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FLORA DES IRANISCHEN HOCHLANDES UND DER UMRAHMENDEN GEBIRGE

PERSIEN, AFGHANISTAN, TEILE VON WEST-PAKISTAN, NORD-IRAQ, AZERBAIDJAN, TURKMENISTAN

von

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Dedicated to the memory of PER WENDELBO (1927–1981).

the Norwegian author of numerous accounts
for Flora Iranica. Over many years he made
important collections throughout the region
and, had he lived, he would have been, with his
wide field knowledge of the *Chenopodiaceae*,
a major contributor to this volume.

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Chenopodiaceae VENT., Tabl. Règne Vég. 2: 253 (1799); nom. alt.: *Salsolaceae* MOQ. in DC., Prodr. 13; 2: 41 (1849).
Syn.: *Salicorniaceae* J. ÅGARDH, Theoria Syst. Pl. (1858).

Lit.: A. MOQUIN-TANDON, Chenopodearum monographica enumeratio 1 - 182 (1840). A. MOQUIN-TANDON, Salsolaceae in A.P. DE CANDOLLE, Prodromus systematis naturalis regni vegetabilis 13,2: 41-219 (1849). A. BUNGE, Anabasearum revisio, Mémoires de l'Académie Impériale des Sciences de St.-Pétersbourg 7 Série, 4, 11: 1-104 (1862). F.B. UNGERN-STERNBERG, Versuch einer Systematik der Salicornieen 1-114 (1866). E. BOISSIER, Salsolaceae in Flora Orientalis 4: 897-986 (1879). G. BENTHAM & J.D. HOOKER, Chenopodiaceae in Genera Plantarum 3: 43-78 (1883). E. ULBRICH, Chenopodiaceae in ENGLER & H. HARMS, Die natürlichen Pflanzenfamilien ed. 2, 16c: 379-584 (1934). M.M. ILJIN, Chenopodiaceae in V.L. KOMAROV, Flora URSS. 6: 2-354 (1936). A. GROSSHEIM, Chenopodiaceae in Flora Kavkaza ed. 2, 3: 115-170 (1945). Y. ISAEV & al., Chenopodiaceae in I.I. KARJAGIN, Flora Azerbaijana 3: 181-260 (1952). V. BOTSCHANTZEV, Chenopodiaceae in E.P. KOROVIN, Flora Uzbekistanica 2: 207-333 (1953). A. TAKHTADJAN & Y. MULKIDJAN, Chenopodiaceae in A. TAKHTADJAN, Flora Armenii 2: 222-393 (1956). M. ZOHARY, Chenopodiaceae in Flora Palaestina I: 136-179, plates 196-263 (1966). V. GRUBOV, Chenopodiaceae in Plantae Asiae Centralis 2: 3-119 (1966). P. AELLEN, Chenopodiaceae in P.H. DAVIS, Flora of Turkey and the East Aegean Islands 2: 294-339 (1967). G. SIDORENKO et al., Chenopodiaceae in P.N. OVCHINNIKOV, Flora Tadjikskoi SSR 3: 307-459 (1968). V. PRATOV, Chenopodiaceae in A.I. VVEDENSKY, Conspectus Florae Asiae Mediae 3: 29-137 (1972). J. WILLIAMS & B. FORD-LLOYD, The systematics of the Chenopodiaceae, Taxon 23: 353-354 (1974). J.W. NOWICKE, Pollen Morphology in the Order Centrospermae, Grana 15: 51-77 (1975). D. PODLECH, Zur Kenntnis der Chenopodiaceae-Flora Afghanistans, Mitteilungen der Botanischen Staatssammlung München 12: 51-90 (1975). A. J. SCOTT, Reinstatement and revison of Salicorniaceae J. Ågardh, Botanical Journal of the Linnean Society 75: 357-374 (1977). W.H. BLACKWELL, The subfamilies of the Chenopodiaceae, Taxon 26: 395-397 (1977). A.J. SCOTT, A revision of the Camphorosmioideae, Feddes Repertorium 89: 101-119 (1978). S. JAFRI & F. RATEEB, Chenopodiaceae in S. JAFRI & EL GADI, Flora of Libya 58: 7-109 (1978). KUNG HSIEN-WU & CHU GE-LIN & al., Chenopodiaceae in KUNG & TSIEN, Flora Reipublicae Popularis Sinicae 25, 2: 1-194 (1979). K. URMI-KÖNIG, Blütentragende Spross-Systeme einiger Chenopodiaceae, Dissertationes Botanicae 63: 1-150, Abb. 1-110 (1981). J. LÉONARD, Chenopodiaceae in Contribution a l'étude de la flore et de la végétation des déserts d'Iran 7: 9-60 (Jardin Botanique national de Belgique (1987). V.V. NIKITIN & A. M. GELDIKHANOV, Chenopodiaceae in Opredelitel Rastenii Turkmenistana 164-198 (1988). H. FREITAG, Contributions to the Chenopod flora of Egypt, Flora 183: 149-173 (1989). H. FREITAG, The distribution of some prominent Chenopodiaceae in SW Asia and their phytogeographical significance, Flora et Vegetatio Mundi 9: 281-292 (1991). H. FREITAG, The Chenopodiaceae of Pakistan - an assessment of pressent knowledge in S.I. ALI & A.GHAFFAR, Plant Life of South Asia 73–93 (1991). W. KÜHN, Chenopodiaceae in K. KUBITZKI, The families and genera of vascular plants 2: 253-281 (1993).

Annual to perennial herbs, shrubs or small trees, succulent or not, glabrous, with a mealy bloom of vesicular hairs or an indumentum of simple to branched hairs. Stems with distinct segments or joints, or stems continuous. Leaves well-developed, with a distinct flat lamina or terete, or represented by small scales or by prickles, exstipulate, opposite or alternate, petiolate or sessile, with or without a terminal bristle or mucro. Inflorescence cymose, paniculate or spicate. Flowers hermaphrodite or unisexual, and then plants monoecious or dioecious, sessile, borne in leaf axils or leaf-like bracts, solitary or in clusters (glomerules), free or immersed in the inflorescence axis. Flower parts very variable in number, even in the same taxon, with a marked tendency to reduction. Perianth actinomorphic, rarely zygomorphic, of membranous or herbaceous, rarely petaloid, free or variously fused lobes, 1-5 in number, or perianth absent; in fruit, perianth lobes developing wings, spines or protuberances, or becoming succulent, or lobes unchanged in fruit. Stamens 1-5, opposite the perianth lobes, included within the perianth or exserted from it; filaments free or basally united; thecae with or without a terminal appendage, often inflated and coloured. Ovary 1-locular, superior or, rarely, semi-inferior, with 1 basal or subbasal, campylotropous or amphitropous, ovule; stigmas 2-6, sessile or on stylar arms. Fruit dehiscent or indehiscent, a utricle or achene, dry or fleshy, free or coalesced to the perianth, rarely a hard nut with circumscissile dehiscence. Seeds positioned in a horizontal or vertical plane; embryo variously curved, hippocrepiform, (horse-shoe shaped), annular or spiral; endosperm present or absent.

Synopsis of the genera of *Chenopodiaceae*

Subfamily ***Cyclolobeae***

Tribe *Polycnemeae*

1. *Polycnemum*[1]

Tribe *Hablitzieae*

2. *Acroglochin*[1]
3. *Hablitzia*[1]

Tribe *Beteae*

4. *Beta*[1]

Tribe *Chenopodieae*

5. *Chenopodium*[2]

Tribe *Atripliceae*

6. *Spinacia*[2]
7. *Atriplex*[1]
8. *Krascheninnikovia*[1]
9. *Ceratocarpus*[1]

Tribe *Camphorosmeae*

10. *Camphorosma*[1]
11. *Panderia*[1]
12. *Kirilowia*[1]
13. *Bassia*[1]
14. *Kochia*[1]

Tribe *Corispermeae*

15. *Corispermum*[1]
16. *Agriophyllum*[1]
17. *Anthochlamys*[1]

Tribe *Salicornieae*

18. *Kalidium*[1]
19. *Halopeplis*[1]
20. *Halostachys*[1]
21. *Halocnemum*[1]
22. *Arthrocnemum*[1]
23. *Salicornia*[1]
24. *Microcnemum*[1]

Subfamily ***Spirolobeae***

Tribe *Suaedeae*

25. *Suaeda*[3]
26. *Bienertia*[1]

Tribe *Salsoleae*

27. *Salsola*[4]
28. *Halothamnus*[5]
29. *Seidlitzia*[1]
30. *Noaea*[1]
31. *Girgensohnia*[1]
32. *Horaninovia*[1]
33. *Anabasis*[1]
34. *Haloxylon*[1]
35. *Petrosimonia*[1]
36. *Halocharis*[1]
37. *Halimocnemis*[1]
38. *Piptoptera*[1]
39. *Halanthium*[1]
40. *Gamanthus*[1]
41. *Halarchon*[1]
42. *Cornulaca*[1]
43. *Agathophora*[1]
44. *Halogeton*[1]

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General Remarks

I.C. Hedge, Edinburgh

The *Chenopodiaceae* are very well represented in the Flora Iranica area with more than one third of the global total of genera present. But it is not an area of major autochthonous development for the family, rather an area with a rich representation of different ecological and phytogeographical elements. Levels of species endemism are much lower than in other major SW Asiatic families and only one genus, *Halarchon*, is endemic.

Ecologically and economically, it is a most important family. In such inhospitable places as deserts, semi-deserts or salt marshes (maritime and inland), its species are often dominants in plant communities and are an important source of forage for grazing livestock. Some species provide a useful source of fuel, others are or have been used as a commercial source of potash or alkaloids. The major agricultural crops of the different kinds of beet have been developed from native SW Asiatic species of *Beta*; spinach, likewise, may have as its progenitor a SW Asiatic species of *Spinacia*.

Taxonomically, it is an especially difficult family. There are several main reasons for this. There is a very high level of phenotypic plasticity and of facies variation throughout the plant's life cycle: juvenile plants frequently look very different from adult ones. There is also great variation, even within a particular taxon or plant, in the number and form of flower and fruit parts. Furthermore, herbarium specimens and their complementary field notes rarely provide all the information needed for accurate descriptions. Many species are very succulent and dried specimens (e.g. of *Bienertia*, *Halopeplis* or *Suaeda*) often give a totally false impression of what the living plant looks like. A further major difficulty stems from problems of types and typification. Many widespread species were first described a long time ago and interpretation of their type specimens, if they can be traced, is often uncertain because of their inadequacy.

Numerous specimens in herbaria are so incomplete that they cannot be named. Often, collections are made at the wrong time of the year (too early). Almost all our perennial and/or succulent species start fruiting from October onwards. This is optimum collecting time because fruits are usually essential for identification. Good field-notes are most important in complementing the dried specimen - preferably with photographs and spirit material. Although the importance of a particular character often varies according to the taxon, the following features should be dealt with in the ideal field-note: habit, life-duration, height and width, caudex, posture of branches, smell, colour, degree of succulence of stems and leaves, leaf shape in the succulents, colour of anther appendages if present, fruit (dry or succulent) and habitat.

Characters

There are many good macro- and micro-morphological characters in the family, as well as important anatomical and physiological ones. All are taxonomically of value, but all must be used with caution. Over-emphasising particular characters can result in artificial classifications or misalliancies. The difference, for instance, between a fruiting perianth with prominent wings and one without wings might seem a basic one and of major taxonomic importance. In the past, for example, *Brachylepis* C.A. MEY., without winged fruiting segments, has been separated from *Anabasis* which, usually, has prominent wings, but in all other respects they are so similar that it would be misleading to regard them as different genera. Another example is provided by the difference between a horizontally positioned seed and a vertical one. In BENTHAM & HOOKER's Genera Plantarum, this character was used to define groupings of genera. As a result *Anabasis* with a vertical seed was widely separated from the horizontally seeded *Haloxylon*. In all their other characters the genera are so similar that although they do merit generic separation, they should certainly be regarded as close relatives.

A further instance of a character that should be regarded with caution is that of the classically used embryo form: spiral folding versus annular horse-shoe shaped folding. In ULBRICH's (1934) Pflanzenfamilien account of the family and in ILJIN's (1936) Flora URSS treatment, this difference was used to define the two highest sub-familial taxa: *Spirolobeae* and *Cyclolobeae*. But these two character states seem only to be different versions of the same kind of growth. Within each taxon, the *Cyclolobeae* and the *Spirolobeae*, there is considerable variation in the degree of folding. In the former it varies from a scarcely bent embryo to an annular one. Although the variation is less in the *Spirolobeae* the difference between a "flat" spiral and a "conical" spiral embryo is not insignificant. It is interesting to note that it is only the difference between the annular and spiral shape that has been given taxonomic weighting, not the range of variation within these two types.

Comments on some particular characters

Life duration and habit. Many of our annual species become very woody at the stem base towards the end of the growing season and can readily be mistaken for perennials - e.g. *Atriplex, Suaeda*.

In some of the clearly perennial or shrubby species, young seedlings or 1st year plants can have a markedly different facies when adult. Seedlings of *Haloxylon* species have very distinct linear leaves, while at maturity the plant is virtually leafless. Young plants of *Cornulaca Aucheri*, collected in April-May, look quite different from the hard spiny adult plants ("*C. leucacantha*"); it has only recently been demonstrated that only one species is involved.

Our species vary in habit from delicate annuals to the small or medium-sized trees of *Haloxylon persicum* and *H. ammodendron*, the saxauls.

I n d u m e n t u m . There are many useful characters in the type of indumentum but not its quantity. In *Agriophyllum* and *Krascheninnikovia* there are prominent stellate-dendroid hairs; in *Petrosimonia* there are always some "medifixed" hairs, frequently few in number and very inconspicuous requiring high magnification and careful observation. "Barbellate" hairs with very finely serrulate margins are often diagnostic for such genera as *Kochia, Bassia, Halocharis, Cornulaca, Kirilowia* and some species of *Salsola*: again high magnification is essential. Bladdery vesicles cover the leaves of most *Atriplex* and *Chenopodium* species and are usually diagnostic for these genera. Vesicular papillae occur in several genera.

L e a v e s o p p o s i t e v e r s u s a l t e r n a t e . This might seem to be a valuable character in classification, but is one that should be viewed with caution. This for two reasons. Firstly in many of our species the lower stem leaves are often opposite whereas the upper ones are alternate. Secondly, there are other species where all the leaves are opposite but in some genera they are clearly related to alternate-leaved species. In *Horaninovia* for example a major division in the species-key is "leaves opposite" versus "leaves alternate" yet that difference should be regarded, because of the great similarity between the species on all characters, as a less than fundamental one.

P e r i a n t h . Throughout the family, the number of perianth segments or lobes is basically 5, but there is great variation, even within a species or a specimen, and little reliance can be placed on the number of parts as a taxonomic character. Likewise, the segments may be free to the base or united almost to the apex; this is also a feature of limited value. Of much greater importance is the presence or absence of wings or other protuberances on the fruiting perianth lobes; and whether or not they coalesce or indurate, or become fleshy, or coalesce with subtending bracts or bract-like leaves.

A n t h e r a p p e n d a g e s . In 7 of our genera, the apex of the theca connective ends in a prominently inflated vesicular appendage which is sometimes brightly coloured, usually yellow, pink or purple. The most striking example is in the Afghan *Halarchon vesiculosus* where the large vesicles are bright purple, c. 5.5 × 2.8 mm. It might be thought that, in these 7 genera, the vesicles act as an attraction for possible insect pollinators, but there is no proof that this is so. In at least *Halarchon*, the pollen seems to be shed while the flowers are still in bud and self-pollination apparently a frequent method of fertilization. Most of the genera which have these vesicles are inter-related, but prominent vesicles also occur in some species of the unrelated *Salsola*. Quite small vesicular appendages, or rather short extensions of the staminal connective, also occur throughout the family - as in species of *Noaea* and *Agathophora*.

S t y l a r a r m s . It is difficult to assess the value of stylar length as a character within the family because the development stage of the organ plays a role, but there certainly is a range from very short thick styles (as in *Anabasis* and *Haloxylon*) to elongated styles (as in *Kochia*). In many genera the stylar arms are smooth whereas in, for example, *Bassia, Camphorosma, Kirilowia, Kochia* and *Panderia* the arms are prominently papillose-hairy. The number of styles is usually 2, but not rarely 3, and can in *Suaeda* be up to 6.

U n i t s o f d i s p e r s a l . Throughout the family the unit of dispersal varies greatly. Sometimes it is a simple utricle. In many it consists of a unit combining the persistent perianth, frequently with wings on the lobes, and the enclosed seed. Although the term "fruit" is used in the des-

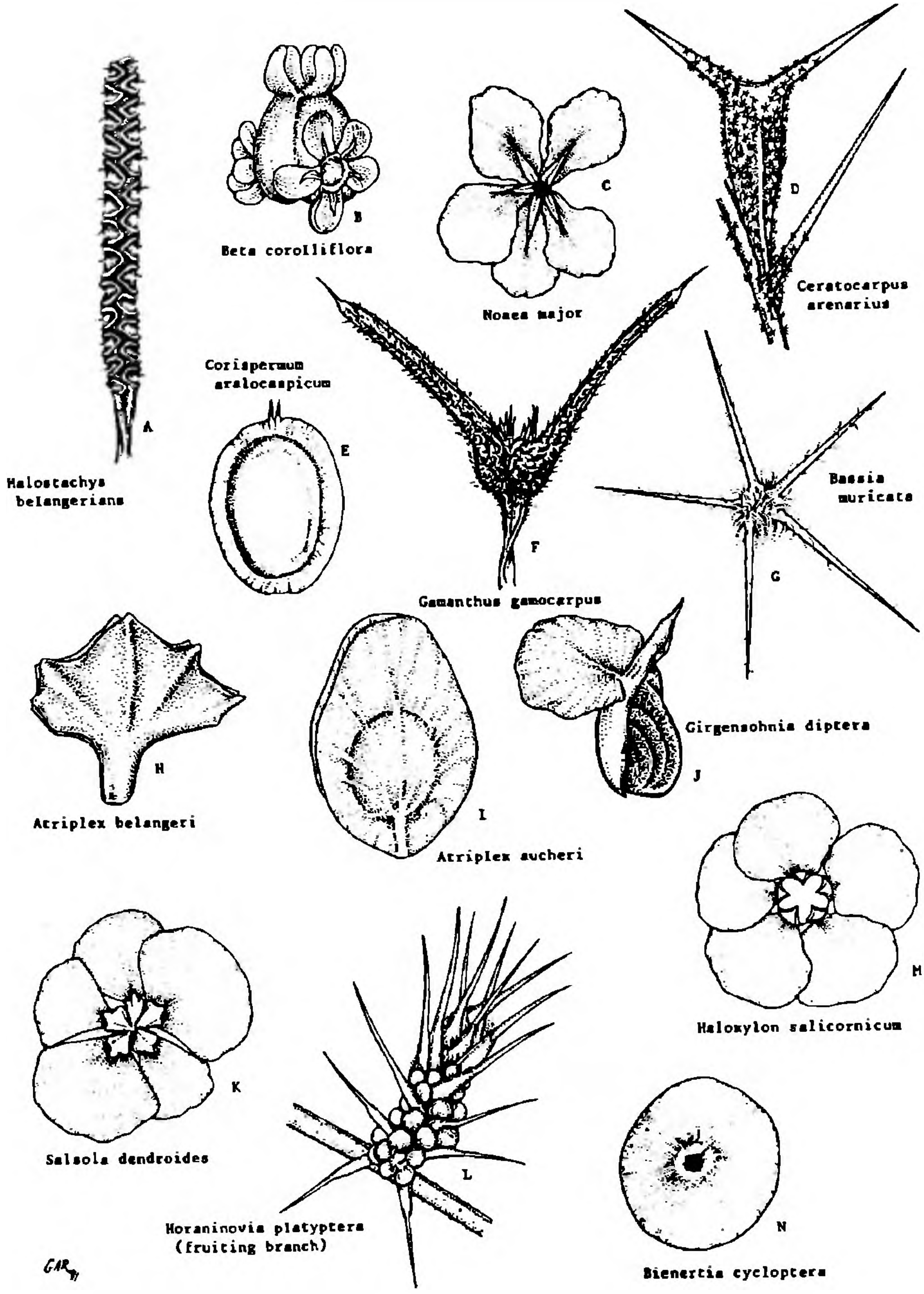


Fig. 1: Examples of some units of dispersal and infrutescences in the family

criptions that follow, a more correct terminology would be "diaspore", "disseminule" or "unit of dispersal". A selection of some units of dispersal and infructescences is given on Fig. 1.

A n a t o m y o f s t e m s a n d l e a v e s ; p h o t o s y n t h e t i c p a t h w a y s . There are important anatomical and physiological characters. Sometimes genera can be separated or named on features of stem anatomy - eg *Anabasis* versus *Arthrocnemum*. Important or useful information sources about stem or leaf anatomy are in: PAULSEN, Studies in the vegetation of the Transcaspian lowlands (Bot. Tidsskr. 32: 1-240. 1912 - and its English reprint translation of the same year); ULBRICH in his detailed Pflanzenfamilien account (1934); and CAROLIN & al. Leaf structure in Chenopodiaceae (Bot. Jahrb. Syst. 95: 226-255. 1975).

Photosynthetic pathways are not a traditional subject for Floras, but plants with C3 or C4 photosynthesis clearly show major physiological differences which might help towards an understanding of otherwise unclear relationships, or of different patterns of adaptive radiation.

R e d u c t i o n , f u s i o n a n d i n d u r a t i o n . Throughout the family or within genera or groups of related genera, there is a strong evolutionary tendency towards reduction in the number of floral parts - from the basic 5 to 4, 3, 2 or 1. In many of the genera where the flowers are immersed in the inflorescence axis, the perianth is a very reduced unimportant structure and frequently there is only one stamen - eg many of the *Salicornieae*.

Leaves too show a strong tendency to reduction in size and development. In the least specialized genera, such as *Chenopodium* and *Atriplex*, the leaves are well-developed with a broad flat lamina. But in, for example, *Halopeplis*, the leaves are fleshy globules. The final stage in reduction is in such genera as *Haloxylon*, many *Anabasis*, *Halostachys* where the leaves are reduced to minute, adpressed, scale-like cusps.

Fusion and induration of floral parts at fruiting time are also characteristic trends in the family. The perianth lobes and subtending bracts variously coalesce and indurate in *Gamanthus*, *Halanthium* and *Halimocnemis*. In *Beta*, up to 3 or 4 individual flowers fuse and harden in fruit and the dispersed disseminule is this fused unit (Fig. 1B).

H a b i t a t s a n d e c o l o g y . Several of our species grow where few other plants can survive. Many are restricted to particular habitats or ecological niches. *Halocnemum strobilaceum* grows, often in vast numbers, in a mono-species association in maritime lagoons or inland salt marshes. *Halopeplis pygmaea* covers huge areas at the edge of salt lakes. Some *Haloxylon* and most *Agriophyllum* species are true psammophytes being mostly restricted to sand dunes or plains. On the other hand, *Krascheninnikovia*, the widespread *Kochia prostrata*, *Camphorosma*, *Beta* and many *Salsolae* are taxa of dry rocky, not or scarcely saline, slopes.

C o l o u r a n d s m e l l . A striking feature of Chenopod vegetation in autumn is the wide range of colours among its constituent species. Salt marshes in October or November are surprisingly brightly coloured with greens, greys, browns, pinks or purple.

The smell of a plant, usually elusive of definition, can sometimes be diagnostic. A few have a pleasant fragrance, others a disagreeable odour reminiscent of rotting fish.

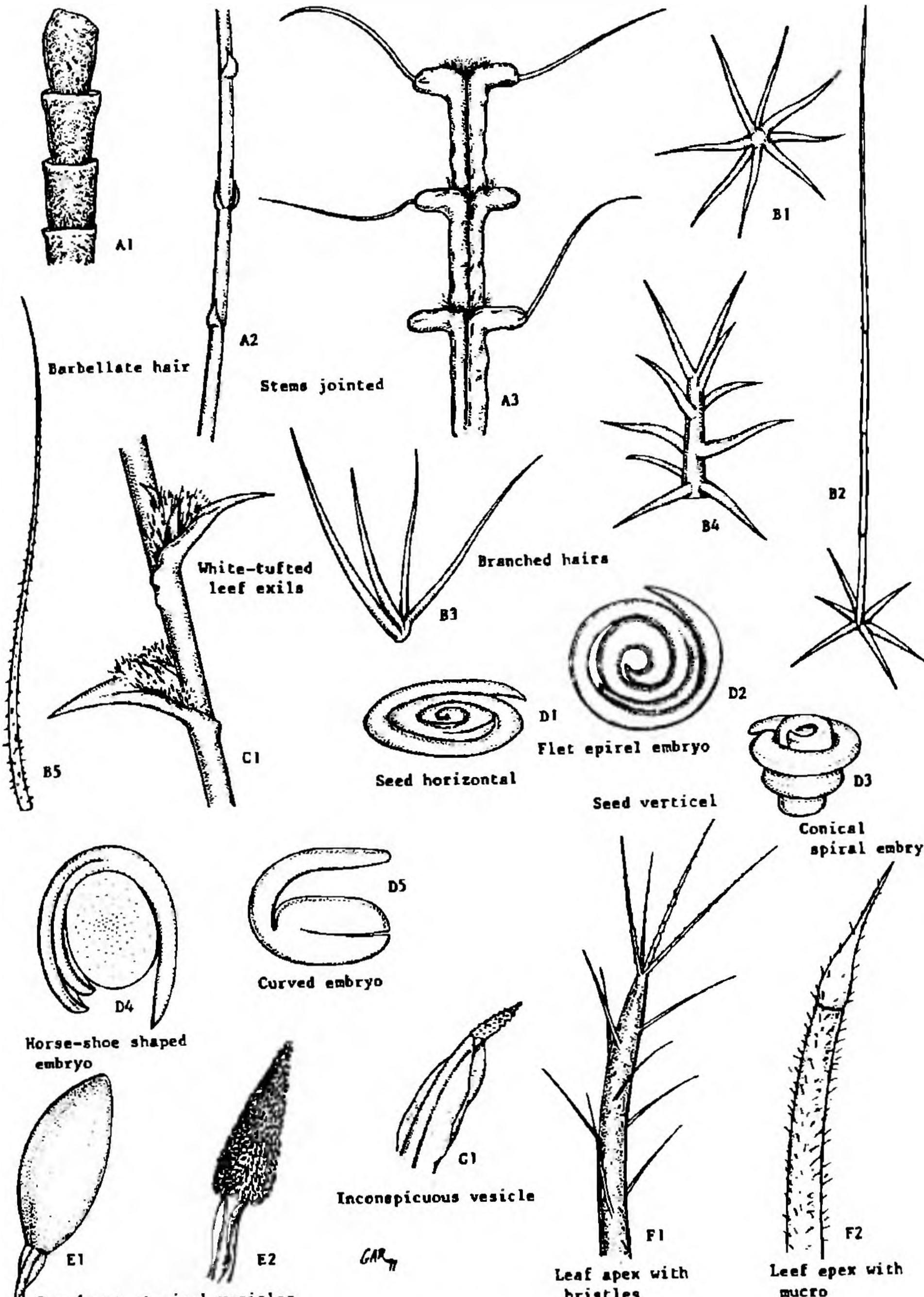


Fig. 2: Structures and terms to complement the keys to the artificial groups of genera and the keys to genera

Keys

It is impossible to construct any kind of generic key which will infallibly identify all specimens, dried or living. Inevitably, for the reasons discussed above, a key to the genera has to be considered as a guide in identification. In the keys that follow, the first one divides our genera into 6 artificial groups that are based on either vegetative features or ones that usually are present. The keys within the 6 groups use, in addition, characters of a more technical nature.

Key to Artificial Groups

(see Fig. 2)

1a. Stems consisting of clearly jointed segments (A 1–3) at least on the stems and branches of the current year's growth; leaves absent, present as small often opposite and adpressed scales, or leaves well-developed and fleshy (in species of *Anabasis* and *Haloxylon*) .... GROUP A

b. Stems without jointed segments; leaves present and either herbaceous or succulent or spiny or thorn-like 2

2a. At least some part of the plant with branched hairs, either stellate-dendroid (B 1–4) or irregularly "medifixed" (the adpressed "medifixed" hairs in *Petrosimonia* are difficult to discern and require high magnification) .... GROUP B

b. Plants with only simple unbranched hairs, sometimes barbellate (B 5), or papillae, or with a meal-like bloom (*Atriplex* and *Chenopodium* species) or glabrous 3

3a. Leaf axils and the base of flowers or glomerules with ± dense tufts of white hairs (C 1); otherwise, plants glabrous or with scabrid papillae; embryo spiral (D 1–3) .... GROUP C

b. Leaf axils, flower and glomerule bases either glabrous or with only a few hairs; otherwise plants either glabrous, with hairs, papillae or a meal-like bloom; embryo spiral, horse-shoe shaped (D 4) annular or curved (D 5) 4

4a. Stamens with prominent, yellow, cream, pink or purple vesicles (E 1–2), or appendages near the apex of the connectives [if stamens are absent the leaf apex in *Halanthium, Halocharis, Halarchon, Gamanthus, Halimocnemis, Piptoptera* has a deciduous or persisting mucro (F 2) or a single or few bristle-like hairs (F 1)] .... GROUP D

b. Stamens without or with short inconspicuous (in *Noaea* and *Agathophora*) apical extensions on the thecae (G 1) 5

5a. Perianth segments developing in fruit at least some distinct terminal/or lateral spreading wings (Fig. 1, C, K, M), or spines (Fig. 1 G), or protuberances .... GROUP E

b. Perianth segments in fruit without wings or spines or protuberances .... GROUP F

Keys to the genera

Group A

1a. Plants with ± prominent tufts of white hairs in the leaf axils and at base of flowers or flower glomerules; perianth segments winged in fruit . . 2
b. Plants without tufts of white hair in leaf axils, glabrous or slightly papillose, perianth segments not winged in fruit 3
2a. Seed vertical; annual to perennial herbs or subshrubs . . . . 33. *Anabasis* L.
b. Seed horizontal; subshrubs to small trees (some species are psammophytes) . . . . 34. *Haloxylon* BUNGE ex FENZL
3a. Leaves very small, ± globular, fleshy, alternate, decurrent; stamens 2 . . . . 18. *Kalidium* MOQ.
b. Leaves absent or present as small opposite adpressed scales; stamens 1(–2) 4
4a. Annuals, herbaceous throughout or eventually woody at base 5
b. Perennial herbs, subshrubs or shrubs 6
5a. Delicate plant 5–10 cm tall; perianth ± absent; testa of seed granular . . . . 24. *Microcnemum* UNGERN-STERNB.
b. Sturdy plants, 10–30 cm; perianth present; testa with hooked or uncinate hairs . . . . 23. *Salicornia* L.
6a. Stems ± papillose at least when young; scale-like leaves apically papillose-fringed; perianth segments united for c. 3/4 of their length . . . . 20. *Halostachys* C. A. MEY. ex SCHRENK
b. Stems glabrous, without papillae; scale-like leaves not papillose-fringed; perianth segments united only in basal half 7
7a. Stems with numerous opposite globular buds, giving rise to short lateral ± spreading branches; internodes c. 3 mm; flower spikes prominently 4-sided . . . . 21. *Halocnemum* M. B.
b. Stems without lateral globular buds; internodes 5–7 mm; flower spikes not 4-sided, ± cone-like . . . . 22. *Arthrocnemum* MOQ.

Group B

1a. Plants monoecious; female flowers without a perianth, subtended by 2 foliaceous bracts 2
b. Flowers hermaphrodite with clearly developed perianth segments 3
2a. Shrub; bracts in fruit densely covered with long silky hairs, tawny when dry, ovate to ovate-oblong . . . . 8. *Krascheninnikovia* GUELDENST.
b. Annual; bracts in fruit without silky hairs, grey-green, obtriangular, with 2 prominent apical spines (Fig. 1 D) . . . . 9. *Ceratocarpus* L.

3a. Some irregularly "medifixed" adpressed hairs present on some part of the plant (N.B. – careful observation with high magnification essential) 4
b. Hairs branched but not adpressed-medifixed 5
4a. Fruit hidden within ± navicular bracts .... 35. *Petrosimonia* BUNGE
b. Fruit distinct, with 5-winged perianth segments .... 27. *Salsola* L. (sect. *Malpighipila*)
5a. Dwarf shrubs; fruiting perianth 5-winged .... 27. *Salsola* L. (sect. *Belanthera* p.p.)
b. Annuals; fruiting perianth without wings 6
6a. Perianth showy, of 5 petaloid rose-white lobes; stamens 5; plants of varied habitats (N.B. – careful observation with high magnification needed to detect the branched hairs) .... 17. *Anthochlamys* FENZL
b. Perianth of 1–5 lobes, membranous, inconspicuous; stamens 1–5; mainly psammophytes or plants of somewhat sandy places 7
7a. Leaves linear, densely clustered up the stem; plant of sprawling habit; fruit ± suborbicular, enclosed within perianth segments (Kopet Dagh) .... 1. *Polycnemum* L.
b. Leaves ovate to linear oblong, not or scarcely clustered; erect or procumbent plants; fruit strongly flattened, exserted from perianth (widely spread) 8
8a. Leaves spine-tipped, stiff; inflorescence distinctly spiny; perianth of one 3-lobed segment .... 16. *Agriophyllum* M. B.
b. Leaves not or scarcely mucronate, herbaceous; inflorescence not spiny; perianth present or absent, not of one 3-lobed segment .. 15. *Corispermum* L.

Group C

1a. Leaves all opposite 2
b. Leaves alternate or lowermost only opposite 4
2a. Plant glabrous, with or without a shiny white stem; leaves apically obtuse without a bristle or mucro; seed horizontal .... 29. *Seidlitzia* BUNGE ex BOISS.
b. Plant with at least some scabrid papillae; leaves spiny or mucronate; seed horizontal or vertical 3
3a. Inflorescence spiny, condensed; leaf bases without or with only a narrow scarious margin; seed horizontal .... 32. *Horaninovia* FISCH. & C. A. MEY.
b. Inflorescence not spiny, elongated; leaf bases with a broad scarious margin; seed vertical .... 31. *Girgensohnia* BUNGE ex FENZL
4a. Perianth segments in fruit fused and indurated with 1(–2) prominent long sturdy spines; leaves often only represented by hard spines .... 42. *Cornulaca* DELILE

b. Perianth segments winged in fruit, without spines; leaves herbaceous 5
5a. Fruiting perianth thickened and strongly indurated below the wings . . . . 28. *Halothamnus* JAUB. & SPACH
b. Fruiting perianth not thickened and indurated 6
6a. Stems green with white or purple lines, often angular 7
b. Stems whitish throughout, ± terete 8
7a. Leaves spine-tipped, seeds usualy horizontal . . . . 27. *Salsola* L. (sect. *Salsola*)
b. Leaves not or somewhat spine-tipped, seeds vertical; stamens with short terminal appendages (Fig. 2 G 1) – see also *Salsola collina* . . . 30. *Noaea* MOQ.
8a. Perennial; only 3 (–4) perianth segments winged in fruit; seeds vertical . . . . 43. *Agathophora* (FENZL) BUNGE
b. Annuals or perennials; all 5 perianth segments winged in fruit 9
9a. Dwarf annual; wings developing near apex of perianth segments . . . . 44. *Halogeton* C. A. MEY.
b. Taller annuals or perennials; wings present in lower half of perianth segments . . . . 27. *Salsola* L.

Group D

1a. Fruiting perianth segments winged; in flower, segments with a transverse line 2
b. Fruiting perianth segments without wings; in flower without a transverse line 4
2a. All 5 perianth lobes winged in fruit . . . . 27. *Salsola* L.
b. Only two perianth lobes winged in fruit 3
3a. Staminal vesicular appendages conical, acute; wings of fruiting perianth lobes to 8,5 mm long, semi-orbicular reniform; sturdy *Salsola*-like plant . . . . 38. *Piptoptera* BUNGE
b. Staminal appendages obtuse or sub-acute; wings of fruiting perianth lobes up to c. 2 mm, oblong-obovate . . . . 39. *Halanthium* C. KOCH
4a. Staminal appendages c. 5 × 3 mm, purplish; stigma with a radial membranous fringe . . . . 41. *Halarchon* BUNGE
b. Staminal appendages up to 2 mm long, yellow, white or purple; stigma without a membranous fringe 5
5a. Perianth segments and subtending leaf-like bracts not coalescing or indurated in fruit 6
b. Perianth segments and/or subtending leaf-like bracts coalescing or indurating in fruit 7
6a. Perennials; leaf apex without terminal bristle-like hairs . . . . 27. *Salsola* L. (sect. *Belanthera* p.p.)
b. Annuals; leaf apex with 1 or a few terminal bristle-like hairs . . . . 36. *Halocharis* MOQ.

7a. Perianth segments not or scarcely indurating in fruit; subtending bracts indurating; both forming a nut-like fruiting disseminule, 2-horned or not (Fig. 1 F) . . . . 40. *Gamanthus* BUNGE
b. Perianth segments basally indurating and coalescing in fruit forming a flask-like disseminule, not 2-horned . . . . 37. *Halimocnemis* C. A. MEY.

Group E

1a. Plants with distinct hairs, usually "barbellate" (Fig. 2 B 5 – high magnification needed) 2
b. Plants without hairs, either glabrous or with papillae or vesicles 5
2a. Fruiting perianth segments with straight to uncinate spiny outgrowths . . . . 13. *Bassia* ALL.
b. Fruiting perianth segments winged or with horny outgrowths 3
3a. Leaves semi-terete or terete; seeds horizontal, rarely vertical; embryo spiral . . . . 27. *Salsola* L.
b. Leaves flat; seeds horizontal or vertical: embryo annular or horse-shoe shaped 4
4a. Seed vertical; fruiting perianth segments with apical horns or wings . . . . 11. *Panderia* FISCH. & C. A. MEY.
b. Seed horizontal; fruiting perianth segments variously winged . 14. *Kochia* ROTH
5a. Annuals; all leaves opposite 6
b. Annuals or perennial; all or at least upper leaves alternate 7
6a. Inflorescence distinctly spiny, condensed (Fig. 1 L); seed horizontal . . . . 32. *Horaninovia* FISCH. & C. A. MEY.
b. Inflorescence not or scarcely spiny, elongated; seed vertical . . . . 31. *Girgensohnia* BUNGE ex FENZL
7a. Fruiting perianth lobes united,forming a regular circular wing; very fleshy sturdy annual (Fig. 1 N) . . . . 26. *Bienertia* BUNGE ex BOISS.
b. Fruiting perianth not forming an undivided circular wing; annuals or perennials, fleshy or not 8
8a. Fruiting perianth thickened and strongly indurated below the wings . . . . 28. *Halothamnus* JAUB. & SPACH
b. Fruiting perianth not or scarcely thickened and indurated 9
9a. Stems whitish throughout, ± terete . . . . 27. *Salsola* L.
b. Stems green, with white or purple lines, often angular 10
10a. Leaves spine-tipped; seeds horizontal . . . . 27. *Salsola* L. (sect. *Salsola*)
b. Leaves not or somewhat spine-tipped; plant often with hardened spiny lateral branches; seed vertical (see also *Salsola collina*) . . . . 30. *Noaea* MOQ.

Group F

1a. Hairs clearly present on at least some part of the plant 2
b. Plant entirely glabrous, or with a mealy indumentum, or with some scabrid papillae 6
2a. Dwarf shrub with very dense clusters of basal linear, rigid leaves; hairs barbellate (Fig. 2 B 5); perianth segments 4; stamens 4 . . 10. *Camphorosma* L.
b. Annual or perennial herbs; leaves not basally clustered; hairs barbellate or not; perianth segments and stamens usually 5 3
3a. Perianth showy, of rosy-white petaloid lobes; stems clearly ridged; fruit erect, strongly flattened . . . . 17. *Anthochlamys* FENZL
b. Perianth segments inconspicuous, scarious membranous; stems ridged or not; fruit horizontal or erect 4
4a. Plant with some stalked glandular hairs or sessile glands; testa of seed glossy to matt, dark brown to black . . . . 5. *Chenopodium* L.
b. Plant without glandular hairs; testa of seed matt, dark brown 5
5a. Leaves linear-cylindrical; fruit hidden within indurated leaf-like bracts (careful examination will reveal some "medifixed" hairs) . . . . 35. *Petrosimonia* BUNGE
b. Leaves oblong-elliptic to broad-oblong; fruit not hidden within indurated bracts . . . . 12. *Kirilowia* BUNGE
6a. Plants with a mealy indumentum or scabrid papillae 7
b. Plants glabrous, rarely with few scattered hairs 9
7a. Leaves opposite, sessile, with a basal scarious margin; indumentum scabrid-papillose . . . . 31. *Girgensohnia* BUNGE ex FENZL
b. Leaves opposite or alternate, petiolate, basally not scarious; indumentum a mealy bloom 8
8a. Plants monoecious; female flowers, lacking a perianth, subtended by 2 bracts . . . . 7. *Atriplex* L.
b. Plants with both hermaphrodite flowers and some female ones . . . . 5. *Chenopodium* L.
9a. Leaves with a ± broad, flat lamina, clearly petiolate 10
b. Leaves terete, fleshy, sessile 14
10a. Scandent vine-like plants with elegantly ovate-cordate leaves; perianth segments clearly spreading . . . . 3. *Hablitzia* M. B.
b. Erect to prostrate herbs; leaves cuneate to cordate; perianth segments usually ± erect 11
11a. Ends of sterile branches somewhat spiny; annual with coarsely toothed margins . . . . 2. *Acroglochin* SCHRAD. ex J. A. SCHULTES
b. Sterile branches not spiny; annuals or perennials with entire to dentate margins or lobed 12
12a. Leaves dentate, often hastate; flowers in dense clusters, often berry-like,

not hardening in fruit .... 5. *Chenopodium* L.

b. Leaves entire to sinuately lobed; perianth segments and bracteoles coalescing and hardening in fruit 13

13a. Flowers hermaphrodite; leaves entire, sometimes with wavy margins .... 4. *Beta* L.

b. Plants dioecious with unisexual flowers; leaves mostly lobed ... 6. *Spinacia* L.

14a. Flowers grouped in 3s immersed in fleshy spikes; perianth segments 3 inconspicuous .... 19. *Halopeplis* BUNGE ex UNGERN-STERNB.

b. Flowers solitary or few in leaf axils, with 2 small bracteoles; perianth segments 5, well-developed .... 25. *Suaeda* SCOP.

Subfamilies and Tribes of *Chenopodiaceae*

(based on ULBRICH, 1934)

Cyclolobeae. Embryo annular, horse-shoe shaped, conduplicate, curved or unicinate; endosperm present, often copious. – Genera 1–24.

Polycnemeae. Stems and roots with normal dicot anatomy; flowers hermaphrodite, solitary; stamens basally united; sprawling herbs. – Genus 1.

Hablitzieae. Flowers mostly hermaphrodite, solitary; stamens basally united; dehiscence usually circumscissile. – Genera 2–3.

Beteae. Flowers hermaphrodite, clustered or solitary; stamens basally united; ovary semi-inferior; basal parts of perianth indurated in fruit. – Genus 4.

Chenopodieae. Flowers hermaphrodite or female, clustered; stamens free or basally united; fruit with a thin pericarp; seeds horizontal to vertical. – Genus 5.

Atripliceae. Flowers unisexual; plants monoecious or dioecious; perianth present or in female flowers absent; bracts always present. – Genera 6–9.

Camphorosmeae. Flowers hermaphrodite or unisexual; perianth segments in fruit with or without wings; plants with a prominent indumentum often consisting of barbellate hairs. – Genera 10–14.

Corispermeae. Annuals with branched hairs or glabrous; flowers hermaphrodite; perianth segments unchanged in fruit; fruit flat, ± exserted from perianth. – Genera 15–17.

Salicornieae. Glabrous succulent halophytes mostly with clearly jointed stems; flowers hermaphrodite or unisexual, usually in groups of 3, immersed in inflorescence axis; stamens 1–2. – Genera 18–24.

Spirolobeae. Embryo spirally inrolled; spiral flat or conical; endosperm absent or sparse. – Genera 25–44.

Suaedeae. Flowers hermaphrodite and unisexual (male) perianth 5–lobed, often ± succulent, unchanged in fruit; bracts small, scarious; seeds horizontal or vertical; succulent glabrous halophytes. – Genera 25–26.

Salsoleae. Flowers hermaphrodite and unisexual; bracts herbaceous; perianth lobes with or without prominent wings in fruit; thecae with or without inflated terminal appendages; seeds horizontal or vertical; plants with or without an indumentum. – Genera 27–44.

1. *Polycnemum*

I. C. HEDGE, Edinburgh

Polycnemum L., Spec. Plant. 35 (1753); Gen. Plant. ed. 5: 22 (1754).

Annual or perennial decumbent or ascending herbs with a sparse indumentum of simple and irregularly branched hairs. Stems ridged. Leaves well-developed, clustered, not fleshy, alternate, sessile, ± amplexicaul, linear, entire. Flowers very small and inconspicuous, hermaphrodite, solitary in leaf axils, with 2 scarious bracts. Perianth segments 5, membranous. Stamens 1–5, ± basally fused. Ovary ovoid. Fruit vertical slightly compressed, with a thin pericarp, enclosed by persistent perianth segments; stylar arms short. Seed vertical, black, prominently granular; embryo annular, peripheral; endosperm present. – Type of genus: *P. arvense* L.

Six or 7 species in C & S Europe, NW Africa, the Mediterranean area east to C Asia. Distinctive on account of the ± sprawling habit (1 species is erect) the clustered leaves and the vertical fruit with a granular black seed. With some similarities to genera of the *Amaranthaceae* and placed in that family by MOQUIN, Chenopod. Monogr. 11 (1840) and BOISSIER, Fl. Or. 4: 995 (1879).

1. ***P. arvense*** L., Spec. Plant. 35 (1753).
Icon.: Ovcz., Fl. Tadjik. 3: 314, tab. 56 figs. 1, 2 (1968). – Tab. 1.
Type: [Europe] "in Galliae, Italiae, Germaniae arvis", LINN. 55/2-microfiche!

Annual with some simple and branched hairs (high magnification needed). Stems sprawling, 3–15 cm long, branched from base, clearly angular, densely leafy. Leaves c. 10 × 0,5 mm, glabrous linear-subulate, spreading-erect, spinulose, below with a prominent midrib, broadest at base. Bracts scarious, ovate, c. 1,5 × 0,4 mm, long-acuminate. Perianth segments divided to near base, c. 1 × 0,5 mm. Stamens usually 3, with slender filaments. Fruit membranous, suborbicular to broad-elliptic; seed c. 1,2 × 0,9 mm, dull black, prominently granular; embryo annular.

Turcomania: Kopet Dagh sec. PRATOV in VVED., Conspect. Fl. As. Med. 3: 35 (1972).

Distr. gen.: C. & S Europe, to Cyprus, Turkey, Caucasus, Turcomania to Tadjikistan.

Although no specimens of this distinctive species have been seen from our area, there seems no reason to doubt its presence on Kopet Dagh. Possibly to be expected elsewhere in adjacent regions; throughout its range it usually grows on sandy soils.

2. *Acroglochin*

I. C. HEDGE, Edinburgh

Acroglochin SCHRAD. ex J. A. SCHULTES, Mantissa 1, 2: 69 (1822).

Erect glabrous annual herbs. Leaves alternate, large, long petiolate, irregularly toothed. Inflorescences axillary, much branched; ends of sterile branches somewhat rigid or spinulose. Flowers hermaphrodite, without bracts, sessile. Perianth segments 5, linear-oblong, curved upwards, with a central green area and membranous margins. Stamens 1–3; filaments almost as long as perianth segments. Ovary elongated into style; stigmas 2 very short. Fruit saucer-shaped; dehiscence circumscissile. Seed black, with a glossy testa, horizontal; embryo annular: endosperm present. – Type of genus: *A. chenopodioides* SCHRAD. ex J. A. SCHULTES (= *A. persicarioides* (POIR.) MOQ.).

Monotypic. Sharing the same floral and fruit structure as *Hablitzia*, but an erect herb with toothed leaves, condensed ± erect infrutescences with short spinulose branches and 1–3 stamens; of similar facies to some *Chenopodium*.

1. ***A. persicarioides*** (POIR.) MOQ. in DC., Prodr. 13, 2: 254 (1849).
Syn.: *Amaranthus persicarioides* POIR. in LAM., Encycl. Méth. Bot. Suppl. 1: 311 (1810). *Acroglochin chenopodioides* SCHRAD. ex J. A. SCHULTES, Mantissa 1,2: 227 (1822). *Lecanocarpus nepalensis* NEES in NEES & SINNING, Pl. Hort. Bonn. Icon. tab. 2 (1824).
Icon.: Tab. 2.
Type: Based on a cultivated specimen of unknown provenance, P ?

Annual rather coarse herb 30–80 cm. Stems erect, sulcate-ridged, little branched, green or purplish. Leaves up to 60 × 35 mm, irregularly and coarsely toothed; petiole up to 70 mm. Inflorescences starting from near base of stem, numerous, axillary, contracted, erect-spreading. Perianth segments 0–0,7 mm, ± green, upcurved, linear-oblong. Fruit c. 1–4 mm in diameter, scarcely shorter than the adpressed persistent perianth segments, green or reddish. Seed 1,4 mm long with a hard thin testa, flattened.

Hab.: Among rocks, waste grounds, near cultivation.

Pakistan: Swat: Ushu, 2400 m, RECH. 19499 (as *Chenopodium pakistanicum* AELLEN – nomen). Ushu Valley, Shohrat forest, KAZMI 3562! Kalam, 2000 m, R.R. STEW. 24551!, 24603! Kalam to Utror, R. R. STEW., Pak. Journ. For. 17, 4: 482 (1967).

Distr. gen.: Pakistan, Kashmir, Himalayas, Tibet, Nepal to China.

A clear-cut species on account of its combination of characters even though it is a rather nondescript-looking plant. *Acroglochin* and *Hablitzia* were treated by MOQUIN as members of the *Amaranthaceae* [in DC., Prodr. 13,2: 253 (1849)] but are now generally accepted in the tribe *Hablitzieae* ULBRICH of *Chenopodiaceae*.

3. *Hablitzia*

I. C. HEDGE, Edinburgh

Hablitzia M. B., Mém. Soc. Imp. Nat. Mosc. 5: 24 (1817).

Scandent perennial with a fleshy root. Stems angled with few scattered simple hairs. Leaves large, alternate, petiolate, ovate, cordate, glabrous. Flowers on slender pedicels, in lax axillary drooping racemes, mostly hermaphrodite. Perianth segments large (for the family) ± green, oblong, spreading, fused at base, persistent. Stamens 5. Styles thick, short, with 2–3 stigmas; ovary semi-inferior. Fruit saucer-shaped with circumscissile dehiscence. Seeds horizontal, flattened, with a smooth shiny black testa. Embryo annular; endosperm present. – Type of genus: *H. tamnoides* M.B.

Monotypic. Very distinctive because of the scrambling habit, large leaves and spreading oblong perianth segments. Placed at one time [by MOQUIN, Chenopod. Monogr. 11 (1840) and BOISSIER, Fl. Or. 4: 987 (1879)] in the *Amaranthaceae*, but better in the *Chenopodiaceae*.

1. ***H. tamnoides*** M. B., Mém. Soc. Imp. Nat. Mosc. 5: 24 (1817).
Icon.: ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16c: 456, fig. 174 J–K (1934). ASSADI, Iranian Journ. Bot. 2, 1: 5, fig. 3 (1983). – Tab. 3.
Type: [Caucasus] Mount Mechenka, near Konstantinogorsk, F. A. MARSCHALL VON BIEBERSTEIN, (?) LE.

Scrambling herbaceous vine-like perennial with striate stems to 2 m. Leaf lamina thin-textured, elegantly ovate, to c. 10 × 5 cm, glabrous, entire-margined, gradually acuminate, deeply cordate; petiole 3–5 cm. Inflorescences slender, to c. 12 cm long, arising from leaf axils. Perianth segments green, 2–2,5 mm, stellately spreading, scarcely larger in fruit. Staminal thecae small, ovoid; filaments c. 1/2 as long as perianth segments. Fruit strongly flattened, c. 2,5 mm in diameter with perianth segments persisting. Seeds 1,5–2 mm, black, embryo horse-shoe shaped.

Hab.: In woods and shady places among rocks; c. 1000 m.

Persia: W: Azerb.: Arasbaran Prot. Reg.: Vaighan to Veinagh, scrub forest in valley, 1000 m, ASSADI & MASSOUMI 20485 (TARI – n.v.).

Distr. gen.: Caucasia, easternmost Turkey (Kars), Persia (N Azerbaijan).

An unmistakable species recently discovered in Persia (and Turkey) close to the border with Azerbaijan.

4. *Beta*

I. C. HEDGE, Edinburgh

Beta L., Spec. Plant. 222 (1753); Gen. Plant. ed. 5: 103 (1754).

Lit.: P. AELLEN, Die orientalischen Beta-Arten. Berichte der Schweizerischen Botanischen Gesellschaft 48: 470–484 (1938). V. P. ZOSIMOVIČ, Eco-geographical characteristic of the wild species of Beta. Otcet. Priszud. Akad. Nauk 24: 69–72 (1939). K. P. BUTTLER, Revision von Beta Sektion Corollinae 1. Selbststerile Basisarten. Mitteilungen der Botanischen Staatssammlung München 13: 255–336 (1977).

Erect annual, biennial or perennial herbs, glabrous or pubescent. Roots fusiform or much swollen. Leaves alternate, large, broad, long-petiolate, entire. Inflorescence spicate, elongated. Flowers hermaphrodite, sessile, solitary or in few-flowered axillary clusters, subtended by leaves or leaf-like bracts. Perianth 5 lobed, petaloid or not, basally indurated at fruiting time and often uniting with other flowers in the glomerule. Stamens 5 inserted on a glandular disc. Ovary semi-inferior. Stigmas 2–3. Utricle immersed in the hardened perianth base; fruit indehiscent or dehiscence eventually circumscissile. Seed horizontal, smooth or glossy, embryo annular, or curved; endosperm copious. -- Type of genus: *B. vulgaris* L.

About 8 species in Europe and Asia. An easily recognized genus on account of its semi-inferior ovary and the indurated coalescing bases of the fruiting perianths.

1a. Perianth segments clearly fimbriate-toothed at the apex; flowers solitary or in clusters of 2 .... 2. *B. lomatogona* FISCH. & C. A. MEY.
b. Perianth segments apically entire; flowers solitary or in clusters of 2–5 ... 2
2a. Stems leafy throughout; flowers borne in the axils of large broad stem leaves; perennial .... 4. *B. macrorhiza* STEV.
b. Stems leafy to the base of inflorescence; flowers borne in the axils of ± lanceolate bracts; annuals or perennials 3
3a. Perianth segments petaloid, membranous, 3–3,5 mm, yellow-white; base of fruiting perianth rounded not angular; perennial .... 3. *B. corolliflora* ZOSIMOVIC ex BUTTLER
b. Perianth segments herbaceous thickish, 2 mm, green; base of fruiting perianth angular, ridged; annual to perennial .... 1. *B. vulgaris* L.

1. ***B. vulgaris*** L., Spec. Plant. 222 (1753).
In our area only occurs:

– – subsp. ***maritima*** (L.) ARCHANGELI, Comp. Fl. Ital. 593 (1882).
Syn.: *B. maritima* L., Spec. Plant. ed. 2: 322 (1762). *B. vulgaris* subsp. *lomatogonoides* AELLEN, Ber. Schweiz. Bot. Ges. 48: 478 (1938).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 196 (1966). – Tab. 4.
Type of subspecies: "In Angliae, Belgii littoribus maris", LINN 314/3 – microfiche!

Lit.: B. V. FORD-LLOYD & J. T. WILLIAMS, A revision of Beta sect. Vulgares with new light on the origin of cultivated beets. Botanical Journal of the Linnean Society 71: 89–102 (1975). K. P. BUTTLER, Variation in wild populations of annual beet, Pl. Syst. Evol. 128: 123–136 (1977).

Annual or perennial, glabrous or with few scattered hairs; root not or scarcely thickened. Stems erect or decumbent, 20–100 cm, ridged, green, leafy. Leaves ovate to rhomboid; basal up to 10 × 5 cm; cauline smaller, cuneate, acute to obtuse, margins flat or slightly undulate. Inflorescence with several erect or spreading bran ches, not leafy or leafy only near base. Flowers subtended by short linear-lanceolate bracts, solitary or in 2–3 flowered glomerules. Perianth segments c. 2 mm, ovate-triangular or oblong, green, with a membranous margin, carinate, incurved in fruit with lobes as long as or longer than the fruit diameter, strongly carinate. Seed embedded in perianth base, c. 2 mm; testa reddish brown.

Hab.: Field margins, waste ground; nr sea level–1200 m. – Fl. III–V, fr. VI–VIII.

P e r s i a : N: Gorg.: Pahlavi-Dezh, PABOT 30058-E! Qareh Makher N Gonbad-e Kavus, SHAR. 30059-E! – W: Khuz.: Haft-Tappeh, IRANSHAHR & TERME 15011-E! Hamidiyeh, 100 m, IRANSHAHR & TERME 15013-E! Ahvaz, KOELZ 14945! Ahvaz to Masjed-Soleyman, 100 m, IRANSHAHR & TERME 15014-E! Masjed Soleyman, 600 m, MACMILLAN 255, 256 (types of subsp. *lomatogonoides*). – S: Fars: Borazjan, STAPF 817! 5 km S Borazjan, 150 m, DAVIS 55948! Mohammad Ameri, IRANSHAHR & TERME 34372-E! Kerm.: Minab, SOJÁK 4787! Lar.: Insula Qeshm, TERME & MOUSSAVI 34571-E!, BORNM. 628! Hajjiabad prope Tarom, 900 m, RECH. 3291! "Ouz" (?), MANUCH. 30060-E! 35 km Taheri to Kangan, IRANSHAHR & TERME 34374-E! – E: Khor.: 60 km W Mashhad, W Chenaran, 1200 m, UOTILA 19002! – C: Damgh.-Semn.: S Kuh-i Nizva, 2350 m, AELLEN & BEHB. 4292!
P a k i s t a n : Quetta: Quetta, Sibi, LACE 3443! Peshawar: Tor Khama, ad confines Afghaniae, 200 m, RECH. 30348!

Distr. gen. of subspecies.: Throughout Europe and Asia.

Sugar beet, beetroot, mangold-wurzel and spinach beet have all been developed from *B. vulgaris*.

Subsp. *maritima* is a polymorphic taxon in which many infra taxa were recognized by AELLEN (l.c. 470–476); in Europe and W Mediterranean it is mainly found near the sea, but in our area it occurs inland. Very few of our gatherings are in fruit and its range of variation is not known. It is uncertain if it occurs in truly wild habitats.

2. ***B. lomatogona*** FISCH. & C. A. MEY. in HOHEN, Enum. Pl. Talysh = Bull. Soc. Imp. Nat. Mosc. 3: 360 (1838).
Syn.: *B. longespicata* MOQ., Chenopod. Monogr. 13 (1840).
Icon.: TAKHT., Fl. Armen. 2: 289, tab. 88 (1956). – Tab. 5.
Type: (Azerbaijan) Talysh "in campis prope Tatuni, 4000 ped., fl. Jul., R.F. HOHENACKER, LE.

Perennial to c. 100 cm, glabrous or with few scattered short hairs; root strongly woody, fusiform. Stems erect, angular or ridged, usually unbranched below, leafy. Basal leaves broad ovate, to c. 10 × 9 cm, cordate to truncate, apically acute; petiole to c. 12 cm; cauline leaves much smaller, short-petiolate or sessile. Inflorescence with several spreading branches, only leafy at base. Flowers subtended by small linear-lanceolate bracts, solitary or rarely in 2-flowered glomerules. Perianth segments c. 2,5 mm long, broad oblong, green with a membranous margin apically markedly fimbriate-toothed; in fruit inrolled forming an angular fruit cup. Seeds imbedded in hard tissue, c. 2 × 2 mm; testa dark reddish brown, rugulose. – 2n = 18, cf. BUTTLER (1977), l.c.: 284.

Hab.: Rocky slopes, cultivated places; 1500–1800 m. – Fl. VI, fr. VII–IX.

Talish: Tatuni, HOHEN.
Persia: W: Azerb.: 2–12 km W Zonuz, c. 1600 m, RECH. 41362!, LAMOND 3841!, IRANSHAHR 30366-E! Tabriz to Esfahan, 1500 m, MIRD. 2147!, GAUBA 30432-E! Kaleybar, MIRD. 2146! Shahpur to Rezaiyeh, TERME 14811-E! Qotur, SHAR. 30057-E! Mianeh to Kivi, near Mahmudabad, 1720 m, TERME & al. 38835! Kurd.: Sanandaj, 1800 m, JACOBS 6923!

Distr. gen.: Throughout Turkey, Transcaucasus, NW Persia.

Similar in facies and most characters to *B. corolliflora*, but clearly distinguished by the fimbriate-toothed apices of the perianth segments.

3. ***B. corolliflora*** ZOSIMOVIČ ex BUTTLER, Mitt. Bot. Staatssamml. München 12: 289 (1975).
Syn.: *B. trigyna* WALDST. & KIT. f. *glaberrima* AELLEN, Ber. Schweiz. Bot. Ges. 48: 481 (1938). *B. trigyna* auctt. – non WALDST. & KIT.
Icon.: TAKHT., Fl. Armen. 2: 293, tab. 89 (1956). – Tab. 6.
Type: (Armenia) Okr. Daracicag, sev. Sklony, 21.IX.1931, V. ZOSIMOVIČ; holotype WIR.

Perennial to 100 cm, glabrous or with few scattered short hairs; root woody, fusiform. Stems sturdy, markedly angular or ridged, reddish purple below, leafy throughout. Basal leaves up to 13 × 8 cm, ovate-lanceolate, cordate acute, petiole c. 8 cm; cauline leaves decreasing in size up stem. Inflorescence much branched with elongated spreading-erect shoots. Flowers subtended by short oblong-lanceolate bracts, in sessile 1–3(–4) flowered clusters. Perianth segments petaloid, 3–3,5 mm, yellowish white, broad oblong-elliptic, margin entire; in fruit scarcely enlarged, green, ± horizontally spreading; base of fruiting cup rounded, not angular. Seeds embedded in indurated tissue, c. 2 × 1,5 mm; testa thin, dark brown. – 2n = 36, cf. BUTTLER (1977), l.c. 282.

Hab.: Rocky slopes, edge of fields; c. 2000 m. – Fl. VI, fr. VII–IX.

Persia: W: Azerb.: in valle fluvii Qotur W Khvoy versus fines Turcicas, c. 1900 m, RECH. 41729!

Distr. gen.: E Turkey, Caucasus, NW Persia.

Closely related to *B. trigyna* WALDST. & KIT. of Europe – from which it is not readily separated on dried material - but a tetraploid [cf. BUTTLER l.c. 291-294 (1977)].

4. ***B. macrorhiza*** STEV., Mém. Soc. Imp. Nat. Mosc. 3: 257 (1812).
Syn.: *B. foliosa* HAUSSKN. nomen (SINTENIS, It. Or. 2750, ann. 1890).
Icon.: TAKHT., Fl. Armen. 2: 287, tab. 87 (1956). – Tab. 7.

Type (? Azerbaijan): In glareosis alpium circa Chinaberg, C. STEVEN, H, LE.

Glabrous perennial, 30–80 cm; root fusiform. Stems sturdy, c. 6 mm diameter at base, erect or procumbent, strongly ridged, often reddish below, leafy throughout. Basal leaves with a lamina to 14 × 9 cm and petiolate to 10 cm; stem leaves oblong to broad ovate, c. 2–6 × 1,5–3,5 cm, cuneate below, obtuse to acute above, short-petiolate or sessile, ± thick-textured. Inflorescence elongate, branched or not. Flowers borne in the axils of broad stem leaves, in sessile clusters of (1–) 3 (–5). Perianth segments yellowish green, 2–3 mm in flower, oblong to ovate-oblong, margin entire, enlarging in fruit to c. 4 mm, flat and spreading; base of fruiting perianth cup short, rounded, not ridged. Seeds c. 2,5 × 1,5 mm, firmly embedded in indurated tissue; testa thin, dark brown. – 2n = 18, cf. BUTTLER, (1977), l.c.278.

Hab.: Rocky slopes, edge of fields; c. 2000 m, - Fl. VI, fr. VII–IX.

Persia: W: Azerb.: Near Murestan, 16 km NNE Herowabad, 2050 m, FERGUSON 119! Khvoy "Kalawanez" (?), SZOVITS 342.

Distr. gen.: C & E Turkey, Caucasus, NW Persia.

Apparently a clear-cut species, but very variable in leaf size and shape.

5. *Chenopodium*

PERTTI UOTILA, Helsinki

Chenopodium L., Spec. Plant.: 218 (1753); Gen. Plant. ed. 5: 103 (1754).

Lit.: P. AELLEN, Chenopodium in K.H. RECHINGER (ed.), HEGI, Illustrierte Flora von Mitteleuropa ed. 2,3(2):509-659 (1960-1961). A. BEAUGÉ, Chenopodium album et especes affines. Étude historique et statistique, 447 pp. (Paris 1974). L. ENGSTRAND & M. GUSTAFSSON, Drawings of Scandinavian plants 81–100, Chenopodium L., Botaniska Notiser 125: 283–286 (1972); 126: 1–6, 135–141, 273–276, 393–397 (1973); 127: 1–6, 159–164, 291–296, 457–463 (1974). M. M. ILJIN & P. AELLEN, Chenopodium in KOMAROV, Flora URSS 6: 41–73 (1936). D. PODLECH & A. DIETERLE, Chromosomenstudien an afghanischen Pflanzen, Candollea 24: 185–243 (1969). A. SCOTT, A review of the classification of Chenopodium L. and related genera (Chenopodiaceae), Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie 100: 205–220 (1978). P. UOTILA, Chromosome counts on Chenopodium L. from SE Europe and SW Asia, Annales Botanici Fennici 10: 337–340 (1973). P. UOTILA, Variation, distribution and taxonomy of Chenopodium suecicum and C. album in N Europe, Acta Botanica Fennica 108: 1–35 (1978). P. UOTILA, Chenopodium in S. CASTROVIEJO et al. (eds.), Flora iberica 2: 484–500 (1990). P. UOTILA, Taxonomic and nomenclatural notes on Chenopodium in the Flora Iranica area, Annales Botanici Fennici 30: 189–194 (1993).

Annual or rarely short-lived perennial herbs; young parts farinose because of vesicular hairs which later collapse to scales or disappear, or plant glandular-hairy, or glabrous. Stem erect to ascending or prostrate, usually ± terete, sometimes angular, yellowish, green or green-striped, sometimes red to purple especially in branch and leaf axils. Leaves alternate except for sometimes the lowermost ones, well developed; petiole usually shorter than lamina, shortening progressively upwards in the sequence of leaves; lamina simple to pinnatifid, variously dentate – irregularly serrate – lobed or entire, flat, somewhat fleshy or not, soft, more entire and narrower in bracts. Inflorescence usually a variable panicle or spiciform, formed of clusters of cymosely arranged flowers (glomerules). Flowers small, often dimorphic: terminal flowers bisexual or male, lateral flowers usually female. Perianth segments 3–5. Stamens 5 or less, usually free. Stigmas usually 2, sometimes to 5. Fruit usually falling with perianth. Pericarp usually membranous, sometimes succulent. Seeds horizontal to vertical, lenticular; testa crustaceous, usually lustrous; embryo annular to hippocrepiform. – Type of genus: *C. album*.

Circa 150 species in all continents.

Vegetative characters (branching habit, leaf shape, shape of inflorescence) should be used with caution in identification of *Chenopodium* taxa because the variation of these characters, both genetically and environmentally controlled, is wide and to some extent parallel in most species. Petioles are shorter, lamina smaller and narrower and more entire from lower (except the lowermost ones) to median leaves and to bracts. So, the best diagnostic characters in leaves are in lower and median leaves, and, if not otherwise indicated, the leaf characters given in the key and descriptions refer to mature leaves in the basal half of the stem.

In addition to mature leaves, floral characters and seeds are often required to confirm identification. However, their value must not be over-emphasized; the variation, for instance, in the perianth segment shape, and seed size, shape and testa characters is wide and in many cases partly overlapping. The seed testa characters given here, if not otherwise indicated, are from the lower surface not too close to the margins or the umbo. A good hand-lens or preferable a binocular is needed to study the testa ornamentation.

All this stresses the importance to collect as perfect specimens as possible. Inadequate specimens are often impossible to name with confidence.

The genus *Chenopodium* can be divided into 3 subgenera. Subgen. *Blitum* (L.) HIITONEN (species 1–2) is characterized by almost glabrous plants with densely aggregated and usually bracteate glomerules, mostly fleshy and red in fruit. Species of subgen. *Chenopodium* (species 3–19) are more or less farinose (mealy) especially in younger parts due to vesicular hairs which later collapse in scar-like hairs or disappear. Glomerules are often less aggregated, usually ebracteate, dry. Species of subgen. *Ambrosia* A. J. SCOTT (species 20–23) lack vesicular hairs and have an indumentum of simple and glandular hairs, and the inflorescence is often dichasially branched, glomerules ebracteate or bracteate, dry.

1a. Plant with glands or glandular hairs, aromatic 2
b. Plant glabrous to vesicular hairy (farinose), not aromatic but sometimes smelling of rotting fish 5
2a. Flowers in dense glomerules, arranged in spikes or panicles . . . . 20. *C. ambrosioides* L.
b. Flowers solitary or a few in loose dichasial cymes, arranged in panicles . . . 3
3a. All glandular hairs stalked; perianth segments narrowly ovate, weakly keeled dorsally . . . . 21. *C. botrys* L.
b. Glandular hairs sessile, some subsessile; perianth segments ovate to broadly ovate, margins with sessile glands 4

4a. Perianth segments fairly weakly keeled, keel with simple eglandular hairs .... 22. *C. nepalense* COLLA
b. Back of perianth segments cristate, glabrous ... 23. *C. Schraderianum* SCHULT.
5a. Plants glabrous, lower leaves long-petiolate, ± triangular; inflorescence composed of ± sessile, very compact, often berry-like axillary glomerules along the stem and branches 6
b. Usually vesicular hairy (farinose) especially when young, sometimes glabrous, petiole of the leaves mostly much shorter than the lamina; inflorescence much branched, glomerules not axillary, less compact, not berry-like 7
6a. Usually erect plant, branches spreading; uppermost bracts dentate; sometimes prostrate and then leaves entire; seeds 1,05–1,35 mm in diameter, ± round in outline .... 1. *C. foliosum* ASCHERS.
b. Prostrate plant; leaves dentate, uppermost bracts entire except for basal lobes; seeds 0,8–1,15 mm in diameter, ovoid in outline .... 2. *C. Litwinowii* (PAULSEN) UOTILA
7a. Leaf lamina triangular, 3–7-angular and ± cordate at base; seeds 1,5–2 mm, testa coarsely pitted .... 9. *C. badachschanicum* TZVEL.
b. Leaf lamina entire – dentate – 3-lobed – sometimes triangular, usually attenuate at base; seeds less than 1,6 mm, testa smooth to radially furrowed, reticulate or pitted 8
8a. Stems ±4-angled, leaves entire; flowers solitary or few together in dichasia .... 7. *C. polyspermum* L.
b. Stems ± terete, leaves entire to toothed or 3-lobed; flowers mostly in glomerules forming a paniculate or spiciform inflorescence 9
9a. In terminal flowers perianth segments 5 and seeds horizontal; in lateral flowers perianth segments usually 3, free to base or connate, and seeds vertical 10
b. All flowers with horizontal seeds and 5 perianth segments, free to at least half-way 12
10. Lower leaves elliptic-ovate to lanceolate, green above, glaucous and farinose beneath, margin sinuate-serrate to sinuate .... 5. *C. glaucum* L.
b. Lower leaves deltate to rhombic-ovate, green to reddish and ± same colour on both sides; margin irregularly toothed 11
11a. Perianth segments of lateral flowers free to half-way .... 4. *C. rubrum* L.
b. Perianth segments of lateral flowers connate to near apex, forming a sac surrounding the fruit .... 3. *C. chenopodioides* (L.) AELLEN
12a. Leaf lamina toothed; perianth segments with a prominent green or red swelling on the back near the apex; pericarp persistent, margin of seed keeled, acute; testa prominently pitted .... 8. *C. murale* L.
b. Leaf lamina toothed to entire; perianth segments with a rounded back or keeled for the major part of its length; pericarp free to adherent, margin

of seed rounded to somewhat acute; testa finely sculptured to smooth ... 13
13a. Testa pitted, pits radially elongated except for margin area; leaf lamina 3-lobed with elliptic to truncate middle-lobe, or whole lamina elliptic with a few teeth .... 10. *C. ficifolium* SM.
b. Testa smooth to radially furrowed or minutely pitted to obscurely reticulate; leaves not as above 14
14a. Leaf lamina entire to somewhat 3-lobed, margin entire, or angled or with a pair of lobe-like teeth at broadest point 15
b. Leaf lamina serrate or dentate, sometimes with 1–2 lobe-like toothed teeth on both sides at the broadest point 20
15a. Leaf lamina ovate to broadly rhombic, often angled or slightly 3-lobed, less than 2x longer than broad 16
b. Leaf lamina lanceolate – narrowly trullate to elliptic, entire or with 1–2 lobe-like basal teeth, more than 2x longer than broad 18
16a. Plant procumbent to ascending, strongly farinose, smelling of decaying fish; leaf lamina usually entire, ovate to rhombic, sometimes angled at broadest point .... 11. *C. vulvaria* L.
b. Plant often erect with spreading branches, less farinose, not smelling as above; leaf lamina usually somewhat 3-lobed because of a pair of lobe-like acute teeth or rounded angles, sometimes entire, ovate 17
17a. Leaf lamina with a pair of lobe-like acute teeth at broadest point or entire; seeds 1,2–1,5 mm in diameter .... 12. *C. Sosnowskyi* KAPELLER
b. Leaf lamina slightly 3-lobed with rounded angles – side-lobes; seeds up to 1,2 mm in diameter .... 13. *C. Karoi* (MURR) AELLEN
18a. Leaf lamina lanceolate, green to yellowish or dull green; seeds 1,2–1,6 mm .... 16. *C. album* L.
b. Leaf lamina narrowly trullate to narrowly elliptic or elliptic, entire or with 1–2 lobe-like basal teeth; seeds 1,0–1,3 mm 19
19a. Leaf lamina narrowly trullate to narrowly elliptic, entire or with 1–2 lobe-like basal teeth, silvery greyish green to glaucous .... 14. *C. Novopokrovskyanum* (AELLEN) UOTILA
b. Leaf lamina elliptic, entire, glaucous green .... 15. *C. strictum* ROTH
20a. Leaves to 3 cm long, triangular, thin, acute-acuminate, margin usually sparsely dentate, with prominent basal teeth; inflorescence very lax, glomerules spicately arranged; perianth segments with prominent keel on back .... 19. *C. atripliciforme* MURR
b. Leaves rhombic – ovate – elliptic, variously serrate to dentate, variously thick; if leaves triangular so leaves large and inflorescence dense; keel of perianth segments not prominent 21
21a. Leaves triangular, dentate; inflorescence densely spiciform, almost glabrous .... 6. *C. urbicum* L.
b. Leaves rhombic-ovate-elliptic, variously serrate to dentate; inflorescence

variously paniculate to spiciform, farinose especially when young 22

22a. Lamina of lower leaves to 2(–4) cm long, ± as broad as long, broadly ovate, 3-lobed; inflorescence densely farinose .... 18. *C. opulifolium* SCHRADER ex KOCH & ZIZ

b. Lamina of leaves usually more than 4 cm, if 3-lobed usually clearly longer than broad, rhombic-ovate-oblong; inflorescence variously farinose 23

23a. Leaf lamina roundish, almost as broad as long, regularly dentate; vesicular hairs often red............................. 17. *C. giganteum* D. DON

b. Leaf lamina usually clearly longer than broad, irregularly serrate or lobed, or smaller and more regularly serrate or entire; vesicular hairs white 24

24a. Leaf lamina trullate to elliptic, regularly serrate-entire, apex rounded, teeth fairly small; inflorescence spiciform; seeds 1,0–1,3 mm in diameter .... 15. *C. strictum* ROTH

b. Leaf lamina trullate-ovate-rhombic but not elliptic, irregularly serrate, lobed or entire; glomerules paniculate or spiciform; seeds 1,2–1,6 mm in diameter .... 16. *C. album* L.

Synoptic guide to the species

Because of the many difficulties in identification by means of a dichotomising key, a synoptic guide to species with less frequently occurring characters or character states is provided. The numbers refer to those of the species in this account; if a character is infrequent in a particular species, the number is in parenthesis.

Habit, smell, indumentum. Habit: prostrate (1), 2, (3), (5), (7), (11), (13); stem angular 7,9.

Smell: aromatic 20–23; rotting fish 11.

Indumentum: almost glabrous 1, 2, 3, 4, 6, 7, 9; very densely vesicular hairy on lower leaf surface, almost glabrous on upper surface 5; glandular hairs stalked 21; glandular hairs sessile 20, 22, 23.

Leaves. Lower leaves: triangular 1, 2, 6, 9, 19; entire, margin entire (1), (3), 7, 11, (12–16); entire excluding a pair of basal lobes, margin entire or toothed (4), (5), 10, (11), 12, 13, 14, 15, (16), (17); regularly toothed 6, 16, 19; lobed, lobes more than three 9, (20), 21, 22, 23.

Inflorescence, perianth. Inflorescence: dichasial, flowers mainly solitary 7, 21, 22, 23; spiciform, glomerules axillary 1, 2; mainly spiciform, glomerules ebracteate 6, (14), 15, 16, (18), (19), 20.

Perianth segments: succulent in fruit 1, 2; spreading in fruit 7, (15), (19); with prominently keeled back 8, 9, 14, 19, (22), 23; midrib clearly visible inside 9.

Fruits, seeds. Pericarp: easily removable 3, 4, 5, 7, 20; persistent 8, 9.

Seeds: vertical at least in lateral flowers 1, 2, 3, 4, 5; to 1,0 mm in diameter 3, 4, 5, (13), 21, 22, 23; more than 1,5 mm in diameter 9, (16); reddish-brown 1, 2, 3, 4, 5, 7, 21, 22. Margin of seed: in part emarginate 1, 2, 21, 22; acute 8, (16), (19).

Testa: clearly pitted 7, 8, 9, 10, 23; matt 1, 2, 8, 23.

1. *C. foliosum* ASCHERS., Fl. Brandenb. 1: 572 (1864).
Syn.: *Blitum virgatum* L., Spec. Plant.: 4 (1753). *Chenopodium virgatum* (L.) AMBROSI, Fl. Tirolo merid. 2: 179 (1875), non THUNB. (1815). *C. blitum* F. MUELL., Additions Princip. Timber Trees & Sel. Pl.: 11 (1874).

Almost glabrous annual (? sometimes short-lived perennial), (5–)10–60(–80) cm; stems yellowish to red, erect to ascending, branches ± spreading, mainly at the middle of stem. Leaves somewhat fleshy, pure green, sometimes red; basal leaves long-petiolate, lamina 3–7 cm, triangular, coarsely dentate-serrate, rarely ovate and almost entire; lamina of middle cauline leaves hastate, middle-lobe with a few teeth or entire; bracts lanceolate with basal lobes and several teeth, sometimes entire; lobes and teeth spreading to forward-projecting, hardly ever reflexed. Inflorescence of spicately arranged axillary, sessile, compact, globose glomerules, to 10 mm in diameter. Flowers bisexual or female. Perianth segments 3–5, connate below the middle, in fruit usually becoming red and succulent, on branches and in exceptional conditions often remaining greenish and dry. Stamens 1–5. Stigmas 2, short, Seeds mostly vertical, dark red-brown, 1–1,4 mm in diameter, mostly roundish in outline (length to width ratio 1,05–1,25), margin obtuse-truncate, in part prominently grooved; testa dull, with obscurely reticulate striations.

Distr. gen. of species: From the Iberian peninsula to the Alps and SE Europe, Turkey, Cyprus, Palestine, N Iraq, Caucasus, Persia, Afghanistan, Pakistan, the Himalayas to Bhutan and north to the Altai Mts.; naturalized in C and E Europe, and locally in N America and N and S Africa.

1a. Stems erect, often yellowish; usually tall; leaves coarsely dentate to lobed; glomerules succulent at least on main axis; seeds 1,05–1,4 mm, roundish in outline . . . . subsp. *foliosum*
b. Stems ascending, often red; usually 5–15 cm; leaves entire or hastate with entire middle-lobe, glomerules greenish and dry; seeds 1–1,15 mm, roundish-ovoid in outline . . . . subsp. *montanum* UOTILA

— — subsp. *foliosum*
Icon.: SAVULESCU, Fl. R.P.R. 1, Pl. 72 fig. 1 (1952). GHAHREMAN, Flore de l'Iran 4, no. 414 (1983). – Tab. 8; 25 fig. 1.
Type: "Süddeutschland einheimisch..."
2n=18 (cf. PODLECH & DIETERLE 1969, UOTILA 1993).

Hab.: Rocky mountain slopes, stony and sandy screes, slopes and banks, open forests; often near stream shores, on calcareous, acid or volcanic soil; fields, roadsides and yards; 1300–4200 m. – Fl., fr. V–IX.

Iraq: Kurd.: Arbil: M. Qandil ad confines Persiae, 2000–3000 m, RECH. 11172 p.p.! Supra

Pushtashan, 2000 m, RECH. 11201! Inter Pushtashan et lacum Goam-e Kirmosoran, 2000 m, RECH. 11764!

T a l i s h : Orant, ad ripam fl. Orant-Czai, 1640 m, ALEXEENKO 3641! Kuz-Yurdy, 2440 m, LOMAKIN! SW Lerik, MENTSKII YU! Lenkoran: Swant, C.A. MEY.! Germin, SCHELKOWNIKOW! Between Kuyurbakh Yurdinskii and Khodzhadai, 1900 m, MATVEEVA 623! Inter Avash et Dyman, GROSSH.!

P e r s i a : N: Gorg.: Shahkuh, KOELZ 16275! Aliabad (Ketul), SHAR. 582! In decl. borealibus M. Shahvar prope Hajjilang, 2400–2600 m, RECH. 6147! Moh. Reza Shah Prot. Reg.: Almeh, 1500–1800 m, RECH. 53049!, UOTILA 19162! Maz.: Polur, 2000 m, HEWER!, TROTT 861! 7 km N Polur, 2500 m, GRANT 16509! 77 km S Chalus, 2800 m, GRANT 16459! Pol-e Zanguleh, 2200–2600 m, RECH.! Ileka (Elika), 1600 m, ZARGARI 72! N side Kandavan, 2400–2500 m, GAUBA s.n.!, KY. 357 p.p.!, TERME & al. 39810-E!, BOWLES Scholarsh. Bot. Exp. 2171!, Zagros Bot. Exp. A-46! – W: Azerb.: Murestan 16 km NNE Herowabad, 2050 m, FERGUSON 118! Kaleybar, MIRD. 2150! Kuhha-ye Doghrun near Nabi Jan, 2710 m, TERME & al. 38836! Kuhha-ye Sabalan, 2600 m, TERME! Meshg Ambar prope Tabriz, MIRD. 2151! 26 km W Rezaiyeh towards Sero, 1600–1700 m, LAMOND 4143!, RECH. 42027! Qasemlu, 1500 m, SIAMI 6865! 12 km E Sarab, 1670 m, COWAN & DARL. 1575! Yam, GILL.-SM. 2383! Qotur, 2000 m, IRANSHAHR! Ghogeh Dagh W Bazorgan, 2200–2250 m, LAMOND 4950! Khamseh: NE Zanjan, 1830 m, HEWER 2155! Kurd.: In jugo Ariz 20 km W Sanandaj, 2200 m, RECH. 42872! Ham.: Kuh-e Kharsane, SAB. 2152! Arak: M. Latetar, STR. 71! Arak, STR.! Esf.: Golestan Kuh prope Khunsar, IRANSHAHR 14837-E! Qashqai: Bordekan, 79 km from Shahreza to Semirom, 2530 m, ALAVA 13607! Lur.: Oshtoran Kuh (Shuturunkuh), substr. calc., RENZ in RECH. 48237!, STR.! Nuzian (Nijiu), 1900 m, KOEIE 947! Gahar, KOELZ 17962! Kuh-e Eshger, 2740 m, HAUSSKN.! – S: Fars.: Tang-e Sorkh between Ardakan and Yasuj, 2450 m, EDMONDSON & BOKHARI 2165! Hoseynabad 40 km W Shiraz, 1700 m, GRANT 15859! Kushk 53 km N Masiri, 1800–2230 m, SOJÁK 6148! Kuh-e Dinar near Sisakht, 3100 m, TERME & IZADYAR 14839-E! Kerm.: Kuh-e Jupar, 3000 m, BORNM. 5095! Kuh-e Hezar, 3450 m, EDMONDSON & MILLER 1570! Zehrud Bala SW Rayen, 2800 m, EDMONDSON & MILLER 1645! Kuh-e Jebal Barez near Deh Bakri, 1700–2700 m, SOJÁK 4041! 35 km from Jiroft E Mohammadabad, 1600–3000 m, SOJÁK 4157! – E: Khor.: Kuh-e Hazar Masjed, 2000 m, RECH. 5102! Khorasan, 1520 m, AITCH. 652! – C: Tehr.: M. Tuchal, KY. 226! Ab-e Garm to Ask, BEHB. 11146-E! 60 km E Tehran, 1900 m, DINI & ARAZM 2828! W Tehran, 2000 m, AMIN & BAZARGAN 2772! Qazv.: Gach Sar 80 km NE Karaj, 2130 m, FURSE 2674! 96 km N Karaj, 2740 m, Zagros Bot. Exp. 46! Gowzal Darreh in valle Lar, 2400 m, SANII & ASSADI 14152! Damgh.-Semn.: Inter Firuzkuh et jugum Bashm, 1900–2200 m, RECH. 1166!

T u r c o m a n i a : Ashkhabad: Suluklü (Saratowka) in valle M. Suluklü Dagh, SINT. 851! Kopet Dagh, 1300 m, FEDTSCH. & al. 175!

A f g h a n i s t a n : NW: Sangcharak: Safedsang, KOELZ 13987! – E: Gardez: Nozi, 2740 m, KOELZ 12043! Ghazni: Dasht-i Nawar, 3150–3200 m, BRECKLE 1957!, 4602! 15 km E Sabzak between Dasht-e Nawar and Malestan, 3500 m, PODLECH 19275! M. Saperlebuli SE altoplanitiei Dasht-i Nawar, 3200–4200 m, RECH. 37371!, FREITAG 1516! Bozghalak near Shashgao 24 km NE Ghazni, 2400 m, RECH. 17295! Jaji: Inter Dre Kalla et Qasim Khel, RECH. 32292! Kotkai, 2300–2450 m, AMSEL!, BRECKLE 2039!, HDG. & WDB. W-8939!, VOLK 71/850a! Khost: Maydan Shahidan E Khost near Peiwar Kotal, VOLK 71/502! Nuristan: Darrah-i Pushol, 3300–4020 m, PODLECH 16410!, RASOUL 136 in BRECKLE 3536! Darrah-i Pengar 4 km below Samanaknesha, 3000 m, PODLECH 16566! Bashgal valley between Dewana Baba and Garm Chashmeh, 3000 m, RASOUL in BRECKLE 3442! Sumnak valley E Garm Chashmeh, 3000 m, RASOUL 273 in BRECKLE 3673! Ateregrom between Chitur pass and Nilau, 2100–2500 m, KERST. 1152a! – NE: Wakhan: Darya-e Birgula-e Jelga Chelab Valley NW Kol-e Chaqmaqtin, 4200–4400 m, ANDERS 7571! Dary-e Waghjir between Chartash and Zemestan-e Duldul, AN-

DERS 7645! Kataghan: N side Salang pass, 2700 m, CARTER 1265! Khost-o Fereng, on NE slopes of Kotal-i Yawnu, 2900 m, PODLECH 11711! Yaoulang on west shore of Shiva lake, LINDB. 666/1959! – C: Bamian: 10 km W Bamian to Band-i Amir, 2500 m, BRECKLE 2389! Kuh-i Baba, Sard Darrah, 3100 m, GILLI 2098! Band-i Amir, VOLK 2846b! South slopes of Kuh-i Baba, 2740 m, THESIGER 22! Panjao: Panjao, 2700 m, HDG. & WDB. W-4944! Kotal-e Dewali between Naiak and Panjao, 2900 m, DIETERLE 724! Doab: Hajir valley 64 km W Doab, 1980 m, FURSE 8307! Darreh-i Shikar 20 km S Doab, 1500 m, HDG. & WDB. W-4148! Ao Khorak, 2750 m, KOELZ 13787! Ghorband: Shibar pass, VOLK 2796! Behzud: Between Behzud and Bom, 2700–3000 m, LUTFULLAH in FREITAG 6101! Kharbet in Kajao Valley, 2590 m, THESIGER 178! "Shuraki" tributary of Helmand river, 2740 m, THESIGER 153! Orozgan: Dorahi Tarbulak inter Panjao et Lal, 34°27' N, 66°29'E, 2700 m, RECH. 18813!
Pakistan: Chitral: Glacier Pechus, 3500 m, STAMM & WÖHRL 27! Madaklasht NE Drosh, 3048 m, STAINTON 3132! Drosh, Painogh, 3200 m, BOWES LYON 174! – Kurram: Sikaram, 3040 m, AITCH. 491! Bian Khel, AITCH. 577! Hariab Distr., AITCH.! Kurram Valley, HARSUKH 14963!, 15477! Bharowul, GRIFF. 1735 = Herb. Late East Ind. Cy. 4197! – N.-Wazir.: Razmak, QAISER 6274! – Quetta: Ziarat, 2430 m, LACE 3864!, JAFRI 2072! Wali Tangi, SAOOD OMER & GHAFOOR 17721, TAHIR ALI & TUFAIL AHMED 1388!

