3 Stems erect; leaves thin — (c) subsp. **cinerea**
3 Stems procumbent; leaves fleshy — (d) subsp. **veneris**

(a) Subsp. **cineraria**: Plant densely white-tomentose. Stems erect. Lower leaves 1-(2–)pinnatisect, with 8–12 segments on each side. Capitula sessile. Involucre 10–15 × 9–12 mm, ovoid-oblong; fimbriae 0·5–1·5 mm. $2n=18$. *W. coast of C. & S. Italy; ?Sicilia.*

(b) Subsp. **busambarensis** (Guss.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 196 (1976) (*C. cineraria* var. *busambarensis* Guss.): Plant white-tomentose. Stems erect. Lower leaves lyrate, with 4–7 segments on each side. Capitula pedunculate. Involucre *c.* 18 mm in diameter, oblong-ovoid; appendages black; fimbriae up to 2 mm. $2n=18$. *Maritime rocks. W. & C. Sicilia; one station in W.C. Italy.*

(c) Subsp. **cinerea** (Lam.) Dostál, *loc. cit.* (1976) (*C. cinerea* Lam.): Plant grey-tomentose, rarely subglabrous. Stems erect. Lower leaves lyrate, with 3–5 segments on each side. Capitula long-pedunculate. Involucre up to 30 mm in diameter, ovoid. *Sicilia (near Palermo), ?S. Italy.*

(d) Subsp. **veneris** (Sommier) Dostál, *loc. cit.* (1976) (*C. veneris* Sommier): Plant sparsely grey-tomentose, sometimes glabrescent. Stems procumbent. Lower leaves pinnatifid, with 4–7 segments on each side. Capitula subsessile. Involucre 10–30 × 10–25 mm, ovoid. $2n=18$. *Coast of N.W. Italy.*

71. C. cuspidata Vis., *Flora (Regensb.)* **12** (Ergänz. 1): 22 (1829). Perennial. Stems 15–30 cm, erect or ascending, simple or with 2–3 branches above. Leaves undivided, ovate-lanceolate, entire or dentate at base, usually green on upper surface, grey-tomentose beneath. Capitula solitary. Involucre *c.* 14 × 12 mm, ovoid-globose. Bracts 5-veined; appendages triangular-lanceolate, blackish, whitish-fimbriate, the apex 1·5 mm, subulate, recurved; lower fimbriae confluent with the hyaline margin. Florets pink. Pappus somewhat longer than the achene. *Mountain rocks.* ● *W. Jugoslavia (Biokovo Planina, S. of Split).* Ju.

72. C. niederi Heldr., *Ann. Sci. Nat.* ser. 4, **13**: 380 (1860). Perennial. Stems 30–50 cm, numerous, erect or ascending, sparingly paniculately branched, whitish-tomentose. Leaves whitish-tomentose; lower 2-pinnatisect, the lateral segments oblong to broadly linear, acute; upper 1-pinnatisect. Capitula solitary. Involucre 18–20 mm, ovoid-globose; appendages covering the bracts, pale brown, the apical spine 2–2·5 mm, longer than the fimbriae. Florets purple. Pappus 1½ times as long as achene. *Calcareous rocks.* ● *W. Greece (N. of Mesolongion).* Gr.

73. C. kilaea Boiss., *Fl. Or.* **3**: 643 (1875). Perennial. Stems up to 80 cm, ascending, branched above, appressed-white-tomentose. Leaves whitish-tomentose; lower lyrate, rarely undivided with lanceolate segments. Capitula in corymbs. Involucre 14 × 7 mm, ovoid-oblong; bracts appressed; appendages small, pale brown, the fimbriae and apical spine 1–1·5 mm. Florets pale pink. Pappus about as long as achene. *Maritime sands. Turkey-in-Europe.* Tu.

74. C. wettsteinii Degen & Dörfler, *Denkschr. Akad. Wiss. Math.-Nat. Kl. (Wien)* **64**: 726 (1897). Perennial. Stems ascending, with few branches. Leaves appressed-white-tomentose; lower pinnatisect, the segments ovate. Capitula solitary. Involucre 14 × 10 mm, ovoid; appendages lanceolate, blackish, the apical spine 2 mm. Florets pink. Pappus slightly longer than achene. ● *S. Jugoslavia (Makedonija).* Ju.

C. leucomelaena Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 758 (1931), described from Albania, is like **74** but has arachnoid-hairy leaves, triangular-ovate, non-spiny appendages, and pappus ⅓–½ as long as the achene. Its status requires confirmation.

75. C. argentea L., *Sp. Pl.* 912 (1753). Whitish-tomentose perennial. Stems 10–45 cm, erect or ascending, with few, short branches. Lower leaves lyrate, with oblong segments. Capitula solitary. Involucre 8–10 × 5–7 mm, ovoid; appendages unarmed, pale brown. Florets yellow. Pappus about as long as achene. $2n=18$. *Mountain rocks.* ● *S. Aegean region (Kriti, Kithira).* Cr.

76. C. pannosa DC., *Prodr.* **6**: 582 (1838). Perennial. Stems up to 60 cm, erect, corymbosely branched above. Leaves densely appressed-white-tomentose; lower pinnatisect to sublyrate; cauline mostly pinnatisect. Capitula 3–5 on each branch. Involucre 12 × 6 mm, ovoid; bracts with prominent veins; appendages not covering the bracts, with 3–4(–5) fimbriae on each side, pale brown, the apical spine *c.* 2 mm, stout. Florets pink to white, rarely becoming yellow. Pappus about as long as achene. *Mountain rocks.* ● *N. Greece (Athos).* Gr.

77. C. nicopolitana Bornm., *Feddes Repert.* **40**: 374 (1936). Caespitose perennial. Stems 20–40 cm. Leaves appressed-yellow-tomentose; lower lyrate; upper pinnatisect. Capitula in clusters of 2–4. Involucre *c.* 8 × 4 mm, ovoid or ovoid-conical; appendages yellow, with pale brown fimbriae, the apex mucronulate. Florets yellow or pink. Achene unknown. *Mountain rocks.* ● *N.W. Greece.* Gr.

78. C. cuneifolia Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 198 (1813). Biennial. Stems 30–60 cm, erect. Leaves appressed-grey-tomentose, sometimes glabrescent. Involucre 10–14 × 6–8 mm, usually ovoid-oblong; bracts oblong, with prominent veins; appendages shortly triangular, not covering the bracts, brown or blackish, with (4–)5–8(–9) fimbriae on each side. Florets pink, rarely white, the outer radiate. Pappus ¼–⅔ as long as achene. *Maritime sands and other dry, open habitats. S. & E. parts of Balkan peninsula, E. Romania.* Al Bu Gr Ju Rm Tu [Hu].

1 Stems simple or branched at base; leaves lyrate, with broadly ovate terminal segment — (c) subsp. **sublanata**
1 Stems branched at middle; leaves lyrate-pinnatifid or bipinnatisect, with oblong terminal segment
2 Appendages spinose at apex — (b) subsp. **pallida**
2 Appendages not spinose at apex — (a) subsp. **cuneifolia**

(a) Subsp. **cuneifolia** (*C. oviceps* Bornm.): Stems branched at the middle. Leaves white-tomentose, sometimes glabrescent; lower lyrate-pinnatifid. Involucre 12–14 × 7–8 mm; appendages brown, not spinose at apex. *Stony hillsides.* ● *Bulgaria, N. Greece, Turkey-in-Europe.*

(b) Subsp. **pallida** (Friv.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 763 (1931): Stems branched at the middle. Leaves scabrid, appressed-white-tomentose, sometimes glabrescent; lower lyrate. Involucre 10–12 × 6–7 mm; appendages pale brown, with an apical spine *c.* 2·5 mm. ● *From N. & E. Greece to E. Romania.*

(c) Subsp. **sublanata** (DC.) Hayek, *loc. cit.* (1931): Stems simple or branched at the base. Leaves arachnoid-lanate, sometimes glabrescent; lower lyrate. Involucre 12–14 × 7–8 mm; appendages black, the apex shortly spinose. *Throughout the range of the species except Romania, but in some regions only casual.*

79. C. ipsaria Stoj. & Kitanov, *Bull. Soc. Bot. Bulg.* **9**: 102 (1943). Like **78**(c) but stems 8–20 cm; involucre *c.* 10 mm; appendages yellowish- or purplish-brown, with hyaline auricles at base; pappus as long as achene. *Rock-crevices.* ● *N. Aegean region (Thasos).* Gr.

Further information is required about the specific status of this plant, and it may be better placed as a further subspecies of **78.**

80. C. rutifolia Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 205 (1813). Perennial. Stems 20–80 cm, branched above. Leaves white-tomentose; lower 1- or 2-pinnatisect, the lowermost sometimes lyrate. Capitula solitary. Involucre 10–13 × 6–7 mm; bracts ovate-oblong, with prominent veins; appendages shortly triangular, pale brown, the fimbriae up to 0·5 mm. Florets pink, the outer radiate. Pappus not more than ¼ as long as achene, or absent. ● *S.E. Europe.* Bu Gr Rm ?Rs (W) Tu.

1 Stems not more than 40 cm; appendages with 2–3 fimbriae on each side, the apical not pungent — (a) subsp. **rutifolia**
1 Stems up to 80 cm; appendages with 3–7 fimbriae on each side, the apical pungent
2 Involucre 12–13 mm; fimbriae 3–5 on each side — (b) subsp. **jurineifolia**
2 Involucre 10 mm; fimbriae 5–7 on each side — (c) subsp. **pseudobovina**

(a) Subsp. **rutifolia**: Stems 20–40 cm, corymbosely branched. Lower leaves 1-pinnatisect; cauline with sessile, spathulate segments. Involucre *c.* 12 × 6 mm, ovoid-cylindrical; bracts subtomentose; appendages pale brown, with 3–5 fimbriae on each side, the apex not pungent. Pappus ¼ as long as achene. *Stony slopes. E. part of Balkan peninsula.*

(b) Subsp. **jurineifolia** (Boiss.) Nyman, *Consp.* 425 (1879) (*C. jurineifolia* Boiss.): Stems 30–80 cm, paniculately branched. Lower leaves 2-pinnatisect; cauline with shortly petiolate, spathulate segments. Involucre 12–13 × 6–7 mm, oblong-ovoid; bracts glabrous; appendages rather dark brown, with 3–6 fimbriae on each side, the apex pungent. Pappus very short or absent. *Scrub slopes. Bulgaria and Romania.*

(c) Subsp. **pseudobovina** (Hayek) Dostál, *Bot. Jour. Linn. Soc.* **71**: 196 (1976) (*C. pseudobovina* Hayek): Like subsp. (b) but cauline leaves with linear-lanceolate segments; involucre *c.* 10 × 6 mm, narrowly ovoid; bracts sometimes sparsely tomentose; appendages pale brown, with 5–7 fimbriae on each side; pappus absent. *Grassy slopes. N. Bulgaria.*

81. C. varnensis Velen., *Fl. Bulg.* 313 (1891). Biennial. Stems 30–80 cm, paniculately branched from middle. Leaves with white arachnoid indumentum; lower 2-pinnatifid with lanceolate, dentate or divided segments. Capitula in clusters of 2–3. Involucre 8–10 × 4–5 mm, ovoid-oblong; bracts with prominent veins; appendages with 4–7 fimbriae on each side and a long, patent apical spine. Florets pink. Pappus about ½ as long as achene. *Calcareous hillsides.* ● *C. & E. Bulgaria, S.E. Romania.* Bu Rm.

C. inermis Velen., *Österr. Bot. Zeitschr.* **52**: 154 (1902), from Bulgaria, is a variant with mucronate, not spiny, appendages.

82. C. crithmifolia Vis., *Fl. Dalm.* **2**: 40 (1847). Perennial. Stems 30–40 cm, shortly paniculately branched above. Leaves glabrous, green; lower 2-pinnatisect. Capitula solitary. Involucre 14–17 × 10–14 mm, ovoid-globose; bracts with 5 indistinct veins; appendages with 3–4 fimbriae on each side, without an apical spine. Florets pink. Pappus about as long as achene. *Rocky ground.* ● *W. Jugoslavia.* Ju.

83. C. friderici Vis., *loc. cit.* (1847). Perennial. Stems 30–40 cm, paniculately branched. Leaves white-tomentose; lower 2-pinnatisect. Capitula solitary. Involucre 12–17 × 9–14 mm;

appendages orbicular, cartilaginous, pale brown, with 3–4 fimbriae on each side, acute at apex. Florets purple, rarely white. *Calcareous maritime rocks.* ● *Islands of C. Adriatic.* Ju.

(a) Subsp. **friderici**: Involucre 12–15 × 9–12 mm, ovoid-oblong; bracts oblong. Pappus ¼–½ as long as achene, asymmetrical. *Palagruža.*

(b) Subsp. **jabukensis** (Ginzberger & Teyber) Dostál, *Bot. Jour. Linn. Soc.* **71**: 196 (1976) (*C. jabukensis* Ginzberger & Teyber): Involucre 14–17 × 10–14 mm, ovoid; bracts ovate. Pappus about as long as achene, symmetrical. *Jabuka.*

84. C. affinis Friv., *Flora* (*Regensb.*) **19**: 435 (1836). Perennial. Stems 30–80 cm, erect. Leaves scabrid, white-tomentose or with greyish-arachnoid indumentum; lower 1-pinnatisect, the segments 3–5 mm wide, oblong; cauline usually lyrate or pinnatifid. Capitula solitary. Involucre 12–15 × 8–12 mm, ovoid-globose; bracts ovate-oblong, with prominent veins; appendages dark brown or black, rarely yellow with a brown centre, not or scarcely spinose at apex. Florets pink. Pappus about as long as achene. *Rocky places, mainly in the mountains. Balkan peninsula, S. Romania.* Al Bu Gr Ju Rm Tu.

1 Cauline leaves undivided or with 1 pair of segments at base (c) subsp. **peloponnesiaca**
1 Cauline leaves pinnatifid or lyrate
2 Cauline leaves pinnatifid
3 Leaf-segments ovate or elliptical (d) subsp. **candida**
3 Leaf-segments linear, mucronate (e) subsp. **lacerata**
2 Cauline leaves lyrate
4 Appendages 1 mm wide, with 5–6 fimbriae on each side (b) subsp. **balcanica**
4 Appendages 2–3 mm wide, with 6–8 fimbriae on each side (a) subsp. **affinis**

(a) Subsp. **affinis**: Stems paniculately branched. Leaves grey-green; cauline lyrate, the terminal segment and the uppermost leaves oblong, *c.* 3 mm wide, the lateral segments 3 mm wide. Appendages 2–3 mm wide, broadly triangular, black, with 6–8 fimbriae on each side. *Throughout the range of the species.*

(b) Subsp. **balcanica** (Urum. & H. Wagner) Dostál, *Bot. Jour. Linn. Soc.* **71**: 196 (1976) (*C. balcanica* Urum. & H. Wagner): Like subsp. (a) but cauline leaves with terminal segment up to 10 mm wide, broadly ovate, the lateral segments 4–5 mm wide; appendages 1 mm wide, narrowly triangular, with 5–6 fimbriae on each side. ● *N. Bulgaria.*

(c) Subsp. **peloponnesiaca** (Halácsy) Dostál, *loc. cit.* (1976) (*C. affinis* var. *peloponnesiaca* Halácsy): Stems divaricately branched from the base, rarely very short and unbranched. Leaves pubescent, green, scabrid; cauline undivided or with one pair of segments at the base. Appendages dark brown, with 6–7 fimbriae on each side. ● *S. Greece.*

(d) Subsp. **candida** (Velen.) Dostál, *op. cit.* 197 (1976) (*C. candida* Velen.): Stems paniculately branched above. Leaves whitish-tomentose; cauline pinnatifid, the terminal segment and the uppermost leaves 5–10 mm wide. Involucre 15 × 11 mm; appendages yellow with a brown centre and with 6–9 fimbriae on each side. ● *S. Bulgaria.*

(e) Subsp. **lacerata** (Hausskn.) Dostál, *loc. cit.* (1976) (*C. affinis* var. *lacerata* Hausskn.): Leaves pinnatisect, the segments linear, mucronate. Appendages orbicular, very shortly fimbriate. ● *Greece.*

C. thasia Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 762 (1931), described from Macedonia and Thasos, is very like **84(d)** but the leaves are lyrate; the type is not known and further information is required.

85. C. pallidior Halácsy, *Bull. Herb. Boiss.* **6**: 594 (1898). Perennial. Stems branched. Leaves arachnoid-lanate; lower pinnatisect. Involucre 12–13 × 7–9 mm, ovoid; appendages black or brown, the fimbriae at least 2 mm, the apex not spinose. Florets pink. Pappus ¼–½ as long as achene. *Dry places.* ● *Mountains of Bulgaria and Greece.* Bu Gr.

1 Appendages black; stems sparingly branched (c) subsp. **vatevii**
1 Appendages brown; stems much-branched
2 Appendages with 4–6 white fimbriae on each side (b) subsp. **denudata**
2 Appendages with 5–8 brown fimbriae on each side (a) subsp. **pallidior**

(a) Subsp. **pallidior** (*C. affinis* subsp. *pallidior* (Halácsy) Hayek): Stems much-branched. Capitula solitary. Involucre 8–9 mm in diameter; appendages brown, with 5–8 brown fimbriae on each side. Pappus *c.* 2 mm. *N. Greece.*

(b) Subsp. **denudata** (Halácsy) Dostál, *Bot. Jour. Linn. Soc.* **71**: 197 (1976) (*C. affinis* var. *denudata* Halácsy): Stems much-branched. Capitula solitary or in clusters of 2–3. Involucre 7–8 mm in diameter; appendages brown, with 4–6 white fimbriae on each side. Pappus *c.* 1·5 mm. *C. Greece.*

(c) Subsp. **vatevii** (Degen, Urum. & H. Wagner) Dostál, *loc. cit.* (1976) (*C. vatevii* Degen, Urum. & H. Wagner): Stems sparingly branched. Capitula solitary. Involucre 7–9 mm in diameter; appendages black, with 6–10 fimbriae on each side. *Bulgaria.*

Sect. DISSECTAE (Hayek) Dostál. Like Sect. *Pannophyllum* but leaf-segments linear; florets purple.

86. C. parlatoris Heldr., *Ann. Accad. Aspir. Nat.* (*Napoli*) **1**: 287 (1843). Perennial. Stems 10–40 cm, erect or ascending, corymbosely branched. Leaves whitish–tomentose, glabrescent, scabrid; lower 1- to 2-pinnatisect, with more or less linear segments 1–3 mm wide. Capitula solitary. Involucre 12–20 × (6–)10–20 mm, ovoid. Florets purple. Pappus about as long as achene. *Mountain rocks. S. & C. Italy, Sicilia.* It Si.

1 Involucre 15–20 mm in diameter; appendages covering bracts (b) subsp. **nigra**
1 Involucre 6–15 mm in diameter; appendages not covering bracts
2 Leaves whitish-tomentose, not glabrescent (a) subsp. **tenorei**
2 Leaves floccose, glabrescent (c) subsp. **parlatoris**

(a) Subsp. **tenorei** (Guss. ex Lacaita) Dostál, *Bot. Jour. Linn. Soc.* **71**: 197 (1976) (*C. tenorei* Guss. ex Lacaita, *C. dissecta* Ten., non Hill): Leaves whitish-tomentose, not glabrescent. Involucre 7–15 mm in diameter; appendages not covering the bracts. *S. Italy, Sicilia.*

(b) Subsp **nigra** (Fiori) Dostál, *loc cit.* (1976) (*C. dissecta* var. *nigra* Fiori & var. *montium* Gugler): Leaves whitish-tomentose, not glabrescent. Involucre 15–20 mm in diameter; appendages covering the bracts. ● *C. Appennini.*

(c) Subsp. **parlatoris**: Leaves floccose, glabrescent. Involucre 8–10 × 6–8 mm: appendages not covering the bracts. ● *Sicilia*
8–10 × 6–8 mm; appendages not covering the bracts. ● *Sicilia.*

C. ambigua Guss., *Ind. Sem. Horto Boccad.* **1826**: 3 (1826) (incl. subsp. *laciniata* (Guss.) Arcangeli), described from Sicilia, is probably the hybrid **86 × 178.**

Sect. HORRIDAE Dostál. Stems herbaceous or woody at base, the branches spiny. Leaf-segments rigid, the terminal spiny. Involucre ovoid or cylindrical; appendages mucronate or spiny, not filiform and plumose-fimbriate at apex, the lower fimbriae free. Florets pink or yellow.

87. C. horrida Badaro, *Gior. Fis.* (*Brugnat.*) ser. 2, **7**: 363 (1824). Perennial. Stems 10–30 cm, much-branched. Leaves pinnatisect, the terminal segments with a single apical spine. Capitula solitary. Involucre 3–4 mm in diameter, ovoid-cylindrical; appendages mucronate, shortly fimbriate. Florets pale pink. Pappus somewhat shorter than achene. *Maritime rocks.* ● *Sardegna* (*islets of Asinara and Tavolara*). Sa.

88. C. balearica Rodr., *Bull. Soc. Bot. Fr.* **16**: 237 (1869). Dwarf shrub. Stems *c.* 100 cm, much-branched. Leaves small; spring leaves undivided, linear; summer leaves pinnatisect, the terminal segment with 3 apical spines. Capitula solitary. Involucre *c.* 4 mm in diameter, ovoid; appendages spinose at apex, fimbriate-dentate. Florets yellow. Pappus ⅓–½ as long as achene. *Limestone rocks.* ● *Islas Baleares.* Bl.

Sect. ARENARIAE (Hayek) Dostál. Stems herbaceous, the branches not spiny. Leaf-segments not rigid or spiny. Involucre usually ovoid; appendages usually spiny, not filiform and plumose-fimbriate at apex, the lower fimbriae confluent into a hyaline margin or forming auricles. Florets pink or purple, rarely yellow or lilac.

89. C. arenaria Bieb. ex Willd., *Sp. Pl.* **3**: 2278 (1803). Biennial or perennial. Stems 30–120 cm, erect, paniculately branched in lower half. Leaves greenish- or whitish-tomentose; lower 2-pinnatisect. Capitula in clusters. Involucre 9–12 × 4–8 mm; appendages yellow or pale brown, mucronate, auriculate. Florets pink to lilac. Pappus usually about as long as achene. *Sandy ground. S.E. & E.C. Europe, from Hungary southwards to Bulgaria and eastwards to W. Kazakhstan.* Bu Hu Ju Rm Rs (C, W, K, E).

1 Appendages with regularly fimbriate margin, brownish at centre
2 Leaves white-tomentose; pappus *c.* ½ as long as achene (d) subsp. **odessana**
2 Leaves lanate; pappus about as long as achene (e) subsp. **borysthenica**
1 Appendages with irregularly dentate or lacerate-fimbriate margin, often yellowish at centre
3 Involucre 6–8 mm in diameter (c) subsp. **majorovii**
3 Involucre 4–6 mm in diameter
4 Stem ± glabrescent, with long branches; leaf-margin smooth (a) subsp. **arenaria**
4 Stem densely arachnoid, with short branches; leaf-margin scabrid (b) subsp. **sophiae**

(a) Subsp. **arenaria**: Perennial. Stems glabrescent above, with long branches. Leaves greenish. Involucre 9–11 × 4–6 mm, oblong-ovoid; appendages yellow at centre, with lacerate-fimbriate or denticulate margin. *S.E Russia* (*lower Volga valley*).

(b) Subsp. **sophiae** (Klokov) Dostál, *Bot. Jour. Linn. Soc.* **71**: 197 (1976) (*C. sophiae* Klokov): Biennial. Stems with arachnoid indumentum, with short branches. Leaves greenish. Involucre 9–12 × 5–6 mm, oblong-ovoid; appendages yellowish at centre, with lacerate-denticulate margin. *Sandy river-banks.* ● *S.E. Russia* (*lower Don valley*).

(c) Subsp. **majorovii** (Dumbadze) Dostál, *loc. cit.* (1976) (*C. majorovii* Dumbadze): Biennial. Stems scabrid and densely lanate. Leaves whitish-lanate. Involucre 9–11 × 6–8 mm, ovoid-conical; appendages brownish at centre, with dentate margin. *From E. Ukraine to W. Kazakhstan.*

(d) Subsp. **odessana** (Prodan) Dostál, *loc. cit.* (1976) (*C. odessana* Prodan): Biennial. Stems arachnoid-pubescent. Leaves white-tomentose. Involucre 10–12 × 4·5–6·5 mm, oblong-ovoid; appendages brownish at centre, regularly fimbriate. Florets pink. Pappus *c.* ½ as long as achene. ● *Coast of Ukraine.*

(e) Subsp. **borysthenica** (Gruner) Dostál, *loc. cit.* (1976) (*C. borysthenica* Gruner): Biennial. Stems lanate. Leaves scabrid and lanate. Involucre 9–12 × 5–6 mm, oblong-ovoid; appendages brownish at centre, pectinate-fimbriate. Florets lilac. ● *From Hungary and Jugoslavia eastwards to C. Ukraine.*

90. C. ovina Pallas ex Willd., *Sp. Pl.* **3**: 2292 (1803). Biennial. Stems 20–80 cm, paniculately branched. Leaves arachnoid-hairy, glabrescent, greenish; lower 2-pinnatisect. Involucre 8–12 × 3–6 mm; appendages yellow or pale brown, with apical spine *c.* 1 mm; auricles small or indistinct. Florets lilac. *From Ukraine to Bulgaria.* Bu Rm Rs (W, K, E).

Subsp. *ovina* is endemic to the Caucasus.

1 Pappus 1·5–2·5 mm; bracts with 3 veins
2 Involucre 5–6 mm in diameter; plant sparsely pubescent (a) subsp. **besserana**
2 Involucre 3–5 mm in diameter; plant densely pubescent (b) subsp. **lavrenkoana**
1 Pappus not more than 0·5 mm; bracts with 3–7 veins
3 Involucre 10–12 × 5–6 mm; capitula pedunculate (c) subsp. **steveniana**
3 Involucre 9 × 3·5–4 mm; capitula sessile (d) subsp. **koktebelica**

(a) Subsp. **besserana** (DC.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 197 (1976) (*C. besserana* DC.): Plant sparsely pubescent. Involucre 10–12 × 5–6 mm, ovoid-cylindrical; bracts with 3 veins, the lower fimbriae forming denticulate auricles. Pappus *c.* 2·5 mm. *Stony slopes.* ● *From Bulgaria to W. Ukraine.*

(b) Subsp. **lavrenkoana** (Klokov) Dostál, *loc. cit.* (1976) (*C. lavrenkoana* Klokov): Plant densely pubescent. Involucre 8–11 × 3–5 mm, oblong-cylindrical; bracts with 3 veins, the lower fimbriae forming small auricles. Pappus 1·5–2 mm. *Calcareous rocks.* ● *S.E. Ukraine.*

(c) Subsp. **steveniana** (Klokov) Dostál, *loc. cit.* (1976) (*C. steveniana* Klokov): Capitula pedunculate. Involucre 10–12 × 5–6 mm, oblong-ovoid; bracts with 3–7 veins, the lower fimbriae forming auricles. Pappus absent or very short. *Sandy and gravelly places.* ● *Moldavia; Krym.*

(d) Subsp. **koktebelica** (Klokov) Dostál, *op. cit.* 198 (1976) (*C. koktebelica* Klokov): Capitula sessile. Involucre 9 × 3·5–4 mm, oblong-ovoid; bracts with 3 veins, the lower fimbriae forming indistinct auricles. Pappus very short. *Steppes.* ● *E. Krym.*

C. jankeana Simonkai, *Term. Füz.* **1**: 168 (1877), from Romania (Iasi), is like **90** but has the involucre 6–8 × 3–4 mm; **C. pseudotenuiflora** Prodan, *Centaur. Român.* 158 (1930), from Ukraine to Bulgaria, is intermediate between **91** and **90(a)**; the status of both these taxa is uncertain.

91. C. tenuiflora DC., *Prodr.* **6**: 584 (1838) (*C. ovina* sensu Bieb., non Pallas ex Willd.). Biennial. Stems 30–50 cm, erect, corymbosely branched. Leaves greenish, appressed-arachnoid-tomentose; lower 2-pinnatisect, the segments *c.* 1 mm wide, linear. Capitula in clusters. Involucre 7–8 × 3–4 mm, oblong-cylindrical; appendages dark brown, with white fimbriae, auriculate, with an apical spine 2–3 mm. Florets pink. Pappus about as long as achene. *Open hillsides.* ● *From Bulgaria and Romania to Krym.* Bu Rm Rs (W, K).

C. codruensis Prodan, *Centaur. Român.* 155 (1930), from Romania (Galati), is like **91** but has the involucre 11–12 × 6 mm and appendages with very large auricles; its status is uncertain.

92. C. spinosociliata Seenus, *Beschr. Reise Istr. Dalm.* 65 (1805). Annual or biennial. Stems 30–40 cm, erect, paniculately

branched. Leaves green; lower 2-pinnatisect, the segments *c.* 1 mm wide, linear. Capitula solitary. Involucre 10–12 × 5–8 mm; appendages usually auriculate, usually with a patent apical spine 1–3(–6) mm. Florets pink. Pappus absent or very short. ● *N.E. Italy, W. Jugoslavia.* It Ju.

1 Appendages denticulate-fimbriate, the fimbriae 0·2–0·5 mm (c) subsp. **tommasinii**
1 Appendages pectinate-fimbriate, the fimbriae 1–3 mm
2 Appendages with apical spine 2–3 mm (b) subsp. **spinosociliata**
2 Appendages with apical spine 1 mm (a) subsp. **cristata**

(a) Subsp. **cristata** (Bartl.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 198 (1976) (*C. cristata* Bartl.): Appendages almost covering the bracts, pectinate-fimbriate with apical spine 1 mm; fimbriae 1·8 mm. Pappus absent. *Stony places. N.W. Jugoslavia.*

(b) Subsp. **spinosociliata**: Appendages not covering the bracts, pectinate-fimbriate with apical spine 2–3 mm; fimbriae 1–2 mm. Pappus absent or very short. *Maritime rocks. W. Jugoslavia.*

(c) Subsp. **tommasinii** (A. Kerner) Dostál, *loc. cit.* (1976) (*C. tommasinii* A. Kerner): Appendages not covering the bracts, denticulate-fimbriate, without an apical spine; fimbriae 0·2–0·5 mm. Pappus absent. *Maritime rocks. N.E. Italy, Istra.*

C. cristata subsp. **curictana** Lovrić, *Acta Bot. Croat.* **26–27**: 267 (1968), described from W. Jugoslavia (island of Krk), is like subsp. (b) but perennial, with stems 5–25 cm, branched at the base, and appendages with fimbriae 1·5–3 mm and an apical spine *c.* 6 mm; its status is uncertain.

93. C. incompta Vis., *Fl. Dalm.* **2**: 38 (1847). Perennial. Stems up to 50 cm, erect, simple or sparingly branched. Leaves green; lower lyrate-pinnatifid. Capitula solitary. Involucre 12–14 × 6–11 mm; appendages with 2–3 fimbriae on each side, auriculate, without an apical spine. Florets purple. *Rocky places.* ● *S. & W. Jugoslavia.* Ju.

(a) Subsp. **incompta**: Stems 30–50 cm, with long branches. Involucre 14 × 10(–11) mm; appendages blackish. Pappus *c.* ½ as long as achene. *Mainly in the north and west parts of the range of the species.*

(b) Subsp. **derventana** (Vis. & Pančić) Dostál, *Bot. Jour. Linn. Soc.* **71**: 198 (1976) (*C. derventana* Vis. & Pančić): Stems 10–30 cm, with short branches. Involucre 12 × 6–7 mm; appendages brown. Pappus about as long as achene. *Mainly in the south and east parts of the range of the species.*

94. C. chalcidicaea Hayek, *Österr. Bot. Zeitschr.* **64**: 359 (1914). Perennial. Stems up to 30 cm, ascending, simple or branched. Leaves white-tomentose; lower pinnatisect. Capitula solitary. Involucre 12 × 6–7(–9) mm, ovoid; appendages with 4–6 fimbriae on each side, auriculate, without an apical spine. Florets pink. Pappus ½–¾ as long as achene. *Mountain rocks.* ● *N.E. Greece.* Gr.

95. C. grisebachii (Nyman) Form., *Verh. Naturf. Ver. Brünn* **34**: 300 (1896). Perennial, rarely biennial. Stems up to 50 cm, erect, paniculately branched. Leaves scabrid and with arachnoid indumentum or appressed-pubescent, grey-green; lower pinnatisect with narrowly oblong to linear segments. Capitula usually in clusters. Involucre 10–11(–14) × 5–7 mm; appendages dark brown, acute, with 4–6 fimbriae 1·5 mm on each side, auriculate. Florets purple. Achenes puberulent; pappus ¼–½ as long as achene. *Stony slopes.* ● *S. part of Balkan peninsula.* Al Gr Ju.

1 Lower leaves with more than 5 pairs of segments; involucre 6–7 mm in diameter (a) subsp. **grisebachii**
1 Lower leaves with 3–5 pairs of segments; involucre 5–6 mm in diameter
2 Stems 30–50 cm, branched above; involucral appendages with narrow auricles (b) subsp. **confusa**
2 Stems not more than 20 cm, branched at base; involucral appendages with wide auricles (c) subsp. **paucijuga**

(a) Subsp. **grisebachii**: Stems 30–50 cm, branched at about the middle. Lower leaves with more than 5 pairs of segments. Involucre 6–7 mm in diameter; appendages with wide auricles. *Throughout the range of the species.*

(b) Subsp. **confusa** (Halácsy) Dostál, *Bot. Jour. Linn. Soc.* **71**: 198 (1976) (*C. confusa* Halácsy): Stems 30–50 cm, branched above. Lower leaves with 3–5 pairs of segments. Involucre 5–6 mm in diameter; appendages with narrow auricles. *N.W. & C. Greece.*

(c) Subsp. **paucijuga** (Halácsy) Dostál, *loc. cit.* (1976) (*C. paucijuga* Halácsy): Stems not more than 20 cm, branched at base. Lower leaves with 2–3 pairs of segments. Involucre 5–6 mm in diameter; appendages with wide auricles. *C. Greece.*

C. vermia Rech. fil., *Bot. Jahrb.* **69**: 526 (1939), from N. Greece (Vermion Oros), is like **95(a)** but is puberulent throughout, has solitary capitula, involucre up to 8 mm in diameter and appendages with *c.* 7 fimbriae up to 1·8 mm long on each side; it is perhaps another subspecies of **95**.

96. C. tauscheri A. Kerner, *Österr. Bot. Zeitschr.* **22**: 119 (1872). Like **95(a)** but stems with long branches; leaves arachnoid-lanate, the lower with linear-lanceolate segments; involucre 12 × 9 mm; appendages blackish, the fimbriae 3–4 on each side; florets pink; achenes glabrous; pappus ¼–½ as long as achene. *Sandy places.* ● *Hungary, N.E. Jugoslavia.* Hu Ju ?Rm.

Probably originated as a result of hybridization between **89** and **128**.

97. C. biokovensis Teyber, *Österr. Bot. Zeitschr.* **63**: 27 (1913). Perennial. Stems 20–40 cm. Leaves glabrescent, glandular-punctate, green, smooth; lower pinnatisect. Capitula in panicles. Involucre 12–14 × 7–12 mm; appendages dark brown, acute to acuminate, auriculate, the fimbriae 2–3 mm, 4–6 on each side. Florets pink. Pappus *c.* ½ as long as achene. *Rocky places in mountains.* ● *N.W. Jugoslavia (Biokovo).* Ju.

98. C. gracilenta Velen., *Fl. Bulg.* 321 (1891) (*C. kanitziana* Janka). Biennial. Stems up to 40 cm, with many long branches. Leaves scabrid, grey-green; lower pinnatisect with linear segments 0·5 mm wide. Capitula solitary. Involucre 9–11 × 4–6 mm; appendages brown, auriculate, with 4–6 fimbriae on each side and an apical spine *c.* 2 mm. Florets pink. Pappus *c.* ½ as long as achene. *Stony slopes.* ● *E. Bulgaria, E. Romania.* Bu Rm.

99. C. kalambakensis Freyn & Sint., *Bull. Herb. Boiss.* **5**: 784 (1897). Perennial. Stems 25–50 cm, erect, branched above. Leaves somewhat scabrid, green, glabrous; lower lyrate, with segments *c.* 2 mm wide. Capitula solitary. Involucre 14 × 8–10 mm; appendages pale brown, auriculate, with 4–6 fimbriae on each side and an apical spine *c.* 3 mm. Florets pink. Pappus as long as or longer than achene. *Rocky places.* ● *C. Greece (near Kalabaka).* Gr.

100. C. transiens Halácsy, *Bull. Herb. Boiss.* **6**: 587 (1898). Perennial. Stems 15–30(–50) cm, erect, paniculately branched at about the middle. Leaves scabrid, pubescent; lower lyrate with segments 2–3 mm wide. Capitula solitary. Involucre 12 × 6–8 mm; appendages pale brown, auriculate, with an apical spine 3–4 mm. Florets purple. Pappus *c.* ¼ as long as achene. *Mountain rocks.* ● *E. Greece (Olimbos).* Gr.

101. C. subsericans Halácsy, *Magyar Bot. Lapok* **11**: 164 (1912). Perennial. Stems 10–35 cm, ascending, simple or with one short branch. Leaves appressed-white-tomentose; lower pinnatisect with segments 1–2 mm wide. Capitula solitary. Involucre 12–14 × 7 mm; appendages blackish, auriculate, with 2–3 fimbriae on each side and an apical spine 2–3 mm. Florets pink. Pappus *c.* ¼ as long as achene. *Mountain rocks.* ● *S.E. Greece (Pateras Oros, near Megara).* Gr.

102. C. attica Nyman, *Syll.* 33 (1854–1855) (*C. graeca* sensu Boiss. & Spruner, non Griseb., *C. boissieri* Walpers, non DC.). Perennial. Stems 5–30 cm, erect or ascending, usually branched below the middle. Leaves usually more or less whitish-tomentose, rarely glabrescent; lower 1(–2)-pinnatisect, the segments 1 mm wide or more; upper undivided. Capitula solitary. Involucre 10–16 × 5–10 mm; bracts with 3 veins; appendages with a long apical spine, sometimes auriculate. Florets pink or purple. Pappus ¼ as long to as long as achene. *Mountain rocks.* ● *N. & E. Greece.* Gr.

1 Involucral appendages without auricles
2 Pappus *c.* ¼ as long as achene; leaf-segments oblong-lanceolate (e) subsp. **drakiensis**
2 Pappus *c.* ½ as long as achene; leaf-segments narrowly lanceolate (f) subsp. **pentelica**
1 Involucral appendages auriculate
3 Involucral appendages with recurved apical spine 2–3 mm (a) subsp. **ossaea**
3 Involucral appendages with erect to patent apical spine up to 7 mm
4 Pappus about as long as achene; involucral appendages covering bracts (b) subsp. **asperula**
4 Pappus *c.* ¼ as long as achene; involucral appendages not covering bracts
5 Leaf-segments linear; involucral appendages with apical spine 2–3(–6) mm (c) subsp. **attica**
5 Leaf-segments ovate-lanceolate; involucral appendages with apical spine 3–5(–7) mm (d) subsp. **megarensis**

(a) Subsp. **ossaea** (Halácsy) Dostál, *Bot. Jour. Linn. Soc.* **71**: 198 (1976) (*C. ossaea* Halácsy): Stems ascending. Leaves white-tomentose. Involucre *c.* 11 × 6 mm; appendages black, auriculate, with recurved apical spine 2–3 mm. Florets pale purple. Pappus *c.* ½ as long as achene. *E. Greece (Oros Ossa).*

(b) Subsp. **asperula** (Halácsy) Dostál, *loc. cit.* (1976) (*C. asperula* Halácsy): Stems erect. Leaves with sparse arachnoid indumentum. Involucre 10–12 × 6–8 mm; appendages covering the bracts, brown, auriculate, with erect or erecto-patent apical spine 3–4 mm. Florets pink. Pappus about as long as achene. *Stony places. S.E. Greece (Attiki).*

(c) Subsp. **attica**: Stems branched below. Leaves white-tomentose, scabrid; segments linear. Involucre 10–12 × 5–6(–7) mm; appendages not covering the bracts, blackish, auriculate, with erect or patent apical spine 2–3(–6) mm. Florets pink or purple. Pappus *c.* ½ as long as achene. *N. & E. Greece.*

(d) Subsp. **megarensis** (Halácsy & Hayek) Dostál, *loc. cit.* (1976) (*C. megarensis* Halácsy & Hayek): Stems with short branches above. Leaves with appressed arachnoid indumentum, scabrid; segments ovate-lanceolate. Involucre 14–16 × 8–9 mm; appendages not covering the bracts, rather dark brown, auriculate, with erect or erecto-patent apical spine 3–5(–7) mm. Florets pink. Pappus *c.* ½ as long as achene. *S.E. Greece (near Megara).*

(e) Subsp. **drakiensis** (Freyn & Sint.) Dostál, *loc. cit.* (1976) (*C. drakiensis* Freyn & Sint.): Leaves greenish, with more or less arachnoid indumentum; segments oblong-lanceolate. Involucre 10–15 × 6–10 mm; appendages with recurved apical spine 2–5 mm, without auricles. Pappus *c.* ¼ as long as achene. *E. Greece (Thessalia).*

(f) Subsp. **pentelica** (Hausskn.) Dostál, *loc. cit.* (1976) (*C. pentelica* Hausskn.): Leaves greenish, with somewhat arachnoid indumentum; segments narrowly lanceolate. Involucre 12 × 6–7 mm; appendages with erect apical spine 3 mm, without auricles. Pappus *c.* ½ as long as achene. *S.E. Greece (mountains around Athinai).*

C. poculatoris W. Greuter, *Bauhinia* **3**: 252 (1967), from crevices of calcareous rocks in W. Kriti (Aspéndos), has not been collected in flower or fruit but appears to be a distinct species related to **102**; it is a perennial, with procumbent stems 5–10 cm, leaves white-floccose-tomentose at least beneath but more or less glabrescent, the basal sinuate-pinnatifid to pinnatisect with ovate to suborbicular segments and the upper subentire, solitary capitula with involucre 12–16 × 6–8 mm, and pectinate-ciliate appendages with a slender, erect apical spine.

103. C. soskae Hayek ex Košanin, *Glas Srpske Kralj. Akad.* **119**: 275 (1926). Perennial. Stems erect, paniculately branched. Leaves whitish-tomentose; lower pinnatisect, with linear-lanceolate segments 1–2 mm wide. Capitula solitary. Involucre 15 × 8–10 mm, ovoid; appendages pale brown, auriculate, with more or less erect apical spine 3–4 mm. Florets yellow. Pappus about as long as achene. *Rocky places.* ● *S. & E. Jugoslavia.* Ju.

104. C. kartschiana Scop., *Fl. Carn.* ed. 2, **2**: 140 (1772). Perennial. Stems 30–40 cm, erect, with long, paniculate branches. Leaves glabrous, scabrid; lower pinnate. Capitula solitary. Involucre 11 × 9 mm, ovoid-globose; appendages yellowish, with patent apical spine 1–1·5 mm, without auricles. Florets pink. Pappus as long as or longer than achene. ● *N.E. Italy, N.W. Jugoslavia.* It Ju.

105. C. dalmatica A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **1**: 87 (1881). Perennial. Stems 20–30 cm, ascending, branched at base. Leaves glabrous, smooth; lower pinnatisect. Capitula solitary. Involucre 11 × 9 mm, ovoid-globose; appendages pale brown, with recurved apical spine 2–3 mm, without auricles. Florets pink. Pappus *c.* ½ as long as achene. *Maritime rocks.* ● *N.W. Jugoslavia.* Ju.

106. C. brachtii Reichenb. fil., *Icon. Fl. Germ.* **15**: 35 (1852). Biennial. Stems 10–50 cm, much-branched from the middle. Leaves green; lower 1(–2)-pinnatisect. Capitula solitary. Involucre 12 × 8 mm, cylindric-ovoid; appendages brown with a black centre, mucronulate, with broad hyaline membrane below, without auricles. Florets pink. Pappus *c.* ½ as long as achene. ● *Coasts of N. Italy and N.W. Jugoslavia.* It Ju.

Sect. PANICULATAE (Hayek) Dostál. Stems herbaceous, often paniculately branched, the branches not spiny. Leaf-segments not rigid or spiny. Involucre usually ovoid; lower bracts usually without prominent veins on dorsal surface; appendages usually spiny, not filiform and plumose-fimbriate at apex, the lower fimbriae free, without auricles or hyaline margin. Florets purple, rarely pink or lilac.

107. C. schousboei Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1861**: 85 (1861). Perennial. Stems 30–50 cm, erect, corymbosely branched. Leaves lanate to tomentose, grey; lower pinnatisect, with few, linear to lanceolate, mucronate segments. Capitula solitary. Involucre ovoid-oblong. Florets pink. Pappus about as long as achene. *Grassland.* ● *W. Spain, E.C. Portugal.* Hs Lu.

(a) Subsp. **schousboei**: Involucre 6–9 mm in diameter, tapering at base; appendages with 6–9 brown fimbriae on each side, the apical spine 1 mm. *Almost throughout the range of the species.*

(b) Subsp. **septentrionalis** (J. Arènes) Dostál, *Bot. Jour. Linn. Soc.* **71**: 198 (1976) (*C. paniculata* var. *septentrionalis* J. Arènes): Involucre 5–7 mm in diameter, rounded at base; appendages with 4–5 whitish fimbriae on each side, the apical spine 0·7 mm. *N.W. Spain.*

108. C. spinabadia Bubani ex Timb.-Lagr., *Mém. Acad. Sci. Toulouse* ser. 8, **1(2)**: 187 (1879) (*C. coerulescens* auct., ?an Willd.). Biennial or perennial. Stems 20–50 cm. Leaves whitish or greenish, rather rigid; lower 2-pinnatisect with linear to narrowly oblong-lanceolate segments, the terminal segment ovate. Capitula in a lax corymb. Appendages reddish-black, with 6–8 fimbriae on each side. Florets purple. $2n=18$. ● *E. Spain, S. France.* Ga Hs.

1 Pappus 2–2·5 mm (a) subsp. **shuttleworthii**
1 Pappus not more than 1·5 mm
2 Involucre 5–7 mm in diameter; bracts ±recurved, purplish; appendages not spiny at apex (d) subsp. **hanryi**
2 Involucre 7–10 mm in diameter; bracts appressed, pale green; appendages with apical spine
3 Appendages with recurved apical spine 2–3 mm; pappus 1–1·5 mm (b) subsp. **spinabadia**
3 Appendages with patent apical spine 1·5 mm; pappus *c.* 0·5 mm (c) subsp. **isernii**

(a) Subsp. **shuttleworthii** (Rouy) Dostál, *Bot. Jour. Linn. Soc.* **71**: 198 (1976) (*C. paniculata* subsp. *shuttleworthii* Rouy): Perennial. Stems 20–50 cm. Leaves white-tomentose to greyish-green. Involucre 8–12 × 6–11 mm; bracts with prominent veins; appendages with recurved apical spine 1·5–2 mm. Pappus 2–4 mm, ½ as long or as long as achene. *S.E. France (foothills of l'Esterel).*

(b) Subsp. **spinabadia**: Biennial. Stems 30–50 cm. Leaves green. Involucre 10–12 × 7–10 mm; bracts with indistinct veins, appressed, pale green; appendages with recurved apical spine 2–3 mm, the fimbriae *c.* 2 mm, brownish. Pappus 1–1·5 mm, ⅓–½ as long as achene. *E. Spain, just extending into S. France.*

(c) Subsp. **isernii** (Willk.) Dostál, *op. cit.* 199 (1976) (*C. isernii* Willk.): Like subsp. (b) but involucre 14 × 9 mm; appendages with patent apical spine 1·5 mm, the fimbriae *c.* 1 mm, pale brown. *N.E. Spain.*

(d) Subsp. **hanryi** (Jordan) Dostál, *loc. cit.* (1976) (*C. hanryi* Jordan): Biennial. Stems 30–50 cm. Leaves grey-green. Involucre 10–12 × 5–7 mm; bracts recurved, purplish, with prominent veins; appendages not spiny at apex. Pappus *c.* 1·5 mm, ½ as long as achene. *S. France, N.E. Spain.*

109. C. limbata Hoffmanns. & Link, *Fl. Port.* **2**: 221 (1820–1828). Perennial. Stems 10–20 cm. Leaves greyish-tomentose; lower pinnatipartite. Capitula in a lax corymb. Involucre 5–8 mm in diameter; appendages with a recurved apical spine 0·5–1·5 mm, longer than fimbriae. Florets purple. Pappus ⅓–½ as long as achene. $2n=18$. *Heaths and dry grassland.* ● *N.W. Spain, N. Portugal.* Hs Lu.

110. C. urgellensis Sennen, *Bull. Soc. Bot. Fr.* **75**: 447 (1928). Biennial. Stems *c.* 30 cm, branched from base. Leaves greyish-tomentose, glabrescent; lower 2-pinnatisect. Capitula solitary. Involucre *c.* 8 mm in diameter, ovoid-conical; appendages brownish, with an erecto-patent or patent apical spine 0·5 mm, shorter than fimbriae, the fimbriae 3–4 on each side. Florets purple. Pappus *c.* ½ as long as achene. ● *E. Pyrenees.* Ga Hs.

111. C. rothmalerana (J. Arènes) Dostál, *Bot. Jour. Linn. Soc.* **71**:199 (1976) (*C. paniculata* subsp. *rothmalerana* J. Arènes). Like **110** but involucre 7–9 mm in diameter, ovoid; appendages blackish, the apical spine 1·5 mm, the fimbriae 4–6 on each side. *Mountain pastures.* ● *N.C. Portugal (Serra da Estrêla).* Lu.

112. C. aristata Hoffmanns. & Link, *Fl. Port.* **2**: 226 (1820–1828). Biennial. Stems 30–80 cm, erect, with lax paniculate branching. Leaves green, scabrid; lower pinnatisect. Capitula few. Appendages acuminate or with an erect to recurved apical spine 0·8–1·5 mm. Florets purple. Pappus 0·5–1·5 mm, ½ as long to as long as achene. ● *Portugal, N.W. Spain.* Hs Lu.

1 Involucre narrowed at base
2 Entire part of appendages wider than long, the apical spine 1–1·5 mm (a) subsp. **exilis**
2 Entire part of appendages longer than wide, the apical spine *c.* 0·8 mm (b) subsp. **langeana**
1 Involucre rounded at base
3 Involucre 6–9 mm in diameter; fimbriae brown; pappus 1–1·5 mm (c) subsp. **geresensis**
3 Involucre 4–7(–8) mm in diameter; fimbriae white; pappus 1·5–3 mm (d) subsp. **aristata**

(a) Subsp. **exilis** (J. Arènes) Dostál, *Bot. Jour. Linn. Soc.* **71**: 199 (1976) (*C. paniculata* subsp. *exilis* J. Arènes): Involucre 4–7 mm in diameter, narrowed at base; entire part of appendages broadly triangular, wider than long, the apical spine 1–1·5 mm, the fimbriae 1·5 mm. *E.C. Portugal (Monfortinho).*

(b) Subsp. **langeana** (Willk.) Dostál, *loc. cit.* (1976) (*C. langeana* Willk.): Involucre 5–10 mm in diameter, narrowed at base; entire part of appendages triangular, longer than wide, the apex 0·8 mm, acuminate, not spiny. Pappus about as long as achene. *N.W. Spain.*

(c) Subsp. **geresensis** (J. Arènes) Dostál, *loc. cit.* (1976) (*C. paniculata* subsp. *geresensis* J. Arènes): Involucre 6–9 mm in diameter, more or less rounded at base; entire part of appendages broadly triangular, as long as wide, the apical spine 0·8–1 mm, the fimbriae 1–1·2 mm. Pappus 1–1·5 mm. *N. Portugal (Serra do Gerez).*

(d) Subsp. **aristata**: Involucre 4–7(–8) mm in diameter, rounded at base; entire part of appendages narrowly triangular, longer than wide, the apical spine 0·8–1 mm, the fimbriae *c.* 1 mm. Pappus 1·5–3 mm. *Portugal, N.W. Spain.*

113. C. paniculata L., *Sp. Pl.* 912 (1753). Biennial. Stems 40–80 cm, erect, much-branched from middle or below. Leaves green, pubescent to arachnoid-lanate and scabrid; lower 1- to 2-pinnatisect. Involucre 5–10 × 3–6 mm, narrowed at base; bracts appressed; appendages shortly triangular, acuminate or with an apical spine 1–2 mm, the fimbriae 1–2 mm, 3–6 on each side. Florets purple. Pappus 0·5–1·5 mm. $2n=18(19)$. ● *S.W. Europe.* Ga Hs It Lu.

1 Appendages not spiny at apex (a) subsp. **paniculata**
1 Appendages with an apical spine
2 Appendages with fimbriae 1·8–2 mm
3 Appendages 3·5 mm, pale brown, the apical spine usually 2–3 mm (e) subsp. **castellana**
3 Appendages 1·5 mm, dark brown, the apical spine 0·7–0·8 mm (f) subsp. **cossoniana**
2 Appendages with fimbriae 1–1·2 mm
4 Appendages with apical spine shorter than lateral fimbriae (d) subsp. **esterellensis**
4 Appendages with apical spine as long as or longer than lateral fimbriae
5 Involucre 4–6(–8) mm in diameter; appendages with erect apical spine (b) subsp. **rigidula**
5 Involucre 3–4 mm in diameter; appendages with recurved apical spine (c) subsp. **polycephala**

(a) Subsp. **paniculata**: Capitula solitary. Involucre 3–5 mm in diameter; appendages with acuminate apex 1 mm, the fimbriae 1 mm. Pappus ⅓–½ as long as achene. *S. France, S. & E. Spain, N.W. Italy.*

(b) Subsp. **rigidula** (Jordan) Dostál, *Bot. Jour. Linn. Soc.* **71**: 199 (1976) (*C. rigidula* Jordan): Leaves green, arachnoid, glabrescent. Capitula in a lax corymb, in clusters of 2–3(–6). Involucre 4–6(–8) mm in diameter; appendages with erect apical spine 1·5 mm, the fimbriae 1–1·2 mm. Pappus ⅓–½ as long as achene. *S.E. France.*

(c) Subsp. **polycephala** (Jordan) Nyman, *Consp.* 426 (1879) (*C. polycephala* Jordan): Like subsp. (b) but leaves arachnoid-lanate; capitula numerous, in a dense corymb; involucre 3–4 mm in diameter; appendages with recurved apical spine, the fimbriae *c.* 1 mm. *S.E. France.*

(d) Subsp. **esterellensis** (Burnat) Dostál, *Bot. Jour. Linn. Soc.* **71**: 199 (1976) (*C. paniculata* var. *esterellensis* Burnat): Capitula solitary, in a lax corymb. Involucre 3–4 mm in diameter; appendages dark brown, with a somewhat recurved apical spine 0·7–1 mm, the fimbriae 1·2 mm. Pappus *c.* ½ as long as achene. *S.E. France (l'Esterel).*

(e) Subsp. **castellana** (Boiss. & Reuter) Dostál, *loc. cit.* (1976) (*C. castellana* Boiss. & Reuter): Branches long. Involucre 10 × 5 mm; appendages 3·5 mm, pale brown, with an erect apical spine 2–3 mm, rarely very short, the fimbriae *c.* 2 mm. Pappus *c.* ½ as long as achene. *C., E. & S. Spain, C. Portugal.*

(f) Subsp. **cossoniana** (J. Arènes) Dostál, *loc. cit.* (1976) (*C. paniculata* var. *cossoniana* J. Arènes): Branches short. Involucre *c.* 7 × 5 mm; appendages dark brown, with an apical spine 0·7–0·8 mm, the fimbriae *c.* 2 mm. Pappus *c.* ½ as long as achene. *Spain.*

114. C. micrantha Hoffmanns. & Link, *Fl. Port.* **2**: 220 (1820–1828) (*C. hoffmannseggii* Hayek). Biennial 40–90 cm. Stem erect, much-branched, forming a lax panicle. Leaves green above, lanate beneath; lower 2-pinnatifid. Capitula solitary. Involucre 5–8 mm in diameter, narrowed at base; appendages acuminate at apex. Florets purple. ● *N.W. Spain, N. & C. Portugal.* Hs Lu.

1 Appendages black, the fimbriae *c.* 0·5 mm (c) subsp. **melanosticta**
1 Appendages brown, the fimbriae *c.* 1 mm
2 Appendages reddish-brown, the apex 1–1·2 mm; involucre 7–8 mm in diameter (b) subsp. **herminii**
2 Appendages dark brown, the apex 0·5–1 mm; involucre 5–6 mm in diameter (a) subsp. **micrantha**

(a) Subsp. **micrantha**: Involucre 5–6 mm in diameter; appendages dark brown, the apex 0·5–1 mm, the fimbriae *c.* 1 mm. Pappus ⅓–½ as long as achene. *Throughout the range of the species.*

(b) Subsp. **herminii** (Rouy) Dostál, *Bot. Jour. Linn. Soc.* **71**: 199 (1976) (*C. herminii* Rouy): Involucre 7–8 mm in diameter; appendages reddish-brown, the apex 1–1·2 mm, the fimbriae *c.* 1 mm. Pappus ⅓–½ as long as achene. *N.C. Portugal (Serra da Estrêla).*

(c) Subsp. **melanosticta** (Lange) Dostál, *loc. cit.* (1976) (*C. limbata* var. *melanosticta* Lange): Involucre 5–6 mm in diameter; appendages black, the apex 0·5–0·7 mm, the fimbriae *c.* 0·5 mm. Pappus *c.* ½ as long as achene. *Almost throughout the range of the species.*

1 Pappus absent or very short (e) subsp. **biformis**
1 Pappus at least ⅙ as long as achene
2 Appendages yellow, covering the bracts (f) subsp. **ochrolopha**
2 Appendages brown, not covering the bracts
3 Appendages pale brown; involucre not spotted
4 Bracts ovate; involucre rounded at base (a) subsp. **brunnescens**
4 Bracts oblong; involucre narrowed at base (b) subsp. **reuteri**
3 Appendages dark brown; involucre spotted
5 Appendages mucronate at apex, with *c.* 6 fimbriae on each side (c) subsp. **leucophaea**
5 Appendages with an apical spine and 8–9 fimbriae on each side (d) subsp. **pseudocoerulescens**

(a) Subsp. **brunnescens** (Briq.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 200 (1976) (*C. paniculata* subsp. *leucophaea* var. *brunnescens* Briq.): Involucre 7–10 × 6–9 mm, ovoid, rounded at base, not spotted: bracts ovate, smooth; appendages small, pale brown, with mucronate apex and a narrow, brown margin, the fimbriae *c.* 1 mm, *c.* 6 on each side. Pappus *c.* ⅓ as long as achene. *N.W. Italy, just extending into S.E. France.*

(b) Subsp. **reuteri** (Reichenb. fil.) Dostál, *loc. cit.* (1976) (*C. reuteri* Reichenb. fil., *C. cineraria* var. *saratoi* Briq.): Involucre 5–8 mm in diameter, ovoid-oblong, narrowed at base, not spotted; bracts oblong, lanate; appendages small, pale brown, with acuminate apex *c.* 0·5 mm, and a hyaline margin, the fimbriae *c.* 1 mm. Pappus ¼–⅓ as long as achene. *N.W. Italy, S.E. France.*

(c) Subsp. **leucophaea** (incl. *C. paniculata* subsp. *pallidula* Rouy): Involucre 6–9 mm in diameter, rounded at base, spotted; appendages not covering the bracts, brown, rarely pale, with mucronate apex, the fimbriae *c.* 6 on each side. Florets pinkish-purple. Pappus *c.* ⅓ as long as achene. $2n=18$. *From E. Pyrenees to N.W. Italy.*

(d) Subsp. **pseudocoerulescens** (Briq.) Dostál, *loc. cit.* (1976) (*C. paniculata* var. *pseudocoerulescens* Briq., *C. pseudocineraria* (Fiori) Rouy): Like subsp. (c) but involucre 10–13 × 8–12 mm; appendages with a short apical spine, the fimbriae 8–9 on each side. Florets lilac. $2n=18$. *S.E. France.*

(e) Subsp. **biformis** (Timb.-Lagr.) Dostál, *loc. cit.* (1976) (*C. biformis* Timb.-Lagr.): Involucre 10–13 mm in diameter, rounded at base; appendages yellow, with mucronate apex, the fimbriae *c.* 6 on each side. Pappus absent or very short. *Foothills of E. Pyrenees (W. of Perpignan).*

(f) Subsp. **ochrolopha** (Costa) Dostál, *loc. cit.* (1976) (*C. ochrolopha* Costa): Lower leaves sometimes undivided. Involucre 9–10 mm in diameter; appendages covering the bracts, yellow, with acuminate apex, the fimbriae 6–8 on each side. Florets pink. Pappus ⅓ as long as achene. *N.E. Spain.*

Sect. MACULOSAE (Hayek) Dostál. Like Sect. *Paniculatae* but stems usually laxly paniculately or corymbosely branched; bracts with prominent veins on dorsal surface; florets pink, rarely pinkish-yellow, purple or white.

116. C. filiformis Viv., *Fl. Cors., App.* **1**: 6 (1825). Perennial. Stems 30–70 cm, woody and reddish-hairy below, corymbosely branched above. Leaves glabrous; lower 2-pinnatifid, with narrowly linear mucronulate segments. Involucre 12–15 mm in diameter, ovoid-globose; appendages reddish-brown, acute, with *c.* 6 fimbriae on each side. Florets pinkish-purple, rarely white, the outer radiate. Pappus about as long as achene. *Calcareous rocks.* ● *Sardegna.* Sa.

117. C. corymbosa Pourret, *Mém. Acad. Sci. Toulouse* **3**: 310 (1788). Biennial. Stems 10–30 cm, erect, paniculately branched. Leaves green, glandular-punctate; lower 2-pinnatisect. Involucre

18–20 × 8–10(–15) mm, ovoid; appendages with a blackish centre and a recurved apex *c.* 1·5 mm, the fimbriae 2–2·2 mm, *c.* 6 on each side. Florets purple. Pappus 3–3·5 mm, as long as achene. *Hillsides.* ● *S. France (near Narbonne).* Ga.

118. C. subtilis Bertol., *Fl. Ital.* **9**: 451 (1853). Perennial. Stems 10–30 cm, sparingly branched. Leaves white-tomentose; lower 1-pinnatisect. Capitula solitary. Involucre 7–11 mm in diameter; appendages with an appressed apical spine 0·5–1 mm, the fimbriae 0·5 mm. Florets purple. Pappus 1–2 mm, ⅓–½ as long as achene. *Calcareous rocks.* ● *S.E. Italy (Mte. Gargano).* It.

119. C. exarata Boiss. ex Cosson, *Not. Pl. Crit.* 116 (1851). Perennial. Stems 30–40 cm, erect, simple or sparingly branched. Lower leaves undivided, oblong-lanceolate, arachnoid; upper linear-lanceolate. Capitula solitary. Involucre 14–18 × 8–13 mm, ovoid; bracts appressed; appendages narrowly triangular, reddish-brown, erect, long-fimbriate, the apex *c.* 2 mm, not spinose. Florets purple. Pappus 1·5–2 mm, *c.* ½ as long as achene. ● *Portugal, S.W. Spain.* Hs Lu.

120. C. maculosa Lam., *Encycl. Méth. Bot.* **1**: 669 (1785). Biennial. Stems 20–60 cm, erect, paniculately branched. Leaves greenish, with arachnoid indumentum or glabrous; lower 2-pinnatisect, with lanceolate segments. Capitula solitary. Involucre 9–15 × 8–15 mm; bracts with prominent veins on dorsal surface; appendages pale brown, sometimes with a black spot at the base; fimbriae 2–3 mm, 6–12 on each side. Florets pink. Pappus 0·5–2 mm, ⅓–½ as long as achene. $2n=18$. ● *From C. France eastwards to S. Germany and N. Italy.* Au Ga Ge He It.

1 Appendages with apical mucro 0·7–1 mm, the fimbriae 2–3 mm (c) subsp. **albida**
1 Appendages acute, or with apical mucro not more than 0·5 mm, the fimbriae 1·5–2·5 mm
2 Involucre 8–13 mm in diameter, rounded at base (a) subsp. **maculosa**
2 Involucre 5–8 mm in diameter, narrowed at base
3 Appendages dark brown with a blackish spot (b) subsp. **chaubardii**
3 Appendages yellow-brown, not spotted (d) subsp. **subalbida**

(a) Subsp. **maculosa** (*C. stoebe* subsp. *maculosa* (Lam.) Hayek): Leaves with arachnoid indumentum. Involucre 8–13 mm in diameter, ovoid, rounded at base. Appendages with apical mucro up to 0·5 mm, the fimbriae 1·5–2 mm. Achenes 3–3·5 mm; pappus *c.* 1 mm. *Throughout the range of the species.*

(b) Subsp. **chaubardii** (Reichenb. fil.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 200 (1976) (*C. chaubardii* Reichenb. fil.): Like subsp. (a) but involucre 6–8 mm in diameter, ovoid-conical or -cylindrical, narrowed at base; appendages with fimbriae 2–2·5 mm. *N.W. Italy.*

(c) Subsp. **albida** (Lecoq & Lamotte) Dostál, *loc. cit.* (1976) (*C. maculosa* var. *albida* Lecoq & Lamotte): Leaves green, glabrous or sparsely tomentose. Involucre 8–10 mm in diameter, rounded at base; appendages with apical mucro 0·7–1 mm, the fimbriae 2·5–3 mm. Achenes 3–4 mm; pappus 1–2 mm. *S.C. France (Dept. Ardèche).*

(d) Subsp. **subalbida** (Jordan) Dostál, *loc. cit.* (1976) (*C. subalbida* Jordan): Like subsp. (c) but involucre 5–7 mm in diameter, narrowed at base; appendages with apical mucro 0·5 mm; achenes *c.* 2·5 mm; pappus 0·5 mm or absent. *S.C. France (Dept. Ardèche).*

C. muretii Jordan, *Pug. Pl. Nov.* 108 (1852) (*C. maculosa* subsp. *muretii* (Jordan) Janchen), described from Switzerland (Grisons), has white-tomentose leaves, involucre *c.* 13 mm in diameter and black appendages; it is intermediate between **120** and **122** and its status is uncertain.

121. C. vallesiaca (DC.) Jordan, *Pug. Pl. Nov.* 111 (1852). Biennial. Stems 25–70 cm, much-branched from the middle. Leaves greyish-green; lower 2-pinnatisect, with oblong to linear segments. Involucre 8–10 mm in diameter; appendages not covering the bracts, pale brown, sometimes with a small black centre, with an apical mucro up to 0·5 mm, the fimbriae 1–2 mm, 3–5 on each side, the lower forming a large auricle. Florets pink. Pappus *c.* 1 mm, *c.* ½ as long as achene. ● *S.W. Alps.* Ga He It.

122. C. rhenana Boreau, *Fl. Centre Fr.* ed. 3, **2**: 355 (1857) (*C. stoebe* L. pro parte). Usually biennial. Stems 30–80(–100) cm, corymbosely branched at about the middle. Leaves usually green, glabrescent, sometimes lanate; lower (1–)2-pinnatisect, with lanceolate segments; cauline pinnatisect. Capitula solitary. Involucre 12–15 × 5–13 mm; bracts with prominent veins on dorsal surface; appendages pale brown, with blackish-brown centre and with mucro 0·3–0·5 mm. Florets pink. *Grassland and stony places. C. & S.E. Europe, extending to N. Italy and C. Russia.* Au Bu Cz Ga Ge He Hu It Ju Po Rm Rs (C, W, K, E) [Da Su].

1 Appendages with *c.* 12 fimbriae on each side (b) subsp. **tartarea**
1 Appendages with 5–9(–10) fimbriae on each side
2 Involucre 5–6 mm in diameter; bracts with 3(–5) veins (d) subsp. **savranica**
2 Involucre 7–12 mm in diameter; bracts with 5–7 veins
3 Inflorescence distinctly corymbose; appendages with blackish centre (a) subsp. **rhenana**
3 Inflorescence not or scarcely corymbose; appendages with brown or blackish centre (c) subsp. **pseudomaculosa**

(a) Subsp. **rhenana**: Inflorescence distinctly corymbose. Involucre *c.* 13 × 8(–10) mm; bracts with 5(–7) veins; appendages with blackish centre, with mucro *c.* 0·5 mm, the fimbriae 6–8 on each side. Pappus 1·5–1·8 mm, *c.* ½ as long as achene. $2n=18+0$–2B. ● *Throughout the range of the species except S.E. Russia and E. & C. Ukraine.*

(b) Subsp. **tartarea** (Velen.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 200 (1976) (*C. tartarea* Velen.): Perennial. Involucre 14 × 12 mm; appendages with mucro *c.* 0·3 mm, the fimbriae *c.* 12 on each side. Pappus *c.* 1 mm, *c.* ½ as long as achene. ● *Mountains of Bulgaria.*

(c) Subsp. **pseudomaculosa** (Dobrocz.) Dostál, *loc. cit.* (1976) (*C. pseudomaculosa* Dobrocz.): Lower leaves 2-pinnatisect. Inflorescence broadly paniculate, not or scarcely corymbose. Involucre 12–14 × 10–13 mm; bracts with 5(–7) veins; appendages with brown centre, the fimbriae 6–9(–10) on each side. Outer florets *c.* 15 mm. Achenes brown; pappus 1–1·5 mm, ⅓–½ as long as achene. *S. part of U.S.S.R.*

(d) Subsp. **savranica** (Klokov) Dostál, *loc. cit.* (1976) (*C. savranica* Klokov): Lower leaves whitish-lanate. Involucre 12–15 × 5–6 mm; bracts with 3(–5) veins; appendages with 6–8 fimbriae on each side, the lower confluent with the hyaline margin. Achenes *c.* 3 mm; pappus 2–2·5 mm. ● *W. Ukraine (E. of Balta).*

C. coziensis E. I. Nyárády, *Bul. Şti. Acad. Rep. Pop. Române (Sect. Biol.)* **7**: 230 (1955), described from Romania, has leaves pinnatisect into elliptical segments 20 × 10 mm, involucre 12–13 × 11–12 mm, glabrous, pappus 3·5–4 mm and achenes *c.* 3 mm. It requires further investigation and is probably only a variety of **122**.

123. C. glaberrima Tausch, *Flora (Regensb.)* **10**: 249 (1827). Biennial or perennial. Stems *c.* 40 cm, erect, branched below. Leaves green, glabrous; lower 2-pinnatisect with numerous linear segments not more than 1 mm wide. Capitula solitary. Involucre *c.* 10 × 6 mm, ovoid-conical; appendages brown, the apex 0·5 mm, mucronate, the fimbriae 0·5 mm, 3–5 on each side. Florets pink. Pappus *c.* 1 mm, *c.* ½ as long as achene. *Fields and waste places.* ● *W. Jugoslavia.* Ju.

124. C. triniifolia Heuffel, *Österr. Bot. Zeitschr.* **8**: 27 (1858). Biennial. Stems 80–120 cm, much-branched from middle. Leaves green; lower 2-pinnatisect, the segments *c.* 1 mm wide, linear. Capitula solitary. Involucre *c.* 14 × 8–10 mm; bracts with 5 veins; appendages blackish, with apex up to 2 mm, erect, sometimes spinose, the fimbriae 6–8 on each side, more or less confluent with the hyaline margin. Florets pinkish-yellow. Pappus *c.* 4 mm, about as long as achene. ● *S. & E. Jugoslavia, S.W. Romania.* Ju Rm.

125. C. reichenbachii DC., *Prodr.* **6**: 583 (1838) (*C. reichenbachioides* Schur). Biennial. Stems 30–50 cm, branched from middle. Leaves arachnoid-hairy, greenish; lower pinnatisect; segments oblong-lanceolate. Capitula solitary. Involucre *c.* 13 × 10 mm; appendages black, with a spinose apex 0·5 mm, the fimbriae 1·5 mm, 4–6 on each side. Florets pink. Achenes 3·5 mm; pappus absent. ● *From W.C. Romania to W. Ukraine.* Rm Rs (W).

126. C. calvescens Pančić, *Fl. Princ. Serb.* 442 (1874). Biennial. Stems 60–150 cm, much-branched. Leaves green, glabrous or sparsely tomentose, somewhat rigid; lower pinnatisect; segments linear, *c.* 1 mm wide. Capitula in clusters of 2–3. Involucre 10–13 × 6–8 mm; appendages brown, with apical spine 1·5 mm. Florets pale pink. Achenes 2·5 mm; pappus 0–1 mm. *Rocks; usually calcicole.* ● *N. part of Balkan peninsula, S.W. Romania.* Bu Ju Rm.

127. C. peucedanifolia Boiss. & Orph. in Boiss., *Fl. Or.* **3**: 647 (1875). Biennial. Stems 40–60 cm, branched about middle. Leaves green, scabrid-pubescent, glandular-punctate; lower 2-pinnatisect, the lobes up to 2 mm wide, narrowly lanceolate. Capitula solitary. Involucre 12–14 × 7–9 mm; appendages brown, with slender apical spine 1·5 mm, the fimbriae 4–5(–6) on each side, as long as the spine. Florets pinkish-yellow. Pappus about as long as achene. *Rocky places.* ● *N.E. Greece (Athos).* Gr.

128. C. biebersteinii DC., *Prodr.* **6**: 583 (1838). Biennial or perennial. Stems 20–70 cm, with long branches from near the base. Leaves 1- to 2-pinnatisect. Capitula solitary. Appendages mucronate or spinulose at apex. Florets pink. Pappus *c.* ⅓ as long as achene. $2n=36$. *Cultivated and waste places.* ● *E.C. & S.E. Europe, extending north-eastwards to N.C. Ukraine.* Al Bu Cz Hu Ju Rm Rs (C, W, K, E).

1 Involucre 15 mm (d) subsp. **radoslavoffii**
1 Involucre 10–11 mm
2 Leaf-segments 3–5 mm wide, oblong (c) subsp. **rhodopaea**
2 Leaf-segments 3–5 mm wide, oblong (c) subsp. **rhodopaea**
2 Leaf-segments 1–1·5 mm wide, linear
3 Involucral appendages mucronate (a) subsp. **biebersteinii**
3 Involucral appendages spinulose at apex
4 Lower leaves 2-pinnatisect; involucre 7–8 mm in diameter, ovoid (b) subsp. **australis**
4 Lower leaves 1-pinnatisect; involucre *c.* 5 mm in diameter, ovoid-conical (e) subsp. **cylindrocephala**

(a) Subsp. **biebersteinii** (*C. micranthos* S. G. Gmelin ex Hayek): Lower leaves 2-pinnatisect, more or less glabrescent; segments 1–1·5 mm wide, narrowly linear. Involucre 11 × 7 mm, ovoid; appendages mucronate. *Throughout the range of the species except C. & S. Bulgaria.*

(b) Subsp. **australis** (Pančić) Dostál, *Bot. Jour. Linn. Soc.* **71**: 200 (1976) (*C. australis* Pančić): Leaves grey-tomentose; segments 1–1·5 mm wide, narrowly linear. Involucre 11 × 7–8 mm; appendages with an apical spine 0·5–1·5 mm. *Bulgaria, E. Jugoslavia.*

(c) Subsp. **rhodopaea** (Hayek & H. Wagner) Dostál, *op. cit.* 201 (1976) (*C. maculosa* forma *rhodopaea* Hayek & H. Wagner): Leaves grey-tomentose; segments 3–5 mm wide, oblong to oblong-lanceolate. Involucre 10 × 7 mm; appendages covering bracts. *S. Bulgaria.*

(d) Subsp. **radoslavoffii** (Urum.) Dostál, *loc. cit.* (1976) (*C. radoslavoffii* Urum.): Leaves more or less glabrescent. Involucre 15 × 5–7 mm, more or less cylindrical; appendages dark brown, mucronulate. *W. & C. Bulgaria.*

(e) Subsp. **cylindrocephala** (Bornm.) Dostál, *loc. cit.* (1976) (*C. cylindrocephala* Bornm.): Lower leaves 1-pinnatisect, grey-lanate; segments linear, entire. Involucre 10 × 5 mm, ovoid-conical; appendages pale brown, spinulose at apex. *S. Jugoslavia (near Skopje).*

Sect. ACROCENTROIDES (DC.) Dostál. Stems herbaceous, woody at base, usually procumbent, the branches not spiny. Leaves or leaf-segments not rigid or spiny. Involucre usually ovoid; bracts with prominent veins; appendages long-cuspidate or with a long apical spine, spiny or fimbriate at the base, the lower fimbriae usually free and not forming auricles. Florets pink, purple or red.

129. C. boissieri DC., *Prodr.* **7**: 303 (1838). Perennial. Stems 10–30 cm. Leaves glabrous to lanate. Capitula usually solitary. Florets pink or purple. Pappus ¼–½ as long as achene. *S. & E. Spain.* Hs.

1 Stems ± erect
2 Leaves whitish-tomentose or -lanate above (k) subsp. **spachii**
2 Leaves green above (i) subsp. **paul**
1 Stems procumbent or ascending
3 Leaves green above
4 Leaves green beneath (g) subsp. **mariolensis**
4 Leaves grey-tomentose beneath (f) subsp. **pomeliana**
3 Leaves white- or grey-tomentose on both surfaces
5 Leaves white-tomentose
6 Involucre ovoid-cylindrical (a) subsp. **dufourii**
6 Involucre ovoid to ovoid-globose
7 Leaf-segments lanceolate; appendages triangular-lanceolate (e) subsp. **willkommii**
7 Leaf-segments linear; appendages ovate (j) subsp. **jaennensis**
5 Leaves grey-tomentose or -arachnoid
8 Involucre ovoid-cylindrical
9 Appendages long pectinate-fimbriate (b) subsp. **resupinata**
9 Appendages very shortly fimbriate-dentate (c) subsp. **prostrata**
8 Involucre ovoid or ovoid-globose
10 Stems decumbent; involucre ovoid (h) subsp. **pinae**
10 Stems ascending; involucre ovoid-globose (d) subsp. **boissieri**

(a) Subsp. **dufourii** Dostál, *Bot. Jour. Linn. Soc.* **71**: 201 (1976) (*C. tenuifolia* Dufour, non Salisb.): Stems 10–30 cm, procumbent or ascending, rarely suberect. Leaves white-tomentose on both surfaces; lower pinnatifid. Involucre ovoid-cylindrical; appendages with a long, recurved apical spine. Florets pink. Pappus ¼–⅓ as long as achene. *Calcareous hillsides.* ● *E. Spain.*

(b) Subsp. **resupinata** (Cosson) Dostál, *loc. cit.* (1976) (*C. resupinata* Cosson): Stems 10–20 cm, procumbent. Leaves grey-arachnoid-lanate; lower pinnatisect. Involucre ovoid-

cylindrical; appendages with a patent apical spine 3–4 mm. Florets purple. Pappus *c.* ½ as long as achene. *Waste places.* ● *S.E. Spain.*

(c) Subsp. **prostrata** (Cosson) Dostál, *loc. cit.* (1976) (*C. prostrata* Cosson, ?*C. amoi* Amo): Stems 20–30 cm, procumbent. Leaves grey-tomentose on both surfaces; lower lyrate or undivided. Involucre 6–7 mm in diameter, ovoid-cylindrical; appendages with a short apical spine, the lateral fimbriae 0·5 mm. Florets purple. *Mountain grassland.* ● *S.E. Spain.*

(d) Subsp. **boissieri**: Stems 10–30 cm, ascending. Leaves grey-tomentose on both surfaces; lower undivided or pinnatifid. Involucre *c.* 11 × 8 mm, ovoid-globose; appendages triangular-lanceolate, with recurved apical spine 3–5 mm, the lateral fimbriae confluent with the hyaline margin. Florets pink. *Rocky places on mountains.* ● *S. & E. Spain.*

(e) Subsp. **willkommii** (Schultz Bip.) Dostál, *loc. cit.* (1976) (*C. willkommii* Schultz Bip.): Stems 10–30 cm, ascending. Leaves white-tomentose on both surfaces; lower pinnatisect. Involucre *c.* 7 × 5 mm, ovoid-globose; appendages triangular-lanceolate, with a recurved apical spine 4–5 mm, the lateral fimbriae long. Florets pale pink. *Dry grassland and calcareous rocks.* ● *S.E. Spain.*

(f) Subsp. **pomeliana** (Batt. & Trabut) Dostál, *loc. cit.* (1976) (*C. pomeliana* Batt. & Trabut): Stems 30–50 cm, ascending. Leaves green above, grey-tomentose beneath; lower undivided. Involucre 15–17 mm, globose; appendages with lower fimbriae confluent with the hyaline margin. Florets pink. *Stony slopes. E. Spain* (*S.E. of Valencia*). (*Algeria.*)

(g) Subsp. **mariolensis** (Rouy) Dostál, *loc. cit.* (1976) (*C. mariolensis* Rouy): Stems 10–20 cm, procumbent or ascending. Leaves green on both surfaces; lower pinnatisect. Involucre large; appendages with a slender, patent apical spine. Florets purple. *Mountain rocks.* ● *S.E. Spain* (*Sierra Mariola*).

(h) Subsp. **pinae** (Pau) Dostál, *loc. cit.* (1976) (*C. pinae* Pau): Stems decumbent. Leaves lanate on both surfaces; lower pinnatisect. Involucre 16–20 mm, ovoid; appendages with a short, recurved apical spine. Florets pink. ● *E. Spain* (*provs. Castellón, Teruel*).

(i) Subsp. **paui** (Loscos ex Willk.) Dostál, *op. cit.* 202 (1976) (*C. paui* Loscos ex Willk.): Stems 10–30 cm, erect; branches patent. Leaves usually green above, whitish-tomentose beneath; lower pinnatisect. Involucre 15–20 mm in diameter, ovoid; appendages large, with a recurved apical spine, the lower fimbriae confluent with the hyaline margin. Florets purple. *Calcareous mountain rocks.* ● *E. Spain* (*Sierra de Espedan, N. of Valencia*).

(j) Subsp. **jaennensis** (Degen & Debeaux) Dostál, *loc. cit.* (1976) (*C. jaennensis* Degen & Debeaux): Stems 10–20 cm, procumbent or ascending. Leaves white-tomentose on both surfaces; lower pinnatisect. Involucre ovoid; appendages with a recurved apical spine 5 mm. Florets pink. *Rocky and open places.* ● *Spain* (*prov. Jaen*).

(k) Subsp. **spachii** (Schultz Bip. ex Willk.) Dostál, *loc. cit.* (1976) (*C. spachii* Schultz Bip. ex Willk.): Stems 10–20 cm, usually erect. Leaves whitish-tomentose or -lanate on both surfaces; lower 1(–2)-pinnatisect. Involucre 12 mm, ovoid-oblong; appendages with a patent apical spine 5 mm. Florets pale pink. *Hillsides.* ● *S.E. Spain* (*provs. Albacete, Valencia*).

C. cordubensis Font Quer, *Collect. Bot.* (*Barcelona*) **1**: 310 (1947), described from S. Spain (near Cordoba), is said to be like **129**(a) but has the appendages with erect apical spines and the pappus slightly longer than the achene; further information is required.

130. C. lagascae Nyman, *Syll.* 33 (1854–1855) (*C. incana* Lag., non Ten.). Perennial 10–20 cm. Stems erect, branched at about the middle. Leaves arachnoid-tomentose, sometimes glabrescent; lower lyrate, with oblong segments; middle cauline pinnatifid, with linear segments. Capitula solitary. Involucre 12–15 × 7–9 mm, ovoid-oblong; appendages with a recurved apical spine 5 mm, the lower fimbriae confluent with the hyaline margin. Florets pale pink. Pappus about as long as achene. *Rock-crevices and screes.* ● *S.E. Spain.* Hs.

131. C. bombycina Boiss. ex DC., *Prodr.* **7**: 302 (1838). Caespitose perennial with basal rosettes of leaves. Stems 10–20(–40) cm, procumbent to ascending. Leaves white-tomentose; lower undivided or pinnatisect; middle cauline pinnatisect, with obovate segments. Capitula usually solitary, rarely in pairs. Florets pink to red. Involucre 10–12 × 7–9 mm, ovoid-oblong; appendages with apical spine 2–3 mm. Achenes 5 mm; pappus 0·7 mm. *Calcareous rocks and screes.* ● *S. Spain* (*prov. Granada*). Hs.

(a) Subsp. **bombycina**: Densely caespitose. Involucral appendages with apical spine *c.* 2 mm, with a distinct hyaline margin. Florets pink to red. *Sierra Tejeda.*

(b) Subsp. **funkii** (Schultz Bip.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 202 (1976) (*C. funkii* Schultz Bip., *C. boissieri* var. *nevadensis* Boiss. & Reuter): Laxly caespitose. Involucral appendages with apical spine *c.* 3 mm, without a distinct hyaline margin. Florets red, becoming yellowish. *Sierra Nevada and hills around Granada.*

132. C. monticola Boiss. ex DC., *Prodr.* **7**: 302 (1838). Perennial. Stems 20–30 cm, erect, with long branches. Leaves lanate, more or less glabrescent; lower pinnatisect; middle undivided. Capitula solitary. Involucre 12–15 × 7–9 mm, ovoid; appendages with apical spine 2–3 mm. Florets pink. Pappus *c.* ¼ as long as achene. *Dry screes.* ● *S. Spain* (*Sierra Nevada*). Hs.

133. C. carratracensis Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1881**: 94 (1882). Perennial. Stems 20–60 cm, erect, simple or with few branches. Leaves floccose-lanate, glabrescent; lower undivided or lyrate. Capitula solitary. Involucre 12–18 mm in diameter, ovoid-globose; appendages shortly acuminate at apex, the fimbriae confluent with the distinct hyaline margin. Florets pink. Pappus shorter than achene. *Dry rocks or scrub.* ● *S. Spain* (*Carratraca, prov. Málaga*). Hs.

Sect. APLOLEPIDAE (J. Arènes) Dostál. Like Sect. *Acrocentroides* but bracts with indistinct veins, entire, without distinct appendages, or with denticulate to fimbriate appendages, the apex mucronate to spiny; florets pink.

134. C. aplolepa Moretti, *Gior. Fis.* (*Brugnat.*) ser. 2, **9**: 154 (1826). Perennial. Stems 20–70 cm, erect or ascending. Leaves glabrous to tomentose; lower undivided to 2-pinnatisect. Capitula solitary or in clusters of 2–3. Florets pink. *Dry, usually rocky places.* ● *W. Italy and small islands of the Tyrrhenian sea.* It Si.

1 Bracts entire; appendages absent
2 Lower leaves 1(–2)-pinnatisect with linear segments; involucre 10–13 mm in diameter **(b)** subsp. **aeolica**
2 Lower leaves entire to sublyrate; involucre 8–10 mm in diameter **(c)** subsp. **pandataria**
1 Bracts denticulate to fimbriate; appendages present
3 Pappus absent
4 Achenes grey; appendages shortly fimbriate **(d)** subsp. **carueliana**
4 Achenes black; appendages denticulate **(e)** subsp. **maremmana**
3 Pappus present
5 Pappus at least ¾ as long as achene **(a)** subsp. **aplolepa**
5 Pappus not more than ½ as long as achene
6 Involucral appendages very shortly fimbriate **(f)** subsp. **subciliata**
6 Involucral appendages pectinate-fimbriate, at least at apex
7 Lower fimbriae 0·5–1·5 mm
8 Lower fimbriae 1–1·5 mm; stems 50–70 cm **(k)** subsp. **gallinariae**
8 Lower fimbriae 0·5–1 mm; stems 30–50 cm **(g)** subsp. **ligustica**
7 Lower fimbriae 0·2–0·5 mm
9 Achenes black; appendages dentate-fimbriate below **(h)** subsp. **aetaliae**
9 Achenes grey; appendages shortly fimbriate below
10 Appendages mucronulate at apex **(i)** subsp. **lunensis**
10 Appendages long-mucronate at apex **(j)** subsp. **cosana**

(a) Subsp. **aplolepa**: Stems 20–30 cm. Leaves grey-green, scabrid; lower pinnatisect. Involucre 10–12 × 8–10 mm, ovoid-globose; bracts subentire or denticulate; inner appendages irregularly serrate. Achenes black; pappus ¾ as long to as long as achene. $2n = 18$. *Coast of N.W. Italy, from prov. Savona to prov. Livorno.*

(b) Subsp. **aeolica** (Guss. ex Lojac.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 202 (1976) (*C. aeolica* Guss. ex Lojac.): Stems 30–40 cm. Leaves grey-green; lower 1(–2)-pinnatisect. Involucre 10–13 mm in diameter, ovoid; bracts entire; appendages absent. $2n = 18$. *Isole Lipari.*

(c) Subsp. **pandataria** (Fiori & Béguinot) Dostál, *loc. cit.* (1976) (*C. cineraria* var. *pandataria* Fiori & Béguinot): Stems 20–40 cm. Leaves grey-tomentose; lower undivided or sublyrate. Involucre 8–10 mm in diameter; bracts entire; appendages absent. *Islands W. of Napoli* (*Ventotene, Ischia*).

(d) Subsp. **carueliana** (Micheletti) Dostál, *loc. cit.* (1976) (*C. paniculata* var. *carueliana* Micheletti): Stems up to 60 cm. Lower leaves lyrate-pinnatisect. Capitula in clusters. Involucre 8 × 4 mm, ovoid; appendages very narrowly decurrent, shortly fimbriate. Achenes grey; pappus absent. *W. Italy, from prov. Carrara to prov. Grossato, and inland to Firenze.*

(e) Subsp. **maremmana** (Fiori) Dostál, *loc. cit.* (1976) (*C. paniculata* var. *aetalia* forma *maremmana* Fiori): Leaves glabrous; lower pinnatisect with filiform segments. Involucre 6–8 × 4–5 mm, ovoid-oblong; appendages very narrowly decurrent, denticulate. Achenes black; pappus absent. *W. Italy* (*prov. Livorno*).

(f) Subsp. **subciliata** (DC.) Arcangeli, *Comp. Fl. Ital.* 391 (1882): Leaves grey-tomentose; lower 1- to 2-pinnatisect or undivided. Involucre 8–10 × 6–9 mm, ovoid-oblong; appendages very narrowly decurrent, irregularly and very shortly dentate-fimbriate. Achenes grey; pappus less than ½ as long as achene. *W. Italy, from prov. Genova to prov. Livorno.*

(g) Subsp. **ligustica** (Gremli ex Briq.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 202 (1976) (*C. aplolepa* var. *ligustica* Gremli ex Briq.): Stems up to 50 cm. Leaves grey-green, the lower 1- to 2-pinnatisect. Involucre 6–9 × 4–7 mm, oblong; bracts not covered by the indistinctly fimbriate, shortly mucronate appendages; fimbriae 0·5–1 mm, 6 on each side. Achenes 2·5 mm; pappus 1 mm. *N.W. Italy* (*near Pieve de Teco, prov. Imperia*).

(h) Subsp. **aetaliae** (Sommier) Dostál, *op. cit.* 203 (1976) (*C. paniculata* var. *aetaliae* Sommier): Stems up to 50 cm. Leaves glabrous, pinnatisect. Involucre 10–12 × 8–10 mm, ovoid; appendages dentate-fimbriate below; lower fimbriae 0·2–0·5 mm. Achenes black; pappus *c.* ½ as long as achene. *Elba.*

(i) Subsp. **lunensis** (Fiori) Dostál, *loc. cit.* (1976) (*C. paniculata* var. *lunensis* Fiori): Stems herbaceous throughout. Leaves green, scabrid, pinnatisect with linear-lanceolate segments. Involucre 8–11 mm in diameter, ovoid; appendages mucronulate, with lower fimbriae 0·2–0·5 mm. Achenes grey; pappus *c.* ½ as long as achene. *Coast of N. Italy from Genova to La Spezia, and adjacent part of N. Appennini.*

(j) Subsp. **cosana** (Fiori) Dostál, *loc. cit.* (1976) (*C. paniculata* var. *cosana* Fiori): Stems 30–50 cm, woody at base. Leaves green, smooth, pinnatisect with filiform segments. Involucre 8–10 mm in diameter, ovoid-conical; appendages long-mucronate, with lower fimbriae 0·5–1 mm. Achenes grey; pappus *c.* ½ as long as achene. *Coast of C. Italy* (*Mte. Argentario, near Orbetello*).

(k) Subsp. **gallinariae** (Briq. & Cavillier) Dostál, *loc. cit.* (1976) (*C. paniculata* var. *gallinariae* Briq. & Cavillier): Stems 50–70 cm. Leaves green, scabrid; lower pinnatisect. Capitula often in clusters of 2–3. Involucre 10–12 × 8–11 mm, ovoid; appendages with fimbriae 1–1·5 mm. Pappus ½–¾ as long as achene. *N.W. Italy* (*Isola Gallinara, prov. Savona*).

C. integrans Naggi, *Malpighia* **19**: 79 (1905), described from N. Italy (Liguria) is like subsp. (i) but the lower leaves are entire and grey-tomentose; it is probably worth only varietal status.

Sect. ALBIFLORAE Dostál. Stems herbaceous, the branches not spiny. Leaf-segments not rigid or spiny. Involucre usually ovoid; appendages with a short apical spine. Florets white, cream or yellow.

135. C. lactiflora Halácsy, *Bull. Herb. Boiss.* **6**: 601 (1898). Biennial. Stems 30–40 cm, erect. Leaves with somewhat arachnoid indumentum and scabrid; lower pinnatisect. Capitula solitary. Involucre 10 × 5–6 mm, oblong-ovoid; appendages with an erecto-patent apical spine 2–3 mm. Florets white. Pappus *c.* ½ as long as achene. *Hills.* ● *C. Greece* (*Koniskos, N.E. of Kalabaka*). Gr.

136. C. laureotica Heldr. ex Halácsy, *op. cit.* 590 (1898). Perennial. Stems 30–40 cm, erect. Leaves greyish-tomentose; lower pinnatisect. Capitula solitary. Involucre 12 × 6–7 mm, ovoid; appendages reddish-brown, with an erect apical spine 1–2 mm. Florets cream. Pappus about as long as achene. *Pinus-woods.* ● *S.E. Greece.* Gr.

137. C. pelia DC., *Prodr.* **6**: 586 (1838). Perennial. Stems 30–50 cm, erect. Leaves arachnoid-pubescent, scabrid; lower pinnatisect. Capitula solitary. Involucre 10 × 4–5 mm, ovoid-oblong or -cylindrical. Appendages pale brown, with a somewhat recurved apical spine 1·7–3 mm. Florets yellow. Pappus about as long as achene. *Dry, rocky ground.* ● *C. & E. Greece.* Gr.

Sect. CYLINDRACEA (Hayek) Dostál. Stem herbaceous, the branches not spiny. Leaf-segments not rigid or spiny. Involucre cylindrical; appendages with an erect or patent apical spine which is not spiny or fimbriate at its base, the lower fimbriae free. Florets purple or pink, rarely white or cream.

138. C. rufidula Bornm., *Feddes Repert.* **19**: 103 (1923). Biennial. Stems 30–50 cm, erect. Leaves scabrid, with sparse arachnoid indumentum; lower pinnatisect. Capitula solitary. Involucre *c.* 10 × 5–6 mm, ovoid-cylindrical; appendages covering the puberulent bracts, reddish-brown, with an erect or subpatent apical spine 1·5–2 mm. Florets purple. Pappus much shorter than achene. *Rocky places.* ● *S. Makedonija* (*N.W. of Dojran*). Ju.

139. C. tymphaea Hausskn., *Mitt. Thür. Bot. Ver.* nov. ser., **7**: 44 (1895). Biennial. Stems 20–40 cm. Leaves scabrid; lower

pinnatisect. Capitula solitary. Involucre 5–10 × 3–5 mm, ovoid-cylindrical; appendages not covering the glabrous bracts, pale brown, with an apical spine 2 mm. Florets purple. Pappus *c.* ½ as long as achene. *Stony scrub.* ● *S. Jugoslavia, N. Greece.* Gr Ju.

(a) Subsp. **tymphaea**: Leaves green; segments linear-lanceolate. Involucre 6–8 × 4–5 mm. *Throughout the range of the species.*

(b) Subsp. **brevispina** (Hausskn.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 203 (1976) (*C. brevispina* Hausskn.): Leaves whitish, arachnoid-lanate; segments ovate-lanceolate. Involucre 8–10 × 5 mm. *N.C. Greece (Thessalia).*

140. C. orphanidea Heldr. & Sart. ex Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 73 (1856). Biennial. Stems 20–50 cm, erect. Leaves arachnoid-tomentose or pubescent, scabrid; lower pinnatisect. Capitula solitary. Involucre 8–12 × 4–7 mm, ovoid-cylindrical; appendages with apical spine 2–5 mm. Florets purple. Pappus about as long as achene. *Roadsides and cultivated ground.* ● *N. & E. Greece.* Gr.

(a) Subsp. **orphanidea**: Stems 20–30 cm, much-branched. Leaves grey-arachnoid-tomentose. Involucral appendages brown, with long fimbriae; apical spine 3–5 mm. *Attiki, Makedhonia.*

(b) Subsp. **thessala** (Hausskn.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 203 (1976) (*C. thessala* Hausskn.): Stems 30–50 cm, sparingly branched. Leaves greenish-tomentose. Involucral appendages pale brown, with short fimbriae; apical spine 2–3 mm. *E. Greece (Thessalia).*

141. C. diffusa Lam., *Encycl. Méth. Bot.* **1**: 675 (1785) (*C. parviflora* Sibth. & Sm., non Lam.). Annual or biennial. Stems 10–50(–60) cm, erect, divaricately much-branched. Leaves green, with rather arachnoid indumentum; lower 2-pinnatisect. Capitula solitary. Involucre 7–10 × 4–5 mm, ovoid-cylindrical; appendages with an erect or patent apical spine 2–3(–5) mm. Florets pink. Pappus absent. *Waste places and maritime sands. S.E. Europe, northwards to N.C. Ukraine; naturalized elsewhere, mainly in C. Europe.* Bu Gr Ju Rm Rs (C, W, K, E) Tu [Au Cz Ga Ge He Hu It Po].

Records from Greece of *C. polyclada* DC., native of N.W. Anatolia, refer to **141**.

142. C. bovina Velen., *Sitz.-Ber. Böhm. Ges. Wiss. (Math.-Nat. Kl.)* **1889(2)**: 36 (1889). Biennial. Stems 30–40 cm, much-branched. Leaves scabrid, with somewhat arachnoid indumentum; lower pinnatisect. Capitula solitary or in clusters of 2–3. Involucre 6–7 × *c.* 3·5 mm, conical-cylindrical; appendages with an erecto-patent apical spine 3 mm. Florets purple. Pappus absent. *Grassy slopes.* ● *N.E. & S.C. Bulgaria.* Bu.

143. C. aemulans Klokov in Bobrov & Czerep., *Fl. URSS* **28**: 617 (1963). Biennial. Stems 30–60 cm, erect, much-branched at base. Leaves scabrid, very sparsely arachnoid-tomentose; lower 1(–2)-pinnatisect. Capitula solitary or in clusters. Involucre 10–12 × 3–3·5 mm, narrowly cylindrical; appendages with a somewhat recurved apical spine 1–4 mm. Florets purple, rarely white. Pappus absent. *Grassy slopes.* ● *Krym.* Rs (K).

Sect. PSEUDOPLUMOSAE (Hayek) Dostál. Stems herbaceous, the branches not spiny. Leaf-segments not rigid or spiny. Involucre cylindrical; appendages filiform and plumose-fimbriate at apex, recurved. Florets pink.

144. C. zuccariniana DC., *Prodr.* **6**: 574 (1838). Biennial. Stems 20–30(–40) cm, erect, branched above. Leaves pubescent; lower pinnatisect or lyrate. Capitula in clusters of 2–4. Involucre 12–14 × 3–4 mm, cylindrical; appendages recurved, pale brown to yellowish. Florets pink. Pappus ½–½ as long as achene. *Dry scrub.* ● *Greece, S. Albania.* Al Gr.

Sect. DUMULOSAE (Hayek) Dostál. Dwarf shrub. Branches and leaf-segments spiny. Involucre cylindrical; appendages mucronate or spinulose at apex. Florets pink, white or cream.

145. C. spinosa L., *Sp. Pl.* 912 (1753). Dwarf shrub. Stems up to 20 cm, thick, much-branched, spiny. Leaves appressed-grey-tomentose or glabrescent; lower undivided to pinnatifid, the segments spiny. Capitula solitary. Involucre *c.* 8 × 3 mm. Florets pale pink or white, rarely cream. Pappus absent. $2n=36$. *Maritime sands, rarely inland. Greece, Aegean region.* Cr Gr.

(a) Subsp. **spinosa** (*C. spinosa* subsp. *tomentosa* (Halácsy) Hayek): Stems and leaves white-tomentose. Florets pale pink. *Throughout most of the range of the species.*

(b) Subsp. **cycladum** (Heldr.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 779 (1931): Stem and leaves green, sparsely hairy. Florets cream. *Kikladhes.*

Subgen. **Calcitrapa** (Heister ex Fabr.) Hayek. Biennial. Leaves pinnatisect, not decurrent. Appendages not decurrent at base, palmate- or pinnate-spiny at apex, the apical spine much longer than the others. Pappus usually present.

146. C. hyalolepis Boiss., *Diagn. Pl. Or. Nov.* **1(6)**: 133 (1846) (*C. pallescens* auct. eur., non Delile). Stem 20–40 cm long, divaricately branched from the base. Basal leaves in a rosette, pinnatisect to lyrate, the segments narrow, crenate-dentate; upper broadly linear, dentate, not decurrent. Capitula solitary, shortly pedunculate. Involucre *c.* 15 mm in diameter, subglobose; bracts coriaceous, veinless, with wide scarious, entire margin, with apical spine simple or with 2–3 short basal spines. Florets yellow. Achenes *c.* 3 mm; pappus about as long as achene. *Waste places. S.E. Greece, Kriti.* Cr Gr. (*S.W. Asia.*)

147. C. iberica Trev. ex Sprengel, *Syst. Veg.* **3**: 406 (1826). Stems up to 100 cm, ascending to erect, divaricately branched in lower half. Leaves greenish, hispidulous, with denticulate, setulose margin; lower runcinate- to lyrate-pinnatisect, the lobes ovate to linear-lanceolate; upper lanceolate. Capitula subsessile, surrounded by upper leaves. Involucre 8–14 mm in diameter, ovoid; bracts indistinctly veined, with scarious margin; appendages scarious, the apical spine 15–30 mm, stout, patent, sulcate, usually with 1–3 basal spines *c.* 3 mm. Florets deep purple, glandular, the outer slightly patent. Achenes *c.* 3 mm; pappus 2–2·5 mm. *S.E. Europe, extending to W. Romania.* Bu Gr Ju Rm Rs (K).

(a) Subsp. **iberica**: Stem 30–100 cm, erect. Appendages of bracts with apical spine 15–20 mm. *Throughout the range of the species.*

(b) Subsp. **holzmanniana** (Boiss.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 203 (1976) (*C. iberica* var. *holzmanniana* Boiss.): Stem not more than 30 cm, ascending. Appendages of bracts with apical spine *c.* 30 mm. ● *C. & S. Greece.*

148. C. calcitrapa L., *Sp. Pl.* 917 (1753). Stems 20–100 cm, ascending to erect, divaricately branched from the base. Young leaves grey-lanate, becoming greenish and crispate-pubescent, glandular; lower pinnatifid, with lanceolate, acute, remotely serrate lobes, withered at anthesis; upper pinnatifid, with linear-lanceolate segments, the uppermost lanceolate or somewhat hastate. Capitula sessile, surrounded by upper leaves. Involucre

6–8 mm in diameter, ovoid-cylindrical; bracts coriaceous, ovate, indistinctly veined, with scarious margin; appendages with slender, patent apical spine 10–18 mm, strongly thickened at base, and usually 1–3 basal spines 3–5 mm. Florets pale purple, glandular, equal. Achenes *c.* 3 mm; pappus absent. $2n=20$. *Waste places and disturbed ground. S. & S.C. Europe; naturalized elsewhere in W. & C. Europe, but less widely than formerly.* Al Bl Bu Co Cr Cz Ga Gr He Hs Hu It Ju Lu Rm Rs (W, K) Sa Si [Au Be Br Ge Ho].

C. torreana Ten., *Ind. Sem. Horti Neap.* **1829**: 15 (1830), described from S.E. Italy (Mte. Gargano), is said to be like **148** but has the stems erect with erect branches and the appendages with more slender spines; further investigation is required. Plants of hybrid origin between **148** and **153** (referred to as *C. asperocalcitrapa* Gren. & Godron, *C. calcitrapaspera* Gren. & Godron, *C. arrectispina* Bertol. and *C. calcitrapoides* auct., non L.) occur commonly where the species grow together.

149. C. pontica Prodan & E. I. Nyárády in Prodan, *Centaur. Român.* 57 (1930). Like **148** but with long-pedunculate capitula; involucre *c.* 12 mm in diameter; apical spine of the appendages up to 30 mm, stout, the basal spines up to 15 mm; achenes *c.* 4 mm; pappus present. *Maritime sands.* ● *E. Romania (near Sulina).* Rm.

Subgen. **Seridia** (Juss.) Czerep. Annual or perennial. Lower leaves entire to pinnatisect; upper entire to lobed, usually decurrent. Appendages not decurrent at base, palmately spiny at apex, the apical spine not or slightly longer than the others. Pappus usually present.

150. C. sonchifolia L., *Sp. Pl.* 915 (1753) (incl. *C. jacobi* Dufour). Perennial. Stems 30–40 cm, erect, corymbosely branched, scabrid-puberulent, with wide dentate wings. Leaves hispidulous; lower ovate to lyrate, spinulose-dentate, petiolate; upper entire to lyrate, lanceolate. Capitula solitary, surrounded by upper leaves. Involucre *c.* 20 mm in diameter, ovoid; appendages as long as or longer than bract, deflexed, yellowish-brown, the spines 3–5 mm, 5–7, the apical slightly longer. Florets purple, the outer scarcely patent. Achenes 4–4·5 mm; pappus *c.* 2 mm, reddish. *Maritime sands.* ● *Mediterranean region.* ?Cr Gr Hs It Si.

151. C. seridis L., *Sp. Pl.* 915 (1753). Perennial. Stems 30–80 cm, erect, simple or branched, winged. Leaves hispidulous; lower petiolate. Capitula solitary, surrounded by upper leaves. Involucre 15–25 mm in diameter, ovoid to subglobose; appendages slightly deflexed, the spines 3–5 mm, (5–)7–11, the apical somewhat longer, 1½ times as long as bract. Florets purple, the outer patent. Achenes 4–5 mm; pappus absent in outer and short in inner achenes. ● *S. & S.E. Spain.* ?Bl Hs.

1 Lower leaves lyrate-pinnatifid — (c) subsp. **maritima**
1 Lower leaves sinuately lobed to entire
2 Appendages with stout spines at apex, the central one longer than the others — (a) subsp. **seridis**
2 Appendages with slender spines at apex, the central one not longer than the others — (b) subsp. **cruenta**

(a) Subsp. **seridis**: Lower leaves oblong-ovate in outline, sinuately lobed; upper oblong-lanceolate, pinnately lobed, the segments spinulose-mucronate. Involucre 20–25 mm in diameter, subglobose; appendages with stout apical spines, the central spine longer than the others. *Dry, open habitats. S. Spain.*

(b) Subsp. **cruenta** (Willd.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 203 (1976) (*C. cruenta* Willd.): Lower leaves broadly ovate; upper ovate-lanceolate, mucronate, spinulose-denticulate. Involucre 17–22 mm in diameter, subglobose; appendages with slender apical spines, the central spine not longer than the others. *Rocky ground. S.E. Spain (near Jativa).*

(c) Subsp. **maritima** (Dufour) Dostál, *loc. cit.* (1976) (*C. maritima* Dufour): Leaves dentate, mucronate; lower lyrate-pinnatifid; upper auriculate-semiamplexicaul. Involucre *c.* 25 mm in diameter, ovoid; appendages ovate-lanceolate, strongly deflexed, the apical spines subequal. *Maritime sands. S. & S.E. Spain.*

152. C. sphaerocephala L., *Sp. Pl.* 916 (1753). Perennial. Stems 5–70 cm, procumbent to erect, simple or branched, leafy up to capitulum, not winged. Leaves spinulose-mucronate, hispidulous to arachnoid-tomentose, viscid; lower usually lyrate; upper usually entire or dentate, sometimes auriculate-semiamplexicaul. Capitula solitary; involucre 12–35 mm in diameter; bracts not distinctly veined; appendages reddish-brown, deflexed, with 5–13 slender spines 3–5 mm, the apical usually somewhat longer. Florets purple or sometimes the inner whitish, the outer patent. Achenes *c.* 5 mm, shiny; pappus absent in outer and short in inner achenes. *Sandy ground, mainly by the sea. W. Mediterranean region, Portugal.* Co ?Cr ?Gr Hs It Lu Sa Si.

1 Stems up to 60 cm, corymbosely branched; involucre 8–20 mm in diameter, the appendages with yellowish-orange spines — (b) subsp. **lusitanica**
1 Stems 5–30 cm; simple or sparingly branched; involucre (15–)20–35 mm in diameter, the appendages with yellow spines
2 Stems 5–15 cm; involucre 30–35 mm in diameter, truncate at base — (d) subsp. **polyacantha**
2 Stems 10–30 cm; involucre *c.* 20 mm in diameter, rounded at base
3 Leaves arachnoid-hairy, mucronate-dentate — (a) subsp. **sphaerocephala**
3 Leaves tomentose, somewhat viscid, spiny-dentate — (c) subsp. **malacitana**

(a) Subsp. **sphaerocephala**: Stems 5–15(–50) cm, simple or sparingly branched. Leaves arachnoid-hairy, mucronate-dentate, sessile; lower lyrate; upper entire, auriculate-semiamplexicaul at base. Involucre (15–)25–30 mm in diameter; appendages with 5–9(–13) yellow spines. Achenes reddish-brown; pappus white, half as long as achene. *Throughout the range of the species.*

(b) Subsp. **lusitanica** (Boiss. & Reuter) Nyman, *Consp.* 432 (1879) (*C. lusitanica* Boiss. & Reuter): Stems up to 60 cm, corymbosely branched. Leaves tomentose, scabrid; lower lyrate; upper obovate-oblong, lyrate to sinuately lobed or serrate. Involucre 8–15(–20) mm in diameter, ovoid; appendages with 5–7 yellowish-orange spines. Achenes whitish; pappus white. $2n=20$, 22. *C. & S. Portugal.*

(c) Subsp. **malacitana** (Boiss.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 203 (1976) (*C. malacitana* Boiss.): Stems up to 30 cm, simple or sparingly branched. Leaves tomentose, somewhat viscid, spiny-dentate; lower lyrately lobed; upper obovate to elliptic-lanceolate, shortly petiolate, auriculate at base; upper indistinctly auriculate, semiamplexicaul. Involucre *c.* 20 mm in diameter, ovoid-globose; appendages with divaricate spines. Pappus short. ● *S. Spain.*

(d) Subsp. **polyacantha** (Willd.) Dostál, *loc. cit.* (1976) (*C. polyacantha* Willd.): Stems 5–15(–30) cm, simple or rarely branched. Leaves arachnoid-hairy; lower lyrate to pinnatifid; upper pinnatilobed to irregularly mucronate-dentate. Involucre 30–35 mm in diameter, ovoid, truncate at base; appendages with equal divaricate spines all over the back. Achenes whitish; pappus short. $2n=22$. *Sandy or rocky places.* ● *Portugal, S. Spain.*

Subsp. (**d**) is possibly worth specific rank, and further investigation is required.

153. C. aspera L., *Sp. Pl.* 916 (1753) (*C. heterophylla* Willd.). Stems 20–50 cm, erect, much-branched, often white-tomentose below. Leaves green, scabrid; lower usually divided; upper entire to sinuate-dentate, mucronate, sometimes with auriculate base. Capitula solitary. Involucre (10–)15–25 mm in diameter, ovoid to globose; bracts pale reddish, indistinctly veined; appendages small, patent or deflexed, usually with 3–5 palmately arranged, divergent or parallel spines. Florets purple, the outer slightly patent. Achenes *c.* 4 mm, whitish, with reddish stripes; pappus 1–2 mm, reddish. $2n=22$. *Dry, open habitats.* ● *S.W. Europe, extending eastwards to C. Italy.* Bl Ga Hs It Lu Sa.

1 Stems simple or sparingly branched; leaves entire or serrate (c) subsp. **scorpiurifolia**
1 Stems much-branched; lower leaves pinnatifid or lobed
2 Involucre 20–25 mm in diameter, globose; appendages with parallel spines (d) subsp. **pseudosphaerocephala**
2 Involucre 10–20 mm in diameter, ovoid; appendages with divergent spines
3 Upper leaves oblong- to linear-lanceolate; involucre *c.* 20 mm in diameter (a) subsp. **aspera**
3 Upper leaves narrowly linear to filiform; involucre 6–15 mm in diameter (b) subsp. **stenophylla**

(a) Subsp. **aspera**: Stems up to 50 cm, erect or ascending, much-branched. Lower leaves oblong-lanceolate, pinnatifid to sinuate-dentate; upper linear-lanceolate. Involucre *c.* 20 mm in diameter, globose; appendages half as long as bract, with 3–5 divergent, yellow spines, the apical longer. *Throughout the range of the species.*

(b) Subsp. **stenophylla** (Dufour) Nyman, *Consp.* 432 (1879) (*C. stenophylla* Dufour): Stems up to 50 cm, erect, branched. Leaves green to grey-tomentose; lower pinnatifid to deeply dentate; upper narrowly linear to filiform, the margin revolute, entire or remotely dentate at base. Involucre 6–15 mm in diameter, ovoid; appendages with 3 divergent, equal, palmate spines. *E. Spain* (*S. of Valencia*), *S. Portugal* (*Algarve*).

(c) Subsp. **scorpiurifolia** (Dufour) Nyman, *loc. cit.* (1879) (*C. scorpiurifolia* Dufour): Stems *c.* 20 cm, simple or sparingly branched. Leaves undivided, entire to serrate; lower oblong-ovate, acuminate. Involucre 10–15 mm in diameter, ovoid; appendages with 3–5 divergent spines. *S. Spain.*

(d) Subsp. **pseudosphaerocephala** (R. J. Shuttlew. ex Rouy) Gugler, *Centaur. Ung. Nationalmus.* 214 (1907): Stems up to 60 cm, erect, sparingly branched. Lower leaves oblong, pinnatifid to lobed; upper linear-lanceolate. Involucre 20–25 mm in diameter, globose; appendages with 3(–5) parallel spines. *S. France.*

154. C. napifolia L., *Sp. Pl.* 916 (1753). Annual. Stems 30–50 cm, erect, branched, the branches narrowly winged. Leaves greyish-pubescent, sometimes lanate; lower broadly ovate to lyrate, with 1–2 segments on each side; upper broadly linear, entire, except near the apex. Capitula solitary. Involucre *c.* 10 mm in diameter, ovoid; bracts pale; appendages 3 times as wide as bracts, broadly semilunate, narrowed at the base, pectinate-spinose with 5–9(–11) slender, parallel spines. Florets purple, the outer distinctly patent. Achenes *c.* 3·5 mm, pale; pappus half as long as achene, pale pink. *Cultivated and waste ground. W.C. Mediterranean region.* Co ?Cr ?Hs It Sa Si.

155. C. micracantha Dufour, *Ann. Sci. Nat.* **23**: 164 (1831). Annual. Stems 20–50 cm, erect, much-branched, the branches narrowly and interruptedly winged. Leaves lanate-puberulent, scabrid, glabrescent, denticulate; lower pinnately lobed; upper lanceolate, the uppermost linear-lanceolate. Capitula in corymbose clusters. Involucre *c.* 8 mm in diameter, ovoid; appendages *c.* 3 times as wide as bracts, broadly semilunate, narrowed at the base, palmately spinose, with 4–6 parallel, rigid, yellow spines, the apical stouter and longer. Florets purple. Achenes *c.* 3·5 mm. ● *S. Spain.* Hs.

156. C. hermannii F. Hermann, *Bull. Soc. Bot. Bulg.* **4**: 27 (1931). Perennial. Stems 50–60 cm, erect, simple. Leaves greyish-tomentose; lower lyrate-pinnatifid; upper linear-lanceolate, entire, narrowly decurrent. Capitula solitary. Involucre *c.* 15 mm in diameter, ovoid; bracts broadly ovate; appendages *c.* 5 mm, palmately divided into 5–9 subulate, scarcely pungent spines, the apical scarcely larger than the laterals. Florets orange. Achenes *c.* ½ as long as the brownish-purple pappus. *Turkey-in-Europe* (*near Çilingoz*). Tu. (*Anatolia.*)

Subgen. **Solstitiaria** (Hill) Dobrocz. (Sect. *Mesocentron* Hayek). Annual to perennial. Leaves usually decurrent; lower lobed to pinnatifid; upper entire to dentate. Appendages not or shortly decurrent at base, palmately spiny at apex, the apical spine usually much longer than the others. Pappus usually present.

157. C. solstitialis L., *Sp. Pl.* 917 (1753). Biennial. Stems 30–100 cm, erect, much branched from lower half, usually greyish-tomentose; branches long, winged. Leaves scabrid, and arachnoid or lanate, or greyish-tomentose; lower usually lyrate to pinnatifid, with triangular-oblong lobes; upper linear-lanceolate, entire, mucronate. Capitula solitary. Involucre 7–12(–15) mm in diameter, usually ovoid-globose; bracts broadly ovate; appendages not decurrent, short, the apical spine 10–15(–30) mm, with basal spines *c.* 3 mm. Florets usually yellow, eglandular, uniform. Achenes *c.* 2·5 mm, black; pappus up to 5 mm. $2n=16$. *Dry, open habitats. S. Europe; a frequent casual elsewhere and naturalized in parts of C. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju *Rm Rs (*W, K) Sa Si Tu [Au Br Cz Ge He *Hu Po].

1 Appendages with stout apical spine and 1–2 short lateral spines
2 Upper leaves linear-lanceolate; appendages with yellow apical spine (c) subsp. **schouwii**
2 Upper leaves linear; appendages with reddish-brown apical spine (d) subsp. **erythracantha**
1 Appendages with 3–7 spines
3 Spines yellowish, the apical stouter and much longer than the others (a) subsp. **solstitialis**
3 Spines brownish, subequal or the apical slightly stouter and longer (b) subsp. **adamii**

(a) Subsp. **solstitialis**: Appendages erect or slightly deflexed, with 3–5(–7) yellowish spines, the apical stouter and longer than the others. *Almost throughout the range of the species.*

(b) Subsp. **adamii** (Willd.) Nyman, *Consp.* 430 (1879) (*C. adamii* Willd.): Appendages erect or slightly deflexed, with 5(–7) brownish spines, the apical not or only slightly stouter and longer than the others. *C. & E. Mediterranean region; Krym.*

(c) Subsp. **schouwii** (DC.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 204 (1976) (*C. schouwii* DC.): Upper leaves linear-lanceolate. Appendages of outer and middle bracts with stout, yellow apical spine, and with 1–2 short lateral spines; spine of inner bracts erect, that of outer bracts deflexed. ● *Sicilia, Sardegna.*

(d) Subsp. **erythracantha** (Halácsy) Dostál, *loc. cit.* (1976) (*C. erythracantha* Halácsy): Like subsp. (c) but upper leaves narrowly linear; appendages of bracts with reddish-brown apical spine. ● *E. Greece* (*Litokhoron, E. of Olimbos*).

158. C. idaea Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **2(10)**: 119 (1849). Biennial. Stems numerous, the central one very short, the others 10–15(–30) cm, more or less branched, very narrowly winged. Leaves greyish-green beneath, with arachnoid indumentum above; basal 10–13 cm, in a rosette, oblong in outline, lyrate-pinnatifid with ovate-triangular, dentate lobes, the apical 3 times as large as the others; upper linear. Capitula solitary. Involucre *c.* 10 mm in diameter, ovoid; bracts tomentose, yellowish; appendages not decurrent, with apical spine 15–30 mm and 1–2 short black lateral spines. Florets yellow, glandular. Achenes *c.* 2·5 mm; pappus absent in outer florets, as long as achene in inner. *Dry places.* ● *Kriti.* Cr.

159. C. melitensis L., *Sp. Pl.* 917 (1753). Annual or biennial. Stems up to 80 cm, erect, winged above, sparingly branched from the middle. Leaves green, crispate-puberulent, the margin scabrid; lower lanceolate, lyrate-pinnatifid to sinuately lobed; upper lanceolate. Capitula solitary or in groups of 2–3. Involucre 8–12 mm in diameter, ovoid-globose; bracts glabrous or puberulent, veinless; appendages not decurrent, short, with patent apical spine 5–8 mm and 1–3 remote, short lateral spines on each side. Florets yellow, glandular, the outer patent. Achenes *c.* 2·5 mm; pappus as long as achene. $2n=24$. *Dry places and disturbed ground. S. Europe.* Az Bl Co Cr Ga Gr Hs It Ju Lu Sa Si.

160. C. sulphurea Willd., *Enum. Pl. Horti Berol.* 930 (1809). Annual. Stems 30–50 cm, erect, divaricately branched above, narrowly winged, leafy almost to apex. Leaves linear to linear-lanceolate or the lower lyrate-pinnatifid, sparsely lanate; lower petiolate; upper sessile. Involucre (12–)15–20 mm in diameter, ovoid-conical; bracts ovate, sparsely lanate to subglabrous; appendages not decurrent, semiorbicular, with slender, patent, dark purple apical spine 15–20 mm and very slender lateral spines 5–6 mm; appendages of outer bracts with subequal, whitish spines 7–8 mm. Florets yellow, glandular. Achenes *c.* 4·5 mm; pappus *c.* 2 mm, brownish. *Disturbed or rocky ground. S. & S.E. Spain.* Hs.

161. C. nicaeensis All., *Fl. Pedem.* **1**: 162 (1785). Biennial. Stems 30–60 cm, erect, virgately branched above, not winged. Lower leaves lyrate-pinnatifid; upper oblong, cordate, semi-amplexicaul; uppermost oblong to lanceolate. Capitula solitary, surrounded by upper leaves. Involucre 12–18 mm in diameter, ovoid; bracts glabrous; appendages not decurrent, with apical spine 10–15 mm and 2–3 short lateral spines on each side. Florets yellow. Achenes *c.* 4·5 mm; pappus 1–1·5 mm. *Cultivated or waste ground. W. & C. Mediterranean region eastwards to Malta.* Hs It Sa Si.

162. C. eriophora L., *Sp. Pl.* 916 (1753). Annual. Stems 20–40 cm, erect, divaricately branched, the branches broadly winged. Lower leaves incise-dentate to pinnatifid; upper oblong-lanceolate, the uppermost linear, dentate, mucronate, sparsely lanate. Capitula solitary, surrounded by upper leaves. Involucre 15–20 mm in diameter, ovoid-globose; bracts densely arachnoid; appendages not decurrent, with brownish, slender, patent apical spine 15–26 mm and 3 very short, remote lateral spines on each side less than 5 mm long. Florets yellow, glandular. Achenes *c.* 4·5 mm, shiny; pappus *c.* 2 mm, brownish. $2n=24$. *Roadsides and cultivated ground. S. & S.E. Spain, S. Portugal.* Hs Lu.

163. C. diluta Aiton, *Hort. Kew.* **3**: 261 (1789). Perennial. Stems up to 50 cm, erect, branched. Lower leaves incise-dentate, the lowermost lyrate; upper entire, semiamplexicaul. Capitula solitary, pedunculate. Involucre 8–12 mm in diameter, ovoid; bracts brown, appressed; appendages shortly decurrent, orbicular-ovate, with membranous margin, irregularly fimbriate-lacerate, the apex emarginate with a rigid, filiform spine in the notch. Florets purple, the marginal distinctly patent. Inner achenes with pappus as long as achene; outer with very short pappus. *S.W. Spain; a frequent casual elsewhere.* Hs. (*N.W. Africa.*)

Subgen. **Phalolepis** (Cass.) Dobrocz. Biennial or perennial. Lower and middle leaves pinnatisect. Appendages denticulate to fimbriate, with apex usually muticous or mucronulate. Pappus present or absent.

Sect. PSEUDOPHALOLEPIS Klokov. Biennial. Appendages with or without a dark central spot, the margin scarcely distinct from the centre.

164. C. margaritacea Ten., *Fl. Nap.* **4**, *Syll. App.* **3**: 14 (1830) (*C. splendens* auct., non L.). Stems 15–120 cm, erect or ascending, branched from the middle, arachnoid-hairy. Leaves densely arachnoid-hairy or lanate; lower (1–)2-pinnatisect, with linear segments; middle pinnatisect; uppermost linear, undivided. Capitula solitary, rarely in groups of 2–3. Involucre 8–25 × 6–27 mm, ovoid or globose; bracts yellow; appendages 4–12 × 3·5–9 mm, orbicular or elliptical, concolorous or with dark basal spot, irregularly denticulate or lacerate, muticous or with apical spine. Florets pink, purple, white or yellow. Achenes 2–5 mm, white, brown or blackish, sometimes with white ribs; pappus shorter to longer than achene. *S. part of U.S.S.R.* Rs (C, W, E).

The following subspecies apparently represent the localized remnants of a former species of more continuous distribution (cf. D. Dobroczova, *Ukr. Bot. Žur.* **6(2)**: 63–65 (1949); M. Klokov, *Trav. Inst. Bot.* (*Charkov*) **1**: 78–106 (1935); M. Iljin, *Bull. Jard. Bot. URSS* **26**: 31–38 (1927)).

1 Involucre 8–13 × 6–10 mm; appendages with apical spine; achenes 2–4 mm
2 Appendages not covering bracts, oblong-elliptical, with brownish-purple central spot (b) subsp. **breviceps**
2 Appendages covering bracts, orbicular, with yellowish centre (a) subsp. **pseudoleucolepis**
1 Involucre 11–25 × 9–27 mm; appendages muticous; achenes 3–5 mm
3 Appendages not pellucid
4 Florets white or yellowish; achenes white or pale brown (c) subsp. **margaritacea**
4 Florets pale pink to purple, rarely whitish; achenes blackish when mature
5 Involucre 15–20 mm in diameter, globose; appendages covering the bracts, white; florets purple (d) subsp. **margaritalba**
5 Involucre 11–15 mm in diameter, ovoid; appendages not completely covering the bracts, yellow or pale orange; florets pink, rarely whitish (e) subsp. **protomargaritacea**
3 Appendages pellucid, shining
6 Appendages 10–12 mm, keeled, apiculate, coriaceous along keel, the margin sometimes convolute
7 Florets whitish to pale yellow; involucre 22–27 mm in diameter; stem scabrid above (f) subsp. **appendicata**
7 Florets pink; involucre 16–17 mm in diameter; stem smooth above (g) subsp. **konkae**
6 Appendages 4–7 mm, indistinctly keeled, not distinctly apiculate, not coriaceous, the margin flat
8 Florets pink or pale purple, rarely white or yellowish; stem scabrid above
9 Appendages yellow, hard, convex (h) subsp. **protogerberi**
9 Appendages white with a dark basal spot, soft, not distinctly convex
10 Involucre globose; achenes pale brown (i) subsp. **donetzica**
10 Involucre ovoid; achenes blackish (j) subsp. **pineticola**

8 Florets pale yellow; stem smooth above
11 Involucre 15–25 × 15–25 mm, subglobose; appendages 8–9 mm wide, covering bracts (k) subsp. **dubjanskyi**
11 Involucre 11–19 × 9–19 mm, ovoid or subglobose; appendages *c.* 6 mm wide, not covering bracts
12 Appendages yellow; achenes blackish (l) subsp. **gerberi**
12 Appendages yellowish-brown, with dark purple central spot; achenes white (m) subsp. **paczoskii**

(a) Subsp. **pseudoleucolepis** (Kleopow) Dostál, *Bot. Jour. Linn. Soc.* **71**: 204 (1976) (*C. pseudoleucolepis* Kleopow): Stems smooth above. Leaf-segments linear-lanceolate. Involucre 8–10 × 7–8 mm, ovoid; appendages covering bracts, orbicular, convex, shiny, with short apical spine, with yellowish centre, the margin pellucid. Florets pale pink. Achenes 2–2·5 mm, brown, with white ribs; pappus 1–1·5 mm. *Granite rocks.* ● *S.E. Ukraine* (*Volodarskoe, N.W. of Ždanov*).

(b) Subsp. **breviceps** (Iljin) Dostál, *loc. cit.* (1976) (*C. breviceps* Iljin): Stems scabrid above. Leaf-segments linear-filiform. Involucre 10–13 × 6–10 mm, ovoid; appendages 4–5 × 3·5 mm, not covering bracts, oblong-elliptical, convex, with oblong-triangular, reddish-brown-purple central spot, pellucid, entire or indistinctly denticulate. Florets purple. Achenes 3–4 mm, brown; pappus shorter than achene. *Sandy steppes.* ● *S. Ukraine* (*by the S.E. bank of the lower Dnepr*).

(c) Subsp. **margaritacea**: Stems scabrid above. Leaf-segments linear. Involucre 15–18 × 20–22 mm, depressed-globose; appendages 6–7 × 7–9 mm, not completely covering the yellow bracts, orbicular, convex, keeled, not pellucid, irregularly denticulate, convolute, the apex muticous. Florets yellowish or white. Achenes 3·5–4·5 mm, pale brown; pappus as long as or somewhat longer than achene. *Submaritime sands.* ● *S. Ukraine* (*W. side of estuary of R. Bug*).

(d) Subsp. **margaritalba** (Klokov) Dostál, *loc. cit.* (1976) (*C. margaritalba* Klokov): Stems scabrid above. Segments of cauline leaves linear-filiform. Involucre 15–20 mm in diameter, globose; appendages 6–8 × 8–10 mm, covering the yellow bracts, membranous, white, not pellucid, not keeled, with triangular, reddish-brown central spot, the margin denticulate, the apex convolute, muticous. Florets purple. Achenes 3·5–4 mm, blackish, with white ribs; pappus somewhat shorter than to as long as achene. *Submaritime sands.* ● *S. Ukraine* (*E. side of estuary of R. Bug*).

(e) Subsp. **protomargaritacea** (Klokov) Dostál, *loc. cit.* (1976) (*C. protomargaritacea* Klokov): Stems smooth above. Leaf-segments linear-filiform. Involucre 11–16 × 11–15 mm, ovoid; appendages 5–6 × 4–5 mm, not completely covering bracts, elliptic-orbicular, yellow or pale orange, membranous, not pellucid, the centre brown, convex, the margin lacerate, convolute, the apex muticous. Florets pink, to almost white. Achenes 3–4 mm, blackish, with white ribs; pappus *c.* 3 mm, somewhat shorter than achene. *Submaritime sands.* ● *S. Ukraine* (*E. side of estuary of R. Bug*).

(f) Subsp. **appendicata** (Klokov) Dostál, *loc. cit.* (1976) (*C. appendicata* Klokov): Stems scabrid above. Leaf-segments broadly linear. Involucre 22–27 mm in diameter, globose; appendages 10–12 × 6–11 mm, not covering bracts, orbicular-rhombic, yellow, keeled, coriaceous on keel, with oblong-triangular, dark purple central spot, the margin wide, pellucid, irregularly dentate, sometimes convolute, the apex muticous. Florets pale yellow. Achenes 4·5–5 mm, brown, with white ribs; pappus 5–7 mm. *River sands.* ● *S.E. Ukraine* (*by west bank of R. Dnepr, below Zaporož'e*).

(g) Subsp. **konkae** (Klokov) Dostál, *loc. cit.* (1976) (*C. konkae* Klokov): Stems smooth above. Involucre 15–16 × 16–17 mm, subglobose; appendages 6–7 × 8–10 mm, covering bracts, reniform, keeled, coriaceous on keel, with oblong-triangular, reddish- or blackish-brown central spot, the margin denticulate, pellucid, sometimes convolute, the apex muticous. Florets pink. Achenes 3·5–5 mm, brown, with white ribs; pappus somewhat longer than achene. *River sands.* ● *S.E. Ukraine* (*by east bank of R. Dnepr, above Zaporož'e*).

(h) Subsp. **protogerberi** (Klokov) Dostál, *loc. cit.* (1976) (*C. protogerberi* Klokov): Stems scabrid above. Involucre 14–15 × 12–14 mm, ovoid-globose; appendages 5 × 5–6 mm, not covering bracts, orbicular-ovate, yellow, hard, convex, indistinctly keeled, with triangular, subcoriaceous centre, the margin narrow, pellucid, flat, the apex muticous. Florets pale pink, yellowish or white. Achenes 4–5 mm, blackish-brown; pappus as long as achene. *River sands.* ● *Borders of S. Russia and E. Ukraine* (*by R. Donets*).

(i) Subsp. **donetzica** (Klokov) Dostál, *loc. cit.* (1976) (*C. donetzica* Klokov): Stems scabrid above. Segments of basal leaves broadly linear, of upper leaves narrowly linear. Involucre 12–15 × 10–16 mm, globose; appendages 5–6 × 4–4·5 mm, not covering bracts, elliptical, soft, indistinctly keeled, with shortly triangular, reddish-brown basal spot, the margin white, pellucid, shining, flat, the apex muticous. Florets pink. Achenes 4–5 mm, pale brown; pappus as long as achene. *River sands.* ● *E. Ukraine and S. Russia* (*Donets valley*).

(j) Subsp. **pineticola** (Iljin) Dostál, *loc. cit.* (1976) (*C. pineticola* Iljin): Stems scabrid above. Leaf-segments narrowly oblong. Involucre 15–18 × 10–14 mm, ovoid; appendages 4–6 mm, not covering bracts, orbicular, white, soft, indistinctly keeled, with triangular, dark blackish-brown central spot, the margin subdenticulate, pellucid, flat, the apex muticous. Florets pale purple. Achenes *c.* 4 mm, blackish; pappus as long as or somewhat longer than achene. *Sandy pine woods.* ● *S.C. Russia* (*S.E. of Voronež*).

(k) Subsp. **dubjanskyi** (Iljin) Dostál, *loc. cit.* (1976) (*C. dubjanskyi* Iljin): Stems smooth above. Involucre 15–25 × 15–25 mm, subglobose; appendages 6–7 × 8–9 mm, covering bracts, orbicular, concolorous, pale yellow, shining, pellucid, indistinctly keeled, the margin subdenticulate, flat, the apex muticous. Florets yellow. Achenes 4·5–5 mm, blackish; pappus 3·5–5 mm. *Sandy hills.* ● *S.C. Russia* (*near Borisoglebsk, Voronežskaja Obl.*).

(l) Subsp. **gerberi** (Steven) Dostál, *loc. cit.* (1976) (*C. gerberi* Steven): Stems smooth above. Leaf-segments oblong. Involucre 11–16 × 9–14 mm, ovoid; appendages *c.* 6 mm in diameter, not covering bracts, orbicular, concolorous, pale yellow, shining, pellucid, indistinctly keeled, the margin subdenticulate, flat, the apex muticous. Florets pale yellow. Achenes 3·5–4·5 mm, blackish; pappus as long as achene. *Sandy steppes.* ● *S.E. Russia.*

(m) Subsp. **paczoskii** (Kotov ex Klokov) Dostál, *loc. cit.* (1976) (*C. paczoskii* Kotov ex Klokov): Stems smooth above. Leaf-segments filiform. Involucre 15–19 × 15–19 mm, subglobose; appendages *c.* 6 mm in diameter, not covering bracts, orbicular, yellowish-brown, convex, shining, indistinctly keeled, with an elongate-triangular, dark purple central spot, the margin subdenticulate, pellucid, flat, the apex muticous. Florets pale yellow. Achenes 3·5–5 mm, white; pappus somewhat longer than achene. *Sandy steppes.* ● *S.C. Ukraine* (*by west bank of R. Dnepr, near Kherson*).

Sect. PHALOLEPIS. Biennial or perennial. Appendages often with a dark central spot, coriaceous in the middle, the margin membranous, distinct from the centre.

165. C. transcaucasica D. Sosn. ex Grossh., *Fl. Kavk.* **4**: 212 (1934) (*C. sarandinakiae* Illarionova). Biennial. Stems 40–70 cm or more, 1–4, erect or ascending, much-branched. Leaves lanate, scabrid; lower pinnatisect, with linear-lanceolate segments; middle pinnatisect; upper linear-lanceolate. Capitula 10–20, not in clusters. Involucre 10–16 mm in diameter, ovoid or ovoid-globose; appendages orbicular-obovate, usually covering the yellowish bracts, with a distinct, narrowly triangular, yellow central spot, the margin pellucid, often shining, the apex emarginate, muticous; outer bracts sometimes with soft mucro at apex. Florets purple. Achenes 4 mm; pappus ⅓–½ as long as achene. *Rocks and screes. Hills of S.E. Krym* (*Sudak to Planerskoe*). Rs (K). (*Caucasus.*)

166. C. sterilis Steven, *Bull. Soc. Nat. Moscou* **29(2)**: 390 (1856). Biennial or perennial. Stems 20–100 cm, 2–20, procumbent, ascending from the base or erect, sparingly branched above the middle, scabrid above. Leaves arachnoid-tomentose or lanate; lower pinnatisect, with oblong- to linear-lanceolate segments, long-petiolate; middle pinnatisect or lyrate-pinnate; uppermost linear to narrowly oblong, with mucronate apex. Capitula solitary, or up to 10, not in clusters. Involucre 10–14 × 6–10 mm, ovoid to subglobose; appendages shining, orbicular, covering bracts, with narrowly triangular to ovate-triangular, reddish-brown centre, the margin wide, white-membranous, pellucid, denticulate or denticulate-fimbriate, the apex emarginate and mucronate, or with a setaceous spine. Florets purple. Achenes 2·5–4 mm, sparsely puberulent; pappus shorter than achene. *Stony slopes.* ● *Krym.* Rs (K).

Frequently hybridizes with **90**, **122** and **141**.

1 Involucre 6–10 mm in diameter; appendages with narrowly triangular reddish-brown centre, the apex abruptly contracted into a spine (a) subsp. **sterilis**
1 Involucre 10–20 mm in diameter; appendages with pale or dark reddish-brown centre, oblong-lanceolate to ovate-triangular, the apex flat, emarginate, with a soft mucro
2 Involucre 12–20 mm in diameter, subglobose; appendages with pale reddish-brown centre (b) subsp. **semijusta**
2 Involucre 10–14 mm in diameter, ovoid; appendages with dark reddish-brown centre (c) subsp. **vankovii**

(a) Subsp. **sterilis** (*C. stankovii* Illarionova): Leaves arachnoid-tomentose. Involucre 10–14 × 6–10 mm, ovoid-globose; appendages with narrowly triangular, reddish-brown centre, the apex abruptly contracted into a spine 0·5–2 mm. Achenes 2·5–3·5 mm; pappus 0·5–2 mm. *S. & S.E. Krym.*

(b) Subsp. **semijusta** (Juz.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 204 (1976) (*C. semijusta* Juz.): Leaves lanate. Involucre 16–22 × 12–20 mm, subglobose; appendages with oblong-lanceolate, pale reddish-brown centre, the apex flat, emarginate, with a soft mucro up to 3 mm. Achenes *c.* 4·5 mm; pappus 1·5–2 mm. *Mountains of Krym* (*above Alušta*).

(c) Subsp. **vankovii** (Klokov) Dostál, *loc. cit.* (1976) (*C. vankovii* Klokov): Leaves arachnoid-tomentose. Involucre 14–16 × 10–14 mm, ovoid; appendages with ovate-triangular, dark reddish-brown centre, the apex flat, emarginate, with a soft mucro 0·5 mm. Achenes *c.* 4 mm; pappus 1·5–2 mm. *Mountains of Krym* (*above Jalta*).

167. C. alba L., *Sp. Pl.* 914 (1753). Biennial or perennial. Stems 10–80 cm, erect, rarely ascending from the base, branched from the lower half, rarely simple. Leaves arachnoid-lanate to subglabrous, rarely viscid; lower 1- to 2(–3)-pinnatisect to lyrately lobed, rarely undivided, the segments linear to ovate, entire to dentate; middle pinnately divided, rarely undivided, the segments linear, lanceolate to oblong; upper pinnately divided or lobed, the segments linear-filiform to -lanceolate; uppermost linear to lanceolate, undivided to 2- to 3-fid. Capitula usually more than 10, not in clusters. Involucre 8–22 × 6–25 mm, ovoid to globose or ovoid-cylindrical; appendages mostly covering the bracts, orbicular or broadly ovate, concolorous or with a dark or paler centre, the margin entire or denticulate- or lacerate-fimbriate, the apex emarginate, with a soft mucro or arista, or muticous. Florets pink or purple, rarely white. Achenes 2·5–4 mm; pappus absent, or ¼ as long to somewhat longer than the achene. $2n = 18$. *Dry places. S. Europe.* Al Bu Gr He Hs It Ju Lu Rm Si.

This species contains many variants separable only on minute but distinctive characters; whilst these variants have usually been given specific status, they are here regarded as subspecies.

1 Lower leaves undivided or lyrately lobed
2 Involucre 20–25 mm in diameter, ovoid-globose (e) subsp. **tenoreana**
2 Involucre 6–10 mm in diameter, ovoid (t) subsp. **subciliaris**
1 Lower leaves 1- to 3-pinnatisect or -partite
3 Leaves viscid, glandular-punctate; involucre 20–25 mm in diameter (s) subsp. **princeps**
3 Leaves not viscid; involucre not more than 20 mm in diameter
4 Involucre 7–12 mm in diameter
5 Appendages white, often with green centre
6 Perennial; stem divaricately branched; leaves arachnoid-lanate; pappus ¼ as long as achene (o) subsp. **formanekii**
6 Biennial; stem sparingly branched, the branches erect; leaves subglabrous or greyish-green; pappus as long as achene (q) subsp. **euxina**
5 Appendages with brown to black centre
7 Involucre 10–12 mm in diameter (p) subsp. **vandasii**
7 Involucre 6–10 mm in diameter
8 Leaves arachnoid or white-tomentose; involucre ovoid; appendages entire or sometimes somewhat lacerate, with a brown centre
9 Leaves white-tomentose; involucre 10 mm in diameter; appendages entire or sometimes somewhat lacerate, the apex muticous (g) subsp. **diomedea**
9 Leaves arachnoid; involucre 7–8 mm in diameter; appendages entire, the apex mucronate
10 Pappus absent (l) subsp. **epapposa**
10 Pappus present (m) subsp. **caliacrae**
8 Leaves green or greyish-green; involucre ovoid-globose or ovoid-cylindrical; appendages lacerate- or fimbriate-denticulate, with a blackish- or reddish-brown centre
11 Stem with simple branches; pappus ½ as long as achene (a) subsp. **costae**
11 Stem paniculately or corymbosely branched; pappus absent or ⅓ as long as achene
12 Stem paniculately branched with virgate branches; leaves green; involucre ovoid-cylindrical; appendages with reddish-brown centre; pappus ⅓ as long as achene (b) subsp. **latronum**
12 Stem corymbosely branched with erect branches; leaves greyish-green; involucre ovoid-globose; appendages with blackish-brown centre; pappus absent (f) subsp. **pestalottii**
4 Involucre 10–16 mm in diameter
13 Appendages white, sometimes with yellow or greyish-brown centre
14 Leaves densely lanate or whitish-tomentose
15 Stem corymbosely branched; leaves lanate, the lower with linear-lanceolate segments; involucre 12–15 mm in diameter, ovoid-globose; appendages entire, covering bracts (c) subsp. **alba**
15 Stem paniculately branched; leaves white-tomentose, the lower with few, oblong to lanceolate segments; involucre 10–12 mm in diameter, globose; appendages undulately erose, not covering bracts (n) subsp. **lencomalla**
14 Leaves puberulent, or setulose-puberulent and sparsely lanate
16 Leaves puberulent, the lower with lanceolate segments; involucre 11–12 mm in diameter, ovoid; appendages with yellow centre, the apex muticous; pappus ¼ as long as achene; stem up to 60 cm (d) subsp. **splendens**

16 Leaves setulose-puberulent and sparsely lanate, the lower with linear-filiform segments; involucre 12–16 mm in diameter, subglobose; appendages with greyish-brown centre, the apex aristate; pappus somewhat longer than achene; stem up to 20 cm (h) subsp. **albanica**

13 Appendages with brown or black centre

17 Mature leaves white-tomentose, the lower with linear-oblong segments (r) subsp. **heldreichii**

17 Mature leaves green, glabrescent, the lower with linear or linear-lanceolate segments

18 Leaves puberulent, the lower pinnatisect with linear segments; involucre 17–20 mm in diameter; appendages with a triangular-lanceolate central spot (i) subsp. **ipecensis**

18 Leaves tomentose, the lower 2-pinnatifid with lanceolate segments; involucre 12–14 mm in diameter; appendages with a broadly ovate or orbicular central spot

19 Leaves soft, the segments oblong-lanceolate; appendages with black central spot (j) subsp. **deusta**

19 Leaves coriaceous, the segments linear to lanceolate; appendages with brown or pale brown central spot

20 Segments of leaves linear-filiform; appendages with pale brown centre, aristate (h) subsp. **albanica**

20 Segments of leaves linear-lanceolate; appendages with brown centre (k) subsp. **brunnea**

(a) Subsp. **costae** (Willk.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 205 (1976) (*C. costae* Willk.): Perennial, woody at base. Stems *c.* 10 cm, with simple branches. Leaves green above, arachnoid-hairy beneath; lower pinnatisect with narrowly linear, entire or mucronate-dentate segments. Involucre 8–10 mm in diameter, ovoid; appendages small, not covering bracts, semilunate, bilobed, lacerate, with triangular, blackish-brown central spot, the margin wide, hyaline, the apex emarginate, mucronulate. Florets pink. Achenes *c.* 3 mm, pale; pappus *c.* 1·5 mm. *Lowland.* ● *N.E. Spain.*

(b) Subsp. **latronum** (Pau) Dostál, *loc. cit.* (1976) (*C. latronum* Pau): Biennial. Stems up to 60 cm, paniculately branched, with virgate branches from the middle. Leaves green; lower pinnatisect with linear segments. Involucre (6–)7–8(–10) mm in diameter, ovoid-cylindrical; appendages broadly ovate, not covering bracts, with triangular-lanceolate, reddish-brown, obscurely striate central spot, the margin hyaline, lacerate, the apex emarginate, with rigid mucro. Florets pink. Achenes *c.* 3 mm; pappus *c.* 1 mm. ● *N.C. Spain.*

(c) Subsp. **alba** (*C. strepens* Hoffmanns. & Link): Biennial. Stems 10–40 cm, corymbosely branched, with patent branches above the middle. Leaves lanate, greyish-green; lower pinnatipartite or 2-pinnatisect, with linear-lanceolate, sometimes mucronate-dentate segments. Involucre 12–15 mm wide, ovoid-globose; appendages covering bracts, white, pellucid, cucullate, shining, entire, the apex emarginate, aristate. Florets pale purple. Achenes 2·5–3 mm; pappus $\frac{1}{4}$–$\frac{1}{2}$ as long as achene. ● *Spain, Italy; ?France.*

(d) Subsp. **splendens** (L.) Arcangeli, *Comp. Fl. Ital.* 387 (1882) (*C. splendens* L., *C. deusta* subsp. *concolor* (DC.) Hayek): Biennial. Stems up to 60 cm, paniculately branched from the middle. Leaves green, puberulent; lower 2-pinnatisect, with lanceolate, mucronate segments. Involucre 11–12 mm in diameter, ovoid; appendages covering bracts, orbicular, white, with yellow centre, the margin wide, membranous, pellucid, convolute above, the apex emarginate, muticous. Florets pale pink to white. Achenes *c.* 3 mm; pappus $\frac{1}{3}$ as long as achene. $2n=20$. ● *Italy, Sicilia, S. Switzerland, Balkan peninsula.*

(e) Subsp. **tenoreana** (Willk.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 205 (1976) (*C. tenoreana* Willk., *C. incana* Ten., non Burm. fil.): Perennial. Stems 30–50 cm, simple or with few branches. Leaves white- or silvery-tomentose; lower undivided and broadly elliptical or lyrately lobed, the lobes ovate to lanceolate, entire, obtuse, mucronate. Involucre 20–25 mm in diameter, ovoid-globose; appendages orbicular, not completely covering bracts, with blackish-brown central spot, the margin wide, hyaline, erose-lacerate, the apex muticous. Florets purple. Achenes *c.* 4 mm, black; pappus very short or almost absent. *Mountain pastures and calcareous rocks.* ● *C. Appennini.*

(f) Subsp. **pestalottii** (De Not.) Arcangeli, *Comp. Fl. Ital.* 387 (1882): Biennial. Stems 50–80 cm, corymbosely branched with erect branches. Leaves greyish-green; lower 2-pinnatisect, with linear, acute segments. Involucre 7–10 mm in diameter, ovoid-globose; appendages broadly ovate, not covering bracts, with small, semilunate, blackish-brown central spot, the margin wide, hyaline, long-fimbriate, the apex emarginate, mucronate. Florets pink. Achenes *c.* 4 mm; pappus absent. *Dry, rocky pastures. N. Italy.* (*N. Africa.*)

(g) Subsp. **diomedea** (Gasparr.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 205 (1976) (*C. diomedea* Gasparr.): Perennial, woody at base. Stems 40–50 cm, paniculately branched from the middle. Leaves densely appressed-white-tomentose; lower 2-pinnatisect. Involucre *c.* 10 mm in diameter, ovoid; appendages suborbicular, not completely covering bracts, with triangular, brown central spot, the margin entire, sometimes somewhat lacerate, the apex obtuse, muticous. Florets purple. Achenes *c.* 4 mm; pappus very short. *Calcareous rocks.* ● *Italy* (*Isole Tremiti*).

(h) Subsp. **albanica** (Halácsy) Dostál, *loc. cit.* (1976) (*C. albanica* Halácsy): Perennial. Stems 10–20 cm, sparingly branched below. Leaves setulose-puberulent and sparsely lanate; lower 2-pinnatisect, with linear-filiform, remotely dentate segments. Involucre 12–16 mm in diameter, subglobose; appendages orbicular, white, scarious, with pale blackish-brown centre, the margin white, hyaline, pellucid, lacerate or denticulate, the apex aristate. Florets purple. Achenes 3 mm; pappus somewhat longer than achene. *Mountain rocks.* ● *N.W. Greece.*

(i) Subsp. **ipecensis** (Rech. fil.) Dostál, *loc. cit.* (1976) (*C. ipecensis* Rech. fil.): Perennial, woody at base. Stems *c.* 30 cm, sparingly branched at middle. Leaves green, puberulent, glabrescent; lower pinnatisect, with remote, linear, remotely dentate, repand segments. Involucre 17–20 mm in diameter, subglobose; appendages 10 × 8 mm, ovate-orbicular, covering bracts, with triangular-lanceolate, black central spot, the margin wide, hyaline, membranous, indistinctly denticulate, the apex mucronate. Florets pink. Achenes *c.* 3 mm; pappus 1 mm. *Calcareous rocks.* ● *S.W. Jugoslavia* (*near Peć*).

(j) Subsp. **deusta** (Ten.) Nyman, *Consp.* 420 (1879) (*C. deusta* Ten.): Biennial. Stems 20–40 cm, erect, paniculately branched with long branches. Leaves soft, tomentose, becoming green and subglabrous; lower 2-pinnatifid with oblong-lanceolate segments. Involucre 12–14 mm wide, subglobose to ovoid-globose; appendages covering bracts, orbicular, convex, scarious, with large, broadly ovate to orbicular black central spot, the apex mucronate. Florets pink. Achenes 3 mm; pappus $\frac{1}{4}$–$\frac{1}{3}$ as long as achene. $2n=18$. ● *Italy, Balkan peninsula.*

(k) Subsp. **brunnea** (Halácsy) Dostál, *Bot. Jour. Linn. Soc.* **71**: 205 (1976) (*C. deusta* var. *brunnea* Halácsy): Like subsp. (j) but leaves coriaceous, the lower with linear-lanceolate segments; appendages with brown central spot. ● *N.W. Greece.*

(l) Subsp. **epapposa** (Velen.) Dostál, *loc. cit.* (1976) (*C. epapposa* Velen.): Like subsp. (j) but stems 10–20 cm; leaves arachnoid-hairy, the lower 2-pinnatisect with linear segments; involucre 7–8 mm wide; appendages ovate-orbicular, with triangular, brown central spot; pappus absent. *Dry hillsides.* ● *Bulgaria, E. Jugoslavia.*

(m) Subsp. **caliacrae** (Prodan) Dostál, *loc. cit.* (1976) (*C. caliacrae* Prodan): Like subsp. (j) but stems procumbent; involucre 6–7 mm wide; pappus 1–1·5 mm. ● *S.E. Romania, N.E. Bulgaria.*

(n) Subsp. **leucomalla** (Bornm.) Dostál, *loc. cit.* (1976) (*C. leucomalla* Bornm.): Biennial. Stems up to 50 cm, paniculately branched. Leaves white-tomentose; lower lyrate-pinnatisect, with 1–3, oblong to lanceolate segments on each side. Involucre 10–12 mm in diameter, globose; appendages small, not covering bracts, triangular, white, with membranous centre, the margin wide, hyaline, pellucid, undulate, erose. Florets pink. Achenes *c.* 3 mm; pappus not more than 1 mm. *Stony slopes.* ● *C. Macedonia* (*Alšar, S.E. of Prilep*).

(o) Subsp. **formanekii** (Halácsy) Dostál, *loc. cit.* (1976) (*C. formanekii* Halácsy): Perennial. Stems up to 60 cm, divaricately branched. Leaves arachnoid-lanate; lower pinnatisect with small segments. Involucre 8 mm in diameter, ovoid; appendages ovate-orbicular, not covering bracts, convex, scarious, white, the margin wide, pellucid, deeply lacerate-denticulate, the apex setaceous-acuminate. Florets pale pink. Achenes *c.* 3 mm; pappus *c.* 1 mm. *Dry hills.* ● *C. Macedonia* (*S.E. of Titov Veles*).

(p) Subsp. **vandasii** (Velen.) Dostál, *loc. cit.* (1976) (*C. vandasii* Velen.): Biennial. Stems 30–50 cm, paniculately much-branched from the base with erect branches. Leaves greyish-tomentose or -puberulent; lower 2- to 3-pinnatisect, with small, linear, lobed segments. Involucre 10–12 mm in diameter, ovoid-conical or -globose; appendages small, not covering bracts, orbicular, brownish-black, with broadly ovate, blackish central spot, the margin hyaline-scarious, denticulate, slightly lacerate, the apex deeply emarginate, mucronate. Florets pink. Achenes *c.* 3·5 mm; pappus 0·5–1·5 mm. *Mountain rocks.* ● *S. Bulgaria* (*Rodopi*).

(q) Subsp. **euxina** (Velen.) Dostál, *loc. cit.* (1976) (*C. euxina* Velen., *C. margaritacea* sensu Hayek, non Ten.): Biennial. Stems 40–50 cm, sparingly branched from the middle with erect branches. Leaves greyish-green or subglabrous; lower 2-pinnatisect, with remote, narrowly linear segments; upper pinnatisect. Involucre 7–8 mm in diameter, ovoid-globose; appendages covering bracts, orbicular, with green centre, the margin wide, scarious, white, somewhat lacerate, the apex mucronate. Florets pink. Achenes *c.* 3 mm; pappus *c.* 3 mm. *Maritime sands.* ● *N.E. Bulgaria.*

(r) Subsp. **heldreichii** (Halácsy) Dostál, *loc. cit.* (1976) (*C. heldreichii* Halácsy): Perennial. Stems 30–60 cm, caespitose, paniculately branched. Leaves appressed-white-tomentose; lower 2-pinnatisect, with linear-oblong segments. Involucre 13–20 mm in diameter, ovoid-globose; appendages up to 8 mm in diameter, covering bracts, orbicular, white, semi-pellucid, with large, triangular, brownish-black or black central spot, the margin wide, pellucid, denticulate-fimbriate, the apex mucronate. Florets pale purple. Achenes *c.* 4 mm; pappus as long as or somewhat longer than achene. *Maritime rocks.* ● *W. Greece* (*E. of Mesolongion*).

(s) Subsp. **princeps** (Boiss. & Heldr.) Gugler, *Centaur. Ungar. Nationalmus.* 31 (1907) (*C. princeps* Boiss. & Heldr.): Biennial. Stems 10–20 cm, much-branched from the base, with erect branches. Leaves viscid, glandular-punctate; lower 2-pinnatisect, with linear-lanceolate, entire or dentate segments. Involucre 20–25 mm in diameter, globose; appendages orbicular to ovate, covering bracts, up to 10 mm in diameter, cucullate-convex, with blackish-brown central spot, the margin wide, hyaline, white, denticulate, the apex aristate. Florets purplish-white. Achenes 3–4 mm; pappus *c.* 1 mm. *Mountain rocks.* ● *S.C. Greece* (*Timfristos*).

(t) Subsp. **subciliaris** (Boiss. & Heldr.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 205 (1976) (*C. subciliaris* Boiss. & Heldr.): Perennial. Stems 10–15 cm, sparingly and divaricately branched at the base. Leaves appressed arachnoid-hairy, green; lower oblong-spathulate, long-attenuate into the petiole, undivided or lyrately lobed with 2–4 minute lobes on each side. Involucre 6–10 mm in diameter, ovoid; appendages covering bracts, large, orbicular, pale yellow, with large, pale brown central spot, the margin membranous, hyaline, denticulate, the apex aristate. Florets pink. Achenes *c.* 3 mm; pappus $\frac{1}{4}$ as long as achene. *Montane regions.* ● *W. Greece* (*Kefalinia*).

C. huljakii H. Wagner, *Feddes Repert.* **38**: 287 (1935), from rocks at *c.* 600 m in N. Greece (Athos), is like subsp. (q) but is a perennial with white-tomentose 2- to 3-pinnatisect leaves and the involucre is *c.* 6 mm; it is perhaps another subspecies.

C. sanctae-annae H. Wagner, *op. cit.* 288 (1935), is probably the hybrid **167 × 141**.

C. haynaldiformis Prodan, *Anal. Acad. Rep. Pop. Române* **3(18)**: 691 (1950), from W. Romania (Arad region), with erect stems, lanceolate, entire leaves, involucre 20–22 mm in diameter and orbicular appendages with a black central spot and wide, yellowish, entire or weakly lacerate margin, requires further investigation.

168. C. deustiformis Adamović, *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **74**: 145 (1904). Perennial. Stems 10–20 cm, procumbent, the apex ascending, simple or sparingly branched. Leaves green, greyish or white, hirsute, floccose-lanate or white-tomentose, pinnatifid, with lanceolate to oblong segments. Capitula solitary. Involucre 15–16 × 8–15 mm, ovoid, ovoid-globose or -cylindrical; appendages ovate to orbicular, covering bracts, with a large, triangular to orbicular, black central spot, the margin white, hyaline, denticulate, lacerate or entire, the apex mucronate. Florets purple, the outer erecto-patent. Achenes 3–4 mm; pappus shorter than to somewhat longer than achene. *Rocky slopes and cliffs in alpine and montane zones.* ● *S. part of Balkan peninsula.* Al Gr Ju.

1 Leaves green, shortly hairy (a) subsp. **deustiformis**

1 Leaves greyish or white, floccose-lanate or white-tomentose

2 Leaves floccose-lanate; involucre ovoid-globose; appendages not decurrent, with orbicular central spot (b) subsp. **ptarmicifolia**

2 Leaves white-tomentose; involucre ovoid; appendages decurrent, with triangular central spot (c) subsp. **pseudocadmea**

(a) Subsp. **deustiformis**: Leaves green, shortly hairy. Involucre 8 mm in diameter, ovoid-cylindrical; appendages ovate, with a triangular central spot, the margin entire. Pappus shorter than achene. *Albania and Macedonia.*

(b) Subsp. **ptarmicifolia** (Halácsy ex Hayek) Dostál, *Bot. Jour. Linn. Soc.* **71**: 205 (1976) (*C. ptarmicifolia* Halácsy ex Hayek): Leaves greyish, floccose-lanate. Involucre 12–15 mm in diameter, ovoid-globose; appendages orbicular, with an orbicular central spot, the margin lacerate. Pappus shorter than achene. *S. Albania, N.W. Greece.*

(c) Subsp. **pseudocadmea** (Wagenitz) Dostál, *op. cit.* 206 (1976) (*C. pseudocadmea* Wagenitz, *C. cadmea* auct. eur., non Boiss.): Leaves appressed-white-tomentose. Involucre 8–10 mm in diameter, ovoid; appendages broadly obovate, with a triangular central spot, the margin indistinctly decurrent, entire or denticulate below, truncate and fimbriate at the apex. Pappus about as long as achene. *S.E. Greece* (*N.W. of Athinai*).

169. C. ferulacea U. Martelli, *Nuovo Gior. Bot. Ital.* nov. ser., **3**: 370 (1896). Perennial. Stems 5–30 cm, the base covered with withered leaf-bases, sparingly corymbosely branched and almost leafless above. Leaves shiny, tomentose when young, glabrescent; lower in a basal rosette, with a short, reddish-brown-lanate petiole, the lamina more or less obovate, pectinate-pinnatisect, the segments numerous, setiform, acute, with cartilaginous apex;

upper few, remote, small; uppermost sessile at the base of branches, small. Capitula solitary. Involucre 18–20 mm in diameter, globose; appendages up to 10 mm wide, covering bracts, orbicular, hyaline, white, with an ovate, blackish-brown central spot, lacerate, denticulate, the apex with short mucro. Florets purple. Pappus as long as or somewhat longer than achene. $2n=18$. *Calcareous rocks.* ● *E. Sardegna* (*Baunei*). Sa.

170. C. musarum Boiss. & Orph. in Boiss., *Diagn. Pl. Or. Nov.* **3(5)**: 112 (1856). Perennial. Stems up to 20 cm, caespitose, procumbent, the apex ascending, simple or sparingly branched, leafy up to the inflorescence. Leaves appressed-hairy, greyish-green; lower shortly petiolate, pinnatifid, with oblanceolate to ovate segments, entire or lobed, the upper pinnatisect; uppermost lyrately lobed or entire, oblong. Capitula solitary. Involucre 20–25 mm in diameter, subglobose; appendages orbicular, covering bracts, convex, with ovate, blackish-brown central spot, the margin broadly white-membranous, erose-denticulate, the apex obtuse, muticous. Florets yellow, the outer somewhat patent. Achenes *c.* 3 mm, pale; pappus as long as or up to twice as long as achene. *Mountain rocks.* ● *S.C. Greece* (*Parnassos*). Gr.

Subgen. **Jacea** (Miller) Hayek. Perennial. Lower leaves undivided or pinnately lobed; middle leaves entire or dentate, not pinnatisect. Appendages entire to fimbriate, muticous or mucronulate. Pappus present or absent.

Sect. JACEA. Appendages broadly ovate or orbicular, usually covering bracts, the margin entire, lacerate, or denticulate. Pappus usually absent.

171. C. haynaldii Borbás ex Vuk., *Rad Jugosl. Akad. Znan. Umj.* **58**: 149 (1881) (*C. jacea* subsp. *haynaldii* (Borbás ex Vuk.) Hayek). Perennial. Stems 20–60 cm, caespitose, erect, simple or with few short branches above. Leaves green above, floccose and grey but becoming green beneath, undivided, ovate or ovate-lanceolate, mucronate; lower petiolate; middle sessile, entire or remotely dentate; upper smaller, the uppermost crowded, subtending the capitula. Capitula solitary. Involucre 18–22 mm in diameter, globose; appendages 10 mm wide, covering the green, distinctly veined bracts, scarious, convex, greyish-brown, irregularly denticulate, muticous, with darker, blackish-brown, rarely white centre. Florets purple, the outer strongly radiate. Achenes 3·5 mm, pale greyish; pappus absent. ● *Mountains of Jugoslavia and N. Albania.* Al ?It Ju ?Rm.

Subsp. **julica** (Hayek) E. Mayer in Lazar, *Ad Annum Horti Bot. Labac. Solemn. CL* 39 (1960), from N.E. Italy and N.W. Jugoslavia, differs from typical **171** chiefly in having broadly elliptical, pale green leaves and the involucre *c.* 25 mm in diameter, with lacerate appendages; its status is uncertain.

172. C. bracteata Scop., *Delic. Fl. Insubr.* **2**: 17 (1786) (*C. jacea* subsp. *bracteata* (Scop.) Hayek). Perennial. Stems up to 60 cm, caespitose, erect or ascending, shortly and sparingly branched at the middle. Leaves floccose-tomentose or green and sparsely arachnoid-hairy, scabrid; lower petiolate, ovate-lanceolate, undivided, rarely lyrately lobed, denticulate, mucronate; upper lanceolate, subtending the capitula. Capitula solitary. Involucre 14–20 × (12–)14–20 mm, globose or broadly cylindrical; appendages orbicular, covering bracts, convex, scarious, white, sometimes darker, the margin 6–8 mm wide, involute, entire or somewhat lacerate, the apex obtuse. Florets pinkish-orange, the outer radiate. Achenes 3 mm, pale greyish-brown; pappus absent. *Dry hillsides.* ● *S. Alps and mountains of N.W. Jugoslavia.* Au Ga He It Ju.

173. C. weldeniana Reichenb., *Fl. Germ. Excurs.* 213 (1831). Perennial. Stems 30–60 cm, caespitose, erect, sparingly branched below the middle, the branches long, virgate. Leaves scabrid, sparsely greyish-tomentose or arachnoid-hairy, undivided; basal broadly lanceolate, acute; cauline lanceolate. Capitula solitary, subtended by the uppermost leaves. Involucre *c.* 13 × 10 mm, ovoid-cylindrical; appendages orbicular, covering the indistinctly veined bracts, scarious, convex, white to yellowish or pale reddish-brown, entire or irregularly denticulate, involute above, the apex acute. Florets pinkish-orange, the outer radiate. Achenes *c.* 3 mm, pale greyish-brown; pappus absent. *Stony grassland.* ● *E. Mediterranean region.* Al Gr It Ju.

Intermediates between **173** and **175** occur frequently in the S.E. Alps and Balkan peninsula (*C. weldeniana* var. *balcanica* Hayek, *C. stenophylla* Wilmott, non Dufour).

174. C. rocheliana (Heuffel) Dostál, *Bot. Jour. Linn. Soc.* **71**: 205 (1976) (*C. jacea* var. *rocheliana* Heuffel, *C. jacea* subsp. *banatica* Hayek). Perennial. Stems 60–100(–150) cm, caespitose, erect or ascending, sparingly branched at the middle, the branches long, erect. Leaves scabrid, greyish-arachnoid-tomentose, sometimes green; basal ovate-lanceolate, entire, denticulate or with a few lobes, acute; cauline broadly lanceolate, rounded or subcordate at the base. Capitula solitary. Involucre 13(–16) × 11–12(–15) mm, ovoid-globose; appendages 5–6 mm wide, covering the distinctly veined bracts, orbicular, scarious, convex, greyish-brown, denticulate, the central vein produced into a very short mucro. Florets pinkish-orange, the outer radiate. Achenes *c.* 3 mm, pale greyish-brown; pappus absent. *Sandy hills, meadows, open forests.* ● *From S. Hungary to N. Bulgaria.* Bu Hu Ju Rm.

175. C. pannonica (Heuffel) Simonkai, *Math. Term. Közl.* **24**: 620 (1891) (*C. angustifolia* Schrank, non Miller). Perennial. Stems 30–100 cm, 1–3, erect or ascending, branched at or above the middle, the branches virgate, erecto-patent, long. Leaves scabrid, green or sparsely hairy, glabrescent; basal dead at anthesis, lanceolate, entire, rarely lobed; cauline linear to lanceolate, entire to pinnately lobed. Capitula solitary or in dense corymbs. Involucre *c.* 15 × 10–12 mm, ovoid-globose or -cylindrical; appendages orbicular, almost covering the appressed bracts, with blackish- or yellowish-brown centre, the margin white or pale reddish-brown, entire, lacerate or irregularly denticulate, muticous. Florets pink, the outer radiate. Achenes *c.* 3 mm, greyish-brown; pappus absent. $2n=22$, 44. *C. & S.E. Europe.* Al Au Bu Cz Ga Ge He Hu ?It Ju Po Rm Rs (C, W, K, E).

Intermediates between **175** and **178** from E.C. Europe have been described as **C. jacea** subsp. **jungens** Gugler, *Mitt. Bayer. Bot. Ges.* **1**: 406 (1904). Intermediates also occur between **175** and **174**, and between **175** and **172**, as well as between **175** and various other species of Sect. *Jacea* and *Lepteranthus*.

(a) Subsp. **pannonica**: Leaves green or sparsely greyish-arachnoid-hairy; cauline lanceolate to linear, entire, rarely pinnately lobed. Capitula solitary, shortly pedunculate. Involucre *c.* 10 mm in diameter; appendages irregularly denticulate. ● *C. & S.E. Europe.*

(b) Subsp. **substituta** (Czerep.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 206 (1976) (*C. substituta* Czerep.): Leaves greyish-green, arachnoid-pubescent; lower cauline oblong-lanceolate; upper linear-lanceolate, remotely denticulate to sinuately lobed. Capitula in dense corymbs. Involucre 12–16 mm in diameter; appendages lacerate or lacerate-fimbriate. *S.W. part of U.S.S.R.*

176. C. vinyalsii Sennen, *Brotéria* (*Bot.*) **23**: 88 (1927). Like **175** but leaves hastate to auriculate at the base, lanate-pubescent or arachnoid-hairy, glabrescent; capitula solitary; involucre *c.* 15 × 12–14(–16) mm; appendages with lacerate margin, the outer sometimes with fimbriate margin. ● *W. & W.C. Europe.* Ga Hs It Lu.

(a) Subsp. **vinyalsii**: Leaves lanate-pubescent, glabrescent; lower cauline lingulate-lanceolate, sinuately pinnatifid at the base; upper narrowly linear, entire. Capitula subtended by the uppermost leaves. Involucre 12–14(–16) mm in diameter. *N.E. Spain.*

(b) Subsp. **approximata** (Rouy) Dostál, *Bot. Jour. Linn. Soc.* **71**: 206 (1976) (*C. amara* prol. *approximata* Rouy): Leaves greyish-green, sparsely arachnoid-hairy; cauline linear, with 1–2 linear laciniae on each side at the base. Involucre *c.* 12 mm in diameter. *Throughout the range of the species.*

177. C. dracunculifolia Dufour, *Ann. Sci. Nat.* **23**: 157 (1831)• Perennial. Stems 20–60 cm, slender, simple or virgately branched, procumbent or ascending. Leaves sparsely lanate, minutely punctate, undivided, linear-lanceolate; lower entire or remotely denticulate; middle sessile, entire. Capitula solitary, small. Involucre 11–12 × 6–8 mm, cylindric-obconical; appendages obovate-orbicular, wider than and covering the distinctly veined, broadly ovate bracts, with pale reddish-brown centre, the margin hyaline, lacerate-denticulate. Florets purple, the outer strongly radiate. Achenes *c.* 3 mm; pappus absent. $2n=22$. *Saline grassland.* ● *E. Spain, just extending to S. France.* Ga Hs.

178. C. jacea L., *Sp. Pl.* 914 (1753) (*C. amara* L. pro parte). Perennial. Stems 50–120 cm, 1–5, erect or ascending, scabrid, simple or sparingly branched from the middle, thickened below the capitula. Leaves scabrid on the margin and beneath, green, hairy; basal ovate to broadly lanceolate, entire, dentate or pinnately lobed; cauline sessile, oblong-lanceolate, entire or dentate. Capitula in a corymb. Involucre 15–18 × 12(–15) mm, ovoid; appendages appressed, orbicular, usually covering bracts, scarious, pale brown, darker in the centre, muticous, the outer bracts denticulate to pectinate-lacerate. Florets purple, rarely white, the outer more or less radiate. Achenes *c.* 3 mm, pale greyish- to blackish-brown; pappus absent or very short. $2n=22$, 44. *Grassland and open woods. Most of Europe, except the islands.* Al Au Be Bu Cz Da Fe Ga Ge Gr He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Si Su Tu [Br].

Many morphological intermediates between **178** and **186**, **187** and **188** occur and have been given formal recognition; it is probable, however, that they are of hybrid origin.

Sect. FIMBRIATAE (Hayek) Dostál. Appendages triangular or ovate-triangular, lanceolate or ovate-lanceolate, covering bracts, the margin pectinate-fimbriate, the terminal fimbriae longer than the lateral. Pappus present or absent.

179. C. decipiens Thuill., *Fl. Paris* ed. 2, 445 (1800). Perennial. Stems 30–60 cm, erect or ascending from the base, simple or corymbosely branched, with 5–6 leaves. Leaves green or greyish-tomentose; lower elliptical or oblanceolate, entire, dentate or lyrately lobed, long-petiolate; upper narrowly elliptical or lanceolate, acute. Capitula solitary, sessile. Involucre 12–14 × 10–12 mm, ovoid or subglobose; appendages ovate-lanceolate, erect, covering the ovate, 3- to 5-veined bracts, pectinate-fimbriate, pale brown, the fimbriae up to 2 mm, 9–10 on each side. Florets purple, the outer not distinctly radiate. Achenes *c.* 3 mm; pappus absent. *Pastures.* ● *W. Europe, from Norway to S. France.* Be Da Ga Ge Ho ?It No.

(a) Subsp. **decipiens**: Stems 30–40 cm, simple or branched above. Leaves greyish-tomentose. Involucral bracts 5-veined. *Mainly in the north part of the range of the species, except the Netherlands.*

(b) Subsp. **ruscinonensis** (Boiss.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 206 (1976) (*C. ruscinonensis* Boiss.): Stems up to 60 cm, branched at middle. Leaves green, scabrid or sparsely arachnoid-hairy. Involucral bracts 3- to 5-veined. *Mainly in the south part of the range of the species.*

180. C. subjacea (G. Beck) Hayek, *Denkschr. Akad. Wiss. Math.-Nat. Kl.* (*Wien*) **70**: 712 (1901). Perennial. Stems 30–50 cm, erect, sparingly branched above, densely leafy. Leaves green, rarely almost greyish, entire or denticulate; basal ovate-lanceolate, sinuate-dentate; cauline ovate-lanceolate. Capitula solitary, sessile. Involucre 14 × 12–14 mm, ovoid-globose; appendages ovate-triangular, usually covering bracts, erect, blackish-brown, pectinate-fimbriate, the fimbriae *c.* 2 mm, 10–15 on each side, blackish-brown, rarely paler, flexuous, the terminal fimbriae scarcely longer. Florets deep pink, the outer radiate. Achenes *c.* 3 mm; pappus absent. *Mountain meadows.* ● *C. Europe.* Au Cz Ge Hu Po.

181. C. macroptilon Borbás, *Vasvárm. Növ. Fl.* 192 (1877). Perennial. Stems 60–80 cm, erect, branched above, the branches thickened below the capitula. Leaves green, scabrid, crispate-hairy; lower ovate-lanceolate or elliptical, denticulate or lobed; upper lanceolate, subentire or sinuate-dentate. Capitula solitary or in pairs. Involucre 15–17 × 12–14 mm, ovoid or ovoid-globose; bracts green, prominently veined; appendages up to 5–8 mm, lanceolate, arcuate-recurved, pectinate-fimbriate, the fimbriae 8–15 on each side, the terminal the longest. Florets pink, the outer radiate. Achenes *c.* 3 mm; pappus absent or very short. ● *E.C. Europe, W. Jugoslavia.* Au Cz Hu ?It Ju Po.

(a) Subsp. **oxylepis** (Wimmer & Grab.) Soó, *Acta Bot. Acad. Sci. Hung.* **18**: 176 (1973) (*C. jacea* subvar. *oxylepis* Wimmer & Grab.): Lower leaves ovate-lanceolate. Capitula solitary. Involucre 16–17 × 13–14 mm; appendages completely covering bracts, up to 8 mm. *Carpathian and Sudeten Mts.*

(b) Subsp. **macroptilon**: Lower leaves elliptical. Capitula solitary or 2–3 together. Involucre 15 × 12 mm; appendages up to 5 mm, partially covering bracts. *Throughout the range of the species except the north.*

C. zlatarskyana Urum. & H. Wagner, *Magyar Bot. Lapok* **6**: 166 (1907), described from Bulgaria (Karlovo), has been shown to be based on a mixed gathering of immature specimens of previously described species.

C. magocsyana H. Wagner, *Magyar Bot. Lapok* **2**: 281 (1903) (incl. *C. pseudomagocsyana* Prodan), from Romania, like **181** but with triangular appendages *c.* 10 × 2 mm covering the bracts and the fimbriae confluent below into a lacerate membrane, **C. pugioniformis** E. I. Nyárády, *Borbásia Nova* **19**: 5 (1943), from Romania, like **181** but with narrowly lanceolate appendages not covering the bracts, **C. degeniana** H. Wagner, *Magyar Bot. Lapok* **6**: 114 (1907) (*C. phrygia* subsp. *degeniana* (H. Wagner) Stoj. & Acht.), from Bulgaria and Romania, like **181** but with oblong to elliptical, white-tomentose leaves, involucre 15 mm in diameter and narrowly lanceolate, brown appendages not covering the bracts, **C. pseudodegeniana** Prodan, *Anal. Acad. Rep. Pop. Române* **3(18)**: 682 (1950), from Romania, like **181** but with white-tomentose leaves, narrower, cylindrical involucre and yellowish, narrowly lanceolate appendages, and **C. degenianiformis** Prodan, *op. cit.* 678 (1950), from Romania, like **181** but with narrowly lanceolate, brown appendages, are all probably of hybrid origin with **181** as one of the parents.

182. C. microptilon Gren. & Godron, *Fl. Fr.* **2**: 242 (1851). Perennial. Stems 30–100 cm, erect, much-branched. Leaves green, sparsely tomentose beneath, the lower lanceolate, sinuate-dentate to pinnatifid, the upper linear to lanceolate, entire or lobed. Capitula solitary, sessile. Involucre 10–13 × (6–)8–10 mm, ovoid; appendages lanceolate or triangular-lanceolate, sometimes covering bracts, blackish- or reddish-brown, pectinate-fimbriate, the fimbriae 2–2·5 mm, brown, erect or flexuous, 7–10 on each side. Florets purple or pink, the outer radiate. Achenes *c.* 2·5 mm; pappus very short. *Roadsides, pastures and wood-margins.* ● *W. Europe, from the Netherlands to N. Spain.* Be Ga Ho Hs.

(a) Subsp. **microptilon**: Branches slender, long. Leaves green or sparsely white-tomentose, the cauline linear, entire or dentate at the base, the uppermost remote. Capitula shortly pedunculate. Appendages lanceolate, not completely covering bracts, the fimbriae 2 mm, 7–8 on each side, erect. *Throughout the range of the species.*

(b) Subsp. **emporitana** (Vayr. ex Hayek) Dostál, *Bot. Jour. Linn. Soc.* **71**: 206 (1976) (*C. emporitana* Vayr. ex Hayek): Branches short, densely leafy. Leaves arachnoid-tomentose, the cauline lanceolate, hastate at the base, the uppermost closely subtending capitula. Appendages triangular-lanceolate, covering bracts, the fimbriae *c.* 2·5 mm, 10 on each side, flexuous. *N. Spain.*

Sect. NIGRESCENTES (Hayek) Dostál. Appendages triangular, ovate-triangular or -lanceolate to orbicular, usually not covering bracts, the margin pectinate-fimbriate, the terminal fimbriae shorter than the lateral. Pappus present or absent.

The species of this Section, although well-characterized, are very closely related to each other and transitional variants between them often occur.

183. C. transalpina Schleicher ex DC., *Prodr.* **6**: 571 (1838) (*C. dubia* Suter, non S. G. Gmelin). Perennial. Stems 40–80 cm, stout, with short, arcuate-erect branches. Leaves scabrid, green, the lower petiolate, oblong, subentire or sinuate-dentate, the upper oblong-lanceolate, narrowed to the cordate or sub-amplexicaul base. Capitula solitary or in clusters of 2–4. Involucre 12–18 × 12–15 mm, globose; appendages 1·5–2 mm, broadly triangular to ovate-lanceolate, more or less covering the bracts, dark brown, pectinate-fimbriate, the fimbriae 1–2 mm, 8–12 on each side; inner appendages brown, lacerate. Florets pink or orange-pink, the outer not radiate. Achenes 2·5–3 mm; pappus absent or very short. $2n=44$. *Mountain pastures.* ● *S. slopes of the Alps.* Au Ga He It.

184. C. nigrescens Willd., *Sp. Pl.* **3**: 2288 (1803) (*C. rotundifolia* (Bartl.) Hayek pro parte). Perennial. Stems 40–100 cm, erect, with few erecto-patent branches. Leaves scabrid, green or tomentose; lower petiolate, oblong-lanceolate, entire to sinuately or lyrately lobed; upper ovate-lanceolate or lanceolate, attenuate at the base, entire to pinnatifid. Capitula solitary, pedunculate. Involucre 12–14 × 6–12 mm, ovoid-cylindrical; bracts laxly imbricate; appendages 1–1·5 mm, triangular, not covering bracts, blackish-brown, pectinate-fimbriate, the fimbriae 6–8 on each side, pale brown, scarcely longer than the width of the very narrow margin. Florets purple, the outer sometimes radiate. Achenes 3 mm; pappus absent or the inner achenes with a very short pappus. $2n=44$. ● *S.C. & E. Europe, extending southwards to S. Italy and N. Bulgaria.* Au Bu *Cz Ga Ge He Hu It Ju Rm ?Rs (W).

1 Leaves scabrid
 2 Lower leaves lyrately lobed, the upper pinnatifid; involucre 6–7 mm in diameter, ovoid-cylindrical; appendages brown (d) subsp. **pinnatifida**
 2 All leaves entire or with few teeth; involucre 10–11 mm in diameter, ovoid-cylindrical (a) subsp. **nigrescens**
1 Leaves arachnoid-lanate or densely tomentose
 3 Involucre 8–10 mm in diameter, ovoid-cylindrical; appendages triangular, erect (b) subsp. **ramosa**
 3 Involucre narrowly cylindrical
  4 Appendages triangular, erect, black (e) subsp. **smolinensis**
  4 Appendages orbicular, recurved, brown (c) subsp. **neapolitana**

(a) Subsp. **nigrescens** (*C. vochinensis* Bernh. ex Reichenb.): Stems branched. Cauline leaves ovate-lanceolate, attenuate at the base, entire or with few teeth. Involucre (9–)10–11 mm in diameter, ovoid-cylindrical. Outer florets not radiate. *From S. Germany to Romania and Bulgaria, but only north and east of the Alps.*

(b) Subsp. **ramosa** Gugler, *Centaur. Ung. Nationalmus.* 69 (1907): Stems with long, thin, densely leafy branches. Leaves densely tomentose, narrowly lanceolate or linear. Involucre 10–11 mm in diameter, ovoid-globose; appendages brown, triangular, erect. *Meadows and pastures. Alps, mainly in the south-west.*

(c) Subsp. **neapolitana** (Boiss.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 206 (1976) (*C. neapolitana* Boiss.): Stems simple or with few branches. Cauline leaves narrowly oblong, entire or with few teeth. Involucre *c.* 10 mm in diameter, ovoid-cylindrical; appendages orbicular, brown. *C. & S. Italy.*

(d) Subsp. **pinnatifida** (Fiori) Dostál, *loc. cit.* (1976) (*C. vochinensis* forma *pinnatifida* Fiori): Stems with few, long, slender branches. Basal leaves oblong-lanceolate, lyrate, pinnatifid; cauline lanceolate, entire. Involucre 6–7 mm in diameter, ovoid; appendages triangular, brown. *Open* Castanea-*woods. N.C. Appennini* (*E. of Firenze*).

(e) Subsp. **smolinensis** (Hayek) Dostál, *loc. cit.* (1976) (*C. smolinensis* Hayek): Stems simple or with few branches. Leaves entire or dentate; lower ovate-lanceolate; upper narrowly lanceolate. Involucre *c.* 14 × 7–8 mm, narrowly cylindrical; appendages small, triangular, black. *Serpentine rocks. C. Jugoslavia* (*Bosna*).

185. C. carniolica Host, *Fl. Austr.* **2**: 517 (1831) (*C. rotundifolia* (Bartl.) Hayek pro parte). Perennial. Stems 50–80 cm, simple or with few long branches. Leaves grey-green, sparsely tomentose; lower broadly ovate, remotely dentate; upper ovate-lanceolate, rounded or amplexicaul at base. Capitula solitary or in clusters. Involucre *c.* 13 × 7–8 mm, ovoid-cylindrical; appendages small, not covering bracts, triangular, black, pectinate-fimbriate, with 5–9 fimbriae 1–1·5 mm on each side, the inner appendages with a black spot in the centre. Florets pink, the outer radiate. Achenes 3 mm; pappus absent. ● *S.E. Alps, N.W. Jugoslavia, Hungary.* Au Hu It Ju ?Rm.

Sect. LEPTERANTHUS (DC.) Dumort. Appendages linear to lanceolate, rarely orbicular, usually covering bracts, the margin pectinate-fimbriate, the terminal fimbriae longer than the lateral. Pappus usually present.

186. C. debeauxii Gren. & Godron, *Fl. Fr.* **2**: 243 (1851). Perennial. Stems 10–80 cm, erect or ascending, simple or branched. Leaves scabrid to greyish-arachnoid-hairy; lower ovate to narrowly lanceolate, entire to pinnatifid; upper oblong to linear-lanceolate, entire, sometimes lobed at base. Capitula usually solitary. Involucre 12–16 × 9–14 mm, ovoid-cylindrical to globose; appendages linear-lanceolate to ovate-triangular, almost or completely covering bracts, erect at apex, not attenuate into a narrow acumen, reddish-brown, pectinate-fimbriate, the lateral fimbriae as long as to 3 times as long as the width of the appendage, brown or yellowish-brown, the terminal fimbria not longer than appendage; appendages of inner bracts orbicular, scarious, lacerate. Florets pinkish-orange, the outer erect or radiate. Achenes *c.* 3 mm; pappus absent or very short. $2n=22$, 33, 44. ● *W. Europe, northwards to England and the Netherlands.* Be Br Co Ga Ge He Ho Hs It ?Sa [Cz].

1 Appendages of bracts linear- or triangular-lanceolate
 2 Leaves greyish-tomentose; involucre 9–12 mm in diameter; appendages with 7–9 fimbriae on each side (e) subsp. **debeauxii**
 2 Leaves green; involucre 10–14 mm in diameter; appendages with 12–16 fimbriae on each side
  3 Fimbriae 2–3 times as long as the width of the pale brown appendages; outer florets scarcely radiate (d) subsp. **nemoralis**
  3 Fimbriae as long as the width of the dark brown appendages; outer florets radiate (c) subsp. **thuillieri**
1 Appendages of bracts ovate-triangular
 4 Fimbriae as long as the width of the appendages, brown; appendages nearly covering bracts; leaves green (c) subsp. **thuillieri**
 4 Fimbriae longer than the width of the appendages, pale- or yellowish-brown or white; appendages covering bracts; leaves greyish-hairy
  5 Involucre 8–10 mm in diameter, ovoid-cylindrical (b) subsp. **nevadensis**
  5 Involucre 10–12 mm in diameter, ovoid (a) subsp. **endressii**

(a) Subsp. **endressii** (Hochst. & Steudel ex Lamotte) Dostál, *Bot. Jour. Linn. Soc.* **71**: 206 (1976) (*C. endressii* Hochst. & Steudel ex Lamotte): Leaves shortly greyish-hairy. Involucre 10–12 mm in diameter, ovoid; appendages ovate-triangular, covering bracts, the fimbriae longer than the width of the appendage, pale brown, 10–13 on each side. Outer florets radiate. *Pyrenees.*

(b) Subsp. **nevadensis** (Boiss. & Reuter) Dostál, *loc. cit.* (1975) (*C. nevadensis* Boiss. & Reuter): Like subsp. (a) but leaves greyish-arachnoid-hairy; involucre 8–10 mm in diameter, ovoid-cylindrical; fimbriae yellowish-brown or white, 12–15 on each side. Outer florets radiate. *S. Spain* (*Sierra Nevada*).

(c) Subsp. **thuillieri** Dostál, *op. cit.* 207 (1976) (*C. pratensis* Thuill., non Salisb.): Leaves green. Involucre 10–14 mm in diameter, ovoid-globose; appendages dark brown, ovate- to narrowly triangular, almost covering the bracts, the fimbriae as long as the width of the appendage, brown, 12–16 on each side. Outerflorets radiate. *Throughout the range of the species.*

(d) Subsp. **nemoralis** (Jordan) Dostál, *loc. cit.* (1976) (*C. nemoralis* Jordan, *C. nigra* sensu Hegi pro parte; incl. *C. inuloides* Willk.): Like subsp. (c) but appendages pale brown, triangular-lanceolate, mostly covering bracts, the fimbriae 2–3 times as long as the width of the appendage; outer florets scarcely radiate. *Throughout most of the range of the species.*

(e) Subsp. **debeauxii**: Leaves grey-tomentose. Involucre 9–12 mm in diameter, globose; appendages triangular- to linear-lanceolate, not completely covering bracts, the fimbriae 3 times as long as the width of the appendage, yellowish-brown, 7–9 on each side. Outer florets not radiate. *S.W. France, N. Spain.*

187. C. nigra L., *Sp. Pl.* 911 (1753). Perennial. Stems (15–)30–100 cm, erect or ascending, simple to corymbosely branched, the branches thickened below the capitula. Leaves green, to greyish-arachnoid-hairy; lower ovate to lanceolate, entire, dentate or lobed; upper entire, lanceolate. Capitula solitary or in clusters at apices of branches. Involucre 12–18 × 15–20 mm, globose; appendages black or blackish-brown, ovate-orbicular to linear-lanceolate, mostly completely covering bracts, the apex somewhat recurved, plumosely pectinate-fimbriate, the fimbriae shorter than or up to 3 times as long as the width of the appendage, 10–20 on each side, dark to pale brown. Florets purple, the outer usually not radiate. Achenes *c.* 3 mm, compressed; pappus ~~1–1~~ as long as achene. $2n=22$, 44. ● *Europe eastwards to Sweden and C. Italy; one station in C. Jugoslavia.* Be Br Ga Ge Hb He Ho Hs It Ju Lu No Su [Au Cz Da].

Variation in this species has been discussed by D. J. Ockendon, S. M. Walters & T. P. Whiffen, *Proc. Bot. Soc. Brit. Is.* 7: 549–552 (1969).

1 Outer florets somewhat radiate; involucre *c.* 18 mm in diameter (c) subsp. **rivularis**
1 Outer florets not radiate; involucre 12–15 mm in diameter
 2 Fimbriae dark brown, 15–20 on each side (a) subsp. **nigra**
 2 Fimbriae pale- or yellowish-brown, 14–16 on each side (b) subsp. **carpetana**

(a) Subsp. **nigra**: Leaves glabrous, green; lower elliptical to ovate-lanceolate. Appendages broadly ovate-triangular, covering bracts, the fimbriae as long as or somewhat longer than width of appendage, 15–20 on each side, dark brown. Outer florets not radiate. $2n=22$. *Throughout the range of the species except Portugal.*

(b) Subsp. **carpetana** (Boiss. & Reuter) Nyman, *Consp.* 422 (1879) (*C. carpetana* Boiss. & Reuter): Leaves shortly hairy, with scabrid margin; lower ovate to ovate-lanceolate. Appendages ovate, covering bracts, the fimbriae as long as width of appendage, 14–16 on each side, pale brown or yellowish-brown. Outer florets not radiate. *W. Pyrenees and mountains of C. Spain.*

(c) Subsp. **rivularis** (Brot.) Coutinho, *Fl. Port.* 655 (1913): Like subsp. (b) but lower leaves lanceolate to ovate-lanceolate; appendages not completely covering bracts; fimbriae as long as or slightly longer than width of appendage, 10–12 on each side; outer florets somewhat radiate. $2n=22$. *N. & C. Portugal.*

188. C. phrygia L., *Sp. Pl.* 910 (1753). Perennial. Stems 30–120 cm, erect, simple or branched, the branches thickened below the capitula. Leaves green to sparsely greyish-arachnoid-tomentose, undivided, lanceolate to ovate, entire or dentate, acute or acuminate; middle acute, rounded at the base or amplexicaul. Capitula usually solitary. Involucre 15–20 × 10–20 mm, ovoid to globose; appendages mostly covering bracts, those of the inner bracts ovate or orbicular, those of the middle bracts orbicular to lanceolate, pale brown to black, abruptly or gradually attenuate into a subulate-filiform, erect or recurved, plumosely pectinate-fimbriate acumen, the fimbriae 12–25 on each side, black, yellowish-brown or brown, 2–3 times as long as the width of the appendage. Florets pink to purple, the outer usually radiate. Achenes 3–4 mm; pappus 0·5–2 mm. *Grassland and open woods. N., C. & E. Europe and N. part of Balkan peninsula.* Al Au Bu Cz Da Fe Ge He Hu It Ju No Po Rm Rs (N, B, C, W, K, E) [Su].

1 Involucre *c.* 10 mm in diameter, ovoid (h) subsp. **ratezatensis**
1 Involucre (12–)14–18(–20) mm in diameter, globose or ovoid-globose (i) subsp. **rarauensis**
 2 Leaves arachnoid-tomentose; stem simple, rarely with 2–3 branches
 2 Leaves green, glabrous, puberulent or sparsely arachnoid-tomentose beneath; stem branched
  3 Inner appendages exserted, distinctly exceeding the middle appendages
   4 Appendages of middle bracts ovate or broadly lanceolate, gradually attenuate into an acumen (a) subsp. **phrygia**
   4 Appendages of middle bracts broadly ovate or orbicular or triangular, abruptly attenuate into an acumen

5 Appendages of middle bracts triangular or broadly ovate, straight (b) subsp. **melanocalathia**
5 Appendages of middle bracts orbicular, recurved (e) subsp. **nigriceps**
3 Inner involucral appendages not exserted, not exceeding the middle appendages
6 Involucre 14–18 mm in diameter; appendages of middle bracts broadly lanceolate or ovate, abruptly attenuate into a filiform acumen; upper leaves ovate-orbicular
7 Leaves green; involucre 17–18 mm in diameter; appendages broadly lanceolate, blackish-brown (c) subsp. **carpatica**
7 Leaves arachnoid-hairy; involucre 14 mm in diameter; appendages ovate, black (d) subsp. **moesiaca**
6 Involucre 12–20 mm in diameter; appendages of middle bracts triangular-lanceolate, gradually attenuate into a filiform acumen; upper leaves ovate or ovate-lanceolate
8 Appendages of middle bracts with the apex lanceolate-acuminate, erect (g) subsp. **abbreviata**
8 Appendages of middle bracts with the apex subulate or filiform
9 Appendages of middle bracts brown, narrowly lanceolate, the apex long-subulate-acuminate (f) subsp. **pseudophrygia**
9 Appendages of middle bracts black, ovate, abruptly attenuate into a filiform acumen (d) subsp. **moesiaca**

(a) Subsp. **phrygia** (*C. austriaca* Willd.): Stems up to 80 cm, sparingly branched. Leaves green, hairy when young. Capitula solitary. Involucre 15–18 × 14–16 mm, globose; appendages of middle bracts ovate, black, gradually attenuate into a filiform, shortly recurved apex; appendages of inner bracts exserted, distinctly exceeding those of the middle bracts. Florets purple, the outer radiate. $2n=22$. *In the north and west parts of the range of the species, south-eastwards to Czechoslovakia and Romania.*

(b) Subsp. **melanocalathia** (Borbás) Dostál, *Bot. Jour. Linn. Soc.* **71**: 207 (1976) (*C. melanocalathia* Borbás): Like subsp. **(a)** but appendages of middle bracts shorter, triangular or broadly ovate, abruptly attenuate into a short, subulate, black, straight apex; florets dark violet. ● *E.C. Europe.*

(c) Subsp. **carpatica** (Porc.) Dostál, *loc. cit.* (1976) (*C. plumosa* var. *carpatica* Porc.): Stems up to 120 cm, simple or sparingly branched. Leaves green, broadly ovate. Capitula solitary. Involucre 18–20 × 17–18 mm, ovoid-globose; appendages of middle bracts blackish-brown, broadly lanceolate, abruptly attenuate into a filiform, recurved acumen; appendages of outer bracts imbricate, not exceeding those of the middle bracts. Florets purple, the outer radiate. ● *E. Carpathians.*

(d) Subsp. **moesiaca** (Urum. & H. Wagner) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 789 (1931): Like subsp. **(c)** but leaves arachnoid-hairy; involucre 16 × 14 mm; appendages of middle bracts black, ovate; outer florets not radiate. ● *Bulgaria.*

(e) Subsp. **nigriceps** (Dobrocz.) Dostál, *Bot. Jour. Linn. Soc.* **71**:207 (1976) (*C. nigriceps* Dobrocz.): Stems up to 100 cm, branched. Leaves glabrous above, puberulent beneath. Capitula solitary or in clusters of 3–4. Involucre 15–17 mm in diameter, globose; appendages of middle bracts orbicular, abruptly attenuate into a filiform, recurved apex; appendages of inner bracts exserted, distinctly exceeding those of the middle bracts. Florets pinkish-purple, the outer radiate. ● *Ukrainian Carpathians.*

(f) Subsp. **pseudophrygia** (C. A. Meyer) Gugler, *Mitt. Bayer. Bot. Ges.* **1**: 408 (1904) (*C. pseudophrygia* C. A. Meyer): Stems up to 100 cm, more or less branched. Leaves green, scabrid, rarely sparsely arachnoid-hairy beneath, oblong-lanceolate to ovate, acuminate. Capitula solitary or in clusters of 2–4. Involucre 15–20 × 12–20 mm, ovoid-globose; appendages more or less covering bracts, those of the middle bracts pale brown, narrowly lanceolate, gradually attenuate into a long-subulate, straight, brown or blackish-brown acumen, the lower fimbriae crowded, the upper remote; appendages of inner bracts not exceeding those of the middle bracts. Florets pinkish-purple, the outer radiate. $2n=22$. ● *C. Europe, Denmark and Norway, S. part of U.S.S.R.*

(g) Subsp. **abbreviata** (C. Koch) Dostál, *Bot. Jour. Linn. Soc.* **71**: 207 (1976) (*C. salicifolia* var. *abbreviata* C. Koch): Stems 30–60 cm, sparingly branched. Leaves green, puberulent, oblong-lanceolate. Capitula solitary. Involucre 17–20 × 12–15 mm, ovoid-globose; appendages not completely covering bracts, those of the middle bracts black or dark brown, broadly triangular-lanceolate, gradually attenuate into the lanceolate, erect apex; appendages of inner bracts not exceeding those of the middle bracts. Florets pinkish-purple, the outer radiate. *Mountains of Krym.* (*Caucasus, N. Anatolia.*)

(h) Subsp. **ratezatensis** (Prodan) Dostál, *loc. cit.* (1976) (*C. ratezatensis* Prodan): Stems up to 100 cm, sparingly branched. Leaves green, subglabrous, ovate. Capitula solitary. Involucre 20 × 10 mm, ovoid; appendages completely covering bracts, those of the middle bracts triangular-lanceolate, dark brown, the apex subulate, erect. Florets pink. *Steep, grassy, calcareous slopes.* ● *S. Carpathians (Mţii. Retezatului).*

(i) Subsp. **rarauensis** (Prodan) Dostál, *loc. cit.* (1976) (*C. rarauensis* Prodan): Stems 30–50 cm, simple, rarely branched. Leaves arachnoid-tomentose. Capitula solitary. Involucre 18 × 12 mm, ovoid-globose; appendages mostly covering bracts, those of the middle bracts dark brown, broadly triangular, attenuate into a filiform, subulate, erect or somewhat recurved acumen, appendages of inner bracts exserted. ● *N. & C. Romania.*

C. pectinata var. *fuscata* Rouy (*C. fuscata* Jordan, non Desf.), from S. France, is like **188(a)** but has the involucre *c.* 15 × 10 mm, the appendages of the middle bracts narrowly triangular and blackish-brown, those of the inner bracts not exserted, and the outer florets scarcely radiate. It perhaps originated as a hybrid between **186** or **187** and **193.**

It is possible that two elements may be distinguishable within subsp. **(f)**. One, corresponding with *C. pseudophrygia* C. A. Meyer sensu stricto, has the involucre 12–15 mm in diameter and narrow appendages and occurs from the E. Carpathians to the S. part of the U.S.S.R.; the other, which has been called *C. phrygia* var. *elatior* Gaudin, has the involucre 18–20 mm in diameter and wider appendages and occurs in the more central and westerly parts of the range of the subspecies.

189. C. stenolepis A. Kerner, *Österr. Bot. Zeitschr.* **22**: 45 (1872) (*C. cirrhata* Reichenb. pro parte). Perennial. Stems up to 100 cm, corymbosely branched above, densely leafy. Leaves tomentose, undivided, ovate to lanceolate; lower petiolate, denticulate, acuminate; upper and middle cuneate, rounded or cordate at base, or semiamplexicaul. Capitula solitary or in clusters at apices of branches. Involucre 15–18 × 9–14 mm, oblong-ovoid or ovoid-cylindrical; appendages not completely covering bracts, the inner orbicular, brown, not exserted; middle appendages lanceolate, attenuate into a subulate-filiform, arcuate-recurved, pectinate-fimbriate acumen 8–10 mm, the fimbriae as long as or longer than the width of the appendage, black at the base, pale at apex. Florets pinkish-orange, the outer radiate. Achenes *c.* 3·5 mm; pappus up to 0·5 mm. *Grassland and scrub.* ● *From Czechoslovakia and W. Ukraine southwards to C. Italy and N. Greece.* Au Bu Cz Gr Hu It Ju Rm Rs(w).

1 Leaves sparsely arachnoid-tomentose, the middle leaves cuneate or rounded at the base, not semiamplexicaul (a) subsp. **stenolepis**
1 Leaves green above, sparsely arachnoid or arachnoid-lanate beneath, the middle leaves semiamplexicaul
2 Capitula solitary; appendages blackish-brown, shortly pectinate-fimbriate (c) subsp. **bosniaca**
2 Capitula solitary or in clusters; appendages yellowish-brown, long-pectinate-fimbriate (b) subsp. **razgradensis**

(a) Subsp. **stenolepis** (*C. cetia* (G. Beck) H. Wagner): Stems 70–100 cm. Leaves ovate-lanceolate, sparsely arachnoid-tomentose, membranous, the middle cauline narrowed or rounded at the base. Capitula solitary. Involucre (10–)12–14 mm in diameter, shortly cylindrical; appendages pale yellow or yellowish-brown, shortly fimbriate, recurved. $2n=22$. *Throughout the range of the species.*

(b) Subsp. **razgradensis** (Velen.) Stoj. & Acht., *Stud. Centaur. Bulg.* 69 (1935): Stems 30–60 cm. Leaves green above, sparsely arachnoid-hairy beneath, membranous, the middle cordate at the base, semiamplexicaul. Capitula solitary or in clusters. Involucre 9 mm in diameter, oblong-ovoid; appendages yellowish-brown, long-fimbriate. *Bulgaria.*

(c) Subsp. **bosniaca** (Murb.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 207 (1976) (*C. pseudophrygia* subsp. *bosniaca* Murb., *C. phrygia* subsp. *bosniaca* (Murb.) Hayek): Stems 10–40 cm. Leaves green above, arachnoid-lanate beneath, membranous, the middle broadly rounded or subcordate at the base, semiamplexicaul. Capitula solitary. Involucre 10 mm in diameter, ovoid-cylindrical; appendages blackish-brown, shortly pectinate-fimbriate. *Mountains of C. Jugoslavia (Bosna).*

Subsp. **bansagensis** (H. Wagner) Soó, *Syn. Syst. Geobot. Fl. Veg. Hung.* **4**: 174 (1970) (*C. bansagensis* H. Wagner), from Romania, is like **189(b)** but has the leaves densely arachnoid-lanate, the middle cauline leaves lanceolate or elliptical, the involucre 14–18 × 12–14 mm and brown, recurved appendages; subsp. **joannis** Kárpáti, *Borbásia* **5–6**: 92 (1946), described from N.W. Jugoslavia, is like **189(c)** but has the leaves wider and shorter, the lower leaves green and the upper mostly lanate, clustered capitula and the involucre *c.* 10 × 3–4 mm; the status of both these taxa is uncertain.

190. C. indurata Janka, *Flora* (*Regensb.*) **41**: 444 (1858). Perennial. Stems 50–80(–100) cm, erect, sparingly branched. Leaves greyish-arachnoid-hairy, undivided, broadly lanceolate; lower dentate, acute, attenuate into the petiole; middle attenuate or rounded at the base. Capitulum solitary. Involucre 15 × 8–10 mm, ovoid or ovoid-cylindrical; appendages not completely covering bracts, dark brown, black at the base, narrowly lanceolate, attenuate into a subulate-filiform, recurved, pectinate-fimbriate, black acumen 6–7 mm, the fimbriae 8–12 on each side, pale brown, the middle ones 3 mm. Florets pinkish-orange or purple, the outer radiate. Achenes *c.* 3 mm; pappus very short. *Grassland and open woods.* ● *From E. Czechoslovakia to Bulgaria.* Bu Cz Hu Rm.

Probably a hybrid between **188** and **189.**

191. C. uniflora Turra, *Farset. Nov. Gen.* 12 (1765). Perennial. Stems 10–15(–20) cm, numerous, erect or ascending (rarely up to 50 cm and procumbent), leafy up to the apex. Leaves green to greyish-lanate-tomentose, undivided; lower oblong-lanceolate, ovate or elliptical, long-attenuate into the petiole; middle cauline truncate, auriculate or narrowed at base, entire to dentate; upper linear-lanceolate, entire, acuminate. Involucre 12–25 mm in diameter, ovoid-cylindrical to subglobose; appendages of inner bracts ovate, imbricate, not exserted; appendages of middle bracts blackish-brown, the acumen lanceolate-setaceous, plumose-fimbriate, recurved at the apex, the fimbriae *c.* 20–30 on each side. Florets violet, rarely white, the outer radiate. Achenes 3–4 mm; pappus 0·5–1 mm. $2n=22$. *Dry grassland, rocky slopes in montane and alpine regions.* ● *Alps and N. Appennini; S. Carpathians and mountains of N. & C. parts of Balkan peninsula.* Au Bu Ga Gr He It Ju Rm.

1 Leaves white-tomentose on both surfaces, later glabrous and greyish-green (a) subsp. **uniflora**
1 Leaves green, puberulent on both surfaces
2 Stem usually simple, with one capitulum; middle cauline leaves truncate, hastate or auriculate-semiamplexicaul at base, dentate; involucre 18–20(–25) mm in diameter, ovoid-globose (b) subsp. **nervosa**
2 Stem branched, with several capitula; middle cauline leaves gradually narrowed into a petiole, rounded at the base; involucre 12 mm in diameter, ovoid-cylindrical
3 Stem ascending; lower leaves sinuately lobed; appendages not covering bracts (c) subsp. **ferdinandi**
3 Stem erect; lower leaves entire; appendages completely covering bracts (d) subsp. **davidovii**

(a) Subsp. **uniflora**: Stems simple, rarely branched. Leaves white-tomentose, entire; lower oblong-lanceolate, gradually attenuate into the petiole; middle cauline lanceolate. Involucre 17–22 mm in diameter, subglobose; appendages covering bracts. *Pastures and rocky places in montane regions. S.W. Alps.*

(b) Subsp. **nervosa** (Willd.) Bonnier & Layens, *Fl. Fr.* 180 (1894) (*C. nervosa* Willd.): Stems erect, usually simple, with one capitulum. Leaves green, puberulent, dentate or sinuate-dentate; lower oblong-ovate, truncate at the base, hastate or auriculate-semiamplexicaul; upper narrowly elliptical. Involucre 18–20(–25) mm in diameter, ovoid-globose; appendages covering bracts. $2n=22$. *Throughout the range of the species.*

(c) Subsp. **ferdinandi** (Gren.) Bonnier, *Fl. Compl. Fr.* **6**: 45 (1923): Like subsp. **(b)** but stems ascending, branched; lower leaves sinuately lobed; capitula numerous; appendages not completely covering bracts. *S.W. & S.C. Alps.*

(d) Subsp. **davidovii** (Urum.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 208 (1976) (*C. davidovii* Urum., *C. nervosa* subsp. *davidovii* (Urum.) Hayek): Stems branched. Leaves green, puberulent, entire; lower elliptical, gradually attenuate into the petiole; upper lanceolate, rounded at base. Involucre 12 mm in diameter, ovoid-cylindrical; appendages completely covering bracts. *Bulgaria (Stara Planina).*

192. C. kernerana Janka, *Österr. Bot. Zeitschr.* **22**: 178 (1872) (*C. derventana* Janka, non Vis. & Pančić). Perennial. Stems 10–40 cm, simple or with 2 branches, ascending. Leaves green, subglabrous or hispidulous, scabrid; lower lanceolate, dentate, pinnatifid or pinnatilobed, attenuate into a petiole; uppermost oblong or ovate-lanceolate, sometimes subamplexicaul. Involucre 15 × 15–18 mm; appendages attenuate into a triangular-lanceolate, blackish, filiform, plumose-fimbriate, arcuate-recurved acumen up to 8 mm. Florets purple, the outer radiate. Achenes *c.* 4 mm; pappus 2–4 mm. *Mountain rocks.* ● *Bulgaria.* Bu.

(a) Subsp. **kernerana**: Leaves subglabrous, the uppermost oblong, not subamplexicaul. Florets pale purple. Pappus as long as achene. *Stara Planina; Rila Planina.*

(b) Subsp. **gheorghieffii** (Halácsy) Dostál, *Bot. Jour. Linn. Soc.* **71**: 208 (1976) (*C. gheorghieffii* Halácsy): Leaves hispidulous, the uppermost ovate-lanceolate, subamplexicaul. Florets purple. Pappus ½ as long as achene. *Rila Planina.*

193. C. pectinata L., *Sp. Pl.* ed. 2, 1287 (1763). Perennial. Stems 10–40 cm, erect or ascending, sparingly branched. Leaves subcoriaceous, glabrous or hairy, obovate to oblong, entire, dentate to pinnatisect; lower attenuate into the petiole; upper semiamplexicaul or narrowed to the base. Capitulum sessile, solitary. Involucre 18–20 × 13–18 mm, ovoid or subglobose;

appendages 8–10 mm, narrowly lanceolate-subulate, almost completely covering bracts, with recurved apex, yellowish-brown, or black at the base and dark brown at apex, densely pectinate-fimbriate, the fimbriae up to 3 mm, reddish-brown. Florets pink or purple, the outer sometimes radiate. Achenes *c.* 3 mm; pappus 0·5 mm. $2n=22$. *Dry, rocky places.* ● *S. & S.C. France, C. & E. Spain.* Ga Hs.

1 Involucre 18 mm in diameter; leaves acute **(b)** subsp. **acutifolia**
1 Involucre *c.* 15 mm in diameter; leaves obtuse
2 Leaves greyish-tomentose or -lanate; stems short **(c)** subsp. **supina**
2 Leaves green or greyish-green, glabrous or tomentose; stems long **(a)** subsp. **pectinata**

(a) Subsp. **pectinata**: Stems 20–40 cm. Leaves pale or greyish-green, tomentose; upper cordate at the base, semiamplexicaul. Involucre 15 mm in diameter, ovoid. *Throughout the range of the species.*

(b) Subsp. **acutifolia** (Jordan) Dostál, *Bot. Jour. Linn. Soc.* **71**: 208 (1976) (*C. acutifolia* Jordan): Stems up to 40 cm. Leaves green, glabrous, lobed at base, acute. Involucre 18 mm in diameter, subglobose. *S.C. France.*

(c) Subsp. **supina** (Jordan) Dostál, *loc. cit.* (1976) (*C. supina* Jordan): Like subsp. **(b)** but stems short; leaves greyish-tomentose or -lanate. *S. France.*

C. pectinata var. *thuretii* Briq. & Cavillier, from S.E. France (N. of Nice), is known only from the original gathering; it is like subsp. **(a)** but the leaves are green and glabrous, the upper narrowed at the base. It may possibly represent another subspecies.

194. C. antennata Dufour, *Ann. Sci. Nat.* **23**: 158 (1831). Perennial. Stems 5–10(–18) cm, procumbent, numerous, branched. Leaves spathulate-oblanceolate, entire; lower sometimes denticulate, obtuse; upper oblong, acute, surrounding capitulum. Capitula sessile. Involucre 8–10 mm in diameter, obovoid-obconical; appendages linear, brown, with recurved apex, long-pectinate-fimbriate, the fimbriae very shortly plumose. Florets pale purple, the outer scarcely radiate. Achenes *c.* 3·5 mm; pappus *c.* 1 mm. *Dry places.* ● *S.E. Spain.* Hs.

195. C. trichocephala Bieb. ex Willd., *Sp. Pl.* **3**: 2286 (1803). Perennial. Stems 40–60 cm, caespitose, numerous, erect, divaricately branched, densely leafy, thickened below the capitulum. Leaves linear to oblong-lanceolate, scabrid; lower entire, denticulate or lobed; upper linear-lanceolate. Capitula subsessile, solitary. Involucre 13–18 × 6–10 mm, ovoid-globose or ovoid-cylindrical, lanate; appendages 10 mm or more, pale or dark brown or yellow, attenuate into a narrowly linear-lanceolate, recurved acumen, pectinate-fimbriate, the fimbriae 3 mm, 10–14 on each side, equally spaced. Florets pink or purple, the outer radiate. Achenes *c.* 4 mm; pappus 1·5–2 mm. *S. part of U.S.S.R., Romania.* Rm Rs (C, W, E).

(a) Subsp. **trichocephala**: Leaves oblong-lanceolate, sinuately lobed, pale or yellowish-green. Involucre *c.* 18 × 10 mm, ovoid-globose; appendages *c.* 10 mm, not covering bracts, dark brown. *S. part of U.S.S.R.*

(b) Subsp. **simonkaiana** (Hayek) Dostál, *Bot. Jour. Linn. Soc.* **71**: 208 (1976) (*C. simonkaiana* Hayek): Leaves linear-lanceolate, entire or denticulate, greyish-green. Involucre 13–16 × 6–8 mm, ovoid-cylindrical; appendages more than 10 mm, mostly completely covering bracts, yellow. ● *Romania.*

196. C. janeri Graells, *Mem. Real Acad. Ci. Madrid* **2**: 466 (1859). Perennial. Stems 5–10 cm, numerous, ascending, simple. Leaves linear-lanceolate, entire, acute, greyish-white-lanate, the lower attenuate into a petiole. Capitula sessile, usually solitary, subtended by the uppermost leaves. Involucre 15 × *c.* 12 mm, ovoid-oblong; bracts conspicuously veined, tomentose; appendages short, linear, reddish-brown, somewhat recurved, pectinate-fimbriate, the fimbriae puberulent, with pale apex. Florets pink-violet, the outer slightly radiate. Achenes *c.* 5 mm, shining; pappus 2 mm, reddish. ● *Mountains of W.C. Spain (Sierra de Ávila).* Hs.

C. emigrantis Bubani, *Nuovo Gior. Bot. Ital.* **5**: 318 (1873), described from an unidentifiable locality in Spain, is like **196** but has narrower leaves and blackish appendages. Its status requires investigation.

197. C. linifolia L., *Mantissa* 117 (1767). Perennial. Stems 5–40 cm, procumbent, numerous, simple or sparingly branched. Leaves scabrid, linear, entire; lower obtuse; upper acute, the uppermost mucronate. Capitula solitary. Involucre 12–14 × 7–10 mm, subglobose; appendages narrowly linear-lanceolate, not completely covering the conspicuously veined bracts, dark brown at the base, reddish at the apex, pectinate-fimbriate, the fimbriae 4–6 on each side, remote, puberulent, with recurved apex. Florets purple, the outer somewhat radiate. Achenes *c.* 4 mm, pale; pappus 1·5 mm. $2n=44$. *Dry hillsides and cultivated ground.* ● *C., E. & S. Spain.* Hs.

198. C. hyssopifolia Vahl, *Symb. Bot.* **1**: 75 (1790). Perennial. Stems 10–30 cm, slender, erect, numerous, branched from the base. Leaves scabrid-puberulent, linear-lanceolate to linear, mucronate, entire. Capitula numerous, corymbose. Involucre 15–16 × 6–8 mm, ovoid-cylindrical; bracts conspicuously veined, tomentose; appendages 3–6 mm, linear, not covering bracts, pale brown, with recurved apex, remotely pectinate-fimbriate, the fimbriae plumose. Florets pink, the outer slightly radiate. Achenes *c.* 4 mm; pappus 2 mm. *Dry or saline bare soils.* ● *S.C. & S.E. Spain.* Hs.

199. C. parilica Stoj. & Stefanov, *Österr. Bot. Zeitschr.* **72**: 92 (1923). Perennial. Stems 5–20 cm, erect or ascending from the base, simple. Leaves 0·5–1·5 mm wide, linear-filiform, entire, acute, glabrous, the margin slightly revolute. Capitula solitary. Involucre 20 × 9–12 mm, ovoid-cylindrical; appendages narrowly lanceolate, not completely covering bracts, pale brown, attenuate into a filiform, recurved, pectinate-fimbriate acumen 8 mm, the fimbriae plumose, long. Florets purplish-red or white, the outer not distinctly radiate. Achenes *c.* 3·5 mm; pappus *c.* 1 mm. *Mountain rocks.* ● *S.W. Bulgaria, N. Greece.* Bu Gr.

200. C. procumbens Balbis, *Mem. Acad. Sci. (Turin)* **16**: 229 (1809). Perennial. Stems 5–30 cm, arcuate-ascending, branched. Leaves entire, dentate or lobed, tomentose or lanate; lower obovate to oblong; upper ovate or oblong-elliptical, the uppermost amplexicaul, cuneate or rounded at the base. Capitula solitary. Involucre 14–22 × 12–20 mm, ovoid-globose or ovoid-cylindrical, white-tomentose when immature; appendages linear, narrowly semilunar-decurrent, pale- or blackish-brown, attenuate into a short, subulate, finally recurved, pectinate-fimbriate acumen 3–6 mm, the fimbriae 2–3 mm, pale brown, numerous. Florets pink-purple, the outer radiate. Achenes 3·5–4 mm; pappus 0·5–1·5 mm. *Dry rocky slopes, 800–1500 m.* ● *Lower slopes of the S.W. Alps, N. & N.W. of Nice.* Ga ?Hs.

1 Leaves greyish-green, not tomentose **(d)** subsp. **verguinii**
1 Leaves white-tomentose at least beneath
2 Upper leaves amplexicaul **(a)** subsp. **procumbens**
2 Upper leaves cuneate or rounded at the base, not amplexicaul
3 Involucre ovoid-cylindrical; appendages not covering bracts **(b)** subsp. **jordaniana**
3 Involucre ovoid-globose; appendages covering bracts **(c)** subsp. **aemilii**

(a) Subsp. **procumbens**: Stems 10–30 cm. Upper leaves amplexicaul, white-tomentose on both surfaces. Involucre ovoid-globose; appendages not covering bracts. *Hills by the R. Vésubie, N. of Nice.*

(b) Subsp. **jordaniana** (Gren. & Godron) Rouy, *Fl. Fr.* **9**: 131 (1905) (*C. jordaniana* Gren. & Godron): Stems 5–15 cm. Upper leaves cuneate-attenuate at the base, white-tomentose beneath. Involucre ovoid-cylindrical; appendages not covering bracts. *Mountains S.E. of Villars (Alpes Maritimes).*

(c) Subsp. **aemilii** (Briq.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 208 (1976) (*C. aemilii* Briq.): Stems 5–10 cm. Upper leaves cuneate at the base, white-tomentose on both surfaces. Involucre ovoid-globose; appendages covering bracts. *Mountains N. of Villars (Alpes Maritimes).*

(d) Subsp. **verguinii** (Briq. & Cavillier) Dostál, *loc. cit.* (1976) (*C. procumbens* var. *verguinii* Briq. & Cavillier): Stems 20–30 cm. Upper leaves amplexicaul, greyish-green. Involucre ovoid-globose; appendages covering bracts. *Alpes Maritimes.*

201. C. rhaetica Moritzi, *Neue Denkschr. Schweiz. Ges. Naturw.* **3**: 81 (1839) (*C. cirrhata* Reichenb. pro parte). Perennial. Stems 10–60 cm, numerous, erect or ascending, simple or sparingly branched. Leaves subcoriaceous, scabrid, otherwise glabrous, rarely subfloccose, undivided; lower oblong- to linear-lanceolate; upper semiamplexicaul; uppermost sometimes hastate, entire. Capitula solitary, sessile. Involucre 14–20 × 8–15 mm, ovoid-cylindrical; appendages triangular, not completely covering the linear bracts, black at the base, narrowly semilunate-decurrent, the apex 7 mm, filiform, subulate, recurved, blackish-brown, plumose-fimbriate, the lower fimbriae very short, approximate, black, the upper fimbriae up to 3 mm, brown. Florets pink-purple, the outer radiate. Achenes *c.* 3 mm, pale brown; pappus up to 1 mm. $2n=22$. *Open woods and meadows; calcicole.* ● *S. Alps, from 9° to 10° 45′ E.* He It.

Subgen. **Psephellus** (Cass.) Schmalh. Perennial; stems erect. Lower leaves pinnatisect; middle leaves entire or dentate, not pinnatisect. Appendages not decurrent, pectinate-fimbriate, not spinose. Corolla 5-fid. Pappus present, caducous.

202. C. leucophylla Bieb., *Fl. Taur.-Cauc.* **3**: 591 (1819). Stems 10–30 cm, simple, ascending. Leaves whitish-green above, grey-tomentose beneath; lower pinnatisect, with obtuse segments; cauline lyrate. Involucre 8–15 mm in diameter; appendages triangular-lanceolate, yellow or pale brown. Florets pink, the marginal radiate. *Steppes and rocky hillsides. Krym.* Rs (K). (*Caucasus.*)

203. C. declinata Bieb., *op. cit.* 590 (1819). Like **202** but involucre 15–20 mm in diameter; appendages brown. *Rocky hillsides and coniferous woods. Krym.* Rs (K). (*Caucasus.*)

204. C. dealbata Willd., *Sp. Pl.* **3**: 2295 (1803). Stems up to 100 cm, branched, erect. Leaves green above, grey-tomentose beneath; lower pinnatisect, with acute segments, long-petiolate; upper surrounding the capitula, pinnatisect, rarely entire, sessile. Involucre 30–40 mm in diameter; appendages ovate-orbicular, yellowish-brown. Florets bright pink, the marginal distinctly patent. *Cultivated for ornament and locally naturalized.* [Cz.] (*Caucasus.*)

Subgen. **Heterolophus** (Cass.) Dobrocz. Like Subgen. *Psephellus* but stems usually procumbent; pappus persistent.

205. C. sibirica L., *Sp. Pl.* 913 (1753). Stems up to 60 cm, erect. Basal leaves up to 40 cm, pinnatisect, long-petiolate, with oblong-ovate, entire or weakly dentate segments; lower cauline pinnatisect, upper oblanceolate-elliptical, undivided. Involucre *c.* 20 mm in diameter, globose; appendages of middle bracts broadly ovate, yellowish-brown, with 9–12 fimbriae 2–3 mm on each side. Florets purplish-pink. Achenes *c.* 5 mm; pappus *c.* 2 mm. *Steppes, stony slopes and mountain woods. E. Russia, northwards to c.* 57° 30′ *N.* Rs (C, E).

206. C. carbonata Klokov, *Nauk. Zapysky Kyjiv. Derž. Univ.* **7(6)**: 77, 82 (1948). Stems up to 20 cm, procumbent. Basal leaves 6–10(–20) cm, pinnatisect, shortly petiolate, with oblong-lanceolate, weakly dentate, rarely entire segments; lower cauline pinnatisect, the upper oblanceolate-elliptical, remotely serrate or entire. Involucre 10–15 mm in diameter, globose; appendages of middle bracts broadly ovate, brown at the base, blackish-brown towards the apex, with 6–10 fimbriae *c.* 2 mm on each side. Inner florets pale purple, the outer pink. Achenes *c.* 4–5 mm; pappus *c.* 1·5 mm. *Calcareous rocks.* ● *S. Russia and E. Ukraine.* Rs (C, W, E).

207. C. marschalliana Sprengel, *Syst. Veg.* **3**: 398 (1826) (*C. sibirica* sensu Bieb., non L.). Stems 10–20(–30) cm, procumbent. Basal leaves 6–12 cm, pinnatisect, petiolate, with oblong segments; lower cauline undivided, the middle lyrate, the upper oblong, undivided. Involucre 10–15 mm in diameter, ovoid; appendages of middle bracts oblong, brown, with 3–4 fimbriae *c.* 1 mm on each side. Florets purplish-pink. Achenes *c.* 4 mm; pappus *c.* 1·5 mm. *Stony slopes. From N.E. Bulgaria to E. Ukraine.* Bu Rm Rs (W, E).

208. C. sumensis Kalenicz., *Bull. Soc. Nat. Moscou* **18(1)**: 238 (1845). Like **207** but appendages of middle bracts narrowly lanceolate to triangular-lanceolate, blackish-brown, entire or with 1–3 fimbriae on each side. *Sandy coniferous woods and stony steppes.* ● *S.W. and S.C. parts of U.S.S.R., northwards to c.* 56° 30′ *N.* Rs (C, W, E).

Subgen. **Odontolophus** (Cass.) Hayek. Perennial. Leaves undivided. Middle bracts with irregularly pectinate-lacerate appendages not clearly separated from the bracts. Pappus present.

209. C. trinervia Stephan ex Willd., *Sp. Pl.* **3**: 2301 (1803). Plant sparsely floccose-tomentose. Stems up to 30 cm, erect, leafless above. Leaves undivided, up to 70 × 4 mm, linear-lanceolate, distinctly 3-veined, entire, acute, the lower long-petiolate, the upper sessile. Involucre 6–10 × 12–15 mm; bracts pale green, with dark brown apex; middle bracts oblong-ovate. Florets pink, the outer longer than the inner, patent. Achenes 4–6 mm; pappus 2–3 mm. *Dry grassland. From C. Romania to S.E. Russia.* Rm Rs (W, K, E).

C. saxatilis C. Koch, *Linnaea* **24**: 419 (1851) (*Phaeopappus saxatilis* (C. Koch) Boiss.) was described from Kriti but has never been refound; its status is uncertain.
been refound; its status is uncertain.

Subgen. **Cyanus** (Miller) Hayek. Annual or perennial, rarely biennial. Leaves undivided to pinnatisect. Appendages distinctly decurrent, denticulate to fimbriate, muticous. Pappus present, rarely absent.

210. C. montana L., *Sp. Pl.* 911 (1753). Perennial with creeping rhizome. Stems up to 80 cm, erect, rarely ascending, simple, rarely sparingly branched above, broadly winged. Leaves soft, patent, ovate to oblong or broadly lanceolate, entire or rarely the lower remotely dentate to lobed, floccose-tomentose beneath, glabres-

cent, the lower shortly petiolate. Involucre 10–15 mm in diameter, ovoid-cylindrical; appendages decurrent near base, black to dark brown; fimbriae as long as the width of the margin, dark brown. Inner florets violet; outer blue. Achenes 5–6 mm; pappus *c.* 1·5 mm. 2*n*=44. *Open woods and meadows*; *usually calcicole*. ● *Mountains of Europe, from the Ardennes and the Carpathians to the Pyrenees, C. Italy and C. Jugoslavia.* Au Be Cz Ga Ge He Hs It Ju Po [Fe].

Widely cultivated for ornament.

211. C. mollis Waldst. & Kit., *Pl. Rar. Hung.* **3**: 243 (1806). Perennial with long-creeping, branched rhizome. Stems 30–50(–100) cm, erect, simple, rarely sparingly branched above, not or shortly winged. Leaves somewhat rigid, ovate to elliptic-lanceolate, entire, gradually acuminate, green above, densely grey-tomentose beneath, sessile. Involucre 12–18 mm in diameter, ovoid; appendages long-decurrent, irregularly denticulate, black; teeth short, black. Inner florets violet; outer blue. Achenes 6–7 mm; pappus 1–1·5 mm, white. 2*n*=44. *Mountain meadows.* ● *E.C. Europe.* Cz Hu Ju Po Rm Rs (W).

212. C. maramarosiensis (Jáv.) Czerep., *Not. Syst.* (*Leningrad*) **20**: 395 (1960). Like **211** but leaves thin, soft, abruptly acuminate, subglabrous and green beneath; involucre 10–14 mm in diameter, subcylindrical; achenes *c.* 5 mm; pappus 1·5–2 mm, reddish. *Mountain woods.* ● *E. Carpathians.* Cz Rm Rs (W).

213. C. pinnatifida Schur, *Enum. Pl. Transs.* 405 (1866). Perennial with creeping rhizome. Stems 10–20(–40) cm, simple, shortly or narrowly winged. Leaves patent, greyish-tomentose above; lower lanceolate, long-acuminate, shortly petiolate. Involucre 12–15 mm in diameter, broadly ovoid; appendages broadly decurrent, black; fimbriae as long as the width of the margin, blackish-brown. Florets violet. Achenes *c.* 4 mm; pappus 1·5–2 mm. *Alpine meadows. S. & E. Carpathians.* Rm.

Subsp. **sooana** (Borhidi) Soó, *Feddes Repert.* **83**: 149 (1972) (*C. achtarovii* subsp. *sooana* Borhidi), differs from typical **213** chiefly in having the lower leaves ovate- to oblong-spathulate and the involucre 30–35 mm; its status is uncertain.

214. C. baldaccii Degen ex Bald., *Malpighia* **9**: 277 (1895). Perennial, with short rhizome. Stems very stout. Leaves linear-lanceolate in outline, entire or lyrate, with undulate margin, arachnoid-tomentose, shortly petiolate. Involucre 6–8 mm in diameter, ovoid; appendages long-decurrent, dark brown; fimbriae shorter than the width of the margin, silvery. Florets cream. Achenes *c.* 3 mm; pappus *c.* 1 mm. *Alpine pastures.* ● *W. Kriti.* Cr.

215. C. pindicola Griseb., *Reise Rumel.* **2**: 164 (1841). Perennial with short rhizome. Stems up to 15 cm. Lower leaves lyrate-pinnatisect with 2–3(–4) lobes on each side, petiolate; cauline entire or weakly dentate, decurrent. Involucre 16–18 mm in diameter, ovoid; appendages broadly decurrent, black; fimbriae silvery-white at apex. Florets cream. Pappus 1–1·5 mm. ● *Mountains of S.W. part of Balkan peninsula.* Al Gr Ju.

216. C. triumfetti All., *Auct. Syn. Stirp. Horti Taur.* 16 (1773) (*C. axillaris* Willd.). Perennial, often with short rhizome. Stems up to 70(–100) cm, rarely very short, erect or ascending, simple or sparingly branched in upper half. Leaves oblong to lanceolate, usually tomentose or lanate, often glabrescent, the lower petiolate. Involucre 7–25 mm in diameter, ovoid to ovoid-globose or cylindrical; appendages decurrent, brown or black; fimbriae 1–3 times as long as the width of the margin, pale brown, white or silvery at apex. Inner florets violet; outer blue. Achenes (3–)4–5 mm; pappus 0·5–3 mm, rarely absent. 2*n*=22, 44. *S. & C. Europe.* Al Au Bu Cz Ga Ge Gr He Hs Hu It Ju Lu Po Rm Rs (W, K, E) Si Tu.

The following subspecies are mostly readily distinguishable morphologically as well as in their distributions and ecological preferences, and their characters remain constant in cultivation; intermediates occur, however, and the key is best used on populations rather than on individual specimens.

1 Lower leaves broadly elliptical to ovate or obovate, the cauline oblong or oblong-lanceolate; fimbriae with pale brown or white but not silvery apex
2 Stems (0·5–)2–20 cm, simple; leaves densely white-lanate
3 Basal leaves broadly elliptical; cauline leaves lanceolate, long-decurrent (c) subsp. **pirinensis**
3 Basal leaves oblong-lanceolate, lyrately sinuately lobed or entire; cauline leaves linear-lanceolate, long-acuminate, shortly decurrent (l) subsp. **cana**
2 Stems 20–70(–100) cm, sparingly branched; leaves grey- to white-tomentose, glabrescent, the cauline oblong to oblong-lanceolate
4 Cauline leaves obtuse; involucre 7–10 mm in diameter, cylindrical; appendages reddish-brown; fimbriae pale brown, the terminal one spinuliform (f) subsp. **novakii**
4 Cauline leaves acute; stems broadly winged; appendages black or brown; fimbriae brown, with white but not silvery apex
5 Cauline leaves not mucronate or spinulose at apex; involucre 15–20 mm in diameter; fimbriae twice as long as width of the margin of the appendage (a) subsp. **aligera**
5 Cauline leaves with spinulose, mucronate apex; involucre 10–15 mm in diameter; fimbriae less than twice as long as the width of the margin of the appendage (b) subsp. **tanaitica**
1 Lower leaves linear or oblong-lanceolate to lingulate; fimbriae with brown, white or silvery apex
6 Fimbriae silvery and shining at apex
7 Lower leaves ±linear-lingulate, the cauline broadly linear, entire; all leaves abruptly acuminate at the apex; involucre *c.* 13 mm in diameter; appendages narrowly decurrent (m) subsp. **lingulata**
7 Lower leaves linear-lanceolate, entire, rarely remotely dentate, the cauline linear or narrowly lanceolate, erect, acute, long-decurrent with narrow wings
8 Leaves green or grey-green beneath; bracts numerous (k) subsp. **triumfetti**
8 Leaves white-tomentose beneath; bracts few (l) subsp. **cana**
6 Fimbriae brown, the apex sometimes white but not silvery
9 Fimbriae as long as, or scarcely longer than the width of the margin of the appendage; leaves erect, glabrous and green, entire; stem shortly and broadly winged (d) subsp. **semidecurrens**
9 Fimbriae 2–3 times as long as the width of the margin of the appendage; leaves erect or patent; stem angled or narrowly winged
10 Stems angled, not winged; leaves patent, lanceolate to linear-lanceolate; involucre 7–10 mm in diameter, cylindrical (e) subsp. **dominii**
10 Stems with long, narrow wings; leaves erect; involucre 10–25 mm in diameter, ovoid-cylindrical
11 Involucre 18–25 mm in diameter; bracts numerous, in 6–8 rows; fimbriae dark brown, with white apex (g) subsp. **stricta**
11 Involucre 10–15 mm in diameter; bracts numerous or few, in 4–7 rows; fimbriae pale brown
12 Stems with a few long branches above; lower leaves oblong-lanceolate, sparsely glandular, long-decurrent; bracts few, in 4–5 rows (h) subsp. **angelescui**
12 Stems simple, rarely sparingly branched above; lower leaves narrowly lanceolate, eglandular, very narrowly decurrent
13 Leaves subglabrous and green above, grey-tomentose beneath; bracts few, in 4–5 rows; appendages with decurrent margin *c.* 0·3 mm wide; fimbriae 3 times as long as the width of the margin of the appendage (i) subsp. **adscendens**
13 Leaves glabrous, green on both surfaces, the cauline lanceolate, acute; bracts numerous, in 6–7 rows; appendages with decurrent margin *c.* 1 mm wide; fimbriae twice as long as the width of the margin of the appendage (j) subsp. **lugdunensis**

(a) Subsp. **aligera** (Gugler) Dostál, *Bot. Jour. Linn. Soc.* **71**: 208 (1976) (*C. variegata* var. *aligera* Gugler): Stems 20–70(–100) cm, sparingly branched above, broadly winged, leafy almost to capitulum. Leaves more or less patent, grey- to white-tomentose, glabrescent; basal in a rosette and present at anthesis; lower cauline oblong or broadly lanceolate, sinuately lobed or lyrate; middle and upper cauline oblong-lanceolate, entire or pinnately lobed. Involucre 15–20 mm in diameter, ovoid; appendages with decurrent margin *c.* 2 mm wide, black or brown; fimbriae twice as long as the width of the margin, dark brown, with white apex. Pappus *c.* 1 mm. *Open woods and scrub, mainly in the lowlands*; *usually calcicole. France and Italy*; *C. & S.E. Europe.*

(b) Subsp. **tanaitica** (Klokov) Dostál, *loc. cit.* (1976) (*C. tanaitica* Klokov): Like subsp. (a) but cauline leaves with spinulose, mucronate apex, the upper oblong-oblanceolate, entire, rarely subdentate; involucre 10–15 mm in diameter, cylindrical-ovoid; appendages with narrower decurrent margin *c.* 1 mm wide, blackish-brown, the fimbriae less than twice as long as the width of the margin; pappus 2–3 mm. *Steppes. S.E. Russia and E. Ukraine.*

(c) Subsp. **pirinensis** (Degen, Urum. & H. Wagner) Dostál, *loc. cit.* (1976) (*C. variegata* var. *pirinensis* Degen, Urum. & H. Wagner): Stems 10–20 cm, simple, broadly winged, leafy. Leaves white-lanate; lower broadly elliptical, entire or remotely sinuate-dentate, gradually narrowed into petiole; cauline entire. Capitula shortly pedunculate. Involucre 10–15 mm in diameter, ovoid; bracts few, large; appendages with broad decurrent margin, dark brown; fimbriae twice as long as the width of the margin, pale brown, with white apex. Pappus 0·5–1 mm. ● *S.W. Bulgaria* (*Pirin Pl.*).

(d) Subsp. **semidecurrens** (Jordan) Dostál, *op. cit.* 209 (1976) (*C. semidecurrens* Jordan): Stems 30–60 cm, sparingly branched near the apex, shortly and broadly winged, leafy. Leaves erect, subglabrous and green above, grey-tomentose beneath, entire; lower obovate-elliptical, shortly petiolate; cauline linear-lanceolate. Involucre ovoid; appendages with decurrent margin *c.* 1 mm wide, black or blackish-brown; fimbriae as long as or scarcely longer than the width of the margin, dark brown. Pappus *c.* 1 mm. *Pastures and stony ground.* ● *Alps*; *N.E. Spain.*

(e) Subsp. **dominii** Dostál, *Acta Bot. Bohem.* **10**: 71 (1931): Stems 20–70 cm, simple, rarely sparingly branched above, angled but not winged. Leaves white-tomentose beneath; lower withered at anthesis; cauline narrowly oblong to linear-lanceolate, entire, acute, often with revolute margin, patent. Involucre 7–10 mm in diameter, cylindrical-ovoid; appendages with narrow decurrent margin, pale brown; fimbriae 2–3 times as long as the width of the margin, white at apex. Pappus *c.* 1 mm. *Dry, rocky scrub*; *somewhat calcicole.* ● *W. Carpathians, Bulgaria.*

(f) Subsp. **novakii** (Dostál) Dostál, *Bot. Jour. Linn. Soc.* **71**: 209 (1976) (*C. novakii* Dostál): Stems 40–60 cm, simple or sparingly branched above. Basal leaves in a rosette, withered at anthesis, oblong-ovate, long-petiolate; cauline oblong, entire, obtuse, grey-tomentose. Involucre 7–10 mm in diameter, cylindrical; appendages blackish-brown; fimbriae twice as long as the width of the margin, pale brown, the terminal thickened, subspinuliform, rigid. Pappus *c.* 1 mm. ● *S. Bulgaria* (*Rodopi Pl.*).

(g) Subsp. **stricta** (Waldst. & Kit.) Dostál, *Acta Bot. Bohem.* **10**: 72 (1931): Stems 30–70(–80) cm, strict, simple or sparingly branched above, narrowly winged, leafy. Leaves narrowly lanceolate, entire, rarely with 1–2 teeth at the base, grey-tomentose; lower withered at anthesis; cauline erect, acute. Capitula solitary, rarely 2–3 together. Involucre 18–25 mm in diameter, ovoid; appendages narrowly (0·7 mm) decurrent, brown; fimbriae twice as long as the width of the margin, dark brown, with white apex. Pappus 1–1·5 mm. *Rocky ground*; *calcicole.* ● *E.C. Europe and N. part of Balkan peninsula.*

(h) Subsp. **angelescui** (G. Grinț.) Dostál, *Bot. Jour. Linn. Soc.* **71**: 209 (1976) (*C. angelescui* G. Grinț.): Stems with 2–3 long branches from the middle, narrowly winged. Leaves grey-tomentose, sparsely glandular; lower oblong-lanceolate, entire or remotely sinuate-dentate, long-petiolate; cauline linear-lanceolate, entire, acute, erect. Involucre 10–12 mm in diameter, ovoid; bracts few; appendages with decurrent margin 1–2 mm wide, dark brown; fimbriae twice as long as the width of the margin, pale yellowish-brown. Pappus 2·5–3 mm. *Open woods.* ● *Moldavia, S.E. Romania.*

(i) Subsp. **adscendens** (Bartl.) Dostál, *loc. cit.* (1976) (*C. montana* var. *adscendens* Bartl.): Stems *c.* 30 cm, simple, narrowly winged, slender. Leaves narrowly lanceolate, entire, acute, glabrescent and green above, grey-tomentose beneath; lower long-petiolate. Involucre 10–12 mm in diameter, ovoid; appendages with decurrent margin *c.* 0·3 mm wide, blackish-brown; fimbriae 3 times as long as the width of the margin, pale brown. Pappus *c.* 2 mm. *Calcareous rocks.* ● *S.E. Austria to W. Bulgaria.*

(j) Subsp. **lugdunensis** (Jordan) Dostál, *loc. cit.* (1976) (*C. lugdunensis* Jordan): Stems simple, rarely sparingly branched from the middle, narrowly winged or angled. Leaves linear-lanceolate, entire, acute, erect, glabrous, green; lower long-petiolate. Involucre *c.* 15 mm in diameter, ovoid; appendages with decurrent margin *c.* 1 mm wide, dark brown; fimbriae twice as long as the width of the margin, pale brown. Pappus 1–1·5 mm. ● *S.W. Alps*; *?Spain.*

(k) Subsp. **triumfetti** (incl. *C. variegata* Lam., *C. seussana* Chaix): Stems 10–50 cm, simple, angled or narrowly winged, slender. Leaves narrowly lanceolate, entire, rarely remotely dentate; lower in basal rosette, long-petiolate. Involucre 12–20 mm in diameter, ovoid-globose; appendages with narrow decurrent margin, pale brown; fimbriae 2–3 times as long as the width of the margin, silvery. Pappus *c.* 2 mm. 2*n*=22, 44. *Rocks and scrub*; *calcicole. S. Europe.*

(l) Subsp. **cana** (Sibth. & Sm.) Dostál, *loc. cit.* (1976) (*C. cana* Sibth. & Sm.): Stems 3–20 cm, simple, narrowly winged. Leaves white-tomentose, lyrately sinuately lobed or entire, rarely pinnatisect, oblong-lanceolate or the cauline narrowly lanceolate, shortly decurrent; upper linear-lanceolate. Involucre *c.* 15 mm in diameter, ovoid; appendages with decurrent margin *c.* 1 mm wide, dark brown; fimbriae 2–3 times as long as the width of the margin, silvery. Pappus 1–2 mm. *Balkan peninsula*; *Krym.*

(m) Subsp. **lingulata** (Lag.) Dostál, *loc. cit.* (1976) (*C. lingulata* Lag.): Stems 15–25 cm, simple, unwinged. Leaves grey-tomentose; lower oblong-spathulate, remotely dentate; cauline broadly linear, entire, erect. Involucre *c.* 13 mm in diameter, ovoid; appendages with decurrent margin *c.* 0·5 mm wide, brown; fimbriae 3 times as long as the width of the margin, silvery. Pappus *c.* 1·5 mm. *C., S. & E. Spain, N.E. Portugal.*

Subsp. (a) is very variable in leaf-shape; the characteristic shape is found in the Carpathians, and variants transitional to subsp. (k) are often found in the lowlands of E.C. Europe.

C. achtarovii Urum., *Magyar Bot. Lapok* **19**: 37 (1920) (*C. montana* subsp. *achtarovii* (Urum.) Hayek), described from S.W.

Bulgaria (Pirin Pl.), is like **216(c)** but has simple unwinged stems 1–10 cm, narrowly lanceolate leaves mostly confined to a basal rosette and long-pedunculate capitula. **C. ternopoliensis** Dobrocz., *Bot. Žur.* **6(2)**: 71 (1949), described from W. Ukraine (near Ternopol'), is like **216(g)** but has a thicker stem, entire or sinuately lobed, shortly decurrent, sometimes white-lanate leaves and black or dark brown fimbriae. **C. epirota** Halácsy, *Bull. Herb. Boiss.* **6**: 581 (1898), from the W.C. part of the Balkan peninsula, is like **216(l)** but has lyrate-pinnatisect leaves, the involucre 10–15 mm in diameter and appendages with decurrent margin 1–2 mm wide. The status of all these taxa is uncertain and further investigation is required.

217. C. napulifera Rochel, *Magyar Tudós Társaság Évkönyvei (Budapest)* **2**: 260 (1835). Perennial; rhizome present, rarely with stolons; roots fusiform or napiform. Stem (1–)5–35 cm, erect, simple or sparingly branched, not or narrowly winged. Leaves glabrescent; lower petiolate, rarely in a basal rosette; cauline entire or remotely dentate. Involucre 8–14 mm in diameter, ovoid; appendages decurrent, dark brown or black; fimbriae 2(–3) times as long as the width of the margin, silvery at apex. Inner florets purple or lilac. Achenes 4–5 mm; pappus 2–3 mm. ● *Balkan peninsula, S.E. Romania, S. Moldavia.* Al Bu Gr Ju Rm Rs (W) Tu.

Very variable in leaf-shape, corolla-colour and root-shape. Resembling **216** in most respects but distinguished by its fusiform or napiform roots and purple or lilac inner florets.

1 Roots up to 20 cm, narrowly fusiform with very long, slender apex; leaves mostly entire, narrowly lanceolate **(a)** subsp. **pseudaxillaris**
1 Roots up to 5 cm, broadly fusiform or napiform with a short apex; leaves mostly lobed
2 Rhizome long-creeping, sometimes with stolons; roots spreading, fusiform
3 Outer florets white or pale cream, rarely pale blue or pale purple; stems 10–30 cm; rhizome with or without stolons; leaves eglandular **(d)** subsp. **nyssana**
3 Outer florets purple or pink; stems 5–10 cm, rarely almost absent; rhizome with stolons; leaves glandular **(c)** subsp. **napulifera**
2 Rhizome short, without stolons; roots crowded, fusiform or napiform
4 Outer florets dark blue; stems 10–20 cm; roots fusiform; upper leaves linear, entire, the basal remotely lobed or pinnatisect **(b)** subsp. **tuberosa**
4 Outer florets pale cream, rarely purple; stems 1–10(–20) cm; roots napiform; all leaves broadly ovate, lyrately lobed **(e)** subsp. **thirkei**

(a) Subsp. **pseudaxillaris** (Stefanov & Georgiev) Dostál, *Bot. Jour. Linn. Soc.* **71**: 209 (1976) (*C. sepudaxillaris* Stefanov & Georgiev): Rhizome short, truncate, without stolons; roots up to 20 cm, spreading, narrowly fusiform, with very long, slender apex. Stem 25–35 cm, simple or sparingly branched. Leaves with arachnoid indumentum; lower narrowly lanceolate, entire or lyrate-dentate, very acute; cauline linear-lanceolate. Appendages with decurrent margin *c.* 0·5 mm wide. Outer florets purplish-pink. *S. Bulgaria.*

(b) Subsp. **tuberosa** (Vis.) Dostál, *loc. cit.* (1976) (*C. tuberosa* Vis.): Rhizome short, truncate, without stolons; roots up to 5 cm, fusiform, crowded. Stem 5–20 cm, simple. Leaves grey-tomentose; lower linear-lanceolate, entire, rarely sinuate-dentate; cauline linear, entire. Appendages with decurrent margin *c.* 1 mm wide. Outer florets dark blue. *Mountains of W. Jugoslavia, N. Albania and S. Bulgaria.*

(c) Subsp. **napulifera**: Rhizome long-creeping, with stolons; roots up to 5 cm, fusiform, spreading. Stem 5–10 cm, rarely almost absent, simple or sparing branched. Leaves with arachnoid indumentum, glandular; lower oblong, sinuate-dentate or lyrately lobed; cauline linear-lanceolate, entire or remotely dentate. Appendages narrowly (0·5 mm) decurrent. Outer florets purple or pink. *From N. Greece northwards to E. Jugoslavia and E. Romania.*

(d) Subsp. **nyssana** (Petrović) Dostál, *loc. cit.* (1976) (*C. nyssana* Petrović; incl. *C. orbelica* Velen., *C. velenovskyi* Adamović): Rhizome long-creeping, with or without stolons; roots up to 5 cm, fusiform, spreading. Stem 10–30 cm, simple. Leaves grey-tomentose; lower linear-lanceolate or lyrately lobed, entire or remotely dentate; cauline linear-lanceolate, entire. Appendages broadly (1 mm) decurrent. Outer florets white or pale cream, rarely pale blue or pale purple. *S.W. Bulgaria, S. & E. Jugoslavia, N. Greece.*

(e) Subsp. **thirkei** (Schultz Bip.) Dostál, *op. cit.* 210 (1976) (*C. thirkei* Schultz Bip.): Rhizome short, truncate, without or with short stolons; roots up to 5 cm, napiform, crowded. Stem 1–10(–20) cm, simple, rarely sparingly branched. Leaves grey-tomentose; lower in basal rosette, broadly obovate to broadly oblong-elliptical, sinuately lobed or lyrate-pinnate; cauline linear-oblong, remotely dentate. Appendages broadly (1–2 mm) decurrent. Outer florets pale cream, rarely purple. *E. part of Balkan peninsula, extending northwards to S. Moldavia.*

C. **karlowensis** Friv. ex Hampe, *Flora (Regensb.)* **20**: 228 (1837), from Bulgaria (Karlovo), is probably only a variant of **217(d)** with the leaves not or scarcely decurrent.

218. C. depressa Bieb., *Fl. Taur.-Cauc.* **2**: 346 (1808). Annual, rarely biennial. Stem 20–60 cm, unwinged, with many erecto-patent branches from the base. Leaves grey-tomentose; lower oblong, undivided, rarely lyrate-pinnatisect, obtuse, shortly petiolate; upper oblong- or linear-lanceolate, entire, acute, spinulose-mucronulate. Involucre 10–12 mm in diameter, ovoid; appendages narrowly (*c.* 0·3 mm) decurrent, reddish-black; fimbriae *c.* 2 mm, silvery. Inner florets violet; outer dark blue. Pappus 6–8 mm. *Cultivated fields and waste ground. Naturalized in S.E. Europe.* [Bu Gr Rs (K) Si Tu.] (*S.W. & C. Asia.*)

219. C. pinardii Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 17 (1844). Annual. Stem 8–20 cm, erect or procumbent, simple or sparingly branched, unwinged. Leaves grey-tomentose; lower obovate or oblanceolate, undivided or lyrately pinnatisect, shortly petiolate; upper linear-oblong, entire or subdentate, attenuate at base. Involucre *c.* 10 mm in diameter, ovoid; appendages broadly decurrent, dark brown; fimbriae slightly longer than the width of margin, silvery. Inner florets purple; outer bluish-violet. Achenes *c.* 3 mm; pappus absent. *Cultivated fields and stony hillsides. C. part of Balkan peninsula.* Bu Gr Ju.

C. **mentiens** Czerep., *Not. Syst. (Leningrad)* **20**: 397 (1960), from dry grasslands in Greece, differs from **219** in its longer stem 20–30 cm, larger, more sparsely tomentose leaves, and larger capitula and bracts. Its status requires further investigation.

220. C. cyanus L., *Sp. Pl.* 911 (1753). Annual, rarely biennial. Stem 20–80 cm, erect, branched. Leaves floccose beneath, glabrescent and green; lower lanceolate, entire, remotely dentate or lyrately pinnatisect with 1–3 linear or lanceolate segments on each side, acute, petiolate; upper linear-lanceolate, entire. Involucre 12–13 mm in diameter, ovoid-globose; appendages narrowly (0·3 mm) decurrent, brown; fimbriae *c.* 1 mm, silvery. Inner florets bluish-violet; outer dark blue, rarely white or purple. Achenes 3·5–4 mm; pappus 3–4 mm. $2n=24$. *Native in dry, open habitats in S.E. Europe and Sicilia; naturalized in cornfields almost throughout Europe, but now very rare or only casual in* Br Hb Rs (E) *and perhaps other regions.* Al Bu Gr *Ju Si Tu [Au Be Br Co Cz Da Fe Ga Ge Hb He Ho Hs Hu It Lu No Po Rm Rs (N, B, C, W, K, E) Sa Su].

C. hortorum Pau, *Not. Bot. Fl. Esp.* **1**: 12 (1887), described from cultivated material from Spain, with procumbent stems, very small capitula and the pappus twice as long as the achene, is probably a monstrous variant of **220**.

Subgen. **Melanoloma** (Cass.) Dostál. Annual. Leaves lobed to pinnatisect. Appendages of middle bracts with remotely pinnate-spinulose apical spine. Pappus present.

221. C. pullata L., *Sp. Pl.* 911 (1753) Stems 5–45 cm, leafy up to the capitula, simple or branched, sometimes absent. Leaves hairy, scabrid; basal in a rosette, oblong, sinuately lobed or lyrate, petiolate; cauline pinnatisect or lyrate-pinnatisect, the uppermost pinnately lobed, rarely entire. Capitula 3–5 cm in diameter. Involucre 15–18 mm, glabrous; bracts ovate-lanceolate, ciliolate, pale green. Florets bluish-purple, rarely white, the outer patent, much longer than the inner. Achenes 3–4 mm, sparsely villous, pale brown or greyish; pappus 2·5–3 mm, white. $2n=22$. *Dry, open habitats. Spain and Portugal.* Hs Lu [Ga].

139. Crupina (Pers.) Cass.[1]

Slender, erect, annual herbs, corymbosely branched above. Leaves alternate, unarmed; basal simple; cauline pinnatisect. Involucre cylindrical to ovoid; bracts imbricate, unequal, oblong-lanceolate, acute. Receptacular scales linear-subulate. Florets 5-fid; inner hermaphrodite; outer sterile. Corolla purple. Achenes subcylindrical to compressed, puberulent at base, villous towards apex, dark brown; pappus absent in the outer achenes, of 2 rows in the inner achenes, the outer with very unequal, minutely scabrid hairs, the inner with 5–10 short scales.

Literature: M. Le Vaillant, *Rev. Gén. Bot.* **77**: 111–124 (1970).

Stem leafy up to the branches; capitula with 3–5 florets **1. vulgaris**
Stem leafy only in lower ⅓–½; capitula with 9–15 florets **2. crupinastrum**

1. C. vulgaris Cass., *Dict. Sci. Nat.* **12**: 68 (1817). Stem 20–50(–80) cm, leafy up to the branches. Basal leaves oblong to obovate, entire to dentate, scabrid, sessile to petiolate, soon decaying; cauline leaves scabrid, sessile, the lobes 0·5–1·5 mm wide, linear, denticulate. Involucre 8–15 × 3–5 mm at anthesis, the bracts light green, sometimes purplish distally. Capitula with 3–5 florets. Achenes 3–4 × 2–2·5 mm, subcylindrical, with a wide, suborbicular, basal scar; pappus-hairs 5–6 mm, blackish-brown, the scales triangular-lanceolate, acute. $2n=30$. *Dry grassland and stony slopes. S. Europe, extending northwards to W.C. France, S. Czechoslovakia and S. Ukraine.* Al Bl Bu Co Cz Ga Gr He Hs Hu It Ju Lu Rm Rs (W, K, E) Sa Tu.

2. C. crupinastrum (Moris) Vis., *Fl. Dalm.* **2**: 42 (1847) (*C. morisii* Boreau). Like **1** but stem leafy only in lower ⅓–½; basal leaves often broadly pinnatifid; lobes of cauline leaves 1·5–3 mm wide, dentate to pinnatisect; involucre 15–20 × 5–10 mm at anthesis; capitula with 9–15 florets; achenes usually compressed, with a linear, sublateral scar; pappus-hairs golden-brown, the scales oblong, truncate or trifid. $2n=28$. *Mediterranean region.* Al Bl Bu Co Cr Gr Hs It Ju Sa Si Tu.

[1] By J. do Amaral Franco.
[2] By J. Dostál.

140. Chartolepis Cass.[2]

Perennial herbs. Leaves entire or dentate. Capitula solitary on stems and branches. Involucre oblong-ovoid; bracts imbricate, with orbicular, non-decurrent, lacerate, membranous apical appendage. Florets tubular, equal, hermaphrodite. Corolla 4-fid. Anthers without basal appendage. Achenes somewhat compressed; pappus-hairs in 2 rows, the outer plumose, connate at the base.

1. C. glastifolia (L.) Cass., *Dict. Sci. Nat.* **54**: 492 (1829) (*C. intermedia* Boiss.). Stem up to 100 cm, simple or sparingly branched, broadly winged, leafy throughout. Basal leaves up to 30 cm, oblong-elliptical, petiolate; cauline oblong to linear-lanceolate, long-decurrent at base, entire, sessile, arachnoid-lanate, with yellowish sessile glands. Involucre up to 30 mm in diameter; outer bracts elliptical, the inner sublinear, covered by overlapping appendages; appendages pellucid, with brown basal spot. Corolla yellow. Achenes 5·5–6 mm, oblong, smooth, puberulent; outer pappus-hairs 8–10 mm, the inner very short. *Wet, saline grasslands. S. & S.E. parts of U.S.S.R.* Rs (C, W, E).

141. Wagenitzia Dostál[2]

Perennial herbs with robust, woody rhizome. Leaves alternate. Capitula large, solitary on stems and branches. Involucre ovoid; bracts in several rows, imbricate, coriaceous, with spiny apical appendages. Florets tubular, equal, the inner hermaphrodite, the outer sterile. Corolla with filiform lobes. Achenes somewhat compressed; pappus-hairs persistent, plumose, in 2 rows.

1. W. lancifolia (Sieber ex Sprengel) Dostál, *Acta Bot. Acad. Sci. Hung.* **19**: 76 (1973) (*Centaurea lancifolia* Sieber ex Sprengel). Stems erect or procumbent, sparingly branched above, sometimes woody at base. Leaves lanceolate, acuminate, entire, scabrid; basal petiolate; cauline indistinctly auriculate at base, sessile. Capitula surrounded by upper leaves. Involucre 10–20 mm in diameter; outer bracts ovate-triangular, the inner linear-oblong, covered by overlapping appendages; appendages palmately divided into 9–13 spinules, the middle longer, erect, dark brown. Florets yellow. Achenes *c.* 4·5 mm, pale; pappus as long as or longer than achene. ● *Mountains of Kriti.* Cr.

142. Cnicus L.[1]

Annual herbs. Leaves alternate, subcoriaceous, minutely spinose-dentate. Capitula solitary, surrounded by the upper leaves. Involucre ovoid; bracts imbricate, ovate-lanceolate, the outer mucronate-subulate, the inner longer and with a pectinate, spine-like apical appendage. Receptacular scales numerous, setaceous. Inner florets hermaphrodite; outer florets very small, sterile. Corolla yellow. Achenes subcylindrical, ribbed, sparsely hairy, with an oblong lateral scar and crowned by a dentate ring; pappus of 2 rows of 10 setae, the outer long, minutely scabrid, the inner much shorter, ciliate.

1. C. benedictus L., *Sp. Pl.* 826 (1753). Stem 10–60 cm, arachnoid-villous. Leaves oblong in outline, light green with prominent white veins beneath; basal up to 30 × 8 cm, runcinate to pinnatifid, petiolate; cauline smaller, usually sinuate in the wide proximal half, sessile, semiamplexicaul, the uppermost ovate-lanceolate, spine-tipped. Capitula 25–40 × 20–30 mm; involucral bracts brown. Achenes 6–8 × 2–2·5 mm, brown; pappus yellow. $2n=22$. *Cultivated fields and waste places.*

Mediterranean region, Portugal; cultivated as a medicinal herb elsewhere, and locally naturalized in C. & S.E. Europe. Al Bu Cr Ga Gr Hs It Ju Lu Sa Tu [Cz Rm Rs (W)].

143. Carthamus L.[1]

(incl. *Kentrophyllum* DC.)

Usually spiny, branched annuals, rarely perennial and woody at the base, with glandular and more or less villous-lanate to arachnoid indumentum. Leaves usually pinnatifid to pinnatisect, with spiny margin. Involucral bracts in many rows, imbricate, spiny, the outer leaf-like, the inner sometimes with apical appendages. Capitula solitary on stems and branches. Florets all hermaphrodite; corolla yellowish or violet to pinkish-purple; filaments usually densely bearded. Achenes oblong to obpyramidal, 4-angled, glabrous, the outer usually coarsely rugose, without pappus, the inner more or less smooth, usually with a persistent pappus of many rows of linear scales.

All species grow in dry, open habitats, principally as ruderals or weeds of cultivated ground.

Literature: A. Ashri & P. F. Knowles, *Agron. Jour.* **52**: 11–17 (1960). P. Hanelt, *Feddes Repert.* **67**: 41–180 (1963).

1 Leaves usually undivided, entire or spinose-dentate; filaments subglabrous; achenes ±smooth; pappus usually absent **2. tinctorius**
1 Leaves ±divided, spinose-dentate; filaments bearded; at least the outer achenes rugose, the inner with a pappus
2 Corolla yellow or whitish
3 Perennial, woody at the base; inner involucral bracts without apical appendages; inner achenes rugulose; pappus of very narrow scales, deciduous **1. arborescens**
3 Annual; inner involucral bracts with ovate-lanceolate, dentate to subentire apical appendages (often inconspicuous); inner achenes ±smooth; pappus of rather wide scales, persistent **7. lanatus**
2 Corolla pale violet to pinkish-purple
4 Inner involucral bracts with distinct, ovate-lanceolate, dentate apical appendages **3. dentatus**
4 Inner involucral bracts oblong-lanceolate, entire, without apical appendages
5 Plant usually subglabrous; stems white to purple, without spots; cauline leaves pinnatisect to pinnate, with spinose segments, shiny; pappus-scales usually truncate **6. leucocaulos**
5 Plant ±densely glandular, with lanate-villous and arachnoid indumentum; stems pale brown with brownish to violet spots; cauline leaves sinuate to pinnatifid, spinose-dentate, not shiny; pappus-scales acute or acuminate
6 Stems densely arachnoid-hairy; outer involucral bracts 4–5 cm, patent, with spines 7–9 mm, the inner bracts abruptly acuminate; achenes 4–5 mm **5. boissieri**
6 Stems rather sparsely arachnoid-hairy; outer involucral bracts less than 4 cm, ±erect, with spines 4–7 mm, the inner bracts gradually acuminate; achenes 3·5–4 mm **4. glaucus**

1. C. arborescens L., *Sp. Pl.* 831 (1753) (*Kentrophyllum arborescens* (L.) Hooker). Much-branched, densely glandular perennial up to 2·5 m, woody at the base. Upper cauline leaves ovate to lanceolate-ovate, pinnatifid, spinose-dentate. Capitula up to 40 mm in diameter, broadly ovoid. Inner involucral bracts oblong- to ovate-lanceolate, entire to denticulate towards the apex. Corolla yellow. Achenes oblong to obpyramidal, rugulose. Pappus-scales very narrow, densely ciliate, deciduous. $2n=24$. *S. & S.E. Spain.* Hs.

[1] By P. Hanelt.

2. C. tinctorius L., *Sp. Pl.* 830 (1753). Subglabrous annual. Cauline leaves undivided or rarely sinuate to pinnatifid, ovate to lanceolate-ovate, spinose-dentate or entire. Capitula broadly ovoid to conical-ovoid. Inner involucral bracts oblong-lanceolate, entire. Corolla yellow, orange or reddish; filaments subglabrous. Achenes obpyramidal, more or less smooth, shiny, white. Pappus absent or rarely the inner achenes with short narrow scales. $2n=24$. *Formerly cultivated in a large part of Europe for its red and yellow flower-pigments used in dyeing; nowadays cultivated on a smaller scale in parts of S. & C. Europe, mainly for the oil derived from the achenes, and occasionally naturalized.* [Au Cz ?Ga ?Ge ?Gr Hs It Ju Lu Rm.] (*W. Asia.*)

C. gypsicola Iljin, *Bull. Jard. Bot. URSS* **30**: 357 (1932), a species of W.C. Asia with globose capitula, numerous soft, yellowish spines crowded near the base of the outer involucral bracts, yellow corolla, shiny, inconspicuously angled, white or mottled achenes, and pappus absent or reduced to short scales, may also occur in the European part of W. Kazakhstan.

3. C. dentatus (Forskål) Vahl, *Symb. Bot.* **1**: 69 (1790). Glandular annual, with more or less lanate or villous, arachnoid indumentum. Cauline leaves lanceolate to ovate-lanceolate, pinnatifid to pinnatisect, with spiny margin. Capitula oblong-ovoid. Inner involucral bracts with scarious, ovate-lanceolate, dentate apical appendages. Corolla pale violet to pinkish-purple. Achenes broadly obpyramidal. Pappus of long, brown, linear, ciliate scales, at least twice as long as the achene. $2n=20$. *S. part of Balkan peninsula, Aegean region.* Bu Cr Gr Ju Tu.

(a) Subsp. **dentatus**: Plant densely glandular, with lanate and arachnoid indumentum. Leaves greyish. Outer involucral bracts not more than 1½ times as long as the inner, erect or somewhat patent, with short spines. Inner pappus-scales usually shorter than the outer. *Throughout the range of the species, except the south.*

(b) Subsp. **ruber** (Link) Hanelt, *Feddes Repert.* **67**: 98 (1963) (*Kentrophyllum rubrum* Link): Plant more or less glandular, with sparsely villous and arachnoid indumentum. Leaves greyish or green. Outer involucral bracts at least twice as long as the inner, strongly patent or deflexed, with long spines. Most or all inner pappus-scales as long as the outer. *S. Greece and Aegean region.*

4. C. glaucus Bieb., *Tabl. Prov. Casp.* 118 (1798). Glandular annual, with lanate-villous and sparsely arachnoid indumentum; stems with brownish to purplish spots. Basal leaves with up to 6 pairs of lobes; cauline leaves broadly to narrowly lanceolate, sinuate to pinnatifid, spinose-dentate, greyish. Capitula 13–15 mm in diameter, ovoid. Outer involucral bracts 2·5–3·8 cm, up to 1½ times as long as the inner, more or less erect, densely greyish-villous; inner bracts oblong-lanceolate, entire, without apical appendages. Corolla pinkish-purple, the lobes 4·5–6·5 mm. Achenes 3·5–4 mm. Pappus of linear, acuminate, ciliate scales 2–2½ times as long as the achene. *S. Krym.* Rs (K). (*S.W. Asia, Egypt.*)

5. C. boissieri Halácsy, *Verh. Zool.-Bot. Ges. Wien* **49**: 186 (1899). Like **4** but basal leaves usually with more than 10 pairs of lobes; stems with dense arachnoid indumentum; capitula oblong-ovoid; outer involucral bracts 4–5 cm, patent, 1½–2 times as long as the inner, with spines 7–9 mm; inner bracts wider than the outer, abruptly acuminate; corolla-lobes 7–7·5 mm; achenes 4–5 mm; pappus-scales acute or shortly acuminate. ● *S. Aegean region.* Cr Gr.

6. C. leucocaulos Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 160 (1813). Usually subglabrous annual, rarely with arachnoid indumentum, sometimes sparsely glandular; stems whitish to purplish. Cauline leaves pinnatisect to pinnate, with 2–3 pairs of segments, shiny; segments 13–17 mm, spiny. Capitula 10–13 mm in diameter. Outer involucral bracts very shiny, deflexed, 2½–3 times as long as the inner; inner bracts entire. Corolla pale violet, the lobes 3–3·5 mm. Pappus of linear, usually truncate scales 5–7 mm. $2n=20$. ● *Aegean islands.* Cr Gr.

C. rechingeri P. H. Davis, *Notes Roy. Bot. Gard. Edinb.* **21**: 128 (1953), described from Karpathos, is like **6** but has densely crowded, narrower capitula, leaves with 3–4(–7) pairs of segments, less shiny involucral bracts and pappus-scales 4·5–5 mm. Like **5** it has villous, sometimes spotted stems and shorter leaf-spines. It requires further investigation.

7. C. lanatus L., *Sp. Pl.* 830 (1753) (*Kentrophyllum lanatum* (L.) DC.). Glandular annual, with more or less lanate-villous arachnoid indumentum. Leaves pinnatifid or pinnatisect, spinose-dentate. Capitula ovoid. Inner involucral bracts oblong-lanceolate, with small, often inconspicuous, ovate-lanceolate, scarious, dentate to subentire apical appendages. Corolla yellow, rarely whitish. Pappus of narrow, acute, ciliate scales. *S. Europe, extending locally northwards to N.C. France and S.E. Czechoslovakia.* Al Bl Bu Co Cr Cz Ga Gr He Hs Hu It Ju Lu Rm Rs (W, K, ?E) Sa Si Tu.

A complex containing allopolyploid taxa which are treated here as subspecies because morphological intermediates occur in areas of contact and hybridization seems to occur.

(a) Subsp. **lanatus**: Indumentum more or less densely lanate-villous and arachnoid; stems straw-coloured. Spines borne at an acute angle to the leaf-margin. Outer involucral bracts erect or slightly patent, *c.* 1½ times as long as the inner. Corolla and anthers yellow. $2n=44$. *Throughout the range of the species except parts of the extreme south.*

An allotetraploid, perhaps with **3** as one parent.

(b) Subsp. **baeticus** (Boiss. & Reuter) Nyman, *Consp.* 419 (1879) (*Kentrophyllum baeticum* Boiss. & Reuter): Usually sparsely hairy to subglabrous; stems whitish. Leaves shiny, the spines borne at 90° to the margin. Outer involucral bracts twice as long as the inner, patent to deflexed, with longer spines, shiny. Corolla pale yellow, rarely whitish; anthers white with violet lines. $2n=64$. *Mediterranean islands, S. Greece, S. Spain.*

An allohexaploid derived from **7**(a) and **6**.

144. Carduncellus Adanson[1]

Perennial herbs, usually spiny, acaulescent or with simple or rarely somewhat branched stems, more or less lanate to arachnoid-hairy. Basal leaves usually pinnate to lyrate, the cauline usually sinuate to dentate, the teeth often spinose. Involucral bracts in many rows, imbricate, usually spiny, the outer more or less leaflike, the inner with semicircular to ovate, lacerate to fimbriate appendages. Florets hermaphrodite; corolla usually blue or purple; filaments bearded. Achenes more or less 4-angled, usually rugose to sulcate at least towards the apex, glabrous; pappus of many rows of narrow ciliate scales to plumose setae, which are usually connate at the base and deciduous.

All species grow in dry, open habitats and are calcicole.

Literature: S. Rivas Goday & S. Rivas Martínez, *Anal. Inst. Bot. Cavanilles* **25**: 188–197 (1967).

[1] By P. Hanelt.

1 Acaulescent or with stems not more than 20 cm; cauline leaves not more than 6; pappus (3–)4–6 times as long as the achene
2 Leaves entire or setulose-dentate; involucral bracts setulose-dentate; achenes smooth; pappus *c.* 6 times as long as the achene **2. mitissimus**
2 Leaves and involucral bracts spinose-dentate; achenes rugose at least towards the apex; pappus *c.* 4 times as long as the achene
3 Leaves with 6–9 pairs of linear- to oblong-lanceolate pinnae or lobes; outer involucral bracts patent, as long as or longer than the inner; achenes rugose towards the apex; pappus white **1. monspelliensium**
3 Leaves with (8–)11–13 pairs of ovate to lanceolate-ovate pinnae; outer involucral bracts appressed, as long as or shorter than the inner; achenes rugose all over; pappus reddish-brown **3. pinnatus**
1 Stems usually more than 20 cm; cauline leaves 10 or more; pappus usually not more than twice as long as the achene
4 Leaves entire or denticulate; outer involucral bracts shorter than the inner; corolla yellowish **4. dianius**
4 Leaves spinose-dentate; outer involucral bracts as long as or longer than the inner; corolla blue
5 Stem (10–)15–30(–45) cm, with greyish-white, subtomentose to densely arachnoid indumentum; spines yellowish; pappus-setae plumose, connate at base, deciduous **5. araneosus**
5 Stem (15–)30–60 cm, with ±lanate-arachnoid indumentum, sometimes glabrescent; spines whitish; pappus-scales ciliate, free, persistent **6. caerulens**

1. C. monspelliensium All., *Fl. Pedem.* **1**: 154 (1785). Acaulescent, or with stem 2–20 cm and with 2–6 cauline leaves, more or less sparsely lanate to arachnoid-hairy, sometimes subglabrous. Leaves pinnate to pinnatifid; pinnae or segments 6–9 pairs, linear- to oblong-lanceolate, spinose-dentate or -lobed. Outer involucral bracts patent, leaf-like, spinose-dentate, acuminate, as long as or longer than the inner. Achenes *c.* 5 mm, more or less obpyramidal, rugose towards the apex; pappus-setae subplumose, white, *c.* 4 times as long as the achene. $2n=48$. ● *S.W. Europe.* Bl Ga Hs It.

2. C. mitissimus (L.) DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 73 (1805). Like **1** but usually acaulescent; leaves usually subglabrous; leaf-lobes or pinnae entire or setulose-dentate, with setose apex; outer involucral bracts appressed, ovate to ovate-lanceolate, setulose-dentate, with setose apex, sometimes pinnatifid, shorter than the inner; achenes smooth; pappus-setae plumose, *c.* 6(–8) times as long as the achene. $2n=24$. ● *S., W. & C. France, N.E. Spain.* Ga Hs.

3. C. pinnatus (Desf.) DC., *Prodr.* **6**: 614 (1838). Acaulescent, sometimes with stem 2–20 cm and with cauline leaves. Leaves pinnate, glabrous but the rhachis somewhat lanate to arachnoid-hairy; pinnae (8–)11–13(–15) pairs, ovate to lanceolate-ovate, glaucous. Outer involucral bracts appressed, dentate or pinnatifid towards the apex, with margin and apex spiny, as long as or shorter than the inner. Achenes *c.* 7 mm, broadly obpyramidal, rugose, with sharp, somewhat prominent angles, reddish-brown; pappus-setae subplumose, reddish-brown, 3–4 times as long as the achene. *C. Spain, Sicilia.* ?Bl Hs Si. (*N. Africa.*)

Plants from Spain, described as subsp. **matritensis** (Pau) Rivas Goday & Rivas Martínez, *Anal. Inst. Bot. Cavanilles* **25**: 192 (1967), are distinguished by the decurrent pinnae and more plumose pappus-setae.

4. C. dianius Webb, *Iter Hisp.* 33 (1838). Stem 70–100 cm, somewhat branched, with sparse shortly stipitate glands, the base covered with remains of leaves of previous years. Basal leaves up

to 20 cm, rather soft, simple, oblong-elliptical to lyrate-pinnate; cauline leaves lyrate with oblong-lanceolate to elliptical, entire or denticulate lobes; uppermost leaves dentate. Outer involucral bracts appressed, shorter than the inner, with ovate-lanceolate, dentate, leaf-like part towards the apex. Corolla yellowish. Achenes *c.* 6 mm, rugose towards the apex, with inconspicuous angles, brown, rarely smooth and white; pappus-scales densely ciliate, brownish, twice as long as the achene. *Mountain rocks.* ● *E. Spain* (*near Denia*). ?Bl Hs.

5. C. araneosus Boiss. & Reuter, *Diagn. Pl. Nov. Hisp.* 18 (1842). Stem (10–)15–30(–45) cm, simple or somewhat branched, greyish-white subtomentose to arachnoid-hairy. Basal and lower cauline leaves (lyrate-)pinnate; segments in 6–9 pairs, lanceolate, spinose-dentate; upper cauline leaves pinnatifid to dentate, ovate-lanceolate, with more or less lanate-arachnoid indumentum, with spiny margin and apex, the spines 3–4 mm. Involucral bracts subtomentose to arachnoid-hairy; outer bracts patent, distinctly leaf-like, spinose-dentate, as long as or longer than the inner, the spines or spiny lobes 5–8 mm, yellowish. Achenes 4–7 mm, smooth, with inconspicuous angles; pappus-setae more or less plumose, white, rarely reddish, 2(–4) times as long as the achene. ● *C., E. & S. Spain.* Hs.

The size of the plant, capitula, achenes and pappus have been used for delimiting subspecies but they show considerable variation and no satisfactory subdivision of the species is possible at present.

6. C. caeruleus (L.) C. Presl, *Fl. Sic.* xxx (1826) (*Carthamus caeruleus* L., *Kentrophyllum caeruleum* (L.) Gren. & Godron). Stem (15–)30–60 cm, simple, rarely branched, with variable lanate-arachnoid indumentum, sometimes glabrescent. Basal and cauline leaves shiny, simple, dentate, or pinnatisect to lyrate with 6–10 pairs of lobes or teeth, the margin and apex spiny; upper cauline leaves ovate-lanceolate. Involucral bracts with short glands, more or less arachnoid-hairy; outer bracts leaf-like, spinose-dentate, as long as or longer than the inner. Achenes *c.* 6 mm, more or less obpyramidal, inconspicuously angled, narrowed from the middle to the base, rugose towards the apex; pappus-scales ciliate, whitish, 1½–2 times as long as the achene, free, persistent. $2n=24$. *Mediterranean region* (*mainly in the west*), *C. & S. Portugal.* Bl Co Cr Ga Gr Hs It Lu Sa Si.

A very variable species in which leaf-division and indumentum have been used to separate infraspecific taxa. However, no consistent morphological and geographical pattern can be discerned at present and further study is required.

Subfam. CICHORIOIDEAE[1]

Plant with latex. All florets with a ligulate corolla. Pollen-grains usually with spines arranged in rows and forming a polygonal pattern.

145. Scolymus L.[2]

Spiny annual to perennial herbs. Stems solitary, branched. Leaves pinnatifid. Capitula few to numerous. Involucral bracts in several rows. Ligules yellow. Achenes dorsally compressed, tightly enclosed in and adnate to the ovate, slightly winged, deciduous receptacular scales; pappus absent or of a few rigid hairs.

All species occur on waste ground or in other dry, open habitats.

[1] Edit. S. M. Walters. [2] By P. D. Sell.

1 Leaves and wings of stem with a strongly thickened white margin; uppermost leaves regularly pectinate-spiny; pappus absent **1. maculatus**
1 Leaves and wings of stem without or with only a slightly thickened white margin; uppermost leaves irregularly spiny; pappus of a few rigid hairs
2 Involucral bracts without or with few hairs, more or less lanceolate, gradually attenuate to an acute apex; receptacular scales narrowed at apex **2. hispanicus**
2 Involucral bracts with numerous hairs, ovate-lanceolate to linear-oblong, at least the outer abruptly contracted into a spiny apex; receptacular scales not narrowed at apex **3. grandiflorus**

1. S. maculatus L., *Sp. Pl.* 813 (1753). Annual 15–90 cm, nearly glabrous, the continuous, irregularly spinose-dentate wings of the stem and the leaves with strongly thickened white margins. Leaves 40–200 × 20–80 mm; basal oblanceolate, soft, pinnatifid, with few spines; cauline rigid, oblong-lanceolate to ovate, sinuate-pinnatifid, spiny, the uppermost regularly pectinate-spiny. Panicle subcorymbose. Involucre 12–18 × 8–12 mm; bracts ovate-lanceolate to lanceolate, acute. Receptacular scales not narrowed at apex. Achenes 2·5–4 mm, obovate; pappus absent. $2n=20$. *S. Europe.* Bl Bu ?Cr Ga Gr Hs It Lu Rs (K) Sa Si Tu [Ju].

2. S. hispanicus L., *Sp. Pl.* 813 (1753). Biennial or perennial 20–80 cm, more or less hairy; stem with interrupted spinose-dentate wings. Leaves 40–200 × 15–70 mm; basal oblanceolate, soft, pinnatisect, with few spines, petiole long; cauline rigid, linear-oblong to ovate, sinuate-pinnatifid, spiny, not or scarcely thickened at margin, the uppermost very irregularly spiny. Panicle narrow. Involucre 15–20 × 8–10 mm; bracts more or less lanceolate, gradually attenuate to an acute apex, without or with few hairs. Receptacular scales narrowed at apex. Achenes 3–5 mm, clavate; pappus of a few rigid hairs. $2n=20$. *S. Europe, extending to N.W. France.* Al*Az Bl Bu Co Cr Ga Gr Hs It Ju Lu Rm Rs (W, K) Sa Si Tu.

3. S. grandiflorus Desf., *Fl. Atl.* **2**: 240 (1799). Perennial 18–40 cm, more or less hairy; stem with continuous spinose-dentate wings. Leaves 60–120 × 35–40 mm; ovate-lanceolate to linear-oblong, pinnatisect, spiny, not or scarcely thickened at margin; the uppermost sparsely long-spinose-dentate. Panicle subcorymbose. Involucre 15–22 × 14–16 mm; bracts ovate-lanceolate to linear-oblong, the outer abruptly contracted into a spiny apex, with numerous hairs. Receptacular scales not narrowed at apex. Achenes *c.* 5 mm, obovate; pappus of a few rigid hairs. *W. Mediterranean region.* Co Ga It Sa Si *Tu.

146. Cichorium L.[2]

Annual to perennial herbs. Stems usually solitary, branched. Leaves runcinate-pinnatifid or dentate. Capitula numerous, terminal and axillary. Involucre cylindrical; bracts in 2 rows, the outer shorter. Receptacle more or less flat, without scales. Ligules usually blue. Achenes obovoid, more or less angled, truncate at apex; pappus of 1–2 rows of short, obtuse scales.

1 Upper branches non-flowering and spine-like; involucre 5–8 mm **3. spinosum**
1 Spine-like branches absent; involucre 11–14 mm
2 Peduncles of terminal capitula slightly thickened at apex; pappus-scales $\frac{1}{10}$–$\frac{1}{8}$ as long as achene **1. intybus**
2 Peduncles of terminal capitula strongly thickened; pappus-scales $\frac{1}{5}$–$\frac{1}{2}$ as long as achene **2. endivia**

1. C. intybus L., *Sp. Pl.* 813 (1753). Glabrous or with subrigid hairs. Perennial with long, stout taproot. Stems 30–120 cm, erect, with rigid, patent-ascending branches. Basal leaves 7–30 × 1–12 cm, oblanceolate, runcinate-pinnatifid to dentate, shortly petiolate; cauline with fewer teeth or entire, sessile, amplexicaul. Peduncles of terminal capitula slightly thickened at apex. Involucre 11–14 × 4–10 mm; outer bracts *c.* 8, broadly lanceolate, patent at apex; inner bracts *c.* 5, twice as long as the outer and narrower, erect. Ligules bright blue, rarely pink or white, 3 times as long as involucre. Achenes 2–3 mm, irregularly angular, pale brown; pappus-scales $\frac{1}{10}$–$\frac{1}{8}$ as long as achene. $2n=18$. *Much of Europe, but doubtfully native in most of the north. Formerly cultivated as a medicinal plant, and more recently as a coffee-substitute and for ornament, and widely naturalized.* All except Fa Is Sb, but only casual or doubtfully naturalized in Fe Hb No Rs (N).

The cultivated plant is larger in all its parts, with more handsome flowers.

2. C. endivia L., *Sp. Pl.* 813 (1753). Like **1** but usually annual or biennial; peduncles of terminal capitula strongly thickened; pappus-scales of larger achenes $\frac{1}{5}$–$\frac{1}{2}$ as long as achene. *S. Europe; widely cultivated elsewhere.* Al Bu Co Cr Ga Gr Hs It Ju Lu Si Tu.

(a) Subsp. **endivia**: Stems (30–)60–120 cm. Leaves dentate to deeply pinnatifid, nearly glabrous. $2n=18$. *Widely cultivated as a salad plant, particularly in S. Europe.*

(b) Subsp. **divaricatum** (Schousboe) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 240 (1976) (*C. divaricatum* Schousboe, *C. pumilum* Jacq.): Stems 5–50 cm. Leaves runcinate-dentate, the basal hairy. *S. Europe.*

3. C. spinosum L., *Sp. Pl.* 813 (1753). Dwarf perennial with a woody stock. Stems 3·5–18 cm, divaricately branched from the base, the upper branches non-flowering and spine-like. Leaves 2–9 × 0·2–1·5 cm, fleshy, runcinate or dentate, glabrous. Capitula mostly in the dichotomies of the stem, subsessile in groups of 1–4. Involucre 5–8 × 2–3 mm; outer bracts ovate to broadly elliptical, the inner lanceolate, *c.* 3 times as long as the outer. Ligules blue, rarely pink or white, about twice as long as involucre. Achenes 1·5–2 mm; pappus-scales $\frac{1}{10}$–$\frac{1}{8}$ as long as achene. *Mediterranean region.* Cr Gr Hs It Si.

147. Catananche L.[1]

Annual or perennial herbs. Stems solitary or few. Leaves entire or remotely dentate, mostly basal. Capitula 1–5, mostly long-pedunculate. Involucral bracts in several rows, scarious except for darker mid-vein. Receptacle flat, with long, filiform scales. Ligules blue or yellow. Achenes oblong, obscurely 5-angled, 5- to 10-ribbed; pappus of 1 row of 5–7 ovate, long-aristate scales.

Involucral bracts all ovate, abruptly and acutely cuspidate; ligules blue **1. caerulea**
Involucral bracts of 2 kinds, the outer ovate, abruptly acute at apex, the inner narrower and long-attenuate at apex; ligules yellow **2. lutea**
yellow **2. lutea**

1. C. caerulea L., *Sp. Pl.* 812 (1753). Perennial. Stems 20–90 cm, hairy, the hairs mostly appressed. Leaves linear, entire, or with up to 4 linear, usually forwardly directed teeth; basal 20–300 × 2–7 mm, numerous; cauline remote. Peduncles up to 30 cm, bracteate. Involucre 13–25 × 10–20 mm; all bracts ovate, the apex abruptly and acutely cuspidate. Ligules blue. $2n=18$. *S.W. Europe.* Bl Ga Hs It.

[1] By P. D. Sell.

2. C. lutea L., *Sp. Pl.* 812 (1753.) Annual. Stems 8–40 cm, hairy, the hairs mostly appressed. Leaves linear, narrowly oblanceolate-linear or very narrowly elliptic-linear, entire or remotely and shallowly dentate; basal 30–150 mm, numerous; cauline remote. Peduncles up to 20 cm, mostly ebracteate, usually with several sessile capitula at base of stem. Outer involucral bracts ovate, the inner narrow and long-attenuate at apex, much exceeding the outer. Ligules yellow. *Dry places. Mediterranean region.* Cr Gr *Hs It Sa Si Tu.

(a) Subsp. **lutea**: Involucre 15–20 mm. *From the Aegean region to N.W. Italy.*

(b) Subsp. **carpholepis** (Schultz Bip.) Nyman, *Consp.* 472 (1879) (*Piptocephalum carpholepis* Schultz Bip.): Involucre 20–30 mm. *S. Spain* (*perhaps introduced*). (*N. Africa.*)

148. Rothmaleria Font Quer[1]

(*Haenselera* Boiss. ex DC., non Lag.)

Perennial herbs. Stems several, simple. Leaves dentate to pinnatifid. Capitulum solitary. Involucral bracts in several rows. Receptacle with numerous scales. Ligules yellow. Achenes oblong; pappus of 5 or 6 ovate, dentate scales.

1. R. granatensis (Boiss. ex DC.) Font Quer, *Brotéria* (*Ci. Nat.*) **9**: 151 (1940) (*Haenselera granatensis* Boiss. ex DC.). Stems 2–30 cm, several, glabrous or scabridulous, with a thick stock. Basal leaves 15–100 × 5–20 mm, in a rosette, thick, glaucous, obovate-oblong, narrowed to the petiole, incise-dentate to pinnatifid with crispate, dentate lobes; cauline leaves similar but smaller, often sessile, remote. Involucre 10–12 × 10–12 mm; bracts imbricate, oblong, obtuse to acute, with a wide, whitish, scarious margin. Receptacular scales linear, acute. Achenes 4–5 mm. *Mountain rocks and screes.* ● *S. Spain* (*Sierra Nevada, Sierra Harana*). Hs.

149. Hymenonema Cass.[1]

Perennial herbs. Stems solitary to few, branched. Leaves pinnatifid. Capitula few. Involucral bracts in several imbricate rows; margins scarious. Receptacle pitted, with scales near the margin. Ligules yellow. Achenes 5-angled, with rigid, appressed hairs, the marginal enfolded within the inner involucral bracts (or bract-like scales); pappus of rigid, subplumose hairs and scales in 2–3 rows, or sometimes only of scales.

Terminal lobe of leaf (10–)15–30 mm wide; outer achenes with pappus of trifid scales with a rigid, subplumose hair at apex; inner achenes with outer pappus of rigid, subplumose hairs and inner pappus of entire, lanceolate scales with a rigid subplumose hair at apex **1. laconicum**
Terminal lobe of leaf not more than 10 mm wide; pappus more or less uniform, of lanceolate scales, with a rigid, subplumose hair at apex **2. graecum**

1. H. laconicum Boiss. & Heldr. in Boiss., *Fl. Or.* **3**: 715 (1875).
Stems 20–70 cm, with pale, minute glandular and longer eglandular hairs. Leaves with dense, appressed, rigid hairs; basal 70–250 mm, pinnatifid, with dentate segments, the terminal (10–)15–30 mm wide, larger than the lateral; cauline 1–6, like basal or bract-like. Capitula 1–3. Involucre 15–24 × 15–22 mm; bracts ovate or oblong-ovate, obtuse, entire or dentate, glabrous. Receptacular pits long-ciliate. Achenes 4–5 mm; pappus of outer achenes of trifid scales, the central point of each scale prolonged as a rigid, subplumose hair; pappus of inner achenes with an outer row of rigid, subplumose hairs and an inner row of lanceo-

late scales, the midrib prolonged as a rigid, subplumose hair. *Dry grassland.* ● *S. Greece (Peloponnisos).* Gr.

2. H. graecum (L.) DC., *Prodr.* 7: 116 (1838). Like **1** but leaves with the terminal segment not more than 10 mm wide; ligules sometimes with a purple spot at base; receptacular pits glabrous or with a few short cilia; all achenes with more or less uniform pappus of lanceolate scales, the midrib prolonged as a rigid, subplumose hair. *Roadsides and stony places.* ● *S. Aegean region.* Cr Gr.

150. Tolpis Adanson[1]

Annual to perennial herbs. Stems solitary to many, usually branched. Leaves entire to dentate or lobed. Capitula few to numerous. Involucral bracts in 2–3 rows. Receptacle flat, pitted, without scales. Ligules yellow or the inner purplish-brown, usually turning greenish when dry. Achenes 0·5–4 mm, with 6–8(–10) ribs, not narrowed or beaked above, uniform or of 2 kinds; pappus of short or long rigid hairs, or a mixture of the two, the hairs sometimes expanded at the base.

1 Annual; outer involucral bracts at least as long as the inner; achenes with pappus of numerous short hairs, the inner with (0–)2–4(–5) long hairs, the outer without long hairs **1. barbata**
1 Perennial, rarely biennial; outer involucral bracts shorter than the inner; all achenes with pappus of 4 to many long hairs, with or without short hairs
2 Stem uniformly leafy; middle cauline leaves as large as or larger than the basal **4. azorica**
2 Leaves mostly basal, the cauline usually much smaller than the basal, or absent
3 Stems simple, or with branches not or scarcely overtopping the main stem; pappus of numerous long hairs and no short hairs **5. staticifolia**
3 Stems with branches overtopping the main stem; pappus of 4–12 long hairs mixed with short hairs
4 Mature leaves pubescent; branches making a narrow angle with the main stem **2. virgata**
4 Mature leaves glabrous; branches divaricate **3. fruticosa**

1. T. barbata (L.) Gaertner, *Fruct. Sem. Pl.* 2: 372 (1791). Somewhat pubescent annual 6–90 cm. Lower leaves 2–10 cm, linear-lanceolate to broadly ovate or obovate, entire to coarsely dentate or subpinnatifid, usually acute; upper cauline leaves similar but smaller. Stem simple or branched, the branches overtopping the main stem. Capitula 1 to several, on thickened peduncles with few to many curved, setaceous supplementary bracts. Involucre 6–15 mm; outer bracts at least as long as inner, setaceous, curved, not appressed; inner linear-lanceolate, erect. Outer achenes with pappus of hairs much shorter than the achene; inner achenes with pappus of short hairs mixed with (0–)2–4(–5) hairs much longer than the achene. $2n=18$. *Grassy and sandy places. S. Europe.* Az Bl Bu Co Cr Ga Gr Hs It Lu ?Rm.

Very variable in leaf-shape, size of capitula and colour of florets, as well as in number of long hairs in the pappus. Most florets, as well as in number of long hairs in the pappus. Most commonly the capitula are 17–30 mm in diameter, with the outer florets pale yellow and the inner purplish-brown. A variant (**T. umbellata** Bertol., *Rar. Lig. Pl.* 1 : 13 (1803)) has the capitula 11–16 mm in diameter and all the florets pale yellow. There is little correlation between these characters and the number of long hairs in the pappus of the inner achenes, and the variant occurs rather rarely throughout most of the range of the species. In S.W. Spain another variant occurs which has the outer florets deep yellow, the inner purplish and the leaves usually broadly ovate to obovate, obtuse and mucronate. The pappus is sometimes entirely without long hairs and the plant biennial or perennial.

2. T. virgata Bertol., *op. cit.* 15 (1803) (*T. altissima* Pers.). Somewhat pubescent perennial or biennial 30–100 cm. Lower leaves 5–20 cm, oblong-lanceolate to elliptical, entire to serrate or deeply dentate, acute or subobtuse; upper cauline leaves similar but smaller. Stem branched, the branches making a narrow angle with the main stem and overtopping it. Capitula usually several; peduncles slightly thickened below the capitula; supplementary bracts absent, or few, small and usually appressed. Involucre 6–8 mm; outer bracts shorter than inner; all bracts linear-lanceolate, straight, appressed. All achenes with pappus of 4–12 long hairs mixed with short hairs. *Dry, grassy or sandy places. Mediterranean region from S.E. France eastwards.* Al Co Cr Ga Gr It Sa Si Tu.

T. virgata var. *quadriaristata* (Biv.) Fiori & Paol., from Sicilia, is somewhat intermediate between **1** and **2**. It appears to be perennial and has a pappus of usually 4 long hairs, but the outer involucral bracts are about as long as the inner, curved and not appressed. It requires further investigation.

3. T. fruticosa Schrank, *Pl. Rar. Horti Monac.* t. 46 (1819). Like **2** but involucre and very young stems and leaves floccose, soon glabrescent; stems up to *c.* 30 cm, woody at base, with divaricate branches; capitula usually 3–4; pappus usually of 12 long hairs. *Maritime rocks. Açores.* Az. (*Madeira.*)

4. T. azorica (Nutt.) P. Silva in Palhinha, *Cat. Pl. Vasc. Açores* 129 (1966). Subglabrous perennial 15–70 cm, woody below. Leaves 3–15 cm, the middle cauline as large as or larger than the basal, oblong to ovate, dentate, often deeply so, the teeth usually falcate with a wide, rounded sinus between them. Stem branched, the branches not or slightly overtopping the main stem. Capitula usually several; peduncles not thickened below the capitula, with more or less numerous erecto-patent supplementary bracts. Involucre 8–11 mm; bracts linear-lanceolate, the outer half as long as the inner, floccose at base, the inner puberulent near apex. Pappus usually of 10–12 hairs. *Shady rocks.* ● *Açores.* Az.

5. T. staticifolia (All.) Schultz Bip., *Bonplandia* 9: 173 (1861) (*Hieracium staticifolium* All.). Subglabrous, rhizomatous perennial 10–50 cm. Basal leaves 4–10 cm, linear to linear-oblanceolate, entire or remotely denticulate, subacute; cauline few or none, linear, entire. Stems simple or sparingly branched, the branches not or scarcely overtopping the main stem. Capitula few; peduncles somewhat thickened below the capitula, with few, more or less appressed small supplementary bracts. Involucre 9–11 mm; bracts linear-lanceolate to narrowly elliptical, the outer much shorter than the inner, all floccose. Pappus of numerous long hairs and no short hairs. $2n=18$. *Dry, open habitats, mainly in the mountains; somewhat calcicole.* ● *Alps and adjacent regions; Albania.* Al Au ?Cz Ga Ge He Hu It Ju.

151. Arnoseris Gaertner[2]

Annuals. Stems numerous. Leaves all basal, more or less dentate. Capitula 1–3. Involucral bracts usually in 1 row, connate near base, sometimes with a few small supplementary bracts. Receptacle flat, without scales. Ligules yellow, becoming discoloured when dry. Achenes 3- to 5-angled, with the same number of alternate, weaker ribs; pappus absent.

[1] By T. G. Tutin. [2] By P. D. Sell.

1. A. minima (L.) Schweigger & Koerte, *Fl. Erlang.* 2: 72 (1811). Leaves 10–90 × 3–20 mm, numerous, spathulate or oblanceolate, obtuse to acute, with patent to ascending teeth, narrowed at base to a usually short petiole, scabridulous or slightly hairy particularly on the margin. Scapes 5–32 cm, glabrous or nearly so; peduncles conspicuously thickened towards apex. Involucre 3–6 × 4–8 mm; bracts lanceolate, acuminate, glabrous or minutely hairy; midrib paler and thickened dorsally after flowering. Achenes 1·5–2·25 mm, narrowly obovate, dark, with pale angles and ribs and a short border at apex. $2n=18$. *Cultivated and waste land, mainly on sandy soils. W. & C. Europe, extending northwards to S. Sweden and eastwards to S. W. Ukraine.* Au Be Br Co Cz Da Ga Ge He Ho Hs It Ju Lu Po ?Rm Rs (B, ?C, W) Su.

152. Koelpinia Pallas[1]

Annuals. Stem solitary, often branched. Leaves linear to filiform, entire. Capitula 1–3. Involucral bracts few, subequal. Receptacle without scales. Ligules whitish-yellow. Achenes linear-cylindrical, strongly incurved, with long hooked projections along the back and at the apex, the pappus otherwise absent.

1. K. linearis Pallas, *Reise* 3: 755 (1776). Up to 40 cm. Leaves 15–90 × 0·5–3 mm, linear or filiform, entire. Inflorescence of 1–3 capitula on peduncles up to 4 cm, and usually with 1 capitulum on a short peduncle at the base of the plant. Involucre 7–8 × 2–6 mm; bracts 5–7, linear, entire. Achenes (8–)12–16 mm. *Semi-deserts. S.E. Spain (Almeria prov.); S.E. Russia, W. Kazakhstan.* Hs Rs (E). (*C. Asia, N. Africa.*)

153. Hyoseris L.[1]

Annual or perennial herbs. Stems several, simple. Leaves all basal, pinnatifid. Capitula solitary. Involucral bracts in 2 rows, the outer much shorter than the inner. Receptacle flat, without scales. Ligules yellow, the outer sometimes with a purplish stripe on outer face which turns greenish when dry. Marginal achenes compressed, the median compressed and winged, the inner terete or compressed and winged; pappus of rigid hairs and scales, or only of scales.

1 Scapes 0·5–7 cm, often swollen; involucre 7–10 × 3–5 mm **1. scabra**
1 Scapes 6–36 cm, not swollen; involucre 10–19 mm
2 Stock not woody; involucre 10–15 mm; inner achenes terete, sterile **2. radiata**
2 Stock woody; involucre 13–19 mm; inner achenes compressed, winged, fertile **3. taurina**

1. H. scabra L., *Sp. Pl.* 809 (1753). Annual. Leaves 15–80 × 3–14 mm, patent, narrowly oblanceolate, obtuse to subacute, narrowed at base to a winged petiole, glabrous or with few hairs, often farinose; lobes ovate, obtuse or acute, more or less dentate. Scapes 0·5–7 cm, ascending or procumbent, often swollen at the middle or near the apex, glabrous or farinose. Involucre 7–10 × 3–5 mm; bracts usually pale, linear, oblong or lanceolate, more or less obtuse, glabrous or slightly farinose. Achenes 7–8 mm, brown, sometimes minutely puberulent, the outer compressed, the median compressed and winged, the inner terete; outer achenes with a pappus of short hairs, the median and inner achenes with a pappus of pale, narrowly linear-lanceolate scales. $2n=16$. *Dry, open habitats. Mediterranean region, S. Portugal.* ?Al Bl Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

[1] By P. D. Sell.

2. H. radiata L., *Sp. Pl.* 808 (1753). Perennial. Leaves 50–250 × 10–50 mm, ascending or erect, oblanceolate, obtuse to acute, often long-petiolate; lobes more or less ovate, often runcinate, sometimes imbricate, subentire to dentate. Scapes 6–36 cm, erect, usually glabrous or farinose, sometimes hispid. Involucre 10–15 × 7–15 mm; bracts pale or dark, linear or oblong, obtuse, glabrous or farinose. Achenes 8–10 mm, brown, puberulent, the marginal compressed, the median compressed and winged, the inner terete; all achenes with a pappus of both rigid hairs and linear scales, those of the outer achenes sometimes much shorter than those of the inner. *Mediterranean region.* Bl Co Cr Ga Gr Hs It Ju Sa Si.

(a) Subsp. **radiata**: Leaves not fleshy, glabrous, farinose or somewhat hispid; lobes dentate. Pappus of all achenes more than 5 mm. $2n=16$. *Throughout the range of the species.*

(b) Subsp. **graeca** Halácsy, *Consp. Fl. Graec.* 2: 179 (1902) (*H. lucida* L.): Leaves fleshy, glabrous or farinose; lobes subentire or slightly dentate. Pappus of outer achenes up to 1 mm. $2n=16$. *Mainly in C. Mediterranean region.*

3. H. taurina (Pamp.) G. Martinoli, *Caryologia* 5: 257 (1953). Perennial with branched, woody stock. Leaves 70–250 × 25–60 mm, ascending or erect, fleshy, oblanceolate or oblong, obtuse, glabrous; lobes ovate, sinuate-dentate or -crenate. Scapes 13–16 cm, erect, glabrous or with a few hairs. Involucre 13–19 × 10–15 mm; bracts pale, sometimes with dark apex, the outer ovate and contracted into a narrow but obtuse apex, the inner broadly oblong, obtuse, glabrous. Achenes 7–8 mm, pale brown, puberulent, the outer compressed and with a pappus of hairs and scales up to 1 mm, the inner compressed, winged and with a pappus of long hairs and linear scales. $2n=16$. *Rock crevices.* ● *S.W. Sardegna (Isola il Toro).* Sa.

154. Hedypnois Miller[1]

Annuals. Stems usually many, branched. Leaves entire to dentate or lobed. Capitula 1–many. Involucral bracts in 2 rows, the outer very small. Receptacle flat, without scales. Ligules yellow, the outer sometimes with a greenish stripe on the outer face. Achenes more or less cylindrical, often incurved, the outer usually partly enclosed in the involucral bracts; pappus (at least of inner achenes) of narrow, long-aristate scales, sometimes also including hairs.

Involucral bracts strongly incurved in fruit; pappus of outer achenes usually a corona **1. cretica**
Involucral bracts not or only slightly incurved in fruit; pappus of all achenes of scales and hairs **2. arenaria**

1. H. cretica (L.) Dum.-Courset, *Bot. Cult.* 2: 339 (1802) (*H. rhagadioloides* (L.) F. W. Schmidt, *H. polymorpha* DC.). Plant 3–45(–60) cm, more or less hairy. Leaves 5–180(–250) × 2–25(–35) mm, mostly narrowly elliptical to oblanceolate, entire to deeply dentate or lobed, the basal usually with winged petioles, the cauline usually sessile. Capitula 1–numerous; peduncles more or less thickened. Involucre 7–10·5 × 3–11 mm; bracts narrowly linear-lanceolate, more or less acute, the inner usually partially enclosing the outer achenes and strongly incurved in fruit. Achenes 5–7·5 mm, often narrowed near apex, with minute, rigid hairs; outer achenes incurved. Pappus of outer achenes usually a corona, that of inner achenes of narrow, long-aristate scales. $2n=8, 11, 12, 13, 14, 15, 16, 18$. *Dry places. S. Europe.* Al Az Bl Bu Co Cr Ga Gr Hs It Ju Lu Rs (K) Sa Si Tu.

Very variable in size, habit, hairiness, dissection of leaf and thickening of peduncle. Many variants have been named, but the

characters occur in various combinations, even in the same locality, and there seem to be no variants of any geographical or ecological significance.

2. H. arenaria (Schousboe) DC., *Prodr.* 7: 82 (1838). Plant 10–40 cm, glabrous or sparsely hairy. Leaves 6–35 × 5–12 mm, lanceolate to oblong-linear, sinuate-dentate, the basal usually with winged petioles, the cauline sometimes semiamplexicaul. Capitula more or less numerous; peduncles not or only slightly thickened. Involucre 11–14 × 8–12 mm; bracts lanceolate to linear-lanceolate, the inner sometimes partially enclosing the outer achenes, not or only slightly incurved. Achenes 8–9 mm, with minute rigid hairs, the outer not incurved. Pappus of all achenes of hairs and narrow scales. $2n=6$. *Maritime sands. S.W. Spain, S. Portugal.* Hs Lu.

155. Rhagadiolus Scop.[1]

Annuals. Stems usually solitary, branched. Leaves dentate to pinnatifid. Capitula few to numerous. Involucral bracts in 2 rows, the outer very short, the inner accrescent and patent in fruit. Receptacle flat, without scales. Ligules yellow. Achenes narrowly cylindrical, the inner caducous, the outer enclosed in the involucral bracts and long-persistent; pappus absent.

1. R. stellatus (L.) Gaertner, *Fruct. Sem. Pl.* **2**: 354 (1791) (*R. edulis* Gaertner). Plant 7–40 cm, usually sparsely hairy throughout. Leaves 25–140 × 10–70 mm, mostly oblong-obovate, sinuate-dentate to lyrate-pinnatifid, but the cauline sometimes ovate to lanceolate. Involucre 5–8 × 2·5–3·5 mm at anthesis, accrescent in fruit; outer bracts 5, very small, ovate; inner bracts 5–8, narrowly linear-lanceolate, sometimes with a median row of rigid hairs. Outer achenes 10–15 × 1–1·5 mm, curved, forming a characteristic radiating infructescence. $2n=10$. *Cultivated ground and stony waste places. S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Rs (K) Sa Si Tu.

156. Aposeris Cass.[1]

Perennial herbs. Stems several, simple. Leaves all basal, pinnately divided. Capitulum solitary. Involucral bracts in 1 row. Receptacle flat, without scales. Ligules yellow. Achenes oblong-cuneate to obovoid, 5-angled; pappus absent.

1. A. foetida (L.) Less., *Syn. Gen. Comp.* 128 (1832). Leaves 5–18 × 1·5–5 cm, numerous, oblanceolate, subacute, regularly pinnately divided into subrhombic, subacute, patent or retrorse lobes which have 1–2 subacute teeth on the lower margin, narrowed at base to a short more or less winged petiole, glabrous, or with a few hairs especially on the veins beneath. Scapes 10–20 (–35) cm, glabrous or subglabrous. Involucre 10–12 × 4–6 mm; bracts dark, linear to narrowly linear-lanceolate, obtuse, glabrous, the outermost *c.* ½ as long as the inner. Achenes 4–4·5 mm, pale yellowish-brown. $2n=16$. *Woods, river-banks and damp meadows, mainly in the mountains; somewhat calcicole. C. Europe, extending to S.E. France, N. Italy, C. Jugoslavia and White Russia.* Au Cz Ga Ge He ?Hs It Ju Po Rm Rs (C, W).

157. Urospermum Scop.[1]

Annual to perennial herbs. Stems solitary, sparingly branched. Leaves entire to pinnatifid. Capitula few, large. Involucral bracts 7–8, in 1 row, connate at base, some with pale margins. Receptacle without scales. Ligules yellow, sometimes striped with red. Achenes beaked; pappus of 2 rows of plumose hairs.

Involucral bracts lanceolate, subacute, softly hairy; pappus pale reddish-brown **1. dalechampii**
Involucral bracts ovate-lanceolate, long-acuminate, spinulose; pappus white **2. picroides**

1. U. dalechampii (L.) Scop. ex F. W. Schmidt, *Samml. Phys. Aufs. Naturk.* 276 (1795). Probably always perennial. Stem 25–40 cm, pubescent. Leaves 50–190 × 10–40 mm, hispid; lower usually runcinate-pinnatifid (rarely entire), with winged petiole; upper lanceolate to ovate, entire to dentate, amplexicaul. Capitula up to 5 cm in diameter, 1–3 on very long peduncles. Involucral bracts 15–25 × 2·5–6 mm, lanceolate, subacute, softly hairy. Ligules pale yellow, often with a red stripe on the outer face. Body of achene 4–5·5 mm, oblong, with short, obtuse projections; beak 9–14 mm, scabrid, very narrowly pyramidal, confluent with the body; pappus pale reddish-brown. $2n=14$. *Cultivated and waste ground. Mediterranean region, eastwards to Jugoslavia.* Bl Co Ga Hs It Ju Sa Si.

2. U. picroides (L.) Scop. ex F. W. Schmidt, *op. cit.* 275 (1795). Annual. Stem 30–45 cm, long-hispid and spinulose. Leaves 40–140 × 10–50 mm, hispid or spinulose at least on the veins beneath; lower obovate-oblong, pinnatifid or dentate, with winged petiole; upper ovate to linear, acute, more or less dentate, auriculate-amplexicaul. Capitula up to 4 cm in diameter, 1–9 on long peduncles thickened at the apex. Involucral bracts 13–22 × 5–8 mm, ovate-lanceolate, long-acuminate, hispid and spinulose. Ligules pale yellow. Body of achene 5–6·5 mm, more or less oblong but swollen distally, with short, obtuse projections; beak 6–8 mm, slender, cylindrical, shortly hairy; pappus white. $2n=10$. *Cultivated ground, dry grassland and waste places. Mediterranean region and S.W. Europe.* Al Az Bl Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

158. Hypochoeris L.[2]

Annual to perennial herbs. Stems solitary to few, usually branched. Leaves usually all basal, entire or sinuate-dentate to pinnatifid. Capitula 1–few. Involucral bracts in 1–several imbricate rows. Receptacle flat, with numerous scarious scales. Ligules yellow, the outer sometimes with a greenish or reddish stripe on the outer face. Achenes more or less cylindrical, at least the inner usually beaked; pappus of 1–2 rows of scabrid or plumose rigid hairs sometimes dilated at the base, or rarely of fimbriate scales.

1 Pappus of 2 rows of hairs
 2 Outer row of pappus-hairs 0·5–1 mm; inner row of pappus-hairs 4–8 mm, narrowly dilated at the base; achenes 4·5–6·5 mm, beaked; involucral bracts up to 15 mm
  3 Perennial; stem usually glabrous, at least above; capitula 15–20 mm wide **2. laevigata**
  3 Annual; stem hispid, at least above; capitula up to 15 mm wide **3. achyrophorus**
 2 Outer row of pappus-hairs 3–6 mm; inner row of pappus-hairs 9·5–15 mm, not dilated at the base; achenes 2·5–17 mm, beaked or unbeaked; involucral bracts up to 25 mm
  4 Marginal achenes 2·5–6 mm, unbeaked, inner achenes 6–8·5(–13·5) mm, beaked or unbeaked; capitula 5–15 mm wide; leaves glabrous to puberulent, rarely setulose-hispid; usually annual **8. glabra**
  4 Achenes 8–17 mm, beaked, or the marginal achenes *c.* 5 mm, beaked or unbeaked; capitula 20–30(–40) mm wide; leaves usually setulose-hispid; perennial **9. radicata**
1 Pappus of 1 row of hairs or fimbriate scales
 5 Capitula up to 60 mm wide; involucral bracts up to 30 mm; pappus-hairs 6–13 mm; achenes 9·5–20 mm
 6 Outer involucral bracts entire; leaves often streaked with dark purple; stem not thickened, or sometimes thickened immediately below the capitula **5. maculata**
 6 Outer involucral bracts usually lacerate-fimbriate; leaves not streaked; stem thickened in upper half **6. uniflora**
 5 Capitula up to 25 mm wide; involucral bracts up to 15 mm; pappus of hairs 4–6 mm or of scales 0·15 mm; achenes 3·5–10 mm
  7 Stems with at least one ± large foliage leaf; marginal achenes 5·5–6 mm, with pappus of fimbriate scales *c.* 0·15 mm or of hairs; inner achenes 7·5–10 mm, with pappus of hairs **4. cretensis**
  7 Leaves all in a basal rosette (the stem with several bract-like scales); achenes 3·5–6·5 mm, with pappus of hairs
   8 Stems 4–30 cm; achenes unbeaked; pappus-hairs narrowly dilated at the base **1. robertia**
   8 Stems 2–9 cm; achenes shortly beaked; pappus-hairs not dilated at the base **7. tenuiflora**

1. H. robertia Fiori, *Nuovo Gior. Bot. Ital.* nov. ser., **17**: 655 (1910) (*Robertia taraxacoides* (Loisel.) DC.). Perennial. Stems 4–30 cm, simple, not thickened near the apex, glabrous, or sparsely setose below, with several remote, linear scales. Leaves 3–12 cm, spathulate to oblanceolate, pinnatifid, rarely entire, glabrous. Capitula up to 10(–25) mm wide. Involucral bracts up to 11 × 3 mm, in 1–several rows, glabrous (except for tomentose apex), crispate-puberulent or hispid. Ligules lemon yellow or pale golden yellow. Achenes 3·5–6·5 × 0·5–0·7 mm, unbeaked; pappus of 1 row of plumose hairs 5–6 mm, narrowly lanceolate-dilated at the base. $2n=8$. *Mountain rocks and screes.* ● *Italy, Sicilia, Corse, Sardegna.* Co It Sa Si.

2. H. laevigata (L.) Cesati, Passer. & Gibelli, *Comp. Fl. Ital.* 465 (1879). Perennial. Stems 8–50 cm, simple or branched, not thickened near the apex, usually glabrous, sometimes with several remote, linear scales. Leaves 3–20 cm, spathulate to oblanceolate, entire to pinnatifid, glabrous to hispid. Capitula 15–20 mm wide. Involucral bracts up to 15 × 2·5 mm, in several rows, hispid or pubescent (rarely glabrous) at least along upper part of the mid-vein, with tomentose apex. Ligules sulphur-yellow. Achenes 5–6 mm, beaked; pappus of 2 rows of hairs, the outer 0·5–1 mm, the inner 7–8 mm, plumose, narrowly lanceolate-dilated at the base. *Rocks and dry grassland. S.W. Italy, Sicilia.* It Si. (*N. Africa.*)

3. H. achyrophorus L., *Sp. Pl.* 810 (1753) (*H. aethnensis* (L.) Ball). Annual. Stems 8–35(–60) cm, usually branched, sometimes thickened immediately below the capitula, hispid at least above, sometimes with remote, linear scales. Leaves 3–18 cm, spathulate, oblanceolate or obovate, entire to lobed, hispid; cauline 0–several. Capitula up to 15 mm wide. Involucral bracts up to 14 × 2 mm, in several rows, densely hispid. Ligules golden- or orange-yellow. Achenes 4·5–6·5 mm, beaked; pappus of 2 rows of hairs, the outer *c.* 0·5 mm, the inner 4–6 mm, plumose, narrowly lanceolate-dilated at the base. $2n=12$. *Mediterranean region.* Al Bl Co Cr Ga Gr Hs It Ju Sa Si Tu.

4. H. cretensis (L.) Borv & Chaub. in Borv. *Exnéd. Sci. Morée* **4. H. cretensis** (L.) Bory & Chaub. in Bory, *Expéd. Sci. Morée* **3(2)**: 237 (1832) (*H. pinnatifida* (Ten.) Cyr.). Perennial. Stems 10–85 cm, usually branched, somewhat thickened below the apex, glabrous to sparsely tomentose, sometimes hirsute below. Leaves 5–25 cm, spathulate, elliptical or oblanceolate, pinnatifid, rarely dentate, glabrous to setose-hispid; cauline several, gradually merging into scales above. Capitula up to 22 mm wide. Involucral bracts up to 15 × 1·5 mm, in several rows, subglabrous, tomentose, or the keel setose-hispid. Ligules yellow. Marginal achenes 5·5–6 mm, beaked, with pappus a corona of fimbriate scales *c.* 0·15 mm or of 1 row of long, plumose hairs; inner achenes 7·5–10 mm, long-beaked, with pappus of 1 row of plumose hairs 5–6 mm, not dilated at the base. $2n=6$. *E. & C. Mediterranean region.* Al Bu Co Cr Gr It Ju Sa Si.

5. H. maculata L., *Sp. Pl.* 810 (1753) (*Achyrophorus maculatus* (L.) Scop.). Perennial. Stems 15–75(–90) cm, simple or sparingly branched, not thickened, or sometimes thickened immediately below the capitula, hispid or sparsely hirsute. Leaves 4–30 cm, elliptical to ovate or obovate, subentire to deeply dentate, subglabrous to hispid, often streaked with dark purple; cauline few or absent, often merging into scales above. Capitula up to 45(–60) mm wide. Involucral bracts up to 25 × 2·5 mm, in several rows, entire, setose-hispid, often with tomentose margin. Ligules pale lemon-yellow. Achenes 9·5–17 mm, rather long-beaked; pappus of 1 row of plumose hairs 6–11 mm, not dilated at the base. $2n=10$. *Meadows and open woodland. Much of Europe, but absent from the arctic and most of the Mediterranean region.* Al Au Be Br Bu Cz Da Fe Ga Ge Gr He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, E) Su.

6. H. uniflora Vill., *Prosp. Pl. Dauph.* 37 (1779) (*Achyrophorus uniflorus* (Vill.) Bluff & Fingerh.). Perennial. Stems 13–60 cm, usually simple, strongly thickened in upper half, hirsute, puberulent near the apex. Leaves 5–22 cm, oblong, elliptical or oblanceolate, dentate, rarely subentire, subglabrous to pubescent, ciliate, not streaked; cauline 1–several, often merging into remote scales above. Capitula up to 60 mm wide. Involucral bracts in several rows, the outer up to *c.* 15 × 8 mm, lanate-tomentose or hispid, usually lacerate-fimbriate, the inner up to 30 × 12 mm. Ligules pale golden yellow. Achenes 10–20 mm, long-beaked; pappus of 1 row of plumose hairs 9·5–13 mm, not dilated at the base. $2n=10$. *Mountain meadows and pastures; calcifuge.* ● *C. Europe, extending to W. Ukraine.* Au Cz Ga Ge He It Ju Po Rm Rs (W).