Distr. gen. of subspecies: As the species excl. the Altai mts.

–– subsp. ***montanum*** UOTILA, Ann. Bot. Fennici 30: 190 (1993).
Icon: Tab. 9 fig. 1–3.
Type of subspecies: K. H. & F. RECHINGER 6046, holotype W!, isotypes E!, G!.

Hab.: Stony bare ground, banks, fields and streamsides; 1900–4200 m. – Fl., fr. V–IX.

Iraq: Kurd.: Arbil: M. Qandil, 2500–3500 m, in glareosis calc., RECH. 11172 p.p.!, SERHANG & RAWI 26751! Bardamas, 2500–2600 m, RAWI & SERHANG 24350! Algurd Dagh (Helgurd, Arl Gird Dagh), 2440–3300 m, GUEST & LUDL.-HEW. 2942!, RAWI & SERHANG 24901!
Persia: N: Gorg.: In decl. borealibus M. Shahvar supra Hajjilang, 3200 m, RECH. 6046-a! Maz.: In valle Talar E Gaduk, 2300 m, AELLEN & BEHB. 215! N side M. Damavand, 1980 m, KY. 357 p.p.! N side Kandavan pass (Chalus pass), 2740 m, FURSE & SYNGE 366! "Kuhhaye Galzar" near Veresk, 1900–2750 m, TERME & al. 39811-E! M. Alamut, AUCH. 5260! – C: Tehr.: M. Tuchal, 2500 m, BORNM. 8102!, KY. 226! Darband, 2000–3800 m, SOJÁK 7035!, 7297! South slope of Damavand, 4200 m, COBHAM 18669! E slope M. Damavand 7 km SW Reneh, 4000 m, GRANT 16538! Reneh, 2750–3000 m, MOUSSAVI & al. 40017-E! Dizin pass inter Shemshak et confluentes fl. Karaj, in saxosis calc., 3100–3540 m, BUTTLER & al. 22985!, RECH. 57243! Above Shemshak, 2800–2900 m, UOTILA 25312! Pass NW Tehran against Amol, 2100 m, ANDERSEN & PETERSEN 226! Qazv.: Between Karaj and Chalus, 2550 m, BABAKHANLU & AMIN 3008! 96 km N Karaj, 2740 m, Zagros Bot. Exped. 40! Gach Sar NE Karaj, 2130 m, FURSE 2674! Between Polur and Lar, MATIN & TERME! South slopes Kandavan pass 23 km W of the tunnel, 2640 m, PABOT 4441! Damgh.-Semn.: E side of Qadamgah 60 km E Firuzkuh, 2600 m, AELLEN & BEHB. 217! Kuh-i Nizva 8–10 km N Chashm (Dhaschm, Tschafte), 2600–2900 m, AELLEN & BEHB. 216!, 218! Shahr.-Bust.: Kuh-i Kakashan, 3050 m, KOELZ 16417! In saxosis calc. jugi Abr NE Shahrud, 1950–2500 m, RECH. 55394!, 56339!, WDB. & FOROUGHI 12949! In decl. australibus M. Shahvar supra Nokarman (Nigarman) supra Rake, 3000 m, RECH. 5961!

Distr. gen. of subspecies.: Mountains of N Persia and Kurdistan; possibly the Taurus and Hermon.

C. foliosum s.l. is very variable throughout its wide range from N Africa and the Iberian peninsula to the Himalayas and the Altai mts. *C. foliosum* s.str. grows throughout most of that area, with also some related local taxa in various parts of the area. In the west, *C. exsuccum* (LOSCOS) UOTILA is common in NW Africa and the Iberian peninsula (cf. UOTILA, *Chenopodium exsuccum*, a neglected species of the *C. foliosum* aggregate, Ann. Bot. Fennici 16: 237–240 (1979). In the east, the rare *C. Korshinskyi* (LITW.) ILJIN & AELLEN grows in the Karakoram and the Pamir, and *C. Litwinowii* in the Hindukush and the Pamir; both being high mountain taxa. *C. foliosum* s.str. of the Altai mountains is replaced by a separate race.

Relationships of the high mountain taxon of the Elburs and the Zagros are most problematic; this taxon is here provisionally treated as a subspecies of *C. foliosum*, even though it has some similarities with *C. Litwinowii*, probably caused by adaptation to similar harsh conditions. Both *C. Litwinowii* and *C. foliosum* subsp. *montanum* are geographically sympatric with *C. foliosum* subsp. *foliosum*, but not with each other. The former two grow only at higher altitudes: *C. foliosum* subsp. *montanum* from 1900 to 3500 (–4200 m); and *C. Litwinowii* from (2300–) 2500–4000 (–4200) m. *C. foliosum* subsp. *foliosum* has a wider altitudinal range of from (1300–) 1500 to 3500 (–4200) m, but is more infrequent than the former at higher altitudes. I have seen few mixed sheets, which probably reflect few mixed communities; some unknown ecological factors appear to keep the populations separate.

All these high mountain races have somewhat smaller seeds than *C. foliosum* s.str., partly due possibly to the harsher conditions. Even in *C. foliosum* s.str. seed size may decrease from main stem fruits to those produced later in the season on side branches. Similarly, environmentally affected may be non-succulent glomerules, almost always in *C. foliosum* subsp. *montanum* and often in *C. Litwinowii*, and also in late season branches and depauperate plants of *C. foliosum* subsp. *foliosum*.

2. *C.* ***Litwinowii*** (PAULSEN) UOTILA, Ann. Bot. Fennici 30: 190 (1993).
Syn.: *Monolepis Litwinowii* PAULSEN, Vidensk. Meddel. Dansk Naturhist. Fören. Kjöbenh. 187 (1903).
Icon.: Tab. 9 fig. 4–6; 25 fig. 2.
Type: "Pamir, in siccis prope fl. Müscol. 4300 m, 2. VII. 1898, O. PAULSEN 667", C!; isotype LE!

Summer to winter annual, similar to *C. foliosum*, but a prostrate herb, often without a distinct main stem, basal branches to 50 cm long, secondary branches few. Petiole of basal leaves to 4 cm, lamina to 2,2 × 1,4 cm, triangular, dentate. Cauline leaves triangular, hastate and dentate or middle-lobe entire, especially on bracts, lobes and teeth mostly reflexed, base short attenuate to subcordate, apex acute. Glomerules 4–7 mm in diameter. Perianth segments 3, usually becoming red and succulent in fruit. Seeds 0,8–1,15 mm, ovoid (length: width ratio 1,15–1,30), margin obtuse to truncate, mostly not grooved. – 2n=18 (cf. UOTILA 1993).

Hab.: Mountain slopes on ± bare sand or gravel or between boulders, substrate acid or calcareous, often moist; roadsides, streambeds, gardens; 2300–4200 m. – Fl. V–X, fr. VI–X.

Afghanistan: SW: Ghorat: In decl. borealibus Kuh Cheling Safed Daraq S Parjuman, substr. calc., 2600–2800 m, RECH. 19090! – E: Kabul: S slopes of Unai pass, 3300–3960 m, BRECKLE 2706!, FURSE 8600! S side Salang pass, 2700–3300 m, BRECKLE 2220!, FOHLEN S-1-b!, PODLECH 12230!, 15946!, RECH. 31417!, 37467!, 37076!, UOTILA 18770!, 18881! Kabul, KOELZ 11114! Paghman: M. Paghman, 4000 m, VOLK 941! Kotal-i Kotandar, 4000 m, GILLI 20979!; 3000 m, NEUB. 324! Sanglakh, 3960 m, THESIGER 203! Ghazni: Sardalu pass W Qarabagh, 2300–2500 m, RECH. 17319! 15 km E Sabzak between Dasht-i Nawar and Malestan, 3500 m, PODLECH 19275! Jaji: N Khaneh 50 km E Shuturgardan (Shutur Augardan), 2600 m, EKBERG W-9211! – NE: Kataghan: N side Salang pass, 2400–3650 m, DOBSON 114!, FOHLEN N-4-K!, FURSE 6610!, 6036!, LAMOND 2226!, RECH. 31595!, UOTILA 17117! Khinjan valley, 2600 m, ANDERS 10972! Badakhsh.: Khash distr., 3050 m, KOELZ 13010! – E/NE: Salang, 3000–3500 m, BRECKLE 573!, CARTER 602!, NEUB. 5055! – C: Bamian: Band-i Amir ad lacum Band-i Zolfikar, 2900 m, RECH. 18424! Kuh-i Baba, Fuladi-Kar, 4200 m, BRECKLE A-1570! Doab: Lorinj pass, 3660 m, KOELZ 13764!

Distr. gen.: Afghanistan, Hindukush, Pamir.

3. *C. chenopodioides* (L.) AELLEN, Ostenia, Festschr. Osten: 98 (1933).
Syn.: *Blitum chenopodioides* L., Mantissa Pl.: 170 (1771). *Chenopodium botryodes* SM. in SOWERBY, Engl. Bot. 32: tab. 2247 (1811). *C. crassifolium* HORNEM., Hort. Bot. Hafn.: 254 (1813).
Icon.: HEGI, Ill. Fl.. Mitteleur. ed. 2, 3(2): 609, fig. 270a-d (1960). CASTROVIEJO et al., Fl. iberica 2: 491, fig. 144 h-m (1990). – Tab. 10 fig 1–2.
Type: "Habitat in Tataria; nunc in Svecia.".

Annual; stems greenish, yellow or reddish, prostrate to erect, 5–15(–40) cm, basally branched, internodes short, branches prostrate to procumbent. Leaves almost glabrous, sometimes young leaves mealy; petiole usually somewhat shorter than lamina; lamina fleshy, 1–3(–6) cm, broadly ovate to broadly triangular–broadly trullate, subentire (except for sometimes lobe-like basal angles) to coarsely dentate, obtuse at apex, short attenuate at base. Inflorescence terminal and axillary, composed of small, dense glomerules, arranged spicately–paniculately. Flowers dimorphic: terminal ones perfect, perianth segments 5, free to the middle or below, stamens 5; lateral ones perfect or female, perianth segments 3, membranous except for green somewhat keeled back, segments connate to near apex and forming a sac closely enclosing the fruit; stamens 0–3. Stigma 2, short, thick. Fruits falling with perianth. Pericarp membranous, free. Seeds brown, 0,6–0,9 mm, vertical and sometimes horizontal in terminal flowers, ovoid; testa with reticulate striations at least in central parts, minutely pitted.

Hab.: Salty muddy shores of ponds; (alt. Lenkoran–) 1740–1820 m. – Fl. IX, fr. IX–X.

Talish: Lenkoran, Ostrov Sara, 3 km NE Kazennaya, POBEDIMOVA!
Persia: W: Khuz.: Khorramshahr (Mohammera), NOË!
Afghanistan: E: Kabul: Aliabad, 1820 m, ANDERS 5326! Kabul, 1740 m, GILLI 2095! Charasiah, 1780 m, GILLI 2096! Panjeshah, NEUB. 51!

Distr. gen.: Europe, coasts of the Atlantic and the Mediterranean; inland salt marshes of SW, C and E Europe, local and very rare in Asia from Turkey and Iraq to C Asia and Afghanistan, and in Africa; introduced in N America.

A f g h a n i s t a n : N: Mazar-i Sharif: 10 km W Balkh on road to Akcha, 340 m, PODLECH 19799! – SW: Kandahar: Helmand valley, island opposite Qala Bist (Lashkargah), 800 m, FREITAG 2073!, 2074! Girishk, 1000 m, UOTILA 16469! – E: Kabul: Kabul, 1700–1800 m, BRECKLE 4942!, GILLI 2082!, LINDB. 1303!, UOTILA 18755!, 18908! Aliabad, 1800 m, PODLECH 19592!

Distr. gen.: Widespread in Europe, rare in the north and south; Egypt, Turkey, and from Persia and Afghanistan to W Siberia; introduced in N and S America, S Africa; in N America there is an indigenous race subsp. *humile* (HOOK.) HULTÉN.

Widely variable, as in Europe, but many plants from the Flora Iranica area deviate from more northern and western ones in being more hairy and greyer and in the leaf shape: the lamina is broad, almost triangular with basal, lobe-like outward-projecting teeth. Such leaves are not usual in Europe, and they resemble *C. chenopodioides* and certain plants of *C. urbicum*. Difficulties exist in determining young plants of these three species.

5. *C.* ***glaucum*** L., Spec. Plant.: 220 (1753).
Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2): 623, fig. 275 f-o (1961). SAVULESCU, Fl. R.P.R. 1: Pl. 78, fig. 3 (1952). – Tab. 11 fig. 1; 25 fig. 3.
Type: "Habitat ad Europae fimeta", LINN 313/17!; lectotype, selected by UOTILA, Ann. Bot. Fennici 30: 190 (1993).

Annual, 5–30 (–50) cm, almost glabrous except for the leaves beneath; stems green striped, sometimes red, usually erect, sometimes ascending to procumbent, often much branched especially in basal parts. Leaves somewhat fleshy; lamina (1–)2–3 x as long as petiole, (0,5–)1–3(–4,5) cm long, usually elliptic-ovate, sometimes narrowly elliptic, lanceolate or fairly broadly ovate, mostly coarsely sinuate-serrate to sinuate, sometimes subentire or slightly 3-lobed, usually obtuse at apex, variously attenuate at base, green and glabrescent above, glaucous-whitish and densely mealy below except for main veins, sometimes red especially in margins; bracts ± narrowly elliptic, entire to dentate. Inflorescence mostly leafy, axillary and terminal; composed of small, dense glomerules arranged spicately or paniculately. Flowers dimorphic, terminal flowers bisexual, with 3–5 perianth segments and 1–5 stamens; lateral flowers mostly female, with 3 perianth segments and 0 or 1 stamen. Perianth segments free to base, glabrous, obovate, margin broadly membranous, apex ± truncate, back green, swollen in apical part. Stigmas 2, short. Fruits falling with perianth. Pericarp thin, greenish and free or almost so. Seeds vertical in the lateral flowers, horizontal in the terminal ones, reddish to dark brown, 0,5–0,9 mm long, roundish-ovoid, margin rounded; testa sometimes with reticulate striations especially in central parts, minutely pitted. – 2n=18 (cf. UOTILA 1973)

Hab.: Gardens, yards, fields, roadsides, ruderal places, pools, river and lake shores; often salty soil; 1220–2900 m. – Fl. V–IX, fr. V–X.

T a l i s h : Lenkoran, LIPSKY! Lenkoran, Goryachie Istochniki, River Bilyazhchai, PASTUKHOV!
P e r s i a : N: Maz.: M. Elburs below Pol-e Zanguleh, 1400 m, GAUBA 1702! – W: Azerb.: In

litore salso lacus Rezaiyeh (Urmia), Sharafkhaneh, 1400 m, AELLEN & BEHB. 220!, 221!, BEHB. & AELLEN 30111-E!, RECH. 43640! Kürüsh-göl S Tabriz, STARM. 325! 25 km W of Mianeh, 1300 m, UOTILA 19500! M. Sabalan 38°10'N 47°40'E, 2740 m, HARRINGTON 255! Khamseh: Zanjan, Hotel Bimeh, 1700 m, UOTILA 19461! Esf.: Esfahan, SOJÁK 6834! – E: Khor.: Birjand to Torbat-e Heydariyeh, MANUCH. 30-E!
Afghanistan: SE: Kalat-i Ghilzai: Kalat, 2440 m, KOELZ 13218! E: Kabul: Kabul, 1780–1800 m, BRECKLE 4941!, GILLI 2083–2085!!, GRIFF. 1838-a!, KERST. 572!, LINDB. 1366/1962!, NEUB. 180!, 327!, PABOT 1390!, PODLECH 17058!, RECH. 18022!, UOTILA 16526!, 18753!, VOLK 265!, 1252! Gulbahar, VOLK! Pul-i Charkhi 20 km E Kabul, 1800 m, RECH. 36832! Paghman: Paghman-Stausee W Kabul, 2100 m, FREY 479! Gardez: Gardez, 2480 m, KOELZ 11903! – NE: Badakhsh.: Kalifgan W Kishm, PODLECH 12762! – C: Bamian: 23–25 km W Bamian, 2740–2900 m, PABOT!, UOTILA 18624! 4 km W Yakawlang on shore of Band-i Amir river, 2550 m, PODLECH 19572! Bamian Hotels, 2500 m, UOTILA 18709!
Pakistan: Quetta: Zaranda, Ziarat Distr., T. ALI & T. AHMAD 1317! Quetta, Baluchistan Univ. Campus, KHATOON & al. 447! Spin Karez, 1830 m, CROOKSHANK!

Distr. gen.: Europe, except for northernmost and westernmost parts; rare in the Mediterranean and Gulf of Persia area; C and E Asia; introduced in N America and Australia; other races are in western North America, South Africa, Australia and New Zealand.

Morphological variation of *C. glaucum* is relatively wide, and infraspecific races might be possible to recognize within the Eurasian range of the species. Most of the plants from the Flora Iranica area, as well as in surrounding areas, are morphologically fairly uniform and agree relatively well with south and central European plants. Our plants are typically erect, the leaves relatively long, coarsely and fairly acutely dentate, and the inflorescence is predominantly terminal and has a spicate appearance. More prostrate plants with relatively broader slightly 3-lobed leaves with sinuate to bluntly dentate margins and more hidden inflorescence are relatively few. In salty places plants are often depauperate.

6. *C.* ***urbicum*** L., Spec. Plant.: 218 (1753).
Syn.: *C. urbicum* var. *intermedium* (MERT. & KOCH) KOCH, Syn. Fl. Germ. Helv., ed. 1: 605 (1837).
Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2): 636, fig. 285c-d; 646, fig. 288g-l (1961). SAVULESCU, Fl. R.P.R. 1: Pl. 83, fig. 2–3 (1952). – Tab. 11 fig. 2; 25 fig. 7.
Type: "Habitat in Europae borealis plateis", LINN 313/2!; lectotype, selected by UOTILA, Ann. Bot. Fennici 30: 190 (1993).

Annual, stems 20–60 cm, erect, simple to few-branched, usually yellowish. Leaves glabrous to sometimes farinose, lamina longer than petiole, olive-green, in lower leaves to 10 cm, triangular, almost as broad as long, short attenuate into petiole, apex acute to obtuse, margins sinuate to regularly dentate, teeth outward-pointing, sometimes recurved, rarely subentire, often with outward-pointing basal lobes; in upper leaves narrowly triangular-trullate, coarsely dentate to entire. Inflorescence mostly leafless, erect, branches erect, spike-like, composed of small, compact densely arranged glomerules. Flowers perfect or female, small; perianth segments 5, yellowish green, free to near base, partly spreading in fruit, back somewhat swollen, not keeled. Stamens 5, basally adnate. Stigmas 2, short. Only part of fruits falling with perianth; pericarp membranous, somewhat adhering to seed. Seeds horizontal, black, 1,0–1,2 mm in diameter, roundish in outline, margin roundish; testa with weak reticulate striations to sometimes almost smooth.

Hab.: Ruderal and waste places, fields, stream sides; 1220–1770 m. – Fl. IX, fr. IX–XII.

I r a q : Kurd.: Arbil: Walash between Rawandiz and Rayat, THESIGER 304!
T a l i s h : Lenkoran, KARYAGIN & SOSNOVSKII, Fl. Azerb. 3: 195 (1952).
P e r s i a : N: Maz.: Sorkhabad, 1400 m, RECH. 5619! – W: Azerb.: NE shore of Rezaiyeh lake near Sharafkhaneh, 1220 m, AELLEN & BEHB. 219! Kurd.: Sanandaj (Sihna, Sinua), 1770 m, HAUSSKN.! – C: Qazv.: Karaj, Kamalabad, MAZAHERI 301314-E, p.p.! "Iran", RATHI 5420 A! – "Herbier de Perse", BELANGER!.
A f g h a n i s t a n : NW: Maimana: Maimana, RODIN 506! – NE: Badakhsh.: Kalifgan, PODLECH 12763! – C: Darra-i Suf: Qala Sarkari, 1520 m, KOELZ 13919!

Distr. gen.: Europe, rare in the north and south; Turkey, Syria, Iraq, Caucasia, Persia, Afghanistan, C Asia and W Siberia; introduced in N America.

7. *C.* ***polyspermum*** L., Spec. Plant.: 220 (1753).
Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2): 584, fig. 260 k-o (1960). ENGSTRAND & GUSTAFSSON, Bot. Not. 126: 274, fig. 89 (1973). – Tab. 12; 25 fig. 6.
Type: "Habitat in Europae cultis", LINN 313/19!; lectotype, selected by UOTILA, Ann. Bot. Fennici 30: 190 (1993).

Almost glabrous annual, stems 10–50(–80) cm, erect to procumbent, ± quadrangular, often red; lower branches subopposite, often long, secondary branches few. Leaf lamina 1,5–3 x as long as petiole, thin, green to brownish-reddish, usually 1,5–5 cm long, ovate to elliptic, entire, mostly short attenuate at base, acute to obtuse at apex; bracts lanceolate to obovate. Inflorescence elongated, axillary and terminal; flowers solitary or in small loose glomerules in variously branched lax cymes or in dense cymes arranged in spikes. Flowers perfect; perianth segments 5, free to the base, not contiguous, spreading in fruit, obovate, ± obtuse at apex, broadly membranous at margins, green on back and somewhat keeled near apex. Stamens mostly 1–3. Stigmas 2, short. Fruits falling without perianth; pericarp rather thick, radially furrowed, easily detached. Seeds horizontal, reddish brown to blackish, 0,8–1,0 mm in diameter, roundish in outline, margin obtuse; testa with radially elongated large pits with sinuous margins.

Hab.: Gardens, woods. – Fr. IX.

T a l i s h : Lenkoran, ALEXEENKO!, HOHEN.!, KOCH 2813!, 2827!, PRILIPKO! Alexejevka, "BEIDOMA"! Maschan, BOBROV & TZVELEV 734! Girkan, KURLJUTKUN! Prope Burdzaly, PASTUKHOV!, PRILIPKO! Vilyazh-chayu, PASTUKHOV! Sovhoz "Avrora", THEODOROV! Pr. pag. Vel, ZAKARJAN!

Distr. gen.: Europe, rare in the north and south, Turkey, Caucasus, W Siberia; introduced in N America.

Very distinct without close relatives.

8. *C. murale* L., Spec. Plant.: 219 (1753).
Syn.: *C. ilicifolium* GRIFF., Not. Pl. Asiat. 4: 337 (1854), Icones Pl. Asiat. 4: Pl. 521 (1854).
Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2): 622, fig. 274; 646, fig. 288 a-e (1961). SAVULESCU, Fl. R.P.R. 1: Pl. 81, fig. 1 (1952). – Tab. 13; 25 fig. 8.

Type: "Habitat in Europae muris aggeribusque", LINN 313/6!; lectotype, selected by BRENAN, Fl. Trop. E Africa, Chenopodiaceae: 7 (1954).

Annual, stem yellowish to green-striped, rarely tinged with red, (3–)10–90 cm, usually erect, often much branched especially in basal parts, branches ± spreading, lowermost subopposite. Leaves usually olive green, sometimes yellowish or tinged with red, ± farinose; petiole shorter than or equal to lamina; lamina thin to somewhat fleshy, 1–8(–10) cm long, usually relatively broad, triangular – broadly ovate (– rhombic), coarsely dentate, not 3-lobed, teeth slightly incurved and acute to obtuse, apex acute to obtuse, base variously attenuate to truncate; uppermost leaves lanceolate, sometimes entire. Inflorescence terminal and axillary, mostly leafy, divaricately branched, branches shorter than subtending leaves, glomerules small, ± densely arranged. Flowers bisexual and sometimes female. Perianth segments 5, connate below the middle, prominently keeled near apex, green, sometimes red when old, vesicular hairy. Stamens 5. Stigmas 2. Fruits falling with perianth. Pericarp prominently papillose, firmly adherent. Seeds horizontal, black, 1,2–1,4 mm in diameter, round in outline, margin acutely keeled; testa prominently pitted, pits not elongate. – 2n=18 (cf. UOTILA 1973).

Hab.: Gardens, fields, roadsides, ruderal places, semi-deserts, poplar and palm plantations, streamsides, seashore, sometimes limestone cliffs and saline places; s.l.–1675 m. – Fl. I–VI, fr. II–XII.

I r a q : Kurd.: Arbil: Gali Ali beg, 1200 m, ANDERS 1415! – Mosul: Mosul, REGEL!
T a l i s h : Orant, ad fl. Orant Czai, 1650 m, ALEXEENKO! Lenkoran, LIPSKY! Lerik, BOBROV & TZVELEV!
P e r s i a : N: Gorg.: Tappeh-ye Moraveh N Gonbad-e Kavus, 200 m, HEWER 3770! Gorgan, 10 m, AELLEN & BEHB. 224!, SHAR. 588-E! Bandar-i Gaz, in ruderatis, SINT. 1398! Maz.: 32 km SE Chalus, 760 m, FURSE 2866! 23 km S Amol, JARDINE 844! Gilan: Ispili, LINDS. 1280! – W: Khuz.: Haft Tappeh, IRANSHAHR & TERME! Isin, 150 m, KOELZ 14188! 18 km from Chahar-e Rah-e Bibi Hakimeh to Dow Gonbadan, IRANSHAHR & TERME! Khorramshahr (Mohammerah) near Karun river, KOEIE 944! 60 km NE Dezful, 500 m, KOEIE 945! Between Haft Gel and Masjed Soleyman, PABOT! – S: Fars.: 16 km from Taheri to Jam, 600–650 m, BOKHARI & WDB. 247! Jahrom, KOELZ 14656! Bushehr, KOELZ 14843!, KOEIE 232!, STAPF 815! Konar Takhteh, STAPF 813! Rishahr, STAPF 814! Farrashband, SHARAFEH! In angustiis Tang-e Chogan-e Olia, 29°47'N 59°35'E, SOJÁK 5848!, 5934! 5 km SW Borazjan, 150 m, DAVIS & BOKHARI 56058! Rudak to Borazjan, 400 m, DAVIS & BOKHARI 55907! Kerm.: Tomagoa, KOELZ 14341! Isin, SOJÁK 4576!, 4587!, 4593!, 4598! Minab, SOJÁK 4811!, 4812!, 4855!, 4677! Khanu near Hamun-e Jaz Murian, 400 m, STARM. 88! Lar: Bandar Abbas, 10 m, PABOT 6576? / 6516!, IRANSHAHR & TERME! 50 km from Bandar Abbas to Minab, 50 m, TERME & al. 41712-E! 24 km S Kahorestan, IRANSHAHR & TERME 34376-E! Gav Bandi, PAG 39384-E! Hajjiabad prope Tarom, 900 m, RECH. 3285! Sabzvaran, SOJÁK 4221! Island of Qeshm (Kishm), BORNM. 634!, KUNKEL 16502-16504!!, 16529!, 16679!, 16747!, TERME & MOUSSAVI

34567-E!, 34569-E! Island of Hengam (Henqam), KUNKEL 16851!, 16859!, 16870! Island of Lavak, KUNKEL 16679!, 16830!, TERME & MOUSSAVI! Island of Khark, TERME & MOUSSAVI 34566-E! Bal.: Bazman, 750 m, IRANSHAHR & ERSHAD! Makran: Between Bahu Kalat and Hudar, IRANSHAHR & ERSHAD! Bahsu Kalat, SOJÁK 1211! Tis, SOJÁK 1370!, 1374!, 1376! 13 km SSE Nikshahr, SOJÁK 1491! 34 km E Nikshahr to Qasr-e Qand, SOJÁK 1582! Iranshahr, SOJÁK 1807! Rask, 300 m, IRANSHAHR & ERSHAD! 10 km ENE Sarbaz, SOJÁK 815!, 972! Chah Bahar, 15 m, POPOV PS 10! Biaban: Between Bemuni and Gachineh, IRANSHAHR & MOUSSAVI! – E: Khor.: Mashhad, RECH. 4844! Zoshk, TERME & TEHRANI 35153! Tayyebat, 840 m, UOTILA 16273!, 18948! – C: Tehr.: Mahmudiyeh 15 km N Tehran, 1250 m, AELLEN 225! Kashan: Kashat, weed in garden, 990 m, AELLEN & SHAR. 223! Siin Dasht in Hableh Rud valley, 1150 m, AELLEN & MANUCH. 222! – Persian plants, THRELFALL! "Herbier de Perse", BÉLANGER!

T u r c o m a n i a : Kopet Dagh: Koina Kosyr, DUBIANSKY & BASILEVSKAJA! Ashkhabad, in ruderatis, LITW. 74! Ferghana, PAULSEN 338!

A f g h a n i s t a n : N: Mazar-i Sharif: Chashmeh-e Shafal in faucibus fl. Balkh SW Mazar-i Sharif, 460–800 m, RECH. 16198!, UOTILA 16900! Andkhui, RECH. 16134! 25 km NW Haibak (Samangan) on road to Khulm, 850 m, UOTILA 16800! – SW: Farah: Farah, 520 m, KOELZ 13256! – SE: Kandahar: Helmand valley opposite Lashkargah (Qala Bist), 800 m, FREITAG 2076! Kandahar, 1000 m, UOTILA 16498! – E: Kabul: Sarobi, VOLK 1885! Nangarhar: W Jalalabad near Charbagh (Tscharbagh), 600–700 m, KERST. 646! Jalalabad, 570–900 m, ANDERS 2852!, BRECKLE 217!, PODLECH 22140!, UOTILA 17314! – NE: Kataghan: 8–17 km W Khinjan, 1000 m, UOTILA 16629!, 16675! Baghlan, VOLK 774!, 775! Pul-i Khumri, 550–650 m, TONČEV in FREITAG 2249!, UOTILA 17038! 6 km S Pul-i Khumri, 650 m, UOTILA 17105! Taliqan: Khanabad, 610 m, KOELZ 12206! Ak Masjed S Taliqan, 850 m, PODLECH 11395! Badakhsh.: Faizabad (Faydzabad), PODLECH 12740! – Afghanistan, GRIFF. 1738!

P a k i s t a n : Chitral: Drosh, GHAFOOR & OMER 2464! Chitral, HARRISS 16575! – Peshawar: Peshawar, DEANE!, PODLECH 17199! Nowshera 43 km E Peshawar, 400 m, UOTILA 17354!, 17379! Between Peshawar and Landi Kotal, GHAFOOR & JEHANDAR 976! Kalat: Khuzdar, GHAFOOR & GOODMAN 4948!, Khuzdar, NAZIM & ABEDIN 513! – Dera Ismail Khan: 3 km from Dera Ismail Khan to Bannau, QAISER & GHAFOOR 1618! Dera Ismail Khan, coll. ign. 7195! – Quetta: Spin Karez 15 km from Quetta, T. ALI & T. AHMED 1375! Fort Sandeman, HARSUKH 20637! – Sibi: 16 km from Nasirabad to Larkana, NAZAINA & al. 138! – Makran: Panjgur, in palmetis (*Phoenix dactylifera*) 1000 m, LAMOND 614!, RECH. 28156! 33 km from Turbat to Panjgur, FAROOGI & al. 893! 8–25 km W Awaran to Rubat, RECH. 27731! 30–70 km from Awaran to Hoshab, T. ALI 716!, 1474! 10 km W Hoshab, 100–200 m, LAMOND 378! Ras Nuh S Gwadar, 50–100 m, LAMOND 492!, RECH. 27907! Neli Nut prope Kappar inter Pasni et Kappar, RECH. 27895! – Karachi: Karachi, ANSARI 11!, GHAFOOR!, GHAFOOR & al. 3474!, JALAL & SADI 6!, SAADI J. SHARIQ 33!

Distr. gen.: From C and S Europe and N Africa to Caucasia, Persia, Afghanistan, Turcomania, India, Ceylon and the Arabian peninsula; introduced in subtropical and tropical C, E and S Africa, America, Australia and Oceanic islands.

Probably the most common species of *Chenopodium* in lowland parts of our area. Usually easily recognized by its leafy inflorescence, its yellowish to pure green colour, and always by its clearly pitted testa and the acutely keeled margin of the seed.

9. *C. badachschanicum* TZVEL., Not. Syst. Leningrad 20: 434 (1960).
Icon.: Tab. 14, 25. fig. 9.
Type: Tadjikistan, Pamir occid., in decl. lapidoso in valle fl. Murghab 3–4 km infra ostium fl. Pschart occid., 3300 m, 16.VI.1958, N. TZVELEV 220, LE!

Sparsely farinose to subglabrous annual; stem 15–100 cm, yellowish-green, erect, angular, branched, lower branches sometimes subopposite. Petiole usually c. 1/3 of the length of leaf lamina; lamina thin, 3–8(–15) cm, triangular to ovate, with outward-projecting acute basal lobes and 0–2 lobe-like acute teeth on both sides, apex acute to acuminate, base subtruncate to slightly cordate; bracts narrowly triangular, hastate, uppermost lanceolate. Inflorescence narrow, lax, mostly leafless, terminal and axillary, cymose-dichasial, branches divaricate, glomerules loose, small or flowers solitary. Perianth segments 5, free to below the middle, partly spreading in fruit, with a sturdy midrib visible inside, back apically keeled. Stamens 5. Stigmas 2–3. Part of fruits falling with perianth. Pericarp persisting. Seeds horizontal, black, 1,6–2 mm in diameter, round in outline, margin somewhat acute; testa with large, irregular but mostly radially elongated pits, radial furrows and other irregularities.

Hab.: "Substr. granit", "*Juniperus* region"; 1830–2700 m. – Fl. VII, fr. VII–VIII.

Afghanistan: E: Nuristan: S slopes of Spuk-Pass between Waigalak und Bardsdesch, 2000–2700 m, KERST. 1200!
Pakistan: Swat: Ushu, NASIR & SIDDIQUI 1043! Utror, ca. 35°35'N, 72°25'E, 2500 m, RECH. 19544! W of Swat River above Bahrein, 1830–2130 m, RODIN 5560! – Quetta: Ziarat, A. ALI 225! Sasnamama, *Juniperus* forest region, SARWAR ALAM s.n.!

Distr. gen.: NE Afghanistan, N Pakistan, N India, Nepal, C Asia, China.

C. badachschanicum belongs to the *C. hybridum* aggr., and specimens of it in the past have generally been named as *C. hybridum*. It differs from *C. hybridum* L. in laxer inflorescences and narrower leaves with more elongated apices, angles and teeth, and especially in the seeds which have a somewhat acute margin and a prominently irregularly ornamented testa compared with the rounded margin and regularly deeply pitted testa in *C. hybridum*. *C. hybridum* aggr. is morphologically more variable in Asia than in Europe or N America, both in leaf shape and fruit characters (cf. A. BARANOV, On the perianth characters of Chenopodium hybridum and C. gigantospermum, Rhodora 66: 168–171, 1965). Our taxon has been named with some hesitation as *C. badachschanicum*, the type specimen of which is somewhat young and probably reprensents an extreme high mountain plant.

When the manuscript was in print *C. hybridum* L., Spec. Plant. 219 (1753), was revealed to be a member of our Flora. A specimen from Gilan: Achewlar (Talish, Ach-Ewlar), BUHSE! was found in LE. The find matches well with the previously known area of *C. hybridum* with stretches from Europe to the Caucasus.

10. *C. ficifolium* SM., Fl. Brit. 1: 276 (1800).
Syn.: *C. serotinum* auct., non L. (1756).
Type: "In fimetis et ruderatis. About London", W. CURTIS.

Annual, 20–70 cm tall. Stem usually erect, green-striped, sometimes yellow or tinged with red, rarely with red spots in leaf axils, branched, branches spreading, fairly short. Leaves fairly thin, glabrous to farinose, petiole as long as or shorter than lamina; lamina 2–5 cm long, elliptic to ovate, usually with a forward-projecting tooth or lobe on both sides near base; middle-lobe ± oblong, with several teeth or sometimes subentire, obtuse to truncate at apex. Inflorescence a terminal, much branched rather loose panicle, leafless only in terminal parts; bracts narrowly lanceolate, usually entire; glomerules small. Perianth segments 5, connate to middle, slightly keeled on back. Stamens 5. Stigmas 2. Fruits falling with perianth. Pericarp ± adherent. Seeds horizontal, black, 0,8–1 mm, roundish in outline, margin ± obtuse; testa with radial striae and radially elongated pits, more circular near the margin.

Distr. gen.: From C Europe and the Mediterranean area to SW, S and C Asia, China, India, Japan, SE Asia.

1a. Stem branched mainly in upper parts; leaves mostly pure green, large, usually with prominent side lobes, middle-lobe entire to dentate; pericarp somewhat adherent; pits on testa angular and distinct, with ± straight margins . . . . subsp. *ficifolium*

b. Stem often much branched in basal parts; leaves often greyish green, small to fairly large, truncate at apex, dentate, side lobes usually not very prominent or if so the middle-lobe broad and short; pericarp fairly adherent; pits on testa shallower and more obscure, with sinuous margins . . . . subsp. *Blomianum* (AELLEN) AELLEN

– – subsp. ***ficifolium***

Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2): 623, fig. 275 a-e: 624, fig. 276a (1961). SAVULESCU, Fl. R.P.R. 1: Pl. 80, fig. 2 (1952), as *C. serotinum*. – Tab. 15 fig. 1; 26 fig. 3.

Hab.: Fields, ruderal places, "ad versuras"; 550–1750 m. – Fl. IV–IX, fr. IX.

Iraq: Kurd.: Mosul, pr. Mosul, KOTSCHY 450b, pp.!
Persia: E: Khor.: Mashhad 900 m, RECH. 4892!
Afghanistan: E: Kabul, Kabul, 1750 m, RECH. 18021! – NE: Kataghan: Kunduz, between Kunduz and Khanabad, 550 m, ANDERS 5869!

Distr. gen. of subspecies.: From C Europe and the Mediterranean area to C Asia.

–– subsp. ***Blomianum*** (AELLEN) AELLEN in HEGI, Ill. Fl. Mitteleur., ed. 2, 3(2): 624 (1960).

Syn.: *C. Blomianum* AELLEN, Bot. Not. 1928: 203 (1928). *C. ficifolium* subsp. *Blomianum* var. *indicola* (MURR) AELLEN in HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2): 624 (1961), comb. inval.

Icon.: AELLEN, Bot. Not. 1928: 204 (1928). – Tab. 15 fig. 2; 25 fig. 1,2.

Syntypes of subspecies: Sweden; Kristianstad, 1921, C. BLOM! and Göteborg, 1927, C. BLOM!; adventive plants.
2n=18 (cf. UOTILA 1973).

Hab.: Gardens and other cultivated places, ruderal places, roadsides; 370–1800 m. – Fl. IV–IX, fr. V–X.

Afghanistan: SE: Kandahar: Kandahar. KITAM.! – E: Kabul: Kabul, GILLI 2074!, LINDB. 1302/1962!, TOGASHI 4, UOTILA 18471!, 18479!, 18749!, 18750!, 18754!, 18907! Nangarhar: Jalalabad, 610 m, UOTILA 17324!, 21077! Khost: Khost, WALD 40! – NE: Kataghan: Pul-i Khumri, 650 m, UOTILA 17057! 6 km S Pul-i Khumri, 650 m, UOTILA 17106!
Pakistan: Swat: Mingora, ZIA-UL QAMAR 9! – Peshawar: E Pabbi on the road to Rawalpindi, 370 m, UOTILA 17293! – Dera Ismail Khan: Dera Ismail Khan, RECH. 30014!

Distr. gen. of subspecies.: Lowland Iraq, Afghanistan to India, China, Japan, SE Asia.

AELLEN (1960) divided *C. ficifolium* into two subspecies based on seed coat characters, and separated further taxa on the basis of leaf shape. Even if there are also differences between Indian and European *C. ficifolium* in leaf shape, the variation in both subspecies and their overlapping is such that in some cases the races cannot, without seeds, be separated with certainty. All the material listed under subsp. *ficifolium* lacks ripe seeds, but the leaf shape of especially Kurdistan and Persian plants does agree well with the type subspecies. Furthermore, the variation in seed coat characters in this group needs to be re-assessed, and the subspecific division of *C. ficifolium* accepted here must be considered provisional.

11. ***C. vulvaria*** L., Spec. Plant.: 220 (1753).
Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2): tab. 96, fig. 3 (1960). SAVULESCU, Fl. R.P.R. 1; Pl. 83, fig. 1 (1952). – Tab. 16 fig. 1; 26 fig. 5.
Type: "Habitat in Europae cultis oleraceis", LINN 313/18!; lectotype selected by JAFRI & RATEEB, Fl. Libya 58: 15 (1978).

Low, grey-farinose annual, smelling of decaying fish, especially when rubbed between finger and thumb; main stem to 30 cm, erect to procumbent, without red colour, usually divaricately much-branched, lowermost internodes short and lower branches often subopposite, to 70 cm long, ascending to prostrate. Leaf lamina grey-farinose especially beneath, greener above, rarely reddish, longer than or equal to petiole, 0,5–3 cm long, broadly trullate or broadly ovate to ovate, margins entire, in large leaves sometimes with a fairly acute angle on each margin at broadest point, base truncate to short attenuate, apex obtuse to acute. Inflorescence small, terminal and axillary, composed of loose, short thyrses, glomerules small. Flowers perfect or lateral ones often female. Perianth segments 5, with rounded back. Stamens 5 or 0. Stigmas 2, short. Fruits falling with perianth. Pericarp somewhat adherent. Seeds horizontal, brownish black, 0,9–1,2 mm in diameter, round in outline, margin obtuse, roundish; testa almost smooth except for weak radial striae.

Hab.: Gardens, yards, roadsides, fields, steppes, open forests; 530–2800 m. – Fl. V–IX, fr. V–X.

Talish: "Revarut", 1615 m, ALEXEENKO!
Persia: N: Gorg.: Gorgan, SHAR. 506!, 586! 6 km N At Temar on road to Hottan, HEWER

3746! Moh. Reza Shah Prot. Reg.: Ad cascades E Tang-e Gol, substr. calc., 750 m, RECH. 5266! Tang-e Gol, 540 m, UOTILA 19034! Maz.: 48 km of Shahi, 1220 m, FURSE 2933! 60 km NNW Tehran 5 km N of tunnel, 2400 m, SODER 120! 5 km from Veresk to Firuzkuh, 1400–1450 m, MATIN & TERME 41709-E! Gilan: Gilan, LINDS. 1090! – W: Azerb.: Tabriz, GILL.-SM. 1313 p.p.! Slopes above Goja Bel Pass 20 km W Ahar, JARDINE 603! Kuhha-ye Sabalan, in decl. borealibus "Radar Road", 2650 m, LAMOND 4732! & TERME in RECH. 44112! Shotur-su, 1600 m, TERME 30350-E! Dasht-e Moghan: 14 km SE Alirezaabad-e Jadid, 50–90 m, LAMOND 3169! Khamseh: Kuh-i Qeydar, 2200–2650 m, TERME & MOUSSAVI 40087-E! Esf.: Esfahan, HAUSSKN.! 30 km S Esfahan versus Shahreza, SAHEBI 2017! Lur.: Dow Rud, 1520 m, KOELZ 15704! – S: Fars.: Shiraz, STAPF 812! Eqlid, SHARAFEH 40286-E! Mian Jangal, SOJÁK 5165! Kerm.: Kuh-e Jupar, 2100 m, BORNM. 4159! Kuh-e Jebal Barez near Deh Bakri, 1700–2700 m, SOJÁK 4115! Kerman, 1700 m, RECH. 2959! – E: Khor.: 35 km E Shirvan, 1100 m, UOTILA 19076! In montibus inter Bojnurd et Tappeh-ye Moraveh, RECH. 1932! Helali inter Gonabad et Behestan, 1250 m, RECH. 51480! In collibus ad Torbat-e Heydariyeh, 1300 m, RECH. 4332! Tayyebat, 840 m, UOTILA 16275!, 18952! Sarbisheh, MANUCH. 30126-E! – C: Tehr.: Mahmudiyeh 15 km N Tehran, 1250 m, AELLEN 233!, 234! Hableh Rud Valley near Sinin Dasht, 1150 m, AELLEN & MANUCH. 232! Qazv.: Karaj, 1330 m, AELLEN 231!, GAUBA 1127!, 2097! Kamalabad near Karaj, MAZAHERI 40287-E!, RECH.! Damgh.-Semn.: Sarlash S Kuh-i Nizva, 2350 m, AELLEN & BEHB. 240! 45–52 km from Shahmirzad to Fulad Mahalleh, 2200–2300 m, RENZ & IRANSHAHR 16787! Shahr.-Bust.: Turan Prot. Reg.: Baghestan, 1250 m, BRECKLE & BHADRESA 5148! Qaleh Bala, 1120 m, RECH. 50382! In decl. australibus M. Shahvar supra Nokarman, RECH. 7547! Khush Yailaq, Gardaneh-ye Olang, 1950–2000 m, TERME & MOUSSAVI 39358!

T u r c o m a n i a : Ashkhabad, SINT. 641!

A f g h a n i s t a n : N: Mazar-i Sharif: Akupruk (Aq Kupruk), ca. 36°5'N, 66°52'E, 700–800 m, RECH. 16320! Shashma-i Shafa Pass (Chashmeh-i Shafal) 25 km S of Mazar-i Sharif (Balkh), 460 m, UOTILA 16906! Kuh-e Damesh Pass S Tashkurghan (Khulm), 530 m, UOTILA 16996! – NW: Herat: Herat, 850 m, UOTILA 16338! – SE: Kandahar: Kandahar, 1000 m, UOTILA 16499! – E: Kabul: Gulbahar, 2100 m, VOLK 266! Kabul, 1800 m, BRECKLE 4943!, HAY 307!, 448!, NEUB. 48!, 319!, PODLECH 17059!, UOTILA 18906! Maidan Valley near Kotal-i Ashro, 2240 m, PODLECH 18679! Gulbahar, VOLK 266! Gardez: Gardez, 2440 m, KOELZ 11913! – NE: Kataghan: Sorkhab Valley 2 km S Sangsolakh, 750 m, PODLECH 18243! 8 km W Khinjan, 1000 m, UOTILA 16628! Pul-i Khumri, 650 m, UOTILA 17039! Taliqan: Taliqan towards Kalifgan, GIBBONS! Taliqan, 720 m, PODLECH 10442! Badakhsh.: Kalifgan, PODLECH 12765! – C: Ghorat: Chakcharan (Qala Qansi), Darrah-e Nayak, 2100 m, JANATA 66!

P a k i s t a n : Quetta: Sariab Road near Quetta, GHAFOOR & RIZWAN 1010! Quetta, S.I. ALI 1237!, STEW. 27990!, PAUKASH 16462! Quetta, Chaman Phatak, GHAFOOR 1402! Chiltan at. Park near Kooli Hazzargangi, RIZWAN 1569!

Distr. gen.: The Mediterranean area, C and E Europe, SW and C Asia; introduced in S Africa, N America and Australia.

Very variable in leaf size; the nasty smell of trimethylamine persists even in several decades old herbarium material by slightly moistening the plant before rubbing between finger and thumb.

12. *C.* ***Sosnowskyi*** KAPELLER, Vestn. Tiflisskogo Bot. Sada. Nov. ser. Vyp. (Monit. Jard. Bot. Tiflis, 1926–1927, n.s. Pt.) 3–4: 47 (1927).
Icon.: Tab. 16 fig. 2–3.
Type: Described from several localities in Caucasus; type at TBI, not designated.

Annual, 7–70 cm tall, farinose. Stem yellowish to pale green-striped, rarely reddish, erect, sometimes ascending, branched especially in basal parts, branches spreading to ascending, long. Leaves not smelling of decaying fish; lamina green above, glaucous to greyish green below, to 35 × 35 mm, broadly triangular to broadly ovate or ovate, entire or slightly 3-lobed with acute small lobes, base short attenuate to almost truncate, apex obtuse to acute-acuminate, margin entire except for basal lobes; upper leaves narrowly ovate-elliptic to lanceolate, acuminate. Inflorescence terminal and axillary, small, fairly lax, glomerules small, loose. Perianth segments keeled on back. Stamens 5 or 0. Stigmas 2, fairly long. Fruits falling with perianth. Pericarp greenish, somewhat adherent. Seeds horizontal, black, lustrous, 1,2–1,5 mm in diameter, round in outline, margine obtuse, testa with obscure radially reticulated striations.

Hab.: Fields, gardens, dry river beds, river shores, mountain steppes; 1200–2800 m. – Fl. VI–VII; fr. VI–VIII.

T a l i s h : Lenkoran: Lerik, BOBROV & TZVELEV 656! 1–2 km W Khodzhadai, MATVEEVA! P e r s i a : N: Gorg.: Shah Pasand, PETTER! Shahkuh, KOELZ 16230! Maz.: N of water shed above Elika (Ileka), 2290 m, FURSE 2789! Pol-e Zanguleh in valle fl. Chalus, 2200–2600 m, RECH. 6390! Distr. Kojur inter Zanus et Kinch, 1300–1600 m, RECH. 6591! Below Qomrud Bala, 2200–2400 m, AELLEN & BEHB. 227! Qomrud Pain, 2200 m, AELLEN & BEHB. 239! Gilan: In fagetis W Asalem (Navrud) versus Khalkhal (Herowabad), 1250–1900 m, RECH. 43381! Barreh Sar between Amarlu and Damash, 1800 m, TERME & DARYADEL 30408-E! "Tspili" (Espeyli ?), LINDS. 1360! – W: Azerb.: In valle fl. Qotur W Khvoy versus fines Turcicas, 1800–2000 m, RECH. 41690! – E: Khor.: Mashhad, RECH. 4845! Inter Gardaneh Perimus S Bojnurd et Esfarayen, substr. calc., 1700–1800 m, RECH. 53563! M. Hazar Masjed inter Ardak et Talqur (Tolgor), 1200–1600 m, RECH. 4996! – C: Tehr.: M. Tuchal in Hafthauz valley, 1300–1500 m, AELLEN 228! Shore of Delichay river 100 km E Tehran, 1700 m, AELLEN 229! M. Damavand above Reneh, 2640 m, GILLI! S Ab-e Garm, S-foot of M. Damavand, 2200 m, AELLEN 230! Qazv.: Gach Sar NE Karaj, 2130 m, FURSE 2687! Damgh.-Semn.: Sarlash S Kuh-i Nizva, 2350 m, AELLEN & BEHB. 339! Kuh-i Nizva 8–10 km N Chashm (Dhaschm, Tschafte), 2600 m, AELLEN & BEHB. 226! Between Shahmirzad and Chashm, 2800 m, IRANSHAHR & ZARGANI 15279-E! Kuhha-ye Kahesh, 2130–2350 m, TERME & al. 39374! Shahr.-Bust.: In decl. australibus M. Shahvar supra Nokarman prope Dihi, 2500 m, RECH. 5930! Nokarman (Nekarman, Nigarman), 2000 m, RECH. 6255!

Distr. gen.: Caucasus, E Turkey, Persia.

KAPELLER (1927) says that fresh plants of *C. Sosnoswskyi* can sometimes have the smell of trimethylamine, but the smell is not present in dried herbarium specimens. *C. Sosnowskyi* is often less mealy, and greener, than its relative *C. vulvaria*, and even its small leaves often have a lamina with basal angles or lobes and leaves relatively longer, the perianth segments more keeled and the seeds larger with a more scultured testa than in *C. vulvaria*.

13. *C. **Karoi*** (MURR) AELLEN, Feddes Repert. 26: 149 (1929).
Syn.: *C. **album*** subsp. *Karoi* MURR, Neue Übers. Farn.- u Bl. Pfl. Vorarlberg 97 (1923). *C. **prostratum*** BUNGE in HERDER, Acta Horti Petrop. 10:594 (1889) non SCHULTES (1820).

Icon.: Tab. 17 fig. 1–2.
Type: Described from Sibiria, (sic).

Slender annual to 30 cm; stems (erect-)ascending(-prostrate), yellowish to green-striped, sometimes partly with red, usually branched especially basally, lowermost branches subopposite, ascending, upper spreading, Leaf lamina 1–2 cm, ovate to broadly ovate to trullate or elliptic, slightly 3-lobed, ± farinose especially below, lobes rounded, margin ± entire, base short attenuate, apex obtuse to acute. Inflorescence paniculate, mostly terminal and on short branches, glomerules small, loose to dense. Perianth segments 5, green, farinose, united up to the middle, keeled on back. Stamens 5 or 0. Stigmas 2. Pericarp fairly loose to somewhat attached. Seeds horizontal, black, (0,8–)1,0–1,3 mm in diameter, round in outline, margin ± obtuse; testa with radial furrows and elongated shallow pits especially near the margin.

Hab.: Fields; 1650–4000 m. – Fl. VIII–IX, fr. VII–IX.

Afghanistan: E: Nuristan: Bashgal Valley between Bargematal and Kamdesh, 1700 m, BRECKLE A-3293! Bashgal Valley 7 km supra Kamdesh, 1650 m, PODLECH 16739! – NE: Munjan: Sanglich, 3500 m, KOELZ 12647! Wakhan: Lower Waghjir Valley until Zemestan-e Tikili, 37°06 N, 74°05' E, 3950–4000 m, ANDERS 7620!
Pakistan: Dir: 1,6 km from Dir to Loasi Tofs, QAISER & GHAFOOR 6483! – Chitral, Baroghil Pass 3660 m, STAINTON 2982! – Swat: Kalam, 35°30'N, 72°30'E, 2200 m, RECH. 19466!

Distr. gen.: Tian-Shan, Pamir, N Hindukush, Himalayas, C Asia, Siberia.

Several taxa have been described from Central Asia to Siberia belonging to the group of small Chenopodiums with slightly 3-lobed, otherwise almost entire leaves. The name *C. Karoi* is accepted here, with hesitation, in a wide sense. *C. pamiricum* ILJIN is related to *C. Karoi* but probably not conspecific. The relationships between *C. Iljinii* GOLOSK., *C. Karoi* and *C. pamiricum* should also be considered. The taxa have never been compared in the same study, and a revision is needed. The few specimens from Flora Iranica area are heterogeneous: the specimens BRECKLE A-3293, PODLECH 16739 and RECH. 19466 have a diffuse branching habit, small, fairly smooth seeds and small leaves, and could belong to *C. pamiricum*.

14. ***C. Novopokrovskyanum*** (AELLEN) UOTILA, Ann. Bot. Fennici 30: 192 (1993).
Syn.: *C. album* subsp. *Novopokrovskyanum* AELLEN, Trudy Rostovskogo Oblast. Biol. Obch. 2: 3 (1938). *C. album* var. *Novopokrovskianum* AELLEN in ILJIN & AELLEN, Fl. URSS 6: 62 (1936), nomen inval. *C. leptophyllum* sensu MURR, Magyar Bot. Lapok 2: 5 (1903), p.p., non NUTT.
Icon.: Tab. 17 fig. 3; 26 fig. 4.
Type: P. SINTENIS 527, S! lectotype selected by UOTILA 1993; isolectotypes G!, G-DC!, K!, LD!, LE!

Annual herb, usually 20–60 cm tall. Stems erect, greyish green-striped – yellowish, almost always without red colour, branched, lowermost branches often close to each others, subopposite, longer, ascending, other branches relatively short, spreading to ascending. Lamina of leaves silvery to glaucous green especially below, often also above, sometimes pure green, (1–)2–4,5(–6) × 0,5–1,5(–2,5) cm, 2–3 × length of the petiole, narrowly trullate to narrowly elliptic, often in main stem with a pair of lobe-like teeth at broadest point of lowermost leaves, otherwise entire, rarely with solitary other blunt teeth, sometimes totally entire, apex acute to obtuse and shortly acuminate; upper leaves narrower, lanceolate, acute – acuminate. Inflorescence spiciform small, terminal, leafless, glomerules small, dense. Perianth farinose, segments often spreading in fruit, divided to 1/2 or somewhat more, margin membranous, apex obtuse to emarginate, back rounded, midrib often clearly visible on inner side. Part of fruits falling without perianth. Pericarp ± easily removed. Seeds horizontal, black, 0,9–1,2 mm, round in outline, margin obtuse; testa almost smooth or with obscure radial striae.– 2n=36 (cf. UOTILA 1993).

Hab.: Fields, gardens, roadsides, ruderal places, irrigated places, riverbanks, deserts; calcareous and acid places; 300–2650 m. – Fl. IV–VIII, fr. V–XI.

P e r s i a : N: Maz.: 32 km SE Chalus, 760 m, FURSE 2867! Tejan valley (Tedschen) near Qomrud Pain, 2200 m, AELLEN & BEHB. 252! – W: Esf.: 7 km W Esfahan, 1600 m, RECH. 46656! Esfahan, SOJÁK 6830! – S: Fars.: N Darab, MONSEF 40268-E! Kerm.: Kuh-e Jupar, 1830 m, ARMSTRONG 14! Kerman, RECH. 2952*! Baghin, 1900 m, BORNM. 5091! Minab, SOJÁK 4782! 44–45 km W Jiroft to Gav Koshi, 1500–1700 m, SOJÁK 4245! Khansir Spring 40 km W Bam = 3 km E Deh Bakri, 1900 m, EDMONDSON & al. 2024! Bal.: Khash, 1600 m, RECH. 4298d*! – E: Khor.: Showkatabad prope Birjand, 1400 m, RECH. 4152! Mashhad, BRENAN 14034! Tayyebat, 840 m, UOTILA 16278!, 18947! – C: Tehr.: Mahmudiyeh 15 km N Tehran, 1250 m, AELLEN 250! Tehran, 1130–1520 m, AELLEN 249!, FURSE 3107! Gol-e Sahran near Tehran, 1230 m, UOTILA 19366! Desert near Tehran, KOELZ 16071!, 18404! 20 km W Tehran, 1200 m, AELLEN 246!, 248! Damgh.-Semn.: Semnan, RECH. 52220! Kashan: Kashan, 990 m, AELLEN & SHAR. 251! Between Hoseynabad and Jannatabad, 830 m, TERME & TEHRANI 40036-E!

T u r c o m a n i a : Ashkhabad, LITW. 311!, SINT. 527!

A f g h a n i s t a n : NW: Herat: Herat Airport on road to Kandahar, 920 m, UOTILA 16382! – E: Kabul: Kabul, 1800 m, HAY 356*!, PABOT 1392!, RECH. 17066! Pul-i Charkhi 20 km E Kabul, 1800 m, RECH. 36833!, 36834! Between Tang-i Saidan and Lalandar, 1810 m, GILLI 2080! In faucibus Tang-i Gharu inter Kabul et Sarobi, 1220–1500 m, GREY-WILSON & HEWER 1083!, RECH. 16953! Paghman: NEUB. 326/1950! Nangarhar: Jalalabad, 610 m, PODLECH 17090!, UOTILA 17326!, 18433-b*! 50 km NW Tor Khama versus Jalalabad, 600 m, RECH. 31012! Ghazni: W jugi Sardalu inter Qarabagh et Sang-i Masha, substr. gyps., 2600 m, RECH. 17369! Jaji: Below Hazar Darakht, 2300 m, FREITAG 1649*! Nuristan: Parigel, 1810 m, KERST. 1182! – NE: Kataghan: 8 km W Khinjan, 1000 m, UOTILA 16624! Khinjan, 1080 m, UOTILA 18825! 10 km S Farkhar, substr. granit., 1520–2440 m, FURSE 8192! Pul-i Khumri, 650 m, UOTILA 17040! 25 km S Pul-i Khumri, 750 m, UOTILA 17078! Badakhshan: Faizabad, 1520 m, FURSE 6271! Baharak (Baracq), 1430–1550 m, ANDERS 6934!, LULMAN 101! – C: Bamian: Bamian, 2500 m, MORGENSTIERNE*!, UOTILA 18706!, 18707!, 18708!, 18710!, 18711! Doab: 45 km E of crossing to Doshi on the road from Charikar to Bamian, 2350 m, UOTILA 18481! Eshpushta, 1500 m, GILLI 2078*! Pshang W Doab, 1700 m, GILLI 2079*!

P a k i s t a n : Swat: M. Ilam, R.R. STEW. 24351*! – Peshawar: Inter Pabbi et Peshawar, 300 m, RECH. 30272! Landi Kotal (Khyber Pass), 700–1000 m, RECH. 30283! Inter Attock et Khushalgarh, 500 m, RECH. 30408! 20 km E Peshawar to Akbapura, BURTT 1048*! Kohat: 20–30 km W Kohat versus Thal, 500–700 m, RECH. 30213! – Kurram: Parachinar, 1500–1700 m, RECH. 30945! – Dera Ismail Khan: M. Sulaiman in faucibus Dhana Sar, 80 km E Fort Sandeman, substr.

calc., RECH. 30130! – Quetta: 38 km E Gumbaz, in faucibus calc., 1050 m, RECH. 29662! Ziarat, 2440 m, CROOKSHANK 456*!, LACE 4040*! Quetta, LACE 3407*!, KHATOON & al. 450*! 2,5 km from Zhob to Loralai Rd. T. ALI & T. AHMAD 1177*! Onza between Zhob and Shinghar, TAHIR & AHMAD 4076*! Mogh between Shoghor and Garin Chashma in Lutko valley, GHAFOOR & OMER 2577*! – Makran: Panjgur, in palmetis (*Phoenix dactylifera*), 1000 m, LAMOND 594!, RECH. 28157!

Distr. gen.: Iraq, Persia, Afghanistan, Pakistan, Caucasus, C Asia.

The closest relative of *C. Novopokrovskyanum* is probably the tetraploid *C. strictum*; it differs from *C. strictum* in colour, leaf shape and the spreading perianth segments. Many plants from Afghanistan and surrounding areas marked with an asterisk in the list of specimens, have greener or yellower colour because of sparser mealiness, red in leaf axils, entire leaves and somewhat looser inflorescence; they may represent another race. Several plants from Afghanistan and Pakistan (BURTT 1048, FREITAG 1649, GILLI 2079, RECH. 36833, WATT 4040 and HAY 356) have exceptionally narrow leaves, a sparse inflorescence and a spreading branching habit; they may not belong here, but the material is inadequate. *C. album* may also develop a rather similar habit, but its seeds are larger, the inflorescence more paniculate and the glomerules looser.

Species 14–19 form a group of species which can be called the *C. album* aggregate. The morphological variation in this group is exceptionally wide. Without extensive cultivation experiments and much better knowledge of the variation pattern of the *C. album* group in its whole area, it is not possible to achieve a more satisfactory taxonomic treatment for the group, and the account presented here is only provisional.

15. ***C. strictum*** ROTH, Nov. Pl. Praes. Ind. or.: 180 (1821).
In our area only occurs:

– – subsp. ***strictum***
Syn.: *C. album* L. subsp. *striatum* (KRAŠAN) MURR in URBAN & GRAEBNER, Festschr. Ascherson: 222 (1904).
Icon.: SAVULESCU, Fl. R.P.R. 1: Pl. 82, fig. 1 (1952). – Tab. 18.
Type: "Innominatum erat in collectione spectatissima, quam me ditavit clariss. HEYNE ex India orientali."

Annual to 2 m tall, stems erect, green-striped, sometimes red especially in axils, branched mostly basally, lowermost branches long, ascending from an almost horizontal base. Leaf lamina dark olive green to glaucous green above, glaucous green below, sometimes red-rimmed, c. 2 × length of petiole, 2–5 × 1–2,5 cm, ovate to elliptic, somewhat attenuate towards apex, margins often almost parallel in middle part; ± regularly toothed, teeth small, sometimes with a pair of somewhat larger teeth at broadest point of lamina, or sometimes margins entire; apex rounded. Lamina of upper leaves (rarely of all leaves) narrowly trullate to narrowly elliptic, margin entire. Flowers concentrated in small glomerules mostly arranged in terminal and usually spiciform, branched inflorescence. Perianth segments olive green, united at base, keel not prominent. Fruits falling with perianth. Pericarp easily detached. Seeds horizontal, black, lustrous, 1–1,2 mm in diameter, somewhat ovoid; testa almost smooth or sometimes with faint radial striae. – 2n=36 (cf. UOTILA 1973).

Hab.: Fields, ruderal places, roadsides, gardens, shores of waterways, semideserts and steppes; 300–2750 m. – Fl. VII–X, fr. VIII–XI.

P e r s i a : N: Maz.: Amol, UOTILA 19250! Tejan valley (Tedschen) near Qomrud Pain, 2200 m, AELLEN & BEHB. 244! Baladeh 1,5 km E Takar to Razan, 1610 m, BUTTLER & BOTHMER 22886-B! – W: Azerb.: Maku, 1170 m, BUTTLER & BOTHMER 22682-B! Marand, 1300 m, UOTILA 19513a!, 19515! 25 km W Mianeh, 1300 m, UOTILA 19503!, 19509! – Khamseh: 60 km W Takestan to Zanjan, 1630 m, UOTILA 19449! 25 km E Zanjan, 1770 m, UOTILA 19460! Ham.: Malayer, 1800 m, BUTTLER & BOTHMER 23027-B! – E: Khor.: Atrak Valley E Bojnurd, 1220 m, FURSE 8935! 62 km W Mashhad, 1200 m, UOTILA 19008a!, 19016! W Chenaran, 1200 m, UOTILA 19008b! 65 km E Quchan, 1200 m, UOTILA 19026! – C: Tehr.: Mahmudiyeh 15 km N Tehran, 1250 m, AELLEN 245! Marunak, 1900 m, AELLEN 241! Shahabad 20 km W Tehran, 1200 m, AELLEN 242!, 247!, 269! Tehran, MANUCH. & AELLEN 30110-E!, UOTILA 19354!, 19390!, 19417! Ariamehr bot. gard. 1350 m, UOTILA 19416! 8 km NE Shahr-i Yar (Robat Karim) to Tehran, 1130 m, BUTTLER & BOTHMER 23011! 3 km W Uzneh to Jaban, 2150 m, BUTTLER & BOTHMER 22844-B! Qazv.: Karaj: AELLEN 253!, 254!, RECH. 6690!, 6700-b!, -c! 2,7 km W of South entrance of Kandavan tunnel, 2750 m, BUTTLER & BOTHMER 22927! 2 km E Takestan to Qazvin, 1300 m, UOTILA 19446! - Shahr.-Bust.: Turan Prot. Reg.: 5 km NW Majrad, 1100 m, BRECKLE & BHADRESA 5056!
T u r c o m a n i a : Ashkhabad, 300 m, LITW. 380!, SINT. 1243!, VASAK! Suluklü (Saratowka), SINT. 2189!
A f g h a n i s t a n : SE: Kandahar: In *Populus* forest on island in Helmand river opposite to Laskarga (Qala Bist), 800 m, FREITAG 2073! – E: Kabul: Kabul, PODLECH 17062! Nangarhar: Jalalabad, 610 m, UOTILA 18431! Jaji: Bian Khel to Peiwar Kotal, AITCH. 891! Nuristan: Nuristan, EDELB. 1431! Bragamata (Barge Matal), 2300–2450 m, ANDERS 5051! – NE: Kataghan: Khinjan, 1080 m, UOTILA 18828!, 18899b! – C: Doab: Kamard, 1830 m, KOELZ 13571!
P a k i s t a n : Peshawar: Peshawar University campus, AKRAM 90! – Kurram: Parachinar to Shalozan, SIDDIQUI & Y. NASIR 6530!

Distr. gen. of subspecies: SE Europe, Turkey, Caucasus, C Asia, Persia, Afghanistan, Pakistan, India.

Some smaller plants resemble *C. strictum* subsp. *striatiforme* (MURR) UOTILA (cf. UOTILA, Chenopodium strictum subsp. striatiforme in the Baltic Sea area, Ann. Bot. Fennici 14: 194–205, 1977), and were determined as this taxon (as *C. album* subsp. *microphyllum*) by AELLEN. However, typical subsp. *striatiforme* is a seashore and ruderal plant in C and SE Europe and has smaller leaves. Plants with entire leaf margins and without fully developed stem leaves may be difficult to distinguish from *C. Novopokrovskyanum*. These two species seem to have a different flowering and fruiting time.

16. *C.* ***album*** L., Spec. Plant.: 219 (1753).
Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2); tab. 96, fig. 5 (1960).
Type: "Habitat in agris Europae", LINN 313/8!, lectotype designated by BRENAN, Fl. Trop. E. Africa, Chenopodiaceae: 6 (1954).

Annual, 10–150 cm, usually erect, variously branched, grey farinose. Stems yellowish to green, green striated, sometimes reddish or with red spots at leaf axils. Lower and medium leaves petiolate, lamina usually 2–6(–8) cm, variously trullate, rhombic-ovate to lanceolate, irregularly dentate to entire, often somewhat 3-lobed; uppermost leaves lanceolate, entire. Inflorescence a variable spiciform or cymosely branched panicle, mostly terminal. Perianth segments 5, dorsally keeled. Fruits falling with perianth. Pericarp thin, somewhat adherent. Seeds horizontal, black, 1,2–1,6 mm in diameter, margin somewhat acute; testa with faint radial striae, otherwise almost smooth. – 2n=54 (cf. UOTILA 1973).

Hab.: Fields, gardens, ruderal places, roadsides, yards, irrigated places, steppes, semi-deserts.

Distr. gen. of species: Almost cosmopolitan, common in subtropical to temperate zones, more infrequent in the tropics and cooler regions.

1a. Lamina of lower leaves usually less than 5 cm long, clearly longer than broad, base narrowly to broadly cuneate, margins toothed to entire, teeth mostly acute, often unequal in size but usually not lobe-like, apex acute to obtuse; inflorescence variable . . . . subsp. *album*
b. Lamina of lower leaves to 6 x 6 cm, usually ± as long as broad, base broadly cuneate, margin usually with 1–2 pairs of lobe-like teeth and many smaller, usually obtuse teeth, apex obtuse, sometimes leaves entire broadly lanceolate; inflorescence mostly spiciform . . subsp. *iranicum* AELLEN

– – subsp. ***album***

Icon.: BHOPAL & CHAUDHRI, Pakistan Systematics 1: 46–47, pl. 4 (1977). – Tab. 19.

Alt.: 30–3800 m. – Fl. II–X, fr. V–XI.

Iraq: Kurd.: Arbil: Algird Dagh (M. Helgurd) supra Nowanda, 2000–2600 m, RECH. 11857! Bany near Baradost, THESIGER 328! Mosul: N Mosul, island in river Tigris, 220 m, ANDERS 1560! Mosul, KY. 450b/658! Wadi Aloka, BARKLEY & AL ANI 9009!

Persia: N: Gorg.: 10 km N Gorgan, –30 m, UOTILA 19216!, 19219! Bandar-i Gaz, SINT. 1377! 15 km NE Pahlavi Dezh, –25 m, BRECKLE & BHADRESA 5261! Jangal-e Loveh, 400–480 m, TERME & MATIN 35095! Mohammad Reza Shah Prot. Reg.: Tang-e Gol, KORHONEN 1093!, UOTILA 19019!, 19037a! Maz.: Between Qomrud Pain and pass 60 km E Firuzkuh, 2200–2500 m, AELLEN & BEHB. 258! Kalar Dasht, TERME 14806-E! Gaznak in Haraz valley, 1600 m, WDB. 1435! Gilan: Gilan, LINDS. 1030! Abbasabad near Astara, MIR KAMALI 40249-E! – W: Azerb.: 44 km NE Mianeh, PABOT! Tabriz, GILL.-SM. 1313 p.p.!, 2163! N Tabriz along Talkheh Rud (Azschi Chay), 1450 m, AELLEN & BEHB. 270! Marand, 1300 m, UOTILA 19513a p.p.!, 19514! Maku, 1170 m, BUTTLER & BOTHMER 2268! 60 km from Oshnoviyeh to Rezaiyeh, 1500 m, BABAKHANLOU 23789! NE shore Rezaiyeh Lake (Urmia) near Sharif Khaneh, 1220 m, AELLEN & BEHB. 259!, 260! 5 km E Haydarabad, 1275 m, BUTTLER & BOTHMER 23065! Zanjan: 25 km E Zanjan, 1770 m, UOTILA 19460! 60 km W Takestan, 1630 m, UOTILA 19450! Ham.: Hamadan, 1750 m, BUTTLER & BOTHMER 23031!, MIRD. 2149! Esf.: Esfahan, SOJÁK 6820!, 6847!, 6848! Lur.: Borujerd, KOELZ 18554! – S: Fars.: Prope Mian Jangal, SOJÁK 5160! Kerm.: Baft, 2000 m, DINI & BAZARGAN 30623! Zahedan, AELLEN in RECH. 3943 p.p.! Bal.: Khash, 1300 m, RECH. 4295! Sangun in ditione vulcani Taftan, RECH. 7363! – E: Sistan: Zabol (Nosratabad), 600 m, RECH. 4117! Sistan, AYAZI 5620! Khor.: 15 km N Quchan, 1650–1700 m, KUKKONEN 7601! 65 km E Quchan, 1200 m, UOTILA 19022!, 19023!, 19024!, 19025! 35 km E Shirvan, 1100 m, UOTILA 19086!, 19090!, 19091!, Inter Bojnurd et Tappeh-ye Moraveh, RECH. 1931! Kuh Sangi prope Mashhad, RECH. 4896 p.p.! Mashhad, 1150

m, UOTILA 19012! 62 km W Mashhad, 1200 m, UOTILA 19015!, 19017! Sarakhs, 400 m, RECH. 55725! Radkan, 2000 m, TERME & al. 36570-E! 40 km a Qayen versus Gonabad (Juymand), 1600 m, RECH. 56247! Kuh-e Ahangaran prope Qaleh Ahangaran. 2000–2300 m, RECH. 56134! Tayyebat, 850 m, UOTILA 16279!, 18946!, 18958! – C: Tehr.: Tehran, BRUNS!, UOTILA 18389!, 19359!, 19361! Ariamehr Bot. Garden, 1350 m, UOTILA 19416b p.p.! Mahmudiyeh 15 km N Tehran, 1250 m, AELLEN 257!, 271! 75 km S Tehran to Qom, 1360 m, UOTILA 19410! Ab-e Garm, 2200 m, AELLEN 263! 28 km E Tehran, 1650 m, AMIN & BAZARGAN 2759! Delichay 100 km E Tehran, 1700 m, AELLEN 268! Yatri near Garmsar, 750 m, MOUSSAVI & TEHRANI 41704-E! 26 km NW Tehran, 2100 m, AMIN & BAZARGAN 2809! 6 km W of crossing to Farahnaz-e Pahlavi dam on the road to Tehran from Damavand, 1720 m, BUTTLER & BOTHMER 22790! 27 km SE Tehran, 900 m, BRECKLE & BHADRESA 5436! Bonehkuh, AELLEN & MANUCH. 264! Qazv.: Karaj, GAUBA 80!, 1043!, RECH. 6700! SE Karaj, 1300 m, FORUGHIAN 3082!, 3083! Kamalabad, MAZAHERI 30313-E!, 30314-E! 60 km N Karaj to Chalus, 1500 m, UOTILA 19344! Qazvin, 1330 m, UOTILA 19428!, 2 km E Takestan, 1300 m, UOTILA 19444a!, -b! Shahr.-Bust.: M. Shahvar ad Nokarman, 2000 m, RECH. 6254! Abr pass, 1900 m, DOBSON 290! Kashan: Qamsar, MANUCH. 27!
Turcomania: Kizyl Arvat, Karakala: M. Sundsodagh, SINT. 1911! Ashkhabad, SINT. 432!, 1243! Near Vanovskoie, 600–700 m, VASAK!
Afghanistan: N: Mazar-i Sharif: Balkh, 400 m, RECH. 16151! S Tashkurghan (Khulm) W Sayad, 650 m, UOTILA 16953a!, -b! 10 km SE Andkhui, 290 m, PODLECH 16974! – NW: Herat: Herat, 850 m, UOTILA 16312!, 16339! 80 km E of Iranian border along highway, 850 m, UOTILA 18938! Sabzzak pass, LINDB. 649/1959! – SW: Herat: In valle Tang-i Chorsar inter Qala Shahrak et Chisht, 1800 m, RECH. 19196! Farah: Farah Rud, 850 m, UOTILA 16440! Ghorat: Qala Shahrak, 2000 m, RECH. 19152! – SE: Kandahar: Registan Desert prope Bhagat, 600 m, RECH. 34654! Kandahar, 1000 m, UOTILA 16497! 18909!, 18910! – E: Kabul: Kabul, 1780 m, GILLI 2072!, 2076!, PABOT 1392!, RECH. 18017!, UOTILA 18752!, 18756!, 18905! Qala-e Wazir inter Chashma et jugum Unai, 2900 m, RECH. 18072! Gulbagh, 1800 m, GILLI 2073! Paghman: Paghman, 2100–2280 m, KOELZ 12089!, PODLECH 16841! Laghman, 1220 m, KOELZ 11608! Nangarhar: Jalalabad, 570–610 m, GILLI 2071!, 2077! PODLECH 17083!, UOTILA 17325!, 18433! 40 km W Torkham on road to Jalalabad, 570 m, KUKKONEN 7124!, 7142! In valle Logar, JOHNSTON! Ghazni: W jugi Sardalu inter Qarabagh et Sang-i Masha, substr. gyps., 2600 m, RECH. 17368! Okak NE Dasht-i Nawar, 3000 m, RECH. 17679! Jaji: Dobandi, VOLK 485/1971! Nuristan: Bashgal valley, 4 km E Garm Chashma, 3100 m, BRECKLE A-3174! Darrah-i Pengar near Samanaknesha, 3100 m, PODLECH 16561!, 16593! Parigel valley near Parigel, KERST. 1183! – NE: Wakhan: Between Neshtkhawr and Sarhad, 3120–3180 m, ANDERS 7140! Urghend-i Bala, 2700 m, ROEMER 284! Between Langar and Zemestan-e Baharak, 3600–3800 m, ANDERS 7754! Kataghan: Kunduz, PODLECH 12777!, VOLK 672/1971! 8 km W Khinjan, 1000 m, UOTILA 16625!, 18839!, 18841!, 18842!, 18846! Khinjan, 1080 m, UOTILA 17116!, 18823!, 18830!, 18889!, 18890!, 18894!, 18899a! 25 km S Pul-i Khumri, 750 m, UOTILA 17068! Pul-i Khumri, VOLK 709! Darrah-e Farkhar, Sang-e Alash, 1300 m ANDERS 10904! Badakhshan: Faizabad, PODLECH 12737!, 12739! Baharak, 1550 m, ANDERS 6931! Ribat-e Pain (Rubat), 2590 m, KOELZ 12833! Ishkashim, YOSII 815! – C: Bamian: Inter Bamian et Band-i Amir, 2800–3000 m, RECH. 18170! 15–23 km W Bamian, 2650–2740 m, UOTILA 18566!, 18568-70!!, 18626! Bamian, 2500 m, UOTILA 18712!, 18701! Darrah-i Fuladi SW Bamian, 2620 m, PODLECH 19506! North side Kuh-i Baba, THESIGER 57! Qala Sarkari, 1525 m, KOELZ 13918! Hajigak, REINER 749! Band-i Amir, 2900 m, ANDERS 4499! Inter Kotal Deras Kol et Panjao prope Mandigak, 2800–3280 m, RECH. 18711! Doab: Darreh-i Shikar (Dari Shikari), VOLK 1788! In valle 16 km S Doab, 1500 m, RECH. 16684! In valle Ajar "Königstal", 1400–1500 m, PODLECH 12606!, RECH. 16624! Behzud: Farakulum (Dahane Tanor),

2900 m, PODLECH 18743! Ghorat: Darra-e Naiak, 2100 m, JANATA 82a! Tang-i Azao, 2400 m, JANATA 91! – Afghanistan, GRIFF. 1741-a!, -b!
Pakistan: Chitral: Lowarai Pass, 2430–2740 m, SIDDIQUI 27145! Madaklasht, 2740 m, TOPPIN 523! – Peshawar: Nowshera 43 km E Peshawar, 400 m, UOTILA 17368! – Kohat: In jugo Kohat substr. calc., 700–900 m, RECH. 30191! – Quetta: Sariab road, RIZWAN 1010! 100 km from Quetta to Zhob, T. ALI & AHMED TUFAUL 1229! Zhob Valley, Hindubagh, 1780 m, NATH! – Kurram: Robert garden 5 km from Parachinar, KAZMI 3850! Shalozan, AITCH.! – Karachi: 10 km from Gadaf to Karachi, QAISER & QURESHAY 4203!

Distr. gen. of subspecies: As the species.

– – subsp. ***iranicum*** AELLEN, Notes Roy. Bot. Gard. Edinb. 28: 30 (1967).
Icon.: Tab. 20.
Type of subspecies: P. AELLEN 257, holotype G!, isotypes BR!, M!, W! (conf. UOTILA, 1993).

Hab.: 360–3100 m. – Fl. V–IX, fr. VI–XI.

Persia: N: Maz.: Baladeh 5 km E Razan, 1050 m, BUTTLER & BOTHMER 11856! Between Qomrud Pain and pass 60 km E Firuzkuh, 2200–2500 m, AELLEN & BEHB. 258! – W: Azerb.: Tabriz, GILL.-SM. 2136! Maku, 1170 m, BUTTLER & BOTHMER 22681! – S: Fars.: Sivand, STAPF 816! Kerm.: Mahun, 2000 m, BORNM. 4160! Jupar, 1830 m, ARMSTRONG 13! Kuh-e Hazaran (Kuh-e Hezar) 20 km S Rayen, 2700 m, EDMONDSON & MILLER 1638! – E: Khor.: 8 km NW Aliabad versus Asfak ad radices montium, 800 m, RECH. 51714! 35 km E Shirvan, 1000 m, UOTILA 19087! – C: Tehr.: Mahmudiyeh 15 km N Tehran, 1250 m, AELLEN 257! S Ab-e Garm, 2200 m, AELLEN 262! 35 km S Tehran along road to Qom, 1000 m, UOTILA 19394! Qazv.: Karaj, 12330 m, AELLEN. 256!, RECH. 6700-a et -b! SE Karaj, 1300 m, FOROUGHIAN 3083! Damgh.-Semn.: Kuhha-ye Anjirab, 1500–1650 m, TERME & MOUSSAVI 39244! Shahr.-Bust.: Shahrud, KOELZ 16959! Bagh Sar-e Chashmeh, RECH. 5377!
Turcomania: Kizyl Arvat, Karakala in herbidis M. Sundsodagh, SINT. 1911!
Afghanistan: N: Mazar-i Sharif: Waziristan (Balkh), 400 m, RECH. 16160! – NE: Kataghan: Baghlan distr., 460 m, FURSE 6016! 8 km W Khinjan, 1000 m, UOTILA 16625! Surkh Kotal 15 km NW Pul-i Khumri, 700 m, UOTILA 17026!

Distr. gen. of subspecies: E Turkey, Persia, Turcomania, Afghanistan.

The morphological variation in *C. album* is exceptionally wide both because of genetic and environmental factors. On the basis of current information, only the most clearly distinct race, subsp *iranicum*, is recognized here. All other material, even though clearly heterogeneous, is included in subsp. *album*. Adequate material from Pakistan and India is especially needed.

17. *C.* ***giganteum*** D. DON, Prodr. Fl. Nepal.: 75 (1825).
Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3 (2): 636 fig. 285-b (1960). SCHWARZOVA & MAJOVSKY, Biologia (Bratislava) 35: 518 (1980). – Tab. 21 fig. 1.
Type: "In Nepalia", WALLICH, K!

Tall annual, erect herb resembling *C. album*; young parts of the plant often covered with purple vesicular hairs. Petiole of leaves shorter than lamina; mature lamina to 14 cm, broadly triangular to deltoid with rounded apex and rounded basal angles, dentate, teeth fairly equal in size, not very large. Inflorescence mostly spiciform, glomerules fairly small. Seeds c. 1 mm, round in outline, margin obtuse; testa almost smooth.

Hab.: Gardens and other cultivated places; 1300–1400 m.

P e r s i a : S: Kerm.: Zahedan (Duzdab), 1300 m, RECH. 3931! Bal.: Khash (Vasht, Kwash), 1300 m, RECH. 4294! – E: Khor.: Showkatabad prope Birjand, 1400 m, RECH. 4153!

Distr. gen.: India; introduced and locally naturalized in the Mediterranean area (S France, Italy, Greece, Crete, Algeria and Morocco) and Canary Islands.

C. giganteum differs from *C. album* mainly in leaf size and shape and the red colour of young parts of the plant. The two species are closely related and hybridization between them is possible. *C. giganteum* is a late-flowering species, and all available Persian material consists of only young sterile plants, collected in May 1948. The characteristic leaf form is clear in all of them but the purple tinge is only present in RECH. 3931.

18. *C.* ***opulifolium*** SCHRADER ex KOCH & ZIZ, Cat. Pl.: 6 (1814).
Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2): 646, fig. 288 m-q (1961). CASTROVIEJO et al., Fl. iberica 2: 493, fig. 145 e-k (1990). – Tab. 22, fig. 1–2; 26 fig. 6.
Type: Germany, Oberen Grafschaft Catzenellenbogen (sec. BORKHAUSEN, Rhein. Mag. Erweit. Naturk. 1: 472, 1795–1796).

Annual, 30–100(–200) cm, usually erect. Stems often much branched, green striped to yellowish, rarely red-tinged, without red spots in leaf axils. Petiole of leaves often longer than lamina; lamina green to glaucous green, sometimes densely farinose especially in small leaves; lower and middle leaves 0,5–2(–3,5) cm, broadly ovate – rhombic – trullate, almost as wide as long, sometimes wider than long, usually somewhat 3-lobed, with short prominent basal lobes, otherwise entire or with several teeth, apex mostly obtuse; lamina of upper leaves clearly longer than wide, with basal teeth or lobes (uppermost entire), apex acute to acuminate. Inflorescence often dense and large, mostly leafless, grey farinose, of paniculate or to somewhat spicate terminal and axillary thyrses composed of very numerous, small glomerules and solitary flowers. Perianth segments 5, keeled, densely farinose. Stamens 5. Stigmas 2. Pericarp free. Seeds horizontal, black, 1,1–1,4 mm, roundish in outline, margin obtuse; testa almost smooth to with obscure radial striae. – 2n=54 (cf. UOTILA 1973).

Hab.: Roadsides, gardens, ruderal places; 650–1600 m. – Fl. IV–VIII, fr. VII–XI.