7. H. tenuiflora (Boiss.) Boiss., *Fl. Or.* **3**: 785 (1875). Perennial. Stems 2–9 cm, simple or sparingly branched, not thickened near the apex, subglabrous, with several remote, linear scales. Leaves 1·5–10 cm, linear to spathulate or oblanceolate, subentire to pinnatifid, glabrous to sparsely pubescent. Capitula up to 5–9 mm wide. Involucral bracts up to 10 × 2 mm, in several rows, tomentose on the margin or on the back, sometimes sparsely long-setose on the back. Ligules yellow. Achenes 4·5–6·5 mm, shortly beaked; pappus of 1 row of plumose hairs 4–4·5 mm, not dilated at the base. *Rock-crevices,* 1700–2100 *m.* ● *Kriti.* Cr.

8. H. glabra L., *Sp. Pl.* 811 (1753). Annual or perennial. Stems 1–40 cm, usually branched, slightly to strongly thickened immediately below the capitula, glabrous, rarely setulose or prickly, usually with remote scales or leaves above. Leaves 1–20 cm, oblanceolate or spathulate, dentate to pinnatifid, glabrous to puberulent, rarely setulose-hispid. Capitula 5–15 mm wide. Involucral bracts up to 21 × 2·5 mm, in several rows, glabrous, or sparsely long-setose on the mid-vein. Ligules bright or pale yellow. Marginal achenes 2·5–6 mm, unbeaked, sometimes absent; inner achenes 6–8·5(–13·5) mm, long-beaked or unbeaked; pappus of 2 rows of hairs, the outer 3–6 mm, scabrid or sparsely plumose, the inner 9·5–15 mm, plumose, not dilated at the base. $2n=10$. *Europe northwards to S.E. Norway and eastwards to Latvia, W. Ukraine and the Aegean region.* All except Fa Fe Hu Is Rs (N, K, E) Sb.

9. H. radicata L., *Sp. Pl.* 811 (1753). Perennial. Stems (10–)20–60(–100) cm, usually branched, sometimes thickened immediately below the capitula, glabrous, or hispid below, with remote scales above. Leaves (2–)5–25 cm, oblong to elliptical or

[1] By P. D. Sell. [2] By R. A. DeFilipps.

oblanceolate, dentate to pinnatifid, usually setulose-hispid; cauline 0–2. Capitula 20–30(–40) mm wide. Involucral bracts up to 25 × 2·5 mm, in several rows, glabrous, or setose on the mid-vein. Ligules bright yellow. Achenes 8–17 mm, long-beaked, or the marginal achenes *c.* 5 mm, unbeaked or very shortly beaked; pappus of 2 rows of hairs, the outer 3–6 mm, scabrid or sparsely plumose, the inner 9·5–12·5 mm, plumose, not dilated at the base. $2n=8$. *Most of Europe except the north-east.* All except Bl Fa Fe Is Rs (N, K) Sb.

159. Leontodon L.[1]

(*Microderis* DC.)

Annual to perennial, sometimes tuberous herbs, variously hairy but the hairs never with hooked branches. Stems solitary to numerous, scapose, sometimes branched, with 0–numerous bracts. Leaves all basal, entire to deeply pinnatisect. Capitula 1–few, rarely numerous. Involucral bracts in several imbricate rows. Receptacle pitted, the pits often with dentate or ciliate margins, without scales. Ligules yellow, rarely orange, the outer often with a reddish or greyish stripe on the outer face. Achenes more or less cylindrical, sometimes beaked, longitudinally ribbed, with numerous transverse ridges or minute rigid hairs; pappus-hairs 10–40, in 1 row, plumose and with dilated bases, or in 2 rows, the inner always plumose and with dilated bases, the outer sometimes plumose and with dilated bases; marginal achenes sometimes without pappus or with a pappus of scales or hairs.

The nature of the indumentum is important; the hairs may be simple, or more or less sessile and stellate, or stalked and 2- to 7-fid. The length of the stalks in relation to the arms is also important and difficult to define other than by comparison. In an attempt to indicate this difference the terms *long-stalked* and *short-stalked* are used. The abundance of the hairs is indicated by the following terms: *few* or *sparse*, when the hairs in question are scattered or form only a small proportion of the total indumentum; *numerous*, when the hairs are abundant but separated widely enough to be individually distinct; *dense*, when they form a continuous indumentum.

Stigmas which are *discoloured* have developed a dirty greyish or greenish tinge which may turn even darker when dry; yellow stigmas with no discoloration usually remain yellow when dry.

1 Leaves glabrous or with an occasional hair
2 Plant with slender tubers
3 Leaves 2–5 mm wide; involucre 7–8 mm; achenes 4–5 mm **8. microcephalus**
3 Leaves 5–20 mm wide; involucre 12–15 mm; achenes 7–10 mm **9. cichoraceus**
2 Plant without tubers
4 Pappus of 2 rows of hairs or scales
5 At least the inner achenes with a beak at least ½ as long as remainder of achene
6 Outer achenes without a pappus **11. salzmannii**
6 All achenes with a pappus
7 Leaf-hairs 2- to 3-fid; achenes 5–8 mm **15. hispidus**
7 Leaf-hairs 2- to 7-fid; achenes 7–12 mm **19. crispus**
5 Achenes narrowed above or only obscurely beaked
8 Leaves deeply pinnatisect with narrow lobes; stigmas discoloured **5. keretinus**
8 Leaves sinuate-dentate, or pinnatifid with broad lobes; stigmas yellow
9 Involucral bracts with pale, weak simple eglandular hairs **14. schischkinii**
9 Involucral bracts glabrous or with a few rigid simple eglandular or stalked 2-fid hairs **15. hispidus**
4 Pappus of 1 row of hairs
10 Achenes slightly narrowed at apex but not beaked
11 Leaves entire to denticulate; stigmas yellow **2. croceus**
11 Leaves sinuate-dentate to deeply pinnatifid; stigmas discoloured **4. autumnalis**
10 At least some achenes distinctly beaked
12 Outer achenes with a pappus of short scales **10. muelleri**
12 Outer achenes with a pappus of long hairs
13 Beak of inner achenes ¼–½ as long as remainder of achene; pappus-hairs *c.* 10 **12. hispidulus**
13 Beak of inner achenes not more than ¼ as long as remainder of achene; pappus-hairs more than 12
14 Ligules yellow, concolorous **6. carpetanus**
14 Ligules yellow, the outer with a purplish or bluish stripe on outer face
15 Leaves sinuate-dentate to deeply pinnatisect; involucre 10–14 mm; beak of achene ¼–⅓ as long as remainder of achene **6. carpetanus**
15 Leaves usually entire to sinuate-dentate; involucre 9–11 mm; beak of achene less than ¼ as long as remainder of achene **7. duboisii**
1 Leaves hairy
16 Hairs on leaves simple
17 Plant with slender tubers
18 Leaves 2–5 mm wide; involucre 7–8 mm; achenes 4–5 mm **8. microcephalus**
18 Leaves 5–20 mm wide; involucre 12–15 mm; achenes 7–10 mm **9. cichoraceus**
17 Plant without tubers
19 Stigmas discoloured
20 Involucre glabrous or with dark hairs; pappus-hairs in 1 row **4. autumnalis**
20 Involucre with reddish hairs; pappus-hairs in 2 rows **5. keretinus**
19 Stigmas yellow
21 At least the inner achenes with a beak ¼–½ as long as remainder of achene
22 Pappus-hairs more than 12 **6. carpetanus**
22 Pappus-hairs *c.* 10 **12. hispidulus**
21 Achenes narrowed above or only obscurely beaked
23 Leaves 90–230 mm; involucre with pale simple eglandular hairs **13. repens**
23 Leaves 10–90 mm; involucre with blackish or grey simple eglandular hairs intermixed with shorter whitish hairs
24 Outer ligules with purplish stripe on outer face **7. duboisii**
24 Ligules yellow, concolorous
25 Stems 4–50 cm; leaves entire to dentate or rarely pinnatifid; involucre 9–13 mm; pappus very pale brown **1. pyrenaicus**
25 Stems 1–20 cm; leaves dentate to runcinate-pinnatifid; involucre 9–18 mm; pappus white, greyish or yellowish **3. montanus**
16 At least some hairs on leaves stellate or 2- to 7-fid
26 Outer achenes with a pappus of short scales, or hairs not more than 1 mm
27 Plant with tubers; outer achenes with pappus of short hairs **23. tuberosus**
27 Plant without tubers; outer achenes with pappus of scales
28 Beak of inner achenes 5–7 mm **24. maroccanus**
28 Beak of inner achenes not more than 3 mm **25. taraxacoides**
26 Outer achenes with a pappus of hairs more than 5 mm
29 Hairs on leaves long-stalked and not more than 2-fid
30 Capitula 2–80
31 Capitula 2–4, on long peduncles **26. filii**
31 Capitula 20–80, in a corymbose panicle **27. rigens**
30 Capitulum solitary
32 Leaves with a small terminal lobe; hairs on leaves thickened at base **18. hirtus**
32 Leaves with a large terminal lobe; hairs on leaves not thickened at base
33 Outer ligules orange, reddish or greyish-violet on outer face **15. hispidus**
33 All ligules yellow, concolorous **26. filii**
29 At least some hairs on leaves sessile and stellate or stalked and 2- to 7-fid
34 Achenes with numerous short, rigid hairs at least above
35 Stems 1–4 cm; achenes narrowed at apex or obscurely beaked **17. boryi**
35 Stems 7–40 cm; achenes with a distinct beak up to about as long as remainder of achene
36 Leaves dentate to pinnatifid **19. crispus**
36 Leaves entire or subentire **21. incanus**
34 Achenes more or less muricate but not with short rigid hairs
37 Leaves with long-stalked 3- to 5-fid hairs, without sessile stellate or short-stalked 3- to 7-fid hairs
38 Involucre 9–15 mm; achenes 5–8 mm **15. hispidus**
38 Involucre 15–18 mm; achenes 10–15 mm **16. siculus**
37 Leaves with either sessile stellate hairs or short-stalked 3- to 7-fid hairs, or with both
39 Stems not more than 8 cm; all hairs on leaves sessile and stellate **20. hellenicus**
39 Stems 6–35 cm; some hairs on leaves obviously stalked
40 Capitulum solitary; involucre with simple eglandular and stalked 2-fid hairs **21. incanus**
40 Capitula usually 2; involucre with dense sessile stellate and short-stalked 3- to 5-fid hairs **22. berinii**

Sect. SCORZONEROIDES (Moench) Dumort. (Sect. *Oporinia* (D. Don) Koch). Stems with few to numerous bracts which merge into those of the involucre. Hairs, when present, simple and eglandular. Pappus of 1(–2) rows of hairs.

1. L. pyrenaicus Gouan, *Obs. Bot.* 55 (1773). Perennial with vertical or oblique, truncate stock. Stems 1–3, 4–50 cm, simple, thickened at apex, glabrous or nearly so below, with few to numerous dark simple eglandular hairs above; bracts 3–7. Leaves 10–80 × 3–20 mm, linear, narrowly elliptical or oblanceolate, entire, dentate or pinnatifid, with few to numerous hairs. Capitulum solitary. Involucre 9–13 mm; bracts linear-lanceolate, obtuse, with few to numerous dark simple eglandular hairs intermixed with shorter whitish hairs. Ligules yellow, concolorous. Stigmas yellow. Achenes 5–10 mm, pale brown or pale chestnut-brown, cylindrical or narrowly fusiform, gradually narrowed at apex, weakly transversely muricate; pappus-hairs very pale brown, in 1 row and plumose, or in 2 rows, the outer not plumose, the inner longer and plumose. ● *Mountains of S. & S.C. Europe, from N. Portugal to W. Jugoslavia.* Au Ga Ge He Hs It Ju Lu.

1 Leaves entire or subentire (a) subsp. **pyrenaicus**
1 Leaves denticulate to dentate or pinnatifid
2 Petioles indistinct or up to 20 mm; involucre 9–10 mm (b) subsp. **cantabricus**
2 Petioles 5–50(–80) mm; involucre 10–13 mm (c) subsp. **helveticus**

(a) Subsp. **pyrenaicus**: Stems 7–30 cm. Leaves 10–40 × 3–10 mm, entire or subentire; petioles (10–)20–80 mm, slender. Involucre 9–11 mm. *Pyrenees.*

(b) Subsp. **cantabricus** (Widder) Finch & P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 241 (1976) (*L. cantabricus* Widder): Stems 4–15 cm. Leaves 15–40 × 4–8 mm, denticulate to retrorse-dentate or -pinnatifid; petioles indistinct, or up to 20 mm. Involucre 9–10 mm. *N.W. Spain, N. Portugal.*

(c) Subsp. **helveticus** (Mérat) Finch & P. D. Sell, *loc. cit.* (1976) (*L. helveticus* Mérat): Stems 5–50 cm. Leaves 10–80 × 5–20 mm, more or less dentate; petioles 5–50(–80) mm. Involucre 10–13 mm. $2n=12$. *From S.C. France to W. Jugoslavia.*

2. L. croceus Haenke in Jacq., *Collect. Bot.* **2**: 16 (1789). Perennial with horizontal or oblique, truncate stock. Stems 1–3, 5–30 cm, simple, glabrous or with pale and dark simple eglandular hairs near the thickened apex; bracts 2–4. Leaves 25–170 × 3–20 mm, linear to narrowly oblanceolate, entire to denticulate, gradually narrowed to the petiole, glabrous or with sparse hairs beneath. Capitulum solitary. Involucre 10–14 mm; bracts linear-lanceolate, obtuse, with numerous dark simple eglandular hairs intermixed with shorter whitish hairs. Ligules orange-yellow, concolorous. Stigmas yellow. Achenes 5–6 mm, pale brown or pale chestnut-brown, cylindrical or narrowly fusiform, slightly narrowed at apex, weakly transversely muricate; pappus-hairs in 1 row, whitish, plumose. ● *E. Alps, E. & S. Carpathians, mountains of Bulgaria.* Au Bu It Ju Rm Rs (W).

(a) Subsp. **croceus**: Leaves 25–170 × 5–20 mm, denticulate, with sparse hairs beneath. $2n=24$. *E. Alps, E. & S. Carpathians.*

(b) Subsp. **rilaensis** (Hayek) Finch & P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 242 (1976) (*H. rilaensis* Hayek, *H. montanus* subsp. *rilaensis* (Hayek) Hayek): Leaves 25–70(–100) × 3–8 mm, entire, glabrous. $2n=14$. *S. Carpathians, mountains of Bulgaria.*

3. L. montanus Lam., *Fl. Fr.* **3**: 640 (1779). Perennial with oblique or vertical, truncate stock. Stems 1–2(–4), 1–20 cm, simple, with numerous, long simple eglandular hairs; bracts 0–2. Leaves 10–90 × 3–10 mm, linear to oblanceolate, dentate to runcinate-pinnatifid, narrowed at base to a winged petiole, with few to numerous long hairs. Capitulum solitary. Involucre 9–18 × 9–14 mm; bracts linear-lanceolate, obtuse, with dense, long simple eglandular hairs. Ligules deep yellow, concolorous. Stigmas yellow. Achenes 6·5–7·5 mm, pale brown, cylindrical or slightly fusiform, slightly narrowed at apex, weakly transversely muricate; pappus-hairs in 1 row and plumose, or in 2 rows, the outer not plumose, the inner longer and plumose. ● *Mountains of C. & S. Europe from the Carpathians southwards to Pyrenees, C. Appennini and Albania.* Al Au Cz Ga Ge He Hs It Ju Po Rm Rs (W).

1 Stems (3–)10–20 cm; involucre 9–12 mm; pappus-hairs yellowish (c) subsp. **pseudotaraxaci**
1 Stems 1–10 cm; involucre 9–18 mm; pappus-hairs white or greyish
2 Terminal segment of leaf 8–20 mm; hairs of involucre pale grey (a) subsp. **montanus**
2 Terminal segment of leaf 4–10 mm; hairs of involucre blackish (b) subsp. **montaniformis**

(a) Subsp. **montanus**: Stems 1–10 cm. Leaves 20–70 × 3–10 mm, the terminal segment 8–20 × 3–10 mm. Involucre 12–18 × 10–14 mm, with pale grey hairs. Pappus-hairs white. $2n=12$. *Pyrenees, W. & W.C. Alps.*

(b) Subsp. **montaniformis** (Widder) Finch & P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 242 (1976) (*L. montaniformis* Widder, *L. illyricus* (Rohlena) K. Malý): Stems 3–7 cm. Leaves 10–40 × 3–8(–10) mm, the terminal segment 4–10 × 3–8(–10) mm. Involucre 9–15 × 8–11 mm, with blackish hairs. Pappus-hairs pale grey. *C. & E. Alps; C. Appennini; mountains of Jugoslavia and Albania.*

(c) Subsp. **pseudotaraxaci** (Schur) Finch & P. D. Sell, *loc. cit.* (1976) (*L. pseudotaraxaci* Schur): Stems (3–)10–20 cm. Leaves 20–90 × 4–8(–10) mm, the terminal segment (10–)15–18 × 4–8(–10) mm. Involucre 9–12 × 9–11 mm, with numerous dark hairs. Pappus-hairs yellowish. $2n=12$. *Carpathians.*

4. L. autumnalis L., *Sp. Pl.* 798 (1753). Perennial with branched, oblique, truncate stock. Stems 1–numerous, 5–60 cm, usually branched, glabrous or with few simple eglandular hairs; bracts numerous, particularly just below the capitula. Leaves 20–200 × 3–30 mm, narrowly oblanceolate, acute, sinuate-dentate to deeply pinnatisect, the segments narrowly lanceolate or linear and usually patent or recurved, tapered into the petiole,

[1] By R. A. Finch & P. D. Sell.

glabrous or with simple eglandular hairs. Capitula (1–)2–7. Involucre 7–12 × 7–11 mm; bracts linear-lanceolate, obtuse to acute, glabrous or with simple eglandular hairs. Ligules deep yellow, the outer with a reddish stripe on outer face. Stigmas discoloured. Achenes 3·5–7 mm, reddish-brown, cylindrical, slightly narrowed above, transversely muricate; pappus of 1 row of plumose hairs. $2n = 12, 24$. *Most of Europe, but rather local in the south.* All except Al Az Bl Cr Sa Sb Tu.

(a) Subsp. **autumnalis**: Stems 5–60 cm. Capitula (1–)2–7. Involucre glabrous or with few to numerous pale or dark hairs. *Throughout most of the range of the species.*

(b) Subsp. **pratensis** (Koch) Arcangeli, *Comp. Fl. Ital.* 416 (1882) (*L. gutzulorum* V. Vassil.): Stems 5–25 cm. Capitula 1–3. Involucre with dense, long, dark hairs. ● *N., C. & E. Europe, mainly in the mountains.*

5. L. keretinus F. Nyl., *Spicil. Pl. Fenn.* **1**: 24 (1843). Perennial with oblique, truncate stock. Stems 1–numerous, 15–45 cm, usually branched, with few simple eglandular hairs below, glabrous or nearly so above; bracts numerous, particularly just below the capitula. Leaves 30–180 × 3–25 mm, oblong-lanceolate or oblanceolate, deeply pinnatisect with narrowly lanceolate or linear, usually upwardly directed lobes, tapered into the petiole, glabrous or with simple eglandular hairs. Capitula (1–)2–4. Involucre 7–12 × 7–12 mm; bracts linear-lanceolate, with dense, long, reddish simple eglandular hairs and shorter whitish hairs. Ligules orange, concolorous. Stigmas discoloured. Achenes 5–7 mm, brown, with a short beak, transversely muricate; pappus of 2 rows of plumose hairs, the hairs of the outer row shorter. ● *N.E. Europe.* Fe Rs (N, C).

6. L. carpetanus Lange, *Vid. Meddel. Dansk Naturh. Foren. Kjøbenhavn* **1861**: 96 (1861). Perennial with vertical or oblique, often branched, truncate stock. Stems 1–numerous, 10–45 cm, simple or branched, glabrous or with few simple eglandular hairs; bracts numerous. Leaves 10–120 × 1–15 mm, linear or narrowly oblanceolate, obtuse to acute, sinuate-dentate to deeply pinnatisect with usually linear segments, tapered into the petiole, glabrous or with simple eglandular hairs. Capitula 1–3. Involucral bracts linear-lanceolate, obtuse to acute, with numerous long, greyish simple eglandular hairs intermixed with shortish whitish ones. Stigmas yellow. Achenes 5–7 mm, pale brown, with a beak ⅓–½ as long as the remainder of the achene, transversely muricate; pappus of 1 row of at least 12 plumose hairs. ● *Mountains of C., S. & E. Spain.* Hs.

(a) Subsp. **carpetanus** (*L. pyrenaicus* subsp. *reverchonii* Freyn): Involucre 10–14 mm. Ligules yellow, the outer with a bluish stripe on outer face. *Throughout most of the range of the species.*

(b) Subsp. **nevadensis** (Lange) Finch & P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 243 (1976) (*L. nevadensis* Lange): Involucre 8–10 mm. Ligules yellow, concolorous. *Sierra Nevada.*

7. L. duboisii Sennen ex Widder, *Phyton* (*Austria*) **12**: 201 (1967). Perennial with oblique or vertical, truncate stock. Stems 1–3, 3–25 cm, usually simple, glabrous or with a few simple eglandular hairs; bracts numerous. Leaves 15–60 × 1–15 mm, linear, linear-lanceolate or -oblanceolate, obtuse to acute, entire to sinuate-dentate, rarely runcinate-pinnatifid, sessile or shortly petiolate, glabrous or with simple eglandular hairs. Capitula 1–2(–3). Involucre 9–11 × 8–11 mm; bracts linear-lanceolate, with long, dark simple eglandular hairs intermixed with shorter whitish ones often in a median line, with the margins subglabrous. Ligules yellow, the outer with a violet-purple stripe on the outer face. Stigmas yellow. Achenes 4–6 mm, pale brown, with a short beak, transversely muricate; pappus of 1 row of at least 12 plumose hairs. ● *Pyrenees and Cordillera Cantábrica.* Ga Hs.

8. L. microcephalus (Boiss. ex DC.) Boiss., *Voy. Bot. Midi Esp.* **2**: 380 (1841). Perennial with long, slender tubers. Stems 1–4, 3–10 cm, sometimes branched, glabrous; bracts 2–numerous. Leaves 10–45 × 2–5 mm, linear, spathulate to oblanceolate, obtuse, entire, glabrous or with a few simple eglandular hairs. Capitula 1–2. Involucre 7–8 × 4–5 mm; bracts linear-lanceolate, obtuse, glabrous or with a few short simple eglandular hairs. Ligules yellow. Stigmas yellow. Achenes 4–5 mm, pale brown, cylindrical, weakly transversely muricate; pappus of 1 row of plumose hairs. ● *S. Spain* (*Sierra Nevada*). Hs.

9. L. cichoraceus (Ten.) Sanguinetti, *Cent. Prodr. Fl. Rom.* 111 (1837) (*L. fasciculatus* (Biv.) Nyman). Perennial with slender tubers. Stems 1–numerous, 8–40 cm, simple, glabrous or with few simple eglandular hairs; bracts numerous. Leaves 15–70 × 5–20 mm, oblanceolate, dentate to runcinate-pinnatifid, glabrous or with few to numerous simple eglandular hairs. Capitulum solitary. Involucre 12–15 × 7–8 mm; bracts narrowly linear-lanceolate, obtuse, with numerous simple eglandular hairs. Ligules yellow, concolorous. Stigmas yellow. Achenes 7–10 mm, brown, with a beak about as long as body, transversely muricate; pappus of 1 row of plumose hairs. *C. & S. Italy, Balkan peninsula.* Al Bu ?Cr Gr It Ju Si.

10. L. muelleri (Schultz Bip.) Fiori in Fiori & Paol., *Fl. Anal. Ital.* **3**: 396 (1904). Annual. Stems 1–4, 10–30 cm, simple or branched, glabrous; bracts 1–3. Leaves 10–60(–150) × 5–15 mm, oblong to oblanceolate, shallowly sinuate-dentate, gradually narrowed into the relatively long petiole, glabrous. Capitula 1–2, on long peduncles. Involucre 8–10 × 7–9 mm; bracts lanceolate, obtuse, glabrous. Ligules yellow, concolorous. Stigmas yellow. Achenes dark brown, strongly transversely muricate, of 2 kinds: outer 4–4·5 mm, narrowed into a beak, with a pappus of short scales; inner 6–7 mm, narrowed into a long beak, with a pappus of 1 row of *c.* 10 rigid, plumose hairs. *Sardegna, Sicilia.* Sa Si [*Lu]. (*N. Africa.*)

11. L. salzmannii (Schultz Bip.) Ball, *Jour. Linn. Soc. London* (*Bot.*) **16**: 545 (1878). Annual. Stems 1–3, 10–30 cm, branched, glabrous; bracts 0–3. Leaves 40–110 × 10–20 mm, oblong to oblanceolate, obtuse to subacute, sinuate-dentate to pinnatifid, gradually narrowed into the short petiole, glabrous. Capitula 2–3, on long peduncles. Involcure 10–12 × 8–12 mm; bracts narrowly lanceolate, obtuse, glabrous or with a few simple eglandular hairs in a median line. Ligules yellow, concolorous. Stigmas yellow. Achenes brown, strongly tuberculate-muricate, of 2 kinds: outer 2–3 mm, cylindrical, truncate at apex, without a pappus; inner 6–7 mm, narrowed at apex into a long beak, with a pappus of an inner row of *c.* 10 rigid, plumose hairs and an outer row of short scales. *Sandy places. S. Spain* (*rare*); *once recorded from S.E. Portugal.* Hs Lu. (*Morocco.*)

12. L. hispidulus (Delile) Boiss. *Fl. Or.* **3**: 727 (1875) (*L. creticus* Boiss.). Annual. Stems numerous, 10–20 cm, usually branched, glabrous or with simple eglandular hairs below; bracts numerous. Leaves 30–90 × 3–20 mm, oblong to narrowly oblanceolate in outline, obtuse or acute, dentate to pinnatifid, narrowed to the obscure petiole, glabrous or with simple eglandular hairs. Capitula 1–3. Involucre 9–12 × 8–11 mm; bracts linear-lanceolate, obtuse to acute, usually with soft simple eglandular hairs and sometimes also rigid ones, mainly in a median line. Ligules yellow, concolorous. Stigmas yellow. Achenes 7–8 mm, uniform, brown, with beak ⅓–½ as long as the rest of the body, strongly transversely muricate; pappus of 1 row of *c.* 10 rigid, plumose hairs. *S.E. Spain* (*Prov. Almería*). Hs. (*N. Africa.*)

The type specimen of *L. creticus* Boiss. (*L. taraxacifolius* (Cass.) Halácsy, non St-Lager), allegedly from Kriti, was probably collected in Egypt.

Sect. LEONTODON. Stems with 0–3 bracts which do not merge into those of the involucre. At least some hairs sessile and stellate, or stalked and 2- to 7-fid. Pappus of 2 rows of hairs (or pappus of some marginal achenes of scales or absent).

13. L. repens Schur, *Verh. Mitt. Siebenb. Ver. Naturw.* **10**: 148 (1859). Perennial with branched, horizontal or ascending stock. Stems 1–numerous, 25–45 cm, simple, glabrous or with few simple eglandular hairs in the upper part especially just below the capitulum; bracts 0–3. Leaves 90–230 × 10–30 mm, dark green, oblong-lanceolate or -oblanceolate, obtuse or acute, subentire to sinuate-denticulate, tapered to base, with very sparse simple eglandular hairs above and more numerous hairs on the margin and veins beneath. Capitulum solitary. Involucre 10–15 × 5–11 mm; bracts blackish, linear-lanceolate, obtuse, with long, whitish simple eglandular hairs mainly in a median line. Ligules yellow, the outer brownish on the outer face, blackish at apex of teeth. Stigmas yellow. Achenes *c.* 5 mm, brown, narrowed at apex, but without a beak, transversely muricate; pappus of 2 rows of hairs, the inner plumose, the outer shorter and scabrid. ● *Mountains of Romania and W. Ukraine.* Rm Rs (W).

14. L. schischkinii V. Vassil., *Not. Syst.* (*Leningrad*) **21**: 398 (1961). Perennial with oblique, truncate stock. Stems 1–numerous, 15–35 cm, simple, slightly thickened above; bracts 1–3, glabrous or with minute, white, simple eglandular hairs. Leaves 50–110 × 10–22 mm, oblanceolate or spathulate, obtuse or acute, sinuate-dentate to -pinnatifid, with winged petioles, glabrous or with a few simple hairs. Capitulum solitary. Involucre 13–15 × 10–13 mm; bracts linear-lanceolate, obtuse to acute, the outermost linear, deflexed, dark, the inner with pale margins, the median with pale, weak simple eglandular hairs. Ligules yellow, concolorous. Stigmas yellow. Achenes 5–7 mm, brown, fusiform, curved, weakly transversely muricate; pappus of 2 rows of plumose hairs, or the outer sometimes simple. ● *W. & E. Carpathians.* Po Rs (W).

15. L. hispidus L., *Sp. Pl.* 799 (1753). Perennial with vertical or oblique, usually branched, truncate stock. Stems 1–numerous, 5–70 cm, usually simple, glabrous or with simple eglandular or long-stalked 2- to 3-fid hairs. Leaves 30–350 × 3–40 mm, oblanceolate, obtuse to acute, sinuate-dentate to deeply pinnatifid with the terminal lobe usually large, attenuate into the winged petiole, glabrous or with simple eglandular or long-stalked 2- to 3-fid hairs. Capitula 1(–2). Involucre (9–)10–15 × 6–12(–15) mm; bracts linear-lanceolate, obtuse to acute, the outermost lax, glabrous, or with simple eglandular and long-stalked 2- to 3-fid hairs mainly in a median line. Ligules bright yellow, the outermost orange or reddish (rarely greyish-violet) on outer face. Stigmas yellow. Achenes 5–8 mm, brown, narrowed above or beaked, the inner with a beak ½ as long as the remainder of the achene, transversely muricate; pappus very pale brown, of 2 rows of hairs, the inner plumose, the outer denticulate. $2n = 14$. *Most of Europe, but absent from many of the islands.* Al Au Be Br Bu Cz Da Fe Ga Ge Gr Hb He Ho Hs Hu It Ju Lu No Po Rm Rs (N, B, C, W, K) Su.

1 Plant with numerous hairs
2 Leaves pinnatifid with sinuate-crispate lobes
(c) subsp. **pseudocrispus**
2 Leaves sinuate-dentate to pinnatifid, but lobes not crispate
3 Stems (5–)10–60 cm, 2–3 times as long as leaves; involucre (9–)11–13(–15) mm (a) subsp. **hispidus**
3 Stems 10–20 cm, usually not more than twice as long as leaves; involucre 13–15 mm (b) subsp. **alpinus**
1 Plant glabrous or almost so
4 Leaves deeply pinnatifid, usually with a narrow apex
(f) subsp. **hyoseroides**
4 Leaves sinuate-dentate, usually with a broad apex
5 Stems 15–70 cm, at least twice as long as leaves
(d) subsp. **danubialis**
5 Stems 5–20 cm, usually not more than twice as long as leaves
(e) subsp. **opimus**

(a) Subsp. **hispidus**: Stems (5–)10–60 cm, 2–3 times as long as leaves, with numerous, white, rigid simple eglandular or stalked 2- to 3-fid hairs. Leaves sinuate-dentate to pinnatifid, with numerous to dense, white, rigid simple eglandular or 2- to 3-fid hairs. Involucre (9–)11–13(–15) mm, with numerous to dense white, rigid simple eglandular or stalked 2- to 3-fid hairs. $2n = 14$. *Throughout most of the range of the species.*

(b) Subsp. **alpinus** (Jacq.) Finch & P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 244 (1976) (*L. alpinus* Jacq., *L. protheiformis* subsp. *alpicola* Rouy, *L. hispidus* var. *dubius* (Hoppe) Hegi): Stems 10–20 cm, usually not more than twice as long as leaves, with numerous white, rigid, simple eglandular or 2- to 3-fid hairs. Leaves sinuate-dentate, with numerous to dense, white, rigid, simple eglandular or stalked 2- to 3-fid hairs. Involucre 13–15 mm, with white, rigid, simple eglandular or long-stalked 2- to 3-fid hairs. *Alpine pastures and scree.* ● *Alps, Carpathians.*

(c) Subsp. **pseudocrispus** (Schultz Bip. ex Bischoff) J. Murr, *Neue Uebers. Farn-Blütenpfl. Vorarlb.* 337 (1924): Stems 7–20 cm, with numerous, white, rigid simple eglandular or 2- to 3-fid hairs. Leaves pinnatifid with sinuate, crispate lobes, with dense, white, rigid simple eglandular or 2- to 3-fid hairs. Involucre 11–13 mm, with numerous to dense, white, rigid simple eglandular or 2- to 3- fid hairs. *Stony ground and screes.* ● *C. & S. Alps.*

(d) Subsp. **danubialis** (Jacq.) Simonkai, *Enum. Pl. Transs.* 353 (1887) (*L. hastilis* L., *L. danubialis* Jacq., *L. hastilis* var. *glabratus* Koch): Stems 15–70 cm, at least twice as long as leaves, glabrous or with a few simple eglandular or stalked 2-fid hairs. Leaves sinuate-dentate, with broad apex, glabrous or with a few simple eglandular or stalked 2-fid hairs. Involucre 12–15 mm, glabrous or with a few simple eglandular or stalked 2-fid hairs. $2n = 14$. *From C. Europe to N. Balkan peninsula, C. Russia and Krym.*

(e) Subsp. **opimus** (Koch) Finch & P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 244 (1976) (*L. hastilis* var. *opimus* Koch): Stems 5–20 cm, up to twice as long as leaves, glabrous or almost so. Leaves sinuate-dentate, with broad apex, glabrous or subglabrous, shining. Involucre 11–14 mm, glabrous or subglabrous. ● *Mountains of C. Europe, Appennini.*

(f) Subsp. **hyoseroides** (Welw. ex Reichenb.) J. Murr, *Neue Uebers. Farn-Blütenpfl. Vorarlb.* 337 (1924): Stems up to 20(–30) cm, slender, glabrous or almost so. Leaves more or less deeply pinnatifid, usually with narrow apex, glabrous or almost so. Involucre 13–15 mm, glabrous or almost so. *Limestone rocks and screes.* ● *Alps, Carpathians.*

Sterile hybrids ($2n = 11$) of subsp. (a) with **25** are frequent in Britain where the two species grow together.

Intermediates between subspp. (a) and (d) are frequent, and occasional plants similar to subsp. (d) occur among those of subsp. (a) outside the range of the former.

16. L. siculus (Guss.) Finch & P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 245 (1976) (*Apargia sicula* Guss.). Perennial with vertical stock and vertical rhizome. Stems 1–3, 20–60 cm, simple, with few to numerous rigid, long-stalked 2- to 4-fid hairs and sometimes some

weaker simple eglandular hairs; bracts 0–2. Leaves 35–160 × 5–20 mm, lanceolate, linear-lanceolate or oblanceolate, usually acute, denticulate to remotely dentate, gradually narrowed to the petiole, with dense long-stalked 2- to 5-fid hairs. Involucre 15–18 mm; bracts linear-lanceolate, obtuse, with weak simple eglandular hairs and stouter simple eglandular and long-stalked 2-fid hairs. Ligules yellow, concolorous. Stigmas yellow. Achenes 10–15 mm, strongly transversely muricate, the inner with a beak about as long as remainder of achene; pappus-hairs in 2 rows, more or less plumose, pale brown. ● *S.W. Italy, Sicilia.* It Si.

17. L. boryi Boiss. ex DC., *Prodr.* 7: 103 (1838). Perennial with branched, woody stock and long, vertical rhizome. Stems 1–4, 1–4 cm, simple, with few to numerous long-stalked, 2- to 4-fid hairs and shorter, weaker simple eglandular hairs; bracts 0–1. Leaves 10–30 × 6–8 mm, crowded, oblanceolate to elliptical, regularly pinnately divided nearly to the midrib with narrow lobes, with dense indumentum of usually long-stalked 2- to 4-fid hairs. Capitulum solitary. Involucre 11–16 × 6–9 mm; bracts linear-lanceolate, acute, glabrous or with simple eglandular or long-stalked 2-fid hairs mainly in a median line. Ligules yellow, the outer with a darker stripe on outer face. Stigmas yellow. Achenes 8–10 mm, pale brown, narrowed at apex or shortly beaked, with dense short rigid hairs; pappus-hairs in 2 rows, the inner plumose, the outer simple. $2n=14$. ● *S. Spain (Sierra Nevada).* Hs.

18. L. hirtus L., *Syst. Nat.* ed. 10, **2**: 1194 (1759) (*L. villarsii* (Willd.) Loisel.). Perennial with an oblique or vertical, truncate stock. Stems 1–several, 10–30 cm, with short, rigid simple eglandular or 2- to 4-fid hairs; bracts 0–2. Leaves 15–70 × 3–12 mm, regularly pinnatisect with narrow lateral lobes and small terminal lobe, with few to numerous, sometimes dense, long, more or less rigid hairs thickened at the base and minutely 2-fid at the apex. Capitulum solitary. Involucre 9–15 × 5–10 mm; bracts linear-lanceolate, obtuse, with few to numerous simple eglandular or minutely 2-fid hairs. Ligules pale yellow, concolorous. Stigmas yellow. Achenes 5–8 mm, brown, narrowed above or shortly beaked, transversely muricate; pappus of 2 rows of plumose hairs or the outer scabrid. $2n=8$. ● *Italy, S. France.* Ga It.

19. L. crispus Vill., *Prosp. Pl. Dauph.* 34 (1779). Perennial with branched, oblique stock and long, vertical rhizome. Stems 1–6, 7–40 cm, more or less thickened at apex, simple or branched, with few to numerous, rigid, stalked 2- to 4-fid hairs (often with only their bases remaining) and sometimes shorter, weaker, simple eglandular and sessile stellate hairs; bracts 0–5. Leaves numerous, 20–140 × 3–15(–20) mm, more or less oblanceolate, dentate to pinnatifid, usually with numerous 2- to 7-fid hairs, sometimes also with sessile stellate hairs. Capitula 1(–3). Involucre 10–25 × 7–14 mm; bracts oblong-lanceolate, more or less acute, glabrous or with simple eglandular, 2- to 4-fid or stellate hairs, often pectinate-ciliate. Ligules yellow, sometimes reddish-purple on outer face. Stigmas yellow. Achenes 7–12 mm, brown, with beak up to about as long as remainder of achene, with short rigid hairs above and transversely muricate below; pappus of 2 rows of very pale brown plumose hairs dilated at the base, the outer shorter than the inner. *S. & S.E. Europe, extending northwards to c. 55° N. in E.C. Russia.* Al Bu Co Ga Gr Hs It Ju Rm Rs (C, W, K, E) Si Tu.

1 Leaves with at least some sessile stellate hairs and numerous 2- to 7-fid stalked hairs
2 Leaves with scattered small stellate hairs and numerous stalked 2- to 5-fid hairs (d) subsp. **bourgaeanus**
2 Leaves with numerous or dense ± sessile stellate hairs and 3- to 7-fid hairs (e) subsp. **graecus**
1 Leaves with stalked 2- to 7-fid hairs, without sessile stellate hairs
3 Involucral bracts with minute hairs or glabrous (a) subsp. **rossianus**
3 Involucral bracts with rigid hairs, at least on the margins
4 Involucre 12–15 mm, the bracts not or minutely pectinate-ciliate; achenes 7–12 mm (b) subsp. **crispus**
4 Involucre 14–25 mm, with at least the outer bracts strongly pectinate-ciliate; achenes 12–20 mm (c) subsp. **asperrimus**

(a) Subsp. **rossianus** (Degen & Lengyel) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 813 (1931): Stem simple. Leaves with a few simple or long-stalked 2- to 3-fid hairs. Involucre 9–12 mm; bracts with minute simple eglandular hairs or glabrous, not or only minutely pectinate-ciliate. Achenes 7–10 mm. ● *Jugoslavia and N. Greece.*

(b) Subsp. **crispus** (*L. asper* (Waldst. & Kit.) Poiret, non Forskål, *L. crispus* subsp. *asper* (Waldst. & Kit.) Rohlena): Stems simple or branched. Leaves with numerous long-stalked 2- to 6-fid hairs. Involucre 12–15 mm; bracts with rigid, white simple eglandular or long-stalked 2-fid hairs on outer face particularly in a median line, not or only minutely pectinate-ciliate. Achenes 7–12 mm. $2n=8$. *Almost throughout the range of the species.*

(c) Subsp. **asperrimus** (Willd.) Finch & P. D. Sell, *Bot. Jour. Linn. Soc.* **17**: 246 (1974) (*L. asperrimus* (Willd.) Boiss. ex Ball, *Scorzonera asperrima* Willd.): Stems simple or rarely branched. Leaves with numerous long-stalked 2- to 7-fid hairs. Involucre 14–25 mm; at least the outer bracts distinctly white-pectinate-ciliate, the outer face glabrous or with 2- to 4-fid rigid hairs and softer, simple eglandular hairs. Achenes 12–20 mm. *Balkan peninsula.*

(d) Subsp. **bourgaeanus** (Willk.) Finch & P. D. Sell, *loc. cit.* **6** (1976) (*L. bourgaeanus* Willk.): Stems simple. Leaves with few sessile stellate hairs and numerous long-stalked 2- to 5-fid hairs. Involucre 15–16 mm; bracts with long, rigid simple eglandular or long-stalked 2-fid hairs mainly in a median line, and soft simple eglandular hairs, not or minutely white-pectinate-ciliate. Achenes 10–11 mm. ● *C. Spain.*

(e) Subsp. **graecus** (Boiss. & Heldr.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 813 (1931) (*L. graecus* Boiss. & Heldr.): Stems simple. Leaves with numerous to dense, more or less sessile stellate hairs and short- to long-stalked 3- to 7-fid hairs. Involucre 12–15 mm; bracts with few to numerous sessile stellate hairs and unequal, rigid simple eglandular or 2- to 4-fid hairs mainly in a median line, sometimes pectinate-ciliate. Achenes 9–12 mm. $2n=8$. ● *Greece and S. Albania; S. & C. Italy.*

Var. *intermedius* Huter, Porta & Rigo ex Fiori, with short indumentum and less divided leaves, and *L. graecus* var. *heldreichianus* Boiss., with longer, denser, less forked hairs, which are included in subsp. *graecus*, may perhaps merit subspecific rank.

20. L. hellenicus Phitos, *Österr. Bot. Zeitschr.* **113**: 272 (1966). Perennial with branched stock and long rhizome. Stems up to 8 cm, simple, thickened at the apex, with numerous stellate hairs; bracts 1–2. Leaves up to 55 × 12 mm, spathulate or oblanceolate, entire or remotely denticulate, narrowed at base, subpetiolate, with dense, short stellate hairs on both surfaces. Capitulum solitary. Involucre 10–13 mm; bracts linear-lanceolate, with stalked 2- to 5-fid hairs. Ligules yellow. Stigmas yellow. Pappus-hairs in 2 rows, the inner plumose, the outer shorter and scabrid. ● *C. Greece (Evritania).* Gr.

21. L. incanus (L.) Schrank, *Baier. Reise* 14 (1786). Perennial with vertical or oblique, often branched stock. Stems 1–6, 10–35 cm, simple, with numerous, sessile stellate and short-stalked 2- to 4-fid hairs; bracts 0–3. Leaves 25–150 × 5–20 mm, linear-oblong to narrowly oblanceolate, more or less acute, entire, denticulate or rarely with a few irregular teeth, long-attenuate to the winged petiole, with numerous to dense, short- to long-stalked 2- to 7-fid hairs on both surfaces. Capitulum solitary. Involucre 10–15 × 8–11 mm; bracts linear to linear-lanceolate, obtuse to acute, with few to numerous simple eglandular and stalked 2-fid hairs. Ligules deep yellow. Stigmas yellow. Achenes 7–9 mm, brown, narrowed and with minute rigid hairs above, transversely muricate below; pappus of 2 rows of hairs, the inner plumose, the outer denticulate. ● *Mountains of C. Europe, N. Italy and N. & C. Jugoslavia.* Au Cz Ga Ge He Hu It Ju Po ?Rm.

(a) Subsp. **incanus**: Leaves narrowly elliptical or narrowly oblanceolate, densely hairy. Pappus-hairs much longer than achene. $2n=8$. *Almost throughout the range of the species.*

(b) Subsp. **tenuiflorus** (Gaudin) Hegi, *Ill. Fl. Mitteleur.* **6(2)**: 1031 (1928): Leaves linear-oblong, less densely hairy than in subsp. (a) so that the leaf appears to be greener. Pappus-hairs about as long as achene. *S. Alps.*

22. L. berinii (Bartl.) Roth, *Man. Bot.* **3**: 1129 (1830). Perennial with vertical or oblique, often branched stock. Stems 1–4, 6–30 cm, often branched, with numerous sessile stellate and short-stalked 2- to 4-fid hairs; bracts 0–3. Leaves 25–80 × 3–10 mm, narrowly oblanceolate, obtuse to acute, sinuate-denticulate, with numerous to dense small, sessile stellate and short-stalked 3- to 7-fid hairs on both surfaces. Capitula 1–2, on long peduncles. Involucre 10–14 × 10–14 mm; bracts linear-lanceolate, obtuse to acute, with dense sessile stellate and short-stalked 3- to 5-fid hairs. Ligules yellow. Stigmas yellow. Achenes 6–7 mm, yellowish-brown, narrowed above, transversely muricate; pappus-hairs in 2 rows, the inner plumose, the outer denticulate. ● *N.E. Italy, N.W. Jugoslavia.* It Ju.

23. L. tuberosus L., *Sp. Pl.* 799 (1753) (*Thrincia tuberosa* (L.) DC.). Perennial with long, slender tubers. Stems 1–6, 7–35 cm, simple, with few to numerous, rigid, simple eglandular or long-stalked 2- to 3-fid hairs; bracts 0–2. Leaves 20–140 × 5–25 mm, obovate to oblanceolate-oblong, more or less obtuse, retrorse-dentate to runcinate-pinnatifid, narrowed to a sometimes dentate petiole, with numerous rigid, long-stalked 2- to 3-fid hairs. Capitulum solitary. Involucre 9–15 × 6–10 mm; bracts oblong, narrowed to an obtuse apex, glabrous or with rigid, long-stalked 2-fid hairs often confined to a median line. Ligules yellow, the outer with a greenish stripe on the outer face. Stigmas yellow or discoloured. Achenes 3–7 mm, transversely rugose or muricate, of 2 kinds; outer curved, sometimes with a short beak and with a pappus of hairs not more than 0·5 mm; inner usually straight, beaked, the pappus of 2 rows of plumose hairs. $2n=8$. *Mediterranean region, Portugal.* Al Bl Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

24. L. maroccanus (Pers.) Ball, *Jour. Linn. Soc. London (Bot.)* **16**: 544 (1878). Annual. Stems 1–few, up to 25 cm, simple, with few to numerous, rigid simple eglandular or long-stalked 2-fid hairs; bracts absent. Leaves 100–140 × 30–40 mm, oblanceolate, obtuse, dentate, attenuate into a winged, sometimes dentate petiole, with numerous rigid, long-stalked 2-fid hairs. Capitulum solitary. Involucre 12–16 × 10–14 mm; bracts lanceolate, obtuse, with rigid simple eglandular or long-stalked 2-fid hairs mainly in a median line. Ligules yellow, the outer with a stripe on the outer face. Stigmas yellow. Achenes brown, of 2 kinds: outer shortly beaked, with the pappus of small scales; inner 9–10 mm, with beak 5–7 mm and pappus-hairs in 2 rows, plumose. $2n=8$. *S. Spain.* Hs. (*N.W. Africa.*)

[1] By P. D. Sell.

25. L. taraxacoides (Vill.) Mérat, *Ann. Sci. Nat.* **22**: 108 (1831). Stems 1–numerous, 2·5–35 cm, simple, with few to numerous simple eglandular or long-stalked 2- to 3-fid hairs; bracts 0–2. Leaves 20–150(–250) × 3–10 mm, narrowly oblanceolate to oblong-oblanceolate, obtuse to acute, entire, dentate to pinnatifid, attenuate into a short or long petiole, with numerous rigid, simple eglandular or long-stalked 2- to 3-fid hairs. Capitulum solitary. Involucre 7–11 × 4–9 mm; bracts narrowly lanceolate, obtuse to acute, with few to numerous, rigid simple eglandular or long-stalked 2-fid hairs. Ligules deep yellow, the outer greyish-violet on the outer face. Stigmas yellow. Achenes 4–5·5 mm, brown, transversely muricate, of 2 kinds: outer curved and with a pappus of small scarious scales; inner more or less beaked, with the pappus-hairs in 2 rows, the outer rigid and simple, the inner plumose. *S., W. & C. Europe.* Al Au Az Be Bl Br Co Cz Ga Ge Gr Hb He Ho Hs Hu It Ju Po Rm Tu [Da Su].

(a) Subsp. **taraxacoides** (*L. nudicaulis* auct., non (L.) Banks ex Schinz & R. Keller, *L. saxatilis* Lam., *Thrincia hirta* Roth): Perennial, rarely biennial, with short, vertical, truncate stock. Inner achenes with beak *c.* 1 mm. $2n=8$. *Throughout the range of the species.*

(b) Subsp. **longirostris** Finch & P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 247 (1976) (*L. nudicaulis* subsp. *rothii* auct., non (Ball) Schinz & Thell.): Usually annual. Inner achenes with beak 2–3 mm. $2n=8$. *S. Europe.*

26. L. filii (Hochst.) Paiva & Ormonde, *Bol. Soc. Brot.* ser. 2, **46**: 447 (1972) (*Microderis filii* Hochst.). Perennial with oblique, truncate stock. Stems 20–50 cm, usually branched, with numerous rigid, simple eglandular and long-stalked 2- to 3-fid hairs; bracts 0–3. Leaves 30–170 × 15–45 mm, elliptical to oblanceolate, obtuse to subacute, long-attenuate at base into a winged petiole, dentate with narrow, patent teeth, with numerous rigid, simple eglandular or long-stalked 2-fid hairs. Capitula 1–4, on long peduncles. Involucre 10–13 × 7–10 mm; bracts linear, more or less obtuse, glabrous or with few to numerous, simple eglandular or long-stalked 2-fid hairs. Ligules yellow. Stigmas yellow or discoloured. Achenes 4·5–5·5 mm, pale brown, weakly transversely muricate, shortly beaked; pappus-hairs in 2 rows, the inner plumose, the outer scabrid. ● *Açores.* Az.

27. L. rigens (Aiton) Paiva & Ormonde, *op. cit.* 448 (1972) (*Crepis rigens* Aiton). Perennial with oblique, truncate stock. Stems 15–60 cm, branched, with few to numerous, rigid simple eglandular and long-stalked 2-fid hairs; bracts numerous. Leaves 90–310 × 30–120 mm, elliptical, obtuse to subacute, narrowed into a winged petiole, regularly dentate with narrowly mammiform, patent teeth, with few to numerous, rigid, simple eglandular or long-stalked 2-fid hairs. Capitula 20–80, in a more or less corymbose panicle. Involucre 8–12 × 4–6 mm; bracts linear to linear-lanceolate, more or less obtuse, glabrous or with appressed soft hairs, sometimes with a few longer rigid hairs. Ligules yellow. Styles discoloured. Achenes 4·5–5·5 mm, pale brown, weakly transversely muricate, shortly beaked; pappus-hairs in 2 rows, the inner plumose, the outer scabrid. ● *Açores.* Az.

160. Picris L.[1]

Annual to perennial herbs with rigid hairs, most of which have 2–4 small, hooked branches at the apex, sometimes also with spines. Stems usually solitary, usually branched. Leaves sinuate-dentate to pinnatisect; cauline often more or less amplexicaul. Capitula few to numerous. Involucral bracts in several imbricate rows. Receptacle pitted, without scales. Ligules yellow, the outer

often with a reddish stripe on outer face. Achenes transversely muricate between the ribs, usually narrowed at apex or beaked; pappus of 2 rows of deciduous hairs, the inner plumose, the outer plumose or simple, the outer achenes rarely with short scarious pappus.

1 Outer involucral bracts ovate to ovate-lanceolate, usually wider than the inner
2 Peduncles thickened after anthesis; involucral bracts not pectinate-ciliate or spiny-ciliate **1. aculeata**
2 Peduncles not thickened; at least some involucral bracts pectinate-ciliate or spiny-ciliate
3 Outer involucral bracts more than half as long as inner **2. echioides**
3 Outer involucral bracts not more than half as long as inner
4 Involucre 10–12 mm **5. spinifera**
4 Involucre 15–25 mm
5 Involucre (15–)20–25 mm; beak of achene *c.* ½ as long as body **3. comosa**
5 Involucre 16–18 mm; beak of achene twice as long as body **4. algarbiensis**
1 Outer involucral bracts linear-lanceolate to narrowly lanceolate, similar to the inner
6 Outer achenes with a short scarious pappus, the inner with pappus of plumose hairs **12. willkommii**
6 All achenes with pappus of plumose hairs
7 Involucral bracts distinctly pectinate-ciliate **7. hispidissima**
7 Involucral bracts not pectinate-ciliate
8 Capitula 1–2; involucre 12–20 mm **6. hispanica**
8 Capitula more than 2; involucre 8–13(–15) mm
9 Achenes without a beak, not narrowed at apex **11. sprengerana**
9 Achenes narrowed at apex or shortly beaked
10 Peduncles often thickened after anthesis; achenes more or less curved, strongly transversely muricate **10. pauciflora**
10 Peduncles not thickened after anthesis; achenes straight or slightly curved, weakly transversely muricate
11 Leaves pinnatisect **8. scaberrima**
11 Leaves entire to ±dentate **9. hieracioides**

Sect. HELMINTIA O. Hoffm. Outer involucral bracts ovate to ovate-lanceolate, wider than inner.

1. P. aculeata Vahl, *Symb. Bot.* **2**: 89 (1791). Perennial. Stem 18–50 cm, with scattered spines and few to numerous rigid hairs. Leaves with short, bulbous-based spines and a few rigid hairs; basal 30–100 × 10–35 mm, oblanceolate to elliptical, obtuse, shallowly dentate, subpetiolate; cauline small, lanceolate to ovate, sessile, more or less amplexicaul. Capitula few; peduncles thickened after anthesis. Involucre 14–18 × 12–18 mm; bracts glabrous or with rigid hairs, the outer ovate, muricate, the inner lanceolate or oblong, about twice as long as outer. Achenes 8–9 mm, reddish-brown, more or less straight, the beak longer than the body. *Dry places*; *calcicole*. *S. Italy*, *Sicilia*. It Si. (*N. Africa.*)

2. P. echioides L., *Sp. Pl.* 792 (1753) (*Helmintia echioides* (L.) Gaertner). Annual or biennial. Stems 30–90 cm, with rigid, often tubercle-based hairs and often with some slender spines. Leaves with numerous unequal, rigid hairs, the larger thickened at the base or tubercle-based, and often with scattered spines; basal 35–250 × 15–100 mm, elliptical to oblanceolate or oblong-oblanceolate, obtuse to acute, sinuate to dentate, narrowed at base into a winged petiole; lower cauline similar to basal but with semiamplexicaul petioles, the upper lanceolate to ovate, sessile, amplexicaul. Capitula numerous. Involucre 12–20 × 10–15 mm; bracts with pectinate-ciliate margins, the outer ovate-cordate, acuminate the inner lanceolate, slightly longer than the outer. Achenes 5–7 mm, transversely muricate, with beak about as long as the body, the inner reddish-brown, more or less straight, the outer whitish, curved. $2n = 10$. *S. Europe*; *widely naturalized further north, though often inconstant in its appearances*. Al Az Bl Bu Co Cr Ga Gr Hs It Ju Lu *Rs (K) Sa Tu [Au Be Br Cz Ge Hb He Ho Hu Po Rm].

3. P. comosa (Boiss.) B. D. Jackson, *Ind. Kew.* **2**: 521 (1894) (*Helmintia comosa* Boiss.). Annual or biennial. Stems 30–70 cm, with scattered spines and few to numerous rigid hairs. Leaves with bulbous-based spines and rigid hairs; basal 50–150 × 35–50 mm, more or less elliptical, obtuse, entire to sinuate-dentate, subpetiolate; lower cauline similar to basal, the upper broader, sessile, amplexicaul. Capitula numerous. Involucre (15–)20–25 × 13–15 mm; outer bracts ovate-lanceolate, acute, with thickened midrib, spiny-pectinate margins, and also rigid hairs; inner bracts more than twice as long as outer, linear-lanceolate, acute, with a dorsal appendage much exceeding the apex of the bracts, with rigid hairs mainly along the median line. Achenes 8–10 mm, reddish-brown, transversely muricate, more or less straight; beak *c.* ½ as long as the body. *Dry scrub*. *S. Spain*. Hs. (*N. Africa.*)

4. P. algarbiensis Franco, *Bot. Jour. Linn. Soc.* **71**: 268 (1976). Like **3** but biennial or short-lived perennial; stems 50–90 cm; leaves with scattered, short, bulbous-based spines and a few rigid hairs (mostly on the midrib beneath), the cauline small, oblong; involucre 16–18 × 8–13 mm, the outer bracts without rigid hairs, the inner 3 times as long as outer, linear-oblong, with a dorsal appendage scarcely exceeding the apex of the bracts; achenes olive-brown, the beak twice as long as the body. *Woods*. ● *S. Portugal*. Lu.

5. P. spinifera Franco, *loc. cit.* (1976). (*Helmintia spinosa* auct., non DC., *Picris spinosa* auct. lusit., non (DC.) Poiret). Biennial. Stems 20–75 cm, with few to numerous spines and rigid hairs usually confined to the upper part. Leaves with numerous bulbous-based spines and rigid hairs; basal (45–)90–180 × (18–)20–60 mm, oblanceolate, subobtuse, entire, with a short petiole; lower cauline similar to basal but subsessile, the upper gradually becoming smaller, sessile and semi-amplexicaul. Capitula numerous; peduncles with numerous spines, long rigid hairs and shorter, softer hairs. Involucre 10–12 × 10–12 mm; outer bracts oblong-elliptical, subobtuse, narrower than inner, with spiny-pectinate margins and a few strong spines along the median line, without rigid hairs; inner bracts twice as long as outer, oblong-lanceolate, acute, with rigid hairs along the median line and a short tomentum near the apex. Achenes with a short beak. *Dry, waste places*. ● *C. & E.C. Portugal*. Lu.

Sect. PICRIS. Outer involucral bracts linear-lanceolate to narrowly lanceolate, similar to inner.

6. P. hispanica (Willd.) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 248 (1976) (*Apargia hispanica* Willd., *Leontodon hispanicus* (Willd.) Poiret). Perennial. Stems 4–20 cm, with numerous hairs, some rigid and broad-based, some soft. Leaves with numerous broad-based, rigid hairs; basal 25–80 × 10–25 mm, oblanceolate, pinnatisect, the lobes linear to narrowly triangular; cauline similar but smaller and narrower. Capitula 1(–2). Involucre 13–20 × 10–15 mm; bracts lanceolate, obtuse, with short, wavy hairs and longer, rigid hairs mainly on the median line; outer bracts up to half as long as inner. Achenes 9–10 mm, dark brown, slightly curved, weakly transversely muricate, shortly beaked. *Dry places*; *calcicole*. *C., E. & S. Spain*. Hs.

7. P. hispidissima (Bartl.) Koch, *Syn. Fl. Germ.* ed. 2, 484 (1844). Biennial. Stems 30–40 cm, with numerous unequal, rigid hairs. Leaves with numerous unequal hairs; basal 40–95 × 15–30 mm, narrowly elliptical to lanceolate in outline, pinnatisect with linear to narrowly triangular lobes, subpetiolate; cauline similar but smaller. Capitula numerous; peduncles thickened above but constricted immediately below apex. Involucre 11–15 × 10–12 mm; bracts lanceolate, acute, strongly pectinate-ciliate and with rigid hairs on the median line; outer bracts up to ⅔ as long as inner. Achenes 5–6 mm, dark brown, strongly transversely muricate, slightly narrowed at apex. ● *W. Jugoslavia, just extending to N.E. Italy*. ?Gr It Ju.

8. P. scaberrima Guss. in Ten., *Fl. Nap.* **4**, *Syll.*: 113 (1830). Biennial. Stems 30–70 cm, with numerous unequal, rigid hairs. Leaves with numerous unequal, rigid hairs; basal 40–90 × 15–25 mm, narrowly elliptical or lanceolate in outline, pinnatisect with narrow lobes, subpetiolate; cauline similar but smaller. Capitula few, solitary at the ends of long branches. Involucre 9–10 × 6–8 mm; bracts lanceolate, acute, with dense, short tomentum and sometimes a few short, rigid hairs; outer bracts up to half as long as inner. Achenes 5–6 mm, dark brown, strongly transversely muricate, shortly beaked. *Dry calcareous places*. ● *S. Italy*; *N.W. Jugoslavia* (*Velebit*). It Ju.

9. P. hieracioides L., *Sp. Pl.* 792 (1753). Biennial to perennial. Stems 15–100 cm, with few to numerous, unequal, rigid hairs. Leaves with few to numerous, more or less rigid hairs; basal and lower cauline 60–140 × 10–50 mm, lanceolate, ovate, narrowly elliptical or oblong, obtuse to acute, entire to dentate, narrowed into petiole; middle and upper cauline similar but smaller, sessile, more or less amplexicaul. Capitula few to numerous. Involucral bracts lanceolate to narrowly elliptical, obtuse to acute, the outer about half as long as inner. Achenes 3–6 mm, reddish-brown, weakly transversely muricate, shortly beaked. $2n = 10$. *Most of Europe*. All except Az Bl Cr Fa Hb Is No Sb.

1 Capitula on very short peduncles, crowded at apex of stems; lateral capitula often sessile or nearly so (c) subsp. **spinulosa**
1 Capitula on ± long peduncles
2 Involucre 12–15 mm, with dark hairs (e) subsp. **grandiflora**
2 Involucre 8–13 mm, with pale hairs
3 Involucre 8–11 mm (a) subsp. **longifolia**
3 Involucre 10–13 mm
4 Involucre greenish (b) subsp. **hieracioides**
4 Involucre blackish (d) subsp. **villarsii**

(a) Subsp. **longifolia** (Boiss. & Reuter) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 248 (1976) (*P. longifolia* Boiss. & Reuter): Capitula on more or less long peduncles. Involucre 8–11 mm, greenish, with dense short hairs and few to numerous, longer, pale, rigid, simple hairs. ● *Mountains of S. Spain and N. Portugal*.

(b) Subsp. **hieracioides**: Capitula on erect, more or less long peduncles. Involucre 11–13 mm, greenish, with short hairs and few to numerous, longer, pale, rigid, simple hairs. *Throughout most of the range of the species*.

(c) Subsp. **spinulosa** (Bertol. ex Guss.) Arcangeli, *Comp. Fl. Ital.* 418 (1882): Capitula crowded at apex of stems on very short peduncles, the lateral capitula often sessile or nearly so. Involucre 9–11 mm, greenish, glabrous or sometimes with a few pale, rigid hairs mainly on the median line of each bract. *S. & S.C. Europe*.

(d) Subsp. **villarsii** (Jordan) Nyman, *Consp.* 467 (1879) (*P. pyrenaica* sensu Coste, non L., *P. hieracioides* subsp. *crepoides* (Sauter) Nyman & subsp. *sonchoides* (Vest) Thell.): Capitula on erect, more or less long peduncles. Involucre 10–13 mm, blackish, glabrous or with sparse, pale hairs. ● *W. & C. Europe*.

(e) Subsp. **grandiflora** (Ten.) Arcangeli, *Comp. Fl. Ital.* 418 (1882) (subsp. *auriculata* (Schultz Bip.) Hayek, subsp. *paleacea* (Vest) Domin & Podp.): Like subsp. (d) but involucre 12–15 mm, with dense, dark hairs. ● *C. Europe, N. part of Balkan peninsula and Italy*.

10. P. pauciflora Willd., *Sp. Pl.* **3**: 1557 (1803). Annual. Stems 10–50 cm, with numerous unequal, rigid hairs. Leaves with few to numerous, more or less rigid hairs; basal 30–120 × 5–15 mm, narrowly elliptical, oblong-elliptical or oblanceolate, entire to sinuate-dentate, narrowed into petiole; lower cauline similar to basal, the upper smaller, narrower, sessile, sometimes semiamplexicaul. Capitula few; peduncles long, slightly thickened after anthesis. Involucre 10–12 × 7–10 mm; bracts linear-lanceolate to lanceolate, mostly acute, with short stellate and longer rigid hairs mainly on the median line; outer bracts patent, up to half as long as inner. Achenes 4·5–5 mm, dark brown, more or less curved, strongly transversely muricate, shortly beaked. *Balkan peninsula and Aegean region*; *Krym*; *S.E. France*. Al Bu Cr Ga Gr ?Hs Ju Rs (K).

11. P. sprengerana (L.) Poiret in Lam., *Encycl. Méth. Bot.* **5**: 310 (1804). Annual. Stems 10–50 cm, with numerous unequal, rigid hairs. Leaves with numerous rigid hairs; basal 40–90 × 6–20 mm, mostly oblanceolate, entire to sinuate-dentate, narrowed into petiole; lower cauline similar to basal, semiamplexicaul, the upper smaller, narrower and often entire. Capitula numerous; peduncles often short, not thickened after anthesis. Involucre 8–12 × 6–9 mm; bracts linear-lanceolate, acute, with dense rigid hairs, the outer up to half as long as inner. Achenes 2·5–3 mm, dark brown, more or less curved, strongly transversely muricate, without a beak. *Balkan peninsula and Aegean region*; *N. Italy and S.E. France*. Al Bu Cr Ga Gr ?Hs It Ju Tu.

12. P. willkommii (Schultz Bip.) Nyman, *Syll.* 53 (1854–1855) (*Spitzelia willkommii* Schultz Bip.). Stem 10–50 cm, with rigid hairs. Leaves with rigid hairs; basal *c.* 30 × 5–6 mm, oblanceolate to oblong, sinuate-dentate to pinnatifid, narrowed into petiole; cauline long-acute, dentate or the upper entire. Capitula few; peduncles long, thickened after anthesis. Involucre 10–12 × 7–10 mm; bracts linear-lanceolate, with rigid hairs mainly on the median line. Achenes 5–6 mm, tomentose, beaked; outer curved, with short, scarious pappus; inner with pappus of plumose hairs. *Dry scrub*. ● *S.W. Spain*, *?S.E. Portugal*. Hs ?Lu.

161. Scorzonera L.[1]

(incl. *Gelasia* Cass., *Podospermum* DC.)

Usually perennial herbs. Stems solitary to several. Leaves entire to pinnatisect. Capitula solitary to many. Involucral bracts in several rows. Receptacle without scales. Ligules yellow, whitish or purplish. Achenes usually cylindrical, not or obscurely beaked, without an annulus; pappus of several rows of hairs, usually all plumose at least at base, or the outermost (rarely all) simple and scabrid.

Literature: S. J. Lipschitz, *Fragmentae Monographiae Generis Scorzonerae*. **1**. Moskva. 1935. **2**. Moskva. 1939.

Because of uncertainty about the morphological nature of the underground parts in this genus, these are called *rootstocks* in this account.

[1] By A. O. Chater.

1 Achenes densely villous or lanate
2 Pappus-hairs scabrid **25. cretica**
2 Pappus-hairs plumose at least below
3 Rootstock with a globose tuber 2–5 cm below surface of soil
4 Plant ± sericeous-lanate throughout; stems simple or branched at base **27. lanata**
4 Plant sparsely tomentose with short, crispate hairs; stems branched at or above the middle **28. tuberosa**
3 Rootstock without a tuber
5 Involucre densely villous-lanate at least on outer bracts
6 Stems simple, leafy only at or near the base, with 2–3 scale-like leaves above; involucre 10–15 mm **26. albicans**
6 Stems simple or branched, leafy for at least the lower half; involucre often more than 15 mm
7 Pappus-hairs plumose throughout **25. cretica**
7 Pappus-hairs plumose only below **22. ensifolia**
5 Involucre glabrous or shortly tomentose to very sparsely villous at base
8 Hairs on achenes less than 3 mm; pappus purplish-brown **24. doria**
8 Hairs on achenes more than 3 mm; pappus pale reddish-brown
9 Pappus 2½–3 times as long as achene **23. hirsuta**
9 Pappus 1½–2 times as long as achene **25. cretica**
1 Achenes glabrous but sometimes scabrid or tuberculate-squarrose
10 Ligules lilac or purplish on both surfaces, very rarely white
11 Plant not more than 8 cm; leaves recurved **6. purpurea**
11 Plant usually more than 8 cm, with straight leaves
12 Rootstock densely fibrous at apex **6. purpurea**
12 Rootstock not fibrous at apex **5. undulata**
10 Ligules yellow inside, yellow, reddish or purplish outside
13 Achenes with a pale tubular base $\frac{1}{10}$–$\frac{1}{3}$ as long as rest of achene
14 Outer achenes 13–28 mm, with squamulose ribs; leaves entire, sometimes undulate at margin
15 Stems 5–30 cm; leaves 5–15 cm, usually crowded in middle or lower part of stem; involucre 18–27 mm **3. mollis**
15 Stems less than 5 cm; leaves 3–6 cm, all basal; involucre 10–15 mm **4. idaea**
14 Outer achenes 6–17 mm, with smooth ribs; leaves usually pinnatisect
16 Monocarpic; ligules less than 1½ times as long as involucre, yellow outside **2. laciniata**
16 Polycarpic; ligules 1½–2 times as long as involucre, reddish or purplish outside **1. cana**
13 Achenes without a pale tubular base
17 Rootstock densely fibrous at apex
18 Stems usually leafless except for 3–6 scale-like leaves; leaves at least 3 mm wide **8. austriaca**
18 Stems leafy throughout; leaves 1–2 mm wide **20. pusilla**
17 Rootstock not fibrous at apex
19 Stems fistular, arising from a long-creeping, slender rootstock; leaves fistular **19. fistulosa**
19 Stems and leaves not fistular; rootstock vertical or shortly oblique
20 All achenes with smooth ribs
21 Pappus-hairs plumose only at the base, reddish-brown **21. villosa**
21 Pappus-hairs mostly plumose for most of their length, dirty white
22 Achenes 15–25 mm
23 Stems densely leafy almost to the apex **7. graminifolia**
23 Stems leafy only in lower half or leafless
24 Stems leafless; leaves 1–2 mm wide, suberect, with densely crowded, rather prominent, rigid sheaths **12. transtagana**
24 Stems leafy at least near the base; leaves at least 2 mm wide, not densely crowded, without rigid sheaths **11. baetica**
22 Achenes less than 15 mm
25 Leaves less than 3 mm wide; rootstock with an ovoid tuber **20. pusilla**
25 Leaves at least 3 mm wide; rootstock without a tuber
26 Upper cauline leaves ovate-cordate at base; achenes 12–14 mm **18. scyria**
26 Upper cauline leaves ± linear, not cordate at base; achenes 7–11 mm
27 Plant glabrous; ligules 1–1½ times as long as involucre **10. parviflora**
27 More or less arachnoid-lanate at least at base of stems, leaves and involucre; ligules 1½–2 times as long as involucre **9. humilis**
20 At least the outer achenes with rugose, scabrid or lamellate ribs
28 Pappus-hairs reddish-brown **21. villosa**
28 Pappus-hairs dirty white
29 Plant ± densely arachnoid-tomentose or -lanate throughout; leaves usually crowded in middle or lower part of stem **3. mollis**
29 Plant subglabrous, or sparsely arachnoid-tomentose or -lanate only at base of stems, leaves or involucre; leaves mostly basal
30 Stems less than 5 cm (Kriti) **4. idaea**
30 Stems more than 10 cm
31 Stems leafless or with 1 small leaf
32 Outermost involucral bracts at least ½ as long as inner; achenes *c.* 10 mm **14. aristata**
32 Outermost involucral bracts less than ½ as long as inner; achenes *c.* 20 mm **17. brevicaulis**
31 Stems with several to many leaves
33 Leaves densely crowded with prominent, erect, sheathing bases (Greece) **13. crocifolia**
33 Leaves not densely crowded, without prominent, erect bases
34 Stems simple or branched below the middle; leaves irregularly dentate, usually with at least some linear teeth **16. crispatula**
34 Stems usually branched at or above the middle; leaves entire to weakly dentate
35 Leaves up to 6 cm wide, not folded, sometimes undulate at margin **15. hispanica**
35 Leaves not more than 0·8 cm wide, folded, not undulate **11. baetica**

Sect. PODOSPERMUM (DC.) Boiss. Leaves usually 1- to 2-pinnatisect. Achenes glabrous, with smooth ribs, with a pale, tubular base *c.* ½ as long as the rest of the achene.

1. S. cana (C. A. Meyer) O. Hoffm. in Engler & Prantl, *Natürl. Pflanzenfam.* **4(5)**: 365 (1893) (*Podospermum canum* C. A. Meyer). Subglabrous to floccose-tomentose perennial 5–60 cm, with short rootstock and taproot. Stems several, usually branched up to about the middle, erect or ascending, more or less trigonous and sulcate above. Basal leaves 3–20 × (0·2–)1–5 cm, pinnatisect with remote, linear to linear-lanceolate, entire, acute segments, rarely leaves linear, entire; cauline similar but often entire. Involucre 12–20 mm, up to 25 mm in fruit. Ligules 1½–2 times as long as involucre, pale yellow, reddish or purplish outside. Achenes 6–10 mm, cylindrical, with strong ribs, brownish or greyish. Pappus-hairs 1–2 times as long as achene, plumose, dirty or brownish-white. $2n=14$. *E.C. & S.E. Europe, extending westwards to Sardegna.* Al Au Bu Cz Gr Hu It Ju Rm Rs (W, K, E) Sa Si Tu.

2. S. laciniata L., *Sp. Pl.* 791 (1753) (*Podospermum laciniatum* (L.) DC.; incl. *P. calcitrapifolium* (Vahl) DC., *P. willkommii* Schultz Bip., *Scorzonera resedifolia* L.). Like **1** but annual, biennial or sometimes a monocarpic perennial; stems terete and finely striate above; leaf-segments sometimes obovate and subobtuse, sometimes pinnatisect; involucre 7–20 mm, up to 40 mm in fruit; ligules equalling or up to 1½ times as long as

bracts, yellow outside; achenes up to 17 mm; pappus-hairs as long as achene. $2n=14$. *C., S. & S.E. Europe, extending northwards to N. France.* Al Au Be Bl Bu Co Cz Ga Ge Gr He Hs Hu It Ju Lu Po Rm Rs (W, K, E) Sa Si Tu.

Extremely variable, especially in leaf-shape.

Sect. SCORZONERA. Leaves entire to dentate. Achenes glabrous (rarely spinulose), with smooth to lamellate ribs, without or with a short tubular base not more than ⅓ as long as the rest of the achene.

3. S. mollis Bieb., *Fl. Taur.-Cauc.* **3**: 522 (1819) (incl. *S. rumelica* Velen.). More or less densely arachnoid-tomentose or -lanate perennial 5–30 cm; rootstock vertical, tuberous-incrassate and obovoid to oblong-cylindrical. Stems solitary or few, simple or branched near the base, erect or ascending. Leaves 5–15 × 0·2–0·4(–0·6) cm, linear, acute, entire, sometimes undulate, dilated and semiamplexicaul at base, usually crowded in the lower or middle part of stem. Involucre 18–27 mm, up to 35 mm in fruit. Ligules (¾–)1¼–1½ times as long as involucre, yellow, reddish outside. Achenes 13–20(–28) mm, cylindrical, glabrous, the outer with squamulose and the inner with smooth, weak ribs, pale brown, with a pale tubular base $\frac{1}{10}$–$\frac{1}{3}$ as long as the rest of the achene. Pappus-hairs 1–1¼ as long as achene, plumose, dirty white. *S.E. Europe.* Al Bu ?Cr Gr Ju Rm Rs (W, K, E).

4. S. idaea (Gand.) Lipsch., *Fragm. Monogr. Scorzonerae* **2**: 11 (1939). Like **3** but less hairy and much smaller in all its parts; stems not more than 4 cm, several, simple; leaves 3–6 cm, all basal; involucre 10–15 mm, up to 22 mm in fruit. 1800–2300 *m.* ● *Kriti.* Cr.

Plants of **3** from E. Greece (Evvoia) show some approach to **4**, and the two are perhaps not specifically distinct.

5. S. undulata Vahl, *Symb. Bot.* **2**: 86 (1791). Glabrous or sparsely tomentose perennial 7–30 cm; rootstock vertical, 0·7–1·5 cm thick, tuberous-incrassate, oblong-cylindrical, not fibrous at apex. Stem solitary, simple or branched near the base, erect. Basal leaves 3–15 × 0·2–0·7 cm, linear to linear-lanceolate, flat, entire; cauline similar but smaller, amplexicaul. Involucre 15–25 mm. Ligules 1½–2 times as long as involucre, purplish, very rarely white. Achenes *c.* 12 mm, cylindrical-ellipsoid, with the ribs scabrid or rugose to squamate above, otherwise glabrous, brownish, with a paler, tubular base *c.* ½ as long as rest of achene. Pappus-hairs about as long as achene, plumose. *Calcareous hills. S. Italy, Sicilia.* It Si. (*N. Africa.*)

The European plant is subsp. **deliciosa** (Guss.) Maire, *Bull. Soc. Hist. Nat. Afr. Nord* **22**: 54 (1931), with more or less glabrous leaves and scentless flowers; subsp. **undulata** has hairy leaves and scented flowers. Plants of both subspecies in N. Africa often have much wider leaves.

6. S. purpurea L., *Sp. Pl.* 791 (1753). Perennial, subglabrous or arachnoid-lanate at apex of stock and at base of capitula and leaves; rootstock vertical, usually less than 1 cm thick, cylindrical. Stem solitary, erect. Basal leaves (3–)10–25(–40) cm, grass-like, entire; cauline similar but smaller, amplexicaul. Ligules 1½–2 times as long as involucre. Achenes cylindrical-ellipsoid, shortly and obscurely beaked, ribbed, pale brownish, with a paler, tubular base *c.* ½ as long as rest of achene. Pappus-hairs about as long as achene, plumose, dirty white. $2n=14$. *From C. Germany and Lithuania southwards to C. Italy, C. Greece and S.E. Russia; S.C. France.* Al Au Bu Cz Ga Ge Gr Hu It Ju Po Rm Rs (B, C, W, E).

1 Plant not more than 8 cm, with rootstock not or only weakly fibrous at apex; leaves recurved **(c)** subsp. **peristerica**
1 Plant more than 8 cm, with rootstock densely fibrous at apex; leaves straight, ± erect
2 Leaves 0·3–0·7 cm wide, flat, scarcely keeled; achenes scabrid towards apex **(b)** subsp. **rosea**
2 Leaves 0·1–0·3 cm wide, canaliculate, keeled; achenes smooth **(a)** subsp. **purpurea**

(a) Subsp. **purpurea**: Rootstock densely fibrous at apex. Stems 10–70 cm, often branched above. Leaves 0·1–0·3 cm wide, canaliculate, keeled, more or less erect. Involucre 15–25 mm, with 10–16 bracts. Ligules pale lilac. Achenes 10–12 mm, smooth. *Dry places. Throughout most of the range of the species but absent from most of the Balkan peninsula.*

(b) Subsp. **rosea** (Waldst. & Kit.) Nyman, *Consp.* 464 (1879) (*S. rosea* Waldst. & Kit.): Like subsp. **(a)** but stems simple; leaves flat, not or scarcely keeled; involucre with 15–20 bracts; ligules pale purplish; achenes 10–15 mm, scabrid towards apex. $2n=14$. *Damp or shady places.* ● *E.C. Europe, Balkan peninsula, N. & C. Italy.*

(c) Subsp. **peristerica** Form., *Verh. Naturf. Ver. Brünn* **37**: 159 (1899): Rootstock not or only weakly fibrous at apex. Stems not more than 8 cm, simple. Leaves not more than 5 × 0·3 cm, canaliculate, keeled, usually recurved. Involucre 12–17 mm, with 10–15 bracts. Ligules pale purplish. Achenes 8–12 mm, smooth. *Rocky and grassy places, above* 2000 *m.* ● *C. & N.W. Greece.*

7. S. graminifolia L., *Sp. Pl.* 791 (1753). Perennial or rarely biennial 10–50 cm, subglabrous to more or less arachnoid-tomentose especially at base of stems, leaves and capitula; rootstock vertical, slender, not fibrous at apex. Stems usually solitary, simple or sparingly branched, erect, densely leafy almost to the apex. Leaves 5–25 × 0·1–0·3(–0·5) cm, grass-like, flat, entire, subamplexicaul at base. Involucre 30–50(–70) mm. Ligules 1–1½ times as long as involucre, pale yellow or whitish, usually purplish outside. Achenes 15–25 mm, cylindrical-ellipsoid, attenuate above, with weak, smooth ribs, glabrous. Pappus-hairs about as long as achene, plumose, dirty white. *Dry places.* ● *Spain and Portugal.* Hs Lu.

8. S. austriaca Willd., *Sp. Pl.* **3**: 1498 (1803). Perennial 5–50 cm, glabrous or sparsely arachnoid-tomentose especially at base of stems and leaves; rootstock vertical, stout, densely fibrous at apex. Stems solitary or few, erect, usually leafless except for 3–6 almost scale-like leaves. Basal leaves 5–30 × 0·3–3 cm, entire, acuminate. Involucre 15–25(–30) mm. Ligules 1½–2 times as long as bracts, pale yellow. Achenes 8–14 mm, cylindrical-ellipsoid, with smooth to rugose ribs, glabrous. Pappus-hairs about as long as achene, plumose, white. $2n=14$. *Dry places. From C. France and Czechoslovakia southwards to S. Italy and Bulgaria, and in the S. & E. parts of U.S.S.R.* Al Au Bu Cz Ga Ge He Hu It Ju Rm Rs (N, C, W, K, E).

Very variable, especially in leaf-shape; the following subspecies are more or less distinct.

1 Stems branched **(b)** subsp. **crispa**
1 Stems branched **(b)** subsp. **crispa**
1 Stems simple
2 Lamina of basal leaves abruptly contracted into petiole **(c)** subsp. **bupleurifolia**
2 Lamina of basal leaves gradually narrowed into petiole **(a)** subsp. **austriaca**

(a) Subsp. **austriaca** (incl. *S. ruprechtiana* Lipsch. & Krasch.): Stems simple. Lamina of basal leaves not coriaceous, usually with flat margin, linear to narrowly elliptical, gradually narrowed into a short or long petiole. *Throughout the range of the species except Krym.*

(b) Subsp. **crispa** (Bieb.) Nyman, *Consp.* 464 (1879) (*S. crispa* Bieb.): Stems branched, with 2–4 capitula. Lamina of basal leaves not coriaceous, often with undulate margin, narrowly elliptical to ovate-lanceolate, gradually narrowed into a short or long petiole. *Krym.*

Plants from S.E. Russia and W. Kazakhstan, described as **S. pratorum** (Krasch.) Stankov in Stankov & Taliev, *Opred. Vyss. Rast. Evrop. SSSR* 687 (1949), are somewhat intermediate between subspp. (a) and (b); they have usually branched stems and narrow basal leaves with flat margins.

(c) Subsp. **bupleurifolia** (Pouzolz) Bonnier, *Fl. Compl. Fr.* **6**: 71 (1923) (*S. crispa* auct. gall., non Bieb.): Stems simple. Lamina of basal leaves somewhat coriaceous, usually with undulate margin, broadly elliptical, abruptly contracted into a petiole or subcordate at base. ● *S. France*; ?*N. Italy and W. Jugoslavia.*

9. S. humilis L., *Sp. Pl.* 790 (1753) (incl. *S. candollei* Vis.). Perennial 5–50(–120) cm, subglabrous to more or less arachnoid-lanate at base and apex of stem and at base of leaves and involucre; rootstock vertical, stout, not fibrous at apex. Stems solitary or few, simple or rarely with 1–2 branches, erect, with 1–7 leaves, the upper usually scale-like. Basal leaves 5–30 × 0·3–5 cm, linear to ovate-elliptical, acute or acuminate, flat, entire, gradually narrowed at base into a usually distinct petiole. Involucre 15–30 mm. Ligules 1½–2 times as long as bracts, yellow or rarely whitish, sometimes brownish outside. Achenes 7–11 mm, cylindrical, with slender, smooth ribs, glabrous. Pappus-hairs slightly longer than achene, plumose, dirty white. $2n = 14, 15$. ● *Much of Europe, but absent from the N., S. & E. margins.* Au Be *Br Cz Da Fe Ga Ge He Ho Hs Hu It Ju Lu No Po Rm Rs (B, C, W) Su.

Plants from N. Italy with acuminate (not subobtuse) involucral bracts and achenes with scabrid ribs have been called subsp. **tenuifolia** (Schrader) Arcangeli, *Comp. Fl. Ital.* 421 (1882) (*S. tenuifolia* Schrader); their status and relationships are uncertain.

10. S. parviflora Jacq., *Fl. Austr.* **4**: 3 (1776). Glabrous perennial or biennial (10–)15–60 cm; rootstock oblique, stout, with stout fleshy roots, not fibrous at apex. Stems solitary or few, simple or with 1–3 branches, rather fleshy, erect, with 1–3 usually small leaves. Basal leaves 7–30 × 0·5–1·5 cm, linear-lanceolate, acute, entire, flat, often more or less petiolate. Involucre 12–25 mm. Ligules 1–1½ times as long as bracts, pale yellow, sometimes purplish outside. Achenes 7–9 mm, cylindrical, with smooth ribs, glabrous. Pappus-hairs about twice as long as achene, plumose, dirty white. $2n = 14$. *Saline soils. From N.W. Czechoslovakia and S.C. Russia southwards to E.C. Spain, Bulgaria and Krym.* Au Bu Cz Ga Ge Gr Hs Hu Ju Rm Rs (C, W, K, E).

11. S. baetica (Boiss.) Boiss., *Voy. Bot. Midi Esp.* **2**: 382 (1841). Perennial 20–50 cm, sparsely tomentose at base of stems and involucre and more or less throughout the leaves; rootstock [illegible] vertical, cylindrical, not fibrous at apex. Stems solitary, stout, simple or with 1–2 branches at about the middle, leafy only near base or in lower part. Basal and lower cauline leaves 10–30 × 0·2–0·8 cm, linear to linear-lanceolate, folded and keeled, not undulate, long-attenuate at apex, widened and sheathing at base. Involucre 27–35 mm, up to 50 mm in fruit. Ligules *c.* 1¼ times as long as involucre, yellow, sometimes purplish outside. Achenes 17–22 mm, cylindrical, attenuate above, with smooth ribs or rarely the outer achenes with weakly squamate-rugose ribs, glabrous. Pappus-hairs about as long as achene, plumose, dirty white. *S.W. Portugal, S. Spain.* Hs Lu. (*Morocco.*)

12. S. transtagana Coutinho, *Fl. Port.* 690 (1913). Perennial 20–40 cm, subglabrous to sparsely and minutely tomentose at base of leaves and involucre; rootstock vertical, with a globose to fusiform tuber, not fibrous at apex. Stems usually solitary, simple or with a few branches at base or middle, erect, leafless. Leaves 10–20 × 0·1–0·2 cm, grass-like, entire, folded and keeled, suberect, with densely crowded, rather rigid sheaths. Involucre 20–30 mm. Ligules 1¼–1½ times as long as involucre, yellow, reddish or purplish outside. Achenes 20–30 mm, cylindrical-ellipsoid, attenuate above, with smooth ribs or the outer achenes with squamate ribs, glabrous. Pappus-hairs all plumose, dirty white. *Dry places.* ● *S. Portugal, S.W. Spain.* Hs Lu.

13. S. crocifolia Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 123 (1813). Perennial 15–45 cm, subglabrous or arachnoid-lanate at base of stems and leaves; rootstock vertical, cylindrical, stout, not fibrous at apex. Stems solitary or few, slender, rigid, usually with 1–3 branches near the base, erect, sparsely leafy below. Basal leaves 7–25 × 0·1–0·3(–0·6) cm, grass-like, rigid, densely crowded, with prominent erect sheaths. Involucre 15–30 mm; outer bracts ¼–⅓ as long as inner. Ligules 1¼–2 times as long as bracts, yellow, often reddish outside. Achenes 15–20 mm, cylindrical, the outer with scabrid to squamate ribs, the inner with smooth ribs. Pappus-hairs about as long as achene, plumose, dirty white. $2n = 14$. *Dry, rocky places.* ● *C. & S. Greece and Aegean region.* Gr.

S. serpentinica Rech. fil., *Anzeig. Akad. Wiss.* (*Wien*) **93**: 102 (1956), described from serpentine rocks on Evvoia, has more flaccid, less strongly veined leaves with scarcely crowded and much less prominent sheaths; it is also very similar to **15**, and its status and relationships are uncertain.

14. S. aristata Ramond ex DC. in Lam. & DC., *Fl. Fr.* ed. 3, **4**: 922 (1805). Perennial 10–50 cm, subglabrous or arachnoid-tomentose on stems and at base of leaves and involucre; rootstock vertical, cylindrical, stout, not fibrous at apex. Stems solitary or few, rather fleshy, simple or rarely with one branch, erect, leafless or with one small leaf. Leaves 7–30(–40) × 0·1–0·4(–0·6) cm, linear or narrowly linear-lanceolate, without prominent, erect bases. Involucre 20–30 mm; outer bracts at least ½ as long as inner. Ligules 1½–2 times as long as involucre, yellow, sometimes reddish outside and often reddish when dry. Achenes 9–11 mm, cylindrical-ellipsoid, the outer with strongly rugose or tuberculate-squamate ribs, the inner with smooth or rugulose ribs. Pappus-hairs 1–1½ times as long as achene, plumose, dirty white. $2n = 14$. *Meadows and other grassy places in the mountains; calcicole.* ● *C. & E. Pyrenees, S. Alps, N. & C. Appennini.* Au Ga Hs It Ju.

15. S. hispanica L., *Sp. Pl.* 791 (1753) (incl. *S. stricta* Hornem.). Perennial 25–100(–130) cm, subglabrous or sparsely arachnoid-lanate especially at base of stems, leaves and involucre; rootstock vertical, cylindrical or fusiform, not fibrous at apex. Stems solitary or few, rigid, usually branched at or above the middle, [illegible] erect, leafy especially in lower half. Basal and lower cauline leaves 15–40 × (0·1–)0·3–6 cm, linear to ovate-elliptical, acuminate, entire or rarely weakly dentate, flat or sometimes undulate at margin, narrowed at base and sometimes petiolate; upper cauline leaves linear-lanceolate, scarcely widened at base. Involucre 20–30 mm, up to 40 mm in fruit; outer bracts ¼–½ as long as inner. Ligules 1½–2 times as long as involucre, yellow, sometimes purplish outside. Achenes 10–15(–20) mm, cylindrical, weakly attenuate above, the outer with prominent rugose to almost tuberculate-squamate ribs, the inner with usually smooth, weak ribs. Pappus-hairs as long as or slightly shorter than

achene, plumose, dirty white. $2n = 14$. *C. & S. Europe and S. part of U.S.S.R.; occasionally cultivated for its edible rootstock and locally naturalized.* Al Au *Bl Bu Cz Ga Ge Gr Hs Hu It Ju Lu Rm Rs (C, W, K, E) [He ?Po].

Extremely variable, especially in leaf-shape.

16. S. crispatula (Boiss.) Boiss., *Voy. Bot. Midi Esp.* **2**: 741 (1845). Like **15** but 15–40 cm; stems simple or with a few branches usually below the middle; basal and lower cauline leaves 5–25 × 1–4·5 cm, lanceolate and long-attenuate at apex to obovate-elliptical and acuminate or obtuse and long-apiculate, dentate with usually some of the teeth linear, usually crispate or undulate at margin; involucre 25–45 mm; achenes 15–18 mm, usually strongly attenuate above. *Dry places.* ● *S. France, S. & E. parts of Iberian peninsula.* Ga Hs Lu.

17. S. brevicaulis Vahl, *Symb. Bot.* **2**: 88 (1791) (*S. coronopifolia* Desf.). Like **15** but 15–50 cm; stems simple or with one branch at the base, leafless or with one small leaf; leaves 5–20 × 1–4 cm, linear to linear-lanceolate, long-attenuate at apex, variably lacerate-dentate with irregular linear lobes to crenulate-undulate at margin; involucre 25–40 mm; achenes *c.* 20 mm; pappus-hairs slightly shorter than achene. *Dry places. S. France; S.E. Spain.* Ga Hs. (*N.W. Africa.*)

Very variable in shape and dissection of leaves; the plants from Spain have the leaves crenulate-undulate and never lacerate-dentate at the margin.

18. S. scyria M. Gustafsson & Snogerup, *Bot. Not.* **125**: 323 (1972). Like **15** but 20–35 cm, rather densely floccose-lanate in lower part of stem and on lower surface of leaves; basal and lower cauline leaves 5–15 × 1·5–3 cm, lanceolate to elliptical, entire, acute or subobtuse; upper cauline leaves ovate-acuminate, widely cordate at base; achenes with more or less weak, smooth ribs. $2n = 14$. *Limestone cliffs.* ● *N. Aegean region (Skiros).* Gr.

19. S. fistulosa Brot., *Fl. Lusit.* **1**: 329 (1804). Perennial 15–70 cm, glabrous except sometimes for base of involucre; rootstock long-creeping, branched, slender. Stems procumbent at base, ascending to erect above, simple or branched in lower half, fistular, leafy. Lower leaves 10–30 × 0·2–0·5 cm, fistular, more or less sulcate, subulate at apex, flattened and widened at base. Involucre 10–20 mm. Ligules 1½–2 times as long as involucre, yellow, purplish outside. Achenes *c.* 6 mm, narrowly elliptical, with smooth ribs. Pappus-hairs slightly longer than achene, dirty white. *Water-meadows and other seasonally wet places.* ● *C. & S. Portugal, S.W. Spain; very local.* Hs Lu.

20. S. pusilla Pallas, *Reise* **2**: 744 (1773). Perennial 5–40 cm, subglabrous to more or less arachnoid-tomentose especially on leaves and at base of involucre; rootstock vertical, slender, with a deeply buried ovoid tuber, somewhat fibrous at apex. Stems usually several, slender, rigid, sinuous, usually branched in upper half, leafy throughout. Leaves 5–15 × 0·1–0·2 cm, linear, entire, [illegible] the basal with dilated whitish sheaths. Involucre 10–25 mm, up to 40 mm in fruit. Ligules *c.* 1¼ times as long as involucre, yellow, purplish outside. Achenes 7–12 mm, cylindrical, with smooth ribs, glabrous. Pappus-hairs 2–2½ times as long as achene, plumose, dirty white. *Saline soils and stony or sandy steppes. S.E. Russia* (*near Astrakhan'*). Rs (E). (*Temperate Asia.*)

21. S. villosa Scop., *Fl. Carn.* ed. 2, **2**: 97 (1772). Perennial 20–60 cm, more or less hirsute to arachnoid-lanate especially at base of stems, leaves and on outer involucral bracts, more sparsely hairy or glabrous elsewhere; rootstock vertical, cylindrical, sometimes with a deeply buried ovoid tuber, not fibrous at apex. Stems solitary or few, rather rigid, simple or rarely with 1(–2) branches, leafy only in lower half. Leaves 10–25 × 0·2–0·3 cm, linear, entire, keeled, the basal with dilated whitish sheaths. Involucre 17–25 mm. Ligules 1¼–1½ times as long as involucre, yellow, reddish outside. Achenes 9–15 mm, cylindrical-ellipsoid. Pappus-hairs 1½–2 times as long as achene, pale reddish-brown. *Grassy places.* ● *C. Mediterranean region and N.W. part of Balkan peninsula.* ?Al It Ju Sa Si.

1 Achenes with ± smooth ribs; leaves callose at apex
(c) subsp. **callosa**
1 At least the outer achenes with spinulose-dentate or acutely lamellate ribs; leaves not or scarcely callose at apex
2 Pappus-hairs scabrid with the projections *c.* 0·1 mm
(a) subsp. **villosa**
2 Pappus-hairs plumose at least at base with the lateral hairs at least 0·5 mm
(b) subsp. **columnae**

(a) Subsp. **villosa** (*Gelasia villosa* (Scop.) Cass.): Leaves not or scarcely callose at apex. At least the outer achenes with spinulose-dentate or acutely lamellate ribs. Pappus-hairs scabrid, the projections *c.* 0·1 mm. *Throughout the range of the species except S. Italy and the islands.*

(b) Subsp. **columnae** (Guss.) Nyman, *Consp.* 465 (1879): Like subsp. (a) but pappus-hairs plumose at base or in lower half, the lateral hairs more than 0·5 mm. *C. & S. Italy, Sicilia.*

(c) Subsp. **callosa** (Moris) Chater, *Bot. Jour. Linn. Soc.* **71**: 270 (1976) (*S. callosa* Moris): Leaves callose at apex. Achenes with smooth or very weakly rugose ribs, glabrous. Pappus-hairs plumose at base, the lateral hairs more than 0·5 mm. *Sardegna.*

Sect. LASIOSPORA Less. Leaves entire. Achenes densely villous or lanate, with smooth ribs, without a tubular base.

22. S. ensifolia Bieb., *Fl. Taur.-Cauc.* **2**: 235 (1808). Perennial 20–60 cm, densely villous at base of stems and on involucre, sometimes also on leaves and rest of stems; rootstock vertical, cylindrical, not fibrous at apex. Stems solitary or few, simple or sparingly branched, erect, leafy usually throughout. Leaves 5–25 × 0·2–0·6(–1) cm, linear-lanceolate, long-attenuate at apex, rigid, with prominent veins. Involucre 18–22 mm. Ligules *c.* 1½ times as long as involucre, yellow. Achenes 5–7 mm, cylindrical. Pappus-hairs 2–2½ times as long as achene, plumose below, pale reddish-brown. *Sandy places. S. part of U.S.S.R.* Rs (C, W, E).

S. biebersteinii Lipsch., *Fragm. Monogr. Scorzonerae* **2**: 95 (1939) (*S. eriosperma* Bieb., non Gouan), from the Caucasus, with subglabrous involucre and acute (not acuminate) bracts has been doubtfully reported from S.W. Ukraine.

23. S. hirsuta L., *Mantissa Alt.* 278 (1771). Perennial 10–45 cm, subglabrous to more or less sparsely villous; rootstock vertical, cylindrical, not fibrous at apex. Stems solitary or few, slender, rigid, simple or sparingly branched at about the middle, ascending, more or less densely leafy in lower half, usually [illegible] ascending, more or less densely leafy in lower half, usually leafless above. Leaves 5–20 × 0·1–0·4 cm, linear, long-attenuate at apex, rigid, with prominent veins. Involucre 13–20 mm, up to 30 mm in fruit, glabrous or very sparsely villous at base. Ligules 1¼–1½ times as long as involucre, yellow. Achenes 6–8 mm, oblong-cylindrical, with hairs 3–5 mm. Pappus-hairs 2½–3 times as long as achene, plumose throughout, pale reddish-brown. $2n = 12, 14$. *Dry places.* ● *Italy and Sicilia, France northwards to c.* 46° 30′ *N., N.E. Spain.* Ga Hs It Si.

S. villosiformis (Fiori & Béguinot) Vierh., *Österr. Bot. Zeitschr.* **65**: 66 (1915), described from S. Italy, has the pappus-hairs

plumose only at the base, with short lateral hairs; it is probably a hybrid between **23** and **21**.

24. S. doria Degen & Bald., *Österr. Bot. Zeitschr.* **46**: 417 (1896). Like **23** but leaves less rigid and with less prominent veins; achenes with hairs less than 3 mm; pappus-hairs about twice as long as achene, purplish-brown. *Dry, usually rocky places.* ● *From S.W. Jugoslavia to N.W. Greece.* Al Gr Ju.

25. S. cretica Willd., *Sp. Pl.* **3**: 1504 (1803). Perennial 3–45 (–60) cm, subglabrous to densely villous-lanate especially at base of stems, leaves and involucre; rootstock vertical, cylindrical, not fibrous at apex. Stems solitary or few, rigid, simple or sparingly branched, ascending or erect, leafy in lower half or throughout. Leaves 5–30(–45) × 0·1–1 cm, linear, long-attenuate at apex, rigid or flaccid, often with prominent veins. Involucre 10–30 mm, up to 40 mm in fruit, glabrous to villous or lanate. Ligules 1¼–1¾ times as long as involucre, yellow, often reddish outside. Achenes 5–10 mm, oblong-cylindrical. Pappus-hairs 1½–2 times as long as achene, plumose or scabrid, pale reddish- or whitish-brown. *Rocks and dry places. S. Aegean region.* Cr Gr.

An extremely variable species in need of detailed study. **S. araneosa** Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 123 (1813) (incl. *S. eximia* Rech. fil.), from the Kikladhes (the type being probably erroneously described as coming from Cyprus), is said to differ in having the involucre 20–30 mm in flower, achenes *c.* 10 mm with hairs less than 2 mm, and scabrid, pale whitish-brown pappus-hairs; **S. cretica** itself (incl. *S. lassitica* Vierh.), from Kriti, has the involucre 10–20 mm in flower, achenes 5–8 mm with hairs 3–5 mm, and plumose, pale reddish-brown pappus-hairs. **S. dependens** Rech. fil., *Magyar Bot. Lapok* **33**: 17 (1934), is a very robust plant with scabrid pappus-hairs, described from Kriti; it is uncertain whether it should be united with *S. araneosa*, if the latter is kept separate from *S. cretica* chiefly on the basis of the scabrid pappus-hairs, or whether the whole variation indicated above is of a much more complex nature and might justify the recognition of several isolated populations as species or subspecies.

26. S. albicans Cosson, *Not. Pl. Crit.* 119 (1851). Perennial 3–17 cm, more or less densely villous-lanate throughout; rootstock vertical, cylindrical, stout, not fibrous at apex. Stems usually several, simple, ascending, leafy only at or near the base, with 2–3 scale-like leaves above. Leaves 2–10 × 0·3–0·7 cm, linear-lanceolate, flat or folded. Involucre 10–15 mm. Ligules 1¼–1½ times as long as involucre, yellow. Achenes 5–7 mm, oblong-cylindrical, with hairs *c.* 3 mm. Pappus-hairs about twice as long as achene, plumose for most of their length, pale reddish-brown. *Dry, rocky or sandy places.* ● *S. Spain.* Hs.

27. S. lanata (L.) Hoffm., *Comment. Soc. Phys. Med. Mosq.* **1**: 9 (1806). Perennial 3–22 cm, more or less sericeous-lanate throughout; rootstock vertical, with a globose tuber 2–5 cm below surface of soil, not fibrous at apex. Stems solitary or few, simple or sparingly branched at the base, ascending to erect, leafy only below. Leaves 3–10 × 0·1–0·5(–0·8) cm, linear or linear-lanceolate. Involucre 10–15 mm, up to 20 mm in fruit. Ligules 1–1½ times as long as involucre, yellow, reddish outside. Achenes *c.* 4 mm. Pappus-hairs 3–4 times as long as achene, plumose, pale reddish-brown. *Dry, usually rocky places. E. part of Balkan peninsula, just extending to S.W. Romania.* Bu Gr Rm Tu.

The plants from Europe and Anatolia have been called **S. sublanata** Lipsch., *Fragm. Monogr. Scorzonerae* **2**: 42 (1939), since typical *S. lanata* from the Caucasus is more densely lanate and has often wider leaves and longer ligules; some European specimens, however, match material from the Caucasus very closely, and the two plants would seem to merit subspecific distinction at the most.

28. S. tuberosa Pallas, *Reise* **3**: 757 (1776). Perennial 3–10 cm with the habit of a *Gagea*, sparsely tomentose with short, crispate hairs throughout; rootstock vertical, with a globose tuber 2–5 cm below surface of soil, not fibrous at apex. Stems solitary or few, slender, branched at or above the middle, ascending or erect, leafy at least in lower half. Leaves 3–15 × 0·1–0·4 cm, linear. Involucre 8–12 mm. Ligules *c.* 1¼ times as long as bracts, yellow, reddish outside. Achenes *c.* 4 mm. Pappus-hairs *c.* 2½ times as long as achene, plumose, pale reddish-brown. *Sandy steppes. S.E. Russia and W. Kazakhstan.* Rs (E).

A single record for N.W. Spain is probably a misidentification.

162. Tragopogon L.[1]

(incl. *Geropogon* L.)

Annual, biennial or perennial herbs. Stems usually solitary, simple or sparingly branched. Leaves linear-lanceolate to linear, entire, the cauline sheathing. Capitula solitary or few. Involucral bracts in 1 row. Receptacle without scales. Ligules yellow or purplish. Achenes fusiform, with 5–10 more or less distinct ribs, usually beaked, the beak usually with an annulus separating it from the pappus; pappus of 1 row of mostly plumose hairs, or the outer achenes with a pappus of 1 row of scabrid, rigid hairs.

Literature: C. Regel, *Ber. Schweiz. Bot. Ges.* **65**: 251–262 (1955).

Because of uncertainty about the morphological nature of the underground parts in this genus, these are called *rootstocks* in this account. Characters of leaves refer to the lower cauline leaves, and of ligules and achenes (except where otherwise stated) to those of the outer florets. Length of achenes includes the beak, when present.

1 Outer achenes without an annulus and with a pappus of scabrid, rigid hairs **20. hybridus**
1 All achenes with an annulus and with a pappus of plumose hairs
2 Outer ligules purplish
3 Peduncles distinctly inflated
4 Achenes with 5 rows of scales forming distinct wings **5. pterodes**
4 Achenes not winged
5 Beak about as long as body of achene, scarcely clavate; leaves broadly linear **4. porrifolius**
5 Beak about twice as long as body of achene, distinctly clavate; leaves narrowly linear **7. longirostris**
3 Peduncles not distinctly inflated
6 Beak ± distinctly clavate; achenes not densely white-squamose
7 Involucral bracts 4–5, about equalling ligules **6. balcanicus**
7 Involucral bracts 5–12, exceeding ligules **8. crocifolius**
6 Beak not distinctly clavate; achenes densely white-squamose
8 Biennial; bracts exceeding ligules **3. cretaceus**
8 Perennial; bracts shorter than ligules
9 Achenes gradually narrowed into a beak 0·7–1 cm **1. ruber**
9 Achenes abruptly narrowed into a beak 0·6 cm **2. marginifolius**
2 Outer ligules yellow, rarely lilac at apex (sometimes drying reddish)
10 Peduncles distinctly inflated **10. dubius**
10 Peduncles not or scarcely inflated
11 Beak more than ½ as long as body of achene
12 Beak longer than body of achene
13 Ligules golden-yellow, exceeding the bracts **13. hayekii**
13 Ligules pale yellow, about as long as bracts **14. tommasinii**
12 Beak not longer than body of achene
14 Involucral bracts 5–7; leaves not or scarcely widened at base **8. crocifolius**
14 Involucral bracts 8(–12); leaves usually widened at base
15 Rootstock cylindrical to fusiform; achenes ± squamose **11. pratensis**
15 Rootstock ovoid to globose; achenes almost smooth **9. kindingeri**
11 Beak less than ½ as long as body of achene
16 Leaves mostly with flat margins
17 Achenes more than 2·5 cm; pappus about equalling achene **16. dasyrhynchus**
17 Achenes not more than 2 cm; pappus usually shorter than achene
18 Stems less than 10 cm; achenes squamose-muricate **12. lassithicus**
18 Stems usually more than 10 cm; achenes smooth or tuberculate **15. brevirostris**
16 Leaves mostly with undulate margins
19 Plant glabrous; beak of achene 0·3–0·4 cm **17. elatior**
19 Plant ± lanate; beak of achene absent or up to 0·3 cm
20 Beak present; ligules pale yellow **18. floccosus**
20 Beak absent; ligules deep yellow **19. ruthenicus**

1. T. ruber S. G. Gmelin, *Reise Russl.* **2**: 198 (1774). Glaucous perennial with a robust, cylindrical rootstock. Stems 8–25(–40) cm, floccose-lanate, glabrescent. Leaves linear-lanceolate, widened at base, with a whitish, scarious margin. Peduncles not inflated; involucral bracts 8–10, *c.* ⅔ as long as ligules. Ligules lilac-purple. Achenes 2–2·5 cm, densely white-squamose, somewhat sulcate; beak 0·7–1 cm, gradually widened into body, not clavate. Pappus *c.* 2·5 cm. *Dry slopes and sandy wastes. S.E. Russia, W. Kazakhstan.* Rs (E).

Plants from the eastern part of the European range, with slightly inflated peduncles and involucral bracts about as long as ligules, have been separated as **T. kasahstanicus** S. Nikitin, *Not. Syst.* (*Leningrad*) 7: 268 (1937). They perhaps merit recognition as a subspecies.

2. T. marginifolius Pawł., *Bull. Soc. Nat. Moscou* nov. ser., **47(2)**: 83 (1938). Like **1** but leaves with a white, usually coriaceous margin; achenes deeply sulcate; beak 0·6 cm, abruptly widened into body. *Rocky slopes and semi-deserts. S.E. Russia.* Rs (E). (*C. Asia.*)

3. T. cretaceus S. Nikitin, *Not. Syst.* (*Leningrad*) **7**: 264 (1937). Like **1** but biennial; stems glabrous; leaves linear; involucral bracts 8–12, somewhat exceeding ligules; beak of achene about as long as body; pappus distinctly shorter than achene. *Chalky slopes.* ● *S.E. Russia* (*near Vol'sk*). Rs (E).

4. T. porrifolius L., *Sp. Pl.* 789 (1753). Glabrous to somewhat floccose-lanate biennial with a cylindrical rootstock. Stems 20–125 cm. Leaves broadly linear, widened at base. Peduncles inflated; involucral bracts *c.* 8; ligules lilac to deep violet or reddish-purple. Achenes 3–4 cm, squamose-muricate; beak scarcely clavate. Pappus shorter than achene. *Grassland. Mediterranean region, extending to E. Romania; widely cultivated for its edible root (salsify) and occasionally for ornament and naturalized in N., W. & C. Europe.* Bl Bu Co Cr Ga Gr Hs It Ju Rm Sa Si Tu [Au Be Br Cz Da Ge Hb He Ho Su].

1 Leaves lanate (c) subsp. **cupani**
1 Leaves glabrous or puberulent
2 Ligules about as long as bracts (a) subsp. **porrifolius**
2 Ligules *c.* ½ as long as bracts (b) subsp. **australis**

(a) Subsp. **porrifolius** (incl. subsp. *sativus* (Gaterau) Br.-Bl., *T. eriospermus* Ten.): Glabrous. Stems 30–125 cm. Ligules almost as long as involucral bracts, lilac to reddish-purple. Beak abruptly widened into body of achene. $2n=12$. *Perhaps native in the C. & E. Mediterranean region; cultivated throughout a large part of Europe and widely naturalized.*

(b) Subsp. **australis** (Jordan) Nyman, *Consp.* 462 (1879) (*T. australis* Jordan): Often puberulent. Stems 20–50 cm. Ligules *c.* ½ as long as involucral bracts, deep violet. Beak gradually widened into body of achene. $2n=12$. *Mediterranean region, extending northwards to E. Romania; occasionally casual elsewhere.*

(c) Subsp. **cupani** (Guss. ex DC.) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 270 (1976) (*T. cupani* Guss. ex DC.): Stems usually *c.* 10 cm. Leaves lanate. Ligules somewhat shorter than involucral bracts, purple. Beak gradually widened into body of achene. ● *S. Italy and Sicilia.*

5. T. pterodes Pančić, *Fl. Princ. Serb., Addit.* 170 (1884). Like **4(c)** but involucral bracts 6–8; achenes with 5 rows of scales forming distinct wings, otherwise muricate, the beak about as long as the body. $2n=12$. *Rocky places.* ● *C. part of Balkan peninsula.* Bu Ju.

6. T. balcanicus Velen., *Abh. Böhm. Ges. Wiss.* ser. 7, **1(8)**: 28 (1886). Biennial with a usually simple rootstock. Stems 15–60 cm, usually branched, glabrous or sparsely floccose. Leaves narrowly linear, widened at base. Peduncles not inflated; involucral bracts 4–5, about as long as ligules. Ligules purplish-violet. Achenes *c.* 2 cm, squamose-muricate; beak about as long as body, distinctly clavate. Pappus about as long as achene. $2n=12$. *Rocky places.* ● *N. & C. parts of Balkan peninsula; S.W. Romania.* Al Bu Gr Ju Rm Tu.

7. T. longirostris Bischoff ex Schultz Bip. in Webb & Berth., *Phyt. Canar.* **2**: 469 (1850). Like **6** but peduncles inflated; involucral bracts 6–8, exceeding the ligules; beak up to twice as long as body of achene. *Rocky grassland. Karpathos.* Cr. (*S.W. Asia.*)

8. T. crocifolius L., *Syst. Nat.* ed. 10, **2**: 1191 (1759) (incl. *T. flaviflorus* (Willk.) Willk., *T. stenophyllus* Jordan, *T. castellanus* Leresche & Levier, *T. badalii* Willk.). Annual or biennial with a fusiform rootstock. Stems 10–80 cm, simple or branched. Leaves narrowly linear, scarcely widened at base. Peduncles not inflated; involucral bracts 5–12; outer ligules violet, yellow at base, rarely either yellow or violet throughout; inner yellow, rarely violet. Achenes *c.* 2 cm, more or less strongly tuberculate; beak stout, distinctly clavate, about as long as body; annulus glabrous or hairy. Pappus about as long as achene. *S. Europe from Portugal to the Balkan peninsula.* Bu Co Ga Gr Hs It Ju Lu ?Sa [Su].

(a) Subsp. **crocifolius**: Leaves floccose-lanate. Involucral bracts 5–12, exceeding the ligules. *Waste places. From Portugal to Italy.*

(b) Subsp. **samaritani** (Heldr. & Sart. ex Boiss.) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 270 (1976) (*T. samaritani* Heldr. & Sart. ex Boiss.): Leaves more or less glabrous. Involucral bracts 5–7, as long as the ligules. *Rocky places on mountains.* ● *C. & S. Italy; W. & S. parts of Balkan peninsula.*

9. T. kindingeri Adamović, *Österr. Bot. Zeitschr.* **55**: 236 (1905). Perennial with a tuberous ovoid to globose rootstock. Stems 30–40 cm, simple or branched above, glabrous or sparsely hairy. Leaves widened at base. Peduncles not or scarcely inflated; involucral bracts 8, about as long as ligules. Ligules

[1] By I. B. K. Richardson.

yellow. Achenes 1·5–2 cm, almost smooth; beak about as long as body. Pappus about as long as achene. *Pastures and waste places.* ● *S. Jugoslavia (near Titov Veles).* Ju.

10. T. dubius Scop., *Fl. Carn.* ed. 2, **2**: 95 (1772) (*T. major* Jacq.; incl. *T. dubius* subsp. *campestris* (Besser) Hayek). Annual or biennial with a cylindrical rootstock. Stems 25–50 cm, often simple, glabrous. Leaves linear-lanceolate, subamplexicaul. Peduncles strongly inflated; involucral bracts (5–)8–12(–18), exceeding ligules. Ligules yellow. Achenes 2·5–3·5 cm, squamose; beak about as long as body. Pappus about as long as achene. $2n=12$. *Europe, from N. France and C. Russia southwards.* Au Bu Cz Ga Ge Gr He Hs Hu It Ju Lu Rm Rs (C, W, K, E) Tu [Be].

Plants with wide leaves, large capitula and 10–12(–18) involucral bracts have been called subsp. **major** (Jacq.) Vollmann, *Fl. Bayern* 772 (1914), but are not sufficiently distinct to warrant recognition even at subspecific rank.

11. T. pratensis L., *Sp. Pl.* 789 (1753). Annual to perennial with a cylindrical rootstock. Stems 30–70 cm, often simple, glabrescent. Leaves linear-lanceolate, more or less subamplexicaul at base. Peduncles not inflated. Involucral bracts *c.* 8. Ligules yellow. Achenes 1–2·5 cm, more or less squamose. *Dry grassland, roadsides and waste places. Most of Europe.* Al Au Be Br Bu Co Cz Da Fe Ga Ge Gr Hb He Ho Hs It Ju No Po Rm Rs (N, B, C, W, K, E) Su Tu.

1 Involucral bracts about twice as long as ligules, often with a reddish margin — (b) subsp. **minor**
1 Involucral bracts shorter than or equalling ligules, with a pale or white margin
2 Ligules pale yellow; beak about as long as body of achene — (a) subsp. **pratensis**
2 Ligules golden yellow; beak usually shorter than body of achene — (c) subsp. **orientalis**

(a) Subsp. **pratensis**: Involucral bracts shorter than or equalling ligules, with a pale or white margin. Ligules pale yellow. Beak about as long as body of achene. $2n=12$. *Throughout much of the range of the species, but absent from parts of the east.*

(b) Subsp. **minor** (Miller) Wahlenb., *Fl. Suec.* 481 (1826) (*T. minor* Miller): Involucral bracts about twice as long as ligules, often with a reddish margin. Ligules pale yellow. Beak about as long as body of achene. $2n=12$. *W. & C. Europe.*

(c) Subsp. **orientalis** (L.) Čelak., *Prodr. Fl. Böhm.* 215 (1871) (*T. orientalis* L.; incl. *T. rumelicus* Velen.): Involucral bracts shorter than or equalling ligules, with a pale or white margin. Ligules golden yellow. Beak usually shorter than body of achene. $2n=12$. *C. & E. Europe; rare or only casual in the west.*

12. T. lassithicus Rech. fil., *Denkschr. Akad. Wiss. Math.-Nat. Kl. (Wien)* **105(2, 1)**: 157 (1943). Like **11(a)** but stems 6–8 cm, simple; leaves linear, not or scarcely widened at base; involucral bracts 5; achenes 1·6–1·8 cm, squamose-muricate, with indistinct beak 0·1–0·2 cm. *Mountain rocks.* ● *E. Kriti (Dhikti Oros).* Cr.

13. T. hayekii (Soó) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 270 (1976) (*T. transsilvanicus* Hayek, non Schur, *T. orientalis* var. *hayekii* Soó). Like **11(a)** but stems branched; ligules golden yellow, exceeding the bracts; beak of achene 1½–3 times as long as body. *Meadows.* ● *C. Romania; Macedonia.* ?Gr Ju Rm.

14. T. tommasinii Schultz Bip. in Bischoff, *Beitr. Fl. Deutschl.* 97 (1851). Like **11(a)** but stem branched, usually floccose-lanate; achenes squamose-muricate, the beak 1½–3 times as long as the body. *Grassland.* ● *N. & C. parts of Balkan peninsula, extending north-westwards to Slovenija and N. Italy.* Al Gr It Ju.

15. T. brevirostris DC., *Prodr.* **7**: 114 (1838). Biennial with a fusiform vertical rootstock. Stems up to 60(–110) cm, often branched below, usually sparsely hairy. Leaves linear, usually widened at base, the margins mostly flat. Peduncles not inflated; involucral bracts 5–11, shorter than or equalling ligules. Ligules yellow. Achenes 1–2 cm, smooth or tuberculate; annulus hairy. Pappus usually shorter than achene. *S. part of U.S.S.R., extending to E. Romania; S. Greece.* Gr Rm Rs (C, W, E).

1 Beak of achene absent — (a) subsp. **brevirostris**
1 Beak of achene present
2 Leaves not widened at base, glabrous — (e) subsp. **longifolius**
2 Leaves widened at base, usually hairy
3 Bracts 7–11; beak of achene 0·5–0·7 cm; pappus 1·2–1·7 cm — (d) subsp. **bjelorussicus**
3 Bracts 5–8; beak of achene 0·3–0·4(–0·7) cm; pappus 0·8–1·3 cm
4 Pappus shorter than achene — (c) subsp. **podolicus**
4 Pappus as long as or longer than achene — (b) subsp. **volgensis**

(a) Subsp. **brevirostris** (incl. *T. borystenicus* Artemczuk): Leaves widened at base, sparsely hairy. Bracts 5–8(–10). Beak absent. Pappus *c.* 1 cm. *Throughout most of the range of the species.*

(b) Subsp. **volgensis** (S. Nikitin) C. Regel, *Scripta Hort. Bot. Univ. Vyt. Magni* **5**: 40 (1937) (*T. volgensis* S. Nikitin): Leaves widened at base, sparsely hairy. Bracts 5–8. Beak 0·4 cm. Pappus 1·2 cm, longer than achene. *Meadows and river-sands. By the lower Volga and Ural R.*

(c) Subsp. **podolicus** (DC.) C. Regel, *op. cit.* 39 (1937) (*T. podolicus* (DC.) Artemczuk; incl. *T. stepposus* (S. Nikitin) Stankov, *T. ukrainicus* Artemczuk): Leaves widened at base, sparsely hairy. Bracts (7)8. Achenes smooth or weakly tuberculate; beak 0·3–0·4(–0·7) cm. Pappus 0·8(–1) cm, shorter than achene. *Ukraine, S.E. Russia, W. Kazakhstan.*

(d) Subsp. **bjelorussicus** (Artemczuk) C. Regel, *op. cit.* 41 (1937) (*T. bjelorussicus* Artemczuk): Leaves widened at base, usually sparsely hairy. Bracts 7–11. Achenes tuberculate; beak 0·5–0·7 cm. Pappus 1·2–1·7 cm. *River-sands and pine-woods.* ● *S.E. White Russia.*

(e) Subsp. **longifolius** (Heldr. & Sart. ex Boiss.) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 270 (1976) (*T. longifolius* Heldr. & Sart. ex Boiss.): Stems glabrous. Leaves not widened at base, glabrous. Achenes with small tubercles or smooth; beak *c.* 0·5 cm. *Damp meadows.* ● *S. Greece.*

16. T. dasyrhynchus Artemczuk, *Trav. Inst. Bot. (Charkov)* **2**: 42 (1937). Biennial with a slender rootstock. Stems up to 130 cm, glabrous to floccose-tomentose. Leaves with flat margins. Peduncles not inflated; involucral bracts 7–8, shorter than the ligules. Ligules yellow. Achenes with beak 0·1–0·5 cm. Pappus *c.* 1·7 cm, about equalling the achene. *Steppes and sandy ground. S.E. part of U.S.S.R.* Rs (K, E).

(a) Subsp. **dasyrhynchus**: Stems up to 130 cm. Involucral bracts 7(8). Achenes *c.* 2·7 cm, squamose-tuberculate. *Throughout the range of the species.*

(b) Subsp. **daghestanicus** Artemczuk, *op. cit.* 44 (1937) (*T. daghestanicus* (Artemczuk) Kuthath.): Stems not more than 60 cm. Involucral bracts 8. Achenes *c.* 3·2 cm, more or less smooth. *S.E. Russia.*

17. T. elatior Steven, *Bull. Soc. Nat. Moscou* **29(2)**: 407 (1856) (incl. *T. stribrnyi* Hayek). Glabrous biennial. Stems usually 90–125 cm, much branched. Leaves with undulate margins. Peduncles not inflated; involucral bracts 8, shorter than or equalling the ligules. Ligules yellow. Achenes *c.* 3 cm, squamulose; beak 0·3–0·4 cm. Pappus 1·1–1·5 cm, usually shorter than achene. *S.E. Europe, from Turkey to Krym.* Bu Rs (K) Tu.

Perhaps conspecific with **T. latifolius** Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 23 (1844), from Anatolia.

18. T. floccosus Waldst. & Kit., *Pl. Rar. Hung.* **2**: 116 (1802). Biennial or perennial with a vertical, cylindrical rootstock. Stems 20–50 cm, branched, more or less lanate. Leaves linear, widened at base, the margins undulate. Peduncles not inflated; involucral bracts 7–12. Ligules pale yellow. Achenes 2·3–3·5 cm; beak 0·1–0·3 cm; annulus shortly hairy. Pappus 1–1·5 cm, usually shorter than achene. ● *E.C. Europe, extending to the Baltic region.* Cz Hu Ju Po Rm Rs (B).

(a) Subsp. **floccosus**: Involucral bracts 8, equalling the ligules. Achenes muricate. $2n=12$. *River-sands. Valley of middle and lower Danube.*

(b) Subsp. **heterospermus** (Schweigger) C. Regel, *Scripta Hort. Bot. Univ. Vyt. Magni* **5**: 42 (1937) (*T. heterospermus* Schweigger): Involucral bracts 8–12, usually shorter than ligules. Achenes smooth. *Maritime sands. Baltic region, from Poland to Latvia.*

T. lithuanicus (DC.) Boriss. in Bobrov & Tzvelev, *Fl. URSS* **29**: 162 (1964), and **T. gorskianus** Reichenb. fil., *Icon. Fl. Germ.* **19(1)**: 19 (1858), are imperfectly understood variants apparently related to **18(b)**. Both were described from S. Lithuania, and perhaps extend into White Russia.

19. T. ruthenicus Besser ex Krasch. & S. Nikitin, *Otč. Počv.-Bot. Kazakhst. Eksped.* **4(2)**: 292 (1930). Like **18** but stems up to 75 cm; involucral bracts shorter than the dark yellow ligules; achenes 1–3 cm, without beak, the annulus sometimes glabrous; pappus 0·9–1·8 cm. *S. Russia and E. Ukraine.* Rs (C, E).

1 Perennial; pappus shorter than achene — (c) subsp. **tanaiticus**
1 Biennial; pappus as long as or longer than achene
2 Achene 1·5–3 cm; pappus 1·5–1·8 cm — (a) subsp. **ruthenicus**
2 Achene 1–1·4 cm; pappus *c.* 1 cm — (b) subsp. **donetzicus**

(a) Subsp. **ruthenicus**: Biennial 30–80 cm. Involucral bracts 7–12. Achenes 1·5–3 cm, with alternately smooth and minutely tuberculate ribs; annulus hairy. Pappus 1·5–1·8 cm. *Sandy hillsides and river-valleys. S.E. Russia.*

(b) Subsp. **donetzicus** (Artemczuk) I. B. K. Richardson, *Bot. Jour. Linn. Soc.* **71**: 270 (1976) (*T. donetzicus* Artemczuk): Biennial 10–40 cm. Involucral bracts 7–8. Achenes 1–1·4 cm, weakly scabrid; annulus glabrous. Pappus *c.* 1 cm. *Sandy places, mostly in river-valleys.* ● *N.E. Ukraine, S.C. Russia.*

(c) Subsp. **tanaiticus** (Artemczuk) C. Regel, *Scripta Hort. Bot. Univ. Vyt. Magni* **5**: 44 (1937) (*T. tanaiticus* Artemczuk): Perennial up to 75 cm. Involucral bracts **7**(8). Achenes 2·5 cm, squamulose; annulus hairy. Pappus 0·9–1 cm. *Sandy steppes.* ● *E. Ukraine, S.E. Russia, W. Kazakhstan.*

20. T. hybridus L., *Sp. Pl.* 789 (1753) (*Geropogon glaber* L.; *G. hybridus* (L.) Schultz Bip.). Glabrous annual. Stems 20–50(–80) cm, simple or branched. Leaves long-linear, subamplexicaul. Peduncles inflated; involucral bracts 8, 2–3 times as long as ligules. Ligules pinkish-lilac. Achenes fusiform, sulcate, somewhat hispid on the ribs; outer 3·5–5 cm with beak 1·5–2 cm and pappus of 5 unequal, scabrid, rigid hairs 1–2 cm; inner *c.* 2·5 cm, with beak *c.* 1 cm and pappus of plumose hairs *c.* 2 cm. $2n=14$. *Stony pastures. S. Europe.* Al Bl Cr Ga Gr Hs It Ju Lu Sa Si Tu.

[1] By P. D. Sell.

163. Reichardia Roth[1]

(*Picridium* Desf.)

Annual to perennial herbs. Stems solitary to numerous, branched. Leaves entire to deeply pinnatisect, the cauline usually amplexicaul. Capitula few to numerous. Involucral bracts in several imbricate rows, at least the outer with scarious margins and often grading into the bracts of the peduncle. Receptacle without scales. Ligules yellow, the outer often with a reddish stripe on outer face, sometimes purplish at base. At least the outer achenes 4- to 5-angled and transversely rugose; inner achenes always paler, often smooth, probably often sterile; pappus of numerous rows of soft simple hairs.

1 All achenes transversely rugose; ligules purplish at base
2 Involucre 10–15 × 10–15 mm — **1. tingitana**
2 Involucre 15–22 × 15–30 mm — **2. gaditana**
1 Inner achenes not transversely rugose; ligules yellow at base
3 Outermost involucral bracts 3–5 × 1·5–2·5 mm, with a scarious margin not more than 0·5 mm wide — **3. picroides**
3 Outermost involucral bracts 4–7 × 2·5–3·5 mm, with a scarious margin up to 1·25 mm wide — **4. intermedia**

1. R. tingitana (L.) Roth, *Bot. Abh.* 35 (1787) (*Picridium tingitanum* (L.) Desf.). Glabrous annual to perennial. Stems 4–35 cm. Leaves smooth to densely white-papillose; basal leaves 2–17 × 0·5–7 cm, oblanceolate, obtuse to acute, dentate to pinnatifid, narrowed at base into a short, broadly winged petiole; cauline 1–6, similar to basal or linear, sessile and more or less amplexicaul. Capitula 1–4; peduncles long, thickened at the apex. Involucre 10–15 × 10–15 mm; bracts ovate, obtuse to acute, with wide scarious margins, glabrous. Ligules yellow, purplish at base, the outer with a red stripe on outer face, about twice as long as involucre. Achenes 1·5–2·5 mm, 4- to 5-angled, all strongly transversely rugose. $2n=16$. *Mediterranean region.* Bl Cr Gr Hs Si.

2. R. gaditana (Willk.) Coutinho, *Fl. Port.* 676 (1913) (*Picridium gaditanum* Willk.). Like **1** but leaves never white-papillose, often with spinulose-denticulate margins; involucre 15–22 × 15–30 mm, the outer bracts with the scarious margins often pale brownish and plicate; ligules *c.* 1½ times as long as involucre; inner achenes less rugose than outer. $2n=16$. *Sandy and rocky places near the sea.* ● *S.W. & N.W. Spain, W. & S. Portugal.* Hs Lu.

3. R. picroides (L.) Roth, *Bot. Abh.* 35 (1787) (*Picridium vulgare* Desf., *R. macrophylla* Vis. & Pančić). Glabrous perennial. Stems 10–45 cm. Leaves smooth or more or less papillose; basal 2–13 × 0·5–2·5 cm, oblanceolate or linear-lanceolate, obtuse to acute, entire to pinnatisect with patent lobes, long-attenuate at base into a winged petiole; lower cauline similar to basal but sessile, amplexicaul, the upper smaller and often more or less entire. Capitula 1–5; peduncles long, with numerous small, ovate, acuminate bracts which have a scarious margin. Involucre 10–20 × 8–14 mm, glabrous; outermost bracts 3–5 × 1·5–2·5 mm, ovate, with a scarious margin up to 0·5 mm wide, the inner lanceolate, obtuse, usually with a narrow scarious margin. Ligules yellow, the outer usually with a dark stripe on outer face, 1½–2 times as long as involucre. Achenes 2–3 mm, the outer 4- to 5-angled, transversely rugose, the inner smooth and appearing sterile. $2n=14$. *Cultivated ground and waste places. S. Europe.* Al Bl Bu Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

4 R. intermedia (Schultz Bip.) Coutinho, *Fl. Port.* 676 (1913) (*Picridium intermedium* Schultz Bip.). Like **3** but often annual;

outer involucral bracts 4–7 × 2·5–3·5 mm, broadly ovate, with a scarious margin up to 1·25 mm wide. $2n=14$. *Cultivated ground and waste places. Mediterranean region, Portugal.* Bl Cr Gr Hs It Lu Si.

164. Launaea Cass.[1]

(*Zollikoferia* DC., non Nees, *Microrhynchus* Less.)

Biennial or perennial herbs or spiny dwarf shrubs. Stems solitary or few, freely and dichotomously branched. Leaves mostly basal. Capitula few to numerous. Involucral bracts in several rows, imbricate, with scarious margins. Receptacle without scales. All florets hermaphrodite. Ligules yellow, often with an olive stripe. Achenes cylindrical or slightly compressed, ribbed, not beaked; pappus of several rows of simple hairs.

L. mucronata (Forskål) Muschler, *Man. Fl. Egypt* **2**: 1057 (1912), native of Egypt and W. Asia, has been doubtfully recorded from Macedonia.

1 Spiny dwarf shrub
2 Apex of stock and axils of leaves lanate — **5. lanifera**
2 Apex of stock and axils of leaves not lanate
3 Plant not more than 20 cm, intricately branched; capitula on long peduncles arising laterally from the branches — **4. cervicornis**
3 Plant at least 20 cm, not intricately branched; capitula very shortly pedunculate, usually terminal — **6. arborescens**
1 Unarmed herb
4 Involucre more than 10 mm wide; bracts 2·5–3·5 mm wide, with narrow scarious margins — **3. pumila**
4 Involucre less than 10 mm wide; bracts 1·5–3 mm wide, with wide scarious margins
5 Achenes 3–4 mm; leaf-margins white-spinulose — **2. nudicaulis**
5 Achenes 5–7 mm; leaf-margins not spinulose — **1. resedifolia**

1. L. resedifolia (L.) O. Kuntze, *Revis. Gen.* **1**: 351 (1891) (*Zollikoferia resedifolia* (L.) Cosson). Biennial or perennial herb 10–40 cm, often woody at the base. Leaves usually confined to lower half of stem, pinnatisect; lobes usually linear, entire, mucronate. Capitula terminal. Involucre 14–20 × 5–8 mm; bracts 1·5–3 mm wide, with wide scarious margins. Achenes 5–7 × 0·5–0·7 mm, cylindrical or somewhat narrowed at base, with 5–6 obscure ribs, papillose-puberulent to subglabrous; pappus 9–12 mm, persistent. *Maritime sands and dry hillsides. C., E. & S. Spain; Sicilia.* Hs Si.

2. L. nudicaulis (L.) Hooker fil., *Fl. Brit. India* **3**: 416 (1881) (*Microrhynchus nudicaulis* (L.) Less.). Biennial or perennial herb 20–50 cm, often woody at the base. Leaves mostly basal, usually lyrate- or runcinate-pinnatisect; lobes broadly triangular, white-spinulose at margin. Capitula terminal. Involucre 12–15 × 4–6 mm; bracts 1·5–2·5 mm wide, with wide scarious margins. Achenes 3–4 × *c.* 1 mm, slightly narrowed at both ends, with 4 prominent ribs, transversely rugulose, glabrous; pappus 7–9 mm, deciduous. *S.E. Spain.* Hs. (*N. Africa, S.W. Asia, India.*)

3. L. pumila (Cav.) O. Kuntze, *Revis. Gen.* **1**: 351 (1891) (*Zollikoferia pumila* (Cav.) DC.). Perennial herb 10–30 cm, woody at the base. Leaves usually confined to lower half of stem, pinnatisect; lobes linear to triangular, mucronate. Capitula terminal. Involucre 20–24 × 12–16 mm; bracts 2·5–3·5 mm wide, with narrow scarious margin. Achenes 4–7 × *c.* 0·7 mm, often curved, slightly narrowed at both ends, with 4 prominent ribs, papillose-puberulent; pappus 8–12 mm, persistent. $2n=16$. *Dry, gypsaceous or saline soils.* ● *E. Spain.* Hs.

4. L. cervicornis (Boiss.) Font Quer & Rothm., *Sched. Fl. Iber. Select., Cent.* **1**: no. 99 (1934) (*Sonchus spinosus* var. *cervicornis* (Boiss.) Lange). Spiny dwarf shrub 5–20 cm, with densely intricate branches. Leaves mostly basal, dentate to pinnatisect; lobes more or less triangular, entire, mucronate. Capitula long-pedunculate, lateral on the branches and not exceeding them. Involucre 8–10 × 3–4 mm; bracts 1–1·5 mm wide, with wide scarious margins, the outer with an appendage at the apex. Achenes 3·25–4 × 0·5–0·7 mm, cylindrical, often curved, slightly narrowed at both ends, with 4 prominent ribs, papillose-puberulent; pappus 4–5 mm, persistent. $2n=18$. *Rocky ground, mostly near the sea.* ● *Islas Baleares.* Bl.

5. L. lanifera Pau, *Mem. Mus. Ci. Nat. Barcelona* (*Bot.*) **1(3)**: 23 (1925) (*Sonchus spinosus* auct., non (Forskål) DC.). Spiny dwarf shrub 15–40 cm, lanate at apex of stock and in axils of leaves. Leaves mostly basal, dentate to pinnatisect; lobes triangular, entire or slightly spinulose. Capitula terminal. Involucre 12–14 × 5–7 mm; bracts 1–2·5 mm wide, with wide scarious margins. Achenes 4–5 × 0·6–0·8 mm, more strongly narrowed at apex than at base, with 4 prominent ribs, transversely rugulose, subglabrous; pappus 7–8 mm, persistent. $2n=16$. *S.E. Spain.* Hs. (*N. Africa, Arabia.*)

6. L. arborescens (Batt.) Murb., *Lunds Univ. Årsskr.* nov. ser., **19(1)**: 65 (1923) (*Sonchus spinosus* auct., non (Forskål) DC., *S. freynianus* Huter). Like **5** but more or less glabrous; leaves usually with narrowly linear lobes; involucre 10–12 mm; achenes 3·5–4 × *c.* 1 mm, more strongly narrowed at base than at apex, papillose-puberulent. *S.E. Spain (near Almería).* Hs. (*N.W. Africa.*)

165. Aetheorhiza Cass.[2]

Perennial herbs with rhizomes sometimes bearing whitish, subglobose tubers. Stems usually several, simple. Leaves usually all basal, entire or dentate. Capitula 1(–8). Involucral bracts in several rows, imbricate. Receptacle pitted, without scales. Ligules yellow, sometimes with a reddish-purple or greenish stripe on the outer face. Achenes pale brown, with 4 deep grooves; pappus white, of many rows of simple hairs.

Literature: K. H. Rechinger, *Phyton* (*Austria*) **16**: 211–220 (1974).

1. A. bulbosa (L.) Cass., *Dict. Sci. Nat.* **48**: 426 (1827) (*Crepis bulbosa* (L.) Tausch). Glaucous perennial 7–55 cm, with leafy stolons and long rhizomes. Stems 1–3, each with 1(–8) capitula. Leaves usually glabrous; basal 10–250 × 4–35 mm, elliptical to obovate, mostly acute, gradually attenuate to the petiole, entire to sinuately lobed; cauline usually absent, but sometimes 1–2 near the base of the stem. Involucre 8–16 × 3–12 mm; bracts lanceolate, usually subobtuse, with blackish, clavate glandular hairs at the base and extending on to the stem. Achenes 3–5 × *c.* 0·5 mm, more or less attenuate at apex, with hollow, swollen base. $2n=18$. *Cultivated fields, maritime sands and dry, rocky ground. Mediterranean region and W. coast of Europe, northwards to* 47° 45′ *in N.W. France.* Al Bl Co Cr Ga Gr Hs It Ju Lu Sa Si Tu.

1 Involucre 8–11 mm — (b) subsp. **microcephala**
1 Involucre 13–16 mm
2 Involucral bracts linear-lanceolate, *c.* 2 mm wide; achenes 4–4·5 mm — (a) subsp. **bulbosa**
2 Involucral bracts narrowly linear, 1–1·8 mm wide; achenes *c.* 5 mm — (c) subsp. **willkommii**

(a) Subsp. **bulbosa**: Leaves usually sinuate-denticulate. Involucral bracts (13–)14–15(–16) × *c.* 2 mm, linear-lanceolate, abruptly narrowed to the subobtuse apex. Achenes 3–4·5 mm. *Throughout most of the range of the species.*

(b) Subsp. **microcephala** Rech. fil., *Phyton* (*Austria*) **16**: 217 (1974): Leaves sinuate- to runcinate-dentate or sinuately lobed. Involucral bracts (8–)9–10(–11) × 1·5–2 mm, linear, abruptly narrowed to the subacute apex. Achenes 4–4·5 mm. *Aegean region.*

(c) Subsp. **willkommii** (Burnat & W. Barbey) Rech. fil., *op. cit.* 219 (1974) (*Crepis willkommii* Burnat & W. Barbey, *Aetheorhiza montana* Willk.): Leaves slightly sinuate-denticulate. Involucral bracts 13–15 × 1–1·8 mm, narrowly linear, long-attenuate to the acute apex. Achenes *c.* 5 mm. ● *Mallorca.*

166. Sonchus L.[1]

Annual, biennial or perennial herbs, rarely woody at the base. Stems usually solitary, usually branched. Leaves denticulate to pinnatisect, often spiny, the cauline amplexicaul. Capitula few to numerous. Involucral bracts in 3 imbricate rows. Receptacle without scales. Ligules yellow. Achenes compressed, narrowed at both ends, with 1–4 ribs on each face, not beaked; pappus of 2 kinds of hairs: deciduous, rough solitary hairs and more or less persistent, softer hairs in fascicles.

1 Stem woody at base; achenes 3·5–5 mm — **8. pustulatus**
1 Stem not woody; achenes 2–3·75 mm
2 Annual or biennial
3 Achenes smooth at least between the ribs, strongly compressed and ± winged — **1. asper**
3 Achenes rugose or tuberculate between the ribs, neither strongly compressed nor winged
4 Leaf-lobes strongly constricted at base, or narrowly linear; terminal lobe usually about as large as the lateral lobes; ligules longer than corolla-tube; achenes abruptly contracted at base — **2. tenerrimus**
4 Leaf-lobes (if present) not constricted at base; terminal lobe usually much larger than the lateral lobes; ligules about as long as corolla-tube; achenes gradually narrowed at base — **3. oleraceus**
2 Perennial
5 Capitula subsessile; leaves with strong marginal spines — **6. crassifolius**
5 Capitula distinctly pedunculate; leaves not or weakly spiny
6 Leaf-lobes strongly constricted at base, or narrowly linear — **2. tenerrimus**
6 Leaf-lobes (if present) not constricted at base, not narrowly linear
7 Auricles of cauline leaves lanceolate, acute, denticulate — **5. palustris**
7 Auricles of cauline leaves rounded, often dentate
8 Achenes strongly transversely rugose; capitula glandular-hairy or glabrous — **7. arvensis**
8 Achenes not or weakly transversely rugose; capitula glabrous or eglandular-tomentose at base — **4. maritimus**

1. S. asper (L.) Hill, *Herb. Brit.* **1**: 47 (1769). Annual or biennial, glabrous, but base of capitula and upper part of stem and peduncles often glandular-hairy; stem 10–120(–200) cm, sometimes branched. Leaves glabrous, the lower spathulate, entire to pinnatifid, the upper entire to pinnatisect, with triangular-ovate to linear, dentate lobes and rounded, sometimes dentate auricles. Involucral bracts 35–45. Ligules shorter than corolla-tube. Achenes 2–3 × 1 mm, strongly compressed and more or less winged, elliptical to broadly oblanceolate, smooth between the ribs, the margins and ribs often with recurved spinules. Pappus 6–9 mm, more or less deciduous. *Cultivated ground and waste places. Almost throughout Europe.* All except Fa Is Sb.

(a) Subsp. **asper**: Annual. Leaves mostly cauline, thin, sometimes without spiny margins. Achenes with sparse spinules on margins and ribs. Pollen-grains 35–42 μ. $2n=18$. *Almost throughout the range of the species.*

(b) Subsp. **glaucescens** (Jordan) Ball, *Jour. Linn. Soc. London* (*Bot.*) **16**: 548 (1878) (*S. glaucescens* Jordan): Biennial. Leaves often forming a rosette, coriaceous, with spiny margins. Achenes with dense, recurved spinules on margins and ribs. Pollen-grains 30–35·5 μ. *S., W. & C. Europe.*

2. S. tenerrimus L., *Sp. Pl.* 794 (1753). Annual, biennial or perennial; stem 10–80 cm, branched (except in some annual variants). Leaves with subobtuse to acuminate auricles, the lower glabrous, with few lobes, the upper larger, often white-tomentose when young, pinnatisect with many ovate to linear-lanceolate lobes strongly constricted at the base and entire or denticulate, or rarely with linear lobes. Base of capitula and upper part of peduncles white-tomentose, often glandular-hairy. Involucral bracts 25–30. Ligules longer than corolla-tube. Achenes 2·5–3·3 × 0·5–1·2 mm, narrowly oblanceolate, tuberculate or rugose between the ribs; pappus 6–8 mm, more or less persistent. $2n=14$. *S. Europe.* Az Bl Co ?Cr Ga Gr Hs It Ju Lu ?Rm Sa Si ?Tu.

3. S. oleraceus L., *Sp. Pl.* 794 (1753). Annual or biennial; stem 10–140 cm, simple or branched, often glandular-hairy in upper part and sometimes white-tomentose at base of capitula and on upper part of peduncles. Leaves glabrous, the lower undivided, with narrowly winged petiole, the upper larger, pinnatifid to pinnatisect, lyrate or sometimes runcinate with the lobes not or only slightly constricted at the base, with acute auricles. Involucral bracts 27–35. Ligules about as long as corolla-tube. Achenes 2·5–3·75 × 0·75–1 mm, oblanceolate, rugose between the ribs, weakly compressed; pappus 5–8 mm, more or less persistent. $2n=32$. *Cultivated ground and waste places. Almost throughout Europe.* All except Fa Is Sb.

Often difficult to distinguish from **2**, and believed to be an allopolypoid derived from **1** and **2**.

4. S. maritimus L., *Syst. Nat.* ed. 10, **2**: 1192 (1759). Rhizomatous perennial; stem 15–60 cm, not or sparingly branched. Lower leaves glabrous, linear, entire to dentate, the upper slightly tomentose beneath when young, linear to oblong, undivided or rarely pinnatisect, with denticulate margins; auricles rounded, often dentate. Base of capitula and upper part of peduncles often white-tomentose, eglandular. Involucral bracts *c.* 27. Ligules much longer than corolla-tube. Achenes 2·2–3 × 1–1·6 mm, oblong to elliptical, weakly rugose between the ribs or smooth, with wide margin; pappus 5·5–9 mm, usually deciduous. $2n=18$. *S. & W. Europe, northwards to N.W. France and eastwards to Albania.* Al Bl Co Ga Hs It Ju Lu Sa Si.

(a) Subsp. **maritimus**: Involucre *c.* 15 mm; outer bracts ovate-lanceolate, the inner lanceolate. Achenes oblong. *Damp, saline soils. Throughout the range of the species.*

(b) Subsp. **aquatilis** (Pourret) Nyman, *Consp.* 434 (1879) (*S. aquatilis* Pourret; incl. *S. loscosii* Willk.): Involucre *c.* 10 mm; all bracts lanceolate. Achenes elliptical. *Damp but not saline soils. S.W. Europe.*

5. S. palustris L., *Sp. Pl.* 793 (1753). Perennial; stem 100–250(–400) cm, simple, angled, the upper part, including the inflorescence, with dense glandular hairs. Basal leaves oblong-lanceolate, entire to pinnatifid; cauline with lanceolate, acute, denticulate auricles, the upper cauline smaller and linear-lanceolate. Capitula terminal, pedunculate, densely glandular-

[1] By L. Boulos. [2] By P. D. Sell.

[1] By L. Boulos.

hairy. Involucral bracts *c.* 42. Ligules as long as corolla-tube. Achenes *c.* 3·75 × 1·2 mm, oblong-elliptical, rugose between the ribs, with wide margin; pappus *c.* 7·5 mm, deciduous. $2n=18$. *Marshes and other wet places. From England, S. Fennoscandia and N.C. Russia southwards to S. France, N. Italy and Bulgaria.* Au Be Br Bu Cz Da Ga Ge †He Ho Hu It Ju No Po Rm Rs (?N, B, C, W, K, E) Sa Su.

6. S. crassifolius Pourret ex Willd., *Sp. Pl.* **3**: 1509 (1803). Perennial; stem 10–40 cm, simple, glabrous. Leaves glabrous, auriculate, entire to pinnatifid, irregularly spinose-dentate, the lower spathulate, the upper oblong to oblong-elliptical, the uppermost triangular-ovate. Capitula axillary and terminal, subsessile. Involucral bracts *c.* 35. Ligules about as long as corolla-tube. Achenes 2–3 × 1–1·4 mm, elliptical to oblong-elliptical, rugose between the ribs; pappus 7–10 mm, persistent. *Damp saline or calcareous soils.* ● *C. & E. Spain.* Hs.

7. S. arvensis L., *Sp. Pl.* 793 (1753). Perennial, far-creeping; stem 30–150 cm, simple or branched. Leaves glabrous, with dentate margins, the lower entire to pinnatipartite with triangular lobes, the upper larger, pinnatipartite to pinnatisect, with rounded, often dentate auricles. Capitula terminal, pedunculate. Involucral bracts 38–50. Ligules about as long as corolla-tube. Achenes 2·5–3·5 × 1–1·5 mm, elliptical, rugose between the ribs; pappus 10–14 mm, persistent. $2n=36$, 54. *Cultivated and waste ground, and on maritime sands and shingle. Throughout Europe except for parts of the south-west and some of the islands.* Al Au Be Br Bu Cz Da Fa Fe Ga Ge Gr Hb He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Sa Su Tu.

There seems to be no clear correlation in Europe between chromosome number and subspecific differentiation.

(a) Subsp. **arvensis**: Capitula and upper parts of peduncles densely glandular-hairy. Longest involucral bracts 14–17 mm. *Throughout the range of the species, except for parts of the Balkan peninsula.*

(b) Subsp. **uliginosus** (Bieb.) Nyman, *Consp.* 433 (1879) (*S. uliginosus* Bieb.): Capitula and peduncles glabrous. Longest involucral bracts 10–15 mm. *Throughout much of the range of the species, but absent from parts of the north and west.*

8. S. pustulatus Willk. in Willk. & Lange, *Prodr. Fl. Hisp.* **2**: 242 (1865). Perennial; stem 15–30 cm, branched, woody and with greyish-yellow bark below. Lower leaves few, the upper grouped below inflorescence, white-tomentose at base, pinnatisect, with ovate to elliptical, entire lobes. Involucral bracts *c.* 24. Ligules about twice as long as corolla-tube. Achenes 3·5–5 × 1·5 mm, narrowly rectangular or more or less elliptical, often curved, slightly rugose between the ribs; pappus *c.* 8 mm, most of the long hairs deciduous and the short cottony ones persistent. *Calcareous rocks. S.E. Spain (near Almería).* Hs. (*N.W. Africa.*)

167. Cephalorrhynchus Boiss.[1]

Biennial or perennial herbs, with more or less tuberous roots. Stems usually solitary, much-branched above. Leaves pinnatifid, the cauline often more or less amplexicaul. Capitula numerous. Involucral bracts in several rows. Receptacular scales absent. Ligules yellow. Achenes fusiform, beaked; pappus of 2 rows of simple hairs, the outer much shorter than the inner.

1. C. tuberosus (Steven) Schchian, *Not. Syst. Inst. Bot. Thbiliss.* **23**: 99 (1963) (*C. glandulosus* Boiss., *Mycelis glandulosa* (Boiss.) Hayek, *M. hispida* (DC.) Hayek). Stem up to 1 m, glandular-hairy. Leaves 3–13 × 1–8 cm, glabrous, ovate to elliptical in outline, pinnatifid or the upper dentate or entire, the lobes dentate; lower leaves with winged petioles, the upper sessile. Involucre 10–13 mm, cylindrical; bracts linear-lanceolate, obtuse, glabrous or with a few glandular hairs. Achenes 6–8 mm, 5- to 15-ribbed, the pale beak ⅓–½ as long as the blackish-brown body. *Rocky, mountain woods. C. part of Balkan peninsula, S.W. Romania; Krym.* Al Bu Gr Ju Rm Rs(K). (*S.W. Asia.*)

168. Steptorhamphus Bunge[2]

Perennial herbs with tuberous roots. Stems solitary, simple or branched. Leaves entire to pinnatifid, amplexicaul. Capitula few to numerous. Involucral bracts in several rows. Receptacle without scales. Ligules yellow or violet. Achenes compressed, with a very long, slender beak; pappus of 2 rows of simple hairs, the outer few, forming a very short fringe.

1. S. tuberosus (Jacq.) Grossh., *Fl. Kavk.* **4**: 258 (1934) (*Lactuca cretica* Desf.). Stem 40–60(–100) cm, sometimes branched above. Lower leaves entire to runcinate-pinnatifid, sagittate-amplexicaul, hairy; uppermost cauline lanceolate, entire. Capitula 1–2. Involucral bracts up to 40 mm, lanceolate to ovate, usually purplish-tinged, glabrous or nearly so. Ligules yellow. Achene 6–15 mm; body elliptical, 1- to 3-ribbed, minutely hairy and rugulose; beak pale, 1½–3 times as long as body. *S. part of Balkan peninsula and Aegean region; Krym.* Bu Cr Gr Rs (K).

Plants with lilac or purple ligules but otherwise similar to **1** occur in S.W. Asia; they have been reported from Krym, but have not been seen there in recent years.

169. Lactuca L.[3]

(incl. *Scariola* F. W. Schmidt)

Annual to perennial herbs. Stem usually solitary, branched. Leaves entire to pinnatifid, often prickly. Capitula few to numerous. Involucre cylindrical; bracts in several rows. Receptacle without scales. Ligules yellow or bluish. Achenes compressed, beaked, usually with ribs; pappus of 2 equal rows of simple hairs.

In the descriptions of achenes, the length includes the beak, and the number of ribs is given for one side.

L. singularis Wilmott, *Jour. Bot.* (*London*) **68**: 79 (1930) (*L. grosii* Pau & Font Quer), from near the E. end of the Sierra Nevada, S. Spain, is unlike any other European species of *Lactuca*. It has the stem up to 20 cm, leaves obovate, entire to shallowly dentate, and blue florets. The available material has only unripe achenes which have a short beak; in the absence of ripe achenes the sectional and even the generic position of the species is uncertain.

1 Body of achene darker than beak
2 Ligules blue or lilac; achenes with 1–3 ribs
3 Achenes obovate **16. tenerrima**
3 Achenes narrowly elliptical
4 Stem branched from the base; achenes greyish **17. graeca**
4 Stem branched only in the upper part; achenes black **15. perennis**
2 Ligules yellow; achenes with at least 5 ribs
5 Achenes black or blackish
6 Lateral veins of underside of leaves smooth **13. virosa**
6 Lateral veins of underside of leaves spinulose **14. livida**
5 Achenes pale
7 Cauline leaves orbicular to broadly lanceolate; inflorescence usually a pyramidal panicle
8 Cauline leaves held vertically, spinulose on midrib; involucral bracts patent or deflexed in fruit **9. serriola**
8 Cauline leaves not held vertically, smooth on midrib; involucral bracts erect in fruit **10. sativa**
7 Cauline leaves oblong to linear; inflorescence usually a spike-like panicle
9 Stem glabrous; achenes subglabrous at apex **11. saligna**
9 Stem setose below; achenes setose at apex **12. altaica**
1 Body and beak of achene concolorous
10 Ligules blue or bluish
11 Leaves arachnoid-lanate beneath; capitulum with *c.* 8 florets **7. watsoniana**
11 Leaves not arachnoid-lanate beneath; capitulum usually with more than 8 florets
12 Rhizome with underground stolons; at least the middle cauline leaves usually lobed **4. tatarica**
12 Rhizome without underground stolons; leaves usually without lobes **5. sibirica**
10 Ligules yellow
13 Stem glandular-hairy below **8. aurea**
13 Stem glabrous or with eglandular hairs below
14 Achenes yellowish-brown; stem arachnoid-lanate at the base **2. acanthifolia**
14 Achenes black; stem glabrous or with sparse hairs at the base
15 Leaves not decurrent **6. quercina**
15 Leaves decurrent
16 Lower leaves pinnatifid to pinnatisect; undivided part of lamina less than 2 cm wide **1. viminea**
16 Lower leaves laciniate-runcinate; undivided part of lamina at least 2 cm wide **3. longidentata**

Sect. PHOENIXOPUS (Cass.) Bentham. Inflorescence a pyramidal or spike-like panicle with capitula solitary or in fascicles. Capitula with 4–8 florets. Achenes with 5–11 ribs, gradually contracted into a concolorous beak not longer than body.

1. L. viminea (L.) J. & C. Presl, *Fl. Čechica* 160 (1819). Usually glabrous biennial or perennial with fusiform root. Stems up to 100 cm, usually numerous. Leaves glaucous, decurrent with long, appressed, linear auricles; lower pinnatifid to pinnatisect with linear-lanceolate, often dentate segments, the undivided part of the lamina less than 2 cm wide; upper often entire. Inflorescence a much-branched or spike-like panicle. Capitula subsessile. Ligules pale yellow. Achenes 7–15 mm; body narrowly oblong-elliptical, 5- to 15-ribbed, black; beak shorter than or as long as body. *Dry, rocky or stony places. S. & C. Europe, extending to C. France and S.E. Russia.* Al Au Bl Bu Co Cr Cz Ga Ge Gr He Hs Hu It Ju Lu Rm Rs (C, W, K, E) Sa Si Tu.

1 Achenes 7–9 mm; beak not more than ¼ as long as body
2 Stem 7–25 cm (a) subsp. **alpestris**
2 Stem 30–80(–100) cm (c) subsp. **chondrilliflora**
1 Achenes 9–15 mm; beak about as long as body
3 Plant branched only in the upper part (b) subsp. **viminea**
3 Plant branched from the base (d) subsp. **ramosissima**

(a) Subsp. **alpestris** (Gand.) Feráková, *Bot. Jour. Linn. Soc.* **71**: 268 (1976) (*Phoenixopus alpestris* Gand., *L. viminea* var. *decumbens* Halácsy): Stem 7–25 cm, with few branches in upper part. Achenes *c.* 8 mm, with beak *c.* ¼ as long as body. ● *Mountains of Kriti.*

(b) Subsp. **viminea** (*Scariola viminea* (L.) F. W. Schmidt, *L. contracta* Velen.): Stem 30–80(–100) cm, branched only in upper part. Achenes 12–15 mm, with beak about as long as body. $2n=18$. *Throughout the range of the species except Corse.*

(c) Subsp. **chondrilliflora** (Boreau) Bonnier, *Fl. Compl. Fr.* **6**: 79 (1923): Stem 30–80(–100) cm, branched throughout. Achenes 7–9 mm, with beak ¼–½ as long as body. *W. & C. Mediterranean region.*

(d) Subsp. **ramosissima** (All.) Bonnier, *loc. cit.* (1923): Stems 20–30 cm, with numerous, short, divaricate branches. Achenes 9–11 mm, with beak about as long as body. *Mediterranean region.*

2. L. acanthifolia (Willd.) Boiss., *Fl. Or.* **3**: 818 (1875) (*L. amorgina* Heldr. & Orph. ex Halácsy). Perennial. Rhizome large, covered with remains of leaves. Stem 30–100 cm, erect, striate, glabrous except for the arachnoid-lanate base. Lower leaves very variable in shape, oblong-ovate or spathulate in outline, lobed or pinnatifid, rarely entire, petiolate; upper pinnatipartite, auriculate; all densely arachnoid-lanate on the proximal side of petiole and sometimes on midrib, otherwise glabrous or subglabrous. Capitula subsessile in a spike-like panicle, solitary or in small fascicles. Involucral bracts lanate at apex. Ligules yellow. Achenes 8–9 mm; body oblong-lanceolate, 5- to 7-ribbed, yellowish-brown; beak ¼ as long as to as long as body. $2n=18$. *Shady rocks. S. Aegean region.* Cr Gr.