I r a q : Kurd.: Arbil: Just below "Chalelawa", BARKLEY! – Sul.: Qara Dagh Mountain, MAKKI 534! M. Baradost, "Bany", THESIGER 328 p.p.! – Mosul, College of Science, HOSSAIN 41!
P e r s i a : N: Gorg.: Gorgan, Kalaleh, HASHEMI 30319-E! Gorgan, SHAR. 587! Moh. Reza Shah Prot. Reg.: Tang-e Gol, 650 m, UOTILA 19031! – W: Azerb.: Tabriz, 1350 m, AELLEN & BEHB. 261! Kermansh.: Kermanshah: HAUSSKN.! – C: Tehr.: S slope of M. Tuchal, 1300–1600 m, AELLEN 238! Qazv.:Qazvin, 1330 m, UOTILA 19438! Karaj, Agricultural high school, AELLEN 237!, GAUBA 2148!, RECH. 6696! Kashan: Kashan, 990 m, AELLEN & SHARIF 235!, 236!
T u r c o m a n i a : Ashkhabad, LITW. 312!

Distr. gen.: From the Mediterranean and C Europe E to Persia and C Asia, S to tropical Africa; adventive in N America.

The species has also often been reported from further east, up to India, but all adequate specimens claimed as *C. opulifolium* have been misidentifications of other taxa, mostly *C. album* and *C. atripliciforme*. Plants of tropical Africa may represent a different race. The specimens AELLEN & SHARIF 236, AELLEN & BEHB. 261 and LITW. 312 have larger, more sharply-dentate leaves and small diffuse inflorescences.

19. ***C. atripliciforme*** MURR, Magyar Bot. Lapok 1: 360 (1902).
Icon.: Tab. 22 fig. 3–4.
Type: J.E.T. AITCHISON 980, G!; lectotype selected by UOTILA, Ann. Bot. Fennici 30: 191 (1993); isolectotypes C!, FI!, G-BOISS!, K!, S!

Annual, sparsely mealy to glabrous. Stems to 70 cm (30–100 cm), erect, pale green, striped, sometimes reddish, branched mostly basally, lowermost branches subopposite. Leaf lamina 1,5–4 cm, thin, triangular-hastate, usually at least somewhat longer than broad, base broadly truncate to sometimes slightly cordate, often with prominent, spreading basal lobes with 1–2 teeth, otherwise margin entire to dentate, apex acute to obtuse, usually acuminate; sometimes leaves ovate, entire. Uppermost leaves bract-like, ovate, entire. Inflorescence lax, mostly spiciform and leafy, glomerules small. Perianth segments partly spreading in fruit, divided to c. 1/3 from the base, prominently keeled, midrib often visible inside. Fruits partly falling without perianth. Pericarp fairly adherent. Seeds (1,0–)1,2–1,4 mm, circular in outline, margin acute to obtuse; testa with radial striae, otherwise almost smooth to somewhat uneven.

Hab.: 1600–2500 m. – Fl. VIII–IX, fr. VIII–X.

Afghanistan: E: Nuristan: Dewagal Darreh near Chalas, 1600–1700 m, ANDERS 11030!, 11078! Darrah-ye Katigal 5 km S Pol-e Rustam, 1700 m, ANDERS 5163! Darrah-ye Katigal between Bragamata (Barge Matal) and Apsai (Afsay), 2250 m, PODLECH 16671! Chitur Valley (Tschitur) below Wurerchitur, 1900–2300 m, KERST. 1141!
Pakistan: Swat: Kalam, substr. granit., 2200 m, RECH. 19416! Utror, substr. granit., 2500 m, RECH. 19591! M. Ilam, 2130–2440 m, R.R. STEW. 24348! Bazdarra (Bazh Dehri) near Fatehpur, 1600 m, GHAFOOR & T. ALI 4084! – Kurram: Shalozan, AITCH. 980!

Distr. gen.: E Afghanistan, N Pakistan and N India.

Specimens of *C. atripliciforme* have frequently been determined as *C. opulifolium* based on a fairly similar leaf shape. However, the leaves of *C. atripliciforme* are relatively narrower, have more acute apices, lobes and teeth, the inflorescence is laxer and the perianth segments have a more prominent keel. *C. atripliciforme* has been often synonymized with *C. bryoniifolium* BUNGE from Altai to E Siberia because syntypes of the former also include a specimen from E Siberia. *C. bryoniifolium* has a somewhat similar inflorescence and leaves, but the middle-lobe of the leaf is entire and the testa more sculptured. *C. bryoniifolium* and many other Chenopodiums even *C. atripliciforme* may sometimes have ± entire leaves (ANDERS 11078, PODLECH 16671, RECH. 19591).

20. *C. ambrosioides* L., Spec. Plant.: 219 (1753).
Syn.: *C. integrifolium* VOROC., Bot. Zhurn. 27: 42 (1942). *C. suffruticosum* WILLD., Enum. Pl. Hort. Berol.: 290 (1809).
Icon.: BHOPAL & CHAUDHRI, Pakistan Systematics 1: 42–43, pl. 2 (1977). – Tab. 21 fig. 2–3; 26 fig. 7.
Type: "Habitat in Mexico, Lusitania".

Strongly aromatic annual, rarely a short-lived perennial, variously pubescent (sometimes also with longer hairs) especially on stem, and with sessile yellow glands. Stem to 100 cm, ± erect, branches long, ascending. Leaves with to 1 cm long petiole; lamina 5–10 cm, lanceolate to ± elliptic, irregularly coarsely serrate, sometimes shallowly sinuate to almost entire, attenuate at base, acute to obtuse at apex; bracts entire, linear-lanceolate-narrowly obovate, uppermost very small. Inflorescence paniculate, flowers sessile in small, dense glomerules usually subtended by bracts and arranged spicately. Terminal flowers bisexual, perianth deeply 5-lobed, segments cucullate, stamens usually 5; lateral flowers female, perianth connate, 5-toothed; teeth roundish on back; perianth herbaceous, glabrous to sparsely pubescent. Stigmas usually 3–4, long, slender. Fruits falling with perianth. Pericarp free. Seeds mostly horizontal, sometimes oblique or vertical, brown, 0,6–0,8 mm in diameter, somewhat ovoid to circular in outline, margin obtuse; testa almost smooth, sometimes with obscure shallow pits.

Hab.: Seashores, roadsides, moist ruderal places; –25 – 1000 m. – Fl. IV–VIII; fr. VI–X.

Persia: N: Gilan: E Bandar-e Pahlavi, –25 m, BUTTLER & BOTHMER 22776!, WDB. & ASSADI 18313!
Afghanistan: SE: Kandahar: Near Kandahar, 1000 m, KERST. 262! – E: Nangarhar: 8 km SW Ghaziabad along the road from Jalalabad to Torkham, 550 m, PODLECH 19989!, 19991! E part of Jalalabad basin, Dwala China near Ghanmi Khel, 780 m, FREITAG 7359!
Pakistan: Swat: Jahanan near Bat Khela, QAISER & GHAFOOR 1694! Peshawar: Peshawar University Campus, MEHMOOD AKRAM 12! Peshawar, DEANE! Between Peshawar and Gullozai, BURTT 1009! – Kohat: Hangu, KAZMI & SALIM 3254! – Karachi: Karachi University, students' Hostel, ABRAR HUSAIN!

Distr. gen.: Probably originating from tropical America; introduced into cultivation as a vermifuge and naturalized throughout tropical and subtropical zones; in Europe especially in the Mediterranean area; Africa; in Asia from S Arabia and Persia to India, Japan, Philippines.

Several allied species or infra-specific taxa have been recognized based on variation in hairiness, leaf shape and presence/absence of leaves and bracts in the inflorescence. Material from the Flora Iranica area is fairly uniform, and matches well *C. ambrosioides* s.str.

21. *C. botrys* L., Spec. Plant.: 219 (1753).
Icon.: HEGI, Ill. Fl. Mitteleur. ed. 2, 3(2): 584, fig. 260a-i; 585, fig. 261a (1960). HSIEN-WU & CHO-PO, Fl. R.P. Sinicae 25(2): Tab. 15, fig. 4–5 (1979). – Tab. 23 fig. 1–2; 26 fig. 8.

Type: "Habitat in Europae australis arenosis", lectotype LINN 313/12!; selected by JAFRI & RATEEB, Fl. Libya 58: 13 (1979).

Aromatic annual, 5–50 cm, erect, usually with several ascending branches, main axis sometimes shorter than some of the branches, densely hairy, most hairs stalked, glandular, some simple, eglandular. Leaves dull green, somewhat glaucous, lamina 1–7 cm, elliptic to ovate in outline, cuneate to subcordate at base, obtuse at apex, pinnatifid with 2–5 broad lobes and several teeth on each side; lower leaves sometimes repand. Inflorescence elongate, main axis to 5 cm wide, terminal, composed of mostly leafless dense dichasial cymes, or axillary with smaller cymes. Terminal flowers solitary, larger and earlier flowering than lateral ones. Perianth segments 5, c. 1 x 0,5 mm, elliptic to ovate, acuminate, free to base, often not contiguous at base, herbaceous with membranous margins, sometimes purple, often whitish in fruit, weakly keeled, with stalked glandular hairs on back. Stamens 1–5. Stigmas 2. Pericarp free. Seeds horizontal, black, 0,6–0,8 mm, round in outline, margin rounded often truncate in part; testa almost smooth. – 2=18 (cf. PODLECH & DIETERLE 1969, UOTILA 1973).

Hab.: Semi-desert, steppes, mountain slopes, riverbeds, river shores, roadsides, fields, gardens, yards, ruderal places; 150–3660 m; – Fl. IV–X, fr. V–X.

I r a q : Kurd.: Arbil: Between Rawandiz and Rayat, S. OMAR & al. 38505! Hajji Omran, AL-DALBAGH 46293! Ruban-i Rost, 975 m, HALEY 108! – Sul.: Penjwin, 1280–1550 m, GUEST 22962!, RAWI 22560! – Mosul: 10 km from Zawita to Atrosh, 1400 m, AL KAISI HAMED & HAMID 46081! N Mosul on island in Tigris, 220 m, ANDERS 1533! Nineveh, BORNM.! Mindan bridge on Mosul-Aqrah rd., 260 m, CHAPMAN 26245! M. Khantar NE Zakho, 1200 m, RAWI 23326! 36 km NE Zakho, 1060 m, RAWI 23525! Sirsang, 1060 m, HAINES 515!

P e r s i a : N: Gorg.: Golestan forest, 500 m, IRANSHAHR & ZARGANI 15289-E!, WALTON 161!, 184! Maz.: 24 km S Amol, 460 m, FURSE 9042! Alamut, TERME 14807-E! Gilan: Kuhshavar, 50 m, CRISP 127! Between Rudbar and Manjil, 450 m, SAB. 3104! Gilan, AUCH. 5264! – W: Azerb.: Hills S of Tabriz, GILL.-SM. 2378! 30 km S Mianeh, 1600 m, ANDERSEN & PETERSEN 118! 25 km W Mianeh, 1300 m, UOTILA 19498! M. Divan (Dareh Diz) S Jolfa, 1100–1500 m, TERME in RECH. 43796! 15 km N Khvoy to Maku, RECH. 14933! Firuzabad near Ardabil river, 1160 m, BROWN 2103! Maku, 1450 m, SIAMI 8633! Dhavan Bala 13 km N Maragheh S Kuh-e Sahand, 1815 m, WARREN 3! Dasht-e Moghan: Parsabad, IRANSHAHR! Ad ripas fl. Araxes 40 km SW Parsabad versus Aslanduz, 150 m, LAMOND 3188!, in RECH. 40152! Dasht-e Moghan, 160–500 m, SCHMID 6562!, 6563! Khamseh: 10 km NW Zanjan, SOJÁK 7577!, 7581! Kuh Anguran, 10 km SW Tashvir, Tarom pass, 800–1100 m, LAMOND & IRANSHAHR 3503 in RECH. 41023! 30 km W Zanjan, 1450 m, KUKKONEN 7928! Kurd.: 8 km E Sanandaj, 1520 m, FURSE 3362! 65 km S Sanandaj, 1400 m, GRANT 16031! Sardasht, 1100–1300 m, IRANSHAHR & TERME 14832-E! Ham.: 25 km W Hamadan, 1840 m, LISTER 46! Darreh Moradbagh, SAB. 2096! Shah pass near Hamadan, 2130 m, BOWLES Scholarsh. Bot. Exp. 1075-A! Kermansh.: 63 km NNW Taq-i Bustan inter Kermanshah et Sanandaj, RECH. 14644! Arak: M. Rasvand, STR.! M. "Nowdera" near Arak (Sultanabad), STAPF! Lur.: Dow Rud, 1520 m, KOELZ 15707!, 18108! Bisheh 50 km E Khorramabad, substr. calc., 1200–1400 m, RECH. 5780! Oshtoran Kuh, STAPF 202! Kharon, 1300 m, KOEIE 946! – S: Kerm.: Negar 48 km SSW Kerman, 2130 m, ARMSTRONG 108! Kuh-e Hazaran (Kuh-i Häsar) 3000 m, BORNM. 5158! Kuh-e Jebal Barez near Deh Bakri, 1700–2700 m, SOJÁK 2838! Bal.: Deh Pabid, SOJÁK 2584! – E: Khor.: Mashhad, RECH. 4886-b! 91 km W Mashhad, 1300 m, ANDERSEN & PETERSEN 345! 35 km E Shirvan, 1100 m, UOTILA 19069! In valle fl. Atrak inter Bojnurd et Shirvan, RECH. 1818! M. Yoghatay 20 km N Sabzevar, 1750 m, RECH. 53659! Tayyebat, 840 m, UOTILA 18953! Kharv-e Olya 30 km E Neyshabur, 1500 m, IRANSHAHR 30409-E! Bardu Forest, KOELZ 16763! – C: Tehran: Tehran, 1200 m, BRAUS 39!, PRAVITZ 179!, TROTT 802! E Tehran, 1400 m, AMIN & BAZARGAN 18980! 28 km E Tehran, 1650 m, AMIN & BAZARGAN 2762! 40 km NNE Tehran, 1830 m, FURSE 3111! Evin, ALAVA 10329! In valle Lar (Loura), KY. 703! Qazv.: 32 km NW Karaj, 1300 m, AMIN & BAZARGAN 2805! Karaj, 1560 m, BABAKHANLOU & AMIN 3004!, GAUBA 1025!, RECH. 6849! 32 km NE Karaj, 1830 m, FURSE 2589! 20 km N Karaj, Karaj Dam, 1800 m, KORHONEN 1062! 100 km N Karaj, 2740 m, Zagros Bot. Exp. A-47! Kuh Dashteh, Darreh Wardi, 1600 m, RECH. 759! Shahrestanak, 1500–1800 m, TERME! Qazv.: Karaj, ZARGARI! Damgh.-Semn.: 8 km N Sangsar, 1900 m, RENZ & IRANSHAHR! Shahr.-Bust.: Abr pass. 1900 m, CARTER 292! Turan Prot. Reg.: Ahmadabad, BRECKLE & BHADRESA 5181! 15 km S Ahmadabad, 1200 m, BRECKLE & BHADRESA 5126! Kashan: Qohrud, HAUSSKN.!

T u r c o m a n i a : Ashkhabad in steppis ad Mekrowa, SINT. 285! Ashkhabad, LITW. 126! M. Kopet Dagh near Chuli, 650–700 m, VASAK!

A f g h a n i s t a n : N: Mazar-i Sharif: Chashmeh-i Shafal (Shashma-i Shafa) 25 km S Balkh, 460 m, UOTILA 16898! – NW: Herat: 15 km S Herat near Airport, 920 m, UOTILA 16383! Badghiz: Kuh-i Doshakh. AITCH. 764! – SE: Kandahar: Girishk, LINDB. 310! – E: Kabul: South of Salang pass FOHLEN!; 1900–3100 m, RECH. 31303!, UOTILA 18882! Kabul, 1850 m, BRECKLE 4542!, 4940!, GILLI 2089-2091!!, HAY 274!, HDG. & WDB. W-3176!, KERST. 433!, 492!, NEUB 328!, RECH. 17043!, VOLK 16! Aliabad, NEUB. 3116!, 3196!, VOLK 16a! 11 km N Kabul, REINER 732! 27 km N Kabul to Charikar, 1750 m, PODLECH 18123! Pol-i Matak, LINDB. 498! Ghorband valley 5 km above bridge near Charikar, 1600 m, FREITAG 1048! Tang-i Gharu, 1220–1350 m, ANDERS 3693!, UOTILA 17212! 22 km SW Kabul (tollgate), 2000 m, BRECKLE A-757 A-757! Sarobi, 1050 m, GILLI 2086!, 2087!, VOLK 16-a! 2–15 km W Sarobi, substr. calc., 1000–1300 m, RECH. 34396!, GREY-WILSON & HEWER 1076! E Sarobi, 1180 m, UOTILA 18457! Band-i Kargha between Kabul and Paghman, 2000 m, LINDB. 1962/1275!, 1357!, 1371! Hauz-i Mahiha, 2500 m, KOEIE 3028! Laghman: Kail, 2440 m, KOELZ 11677! Between Badakhshi and Kail (Kayli), 1700–2100 m, ANDERS 10701! Aq Robat (Aghrabat) shore of Laghman river, 650 m, PODLECH 19900! Paghman: Kushak, east side Paghman mountains, 2200–2400 m, ANDERS 10152! Nijrao: Between Sarobi and Gulbahar above Shekhan, 3210 m, GILLI 2094! Panjshir: Gulbahar, NEUB. 329! Dasht-i Rewat (Decht-Revat), LINDB. 989/1960! Ruka, 1950 m, ANDERS 10033! Mukeni, 2400 m, HDG. & WDB. W-5300! Unai pass, 3100 m, GILLI 2093! Logar: Logar valley, JOHNSTON! 40 km SW Kabul, 2150 m, UOTILA 18923! Nangarhar: Khyber pass, JOHNSTON! Ghazni: W jugi Sardalu inter Qarabagh et Sang-i Masha, substr. gyps., 2600 m, RECH. 17366! Deh-e Nehal between Ghazni and Dasht-i Nawar, 2300 m, PODLECH 19217! Jaji: Kotkai, 2700 m, ANDERS 5308! Khost: In valle Tangai inter Domandao et Urgun, 1500–2000 m, RECH. 35783! Khost, VOLK 71/152! Nuristan: Chapadarrah between Wersek and Kandar, 1700–2000 m, ANDERS 10538!, 10587! Dewagal Darrah near Chalas, 1600–1700 m, ANDERS 11077! Bashgal Valley between Peshawari and Apsai (Afsay), 2500 m, BRECKLE A-3216! Between Chigha Sarai and Jalalabad, 600–800 m, KERST. 670! Waigel valley, 1800 m, EDELB. 2399! Nuristan, EDELB.! – NE: Wakhan: Khandud, 2800 m, ROEMER 253! Warg, 2600 m, GRANCY 110! Kataghan: N slopes Salang pass, 2500 m, DOBSON 112! Andarab Valley 2 km above Khinjan, 1000 m, PODLECH 11300! 8 km W Khinjan, 1000 m, UOTILA 16587!, 18837! 8 km W Khinjan, 1000 m, UOTILA 16627! Doshi, 900 m, PODLECH 19736! Pul-i Khumri 650–700 m, RECH. 16508!, UOTILA 17036! Aliabad mountain near Pul-i Khumri, 1800 m, VOLK 663! W Pul-i Khumri on road to Doshi, 750 m, HDG. & WDB. W-4051! 48 km SW Doshi, 1060 m, FURSE 8235! 25 km S Pul-i Khumri, 750 m, UOTILA 17069! Surkh Kotal 15 km NW Pul-i Khumri, 700 m, KUKKONEN 6429! Khost-o Fereng, PODLECH 11960! Taliqan: Namakab valley near Taqcha Khana, 1400 m, PODLECH 11518! Badakhsh.: Between

Chambuk and Argu, 1450 m, CARTER 492! Jurm, 2130 m, KOELZ 12908! Bam Kotal, LINDB. 732/1959! Baharak, 1550 m, ANDERS 6927! 10 km S Jurm in Kokcha valley, 1600 m, FREY 81! – C: Bamian: Kotal-i Ak Robat (Aqrabot) NW Bamian, 3000 m, DIETERLE 498! Near Bamian, 2520 m, GILLI 2092! Bamian gorge, RODIN 284! Doab: 35 km E of crossing to Doshi on the road to Bamian, 2500 m, UOTILA 18492! Shikar (Sekari) at the crossing to Doshi from Bamian Charikar road, 2230 m, UOTILA 18728! Shibar to Doshi, 1675 m, FURSE 5842! Pshang W Doab, 1700 m, GILLI 2088! Doab, 1400 m, AMSEL! Kamard, 1830 m, KOELZ 13597! Panjao: Nawa-i Surkhjoy between Panjao and Shahrestan, 2700 m, PODLECH 18898! Behzud: Dahan-i Abdila (Dohane Abdulla), 3100 m, ANDERS 4249! Nayak between Behzud and Dahan-e Abdila, 3000 m, ANDERS 4614! Behzud, 2740 m, THESIGER 136! – Afghanistan, GRIFF. 1734 = Herb. East Ind. Comp. 4192!

P a k i s t a n : Dir: Dir, RAHMAN 1! – Chitral: Drosh, 1370 m, TOPPIN 777! Markoh 88 km from Chitral to Tirich Mir, KAMAL & NAZIMUDDIN 1444! Brep N Mastuj, 2440 m, STAINT. 3081! Chapalli in valle Yarkhun, STAMM & WÖHRL 80! 19 km from Chitral to Mastuj, GHAFOOR & OMER 2955!, 2965! Near Mogh between Shoghor and Garin Chashma, GHAFOOR & OMER 2577! Chitral near Airport, ABEDIN 8088! Hojusk in Yarkhun valley, Österr. Alpenver. 267! – Swat: Kalam, KAZMI 3455! 10 km from Saidu Sharif to Kalam, SULTAN ALABEDIN 8255! Ushu, substr. granit., 2400 m, RECH. 19496! Shohrat forest in Ushu valley, KAZMI 3560! Between Banda Barai and Matta W bank of river Swat, GHAFOOR & ALI 3963! 40 km from Mingora to Jabba, 1370 m, QAISER & GHAFOOR 4763! – Peshawar: Landi Kotal, SHER AHMAD LODHI 5! Kund ad confl. fluvios Kabul et Indus, RECH. 30378! Peshawar, DEANE! – Kohat: Sherkot, CHAUDARY 6! Cherat, 700–950 m, RECH. 30237! – Kurram: Habib Kala, AITCH. 899! Kurram Valley, AITCH. 750! Parachinar, QAISER & ABEDIN 6027! – S. Wazir.: Razmak, coll. ign.! Kerankot 20 km from Wana, NAZIM & ABEDIN 941! – Quetta: Ziarat, 2449 m, JAFRI 486!, LACE 3961!, WATT! Spin Karez, 1830 m, CROOKSHANK 313! Bolan pass between Spezand and Mach, GHAFOOR & YUSUF 1076! Mach, 990 m, JAFRI 2829! Lak pass between Mastung and Mastung Road, JAFRI & AKBAR 2002! Shinghar 50 km N Fort Sandeman, 2050 m, LAMOND 608!, 614!, 1463! RECH. 29862! Fort Sandeman, 2600 m, QAISER & GHAFOOR 1575!

Distr. gen.: Mediterranean area to SW and C Asia and NW India; introduced and naturalized in C Europe, S Africa (?) and N America.

C. botrys is morphologically fairly uniform throughout its area. Some variation does occur in the number, depth and width of the leaf lobes, but is not worth taxonomic recognition.

Species 21–23 belong to Sect. *Botryoides* C.A. MEY. characterized by mainly solitary flowers in ± dichasially branched inflorescences.

22. *C.* ***nepalense*** COLLA, Herb. Pedemont. 5:571 (1836).
Syn.: *C. multiflorum* MOQ. in DC., Prodr. 13, 2: 75 (1849). *C. foetidum* auct., non SCHRADER (1808), non LAM. (1778).
Icon.: R. K. GUPTA, The living Himalayas 2: CXLIII (1989), as *C. botrys*. HSIEN-WU & CHO-PO, Fl. R.P. Sinica 25(2): Tab. 15, fig. 1–3 (1979), as *C. foetidum*. – Tab. 23 fig. 3; 24 fig. 1–2.
Type: "Specimen in ex hb. BIROLI in herb. COLLA", TO 5972 – photo!

Aromatic annual. Stems 5–40 cm, erect, branched mainly in the middle, main axis longer than branches, densely hairy, hairs sessile, glandular. Leaves yellowish – brownish green, lamina 1–5 cm, elliptic-ovate to broadly elliptic, pinnatifid with

2–5 broad lobes and sometimes several teeth on each side. Inflorescence with a few leaves, elongate, to 10 cm wide, composed of often fairly lax dichasial cymes, or more axillary with smaller cymes. Terminal flowers larger and earlier flowering than lateral ones. Perianth segments 5, c. 1 × 0,5 mm, elliptic to ovate, acuminate, free to halfway or more, herbaceous with membranous margins, dorsally with ± hairy keel, margins with sessile glands. Stamens 1–5. Stigmas 2. Pericarp free. Seeds horizontal, black, 0,6–0,8 mm, round in outline, thick, partly emarginate with or without keel in the middle; testa almost smooth.

Hab.: Fields, waste ground, near water, clayey places; 1585–3505 m. – Fl. VI–IX, fr. VII–X.

Afghanistan: E: Kabul: Laghman, EDELB. 2137! Nuristan: Bragamata (Barge Matal), 2050–2200 m, ANDERS 4960! Darrah-i Pengar 4 km below Samanaknesha, 3000 m, PODLECH 16587! NE: Munjan: Sanglich, 3505 m, KOELZ 12643! Rubat, 2590 m, KOELZ 12830! Wakhan: Warg, substr. granit., 2600 m, GRANCY 168! Deh Ghulaman E Baba Tangi, 3150 m, ANDERS 7941!, GREY-WILSON & HEWER 1408! In alveo fl. Pandsh, 3000 m, PAULSEN 1346! Langarkish, 3000 m, PAULSEN 1280! Rawchun (Rutschaun), 3200 m, HUSS 37!
Pakistan: Chitral: Bromboret (Bombrait) Valley, QAISER & GHAFOOR 6773!, GHAFOOR & OMER 3288! 28 km from Balakot to Narani, FARUQI & QAISER 3248! – Swat: 5–10 km from Kalam to Utror, 3000 m, GHAFOOR & OMER 3424!

Distr. gen.: the Pamir, the Himalayas, China to Yunnan, Sichuan and Gansu.

A variable species in leaf shape and perianth characters, but Afghan material is fairly uniform.

23. *C.* ***Schraderianum*** SCHULT., Syst. Veg. 6: 260 (1820).
Syn.: *C. foetidum* SCHRADER, Mag. Ges. Naturf. Freunde Berlin 2; 72 (1808), non LAM. (1778).
Icon.: SAVULESCU, Fl. R.P.R. 1: Pl. 76, fig. 4 (1962). – Tab. 23 fig. 4; 24 fig. 3; 26 fig. 9.
Type: Plant of unknown origin, cultivated by SCHRADER.

Aromatic annual with erect stems, 5–50 cm, sparingly branched in middle, main axis longer than branches, with short hairs and sessile glands. Leaf lamina green to yellowish green, to 8,5 cm, elliptic-ovate, pinnatifid with 3–5 broad lobes and several teeth on each side. Inflorescence elongate, not more than 5 cm wide, terminal, composed of mostly leafless dense dichasial cymes, or axillary with smaller cymes. Terminal flowers larger and flowering earlier than lateral ones. Perianth segments 5, c. 1 × 0,5 mm, elliptic to ovate, acuminate, free to base, often not contiguous at base, herbaceous with membranous margins, sometimes purple, with cristate glabrous keels, margins with sessile glands. Stamens 1–5. Stigmas 2. Pericarp free. Seeds horizontal, black, 0,6–0,8 mm, round in outline, margin rounded; testa uneven, with shallow small pits.

Hab.: Fields; 2000–2440 m. – Fl. VIII.

Pakistan: Kurram: Shalozan, c. 2000 m, AITCH. 750! Kurram valley, HARSUKH 15474! – Quetta: Ziarat, 2440 m, LACE 4015!

Distr. gen.: E and S Africa, SW Arabia, Pakistan; locally naturalized in C and E Europe.

6. *Spinacia*

PERTTI UOTILA, Helsinki

Spinacia L., Spec. Plant.: 1027 (1753); Gen. Plant. ed. 5: 452 (1754).

Lit: P. AELLEN, Beitrag zur Kenntnis von Spinacia L. Berichte der Schweizerischen Botanischen Gesellschaft 48: 485–490 (1938). M. GIRENKO, O klassifikacii spinata. Trudy po Prikladnoi Botanike, Genetike i Selekcii 40: 28–36 (1968).

Dioecious or exceptionally monoecious annual herbs, glabrous, or sparsely farinose when young. Leaves alternate, flat; in female plants up to the top of stem, sinuate-lobed to entire; in male plants, only a few leaves in basal part of the stem and less lobed. Flowers in dense glomerules; male inflorescence terminal, glomerules in interrupted spikes, paniculate; female glomerules in leaf axils. In male flowers, perianth segments 4(–5), herbaceous, with membranous margins and apex, often somewhat laciniate apically; stamens 4(–5), exserted. Female flowers without perianth, but with 2–4 persistent bracteoles enlarging, coalescing and hardening in fruit, individual flowers free or coalescing with each other in fruit; ovary superior, stigmas 4–5, long. Seeds vertical, c. 2 mm, ovoid, brown, testa thin; embryo annular; endosperm present. – Type of genus: *S. oleracea* L.

3 species, native in C and SW Asia.

Because of widely varying leaf characteristics and few differences in male flowers of the 3 species, identification of male plants can be problematic. Spine length and width, and surface texture of fruits varies much in all species, to some extent even within a population or even a single plant. In the material studied no correlation with other characters or geographical patterns was noted and no taxonomic recognition of fruit type variants has been adopted.

1a. Female flowers free from each other in fruit .... 3. *S. oleracea* L.
b. Female flowers united into an aggregate in fruit 2
2a. Terminal lobe of leaves clearly larger than the others; plant tall; female plants only with cauline clusters of flowers; bracts short-petiolate .... 1. *S. turkestanica* ILJIN
b. Terminal lobe of leaves at most somewhat larger than the others; plant small; female plants with cauline and basal clusters of flowers; bracts sessile .... 2. *S. tetrandra* STEVEN ex M.B.

1. ***S. turkestanica*** ILJIN, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. I, 2: 123 (1936).
Syn.: *S. tetrandra* auct. non STEVEN. *S. turkestanica* ILJIN, Sorn. Rast. SSSR 2: 113 (1935), nomen inval. (sine descr. lat.). *S. turkestanica* var. *brevispina* ILJIN, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. I, 2: 123 (1936).

Icon.: KOMAR., Fl. URSS 6: 76, tab. 3, fig. 9 (1936). – Tab. 27, 28.
Type: (Tadjikistan): Distr. Samarkand, prope Katta-Kurgan, 2.V.1925, JAKIMOV, Exsicc. Herb. Fl. As. Med. no. 230, LE, isotype S!

Plant glabrous or young parts diffusely farinose; stems 10–40(–50) cm, simple or basally branched, green-striated to yellowish. Petiole of basal and lowermost cauline leaves to 13 cm, lamina often somewhat longer than petiole, runcinate, pinnatisect, with a large triangular-hastate terminal lobe and 1–3 pairs of usually much smaller oblong to linear lateral lobes, sometimes with few secondary teeth; upper leaves with a shorter petiole, lamina broadly to narowly triangular-hastate; uppermost bracts lanceolate; all leaves acuminate at apex. Male flowers 4-merous, margin of perianth segments with a few teeth; anthers c. 1 mm. Female flowers mostly in groups of 3–6 in axils of most cauline but not basal leaves; in fruit united into a spiny corniculate aggregate, 8–15 mm in diameter, almost smooth to deeply furrowed-rugose on surface, horns 3-angled, channelled above, 4–8 mm long on upper surface, 1–2,5 mm broad in basal part, narrowly triangular to lanceolate, sometimes 2-tipped or with 1–2 secondary spines.

Hab.: Steppe and semi-deserts on sand or loess soil; roadsides, fields and gardens; 200–1500 m. – Fl. III–V, fr. IV–VI.

P e r s i a : N: Gorg.: Gonbad, RIEDL & ERSHAD 15883-E! Hottan N of Gonbad-e Kavus, 200 m, HEWER 3534!, 3551! Near At Temar S Hottan, HEWER 3567!, 3717! Narli, SHAR. 30073-E! c. 30 km W of Shirvan on road from Bojnurd to Mashhad, 1030 m, UOTILA 16197!, 16203! Moh. Reza Shah Prot. Reg.: Road to Behkadeh, 1250–1300 m, WDB. & FOROUGHI 12825!
T u r c o m a n i a : Ashkhabad: Ashkhabad, LITW. 197!, Gjaurs, SINT. 73a! Geok-tepe, SINT. 73b! Mekrowa, SINT. 73c! Kara-Kalinskii rayon: Akbulak, 1200 m, NIKITIN & IVANOV!
A f g h a n i s t a n : N: Mazar-i Sharif: Mazar-i Sharif, 360 m, PODLECH 20539! 5 km E Mazar-i Sharif, 450 m, ANDERS 5420! Ali Kuh, mountains 15 km S of Mazar-i Sharif, 1300 m, HDG., WDB. & EKBERG W-8513! 4 km SE Sultan Baba Ali Sher (18 km S Mazar-i Sharif), 850–1000 m, PODLECH 30994! 10 km S Pul-e Imam Bukri, 600 m, BRECKLE A-933! 4 km S Tash Kanda, on road to Akupruk, 36°16'N 66°54'E, 600 m, PODLECH 30924! Alakajar, on road to Akupruk, 36°29'N 66°54'E, 500 m, PODLECH 30972! Chashmeh-i Shafa pass, 25 km S Balkh, 480 m, KUKKONEN 6311! Samangan: Samangan valley, Tang-e Sayad NW Sayad, 36°36'N 67°45'E, 600 m, ANDERS 5714! 20 km NNW Haibak on road to Tashkurghan, 850 m, PODLECH 20455! 20–30 km NW Haibak, versus Tashkurghan, 600 m, RECH. 34008! 10 km E Haibak (Samangan), 1080 m, KUKKONEN 6391! Kishlagh near Haibak, 1080 m, CARTER 110! Shibarghan: 10 km NE Shibarghan, PABOT A-785! – NW: Maimana: 5–7 km E Daulatabad, 420–700 m, ANDERS 5456!, KOEIE 3534!, PODLECH 20619! Kohna Qala, 27 km N Maimana on road to Daulatabad, 660 m, PODLECH 20806! Kotal-i Kattakam, Pass-top 10 km E Maimana to Belchiragh, 960 m, PODLECH & JARMAL 29958! Between Belchiragh and Darrah Abdullah, 1100 m, HDG. & WDB. W-3693! Between Qala-Nyaz Beg and Aqdarrah, along the road from Maimana to Sare Hawdz, 1310 m, PODLECH & JARMAL 29982! Maimana, 800 m, AMIN in FREITAG 4265! Herat: Badghiz: Qala Nau, 900 m, KOEIE 3791! Badghiz: AITCH. 501! 10–32 km SE Qala Naw on road to Qaddis (Qades), 1130 m, PODLECH & JARMAL 29834!, 29857! Khwajamali, 8 km SW of Qala Naw, 63°05'N 34°54'E, 980 m, PODLECH & JARMAL 29793! – NE: Kataghan: 3 km W Khinjan, 920 m, UOTILA 16633! 8 km W Doshi, 915 m, FURSE 5944! 16 km N Doshi, 760 m, FURSE 5976! In jugo Paigah Kotal inter Pul-i Khumri 35°55'N, 68°45'E et Haibak, 36°15'N, 68°03'E, 1500 m, RECH. 33872!, 33873! Kotal-e Mirza Atbili (Paigah Kotal)

on road Pul-i Khumri to Haibak, 1410 m, PODLECH 22429!; 1250 m, UOTILA 16751! Kotal-e Robatak (Paigah Kotal) NW Pul-i Khumri, 1410 m, FREITAG 3141! 15 km W Robatak on road from Pul-i Khumri to Haibak (Samangan), 800 m, UOTILA 16734!, 16735! 35 km W Pul-i Khumri, in Koh-e Cungar, 850–1000 m, FREITAG 4950! Surkhab Valley near Husan Khel, 8 km N Pul-i Khumri, 620 m, ANDERS 5618! Dasht-e Layeqa between Pul-i Khumri and Doshi, ANDERS 5782! 20–25 km S Pul-i Khumri, 35°55'N, 68°45'E, in argillosis vallis fluvii Surkhab, 700 m, RECH. 33738! Buyrak, 12 km NW Ishkamish (Eshkamesh), 1200 m, PODLECH 21546! Sanduqsay, S Khanabad along the road to Ishkamish; 36°37'N 69°06'E, 620 m, ANDERS 6035!, 6076! Arabqunduq, between Khanabad and Ishkamish, 36°32'N, 69°07'E, 900 m, ANDERS 6733! Koh-i Damesh Pass, S Khulm (Tashkurghan), 530 m, UOTILA 16995! Taliqan: Naqel, between Taliqan and Khanabad, 36°44'N 69°17'E, 620 m, ANDERS 60117! Shamar, 12 km E of Taliqan, 1400 m, PODLECH 10366! Aqbolaq, on road Taliqan – Kishm, 36°45'N 69°52'E, 1320 m, ANDERS 6610! Badakhshan: Faizabad, 1070 m, FURSE 6213!, 6214!
P a k i s t a n : Quetta: 9.IV.1898, DUTHIE 8706!

Distr. gen.: Central Asia from Persia to southern Russia east of the Caspian Sea, C Asia and to Tibet and India.

Considerable variation exists in spine length and width (Tab. 28), fairly narrow and long spines being most frequent; plants with shorter and broader spines have been described as var. *brevispina* ILJIN.

2. *S.* ***tetrandra*** STEVEN ex M.B., Fl. Taur.-Cauc. 2: 417 (1808).
Syn.: *S. tetrandra* f. *cyclostegia* BORNM., Bull. Herb. Boissier, 2me sér. 8: 236 (1908).
Icon.: TAKHT., Fl. Armen. 2: tab. 76 (1956). – Tab. 29.
Type: "Habitat in Armenia iberica orientali, locis argillosis salsuginosis frequentes. Iberis pre olere, Schamun dicta."

Glabrous or weakly farinose; stems 8–30(–40) cm, usually several, simple to sparsely branched, dull green to yellowish green. Basal and lower cauline leaves variously petiolate; lamina 2–7 cm, deeply pinnatifid or sometimes pinnatisect, often runcinate, sometimes almost entire especially in male plants, the terminal lobe triangular to lanceolate, c. of equal size as 1–3 pairs of lateral lobe. Upper cauline leaves lanceolate or absent in male plants, in female plants triangular ovate to orbicular ovate, sessile, entire or somewhat lobed, usually spine-tipped. Male flowers 4-merous, margin of perianth segments somewhat laciniate; anthers 1–1,5 mm. Female flowers mostly in sessile groups of 4–8 in the axils of all cauline leaves and also of basal leaves; in fruit united into a spiny corniculate aggregate, 7–15 mm in diameter, often rugose, sometimes brownish, horns 3-angled, channelled above, to 6 mm long above, often relatively broad and warty at base, narrow and pointed at apex.

Hab.: Semi-desert, steppe, waste lands, fields, shores of salty lakes; 150–1400 m. Fl. III–V; fr. V–VI.

P e r s i a : W: Azerb.: S Mianeh along road to Tabriz, 1370 m, BOWLES' Scholarsh. Bot. Exp. 1134! 32 km E of Mianeh, mud hills, 1675 m, BOWLES' Scholarsh. Bot. Exp. 1564! Near Tabriz, GILL.-SM. 1384!, 1425! 45 km SE of Maku on the road from Bazargan to Tabriz, 970 m, KUKKONEN 5451!, UOTILA 15680! Qareh Su (Karasu, Kurassu = tributary of Aras River NE Ahar), SZOV.! Dasht-e Moghan: Ali Rezaabad-e Jadid to Qareh Aghaj, 900 m, IRANSHAHR 30377-E! In collibus aridis inter Alirezaabad-e Jadid et Sarband, 39°35'N 47°50'E, 200 m, RECH. 40189! 25 km NW Qareh-Aghai, 250 m, PABOT 3117! Ad ripas fluvii Araxes (Aras) 43 km SW Parsabad versus Aslanduz, ad versuras agrorum (*Medicago*), 125–180 m, LAMOND 3189!, 3193! in RECH. 40162!, 40165! 16 km NW Mahabad to Rezaiyeh, c. 1280 m, LAMOND 4203! Lake Rezaiyeh, SW side, 36°56'N, 45°52'E, 1300–1400 m, JACOBS 6641!, 6649! Ad versuras et in agris derelictis 16 km NW Mahabad versus Miandoab, 1280–1300 m, RECH. 42194! – C: Qazv.: Prope Pachenar inter Rasht et Qazvin, 600 m, BORNM. 8103 (type of f. *cyclostegia*)!

Distr. gen.: Caucasus, W Persia, Iraq, Syria, Jordan, (? E Turkey).

A characteristic feature of the species is the 1–2,5 cm broad 'tuber-like' base of the plant formed by the stem bases and the basal fruit-aggregates. As in the other species there is variation in the length and width of the spines, but generally the spines are relatively broader at the basal part and more thin-pointed at the apex than in other species.

3. ***S. oleracea*** L., Spec. Plant.: 1027 (1753).
Syn.: *S. oleracea* L. subsp. *orientalis* GIRENKO, Trudy Prikl. Bot., Genet. Selekcii 40: 35 (1968), nomen inval. (no type designed). *S. spinosa* MOENCH, Meth.: 318 (1794) – nomen illegit.
Icon.: HEGI, Ill. Fl. Mitteleur, ed. 2, 3 (2): tab. 97, fig. 1 (1961). – Tab. 30.
Type: LINN 1174.1!; lectotype selected by HEDGE, Regnum Veg. 127: 90 (1993).

Plant dioecious or sometimes ± monoecious, usually glabrous; stem to 50 cm, erect, simple or branched, yellow to pale green. Leaves green to yellowish, basal and lower cauline leaves long-petiolate, lamina to 12 cm, ovate to triangular-hastate, entire or with a pair of lanceolate side-lobès; upper leaves petiolate to sessile, lamina triangular-hastate-ovate-lanceolate, entire. Flowers unisexual; in monoecious plants some ± hermaphrodite. Male flowers 4(–5)-merous, margin of perianth segments almost entire; anthers c. 1 mm. Female flowers mostly in groups of c. 10 in leaf axils except lowermost ones; bracteoles of different flowers not united; each flower remaining free in fruit and falling separately; fruits 2–3 mm long, orbicular-obovoid, somewhat flattened, almost smooth, horns absent or to 6 mm long, relatively thin.

Hab.: Cultivated as a vegetable; remnant of cultivation or an escape from cultivation; 850–1550 m. – Fl. V, fr. V–VI.

Persia: W: Arak: Golpayegan, HASHEMI 40274-E! – S: Bal.: In hortis oppidi Iranshahr, SOJÁK 1806!
Turcomania: Kizyl-Arvat, "Vorgebirge", SINT. 851b!
Afghanistan: NW: Herat: N of the town of Herat, 850 m, UOTILA 16335! – SE: Kandahar: Girishk, 1000 m, UOTILA 16468! – NE: Kataghan: Mittleres Andarab-Tal, Banu, 1500 m, PODLECH 10943!

Distr. gen.: Widely cultivated as a vegetable (spinach) in temperate and subtropical Europe, Asia and N America, sometimes naturalized or found as an escape. Not known wild in nature, but probably domesticated in SW Asia.

Various cultivars occur in the area, and those with horny fruits (SINT. 851b, PODLECH 10943) are more primitive. Orbicular-fruited cultivars with paler more entire leaves (HASHEMI, UOTILA 16335, 16468) are more advanced and have probably arisen independently in several areas. In Turkey, plants with both orbicular and variously horny fruits have been seen on the same plant.

7. *Atriplex*

I. C. HEDGE, Edinburgh

Atriplex L., Spec. Plant. 1052 (1753); Gen. Plant. ed. 5: 472 (1754).
Syn.: *Obione* J. GAERTN., Fruct. Sem. Pl. 2: 198 (1791). *Halimus* WALLR., Sched. Crit. 117 (1822) non P. BROWN (1756). *Halimione* AELLEN, Verh. Naturf. Ges. Basel 49: 121 (1938). *Senniella* AELLEN, Bot. Jahrb. 68: 416 (1938).

Lit.: E. ULBRICH, Atriplex and Obione in ENGLER & HARMS, Die natürlichen Pflanzenfamilien ed. 2, 16C: 505–519 (1934). M. ILJIN, Atriplex in KOMAROV, Flora URSS 6: 78–108 (1936). P. AELLEN, Halimione AELLEN, eine rehabilitierte Chenopodiaceen-Gattung, Verhandlungen der Naturforschenden Gesellschaft in Basel 49: 118–130 (1938). P. AELLEN, Die orientalischen Obione-Arten, Verhandlungen der Naturforschenden Gesellschaft in Basel 49: 131–137 (1938). P. AELLEN, Die Atriplex-Arten des Orients, Botanische Jahrbücher 70: 1–66 (1939). A. FRANCHET & H.N. LE HOUEROU, Les Atriplex en Tunisie et en Afrique du Nord, (Rome 1971).

Annual or perennial herbs, sub-shrubs or shrubs with a mealy grey to white indumentum of vesicular scales or glabrous. Leaves well-developed, flat, alternate or opposite, sessile or petiolate, entire to irregularly toothed or lobed. Flowers unisexual; plants monoecious or dioecious. Inflorescence spiciform or paniculate. Flowers borne in glomerules, rarely solitary. Male flowers with (3–)5 small scarious perianth segments and (3–)5 free stamens opposite them. Female flowers usually without, rarely with, a perianth, within two persistent herbaceous bracts, increasing in size in fruit; fruiting bracts (valves) of varied shape, degree of fusion and ornamentation. Stigmas 2 diverging, filiform. Seed within a membranous pericarp, usually vertical, seldom horizontal (in female flowers with a perianth), sometimes dimorphic; embryo annular with a variously positioned radicle. – Type of genus: *A. hortensis* L. [See BRITTON & BROWN, Ill. Fl. N United States ed. 2, 3: 17 (1913), MCNEILL & al., Taxon 32,4: 549–556 (1983)].

An almost cosmopolitan genus of up to 200 species with centres in various parts of the world, including a major one in Australia. In SW Asia the species are segetal, halophytic, psammophytic or semi-desertic; many of our species are important ecologically or economically as grazing plants. The individual species vary greatly in morphology, probably hybridize and introgress, and their circumscription is often particularly difficult. The most important characters are provided by the fruiting bracts (often called bracteoles) or valves, but even these can vary greatly within a species or even on the same plant. AELLEN in his 1939 review of the SW Asiatic species (l.c.) recognized a large number of taxa at specific and infra-specific rank, whereas present-day botanists tend to recognize a smaller number of species, in some cases extremely multiform. Many problems have still to be resolved in our species; detailed field observations and biosystematic studies have proved to be of paramount importance in solving problems in other parts of the world, e.g. North America and Europe, and such studies are much needed for the species of SW and C Asia. Many specimens from our area lack fruits and consequently cannot usually be identified with accuracy. In common with many Chenopodiaceae adapted to life in dry salty conditions, our *Atriplex* species have a different pathway of photosynthesis (the C4 type) from most flowering plants; the leaf venation is of the Kranz anatomy type.

Different authors have held clearly differing opinions both on the circumscription of *Atriplex* and its infra-generic classification. ULBRICH (1934) recognized *Obione* as a separate genus; AELLEN (1938, 1939) recognized both *Obione* and *Halimione* as separate genera. In contrast, most recent authors (not all) include both these genera in *Atriplex*, a course which, with some conviction, is followed here. Differing sectional classifications have been proposed by ULBRICH (l.c.), AELLEN (l.c.), ILJIN (1936) and others, but none has been followed in this account. Although there are undoubtedly a number of clear-cut species-groups in SW Asia (such as those of *A. halimus*, *A. hortensis* and *A. tatarica*), currently recognized sections are much less natural and can only be defined rather arbitrarily.

A number of species from Australia and the New World have been introduced into the arid zones of the E Mediterranean and SW Asia as potential economic or grazing plants (e.g. *A. canescens*); others have come in as weeds (e.g. *A. spongiosa*).

1a. Fruit valves free to the base; annuals 2
b. Fruit valves loosely fused at base to ± completely fused up to apex; annual or perennial herbs or shrubs 7
2a. Female flowers dimorphic: some with a perianth and in fruit with a horizontal seed; others without a perianth and in fruit with a vertical seed ... 3
b. Female flowers all monomorphic: without a perianth and in fruit with a vertical seed 4
3a. Leaves distinctly bicolorous, white or greyish white below, ± green above .... 2. *A. Aucheri* MOQ.
b. Leaves ± green on both surfaces, glabrous or almost so (cultivated) .... 3. *A. hortensis* L.
4a. Upper cauline leaves narrow oblong to linear-elliptic; fruits monomorphic, valves ± ovate-trullate 5
b. Upper cauline leaves broad ovate, deltoid or broad triangular; fruits ± dimorphic of 2 sizes, large and small; valves broad ovate to ± suborbicular 6
5a. Glomerules many-flowered, ± condensed; fruit valves c. 3,5 × 2,5 mm; internodes ± short .... 4. *A. laevis* LEDEB.
b. Glomerules few-flowered, lax; fruit valves 4–6,5 × 3,5–4 mm; internodes elongated .... 5. *A. patula* L.
6a. Glomerules all borne in axils of upper leaves; at least some fruits clearly stipitate; low-growing (5–40 cm), mainly desert plants branched from base .... 6. *A. dimorphostegia* KAR. & KIR.
b. Only lowermost glomerules borne in leaf axils; fruits not stipitate; erect non-desert plants (60–150 cm) branched above ...... 1. *A. micrantha* LEDEB.
7a. Dioecious shrub with linear-oblong to linear-elliptic leaves; infructescence

condensed; fruit valves 4-winged (introduced) ....
.... 20. *A. canescens* (PURSH) NUTT.

b. Monoecious herbs or shrubs; fruit valves not 4-winged 8

8a. All leaves or most leaves opposite 9

b. All leaves alternate or lowermost opposite and the rest alternate 10

9a. Shrub with entire thick-textured oblong-ovate to elliptic cuneate leaves; fruit ± spherical, warty-tuberculate .... 16. *A. verrucifera* M.B.

b. Annual with serrate to subentire thin-textured truncate to cordate leaves; fruit ovoid in outline, 6–10-toothed or lobed. 8. *A. flabellum* BUNGE ex BOISS.

10a. Fruit with a prominent thick stipe, 1,5–2,5 mm long; leaves ± regularly broad triangular, subentire, apically acute or mucronate ....
.... 9. *A. Belangeri* (MOQ.) BOISS.

b. Fruit without a stipe or with a shorter slender stipe; leaves oblong to ovate-triangular to suborbicular 11

11a. Fruit valves ± orbicular, flat, fused to apex, with a broad all-round 2 mm wing; plant often yellowish .... 7. *A. moneta* BUNGE ex BOISS.

b. Fruit valves not orbicular, without a wing; plants grey or greyish green
.... 12

12a. Fruit valves spongy-inflated; fruit ellipsoid to globular, internally with a reticulum of fibrous veins (naturalized alien) ... 21. *A. spongiosa* F. MUELLER

b. Fruit valves not spongy-inflated; fruit not globular, internally without a fibrous reticulum 13

13a. Shrubs with suborbicular to reniform ± flat fruits; valves fused only at base; leaves entire or obsoletely repand-lobed 14

b. Shrubs, perennial or annual herbs; fruits variable, with clearly fused valves; leaves entire to clearly serrate 16

14a. Glomerules many-flowered forming dense elongated leafless fruiting spikes; fruit valves c. 4 × 5 mm, entire or dentate; plant 1–2(–3) m ....
.... 19. *A. halimus* L.

b. Glomerules few to many-flowered; fruiting spikes ± lax, leafless or not; fruit valves 5–10 × 5–10 mm; plants 15–80 cm 15

15a. Fruit valves 5–6 × 5–6 mm; leaves oblong-obovate, attenuate into a 0,5–1,5 mm petiole .... 18. *A. Stocksii* BOISS.

b. Fruit valves 7–10 × 10–12 mm; leaves rhomboid to suborbicular, broadly cuneate to subcordate with a 2–10 mm petiole on lower leaves ....
.... 17. *A. Griffithii* MOQ.

16a. Fruit valves strongly adnate to apex; perennial herb or shrub with thick-textured often sessile, entire to sinuate-dentate leaves ....
.... 15. *A. leucoclada* BOISS.

b. Fruit valves basally united, free above; annuals often woody below, with ± thin-textured usually petiolate entire to serrate leaves (*A. tatarica* complex) 17

17a. Fruit valves (c. 12 × 10 mm), markedly 3-lobed, with a much elongated middle lobe, central portion of valves with large tubercles .... 14. *A. ornata* ILJIN
b. Fruit valves 3-lobed or not, without an elongated middle lobe and valves with or without small tubercles 18
18a. Upper stem leaves linear-oblong, oblong or narrow triangular, entire or with remote toothing 19
b. Upper stem leaves oblong to triangular ovate, irregularly serrate to sinuate-lobed 20
19a. Stems 1,5–15 cm; inflorescence with at least some distinct vesicular hairs .... 12. *A. pamirica* ILJIN
b. Stems 10–100(–150) cm; inflorescence without distinct vesicular hairs, glabrescent or vesicular scaly .... 11. *A. lasiantha* BOISS.
20a. Upper leaf surface glabrous; petiole on middle cauline leaves 15–20 mm .... 13. *A. schugnanica* ILJIN
b. Upper leaf surface with an indumentum; petiole on middle cauline leaves less than 10 mm .... 10. *A. tatarica* L.

1. ***A. micrantha*** LEDEB., Icon. Pl. Fl. Ross. 1: 11 (1829).
Syn.: *A. heterosperma* BUNGE, Beitr. Fl. Russl. 272 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 448 (1854).
Icon.: LEDEB., l.c. tab. 43 (1829). – Tab. 31.
Type: (? Kazakhstan) "In locis salsis humidiusculis deserti Songoro-Kirghisici trans fl. Irtysch, Jul. (1826)", C.F. VON LEDEBOUR, LE.

Sturdy green annual, monoecious. Stems 60–150 cm, erect, branched, angular, glabrous or with some vesicular scales, leafy. Leaves alternate, except lowermost, 4–8 × 2–6 cm, ovate to triangular, broadly cuneate, truncate to hastate, entire to irregularly serrate, obtuse to acute, sometimes apiculate, ± concolorous, glabrous on both surfaces or with a thin vesicular scaly indumentum below; petiole on lower leaves up to 3 cm. Inflorescence paniculate with rather short lateral branches; lower spikes borne in leaf axils, upper without subtending leaves; sexes mixed within spikes. Male flowers 5-partite. Female flowers monomorphic. Fruiting valves free to the base, membranous, broadly ovate to suborbicular, of 2 types: a) small, 2–2,5 × 2–2,5 mm, scarcely veined, completely filled with the black 1–1,5 mm seed; b) clearly larger c. 4,5 × 4,5 mm, clearly veined, with the brown, c. 2–2,5 mm seed only filling central part of the valves.

Hab.: Waste places, garden weed, edge of ditches, salty ground, river banks; 500–1800 m. – Fl. V–VII, fr. VI–IX.

Iraq: Mosul: Mosul, ANDERS 2425!
Talis: Talish, sec. GROSSH., Fl. Kavk. 3: map 107 (1945).
Persia: N: Gorg.: Mohammad Reza Shah Prot. Reg. (Golestan), Kuhha-ye Almeh, 1500 m, TERME & MATIN 35102-E! – W: Azerb.: Ardabil, KAMALI 40208-E! Rezaiyeh (Urmia) lake,

salt steppe NE shore at Sharif-Khaneh, 1200 m, BEHB. & AELLEN 103!, 104!, 106!, 114!, 121! Garden at Maragheh, 1250 m, BEHB. & AELLEN 105! – E: Khor.: Torbat-e Heydariyeh, KOELZ 16874! – C: Tehr.: Karaj, 1330 m, AELLEN 107!, 115!, 127! Hableh-Rud, Simin-Dascht, 1150 m, AELLEN & MANUCH. 126!, 30163-E! Shahr.-Bust.: Shahrud, 1350 m, TERME & al. 39366-E! Kashan: Qamsar, MANUCH.!

Turcomania: Ashkhabad, LITW. 306!, 307!

Afghanistan: N: Mazar-i Sharif: Tashkurghan, 550 m, FREITAG 3901! – E: Kabul: Dehmasang to Chehelsotun, 1770 m, GILLI 2099! Kabul, 1780 m, GILLI 2100!, NEUB. 3102! Guzargah, NEUB. 97–100/1950!! – NE: Kataghan: Kunduz, river banks, 400 m, RECH. 16042! Badakhsh.: Rustak, 600 m, KOELZ 13137!

Distr. gen.: Lebanon? , Turkey, N Iraq, Caucasus, Persia, Turcomania, C Asia, Siberia, China.

In facies, very similar to *A. Aucheri*, but leaves beneath with almost no indumentum, or glabrous, and fruit valves of 2 distinct types (large and small). From the available evidence the two species grow in identical habitats and occupy very similar geographical ranges. Although *A. Aucheri* has been placed in sect. *Dichrosperma* DUMORT. and *A. micrantha* in sect. *Teutliopsis* DUMORT. – the former section having dimorphic female flowers, the latter monomorphic female flowers – there is no doubt that the two species are very closely allied and part of the *A. hortensis* complex. Some records of *A. hastata* auctt. non L. may belong here.

2. ***A. Aucheri*** MOQ., Chenopod. Monogr. 51 (1840).

Syn.: *A. amblyostegia* TURCZ., Bull. Soc. Imp. Nat. Mosc. 25, 2: 416 (1852). *A. nitens* MOQ. subsp. *desertorum* ILJIN, Bull. Jard. Bot. URSS 26: 414 (1927). *A. hortensis* L. subsp. *desertorum* (SOSN.) AELLEN, Bot. Jahrb. 70: 29 (1939). *A. nitens* SCHKUHR subsp. *Aucheri* (MOQ.) TAKHT. in TAKHT.& AN. A. FEDOR., Fl. Erevana 90 (1972).

Icon.: Tab. 32.

Type: Persia (occidentalis), P.M.R. AUCHER-ELOY 3099, G-DC – microfiche!

Sturdy annual, greyish, monoecious. Stems 40–180 cm, erect, usually branched, angular, glabrous or somewhat vesicular scaly, leafy below. Leaves alternate, 3,5–10 x 1,5–8 cm, triangular, truncate, hastate to cordate, entire or irregularly toothed or lobed, acute sometimes apiculate, ± bicolorous with a dense greyish white vesicular scaly indumentum below, much thinner or subabsent above; petiole on lower leaves to 3 cm. Inflorescence widely paniculate with many slender branches; lower spikes borne in leaf axils, upper without subtending leaves. Glomerules few to many-flowered; sexes variously arranged on spikes. Male flowers 5-partite. Female flowers dimorphic, some with 5 perianth segments and a c. 1,5 mm horizontal seed; most without 5 perianth segments. Valves of fruit free to base, membranous, broadly ovate to suborbicular, (4–)7,5–11 x (4–)5–9 mm, entire, sessile, reticulately veined, obtuse; seed vertical, c. 2,5 mm in diameter.

Hab.: Waste places, garden weed, salt steppe; 1300–2600 m. – Fl. IV–V, fr. V–X.

Persia: N: Gorg.: Inter Dasht et Loveh, 1200 m, RECH. 37619! Maz.: Tejan valley (Tedschen), Qomrud Pain to head of pass, c. 2400 m, AELLEN & BEHB. 88! Veresk versus Pol-e Safid, 1350 m, MATIN & TERME 41710! Marzunabad to Chalus, TERME 14824-E! – W: Azerb.: Tabris, uncultivated land, 1350 m, AELLEN & BEHB 94!, 95! Rezaiyeh (Urmia) lake, salt steppe NE shore at Sharif Khaneh, 1220 m, AELLEN & BEHB. 86!, 486! "Persia occidentalis", AUCH. 3099. – E: Khor.: In valle fluvii Atrek inter Bojnurd et Shirvan, RECH. 1814! – C: Tehr.: Hableh Rud between Simin Dasht and Kabutar-Darreh, 1150 m, AELLEN & MANUCH. 90!, MANUCH. & AELLEN 30161-E! Qazv.: Mardabad prope Karaj, MIRD. 2077! Shahr.-Bust.: Shahrud, Bagh Sar-e Chashmeh, RECH. 5378! Dasht-e Kalpush, TERME & MATIN 35096-E! Shahrud, KOELZ 16944!

Turcomania: Ashkhabad, Suluklü ad fines Persiae, SINT. 1088!, 1118! Prope Chuli, LITW. 309!

Afghanistan: E: Kabul: Kabul Univ., UOTILA 18454!

Distr. gen.: S Russia, Crimea, Persia, Turcomania, Afghanistan, C Asia, China (Sinkiang).

A close ally of *A. micrantha* q.v. and a member of the *A. hortensis* complex. The dimorphic female flowers are distinctive.

3. *A.* ***hortensis*** L., Spec. Plant. 1053 (1753).
Type: Tartary (Russia, Orenburg steppe), Hort. Sicc. Cliff., BM (conf. McNEILL, l.c.: 552).

Similar in facies to *A. Aucheri* in vegetative and inflorescence characters, but leaves almost glabrous on both surfaces; female flowers dimorphic as in *A. Aucheri.*

Persia: S: Kerm.: Zahedan, REMAUDIERE 80!

Distr. gen.: Europe (naturalized), SE Russia, Turkey, Caucasus, Persia, C Asia(?), China; cultivated elsewhere.

Cultivated in Europe as a spinach-like pot herb (orache) and naturalized in the centre and south of this area. The Persian specimen cited above is provisionally named; it may be merely a glabrous form of *A. Aucheri*. In common with many long-cultivated plants, the wild distribution of *A. hortensis* is uncertain, if indeed it occurs anywhere as a truly wild plant. Its relationship to its closest ally, *A. Aucheri*, which apparently differs only in its prominent leaf indumentum, is also not clear. AELLEN, Bot. Jahrb. 70: 29 (1939) regarded *A. Aucheri* (as *desertorum*) as a subspecies of *A. hortensis*.

Although *A. hortensis* is widely cultivated in various parts of the world, including Kashmir and different parts of India, there seems to be no record of it as a cultivated plant in our area.

4. *A.* ***laevis*** LEDEB., Icon. Pl. Fl. Ross. 1: 10 (1829).
Syn.: *A. patula* L. var. *tatarica* TRAUTV., Bull. Soc. Imp. Nat. Mosc. 40: 55 (1867). *A. patens* (LITW.) ILJIN, Bull. Jard. Bot. URSS 26: 415 (1927).
Icon.: LEDEB., Icon. Pl. Fl. Ross. 1: tab. 41 (1829). – Tab. 33.
Type: (? Kazakhstan) "In subsalsis ad fl. Irtysch et in deserto edito ad fl. Tschuja", C.F. VON LEDEBOUR, LE.

Annual, monoecious, pale green. Stems 40–60 cm, erect, unbranched or with lateral branches, angular, glabrous, leafy. Leaves alternate, 40–60 x 4–10 mm, linear-oblong, attenuate into a 5–10 mm petiole, entire or irregularly serrate, acute or apiculate, glabrous. Inflorescence spiciform-paniculate; lower sub-erect spikes in axils of leaves, upper leafless. Glomerules many-flowered, ± condensed, with ± long vesicular hairs; male flowers interspersed among the more numerous female flowers. Perianth of male flowers 5-partite. Valves of fruit free to base, green or brownish green, ovate-trullate, 3,5 × 2,5 mm, 3-veined, entire or finely serrulate, sessile, without appendages. Seeds black c. 1,3 mm in diameter.

Hab.: Salty marshes and cultivated land; c. 1300 m. – Fl. VI.

Persia: W: Azerb.: In limosis salsis 35 km NW Mahabad, 1280 m, RECH. 42168! Ad pagum Mohammed Yar inter Haydarabad et Mahabad, 1300 m, RECH. 42162!

Distr. gen.: Turkey, Persia, C Asia, Siberia, China.

A distinct annual species, erect in habit with ± linear leaves and fruit valves free to the base; the glomerules are congested and have ± long vesicular hairs. In other parts of its range, dimorphic seeds have been reported but this has not been observed in our area. *A. laevis* had not previously been recorded from the Flora Iranica region.

5. ***A. patula*** L., Spec. Plant. 1053 (1753).
Syn.: *A. oblongifolia* auct. non WALDST. & KIT.
Icon.: ROSS-CRAIG, Draw. Brit. Pl. 25: tab. 26 (1968). – Tab. 34.
Type: Europe, LINN 1221/19 microfiche!

Annual, monoecious, pale green or green. Stems 40–100 cm, erect or prostrate-ascending, angular, with long internodes, ± glabrous, branched or not, leafy. Leaves alternate, 30–75 × 7–15 mm, glabrous or with scattered vesicular scales; lower ovate-oblong or rhombic, entire or irregularly toothed; upper narrow oblong or linear-elliptic, entire, cuneate with a petiole to 2 cm. Inflorescence lax, paniculate, ± densely vesicular scaly when young, glabrescent; lower spikes in leaf axils. Glomerules few-flowered, condensed; male and female flowers interspersed, ± in equal proportions. Perianth of male flowers 5-partite. Valves of fruit ± free to base, green, ovate-trullate to deltoid-rhombic, c. 4–6,5 × 3,5–4,5 mm, entire or finely serrulate, sessile, with weakly developed appendages on central part or without appendages. Seeds dark brown or black, c. 2 mm in diameter.

Hab.: Weed in gardens, fields, *Cupressus* forest, among *Tamarix*; 500–2300 m. – Fl. VIII, fr. IX–XII.

Talish: Talish sec. GROSSH., Fl. Kavk. 3: map 129 (1945).
Persia: N: Gorg.: Gorgan to Shah Pasand 17 km Aliabad, 500 m, ASSADI 25569! – W: Azerb.: Maragheh, Rezaiyeh (Urmia) lake, 1250 m, AELLEN & BEHB. 85! – S: Fars.: Shiraz, 1600 m, M. GRANT 17016! – E: Khor.: Mashhad, Zoshk, c. 2200 m, TERME & al. 36571-E! Chenaran, Radkan, Gorou, 2000 m, TERME & al. 36569-E!
Afghanistan: E: Kabul: Gulbagh, rice fields, 1800 m, GILLI 2112! Among *Tamarix*, Logar river at Charasiah, 1780 m, GILLI 2111! – NE: Badakhsh.: Rustak, 600 m, KOELZ 13149!

Distr. gen.: Europe, N Africa, Turkey, Lebanon, Syria, Persia, Afghanistan, C Asia.

Of similar appearance to *A. laevis*, but with longer internodes, loose infructescences and larger fruit valves.

6. *A. dimorphostegia* KAR. & KIR., Bull. Soc. Imp. Nat. Mosc. 15: 438 (1842).
Syn.: *A. bracteosa* TRAUTV., Acta Horti Petrop. 1: 17 (1871). *A. transcaspica* BORNM. & SINT. – nomen.
Icon.: ZOHARY, Fl. Palaest. 1: tab. 210 (1966). JAFRI & EL-GADI, Fl. Libya 58: tab. 16 (1978). – Tab. 35.
Type: (C Asia) Lake Kli near Sassykpastau, G.S. KARELIN & I.P. KIRILOW, LE.

Annual, grey or greyish green, monoecious, ± succulent. Stems 5–40 cm, much branched from base, prostrate or ascending, whitish, glabrous. Leaves alternate except lowermost, 1–4 x 1–3,5 cm, ovate, broad ovate or deltoid, truncate or cuneate, acute or obtuse, entire or sinuate-lobed, with a vesicular scaly indumentum denser below, glabrescent above; petiole 2–5 mm on lower leaves, absent on upper leaves. Glomerules borne in axils of upper leaves, few-flowered; lowermost mostly female, uppermost male and female. Perianth of male flowers yellowish, 4–5-partite. Valves of fruit free to base, often of two types: lower up to 10 x 12 mm, with a ± terete thick stipe up to 9 mm long, broad triangular-orbicular, triangular-cordate or reniform, serrate or subentire; upper c. 4 x 2,5 mm, of similar shape, central part with or without appendages. Seeds often of 2 forms: larger up to 2 mm in diameter, brownish; smaller c. 1,5 mm diameter, dark brown.

Hab.: Sandy places in desert, mobile sands, sand dunes, stony desert, salty soil, *Artemisia* steppe, fields, roadside; 300–1450 m. – Fl. IV–V, fr. IV–VI.

Persia: S: Kerm.: Inter Bahramabad et Kabutarkhan, RECH. 2901! 35 km SE Zahedan versus Mirjaveh, RECH. 27237! Inter Zahedan et Khash, c. 1500 m, RECH. 4252! Jiroft, Jaz Murian, STARM. 121!, LÉONARD 5725! Inter Saidabad et jugum Chah-e Chaghak, c. 1800 m, RECH. 3103! 2 km S Kahurak, SOJÁK 231!, 232! 233! 13 km S Rafsanjan, SOJÁK 129! Bal.: Khash, 1300 m, RECH. 4290!, SOJÁK 432! In ditione montis Taftan prope Sangon, 1600 m, RECH. 4076! Makran: 9 km bor.-occ. Paskuh, SOJÁK 578!, 611! 44 km NE Zaboli, SOJÁK 748! Bazman ad Eskalabad, SOJÁK 2038! – E: Khor.: Badghiz: Inter Tayyebat et Kisil Islam Qaleh, 700 m, RECH. 33241! Tayyebat, 840 m, UOTILA 16276! 70 km SE Torbat-e Heydariyeh, Jannatabad to Alui, 850 m, RECH. 51372!, IRANSHAHR 40152E! E margin of great Kavir, Ozbagu (Ozbah-Kuh), Chashmeh Shir, RUTTNER 225!, 398! In arenosis c. 58 km N Gonabad inter Mahmeh et Emrani, 900 m, RECH. 51416! In argillosis salsis and radices montium 8 km NW Aliabad versus Asfak, 800 m, RECH. 51712! Deyhuk, 1200 m, RECH. 51616! Ferdows to Tabas, 1100 m, REJAMAND & BAZARGAN 31963! SE Mashhad, 20 km NW Torbat-e Jam, 1100 m, UOTILA 16225! Doruneh, 1000 m, PARRIS 75/143! – C: Tehr.: Kavir Prot. Reg.: 34 km a Chashmeh-ye Safid Ab versus Hajji Ali Abbas, 1100 m, RECH. 46467! Siah-Kuh prope cisternam Howz-e Agha Mohammed a Caravan-Sarai Shah Abbas, 900 m, RECH. 46362! Siah-Kuh, in ditione refugii Caravan-Sarai Shah Abbas, c. 1200 m, RECH. 46236! Siah-Kuh, IRANSHAHR 30298-E! Prope Mulkabad 64 km SE Caravan-Sarai Shah Abbas, 900 m, RECH. 46329! Tehran to Tabas, S du Dasht-e Kavir, 850 m, LÉONARD 5406! Shahr.-Bust.: Turan Prot. Reg.: ESE Delbar versus Ahmadabad, 800–1000 m, RECH. 50643!, 50526!, 50572!, IRANSHAHR 40082-E! Bijarjumand, 1100 m, RECH. 50323! Inter Asb Keshan et Bargh, 1200 m, RECH. 51046! In arenosis mobilibus prope Darb-Ahang, 18 km NNE Ahmadabad, 800 m, RECH. 50660! Inter Ahmadabad et Darb Ahang, IRANSHAHR 40155-E! Versus Zamanabad, in arenosis, 900 m, RECH. 50717! Damgh.-Semn.: Anjirab, 66 km SE Semnan, 1500 m, RIEDL & IRANSHAHR 15885! Yazd: 15 km W

Chah Malek versus Chupunum, c. 850 m, RECH. 51891!, IRANSHAHR 40154-E! Yazd: Robat-e Khan to Tabas, 850 m, AMIN & REJAMAND 32907!
Turcomania: Ashkhabad sec. NIKITIN, Ill. Opred. Rast. Ashkhabad 113 (1965).
Afghanistan: N: Mazar-i Sharif: 60 km NW Balkh, BRECKLE 4670! Mazar-i Sharif versus Tashkurghan, 400 m, RECH. 34217! 12 km N Khairabad, sand dunes, 290 m, UOTILA 16874! Siahgird, UOTILA 16849! Tashkurghan, 430 m, UOTILA 16803! – NW: Herat: 81 km WNW Herat to Kisil Islam Qaleh, 800 m, PODLECH & JARMAL 29362! 150 km W Herat to Persian border, ANDERSEN & PETERSEN 367! – SW: Farah: Farah Rud, 850–1150 m, RECH. 33394!, UOTILA 16441! 100 km SE Farah Rud, 850 m, UOTILA 16451! 80 km E Dilaram, 1000 m, HDG., WDB. & EKB. W-7650! 21 km NW Dilaram, 850 m, RECH. 33488! 14 km SW Dilaram to Chakhansur, 780 m, ANDERS 8503! 30 km E Dilaram versus Girishk, 1050 m, RECH. 33536! – SE: Kandahar: Girishk to Kandahar, 850–950 m, PODLECH & JARMAL 28953!, KERST. 266! Herat to Kandahar, 50 km W Girishk, 1000 m, UOTILA 16471! E Girishk, 920 m, UOTILA 16460! Dasht-i Margo, SW Qala Bist, 820 m, RECH. 34507! 16 km NE Qala Bist, 900 m, RECH. 34740! Qala Bist (Lashkargah) to Darweshan, 720 m, ANDERS 8455! 65 km E Kandahar, 1200 m, UOTILA 16504! 40 km W Kandahar, 940 m, FREITAG 459! Prope Mianpushta et Darweshan, 700 m, RECH. 34583! 20 km S Kandahar, 1000 m, RECH. 35316! 20 km E Kushk-i Nakhud, "dasht", ANDERS 8395! Kandahar to Kushk i-Nakhud, 1000 m, KERST. 283! Prope Baghat, 600 m, RECH. 34642! Kandahar, VOLK 132! – C: Doab: 15 km W Doab, 1450 m, HDG. & WDB. W-3433!
Pakistan: Quetta: Yaro, Quetta to Chaman, 1450 m, LAMOND 1020!, RECH. 28950! Pishin, LACE 3568! Kalat: Basima prope Jangal, 1350 m, RECH. 28293! Bal.: Chagai: 35 km E Dalbandin, LAMOND 145!, RECH. 27282! Nushki: Padag to Nushki, 700 m, LAMOND 166! 8 km W Warechah, 800 m, GRANT 78! Makran: Hoshab to Panjgur, LAMOND 571!, RECH. 30110! Panjgur, 1000 m, RECH. 28162! Panjgur to Nag, 1100 m, RECH. 28202!

Distr. gen.: Morocco, Algeria, Libya, Egypt, Sinai, Saudi Arabia, Kuwait, Palestine, Syria, Jordan, Persia, Afghanistan, Turcomania, Pakistan, C Asia (Kirghizistan, Uzbekistan, Kazakhstan), China (Sinkiang).

A widespread and common annual species in our area, generally recognized by the stipitate, ± broad triangular or reniform, lowermost fruit valves and the shortly stipitate clearly smaller upper fruit valves. There is considerable variation, however, in the shape of the valves, their degree of toothing, the stipe length and the presence or absence of central appendage. In some specimens the stipes on the lower fruits are very prominent, thick and shiny, reminiscent of those on *A. Belangeri*, q.v.; in others the stipe is not prominent and the fruit scarcely larger than the upper ones. Often to be found growing in sandy places.

7. ***A. moneta*** BUNGE ex BOISS., Fl. Or. 4: 912 (1879).
Syn.: *A. Sintenisii* GAND., Bull. Soc. Bot. France 66: 223 (1919). *Obione moneta* (BUNGE) ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 506 (1934). *Atriplex bucharica* ILJIN, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyss. Rast. 4: 309 (1937).
Icon.: AITCH., Trans. Linn. Soc. Ser. 2, Bot. 3: tab. 44 (1888). – Tab. 36.
Syntypes: (Persia) "Khorassan inter Riwed et Ssebsewar et ad Achmetabad non procul ab urbe Meschhed", A. VON BUNGE, LE, P; (Afghanistan) "In collibus afghaniae", W. GRIFFITH (1750 ? vel 1751), K.

Annual, usually low-growing and bushy, yellowish green, greyish green or bright green, monoecious. Stems erect, angled, 10–60 cm, branched from base, rarely unbranched with a scurfy or vesiculose scaly indumentum, pale straw-coloured. Leaves alternate or lowest opposite, suborbicular to ovate, 2,5–12 x 1,5–14 cm, entire, lobed or serrate, with or without reddish marginal mucronulate teeth, broadly cuneate to cordate, apically rounded to acute, with a scurfy or vesiculose scaly indumentum on both surfaces, denser below, or glabrous above; petiole on largest leaves to 6 cm. All branches ending in an inflorescence of leafless racemose panicles. Flowers in condensed many-flowered ± globose, distant or approximating yellowish glomerules. Male flowers numerous, with (4–)5 perianth segments; female flowers 1–2 at base of glomerules. Fruit valves 10–15 x 10–17 mm, ± orbicular, united almost to apex, entire-margined or finely toothed, central part indurate and reticulate-rugose, with a c. 2 mm wide circular wing. Seed vertical, firmly enclosed within the valves, 2,5–3 mm, reddish brown.

Hab.: Fields, dry rocky and soil slopes, loess, sandy places, dry river bed, salty hills, eroded slopes, near salt mine; 370–1500(–2400) m. – Fl. V–VI; fr. V–VIII(–IX).

Persia: E: Khor.: Abbasabad, 940 m, REJAMAND & BAZARGAN 32459! Sabsevar, 900 m, IRANSHAHR 30406-E! 4 km E Sabzevar, 900 m, ALAVA 10882! Inter Robat-e Rivand (Riwed) et Sabzevar et Ahmadabad prope Mashhad, BUNGE. Torbat-e Jam, Bezg, ALAVA 10963!, IRANSHAHR 15286-E! Daroneh, 100 km W Kashmar, 950 m, AMIN & REJAMAND 33025! – C: Shahr.-Bust.: Turan Prot. Reg.: Kavir road 15 km SW Razveh, 900 m, FREITAG 14120!
Turcomania: Ashkhabad, NIKITIN! In collibus arenosis ad Mekrowa, SINT. 344! In cultis, SINT. 504 (type of *A. Sintenisii* GANDOGER).
Afghanistan: N: Mazar-i Sharif: Tashkurghan to Samangan, 600 m, HDG. & WDB. W-3976! In jugi Shibaghlu, 34 km E Tashkurghan, 600 m, RECH. 34269! In faucibus SE Tashkurghan versus Haibak, 650 m, RECH. 16347! In deserto arenoso 25–35 km Mazar-i Sharif versus Tashkurghan, 400 m, RECH. 34208! W Robat-i Bala, 570 m, UOTILA 16910! W Tashkurghan, 1000 m, EKBERG W-9089! S Mazar-i Sharif (Khulm), UOTILA 16802! Paigah Kotal (Kotal-e Mirza Atbili), 1400 m, KUKKONEN 6176! Koh-i Elburz, 600 m, HEWER 1101! Terak, 2400 m, KOELZ 13897! – NW: Bala Murghab: 15 km S Bala Murghab, 520 m, HDG., WDB. & EKBERG W-8223! Herat: Hari-rud, AITCH. 449. 44 km Herat to Kisil Islam Qaleh (Eslam Qala), 830 m, PODLECH & JARMAL 29350! – E: Kabul: Woresmin Tangi, 820 m, RASOUL 441! Nangarhar: 50 km Torkham to Jalalabad, 700 m, LAMOND 1906!, RECH. 31016! 20–30 km E Jalalabad, 650 m, BRECKLE 4960!, FREITAG 7311! 8 km SW Ghaziabad, 550 m, PODLECH 19975! Ghorband: Pul-i Matak, LINDB. 480/1959! – NE: Kataghan: Baghlan 620 m, VOLK 71/669! Darya-e Baghlan, Qezel Say, 600 m, ANDERS 5646! Surkhab valley S Aliabad, PODLECH 11346! Taliqan: Qarandu, Khanabad to Taliqan, 650 m, ANDERS 6008! Namakab valley, 4 km S Taqcha Khana, 1450 m, PODLECH 22079. Badakhsh.: Takia, 1370 m, KOELZ 13108! – C: Bamian: Qala Sarkari, 2100 m, KOELZ 13927! Doab: 15 km W Doab, 1450 m, HDG. & WDB-3434! Ajar valley, Darband, 1500 m, ANDERS 6272!

Distr. gen.: E Persia, Turcomania, Afghanistan, C Asia.

In fruit easily recognized by the large orbicular, winged, adnate, entire valves. The overall usually yellowish green colour of the plant and its large leaves are usually characteristic before the fruiting stage. Allied to *A. flabellum* q.v., which has a similar distribution. AITCHISON, Trans. Linn. Soc. ser. 2, Bot. 3: 101 (1888), observed of *A. moneta* that it is "a most excellent spinach".

8. ***A. flabellum*** BUNGE ex BOISS., Fl. Or. 4: 912 (1879).
Syn.: *Obione flabellum* (BUNGE ex BOISS.) ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 506 (1934).
Icon.: KOMAR., Fl. URSS 6: tab. 4, fig. 4 (1936), fruct. – Tab. 37.
Syntypes: (Persia) "Khorasan, in montosis salsis ad orientem urbis Mesched, inter Faz et Tabatkuh", A. VON BUNGE, P; Uzbekistan: Samarkand, in valle Sarafschan, O.A. FEDTSCHENKO.

Annual, greyish green, monoecious. Stems erect, terete or angled, 10–50 cm, with many usually lateral branches, rarely not branched, with a scurfy or vesiculose-scaly indumentum, glabrescent, especially below, pale straw-coloured. Leaves all opposite or nearly so, ovate to ovate-triangular, 3–4,5(–10) x 1,5–4,5(–8) cm, irregularly serrate, serrulate or subentire, with reddish marginal mucronulate teeth rarely absent, truncate to cordate, apically acute, with a vesiculose-scaly indumentum denser on lower surface; petiole on lower leaves to 4,5 cm, decreasing or absent above. Branches all ending in a ± leafless paniculate inflorescence. Flowers in condensed distant or approximating greenish yellow glomerules; lowermost glomerules in upper leaf axils. Male flowers numerous, with (4–)5 perianth segments; female flowers usually solitary at base of glomerules. Fruit valves usually vesicular-scaly, up to 10 x 15 mm, broadly ovate in outline, united almost to apex, 6–10-toothed (denticulate) – or lobed, cordate, with or without a stipe to 3 mm; central part indurate, reticulate-rugose, with or without irregular appendages. Seed vertical, embedded within valves, c. 4 x 3 mm.

Hab.: Semi-desert, open steppe, rocky, loess and earth banks, river banks, fields, roadsides, salty ground; 400–1500 m. – Fl. V–VI, fr. V–VIII.

P e r s i a : N: Gorg.: Jangal-e Golestan, Dasht-e Kalpush, c. 1000 m, TERME & MATIN 34916-E! – E: Khor.: 30 km W Shirvan, Bojnurd to Mashhad, 1030 m, UOTILA 16204! Bojnurd, GAUBA 2074!, 30324-E! In valle fluvii Atrak, inter Bojnurd et Shirvan, in salsis, RECH. 1840! Kalat-e Naderi, IRANSHAHR & ZARGANI 15291-E!, 15293-E! Mashhad to Sarakhs 25 km N Mozduran, 650 m, RUNEMARK & SARDABI 23380! Inter Faz et Tabadkan (Tabatkuh), in montosis salsis E Mashhad, BUNGE.
T u r c o m a n i a : In ruderatis prope Ashkhabad, LITW. 322!, SINT. 458! In montibus prope Jablonka, LITW. 321! In montibus supra pagum Nephton, SINT. 2183a. Kopet Dagh, near Vanovskoie, VAŠAK!
A f g h a n i s t a n : N: Mazar-i Sharif: Chashmeh-i Shafa, 500 m, HDG. & WDB. W-3896!, RECH. 16193!, 34121! Haibak, NEUB. 4297! Tashkurghan to Pul-i Khumri, 1500 m, FURSE 7815! – NW: Shibarghan: Akcha, NEUB. 4321! Maimana: Maimana, 800 m, HDG., WDB. & EKBERG W-8277!, NEUB. 4241! Maimana to Andkhoi, 400 m, HDG. & WDB. W-3826!, ANDERS 5501! Shobaqtu (Chobaqtou) LINDB. 439/1959! Astana 30 km E Daulatabad (Shirin Tagao), UNGER 26! Daulatabad, 500 m, AMSEL! Bala Morghab: Qala-i Chasma, near Bala Murghab, 550 m, JAKEŠ! Herat: Badghis: Chapchal valley, 7 km E Sakzai, 430 m, PODLECH & JARMAL 29899! Badghis, AITCHISON 362. – NE: Kataghan: In jugo Paigah Kotal (Robatak) inter Pul-i Khumri et Haibak, 1300–1500 m, BRECKLE 4641!, RECH. 16486!, 33927! 15 km W Robatak, Pul-i Khumri to Samangan, 800 m, UOTILA 16733! Pul-i Khumri, 700 m, UOTILA 17066!, VOLK 673! In valle fluvii Kunduz prope Doshi, 850 m, RECH. 16538! Kotal-e Erganaka W Kunduz, 650 m, FREITAG 3842! Arabqunduq on road to Ishkamish (Eshkashem), 900 m, ANDERS

6729! 14 km S Khanabad on road to Ishkamish (Eshkamesh), 700 m, PODLECH 21538! NW Sanduqsay on road to Ishkamish (Eshkamesh), 650 m, ANDERS 6032! 3 km unterhalb Shakush, 1350 m, ANDERS 9287! Taliqan: Namakab valley, 1500 m, PODLECH 11522! Mughul, 20 km NW Taliqan, 740 m, PODLECH 11383!

Distr. gen.: E Persia, Turcomania, Afghanistan, C Asia (Uzbekistan, Tadjikistan).

The opposite leaves and sub-flabellate fruit valves are diagnostic. In the vegetative state it can be confused with *A. moneta*, but the toothed opposite leaves, the overall greyish green colour and the generally glabrescent stems are characteristic of *A. flabellum*. It is of interest to note that the two species, which have completely different fruiting valves, appear to have almost identical distributions and grow in the same habitats; the same comment was made about *A. micrantha* and *A. Aucheri*.

9. *A.* ***Belangeri*** (MOQ.) BOISS., Fl. Or. 4: 913 (1879).
Syn.: *Obione Belangeri* MOQ. in DC., Prodr. 13, 2: 108 (1849). *O. Thunbergiaefolia* BOISS. & NOË, Diagn. Pl. Or. Nov. Ser. 2, 4: 74 (1859). *Atriplex Thunbergiaefolia* (BOISS. & NOË) BOISS., Fl. Or. 4: 911 (1879).
Icon.: KOMAR., Fl. URSS 6: tab. 4, fig. 13 (1936), fruct. – sub *A. Thunbergiaefolia*. – Tab. 38.
Type: Persia (sine loc.), C.P. BELANGER 581, holotype G-DC – microfiche!; isotype E!

Annual, green or greyish green, monoecious. Stems erect ± terete, 20–80 cm, glabrous or vesicular scaly and glabrescent, pale straw-coloured, usually branched from near base; roots violet-coloured or not. Leaves alternate, broad ± regularly triangular 2–4 x 1–3 cm, with a thin to ± dense covering of vesicular scales, apically acute and mucronulate, broad truncate to subhastate, ± entire or sinuate-dentate; lower leaves with a petiole to 1,5(–2) cm, upper leaves ± sessile. Inflorescence paniculate. Glomerules short, condensed, several-flowered, distant or approximating, lower or most borne in leaf axils. Female flowers more numerous than male. Fruit valves broadly obtrullate 4–8 x 2,5–4 mm, apically crenate or crenulate, fused ± to apex, indurate, with a solid terete, shiny 1,5–2,5 mm stipe. Seed c. 1,5 mm, embedded within valves.

Hab.: Fields, beside brackish spring, salty mud; 700–1600 m,. – Fl. V–VI, fr. VII–XII.