3. L. longidentata Moris ex DC., *Prodr.* **7**: 139 (1838). Glaucous biennial. Stem up to 100 cm, erect, striate. Lower leaves obovate to lanceolate, laciniate-runcinate to pinnatipartite, narrowed into a petiole, with the undivided part of the lamina 2–8 cm wide; upper ovate in outline, deeply laciniate, dentate, acuminate, with decurrent-amplexicaul base. Inflorescence a pyramidal panicle with ascending branches. Capitula with 5–6(–8) florets. Ligules yellow. Achenes 7–9 mm; body oblong, 7- to 11-ribbed, black; beak ¼ as long as body. *Calcareous rocks.* ● *Sardegna.* Sa.

Sect. MULGEDIUM (Cass.) C. B. Clarke. Inflorescence with ascending branches and few capitula; florets numerous. Achenes oblong-elliptical, many-ribbed, slightly compressed, narrowed into a very short, concolorous beak.

4. L. tatarica (L.) C. A. Meyer, *Verz. Pfl. Cauc.* 56 (1831). Subglabrous perennial. Rhizome vertical, with underground stolons. Stem 30–80(–100) cm, erect, branched above. Lower leaves runcinate-pinnatifid, shortly petiolate; upper lanceolate, sessile, semiamplexicaul. Inflorescence a more or less branched panicle. Capitula with 16–23 florets. Ligules lilac-blue. Achenes 4·5–6·5 mm, yellowish to black; beak ⅓–½ as long as body. Pappus white. $2n=18$. *Seashores, river-banks, and as a weed or ruderal. E. Europe, northwards to N.C. Russia; naturalized widely in N. and N.C. Europe.* Bu Rm Rs(C, W, K, E) Tu [Cz Da Fe Ge Hb He Ho No Po Rs (N, B) Su].

5. L. sibirica (L.) Maxim., *Bull. Acad. Imp. Sci. Pétersb.* **19**: 528 (1874). Glabrous perennial. Stem 30–100 cm, erect, usually simple. Leaves lanceolate, entire, mucronate-dentate or incise-dentate (rarely pinnatifid), with semiamplexicaul, cordate base, the lowest narrowed to a short petiole. Inflorescence corymbose, with slender branches. Capitula large, with *c.* 20 florets. Ligules lilac-blue. Achenes 4·5–6 mm, yellowish-olive; beak about ¼ as long as body. Pappus greyish-white. *Woods and scrub, and on river-sands and gravels. N. Russia, N. & E. Fennoscandia.* Fe No Rs (N, B, C, ?E) Su.

Sect. LACTUCOPSIS (Schultz Bip. ex Pančić) Rouy. Inflorescence usually corymbose; capitula of 6–15 florets. Achenes oblong-elliptical to ovate, 2- to 10-ribbed, narrowed into a concolorous beak ⅓–½ as long as body.

6. L. quercina L., *Sp. Pl.* 795 (1753). Annual or biennial. Root tuberous. Stem 30–100(–150) cm, erect. Leaves thin, sagittate-

[1] By P. D. Sell. [2] By V. Feráková and P. D. Sell. [3] By V. Feráková.

amplexicaul at base; lower lyrate-pinnatifid with large, ovate terminal segment, petiolate; upper oblong-elliptical to lanceolate, entire or pinnatifid to pinnatisect with oblong-ovate, dentate segments; all with sagittate-amplexicaul base. Inflorescence a dense, usually corymbose panicle. Capitula with 7–15(–22) florets. Ligules yellow. Involucral bracts often with appendages. Achenes 7–8 mm; body oblong-elliptical, setose at apex, 5-ribbed, black; beak ⅓–½ as long as body. Pappus white. *C. & E. Europe, from Bulgaria northwards to C. Germany and S.C. Russia; S.W. Alps; one station in Gotland.* Al Au Bu Cz Ga Ge Gr Hu It Ju Rm Rs (C, W, K, E) Su ?Tu.

(a) Subsp. **quercina** (*L. stricta* Waldst. & Kit., *L. quercina* subsp. *stricta* (Waldst. & Kit.) Hayek): Beak of achene less than 2·4 mm. $2n=18$. *Woods and scrub; nitrophile. Throughout the range of the species.*

(b) Subsp. **wilhelmsiana** (Fischer & C. A. Meyer ex DC.) Feráková, *Folia Geobot. Phytotax. (Praha)* **5**: 420 (1970) (*L. wilhelmsiana* Fischer & C. A. Meyer ex DC., *L. quercina* var. *rostrata* Velen.): Beak of achene more than 2·4 mm. *S.E. Europe. (Anatolia, Caucasus.)*

L. quercina var. *integrifolia* (Bogenh.) Bischoff (*L. chaixii* Vill., *L. quercina* subsp. *chaixii* (Vill.) Čelak.), differs from subsp. (a) only in its undivided cauline leaves and occurs almost throughout its range.

7. L. watsoniana Trelease, *Ann. Rep. Missouri Bot. Gard.* **8**: 127 (1897). Erect perennial. Stem 30–200 cm. Leaves sinuate-dentate, pruinose, arachnoid-lanate beneath; lower 30 × 15 cm, ovate, obtuse, contracted into a winged petiole; upper ovate-lanceolate, sessile, sagittate-amplexicaul. Inflorescence a corymbose panicle. Capitula with *c.* 8 florets. Ligules pale blue. Achenes 4–6 mm; body ovate, 5- to 8-ribbed, brownish-green with yellowish spots; beak ⅓–½ as long as body. *Scrub in volcanic craters.* ● *Açores.* Az.

8. L. aurea (Schultz Bip. ex Pančić) Stebbins, *Jour. Bot. (London)* **75**: 14 (1937) (*Mycelis sonchifolia* (Vis. & Pančić) Hayek). Perennial. Stem 40–80 cm, erect, usually simple, densely glandular-hairy below. Leaves densely hairy, especially on the midrib and lateral lobes; lower pinnatifid, with large triangular terminal segment and 1 or 2 pairs of lateral ones; upper amplexicaul, subentire. Inflorescence a narrow panicle. Capitula with 8–18 florets. Involucral bracts triangular-lanceolate, glabrous. Ligules yellow. Achenes 7–8 mm; body oblong-elliptical, 10-ribbed, pale brown; beak about ¼ as long as body. $2n=16$. *Scrub. C. & E. parts of Balkan peninsula, extending to S.W. Romania.* Bu Ju Rm Tu.

Sect. LACTUCA. Inflorescence a dense panicle of many capitula. Capitula with 10–50 florets. Achenes elliptical to obovate, 1- to 9-ribbed, narrowed in the upper part, with distinct, slender, pale beak usually at least as long as body.

9. L. serriola L., *Cent. Pl.* **2**: 29 (1756) (*L. scariola* L.). Annual or biennial. Stem up to 180 cm, rigidly erect, glabrous or setose, branched. Leaves rigid, spinulose on the midrib beneath; basal narrowly obovate-oblong, usually deeply pinnatifid (rarely undivided); cauline less deeply lobed, held vertically. Inflorescence a long, pyramidal or spike-like panicle. Involucre patent or deflexed in fruit. Capitula with 7–15(–35) florets. Ligules pale yellow. Achenes 6–8 mm; body elliptical, setose at apex, 5- to 9-ribbed, greyish; beak as long as body. $2n=18$. *Roadsides, waste places and sand-dunes. Much of Europe, but only as an alien in the north.* All except Fa Fe Hb Is No Rs (N) Sb; occurs in some of these as a casual.

Plants with densely setose inflorescence and spinose-ciliate leaves, restricted to the Mediterranean region, may be worthy of subspecific rank.

10. L. sativa L., *Sp. Pl.* 795 (1753). Glabrous annual or biennial, with a slender tap-root, dense basal rosette and erect flowering stems 30–70(–100) cm. Basal leaves undivided or runcinate-pinnatifid, shortly petiolate; cauline simple, ovate to orbicular, cordate-amplexicaul, sessile, not held vertically. Inflorescence a dense, corymbose panicle. Involucre erect in fruit. Capitula numerous, with 7–15(–35) florets. Ligules pale yellow, often violet-streaked. Achenes 6–8 mm; body obovate, often finely muricate at apex, 5- to 9-ribbed, greyish; beak as long as body. $2n=18$. *Cultivated as a vegetable almost throughout Europe; frequent as a casual, but seldom naturalized.*

Probably originated in Egypt from *L. serriola.*

11. L. saligna L., *Sp. Pl.* 796 (1753). Annual or biennial. Stem 30–100 cm, glabrous, erect, whitish, branched. Leaves often muricate on the midrib; lower undivided to pinnatifid with narrow distant lobes; upper oblong to linear with sagittate base. Inflorescence a spike-like panicle of numerous capitula. Capitula with 6–15 florets. Ligules pale yellow. Achenes 5–8 mm; body elliptical, finely muricate at apex, 7- to 8-ribbed, pale brown; beak 1½–3 times as long as body. $2n=18$. *Europe, northwards to S. England, C. Germany & S.C. Russia.* Al Au Be Bl Br Bu Co Cr Cz Ga Ge Gr He Ho Hs Hu It Ju Lu *Po Rm Rs (C, W, K, E) Sa Si Tu.

12. L. altaica Fischer & C. A. Meyer, *Ind. Sem. Horti Petrop.* **11**: 73 (1846). Annual or biennial. Stems 50–80(–120) cm, erect, often violet, setose below, sometimes branched. Lower leaves pinnatifid; upper linear-lanceolate or oblong, entire or spinulose-dentate. Inflorescence a spike-like panicle of numerous capitula. Capitula with 7–17 florets. Ligules pale yellow. Achenes 6–10 mm; body elliptical, setose at apex, 5- to 10-ribbed, brownish or greyish; beak as long as or longer than body. *Steppes. S.E. Russia.* Rs (E). *(C. & S.W. Asia.)*

13. L. virosa L., *Sp. Pl.* 795 (1753). Annual or biennial, with foetid roots. Stem up to 200 cm, erect, glabrous or setose below. Leaves obovate-oblong, dentate to pinnatifid with wide lobes, spinulose on the midrib beneath. Bracts with appressed auricles. Inflorescence a long, pyramidal panicle; capitula with *c.* 15 florets. Ligules pale yellow. Achenes 6–10 mm; body elliptical, narrowly winged, rugose, 5-ribbed, blackish; beak as long as body. $2n=18$. *Dry, stony or sandy places. S., W. & C. Europe; cultivated as a medicinal plant and in some districts only naturalized.* Au Be ?Bl *Br Co Ga Ge Gr He Hs Hu It Ju Lu Rm Sa Si Tu [Po].

14. L. livida Boiss. & Reuter in Boiss., *Voy. Bot. Midi Esp.* **2**: 742 (1845). Pruinose biennial. Stem erect, spinulose. Lower leaves oblong-spathulate, entire or lobed, narrowed into a long petiole; upper runcinate with sagittate base; all densely spinulose especially on the veins. Inflorescence a panicle with divaricate branches. Capitula with up to 25 florets. Ligules yellow. Achenes up to 7 mm; body narrowly winged, usually 5- or 6-ribbed, black; beak about as long as body. *Shady mountain rocks.* ● *C. Spain (Montes de Toledo).* Hs.

15. L. perennis L., *Sp. Pl.* 796 (1753). Glabrous perennial. Stems (20–)30–80 cm, erect, branched above. Leaves pinnatifid or pinnatisect with lanceolate, entire or toothed segments, grey-green; lower shortly petiolate; middle and upper sessile or subsessile. Inflorescence a corymbose panicle with ascending branches. Capitula few, on peduncles 2–8 cm long, with 12–20 florets. Ligules blue to lilac. Achenes 10–14 mm; body narrowly elliptical, slightly tuberculate, 1-ribbed, black; beak almost as long as body. Pappus white, persistent. $2n=18$. *Rocks and other dry places; calcicole. C. Europe, extending to Belgium and locally southwards to S. Spain, S. Italy and S.W. Bulgaria.* Al Au Be Bu Cz Ga Ge He Hs Hu It Ju Rm.

16. L. tenerrima Pourret, *Mém. Acad. Sci. Toulouse* **3**: 321 (1788). Perennial. Stems 20–50 cm, erect, branched, setose below. Lower leaves shortly petiolate; middle and upper auriculate-amplexicaul with narrow, often linear segments, glabrous or spinulose especially on the veins. Inflorescence with long, ascending branches. Capitula usually solitary, with 12–20 florets. Ligules lilac. Achenes 8–12 mm; body obovate, 1- to 3-ribbed, dark brown; beak as long as body. Pappus yellowish, persistent. $2n=16$. *Shady rocks and screes. S.W. Europe.* ?Al Bl Ga Hs It.

17. L. graeca Boiss., *Fl. Or.* **3**: 812 (1875). Perennial. Stems 10–35 cm, glabrous, branched from the base. Lower leaves petiolate, pinnatifid to pinnatisect; upper sessile with auriculate base; all lanate, especially on the midrib, rarely glabrous. Inflorescence with divaricate, ascending branches up to 25 cm, with solitary capitula and few small bracts. Florets 6–15. Ligules blue. Achenes 10–12 mm; body narrowly elliptical, 1- to 3-ribbed, greyish; beak white, as long as or shorter than body. Pappus white, persistent. *Mountain rocks and screes.* ● *N. & C. Greece, S. Albania.* Al Gr.

170. Cicerbita Wallr.[1]

Perennial herbs. Stems usually solitary, branched. Leaves lobed, the cauline amplexicaul. Capitula numerous. Involucral bracts in several rows. Receptacle without scales. Ligules blue, lilac or violet. Achenes flattened, not beaked; pappus of 2 rows of simple hairs, the outer shorter than the inner.

All species grow in damp or shady places.

Literature: G. Beauverd, *Bull. Soc. Bot. Genève* ser. 2, **2**: 99–144 (1910).

1 At least the peduncles, and usually also the upper part of the stem and the involucre, glandular-hairy
2 Lower leaves with a triangular terminal lobe and few pairs of small lateral lobes; capitula in an elongated panicle; achenes linear **1. alpina**
2 Lower leaves with a cordate terminal lobe and usually only a single pair of lateral lobes; panicle wider, more or less corymbose; achenes narrowly elliptical **2. macrophylla**
1 Plant glabrous
3 Midrib between leaf-segments with broad wing; achenes flat, conspicuously narrowed at apex **3. plumieri**
3 Midrib between leaf-segments with narrow wing; achenes triangular in section, not narrowed to apex **4. pancicii**

1. C. alpina (L.) Wallr., *Sched. Crit.* 434 (1822) (*Mulgedium alpinum* (L.) Less., *Sonchus alpinus* L.). Stem 50–250 cm, simple or branched, with dense, reddish glandular hairs on the upper part including peduncles and involucre. Leaves 80–250 × 20–120 mm, glabrous, glaucous beneath; lowest lyrate or runcinate-pinnatifid with a large, broadly triangular, acuminate terminal lobe and a few pairs of much smaller triangular lateral ones, with the base narrowed into a winged petiole; upper smaller and less divided, with a winged petiole widened into a cordate-amplexicaul base. Capitula in an elongated panicle. Involucre 10–15 × 7–10 mm; bracts linear. Ligules pale blue. Achenes 4·5–5 mm, linear. $2n=18$. *Fennoscandia; mountains of Europe southwards to the Pyrenees, N. Appennini and Bulgaria.* Al Au Br Bu Cz Fe Ga Ge He Hs It Ju No Po Rm Rs (N, W) Su.

2. C. macrophylla (Willd.) Wallr., *loc. cit.* (1822). Like **1** but leaves more or less setose, the lower more or less lyrate, with a large cordate terminal lobe and usually only a single pair of small lateral lobes; panicle wider and more or less corymbose; ligules lilac; achenes narrowly elliptical. *C. & E. Russia; naturalized elsewhere.* Rs (C, E) [Br Cz Da Fe Ga Ge Hb It No Su].

The above description applies to subsp. **uralensis** (Rouy) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 249 (1976) (*C. uralensis* (Rouy) Beauverd, *Mulgedium uralense* Rouy). It is possible that some of the naturalized plants belong to subsp. *macrophylla*, native of the Caucasus, which has dark violet ligules and the main branches of the panicle 2·5–3·5(–5) mm in diameter (not 1·5–2·5(–3) mm in diameter).

3. C. plumieri (L.) Kirschleger, *Fl. Alsace* **1**: 401 (1852) (*C. orbelica* (Velen.) Hayek, *Mulgedium plumieri* (L.) DC., *Sonchus plumieri* L.). Glabrous; stems 60–130 cm. Leaves 50–600 × 20–170 mm, lyrate-pinnatifid with a large triangular terminal lobe and several pairs of more or less ovate lateral ones which are shorter than, but at least as wide as, the terminal; lobes more or less undulate, with mammiform teeth; midrib between lobes and petiole with a broad wing. Capitula in a wide, more or less corymbose panicle. Involucre 10–17 × 9–12 mm; bracts lanceolate or linear-lanceolate. Ligules blue. Achenes 5·5–6·5 mm, flat, linear to narrowly elliptical, conspicuously narrowed at apex. ● *Pyrenees; mountains of France and W.C. Europe; S.W. Bulgaria.* Bu Ga Ge He Hs ?Ju [Br].

4. C. pancicii (Vis.) Beauverd, *Bull. Soc. Bot. Genève* ser. 2, **2**: 121 (1910). Like **3** but leaves with lateral lobes shorter and not as wide as the terminal; midrib between lobes with a narrow wing; lobes with prominent mammiform teeth; panicle narrower; achenes triangular in section, not narrowed at apex. ● *Mountains of Albania, Jugoslavia and Bulgaria.* Al Bu Ju.

171. Prenanthes L.[1]

Perennial herbs. Stems usually solitary, much-branched. Leaves lobed, the cauline auriculate, amplexicaul. Capitula numerous. Involucral bracts in 2 or 3 rows. Receptacle without scales. Ligules purplish. Achenes compressed, not beaked; pappus of 2 or 3 equal rows of simple hairs, the outer not thickened near the base.

1. P. purpurea L., *Sp. Pl.* 797 (1753). Stems 25–150(–250) cm, glabrous. Leaves 40–180 × 5–40 mm, all cauline, elliptical, oblong or panduriform, sometimes linear (var. *angustifolia* Koch), acute, entire to sinuate-dentate, rarely lyrate-pinnatifid, glaucous. Inflorescence a much-branched panicle of numerous, narrow capitula. Involucre 10–15 × 3–5 mm; bracts lanceolate, obtuse, the outer and median ⅓–½ as long as the inner. $2n=18$. *Woods and other shady places, mainly in mountain districts. From C. France and S. Poland southwards to N. Spain, C. Italy and Greece.* Al Au Bu Co Cz Ga Ge Gr He Hs Hu It Ju Po Rm Rs (W) [Da].

172. Mycelis Cass.[1]

Perennial herbs. Stems usually solitary, branched. Leaves lobed, the cauline more or less amplexicaul. Capitula many. Involucral

[1] By P. D. Sell.

bracts in 2 rows. Receptacle pitted, without scales. Ligules yellow. Achenes more or less flattened, beaked; pappus of 2 rows of simple hairs, the outer shorter than the inner.

1. M. muralis (L.) Dumort., *Fl. Belg.* 60 (1827) (*Lactuca muralis* (L.) Gaertner). Glabrous. Stem 20–100 cm. Lower leaves 50–220 × 35–90 mm, lyrate-pinnatifid, with long, winged petioles, the terminal lobes often hastately three-lobed and larger than the rhombic or hastate lateral lobes; middle and upper leaves sessile, becoming gradually smaller and less divided upwards. Capitula narrowly cylindrical, in a large, open panicle. Involucre 7–10 × 1·5–3 mm, the outer bracts very small, lanceolate, patent, the inner linear. Achenes 3–4 mm, blackish, with a short, pale beak. $2n=18$. *Woods, usually on base-rich soils; also on rocks and walls, and in waste places and cultivated ground. Most of Europe.* All except Az Bl Cr Fa Is Lu Rs (N) Sb, but only as a naturalized alien in Hb.

173. Taraxacum Weber[1]

Perennial herbs with tap-root. Stems few to many, simple. Leaves all basal, entire to laciniate-dentate or lobed. Capitulum solitary, often flat-topped. Involucral bracts in 2 rows, glabrous or ciliate; inner erect, more or less linear; outer shorter, usually wider, often with paler margins, sometimes with a small lump (*callosed*) or small appendage (*corniculate*) just below the apex. Receptacle more or less flat, without scales. Ligules usually yellow, often with a darker stripe beneath. Achenes fusiform to oblanceolate, often spinulose near apex, usually with a slender beak and a more or less clearly demarcated swollen region (*cone*) between beak and body. Pappus of many rows of simple, rough, usually white hairs.

The posture of the outer involucral bracts is of taxonomic importance and this should be ascertained when the plant is living.

Most species flower in spring or early summer; they sometimes also have a secondary flowering in autumn but then lack many of their diagnostic characters. A few species are mainly if not entirely autumn-flowering and for these this peculiarity is noted in the descriptions. Ripe achenes are necessary for the determination of the species.

Most European species of *Taraxacum* are apomictic polyploids ($2n=24$, 32, 40, 48) or occasionally aneuploids (e.g. $2n=25$, 26, 27). Wholly sexual species (**1–3**) are always diploid ($2n=16$); a few other diploid sexual species are found under **8**, **24**, **28** and **30**. Facultative apomixis is found in a few triploid species under **24** and **30**. Sexual and facultatively apomictic plants are recognizable by their small, regular pollen and often imperfect setting of seed. Obligately apomictic plants have irregular pollen (or lack pollen altogether) and set seed well. Hybrids occur rarely, and only where sexual or facultatively apomictic plants grow together, or occur with pollen-bearing apomicts.

In this account, 30 species or groups of species have been numbered and described. A selection of the more widespread of the *c.* 1200 species described from Europe has been listed under the groups to which they belong (though where fewer than 12 such species have been described in any group all have been listed). The index contains in addition all the species that have been recorded from Europe (with the exception of some of those in the *T. officinale* group); these entries are in roman type and are equated with the groups to which they belong. In the case of the *T. officinale* group, because of the very large number of species involved, only those which occur in Standard Floras or are especially widespread have been included.

[1] By A. J. Richards & P. D. Sell.

Names of synonyms of species which do not appear in the text are given in italics in the index and equated simply with the groups to which they belong. In some cases the sectional names used in this account are nomenclaturally incorrect, but they have been retained here because they are familiar and helpful and because the correct sectional nomenclature has yet to be worked out.

Since H. von Handel-Mazzetti, *Monographie der Gattung* Taraxacum. Leipzig & Wien. 1907, there has been no complete monograph; most of the species have been described since this date. There is a recent monograph of the **17.** *T. palustre* group (Sect. *Palustria*) by J. L. van Soest, *Acta Bot. Neerl.* **14**: 1–53 (1965), and useful accounts of **7** and **18–22** can be found in J. L. van Soest (1969) (see below). A list of species in **24–27** is given in J. L. van Soest, *A Catalogue of* Taraxacum *Section* Erythrosperma *Dt. em. Lb.* Leiden. 1966, and these are monographed by R. Doll, *Feddes Repert.* **84**: 1–180 (1973).

Detailed accounts of the species in particular regions include: J. L. van Soest, *Bull. Jard. Bot. Bruxelles* **26(2)** (1956); **31(3)** (1961) (Belgium). A. J. Richards, *Watsonia* **9** (Suppl.) (1972) (British Isles). K. Jessen & K. Wiinstedt in C. Raunkiaer, *Dansk Ekskursions-Flora*, ed. 5, 302–318. København. 1934. (Denmark). J. L. van Soest, *Veröff. Geobot. Inst. Rübel (Zürich)* **42** (1969) (Switzerland). M. P. Christiansen in L. K. Rosenvinge et al., *The Botany of Iceland* **3(3)**. Copenhagen & London. 1942. (Iceland). J. L. van Soest, *Acta Bot. Neerl.* **4**: 82–107 (1955); **6**: 74–92 (1957) (Netherlands). B. K. Schischkin in E. G. Bobrov & N. N. Tzvelev, *Flora URSS* **29**: 405–560. Leningrad & Mosqua. 1964. (U.S.S.R.). H. Dahlstedt in C. A. M. Lindman, *Svensk Fanerogamflora* 559–589. Stockholm. 1918. (Sweden).

Recent accounts of the cytology, micro-evolution and breeding systems in the genus can be found in A. J. Richards, *New Phytol.* **69**: 761–774, 1103–1121 (1970) and *Bot. Jour. Linn. Soc.* **65**: 47–59 (1972).

1 Achenes without a beak, or with a short beak not more than ¼ the length of body **1. glaciale**
1 Achenes with a distinct beak at least ¾ the length of body
2 Achenes without a cone, smooth or nearly so; pappus yellowish; flowering in autumn
3 Leaves linear-lanceolate in outline; capitula 15–20 mm in diameter **2. bessarabicum**
3 Leaves obovate-lanceolate in outline; capitula 30–40 mm in diameter **3. serotinum** group
2 Achenes with a cone, usually more or less rugose or spinulose; pappus whitish; usually flowering in spring
4 Beak of achene stout, not or scarcely longer than body; leaves entire or shallowly lobed (arctic-alpine)
5 Achenes blackish; body spinulose throughout **4. phymatocarpum** group
5 Achenes straw-coloured, red or brownish; body smooth or rugose
6 Achenes dark red, almost smooth **5. glabrum** group
6 Achenes straw-coloured or brownish, rugose **6. pacheri** group
4 Beak of achene slender, often much longer than body; leaves usually lobed, often deeply dissected
7 Body of achene 4–5·5 mm, smooth or nearly so **12. spectabile** group
7 Body of achene 2·3–4·5 mm, usually rugose, at least above
8 Outer involucral bracts with wide pale or scarious margins comprising at least ¼ of area of bract
9 Leaves many, with persistent bases; outer involucral bracts with brown midrib **22. dissectum**
9 Leaves few, with bases not persistent; outer involucral bracts without brown midrib
10 Leaves oblanceolate to obovate; usually autumn-flowering **8. bithynicum** group
10 Leaves linear to linear-lanceolate; spring-flowering **17. palustre** group
8 Outer involucral bracts with at most a narrow pale or scarious margin comprising less than ¼ of area of bract
11 Achenes reddish (red, purple, violet, reddish- or pinkish-brown)
12 Achenes with conical cone less than ⅓ as long as body
13 Achenes deep reddish-purple, with body 3·5–4 mm; leaf-lobes usually entire **7. schroeteranum**
13 Achenes pinkish to pale reddish-brown, with body 2·5–3 mm; leaf-lobes dentate **14. unguilobum** group
12 Achenes with cylindrical cone ⅓–½ as long as body
14 Petiole distinctly winged; ligules deep yellow
15 Achenes reddish-purple or brownish, with cone 1–1·5 mm, and beak 8–12 mm **28. hoppeanum** group
15 Achenes straw-coloured, or sometimes reddish, with cone 0·6–1 mm, and beak 6–9 mm
16 Involucre usually dark, often ± violet-purple, pruinose **19. nigricans** group
16 Involucre green **15. croceum** group
14 Petiole unwinged; ligules pale or medium yellow
17 Plant relatively robust; body of achene 3·5 mm or more **28. hoppeanum** group
17 Plant slender; body of achene 2·3–3·5 mm
18 Achenes red, purple or violet **24. erythrospermum** group
18 Achenes reddish-brown or pink
19 Leaves patent, deeply and narrowly lobed; achenes reddish- or pinkish-brown **26. fulvum** group
19 Leaves erect, often entire to shallowly lobed, sometimes dissected; achenes pink or reddish **27. gasparrinii** group
11 Achenes brown, yellow, cream or greyish, without red or pink tint
20 Outer involucral bracts corniculate
21 Leaves 3–15 cm, dissected; body of achene not more than 3·5 mm
22 Leaf-lobes 6–8; ligules golden-yellow, often involute; cone less than 0·5 mm, conical **23. obliquum** group
22 Leaf-lobes 3–5; ligules pale to medium yellow, never involute; cone more than 0·6 mm, cylindrical **25. simile** group
21 Leaves 5–25 cm, entire or shallowly lobed; body of achene 3·2–4·5 mm
23 Leaves glabrous, more or less coriaceous, not or scarcely lobed
24 Leaves dark green, obovate, not denticulate **9. obovatum** group
24 Leaves grey-green, oblanceolate, denticulate **10. glaucanthum** group
23 Leaves rarely glabrous, never coriaceous, usually lobed
25 Outer involucral bracts with a distinct pale margin; cone of achene 1–1·5 mm **28. hoppeanum** group
25 Outer involucral bracts without a distinct margin; cone of achene not more than 0·8 mm **11. ceratophorum** group
20 Outer involucral bracts ecorniculate, but sometimes with a slight callosity
26 Leaves with dark spots
27 Outer involucral bracts erect or appressed; body of achene more than 4 mm **12. spectabile** group
27 Outer involucral bracts patent; body of achene less than 4 mm
28 Plant bright green; ligules deep yellow; cone of achene 0·6–1 mm, cylindrical **15. croceum** group
28 Plant dull or dark green; ligules medium yellow; cone of achene 0·3–0·8 mm, conical **13. praestans** group
26 Leaves unspotted
29 Petioles winged; ligules deep yellow, orange-yellow or yellowish-brown (arctic-alpine)
30 Ligules yellowish-brown, involute **21. cucullatum** group
30 Ligules deep yellow or orange-yellow, flat
31 Cone of achene *c.* 1 mm, sub-cylindrical (arctic) **15. croceum** group
31 Cone of achene less than 1mm, conical (alpine)
32 Leaves narrow, lobed; involucre dark, often ± violet-purple, pruinose **19. nigricans** group
32 Leaves wide, entire or shallowly lobed; involucre green **20. fontanum** group
29 Petioles winged or unwinged; ligules pale or medium yellow
33 Outer involucral bracts patent or deflexed (rarely erect)
34 Outer involucral bracts 6–12 mm, patent, sometimes glaucous on inner face; body of achene *c.* 3·5 mm **13. praestans** group
34 Outer involucral bracts 11–20 mm, erect to deflexed, never glaucous on inner face; body of achene 2·5–3·5 mm
35 Robust plant of N. Fennoscandia; outer involucral bracts very pale on inner face; leaves with elongate terminal lobes; petioles pale, wide **29. crassipes** group
35 Usually on disturbed ground; variable, but without the above combination of characters **30. officinale** group
33 Outer involucral bracts erect or appressed
36 Beak *c.* 1½ times as long as body of achene; small alpine plant
37 Leaves many; leaf-bases persistent; outer involucral bracts with a brown midrib **22. dissectum**
37 Leaves few; leaf-bases not persistent; outer involucral bracts without a brown midrib **18. apenninum** group
36 Beak more than 1½ times as long as body of achene; plant of wet places
38 Body of achene 3–4 mm, brown **16. adamii** group
38 Body of achene 4–5·5 mm, straw-coloured **12. spectabile** group

Sect. GLACIALIA (Hand.-Mazz.) Van Soest.

1. T. glaciale Huet ex Hand.-Mazz., *Monogr. Taraxacum* 15 (1907). Dwarf, glabrous plant. Leaves 2–6 cm, entire to pinnatisect. Scapes 3–7 cm. Capitulum 10–15 mm in diameter. Involucre 8–12 × 2–4 mm; outer bracts linear, narrower than inner, black on outer surface, glaucous on inner surface, erect, long-corniculate. Ligules with a grey or red stripe. Achenes 4–5 mm, fusiform, pale grey; beak absent or very short (not more than ¼ as long as body); cone absent. Sexual. ● *Appennini; mountains of Greece.* Gr It.

Sect. LEPTOCEPHALA Van Soest.

2. T. bessarabicum (Hornem.) Hand.-Mazz., *op. cit.* 26 (1907) (*T. serotinum* subsp. *bessarabicum* (Hornem.) Hegi). Leaves 5–25 cm, linear-lanceolate in outline, lobed, fleshy, greyish- or reddish-green, sparsely arachnoid-hairy; lobes many, narrow, patent, short, acute. Scapes 5–20 cm. Capitulum 15–20 mm in diameter. Involucre 10–15 × 8–10 mm, often tinged pink; outer bracts 7–8 mm, lanceolate, dark green, with a very wide, pale, more or less scarious margin, erect to appressed, ecorniculate. Ligules golden-yellow with a silvery-grey stripe, or concolorous. Achenes greyish; body 3–4·5 mm, fusiform, more or less smooth; beak 4–6 mm, stout; cone absent. Pappus greyish-

white. Autumn-flowering. Sexual. $2n=16$. *Saline soils. C. & E. Europe; one station in S.C. France.* Au Bu Cz Ga Hu Rm Rs (C, W, K, E).

Sect. SEROTINA Van Soest.

3. T. serotinum group. Leaves 5–15 cm, obovate-lanceolate, entire to shallowly lobed, more or less cartilaginous-denticulate, thick, fleshy, horizontal. Petiole short, wide, pale. Scapes 3–15 cm, slender, green, more or less woolly. Capitulum 30–40 mm in diameter. Involucre 10–15 × 10–15 mm; outer bracts linear, glaucous, or suffused with brown, with a pale margin, thin, soft, erect, more or less ciliate, sometimes corniculate. Ligules clear pale yellow, usually with a red stripe. Achenes greyish-brown; body 4·5–6 mm, fusiform, more or less smooth; beak 4–8 mm, stout; cone absent. Pappus greyish-white. Autumn-flowering. Sexual. *Dry places. S., C. & E. Europe.* Au Bu Cz Ga Gr Hs Hu Ju Rm Rs (C, W, K, E) Tu.

2 species have been described for Europe:

T. pyropappum Boiss. & Reuter, *Diagn. Pl. Nov. Hisp.* 19 (1842) (*T. tomentosum* Lange). ● Ga Hs.

T. serotinum (Waldst. & Kit.) Poiret in Lam., *Encycl. Méth. Bot., Suppl.* **4**, 420 (1817) (*T. crispum* Heuffel, *T. gracile* Form., *T. haussknechtii* Uechtr. ex Hausskn., *T. neyrautii* Debeaux). $2n=16$. Au Bu Cz Ga Gr Hu Ju Rm Rs (C, W, K, E) Tu.

Sect. ARCTICA Dahlst.

4. T. phymatocarpum group. Dwarf, glabrous plants. Leaves 2–7 cm, narrowly spathulate, entire to shallowly triangular-lobed, bright green. Scapes 4–10 cm. Capitulum 15–25 mm in diameter. Involucre 10–15 × 6–12 mm; outer bracts up to 6 mm, ovate, greyish-green to nearly black with paler margins, appressed, sometimes shortly corniculate. Ligules short, wide, white or yellow with a grey, violet or purple stripe. Achenes blackish; body 4–5·5 mm, spinulose; cone short, conical; beak stout, shorter to slightly longer than body. Apomictic. *Arctic Europe; Alps.* Au He No Rs (N) Sb.

T. phymatocarpum J. Vahl, *Fl. Dan.* **13(39)**: t. 2298 (1840) occurs only in Greenland and Alaska.

4 species have been described for Europe:

T. arcticum (Trautv.) Dahlst., *Ark. Bot.* **2(8)**: 8 (1905) (*T. phymatocarpum* auct. eur., non J. Vahl). Rs (N) Sb.

T. dovrense (Dahlst.) Dahlst., *Kungl. Svenska Vet.-Akad. Handl.* ser. 3, **6(3)**: 56 (1928). ● No.

T. handelii J. Murr, *Allgem. Bot. Zeitschr.* **1904**: 71 (1904) (*T. officinale* subsp. *handelii* (J. Murr) Hegi). ● Au He.

T. reichenbachii Huter ex Dahlst., *Ark. Bot.* **7(1)**: 3 (1908) (*T. officinale* subsp. *reichenbachii* (Huter ex Dahlst.) Hegi). ● Au.

5. T. glabrum group. Like **4** but capitulum 30–40 mm in diameter; outer involucral bracts ovate-lanceolate, dark, without a pale margin, ecorniculate; ligules narrow, deep yellow with a dull violet stripe; achenes dark red, with smooth body, 3·5–4 mm. *N.W. Russia* (*Kol'skij Poluostrov*). Rs (N).

3 species have been described for Europe:

T. glabrum DC., *Prodr.* **7**: 147 (1838). Rs (N).

T. nivale Lange ex Kihlman, *Meddel. Soc. Fauna Fl. Fenn.* **16**: 67 (1889). Rs (N). (*Siberia.*)

T. turiense Orlova in Bobrov & Tzvelev, *Fl. URSS* **29**: 742 (1964). ● Rs (N).

6. T. pacheri group. Leaves 3–5 cm, narrow, more or less spathulate, lobed, bright green, thin, subglabrous; lobes regular, shallow, more or less obtuse. Scapes 3–5 cm, slender, hairy just below capitulum. Capitulum 20–30 mm in diameter. Involucre 8–10 × 7–8 mm; outer bracts up to 6 mm, ovate to ovate-lanceolate, black, dark green or olive-green, with more or less pale margins, erect or appressed, ecorniculate. Ligules yellow, with a brown or grey stripe. Achenes straw-coloured or brownish; body 3–4 mm, rugose in the upper part; cone short, conical; beak 1–1½ times as long as body, rather stout. $2n=32$. ● *E. Alps; mountains of S. Spain and Corse.* Au Co Ga He Hs It.

3 species have been described for Europe:

T. litardieri Van Soest, *Acta Bot. Neerl.* **6**: 416 (1957). Co Ga.

T. nevadense H. Lindb. fil., *Acta Soc. Sci. Fenn.* nov. ser. B, **1(2)**: 172 (1932). Hs.

T. pacheri Schultz Bip., *Flora* (*Regensb.*) **31**: 170 (1848). Au He It.

Sect. RHODOCARPA Van Soest.

7. T. schroeteranum Hand.-Mazz., *Österr. Bot. Zeitschr.* **55**: 461 (1905). Glabrous. Leaves 5–15 cm, few, narrowly spathulate, entire to shallowly lobed, with deflexed, acute, entire lobes; petiole long, narrow, red. Scapes 10–20 cm, few, about equalling leaves. Capitulum *c.* 30 mm in diameter. Involucre 12–15 × 7–8 mm; outer bracts ovate, acuminate, greyish-green, often suffused reddish, without pale margins, appressed, more or less ecorniculate. Ligules yellow. Pollen absent. Achenes deep reddish-purple; body 3·5–4 mm, narrow, rugose in upper part; cone 0·5–0·7 mm, conical; beak 6–8 mm, rather stout. Apomictic. $2n=24$. ● *Alps; C. Spain.* Ga He Hs It.

Sect. SCARIOSA (Hand.-Mazz.) Dahlst.

8. T. bithynicum group. Leaves 5–15 cm, oblanceolate to obovate, entire to lobed, horizontal, thick, glabrous or hairy beneath; lobes 6–7 on each side, patent, broad-based, often obtuse, dentate; petiole often purplish. Scapes 5–10 cm, numerous, slender, ascending or procumbent, glabrescent. Capitulum 10–25 mm in diameter. Involucre 9–12 × 7–10 mm; outer bracts broadly ovate, acuminate, ½ to entirely scarious, suffused red or purple, more or less appressed, often conspicuously reticulate-veined, corniculate. Ligules short, wide, pale yellow with a red, purple or brown stripe. Achenes greyish-brown or straw-coloured; body 3·5–4 mm, more or less tuberculate often throughout; cone short, conical; beak 4–7 mm, rather stout. Mainly autumn-flowering. Sexual or apomictic. *S. Europe.* Al Bu Co Cr Ga Gr Hs It Ju Lu Rs (W, K) Sa Si Tu.

Cr Ga Gr Hs It Ju Lu Rs (W, K) Sa Si Tu.

T. bithynicum DC., *Prodr.* **7**: 149 (1838). Although this name has always been used for this group of plants in the aggregate sense, it has never been typified and it is uncertain to which of the segregates the name applies.

13 species have been described for Europe, mainly from S.W. & S.E. Europe. The following are the only 2 which are widespread:

T. megalorhizon (Forskål) Hand.-Mazz., *Monogr. Taraxacum* 35 (1907). Al Bu Co Cr Ga Gr Hs It Ju Lu Rs (W) Sa Tu.

T. minimum (Briganti ex Guss.) N. Terracc., *Atti Real Ist. Incoragg. Sci. Nat. Nap.* ser. 2, **6**: 352 (1869). $2n=16$. Ga Gr Hs It Lu Si.

Sect. OBOVATA Van Soest.

9. T. obovatum group. Leaves 5–10 cm, obovate, entire or shallowly lobed, dark green, glabrous, horizontal; petiole short, wide, green. Scapes 5–10 cm, slender, lanate, glabrescent. Capitulum 25–30 mm in diameter. Involucre 5–9 × 7–10 mm; outer bracts ovate to ovate-lanceolate, slightly glaucous with a more or less pale margin, erect, shortly corniculate. Ligules yellow with a grey stripe. Achenes grey, cream, brownish or red; body 3·5–4 mm, strongly rugose; cone 0·5 mm, conical; beak 4–7 mm, stout. Apomictic. $2n=32$. *S.W. Europe, extending eastwards to Sicilia.* Bl Co Ga Hs It Lu Sa Si.

2 species have been described for Europe:

T. leucospermum Jordan, *Cat. Jard. Dijon* 31 (1848) (*T. officinale* subsp. *leucospermum* (Jordan) P. Fourn.). ● Ga.

T. obovatum (Willd.) DC., *Mém. Soc. Agric. Paris* **11**: 83 (1809) (*T. taraxacoides* subsp. *obovatum* (Willd.) Willk.). Bl Co Ga Hs It Lu Sa Si.

Sect. MACROCORNUTA Van Soest.

10. T. glaucanthum group. Glabrous. Leaves 10–15 cm, few, oblanceolate, remotely sinuate-dentate or lobed, brownish- or grey-green, erect, fleshy; lateral lobes narrow, acute, patent or more or less recurved, entire or slightly dentate; terminal lobe very long, hastate. Scapes 15–25 cm, numerous, slender, erect. Capitulum 25–30 mm in diameter. Involucre 12–15 × 9–12 mm; outer bracts up to 8 mm, ovate, glaucous-pruinose with a conspicuous scarious margin, erect to appressed, corniculate. Ligules wide, pale yellow with a grey stripe. Achenes pale greyish-brown; body 3·5–4·5 mm, narrow, spinulose in upper part; cone 1–1·8 mm, cylindrical; beak 6–9 mm, white. *Saline soils. S. part of U.S.S.R.* Rs (C, W, K, E) [Au Cz Ge Hu Rm].

4 species have been recorded for Europe:

T. glaucanthum (Ledeb.) DC., *Prodr.* **7**: 147 (1838). Rs (E).

T. hybernum Steven, *Bull. Soc. Nat. Moscou* **29(4)**: 410 (1856). ● Rs (K).

T. klokovii Litv., *Učen. Zap. Khar'kivsk. Derž. Univ.* **2–3**: 150 (1935). ● Rs (C, W).

T. kok-saghyz Rodin, *Acta Inst. Bot. Acad. Sci. URSS* (*Ser.* 1) **1**: 187 (1933). Formerly cultivated in E. & E.C. Europe for its latex and locally naturalized. [Au Cz Ge Hu Rm Rs (W, K, E).] (*C. Asia.*)

Sect. CERATOPHORA Dahlst.

11. T. ceratophorum group. Leaves 8–20 cm, broadly lanceolate, lobed, dark green, rather thin, hairy; lobes large, more or less deltate, acute, dentate; petiole winged. Scapes 10–25 cm, stout, hairy. Capitulum 35–50 mm in diameter. Involucre 15–20 × 15–20 mm; outer bracts 7–12 mm, ovate to lanceolate, green, with a scarcely paler margin, erect, corniculate, sometimes conspicuously so. Ligules narrow, yellow with a red, purple or brown stripe. Achenes brownish; body 3·5–4 mm, rather wide, tuberculate in upper part; cone up to 0·8 mm, conical; beak 7–11 mm, slender. Apomictic. *N. Europe; Alps.* Au Fe Ga He Is No Rs (N) Sb Su.

T. ceratophorum (Ledeb.) DC., *Prodr.* **7**: 146 (1838). Although this name has always been used for this group of plants in the aggregate sense, it has never been typified and it is uncertain to which of the segregates the name applies.

13 species have been described for Europe, mainly from the Alps and N.W. Europe. The following are the 2 which are most widespread:

T. brachyceras Dahlst., *Ark. Bot.* **5(9)**: 19 (1906) (*T. melanostylum* T. C. E. Fries, *T. simulum* Brenner). Fe No Rs (N) Sb Su.

T. tornense T. C. E. Fries, *Svensk Bot. Tidskr.* **2(2)**: 142 (1908) (*T. lactucaceum* Dahlst.). $2n=32$. Fe No Su.

Sect. SPECTABILIA Dahlst.

12. T. spectabile group. Leaves 5–25 cm, entire or shallowly lobed, dull green, often dark-spotted, hairy, sometimes horizontal; petioles narrow, usually purplish. Scapes 3–30 cm, stout, ascending, often purplish, often glabrous. Capitulum 35–45 mm in diameter. Involucre 15–25 × 15–20 mm; outer bracts ovate to lanceolate, sometimes purplish with a narrow, pale margin, appressed, ecorniculate. Ligules wide, bright deep yellow, with a red or purple stripe. Achenes straw-coloured; body 4–5·5 mm, oblong, smooth or slightly tuberculate; cone 0·2–0·6 mm, stout, conical; beak 7–9 mm, rather stout. Apomictic. *Wet places. N. & W. Europe.* Br Da Fa Hb Hs Is No Su.

38 species have been described for Europe, mainly from Fennoscandia and N.W. Europe. The following have a relatively wide distribution:

T. eximium Dahlst., *Ark. Bot.* **12(2)**: 30 (1912). $2n=40$. ● Br No Su.

T. faeroense (Dahlst.) Dahlst., *Bergens Mus. Aarb.* **1923–1924(6)**: 12 (1925). $2n=40$. ● Br Fa Hb Is No Su.

T. reclinatum M. P. Christiansen in Rosenvinge et al., *Bot. Iceland* **3**(3): 293 (1942). ● Br Is No.

T. spectabile Dahlst., *Bot. Not.* **1905**: 159 (1905) (*T. cimbricum* Wiinst., *T. crispifrons* M. P. Christiansen, *T. dilutiroseum* M. P. Christiansen, *T. subspectabile* M. P. Christiansen). $2n=40$. Br Da Fa Fe Hb Is No Su.

13. T. praestans group. Leaves 5–30 cm, lobed to laciniate, dull green, often dark-spotted, often hairy; lobes usually narrow, acute, patent, acutely or acuminately dentate; petiole usually winged, dentate. Scapes 8–25 cm, erect, usually hairy. Capitulum 35–55 mm in diameter. Involucre 15–25 × 15–20 mm; outer bracts 6–12 mm, ovate-lanceolate, with a narrow pale margin, often glaucous on inner face, erect to patent, ciliate, ecorniculate or slightly callosed. Ligules rather pale yellow with a grey or brown stripe. Achenes straw-coloured or brown; body 3–4 mm, tuberculate in upper part; cone 0·3–0·8 mm, conical; beak 7–10 mm, slender. Apomictic. *Wet places. N. & W. Europe.* Br Da Fa Fe Ge Hb Ho Hs Is No Rs (N, B) Su.

Fa Fe Ge Hb Ho Hs Is No Rs (N, B) Su.

42 species have been described for Europe, mainly from Norway and Iceland. The following have a relatively wide distribution:

T. euryphyllum (Dahlst.) M. P. Christiansen, *Bot. Tidsskr.* **45**: 154 (1940). $2n=32$. ● Br Da Ge Hb Ho No Su.

T. lainzii Van Soest, *Trab. Jard. Bot. Univ. Santiago Comp.* **7**: 5 (1954). $2n=24$. Br Hb Hs.

T. landmarkii Dahlst., *Bergens Mus. Aarb.* **1923–1924(6)**: 14 (1925). $2n=32$. ● Br Hb No.

T. maculigerum H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 35 (1907). $2n=32$. ● Br Da Fe Ge Hb Ho No Su.

T. naevosiforme Dahlst., *Ark. Bot.* **12(2)**: 49 (1912) (*T. johnstonii* Dahlst., *T. unguilobiforme* Dahlst.). $2n=32$. ● Br Hb No Su.

T. naevosum Dahlst. in Warming, *Bot. Faeroes* **3**: 840 (1908) (*T. asperum* M. P. Christiansen, *T. atroglaucum* M. P. Christiansen, *T. brachylobum* M. P. Christiansen, *T. brevilobum* M. P. Christiansen, *T. dilutisquameum* M. P. Christiansen, *T. galeipotens* M. P. Christiansen, *T. rubellum* M. P. Christiansen, *T. scabrum* M. P. Christiansen). $2n=32$. Br Fa Fe Is No Su.

T. praestans H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 24 (1907) (*T. opeatolobum* Dahlst.). $2n=32$. ● Br Da Fe Hb No Rs (B) Su.

T. purpuridens Dahlst., *Ark. Bot.* **12(2)**: 25 (1912). ● Fe No Su.

T. sagittifolium H. Lindb. fil. ex Dahlst., *Kungl. Svenska Vet.-Akad. Handl.* **9(2)**: 74 (1930). ● Fe Rs (N) Su.

T. stictophyllum Dahlst., *Ark. Bot.* **12(2)**: 38 (1912). $2n=32$. ● Br Fa Is No.

14. T. unguilobum group. Like **13** but leaves never spotted; leaf-lobes strongly deflexed, dentate; petiole more or less unwinged; outer involucral bracts pale green, tipped with pink; ligules unstriped or with pale pink stripe; achenes pinkish to pale reddish-brown, with shortly spinulose body 2·5–3 mm and beak 6–8 mm. *Wet places.* ● *N.W. Europe.* Br Hb No.

2 species have been described:

T. fulvicarpum Dahlst., *Trans. Proc. Bot. Soc. Edinb.* **29**: 420 (1927). $2n=32$. Br.

T. unguilobum Dahlst., *Ark. Bot.* **12(2)**: 57 (1912). $2n=32$. Br Hb No.

15. T. croceum group. Leaves 5–13 cm, lobed or almost entire, often bright green, sometimes spotted, glabrous to hairy; lobes short, patent or somewhat recurved, somewhat dentate; petioles often widely winged, entire, green or dull purple. Scapes 5–12 cm, stout, usually green, sparsely hairy, ascending or erect. Capitulum 35–45 mm in diameter. Involucre 12–20 × 12–18 mm; outer bracts 7–12 mm, lanceolate, dark green, often with paler margins, sometimes paler or glaucous on inner face, patent to erect, sometimes ciliate, ecorniculate. Ligules narrow, deep or orange-yellow, with a grey or brown stripe. Achenes straw-coloured, occasionally reddish; body 3·5–4 mm, shortly spinulose; cone 0·6–1 mm, subcylindrical; beak 7–9 mm, slender. Apomictic. *N. Europe.* Br Fa Fe Is No Rs (N) Sb Su.

96 species have been described for Europe, mainly from Iceland and Norway. The following have a relatively wide distribution:

T. ceratolobum Dahlst., *Ark. Bot.* **12(2)**: 12 (1912) (*T. acidotum* M. P. Christiansen). Br Is No Rs (N) Su.

T. craspedotum Dahlst., *Bergens Mus. Aarb.* **1923–1924(6)**: 9 (1925). $2n=32$. ● Br Fa No.

T. croceum Dahlst., *Bihang Kungl. Svenska Vet.-Akad. Handl.* **26(3), 1**: 12 (1900) (*T. lapponicum* Kihlman ex Hand.-Mazz.). $2n=32$. ● Br Fa Fe Is No Rs (N) Sb Su.

T. cymbifolium H. Lindb. fil. ex Dahlst., *Kungl. Svenska Vet.-Akad. Handl.* ser. 3, **9(2)**: 73 (1930) (*T. acromaurum* Dahlst.). $2n=32$. ● Br Fa Is No Sb.

T. pycnostictum M. P. Christiansen in Rosenvinge et al., *Bot. Iceland* **3(3)**: 266 (1942) (*T. stictophoreum* M. P. Christiansen). $2n=32$. Br Fa Is.

T. repletum (Dahlst.) Dahlst., *Ark. Bot.* **12(2)**: 17 (1912) (*T. anisolobum* G. Hagl., *T. rufescens* M. P. Christiansen, *T. subrepletum* G. Hagl.). $2n=40$. ● Is No Su.

T. rhodolepis Dahlst., *op. cit.* 92 (1912) (*T. grammolepis* Dahlst.). ● Fe No Su.

16. T. adamii group. Leaves 4–25 cm, narrowly lanceolate, lobed, often bright green, rarely spotted, glabrous or hairy; lobes patent, more or less entire, terminal lobe small; petiole narrowly winged, subentire. Scapes 6–20 cm, green, purplish, stout, glabrous or slightly hairy, usually exceeding the leaves. Capitulum 30–50 mm in diameter. Involucre 12–15 × 15–18 mm; outer bracts 7–10 mm, lanceolate, dark green, sometimes pruinose, ciliate or denticulate, stiff, erect, ecorniculate. Ligules rather narrow, yellow with a grey, red or purple stripe. Achenes brown; body 3·5–4 mm, tuberculate to spinulose; cone 0·4–0·8 mm, conical; beak 8–10 mm, slender. Apomictic. *Wet places.* ● *N. & W. Europe.* Be Br Cz Da Fe Ga Ge Hb He Ho Hs Lu No Rs (B) Su.

15 species have been described. The following have a relatively wide distribution:

T. adamii Claire, *Bull. Soc. Bot. Rochel.* **12**: 49 (1891) (*T. britannicum* Dahlst., *T. gelertii* Raunk.). $2n=24$. Be Br Da Fe Ga Ge Hb He Ho Lu No Rs (B) Su.

T. litorale Raunk., *Dansk Ekskurs.-Fl.* ed. 2, 256 (1906). $2n=24$. Br Da Fe Ge No Rs (B) Su.

T. nordstedtii Dahlst., *Ark. Bot.* **10(11)**: 27 (1911). $2n=48$. Be Br Cz Da Ga Ge Hb Ho Hs Lu Su.

Sect. PALUSTRIA Dahlst.

17. T. palustre group. Leaves 5–20 cm, linear to linear-lanceolate, entire to lobed, erect to patent, glabrous or glabrescent; lobes, if present, entire, more or less linear, and frequently obtuse; petiole long, narrow, entire, often purple. Scapes 6–15 cm, usually glabrous, often purple, ascending to erect, rarely exceeding the leaves before fruiting. Capitulum 25–50 mm in diameter. Involucre 12–15 × 15–20 mm; outer bracts up to 7 mm, ovate, more or less broadly acuminate, often suffused with violet or purple, with very wide, pale or scarious margins, appressed, ecorniculate. Ligules wide, sometimes involute, rather pale yellow, sometimes with a grey or purple stripe. Achenes straw-coloured to brown; body 3·2–4·2 mm, smooth to shortly spinulose in the upper part; cone 0·3–1·5 mm, conical or subcylindrical; beak 6–9 mm. Apomictic. *Wet places. Throughout a large part of Europe, but absent from the south-west, many of the islands and most of the U.S.S.R.* Al Au Bu Be Br Cz Da Fe Ga Ge Gr Hb He Ho Hu It Ju No Po Rm Rs (B, ?W) Si Su Tu.
1u.

56 species have been described for Europe, mainly from C. Europe. The following have a relatively wide distribution:

T. anglicum Dahlst., *Rep. Bot. Exch. Club Brit. Is.* **5**: 567 (1920) (*T. angliciforme* Dahlst.). ● Be Br Ga Ge He Ho.

T. austrinum G. Hagl., *Bot. Not.* **1946**: 343 (1946). $2n=24, 32$. Be Br Da Ga Ge Hb He Ho Po.

T. balticiforme Dahlst., *Ber. Schweiz. Bot. Ges.* **42**: 719 (1933). $2n=24$. ● Au Ga Ge He It.

T. balticum Dahlst., *Bot. Not.* **1905**: 162 (1905). $2n=24, 31, 32$. Au Da Fe Ge Po Rs (B) Su.

T. crocodes Dahlst., *Ark. Bot.* **7(6)**: 18 (1907). $2n=40$. ● Fe No Su.

T. decolorans Dahlst., *op. cit.* **29(18)**: 8 (1925). ● Ge Rs (B) Su.

T. divulsifolium Van Soest, *Acta Bot. Neerl.* **14**: 28 (1965). ● Ga Ge He.

T. frisicum Van Soest, *op. cit.* **5**: 96 (1956). ● Be Ge Ho.

T. germanicum Van Soest, *op. cit.* **14**: 32 (1965). ● Ga Ge He It.

T. heleonastes G. Hagl., *Ber. Schweiz. Bot. Ges.* **60**: 236 (1950). ● Ga Ge He It.

T. hollandicum Van Soest, *Nederl. Kruidk. Arch.* **52**: 226 (1942). ● Be Ga Ge He Ho.

T. illyricum Dahlst. ex Van Soest, *Acta Bot. Neerl.* **14**: 35 (1965). $2n=29$. ● Cz Hu Ju.

T. limnanthes G. Hagl., *Bot. Not.* **1946**: 343 (1946). Da Ge Ho Rs (B) Su.

T. lividum (Waldst. & Kit.) Peterm., *Deutschl. Fl.* 337 (1849) (*T. lissocarpum* (Dahlst.) Dahlst.). Au Be Bu Cz Da Fe Ge Ho Hs Hu Po Rm Rs (B) Su.

T. neoaellenii Van Soest, *Acta Bot. Neerl.* **14**: 42 (1965). ● Be Ga He.

T. palustre (Lyons) Symons, *Syn. Pl. Brit.* 172 (1798) (*T. commutatum* Jordan, *T. gremlii* Appel, *T. lanceolatum* Poiret, *T. paludosum* (Scop.) Schlecht. ex Crépin, *T. scorzonera* Reichenb.). $2n=40$. ● Be Br Ga Hb Ho.

T. scaturiginosum G. Hagl., *Ark. Bot.* **26A(5)**: 26 (1933) (*T. albanicum* Van Soest, *T. murbeckianum* G. Hagl.). Al Gr It Po Tu.

T. suecicum G. Hagl., *Göteb. Kungl. Vetensk. Vitterh. Samh. Handl.* ser. 6(B), **7**: 364 (1952). Ga Ge Rs (B, ?W) Su.

T. turfosum (Schultz Bip.) Van Soest, *Acta Bot. Neerl.* **10**: 281 (1961). $2n=24$. ● Au Cz Ge He It Rm.

T. udum Jordan, *Pug. Pl. Nov.* 114 (1852). ● Ga He It.

T. vindobonense Van Soest, *Acta Bot. Neerl.* **14**: 50 (1965). ● Au Cz Ge.

Sect. ALPINA G. Hagl.

18. T. apenninum group. (*T. alpinum* Hegetschw., *T. officinale* subsp. *alpinum* (Hegetschw.) Chenevard). Leaves 3–10 cm, variable, entire or lobed, mid-green, subglabrous to arachnoid, horizontal; lobes, if present, narrow, recurved, acute, 4–5 on each side; petiole narrow, short, entire. Scapes 1–5 cm, slender, procumbent or ascending (to erect), usually not exceeding the leaves. Capitulum 15–20 mm in diameter. Involucre 8–12 × 11–14 mm, narrow; outer bracts up to 8 mm, lanceolate to ovate, mid or dark green, rarely purplish, usually without a pale margin, erect to appressed, ecorniculate or slightly callosed. Ligules short, narrow, with a grey or brown stripe. Achenes brownish; body 3–4·3 mm, shortly spinulose; cone 0·2–0·7 mm, conical; beak 5–8 mm, slender. Apomictic. ● *Mountains of C. & S. Europe.* Al Au Bu Cz Ga Ge Gr He Hs It Ju Lu Po Rm.

23 species have been described, mainly from the Alps. The following have a relatively wide distribution:

T. apenninum (Ten.) Ten., *Cat. Piante Orto Bot. Napoli* 70 (1845). It.

T. carinthiacum Van Soest, *Acta Bot. Neerl.* **8**: 83 (1959). Au Ga Ge He It Ju.

T. helveticum Van Soest, *op. cit.* 85 (1959). $2n=32$. Au Cz Ga Ge He It Po.

T. mattmarkense Van Soest, *op. cit.* 86 (1959). Au Ga He.

T. panalpinum Van Soest, *op. cit.* 88 (1959). Al Au Cz Ga Ge He Hs It Lu Rm.

T. parsennense Van Soest, *op. cit.* 91 (1959). Au Ga He.

T. petiolulatum Van Soest, *op. cit.* 93 (1959). Au Ge It.

T. saasense Van Soest, *op. cit.* 95 (1959). Ga He It.

T. venustum Dahlst., *Ark. Bot.* **7(1)**: 5 (1908) (*T. alpinum* var. *kalbfussii* (Schultz Bip.) Hand.-Mazz.). $2n=32$. Au Ge He It.

T. vetteri Van Soest, *Acta Bot. Neerl.* **8**: 101 (1959). Au Ga Ge He It.

Sect. ALPESTRIA Van Soest.

19. T. nigricans group. Leaves 8–15 cm, lobed, bright to pale medium green, erect, sparsely hairy or glabrescent; lobes variable, few, acute, often dentate with acuminate teeth; petiole often green, long, winged, sometimes with long, narrow teeth. Scapes 8–18 cm, rather slender, sparsely hairy to subglabrous, usually exceeding the leaves. Capitulum 25–35 mm in diameter. Involucre 10–15 × 8–14 mm, dark, often more or less violet-purple, pruinose; outer bracts lanceolate, dark, without a pale margin, patent to erect, ecorniculate. Ligules narrow, dark yellow to orange-yellow, with a grey or purple stripe. Achenes straw-coloured, more rarely reddish; body 3·5–4·5 mm, narrow, shortly spinulose; cone 0·6–1 mm, subcylindrical; beak 6–9 mm, slender. ● *Alps*; *Carpathians*; *mountains of Bulgaria.* Au Bu Cz Ga Ge He It Ju Po Rm Rs (W).

32 species have been described for Europe, mainly from the Alps. The following have a relatively wide distribution:

T. aestivum Van Soest, *Acta Bot. Neerl.* **8**: 117 (1959). $2n=32$. Au He It.

T. cordatifolium Van Soest, *Veröff. Geobot. Inst. Rübel (Zürich)* **42**: 119 (1969). Au He It.

T. nigricans (Kit.) Reichenb., *Fl. Germ. Excurs.* 270 (1813). $2n=24, 32$. Bu Cz Po Rs (W).

T. perfissum Van Soest, *Acta Bot. Neerl.* **8**: 129 (1959). Au Ga He It.

T. reophilum Van Soest, *op. cit.* 132 (1959). Au He It.

T. rhaeticum Van Soest, *op. cit.* 134 (1959). $2n=24$. Ga Ge He It Ju.

T. rufocarpum Van Soest, *op. cit.* 124 (1959). Au Ga He It Ju.

Sect. FONTANA Van Soest.

20. T. fontanum group. Leaves 4–12 cm, very wide, entire to dentate or lobed, bright green, ascending or erect, hairy; lobes, if present, variable, few, wide, acute, dentate with acuminate teeth, the terminal lobe large, wide, more or less obtuse; petiole widely winged, long-dentate. Scapes 5–15 cm, rather robust, green, hairy, exceeding the leaves. Involucre 10–15 × 10–15 mm; outer bracts 6–12 mm, lanceolate, green, without a pale margin, erect or recurved, usually glabrous. Ligules long, narrow, orange-yellow, with a stripe. Achenes brownish; body 3–4 mm, tuberculate in the upper part; cone 0·2–0·7 mm, conical; beak 7–10 mm,

often white, slender. Apomictic. ● *Alps, W. Carpathians; Corse.* Au Co Cz Ga He It Ju Po Rm Rs (W).

18 species have been described, mainly from the Alps. The following have a relatively wide distribution:

T. croceicarpum Van Soest, *Veröff. Geobot. Inst. Rübel (Zürich)* **42**: 118 (1969). He It Ju.

T. fontanicola Van Soest, *Acta Bot. Neerl.* **8**: 108 (1959). Au Cz He It Po Rm Rs (W).

T. fontanosquameum Van Soest, *op. cit.* 110 (1959). $2n=25$. Au Ga He.

T. fontanum Hand.-Mazz., *Monogr. Taraxacum* 100 (1907). Au He.

T. magnopyramidophorum Van Soest, *Veröff. Geobot. Inst. Rübel (Zürich)* **42**: 118 (1969). He It Ju.

T. pohlii Van Soest, *Acta Bot. Neerl.* **8**: 113 (1959). $2n=32$. Au He It.

Sect. CUCULLATA Van Soest.

21. T. cucullatum group. Leaves 12–25 cm, lobed, dark, bright green, hairy, erect; lobes short, more or less deltate, acute, patent, dentate; petiole winged. Scapes 15–25 cm, hairy, exceeding the leaves. Capitulum 30–45 mm in diameter. Involucre 12–18 × 6–10 mm; outer bracts ovate-lanceolate, dark green, often suffused purple, with more or less pale margin, laxly appressed, ecorniculate. Ligules very long, involute, yellow-brown, fading to white on the margins, unstriped or with a purple stripe. Stigmas sometimes purple. Achenes brownish; body 3·5–4 mm, shortly spinulose in the upper part, rugose below; cone 0·5–0·7 mm, conical; beak 6–8 mm, slender. ● *Alps; Corse.* Au Co Ga He It.

10 species have been described:

T. aureocucullatum Van Soest, *Veröff. Geobot. Inst. Rübel (Zürich)* **42**: 126 (1969). He It.

T. concucullatum A. J. Richards, *Bot. Jour. Linn. Soc.* **65**: 40 (1972). $2n=24$. Au.

T. cucullatiforme Van Soest, *Acta Bot. Neerl.* **6**: 417 (1957). Co.

T. cucullatum Dahlst., *Acta Horti Berg.* **4(2)**: 25 (1907). Au Ga He.

T. fontaniforme Van Soest, *Acta Bot. Neerl.* **8**: 122 (1959). He.

T. inclusum Walo Koch, *Veröff. Geobot. Inst. Rübel (Zürich)* **42**: 126 (1969). He.

T. luteocucullatum Walo Koch & Van Soest, *op. cit.* 127 (1969). He.

T. oreophilum G. Hagl., *Ber. Schweiz. Bot. Ges.* **60**: 238 (1950). He.

T. sulger-buoelli Van Soest, *Veröff. Geobot. Inst. Rübel (Zürich)* **42**: 125 (1969). He.

T. tiroliense Dahlst., *Acta Horti Berg.* **4(2)**: 23 (1907). Au He.

Sect. DISSECTA Van Soest.

22. T. dissectum (Ledeb.) Ledeb., *Fl. Ross.* **2**: 814 (1846). Leaves 3–25 cm, lanceolate or more or less spathulate, much dissected, mid to dark green, very numerous, glabrous or hairy beneath; lobes variable, often narrow, linear, patent, more or less obtuse, dentate or nearly 2-pinnatifid, with up to 7 or 8 teeth on each side; petiole short, green, narrow; leaf-bases of previous year persistent. Scapes 3–20 cm, erect, slender, green, glabrous, more or less exceeding the leaves. Capitulum 20–30 mm in diameter. Involucre 10–25 × 15–25 mm; outer bracts narrowly ovate, green, with a brownish vein and scarious margin, appressed, ecorniculate. Ligules pale yellow with a red or grey stripe. Achenes grey; body 3–3·5 mm, more or less tuberculate in upper part, abruptly contracted into a cylindrical cone 1 mm; beak 3–6 mm. *Alps; Pyrenees; Spain (Sierra Nevada).* Ga He Hs It.

Sect. OBLIQUA Dahlst.

23. T. obliquum group. Leaves 3–8 cm, narrow, short, lobed to much dissected, bright or dark green, rather thick, glabrous, horizontal; lobes 6–8 on each side, short, patent, entire, obtuse, interspersed with similar lobules; petiole short, narrow. Scapes 3–10 cm, more or less equalling the leaves, glabrous, purple, ascending. Involucre 8–10 × 7–10 mm; outer bracts dark green, with a pale margin, appressed, slightly corniculate. Ligules short, often involute, golden yellow with a reddish-purple stripe. Achenes pale brown; body 2·5–3 mm, spinulose in the upper part; cone *c.* 1 mm, conical-cylindrical; beak 5–8 mm. Apomictic. ● *N. Europe.* Br Da Ge Ho No Rs (B) Su.

2 species have been described:

T. obliquum (Fries) Dahlst., *Bot. Not.* **1905**: 192 (1905). $2n=24$. Br Da Ge Ho No Su.

T. platyglossum Raunk., *Dansk Ekskurs.-Fl.* ed. 2, 256 (1906) (*T. obliquum* subsp. *platyglossum* (Raunk.) Nordh.). Br Da Ge No Rs (B) Su.

Sect. ERYTHROSPERMA Dahlst.

24. T. erythrospermum group. Leaves 4–15(–20) cm, lobed, usually horizontal; lobes narrow, very variable; petiole narrow, green, red or purple. Scapes 4–15 cm, ascending to erect, slender, often purplish. Capitulum 15–35 mm in diameter. Involucre 6–12 × 5–9 mm; outer bracts up to 6 mm, often glaucous and purplish, with a pale margin, appressed to patent (rarely recurved), usually corniculate. Ligules short, wide, pale yellow with a grey, brown or purple stripe. Achenes red, purple or violet; body 2·3–3·3 mm, spinulose in the upper part; cone 0·7–1·2 mm, cylindrical; beak 6–11 mm, white, slender. Apomictic or sexual. *Dry places. Almost throughout Europe.* All except Az Bl Cr Fa Sb.

T. erythrospermum Andrz. ex Besser, *Enum. Pl. Volhyn.* 75 (1822). Although this name has always been used for this group of plants in the aggregate sense, it has never been typified and it is uncertain to which of the segregates the name applies.

68 species have been described for Europe. The following have a relatively wide distribution:

T. austriacum Van Soest, *Proc. Koninkl. Nederl. Akad. Wetensch.* ser. C, **69 (4)**: 434 (1966). $2n=16, 24$. ● Au Cz Ge Hu It Ju [Br].

T. badium Van Soest, *Veröff. Geobot. Inst. Rübel (Zürich)* **42**: 111 (1969). ● Cz Ga He.

T. brachyglossum (Dahlst.) Dahlst. in Sernander et al., *Bot. Stud. (Kjellman)* 183 (1906). $2n=16, 24$. ● Au Be Br Da Fe Ga Ge Hb He Ho It Ju No Rs (B) Su.

T. braunblanquetii Van Soest, *Vegetatio* **5–6**: 524 (1954). Co Ga Lu.

T. commixtum G. Hagl. in Hyl., *Fört. Skand. Växter* 156 (1941) (*T. commutatum* Dahlst., non Jordan). ● Br Da Ga Ge Ho Su.

T. decipiens Raunk., *Bot. Tidsskr.* **25**: 139 (1903) (*T. laevigatum* subsp. *glaucescens* var. *decipiens* (Raunk.) Hayek, *T. linguatifrons* Marklund). Da Fe Ge Ju No Rs (B) Su.

T. disseminatum G. Hagl., *Svensk Bot. Tidskr.* **41**: 85 (1947). $2n=24$. Au Cz Da Fe Ga Ge He Ho No Su [Br].

T. dunense Van Soest, *Acta Bot. Neerl.* **5**: 95 (1954). $2n=24$. ● Be Br Ho Su.

T. glaucinum Dahlst., *Bot. Not.* **1909**: 177 (1909). ● Br Fe Ge He Su.

T. gotlandicum (Dahlst.) Dahlst., *op. cit.* 171 (1909). ● Br Hb No Rs (B) Su.

T. gracillimum Van Soest, *Veröff. Geobot. Inst. Rübel (Zürich)* **42**: 112 (1969). ● Au Ga He.

T. isophyllum G. Hagl., *Bot. Not.* **1938**: 499 (1938). $2n=24$. ● Au Cz Da Fe Ge No Rs (B) Su.

T. lacistophyllum (Dahlst.) Raunk., *Dansk Ekskurs.-Fl.* ed. 2, 257 (1906). $2n=24, 25$. ● Be Br Co Da Ga Ge He Ho Lu No Rs (B) Su.

T. laetiforme Dahlst., *Bot. Not.* **1909**: 174 (1909). ● Au Br Da Ga Ge Ho Su.

T. laetum (Dahlst.) Dahlst. in Sernander et al., *Bot. Stud. (Kjellman)* 183 (1906). $2n=24$. ● Br Da Fe Ge Ho No Rs (B) Su.

T. limbatum Dahlst., *Bot. Not.* **1909**: 173 (1909) (*T. reflectens* Dahlst.). ● Fe No Su.

T. marginatum (Dahlst.) Dahlst. in Sernander et al., *Bot. Stud. (Kjellman)* 183 (1906). ● Da Fe Ge No Rs (B) Su.

T. montesignum Van Soest, *Collect. Bot. (Barcelona)* **4**: 25 (1954). ● Ga Hs It Sa.

T. obscurans (Dahlst. ex H. Lindb. fil.) G. Hagl. in Hyl., *Fört. Skand. Växter* 156 (1941) (*T. abietifolium* Saarson, *T. diversiflorum* M. P. Christiansen). ● Da Fe Is No Rs (B) Su.

T. pindicola (Bald.) Hand.-Mazz., *Monogr. Taraxacum* 107 (1907) (*T. laevigatum* subsp. *pindicola* (Bald.) Hayek). ● Al Gr Ju.

T. plumbeum Dahlst., *Ark. Bot.* **10(6)**: 2 (1911). ● Au Cz Fe Ge He It Su.

T. polyschistum Dahlst., *Bot. Not.* **1909**: 178 (1909). $2n=24$. ● Be Ga He Ho Su.

T. proximum (Dahlst.) Dahlst. in Sernander et al., *Bot. Stud. (Kjellman)* 183 (1906) (*T. conjugens* H. Lindb. fil.). $2n=24$. Au Be Br Cz Da Fe Ga Ge He Ho No Rs (B, E) Su.

T. rubicundum (Dahlst.) Dahlst. in Sernander et al., *Bot. Stud. (Kjellman)* 183 (1906) (*T. rubicundum* subsp. *monspeliense* Dahlst., subsp. *pulvigerum* H. Lindb. fil.). $2n=24$. ● Au Be Br Co Da Fe Ga Ge He Ho It Ju Sa Si Su.

T. saphycraspedum Saarson & G. Hagl., *Ark. Bot.* ser. 2, **4**: 521 (1963). ● Ge Ho Su.

T. scanicum Dahlst., *Ark. Bot.* **10(11)**: 21 (1911). $2n=25$. Au Be Da Fe Ga Ge He Ho It Ju No Po Rs (B) Su.

T. silesiacum Dahlst. ex G. Hagl., *Bot. Not.* **1938**: 500 (1938). $2n=24$. Au Be Br Co Cz Da Ga Ge Hb He Ho Hu It Po Rm Su.

T. taeniatum G. Hagl. ex Holmgren, *Blekinges Fl.* 326 (1942). $2n=24$. ● Be Da Fe Ho No Rs (E) Su.

T tenuilobum (Dahlst.) Dahlst., *Bot. Not.* **1909**: 172 (1909). $2n=24, 25$. ● Da Ge He Ho No Po Rs (B) Su.

T. xerophilum Marklund, *Acta Bot. Fenn.* **23**: 87 (1938). ● Rs (B, C) Su.

25. T. simile group. Leaves 4–15 cm, usually patent to erect, more or less deeply lobed; lobes 3–5 on each side, narrow, or rarely broadly triangular; petioles sometimes winged, often purplish. Scapes 4–15 cm, erect, often stout, exceeding the leaves. Capitulum 25–50 mm in diameter. Involucre 8–12 × 5–10 mm; outer bracts green, with a pale margin, erect to appressed, corniculate. Ligules usually long and narrow, pale to bright yellow, with a grey, brown or purple stripe. Achenes straw-coloured or greyish-brown; body 2·5–3·5 mm, spinulose; cone 0·8–1·2 mm, cylindrical; beak 7–13 mm, white. Apomictic. *Dry places.* ● *N., W. & C. Europe; Corse.* Au Be Br Co Cz Da Fe Ga Ge Hb He Ho It No Rs (B, C, E) Su.

26 species have been described. The following have a relatively wide distribution:

T. canulum G. Hagl., *Acta Bot. Fenn.* **26**: 134 (1940). Be Br Fe Su.

T. degelii G. Hagl., *Bot. Not.* **1935**: 430 (1935). Br Ga Hb.

T. dissimile Dahlst., *Ark. Bot.* **10(11)**: 8 (1911) (*T. parvilobum* Dahlst.). $2n=24$. Be Da Fe Ge Ho No Rs (B) Su.

T. falcatum Brenner, *Meddel. Soc. Fauna Fl. Fenn.* **34**: 25 (1908) (*T. pectinosum* G. Hagl.). ?Be Da Fe He Is No Rs (B) Su.

T. isthmicola H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 42 (1907). Da Fe Rs (B) Su.

T. microlobum Marklund, *Acta Bot. Fenn.* **23**: 84 (1938). Fe No Rs (B) Su.

T. placidum A. J. Richards, *Watsonia* **9** (*Suppl.*): 96 (1972). $2n=24$. Br Ga Hs.

T. proximiforme Van Soest, *Lejeunia* nov. ser., **8**: 2 (1962). $2n=24$. Be Br Ga Ge Ho.

T. pseudocastaneum Van Soest, *Proc. Koninkl. Nederl. Akad. Wetensch.* ser. C, **69(4)**: 447 (1966). Co Ga It.

T. pseudolacistophyllum Van Soest, *Bull. Jard. Bot. Bruxelles* **26**: 228 (1956) (*T. affine* G. Hagl., non Jordan). $2n=24$. Au Be Br Da Ga Ge He It.

T. purpureomarginatum Van Soest, *Bull. Soc. Fr. Éch. Pl. Vasc.* **11**: 23 (1964). $2n=24$. Au Cz Ga He.

T. schizophyllum Dahlst., *Bergens Mus. Aarb.* **2(16)**: 20 (1920) (*T. dentosum* M. P. Christiansen). Au Cz Da He No Su.

T. simile Raunk., *Dansk Ekskurs.-Fl.* ed. 2, 257 (1906). $2n=32$. Br Da Ga Ge Ho No Su.

T. subdissimile Dahlst., *Ber. Schweiz. Bot. Ges.* **42**: 719 (1933). Au Be Ga He ?Ho It.

T. tanyolobum Dahlst., *op. cit.* 720 (1933). Au Be Da Ga Ge He Ho.

T. tortilobum Florström, *Acta Soc. Fauna Fl. Fenn.* **39(4)**: 11 (1914). $2n=24$. Be Br Co Fe Ga Ge He Ho It Rs(B) Su.

26. T. fulvum group. Leaves 5–18 cm, bright green, horizontal or erecto-patent, with deep narrow lobes; petiole unwinged, green or purple. Scapes 5–15 cm, ascending or erect, often purplish. Capitulum 20–40 mm in diameter. Involucre 7–12 × 5–9 mm; outer bracts up to 6 mm, green, often with paler margins, recurved to appressed, usually corniculate. Ligules short, wide, pale yellow. Achenes reddish- or pinkish-brown; body 2·5–3·5 mm, narrow, shortly spinulose; cone long-cylindrical; beak 5–8 mm, rather stout, often white. Apomictic. *Dry places.* ● *N., W. & C. Europe.* Au Be Br Co Cz Da Fe Ga Ge Hb He Ho Hs Is It No Rs (B) Su.

13 species have been described. The following have a relatively wide distribution:

T. fulviforme Dahlst., *Rep. Bot. Exch. Club Brit. Is.* **6**: 775 (1923). $2n=32$. Be Br Co Ga.

T. fulvum Raunk., *Dansk Ekskurs.-Fl.* ed. 2, 258 (1906) (*T. brachycranum* (Dahlst.) Dahlst.). $2n=32$. Be Br Co Cz Da Fe Ga Ge He Ho No Rs (B) Su.

T. glauciniforme Dahlst., *Rep. Bot. Exch. Club Brit. Is.* **8**: 620 (1929). Be Br Ga Hb Ho.

T. oxoniense Dahlst., *op. cit.* **6**: 776 (1923) (*T. helvicarpum* Dahlst.). $2n=32$. Au Be Br Co Ga Hb He Ho It No.

27. T. gasparrinii group. Like **26** but leaves with relatively wide and shallow lobes; involucre 7–11 mm wide; achenes pink or reddish, with body 2·5–3 mm and slender beak 7–9 mm. *Dry places.* ● *S. Europe.* Al Co Ga Gr He Hs It Ju Si Tu.

11 species have been described:

T. asturiense Van Soest, *Acta Bot. Neerl.* **20**: 145 (1971). Hs.

T. dorchocarpum Van Soest, *loc. cit.* (1971). Gr.

T. epirense Van Soest, *Proc. Koninkl. Nederl. Akad. Wetensch.* ser. C, **69(4)**: 441 (1966). Ga Gr He It.

T. gasparrinii Tineo ex Lojac., *Fl. Sic.* **2(1)**: 201 (1902). Al Co Ga Hs It Ju Si.

T. lambinonii Van Soest, *Acta Bot. Neerl.* **10**: 289 (1961). Ga He Hs It.

T. nanum Van Soest, *Proc. Koninkl. Nederl. Akad. Wetensch.* ser. C, **69(4)**: 445 (1966). Ga.

T. roseocarpum Van Soest, *Acta Bot. Neerl.* **6**: 411 (1957). Co Ga He It.

T. stenospermum Sennen ex Van Soest, *Collect. Bot.* (*Barcelona*) **4**: 27 (1954). Hs.

T. thracicum Van Soest, *Proc. Koninkl. Nederl. Akad. Wetensch.* ser. C, **69(4)**: 447 (1966). Tu.

T. vinosum Van Soest, *Collect. Bot.* (*Barcelona*) **4**: 29 (1954). Hs.

T. xanthiense Van Soest, *Acta Bot. Neerl.* **20(1)**: 146 (1971). Gr.

Sect. ERYTHROCARPA (Hand.-Mazz.) Dahlst.

28. T. hoppeanum group. Leaves 5–25 cm, variably lobed, dark olive-green, hairy, erect; lobes long, narrow, acute, patent, acuminate-dentate towards the apex; petiole winged, dentate. Scapes 10–30 cm, stout, hairy, reddish in upper part, exceeding the leaves. Capitulum 35–45 mm in diameter, flat or convex. Involucre 8–18 × 7–15 mm; outer bracts ovate-lanceolate, dark green, with an often rather wide, pale margin, erect, corniculate or only slightly callosed. Ligules bright yellow, with a purple stripe. Achenes reddish-purple or brownish; body 3·5–4 mm, spinulose, rather narrow; cone 1–1·5 mm, cylindrical; beak 8–12 mm, slender, white. Sexual or apomictic. *Dry places in the mountains. C. & S. Europe.* Au Cz Ga Gr He It Ju Lu Po Rm Si.

8 species have been described for Europe:

T. amborum G. Hagl., *Ark. Bot.* **26A(5)**: 25 (1933). $2n=24$. Gr.

T. aquilonare Hand.-Mazz. in Dalla Torre & Sarnth., *Fl. Tirol* **6(3)**: 687 (1912) (*T. laevigatum* subsp. *aquilonare* (Hand.-Mazz.) Hegi). $2n=24$. Au Ga He.

T. capricum Van Soest, *Proc. Koninkl. Nederl. Akad. Wetensch.* ser. C, **69(4)**: 434 (1966). $2n=24$. Ga It.

T. caramanicae Lojac., *Fl. Sic.* **2(1)**: 200 (1902). Si.

T. duriense Van Soest, *Agron. Lusit.* **13**: 67 (1951). Lu.

T. hoppeanum Griseb., *Arch. Naturgesch.* (*Berlin*) **18**: 349 (1852) (*T. calocephalum* Hand.-Mazz., *T. laevigatum* subsp. *calocephalum* (Hand.-Mazz.) Hayek). Cz Gr It Ju Rm.

T. pieninicum Pawł., *Bull. Int. Acad. Sci. Cracovie* ser. B, **1924**: 109 (1924) (*T. hoppeanum* subsp. *pieninicum* (Pawł.) Domin). $2n=16$. Cz Po.

T. poliochlorum Dahlst., *Acta Horti Berg.* **9**: 26 (1929). Gr.

Sect. BOREIGENA (Dahlst.) G. Hagl.

29. T. crassipes group. Leaves 15–40 cm, lanceolate, variably lobed, large and coarse, never spotted, erect; terminal lobe long; petiole widely winged, pale. Scapes 15–40 cm, stout, erect, pale. Capitulum 50–70 mm in diameter, slightly convex. Involucre 20–25 × 20–25 mm; outer bracts up to 20 mm, narrow, erect to deflexed, whitish on inner face, ecorniculate or slightly callosed. Ligules pale yellow, long, narrow, not or scarcely striped. Achenes pale brown; body 3–3·5 mm, tuberculate; cone 0·2–0·7 mm, conical; beak 10–15 mm, slender. Apomictic. *Meadows and clearings in coniferous woodland.* ● *N. Fennoscandia.* Fe No Rs (N) Su.

21 species have been described. The following have a relatively wide distribution:

T. cochleatum Dahlst. & H. Lindb. fil., *Ark. Bot.* **12(2)**: 73 (1912) (*T. latipes* Dahlst., *T. praelongum* G. Hagl.). $2n=24$. Fe No Su.

T. crassipes H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 37 (1907). Fe Rs (N).

T. galeatum Dahlst., *Ark. Bot.* **12(2)**: 59 (1912) (*T. molle* H. Lindb. fil.). Fe No Su.

T. kuusamoense H. Lindb. fil. & Palmgren, *Meddel. Soc. Fauna Fl. Fenn.* **37**: 41 (1911). Fe No Su.

T. polyxanthum Dahlst., *Acta Bot. Fenn.* **21**: 161 (1938). Fe No Su.

T. rubrolineatum H. Lindb. fil., *Acta Bot. Fenn.* **17**: 21 (1935). Fe No Su.

Sect. TARAXACUM (Sect. *Vulgaria* Dahlst.).

30. T. officinale group. Leaves 5–40 cm, entire to very laciniate, often large and coarse, never thin, never spotted; lobes usually more or less triangular; petiole often winged. Scapes

5–40 cm, stout, erect or ascending, usually hairy. Capitulum 25–75 mm in diameter, often convex. Involucre 12–25 × 15–25 mm; outer bracts up to 17 mm, linear-lanceolate, usually rather dark, more or less glaucous green, paler on inner surface, pale margin often present but never conspicuous, erect to deflexed, ecorniculate or slightly callosed. Ligules long, narrow, medium yellow, usually with a brownish stripe. Achenes brownish; body 2·5–3·5 mm, tuberculate or spinulose; cone 0·2–0·7 mm, conical; beak 7–15 mm, slender. Apomictic; more rarely sexual. *Disturbed ground, meadows and woods. Throughout Europe. All except Sb, where it has been reported as recently introduced.*

Numerous species have been described for Europe. The following have a relatively wide distribution:

T. acutangulum Marklund, *Acta Soc. Fauna Fl. Fenn.* **55(5)**: 18 (1926) (*T. oxyodon* M. P. Christiansen). Be Da Fe Ga Ge He Ho Hs Lu No Rs (B) Su.

T. aequilobum Dahlst., *Ark. Bot.* **9(10)**: 42 (1910). $2n=24$. ● Be Br Da Fe Ge He Ho Hs No Rs (B) Su.

T. alatum H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 20 (1907) (*T. semiprivum* Dahlst.). $2n=24$. ● Be Br Da Fe Ga Ge Hb He Ho No Rs (B) Su.

T. ancistrolobum Dahlst., *Bergens Mus. Aarb.* **1923–1924(1)**: 27 (1925). ● Be Br Da Fe He Ho No Su.

T. angustisquameum Dahlst. ex H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 23 (1907). ● Be Da Fe Ga Ge Is No Rs (B) Su.

T. arrhenii Palmgren, *op. cit.* **34(1)**: 25 (1910) (*T. amoenum* Marklund ex Puolanne). ● Da Fe No Su.

T. atrovirens Dahlst., *Bot. Not.* **1935**: 100 (1935) (*T. pruinatum* M. P. Christiansen). ● Be Da Fe Ge No Su.

T. aurosulum H. Lindb. fil., *Meddel. Soc. Fauna Fl. Fenn.* **35**: 14 (1909). ● Be Br Fe Ga He Ho No Su.

T. biformatum H. Lindb. fil., *op. cit.* **36**: 5 (1910) (*T. albicollum* Dahlst.). Fe No Rs (B) Su.

T. borgvallii Dahlst. ex G. Hagl., *Acta Horti Gothob.* **11**: 20 (1936). ● Ge No Rs (B) Su.

T. bracteatum Dahlst., *Ark. Bot.* **19(18)**: 11 (1925). ● Be Br Da Fe Ga Ge He Ho No Su.

T. caloschistum Dahlst., *op. cit.* **10(6)**: 15 (1911). ● Da Fe Ge He No Rs (B) Su.

T. canoviride H. Lindb. fil. ex Puolanne, *Mem. Soc. Fauna Fl. Fenn.* **8**: 147 (1932–1933). ● Be Br Da Fe He Ho No Rs (B) Su.

T. caudatulum Dahlst., *Ark. Bot.* **9(10)**: 67 (1910). ● Be Da Fe Ga Ge He Ho No Rs (B) Su.

T. christiansenii G. Hagl. in Hyl., *Fört. Skand. Växter* 157 (1941) (*T. marginellum* M. P. Christiansen, non H. Lindb. fil.). ● Be Br Da No Su.

T. copidophyllum Dahlst., *Ark. Bot.* **9(10)**: 25 (1910). ● Be Da Fe Ge Ho No Po Su [Brl.

T. cordatum Palmgren, *Acta Soc. Fauna Fl. Fenn.* **34(1)**: 12 (1910) (*T. amblycentrum* Dahlst.). $2n=24$. ● Be Br Da Fe Ge Hb Ho Hs No Rs (B) Su.

T. crispifolium H. Lindb. fil., *op. cit.* **29(9)**: 27 (1907). ● Be Br Da Fe Hb He Ho No Rs (B) Su.

T. croceiflorum Dahlst., *Ark. Bot.* **9(10)**: 9 (1910). ● Be Br Da Fe Ga He Ho No Rs (B) Su.

T. cyanolepis Dahlst., *op. cit.* **10(11)**: 40 (1911) (*T. alienum* Dahlst.). $2n=24$. ● Be Br Da Fe Ge Ho No Rs (B) Su.

T. dahlstedtii H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 27 (1907) (*T. densiflorum* M. P. Christiansen, non Brenner). $2n=24$. ● Be Br Da Fe Ga Ge Ho Is No Rs (B) Su.

T. dilaceratum M. P. Christiansen, *Dansk Bot. Ark.* **9(2)**: 9 (1936). ● Da Ge Ho Su.

T. dilatatum H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 22 (1907). ● Be Br Da Fe Ga Ge No Rs (B) Su.

T. duplidens H. Lindb. fil., *op. cit.* 38 (1907). $2n=24$, 26. Be Br Da Fe Ga Ge He Ho Is No Rs (B) Su.

T. ekmanii Dahlst., *Ark. Bot.* **10(6)**: 19 (1911). $2n=24$. ● Be Br Da Ga Ge Hb He Hs It Lu No Rs (B) Su.

T. expallidiforme Dahlst., *op. cit.* **9(10)**: 18 (1910) (*T. oncolobum* Dahlst.). ● Br Da Fa Hb No Su.

T. explicatum G. Hagl., *Acta Horti Gothob.* **11**: 24 (1936) (*T. angustissimum* H. Lindb. fil.). ● Fe No Rs (B) Su.

T. fasciatum Dahlst. in Sernander et al., *Bot. Stud.* (*Kjellman*) 172 (1906) (*T. sublatissimum* Dahlst.). $2n=24$. ● Be Br Da Fe Ge Ho No Su.

T. florstroemii Marklund, *Acta Soc. Fauna Fl. Fenn.* **55(5)**: 22 (1926). ● Fe Ge No Rs (B) Su.

T. geminatum G. Hagl., *Bot. Not.* **1937**: 450 (1937) (*T. trigonophorum* Marklund). ● Fe No Rs (B) Su.

T. gibberum Marklund, *Acta Soc. Fauna Fl. Fenn.* **55(5)**: 3 (1926). ● Da Fe Ge Su.

T. haematicum G. Hagl., *Svensk Bot. Tidskr.* **31**: 347 (1937) (*T. haematopus* sensu Dahlst., non H. Lindb. fil.). $2n=24$. ● Be Br Da Fe Ge He Ho No Rs (B) Su.

T. haematopus H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 25 (1907). $2n=24$. ● Da Fe No Rs (B) Su.

T. hamatiforme Dahlst. in Lindman, *Svensk Fanerogamfl.* 583 (1918) (*T. hamatifrons* Dahlst., *T. hamiferum* Dahlst.). $2n=24$. ● Be Br Da Fe Ga Ge Hb Hs No Su.

T. hamatum Raunk., *Dansk Ekskurs.-Fl.* ed. 2, 255 (1906). $2n=24$. ● Be Br Da Fe Ga Ge No Su.

T. hastatum Marklund, *Acta Soc. Fauna Fl. Fenn.* **55(5)**: 8 (1926) (*T. undulatiflorum* M. P. Christiansen). ● Be Da Fe Ga Ge He Ho Su.

T. huelphersianum Dahlst., *Bot. Not.* **1935**: 104 (1935) (*T. angermannicum* Dahlst.). ● Da Fe No Rs (B) Su.

T. insigne E. L. Ekman ex Wiinst. & K. Jessen in Raunk., *Dansk Ekskurs.-Fl.* ed. 5, 312 (1934). $2n=25$. ● Be Br Da Ge Hb Rs (B) Su.

T. involucratum Dahlst., *Ark. Bot.* **9(10)**: 29 (1910). $2n=24$. ● Da Fe Ge No Rs (B) Su.

T. kjellmanii Dahlst. in Sernander et al., *Bot. Stud.* (*Kjellman*) 178 (1906) (*T. onychodontum* Dahlst. pro parte). ● Be Da Fe Ge No Rs (B) Su.

T. laciniosifrons Wiinst. in Raunk., *Dansk Ekskurs.-Fl.* ed. 5, 309 (1934). $2n=19$, 20, 21, 22, 23, 24, 48. ● Be Da Fe Ge He Ho No Rs (B) Su.

T. laciniosum Dahlst., *Ark. Bot.* **9(10)**: 20 (1910) (*T. naeviferum* Dahlst.). ● Br Da Fe Ho No Rs (B) Su.

T. laeticolor Dahlst. in Sernander et al., *Bot. Stud.* (*Kjellman*) 168 (1906). $2n=24$. ● Be Br Da Fe Ge No Su.

T. leptodon Marklund, *Acta Soc. Fauna Fl. Fenn.* **55(5)**: 10 (1926). ● Da Fe Ge No Su.

T. linguatum Dahlst. ex M. P. Christiansen & Wiinst. in Raunk., *Dansk Ekskurs.-Fl.* ed. 5, 313 (1934). ● Be Br Da Fe Ga Ge He No Su.

T. lingulatum Marklund, *Acta Soc. Fauna Fl. Fenn.* **55(5)**: 20 (1925) (*T. aequatum* Dahlst., *T. subpallescens* Dahlst.). ● Br Da Ga Ge He No Rs (B) Su.

T. longisquameum H. Lindb. fil., *op. cit.* **29(9)**: 21 (1907) (*T. sagittatum* Dahlst.). $2n=24$. ● Be Br Da Fe Ge Hb He Ho No Rs (B) Su.

T. lucidum Dahlst., *Ark. Bot.* **9(10)**: 27 (1910) (*T. laeticolorans* A. Lindström ex Dahlst.). ● Be Da Fe Ge Ho No Rs (B) Su.

T. lunare M. P. Christiansen in Raunk., *Dansk Ekskurs.-Fl.* ed. 6, 321 (1942) (*T. nemorum* G. Hagl.). ● Be Da He Ho Su.

T. macranthum Dahlst., *Ark. Bot.* **10(6)**: 18 (1911) (*T. longisectum* G. Hagl.). ● Da Fe Ge No Su.

T. maculatum Jordan, *Pug. Pl. Nov.* 117 (1852) (*T. atripictum* Marklund). Br Fe No Rs (B) Su.

T. marklundii Palmgren, *Acta Soc. Fauna Fl. Fenn.* **34(1)**: 20 (1910) (*T. subhamatum* M. P. Christiansen). $2n=24$. ● Be Br Da Fe Ga Hb Hs Lu Rs (B) Su.

T. melanthoides Dahlst., *Bot. Not.* **1935**: 309 (1935). $2n=24$. ● Be Br Da Fe No Su.

T. mimulum Dahlst., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 29 (1907). $2n=24$. ● Be Da Fe Ga Ge He No Rs (B) Su.

T. mucronatum H. Lindb. fil., *op. cit.* 24 (1907) (*T. latispinum* Dahlst.). ● Br Fe Rs (B) Su.

T. multilobum Dahlst. ex Puolanne, *Mem. Soc. Fauna Fl. Fenn.* **8**: 161 (1932–1933). ● Da Fe No Rs (B) Su.

T. obliquilobum Dahlst., *Ark. Bot.* **9(10)**: 46 (1910) (*T. tenuisquameum* Dahlst. ex G. Hagl., *T. tortisquameum* H. Lindb. fil., *T. unguiculosum* H. Lindb. fil. & Palmgren). ● Be Br Da Fe Ga Ge He No Rs (B) Su.

T. oblongatum Dahlst., *Rep. Bot. Exch. Club Brit. Is.* **9**: 27 (1930) (*T. falciferum* Marklund ex Puolanne, *T. fusciceps* G. Hagl., *T. perhamatum* Dahlst.). $2n=24$. Br Fe Ho Su.

T. occidentale Dahlst., *Bergens Mus. Aarb.* **1923–1924(6)**: 35 (1925) (*T. valloense* M. P. Christiansen). ● Da Fe No Su.

T. officinale Weber in Wiggers, *Prim. Fl. Holsat.* 56 (1780). Although this name has been used for this group of plants in the aggregate sense, it has never been typified and it is uncertain to which of the segregates the name applies.

T. pachylobum Dahlst., *Ark. Bot.* **9(10)**: 54 (1910). ● Da Fe Ge No Rs (B) Su.

T. pallescens Dahlst., *op. cit.* 22 (1910). ● Be Br Da Fe Ge He Ho No Rs (B) Su.

T. pallidulum H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 40 (1907). ● Fe Ge No Rs (B) Su.

T. pannucium Dahlst., *Bergens Mus. Aarb.* **1923–1924(6)**: 21 (1925) (*T. protractifrons* Dahlst. ex M. P. Christiansen & Wiinst.). ● Be Br Da Fe Hb No Su.

T. pannulatiforme Dahlst., *Rep. Bot. Exch. Club Brit. Is.* **9**: 563 (1932) (*T. densilobum* Dahlst., *T. percrispum* M. P. Christiansen). ● Be Da Fe No Su.

T. pannulatum Dahlst., *Ark. Bot.* **9(10)**: 13 (1910) (*T. amphilobum* M. P. Christiansen). ● Da Fe Ga Ge No Rs (B) Su.

T. parvuliceps H. Lindb. fil., *Meddel. Soc. Fauna Fl. Fenn.* **36**: 5 (1910) (*T. laceratum* (Brenner) Brenner). $2n=24$. ● Be Br Da Fe Ge No Rs (B) Su.

T. pectinatiforme H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 30 (1907). ● Be Da Fe Ge He No Su [Br].

T. piceatum Dahlst., *Ark. Bot.* **9(10)**: 11 (1910). ● Be Br Da Fe Ga Ge Hs No Rs (B) Su.

T. polychroum E. L. Ekman ex Th. Lange, *Bot. Not.* **1911**: 286 (1911) (*T. acroschistum* G. Hagl., *T. purpureum* Raunk.). ● Da Fe Ge No Rs (B) Su.

T. polyodon Dahlst., *Ark. Bot.* **9(10)**: 56 (1910) (*T. ardisodon* Dahlst.). $2n=21, 22, 23, 24, 44, 45, 46, 47, 48$. ● Be Br Da Ga Ge No Rs (?) Su.

T. praecox Dahlst. ex Puolanne, *Mem. Soc. Fauna Fl. Fenn.* **8**: 165 (1932–1933). ● Fe No Rs (B) Su.

T. privum Dahlst., *Ark. Bot.* **10(6)**: 7 (1911). ● Be Br Da Fe Ge Ho No Su.

T. pycnolobum Dahlst., *op. cit.* 9 (1911). ● Be Da Fe Ge He Ho Rs (B) Su.

T. raunkiaeri Wiinst. in Raunk., *Dansk Ekskurs.-Fl.* ed. 5, 303 (1934) (*T. duplidentifrons* auct., non Dahlst.). $2n=24$. ● Be Br Da Ge Ho No Su.

T. recurvum Dahlst., *Ark. Bot.* **9(10)**: 49 (1910) (*T. intricatum* H. Lindb. fil., *T. rubefactum* Dahlst.). ● Da Fe No Rs (B) Su.

T. remotijugum H. Lindb. fil., *Meddel. Soc. Fauna Fl. Fenn.* **35**: 20 (1909). ● Fe Ge No Su.

T. retroflexum H. Lindb. fil., *op. cit.* 18 (1909). $2n=24$. ● Be Da Fe Ge He No Rs (B) Su.

T. rhodopodum Dahlst. ex M. P. Christiansen & Wiinst. in Raunk., *Dansk Ekskurs.-Fl.* ed. 5, 310 (1934). ● Be Da Fe Ga Ge He No Rs (B) Su.

T. rubrisquameum M. P. Christiansen, *Dansk Bot. Ark.* **9(2)**: 4 (1936). ● Da Ge No Rs (B) Su.

T. sagittipotens Dahlst. & R. Ohlsén ex G. Hagl., *Bot. Not.* **1934**: 29 (1934) (*T. valens* Marklund). ● Da Fe Ge No Rs (B) Su.

T. scotiniforme Dahlst. ex G. Hagl., *Acta Horti Gothob.* **11**: 35 (1936) (*T. obscuratum* G. Hagl., non Dahlst.). ● Da He No Su.

T. scotinum Dahlst., *Ark. Bot.* **9(10)**: 38 (1910). ● Da Fe No Su.

T. sellandii Dahlst., *Bergens Mus. Aarb.* **1923–1924(6)**: 19 (1925) (*T. granvinense* Dahlst.). $2n=24$. ● Be Br Da Fe Ga Hb No Su.

T. semiglobosum H. Lindb. fil., *Acta Soc. Fauna Fl. Fenn.* **29(9)**: 33 (1907) (*T. acutulum* Marklund, *T. adiantifrons* E. L. Ekman ex Dahlst.). ● Da Fe Ge No Su.

T. sententrionale Dahlst., *Ark. Bot.* **12(2)**: 115 (1912) (?*T. septentrionale* Dahlst., *Ark. Bot.* **12(2)**: 113 (1912) (?*T. boreum* Dahlst., *T. guttulatum* H. Lindb. fil. ex Puolanne, *T. myvatnense* M. P. Christiansen, *T. parvicorne* Dahlst.). ● Br Fe Is No Su.

T. speciosum Raunk., *Bot. Tidsskr.* **25**: 139 (1903). $2n=24$. ● Be Da Fe No Su.

T. spilophyllum Dahlst., *Ark. Bot.* **12(2)**: 111 (1912). ● Br Hb No Su.

T. stenoschistum Dahlst., *op. cit.* **9(10)**: 58 (1910). $2n=24$. ● Fe Ge No Su.

T. stereodes E. L. Ekman, *Acta Bot. Fenn.* **21**: 164 (1938) (*T. onychodontum* Dahlst. pro parte). ● Da Fe Ge No Su.

T. subcanescens Marklund ex Puolanne, *Mem. Soc. Fauna Fl. Fenn.* **8**: 170 (1932–1933). ● Cz Fe Ge He Hu Rs (B) Su.

T. subcyanolepis M. P. Christiansen, *Dansk Bot. Ark.* **9(2)**: 23 (1936). $2n=24$. ● Be Br Da Ga Hb Ho Su.

T. subintegrum Dahlst., *Ark. Bot.* **10(11)**: 69 (1911). ● No Rs (B) Su.

T. sublaciniosum Dahlst. & H. Lindb. fil., *op. cit.* **19(18)**: 15 (1925) (*T. subexpallidum* Dahlst., *T. sublutescens* Dahlst.). ● Br Fe No Su.

T. sublaeticolor Dahlst., *op. cit.* **19(18)**: 17 (1925). $2n=24$. ● Br Da Fe Ge Ho Is No Rs (B) Su.

T. subpraticola G. Hagl., *Bot. Not.* **1934**: 33 (1934) (*T. lepidum* M. P. Christiansen). ● Da Ga Ge Ho Su.

T. subundulatum Dahlst., *Rep. Bot. Exch. Club Brit. Is.* **6**: 779 (1923) (*T. amphiodon* Dahlst. ex G. Hagl.). ● Br Da Fe Ge No Su.

T. sundbergii Dahlst., *Ark. Bot.* **12(2)**: 100 (1912). ● Da Fe Lu No Rs (B) Su.

T. tenebricans (Dahlst.) Dahlst., *op. cit.* **9(10)**: 5 (1910). $2n=24$. ● Be Br Da Fe Ga Ge Ho Is No Rs (B) Su.

T. triangulare H. Lindb. fil., *Meddel. Soc. Fauna Fl. Fenn.* **35**: 19 (1909). ● Fe Is No Rs (B) Su.

T. trilobatum Palmgren, *Acta Soc. Fauna Fl. Fenn.* **34(5)**: 7 (1910) (*T. chloroleucum* Dahlst., *T. planum* Raunk., *T. versifolium* Dahlst.). ● Be Da Fa Fe Ga Ge He No Rs (B) Su.

T. undulatiforme Dahlst., *Ark. Bot.* **19(18)**: 18 (1925) (*T. firmulifolium* Marklund, *T. orphnocephalum* Dahlst. & R. Ohlsén). ● Be Da Ga No Rs (B) Su.

T. undulatum H. Lindb. fil. & Marklund, *Acta Soc. Fauna Fl. Fenn.* **34(7)**: 5 (1911). ● Be Fe Ga No Su.

T. vastisectum Marklund ex Puolanne, *Mem. Soc. Fauna Fl. Fenn.* **8**: 173 (1932–1933). ● Be Da Fe Ga Ge He Ho No Rs (B) Su.

T. xanthostigma H. Lindb. fil., *Meddel. Soc. Fauna Fl. Fenn.* **36**: 5 (1910). ● Be Br Da Fe Ge He No Rs (B) Su.

174. Chondrilla L.[1]

Biennial to perennial herbs. Stems 1–5, much-branched. Leaves entire to runcinate-dentate; cauline often narrow or bract-like. Capitula numerous, with fewer than 15 florets. Involucre 9–12 × 2·5–5 mm, cylindrical; bracts in 2 rows, the outer much shorter than the inner. Receptacle flat, without scales. Ligules yellow. Achenes with numerous ribs; beak very short to longer than the body, rarely absent, usually surrounded at its base by up to 6 short scales forming a collar; pappus of numerous rows of soft, simple hairs.

1 Leaves entire to remotely dentate; capitula all terminal on rather long peduncles **4. chondrilloides**
1 Leaves (at least the basal) deeply and irregularly runcinate-dentate; at least some capitula axillary or lateral on short peduncles, or sessile
2 Beak of achene not more than 0·7 mm, sometimes absent **3. pauciflora**
2 Beak of achene more than 0·7 mm
3 Branches ascending; stems glabrous or with patent rigid hairs or sparse short appressed hairs **1. juncea**
3 Branches divaricate; stem with a short, whitish tomentum and few to numerous rigid hairs **2. ramosissima**

[1] By P. D. Sell.

1. C. juncea L., *Sp. Pl.* 796 (1753) (incl. *C. acantholepis* Boiss., *C. brevirostris* Fischer & C. A. Meyer, *C. canescens* Kar. & Kir., *C. graminea* Bieb., *C. latifolia* Bieb.). Greyish-green biennial to perennial. Stems usually solitary, 50–100 cm, with numerous ascending branches, glabrous or with rigid hairs particularly below, sometimes with short appressed hairs. Leaves glabrous or with a few rigid hairs; basal 40–120 × 15–45 mm, soon withering, oblanceolate, more or less acute, deeply and irregularly runcinate-dentate, narrowed to a short, winged petiole; lower cauline usually like basal, the remainder usually long-linear, sometimes lanceolate, entire or denticulate. Capitula numerous, with 9–12 florets, terminal, lateral or axillary, solitary or in groups of 2–5, sessile or with rather short peduncles. Involucre 9–12 × 2·5–5 mm; bracts linear-lanceolate, obtuse to subacute, glabrous or sparsely tomentose, sometimes with a row of rigid hairs on the median line, the inner 7–9. Achenes 8–10 mm; beak slender, about half as long as to longer than the body. $2n=14+1B, 30$. *Dry, open habitats. Europe northwards to N. France and S.C. Russia.* Al Au Bl Bu Co Cr Cz Ga Ge Gr He Hs Hu It Ju Lu Po Rm Rs (C, W, K, E) Sa Si Tu.

Variable in indumentum, size of cauline leaves and length of beak of achene.

2. C. ramosissima Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 128 (1813). Like **1** but branches divaricate; stems and sometimes branches with a short, whitish tomentum and few to numerous rigid hairs. *Cultivated ground and waste places.* ● *Greece and S. Aegean region.* Cr Gr.

3. C. pauciflora Ledeb., *Icon. Pl. Fl. Ross.* **2**: 28 (1830) (*C. ambigua* Fischer ex Kar. & Kir., *C. urumoffii* Degen). Like **1** but capitula with 5–7 florets; involucre with 5–7 inner bracts; achenes 5–7 mm, with a very short beak up to 0·7 mm or rarely beakless, the collar of scales sometimes partially or completely absent. *Mountains of Bulgaria; S.E. Russia, W. Kazakhstan.* Bu Rs (E). (*W.C. Asia.*)

4. C. chondrilloides (Ard.) Karsten, *Deutsche Fl.* 1139 (1883) (*C. prenanthoides* (Scop.) Vill.). Glabrous or subglabrous perennial. Stems 1–5, 10–35 cm. Basal leaves 20–70 × 3–9 mm, glaucous, linear, narrowly oblanceolate or narrowly elliptical, obtuse to acute, entire to remotely patent-dentate, narrowed at base into a short, winged petiole; cauline 1–3, similar to basal or bract-like. Capitula usually numerous, all terminal on rather long peduncles. Involucre 8–11 × 3·5–5 mm; bracts linear to linear-lanceolate, more or less obtuse. Achenes 5–6 mm; beak slightly shorter than body. *River gravels; calcicole.* ● *E. Alps and adjacent lowlands; isolated and perhaps only temporary occurrences in S.W. Alps, N. Appennini and Corse.* Au Co Ga Ge He It Ju ?Rm.

175. Calycocorsus F. W. Schmidt[1]

(*Willemetia* Cass., non *Willemeta* Cothenius)

Like *Chondrilla* but involucre 10–12 × 7–12 mm, campanulate, with dense glandular hairs; capitula 1–5, each with more than 15 florets.

1. C. stipitatus (Jacq.) Rauschert, *Feddes Repert.* **73**: 225 (1966) (*Hieracium stipitatum* Jacq., *Willemetia stipitata* (Jacq.)

Schinz & R. Keller, *W. apargioides* Less.). Perennial 20–50 cm. Stems, peduncles and involucre with dense, long, unequal, dark glandular hairs and sparse to numerous stellate hairs. Leaves glabrous or with sparse, dark, simple eglandular hairs; basal 20–170 × 15–30(–42) mm, oblanceolate to obovate, obtuse to cuspidate, denticulate to retrorse-dentate; cauline 0–2, more or less linear, entire. Capitula 1–5. Involucre 10–12 × 7–12 mm; bracts dark, linear-lanceolate, more or less acute. Ligules yellow. Achenes 8–10 mm, 5-angled, tuberculate; beak slender, slightly longer than the body, with a crenulate collar at its base. $2n=10$. *Wet, grassy places, mainly in the mountains.* ● *S.C. Europe; Crna Gora and Albania; E. Pyrenees.* Al Au Cz Ga Ge He It Ju.

176. **Heteracia** Fischer & C. A. Meyer[1]

Annuals. Stems several, branched. Leaves dentate to pinnatisect. Capitula few to numerous. Involucral bracts in 2 rows, the outer few, much smaller than the inner. Receptacle flat, without scales. Ligules yellow or whitish-yellow. Achenes of 2 kinds: outer with very short beak and without or with very short pappus; inner with long slender beak, usually with a pappus of rigid hairs.

1. H. szovitsii Fischer & C. A. Meyer, *Ind. Sem. Hort. Petrop.* **1**: 30 (1835) (*H. epapposa* (Regel & Schmalh.) M. Popov). Glabrous annual. Stems 5–30 cm. Basal leaves 50–120 × 15–20 mm, oblong or oblong-ovate, more or less sinuate-dentate to pinnately lobed or pinnatipartite, the lobes triangular; cauline lanceolate or oblong-ovate, sessile, cordate-sagittate. Peduncles thickened. Involucre 5–9 × 6–9(–12) mm; bracts lanceolate, more or less obtuse, united towards the base. Outer achenes *c.* 8 mm, obpyramidal, greyish-brown, somewhat compressed on back with 2 spongy, cylindrical ribs on the ventral side, more or less transversely rugose, laterally dilated upwards into wings; inner *c.* 10 mm, with 4–5 spongy ribs, 2 of which are cylindrical, the others narrowly winged, with filiform beak 2–2½ times as long as the body. *Dry waste places. W. Kazakhstan.* Rs (E). (*S.C. & S.W. Asia.*)

177. **Lapsana** L.[1]

Annual to perennial herbs. Stem usually solitary, branched. Leaves entire to lobed. Capitula numerous. Involucral bracts in 2 rows, the outer few, small and scale-like. Receptacle flat, without scales. Ligules yellow. Achenes slightly compressed, with *c.* 20 ribs; pappus absent.

1. L. communis L., *Sp. Pl.* 811 (1753). Plant 10–125 cm. Leaves 10–150 × 10–70 mm, ovate and dentate to lyrate-pinnatifid with a large terminal lobe and small lateral lobes, the upper sessile or shortly petiolate, sometimes lanceolate and entire, the lower long-petiolate. Capitula in a more or less corymbose panicle. Involucre 5–10 × 2–5 mm; inner bracts linear-oblong, more or less obtuse, keeled in fruit; outer 0·5–1 mm, few, ovate-lanceolate. Achenes 2·5–9 mm, the outer much longer than the inner. *Throughout Europe.* All except Cr Fa Is Sb; recently introduced to Az.

All subspecies can have the peduncles and involucre glabrous or with varying amounts of glandular hairs.

1 Plant glaucous; stems 10–25 cm, numerous; involucre less than 3 mm wide **(d)** subsp. **alpina**
1 Plant green; stem more than 25 cm, usually solitary; most involucres at least 3 mm wide
2 Ligules not more than 1½ times as long as involucre **(a)** subsp. **communis**
2 Ligules about twice as long as involucre
3 Peduncles usually not more than twice as long as involucre; involucre 6–8 mm **(b)** subsp. **adenophora**
3 Most peduncles more than twice as long as involucre; involucre 7–10 mm **(c)** subsp. **intermedia**

(a) Subsp. **communis**: Annual; stem up to 125 cm, slender to robust, usually with eglandular hairs at the base. Leaves ovate to lyrate-pinnatifid, the lateral segments (if developed) not as wide as the terminal. Peduncles slender, usually more than twice as long as involucre. Involucre 5–7(–8) mm. Ligules up to 1½ times as long as involucre. $2n=14$, 16. *Throughout the range of the species except perhaps S.E. Europe.*

(b) Subsp. **adenophora** (Boiss.) Rech. fil., *Denkschr. Akad. Wiss. Math.-Nat. Kl. (Wien)* **105(1)**: 673 (1943) (*L. communis* forma *adenoclados* (Borbás) Hayek): Annual, usually with short glandular hairs throughout; stem up to 80 cm, robust, rigid. Lower leaves lyrate-pinnatifid, the upper linear-lanceolate, entire. Peduncles rigid, often not more than twice as long as involucre. *Greece, Jugoslavia, Romania.*

(c) Subsp. **intermedia** (Bieb.) Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 803 (1931) (*L. intermedia* Bieb.): Annual, biennial or perennial; stem 25–80(–100) cm, with eglandular hairs towards the base, usually glabrous above. Leaves green, the basal and lower and middle cauline lyrate-pinnatifid, with the lateral segments often about as wide as the terminal one, the upper lanceolate to linear-lanceolate, dentate to entire. Peduncles slender, mostly more than twice as long as involucre. Involucre 7–10 × 3–5 mm. Ligules about twice as long as involucre. $2n=14$. *S.E. Europe; rarely introduced elsewhere.*

(d) Subsp. **alpina** (Boiss. & Balansa) P. D. Sell, *Notes Roy. Bot. Gard. Edinb.* **33**: 432 (1975) (*L. alpina* Boiss. & Balansa, *L. aipetriensis* Vassilcz.): Like subsp. (c) but stems numerous, 10–25 cm; leaves glaucous; involucre less than 3 mm wide. *Mountains of Krym.*

Subsp. **pisidica** (Boiss. & Heldr.) Rech. fil., *Denkschr. Akad. Wiss. Math.-Nat. Kl. (Wien)* **105(1)**: 674 (1943) (*L. pisidica* Boiss. & Heldr.), which differs from subsp. (c) in having the lower part of the stem with dense, crispate glandular hairs, has been erroneously recorded from Turkey-in-Europe and doubtfully recorded from Greece (Samothraki).

178. **Crepis** L.[1]

Annual to perennial herbs. Stems 1 to many, usually branched. Leaves subentire to pinnatisect or loped. Capitula 1–numerous. Involucral bracts in 2 rows, the outer up to ¾ (rarely ⅞) as long as the inner. Receptacle flat or convex, usually pitted, the raised margins of the pits often ciliate, rarely also with 1 or 2 rigid hairs or narrow, membranous scales between the florets. Ligules usually yellow (sometimes with a red stripe on the outer face), sometimes orange, pink, white or parti-coloured. Achenes yellowish to black, uniform or of 2 or 3 kinds, with 4–35 ribs or striae, usually narrowed towards apex, sometimes beaked; pappus of 1–many rows of usually white and soft, sometimes greyish or yellow and brittle hairs.

Literature: E. B. Babcock, *Univ. Calif. Publ. Bot.* **21**: 1–197 (1947); **22**: 198–1030 (1947); **23**: 383–404 (1951).

C. aspera L., *Sp. Pl.* ed. 2, 1132 (1763), native of S.W. Asia and Egypt, has been recorded as an occasional casual in Europe.

1 Plant acaulescent; capitula in sessile clusters in the centre of a flat rosette of leaves **57. pusilla**
1 Plant with stems each bearing 1 or more capitula
2 Leaves pinnately divided to the midrib into narrowly linear segments **26. chondrilloides**

[1] By P. D. Sell.

2 Leaves not divided to the midrib, the segments, if present, not narrowly linear
3 Achenes of 2 or 3 kinds
4 Ligules pink or white **50. rubra**
4 Ligules yellow, often with a red stripe on outer face
5 Receptacle with scales or rigid hairs subtending the florets
6 Outer involucral bracts ⅓–¾ as long as inner; receptacle with linear scales subtending the florets **51. foetida**
6 Outer involucral bracts ⅛–⅓ as long as inner; receptacle with rigid hairs subtending the florets **53. sancta**
5 Receptacle glabrous or with ciliate pits, but never with scales or rigid hairs subtending the florets
7 Receptacle glabrous
8 Involucre 5–7 mm; achenes 2–2·5 mm **56. zacintha**
8 Involucre 8–13 mm; achenes 3–6·5 mm
9 Leaves with glandular hairs; involucre glabrous **47. pulchra**
9 Leaves without glandular hairs; involucre hairy
10 Achenes 5·5–6·5 mm, *c.* 30-striate **2. geracioides**
10 Achenes 3–5 mm, 4- to 10-ribbed
11 Involucre 8–12 × 5–10 mm; florets 11–18 mm **54. dioscoridis**
11 Involucre 8–9 × 4–6 mm; florets 7–8 mm **55. multiflora**
7 Receptacle with ciliate pits
12 Achenes without or with short thick beak, the marginal mostly broadly winged **54. dioscoridis**
12 Achenes not broadly winged, at least the inner with an obvious beak
13 Inner achenes 10–20 mm
14 Involucre 15–22 mm; outer bracts ovate **49. alpina**
14 Involucre 7–16 mm; outer bracts lanceolate to linear-lanceolate
15 Stem usually with several capitula; at least the inner achenes more than 12 mm **51. foetida**
15 Stems numerous, each with a single capitulum; achenes less than 12 mm **67. tybakiensis**
13 Inner achenes 2–7·5(–9) mm
16 Cauline leaves filiform, bract-like **67. tybakiensis**
16 Cauline leaves larger and amplexicaul
17 Involucre 8–14 mm; achenes 4–9 mm **66. vesicaria**
17 Involucre *c.* 7 mm; achenes 3–3·75 mm **68. setosa**
3 Achenes more or less uniform
18 At least some achenes contracted into a distinct beak
19 Cauline leaves more or less amplexicaul
20 Involucre 3–10 mm
21 Involucre with pale, rigid eglandular hairs thickened at their base **68. setosa**
21 Involucre without pale, rigid eglandular hairs thickened at their base, sometimes with soft, slender eglandular hairs
22 Involucre 3–8 mm; achenes 1·75–4 mm
23 Outer involucral bracts 4–6, very small; achenes 1·75–3·25 mm **62. neglecta**
23 Outer involucral bracts 10–12, ¼–½ as long as inner; achenes 3–4 mm **63. suffreniana**
22 Involucre 7–10 mm; achenes 3·5–9 mm
24 Outer involucral bracts linear-lanceolate to ovate **66. vesicaria**
24 Outer involucral bracts very narrowly linear **69. bellidifolia**
20 Involucre 10–20 mm
25 Achenes (13–)15- to 20-ribbed
26 Achenes 10–12 mm **15. bocconi**
26 Achenes 5–9 mm
27 Leaves hairy; involucre 10–20 × 8–20 mm, tomentose and with longer hairs **16. conyzifolia**
27 Leaves glabrous; involucre 10–12 × 7–9 mm, tomentose but without longer hairs **25. bertiscea**
25 Achenes 10- to 12-ribbed
28 Outer involucral bracts more or less ovate, imbricate, becoming scarious **65. bourgeaui**
28 Outer involucral bracts linear to lanceolate, neither imbricate nor scarious
29 Leaves conspicuously retrorsely dentate **20. tingitana**
29 Leaves variously divided but not conspicuously retrorsely dentate
30 Beak of achene stout **18. alpestris**
30 Beak of achene slender **66. vesicaria**
19 Cauline leaves, if present, not amplexicaul
31 Achenes 9–18 mm **19. albida**
31 Achenes 5·5–8·5 mm
32 Receptacular pits glabrous
33 Achenes *c.* 10-ribbed **21. leontodontoides**
33 Achenes 15- to 20-ribbed
34 Leaves lyrate-pinnatifid with broad, obtuse lateral segments and a broadly obovate terminal segment; involucre with dense, short, glandular and sometimes eglandular hairs **14. fraasii**
34 Leaves deeply runcinate-pinnatifid or pinnately divided with narrow, acute lateral and terminal segments; involucre canescent-tomentulose (sometimes also with eglandular hairs) **24. lacera**
32 Receptacular pits ciliate
35 Achenes *c.* 10-ribbed
36 Involucre 8–11 × 3–5 mm; leaves lyrate-pinnatifid **70. bursifolia**
36 Involucre 10–13 × 5–9 mm; leaves denticulate to dentate, rarely shallowly lobed
37 Involucral bracts glabrous on inner face **31. triasii**
37 Involucral bracts pubescent on inner face
38 At least some cauline leaves like basal; capitula few to numerous; achenes (2·5–)3–4(–4·5) mm **44. tectorum**
38 Cauline leaves small or bract-like; capitula 1–4; achenes *c.* 5·5 mm **64. spathulata**
35 Achenes 16- to 20-ribbed
39 Involucre without glandular hairs
40 Leaves glabrous or with eglandular hairs, all basal or the cauline bract-like **9. aurea**
40 Leaves sparsely canescent-tomentose and with minute glandular hairs, the cauline well-developed **38. guioliana**
39 Involucre with glandular hairs
41 Leaves with glandular hairs **41. schachtii**
41 Leaves without glandular hairs
42 Branches of inflorescence more or less erect **30. pantocsekii**
42 Branches of inflorescence divaricate **32. albanica**
18 Achenes not distinctly beaked, although often attenuate at apex
43 Involucre with glandular hairs
44 Involucral bracts hairy on inner face
45 Achenes 10- to 12-ribbed
46 Involucre tomentose and with longer eglandular and glandular hairs **44. tectorum**
46 Involucre tomentose and with longer glandular hairs only
47 Involucre 9–16 mm **18. alpestris**
47 Involucre 7–8 mm **59. foliosa**
45 Achenes 13- to 20-ribbed
48 Achenes 9–18 mm **19. albida**
48 Achenes 5–9 mm
49 Branches divaricate
50 Basal leaves 3–8 cm, denticulate to coarsely runcinate-dentate; achenes unequally ribbed **27. auriculifolia**
50 Basal leaves 10–15 cm, deeply and irregularly runcinate-pinnatifid or lyrate; achenes nearly equally ribbed **32. albanica**
49 Branches erect or arcuate-ascending
51 Involucre sometimes tomentose, sometimes with longer eglandular and glandular hairs, but never with dense glandular hairs and no eglandular hairs
52 Involucre 10–20 × 8–20 mm; florets 18–21 mm **16. conyzifolia**

52 Involucre 8–13 × 5–12 mm; florets 12–18 mm **22. biennis**
51 Involucre canescent-tomentose and with dense, longer glandular hairs, without long eglandular hairs
53 Leaves coarsely dentate or shallowly pinnatifid; achenes with every fourth or fifth rib stronger **28. baldaccii**
53 Leaves deeply pinnatifid, with narrow, dentate segments; achenes with ribs nearly equal **30. pantocsekii**
44 Involucral bracts glabrous on inner face
54 Achenes 4- to 12-ribbed
55 Cauline leaves mostly bract-like, not amplexicaul
56 Ligules bluish-purple; receptacle with rigid hairs **45. purpurea**
56 Ligules yellow; receptacle glabrous **52. multicaulis**
55 At least some cauline leaves amplexicaul
57 Achenes 1·4–3·8 mm
58 Involucre 8–10 mm; achenes 2·5–3·8 mm **58. nicaeensis**
58 Involucre 3–9 mm; achenes 1·4–2·5 mm
59 Capitula erect before anthesis; outer involucral bracts 7–9, ⅓–½ as long as inner **60. capillaris**
59 Capitula nodding before anthesis; outer involucral bracts 4–6, smaller **62. neglecta**
57 Achenes (3·5–)4–5·5 mm
60 Some achenes more than 0·75 mm wide, 4- to 10-ribbed **54. dioscoridis**
60 Achenes 0·5–0·75 mm wide, 10- to 15-ribbed
61 Leaves glabrous; achenes 4·5–5·5 mm, 10-ribbed **4. paludosa**
61 Leaves very hairy; achenes 3·5–5·5 mm, 10- to 15-ribbed **12. smyrnaea**
54 Achenes (13–)15- to 35-ribbed or -striate
62 Receptacular pits ciliate
63 Cauline leaves well-developed **11. lampsanoides**
63 Cauline leaves absent or bract-like
64 Involucre 12–14 mm; achenes *c.* 7·5 mm, 18- to 20-ribbed **41. schachtii**
64 Involucre 9–12 mm; achenes 5–6 mm, 15-striate **42. bithynica**
62 Receptacular pits glabrous
65 Involucre 11–13 mm; achenes 5·5–8·5 mm, 25- to 35-striate **3. viscidula**
65 Involucre 8–11 mm; achenes 3–5 mm, up to 20-ribbed
66 Basal and lowest cauline leaves entire to denticulate **13. mollis**
66 Basal and lowest cauline leaves lyrate-pinnatifid
67 Cauline leaves well-developed, amplexicaul **12. smyrnaea**
67 Cauline leaves few and, except the lowermost, bract-like, not amplexicaul **14. fraasii**
43 Involucre without glandular hairs
68 Involucral bracts pubescent on inner face
69 Achenes 2–4 mm **44. tectorum**
69 Achenes more than 4 mm
70 Receptacular pits glabrous
71 Achenes 4·5–6 mm; ligules entirely yellow **24. lacera**
71 Achenes 7–9·5 mm; ligules yellow with red stripe on outer face **34. oporinoides**
70 Receptacular pits ciliate
72 Achenes 9–18 mm
73 Cauline leaves wide; all involucral bracts linear-lanceolate **15. bocconi**
73 Cauline leaves lanceolate or bract-like; outer involucral bracts lanceolate or ovate-lanceolate, wider than inner **19. albida**
72 Achenes 4–7·5 mm
74 Involucre 14–16 mm **10. chrysantha**
74 Involucre less than 14 mm
75 Outer involucral bracts not more than ⅓ as long as inner
76 Involucre 9–10 mm, densely canescent-tomentose **35. sibthorpiana**
76 Involucre 10–13 mm, glabrous or sparsely pubescent **46. reuterana**
75 Outer involucral bracts at least ½ as long as inner
77 Achenes 3- to 5-striate **27. auriculifolia**
77 Achenes 10- to 20-ribbed or -striate
78 Plant not more than 10 cm
79 Involucre with long, yellowish eglandular hairs **8. rhaetica**
79 Involucre canescent-tomentulose **33. macedonica**
78 Plant at least 15 cm
80 Leaves (15–)30–75 mm wide **22. biennis**
80 Leaves not more than 30 mm wide
81 Achenes *c.* 7 mm **38. guioliana**
81 Achenes 4–5·5 mm
82 Involucre canescent-tomentose to densely white-lanate; outer bracts 6–8 **29. turcica**
82 Involucre canescent-tomentulose; outer bracts 10–12 **40. athoa**
68 Involucral bracts glabrous on inner face
83 Receptacle naked; receptacular pits glabrous
84 Cauline leaves ±amplexicaul or auriculate-amplexicaul
85 Involucre 4–9 mm; achenes 1·4–2·5 mm
86 Involucre sometimes with glandular hairs, but not rigid eglandular hairs; outer bracts 7–9 **60. capillaris**
86 Involucre usually with rigid eglandular hairs; outer bracts 5 **61. micrantha**
85 Involucre 8–13 mm; achenes 3·5–6·5 mm
87 Involucre glabrous **47. pulchra**
87 Involucre hairy
88 Achenes *c.* 30-striate **2. geracioides**
88 Achenes 4- to 10-ribbed **54. dioscoridis**
84 Cauline leaves not amplexicaul, often bract-like, sometimes absent
89 Leaves 2–4 mm wide **39. crocifolia**
89 At least some leaves more than 4 mm wide
90 Plant up to 20(–25) cm
91 Plant 2–6 cm; capitulum solitary; achenes 1–1·25 mm wide **6. terglouensis**
91 Plant 5–20(–25) cm; capitula 1–6; achenes 0·75–1 mm wide **7. jacquinii**
90 Plant usually more than 25 cm
92 Achenes *c.* 10-ribbed **48. stojanovii**
92 Achenes 16- to 20-ribbed or -striate
93 Leaves runcinate-pinnatifid to 2-pinnatifid; involucral bracts pubescent on inner face **24. lacera**
93 Leaves entire to repand-dentate; involucral bracts glabrous on inner face **43. praemorsa**
83 Receptacle with scales or rigid hairs, or receptacular pits ciliate
94 Achenes 4- to 10-ribbed
95 Cauline leaves not amplexicaul, often bract-like
96 Receptacle without scales or rigid hairs; ligules yellow with reddish-purple stripe on outer face **37. taygetica**
96 Receptacle with rigid hairs; ligules bluish-purple **45. purpurea**
95 Cauline leaves amplexicaul
97 Ligules purplish-pink; achenes 5–6 mm **36. incana**
97 Ligules yellow, usually with reddish stripe on outer face; achenes 2·5–5 mm
98 Achenes 3·5–5 × 0·5–2 mm, 4- to 10-ribbed **54. dioscoridis**
98 Achenes 2·5–3·8 × *c.* 0·6 mm, 10-ribbed
99 Involucre 8–10 mm; outer bracts 7–9 **58. nicaeensis**
99 Involucre 3–7 mm; outer bracts 4–6 **62. neglecta**
94 Achenes 14- to 25-ribbed or -striate
100 Not more than 30 cm, with peduncles about as long as stem or stem simple; leaves not amplexicaul
101 Involucre 10–19 mm; achenes 4–9 mm, 20- to 25-ribbed **5. pygmaea**
101 Involucre 7–13 mm; achenes 5–6 mm, 15- or 16-ribbed
102 Involucral bracts obtuse **9. aurea**
102 Involucral bracts acuminate **33. macedonica**
100 Up to 150 cm, with long stems and comparatively short peduncles; leaves amplexicaul
103 Achenes 6–11 mm; plant rhizomatous **1. sibirica**
103 Achenes 5–8 mm; plant not rhizomatous
104 Involucral bracts with a median line of long eglandular hairs **17. pyrenaica**
104 Involucral bracts ±tomentose, without longer hairs **23. pannonica**

Sect. HAPALOSTEPHIUM (D. Don) Froelich. Rhizomatous, usually pubescent perennials. Stems robust, with few branches mostly above the middle. Lower leaves large, petiolate, the upper becoming gradually smaller. Capitula with many florets. Ligules yellow. Receptacle with glabrous or shortly ciliate pits.

1. C. sibirica L., *Sp. Pl.* 807 (1753). Stems 30–150 cm. Leaves more or less hairy especially on the veins beneath; basal fugacious; cauline 10–40 × 4–9 cm, ovate, oblong or lanceolate, more or less acute, sinuate-dentate; lower cauline with long, winged, dentate petioles; upper cauline sessile and amplexicaul. Capitula 1–6; peduncles stout, straight or arcuate. Involucre 13–20 × 10–25 mm; bracts linear-lanceolate, more or less acute, glabrous or with long, eglandular hairs especially in the middle, the outermost not more than ⅔ as long as inner. Achenes 6–11 × 1–1·3 mm, fusiform, straight or curved, brown, more or less attenuate at the apex, *c.* 20-ribbed. $2n=10$. *Scrub and open woods. U.S.S.R.; C. Romania; E. Czechoslovakia.* Cz ?Po Rm Rs (N, C, W, E).

2. C. geracioides Hausskn., *Mitt. Thür. Bot. Ver.* nov. ser., **7**: 52 (1895). Stems 35–75 cm. Basal leaves up to 24 × 6 cm, obovate to oblanceolate, obtuse to acute, deeply runcinate-pinnatifid or sublyrate, gradually attenuate into a narrowly winged petiole, shortly hairy on the margin and veins, glabrescent; lower cauline leaves like the basal but more or less amplexicaul; upper cauline lanceolate or linear and entire, or bract-like. Capitula 1–4; peduncles very long, stout, erect. Involucre 11–13 × 5–10 mm; bracts narrowly linear-lanceolate, acute, with numerous eglandular hairs, the outermost not more than ¾ as long as the inner. Achenes 5·5–6·5 × 1 mm, pale brown, fusiform, the marginal strongly curved near the base, the inner nearly straight, *c.* 30-striate. $2n=12$. *Damp places.* ● *Mountains of Albania and N. Greece.* Al Gr.

3. C. viscidula Froelich in DC., *Prodr.* **7**: 166 (1838). Stems 25–60 cm. Leaves glabrous or glabrescent; basal up to 17 × 5 cm, elliptical, coarsely and retrorsely dentate or lyrate, fugacious; cauline oblanceolate, lanceolate or ovate, acuminate, very sharply dentate or denticulate, sessile, amplexicaul. Capitula 1–5 in a corymb; peduncles stout, erect. Involucre 11–13 × *c.* 8 mm; bracts linear to linear-lanceolate, acute, the outermost very unequal, not more than ½ as long as inner, with numerous, unequal, glandular hairs. Achenes 5·5–8·5 × 0·7–1 mm, brown, fusiform, straight or slightly curved, 25- to 35-striate. $2n=12$. *Meadows and open woods,* 1100–2300 *m.* ● *Mountains of Romania and C. part of Balkan peninsula.* Al Bu Ju Rm.

4. C. paludosa (L.) Moench, *Meth.* 535 (1794). Stems 25–100 cm. Leaves dark green, glabrous; basal 8–28 × 3–5 cm, oblanceolate, subacute, sinuate-dentate or denticulate, narrowed to a winged petiole, fugacious; lower cauline like the basal or sessile; middle cauline lanceolate to ovate or panduriform, acute or acuminate, sessile, rounded-auriculate, amplexicaul; uppermost linear and bract-like. Capitula up to 25, in lax corymbs or compound corymbs; peduncles long, rather slender and usually arcuate. Involucre 9–12 × 3–10 mm; bracts linear or linear-lanceolate, acute, the outer not more than ⅓ as long as inner, usually with unequal glandular hairs. Achenes 4·5–5·5 × 0·75 mm, pale yellow, cylindrical, 10-ribbed; pappus pale yellowish, brittle. $2n=12$. *Damp or shady places. N. & C. Europe, extending southwards to N. Spain, S. Italy, S. Bulgaria and S.C. Russia.* Au Be Br Bu Cz Da Fe Ga Ge Hb He Ho Hs Hu Is It Ju No Po Rm Rs (N, B, C, W) Su.

Sect. OMALOCLINE (Cass.) Babcock. Small, rhizomatous, mat-forming, tomentose perennials with slender stems. Leaves rather small and long-petiolate, the upper only slightly smaller. Capitula with many florets. Ligules yellow, often reddish-purple on outer face. Receptacle with shortly ciliate pits.

5. C. pygmaea L., *Sp. Pl.* 805 (1753). Stems 4–20 cm. Leaves more or less tomentose; basal 3–11 × 1–3 cm, lyrate-pinnatifid, with a large, elliptical, orbicular to ovate terminal lobe and 2–4 remote lateral lobes; terminal lobe sinuately denticulate or subentire; lateral lobes sometimes absent, making the leaf simple and spathulate; petiole narrowly winged, 1–3 times as long as the terminal lobe; cauline smaller. Capitula up to 8; peduncles long, erect or arcuate, arising from the axils of cauline leaves or from near the base of the stem. Involucral bracts linear-lanceolate; outer up to ½ as long as inner, tomentose and often with longer pubescence. Marginal ligules often reddish-purple on outer face. Achenes cylindrical or ellipsoid. *Calcareous screes.* ● *Mountains of S.W. Europe, S. Alps, S. Appennini.* Ga He Hs It.

(a) Subsp. **pygmaea**: Involucre 10–15 mm. Achenes 4–6·5 mm, 20- to 25-ribbed, the ribs nearly equal; pappus 7–8 mm. $2n=12$. *Throughout the range of the species except Sierra de Mágina.*

(b) Subsp. **anachoretica** Babcock, *Univ. Calif. Publ. Bot.* **22**: 245 (1947): Involucre 16–19 mm. Achenes *c.* 9 mm, 20-ribbed, the ribs alternately wide and narrow; pappus *c.* 10 mm. 1800–2050 *m. S. Spain (Sierra de Mágina).*

Sect. SUCCISOCREPIS Schultz Bip. ex Bischoff. More or less pubescent perennials with a short, praemorse rhizome; stem branched or simple. Leaves pinnatifid or dentate, petiolate, the upper gradually or abruptly reduced in size. Capitula solitary or few, with many florets. Ligules usually yellow. Receptacle with glabrous or hairy pits.

6. C. terglouensis (Hacq.) A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **1**: 61 (1881). Stems 2–6 cm. Leaves glabrous or sparsely hairy; basal 2–7 × 0·6–1·5 cm, oblanceolate, runcinately dentate to pinnatifid, the lobes triangular to semicircular; cauline few, like basal or linear and entire, crowded. Capitulum solitary. Involucre 7–15(–20) × 4–15(–20) mm; bracts linear-lanceolate, acute or acuminate, the outer ½–¾ as long as inner, with numerous, dark, simple eglandular hairs. Achenes 3·5–5 × 1–1·25 mm, yellow, cylindrical or narrowly obovoid, truncate at both ends, 10- to 13-ribbed. $2n=12$. *Screes,* 1800–2800 *m*; *calcicole.* ● *C. & E. Alps.* Au Ge He It.

Very similar in appearance to *Leontodon montanus.*

7. C. jacquinii Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 79 (1828). Stems 5–20(–25) cm. Leaves glabrous or sparsely hairy; basal 3–15 × 0·2–1·7 cm, oblanceolate to linear, entire to pinna-

tifid; cauline like basal, distant. Capitula 1–6. Outer involucral bracts unequal, ½–⅔ as long as inner. Achenes 4–5 × 0·75–1 mm, light brown or yellowish, fusiform, slightly attenuate at both ends, 10- to 15(–20)-ribbed. *Calcicole.* ● *E. Alps, Carpathians and mountains of N.W. part of Balkan peninsula.* Al Au Cz Ge He It Ju Po Rm.

(a) Subsp. **jacquinii**: Similar in appearance to *Leontodon montanus* subsp. *pseudotaraxaci*. Stems (6–)12–20(–25) cm. Leaves mostly oblanceolate to lanceolate, denticulate to runcinate-pinnatifid, with narrow, often remote lobes. Capitula (1–)2–6. Involucre 8–12 × 4–10 mm; bracts linear-lanceolate, gradually acute, with more or less numerous stellate and simple eglandular hairs. *N.E. Alps; Carpathians.*

(b) Subsp. **kerneri** (Rech. fil.) Merxm., *Jahrb. Ver. Schutze Alpenpfl.* **17**: 102 (1952) (*C. kerneri* Rech. fil., *C. jacquinii* sensu Hayek, non Tausch): Stem 5–15(–20) cm. Leaves mostly linear to linear-lanceolate, entire to runcinate-dentate with narrow, remote teeth. Capitula 1–2(–3). Involucre 10–14 × 6–12 mm; bracts linear-oblong, obtuse to abruptly acute, with numerous stellate and dark, long, simple eglandular hairs. 1500–1800 *m. E. Alps and mountains of N.W. part of Balkan peninsula.*

8. C. rhaetica Hegetschw., *Fl. Schweiz* 769 (1840) (*C. jubata* Koch). Stems 2–9 cm. Leaves more or less hairy; basal 2–5 × 0·5–1 cm, few, congested, oblanceolate, obtuse, entire or slightly dentate, narrowed to a short, winged petiole; cauline 1–2, linear-lanceolate, subacute, sessile. Capitulum solitary. Involucre 11–13 × 9–12 mm; bracts oblong or linear-lanceolate, the outer ½–⅔ as long as inner, with numerous, long, yellowish, simple eglandular hairs, pubescent on inner face. Achenes 6–8 × 0·7 mm, brown, cylindrical but gradually attenuate upwards, 18- to 20-ribbed. Pappus greyish or yellowish-white. *Calcareous debris and rock crevices above 1950 m.* ● *Alps, from 7° E. to 11° 30′ E.* Au Ga He It.

Very similar in appearance to some alpine species of *Hieracium.*

9. C. aurea (L.) Cass., *Dict. Sci. Nat.* **25**: 88 (1822). Stems 1–8, 2–30 cm, not or scarcely branched. Basal leaves 1–10 × 0·3–3 cm, obovate to oblanceolate, dentate to pinnatifid, glabrous or sparsely hairy; without cauline leaves. Involucral bracts linear-lanceolate, obtuse, the outer ⅓–½ as long as inner. Ligules yellow or orange, with a reddish or reddish-purple outer face. Achenes 5–6 mm, pale brown, fusiform, rather strongly attenuate at apex, *c.* 16-ribbed. *Meadows and pastures.* ● *Alps, and mountains of Italy and S. & W. parts of Balkan peninsula.* Al Au Ga Ge Gr He It Ju.

A very variable species, the following two subspecies being connected by many intermediates.

(a) Subsp. **aurea**: Stems 10–30 cm. Involucre 10–13 mm. Florets *c.* 16 mm. $2n=10$. *Alps, and mountains of Jugoslavia.*

(b) Subsp. **glabrescens** (Caruel) Arcangeli, *Comp. Fl. Ital.* 432 (1882) (*C. columnae* (Ten.) Froelich): Stems 2–16 cm. Involucre 7–9 mm. Florets *c.* 11 mm. $2n=10$. *Alpi Apuane and Appennini; S. & W. parts of Balkan peninsula.*

10. C. chrysantha (Ledeb.) Turcz., *Bull. Soc. Nat. Moscou* **11**: 96 (1838). Stems 1–3, 8–20 cm. Leaves more or less white-tomentulose; basal up to 9 × 2 cm, oblanceolate, obtuse to acute, sinuate-dentate or denticulate, gradually attenuate into the narrow petiole; cauline 1–3, like the basal or bract-like. Capitula 1–3. Involucre 14–16 mm; bracts linear-lanceolate, acute, the outer *c.* ¾ as long as inner, with numerous, dark green, eglandular hairs, pubescent on inner face. Achenes 5–7(–9·5) mm, reddish-brown or dark purple, fusiform, usually more attenuate at apex than base, 15-ribbed. $2n=8$. *Meadows and streamsides. Ural, southwards to* 54° 30′. Rs (N, C). (*N. & C. Asia.*)

Sect. HIERACIOIDES Froelich. Rhizomatous, pubescent perennials with robust to slender stems, with few branches mostly above the middle. Leaves petiolate, lyrate-pinnatifid or entire. Capitula with many florets. Ligules yellow. Receptacle with glabrous or ciliate pits.

11. C. lampsanoides (Gouan) Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 80 (1828). Stems 30–90 cm, branched above. Leaves with yellow eglandular hairs; basal up to 12 × 3 cm, fugacious, oblanceolate, lyrate, with an ovate, denticulate to dentate terminal segment nearly ½ as long as whole leaf, and 2–4 small opposite pairs of lateral segments; lower cauline similar, middle and upper sublyrate or panduriform to ovate or lanceolate. Capitula 2–12. Involucre 9–11 × 6–10 mm; bracts linear-lanceolate, long-acute, the outer ⅓–½ as long as inner, with numerous, unequal glandular hairs. Achenes 5–6 × 0·5–0·8 mm, brown, cylindrical, *c.* 20-ribbed. $2n=12$. *Damp places.* ● *Mountains of S.W. Europe, from N. Portugal to S.C. France.* Ga Hs Lu.

12. C. smyrnaea DC. ex Froelich in DC., *Prodr.* **7**: 170 (1838) (*C. murmanni* Boiss.). Like **11** but stems 20–60 cm; leaves up to 25 × 6 cm, the terminal segment ¼–½ as long as whole leaf; outer involucral bracts ¼–⅓ as long as inner; achenes 3·8–4·5 × 0·5–0·6 mm, fusiform, 10- to 15-ribbed. *Woods and scrub. Turkey-in-Europe; one station in S. Greece.* Gr Tu.

13. C. mollis (Jacq.) Ascherson, *Fl. Brandenb.* **1**: 385 (1864) (*C. succisifolia* (All.) Tausch). Stems 30–75(–90) cm. Leaves more or less pubescent with yellow eglandular hairs, or glabrous; basal 4–27 × 1·5–5 cm, elliptical to oblanceolate, obtuse to acute, entire or denticulate, more or less attenuate into a long or short winged petiole; lower cauline like the basal or sessile, remainder lanceolate, semiamplexicaul or bract-like. Capitula several, in corymbs. Involucre 8–10(–12) × 5–6 mm; bracts linear to linear-lanceolate, acute, the outer ½–½ as long as inner, with more or less numerous, unequal, black, yellow or brown glandular hairs. Achenes 3–4·5 × 0·5–0·7 mm, reddish-brown, fusiform, the marginal curved, the inner straight, all gradually attenuate at base and apex, *c.* 20-ribbed. $2n=12$. *Damp or shady places. C. & S.E. Europe, extending locally westwards to Scotland and E. Pyrenees and north-eastwards to Estonia.* Al Au Br Bu Cz Ga Ge He Hs†Hu It Ju Po Rm Rs (B, C, W).

Very variable in hairiness of stem, leaves and involucre, robustness of stem and leaves and the exact colour of the florets. In C. Europe the plants of higher altitudes are said to be more robust, have firmer stems and leaves, and blackish hairs, whereas those from lower altitudes are more slender and have thinner leaves and paler hairs, but if the whole range of the species is considered the variation does not fit into any significant pattern.

14. C. fraasii Schultz Bip., *Flora* (*Regensb.*) **25**: 173 (1842). Stems 6–35 cm. Leaves with glandular or eglandular hairs; basal 3–22 × 0·8–5·2 cm, oblanceolate, lyrate-pinnatifid, the terminal segment broadly ovate and remotely denticulate, the lateral segments broad, obtuse, close or remote; lower cauline like the basal or lanceolate and dentate; upper cauline bract-like. Capitula few to many in a compound or irregular corymb. Involucre 9–10 × 4–5 mm; bracts linear-lanceolate, acute, the outer ¼–½ as long as inner, with numerous, short glandular and sometimes some longer eglandular hairs. Achenes 3–5 mm, dark brown, fusiform, more or less curved, 15- to 20-ribbed. *Mountain rocks up to* 2300 *m. Greece, Kriti, Karpathos.* Cr Gr.

(a) Subsp. **fraasii** (*C. montana* D'Urv., non Bernh.): Capitula with *c.* 25 florets. Ligules yellow, with very unequal teeth. Achenes 3·75–5 mm, with smooth ribs. $2n=12$. *Greece, Karpathos.*

(b) Subsp. **mungieri** (Boiss. & Heldr.) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 250 (1976) (*C. mungieri* Boiss. & Heldr.): Capitula with 35–50 florets. Ligules yellow, red on the outer face, with subequal teeth. Achenes 3–3·75 mm, with acutely tuberculate ribs. $2n=12$. ● *Kriti, Karpathos.*

Sect. SOYERIA (Monnier) Bentham. More or less pubescent perennials, with long, woody tap-roots and stout, sometimes branched stems. Leaves entire to pinnatifid, petiolate, the upper gradually reduced in size. Capitula with many florets. Ligules yellow. Receptacle with ciliate pits.

15. C. bocconi P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 250 (1976) (*C. montana* (L.) Tausch, non Bernh., *C. pontana* auct.). Stems 15–60 cm. Leaves glabrous except for short eglandular hairs on the margins and veins beneath; basal 4–12 × 1·5–3 cm, oblanceolate, obtuse to acute, sinuately or retrorsely denticulate, narrowed at base to a short, broadly winged petiole; lower cauline like the basal; upper cauline remote, lanceolate, acuminate, entire and amplexicaul, or bract-like. Capitula 1(–2). Involucre 18–20 × 18–25 mm; bracts linear-lanceolate, obtuse to acute, the outer ⅔–¾ as long as inner, with numerous, unequal, green or yellowish eglandular hairs, pubescent on inner face. Achenes 10–12 × 1·5–2 mm, yellowish-brown, cylindrical but strongly attenuate to the narrow apex, *c.* 17-ribbed, with 5 or 6 ribs more prominent than the remainder. $2n=10$. *Alpine and subalpine meadows, stony slopes and woods.* ● *Alps; mountains of C. & S.W. Jugoslavia.* Au Ga Ge He It Ju.

16. C. conyzifolia (Gouan) A. Kerner, *Österr. Bot. Zeitschr.* **22**: 255 (1872) (*C. grandiflora* (All.) Tausch, *C. balcanica* Velen., *C. trojanensis* Urum.). Stems 12–50 cm, usually branched above. Leaves with short, pale eglandular hairs, sometimes more or less glandular-hairy, rarely glabrescent; basal 5–30 × 1–4(–5) cm, oblanceolate, acute or obtuse, runcinately denticulate to pinnatifid, rarely pinnatisect, narrowed at base to broadly winged petioles; lower cauline oblanceolate to lanceolate, dentate or denticulate, broadly petiolate or sessile; upper cauline oblong or lanceolate, amplexicaul, sagittate-auriculate, or bract-like. Capitula 1–10. Involucre 10–20 × 8–20 mm; bracts lanceolate to linear-lanceolate, obtuse to acute, the outer unequal, *c.* ½ as long as inner, with greenish or yellowish eglandular hairs intermixed with shorter glandular hairs, sometimes more or less tomentose, rarely glabrescent, usually pubescent on inner face. Achenes 5–9 × 1–1·25 mm, yellowish-brown, fusiform, nearly equally attenuate at both ends, 15- to 20-ribbed. $2n=8$. *Meadows and pastures, calcifuge. Mountains of Europe, from S.C. France and the Carpathians southwards to the Pyrenees and S.W. Bulgaria.* Al Au Bu Cz Ga Ge He Hs It Ju Po Rm Rs (W).

A very variable species, especially in degree of dissection of leaves and nature of the indumentum. Many segregate taxa have been described, some at specific rank.

17. C. pyrenaica (L.) W. Greuter, *Exsicc. Genav.* **1**: 15 (1970) (*C. blattarioides* (L.) Vill.). Stems 4–70 cm, branched above. Leaves with pale eglandular hairs; basal 5–17 × 1–2·5 cm, few, fugacious, oblanceolate, acute, denticulate or dentate, narrowed into a winged petiole; lower cauline like the basal or oblong; upper cauline lanceolate to ovate, denticulate or dentate, sessile and amplexicaul. Capitula 1–6. Involucre 12–18 × 10–18 mm; bracts linear-lanceolate, acute to obtuse, the outer nearly equalling inner, with a median line of long, green, black or yellowish, rigid eglandular hairs. Achenes 6–8 × *c.* 1 mm, yellowish-brown, fusiform, equally attenuate at both ends, *c.* 20-ribbed. $2n=8$. *Mountains,* 700–2200 *m; usually calcicole.* ● *Alps and N. Appennini; Pyrenees; mountains of N. & E. Spain and S. & E. France.* Au Ga Ge He Hs It Ju.

18. C. alpestris (Jacq.) Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 79 (1828). Stems 10–35 cm, usually simple. Leaves with short yellow glandular or eglandular hairs and sparsely tomentulose, or glabrescent; basal 3–12 × 0·7–2 cm, oblanceolate, obtuse to acute, denticulate to runcinate-pinnatifid or pinnately divided, with terminal segment narrowly lanceolate, narrowed into a winged petiole; cauline like the basal or lanceolate, sessile, more or less amplexicaul. Capitula 1(–6). Involucre (9–)12–15(–16) × 7–15 mm; bracts linear-lanceolate, usually obtuse, the outer ⅓–¾ as long as inner, greyish- or yellowish-tomentose and with short, black or green glandular hairs, pubescent on inner face. Achenes 7–10 mm, pale brown, fusiform, strongly attenuate above, rarely coarsely and shortly beaked, 10- to 12-ribbed. $2n=8$. 500–2650 *m; usually calcicole. From the Jura and Carpathians to the mountains of N. Italy and Albania.* Al Au Cz Ga Ge He It Ju Rm.

Hybrids of **18** with **17** and with **16** have been recorded from C. Europe.

Sect. PALEYA (Cass.) Bentham. Pubescent perennials with long woody taproots. Basal leaves denticulate to pinnatifid, petiolate, the upper few, more or less reduced. Capitula with many florets. Ligules yellow. Receptacle with ciliate pits.

19. C. albida Vill., *Prosp. Pl. Dauph.* 37 (1779). Stems 1–3, 3–55(–70) cm, simple or with 1–3 long branches. Basal leaves 5–28 × 1·5–8 cm, numerous, oblanceolate, lanceolate or narrowly elliptical, narrowed into a winged petiole; cauline few, lanceolate to linear, sessile. Capitula 1–4. Involucre 10–20 × 10–20 mm; bracts tomentose, or with short yellowish, glandular hairs, or glabrous, pubescent on the inner face towards apex with whitish or yellowish, silky, appressed hairs, the outer in 2 or 3 imbricate rows and ½–¾(–⅞) as long as inner. Achenes 9–18 mm, pale yellowish to brown, fusiform, more or less attenuate to the slightly swollen apex, *c.* 15-ribbed. *Rock-crevices and cliffs; usually calcicole. S.W. Europe.* Ga Hs It.

The following subspecies are sometimes very distinct, but they are all connected by intermediates.

1 Stems (15–)35–55(–70) cm, branched
2 Involucre *c.* 10 mm wide at middle; inner bracts *c.* 15 mm; achenes reddish-brown (e) subsp. **macrocephala**
2 Involucre 12–18 mm wide at middle; inner bracts 16–22 mm; achenes yellowish or yellowish-brown (f) subsp. **longicaulis**
1 Stems 3–30(–40) cm, usually simple
3 Leaves obscurely petiolate, elliptical, obovate or oblanceolate, usually with thick tomentum on both surfaces, without simple or glandular hairs, rarely glabrous
simple or glandular hairs, rarely glabrous (d) subsp. **scorzoneroides**
3 Leaves obviously petiolate, oblanceolate to lanceolate, ± glandular-hairy, often tomentulose, sometimes stellate-hairy, rarely glabrous
4 Outer involucral bracts lanceolate; inner bracts acuminate or filamentous at apex (c) subsp. **grosii**
4 Outer involucral bracts ovate, ovate-lanceolate or lanceolate; inner bracts obtuse, acute or acuminate
5 Anther-tube 4–5 mm; appendages 0·5 mm; plant not suffrutescent (a) subsp. **albida**
5 Anther-tube (4–)5–6 mm; appendages 1 mm; plant suffrutescent (b) subsp. **asturica**

(a) Subsp. **albida**: Stems 3–30(–40) cm, simple or with one branch; plant more or less tomentose, glandular-hispidulous or glabrous. Basal leaves oblanceolate or lanceolate, denticulate to pinnatisect. Outer involucral bracts ovate, ovate-lanceolate or lanceolate, the inner lanceolate or linear-lanceolate, obtuse, acute or rarely acuminate. Anther-tube 4–5 mm; appendages 0·5 mm. $2n=10$. *Throughout the range of the species.*

(b) Subsp. **asturica** (Lacaita & Pau) Babcock, *Univ. Calif. Publ. Bot.* **19**: 399 (1941): Stems 15–30 cm, simple or with up to 3 branches, suffrutescent; plant glabrous or sparsely tomentose. Basal leaves narrowly oblanceolate, denticulate to sinuate-lobed or pinnatisect. Outer involucral bracts ovate to lanceolate, the inner linear-lanceolate, obtuse. Anther-tube (4–)5–6 mm; appendages 1 mm. $2n=10$. ● *N.W. Spain (Cordillera Cantábrica).*

(c) Subsp. **grosii** (Pau) Babcock, *op. cit.* **22**: 311 (1947): Stems (7–)15–30(–40) cm, simple or with 1–2 branches; plant with dense simple eglandular hairs, sometimes also or only with fine glandular hairs, or tomentose, or glabrous. Basal leaves oblanceolate to lanceolate, pinnatisect to lobed. Outer involucral bracts lanceolate, the inner linear-lanceolate, acuminate or filamentous at apex. Anther-tube (4–)5 mm; appendages 0·5–0·75 mm. ● *S. & S.E. Spain.*

(d) Subsp. **scorzoneroides** (Rouy) Babcock, *op. cit.* 315 (1947): Stems 12–30(–45) cm, simple or with 1–6 branches, usually tomentose throughout, rarely nearly glabrous. Basal leaves elliptical, obovate or oblanceolate, irregularly denticulate to coarsely dentate or runcinately lobed. Outer involucral bracts broadly ovate to ovate-lanceolate, the inner linear-lanceolate, acute. Anther-tube (4–)6 mm; appendages 0·6 mm. ● *S. & E. Spain.*

(e) Subsp. **macrocephala** (Willk.) Babcock, *op. cit.* **19**: 399 (1941) (*C. albida* var. *major* Willk.): Stems (15–)25–70 cm, simple or with 1–6 branches; plant more or less tomentulose, sometimes also or only with simple hairs, with or without glandular hairs, rarely glabrous. Basal leaves oblanceolate, denticulate, sinuately or runcinately dentate, or 1- to 2-pinnatifid. Outer involucral bracts ovate, the inner linear-lanceolate, acute to acuminate. Anther-tube (4·5–)6 mm; appendages 0·65–0·85 mm. $2n=10$. ● *N.E. Spain.*

(f) Subsp. **longicaulis** Babcock, *op. cit.* **22**: 317 (1947): Stems 25–57 cm, with 1–4 branches, with glandular or simple eglandular hairs and sparsely tomentulose. Basal leaves oblanceolate to lanceolate, denticulate, irregularly runcinate-dentate or lobed. Outer involucral bracts ovate to ovate-lanceolate, the inner linear-lanceolate, acuminate or acute. Anther-tube (5–)6 mm; appendages *c.* 0·75 mm. ● *C. & S.E. Spain.*

Sect. GEPHYROIDES Babcock. Glabrous or pubescent perennials or biennials with taproots; stems with few branches. Lower leaves petiolate, denticulate to dentate or subpinnatifid. Capitula with many florets. Ligules yellow, sometimes reddish-purple on outer face. Receptacle with glabrous or ciliate pits.