I r a q : Diyala, in limosis salsis 10 km SW Mandali, RECH. 13399a!
P e r s i a : W: Esf.: In hortis ad margines oppidi Esfahan, SOJÁK 6819! – C: Tehran: Varamin, IRANSHAHR 30299-E! Kavir Prot. Reg.: Siah Kuh, in ditione refugii Caravan-Sarai Shah Abbas, 1200 m, RECH. 46157! Spring of Eyn or-Rashid, 1080 m, WDB. & FOROUGHI 15217! – S: Bal.: In ditione montis Taftan prope Sangon, 1600 m, RECH. 4062!
A f g h a n i s t a n : SE: Kandahar: 2 km N Mianpushta, 720 m, PODLECH 19665! Island opposite Qala Bist (Lashkargah), 800 m, FREITAG 2065.

Distr. gen.: Iraq, Persia, Afghanistan, Tadjikistan, Uzbekistan.

A distinct species, particularly in fruit. In the vegetative state the triangular leaves with acute or mucronulate apices are characteristic; in fruit the prominent stipe and the hard obtrullate valves are diagnostic. Although AELLEN, Bot. Jahrb. 70: 14 (1939) considered *A. Belangeri* as a shrub, without any affinity to *A. Thunbergiaefolia*, there seems no doubt that the two species are annuals and the same; in common with other annual/short-lived species of *Atriplex*, at fruiting stage at least the basal parts of *A. Belangeri* become indurate.

10. ***A. tatarica*** L., Spec. Plant. 1053 (1753).
Syn.: *A. laciniata* auctt. non L. *A. incisa* M.B., Fl. Taur. Cauc. 3: 641 (1819). *A. rosea* L. var. *subintegra* C.A. MEY. in LEDEB., Fl. Alt. 4: 314 (1833). *A. tatarica* L. var. *virgata* BOISS., Fl. Or. 4: 910 (1879) p.p. *A. Olivieri* MOQ., Chenopod. Monogr. 52 (1840). *A. multicolora* AELLEN, Bot. Jahrb. 70: 41 (1939). *A. rosea* auctt. non L.
Icon.: ZOHARY, Fl. Palaest. 1: tab. 212 (1966). – Tab. 39.
Type: (? Ukraine – possibly Volga steppes) Tatary, LINN 1221/10 – microfiche!

Annual, grey or green, monoecious. Stems (10–)30–80(–200) cm high and to 150 cm wide, erect, ascending, decumbent or prostrate, terete or angled, much branched, pale brown, glabrous or glabrescent. Leaves 3–6 x 2–4 cm, variable in shape, alternate, triangular-ovate to oblong in outline, irregularly sinuate-lobed to serrate, rarely subentire, obtuse or apiculate, hastate or cuneate, with an indumentum of vesicular scales denser on lower surface; petiole up to 12 mm on lower leaves. Inflorescence paniculate of numerous terminal and lateral spikes. Flowers in glomerules or solitary and female in lower leaf axils. Glomerules globose, distant or approximating, lowermost subtended by leaves, in short or elongated spikes, mostly of male flowers. Male flowers with 5 perianth segments. Valves ± rhombic-deltoid, loosely united near base, otherwise free, irregularly dentate or ± 3-lobed, 5–7 x 2–4 mm, reticulately veined, usually without tuberculate appendages. Seeds brown or dark brown, 1,5 mm in diameter.

Hab.: Salt steppe, salty fields, semi-desert, waste places, gardens; (360–)1300–1800(–3000) m. – Fl. VII–IX, fr. X–XI.

T a l i s h : Talish sec. GROSSH., Fl. Kavk. 3: map 133 (1945).
P e r s i a : N: Gorg.: Golestan forest, 1000 m, WALTON 181! Gilan: Road to Zanjan, 1250 m, UOTILA 19488! – W: Azerb.: Lake Rezaiyeh (Urmia), Golman Khaneh (Gurmeh-Khaneh), 1220 m, AELLEN & BEHB. 487!, 489!, 490!, BEHB. & AELLEN 30136-E!, 30150-E! Sharafkhaneh, 1220–1400 m, RECH. 43649!, AELLEN & BEHB. 59!, BEHB. & AELLEN 30123-E!, 30133-E!, 30148-E! 10 km S Ilkhchi, 1280 m, WDB. & SHIRDELPUR 14940! Ad ripam austr.-or. salsam lacus Urmia, inter Bonab et Khanian, RECH. 14778! In salsis 7 km NW Bonab, 1350 m, RECH. 43157! Bonab, AELLEN & BEHB. 30151-E! Prope Khvoy to Shahpur, 1700 m, BEHB. & AELLEN 84! Inter Tabriz et Ahar, in valle fluvii Talkheh Rud (Atschi Tschai), 1500 m, RECH. 14826! Near Tabriz, 1350 m, AELLEN & BEHB. 47!, 69! 2–12 km W Zonuz, 1600 m, RECH. 41360! 25 km W Rezaiyeh, Darband, JARDINE 717! Hasanlu, 11 km NE Naqadeh, 1200 m, GRANT 16079! Dasht-e Moghan, 165–500 m, SCHMID 6360! Khamseh: Soltaniyeh, 1670 m, FURSE 3230! Ham.: In colle Mussallah prope Hamadan, PICHLER! Lur.: Azna, Tiyan, Garmishan in Oshtoran Kuh, IRANSHAHR 14836-E! – S: Lar: Hajjiabad prope Tarom, c. 900 m, RECH. 3286! – E: Khor.: Atrak, inter Bojnurd et Shirvan, RECH. 1837!, FURSE 8925! 60 km NE Gonabad (Juymand), 1300 m, REJAMAND & ARAZM 32483! 5 km S Sabzevar, 940 m, REJAMAND & ARAZM 32543! Abbasabad, 1400 m, REJAMAND & ARAZM 32529!, FOROUGHI 10531! 74 km W Mashhad, 1300 m, ANDERSEN & PETERSEN 355! – C: Tehr.: Garmsar,

700 m, IRANSHAHR & MOUSSAVI 15385-E!, 15396-E!, 30417-E! Qazv.: In collibus Halkedar ad Mardabad prope Karaj, 1200 m, RECH. 6817!, AELLEN 40!, 75!, 77!, 84!, HDG., WDB. & FOROUGHI 14674! Damgh.-Semn.: Sorkheh, SW Semnan, 1100 m, HDG., WDB. & al. 14758! Mehmandust, Hematabad, 1100 m, TERME & al. 41696! Shahr.-Bust.: Bustam, SABETI 2141! Turan Prot. reg.: Delbar to Ahmadabad, 760 m, FREITAG 13926! Kashan: Kavir, Sefidab, 940 m, TERME & TEHRANI 40031-E! Qom, Pol-e Rud Shur, 980 m, FOROUGHI 10582!
T u r c o m a n i a : In salsis prope Ashkhabad, LITW. 313! In deserto prope Ashkhabad, LITW. 3081a! Kopet Dagh, Vanovskoie, 650 m, VAŠAK!
A f g h a n i s t a n : N: Mazar-i Sharif: Tashkurghan, 360 m, KOELZ 13177! – NW: Maimana: 38 km SW Andkhui to Maimana, 360 m, PODLECH 16968! 40 km ENE Daulatabad to Shibarghan, 450 m, PODLECH 19813! – SW: Ghorat: Qala Qansi (Tschaktscharan), ad ripas fluvii Hari Rud, 2200 m, RECH. 18836! Qala Shahrak (Sharak), 2000 m, RECH. 19154! – E: Kabul: Aliabad, NEUB. 325/1950!, 3238! Kabul, 1780 m, GILLI 2104!, 2105!, 2108!, UOTILA 18903! Charikar to Bamian, 2350 m, UOTILA 18482!, 14833! Ghazni: Okak, NE altoplanitiei Dasht-e Nawar, 3000 m, RECH. 17712! Dasht-e Nawar, 3150 m, BRECKLE 4601! – NE: Kataghan: Paigah Kotal (Mirza Atbili pass), 1420 m, PODLECH 17011! N Kunduz, 380 m, NEUB. 1041! Kunduz to Tashkurghan, 520 m, FREITAG 3853! Badakhsh.: Hazrat Said, 2440 m, KOELZ 12862! Khash, 2440 m, KOELZ 12953! – C: Bamian: Band-i Amir, 2800 m, RECH. 18471! Darrah-i Tarigak, 3000 m, DIETERLE 30! 15 km W Bamian, 2650 m, UOTILA 18578! Bamian, 2450 m, UOTILA 18681!, KOEIE 28241 Shahr-e Shak (Sahre Zohak, red city), 2400 m, PODLECH 16033! Doab: W Doab, 1630 m, GILLI 2102!, 2103! N Doab, 1500 m, GILLI 2101! 10 km S Doab, 1600 m, RECH. 16671! Lorinj, 2440 m, KOELZ 13706! Panjao: 12 km W Panjao, 2700 m, RECH. 36217! Ghorat: Darrah-i La'l near Dahan-e Chaka between La'l and Daulat Yar, 2710 m, PODLECH 19101!

Distr. gen.: C Europe, Mediterranean area, Caucasus, SW and C Asia, China (Sinkiang).

A. tatarica is at the centre of a complex which in our area includes species 10–14 in this account. It is an extremely variable species in all its characters and represented by a very large number of gatherings, many of which lack ripe fruits. Only experimental studies and detailed field observations (made throughout the year) will provide the further information necessary to produce a more definitive classification of the complex; the treatment here is inevitably provisional.

11. ***A. lasiantha*** BOISS., Diagn. Pl. Or. Nov. Ser. 1, 12: 95 (1853).
Syn.: *A. lasiantha* var. *lanceolata* BOISS., l.c.: 96. *A. tatarica* L. var. *virgata* BOISS., Fl. Or. 4: 910 (1879) p.p. *A. tatarica* L. var. *hierosolymitana* EIG, Palest. Journ. Bot. Jerusalem Ser. 3: 122 (1945). *A. Olivieri* auctt. non MOQ. *A. kalafganica* AELLEN ex PODLECH, Mitt. Bot. Staatssamml. München 12: 58 (1975).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 213 (1966). – Tab. 40.
Type: (Lebanon) "In regione superiore Libani supra Cedros ubi Junii fine eam floriferam legi", E. BOISSIER, G-microfiche!

Annual, grey or green, monoecious. Stems 10–100(–150) cm, erect or prostrate, terete, slender, white, pale brown or reddish, glabrous at least below, branched. Leaves 10–40 x 2–5(–10) mm; lower oblong-deltoid, subopposite, upper alternate, oblong, to linear-oblong or narrow triangular, entire or with few teeth, cuneate, obtuse or apiculate, sessile or rarely petiolate, subglabrous or with a ± dense vesicular-scaly indumentum. Inflorescence wide paniculate of many slender spikes. Lowermost flowers solitary or few in leaf axils, female. Glomerules globose, 1,5–4 mm in diameter, mostly male, distant or approximating, in elongated spikes. Male flowers with 5 yellowish or green perianth segments. Valves of lower axillary fruits up to 6 x 3 mm, rhombic deltoid, upper portion free with or without lateral teeth, lower part united; valves of upper fruits smaller, c. 3–4 x 2,5–3 mm, variously toothed, tuberculate in lower portion or not. Seeds dark brown, c. 1 mm in diameter.

Hab.: Dry limestone slopes, sandy dry banks, edge of irrigation ditches, cultivated places, warm springs; (300–)1200–2800 m. – Fl. IV–IX, fr. VIII–X.

I r a q : Mosul: Ad confines Turciae, in ditione pagi Sharanish, Jabal Khantur, 1480 m, RECH. 10859! Sirsang, 1370 m, HAINES 460! Sul.: In monte Qara Dagh, 1500 m, HAINES in RECH. 15841!
P e r s i a : W: Azerb.: 30 km E Khvoy, 1300 m, RECH. 32652! Kurd.: Bijar, Quri-Chay, Kuh-e Bash, c. 2000 m, IRANSHAHR & DEZF. 14849-E! Khamseh: Soltaniyeh, 1670 m, FURSE 3230! Kermanshah: Kuh-i Parrow, MOUSSAVI & SATEI 40088-E! Esf.: Akhvoreh, Makeh-Din, 2800 m, MOUSSAVI & SATEI 40089-E! Bakht.: Kuh Rang dam versus Sar Chashmeh Karum, 2350 m, IRANSHAHR & MOUSSAVI 15662! Lur.: In convallibus borealibus montium Khali Kuh, c. 2500 m, RECH. 48005! Dow Rud, 1500 m, KOELZ 18500! – S: Fars.: Kuh-e Dinar (Daena), KY. 714 (type of *A. lasiantha* var. *lanceolata*)! Kuh Chah Siah, STAPF 811! Kerm.: In cultis ad Kerman. 1900 m, BORNM. 4218!, 4219! – C: Tehran: Varamin, IRANSHAHR 14834-E! Qazv.: Karaj, ad canales irrigationis, RECH. 6689! Karaj, 1300 m, AELLEN 33!, 37! Shahr.-Bust.: Shahrud, KOELZ 16932! Damgh.-Semn.: In desertis ad Sorkheh prope Semnan, 1600 m, RECH. 1225! Kuhha-ye Anjirab, 1500 m, TERME & MOUSSAVI 30226-E!, 30269-E! Semnan to Anjirab, 1500 m, TERME & MOUSSAVI 30238-E! Kashan: In montibus a Muteh (Mooteh) septentriones versus, ad minas derelictas, 2300 m, RECH. 46927! Muteh, 150 km N Esfahan, IRANSHAHR 30300-E!
T u r c o m a n i a : Ad marginem boreo-orientalem oppidi Ashkhabad, 300 m, VASAK!
A f g h a n i s t a n : N: Mazar-i Sharif: Tashkurghan to Haibak, NEUB. 205! – SE: Kandahar: Kajakai, 1000 m, KOEIE 2169! – E: Kabul: Kabul, 1800 m, RECH. 17082!, GILLI 2106!, 2107! In faucibus Tang-i Gharu, 1400–1500 m, RECH. 16954! Nangarhar: Jalalabad, 570–600 m, ANDERS 5375!, FREITAG 7446!, PODLECH 17082!, 17091! 45–48 km E Jalalabad, BRECKLE 4851!, KOELZ 16932! Darunta, 600 m, RASOUL 553! 12 km W Torkham, 600 m, BRECKLE 4955! Ghazni: Ad lacum Sabzab, inter Okak et Behzud, 2800 m, RECH. 17903! Ghazni, 2100–2700 m, GILLI 2110!, PODLECH 16859! Nuristan: Sine loc., EDELB. 1227! – NE: Takhar: Kalafgan, substr. Loess, PODLECH 12766 (type of *A. kalafganica*)! – C: Bamian: Warm springs, Hajigak valley, 2700 m, BRECKLE 4802! Kalu valley between Bamian and Hajigak, 2700 m, FREITAG 6400! Bamian, GILLI 2109! Ghorband: 5 km above Siagil, 1900 m, FREITAG 3938! Ghorat: Darrah-i Tarbolaq, Sar-e Bum, 2880 m, PODLECH 18970!
P a k i s t a n : Peshawar: 12 km E Peshawar to Akbapura, BURTT 1047!, 1513! Quetta: Ziarat near Quetta, 2440 m, LACE 3406! Hanna lake, GHAFOOR & OMER 2072!, FREITAG & KOTHE 18809! Chappar Rift, 1500 m, LACE 3393!

Distr. gen.: Lebanon, Syria, Palestine, Jordan, Turkey, Persia, Turcomania, Afghanistan, Pakistan, C Asia(?).

A close relative of *A. tatarica*, but apparently meriting separate specific status. *A. lasiantha* differs from it in the slender inflorescence branches and the usually entire-margined ± oblong to narrow triangular upper stem leaves. As in that species the lowermost flowers are not infrequently solitary in the leaf axils and are female. A proper understanding of *A. lasiantha* and its relationship to *A. tatarica* is hampered by the paucity of good fruiting specimens. Some dwarf specimens of *A. lasiantha* approach *A. pamirica* q.v.

12. ***A. pamirica*** ILJIN, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyss. Rast. 2: 124 (1936).
Syn.: *A. crassifolia* auctt. non C.A. MEY.
Icon.: KOMAR., Fl. URSS 6: tab. 4, fig. 9 (1936) – fruct. – Tab. 41.
Type: Tadjikistan: "Pamir, Chargoschi, in ripa lacus Kara-kul, 30.VII.1878", ASCHURBAJEV, LE.

Annual greyish green, monoecious, low-growing. Stems 1,5–15 cm, prostrate or ascending, usually branched from base, terete, slender, white or pale brown, glabrous or glabrescent below, vesicular scaly in inflorescence region with some distinct vesicular hairs. Leaves small, 10–20 × 5–8 mm, alternate, ovate-triangular, elliptic oblong or linear, entire or with few teeth, cuneate, obtuse or acute, with a vesicular scaly indumentum, denser on lower surface; petiole on lower leaves to 5 mm, upper leaves sessile. Lowermost flowers solitary in leaf axils, female. Glomerules distant or approximating forming short terminal spikes, lower subtended by upper leaves, mostly of 5-partite male flowers. Valves of lowermost axillary fruits rhombic, c. 2–5 × 1,5–5 mm, entire or irregularly serrate; valves of upper terminal fruits of similar shape and size, united in lower part, free above; central portion with prominent nerves, not tuberculate. Seed brown, c. 1,5 mm in diameter.

Hab.: Dry mountain slopes and plains, most salty places; 2600–3200(–4000) m. – Fl. VIII, fr. VII–IX.

Afghanistan. E: Kabul: Upper Panjir valley, Dasht-e Rewat to Jishta, 2600 m, PODLECH 12276! Ghazni: Ad marginem borealem alto-planitiei Dasht-i Nawar, 3100 m, RECH. 37391! Dasht-i Nawar, 3000–3100 m, BRECKLE 4601!, FREITAG 5888!, KASY 66! – NE: Wakhan: Lower Ab-i Wakhan valley, 3000 m, ROEMER 395! Waghjir valley, Zemestan-e Tikili, 4000 m, ANDERS 7620a! Langar, 3650 m, ANDERS 7747!

Distr. gen.: C Asia (Pamir), Afghanistan.

A dwarf alpine species. Very closely related to *A. lasiantha* and possibly only a higher altitudinal variant of it. Better material is needed to assess its status; in our area it is apparently confined to the eastern and extreme north-eastern parts of Afghanistan. In common with all our species of the *A. tatarica* complex (species 10–14), correlation with the situation in C Asia is much needed.

13. ***A. schugnanica*** ILJIN, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyss. Rast. 2: 123 (1936).
Icon.: Tab. 42.
Type: Tadjikistan, Pamir: "Roschan, Usoj, in ripa flum. Bartanga, in decliviis lapidosis, 20.VIII.1897", S.I. KORSHINSKY 4692, LE – n.v.

Annual, greyish green, monoecious. Stems 24–60 cm, erect or ascending, branching above or from base, terete, white or brownish white, glabrous except for a thin indumentum of vesicular scales on inflorescence axis. Leaves broad or narrow ovate to oblong, 15–55 × 7–25 mm, thin-textured, entire or with few teeth or lobes, cuneate to truncate, obtuse or acute, vesicular scaly below, ± glabrous above; petiole prominent, 15–20 mm on middle cauline leaves. Inflorescence spiciform; glomerules distant or approximating forming short or much elongated spikes, lower subtended by leaves. Valves of lowermost axillary fruits ± rhombic, up to 9 × 7 mm, serrate or lobed, without appendages; valves of upper fruits smaller, c. 4 × 2,5 mm strongly tuberculate or without tubercles on central portion.

Hab.: Hard dry soil, dry slopes, fields; 1400–3000 m,. – Fl. VII–IX, fr. VIII–X.

Afghanistan: E: Nuristan: Bashgal valley, Badmuk, 2000 m, PODLECH 16711! Upper Pech valley, Wama, 1400 m, KERST. 1289! Upper Madschegel valley, Kulatan, 1460 m, KERST. 1228! Sine loc., 23. VII. 1948, EDELB.! Central Nuristan, EDELB. 1227! – C: Doab: Doab, VOLK 1786!
Pakistan: Chitral: Yarkhun valley, Mastuj, c. 2100 m, KERST. 2033! Laspur ((Phargam), 3050 m, BOWES LYON 34! – Swat: Kalam, 2200 m, RECH. 19425!, 19467!, KAZMI 3496! Kalam to Bahrein, SULTANUL ABEDIN 8402!

Distr. gen.: C Asia (Pamir, Schugnan), N & E Afghanistan, NW Pakistan.

No type or authentic specimens have been seen. It appears to be closely allied to *A. lasiantha*, but with thin-textured, long petiolate leaves. Comparison with material from C Asia is needed. In our area *A. schugnanica* appears to have a limited range, mainly in Nuristan and adjacent parts of NW Pakistan.

14. ***A. ornata*** ILJIN, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyss. Rast. 2: 124 (1936).
Icon.: KOMAR., Fl. URSS 6: tab. 4, fig. 18 (1936). – Tab. 43.
Type: "Kazakhstan, arenae Mujun-Kum", Haloxyloneta prope Kos-kuduk prope stationem viae ferreae Czu, 20.IX.1929, A.A. NIKITIN 465, LE.

Annual, greenish. Stems 30–60 cm, much branched, erect, terete, glabrous, white. Leaves c. 25 × 20 mm, alternate, ovate to oblong-ovate, rounded or hastate at base, obtuse to acute at apex, entire or with few remote teeth, with a thin indumentum of vesicular scales below, glabrescent above; petiole very short on lower leaves, upper leaves sessile. Inflorescence paniculate of many spikes. Glomerules globose, approximating or condensed, mostly of male flowers; solitary female flowers often present in leaf axils; lowermost spikes subtended by upper leaves. Male flowers with bright yellow perianth segments. Upper fruits in clusters of 3–5. Valves free almost to base, c. 12 × 10 mm, triangular in outline, prominently 3-lobed, with a prominent elongated middle lobe, entire or basally 1–2-lobed, and 2 horizontally spreading entire or toothed basal lobes; central portion with large tubercles; stipe terete, c. 3 mm long. Seed c. 1,5 mm wide, brown.

Hab.: *Artemisia* steppe (solonetz soils with *Haloxylon* in C Asia); c. 1200 m. – Fr. VI.

Persia: N: Gorg.: Mohammed Reza Shah Prot. Reg.: Near Behkadeh, 1200 m, WDB. & FOROUGHI 12820!
Turcomania: Ashkhabad sec. NIKITIN, Ill. Opred. Rast. Ashkhabad 114 (1965).

Distr. gen.: N Persia, Turcomania, C Asia (Kara Kum to Tian Shan).

Related to *A. Belangeri* and *A. tatarica*, but fruit valves very distinctive: no other species in our area has such a prominently elongated middle lobe.

15. ***A. leucoclada*** BOISS., Diagn. Pl. Or. Nov. Ser. 1, 12: 95 (1853).
Syn.: *A. laciniata* L. var. *turcomanica* MOQ. in DC., Prodr. 13, 2: 93 (1849). *A. leptoclada* BOISS. & NOË, Diagn. Pl. Or. Nov. Ser. 2, 4: 74 (1859). *A. Chanikowii* BOISS., Fl. Or. 4: 913 (1879). *A. turcomanica* (MOQ.) BOISS., Fl. Or. 4: 911 (1879). *Obione turcomanica* (MOQ.) ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16 C: 506 (1934). *Obione Chanikowii* (BOISS.) ULBRICH, l.c. 506. *Obione leucoclada* (BOISS.) ULBRICH, l.c. 506. *Atriplex inamoena* AELLEN, Bot. Jahrb. 70; 20 (1939). *A. leucoclada* subsp. *turcomanica* (MOQ.) AELLEN, l.c. 23 (1939).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 206–208 (1966). – Tab. 44.
Syntypes: (Sinai) "In desertis Arabiae Petraea, valles montis Sinai, N. BOVE, G.W. SCHIMPER 454, G, E!; Wadi Useit, E. BOISSIER, G.

Perennial herb, woody below, or shrub with a ± dense all-over indumentum of vesicular scales. Stems divaricately branched, 30–80 cm, prostrate to erect, white, yellow or brown. Leaves alternate, ± thick-textured, often small, 8–30 × 5–25 mm, oblong-ovate to triangular deltoid, truncate, cuneate or cordate, obtuse or acuminate, entire and flat to sinuate-dentate, greyish green on both surfaces; lower leaves shortly petiolate, upper sessile. Inflorescence of terminal and axillary spikes. Glomerules several-flowered, globose, distant or approximating; axillary sometimes of only female flowers; terminal male and female. Male flowers with a 5-partite perianth. Fruits clustered or solitary, hard, sessile, campanulate to ovoid. Valves very variable in shape and ornamentation, 5–7 × 3–8 mm, strongly adnate except at apex; irregularly lobed apically, tuberculate at central portion or not, to muricate, usually densely vesicular scaly. Seeds c. 2 mm in diameter.

Hab.: Salt marshes and flats, sandy deserts, dry river beds, clay flats, and slopes dominated by Chenopods, dry hills, gypsum and marl slopes; 50–1700 m. – Fl. VI–X, fr. IX–XI.

Iraq: Diyala: Inter oppida Mandali et Badra, RECH. 12745! 5 km a Mandali occidentem versus, RECH. 9611!
Persia: N: Gilan: Manjil, PABOT 30326-E! – W: Azerb.: 34 km W Marand to Khvoy, RECH. 14920! Khvoy to Shahpur, 1700 m, AELLEN & BEHB. 9!, BEHB. & AELLEN 30164-E! In argillosis salsis 27 km W Marand versus Evowghli, 1100 m, RECH. 43824! In collibus argillosis, Qezel Owzan (Kizil Uzun), 1150 m, RECH. 4322! 60 km NE Tabriz, 1500 m, PABOT 30325-E! 20 km Mianeh to Khalkhal, 960 m, WDB. & SHIRDELPUR 14933! Inter Bunab et Khanian, lacus Urmia (Rezaiyeh), RECH. 14776!, 14777! Ad lacum Urmia, prope Bander Danalu, 1220 m, STARM. 53!, 77! Ajab Shahr, 1300 m, WALTON 114! Dasht-e Moghan: Inter Alirezaabad-e Jadid et Sarband, 200 m, RECH. 40224! Lur.: Dow Rud, KOELZ 18293!, 18536! Khuz.: NW Dow Gonhadan, FASIHI 40147-E! – S: Fars.: Maharlu lake, Pol-e Fasa, 1500 m, FOROUGHI & ASSADI

15000! Ad lacum Neyriz, 1400 m, STARM. 28! 32 km W Rostaq, 73 m, GRANT 16987! Kerm.: Rafsanjan, SOJÁK 2754! Prope Kamalabad, SOJÁK 5525! Lar.: Hajjiabad prope Tarom, 900 m, RECH. 3381! E Genavi, 20 m, BOKHARI & al. 14798! Taheri to Akhtar, 60 m, BOKHARI & al. 14832! Bal.: Inter Khash et Iranshahr, 1500–1600 m, RECH. 3963! Biaban: Bunji, BEHB. 866-E! – E: Sist.: Inter Kuh-i Malek Siah et Zabol, 700 m, RECH. 7531! Sistan, AYAZI E-5868!, HENDERSON 8! 60 km N Zahedan, Hormak, 800 m, TERME & MOUSSAVI 34436-E! Khor.: Tayyebat, in argillosis salsis, RECH. 37592! – C: Tehr.: Gol-e Sahra camping place near Tehran, 1230 m, UOTILA 19369! Hableh Rud, Bonehkuh, 1100 m, MANUCH. & AELLEN 30147-E!, AELLEN & MANUCH. 15! Simin Dasht to Kabutar-Darreh, 1150 m, AELLEN & MANUCH. 21!, 22! Bahram, 1100 m, AELLEN 3! Parandak, 900 m, AELLEN 18! Qazv.: Karaj, 1500 m, RECH. 6852!, AELLEN 14! Mardabad, GAUBA 2076! Damgh.-Semn.: Sorkheh SW Semnan, 1100 m, HEDGE & al. 14757! 25 km Garmsar to Semnan, 740 m, TERME & TEHRANI 40023-E! 8 km W Semnan, 1150 m, HEDGE & al. 14757! Mehmandust, Hamatabad, 1100 m, TERME & al. 41697! Shahr.-Bust.: Turan Prot. Reg.: Shakh-e Biar, 1180 m, BRECKLE 5107! NW Dowchah to Chajam, 1150 m, FREITAG 14101! Kashan: Nushabad to Ab-e Shirin, 750 m, TERME & MOUSSAVI 30249-E!, 30252-E!, 30274-E! Natanz, Abbasabad, 1320 m, FOROUGHI & ASSADI 15173! Shahdad to Birjand, c. 1200 m, TERME & MOUSSAVI 34437-E! – Kahir to Ghattam, ERSHAD & al. 35396-E!
Turcomania: Ashkhabad, 300 m, VASAK! In montibus supra pagum Kulkulab, BORNM. 1180! Kopet Dagh, 700 m, VASAK!
Afghanistan: NW: Bala Morghab: Dahana-i Shor, in valle Wadi-i Kafar Shor, 600 m, JAKEŠ! Wadi-i Namak Shor, prope Maruchak (Muričag), 400 m, JAKEŠ! – SW: Herat: 35 km W Herat to Mashhad, VOLK 71/872! 15 km N Herat to Torah Ghundi, 1230 m, PODLECH 32491! Farah: 13 km Girishk to Dilaram, 900 m, RECH. 37552!, PODLECH 17175! E margin Jehile Puzak, 460 m, BRECKLE 4921! 10 km SE Farah Rud to Dilaram, VOLK 71/636! 6 km E Farah, BRECKLE 4888! 10 km Dilaram to Farah Rud, 900 m, RECH. 37571b! 5 km E Kang (Zaranj), 475 m, PODLECH 16904! – SE: Kandahar: E margin Registan, Cagary Qala, 1050 m, BRECKLE 4817! Qala Bist to Darweshan, 750 m, RECH. 34555! 35 km W Kandahar to Girishk, 940 m, PODLECH 32679! Kalat-i Ghilzai: 13 km NE Kalat-i Ghilzai, 1610 m, PODLECH 19606! Tarnak Rud, Shelagaz, 1210 m, PODLECH 19703! – E: Kabul: Sarobi to Jalalabad, 820 m, RASOUL 445! Nangarhar: 12 km W Torkham, 600 m, BRECKLE 4954! Ghaziabad, 500 m, PODLECH 19938! 20 km E Jalalabad versus Tor Khama, 700 m, RECH. 37429! Ghorband: Ghorband valley, BRECKLE 4748!
Pakistan: Peshawar, 8 km Peshawar to Warsak, BURTT 1511! – Quetta: Sibi, 90 m, LACE 4095! Marqil near Sar Range, QAISER & GHAFOOR 4337! – Quetta: Quetta, 1600 m, HEISS! – Khuzdar/Bela: 72 km SSW Khuzdar, Wad, 1300 m, FREITAG & KOTHE 18951! – Bal.: Makran: Pasni to Gwadar, T. ALI 884! 4 km Ras Saven, 5 m, FREITAG 18485! 14 km WSW Panjgur near road to Hoshab, 940 m, FREITAG & KOTHE 18610!

Distr. gen.: Palestine, Jordan, Syria, Sinai, Iraq, Kuwait, Bahrein, United Arab Emirates, Saudi Arabia, Yemen, Qatar, Caucasus, Persia, Turcomania, Afghanistan, Pakistan.

A most variable species, widely distributed and frequent in our area. The polymorphism in fruit characters is unusually great. The extremes are represented by: campanulate valves, without appendages and apically 3-lobed; and ovate valves irregularly muricate over most of surface and apically with numerous lobes. Leaf size is also extremely variable: in summer the plants often have very small thick leaves as opposed to the large winter leaves. Despite this great fruit and leaf variation, it appears to be continuous from one extreme to another and recognition of infra-specific taxa seems unwarranted from the available evidence. Recent field observations in Israel (DANIN & al. in litt.) have shown that the three varieties recognized in Fl. Palaest. 1: 147 (1966) viz. var.

leucoclada, var. *turcomanica* (MOQ.) ZOHARY and var. *inamoena* (AELLEN) ZOHARY can sometimes all be found on the same shrub. Numerous of our specimens are not in ripe fruit; many gatherings as late as October are still in flower. Generally a lowland species often growing with other Chenopods or in places with little other vegetation; often one of the most important colonizing plants in desertic areas.

16. *A.* ***verrucifera*** M.B., Fl. Taur. Cauc. 2: 441 (1808).
Syn.: *Obione verrucifera* (M. B.) MOQ., Chenopod. Monogr. 76 (1840). *Halimione verrucifera* (M. B.) AELLEN, Verh. Naturf. Ges. Basel 49: 129 (1938). *Obione portulacoides* auctt. non (L.) AELLEN.
Icon.: LEDEB., Icon. Pl. Fl. Ross. 2: tab. 144 (1830). – Tab. 45.
Type: "Copiosa in Tauriae et Caucasi salsuginosis, praesertim mari adjacentibus, Fl. Aug.", F.A. MARSCHALL VON BIEBERSTEIN, LE.

Shrub, grey, monoecious, with a thick woody rhizome. Stems much branched, 15–75 cm high, terete below, often angular above. Leaves 15–45 x 6–20 mm, oblong-ovate to elliptic, mostly opposite except uppermost, with clusters of young leaves in axils, obtuse or acute, cuneate, entire, thick-textured, slightly fleshy, on both surfaces with a dense adpressed grey scaly indumentum, without vesicular hairs; petiole to 10 mm on lower leaves. Inflorescence terminal, paniculate, leafless, with many slender spreading-erect branches. Glomerules in flower c. 2 mm in diameter with male and female flowers, distant or approximating; male flowers green with yellow stamens. Fruit 2–3 x 2–3 mm, ovoid, campanulate-ovoid or ± spherical; valves ± thick-textured, densely covered with prominent large warty tubercles, united almost to apex. Seed c. 1,3 mm in diameter.

Hab.: Salt marshes and salt steppe; 1000–1900 m. – Fl. VIII–X, fr. X–XI.

P e r s i a: W: Azerb.: Astara to Ardabil, Namin, coll. ignot. 14819-E! Ardabil, c. 1500 m, SCHMID 6499! N Ardebil, STUTZ 563! In salsis 7 km NW Bonab versus lacum Rezaiyeh (Urmia), 1350 m, RECH. 43160! Ad ripam austro-orientalem salsam lacus Rezaiyeh, RECH. 14779! Lacus Rezaiyeh, Sharaf-Khaneh, BEHB. & AELLEN 30124-E!, 30132-E!, 30149-E!, AELLEN & BEHB. 468! Lacus Rezaiyeh (Urmia), Golman Khaneh (Gurmeh-Khaneh), 1220 m, AELLEN & BEHB. 467! Rezaiyeh to Shahpur, ABAI & MODJIB 30379-E! S Shahpur, 1200 m, FURSE 3519! E side lake Rezaiyeh, Haft Cheshmeh, 1280 m, WDB. & SHIRDELPUR 14948! 40 km NE Tabriz ad fontes salsas in valle fluvii Talkheh Rud (Atschi Tschai), 1500 m, RECH. 14833! In argillosis salsis 27 km W Marand versus Evowghli, 1100 m, RECH. 43820! Maku to Marand, 1000 m, TERME 40097-E!, 40267-E! 62 km NE Tabriz, 1000 m, PABOT! Ham.: Aq Bolagh, 100 km N Hamadan, RIOUX & GOLVAN 112! – S: Fars: Ad lacum Neyriz, 1400 m, STARM. 27! Maharlu lake, Pol-e Fasa, 1500 m, FOROUGHI & ASSADI 14999!, GRANT 16959! – C: Qazv.: Mardabad, GAUBA 2075! Damghan: Vardenow to Kalateh, 4 km "Menghas"? , 1750 m, TERME & al. 39354! Kashan: Muteh, 110 km S Qom, 1900 m, EDMONDSON 837! Locis subsalsis ad fontem prope vicum Robat-e Tork, SOJÁK 6881!, 6900!

Distr. gen.: SE Europe, Turkey, Persia, C Asia, Mongolia, China (Sinkiang).

A relatively oligomorphic species characterized by the shrubby habit, entire greyish leaves with a dense scaly indumentum, small glomerules and ± ovoid warty-tuberculate fruits with fused valves. Apparently restricted to salt marshes.

17. ***A. Griffithii*** MOQ. in DC., Prodr. 13, 2: 102 (1849).
Syn.: *A. persicum* BOISS., Fl. Or. 4: 916 (1879). *A. Wendelboi* AELLEN, Arb. Univ. Bergen, math.-nat. ser. 1962, 1: 13 (1962).
Icon.: Årb. Univ. Bergen, math.-nat. ser. 1962, 1: fig. 4 (1962) as *A. Wendelboi*. – Tab. 46.
Type: Afghanistan, Bamian Valley, W. GRIFFITH 1751 = Herb. East Ind. Comp. 4200, K!

Shrub, much branched, with a ± dense all-over indumentum of greyish-white scales. Stems 20–80 cm with spreading-flexuose branches. Leaves alternate, 15–30 × 10–28 mm, rhomboid, broad ovate to suborbicular, entire, broadly cuneate to subcordate, acute or rounded, mucronulate or not, ± thick-textured, with a dense greyish white indumentum on both surfaces; petiole 2–10 mm on lower leaves. Inflorescence spiciform. Glomerules distant below, approximating above, sessile or shortly pedunculate, lowermost in axils of leaves. Male flowers numerous with 5 perianth segments; female flower few or solitary, solitary at base of glomerules. Fruit valves 7–10 × 10–12 mm, suborbicular or reniform, entire, fused in only lower half, vesicular scaly, somewhat coriaceous in central part, without or with 1–3 short tuberculate appendages. Seed ± free within the valves, vertical, 1,5–2 mm long.

Hab.: Dry rocky slopes, scree, soil banks, on limestone and gypsum, among *Tamarix*, salt steppe; 950–2800 m. – Fl. V–VI, fr. VII–IX.

P e r s i a : N: Maz.: Haraz valley, above Panjab, 1100 m, WDB. 634! – W: Esf.: 150 km N Esfahan, Muteh, IRANSHAHR 30297-E! Kuh-e Sofeh, 2000 m, WDB. 921 (type of *A. Wendelboi*)! – S: Kerm.: Ad Bahramjerd in apricis aridis, c. 2200 m, BORNM. 5066 (as *A. persicum*)! Dasht-e Lut inter Guk et via Kerman-Bam, LÉONARD 6272! In declivi saxoso ad vicum Abareq, SOJÁK 2640! Bal.: Inter Zahedan et Khash, c. 1500 m, RECH. 4206! In desertis Persiae, AUCH. 5268 (syntype *A. persicum* – microfilm)! – E: Khor.: 100 km E Birjand, Kuh-e Ahangaran 7 km NNW Zeydan, 2200 m, RUNEMARK & SARDABI 23736! Kuh-e Ahangaran, in saxosis montis prope Qaleh Ahangaran, c. 2200 m, RECH. 56133! – C: Damgh.-Semn.: In deserto gypsaceo c. 5 km supra Sorkheh prope Semnan, c. 1350 m, RECH. 52176! 66 km SE Semnan, Anjirab, 1500 m, RIEDL & IRANSHAHR 15888! Near Semnan, SAB. in GAUBA 2073! 20 km E Semnan, Chasht Khowran to Kuh-e Warzom, 1800 m, TERME & ZARGANI 40080-E! Shahr.-Bust.: Turan Prot. Reg.: In jugo inter Asb Kashan et Bargh, 1100–1200 m, RECH. 51046a!, IRANSHAHR 40204-E! Kavir Prot. Reg.: In deserto c. 50 km a Chashmeh-ye Safid Ab versus Hajji Ali Abbas, 950 m, RECH. 46481! Kashan: Kuh-e Yakhab, IRANSHAHR 14813-E! ? Varamisu to Ardestan, IRANSHAHR 30293-E!
A f g h a n i s t a n : NW: Maimana: Prope Kaolian (Kawlyan), E Belcheragh, 1200 m, HDG., WDB. & EKB. W-8396! – E: Gardez: Zormat, SW Gardez, VOLK 71/411 (det. uncertain)! Ghorband: Surkh-i Parsa, 2050 m, RECH. 36885! Ghorband, VOLK 488! Farinjab, 2000 m, FREITAG 1114! – C: Bamian Valley, GRIFF. 1751 = Herb. East Ind. Comp. 4200! Bamian, NEUB. 428! Darband, 1500 m, ANDERS 6260! ENE Bamian, 2800 m, GILLI 2114! Drachental 5 km W Bamian, 2500 m, PODLECH 19512!, BRECKLE 4761! In valle Hajigak, 2700 m, BRECKLE 4799! Band-i Amir, 2800 m, REINER 687! Darrah-i Kalu, bei der "heissen Quelle", oberhalb Paymuri, 2500 m, PODLECH 16041! S of Doab, PABOT A-1241! Doab: Ajar valley, W Doab, 1300 m, HDG. & WDB. W-4112!, RECH. 16612! 3 km a Bulola versus Bamian, 2250 m, RECH.

36973! Kalkberg bei Bulola, 2800 m, GILLI 2113! Lorinj, 2400 m, KOELZ 13654! Ghorat: Darrah-i-Ghuk bei Dahane Garmab, 2350 m, PODLECH 21886!

Distr. gen.: Persia, Afghanistan.

The shrubby habit, broad entire leaves and the ± orbicular or reniform entire fruiting valves fused only in the lower half are characteristic. There seems no justification for recognizing *A. Wendelboi* as a separate species; AELLEN described it as a close relative of *A. Griffithii* differing only in the small tuberculate appendages on the fruit valves. The Afghan type locality of *A. Griffithii* is uncertain.

18. *A.* ***Stocksii*** BOISS., Diagn. Pl. Or. Nov. Ser. 2, 4: 73 (1859).
Syn.: *Obione Stocksii* WIGHT, Icon. Pl. Ind. Or. 5, Expl. plates 5 & tab. 1789 (1852). *Atriplex Griffithii* MOQ. var. *Stocksii* (BOISS.) BOISS., Fl. Or. 4: 916 (1879). *A. Griffithii* MOQ. subsp. *Stocksii* (BOISS.) BOULOS, Nord. Journ. Bot. 11: 310 (1991).
Icon.: WIGHT, l.c. – Tab. 47.
Type: (Pakistan) Scinde, J.E. STOCKS 542, holotype G-DC; isotype K!

Similar in habit, facies, indumentum and fruit to *A. Griffithii* but: stems shorter (14–50 cm), leafier, more branched; leaves smaller (c. 10–15 x 5 mm), with flat or undulate entire or lobulate margins, oblong-obovate, attenuate into a short (0,5–1,5 mm) petiole; fruit valves smaller (c. 5–6 x 5–6 mm).

Hab.: Sandy saline soils, lagoons with *Avicennia, Commiphora*; at and near sea level – Fl. IV, fr. V–XI.

P a k i s t a n : Karachi: Hawk's Bay, in arenosis litoralibus, RECH. 27495!, FREITAG & KOTHE 18102! Near Hawk's Bay, LAMOND 5319! Sun's Pit prope Karachi, in regione litorea, RECH.! Landspit near Karachi, RIZWAN YUSUF 44! Drigh Road, BURTT 1558! University Campus, CHOWDHURY 11! Karachi, JAFRI! West of Layari river, PODLECH 10053! – Sind, STOCKS.

Distr. gen.: Pakistan (endemic ?).

Although BOISSIER, Fl. Or. 4: 916 (1879) and AELLEN, Bot. Jahrb. 70: 16 (1939) considered this taxon as a variety of *A. Griffithii*, the morphological difference given above, combined with those of habitat and geographical distribution, merit specific separation. Recently, BOULOS, Nord. Journ. Bot. 11: 310 (1991) has named coastal plants from Oman, Socotra and Somalia as *A. Griffithii* subsp. *Stocksii* (BOISS.) BOULOS. They seem to be sturdier shrubs with thicker textured almost orbicular leaves and correspond with the taxon described as *A. sokotranum* VIERH.

19. *A.* ***halimus*** L., Spec. Plant. 1052 (1753).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 204 (1966). JAFRI & EL-GADI, Flora Libya 58: tab. 13 (1978). – Tab. 48.
Type: "In Hispaniae, Lusitaniae, Virginiae sepibus maritimis", LINN 1221/1 – microfiche!

Sturdy erect shrub, much branched, monoecious. Stems up to 2(–3) m; young shoots obtusely angled; older shoots with a greyish white peeling bark. Leaves alternate, oblong-ovate, ovate to deltoid, 1–4(–6) x 0,5–3(–5) cm, silver white, entire or repand lobed, cuneate, truncate or subhastate, apically obtuse, mucronulate or emarginate; petiole 3–10 mm. Inflorescence ± leafless, wide paniculate, terminal. Glomerules many-flowered, forming congested lateral and terminal spikes. Male flowers with very small perianth segments, often less numerous than female flowers. Fruits numerous, condensed, often horizontally spreading; valves thick-textured, fused only at base, reniform, broad triangular to suborbicular, 3,5–4 x 5–6 mm, entire or serrate-dentate, without tubercles. Seeds c. 1,5 mm in diameter, dark brown.

Persia: S: Bal.: Makran: Jask to Biaban, BEHB. 30061-E! Bandar Abbas to Minab, 350 m, TERME & al. 41711! – C: Tehran: Varamin, 10 km from Garmsar, 800 m, TERME & TEHRANI 40039-E! 35 km S Tehran on road to Qom, 1000 m, UOTILA 19393!

Distr. gen.: Mediterranean region (widespread) to Turkey, Egypt, Sinai, Jordan, Syria, Persia (cultivated); Tanzania (var. *granulata* CHEVALL.), Madagascar? – Introduced for grazing in other arid zones.

The identification of the specimens cited above is somewhat uncertain because they are not in ripe fruit. The two specimens from the south are sterile, but bear the rather distinctive galls which are not infrequent on *A. halimus* in other parts of its range. *A. halimus* has apparently been much cultivated in different parts of Persia as a forage plant, and probably is nowhere native in our area.

20. ***A. canescens*** (PURSH) NUTT., Gen. N. Amer. Pl. 1: 197 (1818).
Syn.: *Calligonum canescens* PURSH, Fl. Amer. Septent. 2: 370 (1814).
Icon.: Tab. 49.
Type: (America) "Missouri, near the Big-bend, in herb. LEWIS (goats delight to feed upon this shrub)". PH (conf. MCNEILL, l.c.: 553).

Shrub, 40–100 cm, dioecious, much branched with a dense all-over indumentum (except on old branches) of greyish white adpressed vesicular scales. Stems erect, ascending or spreading, yellowish brown. Leaves alternate, linear oblong to linear elliptic, c. 20–30 x 4–5 mm, entire, apically obtuse, cuneate, ± sessile. Inflorescences of spike-like panicles. Male plants with very dense terminal and lateral spikes, lowermost arising in leaf axils. Female plants with less dense terminal and lateral spikes. Male flowers with 5-perianth segments. Infructescences often dense. Fruit valves large, up to c. 10 x 10 mm, shortly stipitate, 4-winged, wings flat or undulate, usually erose-dentate. Seed enclosed within hard fused central portion of valves, c. 2 mm broad.

Hab.: Sand and clay soils – introduced and ± naturalized; c. 900–1800 m. – Fl. V, fr. IX–XI.

Persia: S: Kerm.: Hoseynabad, 1830 m, FOROUGHI 10536!, 10574! – E: Khor.: 10 km SW Sabzevar, 940 m, ASEFI & MOUSSAVI 25207! – C: Tehr.: 10 km Varamin to Garmsar, 800 m, TERME & TEHRANI 40040-E!, 40045-E! 4–13 km W Garmsar, 850 m, FREITAG 14203!, 14204!, MOUSSAVI & KARAVAR 41703!
Pakistan: Quetta: Mastung forest research station, QAISER!

Distr. gen.: Native to W and SW USA.

The shrubby habit, ± linear-oblong leaves and the 4-winged fruiting valves are diagnostic for this introduced species which is now quite widely grown in the more arid parts of SW Asia.

21. ***A. spongiosa*** F. MUELLER, Trans. Proc. Phil. Inst. Victoria 2: 74 (1858).
Syn.: *Senniella spongiosa* (F. MUELLER) AELLEN, Bot. Jahrb. 68: 416 (1938).
Icon.: GEORGE, Fl. Austral. 4: 92, tab. 20, fig. B (1984), fruct. – Tab. 50.
Lectotype: Australia, Sturts Creek, F. MUELLER (MEL 607132 – cf. P.G. WILSON in GEORGE, Fl. Austral. 4: 325. 1984).

Annual or short-lived perennial, greyish green, monoecious. Stems erect or spreading, branched, ± densely vesicular-scaly on all parts except fruit valves. Leaves alternate, broad elliptic to ovate, c. 10–15 × 10–15 mm, subentire to sinuate dentate or lobed, cuneate; petiole c. 5 mm on lower leaves, less on upper leaves. Inflorescence spiciform. Glomerules short, condensed, borne in leaf axils; sexes mixed within glomerules. Fruiting bracts spongy, ellipsoid to globular, inflated, c. 10 × 10 mm, glabrous or with few vesicular scales, fused to ± apex, apiculate, internally with a reticulate network of fibrous veins. Seed c. 2 × 1,3 mm.

Hab.: Spontaneous in garden; 1300 m – Fr. VI.

P e r s i a : C: Tehran: Botanical garden, AMINI 11374!

Distr. gen.: C Australia. Naturalized in various parts of SW Asia. Easily recognized by the almost globular inflated fruits.

Although AELLEN, Bot. Jahrb. 68: 416 (1938), and some other authors, regarded it as a member of the independent genus *Senniella*, modern Australian Floras rightly subsume it in *Atriplex*.

Other species recorded probably based on misidentifications

A. crassifolia C.A. MEY., Recorded from Persia by PARSA, Flore de l'Iran 4: 991 (1949) and Pakistan [STEWART, Ann. Catal. Vasc. Pl. Pakistan 217 (1972)], but no Flora Iranica specimens of this mainly SE European and C Asiatic species have been seen.

A. hastata L. Although there are many records of this species from our area, e.g. GROSSH., Fl. Kavk. 3: map 131 (1945), they are almost certainly based on misidentifications of other species such as *A. patula* or *A. micrantha. A hastata* is mainly a European plant.

A. littoralis L. Recorded from Persia by PARSA, Flore de l'Iran 4: 992 (1949); probably refers to *A. patula* or *A. laevis*.

A. repens ROTH. This distinctive species is listed by PARSA, l.c., from Persia and STEWART, l.c.: 218 from Pakistan, but both seem to be improbable records.

A. rosea L. Records of this mainly European species most probably refer to *A. tatarica* and its allies.

Introduced species possibly in our area

A number of Australian species of *Atriplex* have been introduced accidentally or as grazing plants in arid zones of northern Africa, Egypt, Israel and Iraq. The following four have not yet been recorded from our area but seem likely to be present. Full descriptions can be found in A.S. GEORGE, ed. Fl. Australia 4 (1984).

1. ***A. Lindleyi*** MOQ. in DC., Prodr. 13,2: 100 (1849).
Syn.: *A. inflata* F. MUELLER; *Blackiella inflata* (F. MUELLER) AELLEN.
Monoecious annual; fruit valves flattened to spongy turbinate.

2. ***A. nummularia*** LINDLEY in T. MITCH., J. Exped. Trop. Australia 64 (1848).
Dioecious shrub to 2–3 m with broad ovate leaves; fruit valves ± free, up to 15 x 15 mm, entire or denticulate. In habit very similar to *A. halimus*.

3. ***A. semibaccata*** R. BR., Prodr. 406 (1810).
Monoecious perennial with thin oblong-elliptic sinuate dentate leaves; fruit valves rhomboid, red and succulent or dry and reticulate.

4. ***A. vesicaria*** HEWARD ex BENTH., Fl. Austral. 5: 172 (1870).
Dioecious shrub with entire oblong to elliptic leaves; fruit valves orbicular to rhomboid with bladder-like appendages.

8. *Krascheninnikovia*

I.C. HEDGE, Edinburgh

Krascheninnikovia GUELDENST., Novi Comment. Acad. Sci. Imp. Petrop. 16: 551 (1772).
Syn.: *Eurotia* ADANS., Fam. 2: 269 (1763) – nom. illegit.

Lit.: A. LOSINA-LOSINSKAJA, A review of the genus Eurotia, Bulletin de l'Académie des Sciences de l'URSS Sér. 7: 995–1000 (1930), in Russian; P. AELLEN, Eurotia in Ergebnisse einer botanisch-zoologischen Sammelreise durch den Iran, Verhandlungen der Naturforschenden Gesellschaft in Basel 63, 2: 264–272 (1952); J.L. REVEAL & N.H. HOLMGREN, Ceratoides, an older generic name for Krascheninnikovia and Eurotia, Taxon 21: 209 (1972); W. GUTERMANN, Notulae nomenclaturales 5, Phyton (Austria) 17: 35–36 (1975).

Shrubs, monoecious (or dioecious?) with a prominent indumentum of 4–10-armed stellate-dendroid (not barbellate) hairs. Leaves well-developed, alternate, not fleshy, linear-oblong to broad ovate, entire. Plants predominantly either male or female. Inflorescence spike-like. Flowers unisexual: male flowers in short ± erect axillary fascicles or catkins with 4 membranous perianth segments and (3–)4 stamens, not subtended by bracts; female flowers solitary or in pairs in leaf axils enclosed by 2 fused bracts, without perianth segments. Styles 2, prominent, split to near base, papillose. Fruit enclosed within the 2-horned bracts, densely covered with very long silky hairs, vertical. Seed erect with a horse-shoe shaped sturdy embryo; endosperm present – Type of genus: *K. ceratoides* (L.) GUELDENST. (basionym *Axyris ceratoides* L.).

A very distinct genus on account of the shrubby habit, the unisexual flowers, the very dense long silky hairs on the fruiting bracts and the stellate-dendroid indumentum; related to the annual *Axyris* L. (not in our area); 4–6 species in Europe and Asia, W & E N America.

1a. Leaf base cuneate or rounded; leaves 10–25(–35) × 2–10(–15) mm, linear-oblong to ovate .... 1. *K. ceratoides* (L.) GUELDENST.
b. Leaf base cordate or broadly rounded; leaves 15–40 × 10–20 mm, oblong-ovate to broadly ovate .... 2. *K. Ewersmanniana* (STSCHEGL. ex LOSINSK.) GRUBOV

1. ***K. ceratoides*** (L.) GUELDENST., Novi Comment. Acad. Sci. Imp. Petrop. 16: 555 (1772).
Syn.: *Axyris ceratoides* L., Spec. Plant. 979 (1753). *Krascheninnikofia* [sic!] *latens* J.F. GMELIN, Syst. Nat. 2: 274 (1791) – nom. illeg. *Diotis ceratoides* (L.) WILLD., Spec. Plant. ed. 4, 4, 1: 368 (1805). *Eurotia ceratoides* (L.) C.A. MEY. in LEDEB., Fl. Alt. 4: 239 (1833). *E. ferruginea* BOISS. ex MOQ. in DC., Prodr. 13, 2: 120 (1849). *E. pungens* (POPOV) PAZIJ in VVED., Fl. Uzbek. 2: 231 (1953). *Krascheninnikovia ceratoides* subsp. *deserticola* (LOSINSK.) OVCZ. & KINZ. in OVCZ., Fl. Tadjik. 3: 346 (1968). *K. ceratoides* subsp. *tragacanthoides* (LOSINSK.) OVCZ. & KINZ., l.c. 347. *Ceratoides papposa* BOTSCH. & IKONN., Nov. Syst. Leningrad 6 [1969]: 267 (1970). *C. latens* REVEAL & HOLMGREN, Taxon 21: 209 (1972). *Krascheninnikovia pungens* (PAZIJ) PODLECH, Mitt. Bot. Staatssamml. München 12: 74 (1975).
Icon.: ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 524, fig. 197 (1934). – Tab. 51, 52.
Type: "Tataria, Moravia", LINN 1101/1 – microfiche!

Small to medium-sized shrub, from c. 20 × 20 cm to 100 × 75 cm with an all-over persistent indumentum of stellate-dendroid hairs often drying reddish brown. Stems erect-ascending, much branched, usually glabrescent, rather densely leafy especially below. Leaves linear-oblong, elliptic, narrow ovate to ovate, 10–25 (–35) × 2–10(–15) mm, obtuse or acute, cuneate to rounded at base, 1-nerved; petiole 1–2,5 mm. Flowers unisexual, small, in terminal or lateral numerous fascicles. Male flowers with 4 lobes c. 1,5 × 0,5 mm, membranous, densely stellate-dendroid; stamens 3–4, exserted beyond perianth, thecae ellipsoid, pink, red or yellow, c. 0,6 mm long. Female flowers with 2 bracts united below. Fruiting bracts densely covered with often fascicled hairs, 5–7 mm long with 4–6 very short basal arms; horns 1,5–2,5 mm erect-spreading; styles shorter than horns. Embryo c. 2,5 mm long.

Hab.: Hot rocky slopes, *Artemisia* steppe, on gypsum, limestone, serpentine rocks, sand hills, stony desert, roadsides; 1100–4400 m. – Fl. VI–VIII, fr. VI–X.

T a l i s h : Talish sec. GROSSH., Fl. Kavk. 3: map 135 (1945).
P e r s i a : N: Gorg.: Shahkuh, KOELZ 16291!, 16298!, 16334!, 16335! Shahpasand to Bojnurd, 1200 m, TERME 41539-E! Mohammad Reza Shah National Park: road to Almeh, 1200 m, RECH. 52885!, UOTILA 19175! Road to Behkadeh, 1300 m, WDB. & FOROUGHI 12824! Maz.: Haraz valley, Darli above Panjab, 2000 m, WDB. 1605! – W: Azerb.: Rezaiyeh, 1700 m, BEHB. & AELLEN 589!, 590! Tabriz to Ahar, Goja Bel, 1800 m, RECH. 14869! Esf.: Esfahan to Nain, Kuhpayeh, Tinjan-e Jabal, c. 2000 m, TERME & TEHRANI 41727! – S: Fars.: Abadeh, Najafabad, SCHARAFEH 30312-E! Abadeh, Eqlid, Kuh-e Bul, TERME 14835-E! Hassanabad, STAPF 807! Deremgun near Shiraz, KY. 556! Kuh Delu, KY. 516! Kerm.: Kuh-e Laleh Zar, 3000–3200 m, FOROUGHI & ASSADI 16280!, MOUSSAVI & TEHRANI 40067-E! Rayen, near Shirinak, 2500 m, MOUSSAVI & TEHRANI 40066-E! Kuh-e Jupar, to 2900 m, 6.VIII.1973, KUHLE! Bal.: Zahedan to Khash, c. 1500 m, RECH. 4270! Firuzabad, 47 km NW Khash, SOJÁK 2189! Kuh-e Taftan, 2000 m, 9.V.1939, SAB. & GAUBA. – E: Khor.: Kuh-e Ahangaran, Zaidan, 1900 m, RECH. 56151! Robat-i Safid, 1520 m, RECH. 51347! 15 km N Quchan, N Shurak, 1650 m, UOTILA 18965! Chenaran to Quchan, 1250 m, RECH. 4696! Chenaran, Radkan to Goran, 1450 m, TERME et al. 36568-E!, 40073-E! Tabas, c. 25 km E Jow Khvah to Robat-e Gur, IRANSHAHR 40276-E! – C: Tehr.: Damavand, KY. 603!, IRANSHAHR 30286-E! N Ab-e Garm, S foot M Damavand, c. 2000 m, AELLEN 592! Firuzkuh, c. 2000 m, AMIN & BAZARGAN 2860!, 2897! Pir Deh, 31 km S Firuzkuh, 2200 m, AMIN 3020! 26 km NW Firuzkuh, 2150 m, AMIN & BAZARGAN 2757! Karaj: Eshtehard, Kuh Mirza-Mahmud, TERME 14848-E! Zarand to Saveh-e Kohneh, 1320 m, FORUGHIAN 2929! Damgh.-Semn.: Semnan to Damghan, RECH. 1263a!, 1263b!, DINI & BAZARGAN 32926!, REJAMAND & BAZARGAN 32155! Damghan to Shahrud, Kuh-e Sefid, c. 2000 m, TERME & ZARGANI 40076-E! Chashmeh-i Ali, SE Kuh-i Nizva, 2200 m, BEHB. & AELLEN 595! 75 km Semnan to Sari, Parvar, c. 2000 m, TERME et al. 39350! 23 miles E Semnan to Mashhad, 1800 m, ALAVA 10839! 35 km Shahmirzad to Fulad Mahalleh, 2400 m, RENZ & IRANSHAHR 16784!, 16786! Shahr.-Bust.: c. 20 km E Shahrud, RECH. 5407! Shahvar above Nokarman, 3500 m, RECH. 5994! Shahrud, Tash, 2500 m, MOUSSAVI & KARAVAR 34370-E! Inter Mayamay et Abbasabad, RECH. 5353! Turan Prot. Reg.: Qaleh Bala to Delbar, 1100 m, RECH. 50480! Salahabad to Zamanabad, c. 1100 m, RECH. 50954! Shahrud to Abbasabad, c. 1200 m, SCHMID 6088! Kashan: Qamsar, MANUCH. 5220-E! Muteh, IRANSHAHR 30287-E!
T u r c o m a n i a : Ashkhabad, Suluklü, BORNM. 1116! Kopet Dagh, Chuli, 10.IX.1976, VASAK! Kizyl Arwat, Karakala, BORNM. 2015b!
A f g h a n i s t a n : NW: Herat: 5 km Khusan WNW Herat, 790 m, FREITAG 5475! – SW: Farah: 20 km SW Sherzad, 1600 m, PODLECH 22003! – E: Kabul: Chakewardak, 2200 m, GILLI 2118!, 2119! C Panjshir valley near Dasht-i Riwat, 2500 m, PODLECH 12257! Ghazni: 52 km W Ghazni, 2700 m, RECH. 37209! Lalchak 9 km ENE Malestan, 2850 m, PODLECH 19304! Okak, NE Dasht-e Nawar, 3000 m, RECH. 17725! Saperlebuli SE Dasht-i Nawar, 3150 m, FREITAG 1509! Jaji: Hassankhel, Gardez to Ali Khel, VOLK 71/700! Urgun: Urgun, VOLK 71/300a!, 71/756b! Gomal, VOLK 71/296a! 18 km NE Ziluk (Zirok), Khost to Urgun, VOLK 71/310a! – NE: Munjan: Ptili, 2600 m, EDELB. 1517! Parwara, KOELZ 12813! Wakhan: W Wakhan, Sar-i Skhaur,

2750 m, ROEMER 293! Khandud valley, 3000 m, RENZ 87! Zemestan-e Baharagh E Sarhad, ROEMER 348! Darya-e Istmoch valley, 3800 m, ANDERS 8159! C Wakhan, Walbai valley, NE Kotal-e Wazit, 4400 m, RASOUL in BRECKLE 1400! (several other gatherings from Wakhan seen) Kataghan: Baghlan: foot of Koh-e Shindadara, 2000 m, ANDERS 9357! Badakhsh.: Khash, KOELZ 12948! Hazrat Said, KOELZ 12862-b! – C: Bamian: Shibar pass, 3000 m, HDG. & WDB. W-4227!, PODLECH 12065! Hajigak Pass, 2700–3350 m, PODLECH 12587a!, BRECKLE 4788! Panjao to Naiak, 3350 m, RECH. 36298! Kotal-i Dewali, Naiak to Panjao, 3000 m, DIETERLE 774! Yakawlang (Naiak), 2800 m, DIETERLE 1297! Yakawlang to Panjao, 3380 m, PODLECH 19552! E Naiak, Band-e Amir to Panjao, 2800 m, HDG. & WDB. W-4814! Bamian, 2500 m, UOTILA 18718!, VOLK 2241! NE Bamian, 2600–3140 m, GILLI 2118!, 2119! Bamian to Shahr-e Shak, 2300 m, NEUB. 4191! Bamian to Band-i Amir, c. 3000 m, RECH. 18191b!, UOTILA 18549! Band-i Amir, 2800–2950 m, RECH. 18214!, 18228!, PODLECH 12148!, ANDERS 4423!, UOTILA 18637!, GILLI 2117!, DIETERLE 1011!, BRECKLE 4786A!, VOLK 2732! Ghorband: Upper Ghorband valley, Dohane Kotak to Dohane Botyan, 2400 m, ANDERS 4354! Doab: Ao Khorak, KOELZ 1795! Inter Bulola et jugum Shibar, 2600–2800 m, RECH. 16818! Pakistan: Chitral: Tirich Mir: Ojhor valley, 2800 m, KERST. 1584! Ojhor to Hasanabad, c. 2500 m, KERST. 1591! Pechus, 3250 m, STAMM & WÖHRL 24! Mastuj, 2280 m, BOWES LYON 910! Mastuj to Baroghil, 3050 m, STAINT. 3035! Utak An, 2740 m, STAINT. 3237! – Quetta: Spin Karez, 1850 m, RECH. 29261! Hanna valley, 1670 m, JAFRI & AKBAR 1659. – Kalat: 50 km NNE Kalat, Koh-e Maran, 2600 m, FREITAG & KOTHE 18872! 4 km SW Kalat, FREITAG & KOTHE 18872! 4 km SW Kalat, FREITAG & KOTHE 18895!

Distr. gen.: Spain, NW Africa, E Europe, Crimea, Caucasus, Turkey, Lebanon, Syria, Sinai, Persia, Turcomania, Afghanistan, Pakistan, C Asia to Siberia, Mongolia and N China.

A very common widespread species in our area. Although in height, leaf size and shape it is most variable, in flower and fruit characters it is relatively constant. AELLEN (l.c. 270–271) cited 4 varieties (*tenuifolia* MOQ., *angustifolia* FENZL, *ferruginea* BOISS., *latifolia* MOQ.) based on leaf shape. LOSINA-LOSINSKAJA in her review of the genus (l.c.) recognized 3 eco-geographical races (*pratensis*, *deserticola*, *tragacanthoides*). With the material now available for study, all these variants completely intergrade. In some parts of our area there is a particularly great range of variation – e.g. Bamian in C Afghanistan (where "*K. pungens*" is a common variant) – or Mazandaran in N Iran (where forms occur closely approaching *K. Ewersmanniana*, e.g. AELLEN 592, AMIN & BAZARGAN 2757, RECH. 5994, WDB. 1605).

2. ***K. Ewersmanniana*** (STSCHEGL. ex LOSINSK.) GRUBOV, Akad. Nauk SSSR Bot. Inst. Komarov Rast. Tsentral Azii 38 (1966).
Syn.: *Eurotia Ewersmanniana* STSCHEGL. ex LOSINSK., Bull. Acad. Sc. URSS ser. 7, 9: 993 (1930). *Ceratoides Ewersmanniana* (STSCHEGL. ex LOSINSK.) BOTSCH. & IKONN., Nov. Syst. Leningrad [6] 1969: 267 (1970).
Icon.: OVCZ., Fl. Tadjik. 3: 347, tab. 56, fig. 7 (1968). – Tab. 53.
Type: E Ural, LE.

Shrub to 1 m, much branched. Only differing from the preceding species in the size (up to 40 × 20 mm) and shape of the leaves (see key to species). In all other characters of indumentum, flower and fruit apparently not different.

Hab.: Dry rocky slopes, granite hills, gravel slopes, salt steppe, edges of fields; 1400–4100 m. – Fl. VI–VIII, fr. VIII-X.

A f g h a n i s t a n : **SW**: Ghorat: Darra-e Naiak, 34°54'N 65°27'E, 2100 m, JANATA 82b! Daulat Yar to Qala Qansi (Chakcharan, Tschaktscharan), c. 2200 m, RECH. 18834! Darrah-i Tarbolagh, 2 km S Gala Asya, Chakcharan to (Qala Shahrak) Sharak, 2750 m, PODLECH 19148! 3 km SW Dahane Astarawa, Sharak to Tulak, 2370 m, PODLECH 19174! Darrah-i-La'l near Dahane Chaka, 2710 m, La'l to Daulat Yar, 2710 m, PODLECH 19099! – **E**: Kabul: Maidan valley, Qole Nati, 2800 m, ANDERS 4178! Maidan valley, upper Darrah-i Sanglakh, near Darsudyar, 2670 m, PODLECH 32250! Maidan valley, 2400 m, BRECKLE 2761! Wardak (Maidan) valley, Chak-e Wardak, 2200 m, NEUB. 1622! Darrah-i Siahsang, 2950–3180 m, BRECKLE 2304!, ANDERS 4638! Ghazni: E side Dasht-i Nawar, 3320 m, BRECKLE 4608!, 4612! SW side of Dasht-i Nawar, 3150 m, PODLECH 19258! Goladi Alamajid, E of Dasht-i Nawar, 2900 m, ANDERS 3985! Bozghalak, near Shashgao, 24 km NE Ghazni, 2400 m, RECH. 17302! Regak, 3 km above Gardandewal on way to Hajigak pass, 3000 m, DIETERLE 693! Ghorband: Upper Ghorband valley, E slopes of Shibar pass, 2950 m, PODLECH 12200!, RECH. 36904! Upper Ghorband valley, Dahane Kotak to Dahane Botyan, 2400 m, ANDERS 4354! Ghorband valley, VOLK 2792! – **NE**: Wakhan, Darya-e Birgula-e Jelga Chelab valley, 74°06' 37°14', 4000–4100 m, ANDERS 7537! Qala-e Panja, 2790 m, ANDERS 6999! Kataghan: Farkhar valley, near Zingerd, ANDERS 10884!, 10949! Upper Farkhar valley, 2 km below junction with Piu valley, 2350 m, PODLECH 12641! Lower Andarab valley, 10 km E Doshi, 980 m, PODLECH 19726! – **C**: Bamian: Bamian, BLIGNY 20! Gholghola, 2440 m, GILLI 2116! Band-i Amir, c. 2800 m, DIETERLE 1333!, RECH. 18268! 12 km W Bamian, 2750 m, PODLECH 15973! 15 km W Band-i Amir to Naiak, 2650 m, DIETERLE 746! Charikar to Bamian, 2500 m, UOTILA 18490! Bamian to Shahr-e Shak, 2300 m, NEUB. 4192! Darrah-i Kalu, Gumbad, 2850 m, PODLECH 17020! Ashgarat near Bariki Sufla, 2820 m, PODLECH 18945! Shibar Pass, 3050 m, KOELZ 12163! Doab: Doab, c. 1800 m, VOLK 1793! Lorinj, 2440 m, KOELZ 13633!

Distr. gen.: Afghanistan, C Asia to Mongolia and China (Sinkiang) (map in GRUBOV, Pl. As. Central. 2, map 1, 1966).

Doubtfully different from the multiform preceding species, q.v.; some collections, e.g. PODLECH 19258 are clearly similar to it.

9. *Ceratocarpus*

I. C. HEDGE, Edinburgh

Ceratocarpus L., Spec. Plant. 969 (1753); Gen. Plant. ed. 5: (1754).

Annual monoecious herbs with a prominent indumentum of stellate-dendroid hairs. Leaves well-developed, alternate, sessile or shortly petiolate, spine-tipped. Flowers solitary or in clusters in leaf axils or angles of branches. Male flowers with a 2(3–)-lobed perianth and 1 stamen, not subtended by bracts. Female flowers without a perianth, consisting of an ovary with a 2-lobed style enclosed within 2 ± obtriangular fused bracts; fruiting bracts conspicuous with 2 spreading spines. Seed within a thin membranous pericarp, vertical; embryo green in the form of a loop; endosperm present. – Type of genus: *C. arenarius* L.

A most distinct probably monotypic genus easily recognized by the annual habit, stellate-dendroid indumentum, the spine-tipped leaves and spreading spines on the fruiting bracts.

1. *C. arenarius* L., Spec. Plant. 969 (1753).
Syn.: *C. utriculosus* BLUK. in KRYLOV, Fl. Sib. Occid. 4: 905 (1930). *C. turkestanicus* SAV.-RYCZ. ex ILJIN in KOMAR., Fl. URSS 6: 874 (1936). C. *arenarius* subsp. *utriculosus* (BLUK.) TAKHT. in TAKHT. & AN. A. FEDOR., Fl. Erevana 91 (1972).
Icon.: Tab. 54.
Typus: (Russia – possibly Volga steppes) "in Tatariae arenosis", LINN 1086/1 – microfiche!

Annual greyish green, often bushy, with an all-over dense indumentum of stellate-dendroid hairs. Stems 5–30 cm, usually much and divaricately branched from base, up to 50 cm across, leafy and spiny. Leaves linear to linear-elliptic, spine-tipped, spreading-erect, c. 10–40(–50) x 1,5–3,5(–10) mm, 1-nerved, entire, ± sessile; upper leaves filiform-spiny. Perianth segments of male flowers ± oblong, apically truncate-rounded, 1,5–2 mm. Fruiting bracts obtriangular c. 5–6 x 3–4 mm, ± flat; apical lateral spines, 5–8(–11) mm, subulate, spreading-erect, with stellate-dendroid hairs. Seed c. 4,5 mm long.

Hab.: Semi-desert, dry plains, sandy soil, salt steppe, waste ground, edge of fields; 450–2550 (–3000) m. – Fl. & fr. IV–X.

T a l i s h : Talish sec. GROSSH., Fl. Kavk. 3: map 136 (1945).
P e r s i a : N: Gorg.: Qareh Makher N Gonbad-e Kavus, KALALI 30391-E! Mohammad Reza Shah National Park near Almeh, c. 1200 m, RECH. 52844!, WDB. & FOROUGHI 12711! – Persia borealis, BUHSE! – W: Azerb.: Aras Dam near Maku, 800 m, SIAMI 4108! SE Tabriz, 1540 m, WDB. & SHIRDELPUR 14935! Talkheh Rud (Achi Chay), N Tabriz, 1600 m, BEHB. & AELLEN 424! Ad ripam austro-orientalem arenosum lacus Urmia (Rezaiyeh) inter Bunab et Khanian, RECH. 14775! 16 km N Marand to Jolfa, 1400 m, RECH. 41417! 2–12 km W Zonuz, c. 1600 m, RECH. 41385! Khamseh: 10–80 km NW Zanjan, RECH. 42345!, 53833!, SOJÁK 7456!, 7574! 16 km W Takestan versus Zanjan, 1300 m, RECH. 42337-b! Kurd.: Sarab, 6 km NE Gol Tappeh, 2190 m, CALDER 24! Soltanyeh, 1670 m, FURSE 3215! Bijar hills, 1520 m, FURSE 3271! Ham.: Aq Bolagh, c. 90–100 km N Hamadan, RIOUX & GOLV. 102! In planitie Alladabad ad Hamadan, HAUSSKN. 844-a! – S: Fars.: Pasargadae, SOJÁK 6798! Kerm.: Mahan, SOJÁK 2795! Kuh-e Jupar, 2100 m, BORNM.! – E: Sistan: Sistan: FURON 32!, 34!, 41! Khor.: 40 km Qayen to Gonabad, 1600 m, RECH. 56246! Kuh-e Najafi near Mashhad, ALAVA 10917! Mashhad, RECH. 4847! Torbat-e Jam, Bezg, ALAVA 10949! 60 km W Mashhad, W of Chenaran, 1200 m, UOTILA 18999! Helali, Gonabad to Bejestan, 1250 m, RECH. 51461! Birjand to Qayen, 1900 m, RECH. 4177! Torbat-e Heydarieh, 1300 m, RECH. 1582!, 4327! Qayen to Torbat-e Heydarieh, 900 m, RECH. 7283! Bojnurd, KOELZ 16651! Dasht to Loveh, 1200 m, RECH. 37613! – C: Tehr.: Gol-e Sahra, 1230 m, UOTILA 19372! Hableh-Rud, Simin-Dasht to Kebutar-Darreh, 1150 m, MANUCH. & AELLEN 429! Damavand prope Reneh, BORNM. 8105! Tehran, KOTSCHY 43! Robat Karim (Shahriar) Qom to Tehran, RECH. 5808! Hasanabad between Tehran and Qom, ASEFI 30317-E! Qazvin: Qazvin, 1200 m, SCHMID 6435! Qazvin to Zanjan, 1300 m, UOTILA 19441! 105 km from Qazvin to Zanjan, 1760 m, ASSADI & AMINI 13534! Mardabad SW Karaj, 1300 m, AELLEN 431! Karaj, RECH. 534!, 6792! Shahr.-Bust.: 100 km SE Shahrud, 1420 m, REJAMAND & ARAZM 32593! Mayamey to Shahrud, RECH. 5317! Turan Prot. Region: In arenosis 48 km ESE Delbar to Ahmadabad, 1000 m, RECH. 50604! Kashan: Robat-e Tork, SOJÁK 6888!
T u r c o m a n i a : Ashkhabad, in agris arenosis, BORNM. 286! (type of *C. turkestanicus*). Ashkhabad, 300–400 m, VASAK s.n.! E Bami, 350 m, VASAK s.n.!

Afghanistan: N: Mazar-i Sharif: 15 km NNW Haibak to Tashkurghan, 990 m, PODLECH 19778! Akcha to Mazar-i Sharif, 400 m, RECH. 16142! Paigah Kotal (Mirza Atbili) to Haibak, 1170 m, PODLECH 18285! – NW: Maimana: Andkhui to Shibarghan, 450 m, HDG. & WDB. W-3570! Herat: Badghiz: 20 km S Torah Ghundi to Herat, Yaka Tut, 800 m, PODLECH & JARMAL 29495! 15 km NW Herat, 1100 m, PODLECH & JARMAL 29326! N Herat, GILLI 2121! Herat to Kisil Islam Qaleh, RECH. 32506! 14 km ESE Kisil Islam Qaleh to Herat, 720 m, PODLECH & JARMAL 29379! 80 km E Iran frontier to Herat, 850 m, UOTILA 18944! – SW: Herat: 28 km S Herat to Dilaram, Qala-i-Mir Daud (Hauz-i Mir Daud), 1280 m, PODLECH 32539! Farah: Tulak to Farsi, Dyaragha, 1980 m, PODLECH 19189! – SE: Kalat-i Ghilzai: Kalat-i Ghilzai to Mirzan Alaqadari, 1620 m, PODLECH 31329! – E: Kabul: Kabul, KOELZ 13492!, NEUB. 79/1950! In collibus ab urbe Kabul orientem versus, 1800 m, RECH. 19339! Sher Darwasa, 1800 m, RECH. 16999!, PODLECH 15819!, GILLI 2122!, 2125!, 2126!, HDG. & WDB. W-2909! Kabul to Charikar, 1800 m, HDG. & WDB W-4324! NW Kabul, Karisimir, 1900 m, PODLECH 32619! Aliabad, NEUBAUER 78/1950!, 3145!, 3197! Khair Khaneh pass, REINER 722! Gulbahar, 1600 m, AMSEL s.n.! Paghman, VOLK 357! 2 km W Shahr-i Maidan, 2200 m, PODLECH 32218! Logar: 6 km Pul-Alam to Khoshi, 2000 m, PODLECH 31208! Kotubkhel, 1880 m, PODLECH 22265! 2 km N Woluswoli Kolanger, 1850 m, PODLECH 30419! Kabul to Ghazni, 5 km S Arghandeh, 1900 m, RECH. 17216! Sheikhabad, 2300 m, RECH. 17257! Gardez: 15 km SE Gardez to Khost, 2500 m, RECH. 32088! Gardez, VOLK 71/431-a!, KOELZ, 11907! Ghazni: 63 km NNE Ghazni to Kabul, 2100 m, PODLECH 19601! Ghazni to Moqur, Sangi, 2050 m, PODLECH 22352!, 31235! Ghazni, 2180 m, PODLECH 22110! 20 km S Ghazni, FREITAG 3681! 65 km Ghazni to Kandahar, 2100 m, UOTILA 18918! 4 km Luman to Sang-i Masha, 2550 m, PODLECH 19405! Chacar, N Sang-i Masha, ANDERS 11175! Dasht-i Nawar, 3000 m, RECH. 37298! Urgun: Urgun, VOLK 71/219-a! – NE: Badakhshan: Kokcha valley, 8 km S Jurm, PODLECH 12728! 33 km E Faizabad to Baharak, PODLECH 12718! – C: Bamian: 5 km SW Bamian, PODLECH 22238! 6 km W Bamian, 2550 m, FREITAG 1243! Bamian, 2500 m, VOLK 2711! Kuh-i Baba, 2900 m, GILLI 2123! Gulgola, VOLK 2817! Ghorat: Chaghcharan to Qala Shahrak, Hari Rud valley, 221 m, PODLECH 19134! Taiwara, 2100 m, RECH. 19122! Dawlatyar to Qala Qansi (Chaghcharan), 8 km SE Badgah, 2460 m, PODLECH 19122! Taiwara to Pasaband, Awlade Rahmatbeg, 2140 m, PODLECH 21830!

Pakistan: Quetta: Quetta, Kanozai valley, LACE 3979! Hanna Lake, 1750 m, FREITAG & KOTHE 18815! Mastung, QAISER & GHAFOOR 4376! Chiltan Nat. Park near Kohe Hazargangi, GHAFOOR & YUSUF 1580!

Distr. gen.: Persia, Turcomania, Afghanistan, Pakistan, C Asia, W Mongolia, Sinkiang.

Although almost all recent "Soviet" Floras recognize *C. arenarius* and *C. utriculosus* as independent species, I find it impossible to separate them. At the western end of the species (s.l.) range, where *C. arenarius* was described from, the spines on the bracts are mostly shorter than those on plants from our area, but there is no clear disjunction between the two variants and with the large number of specimens studied from our area there seem no good reasons to give any formal rank to the variants of this essentially oligomorphic species.

Some specimens bear at the stem base, about or somewhat below soil level one, two or three female flowers. Their bracts are more rounded than those of flowers on the main inflorescence, have a much denser indumentum and bear very short spines, or no spines.

10. *Camphorosma*

I.C. HEDGE, Edinburgh

Camphorosma L., Spec. Plant. 122 (1753); Gen. Plant. ed. 5: 58 1754.

Lit.: A.J. SCOTT, A revision of the Camphorosmioideae (Chenopodiaceae). Feddes Repertorium Specierum Novarum Regni Vegetabilis 89: 101–119 (1978).

Annual or perennial herbs or subshrubs, sometimes aromatic, with a prominent indumentum of simple smooth or minutely barbellate hairs. Leaves well-developed, alternate, often densely clustered, linear, ± rigid, subulate or acute, sessile. Flowering shoots several, ascending, sturdy, leafy. Flowers hermaphrodite, male or (?) female, borne in leaf axils, forming short lateral spike-like inflorescences. Perianth segments 4, urceolate, united to near middle, membranous, usually with dense long hairs, equal or unequal. Stamens 4, with large oblong thecae, clearly exserted beyond perianth segments. Ovary ovoid; styles 2, prominent, filiform, papillose. Fruiting perianth segments not enlarging, without wings or appendages. Utricle ovoid-elongated, erect. Seed vertical; embryo horse-shoe-shaped to ± circular; endosperm present. – Type of genus: *C. monspeliaca* L.

About 5 species in Europe, N Africa and Asia.

Characterized by the densely clustered linear leaves, the 4-partite perianth unchanged in fruit, the 4 exserted stamens, the long exserted filiform-papillose styles and the vertical seeds.

1. ***C. monspeliaca*** L., Spec. Plant. 122 (1753).
Syn.: *C. perennis* PALL., Illustr. Pl. 66, tab. 57 (1803). *C. ruthenica* M. B., Fl. Taur.-Cauc. 3: 112 (1819). *C. polygama* BUNGE ex BOISS., Fl. Or. 4: 921 (1879). *C. Lessingii* LITW., Trav. Mus. Bot. Acad. Sci. Imp. Pétersbg. 2: 96 (1905). *C. monspeliaca* subsp. *Lessingii* (LITW.) AELLEN, Notes Roy. Bot. Gard. Edinb. 28: 31 (1967).
Icon.: PALL., Illustr. Pl. tab. 57 (1803) – as *C. perennis*. KOROV., Fl. Uzbek. 2: tab. 22, fig. 1 (1953) – as *C. Lessingii*. – Tab. 55.
Type: "In Hispaniae, Narbonae, Tatariae arenosis", (? Herb. BURSER XXV: 55 – UPS – microfiche!)

Dwarf shrub, caespitose, often forming dense cushions, with a thick woody rootstock; sterile shoots short, densely covered with clusters or pseudo-rosettes of leaves; flowering shoots ascending, 8–40 cm, unbranched, with scattered or ± contiguous dense fascicles of leaves, densely hairy when young with intertwined hairs, glabrescent. Leaves c. 3–5 mm long linear, stiff-textured. Leaf-like bracts subtending the flowers, as long as perianth segments. Perianth c. 2 mm long, with a dense indumentum of spreading hairs, unchanged in fruit. Fruiting styles prominent, c. 2,5 mm in total length, split to c. 1,5 mm, and densely papillose. Fruit hidden within the enclosing leaves. Pericarp thin; seed c. 1,8 mm long, compressed, brownish black.

Hab.: Salt steppe, plains, *Artemisia* steppe, clay hills, eroded marl slopes, loess semi-desert; 1000–3175 m. – Fl. VI–VIII, fr. VIII–X.

Persia: N: Maz.: Qomrud, BEHB. & AELLEN 30186-E! – W: Azerb.: Ardabil, 1000–1600 m, SCHMID 6502! In collibus rubris "Einal Zeinal" inter Tabriz et fluvium Talkheh Rud, 1700 m, RECH. 43536! 15 km NE Tabriz to Ahar, RECH. 14820! In valle fluvii Talkheh Rud (Atschi Tschai), c. 65 km E Tabriz, 1500 m, RECH. 40528!, AELLEN & BEHB. 3107! Mianeh, PABOT 30328-E! Urmia Lake (Lacus Rezaiyeh) Ashk Island, 1350 m, MOUSSAVI & ZARGANI 40114-E! Ham.: Aq Bolagh 90–100 km N Hamadan, RIOUX & GOLV. 104! Lur.: Dow Rud, KOELZ 18295! – S: Fars.: Persepolis, in planitie copiosissime, 1800 m, BORNM. 4147! Pulvar Lake, BOBEK 197! – E: Khor.: Bojnurd, Besh-Ghardash, 1100 m, IRANSHAHR & ZARGANI 1520-E! C: Tehr.: M. Damavand above Polur, 2500 m, GAUBA 2098! Foot of Damavand, Polur to Reneh, 2300 m, GILLI s.n.! Qazv.: Qazvin, 1280 m, PABOT 30341-E! N of watershed above Ileka, 2280 m, FURSE 2802! Damgh.-Semn.: Inter Firuzkuh et jugum Bashm, 2000 m, RECH. 1180! – Persia borealis, 25. VIII. 1882, PICHLER s.n.!

Turcomania: Ashkhabad, Suluklü, ad fines Persiae, SINT. 1089!

Afghanistan: N: Darra-i Suf: Baligali Pass, 2740 m, KOELZ 13849! – SE: Mukur: Khushamand, Mukur to Zarghun Shahr, 2000 m, PODLECH 19426! 15 km SE of Zarghun Shahr to Gomal, VOLK 71/275a! 15 km SE Mukur, 2000 m, BRECKLE 4616! 8 km S Mukur to Ab-i Istada, 2000 m, FREITAG 2012! 40 km E Mukur, 2000 m, FREITAG 3401! – E: Kabul: Kabul, VOLK 2156! Wazirabad, road to Charikar, NEUB. 59! Ghazni: 5 km NW Dila, 1980 m, PODLECH 19420! 2 km S Sherbuz between Ghazni and Gardez, 2475 m, PODLECH 19454! Khost: Yakubi, in argillosis salsis, 1200 m, RECH. 35563! Sombar, NEUB. 320! Khost, HAGER 101! Urgun: 50 km NW Urgun to Surmat, 2300 m, RECH. 35946! – NE: Hazarbagh, KOELZ 13152! – C: Bamian: Bulola to Shibar pass, 2700 m, RECH. 16846! Koh-i Baba, GILLI 2130! 6 km W Bamian, 2550 m, FREITAG 1237! Akrobat (Ak Robat W Bamian), GRIFF. 1763 = Herb. East Ind. Comp. 4205 (type of *C. polygama*)! Bamian to Band-i Amir, 2900 m, RECH. 18185!, WDB. & EKBERG W-9768! Darrah Kalou (Kalu), 2700–2800 m, FREITAG 6383!, HDG. & WDB. W-4680! "Dragon valley", 5 km W Bamian, 2500 m, BRECKLE 2351!, 4756!, PODLECH 19519! Kotal-i Dewali, 2900 m, DIETERLE 726a! Band-i Amir, 3000 m, DIETERLE 1016!, 1207! Bamian, 2500 m, NEUB. 423/1951!, 4450!; 3000, GILLI 2131! Dara-i Bum, 4 km N Top'Ali, 3175 m, PODLECH 16023! Zari valley, 3 km N Naylanor, Yakawlang to Panjao, 2600 m, ANDERS 4552! Hajigak pass, N side, 2650 m, BRECKLE 4787! Ghorband: W side Shibar pass, 3000 m, HDG. & WDB. W-4226!, RECH. 36964! Ghorat: Lal-i Sar Jangal, 2500 m, KOEIE 2754!

Pakistan: Quetta, Popalzai-Pishin valley, 1400 m, LACE 4090! Quetta, Lorha Nadi, SINCLAIR 2795! Inter Saranan et Qila Abdullah, 1400 m, RECH. 28974! – "Douband", STOCKS.

Distr. gen.: S. Europe, Morocco, Tunisia, Libya, SW & C Asia to W Mongolia and China (Sinkiang).

After studying a large amount of material from the overall range of the species, I concluded that only one species could be recognized and that the species and subspecies cited above in synonymy could not be maintained.

At least in Europe, *C. monspeliaca* is said to smell of camphor (*Cinnamomum*), but in our area, neither field notes (of the numerous specimens), nor published data give any indication of this.

Species inadequately known

*C. **monandrum*** BUNGE ex BOISS., Fl. Or. 4: 922 (1879).
Type: [Afghanistan] "ad cacumen jugi Erak [Bamian to Kabul, c. 3900 m], regni Cabulici, W. GRIFFITH 1762" = Herb. East Ind. Comp. 4206, G-microfiche!, K!

This was described as a dwarf annual with short linear leaves with the facies of a *Panderia*. The type specimen is scarcely adequate but it seems to be no different from *Kirilowia eriantha*, despite its linear leaves.

11. *Panderia*

I. C. HEDGE, Edinburgh

Panderia FISCH. & C.A. MEY., Ind. Sem. Horti Petrop. 2: 46 (1835).
Syn.: *Pterochlamys* FISCH. ex ENDL., Gen. Plant. Sec. Ord. Natur.: 294 (1837).

Lit.: A.J. SCOTT, Revision of the Camphorosmioideae, Feddes Repertorium Specierum Novarum Regni Vegetabilis 89: 104, 105 (1978).

Annual herbs with a prominent adpressed or long-spreading indumentum of smooth or barbellate hairs (high magnification needed). Stems single or several, erect or ascending. Leaves well-developed, not fleshy, alternate, sessile, entire. Flowers hermaphrodite or unisexual, oblong-urceolate, solitary or several in upper leaf axils, usually without subtending bracts, forming lateral or terminal spike-like inflorescences. Perianth segments 5, membranous, connate to above middle, apically incurved; in fruit with short apical horns or prominent transverse wings. Stamens 5, exserted; thecae oblong, without appendages. Ovary oblong-ovoid. Style with 2 prominent papillose apical arms. Fruit vertical, ovoid, seed erect, with a horse-shoe-shaped embryo; endosperm present. – Type of genus: *P. pilosa* FISCH. & C. A. MEY.

Probably monotypic. Related to *Kirilowia*, but with winged or horned fruiting perianth segments; and to *Kochia*, but with vertical seeds. The prominently papillose hairy stylar arms are shared with *Kirilowia*, its closest ally, and with *Bassia* and *Kochia*.

1. ***P. pilosa*** FISCH. & C.A. MEY., Ind. Sem. Horti Petrop. 2: 46 (1835).
Syn.: *Kochia monticola* BOISS., Diagn. Pl. Or. Nov. Ser. 1, 7: 82 (1846). *Panderia divaricata* C. KOCH, Linnaea 22: 186 (1849). *Pterochlamys pilosa* FISCH. & C. A. MEY. in LEDEB., Fl. Ross. 3: 741 (1851) nomen. *P. turkestanica* ILJIN, Bull. Jard. Bot. Acad. Sc. URSS 30: 364 (1932).
Lit.: C.C. TOWNSEND, Kew Bull. 35: 292–293 (1980).
Icon.: ULBRICH in ENGLER & HARMS, Natürl Pflanzenfam. ed. 2, 16C: 527, tab. 198, E–H (1934). ZOHARY, Fl. Palaest. 1: tab. 217 (1966). – Tab. 56.
Type: Azerbaijan: Talysh, LE.

Annual, (5–)10–30(–80) cm, with a ± all-over indumentum of short and long tangled or spreading hairs. Stems simple or branched from base, ascending or erect.

Leaves linear to oblong-elliptic, 8–14 x 1–4 mm, narrowed at base, not or scarcely petiolate. Perianth urceolate; segments c. 2,5 mm, connate to c. 2/3 of tube; in fruit oblong-cylindrical, 3–3,5 mm, with horn-like appendages or distinct spreading entire or erose wings. Seeds oblong-obovoid, c. 1,8 x 1 mm, dark brown, smooth.

Hab.: Sterile slopes, field-edges, garden weed, waste ground, roadside, near habitation; 1500-3000 m. – Fl. VI–VIII, fr. ? IX.

T a l i s h : Talish sec. GROSSH., Fl. Kavk. 3: map 117, 1945.
P e r s i a : W: Ham.: Hamadan, PICHLER 95! Ab-e Garm, SAB. 2114! – S: Kerm.: ad radices montis Kuh-e Lalesar, 3000 m, BORNM. 4184! In locis alpis Kuh-e Dinar (Kuh-Daena), ubi nomades tentoria sua constituunt, KY. 521!, 715! (type of *Kochia monticola*, juvenile). Bal.: Bazman to Iranshahr, SHAR. 112! – C: Tehran: M. Elburz centr., Shahrestanak, 2200 m, GAUBA 2117! Bahram, AELLEN 634! Qazv.: Karaj, 1300 m, AELLEN 636! 638! Mardabad near Karaj, GAUBA 2116! Damgh.-Semn.: Sorkheh prope Semnan, 1600 m, RECH. 1254! Shahr.-Bust.: M. Shahvar ad Nokarman, 2000 m, RECH. 5912! Shahrud, KOELZ 16931! E Shahrud, RECH. 7546! Khush Yailaq Prot. Region, 1490 m, TERME & al. 39363!, 39365! Qom: Rahjerd (Radschird), 1700 m, KOEIE 1516!
A f g h a n i s t a n : E: Kabul: Kabul, GILLI 2194!, 2127!, NEUB. 50/1951!, 52/1950! Bala Hissar, 1760 m, GILLI 2193! Aliabad, NEUB. 3239! Ghazni: Okak NE Dasht-i Nawar, 3000 m, RECH. 17704! – C: Bamian: Bamian, at the large Buddha statue c. 2450 m, BRECKLE 4752!, PODLECH 12598! Bamian, 2500 m, RECH. 36974!, GILLI 2128! 8 km W Bamian, 2600 m, FREITAG 3951! Gulgola near Bamian, 2500 m, HDG. & WDB. W-4643!
P a k i s t a n : Quetta: Quetta, 1670 m, R.R. STEW. 27995! – Kalat: Mastung, 1690 m, FREITAG & KOTHE 18835! Kalat, 2100 m, FREITAG & KOTHE 18894! [KITAMURA, Flora of Afghanistan (1960), notes the species from near Kabul, Doab and Bulola – the specimens (KYO) have not been seen].

Distr. gen.: Palestine, S Iraq, Caucasus, C & E Turkey, Persia, Afghanistan, Pakistan, C Asia.

Very variable in habit and leaf-size. Few specimens (anywhere) are in ripe fruit and immature plants often cannot be identified with certainty. The perianth segments in flower usually have a dark green or brown area near the apex; this feature combined with prominently papillose hairy long stylar arms and a vertical seed is often helpful in generic identification, but the same is also valid for *Kirilowia*.

The determinations of plants collected by SHARIF 112 and R.R. STEW. 27995 are uncertain.

12. *Kirilowia*

I.C. HEDGE, Edinburgh

Kirilowia BUNGE, Del. Sem. Horti Bot. Dorpat. 7 (1843).

Lit.: A.J. SCOTT, Revision of the Camphorosmioideae, Feddes Repertorium Specierum Novarum Regni Vegetabilis 89: 104, 105 (1978).

Annual herbs of small stature with a prominent adpressed or spreading indumentum of barbellate hairs (high magnification needed). Stems branched, spreading or ascending. Leaves well-developed, not fleshy, alternate, sessile, entire. Flowers hermaphrodite or unisexual, campanulate or urceolate, usually solitary in upper leaf axils and without subtending bracts, forming an interrupted spike-like inflorescence. Perianth segments (4–)5, membranous, connate from above middle to c. 4/5 length of tube, apically incurved, without appendages, unchanged in fruit. Stamens (4–)5, exserted; thecae prominent, exserted, without or with very small appendages. Ovary oblong-ovoid. Style elongated with 2 prominent papillose apical arms. Fruit with a membranous pericarp, free within the persistent perianth; seed erect, with a horse-shoe-shaped embryo; endosperm present. – Type of genus: *K. eriantha* BUNGE.

Probably monotypic. The annual dwarf habit, the erect, not horizontal, seed and the unchanged perianth segments in fruit (i.e. without wings or appendages) are characteristic features and separate the genus from its allies, *Kochia* and *Bassia*. It is also closely related to *Panderia* but in that genus, the fruiting perianth segments are winged or horned.

1. ***K. eriantha*** BUNGE, Del. Sem. Horti Dorpat. 8 (1843).
Syn.: *Axyris villosa* MOQ. in DC., Prodr. 13, 2: 117 (1849). *Kirilowia villosa* (MOQ.) BENTH. & HOOK. ex ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 528 (1934). *K. eriantha* subsp. *afghanica* PODLECH, Mitt. Bot. Staatssamml. München 12: 71 (1975).
Icon.: ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 527, tab. 198, J–N (1934). – Tab. 57.
Type: Kazakhstan: Tarbagatai range, Burgan river, A. VON BUNGE, LE.

Dwarf annual. Stems slender, single or branched, 2–15 cm, erect or spreading-ascending, with a ± dense spreading and adpressed indumentum, brown or pink. Leaves oblong-elliptic to broad oblong, 6–10 × 2–3,5 mm, ± densely covered with adpressed long hairs. Perianth in flower c. 2,5 mm; in fruit c. 3,5 mm, oblong, with long hairs covering whole tube ("subsp. *eriantha*") or restricted to apex ("subsp. *afghanica*"). Stamens c. 4,5 mm long. Seeds oblong-obovoid, 1,5 × 0,8 mm, dark brown, smooth.

Hab.: Dry slopes, edge of tracks; 2900–3900 m. – Fl. & fr. VI–IX.

Afghanistan: E: Kabul: Botkhak, NEUB. 357! Usmankhel to Sarobi, VOLK 1045! S Unai Pass, 3800 m, BRECKLE 2746! Gardez: 10 km W Altimur pass (Terah Kotal), Awdakay, 2900 m, VOLK 71/454! Ghazni: W side Dasht-e Nawar, 3140 m, BRECKLE 1884! E side Dasht-i Nawar, 3000 m, RECH. 37308! Okak NE altoplanitie Dasht-i Nawar, 3000 m, RECH. 17693!, 17705! – C: Bamian: N Hajigak pass, 3100 m, HDG. & WDB. W-4626! Bamian/Wardak: Hajigak pass, 355-m, BRECKLE 4804! Kuh-i Baba, Kuh-e Fuladi, 3900 m, BRECKLE 1581! W Nil Kotal, Bamian to Band-i Amir, 3200 m, PODLECH 12074 (type of subsp. *afghanica* PODLECH)! Bamian to Band-i Amir, 2900 m, RECH. 18196! 15 km W Bamian, 2650 m, UOTILA 18582! Dara-i Sabzak, Ak Robat (Aqrabat), 3050 m, DIETERLE 447! Band-i Amir, Sabzel valley, 3000 m, DIETERLE 1210! Band-i Amir, bank of Band-i Zolfikar, 1980 m, DIETERLE 1006! Panjao: Panjao, 2200 m, KOEIE 2749! Ghorat: Panjao to La'l, Asgharat to Khargol, 3120 m, PODLECH 18952!

Distr. gen.: Afghanistan (E and C), C Asia, China (Sinkiang).

In our area apparently mainly restricted to high altitudes in E and C Afghanistan.

The inadequately known *Camphorosma monandrum* BUNGE ex BOISS. (q.v.) is possibly a synonym of *Kirilowia*.

13. *Bassia*

I.C. HEDGE, Edinburgh

Bassia ALL., Misc. Taurin. (Mat. Phil. Math. Soc. Roy. Turin) 3: 177, tab. 4, fig. 2 (1766) non L. (1771).
Syn.: *Willemetia* MAERKLIN in SCHRAD., Journ. Bot. 1: 329 (1801) non *Willemeta* COTHENIUS 1790. *Echinopsilon* MOQ., Ann. Sc. Nat. Bot. ser. 2, 2: 127 (1834). *Londesia* FISCH. & C.A. MEY., Ind. Sem. Horti Petrop. 2: 40 (1835). *Kochia* sect. *Bassiae* (ALL.) BOISS., Fl. Or. 4: 925 (1879). *Chenolea* THUNB. sect. *Echinopsilon* (MOQ.) HOOK. f. in BENTH. & HOOK. f., Gen. Plant. 3: 60 (1880).

Lit.: A. GRAS, Note sur l'histoire du genre Bassia, Bulletin de la Société Botanique de France 11: 71–84 (1864). A.J. SCOTT, Revision of the Camphorosmioideae, Feddes Repertorium Specierum Novarum Regni Vegetabilis 89: 105–108 (1978).

Annual or perennial herbs with an indumentum of spreading or adpressed usually barbellate hairs (high magnification needed). Leaves well-developed, somewhat fleshy or not, alternate, sessile, entire. Flowers hermaphrodite or unisexual, urceolate, solitary or several in upper leaf axils, usually without subtending bracts, forming short or elongated spike-like inflorescences or spreading panicles. Perianth segments 5, membranous, connate to c. middle; in fruit developing apical or subapical short or long, straight or uncinate, spiny outgrowths. Stamens 5, exserted; thecae broad oblong, without appendages. Ovary broad ovoid. Style with 2 papillose apical arms. Fruit ± circular, horizontally compressed or sometimes vertical, apparent or hidden in a dense ball of wool; seed horizontal; embryo horse-shoe-shaped, with some endosperm. – Type of genus: *B. aegyptiaca* ALL. = *B. muricata* (L.) ASCHERS.

Clearly related to *Kochia*, q.v., but all *Bassia* species have spines or spine-like tubercles, not wings, on the fruiting perianth segments.

The curious history of the names *Bassia* ALL. and *Bassia* KÖNIG ex L. (*Sapotaceae*), both named for the Italian botanist FERDINANDO BASSI, is related by GRAS (l.c.)

1a. Flowers and fruits hidden in dense balls of white wool; spines on fruiting perianth segments c. 0,2 mm . . . . 3. *B. eriophora* (SCHRAD.) ASCHERS.
b. Flowers and fruits with an indumentum, but not embedded in wool balls 2
2a. Spines on fruiting perianth segments c. 4 mm long, straight-spreading . . . . 2. *B. muricata* (L.) ASCHERS.
b. Spines on fruiting perianth segments 1–1,5 mm long, straight or curved . . 3
3a. Leaves flat, 15–30 mm long; spines on fruiting perianth segments regu-

larly uncinate .... 1. *B. hyssopifolia* (PALL.) O. KUNTZE
b. Leaves semiterete, 12–15 mm long; spines on fruiting perianth segments straight or curved (Talish) 4
4a. Stems ascending-erect; spines on fruiting perianth segments pubescent .... 4. *B. hirsuta* (L.) ASCHERS.
b. Stems erect; spines on fruiting perianth segments glabrous .... 5. *B. sedoides* (PALL.) ASCHERS.

1. ***B. hyssopifolia*** (PALL.) O. KUNTZE, Revis. Gen. Pl. 2: 547 (1891).
Syn.: *Salsola hyssopifolia* PALL., Reise 1: 491, tab. H (male) (1771). *Kochia hyssopifolia* (PALL.) ROTH, Neue Beitr. 176 (1802). *Suaeda hyssopifolia* (PALL.) PALL., Illustr. Pl. 44 (1803). *Echinopsilon hyssopifolium* (PALL.) MOQ., Chenopod. Monogr. 87 (1840).
Icon.: PALL., Illustr. Pl. tab. 36 (1803) – as *Suaeda hyssopifolia*; TAKHT., Fl. Armen. 2: tab. 94 (1956) as *Echinopsilon hyssopifolium*. – Tab. 58.
Type: "In campis siccis atque salsis ad Rhymnum, infra fortalitum a Calmaccis dictum" [Ural river below Kalmykovskoe – sec. Fl. URSS 6 (1936)].

Annual up to 1,2 m, pilose to villous. Stems erect, straw-coloured, usually with a sparse indumentum, ridged, with many short lateral branches. Leaves mainly in lower part of stem, linear to oblong-elliptic, 15–30 × 1–3 mm, flat, acute, narrowed at base, 1-nerved, not or scarcely fleshy, with mostly adpressed long hairs. Inflorescence wide-spreading paniculate, of numerous terminal and lateral spiciform branches. Flowers c. 0,7 mm in diameter, 2–4 in glomerules in upper leaf axils, condensed or ± distant.Stamens clearly exserted. Perianth segments incurved, with long spreading hairs; in fruit with 5, 1–1,5 mm, subulate spreading regularly uncinate hard spines. Seeds horizontal, enclosed within, but not fused to, persisting perianth segments, ± circular, c. 1,2 mm in diameter.

Hab.: Waste places, gardens, salty ground, among *Tamarix*, damp riverside, dry rocky slopes; 300–2900 m. – Fl. VI–VIII, fr. IX–X.

Talish : sec. GROSSH., Fl. Kavk. 3: map 138 (1945).
Persia : W: Esf.: Kavir near "Edschijeh", STAPF 798! – S: Kerm.: Kerman, 1900 m, BORNM. 4221 as f. *vegeta*!, BORNM. 4222 as f. *aprica*! – E: Khor.: Birjand to Zahedan, Sahlabad, 1420 m, TERME & MOUSSAVI 34435-E! – C: Shahr.-Bust.: Shahrud, KOELZ 16930! Mayamey, SAB. in GAUBA 2115!
Turcomania : Ashkhabad, LITW. 4!, 133!, SINT. 1234-b! Ashkhabad, 300 m, 6 & 13.IX 1976, VASAK!
Afghanistan : N: Mazar-i Sharif: 15 km NW Balkh, 340 m, BRECKLE 4684! 10 km W Balkh on road to Akcha, 340 m, PODLECH 19793! – SE: Kandahar: 2 km S Lashkargah, 780 m, PODLECH 19627! Helmand valley opposite Lashkargah, 800 m, FREITAG 2064! 25 km S Darweshan, Mianpushta, 720 m, PODLECH 19645! Kalat-i Ghilzai: 25 km SE Kalat to Kandahar, 1450 m, PODLECH 16863! – E: Kabul: Kabul, 1780 m, BRECKLE 4938!, GILLI 2195-2199!! Guzar Gah, NEUB. 567! Aliabad, NEUB. 3239! Nangarhar: 48 km E Jalalabad, 540 m, BRECKLE 4948! 10 km W Jalalabad, Darunta dam, 710 m, FREITAG 7478! – NE: Wakhan: Sargaz to Qala-e Pan-

ja, 2850 m, ANDERS 8220! 2 km E Khandud, 2700 m, ANDERS 8256! Kataghan: Zingerd to Warsaj, Farkhar valley, 1600 m, ANDERS 10936!, 10943! Taliqan: 6 km SE Taliqan, Ismay Sanglakh, 820 m, PODLECH 16088! "Dschelaugir", Kundus river, NEUBAUER 171! – C: Bamian: Band-i Amir, c. 2950 m, RECH. 18287! 16 km E Bamian, Shahr-e Shak, (Sahre Zohak), 2400 m, PODLECH 22069!, BRECKLE 2328! Darrah Paimuri, 2400 m, BRECKLE 7069!
Pakistan: Chitral: Yarkhun valley, Mastuj, 2200 m, KERST. 2031!

Distr. gen.: Spain, Crimea, Caucasus, Turkey (?), Kuwait, Saudi Arabia, Persia, Turcomania, Afghanistan, Pakistan, C Asia, China (Sinkiang).

A relatively clear-cut species recognised by the regularly uncinate spines on the fruiting perianth. BRECKLE 4948 has an unusually thick indumentum.

2. ***B. muricata*** (L.) ASCHERS. in SCHWEINF., Beitr. Fl. Aethiop. 1: 187 (1867).
Syn.: *Salsola muricata* L., Mantissa 54 (1767). *Bassia aegyptiaca* ALL., Misc. Taurin. (Mat. Phil. Math. Soc. Roy. Turin) 3: 178 (1766) & 5: 93 (1770). *Kochia muricata* (L.) SCHRAD., Neues Journ. Bot. 3, 3: 86 (1809). *Echinopsilon muricatus* (L.) MOQ. in DC., Prodr. 13, 2: 134 (1849). *Chenolea muricata* (L.) HUTCH. & DALZ., Fl. Trop. W Africa 1: 122 (1927).
Icon.: JAFRI & EL-GADI, Flora Libya 58: fig. 8 (1978). ZOHARY, Fl. Palaest. 1: tab. 219 (1966). – Tab. 59.
Type: "In Europa australis, Aegypto" LINN 315/22 – microfiche!

Annual, up to 50 cm. Stems several, much branched, with tangled white hairs, erect or ascending, somewhat woody at base. Leaves linear to linear elliptic, slightly fleshy, c. 10 × 1,5 mm, with a dense indumentum of ± adpressed long hairs. Flowers solitary or few in clusters subtended by upper leaves, forming wide spreading panicles. Flowers greenish, c. 1,2 mm in diameter. Perianth segments connate to above middle or 2/3; in fruit ± indurated with c. 4 mm straight spreading yellowish filiform spines. Seeds horizontal, c. 1,2 mm in diameter, enclosed within the hardened perianth segments.

Persia: S: Bal.: W of Jaz Murian, 370 m, 23.IV.1972, LÉONARD 5765!

Distr. gen.: N & W Africa, Sinai, Palestine, Cyprus, Jordan, Syria, Iraq, throughout the Arabian peninsula, Persia.

Very distinctive with its long straight spines on the fruiting perianth segments. Common and widespread throughout its mainly Saharo-Sindian range, but to date only known in our area from the cited specimen.

When ALLIONI described the genus *Bassia* in 1766 he did not give a species name, but it is clear from his subsequent publication (1770) that *B. aegyptiaca* ALL. (= *B. muricata*) was the basis of his generic description.

3. ***B. eriophora*** (SCHRAD.) ASCHERS. in SCHWEINF., Beitr. Fl. Aethiop. 1: 187 (1867).
Syn.: *Kochia eriophora* SCHRAD., Neues Journ. Bot. 3, 3–4: 86, tab. 3 (1809). *K. latifolia* FRESEN., Mus. Senckenb. 1: 179 (1834). *Londesia eriantha* FISCH. & C.A. MEY., Ind. Sem. Horti Petrop. 2: 40 (1835); *Echinopsilon eriophorus* (SCHRAD.)

MOQ., Ann. Sc. Nat. ser. 2, 2: 127 (1840) et in DC., Prodr. 13, 2: 135 (1849). *Kochia latifolia* var. *inermis* BOISS., Fl. Or. 4: 927 (1879). *Chenolea eriophora* (SCHRAD.) AITCH. & HEMSL., Trans. Linn. Soc. Bot. ser. 2, 3: 102 (1886). *Bassia eriantha* (FISCH. & C.A. MEY.) N. PAVLOV, Acta Univ. As. Med. ser. 8b, 22: 28 (1935). *B. eriophora* var. *rosea* EIG, Palaest. Journ. Bot. Jerusalem ser. 3: 125 (1945).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 220 (1966). Iranian Journ. Bot. 1. 38, fig. 5 (1976) - as *Londesia eriantha*. - Tab. 60.
Type: no specimen indicated; description based on a cultivated specimen of uncertain provenance.

Annual, ± densely white fleecy villous, mostly branched from the base and bushy. Stems 5–30 cm, ascending to erect, rather slender, green-brown or pink, leafy. Leaves not or slightly fleshy, linear, linear-elliptic to ovate elliptic, 8–20 x 1–4 mm, with a sparse indumentum, apically acute, narrowed at base into a short petiole or not and then sessile. Inflorescence showy, of densely white-woolly glomerules forming leafy pseudo-spikes. Flowers hidden in wool. Perianth segments fused to 1/2–3/4 their length; in fruit segments indurated and coalesced, c. 2,2 mm in diameter including short horns or spreading spines c. 0,2 mm long; fruit hidden in the dense persistent ball of wool. Seeds horizontal, c. 1 mm in diameter.

Hab.: Dry hills, semi-desert, sand dunes, gravel and sand plains, dry river bed, salt flats, roadside; 10–3200 m. – Fl. & fr. IV–VIII.

Iraq: Diyala: ad confines Persiae, inter oppida Mandali et Badra, RECH. 9684! – Kut al-Imara, ad confines Persiae in ditione oppidi Badra, RECH. 9216!
Persia: W: Khuz.: Ahvaz, KOELZ 14944!, GRANT 17558! 35 km W Ahvaz, BENT & WR. 501–302! 20 km Ahvaz to Susangerd, IRANSHAHR & TERME 15007-E! Shush, 200 m, IRANSHAHR & TERME 40187-E! Behbehan to Omidiyeh, 350 m, DAVIS & BOKHARI D.55794! Pazanan, GAUBA 30434-E! – S: Fars.: Abadeh, KASHKOULI 14860-E!, PRAVITZ 732! Abadeh to Daulatabad, SCHMID 5292! Deh Bid, KOELZ 33443! 15 km to Ahram from junction with Bushehr-Borazjan road, 100 m, DAVIS & BOKKHARI D.56027! Mohammad-Ameri, IRANSHAHR & TERME 34373-E! In arenosis salsis prope Bushehr, V.1868, HAUSSKN.! Kerman: 30–40 km Zahedan to Mirjaveh, LAMOND 124!, RECH. 27222! Bahramabad to Kabutar Khan, RECH. 2868c! Bam, SOJÁK 201!, 205! 53 km NW Bam, SOJÁK 2636!, 2637! Hamun-e Jaz Murian, Rig Mati, 400 m, STARM. 120! W Jaz Murian, 370 m, LÉONARD 5742! In jugo a Nosratabad austro-occidentem versus, 1300 m, RECH. 54670! Lar.: Kaki to Deyyer, 100 m, DAVIS & BOKHARI D.55991! Inter Hajjiabad prope Tarom et Bandar Abbas, ad Saadatabad, RECH. 3288! 85 km E Hajjiabad, SOJÁK 4357! Bandar Abbas: 22 km N Qotbabad N side of tunnel, 1000 m, WDB & FOROUGHI 15829! Iranshahr, SOJÁK 1799! Bastak, 450 m, GAUBA 30435-E! Bal.: 10 km Khash to Iranshahr, 1450 m, RECH. 3962!, 54866! In ditione montis Taftan prope Sangor, 1600 m, RECH. 4077! Zahedan to Khash c. 1500 m, RECH. 4218! Khash, SAFAVI & DEZFOULIAN 6960! Karevandar, MIRZAJAN 30155-E! Zahedan, ALEXANDROV 5614-E! Neh to Zahedan, 700 m, LÉONARD 5583! Makran: 13 km SSE Nikshahr, SOJÁK 1490! Khash to Paskuh, SOJÁK 535! 44 km NE Zaboli, SOJÁK 754! 30 km N Bampur, SOJÁK 1826! 13 km NNE Espakeh, SOJÁK 1723! Esfandak, 1000 m, IRANSHAHR & ERSHAD 16300-E! 16 km Qhasr-e Qand to Rask, FOROUGHI 10772! – E: Sistan: Ad confines Afghaniae, in deserto inter Kuh-i Malik Siah et Zabol, 700 m, RECH. 4101! Zabol Lake, 500 m, GRANT 15354! Kuh-e

Khvajeh, SHAR. 40217-E! Khor.: 8 km NW Aliabad, 800 m, RECH. 51715! Deyhuk, 1200 m, RECH. 51619! 25 km SW Ferdows to Deyhuk, 1200 m, RECH. 51584! Ferdows to Tabas, 1100 m, REJAMAND & BAZARGAN 31965! Boshruyeh, Aliabad to Asfak (Espak), 900 m, IRANSHAHR 40110E! Tabas Shir Geshk, RUTTNER 577! E margin of the Great Kavir, Ozbagu (Ozbah-Kuh), RUTTNER 63!, 249!, 407!, 421! – C: Kavir Prot. Reg.: Siah Kuh, S of Shah Abbas Caravan-Sarai, 1000 m, WDB. & al. 10882!, 10892!, RECH. 46209!, FREITAG 13998! Near Mobarakiyeh 40 km S Varamin, IRANSHAHR 30301-E!, RECH. 46087! Mobarakiyeh to Shah Abbas Caravan-Sarai, 1100 m, RECH. 50114! Chashmeh-ye Safid Ab, 1000 m, RECH. 46417! Damgh.-Semn.: Damghan to Semnan, 1500 m, REJAMAND & BAZARGAN 32156! 66 km SE Semnan, Anjirab, 1500 m, IRANSHAHR & RIEDL 15884! Shahr.-Bust.: Turan Prot. Reg.: Asb Keshan to Bargh, 1200 m, RECH. 51026!, 51084!, 18–48 km ESE Delbar to Ahmadabad, 820–1000 m, RECH. 50547!, 50640! Delbar SE Shahrud, 1200 m, FREITAG 15211! 9 km SW Chejam, 1150 m, FREITAG 14725! Yazd: Jandaq to Tabas, 950 m, DINI & BAZARGAN 33011! 15 km W Chah Malek to Chupunum, 850 m, RECH. 51893! Kashan: 15 km NW Tork, SOJÁK 5012! – Lut: Nay Band, RUTTNER 517! – Yazd et Kerman: inter Anar et Bahramabad, RECH. 2870!

T u r c o m a n i a : Repetek, LITW. 355a! Ashkhabad sec. NIKITIN, Fl. Ashkhabad 114 (1965).

A f g h a n i s t a n : NW: Herat: Hari-rud, AITCHISON 431! – SW: Heral: Girishk to Dilaram, Koh Gerd, 800 m, BRECKLE 4873a! 33 km WNW Girishk to Dilaram, 900 m, PODLECH & JARMAL 28968! 30 km E Dilaram to Girishk, 1050 m, RECH. 33523! 21 km NW Dilaram, 850 m, RECH. 33502! S Darweshan, E Mohamad Rahim Kalay, 710 m, ANDERS 8479! Shurab, 1050 m, ANDERS 8611! Farah: Farah Rud, Shindand to Dilaram, 1150 m, RECH. 33393! Jija, 900 m, KOEIE 3899! – SE: Kandahar: Lashkargah, 780 m, PODLECH 30720! 7 km E road-crossing Girishk-Lashkargah-Kandahar on the road to Kandahar, 900 m, PODLECH 30741! 16 km NE Qala Bist, 900 m, RECH. 34749! Ad marginem deserti Dasht-i-Margo, SW Qala Bist, 820 m, RECH. 34523! Ad marginem deserti Registan prope Kushk-i Nahhud, 1000 m, RECH. 37539!, ANDERS 8394!, 8407!, PODLECH 30667!. PODLECH & JARMAL 19818! Pirzada, 980 m, KOEIE 2102! 20 km E Kandahar, 1040 m, HDG, WDB. & EKBERG W-7617! 70 km W Kandahar to Herat, 1000 m, UOTILA 18928! – C: Bamian: Band-i Amir, VOLK 2763e! Among the ruins of Shahr-e Shak (Schar-e Sohak) E of Bamian, 2400 m, GILLI 2129! Band-i Amir, steppe, 3000–3200 m, RENZ 115!

P a k i s t a n : Quetta: Qila Saiffullah, JAFRI & AKBAR 2331! – Bal.: Makran: Hoshab to Panjgur, LAMOND 560!, RECH. 28135! 30–50 km from Panjgur to Surab, 1100 m, LAMOND 635! 8–25 km W Awaran to Turbat, RECH. 27751! 60 km S Panjgur, 800 m, RECH. 28115! Nushki: Padag to Nushki, RECH. 27309! Chagai: Koh-e Sultan 39 km N Nok Kundi, 1800 m, FREITAG & KOTHE 18699/698! Nushki to Quetta, GHAFOOR & YUSUF 1391! Quetta?: Kala Khan, LACE 46!

Distr. gen.: Sinai, Saudi Arabia, Bahrain, Kuwait, Palestine, Jordan, Iraq, Turcomania, Persia, Afghanistan, Pakistan, C Asia, China (Sinkiang).

One of our most conspicuous species and in some places a local dominant. The great majority of our specimens are from hot subdesertic lowland areas. Exceptions are provided by the 3 cited specimens from Bamian in C Afghanistan; they are from steppic vegetation at an altitude of 2400–3200 m. They agree well with specimens from higher regions of Kazakhstan in having smaller and unarmed fruits. Further study of the C Asiatic material is needed to establish whether they are merely higher altitude forms or merit separate status.

4. ***B. hirsuta*** (L.) ASCHERS. in SCHWEINF., Beitr. Fl. Aethiop. 187 (1867).
Syn.: *Chenopodium hirsutum* L., Spec. Plant. 221 (1753). *Kochia hirsuta* (L.)

NOLTE, Novit. Fl. Holsat. 24 (1826). *Echinopsilon hirsutus* (L.) MOQ., Ann. Sc. Nat. ser. 2, 2: 127 (1834).
Icon.: PALL., Illustr. Pl.: tab. 45 (1803) sub *Suaeda albida*. – Tab. 61.
Type: "Montpellier" LINN 315/13 – microfiche!

Annual, ascending-erect, 10–30 cm, with a rather dense villous indumentum. Leaves fleshy, linear, semi-cylindrical, c. 15 mm. Fruiting perianth segments with tubercles or short c. 1 mm, conical or hooked, pubescent spines.

Talish: sec. GROSSH., Fl. Kavk. 3: map 138 (1945).

Distr. gen.: Europe, Asia, Talish.

No specimens have been seen from our area; only doubtfully present in the Talish.

5. ***B. sedoides*** (PALL.) ASCHERS. in SCHWEINF., Beitr. Fl. Aethiop. 187 (1867).
Syn.: *Salsola sedoides* PALL., Reise 1: 492 (1771). *Kochia sedoides* (PALL.) SCHRAD., Neues Journ. Bot. 3, 3–4: 86 (1909). *Echinopsilon sedoides* (PALL.) MOQ., Ann. Sc. Nat. ser. 2, 2: 127 (1834).
Icon.: KOMAR., Fl. URSS 6: tab. 5, fig. 11 (1936). – Tab. 62.
Type: "Vulgatissima planta in humidis salsisque ad Samaram, et laicum medium" [near Kuibyshev, middle Volga – sec. Fl. URSS. 6: 127 (1936)].

Annual to c. 50 cm, ± lanate, with erect branches. Leaves fleshy, linear, semi- terete, c. 12 mm. Fruiting perianth segments with c. 1 mm conical ± glabrous spines.

Talish: sec. GROSSH., Fl. Kavk. 3: map 139 (1945).

Distr. gen.: Europe, Caucasus, Talish.

No specimens have been seen from our area; only doubtfully present in the Talish.

14. *Kochia*

I.C. HEDGE, Edinburgh

Kochia ROTH in SCHRAD., Journ. Bot. 1: 307 (1801).
Syn.: *Bassia* auctt. p.p. non ALL. sensu stricto. *Bassia* sect. *Kochia* (ROTH) A.J. SCOTT, Feddes Repert. 89: 107 (1978).

Lit.: P. AELLEN, Ergebnisse einer botanisch-zoologischen Sammelreise durch Iran. Botanische Ergebnisse IV: Chenopodiaceae: Kochia, Mitteilungen der Basler Botanischen Gesellschaft 2, 1: 4–16 (1954). A.J. SCOTT, Revision of the Camphorosmioideae, Feddes Repertorium Specierum Novarum Regni Vegetabilis 89: 105–108 (1978).

Annual or perennial herbs or subshrubs with a prominent indumentum of spreading or adpressed barbellate (high magnification needed) or smooth hairs, or almost glabrous. Stems much branched, leafy. Leaves well-developed, flat or semi-cylindrical, linear to lanceolate, alternate, sessile, not or scarcely fleshy. Flowers hermaphrodite or unisexual, urceolate, solitary or several in leaf axils, with or without subtending bracts, forming spike-like inflorescences or panicles. Perianth segments 5, membranous, connate to c. middle; in fruit developing variously shaped spreading wings. Stamens (4–)5, clearly exserted; thecae broad oblong-ovoid, without appendages. Ovary broad ovoid. Style elongated with 2 prominently papillose apical arms. Fruit enclosed within persistent perianth segments, horizontally compressed; seed horizontal; embryo horse-shoe-shaped, with some endosperm. – Type of genus: *K. arenaria* (MAERKLIN) C. KOCH = *K. laniflora* (S.G. GMELIN) BORBÁS.

Although A.J. SCOTT (l.c. 1978) reduced *Kochia* to synonymy under *Bassia* (and was followed by GREUTER et al. in Med. Checklist 1: 294. 1984), I prefer to keep the two genera separate. But there is no doubt that they are closely related, being distinguished almost solely by the presence of wings on the fruiting perianth segments of *Kochia*, and spines or hooks in *Bassia*. *Kochia stellaris* has a distinct similarity to *Salsola* and only the cyclical embryo of the former separates it from the spiral one of *Salsola*. Two *Kochia* species in our area (the shrubby *K. prostrata* and the annual *K. stellaris*) are very frequent and widespread plants. In common with most genera in the family, many herbarium specimens of all 4 species lack mature fruit, which in some species is not fully developed till October or November.

1a. Leaves 20–40(–80) × 1,5–9 mm, green, ± glabrous on upper surface; annual to 120 cm . . . . 3. *K. scoparia* (L.) SCHRAD.
b. Leaves 5–25 × 1–2 mm, green, whitish or grey, with or without a prominent indumentum on upper surface; annuals (? biennials) or subshrubs . . 2
2a. Subshrub . . . . 1. *K. prostrata* (L.) SCHRAD.
b. Annuals 3
3a. Perianth segments in fruit with well-developed horizontally spreading or erect wings, c. 1,5–3 × 1–1,5 mm; plant 10–60 cm tall . . . . 2. *K. stellaris* MOQ.
b. Perianth segments in fruit without clearly developed wings, or wings c. 1 × 1 mm; plant 50–150 cm tall . . . . 4. *K. indica* WIGHT

1. ***K. prostrata*** (L.) SCHRAD., Neues Journ. Bot. 3, (3 & 4): 85 (1809).

Syn.: *Salsola prostrata* L., Spec. Plant. 222 (1753); *Kochia prostrata* vars. *canescens* MOQ. & *rubella* MOQ., Chenopod. Monogr. 93 (1840). *K. prostrata* var. *villosissima* C.A. MEY., Mém. Acad. Imp. Sc. Pétersb. 6. sér. 4: 223 (1840). *Bassia prostrata* (L.) A.J. SCOTT, Feddes Repert. 89: 108 (1978).

Lit.: N.L. SEMIOTROCZEVA, Taxonomia infraspecifica Kochia prostrata, Botaničeskie Materialy Gerbaria Instituta Botaniki Akademija Nauk Kazahskoj SSR. 12: 26–27 (1982) – in Russian.

Icon.: TAKHT., Fl. Armen. 2: tab. 95 (1956); DAVIS, Fl. Turkey 2: 317, tab. 9, fig. 3 (1967), fruit. – Tab. 63.

Type: "Hab. in Asia boreali, Virginia" (LINN 315/15 & 16 – microfiche!)

Subshrub, 15–150 cm, with a woody rootstock to 4 cm thick, clump-forming; indumentum varying from densely villous to pilose. Stems ascending or erect, rather slender, straw-coloured, reddish or yellow-orange. Leaves often mostly basal, linear to linear-elliptic, 8–25 x 1–2 mm, flat, not or scarcely fleshy, with long ± adpressed hairs; younger leaves often present in axils. Inflorescence spike-like or paniculate with elongated slender or wand-like branches. Flowers 1–4 in sessile glomerules, usually remote; perianth segments with a prominent indumentum. Stamens exserted; thecae c. 0,7 x 0,6 mm, red or yellow. Stylar branches prominently papillose. Fruiting perianth, excluding wings, c. 2 mm in diameter; wings distinct, c. 2 x 0,9–2 mm, entire or toothed. Seed horizontal, 2–2,2 mm in diameter, free.

Hab.: Dry rocky slopes, on limestone, granite, serpentine, shale, meadows, roadside, *Artemisia*-steppe, streamside; (160–)400–3800 m. – Fl. VI–VIII, fr. IX–X.

T a l i s h : Lenkoran, XI. 1909, SCHELKOVNIKOV!
P e r s i a : N: Gorg.: Mohammed Reza Shah Prot. Reg.: (Golestan) Almeh, 1250 m, UOTILA 19180! Golestan forest, 1000 m, WALTON 208! Maz.: in valle fluvii Talar, Sorkhabad, 1400 m, RECH. 5609! Haraz valley, 1750 m, WDB. 1457!, 1458! In valle fluvii Chalus, 400 m, SAB. in GAUBA 2113!, GAUBA 30433-E! – W: Azerb.: in saxosis aridissimis vulcanicis 30 km ESE Maku, 1200 m, RECH. 43861! 20 km E Khvoy, 1120 m, PABOT 5363!, 30337-E! Khvoy to Qotur, SHAR. 30210-E! Khvoy to Shahpur, AELLEN & BEHB. 552!, BEHB. & AELLEN 30184-E!, 30204-E! Rashakan to Soltanabad, IRANSHAHR & TERME 14830-E! In jugo inter Sufian et Marand, 56 km NW Tabriz, RECH. 14904! 16 km S Mianeh, 1090 m, PABOT 30336-E! Qara Dagh, in monte Divan, S Jolfa, c. 1300 m, TERME in RECH. 43807! Dasht-e Moghan, 160–500 m, SCHMID 6571! Ham.: c. 100 km N Hamadan, Aq Bolagh, RIOUX & GOLV. 105! M. Alvand, PICHLER! Esf.: Khunsar: Kuh-e Darband, 2600 m, IRANSHAHR 14838-E! Bakht.: 12 km E Borujen, 2500 m, IRANSHAHR 30296-E! Lur.: Dow Rud, 2440 m, KOELZ 18380! – S: Fars.: Kuh-e Dinar (Dina, Daena) c. 3500 m, SOJÁK 6346!, KY. 707! – E: Khor.: Inter Mashhad et Torbat-e Heydariyeh, Robat-Safid, 1700 m, RECH. 1548! – C: Tehran: Tehran to Ab-e Ali, 1650 m, HDG. & al. 14705! Damavand, Ab-e Garm, c. 2100 m, AELLEN 551!, 556! 1458! Varamin, "Karaghadj" (Qara Aghaj, Qara Aghach ?), 1980 m, BROWN 737!, IRANSHAHR 14833-E!, SAFAVI 30387-E! 27 km W Firuzkuh, 1830 m, FURSE 3081!, AMIN & BAZARGAN 2756! Qazv.: Karaj, Kuh-e Dasht, GAUBA 2112! Shir Kuh, 1420 m, BABAKHANLOU & AMIN 3034! Shahr.-Bust.: 56 km NE Shahrud, 1700 m, BRECKLE 5206!
T u r c o m a n i a : Ashkhabad, Suluklü SINT. 855!, 1025!, 1115! E of Ashkhabad, 300 m, VASAK! Kopet Dagh, 600–1000 m, VASAK!
A f g h a n i s t a n : E: Ghorband: Khaak-e Shaak, 1700 m, ANDERS 4320! Ghazni: Bozghalak, in collibus graniticis prope Shashgao, 24 km NE Ghazni, 2400 m, RECH. 17291! Inter Ghazni et Sariab, 2400 m, RECH. 37124! Sariab, 52 km W Ghazni, 2700 m, RECH. 37206! 4 km E Sar Tasan, 2150 m, PODLECH 19457! Dasht-e Nawar, Okak, RECH. 17746! Dasht-e Nawar, 3200 m, BRECKLE 1985!, 4563!, 4609! Khost: Khost, 1170 m, VOLK 71/125a!, PODLECH 18653! Gomal, VOLK 71/298! Yakubi, NE of Khost, 1170 m, VOLK 71/807! 4 km N Yakubi, 1200 m, FREITAG 1915! Kotanni Kotal NW Urgun, 2300 m, FREITAG 3293! Nuristan: Bashgal valley, Barge Matal (Bragamata), to Afsay, 2300 m, BRECKLE 3226!, PODLECH 16686!, RASOUL 3761! – NE: Wakhan: Wakhan: Qazi-Deh, 2600 m, ROEMER 116! Langar to Zemestan-e Baharak, 3606–3800 m, ANDERS 7751! Darya-e Ptukh valley, ANDERS 7231! Kataghan: Takhar: upper Farkhar valley, 2050 m, PODLECH 12639! In valle Andarab, 1000 m, RECH. 31785! Badakhshan: Kokcha valley, 8 km S Jurm, PODLECH 12727! 25 km W Baharak to Faizabad, PODLECH 12735! Hazratsaid, 2400 m, KOELZ 12847! Khash, 2400 m, KOELZ 12943! – C: Bamian: Kuh-i Baba in latere boreo-occid. jugi Hajigak, c. 3100 m, RECH. 18507! Valley S of Hajigak pass, 3000 m, FREITAG 3970! In jugo Shibar, 2750–2800 m, RECH. 36965!, VOLK 2225!, WDB & EKBERG W-970! Ghorat: 3 km SW Dahane Astarawa, 2370 m, PODLECH 19175! La'l to Dawlatyar, 2710 m, PODLECH 19100!

Pakistan: Chitral: Mastuj to Baroghil, Lasan, 2740 m, STAINT. 2945! Arkari Gol, Arkari to Avir, 3000 m, GHAFOOR & OMER 2775! – Quetta: Quetta, Kawas, 2000 m, LACE 3980! 6 km NE Quetta, NW side of Hannah lake, 1750 m, FREITAG & KOTHE 18792!

Distr. gen.: S Europe, Caucasus, Turkey, Persia, Turcomania, Afghanistan, Pakistan, India, C Asia, S Mongolia, China.

Although variable in habit, indumentum density and the shape of the fruiting perianth wings, (many varieties have been recognized in the past), this is a fairly distinct and easily recognized species, not likely to be confused with our other species.

2. ***K. stellaris*** MOQ., Chenopod. Monogr. 93 (1840).
Syn.: *Salsola suaedoides* MOQ., l.c.: 148 (1840). *Kochia odontoptera* SCHRENK, Bull. Acad. Sc. Petersb. 1: 361 (1843). *K. odontoptera* vars. *Schrenkiana* MOQ. & var. *curta* MOQ. in DC., Prodr. 13, 2: 132 (1849). *K. cana* BOISS., Fl. Or. 4: 924 (1879). *K. iranica* BORNM., Bull. Herb. Boissier. Sér. 2, 8: 546 (1908). *Bassia iranica* (BORNM.) BORNM., Feddes Repert. 17: 276 (1921) incl. var. *gossypina* BORNM. l.c. *Kochia stellaris* var. *Schrenkiana* (MOQ.) AELLEN, Mitt. Basler Bot. Ges. 2, 1: 9–11 (1954) [where further synonymy is listed].
Lit.: B.L. BURTT, Kochia odontoptera and K. iranica. Kew Bulletin 3: 43–45. 1948.
Icon.: P. AELLEN, l.c.: 12, figs. G–J (1954) – fruct. KOMAR., Fl. URSS 6: tab. 5, fig. 8 (1936) as *K. Schrenkiana*, fruct. – Tab. 64.
Type: "Persia (sine loc.), C.P. BÉLANGER [436], G–microfiche! (This is also the type of *Salsola suaedoides* MOQ.).

Annual, 10–60 cm, with or without a "fishy" smell. Stems much branched, erect or ascending, usually with many lateral ± horizontal shoots, reddish brown or yellowish-white, with a variable indumentum of mostly crisped hairs, ± glabrescent or not. Leaves linear to linear-elliptic, flat, 5–15(–20) × 1–2 mm, slightly fleshy, sessile, tomentose to densely woolly. Inflorescence paniculate. Flowers few in glomerules in leaf axils. Perianth segments cucullate, incurved, c. 0,5 mm, pilose to densely woolly, connate to c. 2/3 length; in fruit winged above the middle; wings well-developed, scarious, horizontally spreading or rarely erect, yellowish-white or silvery-white, 1,5–2(–3) × 1–1,5 mm, rhomboid obovate, oblong to linear, irregularly lacinate. Stamens clearly exserted; thecae yellowish or reddish. Stylar arms prominently papillose, split to near base. Seeds horizontal, c. 1 mm in diameter.

Hab.: Clay, sand and soil slopes, dry hills, gravel plains, semi-desert, mobile sands, stream banks, semi-desert, salt steppe, waste ground, gardens, fields; 450–3200 m. – Fl. V–VIII, fr. IX–X.

Persia: W: Khamseh: 35 km NW Zanjan, 1440 m, PABOT 5090!, 30338-E! M. Karaghan, inter Qazvin et Hamadan, 2100 m, RECH. 2125! Ham.: 39 km NW Tafresh, 1400 m, AMIN & BAZARGAN 18777! Esf.: 9 km Nain to Anarak, 1380 m, FOROUGHI & ASSADI 15129! In hortis ad margines oppidi Esfahan, SOJÁK 6836!, 6849!, 6853!, 6854! – S: Kerm.: in ditione oppidi Kerman, 1700 m, STARM. 176! Rafsanjan, SOJÁK 2726! 22 km e Rafsanjan, 1670 m, TERME & MOUSSAVI 34425-E! Baft-e Kerman, 2200 m, DINI & BAZARGAN 30581! Bam, SOJÁK 2606-A!,–B!, 2607!, 2626! 13 km WSW Kerman, SOJÁK 2784! W of Jaz Murian, Kahn Mirza to Tum-

giran, 450 m, LÉONARD 5699! Bal.: 63 km NNE Bazman to Eskelabad, SOJÁK 2040!, 2041! 8 km SW Nosratabad, SOJÁK 2597! Deh Pabid, 1420 m, SOJÁK 377! Zahedan to Khash, c. 1450 m, RECH. 4212-a! Khash, 1400 m, RECH. 54863! Makran: 13 km NNW Espakeh, SOJÁK 1700!, 1710!, 1763! 30 km S Bampur, SOJÁK 1827! – E: Sistan: Kuh Khajeh, SHAR. 30154-E! Khor.: 45 km W Mashhad, MARTINIĆ & WRABER 75! Neyshabur, 1100 m, IRANSHAHR 15278-E! Tayyebat, 840 m, UOTILA 18945! 95 km S Torbat-e Heydariyeh, ZOHARY & ORSHAN 9450/6! – C: Tehr.: Shahabad, 1200 m, AELLEN 971! Tehran, 1200 m, BORNM. 8109! Qom to Tehran, 1130 m, WDB. & al. 14447!, BABAKHANLOU & AMIN 2882! Qazv.: 20 km Shahrestanak to Karaj, 1600 m, TERME 14825-E! In ditione oppidi Karaj, 1200 m, RECH. 6816! W Mardabad, 1250 m, HDG. & al. 14690!, AELLEN 972!, 975!, 977! Chitgar to Vardavard, 1400 m, HDG. & WDB. 14776! Shahr.-Bust.: SE Shahrud, 1200 m, FREITAG 15210! 30–42 km E Shahrud, 1200–1300 m, BRECKLE 5204!, IRANSHAHR 30404-E! Turan prot. reg.: Baghestan, 1250 m, BRECKLE 5146! 8 km S Majerad, 800 m, BRECKLE 5057! 15 km S Zeydar, 1300 m, BRECKLE 5036! – Persia, BÉLANGER (microfiche!).
T u r c o m a n i a : Ashkhabad, LITW. 298!, SINT. 1321c! Repetek, LITW. 338!
A f g h a n i s t a n : NW: Herat: 30 km of Iranian border, 850 m, UOTILA 18943! – SW: Herat: 4 km S Adraskan to Dilaram, 1380 m, PODLECH 32546! – SE: Kandahar: 20 km E Girishk, 900 m, UOTILA 16477! 12–33 km WNW Girishk to Dilaram, 900 m, PODLECH & JARMAL 28963!, PODLECH 17176! Ad marginem deserti Registan prope Kushk-i Nahhud, 1000 m, RECH. 37545!, 37550! 25 km S Darweshan near Mianpushta, 560 m, FREITAG 680! Darweshan to Safer, Mianpushta, 700 m, RECH. 34575-b! Bhagat, 600 m, RECH. 34662! 40 km SE Kandahar, Cagray Qala, 1050 m, BRECKLE 4822! – E: Kabul: Kabul, 2000 m, GILLI 2135!, RECH. 17054!, KOELZ 13483!, NEUB 58/1950! Kabul to Aliabad, NEUB. 57!, 3380! Aliabad, 1860 m, GILLI 2134! Kabul to Paghman, Band-e Kharghak, 2000 m, RECH. 19294! Gulbahar, AMSEL! Logar.: Shar-e Logar, 1900 m, PODLECH 31765! Ghazni: in jugo Shashgao, S Ghazni, 2400 m, RECH. 19290! – NE: Wakhan: Qala Panja, 2800 m, BRECKLE 1479! Warg, SENARCLENS DE GRANCY 117! – C: Bamian: 15 km W Bamian, 2650 m, UOTILA 18571! 2 km W Bulola to Bamian, 2400 m PODLECH 17042! Bamian to Band-i Amir, W Nil Kotal, 3200 m, PODLECH 12076! Bamian, LINDB. 218/1957! Eshpushta (Dahan-e Eshposhtek), 1500 m, GILLI 2132! Gholghola, 2550 m, GILLI 2136! Shahr-e Shak (Sahre Zohak), 2400 m, PODLECH 10632! Doab: 16 km S Doab, 1600 m, RECH. 16664! Pshang W Doab, 1700 m, GILLI 2133!
P a k i s t a n : Quetta: Quetta, SINCLAIR 2762! 7 km N Mastung, 1680 m, FREITAG & KOTHE 18828! – Kalat: 52 km SW Kalat, near road to Sorab, 1800 m, FREITAG & KOTHE 18911! – Bal.: Chagai: Koh-e Sultan, 39 km N Nok Kundi, 1800 m, FREITAG & KOTHE 18699/695!

Distr. gen.: Transcaucasus, Persia, Turcomania, Afghanistan, Pakistan, C Asia, Sinkiang.

A very frequent species in our area. Variable in the density of the indumentum and, especially so, in the shape of the fruiting perianth wings. In the commonest forms, the wings are ± broad-ovate and spreading, but at the other end of the continuous range of variation occur forms in which the wings are almost linear and erect [var. *Schrenkiana* (MOQ.) AELLEN].

3. ***K. scoparia*** (L.) SCHRAD., Neues Journ. Bot. 3, 3–4: 85 (1890).
Syn.: *Chenopodium scoparium* L., Spec. Plant. 221 (1753). *Salsola scoparia* (L.) M.B., Mém. Soc. Imp. Nat. Mosc. 1: 144 (1811). *Kochia 'trichophylla'* hort.; *Bassia scoparia* (L.) A.J. SCOTT, Feddes Repert. 89: 108 (1978).
Icon.: REICHENB., Icon. Fl. Germ. 24, 155: tab. 278 (1909). – Tab. 65.
Type: "Hab. in Graecia, Japonia", LINN 313/20 – microfiche!

Annual bushy plant, 30–120 cm. Stems erect with spreading-erect lateral branches, straw-coloured, shortly pilose or glabrescent, leafy. Leaves flat, linear-elliptic, 20–40(–80) × 1,5–9 mm, green, almost glabrous above, below usually with ± adpressed hairs, sessile or attenuate into a short petiole. Inflorescence of many lateral and terminal somewhat congested spikes. Flowers c. 1,1 mm in diameter, solitary or 2–3 in axils of ascending-erect often long ciliate upper linear leaves; perianth segments connate to c. 1/2 or more, incurved, green, white or pink, glabrous or apically short-ciliate, scarcely changed in fruit or indurating with a small apical horn or tubercles. Stamens shortly exserted. Stylar arms up to 1,2 mm. Seeds horizontal, c. 1,1 mm in diameter.

Hab.: Cultivated and fallow fields, ornamental in gardens, irrigated areas, roadside, salty clay; 300–1800 m. – Fl. IV–VIII, fr. IX–X.

Persia: W: Azerb.: in argillosis salsis, 42–55 km W Marand versus Evowghli, 1000 m, RECH. 43850! 85 km W Mianeh, Zanjan to Tabriz, 1800 m, UOTILA 19472! Kurd.: 75 km SE Bijar, 1520 m, FURSE 3296! Kermansh.: Shahabad, Shian, NOURI 40107-E! – S: Kerm.: Kerman, 1700 m, RECH. 3639-C! – E: Khor.: Tayyebat, 840 m, UOTILA 16251!, 18950! Bojnurd, 900 m, IRANSHAHR & ZARGUANI 30407-E! – C: Tehr.: Evin, BEHB. 14804-E! 75 km S Tehran to Qom, 1360 m, UOTILA 19411! Qazv.: Qazvin, 1330 m, UOTILA 19435! Shahr.-Bust.: Turan Prot. Reg., 1200 m, BRECKLE 5118!
Turcomania: Ashkhabad, 300 m, VASAK s.n.! Kotsche, BORNM. 854!
Afghanistan: E: Kabul: Kabul, 1800 m, BRECKLE 4937!, LINDB. 1288!
Pakistan: Kurram: Parachinar, AFENDI 240! – Karachi: Karachi, in garden, JAFRI 4041.

Distr. gen.: Europe, Asia – cultivated and naturalized; of uncertain wild distribution.

Easily recognized by its habit, flat green leaves and ascending-erect branches. Very few gatherings in fruit have been seen. In our area cultivated as an ornamental; also apparently naturalized.

4. ***K. indica*** WIGHT, Pl. Ind. Or. 5, 2: 5, t. 1791 (1852).
Syn.: ?*K. Griffithii* BUNGE ex BOISS., Fl. Or. 4: 924 (1879). *Bassia joppensis* BORNM. & DINSMORE, Feddes Repert. 17: 274 (1921). *Kochia scoparia* subsp. *indica* (WIGHT) AELLEN in HEGI, Ill. Fl. Mitteleur. 3, 2, 4: 711 (1961). *Bassia indica* (WIGHT) A.J. SCOTT, Feddes Repert. 89: 108 (1978).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 221 (1966). JAFRI & EL-GADI, Flora Libya 58: 25, tab. 9 (1978). – Tab. 66.
Type: [S India, Madras] "Coimbatore, in salt soils, flowering October".

Annual (or? biennial) bushy plant, 50–150 cm. Stems erect, straw-coloured, with many spreading-erect or horizontally lateral branches, pilose-pubescent, sometimes densely so. Leaves oblong-elliptic to linear elliptic, 6–15 × 2–3 mm, with long (to 1,5 mm) soft adpressed spreading hairs, mostly on lower surface. Inflorescence wide-paniculate with many spreading elongate spike-like branches. Flowers 1–4, greenish yellow, in sessile glomerules in axils of upper reduced leaves, densely white hairy; perianth segments with long white hairs, connate to c. 1/2–3/4, in fruit with apical tubercles (?) or short spreading wings c. 1 x 1 mm. Stamens exserted. Stylar arms prominently papillose. Seeds not seen.

Afghanistan: E: Nangahar: 8 km SW Ghaziabad, Jalalabad to Torkham, 550 m, PODLECH 19990! Jalalabad, University campus, 600 m, ANDERS 5337! Jalalabad, 600 m, FREITAG 7462! Pakistan: Peshawar: 16 km E Peshawar to Akbapura, BURTT 1514! – Quetta: Loralai: c. 10 km from Loralai to Dera Ghazi Khan, QAISER 2506! Loralai, 1400 m, JAFRI & AKBAR 2289.

Distr. gen.: Libya, Egypt, Sinai, Palestine, Saudi Arabia, Afghanistan, Pakistan, India.

A little-known species. None of our specimens is in fruit. Whether it is truly native in some parts of its overall range is doubtful. AELLEN (1961) regarded it as a southern hairy subspecies of *K. scoparia* but, with the material I have seen, this treatment seems unjustified.

15. *Corispermum*

I.C. HEDGE, Edinburgh

Corispermum L., Spec. Plant. 4 (1753); Gen. Plant. ed. 5, 5 (1754).

Annual, small herbs with a thin to dense indumentum of distinct stellate-dendroid hairs, or almost glabrous; tap root long and slender. Leaves well-developed, alternate, linear to elliptic, entire, not or scarcely fleshy, sessile, not or scarcely apically mucronate. Flowers solitary, borne in axils of upper bract-like leaves, very small, hermaphrodite; perianth usually consisting of one scarious adaxial 3-lobed or incised segment, abaxial segments usually absent; perianth segments deciduous or unchanged in fruit. Stamens usually 3, on adaxial side; thecae ovoid, without appendages. Ovary globose, abaxial; styles 2 free to base. Inflorescence axis elongating in fruit. Fruit clearly flattened, elliptic to broad elliptic, hard-textured, glabrous (in ours) or hairy with or without a narrow wing. Seed vertical; endosperm copious; embryo slender, peripheral, horse-shoe shaped. – Type of genus: *C. hyssopifolium* L.

About 50 species of generally similar facies are recognized (probably too many) in north temperate regions, mainly Asia. The genus is clear-cut and well-suited to a global revision. Many species are true psammophytes. The combination of annual habit, the very reduced perianth segments, the stellate-dendroid hairs and the strongly flattened fruits, almost reminiscent of some *Cruciferae*, make it an easily recognized genus. Although quite distinct, its closest ally appears to be *Anthochlamys*. Five species are recognized here, but they are represented by less than 20 gatherings and their range of variation is inadequately known.

1a. Fruit without a peripheral wing . . . . 1. *C. orientale* LAM.
b. Fruit with a distinct peripheral wing 2
2a. Fruit obscured by subtending bract-like leaves; indumentum ± dense . . . .
. . . . 3. *C. afghanicum* PODLECH

b. Fruit longer and broader than subtending bract-like leaves; indumentum rather sparse 3
3a. Leaves linear to linear-filiform .... 2. *C. aralocaspicum* ILJIN
b. Leaves oblong to oblong-elliptic 4
4a. Fruit surface papillose .... 5. *C. papillosum* (O. KUNTZE) ILJIN
b. Fruit surface not papillose .... 4. *C. Lehmannianum* BUNGE

1. ***C. orientale*** LAM., Encycl. Méthod. Bot. 2: 111 (1786).
Icon.: GOLOSK. in PAVLOV, Fl. Kazakhst. 3: tab. 25, fig. 7 (1960), fruct. – Tab. 67.
Type: "Cette plante croît dans le Levant, d'où M. ANDRÉ en a envoyé des graines au Jardin du Roi" (a possible type specimen is in herb. LAMARCK – microfiche 551!).

Annual, much branched from base, 10–30 cm high. Stems erect angular. Leaves linear to linear-elliptic with scattered stellate-dendroid hairs, c. 15 x 2 mm, mucronulate or scarcely so. Inflorescence spike-like with lateral and terminal ± dense flowered branches. Upper bract-like leaves narrow ovate, acuminate, with a rather dense indumentum. Fruits ± covered by bract-like leaves, c. 2,5 x 1,5–2 mm, oval to elliptic, without or with only a vestigial peripheral wing, glabrous, with a concave outer and flat inner surface; remains of style to 0,6 mm.

Hab.: Shores of Caspian Sea – Fl. & fr. X.

T a l i s h : sec. GROSSH., Fl. Kavk. 3: map 135 (1945).
P e r s i a : N: Maz.: Mahmudabad, sea shore, SAB. 40214-E! Gil.: Pahlavi, Ghazian, MIR KAMALI 6746-E!, 40283-E!
A f g h a n i s t a n : SE: Kandahar: Registan desert, 25–30 km S Kandahar, 31°36'N 65°47'E, RECH. 35330!

Distr. gen.: Caspian Sea, N Persia, C Asia (Aralo-Caspian), N Sinkiang.

Recognized by the rather small wingless fruits, apparently less strongly flattened than the other species.

2. ***C. aralocaspicum*** ILJIN in Izv. Glavn. Sada SSSR 28: 637 (1929).
Syn.: *C. caucasicum* (BUNGE) GROSSH., Fl. Kavk. 3: 142 (1945).
Icon.: GOLOSK. in PAVLOV, Fl. Kazakhst. 3: tab. 25, fig. 2 (1960), fruct.
Type: Numerous syntypes from Aralo-Caspian region, LE.

Annual, much or little branched, with rather few scattered dendroid-stellate hairs or almost glabrous, dark green, 10–30 cm. Stems angular-striate, often purplish at base. Leaves linear to linear-filiform, flat, slightly fleshy, c. 15–30 x 1–2,5 mm, few, erect-spreading, not or scarcely mucronulate, sessile, 1-nerved. Inflorescence slender, elongated. Bract-like upper leaves subtending flowers ovate to ovate-triangular, shorter and narrower than fruit. Fruits glabrous, shining, broadly ovate to ± circular in outline, c. 3,5 x 3 mm with a c. 0,4 mm entire or somewhat erose wing, apically rounded, emarginate.

Hab.: Sand places, near shore; –20–200 m. – Fl. VI–VII, fr. VII– ??

Talish: Sec. GROSSH., Fl. Kavk. 3: map 142, 1945 – as. *C. caucasicum*.
Persia: N: Gorg.: Gorgan (Asterabad), in littore maris Hyrkani, EICHWALD s.n. Gil.: E Rudbar, 200 m, WDB. & ASSADI 18300! Bandar-e Pahlavi, –20 m, WDB. & ASSADI 18309!, GILLI!

Distr. gen.: Transcaucasus coast, N Persia, Aralo-Caspian.

Distinctive on account of the ± linear leaves, the sparse indumentum and the fruits clearly larger and broader than the subtending bract-like leaves. In the original description of the species, ILJIN also described subsp. *caucasicum* ILJIN, citing several specimens from the shores of the Caspian Sea. I have not seen sufficient material of the taxa involved to reach a decision about its status, but it seems to be merely a lowland or sea shore form of *C. aralocaspicum*, not meriting formal recognition.

3. ***C. afghanicum*** PODLECH, Mitt. Bot. Staatssamml. München 12: 65 (1975)
Icon.: l.c.: fig. 2, fruct. – Tab. 68.
Type: Afghanistan: O.H. VOLK 72/406, holotype M!

Annual, branched from base, 5–15 cm high, green to dark green, with a ± dense all-over indumentum of stellate-dendroid hairs. Stems finely striate, ascending erect. Leaves elliptic or oblong-elliptic, 5–10(–15) x 2–6 mm, 1-nerved, margin entire, cartilaginous ± sessile, apically clearly mucronulate or scarcely so. Inflorescence ± dense, spike-like. Upper bract-like leaves oblong-ovate to ovate, triangular acuminate, with a white membranous margin. Perianth segments 1, 3-lobed or lacerate, c. 0,8 mm; thecae ovoid, 0,3 mm. Fruit c. 3 x 2 mm, obscured by bract-like leaves, glabrous, with a 0,5 mm surrounding wing; styles c. 0,5–1 mm long.

Hab.: Plains; c. 3000 m. – Fl. VI–VII.

Afghanistan: E: Ghazni: ad marginem orientalem altoplanitiei Dasht-i Nawar, 3000 m, RECH. 37310! Mountains SE Dasht-i Nawar, Saperlebuli, 3050 m, FREITAG 1519! Gardez: Zormat (Zurmat), 24.VI.1971, VOLK 71/406!

Distr. gen.: Afghanistan (endemic).

Only known from these gatherings. Distinct among our species on account of the ± dense indumentum, oblong elliptic leaves and the apparently small fruits. Although related in the original description to the geographically distant Russian *C. sibiricum* ILJIN, its affinities are not certain.

4. ***C. Lehmannianum*** BUNGE Beitr. Fl. Russl. 282 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 458 (1854).
Icon.: GOLOSK. in PAVLOV, Fl. Kazakhst., 3: tab. 25, fig. 8 (1960), fruct. – Tab. 69.
Type: (Kazakhstan, Kizil Kum) Sands between Kuwan and Jan darya, A. LEHMANN, LE.

Annual, 10–25 cm, with a sparse indumentum of stellate-dendroid hairs, glabrescent or not. Stems angular striate, pale brown. Leaves oblong to oblong-elliptic, c. 15–35 x 0,5–6 mm, apically rounded to mucronulate, spreading erect. Inflorescence of slender elongated spike-like rather loose, many-flowered racemes to c.

10 cm. Upper bract-like leaves adpressed-erect, narrow ovate, pilose, acuminate, with a white membranous margin, ± equal to or shorter than fruits. Fruit 3–5 x 2,5–4 mm, oval to broad elliptic, with a c. 0,4 mm wing, emarginate.

Hab.: Sand hills, mobile sand dunes; 900–2000 m,. – Fl. V, fr. V.–VI.

P e r s i a : S: Kerm.: Kuh Tagh Ali, 2000 m, BORNM. 2254! 30 km Kerman to Bam, 37°18'E 30°05'N, 1850 m, LÉONARD 6010! – C: Turan Prot. Region: Ahmadabad to Zamanabad, 1000 m, WDB. & FOROUGHI 18786! 5 km NW Zamanabad, 1170 m, FREITAG 13871! Sabri to Yeke rig, 1200 m, FREITAG & JADIDI 29096! Between Sabri and Zamanabad, 1150–1200 m, FREITAG 15491!
T u r c o m a n i a : Ashkhabad, Annaju to Gjaurs, SINT. 332!, 332-b!
A f g h a n i s t a n : SE: Kandahar: Registan desert, 25–30 km S Kandahar, 31°36'N 65°47'E, RECH. 35330!

Distr. gen.: Persia, Turcomania, Afghanistan, C Asia, N Sinkiang.

Apparently a widely distributed, but local and uncommon psammophyte.

5. *C. papillosum* (O. KUNTZE) ILJIN in Izv. Glavn. Sada SSSR 28: 638 (1929).
Syn.: *C. hyssopifolium* L. var. *papillosum* O. KUNTZE, Acta Horti Petrop. 10, 1: 232 (1887).
Icon.: GOLOSK. in PAVLOV, Fl. Kazakhst. 3: t. 25, f. 9 (1960), fruct. – Tab. 70.
Type: "Turkmenen Steppe" (near Farab, ANDROSOV), LE.

Very similar in facies, indumentum and inflorescence to the preceding species, but fruit slightly smaller (c. 3,5 x 2,5 mm) and ± clearly papillose.

T u r c o m a n i a : Near Ashkhabad, 4.VI.1973, NIKITIN s.n.!

Distr. gen.: C Asia (Kizil Kum, Kara Kum, Pamir Alaj), Turcomania.

When ILJIN recognized this taxon at specific level he cited a large number of Turkestan specimens. Subsequent Russian botanists have maintained it as an independent species, but with the (admittedly small) amount of material I have seen it scarcely merits separation from *C. Lehmannianum* which has a similar distribution.

Species doubtfully determined or doubtfully in our area

C. hyssopifolium L., Spec. Plant. 4 (1753).

P e r s i a : W: Arak: "Ad lacum Teramis ditionis Sultanabad, 5.VIII.1887, STRAUSS"!

BORNMÜLLER published this record in Beih. Bot. Centrbl. 24,2: 86 (1909). The specimen (at JE) is without fruit and cannot be accurately identified. However, it may be either *C. hyssopifolium* or *C. Marschallii* STEVEN, both mainly European species. It is an erect plant, with linear leaves, a dense indumentum and, apparently, rather short flower spikes. More adequate specimens are needed but it does seem to be different from the other species dealt with above. BOISSIER, Fl. Or. 4: 930 (1879) also records this species from Enzeli (Bandar-e Pahlavi) on the Caspian shore (BUHSE) and from Kerman (BUNGE); neither of these specimens has been seen.

C. pamiricum ILJIN, Acta Inst. Bot. Acad. Sci. URSS ser. 1, fasc. 3: 165 (1936).

This was described from a locality very close to the Afghanistan Wakhan border ("in valle fl. Pamir, prope castellum Langar-Gischt"). No specimens have been seen, but the description suggests that it is related to *C. orientale* because of the wingless fruit; it is a dwarf plant with a dense indumentum throughout. Some specimens from Gilgit, also close to Flora Iranica territory, apparently belong to the species.

16. *Agriophyllum*

I. C. HEDGE, Edinburgh

Agriophyllum M.B., Fl. Taur.-Cauc. 3: 6 (1819) – in obs. MOQ., Chenopod. Monogr. 107 (1840).

Lit.: P. AELLEN, Agriophyllum in Ergebnisse einer botanisch-zoologischen Sammelreise durch den Iran, Verhandlungen der Naturforschenden Gesellschaft in Basel 63: 254–262 (1952).

Annual ± rigid herbs with a prominent indumentum of dendroid or dendroid-stellate hairs, rarely ± glabrous. Leaves well-developed, alternate, except lowermost opposite, sessile or clearly petiolate, spine-tipped. Flowers unisexual or hermaphrodite, solitary or in clusters, sessile in leaf axils. Floral parts irregular in number and development. Perianth segments membranous 1–5, basally united or ± free, or perianth absent. Stamens 1–3(–5). Ovary flat, compressed; in fruit hardening with 2 persistent ± free or fused styles with or without lateral horns and in lower portion of fruit with or without toothed wings. Seed vertical, free from fruit wall. Embryo circular; endosperm present. – Type of genus: *A. arenarium* M.B. (= *A. squarrosum* (L.) MOQ.).

Four to six currently recognized usually psammophytic species mostly on mobile sands, from SE Russia through SW and C Asia to the Himalayas and northern parts of China. They fall into 2 clear groups: species with broad petiolate leaves and those with sessile linear leaves. The differences between the individual species within the two groups are slight.

1a. Leaves broad ovate, clearly petiolate .... 1. *A. latifolium* FISCH. & C.A. MEY. ex FENZL
b. Leaves linear to linear-lanceolate 2
2a. Lateral outgrowths at base of style well-developed, ± as long as style 3
b. Lateral outgrowths at base of style absent or poorly developed, much shorter than style .... 4. *A. squarrosum* (L.) MOQ.
3a. Lower portion of fruit with well-developed irregularly serrate or toothed lateral wings .... 2. *A. minus* FISCH. & C.A. MEY. ex FENZL
b. Lower portion of fruit without or with scarcely developed subentire lateral wings .... 3. *A. lateriflorum* (LAM.) MOQ.

1. *A. latifolium* FISCH. & C.A. MEY. [Bull. Soc. Imp. Nat. Mosc. 12: 170 (1839)] ex FENZL in LEDEB., Fl. Ross. 3: 757 (1851); BUNGE, Beitr. Fl. Russl. 280 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 456 (1854).
Icon.: OVCZ., Fl. Tadjik. 3: tab. 61, fig. 9–12 (1968). – Tab. 71.
Typus: (Caspian Sea), Cheleken, coll. ign., LE.

Annual, much branched from near base, with an all-over indumentum of dendroid hairs. Stems 20–50(–70) cm high and up to 80 cm wide, clearly ridged, with distinct internodes, ± leafy. Leaves ovate-lanceolate to broadly ovate, green, 10–20(–30) x 10–20(–35) mm, with a terminal mucro to 5 mm; petiole on lower leaves 10–20(–30) mm. Inflorescence axis much branched, usually with a few larger leaves. Leaves subtending flowers spine-like, 5–8 mm, broadened at base, clustered. Perianth segments ± oblong, basally with a tuft of long simple, barbellate hairs. Fruit ampulliform, c. 6 x 2 mm, strongly flattened, hairy when young, laterally winged in lower portion; styles persistent, diverging, without lateral outgrowths at base. Seed c. 1,7 x 0,7 mm, pale brown.

Hab.: Sand dunes, mobile sands, in saxaul communities, edge of desert; 300–1200 m. – Fl. & fr. VII–X.

P e r s i a : E: Khor.: In arenosis mobilibus 25 km SE Boshruyeh, 900 m, RECH. 51658! 55 km N Gonabad, Mahneh to Emrani, 900 m, RECH. 51438! Sabzevar, dunes, SABETI 12600-E!, 30383-E!, 30345-E! – C: Shahr.-Bust.: Turan Prot. Reg.: 16 km S Ahmabad, 1150 m, BRECKLE 5133! Zalehabad to Talkhab, 1200 m, FREITAG 13643! In arenosis, c. 7 km S Ahmadabad to Zamanabad, 900 m, RECH. 50756!, WDB. & FOROUGHI 18788! – C: Yazd.: In arenosis mobilibus 6 km SW Robat-e Khan, 1000 m, RECH. 51813!, IRANSHAHR s.n.! Rig-e Jin, 37 km Chah Malek to Chupunum, 800 m, RECH. 51908! Near Chupunum, 850 m, FOROUGHI & ASSADI 15148! 37 km NW Posht-e Badam, 750 m, RECH. 51836! – ? Khor. 5 km W Sarekhz (Sarakhs ?) STUTZ 631A!
T u r c o m a n i a : In arenosis Ashkhabad, LITWINOW 82!, 281! Ashkhabad, 300 m, VASAK s.n.!, SINT. 514!, 2201!
A f g h a n i s t a n : NW: Maimana: Andkhui to Maimana, 600 m, NEUB. 4256! In arenosis mobilibus ad margines deserti Kara Kum 15–20 km SW Andkhui, 300 m, RECH. 16130! Andkhui, Karam Kul, NEUB. 178! – SE: Kandahar: In arenosis deserti Registan prope Bhagat, 600 m, RECH. 34613! 5 km S Bhagat, 700 m, FREITAG 723! c. 25 km S Kandahar, 1000 m, RECH. 35346!, 35295! Mianpushta, Darweshan to Safer, 700 m, RECH. 34569! 40 km Kandahar to Spin Boldak, WAGNER s.n.! – NE: Kataghan: Kunduz to Tashkurghan 15 km W Kotal-e Erganak, 530 m, FREITAG 3851!
P a k i s t a n : Bal.: Mastung, JAFRI & AKBAR 1998. Nushki, AITCH. Chagai: 14 km SW Nushki at road to Dalbandin, 900 m, FREITAG & KOTHE 18748!

Distr. gen.: Persia, Turcomania, Afghanistan, Soviet C Asia, Pakistan.

Easily recognized by the broad leaves; a psammophyte and a tumbleweed.

2. *A. minus* FISCH. & C.A. MEY. [Bull. Soc. Imp. Nat. Mosc. 12: 170 (1839)] ex FENZL in LEDEB., Fl. Ross. 3: 755 (1851); BUNGE, Beitr. Fl. Russl. 281 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 457 (1854).
Syn.: *A. minus* subsp. *minus* and subsp. *aranense* AELLEN, Verh. Naturf. Ges. Basel

63: 257 (1962). *A. montasiri* EL GAZZAR, Mitt. Bot. Staatssamml. München 27: 16 (1986).
Icon.: OVCZ., Fl. Tadjik. 3: tab. 61, fig. 6–8 (1968). – Tab. 72.
Typus: (Turcomania, Caspian Sea), Ogurchinsky Island, G.S. KARELIN, LE.

Annual, much branched from base, with an indumentum, variable in density, on all parts, of dendroid hairs or plant almost glabrous. Stems 12–40 cm high and up to c. 30 cm wide, leafy. Leaves linear to linear-lanceolate, 20–50 × 1,5–8 mm, cuneate, spine-tipped, entire, sessile, with prominent parallel raised veins below. Inflorescence much branched. Flowers sessile in axils of clustered upper spine-like leaves. Perianth segments oblong, very small, basally with a few simple barbellate hairs or hairs absent. Fruit ampulliform, c. 4 × 1,5–2 mm, strongly flattened and curved, winged in lower round part and laciniate-toothed; styles hard, persistent, with 2 basal spreading outgrowths c. as long as styles. Seed 1,5–2 × c. 1 mm, broad elliptic.

Hab.: Sand dunes, mobile sands, fields, edge of desert; 200–1200 m. – Fl. & fr. V–X(–XII).

Persia: N: Gil..: E Rudbar, 200 m, WDB. & ASSADI 18299! (determination uncertain) – W: Esf.: Ardestan, Zavareh, 960 m, FOROUGHI 10578! – S: Kerm.: Rafsanjan, SOJÁK 2736! E Dasht-e Lut, 30°35'N, 59°52'E, 1000 m, LÉONARD 6127!, 6159!, 6160! – E: Khor.: In arenosis 56 km N Gonabad, Mahneh to Emrani, 900 m, RECH. 51451!, IRANSHAHR 40275-E! NW Ferdows and Robat-i Shur, 1200 m, REJAMAND & ARAZM 32465! – C: Tehran: Kavir Prot. Reg.: SE Siah Kuh, 850 m, WDB. & FOROUGHI 15212!, 15213! 7 km E Bad Rud, 1050 m, RECH. 46485!, 46487! Shahr.-Bust.: Darb Ahang, 18 km NNE Ahmatabad, 800 m, RECH. 50696! Yazd: In arenosis mobilibus Rig-e Jin, 37 km Chah Malek to Chupunum, 800 m, RECH. 51907! Kashan: 10 km N Kashan, Aran, SHAR. & AELLEN 417 (type of subsp. *aranense*)! N Kashan, "Tschah daghi", 890 m, SHAR. & AELLEN 418! Fakhrabad to Nushabad, IRANSHAHR & MOUSSAVI 15386-E! E Kashan, FOROUGHI & BAZARGAN 32448! Kavir Ab-Barik, SHAR. & AELLEN 6229-E!
Turcomania: NW Ashkhabad, 300 m, VASAK s.n.! In collibus arenosis inter Annaju et Gyaurs, BORNM. 380!
Afghanistan: NW: Maimana: 15 km NE Daulatabad, Dasht-e Layli, 360 m, FREITAG 6678! – SE: Kandahar: Desert of Registan, Bhagat, 600 m, RECH. 34631!, FREITAG 729! 4 km SE Safer, RECH. 34598-a! SW Qala Bist, Dasht-i Margo, 820 m, RECH. 34508! Mianpushta, Darweshan to Safer, 700, RECH. 34579! E border of Dasht-i Margo, 37 km SW Lashkarga, 600 m, FREITAG 669! – NE: Kataghan: Kunduz to Tashkurghan, Dasht-i Mir Alam, 400 m, FREITAG 3857!

Distr. gen.: Persia, Turcomania, Afghanistan, C Asia, Sinkiang, Qatar, United Arab Emirates, Saudi Arabia.

Generally growing on sand. Some specimens from the Kavir in C Persia approach the following species in fruit characters.

3. ***A. lateriflorum*** (LAM.) MOQ. in DC., Prodr. 13, 2: 139 (1849).
Syn.: *Eryngium lateriflorum* LAM., Encycl. Méth. Bot. 4: 756 (1797).
Type: "Cette plante croît dans le Levant, elle est dans l'herbier du Museum" [P] – TOURNEFORT herbarium – microfiche 4941, P!
Icon.: TAKHT., Fl. Armen. 2, tab. 96 (1956).

Similar in facies, indumentum and leaf characters to *A. minus*, but basal part of fruit without or with very narrow subentire lateral wings.

Persia: S: Bal.: Makran: Saravan, SALAVATIAN 14822-E! – E: Khor.: Robat-i Khan, Taq plain, KOELZ 16806!

Distr. gen.: Caucasus, Persia, Soviet C Asia, Sinkiang.

It is doubtful if this merits specific separation from *A. minus*. Although they have always been maintained as independent species by previous authors, the differences seem very slight, but I have not studied the type specimens.

4. ***A. squarrosum*** (L.) MOQ. in DC., Prodr. 13, 2: 139 (1849).
Syn.: *Corispermum squarrosum* L., Spec. Plant. 4 (1753). *C. pungens* VAHL, Enum. Pl.. 1: 17 (1805). *Agriophyllum pungens* (VAHL) LINK ex A. DIETR., Sp. Pl. 1: 124 (1831). *A. arenarium* M.B., Fl. Taur.-Cauc. 3: 6 (1819).
Icon.: GOLOSK. in PAVLOV, Fl. Kazakhst. 3: tab. 25 (1960), fr. as *A. arenarium*. – Tab. 73.
Type: "Habitat ad Wolgam Tartariae, inque desertis Cossacorum".

Similar in facies, indumentum and leaf characters to *A. minus*, but fruit without lateral outgrowths at base of styles.

Talish: Talish sec. GROSSH., Fl. Kavk. 3: map 143 (1945) – as *A. arenarium*.
Persia: N: Gil.: sine loc., AUCHER-ELOY. Enzeli (Bandar-e Pahlavi), BUHSE.
Turcomania: Ashkhabad, SINT. 380 (spec. immature)!

Distr. gen.: S Russia, Caucasus, Persia(?), Turcomania, C Asia, Himalaya, China.

I have seen no specimens from our area that are certainly referable to this widespread species and it is included here on the basis of the records given by AELLEN, Ver. Naturf. Ges. Basel 63: 260 (1952), under *A. arenarium*.

17. *Anthochlamys*

I.C. HEDGE, Edinburgh

Anthochlamys FENZL in ENDL., Gen. Plant. 300 (1837).

Lit.: P. AELLEN, Anthochlamys, in Ergebnisse einer botanisch-zoologischen Sammelreise durch den Iran 1948/49, Botanische Ergebnisse I, Verhandlungen der Naturforschenden Gesellschaft in Basel 61: 166–172 (1950).

Annual erect herbs, glaucous, with a sparse indumentum of simple and irregularly branched (high magnification needed) hairs. Stems ± ridged, with spreading-erect branches. Leaves well-developed, mostly basal, alternate, thick-textured, not or scarcely fleshy, elliptic to broad-ovate, prominently veined beneath. Flowers hermaphrodite, solitary in axils of spreading-adpressed bracts, either few and congested in leaf axils or else in narrow lateral and terminal spike-like inflorescences, initially condensed, elongating later. Perianth of 5 membranous white or rose ± petaloid segments usually fused for c. 1/2 their length. Stamens 5, fused at base to perianth;

thecae oblong-elliptic. Style with 2 apical, ± clavate branches; stigmatic surfaces prominently papillose. Fruit strongly flattened, vertical, broad elliptic to orbicular, hard-textured, indehiscent, with a prominent peripheral membranous wing; stylar arms ± persistent; seed vertical; endosperm copious, hard-textured; embryo slender, peripheral, horse-shoe shaped. – Type of genus: *A. polygaloides* (FISCH. & C.A. MEY.) FENZL.

A distinctive annual genus closely allied to *Corispermum* with which it shares very similar fruits, the same slender horse-shoe-shaped embryos and copious endosperm; they also share a similar type of indumentum although the stellate-dendroid hairs of *Corispermum* are very readily seen whereas the soft tangled few-branched hairs of *Anthochlamys* require high magnification to be observed. Although AELLEN (1950) laid emphasis on the character of the fruit apex and the fruiting stylar arms, the large amount of material now available shows that these characters are not reliable. Probably a genus of only 5 or 6 species with its maximum diversity in the Flora Iranica area. The species bear some similarity to genera of the *Amaranthaceae* because of their showy perianths.

1a. Lowermost leaves elliptic to oblong-ovate, 1-nerved beneath; branches rather slender, wand-like 2
b. Lowermost leaves broadly ovate or broadly obovate, prominently 3–5-nerved beneath; branches rather stiff and sturdy, ± squarrose 3
2a. Apical sinus of fruit very narrow, stylar arms included within it . . . . 2. *A. turcomanica* ILJIN
b. Apical sinus of fruit broad or absent, stylar arms usually exserted from the sinus . . . . 1. *A. polygaloides* (FISCH. & C.A. MEY.) FENZL
3a. Stems very prominently sulcate-ridged; basal leaves c. 15–20 × 20–35 mm (C Persia) . . . . 3. *A. multinervis* RECH.f.
b. Stems usually inconspicuously ridged; basal leaves to 50 × 30 mm (Afghanistan, ? Pakistan) . . . . 4. *A. afghanica* PODLECH

1. ***A. polygaloides*** (FISCH. & C.A. MEY.) FENZL in ENDL., Gen. Plant. 300 (1837).
Syn.: *Corispermum polygaloides* FISCH. & C.A. MEY., Ind. Sem. Horti Petrop. 24 (1835). *Anthochlamys polygaloides* var. *caucasica* ILJIN in KOMAR., Fl. URSS 6: 165 (1936). *A. Rechingeri* AELLEN, Verh. Naturf. Ges. Basel 61: 171 (1950) – includ. var. *denticulata* AELLEN.
Icon.: JAUB. & SPACH, Ill. Pl. Or. 3: tab. 299 (1850). – Tab. 74.
Type: (Azerbaijan, Talysch) "in montibus Talüsch [Kulenesov Mts on road to Suvant]", R.F. HOHENACKER, LE.