20. C. tingitana Ball, *Jour. Linn. Soc. London (Bot.)* **16**: 537 (1878). Perennial; stems 15–45 cm, simple or branched above. Leaves glabrous or rarely with eglandular hairs above; basal up to 9 × 4 cm, spathulate, elliptical, obovate to oblanceolate, obtuse, conspicuously retrorsely dentate, abruptly contracted into a long, slender petiole; cauline oblanceolate to lanceolate, acute, more or less dentate, mostly sessile, auriculate, amplexicaul. Capitula 1–10. Involucre 11–13 × 5–6 mm; bracts linear-lanceolate, obtuse, the outer ½–½ as long as inner, canescent-tomentulose and with simple eglandular hairs. Achenes 5–8 × 0·5–0·8 mm, very dark reddish-brown, fusiform, strongly attenuate above or coarsely beaked, 10-ribbed. $2n=10$. *S. Spain.* Hs.

21. C. leontodontoides All., *Auct. Fl. Pedem.* 13 (1789). Perennial or biennial. Stems 1–8, 10–40 cm, remotely branched. Leaves glabrous, or slightly canescent-tomentose, or with eglandular hairs especially along the veins; basal 3–25 × 0·5–5·5 cm, oblanceolate, acute to obtuse, runcinately dentate or runcinate-pinnatifid, narrowed into a petiole; cauline all much reduced or bract-like, or the lower like the basal. Involucre 7–8 × 2·5–6 mm; bracts linear-lanceolate, obtuse, the outer ⅓–¼ as long as inner, slightly tomentose or glabrous, sometimes glandular-hairy (var. *preslii* Nicotra). Ligules sometimes reddish-purple on outer face. Achenes 3·5–5 × 0·4–0·6 mm, brown, fusiform, sometimes beaked, 10-ribbed. $2n=10$. *Dry places.* ● *C. Mediterranean region.* Al Co Ga It *Ju Sa Si.

23. C. pannonica (Jacq.) C. Koch, *Linnaea* **23**: 689 (1851). Perennial; stems 13–130 cm, branched above the middle. Leaves with sparse to numerous eglandular hairs and more or less numerous glandular hairs; basal 15–30 × 4–6 cm, oblanceolate to elliptical, acute, dentate, narrowed into a long, winged petiole; lower cauline like the basal; middle and upper cauline obovate, elliptical, ovate or lanceolate, acute to acuminate, dentate, sessile, amplexicaul, with rounded or acute auricles, gradually reduced in size. Capitula more or less numerous, in a simple or compound corymb. Involucre 10–15 × 6–12 mm; bracts linear-lanceolate to lanceolate, obtuse to acute, the outer up to ½ as long as inner, more or less tomentulose or canescent-tomentose. Achenes 5–6 × 0·9–1·1 mm, brown, fusiform, attenuate to the narrow apex, 15- to 20-ribbed. $2n=8$. *Dry places. E. & E.C. Europe, northwards to C. Czechoslovakia and to c.* 54° *N. in C. Russia.* Au Bu Cz Hu Ju Rm Rs (C, W, K, E).

24. C. lacera Ten., *Fl. Nap.* **1**, *Prodr.*: 71 (1811) (*C. latialis* Sebastiani). Perennial; stems 20–60 cm, branched at or above the middle. Leaves slightly tomentulose or with a few eglandular hairs; basal up to 20 × 8 cm, obovate to elliptical, acute, runcinate-pinnatifid to pinnatisect or 2-pinnatifid, rarely subentire, the terminal lobe rhombic or triangular to linear-acuminate, the lateral lobes lanceolate to linear, entire to pinnately lobed, gradually reduced towards the apex and base; lower cauline like the basal; upper cauline sessile, pinnatifid and caudate-acuminate or linear and entire. Capitula many. Involucre 8–11 × 5–10 mm;

bracts linear to linear-lanceolate, acute or obtuse, the outer ⅓–⅔ as long as inner, canescent-tomentose, sometimes with short, black, eglandular hairs, pubescent on inner face. Achenes 4·5–6 × 0·9–1·3 mm, dark reddish- or purplish-brown, fusiform, strongly attenuate at apex, sometimes with a short coarse beak, (16–)18 (–20)-ribbed. $2n=18$. *Dry, rocky places; calcicole.* ● *C. & S. Italy.* It.

25. C. bertiscea Ják., *Magyar Bot. Lapok* **21**: 21 (1922). Perennial; stems 50–60 cm, branched from about the middle. Leaves tomentulose on the midrib beneath, glabrous elsewhere; basal oblong, acute, lyrate-runcinate, sinuate-dentate, with narrowly oblong or linear teeth; lower cauline 15–19 × 3–6 cm, elliptical, acute, sublyrate-pinnatifid, the terminal part incompletely segmented and acuminately dentate, the lateral segments numerous, close together, linear-lanceolate, acuminate, denticulate or entire, steadily decreasing in length at apex and base of leaf; upper cauline linear, acuminate, entire, sessile, amplexicaul. Involucre 10–12 × 7–9 mm; bracts linear-lanceolate, acute, the outer *c.* ½ as long as inner, canescent-tomentulose. Achenes 5·5–7·5 × 0·8 mm, dark brown, oblong or fusiform, attenuate into a short beak, 13- to 18-ribbed. *Calcareous screes.* ● *N. Albania (N.W. of Tropojë).* Al.

26. C. chondrilloides Jacq,. *Enum. Stirp. Vindob.* 312 (1762). Perennial; stems 15–55 cm, with a few branches from the middle or below. Leaves glabrous or with simple eglandular or glandular hairs; basal 6–16 × 1·5–5 cm, numerous and forming a dense rosette, oblanceolate, pinnatisect into very numerous, more or less narrowly linear, entire or 1-toothed segments; lower cauline like the basal; upper cauline reduced to the narrow rhachis or bract-like. Capitula few. Involucre 11–14 × 6–10 mm; bracts linear-lanceolate, acute, the outer ½–⅔ as long as inner, canescent-tomentose, the inner often with yellow or black, simple eglandular hairs, with or without glandular hairs. Achenes 5–7 × 0·7–0·9 mm, more or less brown, fusiform, strongly attenuate at apex and sometimes with a short, coarse beak, 14- to 18-ribbed. $2n=8$. *Stony pastures; calcicole.* ● *N.E. Italy; W. Jugoslavia.* It Ju.

27. C. auriculifolia Sieber ex Sprengel, *Syst. Veg.* **3**: 634 (1826) (*C. raulinii* Boiss.). Perennial; stems 6–35 cm, simple or with 1–4 branches above. Leaves with pale eglandular hairs or glabrous; basal 3–21 × 1–4·5 cm, obovate, oblanceolate or elliptical, obtuse or acute, denticulate to coarsely runcinate-dentate, narrowed at base; cauline reduced to linear-lanceolate bracts. Capitula few. Involucre 10–14 × 4–12 mm; bracts linear-lanceolate, acute, the outer ½–⅔ as long as inner, more or less canescent-tomentose, occasionally with pale, simple, eglandular hairs and short glandular hairs, pubescent on inner face. Achenes 5–6·5 × 0·6–1·2 mm, yellowish, fusiform, with 4–5 strong ribs and 3–5 striae between the ribs. $2n=10$. *Rocks and cliffs.* ● *Kriti.* Cr.

28. C. baldaccii Halácsy, *Verh. Zool.-Bot. Ges. Wien* **42**: 577 (1893). Perennial; stems 13–35 cm, branched often from near the base. Leaves with short, pale, glandular hairs; basal 10–23 × 2–4·5 cm, oblanceolate, acute to obtuse, retrorse- or runcinate-dentate, or pinnately lobed with wide, triangular, acute, dentate segments, or lyrate with large terminal segment and few small lateral ones; cauline 1–4, similar, or lanceolate, acuminate. Capitula few. Involucre 9–12 × 7–11 mm; bracts linear-lanceolate, acute, the outer ¾–¾ as long as inner, greyish- to dark brown-tomentose, densely glandular-hairy, pubescent on inner face. Achenes 5–6·5 × 0·6–0·8 mm, brown, fusiform, gradually attenuate at apex, *c.* 20-ribbed, every fourth or fifth rib stronger than the rest. $2n=10$. *Rock-crevices.* ● *Albania, N.W. Greece.* Al Gr.

29. C. turcica Degen & Bald., *Österr. Bot. Zeitschr.* **46**: 417 (1896). Perennial; stems 20–50 cm, with a few branches from or below the middle. Leaves more or less canescent-tomentulose, sometimes with short glandular hairs beneath, or glabrescent; basal 8–16 × 2–3 cm, oblanceolate to obovate, acute to obtuse, narrowed to the petiole, acutely runcinate-dentate or pinnatifid, the lobes and teeth mucronate; lower cauline like the basal; upper cauline linear-lanceolate to lanceolate, acute to acuminate, auriculate, amplexicaul. Capitula 5–30, in a corymb. Involucre 11–12 × 7–11 mm; bracts linear-lanceolate, acute, the outer about ½ as long as inner, canescent-tomentose to densely white-lanate, pubescent on inner face. Achenes 4–5·5 × 0·6–0·8 mm, brown, somewhat angled, fusiform, equally attenuate at both ends, 10- to 20-ribbed. *Rocky places.* ● *S. Albania, N.W. Greece.* Al Gr.

30. C. pantocsekii (Vis.) Latzel, *Verh. Ges. Deutsch. Naturf. Ärzte* **85**: 658 (1913). Perennial; stems 1–3, 30–50 cm, with few branches. Leaves nearly glabrous or canescent-tomentulose and with white, mostly eglandular hairs; basal 10–18 × 2–4 cm, oblanceolate, acute or acuminate, pinnatisect almost to the midrib, with narrow terminal segment and numerous narrow, acuminate, dentate lateral segments, strongly attenuate at base; cauline few, small, pinnatifid, entire or bract-like. Capitula 1–3. Involucre 10–14 × 6–11 mm; bracts linear-lanceolate, acute, the outer ¾–¾ as long as inner, canescent-tomentose, with unequal, brown glandular hairs, pubescent on inner face. Achenes *c.* 6 mm, brown, fusiform, strongly attenuate at apex and almost beaked, 16- to 18-ribbed. *Mountain rocks*, 900–1500 *m.* ● *Jugoslavia, N. Albania.* Al Ju.

31. C. triasii (Camb.) Nyman, *Syll.* 49 (1854–1855). Perennial; stems 1–3, 10–45 cm, with few branches. Leaves with pale yellow, eglandular hairs; basal up to 13 × 3·5 cm, oblanceolate, obtuse or acute, denticulate to coarsely dentate, rarely with shallow lobes, attenuate at base; cauline few, the lower like the basal, or sessile, the upper bract-like. Capitula in a corymb. Involucre 10–12 × 5–9 mm; bracts linear-lanceolate, acute, the outer ½–½ as long as inner, canescent-tomentose. Achenes 5·5–8·5 × 0·75 mm, dark brown, fusiform, attenuate at apex with a definite beak, 10-ribbed. $2n=8$. *Rock-crevices and mossy banks; calcicole.* ● *Islas Baleares.* Bl.

32. C. albanica (Ják.) Babcock, *Univ. Calif. Publ. Bot.* **22**: 468 (1947) (*C. baldaccii* subsp. *albanica* Ják.). Perennial; stems 3–4, up to 35 cm, with 1–10 branches. Leaves glabrous or sparsely puberulent; basal 10–15 × 2·5–3 cm, numerous, oblanceolate, acute, deeply and irregularly runcinate-pinnatifid to lyrate-pinnate with a large, acutely dentate terminal lobe and acute, rapidly reduced, remote lateral lobes, narrowed at base; lower cauline like the basal; upper cauline linear-lanceolate, acuminate. Capitula few to numerous. Involucre 11–14 × 7–9 mm; bracts linear-lanceolate, acute, the outer ¾ as long as inner, canescent-tomentose and with short glandular hairs, pubescent on inner face. Achenes 6·5–7·75 × 0·7–0·8 mm, reddish-brown, fusiform, attenuate at apex, *c.* 20-ribbed. *Calcareous rocks and screes.* ● *N. Albania, S.E. Crna Gora.* Al Ju.

33. C. macedonica Kitanov, *Bull. Inst. Bot.* (*Sofia*) **1**: 372 (1950). Perennial; stems 1–3, 7–10 cm, usually branched. Leaves canescent-tomentulose; basal 4–11 × 0·8–2 cm, numerous, oblanceolate, irregularly runcinate-pinnatifid to lyrate-pinnate with large acutely dentate terminal lobe and acute, rapidly reduced lateral lobes; cauline usually 2, the lower like the basal, the upper bract-like. Capitula few. Involucre 10–12 × 5–8 mm; bracts linear-lanceolate, acuminate, canescent-tomentose, the outer ¾–⅞ as long as inner. Achenes 5·5–6 × 0·7 mm, yellowish, cylindrical

but slightly attenuate at base and apex, *c.* 15-ribbed. ● *Border of Albania and S. Jugoslavia.* Al Ju.

34. C. oporinoides Boiss. ex Froelich in DC., *Prodr.* **7**: 165 (1838). Perennial; stems 1–8, 8–50 cm, simple or divaricately branched. Leaves glabrous or with short glandular or eglandular hairs; basal 5–23 × 1–3(–5) cm, oblanceolate, acute to caudate-acuminate, narrowed at base, pinnatifid with retrorse triangular to linear, mucronate lateral lobes; cauline like the basal or bract-like. Capitula few. Involucre 9–15 × 4–10 mm; bracts linear-lanceolate, obtuse, the outer *c.* ½ as long as inner, canescent-tomentulose, pubescent on inner face. Ligules reddish-purple on outer face. Achenes 7–9·5 mm, yellowish, fusiform, attenuate at apex, 20- to 30-ribbed. $2n=8$. *Screes and rock-crevices*, 1700–3000 *m.* ● *S. & S.E. Spain.* Hs.

35. C. sibthorpiana Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **2(11)**: 56 (1849) (*C. divaricata* subsp. *sibthorpiana* (Boiss. & Heldr.) Hayek). Perennial; stems 3–12 cm, with 3–4 short, divaricate branches. Leaves canescent-tomentose or glabrous; basal 2–6 × 0·5–1·3 cm, oblanceolate, acute to obtuse, narrowed at base, runcinate-dentate or pinnatifid, terminal segment irregular, lateral segments triangular-acute; cauline few, small, the lower like the basal or bract-like. Capitula few. Involucre 9–10 × 5–7 mm; bracts lanceolate or linear-lanceolate, obtuse, the outer *c.* ½ as long as inner, densely canescent-tomentose, pubescent on inner face. Ligules reddish-purple on outer face. Achenes 4·7–5 × 0·8 mm, brown, fusiform, slightly attenuate at apex, 10-ribbed. *Mountain rocks*, 1800–2450 *m.* ● *Kriti.* Cr.

36. C. incana Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 136 (1813). Perennial; stems 1–5, 3–15 cm, with 1–4 divaricate branches from near the base. Leaves glabrous or canescent-tomentose; basal 3–13 × 1–2 cm, oblanceolate, acute, narrowed to base, pinnatisect, with lanceolate, entire or triangular, dentate lateral segments, with acute lobes and teeth; cauline like the basal, sessile, amplexicaul, more or less reduced, the uppermost bract-like. Capitula few to numerous. Involucre 10–12 × 5–10 mm; bracts linear-lanceolate, obtuse, the outer *c.* ½ as long as inner, densely canescent-tomentose, sometimes with a median row of short black hairs. Ligules purplish-pink. Achenes 5–6 × 0·8–1·4 mm, brown, fusiform, 10-ribbed. $2n=16$. *Mountain rocks*, 1200–1850 *m.* ● *S. & S.E. Greece.* Gr.

37. C. taygetica Babcock, *Univ. Calif. Publ. Bot.* **19**: 404 (1941) (*C. divaricata* Boiss. & Heldr., non (Lowe) F. W. Schultz). Perennial; stems many, 7–15(–30) cm, with many divaricate branches. Leaves canescent-tomentose and with pale eglandular hairs; basal 5–10 × up to 1·7 cm, numerous, oblanceolate, acute, gradually narrowed at base, runcinate-dentate or pinnately lobed, with triangular or lanceolate, acute lateral segments; cauline like the basal or smaller, linear, entire. Capitula few to numerous. Involucre 10–12 × 4–8 mm; bracts linear-lanceolate, obtuse, the outer *c.* ½ as long as inner, canescent-tomentulose. Ligules reddish-purple on outer face. Achenes 5·5 × 1 mm, chestnut-brown, fusiform, 10-ribbed. $2n=c.\ 40$. ● *S. Greece* (*Taïyetos*). Gr.

38. C. guioliana Babcock, *op. cit.* **22**: 485 (1947). Perennial; stems 2, up to 45 cm, with up to 5 branches. Leaves sparsely canescent-tomentulose, and with minute, brown, glandular hairs; basal up to 15 × 2 cm, numerous, oblanceolate, acute or acuminate, narrowed at base, pinnately sinuate-dentate, the teeth acuminate and mucronate; lower cauline like the basal; upper cauline linear and entire. Capitula few. Involucre 10–13 × 7–12 mm; bracts linear-lanceolate to lanceolate, obtuse to acute, the outer 10–12, ⅓–¾ as long as inner, canescent-tomentose, pubescent on inner face. Achenes *c.* 7 mm, yellowish-brown, fusiform, attenuate and constricted at apex, 16- to 20-ribbed. ● *N.W. Greece* (*Smolikas*). Gr.

39. C. crocifolia Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1**(7): 14 (1846–1847). Perennial; stems up to 25 cm, with a few slender branches. Leaves glabrous; basal 4–8 × 0·2–0·4 cm, numerous, linear or the lowest narrowly oblanceolate, acute or somewhat obtuse, gradually narrowed to the petiole, entire; lowest cauline like the basal, the remainder remote, gradually reduced or bract-like. Capitula 1–few. Involucre *c.* 10 mm; bracts linear-lanceolate, acute, the outer *c.* ½ as long as inner, sparsely canescent-tomentulose. Achenes 5–5·5 × 0·6–0·7 mm, yellowish, fusiform, sometimes slightly curved, strongly attenuate at apex, *c.* 20-striate. *Mountain rocks.* ● *S. Greece* (*Taïyetos*). Gr.

40. C. athoa Boiss., *Diagn. Pl. Or. Nov.* **2(11)**: 57 (1849). Perennial; stems 1 or more, 15–35 cm, remotely branched from near the base. Leaves glabrous or tomentulose; basal 5–15 × 0·5–3 cm, numerous, oblanceolate, acute, dentate to runcinate-pinnate, with triangular, acute teeth or lobes; cauline few, linear, acute or acuminate, entire. Capitula 1–4. Involucre 9–10 × 5–7 mm; bracts linear-lanceolate, acute, the outer *c.* ½ as long as inner, canescent-tomentulose, pubescent on inner face. Achenes 4·4–5 × 0·5 mm, yellowish-brown, fusiform-cylindrical, *c.* 16-striate. *Mountain rocks.* ● *N.E. Greece* (*Athos*). Gr.

Sect. MACROPODES Babcock. Pubescent perennials with long, woody taproots; stems simple or with few branches. Lower leaves petiolate, denticulate to lobed. Capitula with few to many florets. Ligules yellow. Receptacle with ciliate pits.

41. C. schachtii Babcock, *Magyar Bot. Lapok* **33**: 5 (1934). Stems up to 10 cm, simple, scapose. Leaves up to 9 × 2 cm, all basal, oblanceolate, obtuse to acute, narrowed to base, unequally shallowly lobed or coarsely toothed, with fine, pale brown glandular hairs. Capitulum solitary. Involucre 12–14 × 6 mm; bracts linear-lanceolate, acute, the outer ⅔ as long as inner, with numerous, long, pale glandular hairs. Achenes 7·5 × 0·75 mm, greyish-brown, fusiform, long-attenuate at apex, 18- to 20-ribbed. $2n=10$. *Calcareous rocks.* ● *S. Bulgaria* (*Ali-Botuš*). Bu.

42. C. bithynica Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 29 (1844). Stems 1–4, 5–12 cm, simple or with up to 4 branches. Leaves up to 10 × 1·3 cm, all basal, numerous, spathulate, rounded-obtuse or oblanceolate, acute, narrowed at base, shallowly lobed or dentate, with short, yellow, glandular or eglandular hairs. Capitula 1–4. Involucre 9–12 × 4 mm; bracts linear-lanceolate, acute, the outer *c.* ½ as long as the inner, with numerous, short glandular or eglandular hairs, sometimes tomentulose at base. Achenes 5–6 × 0·5 mm, pale greenish-yellow, fusiform, 15-striate. $2n=10$. *Calcareous rocks and dry pastures. Mountains of the Balkan peninsula from Bosna to E.C. Greece.* Bu Gr Ju.
Balkan peninsula, from Bosna to E.C. Greece. Bu Gr Ju.

Sect. INTYBELLIOIDES Froelich. More or less pubescent, rhizomatous perennials. Leaves petiolate, entire to repand-dentate, the margin narrowly revolute. Capitula with few to many florets, in a narrow, elongated or corymbose cyme. Ligules yellow, white or pink. Receptacle with glabrous pits.

43. C. praemorsa (L.) Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 79 (1828). Stems 15–75 cm. Leaves 5–20 × 0·8–5·5 cm, all basal, obovate, oblanceolate, elliptical, oblong or lanceolate, obtuse,

acute or apiculate, abruptly or gradually contracted at base, entire or obscurely denticulate to repand-dentate, with dense, very short, pale hairs or glabrescent. Involucre 7–12 × 3–7 mm; bracts linear-lanceolate, acute, the outer ⅓–¾ as long as the inner. Achenes 3–5·5 mm, pale brown, fusiform, *c.* 20-ribbed. *Most of Europe eastwards from S.E. Norway and S.E. France, but absent from the Mediterranean region.* Al Au Bu Cz Da Fe Ga Ge He Hu It Ju No Po Rm Rs (N, B, C, W, E) Su.

1 Ligules pink or white — (c) subsp. **dinarica**
1 Ligules yellow
2 Capitula in a narrow, elongated cyme; achenes 3–4 mm — (a) subsp. **praemorsa**
2 Capitula in a lax, often subcorymbose cyme; achenes 4–5·5 mm — (b) subsp. **corymbosa**

(a) Subsp. **praemorsa**: Leaves mostly oblanceolate or narrowly elliptical. Capitula in a narrow, elongated cyme; involucre with numerous, very short, pale hairs or glabrescent. Ligules yellow. Achenes 3–4 mm, equally attenuate at both ends. $2n=8$. *Throughout the range of the species except parts of the S. Alps and W. Jugoslavia.*

(b) Subsp. **corymbosa** (Gaudin) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 253 (1976) (*C. froelichiana* DC. ex Froelich, *Hieracium praemorsum* subsp. *corymbosum* Gaudin): Leaves mostly obovate. Capitula in a lax, often subcorymbose cyme; involucre glabrous or tomentose. Ligules yellow. Achenes 4–5·5 mm, more attenuate at apex than base. *Meadows and wood-margins, mainly in the mountains; calcicole.* ● *S. Alps, from c.* 8° 30′ *to c.* 11° 45′ *E.*

(c) Subsp. **dinarica** (G. Beck) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 253 (1976) (*C. incarnata* var. *dinarica* G. Beck, *C. incarnata* (Jacq.) Tausch, non Vis.): Like subsp. (b) but with pink or white ligules. ● *S.E. Alps and mountains of W. Jugoslavia.*

Sect. MESOPHYLION Babcock. Subglabrous to pubescent annuals with slender, tapering roots; stems branched from base or middle. Lower leaves petiolate, denticulate to 2-pinnatisect. Capitula many, with few to many florets. Ligules yellow. Receptacle with ciliate pits.

44. C. tectorum L., *Sp. Pl.* 807 (1753). Stems 6–100 cm. Leaves glabrous to tomentulose, sometimes glandular; basal up to 15 × 4 cm, rosulate, lanceolate to oblanceolate, acute, narrowed at base, denticulate, dentate or runcinate-pinnatifid or lyrate, pinnatisect or 2-pinnatisect, with remote, unequal, lanceolate to linear, acute lobes; lower cauline like the basal, the rest lanceolate or linear, sessile. Capitula sometimes in corymbs. Involucre up to 13 × 8 mm; bracts linear-lanceolate, more or less acute, the outer ½ as long as inner, appressed-hairy on inner face. Achenes (2·5–)3–4(–4·5) mm, dark purplish-brown, fusiform, strongly attenuate at apex, 10-ribbed. $2n=8$. *Europe, except the islands, southwards to N.E. Spain, N. Italy, C. Jugoslavia and Krym.* Au Be ?Bu Cz Da Fe Ga Ge He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W, K, E) Su.

1 Stems (7–)12–100 cm; capitula usually numerous — (a) subsp. **tectorum**
1 Stems up to 30 cm; capitula 1–7
2 Basal leaves few; involucre 9–12 mm — (b) subsp. **nigrescens**
2 Basal leaves numerous; involucre 7–9 mm — (c) subsp. **pumila**

(a) Subsp. **tectorum** (*C. astrachanica* Steven ex Czerep., *C. ramosissima* D'Urv.): Stems (7–)12–100 cm. Basal leaves few; cauline numerous. Capitula usually many; involucral bracts 7–10 mm, more or less tomentose and with few to numerous short hairs. Ligules 12–15 mm. *Throughout the range of the species.*

(b) Subsp. **nigrescens** (Pohle) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 253 (1976) (*C. nigrescens* Pohle): Stems 7–30 cm. Basal leaves few; cauline 3–6. Capitula 1–7; involucral bracts 9–12 mm, with long, usually greyish eglandular hairs. Ligules 13–18 mm. *Rocky and sandy ground by rivers and the sea. Arctic Russia and Finland.*

(c) Subsp. **pumila** (Liljeblad) Sterner, *Acta Phytogeogr. Suec.* **9**: 166 (1938): Stems up to 7 cm. Basal leaves numerous; cauline 2–4. Capitula 2–7; involucral bracts 7–9 mm, with slender, unequal glandular hairs. Ligules 10–13 mm. *Shallow soil over limestone rock.* ● *Sweden* (*Öland, Gotland*).

Sect. LAGOSERIS (Bieb.) Babcock. Tomentose perennials with vertical taproots. Lower leaves petiolate, runcinate-pinnatifid. Capitula 2–8, with many florets. Ligules pinkish-purple. Receptacle flat, with long rigid hairs between the florets.

45. C. purpurea (Willd.) Bieb., *Fl. Taur.-Cauc.* **2**: 255 (1808) (*Lagoseris purpurea* (Willd.) Boiss., *L. callicephala* Juz. ex Czerep., *L. robusta* Czerep.). Stems 10–40 cm. Leaves canescent-tomentulose; basal 3–9 × 1·5–3 cm, numerous, oblanceolate, acute, narrowed at base, deeply runcinate-pinnatifid with the segments all acutely dentate, to 2-pinnatisect; cauline mostly reduced to small bracts, occasionally like the basal. Involucre 10–12 × 5–6 mm; bracts linear-lanceolate, acute, the outer ⅓–½ as long as the inner, canescent-tomentose, rarely with unequal, yellow glandular hairs. Achenes 4·5–5 × 0·5–0·6 mm, dark brown, cylindrical but slightly attenuate above, 10-ribbed. *Chalky hillsides. Krym.* Rs (K). (*Anatolia.*)

Sect. PHAECASIUM (Cass.) Dumort. Pubescent annuals (rarely perennials). Lower leaves petiolate, denticulate to pinnatifid. Capitula usually many, in a corymb, with few to many florets. Ligules yellow. Receptacle with ciliate or glabrous pits.

46. C. reuterana Boiss., *Diagn. Pl. Or. Nov.* **2(11)**: 55 (1849). Perennial; stems 30–75 cm, branching from near the base. Leaves pubescent or hispidulous; basal 4–18 × 1–3 cm, oblanceolate, lyrate-runcinate-pinnatifid or coarsely dentate, acute to obtuse; lower cauline like the basal or all bract-like. Involucre 10–13 × 4–7 mm; bracts linear-lanceolate, acute, mostly with a white margin, glabrous or sparsely pubescent, pubescent on inner face, the outer ¼–½ as long as the inner. Achenes 4–5 × *c.* 0·5 mm, fusiform, attenuate at apex, slightly constricted above base, *c.* 15-ribbed. *Turkey-in-Europe.* Tu. (*S.W. Asia.*)

47. C. pulchra L., *Sp. Pl.* 806 (1753). Annual; stems (5–)30–70–(–100) cm, branched from the base. Leaves with short glandular and longer eglandular hairs; basal (1–)3–15(–24) × (0·5–)1–3(–5) cm, rosulate, oblanceolate, acute to obtuse, narrowed at base, denticulate to runcinate-dentate or pinnatifid, with triangular, acute lobes; lower cauline like the basal but lanceolate and less divided; upper cauline linear or bract-like. Capitula in a compound corymb. Involucre 8–11(–12) × 3–6 mm; bracts linear-lanceolate, acute, the outer very short, glabrous. Achenes uniform (all like the inner), or of 2 kinds: marginal 5–6 mm, somewhat compressed, more or less attenuate at apex, spinulose, usually without pappus; inner 4–4·5(–5) mm, cylindrical, more or less attenuate at apex, usually striate, with a pappus. $2n=8$. *Dry, open habitats. S. Europe, extending northwards to N. France and S.E. Czechoslovakia; casual further north.* Al Bu Cz Ga Ge Gr Hs Hu It Ju Lu Rm Rs (K) Tu.

48. C. stojanovii Georgiev, *Bull. Soc. Bot. Bulg.* **1**: 67 (1926). Annual; stems 35–40 cm. Leaves with short glandular or eglandular hairs; basal up to 15 × 3 cm, numerous, obovate, acute, narrowed at base, coarsely dentate; cauline small and

bract-like. Capitula few to many, in a corymb. Involucre *c.* 8 mm; bracts linear-lanceolate, acute to obtuse, the outer very short, glabrous. Achenes 3–3·5 × 0·75–1 mm, brown, curved, fusiform, abruptly attenuate at apex, 10-ribbed; pappus caducous in one piece. $2n=8$. *Stony places. S.E. Bulgaria.* Bu. (*W. Anatolia.*)

Sect. BARKHOUSIA (Moench) Gaudin. Annuals or rarely perennials, usually pubescent or hispid, with slender roots; stems simple, scapose, or more or less branched. Lower leaves usually petiolate, denticulate to 2-pinnatifid. Capitula with few to many florets, solitary or in a corymb. Ligules yellow, pink or white. Receptacle with ciliate pits and usually a linear scale subtending each floret.

49. C. alpina L., *Sp. Pl.* 806 (1753). Stems 10–120 cm, with long, erect branches from the base or middle. Leaves puberulent or rarely with short glandular hairs; basal up to 15 × 4 cm, obovate-oblong, obtuse, narrowed to the base, denticulate, sometimes with 3 or 4 irregular, usually shallow, lobes near apex; lower cauline like the basal; upper cauline oblong, ovate to lanceolate, acute or acuminate, amplexicaul, subauriculate, entire or denticulate. Capitula 1–20. Involucre 15–22 × 7–15 mm; outer bracts ovate, acute, scarious, *c.* ½ as long as inner, glabrous or tomentulose, becoming recurved at maturity; inner linear-lanceolate, obtuse, with scarious margins, tomentose, with short glandular hairs and longer rigid hairs. Ligules yellow, purplish on outer face. Achenes of 2 kinds: marginal 15–17 mm, curved, gradually attenuate into a coarse beak, strongly attenuate at base, striate, densely white-puberulent; inner 15–20 mm, narrowly fusiform, gradually attenuate into a slender beak, finely 15-ribbed, spinulose. $2n=10$. *Krym.* Rs (K). (*S.W. Asia.*)

50. C. rubra L., *Sp. Pl.* 806 (1753). Stems 1 to many, 4–40 cm, simple or with 1 branch. Leaves with pale simple eglandular hairs; basal 2–15 × 0·5–3 cm, few to many, oblanceolate, acute, narrowed to base, denticulate, dentate or runcinate-pinnatifid, with triangular or lanceolate, acute segments; cauline few, mostly bract-like, the lower sometimes like the basal. Capitula 1 or 2. Involucre 11–15 × 4–10 mm; outer bracts lanceolate, acute, pale or scarious, *c.* ½ as long as the inner, glabrous or puberulent; inner linear-lanceolate, acute or obtuse, pale at margin, with numerous, long and short, pale glandular hairs. Ligules pink or white. Achenes dark brown, fusiform, of 2 kinds: marginal 8·5–9 mm, gradually attenuate into a usually short beak, *c.* 10-ribbed, coarsely and strongly spinulose; inner 12–21 mm, gradually attenuate into a long, rather slender beak, 15- to 20-ribbed, spinulose. $2n=10$. *S. Italy; Balkan peninsula, Kriti.* Al Cr Gr It Ju [Ga].

51. C. foetida L., *Sp. Pl.* 807 (1753). Stems 10–50 cm, branched from the base or middle. Leaves more or less hispid; basal up to 13 × 3 cm, oblanceolate, denticulate to 2-pinnate; cauline elliptical, ovate, lanceolate or linear, runcinate to deeply pinnatifid, sessile, auriculate. Capitula 1 to many. Involucre 7–16 × 4–13 mm. Ligules yellow, reddish-purple on the outer face. Achenes fusiform, of 2 kinds: marginal stout, shortly and coarsely beaked or beakless; inner longer, slender, with a slender beak. *Most of Europe except the north.* Al Au Be Bl Br Bu Co Cr Cz Ga Ge Gr He Hs Hu It Ju Lu Po Rm Rs (C, W, K, E) Si Tu.

1 Receptacle with scales; pappus 3–4 mm (c) subsp. **commutata**
1 Receptacle without scales; pappus (4–)5–6(–7) mm
2 Outer involucral bracts up to 0·75 mm wide, linear-lanceolate, *c.* ½ as long as inner, usually predominantly glandular-hairy (a) subsp. **foetida**
2 Outer involucral bracts 1–1·5 mm wide, lanceolate, *c.* ⅔ as long as inner, mostly or entirely eglandular-hairy (b) subsp. **rhoeadifolia**

(a) Subsp. **foetida** (subsp. *glandulosa* (C. Presl) Hayek, subsp. *maritima* (Boiss.) Hayek, subsp. *zacynthia* (Margot & Reuter ex DC.) Hayek): Outer involucral bracts up to 0·75 mm wide, linear-lanceolate, *c.* ½ as long as the inner, with usually predominantly glandular hairs. Receptacle without scales. Marginal achenes 7–9 mm, the inner 12–17 mm. $2n=10$. *Almost throughout the range of the species.*

(b) Subsp. **rhoeadifolia** (Bieb.) Čelak., *Prodr. Fl. Böhm.* 190 (1871) (*C. rhoeadifolia* Bieb., *C. stribrnyi* Velen.): Outer involucral bracts 1–1·5 mm wide, lanceolate, *c.* ⅔ as long as inner, with mostly or entirely eglandular hairs. Receptacle without scales. Marginal achenes 5–7 mm, the inner 12–16 mm. $2n=10$. *C. & S.E. Europe.*

(c) Subsp. **commutata** (Sprengel) Babcock, *Jour. Bot.* (*London*) **76**: 207 (1938) (*Rodigia commutata* Sprengel, *R. bulgarica* Velen.): Outer involucral bracts linear-lanceolate, *c.* ½ as long as inner, with glandular and eglandular hairs. Receptacle with 2 scales subtending each achene. Marginal achenes 5–9·5 mm, the inner 10–14 mm. $2n=10$. *S. part of Balkan peninsula and Aegean region.*

Sect. MICROCEPHALUM Babcock. Pubescent perennial with horizontal rhizome. Lower leaves petiolate. Capitula with few florets, in a corymb. Ligules yellow. Receptacle with glabrous pits.

52. C. multicaulis Ledeb., *Fl. Altaica* **4**: 125 (1833). Stems 1–3, 10–40 cm. Leaves inconspicuously pubescent with simple eglandular hairs; basal up to 9 × 1·2 cm, oblanceolate to elliptical, obtuse to acute, dentate or obscurely lyrate; cauline mostly bract-like. Involucre 7–9 × 2·5–3 mm; bracts linear-lanceolate, obtuse to acute, the outer short; all canescent-tomentose and with short glandular hairs. Achenes *c.* 4 mm, reddish-brown, narrowly fusiform, attenuate at apex, 10- to 12-ribbed. $2n=10$. *Arctic and subarctic Russia; one station in arctic Norway.* No Rs (N). (*N. & C. Asia.*)

Sect. PTEROTHECA (Cass.) Babcock. Pubescent annuals with slender roots. Lower leaves petiolate. Capitula solitary or few, with few to many florets. Ligules yellow, sometimes red on outer face. Receptacle with a rigid hair subtending each floret, the pits indistinct, glabrous.

53. C. sancta (L.) Babcock, *Univ. Calif. Publ. Bot.* **19**: 403 (1941) (*Lagoseris sancta* (L.) K. Malý, *L. bifida* (Vis.) Koch, *L. macrantha* (Bunge) Iljin, *Pterotheca sancta* (L.) C. Koch). Stems 3–55 cm, many. Leaves with short, yellow, simple eglandular hairs, or subglabrous; basal 1–20 × 0·5–4 cm, obovate, oblanceolate or spathulate, obtuse to acute, denticulate, runcinate-pinnatifid or lyrate; cauline few, linear or bract-like. Involucre 6–11 × 4–9 mm; outer bracts lanceolate, with conspicuous pale margin, ⅛–¼ as long as inner; inner linear-lanceolate, acute; all more or less tomentose and with dark or pale, simple eglandular hairs, with or without glandular hairs, or glabrous. Achenes of 3 kinds: outermost narrowly fusiform, sometimes somewhat compressed (sometimes absent); intermediate fusiform, spinulose; inner fusiform, smooth. $2n=10$. *E. Mediterranean region and S.E. Europe; naturalized as a weed in W. Europe and Italy.* Al Bu Cr Gr Ju Rm Rs (W, K, E) Tu [Bl Co Ga He Hs It Sa].

Sect. ZACINTHA (Miller) Babcock. More or less pubescent annuals or biennials; stems usually divaricately branched above. Lower leaves sessile or petiolate, denticulate to lyrate-pinnatifid. Capitula many, with few to many florets. Ligules yellow, usually reddish-purple on the outer face, rarely whitish. Receptacle with glabrous or ciliate pits, or flat.

54. C. dioscoridis L., *Sp. Pl.* ed. 2, 1133 (1763). Annual or biennial; stems 10–60 cm, usually branched. Leaves glabrous or with sparse, eglandular hairs; basal 4–15 × 1–3 cm, lanceolate to oblanceolate, acute to obtuse, denticulate to pinnatifid, with 6–8 wide triangular lateral segments; cauline mostly sessile, lanceolate, acute or acuminate, denticulate, amplexicaul, with acute auricles. Involucre 8–12 × 5–9 mm; bracts linear to lanceolate, acute, with glandular and sometimes eglandular hairs, the outer ⅓–¾ as long as the inner. Florets 11–18 mm. Ligules yellow, reddish-purple on outer face. Achenes 3·5–5·5 mm, fusiform, curved, usually of 2 kinds: marginal greenish-yellow or whitish, with 2 lateral wings and usually ribbed; inner greenish-yellow or reddish-brown, with smooth or spinulose ribs; rarely all achenes unwinged. $2n=8$. ● *Greece, Albania and Aegean region; casual elsewhere in S. Europe and locally naturalized.* Al Cr Gr [Ga ?It ?Ju].

A very polymorphic species; subspecies were described by Babcock, but on very limited material, and further information is required before their status can be confirmed.

55. C. multiflora Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 138 (1813). Annual; stems 7–35 cm, branched from the base. Leaves glabrous; basal 1–5 × 0·5–1 cm, few, oblanceolate, obtuse, dentate or runcinate-pinnatifid, attenuate at base; lower cauline sessile, amplexicaul, with acute auricles; upper cauline lanceolate or linear, acute, entire. Capitula many. Involucre 8–9 × 4–6 mm; bracts linear-lanceolate, acute, the outer glabrous, *c.* ½ as long as the inner, the inner with yellowish glandular hairs. Florets 7–8 mm. Ligules yellow. Achenes dark brown, of 2 kinds, or marginal absent: marginal 3·5–4 mm, more attenuate above than below, unequally ribbed; inner 3–3·5 mm, fusiform, strongly attenuate at apex, 10-ribbed, strigulose or finely spinulose near apex. $2n=8$. *S.E. Greece and S. Aegean region.* Cr Gr.

56. C. zacintha (L.) Babcock, *Univ. Calif. Publ. Bot.* **19**: 404 (1941) (*Zacintha verrucosa* Gaertner). Annual; stems 20–30 cm, branched from the base, with some capitula sessile at or near the bifurcations. Leaves with pale, eglandular hairs; basal up to 20 × 4 cm, withering early, oblanceolate, lyrate-pinnatifid, the terminal segment large, ovate, obtuse, the lateral segments remote, narrowly triangular and acute; lower cauline like the basal; upper cauline lanceolate, acuminate, sessile, with acute auricles, or bract-like. Ligules yellow, with reddish-purple stripe on outer face. Involucre 5–7 × 3–7 mm; bracts lanceolate to linear-lanceolate, obtuse, glabrous or tomentulose at base, the outer *c.* ½ as long as the inner. Achenes of 2 kinds: marginal 2–2·5 mm, strongly compressed laterally, triangular, acute at base, truncate or rounded at apex; inner *c.* 2·5 mm, yellowish, obconical, 10-ribbed, smooth. $2n=6$. *Mediterranean region.* Bu Co Cr Ga Ge Gr Hs It Ju Rs (K) Sa Tu.

57. C. pusilla (Sommier) Merxm., *Mitt. Bot. Staatssamm.* (*München*) **7**: 275 (1968) (*Melitella pusilla* Sommier). Acaulescent annual. Leaves 2–7 × 0·2–0·5 cm, in a flat basal rosette, linear-spathulate, entire to runcinate-pinnatifid, attenuate at base, subglabrous. Capitula in sessile clusters of 2–8 in centre of basal rosette. Involucre *c.* 4 × 3–4 mm; outer bracts 2–4, linear, membranous, inner linear-lanceolate, obtuse, with a membranous apex. Achenes 1–1·5 mm, shortly beaked, of 2 kinds: inner and some outer whitish, oblong, compressed, striate; the remainder of the outer achenes brownish, thicker, angled, more finely striate and enclosed by the inner involucral bracts. $2n=10$. *S. Greece, Kriti; Malta; S. Portugal.* Cr Gr Lu Si.

Sect. ALETHOCREPIS Bischoff. Pubescent annuals or biennials; stems many, branched from near the base or middle. Lower leaves petiolate, denticulate to pinnate. Capitula many, with few to many florets. Ligules yellow, usually reddish on outer face. Receptacle usually with ciliate pits.

58. C. nicaeensis Balbis in Pers., *Syn. Pl.* **2**: 376 (1807). Annual or biennial; stem 25–100 cm, branched from the middle or above. Leaves with yellow eglandular hairs; basal up to 19 × 4 cm, oblanceolate, obtuse, runcinate-pinnatifid, dentate, or finely and remotely denticulate, attenuate at base; lowest cauline like the basal, the rest mostly lanceolate, sessile, usually with auricles. Capitula in several corymbs. Involucre 8–10 × 4–6 mm; bracts linear-lanceolate, obtuse, canescent-tomentose and with glandular or eglandular hairs, the outer ½–½(–¾) as long as inner. Achenes 2·5–3·8 × 0·6 mm, golden-brown, fusiform, 10-ribbed. $2n=8$. *W. & C. Mediterranean region; a frequent casual elsewhere in meadows and forage-crops, and naturalized in some regions.* Al Ga Hs It Ju [Br *Bu Cz Da Ge Hu Rm Su].

59. C. foliosa Babcock, *Univ. Calif. Publ. Bot.* **23**: 389 (1951). Annual; glandular-pubescent throughout; stems up to 25 cm, remotely and regularly branched from the base. Basal leaves up to 9 × 2 cm, few, oblanceolate or spathulate, long-petiolate; lowest cauline oblanceolate, shortly petiolate, auriculate; upper cauline lanceolate, acuminate, dentate, sessile, amplexicaul, auriculate, the auricles about as long as the width of the lamina and narrow and acuminate. Involucre 7–8 × 4–5 mm; bracts linear-lanceolate, acute or acuminate, tomentulose and with unequal, brown glandular hairs; outer bracts *c.* ½ as long as the inner. Achenes *c.* 2·75 × 0·5 mm, pale brown, fusiform, 10-ribbed. ● *C. Ural* (*Utka, near Krasnoufimsk*). Rs (C).

A very distinctive species known only from the original collection of 1892.

60. C. capillaris (L.) Wallr., *Linnaea* **14**: 657 (1841) (*C. virens* L. nom. illegit.). Annual or biennial; stems 1–many, (5–)20–100 cm, branched from the base or above. Leaves glabrous or with scattered short eglandular hairs; basal up to 30 × 4·5 cm, numerous, lanceolate to oblanceolate, obtuse to acute, denticulate, dentate, runcinate-pinnatifid, or lyrate, pinnatisect or 2-pinnatisect, narrowed at base; cauline like basal but smaller. Capitula many. Involucre 5–9 × 3–8 mm, glabrous, tomentose or sparsely glandular-hairy; bracts linear-lanceolate, obtuse to acute, outer 7–9, ½–¾ as long as the inner. Achenes 1·4–2·5 mm, brown, 10-ribbed. $2n=6$. *W., C. & S. Europe; naturalized or casual in parts of the north and east.* Al Au Az Be Br Bu Co Cz Ga Ge Gr Hb He Ho Hs Hu It Ju Lu Po Rm ?Tu [Da Rs (B, C, W, K) Su].

Very variable. Plants without a central main stem and involucres 5–7 mm (var. *capillaris*) are more frequent in W., C. & S. Europe, whilst plants with a central main stem and involucres 7–9 mm (var. *agrestis* (Waldst. & Kit.) Dalla Torre & Sarnth.) seem to be more frequent in the northern part of the range. Both have $2n=6$.

61. C. micrantha Czerep. in Bobrov & Tzvelev, *Fl. URSS* **29**: 684 (1964) (*C. parviflora* Desf. ex Pers., non Moench). Like **60** but leaves with numerous, pale, rather rigid, eglandular hairs; lower cauline lanceolate, acute to acuminate, entire or slightly dentate, sagittate-amplexicaul with acute to acuminate auricles; involucre 4–6 × 2–4 mm, usually with rigid, eglandular hairs, sometimes glabrous or tomentulose; outer bracts 5, *c.* ½ as long as the inner; achenes 1·4–2 mm, cylindrical. $2n=8$. *E. Greece and Aegean region; Krym.* Cr Gr Rs (K) Tu.

62. C. neglecta L., *Mantissa* 107 (1767). Annual; stems 10–50 cm. Leaves with short, eglandular hairs; basal oblanceolate,

obtuse to acute, narrowed at base; lower cauline like the basal, or sessile and amplexicaul; upper cauline often bract-like. Involucre 3–7 × 1–4 mm; bracts linear-lanceolate to lanceolate, usually acute, the outer 4–6, very small, the inner 7–9 (rarely more). Achenes 1·75–3·25 mm, pale brown, mostly fusiform, attenuate at apex or distinctly beaked, 10-ribbed. *C. & E. Mediterranean region, Balkan peninsula.* Al Bu Cr Gr It Ju Si Tu.

1 Stem 10–50 cm, solitary, rarely several and then with achenes not distinctly beaked
2 Stem hispidulous below, nearly glabrous above; achenes gradually attenuate to the apex but scarcely beaked, the marginal not enfolded in and retained by the inner bracts (a) subsp. **neglecta**
2 Stem hispid throughout with yellowish setae; at least the inner achenes with a distinct beak which is not more than 1 mm, the marginal enfolded in and often retained by the inner bracts (b) subsp. **corymbosa**
1 Stems up to 30 cm, several; achenes distinctly beaked
3 Basal leaves denticulate to pinnatisect with 4–6 pairs of lateral segments; achenes with stout beak (c) subsp. **fuliginosa**
3 Basal leaves dentate to pinnatisect with 6–10 pairs of lateral segments; achenes with slender beak (d) subsp. **cretica**

(a) Subsp. **neglecta** (*C. neglecta* subsp. *stricta* (Scop.) Vierh.): Plant 10–50 cm. Stems solitary and erect or several and decumbent, more or less hispidulous below, glabrescent above. Basal leaves up to 14 × 3 cm, denticulate to pinnatisect. Involucre glabrous, tomentulose or glandular-pubescent, rarely with greenish, eglandular hairs near the apex of the inner bracts. Achenes gradually attenuate to the apex but not beaked, the marginal not enfolded in or retained by the inner bracts. $2n=8$. *Throughout the range of the species.*

(b) Subsp. **corymbosa** (Ten.) Nyman, *Consp.* 460 (1879): Plant up to 40 cm. Stems branched from the base, with slender, yellow rigid hairs. Basal leaves up to 17 × 2 cm, denticulate to pinnatisect. Involucre usually with numerous yellow or greenish eglandular hairs, sometimes glabrous or nearly so. Achenes with a beak less than 1 mm, the marginal enfolded in and often retained by the inner bracts. $2n=8$. ● *Italy, Sicilia, Greece.*

(c) Subsp. **fuliginosa** (Sibth. & Sm.) Vierh., *Verh. Zool.-Bot. Ges. Wien* **69**: 269 (1919) (*C. fuliginosa* Sibth. & Sm., *C. neglecta* var. *graeca* (Vierh.) Hayek): Plant dwarf, with several sparingly branched stems. Basal leaves 2–6(–8) × 1–2 cm, denticulate to pinnatisect with 4–6 pairs of lateral segments. Involucre glabrescent or tomentulose, with short glandular and eglandular hairs or with very slender, green, eglandular hairs. Achenes with a stout beak. $2n=6$. *Greece and Aegean region.*

(d) Subsp. **cretica** (Boiss.) Vierh., *op. cit.* 268 (1919): Plant dwarf, with numerous, sparingly branched stems. Basal leaves up to 7 × 0·5–1·5 cm, dentate to pinnatisect with 6–10 pairs of lateral segments. Involucre glabrous, tomentulose, or minutely glandular-hairy, sometimes with longer eglandular hairs. Achenes with a short, slender beak. $2n=8$. ● *Kriti and Karpathos.*

63. C. suffreniana (DC.) Lloyd, *Fl. Loire-Inf.* 155 (1844). Annual; stems 3–35 cm, usually many, branched from the base. Annual; stems 3–35 cm, usually many, branched from the base. Leaves with eglandular hairs, or glabrous; basal 0·7–9 × 0·3–1·8 cm, spathulate to oblanceolate, obtuse to acute, denticulate to runcinate-pinnatifid, narrowed at base; cauline lanceolate, acute to acuminate, sessile, semiamplexicaul, auriculate. Involucre with 10–12 linear outer bracts ¼–½ as long as the 10–16 linear-lanceolate inner ones. Achenes 3–4 × 0·3–0·4 mm, narrowed to a slender beak, 10-ribbed. ● *S. & W. France, S. & W. Italy.* Ga It.

(a) Subsp. **suffreniana**: Involucre 4–6·5 × 2–3 mm, with dark eglandular and glandular hairs. Corolla *c.* 5 mm; anther-tube *c.* 1 mm. Achenes deep purplish-brown. $2n=8$. *S. & W. France, N.W. Italy.*

(b) Subsp. **apula** (Fiori) P.D. Sell, *Bot. Jour. Linn. Soc.* **71**: 254 (1976) (*C. suffreniana* var. *apula* Fiori): Involucre 6–8 × 3–4 mm, with dark glandular hairs. Corolla 8–9 mm; anther-tube *c.* 2·5 mm. Achenes dark brown or nearly black. $2n=8$. *S. Italy.*

Sect. LEPIDOSERIS (Reichenb.) Bentham. Pubescent perennials, biennials or annuals, usually with long woody root. Basal leaves petiolate, denticulate to pinnatifid. Capitula with many florets. Ligules yellow, usually reddish or purplish on outer face. Receptacle with ciliate pits.

64. C. spathulata Guss., *Cat. Pl. Boccad.* 73 (1821). Perennial; stems 2–3, 15–30 cm. Leaves glabrous or puberulent; basal 5–15 × 0·5–2·5 cm, oblanceolate to spathulate, obtuse to subacute, sinuate-dentate or denticulate, attenuate at base; cauline small, linear, acuminate and sessile, or bract-like. Capitula 1–4. Involucre 12–13 × 5–7 mm; bracts linear-lanceolate, acute, canescent-tomentose, with short glandular hairs and a few longer eglandular hairs, pubescent on inner face, outer *c.* ⅓ as long as inner. Achenes 5·5 × 0·75 mm, brown, fusiform, gradually attenuate into a beak, 10-ribbed. ● *S. Italy, Sicilia.* It Si.

65. C. bourgeaui Babcock ex Maire, *Bull. Soc. Hist. Nat. Afr. Nord* **29**: 428 (1938). Perennial; stems 20–50 cm, with 1–3 branches from near the base. Leaves with short eglandular hairs or glabrescent; basal up to 21 × 7 cm, oblanceolate, acute, pinnatisect, with unequal, oblanceolate, acute, dentate segments, gradually narrowed at base; lower cauline like the basal or sessile; upper cauline linear, entire to laciniate, narrowly amplexicaul, or bract-like. Capitula 1–9. Involucre 10–12 × 5–7 mm; outer bracts more or less ovate, acute, imbricate, becoming scarious, glabrous or sparsely tomentulose, ⅓–½ as long as the linear-lanceolate inner. Achenes 4·5–6 × 0·5–0·7 mm, brown, fusiform, slightly curved, attenuate into a beak, 10-ribbed. $2n=8$. *S.W. Spain (near Cádiz).* Hs. (*Morocco.*)

66. C. vesicaria L., *Sp. Pl.* 805 (1753). Perennial, biennial or annual; stems 3–150 cm, usually much-branched. Leaves pubescent or glabrous; basal 10–35 × 2–8 cm, oblanceolate or sometimes almost spathulate or ovate, obtuse to acute, sinuately or retrorsely denticulate, dentate or runcinate-pinnatifid, pinnatisect or 2-pinnatisect, often lyrate, sometimes pectinate, narrowed at base; lower cauline like the basal or sessile; upper cauline lanceolate to bract-like, auriculate-amplexicaul. Capitula many, often in a lax corymb. Involucre 5–14 mm, more or less tomentose, often with glandular or eglandular hairs; outer bracts (⅛–)¼–⅓(–¾) as long as inner. Achenes brown or yellowish, fusiform, uniform or of 2 kinds, the inner always beaked, *c.* 10-ribbed. *S., C. & W. Europe, northwards to the Netherlands and W. Austria; widely naturalized in Britain and Ireland.* Al Au Be Bl Cr Ga Ge Gr He Ho Hs It Ju Lu Sa Si Tu [Br Hb].

1 Outer involucral bracts broadly ovate, imbricate
1 Outer involucral bracts broadly ovate, imbricate (a) subsp. **vesicaria**
1 Outer involucral bracts linear-lanceolate, not imbricate
2 Ultimate branches strongly deflexed before anthesis; flowering in winter (b) subsp. **hyemalis**
2 Ultimate branches erect before anthesis; flowering in summer
3 Achenes pale brown, finely beaked and ribbed, the beak smooth or finely muricate; receptacular pits with slender, white cilia (c) subsp. **haenseleri**
3 Achenes brownish-yellow, coarsely beaked and ribbed, the beak definitely ribbed and spinulose to the apex; receptacular pits with coarse, yellow, shining cilia (d) subsp. **congenita**

(a) Subsp. **vesicaria**: Ultimate branches erect before anthesis. Involucre 8–14 × 4–10 mm, glabrous or sparsely pubescent near apex, sometimes with longer eglandular hairs; outer bracts broadly ovate, imbricate, usually with wide scarious margins, ¼–¾ as long as the linear-lanceolate inner. Ligules sometimes entirely red. Achenes (4–)5–7(–8) mm, usually of 2 kinds: marginal attenuate or shortly beaked (sometimes absent); inner with a stout beak equal to or shorter than the body, 10– to 12-ribbed. $2n=8$, 16. *Mediterranean region.*

(b) Subsp. **hyemalis** (Biv.) Babcock, *Univ. Calif. Publ. Bot.* **19**: 404 (1941): Ultimate branches deflexed before anthesis. Involucre 10–13 × 5–9 mm, tomentose, with a median row of black eglandular hairs; bracts linear-lanceolate, not imbricate, outer *c.* ⅓ as long as inner. Achenes 5–7 mm, uniform, pale brown, attenuate into a slender or rather stout beak nearly equalling the body, 10-ribbed. $2n=8$. ● *Sicilia.*

(c) Subsp. **haenseleri** (Boiss. ex DC.) P.D. Sell, *Bot. Jour. Linn. Soc.* **71**: 254 (1976) (*Barkhousia haenseleri* Boiss. ex DC., *Crepis taraxacifolia* Thuill., *C. marschallii* (C. A. Meyer) Schultz Bip., *C. rutilans* Lacaita): Ultimate branches erect before anthesis. Involucre 8–12 × 3–8 mm, of tenpubescent, sometimes with long hairs; outer bracts more or less lanceolate, not imbricate. Receptacular pits with slender, white cilia. Achenes (5–)6–8(–9) mm, pale brown, uniform, gradually attenuate into a slender beak equalling or slightly longer than the body, smooth or muricate, 10-ribbed. $2n=8$, 16. *S., W. & C. Europe.*

(d) Subsp. **congenita** Babcock, *Univ. Calif. Publ. Bot.* **22**: 860 (1947): Ultimate branches erect before anthesis. Involucre 9–11 × 5–8 mm; bracts linear-lanceolate, not imbricate, outer ¼–½ as long as inner. Receptacular pits with coarse, yellow, shining cilia. Achenes 7–8 mm, brownish-yellow, with a coarse, ribbed beak spinulose to the apex, 10-ribbed. ● *S. & E. Spain.*

Sect. NEMAUCHENES (Cass.) Bentham. Pubescent annuals with long, slender to robust roots. Basal leaves petiolate, denticulate to pinnatifid. Capitula with many florets. Ligules yellow, usually reddish or purplish on outer face. Receptacle with ciliate pits.

67. C. tybakiensis Vierh., *Österr. Bot. Zeitschr.* **65**: 73 (1915) (*C. foetida* subsp. *maritima* var. *tybakiensis* (Vierh.) Hayek). Stems several, up to 15 cm, simple. Leaves up to 7 × 1 cm, all basal, numerous, oblong to obovate-lanceolate, subentire to pinnatisect, the lateral lobes triangular, acute, remotely denticulate, the terminal ovate-hastate, glabrous or with a few eglandular hairs. Capitulum solitary. Involucre 6–12 × 5–8 mm; outer bracts lanceolate, the inner linear-lanceolate, with eglandular and shorter glandular hairs or glabrescent, the outer *c.* ⅓ as long as the inner. Ligules yellow, reddish-purple on outer face. Achenes fusiform, of 2 kinds: marginal 6–8 mm, strongly curved, the body equalling the beak, with densely spinulose, obscure ribs; inner 10–12 mm, the beak 2½ times as long as the body and extremely slender, with 10 spinulose ribs. ● *C. & E. Kriti, Kasos.* Cr.

68. C. setosa Haller fil., *Arch. Bot. (Roemer)* **1(2)**: 1 (1797). Stems 8–80 cm, remotely branched. Leaves with pale eglandular hairs; basal up to 30 × 8 cm, oblanceolate, obtuse to acute, denticulate to pinnatisect, narrowed below; cauline mostly lanceolate, auriculate-amplexicaul. Involucre 8–10 × 4–10 mm; bracts linear-lanceolate, acute, with pale, eglandular rigid hairs thickened at their base, the outer bracts up to ½ as long as inner. Style-branches dark green. Achenes 3·25–5 × 0·3–0·6 mm, uniform, fusiform, yellowish-brown, attenuate into a slender beak, 10-ribbed. $2n=6$, 8. *S. & S.C. Europe.* Al Au Bu Co Cz Ga Gr Hs Hu It Ju Rm Rs (K) Sa Tu [Ge He Po].

Plants from E. Greece with the involucre 7 × 4–5 mm, style-branches pale yellowish-green, achenes usually of 2 kinds (the marginal 3 × 0·5 mm, attenuate or with a small beak, the inner, or all when the achenes are uniform, 3–3·75 × 0·3–0·4 mm, attenuate into a very slender beak) have been described as subsp. **topaliana** Babcock, *Univ. Calif. Publ. Bot.* **19**: 403 (1941). Intermediates are frequent and the taxon is not obviously geographically or ecologically isolated, so it is best considered merely as a variety.

C. atheniensis Babcock, *Univ. Calif. Publ. Bot.* **22**: 876 (1947) is known only from the type specimen, collected in S.E. Greece (near Athinai) in 1848, and possibly introduced there. It differs from **68** chiefly in having the involucre 10–14 mm, and the achenes 4·5–6·5 mm.

Sect. PSAMMOSERIS (Boiss. & Reuter) Babcock. More or less pubescent annuals or perennials. Basal leaves petiolate, dentate to pinnate. Capitula with few to many florets. Ligules yellow, reddish or dirty green on outer face. Receptacle with ciliate pits.

69. C. bellidifolia Loisel., *Fl. Gall.* 527 (1807). Annual; stems 35–50 cm, remotely branched from near the base. Leaves glabrous or pubescent on midrib beneath: basal up to 11 × 3 cm, oblanceolate, entire to pinnately lobed, narrowed at base; cauline like the basal or sessile, auriculate-amplexicaul. Ligules reddish on outer face. Involucre 7–10 × 4–5 mm; bracts linear-lanceolate, obtuse, glabrous, tomentulose or glandular-pubescent, the outer ⅓–½ as long as inner. Achenes 3·5–6·5 mm, yellowish or brownish, fusiform, attenuate into a slender beak, 10-ribbed. $2n=8$. ● *W. Mediterranean region.* ?Bl Co Ga Hs It Sa.

70. C. bursifolia L., *Sp. Pl.* 805 (1753). Perennial; stems 5–35 cm, numerous, decumbent or arcuate, branched above. Leaves glabrous or puberulent; basal 2·5–25 × 0·6–5 cm, oblanceolate, obtuse to acute, denticulate to dentate, lyrate-pinnatifid, the lateral segments lanceolate; cauline mostly smaller, the lower like the basal, the remainder often linear. Involucre 8–11 × 3–5 mm; bracts linear to linear-lanceolate, obtuse, canescent-tomentose and with pale yellow eglandular hairs, the outer *c.* ⅓ as long as the inner. Ligules greenish on outer face. Achenes 5·5–7 × 0·4 mm, pale brown, fusiform, abruptly attenuate into a pale, filiform, fragile beak up to nearly twice as long as the body, 10-ribbed. $2n=8$. ● *C. & S. Italy, Sicilia.* It Si [Ga ?Gr Hs].

179. **Hispidella** Barnades ex Lam.[1]

Annuals. Stems 1-several, usually simple. Leaves entire. Capitula usually solitary. Involucral bracts in 1 row, more or less equal. Receptacle densely hairy, without scales. Outer ligules yellow, reddish-brown on outer face; the inner brownish-purple. Achenes obpyramidal; pappus absent.
obpyramidal; pappus absent.

1. H. hispanica Barnades ex Lam., *Encycl. Méth. Bot.* **3**: 134 (1789). Indumentum of both short, stellate hairs, and long, patent, simple hairs up to 12 mm. Stems 2–30 cm, one to several. Basal and cauline leaves similar, 10–60 × 2–10 mm, linear, linear-oblanceolate or spathulate, obtuse, entire. Peduncles thickened at apex after anthesis. Involucre 8–12 × 8–12 mm; bracts linear to linear-lanceolate, more or less acute, strongly incurved and thickened in fruit. Achenes *c.* 1·3 mm. $2n=18$. *Sandy fields and dry waste places.* ● *C. Spain, N. Portugal, mainly in the mountains.* Hs Lu.

[1] By P. D. Sell.

180. Andryala L.[1]

Annual to perennial herbs. Stems usually solitary, rarely numerous. Leaves entire to pinnatisect; cauline few to numerous, often more or less amplexicaul. Capitula usually few to numerous, rarely solitary. Involucral bracts in 2 to several rows. Receptacle pitted, the margins of the pits laciniate-dentate and with cilia which are often longer than the subtending achenes, sometimes with scales enfolding some or all the florets. Ligules yellow, the outer sometimes with a reddish stripe on outer face. Achenes oblong or obconical, truncate (rarely with a disc) at apex, with 8–10 prominent ribs; pappus of greyish hairs, falling entire.

1 Capitulum 1(–2)
2 Involucre with at least some glandular hairs; receptacular scales absent **4. agardhii**
2 Involucre without glandular hairs; receptacle with laciniate scales enfolding the florets **5. levitomentosa**
1 Capitula more than 3
3 Involucre without glandular hairs **3. ragusina**
3 Involucre with numerous glandular hairs
4 Involucre 7–11 × 5–10 mm **1. integrifolia**
4 Involucre 10–13 × 12–15 mm **2. laxiflora**

1. A. integrifolia L., *Sp. Pl.* 808 (1753) (*A. arenaria* (DC.) Boiss. & Reuter, *A. dentata* Sibth. & Sm., *A. sinuata* L.). Annual to perennial. Stems 12–80 cm, sparingly to much-branched, with sparse to dense stellate and short simple eglandular hairs, and sometimes with glandular hairs above. Leaves 20–80 × 3–30 mm, with dense stellate and short eglandular hairs, linear, oblanceolate, lanceolate or ovate, obtuse to acute, entire to deeply pinnatisect, the lower usually narrowed at base, the upper usually broader and sometimes semiamplexicaul; basal leaves usually few, the cauline numerous, sometimes aggregated towards the base. Capitula few to numerous. Involucre 7–11 × 5–10 mm; bracts linear-lanceolate, obtuse to acute, with dense stellate and short simple eglandular hairs and longer glandular hairs. Achenes *c.* 1·5 mm. $2n = 18$. *Mediterranean region and S.W. Europe, northwards to c.* 47° *N. in W. France.* Az Co Ga Gr Hs It Lu Sa Si.

Very variable in all its parts. It appears to be divisible into many closely allied taxa, but, as none of the published classifications seem to cover more than part of this variation, it is thought better to treat it as one extremely variable species until detailed experimental work can be carried out.

2. A. laxiflora DC., *Prodr.* **7**: 246 (1838). Annual. Stems 10–45 cm, tomentose with stellate and simple eglandular hairs, and also with glandular hairs above. Leaves numerous, 40–60 × 10–25 mm, mostly cauline, oblanceolate, lanceolate or oblong-lanceolate, obtuse to acute, subentire to dentate, the lower narrowed at base, the upper cordate-amplexicaul, tomentose with dense stellate and simple eglandular hairs. Capitula numerous. Involucre 10–12 × 12–15 mm; bracts linear-lanceolate, acute, with dense stellate and simple eglandular hairs and numerous longer glandular hairs. Achenes 1·5–2·5 mm, the outer enfolded by the inner involucral bracts and with scales between them. $2n = 18$. *S. & E. Spain, S. & E. Portugal.* Hs Lu.

3. A. ragusina L., *Sp. Pl.* ed. 2, 1136 (1763). Perennial. Stems 10–50 cm, tomentose with stellate and simple eglandular hairs. Leaves 20–80 mm, linear-oblong, elliptical, obovate or oblanceolate, more or less acute, tomentose with dense stellate and simple eglandular hairs, all or at least the lower narrowed at base, the upper sometimes abruptly contracted and semiamplexicaul. Capitula few to numerous. Involucral bracts linear-lanceolate, acute, with dense stellate and simple eglandular hairs, without glandular hairs. Achenes 2–2·5 mm. ● *S.W. Europe.* Bl Co Ga Hs Lu.

Two distinct variants occur: var. *ragusina* has the stems branched only above the middle, leaves 10–30 mm wide, and involucre 11–16 × 12–16 mm, while var. *ramosissima* Boiss. ex DC. has the stems often branched from the base, leaves not more than 10 mm wide, and involucre 8–10 × 6–10 mm. They may deserve the rank of subspecies, but they both appear to occur throughout the range of the species and their ecology is not clearly understood.

4. A. agardhii Haenseler ex DC., *Prodr.* 7: 244 (1838). Perennial with woody, sometimes branched stock covered with the persistent bases of petioles. Stems 7–15 cm, with a tomentum of stellate and simple eglandular hairs throughout and longer glandular hairs above. Leaves with a dense tomentum of short and simple eglandular hairs; basal numerous, 15–35 × 5–15 mm, spathulate to oblanceolate, obtuse to subacute, entire, narrowed below into a long, winged petiole; cauline few, more or less linear. Capitulum solitary. Involucre 10–12 × 10–14 mm; bracts lanceolate, obtuse to acute, with a dense tomentum of stellate and simple eglandular hairs and few to numerous longer glandular hairs. Achenes 2·5–3·5 mm. *Mountain rocks and screes.* ● *S. Spain.* Hs.

5. A. levitomentosa (E. I. Nyárády) P.D. Sell, *Bot. Jour. Linn. Soc.* **71**: 256 (1976) (*Pietrosia levitomentosa* E. I. Nyárády). Perennial with a woody, often branched stock, covered with the persistent bases of petioles. Stems 6–20 cm, with a tomentum of mainly stellate hairs and longer simple eglandular hairs, and sometimes with a few glandular hairs above. Leaves with a dense tomentum of stellate and simple eglandular hairs; basal numerous, 10–100 × 10–25 mm, suborbicular to broadly elliptical, obtuse to subacute, entire or with 1–4 small teeth, attenuate at base into a winged petiole; cauline 1–4, linear. Capitulum 1(–2). Involucre 10–15 × 15–20 mm; bracts lanceolate, acute, with dense stellate hairs and dense, longer, simple eglandular hairs. Achenes *c.* 1·5 mm, obconical, with a 2-rimmed disc at the apex. Receptacle with laciniate scales enfolding the florets. *Mountain cliffs,* 1600–1700 *m.* ● *E. Carpathians* (*Pietrosul Broştenilor*). Rm.

181. Hieracium L.[2]

(incl. *Pilosella* Hill)

Perennial herbs. Stems 1–numerous. Leaves entire to deeply dentate, rarely lobed, the basal usually rosulate. Involucral bracts in several irregularly imbricate rows, linear-lanceolate. Receptacle without scales, flat, pitted; margins of the pits shortly dentate to fimbriate-dentate. Ligules usually yellow (sometimes with a red stripe on outer face), rarely reddish, green or white. Achenes 10- to 13-ribbed, narrowly obconical, never beaked. Pappus of 1 or 2 rows of unequal, brittle, white to pale yellowish-brown hairs.

In the opinion of the authors, *Hieracium* and *Pilosella* are best considered as separate genera (see P. D. Sell & C. West, *Notes Roy. Bot. Gard. Edinb.* **33**: 241–248 (1974)). The Editorial Committee, however, having reviewed the opinions of the Regional Advisers, decided that for the purposes of this Flora they would be best united in order to maintain nomenclatural continuity with the work of Zahn and the majority of European Floras.

[1] By P. D. Sell. [2] By P. D. Sell & C. West.

The amount and nature of the indumentum, particularly on the involucre, are very constant within species. There are two main types of hairs, branched and simple: branched hairs are either more or less *stellate*, or *plumose* or *subplumose* (i.e. pinnately branched with the side-projections longer than the diameter of the hair); *simple* hairs can be glandular or eglandular; simple eglandular hairs include those hairs with minute side-projections not longer than the diameter of the hair. The abundance of the hairs is indicated by the following terms: *few* or *sparse*, when the hairs in question form only a small proportion of the total indumentum or are scattered; *numerous*, when the hairs are abundant but separated widely enough to be individually distinct; *dense* when they form a continuous indumentum. Stigmas which are *discoloured* have developed a dirty greyish or greenish tinge which may turn even darker when dry; yellow stigmas with no discoloration usually remain yellow when dry. Measurement of width of capitulum is made on herbarium material.

More taxa have been described in *Hieracium* than in any other genus in the European flora. Zahn's monograph (1921–1923) is used as a basis for this account.

In Subgenus *Pilosella*, some attempt has been made to indicate the introduced status of some taxa; this has not been possible in Subgenus *Hieracium*.

Plants of Subgenus *Pilosella* are sexual or partially apomictic. The species in this subgenus described here correspond to the species of Zahn, and the subspecies to those of both Zahn and Naegeli & Peter (1885). Only the small number of these subspecies which are morphologically distinct and have a wide geographical range are accepted here. The remaining subspecies of these authors are based on very insignificant characters and are usually of restricted distribution. Plants intermediate in character between most species and subspecies occur; many are obvious hybrids and occur with their parents, some being intermediate in character and others being closer to one parent than to the other. Other plants with intermediate characters are not so certainly of hybrid origin, or at least not of recent hybrid origin, and form uniform populations sometimes at a great distance from one or both of the species between which they are intermediate; such plants may be morphologically identical with part of a variable population of obvious hybrids. Triple and quadruple hybrids occur and have been described and given binomials, and some have been reproduced artificially. Vegetative spread occurs in the majority of the taxa in Subgenus *Pilosella* and further complicates the situation. In this account the intermediates have been given hybrid binomials, followed by an indication of their probable origin in the form: **H. × hypeuryum** Peter (*H. hoppeanum|pilosella*). In Subgenus *Pilosella* the taxa given hybrid binomials are included in the text in alphabetical order under their suggested parents; those which occur in 5 or more territories are numbered and described in the text but are, for practical reasons, not included in the key; the remainder are given distributions, but not descriptions, and are not numbered.

Plants of Subgenus *Hieracium* are usually agamospermic, [illegible] forming only univalents at meiosis, usually having little or no pollen, and setting good seed; only a few species are known to be sexual. The majority of both Zahn's 'species principales collectivae' and his 'species intermediae collectivae' (which are morphologically intermediate between 'species principales collectivae', and may have originated as a result of hybridization) are treated in this account as groups of species, and Zahn's subspecies are treated as species. The groups of species (and a few species) are numbered and given descriptions, and each group-description must be understood to cover all the species known in that group. After each name of a group which Zahn considered to be a 'species intermedia collectiva' a formula is given: **H. rupestre** group (*H. pictum|humile*); these names in brackets correspond to the groups ('species principales collectivae') which in Zahn's opinion contributed to the origin of the group in question. Within each group a selection of species is listed, some because they are widespread or otherwise illustrate the extent of the distribution, and others because they indicate the range of morphological variation within the group. No infrageneric taxa are recognized below the rank of subgenus, but informal subdivisions have been made. At the end of these subdivisions a number of groups or species may be listed which are too local to be worth describing. Certain names in the index to Subgenus *Hieracium* printed in roman type, may on further information prove to be synonyms.

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1 Stolons often present; achenes up to 2·5 mm, each rib shortly projecting above to form a crenulate apex; pappus hairs in 1 row with a few shorter than the rest (Subgen. *Pilosella*)
2 Main rosette non-flowering; capitula borne at ends of stolons **1. castellanum**
2 Main rosette with a flowering stem; capitula rarely borne at ends of stolons
3 Flowering stems usually scapose, each with 1 capitulum
4 Leaves with dense stellate hairs above
5 Stolons long, slender **10. pilosella**
5 Stolons short, thick
6 Involucral bracts with numerous glandular hairs **2. hoppeanum**

6 Involucral bracts without glandular hairs **9. argyrocomum**
4 Leaves with few or no stellate hairs above
7 Stolons short, thick
8 Involucral bracts ±obtuse **2. hoppeanum**
8 Involucral bracts acute **7. peleteranum**
7 Stolons long, slender
9 Leaves glaucous, without stellate hairs **16. lactucella**
9 Leaves green, with dense stellate hairs at least beneath
10 Involucral bracts 0·5–1·5 mm wide, rarely with dense, long, dark, simple eglandular hairs **10. pilosella**
10 Involucral bracts 1·5–2 mm wide, with dense, long, dark, simple eglandular hairs completely concealing the bracts **13. pseudopilosella**
3 Flowering stems scapose or leafy, at least one of the stems with more than one capitulum
11 Ligules deep orange, turning purplish when dry **48. aurantiacum**
(Most *H. aurantiacum* hybrids key out here and can often be distinguished by their more lax or deeply furcate inflorescence.)
11 Ligules yellow, sometimes with a reddish stripe on outer face
12 Capitula few, on long peduncles; involucre (8–)9–12 mm
(Many hybrids between species with a single capitulum per flowering stem and species with few to numerous capitula per flowering stem key out here)
13 Stolons long and thick; leaves without glandular hairs **14. flagellare**
13 Stolons absent or short and thick; leaves with few to numerous minute glandular hairs **25. sphaerocephalum**
12 Capitula often numerous; involucre 5–9 mm
14 Flowering stems usually not more than 25 cm; cauline leaves usually solitary or absent; capitula usually not more than 7
15 Stolons usually long and numerous; leaves without glandular or stellate hairs **16. lactucella**
15 Stolons absent or very short; leaves with stellate or minute glandular hairs
16 Involucral bracts without simple eglandular hairs **22. vahlii**
16 Involucral bracts with simple eglandular hairs
17 Involucral bracts with rather short, simple eglandular hairs and few to numerous, short glandular hairs **23. glaciale**
17 Involucral bracts with long, dense simple eglandular hairs and usually few short glandular hairs
18 Leaves with ±numerous stellate hairs on both surfaces; involucral bracts 6–7 mm **26. breviscapum**
18 Leaves with few stellate hairs above; involucral bracts 7–12 mm **27. alpicola**
14 Flowering stems usually more than 25 cm; cauline leaves 1–3(–11); capitula usually more than 7
19 Stem and leaves glabrous or with scattered (sometimes long) simple eglandular hairs
20 Peduncles without or with few stellate hairs **28. piloselloides**
20 Peduncles with ±dense stellate hairs **29. praealtum**
19 Stems and leaves with numerous simple eglandular or glandular hairs
21 Upper half of stem with glandular and stellate hairs only **64. verruculatum**
21 Upper half of stem always with simple eglandular hairs and sometimes stellate and glandular hairs
22 Whole plant covered with dense, rigid simple eglandular hairs, those of the stem ascending-appressed **57. echioides**
22 Plant with scarcely rigid hairs, those of the stem ±patent
23 Stolons long **38. caespitosum**
23 Stolons very short or absent
24 Flowering stems with 1–4 leaves or bracts **30. cymosum**
24 Flowering stems with (3–)5–20 leaves or bracts **57. echioides**

1 Stolons absent; achenes (1·5–)2·5–5 mm, the ribs apically confluent in an obscure ring; pappus-hairs in 2 rows (Subgen. *Hieracium*)
25 Leaves with ±plumose hairs, particularly on the margin and midrib beneath
26 Apex of rhizome with dense, long hairs; margins of receptacular pits usually densely ciliate
27 Involucre without or with few glandular hairs
28 Involucre 6–9 mm; achenes 1·5–2·5 mm
29 Achenes 2·3–2·8 mm **91. elisaeanum**
29 Achenes 1·5–2 mm **92. candidum**
28 Involucre 9–12 mm; achenes 2·5–3 mm
30 Involucre with few stellate hairs **93. phlomoides**
30 Involucre with numerous stellate hairs **94. rupicaprinum**
27 Involucre with numerous glandular hairs
31 Peduncles with simple eglandular hairs **98. subsericeum**
31 Peduncles without simple eglandular hairs
32 Involucre with numerous stellate hairs **97. briziflorum**
32 Involucre with few or no stellate hairs
33 Peduncles with a few small glandular hairs, or without glandular hairs **93. phlomoides**
33 Peduncles with numerous unequal or long glandular hairs
34 Leaves with dense hairs 1–3 mm **95. eriopogon**
34 Leaves with few to numerous hairs 1–2 mm **96. lawsonii**
26 Apex of rhizome without dense, long hairs; margins of receptacular pits glabrous or more or less ciliate
35 Leaves with numerous obvious glandular hairs; margins of receptacular pits often ciliate
36 Involucre with numerous stellate hairs **185. pedemontanum**
36 Involucre without or with few stellate hairs
37 Peduncles and involucre with subplumose hairs; involucre 12–15 mm
38 Ligules glabrous; achenes pale when mature **186. scapigerum**
38 Ligules with short eglandular hairs at apex; achenes dark when mature **187. urticaceum**
37 Peduncles and involucre without subplumose hairs; involucre 9–12 mm
39 Peduncles with few stellate hairs; ligules with short glandular hairs at apex **184. pardoanum**
39 Peduncles with ±numerous stellate hairs; ligules with short simple eglandular hairs at apex
40 Cauline leaves (2–)3–7(–12), at least 1 of them large; capitula usually 3–8 **182. cordatum**
40 Cauline leaves 1–3(–4), very small; capitula 10–25 **183. glaucophyllum**
35 Leaves without glandular hairs or with occasional minute glandular hairs along the margin; receptacular pits without cilia
41 Achenes pale when mature
42 Involucre with few or no simple eglandular or ±plumose hairs
43 Basal rosette present at anthesis; cauline leaves 2–6 **149. scheppigianum**
43 Basal rosette absent or withered at anthesis; cauline leaves more than 6, often crowded towards base to form a false rosette
44 Involucre with numerous stellate hairs **146. waldsteinii**
44 Involucre with few or no stellate hairs
45 Involucre 12–15 mm **143. gymnocephalum**
45 Involucre 9–13 mm
46 Involucre glabrous or with a few simple eglandular hairs **150. mirificissimum**
46 Involucre with scattered stellate hairs, sparse to dense minute glandular hairs and sometimes a few simple eglandular hairs **156. jankae**
42 Involucre with numerous or dense simple eglandular or ±plumose hairs
47 Involucre without or with few stellate hairs
48 Involucre 12–16 mm
49 Upper part of stem and peduncles with few or no hairs **144. pichleri**

49 Upper part of stem and peduncles with dense hairs **148. guentheri-beckii**
48 Involucre 9–13 mm
50 Ligules glabrous **147. dolopicum**
50 Ligules with short simple eglandular hairs at apex **152. calophyllum**
47 Involucre with numerous stellate hairs
51 Cauline leaves 0–3; basal leaves often present at anthesis
52 Involucre 10–15 mm; bracts acute **155. sericophyllum**
52 Involucre 8–12 mm; bracts obtuse to acute **157. sartorianum**
51 Cauline leaves more than 6; basal leaves absent
53 Upper part of stem and peduncles without or with few simple eglandular or ±plumose hairs
54 Ligules with short simple eglandular hairs at apex **152. calophyllum**
54 Ligules glabrous **154. heldreichii**
53 Upper part of stem and peduncles with numerous simple eglandular or ±plumose hairs
55 Upper part of stem and most of peduncles without or with few stellate hairs **145. gaudryi**
55 Upper part of stem and peduncles with numerous to dense stellate hairs
56 Stems 10–40(–50) cm; leaves entire to denticulate or dentate; involucre 13–20 × 15–25 mm, with dense, long plumose hairs **142. pannosum**
56 Stems 20–100 cm; leaves denticulate to deeply dentate; involucre 10–17 × 8–14 mm, with less dense subplumose hairs **153. pilosissimum**
41 Achenes dark when mature
57 Basal leaves absent at anthesis; cauline leaves more than 6
58 Involucre without or with few simple eglandular or ±plumose hairs **143. gymnocephalum**
58 Involucre with numerous to dense simple eglandular or ±plumose hairs
59 Ligules with short simple eglandular hairs at apex **140. verbascifolium**
59 Ligules glabrous
60 Involucre without or with few stellate hairs **144. pichleri**
60 Involucre with numerous stellate hairs **145. gaudryi**
57 Basal leaves present at anthesis; cauline leaves not more than 6
61 Involucre 8·5–12 mm
62 Involucre without or with few stellate hairs
63 Ligules with glandular hairs at apex **125. mixtum**
63 Ligules glabrous or with few simple eglandular hairs at apex
64 Cauline leaves 3–6 **138. pellitum**
64 Cauline leaves 1–2 **151. lazistanum**
62 Involucre with numerous to dense stellate hairs
65 Peduncles without or with few minute glandular hairs
66 Hairs on upper surface of leaves soft **127. pictum**
66 Hairs on upper surface of leaves rigid **128. farinulentiforme**
65 Peduncles with numerous glandular hairs
67 Involucre with numerous glandular hairs, without or with few simple eglandular or subplumose hairs **133. leiopogon**
67 Involucre with few glandular hairs and numerous simple eglandular or subplumose hairs **134. rupestre**
61 Involucre (11–)12–20 mm
68 Cauline leaves 0–1(–3)
69 Hairs on leaves distinctly plumose **129. pulchellum**
69 Hairs on leaves subplumose or dentate **132. cephalotes**
68 Cauline leaves 2–10(–16)
70 Involucre with numerous glandular hairs **141. chaboissaei**
70 Involucre without or with few glandular hairs
71 Upper surface of leaves without hairs or with few simple eglandular or subplumose hairs
72 Cauline leaves 3–6 **138. pellitum**
72 Cauline leaves 1–2 **151. lazistanum**
71 Upper surface of leaves with dense ±plumose hairs
73 Leaves with small glandular hairs on margin **139. lansicum**
73 Leaves without glandular hairs on margin
74 Cauline leaves 5–10(–16); stigmas discoloured **140. verbascifolium**
74 Cauline leaves 2–6(–8); stigmas usually yellow
75 Cauline leaves ±amplexicaul; whole plant with plumose hairs 4–7 mm **136. erioleucum**
75 Cauline leaves not amplexicaul; plumose hairs less than 4 mm
76 Hairs plumose; leaves entire to sparsely dentate, the cauline ovate to lanceolate **135. lanatum**
76 Hairs subplumose; leaves strongly dentate, the cauline narrower **137. jordanii**
25 Leaves without plumose or subplumose hairs
77 Leaves with glandular hairs which are sometimes sparse and confined to the margins
78 Glandular hairs on leaves numerous, conspicuous
79 Ligules glabrous or with few hairs at apex
80 Cauline leaves (at least the upper) ±amplexicaul
81 Leaves lanceolate, linear-lanceolate or oblong **193. intybaceum**
81 Leaves lanceolate to ovate-lanceolate **194. pallidiflorum**
80 Cauline leaves not amplexicaul, often shortly petiolate
82 Involucre with an occasional simple eglandular hair **195. khekianum**
82 Involucre with ±numerous eglandular hairs
83 Peduncles without or with few stellate hairs **174. humile**
83 Peduncles with numerous stellate hairs
84 Involucre without or with few stellate hairs **175. cottetii**
84 Involucre with dense stellate hairs **176. kerneri**
79 Ligules with numerous simple eglandular or glandular hairs at apex
85 Leaves all cauline (occasionally a few basal withered at anthesis), 5–15(-numerous)
86 Receptacular pits dentate **191. picroides**
86 Receptacular pits fimbriate-dentate
87 Involucre with numerous to dense stellate hairs **189. ramosissimum**
87 Involucre without or with few stellate hairs
88 Leaves 25–170 × 10–170 mm, often panduriform **188. viscosum**
88 Leaves 25–115 × 10–30 mm, never panduriform **192. neopicris**
85 Basal leaves present at anthesis
89 Involucre 12–18 mm
90 Stem, peduncles and involucre with few to numerous stellate hairs; involucral bracts long-acute **178. amplexicaule**
90 Stem, peduncles and involucre without or with few stellate hairs; involucral bracts ±acute **179. chamaepicris**
89 Involucre 8–12 mm
91 Involucre with sparse stellate hairs
92 Leaves entire to remotely denticulate
92 Leaves entire to remotely denticulate **180. pseudocerinthe**
92 Leaves deeply and irregularly dentate **181. rupicola**
91 Involucre with numerous stellate hairs
93 Involucre 8–9 mm; stigmas discoloured **190. arpadianum**
93 Involucre 9–12 mm; stigmas yellow
94 Cauline leaves (2–)3–7(–12), well-developed; capitula usually 3–8 **182. cordatum**
94 Cauline leaves 1–3(–4), small; capitula 10–25 **183. glaucophyllum**
78 Glandular hairs on leaves inconspicuous, mainly on the margin

95 At least the upper cauline leaves ±amplexicaul
96 Ligules glabrous
97 Basal leaves present at anthesis; cauline usually not more than 12
98 Involucre without or with few glandular hairs, stellate hairs absent **211. silesiacum**
98 Involucre with numerous glandular and stellate hairs **222. viride**
97 Basal leaves absent at anthesis; cauline usually more than 12
99 Involucre 11–15 mm, without simple eglandular hairs **245. lucidum**
99 Involucre 9–11 mm, with numerous simple eglandular hairs **252. insuetum**
96 Ligules with short hairs at apex
100 Involucral bracts mostly ±obtuse
101 Cauline leaves more than 10
102 Leaves entire to denticulate **248. compositum**
102 Leaves deeply dentate **250. rectum**
101 Cauline leaves not more than 10
103 Involucre 12–16 mm **171. nigritum**
103 Involucre 9–12 mm
104 Involucre with few glandular hairs
105 Involucre with few simple eglandular hairs and dense stellate hairs **205. neyraeanum**
105 Involucre with numerous simple eglandular hairs and few stellate hairs **238. semidovrense**
104 Involucre with numerous glandular hairs
106 Involucre with few stellate hairs **170. sudeticum**
106 Involucre with numerous stellate hairs
107 Involucre with few simple eglandular hairs **222. viride**
107 Involucre with numerous simple eglandular hairs
108 Some basal leaves ±spathulate **161. fritzei**
108 Basal leaves not spathulate **173. gombense**
100 Involucral bracts mostly ±acute
109 Apex of rhizome with dense long hairs
110 Involucre with numerous to dense stellate hairs **101. purpurascens**
110 Involucre without or with few stellate hairs
111 Stigmas yellow **99. cordifolium**
111 Stigmas discoloured **100. sonchoides**
109 Apex of rhizome without long hairs
112 Involucre 12–16 mm **171. nigritum**
112 Involucre 7–12 mm
113 Involucre with numerous simple eglandular hairs **172. chlorocephalum**
113 Involucre without or with few simple eglandular hairs
114 Involucre with numerous stellate hairs **222. viride**
114 Involucre without or with few stellate hairs
115 Ligules with glandular hairs at apex **184. pardoanum**
115 Ligules with simple eglandular hairs at apex
116 Leaves entire to remotely denticulate **180. pseudocerinthe**
116 Leaves deeply and irregularly dentate **181. rupicola**
95 Leaves not amplexicaul
117 Basal leaves absent or withered at anthesis
117 Basal leaves absent or withered at anthesis
118 Cauline leaves 0–2 **157. sartorianum**
118 Cauline leaves numerous
119 Involucre with dense stellate hairs **217. olympicum**
119 Involucre without or with few stellate hairs **253. bracteolatum**
117 Basal leaves present at anthesis
120 Involucre with numerous glandular hairs
121 Involucre with numerous to dense stellate hairs
122 Achenes pale when mature **213. heterogynum**
122 Achenes dark when mature
123 Involucre greenish, with pale simple eglandular hairs
124 Involucre without or with few simple eglandular hairs **131. pseudoprasinops**
124 Involucre with numerous simple eglandular hairs
125 Peduncles with dense glandular hairs **80. schmidtii**
125 Peduncles with few glandular hairs **130. caesioides**
123 Involucre blackish, with dark or dark-based simple eglandular hairs
126 Stigmas yellow **163. senescens**
126 Stigmas discoloured
127 Involucral bracts mostly obtuse **168. bocconei**
127 Involucral bracts mostly acute
128 Cauline leaves 3–5 **161. fritzei**
128 Cauline leaves 1–3
129 Leaves green, almost glabrous above **160. pietroszense**
129 Leaves glaucous, with numerous simple eglandular hairs above **162. arolae**
121 Involucre without or with few stellate hairs
130 Ligules glabrous
131 Cauline leaves 0–1(–2) **80. schmidtii**
131 Cauline leaves 2–12 **86. onosmoides**
130 Ligules with simple eglandular hairs at apex and sometimes on outer face
132 Involucral bracts mostly obtuse
133 Leaves attenuate at base **168. bocconei**
133 Leaves truncate at base **169. vollmannii**
132 Involucral bracts mostly acute
134 Petioles 50–120 mm
135 Leaves serrate **165. liptoviense**
135 Leaves entire to denticulate **166. krasanii**
134 Petioles less than 50 mm
136 Capitula usually 2–10 **164. atratum**
136 Capitula 1–2
137 Leaves 5–15(–20) mm wide; capitulum usually 1; stigmas usually yellow **158. alpinum**
137 Leaves 10–40 mm wide; capitula often 2; stigmas usually discoloured **159. nigrescens**
120 Involucre without or with few glandular hairs
138 Involucre without or with few stellate hairs
139 Ligules glabrous
140 Involucre with dense simple eglandular hairs **177. valoddae**
140 Involucre without or with few simple eglandular hairs **211. silesiacum**
139 Ligules with short simple eglandular hairs at the apex and sometimes on the outer face
141 Leaves with dense flexuous hairs 4–8 mm **123. cochlearioides**
141 Leaves with fewer, straight, shorter hairs
142 Leaves 5–15(–20) mm wide; capitulum usually 1; stigmas usually yellow **158. alpinum**
142 Leaves 10–40 mm wide; capitula often 2; stigmas usually discoloured **159. nigrescens**
138 Involucre with numerous to dense stellate hairs
143 Apex of rhizome with numerous long hairs; margins of receptacular pits fimbriate-dentate **102. guadarramense**
143 Apex of rhizome without long hairs; margins of receptacular pits shortly dentate
144 Leaves with long rigid hairs on margins and sometimes on upper surface **80. schmidtii**
144 Hairs of leaves not rigid
145 Involucre with dense simple eglandular hairs up to 4 mm **112. leucophaeum**
145 Involucre with shorter hairs
146 Leaves green
147 Capitula 1–2(–3); involucre 10–15 mm, blackish **160. pietroszense**
147 Capitula up to 12; involucre 8–12 mm, greenish
148 Cauline leaves more than 3 **75. hypastrum**
148 Cauline leaves 0–2 **157. sartorianum**
146 Leaves ±glaucous

149 Leaves hairy throughout **167. rohacsense**
149 Leaves glabrous or nearly so above
150 Stigmas yellow **68. subcaesiiforme**
150 Stigmas discoloured **204. fulcratum**
77 Leaves without glandular hairs
151 Capitula with few florets, nodding in bud **212. sparsum**
151 Capitula with numerous florets, erect in bud
152 Basal leaves absent or withered at anthesis
153 Leaves not amplexicaul
154 Cauline leaves 0–2 **157. sartorianum**
154 Cauline leaves numerous
155 Achenes pale when mature
156 Leaves with rigid, patent, bulbous-based simple eglandular hairs **217. olympicum**
156 Leaves glabrous or with a few stellate and simple eglandular hairs beneath **218. leiocephalum**
155 Achenes dark when mature
157 Involucre with numerous stellate hairs
158 Involucre without or with few glandular hairs **76. ramosum**
158 Involucre with numerous glandular hairs **216. tommasinii**
157 Involucre without or with few stellate hairs
159 Margins of leaves revolute **257. umbellatum**
159 Margins of leaves not revolute
160 Leaves green **258. laevigatum**
160 Leaves glaucous
161 Involucre 11–13 mm, the outer bracts ±squarrose **219. virgicaule**
161 Involucre 12–15 mm, the bracts appressed **220. pseudobupleuroides**
153 At least the upper leaves ±amplexicaul
162 Cauline leaves not more than 6
163 Involucre with few simple eglandular hairs **225. pedatifolium**
163 Involucre with numerous simple eglandular hairs
164 Leaves elliptic-lanceolate or lanceolate, the upper sometimes panduriform; involucre 8–9·5 mm **234. segureum**
164 Leaves elliptical; involucre 9–13 mm
165 Cauline leaves (1–)2–6(–7), subpetiolate or sessile; ligules often with simple eglandular hairs at apex **235. epimedium**
165 Cauline leaves (3–)4–8(–10), the lower with a distinct winged petiole; ligules glabrous **237. dovrense**
162 Cauline leaves more than 6
166 Achenes pale when mature
167 Ligules with short simple eglandular hairs at apex
168 Involucre with numerous simple eglandular hairs
169 Involucral bracts acute **230. cydonifolium**
169 Involucral bracts obtuse
170 Involucre with numerous stellate and glandular hairs **228. juraniforme**
170 Involucre with few stellate and few glandular hairs **249. nobile**
168 Involucre without or with few simple eglandular hairs
171 Involucre with numerous stellate hairs **251. symphytaceum**
171 Involucre without or with few stellate hairs
172 Stem and leaves with dense, soft simple eglandu-
172 Stem and leaves with dense, soft simple eglandular hairs **229. pocuticum**
172 Stem and leaves with few (rarely numerous) simple eglandular hairs
173 Leaves 10–30(–50); involucre 8–12 mm **226. prenanthoides**
173 Leaves 5–15(–18); involucre 7–8·5 mm **227. juranum**
167 Ligules glabrous
174 Plant lanate at least in the lower part with dense, long simple eglandular hairs
175 Upper part of plant with dense simple eglandular hairs up to 4 mm **259. eriophorum**
175 Upper part of plant with less dense simple eglandular hairs up to 2·5 mm **260. prostratum**
174 Plant not lanate
176 Involucre 8–9 mm, glabrous or nearly so **253. bracteolatum**
176 Involucre 9–15 mm, hairy
177 Involucre without or with few simple eglandular hairs
178 Leaves entire or remotely denticulate, glabrous or nearly so **245. lucidum**
178 Leaves subentire to dentate, with few to numerous simple eglandular hairs
179 Leaves never panduriform; peduncles with few to numerous simple eglandular hairs; involucre 10–14(–16) mm **246. racemosum**
179 Leaves sometimes panduriform; peduncles without or with few simple eglandular hairs; involucre (7–)9–10(–12) mm **251. symphytaceum**
177 Involucre with numerous simple eglandular hairs
180 Plant with few to numerous simple eglandular hairs; leaves 10–numerous **246. racemosum**
180 Plant with dense simple eglandular hairs; leaves 5–numerous
181 Lower leaves oblong-lanceolate or lingulate **247. pseuderiopus**
181 Lower leaves ±elliptical **249. nobile**
166 Achenes dark when mature
182 Involucral bracts acute
183 Involucral bracts with dense simple eglandular hairs up to 5 mm, and few small glandular hairs **117. valdepilosum**
183 Involucral bracts with few to numerous shorter simple eglandular hairs and few to numerous glandular hairs **230. cydonifolium**
182 Involucral bracts obtuse
184 Involucre with numerous simple eglandular hairs
185 Ligules with short simple eglandular hairs at apex **236. carpathicum**
185 Ligules glabrous
186 Involucre without or with very few stellate hairs **254. sabaudum**
186 Involucre with few to dense stellate hairs
187 Margins of receptacular pits ±dentate
188 Leaves (4–)8–20(–30); capitula not more than 10 **239. truncatum**
188 Leaves 15–50; capitula usually more than 10 **244. crocatum**
187 Margins of receptacular pits fimbriate-dentate
189 Leaves densely hairy throughout; peduncles with numerous simple eglandular hairs **249. nobile**
189 Leaves with few hairs, the upper surface sometimes nearly glabrous; peduncles without or with few simple eglandular hairs
190 Peduncles with minute glandular hairs **252. insuetum**
190 Peduncles without glandular hairs **254. sabaudum**
184 Involucre without or with few simple eglandular hairs
191 Involucre without or with few glandular hairs
192 Involucre with numerous stellate hairs
193 Involucre 8·5–10 mm **242. robustum**
193 Involucre 10–12 mm **256. lycopsifolium**
192 Involucre without or with few stellate hairs
194 Involucre 8·5–10 mm **241. virosum**
194 Involucre 10–13 mm
195 Leaves distinctly reticulate-veined, with short rigid hairs on the margin **240. latifolium**
195 Leaves not distinctly reticulate-veined, with long hairs on the margin **254. sabaudum**
191 Involucre with numerous glandular hairs

196 Ligules with short simple eglandular hairs at apex
197 Lower leaves ovate to ovate-lanceolate, never panduriform, sessile or obscurely petiolate **250. rectum**
197 Lower leaves elliptical to ovate-elliptical or lanceolate, sometimes panduriform, obviously petiolate
198 Margin of receptacular pits dentate **224. rapunculoides**
198 Margin of receptacular pits fimbriate-dentate **232. cantalicum**
196 Ligules glabrous
199 Involucre without or with very few stellate hairs
200 Leaves distinctly reticulate-veined; margins of receptacular pits ±dentate **243. inuloides**
200 Leaves not distinctly reticulate-veined; margins of receptacular pits fimbriate-dentate **254. sabaudum**
199 Involucre with few to dense stellate hairs
201 Margins of receptacular pits dentate **224. rapunculoides**
201 Margins of receptacular pits fimbriate-dentate
202 Leaves nearly glabrous above, with sparse simple eglandular hairs beneath **255. flagelliferum**
202 Leaves with numerous simple eglandular hairs throughout **256. lycopsifolium**
152 Basal leaves present at anthesis
203 At least the upper cauline leaves ±amplexicaul
204 Apex of rhizome with dense long hairs
205 Stigmas yellow **99. cordifolium**
205 Stigmas discoloured **100. sonchoides**
204 Apex of rhizome without dense long hairs
206 Involucre with numerous to dense glandular hairs
207 Involucre with numerous simple eglandular hairs
208 Involucre 8–9·5 mm **223. pinicola**
208 Involucre 9–18 mm
209 Involucral bracts obtuse
210 Involucre without stellate hairs **211. silesiacum**
210 Involucre with few to numerous stellate hairs **235. epimedium**
209 Involucral bracts acute
211 Margins of receptacular pits dentate (without cilia) **231. doronicifolium**
211 Margins of receptacular pits ciliate-dentate
212 Involucre without stellate hairs; stigmas yellow **105. cerinthoides**
212 Involucre with few to numerous stellate hairs; stigmas discoloured **106. alatum**
207 Involucre without or with few simple eglandular hairs
213 Involucre with numerous stellate hairs
214 Upper surface and margin of leaves with rigid hairs **222. viride**
214 Leaves with soft hairs
215 Lower cauline leaves with long petiole, the upper and median semiamplexicaul at base but not cordate **221. umbrosum**
215 Lower cauline leaves with very short petioles,
215 Lower cauline leaves with very short petioles, the upper and median cordate, amplexicaul **224. rapunculoides**
213 Involucre without or with few stellate hairs
216 Outer involucral bracts squarrose **211. silesiacum**
216 Outer involucral bracts appressed
217 Involucral bracts acute **200. falcatum**
217 Involucral bracts obtuse
218 Cauline leaves 2–5(–7); margins of receptacular pits dentate without cilia **225. pedatifolium**
218 Cauline leaves 5–10; margins of receptacular pits ciliate-dentate **233. turritifolium**
206 Involucre without or with few glandular hairs
219 Margins of receptacular pits ciliate-dentate
220 Cauline leaves 7–13(–20) **117. valdepilosum**
220 Cauline leaves 1–8
221 Stigmas yellow
222 Involucre without stellate hairs **105. cerinthoides**
222 Involucre with few to numerous stellate hairs **108. longifolium**
221 Stigmas discoloured
223 Involucre with obvious glandular hairs **106. alatum**
223 Involucre without or with few inconspicuous glandular hairs **107. lamprophyllum**
219 Margins of receptacular pits dentate, without cilia
224 Outer involucral bracts squarrose
225 Involucre 14–17(–23) mm **109. villosum**
225 Involucre (8–)9–12(–14) mm **211. silesiacum**
224 Outer involucral bracts appressed
226 Involucre with few simple eglandular hairs; bracts obtuse **205. neyraeanum**
226 Involucre with numerous simple eglandular hairs; bracts acute
227 Cauline leaves 7–13(–20)
228 At least some hairs on stem more than 5 mm **117. valdepilosum**
228 Hairs on stem not more than 5 mm
229 Involucre 10–12 mm **118. wilczekianum**
229 Involucre 12–17 mm **119. chlorifolium**
227 Cauline leaves 3–8
230 Whole plant with dense long hairs up to 8 mm, giving the plant a shaggy appearance **110. pilosum**
230 Hairs not so dense and many of them shorter, the plant not shaggy in appearance **231. doronicifolium**
203 Leaves not amplexicaul
231 Apex of rhizome with dense long hairs
232 Involucre with few or no stellate hairs
233 Involucre with few or no glandular hairs **90. laniferum**
233 Involucre with numerous glandular hairs **103. aragonense**
232 Involucre with numerous stellate hairs
234 Cauline leaves 2–3; margins of receptacular pits densely ciliate **101. purpurascens**
234 Cauline leaves 0–1; margins of receptacular pits sparsely ciliate **104. loscosianum**
231 Apex of rhizome without dense long hairs
235 Cauline leaf 0–1, or cauline leaves 2 but the upper one bract-like
236 Involucre without or with few simple eglandular hairs
237 Leaves with numerous stellate hairs on upper surface **85. stelligerum**
237 Leaves without stellate hairs on upper surface
238 Margin of leaves with rigid hairs **131. pseudoprasinops**
238 Margin of leaves with soft hairs
239 Involucre with few glandular hairs **202. franconicum**
239 Involucre with numerous glandular hairs
240 Outer involucral bracts much broader and shorter than inner, not regularly imbricate **65. murorum**
65. murorum
240 Involucral bracts all narrow, regularly imbricate **206. austriacum**
236 Involucre with numerous simple eglandular hairs
241 Involucre without or with few glandular hairs
242 Involucre without or with few stellate hairs
243 Involucral bracts obtuse
244 Margin of leaves with soft hairs **74. caesium**
244 Margin of leaves with rigid hairs **89. caledonicum**
243 Involucral bracts acute
245 Leaves truncate or rounded at base **70. incisum**

245 Leaves cuneate to attenuate at base
246 Margins of receptacular pits ciliate-dentate **126. mixtiforme**
246 Margins of receptacular pits fimbriate-dentate, without cilia
247 Basal leaves lanceolate to oblong, entire **120. piliferum**
247 Basal leaves elliptical to lanceolate, denticulate to dentate **122. aphyllum**
242 Involucre with numerous stellate hairs
248 Involucre 14–17 mm **132. cephalotes**
248 Involucre 9–12 mm
249 Upper surface of leaves with numerous simple eglandular hairs
250 Leaves green **69. fuscocinereum**
250 Leaves ±glaucous **74. caesium**
249 Upper surface of leaves glabrous or with very few simple eglandular hairs
251 Outer involucral bracts broader and much shorter than inner, not regularly imbricate; hairs of involucre often dark at base **74. caesium**
251 Involucral bracts all narrow, regularly imbricate; hairs of involucre not dark at base
252 Peduncles with numerous glandular hairs **207. dollineri**
252 Peduncles without or with few glandular hairs **203. oxyodon**
241 Involucre with numerous glandular hairs
253 Involucre without or with few stellate hairs
254 Ligules with short simple eglandular hairs at apex
255 Leaves not spotted or blotched; stigmas dark **164. atratum**
255 Leaves spotted or blotched; stigmas yellow
256 Base of leaves truncate **66. glaucinum**
256 Base of leaves attenuate **82. sommerfeltii**
254 Ligules glabrous
257 Leaves with numerous hairs on upper surface
258 Margins of receptacular pits ciliate-dentate **84. bourgaei**
258 Margins of receptacular pits dentate, without cilia **124. armerioides**
257 Leaves subglabrous on upper surface
259 Leaves spotted or blotched **82. sommerfeltii**
259 Leaves not spotted or blotched
260 Peduncles with dense glandular hairs; margins of receptacular pits sparsely ciliate **83. aymericianum**
260 Peduncles with few small glandular hairs; margins of receptacular pits without cilia **87. saxifragum**
253 Involucre with numerous stellate hairs
261 Stigmas discoloured
262 Ligules with short simple eglandular hairs at apex **167. rohacsense**
262 Ligules glabrous **67. bifidum**
261 Stigmas yellow
263 Leaves without spots or blotches
263 Leaves without spots or blotches
264 Simple eglandular hairs of involucre pale **80. schmidtii**
264 Simple eglandular hairs of involucre dark **163. senescens**
263 Leaves spotted or blotched
265 Leaves with numerous hairs on upper surface **130. caesioides**
265 Leaves subglabrous on upper surface
266 Basal leaves truncate or rounded at base **81. hypochoeroides**
266 Basal leaves attenuate at base **82. sommerfeltii**
235 At least 2 cauline leaves large
267 Involucre without or with few simple eglandular hairs
268 Involucre without or with few stellate hairs
269 Outer involucral bracts ±squarrose **211. silesiacum**
269 Outer involucral bracts appressed
270 Involucre without or with few glandular hairs
271 Involucral bracts acute **200. falcatum**
271 Involucral bracts obtuse
272 Leaves glaucous **209. saxatile**
272 Leaves green **258. laevigatum**
270 Involucre with numerous glandular hairs
273 Peduncles with numerous glandular hairs
274 Involucral bracts 7–8 mm **78. rotundatum**
274 Involucral bracts 9–11 mm **79. diaphanum**
273 Peduncles without or with few glandular hairs
275 Leaves glaucous, the cauline 2–6(–15) **215. macrodontoides**
275 Leaves green, the cauline (4–)8–25(–numerous) **258. laevigatum**
268 Involucre with more or less numerous stellate hairs
276 Involucre with numerous glandular hairs
277 Involucral bracts acute
278 Leaves green, ±dentate **77. argillaceum**
278 Leaves glaucous, usually entire **213. heterogynum**
277 Involucral bracts obtuse
279 Cauline leaves 4 or more **258. laevigatum**
279 Cauline leaves not more than 3
280 Stigmas yellow **202. franconicum**
280 Stigmas discoloured **206. austriacum**
276 Involucre without or with few glandular hairs
281 Involucral bracts obtuse
282 Leaves 1–3(–4·5) mm wide **196. porrifolium**
282 Leaves more than 4·5 mm wide
283 Leaves green **258. laevigatum**
283 Leaves glaucous
284 Leaves without stellate hairs beneath **198. glaucum**
284 Leaves with few to numerous stellate hairs beneath **209. saxatile**
281 Involucral bracts acute
285 Leaves with numerous hairs on upper surface **113. ctenodon**
285 Leaves glabrous or nearly so on upper surface
286 Cauline leaves 2–6(–10); involucre 9–11(–13) mm **198. glaucum**
286 Cauline leaves 3–15; involucre 10–13 mm **208. calcareum**
267 Involucre with ±numerous simple eglandular hairs
287 Involucre with few to numerous glandular hairs
288 Involucre with few to numerous stellate hairs
289 Involucre dark, with dark simple eglandular hairs **163. senescens**
289 Involucre greenish, with pale simple eglandular hairs
290 Leaves spotted **73. maculatum**
290 Leaves not spotted
291 Involucral bracts shortly acute **71. vulgatum**
291 Involucral bracts long-acute **72. benzianum**
291 Involucral bracts long-acute **72. benzianum**
288 Involucre without or with few stellate hairs
292 Involucral bracts obtuse **211. silesiacum**
292 Involucral bracts acute
293 Involucral bracts with pale hairs; ligules glabrous
294 Upper surface of leaves with numerous simple hairs, the cauline 2–12 **86. onosmoides**
294 Upper surface of leaves glabrous or nearly so, the cauline 2–4(–6) **87. saxifragum**
293 Involucral bracts with dark or dark-based hairs; ligules usually with short simple eglandular hairs at apex

295 Petioles short (usually not more than 30 mm) **164. atratum**
295 Petioles long (up to 120 mm)
296 Leaves serrate **165. liptoviense**
296 Leaves entire to denticulate **166. krasanii**
287 Involucre without or with few glandular hairs
297 Involucre with few to numerous stellate hairs
298 Involucral bracts acute
299 Involucre (11–)13–17 mm
300 Peduncles without or with few simple eglandular hairs **115. chondrillifolium**
300 Peduncles with numerous simple eglandular hairs
301 Simple hairs of involucre 3–6 mm **111. scorzonerifolium**
301 Simple hairs of involucre 1–2·5 mm **119. chlorifolium**
299 Involucre 9–13(–14) mm
302 At least some leaves deeply laciniate-dentate **203. oxyodon**
302 Leaves entire to shallowly dentate
303 Margin of leaves with few to numerous simple eglandular hairs up to 3 mm **199. sparsiramum**
303 Margin of leaves with dense simple eglandular hairs up to 11 mm **214. macrodon**
298 Involucral bracts obtuse
304 Involucre usually 12–17 mm
305 Leaves usually less than 10 mm wide **197. bupleuroides**
305 Leaves usually more than 10 mm wide
306 Simple eglandular hairs of involucre dark-based **74. caesium**
306 Simple eglandular hairs of involucre not dark-based
307 Peduncles without or with few simple eglandular hairs **115. chondrillifolium**
307 Peduncles with numerous simple eglandular hairs **119. chlorifolium**
304 Involucre usually 9–12 mm
308 Involucral bracts in regular imbricate rows, the outer not obviously wider than the inner
309 Peduncles without or with few glandular hairs **203. oxyodon**
309 Peduncles with numerous glandular hairs **207. dollineri**
308 Involucral bracts not in regular imbricate rows, the outer wider and much shorter than the inner
310 Cauline leaves 2–4 **74. caesium**
310 Cauline leaves more than 4
311 Leaves glaucous **76. ramosum**
311 Leaves green **258. laevigatum**
297 Involucre without or with few stellate hairs
312 Involucral bracts obtuse
313 Outer involucral bracts squarrose **211. sileslacum**
313 Outer involucral bracts appressed
314 Cauline leaves (4–)8–25(–numerous) **258. laevigatum**
314 Cauline leaves 2–5
314 Cauline leaves 2–5
315 Leaves with hairs at least below and on the margins **89. caledonicum**
315 Leaves glabrous or nearly so **201. glabratum**
312 Involucral bracts acute
316 Upper surface of leaves glabrous or with a few hairs
317 Involucre 9–10 mm **210. naegelianum**
317 Involucre 11–17 mm
318 Leaves with rigid hairs on margin **88. scoticum**
318 Leaves with soft hairs on margin
319 Leaves nearly glabrous beneath **201. glabratum**
319 Leaves with dense hairs beneath **116. cryptadenum**
316 Upper surface of leaves with numerous to dense hairs
320 Margins of receptacular pits with cilia **126. mixtiforme**
320 Margins of receptacular pits without cilia
321 Achenes not more than 3 mm
322 Outer involucral bracts squarrose; styles usually discoloured **121. dasytrichum**
322 Outer involucral bracts appressed; styles usually yellow **122. aphyllum**
321 Achenes more than 3 mm
323 Leaves entire or with a few teeth
324 Cauline leaves (2–)4–8(–15); outer involucral bracts squarrose **109. villosum**
324 Cauline leaves (2–)3–6; outer involucral bracts appressed **110. pilosum**
323 At least some leaves strongly dentate
325 At least some basal leaves obovate or more or less spathulate **114. dentatum**
325 Basal leaves more or less lanceolate **116. cryptadenum**

Subgen. **Pilosella** (Hill) S. F. Gray. Rhizome horizontal or oblique, with a persistent rosette of leaves, from the axils of which are usually developed procumbent leafy, or underground scaly stolons, sometimes bearing capitula at their apices. Flowering stems 1 to numerous. Leaves entire or slightly denticulate, never distinctly petiolate, often all basal, the cauline, when present, usually small or bract-like. Ligules yellow (often with a red stripe on outer face) or reddish, glabrous. Pollen copious. Achenes up to 2·5 mm, each rib shortly projecting above to form a crenulate apex; pappus-hairs in 1 row with a few shorter than the rest. Receptacular pits shortly dentate.

1. H. castellanum Boiss. & Reuter, *Diagn. Pl. Nov. Hisp.* 20 (1842). Main rosette non-flowering; stolons wiry, leafy, bearing at the apex 1–3 scapes, each with a single capitulum. Leaves narrowly elliptical or linear, more or less acute, long-attenuate at base, with dense stellate hairs on both surfaces, and sparse, long, subrigid simple eglandular hairs on both surfaces and the margin. Scapes with dense stellate hairs and more or less numerous, very small glandular hairs, sometimes with few to numerous, simple eglandular hairs. Involucral bracts (8–)9–10(–11) × 0·75–1·25 mm, linear-lanceolate, acute, with dense stellate and very short simple eglandular hairs, few to numerous, much longer simple eglandular hairs, and more or less numerous, short glandular hairs; longer simple hairs sometimes absent (var. *glandulosum* Scheele). Ligules yellow, with a red stripe on outer face. $2n = 18$. *Mountain rocks and meadows.* ● *Spain, N. Portugal.* Hs Lu.

2. H. hoppeanum Schultes, *Österreichs Fl.* ed. 2, **2**: 428 (1814). Stolons few, very short, stout, with large crowded leaves. Rosette-leaves rather numerous, oblanceolate to oblong, with long, white simple eglandular hairs on both surfaces and the margin, and dense stellate hairs beneath and rarely also above. Scapes up to 40 cm, each with a single capitulum, with rather numerous simple eglandular and dense glandular hairs. Involucral bracts (6–)11–14 × 1–4 mm, the outer ovate, the inner sometimes lanceolate, abruptly narrowed to a subacute or obtuse apex, with 0 to numerous simple eglandular hairs, 0 to numerous glandular hairs, and dense stellate hairs. Ligules yellow, the outer usually with a dark red stripe on outer face. $2n = 18$, 45. *C. & S. Europe from Switzerland and Sicilia eastwards, mainly in the mountains.* Al Au Bu Cz Ge Gr He Hu It Ju Po Rm Rs (K) Si Tu.

1 Leaves with dense stellate hairs above (e) subsp. **cilicicum**
1 Leaves without stellate hairs above
2 Involucre with numerous simple eglandular hairs, without or with few glandular hairs
3 Involucral bracts (8–)11–14 × 2–4 mm, ± ovate, the margins pale and without hairs (a) subsp. **hoppeanum**
3 Involucral bracts 9–12 × 1·5–3 mm, lanceolate or narrowly ovate, the margins not pale and with numerous hairs (b) subsp. **pilisquamum**
2 Involucre with numerous glandular hairs, without or with few simple eglandular hairs
4 Involucral bracts 10–12 × 1·5–2·5 mm, with unequal glandular hairs which are often dark throughout their length (c) subsp. **testimoniale**
4 Involucral bracts 6–10 × 1·3–2 mm, with short glandular hairs which are usually dark only at the base (d) subsp. **troicum**

(a) Subsp. **hoppeanum**: Leaves without stellate hairs above. Involucral bracts (8–)11–14 × 2–4 mm, more or less ovate, in the central part with numerous long simple eglandular hairs which are dark at least in their basal half, without or with few glandular hairs; margins pale, without hairs. ● *Alps.*

(b) Subsp. **pilisquamum** Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 124 (1885): Leaves without stellate hairs above. Involucral bracts 9–12 × 1·5–3 mm, lanceolate or narrowly ovate, with numerous simple eglandular hairs which are pale throughout or dark only at the very base, without or with few glandular hairs; margins not pale, covered with hairs. *Throughout the range of the species.*

(c) Subsp. **testimoniale** Naegeli ex Peter, *Bot. Jahrb.* **5**: 251 (1884): Leaves without stellate hairs above. Involucral bracts 10–12 × 1·5–2·5 mm, lanceolate to narrowly ovate, with numerous unequal, dark, broad-based glandular hairs, without or with few simple eglandular hairs; margins not pale, covered with hairs. *C. & S.E. Europe.*

(d) Subsp. **troicum** Zahn in Engler, *Pflanzenreich* **82(IV.280)**: 1153 (1923): Leaves without stellate hairs above. Involucral bracts 6–10 × 1·3–2 mm, more or less lanceolate, with numerous short glandular hairs which are dark only at the base, without or with few simple eglandular hairs; margins rarely pale, usually covered with stellate hairs. *Balkan peninsula and E.C. Europe, extending to N. Italy.*

(e) Subsp. **cilicicum** Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 121 (1885): Leaves with dense stellate hairs above. Involucral bracts 10–11 × 1·5–2 mm, with numerous short glandular hairs, without or with few simple eglandular hairs; margins not pale, with hairs. *Bulgaria* (*E. Stara Planina*).

Subsp. **lydia** Bornm. & Zahn in Engler, *Pflanzenreich* **82(IV.280)**: 1154 (1923), from Turkey-in-Europe and W. Anatolia, differs from subsp. (b) in its narrower, more acute, involucral bracts; in this respect it is very like *H.* x *hypeuryum*.

3. H. × **viridifolium** Peter, *Bot. Jahrb.* **5**: 258 (1884) (*H. latisquamum* Naegeli & Peter, nom. illegit.; *H. hoppeanum*|*lactucella*). Intermediate between the parents, but variable. Like *H. hoppeanum* but leaves more glaucous; capitula 2–3(–5), on long peduncles; involucral bracts 6–9 mm, narrower. Differs from *H. lactucella* in its thicker stolons, larger leaves which have dense stellate hairs beneath, and larger capitula. 1700–2500 *m.* ● *C. Europe, extending to C. Jugoslavia.* Au Ge He Hu It Ju Rm.

4. H. × **hypeuryum** Peter, *Bot. Jahrb.* **5**: 255 (1884) (*H. hoppeanum*|*pilosella*). Like *H. hoppeanum* but with more numerous, longer, more slender stolons. 1400–2600 *m. S. & S.C. Europe.* Al Au Bu Ga Ge He Hs Hu It Ju Rs (K).

Over a large part of its range this taxon grows with its parents and is clearly of hybrid origin, but in other places, particularly the Pyrenees, *H. hoppeanum* has not been recorded and *H. pilosella* is local.

5. H. × **ruprechtii** Boiss., *Fl. Or.* **3**: 861 (1875) (*H. arnoseroides* Naegeli & Peter, *H. biglanum* Bornm. & Zahn, *H. raiblense* (Huter ex Naegeli & Peter) Zahn; *H. hoppeanum*|*piloselloides*). Intermediate between the parents. Differs from *H. hoppeanum* in its more or less glaucous leaves, capitula 2–7 on long peduncles, and involucre 6–9·5 mm, and from *H. piloselloides* in its fewer, larger capitula. *C. Europe and Balkan peninsula.* Au Bu Ge Gr He Hu It Ju Rm.

6. H. × **tephrocephalum** Vuk., *Hier. Croat.* 8 (1858) (*H. hoppeanum*|*praealtum*). Not morphologically distinguishable from *H.* × *ruprechtii* and only recognizable when growing with both parents (*H. piloselloides* and *H. praealtum* do not usually grow together). *C. & S.E. Europe.* Al Au Bu Ge Hu It Ju Rm Rs (K).

Much of the distribution and synonymy of the last two hybrids is doubtful, because of the impossibility of recognizing them unless the parents are recorded.

H. × **byzantinum** (Boiss.) Zahn in Engler, *Pflanzenreich* **82(IV. 280)**: 1194 (1923) (*H. hoppeanum*|*pseudopilosella*). *Turkey-in-Europe.* Tu.

7. H. peleteranum Mérat, *Nouv. Fl. Env. Paris* 305 (1812). Stolons few, short, stout, with large, crowded leaves. Rosette-leaves lanceolate, oblanceolate, oblong or elliptical, obtuse to acute, green, with more or less numerous subrigid simple eglandular hairs 4–6 mm on both surfaces and the margin, and dense stellate hairs and short simple eglandular hairs beneath. Scapes up to 30 cm, each with a single capitulum, with numerous, often dense stellate hairs and more or less numerous simple eglandular and glandular hairs Involucral bracts 8–15 × 1·5–3 mm, lanceolate, acute, densely covered with long simple eglandular hairs 3–4 mm, few to numerous stellate hairs and usually few or no (sometimes numerous) short glandular hairs. Ligules yellow, the outer usually with a dark red stripe on outer face. $2n = 18$, 27, 36, 45. *Dry, sandy or rocky places up to* 2600 *m. N., W. & W.C. Europe.* Au Be Br Da Fe Ga Ge He Ho Hs It Lu No Rs (N) Su.

1 Involucral bracts with numerous glandular hairs, without or with few simple eglandular hairs (c) subsp. **sabulosorum**
1 Involucral bracts without or with few glandular hairs, and with numerous to dense simple eglandular hairs
2 Involucral bracts with numerous but not dense simple eglandular hairs, small but obvious glandular hairs and numerous stellate hairs (e) subsp. **ligericum**
2 Involucral bracts usually with dense simple eglandular hairs and few stellate hairs, without or with few glandular hairs
3 Scapes up to 12(–18) cm; rosette-leaves 9–20 mm wide, cuneate or shortly attenuate at base (a) subsp. **peleteranum**
3 Scapes (6–)10–30 cm; rosette-leaves 4–12(–18) mm wide, distinctly attenuate at base
4 Involucre 11–15 × 12–17 mm; bracts lanceolate, 1·5–2 mm wide at base (b) subsp. **subpeleteranum**
4 Involucre 10–12(–13) × (9–)10–12(–14) mm; bracts linear-lanceolate, *c.* 1·5 mm wide at base (d) subsp. **tenuiscapum**

(a) Subsp. **peleteranum**: Scapes up to 12(–18) cm. Rosette-leaves 21–87 × 9–20 mm, mostly oblanceolate or elliptical, cuneate or shortly attenuate at base. Involucre 11–15 × 12–20 mm; bracts 1·5–3 mm wide at base, lanceolate, with dense, long simple eglandular hairs, rarely with few minute glandular hairs, usually with few stellate hairs. $2n = 18$. *Mainly in coastal areas.*

(b) Subsp. **subpeleteranum** Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 129 (1885): Scapes (6–)10–20(–30) cm. Rosette-leaves

(20–)40–110(–150) × 6–12(–18) mm, mostly narrowly elliptical, attenuate at base. Involucre 11–15 × 12–17 mm; bracts 1·5–2 mm wide at base, lanceolate, usually with dense, long simple eglandular hairs, with few glandular hairs and usually few stellate hairs. $2n=18$. *Probably throughout the range of the species.*

(c) Subsp. **sabulosorum** Dahlst., *Kungl. Svenska Vet.-Akad. Handl.* nov. ser., **23(15)**: 9 (1890): Scapes 5–30 cm. Rosette-leaves 15–50 × 8–15 mm, mostly narrowly elliptical, attenuate at base. Involucre 10–13 × 11–15 mm; bracts 1·5–2 mm wide at base, lanceolate, with dense unequal glandular hairs and few to numerous stellate hairs, without or with few simple eglandular hairs. $2n=18$. *Fennoscandia.*

(d) Subsp. **tenuiscapum** (Pugsley) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 259 (1976) (*H. peleteranum* var. *tenuiscapum* Pugsley): Scapes (6–)12–30(–35) cm. Rosette-leaves (30–)40–70(–130) × 4–12(–16) mm, mostly oblanceolate, long-attenuate at base. Involucre 10–12(–13) × (9–)10–12(–14) mm; bracts *c.* 1·5 mm wide at base, linear-lanceolate, with more or less dense, long simple eglandular hairs, usually few glandular hairs and scattered stellate hairs. *Probably throughout the range of the species.*

(e) Subsp. **ligericum** Zahn in Engler, *Pflanzenreich* **82(IV.280)**: 1158 (1923): Rosette-leaves 20–60 × 4–8(–12) mm, mostly oblanceolate, long-attenuate at base. Involucre 8–12 × 10–12 mm; bracts 1·5–2 mm wide at base, lanceolate, with numerous stellate hairs, rather numerous simple eglandular hairs and numerous, very small glandular hairs. *W.C. & S.W. Europe.*

8. H. × longisquamum Peter, *Bot. Jahrb.* **5**: 256 (1884) (*H. pachylodes* Naegeli & Peter, nom. illegit.; *H. peleteranum*|*pilosella*). Intermediate between the parents. Like *H. peleteranum* but with longer stolons and smaller capitula. Differs from *H. pilosella* in its thicker stolons and dense indumentum of long simple eglandular hairs. $2n=27$. *N. & W.C. Europe.* ● Br Fe Ga Ge He It No Rs (N) Su.

H. × mayeri Vollmann, *Denkschr. Bayer. Bot. Ges. Regensb.* **9**: 81 (1905) (*H. peleteranum*|*pilosella*|*praealtum*). ● *S.E Germany (near Regensburg).* Ge.

H. × hybridiforme Zahn in Schinz & R. Keller, *Fl. Schweiz* ed. 2, **2**: 265 (1905) (*H. adriaticiforme* (Zahn) Zahn, *H. leucense* F. O. Wolf; *H. peleteranum*|*piloselloides*). ● *W.C. Europe.* Ga Ge He It.

H. × promeces Peter, *Bot. Jahrb.* **5**: 491 (1884) (*H. longistolonosum* Vollmann; *H. peleteranum*|*praealtum*). ● *S.E. Germany (near Regensburg).* Ge.

9. H. argyrocomum (Fries) Zahn, *Arch. Bot. Bull. (Caen)* **2**: 201 (1928) (*H. subuliferum* Naegeli & Peter). Stolons short, stout, leafy. Rosette-leaves 30–70 × 6–10 mm, oblanceolate or spathulate, more or less obtuse, with dense stellate hairs and numerous, long simple eglandular hairs on both surfaces. Scapes 17–30 cm, each with a single capitulum, with dense stellate hairs and more or less numerous, pale, long simple eglandular hairs. Involucral bracts 8–12·5 × 1–1·5 mm, linear-lanceolate, long-acute, with more or less numerous stellate hairs and dense, long, pale, flexuous, simple eglandular hairs 3–5 mm, without glandular hairs. Ligules yellow, the outer with a dark red stripe on outer face. $2n=18$. 1500–2400 m. ● *S. & C. Spain.* Hs.

10. H. pilosella L., *Sp. Pl.* 800 (1753). Stolons usually numerous, long, slender, leafy, occasionally with a terminal capitulum. Rosette-leaves 10–120 × 5–20 mm, oblanceolate, spathulate or elliptical, obtuse or acute, with few to numerous, long, pale simple eglandular hairs on both surfaces and the margin, and dense stellate hairs beneath and sometimes also above. Scapes 5–30(–50) cm, each with a single capitulum, with dense stellate hairs and simple eglandular and glandular hairs in various proportions. Involucral bracts (6–)8–12(–15) × 0·5–1·5(–2) mm, linear-lanceolate, acute, with variable indumentum. Ligules yellow, usually with a red stripe on outer face. $2n=18, 36, 45, 54, 63$. *Grassy places. Most of Europe.* All except Az Cr Fa Is Sb Tu.

1 Involucral bracts with numerous glandular and stellate hairs, without simple eglandular hairs
2 Glandular hairs of involucral bracts not more than 0·5 mm, ±equal in length (a) subsp. **micradenium**
2 Glandular hairs of involucral bracts up to 1 mm, very unequal in length (b) subsp. **euronotum**
1 Involucral bracts with stellate and simple eglandular hairs and sometimes also glandular hairs
3 Leaves with dense stellate hairs on both surfaces (h) subsp. **velutinum**
3 Leaves with dense stellate hairs only beneath
4 Involucral bracts with obvious simple eglandular and glandular hairs
5 Hairs of involucral bracts pale (c) subsp. **pilosella**
5 Hairs of involucral bracts dark (d) subsp. **trichosoma**
4 Involucral bracts with dense simple eglandular hairs; glandular hairs absent or inconspicuous
6 Hairs of involucral bracts pale (e) subsp. **tricholepium**
6 Hairs of involucral bracts dark
7 Involucral bracts and upper part of scape with moderately dense dark hairs not more than 2 mm (f) subsp. **melanops**
7 Involucral bracts and upper part of scape with dense dark hairs up to 5 mm (g) subsp. **trichoscapum**

(a) Subsp. **micradenium** Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 164 (1885): Scapes usually 8–20 cm, with glandular, stellate and often a few, pale simple eglandular hairs in the upper part. Leaves with dense stellate hairs beneath only. Involucre 8–11 mm; bracts with numerous, short, pale or dark, more or less equal glandular hairs up to 0·5 mm and dense stellate hairs, without simple eglandular hairs. $2n=18, 36, 45$. *Pastures and sandy ground. Most of Europe.*

(b) Subsp. **euronotum** Naegeli & Peter, *op. cit.* 155 (1885): Like subsp. (a) but scapes up to 30 cm; involucre (8–)10–12(–15) mm; bracts with unequal glandular hairs up to 1 mm. $2n=45$. *N. Europe, and on mountains further south.*

(c) Subsp. **pilosella**: Scapes (5–)10–30(–40) cm, with stellate, pale simple eglandular and glandular hairs in various proportions. Leaves with dense stellate hairs beneath only. Involucre 7–10(–12) mm; bracts with numerous stellate and pale simple eglandular hairs, and with more or less numerous glandular hairs. $2n=36$. *Mainly lowland. Most of Europe.*

(d) Subsp. **trichosoma** Peter, *Bot. Jahrb.* **5**: 254 (1884): Like subsp. (c) but scapes not more than 25 cm; simple eglandular and glandular hairs on upper part of scape and involucral bracts darker and stouter. $2n=36, 45, 54, 63$. *Mainly in N. & E. Europe.*

(e) Subsp. **tricholepium** Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 138 (1885): Scapes 8–25 cm, with stellate, pale simple eglandular and glandular hairs on upper part. Leaves with dense stellate hairs beneath only. Involucre 7–11 mm; bracts with dense stellate and dense, pale simple eglandular hairs, without or with inconspicuous glandular hairs. $2n=36$. *Most of Europe.*

(f) Subsp. **melanops** Peter, *Bot. Jahrb.* **5**: 254 (1884): Scapes 6–30 cm, with stellate hairs and dark simple eglandular and glandular hairs on upper part. Leaves with dense stellate hairs beneath only. Involucre 10–12(–15) mm; bracts with numerous stellate and moderately dense, dark simple eglandular hairs up to 2 mm, without or with inconspicuous glandular hairs. $2n=36, 45$. *Most of Europe; mainly in upland regions.*

(g) Subsp. **trichoscapum** Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 133 (1885): Like subsp. (f) but with dense, dark simple eglandular hairs up to 5 mm at apex of stem and on involucral bracts. $2n=45$. *Most of Europe; mainly in upland regions.*

(h) Subsp. **velutinum** Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 12 (1862) (*H. poliophyton* (Zahn) Juxip): Scapes 8–20 cm, with stellate, glandular and pale simple eglandular hairs on upper part. Leaves with dense stellate hairs on both surfaces. Involucre 9–12 mm; bracts with dense stellate and glandular hairs and pale simple eglandular hairs in various proportions. $2n=45, 54$. ● *Mainly in the upland regions of C. Europe.*

H. tardans Peter, *Bot. Jahrb.* **5**: 256 (1884) (*H. niveum* (Müller Arg.) Zahn), from the W. Alps, differs from subsp. (e) only in having weaker, shorter stolons and in flowering later.

11. H. × florentoides Arvet-Touvet, *Essai Pl. Dauph.* 40 (1871) (*H. adriaticum* Naegeli, *H. aridum* Freyn, *H. cinerosiforme* (Naegeli & Peter) Zahn, *H. tephrodes* Naegeli & Peter; *H. pilosella*|*piloselloides*). Variable, but usually without or with very short stolons. Differs from *H. pilosella* in having more than 1 capitulum per stem and from *H. piloselloides* in having large capitula usually on long peduncles. *C. Europe and Balkan pensinula*; *Corse.* Au Bu Co Cz Ga Ge He It Ju ?Po Rm [Ho].

12. H. × brachiatum Bertol. ex Lam. in Lam. & DC., *Fl. Fr.* ed. 3, **5**: 442 (1815) (*H. leptophyton* Naegeli & Peter; *H. pilosella*|*praealtum*). Often with long slender stolons. Not distinguishable from *H.* × *florentoides* unless growing with parents (*H. piloselloides* and *H. praealtum* do not usually grow together). *C. Europe, extending locally eastwards to C. Russia, Krym and Bulgaria.* Al Au Bu Cz Ga Ge He Hu It Ju Po Rm Rs (B, W, C, K).

13. H. pseudopilosella Ten., *Fl. Nap.* **1**, *Prodr.*: 71 (1811). Stolons long, slender, with remote leaves. Rosette-leaves 10–55 × 5–10 mm, oblanceolate or elliptical, obtuse to acute, with numerous long, pale simple eglandular hairs on both surfaces and the margin and dense stellate hairs beneath. Scapes 20–32 cm, each with a single capitulum, with numerous stellate and long, blackish simple eglandular hairs, sometimes with short glandular hairs. Involucral bracts 10–13 × 1·5–2 mm, lanceolate to ovate-lanceolate, acute, with dense, long, dark simple eglandular hairs completely concealing the bracts, without or with few small glandular hairs. Ligules yellow, often with a red stripe on outer face. *S. Europe.* Bu Co Ga Gr Hs It Lu Rm Tu.

(a) Subsp. **pseudopilosella**: Whole plant without or with very occasional glandular hairs. $2n=18$. ● *Almost throughout the range of the species.*

(b) Subsp. **banaticola** E. I. Nyárády & Zahn, *Magyar Bot. Lapok* **10**: 123 (1911): Stems with numerous small glandular hairs above; involucre with a few small glandular hairs. ● *Bulgaria, N. Greece.*

H. pseudopilosella subsp. **albarracinum** Zahn in Engler, *Pflanzenreich* **82(IV.280)**: 1186 (1923), from E. Spain (near Albarracin), has the involucre with dense, minute glandular hairs and few or no simple eglandular hairs and appears to be either a distinct species or of hybrid origin.

14. H. flagellare Willd., *Enum. Pl. Horti Berol., Suppl.* 54 (1814). Stolons long, stout, leafy. Rosette-leaves 30–130 × 5–25 mm, oblanceolate or spathulate, obtuse to subacute, with long, pale, subrigid simple eglandular hairs on both surfaces and the margin and more or less numerous stellate hairs beneath. Flowering stems 12–40 cm, furcate, with numerous glandular and stellate hairs and few to numerous, long simple eglandular hairs, with 0–2 small leaves. Capitula (1–)2–6. Involucral bracts (8–)9–12 × 1–1·25 mm, linear-lanceolate, acute, with sparse stellate hairs, numerous glandular hairs and more or less numerous long simple eglandular hairs. Ligules yellow, usually with a red stripe on outer face. *N., W. & C. Europe.* Au Br Cz Da Fe Ga Ge Hs Hu Ju Po Rm Rs (N, B, C, W) Su [Be Ho].

(a) Subsp. **flagellare**: Flowering stems up to 40 cm. Capitula 2–4(–7); peduncles with more or less numerous simple eglandular hairs 2–3 mm. Involucral bracts with few to numerous simple eglandular hairs up to 1·5 mm. $2n=36, 45$. *Throughout the range of the species.*

(b) Subsp. **bicapitatum** (P. D. Sell & C. West) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 259 (1976) (*Pilosella flagellaris* subsp. *bicapitata* P. D. Sell & C. West): Flowering stems up to 18 cm. Capitula (1–)2(–4); peduncles with numerous simple eglandular hairs up to 7·5 mm. Involucral bracts with dense simple eglandular hairs up to 2·5 mm. $2n=54$. ● *Zetland.* Br.

H. flagellare has been regarded by many authors as a hybrid between *H. caespitosum* and *H. pilosella*, but its large capitula and wide distribution with little variation suggest that it is better treated as a distinct species.

15. H. × flagellariforme G. Schneider, *Hier. Westsud.* 46 (1889) (*H. flagellare*|*lactucella*). Like *H. flagellare* but leaves glaucous and with few simple eglandular hairs. Differs from *H. lactucella* in its leaves having numerous stellate hairs beneath and in its larger capitula. ● *C. & E. Europe, from the Sudeten Mts. eastwards to N.C. Russia and W. Romania.* Cz ?Po Rm Rs (B, C).

H. × chaunadenium Vetter & Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(1)**: 422 (1930) (*H. flagellare*|*pilosella*|*praealtum*). ● *Austria (W. Steiermark).* Au.

16. H. lactucella Wallr., *Sched. Crit.* **1**: 408 (1822) (*H. auricula* auct., non L.). Stolons numerous, long, with numerous spathulate leaves. Rosette-leaves 20–70(–90) × 3–15 mm, spathulate or narrowly elliptical, usually obtuse, gradually narrowed below into a winged petiole, glaucous, glabrous or with scattered simple eglandular hairs up to 4 mm on the margin and midrib. Flowering stems with minute stellate hairs, numerous minute glandular hairs and sometimes occasional simple eglandular hairs, with 0–2(–3) leaves like the basal and semiamplexicaul. Inflorescence irregularly cymose; capitula 1–5. Involucral bracts linear-lanceolate, usually obtuse, usually with pale margins, with scattered stellate hairs and glandular and simple eglandular hairs usually present in various proportions. Ligules yellow, sometimes with a red stripe at apex. $2n=18, 27, 36$. *Grassland; usually calcifuge. Most of Europe, except the extreme north and south.* Au Be Bu Co Cz Da Fe Ga Ge Gr He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, W) Su.

1 Plant 3–8 cm; glandular hairs on involucral bracts very short; ligules with a deep red stripe (a) subsp. **nanum**
1 Plant (6–)10–28(–45) cm; glandular hairs on involucral bracts longer and stouter; ligules without a red stripe, sometimes with red apex
2 Involucral bracts 5–7 × 0·5–1 mm (b) subsp. **lactucella**
2 Involucral bracts 7–9 × 1–1·25 mm (c) subsp. **magnauricula**

(a) Subsp. **nanum** (Scheele) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 259 (1976) (*H. nanum* Scheele, *H. serpyllifolium* Fries): Plant 3–8 cm. Involucral bracts 6–8 mm, with numerous very short glandular and occasionally with some simple eglandular hairs. Ligules with a deep red stripe. ● *C. Appennini; Corse; Pyrenees.*

(b) Subsp. **lactucella**: Plant (6–)10–20(–45) cm. Involucral bracts 5–7 × 0·5–1 mm, with numerous long and short glandular

hairs and sometimes with numerous simple eglandular hairs. Ligules usually without a red stripe, rarely slightly red at apex. *Almost throughout the range of the species.*

(c) Subsp. **magnauricula** (Naegeli & Peter) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 259 (1976) (*H.auricula* subsp. *magnauricula* Naegeli & Peter): Plant 20–28(–35) cm. Involucral bracts 7–9 × 1–1·25 mm, with more or less numerous long and short glandular hairs and more or less numerous simple eglandular hairs. Ligules without a red stripe. *Probably throughout the range of the species, but more common in the east.*

17. H. × auriculiforme Fries, *Nov. Fl. Suec.* ed. 2, 248 (1828) (*H. lactucella|peleteranum*). Intermediate between the parents. Like *H. lactucella* but stolons shorter and thicker; leaves with numerous stellate hairs beneath; involucral bracts acute. Differs from *H. peleteranum* in its glaucous leaves and glandular-hairy involucral bracts. $2n=18, 36$. ● *Fennoscandia; S.W. & W.C. Alps.* Fe Ge He It No Su.

H. × **paragogiforme** Besse & Zahn ex Kaeser, *Ber. Schweiz. Bot. Ges.* **13**: 139 (1903) (*H. lactucella|peleteranum|piloselloides*). ● *S.W. Switzerland* (*Valais*). He.

18. H. × schultesii F. W. Schultz, *Arch. Fl. Fr. Allem.* 35 (1842) (*H. tardiusculum* Peter; *H. lactucella|pilosella*). Like *H. lactucella* but leaves with numerous stellate hairs beneath and involucral bracts more or less acute. Differs from *H. pilosella* in usually having more than 1 capitulum per scape and glaucous leaves. ● *From W.C. France and Sardegna eastwards to Finland, W.C. Russia and C. Romania.* Au Be Co Cz Fe Ga Ge He Ho Hu It Ju Po Rm Rs (B, C) Sa Su.

This widespread hybrid is difficult to distinguish from *H.* × *auriculiforme* in the few areas where their distributions overlap, but the latter usually has shorter, thicker stolons and broader involucral bracts.

19. H. × paragogum Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 653 (1885) (*H. lactucella|pilosella|praealtum*). Like *H. lactucella* but with larger capitula. Differs from *H. pilosella* in having 3–6(–9) capitula per flowering stem, from *H. praealtum* in its larger capitula, and from *H.* x *auriculiforme* and *H.* x *schultesii* in its shorter peduncles. ● *N.C. Europe, extending eastwards to C. Russia.* Cz Ge Ho ?Po Rs (C, W).

20. H. × sulphureum Döll, *Rhein. Fl.* 521 (1843) (*H. lactucella|piloselloides*). Like *H. lactucella* but without or with very short stolons. Differs from *H. piloselloides* in its shorter stems and lax inflorescence. ● *C. Europe, extending to Latvia; C. Appennini.* Au Cz Ga Ge He It Ju Po Rm Rs (B, W).

21. H. × koernickeanum (Naegeli & Peter) Zahn in Engler, *Pflanzenreich* **82(IV.280)**: 1469 (1923) (*H. lactucella|praealtum*). Not distinguishable with certainty from *H.* × *sulphureum* unless growing with its parents, though it usually has long slender stolons. ● *E.C. Europe and W. part of U.S.S.R.* Au Cz Ge Hu Po Rm Rs (B, C, W) [Ho].

22. H. vahlii Froelich in DC., *Prodr.* **7**: 204 (1838). Stolons short and thick or absent. Rosette-leaves 15–30(–80) × 4–15(–20) mm, spathulate or oblanceolate, rounded-obtuse, mucronulate, entire, gradually narrowed at base, glaucous, with few to numerous, long, rigid simple eglandular hairs and numerous, unequal, yellowish glandular hairs. Flowering stems 5–14(–22) cm, with numerous stellate and dense, yellowish-stalked glandular hairs, often with 1–2 linear bracts. Inflorescence irregularly cymose; capitula 1–3(–4); peduncles usually short. Involucral bracts 7–9 × 0·75–1·25 mm, linear-lanceolate, obtuse, with numerous stellate and dense, unequal, yellow-stalked glandular hairs. Ligules yellow, usually slightly red at apex. $2n=18$. *Screes and mountain pastures.* ● *C. & E. Spain.* Hs.

This taxon was considered by Zahn to be intermediate between *H. breviscapum* and *H. lactucella*, but it does not grow with, and has characters that do not occur in, either of them.

23. H. glaciale Reyn., *Nov. Acta Helv. Phys. Math.* **1**: 305 (1787). Stolons absent or rarely very short. Rosette-leaves 15–60 × (2–)4–10 mm, linear, linear-lanceolate or oblanceolate, obtuse to acute, narrowed to a short, winged petiole, green or slightly glaucous, with stellate hairs at least on the margin and sometimes covering the whole leaf, scattered, long, subrigid simple eglandular hairs throughout, and usually some minute, yellowish glandular hairs on the margin. Flowering stems 10–20(–30) cm, with more or less numerous stellate and short glandular hairs and few to numerous, longer simple eglandular hairs, without or with a small, solitary leaf. Inflorescence cymose; capitula 2–6(–8). Involucral bracts 6–8 × 1–1·25 mm, linear-lanceolate, acute, concolorous, with more or less numerous stellate and simple eglandular hairs, and few to numerous, short glandular hairs. Ligules pale yellow. $2n=18$. *Dry mountain pastures; somewhat calcifuge.* ● *Alps.* Au Ga Ge He It.

H. × **pachypilon** Peter, *Bot. Jahrb.* **5**: 259 (1884) (*H. eurylepium* Naegeli & Peter, nom. illegit., *H. permutatum* Naegeli & Peter; *H. glaciale|hoppeanum* (vel *sphaerocephalum*)). ● *Alps.* Au He It.

H. × **lathraeum** Peter, *op. cit.* 260 (1884) (*H. auriculigenum* Arvet-Touvet & Belli, *H. brachycomum* Naegeli & Peter, *H. nigricarinum* Naegeli & Peter; *H. glaciale|hoppeanum|lactucella*). ● *E. & E.C. Alps.* Au Ge He It.

H. × **salernicola** Vetter & Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(1)**: 409 (1930) (*H. glaciale|hoppeanum|lactucella|piloselloides*). ● *Alpi Dolomitiche.* It.

H. × **basifurcum** Peter, *Bot. Jahrb.* **5**: 260 (1884) (*H. glaciale|hoppeanum|pilosella*). ● *E. & E.C. Europe.* Au Ge He It.

24. H. × niphostribes Peter, *Bot. Jahrb.* **5**: 261 (1884) (*H. niphobium* Naegeli & Peter, nom. illegit.; *H. glaciale|lactucella*). Like *H. glaciale* but with obvious stolons. Differs from *H. lactucella* in having stellate hairs on the lower surface of the leaves and more numerous simple eglandular hairs on the involucral bracts. ● *Alps.* Au Ga Ge He It.

H. × **aletschense** Zahn, *Neue Denkschr. Schweiz. Ges. Naturw.* **40**: 251 (1906) (*H. glaciale|lactucella|peleteranum*). ● *S.W. & W.C. Alps.* Ga He It.

H. × **stellipilum** Peter, *Bot. Jahrb.* **5**: 458 (1884) (*H. triplex* Peter; *H. glaciale|lactucella|pilosella*). ● *E. Alps.* Au He It.

H. x **subrubens** (Arvet-Touvet) Zahn in Koch. *Syn. Deutsch. Fl.* ed. 3, **2**: 1711 (1900) (*H. finalense* Naegeli & Peter, *H. salayense* Zahn; *H. glaciale|peleteranum*). ● *S.W. & W.C. Alps.* Ga He It.

H. × **faurei** (Arvet-Touvet) Arvet-Touvet, *Hier. Alpes Fr.* 5 (1888) (*H. glaciellum* Naegeli & Peter, *H. hypoleucum* Arvet-Touvet, *H. poliocephalum* (Naegeli & Peter) Schinz & Thell.; *H. glaciale|pilosella*). ● *Alps.* Au Ga He It.

H. × **frigidarium** Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 656 (1885) (*H. glaciale|piloselloides*). ● *Alps.* Ga He It.

25. H. sphaerocephalum Froelich in Moessler, *Handb.* ed. 2, **2**: 1386 (1828). Stolons absent or rarely short and thick. Rosette-leaves 20–80 × 6–14 mm, narrowly elliptical or narrowly oblanceolate, usually more or less acute, entire, gradually narrowed at base, glaucous, with few to numerous, rigid, long simple eglandular hairs, few to numerous stellate hairs mainly beneath, and few to numerous, minute glandular hairs. Flowering stems 9–30 cm, with numerous, long, rigid simple eglandular hairs, few to numerous stellate hairs, few to numerous, long, dark glandular hairs and few to numerous, minute, yellowish glandular hairs. Inflorescence lax; capitula (1–)2–4(–7); peduncles long. Involucral bracts 8–11 × 1–1·5 mm, broadly linear-lanceolate, more or less acute, with numerous stellate, numerous, long simple eglandular and few to numerous, dark glandular hairs. Ligules yellow, rarely with some red at apex. ● *E. & E.C. Alps.* Au Ge He It Ju.

This taxon is considered by Zahn to be intermediate between *H. glaciale* and *H. hoppeanum*, but it often occurs in fairly uniform populations without the parents and is best treated as a species.

26. H. breviscapum DC. in Lam. & DC., *Fl. Fr.* ed. 3, **5**: 439 (1815) (*H. pumilum* Lapeyr., non L., *H. candollei* Monnier, nom. illegit.). Stolons very short or absent. Rosette-leaves 20–50 × 2–6 mm, linear to oblanceolate, obtuse, with more or less numerous stellate and numerous, subrigid simple eglandular hairs 3–4 mm on both surfaces and minute glandular hairs on the margin and midrib. Flowering stems 2–10 cm, with dense stellate hairs, few to numerous simple eglandular hairs 2–3 mm, and few to numerous, small, dark glandular hairs, without or with 1(–2) linear leaves. Inflorescence irregularly cymose; capitula 1–6; peduncles short. Involucral bracts 6–7 × 0·75–1 mm, linear-lanceolate, more or less acute, with dense stellate hairs, dense, long, pale simple eglandular hairs and usually a few, small, dark glandular hairs. Ligules yellow, the outer usually red on outer face. *Mountain rocks and pastures*, 1950–2750 *m.* ● *E. Pyrenees.* Ga Hs.

27. H. alpicola Schleicher ex Gaudin, *Fl. Helv.* **5**: 73 (1829). Stolons absent. Rosette-leaves 25–100 × 3–7 mm, oblanceolate or very narrowly elliptical, mostly acute, with few stellate hairs and numerous, subrigid simple eglandular hairs 3–8 mm above and on the margin, and numerous stellate and minute glandular hairs and few simple eglandular hairs beneath. Flowering stems 10–25 cm, with numerous stellate hairs, numerous, subrigid simple eglandular hairs 3–8 mm, and few, small glandular hairs above, with 0–1(–3) leaves like those of the rosette. Inflorescence with 1–3(–5) capitula; peduncles short. Involucral bracts 7–12 × 0·75–1 mm, linear-lanceolate, mostly acute, with dense stellate hairs, villous with very dense simple eglandular hairs up to 8 mm and sometimes with a few, short glandular hairs. Ligules yellow. $2n=36$. *Mountain rocks and stony grassland.* ● *C. Europe and Balkan peninsula.* ?Al Au Bu Cz Gr He It Ju Po Rm.

H. × **banaticola** Sudre, *Bull. Acad. Int. Géogr. Bot.* (*Le Mans*) **26**: 144 (1916) (*H. heuffelii* Janka, non Griseb., *H. oreophilum* Heuffel ex Zahn, nom. illegit.; *H. alpicola|cymosum*). ● *N. part of Balkan peninsula; S.W. Romania.* Bu Ju Rm.

H. × **annae-vetterae** Zahn in Hegi, *Ill. Fl. Mitteleur.* **6(2)**: 1211 (1929) (*H. alpicola|pilosella*). ● *Alpi Dolomitiche.* It.

28. H. piloselloides Vill., *Prosp. Pl. Dauph.* 34 (1775). Stolons usually absent, slender when present. Rosette-leaves 15–120 × 3–13 mm, linear, narrowly elliptical or oblanceolate, obtuse to acute, more or less glaucous, glabrous or with long, subrigid simple eglandular hairs. Flowering stems 15–50 cm, glabrous or with occasional glandular or simple eglandular hairs, with (0–)2–6(–10) leaves like those of the rosette and often more or less amplexicaul. Inflorescence lax; capitula 3–50; peduncles glabrous or with few glandular or simple eglandular hairs or with both, sometimes with a few stellate hairs. Involucral bracts 5–7 × 0·5–0·75 mm, linear to linear-lanceolate, obtuse to acute, with few to numerous glandular hairs, sometimes a few stellate hairs and few to numerous simple eglandular hairs. Ligules yellow, rarely with a red stripe on outer face. *C. & S. Europe.* Al Au Bu Co Cz Ga Ge Gr He Hu It Ju ?Po Rm Rs (W) Tu.

(a) Subsp. **piloselloides** (*H. florentinum* All.): Involucral bracts with numerous glandular hairs, without or with an occasional simple eglandular hair. $2n=36$. *Almost throughout the range of the species.*

(b) Subsp. **megalomastix** (Naegeli & Peter) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 260 (1976) (*H. magyaricum* subsp. *megalomastix* Naegeli & Peter): More frequently with stolons than subsp. (a). Involucral bracts with numerous simple eglandular hairs, without or with few glandular hairs. *C. & S.E. Europe.*

H. pavichii Heuffel, *Flora* (*Regensb.*) **36**: 618 (1853), from C. & S.E. Europe ($2n=18$), has been distinguished by its semiamplexicaul cauline leaves and long branches, but some plants in populations of *H. piloselloides* subsp. *piloselloides* have these characters.

H. × **pseudeffusum** Peter, *Bot. Jahrb.* **6**: 124 (1884) (*H. piloselloides|praealtum*). ● *Romania* (*north of Cluj*). Rm.

H. × **fulvisetum** Bertol., *Fl. Ital.* **8**: 458 (1853) (*H. calabrum* Naegeli & Peter, *H. pseudopilosellinum* Zahn; *H. piloselloides|pseudopilosella*). ● *W. Italy, Corse.* Co It.

29. H. praealtum Vill. ex Gochnat, *Tent. Pl. Cich.* 17 (1808). Stolons absent to very long and leafy, sometimes bearing a capitulum at apex. Rosette-leaves 30–180 × 5–12(–20) mm, oblanceolate, spathulate or narrowly elliptical, obtuse to acute, glabrous or with few to numerous, long, subrigid simple hairs on the margin and sometimes on the surfaces, sometimes with stellate hairs beneath. Flowering stems glabrous or with stellate hairs, simple eglandular hairs and glandular hairs, with 1–3(–9) leaves like those of the rosette but smaller. Inflorescence of few to many capitula usually in a cluster but sometimes with longer branches; peduncles with more or less dense stellate and few to numerous glandular and simple eglandular hairs. Involucral bracts 5–8·5 × 0·75–1 mm, linear to linear-lanceolate, more or less acute, with more or less numerous stellate and simple eglandular and glandular hairs in various proportions. Ligules yellow, the outer sometimes with a red stripe on outer face. *Much of Europe, but absent from many of the islands and from N. & E. Russia.* Al Au Be Bu Co Cz Fe Ga Ge He Hs Hu It Ju No Po Rm Rs (B, C, W, K) Sa Su Tu [Br Ho].