Annual, 10–80 cm, green, greyish or yellowish green, glabrous below, with a varied density of soft tangled branched and simple hairs on inflorescence axis. Stems usually branched from or near base, usually rather slender, erect or ascending-erect, inconspicuously ridged. Lowermost leaves up to 30 × 10 mm, elliptic, narrowed into a subabsent petiole, not or scarcely mucronate, usually with only 1 prominent nerve abaxially; leaves soon withering or deciduous. Cauline leaves linear or linear elliptic

c. 30 x 4 mm, mucronulate. Flowers numerous in slender often showy elongated spikes, 5–20 cm. Bracts linear-lanceolate, mucronulate, spreading-adpressed; upper c. 2,5 mm long. Perianth segments pinkish white to pink to purplish, ± linear, 1,8–2 mm long, bifid. Fruit ± orbicular, 2–4,5 x 2,8–4,5 mm, apically emarginate, ± entire or apiculate with wings running up the stylar remains; wing c. 1,2 mm wide, entire, undulate or flat; stylar remains variable in size and shape according to age, usually exserted from sinus.

Hab.: Dry rocky slopes, clay, gypsum & sandy soils, semi-desert, salt steppe; 860–2000 m. – Fl. VII–VIII, fr. VIII–X.

T a l i s h : In montibus Kulenesov on road to Swant (Suvant), HOHEN. – Talish sec. GROSSH., Fl. Kavk. 3: map 134 (1945).

P e r s i a : W: Azerb.: In saxosis ad pagum Kivi, 90 km ENE Mianeh versus Khalkhal, 1400 m, RECH. 43314! 20 km E Mianeh to Khalkhal, 960 m, WDB. & SHIRDELPUR 14925! In saxosis faucium fluvii Kizil Uzun, 13–19 km SE Mianeh, 1200 m, RECH. 42275! 13 km Mianeh to Zanjan, 1050 m, LAMOND 4225! 100–122 km NW Zanjan to Mianeh, 1200 m, RECH. 32577!, 32591! 10–24 km ENE Mianeh, 1150 m, RECH. 43226! 25 km W Mianeh, 1300 m, KUKKONEN 7945!, UOTILA 19508! Mianeh to Ardabil near Qezel, 1100 m, FOROUGHI & ASSADI 13721! Ardabil, 1300 m, SCHMID 6504! Mianeh to Tabriz, MOUSSAVI & TEHRANI 40292-E! Sarab, Lenjovan, IZADYAR 40291! Khamseh: 10km NW Zanjan, SOJÁK 7531! Soltaniyeh, 1670 m, FURSE 3221! Hills S of Zanjan, 1830 m, FURSE 3259! Zanjan, RECH. 56521! Ad versuras 16 km W Takestan versus Zanjan, 1300 m, RECH. 42320!, 42337b!, LAMOND 4262! – C: Tehr.: Hableh Rud: Simin Dasht, MANUCH. & AELLEN 5752-E! 6 km W Eyvanki, IRANSHAHR & RIEDL 15881-E! Varamin, IRANSHAHR 12115-E! Tehran, MARTINCIČ & WRABER 57! Lehmwüste bei Istgah-e Bahram, 20 km E Tehran, 1100 m, AELLEN 328!, 329! (Types of *A. Rechingeri*)! Rud Shur, 60 km SW Tehran, 950 m, AELLEN 333! Pol-e Rud Shur, 980 m, FOROUGHI 105451 75–90 km S Tehran to Qom, 860–1360 m, KUKKONEN 7873!, 7880! Qom to Tehran, last pass before Tehran, 1130 m, WDB. & al. 14445! Tehran to Qom, Hassanabad, SAB. 40221-E! Inter Hauz Sultan et Kinar-e Gird, anno 1868, HAUSSKN.! 15 km W Garmsar, 1000 m, BRECKLE 5030! Qazv.: Aliabad near Karaj, GAUBA 2058! Karaj, KOELZ 33442! Karaj, 1340 m, AELLEN 498! In collibus Halkedar ad Mardabad, 1200 m, RECH. 6804! West of Mardabad, 1250 m, HDG., WDB & FOROUGHI 14685! 25 km Qazvin to Zanjan, TERME 40290-E!

Distr. gen.: Transcaucasia (Talish), N & W Persia.

An attractive species with its rosy pink perianth segments, elliptic leaves and slender inflorescence spikes.

2. *A. turcomanica* ILJIN in KOMAR., Fl. URSS 6: 875, 165 (1936).
Icon.: KOMAR., l.c. tab. 7, fig. 13. ILJIN in FEDTSCH., Fl. Turkmen. 2: fig. 138 (1937). MOZAFFARIAN, Iranian Journ. Bot. 3: 82, fig. 1 (1985).
Type: (Turcomania) Malye Balkhan range, BOBROV, LE.

Annual, 15–30 cm, grey-green, glabrous below, on inflorescence axis with some short simple and branched hairs. Stems rather slender (on material seen) with few ridges. Lower leaves elliptic to oblong-ovate, c. 1,5–2 x 0,5–1 cm, mucronulate. Inflorescence of short lateral and terminal flower clusters. Bracts c. 2 mm long, ± adpressed, acuminate-mucronulate. Perianth segments 1–1,5 mm long, apically entire-rounded or bifid, united below. Fruit 2,5–3 × 2–2,5 mm, broad elliptic, glabrous; wings undulate; apex with a narrow sinus; stylar arms included in sinus.

Hab.: Gypsum hills, 1400 m.

Persia: E: Khor.: Esfarayen, Shah-Jahan mountain region, Naushirvan village, 1400 m. MOZAFFARIAN 48610.
Turcomania: Kopet Dagh, near Kara Kala, LINCZ. & al. 5540! Chuli, FEDTSCHENKO!

Distr. gen.: E Persia, Turcomania (Kopet Dagh).

Apparently a more slender plant than its close ally *A. polygaloides* with, as its characteristic feature, the style included within the narrow apical sinus of the fruit.

3. ***A. multinervis*** RECH.f., Feddes Repert., 48: 165 (1940) – includ. vars *eumultinervis* AELLEN and *polyantha* AELLEN, l.c. 168, 169.
Icon.: l.c. tab. 305, fig. 1. – Tab. 75.
Type: (C Persia) Damghan–Semnan: Sorkheh, K.H. RECHINGER fil. 1960, holo W!

Annual, 5–80 cm, glaucous, green or grey-green, almost glabrous below, with some soft tangled branched hairs in region of inflorescence. Stems often branched from base, erect, prostrate or ascending, prominently sulcate-striate with c. 15 (often more) raised ridges. Leaves mostly at base of stem; those broad obovate, c. 15–20 × 20–35 mm, prominently 3–5-nerved beneath, narrowed into a broad petiole, apically mucronulate, soon withering. Cauline leaves few, much smaller, obovate-spathulate. Flowers in loose or initially compact short or elongated spikes. Bracts narrow ovate-lanceolate, mucronulate, spreading-adpressed; upper c. 3 mm long. Perianth segments white or rose, 1,5–2,5 mm, apically bifid or erose. Fruit c. 2,5–3,5 × 2–4 mm, ± circular; wing 0,7 mm, undulate; central area ± papillose; styles slightly exserted from the narrow apical sinus.

Hab.: Gypsum and clay soil, in *Seidlitzia rosmarinus* vegetation, 650–140 m. – Fl. VII–IX, fr. X–XI.

Persia: C: Tehr.: 20 km E Tehran, Bahram, 1100 m, AELLEN 325!, 326! Garmsar, 90 km E Tehran, 1100 m, AELLEN 327! 13 km E Evankey, 1100 m, RENZ & IRANSHAHR 16781! N edge of Dasht-e Kavir, 53 km E Garmsar, 900 m, ALAVA 10821! Kavir Prot. Reg.: Near Caravan-Sarai Eyn or-Rashid, 1100 m, WDB. & FOROUGHI 14628! 50 km W of Shah Abbas Caravan-Sarai, 780 m, WDB. & FOROUGHI 14805! Mobarakiyeh, 40 km S Varamin, 900 m, RECH. 46115! Damgh.-Semn.: 7–30 km Semnan to Firuzkuh, 1180–1600 m, WDB. & FOROUGHI 12997!, HDG., WDB. & al. 14736!, WDB. & COBHAM 13683! S of Semnan to Kavir, 1000 m, REJAMAND & AMIN 32588! Gipswüste von Sorkheh nächst Semnan, 1400 m, RECH. 1960! Kavir: Fakhrabad to Nushabad, IRANSHAHR & MOUSSAVI 40289-E! Kavir, Nushabad to Ab Shirin, 780 m, TERME & MOUSSAVI 30276-E! Hoseynian to Howz-Aqa, 650 m, TERME & MOUSSAVI 30421-E!, 40193-E!

Distr. gen.: Endem. (C Persia).

Mainly confined, with the available information, to gypsum soils; the multi-striate stems combined with the rather broad basal leaves are characteristic specific features.

4. ***A. afghanica*** PODLECH, Mitt. Bot. Staatssamml. München 12: 357 (1976).
Icon.: l.c. fig. 1. – Tab. 76.
Type: SW Afghanistan, D. PODLECH 16929, holotype M!; isotypes E!, W!, Hb. PODLECH!

Annual, 17–40 cm, much branched with few simple and branched hairs, mostly on inflorescence axis, eventually rather woody at base. Stems greyish green or green, terete or slightly ridged, with stiff spreading-erect lateral branches. Lowermost leaves ± rosette-forming, broad ovate or obovate up to 5 × 3 cm attenuate into a short broad petiole, apically obtuse or apiculate, prominently 3–5-veined beneath, usually withering by flowering/fruiting time. Cauline leaves few, small, 4–6 mm long. Flowers usually in short dense lateral inflorescences, sometimes in elongated spikes. Bracts narrow ovate-elliptic, 2–3 mm long, acuminate, or mucronulate, often with a prominent raised median nerve. Perianth segments white or pale rose, c. 2 mm long, apically bifid or erose. Fruit 2,5–3 × 2 × 2,8 mm, broad elliptic to ± orbicular, glabrous, green or with a rose rim; wing c. 0,6 mm broad undulate; apex retuse; stylar arms exceeding the sinus.

Hab.: stony or sandy semi-desert, clay desert, on silicate soils, gravel steppe, among dry rocks; 670–1800 m. – Fl. VIII–X., fr. X.

A f g h a n i s t a n : SW: Herat: 105 km S Herat to Shindand, 1300 m, RECH. 37578! Farah: 300 km WNW Girishk to Shindand, RECH. 32492! 4 km S Khwaja Mard, Herat to Dilaram, 1200 m, PODLECH 32477! E slopes Tir Koh, c. 25 km NW Farah to Anardara, PODLECH & JARMAL 29036! 60 km SE Shindand an der Hauptstrasse von Herat nach Dilaram, 1220 m, PODLECH 16929! 10 km NW Dilaram to Farah Rud, 900 m, RECH. 37567! Sangilan, 30 km E Dilaram, 1000 m, BRECKLE 4881! SW Dilaram, 700 m, FREITAG 3710! – SE: Kandahar: 8 km W Lashkargah (Qala Bist), 780 m, BRECKLE 4844! Girishk to Nadi Ali, VOLK 1298 (as *A. squarrosa* AELLEN – nomen)! N of Kandahar, 1070 m, GILLI 2204! 35–80 km W Kandahar to Girishk, 940–1100 m, PODLECH 32678!, RECH. 34828! 53 km W Kandahar, Kuhsk-i Nahhud, 1000 m, RECH. 37549! 70 km W Kandahar to Herat, 1000 m, UOTILA 18929! 2–13 km E Kushk-i Nahhud to Kandahar, 950–9080 m, PODLECH 30671!, 32681!, 32682! Hill S of Arghandab bridge, 12 km W Kandahar, PODLECH 32674!
P a k i s t a n : Quetta: Qila Abdullah, 1800 m, JAFRI & AKHAR 2326!

Distr. gen.: SW & SE Afghanistan, Pakistan (endemic).

Although this seems to be a distinct species, it is certainly closely related to the geographically separate *A. multinervis*; in the Afghan species the branching is more prominently squarrose, the basal leaves are broader and the stems are usually, not always, less prominently ridged.

The identification of the Pakistan specimen, because it is very young, is uncertain.

18. *Kalidium*

I.C. HEDGE, Edinburgh

Kalidium MOQ. in DC., Prodr. 13, 2: 46, 146 (1849).
Syn.: *Kalidiopsis* AELLEN, Notes Roy. Bot. Gard. Edinb. 28: 31 (1967).

Lit.: N. NIKOL'SKAYA, Species of the genus Kalidium, Botaničeskii Zhurnal SSSR 57: 299–312 (1972) [In Russian].

Succulent, glabrous, much branched low shrubs. Stems jointed at nodes at least when young. Leaves alternate, ± globular, decurrent. Flowers hermaphrodite or unisexual, spirally or alternately arranged, usually in 3s, in the upper leaf axils. Perianth segments 4–5, erect, fused to near apex. Stamens 2, not or scarcely exserted. Ovary ovoid; stylar arms subsessile. Utricle enclosed in the persistent papillose or fleshy perianth segments. Seed erect; embryo annular or horse-shoe-shaped; albumen central. – Type of genus: *K. foliatum* (PALL.) MOQ.

Related in the original description to *Salicornia*, but more closely allied to *Halopeplis* and also to *Halostachys*.

1. ***K. caspicum*** (L.) UNGERN-STERNB., Atti Congr. Bot. Firenze 1874: 317 (1876).
Syn.: *Salicornia caspica* L., Spec. Plant. 4 (1753). *S. arabica* PALL., Reise 412, 481 (1771). *Halocnemum arabicum* (L.) SPRENG., Syst. Veg. 1: 19 (1825). *Salicornia Pallasii* C.A. MEY. in HOHEN., Bull. Soc. Imp. Nat. Mosc. (Enum. Pl. Talysch 6: 361 (1838) – nomen.
Icon.: Tab. 77.
Type: "Hab. in squalidis maris Caspii & Mediae", ? LINN. 10/8 – microfiche!

Shrub 10–40 cm and up to 1 m wide, with a thick woody rootstock to c. 8 mm diam., current year's shoots greyish-green, numerous, much branched, closely jointed, brittle, slender c. 0,5 mm diam.; internodes 2–3 mm; leaves fleshy, small, decurrent and stem-clasping. Inflorescence of short, 5–10 mm, mostly terminal spikes. Perianth segments fused, angled. Utricle ovoid, c. 1 mm diameter; seed smooth.

Hab.: Salty clay, salt flats, river banks with *Tamarix*, with *Halocnemum*; c. 300–1200 m.

Persia: W: Azerb.: in argillosis salsis, 27 km W Marand versus Evowghli, 1100 m, RECH. 43830! 27 km W Marand, 1070 m, PABOT 5334!, 30332-E-! – C: Semn.-Damgh.: Mehmandust, Hemmatabad, 1100 m, TERME et al. 41724! Shahr.-Bust.: Abbasabad, 120 km W Sabzevar, 1400 m, REJAMAND & ARAZM 32528! Turan Prot. Reg.: 4 km NE Dastjerd to Abbasabad, 900 m, FREITAG 14140! 15 km SSW Majerad, 725 m, FREITAG 15103! SW Majerad, FREITAG & MOZAFFARIAN 28873!
Turcomania: Kopet Dagh sec. NIKITIN, Ill. Opred. Rast. Ashkhabad 115. (1965).
Afghanistan: N: Mazar-i Sharif: 25 km NW Deh Nau, Nairabad, Sar-e Namak, 330 m, BRECKLE 4722!

Distr. gen.: Caucasus, E Turkey, Persia, Turcomania, N Afghanistan, C Asia, W Mongolia, map in Bot. Zhurn. 57: 303, fig. 2 (1972).

The description given above needs to be improved and amended with the aid of better field notes and adequate flowering and fruiting material.

In the vegetative state *Kalidium* is similar to *Halopeplis* because of the bead-like arrangement of the leaves on the stem. Some of the specimens cited – none of which is in fruit – have hard pale brown ovoid galls 4–5 mm long.

19. *Halopeplis*

I.C. HEDGE, Edinburgh

Halopeplis BUNGE ex UNGERN-STERNB., Versuch einer Systematik der Salicornieen 102 (1866).

Succulent annual or perennial herbs, glabrous. Stems not jointed. Leaves alternate or subopposite, globular or ovate, clasping, with distinct or rudimentary laminae. Flowers immersed in the upper parts of stem forming cylindrical lateral and terminal spike-like inflorescences, hermaphrodite or unisexual, grouped together in 3s in the axils of the bracts, more or less connate to each other and the subtending bract. Perianth segments 3 very inconspicuous. Stamens shortly exserted, 1–3; thecae without connectival appendages. Ovary vertical; styles 2. Utricle included in inflorescence axis, with a membranous pericarp. Seeds ovoid to ± circular, compressed; embryo uncinate or curved; albumen copious. – Type of genus: *H. nodulosa* (DEL.) BUNGE ex UNGERN-STERNB. (*Salicornia nodulosa* DEL.) = *H. amplexicaulis* (VAHL) CESATI et al.

1a. Annual of inland salt flats and lakes .... 1. *H. pygmaea* (PALL.) BUNGE ex UNGERN-STERNB.
b. Perennial shrub of coastal shores .... 2. *H. perfoliata* (FORSSK.) BUNGE ex ASCHERS.

1. ***H. pygmaea*** (PALL.) BUNGE ex UNGERN-STERNB., Versuch Systematik Salicornieen 105 (1866).
Syn.: *Salicornia pygmaea* PALL., Illustr. Pl. 9 (1803).
Icon.: ILJIN, Acta Horti Petrop. 43: 188, tab. 272 (1930). KOMAR., Fl. URSS 6: tab. 8, fig. 2a–d (1936). – Tab. 78.
Type: (Caspian) ": in oris lacuum salsorum and mare Caspium versus Cumam [Kuma river] .." P.S. PALLAS.

Annual, bush-like, 10–20 cm high and up to 25 cm wide, green, yellowish green or pink, much branched from or near base, glabrous, glaucous. Stems not jointed. Leaves alternate; sheathing base clasping stem, subglobose; lamina rudimentary; internodes shorter than or longer than leaves. Inflorescence of numerous terminal and lateral catkin-like oblong-cylindrical spikes, 0,5–2 cm long. Bracts tightly adpressed, fleshy, ovate-orbicular to trullate, c. 1–1,5 × 1 mm. Stamens 1–2; thecae

c. 0,8 mm long, yellow, oblong-ovoid. Ovary c. 0,5 mm; stylar arms c. 0,4 mm usually densely covered with pollen when young. Seed ± circular in outline, flattened, 0,5–0,5 mm, densely papillose.

Hab.: Wet salty soil, edge of salt lakes; 900–1600 m. – Fl. VI.–VIII, fr. VIII.–XI.

Persia: W: Azerb.: ad ripam austro-orientalem salsam lacus Urmia (Rezayieh), inter Bunab et Khanian, RECH. 14772! Arak: Arak, ABAI & MODJIB 30421-E!, 30422-E!, 30424-E! Davudabad, ABAI & MODJIB 14852-E! Esf.: Zayandeh Rud (Zaindeh Rud), STAPF 797! – S: Fars.: Maharlu Lake (Daryacheh-ye Maharlu), 1450 m, ALAVA 10720!, BOKHARI & al. 14844!, FIELD & LAZAR 1143!, FOROUGHI & ASSADI 15003-A!, GRANT 15014.1!, STARM. 15! Bakhtegan Lake (Daryacheh-ye Bakhtegan), Kharamah, 1570 m, FOROUGHI & ASSADI 15030! – E: Khor.: 5 km S Sabzevar, 940 m, REJAMAND & ARAZM 32542! – C: Tehr.: Saveh, Rudshur, ABAI & MODJIB 30372-E! Kashan: Kavir, 10.XI.1948, AELLEN & SHAR.! Kavir, various localities (Iranian Journ. Bot. 2, 2: 132. 1984) Turan Prot. Region: SE Delbar, 700 m, WDB. & FOROUGHI 18923.

Distr. gen.: Ciscaucasus, S Iraq, Persia, lowlands of C Asia, China (Sinkiang).

Sometimes, as at Maharlu Lake near Shiraz, a dominant species in wet salt flats. The mainly Mediterranean *H. amplexicaulis* (VAHL) CESATI et al. is a very close relative. I have not seen the relevant type specimens or sufficient material to reach a firm decision, but the differences between the two species seem very slight and further study might reveal that only one species is involved.

2. ***H. perfoliata*** (FORSSK.) BUNGE ex ASCHERS. in SCHWEINF., Beitr. Fl. Aethiop. 289 (1867).
Syn.: *Salicornia perfoliata* FORSSK., Fl. Aegypt.-Arab. 3, tab. 1 (1775). *Halostachys perfoliata* (FORSSK.) MOQ. in DC., Prodr. 13, 2: 148 (1849) p.p.
Icon.: CORNES, Wild flowering plants of Bahrain 38: tab. 29 (1989). – Tab. 79.
Type: (Saudi Arabia): "Djiddae (Jeddah) et Ghomsodae copiose ad littora..." C-Herb. FORSSKÅL – microfiche!

Much branched succulent shrubby perennial, glabrous, 15–30 cm tall and to 60 cm wide, dark green, reddish or purplish. Stems ascending-erect to c. 4 mm thick, not jointed. Leaves alternate, often clustered; sheathing amplexicaul base subglobose or ovate, c. 2–3 × 3–5 mm, bead-like. Inflorescence of short lateral oblong-cylindrical dense spikes, 0,5–1 cm long. Bracts tightly adpressed. Stamens 1(–2). Perianth segments connate. Seed enclosed in membranous utricle, broad elliptic in outline, c. 0,8 × 0,5 mm, flattened, shortly rugulose-papillose. Embryo hook-shaped.

Hab.: Saline mud-flats, edge of lagoons, sandy place near sea-shore; Fl. VI–VIII, fr. IX–XII.

Persia: S: Lar.: Bandar Abbas, 2 km a litore maris, SOJÁK 4517!, 4518! Jask, BEHB. 857-E!, 30192-E!
Pakistan: Makran: Makran coastal plain: 12 km N Jiwani, 2 km W of road to Suntsar, FREITAG 18546! Jiwani marine base, QAISER & D. KHAN 7139!, 7143!

Distr. gen.: Shores of Red Sea, Sinai, coasts of Yemen, Oman, United Arab Emirates, Qatar, Bahrain, S Persia, Pakistan: Baluchistan. – FREITAG, Fl. et Veg. Mundi 9: 283, fig. 1 (1991).

An easily recognized sea-shore species, apparently uncommon on the Persian side of the Gulf but very frequent on the opposite Arabian peninsula shores.

20. *Halostachys*

I.C. HEDGE, Edinburgh

Halostachys C.A. MEY. ex SCHRENK, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Pétersb. sér. 2, 1: 361 (1843).

Succulent much branched tall shrub. Stems jointed at the nodes, at least when young. Leaves opposite, connate, reduced to scales. Inflorescence of numerous mostly lateral very dense cone-like erect fleshy spikes. Flowers hermaphrodite or (?) unisexual, up to 3 in the axils of the rhombic-quadrate bracts. Perianth 3-lobed; segments ± erect, convex, united for c. 3/4 of their length. Stamen 1, exserted. Ovary ovoid; stylar arms prominent exserted. Utricle membranous, enclosed within the somewhat inflated ± 3-angled perianth segments. Seed erect; embryo annular; albumen present. – Type of genus: *H. caspica* (PALL.) C.A. MEY. ex SCHRENK = *H. Belangeriana* (MOQ.) BOTSCH.

Monotypic. Distinctive on account of its shrubby habit, the dense cone-like erect pedunculate spikes and the single stamens. Related to *Halocnemum* and *Arthrocnemum*.

1. ***H. Belangeriana*** (MOQ.) BOTSCH., Not. Syst. Leningrad 16: 84 (1954).
Syn.: *Arthrocnemum Belangerianum* MOQ., Chenopod. Monogr. 112 (1840). *Salicornia caspica* PALL., Reise 1: 480 (1771) non L. (1853). *Halocnemum caspicum* (PALL.) M.B., Fl. Taur.-Cauc. 3: 3 (1819). *Halostachys caspica* (PALL.) C.A. MEY. ex SCHRENK, Bull. Soc. Imp. Nat. Mosc. 11: 361 (1838). *H. caspica* var. *Belangeriana* (MOQ.) MOQ. in DC., Prodr. 13, 2: 149 (1849).
Icon.: ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: fig. 203 A-F (1934) as *H. caspica*. KOMAR., Fl. URSS 6: fig. 8 3a-d (1936), – Tab, 80.
Type: Persia, C.P. BÉLANGER (601).

Shrub up to 1,5 × 1–3 m with a small trunk to 8 cm diameter; lower parts of stem almost leafless; current year's shoots glaucous-green, jointed, terete or angled, smooth and glabrous or finely papillose, 1,5–2 mm diameter; internodes 2–4 (–8) mm long; leaves reduced to ± membranous short triangular scales, apically finely fringed, connate and stem clasping. Inflorescence wide paniculate with numerous erect or spreading-erect narrow cylindrical fleshy pedunculate spikes, c. 15–20 × 2–5 mm. Perianth segments c. 0,8 mm long, connate, persistent; stamen yellow with 0,5 mm ovoid theca; stylar arms spreading, papillose. Perianth 3-angled in fruit, ± shiny. Seeds oblong, c. 1 × 0,4 mm.

Hab.: Salt-flats, salty ditches, semi-desert, dry river banks, with *Suaeda fruticosa*, *Tamarix*; 330–1500 m. – Fl. VI–VII, fr. X–XII.

Talish: see. GROSSH., Fl. Kavk. 3: map 146 (1945) as *H. caspia*.

P e r s i a : N: Gorg.: Pahlavi Dezh, PABOT 30342-E! – W: Azerb.: Bandar-e Danalu, STARM. 66!, 30139-E! – S: Fars.: Neyriz Lake, 1400 m, BOBEK 118!, STARM. 26! S shore Daryacheh-e Bakhtegan, 70 km WNW Neyriz, 1700 m, BOKHARI & EDMONDSON 2095! Kerm.: S Dasht-e Lut, E of Bam, 29°27'N 59°28'E, 460 m, LÉONARD 6076! E: Sistan: Sistan, HENDERSON 46! Khor.: 43 km SW Ferdows, 1250 m, REJAMAND & ARAZM 32534! – C: Tehr.: Varamin to Kavir S Tehran, 980 m, DINI & BAZARGAN 23452! Deh Namak near Khar, SAB. in GAUBA 2108! Kavir Prot. Reg.: Mobarakiyeh 40 km a Varamin meridiem versus, 900 m, RECH. 50103! 55 km NW Shah Abbas Caravan-Sarai, 800 m, WDB. & FOROUGHI 15190! Kavir-e Garmsar, 840 m, REJAMAND & ARAZM 32506! 25 km a Garmsar to Semnan, 740 m, TERME & TEHRANI 40026-E! Qom: Lake Qom (Hauz-i Sultan), 800 m, GHORBANLI 76/63! Kashan: Robat-e Tork, SOJÁK 6901! Shahr.-Bust.: Turan Prot. Reg.: Delbar to Ahmadabad, 1100 m, TERME & al. 41714! 16 km SSE Majerad, 750 m, BRECKLE 5082! 4 km NE Dastjerd to Abbasabad, 900 m, FREITAG 14138! Kavir border S of Sanjavi, 730 m, FREITAG 13830! Abbasabad, REJAMAND & ARAZM 32523! – Persia, BÉLANGER (601).
T u r c o m a n i a : Ashkhabad sec NIKITIN, Ill. Opred. Rast. Ashkhabad 116 (1965).
A f g h a n i s t a n : N: Mazar-i Sharif: 15 km NW Balkh, 340 m, BRECKLE 4681! – NW: Maimana: 15 km E Daulatabad, Dasht-e Laily, 330 m, FREITAG 198! – SW: Nimruz: Chakhansur, VOLK 2931! – SE: Kandahar: Kang (Zaranj), 500 m, KOELZ 13241! – NE: Kataghan: Asqalan, 420 m, JARMAL 35! "Dschelaugir", NEUB. 172/1950! Kizil Kala (Qizel Qala), VII.1967, PELT!
P a k i s t a n : Bal.: Chagai: W Kharan 48 km NNW Qila Ladgasht at road to Nok Kundi, 530 m, FREITAG & KOTHE 18695! – Karachi: Thatta plain 20 km W Thatta, 30 m, FREITAG & KOTHE 18161!

Distr. gen.: Caucasus, E Turkey, Persia, Pakistan, C. Asia, China (Sinkiang, Kansu)

A clear-cut species scattered throughout our area. It can usually be recognized in the vegetative state by the more or less finely papillose stems and the fringed apical margin (high magnification needed) of the opposite scale-like leaves.

21. *Halocnemum*

I.C. HEDGE, Edinburgh

Halocnemum M.B., Fl. Taur.-Cauc. 3: 3 (1819).
Syn.: *Halocnemon* C. SPRENG., Syst. Veg. 1: 5, 19 (1824) – orth. var.

Succulent glabrous halophytic perennial herbs, woody at base. Stems jointed at the nodes. Leaves opposite, vestigial or obsolete. Inflorescence of numerous short opposite lateral and terminal cylindrical spikes. Flowers hermaphrodite, somewhat immersed in inflorescence axis, grouped together in 3s in the axils of shield-like bracts. Perianth segments 3 subequal, scale-like, loosely connate at base. Stamen 1, exserted. Ovary ovoid with 2 distinct styles. Perianth segments unchanged in fruit. Utricle obovoid, free. Seed vertical; testa slightly papillose. Embryo curved; endosperm copious. – Type of genus *H. strobilaceum* (PALL.) M.B.

Monotypic. Clearly related to *Arthrocnemum*, *Halostachys*, *Kalidium* and *Salicornia*

1. ***H. strobilaceum*** (PALL.) M.B., Fl. Taur.-Cauc. 3: 3 (1819).
Syn.: *Salicornia strobilacea* PALL., Reise 1: 481, tab. B, fig. 1–2 (1771) – *male*.

Icon.: ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam, ed, 2, 16c: 547, fig. 204, A-G (1934). JAFRI & RATEEB, Fl. Libya 58: tab. 19 (1978). – Tab. 81.
Type: (N. Caspian): "Proceriorem (*Halostachys caspica*) et *Salicorniae caspicae* subparem versus mare cum eadem promiscue crescentem inven."

Much branched perennial herb or shrub, clump-forming, 10–100(–150) x 20–300 cm; rootstock to c. 12 mm thick; branches with numerous opposite globular buds, giving rise to short opposite lateral 6–15 mm spreading-erect branches; current year's shoots fleshy, glaucous green; internodes very short c. 3 mm long. Leaves connate at base, scale-like, c. 1 mm. Flowering spikes numerous, often cone-like and 4-sided. Perianth segments 1–1,5 mm long, oblong-ovate. Anther yellow, oblong-ovate, 0,7 mm. Stylar arms c. 1,7 mm. Shield-like bracts ± quadrate-rhombic, deciduous. Seeds orange- or red-brown, irregular in shape, very finely papillose, c. 0,7 mm, flattened.

Hab.: Salt and intertidal marshes, sabkha, salty clay, salt steppe, dried river beds, semi-desert; 0–1200 m. – Fl. & fr. X–XI.

Persia: N: Gorg.: 52 km N Pahlavi Dezh, sea level, HEWER 4050! 5 km N Gonbad-e Kavus, 85 m, HEWER 3897! Gonbad-e Kavus, SAB. 190! Dasht-e Gorgan, SHAR. 591! – W: Azerb.: In salsis 7 km NW Bonab versus ripam lacus Rezaiyeh (Urmia), 1350 m, RECH. 43158! Inter Bonab et Khanian, RECH. 14770! In argillosis salsis 27 km W Marand versus Evowghli, 1100 m, RECH. 43827! Marand to Maku, FERGUSON 249!, UOTILA 19521! E side lake Rezaiyeh (Urmia) 10 km S Ilkchi, 1280 m, WDB. & SHIRDELPUR 14937! 8 km S Shahpur NW shores Lake Rezaiyeh, 1200 m, FURSE 3521! Sharafkhaneh, BEHB. & AELLEN 30137-E! Arak: Arak, ABAI & MODJIB 30423-E! Khuz.: 40 km E Ahvaz, STUTZ 1001! 60 km Abadan to Mashur (Mashahr), IRANSHAHR & TERME 15008-E! Omidiyeh to Dorahiyeh, TERME & MOUSSAVI 35362-E! 14 km E Bandar Mashur, 100 m, GRANT 15917! – S: Fars.: Bakhteghan lake near Kharameh, 1570 m, FOROUGHI & ASSADI 15024! Ad lacum Neyriz, 1400 m, STARM. 10! Chashmeh Gougerdi near Borazjan, IRANSHAHR 14816-E! Borazjan on road to Genavi, 70 m, BOKHARI & al. 14784! Genavi to Bushehr, TERME & MOUSSAVI 35366-E! Borazjan to Hendijan, SAB. in GAUBA 2142! Bushehr, STAPF 800!, 801, 802!, GRANT 15110! Pol-e Fasa 18 km SE Shiraz, 1600 m, GRANT 16958! Kerm.: Sirjan (Saidabad) to Qatruyeh, 1600 m, MOUSSAVI & TEHRANI 40069-E! Lar: Bandar Abbas: 209 km on road to Lar, 600 m, FOROUGHI & ASSADI 15078! Bandar Khamir to Isin, IRANSHAHR & TERME 14798-E! – E: Khor.: 43 km SW Ferdows, 1250 m, REJAMAND & ARAZM 32537! 40 km NW Tabas to Robat-e Gur, 600 m, RECH. 51778! Sabzevar, Sadrabad, 800 m, FOROUGHI 10591! Abbasabad 120 km W Sabzevar, 1400 m, REJAMAND & ARAZM 32519! – C: Tehr.: Kishlak (Garmsar) to Abdullahabad, 900 m, RECH. 2783! Kahak to Siah Kuh, 700 m, IRANSHAHR & MOUSSAVI 15403-E!, 40177-E! Kavir Namak, Sefid-Ab, IRANSHAHR & MOUSSAVI 40243-E! Kavir near Varamin, SHAR. & AELLEN 30062-E! Varamin to Semnan, SAB. in GAUBA 2102!, 2103! Qazv.: Mardabad, 1250 m, GAUBA 2101!, HDG. & al. 14672! Damgh.-Semn.: Semnan to Garmsar, 740–1000 m, HDG. & al. 14761!, TERME & TEHRANI 40019-E!, 4002-E! Damghan, SAB. in GAUBA 2100! Kavir-e Damghan, 1200 m, REJAMAND & ARAZM 32498! Shahr.-Bust.: Inter Mayamey et Abbasabad, RECH. 5369! Turan Prot. Reg.: 17 km S Majerad, 750 m, BRECKLE 5068! Delbar to Ahmadabad, 780 m, FREITAG 13931! S Majerad, Kavir border, 760 m, FREITAG 14171! 4 km NE Dastjerd to Abbasabad, 900 m, FREITAG 14139! Qom: Daryacheh-ye Qom, 750 m, TERME & MOUSSAVI 36567-E! Yazd: Aqda, Yazd to Nain, 1150 m, FOROUGHI & ASSADI 15120!, FOROUGHI 10534!

Turcomania: Ashkhabad, BORNM. 1224!, LITW. 47!, 528!, SINT. 1224!
Afghanistan: N: Mazar-i Sharif: 45 km NW Tashkurghan, Namak Sar, 315 m, FREITAG 3897-a! 25 km NW Deh Nau, Nairabad, Sar-e Namak, 330 m, BRECKLE 4723! – NW: Maimana: 15 km NE Daulatabad, Dasht-e Layli, 330 m, FREITAG 6691!

Pakistan: Bela: Bela Plain, 34 km W Liari at road to Kandewari, 22 m, FREITAG & KOTHE 18223! 8 km Kund Malir to Agore camp, KAMAL & al. 2069! – Makran: 3 km S Pasni, 2 m, FREITAG & KOTHE 18479!, 18480!

Distr. gen.: Spain, E Mediterranean, N Africa, Egypt, Sinai, Turkey, Caucasus, Iraq, Saudi Arabia, E Arabian peninsula, Persia, Turcomania, Afghanistan, Pakistan, China (Sinkiang, Kansu) – FREITAG, Fl. et Veg. Mundi 9: 285, fig. 3 (1991).

Mainly growing on wet salt flats, either near the sea or far inland, often as a dominant or forming a community of its own, and in autumn colouring vast areas with green, orange or purple.

22. *Arthrocnemum*

I.C. HEDGE, Edinburgh

Arthrocnemum MOQ., Chenopod. Monogr. 111 (1840).

Succulent halophytic glabrous perennial herbs or subshrubs. Stems jointed at the nodes, prostrate to erect. Leaves opposite, reduced to opposite connate scales, forming a cup round the stem. Inflorescences lateral and terminal, spicate, cylindrical, fleshy. Flowers, hermaphrodite or unisexual, immersed in cavities in the inflorescence axis, arranged in groups of 3, scarcely exserted beyond the subtending bracts. Perianth segments 3–4, subequal, oblong, connate and tubular-angular. Stamens 1(–2). Ovary ovoid with 2 prominent subulate styles. Perianth segments becoming ± spongy in fruit and enveloping the utricle. Seed vertical with a smooth or papillose testa. Embryo curved; endosperm well-developed. – Lectotype of genus: *Salicornia macrostachya* MORIC. (= *Arthrocnemum macrostachyum* (MORIC.) C. KOCH.)

Note: SCOTT, Bot. Journ. Linn. Soc. 75: 162 (1977) lectotypified MOQUIN's genus with *Salicornia fructicosum* var. *macrostachyum* but this is incorrect because the Code (Art. 10.1) requires that "the type of a genus – – is the type of a name of a species". It is quite possible to cite *Salicornia macrostachya* as the type because it certainly is (Art. 10.2) "a name of – – an included species".

1a. Shrub to 40(–120) cm high and as wide; spicate inflorescences 4–5 mm in diameter; seed testa finely striate, rugulose-papillose .... 1. *A. macrostachyum* (MORIC.) C. KOCH
b. Mat-forming herb or shrub; spicate inflorescences 5–7 mm in diameter; seed testa smooth glossy .... 2. *A. indicum* (WILLD.) MOQ.

A mainly European and SW Asiatic genus. Very closely related to *Salicornia* and the mainly S hemisphere *Halosarcia* P.G. WILSON; of imprecise generic limits. Also similar to *Halocnemum* which has very similar floral and fruit characters, but is distinguished from it by the connate cup-like leaf scales which lack lateral shoots or buds in their axils.

1. *A.* ***macrostachyum*** (MORIC.) C. KOCH, Hort. Dendrol. 96 (1853).
Syn.: *Salicornia macrostachya* MORIC., Fl. Veneta 2 (1820). *S. virginica* FORSSK., Fl. Aegypt.-Arab. 2 (1775) – non L. (1753). *S. glauca* DELILE, Descr. Egypte Hist. Nat. 49 (1813) – non STOKES (1812). *Arthrocnemum fruticosum* MOQ. var. *macrostachyum* (MORIC.) MOQ., Chenopod. Monogr. 112 (1840). *A. glaucum* UNGERN-STERNB., Atti Congr. Bot. Firenze 1874: 283 (1876). *A. indicum* subsp. *glaucum* (UNGERN-STERNB.) MAIRE & WEILLER in MAIRE, Fl. Afriq. Nord 8: 99 (1962).
Icon.: JAFRI & RATEEB, Fl. Libya 58: tab. 20 (1978). – Tab. 82.
Type: (Italy, Venice) "secus viam quae ad portum Malamocco ducit"

Much branched robust, perennial herb or shrub with sprawling procumbent lateral branches, up to 40(–120) cm high and as wide; rootstock to 10 mm thick. Old stems woody, greyish; young stems yellow-green, fleshy; internodes 5–7 mm. Flowering spikes ± erect, numerous, cylindrical, c. 4–5 mm in diameter, eventually disarticulating. Flowers arranged horizontally in groups of 3. Perianth tubular, c. 2 mm long, angular. Anther yellow, c. 1 mm, ± exserted. Seed oblong, c. 0,8 × 0,6 mm, dark brown; testa finely striate, rugulose-papillose, flattened.

Hab.: Salt and intertidal marshes and lagoons at or near sea level – Fl. X–XII.

Persia: S: see FREITAG, Fl. et Veg. Mundi 9: 283, fig. 2 (1991).
Pakistan: Karachi, Hawk's Bay, Mangrove, LAMOND 234!, RECH. 27493!, FREITAG & KOTHE 18099! Karachi, 12 XI.1951, JAFRI s.n.! – Makran coastal plain: 12 km N Jiwani 2 km of road to Suntsar, FREITAG & KOTHE 18547! 2 km E Kalmat, c. 100 km E of Pasni, GHAFOOR & GOODMAN 4853!

Distr. gen.: Mediterranean shores from Portugal and Morocco eastwards to Jordan and Syria, Sinai, Red Sea coasts, E Saudi Arabia, Bahrain, Qatar, United Arab Emirates, Oman, Persia, Pakistan – FREITAG, Fl. et Veg. Mundi 9: 283, fig. 2 (1991).

Only known from a few collections in our area, but a frequent and abundant species on the shores of the eastern Arabian peninsula.

2. *A.* ***indicum*** (WILLD.) MOQ., Chenopod. Monogr. 113 (1840).
Syn.: *Salicornia indica* WILLD., Ges. Naturf. Fr. Neue Schr. 2: 111, tab. 4, fig. 2 (1799). *Halosarcia indica* (WILLD.) P.G. WILSON in Nuytsia 3: 63 (1980).
Lit.: P.G. WILSON, Halosarcia indica in A revision of the Australian species of Salicornieae, Nuytsia 3: 63–69 (1980).
Icon.: J.P. BRENAN, Chenopodiaceae in Fl. Trop. E Africa: 19, fig. 5 (1954). – Tab. 83.
Type: India, Madras: Tranquebar, KLEIN in B-WILLD. – microfiche!; K – photo.

Similar to the preceding species, but main stems prostrate, mat-forming, to 50 (–100) cm long, with short ascending or erect sterile and fertile branches, flowering/

fruiting spikes thicker, c. 5–7 mm in diameter, with closely overlapping bracts and a smooth, glossy seed testa.

Pakistan: Bal.: Gadani, between Sonmiani and mouth of Hab river, salt marsh, 26 VI 1989, D. KHAN (KUH).

Distr. gen.: Tropical east Africa, Pakistan, India, Sri Lanka, Malaysia, Australia.

In WILSON's revision [Nuytsia 3: 28–152 (1980)] of the mainly Australian *Halosarcia*, he includes this species in it. There is no doubt about the similarity of *A. indicum* to species of the large and multiform *Halosarcia*, but as WILSON himself points out, it does occupy a rather isolated geographical and anatomical position in that genus.

Earlier records of the tropical/subtropical *A. indicum* from Pakistan [e.g. STEWART, Ann. Cat. Vasc. Pl. Pak. 217 (1972)] seem mainly based on misidentifications of *A. macrostachyum*.

23. *Salicornia*

I.C. HEDGE, Edinburgh

Salicornia L., Spec. Plant. 3 (1753); Gen. Plant. ed. 5: 4 (1754).
Lit.: P.W. BALL, A taxonomic review of Salicornia in Europe, Feddes Repert. 69: 1–8 (1964).

Succulent annual or perennial herbs, glabrous. Stems jointed at the nodes. Leaves opposite, consisting of small connate scales. Inflorescence of numerous terminal and lateral fleshy cylindrical spikes. Flowers immersed in the inflorescence axis, grouped together in 3s as a triangle on both sides of the stem, subtended by the ± adpressed persistent decussate bracts; flowers hermaphrodite or male. Perianth spongy, angular, persistent, enclosing the ovary, unchanged in fruit. Stamens 1(–2) with exserted non-appendiculate thecae. Ovary vertical; stylar arms, 2 ± exserted. Utricle immersed in the persistent spongy perianth, membranous. Seed erect, small, compressed, ± oblong; testa at maturity with adpressed ± straight or curved or uncinate hairs (high magnification needed); embryo folded. – Lectotype of genus: *S. europaea* L. [(BRITTEN & BROWN, Ill. Fl. N. US. ed. 2, 2: 21 (1913)]; PIIRAINEN, Ann.Bot. Fenn. 28: 82 (1991)].

A complex almost cosmopolitan halophytic genus of rather uncertain limits – *Arthrophytum* is sometimes [(MEIKLE, Flora Cyprus 2: 1386. 1985)] included in it. Specific limits and the names given to species are even more problematical. Specimens collected before July or August are usually so immature that they are worthless; the best specimens for study are usually collected in October to November. Characteristic features of the genus are the jointed stems, the oblong-cylindrical spikes, the opposite sheath-like leaves, the flowers arranged in 3s within a triangular outline and the minute hairs on the seeds.

1. ***S. europaea*** L., Spec. Plant. 3 (1753).
Syn.: *S. herbacea* (L.) L., Spec. Plant. ed. 2, 5 (1762).
Icon.: TAKHT., Fl. Armen. 2: tab. 100 (1956). ZOHARY, Fl. Palaest. 1: tab. 227 (1966). – Tab. 84.

Type: "In Europae litoribus maritimis", LINN 10/1 – microfiche!

Annual, herbaceous throughout or somewhat woody at base. Stems usually much branched from near base, rarely unbranched, 10–30 cm, usually purplish, sometimes green, round below, angular above; branches opposite, erect. Leaves reduced to opposite short sheaths. Inflorescence of numerous terminal and lateral oblong-cylindrical spikes, 10–35 × 2–3 mm, with parallel sides. Flowers 3 in a triangular group; the upper median one usually hermaphrodite, larger than the lower lateral hermaphrodite or male flowers. Thecae yellow, c. 0,4–1 mm long, oblong-ovoid. Perianth ± rhombic. Seeds oblong-ellipsoid, with an irregularly papillose surface and short curved or apically hooked hairs; seeds of median fruits c. 0,9 × 0,4 mm, those of laterals smaller.

Hab.: Wet salty soil and salt flats; near sea level to 1500 m. – Fl. VI.–IX, fr. IX–XI.

Talish: sec. GROSSH., Fl. Kavk. 3: map 148 (1945) – as *S. herbacea*
Persia: N: Gorg.: Brackish lake at Tangeli, 52 km N of Pahlavi Dezh, sea level, HEWER 4049! – W: Azerb.: Inter Tabriz et Ahar, in valle fluvii Atschi Tschai, 1500 m, RECH. 14825! Ad ripam austro-orientalem salsam lacus Urmia (Rezaiyeh), inter Bonab et Khanian, RECH. 14767!, 14768! 7 km NW Bonab, 1350 m, RECH. 43159! Ad lacum Urmia (Rezaiyeh), 1200 m, STARM. 52!, 65! Lake Rezaiyeh, E side near Haft Cheshmeh, 1280 m, WDB. & SHIRDELPUR 14947! SE side Lake Rezaiyeh, 1280 m, WDB. & SHIRDELPUR 14952! In litore salso lacus Rezaiyeh prope Sharafkhaneh, 1400 m, AELLEN & BEHB. 30078-E!, 30079-E!, RECH. 43642! Lur.: Dow Rud, KOELZ 18535! – S: Fars.: Daryacheh-ye Maharlu, 20 km E Shiraz, 1450 m, BOKHARI et al. 14844-A!, GRANT 15014! – E: Khor.: 5 km S Sabzevar, 940 m, REJAMAND & ARAZM 32545! – C: Tehr.: Varamin, Gharchak, Eshghabad, BARKHORDARI 41729! Kavir-e Varamin, 750 m, DINI & BAZARGAN 23278! Qazv.: In collibus Halkedar ad Mardabad prope Karaj, 1200 m, RECH. 6835! Kashan: Kavir-e Kashan, SHAR. & AELLEN 30138-E! Yazd: Jandaq to Khvor (Khour), Rudkhaneh Shur, 700 m, TERME & MOUSSAVI 40282-E!
Turcomania: Ashkhabad, SINT. 1223b!, LITW. 67!
Afghanistan: NE: Kataghan: N Kunduz (Qunduz), NEUB. 1018! Qizil Qala, Amu Darya, VI. 1967, PELT!

Distr. gen.: Throughout Europe and SW Asia to China.

The "blanket" name *S. europaea* L. has been used for this very variable species with a very wide range. Even in W Europe where many studies have been carried out, the taxonomy and nomenclature is still in a confused state. In SW Asia no critical work has been carried out and although there are some differences in the form and structure of the fertile segments among our specimens, I have been unable to recognize any clear variants; although specimens from E Persia, Turcomania and Afghanistan tend to have narrower segments than those further west.

I have only cited specimens that can confidently be assigned to *Salicornia*; many immature or solely vegetative plants may belong here, and widen the known geographic range, but have been left out of the account.

The specific epithets "*herbacea* L." and "*prostrata* PALL." have also been applied for this species in our area.

24. *Microcnemum*

I.C. HEDGE, Edinburgh

Microcnemum UNGERN-STERNB., Atti Congr. Bot. Firenze 1874: 280 (1876).

Lit.: G. WAGENITZ, Neue und bemerkenswerte Chenopodiaceen Inneranatoliens, Berichte der Deutschen Botanischen Gesellschaft 72, 3: 152–154 (1959). J. MOLERO, Taxonomia del genero Micronemum UNGERN-STERNB., Collectanea Botanica a Barcinonensi Botanico Instituto Edita 16: 327–336 (1986).

Dwarf glabrous herb with articulated stems. Stems erect, fleshy, with few branches. Leaves vestigial, opposite and connate, persistent. Inflorescence cone-like with the minute flowers sunk in the axis; each bract-like leaf subtending 2–3 flowers, i.e. 4–6 flowers in each whorl. Perianth segments vestigial or absent. Stamen 1. Seed vertical somewhat flattened, ± lenticular, with a distinctly granular testa; endosperm present; embryo curved. – Type of genus: *M. fastigiatum* LOSCOS & PARDO ex UNGERN-STERNB. = *M. coralloides* (LOSCOS & PARDO) BUEN.

Monotypic. Differing from *Salicornia* in the presence of endosperm and the flowers arranged in a line (not in a triangle) and from *Arthrocnemum* in the ± absent perianth.

1. ***M. coralloides*** (LOSCOS & PARDO) BUEN, Anales Soc. Esp. Hist. Nat. 12: 431 (1883).
Syn.: *Arthrocnemum coralloides* LOSCOS & PARDO, Ser. Inconf. Pl. Arag. 90 (1863). *Microcnemum fastigiatum* LOSCOS & PARDO ex UNGERN-STERNB., Atti Congr. Bot. Firenze 1874: 280 (1876).
Icon.: ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16c: 552, fig. 206 (1934). MOLERO, Collect. Bot. 16: 331, fig. 1 (1986). – Tab. 85.
Type (Spain) "Hab. ad ripas orientales lacunae Laguneta de Chiprana et prope Caspe in loco los Pallaruelos, ubi in solo salsuginosa et sterili crescit, sed rara est"; lectotype COI-WILLK.! cf. MOLERO, Collect. Bot. 16: 332 (1986).

Annual, 5–10 cm, purplish, with few to several branches, all ± erect and terminating in cone-like inflorescences 15–30 mm long. Seeds 0,8 x 0,5 mm, reddish magenta; embryo 0,8 x 0,2 mm, terete, curved at a c. 45° angle (neither coiled nor cyclical).

Persia: W: Azerb.: Asbforushan near Sarab, IZADYAR 14808-E! Arak: N Kavir-e Maighan (Meyghan), near Deh-e Namak, near margin of salt lake, in high-salt soils, 1650 m, AKHANI 1112 (TARI – n.v.).

Distribution: E & C Spain, C Turkey, Syria, C Persia, Armenia.

WAGENITZ (l.c.: 153) described subsp. *anatolicum* WAGENITZ from the Tuz Gölü in central Turkey mainly because of the strongly granular testa surface (inconspicuously so in the Spanish plant). BOTSCHANTZEV & BARZEGJAN, Bot. Zhurn. 57: 504 (1972) have recorded it from Armenia, but it is not possible to confidently assign the Persian plant to either subspecies. Flowering material needs to be studied to determine whether or not perianth segments are present, and whether all the flowers are hermaphrodite. In Spain, FONT QUER (Cavanillesia 1: 20, 1928) recorded that the outer of the 3 flowers in each leaf axil is male and the inner one is hermaphrodite; this seems not to be the situation in our material where 4–6 seeds mature in each whorl.

The very disjunct distribution of the species is of great phytogeographical interest. In all areas it is restricted to the most saline habitats.

25. *Suaeda*

H. AKHANI, Tehran & D. PODLECH, München

Suaeda SCOP., Introd. Hist.-Nat.: 333 (1777) – nomen conserv.

Syn.: *Schoberia* C.A. MEY. in LEDEB., Icon. Pl. Fl. Ross. 1: 11 (1829). *Schanginia* C.A. MEY. in LEDEB., Fl. Altaica 1: 394 (1829). *Brezia* MOQ. in DC., Prodr. 13, 2: 167 (1849). *Chenopodina* MOQ. in DC., l.c.: 159.

Lit.: M.M. ILJIN, Systematike roda Suaeda FORSK. i Tribe Suaedeae RCHB., Sovietskaja Botanika 5: 39–49 (1936). C.C. TOWNSEND, Contributions to the flora of Iraq. XIV. Notes on some genera of Chenopodiaceae, Kew Bulletin 35: 291–296 (1980). V.V. NIKTIN & A.M. GELDIKHANOV, Opredelitel Rastenii Turkmenistana: 173–174 (1988).

Annuals, undershrubs or shrubs. Leaves alternate, fleshy, terete, semi-terete or flat. Flowers borne in leaf axils (leaf-like bracts), hermaphrodite and unisexual, subtended by 2–3 minute, scarious pellucid bracteoles, forming glomerules borne in the leaf axils or at the leaf-base at some distance from the axil. Perianth 5-merous, segments united at least at the base, fleshy, unchanged or sometimes in fruit with transverse or longitudinal tubercle-like or wing-like outgrowths. Stamens 5. Stigmas 2–3, rarely more. Pericarp thin, sometimes adnate to the perianth. Seeds vertical, oblique or horizontal, in pistillate flowers mostly vertical. Endosperm scanty or absent. Embryo spirally coiled, compressed. – Type of genus: *S. vera* FORSSK. ex J.F. GMELIN (typ. cons.)

Suaeda is an extremely difficult genus and no modern revision of all the Eurasian and African species exists. The main problems are the few often inconsistent taxonomic characters and the extreme polymorphism of the species. In addition, there is a further problem due to the fleshy nature of the leaves, flowers and young shoots; as a result, on drying, important characters are lost. According to many references in the literature, the annual species usually produce two kinds of seeds. Those of the earlier (summer) flowers being black and glossy, or with a fine reticulation on the testa, whereas those of the later (autumn) flowers are larger, light brown, dull, with a coarser reticulation on the testa. But, in the rich material investigated by us, we could not distinguish these two kind of seeds. The descriptions of seeds in this account are always based on late collections.

Of the 16 species recognized in this account, the following 9 seem more or less well defined: *S. aegyptiaca*, *S. altissima*, *S. arcuata*, *S. dendroides*, *S. linifolia*, *S. microphylla*, *S. monoica*, *S. paradoxa* and *S. physophora*. The remaining species belong to three widespread polymorphic and difficult groups: a) the *fruticosa*-group including *S. fruticosa*, and *S. baluchestanica*; b) the *acuminata*-group including *S. acuminata* and *S. microsperma*, and c) the *maritima*-group including *S. maritima*, *S. salsa* and *S. Olufsenii*. The Flora Iranica area covers only a small part of the total distribution of each of these species-groups and a monographic study is necessary to solve all the taxonomic problems evident also in our material.

For identification and using the key, it is usually necessary to have fruiting material.

1a. Shrubs or subshrubs 2
b. Annual plants, sometimes woody at the base 7
2a. Glomerules of flowers inserted on the petiole-like base of the leaves at some distance from the axil .... 12. *S. microphylla* PALL.
b. Glomerules of flowers borne directly on the leaf axil; floral leaves sessile 3
3a. Leaves filiform, acute, 20–45 mm long; flowers solitary or rarely 2–3 together; fruiting perianth strongly inflated; inflorescence paniculate .... 11. *S. physophora* PALL.
b. Leaves oblong-linear or if filiform then less than 20 mm long; glomerules mostly with more than 3 flowers; fruiting perianth not inflated 4
4a. Plants mostly black on drying; leaves ± flat or if terete or semi-terete then inflorescence intricately branched 5
b. Plants unchanged on drying; leaves semiterete, up to 15 mm long, exceeding the glomerules; inflorescence rarely branched or if so the branches divaricate .... 13. *S. dendroides* (C.A. MEY.) MOQ.
5a. Fruiting branches ± pendent; flowers ovate; seeds vertical .... 16. *S. monoica* J.F. GMELIN
b. Fruiting branches not pendent; fruiting hermaphrodite flowers ± flattened from the top; seeds vertical, oblique and horizontal 6
6a. Young shoots papillose; leaves 5–15 × 1–4 mm, semi-terete or somewhat flattened; fruiting branches strongly intricate ± zig-zag; seeds 1–1,5 × 0,7–1,2 mm .... 14. *S. fruticosa* J.F. GMELIN
b. Plants mostly glabrous; leaves narrowly oblong to oblong, the lower up to 25 × 8 mm, always flat; fruiting branches spreading; seeds 1,1–1,7 × 1–2 mm .... 15. *S. baluchestanica* AKHANI & PODLECH
7a. Glomerules of flowers inserted on the petiole-like base of the leaves at some distance from the axil 8
b. Glomerules borne on the leaf axil 10
8a. Leaves mostly linear-filiform, the lower ± flat, the upper semi-terete; seeds smooth or obscurely reticulate .... 3. *S. altissima* (L.) PALL.
b. Leaves all flat; seeds with a granular testa 9
9a. Leaves all nearly equal in length, the plant appearing leafy throughout; flowers solitary or few in glomerules; fruiting perianth segments hooded, in pistillate flowers completely united .... 5. *S. linifolia* PALL.
b. Lower leaves much longer than the floral ones, the inflorescence appearing nearly leafless; glomerules mostly many-flowered; fruiting perianth segments not hooded, in pistillate flowers connate up to 2/3 of their length .... 4. *S. paradoxa* (BUNGE) BUNGE
10a. Perianth adnate to the pericarp in the lower part or up to 2/3 of the ovary; filaments inserted on a distinct disc around the middle part of ovary; ovary conical .... 1. *S. aegyptiaca* (HASSELQ.) ZOHARY

b. Perianth free from pericarp; filaments not as above; ovary ± globular 11
11a. Fruiting perianth with distinct wing-like or tubercle-like outgrowths; stigmas 2 (very rarely more), very short, c. 0,5 mm long 12
b. Fruiting perianth very rarely with transverse outgrowths, but sometimes with vertical keel-like outgrowths; stigmas 3, distinctly longer 14
12a. Dwarf high-altitude plants, 3–15 cm high; flowers c. 2 mm broad; seeds 0,75–1,25 mm in diameter .... 10. *S. Olufsenii* PAULSEN
b. Plants larger, growing at lower altitudes; flowers and seeds larger 13
13a. Plant semi-hemispherical, drying black or grey; branches divaricate; leaf-like bracts spreading .... 9. *S. salsa* (L.) PALL.
b. Plant not semi-hemispherical, mostly branched from the very base, drying yellowish or unchanged; branches upright; leaf-like bracts erect, subadpressed .... 8. *S. maritima* (L.) DUMORT.
14a. Leaves terete, linear, obtuse, arcuate; perianth of fruiting hermaphrodite flowers obpyriform, strongly fleshy and spongy; glomerules many-flowered, compact .... 2. *S. arcuata* BUNGE
b. Leaves ± flat; fruiting perianth not spongy 15
15a. Leaves ± obtuse, with a distinct sometimes caducous c. 2–4 mm bristle .... 7. *S. microsperma* (C.A. MEY.) FENZL
b. Leaves acute or acuminate, without a bristle or with a short seta up to 2 mm long .... 6. *S. acuminata* (C.A. MEY.) MOQ.

1. ***S. aegyptiaca*** (HASSELQ.) ZOHARY, Journ. Linn. Soc. Bot. 55: 636 (1957).
Syn.: *Chenopodium aegyptiacum* HASSELQ., It. Palest.: 460 (1757). *Suaeda baccata* J.F. GMELIN in L., Syst. Nat., ed. 13, 2: 503 (1791). *Schanginia baccata* (J.F. GMELIN) MOQ., Chenop. Monogr. 119 (1840). *Schanginia aegyptiaca* (HASSELQ.) AELLEN in RECH.f., Fl. Lowland Iraq: 195 (1964).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 235 (1966). – Tab. 86.
Type: "Alexandria, prope maris Mediterranei litus", coll. unknown, probably lost.

Annual, 10–100 cm high, much branched, erect, ascending or rarely decumbent, herbaceous or rarely woody at base, glabrous, sparsely covered with salt particles; spring and early summer specimens light green in colour, late summer and autumn plants dark green to reddish-green, when dry often yellow to green. Stems white, light green or red. Leaves oblong-linear, fleshy, slightly kidney-shaped in cross section, sometimes flattish, obtuse, attenuate at base, 5–20(–30) x 1–3(–4) mm; leaf-like bracts shorter, linear-oblong to obovate, somewhat arcuate, equal to or longer than glomerules. Bracteoles 1 mm long. Glomerules inserted on very short branchlets, 1–30 flowered. Flowers sessile or rarely with a very short pedicel; fruiting hermaphrodite flowers 2–4 mm long, spongy; perianth segments united up to 1/2 the length, adnate to the pericarp. Filaments inserted on a disc above the middle of the ovary. Ovary conical. Stigmas 3, 1–1,5 mm long, villous. Seeds vertical, 1–1,4 x 0,7–1,2 mm, shining, with reticulate surface.

Persia: W: Lur.: Pol-e Dokhtar, 700 m, MOZAFFARIAN 58424! Khuz.: 70 km from Ahvaz to Ramhormoz, MOZAFFARIAN 58500! 75 km from Ahvaz to Andimeshk, 120 m, MOZAFFARIAN 58457!, 58554! Ahvaz, 50 m, GRANT 15920!, MOZAFFARIAN 58470!, TERME & MOUSSAVI 40213-E! 15 km from Haft Gel to Ramhormoz, 100 m, MOZAFFARIAN 58485! Between Ahvaz and Hamidiyeh, 30 m, MOZAFFARIAN 58509! Bibi Hakimeh between Omidiyeh and Darkhovin, TERME & MOUSSAVI 35361-E! – S: Fars.: 30–60 km S Jahrom, 800–850 m, ASSADI & AKHANI 61842!, 61868! 30 km W Jahrom, 700 m, ASSADI & AKHANI 61832! 8 km from Shiraz to Jahrom, ALAVA 10709! Bushehr, MOZAFFARIAN 58613! SE Bushehr, 1 m, BOKHARI, HDG. & WDB. 14808! Bakhtegan lake near Kharameh, 1570 m, FOROUGHI & ASSADI 15017!, 15025!, 15033!, 15035! Tashk lake between Gomban and Katak, 1700 m, ASSADI & AKHANI 61825! Between Kaki and Khvormuj after Mand river, 20 m, ASSADI & AKHANI 62029! Lake Maharlu 30 km E Shiraz, 1600 m, GRANT 16812! 18 km SE Shiraz, Pol-e Fasa, 1600 m, GRANT 16956! Kerman: Bam, BROWN 343-A! Hamun-e Jaz Murian, 350 m, ASSADI & MOZAFFARIAN 25710!, MOZAFFARIAN 52719! Jiroft to Kahnuj, 600 m, ERSHAD & al.! Zehkalat near Kahnuj, 300 m, MOZAFFARIAN 45620! Between Kahnuj and Sorkh Qaleh, 420 m, ERSHAD & al. 35404-E!, 40144-E! Between Chah Reza and Ziarat, 350 m, ERSHAD & al. 40092-E! Between Qaleh Gandji, 400 m, ERSHAD & al.! 37 km from Kerman to Bafq, 1280 m, ASSADI & ABOUHAMZEH 36406! Sircheh between Kerman and Shahdad, 1750 m, ZEHZAD 85246! Lar: Ab-e Garm between Qir and Lar, ASSADI & AKHANI 61833! 3 km from Bastak to Bandar-e Lengeh, 700 m, ASSADI & AKHANI 61920! 25 km from Bandar-e Lengeh to Bastak, Bavard region, 30 m, MOZAFFARIAN 45186! Near Bandar-e Lengeh, 1000 m, ASSADI & AKHANI 61967!, IRANSHAHR & TERME 14802-E! Gav Bandi, MOZAFFARIAN 58664! 40 km SE Minab, SOJÁK 4898! 11 and 115 km from Minab to Jask, 20 m, MOZAFFARIAN 45076!, 45085! 30 km W Bandar Abbas, LÉONARD 5912! 15–25 km from Bandar Abbas to Minab, 30 m, MOZAFFARIAN 45661! Tiab, 20 m, MOZAFFARIAN 45063! Nakhl-e Nakhoda, 10 m, MOZAFFARIAN 34040! 7 km from Hajjiabad to Bandar Abbas, 850 m, MOZAFFARIAN 44995! Between Gahkom and Sarchahan, 650 m, MOZAFFARIAN 45002! Bandar-e Charak, 10 m, MOZAFFARIAN 45227! Between Bandar-e Lengeh and Bandar-e Charak, ASSADI & AKHANI 61969! Bandar-e Charak, Bandar-e Maqam, sea-level, ASSADI & AKHANI 61902!, 62005! 115 km W Bandar-e Lengeh, GRANT 16997! 27 and 75 km from Lar to Bastak, 600 m, ASSADI & AKHANI 61895!, 61897! Qeshm Island, TERME & MOUSSAVI 34563! Bal.: Ziroki near Eskelebad, 1400 m, MOZAFFARIAN! Chahan, 200–250 m, MOZAFFARIAN 39929! Shuru SW Zahedan, 1450 m, MOZAFFARIAN 52694! Sahlabad between Birjand and Zahedan, 1430 m, TERME & MOUSSAVI 34404-E! Makran: Jask, 10 m, MOZAFFARIAN 45094! Between Ghattam and Bandini, 155 km W Tis, 50 m, ERSHAD & al. 35389-E! 9 km NW Paskuh, SOJÁK 609! – E: Sistan: Salt marshes, HENDERSON 4! – C: Yazd: Kavir-e Lut, 20–40 km SE Khvor to Djafrud, 1150–1320 m, TERME & MOUSSAVI 34405! Rud-e Shur, 3 km to Bafq from Yazd, 950 m, ASSADI & ABOUHAMZEH 36406! Kavir-e Marvast near Rahmatabad, 1600 m, ASSADI & AKHANI 61772! Between Mahriz and Marvast, 1500 m, ASSADI & AKHANI 61759!

Distr. gen.: Libya, Egypt, Israel, Jordan, Arabian peninsula, Persia.

See note under *S. arcuata*.

2. *S.* ***arcuata*** BUNGE, Beitr. Fl. Russl. 285 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 461 (1854).
Icon.: Tab. 87.
Type: Jan-Darja, A. LEHMANN, LE? , P?

Annual, 20–80 cm high, much branched, erect or ascending, herbaceous or rarely woody at the base, glabrous, dark green or sometimes turning reddish; dry specimens often brown. Stem yellowish, purplish or reddish. Leaves oblong-linear to narrowly obovate, terete to semi-terete, slightly kidney-shaped in cross section, obtuse, 5–15(–20) × 0,5–1,5 mm; leaf-like bracts shorter, mostly narrowly obovate and clavate, arcuate upwards, shorter or longer than the glomerules. Glomerules on very short branchlets, very compact, with up to 20 (or more) flowers. Flowers sessile or very rarely very shortly pedicellate; the pistillate ones 1–1,5 mm long, the hermaphrodite 1–2,5 mm long; perianth segments connate for 1/3 to 1/2 of their length, spongy-fleshy, especially in hermaphrodite flowers, cucullate at the apex, connivent. Stigmas 3, up to 1 mm long, papillose. Seeds mostly vertical, 1–1,5 × 0,8–1,1 mm, black, shining, obscurely reticulate.

Persia: W: Ham.: E Qahavand to Hajjiabad, 1650 m, ASSADI 61089!, 61091!, 61099! Hamadan to Qazvin, 1700 m, ASSADI 61071! 15 km SE Kabudar Ahang near Nematabad, 1700 m, ASSADI 61035! Esf.: 120 km SE Esfahan 7 km from Hoseynabad to Varzaneh, 1400 m, ASSADI & ABOUHAMZEH 36550! 23 km E Varzaneh near Gav Khuni, 1350 m, ASSADI & ABOUHAMZEH 36568! W of Batlaq-e Gav Khuni, 1350 m, ASSADI & ABOUHAMZEH 36572! Esfahan, SOJÁK 6837! Kuh-e Sofeh (Saefah), STAPF 794! 38 km from Natanz to Kashmar, 1080 m, FOROUGHI & ASSADI 15182! Arak: 18 km N Arak to Farmahin, AKHANI 1068! 30 km from Arak to Davudabad, 1700 m, MOZAFFARIAN & KARIMI 37874! Davudabad, ABAI & MODJIB 40429-E! N Kavir-e Meyqan between Eybakabad and Davudabad, 1680 m, AKHANI 1127!, AKHANI & GHORBANLI 5399! Margin of Arak salt lake N Kavir-e Meyqan, AKHANI 1055! Island of Meyqan, 1650 m, AKHANI 1080! 37 km NE Arak between Sahlabad and Ebrahimabad, AKHANI 1101! – S: Kerm.: Kerman, 1700 m, MOZAFFARIAN 45643!, ZEHZAD 606!, 85/009! Between Zarand and Rafsanjan NW Kerman, DADASHZADEH in PABOT DK-196! 130 km from Kerman to Sarchashmeh, 2000 m, ZEHZAD 86/1513! – E: Khor.: 23 km SW Ferdows, 1250 m, REJAMAND & ARAZM 32535! Ferdows, Mashhad Univ. Staff 731.21! W Anabat, 800 m, WDB. & FOROUGHI 18894! 63 km from Mashhad to Sarakhs near Shurak, 750 m, WDB. & FOROUGHI 18849! Between Shurak and Mozduran at road to Sarakhs, AYATOLLAHI & ZANGUEI 13916! 15 km W Mozduran, 600 m, IRANSHAHR 15292-E! 65 km from Sabzevar to Kashmar, 1500 m, ASSADI & ABOUHAMZEH 40148! 35–52 km from Kondor to Bajestan, 800 m, ASSADI & ABOUHAMZEH 40173!, 40175! Rud-e Kal Shur 5 km S Sabzevar, 2000 m, ASSADI & ABOUHAMZEH 40122! Abbasabad near Sabzevar, 910 m, ROWSHAN 6860! 45 km SW Sabzevar, 880 m, FOROUGHI 18831! NE Torbat-e Jam, 750 m, JOHARTCHI & ZANGUEI 15411! Tabas, KOELZ 16861! Showkatabad prope Birjand, 1400 m, RECH. 4144! – C: Tehr.: Rud-e Shur between Tehran and Qom, 950–1000 m, AKHANI 4786!, 4815!, BABAKHANLOU & AMIN 2797!, BUTTLER & al. 31854!, 31869!, 31889!, FOROUGHI 10509!, 10557!, SAB. 559! 23 km NE Qom near Asgarabad, 850 m, AKHANI 5809! Daryacheh-ye Howz-e Soltan (Qom lake), 830 m, AKHANI 5817!, RIAZI 65126!, SANII 6527!, UOTILA 19377!, 19384! 30 km N Qom, PABOT 7477! 15 km S Tehran, 1030 m, UOTILA 19412! 60 km S Tehran to Qom, 1100 m, UOTILA 19404! 20 km W Qom to Arak, 1000 m, AMIN & BAZARGAN 18869! Ebrahimabad (Moshkabad) to Qom, 640 m, DINI & BAZARGAN 23404! Masileh, SAB. 557! Qom-Rud to Masileh, Kuh-e Sefid, IRANSHAHR & MOUSSAVI! Chashmeh Shah, IRANSHAHR & MOUSSAVI 15398-E! Nowshabad to Ab-e Shirin, 780 m, TERME & MOUSSAVI 40095-E!, 40258-E!, 30248-E! Ab-e Shirin to Fakhrabad, IRANSHAHR & MOUSSAVI 15366-E!, 15391-E! 11 km S Kushk-e Nosrat to Qom, 850 m, BUTTLER & FAULER 31836! 22 km E Saveh S Anjilavand, AKHANI 1233! Kavir-e Namak, Kushkuh, IRANSHAHR & MOUSSAVI 40229-E! Kavir Prot. Reg.: Saruzan between Garmsar and Kahak, 700 m, IRANSHAHR & MOUSSAVI 15367-E!, 40245-E! Mobarakieh,

700 m, AKHANI 1325!, FREITAG 13977!, IRANSHAHR & MOUSSAVI 40175-E!, 40236-E!, RECH. 50102!, 50105! Caravan-Sarai Shah Abbas, 800–850 m, AKHANI 1366!, IRANSHAHR 30294-E! Siah Kuh in ditione Caravan-Sarai Shah Abbas, 1200 m, AMIN & BAZARGAN 18338!, RECH. 46152! Eyn or-Rashid Caravan-Sarai, 1000 m, IRANSHAHR & MOUSSAVI 15372-E!, 15376-E!, WDB. & FOROUGHI 15220! Qazv.: Mardabad S Karaj, 1250 m, HDG. & al. 14670!, RECH. 6831! 77 km W Karaj, 2100 m, BABAKHANLOU & al. 2825! 15 km from Mardabad to Eshtehard along Rud-e Shur, 1200 m, AKHANI & al. 2066! Qazvin, MOBAYEN 602! 12 km SW Ab-e Yek 2 km after Qarpuzabad, 1100 m, AKHANI & LARI 5614! Damgh.-Semn.: 30–40 km SE Semnan, 1050 m, TERME & MOUSSAVI! S Semnan to Kavir, REJAMAND & ARAZM 32583! 23–32 km SW Semnan, AKHANI 4021!, 4048! Kuhha-ye Anjirab, 1500–1650 m, TERME & MOUSSAVI 30224-E!, 40203-E! Shahr.-Bust.: Turan Prot. Reg.: 4 km ESE Razveh NE Torud, Chah Palang gorge, 1200 m, AKHANI 4131!, FREITAG 14125! Along Rud-e Kal Shur between Delbar and Ahmadabad, AKHANI 4172!, 4215! Between Delbar and Rud-e Kal Shur, 700 m, WDB. & FOROUGHI 18775! Kashan: 28 km from Delijan to Esfahan, 1780 m, AMINI 6439! 2 km from Meymeh to Esfahan, KAVOUSI 6867! Kavir-e Kashan, SHAR. & AELLEN 3083! Sefidabad, 940 m, TERME & TEHRANI 40035-E!, 40050-E! N Aran, 800 m, FOROUGHI & BAZARGAN 3244! Yazd: 203 km from Tabas to Yazd before Robat-e Posht-e Badam, 1300 m, ASSADI & ABOUHAMZEH 40245!
T u r c o m a n i a : Prope Ashkhabad, LITW. 666!, 667!, 669!, 670!, 686!, SINT. 1221!, VASAK!
A f g h a n i s t a n : N: Mazar-i Sharif: 3 km N Haibak, 840 m, PODLECH 17010! Ghaznigak between Haibak and Tashkurghan, 620–680 m, FREITAG 3911!, PODLECH 17004!, 22369! 35 km S Tashkurghan, 410 m, FREITAG 3902!, PODLECH 16994-a! 15 km W Balkh, 340 m, BRECKLE 4683! Shibarghan: 20 km NW Shibarghan to Andkhui, 310 m, PODLECH 16982! – **NW**: Maimana: 15 km NE Daulatabad, Dasht-e Laili 40km ENE Daulatabad to Shibarghan, 450 m, PODLECH 19812! Maimana, 950 m, NEUB. 4239! 45 km S Andkhui to Maimana, 370 m, PODLECH 16966! Herat: 80 km off Iranian border, 850 m, UOTILA 18940! – **SW**: Farah: 30 km N Anardarra to Shindand, 1000 m, PODLECH & JARMAL 29105! 6 km E Farah Rud, 800 m, BRECKLE 4892! – **SE**: Kandahar: Inter Safer et Darweshan ad fl. Helmand, 700 m., RECH. 34682! In valle fl. Helmand inter Qala Bist (Lashkargah) et Darweshan, 740 m, PODLECH 19638!, RECH. 34541! 25 km S Darweshan, 560 m, FREITAG 679! Lashkargah, FREITAG 2063! 50 km SE Lashkargah, 750 m, BRECKLE 4854 p.p.! 15 km N Lashkargah to Girishk, 800 m, PODLECH 22357! 55 km WNW Girishk to Dilaram, 1000 m, PODLECH 17103! Kajakai, 1000 m, ANDERSEN & PETERSEN 440!, PODLECH 31283! 15–45 km E Kandahar to Ghazni, 1045–1200 m, PODLECH 16865!, UOTILA 18911! E side Registan desert 40 km SE Kandahar, 1050 m, BRECKLE 4818! Bhagat, 600 m, RECH. 34644! – **E**: Kabul: Kabul, NEUB. 49/1950!, GILLI 2137! Nangarhar: Ghaziabad, PODLECH 19939! Ghazni: 1 km N Dila, 38 km SE Mukur (Moqur), 1980 m, PODLECH 19423! – **NE**: Kataghan: 8 km W Khinjan, 1000 m, UOTILA 18845! Khinjan, FOHLEN! Paigah Kotal (Kotal-Mirza Atbili) between Haibak and Pul-e Khumri, 1100 m, PODLECH 17013! Kunduz, 450 m, VOLK 71/671! Qizil Qala along Amu Darya, PELT! – **C**: Bamian: Zahre Zohak (Shahr-e Shak, Rote Stadt, Red Town) 16 km E Bamian, 2460 m, FREITAG 3964!, PODLECH 16030!, 17030!, 17032! Bamian, 2400 m, KOEIE 2823!, NEUB. 4473! Doab: Gorges S Doab, PABOT A-1245!, A-1249!
P a k i s t a n : Bal.: Chagai distr. 100 km SE Nushki 1 km off road to Dalbandin, 850 m, FREITAG & KOTHE 18745!

Distr. gen.: Middle Asia, Persia, Afghanistan, Pakistan.

S. arcuata and *S. aegyptiaca* look very alike. The former is an Irano-Turanian element, the latter a Saharo-Sindian one. In the Flora Iranica area both species are widely distributed. In the south of Persia they are sympatric and sometimes it is difficult to distinguish young plants. The presence of filaments inserted on a disc above the middle of the ovary and the adnation of the perianth to the pericarp are good characters to distinguish *S. aegyptiaca* from *S. arcuata* with filaments inserted at the base of the ovary and the perianth free from the ovary.

3. *S. altissima* (L.) PALL., Illustr. Pl.: 49 (1803).
Syn.: *Chenopodium altissimum* L., Spec. Pl.: 221 (1753). *Suaeda leiosperma* MOQ., Ann. Sc. Nat., Ser. 1, 23: 306 (1831). *S. heterocarpa* FENZL in LEDEB., Fl. Ross. 3: 781 (1851).
Icon.: PALL., l.c.: tab. 42. TAKHT., Fl. Armen. 2: 331, tab. 101 (1956). – Tab. 88.
Type: "Ad Astracanum" P.S. PALLAS.

Annual, 20–100 cm high, branched, erect, herbaceous or woody at the base, young stems sparsely covered with short fugacious hairs, otherwise glabrous. Leaves fleshy, filiform, terete or slightly flattened on upper side, sometimes in lower parts of the plant flat on both sides, acute to subobtuse, 10–20(–30) x 0,5–1,5(–2) mm; upper bract-like leaves gradually decreasing, longer or shorter than the clusters. Clusters borne on the petiole-like base of the subtending leaf at some distance from the axil, mostly loose and dendroid, rarely compact. Flowers ± globose, mostly pedicellate, rarely sessile, 0,5–2 mm in diameter (those damaged by frost often up to 3 mm in diameter). Perianth segments connate to 1/2 to 2/3 of their length. Stigmas 3, rarely 2 or 4, up to 1 mm long, villous. Seeds 0,9–2 x 0,7–1,5 mm, mostly vertical, black, shining, obscurely reticulate.

Persia: N: Gorg.: 7 km N "Galeh Payan" toward Gulf of Gorgan, ZEHZAD 87/209! 5 km S Gomishan = 10 km N Bandar-e Shah, –10 m, HEWER 4040! 52 km from Gomishan to Incheh Burun, –20 m, ASSADI & ABOUHAMZEH 43287! 5 km from Tangeli to Incheh Burun, 0–10 m, AKHANI 4392! N Pahlavi Dezh, –30 m, UOTILA 19221! 135 km from Shah Pasand to Bojnurd, 1000 m, IRANSHAHR & ZARGANI! Moh. Reza Shah Prot. Reg. (Golestan): N Robat-e Qareh Bil versus Almeh, 1300 m, RECH. 52959! Almeh, 1250 m, UOTILA 19179! Between Almeh and Behkadeh, 1300 m, WDB. & COBHAM 14238! Mirza Beyglu, 1200 m, GHORBANLI & AKHANI 4860! 22–24 km from Mirza Beyglu to Tang-e Gol, 900 m, ZEHZAD 82/230! Inter Dasht et Loveh, 125–130 km W Bojnurd, 1200 m, RECH. 37606! Solugerd, 1350 m, AKHANI 4334! Between "Sharlegh" and Chashmeh-ye Khan, ZEHZAD 82/249! Maz.: 32 km SE Chalus, FURSE 2868! – W: Azerb.: 35 km NW Mahabad to Rezaiyeh, 1280 m, LAMOND 4192!, RECH. 42170! 28 km from Tasuj (Tasvej) to Shahpur, 1350 m, ASSADI & SALEHI 32001! 10 km from Mohammad Yar, 1200 m, IRANSHAHR 40225-E! 10 km from Azarshahr to Bonab, 1300 m, TERME 30358-E! 15 km W "Gogan", 1320 m, ASSADI & AKHANI 61401! 11 km S Bonab, 1350 m, ASSADI & AKHANI 61302! 7 km N Bonab to Tabriz, 1350 m, LAMOND 4636!, 4638! 7 km NW Bonab versus ripam lacus Rezaiyeh (Urmia), 1350 m, RECH. 43145!, 43152! Azarshahr 10 km from Bonab, 1300 m, TERME 30358-E! Sharafkhaneh, BEHB. & AELLEN 40138-E!, ASSADI & SALEHI 31957! Bandar-e Sharafkhaneh, 1500 m, ASSADI & AKHANI 61504! Between E coast of Urmia lake and Akhund Qeshlaq, 1400 m, ASSADI & AKHANI 61349! N Akhund Qeshlaq, 1400 m, ASSADI & AKHANI 61371! "Qarchili" near Miandoab, 1280 m, ZEHZAD & SIAMI 610! SE lacus Rezaiyeh (Urmia) inter Bonab et Khanian, RECH. 14771! E side Rezaiyeh lake (Urmia), Bandar-e Rahmanlu, 1350 m, ASSADI & SALEHI 32067! SE side Urmia lake, Qareh Qeshlaq Prot. Reg.: Near Zarrineh Rud, ZEHZAD & KIABI 9030! SW side Rezaiyeh Lake, 1300 m, JACOBS 6876! Chapaqlu, 1350 m, ASSADI & AKHANI 61321-a! 25 km NE Rezaiyeh (Urmia), Zanbil mountain, 1270 m, KHARA 6999! Bandar-e Golmankhaneh, 1350 m, ASSADI & SALEHI 32049-a! Tabriz, 1350 m, RECH. 43818! Tabriz, along Talkheh Rud, 1500 m, ASSADI

& AKHANI! Basmenj, TERME 39354-E! 45 km NW Marand to Maku, 1020 m, UOTILA 19518! Evowghli, AMINI 1879! Dasht-e Moghan: 14 km SE Alirezaabad-e Jadid, 50–90 m, LAMOND 3170!, RECH. 40121! Alirezaabad-e Jadid, IRANSHAHR 40227-E! Dasht-e Moghan, SCHMID 6558! Between Khodaafarin and Parsabad, 200 m, ASSADI & AKHANI 61598! Khamseh: Zanjan, 1650 m, AKHANI & LARI 5731! Saleh between Ab-e Garm and Qeydar (Ghidar), 1600 m, ASSADI 60978! Ham.: 44 km from Avej to Hamadan, 1600 m, ASSADI 61044!, 61045! 70 km from Bijar to Hamadan, 1800 m, ASSADI 61015! Arak: 90 km NW Arak near Deh-e Now, 1700 m, AMIN & BAZARGAN 18815! Dasht-e Shomal near Golpayegan, 1600 m, NOWROOZI 3073! – E: Khor.: Between Darreh Gaz and Lotfabad, 200 m, ASSADI & ABOUHAMZEH 43384! 35 km E Shirvan, 1100 m, UOTILA 19077! Garnia, KOELZ 16639! 53 km from Ash Khaneh to Shahrabad, 700 m, Mashhad Univ. Herb. 16633! Shahabad, KOELZ 16676! – C: Qazv.: Qazvin, 1330 m, UOTILA 19434! Damgh-Semn.: Chashmeh Ali NW Damghan, 1500 m, RECH. 56390! Shahmirzad to Chashm, IRANSHAHR & ZARGANI 15287-E!

Turcomania: Ashkhabad, LITW. 682!, 683!, VASAK! Suluklü (Saratowka), SINT. 856! Kizyl Arvat: Karakala, ad Nurgeli-chan, SINT. 1626-b!

Afghanistan: SE: Kandahar: In valle fl. Helmand inter Qala Bist et Darweshan, 700–800 m, RECH. 34540!

Distr. gen.: Spain, Balkans, S. Russia, Caucasia, Middle Asia, Anatolia, Syria, Lebanon, Persia, Afghanistan.

4. *S. paradoxa* (BUNGE) BUNGE, Acta Horti Petrop. 6: 427 (1880).

Syn.: *Belovia paradoxa* BUNGE, Beitr. Fl. Russl. 286 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 462 (1854).

Icon.: Tab. 89.

Type: Zwischen Buchara und Samarkand, A. LEHMANN, LE? , P?

Annual, 50–120 cm high, glabrous, branched. Main stems elongated, much branched in upper part. Leaves mostly crowded in lower part or on sterile shoots, hence the plant appearing leafy in lower part and leafless above. Leaves linear, flat, 10–30 x 1–2 mm, acute, with a distinct midrib in lower surface; bract-like leaf much shorter, keeled on lower surface. Glomerules on short branchlets inserted at some distance from the axil on the basal part of the leaves, mostly many-flowered, forming a paniculate inflorescence. Flowers mostly pedicellate, bisexual or pistillate. Perianth subglobular to slightly ovate; segments of the bisexual flowers connate up to 1/2 of their length, cucullate; segments of the pistillate flowers connate to 2/3 of their length. Stigmas 3, rarely 4, very short, smooth. Seeds vertical, 1,2–1,6(–2) x 1–1,3(–1,5) mm, black, with a distinct granular surface.

Afghanistan: E: Kabul: Bank of Logar river near Charasiah (Tscharasiah), 1780 m, GILLI 2138! – C: Doab: Darreh-i Shikar (Darrah-e Shekari) 4 km S Ghandak between Bamian and Doshi, 2250 m, ANDERS 4684! Doab (i Mekhe Zarin), VOLK 1756!

Distr. gen.: Middle Asia, Afghanistan.

5. *S. linifolia* PALL., Illustr. Pl. 47 (1803).