1 Stolons absent or very short
2 Peduncles and involucral bracts with more or less numerous glandular hairs, without or with few simple eglandular hairs (a) subsp. **praealtum**
2 Peduncles and involucral bracts with numerous simple eglandular hairs, without or with few glandular hairs (b) subsp. **anadenium**
1 Stolons long and slender, sometimes with a capitulum at the apex
3 Involucral bracts with numerous simple eglandular hairs, without or with few glandular hairs (c) subsp. **bauhinii**
3 Involucral bracts with numerous glandular hairs, without or with few to numerous simple eglandular hairs (d) subsp. **thaumasium**

(a) Subsp. **praealtum**: Stolons very short or absent. Involucral bracts and peduncles with more or less numerous glandular hairs,

without or with few simple eglandular hairs. $2n=36$, 45. *Throughout the range of the species.*

(b) Subsp. **anadenium** (Naegeli & Peter) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 260 (1976) (*H. florentinum* subsp. *anadenium* Naegeli & Peter): Stolons very short or absent. Involucral bracts and peduncles with numerous simple eglandular hairs, without or with few glandular hairs. *Mainly in C. Europe.*

(c) Subsp. **bauhinii** (Besser) Petunnikov in Syreistschikov, *Ill. Fl. Mosk. Gub.* **3**: 357 (1910) (*H. bauhinii* Besser): Stolons long and slender. Involucral bracts with numerous simple eglandular hairs, without or with few glandular hairs. $2n=45$. *Mainly in E. & C. Europe.*

(d) Subsp. **thaumasium** (Peter) P. D. Sell. *Bot. Jour. Linn. Soc.* **71**: 260 (1976) (*H. magyaricum* subsp. *thaumasium* Peter): Stolons long and slender. Involucral bracts with numerous glandular hairs, without or with few to numerous simple eglandular hairs. *C. & E. Europe.*

30. H. cymosum L., *Sp. Pl.* ed. 2, 1126 (1763). Stolons, when present, usually short and underground. Rosette-leaves 30–170 × 5–25 mm, mostly oblanceolate, sometimes narrowly elliptical, acute to obtuse, long-attenuate at base, usually entire, rarely minutely denticulate, with more or less numerous, subrigid simple eglandular hairs. Flowering stems 30–80(–100) cm, with few to numerous stellate hairs, numerous simple eglandular hairs and sometimes a few short glandular hairs, with 1–4 leaves like those of the rosette or bract-like. Inflorescence cymose-corymbose, the main branches often subumbellate; capitula (10–)20–80(–100). Involucral bracts (4–)5–8·5 × 0·75–1 mm, linear-lanceolate, more or less acute, with more or less numerous stellate hairs, numerous simple eglandular hairs and few to numerous, shorter, dark glandular hairs. $2n=36$, 54, 63. *Much of Europe, but absent from most of the west.* Al Au Bu Co Cz Da Fe Ga Ge Gr He Hu It Ju No Po Rm Rs (N, B, C, W, E) Sa Su Tu.

1 Involucral bracts with numerous or dense glandular hairs, without or with few simple eglandular hairs (c) subsp. **cymigerum**
1 Involucral bracts with dense simple eglandular hairs, without or with few glandular hairs
2 Inflorescence compact, with short branches (a) subsp. **sabinum**
2 Inflorescence more or less umbellate, with long branches (b) subsp. **cymosum**

(a) Subsp. **sabinum** (Sebastiani & Mauri) Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 407 (1885): Inflorescence compact, with short branches. Involucral bracts with dense simple eglandular hairs, without or with few glandular hairs. *Appennini; mountains of C. & S.E. Europe.*

(b) Subsp. **cymosum**: Inflorescence more or less umbellate, with long branches. Involucral bracts with dense simple eglandular hairs, without or with few glandular hairs. *Throughout most of the range of the species, but mainly in the lowlands.*

(c) Subsp. **cymigerum** (Reichenb.) Peter, *Bot. Jahrb.* **5**: 272 (1884): Inflorescence lax to more or less compact. Involucral bracts with numerous or dense glandular hairs, without or with few simple eglandular hairs. $2n=36$. *N., C. & E. Europe.*

31. H. × fallax Willd., *Enum. Pl. Horti Berol.* 822 (1809) (*H. cymosum|echioides*). Like *H. cymosum* but with the simple eglandular hairs more rigid. Differs from *H. echioides* in its more compact inflorescence of smaller capitula. *N., C. & E. Europe.* Au Cz Ga Ge He Hu Ju No Po Rm Rs (B, C, W) Su.

When growing with its parents an obvious hybrid, but plants morphologically similar occur well outside the range of one or both parents; these may be of different origin.

H. × crassisetum Peter, *Bot. Jahrb.* **5**: 489 (1884) (*H. cinereiforme* Meissner & Zahn, *H. fuckelianum* Touton & Zahn, *H. subfallaciforme* (Zahn) Juxip; *H. cymosum|echioides|pilosella*). *From W. Germany to N.C. Russia.* Ge Po Rs (B, C).

H. × sparsiforme Peter, *Bot. Jahrb.* **6**: 127 (1884) (*H. setifolium* Touton; *H. cymosum|echioides|pilosella|praealtum*). ● *W. Germany* (*west of Mainz*). Ge.

H. × pseudocalodon Peter, *Bot. Jahrb.* **6**: 118 (1884) (*H. cymosum|echioides|piloselloides*). ● *N.W. Czechoslovakia* (*near Teplice*). Cz.

H. × megatrichum Borbás, *Budapest. Körny. Növ.* 95 (1879) (*H. chaetocymum* Degen & Zahn; *H. cymosum|echioides|praealtum*). ● *Hungary, Romania.* Hu Rm.

H. × laggeri (Schultz Bip. ex Reichenb. fil.) Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 27 (1862) (*H. chabertii* F. O. Wolf, *H. densicapillum* Naegeli & Peter; *H. cymosum|glaciale*). ● *Alps.* Au Ga He It.

H. × tendinum Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 453 (1885) (*H. cymosum|glaciale|lactucella*). ● *S. Alps.* Au Ga He It.

H. × tinctilingua (Zahn) Zahn in Engler, *Pflanzenreich* **82(IV. 280)**: 1340 (1923) (*H. cymosum|glaciale|lactucella|pilosella*). ● *Maritime Alps.* Ga It.

H. × pseudotrichodes Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1869 (1901) (*H. cymosum|glaciale|pilosella*). ● *S.W. & C. Alps.* Ga He It.

H. × halacsyi Heldr. ex Halácsy, *Consp. Fl. Graec.* **2**: 235 (1902) (*H. subspurium* Bornm. & Zahn; *H. cymosum|hoppeanum*). *S. Alps*; *Greece.* Gr It.

32. H. × sciadophorum Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 440 (1885) (*H. cymosum|lactucella*). Like *H. lactucella* but without stolons and with stellate hairs on the under surface of the leaves. Differs from *H. cymosum* in its shorter stem, glaucous more obtuse leaves and less numerous capitula. ● *C. Europe, extending to S.W. Alps and N.C. Russia; S. Sweden.* Au Cz Ga Ge He Hu It Po Rm Rs (C, W) Su.

H. × suprafloccosum (Naegeli & Peter) Zahn in Engler, *Pflanzenreich* **82(IV.280)**: 1333 (1923) (*H. cymosum|lactucella|pilosella*). ● *Austria, Czechoslovakia.* Au Cz.

H. × pseudosulphureum Touton, *Jahrb. Nassau. Ver. Naturk.* **74**: 30 (1922) (*H. cymosum|lactucella|piloselloides*). ● *W. Germany* (*south of Mainz*). Ge

H. × hybridum Chaix ex Vill., *Hist. Pl. Dauph.* **3**: 100 (1788) (*H. lautareticum* Rouy; *H. cymosum|peleteranum*). ● *S.W. Alps; S.E. Germany.* Ga Ge It.

H. × fuernrohri Vollmann, *Denkschr. Bayer. Bot. Ges. Regensb.* **9**: 72 (1905) (*H. cymosum|peleteranum|pilosella*). ● *S.E. Germany* (*near Regensburg*). Ge.

33. H. × anchusoides (Arvet-Touvet) Arvet-Touvet, *Spicil. Rar. Nov. Hier.* 23 (1881) (*H. neohybridum* Arvet-Touvet; *H. pseudohybridum* Arvet-Touvet; *H. cymosum|peleteranum* (vel *pilosella*)*|piloselloides*). Stolons usually 0 or very short. Differs from *H. cymosum* and *H. piloselloides* in its larger capitula and more lax inflorescence, and from *H. peleteranum* in its 7–20(–30) capitula per stem. ● *C. & S. Europe, southwards to E. Spain and C. Italy.* Co Cz Ga Ge He Hs It.

In the southern part of its range this taxon often occurs in the absence of one or more of its parents.

34. H. × spurium Chaix ex Froelich in DC., *Prodr.* **7**: 204 (1838) (*H. canum* Peter, non Vuk., *H. laschii* Zahn; *H. cymosum|pilosella*). Differs from *H. cymosum* in having few capitula on longer peduncles, and from *H. pilosella* in having more than 1 capitulum per stem. Difficult to distinguish from *H.* x *anchusoides*, but sometimes has longer, more slender stolons. ● *N. & C. Europe.* Au Bu Cz Ga Ge Gr He *Ho Hu It Ju Po Rm Rs (C) Su.

35. H. × fallacinum F. W. Schultz, *Arch. Fl. Fr. Allem.* 56 (1844) (*H. rhyparum* (Naegeli & Peter) Zahn; *H. cymosum|pilosella|piloselloides*). Differs from *H. cymosum* and *H. piloselloides* in its laxer inflorescence of often larger capitula and from *H. pilosella* in having more than 1 capitulum per stem. From *H.* × *anchusoides* it differs in having long, often slender stolons. ● *C. Europe, extending to S.W. Alps and W. Ukraine.* Au Cz Ga Ge He Hu It Po Rm Rs (W).

H. × subcymiflorum Oborny & Zahn, *Verh. Naturf. Ver. Brünn* **44**: 226 (1905) (*H. prantlii* (Naegeli & Peter) Zahn, *H. subgermaniciforme* Zahn; *H. cymosum|pilosella|praealtum*). ● *C. Europe.* Au Cz Ge Hu.

36. H. × zizianum Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 62 (1828) (*H. bodewigianum* Zahn; *H. cymosum|piloselloides*). Like *H. piloselloides* but with dense stellate hairs on the peduncles. Very difficult to distinguish from *H. cymosum* but its leaves are usually glaucous and less hairy. Very similar to *H. praealtum*, but its leaves are usually more hairy. *C. & S. Europe.* Au Bu Co Cz Ga Ge Gr He Hu It Ju Rm Rs (W) Sa.

H. × litardiereanum Zahn in Engler, *Pflanzenreich* **82(IV.280)**: 1499 (1923) (*H. cymosum|piloselloides|pseudopilosella*). ● *Corse.* Co.

37. H. × densiflorum Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 59 (1828) (*H. pseudomagyaricum* Zahn, *H. tauschii* Zahn; *H. cymosum|praealtum*). Distinguishable from *H.* × *zizianum* only when growing with the parents and in often having long slender stolons. *Throughout much of Europe except the west.* Al Au Bu Cz Fe Ga Ge Gr He Hu It Ju No Po Rm Rs (B, C) Sa Su [Ho].

38. H. caespitosum Dumort., *Fl. Belg.* 62 (1827) (*H. pratense* Tausch). Rosette-leaves (35–)50–200 × 7–25 mm, oblanceolate or oblong-spathulate, acute or obtuse, long-attenuate at base, entire or rarely minutely denticulate, with more or less numerous, long simple eglandular hairs. Flowering stems (20–)30–50(–80) cm, with sparse stellate hairs, numerous, unequal simple eglandular hairs and few, short glandular hairs, with 1–3 leaves like those of the rosette or bract-like. Inflorescence cymose-corymbose; capitula 3–50. Involucral bracts (5–)7–9 × 1–1·25 mm, linear-lanceolate, usually obtuse, with sparse stellate hairs, numerous simple eglandular hairs and numerous, shorter, dark glandular hairs. Ligules pale yellow. $2n=18$, 27, 36, 45. *N., C. & E. Europe.* Au Bu Cz Fe Ga Ge Gr He Hu Ju No Po Rm Rs (N, B, C, W) Su [Be Br Da Ho].

1 Simple eglandular hairs of involucre mostly less than 1 mm; stolons usually underground, rarely above ground and then very short (c) subsp. **brevipilum**
1 Simple eglandular hairs of involucre mostly more than 1 mm; stolons above ground, obviously leafy
2 Involucre dark, the bracts with only a narrow, pale margin; leaves green (a) subsp. **caespitosum**
2 Involucre pale, the bracts with a broad, pale margin; leaves slightly glaucous (b) subsp. **colliniforme**

(a) Subsp. **caespitosum**: Stolons above ground, with large leaves. Leaves green. Involucre dark; bracts with narrow pale margins and simple eglandular hairs mostly 1–3 mm. $2n=45$. *Mainly in C. & E. Europe.*

(b) Subsp. **colliniforme** (Peter) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 259 (1976) (*H. collinum* subsp. *colliniforme* Peter): Stolons above ground, with large leaves. Leaves slightly glaucous. Involucre rather pale; bracts with wide pale margins, with simple eglandular hairs mostly 1–3 mm. *Mainly in N. & E. Europe.*

(c) Subsp. **brevipilum** (Naegeli & Peter) P. D. Sell, *loc. cit.* (1976) (*H. pratense* subsp. *brevipilum* Naegeli & Peter): Stolons usually underground, or above ground and with small leaves. Leaves slightly glaucous. Involucre rather pale; bracts with narrow pale margins and simple eglandular hairs mostly 0·5–1 mm. $2n=18$. *E., E.C. & S.E. Europe.*

39. H. × ambiguum Ehrh., *Beitr. Naturk.* **5**: 178 (1790) (*H. caespitosum|cymosum*). Differs from *H. caespitosum* in having dense stellate hairs on the involucral bracts, and from *H. cymosum* in having long stolons. $2n=36$, 45. ● *N. & C. Europe; Macedonia.* Au Cz Da Fe Ge ?Gr He ?Ju No Po Rm Rs (N, B, C, W) Su.

40. H. × dubium L., *Sp. Pl.* ed 2, 1125 (1763) (*H. scandinavicum* Dahlst.; *H. caespitosum|cymosum|lactucella*). Differs from *H. caespitosum* in its lack of stolons, from *H. cymosum* in its fewer and larger capitula, and from *H. lactucella* in its taller habit, lack of stolons and stellate hairs on the leaves. $2n=36$, 45. ● *N., N.C. & E.C. Europe.* Au Cz Da Fe Ge Hu No Po Rm Rs (N, B, C, W) Su.

H. × poliodermum Dahlst., *Kungl. Svenska Vet.-Akad. Handl.* nov. ser., **23(15)**: 119 (1890) (*H. transbalticum* Dahlst.; *H. caespitosum|cymosum|lactucella|pilosella*). ● *Baltic region and C. Russia.* Rs (B, C) Su.

41. H. × macranthelum Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 473 (1885) (*H. caespitosum|cymosum|pilosella*). Differs from *H. caespitosum* in having short or no stolons, from *H. cymosum* in its fewer, larger capitula, and from *H. pilosella* in having 2–25(–40) capitula per stem. $2n=45$. ● *N. & C. Europe.* Fe Ge No Po Rs (N, B, C, ?W) Su.

H. × solacolui Prodan ex E. I. Nyárády in Săvul., *Fl. Rep. Pop. Române* **10**: 723 (1965) (*H. caespitosum|echioides*). ● *S.E. Romania.* Rm.

H. × wolgense Zahn, *Sched. Fl. Ross.* **6**: 93 (1908) (*H. caespitosum|echioides|lactucella|praealtum*). ● *C. Russia.* Rs (C).

H. × aneimenum Naegeli & Peter, *Hier. Mittel.-Eur.* **1**: 687 (1885) (*H. caespitosum|hoppeanum|pilosella|piloselloides*). ● *S. Germany* (*Bayern*). Ge.

42. H. × floribundum Wimmer & Grab., *Fl. Siles.* **2(2)**: 204 (1829) (*H. cochleatum* (Naegeli & Peter) Norrlin. *H. longiscapum* (1829) (*H. cochleatum* (Naegeli & Peter) Norrlin, *H. longiscapum* (Boiss. & Kotschy ex Naegeli & Peter) Zahn; *H. caespitosum|lactucella*). Intermediate between the parents. Differs from *H. caespitosum* in its glaucous leaves, and from *H. lactucella* in its taller habit. $2n=27$. ● *N. & C. Europe, southwards to N. Switzerland and the E. Carpathians.* Au Cz Da Fe Ge He Ho Hu Is No Po Rm Rs (N, B, C, W) Su.

The only representative of *Hieracium* Subgen. *Pilosella* in Iceland has been described as **H. islandicum** (Lange) Dahlst., *Acta Horti Berg.* **2(4)**: 15 (1894) (*H. depilans* Dahlst., *H. islandiciforme* Dahlst.), but it is sexual, is morphologically indistinguish-

able from *H.* × *floribundum* and has the same chromosome number, $2n=27$.

43. H. × piloselliflorum Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 707 (1885) (*H. apatelium* Naegeli & Peter, *H. callimorphum* Naegeli & Peter, *H. callimorphoides* Zahn, *H. chlorops* (Naegeli & Peter) Zahn, *H. iseranum* (Uechtr. ex Naegeli & Peter) Zahn; *H. caespitosum|lactucella|pilosella*). Like *H.* × *floribundum*, but with deeply furcate inflorescence. ● *N. & C. Europe.* Au Cz Ge Hu Po Rs (N, B, C, W) Su.

H. × leptoclados Peter, *Bot. Jahrb.* **5**: 280 (1884) (*H. caespitosum|pilosella|piloselloides*). ● *S. Germany, Switzerland.* Ge He.

45. H. × melinomelas Peter, *Bot. Jahrb.* **5**: 496 (1884) (*H. acrothyrsum* Naegeli & Peter, *H. montanum* Naegeli & Peter; *H. caespitosum|pilosella|praealtum*). Differs from *H. caespitosum* and *H. praeltum* in its lax, sometimes deeply furcate inflorescence, and from *H. pilosella* in having more than 1 capitulum per stem. ● *E.C. Europe; Baltic region.* Au Cz Rs (B, W) Su [Ho].

46. H. × arvicola Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 666 (1885) (*H. caespitosum|piloselloides*). Intermediate between the parents. Differs from *H. caespitosum* in its glaucous leaves, and from *H. piloselloides* in having numerous stellate hairs on the peduncles. ● *C. Europe.* Au Cz Ge He Hu Po Rm Rs (W).

47. H. × polymastix Peter, *Bot. Jahrb.* **6**: 123 (1884) (*H. obornyanum* Naegeli & Peter, nom. illegit.; *H. caespitosum|praealtum*). Only those nothomorphs with long slender stolons can be distinguished from *H.* × *arvicola*. ● *C. & N.E. Europe.* Au Cz Fe Ge Hu Po Rm Rs (N, B, C, W) [Ho].
~~Au Cz Fe Ge Hu Po Rm Rs (N, B, C, W) [Ho].~~

H. × pawlowskiellum Merxm., *Fragm. Fl. Geobot.* **16**: 99 (1970) (*H. caespitosum|pseudopilosella*). ● *S. Bulgaria* (*Rodopi*). Bu.

48. H. aurantiacum L., *Sp. Pl.* 801 (1753). Stolons more or less numerous, above or below ground, leafy. Rosette-leaves few, pale green or rather glaucous, obtuse to acute, attenuate at base, with numerous, pale simple eglandular hairs on both surfaces and the margin. Flowering stems 20–40(–65) cm, with sparse stellate, numerous, dark simple eglandular hairs 1–6 mm, and few, shorter, dark glandular hairs above, with 1–4 leaves like those of the rosette or bract-like. Inflorescence cymose-corymbose, often with long lower branches; capitula 2–12(–25). Involucral bracts 1·5–3 mm wide, lanceolate, obtuse to acute, with more or less numerous stellate hairs, numerous long, dark simple eglandular hairs and fewer, shorter, dark glandular hairs. Ligules orange-brown or -red, purplish when dry. $2n=18$, 27, 36, 45, 54, 63, 72. *N. & C. Europe, mainly in the mountains, extending locally southwards to S.C. France and Bulgaria; widely cultivated and naturalized elsewhere.* Au Bu Cz Fe Ga Ge He It Ju No Po Rm Rs (*C, W) Su [Be Br Da Ho Is].

The natural distribution of the following two subspecies is made uncertain by the occurrence of intermediates and by the naturalization of both subspecies, particularly of subsp. **(b)**.

(a) Subsp. **aurantiacum**: Stolons rather short and mostly underground. Rosette-leaves 100–200(–300) × 22–60(–70) mm, lanceolate. Involucral bracts 8–11 mm. $2n=36$. *Mainly in the Alps and W. Carpathians.*

(b) Subsp. **carpathicola** Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 290 (1885): Stolons often long and leafy, usually above ground. Rosette-leaves 60–100 (–160) × 12–20(–30) mm, usually oblong-lanceolate or oblanceolate. Involucral bracts 5–8 mm. *Throughout the range of the species.*

Most hybrids of *H. aurantiacum* can be recognized by the amount of red in the ligules.

49. H. × fuscatrum Naegeli & Peter, *op. cit.* 315 (1885) (*H. aurantiacum|caespitosum*). Intermediate between the parents and distinguished from both by the presence of both yellow and red in the ligules. ● *N., C. & E. Europe.* Au Bu Cz Fe Gr He It Ju No Po Rm Rs (N, C, W) Su [Ge Ho].

The taxa placed in *H. aurantiacum* grex *croceum* by Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1245–1247 (1923) are morphologically indistinguishable from *H.* × *fuscatrum*.

H. × norrliniforme Pohle & Zahn, *Allgem. Bot. Zeitschr.* **13**: 111 (1907) (*H. tephranthelum* (Zahn) Juxip; *H. aurantiacum|caespitosum|cymosum*). ● *Subarctic Russia.* Rs (N).

H. × dimorphoides Norrlin, *Acta Soc. Fauna Fl. Fenn.* **2(4)**: 133 (1884) (*H. norrlinii* Naegeli & Peter, *H. vittatum* (Lindeb.) Dahlst.; *H. aurantiacum|caespitosum|cymosum|lactucella*). ● *Finland.* Fe.

H. × subdecolorans (Norrlin) Dahlst., *Acta Horti Berg.* **2(4)**: 22 (1894) (*H. aurantiacum|caespitosum|lactucella*). ● *Norway, Sweden.* No Su.

50. H. × guthnickianum Hegetschw., *Fl. Schweiz* 781 (1840) (*H. aurantiacum|cymosum*). Differs from *H. aurantiacum* in usually having some yellow in the ligules and in its smaller capitula and leaves, and from *H. cymosum* in having at least a red stripe on the ligules. ● *Alps; Carpathians; mountains of Balkan peninsula.* ?Al Au Bu Cz Ga Ge He It Ju Po Rm Rs (W).
~~?Al Au Bu Cz Ga Ge He It Ju Po Rm Rs (W).~~

Through much of its range this taxon is an obvious hybrid, but in the S.W. Alps uniform populations indistinguishable from it occur outside the range of *H. aurantiacum*.

H. × atrocrinitum Arvet-Touvet, *Not. Pl. Alp.* 24 (1883) (*H. naegelii* (Norrlin ex Naegeli & Peter) Zahn, non Burnat & Gremli; *H. aurantiacum|cymosum|glaciale*). ● *Alps.* Au He It.

51. H. × plaicense Wołoszczak, *Spraw. Kom. Fizyogr. Krakow.* **22**: 201 (1898) (*H. fuscescens* (Naegeli & Peter) Zahn; *H. aurantiacum|cymosum|lactucella*). Like *H.* × *guthnickianum* but with few or no stellate hairs on the lower surface of the leaves. ● *Alps; E. Carpathians; W.C. Sweden.* Au He It Rs (W) Su.

52. H. × biflorum Arvet-Touvet, *Essai Pl. Dauph.* 40 (1871) (*H. aurantiacum|cymosum|pilosella*). Differs from all its parents and from *H.* × *guthnickianum* and *H.* × *plaicense* by its deeply furcate inflorescence. ● *Alps; N. & C. parts of Balkan peninsula.* ?Al Au Bu Ga He Ju.

H. × muscelii Prodan, *Bul. Şti. Acad. Rep. Pop. Române* ser. bot., **9**: 311 (1957) (*H. aurantiacum|echioides|praealtum*). ● *S. Carpathians.* Rm.

H. × macutense K. Malý & Zahn, *Glasn. Muz. Bosni Herceg.* **37**: 49 (1925) (*H. aurantiacum|cymosum|praealtum*). ● *E. Bosna.* Ju.

H. × rubrum Peter, *Flora* (*Regensb.*) **64**: 126 (1881) (*H. aurantiacum|flagellare*). ● *Sudeten Mts.; W. Romania.* Cz Po Rm.

H. × aurantellum Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 347 (1885) (*H. aurantiacum|glaciale*). ● *S. Alps.* Au Ga He It.

H. × nothum Huter, *Österr. Bot. Zeitschr.* **20**: 338 (1870) (*H. aurantiacum|glaciale|hoppeanum*). ● *E. & E.C. Alps.* Au Ge He It.

H. × amaurocephalum Peter, *Bot. Jahrb.* **5**: 471 (1884) (*H. rubellum* Peter, *H. krafftianum* Schwimmer & Zahn, *H. subeminens* Touton & Zahn; *H. aurantiacum|glaciale|hoppeanum|lactucella*). ● *E. Switzerland* (*Graubünden*). He.

H. × substoloniflorum Peter, *Bot. Jahrb.* **5**: 263 (1884) (*H. erectum* (Naegeli & Peter) Zahn, *H. rubriflorum* Zahn; *H. aurantiacum|hoppeanum*). ● *E.C. & E. Alps.* Au Ge He It.

H. × eminens Peter, *Bot. Jahrb.* **5**: 469 (1884) (*H. mirabile* Naegeli & Peter; *H. aurantiacum|hoppeanum|lactucella*). ● *E. C. & E. Alps.* Ge He.

53. H. × fuscum Vill. in Vill., G. Lauth & A. Nestler, *Précis Voy. Bot.* 19 (1812) (*H. blyttianum* Fries; *H. aurantiacum|lactucella*). Variable; sometimes more like one parent than the other. Differs from *H. aurantiacum* in its glaucous leaves and smaller capitula, and from *H. lactucella* in its taller habit, more numerous capitula and reddish or striped ligules. $2n=54$. ● *From Norway and N.W. Russia to the Alps and C. Jugoslavia.* Au Cz Fe Ga Ge He It Ju No Po Rm Rs (N, B, C, W) [Ho].

54. H. × peteranum Kaeser, *Ber. Schweiz. Bot. Ges.* **11**: 193 (1901) (*H. aurantiacum|lactucella|pilosella*). Differs from all its parents and *H.* × *fuscum* in its deeply furcate inflorescence of 2–5 capitula. ● *C. Europe; Fennoscandia.* Au Cz Ge He It No Po Su.

H. × moechiadium Peter, *Bot. Jahrb.* **5**: 491 (1884) (*H. cineraria* Naegeli & Peter, nom. illegit.; *H. aurantiacum|lactucella|pilosella|praealtum*). ● *S. Norway* (*Telemark*). No.
~~praealtum). ● S. Norway (Telemark). No.~~

H. × hyperboreum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 28 (1848) (*H. aurantiacum|lactucella|praealtum*). ● *Norway; Sudeten Mts.* ?Cz No Po.

H. × bryhnii Blytt ex Omang, *Nyt Mag. Naturvid.* (*Christiania*) **48**: 21 (1910) (*H. aurantiacum|peleteranum*). ● *S. Norway* (*Setesdal*). No.

55. H. × stoloniflorum Waldst. & Kit., *Pl. Rar. Hung.* **3**: 303 (1812) (*H. aurantiacum|pilosella*). Variable; sometimes more like one parent than the other. Differs from its parents in its lax, often deeply furcate inflorescence. $2n=45$, 46. ● *C. Europe; N.W. Russia.* Au Cz Ga Ge He It Ju Rm Rs (N, C, W) [Br Ho Su].

H. × trigenes Peter, *Bot. Jahrb.* **6**: 122 (1884) (*H. dybowskianum* Rehmann; *H. aurantiacum|pilosella|praealtum*). ● *E.C. Europe.* Au Rs (C).

56. H. × calomastix Peter, *Bot. Jahrb.* **6**: 121 (1884) (*H. aurantiacum|praealtum*). Differs from *H. aurantiacum* in its indumentum of sparse simple eglandular hairs, and from *H. praealtum* in its reddish ligules. ● *E.C. Europe.* Au Cz ?Rm Rs (C, W) [Ho].

H. × atramentarium (Naegeli & Peter) Zahn in Engler, *Pflanzenreich* **82(IV.280)**: 1472 (1923) (*H. aurantiacum|piloselloides*). ● *C. Europe, from S.E. Germany to C. Romania.* Cz Ge Po Rm.

H. × fulgens Naegeli & Peter, *Hier. Mittel.-Eur.* **1**: 349 (1885) (*H. aurantiacum|sphaerocephalum*). ● *E. Alps.* Au He.

57. H. echioides Lumn., *Fl. Poson.* 348 (1791). Stolons usually absent, rarely long, leafy and bearing capitula. Rosette-leaves 30–170 × 5–17 mm, narrowly elliptical, subacute or obtuse, entire, long-attenuate at base, withering early, with stellate hairs numerous below and less numerous above, and with more or less numerous, rigid, usually appressed, bulbous-based simple eglandular hairs. Flowering stems 25–110 cm, with more or less numerous stellate hairs and more or less numerous, usually appressed and forwardly directed, rarely patent, rigid simple eglandular hairs, without glandular hairs, with (3–)5–20 leaves, the lower like those of the rosette, the upper very narrowly linear. Inflorescence more or less cymose-corymbose; capitula (5–)10–70. Involucral bracts 6–10 × 1–1·5 mm, linear-lanceolate, obtuse to acute, tomentose with stellate, and more or less numerous simple eglandular hairs, without glandular hairs. Ligules yellow. $2n=36$. *Dry grassland and sandy ground. C. & S. Europe.* Au Bu Cz Ge Hu Ju Po Rm Rs (B, C, W, K, E) Tu.

(a) Subsp. **echioides**: Simple eglandular hairs of flowering stem appressed and forwardly directed. $2n=36$. *Throughout the range of the species.*

(b) Subsp. **procerum** (Fries) P. D. Sell, *Bot. Jour. Linn. Soc.* **71**: 259 (1976) (*H. procerum* Fries): Simple eglandular hairs of flowering stem patent. *Krym.*

Most hybrids of this species can be recognized by the presence of some rigid hairs and they often have numerous cauline leaves like *H. echioides*.

58. H. × macrotrichum Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 29 (1844) (*H. erythrodontum* Zahn; *H. echioides|hoppeanum*). Variable; some plants are more like one parent than the other. Differs from both parents in its lax or deeply furcate inflorescence of 3–15(–30) capitula. The hairs of the flowering stem are up to 18 mm, longer than those in any other taxon in the subgenus. *E.C. Europe and Balkan peninsula.* Au Bu Gr Hu Ju ?Rm.
~~*E.C. Europe and Balkan peninsula.* Au Bu Gr Hu Ju ?Rm.~~

H. × hortatschicum Zahn in Engler, *Pflanzenreich* **82(IV.280)**: 1515 (1923) (*H. echioides|hoppeanum|piloselloides*). ● *N. Greece* (*near Thessaloniki*). Gr.

H. × budense Borbás, *Term.-Tud. Közl.* **8**: 36 (1876) (*H. echioides|hoppeanum|praealtum*). ● *Hungary* (*near Budapest*). Hu.

H. × tephroglaucum Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 513 (1885) (*H. echioides|lactucella*). ● *S.C. Czechoslovakia; C. Romania.* Cz Rm.

H. × tephrophyton Oborny & Zahn, *Verh. Naturf. Ver. Brünn* **43**: 77 (1905) (*H. echioides|lactucella|pilosella*). ● *S.C. Czechoslovakia (near Znojmo).* Cz.

H. × occidentale E. I. Nyárády, *Acta Fauna Fl. Universali (Ser. Bot.)* **3**: 14 (1940) (*H. echioides|lactucella|praealtum*). ● *W.C. Romania.* Rm.

59. H. × bifurcum Bieb., *Fl. Taur.-Cauc.* **2**: 251 (1808) (*H. rothianum* Wallr.; *H. echioides|pilosella*). Variable; some plants are more like one parent than the other. Differs from both parents in its lax to deeply furcate inflorescence with capitula intermediate in size. *C., E. & S.E. Europe northwards to Latvia and southwards to Krym and Macedonia.* Au Bu Cz Ge Hu Ju Po Rm Rs (B, C, W, K).

60. H. × heterodoxum (Tausch) Naegeli & Peter, *Hier. Mittel-Eur.* **1**: 747 (1885) (*H. euchaetiiforme* Zahn, *H. heterodoxiforme* Zahn ex Touton; *H. echioides|pilosella|piloselloides*). Differs from *H. echioides* in its indumentum being less rigid and its inflorescence more lax, from *H. pilosella* in having more than 1 capitulum per stem, and from *H. piloselloides* in its larger capitula. Stolons absent or very short. ● *C. Europe.* Au Cz Ge Po Rm.

61. H. × euchaetium Naegeli & Peter, *op. cit.* 764 (1885) (*H. echioides|pilosella|praealtum*). Differs from *H. × heterodoxum* in its long slender stolons. ● *C. & S.E. Europe.* Au Bu Cz Ge Hu Rm Rs (K).

62. H. × auriculoides A. F. Láng, *Syll. Pl. Nov. Ratisbon. (Königl. Baier. Bot. Ges.)* **1**: 183 (1824) (*H. calodon* Tausch ex Peter; *H. echioides|piloselloides*). Differs from *H. echioides* in its less dense, less rigid indumentum, from *H. piloselloides* in its larger capitula, and from *H. × heterodoxum* in its more aggregated inflorescence. *C. & S.E. Europe.* Au Bu Cz Ge Gr Hu It Ju Rm Tu.

63. H. × echiogenes (Naegeli & Peter) Juxip in Schischkin & Bobrov, *Fl. URSS* **30**: 487 (1960) (*H. echioides|praealtum*). Not distinguishable from *H. × auriculoides*. *H. piloselloides* and *H. praealtum* do not usually grow together. *C. & C.E. Europe.* Au Bu Cz Ge Hu It Ju Rm Rs (C, K).

The correct distribution and synonymy of *H. × auriculoides* and *H. × echiogenes* are difficult to ascertain.

64. H. verruculatum Link, *Enum. Horti Berol. Alt.* **2**: 287 (1822). Stolons absent. Rosette-leaves 30–200 × 5–40 mm, usually elliptical to linear-lanceolate, more or less acute, entire, attenuate at base, withering early, with numerous stellate hairs, few to numerous, rigid simple eglandular hairs and scattered, small glandular hairs. Flowering stems 45–110 cm, with numerous stellate and few to numerous glandular hairs throughout, with simple eglandular hairs only at the base, with 4–12 leaves smaller and narrower than those of the rosette and usually semi-amplexicaul. Inflorescence laxly paniculate to umbellate; capitula 10–60. Involucral bracts 8–11 × 1–2 mm, linear-lanceolate, obtuse to acute, with dense stellate and yellowish-brown glandular hairs, without or with a few simple eglandular hairs. Ligules yellow. *E.C. Russia.* Rs (C). (*S.W. Asia.*)

Subgen. **Hieracium**. Stock erect or oblique, never stoloniferous. Stems usually solitary, sometimes few. Leaves entire to incise-dentate, at least the basal usually petiolate; cauline solitary to numerous, usually large, rarely absent. Ligules usually yellow, rarely green or white; glabrous or hairy. Pollen rarely copious, sometimes absent. Achenes 2·5–5 mm; ribs apically confluent into an obscure ring; pappus-hairs in 2 rows, both long and short intermixed. Receptacular pits shortly dentate to fimbriate-dentate.

(A) Leaves usually without glandular or plumose hairs, the basal usually numerous, the cauline few to numerous, or absent. Capitula few to numerous. Receptacular pits dentate, fimbriate-dentate or ciliate-dentate. Mainly early-flowering (March–July), though some plants continue to flower throughout the year.

(i) Leaves green or glaucous; basal numerous; cauline 0–2(–3). Capitula 1–15 (–numerous); inflorescences often corymbose; peduncles often arcuate. Ligules glabrous or with simple eglandular hairs at apex. Stigmas yellow or discoloured. Achenes 3–4 mm, dark. Margins of receptacular pits more or less dentate.

65. H. murorum group. Stems (10–)20–50(–80) cm, with few to numerous stellate and glandular hairs at least in the upper part. Leaves with simple eglandular hairs throughout or glabrous above, and sometimes with stellate hairs beneath; basal very variable, numerous, 20–150 × 15–70 mm, green, elliptical, ovate, lanceolate or oblong, obtuse to acute, entire to deeply laciniate-dentate (the teeth often more or less mammiform), attenuate to truncate at base, the outer usually broader, more obtuse and less dentate than the inner; cauline 0–1(–2), like the basal or bract-like. Capitula (1–)4–15(–numerous), often more or less corymbosely arranged; peduncles often arcuate, with dense stellate and glandular hairs and sometimes an occasional simple eglandular hair. Involucre 7·5–14 × 5–12 mm; bracts obtuse to acute, with numerous glandular hairs, usually few to numerous stellate hairs and sometimes a few eglandular hairs. Stigmas yellow or discoloured. Ligules glabrous or with simple eglandular hairs at apex. $2n=27$, 36. *Most of Europe.* All except Az Bl Cr Fa Sb.

It is difficult to give with confidence the original native distribution. Plants of this group are certainly native in rocky places, grassland and open woodland in much of Europe. In the lowlands they often occur on disturbed ground and other open habitats, which they may have reached relatively recently.

K. H. Zahn in Engler, *Pflanzenreich* **75–76(IV.280)**: 287–342 (1921) describes 345 subspecies and many varieties under *H. murorum*, and numerous other taxa have been described since. The quick spread of species of this group over large areas of disturbed land may ensure the survival of new variants more readily than in the case of species growing in native habitats where competition may allow only a few achenes to germinate. N. Hylander, *Symb. Bot. Upsal.* **7(1)**: 125–274 (1943), has described 143 species, most of them new, belonging to this and the following two aggregate species, which have been introduced into grasslands in Sweden. Many of them are not known elsewhere.

Included species:

H. densiglandulum P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 263 (1976) (*H. glandulosissimum* (Dahlst.) K. Joh., non Brenner). ● Au Bu Cz Fe Ge He Hu Su.

H. exotericum Jordan ex Boreau, *Fl. Centre Fr.* ed. 3, **2**: 417 (1857). Al Br Co Cz Da Ga Ge He Hs Hu It Ju Rm.

H. gentile Jordan ex Boreau, *op. cit.* 415 (1857). Al Au Be Bu Co Cz Da Ga Ge Gr He Ho It Ju Po Rs (B, C, K).

H. grandidens Dahlst., *Kungl. Svenska Vet.-Akad. Handl.* **25(3)**: 126 (1893). $2n=27$. Au Br Co Bu Cz Da Fe Ga Ge Gr Hb He It Ju No Po Rm Rs (B, C, W) Su.

H. integratum (Dahlst. ex Stenström) Dahlst., *op. cit.* 112 (1893). ● Au Br Cz Da Gr Hu Ju No Su.

H. murorum L., *Sp. Pl.* 802 (1753). Although this name has always been used for this group of plants in the aggregate sense, it has never been typified and it is uncertain to which of the segregates the name applies.

H. oblongum Jordan, *Cat. Jard. Grenoble* **1849**: 7 (1849). ● Al Au Br Cz Ga Ge He Hu It Ju Rm.

H. pellucidum Laest., *Kungl. Svenska Vet.-Akad. Handl.* 172 (1824). ● Br Da Fe No Rs (N, B, C) Su.

H. praecurreus Vuk., *Rad Jugosl. Akad. Znan. Umj.* **58**: 167 (1881). ● Al Au Bu Cz Hu Ju Rm Rs (W). (This species shows some characters of *H. rotundatum*.)

H. semisilvaticum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 266 (1976) (*H. murorum* subsp. *semisilvaticum* Zahn). ● Al Bu Cz Ga Ge Gr He It Ju Rm.

H. subbifidiforme (Zahn) P. D. Sell & C. West, *loc. cit.* (1976) (*H. murorum* subsp. *subbifidiforme* Zahn). ● Cz Ge Hu Ju Po Rm.

H. tenuiflorum Arvet-Touvet ex C. Bicknell, *Fl. Bordighera* 173 (1896). ● Co Ga He It.

H. triangulare Almq., *Stud. Hier.* xiv (1881). ● *Fennoscandia and Baltic region.* Fe No Rs (C) Su.

66. H. glaucinum group (*H. praecox* Schultz Bip.; *H. murorum|schmidtii*). Like **65** but leaves more or less glaucous and often spotted or blotched, the hairs on the margin often subrigid; involucre with dense, dark glandular hairs and numerous simple eglandular hairs. $2n=27$, 36. *Rocky places and open woods; widespread also as a ruderal. From Ireland and Spain eastward to Sweden, Poland and Bulgaria.* Au Br Bu Co Cz Da Ga Ge Hb He Ho Hs Hu It Ju Po Rm Su.

Included species:

H. bounophilum Jordan ex Boreau, *Fl. Centre Fr.* ed. 3, **2**: 412 (1857). ● Co Cz Ga Ge It Po.

H. cinerascens Jordan, *Cat. Jard. Grenoble* **1849**: 17 (1849). ● Bu Co Cz Ga Ge He Hs Hu.

H. glaucinum Jordan, *Cat. Jard. Dijon* 22 (1848). Au Co Cz Ga Ge Hs Ju.

H. gougetianum Gren. & Godron, *Fl. Fr.* **2**: 368 (1851). $2n=27$. ● Cz Ga Ge Hb He Hs.

H. praecox Schultz Bip., *Pollichia* **9**: 35 (1851). ● Au Cz Ga Ge Ho Hs.

H. scotostictum Hyl., *Symb. Bot. Upsal.* **7(1)**: 127 (1943). $2n=27$. ● Au Br Da Ge Su.

67. H. bifidum group. Like **65** but stem without glandular hairs and usually with only a few simple eglandular hairs; leaves more or less glaucous, glabrous or nearly so above; capitula usually few; peduncles long, usually with numerous simple eglandular hairs, usually without glandular hairs; involucral bracts with dense stellate hairs, numerous simple eglandular hairs and few to numerous glandular hairs. $2n=27$, 36. *Throughout a large part of Europe, but absent from much of the south-east and south-west.* Al Au Br Bu Cz Da Fe Ga Ge Gr Hb He Ho Hu Is It Ju No Po Rm Su.

Included species:

H. ammobium P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 262 (1976) (*H. bifidum* subsp. *psammogenes* Zahn, non *H. psammogenes* Omang). ● Au Cz Ga Ge He It Ju Rm.

H. bifidum Kit. in Hornem., *Hort. Hafn.* **2**: 761 (1851). Although this name has always been used for this group of plants in the aggregate sense, it has never been typified and it is uncertain to which segregate the name applies.

H. caesiiflorum Almq. ex Norrlin, *Acta Soc. Fauna Fl. Fenn.* **3(4)**: 96 (1888). Al Au Cz Fe Ga Ge Gr He Hu It Ju No Rm Rs (N, C) Su.

H. canitiosum Dahlst., *Bot. Not.* **1892**: 155 (1892). Au Bu Cz Ga He Hu It Ju Po Rm Rs (B) Su.

H. cardiobasis (Zahn) Juxip in Schischkin & Bobrov, *Fl. URSS* **30**: 372 (1960). Al Au Cz Ga Ge He It Ju Po Rm Rs (C).

H. cirritum Arvet-Touvet, *Monogr. Hier.* 21 (1873). ● *Alps.* Au Ga He It. (This species shows some characters of the *H. piliferum* group.)

H. macropholidium (Jónsson) Dahlst., *Ark. Bot.* **3(10)**: 35 (1904). ● Is.

H. pallescens Waldst. & Kit., *Pl. Rar. Hung.* **3**: 241 (1808–1809). Au Cz Ga Ge He It Ju Rm.

H. sanguineum (A. Ley) W. R. Linton, *Brit. Hier.* 37 (1905). ● Br Hb.

H. stenolepis Lindeb. in Hartman, *Handb. Skand. Fl.* ed. 11, 45 (1879). Al Au Bu Cz Da Fe Ga Ge Gr He Hu It Ju No Po Rm Rs (B) Su.

H. trebevicianum K. Malý, *Glasn. Muz. Bosni Herceg.* **11**: 149 (1899). Al Bu Cz Ju Rm (W). (This species has some characters of *H. rotundatum*.)

68. H. subcaesiiforme (Zahn) Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 524 (1921) (*H. bifidum|humile*). Like **65** but leaves subglabrous above, the margin and petioles with minute glandular hairs; involucre with numerous simple eglandular hairs and few small glandular hairs. ● *Alps.* Au Ga Ge It.

69. H. fuscocinereum group. Like **65** but with numerous, pale, simple eglandular hairs and fewer, small glandular hairs on the involucre. *N. & N.C. Europe.* Br Cz Da Fe Ga Ge Is No Po Rs (N, B, C) Su.

Included species:

H. chlorellum Norrlin, *Acta Soc. Fauna Fl. Fenn.* **3(4)**: 97 (1888). ● Da Fe No Rs (N) Su.

H. fuscocinereum Norrlin, *op. cit.* 92 (1888). ● No Su.

H. oistophyllum Pugsley, *Jour. Bot. (London)* **79**: 194 (1941) (*H. sagittatum* (Lindeb.) Norrlin, non Hoffmanns. & Link). Br Da Fe Ge Is No Po Rs (N, B, C) Su.

H. philanthrax (Stenström) K. Joh. & Sam., *Dalarnes Hier. Silvat.* 66 (1923). Da Fe Ga No Rs (N, B, C) Su.

H. trichotum (Jónsson) Dahlst., *Ark. Bot.* **3(10)**: 40 (1904) (*H. hemitrichotum* (Zahn) Ostenf. & Gröntved, nom. illegit.). ● Is.

70. H. incisum group (*H. bifidum|dentatum*). Like **65** but leaves with dense, simple eglandular hairs up to 3 mm; involucre with numerous simple eglandular and few small glandular hairs. ● *Alps*; *W. Carpathians.* Au Cz Ga Ge He It Ju.

Included species:

H. incisum Hoppe in Sturm, *Deutschl. Fl.* **39**: t. 622 (1815). Au Cz Ga Ge He Ju.

Other species and groups in (i):

H. adusticeps group (*H. melanops* Arvet-Touvet; *H. murorum|piliferum*). ● *Alps.* Au Ga Ge He It. (Including **H. adusticeps** Zahn, *Hier. Alpes Marit.* 165 (1916). Au Ga He It.)

H. atropictum Arvet-Touvet & Gaut., *Bull. Soc. Bot. Fr.* **51**: lxxvii (1905) (*H. glaucinum|lawsonii*). ● *E. Pyrenees.* Ga Hs.

H. cirritogenes Zahn, *Hier. Alpes Marit.* 198 (1916) (*H. bifidum|schmidtii*). ● *Alpi Marittime.* It.

H. erythrocarpum Peter, *Nachr. Königl. Ges. Wiss. Götting. (Math.-Phys. Kl.)* **1898**: 36 (1898) (*H. murorum|sparsum*). *Balkan peninsula*; *S. Carpathians*. Al Bu Gr Ju Rm.

H. eversianum group (*H. incisum|vulgatum*). ● *Vorarlberg*. Au. (Including **H. eversianum** Arvet-Touvet ex J. Murr, *Deutsche Bot. Monatsschr.* **15**: 282 (1897). Au.)

H. incisiceps Rohlena & Zahn, *Feddes Repert.* **6**: 229 (1909) (*H. bifidum|villosum*). ● *Crna Gora*. Ju.

H. molinieranum Arvet-Touvet & Gaut., *Bull. Soc. Bot. Fr.* **51**: 34 (1905) (*H. murorum|kerneri*). ● *S.W. Alps*. Ga He.

H. peterfii E. I. Nyárády & Zahn, *Bull. Grăd. Bot. Univ. Cluj* **8**: 82 (1928). ● *S. Carpathians*. Rm.

H. prinzii group (*H. murorum|humile*). ● *Alps*. Au Ga Ge He. (Including **H. prinzii** (Kaeser ex Zahn) Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 522 (1921). He.)

H. prodanianum E. I. Nyárády & Zahn, *Bul. Grăd. Bot. Univ. Cluj* **8**: 73 (1928) (*H. rotundatum|sparsum*). ● *S.W. & C. Romania*. Rm.

H. pseudorionii group (*H. pictiforme* (Zahn) Zahn, non Arvet-Touvet & Belli; *H. glaucinum|pictum*). ● *S.W. & S.C. Alps*. He It. (Including **H. pseudorionii** (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 265 (1976) (*H. pictiforme* subsp. *pseudorionii* Zahn). He.)

H. retyezatense group (*H. bifidum|sparsum*). ● *Balkan peninsula; S. Carpathians*. Bu Gr Ju Rm. (Including **H. retyezatense** Degen & Zahn, *Magyar Bot. Lapok* **5**: 87 (1906). Bu Rm.)

H. rupicoliforme group (*H. incisum|schmidtii*). ● *C. Alps*. He. (Including **H. rupicoliforme** Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1811 (1901). He.)

H. solidagineum group (*H. murorum* (vel *glaucinum*)*|sonchoides*). 400–1600(–2000) *m*. ● *Pyrenees*. Ga Hs. (Including **H. solidagineum** Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 55 (1862). Ga Hs.)

H. tephropogon group (*H. incisum|dollineri*). ● *E. Alps*. Au He It Ju. (Including **H. tephropogon** Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1820 (1901). Au He It.)

H. trichopsis (Zahn) Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 513 (1921) (*H. incisum|cirritum*). ● *C. & E. Alps*. Au He It.

(ii) Like (i) but basal leaves usually fewer, sometimes withered at anthesis, the cauline 2–20(–numerous).

71. H. vulgatum group (*H. levicaule* Jordan). Stems 20–80 cm, with stellate and simple eglandular hairs. Leaves with simple eglandular hairs which are usually sparse above, sometimes with stellate hairs beneath; basal numerous, 15–150 × 10–45 mm, lanceolate to ovate, obtuse to acute, denticulate to dentate; cauline 2–10(–15), like the basal, the lower usually petiolate, the upper smaller. Capitula 1–20(–numerous); peduncles with dense stellate hairs, few to numerous simple eglandular hairs, and often a few glandular hairs. Involucre 8–11 × 7–10 mm; bracts obtuse to acute, with few to numerous stellate hairs, numerous simple eglandular hairs and few to numerous glandular hairs. Stigmas discoloured. Ligules glabrous or with simple eglandular hairs at apex. $2n=27$. *Much of Europe, but absent from many of the islands and parts of the south*. Au Be Br Bu Cz Da Fe Ga Ge Hb He Ho Hs Hu It Ju No Po Rm Rs (N, B, C, ?W) Su.

Included species:

H. calcigenum Rehmann, *Österr. Bot. Zeitschr.* **23**: 212 (1873). ● Au Cz Ge Po Rm Rs (?W).

H. lepidulum (Stenström) Omang, *Nyt Mag. Naturvid. (Christiania)* **43**: 291 (1905). ● Au Br Bu Cz Da Ga Ge He Hu It No Po Su.

H. neopinnatifidum Pugsley, *Jour. Ecol.* **33**: 346 (1946) (*H. pinnatifidum* Lönnr. ex Dahlst., non Willd.). ● Au Cz Da Ga Ge He Ho Hu It No Po Su Rs (B).

H. vulgatum Fries, *Nov. Fl. Suec.* 76 (1819). $2n=27$. Au Be Br Da Fe Ga Ge Hb It Ju No Rm Rs (N, B, C) Su.

72. H. benzianum group (*H. incisum|vulgatum*). Like **71** but involucral bracts very long-acute. ● *C. & E. Alps*. Au Ge He It Ju.

Included species:

H. benzianum J. Murr & Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1821 (1901). Au He.

73. H. maculatum group (*H. glaucinum|vulgatum*). Like **71** but leaves spotted or blotched with brownish-purple, the cauline 2–4(–8); involucre with numerous small glandular hairs and few to numerous simple eglandular hairs. $2n=27$. *W. & C. Europe, extending locally south-eastwards to Bulgaria*. Au Be Br Bu Co Cz Ga Ge Hb He Ho Hs Hu It Ju Po Rm.

Included species:

H. approximatum Jordan, *Cat. Jard. Dijon* 20 (1848). ● Au Be Cz Ga Ge He Ho Hu Ju Rm.

H. asperatum Jordan ex Boreau, *Fl. Centre Fr.* ed. 3, **2**: 406 (1857). ● Au Ga Ge He.

H. commixtum Jordan, *Cat. Jard. Dijon* 20 (1848). Au Cz Ga Ge He Hu It Po.

H. divisum Jordan, *op. cit.* 21 (1848). ● Au Ga Ge He Ho Hu It.

H. maculatum Sm. in Sowerby, *Engl. Bot.* **30**: 2121 (1810). $2n=27$. Au Br Cz Ga Ge Hb He Ho Hu It Ju Rm.

H. pollichiae Schultz Bip., *Pollichia* **13**: 23 (1855). Au Be Br Bu Ga Ge He Ho Hu.

74. H. caesium group. Like **71** but leaves more or less glaucous, the cauline 2–4; capitula 1–10; simple eglandular hairs of involucre often dark at base. $2n=27$, 36. *Europe, southwards to N. Italy and S. Romania*. Au Br Cz Da Fa Fe Ga Ge Hb He Hu Is It No Po Rm Rs (N, B, C, W) Su.

Included species:

H. caesiomurorum Lindeb., *Hier. Scand. Exsicc.* **2**: 59 (1872). $2n=36$. Br Da Fe Ga It No Rs (C) Su.

H. caesium (Fries) Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 112 (1848). Au Cz Da Fe Ga Ju No Rm Rs (N, B, C, W) Su.

H. galbanum Dahlst. ex N. J. Andersson, *Bot. Not.* **1890**: 92 (1890). Au Cz Fe Ge Hu No Rs (N, B, C, W) Su.

H. holopleuroides Dahlst., *Bot. Tidsskr.* **20**: 353 (1896). ● Is.

H. orcadense W. R. Linton, *Jour. Bot. (London)* **31**: 196 (1893) (*H. euprepes* F. J. Hanb., non Peter). ● Br Fa Hb.

H. subramosum Lönnr., *Öfvers. Kongl. Vet.-Akad. Förhandl.* **39(4)**: 86 (1882). ● Br Da No Su.

75. H. hypastrum Zahn, *Neue Denkschr. Schweiz. Ges. Naturw.* **40**: 524 (1906) (*H. humile|vulgatum*). Like **71** but leaves with margin and midrib beneath with sparse, minute glandular hairs. ● *Switzerland and W. Austria*. Au He.

76. H. ramosum group (*H. caesium|laevigatum*). Stems 40–80 cm, with scattered stellate and few to numerous simple eglandular hairs. Leaves with numerous simple eglandular hairs or subglabrous above, sometimes with stellate hairs beneath; basal few or absent, 25–90 × 12–30 mm, elliptical or lanceolate-oblong, obtuse to acute, denticulate to deeply dentate, petiolate; cauline 4–15(–18), the lower like the basal, petiolate, the upper smaller, lanceolate or ovate, sessile. Capitula 3–15; peduncles with numerous stellate and sometimes a few simple eglandular hairs. Involucre (8–)10–12 × 8–10 mm; bracts obtuse or subacute, with few to numerous stellate hairs, few to numerous simple eglandular and sometimes a few glandular hairs. Stigmas yellow or discoloured. Ligules glabrous. $2n=27$. ● *E.C. Europe; Fennoscandia*. Au Cz Da Fe He Hu No Rm Su.

Included species:

H. ramosum Waldst. & Kit. ex Willd., *Sp. Pl.* **3**: 1579 (1803). Au Cz Hu Rm.

77. H. argillaceum group (*H. lachenalii* auct., non C. C. Gmelin). Stems 30–100 cm, with numerous simple eglandular hairs especially below and numerous stellate and numerous glandular hairs above. Leaves with simple eglandular hairs which are sometimes sparse above; basal few to numerous, 25–110 × 10–40 mm, elliptical, ovate or lanceolate, usually acute, denticulate to deeply dentate, mostly cuneate at base; cauline 4–20, the lower like the basal, petiolate, the upper smaller and sessile. Capitula 3–50(–numerous); peduncles with dense stellate and numerous glandular hairs, sometimes with an occasional eglandular hair. Involucre 9–11 × 8–10 mm; bracts acute, with numerous stellate, numerous glandular and sometimes an occasional simple eglandular hair. Stigmas yellow or discoloured. Ligules usually with simple eglandular hairs at apex. $2n=27$. *Most of Europe except the Mediterranean region and the south-east*. Au Br Bu Co Cz Da Fe Ga Ge He Ho Hs Hu It Ju Lu No Po Rm Rs (N, B, C) Su.

Included species:

H. acuminatum Jordan, *Cat. Jard. Grenoble* **1849**: 17 (1849) (*H. lachenalii* auct., non C. C. Gmelin). $2n=27$. Au Be Br Bu Cz Ga Ge He Ho Hs Hu It Ju Lu Po Rm.

H. argillaceum Jordan, *loc. cit.* (1849). ● Au Bu Co Cz Da Ga Ge He Ho Hu It Ju Po Rm.

H. aspernatum Jordan ex Boreau, *Fl. Centre Fr.* ed. 3, **2**: 400 (1857). ● Au Be Cz Ga Ge He Ho Hu It Ju Po Rm.

H. chlorophyllum Jordan ex Boreau, *op. cit.* 399 (1857). ● Au Be Co Cz Ge He Ho Hu It Ju Po Rs (B).

H. deductum Sudre, *Hier. Centr. Fr.* 57 (1902). ● Au Ga Ge He Hu It Po.

H. jablonicense Wołoszcsak, *Spraw. Kom. Fizyogr. Krakow.* **25**: 66 (1890). Au Bu Cz Ju Rm Rs (W). (This species shows some characters of *H. rotundatum*.)

78. H. rotundatum Kit. ex Schultes, *Österreichs Fl.* ed. 2, **2**: 439 (1814). Like **77** but leaves obtuse, remotely undulate-dentate, with dense, simple eglandular hairs throughout, the cauline (1–)2–5(–13); involucre 7–8 mm, with few or no stellate hairs. *E.C. Europe and N. part of Balkan peninsula*. Al Au Bu Cz Ju ?Po Rm Rs (W).

79. H. diaphanum group. Like **77** but stellate hairs on involucre sparse or absent. $2n=27$. *N. & C. Europe, extending southwards to S. France & C. Jugoslavia*. Au Br Cz Da Fe Ga Ge He Ho Hu It Ju Po Rm Rs (N, B, C) Su.

Included species:

H. anfractum (Fries) Fries, *Öfvers. Kongl. Vet.-Akad. Förhandl.* **13**: 148 (1856). Au Cz Da Ga Ge He Hu No Po Rm Su.

H. diaphanoides Lindeb., *Bot. Not.* **1882**: 127 (1882). ● Au Br Cz Da Fe Ga Ge He Ho Hu It Ju No Po Rm Rs (N, B, C) Su.

H. diaphanum Fries, *Nov. Fl. Suec.* 75 (1819). $2n=27$. ● Au Br Cz Ge He No Po Su.

H. festinum Jordan ex Boreau, *Fl. Centre Fr.* ed. 3, **2**: 399 (1857). Au Cz Ga Ge He Ho Hu It Ju Po Rm Rs (W).

H. irriguum (Fries) Dahlst., *Kungl. Svenska Vet.-Akad. Handl.*, nov. ser. **26(3)**: 126 (1894). ● Au Ga Ge He Hu It Ju No Po Rm Rs (W) Su.

Other species and groups in (ii):

H. biharianum Prodan & Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(3)**: 687 (1938). ● *Transylvania*. Rm.

H. buianum Prodan, *Fl. Det. Descr. România* ed. 2, 1176 (1939). ● *Romania*. Rm.

H. caesiogenum Wołoszczak & Zahn in Reichenb. fil., *Icon. Fl. Germ.* **19(2)**: 106 (1907) (*H. caesium|vulgatum*). ● *Romania and Ukrainian Carpathians*. Rm Rs (W).

H. pelesii Grec., *Consp. Fl. Roman.* 373 (1898). ● *Romania*. Rm.

H. phaedrocheilon Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 483 (1921) (*H. rotundatum|vulgatum|bifidum*). ● *Romania*. Rm.

H. pseudocaesium Degen & Zahn, *Magyar Bot. Lapok* **5**: 88 (1906) (*H. caesium|sparsum*). ● *S. Carpathians*. Rm.

H. smolandicum group (*H. caesium|vulgatum*). *Fennoscandia*. No Su. (*N. America*.) (Including **H. smolandicum** (Almq. ex Dahlst.) Dahlst. in Lindman, *Svensk Fanerogamfl.* 623 (1918). $2n=27$. Su.)

H. subpatulum Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 110 (1921) (*H. chondrillifolium|murorum*). *S.E. Alps*. It Ju.

H. subpojoritense Prodan, *Fl. Det. Descr. România* ed. 2, 1181 (1939). ● *Romania*. Rm.

H. subrigidum group (*H. macrotonum* Dahlst.; *H. caesium|laevigatum*). ● *Fennoscandia*. Fe No Su. (Including **H. subrigidum** (Almq. ex Stenström) Norrlin in Cajander, *Suomen Kasvio* 124 (1906). Fe No Su.)

H. tajanum K. Malý and Zahn, *Glasn. Mus. Bosni Herceg.* **37**: 58 (1925) (*H. racemosum|rotundatum*). ● *Romania*. Rm.

H. tschamkorijense group (*H. sparsum|vulgatum*). *Bulgaria, Romania*. Bu Rm. (*W. Asia*.) (Including **H. tschamkorijense** Zahn, *Magyar Bot. Lapok* **10**: 172 (1911). ● Bu.)

H. urumoffii Nejc. & Zahn, *Magyar Bot. Lapok* **5**: 89 (1906) (*H. incisum|sparsum*). ● *Bulgaria* (*Stara Planina*). Bu.

H. vladeasae Prodan, *Bul. Şti. Acad. Rep. Pop. Române* (*Sect. Biol., Şti. Agric.*) **9**: 317 (1957). ● *Romania*. Rm.

H. vurtopicum Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1051 (1922) (*H. pseudocaesium|rotundatum*). ● *S. Carpathians*. Rm.

H. wolffii group (*H. argillaceum|murorum|rotundatum*). ● *Stara Planina; Tatry*. Bu Cz. (Including **H. wolffii** Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(2)**: 774 (1935). Bu.)

(iii) Leaves more or less glaucous, the basal numerous, the cauline 0–1(–2); with more or less rigid simple eglandular hairs on the margin and sometimes the upper surface. Capitula 1–12(–18). Ligules glabrous or with a few short simple eglandular hairs at apex. Stigmas yellow. Achenes 3–4·5 mm, dark. Margins of receptacular pits dentate, sometimes slightly ciliate-dentate.

80. H. schmidtii group. Stems 10–40(–50) cm, with few to numerous simple eglandular hairs throughout and numerous, sometimes dense stellate hairs and few to numerous glandular hairs above. Leaves thick, rarely spotted, with numerous rigid simple eglandular hairs on margin and usually also above, with numerous, soft simple eglandular hairs beneath, with few to many stellate hairs beneath and sometimes also above, and sometimes with minute glandular hairs on the margin; basal 30–110 × 10–50 mm, elliptical, ovate-lanceolate or lanceolate, sometimes oblong-lanceolate, obtuse to acute, subentire to deeply dentate, the outer rounded to truncate at base, the inner cuneate or attenuate into a long petiole; cauline 0–1(–2), like the inner basal, often shortly petiolate, often bract-like. Capitula (1–)2–12(–18); peduncles usually long, straight, with dense stellate hairs, numerous, sometimes dense glandular hairs and often a few simple eglandular hairs. Involucre 9–12(–14) × 9–14 mm; bracts narrow, acute, with few to numerous stellate, glandular and simple eglandular hairs. $2n = 27$, 36. *Most of Europe except U.S.S.R.* Au Be Br Bu Co Cr Cz Fa Fe Ga Ge Gr Hb He Hs Hu Is It Ju Lu No Po Rm Sa Si Su.

Included species:

H. bohatschianum Zahn, *Ann. Hist. Mus. Nat. Hung.* **8**: 98 (1910). ● *S.W. Romania.* Rm.

H. comatulum Jordan ex Boreau, *Fl. Centre Fr.* ed. 3, **2**: 410 (1857). ● Co Cz Ga Ge He Hs It Ju Lu Sa.

H. graniticum Schultz Bip., *Bonplandia* 331 (1862). ● Au Cz Ga Ju.

H. lasiophyllum Koch, *Syn. Fl. Germ.* ed. 2, 522 (1844). ● Br Ga Hb Hu It Ju Rm.

H. pallidum Biv., *Nuove Piante Ined.* 11 (1838). ● Cr Ga Gr Hs It Ju Si.

H. neorupicola P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 265 (1976) (*H. rupicola* Fries, non Jordan). ● Ga Ge He Hs Hu It.

H. schmidtii Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 65 (1828). $2n = 27$. ● Br Bu Cz Ga Ge Hb Hs Hu Is It Ju No Su.

81. H. hypochoeroides group (*H. wiesbaurianum* Uechtr. ex Baenitz; *H. bifidum|schmidtii*). Like **80** but leaves often ovate and usually more or less truncate at base, often deeply dentate, with hairs less rigid and sparse above; involucral bracts with dense stellate hairs. $2n = 27$, 36. ● *C., W. & S. Europe.* Au Br Co Cz Fa Ga Ge Gr Hb He Hu It Ju No Rm Sa.

Included species:

H. hypochoeroides Gibson, *Phytologist* (*Newman*) **1**: 907 (1844). Br Hb.

H. planchonianum Timb.-Lagr., *Bull. Soc. Bot. Fr.* **5**: 508 (1858). Ga Sa.

H. wiesbaurianum Uechtr. ex Baenitz, *Herb. Eur. Prosp.* **1879**: 5 (1879). Au Cz Ga Hu It Ju Rm.

82. H. sommerfeltii group (*H. bifidum|schmidtii|vulgatum*). Like **80** but with all leaves more or less narrowly lanceolate and attenuate at base, usually spotted, subglabrous above and with subrigid hairs on the margin. ● *C. & N.W. Europe.* Au Br Cz Ga Ge He Hu Is No.

Included species:

H. sommerfeltii Lindeb., *Hier. Scand. Exsicc.* **2**: no. 66 (1872). Br No.

83. H. aymericianum group (*H. alatum|schmidtii*). Stems 20–40 cm, with few simple eglandular hairs. Leaves with simple eglandular hairs on the margin and midrib, those of the margin more or less rigid, usually subglabrous above; basal 25–110 × 10–30 mm, elliptical or lanceolate, obtuse to acute, more or less dentate (the teeth often mammiform), long-attenuate into a petiole; cauline 1–2, the lower like the basal but sessile, the upper bract-like. Capitula 2–8(–20); peduncles long, with numerous stellate and glandular hairs, sometimes with simple eglandular hairs. Involucre 10–15 × 10–13 mm; bracts acute, with few stellate hairs, few to numerous simple eglandular hairs and numerous unequal glandular hairs. ● *Pyrenees.* Ga Hs.

Included species:

H. aymericianum Arvet-Touvet, *Bull. Soc. Bot. Fr.* **41**: 346 (1894). Ga.

84. H. bourgaei group (*H. bicolor* Scheele; *H. schmidtii|solidagineum* (vel *eriopogon*)). Like **83** but apex of rhizome slightly hairy; leaves with numerous simple eglandular hairs above; involucre with numerous simple eglandular hairs and few small glandular hairs. ● *Pyrenees, N. & E. Spain, N. Portugal.* Ga Hs Lu.

Included species:

H. bourgaei Boiss., *Diagn. Pl. Or. Nov.* **3**(**3**): 102 (1856). Hs.

85. H. stelligerum group. Stems 6–30 cm, with stellate and sometimes a few simple eglandular and glandular hairs. Leaves with dense stellate hairs on both surfaces and more or less rigid simple eglandular hairs on the margin and midrib beneath; basal 20–90 × 8–22 mm, elliptical, oblong, ovate to lanceolate, obtuse to acute, denticulate to dentate, cuneate, attenuate or truncate at base; cauline 0–1, lanceolate, linear or bract-like. Capitula (1–)2–7; peduncles with numerous stellate and often many small glandular or simple eglandular hairs, or with both. Involucre 9–10 × 5–8 mm; bracts acute, with numerous stellate and sparse simple eglandular and glandular hairs. ● *S. France; Transylvania; Wales.* Br Ga Rm.

Included species:

H. cillense Pugsley, *Jour. Bot.* (*London*) **79**: 183 (1941). *Wales.* Br.

H. simonkaianum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 266 (1976) (*H. substellatum* subsp. *simonkaianum* Zahn). *Transylvania.* Rm.

H. stelligerum Froelich in DC., *Prodr.* **7**: 214 (1838). *S. France.* Ga.

H. substellatum Arvet-Touvet & Gaut., *Bull. Soc. Bot. Fr.* **40**: ccxxxvi (1893). *S. France.* Ga.

(iv) Like (iii) but basal leaves usually few and cauline leaves 2–12.

86. H. onosmoides group (*H. schmidtii|vulgatum*). Stems 30–60(–70) cm, with numerous simple eglandular hairs throughout and numerous stellate hairs above. Leaves more or less glaucous, with numerous simple eglandular hairs, those of the margin and upper surface rigid, occasionally with a few minute glandular hairs on the margin, sometimes with stellate hairs beneath; basal 30–100 × 10–30 mm, lanceolate, oblong-lanceolate or ovate, obtuse to acute, denticulate to serrate-dentate, attenuate into an often broadly winged petiole; cauline 2–12, the lower like the basal, sessile or subpetiolate, the upper bract-like. Capitula 2–25(–30); peduncles with dense stellate hairs, few to numerous small glandular hairs and simple eglandular hairs. Involucre 9–12(–15) × 9–12 mm; bracts narrow, more or less acute, with few

stellate hairs, numerous short simple eglandular hairs and small glandular hairs. $2n = 27$. ● *C. & W. Europe, extending to S. Sweden.* Br Cz Ga Ge Hb He Hs Hu It Lu No Su.

Included species:

H. onosmoides Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 102 (1848). Cz Ga Ge He Hs It No Su.

H. oreades Fries, *op. cit.* 100 (1848). Ge No Su.

H. subrude (Arvet-Touvet) Arvet-Touvet, *Addit. Monogr. Hier.* 11 (1879). $2n = 27$. Br Cz Ga Hb He It.

87. H. saxifragum group (*H. schmidtii|vulgatum*). Like **86** but basal leaves few, glabrous or nearly so above; cauline 2–4(–6); peduncles and involucre with more numerous glandular hairs and few to numerous simple eglandular hairs. ● *N.W. Europe, extending eastwards to Finland and southwards to Corse.* Au Br Co Cz Fe Ga Ge Hb He Hs Hu Is It No Su.

Included species:

H. argenteum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 99 (1848). Br Hb Is No Su.

H. extensum Lübeck ex Lindeb. in Hartman, *Handb. Skand. Fl.* ed. 11, 42 (1879). Su.

H. saxifragum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 100 (1848). Au Cz Fe Ga Ge No Su.

88. H. scoticum F. J. Hanb., *Jour. Bot.* (*London*) **26**: 206 (1888) (*H. alatum|saxifragum*). Stems 20–50 cm, with few to numerous simple eglandular hairs, those near the base often deflexed, sometimes with a few stellate and glandular hairs above. Leaves with simple eglandular hairs beneath and on margin and sometimes a few also above, the hairs on the margin more or less rigid; basal 40–120 × 15–60 mm, mostly broadly ovate, obtuse to acute, denticulate to serrate-dentate, cuneate at base, with short petiole; cauline (2–)3–7(–12), the lower like the basal, shortly petiolate, the upper lanceolate, sessile. Capitula (1–)2–8(–15); peduncles long, with numerous stellate hairs, few simple eglandular hairs and sometimes a few small glandular hairs. Involucre 10–15 × 10–15 mm; bracts broad, more or less acute, with few stellate hairs, numerous simple eglandular hairs and few glandular hairs. ● *British Isles, Faeröer.* Br Fa Hb.

89. H. caledonicum group (*H. alatum|schmidtii*). Like **88** but cauline leaves 1–3; involucral bracts obtuse. $2n = 27$. ● *British Isles, Faeröer.* Br Fa Hb.

Included species:

H. caledonicum F. J. Hanb., *Jour. Bot.* (*London*) **27**: 75 (1889). $2n = 27$. Br Fa Hb.

Other species and groups in (iv):

H. angustatum group (*H. angustatiforme* P. D. Sell & C. West, *H. cacuminum* (A. Ley) A. Ley, *H. ericetorum* (Fries) Dahlst., non Freyn, *H. imbricatum* Lindeb., *H. melanostictum* Dahlst., [illegible], *H. microcymon* K. Joh., *H. nitens* Lindeb.; *H. caesium|vulgatum*). ● *Fennoscandia; Britain.* Br Fe No Su. (Including **H. angustatum** Lindeb., *Hier. Scand. Exsicc.* **2**: no. 64 (1868). Br No.)

H. lindebergii (Nyman) Dahlst., *Kungl. Svenska Vet.-Akad. Handl.* nov. ser., **26**(**3**): 208 (1894) (*H. laevigatum|saxifragum*). ● *Fennoscandia.* Fe No Su.

H. proximum F. J. Hanb., *Jour. Bot.* (*London*) **27**: 76 (1889) (*H. hanburyanum* Zahn, nom. illegit.; *H. alatum|onosmoides*). ● *Scotland.* Br.

H. rosulatum group (*H. nigrescens|saxifragum*). ● *Norway.* No. (Including **H. rosulatum** Lindeb., *Hier. Scand. Exsicc.* **3**: no. 117 (1878). No.)

(v) Apex of rhizome with dense, long hairs. Leaves usually more or less glaucous, with long simple or subplumose eglandular hairs especially on the margin, the midrib beneath and petiole, the basal numerous, the cauline 0–8, more or less amplexicaul. Capitula usually few on long peduncles. Ligules with few to dense short hairs at apex. Stigmas usually yellow. Achenes 1·5–3·5 mm, dark. Margins of receptacular pits dentate, usually densely ciliate.

90. H. laniferum group. Stems 5–20(–30) cm, glabrous or nearly so. Leaves glaucous, glabrous or with subplumose hairs on the margin and midrib beneath; basal 40–80 × 5–10 mm, obovate, lanceolate-obovate or spathulate, obtuse to acute, entire to denticulate, narrowed into a winged petiole; cauline 0–3, small or bract-like; petioles with numerous, long, simple eglandular hairs. Capitula 1–2(–4), more or less nodding in bud; peduncles slender, glabrous or with a few stellate and small glandular hairs. Involucre 6–8 × 5–7 mm; bracts linear-lanceolate, acute, outer slightly squarrose, glabrous or with a few stellate or small glandular hairs. Achenes 1·5–2·5 mm. $2n = 18$. 1500–2000 *m.* ● *Mountains of E. Spain.* Hs.

Included species:

H. laniferum Cav., *Icon. Descr.* **3**: 181 (1795). Hs.

91. H. elisaeanum group (*H. candidum|laniferum*). Like **90** but more hairy; cauline leaves ovate-cordate; capitula (1–)2–3(–8); involucre 7–9(–11) mm, with numerous stellate and few glandular hairs; achenes (1·5–)2·3–2·8 mm. $2n = 18$. 1400–2200 *m.* ● *Mountains of E. Spain and Mallorca.* Bl Hs.

Included species:

H. elisaeanum Arvet-Touvet ex Willk., *Suppl. Prodr. Fl. Hisp.* 120 (1893). Bl Hs.

92. H. candidum group. Stems 10–30 cm, glabrous or with a few short simple eglandular hairs at the base. Leaves with short, crispate subplumose hairs on the surface and longer subplumose hairs up to 3·5 mm on the midrib beneath and on the petioles, rarely glabrous; basal 40–80 × 5–15 mm, obovate or obovate-spathulate, oblong-lanceolate or lanceolate, obtuse to shortly acute, sinuate-denticulate, narrowed into a petiole; cauline 1–2(–3), broadly ovate-cordate, semiamplexicaul. Capitula 1–8, erect in bud; peduncles long, slender, arcuate, with 1–2 bracts, with scattered small glandular hairs and dense stellate hairs just below the capitulum. Involucre 6–9 × 5–8 mm; bracts narrow, more or less acute, with numerous stellate hairs and few to numerous glandular hairs. Achenes 1·5–2 mm. 550–1900 *m.* ● *E. & C. Pyrenees.* Ga Hs.

Included species:

H. candidum Scheele, *Linnaea* **32**: 673 (1863). Ga Hs.

93. H. phlomoides group. Stems 15–30(–40) cm, glabrous or nearly so. Leaves dark green or glaucous, with dense, more or less subplumose hairs 1–3 mm; basal 10–100 × 10–25 mm, obovate, obovate-oblong, elliptical or lanceolate, obtuse to shortly acute, entire to denticulate, narrowed into a short, winged petiole; cauline 1–2, ovate-lanceolate or lanceolate, more or less amplexicaul. Capitula (1–)2–5(–10); peduncles long, with 2–3 bracts, glabrous or with few stellate or small glandular hairs. Involucre 9–12 × 9–11 mm; bracts long-acute, glabrous or with sparse

glandular hairs. Achenes 2·5–3 mm. 1100–2300 *m.* ● *E. & C. Pyrenees.* Ga Hs.

Included species:

H. phlomoides Froelich in DC., *Prodr.* **7**: 232 (1838). Ga Hs.

94. H. rupicaprinum group (*H. candidum|phlomoides*). Like **93** but with numerous stellate hairs on the involucre. 1300–2000 *m.* ● *N.E. Spain.* Hs.

Included species:

H. rupicaprinum Arvet-Touvet & Gaut., *Bull. Soc. Bot. Fr.* **51**: xl (1905). Hs.

95. H. eriopogon group (*H. murorum|phlomoides*). Like **93** but stems up to 80 cm; capitula 1–8; peduncles and involucre with dense, long glandular hairs; styles yellow or discoloured; margins of receptacular pits only sparsely ciliate. 1000–2000 *m.* ● *E. & C. Pyrenees.* Ga Hs.

Included species:

H. eriopogon Arvet-Touvet & Gaut., *Bull. Herb. Boiss.* **5**: 721 (1897). Ga Hs.

96. H. lawsonii group. Stems 10–25(–30) cm, with few long simple eglandular hairs and sometimes a few glandular hairs. Leaves subglaucous, with few to numerous long, usually subplumose hairs 1–2 mm; basal 15–70 × 10–25 mm, obovate, obovate-oblong or elliptical, obtuse to shortly acute, entire, narrowed into a short, winged petiole; cauline 0–2(–4), usually small and bract-like, or larger and more or less amplexicaul; petiole with dense hairs 5–10 mm. Capitula 1–5(–12); peduncles long, with few to numerous stellate and numerous unequal glandular hairs. Involucre 10–13 × 7–10 mm; bracts narrow, long-acute, with numerous unequal glandular hairs. Achenes 3–3·5 mm. 500–2000 m. ● *Pyrenees, mountains of S. France, S.W. Alps.* Ga He Hs It.

Included species:

H. lawsonii Vill., *Hist. Pl. Dauph.* **3**: 118 (1788). Ga He Hs It.

97. H. briziflorum group (*H. flocculiferum* Zahn; *H. candidum|lawsonii*). Like **96** but with numerous stellate hairs on the involucre. 500–1500 *m.* ● *E. Pyrenees.* Ga Hs.

Included species:

H. briziflorum Arvet-Touvet, *Hier. Gall. Hisp. Cat.* 143 (1913). Hs.

H. flocculiferum Zahn in Engler, *Pflanzenreich* **75(IV.280)**: 156 (1921). Ga Hs.

98. H. subsericeum group (*H. cerinthoides|phlomoides*). Like **96** but with simple eglandular hairs on the peduncles. 1200–2000 *m.* ● *E. & C. Pyrenees.* Ga Hs.

Included species:

H. subsericeum Arvet-Touvet, *Not. Pl. Alpes* 20 (1883). Ga Hs.

99. H. cordifolium group. Stems 20–40(–80) cm, with few to numerous long simple eglandular hairs 2–6 mm throughout and sometimes some glandular hairs above. Leaves villous with simple eglandular hairs 1–2·5 mm intermixed with occasional glandular hairs, or glabrescent above, the petioles and midrib beneath with simple eglandular hairs 3–10 mm; basal 30–200 × 15–35 mm, obovate, oblanceolate or lanceolate, obtuse to acute, sinuate-denticulate to subdentate, gradually narrowed into a winged petiole; cauline 2–5(–8), ovate-cordate, amplexicaul. Capitula (1–)2–10(–20); peduncles with numerous stellate and numerous glandular hairs. Involucre 8–12 × 8–12 mm; bracts linear-lanceolate, more or less acute, with numerous unequal glandular hairs and sometimes a few simple eglandular hairs. Achenes 3–3·5 mm. 800–2300 *m.* ● *E. & C. Pyrenees, Cevennes.* Ga Hs.

Included species:

H. cordifolium Lapeyr., *Hist. Abr. Pyr., Suppl.* 128 (1818). Although this name has always been used for this group of plants in the aggregate sense it has not been typified and it is uncertain to which segregate the name applies.

H. eriocerinthe Fries, *Hier. Eur. Exsicc.* no. 20 (1861). Ga Hs.

H. gouanii Arvet-Touvet, *Spicil. Rar. Nov. Hier., Suppl.* **2**: 47 (1886). Ga Hs.

H. neocerinthe Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 67 (1848). Ga Hs.

100. H. sonchoides group (*H. cordifolium|murorum*). Stems 30–80 cm, with numerous to dense long simple eglandular hairs throughout and stellate and short glandular hairs above. Leaves all more or less glaucous, with numerous simple eglandular hairs, sometimes glabrous above, sometimes with a few minute glands on the margin; basal 30–120 × 20–50 mm, ovate or elliptical, obtuse to acute, more or less dentate, narrowed into a petiole; cauline 3–6, like the basal, the lower often petiolate, semi-amplexicaul. Capitula (2–)5–15(–20); peduncles with dense stellate and dense glandular hairs. Involucre 10–14 × 8–12 mm; bracts more or less acute, with few to numerous stellate and dense unequal glandular hairs. Stigmas discoloured. Ligules with numerous simple eglandular hairs at apex. 400–1600 *m.* ● *Pyrenees, mountains of S.C. France.* Ga Hs.

Included species:

H. sonchoides Arvet-Touvet, *Suppl. Monogr. Hier.* 8 (1876). Ga Hs.

101. H. purpurascens group (*H. tephrocerinthe* Zahn, nom. illegit.; *H. candidum|cordifolium*). Like **100** but involucre with numerous glandular and dense stellate hairs. 1200–2100 *m.* ● *E. & C. Pyrenees.* Ga Hs.

Included species:

H. purpurascens Scheele ex Willk. in Willk. & Lange, *Prodr. Fl. Hisp.* **2**: 262 (1865). Ga Hs.

102. H. guadarramense group (*H. granatense* Arvet-Touvet & Gaut.; *H. elisaeanum|schmidtii*). Stems (10–)20–35 cm, with few simple eglandular hairs below and few minute glandular hairs above. Leaves sometimes glabrescent above, with simple eglandular hairs, those of the margin subrigid and curved, and with sparse, small glandular hairs also present on margin; basal 25–50 × 5–20 mm, lanceolate or oblong-lanceolate, undulate-denticulate to more or less dentate, narrowed into a petiole; cauline 0–3, small. Capitula (1–)2–5(–10); peduncles with dense stellate hairs and few glandular and simple eglandular hairs. Involucre 7–10 × 7–9 mm; bracts more or less acute, with stellate hairs especially on the margin, and few glandular and simple eglandular hairs. Achenes up to 3 mm. 1500–2000 m. ● *C. & E. Spain.* Hs.

Included species:

H. granatense Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **10**: no. 154 (1900). Hs.

H. guadarramense Arvet-Touvet, *Bull. Herb. Boiss.* **5**: 719 (1897). Hs.

103. H. aragonense group (*H. elisaeanum|glaucinum*). Stems 5–50 cm, with simple eglandular hairs on the lower half. Leaves glabrous above, with numerous simple eglandular hairs beneath and on the margin; basal 40–60 × 20–30 mm, ovate, lanceolate or elliptical, obtuse to acute, denticulate to dentate near the base, narrowed into a petiole; cauline 0–1(–2), small. Capitula 1–3; peduncles with numerous stellate and sparse glandular hairs. Involucre 8–10 × 6–9 mm; bracts acute, with few stellate hairs, numerous glandular hairs and sometimes a few simple eglandular hairs. Stigmas yellow or discoloured. Margins of receptacular pits subulate-dentate, sparsely ciliate. ● *S. & E. Spain.* Hs.

Included species:

H. aragonense Scheele, *Linnaea* **32**: 667 (1863). Hs.

104. H. loscosianum group (*H. baeticum* Arvet-Touvet & Reverchon; *H. elisaeanum|glaucinum* (vel *murorum*)). Stems 10–40 cm, with few simple eglandular hairs throughout and few stellate and glandular hairs above. Leaves with long, dense simple eglandular hairs which are sometimes sparse above, sometimes spotted; basal 25–50 × 5–20 mm, oblong, elliptical, ovate or lanceolate, obtuse to subacute, subentire to sparsely dentate or sinuately lobed, abruptly contracted into a petiole; cauline 0–1, lanceolate. Capitula (1–)2–5(–9); peduncles with stellate and sometimes a few simple eglandular hairs. Involucre 8–10 × 6–9 mm; bracts obtuse to acute, with numerous glandular hairs, few to numerous stellate hairs and sometimes a few simple eglandular hairs. Stigmas yellow or discoloured. Achenes 3–3·5 mm. 1200–1900 *m.* ● *S., E. & C. Spain.* Hs.

Included species:

H. loscosianum Scheele, *Linnaea* **32**: 668 (1863). Hs.

Other species and groups in (v):

H. aurense Zahn in Engler, *Pflanzenreich* **75(IV.280)**: 159 (1921) (*H. cerinthoides|lawsonii*). ● *W. Pyrenees.* Ga.

H. bowlesianum Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **19**: no. 307 (1908) (*H. cordifolium|phlomoides*). 1700–2000 *m.* ● *E. Pyrenees.* Hs.

H. coleoidiforme Zahn in Engler, *Pflanzenreich* **75(IV.280)**: 160 (1921) (*H. cerinthoides|rupicaprinum*). 1600–2200 *m.* ● *E. Pyrenees.* Hs.

H. colmeiroanum group (*H. lawsonii|subsericeum*). 1400–2300 *m.* ● *E. Pyrenees.* Ga Hs. (Including **H. colmeiroanum** Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **19**: no. 291 et 292 (1908). Hs.)

H. inuliflorum Arvet-Touvet & Gaut., *Bull. Soc. Bot. Fr.* **51**: xlv (1904) (*H. candidum|subsericeum*). ● *C. Pyrenees.* Ga Hs.

H. valirense Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **3**: no. 43 (1898) (*H. bourgaei|phlomoides*). ● *C. Pyrenees.* Hs.

H. vellereum group (*H. candidum|eriopogon*). ● *E. Pyrenees.* Hs. (Including **H. vellereum** Scheele ex Fries, *Öfvers. Kongl. Vet.-Akad. Förhandl.* **23**: 160 (1866). Hs.)

(vi) Like (v) but rhizome without dense, long hairs; capitula sometimes up to 20(–25); stigmas yellow or discoloured; achenes 3–4 mm; margins of receptacular pits usually only sparsely ciliate.

105. H. cerinthoides group. Stems 1–several, 25–40(–50) cm, with few to numerous simple eglandular hairs and sometimes a few glandular and stellate hairs above. Leaves with simple eglandular hairs, especially on the margin and midrib beneath; basal few, 20–220 × 15–45 mm, elliptical, oblong-lanceolate or oblanceolate, obtuse to acute, usually entire, sometimes denticulate, gradually narrowed into a petiole; cauline 2–5, ovate-cordate or ovate-lanceolate, sometimes panduriform, more or less acute, amplexicaul. Capitula 1–5; peduncles with dense stellate and few to numerous glandular and simple eglandular hairs. Involucre 9–14(–18) × 10–15 mm; bracts long-acute, with numerous simple eglandular hairs and few to numerous glandular hairs. Ligules with simple eglandular hairs at apex. Stigmas yellow. Achenes up to 4 mm. 1100–2200 *m.* ● *Pyrenees.* Ga Hs.

Included species:

H. cerinthoides L., *Sp. Pl.* 803 (1753). Ga Hs.

H. gymnocerinthe Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **1**: no. 37–40 (1897). *E. Pyrenees.* Ga Hs.

H. ramondii Griseb., *Comment. Hier.* 20 (1852). Ga Hs.

106. H. alatum group. Stems 20–80 cm, with few to numerous simple eglandular hairs throughout and stellate and glandular hairs above. Leaves with simple eglandular hairs especially on the midrib beneath, margin and petiole, sometimes glabrescent above, sometimes with few to numerous stellate hairs beneath or on both surfaces; basal few, 30–120 × 15–40 mm, obovate, oblanceolate, ovate or elliptical, obtuse to acute, denticulate to more or less dentate, narrowed into a winged petiole; cauline 1–8, large, the lower like the basal, petiolate, the upper ovate to lanceolate, more or less amplexicaul. Capitula (1–)2–20(–25); peduncles with dense stellate hairs, numerous glandular hairs and few to numerous simple eglandular hairs. Involucre 10–15 × 10–15 mm; bracts long-acute or acuminate, with few to numerous unequal glandular hairs, few to numerous simple eglandular hairs and few to numerous stellate hairs. Ligules with short simple eglandular hairs at apex. Stigmas usually discoloured. Achenes 3·5–4 mm. $2n = 27, 36$. ● *W. Europe.* Br Fa Ga Hb He Hs Is It.

Included species:

H. alatum Lapeyr., *Hist. Abr. Pyr.* 478 (1813). *S.W. France.* Ga.

H. anglicum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 93 (1848) (*H. perampliforme* Dahlst.). $2n = 36$. Br Fa Hb Is.

H. doronicoides Arvet-Touvet, *Bull. Soc. Bot. Fr.* **41**: 340 (1894). *E. Pyrenees.* Ga Hs.

H. exaltatum Arvet-Touvet, *Spicil. Rar. Nov. Hier., Suppl.* **1**: 41 (1886). *E. Pyrenees.* Ga Hs.

H. flocculosum Backh., *Monogr. Brit. Hier.* 60 (1856). Br Hb.

H. iricum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 60 (1848) (*H. peramplum* Dahlst.). Br Fa Hb.

H. kalsoense Dahlst. in Warming, *Bot. Faeröes* **2**: 645 (1903). Fa.

H. mesopolium Dahlst., *Ark. Bot.* **3(10)**: 27 (1904). Is.

H. olivaceum Gren. & Godron, *Fl. Fr.* **2**: 361 (1851). Ga Hs.

H. soyerioides Arvet-Touvet & Gaut., *Bull. Herb. Boiss.* **5**: 723 (1897). *C. Pyrenees.* Ga.

H. subluridum Arvet-Touvet, *Addit. Monogr. Hier.* 12 (1879). Ga Hs.

H. vogesiacum (Kirschleger) Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 59 (1848) (*H. mougeotii* (Froelich ex Koch) Godron, nom. illegit.). $2n = 36$. Ga He Hs It.

107. H. lamprophyllum group (*H. alatum|cerinthoides*). Like **106** but involucre with dense simple eglandular hairs and without or with very few glandular hairs. 1200–2150 *m.* ● *Pyrenees.* Ga Hs.

Included species:

H. lamprophyllum Scheele, *Linnaea* **31**: 653 (1862). Hs.

108. H. longifolium Schleicher ex Froelich in DC., *Prodr.* **7**: 229 (1838) (*H. alatum|villosum*). Like **106** but with longer, flexuous simple eglandular hairs throughout, those of the lower part of the stem up to 8 mm, those of the involucre 2–4 mm; stigmas yellow. ● *S.W. Alps.* Ga He.

Other species and groups in (vi):

H. fontanesianum Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **20**: no. 1590–1597 (1908) (*H. alatum|colmeiroanum*). ● *C. Pyrenees.* Ga.

H. gastonianum group (*H. alatum|subsericeum*). 800–1500 *m.* ● *C. Pyrenees.* Ga. (Including **H. gastonianum** Arvet-Touvet, *Bull. Herb. Boiss.* **5**: 724 (1897). Ga.)

H. intertextum Arvet-Touvet, *Essai Pl. Dauph.* 45 (1871) (*H. alatum|schmidtii*). ● *S.W. Alps.* Ga.

H. loeflingianum Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **19**: no. 311 (1908) (*H. bourgaei|candidum*). ● *C. Pyrenees.* Hs.

H. souliei group (*H. alatum|subsericeum*). 1400–2150 *m.* ● *Pyrenees.* Ga Hs. (Including **H. souliei** Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **20**: no. 1587–1588 (1908). Ga Hs.)

H. wilczekii Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(2)**: 238 (1935). ● *W. Switzerland* (*Vaud*). He.

(vii) Plant with very long simple eglandular hairs. Leaves more or less glaucous, rarely with small glandular hairs on margin; basal usually present; cauline (2–)3–13(–15). Capitula few. Peduncles long. Ligules usually glabrous, sometimes with a few short hairs at the apex. Stigmas yellow or discoloured. Achenes dark. Margins of receptacular pits fimbriate-dentate.

109. H. villosum group. Stems 15–30(–40) cm, with numerous stellate and very dense, white, soft simple eglandular hairs 4–10 (–12) mm. Leaves with dense simple eglandular hairs up to 8 mm; basal few to many, 45–85(–100) × (10–)12–20(–25) mm, oblong to lanceolate, obtuse to acute, usually with undulate margin, entire to shortly dentate, gradually narrowed into a subpetiolate base; cauline (2–)4–8(–15), gradually decreasing in size up the stem, the uppermost bract-like, the lower narrow at the base, the remainder broad, rounded or more or less amplexicaul at the base. Capitula (1–)2–4; peduncles long, straight, with dense stellate and long simple eglandular hairs, without glandular hairs. Involucre 14–17(–23) × 12–20(–25) mm; bracts lanceolate to linear, long-acute or acuminate, the outer more or less squarrose, with very dense simple eglandular hairs up to 5 mm, without or with few minute glandular hairs. Stigmas yellow or discoloured. $2n=27$, 36. *Stony and grassy places; calcicole.* ● *Mountains of Europe, from the Jura and Carpathians to the S.W. Alps, S. Appennini and N. Bulgaria.* Al Au Bu Cz Ga Ge He It Ju Po Rm Rs (W).

Included species:

H. villosum Jacq., *Enum. Stirp. Vindob.* 142 (1762). Al Au Bu Cz Ga Ge He It Ju Rm Rs (W).

110. H. pilosum group (*H. morisianum* Reichenb. fil.). Like **109** but cauline leaves (2–)3–6, often much smaller; involucral bracts narrower, linear to linear-lanceolate, all appressed. $2n=27$, 36. ● *From the Jura and Carpathians to the S.W. Alps, C. Appennini and Macedonia.* Al Au Cz Ga Ge He It Ju Rm.

Included species:

H. canalense Pacher, *Jahrb. Naturh. Landes-Mus. Kärnten* **22**: 94 (1893). Au Ga He It Ju.

H. pilosum Schleicher ex Froelich in DC., *Prodr.* **7**: 229 (1838). Al Au Cz Ge It Ju.

111. H. scorzonerifolium group (*H. bupleuroides* (vel *glaucum*)*|villosum*). Stems 30–60 cm, with scattered stellate hairs, and usually more or less numerous, flexuous simple eglandular hairs up to 5 mm. Leaves with numerous long simple eglandular hairs, but mainly beneath and on the margin; basal 30–90 × 4–10 mm, lanceolate to narrowly elliptical, more or less acute, entire to denticulate, narrowed at base; cauline 2–7(–12), like the basal, but gradually decreasing in size up the stem. Capitula 1–4(–12); peduncles with dense stellate hairs and more or less numerous, long simple eglandular hairs. Involucre (10–)13–17 × 6–13 mm; bracts linear to narrowly linear-lanceolate, acute, with more or less numerous stellate hairs and more or less dense simple eglandular hairs 3–6 mm. Ligules glabrous. Stigmas yellow or discoloured. $2n=36$. ● *From the Jura and the Carpathians to the S.W. Alps, S. Appennini and Crna Gora.* Au Cz Ga Ge He It Ju Rm.

Included species:

H. flexuosum Waldst. & Kit. ex Willd., *Sp. Pl.* **3**: 1581 (1803). Ga He It Ju.

H. pseudopantotrichum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 265 (1976) (*H. scorzonerifolium* subsp. *pseudopantotrichum* Zahn). Au Ga He It Ju.

H. scorzonerifolium Vill., *Prosp. Pl. Dauph.* 35 (1779). Au Cz Ga Ju.

112. H. leucophaeum group (*H. humile|scorzonerifolium*). Like **111** but leaf-margin, peduncles and involucral bracts with few glandular hairs. ● *Jura, S.W. & C. Alps; C. & S. Appennini.* Ga He It.

Included species:

H. leucophaeum Gren. & Godron, *Fl. Fr.* **2**: 354 (1851). *S.W. Alps.* Ga He.

H. nematopodum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 265 (1976) (*H. leucophaeum* subsp. *nematopodum* Zahn). *C. Appennini.* It.

H. petrophilum Godet ex Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 65 (1862). Ga It.

113. H. ctenodon group (*H. villosum|vulgatum*). Stems up to 50 cm, with numerous simple eglandular hairs. Leaves with more or less numerous simple eglandular hairs on both surfaces and the margin; basal more or less oblong, obtuse to acute, long-petiolate, sometimes absent; cauline (3–)5–9(–12), ovate, elliptical or rhombic, attenuate at base. Capitula 3–10; peduncles with numerous stellate and few glandular hairs. Involucre 10–15 × 8–13 mm; bracts narrow, long-acute, with numerous stellate and few glandular hairs. Ligules glabrous or with small simple eglandular hairs at apex. Stigmas discoloured. ● *E. & E.C. Alps.* Au He It Ju.

Included species:

H. ctenodon Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 202 (1886). Au It Ju.

114. H. dentatum group (*H. bifidum|villosum*). Stems 14–40 cm, with few to numerous stellate and few to numerous simple eglandular hairs. Leaves with simple eglandular hairs on both surfaces and the margin; basal 20–70 × 9–20 mm, green or glaucescent, the outer more or less spathulate or obovate, the inner elliptical, oblong to lanceolate, obtuse to acute, entire to shallowly dentate, narrowed into a petiole; cauline 2–10, lanceolate to ovate, the lower narrowed into a short petiole, the upper sessile, sometimes with a few stellate hairs beneath. Capitula 1–4; peduncles with dense stellate and dense, long simple eglandular hairs. Involucre 11–18 × 10–15 mm; bracts linear to narrowly linear-lanceolate, long-acute, with dense, long, flexuous simple eglandular hairs up to 3 mm, and sometimes a few stellate hairs. Stigmas yellow or discoloured. *Jura, Alps, Carpathians, C. Appennini, mountains of N. & C. Jugoslavia.* Au Cz Ga Ge He It Ju Po Rm Rs (W).

Included species:

H. dentatum Hoppe in Sturm, *Deutschl. Fl.* **39**: 16 (1817). ● Au Ga He It Rm Rs (W).

H. gaudinii Christener, *Hier. Schweiz* 10 (1863). ● *Alps.* Au Ga He It Ju.

H. pseudoporrectum (Christener ex Naegeli & Peter) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 265 (1976). ● *Alps.* Au Ga Ge He It.

H. subexpallens (Zahn) P. D. Sell & C. West, *op. cit.* 266 (1976) (*H. dentatum* subsp. *subexpallens* Zahn). Au Cz Ga He It Ju Po Rm.

115. H. chondrillifolium group (*H. bifidum|glaucum|villosum*). Stems 10–40 cm, glabrous or with occasional simple eglandular hairs. Leaves glabrous or with few simple eglandular hairs above, with numerous simple eglandular hairs and sometimes stellate hairs beneath; basal 40–100 × 5–15 mm, glaucous, lanceolate to narrowly elliptical, obtuse to acute, subentire to shallowly dentate, usually petiolate; cauline 2–6(–8), lanceolate, usually gradually becoming smaller up the stem. Capitula (1–)2–5; peduncles with few stellate hairs and few or no simple eglandular hairs. Involucre (10–)11–17 × 8–15 mm; bracts acute to obtuse, with more or less numerous stellate hairs, especially on the margin, numerous, long simple eglandular hairs and sometimes a few minute glandular hairs. Stigmas usually discoloured. ● *Alps; C. Appennini; W. Carpathians; C. Jugoslavia.* Au Cz Ga Ge He It Ju.

Included species:

H. aprutiorum Sudre, *Bull. Int. Acad. Géogr. Bot.* (*Le Mans*) **26**: 147 (1916). *Alps; C. Appennini.* Au Ga It.

H. chondrillifolium Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 67 (1862). *S.W. Alps.* Ga It.

H. melananthum (Naegeli & Peter) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 264 (1976) (*H. subspeciosum* subsp. *melananthum* Naegeli & Peter). *Tatra.* Cz Po.

H. subspeciosum Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 147 (1886). *Alps.* Au Ge He.

116. H. cryptadenum group (*H. humile|villosum*). Stems 20–50 cm, with numerous, patent simple eglandular hairs. Leaves with dense, patent simple eglandular hairs or sometimes glabrescent above; basal glaucous, more or less lanceolate, obtuse to acute, denticulate to dentate, subpetiolate; cauline 3–8, like the basal but the upper broadly ovate, rounded at base. Capitula (1–)2–3 (–6); peduncles with sparse to dense stellate and numerous simple eglandular hairs. Involucre 12–17 × 11–14 mm; bracts lanceolate, acute, with dense simple eglandular and scattered minute glandular hairs, without stellate hairs. Ligules with a few simple eglandular hairs. Stigmas yellowish. ● *Alps.* Au Ga He It.

Included species:

H. cryptadenum Arvet-Touvet, *Bull. Soc. Bot. Fr.* **41**: 329 (1894). Au Ga He It.

117. H. valdepilosum group (*H. prenanthoides|villosum*). Stems 30–50 cm, with numerous simple eglandular hairs up to 8 mm, and few stellate hairs above. Leaves entire to denticulate, with long simple eglandular hairs; basal few or absent, 50–110 × 10–30 mm, more or less elliptical, usually more or less acute, petiolate; cauline 7–13(–20), the lower like the basal but usually sessile, the median and upper lanceolate to ovate, sometimes panduriform, sessile, more or less amplexicaul. Capitula 1–6(–9); peduncles long, with dense stellate hairs, numerous, long simple eglandular hairs and sometimes a few small glandular hairs. Involucre 10–15(–18) × 10–15 mm; bracts long-acute, the outer often lax, with dense simple eglandular hairs up to 5 mm, sometimes with some stellate and small glandular hairs. Ligules sometimes with short simple eglandular hairs. Stigmas discoloured. ● *Mountains of C. Europe; C. Appennini.* Au Cz Ga Ge He It Ju Rm.

Included species:

H. grabowskianum Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 207 (1886). Cz Rm.

H. porrectum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 106 (1848). *S.W. Alps.* Ga.

H. subglabrescens (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 267 (1976) (*H. valdepilosum* subsp. *subglabrescens* Zahn). *Alps.* Au Ga Ge He.

H. valdepilosum Vill., *Prosp. Pl. Dauph.* 34 (1779). *S.W. & W.C. Alps.* Ga He It.

H. willdenowianum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 267 (1976) (*H. valdepilosum* subsp. *willdenowianum* Zahn). Au Ga He Ju Rm.

118. H. wilczekianum group (*H. bifidum|valdepilosum*). Like **117** but simple eglandular hairs sparser and shorter and glandular hairs often obvious; capitula (1–)3–20; involucre 10–12 mm. ● *Alps.* Au Ga He It Ju.

Included species:

H. wilczekianum Arvet-Touvet, *Bull. Herb. Boiss.* **5**: 732 (1897). Ga He.

119. H. chlorifolium group (*H. glaucum|valdepilosum*). Like **117** but simple eglandular hairs up to 3 mm and glandular hairs absent; capitula 1–10(–15); involucre 12–17 mm, bracts sometimes obtuse, often with stellate hairs, simple eglandular hairs 1–2·5 mm; stigmas sometimes yellow. ● *Alps; C. Appennini.* Au Ga He It.

Included species:

H. chlorifolium Arvet-Touvet, *Essai Pl. Dauph.* 44 (1871). Ga He It.

Other species and groups in (vii):

H. andrasovszkyi group (*H. naegelianum|pilosum*). 1600–2200 *m.* ● *Borders of Albania and Jugoslavia.* Al Ju. (Including **H. andrasovszkyi** Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1032 (1921). Al Ju.)

H. arlbergense Evers ex J. Murr, *Allgem. Bot. Zeitschr., Beih.* **1**: 3 (1899) (*H. chlorifolium|wilczekianum*). ● *Vorarlberg.* Au.

H. braunianum Chenevard & Zahn, *Annu. Cons. Jard. Bot. Genève* **9**: 52 (1905) (*H. chondrillifolium|humile*). ● *C. Alps.* He It.

H. corrensii Kaeser ex Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1874 (1901) (*H. humile|valdepilosum*). *W.C. Alps.* He.

H. corruscans Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 60 (1862) (*H. chloropsis|glaucopsis*). ● *S.W. Alps.* Ga It.

H. fastuosum Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1900 (1901) (*H. picroides|valdepilosum*). ● *E. Alps.* It.

H. glaucopsis group (*H. chondrillifolium|cydonifolium*). ● *S.W. Alps.* Ga It. (Including **H. glaucopsis** Gren. & Godron, *Fl. Fr.* **2**: 355 (1850). Ga It.)

H. hispidulum group (*H. humile|scorzonerifolium*). ● *S.W. Alps.* Ga It. (Including **H. hispidulum** Arvet-Touvet, *Hier. Alpes Fr.* 43 (1888). Ga It.)

H. intumescens Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 230 (1886) (*H. alpinum|glabratum*). ● *S.E. Alps.* It Ju.

H. kalsianum group (*H. picroides|villosum*). ● *C. & E. Alps.* Au He It. (Including **H. kalsianum** Huter, *Zeitschr. Deutsch. Alpen-Ver.* **2**: 557 (1871). Au It.)

H. krizsnae Lengyel & Zahn, *Magyar Bot. Lapok* **25**: 304 (1927) (*H. caesium|villosum*). ● Cz.

H. malovanicum Degen & Zahn, *Magyar Bot. Lapok* **6**: 226 (1907). ● *W. Jugoslavia.* ?Al Ju.

H. misaucinum group (*H. dentatum|humile*). ● *S.W. & C. Alps.* Ga He. (Including **H. misaucinum** Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 238 (1886). Ga He.)

H. mollitum Arvet-Touvet in Decne, *Cat. Gr. Mus. Paris* **1877**: 5 (1877) (*H. chloropsis|valdepilosum*). ● *S.W. Alps.* Ga.

H. plantagineum group (*H. dentatum|scorzonerifolium*). ● *S.W. Alps.* Ga. (Including **H. plantagineum** Arvet-Touvet, *Hier. Alpes Fr.* 31 (1888) Ga.)

H. plumieri Arvet-Touvet ex Wilczek, *Bull. Trav. Soc. Murith.* **31**: 105 (1902) (*H. sublongifolium* (Zahn) Zahn; *H. schmidtii|villosum*). *E. & E.C. Alps.* He.

H. richenii J. Murr, *Jahres-Kat. Wien. Bot. Tauschver.* **1900**: 132 (1900) (*H. bifidum|chlorifolium*). ● *E. Alps.* Au.

H. rostanii group (*H. alpinum|villosum*). ● Au It Rm. (Including **H. rostanii** Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 229 (1886). It.)

H. sauzei (Arvet-Touvet) Arvet-Touvet, *Hier. Gall. Hisp. Cat.* 60 (1913) (*H. schmidtii|valdepilosum*). ● *S.W. Alps.* Ga.

H. silsinum group (*H. valdepilosum|vulgatum*). ● *E. Alps.* He It Ju. (Including **H. silsinum** Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 227 (1886). He.)

H. speciosum Willd. ex Hornem., *Hort. Hafn.* **2**: 764 (1815) (*H. scorzonerifolium|umbellatum*). ● *Tatra.* Cz.

H. spectabile (Fries) Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 129 (1921) (*H. chloropsis|glaucopsis*). ● *S.W. Alps.* Ga It.

(viii) Plant usually with long, often flexuous simple eglandular hairs. Leaves more or less glaucous or pale green, rarely with small glandular hairs on margin; basal few to numerous; cauline 0–4, small. Capitula 1–3(–6). Peduncles long. Ligules glabrous or with a few short simple eglandular hairs at apex. Stigmas yellow to discoloured. Achenes 2·5–3·5 mm, pale to dark brown. Margins of receptacular pits fimbriate-dentate.

120. H. piliferum group. Stems 5–15(–40) cm, with few to numerous stellate hairs, villous with few to numerous simple eglandular hairs (rarely without simple eglandular hairs) and sometimes a few glandular hairs. Leaves with few to numerous long, flexuous simple eglandular hairs; basal few to numerous, 20–110 × 5–20 mm, lanceolate to oblong, acute to obtuse, usually entire, gradually narrowed at base into a short, winged petiole; cauline 0–1(–2). Capitula 1–2(–5). Involucre 9–15(–17) × 15–20 mm; bracts narrow, long-acute, with dense, long, flexuous simple eglandular hairs, often with a few small glandular hairs. Stigmas yellow or discoloured. Ligules glabrous. 1700–2800 *m.* ● *Pyrenees; Alps; mountains of S.C. France; Carpathians; mountains of W. Jugoslavia.* Au Cz Ga Ge He Hs It Ju Po Rm.

Included species:

H. glanduliferum Hoppe in Sturm, *Deutschl. Fl.* **39**: 623 (1815). *Alps.* Au Ga He It Ju.
H. piliferum Hoppe, *Bot. Taschenb.* **1799**: 129 (1799). Au Cz Ga Ge He Hs It Ju Po Rm.
H. subnivale Gren. & Godron, *Fl. Fr.* **2**: 357 (1850). *S.W. Alps.* Ga It.

121. H. dasytrichum group (*H. glanduliferum|villosum*). Like **120** but whole plant with dense simple eglandular hairs 5–10 mm and 2–4 ovate to lanceolate cauline leaves. 1800–2500 *m.* ● *Alps.* Au Ga Ge He It Ju.

Included species:

H. dasytrichum Arvet-Touvet, *Monogr. Hier.* 25 (1873). Au Ga It.

122. H. aphyllum group (*H. dentatum|piliferum*). Like **120** but leaves elliptical to lanceolate, denticulate to dentate, the cauline 0–3; styles usually yellow. 1900–2300 *m.* ● *Alps.* Ga Ge He It.

Included species:

H. aphyllum Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 234 (1889). Ga He.

123. H. cochlearioides group (*H. alpinum|piliferum*). Like **120** but leaves and involucre with small glandular hairs; ligules with short simple eglandular hairs at apex. 1700–2600 *m.* ● *Alps.* Au Ga Ge He It.

Included species:

H. cochlearioides Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 141 (1921). Au He It.

124. H. armerioides group (*H. bifidum|piliferum*). Stems 10–25(–35) cm, with dense stellate hairs, few to numerous simple eglandular hairs and numerous dark glandular hairs. Leaves with few to numerous long simple eglandular hairs; basal 5–8, 15–70 × 5–20 mm, mostly lanceolate, obtuse to acute, entire, gradually narrowed into a short petiole; cauline 0–1(–3), linear. Capitula 1–3(–6); peduncles with dense stellate hairs, few to numerous simple eglandular hairs and few to numerous dark glandular hairs. Involucre (8–)10–12(–15) × 10–15 mm; bracts long-acute, with dense, long simple eglandular hairs and few to numerous dark glandular hairs. Ligules glabrous. Stigmas yellow or discoloured. Achenes pale to dark brown. ● *Alps.* Au Ga He It.

Included species:

H. absconditum Huter ex Dalla Torre, *Anleit. Beob. Bestimm. Alpenpfl.* 264 (1882). *E. Alps.* Au He It.
H. anadenum (Burnat & Gremli) Arvet-Touvet, *Hier. Alpes Fr.* 41 (1888). *S.W. Alps.* Ga It.
H. armerioides Arvet-Touvet, *Essai Pl. Dauph.* 48 (1871). *Alps.* Ga He It.
H. leucochlorum Arvet-Touvet, *Monogr. Hier.* 28 (1873). *Alps.* Ga He It.

(ix) Apex of rhizome usually with long hairs. Plant with long, simple eglandular and sometimes subplumose hairs throughout. Basal leaves numerous; cauline 1–4, more or less amplexicaul. Capitula 1–2, on long peduncles. Ligules with numerous, short simple eglandular or glandular hairs at apex. Stigmas yellow. Achenes 3·5–4 mm, dark. Margins of receptacular pits dentate, slightly ciliate.

125. H. mixtum group (*H. phlomoides|piliferum*). Plant with dense, long subplumose hairs and simple eglandular hairs throughout. Stems (5–)10–20 cm. Basal leaves 10–40 × 7–25 mm, ovate, elliptical or obovate, obtuse to subacute, undulate, entire to denticulate, narrowed into a winged petiole; cauline 1–4, the lower like the basal but sessile and more or less amplexicaul, the upper usually bract-like. Capitula 1–2; peduncles long, with numerous stellate hairs and few small glandular hairs. Involucre 10–12 × 10–13 mm; bracts acute, with a few small glandular hairs amongst the long simple eglandular and subplumose hairs. Ligules with dense, small glandular hairs at apex. 1700–2500 *m.* ● *Pyrenees, Cordillera Cantábrica.* Ga Hs.

Included species:

H. mixtum Froelich in DC., *Prodr.* **7**: 216 (1838). Ga Hs.

126. H. mixtiforme group (*H. cerinthoides|mixtum*). Like **125** but hairs shorter and subplumose hairs absent. 1400–2300 *m.* ● *W. & C. Pyrenees.* Ga Hs.

Included species:

H. mixtiforme Arvet-Touvet, *Bull. Soc. Bot. Fr.* **51**: xxxviii (1904). Ga Hs.

Other species in (ix):

H. intonsum Zahn in Engler, *Pflanzenreich* **75(IV.280)**: 170 (1921) (*H. lawsonii|mixtum*). ● *E. Pyrenees.* Hs.

H. loretii Fries, *Hier. Eur. Exsicc.* no. 21 bis (1862) (*H. cerinthoides|mixtum*). 200–2300 *m.* ● *C. Pyrenees.* Ga.

(B) Leaves and sometimes whole plant with plumose or subplumose hairs, without or with few glandular hairs. Capitula usually few on long branches and peduncles. Margins of receptacular pits dentate.

(x) Leaves narrow, small or medium, glabrous or nearly so above and often spotted, with rather dense plumose hairs beneath and on the margin; cauline leaves few or absent. Involucre with more or less numerous short, rigid simple eglandular hairs, more or less numerous stellate hairs and often a few glandular hairs. Achenes 3·5–4 mm, dark. Margins of receptacular pits slightly dentate, glabrous.

127. H. pictum group. Stems 10–35 cm, with more or less numerous stellate hairs, sparse to dense simple eglandular hairs and few minute glandular hairs. Leaves with more or less numerous more or less plumose and simple eglandular hairs, those of the margin rigid, sometimes with stellate hairs beneath and minute glandular hairs on the margin; basal 20–45 × 8–20 mm, ovate, narrowly elliptical or lanceolate, obtuse to acute, denticulate to deeply and coarsely dentate; cauline 1(–3), lanceolate or bract-like. Capitula 2–5(–9); peduncles clothed like the stem. Involucre 8·5–10(–13) × 6–9 mm; bracts narrowly lanceolate, more or less obtuse, with dense stellate hairs particularly on the margin and at the apex, and more or less numerous short, simple eglandular hairs and few glandular hairs. Stigmas yellow. ● *S.W. & W.C. Alps, N. & C. Appennini; Sardegna.* Ga He It Sa.

Included species:

H. farinulentum Jordan, *Cat. Jard. Dijon* 21 (1848). *Alps, Appennini.* Ga He It.
H. pictum Schleicher ex Pers., *Syn. Pl.* **2**: 374 (1807). *S.W. Alps; Sardegna.* Ga He It Sa.

(xi) Like (x) but leaves usually broader, usually with more or less plumose hairs throughout; involucre usually larger, with longer, softer simpler hairs and glandular hairs sometimes more numerous.

128. H. farinulentiforme group (*H. schmidtii|pictum*). Like **127** but leaves with numerous rigid subplumose hairs above. ● *S.W. Alps; Sardegna.* Ga It Sa.

Included species:

H. farinulentiforme Zahn, *Hier. Alpes Marit.* 202 (1916). Ga It.

129. H. pulchellum group (*H. lanatum|pictum*). Like **127** but leaves with numerous, soft, plumose hairs throughout; involucre 11–15 mm, with dense, white, soft simple eglandular hairs, without glandular hairs. ● *S.W. Alps.* Ga He It.

Included species:

H. pulchellum Gren. in Gren. & Godron, *Fl. Fr.* **2**: 367 (1851). Ga It.

130. H. caesioides group (*H. bifidum|pictum*). Stems (10–)20–40(–50) cm, more or less glaucous, often spotted, with stellate hairs, simple eglandular hairs and few or no glandular hairs. Leaves with more or less numerous eglandular hairs, those of the margin rigid, curved and distinctly dentate, with more or less numerous stellate hairs beneath and few or no minute glandular hairs on the margin; basal 25–65 × 15–30 mm, ovate-oblong to lanceolate, obtuse to acute, more or less dentate; cauline 0–2, narrower than the basal. Capitula 1–numerous; peduncles with stellate and more or less numerous simple eglandular hairs, sometimes with a few glandular hairs. Involucre 10–14 × 9–11 mm; bracts linear-lanceolate, more or less acute, with more or less numerous stellate and simple eglandular hairs and few to numerous glandular hairs. Stigmas usually yellow. 1000–2400 *m.* ● *S.W. Alps; Corse.* Co Ga He It.

Included species:

H. caesioides Arvet-Touvet, *Suppl. Monogr. Hier.* 15 (1876). *S.W. Alps.* Ga It.
H. rionii Gremli, *Neue Beitr. Fl. Schweiz* **3**: 16 (1883). *S.W. Alps; Corse.* Co Ga He It.

131. H. pseudoprasinops group (*H. caesioides|murorum*). Like **130** but peduncles with dense glandular hairs; involucre with fewer simple eglandular hairs and more numerous glandular hairs. ● *S.W. Alps.* Ga It.

Included species:

H. pseudoprasinops Zahn, *Hier. Alpes Marit.* 213 (1916). Ga It.

132. H. cephalotes group (*H. caesioides|pellitum*). Like **130** but involucre 14–17 mm, with dense, distinctly dentate hairs. ● *S.W. Alps; C. Appennini.* Ga It.

Included species:

H. cephalotes Arvet-Touvet, *Suppl. Monogr. Hier.* 14 (1876). *S.W. Alps.* Ga It.

133. H. leiopogon group (*H. glaucinum|pictum*). Stems 10–35 cm, with stellate and numerous simple eglandular hairs throughout and glandular hairs above. Leaves with dense, dentate or subplumose hairs throughout and with minute glandular hairs on the margin; basal 20–50 × 10–15 mm, more or less glaucous, ovate, narrowly elliptical or oblong-lanceolate, obtuse to acute, dentate or lobate-dentate; cauline 0–1(–2). Capitula (1–)2–5(–7); peduncles with dense stellate and numerous glandular hairs, without simple eglandular hairs. Involucre 9–12 × 7–9 mm; bracts linear-lanceolate, more or less acute, with dense stellate and numerous small glandular hairs, sometimes with a few simple eglandular hairs. Stigmas yellow. ● *S.W. Alps; Corse.* Co Ga.

Included species:

H. leiopogon Gren. ex Verlot, *Cat. Pl. Dauph.* 396 (1872). Ga.

134. H. rupestre All., *Auct. Fl. Pedem.* 12 (1789) (*H. humile|pictum*). Stems 5–25 cm, with more or less numerous simple eglandular hairs throughout and stellate and glandular hairs above. Leaves glabrous or subglabrous above, with rigid subplumose hairs and few minute glandular hairs on the margin, and softer, subplumose and sometimes stellate hairs beneath; basal 10–50 × 3–15 mm, glaucous, obovate, ovate-lanceolate or spathulate, obtuse, denticulate to sinuate- or incise-dentate; cauline 0–1(–2), small. Capitula 1–3(–5); peduncles very long, with stellate hairs, dense short glandular hairs and scattered simple eglandular hairs. Involucre 9–11 × 7–10 mm; bracts linear-lanceolate, obtuse to acuminate, with stellate hairs which are dense on the margin, and more or less numerous simple eglandular and scattered glandular hairs. Stigmas more or less yellow. ● *S.W. Alps; C. Appennini.* Ga It.

Other species in (xi):

H. barbulare Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 538 (1921) (*H. leiopogon|murorum*). ● *S.W. Alps.* Ga.

H. leiophaeum Arvet-Touvet, *Hier. Gall. Hisp. Cat.* 287 (1913) (*H. pictum|hypochoeroides*). ● *S.W. Alps.* Ga.

H. oreiocephalum Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 539 (1921) (*H. caesioides|schmidtii*). ● *S.W. Alps.* Ga.

H. sandozianum Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1829 (1901) (*H. pictum|saxifragum*). ● *S.W. & W.C. Alps.* Ga He.

(xii) Leaves rather large, the cauline few to rather numerous, evenly distributed, villous with crispate, subplumose or plumose hairs throughout. Involucre villous with dense, long simple eglandular hairs, without stellate and usually without glandular hairs. Achenes 3·5–4 mm, dark. Margin of receptacular pits shortly dentate, glabrous.

135. H. lanatum group. Stems 10–50 cm, with numerous, sometimes dense stellate hairs and villous with dense, white, crispate simple eglandular hairs or subplumose hairs, usually without glandular hairs. Leaves villous with dense, white, crispate subplumose or plumose hairs, sometimes with stellate hairs beneath; basal 35–100 × 15–40 mm, elliptical, lanceolate or ovate, the outer obtuse, the inner acute, all usually entire or with few teeth, occasionally more strongly dentate, attenuate at base; cauline 2–5(–8), like the basal but often sessile, the upper bract-like. Capitula (2–)3–7(–12); peduncles very long, clothed like the stem. Involucre 12–18 × 10–15 mm; bracts long-acute, villous with dense, white, crispate simple eglandular hairs, without stellate and usually without glandular hairs. Stigmas yellow. Ligules glabrous or with a few short hairs at apex. 300–2100 *m.* ● *S.E. France, W. Switzerland, N.W. Italy.* Ga He It.

Included species:

H. andryaloides Vill., *Prosp. Pl. Dauph.* 35 (1779). *S.E. France, N.W. Italy.* Ga It.

H. lanatum Vill., *loc. cit.* (1779). *From the Jura to the Alpi Apuane.* Ga He It.

H. liottardii Vill., *loc. cit.* (1779). *S.E. France, N.W. Italy.* Ga It.

(xiii) Like (xii) but hairs usually less plumose; glandular and stellate hairs often present; involucre usually smaller; ligules often with obvious hairs at apex.

136. H. erioleucum group (*H. lanatum|villosum*). Stems (6–)20–40 cm, with dense, more or less plumose hairs 4–7 mm throughout and stellate hairs at least above. Leaves 35–100 × 15–40 mm, entire or with few teeth, with dense white, crispate, more or less plumose hairs 4–7 mm; basal elliptical, lanceolate or ovate, the outer obtuse, the inner acute, attenuate at base; cauline 3–6, more or less ovate-cordate, more or less amplexicaul. Capitula 2–6; peduncles long, clothed like stem. Involucre 12–20 × 10–15 mm; bracts broad, long-acute, the outer more or less squarrose, villous with dense white, crispate, more or less plumose hairs 4–7 mm. Stigmas yellow. Ligules usually with short simple eglandular hairs at apex. ● *S.W. Alps.* Ga It.

Included species:

H. erioleucnm Zahn, *Hier. Alpes Marit.* 227 (1916). Ga It.

137. H. jordanii group (*H. bifidum|lanatum*). Like **136** but hairs less numerous, subplumose; leaves more strongly dentate, the cauline narrower, abruptly decreasing in size up the stem, not amplexicaul. ● *S.W. & W.C. Alps.* Ga He It.

Included species:

H. jordanii Arvet-Touvet, *Hier. Alpes Fr.* 60 (1888). Ga He It.

138. H. pellitum group (*H. bifidum|lanatum*). Like **136** but hairs less dense especially on upper surface of leaves and less distinctly plumose; cauline leaves not amplexicaul, narrower; involucre 10–15 mm, usually with some stellate hairs. ● *S.W. Alps; C. Appennini; Sardegna.* Ga He It Sa.

Included species:

H. oligocephalum Arvet-Touvet, *Suppl. Monogr. Hier.* 13 (1876). *S.W. Alps; C. Appennini.* Ga It.

H. pellitum Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 79 (1862). *Alpes Maritimes.* Ga.

H. pseudolanatum Arvet-Touvet, *Essai Pl. Dauph.* 46 (1871). *S.W. Alps.* Ga He It.

139. H. lansicum group (*H. humile|lanatum*). Like **136** but leaves more dentate, often lobate-dentate, the cauline not amplexicaul, with minute glandular hairs on the margin; ligules sometimes with long hairs at apex. ● *S.W. Alps.* Ga ?It.

Included species:

H. lansicum Arvet-Touvet, *Monogr. Hier.* 37 (1873). Ga.
H. lansicum Arvet-Touvet, *Monogr. Hier.* 37 (1873). Ga.

140. H. verbascifolium group (*H. lanatum|prenanthoides*). Like **136** but cauline leaves 5–10(–16); stigmas discoloured. 1500–2000 *m.* ● *S.W. Alps.* Ga It.

Included species:

H. menthifolium Arvet-Touvet, *Not. Pl. Alpes* 22 (1883). *S.W. Alps.* Ga It.

H. thapsoides Arvet-Touvet, *Monogr. Hier.* 33 (1873). *S.W. Alps.* Ga.

H. verbascifolium Vill. in Vill., G. Lauth & A. Nestler, *Précis Voy. Bot.* 56 (1812). *S.W. Alps.* Ga It.

141. H. chaboissaei group (*H. lanatum|umbrosum*). Stems 30–60 cm, with stellate hairs, subplumose hairs and simple eglandular hairs. Leaves with dense subplumose hairs throughout; basal 45–65 × 15–22 mm, elliptical to lanceolate-elliptic, obtuse to acute, subentire to dentate, attenuate at base; cauline 2–6, like the basal, sessile. Capitula 2–5(–12); peduncles long, with dense stellate and glandular hairs and scattered simple eglandular hairs. Involucre 11–14 × 10–12 mm; bracts linear-lanceolate, acute, with stellate hairs, short simple eglandular hairs and more or less numerous glandular hairs. Stigmas discoloured. Ligules with hairs at apex. ● *S.W. Alps.* Ga It.

Included species:

H. chaboissaei Arvet-Touvet, *Addit. Monogr. Hier.* 11 (1879). Ga.

Other species and groups in (xiii):

H. amphisericophorum Zahn in Engler, *Pflanzenreich* **76(IV. 280)**: 547 (1921) (*H. lanatum|piliferum*). ● *S.W. Alps.* It.

H. argothrix group (*H. lanatum|valdepilosum*). ● *S.W. Alps.* Ga It. (Including **H. argothrix** Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 303 (1889). Ga It.)

H. beyeri Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 548 (1921) (*H. lanatum|lawsonii*). ● *S.W. Alps.* Ga It.

H. bornetii Burnat & Gremli, *Cat. Hier. Alpes Marit.* 29 (1883) (*H. humile|lanatum*). ● *S.W. Alps; N. Appennini.* Ga It.

H. burnatii group (*H. glaucum|lanatum*). ● *S.W. Alps.* Ga It. (Including **H. burnatii** Arvet-Touvet ex Burnat & Gremli, *Cat. Hier. Alpes Marit.* 57 (1883). It.)

H. chlorelloides Zahn, *Hier. Alpes Marit.* 242 (1916) (*H. murorum|pellitum*). ● *S.W. Alps.* Ga It.

H. chloropsis group (*H. chondrillifolium|lanatum*). ● *S.W. Alps.* Ga. (Including **H. chloropsis** Gren. & Godron, *Fl. Fr.* **2**: 368 (1851). Ga.)

H. coronarifolium Arvet-Touvet, *Monogr. Hier.* 34 (1873) (*H. lanatum|verbascifolium*). ● *S.W. Alps.* Ga.

H. lannesianum Arvet-Touvet, *Hier. Gall. Hisp. Cat.* 276 (1913) (*?H. pellitum|viride*). ● *S.W. Alps.* Ga.

H. lychnioides Arvet-Touvet, *Monogr. Hier.* 35 (1873) (*H. monnieri|verbascifolium*). ● *S.W. Alps.* Ga It.

H. monnieri group (*H. chondrillifolium|lanatum*). ● *S.W. Alps.* Ga. (Including **H. monnieri** Arvet-Touvet, *Bull. Soc. Murith.* **31**: 107 (1902). Ga.)

H. monregalense group (*H. juranum|lanatum*). 1500–2000 *m.* ● *S.W. Alps.* Ga It. (Including **H. monregalense** Burnat & Gremli, *Cat. Hier. Alpes Marit.* 33 (1883). It.)

H. pamphilii Arvet-Touvet, *Hier. Alpes Fr.* 26 (1888) (*H. lanatum|scorzonerifolium*). ● *S.W. Alps.* Ga It.

H. pseudolaggeri group (*H. jordanii|murorum*). ● *W.C. Alps.* He. (Including **H. pseudolaggeri** (Zahn) Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 551 (1921). He.)

H. pteropogon Arvet-Touvet, *Addit. Monogr. Hier.* 11 (1879) (*H. lanatum|villosum*). ● *S.W. Alps.* Ga It.

H. ravaudii Arvet-Touvet, *Monogr. Hier.* 38 (1873) (*H. amplexicaule|lanatum*). ● *S.W. Alps.* Ga.

H. subpamphilii Zahn, *Hier. Alpes Marit.* 116 (1916) (*H. chloropsis|pamphilii*). ● *Alpes Maritimes.* Ga.

H. subtomentosum group (*H. chloropsis|lanatum*). ● *S.W. Alps.* Ga It. (Including **H. subtomentosum** (Burnat & Gremli) Zahn, *Hier. Alpes Marit.* 231 (1916). Ga It.)

(xiv) Leaves all cauline, or the basal withered at anthesis, numerous, usually more or less congested below, often more or less amplexicaul, with rather long, dense plumose hairs. Involucre large, with long simple eglandular or more or less plumose hairs or with stellate hairs, usually without glandular hairs. Stigmas yellow or discoloured. Achenes pale yellowish-brown or stramineous. Margins of receptacular pits shortly dentate, glabrous.

142. H. pannosum group. Stems 10–60 cm, villous with dense, long plumose hairs, simple eglandular hairs and numerous stellate hairs, without glandular hairs. Leaves all cauline, up to 12(–20), 40–200 × 12–55 mm, oblanceolate-oblong, obovate, oblanceolate or elliptical, obtuse to more or less acute, entire to dentate, narrowed at base, usually sessile, lanate with dense, long plumose hairs, without glandular hairs. Involucre (10–)13–20 × 15–25 mm; bracts linear-lanceolate, obtuse to acute, villous, with few to numerous stellate and minute glandular hairs almost completely concealed by the dense, long, more or less plumose or simple eglandular hairs. Stigmas yellow or discoloured. Achenes pale yellowish-brown or stramineous. $2n=36$. *Balkan peninsula, Aegean region.* Al Bu Cr Gr Ju.

Included species:

H. friwaldii Reichenb. fil., *Icon. Fl. Germ.* **19(1)**: 94 (1859). *Balkan peninsula, Kriti.* Al Cr Gr Ju.

H. pannosum Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 32 (1844). *Balkan peninsula, N. Aegean region.* Al Bu Gr Ju.

143. H. gymnocephalum group. Stems 15–65 cm, with numerous long plumose hairs below and few or none above. Leaves up to 200 × 40 mm, all cauline but sometimes forming a false rosette near the base, up to 15, broadly elliptical or oblong, rarely lanceolate, obtuse to more or less acute, entire or slightly denticulate, long-attenuate into a sessile base, villous with dense plumose hairs and often minute glandular hairs on the margin. Capitula (1–)3–8(–30); peduncles remote, long, arcuate-erect, glabrous or with few simple eglandular or glandular hairs or with both. Involucre 12–15 × 12–15 mm; bracts linear-lanceolate, acute, glabrous or with a few simple eglandular or glandular hairs or with both. Ligules glabrous. Stigmas yellow. Achenes pale to blackish-brown. ● *W. Jugoslavia, Albania.* Al Ju.

Included species:

H. gymnocephalum Griseb. ex Pant., *Österr. Bot. Zeitschr.* **23**: 266 (1873). Al Ju.

144. H. pichleri group (*H. gymnocephalum|pannosum*). Like **143** but involucral bracts with more or less numerous simple eglandular or more or less plumose hairs. ● *W. Jugoslavia, N. Albania.* Al Ju.

Included species:

H. pichleri A. Kerner, *Österr. Bot. Zeitschr.* **24**: 170 (1874). Al Ju.

145. H. gaudryi group (*H. gymnocephalum|pannosum*). Like **143** but involucral bracts and peduncles with dense simple eglandular or subplumose hairs and more or less dense stellate hairs. ● *N. & C. Greece, S. Albania.* Al Gr.

Included species:

H. gaudryi Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 105 (1856). Gr.

146. H. waldsteinii group. Stems 25–50 cm, with very dense, more or less plumose hairs below, less dense hairs above, sometimes with a few stellate hairs. Leaves 20–140 × 5–60 mm, all cauline but sometimes crowded near base or the basal withered at anthesis, more or less numerous, obovate or more or less elliptical, obtuse or subacute, entire or nearly so, long-attenuate at base, villous with dense plumose hairs, the lower sometimes petiolate, the upper bract-like. Capitula (2–)4–7(–25) in a lax panicle; peduncles long, with more or less numerous stellate hairs, sometimes with minute glandular or simple eglandular hairs or with both. Involucre 9–13 × 9–13 mm; bracts broadly linear-lanceolate, more or less acute, with few to numerous stellate hairs, few minute glandular hairs, often numerous longer glandular hairs and sometimes a few simple or subplumose eglandular hairs. Ligules glabrous. Stigmas yellow. Achenes pale or yellowish-brown. $2n=27$, 36. ● *Balkan peninsula, from N.W. Jugoslavia to N.C. Greece.* Al Gr Ju.

Included species:

H. delpinoi Bald., *Malpighia* **6**: 113 (1892). Al Gr Ju.
H. plumulosum A. Kerner, *Österr. Bot. Zeitschr.* **24**: 170 (1874). *C. & S.W. Jugoslavia.* Ju.
H. suborieni (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 267 (1976) (*H. waldsteinii* subsp. *suborieni* Zahn). Al Ju.
H. waldsteinii Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 65 (1828). *C. & N.W. Jugoslavia.* Ju.

147. H. dolopicum group (*H. pannosum/waldsteinii*). Like **146** but involucral bracts very acute, with dense, rather short, more or less plumose hairs; peduncles longer. *C. part of the Balkan peninsula.* Al Bu Gr Ju.

Included species:

H. dolopicum Freyn & Sint., *Bull. Herb. Boiss.* **5**: 212 (1897). Al Gr.

(xv) Like (xiv) but leaves often fewer, the basal sometimes present at anthesis; simple eglandular hairs and more or less plumose hairs present; involucre often with glandular hairs; achenes sometimes dark.

148. H. guentheri-beckii group (*H. gymnocephalum/villosum*). Stems 15–40(–50) cm, with dense, subplumose hairs 3–6 mm throughout, sometimes with a few stellate hairs above. Leaves 80–120 × 15–30 mm, 4–12, all cauline or a few basal ones which are withered at anthesis, glaucous, lanceolate or oblong-lanceolate, more or less acute, entire or with few minute teeth, with very dense, more or less plumose hairs 4–6 mm throughout, the lower long-attenuate at base, the upper more or less rounded at base, semiamplexicaul. Capitula 2–3(–12); peduncles long, erect, with more or less dense simple eglandular or subplumose hairs 3–5 mm, sometimes with scattered minute glandular hairs and usually with a few stellate hairs. Involucre 12–16 × 12–14 mm; bracts linear-lanceolate, more or less acute, with dense simple eglandular or subplumose hairs, sometimes with scattered minute glandular hairs, without stellate hairs. Ligules glabrous. Stigmas yellow or slightly discoloured. ● *W. Jugoslavia, Albania.* Al Ju.

Included species:

H. guentheri-beckii Zahn in Reichenb. fil., *Icon. Fl. Germ.* **19(2)**: 116 (1906). Al Ju.
H. janchenii Zahn, *Magyar Bot. Lapok* **7**: 119 (1908). *Velebit.* Ju.

149. H. scheppigianum group (*H. gymnocephalum/scorzonerifolium*). Stems 15–30(–40) cm, with more or less numerous plumose or subplumose hairs, without stellate or glandular hairs. Leaves with more or less numerous plumose or subplumose hairs, sometimes with minute glandular hairs on the margin; basal glaucous, spathulate to lanceolate, more or less acute, entire or denticulate, attenuate at base, petiolate; cauline 2–6, more or less lanceolate, attenuate to rounded at base, sessile. Capitula 1–3(–7), sometimes with a few stellate, simple eglandular or minute glandular hairs. Involucre 10–13 × 9–12 mm; bracts broadly linear-lanceolate, the outer obtuse, the inner more or less acute, all glabrous or with a few simple eglandular hairs. Ligules glabrous. Achenes pale brown. ● *W. & C. Jugoslavia.* Ju.

Included species:

H. scheppigianum Freyn, *Bull. Herb. Boiss.* **3**: 651 (1895). Ju.

150. H. mirificissimum Rohlena & Zahn, *Feddes Repert.* **6**: 240 (1909) (*H. flexicaule* Freyn & Vandas, non Tausch; *H. gymnocephalum/scorzonerifolium*). Like **149** but leaves with dense subplumose hairs especially on margin and midrib, the basal withered at anthesis, the cauline 6–10; all involucral bracts very acute or acuminate. ● *W. Jugoslavia, N. Albania.* Al Ju.

151. H. lazistanum group (*H. leithneri* (Heldr. & Sart. ex Boiss.) Zahn; *H. murorum/pannosum*). Stems 13–20 cm, with stellate hairs, short glandular hairs and simple eglandular or subplumose hairs. Leaves glabrous or with few subplumose hairs above, with dense subplumose hairs beneath and on the margin and petioles, a few minute glandular hairs sometimes present on the margin; basal ovate to oblong, obtuse to acuminate, denticulate to sinuate-dentate, attenuate at base into a broad, winged petiole; cauline 1(–2), linear or bract-like. Capitula (1–)2–3(–5); peduncles long, patent, with numerous simple eglandular hairs, more or less numerous glandular hairs, and stellate hairs. Involucre 10–12 (–15) × 9–11 mm; bracts linear-lanceolate, acute, with dense subplumose hairs and few glandular and stellate hairs. Stigmas yellow. Achenes dark. *Balkan peninsula, Kriti.* Al Bu Cr Gr Ju.

Included species:

H. lazistanum Arvet-Touvet, *Spicil. Rar. Nov. Hier.* 29 (1881) is confined to Anatolia.
H. leithneri (Heldr. & Sart. ex Boiss.) Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 585 (1921). Cr Gr.

152. H. calophyllum group (*H. gymnocephalum/prenanthoides*). Stems (30–)40–60(–70) cm, with dense, soft, white subplumose hairs 4–6 mm, few glandular and no stellate hairs. Leaves 8–12(–16), 20–100 × 5–50 mm, all cauline, obtuse to acuminate, entire to denticulate, with more or less numerous simple eglandular or subplumose hairs 2–4(–6) mm, the lower oblong-obovate, oblong or oblong-lanceolate, obtuse to acuminate, subpetiolate, the remainder more or less panduriform to ovate, subcordate, semiamplexicaul. Capitula (2–)5–10(–20) in a lax panicle; peduncles with stellate hairs, more or less numerous glandular hairs and few simple eglandular hairs. Involucre 10–12 × 9–11 mm; bracts broadly linear-lanceolate, more or less acute, with few stellate hairs, numerous glandular hairs and simple eglandular hairs 2–2·5 mm. Ligules with simple eglandular hairs at apex. Stigmas more or less yellow. Achenes pale to reddish-brown. ● *S.W. Jugoslavia.* Ju.

Included species:

H. calophyllum Uechtr., *Österr. Bot. Zeitschr.* **24**: 106 (1874). Ju.

153. H. pilosissimum group (*H. pannosum/racemosum*). Stems 20–100 cm, with stellate and more or less dense plumose hairs. Leaves 6–20, 40–70 × 20–40 mm, all cauline, elliptical, oblong-elliptical, ovate-elliptical or oblong, acute to acuminate, denticulate to deeply dentate, narrowed or rounded at base, villous with dense, entangled, plumose or subplumose hairs, and usually a few minute glandular hairs on the margin. Capitula (1–)2–10; peduncles with more or less numerous stellate hairs, numerous simple eglandular or subplumose hairs and sometimes a few small glandular hairs. Involucre 10–17 × 8–14 mm; bracts linear-lanceolate, acute, with more or less numerous stellate, numerous simple eglandular and sometimes subplumose hairs, and usually a few small glandular hairs. Stigmas yellow. Ligules glabrous. Achenes pale brown. *Balkan peninsula.* Al Bu Gr Ju.

Included species:

H. pilosissimum Friv., *Flora* (*Regensb.*) **19**: 436 (1836). Al Bu Ju.

154. H. heldreichii group (*H. pannosum/racemosum*). Like **153** but hairs less numerous and all subplumose; involucral bracts less acute. $2n=27$. *Balkan peninsula.* Bu Gr Ju.

Included species:

H. heldreichii Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 102 (1856). Gr.

155. H. sericophyllum group (*H. naegelianum/pannosum*). Stems 10–20(–25) cm, with more or less numerous stellate and simple eglandular or sometimes subplumose hairs, and sometimes a few minute glandular hairs above. Leaves with dense simple eglandular and subplumose hairs, often with a few minute glandular hairs on the margin; basal 30–100(–150) × 10–18 mm, broadly lanceolate, acute, rarely obovate and obtuse, subentire or denticulate, attenuate at base; cauline 0–3, small, lanceolate. Capitula 1–few; peduncles with dense stellate hairs, and more or less numerous minute glandular and simple eglandular hairs. Involucre (9–)10–15 × 9–13 mm; bracts linear-lanceolate, acute, usually with stellate hairs, few minute glandular hairs and numerous short subplumose and simple eglandular hairs. Stigmas usually yellow. Achenes pale brown. ● *Balkan peninsula.* Al Bu Gr Ju.

Included species:

H. sericophyllum Nejc. & Zahn, *Magyar Bot. Lapok* **5**: 93 (1906). Bu.

156. H. jankae group (*H. pannosum/sparsum*). Stems 20–40(–50) cm, with dense simple eglandular and subplumose hairs 3–5(–6) mm, and more or less numerous stellate hairs above. Leaves 7–13(–15), 45–180 × 15–35 mm, sometimes forming a false rosette near the base, oblong-lanceolate or lanceolate, with more or less dense simple eglandular and subplumose hairs 1·5–4 mm; the upper bract-like, obtuse to acute, entire to denticulate (rarely dentate), sometimes slightly amplexicaul, the lower petiolate, the basal usually withered at anthesis. Capitula few to many; peduncles with more or less dense simple eglandular hairs, dense stellate hairs and often a few minute glandular hairs. Involucre 10–13 × 9–12 mm; bracts broadly linear-lanceolate, more or less acute, with scattered stellate hairs, sparse to dense, minute glandular and sometimes a few simple eglandular hairs. Ligules glabrous. Achenes pale brown. ● *Bulgaria, S. & E. Jugoslavia, S.W. Romania.* Bu Ju Rm.

Included species:

H. jankae Uechtr., *Österr. Bot. Zeitschr.* **23**: 239 (1873). Rm.

157. H. sartorianum group (*H. lazistanum/naegelianum*). Stems 10–30(–40) cm, with more or less numerous simple eglandular and subplumose hairs throughout, and numerous stellate hairs above. Leaves with numerous simple eglandular and subplumose hairs and sometimes occasional minute glandular hairs on the margin; basal 30–60 × 10–18 mm, sometimes withered at anthesis, oblong-lanceolate, lanceolate or elliptical, obtusely mucronate to subacute, entire to denticulate, attenuate below; cauline 0–2, narrowly lanceolate or linear, with stellate hairs beneath. Capitula 2–3(–10); peduncles long, with numerous stellate hairs, few to numerous simple eglandular hairs and usually a few minute glandular hairs. Involucre 8–12 × 8–11 mm; bracts narrowly linear-lanceolate, obtuse to acute, with rather dense stellate hairs, more or less numerous simple eglandular hairs and scattered minute glandular hairs. Ligules glabrous or with short simple eglandular hairs at apex. Stigmas yellow to discoloured. 1625–2500 *m.* ● *Greece, S. Albania.* Al Gr.

Included species:

H. sartorianum Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **1(7)**: 15 (1846). Gr.

Other species and groups in (xv):

H. albanicum group (*H. gymnocephalum/heterogynum*). ● *Albania, S.W. Jugoslavia.* Al Ju. (Including **H. albanicum** Freyn, *Bull. Herb. Boiss.* **3**: 651 (1895). Al Ju.)

H. brevilanosum Degen & Zahn, *Magyar Bot. Lapok* **6**: 222 (1907) (*H. laevigatum/waldsteinii*). ● *W. & C. Jugoslavia.* Ju.

H. chloropannosum Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 591 (1921) (*H. heterogynum/pannosum*). ● *Albania.* Al.

H. coloriscapum Rohlena & Zahn, *Feddes Repert.* **6**: 240 (1909) (*H. gymnocephalum/naegelianum*). ● *Crna Gora, N. Albania.* Al Ju.

H. divergens Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 332 (1889) (*H. latifolium/pannosum*). ● *W. Bulgaria.* Bu.

H. eriobasis group (*H. murorum/pannosum*). ● *N. & C. Greece, Albania.* Al Gr. (Including **H. eriobasis** Freyn & Sint., *Bull. Herb. Boiss.* **5**: 787 (1897). Al Gr.)

H. geminum Hayek & Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 586 (1921) (*H. bifidum/gymnocephalum*). ● *N. Albania.* Al.

H. gnilagredae Zahn, *op. cit.* 600 (1921) (*H. calophyllum/plumulosiforme*). ● *S.W. Jugoslavia.* Ju.

H. gracilifurcum Zahn, *op. cit.* 605 (1921) (*H. sericophyllum/murorum*). ● *E.C. Greece.* Gr.

H. graecum group (*H. pannosum/naegelianum*). ● *C. & S. Greece*; *C. Appennini.* Gr It. (Including **H. graecum** Boiss. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 101 (1856). Gr It.)

H. grossianum Zahn, *Allgem. Bot. Zeitschr.* 184 (1903) (*H. murorum/waldsteinii*). ● *Bosna.* Ju.

H. gugleranum group (*H. murorum/plumulosiforme*). ● *W. Jugoslavia, N. Albania.* Al Ju. (Including **H. gugleranum** Zahn, *Magyar Bot. Lapok* **8**: 309 (1909). Al Ju.)

H. kritschianum Mattf. & Zahn, *Feddes Repert.* **24**: 384 (1928) (*H. olympicum/pannosum*). ● *S. Bulgaria.* Bu.

H. longifidum Zahn in Vandas, *Reliq. Formánek.* 363 (1909) (*H. heldreichii/sparsum*). ● *Macedonia.* Ju.

H. marmoreum group (*H. latifolium/pannosum*). $2n=27$. ● *E. Jugoslavia, W. Bulgaria.* Bu Ju. (Including **H. marmoreum** Pančić & Vis., *Mem. Ist. Veneto* **12**: 468 (1866). Bu Ju.)

H. mattfeldianum Zahn, *Feddes Repert.* **24**: 383 (1925) (*H. bifidum|pannosum*). ● *S. Bulgaria.* Bu.

H. megalothecum Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 587 (1921). (*H. gymnocephalum|murorum*). ● *N. Greece.* Gr.

H. montenegrinum Freyn, *Bull. Herb. Boiss.* **3**: 648 (1895) (*H. racemosum|waldsteinii*). ● *Crna Gora.* Ju.

H. niphobium Georgiev & Zahn, *Bull. Soc. Bot. Bulg.* **6**: 75 (1934) (*H. heterogynum|pannosum*). ● *S.W. Bulgaria.* Bu.

H. ossaeum Zahn in Vandas, *Reliq. Formánek.* 364 (1909) (*H. pilosissimum|sparsum*). ● *S.E. Bulgaria, E.C. Greece.* Bu Gr.

H. parnassi group (*H. murorum|pannosum*). ● *S.C. Greece; Kriti.* Cr Gr. (Including **H. parnassi** Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 86 (1848). Gr.)

H. peristericum Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 591 (1921) (*H. heterogynum|pannosum*). ● *N.C. Greece, S.W. Bulgaria.* Bu Gr.

H. phocaicum Zahn, *op. cit.* 586 (1921) (*H. bifidum|pannosum*). ● *S.C. Greece.* Gr.

H. pirinicola Georgiev & Zahn, *Bull. Soc. Bot. Bulg.* **4**: 80 (1931). ● *S.W. Bulgaria.* Bu.

H. portanum Belli in Fiori & Paol., *Fl. Anal. Ital.* **3**: 472 (1904) (*H. gymnocephalum|heterogynum*). ● *S. Appennini*; *S. Jugoslavia.* It Ju.

H. pseudobracteolatum (Zahn) Rech. fil., *Denkschr. Akad. Wiss. Math.-Nat. Kl. (Wien)* **105**: 704 (1943). ● *N. Greece.* Gr.

H. pseudorienii group (*H. gymnocephalum|tommasinii*). ● *C. Jugoslavia.* Ju. (Including **H. pseudorienii** Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 598 (1921). Ju.)

H. scardicum Bornm. & Zahn, *Feddes Repert.* **16**: 294 (1919) (*H. naegelianum|pannosum*). ● *S. Jugoslavia.* Ju.

H. stefanoffii Zahn ex Markgraf in Hayek, *Prodr. Fl. Penins. Balcan.* **2**: 970 (1932). ● *S.W. Bulgaria.* Bu.

H. thapsiformoides G. Schneider ex K. Malý, *Verh. Zool.-Bot. Ges. Wien* **54**: 291 (1904) *H. plumulosiforme* G. Schneider ex Zahn; *H. tommasinii|waldsteinii*). ● *C. & S.W. Jugoslavia, N. Albania.* Al Ju.

H. triadanum Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 600 (1921) (*H. bracteolatum|pannosum*). ● *S.E. Greece.* Gr.

H. turbinellum Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1013 (1922) (*H. bracteolatum|pannosum*). ● *S.E. Greece.* Gr.

H. wettsteinianum Hayek & Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 586 (1921) (*H. bifidum|gymnocephalum*). *c.* 1800 *m.* ● *Albania.* Al.

(C) Leaves with at least some (sometimes minute) glandular hairs especially along the margin; often whole plant glandular. Capitula solitary or few on long, erect peduncles and branches. Margins of receptacular pits dentate to dentate-fimbriate.

(xvi) Leaves with simple eglandular and minute glandular hairs at least on the margin; cauline 0–4, narrow and bract-like. Capitula usually solitary, sometimes few, large. Involucre blackish. Ligules with simple eglandular hairs at the apex and sometimes also on outer surface. Margins of receptacular pits shortly dentate.

158. H. alpinum group. Stems (5–)10–15(–35) cm, with stellate hairs, numerous dark simple eglandular hairs 3–8 mm, and often dark glandular hairs. Leaves with more or less dense, long, pale simple eglandular hairs, few to numerous minute glandular hairs on the margin and sometimes stellate hairs especially beneath; basal 20–100 × 5–15(–20) mm, numerous, the outer small, elliptical, obovate or oblong, obtuse, the remainder lingulate, spathulate or lanceolate, obtuse to acute, entire to deeply dentate, attenuate into a winged petiole; cauline 0–3(–8), lanceolate, linear or bract-like. Capitula usually 1, very rarely 2–3. Involucre (10–)12–20 × 7–18 mm; bracts linear-lanceolate, obtuse to acute, with more or less dense simple eglandular hairs 2–5 mm, sometimes with few to numerous glandular hairs, without stellate hairs. Ligules with short simple eglandular hairs on outer surface and at apex. Stigmas usually yellow. $2n=27$. 800–3000 *m. N. & C. Europe.* Au Br Cz Fe Ga Ge He Is It Ju No Po Rm Rs (N, C, W) Su.

Included species:

H. alpinum L., *Sp. Pl.* 800 (1753). Au Br Cz Fe Ga Ge He Is It Ju No Po Rm Rs (N, C, W) Su.

H. apiculatum Tausch, *Flora* (*Regensb.*) **20** (Ergänz. 1): 70 (1837). ● *Carpathians, Sudeten Mts.* Cz Po Rm Rs (W).

H. halleri Vill., *Hist. Pl. Dauph.* **3**: 104 (1788). ● *Alps.* Au Ge He Ju.

H. holosericeum Backh., *Monogr. Brit. Hier.* 19 (1856). ● Br.

H. melanocephalum Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 63 (1828). ● Au Cz Ga Ge It No Po Rm Rs (W) Su.

H. pseudofritzei Benz & Zahn, *Österr. Bot. Zeitschr.* **52**: 264 (1902). ● *E. Alps*; *Carpathians.* Au Cz Po Rm Rs (W).

H. tubulosum Tausch, *Flora* (*Regensb.*) **20** (Ergänz. 1): 68 (1837). ● *Sudeten Mts, W. Carpathians.* Cz Po.

159 H. nigrescens group (*H. alpinum|murorum*). Like **158** but leaves 20–110 × 10–40 mm; stems more often with more than 1 capitulum; ligules often with simple eglandular hairs only at apex; stigmas often discoloured. $2n=36$. 800–3000 *m. N. & C. Europe.* Au Br Cz Fe Ga Ge He Is It No Po Rm Rs (N, W) Su.

Included species:

H. adspersum (Norrlin) Elfstr., *Hier. Alpina* 16 (1893). ● No Rs (N) Su.

H. calenduliflorum Backh., *Monogr. Brit. Hier.* 23 (1856). $2n=36$. ● *Scotland.* Br.

H. decipiens Tausch, *Flora* (*Regensb.*) **20** (Ergänz. 1): 66 (1837). ● Au Cz Ge Po Rm Rs (W).

H. frondiferum (Elfstr.) Elfstr., *Hier. Alpina* 21 (1893). No Rs (N) Su.

H. hanburyi Pugsley, *Jour. Bot.* (*London*) **79**: 178 (1941). $2n=36$. ● *Scotland.* Br.

H. neorepandum P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 265 (1976) (*H. repandum* Dahlst., non Schrank). ● Is.

H. nigrescens Willd., *Sp. Pl.* 3: 1574 (1803). ● Au Cz Po Rm Rs (W).

H. praematurum Elfstr., *Hier. Alpina* 24 (1893). ● No Su.

H. pseudorhaeticum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 266 (1976) (*H. nigrescens* subsp. *pseudorhaeticum* Zahn). ● *S. & S.W. Alps.* Ga He It.

H. rhaeticum Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 46 (1862). ● *S.W. & C. Alps.* Ga He.

H. subpumilum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 267 (1976) (*H. nigrescens* subsp. *subpumilum* Zahn). ● *Alps.* Au Ge He It.

160. H. pietroszense group (*H. alpinum|bifidum*). Like **158** but leaves broader and more or less glabrous above; capitula 1–2; peduncles with dense stellate hairs; involucre *c.* 12 mm; bracts with more or less numerous stellate hairs; ligules usually glabrous; styles dark. ● *E. Alps; Carpathians; Norway.* Au Cz Ge It No Po Rm.

Included species:

H. pietroszense Degen & Zahn, *Magyar Bot. Lapok* **5**: 72 (1906). Au It Rm.

(xvii) Leaves with simple eglandular hairs and a few minute glandular hairs on the margin; cauline 1–5(–8), often lanceolate. Capitula 1–10, dark; inflorescence often furcately divided; peduncles erect. Ligules usually with short simple eglandular hairs at apex. Margins of receptacular pits usually shortly dentate.

161. H. fritzei group (*H. alpinum|prenanthoides*). Stems (8–)12–25(–35) cm, with more or less numerous stellate hairs, more or less numerous, usually dark-based simple eglandular hairs and few short glandular hairs. Leaves with more or less numerous simple eglandular hairs, but sometimes subglabrous above; basal 25–60 × 9–15 mm, usually with a few simple eglandular hairs, more or less spathulate, narrowly elliptical or lanceolate, obtuse to acute, denticulate to shallowly dentate, attenuate into a short petiole; cauline (2–)3–5(–8), narrowly elliptical, oblong-lanceolate or lanceolate, more or less acute, denticulate to shallowly dentate, sessile, semiamplexicaul. Capitula 1–3(–10); peduncles with dense stellate hairs, more or less numerous simple eglandular hairs and few glandular hairs. Involucre 10–12(–15) × 9–11 mm; bracts linear-lanceolate, obtuse to acute, without or with numerous stellate hairs, with numerous dark-based simple eglandular hairs and more or less numerous dark glandular hairs. Ligules with short simple eglandular hairs at apex. Stigmas discoloured. *Mountains of E.C. Europe.* Cz Po Rm Rs (W).

Included species:

H. fritzei F. W. Schultz, *Flora* (*Regensb.*) **30**: 281 (1872). Cz Po Rm Rs (W).

H. scitulum Wołoszczak, *Spraw. Kom. Fizyogr. Krakow.* **21**: 128 (1887). Cz Po Rm Rs (W). (Has some characters of *H. nigrescens* group.)

162. H. arolae group (*H. alpinum|incisum*). Stems 10–20(–30) cm, with stellate hairs, few glandular hairs and numerous simple eglandular hairs 3–4 mm. Leaves with more or less numerous simple eglandular hairs and sparse, minute glandular hairs on the margin; basal numerous, pale glaucous-green, ovate, obovate or oblong-lanceolate, acute to acuminate, dentate, abruptly contracted or attenuate into a petiole; cauline 1–3, more or less lanceolate or bract-like, usually sessile. Capitula 1–4(–6); peduncles usually long, sometimes up to ½ as long as stem, with dense stellate hairs, more or less dense simple eglandular hairs and numerous glandular hairs. Involucre 9–15 × 8–12 mm; bracts linear-lanceolate, more or less acute, with dense stellate hairs, dense simple eglandular hairs and numerous small glandular hairs. Ligules with short simple eglandular hairs at apex. Stigmas discoloured. ● *E.C. & E. Alps; Carpathians.* Au He It Ju Rm.