Syn.: *Schanginia linifolia* (PALL.) C.A. MEY. in LEDEB., Fl. Alt. 4: 395 (1833). *S. inderiensis* BUNGE, Beitr. Fl. Russl. 284 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb.

7: 460 (1854). *Suaeda inderiensis* (BUNGE) VOLKENS in ENGLER & PRANTL, Natürl. Pflanzenfam. 3, 3, 1a: 80 (1893).
Icon.: PALL., l.c.; tab. 40 (1803). – Tab. 90.
Type: "Ad rivum salsum Charasacha in lacum Eltoniensem e deserto defluentem", P.S. PALLAS.

Annual, 10–50 cm high, erect, branched mostly in the inflorescence, leafy throughout, glabrous, young shoots sometimes turning black on drying. Leaves fleshy, flat, sometimes reddish, linear-lanceolate, 10–20 x 1–2 mm, acute, attenuate at base, the leaf-like bracts nearly equal in length. Glomerules 1–5 flowered, on short branchlets inserted at some distance from the axil on the basal part of the subtending leaf. Flowers sessile or shortly pedicellate, bisexual and pistillate. Perianth of bisexual flowers obpyriform to obovate, narrowed towards the base, its segments connate to 2/3 of their length, strongly cucullate; segments of pistillate flowers completely united. Stigmas 2 or 3, very short, smooth. Seeds vertical, 1,75–2,25 x 1,5–2 mm, with a distinct granular surface.

P e r s i a : C: Kashan: 25 km after Delijan to Esfahan, 1325 m, KAVOUSI 6853!
A f g h a n i s t a n : NE: Kataghan: Askalan (Asqalan), 36°50'N, 68°44'E, 420 m, YARMAL 34!

Distr. gen.: Middle Asia, Sibiria, Mongolia, Persia, Afghanistan.

6. *S.* ***acuminata*** (C.A. MEY.) MOQ., Ann.Sc. Nat. Ser. 1, 23: 309 (1831).
Syn.: *Schoberia acuminata* C.A. MEY. in LEDEB., Fl. Alt. 1: 398 (1829). *S. transoxana* BUNGE, Beitr. Fl. Russl. 291 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 466 (1854). *Suaeda transoxana* (BUNGE) BOISS., Fl. Or. 4: 943 (1879). *S. cochlearifolia* WOLOCZAK, Denkschr. Akad. Wiss. Wien, Math.–Nat. Kl. 2. Abt. 51: 275 (1886). *S. catenatula* BORNM., Feddes Repert. 47: 55 (1939).
Icon.: LEDEB., Icon. Pl. Fl. Ross.: Tab. 44 (1829). – Tab. 91.
Type: "Hab. in deserto soongoro-kirghisico". C.A. MEYER, LE.

Annual, 5–100 cm high, erect or ascending, much branched from sometimes woody base. Stems often reddish, glabrous or rarely the young shoots with fugacious hairs. Leaves fleshy, flat, in dried state distinctly wrinkled and with ± hyaline margins; lower leaves linear-lanceolate, acute or acuminate, sometimes obtusish, with or without a very short seta, 5–15 x 1–2,5(–3,5) mm; leaf-like bracts smaller, linear-lanceolate to ovate, longer than or equal to the glomerules. Glomerules with 1–10 flowers. Hermaphrodite flowers 2–3(–4) mm in diameter; unisexual flowers smaller. Perianth segments with a longitudinal keel, often cucullate, rarely with obscure transverse outgrowths. Stigmas 3(–4), 0,8–1,5 mm long, villous. Seeds mostly vertical, sometimes oblique and horizontal, 0,8–1,2(–1,3) x (0,6–) 0,7–0,9(–1) mm, dark brown or black, strongly convex, shining.

P e r s i a : W: Azerb.: 39 km W Marand, 1050 m, PABOT 5348! Inter Marand et Khvoy, 1100 m, SAB. in GAUBA 2110! 28 km from Marand to Maku, 1200 m, ASSADI & SALEHI 32029! 19–53 km from Tabriz-Tehran road to Ahar along Talkheh Rud, 1600 m, ASSADI & AKHANI 61543!, 61551! 62 km NE Tabriz, PABOT 5242! 35–40 km W Tabriz, 1450 m, ASSADI & AK-

HANI 61455!, 61460! 3 km Evowghli to Jolfa, 1050 m, ASSADI & SALEHI 32011! Between Khodaaferin and Parsabad, 9–41 km from Safarlu to Aslanduz, 200 m, ASSADI & AKHANI 61581!, 61593! 65 km from Kaleybar to Khodaaferin, 250 m, ASSADI & AKHANI 61575! 15 km W "Gogan", 1320 m, ASSADI & AKHANI 61384! 10 km from Azarshahr to Bonab, TERME 30359-E! Bonab, AELLEN & BEHB. 30089-E! Ad ripas SE lacus Rezaiyeh (Urmia) inter Bonab et Khanian, RECH. 14780!, 14783!, 14784! 11 km SW Bonab, 1350 m, ASSADI & AKHANI 61305! 7 km NW Bonab versus lacus Rezaiyeh (Urmia), 1350 m, LAMOND 4635!, RECH. 43154!, 43155! Between E coast of Urmia lake and Akhund Qeshlaq, 1400 m, ASSADI & AKHANI 61343! SE side Urmia lake, Qareh Qeshlaq Prot. Reg.: Near Zarrineh Rud ZEHZAD & KIABI 9032! Qoyundaghi Island, Zarza valley, 1350- 1400 m, ZEHZAD 83/1099! Ashk Island, 1280 m, ZEHZAD 83/318! S of lake Rezaiyeh near Majidabad, 1320 m, ASSADI & AKHANI 61328! Sharafkhaneh, ASSADI & AKHANI 31962-b!, 61505!, ASSADI & SALEHI 31975! Golmankhaneh, BEHB. & AELLEN! 10 km SW Shabestar, 1450 m, ASSADI & AKHANI 61485! 28 km from Tasuj (Tasvej) to Shahpur, 1350 m, ASSADI & SALEHI 31993! Arak: N Varzaneh near Golpayegan, 1900 m, MOZAFFARIAN & KARIMI 37849! Dasht-e Shomal near Golpayegan, 1600 m, NOWROOZI 3074! N Kavir-e Meyqan between Eybakabad and Davudabad, 1650–1700 m, AKHANI & GHORBANLI 5397! 8 km W Davudabad, 1550 m, AKHANI 1034! 16 km E Davudabad, 1650–1700 m, AKHANI 1092! 2 km E Meyqan near border of Arak lake, AKHANI 991! 4 km S Vismeh, 1650 m, AKHANI & GHORBANLI 5404! Deh-e Namak, 1650 m, AKHANI 5860! Khuz.: 40 km from Ahvaz to Ramhormoz, 30 m, MOZAFFARIAN 58557! Ahvaz, MOZAFFARIAN 58468! 5 km SW Dehloran, 170 m, AKHANI 5567! Howr-e Shadegan 5 km from Darkhovin to Shadegan, ZEHZAD 87/432! Darkhovin, 30 m, MOZAFFARIAN 58552! 7– 8 km N Bamdezh to Mazraeh-ye Seh, ZEHZAD 87/424! Howr-e Bamdezh between Galeh-Sahar and Sadat-Tavaher, ZEHZAD 87/425! NE Bustan, 70 m, MOZAFFARIAN 58526! – S: Fars.: Bushehr, 10 m, MOZAFFARIAN 58614! SE Bushehr, BOKHARI, HDG. & WDB. 14810! Hendijan, 50 m, MOZAFFARIAN 58573! S side of Maharlu lake, BOKHARI & WDB. 18993! W shores Daryacheh-ye Tashk between Gonban and Katak, 1700 m, ASSADI & AKHANI 61813! 23 km W Abadeh-ye Tashk at border of Daryacheh-ye Tashk, 1700 m, ASSADI & AKHANI 61792! Bakhtegan lake near Kharameh, 1570 m, FOROUGHI & ASSADI 15026! Ad lacum Neyriz, 1400 m, STARM. 14!, 40! 10–18 km E Kherameh, 1550 m, BOKHARI & WDB. 19003! NE Kuhenjan, 1450 m, BOKHARI & WDB. 18996! – C: Qazv.: Mardabad S Karaj, 1200–1300 m, HEDGE & al. 14673!, WDB. & FOROUGHI 19018! In collibus Halkedar near Mardabad, 1200 m, RECH. 6830!, 6833! 37 km S Qazvin, PABOT 8330! Khanabad, PICHLER (type of *S. cochlearifolia*)! Yazd: 28 km from Delijan to Esfahan, 1750 m, RIAZI 6436!, KAVOUSI 6858! Kavir-e Marvast near Rahmatabad, 1600 m, ASSADI & AKHANI 61773!
Afghanistan: C: Bamian: 5 km W Bamian, "Drachental", 2500 m, PODLECH 19514! Band-i Amir, HAGER 55! Doab: In valle Ajar "Königstal" W Doab, 1400–1500 m, RECH. 16622!

Distr. gen.: Anatolia, Caucasia, Middle Asia, Central Asia, Mongolia, Iraq, Persia, Afghanistan.

S. acuminata is extremely polymorphic, and several species have been described based on different forms. Its range of variation has been described by GRUBOV (1966). The variation is in growth form, leaf-shape, the presence or absence of a seta at the leaf-apex, and in the shape of the perianth. Sometimes it is difficult to distinguish flat from terete leaves in dried material, so that the distinction between this species and *S. maritima* and *S. salsa* is sometimes not easy. In such cases the presence of a hyaline leaf margin and a longitudinal keel on the back of the perianth, as well as the number of stigmas, are important characters of *S. acuminata*.

See also the discussion under *S. microsperma*.

7. ***S. microsperma*** (C.A. MEY.) FENZL in LEDEB., Fl. Ross. 3: 785 (1851).
Syn.: *Schoberia microsperma* C.A. MEY. in EICHW., Pl. Nov. Casp.-Cauc. 1: 14 (1831).
Icon.: Tab. 92.
Type: "Krasnovodsk, Dagada Island." C.A. MEYER, LE.

Annual, 5 -100 cm high, strongly branched from the sometimes woody base, glabrous or young shoots rarely with fugacious hairs. Stems mostly reddish. Leaves fleshy, flat, linear-oblong or narrowly obovate, up to 15 × 4 mm, in dried state with ± hyaline margins, obtuse, rarely acute, at the apex with a distinct 2–3(–4) mm long caducous bristle; leaf-like bracts smaller, linear-oblong to ovate or orbicular, attenuate at base. Glomerules with 1–10 flowers, inserted in the leaf axil. Flowers 1–3 mm in diameter, perianth segments connate to the middle; hermaphrodite flowers with a longitudinal keel-like outgrowth, cucullate at the apex, rarely also with obscure transverse outgrowths. Stigmas 3 (4), villous. Seeds mostly vertical, sometimes horizontal, 0,7–1,1 mm in diameter, very convex, dark brown to black, glossy.

Persia: N: Gorg.: Moh. Reza Shah Prot. Reg. (Golestan): Between Almeh and Behkadeh, WDB. & COBHAM 14239! Tangeli 52 km NE Pahlavi Dezh, 0–10 m, HEWER 4047!, ASSADI & ABOUHAMZEH 43292! Moh. Reza Shah Prot. Reg. (Golestan); Mirza Beyglu, 1200 m, GHORBANLI & AKHANI 4856!, 4857! Inter Dasht et Loveh 125–130 km W Bojnurd, 1200 m, RECH. 37604!, 37605! – E: Khor.: N Darreh Gaz near Lotfabad, 200 m, ASSADI & ABOUHAMZEH 43389! 65 km from Sabzevar to Kashmar, 1500 m, ASSADI & ABOUHAMZEH 40137! 44 km W Sabzevar to Shahrud, SERAJ in PABOT! 5 km S Sabzevar, Rud-e Kal Shur, 2000 m, ASSADI & ABOUHAMZEH 40127! 100 km S Sabzevar 10 km after Garmab, 1280 m, AKHANI 6457! Sabzevar, Ferdowsi Univ. staff 74! Abbasabad, 120 km W Sabzevar, 830–1100 m, REJAMAND & BAZARGAN 32045!, FOROUGHI 68461, 10598! Inter Abbasabad et Mayamey, RECH. 5367! Between Sarakhs and Mashhad, 600 m, GHORAISHI 1289-b!, IRANSHAHR 40265-E!, WDB. & FOROUGHI 18858! Mozduran, ALAVA 110521, IRANSHAHR 40265-E! 74 km W Mashhad, 1300 m, ANDERSEN & PETERSEN 350! – C: Shahr.-Bust.: Turan Prot. Reg.: Between Delbar and Ahmadabad along Rud-e Kal Shur, AKHANI 4189!, 4193!, 4194!, 4209! 10 km SE Delbar to Majerud, 1000 m, FREITAG 13968! S Kuh-e Peyghambar, 720–750 m, FREITAG 13827! Ahmadabad 1 km E of road to Darb Ahang, 970 m, FREITAG 13901! Qolleh-ye Allekhum WNW Ahmadabad, 1040 m, FREITAG 15306! 1 km SW Kuh-e Doshakh S Abbasabad, 800 m, FREITAG 14142! Razveh NE Torud, FREITAG 14124!
Turcomania: Prope Ashkhabad, LITW. 674!, 677!, 678!, 679!; in herb. Fl. Ross. 636 sub *S. Kareliniana*)! Germab supra Skobelewka, SINT. 1176-b!
Afghanistan: NW: Maimana: 15 km NE Daulatabad, Dasht-e Laili, 330 m, FREITAG 6690! Herat: Hari Rud valley, AITCH. 743! – E: Urgun: S Katawas 4 km W Wazi Khwa, 2200 m, FREITAG 3436! – C: Doab: Gorge S Doab, PABOT A-1248!

Distr. gen.: Middle Asia, Persia, Afghanistan.

The distinction between this species and *S. acuminata* is not clear. The main distinguishing character is the presence of a long caducous bristle on the leaf tip in *S. microsperma* in contrast to the short persistent or absent one in *S. acuminata*. In all other characters there is much similarity. In Persia there seems to be a geographical separation, viz. *S. acuminata* mainly in the western, central and southern part and *S. microsperma* in the northeast. As we do not know the exact overall distribution of both species we have refrained from reducing one to a subspecies of the other. Further investigations throughout the whole area are necessary to clarify their taxonomic position.

8. *S. maritima* (L.) DUMORT., Fl. Belg.: 22 (1827).
Syn.: *Chenopodium maritimum* L., Spec. Pl.: 221 (1753).
Icon.: Tab. 93.
Type: "Ex Europae maritimis".

Annual, up to 100 cm high, prostrate, erect or ascending, mostly branched from the very base, stems often with only one subsequent branch; flowers inserted on lateral branches or on main stems. Stem and leaves glabrous, often turning reddish. Leaves fleshy, semi-terete, linear, upper side flat or slightly navicular, up to 30(–40) × 2 mm, acute or obtuse, rarely with a very short seta at the apex; leaf-like bracts gradually decreasing, shorter or somewhat longer than the glomerules, subadpressed to the axis, apex slightly bent outwards. Glomerules inserted in leaf axil, with 1–15 flowers, often inserted on two very short opposite branchlets. Flowers 2–4 mm in diameter. Perianth segments unequal, sometimes longitudinally keeled and mostly with transverse often wing-like outgrowths, cucullate at the apex, 2–4 mm long. Stigmas 2 , very short, c. 0,5 mm long, glabrous. Seeds horizontal, compressed, 0,9–1,5 × 1–1,7 mm, dark brown to black, reticulate.

Persia: W: Azerb.: 23 km NE Tabriz in valle fl. Talkheh Rud (Atschi Tschai), 1500 m, RECH. 14824!, ASSADI & AKHANI 61509-b!, 61529! 67 km from Ahar to Tabriz, 1500 m, MOZAFFARIAN 43631! 48 km NW Marand to Maku, 1020 m, UOTILA 19523! Inter Bonab et Khanian, RECH. 14765! 32 km N Rezaiyeh (Urmia), 1280 m, PABOT 5453! Kul Tappeh, 1300 m, GHORBANLI 95! SE side of lake Rezaiyeh (Urmia), WDB. & SHIRDELPUR 14950! S of lake Rezaiyeh near Majidabad, 1320 m, ASSADI & AKHANI 61325! SW of lake Rezaiyeh near Chopoghlu, 1350 m, ASSADI & AKHANI 61321! Zanjan: Saleh between Abegarm and Qeydar, 1600 m, ASSADI 60974! Arak: N Kavir-e Meyqan between Eybakabad and Davudabad, 1650 m, AKHANI & GHORBANLI 5398! 8 km W Davudabad, AKHANI 1037! Deh-e Namak, 1650 m, AKHANI 1113!, 5862! Esf.: Gav Khuni swamp (Gave-Ghony), 1350 m, NOWROOZI & ASSADI 1485! Khuz.: Bandar-e Ma'shur, 10 m, MOZAFFARIAN 58567! – S: Fars.: Daryacheh-ye Maharlu, 1450–1500 m, BOKHARI & WDB. 18994!, FOROUGHI & ASSADI 15004! 9 km from Borazjan to Shiraz, 100 m, ASSADI & AKHANI 62042! Lar.: Bandar-e Moghan, 10 m, MOZAFFARIAN 58687! – C: Tehran: Rud-e Shur between Tehran and Qom, 1000 m, AKHANI 4795! Rud-e Shur W of Tehran-Saveh road, 1000 m, BUTTLER & al. 31865! Rud-e Shur E Hassanabad, 1000 m, AKHANI 4814! Qazv.: 3 km N Eshtehard, 1200 m, ASSADI & AKHANI 61726!, AKHANI & al. 2088! 15 km from Mardabad to Eshtehard, 1200 m, AKHANI & al. 2082! Mardabad SW Karaj, 1300 m, AELLEN 947!, HDG., WDB. & FOROUGHI 14669! 39 km S Qazvin, PABOT 8334! Shahr.-Bust.: Near Torud, AKHANI 4105!
Turcomania: Ashkhabad, LITW. 671!, 672!
Afghanistan: E: Kabul: Between Kabul and Tang-i Gharu, 1750 m, GILLI 2141! E Kabul, VOLK 2162! – C: Bamian: 5 km W Bamian "Drachental", 2500 m, PODLECH 19515! Band-i Amir valley near Dahane Chahardeh 16 km W Yakawlang, 2510 m, PODLECH 22341! Sahre Zohak (Schar-e Schak) E Bamian, GILLI 2139!

Distr. gen.: Most of Europe and temperate Asia, north Africa, North America.

The taxonomic relationship of European and Russian specimens of *S. maritima* (L.) DU-

MORT., *S. prostrata* PALL. and plants from Persia is not yet clarified. So we prefer to treat plants from the Flora Iranica area as a single species, i.e. *S. maritima* in a wide sense.

9. ***S. salsa*** (L.) PALL., Illustr. Pl.: 46 (1803).
Syn.: *Chenopodium salsum* L., Spec. Pl.: 221 (1753).
Icon.: Tab. 94.
Type: Habitat ad Astracanum.

Annual, up to 80 cm, glaucous, herbaceous, rarely woody at the base, divaricately branched. Stems ascending, greyish-green, often suffused with red or purple, often drying black. Leaves fleshy, terete or semi-terete, linear, up to 25(–40) x 3 mm, upper surface slightly navicular, apex obtuse or acute; leaf-like bracts much shorter, linear to narrowly ovate, attenuate at base, equal to or longer than the glomerules. Glomerules inserted on two very short opposite branchlets arising from the axil, with 3–8 flowers. Flowers hermaphrodite and pistillate; hermaphrodite flowers 3–4 mm long. Perianth segments cucullate at the apex, with transverse wing-like or unequal tubercle- and star-like outgrowths. Stigmas 2, rarely 3, c. 0,5 mm long, glabrous. Seeds horizontal, somewhat compressed, 1,2–1,7 x 1,1–1,4 mm, dark brown, with a reticulate surface.

Persia: N: Gorg.: 10 km N Qaleh Payen, shore of Gulf of Gorgan, ZEHZAD 87/367! Mian Kaleh Prot. Reg.: 8 km W Ashura Deh, AKHANI 4263! – W: Azerb.: 53 km W Marand, 1000 m, PABOT 5360! Jolfa, 800 m, ASSADI & SALEHI 32023! 30 km from Evowghli to Jolfa, 1050 m, ASSADI & SALEHI 32013! Tabriz, along Talkheh Rud, 1500 m, ASSADI & AKHANI 61509-a! 42 km NE Tabriz, 1500 m, PABOT 5158! 30 km W Tabriz, 1400 m, ASSADI & AKHANI 61445!, 61434! Shabestar, 1450 m, ASSADI & AKHANI 61484! SE side of Rezaiyeh lake (Urmia), 1280 m, WDB. & SHIRDELPUR 14950! Bandar-e Rahmanlu, 1350 m, ASSADI & SALEHI 32065! Haft Chashmeh, 1280 m, WDB. & SHIRDELPUR 14946! Sharafkhaneh, ASSADI & AKHANI 61501!, ASSADI & SALEHI 31962!, BEHB. & AELLEN 30202-E!, 30203-E!, 30087-E!, AELLEN & BEHB. 941-a!, 941-b!, RECH. 43651! Bandar Danalu, 1220 m, STARM. 51! Lake Rezaiyeh west side, 37°15'N, 45°20'E, 1300 m, JACOBS 6896! M. Zanbil 25 km NE Rezaiyeh (Urmia), 1270 m, KHARA 6990! Golmankhaneh (Gurmeh Khaneh), 1350 m, ASSADI & SALEHI 32050!, AELLEN & BEHB. 928!, 936!, 3058!, BEHB. & AELLEN 30195-E!, GRANT 16155!

Distr. gen.: Europe, Causasia, Middle Asia, Persia.

10. ***S. Olufsenii*** PAULSEN, Vidensk. Meddel. Dansk Naturhist. Foren, Köbenhavn 1903: 194 (1903).
Icon.: Tab. 95.
Type: Pamir, in angustiis Chargush, 4200 m, O. PAULSEN 1230, C. (phot.)!

Annual, delicate, glabrous, glaucescent, 3–15 cm high, branched in lower part or not. Leaves narrowly elliptic to linear, flat above, somewhat convex below, obtuse or shortly acuminate, the lower up to 10 x 2,5(–3) mm; leaf-like bracts smaller and often acutish; glomerules many-flowered, forming interrupted spiciform inflorescences. Flowers c. 2 mm broad. Fruiting perianth segments cucullate, in basal part with transverse wing-like outgrowths, upwards narrowly stellate. Stigmas 2.

short, smooth. Seeds horizontal, somewhat convex, 0,75–1,25 mm in diameter, with sharp margins, dark brown or black, glossy, distinctly punctate-reticulate.

Afghanistan: NE: Wakhan: Langar, 37°02'N 73°47'E, 3650 m, ANDERS 7748!

Distr. gen.: Middle Asia, Afghanistan (Pamir), Tibet

A small delicate plant from high altitudes. It is near to *S. heterophylla* (KAR. & KIR.) BUNGE, which in its most distinct forms is not in the Flora Iranica area, and also related to *S. maritima*.

11. ***S. physophora*** PALL., Illustr. Pl. 51 (1803).
Icon.: PALL., l.c., tab. 43 (1803). – Tab. 96.
Type: "In salsuginosis deserti Caspici; a latere Persico". P.S. PALLAS

Shrub, 30–100 cm high, profusely branched from the base, glabrous or young branches covered with short papillae. Leaves fleshy, filiform, semi-terete, acute, non deciduous, 20–45 mm × 0,5–1 mm; leaf-like bracts much shorter. Inflorescence paniculate. Glomerules with 1–3 (rarely more) sessile flowers. Perianth segments 1–1,5 mm long, globose, connate to 1/3 to 1/2 of their length, strongly inflated in fruit. Stigmas 3 (rarely 2), short, glabrous. Seeds mostly horizontal, c. 2 mm in diameter, shining.

Persia: N: Gorg.: 118 km from Gonbad-e Kavus to Bojnurd, BABAKHANLOU & PABOT 23721! – W: Azerb.: 30 km from Ahar to Tabriz, 1600–2000 m, ASSADI & SARDABI 24426! – E: Khor.: 135 km W Bojnurd, 1100 m, ANDERSEN & PETERSEN 314!
Afghanistan: C: Doab: 10 km S Doab, 1600 m, PABOT A-1596!

Distr. gen.: Caucasus, West Sibiria, Middle Asia, Mongolia, Persia, Afghanistan.

12. ***S. microphylla*** PALL., Illustr. Pl.: 52 (1803).
Syn.: *Schoberia microphylla* (PALL.) C.A. MEY., Bull. Soc. Imp. Nat. Mosc. 15: 435 (1842). *Chenopodina microphylla* (PALL.) MOQ. in DC., Prodr. 13(2): 163, (1849).
Icon.: PALL., l.c.: tab. 44. – Tab. 97.
Type: "Ad rivum salsum Gorkaja, inter Cumam et Terec fluvios in Caspium defluentem, frequens in littoralibus Persiae". P.S. PALLAS

Shrub, up to 1 m high, much branched from the base, forming dense greyish-glaucous bushes up to 2 m broad. Branches in upper part covered with papillose hairs, otherwise glabrous. Leaves fleshy, terete or slightly flatted on upper side, sausage-like, abruptly narrowed into a short petiole, obtuse, 3–10(–20) × 0,5–3 mm, in dry state wrinkled and spongy; leaf-like bracts shorter. Flowers sessile or pedicellate, few in a cluster, mostly 2–3, rarely more, borne on the petiole of the subtending leaves. Perianth globose, fleshy, connivent, 1–2,5 mm wide, segments connate to 1/3 of their length, the connate parts thickened. Stigmas 3, free or rarely connate at base, 0,2–1(–2) mm long. Seeds mostly vertical, 1–1,5 × 0,7–1,2 mm, black, shining, obscurely punctate-reticulate.

P e r s i a : N: Gorg.: N Pahlavi Dezh, –30 m, UOTILA 19221! 25–59 km from Gomishan to Tappeh-ye Moraveh, 0–100 m, ASSADI & ABOUHAMZEH 43121!, 43298! Dasht-e Gorgan, SHAR. 594! Moh. Reza Shah Prot. Reg.: 6 km N Behkadeh, 700 m, ASSADI & ABOUHAMZEH 43428! Mirza Beyglu, 1200 m, GHORBANLI & AKHANI 4854! 23 km W Mirza Beyglu, 950 m, GHORBANLI & AKHANI 4841! Bidak, 1250 m, AKHANI 4445! Inter Dasht et Loveh, 125–230 km W Bojnurd, 1200 m, RECH. 37602!, 37618!, ANDERSEN & PETERSEN 312! – W: Azerb.: 42 km NE Tabriz, 1500 m, PABOT 5257! 3 km from Evowghli to Jolfa, 1050 m, ASSADI & SALEHI 32014! 28 km from Marand to Maku, 1200 m, ASSADI & SALEHI 32032! 30 km W Marand, 1060 m, PABOT 5342! 27 km W Marand versus Evowghli, 1100 m, RECH. 43826! 60 km W Marand to Khvoy, VOLK 71/615! Inter Marand et Khvoy, SAB. in GAUBA 2104! 53 km from Tabriz-Tehran road to Ahar along Talkheh Rud, 600 m, ASSADI & AKHANI 61553! 28 km from Tasuj to Shahpur, 1350 m, ASSADI & SALEHI 31989! 15 km W "Gogan", 1320 m, ASSADI & AKHANI 61391! Qareh Qeshlaq Prot. reg.: Near Zarrineh Rud, ZEHZAD & KIABI 9025! S of Rezaiyeh lake (Urmia), border of Zarrineh Rud, 1300 m, ASSADI & AKHANI 61336! Ad ripam lacus Rezaiyeh (Urmia) inter Bonab et Khanian, RECH. 14771-A! 10 km SW Shabestar near Shendabad, 1450 m, ASSADI & AKHANI 61478! 27 km E Mianeh to Khalkhal, Qezel Owzan river bed, 1050 m, AKHANI & LARI 5710! Khamseh: 50 km from Zanjan to Tabriz, 1300 m, ASSADI & SALEHI 31940! 40 km from Zanjan to Mianeh, 1200 m, ASSADI & AKHANI 61248! Saleh between Ab-e Garm and Qeydar (Thidar), 1600 m, ASSADI 60982! Esf.: Shahreza, SAFAVI 30321-E! – S: Kerman: Sirch between Kerman and Shahdad, 1750 m, ZEHZAD 85/247! – E: Khor.: 20 km W Shirvan, 950 m, UOTILA 7643!, 19094! 44 km W Sabzevar, 880 m, BABAKHANLOU & PABOT 23705!, SERAJ IN PABOT! Abbasabad, 850 m, FOROUGHI 6480! Between Mashhad and Sarakhs, AYATOLLAHI & JOHARTCHI 13657!, PABOT 5059! 63 km from Mashhad to Sarakhs, 750 m, WDB. & FOROUGHI 18856! 48 km W Sarakhs, STUTZ 636! 90 km after Sarakhs to Mashhad, 600 m, GHORAISHI 1291! 15 km from Mozduran to Mashhad, 600 m, IRANSHAHR 40264-E! Garnia, KOELZ 16640! 10 km E Baghbaghu to Salehabad, 800 m RUNEMARK & SARDABI 23419! 19 km from Bojnurd to Shirvan, 1000 m, ASSADI & ABOUHAMZEH 43352! In valle Atrak between Shirvan et Bojnurd, RECH. 1812! N Darreh Gaz near Lotfabad, 200 m, ASSADI & ABOUHAMZEH 43390! 81 km from Tappeh-ye Moraveh to Ashkhaneh, 700 m, ASSADI & ABOUHAMZEH 43337! 53 km from Ashkhaneh to Shahrabad, Mashhad Univ. Herb. 1507! Between Tayyebat and Afghan border, MATINČIČ & WABER 82! Between Chahchaheh and Bazangan, 530–640 m, AKHANI 6564! – C: Tehr.: Tehran to Qom, BEHB. 893-E! Hableh Rud between Simin Dasht and Kabutar Darreh, MANUCH. & AELLEN 30090-E!, AELLEN & MANUCH. 499!, 500! Garmsar 90 km E Tehran, AELLEN 505! 34 km N Saveh, 1220 m, KAVOUSI 6826! 30 km SE Saveh, Majidabad, AKHANI 1183! Qazv.: Ravandeh prope Karaj, GAUBA 2105! 32 km S Qazvin, PABOT 8325! 18 km from Buin Zakhra to Qazvin, 1150 m, ASSADI 60958! Shahr.-Bust.: Khush Yailaq pass, 70 km E Shahrud, 1600 m, RECH. 5467! 130 km from Shahrud to Sabzavar, 900 m, ASSADI & ABOUHAMZEH 40093! Turan Prot. Reg.: 6–8 km ENE Razveh, 1150 m, FREITAG 14122-b!, 14971!, AKHANI 4134!, 4151!

T u r c o m a n i a : Ashkhabad: Suluklü (Saratowka), SINT 1214! Ashkhabad, LITW. 686! Inter Vannovskoje et Chuli (Czuli), LITW. 684!

A f g h a n i s t a n : NW: Herat: Kisil Islam Qaleh, RECH. 37583!, VOLK 71/630! – C: Bamian: Sahr-e Zohak (Shahr-e Shak, "rote Stadt") 16 km E Bamian, 2400 m, PODLECH 16038! Doab: Gorges S Doab, PABOT A-1244! 45 km S Doab, PABOT A-1597! Doab, VOLK 2149! In valle Ajar 5–13 km W Doab, 1500 m, RECH. 37009! Darreh-i Shikar between Bamian and Doab, 2200 m, ANDERS 4689!, FREITAG 6426!

Distr. gen.: Anatolia, Caucasia, Middle Asia, Persia, Afghanistan.

13. *S. dendroides* (C.A. MEY.) MOQ., Chenopod. Monogr. 126 (1840).
Syn.: *Schoberia dendroides* C.A. MEY., Verz. Pfl. Cauc. 159 (1831).
Icon.: Y. ISAEV in Fl. Azerb. 3: 233, tab. 19, fig. 2 (1952). – Tab. 98.
Type: "Frequens in campis et collibus argilloso-salsis a Derbend, orientem versus, usque ad fluvium Cyrum". C.A. MEYER, LE

Undershrub, 20–60 cm high, divaricately branched from base, in the inflorescence not or scarcely branched, young shoots covered at the tips with long crisp hairs. Leaves fleshy, linear, semi-terete, 3–15 × c. 0,5 mm, obtuse; leaf-like bracts shorter, ± acute, arcuately incurved, up to 5 mm long. Glomerules with 2–6 (rarely more) flowers, inserted in the leaf axil. Flowers sessile, bisexual and pistillate. Perianth subglobular or ovate, 1–2 mm in diameter, its segments nearly free, connivent. Stigmas 3 or sometimes 2,4, up to 2 mm long, papillose. Seeds black, glossy.

Persia: N: Gilan: "Klaye" Manjil, 500 m, SAB. 3103! – W: Azerb.: 35 km E Maku, 960 m, PABOT 5395!

Distr. gen.: Caucasia, Middle Asia, Persia.

14. *S. fruticosa* J.F. GMELIN, Syst. Nat. 2: 503 (1791).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 230 (1966). FREITAG, Flora 183: 157, fig. 2,b (1989). – Tab. 99.
Type: Arabia, Djidda, P. FORSSKÅL 162 (photo!)

Shrub, 20–200 cm high and up to 3 m in diameter, much branched from the base and intricately but not divaricately branched above, fruiting branches mostly zigzag with irregular angles; young branches papillose. Plants mostly drying black, young specimens turning yellow. Leaves fleshy, linear, oblong, obovate, elliptic or nearly orbicular, 5–15 × 1–4 mm, terete or semi-terete, or both sides sometimes ± flattish and upper side slightly concave; leaf-like bracts shorter, mostly clavate, obovate, nearly orbicular or sausage-shaped, attenuate at the base. Glomerules with up to 15 (or sometimes more) flowers. Hermaphrodite flowers 2–2,5 mm in diameter; perianth fleshy, globose or sometimes furrowed between the segments, the segments connate at the base, mostly rounded on the back, wrinkled on drying; pistillate flowers smaller. Filament disc present or not. Stigmas 3 or 4 (sometimes 2, 5, 6), c. 1 mm long, villous. Seeds in hermaphrodite flowers mostly horizontal, sometimes vertical or oblique, strongly convex, 1–1,5 × 0,7–1,2 mm, shining, obscurely reticulate.

Persia: W: Khuz.: 20 km from Andimeshk to Ahvaz, 150 m, MOZAFFARIAN 58460!, 58471! Khorramshahr, 10 m, MOZAFFARIAN 58550!, ZARGANI 30389-E! Between Ahvaz and Hamidiyeh, 30 m, MOZAFFARIAN 58506!, 58527!, 58546! SE Karkheh dam NW Ahvaz, PABOT 2579! Abadan near the river, TERME & MOUSSAVI 35368-E! 30 km from Bandar-e Deylam to Bandar-e Ganaveh, 20 m, MOZAFFARIAN 58606! Bibi Hakimeh to Ganaveh, TERME & MOUSSAVI 35365-E!, 40211-E! Omidiyeh to Bibi Hakimeh, TERME & MOUSSAVI 35363-E! Bandar-e Ma'shur, 10 m, MOZAFFARIAN 58568! Sand dunes NE Bustan, 70 m, MOZAFFARIAN 58524! Howr-e Shadegan, ZEHZAD 87/431! Howr-e Bamdezh 3 km from Mazraeh-ye Do to Mazraeh-ye Yek, ZEHZAD 87/422! Howr-e Bamdezh between Galeh-Sahar and Sadat-Tavaher, ZEHZAD 87/426! Hoveyzeh near Susangerd, 60 m, MOZAFFARIAN 58527! – S: Fars.: Bushehr, 10 m, MOZAFFARIAN 58612! 50 km NE Bushehr, KOEIE 952! 15 km from Borazjan to Genaveh, 70 m, RUNEMARK & MOZAFFARIAN 27199! 9 km from Borazjan to Shiraz, 100 m, ASSADI & AKHANI 62046! Kerm.: Hamun-e Jaz Murian, 350 m, ASSADI & MOZAFFARIAN 25714!, MOZAFFARIAN 52721! Kavir-e Jaz Murian near Chah Reza, ERSHAD & al. 35407-E!, 40130-E! W Hamun-e Jaz Murian, LÉONARD 5784! Zehkalat near Kahnuj, 300 m, MOZAFFARIAN 45613! S Dasht-e Lut E Bam, 460 m, LÉONARD 6071! Lar.: Bandar Abbas, KAVOUSI 6925!, PABOT 6575! 98 km W Bandar Abbas, PABOT 6514! 85 km from Bandar Abbas to Bandar-e Khamir, 30 m, MOZAFFARIAN 45291! Ab-e Garm-e Khamir, 60 m, MOZAFFARIAN 45285! 10 km from Bandar-e Pol to Bandar-e Khamir, 20 m, MOZAFFARIAN! E Bandar-e Pol border of Kol river, 20 m, MOZAFFARIAN 45149! 15–25 km from Bandar Abbas to Minab, 0–30 m, KAVOUSI 6947!, MOZAFFARIAN 45057! 22 km NE Bandar Abbas, SOJÁK 4939! Nakhl Nakhuda, 10 m, MOZAFFARIAN 45037! Bandar-e Lengeh, ZEHZAD 86/013! 27 km from Lar to Bastak, 600 m, ASSADI & AKHANI 61900! 3 km from Bastak to Bandar-e Lengeh, 200 m, ASSADI & AKHANI 61818! 25–55 km from Bandar-e Lengeh to Bastak, 30 m, MOZAFFARIAN 45183!, 45212! Shurehzar-e Mehragan, 100 m, ASSADI & AKHANI 61965! 44 km from Bandar-e Lengeh to Bandar-e Charak, 0 m, ASSADI & AKHANI 61985! 4 km W Bandar-e Charak, 0 m, ASSADI & AKHANI 61988! 5 km from Bandar-e Charak to Bandar-e Moghuyeh, 30 m, MOZAFFARIAN 45245! 10 km S Gav Bandi, ZEHZAD 86/091! 18 km from Bandar-e Maqam to Gav Bandi, 0 m, ASSADI & AKHANI 62010! Near Bandar-e Maqam, 50 m, ASSADI & AKHANI 61999! Jask, 10 m, BEHB. 865-E!, MOZAFFARIAN 45091! 115 km from Minab to Jask, 20 m, MOZAFFARIAN 45088! 10 km from deviation Minab, Rudan road to Rudan, 150 m, MOZAFFARIAN 58732! Tiab near Minab, 20 m, MOZAFFARIAN 45064! 209 km from Bandar Abbas to Lar, 600 m, FOROUGHI & ASSADI 15075! 38 km E Lar, 600 m, PABOT 6417! Between Gahkom and Sarchahan, 650 m, MOZAFFARIAN 45015! Kish island, TERME & MOUSSAVI 35375-E! Bal.: Eskelabad near Khash, 1400 m, MOZAFFARIAN 52703! Makran: Chah Bahar to Jask W Tis, 110 m, ERSHAD & MOUSSAVI 40206-E! Tis, sea shore, AKHANI 6747! Between Chah Bahar and Nasirabad, 250–750 m, ERSHAD & al. 35393-E! 5 km from Negur to Beris, 30 m, MOZAFFARIAN 52813! 7 km from Negur to Kollani, 20 m, AKHANI 6671! 6 km S Negur, 10 m, AKHANI 6773! Between Negur and Gwater (Guatr), 10 m, AKHANI 6675! Gwater, sea shore, AKHANI 5604!, MOZAFFARIAN 52870! Dashtiari region, POZDENA B. 5! 20 km NE Chah Bahar to Rask, 20 m, AKHANI 6830! 70 km ENE Chah Bahar, 40 m, AKHANI 6661!, 6659! 75 km S Rask near Bahu Kalat, 50 m, AKHANI 6654! From Konarak to Chah Bahar, 0–50 m, AKHANI 6748!, ASSADI & MOZAFFARIAN 25681! From Kalat to Konarak, 0 m, MOZAFFARIAN 52778! Konarak, 10–20 m, MOZAFFARIAN 39976! W Nikshahr, 50 m, MOZAFFARIAN 52757! 92 km from Iranshahr to Chah Bahar, ASSADI & MOZAFFARIAN 25662! – E: Sistan: Inter Kuh-e Malek Siah et Zabol (Nosratabad), 700 m, RECH. 4095! – C: Tehran: E Hassanabad, Rud-e Shur, 1000 m, AKHANI 4800! W Garmsar to Tehran, 900 m, FREITAG 14207!, WDB. & FOROUGHI 18956!, MOUSSAVI & TEHRANI 41725-E! Inter Deh Namak et Khar prope Varamin, SAB. in GAUBA 2065! Band Alikhan Kavir, 860 m, DINI & BAZARGAN 23409!, 23431! Kavir Prot. Reg.: Mobarakieh, AKHANI 1316! Siah Kuh in ditione Caravan-Sarai Shah Abbas, IRANSHAHR & MOUSSAVI 15401-E!, RECH. 50122! S Shah Abbas Caravan-Sarai, FREITAG 14034! 55 km NW Shah Abbas Caravan-Sarai, 800 m, WENDELBO & FOROUGHI 15192! SW side of Siah Kuh, FREITAG 14034!, 14043! Ain or-Rashid Caravan-Sarai, 1100 m, BUTTLER 31807!, WDB. & FOROUGHI 14629! Between Kahak and Siah Kuh, 700 m, IRANSHAHR & MOUSSAVI 15405-E!, 30416-E! Qom: Between Qom and Ebrahimabad (Moshkabad), 640 m, DINI & BAZARGAN 23402! Hauz-i Sultan, 800 m, AKHANI 4759!, 4822! Damgh.-Semn.: Between Garmsar and Semnan, 730–800 m, ASSADI & ABOUHAMZEH 40004!, TERME & TEHRANI 40021-E!, WDB. & FOROUGHI 28955!, AKHANI 6365! Kashan: Sefidab, 940 m,

TERME & TEHRANI 40032-E!, 40033-E!
A f g h a n i s t a n : **SW**: Farah: 15 km E Zaranj, 475 m, PODLECH 16901! Between Chahar Burjak and Zaranj, 530 m, PODLECH 17140!, 17149!, 17152! 2 km Khonnashin, edge of Dasht-i Margo, 660 m, BRECKLE 4869! Chakhansur, FREITAG 3726! 50 km E Chakhansur near Haleli, FREITAG 3731! 33 km NW Chakhansur, to Lase Juwain, 472 m, PODLECH 16915! Lase Juwain, VOLK 2930! Sistan, 500 m, KOEIE 4084! 45–71 km SE Lokhi to Zaranj, 500–545 m, PODLECH 16891!, 17118!, 17119! – **SE**: Kandahar: Inter Qala Bist (Lashkargah) et Darweshan, RECH. 34542! 50 km SW Lashkargah, 750 m, BRECKLE 4854 p.p.! Mianpushta 25 km S Darweshan, 720 m, FREITAG 678!, PODLECH 19646! Darweshan, 720 m, PODLECH 19676! E edge of Registan 40 km SE Kandahar, 1050 m, BRECKLE 4833! – **E**: Nangarhar: 48–59 km E Jalalabad, 540 m, BRECKLE 4949!, UOTILA 17134! 10 km ESE Jalalabad, 550 m, PODLECH 19994!
P a k i s t a n : Peshawar: 12 km from Peshawar to Charsadda, BURTT B.569! 8 km from Peshawar to Warsak, BURTT B.1509! Near Pabbi, 380 m, UOTILA 17403!, 18419!, 18421! 20 km E Peshawar to Akbapura, BURTT B.1515! – S. Wazir.: Tank, GROHMANN 6232! – Kalat: Basima prope Jangal inter Panjgur et Surab, 1350 m, RECH. 28286! 76 km SSW Khuzdar to Bela, 4 km SW Wad, 1300 m, FREITAG & KOTHE 18952! Bal.: Chagai distr.: 44 km E Dalbandin near road to Nushki, 750 m, FREITAG & KOTHE 18744! – Bela: Inter Bela et Uthal, RECH. 27468! Bela, 80 m, FREITAG & KOTHE 18048! Uthal, 40 m, FREITAG & KOTHE 18245! 4 and 39 km W Liari, 25–30 m, FREITAG & KOTHE 18227! Haro Range 15 km N Khandewari, 40 m, FREITAG & KOTHE 18234! Bal.: 15 km NE Qila Ladgasht at end of Hamun-e Mashkel, 500 m, FREITAG & KOTHE 18692! – Makran: Inter Gwadar et Suntsar, RECH. 27966! 1 km SW Gwadar, 25 m, FREITAG & KOTHE 18520!, 18521! Jiwani peninsula, 2 m, FREITAG & KOTHE 18550!, 18551! 10 km NNE Jiwani to Suntsar, 5 m, FREITAG & KOTHE 18542! 3 km S Pasni, 2–3 m, FREITAG & KOTHE 18481! 50 and 117 km E Pasni to Ormara, 20 m, FREITAG & KOTHE 18426!, 18437! 29 km W Ormara, 50 m, FREITAG & KOTHE 18447! 20 km NW Ormara, 20 m, FREITAG & KOTHE 18474! 94 km WSW Panjgur near Parom, 890 m, FREITAG & KOTHE 18648! 42 km WSW Parom, Hamun-e Parom, 890 m, FREITAG & KOTHE 18646! – Karachi: W Liari river, PODLECH 10057! Karachi, JAFRI! Hawk's Bay, KAZMI 877!, RECH. 27494! Karachi Univ. campus, FREITAG & KOTHE 18203! – Sind: 10–15 km S Sehwan, RECH. 28728! Between Karachi and Thatta plain 55 km E Malir river bridge, 20 m, FREITAG & KOTHE 18157!

Distr. gen.: Egypt, Arabian Peninsula, Palestine, Persia, Afghanistan, Pakistan, India.

S. fruticosa is a widespread Saharo-Sindian element which penetrates into the Irano-Turanian area. In the literature and in herbarium material both from our area and in other parts of SW Asia we find different names for material of *S. fruticosa* viz. *S. vermiculata, S. nudiflora, S. mesopotamica,* and *S. mollis* and *S. vera*. Recently FREITAG (1989 and personal communication), who studied the type material of this group believed that almost all the specimens identified as *S. vermiculata* from North Africa to SW Asia and Pakistan are really *S. fruticosa* in a broad sense. However, *S. vermiculata* and *S. vera* are indeed different species distributed in the Mediterranean area. Our intensive field studies (AKHANI) in Iran and the complementary rich herbarium collections showed that inland plants could not be separated as another species or even accorded any subspecific rank. But in the sandy littoral of Persian Baluchestan a new distinct species could be separated. This species, *S. baluchestanica*, grows together with *S. fruticosa* (see note under *S. baluchestanica*).

In the Jalalabad area of eastern Afghanistan and adjacent Pakistan there is another type within the *S. fruticosa*-complex. These plants differ in the crowded leaves at the base and are long, flat and more herbaceous; they also have slender inflorescence branches. It seems to be a ecotype adapted to sweet water in rice fields and along channels.

The taxonomic status of *S. nudiflora* MOQ., Ann. Sc. Nat. Ser. 1, 23: 316 (1831) described from "India orientalis", is not clear to us. We have only seen a photograph of the type in the WILLDENOW herbarium; it seems to differ from both *S. fruticosa* and *S. baluchestanica*.

15. *S.* ***baluchestanica*** AKHANI & PODLECH, spec. nov.
Icon.: Tab. 100.
Type: Persian Baluchestan, Goatr, sea shore, 18.11.1990, H. AKHANI 6706; holotype: MMTT, (Natural History Museum of Iran)!; isotype: Herb. PODLECH!

Frutex ad 1,5 m altus et 2,5 m latus, caulibus ascendentibus vel prostratis, divaricatim ramosis, glaucis, in sicco nigrescens, glaber. Folia anguste oblonga vel oblonga, carnosa, ± plana, 10–25 x 2–8 mm, subsessilia, obtusa. Bracteae ellipticae, ovatae vel orbiculares, glomerulos ± aequantes. Glomeruli densi, 3–7 mm diametro, multiflori. Flores bisexuali et unisexuali. Perianthum tempore fructificationis 1–4 mm diametro, segmentis carnosis, crassis, conniventibus, connatae ad 1/2 – 2/3 longitudinis, margine scariosis, nonnullis transversaliter gibbosis. Stigmata 3 (rarissime 4), 1–1,2 mm longa, villosa. Filamenta libera c. 2 mm longa. Semina verticalia, obliqua vel horizontalia, pyriformia vel suborbicularia, distincte biconvexa, 1,1–1,7 x 1–1,2 mm, nigra, nitida. – Differt ab *S. fruticosa* ramis divaricatis, foliis majoribus, planis, seminibus 0,2 mm majoribus.

Shrub up to 1,5 m high with an up to 2,5 m wide canopy, with ascending or prostrate and ± divaricately branched stems, glaucous, drying black, completely glabrous, the inflorescence branches angulate, zig-zag-shaped. Leaves narrowly oblong to oblong, fleshy, ± flat, 10–25 x 2–8 mm, nearly sessile, obtuse, in cross section with a continuous "Kranz cell" layer; leaf-like bracts elliptic, ovate or circular, slightly inflated at the base, mostly equal to the glomerules, rarely longer. Bracteoles triangular-ovate, 1–2 mm long and broad, with a distinct brownish reticulation. Glomerules compact, 3–7 mm in diameter, many-flowered. Flowers bisexual and unisexual. Fruiting perianth 1–4 mm in diameter, subglobose and slightly flattened above; central flowers often ± turbinate due to pressure from neighbouring flowers in the dense heads; segments strongly fleshy and thickened, connivent, connate to one half or to two-third of their length, scarious at the margins, some also with a short transverse outgrowth. Free filaments c. 2 mm long. Stigmas 3 or very rarely 4, c. 1–1,2 mm long, densely villous. Seeds vertical, horizontal or oblique, pyriform to nearly circular, strongly biconvex, 1,1–1,7 x 1–1,2 mm, black, obscurely reticulate, glossy.

P e r s i a : S: Bal.: Makran: Beris, sea shore, AKHANI 6770! 6 km W Beris, sea shore, AKHANI 6766! 10 km W Konarak, shores near Puzm-Tiab (Pozim Teyab), AKHANI 6752! Gwatar (Goatr), sea shore, 18.XI.1990, AKHANI 6695!, 6706!
P a k i s t a n : Bal.: Makran: 2 km S Pasni, 5 m, FREITAG & KOTHE 18399!, 18400! 1 km SW Gwadar, 25 m, FREITAG & KOTHE 18523! Near Pishukan 35 km ENE Jiwani, 4 m, FREITAG & KOTHE 18536!

Distr. gen.: Persia (Baluchestan), Pakistan.

S. baluchestanica is closely related to *S. fruticosa*. The distinctness of the two species where they grow together (in the type locality according to AKHANI) is a good reason that *S. baluchestanica* is a good species and not merely an ecotype of *S. fruticosa*. It is characterised by its spreading and partly prostrate stems and branches, by its larger flatter leaves and larger seeds. Ecologically it is restricted to sandy shores of Baluchestan and nearly always associated with the grass *Halopyrum mucronatum* (L.) STAPF. On sandy shores at Beris it is the main pioneer species.

16. ***S. monoica*** J.F. GMELIN, Syst. Nat. 2: 503 (1791).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 233 (1966).
Type: Lohaja, P. FORSSKÅL 167, lectotype C.

Shrub or small tree up to 4 m high and 2 m in diameter, divaricately branched, glabrous; inflorescence branches ± pendulous. Leaves linear-oblong, flat, obtuse, ± sessile, 10–30 x 1–4 mm, in cross section the chlorenchyma interrupted at the margin; leaf-like bracts much shorter, similar to the lower leaves, or obovate to subclavate, shorter to longer than the glomerules. Flowers 1–many in each glomerule, frequently unisexual, 1–3 mm long, ovate. Fruiting perianth slightly inflated, segments connate to 1/3 of their length. Stigmas 3, c. 0,1 mm long, subulate, villous; staminate flowers with reduced gynoecium, with very short, glabrous stigmas. Ovary fistulose. Seeds vertical, ± rounded, 1–2 mm in diameter, glossy.

Pakistan: Bal.: Makran: Jiwani peninsula 3 km S Jiwani, 2 m, FREITAG & KOTHE 18549! 44 km SW Suntsar, 5 km S Kundan near Dasht river, 15 m, FREITAG & KOTHE 18558!

Distr. gen.: Palestine, Egypt, Arabian peninsula, Pakistan.

S. monoica is a distinct species easily distinguished by its ± pendulous inflorescence branches, the leaf anatomy and the frequently unisexual flowers. Its distribution is restricted to the sea shores of subtropical areas of northern Africa and the Oman Sea. Some earlier records of this species from Iran (e.g. the Kavir Protected Region) are mostly misidentifications of *S. fruticosa* [e.g. RECHINGER & WENDELBO in Iranian Journ. Bot. 1: 38 (1976)].

Species recorded from our area, but based on misidentifications

[*S. heterophylla* → *Olufsenii*]
S. indica MOQ.
[*S. mollis* (DESF.) DEL. → *fruticosa*]
[*S. nudiflora* MOQ. → *fruticosa*]
[*S. prostrata* PALL. → *maritima*]
S. turkestanica LITW.
[*S. vermiculata* FORSSK. → *fruticosa*]

26. *Bienertia*

I.C. HEDGE, Edinburgh

Bienertia BUNGE [Acta Horti Petrop. 6: 425 (1879)] ex BOISS., Fl. Or. 4: 945 1879.

Sturdy glabrous fleshy annual. Stems erect or ascending somewhat woody at base, leafy. Leaves fleshy, sessile, flat to terete, narrow to broad oblong, obtuse, alternate. Inflorescence paniculate. Flowers borne on axillary erect-ascending shoots arising from axils of leaves, polygamous-hermaphrodite or female; very small scarious bracts usually present. Perianth segments 5, fleshy, basally fused, membranous; in fruit segments connivent, strongly horizontally flattened and with a circular undivided wing, enclosing the fruit. Stamens 5. Stigmas (2–)3, free to near base. Fruit horizontal, flattened; seeds hard black glossy or dull brown; embryo coiled, with little endosperm. – Type of genus: *B. cycloptera* BUNGE ex BOISS.

Monotypic. The flattened circular-winged fruiting perianth segments are characteristic and combined with the sturdy annual habit and the prominent oblong leaves make it an easily recognized plant and a distinct genus, though with some facies similarities to *Suaeda* species.

1. ***B. cycloptera*** BUNGE ex BOISS., Fl. Or. 4: 945 (1879).
Icon.: Tab. 101.
Type: "In Persia orientali frequens", A. VON BUNGE.

Fleshy annual herb, (10–)30–60(–100) cm high and up to 1(–2) m wide, green or yellowish green. Stems branched, erect or ascending; lateral shoots often heavy and drooping. Leaves variable in size and shape, usually with a glaucous bloom; terete or flat on both surfaces, linear-oblong, obtuse, c. 10 mm long, constricted at base of cauline leaves; lowermost often crowded leaves up to c. 25 x 4 mm, and ± flat. Flowers fleshy, numerous. Perianth segments membranous, strongly incurved, cucullate, without wings in flower; in fruit coalescing and developing an entire circular wing at median part. Stamens shorter than perianth segments; thecae ovoid. Fruit adnate to perianth segments, strongly flattened, 4–7 mm in diameter, green or reddish, reticulate-membranous-translucent. Seed embedded in fruit tissue. Embryo c. 2 mm in diameter, coiled.

Hab.: Salty clay and mud, salt flats, edge of salt lake, semidesert, near sea-level – 2000 m. - Fl. IX–X, fr. X–XI.

Persia: W: Azerb.: 27 km W Marand, 1020 m, PABOT 5331! Tabris, in salsis ad Shendabad (Schindawur), 1.X.1884, KNAPP! – S: Fars.: Bakhteghan Lake, near Kharameh, 1570 m, FOROUGHI & ASSADI 15032! SE Bushehr, 1 m, BOKHARI, HDG. & WDB. 14809! Neyriz, 5.X. 1892, BORNM.!, BORNM. 5097! Sirjan to Qatruyeh, 1500–1700 m, MOUSSAVI & TEHRANI 40119-E! Kerm.: Shahdad to Birjand, Kavir-e Lut: 28 km NE Tal-e-Kheshtak to Fedeshk, 880 m, TERME & MOUSSAVI 34434-E! Khur to Jafrud, 20–40 km SE Khur, TERME & MOUSSAVI 34405-E! Kavir-e Jaz Murian, "Ghal'ah Gandji" to Chah Reza, 400 m, ERSHAD & al. 35401-E! 40093-E! – E: Khor.: Birjand to Zahedan, Sahlabad, 1420 m, TERME & MOUSSAVI 34404-E! [?] 43 km SW Ferdows, 1250 m, REJAMAND & ARAZM 32539! Persia orientalis, BUNGE – C:

Tehr.: 14 km E Garmsar to Semnan, 1000 m, HDG. & WDB. & al. 14762! Kahak to Siahkuh, 700 m, IRANSHAHR & MOUSSAVI 40241-E! Kavir-e Garmasar, 840 m, REJAMAND & ARAZM 32509! Between Sadrabad and Aminabad, IRANSHAHR & MOUSSAVI 15380-E! Qazv.: S Karaj, near Mardabad, 1250 m, GAUBA 2086!, HDG., WDB. & al. 14671! Kavir: Dasht-e Kavir: Hoseyniam to Jandaq, Howz-e Jandaq, 700–1000 m, TERME & MOUSSAVI 30271-E!, 40062-E!, 40255-E! Mehmandust, Himmatabad (Kavir), 1100 m, TERME, MOUSSAVI & al. 41705-E!, 41706-E! Nushabad to Ab Shirin, 780 m, TERME & MOUSSAVI 30246-E!, 30247-E!, 40094-E! Hauz-e Sultan, 800 m, GHORBANDI 76/65! Siah Kuh, SHAR. & AELLEN 30180-E! Yazd: Hoseynian to Jandaq, 700 m, TERME & MOUSSAVI 30229-E!, 30231-E! Damgh.-Semn.: Asadabad, Chaleh-dan, 1050 m, MOUSSAVI & TEHRANI 41707-E! S Semnan, 1000 m, REJAMAND & ARAZM 32580! Shahr.-Bust.: Shahrud to Sabzevar, Abbasabad, 820 m, FOROUGHI 10609! Turan Prot. Reg.: 10 km SE Delbar to Majerad, 1000 m, FREITAG 13970! 6 km ESE Abbasabad, 810 m, FREITAG 14153!
Turcomania: Kopet Dagh, Ashkhabad, LITW. 286!, 388!
Afghanistan: SW: Farah; 55 km WNW Girishk to Dilaram, 1000 m, PODLECH 17102! 25 km NNE Girishk, 1000 m, FREITAG 6870! – SE: Kandahar: near Kajakai on road to Girishk, 1200 m, ANDERSEN & PETERSEN 461!
Pakistan: Makran: Jiwani, D. KHAN! 15 km NE Jiwani in road to Pishukan, 35 m, FREITAG & KOTHE 18541!

Distr. gen.: E Europe, SE Russia, Caucasus, E Turkey, Persia, Iraq, Kuwait, United Arab Emirates, Saudi Arabia, Turcomania, Afghanistan, C Asia, Pakistan. – FREITAG, Fl. et. Veg. Mundi 9: 289, fig. 7 (1991).

In KOMAROV, Fl. URSS 6: 200 (1936), ILJIN remarks that the first fruits of the season have seeds with a hard black glossy testa whereas the later ones have a brown matt testa, but I have not observed this in our material. Field observations are needed both to investigate this and also to determine the proportions of hermaphrodite to unisexual flowers.

Very variable in size and leaf form. Sometimes it forms dense stands. Young shoots are sometimes eaten as a salad.

The nomen *Schoberia cycloptera* BUNGE, Bull. Imp. Nat. Mosc. 40, 2: 64 (1867) apparently refers to *B. cycloptera*.

27. *Salsola*

H. FREITAG, Kassel, with a contribution from S. RILKE, Kassel

Salsola L., Spec. Plant. ed. 1: 222 (1753).
Syn.: *Kali* MILL. sect. *Salsola*. *Soda* FOURR. sect. *Salsola*. *Caroxylon* THUNB. sect. *Caroxylon*. *Hypocylix* WOL. sect. *Coccosalsola*. *Darniella* MAIRE & WEILLER sect. *Coccosalsola*. *Climacoptera* BOTSCH. sect. *Physurus*. – For details see under sections.

Lit.: The most important general accounts are those cited for the family. For revisions of smaller groups see under sections I–VIII.

Small or dwarf shrubs, annuals, rarely small trees. Glabrous or with very diverse types of indumentum, hairs 1- or few-celled, papillose, vesicular, setose or variously branched, thin- or thick-walled, with smooth, warty (tuberculate) or spinulose (barbellate) surface, straight or variously curved. Axes whitish even when young, or with more or less extended green cortex. Leaves alternate, subopposite or opposite, rarely distichous; usually semi-terete or terete and ± succulent, with 1 central bundle and Kranz anatomy (in our species); leaf base very variable in shape; usually short-lived and shed at flowering time. Bracts leaf-like or scaly. Bracteoles 2, green at least in upper part, with wide hyaline margins ± enclosing the small flowers, often cucullate. Flowers sessile, solitary or clustered, in loose or dense, simple or paniculate spikes; usually bisexual, protandrous, anemophilous or entomophilous, rarely cleistogamous. Tepals (perianth segments) 5, free from base, of greatly differing shape, the outer wider than the inner, 1–multi-veined, usually in lower 1/2 with a distinct transverse line associated with later wing formation, above that line with or without a variously shaped green blotch. Stamens 5, antitepalous, anthers oblong, linear or sagittate in outline, the thecae usually deeply divided from base; filaments band-shaped, fused at ovary base or inserted on the outside of a disc; disc thin or thick, often lobed, glabrous, glandular papillose or ciliate; apically with small or large, distinctly shaped appendage. Ovary globular, ovoid or depressed; style short or long, thin or thick, rarely absent; stigmas 2, rarely 3, spreading or recurved, filiform, subulate or band-shaped, inner side with short or long papillae; ovule 1, basal. Fruit usually consisting of a utricle and adnate fruiting perianth, both shed together as an anemophilous diaspore; utricle usually enclosed, more rarely exposed, rarely utricle and fruiting perianth enclosed by and shed together with bracteoles and bract. Tepals in fruit with 5 subequal wings or 2 inner wings much smaller, wings horizontally spreading, semi-circular or fan-shaped, usually overlapping, very thin and translucent or thicker and then pale or brown, when young and fresh often pinkish, radially veined; tepal backs above the wings often variously thickened, sometimes hardened, usually connivent; tepals below the wings often coriaceous, never truly indurated; base of fruit rounded or flattened, with 5 shallow, circular grooves around the central scar and a polygonal rim at tepal base. Utricle drum- to disc-shaped or semi-globular, the upper side flattened and the remainders of style and stigma arising from centre; pericarp membranous. Seed horizontal, more rarely oblique or vertical, with membranous testa; endosperm almost absent; embryo flat to conical spiral, greenish. – Type of genus: *S. soda* L.

Synopsis of sections and species

Sect. I. ***Coccosalsola***

1. *S. Drummondii*
2. *S. makranica*
3. *S. Kerneri*

Sect. II. ***Arbuscula***

4. *S. montana*
5. *S. arbusculiformis*
6. *S. arbuscula*
7. *S. Richteri*
8. *S. Paletzkiana*

Sect. III. ***Salsola***

9. *S. kali*
   - subsp. *tragus*
   - subsp. *iberica*

10. *S. Jacquemontii*
11. *S. Tamamschjanae*
12. *S. Paulsenii*
13. *S. praecox*
14. *S. collina*
15. *S. Griffithii*
16. *S. aperta*
17. *S. soda*

Sect. IV. ***Caroxylon***
18. *S. imbricata*
19. *S. nitraria*
20. *S. incanescens*
21. *S. dendroides*
22. *S. vermiculata*
23. *S. orientalis*
24. *S. ericoides*
25. *S. cyclophylla*
26. *S. abarghuensis*

Sect. V. ***Malpighipila***
27. *S. verrucosa*
28. *S. gemmascens*
29. *S. yazdiana*
30. *S. persica*

Sect. VI. ***Cardiandra***
31. *S. inermis*
32. *S. jordanicola*
33. *S. chorassanica*
34. *S. turkestanica*
35. *S. sclerantha*
36. *S. forcipitata*

Sect. VII. ***Belanthera***
37. *S. canescens*
38. *S. Iljinii*
39. *S. Aucheri*
40. *S. tomentosa*
41. *S. lachnantha*
42. *S. rubescens*
43. *S. brachiata*
44. *S. gossypina*
45. *S. Vvedenskyi*

Sect. VIII. ***Physurus***
46. *S. lanata*
    subsp. *lanata*
    subsp. *longistylosa*
47. *S. crassa*
    subsp. *crassa*
    subsp. *turcomanica*
    subsp. *longipistillata*
48. *S. maimanica*

About 100 species, most of them in the Old World desert belt from the Canary Islands through N Africa and SW Asia to C Asia, and a smaller fraction through arid E Africa to SW Africa; a few species penetrating into adjacent humid regions along coast lines and on ruderal and other disturbed sites; 3 species adventive in semi-arid parts of N America, S Africa and Australia; mostly leaf-succulents of slightly to strongly saline dry semi-desert habitats, usually avoiding true salt-marshes.

General remarks

With 48 species recognized in this account the genus has its major centre of diversity in the Flora Iranica area as the central part of the Old World desert belt. In numbers, this equals the *Salsola*-flora of adjacent former Russian parts of Middle Asia (PRATOV 1973) and falls behind the 69 species listed by BOTSCHANTZEV (1978) for S and SW Africa. The number of species treated by BOTSCHANTZEV in the revisions of most sections (except sect. *Salsola*) amounts to c. 170;

and in the genus *Climacoptera*, here included in *Salsola*, its monographer PRATOV (1986) dealt with 42 species. Both authors adhered to a very narrow species concept, which is not followed here.

The high number of species and the lack of easily recognizable characters were often frustrating even for the experienced botanist. Other difficulties encountered in identification are connected with inadequate herbarium material and their often highly changeable habit in the different phenophases. Juvenile plants or young shoots often look completely different from old ones, due to differing branching patterns, leaves and indumentum. The present account is based on years of work with this group, both in the field and with ample herbarium material including most types.

Delimitation and subdivion of genus *Salsola*

Salsola is the largest genus in subfamily *Salsoloideae*, and here it has a central position not far from its base. It became clear during the work, and as is obvious from the great number of entries for *Salsola* in the generic key, that several evolutionary lines start and are developed in the genus. Many of them continue in more advanced genera, but the traditional delimitations are in some cases arbitrary and in need of reconsideration. The base lines of a revised classification are already evident, but they are not yet applied here for 2 reasons: 1, they affect several neighbouring genera which for practical reasons in this volume are dealt with by IAN HEDGE, e.g. *Halanthium*, *Seidlitzia*, *Noaea* and *Girgensohnia*; 2, some refinements of a new classification await investigation of other species from outside the Flora Iranica area, and of other related genera. This work is underway.

To make the large diversity evident which is assembled in the classical *Salsola*-concept, the genus description is enlarged to cover at least the more important variations of characters. Moreover, for a better handling of the numerous species, the genus is split into a number of sections which are in fact comparable to some other traditionally recognized genera. The sections, as used in this account, appear for their greater part to be natural groups, although it is clear to the author that their taxonomic ranks are unequal. With minor variations, they are based on the most remarkable account of ILJIN (1936) and the revisions of BOTSCHANTZEV. These two authors did the pioneer work in regrouping the numerous species.

Characters – some practical hints

Despite the rather uniform habit, the identification of a particular *Salsola*-plant is not too difficult, even without flower or fruit. With some training it is even possible to name almost any juvenile plant. But usually it needs at least a good lens, and better a microscope. Unfortunately, certain specific characters can hardly be used for a key as it is almost impossible to describe them precisely and succinctly. This refers in particular to details of the branching system and growth form.

Some characters used for identification and delimitation in the genus have already been dealt with in the general introduction. A few more meriting comment are briefly discussed below, and relevant figures are given on Fig. 3–6.

L i f e f o r m . Distinguishing annuals from perennials might pose a problem in 2–4 year old perennials, particularly when grazed, and in fragmentary herbarium specimens, as some annuals possess stronger secondary thickening than perennials. But a perennial species has never been seen flowering and fruiting in its first year.

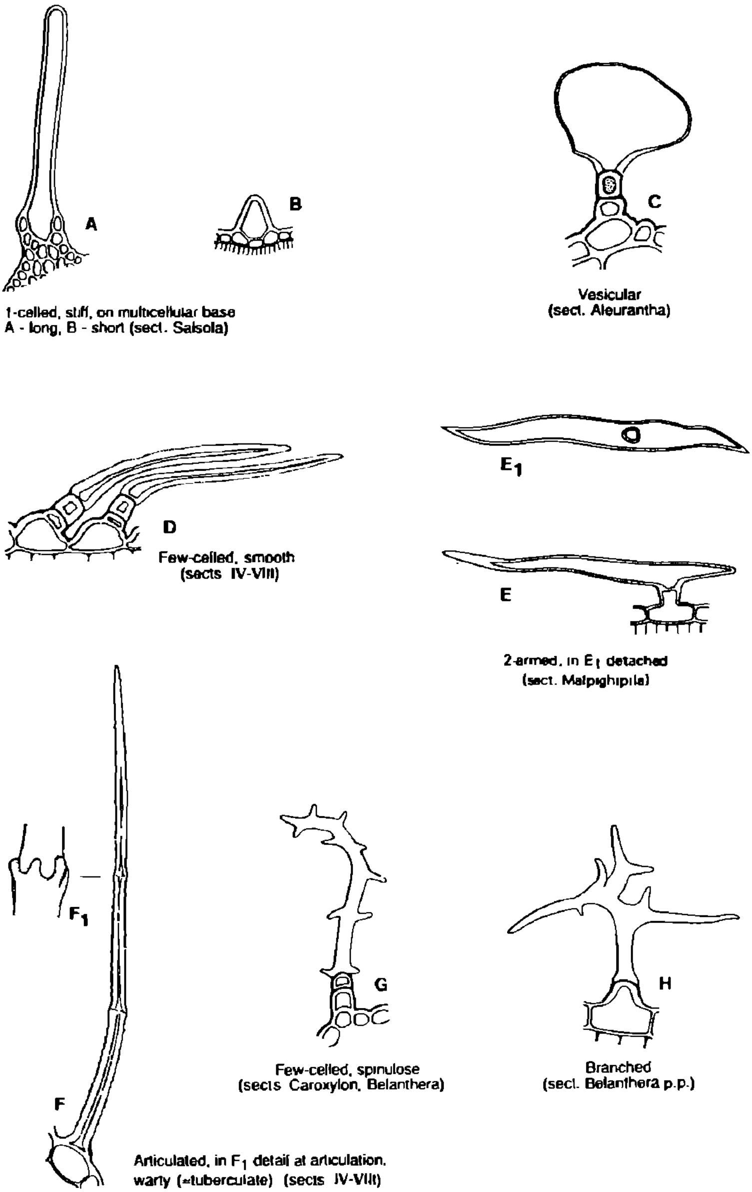


Fig. 3: *Salsola* – hair types. **A, B** – *S. kali* subsp. *tragus*, 29.XII.1989 ZAKI (Egypt) **C** – *S. inermis*, AKHANI 5561; **D** – *S. tetragona*, FREITAG 19722 (Egypt); **E** – *S. YAZdiana*, SABATI 514; **F** – *S. forcipitata*, FREITAG 3832; **G** – *S. vermiculata*, PAB. 5984 **H** – *S. tomentosa*, KOROVIN 1075.

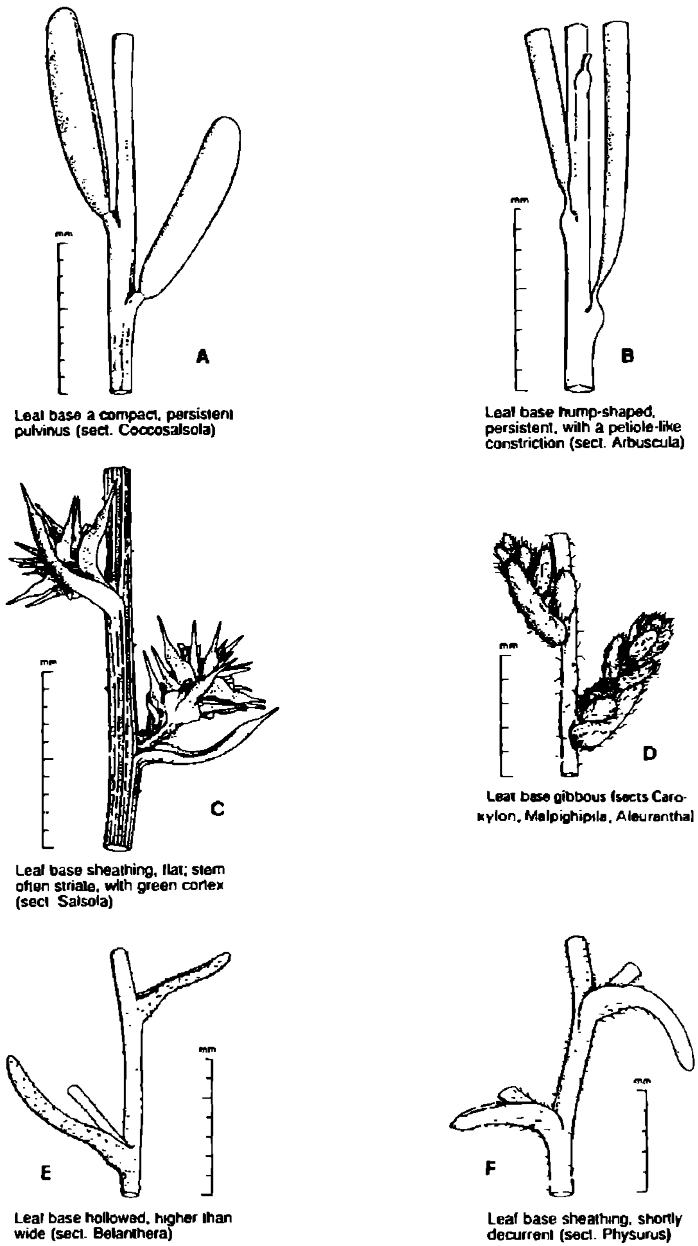
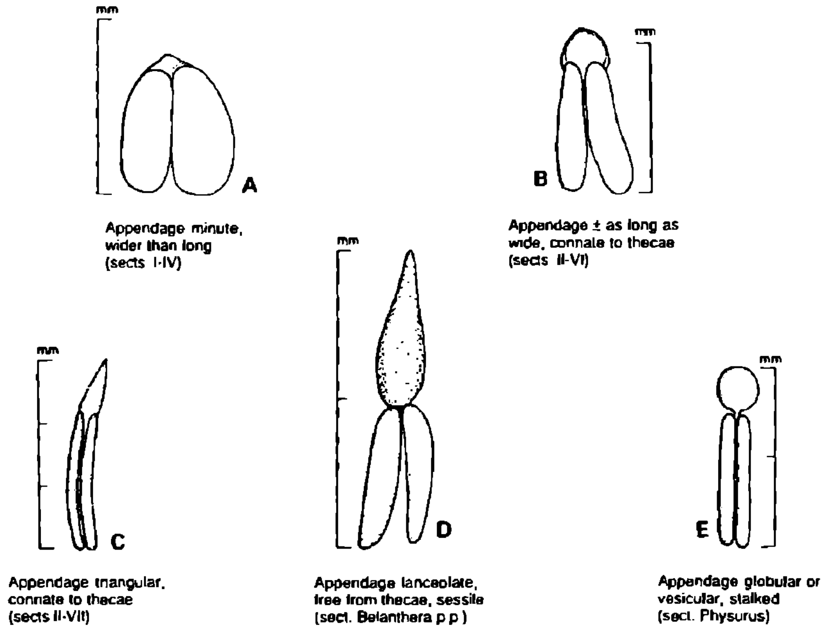


Fig. 4: *Salsola* – leaf bases and leaf insertions. **A** – *S. makranica*, FREITAG 18652; **B** – *S. arbusculiformis*, FREITAG 14146; **C** – *S. kali* subsp. *tragus*, AELLEN & MANUCH. 3079-b; **D** – *S. nitraria*, REGEL s.n. (Turkestan s.l); **E** – *S. tomentosa*, FREITAG 3334; **F** – *S. crassa* subsp. *crassa*, FREITAG 13531 (former Russian Azerbaijan).

Anthers and anther appendages



Hypogynous disc configurations

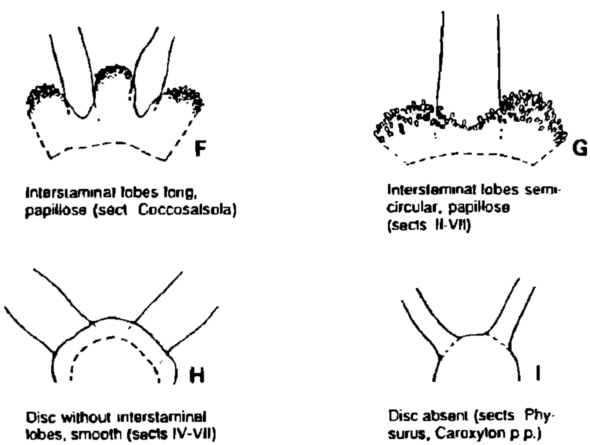


Fig. 5: *Salsola* – **A** – *S. Drummondii*, FREITAG 18959 (cult. Karachi Univ. campus); **B** – *S. turkestanica*, AITCH. 733; **C** – *S. canescens*, MOUTERDE 4464 (Syria); **D** – *S. gossypina*, RECH. 55776; **E** – *S. crassa* subsp. *turcomanica*, FREITAG 13966; **F** – *S. Drummondii*, FREITAG 18959 (cult. Karachi Univ. campus); **G** – *S. Richteri*, FREITAG 3724; **H** – *S. gemmascens*, BRECKLE 4727; **I** – *S. crassa* subsp. *turcomanica*, FREITAG 13966.

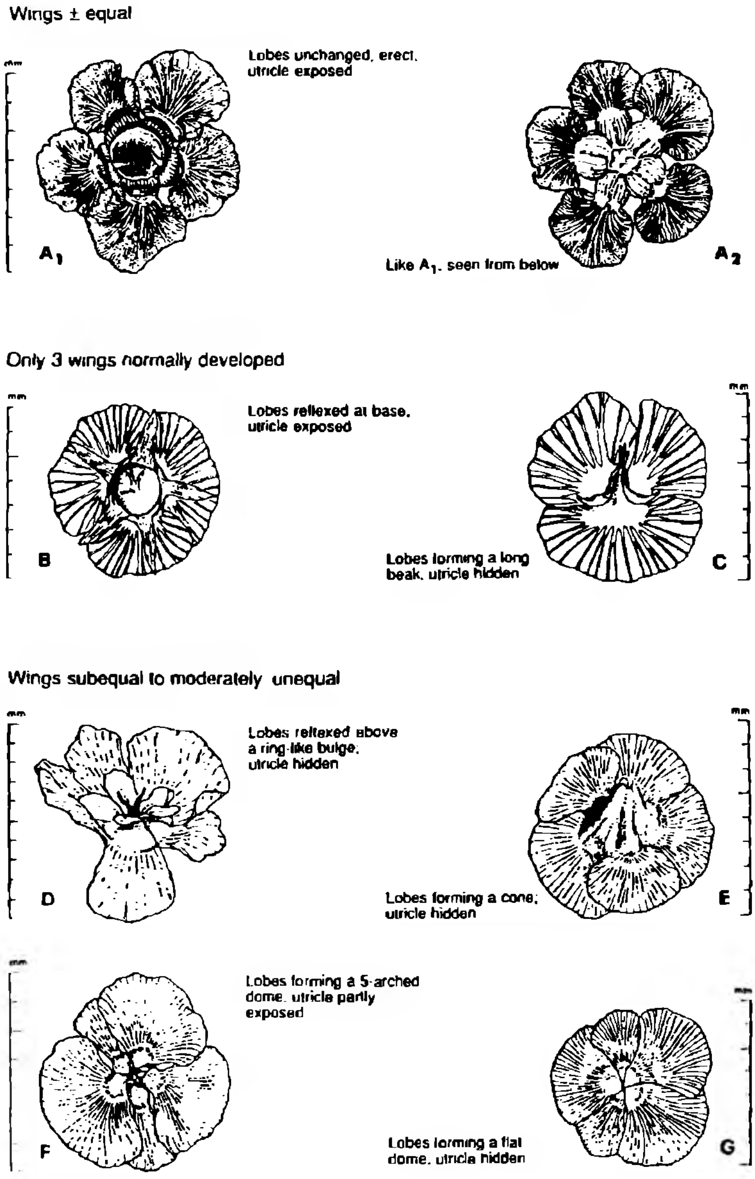


Fig. 6: *Salsola* – fruits with differently developed wings and tepal lobes. **A 1, A 2** – *S. Drummondii*, OMER 2028 (cult. Karachi Univ. campus); **B** – *S. aperta*, ANDROSOV 1182 (Turcomania); **C** – *S. Paulsenii*, UOTILA 18937; **D** – *S. arbuscula*, FREITAG 14195; **E** – *S. yazdiana*, 31.1.1985 TERME & MOUSSAVI; **F** – *S. incanescens*, AELLEN & SHAR. 3161; **G** – *S. nitraria*, AELLEN & SHAR. 2816.

Indumentum. Hair structure is of utmost importance. General aspects of indumentum (glabrous, mealy, hispidulous, pubescent, villous, arachnoid), colour and the relative length of hairs are easy to recognize. An assessment of hair surface type (smooth, warty=tuberculate, spinulose= barbellate, branched etc. (see Fig. 3) requires at least a good lens.

Leaves, bracts. Despite their great variability in size and shape on the same plant, they yield important characters. Care is necessary in distinguishing between leaves (present usually up to flowering time only, and even then the lower might have been already shed) and bracts. They intergrade, and the lower bracts are usually leaf-like.

Dimensions – They differ remarkably. As the length decreases evenly from base to top, the respective data are given in the description in that sequence.

Leaf insertion – The different types are easy to distinguish, but in lowermost leaves and upper bracts they are often poorly expressed (for details see Fig. 4).

Flower arrangement. Most species have solitary flowers, but in all species of sect. *Coccosalsola* and in certain species of sect. *Salsola* more than 1 flower can normally be found per bract axil. They represent small cymes, with 3 or 5 sessile flowers. In other species of sect. *Salsola* another type of "clustered flowers" occurs. They consist of highly reduced but clearly stalked lateral spikes, often produced from serial buds below normal lateral spikes. They consist of a various number of flowers, often 2, and can be reduced to a single flower.

Floral characters. Because of their very small size, most characters of this group can be only seen in dissected flowers.

Tepals – They enlarge and change their shape greatly during fruit formation. To make them comparable, the respective data in the descriptions are given for the flowering stage, because in fruit they are more difficult to obtain. Of some value is the position of wing formation. It grows out along the so called transverse line, a fold which is easily detectable even at flowering time. Above the transverse line a distinct green blotch of various shape is often present and persists up to fruiting time.

Anthers – Shape and size are useful characters, but more so are the shape and structure of the appendages (see Fig. 5 A-E). When short and fused (connate) with the thecae, they are included in the length data of anthers; otherwise not. In the case of larger appendages which are separated from thecae, they articulate easily after the release of pollen grains. Short appendages can be overlooked, as they are often incurved.

Disc – Its presence in various forms (see Fig. 5 F-I) or absence is of high taxonomic significance. Some disc characters, such as presence of lobes, are detectable even in fruit. Others, like the thickness or occurrence and distribution of papillose or glandular surfaces change much with time. In young flowers, the disc tissue is usually much smaller and thicker. The papillae grow just before the male flowering stage, and after the female stage they collapse and disappear, at least for the untrained eye.

Stigma papillae – They are called long, when at least 3x as long as wide. The reverse condition is named short.

Fruit – The rather complex fruit structures are of utmost importance, both for the taxonomist and the layman who tries to identify a *Salsola* plant. For comparison, a few different types are assembled on Fig. 6.

Key to sections

(for indumentum characters careful observation with a strong lens is needed)

1a. Annuals; grey with a dense indumentum of short vesicular hairs (Fig. 3-C) .... Sect. VI. *Cardiandra* AELLEN (p. 218)
b. Annuals or perennials; without vesicular hairs 2
2a. Annuals; stems with green cortex for a short distance below upper leaves and bracts (Fig. 4-F); anther appendages vesicular, stalked (Fig. 5-E), at least (1/8–) 1/4 of thecae length .... Sect. VIII. *Physurus* ILJIN (p. 245)
b. Annuals or perennials; stems whitish or green throughout (except narrow longitudinal lines); anther appendages neither vesicular nor clearly stalked 3
3a. Plants glabrous, papillose or hispidulous, with stiff, 1-celled, papilla- or prickle-like hairs (Fig. 3-A, B), other hairs eventually present in axillary tufts 4
b. Plants throughout or at least the young stems with long or short few-celled hairs of various shape (Fig. 3-D, H) 6
4a. Bracts and bracteoles, mostly also leaves, spine-tipped, leaf base evenly widened, sheathing (Fig. 4-C); stigmas filiform .... Sect. III. *Salsola* (p. 178)
b. Leaves and bracts not spine-tipped, leaf bases indurated, persistent, not sheathing; stigmas not filiform 5
5a. Leaf blade arising from a compact, indurated and persistent pulvinus (Fig. 4-A); flowers in axillary clusters; lobes of fruiting perianth above the wings not significantly thickened (Fig. 6-A); utricle exposed .... Sect. I. *Coccosalsola* FENZL (p. 164)
b. Leaf blade near base petiole-like constricted, arising from a dilated, hump-shaped, persistent base (Fig. 4-B); flowers solitary; lobes of fruiting perianth above the wings ± thickened (Fig. 6-C-G); utricle usually included (hidden) .... Sect. II. *Arbuscula* ULBR. (p. 169)
6a. Leave bases not gibbous; tepal back without green blotch; anther appendages large, at least 1/3 of thecae length (Fig. 5-C,D) .... Sect. VII. *Belanthera* ILJIN (p. 228)
b. Leaves and bracts beneath near base distinctly gibbous (Fig. 4-D); tepal back with green blotch; anther appendages much shorter or absent 7

7a. Perennials; plants, eventually beside simple hairs, with ± adpressed 2-armed hairs (Fig. 3-E); anther appendages at least (0,3–) 0,5 mm long (1/5–1/3 of anther length) . . . . Sect. V. *Malpighipila* BOTSCH. (p. 213)
b. Annuals or perennials; plants without 2-armed hairs; anther appendages much smaller, to 0,2 mm long . . . . Sect. IV. *Caroxylon* FENZL (p. 192)

The author is indebted to the Volkswagen-Stiftung for financial support to carry out field studies in C Iran (grant no. VW AZ 14.0345) and to the Deutsche Forschungsgemeinschaft for grants to undertake an expedition through Pakistani Baluchistan (no. 222/6–1) and to work at the herbarium of the Komarov Institute in St. Petersburg (Leningrad) (grant no. WA 4.438, 111/25.185). Thanks are also due to the patience of the curators of B, BRNU, BSB, C, E, F, FR, G, GB, GOET, H, HAL, HBG, IRAN, ISL, JE, K, KAR, L, LD, LIV, M, MO, P, PES, PPFI, PR, RAW, TARI, US, W, WU, to Dr BRECKLE and Dr PODLECH for specimens from their private herbaria, and to many other colleagues, particularly from Pakistan and from Iran for their help in various ways. Mr KHALILOLLAH KHANI, formerly at the Faculty of Forestry and Range Management in Karaj, Tehran University, carried out important preparatory work, mainly in sect. *Caroxylon*.

Sect. I. *Coccosalsola*

FENZL in LEDEB., Fl. Ross. 3,2: 802 (1851).