Included species:

H. arolae J. Murr in Dörfler, *Hier. Norm. Sched.* **32**: 42 (1897). Au He It.

163. H. senescens group (*H. alpinum|schmidtii*). Stems 20–35(–60) cm, with few to numerous often dark-based simple eglandular hairs throughout, and numerous stellate and often glandular hairs above. Leaves with simple eglandular hairs, those on the upper surface and margin rigid, the margin usually with a few minute glandular hairs; basal 20–100 × 10–40 mm, oblanceolate, lanceolate, elliptic-lanceolate or oblong, obtuse to acute, more or less dentate, base attenuate into a petiole; cauline 1–3, like the basal or bract-like, sometimes with stellate hairs beneath. Capitula (1–)2–5(–6); peduncles with dense stellate hairs, scattered dark-based simple eglandular hairs and numerous dark glandular hairs. Involucre 10–15 × 8–15 mm, blackish; bracts broadly linear-lanceolate, more or less acute, with numerous dark or dark-based simple eglandular hairs (often tufted at apex of bract) and numerous dark, unequal glandular hairs, without or with more or less numerous stellate hairs. Ligules with short simple eglandular hairs at apex. Stigmas yellow. ● *W.C. Alps; Scotland.* Br He.

Included species:

H. senescens Backh., *Monogr. Brit. Hier.* 32 (1856). Br.

164. H. atratum group (*H. alpinum|murorum*). Stems 20–45(–60) cm, with dark-based, simple eglandular hairs and stellate and dark glandular hairs above. Leaves with more or less numerous simple eglandular hairs, and usually with minute glandular hairs on the margin; basal 20–140 × 50 mm, elliptical, ovate, lanceolate or oblong-lanceolate, obtuse to acuminate, shallowly to deeply dentate, truncate to attenuate at base, petiolate; cauline 1–2(–4), like the basal, but with more or less numerous stellate hairs beneath. Capitula (1–)2–10; peduncles erect, with stellate hairs, dark or dark-based simple eglandular hairs and shorter, dark glandular hairs. Involucre 10–16(–17) × 7–14 mm, dark; bracts linear-lanceolate, obtuse to acute, with numerous dark glandular hairs, sometimes also few to numerous dark or dark-based simple eglandular hairs, and sometimes a few stellate hairs. Ligules with more or less numerous short simple eglandular hairs at apex. Stigmas discoloured. $2n=27, 36$. *N. & C. Europe.* Au Br Cz Ga Ge He Is It Ju No Po Rm Rs (N, W) Su.

Included species:

H. atratum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 105 (1848). ● *Alps.* Au Ga He It.

H. atrellum (Zahn) Juxip in Schischkin & Bobrov, *Fl. URSS* **30**: 189 (1960). Cz Po Rm Rs (W).

H. ovaliceps Norrlin, *Acta Soc. Fauna Fl. Fenn.* **3(4)**: 82 (1888). No Rs (N) Su.

H. piciniforme Dahlst., *Ark. Bot.* **3(10)**: 21 (1904). ● Is.

H. samnaunicum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 266 (1976) (*H. atratum* subsp. *samnaunicum* Zahn). ● *C. & E. Alps.* Au He It.

H. schroeteranum (Zahn) P. D. Sell & C. West, *loc. cit.* (1976) (*H. atratum* subsp. *schroeteranum* Zahn). ● *C. & E. Alps.* Au He It Ju.

H. sinuans F. J. Hanb., *Jour. Bot.* (*London*) **30**: 167 (1892). ● *Scotland.* Br.

H. submurorum Lindeb. in Blytt, *Norg. Fl.* **2**: 643 (1874). **H. submurorum** Lindeb. in Blytt, *Norg. Fl.* **2**: 643 (1874). ● Br No Su.

H. subnigrescens (Fries ex Norrlin) Dahlst., *Acta Horti Berg.* **2(4)**: 121 (1894). Cz Ge No Po Rs (W) Su.

H. ussense (Pohle & Zahn) Juxip in Schischkin & Bobrov, *Fl. URSS* **30**: 192 (1960). *N.E. Russia.* Rs (N).

165. H. liptoviense group (*H. atratum|vulgatum*). Like **164** but leaves acutely serrate, with very long petioles; cauline leaves (1–)2–3(–4). ● *E. Alps; Sudeten Mts; Carpathians.* Au Cz Po Rs (W).

Included species:

H. liptoviense Borbás, *Term.-Tud. Közl.* **26**: 498 (1894). Cz Po.

166. H. krasanii group (*H. alpinum|rotundatum*). Like **164** but with some leaves elliptical to ovate, entire to denticulate; petioles 50–120 mm; cauline leaves (1–)2–3(–5); involucre 8–11(–13) mm; stigmas yellow or discoloured. ● *E. & S. Carpathians.* Rm Rs (W).

Included species:

H. krasanii Wołoszczak, *Spraw. Kom. Fizyogr. Krakow.* **25**: 64 (1890). Rm Rs (W).

167. H. rohacsense group (*H. conspurcans* Norrlin; *H. alpinum|bifidum*). Like **164** but leaves often more glaucous; peduncles and involucral bracts with more or less numerous stellate hairs; involucral bracts with few to numerous glandular hairs. *N. & C. Europe.* Au Br Cz Ge He Is It Ju No Po Rm Rs (W) Su.

Included species:

H. bifidellum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 262 (1975) (*H. conspurcans* subsp. *bifidellum* Zahn). ● Au Cz He Po.

H. bipediforme Dahlst., *Ark. Bot.* **3(10)**: 22 (1904). ● Is.

H. callistophyllum F. J. Hanb., *Jour. Bot.* (*London*) **30**: 168 (1892). ● *Scotland.* Br.

H. conspurcans Norrlin, *Acta Soc. Fauna Fl. Fenn.* **3(4)**: 98 (1888). ● No Su.

H. rohacsense Kit. ex Kanitz, *Linnaea* **32**: 422 (1863). Au He Rm Rs (W).

168. H. bocconei group (*H. alpinum|vulgatum*). Stems 25–40 cm, with stellate hairs, simple eglandular hairs and glandular hairs. Leaves with numerous simple eglandular hairs and scattered stellate hairs (more numerous on midrib of cauline) and pale minute glandular hairs; basal 25–120 × 15–35 mm, lanceolate or more or less elliptical, obtuse to acute, denticulate to dentate (the teeth narrowly mammiform), attenuate at base into a short petiole; cauline 2–8, like the basal but becoming gradually smaller, the lower petiolate, the upper more or less sessile, sometimes semiamplexicaul. Capitula (1–)2–6; peduncles rather long, erect, with dense stellate hairs and more or less numerous dark-based simple eglandular hairs and dark glandular hairs. Involucre 9–13 × 8–12 mm, blackish; bracts broadly linear-lanceolate, obtuse to subacute, with few to numerous stellate hairs, few to numerous dark-based simple eglandular hairs, and numerous unequal, dark glandular hairs. Ligules with short simple eglandular hairs at apex. Stigmas discoloured. ● *Alps; W. Carpathians.* Au Cz Ga Ge He It Ju.

Included species:

H. bocconei Griseb., *Comment. Hier.* 35 (1852). *Alps.* Au Ga He It Ju.

H. cornense (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 263 (1976) (*H. bocconei* subsp. *cornense* Zahn). *S.W. Alps.* Ga.

H. glandulosodentatum Uechtr., *Jahresb. Schles. Ges. Vaterl. Kult.* **53**: 143 (1876). 1000–1550 *m. W. Carpathians.* Cz.

H. kuekenthalianum (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 264 (1976) (*H. bocconei* subsp. *kuekenthalianum* Zahn). ● *E. Alps.* Au He.

H. simia (Huter ex Zahn) Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 694 (1921). *C. & E. Alps.* Au Ge He.

169. H. vollmannii group (*H. bocconei|murorum*). Like **168** but base of leaves more or less truncate; cauline leaves (0–)2–4. ● *Alps.* Au Ge He It Ju.

Included species:

H. vollmannii Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1853 (1901). Au Ge He It Ju.

Other species and groups in (xvii):

H. adenophyton (Zahn) Zahn in Schinz & R. Keller, *Fl. Schweiz* ed. 2, **2**: 317 (1905) (*H. atratum|bocconei*). ● *C. Alps.* He It.

H. antholzense Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1875 (1901) (*H. bocconei|valdepilosum*). ● *E. Alps.* Au.

H. atratiforme group (*H. rotundatum|sparsum*). ● *S. Carpathians; N. Albania.* Al Rm. (Including **H. atratiforme** Simonkai, *Enum. Fl. Transs.* 371 (1887). Al Rm.)

H. borzae E. I. Nyárády & Zahn, *Bul. Grăd. Bot. Cluj* **13**: 63 (1933). ● *S. Carpathians.* Rm.

H. bucuranum E. I. Nyárády in Săvul., *Fl. Rep. Pop. Române* **10**: 668 (1965) (*H. rotundatum|sparsum*). ● *S. Carpathians.* Rm.

H. chlorobracteum group (*H. alpinum|murorum|rotundatum*). ● *S. & E. Carpathians.* Rm Rs (W). (Including **H. chlorobracteum** Degen & Zahn, *Magyar Bot. Lapok* **7**: 122 (1908). Rm.)

H. czeremoszense Wołoszczak & Zahn, *Magyar Bot. Lapok* **10**: 162 (1911) (*H. fritzei|rotundatum*). ● *E. Carpathians.* Rm Rs (W).

H. filarszkyi Jáv. & Zahn, *Bot. Közl.* **10**: 30 (1911) (*H. fritzei|sparsum*). ● *S. Carpathians.* Rm.

H. fritzeiforme Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1061 (1922) (*H. fritzei|sparsum*). ● *S. Carpathians.* Rm.

H. gorfenianum Bornm. & Zahn, *Magyar Bot. Lapok* **32**: 185 (1933). ● *Tirol.* Au.

H. gymnodermum Benz & Zahn in Reichenb. fil., *Icon. Fl. Germ.* **19(2)**: 323 (1911) (*H. atratum|sparsum*). ● *E. Alps.* Au.

H. lividorubens group (*H. alpinum|fuscocinereum*). 2*n* = 27. *Fennoscandia.* No Su. (Including **H. lividorubens** (Almq.) Elfstr., *Hier. Alpina* 57 (1893). Su.)

H. lomnicense Wołoszczak, *Spraw. Kom. Fizyogr. Krakow.* **25**: 65 (1890) (*H. fritzei|rotundatum*). ● *S. & E. Carpathians.* Rm Rs (W).

H. napaeum group (*H. alpinum|bifidum*). ● *S. Carpathians.* Rm. (Including **H. napaeum** Zahn, *Ann. Hist.-Nat. Mus. Hung.* **8**: 79 (1910). Rm.)

H. negoiense (Răvărut & E. I. Nyárády) Soó, *Acta Bot. Acad. Sci. Hung.* **14**: 153 (1968). ● *Romania.* Rm.

H. nyaradyanum Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1061 (1922) (*H. chlorocephalum|sparsum*). ● *S. Carpathians.* Rm.

H. paltinae Jáv. & Zahn, *Bot. Közl.* **10**: 31 (1911) (*H. nigrescens|sparsum*). 2*n* = 36. ● *S. Carpathians.*

H. pawlowskianum E. I. Nyárády in Săvul., *Fl. Rep. Pop. Române* **10**: 518 (1965). ● *S. Carpathians.* Rm.

H. paxianum E. I. Nyárády & Zahn, *Bul. Grăd. Bot. Cluj* **8**: 54 (1928). ● *S. Carpathians.* Rm.

H. pseudocaesiiforme E. I. Nyárády & Zahn, *op. cit.* 80 (1928). ● *S. Carpathians.* Rm.

H. pseudodolichaetum (Benz & Zahn) Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 714 (1921) (*H. atratum|incisum*). ● *E. Alps.* Au Ge.

H. pseudonigritum Pax, *Grundz. Pflanzenverbr. Karp.* **2**: 96 (1908). ● *Romania.* Rm.

H. pseudopaltinae E. I. Nyárády & Zahn, *Bul. Grăd. Bot. Cluj* **8**: 79 (1928). ● *S. Carpathians.* Rm.

H. pseudotranssilvanicum (Zahn) Zahn, *op. cit.* 73 (1928). ● *S. Carpathians.* Rm.

H. pseudovagneri Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(3)**: 239 (1936). ● *Romania.* Rm.

H. pseudoratezatense E. I. Nyárády & Zahn, *Bul. Grăd. Bot. Cluj* **8**: 79 (1928). ● *S. Carpathians.* Rm.

H. revucanum E. I. Nyárády & Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(2)**: 400 (1931) (*H. caesium|chlorocephalum*). ● *W. Carpathians.* Cz.

H. serratum group (*H. alpinum|dentatum*). ● *Alps; W. Carpathians.* Au Cz He. (Including **H. serratum** Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 200 (1886). Au.)

H. stenodontophyllum E. I. Nyárády & Zahn, *Bul. Grăd. Bot. Cluj* **8**: 60 (1928). ● *S. Carpathians.* Rm.

H. sterzingense Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1893 (1901) (*H. bocconei|umbrosum*). ● *E. Alps.* Au It.

H. subeversianum Vetter & Zahn, *Sonderschr. Naturh. Komm. Vorarlb. Landesmus.* **5**: 48 (1928). ● *Austria* (*Vorarlberg*). Au.

H. tephrodermum group (*H. bifidum|bocconei|villosum*). ● *E. Alps.* Au. (Including **H. tephrodermum** Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1854 (1901). Au.)

H. thomasianum Zahn in Schinz & R. Keller, *Fl. Schweiz* ed. 2, **2**: 315 (1905) (*H. atratum|bifidum*). ● *C. Alps.* He.

H. thomaisæforme (E. I. Nyárády) E. I. Nyárády in Săvul., *Fl. Rep. Pop. Române* **10**: 517 (1965). ● *S. Carpathians.* Rm.

H. trischistum E. I. Nyárády & Zahn, *Bul. Grăd. Bot. Cluj* **8**: 83 (1928). ● *S. Carpathians.* Rm.

H. vagneri group (*H. alpinum|caesium*). ● *Sudeten Mts, Carpathians.* Cz Po Rm Rs (W). (Including **H. vagneri** Pax, *Grundz. Pflanzenverbr. Karp.* **1**: 154 (1898). Cz Po Rm.)

(xviii) Leaves with at least some minute glandular hairs on the margin; basal absent, or if present usually withered at anthesis; cauline (1–)2–12, small, at least the upper more or less amplexicaul. Inflorescence of few capitula usually on erect peduncles. Involucre blackish. Ligules usually with short simple eglandular hairs at apex.

170. H. sudeticum group (*H. alpinum|prenanthoides*). Stems 15–40(–60) cm, with dense long simple eglandular hairs throughout and few stellate and glandular hairs above. Leaves with long simple eglandular hairs throughout and few small glandular hairs on the margin; basal absent or withering early; cauline 15–60 × 6–20 mm, many, oblong, merging into linear bracts, denticulate to dentate, more or less amplexicaul. Capitula (1–)2–12; peduncles with few to numerous stellate, simple eglandular and glandular hairs. Involucre 10–12 × 7–9 mm; bracts broadly linear-lanceolate, obtuse to subacute, with numerous long simple eglandular hairs, numerous unequal glandular hairs and few stellate hairs. Ligules with very short simple eglandular hairs at apex. Stigmas discoloured. 800–1500 *m.* ● *Sudeten Mts, Carpathians.* Cz Po Rm ?Rs (W).

Included species:

H. pedunculare Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 76 (1828). *Sudeten Mts.* Cz.

H. sudeticum Sternb., *Denkschr. Bayer. Bot. Ges. Regenbs.* **1(2)**: 62 (1818) (*H. bohemicum* Fries). *Carpathians.* Cz Po Rm ?Rs (W).

171. H. nigritum group (*H. fritzei|murorum*). Stems 15–35 cm, with numerous simple eglandular hairs. Leaves with numerous simple eglandular hairs throughout, the upper sometimes with stellate hairs beneath, the margin with small glandular hairs; basal obovate to oblong, obtuse, or narrower and acute, more or less dentate, attenuate into a petiole; cauline (1–)2–4(–8), sessile, semiamplexicaul. Capitula (1–)2–5(–12); peduncles with few stellate and simple eglandular hairs and numerous glandular hairs. Involucre 12–16 × 10–13 mm; bracts linear-lanceolate, obtuse to acute, with few to numerous stellate hairs, simple eglandular hairs and glandular hairs. Ligules with short simple eglandular hairs at apex. Stigmas discoloured. 2*n* = 27. ● *Sudeten Mts.; Carpathians; N.E. Alps.* Au Cz Po Rm Rs (W).

Included species:

H. nigritum Uechtr., *Österr. Bot. Zeitschr.* **23**: 358 (1873). Au Cz Po.

172. H. chlorocephalum group (*H. alpinum|prenanthoides|vulgatum*). Stems (10–)20–30(–40) cm, with few to numerous stellate hairs at least above, few to numerous simple eglandular hairs, and few glandular hairs. Leaves entire to shallowly dentate, with few simple eglandular hairs mostly on the margin, and with few minute glandular hairs on the margin; basal 15–50 × 5–15 mm, often withered at anthesis, elliptical to oblong, obtuse to subacute, abruptly contracted or attenuate into a petiole; cauline 2–4(–6), oblong to lanceolate, acute, the lower petiolate, the upper semiamplexicaul. Capitula (1–)2–5(–12); peduncles with numerous stellate and few to numerous simple eglandular and glandular hairs. Involucre 10–12(–14·5) × 8–12 mm; bracts linear-lanceolate, more or less acute, with few stellate and few to numerous simple eglandular and glandular hairs. Ligules usually with short simple eglandular hairs at apex. Stigmas discoloured. ● *Sudeten Mts.; Carpathians; N.E. Alps.* Au Cz Po Rm Rs (W).

Included species:

H. chlorocephalum Wimmer, *Jahresb. Schles. Ges. Vaterl. Kult.* **22**: 60 (1846). Au Cz.

H. stygium Uechtr., *Jahresb. Schles. Ges. Vaterl. Kult.* **55**: 146 (1876). Cz Po Rm Rs (W).

173. H. gombense group (*H. atratum|epimedium*). Stems 20–40 cm, with numerous simple eglandular hairs and few to numerous stellate and glandular hairs. Basal leaves absent or few; cauline (1–)2–4, ovate-oblong, ovate-lanceolate or more or less elliptical, semiamplexicaul, more or less acute, denticulate to dentate, with numerous simple eglandular hairs throughout and few to numerous minute glandular hairs on the margin. Capitula 2–12; peduncles long, with numerous stellate and simple eglandular hairs and few to numerous glandular hairs. Involucre 10–13 × 8–10 mm; bracts linear-lanceolate, more or less obtuse, with more or less numerous stellate hairs, simple eglandular hairs and glandular hairs. Ligules with short simple eglandular hairs at apex. Stigmas discoloured. ● *Alps; Sudeten Mts.* Au Cz Ga He.

Included species:

H. gombense Lagger & Christener in Christener, *Hier. Schweiz* 19 (1863). Ga He.

Other species and groups in (xviii):

H. amoenanthes E. I. Nyárády & Zahn, *Bul. Grăd. Bot. Cluj* **8**: 63 (1928) (*H. caesium|nigritum*). ● *S. Carpathians.* Rm.

H. corconticum group (*H. nigrescens|prenanthoides*). ● *Sudeten Mts.* Cz Po. (Including **H. corconticum** Knaf fil. ex Čelak., *Österr. Bot. Zeitschr.* **33**: 79 (1883). Cz Po.)

H. grofae Wołoszczak, *Spraw. Kom. Fizyogr. Krakow.* **27**: 142 (1892) (*H. chlorocephalum|umbellatum*). ● *E. Carpathians.* Rs (W).

H. palenicae Rech. fil. & Zahn, *Feddes Repert.* **31**: 356 (1933) (*H. chlorocephalum|dentatum*). ● *Czechoslovakia.* Cz.

H. riphaeoides Bornm. & Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(2)**: 401 (1931) (*H. laevigatum|riphaeum*). ● *Sudeten Mts.* Cz.

H. riphaeum group (*H. alpinum|prenanthoides*). ● *Sudeten Mts.* Cz Po. (Including **H. riphaeum** Uechtr., *Österr. Bot. Zeitschr.* **22**: 41 (1872). Cz Po.)

H. subserratosinuatum Zahn in Engler, *Pflanzenreich* **77(IV. 280)**: 837 (1921) (*H. chlorocephalum|epimedium*). ● *Tatra.* Cz.

(xix) Plants dark or glaucous-green, with glandular and simple eglandular hairs throughout. Basal leaves petiolate; cauline not amplexicaul. Inflorescence furcately branched, with few capitula. Involucre medium to large. Ligules usually glabrous. Receptacular pits subdenticulate, rarely fimbriate-dentate.

174. H. humile group. Stems 10–30 cm, with more or less numerous rigid simple eglandular and short glandular hairs. Leaves with more or less numerous, short, rigid simple eglandular and short glandular hairs; basal 20–110 × 10–40 mm, obovate, elliptical, oblong to lanceolate, obtuse to acuminate, usually deeply sinuate- or incise-dentate (the teeth often more or less mammiform and extending down the petiole); cauline 0–4(–6), the lower like the basal, sessile and often bract-like. Capitula (1–)4–12; peduncles usually long, with numerous rigid simple eglandular and short glandular hairs, sometimes with a few stellate hairs. Involucre (9–)12–15 × 8–12 mm; bracts linear-lanceolate, obtuse to more or less acute, with more or less dense subrigid simple eglandular and numerous short glandular hairs. Ligules glabrous. Stigmas yellow or discoloured. $2n=27$. *Basic rocks,* 250–2500 *m.* ● *S. & S.C. Europe, from the Vosges and S.C. Germany southwards to the Pyrenees, S. Appennini and Crna Gora.* Au Co Ga Ge He Hs It Ju.

Included species:

H. huetii Timb.-Lagr. ex Rouy, *Fl. Fr.* **9**: 439 (1905). *E. Pyrenees.* Ga.

H. humile Jacq., *Hort. Vindob.* **3**: 2 (1776). Au Ga Ge He Hs It Ju.

H. lacerum Reuter ex Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 86 (1862). Au Ga He It.

175. H. cottetii group (*H. humile|murorum*). Like **174** but leaves cordate, truncate or abruptly contracted at base; glandular hairs less numerous; peduncles with numerous stellate hairs. nairs less numerous; peduncles with numerous stellate nairs. ● *Alps.* Au Ga Ge He It.

Included species:

H. cottetii Godet ex Gremli, *Neue Beitr. Fl. Schweiz* **1**: 94 (1880). Au Ga Ge He It.

176. H. kerneri group (*H. bifidum|humile*). Like **174** but with less dense glandular hairs throughout the plant; capitula smaller, with more or less dense stellate hairs on peduncles and involucral bracts. ● *Alps, mountains of N.W. Jugoslavia.* Au Ga Ge He It Ju.

Included species:

H. balbisianum Arvet-Touvet & Briq., *Annu. Cons. Jard. Bot. Genève* **3**: 137 (1899). Au Ga He Ju.

H. kerneri Ausserdorfer ex Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1837 (1901). *E. Alps.* It.

177. H. valoddae group (*H. humile|incisum*). Like **174** but simple hairs of whole plant denser and longer; leaves with only very sparse glandular hairs; peduncles and involucral bracts with few glandular and stellate hairs; involucre 9–12 mm. ● *Alps; S. Appennini.* Au Ga Ge He It.

Included species:

H. valoddae (Zahn) Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 619 (1921). Ga Ge He.

Other species in (xix):

H. axaticum Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **3**: no. 159 (1898) (*H. cerinthoides|humile*). ● *E. Pyrenees.* Ga.

H. corsentinum Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(3)**: 121 (1936) (*H. glaucinum|humile*). ● *W. Alps.* Ga.

H. kochianum Jordan, *Cat. Jard. Grenoble* **1849**: 19 (1849) (*H. humile|lanatum*). ● *S.W. Alps.* Ga It.

H. serinense Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 614 (1921) (*H. humile|schmidtii*). ● *S. Appennini.* It.

H. subsquarrosulum Zahn, *op. cit.* 621 (1921) (*H. amplexicaule|humile*). ● *S.W. & W.C. Alps.* Ga He.

H. toutonianum Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1834 (1901) (*H. humile|schmidtii*). ● *W.C. Alps; C. Appennini.* He It.

(xx) Whole plant with numerous viscid glandular hairs, and sometimes some simple eglandular hairs. Cauline leaves 3–6(–12), large, amplexicaul. Capitula 2–12(–25), on long, arcuate peduncles. Involucre 12–18 mm. Ligules with simple eglandular hairs at apex. Margins of receptacular pits shortly dentate, ciliate with simple eglandular hairs.

178. H. amplexicaule group. Stems 10–50 cm, with stellate hairs, dense brownish, viscid glandular hairs and sometimes simple eglandular hairs. Leaves with dense, brownish, viscid glandular hairs and sometimes also simple eglandular hairs; basal numerous, 30–200 × 10–60 mm, yellowish- or glaucous-green, oblong, spathulate-obovate or lanceolate, usually obtuse and mucronate, denticulate to dentate (the teeth often more or less mammiform), attenuate into a winged petiole; cauline 3–6(–12), like the basal or more or less ovate, auriculate-amplexicaul and sometimes cordate. Capitula 2–12(–25); peduncles long, arcuate, with stellate hairs and dense, unequal, viscid glandular hairs. Involucre 12–18 × 9–16 mm; bracts linear-lanceolate, long-acute, with few to numerous stellate and dense viscid, unequal glandular hairs, sometimes with a few simple eglandular hairs. Ligules with dense simple eglandular hairs at apex. Stigmas yellow or discoloured. $2n=27$, 36. *Mountain rocks, mainly calcicole; often naturalized on old walls. C. & S. Europe.* Al Au Bl Co Ga Ge Gr He Hs Hu It Ju Lu [Be Br Ho Su].

Included species:

H. amplexicaule L., *Sp. Pl.* 803 (1753). Au Bl Ga Ge He Hs Hu It Lu.

H. petraeum Hoppe ex Bluff & Fingerh., *Comp. Fl. Germ.* **2**: 296 (1825). Al Au Co Ga Ge Gr He Hs It Ju.

H. pseudoligusticum Gremli, *Excurs.-Fl. Schweiz* ed. 7, 277 (1883). ● *Alps; Appennini.* Ga He It.

H. pulmonarioides Vill., *Prosp. Pl. Dauph.* 36 (1779). $2n=36$. ● *Pyrenees; Alps.* Au Co Ga Ge He It [Br Su].

H. speluncarum Arvet-Touvet, *Spicil. Rar. Nov. Hier.* 28 (1881). $2n=36$. ● Au Co Ga Ge He It [Br Ho].

179. H. chamaepicris Arvet-Touvet, *Annu. Cons. Jard. Bot. Genève* **1**: 102 (1897) (*H. amplexicaule|pallidiflorum*). Stems 10–35 cm, with numerous pale glandular hairs. Leaves with pale glandular hairs; basal and lowermost cauline crowded, ovate to lanceolate, obtuse to acute, irregularly dentate, attenuate into a winged petiole; remainder of cauline up to 8, like the basal, but rounded-amplexicaul at base. Capitula (1–)2–5(–12); peduncles long, arcuate, with numerous glandular hairs. Involucre 13–15 × 11–13 mm; bracts linear-lanceolate, more or less acute, with numerous glandular hairs. Ligules with dense short simple eglandular hairs at apex. Stigmas yellow. 500–1500 *m.* ● *Pyrenees.* Ga Hs.

(xxi) Like (xx) but simple eglandular or subplumose hairs usually intermixed with the glandular hairs; cauline leaves often smaller and less amplexicaul; involucre usually 9–13(–15) mm.

180. H. pseudocerinthe group (*H. amplexicaule|lawsonii*). Stems 10–40 cm, with numerous pale glandular hairs, sometimes with simple eglandular hairs below. Leaves with pale glandular hairs usually only beneath and on margin; basal 70–120 × 15–30 mm, glaucous or dark green, more or less obovate to oblanceolate, obtuse to subacute, entire to denticulate, attenuate to a petiole; cauline 2–6, the lower like the basal, the upper ovate, acuminate, more or less cordate, amplexicaul. Capitula (1–)2–6 (–20); peduncles arcuate, with stellate hairs and unequal, pale glandular hairs. Involucre 10–12(–13) × 6–9 mm; bracts linear-lanceolate, long-acute, with sparse stellate hairs and dense unequal, pale glandular hairs. Ligules with numerous short simple eglandular hairs at apex. Stigmas yellow or discoloured. 300–2300 *m.* ● *N. Spain; Pyrenees; S. France; W. Alps.* Ga He Hs It.

Included species:

H. pseudocerinthe (Gaudin) Koch, *Syn. Fl. Germ.* ed. 2, 525 (1844). Ga He It.

181. H. rupicola group (*H. leptocladum* (Griseb. ex Fries) Zahn, non Naegeli & Peter; *H. amplexicaule|lawsonii*). Like **180** but leaves deeply and irregularly dentate. ● *N. Spain; S.W. Alps.* Ga Hs.

Included species:

H. rupicola Jordan, *Cat. Jard. Dijon* 24 (1848). Ga.

182. H. cordatum group (*H. amplexicaule|cordifolium*). Stems 20–65 cm, with more or less numerous long, pale simple eglandular hairs, and pale glandular hairs often only above. Leaves with few to numerous small, pale glandular hairs and larger, pale simple eglandular hairs, and sometimes also dentate hairs; basal simple eglandular hairs, and sometimes also dentate hairs; basal 30–130 × 15–30 mm, oblanceolate, obovate, oblong to narrowly elliptical, obtuse to subacute, entire or undulate-dentate, attenuate into a winged petiole; cauline (2–)3–7(–12), large, like the basal but cordate-amplexicaul. Capitula 3–8(–30); peduncles long, arcuate, with more or less numerous stellate and glandular hairs, without or with few simple eglandular hairs. Involucre 9–12 × 7–10 mm; bracts linear-lanceolate, acute, with sparse stellate hairs, more or less numerous unequal glandular hairs and sometimes some simple eglandular hairs. Ligules with short hairs at apex. Stigmas yellow. 500–1500 *m.* ● *Pyrenees.* Ga Hs.

Included species:

H. cordatum Scheele ex Costa, *Introd. Fl. Cataluña* 158 (1864). *E. Pyrenees.* Ga Hs.

H. hispanicum Arvet-Touvet, *Not. Pl. Alpes* 19 (1883). $2n=18$. *E. Pyrenees.* Hs.

H. myagrifolium Arvet-Touvet & Gaut., *Bull. Herb. Boiss.* **5**: 719 (1897). *E. Pyrenees.* Ga Hs.

H. salvatorum Arvet-Touvet & Gaut., *Bull. Soc. Bot. Fr.* **51**: xxxvii (1904). *Pyrenees.* Ga Hs.

H. vayredanum Arvet-Touvet, *Spicil. Rar. Nov. Hier., Suppl. 2,* 46 (1886). *E. Pyrenees.* Hs.

183. H. glaucophyllum group (*H. cordatum|solidagineum*). Like **182** but cauline leaves 1–3(–4), very small; capitula 10–25. 600–900 *m.* ● *E. Pyrenees.* Hs.

Included species:

H. glaucophyllum Scheele, *Linnaea* **32**: 659 (1863). Hs.

184. H. pardoanum group (*H. eriopogon|pseudocerinthe*). Stems 20–40 cm, with simple eglandular or subplumose hairs throughout and glandular hairs above. Leaves with numerous subplumose or simple eglandular and minute glandular hairs; basal 50–80 × 15–25 mm, oblong, elliptical or elliptic-lanceolate, obtuse to acute, denticulate to dentate, attenuate into a petiole; cauline 2–4, lanceolate to ovate, acute to acuminate, sessile, semiamplexicaul. Capitula 2–12; peduncles long, arcuate, with few stellate hairs and numerous unequal glandular hairs. Involucre 10–12 × 8–10 mm; bracts linear-lanceolate, acute, with numerous unequal glandular hairs, without stellate or simple eglandular hairs. Ligules with short glandular hairs at apex. Stigmas yellow. 1200–1400 *m.* ● *C. Pyrenees.* Hs.

Included species:

H. pardoanum Arvet-Touvet & Gaut., *Bull. Soc. Bot. Fr.* **51**: xxxvii (1904). Hs.

185. H. pedemontanum Burnat & Gremli, *Cat. Hier. Alp. Marit.* 27 (1883) (*H. amplexicaule|lanatum*). Stems 15–40 cm, with dense subplumose and numerous glandular hairs. Leaves 30–150 × 10–50 mm, oblong, obovate or lanceolate, usually obtuse, denticulate to dentate, attenuate into a winged petiole, with dense pale glandular and subplumose hairs; cauline 3–5(–6), like the basal, sessile, amplexicaul. Capitula (1–)2–7(–20); peduncles with stellate hairs, dense unequal glandular hairs and few subplumose hairs. Involucre (11–)12–12·5 × 9–12 mm; bracts linear-lanceolate, long-acute, with numerous stellate, glandular and subplumose hairs. Ligules with dense short simple eglandular hairs at apex. Stigmas more or less yellow. 1000–2000 *m.* ● *S.W. Alps.* Ga It.

186. H. scapigerum group (*H. breviscapum* Boiss., Orph. & Heldr., non DC.; *H. amplexicaule|pannosum*). Stems 5–15 cm, with numerous subplumose hairs, stellate hairs and short with numerous subplumose hairs, stellate hairs and short glandular hairs. Leaves up to 10, 25–100 × 15–30 mm, mostly crowded near the base in a false rosette, ovate to oblong-lanceolate, obtuse to acute, irregularly dentate, attenuate into a short, winged petiole or sessile, with short glandular and longer subplumose hairs. Capitula 1–5; peduncles long, with stellate, glandular and subplumose hairs. Involucre 12–14 × 6–10 mm; bracts broadly linear-lanceolate, obtuse to acute, with numerous subplumose and short glandular hairs, without stellate hairs. Ligules glabrous. Stigmas yellow. Achenes pale brown. ● *Albania; Greece.* Al Gr.

Included species:

H. scapigerum Boiss., Orph. & Heldr. in Boiss., *Diagn. Pl. Or. Nov.* **3(3)**: 103 (1856). Gr.

187. H. urticaceum group (*H. amplexicaule|humile*). Stems 10–30 cm, with numerous subplumose hairs throughout and a few stellate and glandular hairs above. Leaves with subplumose and glandular hairs; basal 60–100 × 15–35 mm, elliptical to ovate or ovate-lanceolate, obtuse to acute, denticulate to dentate, attenuate into a winged petiole; cauline 3–6, like the basal, sessile or semiamplexicaul. Capitula 2–8(–16); peduncles long, with stellate, subplumose and glandular hairs. Involucre 12–15 × 10–14 mm; bracts linear-lanceolate, mostly acute, with simple eglandular and glandular hairs, without stellate hairs. Ligules with short eglandular hairs at apex. Stigmas yellow or slightly discoloured. ● *S.W. Alps.* Ga He It.

Included species:

H. urticaceum Arvet-Touvet & Ravaud in Arvet-Touvet, *Suppl. Monogr. Hier.* 10 (1876). Ga He It.

Other species and groups in (xxi):

H. adenophorum Scheele, *Linnaea* **32**: 682 (1863) (*H. cerinthoides|cordatum*). ● *E. Pyrenees.* Ga.

H. ardissonei Zahn, *Hier. Alpes Marit.* 404 (1916) (*H. amplexicaule|pictum*). ● *S.W. Alps.* Ga.

H. baenitzianum Arvet-Touvet, *Spicil. Rar. Nov. Hier., Suppl. 2*, 47 (1886) (*H. amplexicaule|candidum*). ● *C. Pyrenees.* Ga.

H. bicknellianum Belli & Arvet-Touvet in Fiori & Paol., *Fl. Anal. Ital.* **3**: 465 (1904) (*H. lawsonii|pedemontanum*). ● *S.W. Alps.* It.

H. cavanillesianum Arvet-Touvet & Gaut., *Hier. Gall. Hisp. (Exsicc.)* **15**: no. 234 (1903) (*H. amplexicaule|cerinthoides*). ● *Pyrenees.* Hs.

H. chaixianum Arvet-Touvet & Gaut., *op. cit.* **13**: no. 870 (1902) (*H. pseudocerinthe|leiopogon*). ● *S.W. Alps.* Ga.

H. digeneum Burnat & Gremli, *Cat. Hier. Alpes Marit.* 34 (1883) (*H. amplexicaule|lanatum*). ● *S.W. Alps.* Ga It.

H. gavellei De Retz, *Bull. Soc. Bot. Fr.* **112**: 444 (1965) (*H. amplexicaule|bifidum*). ● *Alpes Maritimes.* Ga.

H. glaucocerinthe Arvet-Touvet & Gaut., *Hier. Gall. Hisp. (Exsicc.)* **13**: no. 197 (1902) (*H. amplexicaule|rupicaprinum*). ● *C. Pyrenees.* Hs.

H. glaucophyllomorphum Zahn in Engler, *Pflanzenreich* **77(IV. 280)**: 731 (1921) (*H. amplexicaule|phlomoides*). ● *W. Pyrenees.* Ga.

H. lachnopsilon Arvet-Touvet, *Bull. Soc. Bot. Fr.* **41**: 351 (1894) (*H. alatum|cordatum*). ● *W. Pyrenees.* Ga.

H. oleaginicolor (Zahn) Zahn in Engler, *Pflanzenreich* **77(IV. 280)**: 742 (1921) (*H. leptocladum|rupestre*). ● *S.W. Alps.* Ga.

H. salvifolium Arvet-Touvet & Gaut., *Bull. Soc. Bot. Fr.* **41**: 352 (1894) (*H. cordatum|sonchoides*). ● *W. Pyrenees.* Ga.

H. ucenicum group (*H. amplexicaule|lawsonii*). ● *W. Alps; E. Pyrenees; ?Islas Baleares.* ?Bl Ga Hs. (Including **H. ucenicum** Arvet-Touvet, *Hier. Alpes Fr.* 52 (1888). Ga.)

H. valentinum Arvet-Touvet & Reverchon ex Willk., *Suppl. Prodr. Fl. Hisp.* 119 (1893) (*H. amplexicaule|elisaeanum*). ● *E. Spain (prov. Teruel).* Hs.

(xxii) Plants usually with yellowish glandular hairs throughout, and few or no simple eglandular hairs. Basal leaves usually present but often withered at anthesis; cauline 2–18 (–numerous), more or less amplexicaul. Inflorescence of rather numerous large capitula on long peduncles. Ligules with numerous short simple eglandular or glandular hairs or with both. Achenes sometimes pale. Margins of receptacular pits usually fimbriate-dentate, sometimes dentate.

188. H. viscosum group (*H. amplexicaule|prenanthoides*). Plant yellowish-green; stems up to 70 cm, with numerous slender, yellowish glandular hairs and sometimes a few simple eglandular and stellate hairs. Leaves with numerous yellowish glandular hairs and usually a few simple eglandular hairs; basal obovate- to lanceolate-oblong, narrowed into a petiole, usually withered at anthesis; cauline 5–15, 25–170 × 10–70 mm, ovate- to elliptic-oblong, often panduriform, denticulate to deeply dentate, sessile, more or less amplexicaul or auriculate-amplexicaul. Capitula 10–30(–numerous); peduncles long, with dense unequal glandular hairs, few to numerous stellate hairs and sometimes some simple eglandular hairs. Involucre 12–13(–15) × 8–10 mm; bracts linear-lanceolate, more or less acute, with dense unequal glandular hairs and sometimes some simple eglandular hairs. Ligules with dense short simple eglandular or glandular hairs. Stigmas yellow or discoloured. Receptacular pits fimbriate-dentate. ● *W. Alps; Pyrenees; Corse.* Co Ga He Hs It.

Included species:

H. viscosum Arvet-Touvet, *Suppl. Monogr. Hier.* 26 (1876). Co Ga He Hs It.

189. H. ramosissimum group (*H. amplexicaule|prenanthoides*). Like **188** but with dense stellate hairs on the involucral bracts; ligules with glandular hairs. ● *W. Alps; Appennini; Corse, Sardegna.* Co Ga He It Sa.

Included species:

H. adenoclinium Arvet-Touvet, *Hier. Alpes Fr.* 108 (1888). *W. Alps*; *C. Appennini*; *Corse.* Co Ga It.
H. lactucifolium Arvet-Touvet, *Monogr. Hier.* 44 (1873). *W. Alps*; *Appennini*; *Sardegna.* Ga It Sa.
H. ramosissimum Schleicher ex Hegetschw., *Beytr. Krit. Aufzähl. Schweizerpfl.* 365 (1831). *S.W. Alps; S.C. France; Corse.* Co Ga He It.

190. H. arpadianum group (*H. amplexicaule|juranum*). Stems up to 60 cm, with numerous slender glandular hairs and often some simple eglandular or subplumose hairs. Leaves more or less glaucous, with glandular and sometimes simple eglandular hairs; basal 2–4, elliptical to ovate- or lanceolate-oblong, obtuse to acute, usually denticulate, rarely dentate, rounded to truncate at base, often plicate; cauline 3–6, ovate-lanceolate to lanceolate, the lower attenuate at base, petiolate, the upper sessile, amplexicaul, sometimes with stellate hairs beneath. Capitula 5–25; peduncles with numerous stellate and glandular hairs, and sometimes a few simple eglandular hairs. Involucre 8–9 × 7–8 mm; bracts linear-lanceolate, more or less acute, with more or less numerous stellate and numerous glandular hairs, and sometimes an occasional simple eglandular hair. Ligules with more or less numerous short simple eglandular hairs at apex. Stigmas discoloured. ● *Alpes Maritimes; W. Jugoslavia; E. Greece (Thessalia).* Gr It Ju.

Included species:

H. arpadianum Zahn in Reichenb. fil., *Icon. Fl. Germ.* **19(2)**: 132 (1907). Ju.

191. H. picroides group (*H. intybaceum|prenanthoides*). Stems 30–70 cm, with few stellate hairs and dense unequal slender glandular hairs, sometimes with a few simple eglandular hairs. Leaves all cauline or rarely also a few basal which wither early, 12–18(–numerous), 30–120 × 10–20(–25) mm, oblong-lanceolate, oblong-elliptical or oblong, sometimes panduriform, more or less acute, denticulate to dentate, with numerous, unequal glandular and usually some simple eglandular hairs; the lower narrowed at base, semiamplexicaul, the remainder broadly amplexicaul at base, sometimes with stellate hairs beneath. Capitula 2–12 (–many); peduncles with dense stellate and dense unequal glandular hairs, sometimes with occasional simple hairs. Involucre 10–13 × 9–11 mm; bracts broadly linear-lanceolate, obtuse to acute, with more or less numerous stellate hairs, dense unequal glandular hairs and sometimes some simple eglandular hairs. Ligules with numerous minute glandular hairs at apex. Stigmas discoloured. Receptacular pits dentate. 1700–2350 *m.* ● *Alps.* Au Ga Ge He It.

Included species:

H. ochroleucum Schleicher ex Koch, *Syn. Fl. Germ.* ed. 2, 528 (1844). *Alps.* Au Ga It.
H. picroides Vill. in Vill., G. Lauth & A. Nestler, *Précis Voy. Bot.* 22 (1812). *Alps.* Au Ga Ge He It.
H. sieberi Tausch, *Flora (Regensb.)* **11** (Ergänz. 1): 75 (1828). *Alps.* Au Ga He.

192. H. neopicris group (*H. chamaepicris|prenanthoides*). Like **191** but ligules with dense glandular hairs; receptacular pits fimbriate-dentate. ● *Pyrenees.* Ga Hs.

Included species:

H. neopicris Arvet-Touvet, *Spicil. Rar. Nov. Hier.* 34 (1881). Ga Hs.

Other species and groups in (xxii):

H. hermanii-zahnii Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 852 (1921) (*H. epimedium|picroides*). ● *E. Alps (Kärnten).* Au.

H. pseudostenoplecum group (*H. juranum|picroides*). 1500–2300 *m.* ● *Alps.* Au He. (Including **H. pseudostenoplecum** Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1900 (1901). Au He.)

H. stenoplecum group (*H. intybaceum|prenanthoides*). ● *Alps.* Au Ga Ge He. (Including **H. stenoplecum** Arvet-Touvet & Huter, *Bull. Soc. Bot. Fr.* **41**: 363 (1894). Au Ga He.)

H. vetteranum Ronniger & Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1062 (1922) (*H. picroides|sparsum*). ● *Austria.* Au.

H. xanthoprasinophyes Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(3)**: 418 (1939). ● *S.E. Austria.* Au.

(xxiii) Whole plant with viscid glandular hairs, stellate and simple eglandular hairs sometimes present. Leaves all cauline, but often grouped in lower part of stem in a false rosette. Capitula 1–6, on long, erect peduncles. Involucre 12–18 mm. Ligules usually glabrous. Margins of receptacular pits dentate, sometimes ciliate.

193. H. intybaceum All., *Auct. Syn. Stirp. Horti Taur.* 19 (1773). Stems 5–30 cm, with dense unequal, yellowish-green, viscid glandular hairs. Leaves 30–160 × 5–20 mm, numerous, all cauline, with dense, unequal, yellow, viscid glandular hairs; the lower sometimes forming a false rosette, yellowish-green, lanceolate or oblong to linear-lanceolate, obtuse to acute, dentate (the teeth often cusped), narrowed into a short, winged petiole, the upper smaller, more or less amplexicaul. Capitula 1–6; peduncles long (sometimes arising nearly at base of plant), leafy, with few to numerous stellate hairs and dense unequal, viscid glandular hairs. Involucre 12–18 × 10–18 mm; bracts oblong-lanceolate, mostly obtuse, with or without numerous stellate hairs and with dense unequal glandular hairs. Ligules whitish-yellow, glabrous. Stigmas discoloured. $2n=27$. ● *Alps.* Au Ga Ge He It Ju.

194. H. pallidiflorum group (*H. intybaceum|prenanthoides*). Like **193** but leaves up to 15, more or less lanceolate to ovate-lanceolate and amplexicaul. ● *Alps; Pyrenees.* Au Ga He Hs It.

Included species:

H. lantoscanum Burnat & Gremli, *Cat. Hier. Alpes Marit.* 22 (1883). Ga He Hs It.
H. pallidiflorum Jordan ex Ascherson, *Flora (Regensb.)* **37**: 119 (1854). Although this name has always been used for this group of plants in the aggregate sense, it has never been typified and it is uncertain to which segregate the name applies.

195. H. khekianum Zahn in Schinz & R. Keller, *Fl. Schweiz* ed. 2, **2**: 319 (1905) (*H. alpinum|intybaceum*). Stems 10–20 cm, with numerous glandular hairs. Leaves in a false rosette near the base of stem, with 2–3 distant cauline leaves, lanceolate to spathulate, obtuse to acute, attenuate into a petiole, with numerous glandular and a few simple eglandular hairs. Capitula 1–2; peduncles very long, with dense glandular hairs. Involucre 12–15 × 10–13 mm; bracts linear-lanceolate, more or less acute, with numerous glandular and very occasional solitary simple eglandular hairs. Ligules glabrous. Stigmas yellowish or discoloured. ● *C. Alps.* Au He.

Other species in (xxiii):

H. adenodermum Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1862 (1901) (*H. alpinum|intybaceum|murorum*). ● *C. Alps.* He.

H. andreanszkyanum F. Kováts, *Borbásia* **5–6**: 77 (1946). ● *E. Alps.* Au.

H. macrocephalum Huter ex Dalla Torre, *Anleit. Beob. Bestimm. Alpenfl.* 271 (1882) (*H. kalsianum|pallidiflorum*). 1900–2000 *m.* ● *C. Alps.* Au.

(D) Leaves more or less glaucous, often glabrous or nearly so, usually glabrous above, glandular and plumose hairs usually absent; basal few to numerous or absent at anthesis; cauline 3–numerous. Capitula few to numerous. Margins of receptacular pits dentate.

(xxiv) Leaves glaucous, glabrous or with few to numerous simple eglandular hairs mainly on the margin and midrib beneath; basal numerous; cauline 3–25. Capitula few to many, usually on long peduncles. Ligules glabrous or shortly ciliate. Stigmas yellow or discoloured. Margins of receptacular pits shortly dentate. Achenes yellowish- to dark brown.

196. H. porrifolium L., *Sp. Pl.* 802 (1753). Stems 30–45(–60) cm, glabrous or nearly so. Basal leaves 25–140 × 1–3(4·5) mm, filiform to linear, acute, entire, rarely remotely denticulate, the margin often subrevolute and glabrous or with few long hairs; cauline (3–)5–15, like the basal. Capitula (2–)6–20(–30); peduncles long, slender, glabrous or with a few stellate hairs. Involucre 9–10(–11) × 9–10 mm; bracts linear to linear-lanceolate, more or less obtuse, with few to numerous stellate hairs especially on the margin and at the base, without simple eglandular hairs, without or with occasional small glandular hairs. Stigmas yellow or discoloured. Achenes pale yellowish-brown. $2n=18$. *Rocky places and grassy slopes on limestone*; 60–400(–2100) *m.* ● *S Alps.* Au It Ju.

197. H. bupleuroides group. Stems 20–40(–60) cm, glabrous or with few to numerous long simple eglandular hairs near the base. Basal leaves numerous, 50–160 × 4·5–10(–15) mm, linear-lanceolate to narrowly elliptical, acute, entire, gradually narrowed to base, without an obvious petiole, glabrous or with long simple eglandular hairs mainly on the margin and midrib beneath; cauline (3–)5–10(–15), like the basal. Capitula 2–5(–12); peduncles long, usually with some stellate hairs, sometimes with more or less numerous simple eglandular hairs, rarely with a few small glandular hairs. Involucre (10–)12–15 × 15–20 mm; bracts obtuse to subacute, with few to numerous stellate hairs, few to numerous long simple eglandular hairs, rarely with a few small glandular hairs. Stigmas yellow or discoloured. Achenes pale to blackish-brown. $2n=27$. *Calcareous rocks and screes. Alps; Carpathians; C. Appennini; N.W. part of Balkan peninsula.* Al Au Cz Ga Ge He Hu It Ju Po Rs (W).

Included species:

H. bupleuroides C. C. Gmelin, *Fl. Bad.* **3**: 317 (1808). Au Ga Ge Hu It Po.

198. H. glaucum group. Like **197** but leaves often up to 16 mm wide, denticulate to shallowly dentate, often with an obvious petiole; cauline 2–6(–10); capitula 4–8(–15); involucre 9–11(–13) mm. $2n=27$, 36. *Calcareous scree and stony grassland,* 60–2000 *m. Alps; C. Appennini; N. Jugoslavia.* Au ?Cz Ga Ge He It Ju.

Included species:

H. glaucum All., *Auct. Syn. Stirp. Horti Taur.* 19 (1773). Ga It.

H. limonense Burnat & Gremli, *Cat. Hier. Alpes Marit.* 9 (1883). ● *Alps.* Au He It Ju.

H. willdenowii Griseb., *Comment. Hier.* 74 (1852). ● *Alps.* Au Ge He Ju.

199. H. sparsiramum group (*H. subglaberrimum* (Sendtner) Zahn; *H. bupleuroides/villosum*). Like **197** but involucral bracts long-acute and with more or less dense simple eglandular hairs. ● *Alps.* Au Ge He.

Included species:

H. sparsiramum Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 70 (1886). Au Ge.

200. H. falcatum group (*H. bupleuroides/prenanthoides*). Like **197** but basal leaves often withered at anthesis; cauline leaves broad and semiamplexicaul at base; involucral bracts with few glandular hairs. ● *Alps, N.W. Jugoslavia.* Au Ga He Ju.

Included species:

H. falcatum Arvet-Touvet, *Monogr. Hier.* 22 (1873). Ga He.

201. H. glabratum group (*H. glaucum/villosum*). Like **197** but involucre villous with long, white simple eglandular hairs and ligules with short simple eglandular hairs at apex. *Calcicole.* ● *Mountains of C. Europe, extending southwards to Albania and C. Appennini.* Al Au Ga Ge He It Ju Rm.

Included species:

H. glabratiforme J. Murr, *Deutsche Bot. Monatsschr.* **15**: 226 (1897). Al Au Ju.

H. glabratum Hoppe ex Willd., *Sp. Pl.* **3**: 1562 (1803). Al Au It Ju Rm.

H. pseudoflexuosum (Naegeli & Peter) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 265 (1976) (*H. glabratum* subsp. *pseudoflexuosum* Naegeli & Peter). Au Ga He Rm.

202. H. franconicum Griseb., *Comment. Hier.* 56 (1852) (*H. glaucum/murorum*). Stems 25–30 cm, with sparse simple eglandular hairs. Leaves glabrous above, with more or less numerous simple eglandular hairs beneath and on the margin, sometimes with a few stellate hairs beneath; basal coriaceous, sometimes spathulate, oblong to lanceolate, obtuse to long-acute, remotely denticulate to dentate; cauline 0–2(–3), like the basal but narrower. Capitula 2–6(–12); peduncles with few minute glandular hairs and simple eglandular hairs and dense stellate hairs. Involucre 10–12 × 9–10 mm; bracts lanceolate, obtuse to subacute, with more or less dense stellate hairs, few simple eglandular hairs and sparse glandular hairs. Stigmas yellowish. Achenes dark. ● *W. Alps.* Ga Ge.

203. H. oxyodon group (*H. bifidum/glaucum* (vel *bupleuroides*)). Stems 10–35 cm, without or with few simple eglandular hairs, with few stellate hairs, without glandular hairs. Leaves glabrous above, with few to numerous simple eglandular hairs beneath and on the margin; basal 70–110 × 5–15 mm, broadly to narrowly lanceolate, the outer obtuse, the inner more or less acute, attenuate at base, denticulate to deeply dentate; cauline 0–3, like the basal but smaller or bract-like. Capitula up to 10; peduncles with few stellate hairs, without or with few simple eglandular hairs, without simple glandular hairs. Involucre 9–12(–14) × 8–10(–12) mm; bracts narrowly to broadly lanceolate, obtuse to acute: with more or less numerous stellate hairs especially on the margin, without or with few glandular hairs or few to numerous simple eglandular hairs, or with both. Stigmas yellowish to discoloured. Achenes dark. ● *Alps, extending southwards to Crna Gora.* Au Ga Ge He It Ju.

Included species:

H. ganderi Hausm. ex Fries, *Hier. Eur. Exsicc.* no. 83 (1862). *E. Alps.* Au It Ju.

H. oxyodon Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 90 (1862). *Alps.* Au Ga He It Ju.

204. H. fulcratum group (*H. humile/oxyodon*). Like **203** but whole plant very sparsely covered with minute glandular hairs. ● *C. & S.W. Alps.* Ga He It.

Included species:

H. fulcratum Arvet-Touvet, *Bull. Herb. Boiss.* **2**: 621 (1894). Ga.

205. H. neyraeanum group (*H. arrectum* Gren. ex Zahn, non Jordan; *H. glaucum/prenanthoides*). Stems 30–55 cm, often with a few simple eglandular hairs below. Leaves glabrous above, usually with simple eglandular hairs on margin and veins beneath; basal 0–6, oblong-lanceolate to more or less lanceolate, the outer obtuse, the inner long-acute, narrowed below into a winged petiole; cauline 3–6(–12), lanceolate, the upper narrower, long-acuminate, semiamplexicaul. Capitula 3–10(–18); peduncles with few stellate hairs and minute glandular hairs, without or with very few simple eglandular hairs. Involucre (9–)10–11(–12) × 6–9 mm; bracts obtuse to subacute, with more or less dense stellate hairs, few simple eglandular hairs and few glandular hairs. Ligules sometimes shortly ciliate. Stigmas discoloured. ● *S.W. Alps.* Ga It.

Included species:

H. neyraeanum Arvet-Touvet, *Not. Pl. Alp., Suppl.* **1**: 30 (1883). Ga.

206. H. austriacum group (*H. glaucum/murorum*). Stems 25–50 cm, with simple eglandular hairs, stellate hairs and usually glandular hairs. Leaves denticulate to dentate, glabrous or with few simple eglandular hairs above, with more or less numerous stellate and simple eglandular hairs beneath; outer basal more or less obovate, subobtuse, contracted at base, the remainder elliptic-lanceolate to lanceolate, more or less acute, attenuate at base; cauline up to 3, lanceolate or narrower, denticulate. Capitula 2–15(–20); peduncles with stellate hairs, and few dark simple eglandular hairs, glandular hairs few to numerous or absent. Involucre 10–12 × 7–9 mm; bracts broad, obtuse to subacute, with stellate and dense glandular hairs, without or with few simple eglandular hairs. Stigmas discoloured. ● *Alps.* Au Ge It Ju.

Included species:

H. austriacum Brittinger, *Fl. Ober-Österr.* 67 (1862). Au Ge It Ju.

207. H. dollineri group (*H. bifidum/glaucum*). Like **206** but leaves often more dentate and sometimes spotted; peduncles with numerous glandular hairs; involucral bracts with more or less numerous simple eglandular hairs; stigmas yellow or discoloured. ● *E. Alps; W. Carpathians.* Au Cz Ge It Ju.

Included species:

H. dollineri Schultz Bip. ex F. W. Schultz, *Flora* (*Regensb.*) **33**: 212 (1850). Au Cz Ge It Ju.

208. H. calcareum group (*H. illyricum* Fries; *H. laevigatum/porrifolium*). Stems 20–80 cm, glabrous or with a few stellate hairs above. Leaves glabrous or with few to numerous simple eglandular hairs beneath; basal 20–120 × 5–15 mm, narrowly to broadly lanceolate, acute to long-acuminate, denticulate to dentate; cauline 3–15, like the basal or narrower, gradually becoming smaller up the stem. Capitula 1-numerous; peduncles with numerous stellate hairs especially near apex. Involucre 10–13 × 9–11 mm; bracts acute, with numerous stellate hairs, sometimes with a few simple eglandular or glandular hairs, or with both. Stigmas discoloured. ● *Alps.* Au He It Ju.

Included species:

H. calcareum Bernh. ex Hornem., *Hort. Hafn.* **2**: 762 (1815). It.

209. H. saxatile group (*H. glaucum/laevigatum*). Like **208** but basal leaves sometimes absent at anthesis; leaves with few or numerous stellate hairs beneath; cauline leaves 8–25; involucral bracts more or less obtuse; stigmas yellow or discoloured. *Alps.* Au ?Cz He It Ju.

Included species:

H. saxatile Jacq., *Obs. Bot.* **2**: 30 (1764). Au He It Ju.

210. H. naegelianum group. Stems 10–25 cm, glabrous or with few stellate and glandular hairs above. Leaves glabrous or with few simple eglandular hairs mainly on the margin; basal 30–60 × 7–12 mm, spathulate or lanceolate to linear, obtuse to acute, entire, sometimes undulate, attenuate at base, subpetiolate; cauline 2–3, narrowly linear to subulate. Capitulum 1(–2). Involucre 9–10 × 7–9 mm; bracts narrow, acute, with few to numerous simple eglandular hairs and sometimes a few glandular hairs. Stigmas yellow. *Balkan peninsula; C. & S. Appennini.* Al Bu Gr It Ju.

Included species:

H. naegelianum Pančić, *Elench. Pl. Vasc. Crna Gora* 57 (1875). Al Bu Gr Ju.

211. H. silesiacum group. Stems 10–80 cm, glabrous or with a few simple eglandular hairs, rarely with a few stellate and glandular hairs. Leaves often glabrous above, with few to numerous simple eglandular hairs beneath and on the margin and sometimes with a few minute glandular hairs on the margin; basal 60–120 × 12–22 mm, oblong-lanceolate to linear, obtuse to acute, entire to more or less denticulate, more or less narrowed into a winged petiole; cauline (1–)2–8(–numerous), lanceolate to linear, more or less acuminate, narrowed or rounded at base, sessile and often slightly amplexicaul. Capitula few to numerous; peduncles long, bracteate, with stellate, simple eglandular and glandular hairs. Involucre (8–)9–12(–14) × 8–11 mm; bracts usually obtuse, the outer often more or less squarrose, glabrous or with few to numerous simple eglandular and glandular hairs. Stigmas discoloured. *Mountains of Balkan pensinsula and of C. Europe westwards to* 11° *E.* Al Au Bu Cz Gr Ju Po Rm.

Included species:

H. grisebachii A. Kerner, *Sched. Fl. Exsicc. Austro-Hung.* **1**: 63 (1881). ● Au Bu.

H. silesiacum Krause, *Jahresb. Schles. Ges. Vaterl. Kult.* **28**: 101 (1851). ● Cz Po.

Other species and groups in (xxiv):

H. annae-toutoniae Zahn in Reichenb. fil., *Icon. Fl. Germ.* **19(2)**: 84 (1906) (*H. dollineri/schmidtii*). ● *E. Switzerland* (*Oberengadin*). He.

H. belogradcense Georgiev & Kitanov, *Bull. Soc. Bot. Bulg.* **8**: 77 (1939). ● *N.W. Bulgaria.* Bu.

H. breazense E. I. Nyárády, *Bul. Grăd. Bot. Cluj* **13**: 66 (1936). ● *S. Carpathians and mountains of Transylvania.* Rm.

H. carinthiostiriacum Vetter & Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(3)**: 698 (1938). ● *S. Austria.* Au.

H. crucimontis group (*H. calcareum/laevigatum*). ● *S.E. Alps.* Au It Ju. (Including **H. crucimontis** (Zahn) Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 76 (1921). Au Ju.)

H. excellens J. Murr ex Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1805 (1901) (*H. bupleuroides/chondrillifolium*). ● *Tirol.* Au.

H. fritschianum Hayek & Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1032 (1922). (*H. glabratum/naegelianum*). ● *N. Albania* (*Bjeshkët e Nemuna*). Al.

H. geilingeri Zahn, *Mitt. Bot. Mus. Zürich* **41**: 163 (1908) (*H. murorum/porrifolium*). ● *N. Italy* (*N.E. of Lecco*). It.

H. grecescui E. I. Nyárády & Zahn, *Bul. Grăd. Bot. Univ. Cluj* **8**: 75 (1928) (*H. bifidum/rotundatum*). ● *S. Carpathians.* Rm.

H. harzianum group (*H. franconicum/laevigatum*). ● *E.C. Germany.* Ge. (Including **H. harzianum** Zahn, *Allgem. Bot. Zeitschr.* **13**: 37 (1907). Ge.)

H. hayekii J. Murr, *Österr. Bot. Zeitschr.* **50**: 60 (1900) (*H. porrifolium/vulgatum*). ● *S.E. Alps.* Au It.

H. juratzkae Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 76 (1921) (*H. austriacum/saxatile*). ● *Near Wien.* Au.

H. kaeseranum group (*H. glaucum* (vel *bupleuroides*)/*humile*). ● *Alps.* Ga He. (Including **H. kaeseranum** Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1832 (1901). Ga He.)

H. lingelsheimii Pax, *Grundz. Pflanzenverbr. Karp.* **2**: 97 (1908) (*H. goemoerense* Borbás ex Zahn; *H. bupleuroides/laevigatum*). ● *W. Carpathians.* Cz.

H. longifoliosum E. I. Nyárády in Săvul., *Fl. Rep. Pop. Române* **10**: 731 (1965) (*H. paltinae/sparsum*). ● *S. Carpathians.* Rm.

H. oligodon Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 51 (1886) (*H. glabratum/porrifolium*). ● *E. Alps.* Au ?It.

H. perfoliosum E. I. Nyárády in Săvul., *Fl. Rep. Pop. Române* **10**: 731 (1965) (*H. paltinae|sparsum*). ● *S. Carpathians.* Rm.

H. pisaturense E. I. Nyárády, *Bul. Grăd. Bot. Univ. Cluj* **8**: 149 (1928) (*H. atratiforme|retyezatense*). ● *S. Carpathians.* Rm.

H. pizense Zahn, *Hier. Alpes Marit.* 155 (1916) (*H. glaucum|lanatum*). ● *Alpi Marittime.* It.

H. predilense group (*H. glaucum|porrifolium*). ● *S.E. Alps.* Au It Ju. (Including **H. predilense** (Naegeli & Peter) Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1787 (1901). Au It Ju.)

H. riumarense E. I. Nyárády in Săvul., *Fl. Rep. Pop. Române* **10**: 732 (1965). ● *S. Carpathians.* Rm.

H. sanctoides P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 266 (1976) (*H. sanctum* Naegeli & Peter, non L.; *H. glaucum|pospichalii*). ● *S.E. Alps.* It Ju.

H. telekianum Boros & Lengyel, *Scripta Bot. Mus. Transs.* **1**: 8 (1942). ● *S. Carpathians.* Rm.

H. velebiticum Degen & Zahn, *Magyar Bot. Lapok* **5**: 82 (1906) (*H. bupleuroides|sparsum*). ● *Velebit.* Ju.

H. wichurae Zahn in Ascherson & Graebner, *Syn. Mitteleur. Fl.* **12(2)**: 205 (1935). ● *S. Carpathians.* Rm.

(xxv) Leaves rather glaucous, glabrous or nearly so; basal withered at anthesis; cauline 1–4; entire or denticulate, glabrous or with sparse hairs on the margin. Capitula 2–12, with few florets, nodding in bud, on long, slender peduncles. Outer involucral bracts squarrose. Ligules pale yellow, glabrous. Stigmas discoloured. Margins of receptacular pits dentate. Achenes pale brown.

212. H. sparsum Friv., *Flora* (*Regensb.*) **19**: 436 (1836). Stems 10–20(–25) cm, glabrous or nearly so. Leaves rather glaucous, glabrous or with sparse simple eglandular hairs on the margin; basal soon withering, linear-lanceolate or lanceolate, acute, entire or denticulate, slightly narrowed at base to an indistinct petiole; cauline 1–4, similar to basal, sessile, or bract-like. Capitula 2–12, with few florets, nodding in bud; peduncles slender, long, glabrous. Involucre 8–10 × 7–9 mm; bracts obtuse to acute, the outer squarrose, glabrous or nearly so. Stigmas discoloured. $2n=18$. *S.E. Europe.* Al Bu Gr Ju Rm.

This very distinct species is quite unlike a *Hieracium* in general appearance, but it is connected to other species by taxa here placed in (xxiv).

(xxvi) Leaves glaucous; basal few or absent; cauline 3–30 (–numerous), entire to shallowly dentate, often glabrous above, often with long rigid hairs on margin. Capitula 3–numerous. Ligules glabrous. Stigmas yellow or discoloured. Margins of receptacular pits dentate. Achenes stramineous to brown.

213. H. heterogynum group (*H. stuppeum* Griseb., *Crepis heterogyna* Froelich). Stems 30–70 cm, with numerous stellate hairs and few to dense rigid, flexuous simple eglandular hairs up to 18 mm below. Leaves usually glabrous above, with few simple eglandular hairs beneath, and few to numerous rigid simple eglandular hairs up to 15 mm on the margin, sometimes with a few minute glandular hairs; basal 20–90 × 5–20 mm, lanceolate, oblanceolate or lanceolate-oblong, obtuse to acute, undulate, often plicate, rarely denticulate, narrowed into a long petiole; cauline 3-several, lanceolate to linear, often small. Capitula 3–40; peduncles usually long, slender, with dense stellate hairs, and occasionally with simple eglandular or minute glandular hairs or with both. Involucre 9–12 × 5–8 mm; bracts more or less acute, with numerous stellate hairs and minute glandular hairs, occasionally with a few simple eglandular hairs. Achenes stramineous. ● *W. & C. parts of Balkan peninsula.* Al Bu Ju.

Included species:

H. heterogynum (Froelich) Guterm., *Österr. Bot. Zeitschr.* **122**: 262 (1973). Al Bu Ju.

214. H. macrodon group (*H. bifidum|heterogynum*). Like **213** but leaves sometimes with stellate hairs beneath; involucre with numerous simple eglandular hairs. ● *W. Jugoslavia.* Ju.

Included species:

H. macrodon Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 84 (1886). Ju.

215. H. macrodontoides group (*H. heterogynum|tommasinii*). Like **213** but basal leaves few or absent; simple eglandular hairs of stem and leaves up to 8 mm; achenes darker. ● *S.W. Jugoslavia.* ?Al Ju.

Included species:

H. macrodontoides (Zahn) Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 967 (1922). ?Al Ju.

216. H. tommasinii group (*H. heterogynum|racemosum*). Like **213** but without basal leaves; cauline numerous, large, often remotely dentate; stigmas discoloured; achenes darker. ● *N. part of Balkan peninsula.* Al Bu Ju.

Included species:

H. tommasinii Reichenb. fil., *Icon. Fl. Germ.* **19(1)**: 100 (1859). Al Bu Ju.

217. H. olympicum group (*H. heterogynum|racemosum*). Stems 40–80 cm, with few to numerous stellate hairs and dense patent, rigid simple eglandular hairs 8–25 mm. Leaves 12–20(–30), 20–200 mm, glaucous, with rigid, patent, bulbous-based simple eglandular hairs 3–6 mm, with a few minute glandular hairs on the margin, the lower leaves oblong or oblong-lanceolate, more or less acute, denticulate to shallowly dentate, long-attenuate into a winged petiole, the upper ovate-lanceolate to linear, smaller. Capitula 4–8(–15); peduncles bracteate, with numerous stellate hairs, dense rigid simple eglandular hairs and few glandular hairs. Involucre (9–)12–15(–17) × 8–11 mm; bracts wide, obtuse to acute, with few to dense rigid simple eglandular hairs up to 18 mm, dense stellate hairs and few minute glandular hairs. Achenes pale brown. *Mountains of Bulgaria and N.E. Greece.* Bu Gr.

Included species:

H. argyrotrichum Freyn in Velen., *Fl. Bulg.* 349 (1891). Bu ?Gr.
H. olympicum Boiss., *Diagn. Pl. Or. Nov.* **1(4)**: 30 (1844) is confined to Anatolia.

218. H. leiocephalum group (*H. porrifolium|umbellatum*). Stems 90–125 cm, glabrous or with simple eglandular hairs at the base. Leaves numerous, glaucous, linear to narrowly lanceolate, entire to dentate, glabrous or with few stellate and simple eglandular hairs beneath. Capitula numerous; peduncles with numerous bracts and dense stellate hairs in the upper part. Involucre (8–)10–11(–18) mm; bracts narrow to wide, usually acute, with stellate hairs especially at the base, sometimes with a few simple eglandular or minute glandular hairs, or with both. Stigmas usually discoloured. Achenes pale brown. ● *S.E. Alps.* It Ju.

Included species:

H. leiocephalum Bartl. ex Griseb., *Comment. Hier.* 72 (1852). It Ju.

219. H. virgicaule group (*H. bupleuroides|umbellatum*). Stems up to 80 cm, glabrous or with a few simple eglandular hairs below. Leaves numerous, gradually becoming smaller up the stem, lanceolate, acute, more or less serrate-dentate, often with a few stellate hairs beneath, and with a few simple eglandular hairs in the axil with the stem. Capitula numerous, often forming umbels; peduncles with numerous bracts, glabrous or nearly so. Involucre 11–13 × 10–12 mm; bracts wide, obtuse to subacute, the outer often more or less patent, with few stellate hairs and sometimes a few simple eglandular or simple glandular hairs, or with both. Stigmas discoloured. Achenes dark. ● *Carpathians and mountains of N. Hungary.* Cz Hu Po Rm Rs (W).

Included species:

H. virgicaule Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 72 (1886). Cz Hu.

220. H. pseudobupleuroides group (*H. bupleuroides|sabaudum*). Stems 60–120 cm, nearly glabrous. Leaves more or less lanceolate, denticulate to coarsely serrate, glabrous or with simple eglandular hairs on the margin and beneath. Capitula 6–many; peduncles with stellate hairs. Involucre 12–15 × 10–12 mm; bracts wide, acute to obtuse, with few stellate and simple eglandular hairs and rarely a few minute glandular hairs. Achenes dark brown. ● *N.E. Alps; from the W. Carpathians to Slovenia.* Au Cz Ju ?Po.

Included species:

H. pseudobupleuroides Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 74 (1886). Au.

Other species and groups in (xxvii):

H. bjeluschae group (*H. murorum|tommasinii*). ● *Bosna.* Ju. (Including **H. bjeluschae** K. Malý & Zahn, *Magyar Bot. Lapok* **8**: 307 (1909). Ju.)

H. dragicola group (*H. latifolium|porrifolium*). ● *N.W. Jugoslavia.* (Including **H. dragicola** (Naegeli & Peter) Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 81 (1921). Ju.)

H. leucopelmatum group (*H. heterogynum|waldsteinii*). ● *W. Jugoslavia.* Ju. (Including **H. leucopelmatum** Naegeli & Peter, *Hier. Mittel-Eur.* **2**: 80 (1886). Ju.)

H. obrovacense Degen & Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 966 (1922) (*H. heterogynum|latifolium*). ● *Velebit.* Ju.

H. pospichalii group (*H. porrifolium|racemosum*). ● *S.E. Alps.* It Ju. (Including **H. pospichalii** Zahn, *Neue Denkschr. Schweiz. Ges. Naturw.* **40**: 705 (1906). It Ju.)

H. pseudostupposum Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 922 (1922) (*H. heterogynum|waldsteinii*). ● *S.W. Jugoslavia, N. Albania.* Al Ju.

H. pseudotommasinii group (*H. heterogynum|tommasinii*). ● *W. & C. Jugoslavia.* Ju. (Including **H. psendotommasinii** Rohlena & Zahn, *Feddes Repert.* **6**: 237 (1909). Ju.)

(E) Leaves usually without glandular or plumose hairs; basal usually absent or withered at anthesis; cauline usually numerous. Capitula usually numerous, in a large panicle. Margins of receptacular pits dentate or fimbriate-dentate. Late-flowering (mainly July–September).

(xxvii) Basal leaves usually present at anthesis; cauline 2–12(–25), at least the upper more or less amplexicaul, often slightly panduriform. Inflorescence usually of numerous capitula in a large panicle. Involucral bracts linear-lanceolate, obtuse to acute, with numerous glandular and usually few or no simple eglandular hairs. Ligules glabrous or with few simple eglandular hairs at the apex. Stigmas usually discoloured. Margins of receptacular pits dentate. Achenes dark brown.

221. H. umbrosum group (*H. murorum|prenanthoides*). Stems 30–70 cm, with few to numerous simple eglandular hairs throughout and few stellate and glandular hairs above. Leaves with more or less numerous simple eglandular hairs, sometimes glabrous above; basal 30–140 × 10–60 mm, few, elliptical or elliptic-lanceolate, obtuse to acute, denticulate to dentate, rounded or narrowed into a long petiole; cauline 2–5(–10), remote, like the basal but often ovate, the lower more or less petiolate. Peduncles with dense stellate and numerous glandular hairs, usually without simple eglandular hairs. Ligules glabrous or with few simple eglandular hairs at apex. ● *From arctic Russia to the Pyrenees, C. Italy and Greece; only on mountains in the south.* Al Au Bu Co Cz Da Ga Ge Gr He Hs It Ju No Po Rm Rs (N, W).

Included species:

H. eugraptum Omang, *Nyt Mag. Naturvid.* (*Christiania*) **48**: 214 (1910). No.
H. pseudofastigiatum Degen & Zahn, *Magyar Bot. Lapok* **5**: 68 (1906). Al Bu Ju Rm.
H. umbrosum Jordan, *Cat. Jard. Dijon* 24 (1848). Au Co Cz Da Ga Ge Gr He Hs It Ju No Po Rs (W).
H. vipetinum Huter ex Freyn, *Österr. Bot. Zeitschr.* **37**: 394 (1887). *Alps; W. Carpathians.* Au Cz Ga He It.

222. H. viride group (*H. schmidtii|umbrosum*). Like **221** but leaves more or less glaucous, with rigid simple eglandular hairs above and on margin and sometimes with a few minute glandular hairs on the margin; sometimes with simple eglandular hairs on involucral bracts. 1800–2300 *m.* ● *W. Alps; Pyrenees.* ?Co Ga He Hs It.

Included species:

H. brumale Arvet-Touvet, *Hier. Alpes Fr.* 71 (1888). *S.W. Alps; Pyrenees.* Ga Hs.
H. submacilentum (Rouy) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 267 (1976) (*H. subalpinum* subsp. *submacilentum* Rouy). *S.W. Alps; Pyrenees.* ?Co Ga.
H. viride Arvet-Touvet, *Essai Pl. Dauph.* 69 (1871). Ga ?Hs It.

223. H. pinicola group (*H. cerinthoides|murorum|prenanthoides*). Like **221** but with more or less numerous simple eglandular hairs on the involucral bracts. ● *Pyrenees.* Ga Hs.

Included species:

H. pinicola Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **20**: no. 416 et 417 (1908). Hs.

224. H. rapunculoides group (*H. prenanthoides|vulgatum*). Stems 40–120 cm, with few simple eglandular and stellate hairs and sometimes a few small glandular hairs above. Leaves 20–140 × 5–40 mm, with more or less numerous simple eglandular hairs or glabrous above, the upper sometimes with stellate hairs beneath; basal few or none; cauline 6–12(–25), elliptical to lanceolate, obtuse to acute, denticulate to dentate, the lower attenuate into a petiole, the remainder sessile, cordate. Capitula in an elongated panicle; peduncles with numerous bracts, and

numerous stellate and glandular hairs, usually without simple eglandular hairs. Involucre 8–10 × 8–10 mm; bracts more or less obtuse, with few to numerous stellate and numerous unequal glandular hairs, usually without simple eglandular hairs. Ligules often with a few short simple eglandular hairs at apex. ● *From the E. Alps to the Pyrenees.* Au Ga Ge He Hs It.

Included species:

H. rapunculoides Arvet-Touvet, *Suppl. Monogr. Hier.* 17 (1876). Au Ga Ge He It.

225. H. pedatifolium group (*H. haematopodum* Zahn; *H. umbrosum*|*vulgatum*). Like **224** but cauline leaves 2–5(–7), mostly narrowed into a winged petiole; involucre usually with fewer glandular hairs and often with some simple eglandular hairs. ● *Alps*; *W. Carpathians; Norway.* Au Ga Cz He It No.

Included species:

H. haematopodum Zahn in Schinz & R. Keller, *Fl. Schweiz* ed. 3, **2**: 489 (1914). Au He.
H. pedatifolium Omang, *Nyt Mag. Naturvid.* (*Christiania*) **48**: 209 (1910). No.

Other species and groups in (xxvii):

H. cavillieri group (*H. bifidum*|*prenanthoides*). ● *Alps*; ?*C. Appennini.* Au Ga Ge It. (Including **H. cavillieri** Zahn, *Hier. Alpes Marit.* 305 (1916). It.)

H. elegantidens Zahn, *op. cit.* 316 (1916) (*H. pseudoprasinops*|*umbrosum*). ● *S.W. Alps.* Ga.

H. isolanum Zahn, *op. cit.* 313 (1916) (*H. adusticeps*|*umbrosum*). ● *S.W. Alps.* Ga.

H. rapunculoidiforme Wołoszczak & Zahn, *Magyar Bot. Lapok* **10**: 158 (1911) (*H. pocuticum*|*vulgatum*). ● *Borders of N. Romania and S.W. Ukraine.* Rm Rs(W).

H. ukierniae Wołoszczak & Zahn, *op. cit.* 159 (1911) (*H. pocuticum*|*vulgatum*). ● *E. Carpathians.* Rs (W).

(xxvii) Leaves all cauline, (3–)5–30(–50), often panduriform, more or less amplexicaul. Inflorescence usually of numerous capitula in a large panicle. Involucral bracts linear-lanceolate, more or less obtuse, with numerous glandular and usually few or no simple eglandular hairs. Ligules usually with short simple eglandular hairs at apex. Stigmas discoloured. Margins of receptacular pits dentate. Achenes grey or pale brown.

226. H. prenanthoides group. Stems 30–120 cm, with few to numerous stellate hairs, few to numerous glandular hairs and few to numerous simple eglandular hairs. Leaves 10–30(–50), 30–140 × 8–35 mm, with few to numerous simple eglandular hairs 0·5–1(–2) mm, the lowermost leaves withering early, the remainder gradually decreasing in size upwards, lanceolate to ovate or oblong-lanceolate, often more or less panduriform, more or less acute or acuminate, subentire to more or less dentate; lower cauline attenuate into a short petiole, the upper often cordate-auriculate and sometimes with stellate hairs beneath. Inflorescence-branches leafy; peduncles rather short, arcuate, with more or less dense stellate hairs, numerous glandular hairs and sometimes a few simple eglandular hairs. Involucre (7–)8–12(–13) × 6–8 mm; bracts with few (rarely numerous) stellate hairs, numerous glandular hairs and few or no simple eglandular hairs. $2n = 27, 36$. *Throughout Europe, except the south.* Au Br Bu Cz Da Fe Ga Ge Hb He Hs Is It Ju No Po Rm Rs (N, C, W) Su.

Included species:

H. bupleurifolium Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 74 (1828). *N., C. & E. Europe.* Au Bu Cz Da Fe Ga He It Ju Po Rm Rs (C, W) Su.
H. hoegeri (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 263 (1976) (*H. prenanthoides* subsp. *hoegeri* Zahn). Au Cz Ge He Rm.
H. lanceolatum Vill., *Hist. Pl. Dauph.* **3**: 126 (1788). Au Cz Ga Ge He Hs Ju Po Rm.
H. perfoliatum Froelich in DC., *Prodr.* **7**: 211 (1838). *Alps*; *Appennini*; *Carpathians.* Au Cz Ga He It Ju Rm.
H. prenanthoides Vill., *Prosp. Pl. Dauph.* 35 (1779). *S.W Alps; Britain, N.E. Ireland.* Br Ga Hb It.

227. H. juranum group (*H. murorum*|*prenanthoides*). Like **226** but often with 5–15(–18) leaves, the lower often petiolate; involucre 7–8·5 mm, with dense glandular hairs, usually without simple eglandular hairs. *From Iceland southwards to the Pyrenees and S. Carpathians.* Au Br Cz Ga Ge He Hs Is It Ju No Rm Su.

Included species:

H. atrichocephalum (Dahlst.) Dahlst., *Ark. Bot.* **3(10)**: 58 (1904). ● Is.
H. hemiplecum Arvet-Touvet, *Bull. Soc. Dauph. Éch. Pl.* **4**: 105 (1877). ● *Alps.* Au Ga Ge He.
H. juranum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 129 (1848). Au Ga Ge He It Ju Rm.
H. leiophyton Dahlst. in Lindman, *Svensk Fanerogamfl.* 627 (1918). ● No Su.
H. pseudojuranum Arvet-Touvet, *Suppl. Monogr. Hier.* 24 (1876). *Alps.* Au Ga He It.
H. subperfoliatum Arvet-Touvet, *Not. Pl. Alpes* 12 (1883). Au Ga Ge He It Ju Rm.

228. H. juraniforme group (*H. bifidum*|*prenanthoides*). Like **226** but cauline leaves (3–)4–10; inflorescence laxer; involucre with few to numerous simple eglandular hairs, numerous stellate hairs and less obvious glandular hairs. ● *Alps.* Au Ga He It.

Included species:

H. juraniforme Zahn in Schinz & R. Keller, *Fl. Schweiz* ed. 2, **2**: 332 (1905). Au He It.

229. H. pocuticum group (*H. prenanthoides*|*rotundatum*). Like **226** but leaves and stems with more or less dense soft simple hairs; cauline leaves 8–16(–20). ● *E. & S. Carpathians*; *S.W. Jugoslavia.* ?Al Ju Rm Rs (W).

Included species:

H. pocuticum Wołoszczak, *Spraw. Kom. Fizyogr. Krakow.* **21**: 129 (1887). Rm Rs (W).

Other species and groups in (xxviii):

H. dacicum Uechtr., *Österr. Bot. Zeitschr.* **25**: 214 (1875) (*H. prenanthoides*|*sparsum*). ● *S. Carpathians.* ?Ju Rm.

H. djimilense group (*H. prenanthoides*|*sparsum*). *Bulgaria, Jugoslavia, Romania.* Bu Ju Rm. (Including **H. velenovskyi** Freyn in Velen., *Fl. Bulg.* 346 (1891). ● Bu Ju. **H. djimilense** Boiss. & Balansa in Boiss., *Fl. Or.* **3**: 877 (1875) is confined to Anatolia.)

H. isatidifolium group (*H. bupleuroides*|*prenanthoides*). ● *Alps.* Au Ga He It. (Including **H. isatidifolium** Arvet-Touvet, *Monogr. Hier.* 43 (1873). Ga He It.)

H. subtilissimum group (*H. prenanthoides*|*schmidtii*). 1600–2300 *m.* ● *S.W. Alps*; *Pyrenees.* Ga He It. (Including **H. subtilissimum** Zahn in Koch, *Syn. Deutsch. Fl.* ed. 3, **2**: 1876 (1901). Ga He It.)

(xxix) Like (xxviii) but with more numerous simple eglandular hairs throughout; involucral bracts often more or less acute; capitula less numerous; stigmas sometimes yellow; achenes darker brown.

230. H. cydonifolium group (*H. prenanthoides*|*villosum*). Stems 30–80 cm, with stellate hairs, more or less numerous simple eglandular hairs, sometimes with a few glandular hairs above. Leaves 8–12(–16), 25–100 × 10–35 mm, all cauline, more or less glaucous, more or less acute, denticulate to shallowly dentate, with more or less numerous simple eglandular hairs on both surfaces and the margin, the lowest withering early, the lower oblong-ovate, ovate or lanceolate, sometimes panduriform, narrowed to a semiamplexicaul base, the upper lanceolate or ovate, rounded, amplexicaul or sometimes auriculate at base. Capitula 5–12(–25); peduncles usually rather short, with few to numerous stellate hairs, simple eglandular hairs and glandular hairs. Involucre 9–12(–15) × 8–11 mm; bracts more or less acute, with few to numerous stellate hairs, simple eglandular hairs and glandular hairs. ● *Alps*; *C. Jugoslavia.* Au Ga Ge He It Ju.

Included species:

H. cottianum Arvet-Touvet, *Bull. Soc. Sci. Dauph.* **13**: 557 (1886). *Alps.* Au Ga He It Ju.
H. cydonifolium Vill., *Prosp. Pl. Dauph.* 34 (1779). Although this name has always been used for this group of plants in the aggregate sense, it has never been typified and it is uncertain to which segregate the name applies.
H. mespilifolium Arvet-Touvet, *Suppl. Monogr. Hier.* 12 (1876). *Alps.* Au Ga He It.
H. parcepilosum Arvet-Touvet, *Hier. Alpes Fr.* 103 (1888). *Alps; C. Jugoslavia.* Au Ga He It Ju.

231. H. doronicifolium group (*H. juranum*|*valdepilosum*). Like **230** but basal leaves present; cauline leaves 3–8(–12). ● *S.W. Alps.* Ga He It.

Included species:

H. doronicifolium Arvet-Touvet, *Bull. Soc. Dauph. Éch. Pl.* **2**: 45 (1875). Ga He It.
H. salevense (Rapin ex Fries) Zahn, *Neue Denkschr. Schweiz. Ges. Naturw.* **40**: 526 (1906). Ga He.

232. H. cantalicum group (*H. cerinthoides*|*prenanthoides*). Stems 30–70 cm, with more or less numerous simple eglandular hairs and few stellate and glandular hairs above. Leaves 10–15(–20), 40–100 × 15–40 mm, all cauline or a few basal, glaucous, denticulate to serrate-dentate, more or less amplexicaul, with few to numerous simple eglandular hairs; lower elliptical to ovate-elliptic, sometimes panduriform, often petiolate, the upper ovate to lanceolate, sessile. Capitula 5–15, in a lax panicle; peduncles often long, with numerous stellate and few to numerous glandular and simple eglandular hairs. Involucre 9–14 × 7–12 mm; bracts subacute to obtuse, with scattered stellate hairs, numerous glandular hairs and few simple eglandular hairs. ● *Pyrenees; S.C. France.* Ga Hs.

Included species:

H. cantalicum Arvet-Touvet, *Addit. Monogr. Hier.* 15 (1879). *S.C. France.* Ga.
H. subpanduratum Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*) **5**: no. 306 (1898). *Pyrenees.* Ga Hs.

233. H. turritifolium group (*H. cerinthoides*|*murorum*|*prenanthoides*). Like **232** but with basal leaves present though sometimes withered at anthesis; cauline leaves up to 10. ● *Pyrenees; S.C. France.* Ga Hs.

Included species:

H. turritifolium Arvet-Touvet, *Bull. Soc. Bot. Fr.* **41**: 363 (1894). Ga Hs.

234. H. segureum group (*H. bifidum*|*juranum*). Stems 20–50 cm, with short, soft simple eglandular hairs. Leaves subentire to dentate, with numerous simple eglandular hairs, the upper cauline sometimes with a few stellate hairs beneath; basal obovate or oblong-lanceolate, sometimes withered at anthesis; cauline 2–5(–6), elliptic-lanceolate or lanceolate, the lower narrowed into a more or less winged petiole, the median and upper sometimes panduriform, more or less amplexicaul. Capitula 2–10(–15), in a lax panicle; peduncles with few stellate and more or less numerous simple eglandular and glandular hairs. Involucre 8–9·5 × 6–8 mm; bracts narrow, obtuse to acute, with few stellate and more or less numerous simple eglandular and glandular hairs. Stigmas sometimes yellow. ● *S.W. Alps.* Ga He It.

Included species:

H. segureum Arvet-Touvet, *Bull. Soc. Dauph. Éch. Pl.* **13**: 560 (1886). Ga He.

Other species and groups in (xxix):

H. austroslavicum K. Malý & Zahn, *Glasn. Muz. Bosni Herceg.* **38**: 108 (1926). ● *Jugoslavia.* Ju.

H. beckianum Gremli, *Neue Beitr. Fl. Schweiz* **5**: 60 (1890) (*H. isatidifolium*|*villosum*). ● *E. Austria* (*Schneeberg*). Au.

H. medschedsense group (*H. djimilense*|*murorum*). *W. Bulgaria* (*Vitoša*). Bu. (*S.W. Asia.*) (Including **H. juranomorphum** Zahn, *Maygar Bot. Lapok.* **10**: 174 (1911). Bu. **H. medschedsense** Zahn, *Feddes Repert.* **4**: 323 (1907) is confined to the Caucasus.)

H. staui Belli in Fiori & Paol., *Fl. Anal. Ital.* **3**: 472 (1904) (*H. caesioides*|*epimedium*). ● *Alpi Marittime.* It.

H. strafforelloanum Zahn in Engler, *Pflanzenreich* **77(IV.280)**: 828 (1921) (*H. caesioides*|*cydonifolium*). ● *Alpi Marittime.* It.

(xxx) Basal leaves usually absent or withered at anthesis; cauline 2–20(–40), at least the upper rounded at base and semi-amplexicaul. Inflorescence usually of few capitula in a more or less compact cyme. Involucral bracts broadly linear-lanceolate, more or less obtuse, with glandular and simple eglandular hairs in various proportions. Ligules usually glabrous, sometimes with simple eglandular hairs at apex. Stigmas usually discoloured. Margins of receptacular pits sharply dentate. Achenes dark brown.

(xxx) is very close to (xxviii) but it differs in its dark achenes and less glandular indumentum. Most species grow in exposed situations, and some when cultivated are not distinguishable from (xxxii) to which they are probably most closely allied.

235. H. epimedium group (*H. bifidum*|*juranum*). Stems 18–50 cm, with few stellate hairs, few to numerous simple eglandular hairs and sometimes a few glandular hairs above. Leaves dark green or slightly glaucous, subentire to shallowly mammiform-dentate, with few to numerous simple eglandular hairs; basal 3–6, 25–80 × 12–30 mm, usually elliptical, obtuse-mucronate, truncate or abruptly contracted at base; cauline (1–)2–6(–7), remote, subpetiolate or sessile. Capitula 2–6(–10); peduncles often long,

with numerous stellate hairs, numerous or no glandular hairs and few to numerous simple eglandular hairs. Involucre 9–13 × 6–9 mm; bracts dark, with few to numerous stellate hairs, more or less numerous simple eglandular hairs and few to numerous glandular hairs. Ligules often with a few small simple eglandular hairs at apex. $2n=27$. ● *Alps; Carpathians and Sudeten Mts.; N.W. Europe.* Au Br Cz Da Fa Ga Ge He Is It Ju No Po Rm Rs (W) Su.

Included species:

H. arrostocephalum Omang in Ostenf. & Gröntved, *Fl. Iceland Faeroes* 165 (1934). Is.
H. epimedium Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 103 (1862). *Alps.* Au Ga Ge He It Ju.
H. glaucellum Lindeb. in Hartman, *Handb. Skand. Fl.* ed. 10, 27 (1870). No Su.
H. hartzianum Dahlst. in Warming et al., *Bot. Færöes* 643 (1903). Fa.
H. wimmeri Uechtr., *Österr. Bot. Zeitschr.* **22**: 277 (1872). Cz Po Rm Rs (W).
H. zetlandicum Beeby, *Jour. Bot.* (*London*) **29**: 243 (1891). $2n=27$. *Zetland.* Br.

236. H. carpathicum group (*H. caesium|prenantholdes*). Like **235** but cauline leaves 6–17; ligules with numerous simple eglandular hairs at apex. ● *W. Carpathians and Sudeten Mts.; Norway and Sweden; Scotland.* Br Cz No Po Su.

Included species:

H. carpathicum Besser, *Prim. Fl. Galic.* **2**: 154 (1809). $2n=36$. Br Cz Po.
H. dewarii Syme, *Trans. Proc. Bot. Soc. Edinb.* **13**: 23 (1876). *Scotland.* Br.

237. H. dovrense group. Stems 30–50 cm, with numerous simple eglandular hairs, sometimes a few stellate hairs and sometimes a very few small glandular hairs above. Leaves with few simple eglandular hairs mostly beneath and on the margin; basal absent or soon withering; cauline (3–)4–8(–10), 30–90(–100) × (5–)10–40 mm, narrowly to broadly elliptical, obtusely mucronate to acute, denticulate to irregularly dentate (the teeth often mammiform), the lower attenuate into a winged, semi-amplexicaul petiole; median and upper leaves lanceolate, sessile. Capitula 3–9(–12), the first-flowering almost sessile; peduncles slender, with numerous stellate hairs and with few to numerous simple eglandular or glandular hairs, or with both. Involucre 9–11 × 6–11 mm; bracts with few stellate and numerous simple eglandular hairs. Ligules glabrous. ● *Iceland, N. Scotland, Fennoscandia.* Br Is No Rs (N) Su.

Included species:

H. dovrense Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 128 (1848). $2n=36$. No.

238. H. plicatum group (*H. alpinum|carpathicum|murorum*). Like **237** but margin of leaves with minute glandular hairs; basal leaves usually present; cauline leaves 2–5(–10); involucre often with numerous simple eglandular hairs; ligules with more or less numerous simple eglandular hairs at apex. *N.W. Fennoscandia; Iceland.* Is No Su. (*North America; Greenland.*)

Included species:

H. devians Dahlst., *Ark. Bot.* **3(10)**: 57 (1904). ● Is.
H. plicatum Lindeb., *Hier. Scand. Exsicc.* **2**: no. 86 (1872). No.
H. semidovrense Elfstr., *Bihang Kongl. Svenska Vet.-Acad. Handl.* **16(3)**, **7**: 64 (1890). ● Su.

239. H. truncatum group. Like **237** but leaves (10–)50–120 × 5–20(–40) mm, often narrowly elliptical or oblong-elliptical; cauline leaves (4–)9–20(–30). $2n=27$, 36. ● *N. & W. Fennoscandia; Iceland; Zetland.* Br Is No Rs (N) Su.

Included species:

H. chrysostylum (Lindeb.) Elfstr., *op. cit.* 76 (1890). No.
H. demissum (Strömfelt) Dahlst., *Ark. Bot.* **3(10)**: 60 (1904). Is.
H. depilatum Almq. ex Lindeb. in Hartman, *Handb. Skand. Fl.* ed. 11, 41 (1879). No Su.
H. protractum (Fries) Lindeb., *op. cit.* 51 (1879). No.
H. splendens Elfstr., *Bihang Kongl. Svenska Vet.-Akad. Handl.* **16(3)**, **7**: 70 (1890). No Su.
H. truncatum Lindeb., *Hier. Scand. Exsicc.* **1**: no. 45 (1868). No Su.
H. vinicaule P. D. Sell & C. West, *Watsonia* **3**: 236 (1955). $2n=36$. *Zetland.* Br.

(xxxi) Leaves all cauline, numerous, crowded, more or less amplexicaul, usually glaucous and distinctly reticulately veined beneath, with more or less thickened margin. Capitula usually numerous, in a large panicle. Involucral bracts broadly linear-lanceolate, mostly obtuse, the outer sometimes squarrose, hairs usually sparse. Ligules glabrous. Stigmas yellow or discoloured. Margins of receptacular pits sharply dentate or sometimes fimbriate-dentate. Achenes dark brown.

240. H. latifolium group (*H. brevifolium* Tausch; *H. racemosum|umbellatum*). Stems 40–100 cm, with simple eglandular hairs below. Leaves 25–50 × 10–20 mm, ovate, oblong-ovate or elliptical, obtuse to subacute, denticulate to remotely dentate, with short rigid and some long simple eglandular hairs particularly on the margin and few to numerous stellate hairs particularly beneath, the lower abruptly contracted at base, sometimes subpetiolate, the upper sessile. Capitula in an open, sometimes subumbellate panicle; peduncles with numerous stellate and sometimes a few minute glandular hairs. Involucre 10–13 × 8–11 mm; bracts with sparse stellate hairs, minute simple eglandular hairs and minute glandular hairs, or nearly glabrous. ● *C. & S. Europe.* Al Au ?Be Bu Cz Ga Gr He Hs Hu It Ju Rm.

Included species:

H. brachyphyllum Vuk., *Hier. Croat.* 18 (1858). Au Cz Ga Gr Hu It Ju Rm.
H. halimifolium Froelich ex Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 136 (1862). Au ?Be Bu Ga He Hs Hu It Ju Rm.
H. latifolium Froelich ex Link, *Enum. Horti Berol. Alt.* **2**: 287 (1822). Al Au Bu Cz Ga He Hu It Ju Rm.

241. H. virosum Pallas, *Reise* **1**: 501 (1771). Stems 50–150 cm, glabrous, scabridulous or with short simple eglandular hairs. Leaves 30–110 × 10–35 mm, ovate, lanceolate or oblong, obtuse to acute, entire to remotely dentate, sessile, glabrous or with few rigid simple eglandular hairs, particularly on the margin. Upper part of panicle often subumbellate; peduncles bracteate, glabrous, or with a few stellate or simple eglandular hairs or with both. Involucre 8·5–10 × 7–8 mm; bracts appressed, glabrous, or with occasional stellate or simple eglandular hairs or with both, very rarely with very few minute glandular hairs. $2n=36$. *S.E. Europe, extending northwards to S.C. Russia.* Bu Ju Rm Rs (C, W, K, E).

242. H. robustum group (*H. virosum|umbellatum*). Like **241** but with numerous stellate hairs on leaves and inflorescence; outer involucral bracts squarrose or slightly recurved. *S.E. Europe, extending northwards to S.C. Russia.* Bu ?Cz Ju Rm Rs (C, W, K, E).

Included species:

H. robustum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 193 (1848). Bu ?Cz Ju Rm Rs (C, W, K, E).

243. H. inuloides group (*H. laevigatum|prenanthoides*). Like **241** but whole plant more hairy; leaves usually more dentate; glandular hairs usually present on involucre. $2n=27$. *N., W. & C. Europe.* Au Br Cz Fe Ga Ge Hb He Hs Is It No Po Rm Su.

Included species:

H. inuloides Tausch, *Flora* (*Regensb.*) **20** (Ergänz. 1): 71 (1837). ● Au Cz Ge Po Rm.
H. latobrigorum (Zahn) Roffey in F. J. Hanb., *London Cat. Brit. Pl.* ed. 11, 29 (1925). $2n=27$. ● Br Ga Ge Hb It Rm.
H. reticulatum (Lindeb.) Lindeb., *Hier. Scand. Exsicc.* **3**: 147 (1878). ● Br Fe No Su.
H. tridentatifolium (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 267 (1976) (*H. corymbosum* Fries, non Pers., *H. inuloides* subsp. *tridentatifolium* Zahn). ● Cz Ga Ge He Hs.

244. H. crocatum group (*H. prenanthoides|umbellatum*). Stems 50–100(–130) cm, with few to numerous simple eglandular and few stellate hairs. Leaves 25–100 × 6–20 mm, oblong or oblong-lanceolate to linear, acute, subentire to dentate, with few short simple eglandular hairs mainly on the margin, the upper sometimes with stellate hairs beneath, the lower subpetiolate, the remainder abruptly contracted at the base. Peduncles bracteate, with dense stellate and sometimes some simple eglandular and minute glandular hairs. Involucre 8–12 × 6–9 mm; bracts with numerous unequal glandular hairs, usually few to numerous simple eglandular hairs and sometimes a few stellate hairs. *N. & C. Europe; Pyrenees.* Au Br Cz Fe Ga Hs It Ju No Rs (N, B, C, W) Su.

Included species:

H. angustum Lindeb., *Hier. Scand. Exsicc.* **3**: no. 148 (1878). ● No Su.
H. brachybrachion (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 263 (1976) (*H. aestivum* subsp. *brachybrachion* Zahn). ● *Pyrenees.* Hs.
H. conicum Arvet-Touvet, *Bull. Soc. Dauph. Éch. Pl.* **4**: 188 (1877). Au Cz Ga Hs It Rm Rs (B, W).
H. crocatum Fries, *Summa Veg. Scand.* 6 (1846). Fe No Rs (N, C) Su.
H. subumbellatiforme (Zahn) Roffey in F. J. Hanb., *London Cat. Brit. Pl.* ed. 11, 29 (1925). ● *N. Scotland.* Br.
H. valdefrondosum (K. Malý & Zahn). P. D. Sell & C. West, *Notes Roy. Bot. Gard. Edinb.* **33**: 432 (1975) (*H. aestivum* subsp. *valdefrondosum* K. Malý & Zahn). *Bosna.* Ju.

Other species and groups in (xxxi):

H. bastreranum group (*H. latifolium|symphytaceum*). ● *S.W. Alps.* Ga It. (Including **H. bastreranum** Zahn, *Hier. Alpes Marit.* 340 (1916). Ga It.)

H. melanothyrsum K. Malý & Zahn in Engler, *Pflanzenreich* **79 (IV.280)**: 934 (1922) (*H. latifolium|prenanthoides*). ● *Bosna.* Ju.

H. worochtae Wołoszczak ex Zahn, *Magyar Bot. Lapok* **10**: 166 (1911) (*H. pocuticum|umbellatum*). ● *E. Carpathians.* Rs (W).

(xxxii) Leaves coriaceous, all cauline, 12–20, the lower large and crowded, more or less amplexicaul, glabrous or with a few glandular hairs on the margin. Capitula 3–40, in a narrow, compact panicle. Involucre 11–15 mm; bracts broadly linear-lanceolate, obtuse, with few to dense yellowish glandular hairs. Ligules glabrous. Stigmas discoloured. Margin of receptacular pits dentate. Achenes pale brown.

245. H. lucidum Guss., *Ind. Sem. Horto Boccad.* **1825**: 6 (1825). Stems 10–30 cm, ascending, flexuous, with stellate and short glandular hairs particularly above. Leaves 12–20, 15–100 × 4–45 mm, coriaceous, glabrous or with a few glandular or simple eglandular hairs on the margin, the lower large, crowded, narrowed to a winged, semiamplexicaul petiole, the upper much smaller, broadly ovate, elliptical or lanceolate, acute or mucronate, often plicate, entire or remotely denticulate, sessile. Capitula 3–10(–40) in a narrow compact panicle; peduncles bracteate, with numerous stellate and slender, unequal glandular hairs. Involucre 11–15 × 8–11 mm; bracts pale green, with few stellate and few to dense yellowish, unequal, slender glandular hairs. Ligules glabrous. $2n=18$. *Calcareous rocks.* ● *N.W. Sicilia.* Si.

Other species in (xxxii):

H. symphytifolium Froelich in DC., *Prodr.* **7**: 232 (1838) (*H. siculum* Guss.; *H. lucidum|racemosum*). $2n=36$. ● *Sicilia.* Si.

(xxxiii) Leaves usually all cauline, usually numerous, often crowded in a false rosette towards the base, at least the upper more or less amplexicaul, often with minute glandular hairs on the margin. Capitula few to numerous, in a large panicle. Involucre (9–)11–15 mm; bracts broadly linear-lanceolate, obtuse, with sparse to dense hairs. Ligules glabrous or with few simple eglandular hairs at apex. Stigmas usually discoloured. Margins of receptacular pits dentate. Achenes grey, yellowish, pale brown or reddish-brown.

246. H. racemosum group. Stems 10–80(–100) cm, with few to numerous stellate hairs and few to numerous simple eglandular hairs up to 5(–10) mm. Leaves 20–160 × 3–40 mm, with few to numerous simple eglandular hairs, the lower much larger than the upper, ovate, ovate-lanceolate, or ovate-oblong, more or less acute, subentire to serrate-dentate, narrowed to a winged, semi-amplexicaul petiole, the upper sessile. Capitula few to numerous; peduncles bracteate, with few to numerous stellate, glandular and simple eglandular hairs. Involucre 10–14(–16) × 6–10 mm; bracts with few to numerous stellate hairs especially along the margin, few to numerous, usually pale glandular hairs and simple eglandular hairs absent or numerous. Ligules glabrous. $2n=27$. *S. & C. Europe.* Al Au Bu Co Cz Ga Ge Gr He Hu It Ju Po Rm Sa Si Tu.

Included species:

H. barbatum Tausch, *Flora* (*Regensb.*) **11** (Ergänz. 1): 72 (1828). ● Al Au Bu Cz Ga Ge Gr He Hu It Ju Rm.
H. crinitum Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 134 (1813). $2n=36$. Al Bu Co Gr It Ju Rm Sa Si.
H. italicum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 124 (1848). ● Bu Gr It Ju.
H. moesiacum (A. Kerner & Uechtr. ex Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 265 (1976) (*H. racemosum* subsp. *moesiacum* A. Kerner & Uechtr. ex Zahn). ● Au Bu Cz Ga He Hu It Ju Tu.
H. racemosum Waldst. & Kit. ex Willd., *Sp. Pl.* **3**: 1588 (1803). ● Au Bu Cz Ge Gr He Hu It Ju Po Rm Tu.
H. virgaurea Cosson, *Ann. Sci. Nat.* ser. 3, **7**: 209 (1847). ● Co Ga It.

247. H. pseuderiopus group (*H. racemosum|sparsum*). Like **246** but with more numerous simple eglandular hairs throughout;

leaves 5–20, the lower oblong-lanceolate or lingulate. ● *W. Bulgaria, S. Jugoslavia.* Bu Ju.

Included species:

H. pseuderiopus Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1073 (1922). Bu Ju.

248. H. compositum group (*H. cordifolium|racemosum*). Like **246** but simple eglandular hairs denser throughout; basal leaves sometimes present; margin of leaves with few minute glandular hairs; glandular hairs on involucre obvious; ligules with short, simple eglandular hairs at apex; achenes darker. ● *Pyrenees.* Ga Hs.

Included species:

H. compositum Lapeyr., *Hist. Abr. Pyr.* 476 (1813). Ga.

249. H. nobile group (*H. pyrenaicum* Jordan, non L.; *H. compositum|racemosum*). Like **246** but villous with long simple eglandular hairs throughout; glandular hairs inconspicuous; leaves 6–20; ligules glabrous or with few simple eglandular hairs at apex; achenes sometimes darker. ● *N. Spain, S.W. France.* Ga Hs.

Included species:

H. nobile Gren. & Godron, *Fl. Fr.* **2**: 376 (1851). Ga Hs.

250. H. rectum group (*H. cordatum|racemosum*). Stems 4–100 cm, with dense simple eglandular and numerous stellate hairs. Leaves 20–120 × 5–40 mm, crowded, ovate to ovate-lanceolate, acute, dentate, with numerous simple eglandular hairs throughout, with few to numerous stellate hairs beneath and minute glandular hairs usually present on the margin, the lower leaves attenuate at the base, the remainder rounded at the base. Capitula numerous, in an elongate panicle; peduncles with dense stellate and few to numerous glandular and simple eglandular hairs. Involucre 9–13 × 10–14 mm; bracts with numerous stellate hairs and dense unequal, yellow glandular hairs, without or with few simple eglandular hairs. Ligules with numerous simple eglandular hairs at apex. Stigmas sometimes yellow. ● *Pyrenees and adjacent hill-country.* Ga Hs.

Included species:

H. dipsacifolium Arvet-Touvet, *Spicil. Rar. Nov. Hier., Suppl.* **2**: 49 (1886). Ga Hs.

H. rectum Griseb., *Comment. Hier.* 27 (1852). Although this name has always been applied to this group of species in the aggregate sense, it has never been typified and it is uncertain to which of the segregates the name applies.

251. H. symphytaceum group (*H. prenanthoides|racemosum*). Stems 10–100(–120) cm, with dense simple eglandular and few minute glandular hairs throughout and some stellate hairs above. Leaves glaucous, prominently veined beneath, with few to numerous simple eglandular hairs, the upper sometimes with stellate hairs beneath, the lower broadly ovate, ovate-oblong or ovate-lanceolate, more or less acute, subentire to dentate, narrowed into a winged, semiamplexicaul petiole, the median similar but sometimes panduriform, the upper smaller. Capitula few to numerous; peduncles bracteate or with small leaves, with numerous stellate and glandular hairs, sometimes with few simple eglandular hairs. Involucre (7–)9–10(–12) mm; bracts with numerous to dense stellate and dense glandular hairs, without or with few simple eglandular hairs. Ligules glabrous or with a few simple eglandular hairs at apex. Stigmas sometimes yellow. ● *S.W. Alps; C. Appennini; Corse; W. Jugoslavia.* Co Ga He It Ju.

Included species:

H. polyadenium Arvet-Touvet in Burnat & Gremli, *Cat. Hier. Alpes Marit.* 79 (1883). *W. Alps.* Ga He It.

H. symphytaceum Arvet-Touvet, *Bull. Soc. Dauph. Éch. Pl.* **3**: 75 (1876). *S.W. Alps; C. Appennini.* Ga It.

252. H. insuetum group (*H. laevigatum|racemosum*). Stems 5–110 cm, with simple eglandular hairs dense below, and few to numerous stellate hairs above. Leaves 15–70 × 5–25 mm, ovate, lanceolate or elliptical, acute, dentate, usually with simple eglandular hairs but sometimes nearly glabrous above, often with stellate hairs on the upper leaves and minute glandular hairs sometimes present on the margin, the lower attenuate into a winged, semiamplexicaul petiole, the upper rounded at the base, sessile. Capitula (2–)5–40; peduncles bracteate, with dense stellate and a few simple eglandular and glandular hairs. Involucre 9–11 × 8–10 mm; bracts with few to dense stellate hairs, numerous simple eglandular hairs and few minute glandular hairs. Ligules glabrous. ● *From the E. Pyrenees and N. Italy to the S. Carpathians.* Ga Hu It Rm.

Included species:

H. insuetum Jordan ex Boreau, *Fl. Centre Fr.* ed. 3, **2**: 396 (1857). Ga.

Other species and groups in (xxxiii):

H. bernardii Rouy, *Fl. Fr.* **9**: 434 (1905) (*H. amplexicaule|racemosum*). ● *Corse.* Co.

H. chalasinense Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1073 (1922) (*H. naegelianum|racemosum*). ● *Taïyetos.* Gr.

H. chamaeadenium Oborny & Zahn, *Verh. Naturf. Ver. Brünn* **44** (*Abh.*): 68 (1905). ● *S.C. Czechoslovakia* (*Znojmo*). Cz.

H. grovesianum group (*H. murorum|racemosum*). ● *S.W. Alps.* Ga It. (Including **H. grovesianum** Arvet-Touvet ex Belli, *Mem. Accad. Sci. Torino*, ser. 2, **47**: 491 (1897). It.)

H. haussknechtianum Zahn, *Feddes Repert.* **16**: 299 (1919) (*H. racemosum|umbrosum*). ● *Pindhos Oros.* Gr.

H. marchesettianum group (*H. racemosum|vulgatum*). ● *C. Europe.* Au Cz Ga Hu It Ju. (Including **H. marchesettianum** Zahn, *Hier. Alpes Marit.* 173 (1916). Ju.)

H. psaridianum Zahn in Engler, *Pflanzenreich* **79(IV.280)**: 1073 (1922) (*H. naegelianum|racemosum*). ● *Taïyetos.* Gr.

H. sermenikense group (*H. bracteolatum|racemosum*). ● *Greece.* Gr. (Including **H. sermenikense** Freyn & Sint., *Bull. Herb. Boiss.* **5**: 790 (1897). Gr.)

(xxxiv) Like (xxxiii) but almost glabrous above; leaves often lobed; bracts on peduncles numerous; involucre (7–)8–9(–11) mm; involucral bracts glabrous or with few hairs; stigmas often yellow; achenes yellowish.

253. H. bracteolatum group. Stems (30–)60–90 cm, with simple eglandular hairs and few short glandular hairs in the upper part. Leaves up to 25, all cauline, glaucous, with short, subrigid simple eglandular hairs throughout and very few minute glandular hairs on the margin, the lower often aggregated in a false rosette, oblong-lanceolate, ovate-lanceolate or oblong, obtuse to acute, deeply sinuate with irregular patent lobes, sparsely dentate, attenuate into a broadly winged petiole, the upper rounded and sessile at the base. Capitula numerous in a large panicle; peduncles with numerous bracts, sometimes with a few stellate hairs. Involucre (7–)8–9(–11) × 6–8 mm; bracts

glabrous or with a few glandular, simple eglandular or stellate hairs. Ligules glabrous. *Greece, just extending to S. Jugoslavia.* Gr Ju.

Included species:

H. bracteolatum Sibth. & Sm., *Fl. Graec. Prodr.* **2**: 135 (1813). ● Gr Ju.

(xxxv) Usually hairy. Leaves all cauline, usually numerous, often aggregated below; margin not or only slightly thickened; upper leaves rounded or cordate at base, sometimes semi-amplexicaul. Capitula usually numerous, in a large, often elongate panicle. Involucral bracts usually broadly linear-lanceolate, more or less obtuse, glabrous or hairy, the outer sometimes slightly recurved. Ligules usually glabrous. Stigmas usually discoloured. Margins of receptacular pits usually distinctly fimbriate-dentate. Achenes dark brown or blackish.

254. H. sabaudum group. Stems (30–)50–100(–180) cm, with few to numerous stellate hairs and usually numerous (especially below) simple eglandular hairs, without glandular hairs. Leaves 20–180 × 10–40 mm, ovate-elliptical, lanceolate or oblong-lanceolate, more or less acute, denticulate to dentate, with few to numerous simple eglandular hairs, sometimes with a few stellate hairs beneath, the lower often attenuate and subpetiolate, the upper sessile, rounded or cordate at the base. Peduncles bracteate, with numerous stellate and usually few to numerous simple eglandular hairs. Involucre 10–12 × 7–10 mm; bracts nearly glabrous or with few to numerous simple eglandular, glandular and minute glandular hairs in various proportions, usually without stellate hairs. Stigmas usually discoloured, rarely yellow. $2n=18, 27$. *Europe except for most of the north and some islands.* Al Au Be Br Bu Co Cz Da Ga Ge Gr Hb He Ho Hs Hu It Ju Lu Po Rm Rs (B, C, W, K) Tu.

Included species:

H. auratum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 181 (1848). Au Cz Ga Ge He Ho Hu Ju Rm Rs (K).

H. dumosum Jordan, *Cat. Jard. Grenoble* **1849**: 18 (1849). Cz Ga Ge He Hs Hu It Ju Lu Rm.

H. obliquum Jordan, *Cat. Jard. Dijon* 23 (1848). ● Au Be Cz Ga Ge Gr He Ho Hu It Ju Rm.

H. platyphyllum (Arvet-Touvet) Arvet-Touvet, *Annu. Cons. Jard. Bot. Genève* **1**: 87 (1897). ● Au Cz Ga Ge Hu It Ju Rm.

H. sabaudum L., *Sp. Pl.* 804 (1753). $2n=27$. Au Br Ga Ge Gr Hb He It Ju Rm Tu.

H. vagum Jordan, *Cat. Jard. Grenoble* **1849**: 21 (1849). $2n=18$, 27. Au Be Br Bu Co Cz Ga Ge He Ho Hs Hu It Ju Po Rm Rs (B, C, W, K) Tu.

H. virgultorum Jordan, *Cat. Jard. Dijon* 24 (1848). Au Be Br Bu Co Cz Da Ga Ge Ho Hs Hu It Ju Rm Rs (C, W, K).

255. H. flagelliferum group (*H. sabaudum|vulgatum*). Like **254** but cauline leaves 6–25; peduncles with few to numerous glandular hairs; involucral bracts narrower and usually with numerous stellate hairs. ● *C. Europe, extending westwards to W. France.* Au Cz Ga Ge.

Included species:

H. flagelliferum Ravaud, *Bull. Soc. Dauph. Éch. Pl.* **4**: 117 (1887). Au Ga Ge He.

256. H. lycopsifolium group (*H. prenanthoides|sabaudum*). Stems up to 100 cm, with numerous simple eglandular and stellate hairs and sometimes small glandular hairs at least above. Leaves 15–30, 5–100 × 5–30 mm, oblong, oblong-lanceolate, ovate-lanceolate or elliptical, more or less acute, dentate, with few to numerous sometimes rigid simple eglandular hairs, the upper with few to numerous stellate hairs beneath, the lowest attenuate, subpetiolate, the remainder cordate-amplexicaul. Peduncles bracteate, with dense stellate hairs, few to numerous glandular hairs and usually some simple eglandular hairs. Involucre 9–10 × 5–8 mm; bracts with few to numerous stellate and glandular hairs and often a few simple eglandular hairs. Achenes sometimes pale brown. ● *Alps.* Au Ga Ge He It.

Included species:

H. deltophyllum Arvet-Touvet, *Hier. Alpes Fr.* 120 (1888). Au Ga He.

H. lycopsifolium Froelich in DC., *Prodr.* **7**: 224 (1838). Although this name has always been used for this group of plants in the aggregate sense, it has never been typified and it is uncertain to which of the segregates the name applies.

Other species and groups in (xxxv):

H. borealiforme P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 262 (1976) (*H. pseudoboreale* (Naegeli & Peter) Zahn, non Grec.; *H. porrifolium|sabaudum*). ● *S.E. Alps.* It Ju.

H. favratii Murat ex Gremli, *Excurs.-Fl. Schweiz* ed. 2, 273 (1874) (*H. flagelliferum|prenanthoides*). ● *W. Switzerland.* He.

H. hirsutum Bernh. ex Froelich in DC., *Prodr.* **7**: 213 (1838) (*H. nobile|sabaudum*). ● *Pyrenees, S.C. France.* Ga Hs.

H. pojoritense Wołoszczak, *Magyar Bot. Lapok* **3**: 21 (1904) (*H. sabaudum|sparsum*). ● *E. Carpathians.* Rm Rs (W).

H. pseudoboreale Grec., *Consp. Fl. Roman.* 375 (1898) (*H. pseudolaurinum* Prodan). ● *Romania.* Rm.

H. pseudocorymbosum group (*H. lycopsifolium|umbellatum*). ● *S.W. Alps, Vosges.* Ga He. (Including **H. pseudocorymbosum** Gremli, *Neue Beitr. Fl. Schweiz* **3**: 20 (1883). Ga He.)

H. subhirsutissimum Juxip, *Not. Syst.* (*Leningrad*) **19**: 470 (1959). ● Rs (B).

(xxxvi) Leaves all cauline, 15–50(–numerous), not amplexicaul; margin revolute. Capitula 1–25(–numerous), in large, sometimes elongate panicles, the upper part often more or less umbellate. Involucral bracts broadly linear-lanceolate, obtuse, usually glabrous, the outer squarrose with recurved apices. Ligules glabrous. Stigmas usually yellow. Margin of receptacular pits dentate or fimbriate-dentate. Achenes usually blackish.

257. H. umbellatum L., *Sp. Pl.* 804 (1753). Stems 10–100(–150) cm, with few to numerous simple eglandular hairs and few stellate hairs above, without glandular hairs, sometimes glabrescent. Leaves 15–150 × (1–)3–10(–20) mm, crowded, linear, lanceolate, or oblong-lanceolate, acute to acuminate, attenuate or cuneate at base, subentire to dentate, the teeth usually remote and sometimes long and cusped, with few to numerous simple eglandular hairs and stellate hairs beneath, often glabrescent above. Peduncles bracteate, with few to numerous stellate hairs and sometimes a few simple eglandular or glandular hairs. Involucre (8–)9–11 (–13) × 9–10 mm; bracts glabrous or rarely with a few small simple eglandular or minute glandular hairs. $2n=18$, 27. *Most of Europe.* Au Be Br Bu Cz Da Fe Ga Ge Hb He Ho Hs Hu It Ju Lu No Po Rm Rs (N, B, C, W, ?K, E) Su Tu.

This widespread and very variable taxon contains both sexual and apomictic variants, and cannot be satisfactorily divided into microspecies.

Some variants with broad leaves, particularly in W. Europe, strongly approach members of (xxxv) (e.g. **H. laurinum** Arvet-Touvet, *Addit. Monogr. Hier.* 18 (1879) (*H. vasconicum* Jordan ex Zahn); **H. umbellatum** subsp. **bichlorophyllum** (Druce & Zahn) P. D. Sell & C. West, *Watsonia* **6**: 313 (1967), $2n=18$), but they are connected by intermediates, sometimes in the same colony, to narrow-leaved plants.

(xxxvii) Basal leaves usually absent; cauline (4–)8–25(–numerous), not amplexicaul, the lower often petiolate. Capitula (4–)10–50(–numerous), usually in a large panicle. Involucral bracts linear-lanceolate, more or less obtuse, variously hairy. Ligules glabrous. Stigmas yellow or discoloured. Margin of receptacular pits dentate. Achenes dark brown or blackish.

258. H. laevigatum group. Stems 30–100(–120) cm, with few to numerous simple eglandular hairs throughout and usually stellate and sometimes a few small glandular hairs above. Leaves with few to numerous simple eglandular hairs which are sometimes rigid, sometimes with stellate hairs especially beneath; basal usually absent, or withering early; cauline (4–)4–25(–numerous), 30–200 × 10–40 mm, ovate-lanceolate to linear-lanceolate or lanceolate-oblong, denticulate to deeply dentate, more or less acute, attenuate or contracted at base, the lower sometimes petiolate, the remainder sessile, never amplexicaul. Peduncles and branches often bracteate, with few to numerous stellate hairs, usually some simple eglandular hairs and sometimes some small glandular hairs. Involucre (8–)9–12(–15) × 6–12 mm; bracts glabrous or with various amounts of stellate, glandular and simple eglandular hairs, the glandular hairs usually small. $2n=27$. *Europe southwards to the Pyrenees, N. Italy and Bulgaria.* Au Be Br Bu Cz Da Fa Fe Ga Ge Hb He Ho Hs Hu Is It Ju No Po Rm Rs (N, B, C, W) Su.

Included species:

H. friesii Hartman, *Handb. Skand. Fl.* ed. 3, 187 (1838). ● Au Cz Ge He Su.

H. gothicum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 121 (1848). ● Au Cz Ga Ge He Po Rs (W) Su.

H. knafii (Čelak.) Juxip in Schischkin & Bobrov, *Fl. URSS* **30**: 113 (1960). Au Be Bu Cz Ge He Ho Hu It Ju Po Rm Rs (B, C, W).

H. laevigatum Willd., *Sp. Pl.* **3**: 1590 (1803). Au Cz Ga Ge He Ho Hs It Ju Po Rm Rs (C, W).

H. lapponicum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 170 (1848). Fe No Rs (N) Su.

H. lissolepium (Zahn) Roffey in F. J. Hanb., *London Cat. Brit. Pl.* ed. 11, 29 (1925). Br Cz Da Fe Ga Ge He No Su.

H. mixopolium (Dahlst.) Norrlin in Cajander, *Suomen Kasvio* 735 (1906). Cz Fe Ga Ge Ho Po Rm Rs (W) Su.

H. norvegicum Fries, *Nova Acta Reg. Soc. Sci. Upsal.* **14**: 169 (1848). ● No Su.

H. rigidum Hartman, *Handb. Skand. Fl.* 300 (1820). Au Be Bu Cz Da Fe Ga Ge He Ho Hu It Ju Po Rs (?B, C, W) Su.

H. sparsifolium Lindeb., *Hier. Scand. Exsicc.* **1**: no. 48 (1868). ● Br Fa Hb Is No Su.

H. subgracilipes (Zahn) P. D. Sell & C. West, *Bot. Jour. Linn. Soc.* **71**: 267 (1976) (*H. laevigatum* subsp. *subgracilipes* Zahn). ● Au Ga He Ho.

H. tridentatum Fries, *Nov. Fl. Suec.* 77 (1819). $2n=27$. ● Au Cz Fe Ga Ge He Ho Hu It Ju No Po Rm Rs (?B, C, W) Su.

Other species and groups in (xxxvii):

H. calocymum group (*H. laevigatum|onosmoides*). *W.C. Europe and N.W. Italy.* Ga Ge He It. (Including **H. calocymum** Zahn in Schinz & R. Keller, *Fl Schweiz* ed. 2, **2**: 342 (1905). Ga Ge He It.)

H. muricellum group (*H. laevigatum|sparsum*). *W. Rodopi.* Bu. (*S.W. Asia.*) (Including **H. pseudosparsum** (Uechtr.) Zahn in Vandas, *Reliq. Formánek.* 365 (1909). ● Bu. **H. muricellum** Fries, *Uppsala Univ. Årsskr.* **1862** (*Math. Nat., Epicr. Hier.*): 117 (1862) does not occur in Europe.)

H. pelagae group (*H. sparsum|umbellatum*). *S. Carpathians.* Rm. (*Caucasus.*) (Including **H. pelagae** Degen & Zahn, *Ann. Hist.-Nat. Mus. Hung.* **8**: 100 (1910). ● Rm.)

H. subfarinaceum group (*H. farinosum* (Lindeb.) Omang, non Lam.; *H. laevigatum|onosmoides*). ● *Norway.* No. (Including **H. subfarinaceum** Zahn in Engler, *Pflanzenreich* **76(IV.280)**: 276 (1921). No.)

(xxxviii) At least the lower part of the plant villous, the hairs up to 6 mm, simple and eglandular. Leaves all cauline, numerous, semiamplexicaul. Capitula few to numerous, the upper part of panicle often subumbellate. Involucral bracts linear-lanceolate, more or less acute, hairy, the outer often squarrose. Ligules glabrous. Stigmas yellow. Achenes pale brown. Margin of receptacular pits dentate.

259. H. eriophorum St-Amans, *Bull. Soc. Philom. Paris* **3**: 26 (1801). Stems 30–90 cm, villous with undulate simple eglandular hairs up to 6 mm, and with numerous stellate hairs at least above. Leaves 10–70 × 7–25 mm, crowded, lanceolate or ovate-lanceolate, obtuse to acute, subentire to dentate, sessile, villous with undulate simple eglandular hairs up to 6 mm and sometimes with some stellate hairs. Peduncles with numerous stellate hairs and villous with undulate, simple eglandular hairs up to 4 mm. Involucre 10–12 × 8–11 mm; bracts with numerous stellate hairs and villous with undulate, simple eglandular hairs up to 4 mm. $2n=18$. *Maritime sands.* ● *S.W. France.* Ga.

260. H. prostratum group (*H. eriophorum|latifolium*). Like **259** but particularly the upper half of the plant without or with less dense hairs not more than 2·5 mm. *Maritime sands.* ● *S.W. France.* Ga.

Included species:

H. prostratum DC. in Lam. & DC., *Fl. Fr.* ed. 3, **5**: 413 (1815). Ga.

APPENDICES

NOTE TO APPENDICES I–III

Considerable variation is found in the orthography of the names of many authors, especially of the earlier ones and of those whose names are transliterated from Cyrillic script. Variant spellings are given here only if they are likely to give rise to doubts about identity.

The initials used by some authors vary according to whether the vernacular or latinized form of a Christian name is used (e.g. *Karl* or *Carolus*); the form most frequently used by the author is adopted in these lists.

The dates given for books and periodicals indicate, as far as can be ascertained, the date of effective publication; where this differs from dates on the title-page or elsewhere in the work itself, there is usually a reference to explain the dates given.

Certain publications are of a character intermediate between books and periodicals (e.g. seed-lists, *schedae*). The assignment of these to Appendix II or Appendix III is inevitably somewhat arbitrary.

In Appendix III there is normally no attempt made to indicate whether one periodical is a continuation of another, unless there is some continuity between them in the numbering of the volumes or series.

APPENDIX I

KEY TO THE ABBREVIATIONS OF AUTHORS' NAMES

Abromeit J. Abromeit (1857–1946)
Acht. B. Achtarov (1885–1959)
Adamović L. Adamović (1864–1935)
Adams M. F. Adams (J. F. Adam) (1780–1838)
Adanson M. Adanson (1727–1806)
Ade A. Ade (1876–1968)
Aellen P. Aellen (1896–1973)
Afan., C. C. S. Afanasiev (1905–1960)
Agardh C. A. Agardh (1785–1859)
Agardh, J. J. G. Agardh (1813–1901)
Ahlfvengren F. E. Ahlfvengren (1862–1921)
Ahti T. T. Ahti (b. 1934)
Aichele D. Aichele (b. 1928)
Airy Shaw H. K. Airy Shaw (b. 1902)
Aiton W. Aiton (1731–1793)
Alton fil. W. T. Aiton (1766–1849)
Alavi S. A. Alavi (b. 1934)
Albert A. Albert (1836–1909)
Albov N. M. Albov (Alboff) (1866–1897)
Alechin V. V. Alechin (1884–1946)
Alef. F. G. C. Alefeld (1820–1872)
Alexeenko M. I. Alexeenko (Alexejenko) (b. 1905)
All. C. Allioni (1728–1804)
Allan H. H. B. Allan (1882–1957)
Alleiz. C. d'Alleizette (1884–1967)
Allman G. J. Allman (1812–1898)
Almq. S. O. I. Almquist (1844–1923)
Alpers F. Alpers (1841–1912)
Alston A. H. G. Alston (1902–1958)
Ambrosi F. Ambrosi (1821–1897)
Amo Mariano del Amo y Mora (1809–1894)
Andersen J. C. Andersen (b. 1873)
Anderson, E. E. S. Anderson (1897–1969)
Anderson, G. G. Anderson (d. 1817)
Andersson, N. J. N. J. Andersson (1821–1880)
Andrae C. J. Andrae (1816–1885)
Andrasovszky J. Andrasovszky (1889–1943)
Andreas C. H. Andreas (b. 1898)
Andrews H. C. Andrews (d. 1830)
Andrz. A. L. Andrzejowski (1785–1868)
Angelis, M. M. von Angelis (1805–1894)
Ångström J. Ångström (1813–1879)
Antoine F. Antoine (1815–1886)
Appel O. Appel (1867–1952)
Arcangeli G. Arcangeli (1840–1921)
Ard. P. Arduino (1728–1805)
[illegible]
Ardoino H. J. P. Ardoino (1819–1874)
Arènes, J. J. Arènes (1898–1960)
Aresch., F. F. W. C. Areschoug (1830–1908)
Armstrong J. B. Armstrong (1850–1926)
Arnold (possibly a pseudonym; fl. 1785)
Arnott G. A. W. Arnott (1799–1868)
Arrh., A. J. I. A. Arrhenius (1858–1950)
Arrigoni P. V. Arrigoni (b. 1932)
Arrondeau E. T. Arrondeau (d. 1882)
Artemczuk I. V. Artemczuk (1898–1973)
Arvat A. Arvat (1890–1950)
Arvet-Touvet J. M. C. Arvet-Touvet (1841–1913)
Ascherson P. F. A. Ascherson (1834–1913)
Aspegren G. C. Aspegren (1791–1828)
Asso I. J. de Asso y del Río (1742–1814)
Aublet J. B. C. F. Aublet (1720–1778)
Aucher P. M. R. Aucher-Eloy (1792–1838)
Ausserdorfer A. Ausserdorfer (1836–1885)
Avé-Lall. J. L. E. Avé-Lallemant (1803–1867)
Avr. N. A. Avrorin (b. 1906)
Aznav. G. V. Aznavour (1861–1920)
Bab. C. C. Babington (1808–1895)
Babcock E. B. Babcock (1877–1954)
Backh. J. Backhouse (1825–1890)
Badaro G. B. Badaro (1793–1831)
Baenitz K. G. Baenitz (1837–1913)
Baer K. R. E. von Baer (1792–1876)
Bagnall J. E. Bagnall (1830–1918)
Bailey, L. H. L. H. Bailey (1858–1954)
Baillet C. Baillet (fl. 1862)
Baillon H. E. Baillon (1827–1895)
Bailly E. Bailly (1829–1894)
Baker J. G. Baker (1834–1920)
Baker fil. E. G. Baker (1864–1949)
Baksay L. Baksay (b. 1915)
Balansa B. Balansa (1825–1891)
Balbis G. B. Balbis (1765–1831)
Bald. A. Baldacci (1867–1950)
Balf. J. H. Balfour (1808–1884)
Balk. B. E. Balkovsky (b. 1899)
Ball J. Ball (1818–1889)
Ball, P. W. P. W. Ball (b. 1932)
Banks J. Banks (1743–1820)
Barbarich A. I. Barbarich (b. 1903)
Barbaz. F. Barbazita (fl. 1826)
Barbero M. Barbero (b. 1940)
Barbey, W. W. Barbey-Boissier (1842–1914)
Barc. F. Barceló y Combis (1820–1889)
Barkley, F. A. F. A. Barkley (b. 1908)
Barkoudah Y. I. Barkoudah (b. 1933)
Barn. F. M. Barnéoud (b. 1821)
Barnades M. Barnades (d. 1771)
Barrandon A. Barrandon (1814–1897)
Barratte J. F. G. Barratte (1857–1920)
Bartal. B. Bartalini (1746–1822)
Bartl. F. G. Bartling (1798–1875)
Bartlett H. H. Bartlett (1886–1960)
[illegible]
Barton, W. W. P. G. Barton (1786–1856)
Basil. N. A. Basilevskaja (Bazilevskaja) (b. 1902)
Basiner T. F. J. Basiner (1817–1862)
Bässler M. Bässler (b. 1935)
Bast. T. Bastard (1784–1846)
Batsch A. J. G. C. Batsch (1761–1802)
Batt. J. A. Battandier (1848–1922)
Baudo F. Baudo (fl. 1843)
Baum B. R. Baum (b. 1937)
Baumann, E. E. Baumann (1868–1933)
Baumg. J. C. G. Baumgarten (1765–1843)

Baxter W. Baxter (1787–1871)
Bean W. J. Bean (1863–1947)
Beauv. A. M. F. J. Palisot de Beauvois (1752–1820)
Beauverd G. Beauverd (1867–1942)
Becherer A. Becherer (b. 1897)
Bechst. J. M. Bechstein (1757–1822)
Beck, G. G. Beck von Mannagetta (1856–1931)
Becker, A. A. Becker (1818–1901)
Becker, J. J. Becker (1769–1833)
Becker, W. W. Becker (1874–1928)
Beeby W. H. Beeby (1849–1910)
Beger H. K. E. Beger (b. 1889)
Béguinot A. Béguinot (1875–1940)
Behrendsen W. Behrendsen (d. 1923)
Beldie A. Beldie (b. 1912)
Bellardi C. A. L. Bellardi (1741–1826)
Belli S. C. Belli (1852–1919)
Bellot F. Bellot Rodríguez (b. 1911)
Bell Salter T. Bell Salter (1814–1858)
Beltrán F. Beltrán Bigorra (1886–1962)
Benj. L. Benjamin (b. 1825)
Benn., A. W. A. W. Bennett (1833–1902)
Benn., Ar. Arthur Bennett (1843–1929)
Benson, L. L. D. Benson (b. 1909)
Bentham G. Bentham (1800–1884)
Benz R. Benz von Albkron (1863–1921)
Berchtold F. von Berchtold (1781–1876)
Berger, A. A. Berger (1871–1931)
Bergeret, J. P. J. P. Bergeret (1751–1813)
Berggren, Jakob Jakob Berggren (1790–1868)
Bergius P. J. Bergius (1730–1790)
Bergmans J. Bergmans (b. 1892)
Berlin J. A. Berlin (1851–1910)
Bernard P. F. Bernard (1749–1825)
Bernh. J. J. Bernhardi (1774–1850)
Bernis F. Bernis (fl. 1955)
Berth. S. Berthelot (1794–1880)
Bertol. A. Bertoloni (1775–1869)
Bertram F. W. W. Bertram (1835–1899)
Bertsch, F. F. Bertsch (1910–1944)
Bertsch, K. K. Bertsch (1878–1965)
Besse F. M. Besse (1864–1924)
Besser W. S. J. G. von Besser (1784–1842)
Betcke E. F. Betcke (1815–1865)
Beyer R. Beyer (1852–1932)
Beyrich H. C. Beyrich (1796–1834)
Bianca G. Bianca (1801–1883)
Biasol. B. Biasoletto (1793–1858)
Biatzovsky J. Biatzovsky (*c.* 1802–1863)
Bicknell, C. C. Bicknell (1842–1918)
Bicknell, E. P. E. P. Bicknell (1859–1925)
Bieb. F. A. Marschall von Bieberstein (1768–1826)
Bigelow J. Bigelow (1787–1879)
Bihari J. Bihari (b. 1889)
Billot P. C. Billot (1796–1863)
Binz A. Binz (1870–1963)
Biria J. A. J. Biria (b. 1889)
Biroli G. Biroli (1772–1825)
Bischoff G. W. Bischoff (1797–1854)
Bitter F. A. G. Bitter (1873–1927)
Biv. A. de Bivona-Bernardi (1774–1837)
Biv. fil. A. de Bivona-Bernardi (fl. 1838)
Blaise S. Blaise (fl. 1970)
Blake, S. F. S. F. Blake (1892–1959)
Blakelock R. A. Blakelock (1915–1963)
Blakeslee A. F. Blakeslee (1874–1954)
Blanc — Blanc (fl. 1866)
Blanche E. Blanche (1824–1908)
Blanco F. M. Blanco (1778–1845)
Blečić V. Blečić (b. 1911)
Błocki B. Błocki (1857–1919)
Błoński F. Błoński (1867–1910)
Bloxam A. Bloxam (1801–1878)
Bluff M. J. Bluff (1805–1837)
Blume C. L. von Blume (1796–1862)
Blytt M. N. Blytt (1789–1862)
Bobrov E. G. Bobrov (b. 1902)
Böcher T. W. Böcher (b. 1909)
Bodard P. H. H. Bodard (fl. 1798–1810)
Boedijn K. B. Boedijn (b. 1893)
Boehmer G. R. Boehmer (1723–1803)
Boenn. C. M. F. von Boenninghausen (1785–1864)
Bogenh. C. Bogenhard (1811–?1853)
Boguslaw I. A. Boguslaw (fl. 1846)
Boiss. P. E. Boissier (1810–1885)
Boivin J. R. B. Boivin (b. 1916)
Bolle, F. F. Bolle (b. 1905)
Bolós, A. A. de Bolós (b. 1889)
Bolós, O. O. de Bolós (b. 1924)
Bolton J. Bolton (*c.* 1758–1799)
Bolus, L. L. H. M. Bolus (Mrs F. Bolus) (1877–1970)
Bong. H. G. von Bongard (1786–1839)
Bonjean J. L. Bonjean (1780–1846)
Bonnet E. Bonnet (1848–1922)
Bonnier G. E. M. Bonnier (1853–1922)
Bonpl. A. J. A. Bonpland (1773–1858)
Boos, J. J. Boos (1794–1879)
Borbás V. von Borbás (1844–1905)
Bord. H. Bordère (1825–1889)
Bordzil. E. I. Bordzilowski (1875–1949)
Boreau A. Boreau (1803–1875)
Borgvall T. Borgvall (b. 1884)
Borhidi A. Borhidi (b. 1932)
Boriss. A. G. Borissova-Bekrjaševa (1903–1970)
Borja J. Borja Carbonell (b. 1903)
Borkh. M. B. Borkhausen (Borckhausen) (1760–1806)
Börner C. J. B. Börner (b. 1880)
Bornm. J. F. N. Bornmüller (1862–1948)
Boros Á. Boros (1900–1973)
Borrer W. Borrer (1781–1862)
Bory J. B. G. M. Bory de Saint-Vincent (1778–1846)
Borza A. Borza (1887–1971)
Borzi A. Borzi (1852–1911)
Bosc L. A. G. Bosc (1759–1828)
Bošnjak K. Bošnjak (1866–1953)
Bosse J. F. W. Bosse (1788–1864)
Bothmer S. R. von Bothmer (b. 1943)
Botsch. V. P. Botschantzev (b. 1910)
Bouché C. D. Bouché (1809–1881)
Boulay N. J. Boulay (1837–1905)
Bourgeau E. Bourgeau (1813–1877)
Bout. J. F. D. Boutigny (1820–1884)
Boutelou E. Boutelou (1776–1813)
Bouvet G. Bouvet (1874–1929)
Br., N. E. N. E. Brown (1849–1934)
Br., R. R. Brown (1773–1858)
Brackenr. W. D. Brackenridge (1810–1893)
Bradshaw, M. E. M. E. Bradshaw (b. 1926)
Brand A. Brand (1863–1931)
Brandt, J. P. J. P. Brandt (1921–1963)
Brandza D. Brandza (1846–1895)
Braun, A. A. C. H. Braun (1805–1877)

Braun, G. G. Braun (1821–1882)
Braun, H. H. Braun (1851–1920)
Braun, J. J. Braun (later J. Braun-Blanquet) (b. 1884)
Br.-Bl. J. Braun-Blanquet (b. 1884)
Bréb. L. A. de Brébisson (1798–1872)
Breistr. M. Breistroffer (b. 1910)
Brenan J. P. M. Brenan (b. 1917)
Brenner M. M. W. Brenner (1843–1930)
Brewer W. H. Brewer (1828–1910)
Briganti V. Briganti (1766–1836)
Brign. G. de Brignoli di Brunnhoff (1774–1857)
Briot P. L. Briot (1804–1888)
Briq. J. I. Briquet (1870–1931)
Britten J. Britten (1846–1924)
Brittinger C. C. Brittinger (1795–1869)
Britton N. L. Britton (1859–1934)
Britton, C. E. C. E. Britton (1872–1944)
Brocchi G. B. Brocchi (1772–1826)
Bromf. W. A. Bromfield (1801–1851)
Brot. F. Avellar Brotero (1744–1828)
Brouss. P. M. A. Broussonet (1761–1807)
Browicz K. Browicz (b. 1925)
Brügger C. G. Brügger (1833–1899)
Brumh. P. Brumhard (b. 1879)
Brummitt R. K. Brummitt (b. 1937)
Brunerye L. J. L. Brunerye (b. 1939)
Bruno — Bruno (fl. 1760)
Bruun H. G. Bruun (b. 1897)
Bubani P. Bubani (1806–1888)
Buch C. L. von Buch (1774–1853)
Buchanan-White F. Buchanan-White (1842–1894)
Buchegger J. Buchegger (b. 1886)
Buchenau F. G. P. Buchenau (1831–1906)
Buchholz J. T. Buchholz (1888–1951)
Buchinger J. D. Buchinger (1803–1888)
Buckn. C. Bucknall (1849–1921)
Buffon G. L. L. de Buffon (1707–1788)
Buhse F. A. Buhse (1821–1898)
Buia A. Buia (1911–1964)
Bunge A. A. von Bunge (1803–1890)
Burgsd. F. A. L. von Burgsdorff (1747–1802)
Burm. fil. N. L. Burman (N. L. Burmannus) (1734–1793)
Burnat E. Burnat (1828–1920)
Burtt, B. L. B. L. Burtt (b. 1913)
Busch, N. N. A. Busch (1869–1941)
Buschm. A. Buschmann (b. 1908)
Buser R. Buser (1857–1931)
Bush B. F. Bush (1858–1937)
Butcher R. W. Butcher (1897–1971)
Butkov A. Y. Butkov (b. 1911)
Caballero, A. A. Caballero (1877–1949)
Cabrera A. L. Cabrera (b. 1908)
Cadevall J. Cadevall i Diars (1846–1910)
Cajander A. K. Cajander (1879–1943)
Caldesi L. Caldesi (1821–1884)
Calestani V. Calestani (b. 1882)
Camb. J. Cambessedes (1799–1863)
Campd. F. Campderá (1793–1862)
Campo P. del Campo (fl. 1855)
Camus, A. A. Camus (1879–1965)
Camus E. G. Camus (1852–1915)
Cañigueral J. Cañigueral Cid (b. 1912)
Cannon J. F. M. Cannon (b. 1930)
Cariot A. Cariot (1820–1883)
Carrière E. A. Carrière (1818–1896)
Cartier D. Cartier (b. 1935)
Caruel T. Caruel (1830–1898)
Casav. J. Ruíz Casaviella (1835–1897)
Casper S. J. Casper (b. 1929)
Cass. A. H. G. Cassini (1781–1832)
Cast. J. L. M. Castagne (1785–1858)
Cav. A. J. Cavanilles (1745–1804)
Cavara F. Cavara (1857–1929)
Cavillier F. G. Cavillier (1868–1953)
Ceballos L. Ceballos Fernández de Córdoba (1896–1967)
Čelak. L. J. Čelakovsky (1834–1902)
Černjavski P. Černjavski (1892–1969)
Cesati V. de Cesati (1807–1883)
Chab. A. C. Chabert (1836–1916)
Chaix D. Chaix (1730–1799)
Cham. L. A. von Chamisso (L.C.A. Chamisseau de Boncourt) (1781–1838)
Charadze A. L. Charadze (b. 1905)
Charrel L. Charrel ('Abd-ur-Raḥmān-Nadji) (fl. 1888)
Chassagne M. Chassagne (fl. 1904–1960)
Chater A. O. Chater (b. 1933)
Chaub. L. A. Chaubard (1785–1854)
Chav. E. L. Chavannes (1805–1861)
Chaytor D. A. Chaytor (fl. 1937)
Chaz. L. M. Chazelles de Prizy (fl. 1790)
Chenevard P. Chenevard (1839–1919)
Cheval., A. A. J. B. Chevalier (1873–1956)
Cheval., E. E. Chevalier (1826–1914)
Chevall. F. F. Chevallier (1796–1840)
Chiaje S. delle Chiaje (1794–1860)
Chiarugi A. Chiarugi (1901–1960)
Ching, R.-C. Ren-Chang Ching (Jên-ch'ang Ch'in) (b. 1899)
Chiov. E. Chiovenda (1871–1940)
Chitrowo V. N. Chitrowo (1879–1949)
Chodat R. H. Chodat (1865–1934)
Choisy J. D. Choisy (1799–1859)
Chopinet R. Chopinet (b. 1914)
Chouard P. Chouard (fl. 1921–1970)
Chowdhuri P. K. Chowdhuri (b. 1923)
Chr., C. C. F. A. Christensen (1872–1942)
Christ H. Christ (1833–1933)
Christener C. Christener (1810–1872)
Christiansen, M. P. M. P. Christiansen (b. 1889)
Christm. G. F. Christmann (b. 1752)
Chrshan. V. G. Chrshanovski (b. 1912)
Chrtek J. Chrtek (b. 1930)
Claire C. Claire (?1867–1931)
Clairv. J. P. de Clairville (1742–1830)
Clapham A. R. Clapham (b. 1904)
Clarion ?J. Clarion (1776–1844)
Clarke, C. B. C. B. Clarke (1832–1906)
Clarke, E. D. E. D. Clarke (1779–1822)
Claus K. Claus (1796–1864)
Clavaud A. Clavaud (1828–1890)
Cleland R. E. Cleland (1892–1971)
Clemente S. de Rojas Clemente y Rubio (1777–1827)
Clementi, G. C. G. C. Clementi (1812–1873)
Clements F. E. Clements (1874–1945)
Clerc O. E. Clerc (1845–1920)
Cockayne L. Cockayne (1855–1934)
Coincy A. de Coincy (1837–1903)
Coleman W. H. Coleman (?1816–1863)
Coleman, J. R. J. R. Coleman (b. 1934)
Colla L. A. Colla (1766–1848)
Collett H. Collett (1836–1901)
Colmeiro M. Colmeiro y Penido (1816–1901)
Commerson P. Commerson (1727–1773)

Comolli G. Comolli (1780–1859)
Conr. P. Conrath (b. 1892)
Constance L. Constance (b. 1909)
Contandr. J. Contandriopoulos (b. 1922)
Conti, P. P. Conti (1874–1898)
Coombe, D. E. D. E. Coombe (b. 1927)
Copel. E. B. Copeland (1873–1964)
Corb. L. Corbière (1850–1941)
Cornaz E. Cornaz (1825–1911)
Corr. C. F. J. E. Correns (1864–1933)
Cosent. F. Cosentini (1769–1840)
Cosson E. S. C. Cosson (1819–1889)
Costa A. C. Costa y Cuxart (1817–1886)
Coste H. J. Coste (1858–1924)
Cothenius C. A. von Cothenius (1708–1789)
Coulter T. Coulter (1793–1843)
Coulter, J. M. J. M. Coulter (1851–1928)
Court. R. J. Courtois (1806–1835)
Coust. P. Cousturier (d. 1921)
Coutinho A. X. Pereira Coutinho (1851–1939)
Covas G. Covas (b. 1915)
Coville F. V. Coville (1867–1937)
Craib W. G. Craib (1882–1933)
Crantz H. J. N. von Crantz (1722–1799)
Crépin F. Crépin (1830–1903)
Cristofolini G. Cristofolini (b. 1939)
Crome G. E. W. Crome (1780–1813)
Cronq. A. J. Cronquist (b. 1919)
Csapody V. Csapody (b. 1890)
Csűrös I. Csűrös (b. 1914)
Cuatrec. J. Cuatrecasas (b. 1903)
Cuf. G. Cufodontis (1896–1974)
Cullen J. Cullen (b. 1936)
Cunn., A. A. Cunningham (1791–1839)
Cunn., R. R. Cunningham (1793–1835)
Curtis W. Curtis (1746–1799)
Cusson P. Cusson (1727–1783)
Cutanda V. Cutanda (1804–1865)
Cyr. D. Cyrillo (1739–1799)
Czecz. H. Czeczott (b. 1888)
Czefr. Z. V. Czefranova (b. 1923)
Czerep. S. K. Czerepanov (b. 1921)
Czern. V. M. Czernajew (Czernjaew) (1796–1871)
Czernov E. G. Czernov (b. 1908)
Czernova N. M. Czernova (b. 1901)
Czetz A. Czetz (1801–1865)
Dahl, O. C. O. C. Dahl (1862–1940)
Dahlst. H. G. A. Dahlstedt (1856–1934)
Dalby D. H. Dalby (b. 1930)
Dalla Torre K. W. von Dalla Torre (1850–1928)
Damanti P. Damanti (b. 1858)
Damboldt J. Damboldt (b. 1937)
Dammer C. L. U. Dammer (1860–1920)
Dandy J. E. Dandy (b. 1903)
Danilov A. D. Danilov (b. 1903)
Danser B. H. Danser (1891–1943)
Dansereau P. Dansereau (b. 1911)
Danth. ?E. Danthoine (fl. 1788)
Darlington, W. W. Darlington (1782–1863)
Darracq U. Darracq (d. 1872)
Daveau J. A. Daveau (1852–1929)
Davey F. H. Davey (1868–1915)
Davidov B. Davidov (1870–1927)
Davies H. Davies (1739–1821)
Davis, P. H. P. H. Davis (b. 1918)
DC. A. P. de Candolle (1778–1841)
DC., A. A. L. P. P. de Candolle (1806–1893)
DC., C. A. C. P. de Candolle (1836–1918)
De Bary H. A. de Bary (1831–1888)
Debeaux J. O. Debeaux (1826–1910)
Déchy M. Déchy (b. 1851)
Decken C. C. von der Decken (1833–1865)
Decker P. Decker (b. 1867)
Decne J. Decaisne (1807–1882)
DeFilipps R. A. DeFilipps (b. 1939)
Degen A. von Degen (1866–1934)
Dehnh. F. Dehnhardt (1787–1870)
De Langhe J. E. de Langhe (b. 1907)
De Laramb. de Larambergue
Delarbre A. Delarbre (1724–1813)
De la Soie G. A. de la Soie (1818–1877)
De Lens — De Lens (fl. 1828)
Delile A. R. Delile (1778–1850)
Delponte G. B. Delponte (1812–1884)
Dematra Dematra (1742–1824)
Demjan. O. N. Demjanenko (b. 1894)
Dennst. A. W. Dennstedt (1776–1826)
De Noé F. de Noé (fl. 1855)
De Not. G. de Notaris (1805–1877)
De Retz B. G. G. de Retz (b. 1910)
Déséglise P. A. Déséglise (1823–1883)
Des Etangs N. S. C. des Etangs (1801–1876)
Desf. R. L. Desfontaines (*c.* 1751–1833)
Desmoulins C. Desmoulins (1797–1875)
Desportes N. H. F. Desportes (1776–1856)
Desr. L. A. J. Desrousseaux (1753–1838)
Desv. A. N. Desvaux (1784–1856)
Dettn., U. U. Dettmann (b. 1933)
Deville L. Deville (fl. 1859)
De Wild. É. de Wildeman (1866–1947)
Dickson J. Dickson (1738–1822)
Didr. D. F. Didrichsen (1814–1887)
Diels F. L. E. Diels (1874–1945)
Dierbach J. H. Dierbach (1788–1845)
Dietr., A. A. Dietrich (1795–1856)
Dietr., D. D. N. F. Dietrich (1800–1888)
Dietr., F. G. F. G. Dietrich (1768–1850)
Dingler H. Dingler (1846–1935)
Dingwall I. Dingwall (b. 1945)
Dippel L. Dippel (1827–1914)
Dittrich M. Dittrich (b. 1934)
Dobrescu C. Dobrescu (b. 1912)
Dobrocz. D. N. Dobroczaeva-Kovalczuk (b. 1916)
Dode L. A. Dode (1875–1943)
Döll J. C. Döll (1808–1885)
Dolliner G. Dolliner (1794–1872)
Domac R. Domac (b. 1918)
Domin K. Domin (1882–1953)
Domokos J. Domokos (b. 1904)
Don, D. D. Don (1799–1841)
Don, G. G. Don (1764–1814)
Don fil., G. G. Don (1798–1856)
Donadille P. Donadille (b. 1936)
Donn J. Donn (1758–1813)
Dörfler I. Dörfler (1866–1950)
Dorthes J. A. Dorthes (1759–1794)
Dostál J. Dostál (b. 1903)
Douglas D. Douglas (1798–1834)
Downar N. V. Downar (fl. 1855–1862)
Drejer S. T. N. Drejer (1813–1842)
Drenowski A. K. Drenowski (Drenovsky) (1879–1967)
Dreves J. F. P. Dreves (1772–1816)

Druce G. C. Druce (1850–1932)
Drude C. G. O. Drude (1852–1933)
Düben M. W. von Düben (1814–1845)
Dubjansky V. A. Dubjansky (1877–1962)
Dubois, F. F. N. A. Dubois (1752–1824)
Dubovik O. N. Dubovik (b. 1935)
Duby J. E. Duby (1798–1885)
Duchartre P. E. S. Duchartre (1811–1894)
Duchesne A. N. Duchesne (1747–1827)
Ducommun J. C. Ducommun (fl. 1869)
Dudley, T. R. T. R. Dudley (b. 1936)
Dufour J.-M. L. Dufour (1780–1865)
Dufresne P. Dufresne (1786–1836)
Duh. H. L. Duhamel de Monceau (1700–1781)
Dulac J. Dulac (fl. 1867–1885)
Düll R. Düll (b. 1932)
Dumbadze T. A. Dumbadze (b. 1902)
Dum.-Courset G. L. M. Dumont de Courset (1746–1824)
Dumort. B. C. J. Dumortier (1797–1878)
Dunal M. F. Dunal (1789–1856)
Dupont — Dupont (fl. 1825)
Durand, B. B. M. Durand (b. 1928)
Durand, E. E.-M. (later E.) Durand (1794–1873)
Durande J. F. Durande (1732–1794)
Durieu M. C. Durieu de Maisonneuve (1796–1878)
Duroi J. P. Duroi (1741–1785)
D'Urv. J. S. C. D. D'Urville (1790–1842)
Duthie J. F. Duthie (1845–1922)
Du Tour — Du Tour de Salvert (fl. 1803–1815)
Duval-Jouve J. Duval-Jouve (1810–1883)
Dvořáková M. Dvořáková (b. 1940)
Dyer W. T. Thiselton-Dyer (1843–1928)
Ecklon C. F. Ecklon (1795–1868)
Edgew. M. P. Edgeworth (1812–1881)
Edmondston T. Edmondston (1825–1846)
Ehrenb. C. G. Ehrenberg (1795–1876)
Ehrend. F. Ehrendorfer (b. 1927)
Ehrh. J. F. Ehrhart (1742–1795)
Eichw. K. E. von Eichwald (1794–1876)
Eig A. Eig (1894–1938)
Eklund O. A. Eklund (1899–1946)
Ekman, E. L. E. L. Ekman (1883–1931)
Ekman, Elis. H. M. E. A. E. Ekman (1862–1936)
Elfstr. M. Elfstrand (1859–1927)
Elias Frère H. Elias (fl. 1907–1944)
Elkan L. Elkan (1815–1851)
Elliott S. Elliott (1771–1830)
Emberger L. Emberger (1897–1969)
Enander S. J. Enander (1847–1928)
Endl. S. L. Endlicher (1804–1849)
Engelm. G. Engelmann (1809–1884)
Engler H. G. A. Engler (1844–1930)
Engler, V. V. Engler (1885–1917)
Ern H. Ern (b. 1935)
Eshbaugh W. H. Eshbaugh (b. 1936)
Eschsch. J. F. G. von Eschscholz (1793–1831)
Esteve F. Esteve Chueca (b. 1919)
Etlinger A. E. Etlinger (fl. 1777)
Evers G. Evers (?1837–?1916)
Exell A. W. Exell (b. 1901)
Fabr. P. C. Fabricius (1714–1774)
Facch. F. Facchini (1788–1852)
Farwell O. A. Farwell (1867–1944)
Fasano A. Fasano (fl. 1787)
Fauché M. Fauché (fl. 1832)
Fauconnet C. I. Fauconnet (1811–1876)
Favarger C. P. E. Favarger (b. 1913)
Favrat L. Favrat (1827–1893)
Fedde F. K. G. Fedde (1873–1942)
Fedorov An. A. Fedorov (b. 1908)
Fedtsch., B. B. A. Fedtschenko (1872–1947)
Fedtsch., O. O. A. Fedtschenko (1845–1921)
Fée A. L. A. Fée (1789–1874)
Feer H. Feer (1857–1892)
Feinbrun N. Feinbrun (b. 1900)
Fenzl E. Fenzl (1808–1879)
Feráková V. Feráková (b. 1938)
Ferguson, I. K. I. K. Ferguson (b. 1938)
Fernald M. L. Fernald (1873–1950)
Fernandes, A. A. Fernandes (b. 1906)
Fernandes, R. R. Fernandes (b. 1916)
Ferrarini E. Ferrarini (b. 1919)
Fiala F. Fiala (1861–1898)
Ficalho F. M. de Mello Breyner de Ficalho (1837–1903)
Fieschi V. Fieschi (b. *c.* 1910)
Fil. N. Filarszky (1858–1941)
Finch R. A. Finch (b. 1939)
Fingerh. K. A. Fingerhuth (1802–1876)
Fiori A. Fiori (1865–1950)
Fischer F. E. L. von Fischer (1782–1854)
Fischer, M. M. Fischer (b. 1942)
Fischer von Wald. A. A. Fischer von Waldheim (1803–1884)
Fisher T. R. Fisher (b. 1921)
Fitschen J. Fitschen (1869–1947)
Fleischm. A. Fleischmann (1805–1867)
Flerow A. F. Flerow (1872–1960)
Fletcher H. R. Fletcher (b. 1907)
Flod., B. B. G. O. Floderus (1867–1941)
Floerke H.-G. Floerke (1764–1835)
Florström B. L. Florström (1879–1914)
Flügge J. Flügge (1775–1816)
Focke W. O. Focke (1834–1922)
Foggitt W. Foggitt (1835–1917)
Fomin A. V. Fomin (1869–1935)
Font Quer P. Font Quer (1888–1964)
Form. E. Formánek (1845–1900)
Forrest G. Forrest (1873–1932)
Forskål P. Forskål (1732–1763)
Forster, E. E. Forster (1765–1849)
Forster, G. J. G. A. Forster (1754–1794)
Forster, J. R. J. R. Forster (1729–1798)
Forster, T. F. T. F. Forster (1761–1825)
Fortune R. Fortune (1812–1880)
Fouc. J. Foucaud (1847–1904)
Foug. A. D. Fougeroux de Bondaroy (1732–1789)
Fourn., E. E. P. N. Fournier (1834–1884)
Fourn., P. P.-V. Fournier (1877–1964)
Fourr. J. P. Fourreau (1844–1871)
Franchet A. R. Franchet (1834–1900)
Franco J. do Amaral Franco (b. 1921)
Franklin J. Franklin (1786–1847)
Fraser, Neill P. Neill Fraser (1830–1905)
Freitag H. Freitag (b. 1932)
Fresen. J. B. G. W. Fresenius (1806–1866)
Freyc. L. C. Desaulses de Freycinet (1779–1842)
Freyer H. Freyer (1802–1866)
Freyn J. F. Freyn (1845–1903)
Frid. K. N. Friderichsen (1853–1932)
Friedrich H. Friedrich (b. 1925)
Fries E. M. Fries (1794–1878)
Fries, T. C. E. T. C. E. Fries (1886–1930)
Fries, Th. T. M. Fries (1832–1913)

Fritsch K. Fritsch (1864–1934)
Fritze R. Fritze (fl. 1870)
Friv. E. Frivaldszky von Frivald (I. Frivaldszky) (1799–1870)
Frodin D. G. Frodin (b. 1940)
Froelich J. A. von Froelich (1766–1841)
Fröhlich, A. A. Fröhlich (1882–1969)
Fröhner S. E. Fröhner (b. 1941)
Fuchs, H. P. H. P. Fuchs (b. 1928)
Funck H. C. Funck (1771–1839)
Fürnrohr A. E. Fürnrohr (1804–1861)
Fuss M. Fuss (1814–1883)
Gaertner J. Gaertner (1732–1791)
Gaertner fil. C. F. von Gaertner (1772–1850)
Gaertner, P. P. G. Gaertner (1754–1825)
Gagnebin A. Gagnebin (1707–1800)
Gaill. C. Gaillardot (1814–1883)
Galeotti H. G. Galeotti (1814–1858)
Gamajun. A. P. Gamajunova (b. 1904)
Gamisans J. Gamisans (b. 1944)
Gams H. Gams (b. 1893)
Gand. M. Gandoger (1850–1926)
Ganeschin S. S. Ganeschin (1879–1930)
García J. G. García (1904–1971)
Garcke F. A. Garcke (1819–1904)
Gariod C. H. Gariod (1836–1892)
Gars. F. A. de Garsault (1691–1776)
Gartner, H. H. Gartner (fl. 1939)
Gasparr. G. Gasparrini (1804–1866)
Gaterau — Gaterau (fl. 1789)
Gauckler K. Gauckler (b. 1898)
Gaud.-Beaup. C. Gaudichaud-Beaupré (1789–1854)
Gaudin J. F. A. T. G. P. Gaudin (1766–1833)
Gaussen H. Gaussen (b. 1891)
Gaut. G. Gautier (1841–1911)
Gavioli O. Gavioli (1871–1944)
Gawłowska M. J. Gawłowska (b. 1910)
Gay J. E. Gay (1786–1864)
Gay, C. C. Gay (1800–1873)
Gáyer G. Gáyer (1883–1932)
Geiger P. L. Geiger (1785–1836)
Geil. G. Geilinger (1881–1955)
Gelert O. C. L. Gelert (1862–1899)
Genev. L. G. Genevier (1830–1880)
Genn. P. Gennari (1820–1897)
Genty P. A. Genty (1861–1955)
Georgescu C. C. Georgescu (1898–1968)
Georgi J. G. Georgi (1729–1802)
Georgiev T. Georgiev (b. 1883)
Gérard L. Gérard (1733–1819)
Germ. J. N. E. Germain de Saint-Pierre (1815–1882)
Getliffe F. M. Getliffe (b. 1941)
Gibbs, P. P. E. Gibbs (b. 1938)
Gibelli G. Gibelli (1831–1898)
Gibson G. S. Gibson (1818–1883)
Gilib. J. E. Gilibert (1741–1814)
Gill J. Gill (b. 1936)
Gill J. Gill (b. 1936)
Gillet C. C. Gillet (1806–1896)
Gilli A. Gilli (b. 1903)
Gillies J. Gillies (1747–1836)
Gillot F. X. Gillot (1842–1910)
Gilmour J. S. L. Gilmour (b. 1906)
Ging. F. C. J. Gingins de Lassaraz (1790–1863)
Ginzberger A. Ginzberger (1873–1940)
Girard F. de Girard (fl. 1844)
Giraud. L. Giraudias (1848–1922)
Giroux M. Giroux (fl. 1933)
Gled. J. G. Gleditsch (1714–1786)
Glück C. M. H. Glück (1868–1940)
Gmelin, C. C. C. C. Gmelin (1762–1837)
Gmelin, J. F. J. F. Gmelin (1748–1804)
Gmelin, J. G. J. G. Gmelin (1709–1755)
Gmelin, S. G. S. G. Gmelin (1744 or 1745–1774)
Gochnat F. C. Gochnat (d. 1816)
Godet C. H. Godet (1797–1879)
Godman F. Du Cane Godman (1834–1919)
Godron D. A. Godron (1807–1880)
Goffart J. Goffart (1864–1954)
Goiran A. Goiran (1835–1909)
Goldie J. Goldie (1793–1886)
Golitsin S. V. Golitsin (1897–1968)
Gontsch. N. F. Gontscharov (1900–1942)
González, F. F. González (fl. 1877)
González-Albo J. González-Albo (fl. 1935)
Goodding L. N. Goodding (b. 1880)
Gordon G. Gordon (1806–1879)
Gorodkov B. N. Gorodkov (1890–1953)
Gorschk. S. G. Gorschkova (1889–1972)
Görz, R. R. Görz (1879–1935)
Gouan A. Gouan (1733–1821)
Goulimy C. N. Goulimy (Goulimis) (1886–1963)
Goupil C. J. Goupil (1784–1858)
Govoruchin V. S. Govoruchin (1903–1970)
Grab. H. E. Grabowski (1792–1842)
Graebner K. O. P. P. Graebner (1871–1933)
Graells M. de la P. Graells (1809–1898)
Graf ?S. Graf (1801–1838)
Graham, R. A. R. A. Graham (1915–1958)
Graham, R. C. R. C. Graham (1786–1845)
Gram, K. K. J. A. Gram (1897–1961)
Grande L. Grande (1878–1965)
Grau H. R. J. Grau (b. 1937)
Grauer S. Grauer (1758–1820)
Gray, A. A. Gray (1810–1888)
Gray, S. F. S. F. Gray (1766–1828)
Grec. D. Grecescu (1841–1910)
Gredilla A. F. Gredilla y Gauna (1859–1919)
Greene, E. L. E. L. Greene (1843–1915)
Greenman J. M. Greenman (1867–1951)
Gregory, E. S. E. S. Gregory (1840–1932)
Gremblich J. Gremblich (1851–1905)
Gremli A. Gremli (1833–1899)
Gren. J. C. M. Grenier (1808–1875)
Greuter, W. W. R. Greuter (b. 1938)
Grev. R. K. Greville (1794–1866)
Griesselich L. Griesselich (1804–1848)
Grigoriev J. S. Grigoriev (b. 1905)
Grimm J. F. K. Grimm (1737–1821)
Grinț., G. G. P. Grințescu (1870–1947)
Griseb. A. H. R. Grisebach (1814–1879)
Gröntved J. Gröntved (1882–1956)
Gross, H. H. Gross (b. 1888)
Grosser W. C. H. Grosser (b. 1869)
Grosser W. C. H. Grosser (b. 1869)
Grosset H. E. Grosset (b. 1903)
Grossh. A. A. Grossheim (1888–1948)
Groves H. Groves (1835–1891)
Gruner L. F. Gruner (b. 1838)
Grynj F. A. Grynj (b. 1902)
Gueldenst. J. A. von Gueldenstaedt (1745–1781)
Guépin J. P. Guépin (1779–1858)
Guérin J. X. B. Guérin (1775–1850)
Guersent L. B. Guersent (1776–1848)
Gugler W. Gugler (1874–1909)

Guicc. G. Guicciardi (fl. 1855)
Guimar. J. de Ascensão Guimarães (1862–1922)
Guimpel F. Guimpel (1774–1839)
Guinea E. Guinea (b. 1907)
Guinier P. Guinier (1876–1962)
Guirão A. Guirão y Navarro (d. 1890)
Guittonneau G. Guittonneau (b. 1934)
Gulia G. Gulia (1835–1889)
Gunnarsson J. G. Gunnarsson (1866–1944)
Gunnerus J. E. Gunnerus (1718–1773)
Günther C. C. Günther (1769–1833)
Gürke A. R. L. M. Gürke (1854–1911)
Guss. G. Gussone (1787–1866)
Gustafsson M. Å. Gustafsson (b. 1941)
Guşuleac M. Guşuleac (1887–1960)
Guterm. W. Gutermann (b. 1935)
Guthnick H. J. Guthnick (1800–1870)
Győrffy I. Győrffy (1880–1959)
Habl. C. von Hablitz (1752–1821)
Hacq. B. A. Hacquet (1739–1815)
Hadač E. Hadač (b. 1914)
Haenke T. Haenke (1761–1816 or 1817)
Haenseler F. Haenseler (1766–1841)
Hagendijk A. Hagendijk (b. 1942)
Hagerup O. Hagerup (1889–1961)
Hagl., G. G. E. Haglund (1900–1955)
Hahne A. Hahne (1873–1942)
Halácsy E. von Halácsy (1842–1913)
Hall, H. M. H. M. Hall (1874–1932)
Hall, W. W. Hall (1743–1800)
Haller A. von Haller (1708–1777)
Haller fil. A. von Haller (1758–1823)
Halliday G. Halliday (b. 1933)
Hallier E. Hallier (1831–1904)
Hamet Raymond-Hamet (fl. 1906–1960)
Hämet-Ahti L. Hämet-Ahti (b. 1931)
Hampe G. E. Hampe (1795–1880)
Hanb., F. J. F. J. Hanbury (1851–1938)
Hand.-Mazz. H. von Handel-Mazzetti (1882–1940)
Hanelt P. Hanelt (b. 1930)
Hanry H. Hanry (1807–1893)
Hara H. Hara (b. 1911)
Harley R. M. Harley (b. 1936)
Harms H. A. T. Harms (1870–1942)
Harrison, H.- J. Heslop-Harrison (b. 1920)
Hartig H. J. A. R. Hartig (1839–1901)
Hartinger A. Hartinger (1806–1890)
Hartl D. Hartl (fl. 1955)
Hartman C. J. Hartman (1790–1849)
Hartman fil. C. Hartman (1824–1884)
Hartman, R. R. W. Hartman (1827–1891)
Hartmann, F. X. F. X. von Hartmann (1737–1791)
Hartweg K. T. Hartweg (1812–1871)
Hartwiss N. von Hartwiss (1791–1860)
Harvey W. H. Harvey (1811–1866)
Harvey W. H. Harvey (1811–1866)
Harz, C. O. C. O. Harz (1842–1906)
Hasselq. F. Hasselquist (1722–1752)
Hassk. J. C. Hasskarl (1811–1894)
Hausm. F. von Hausmann (1810–1878)
Haussk n. H. K. Haussknecht (1838–1903)
Haw. A. H. Haworth (1768–1833)
Hayek A. von Hayek (1871–1928)
Haynald S. F. L. Haynald (1816–1891)
Hayne F. G. Hayne (1763–1832)
Häyrén E. F. Häyrén (1878–1957)
Hayward W. R. Hayward (fl. 1868–1895)
Hazsl. F. A. Hazslinszky von Hazslin (1818–1896)
Hedberg K. O. Hedberg (b. 1923)
Hedl. J. T. Hedlund (1861–1953)
Hedley G. W. Hedley (1871–1941)
Hedwig fil. R. A. Hedwig (1772–1806)
Heer O. Heer (1809–1883)
Hegelm. C. F. Hegelmaier (1834–1906)
Hegetschw. J. J. Hegetschweiler (1789–1839)
Hegi G. Hegi (1876–1932)
Heimans J. Heimans (b. 1889)
Heimerl A. Heimerl (1857–1942)
Heister L. Heister (1683–1758)
Heldr. T. von Heldreich (1822–1902)
Heller F. X. Heller (1775–1840)
Helm G. F. Helm (fl. 1809–1828)
Hemsley W. B. Hemsley (1843–1924)
Henckel L. V. F. Henckel von Donnersmarck (1785–1861)
Henderson, A. A. Henderson (fl. 1860)
Henderson, E. G. E. G. Henderson (1782–1876)
Hendrych R. Hendrych (b. 1926)
Henriq. J. A. Henriques (1838–1928)
Henry, A. A. Henry (1857–1930)
Henry, Louis Louis Henry (1853–1913)
Hepper F. N. Hepper (b. 1929)
Herbert W. Herbert (1778–1847)
Herbich F. Herbich (1791–1865)
Herder F. G. T. M. von Herder (1828–1896)
Hermann, F. F. Hermann (1873–1967)
Herrmann, J. J. Herrmann (1738–1800)
Herter W. G. Herter (1884–1958)
Hertsch H. Hertsch (1819–1856)
Hervier J. Hervier-Basson (1846–1900)
Hess, H. H. Hess (b. 1920)
Heuffel J. Heuffel (1800–1857)
Heukels H. Heukels (1854–1936)
Heynh. G. Heynhold (fl. 1828–1850)
Heywood V. H. Heywood (b. 1927)
Hicken C. M. Hicken (1875–1933)
Hiern W. P. Hiern (1839–1925)
Hieron. G. H. E. Hieronymus (1846–1921)
Hiitonen H. I. A. Hiitonen (b. 1898)
Hildebr. F. H. G. Hildebrand (1835–1915)
Hill J. Hill (1716–1775)
Hill, A. W. A. W. Hill (1875–1941)
Hilliard O. M. Hilliard (b. 1925)
Hitchc., A. S. A. S. Hitchcock (1865–1935)
Hitchc., E. E. Hitchcock (1793–1864)
Hladnik F. Hladnik (1773–1844)
Hochreutiner B. P. G. Hochreutiner (1873–1959)
Hochst. C. F. Hochstetter (1787–1860)
Hoffm. G. F. Hoffmann (1761–1826)
Hoffm., O. O. Hoffmann (1853–1909)
Hoffmanns. J. C. von Hoffmannsegg (1766–1849)
Hofmann, E. E. Hofmann (fl. 1839–1856)
Hofmann, H. H. Hofmann (d. 1923)
Hofmann, H. H. Hofmann (d. 1923)
Hohen. R. F. Hohenacker (1798–1874)
Holandre J. J. J. Holandre (1773–1857)
Holl F. Holl (fl. 1820–1842)
Holm T. Holm (1880–1943)
Holmberg O. R. Holmberg (1874–1930)
Holmboe J. Holmboe (1880–1943)
Holmgren B. Holmgren (1872–1946)
Holub, J. J. Holub (b. 1930)
Holuby J. L. Holuby (1836–1923)
Holzm. T. Holzmann (b. 1843)
Honckeny G. A. Honckeny (1724–1805)

Hooker W. J. Hooker (1785–1865)
Hooker fil. J. D. Hooker (1817–1911)
Hope J. Hope (1725–1786)
Hoppe D. H. Hoppe (1760–1846)
Horák B. Horák (fl. 1900)
Hormuzaki K. Hormuzaki (1863–1937)
Hornem. J. W. Hornemann (1770–1841)
Hornsch. C. F. Hornschuch (1793–1850)
Hornung E. G. Hornung (1795–1862)
Horvatić S. Horvatić (b. 1899)
Horvátovszky S. Horvátovszky (fl. 1770)
Hose, J. A. C. J. A. C. Hose (d. 1800)
Hossain M. Hossain (b. 1928)
Host N. T. Host (1761–1834)
House H. D. House (1878–1949)
Houtt. M. Houttuyn (1720–1798)
Houtzagers G. Houtzagers (1888–1957)
Howard H. W. Howard (b. 1913)
Howell T. J. Howell (1842–1912)
Hruby J. Hruby (1882–1964)
Hubbard F. T. Hubbard (1875–1962)
Huber, J. A. J. A. Huber (1867–1914)
Huber-Morath A. Huber-Morath (b. 1901)
Hudson W. Hudson (1730–1793)
Hudziok G. W. Hudziok (b. 1929)
Huet A. Huet du Pavillon (1829–1907)
Hull J. Hull (1761–1843)
Hülphers K. A. Hülphers (1882–1948)
Hülsen R. Hülsen (1837–1912)
Hultén E. O. G. Hultén (b. 1894)
Humb. F. H. A. von Humboldt (1769–1859)
Hussenot L. C. S. L. Hussenot (1809–1845)
Huter R. Huter (1834–1909)
Huth E. Huth (1845–1897)
Hy F. C. Hy (1853–1918)
Hyl. N. Hylander (1904–1970)
Iljin M. M. Iljin (Ilyin) (1889–1967)
Iljinsky, A. A. P. Iljinsky (1885–1945)
Illarionova N. B. Illarionova (fl. 1957)
Ingram C. Ingram (b. 1880)
Insenga G. Insenga (1815 or 1816–1887)
Ionescu M. A. Ionescu (b. 1900)
Irmisch J. F. T. Irmisch (1816–1879)
Irmscher E. Irmscher (1887–1968)
Itz. H. Itzigsohn (1814–1878)
Ivanina L. I. Ivanina (b. 1917)
Ivaschin D. S. Ivaschin (b. 1912)
Iversen J. Iversen (1904–1971)
Ives E. Ives (1779–1861)
Jackson, A. B. A. B. Jackson (1876–1947)
Jackson, B. D. B. D. Jackson (1846–1927)
Jacq. N. J. von Jacquin (1727–1817)
Jacq. fil. J. F. von Jacquin (1766–1839)
Jaeger H. Jaeger (1815–1890)
Jäggi J. Jäggi (1829–1894)
[illegible]
Jahandiez E. Jahandiez (1876–1938)
Jakowatz A. Jakowatz (b. 1872)
Jalas J. Jalas (b. 1920)
Jameson W. Jameson (1796–1873)
Jan G. Jan (1791–1866)
Janchen E. Janchen (1882–1970)
Jancz. E. Janczewski von Glinka (1846–1918)
Janisch. D. E. Janischewsky (1875–1944)
Janka V. Janka von Bulcs (1837–1890)
Jaquet F. Jaquet (1858–1933)
Jardine, N. N. Jardine (b. 1943)
Jasiewicz A. Jasiewicz (fl. 1970)
Jaub. H. F. Jaubert (1798–1874)
Jáv. S. Jávorka (1883–1961)
Jeanb. E. M. J. Jeanbernat (1835–1888)
Jensen, G. J. G. K. Jensen (1818–1886)
Jermy A. C. Jermy (b. 1932)
Jessen, K. K. Jessen (1884–1971)
Joerg. E. H. Joergensen (1863–1938)
Joh., K. K. Johansson (1856–1928)
Johnston, I. M. I. M. Johnston (1898–1960)
Jones, B. M. G. B. M. G. Jones (b. 1933)
Jónsson H. Jónsson (1867–1925)
Jordan A. Jordan (1814–1897)
Jordanov D. Jordanov (b. 1893)
Jovet P. A. Jovet (b. 1896)
Junge P. Junge (1881–1919)
Junger E. Junger (fl. 1891)
Juratzka J. Juratzka (1821–1878)
Jurišić Z. J. Jurišić (1863–1921)
Juss. A. L. de Jussieu (1748–1836)
Juss., A. A. H. L. de Jussieu (1797–1853)
Juxip A. J. Juxip (Üksip) (1886–1966)
Juz. S. V. Juzepczuk (1893–1959)
Kabath H. Kabath (1816–1888)
Kaeser F. Kaeser (1853–1915)
Kalela A. Kalela (b. 1908)
Kalenicz. J. O. Kaleniczenko (1805–1876)
Kalm P. Kalm (1716–1779)
Kaltenb. J. H. Kaltenbach (1807–1876)
Kanitz Á. Kanitz (1843–1896)
Kar. G. S. Karelin (1801–1872)
Kárpáti Z. E. Kárpáti (1909–1972)
Karsch A. Karsch (1822–1892)
Karsten G. K. W. H. Karsten (1817–1908)
Kasakewicz L. I. Kasakewicz (b. 1893)
Kaschm., B. B. F. Kaschmensky (d. 1909)
Kästner A. Kästner (b. 1936)
Kauffm. N. N. Kauffmann (Kaufman) (1834–1870)
Kaulfuss G. F. Kaulfuss (1786–1830)
Kazim. T. Kazimierski (b. 1924)
Kazmi S. M. A. Kazmi (b. 1926)
Keissler K. von Keissler (1872–1965)
Keld E. Keld (1867–1945)
Keller, B. A. B. A. Keller (1874–1945)
Keller, J. B. J. B. von Keller (1841–1897)
Keller, R. R. Keller (1854–1939)
Kellerer, J. J. Kellerer (fl. 1905)
Kem.-Nat. L. M. Kemularia-Nathadze (b. 1891)
Kenyon W. Kenyon (fl. 1847)
Ker-Gawler J. B. Ker (J. Gawler) (1764–1842)
Kerner, A. A. J. Kerner von Marilaun (1831–1898)
Kerner, J. J. Kerner (1829–1906)
Kiffm. R. Kiffmann (fl. 1952)
Kihlman A. O. Kihlman (Kairamo) (1858–1938)
Kindb. N. C. Kindberg (1832–1910)
[illegible]
Kir. I. P. Kirilow (1821 or 1822–1842)
Kirby M. Kirby (1817–1893)
Kirchner G. Kirchner (1837–1885)
Kirp. M. E. Kirpicznikov (b. 1913)
Kirschleger F. R. Kirschleger (1804–1869)
Kiss Á. Kiss (1889–1968)
Kit. P. Kitaibel (1757–1817)
Kitagawa M. Kitagawa (b. 1909)
Kitanov B. Kitanov (b. 1912)
Kittel M. B. Kittel (1798–1885)
Klásková, A. A. Klásková (later A. Skalická) (b. 1932)

Klášt. I. Klášterský (b. 1901)
Klatt F. W. Klatt (1825–1897)
Klebahn H. Klebahn (1859–1942)
Kleopow J. D. Kleopow (1902–1942)
Klett G. T. Klett (d. 1827)
Klika J. Klika (1888–1957)
Klinggr. K. J. von Klinggraeff (1809–1879)
Klink. M. Klinkowski (1904–1971)
Kliphius E. Kliphius (b. 1924)
Klokov M. V. Klokov (b. 1896)
Klotzsch J. F. Klotzsch (1805–1860)
Kluk K. Kluk (1739–1796)
Knaben G. Knaben (b. 1911)
Knaf J. Knaf (1801–1865)
Knaf fil. K. Knaf (1851–1878)
Knerr E. B. Knerr (1861–1942)
Knight J. Knight (1781–1855)
Knobl. E. F. Knoblauch (1864–1936)
Knoche H. Knoche (1870–1945)
Knowles G. B. Knowles (fl. 1829–1852)
Knuth, R. R. G. P. Knuth (1874–1957)
Koch W. D. J. Koch (G. D. I. Koch) (1771–1849)
Koch, C. C. H. E. Koch (1809–1879)
Koch, L. L. K. A. Koch (b. 1850)
Koch, Walo Walo Koch (1896–1956)
Koehler J. C. G. Koehler (1759–1833)
Koehne B. A. E. Koehne (1848–1918)
Koelle J. L. C. Koelle (1763–1797)
Koelliker R. A. von Koelliker (1817–1905)
Koernicke F. A. Koernicke (1828–1908)
Koerte F. Koerte (1782–1845)
Komarov V. L. Komarov (1869–1945)
Kondrat. E. N. Kondratjuk (b. 1914)
König, D. D. König (b. 1909)
Korsh. S. I. Korshinsky (1861–1900)
Košanin N. Košanin (1874–1934)
Koshewn. D. A. Koshewnikow (1858–1882)
Kos.-Pol. B. M. Koso-Poliansky (1890–1957)
Kossko I. N. Kossko (1924–1956)
Kossych V. M. Kossych (b. 1931)
Kostel. V. F. Kosteletzky (1801–1887)
Kotejowa, E. E. Kotejowa (fl. 1963)
Kotov M. I. Kotov (b. 1896)
Kotschy T. Kotschy (1813–1866)
Kotula, A. A. Kotula (1822–1891)
Kovanda M. Kovanda (b. 1936)
Kováts J. Kováts von Szentlelek (1815–1873)
Kováts, F. F. Kováts (1873–1956)
Kožuharov S. I. Kožuharov (b. 1933)
Kralik J. L. Kralik (1813–1892)
Krašan F. Krašan (1840–1907)
Krasch. H. M. Krascheninnikov (1884–1947)
Krause E. Krause (d. 1858)
Krause, E. H. L. E. H. L. Krause (1859–1942)
Krause, K. K. Krause (1883–1963)
[illegible]
Krecz., V. V. I. Kreczełowicz (1901–1942)
Krendl F. Krendl (b. 1926)
Kress A. A. H. L. Kress (b. 1932)
Krentzer K. J. Kreutzer (1809–1866)
Kreyer G. K. Kreyer (1887–1942)
Křísa B. Křísa (b. 1936)
Krocker A. J. Krocker (1744–1823)
Krok T. O. B. N. Krok (1834–1921)
Krösche E. Krösche (fl. 1912)
Krylov P. N. Krylov (1850–1931)
Krysht. A. N. Kryshtofovicz (1885–1953)
Kucowa I. Kucowa (b. 1912)
Kühlew. P. E. Kühlewein (1798–1870)
Kuhn M. F. A. Kuhn (1842–1894)
Kulcz. S. Kulczyński (b. 1895)
Kümmerle J. B. Kümmerle (1876–1931)
Kunth C. S. Kunth (1788–1850)
Kuntze, O. K. E. O. Kuntze (1843–1907)
Kunz, H. H. Kunz (b. 1904)
Kunze, G. G. Kunze (1793–1851)
Kupcsok S. Kupcsok (1850–1914)
Kupffer K. R. Kupffer (1872–1935)
Kuprian. L. A. Kuprianova (b. 1914)
Kurtz, F. F. Kurtz (1854–1920)
Kusn. N. I. Kusnezow (Kuznetzov) (1864–1932)
Kuthath. S. I. Kuthatheladze (b. 1905)
Kütz. F. T. Kützing (1807–1893)
Kuzen. O. I. Kuzeneva (b. 1887)
Kuzinský P. A. von Kuzinský (fl. 1889)
L. C. von Linné (C. Linnaeus) (1707–1778)
L. fil. C. von Linné (1741–1783)
Labill. J. J. H. de Labillardière (1755–1834)
Lacaita C. C. Lacaita (1853–1933)
Laest. L. L. Laestadius (1800–1861)
Lag. M. Lagasca y Segura (1776–1839)
Lagerh. N. G. von Lagerheim (1860–1926)
Lagger F. Lagger (1799–1870)
Lagrèze-Fossat A. R. A. Lagrèze-Fossat (1818–1874)
Laicharding J. N. von Laicharding (1754–1797)
Laínz M. Laínz (b. 1923)
Laínz, J. M. J. M. Laínz (b. 1900)
Lam. J. B. A. P. Monnet de la Marck (1744–1829)
Lamb. A. B. Lambert (1761–1842)
Lamotte M. Lamotte (1820–1883)
Landolt E. Landolt (b. 1926)
Láng, A. F. A. F. Láng (1795–1863)
Lang, K. H. K. H. Lang (1800–1843)
Lang, O. F. O. F. Lang (1817–1847)
Lange J. M. C. Lange (1818–1898)
Lange, Th. T. A. Lange (1872–1957)
Langsd. G. H. von Langsdorff (1774–1852)
Lanza D. Lanza (1868–1940)
Lapeyr. P. Picot de Lapeyrouse (1744–1818)
Lapierre J. M. Lapierre (1754–1834)
La Pylaie A. J. M. B. de la Pylaie (1786–1856)
Larsen, K. K. Larsen (b. 1926)
Lasch W. G. Lasch (1787–1863)
Lasebna A. M. Lasebna (b. 1922)
Laterrade J. F. Laterrade (1784–1858)
Latourr. M. A. L. Claret de Latourrette (1729–1793)
Latzel A. Latzel (1859–1950)
Lauche W. Lauche (1827–1882)
Lauth T. Lauth (1758–1826)
Lauth, G. G. Lauth (1793–1817)
Lavrenko E. M. Lavrenko (b. 1900)
Lawalrée A. Lawalrée (b. 1921)
[illegible]
Lawrance M. Lawrance (fl. 1790–1831)
Lawrence G. H. M. Lawrence (b. 1910)
Lawson, C. C. Lawson (1794–1873)
Lawson, P. P. Lawson (d. 1820)
Laxm. E. Laxmann (1737–1796)
Layens G. de Layens (1834–1897)
Laza M. Laza Palacios (b. 1901)
Lazar J. Lazar (b. 1903)
Láz.-Ibiza Blas Lázaro–Ibiza (1858–1921)
Lebel J. E. Lebel (1801–1878)
Lecoq H. Lecoq (1802–1871)

Lecoyer C.-J. Lecoyer (1835–1899)
Ledeb. C. F. von Ledebour (1785–1851)
Leers J. D. Leers (1727–1774)
Lees E. Lees (1800–1887)
Lefèvre L. V. Lefèvre (b. 1810)
Le Gall N. J. M. le Gall (1787–*c.* 1860)
Le Grand A. le Grand (1839–1905)
Lehm. J. G. C. Lehmann (1792–1860)
Lehm., C. B. C. B. Lehmann (fl. 1860)
Lehm., J. F. J. F. Lehmann (fl. 1809)
Leins P. Leins (b. 1937)
Lej. A. L. S. Lejeune (1779–1858)
Le Jolis A. F. le Jolis (1823–1904)
Lemaire C. A. Lemaire (1801–1871)
Léman D. S. Léman (1781–1829)
Lemke W. Lemke (b. 1893)
Lengyel G. Lengyel (1884–1965)
Leonova T. G. Leonova (b. 1930)
Lepechin I. I. Lepechin (1737 or 1740–1802)
Leresche L. Leresche (1808–1885)
Lesp. G. Lespinasse (1807–1876)
Less. C. F. Lessing (1810–1862)
Lester-Garland L. V. Lester-Garland (1860–1944)
Lestib. T. G. Lestiboudois (1797–1876)
Letendre J. B. P. Letendre (1828–1886)
Léveillé A. A. H. Léveillé (1863–1918)
Levier E. Levier (1838–1911)
Levyns M. R. B. Levyns (b. 1890)
Lewis, P. P. Lewis (b. 1924)
Ley, A. A. Ley (1842–1911)
Leybold F. Leybold (1827–1879)
L'Hér. C. L. L'Héritier de Brutelle (1746–1800)
Libert M. A. Libert (1782–1865)
Lid J. Lid (1886–1971)
Liebl. F. K. Lieblein (1744–1810)
Liebm. F. M. Liebmann (1813–1856)
Liljeblad S. Liljeblad (1761–1815)
Liljefors A. W. Liljefors (b. 1904)
Lincz. I. A. Linczevsky (b. 1908)
Lindb. fil., H. H. Lindberg (1871–1963)
Lindblad M. A. Lindblad (1821–1899)
Lindblom A. E. Lindblom (1807–1853)
Lindeb. C. J. Lindeberg (1815–1900)
Lindem. E. von Lindemann (1825–1900)
Lindley J. Lindley (1799–1865)
Lindman C. A. M. Lindman (1856–1928)
Lindström, A. A. A. Lindström (1864–1946)
Lindt. V. H. Lindtner (1904–1965)
Lingelsh. A. von Lingelsheim (1874–1937)
Link J. H. F. Link (1767–1851)
Linton, E. F. E. F. Linton (1848–1928)
Linton, W. R. W. R. Linton (1850–1908)
Lipsch. S. J. Lipschitz (b. 1905)
Lipsky V. I. Lipsky (1863–1937)
List ?F. L. List (fl. 1828–1837)
[illegible]
Litard. R. V. de Litardière (1888–1957)
Litv. D. I. Litvinov (Litwinow) (1854–1929)
Lloyd J. Lloyd (1810–1896)
Loddiges G. Loddiges (1784–1846)
Loefl. P. Loefling (1729–1756)
Loesener L. E. T. Loesener (1865–1941)
Loisel, R. R. J. Loisel (b. 1938)
Loisel. J. L. A. Loiseleur-Deslongchamps (1774–1849)
Lojac. M. Lojacono-Pojero (1853–1919)
Lona F. Lona (fl. 1949)
Londes F. W. Londes (1780–1807)
Longo, B. B. Longo (1872–1950)
Lönnr. K. J. Lönnroth (1826–1885)
Lonsing A. Lonsing (fl. 1939)
Lorent J. A. von Lorent (1812–1884)
Loret H. Loret (1810–1888)
Losa M. Losa España (1893–1965)
Loscos F. Loscos y Bernál (1823–1886)
Losinsk. A. S. Losina-Losinskaya (1903–1958)
Loudon J. C. Loudon (1783–1843)
Loudon, J. W. J. W. Loudon (1807–1858)
Lour. J. de Loureiro (1717–1791)
Löve, Á. Á. Löve (b. 1916)
Löve, D. D. Löve (b. 1918)
Lovrić A. Ž. Lovrić (b. 1943)
Lowe R. T. Lowe (1802–1874)
Lübeck H. G. Lübeck (1809–1900)
Lucand J.-L. Lucand (1821–1896)
Lucé J. W. L. von Lucé (fl. 1823)
Luckwill L. C. Luckwill (b. 1914)
Lüdi W. Lüdi (1888–1968)
Ludwig C. G. Ludwig (1709–1773)
Ludwig, W. W. Ludwig (b. 1923)
Luerssen C. Luerssen (1843–1916)
Luizet D. Luizet (1851–1930)
Lumn. S. I. Lumnitzer (1750–1806)
Lund, N. N. Lund (1814–1847)
Lundevall C.-F. Lundevall (b. 1921)
Lundström A. N. Lundström (1847–1905)
Lundström, E. E. Lundström (b. 1882)
Lyka K. Lyka (1869–1965)
Lynch R. I. Lynch (1850–1924)
Lynge B. A. Lynge (1884–1942)
Lyons I. Lyons (1739–1775)
Maack R. Maack (1825–1886)
Mabille P. Mabille (1835–1923)
Macbride J. F. Macbride (b. 1892)
Macfadyen J. Macfadyen (1798–1850)
Mach.-Laur. B. Machatschki-Laurich (fl. 1926)
Machule M. Machule (b. 1899)
Mackay J. T. Mackay (1775–1862)
Mackenzie K. K. Mackenzie (1877–1934)
MacOwan P. MacOwan (1830–1909)
Magne J. H. Magne (1804–1885)
Magnier C. Magnier (fl. 1883)
Magnus P. W. Magnus (1844–1914)
Maguire B. Maguire (b. 1904)
Maillefer A. Maillefer (b. 1880)
Maire R. C. J. E. Maire (1878–1949)
Majevski P. F. Majevski (1851–1892)
Major C. J. F. Major (1843–1923)
Makino T. Makino (1862–1957)
Malagarriga Hermano Teodoro (Ramón de Peñafort Malagarriga) (b. 1904)
Malbr. A. F. Malbranche (1818–1888)
Malinovski E. Malinovski (b. 1885)
[illegible]
Malinv. L. J. E. Malinvaud (1836–1913)
Malladra A. Malladra (1865–1944)
Malme G. O. A. Malme (1864–1937)
Malmgren A. J. Malmgren (1834–1897)
Malte M. O. Malte (1880–1933)
Maly, F. F. de Paula Maly (1823–1891)
Maly, J. Joseph Karl Maly (1797–1866)
Malý, K. Karl Malý (1874–1951)
Manden. I. P. Mandenova (b. 1907)
Mansfeld R. Mansfeld (1901–1960)
Manton I. Manton (b. 1904)

Marchesetti C. de Marchesetti (1850–1926)
Marcos A. Marcos Pascual (b. 1900)
Marès P. Marès (1826–1900)
Margot H. Margot (fl. 1838)
Mariz J. de Mariz (1847–1916)
Markgraf F. Markgraf (b. 1897)
Marklund G. G. Marklund (1892–1964)
Marsden-Jones E. M. Marsden-Jones (1887–1960)
Marshall H. Marshall (1722–1801)
Marshall, E. S. E. S. Marshall (1858–1919)
Marsson T. F. Marsson (1816–1892)
Mart., C. F. P. C. F. P. von Martius (1794–1868)
Mart., H. H. von Martius (1781–1831)
Martelli, U. U. Martelli (1860–1934)
Marteus, M. M. Martens (1797–1863)
Martin B. A. Martin (1813–1897)
Martínez M. Martínez Martínez (1907–1936)
Martinoli, G. G. Martinoli (1911–1970)
Martrin-Donos J. V. de Martrin-Donos (1801–1870)
Martyn T. Martyn (1736–1825)
Marzell H. Marzell (1885–1970)
Massara G. F. Massara (1792–1839)
Masters M. T. Masters (1833–1907)
Máthé I. Máthé (b. 1911)
Matouschek F. Matouschek (b. 1871)
Mattei G. E. Mattei (1865–1943)
Mattf. J. Mattfeld (1895–1951)
Mattuschka H. G. von Mattuschka (1734–1779)
Maurer W. Maurer (b. 1926)
Mauri E. Mauri (1791–1836)
Maxim. K. J. Maximowicz (1827–1891)
Maxon W. R. Maxon (1877–1948)
Mayer, E. E. Mayer (b. 1920)
Mayer, J. J. C. A. Mayer (1747–1801)
Mazuc E. Mazuc (fl. 1854)
McClell. J. McClelland (1805–1883)
McMillan C. McMillan (1867–1929)
McNeill J. McNeill (b. 1933)
Medicus F. C. Medicus (Medikus) (1736–1808)
Medv. J. S. Medvedev (1847–1923)
Meerb. N. Meerburgh (1734–1814)
Meikle R. D. Meikle (b. 1923)
Meinsh. K. K. Meinshausen (1819–1899)
Meissner C. F. Meissner (1800–1874)
Mela A. J. Mela (1846–1904)
Melderis A. Melderis (b. 1909)
Melville R. Melville (b. 1903)
Mendes E. J. S. M. Mendes (b. 1924)
Menéndez Amor J. Menéndez Amor (b. 1916)
Menyh. L. Menyhárth (1849–1897)
Mérat F. V. Mérat (1780–1851)
Merc. E. Mercier (1802–1863)
Merino P. B. Merino y Román (1845–1917)
Merr. E. D. Merrill (1876–1956)
Mert. F. K. Mertens (1764–1831)
[illegible]
Merxm. H. Merxmüller (b. 1920)
Metsch J. C. Metsch (1796–1856)
Mett. G. H. Mettenius (1823–1866)
Metzel. A. Metzelova-Kropáčova (b. 1922)
Metzger J. Metzger (1789–1852)
Meusel H. Meusel (b. 1909)
Meyen F. J. F. Meyen (1804–1840)
Meyer, B. B. Meyer (1767–1836)
Meyer, C. A. C. A. von Meyer (1795–1855)
Meyer, D. E. D. E. Meyer (b. 1926)
Meyer, E. H. F. E. H. F. Meyer (1791–1858)
Meyer, G. F. W. G. F. W. Meyer (1782–1856)
Michalet E. Michalet (1829–1862)
Micheletti L. Micheletti (1844–1912)
Michx A. Michaux (1746–1802)
Michx fil. F. A. Michaux (1770–1855)
Middendorff A. T. von Middendorff (1815–1894)
Miégeville Abbé Miégeville (1814–1901)
Miers J. Miers (1789–1879)
Mikan J. C. Mikan (1743–1814)
Mikan fil. J. C. Mikan (1769–1844)
Milde C. A. J. Milde (1824–1871)
Miller P. Miller (1691–1771)
Miller, J. J. M. Miller (d. 1796)
Millsp. C. F. Millspaugh (1854–1923)
Min. N. A. Miniaev (b. 1909)
Minder. E. V. Minderova (fl. 1957)
Miq. F. A. W. Miquel (1811–1871)
Mirbel C. F. B. Mirbel (1776–1854)
Mitterp. L. Mitterpacher (1734–1818)
Moench C. Moench (1744–1805)
Moessler J. C. Moessler (fl. 1805–1815)
Moesz G. Moesz (1873–1946)
Mohr D. M. H. Mohr (1779–1808)
Moldenke H. N. Moldenke (b. 1909)
Molina J. I. Molina (1740–1829)
Molinier R. Molinier (b. 1899)
Monnard J. P. Monnard (b. 1791)
Monnier A. Monnier (fl. 1829)
Monnier, P. P. C. J. Monnier (b. 1922)
Montandon P. J. Montandon (fl. 1856)
Montbret G. Coquebert de Montbret (1805–1837)
Montelucci G. Montelucci (b. 1899)
Monts., P. P. Montserrat Recoder (b. 1920)
Moore, S. S. Le Marchant Moore (1850–1931)
Moq. C. H. B. A. Moquin-Tandon (1804–1863)
Morariu I. Morariu (b. 1905)
Moravec J. Moravec (b. 1929)
Moretti G. Moretti (1782–1853)
Mori A. Mori (1847–1902)
Moric. M. E. Moricand (1779–1854)
Moris G. G. Moris (1796–1869)
Moritzi A. Moritzi (1806–1850)
Morot M. L. Morot (fl. 1885)
Morren C. J. E. Morren (1833–1886)
Morton, C. V. C. V. Morton (1905–1972)
Möschl W. Möschl (b. 1906)
Moss C. E. Moss (1872–1930)
Mössler J. C. Mössler (fl. 1814–1835)
Motelay L. Motelay (1831–1917)
Mouillefert P. Mouillefert (1845–1903)
Mueller, F. F. H. J. von Mueller (1825–1896)
Mueller, O. F. O. F. Mueller (1730–1784)
Mueller, P. J. P. J. Mueller (1832–1889)
Muenchh. O. Muenchhausen (1716–1774)
Muhl. G. H. E. Muhlenberg (1753–1815)
[illegible]
Müller Arg. J. Müller of Aargau (Argoviensis) (1828–1896)
Munby G. Munby (1812–1876)
Münch E. Münch (1876–1946)
Munz P. A. Munz (1892–1974)
Murb. S. S. Murbeck (1859–1946)
Muret J. Muret (1799–1877)
Murith L. J. Murith (1742–1816 or 1818)
Murr, J. J. Murr (1864–1932)
Murray J. A. Murray (1740–1791)
Murray, A. A. Murray (*c.* 1798–1838)
Murray, E. A. E. Murray (b. 1935)

Murray, R. P. R. P. Murray (1842–1908)
Muschler R. Muschler (b. 1883)
Mussin A. A. Mussin-Puschkin (1760–1805)
Mutel A. Mutel (1795–1847)
Mutis J. C. Mutis (1732–1808)
Mygind F. Mygind (1710–1789)
Naegeli C. W. von Naegeli (1817–1891)
Naggi A. Naggi (fl. 1905)
Nakai T. Nakai (1882–1952)
Nasarow M. I. Nasarow (1882–1942)
Nath. A. G. Nathorst (1850–1921)
Naudin C. V. Naudin (1815–1899)
Necker N. J. de Necker (1730–1793)
Nees C. G. D. Nees von Esenbeck (1776–1858)
Nees, T. T. F. L. Nees von Esenbeck (1787–1837)
Neilr. A. Neilreich (1803–1871)
Nejc. I. Nejceff (1870–1913)
Nelson, A. A. Nelson (1859–1952)
Nenukow S. S. Nenukow (1906–1942)
Nestler C. G. Nestler (1778–1832)
Nestler, A. A. Nestler (fl. 1812)
Neuman L. M. Neuman (1852–1922)
Neumann, A. A. Neumann (fl. 1960)
Neumayer, H. H. Neumayer (1887–1945)
Neves, J. J. de Barros Neves (b. 1914)
Nevski S. A. Nevski (1908–1938)
Newbould W. W. Newbould (1819–1886)
Newman E. Newman (1801–1876)
Neygenf. F. W. Neygenfind (fl. 1821)
Nicotra L. Nicotra (1846–1940)
Niedenzu F. J. Niedenzu (1857–1937)
Nikif. N. B. Nikiforova (b. 1912)
Nikitin, S. S. A. Nikitin (fl. 1937)
Nobre A. Nobre (b. 1865)
Nocca D. Nocca (1758–1841)
Noë W. Noë (d. 1858)
Nogueira I. M. S. Nogueira (b. 1935)
Nolte E. F. Nolte (1791–1875)
Nordborg G. Nordborg (b. 1931)
Nordenstam B. Nordenstam (b. 1936)
Nordh. R. Nordhagen (b. 1894)
Nordm. A. von Nordmann (1803–1866)
Nordstedt C. F. O. Nordstedt (1838–1924)
Norlindh, T. T. Norlindh (b. 1906)
Norrlin J. P. Norrlin (1842–1917)
Norton J. B. Norton (1877–1938)
Notø A. Notø (1865–1948)
Noulet J. B. Noulet (1802–1890)
Novák F. A. Novák (1892–1964)
Novopokr. I. V. Novopokrovsky (1880–1951)
Nowacki E. K. Nowacki (b. 1930)
Nutt. T. Nuttall (1786–1859)
Nyárády, A. A. Nyárády (b. 1920)
Nyárády, E. I. E. I. Nyárády (1881–1966)
Nyl., F. F. Nylander (1820–1880)
Nyl., W. W. Nylander (1822–1899)
Nyman C. F. Nyman (1820–1893)
Oborny A. Oborny (1840–1924)
Ockendon D. J. Ockendon (b. 1940)
Oeder G. C. Oeder (1728–1791)
Ohle H. Ohle (b. 1937)
Ohlsén, R. R. Ohlsén (fl. 1934)
Ohwi J. Ohwi (b. 1905)
Oken L. Oken (1779–1851)
Olin J. H. Olin (1769–1824)
Oliver D. Oliver (1830–1916)
Olivier G. A. Olivier (1756–1814)
Olofsson P. Olofsson (b. 1896)
Omang S. O. F. Omang (1867–1953)
Onno M. Onno (b. 1903)
Opiz P. M. Opiz (1787–1858)
Opperman P. A. Opperman (d. 1942)
Orlova N. I. Orlova (b. 1921)
Ormonde J. E. M. Ormonde (b. 1943)
Orph. T. G. Orphanides (1817–1886)
Örsted A. S. Örsted (1816–1872)
Ortega C. Gómez Ortega (1740–1818)
Ortmann J. Ortmann (1814–1890)
Osbeck P. Osbeck (1723–1805)
Óskarsson I. Óskarsson (b. 1892)
Ostenf. C. E. H. Ostenfeld (1873–1931)
Otth K. A. Otth (1803–1839)
Otto C. F. Otto (1783–1856)
Ovcz. P. N. Ovczinnikov (b. 1903)
Pacher D. Pacher (1817–1902)
Pacz. I. K. Paczoski (1864–1942)
Padmore P. A. Padmore (b. 1929)
Paegle B. Paegle (fl. 1927)
Paiva J. A. Rodrigues de Paiva (b. 1933)
Palassou P. B. Palassou (1745–1830)
Palau P. Palau i Ferrer (1881–1956)
Palhinha R. T. Palhinha (1871–1957)
Palitz R. Palitz (fl. 1935)
Pallas P. S. Pallas (1741–1811)
Palmgren A. Palmgren (1880–1960)
Pamp. R. Pampanini (1875–1949)
Pančić J. Pančić (1814–1888)
Pangalo K. I. Pangalo (1883–1965)
Pant. J. Pantocsek (1846–1916)
Panţu Z. C. Panţu (1866–1934)
Paol. G. Paoletti (1865–1941)
Papaf. D. Papafava (fl. 1847)
Pardo J. Pardo y Sastrón (1822–1909)
Parl. F. Parlatore (1816–1877)
Parodi L. R. Parodi (1895–1966)
Parris B. S. Parris (b. 1945)
Parry W. E. Parry (1790–1855)
Pasquale, C. A. C. (G.) A. Pasquale (1820–1893)
Passer. G. Passerini (1816–1893)
Patrin E. L. M. Patrin (1742–1815)
Patzak A. Patzak (b. 1930)
Patze C. A. Patze (1808–1892)
Pau C. Pau (1857–1937)
Paucă A. M. Paucă (1907–1963)
Paulin A. Paulin (1853–1942)
Paulsen O. V. Paulsen (1874–1947)
Pauquy C. L. C. Pauquy (1800–1854)
Pavlov N. V. Pavlov (1893–1971)
Pavón J. Pavón (1750–1844)
Pawł. B. Pawłowski (1898–1971)
Pawł., S. S. Pawłowska (b. 1905)
Pax F. A. Pax (1858–1942)
Paxton J. Paxton (1803–1865)
Pedersen, A. A. Pedersen (b. 1920)
Pennell F. W. Pennell (1886–1952)
Pénzes A. Pénzes (b. 1895)
Peola P. Peola (b. 1869)
Pérard M. Pérard (1835–1887)
Pérez Lara J. M. Pérez Lara (1841–1918)
Perf. I. A. Perfiljew (1882–1942)
Pernh. G. von Pernhoffer (1831–1899)
Perpenti C. Lena-Perpenti (1764–1846)

Perr. E. Perrier de la Bâthie (1825–1916)
Pers. C. H. Persoon (*c.* 1762–1836)
Personnat V. Personnat (fl. 1854–1870)
Persson, H. N. P. H. Persson (b. 1893)
Persson, K. K. M. Persson (b. 1938)
Petagna V. Petagna (1734–1810)
Péteaux J. C. J. Péteaux (1840–1896)
Peter G. A. Peter (1853–1937)
Péterfi M. Péterfi (1875–1922)
Peterm. W. L. Petermann (1806–1855)
Petitmengin M. G. C. Petitmengin (1881–1908)
Petrak F. Petrak (1886–1973)
Petri F. Petri (1837–1896)
Petrov V. A. Petrov (1896–1955)
Petrović S. Petrović (1839–1889)
Petunnikov A. N. Petunnikov (1842–1919)
Petzold C. E. A. Petzold (1815–1891)
Peyer — Peyer (fl. 1829)
Philcox D. Philcox (b. 1926)
Philippe X. Philippe (1802–1866)
Phillips, E. P. E. P. Phillips (1884–1967)
Phipps, C. J. C. J. Phipps (1744–1792)
Phitos D. Phitos (b. 1930)
Pierrat D. Pierrat (1835–1895)
Pignatti S. Pignatti (b. 1930)
Pilger R. K. F. Pilger (1876–1953)
Piller M. Piller (1733–1788)
Pinzger P. Pinzger (fl. 1868)
Pio G. B. Pio (fl. 1813)
Piré L. A. H. J. Piré (1827–1887)
Pires de Lima A. Pires de Lima (b. 1886)
Pirona G. A. Pirona (1822–1895)
Pissjauk. V. V. Pissjaukowa (b. 1906)
Pitard C. J. Pitard (1873–1927)
Planchon J. E. Planchon (1823–1888)
Planellas J. Planellas Giralt (1821–1888)
Pleijel C. G. V. Pleijel (1866–1937)
Pobed. E. G. Pobedimova (b. 1898)
Podl. D. Podlech (b. 1931)
Podp. J. Podpěra (1878–1954)
Poech J. Poech (1816–1846)
Poeverlein H. Poeverlein (1874–1957)
Poggenb. J. F. Poggenburg (1840–1893)
Pohl J. B. E. Pohl (1782–1834)
Pohle R. R. Pohle (1869–1926)
Poiret J. L. M. Poiret (1755–1834)
Poirion L. P. Poirion (b. 1901)
Poiteau P. A. Poiteau (1766–1854)
Pojark. A. I. Pojarkova (b. 1897)
Polatschek A. Polatschek (b. 1932)
Pollich J. A. Pollich (1740–1780)
Pollini C. Pollini (1782–1833)
Polunin N. V. Polunin (b. 1909)
Pomel A. Pomel (1821–1898)
Popl. G. I. Poplavskaja (Poplawska) (1885–1956)
Popov, M. M. G. Popov (1893–1955)
Porc. F. Porcius (1816–1907)
Porsch O. Porsch (1875–1959)
Porsild, A. E. A. E. Porsild (b. 1901)
Porta P. Porta (1832–1923)
Portenschl. F. E. von Portenschlag-Ledermayer (1772–1822)
Porter T. C. Porter (1822–1901)
Pospichal E. Pospichal (1838–1905)
Post G. E. Post (1838–1909)
Postr. S. A. Postrigan (b. 1891)
Pourret P. A. Pourret de Figeac (1754–1818)
Pouzar Z. Pouzar (b. 1932)
Pouzolz P. C. M. de Pouzolz (1785–1858)
Pozd. N. G. Pozdeeva (b. 1913)
Praeger R. L. Praeger (1865–1953)
Prantl K. A. E. Prantl (1849–1893)
Presl, C. C. (K.) B. Presl (1794–1852)
Presl, J. J. S. Presl (1791–1849)
Price W. R. Price (1886–1975)
Pritchard N. M. Pritchard (b. 1933)
Pritzel, G. A. G. A. Pritzel (1815–1874)
Privalova L. A. Privalova (b. 1919)
Proctor, M. C. F. M. C. F. Proctor (b. 1929)
Prodan J. Prodan (1875–1959)
Progel A. Progel (1829–1889)
Prokh. J. I. Prokhanov (1902–1964)
Prolongo P. Prolongo y García (1806–1885)
Puel T. Puel (1812–1890)
Puget F. Puget (1829–1880)
Pugsley H. W. Pugsley (1868–1947)
Pulliat V. Pulliat (1827–1866)
Puolanne M. E. Puolanne (1877–1941)
Purkyně E. Purkyně (1831–1882)
Pursh F. T. Pursh (1774–1820)
Putterlick A. Putterlick (1810–1845)
Quézel P. Quézel (b. 1926)
Raab W. Raab (fl. 1819)
Rabenh. G. L. Rabenhorst (1806–1881)
Racib. M. Raciborski (1864–1917)
Raddi G. Raddi (1770–1829)
Radius J. W. M. Radius (1797–1884)
Rafin. C. S. Rafinesque-Schmaltz (1783–1840)
Rafn C. G. Rafn (1769–1808)
Ramat. T. A. J. d'Audibert de Ramatuelle (1750–1794)
Ramond L. F. E. Ramond de Carbonnières (1753–1827)
Rapaics R. Rapaics (1885–1953)
Rapin D. Rapin (1799–1882)
Rasmussen R. Rasmussen (1871–1962)
Rau A. Rau (1784–1830)
Raulin V. F. Raulin (1815 or 1819–1905)
Raunk. C. Raunkiær (1860–1938)
Räuschel E. A. Räuschel (fl. 1772–1797)
Rauschert S. Rauschert (b. 1931)
Răvărut M. Răvărut (b. 1907)
Ravaud L. C. M. Ravaud (1822–1898)
Raven, P. H. P. H. Raven (b. 1936)
Ravnik V. Ravnik (b. 1924)
Rayss T. Rayss (1890–1965)
Re, G. F. G. F. Re (1772–1833)
Rebr. O. V. Rebristaya (b. 1930)
Rech. K. Rechinger (1867–1952)
Rech. fil. K. H. Rechinger (b. 1906)
Rees A. Rees (1743–1825)
Regel E. A. von Regel (1815–1892)
Regel, C. C. von Regel (1890–1970)
Rehder A. Rehder (1863–1949)
Rehmann A. Rehmann (1840–1917)
Reichard J. J. Reichard (1743–1782)
Reichenb. H. G. L. Reichenbach (1793–1879)
Reichenb. fil. H. G. Reichenbach (1824–1889)
Rendle A. B. Rendle (1865–1938)
Renner O. Renner (1883–1960)
Req. E. Requien (1788–1851)
Resvoll, T. T. R. Resvoll (1871–1948)
Resvoll-Holmsen H. Resvoll-Holmsen (1873–1943)
Retz. A. J. Retzius (1742–1821)
Reuss, G. G. Reuss (1818–1861)

Reuter G. F. Reuter (1805–1872)
Revel J. Revel (1811–1887)
Reverchon E. Reverchon (1835–1914)
Reyn. A. Reynier (1845–1932)
Ricci A. M. Ricci (1777–1850)
Richard, A. A. Richard (1794–1852)
Richard, L. C. M. L. C. M. Richard (1754–1821)
Richards, A. J. A. J. Richards (b. 1943)
Richardson J. Richardson (1787–1865)
Richardson, I. B. K. I. B. K. Richardson (b. 1940)
Richter H. E. F. Richter (1808–1876)
Richter, J. J.-A. Richter (1821–1910)
Richter, K. K. Richter (1855–1891)
Riddelsd. H. J. Riddelsdell (1866–1941)
Riedl H. Riedl (b. 1936)
Rigo G. Rigo (1841–1922)
Rikli M. A. Rikli (1868–1951)
Rink H. J. Rink (1819–1893)
Ripart J. B. M. J. S. E. Ripart (1814–1878)
Risso J. A. Risso (1777–1845)
Rittener T. Rittener (fl. 1887)
Rivas Goday S. Rivas Goday (b. 1905)
Rivas Martínez S. Rivas Martínez (b. 1935)
Rix E. M. Rix (b. 1943)
Robert — Robert (fl. 1838)
Roberts, J. J. Roberts (1912–1960)
Robill. L. M. A. Robillard d'Argentelle (d. 1828)
Robinson B. L. Robinson (1864–1935)
Robson E. Robson (1763–1813)
Robson, N. K. B. N. K. B. Robson (b. 1928)
Robyns W. Robyns (b. 1901)
Rocha Afonso M. da Luz de Oliveira Tavares Monteiro da Rocha Afonso (b. 1925)
Rochel A. Rochel (1770–1847)
Rodin L. E. Rodin (1907–1966)
Rodr. J. D. Rodriguez (1780–1846)
Rodr., J. J. J. J. Rodríguez y Femenías (1839–1905)
Roemer J. J. Roemer (1763–1819)
Roemer, M. J. M. J. Roemer (fl. 1835–1846)
Roemer, R. de R. de Roemer (fl. 1852)
Roffey J. Roffey (1860–1927)
Rogow. A. S. Rogowicz (1812–1878)
Rohde M. Rohde (1782–1812)
Rohlena J. Rohlena (1874–1944)
Röhling J. C. Röhling (1757–1813)
Rohrb. P. Rohrbach (1847–1871)
Ronniger K. Ronniger (1871–1954)
Rönning O. I. Rönning (b. 1924)
Rose J. N. Rose (1862–1928)
Rosellini ?F. Rosellini (1817–1873)
Rosenvinge J. L. A. K. Rosenvinge (1858–1939)
Ross, J. J. Ross (1777–1856)
Ross, R. R. Ross (b. 1912)
Rosser E. M. Rosser (b. 1923)
Rossi M. L. Rossi (1850–1932)
[illegible]
Rössler W. Rössler (b. 1909)
Rostański K. Rostański (b. 1930)
Rostock M. Rostock (fl. 1884)
Rostrup F. G. E. Rostrup (1831–1907)
Roth A. W. Roth (1757–1834)
Rothm. W. Rothmaler (1908–1962)
Rottb. C. F. Rottboell (Rottbøll) (1727–1797)
Rouleau E. Rouleau (b. 1916)
Ronssine N. Roussine (formerly N. A. Schostenko) (1889–1968)
Rouy G. C. C. Rouy (1851–1924)
Rowley G. D. Rowley (b. 1921)
Roxb. W. Roxburgh (1751–1815)
Royle J. F. Royle (1779–1858)
Rozan. M. A. Rozanova (1885–1957)
Rozeira A. D. F. Rozeira (b. 1912)
Rudolph, J. H. J. H. Rudolph (1744–1809)
Rudolphi K. A. Rudolphi (1771–1832)
Ruhmer G. F. Ruhmer (1853–1883)
Ruiz H. Ruiz López (1754–1815)
Rune O. Rune (b. 1919)
Runemark H. Runemark (b. 1927)
Rupr. F. J. Ruprecht (1814–1870)
Russell, A. A. Russell (?1715–1768)
Russell, P. P. G. Russell (1889–1963)
Ruthe J. F. Ruthe (1788–1859)
Rydb. P. A. Rydberg (1860–1931)
Rylands T. G. Rylands (1818–1900)
Sa'ad F. Sa'ad (b. 1925)
Saarson B. Saarson (later B. Saarsoo) (1899–1969)
Sabine J. Sabine (1770–1837)
Sabr. H. Sabransky (1864–1916)
Sadler J. Sadler (1791–1849)
Saelan A. T. Saelan (1834–1921)
Sageret A. Sageret (1763–1851)
Sagorski E. Sagorski (1847–1929)
Sakalo D. I. Sakalo (1904–1965)
Salis C. Ulysses von Salis-Marschlins (1760–?1818)
Salisb. R. A. Salisbury (1761–1829)
Salmon C. E. Salmon (1872–1930)
Såltin H. Såltin (1912–1969)
Salzm. P. Salzmann (1781–1851)
Sam. G. Samuelsson (1885–1944)
Sambuk F. V. Sambuk (1900–1942)
Samp. G. A. da Silva Ferreira Sampaio (1865–1937)
Sanadze K. S. Sanadze (fl. 1946)
Sándor I. Sándor (b. 1853)
Sandwith N. Y. Sandwith (1901–1965)
Sanguinetti P. Sanguinetti (1802–1868)
Santi, G. G. Santi (1746–1822)
Sapjegin A. A. Sapjegin (1883–1946)
Sarato C. Sarato (1830–1893)
Sarg. C. S. Sargent (1841–1927)
Sarnth. L. von Sarntheim (1861–1914)
Sart. G. B. Sartorelli (1780–1853)
Sauer F. W. H. Sauer (1803–1873)
Saunders W. W. Saunders (1809–1879)
Sauter A. E. Sauter (1800–1881)
Sauvage C. P. F. Sauvage (b. 1909)
Sauzé C. Sauzé (1815–1889)
Savi G. Savi (1769–1844)
Savi fil. P. Savi (1798–1871)
Savigny M. J. C. Lelorgne de Savigny (1777–1851)
Săvul. T. Săvulescu (1889–1963)
Scaling W. Scaling (fl. 1863–1882)
Schaeffer J. C. Schaeffer (1718–1790)
Schaeftlein H. Schaeftlein (b. 1886)
[illegible]
Schaffner W. Schaffner (d. 1882)
Schagerström J. A. Schagerström (1818–1867)
Schaner J. K. Schauer (1813–1848)
Schchian A. S. Schchian (b. 1905)
Scheele G. H. A. Scheele (1808–1864)
Schellm. C. Schellmann (fl. 1938)
Schenk J. A. Schenk (1815–1891)
Schenk, E. E. Schenk (b. 1880)
Scherb. J. Scherbius (1769–1813)
Scheutz N. J. W. Scheutz (1836–1889)
Schiede C. J. W. Schiede (1798–1836)

Schiffner V. F. Schiffner (1862–1944)
Schimper, C. C. F. Schimper (1803–1867)
Schindler J. Schindler (b. 1881)
Schinz H. Schinz (1858–1941)
Schipcz. N. V. Schipczinski (1886–1955)
Schischkin B. K. Schischkin (1886–1963)
Schkuhr C. Schkuhr (1741–1811)
Schlecht. D. F. L. von Schlechtendal (1794–1866)
Schleicher J. C. Schleicher (1768–1834)
Schlickum A. Schlickum (b. 1867)
Schljakov R. N. Schljakov (b. 1912)
Schlosser J. C. Schlosser (1808–1882)
Schmalh. I. F. Schmalhausen (1849–1894)
Schmeil O. Schmeil (1860–1943)
Schmid, E. E. Schmid (b. 1891)
Schmidel C. C. Schmidel (1718–1792)
Schmidely A. I. S. Schmidely (1838–1918)
Schmidt, A. A. Schmidt (b. 1932)
Schmidt, Franz Franz Schmidt (1751–1834)
Schmidt, F. W. Franz Willibald Schmidt (1764–1796)
Schmidt, W. L. E. W. L. E. Schmidt (1804–1843)
Schmidt Petrop., Friedrich Friedrich Schmidt of St Petersburg (1832–1908)
Schneider, C. K. C. K. Schneider (1876–1951)
Schneider, G. G. Schneider (1834–1900)
Schneider, U. U. Schneider (b. 1936)
Schnittspahn G. F. Schnittspahn (1810–1865)
Schnizlein A. C. F. H. C. Schnizlein (1814–1868)
Scholler F. A. Scholler (1718–1785)
Scholz, H. H. Scholz (b. 1928)
Scholz, J. B. J. B. Scholz (fl. 1900)
Schönheit F. C. H. Schönheit (1789–1870)
Schönl. S. Schönland (1860–1940)
Schost. N. A. Schostenko (Desjatova-Schostenko) (later N. Roussine) (1889–1968)
Schotsman H. D. Schotsman (b. 1921)
Schott H. W. Schott (1794–1865)
Schousboe P. K. A. Schousboe (1766–1832)
Schouw J. F. Schouw (1789–1852)
Schrader H. A. Schrader (1767–1836)
Schrank F. von Paula von Schrank (1747–1835)
Schreber J. C. D. von Schreber (1739–1810)
Schrenk A. G. von Schrenk (1816–1876)
Schrödinger R. Schrödinger (1857–1919)
Schroeter C. Schroeter (1855–1939)
Schultes J. A. Schultes (1773–1831)
Schultes fil. J. H. Schultes (1804–1840)
Schultz, C. F. C. F. Schultz (1765–1837)
Schultz, F. W. F. W. Schultz (1804–1876)
Schultz, G. E. G. E. Schultz (fl. 1960)
Schultz Bip. C. H. Schultz (Schultz Bipontinus) (1805–1867)
Schultze, W. W. Schultze (fl. 1894)
Schulz, A. A. A. H. Schulz (1862–1922)
Schulz, O. E. O. E. Schulz (1874–1936)
Schulz, R. R. Schulz (b. 1904)
[illegible]
Schulze, M. C. T. M. Schulze (1841–1915)
Schum., K. K. M. Schumann (1851–1904)
Schummel T. E. Schummel (1785–1848)
Schur P. J. F. Schur (1799–1878)
Schuster R. Schuster (b. 1935)
Schwantes G. Schwantes (1881–1960)
Schwarz, A. A. Schwarz (1852–1915)
Schwarz, O. O. Schwarz (b. 1900)
Schwegler H. W. Schwegler (b. 1929)
Schweigger A. F. Schweigger (1783–1821)
Schweinf. G. A. Schweinfurth (1836–1925)
Schwertschl. J. Schwertschleger (1853–1924)
Schwimmer J. Schwimmer (1879–1959)
Scop. G. A. Scopoli (1723–1788)
Sebastiani A. Sebastiani (1782–1821)
Sebeók A. Sebeók de Szent-Miklós (fl. 1780)
Seem. B. C. Seemann (1825–1871)
Seemen K. O. von Seemen (1838–1910)
Seenus J. von Seenus (fl. 1805)
Séguier J. F. Séguier (1703–1784)
Seidl W. B. Seidl (1773–1842)
Selin G. Selin (1813–1862)
Sell, P. D. P. D. Sell (b. 1929)
Semen., N. N. Z. Semenova-Tjan-Schanskaja (1906–1960)
Semler C. Semler (1875–1955)
Sendtner O. Sendtner (1813–1859)
Sennen Frère Sennen (E. M. Grenier-Blanc) (1861–1937)
Ser. N. C. Seringe (1776–1858)
Serg. L. P. Sergievskaja (1897–1970)
Serg., E. E. V. Sergievskaja (C. V. Sergievskaja) (b. 1926)
Sernander J. R. Sernander (1866–1944)
Serres J. J. Serres (d. 1858)
Sesler L. Sesler (d. 1785)
Seub. M. A. Seubert (1818–1878)
Seymann W. Seymann (1887–1915)
Sherff E. E. Sherff (1886–1966)
Shivas M. G. Shivas (b. 1926)
Shull G. H. Shull (1874–1954)
Shuttlew., R. J. R. J. Shuttleworth (1810–1874)
Sibth. J. Sibthorp (1758–1796)
Sieber F. W. Sieber (1789–1844)
Siebert A. Siebert (1854–1923)
Siebold P. F. von Siebold (1796–1866)
Siegfr. H. Siegfried (1837–1903)
Sievers J. Sievers (d. 1795)
Sikura J. J. Sikura (fl. 1960)
Silliman B. Silliman (1779–1864)
Silva, M. M. da Silva (b. 1916)
Silva, P. A. R. Pinto da Silva (b. 1912)
Sim, R. R. Sim (1791–1878)
Simkovics L. Simkovics (later L. von Simonkai) (1851–1910)
Simmler G. Simmler (b. 1884)
Simmons H. G. Simmons (1866–1943)
Simon primus, E. E. Simon (1848–1924)
Simon secundus, E. E. Simon (1871–1967)
Simon, T. T. Simon (b. 1926)
Simonkai L. von Simonkai (1851–1910)
Sims J. Sims (1749–1831)
Sint. P. E. E. Sintenis (1847–1907)
Širj. G. I. Širjaev (Schirjaev) (1882–1954)
Sjöstrand M. G. Sjöstrand (1807–1880)
Skalická A. Skalická (b. 1932)
Skalický V. Skalický (b. 1930)
Skeels H. C. Skeels (1873–1934)
Skvortsov, A. A. K. Skvortsov (b. 1920)
Slavíková Z. Slavíková (b. 1935)
[illegible]
Slosson M. Slosson (b. 1873)
Sm. J. E. Smith (1759–1828)
Sm., A. R. A. R. Smith (b. 1938)
Sm., C. C. Smith (1785–1816)
Sm., G. E. G. E. Smith (1805–1881)
Sm., H. K. A. H. Smith (b. 1889)
Sm., W. W. W. W. Smith (1875–1956)
Small J. K. Small (1869–1938)
Smejkal M. Smejkal (b. 1927)
Smirnov, P. P. A. Smirnov (b. 1896)
Smolj. L. A. Smoljaninova (b. 1904)

Snogerup S. E. Snogerup (b. 1929)
Soczava V. B. Soczava (b. 1905)
Soják J. Soják (b. 1936)
Solac. T. Solacolu (1876–1940)
Solander D. C. Solander (1733–1782)
Sole W. Sole (*c.* 1739–1802)
Solemacher J. V. L. A. G. Solemacher-Antweiler (b. 1889)
Solms-Laub. H. M. C. L. F. Solms-Laubach (1842–1915)
Soltok. M. Soltoković (fl. 1901)
Sommer. I. Sommerauer (d. 1854)
Sommerf. S. C. Sommerfelt (1794–1838)
Sommier C. P. S. Sommier (1848–1922)
Sonder O. W. Sonder (1812–1881)
Song. A. Songeon (1826–1905)
Soó R. de Soó (b. 1903)
Soška T. Soška (1876–1948)
Sosn., D. D. I. Sosnowsky (1885–1952)
Soulié J. A. Soulié (1868–1930)
Šourek J. Šourek (1891–1968)
Sowerby J. Sowerby (1757–1822)
Soyer-Willemet H. F. Soyer-Willemet (1791–1867)
Spach E. Spach (1801–1879)
Speg. C. Spegazzini (1858–1926)
Spenner F. K. L. Spenner (1798–1841)
Spitzner V. Spitzner (1852–1907)
Sprague T. A. Sprague (1877–1958)
Sprengel K. P. J. Sprengel (1766–1833)
Spribille F. J. Spribille (1841–1921)
Spring F. A. Spring (1814–1872)
Spruner W. von Spruner (1805–1874)
Sprygin I. I. Sprygin (1873–1942)
Stace C. A. Stace (b. 1938)
Stadlm. J. Stadlmann (b. 1881)
St-Amans J. F. B. de Saint-Amans (1748–1831)
Standley P. C. Standley (1884–1963)
Stankov S. S. Stankov (1892–1962)
Stapf O. Stapf (1857–1933)
Stearn W. T. Stearn (b. 1911)
Stebbins G. L. Stebbins (b. 1906)
Stechm. J. P. Stechmann (fl. 1775)
Steele W. E. Steele (1816–1883)
Stefani C. de Stefani (1851–1924)
Stefanov B. Stefanov (b. 1894)
Stefánsson S. Stefánsson (1863–1921)
Steinb. E. I. Steinberg (1884–1963)
Steinh. A. Steinheil (1810–1839)
Steininger H. Steininger (1856–1891)
Stenström K. O. E. Stenström (1858–1901)
Stephan C. F. Stephan (1757–1814)
Stern, F. C. F. C. Stern (1884–1967)
Sternb. C. M. von Sternberg (1761–1838)
Sterneck J. von Sterneck (1864–1941)
Sterner K. R. Sterner (1891–1956)
Sterns, E. E. E. E. Sterns (1846–1926)
Steudel E. G. von Steudel (1783–1856)
Steudel E. G. von Steudel (1783–1856)
Steven C. Steven (1781–1863)
St-Hil. A. C. F. P. de Saint-Hilaire (1779–1853)
Steifelhagen H. Steifelhagen (fl. 1910)
St John H. St John (b. 1892)
St-Lager J. B. Saint-Lager (1825–1912)
Stocks J. E. Stocks (1822–1854)
Stoj. N. Stojanov (1883–1968)
Stokes J. Stokes (1755–1831)
Störk A. Störk (1741–1803)
Strail C. A. Strail (1808–1893)
Strempel J. K. F. Strempel (1800–1872)
Strobl P. G. Strobl (1846–1910)
Stroh G. Stroh (b. 1864)
Strömfelt H. F. G. Strömfelt (1861–1890)
Stur D. Stur (1827–1893)
Sturm J. Sturm (1771–1848)
Suard V. Suard (fl. 1839)
Suckow, G. G. A. Suckow (d. 1867)
Sudre H. Sudre (1862–1918)
Sudworth G. B. Sudworth (1864–1927)
Suess. K. Suessenguth (1893–1955)
Suk. V. N. Sukaczev (Sukatschew) (1880–1967)
Suksdorf W. N. Suksdorf (1850–1932)
Sumnev. G. P. Sumnevicz (1909–1947)
Sünd. F. Sündermann (1864–1946)
Suter J. R. Suter (1766–1827)
Sutton C. Sutton (1756–1846)
Sutulov A. N. Sutulov (fl. 1914)
Svob. P. Svoboda (b. 1908)
Swartz O. P. Swartz (1760–1818)
Sweet R. Sweet (1783–1835)
Swingle W. T. Swingle (1871–1952)
Syme J. T. I. Boswell Syme (formerly Boswell) (1822–1888)
Symons J. Symons (1778–1851)
Syreistschikov D. P. Syreistschikov (1868–1932)
Szabó Z. Szabó (1882–1944)
Szafer W. Szafer (1886–1970)
Szov. A. J. Szovits (d. 1830)
Szysz. I. Szyszyłowicz (1857–1910)
Tacik, T. T. Tacik (b. 1926)
Talbot W. H. F. Talbot (1800–1877)
Taliev V. I. Taliev (1872–1932)
Tamamsch. S. G. Tamamschian (b. 1900)
Tanfani E. Tanfani (1848–1892)
Tarasov ?R. P. Tarasov
Tardieu-Blot M. L. Tardieu-Blot (b. 1902)
Taubert P. H. W. Taubert (1862–1897)
Tausch I. F. Tausch (1793–1848)
Taylor, P. P. G. Taylor (b. 1926)
Temesy E. Temesy (fl. 1957)
Ten. M. Tenore (1780–1861)
Tepl. F. A. Teplouchow (1845–1905)
Terechov A. F. Terechov (b. 1890)
Terpó A. Terpó (b. 1925)
Terracc., N. N. Terracciano (1837–1921)
Tesseron Y.-A. Tesseron (1831–1925)
Texidor J. Texidor y Cos (1836–1885)
Teyber A. Teyber (1846–1913)
Thell. A. Thellung (1881–1928)
Thév. A. V. Théveneau (1815–1876)
Thib. ?E. Thibaud (fl. 1785)
Thielens A. Thielens (1833–1874)
Thomas E. Thomas (1788–1859)
Thommen E. Thommen (1880–1961)
Thomson T. Thomson (1817–1878)
Thore J. Thore (1762–1823)
Thore J. Thore (1762–1823)
Thouars L. M. A. Aubert du Petit-Thouars (1758–1831)
Thouin A. Thouin (1747–1824)
Thuill. J. L. Thuillier (1757–1822)
Thunb. C. P. Thunberg (1743–1828)
Thuret G. A. Thuret (1817–1875)
Timb.-Lagr. P. M. E. Timbal-Lagrave (1819–1888)
Timm J. C. Timm (1734–1805)
Tineo V. Tineo (1791–1856)
Tiss. P. G. Tissière (1828–1868)
Tocl K. (C.) Tocl (1870–1910)
Tod. A. Todaro (1818–1892)

Tolm. A. I. Tolmatchev (b. 1903)
Toman, J. J. Toman (b. 1933)
Tommasini M. G. S. de Tommasini (1794–1879)
Top. S. Topali (fl. 1938)
Ţopa E. Ţopa (b. 1900)
Topitz A. Topitz (b. 1857)
Torrey J. Torrey (1796–1873)
Tourlet E.-H. Tourlet (1843–1907)
Touton K. Touton (1858–1934)
Townsend F. Townsend (1822–1905)
Trabut L. Trabut (1853–1929)
Tratt. L. Trattinick (1764–1849)
Trautv. E. R. von Trautvetter (1809–1889)
Travis W. G. Travis (1877–1958)
Trelease W. Trelease (1857–1945)
Trev. L. C. Treviranus (1779–1864)
Trevisan V. B. A. Trevisan de Saint-Léon (1817–1897)
Trew C. J. Trew (1695–1769)
Tropea C. Tropea (fl. 1910)
Trotzky P. Kornuch-Trotzky (1803–1877)
Truchaleva N. A. Truchaleva (b. 1927)
Tryon jun., R. M. R. M. Tryon jun. (b. 1916)
Tubilla T. Andrés y Tubilla (1859–1882)
Tuntas B. Tuntas (b. 1871)
Turcz. N. S. Turczaninow (1796–1864)
Turesson G. W. Turesson (1892–1970)
Turner, D. D. Turner (1775–1858)
Turpin P. J. F. Turpin (1775–1840)
Turra A. Turra (1730–1796)
Turrill W. B. Turrill (1890–1961)
Tutin T. G. Tutin (b. 1908)
Tuzson J. Tuzson (1870–1941)
Tzvelev N. N. Tzvelev (b. 1925)
Ucria Bernadino da Ucria (Michelangelo Aurifici) (1739–1796)
Uechtr. R. F. C. von Uechtritz (1838–1886)
Ugr. K. A. Ugrinsky (fl. 1920)
Uhrová A. Hrabětová-Uhrová (b. 1900)
Ujhelyi J. Ujhelyi (b. 1910)
Ulbr. E. Ulbrich (1879–1952)
Underw. J. Underwood (d. 1834)
Unger F. J. A. N. Unger (1800–1870)
Ung.-Sternb. F. Ungern-Sternberg (1808–1885)
Urban I. Urban (1848–1931)
Urum. I. K. Urumoff (1856–1937)
Utinet — Utinet (fl. 1839)
Vaarama O. A. Vaarama (1912–1975)
Vacc. L. Vaccari (1873–1951)
Vahl M. H. Vahl (1749–1804)
Vahl, J. J. L. M. Vahl (1796–1854)
Valck.-Suringar — Valckenier-Suringar (1865–1932)
Valdés B. Valdés Castrillón (b. 1942)
Valentine D. H. Valentine (b. 1912)
Vandas K. Vandas (1861–1923)
Vandelli D. Vandelli (1735–1816)
Van den Bosch R. B. van den Bosch (1810–1862)
Van den Bosch R. B. van den Bosch (1810–1862)
Van Hall H. C. van Hall (1801–1874)
Van Houtte L. B. van Houtte (1810–1876)
Van Ooststr. S. J. van Ooststroom (b. 1906)
Van Soest J. L. van Soest (b. 1898)
Vasc. J. de Carvalho e Vasconcellos (1897–1972)
Vassil., V. V. N. Vassiliev (b. 1890)
Vassilcz. I. T. Vassilczenko (b. 1903)
Vatke G. K. W. Vatke (1849–1889)
Vaucher J. P. E. Vaucher (1763–1841)
Vayr. E. Vayreda y Vila (1848–1901)
Velen. J. Velenovský (1858–1949)
Velloso J. M. de Conceiçao Velloso (Vellozo) (1742–1811)
Vendr. X. Vendrely (fl. 1895)
Vent. E. P. Ventenat (1757–1808)
Vent, W. W. Vent (b. 1920)
Verdcourt B. Verdcourt (b. 1925)
Verlot J.-B. Verlot (1825–1891)
Verlot, B. P. B. L. Verlot (1836–1897)
Vest L. C. von Vest (1776–1840)
Vestergren J. T. C. Vestergren (1875–1930)
Vetter J. J. Vetter (1865–1913)
Vicioso, B. B. Vicioso (1850–1929)
Vicioso, C. M. C. Vicioso Martínez (1897–1968)
Vidal L. M. Vidal
Vierh. F. Vierhapper (1876–1932)
Vig. L. G. A. Viguier (1790–1867)
Vigineix G. Vigineix (d. 1877)
Vigo J. Vigo Bonada (b. 1937)
Vill. D. Villars (Villar) (1745–1814)
Villar, H. del E. Huguet del Villar (1871–1951)
Vilmorin P. L. F. L. de Vilmorin (1816–1860)
Vilmorin, R. de R.-P.-V. de Vilmorin (b. 1905)
Vindt J. Vindt (b. 1915)
Vines S. H. Vines (1849–1934)
Vis. R. de Visiani (1800–1878)
Vitman F. Vitman (1728–1806)
Viv. D. Viviani (1772–1840)
Vogel B. C. Vogel (1745–1825)
Vogel, T. J. R. T. Vogel (1812–1841)
Vogler J. A. Vogler (1746–1816)
Voigt J. O. Voigt (1798–1843)
Volk. A. Volkart (1873–1951)
Vollmann F. Vollmann (1858–1917)
Vorosch. V. N. Voroschilov (b. 1908)
Voss A. Voss (1857–1924)
Vuk. L. F. Vukotinović (1813–1893)
Vved. A. I. Vvedensky (b. 1898)
Wagenitz G. Wagenitz (b. 1927)
Wagner, H. J. Wagner (H. Wagner) (1870–1955)
Wagner, R. R. Wagner (fl. 1887)
Wahlberg P. F. Wahlberg (1800–1877)
Wahlenb. G. Wahlenberg (1780–1851)
Wainio E. A. Wainio (later Vainio) (1853–1929)
Waisb. A. Waisbecker (1835–1916)
Waldst. F. A. von Waldstein-Wartemberg (1759–1823)
Wale R. S. Wale (d. 1952)
Walker, S. S. Walker (b. 1924)
Wall. N. Wallich (1786–1854)
Wallr. K. F. W. Wallroth (1792–1857)
Walpers W. G. Walpers (1816–1853)
Walsh R. Walsh (1772–1852)
Walter T. Walter (1740–1789)
Walters S. M. Walters (b. 1920)
Walther E. Walther (b. 1912)
Wangenh. F. A. J. von Wangenheim (1747–1800)
Wangerin W. L. Wangerin (1884–1938)
Wangerin W. L. Wangerin (1884–1938)
Warburg O. Warburg (1859–1938)
Warburg, E. F. E. F. Warburg (1908–1966)
Warming J. E. B. Warming (1841–1924)
Wartm. F. B. Wartmann (1830–1902)
Watson, H. C. H. C. Watson (1804–1881)
Watson, S. S. Watson (1826–1892)
Watson, W. C. R. W. C. R. Watson (1885–1954)
Watt D. A. P. Watt (1830–1917)
Watzl B. Watzl (b. 1886)
Webb P. B. Webb (1793–1854)
Webb, D. A. D. A. Webb (b. 1912)

Weber G. H. Weber (1752–1828)
Weber fil. F. Weber (1781–1823)
Weberling F. Weberling (b. 1926)
Weddell H. A. Weddell (1819–1877)
Weevers T. Weevers (1875–1952)
Wehrli — Wehrli
Weigel C. E. von Weigel (1748–1831)
Weihe K. E. A. Weihe (1779–1834)
Weiller M. Weiller (1880–1945)
Wein, K. K. Wein (1883–1968)
Weinm. J. A. Weinmann (1782–1858)
Weiss E. Weiss (1837–1870)
Welden F. L. von Welden (1782–1853)
Welw. F. Welwitsch (1806–1872)
Wendelberger G. Wendelberger (b. 1915)
Wendelbo P. E. B. Wendelbo (b. 1927)
Wenderoth G. W. F. Wenderoth (1774–1861)
Wendl. J. C. Wendland (1755–1828)
Wendl. fil. H. L. Wendland (1792–1869)
Wenzig T. Wenzig (1824–1892)
Werner K. Werner (b. 1928)
Wesmael, A. A. Wesmael (1832–1905)
Wessely I. Wessely (fl. 1960)
West, C. C. West (b. 1887)
Westcott F. Westcott (d. 1861)
Weston R. Weston (1733–1806)
Wettst. R. von Wettstein (1863–1931)
Wettst., F. F. von Wettstein (1895–1945)
Wheldon J. A. Wheldon (1862–1924)
White J. White (*c.* 1750–1832)
Whitehead F. H. Whitehead (b. 1913)
Wibel A. W. E. C. Wibel (1775–1814)
Wibiral E. Wibiral (1878–1950)
Wichura M. E. Wichura (1817–1866)
Wickens G. E. Wickens (b. 1927)
Widder F. Widder (1892–1974)
Widmer E. Widmer (1862–1952)
Wieg. K. McK. Wiegand (1873–1942)
Wierzb. P. Wierzbicki (1794–1847)
Wiesb. J. Wiesbaur (1836–1906)
Wiggers F. H. Wiggers (1746–1811)
Wight R. Wight (1796–1872)
Wiinst. K. J. F. Wiinstedt (1878–1964)
Wikstr. J. E. Wikström (1789–1856)
Wilce J. H. Wilce (b. 1931)
Wilczek E. Wilczek (1867–1948)
Wilensky D. G. Wilensky (1892–1959)
Willd. C. L. Willdenow (1765–1812)
Williams, F. N. F. N. Williams (1862–1923)
Willk. H. M. Willkomm (1821–1895)
Wilmott A. J. Wilmott (1888–1950)
Wilson, E. H. E. H. Wilson (1876–1930)
Wimmer C. F. H. Wimmer (1803–1868)
Winge Ö. Winge (1886–1964)
Winkler M. Winkler (1812–1889)
[illegible]
Winter, F. F. B. Winter (1795–1869)
Winter, N. N. A. Winter (1898–1934)
Winterl J. J. Winterl (1739–1809)
Wirsing A. L. Wirsing (1734–1797)
Wirtgen P. W. Wirtgen (1806–1870)
Wissjul. E. D. Wissjulina (1898–1972)
Witasek J. Witasek (1865–1910)
With. W. Withering (1741–1799)
Wittm. M. C. L. Wittmack (1839–1929)
Wittrock V. B. Wittrock (1839–1914)
Wohlf. R. Wohlfahrt (1830–1888)
Wolf — Wolf (1743 or 1744–1825)
Wolf, F. O. F. O. Wolf (1838–1905)
Wolf, N. M. N. M. von Wolf (1724–1784)
Wolf, T. F. T. Wolf (1841–1921)
Wolff, D. D. Wolff (fl. ?1809)
Wolff, H. H. Wolff (1866–1929)
Wolfner W. Wolfner (fl. 1858)
Wollaston G. B. Wollaston (1814–1899)
Wolley-Dod A. H. Wolley-Dod (1861–1948)
Wolny A. R. Wolny (d. ?1829)
Wołoszczak E. Wołoszczak (1835–1918)
Wood, D. D. Wood (b. 1939)
Wood, W. W. Wood (1745–1808)
Woods, J. J. Woods (1776–1864)
Woodson R. E. Woodson (1904–1963)
Wormsk. M. Wormskiold (1783–1845)
Woronow J. N. Woronow (Voronov) (1874–1931)
Woynar H. K. Woynar (1865–1917)
Wulf E. V. Wulf (E. W. Wulff, E. V. Vul'f) (1855–1941)
Wulfen F. X. von Wulfen (1728–1805)
Wünsche J. G. Wünsche (fl. 1804)
Yavin Z. Ovadiahu-Yavin (b. 1936)
Yeo P. F. Yeo (b. 1929)
Yuncker T. G. Yuncker (1891–1964)
Zabel H. Zabel (1832–1912)
Zaffran J. Zaffran (b. 1935)
Zahar. C. Zahariadi (b. 1901)
Zahlbr. J. Zahlbruckner (1782–1851)
Zahn K. H. Zahn (1865–1940)
Zamels A. Zamels (Zamelis) (1897–1943)
Zanted. G. Zantedeschi (1773–1846)
Zapał. H. Zapałowicz (1852–1917)
Zawadzki A. Zawadzki (1798–1868)
Zefirov B. M. Zefirov (1915–1957)
Zelen. N. M. Zelenetzky (1859–1923)
Zenari S. Zenari (b. 1896)
Zerafa S. Zerafa (Zerapha) (1791–1871)
Zerov D. K. Zerov (1895–1971)
Žertová A. Chrtková-Žertová (b. 1930)
Zett., J. W. J. W. Zetterstedt (1785–1874)
Zevenbergen H. A. Zevenbergen (b. 1943)
Zeyher C. L. P. Zeyher (1799–1858)
Zimm., W. W. Zimmermann (b. 1892)
Zimmeter A. Zimmeter (1848–1897)
Zinger, N. N. Zinger (1866–1923)
Zinger, V. V. J. Zinger (1836–1907)
Zinn J. G. Zinn (1727–1759)
Zinserl. Y. D. Zinserling (1894–1938)
Ziz J. B. Ziz (1779–1829)
Zodda G. Zodda (1877–1968)
[illegible]
Zoega J. Zoega (1742–1788)
Zoz I. G. Zoz (b. 1903)
Zsák Z. Zsák (1880–1966)
Zucc. J. G. Zuccarini (1797–1848)
Zuccagni A. Zuccagni (1754–1807)

APPENDIX II

KEY TO THE ABBREVIATIONS OF TITLES OF BOOKS CITED IN VOLUME 4

Aiton, *Hort. Kew.*
W. Aiton, *Hortus kewensis, or a Catalogue of the Plants cultivated in the Royal Botanic Garden at Kew*. Ed. 1. London. 1789. (**1–3** in 1789.) Ed. 2, by W. T. Aiton. London. 1810–1813. (**1** in 1810; **2** & **3** in 1811; **4** in 1912; **5** in 1813. Cf. F. A. Stafleu, *Taxonomic Literature* 4 (1967).)

All., *Auct. Fl. Pedem.*
C. Allioni, *Auctarium ad Floram pedemontanam cum Notis et Emendationibus*. Augustae Taurinorum. 1789.

All., *Auct. Syn. Stirp. Horti Taur.*
C. Allioni, *Auctarium ad Synopsim methodicam Stirpium Horti reg. taurinensis*. [Torino.] 1773. (Cf. J. E. Dandy, *Taxon* **19**: 617–626 (1970) & F. A. Stafleu, *Taxonomic Literature* 6 (1967).)

All., *Fl. Pedem.*
C. Allioni, *Flora pedemontana, sive Enumeratio methodica Stirpium indigenarum Pedemontii*. Augustae Taurinorum. 1785. (**1–3** in 1785.)

Almq., *Stud. Hier.*
S. O. I. Almquist, *Studier öfver Slägtet* Hieracium. Stockholm. 1881.

Andrews, *Bot. Reposit.*
H. C. Andrews, *The Botanist's Repository*. Ed. 1. London. 1797–1815. (**1–10**. For dates cf. F. A. Stafleu, *Taxonomic Literature* 7 (1967).) Ed. 2. London. 1816.

Arcangeli, *Comp. Fl. Ital.*
G. Arcangeli, *Compendio della Flora italiana, ossia Manuale per la Determinazione delle Piante che trovansi selvatiche od inselvatichite nell'Italia e nelle Isole adiacenti*. Ed. 1. Torino. 1882. Ed. 2. Torino & Roma. 1894.

Ard., *Animadv. Bot. Spec. Alt.*
P. Arduino, *Animadversionum botanicarum Specimen alterum*. Venetiis. 1763.

Arvet-Touvet, *Addit. Monogr. Hier.*
J. M. C. Arvet-Touvet, *Additions à la Monographie des* Pilosella *& des* Hieracium *du Dauphiné*. Grenoble. 1879.

Arvet-Touvet, *Essai Pl. Dauph.*
J. M. C. Arvet-Touvet, *Essai sur les Plantes du Dauphiné*. Grenoble. 1871.

Arvet-Touvet, *Hier. Alpes Fr.*
J. M. C. Arvet-Touvet, *Les* Hieracium *des Alpes françaises*. Lyon, Genève, Bâle & Paris. 1888.

Arvet-Touvet, *Hier. Gall. Hisp. Cat.*
J. M. C. Arvet-Touvet, *Hieraciorum praesertim Galliae et Hispaniae Catalogus systematicus*. Paris. 1913.
Hispaniae Catalogus systematicus. Paris. 1913.

Arvet-Touvet, *Monogr. Hier.*
J. M. C. Arvet-Touvet, *Monographie des* Pilosella *et des* Hieracium *du Dauphiné*. Grenoble. 1873.

Arvet-Touvet, *Not. Pl. Alpes*
J. M. C. Arvet-Touvet, *Notes sur quelques Plantes des Alpes*. Grenoble. 1883. ***Suppl.*, *Supplément***. Grenoble. 1883.

Arvet-Touvet, *Spicil. Rar. Nov. Hier.*
J. M. C. Arvet-Touvet, *Spicilegium rariorum vel novorum Hieraciorum*. Grenoble. 1881. ***Suppl.*, *Supplementum* 1 & 2**. Grenoble. 1886.

Arvet-Touvet, *Suppl. Monogr. Hier.*
J. M. C. Arvet-Touvet, *Supplément à la Monographie des* Pilosella *& des* Hieracium *du Dauphiné*. Grenoble. 1876.

Arvet-Touvet & Gaut., *Hier. Gall. Hisp.* (*Exsicc.*)
J. M. C. Arvet-Touvet & G. Gautier, *Hieraciotheca gallica et hispanica*. Narbonne. 1897–1908. (**1** & **2** in 1897; **3–5** in 1898; **6–8** in 1899; **9** in 1899 or 1900; **10** & **11** in 1900; **12** in 1901; **13** & **14** in 1902; **15** & **16** in 1903; **17** & **18** in 1906; **19** & **20** in 1908.)

Ascherson, *Fl. Brandenb.*
P. F. A. Ascherson, *Flora der Provinz Brandenburg, der Altmark und des Herzogthums Magdeburg*. Berlin. 1859–1864. (**1**: pp. 1–320 in 1860; pp. i–xxii, 321–1034 in 1864; **2** & **3** in 1859.)

Ascherson & Graebner, *Syn. Mitteleur. Fl.*
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2(20): pp. i–vii, 141–156, tt. 174–183 in 1892. Cf. F. A.

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H. M. Willkomm, *Supplementum Prodromi Florae hispanicae*. Stuttgartiae. 1893.

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H. M. Willkomm & J. M. C. Lange, *Prodromus Florae hispanicae*. Stuttgartiae. 1861–1880. (**1**: pp. 1–192 in 1861; pp. i–xxx, 193–316 in 1862; **2**: pp. 1–272 in 1865; pp. 273–480 in 1868; pp. 481–680 in 1870; **3**: pp. 1–240 in 1874; pp. 241–512 in 1877; pp. 513–736 in 1878; pp. 737–1144 in 1880. Cf. F. A. Stafleu, *Taxonomic Literature* 506–507 (1967).)

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Cf. Fomin, *Fl. RSS Ucr.*
Wulf, *Fl. Kryma*
E. V. Wulf, Флора Крыма [*Flora Kryma*].|*Flora taurica*. Jalta. 1927–1969. (**1(1)** in 1927; **1(2)** in 1929; **1(3)** in 1930; **1(4)** in 1951; **2(1)** in 1947; **2(2)** in 1960; **2(3)** in 1953; **3(1)** in 1957; **3(2)** in 1966; **3(3)** in 1969.) **1(2–3)**, Leningrad; **1(4)**, **2(2–3)** & **3(1–2)**, Moskva; **2(1)**, Moskva & Leningrad. Дополнения к I Тому "Флоры Крыма" [*Dopolnenija k I Tomu 'Flory Kryma'*].|*Addenda et Corrigenda ad Vol. I 'Florae tauricae'*. Jalta. 1959.
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K. H. Zahn, *Les* Hieracium *des Alpes maritimes*. Genève, Bâle & Lyon. 1916.
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D. K. Zerov *et al.* (edit.), Визначник Рослин України [*Vyznačnyk Roslyn Ukrajiny*].Kyjiv. 1965.

APPENDIX III

KEY TO THE ABBREVIATIONS OF TITLES OF PERIODICALS AND ANONYMOUS WORKS CITED IN VOLUME 4

Abh. Böhm. Ges. Wiss.
Abhandlungen des böhmischen Gesellschaft der Wissenschaften. Prag. Ser. 1, **1–4**, 1786–1789. Ser. 2, titled *Neuere Abhandlungen der k. böhmischen Gesellschaft der Wissenshaften*, **1–3**, 1791–1798. Ser. 3, titled *Abhandlungen der königlichen böhmischen Gesellschaft der Wissenschaften*, **1–8**, 1804–1823. Ser. 4, **1–5**, 1817–1837. Ser. 5, **1–14**, 1838–1867. Ser. 6, **1–12**, 1867–1884. Ser. 7, **1–4**, 1885–1891. (Ser. 6, **11–12**, 1881–1884, also titled *Pojedáni královské české Společnosti Nauk*; ser. 7 also titled *Rozpravy královské Společnosti Nauk*.)
Abh. Zool.-Bot. Ges. Wien
Abhandlungen der kaiserlich-königliche zoologisch-botanischen Gesellschaft in Wien. Wien. 1901→.
Acta Biol. Cracov. (Bot.)
Acta biologica cracoviensia. Series botanica. Cracovie. 1958→.
Acta Bot. Acad. Sci. Hung.
Acta botanica Academiae Scientiarum hungaricae. Budapest. 1954→.
Acta Bot. Bohem.
Acta botanica bohemica. Praha. 1922–1947.
Acta Bot. Croat.
Cf. *Acta Bot. Inst. Bot. Univ. Zagreb*.
Acta Bot. Fenn.
Acta botanica fennica. Helsingforsiae. 1925→.
Acta Bot. Inst. Bot. Univ. Zagreb.
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Acta botanica neerlandica. Amsterdam. 1952→.
Acta Fauna Fl. Universali
Acta pro Fauna et Flora universali. Series 2. Botanica. Bucureşti. **1–3**, 1932–1940.
Acta Horti Berg.
Acta Horti bergiani. | *Meddelanden från Kongl. Svenska Vetenskaps-Akademiens Trädgård, Bergielund*. Stockholm. 1890→.
Acta Horti Gothob.
Acta Horti gothoburgensis [*gotoburgensis*] | *Meddelanden från Göteborgs botaniska Trädgård*. Göteborg. 1924→.
Acta Horti Petrop.
Acta Horti petropolitani. Peterburgi. **1–43**, 1871–1931. (With alternative title Труды Имп. С.-Петербургскаго ботаническаго Сада [*Trudy Imp. S.-Peterburgskago botaničeskago Sada*] 1871–1918, and Труды главнаго ботаническаго Сада [*Trudy glavnago botaničeskago Sada*] 1918–1931.)
Acta Inst. Bot. Acad. Sci. URSS (Ser. I)
Труды ботаническаго Института Академии Наук СССР. Серия 1. Флора и Систематика высших Растений. [*Trudy botaničeskago Instituta Akademii Nauk SSSR. Serija 1. Flora i Sistematika vysšikh Rastenij.*].|*Acta Instituti botanici Academiae Scientiarum URSS. Ser. 1*. Leningrad & Mosqua. 1933→.
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Acta phytogeographica suecica. Uppsala. 1929→.
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Acta societatis pro Fauna et Flora fennica. Helsingforsiae. 1875→.
Acta Soc. Sci. Fenn.
Acta Societatis Scientiarum fennicae. Helsingforsiae. Ser. 1, **1–50**, 1840–1926. Nov. ser., B, **1**→, 1931→.
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Actes de la Société d'Histoire naturelle de Paris. Paris. **1**, 1792.
Actes Soc. Linn. Bordeaux
Actes de la Société linnéenne de Bordeaux. Bordeaux. 1830→.
Agron. Jour.
Agronomy Journal. Madison, Wisconsin. 1949→.
Agron. Lusit.
Agronomia lusitana. Sacavém. 1939→. (**25**→, 1966→, at Oeiras.)
Allgem. Bot. Zeitschr.
Allgemeine botanische Zeitschrift für Systematik, Floristik, Pflanzen-geographie. Karlsruhe. 1895–1927.
Allgem. Gartenz.
Allgemeine Gartenzeitung. Berlin. 1833–1856.
Amer. Midl. Nat.
American Midland Naturalist. Notre Dame, Indiana. 1909→.
Anais Inst. Vinho Porto
Anais do Instituto do Vinho do Porto. Porto. 1940→.
Anal. Acad. Rep. Pop. Române
Analele Academiei Republicii populare române [*romîne*]. Bucureşti. Ser. 1, **1–3**, 1948–1950. Nov. ser., **1**→, 1951→.
Anal. Acad. Române
Analele Academiei române. Bucureşti. Ser. 1, **1**–?, 1867—?. Ser. 2, **1–40**, 1878–1922. Ser. 3, titled ***Mem. Secţ. Şti.* (*Acad. Română*)**, *Memoriile Secţiunii ştiinţifice* (*Academia română*), **1–20**, 1923–1944.
Anal. Inst. Bot. Cavanilles
Anales del Jardín botánico de Madrid. Madrid. **1–9**, 1941–1950; titled *Anales del Instituto botánico A. J. Cavanilles*, **10**→, 1950→.
Anal. Soc. Esp. Hist. Nat.
Anales de la Sociedad española de Historia natural. Madrid. **1–30**, 1872–1902 (**21–30** also called Ser. 2, **1–10**).
Animadv. Syst. Herb. Univ. Tomsk.
Animadversiones systematicae ex Herbario Universitatis tomskensis. | Систематические Заметки по Материалам Гербария Томского Университета [*Sistematičeskie Zametki po Materialam Gerbarija Tomskogo Universiteta*]. Tomsk. 1927→. With minor changes of title.
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Annali dell'Accademia degli aspiranti Naturalisti. Napoli. Era 1, Ser. 1, **1–3**, 1843–1846. Ser. 2, **1**, 1847. Ser. 3, **1–6**, 1861–1867. Ser. 4, **1**, 1867. Era 2, **1–2**, 1868–1869. Era 3, **1**, 1887.
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Annali di Agricoltura siciliana, redatti per Istituzione del Principe Castelnuovo. Palermo.
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Annali di Botanica. Roma. 1903→ .

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Annales historico-naturales Musei nationalis hungarici. / A Magyar nemzeti Muzeum természetrajzi Osztályainak Folyóirata. Budapest. Ser. 1, **1–41**, 1903–1948. (**33**→ , 1940→ , Hungarian title reads *Az országos magyar természettudományi Muzeum Folyóirata.*) Nov. ser., **1–9**, 1951–1958. Vol. nos. then revert to ser. 1, **51**→ , 1959→ . (With several variations of Hungarian title.)

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Annales Musei Goulandris. / Ἐπετηρὶς Μουσείου Γουλάνδρη. Kifissia. 1973→ .

Ann. Mus. Hist. Nat. (Paris)
Annales du Muséum d'Histoire naturelle. Paris. **1–20**, 1802–1813.

Ann. Nat. Hist.
Annals of natural History; or, Magazine of Zoology, Botany, and Geology. London. Ser. 1, **1–5**, 1838–1840; titled *The Annals and Magazine of natural History, including Zoology, Botany and Geology*, **6–20**, 1841–1842. Ser. 2, **1–20**, 1843–1857. Ser. 3, **1–20**, 1858–1867. Many later series.

Ann. Naturh. Mus. (Wien)
Annalen des k.k. naturhistorischen Hofmuseums. Wien. **1–31**, 1886–1917; titled *Annalen des naturhistorischen Hofmuseums*, **32**, 1918; titled *Annalen des naturhistorischen Museums in Wien*, **33**→ , 1919→ .

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Annual Report. Missouri Botanical Garden. St. Louis, Missouri. **1–23**, 1890–1912.

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Annaes scientificos da Academia polytechnica do Porto. Coimbra. **1–14**, 1905–1922; titled ***Anais Fac. Ci. Porto***, *Anais da Faculdade de Sciências. Universidade do Porto*, **47**→ , 1964→ . (**15**→ at Porto.)

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Annales de la Société botanique de Lyon. Lyon. **1–42**, 1873–1922.

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Annali di Storia naturale. Bologna. **1–4**, 1829–1830.

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Annuaire de Conservatoire et du Jardin botaniques de Genève. Genève. **1–21**, 1897–1922.

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Anzeiger der kaiserlichen Akademie der Wissenschaften. Mathematisch-naturwissenschaftliche Classe. Wien. **1–55**, 1864–1918; titled *Anzeiger. Akademie der Wissenschaften in Wien. Mathematisch-naturwissenschaftliche Klasse*, **56–83**, 1919–1946; titled *Anzeiger. Österreichische Akademie der Wissenschaften. Mathematisch-naturwissenschaftliche Klasse*, **84**→ , 1947→ .

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Archives de Botanique. Bulletin mensuel. Caen. **1–4**, 1927–1930.

Arch. Bot. (Roemer)
Archiv für die Botanik. (*Herausgegeben von D. Johann Jacob Römer.*) Leipzig. **1–3**, 1796–1805.

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Archiv der Freunde der Naturgeschichte in Mecklenburg. Rostock. 1954→ .

Arch. Naturgesch. (Berlin)
Archiv für Naturgeschichte. Berlin. 1835→ .

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Archives des Sciences physiques et naturelles. (*Bibliothèque universelle de Genève.*) Genève. Ser. 1, **1–36**, 1846–1857. Ser. 2, **1–64**, 1858–1878. Ser. 3, **1–34**, 1879–1895. Ser. 4, **1–46**, 1896–1918. Ser. 5, **1–29**, 1919–1947. Ser. 6, titled *Archives des Sciences, éditées par la Société de Physique et d'Histoire naturelle de Genève*, **1**→ , 1948→ .

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Arkiv för Botanik. Uppsala. Ser. 1, **1–33**, 1903–1949. Ser. 2, **1**→ , 1949→ .

Arx. Secc. Ci. Inst. Est. Catalans
Arxivs de la Secció de Ciències Institut d'Estudis Catalans. Barcelona. 1911→ .

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Atti della Accademia di Scienze e Lettere di Palermo. Nuova Serie. Palermo. **1–10**, 1845–1889. Ser. 3, **1–20**, 1891–1938. Ser. 4, **1**→ , 1941→ . With minor changes of title.

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Atti del real Istituto d'Incoraggiamento alle Scienze naturali di Napoli. Napoli. Ser. 1, **1–12**, 1811–1864. Ser. 2, **1–17**, 1864–1881. Ser. 3, **1–6**, 1882–1887. Ser. 4, **1–11**, 1888–1898. Ser. 5, **1–5**, 1899–1904. Ser. 5, **56–60**, 1905–1909.

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Beihefte zum botanischen Centralblatt. Cassel, Jena & Dresden. 1891–1943.

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Berichte der bayerischen botanischen Gesellschaft zur Erforschung der heimischen Flora. München. 1891→ .

Ber. Deutsch. Bot. Ges.
Berichte der deutschen botanischen Gesellschaft. Berlin. 1883→. (**59–61**, 1941–1944, at Jena; **62**→ , 1949→ , at Stuttgart.)

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Bericht über das geobotanische Forschungsinstitut Rübel in Zürich. Zürich. **1931–1958**, 1929–1959; titled *Berichte des geobotanischen Institutes der eidg. techn. Hochschule Stiftung Rübel*, **31**→ , 1960→ .

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Berichte der schweizerischen botanischen Gesellschaft. / *Bulletin de la Société botanique suisse.* Basel & Genf. 1891→ . (**3–18**, 1893–1909, at Bern; **19–29**, 1910–1920, at Zürich; **30**→ , 1922→ at Bern.)

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Bergens Museums Aarbog[*Aarbok, Årbok*]. Bergen. 1893–1948.

Bibliot. Ital.
Biblioteca italiana, ossia Giornale di Letteratura, Scienze ed Arti. Milano. **1–100**, 1816–1840.

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Bibliotheca botanica. Abhandlungen aus dem Gesammtgebiete der Botanik. Cassel. 1886→ . (**28**→ , 1894→ , at Stuttgart.)

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Bibliothèque universelle des Sciences, Belles-lettres, et Arts, faisant suite à la Bibliothèque britannique. Partie des Sciences. Genève. Ser. 1, **1–60**, 1816–1835. Ser. 2, **1–60**, 1836–1845.

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Bihang till kongl. svenska Vetenskaps-Akademiens Handlingar. Stockholm. **1–28**, 1872–1903.

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Billotia, ou Notes de Botanique. Besançon. **1**, 1864–1869.

Biol. Glasn. (Zagreb)
Glasnik biološke Sekcije. Hrvatsko prirodoslovno Društvo. / Periodicum biologorum. Societas Scientiarum naturalium croatica. Zagreb. **1–7**, 1947–1955; titled *Biološki Glasnik. Hrvatsko prirodoslovno Društvo. / Periodicum biologorum. Societas Scientiarum naturalium croatica*, **8–21**, 1955–1968.

Boissiera
Boissiera. Genève. 1936→ . (Supplement of *Candollea.*)

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Boletín del Instituto de Estudios asturianos (*Suplemento de Ciencias*). Oviedo. 1960→ .

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Boletín de la Sociedad aragonesa de Ciencias naturales. Zaragoza. **1–17**, 1902–1918; titled ***Bol. Soc. Ibér. Ci. Nat.***, *Boletín de la Sociedad ibérica de Ciencias naturales*, **18–33**, 1919–1934.

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Boletín de la Sociedad argentina de Botánica. La Plata. **1**→ , 1945→ . (**13(2–3)**→ , 1970→ , at Buenos Aires.)

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Boletim da Sociedade broteriana. Coimbra. Ser. 1, **1–28**, 1880–1920. Ser. 2, **1**→ , 1922→ .

Bol. Soc. Esp. Hist. Nat.
Boletín de la real Sociedad española de Historia natural. Madrid. 1901→ .

Bonplandia
Bonplandia. Zeitschrift für die gesammte Botanik. Hannover, London, New York & Paris. **1–10**, 1853–1862.

Borbásia
Borbásia. Dissertationes botanicae. Budapest. **1–9**, 1938–1949. (**3–9**, 1941–1949, subtitled *A magyar növénytani Társaság Folyóirata. / Acta Societatis Botanicorum hungaricae.*)

Borbásia Nova
Borbásia nova. Budapest. **1–25**, 1940–1944.

Bot. Gaz.
Botanical Bulletin. Hanover, Indiana, etc. **1**, 1875–1876; titled *Botanical Gazette*, **2**→ , 1876→ . (**22**→ , 1896→ , at Chicago, Illinois.)

Bot. Jahrb.
Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie. Leipzig. 1880→ . (**69**→ , 1938→ , at Stuttgart.)

Bot. Jour. Linn. Soc.
Cf. *Jour. Linn. Soc. London* (*Bot.*).

Bot. Közl.
Cf. *Növ. Közl.*

Bot. Mag.
The botanical Magazine or Curtis's botanical Magazine. London. 1793→ . (For publication dates of **1–6** cf. F. A. Stafleu, *Taxonomic Literature* 92–97 (1967).) Continuous volume numbers are used in citations and series are ignored.

Bot. Mag. (Tokyo)
The botanical Magazine. Tokyo. **1–19**, 1887–1905; titled *The botanical Magazine published by the Tokyo botanical Society*, **20–45**, 1906–1931; titled *The botanical Magazine published by the botanical Society of Japan*, **46**→ . 1932→ . (**68**→ , 1955→ , also titled *The botanical Magazine, Tokyo.*)

Bot. Not.
Botaniska Notiser. Lund. 1839→ .

Bot. Reg.
The botanical Register. London. **1–14**, 1815–1829; titled *Edwards's botanical Register*, **15–33**, 1829–1847. (For dates of publication cf. F. A. Stafleu, *Taxonomic Literature* 124–125 (1967).)

Bot. Taschenb.
Botanisches Taschenbuch für die Anfänger dieser Wissenschaft und der Apothekerkunst. Regensburg. 1790–1811.

Bot. Tidsskr.
Botanisk Tidsskrift. Kjøbenhavn. 1866→ .

Bot. Zeit.
Botanische Zeitung. Berlin. **1–68**, 1843–1910. (**14–68**, 1856–1910, at Leipzig.)

Bot. Žur.
Журналъ Русскаго ботаническаго Общества [*Žurnal Russkago botaničeskago Obščestva*]./*Journal de la Société botanique de Russie.* Petrograd. **1–16**, 1916–1931; titled Ботанический Журнал СССР [*Botaničeskij Žurnal SSSR*]./*Journal botanique de l'URSS*, Leningrad, Moscou, **17–32**, 1932–1947; titled Ботанический Журнал Акад. Наук СССР [*Botaničeskij Žurnal Akad. Nauk SSSR*], Leningrad, **33**→ , 1948→ .

Brittonia
Brittonia. New York. 1931→ .

Brotéria
Brotéria. Lisboa. 1902→ . *Série botânica*, **6–25**, 1907–1931. *Série Ciências naturais*, **1**→ , 1932→ .

Bul. Acad. Stud. Agron. Cluj
Buletinul Academiei de înalte Studii agronomice din Cluj. Cluj. **1–6**, 1930–1936.

Bul. Grăd. Bot. Univ. Cluj
Buletinul de Informaţii al Grădinii botanice şi al Muzeului botanic dela Universitatea din Cluj./*Bulletin d'Informations du Jardin et du Musée botanique de l'Université de Cluj, Roumanie.* Cluj. **1–5**, 1921–1925; titled *Buletinul Grădinii botanice şi al Muzeului botanic de la Universitatea din Cluj.*/*Bulletin du Jardin et du Musée botaniques de l'Université de Cluj, Roumanie*, **6–28**, 1926–1948. With minor changes of title.

Bul. Şti. Acad. Rep. Pop. Române
Buletin ştiinţific. Academia Republicii populare române [*romîne*]./*Bulletin scientifique. Académie de la République populaire roumaine.*/Научный Вестник. Академия Румынской народной Республики [*Naučnyj Vestnik. Akademija Rumynskoj narodnoj Respubliki*]. Bucureşti. **1–9**, 1949–1957.

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Bulletin de l'Académie impériale des Sciences de St.-Pétersbourg. St.-Pétersbourg. Ser. 1, **1–32**, 1860–1888. Ser. 2, **1–2**, 1889–1892. Different series and titles later.

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Cf. *Monde Pl.*

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Bulletin du Congrès botanique. Saint-Pétersbourg.

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Bulletin de l'Herbier Boissier. Genève & Bâle. Ser. 1, **1–7**, 1893–1899. Ser. 2, **1–8**, 1900–1909.

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Известия на ботаническия Институт [*Izvestija na botaničeskija Institut*]./*Bulletin de l'Institut botanique.* Sofia. 1950→ .

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Bulletin international de l'Académie des Sciences de Cracovie. Classe des Sciences mathématiques et naturelles. Série B: Sciences naturelles./*Anzeiger der Akademie der Wissenschaften in Krakau. Mathematisch-naturwissenschaftliche Klasse. Reihe B: Biologische Wissenschaften.* Cracovie. 1889–1919. Dates

are used as vol. nos. Continued as *Bulletin international de l'Académie polonaise des Sciences et des Lettres*. 1920–1953.

Bull. Jard. Bot. Bruxelles
Bulletin du Jardin botanique de l'État à Bruxelles. Bruxelles. **1–36**, 1920–1966. (**15–36**, 1938–1966, with alternative title *Bulletin van den* [*de*] *Rijksplantentuin Brussel*); titled ***Bull. Jard. Bot. Nat. Belg.***, *Bulletin du Jardin botanique national de Belgique. Bulletin van de nationale Plantentuin van Belge*, **37** → , 1967 → .

Bull. Jard. Bot. Kieff
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APPENDIX IV

GLOSSARY OF TECHNICAL TERMS

The number of technical terms used in *Flora Europaea* has been kept as low as is consistent with a reasonable standard of accuracy and brevity. Most of them are used in well-established traditional senses, and their meanings may be ascertained by reference to glossaries such as H. I. Featherly, *Taxonomic Terminology of the Higher Plants* (Ames, Iowa, U.S.A., 1954). No term is used in a sense inconsistent with that given by Featherly.

Experience has shown, however, that some useful terms are liable to misinterpretation, and others, which can be used in a wider sense, are used in a restricted sense in *Flora Europaea*. This glossary is intended simply to indicate without ambiguity the sense in which these potentially ambiguous terms are employed.

Certain technical terms, which are restricted to descriptions in particular families or genera, are explained under the family or genus concerned.

ABOVE Used to indicate both the upper surface of a normally horizontal organ and the upper part of an organ or of the whole plant.

ACHENE A small, dry, 1-seeded, indehiscent fruit, whether derived from a superior or from an inferior ovary.

ALTERNATE Arising singly at a node; includes regularly spiral, as well as distichous arrangements.

ANNUAL Completing its life-cycle from seed to seed in less than 12 months; includes 'overwintering' annuals, which germinate in autumn and flower the following year.

BELOW Used to indicate the basal part of a plant, stem or inflorescence; cf. *beneath*.

BENEATH Used to indicate the lower surface of a normally horizontal organ; cf. *below*.

BIDENTATE With two teeth.

BISERRATE Serrate, with the teeth themselves serrate.

CADUCOUS Falling unusually early.

CILIATE With hairs on the margin.

DECIDUOUS Of leaves: falling in autumn; of other organs: falling before the majority of adjacent or associated organs.

ERECTO-PATENT Diverging at an angle of 15–45° from the axis on which the structure is borne.

FLOCCOSE Clothed with woolly hairs, which are disposed in tufts or tend to rub off and adhere in small masses.

GLABRESCENT Becoming glabrous with increasing age or maturity. For structures very slightly but persistently hairy the term *subglabrous* is used.

HIRSUTE Covered with long, moderately stiff and not interwoven hairs.

HISPID Covered with stiff hairs or bristles.

LANATE Covered with soft, flexuous, intertwined hairs.

PELTATE Denotes an organ of which the stalk is attached to a more or less flat surface, and not to the margin; the attachment is not, however, necessarily central.

PUBERULENT With very short hairs.

PUBESCENT With soft, short hairs.

PYRENE A small stone, consisting of one or few seeds with a hard covering, enclosed in fleshy tissue, e.g. *Arctostaphylos*, *Corema*.

SEMI-PATENT Between patent and appressed.

SERICEOUS With silky, appressed hairs.

SETOSE Covered with stout, rigid bristles.

SIMPLE HAIR Indicates an unbranched hair; it may or may not bear a gland.

STOCK The persistent, usually somewhat woody base of an otherwise herbaceous perennial.

STOLON A short-lived, horizontal stem, either above or below the surface of the ground, rooting at one or more nodes.

STRIGOSE With stiff, appressed, straight hairs.

TERETE More or less cylindrical, without grooves or ridges.

TOMENTOSE With hairs compacted into a felty mass.

TUBERCULATE Covered with smooth, knob-like elevations.

VELUTINOUS With a dense indumentum of fine, soft, straight hairs.

VERRUCOSE Covered with rough, wart-like elevations.

VILLOUS Covered with long, soft, straight hairs.

APPENDIX V

VOCABULARIUM ANGLO-LATINUM

IN USUM LECTORUM LINGUAE ANGLICAE MINUS PERITORUM CONFECTUM

N.B. Plurimi termini ad descriptionem botanicam in lingua anglica usurpati aequipollentibus latinis persimiles sunt, e.g. *ovate* (ovatus), *inflorescence* (inflorescentia). Talia verba omnia sunt omissa.

above insuper, supra, super
all omnes
almost fere, paene
always semper
arable fields arva
around circum
arranged dispositus
attached affixus
awn arista
back dorsum
backward(s) retro
bank ripa
barbed pilis hamatis obsitus
bare nudus
bark cortex
basin-shaped pelviformis
beak rostrum
bearded barbatus
become fieri
below infra, sub
beneath infra, subtus
bent inflexus
berry bacca
between inter
bind colligare, firmare
bitter amarus
black niger, ater
bloom pruina
blotch macula
blue caeruleus
boat navicula
border margo
borne prolatus
branch ramus
breadth latitudo
bright laete
bristle seta
broad latus
bronze aeneus
brown fuscus, brunneus
bud gemma
bundle fasciculus
bushy spisse et iteratim ramosus
casual fortuitus
catkin amentum
chaffy paleaceus
chamber loculus
chequered cancellatus
chestnut castaneus
chief principalis
claw unguis
cliff rupes
climbing scandens
close propinquus, affinis
closed clausus
clothed vestitus
cluster glomerulus
coarse crassus, grossus
coast litus, ora
coat tunica
common vulgaris
completely omnino, ex toto
compound compositus
cone strobilus
corner angulus
cornfield seges
covered obtectus
cream ochroleucus, albido-flavescens
crest crista
crevice fissura
crimson kermesinus, sanguineus; ut flos *Paeoniae officinalis* coloratus
crowded confertus
cultivated cultus, sativus
curled crispus
cushion pulvinus
damp humidus
dark obscure
dead emortuus
decay dissolutio
deep profundus; intense
developed evolutus
die mori
docks navalia
downwards deorsum
downy lanuginosus
dry siccus
dull opace; impolitus
dwarf nanus
early prius, mox, praecoce
eastern orientalis
eastwards orientem versus
edge margo
edible edulis
either...or aut...aut
end pars terminalis
enlarge crescere, augere
entire integer
entirely omnino
equal aequalis, aequans
escape evadere; planta ex horto elapsa
established subspontaneus
evening vesper
evergreen sempervirens
exceeding superans
face facies
fan-shaped flabellatus
feebly debiliter, perleviter
female femineus, pistillatus
few pauci
finely subtiliter
first primus
flap valva, ligula
flat planus
flattened compressus, applanatus
flax *Linum usitatissimum*
flesh-coloured carneus, pallide et opace roseus
fleshy carnosus
floating natans
flooded inundatus
flower flos
fodder bestiarum pabulum
fold plica
following sequens
food cibus
forest silva magna
forwards porro
free liber
fringe fimbriae
fruit fructus
furnished munitus
furrow sulcus
garden hortus
glossy nitidus
golden aureus
grassy graminosus
gravelly glareosus

graze pascere
green viridis
grey cinereus
grooved canaliculatus, sulcatus
ground solum
group grex
grow crescere, habitare
hair pilum
hairy pilis munitus
half dimidium
hard durus
head caput, capitulum
heath ericetum, callunetum
hedge saepes
helmet galea
hill collis
hoary incanus
hollow fistulosus, cavus; cavum, excavatio
hood cucullus
hooked uncinatus
inner interior, internus
inside intus, intra; pagina vel pars interior
introduced inquilinus, allatus
jagged argutus
jointed articulatus
juice succus
keel carina
key clavis
lake lacus
late sero
later postea
leaf folium
leafless foliis carens
leaflet foliolum
length longitudo
less minus
level altitudo, gradus
lid operculum
light clare
limestone calx
lip labium
locally hic inde
low humilis, pusillus
lower inferior
lowland campestris, planitiem incolens
main principalis
male masculus, stamineus
many multi
marbled marmoratus
marsh palus
mat stratum e ramulis procumbentibus intertextis compositum
mauve malvinus
meadow pratum
mealy farinosus
medicinal officinalis
middle pars centralis; medius
midrib costa, folii nervus principalis
milky lacteus
mistake error
more plus, magis
most plerique, pars major
mountain mons
mouth os
much multo, multum
naked nudus
narrow angustus
native indigenus
naturalized inquilinus
near prope
nearly paene, fere
neither...nor nec...nec
net reticulum
never numquam
nodding nutans, cernuus
none nulli
northern borealis
northwards septentrionem versus
notch incisio
nut nux
often saepe
oil oleum
old vetus, antiquus
open apertus
orange aurantiacus
ornament decus
other alius, alter
otherwise aliter
outer exterior, externus
outside extra; pagina vel pars exterior
overlapping imbricatus
pale pallidus
papery chartaceus
pasture pascuum
patch macula
peat-bog turbarium
pink roseus
pitted foveolatus
planted cultus
point acumen
pond stagnum
pool stagnum
poor egens
prickle aculeus
pricklet aculeolus
purple purpureus
quarter pars quarta
rank ordo
rarely raro
ray radius
red ruber
related affinis
remains reliquiae
rest ceteri
rib costa
rice-field oryzetum
rich abundans
ridge carina
rind fructus cortex
ring anulus
ripe maturus
river flumen
road via
rock saxum, rupes
root radix
rosette rosula
rough asper
rounded rotundatus
rust-coloured ferrugineus
salt-marsh palus salsa
sand arena
scale squama
scanty exiguus
scar cicatrix
scarcely vix
scarlet laete et clare ruber, paullulo aurantiaco affectus; ut flos *Salviae splendentis* coloratus
scattered sparsus
scented fragrans
scree clivus alpestris, saxis deorsum conjectis coopertus
scrub dumetum, fruticetum
sea mare
seed semen
seldom raro
several nonnulli, complures
shady umbrosus
shallow haud profundus
shape forma
sharply acute
sheath vagina
shelter tegmen contra ventum
shingle glarea maritima vel fluviatilis
shiny nitidus
shoot caudiculus, surculus
shore litus, ora
short brevis
shoulder angulus obtusus
shrub frutex
side latus, pagina
silky sericeus
silvery argenteus
slender tenuis, gracilis
slightly leviter, paullo
slipper calceolus
slit rima, foramen longum sed angustum
slope clivus, declivitas
small parvus
smell odor
smooth laevis
snow-patch locus in montibus ubi nix sero perdurat
soft mollis
soil solum
sometimes interdum
southern australis
southwards meridiem versus

spikelet spicula
spot punctum, macula
spreading patens, divaricatus
spring ver
spur calcar
square quadratus
stalk stipes
standard vexillum
stem caulis
stiff rigidus
stock caudex
stony lapidosus
stout crassus, robustus
straight rectus
streak linea
stream rivulus
stripe vitta
strong robustus, validus
suddenly abrupte
summer aestas
sunk(en) immersus
surface superficies, pagina
sweet dulcis
swollen tumidus, inflatus
tall altus
taste sapor
tawny fulvus
teeth dentes
thick crassus, densus, spissus
thicket dumetum
thin tenuis
third pars tertia
timber materia; lignum ad usum hominum aptum
tinged suffusus
tip apex
tipped ad apicem munitus vel tinctus
tooth dens
top vertex
tough lentus
tree arbor
true verus
tufted in fasciculos dispositus, caespitosus
twice bis
twig ramulus, virga
twining volubilis
twisted contortus
unarmed inermis
uncertain incertus, dubius
undivided indivisus
unequal inaequalis
united conjunctus, connatus
upper superior
uppermost supremus
upwards sursum
usually plerumque
vegetable olus
veil velum
vein nervus
velvety velutinus
vessel vas
violet violaceus
wart verruca
waste incultus
weak debilis, flaccidus
well bene
western occidentalis
westwards occidentem versus
wet madidus
white albus, candidus
whorled verticillatus
wide latus
widespread late diffusus
width latitudo
wing ala
winter hiems
wiry filo ferreo similis
withered marcidus
without sine
wood silva; lignum
woody lignosus
woolly lanatus
wrinkled rugosus
yellow flavus, luteus
young juvenis

INDEX

This index is intended to serve two purposes: to enable the reader to find the page on which any plant is mentioned, and to cite and explain names relegated to synonymy which occur in 'Standard Floras', but are not in sufficiently wide currency to justify their citation in the text (see p. xix).

Generic names adoped in *Flora Europaea* are printed in **bold-faced** type; specific and subspecific epithets adopted are printed in ordinary type. (This applies not only to numbered species and genera, but also to those mentioned incidentally in observations, or in the introductory descriptions of families or genera.) All synonyms are printed in *italic* type, and are followed by a page reference (also in *italics*); for those not cited in the text the page number is followed by a further number or numbers in parentheses to indicate the species (and, where necessary, subspecies and genus) on that page to which the synonym is referable. Among these numbers arabic numerals in ordinary type denote the genus, arabic numerals in **bold-faced** type the species, and a small letter (also in **bold-faced** type) following the species number the subspecies. Thus,

Echinops
armatus Steven, *214* (**9**)

indicates that the name is regarded as a synonym (partial or complete) of the species on p. 214 which is numbered 9, namely **E. bannaticus**. Similarly,

Hedypnois
pygmaea Willk., *307* (154, **1**)

indicates that this name is regarded as a synonym of species 1 (**cretica**) in genus 154 (**Hedypnois**); because more than one genus is treated on the page, the citation of genus as well as species is necessary to avoid ambiguity.

Synonyms of taxa mentioned in notes following a numbered species are indexed as being synonyms of that species. In some cases where this procedure would be ambiguous or misleading, the synonym in question has been inserted in the text.

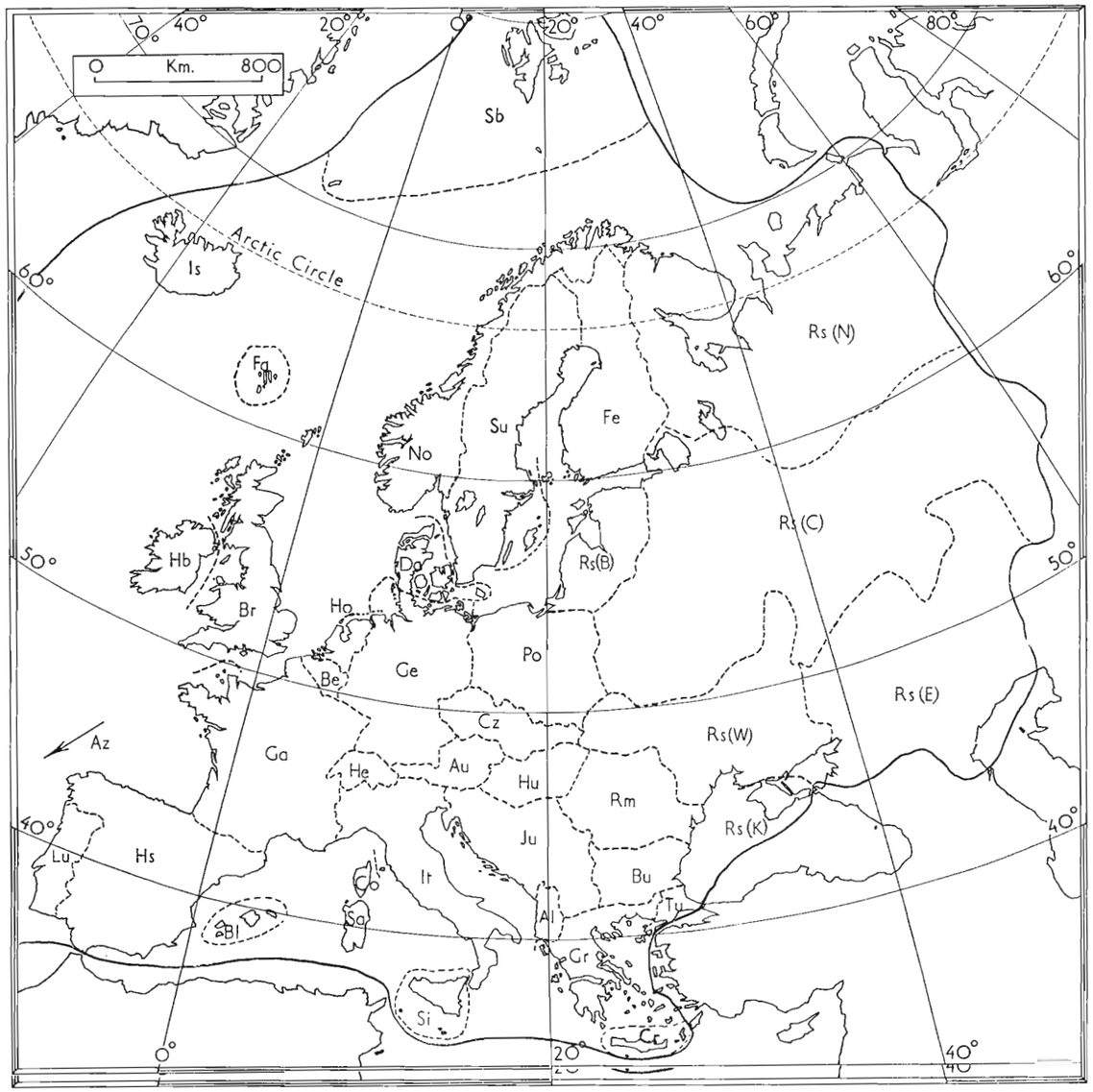
Some names of hybrids are similarly indexed with page and number references to their parent species.

All infraspecific taxa are arranged alphabetically, regardless of rank, under the species with which they are combined.

Because the number of accepted species in the genera *Hieracium* and *Taraxacum* is so large, only a selected number have been included in the text under numbered groups (see generic observations). Where the name of an accepted species is included in the index but not in the text, the name and page number are printed in ordinary type followed by arabic numerals in **bold-faced** type in parentheses to indicate in which group the species is included. Thus,

Hieracium
cinderella (A. Ley) A. Ley, 376 (**65**)

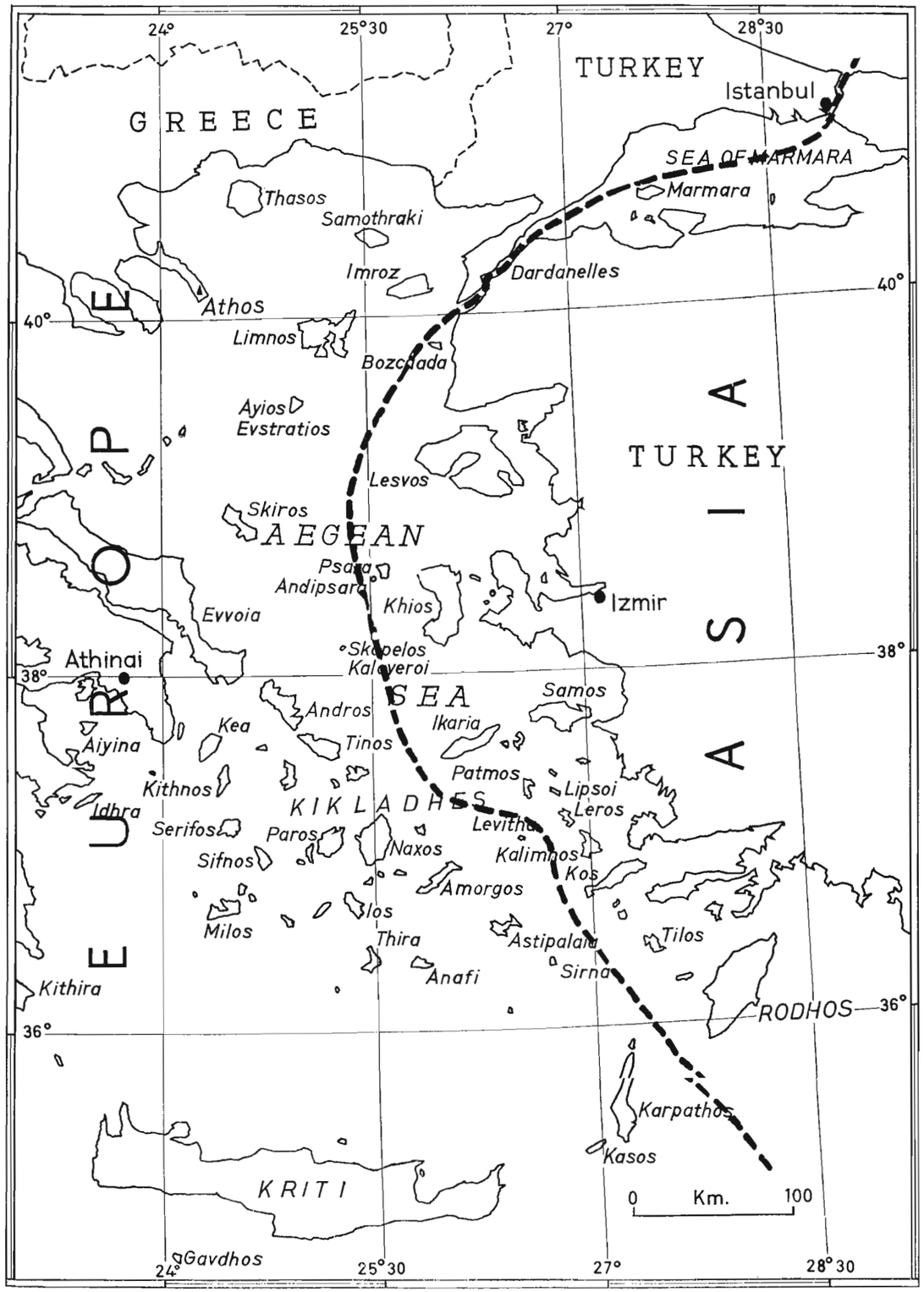
is the correct name for an accepted species included in group 65 (**murorum**) on page 376.



MAP I

To illustrate the boundaries of Europe for the purposes of *Flora Europaea*, and its division into 'territories' which are indicated by two-letter abbreviations after the summary of geographical distribution for each species. These abbreviations are derived from the Latin name of the territory concerned.

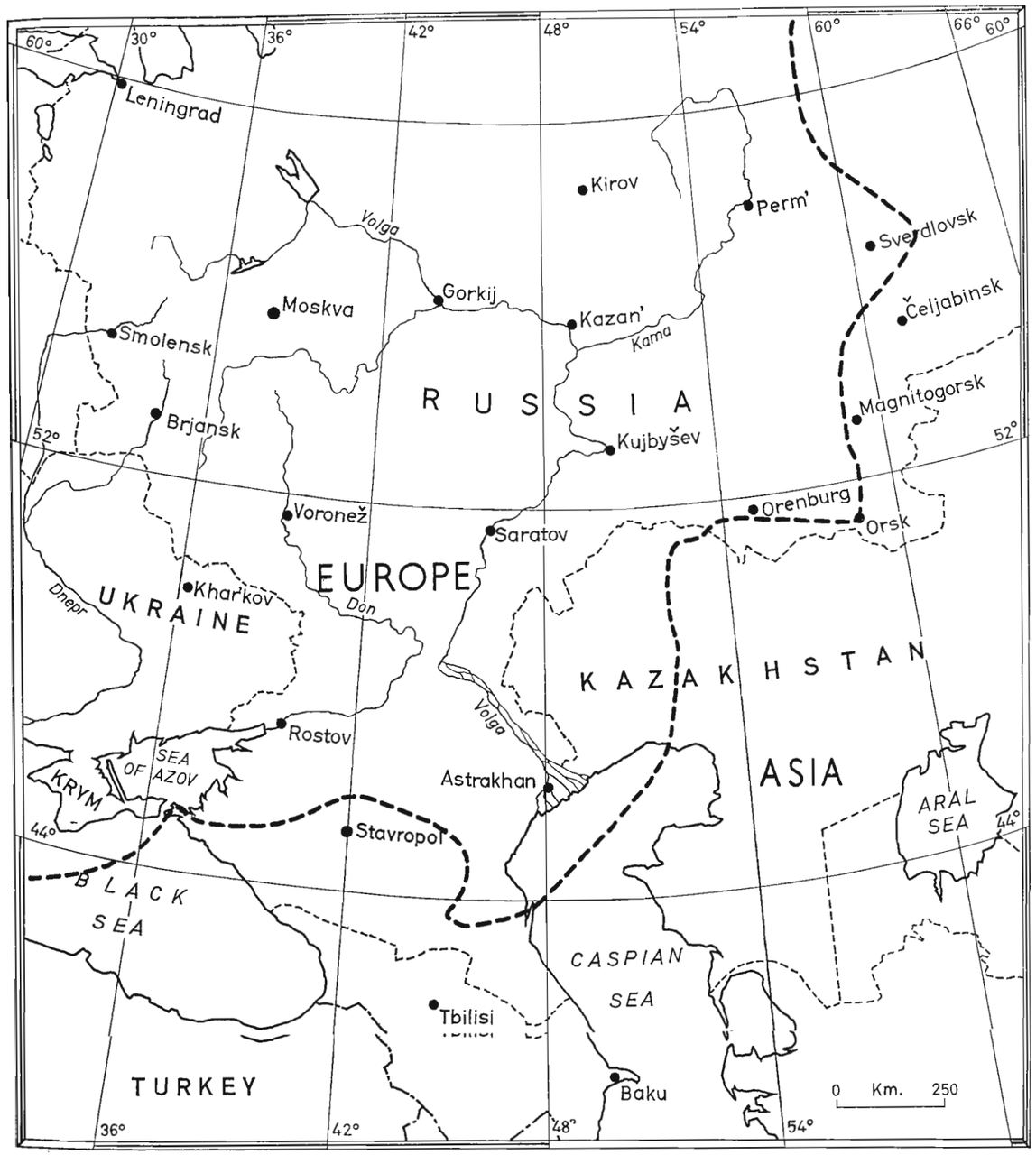
Al Albania
Au Austria, with Liechtenstein
Az Açores
Be Belgium, with Luxembourg
Bl Islas Baleares
Br Britain, including Orkneys, Zetland and Isle of Man; excluding Channel Islands and Northern Ireland
Bu Bulgaria
Co Corse
Cr Kriti (*Creta*), with Karpathos, Kasos and Gavdhos
Cz Czechoslovakia
Da Denmark (*Dania*), including Bornholm
Fa Færöer
Fe Finland (*Fennia*), including Ahvenanmaa (Aaland Islands)
Ga France (*Gallia*), with the Channel Islands (Îles Normandes) and Monaco; excluding Corse
Ge Germany (both eastern and western republics)
Gr Greece, excluding those islands included under Kriti (*supra*) and those which are outside Europe as defined for *Flora Europaea*
Hb Ireland (*Hibernia*); both the republic and Northern Ireland
He Switzerland (*Helvetia*)
Ho Netherlands (*Hollandia*)
Hs Spain (*Hispania*), with Gibraltar and Andorra; excluding Islas Baleares
Hu Hungary
Is Iceland (*Islandia*)
It Italy, including the Arcipelago Toscano; excluding Sardegna and Sicilia as defined *infra*
Ju Jugoslavia
Lu Portugal (*Lusitania*)
No Norway
Po Poland
Rm Romania
Rs U.S.S.R. (*Rossia*). This has been subdivided as follows, using the floristic divisions of Komarov's *Flora U.R.S.S.*; in a few places, however, our boundaries deviate slightly from those of Komarov.
Rs (N) *Northern division:* Arctic Europe, Karelo-Lapland, Dvina-Pečora
Rs (B) *Baltic division:* Estonia, Latvia, Lithuania, Kaliningradskaja Oblast'
Rs (C) *Central division:* Ladoga-Ilmen, Upper Volga, Volga-Kama, Upper Dnepr, Volga-Don, Ural
Rs (W) *South-western division:* Moldavia, Middle Dnepr, Black Sea, Upper Dnestr
Rs (K) *Krym* (*Crimea*)
Rs (E) *South-eastern division:* Lower Don, Lower Volga, Transvolga
White Russia falls entirely within Rs (C). Ukraine is largely in Rs (W), but partly in Rs (K), Rs (C) and Rs (E). The European part of Kazakhstan is in Rs (E)
Sa Sardegna
Sb Svalbard, comprising Spitsbergen, Björnöya (Bear Island) and Jan Mayen
Si Sicilia, with Pantelleria, Isole Pelagie, Isole Lipari and Ustica; also the Malta archipelago
Su Sweden (*Suecia*), including Öland and Gotland
Tu Turkey (European part), including Imroz



MAP II

To illustrate the boundary between Europe and Asia in the Aegean region.

The boundary is based largely on the proposals of K. H. Rechinger, 'Grundzüge der Pflanzenverbreitung in der Aegäis', *Vegetatio* **2**: 55 (1949). His northern, western and Kikladhes divisions are regarded as entirely in Europe and his eastern division as entirely in Asia; it was, however, necessary to divide his southern and north-eastern divisions.



MAP III

To illustrate the boundary between Europe and Asia in the southern part of the U.S.S.R.

The southern boundary of Europe between the Caspian and Black Seas is defined for *Flora Europaea* as running up the Terek River westwards to 45° E.; thence along the eastern and northern boundaries of the Stavropol'skij Kraj (as marked in *The Times Atlas*) to meet the Kuban River a short distance east of Kropotkin; thence down the Kuban River to its more southerly mouth.

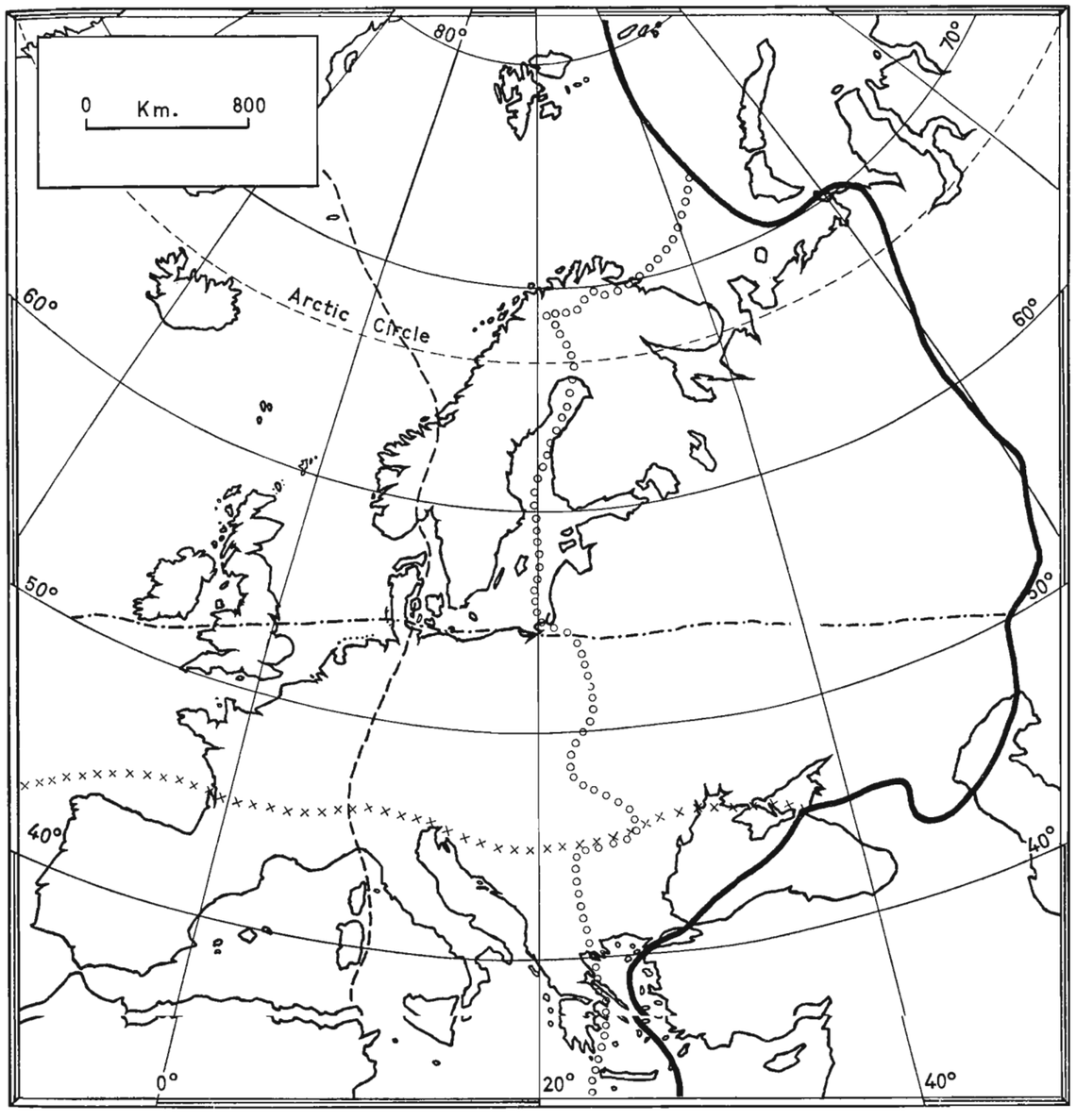
The eastern boundary of Europe is defined as running in the Arctic Ocean between Novaja Zemlja and Vajgač; up the Kara River to 68° N.; thence along the crest of the Ural Mountains (following the administrative boundaries) to 58° 30′ N.; thence by an arbitrary straight line to a point 50 km E. of Sverdlovsk, and by another arbitrary straight line to the head-waters of the Ural River (S. of Zlatoust); thence along the Ural River to the Caspian Sea.

The following administrative districts of the Russian S.F.S.R. near the eastern or southern boundary of Europe are regarded as entirely in Europe:

Arkhangel'skaja Obl.
Komi A.S.S.R.
Permskaja Obl.
Kujbyševskaja Obl.
Saratovskaja Obl.
Volgogradskaja Obl.
Astrakhanskaja Obl.
Kalmyckaja A.S.S.R.
Rostovskaja Obl.

The following are regarded as partly in Europe, partly in Asia:

Russian S.F.S.R.
Sverdlovskaja Obl.
Čeljabinskaja Obl.
Baškirskaja A.S.S.R. (only the extreme N.E. corner being in Asia)
Orenburgskaja Obl.
Dagestanskaja A.S.S.R.
Čečeno-Inguškaja A.S.S.R.
Krasnodarskij Kraj
Kazakhstan
Zapadno-Kazakhstanskaja Obl.
Gur'jevskaja Obl.



MAP IV

To illustrate the meaning to be attached to certain phrases used in summaries of geographical distribution.

W. Europe: Açores, Portugal, Spain, Islas Baleares, France, Ireland, Britain, Færöer, Iceland, S.W. Norway, Netherlands, Belgium, N.W. Germany, W. Denmark (Jylland), Corse, Sardegna, and small parts of N.W. Italy and W. Switzerland

E. Europe: N.E. Greece and the Aegean islands, Bulgaria, S. & E. Romania, Finland, U.S.S.R.

N. Europe: Svalbard, Iceland, Færöer, Ireland, Britain (excluding S. England), Denmark, Fennoscandia, U.S.S.R. north of a line running through Minsk–Tula–Penza–Orsk

S. Europe: Europe south of a line running through Bordeaux–Chambéry–Aosta–Locarno–Riva–Udine–Zagreb–Beograd–Ploesti–Odessa–Rostov–Astrakhan'.

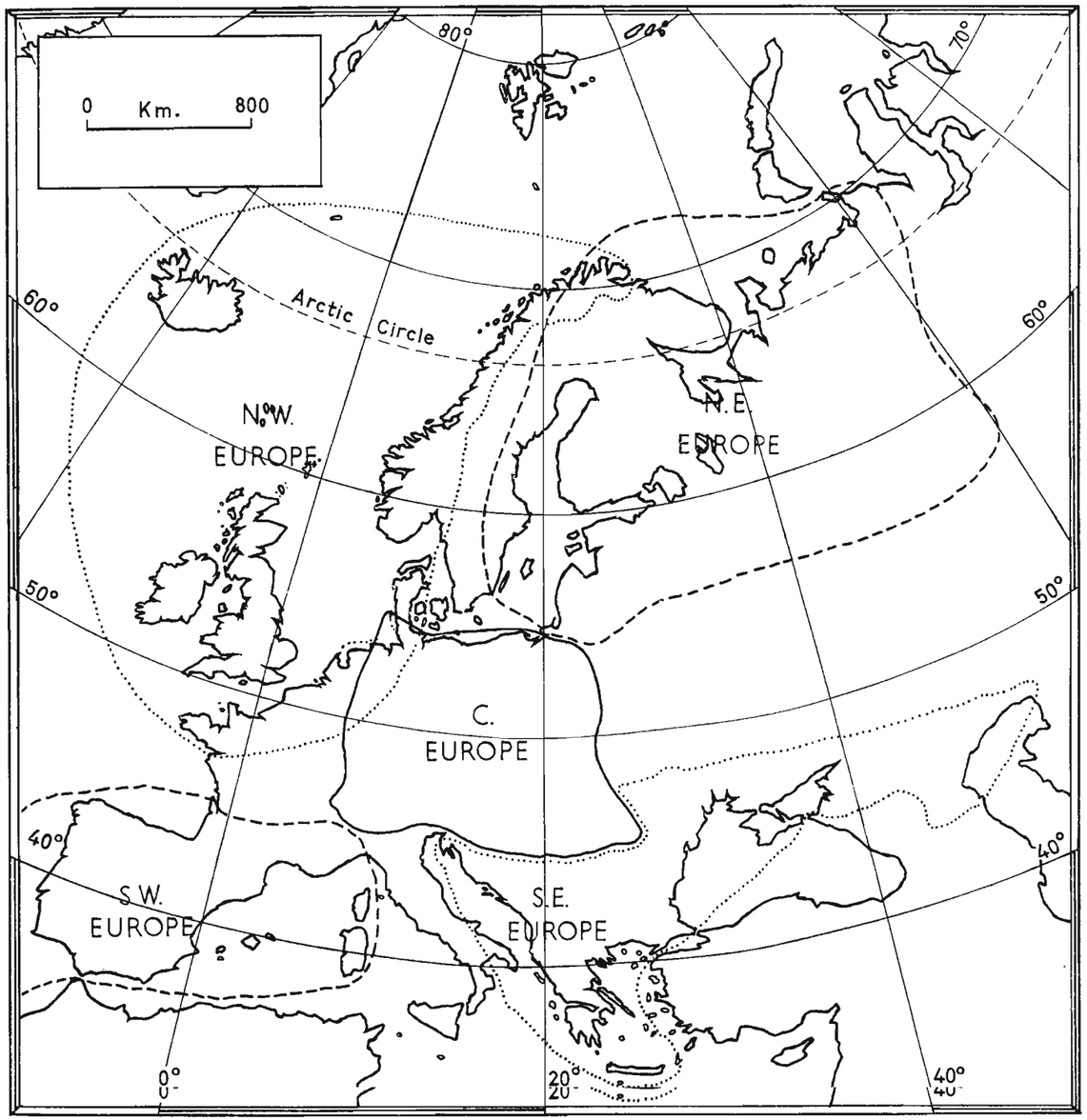
– – – – – – – – eastern boundary of *W. Europe*

– · – · – · – · – southern boundary of *N. Europe*

○ ○ ○ ○ ○ ○ western boundary of *E. Europe*

× × × × × northern boundary of *S. Europe*

For the definition and illustration of the meaning of S.W., N.W., S.E., N.E. and C. Europe, and of certain other geographical phrases, see map v.



MAP V

To illustrate the meaning to be attached to certain phrases used in summaries of geographical distribution.

S.W. Europe: Açores, Portugal, Spain, Islas Baleares, Corse, Sardegna, S. France, N.W. Italy

N.W. Europe: Iceland, Færöer, Britain, N. France, Belgium, Netherlands, N.W. Germany, W. Denmark (Jylland), Norway

S.E. Europe: The Balkan peninsula, Aegean islands, S.E. Italy, S. & E. Romania, U.S.S.R. south of about 48° N.

N.E. Europe: U.S.S.R. north of a line from Vilnius to Sverdlovsk, Finland, E. Sweden, a small part of N.E. Norway.

C. Europe: Alsace and Lorraine, Germany, Switzerland, Austria, the Italian Alps from Monte Bianco eastwards, Hungary, Czechoslovakia, Poland, the Ukrainian Carpathians, N., W. & C. Romania, Jugoslavia north of the Danube–Sava–Kupa line.

Maps IV and V are intended merely to give precision to certain geographical phrases which are commonly used, but used in various senses in different parts of Europe. They do not purport to divide Europe into phytogeographical regions, as is apparent from the fact that along parts of their boundaries these regions overlap, and along other parts they are not contiguous.

Certain other phrases used in the summaries of geographical distribution, but not illustrated in the maps, may be briefly defined as follows:

Alps: Separated from the Appennini at 8° 15′ E. (above Savona); bounded on the east by the line Semmering–Graz–Maribor–Ljubljana–Trieste. Divided into three major divisions: *eastern*, *ceniral*, and *south-western*, by the lines Arlberg–St Moritz–Chiavenna–Como and Genève–Chamonix–Aosta–Ivrea.

Arctic: This term is used to designate all territories north of the Arctic Circle, and is not restricted to those which have only 'arctic' vegetation.

Carpathians: Divided into *western*, *eastern* and *southern* divisions at the pass of Łupków (22° E.) and the Oituz Pass (46° 05′ N.). The western division is in Czechoslovakia and Poland, the southern entirely in Romania, the eastern extends from Czechoslovakia and Poland through Ukraine to Romania.

Pyrenees: Includes the subsidiary chains within 50 km of the main watershed, and extends westwards to Bilbao and Vitoria. Divided into *eastern*, *central* and *western* divisions at the Pont du Roi (0° 45′ E.) and the Col du Somport (0° 30′ W.).

Balkan peninsula: Jugoslavia south of the Danube–Sava–Kupa line, Bulgaria, Albania, Greece (including islands close to the mainland) and Turkey-in-Europe.

Fennoscandia: Norway, Sweden, Finland and part of N.W. Russia (Murmanskaja Oblast' and Karelskaja A.S.S.R.).

Mediterranean region: All European territories within 100 km of the Mediterranean Sea (including the Adriatic, but not the Black Sea), and including also all Italy except the Alpine region and all Spain except the west and north-west. It is divided into *eastern* and *western* divisions by a line following the main watershed of Italy and running east of Sicilia. *Central Mediterranean* indicates the region between 8° E. and 20° E.

Aegean region: All islands in the Aegean Sea which come within the scope of the *Flora*, and those parts of Greece and Turkey-in-Europe which drain into the Aegean Sea or the Dardanelles.

Macedonia: Comprises the Jugoslav republic of Makedonija, the Greek province of Makedhonia, and the Bulgarian province of Blagoevgrad.