Syn.: Sect. *Coccosalsola* subsect. *Coccosalsola* (FENZL) BOTSCH. p.p., Nov. Syst. Pl. Vasc. 13: 94 (1976); ibid. 26: 79 (1989). *Hypocylix* WOL. in STAPF, Denkschr. Akad. Wiss. Wien, Math.-Nat. Kl. 51: 275 (1886). *Darniella* MAIRE & WEILLER, Bull. Soc. Hist. Nat. Afrique N. 30: 301 (1939). *Salsola* sect. *Darniella* (MAIRE & WEILLER) BRULLO, Willdenowia 12: 242 (1982); *Salsola* sect. *Obpyrifolia* BOTSCH. & AKHANI, Bot. Zhurn. 74: 1664 (1989).

Lit.: V.P. BOTSCHANTZEV: Conspectus specierum sectionis Coccosalsola FENZL generis Salsola L., Novitates Systematicae Plantarum Vascularium, Leningrad (Novosti Sistematiki Vysšikh Rastenii) 13: 74–101 (1976); ibid., De genere Darniella MAIRE et WEILLER et relatione ejus ad genus Salsola L. (Chenopodiaceae). l.c. 26: 79–90 (1989).

Shrubs or subshrubs, rarely annuals; glabrous except for prominent tufts of axillary hairs. Stems finely striate, angulate in upper parts, milky white, often shining; after shedding of leaves rough from persistent leaf bases. Leaves opposite, subopposite or alternate, blade arising from a short or longer, compact, indurated, persistent pulvinus, obtuse, semi-terete or terete. Flowers clustered. Tepals circular or ligulate, often emarginate, with linear or triangular green blotch. Anthers oval, divided to 1/2; appendages minute, to 0,15 mm long, never longer than wide, flat; filaments linear for 2/3; disc with long, papillose lobes. Ovary depressed globular, thick-walled; style thick, short; stigmas 2(3), flat. Wings ± equal, not fully overlapping. Tepal lobes in fruit not significantly thickened. Utricle exposed, seed in a coriaceous (our species) pericarp, horizontal. – Type of sect. *S. foliosa* (L.) SCHRAD.

14 species; from the Canary Islands through N Africa to the Salt Range in Pakistan, northwards to Kazakhstan and south to Arabia; 3 species in our area. The constituent species are very

close to *Seidlitzia rosmarinus* and *S. florida*. The two latter species differ by strictly opposite leaves from our species of sect. *Coccosalsola*, but in N African species they are present as well. BRULLO (1984) and BOTSCHANTZEV (1989) mention as a discriminating character free interstaminal disc lobes in *Seidlitzia*, but this observation could not be confirmed.

1a. Small shrub; branches divaricate, recurved; lower leaves clavate, upper leaves and bracts obpyriform or dumb-bell-shaped ... 1. *S. Drummondii* ULBRICH
b. Dwarf shrubs; branches ascending; leaves and bracts terete or subclavate .. 2
2a. Leaves 10–15 x 2–3 mm; annual shoots with paniculate inflorescence .... 2. *S. makranica* FREITAG
b. Leaves 15–30 x 1–1,5 mm; annual shoots with long, loose, spike-like inflorescence .... 3. *S. Kerneri* (WOL.) BOTSCH.

1. ***S. Drummondii*** ULBRICH in ENGL. & PRANTL, Nat. Pflanzenfam., ed. 2, 16c: 565 (1934).
Syn.: *S. Schweinfurthii* sensu BOTSCH., Nov. Syst. Pl. Vasc. 13: 96 (1976) p.p.; *S. obpyrifolia* BOTSCH. & AKHANI, Bot. Zhurn. 74: 1665 (1989).
Icon.: BATANOUNY, Ecol. Flora Qatar: tab. 30 (1983), sub *Seidlitzia rosmarinus*; MANDAVILLE, Fl. East. Saudi Arabia: fig. 42 (1990). – Fig. 5-A, F, 6-A1, 2; Tab. 102.
Type: (Pakistan) Punjab, distr. Mari, abundant on the salthills close to the bungalow at Mari, 25. XII. 1901, J.R. DRUMMOND 13785 lectotype K!; isotype G!, K (3x)!, selected here.

Small hemispherical shrub, 30–100 cm, with very dense divaricate branching, dark green, glabrous, drying black. Stem up to 10 cm thick; woody branches erect or ascending, the upper spreading; annual shoots except the innovation shoots richly branched from base with spreading or evenly recurved branches, each producing a loose, often flexuose spike. Leaves alternate, the lowermost ± opposite, ascending to spreading, on first order axes 15–5 x 1,5–1 mm, terete, clavate; leaf axils with dense tufts of short curled hairs and often with smaller, obconical, rosulate leaves. Bracts obconical, obpyriform or dumb-bell-shaped, 4–2 x 3–1,5 mm, bract axils with 3–5 clustered flowers, 2 bracteoles of 1st order and 4(6) much smaller bracteoles of higher order, immersed in dense wool of 0,5–0,8 mm long curled hairs. Tepals cucullate, almost circular, 1,2–1,5 mm long, all 1-veined or the outer 2(3)-veined, apex rounded, crenulate, emarginate or variously lobed, green blotch broadly triangular, transverse line at 1/2. Anthers 0,5–0,7 mm long; interstaminal disc lobes 0,5–0,6 mm long, densely papillose. Style 0,4–0,5 mm long; stigmas 2 or 3, flat, 0,3–0,6 mm long. Fruiting perianth 5–9 mm diam., wings scarcely overlapping, tepals above the wings evenly incurved or almost straight, leaving the utricle fully or partly exposed. Seed 1,5–2,5 mm diam.

Hab.: Covering vast surfaces at the edge of salt-marshes on sporadically wet silty or sandy flats, often on sand sheets overlying salty clay, in washes and on slopes of tertiary marl rich in gypsum and other soluble salts; usually dominant, in association with other halophytes like *Suaeda fruticosa, Salsola cyclophylla, Anabasis setifera, Cornulaca monacantha* etc., on sands often with psammophytes like *Panicum turgidum* and *Pennisetum dichotomum*; from sea level to 600 (−950) m. – Fl. X–XI, fr. XI–XII.

Persia: S: Fars.: Bushehr: 15 km NW Ganaveh, 30 m, BOKHARI, HDG. & WDB. 14804! Kerm.: Kanis-e Jaz Murian, between Qaleh Ganj and Chah Reza, 400 m, ERSHAD & al. 35402-E! W Jaz Murian, 380 m, LEONARD 5788! Lar.: Qeshm island, FREY & al. VO 2640! Bal.: Makran: Between Kahir and Ghottam, 112 km W Tiz, ERSHAD & al. 35397-E!, 35413-E!, 40058-E! 15 km E Zarabad to Tujak, 100 m, ERSHAD & al. 35399-E! 15 km E Kollani toward Gwatar, AKHANI 6687! 75 km S Rask, near Bahu Kalat, 50 m, AKHANI 6655! 70 km ENE Chah Bahar near Delgan, 40 m, AKHANI 6658! – E: Khor.: N Dasht-e Lut, 650 m, 58°30'E, 31°40'N, LEONARD 5538!

Pakistan: Kohat: S side of Bahar Dahader Khel pass, 550–600 m, FREITAG 21533!, ZUBAIR & KHAN 539!, 26.IV.1968 SALIM! – Dera Ismail Khan: Shaikh Budin, 1.XII.1934, PARKER! – Bal.: N Makran: 14 km SW Panjgur, 900–940 m, FREITAG & KOTHE 18619! 38–50 km WSW Panjgur, FREITAG & KOTHE 18644!, GHAFOOR & OMER 1915! Makran: Turbat, POPOV 116! Makran Coastal Plain: Distr. Gwadar, 24 XI.1985, GHAFOOR! Gwadar, 7.X.1966, s. coll.! 4 km N Pishukan, c. 35 km ENE Jiwani, 4 m, FREITAG & KOTHE 18535!, GHAFOOR & OMER 1838! 32 km from Pasni at road to Gwadar, QAISER 7067! 6 km NW Pasni, 30 m, FREITAG & KOTHE 18397! Between Pasni and Rambra on way to Ormara, GHAFOOR & OMER 1834-A,-B! Between Ormara and Basal, QAISER 7091! 20 km NW Ormara, 20 m, FREITAG & KOTHE 18475! – Las Bela: Between Sonmiani and Bela, KAZMI 893! Las Bela, XI.1969, MC. VEAN!, 17.V.1965, BEG! 15 km W Liari near road to Kandewari, GHAFOOR & OMER 1650! 30 km NW Uthal at road to Bela, FREITAG & KOTHE 18074!, GHAFOOR & OMER 1600!, 1609!

Distr. gen.: E Arabian Peninsula, through S Persia to central parts of Pakistani Baluchistan, western parts of Salt Range; to be expected along the foothills of the Sulaiman Ranges (map in FREITAG 1992).

This very common and distinct species has, in the past, been widely overlooked. Most of the few earlier specimens were named *Suaeda fruticosa*, and superficially in the shape of leaves, bracts and floral clusters *S. Drummondii* does look similar. It differs in the winged fruiting perianth, fleshy bracteoles, dense axillary hairs and a different leaf anatomy. BOTSCHANZEV (1976) put it first into the synonymy of *S. Schweinfurthii*, and later described it (BOTSCH. & AKHANI 1989) as a new species. The german diagnosis of *S. Drummondii* is very short, but the species name was indeed validly published in 1934. The type material agrees very well both with the specimens from further south, and to populations at the type locality and elsewhere in the Salt Range where we studied them in the field. *S. Schweinfurthii*, which reaches its eastern frontier in N Saudi Arabia, differs by cylindrical leaves, ovoid bracts, much smaller fruiting perianth, a different branching system, and light green foliage which on drying does not turn black. Variability of *S. Drummondii* is small in essential characters, but high in leaf shape which changes almost completely from spring to autumn, and in growth form which is greatly influenced by environmental conditions.

2. ***S. makranica*** FREITAG, spec. nov.

Syn.: *Hypocylix Kerneri* WOL. var. *syriaca* EIG, Palest. Journ. Bot. Jerusalem Ser. 3: 122 (1945).

Icon.: Fig. 4-A; Tab. 103.

Type: Pakistani Baluchistan, N Makran, c. 60 km WSW Panjgur on road to Parom, just N of Hamun-e Parom; small plains and scree-covered slopes in limestone hills, 910 m, 7.X.1986, H. FREITAG & G. KOTHE 18652, holotype KAS!; isotypes KAS!, GOET!, K!.

Differt a *S. Kerneri* imprimis inflorescentia paniculata ramulis tenuioribus flexuosis, foliis bracteis brevioribus crassioribus, bracteis subclavatis, floribus minoribus.

Dwarf shrub, 20–40 x 10–30 cm; glabrous. Stem to 15 mm thick, branched from base; woody branches ascending; annual shoots erect, in lower 1/2 rigid, leafy, in upper part densely branched, forming a delicate panicle with thin flexuose branches. Leaves alternate, the lowermost subopposite, ascending or ± adpressed, straight, 10–15 x 2–3 mm, almost cylindrical, obtuse, glaucous or purplish, basal pulvinus much thinner than blade, leaf axils with dense tufts of long curled hairs. Bracts leaf-like, 7–3 mm long, semi-terete, clavate, incurved, at base sheathing with narrow hyaline margins; axils with 3(-5) clustered flowers, 2 bracteoles of 1st order and 4(-6) bracteoles of 2nd order, immersed in long curled hairs. Bracteoles of 1st order cucullate, 1,5 mm long and wide, almost circular in outline, the green back with hyaline wings; bracteoles of 2nd order 1–1,2 x 0,9 mm, with much smaller green back. Tepals cucullate, broad ovate to almost circular in outline, 1,3–1,8 mm long, 1-veined, the outer 1,4–1,6 mm wide, apex emarginate, green blotch linear, transverse line at 1/3–1/2. Anthers 0,8–1,3 mm long; appendage minute, almost indiscernible, anther apex truncate or slightly emarginate; disc thick, with densely papillose margin, interstaminal lobes to 0,3 mm long. Style 0,4–0,5 mm long and wide; stigmas 2(3), 0,4–0,5 mm long. Fruiting perianth, utricle and seed not known.

Hab.: Known from few localities, but locally common and sub-dominant on dry semidesertic slopes covered by thin, moderately saline soils, on different geological strata; usually with *Anabasis setifera, Halogeton alopecuroides, Salsola cyclophylla, Gymnocarpos decander, Zygophyllum tetrapterum*, and *Chrysopogon Aucheri*, also on true saline soils with *Suaeda fruticosa* and *Anabasis lachnantha*; 800–1400(–1500) m. – Fl. VIII–X; fr. X–XII.

P a k i s t a n : Bal.: Kharan: Koh-e Sabz, 1350 m, SHAH & NISAR 434! N Makran: 40 km NW Panjgur, new road to Palantak, 1100 m, FREITAG & KOTHE 18680!, GHAFOOR & OMER 1941! 60 km WSW Panjgur, N of Hamum-e Parom, FREITAG & KOTHE 18652!, GHAFOOR & OMER 1926! Mihta Sing Mts. 30 km E Panjgur, GHAFOOR & OMER 1935! C Makran: 93 km S Panjgur at road to Hoshab, 850 m, FREITAG & KOTHE 18587! 60 km S Panjgur, 26°58'N, 64°06'E, 800–850 m, RECH. 28118!

Distr. gen.: E Syria and Pakistani Makran, to be expected in other parts of Baluchistan and in Persian Makran.

Closely related to, and originally determined (FREITAG 1992) as *S. Kerneri*. It differs most obviously in the different branching system and the resulting inflorescence structure. It is conspecific with *S. Kerneri* var. *syriaca* EIG from Syria, which is only known from the type (Mt. E of Qaryatayn, 21.VII.1890, POST 124, G!). The disjunction from Syria to Makran is uncommon, but in both areas the climatological conditions are similar. A comparable pattern, although with more "stepping- stones", is that of *Halogeton alopecuroides*. In both areas the two species grow in the same communities.

3. *S. Kerneri* (WOL.) BOTSCH., Bot. Zhurn. 54: 990 (1969).
Syn.: *Hypocylix Kerneri* WOL. in STAPF, Denkschr. Akad. Wiss. Wien, Math.-Nat. Kl., 2.Abt. 51: 275 (1886).
Type: Persia borealis, Elburs prope Karsu, 12.IX.1882, T. PICHLER, holotype WU; isotypes G (2x)!, K!, W!.

Dwarf shrub, 20–45 x 10–30 cm; glabrous. Stem to 8 mm thick, branched from base; woody branches ascending; annual shoots erect, rigid, unbranched or rarely with few ascending branches, in upper 2/3–3/4 forming a very loose spike. Leaves alternate, the lowermost subopposite, ascending, straight or slightly incurved, 15–40 x 1–1,5 mm, cylindrical, obtuse, often glaucous or purplish, basal pulvinus thinner than blade; axils with dense tufts of short curled hairs. Bracts leaf-like, 30–7 mm long, at base incurved, sheathing with narrow hyaline margins; axils with 3 clustered flowers, 2 bracteoles of 1st order and 4(-6) bracteoles of higher order, immersed in short wool. Bracteoles of 1st order cucullate, 2,2–1,8 mm long and wide, apiculate, sheathing with wide wing-like hyaline margins, bracteoles of 2nd order 1,3–1,6 x 1,1–1,3 mm, with much smaller green back. Tepals cucullate, broad ovate to circular in outline, 1,7–2,2 mm long, 1-veined, apex obtuse, crenulate or emarginate, green blotch narrow triangular to linear, transverse line at 1/4. Anthers 1–1,3 mm long; interstaminal disc lobes 0,25–0,3 mm long. Style 0,4–0,5 mm long and wide; stigmas 2, 0,4–0,6 mm long. Fruiting perianth 8–10 mm diam., wings almost overlapping, tepals above the wings slightly incurved, with a distinct green keel. Utricle partly exposed. Seed 2 mm diam.

Hab.: Locally common and dominant on shallow, coarse-textured semi-desertic slopes of different geological strata, often with *Anabasis setifera, Halothamnus auriculus, Salsola tomentosa, S. orientalis, Ephedra sarcocarpa* and *Zygophyllum tetrapterum*; 900–1400(–2000) m. – Fl. VI–IX, fr. IX–XI.

P e r s i a : N: Between Gorgan and Shahrud, Kuh-e Chehel Dokhtar, SHAR. 442! Maz.: Between Amol and Polur, 1050 m, ASSADI 25612! Haraz valley between Haraz and Amol, 24.V.1976, MANUCH.! Slopes near Gaznak, 10.I.1943, PETROV! Panjab, 1000 m, WDB. 1627! Between Dudar and Robat-e Toroq, ALEXEENKO 840! – C: Tehr.: Hableh Rud valley, between Simin Dasht and Kabutar Darreh, 1150 m, AELLEN & MANUCH. 496! Kavir Prot. Reg.: S-side of Siah Kuh, 1150 m, WDB. & FOROUGHI 14667! Qazv.: N Kuh Jarub near Karaj, SAB. in GAUBA 2099! Damgh.-Semn.: Between Bashm pass and Sorkheh, 1600–2000 m, RECH. 1970! Kuhha-ye Anjirab, 1500–1650 m, TERME & MOUSSAVI 40098-E! 20 km E Semnan, Chasht Khvaran to Kuh-e Warzam, 1650–1900 m, TERME & ZARGANI 40077-E! Shahr.-Bust.: Turan Prot. Reg.: Qollah Allahkum, 15 km WNW Ahmadabad, 1050 m, FREITAG 14187! 20 km E Shakh-e Biar, 1380 m, BRECKLE 5096! 20 km SSE Razveh, S Andar Kuh, 950–1000 m, FREITAG 14116! Razveh NE Torud, 21 km ENE at road to Jamil, 1320 m, FREITAG 14128! 12 km NE Razveh, Buzmin Kuh, 1220–1300 m, FREITAG 14972! 15 km S Zeydar, 1300 m, BRECKLE 5033! E-side of Ahu pass between Damghan and Shahrud, 1400 m, FREITAG 15544!

Distr. gen.: Restricted to the semi-deserts of N and C Persia.

A rather uniform species, evidently avoided by grazing animals. Under water stress the foliage often turns bright purplish.

Sect. II. *Arbuscula*

ULBR. in ENGL. & PRANTL, Nat. Pflanzenfam. ed. 2, 16c: 565 (1934), p.p.

Syn.: *Salsola* sect. *Anchophyllum* ILJIN in KOMAR., Fl. URSS 6: 237 (1936); sect. *Coccosalsola* FENZL sensu BOTSCH., subsect. *Arbuscula*, Nov. Syst. Pl. Vasc. 13: 77 (1976); *Coccosalsola* subsect. *Genistoides* (ULBR.) BOTSCH. p.p., Nov. Syst. Pl. Vasc. 26: 80 (1989).

Lit.: V.P. BOTSCHANTZEV: Conspectus specierum sectionis Coccosalsola FENZL generis Salsola L., Novitates Systematicae Plantarum Vascularium, Leningrad (Novosti Sistematiki Vysšikh Rastenii) 13: 74–101 (1976).

Small trees, shrubs or subshrubs; glabrous except for axillary hairs, papillose or hispidulous with stiff, smooth, unicellular hairs. Stems milky white, shining, finely striate, angulate in upper parts. Leaves alternate, with a distinct petiole-like constriction above the dilated, hump-shaped, persistent base, obtuse, semi-terete or terete. Bracteoles inside hairy. Flowers solitary. Tepals circular or ligulate, with diffuse green blotch. Anthers oval, linear or sagittate, divided for 1/5–1/2; appendages minute or prominent, as long as or longer than wide, connate with thecae, triangular in outline, flat; filaments linear; disc lobed. Ovary subglobular or conical, thin-walled; stigmas flat, spreading. Fruiting perianth with overlapping, subequal wings, or 2 inner wings much narrower. Tepal lobes in fruit above the wings ± thickened. Utricle usually included. Seed in thin, membranous pericarp, horizontal. – Type of sect.: *S. arbuscula* PALL.

About 9 species (BOTSCHANTZEV, 1976, mentioned 17 in his subsect. *Arbuscula*); S Spain and N Africa, from W Persia to C Asia, southwards to the mountain semi-deserts in S Persia and northern parts of Pakistani Baluchistan; 5 species in our area.

The species of sect. *Arbuscula* are closely allied to those of sect. *Coccosalsola*, and *S. montana* (together with the C Asiatic *S. abrotanoides*) links both groups. BOTSCHANTZEV (1989) added the species of sect. *Arbuscula* to sect. *Genistoides* ULBR., but the small-ranged endemics, *S. genistoides* (SE Spain) and *S. pachyphylla* (Pamir-Alaj), hold an isolated position and are better placed in a separate section.

1a. Loosely branched shrubs or small trees, up to 4 m; lower leaves 30–90 mm long, often pendant; lobes of fruiting perianth forming a stiff cone 2
b. Densely branched smaller plants; leaves shorter, never pendant; lobes of fruiting perianth different 3
2a. Leaves to 1,5 mm thick, "petiole" 1–1,5 mm long; bracteoles without blade; fruit 14–18 mm in diameter . . . . 7. *S. Richteri* (MOQ.) KAREL. ex LITW.
b. Leaves to 1 mm thick, "petiole" 1,5–2 mm long; bracteoles with spine-tipped, recurved blade; fruit 16–22 mm in diameter . . . . 8. *S. Paletzkiana* LITW.

3a. Dwarf shrub up to 50 cm, with numerous erect annual shoots, terminating in paniculate inflorescences; fruiting perianth 7–9(–12) mm in diameter .... 4. *S. montana* LITW.

b. Small shrubs, 30–10 cm, ± divaricately branched, without paniculate inflorescences; fruiting perianth 10–18 mm in diameter 4

4a. Foliage green or glaucous; bracteoles with a blade; lobes of fruiting perianth above the wings forming a thick, indurated circular bulge and a central flower-like cup; utricle hidden .... 6. *S. arbuscula* PALL.

b. Foliage brownish-green; bracteoles without a blade, forming a whitish collar around the lower 1/2 of flower; fruiting perianth with ± erect lobes; utricle partly exposed .... 5. *S. arbusculiformis* DROB.

4. ***S. montana*** LITW., Nov. gorn. solj.: 3 (1917).
Syn.: *S. maracandica* ILJIN, Bot. Zhurn. 18: 276 (1933). *S. masenderanica* BOTSCH., Nov. Syst. Pl. Vasc. 11: 173 (1974). *S. oreophila* BOTSCH., Bot. Zhurn. 60: 1159 (1975). *S. Botschantzevii* KURBANOV, Bot. Zhurn. 68: 237 (1983).
Icon.: LITW., l.c.: 3 (1917). OVCZ., Fl. Tadjik. SSR 3: tab. 63, fig. 3,4 (1968). – Tab. 104.
Type: (Uzbekistan, Fergana) Alay Mts. near Ljangar, Margelan distr., rocky slopes, c. 2400 m, 31.VIII.1897, S.I. KORSHINSKY 4742, lectotype LE!; isotypes (3x) LE!; cf. BOTSCH. (1976).

Dwarf shrub, 20–50 cm high and wide; glabrous, rarely papillose. Stem arising from a thick taproot, up to 3 cm thick, sometimes caudex-like, branched from base; woody branches erect, ascending or prostrate. Annual shoots erect, rigid, in upper part densely branched, the ascending laterals forming a narrow or wide, occasionally diffuse paniculate inflorescence. Leaves ascending, ± incurved, (35–)15–5 × 1,5–1 mm, ± terete, often glaucous or purplish, indistinctly apiculate, basal constriction 0,5–1 mm long, axils with dense tufts of hairs. Bracts leaf-like, but shorter, wider, semi-terete, the lower longer than bracteoles and tepals, the upper as long as or shorter, often with ± clavate blade, at base with hyaline margins sheathing, incurved. Bracteoles cucullate, c. 1 mm shorter than tepals, ovate or almost circular in outline, 1,5–2 mm long and wide, apiculate with a green, succulent, keeled back, only the lowermost sometimes longer and similar to upper bracts. Tepals ovate, firm, 2,5–3,2 mm long, the outer 1,5–2 mm wide, 5-veined, the inner 3(2)-veined, with wide hyaline margins, apex broadly obtuse, crenulate, green blotch narrow triangular, transverse line at 1/2, glabrous. Anthers 1,5–2 mm long, narrow triangular or sagittate, divided up to 1/2; appendage minute, 0,2–0,3 mm long and wide, obtuse; disc thick, with semi-circular, 0,5–0,6 mm long interstaminal lobes, glabrous. Ovary subglobular; style 0,3–0,6 mm long; stigmas 2(3), 0,8–1,3 mm long. Fruiting perianth 7–12 mm diam., wings overlapping, subequal, very thin, straw-coloured, when young often pink, tepals above the wings with a very narrow thickened bulge evenly incurved to a truncate cone or erect, the utricle partially exposed. Seed 2–2,5 mm diam., horizontal.

Hab.: Scattered, but locally common and dominant on driest slopes of mountain semi-deserts, restricted to soils rich in soluble salts, preferably on marl, conglomerate and particular sandstones, forming distinct communities, in Afghanistan usually with *Anabasis macroptera, Atriplex leucoclada, Haloxylon Griffithii, Salsola tomentosa, Ephedra intermedia*, on less saline soils subdominant in *Artemisia* ssp. – and in *Krascheninnikovia ceratoides*-communities; 900–3000 m. – Fl. VII–IX, fr. X–XI.

P e r s i a : N: Gorgan, "Nau Das" (Naudeh ?)-river, road Gorgan to Shahrud, 1300 m, 24.VII. 1942, PETROV! Ibid., "Tashkemlere" GADD 334 (type of *S. masenderanica*)! Maz.: Valley of Rud-e Tejan between Qomrud Pain and pass, 60 km E Firuzkuh, 2200–2500 m, BEHB. & AELLEN 30128-E! Gilan: Between Qazvin and Rasht, 500–1200 m, SCHMID 6583!, 6584! – W: Azerb.: 20 km E Mianeh to Khalkhal, 960 m, WDB. & SHIRDELPUR 14926! 16 km S Mianeh, 980 m, PABOT 3748!, 5129! Esf.: Chashmeh-e Gul-e Zard on Kuh-e Sofeh near Esfahan, 26.IX. 1885, STAPF! – E: Khor.: Kuh-e Ahangaran, near Ahangaran, 2000–2300 m, RECH. 56137! Robat-e Qareh-Bil between Gonbad-e Kavus and Bojnurd, PETTER 8! – C: Tehr.: M. Damavand, 2 km S Ab-e Garm, 2200–2700 m, BRECKLE & BHADRESA 5389! Hableh Rud valley, between Simin Dasht and Kabutar Darreh, 1150 m, AELLEN & MANUCH. 494!, 495! Damgh.-Semn.: Chashmeh Ali, SE Kuh-e Nizva, 2200–2600 m, AELLEN & BEHB. 492!
T u r c o m a n i a : Kyurendag, Iskander near Akgjadik-pass, 20.X.1981, KURBANOV (type of *S. Botschantzevii* KURBANOV)! Ibid., 2 km NW Dzhekirdekli, 23.X.1981, KURBANOV!
A f g h a n i s t a n : E: Kabul: 49 km W Charikar bridge, near Pul-e Rangar, 1920 m, FREITAG 1083! 5–7 km above Siagird near Pul-e Rangar, 1900–1950 m, FREITAG 3936!, FREITAG 3943! Ghorband: Near Burje Guljan, 1700 m, PODLECH 17054b! Urgun: Kotanni pass NW Urgun, 2300 m, FREITAG 3295! – NE: Kataghan: Farkhar valley, 2700 m, PODLECH 12668! – C: Bamian: Sabz pass, 3000 m, KOELZ 13836! Red Town ("Shahr-e Zohak"), 16 km E Bamian, 2350–2450 m, FREITAG 3965!, PABOT A 1383!, PODLECH 17035! Opposite Red Town, 2450 m, BRECKLE 4757! Near Great Buddha, PABOT A 1280! 8–10 km W Bamian, 2600–2700 m, FREITAG 3953!, PODLECH 19521a! Kalu valley between Bamian and Hajigak pass, 2700 m, FREITAG 6393! Ibid., above warm spring, 2700 m, BRECKLE 4800! "Der Hadj", above limestone barrier, 2800 m, BRECKLE 4783! Kuh-e Baba, Dewali pass, road Yakawlang to Panjao, 3000 m, DIETERLE 722! Foothills of Kuh-e Baba, N-side, above Nayak, 2700 m, THESIGER 97! Khushkak pass, Turkestan side, GRIFF.s.n.! GRIFF. Herb. East Ind. Comp. 4216 = Journ. 1807! Doab: Doab, 1400 m, KOEIE 2875! Darrah-e Shikari, 2 km W Bulola to Bamian, 2400 m, PODLECH 17040! Gorge near Bulola, 2500 m, GILLI 2168! Ghorat: W Lal-e Sarjangal, 2400 m, KOEIE 2767!
P a k i s t a n : Quetta: Between Quetta and Ziarat, 1800 m, JAFRI & AKBAR 2047! Ziarat, 6.VII.1959, KHAN! Sultan, 1750 m, STEW. 27989!

Distr. gen.: E Azerbaijan, through the Elburz, Hindukush, and Pamir Alaj to Pamir and Tian Shan, southwards to the Sulaiman Range in NE Baluchistan.

Despite its scattered distribution, *S. montana* is comparatively uniform. Some variation occurs in growth form, density and shape of inflorescence, length and thickness of leaves, bracts and bracteoles, and in the diameter of the fruiting perianth; most of them are ecological forms. *S. masenderanica* BOTSCH., *S. oreophila* BOTSCH. and *S. Botschantzevii* KURBANOV are considered here as minor variations. The first was separated because of the short succulent apical elongation of the bracteoles. Such bracteoles occur here and there on plants growing on most saline soils. *S. oreophila* was said to differ in the lower bracteoles being longer than the tepals and a less branched inflorescence. The type (KORSHINSKY 3714!), also a syntype of *S. montana*, is indeed less branched, but such specimens occur all over the area. Longer lowermost bracteoles are regularly associated with reduced branching, because the main spike starts lower down. Several specimens from C Afghanistan were named *S. oreophila* by BOTSCHANZEV (in schedis). Specimens with larger fruiting perianths (< 9 mm) have been seen only from N Persia and the Kyuren Dagh in westernmost Kopet Dagh (type of *S. Botschantzevii*), but here plants with smaller fruits also occur. The type of the latter and JAFRI & AKBAR 2047 from Baluchistan are the only papillose forms seen. Probably several other taxa described by Russian authors from the Pamir Alaj and Tian Shan also belong to *S. montana*, e.g. *S. flexuosa* BOTSCH., *S. tianschanica* BOTSCH., *S. Lipschitzii* BOTSCH. and *S. Junatovii* BOTSCH. The three specimens from Pakistan are placed here with certain hesitation; they are very young and lack flowers and fruits.

With partly exposed utricles and slightly thickened tepals, the species has a somewhat intermediate position between sects. *Arbuscula* and *Coccosalsola*.

5. *S.* ***arbusculiformis*** DROB., Trav. Mus. Bot. Acad. Sc. Pétersb. (Trudy Bot. Muz. Imp. Akad. Nauk) 16: 142 (1916).
Icon.: DROB., l.c., tab. 17, fig. 1, only pl. nr. 234 (1916). KOMAR., Fl. URSS 6: tab. 11, fig. 10 (1936). – Fig. 4-B; Tab. 105.
Type: (Uzbekistan) Prov. Fergana, distr. Skobelev: In decliviis inter pag. Mujan et Dshulga, V. DROBOV 234, lectotype TAK; isotype LE!; cf. BOTSCH. (1976).

Small, dense, hemispherical shrub of 0,3–0,8 m, usually brownish-green; glabrous or papillose. Stem up to 2 cm thick. Annual shoots erect or ascending, rigid, unbranched or with a few ascending branches, in upper part forming loose, towards the apex denser, spikes; the woody branches with rosulate leaves. Leaves alternate, ascending, usually slightly incurved, 15–10 × 1,5–1 mm, subclavate, apiculate, basal constriction 0,5–1 mm long; leaf axils with dense tufts of short curled hairs. Bracts leaf-like but shorter, incurved, at base widened and sheathing, with narrow hyaline margins, inside with hairs longer than bracteoles and tepals. Bracteoles with wide wing-like hyaline margins forming a collar-like structure around the lower half of the flower, 2,5–2 mm long, 4–3 mm wide, without blade, the green body ovate to circular in outline, also at the apex with broad hyaline margin, slightly keeled. Tepals ovate to ligulate, stiff, 3,5–4,5 mm long, the outer 2–2,5 mm wide, 3–5-veined, the others 1–3-veined, with broad hyaline margins, apex obtuse, often apiculate, back with diffuse triangular to semi-circular green blotch, higher up often purplish, transverse line at 1/4–1/5. Anthers 2,5–3,5 mm long, red or yellow, linear, divided up to 1/2; appendage minute, 0,2–0,4 mm long and wide, obtuse; disc with small interstaminal and epistaminal lobes, glabrous. Ovary subglobular; style 1,5–2 mm long; stigmas 2, 1,5–2 mm long, band-shaped up to the apex, 0,3–0,4 mm wide, yellow. Fruiting perianth 12–15 mm diam., wings overlapping, subequal, rather stiff, brownish to straw-coloured; tepals above the wings forming a steep, open cone with concave flanks, above the wings with a narrow thickened bulge. Utricle semi-exposed, c. 3 mm diam., with a weakly hardened cap; embryo horizontal.

Hab.: Locally common on rocky, gravelly and coarse sandy soils in semi-desert-communities dominated by *Artemisia* ssp., *Ephedra intermedia*, *Zygophyllum tetrapterum*, *Salsola orientalis*, *S. Kerneri* or *Krascheninnikovia ceratoides*; 1100– 1500(–1700) m. – Fl. V–VIII, fr. IX–XI.

Persia: N: Gorg.: 134–139 km E Gonbad-e Kavus to Bojnurd, PABOT 7823!; 10.VII.1965, SERAJ in PABOT! Moh. Reza Shah Prot. Reg.: "Dasht" N Robat-e Qareh Bil, at road to Almeh 1200 m, RECH. 52835! Robat-e Qareh Bil, PETTER 7! Near Dasht, POLUNIN 11883! N/C: Gorg./Shahr.-Bust.: Chehel Dokhtar, SHAR. 265!, 441! – C: Damgh.-Semn.: Between Damghan and Semnan, 1200 m, DINI & BAZARGAN 32917! W of Qushe, c. 1300 m, FREITAG 14198! 40 km E of Semnan, 1920 m, ZOHARY & ORSHAN 1051/2! E side of Ahu-pass between Damghan and Shahrud, 1500–1700 m, FREITAG 15543! 15 km S Zeydar, 300 m, BRECKLE & BHADRESA 5037! Shahr.-Bust.: 40–54 km NE Shahrud to Gorgan, 1650 m, PABOT 8107!, 8153! Between Gorgan and Shahrud, SAB. 566! Turan Prot. Reg.: 24–29 km N Ghazazan to Miandasht, 1200–1300 m, FREITAG 14146!, 15282! E-side of Kuh-e Yazdu, pass between Ghazazan and Ahmadabad, 1280 m, FREITAG 15165! – Road Shah Pasand to Bojnurd, 1200–1300 m, TERME 41550-E! Not localized: Between Berostan and Isfesar, 9.X.1858, BUNGE!
Turcomania: Ashkhabad, Suluklü [Saratovka] SINT. 1029! Kopet Dagh, Kyuren Dagh, 13.VI.1954, MARIOVA!
Afghanistan: NW: Herat, "Barhrugk", BUNGE 50!

Distr. gen.: W Kopet Dagh and Ust-Urt plateau eastwards to the Tian Shan and C Kazakhstan, southwards to Khorasan and S Tadjikistan; to be expected in N Afghanistan.

The species resembles *S. arbuscula*, but even from a distance it can be recognized by its brownish green, very dense foliage. Heavy browsing often causes stunted growth, dominance of rosulate shoots and a gnarled branching system. Highly distinctive are the papery white collars around the lower half of the flowers, the large, usually bright red anthers with a minute appendage, and the fruits with the upper parts of the tepals forming a truncate cone instead of a funnel. Anatomically the leaves differ in the absence of the crystal-bearing hypodermis.

The delimitation from the closely related *S. laricifolia* TURCZ. ex LITW. needs more attention. KINZIKAJEVA (in OVCZ., Fl. Tadjik. SSR. 3, 1968) includes *S. arbusculiformis* into that eastern species (E Kazakhstan to Mongolia and Gansu in China).

6. ***S. arbuscula*** PALL., Reise 1: 487 (1771).
Syn.: *S. arborescens* L. fil., Suppl. pl.: 173 (1781); *S. transhyrcana* ILJIN, Bot. Zhurn. 18: 277 (1933) (probably).
Icon.: PALL., Illustr. Pl. 17 (1803). KOMAR., Fl. URSS 6: tab. 11, fig. 9 (1936). NIKITIN & GELDIKHANOV, Opred. Rast. Turkmen.: tab. 36, fig. 3 (1988). – Fig. 6-D; Tab. 106.
Type: (Kazakhstan) "Occupat summum marginem riparium Lacus salsi Inderiensis, in deserto Tatarico", P.S. PALLAS, holotype BM!; isotype W!

Small, hemispherical shrub or subshrub, 30–100 cm high; glabrous or densely papillose. Stem branched from base; woody branches ascending or divaricate, often subspinescent. Annual shoots rigid, simple or with shorter branches, in upper part forming loose or condensed spikes; previous-year's woody branches sometimes with rosulate leaves. Leaves ascending, straight, in lower part 1–5 cm x 1–2,5 mm, in upper part shorter, apiculate or shortly mucronate, basal constriction 0,5–1 mm long; leaf axils with tufts of curled hairs. Bracts leaf-like but shorter, at base auriculate with wide hyaline, often ciliate margins, always much longer than bracteoles and tepals. Bracteoles similar to upper bracts, the lower usually longer than tepals, the upper as long as or shorter. Tepals ovate-ligulate, 3–4 mm long, the outer 1,5–2,5 mm wide, 9–13-veined, the others at least 3–5-veined, the hyaline margin in lower part sheath-like and ciliate, in upper part and at the rounded apex crenulate and ± undulate, the back thickened, without a distinct green blotch, glabrous, transverse line at 1/7–1/10. Anthers 2,2–3,5 mm long, divided up to 1/2; appendage 0,4–0,5 mm long; filaments linear; disc with short, thick lobes, glabrous. Ovary ± conical; style 0,7–1 mm long; stigmas 2, 1,5–2 mm long, flat, at base c. 0,4 mm wide, at apex almost subulate, deeply red. Fruiting perianth 10–13 mm diam., wings subequal, tepals above the wings first incurved and forming a broad, indurated circular bulge, then abruptly recurved and forming an open flower-like cup. Utricle 2–3 mm diam., with hardened cap, horizontal.

Hab.: Very common but usually a secondary component in many semi-desert communities, both on coarse and fine-textured soils of slopes and plains, enduring moderate salinity; from (400–) 700–1500 m, in S Persia and SE Afghanistan up to 2300 m. – Fl. VI–IX, fr. IX–XI.

P e r s i a : W: Esf.: Desert at Gav Khuni (Gawkhane)-lake, STAPF 790! – S: Fars: Abarqu, 30 km on road to Yazd, 1520 m, FOROUGHI & ASSADI 15113! 45–55 km SE Abadeh, 2000 m, KRAMER VO 11334!, PABOT 2354! Kerman: 40–44 km NW Anar, 1530 m, PABOT 6994! 90 km W Kerman, 1730 m, PABOT 6967! 20 km W Kerman, 1900 m, ASSADI, EDMONDSON & al. 1803! 17,5 km W Rafsanjan, 1490 m, PABOT 6973! Pass between Baghin and Mashiz, 2200 m, BORNM. 5100! 83,5 km SE Sirjan, 1700 m, PABOT 6830! Between Bardesir and Kerman 9.VI. 1960. DADASHZADEH in PABOT! 52–56 km SW Kerman, 2180–2260 m, PABOT 6922!, 6933! S Kerman, at road from Baft, 2000 m, DADASHZADEH in PABOT DK 211! Between Zarand and Rafsanjan, DADASHZADEH in PABOT DK 212!; ibid., at Roukard, 28.VI.1960, DADASHZADEH in PABOT! Tahrud, between Kerman and Bam, c. 1500 m, RECH. 3590! Deh-i Shuturun, c. 2000 m, BORNM. 5099! Bal.: 79 km N Zahedan, 640 m, ZOHARY & ORSHAN 8727/6! – E: Khor.: E of Dasht-e Lut, E of great dunes, 59°52'E, 30°28'N, 1100 m, LEONARD 6121!; N of great dunes, 59°32'E, 30°57'N, 1100 m, LEONARD 6225! 150 km SE Birjand, 1400 m, ZOHARY & ORSHAN 8985/6! 120 km SE Birjand, Sahlabad, 1350 m, DADASHZADEH in PABOT DE/41! Taq plain, Robat-e Khan, KOELZ 16808!, 16809! Torbat-e Heydariyeh to Gonabad (Juymand), 1500 m, REJAMAND & BAZARGAN 31993! – C: Tehr.: Hableh-Rud valley, 1–2 km above Ban-e Kuh, 1100 m, AELLEN & MANUCH. 3104!, 3126!, 3128! Hableh-Rud valley, between Simin Dasht and Kabutar Darreh, 1150 m, AELLEN. & MANUCH. 3090! Near railway-station Kavir, 88 km E Tehran, 1000 m, AELLEN 2834!, 2904!, 2905! Near railway-station Bahram, 20 km E Tehran, AELLEN 2999! Kavir Prot. Reg.: E Siah Kuh, 800 m, WDB. & FOROUGHI 14636!, 14639!, 14640! Near Mulkabad, 64 km SE Shah Abbas Caravan Sarai, 900 m, RECH. 46314! Between Daryacheh-ye Namak and Siah Kuh, 800 m, AELLEN & SHAR. 2855! Kashan: Kavir Namak, Sefid Ab to Kush Kuh, IRANSHAHR & MOUSSAVI 15379-E! 60 km S Qom, 1350 m, PABOT 3431! Yazd: Between Jandaq and Chupunum, road of Tabas, 950 m, FOROUGHI & BAZARGAN 32411! Between Anarak and Chupunum, road of Tabas, 1000 m, FOROUGHI & BAZARGAN 32382! Rig-e Djin, 37 km from Chah Malek to Chupunum, 800 m, RECH. 51929! 50–48 km SE Na'in, 1230 m, PABOT 7083! Ardestan to Na'in, 1900 m, BAZARGAN & FOROUGHI 32419! 45,4 km SE Ardestan, 49,2 km W Na'in, 2050 m, 11.V.1961, PABOT! Dasht-e Kavir: Farrokhi between Jandaq and Khvor, 700 m, TERME & MOUSSAVI 40133-E!, 90282-E! 30 km from Robat Posht-e Badam to Yazd, 1000 m, BAZARGAN & FOROUGHI 32429! Robat Posht-e Badam, 900 m, FOROUGHI & BAZARGAN 32394! Damgh. Semn.: E-side of Ahu-pass between Damghan and Shahrud, 1400 m, FREITAG 15539! S Semnan to Kavir, 1000 m, REJAMAND & ARAZM 32589! 72 km W Semnan, 1250 m, ZOHARY & ORSHAN 11653/5! From Vardenow to Kalateh, 4 km Menghas, 1750 m, TERME & al. 39351-E! Shahr.-Bust.: Torud, S Shahrud, 1350 m, REJAMAND & ARAZM 32560! 38–45 km E Shahrud, 1200–1300 m, ALAVA & IRANSHAHR 10866!, KOELZ 16945! Mayamey, SAB. 534!; 1200 m, GAUBA K-2912! Khush Yailaq, Zardabeh, 1550- 1640 m, TERME & al. 39370-E! Turan Prot. Reg.: 10 km E Abbasabad, c. 950 m, ZOHARY & ORSHAN 10213/4! 18 km ESE Delbar, hills 500 m S road to Ahmadabad, 980 m, FREITAG 13918! 15 km ESE Delbar, 820 m, FREITAG 15221! Qollah Allahkum, c. 15 km WNW Ahmadabad, 1050 m, FREITAG 14186! S of Zalehabad, road to Sanjari, N-side of pass, 1275 m, FREITAG 13822! 8 km S Majrad, S of Abol Yahya spring, 800 m, BRECKLE 5060! N of Shur-e Doruneh, c. 850 m, FREITAG 14195! 24 km N of Ghazazan to Miandasht, 1300 m, FREITAG 15278! 5 km S Miandasht, 1300 m, FREITAG 14147!, 14148! NE of Kuh-e Yazdu, 1240 m, FREITAG 15206! Kavir road 16 km SE Razveh, 900 m, FREITAG 14121! – Not localized: 16.I.(?1849) BUHSE! Between Anadbek and Ney Zor, ALEXEENKO 629!

T u r c o m a n i a : Ashkhabad: Suluklü [Saratovka], SINT. 1029! Kazandzhik, SINT. 2206!

A f g h a n i s t a n : **NW**: Herat: Hari Rud river banks 19 km E Kizil Islam Qaleh, 90 m, FURSE 7649! 5 km N Kohsan, WNW Herat, 790 m, FREITAG 5474! – **SW**: Farah: Dasht-e Bebas, 700–750 m, FREITAG & BRECKLE 4390! 50 km E Farah, near pass between Khurmalik and Sia Ab, 800 m, FREITAG 3786! 30 km N Chakhansur, road to Farah, border of Khuspas-river, 540 m, FREITAG 3765! E border of Jehil-e Puzak, 460 m, BRECKLE 4910! – **E**: Urgun: 25 km NW Urgun, 2300 m, FREITAG 1948! N Katawaz between Kotanni-pass and Patanna, 2250 m, FREITAG 3343! – Not localized: 1884/85, AITCH.!

P a k i s t a n : Not yet seen, but probably present in N Baluchistan.

Distr. gen.: Caspian lowlands and C Persia eastwards to Mongolia and Gansu in China, southeast to the Afghan-Pakistan border.

This is a very polymorphic species. Growth form greatly depends on grazing pressure, and leaf dimensions on water supply and salinity. Variation in length and density of indumentum and the length of bracteoles are apparently genetically controlled. In many populations, glabrous, subpapillose and scabrous individuals occur side by side, and the same helds true for the length of bracts. *S. transhyrcana* was described by ILJIN on the basis of papillose surfaces, semi-terete leaves, shorter bracts and more chartaceous tepals. The type material from Dagada Island in the Caspian just S of Krasnovodsk (EICHWALD 156b, holotype LE!, isotype HAL!) and other specimens preserved in LE, might represent hybrids between *S. arbuscula* and *S. Richteri*.

7. *S.* ***Richteri*** (MOQ.) KAREL. ex LITW., Izv. Turkestansk. Otd. Imp. Russk. Geogr. Obšč. 4: 27 (1905).

Syn.: *S. arborescens* L. fil. var. *Richteri* MOQ. in DC., Prodr. 13,2: 185 (1849), the original citation, by error, is '*Richleri*'. *S. arbuscula* PALL. var. *angustifolia* FENZL in LEDEB., Fl. Ross. 3: 817 (1851).

Icon.: KOMAR., Fl. URSS 6: tab. 11, fig. 11 (1936). NIKITIN & GELDIKHANOV, Opred. Rast. Turkmen.: tab. 36, fig. 1 (1988). – Fig. 5-G; Tab. 107.

Type: Turcomania, G.S. KARELIN, holotype LE!

Shrub or small tree, 1–3 × 0,5–2 m; glabrous or densely papillose. Stem loosely branched, woody branches erect to ascending. Terminal and subterminal annual shoots very long, erect, in upper part producing loose spikes; lateral shoots much shorter, with more condensed leaves and flowers. Leaves almost cylindrical, straight, ascending, the longest often pendant, in lower part 80–30 x 1,5–0,5 mm, in upper part shorter, apiculate, basal constriction 1,5–1 mm long. Bracts leaf-like but shorter, at base with hyaline, sometimes ciliate margins, always much longer than bracteoles and tepals. Bracteoles cucullate, ovate or circular in outline, usually apiculate and obtusely keeled in upper part, with wide hyaline and ciliate wing-like margins embracing the flower, 2–1,2 x 4,5–3,5 mm, 1/3–1/2 as long as tepals. Tepals triangular to ovate, in upper part often ligulate, 3,5–4,5 mm long, the outer 2–2,8 mm wide, 9–13-veined, the others 3–5-veined, the hyaline margins up to 2/3 ciliate, apex rounded or apiculate, back without distinct green blotch, glabrous, transverse line at 1/7–1/10. Anthers 2–2,5 mm long, divided up to 1/2; appendage 0,2–0,5 mm long; filaments linear; disc with short, broad, densely papillose lobes. Ovary ± conical; style 1–1,5 mm long; stigmas 2, 1–1,5 mm long, flat up to apex, 0,3–0,4 mm wide, red. Fruiting perianth 14–18 mm diam., 2 inner wings much narrower, tepals above the wings first incurved and forming a broad, indurated, circular bulge, then more or less recurved, often forming an open funnel. Utricle 2–3 mm diam., with slightly hardened cap; horizontal.

Hab.: A very typical component of sandy semi-desert vegetation, growing on semi-stabilized and on fixed sand dunes, usually together with *Haloxylon persicum, Stipagrostis Karelinii, St. plumosa, Calligonum amoenum* and other psammophytes; in the northern plains up to 500 m, in other parts from 500–1200 (–1300) m. – Fl. VII–X, fr. X–XII.

P e r s i a : S: Kerm.: Namak-e Shahdad, before Shahdad, GABRIEL 271! – E: Khor.: Between Ferdows and Deyhuk, DADASHZADEH DE/243! Tabas, SAB. 545!, 546! Mozhanabad (Mudzhnabad) to Awiz [? Avaz] CZERNIAK. 256! Taq Plain, Robat-e Khan, KOELZ 16808! Sabzevar – Sabri, SAB. 30398-E! – C: Yazd: Anarak to Chupunum, SAB. 550! 40 km NE Anarak, 1320 m, ZOHARY 378! Robat-e Posht-e Badam, 900 m, FOROUGHI & BAZARGAN 32393! Shahr.-Bust.: Turan Prot. Reg.: 7 km E Salahabad to Asb Keshan, 1100 m, RECH. 50958! Dune ridge between Zalehabad and Talkhab, 1200 m, FREITAG 13647! 2,5–4 km N Darb Ahang, at piste to Rezaabad, 910 m, FREITAG 14172a!, 15328! Road Ahmadabad-Zamanabad, above Lur Tangi, 1140 m, FREITAG 14191! 2 km E Hizumi springs, c. 16 km S Ahmadabad, Kalata Rei, 1150 m, BRECKLE & BHADRESA 5135! – Not localized: BUHSE 1112!, BUNGE s.no.!

T u r c o m a n i a : Kara-Kum, hills of Badghis, near Afghan border, BASILEVSKAJA 3541a!, 3541b! Ashkhabad, SINT. 518!, 1205!, 1275!, LITW. 139!, 529!, s.n.! 16.X.1967, METELINA!

A f g h a n i s t a n : N: Mazar-i Sharif: Desert 25–50 km NW Tashhkurghan to Sar-e Namak, BRECKLE 4656!, FREITAG 3889!, 3899! 50 km WNW Tashkurghan, 350 m, FREITAG 3879! 60 km NW Balkh, 280 m, BRECKLE 4675! 8 km S Eslam Chomgar, 280 m, BRECKLE 4657! – NW: Herat: Hari Rud near Zulfikar, CZERNIAK. 183! – SW: Farah: Khash (Kash) Rud, 85 km SW Dilaram near Gilmenda, 600 m, FREITAG 3720! Desert near Khash, c. 700 m, FREITAG 3724!, 3725! Lower Khash Rud valley, 20 km N Lukhi, 530 m, FREITAG 2462! – SE: Kandahar: Registan desert, 7 km E Lashkargah, near Arghandab, c. 900 m, FREITAG 2051! Sir Chahan S Spin Boldak, 1200 m, FREITAG & BRECKLE 4627! – Not localized: 8.X.1884, AITCH.!

P a k i s t a n : Bal.: Chagai: Near Nushki, 1500 m, POPOV 236! Nushki to Sanduri, 16 km, AITCH. 14!, 53! 14 km SW Nushki, at road to Dalbandin, c. 900 m, FREITAG & KOTHE 18751!, 18752! W Kharan: 15–20 km NE Qila Ladgasht, edge of Hamun-e Mashkel, 500–510 m, FREITAG & KOTHE 18688!, GHAFOOR & OMER 1948! – Makran: Near Panjgur, 900 m, POPOV 181! 47 km SW Panjgur, near road to Hoshab, c. 1000 m, FREITAG & KOTHE 18628!, GHAFOOR & OMER 1907!

Distr. gen.: W Central Persia and the Transcaspian lowlands up to N Baluchistan and the foothills of the Pamir Alaj and Tian Shan.

Closely related to *S. arbuscula*, but differing in the taller habit, much longer and sometimes pendant leaves, very short bracteoles, longer tepals, longer styles, shorter stigmas and much larger fruits. Ecologically, *S. Richteri* is a strict psammophyte, and only rarely do both species meet in the same community. Variability is much as in *S. arbuscula*: glabrous and densely papillose forms (var. *Androssovii* LITW.) occur side by side in most areas, the apical part of the bracteoles is either included into the hyaline margin or not, and the length and diameter of leaves differ very much according to growth conditions and to the position on different shoot systems.

8. *S.* ***Paletzkiana*** LITW., Sched. Herb. Fl. Ross. 50: no. 2569 (1914).
Icon.: MAIRE, Fl. Afr. N. 8: 151, fig. 964 (1962).
Type: (Uzbekistan) Dominium Buchara, in arenosis ad st. viae ferreae Farab, 5.X. 1914, N.V. ANDROSSOV & BUKYR', lectotype BOTSCH. 1976, LE!; isotypes BRNU!, C!, H!.
Icon.: Tab. 108.

Very similar and closely related to *S. Richteri*, but differing in the following: Plant up to 4 m, with ultimate branches drooping. Leaves in lower part (90–) 60–40 mm × 1,0–0,5 mm, with 2–1,5 mm long petiole; leaf axils with few and short curled hairs. Bracts often recurved. Bracteoles with a subulate, recurved upper part terminated by a c. 0,5 mm long mucro, 6–2 mm long, at base 5–4 mm wide. Tepals 4,5–5,5 mm long, apiculate with a shortly exserted middle vein. Anthers 3–3,5 mm, divided for 1/3–2/5; appendages 0,8–1 mm long, acute. Stigmas 0,2–0,3 mm wide. Fruiting perianth 16–22 mm diam., wings very thin, silky shining.

Hab.: In our area a very rare species in plant communities of sandy semideserts, on partly mobile sands with *Stipagrostis Karelinii*; 300–350 m. Fl. VI–X, fr. X–XI.

Afghanistan: N: Mazar-i Sharif: 12 km N Khairabad, c. 40 km N Mazar-i Sharif, 290 m, UOTILA 16872! NW Mazar-i Sharif, near Amu-Darya, Tash Guzar-Hazara, TONČEV in FREITAG 2224!

Distr. gen.: Sandy semi-deserts of the Transcaspian lowlands from western Kara-Kum to the foothills of the Pamir Alaj, and from S Kazakhstan to northernmost Afghanistan (naturalized in N Africa).

S. Paletzkiana is closely related to *S. Richteri*, even ecologically. It is tempting to consider it as a subspecies of the former, but it differs in a large suite of characters. Sterile specimens, however, are readily confounded. Some characters, in particular the distinct mucros on bracteoles and tepals point to a hybrid origin between *S. Richteri* and a species of sect. *Salsola* – perhaps *S. Paulsenii*. In the fruiting stage, the very large and delicate silky wings of *S. Paletzkiana* make it a most beautiful plant.

Sect. III. *Salsola*

auctore S. RILKE, Kassel

Syn.: *Kali* MILL., Gard. Dict. abr. ed. 4, 2: 715 (1754) p.p. *Salsola* sect. *Kali* DUMORT., Fl. Belg.: 22 (1827). Sect. *Kali* (MILL.) ULBR. in ENGLER & PRANTL, Nat. Pflanzenfam. ed. 2, 16 c: 564 (1934). Sect. *Soda* DUMORT., Fl. Belg.: 23 (1827).

Lit.: A. BÉGUINOT, Il polimorfismo nel ciclo di Salsola kali L. ed i sui fattori. Atti dell' Accademia scientifica Veneto-Trentino-Istriana (Padova), Ser. 3, 6: 90–126 (1913/14). P. AELLEN in G. HEGI, Illustrierte Flora von Mitteleuropa ed. 2, 3(2): 739–746 (1968). J. C. BEATLEY, Russian thistle (Salsola) species in western United States. Journal of Range Management Denver 26: 225–226 (1973).

Annuals, rarely small shrubs; glabrous except for, sometimes, axillary hairs, or papillose, hispidulous to puberulent with thick-walled, smooth papillae or stiff, obtuse, 1-celled hairs on multicellular base. Stems with green cortex and narrow whitish or purplish longitudinal ridges, or whitish throughout. Leaves alternate or partly opposite, linear, semi-terete to almost terete or ± flat, at base dilated ± sheathing apex mucronate or spine-tipped. Bracts and bracteoles rigid, spine-tipped, spreading, recurved or incurved, in latter case eventually enclosing also the fruiting perianth and becoming the outermost part of the diaspore. Flowers solitary, rarely in clusters of 3, sometimes in additional, highly condensed lateral spikes which produce complex wingless fruits. Tepals with or without a green blotch. Anthers oblong, divided for 1/3–2/3, appendage minute or small; filaments linear; disc low, usually with rounded, ciliate lobes. Ovary subglobular; style thin, stigmas filiform, distinctly exserted, longer than style, inside with long or shorter papillae. Fruiting perianth winged, or with rim- or scale-like dorsal outgrowths; wings unequal, the 2 inner much smaller, linear or subulate. Utricle enclosed, rarely exposed; seed horizontal, oblique or vertical; embryo conical or flat spiral. – Type of sect.: *S. soda* L.

Circa 20 species, from W Europe and NW Africa to E Asia, adventive in S Africa, America and Australia. Nine species are provisionally recognized from our area.

The section is obviously heterogeneous. *S. soda* and *S. aperta* differ significantly in their whitish cortex and leaves with minute mucros. Nevertheless, they are not closely related: *S. soda* has large wingless fruits and opposite leaves; *S. aperta* has wings and alternate leaves. The closely related species *S. kali*, *S. Jacquemontii*, *S. Tamamschjanae*, *S. Paulsenii*, *S. praecox* and *S. collina* are morphologically very similar; transitional forms are not rare and probably originated from hybridization. Fruiting and flowering specimens are necessary for certain identification. The traditional delimitations of *Noaea* and *Girgensohnia* need reconsideration; *Noaea* differs only in its vertical seeds, which also occur in *Salsola* sect. *Salsola* (e. g. in *S. collina*).

1a. Small or dwarf shrub; axillary hairs in dense, wool-like tufts; anthers 2–2,8 mm long with comparatively large appendages 0,3–0,6 mm long; stigmas less than 2 x length of style 15. *S. Griffithii* (BUNGE) FREITAG & KHANI
b. Annuals; axillary hairs less prominent; anthers less than 2 mm long, appendage much smaller; stigmas longer 2

2a. Stems whitish or pale; leaves mostly flat, ± narrow ligulate, with short and weak apical mucros 3
b. Stems with green cortex, often pale or purplish striated; leaves semi-terete, more clearly mucronate or spine-tipped 5
3a. Leaves opposite except the uppermost; fruit without wings . . . . 17. *S. soda* L.
b. Leaves alternate except the lowermost; fruit winged 4
4a. Lower leaves up to 6 cm long; fruits up to 10 mm diam., utricle exposed by the reflexed lobes . . . . 16. *S. aperta* PAULSEN
b. Lower leaves up to 10 cm long; fruits 10–15 mm diam.; utricle covered by tepal segments (not yet found in our area, but to be expected in N Afghanistan and in NE-Persia) . . . . *S. sogdiana* BUNGE
5a. Fruits without wings, up to 2 mm wide; spikes elongated, dense, narrow, with imbricate bracts and bracteoles; outer tepals 1-veined . . . . 14. *S. collina* PALL.
b. Fruits winged, 3–15 mm wide; spikes with spreading bracts and bracteoles; outer tepals 3-veined 6
6a. Fruits 10–15 mm diam.; stigmas to 4,7 mm long; fruiting plant always glabrous (NW Persia) . . . . 11. *S. Tamamschjanae* ILJIN
b. Fruits up to 10(–12) mm diam.; stigmas up to 2 mm long; plant hispidulous, papillose or glabrous 7
7a. Tepals above the wings densely papillose, indurated, in upper 1/2–1/3 with a delicate spine; axillary hairs absent (N & NE Persia, Afghanistan) . . 8
b. Tepals above the wings mostly glabrous, but sometimes ciliate at margin, membranous except base and eventually of midrib (1–3 might protrude at the apex); axillary hairs usually present 9
8a. Plant rigid and spinescent from young stage; leaves 0,7–1,8(–2,5) mm wide; anthers usually rectangular; flowering from May, fruiting usually from July . . . . 12. *S. Paulsenii* LITW.
b. Plant with finer, longer leaves and less spiny; leaves 0,5–0,7 mm wide; anthers usually triangular; flowering and fruiting from April to June . . . . 13. *S. praecox* LITW.
9a. Plant up to 40 cm high, hispid-puberulent; tepals 1–2,2 mm long, distinctly ciliate at margin; anthers 0,4–0,8 (–1,1) mm long (NE Afghanistan, N Pakistan) . . . . 10. *S. Jacquemontii* MOQ.
b. Plant mostly taller, glabrous, papillose or hispid; tepals 2–3,6 mm long, rarely with scattered short papillae, anthers 0,6–1,4 mm long . . . . 9. *S. kali* L.

9. ***S. kali*** L., Spec. Plant. 222 (1753).

The type subspecies was described from the Scandinavian coast and is characterized by a hemispherical outline, spreading or prostrate branches, tepals with 5 protruding midribs and fruits with all tepal lobes spine-tipped. It is distributed around the coast-lines of the Baltic Sea, along the shores of the North Sea (to 63°30') and along the Atlantic coast of Europe. The general description given here is based on subsp. *tragus*, as it is the most common taxon of our area.

Distr. gen. of species: Europe and N Africa to C Asia, adventive in America, S Africa and Australia.

–– subsp. ***tragus*** (L.) NYMAN, Consp. Fl. Eur. 3: 631 (1881).
Syn.: *S. tragus* L., Cent. Pl. 2: 13 (1756). *S. kali* var. *tragus* (L.) MOQ. in DC., Prodr. 13, 2: 187 (1849). *S. australis* R. BR., Prodr.: 411 (1810).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 246 (1966) sub *S. kali*. JAFRI & EL-GADI, Fl. Libya 58: tab. 28 (1978). COLLENETTE, Ill. Guide Flow. Saudi Arabia: 124 (1985) sub *S. kali*. KOMAR., Fl. URSS 6: tab. 11, fig. 2 (1936). – Fig. 3-A - B 4-C; Tab. 109.
Type of subspecies: Herb. BURSER XVI(2) left specimen, UPS!, lectotype designated here.

Lit.: Z. A. AKOPJAN, Biologija Salsola australis R.Br., Biologičeskii Zhurnal Armenii 44: 17–23 (1991), in Russian. A. O. STEVENS, Russian Thistle, life, history and growth. North Dakota agricultural experiment station Bulletin 326: 1-20 (1943). S. RILKE & C. REIMAN, Morphological and ecophysiological differences between the subspecies of Salsola kali L. in Europe. Results of culture experiments. Flora 191 (in press).

Annual, 25–100 cm high, erect, glaucous to green, rigid and spinescent, only young plants soft; glabrous, or papillose to hispid, axillary hairs present. Stem branched from base, branches ascending, often ± angular; cortex green, with pale or purplish lines. Leaves linear, rigid, 50–10 × 1–1,5 mm, in lower part semiterete, in upper terete, upper leaves with stronger, to 2,2 mm long terminal spine. Flowers solitary, sometimes in additional, ± condensed lateral spikes. Bracts and bracteoles spreading. Bracts 8–5 mm long, up to 3× length of bracteoles, apically abruptly narrowed into a prominent, pungent, 1–2,5 mm long spine, base in fruit often inflated, sometimes adnate to the bracteoles and separating from the plants as the outermost part of the complex diaspore. Bracteoles 6–3 mm long, longer than flower, tapering into a 1,5–3 mm long spine. Tepals narrow ovate, 2–3,6 mm long, the outer 0,8–1,6 mm wide, 3-veined, acuminate, acute, or obtuse and erose-dentate, transverse line at 1/4–1/3, without a green blotch, midrib distinct to 3/4 of the tepals or 1–3 tepals with prominent and ± protruding midrib, glabrous, sometimes lower margins with short cilia. Anthers oblong, 0,6–1,4 mm long, including the minute triangular appendage, divided for 1/3 to 1/2; filaments 1,6–3,4 mm long. Style 0,3–0,8 mm long; stigmas 0,8–2,3 mm long, 3–6× length of style. Fruiting perianth 5–11 mm diam., translucent, with 3 wider and 2 much smaller wings, sometimes developing rather late, occasionally without wings and enclosed by bract and bracteoles; tepals below wings hardened, cup-like; tepal lobes above the wings in basal part thickened and hardened, bent together, upper parts erect, papery, wrinkled or 1–3 tepals pungent-tipped. Seed horizontal.

Hab.: Widespread on coarse- and fine-textured, slightly to moderately saline soils, on naturally disturbed habitats like borders of dry river beds, base of slopes and cliffs and coastal dunes, most common on ruderal sites in and around settlements, along roads, railway lines etc.; up to 3125 m. – Fl. VII–IX, fr. VIII–XI.

I r a q : Kurdistan, LAYARD 431!
P e r s i a : N: Gorg.: 20 km NW of Gonbad-e Kavus, 10 m, HEWER 4077! 45 km SW of Shah Pasand, at road to Shahrud, 1500 m, BRECKLE & BHADRESA 5225! Maz.: 8 km W Farahabad, 35 km NW Sari, –28 m, BRECKLE 5276! Between Amol and Polur, 1050 m, ASSADI 25606! Now Shahr, Kuri Chal (Kareh Sar ?), SAB. 30399-E! Now Shahr, Kheyroud, IRANSHAHR 30305-E! Chalus, ZOHARY 194! E of Ramsar, PABOT 4943! Haraz valley, above Gaznak, 1750 m, WDB. 1459! – W: Azerb.: Dasht-e Moghan, 160–500 m, SCHMID 6555! Sufian, NW of Tabriz, 1350 m, AELLEN & BEHB. 2964! 7 km N Bonab, on road to Tabriz, 1350 m, LAMOND 4637! Rezaiyeh Lake (Urmia), 28.VI.1884, KNAPP! Khvoy to Salmas (Shahpur), 1700 m, AELLEN & BEHB. 3021! NE shore of Rezaiyeh Lake, Sharaf-Khaneh, 1220 m, AELLEN & BEHB. 2934! S of Tabriz, GILL.-SM. 2141! 25 km W Mianeh, 1300 m, UOTILA 19502! Chavan Bala, 2000 m, CRISP 16! Khamseh: Soltaniyeh, 1680 m, FURSE 3216! 16 km W Takestan to Zanjan, 1300 m, RECH. 42336!, LAMOND 4263! Kurd.: Sanandaj, HAJLUGHI 30208-E! Amarat, 9.IX.1855, SEIDL.! Ham.: Aq Bulag, 1800 m, RIOUX & GOLV. in PABOT AB-107! 11 km NW Malayer, 1850 m, PABOT 1365! Borujerd, KOELZ 18546! Esf.: Esfahan, BELANGER 664!, PARSA 300! Lur.: 50 km E Khorramabad, 1800 m, KOEIE 949! Istgha-e Ezna (Azna), 1800 m, KOEIE 948! Oshtoran Ku (Shuturun Kuh), STR. 191! – S: Fars.: Neyriz, 1600–1700 m, BORNM. 4226! Ardakan, 1050 m, FOROUGHI & BAZARGAN 32365! Abarqu, 1500 m, FOROUGHI & ASSADI 15105! Kerm.: Road Baft to Gav Koshi (Esfandaqeh), 1800 m, DINI & BAZARGAN 30642! Bal.: Khash, AKHANI 6808! – E: Khor.: W of Chanaran, 60 km W Mashhad, 1200 m, UOTILA 18997! Mashhad, ALAVA 10911! – C: Tehr.: Mahmudieh, 15 km N Tehran, 1250 m, AELLEN 2841! Tehran, 1135 m, AELLEN 2835!, OLIV. & BRUGUIÈRE!, Gol-e Sahra, 1230 m, UOTILA 19371! Shahabad, 20 km W Tehran, 1200 m, AELLEN 2838! Garmsar, E Kuh-e Namak, 1000 m, UOTILA 14985! S Tehran, Varamin to Garmsar, 950 m, ASEFI 3080! Hableh Rud, 1–2 km of Ban-e Kuh (Bonehkuh, Bun-e Kuh), 1100 m, AELLEN & MANUCH. 2777!, 3120!, 3121!, 3122! Simin Dasht to Kabutar Darreh, 1150 m, AELLEN & MANUCH. 2773!, 3079-a!, -b! Qazv.: Qazvin, 1200 m, SCHMID 6420!, 6439! Qazvin to Zanjan, TERME 30349-E! Karaj, GAUBA in BORNM. 1031! Karaj river, 1330–1340 m, AELLEN 2817!, 3033!, 3044! 25 km E Karaj, 1400 m, BRECKLE 4965! SE Karaj, 1300 m, FORUGHIAN 3084! Mardabad, SW Karaj, 1300 m, AELLEN 2797! Halkedar to Mardabad near Karaj, 1200 m, RECH. 6823! W Mardabad, 1250 m, HDG., WDB. & FOROUGHI 14696! Qom: Between Saveh and Arak, 6 km E of Rahjerd at road to Sarafjahan (Salafjegan), 1570 m, BOTHMER & BUTTLER 1900! Hoseynabad to Janatabad, 830 m, TERME & TEHRANI 40054-E! Shahr.-Bust.: Shahrud, KOELZ 16969! – Not localized: Tschelendat (Damgh.-Semn.: Chalehdan ?), SAB. 149! Chahl, 1.X.1884 KNAPP!
T u r c o m a n i a : Ashkhabad, LITW. 327!, SINT. 2198! Geokcha, 300 m, 28. IX.1976, VASAK! Suluklü at Kulkulab, SINT. 1209! Kokcha (Koktsche), SINT. 1207-b!
A f g h a n i s t a n : N: Mazar-i Sharif: Balkh to Akcha, 340 m, PODLECH 19794! – SW: Farah: Chakhansur, 475 m, PODLECH 17127! – SE: Kandahar: Kajakai, 1000 m, KOEIE 2164! Helmand valley, 20 km S Qala Bist (Lashkar Gah), 760 m, PODLECH 19636! Helmand bank at Darweshan, 720 m, PODLECH 19675! Between Safar and Darweshan at Helmand river, 700 m, RECH. 34688! – E: Kabul: Aliabad near Kabul, 1820–1860 m, GILLI 2158!, NEUB. 323!, 3201!, 33811!, PELT 522! Kotal-e Khair Khana, 12 km NW Kabul, 2000 m, PODLECH 32614! Kabul, 1800 m, AKHBAR 406!, BRECKLE 4944!, COLLET 112!, NEUB. 67!, 68!, PABOT A-1402!, VI.1958, REGEL!, RECH. 19342!, VOLK 433! Sher Darwasah near Kabul, 1800 m, GILLI 2157! Chak-i Wardak, NEUB. 322! Band-e Kargha (Qargha-Lake), 12 km W Kabul, 2000 m, PODLECH 32345!, LINDB. 1276! Rishkor, 1830 m, LINDB. 1315! Khair Khaneh, 14.IX.1962, LINDB.! Tang-i Gharu, between Kabul and Sarobi, 1400–1500 m, RECH. 16948!, 1800 m, HDG. & WDB. W-5098! E Kabul at road to Sarobi, 1700 m, RECH. 16878! E of Sarobi, Laghman provincial border, 1180 m, UOTILA 18456! Molayan, 6 km SW Sarobi, road to Lataband, 1100 m, PODLECH 32373! Ghorband valley, 30 km W Charikar, 2000 m, BRECKLE 4745! Shibar Pass,

VOLK 2227! Salang valley near Qalatak, 1950 m, PODLECH 19714! Panjshir, 1800 m, KOEIE 2929! Gulbahar near Charikar, 1600 m, 18.VI.1954 AMSEL!, VOLK 1021! Nangarhar: Kunar valley NE Jalalabad, 570 m, PODLECH 32300! Between Jalalabad and Torkham, 700 m, RECH. 19365! Jalalabad, 570–610 m, ANDERS 5380!, FREITAG 7464!, PODLECH 32297!, UOTILA 18430! W Jalalabad, at confluence of Alingar and Chaharbagh, 600–700 m, KERST. 655! 48 km E Jalalabad, 540 m, BRECKLE 4950! Logar valley at Kotubkhel, 1800 m, PODLECH 18473! Shar-e Logar, 1900 m, PODLECH 31766! Darwesh, 3 km S Pul-i Alam, between Kabul and Gardez, 1955 m, PODLECH 18490! Ghazni: 4 km W Loman, road to Sang-e Masha, 2550 m, PODLECH 19403! Chakar, N Sang-e Masha, 2700 m, ANDERS 1187! Ghazni, 2180 m, PODLECH 16855! Pay Mastali, between Ghazni and Nawar, 2340 m, PODLECH 19226! Dasht-e Nawar, 3000–3125 m, FREITAG 1531!, 1539!, TONČEV in FREITAG 4131!, RECH. 37295!, 37401! Khost: 3 km W Khost, road to Gardez, 1190 m, PODLECH 18628! W Khost, 1200 m, FREITAG 1932! – NE: Wakhan: Qala Panja, 2800 m, BRECKLE A-1480! Sar-e Skhaur, 2650 m, ROEMER 25! Langarkish, 3000 m, PAULSEN 1328! Sergin, 2800 m, PAULSEN 1385! Badakhsh.: Baharak, PODLECH 12722! Takhar: Farkhar valley, Khanaqah-e Warsaj, 1800 m, PODLECH 12687! – C: Bamian: Bamian, 2500–2520 m, GILLI 2159!, LINDB. 215!, NEUB. 399!, 410!, PABOT A-1286!, RECH. 36976! Lorinj, 2440 m, KOELZ 13637! 90 km E Bamian, road to Charikar, 2130 m, UOTILA 18735! Doab: Doab, VII.1951, VOLK!, VOLK 519! Salatin valley near Pshang, W Doab, 1700 m, GILLI 2156! Darrah-e Shikar, 15 km S Doab, PODLECH 12596!

Pakistan: Peshawar: Warsak near Peshawar, 5.VI.1969, MUSHTAQUE! Warsak Dam, NASIR 1509! Zarif Corana, TANVIR & KHAN 584! Kohat: S of Bahadur Khel pass, 550–600 m, FREITAG 21530! Baggan, 6.XI.1959, BEG! – Kurram: Thal, 6.XI.59 BEG! Thal to Kurram, AITCH. 450!, KHAN & AYYAZ 121! – Bannu: Lakki, 650 m, ZUBAIL & KHAN 639! – N.-Wazir.: Ahmad Khel, ZUBAIL & KHAN 1776! Fidr Khel, KHAN & ABASSI 46! Sham, KHAN & ABASSI 442! Spain, KHAN & ABASSI 150! – S.-Wazir.: Wana, 1400 m, 17.VII.1979, MARWAT! – Quetta: Fort Sandeman, HARSUKH 20641!, HUSSAIN & ARIF 551!, HUSSAIN & KHAN 138! 50–60 km from Qila Saifullah on road to Zhob, Quetta, OMER & GHAFOOR 1653! 8 km from Muslimbagh to Qila Saifullah, NAZIMUDDIN & ABEDIN 845! Urak, ALI 1193!, HUSSAIN & KHAN 501!, QAISER 42! Khanai near Quetta, PARKASH 16464! 5–6 km NE Quetta, NW-side of Hanna Lake, 1740–1745 m, FREITAG & KOTHE 18789-b!, 18810!, GHAFOOR & OMER 2100! Quetta, 28.V.1968, BEG!, 30.VIII.1966, BEG!, 1680 m, CROOKSHANK 550!, 1900 m, 3.VII.1987, KHATOON! Pishin, 1500 m, ALI 4853!, NAZIMUDDIN & ABEDIN 369!, 8.IX.1967, SHARIQ! 2,6 km from road on way to Sariab, NAZIMUDDIN & ABEDIN 215! Between Galangur and Quetta, Nushki-Quetta road, GHAFOOR & OMER 2060! Loralai, 1370 m, DUTHIE 18995! 5 km from Loralai, QAISER 168! Loralai near Gov. College, DAR & al. 3! Harnai, 23.VIII.1956, ZAMAN & HUSSAIN! Ziarat, HUSSAIN & MAQSOOD 1320!, MALL 16700!, NASIR & ALI 10072!, 28.VIII.1966, SHARIQ!, 30.VIII.1966, TAHIR & TUFAIT 1323! Dam, 19 km from Ziarat, FAROOQI & QAISER 2376! – Kalat: 7 km N of Mastung, 1680 m, FREITAG & KOTHE 18832! Mastung, DAR & ARIF 247!, 19.VI.1959, KHAN!, 2000 m, POPOV 294!, 18.VII.1977, QAISER!, STEW. 821! Mastung to Spin Blundi, 1700 m, JAFRI & AKBAR 1750! 93 km NE Nushki, 1600 m, FREITAG & KOTHE 18780! 13 km SSE Surab, 1800 m, FREITAG & KOTHE 18915!, GHAFOOR & OMER 2211! Sitani, Gidar, 1620 m, HOTSON M-360! Isplinji, 11.VI. 1959, KHAN!, 22.VI.1959, KHAN! Wad to Khuzdar, QAISER & GHAFOOR 1188!, 1197! – Bal.; Baluchistan, 22.VI.1888, LACE! – Not localized: Teeree (Tirah), 1851 STOCKS! Margel village, QAISER & GHAFOOR 4343!

Distr. gen. of subspecies: W Europe and N Africa to C Asia, adventive in America, S Africa and Australia.

– – subsp. ***iberica*** (SENNEN & PAU) RILKE, comb. nov.
Syn.: *S. tragus* L. subsp. *iberica* SENNEN & PAU, Bull. Acad. Int. Géogr. Bot. 3. Ser. 18: 476 (1908). *S. pestifer* A. NELSON in NELSON & COULTER, New Man. Bot. Centr. Rocky Mount. 2: 169 (1909). *S. ruthenica* ILJIN, Sorn. Rast. SSSR 2: 137 (1934). *S. kali* subsp. *ruthenica* (ILJIN) SOÓ in SOÓ & JAV., Magyar Növ. Kéz.: 786 (1951). *S. kali* L. var. *tenuifolia* TAUSCH, Flora 11: 326 (1828).
Icon.: PAVLOV, Fl. Kazakhst. 3: tab. 27, fig. 16 (1960). – Tab. 110.
Syntypes of subspecies: (Spain) Miranda de Ebro, 6.IX.1907, H. ELIAS, MA!, 12. IX.1911, H.ELIAS, BC!, Logroño, SENNEN, BC.

Plant up to fruiting stage soft; leaves narrow, thin, at most slightly succulent, lowermost up to 65 × 0,5–0,7(–1) mm, spine only up to 1,5 mm.

Hab.: Disturbed sites as subsp. *tragus*, but avoiding saline soils and in our area restricted to higher altitudes; 900–2650 m. – Fl. VI–IX, fr. IX–XI.

Persia: W: Azerb.: Tabris, 1350 m, AELLEN & BEHB. 2850! Rezaiyeh Lake, Golman Khaneh, 1220 m; cult. in BG Lausanne, 18.X.1948 AELLEN & BEHB.! Khamseh: 10 km NW of Zanjan, SOJÁK 7463!, 7474!, 7526! Esf.: Gavkhuni, STAPF 787! – S: Kerm.: Kuh-e Beluch, 2100 m, BORNM. 4227! – C: Tehr.: 27 km SE Tehran, 15 km NW Gadanak, 900 m, BRECKLE & BHADRESA 5441! Qazv.: Karaj, 1330 m, AELLEN 3034! – Not localized: BÉLANGER 1825!
Afghanistan: E: Ghazni: Huftasya near Moroo, GRIFF. Journ. 851! – NE: Kataghan: Farkhar valley between Zingerd and Warsaj, 1500–1700 m, ANDERS 10937! – C: Bamian: Bamian, 2500–2650 m, UOTILA 18581!, 18722!, VOGT 1014! Doab: Doab, VOLK 519! S Doab, gorge, PABOT A-1238! – Not localized: GRIFF. Herb. East Ind. Comp. 4217!
Pakistan: Chitral: Chitral, 4.V.1971, BEG! Near Shagoll, 2300 m, SHAH & KHAN 1461! – Quetta: Spin Karez, 1800 m, CROOKSHANK 345! – Not localized: Agha Zai area, 17.X.1950, KHAN!

Distr. gen. of subspecies: Northern part of the species area; in southern part restricted to higher altitudes; predominantly on sandy soils.

Highly polymorphic, especially with regard to growth form, shape of inflorescence and indumentum. This resulted in the description of several species and a wealth of infraspecific taxa. Most of them have already been reduced to synonymy by earlier authors, and some remain to be checked. The few infraspecific taxa recognized in this account differ in their circumscription from earlier authors (e.g. ILJIN 1936; AELLEN 1968). Hitherto subsp. *tragus* was distinguished from subsp. *iberica* as a glabrous taxon with more succulent leaves and, seemingly most significant, wingless fruits with the bracteoles adnate at base. But this needs a critical reappraisal. 1. Wingless fruits – The type material of *S. tragus* consists of young flowering specimens with young fruits only. Wingless fruits do occur sporadically here and there in subsp. *tragus*, but this is a case of weakly expressed heterocarpy. The last flowers, produced from serial buds in the lower part of the plants sometimes are without wings and remain enclosed in the enlarged sheathing base of bract and bracteoles, but most flowers develop normal winged fruits. Furthermore, the wing development often starts very late, or sometimes all fruits remain completely wingless. Consequently, this character is without value. 2. Indumentum – In specimens of subsp. *iberica* and subsp. *tragus* more or less papillose and glabrous forms always occur side by side. Therefore, taxonomic significance is low. 3. Leaf shape and degree of succulence – At least this seems to remain as a useful character, but many intermediates have been seen from the Atlantic coast to the borders of C Asia, and also from localities in our area. The latter suggests that as in many other *Salsola*-species the degree of succulence might be intimately related to varying soil conditions. However, in greenhouse experiments with plants grown under graded salinity this was only partly confirmed. Plants grown from seeds of subsp. *tragus* from coastal areas proved to be much more salt tolerant than plants of subsp. *iberica* from non-saline inland habitats of C Europe. Therefore, for the time being, the two subspecies are maintained, although they do not differ in any significant floral or fruit character, [see RILKE & REIMAN (1996)].

Important variation has been observed in tepal structure: in some populations, 1–3 flowering tepals have a distinct and protruding midrib which develops into a delicate spine in fruit. In this, they approach both to subsp. *kali* and to *S. Paulsenii* with 5 spiny tepals. Such forms occur scattered from C and S Europe to Pakistan (the type of *S. australis*, described from S Australia but probably introduced from the Mediterranean, belongs here). The development of 1–3 spiny tepal-lobes in fruit also occurs in *S. Jacquemontii* and *S. Tamamschjanae*. The situation becomes more complicated as hybridization with *S. Paulsenii* occurs in areas where both species are sympatric. Most specimens from Afghanistan and Pakistan show such "spiny" tepals. In addition, they are glabrous except for the axillary tufts of hairs, which are often more prominent than in specimens from further west. Other differences are shorter stigmas and slightly larger fruits. They are considered provisionally as an eastern race of subsp. *tragus*, but might deserve subspecies rank. The taxon is still under study.

10. *S.* ***Jacquemontii*** MOQ. in DC., Prodr. 13, 2: 188 (1849).
Syn.: *S. Jacquemontii* var. *angustifolia* MOQ. in DC., l. c. *S. nepalensis* GRUBOV, Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 21: 127–129 (1961).
Icon.: GRUBOV, l.c.: 128, sub *S. nepalensis*. – Tab. 111.
Type: In India orientali, V. JACQUEMONT 2114, lecto- and isotypes (2×) P!, selected here.

Slender annual, 8–40 cm high; hispid-puberulent; axillary hairs sometimes present. Stems branched from base, branches ascending, terminated by dense, often shortened spikes; cortex green with pale or purple lines. Leaves filiform, scarcely succulent, 35–9 × 0,9–0,5 mm, with a short, up to 1 mm long spine. Flowers solitary. Bracts 12–5 mm, up to 3× length of bracteoles, becoming rigid rather late, spine 1–1,5 mm long. Bracteoles 5–2 mm, triangular, spine 1,5–2 mm long. Tepals 1,3–2,2 mm long, the outer 0,6–0,9 mm wide, 3-veined, transverse line at 1/3, without a green blotch, 1(–3) tepals with a stronger midrib ending in a mucro, lower margins with up to 0,16 mm long cilia. Anthers 0,4–0,8(–1,1) mm long including the minute appendage, divided for 1/3; filaments 1,8–2,5 mm long. Style 0,2–0,6 mm long; stigmas 0,5–1,4 mm long. Fruiting perianth 3,5–7 mm diam., the 3 outer wings 1–2 mm long, the inner small lanceolate; tepals above the wings somewhat thickened and indurated, incurved, in upper part membranous, erect, forming a central column, the 1–3 outermost sometimes stiff from protruding and hardened midrib. Seed horizontal.

Hab.: On coarse-textured non-saline soils of dry semi-desertic slopes in high altitudes, locally common on ruderal sites and at edge of dry-farming cultivation; 2500–4200 m. – Fl. VI–IX, fr. IX–X.

Afghanistan: NE: Wakhan: Baba-Tangi, 3000 m, ROEMER 319! Sargaz valley, 3800 m, BRECKLE A-1460!

Distr. gen.: Pamir, Hindukush, Karakorum and inner ranges of the Himalayas, from Wakhan to inner Nepal.

S. Jacquemontii is a small, slender-leaved, scarcely succulent species of the *Kali*-group, restricted to high mountain areas. Morphologically, it approaches *S. kali* subsp. *iberica*, but differs in smaller tepals, smaller anthers and, most obviously, by the densest and longest indumentum occurring in sect. *Salsola*. The tepals have exceedingly long cilia.

11. *S.* ***Tamamschjanae*** ILJIN, Trudy Bot. Inst. Akad. Nauk. SSSR, Ser. 1: 161 (1936).

Icon.: GROSSH., Fl. Kavk. 3: tab. 14, fig. 9 (1945). TAKHT., Fl. Armen. 2: tab. 105 (1956). – Tab. 112.

Type: Armenia, Eczmiadzin (Echmiadzin), Zvartnoz, 11.X.1934, M.M. ILJIN 89, holotype LE!

In habit and structure very similar to *S. kali* subsp. *tragus*; differing in the following characters: fruiting plant always glabrous; anthers 0,5–0,8 mm long including the 0,15 mm long appendage; stigmas up to 4,7 mm long, with very long (0,12 mm) papillae; fruiting perianth 10–15 mm diam.; tepals above the wings membranous, at base indurated, incurved, upper parts erect or slightly reflexed forming a ± funnel shaped structure.

Hab.: On sandy and other coarse-textured soils, reported from *Achillea* semi-deserts and ruderal communities; 1200–1500 m. – Fr. IX–X.

Persia: W: Azerb.: 31,5 km NE Tabriz, road to Ahar, 1480 m, PABOT 5270! Achi Chay (Talkheh Rud) N Tabriz, 1450 m, AELLEN & BEHB. 3108!, BEHB. & AELLEN 30066-E! Tabriz, 1350 m, AELLEN & BEHB. 2851! Uli, 17.IX.1856, SEIDL.! Maman, 9.IX.1856, SEIDL.! W shore of Rezaiyeh Lake (Urmia), near Golman Khaneh, 1220 m, AELLEN & BEHB. 3005! Sharaf Khaneh, 1220 m, AELLEN & BEHB. 2930!, BEHB. & AELLEN 30067-E!

Distr. gen.: Restricted to Transcaucasia and Persian Azerbaijan.

The taxon is close to the sympatric *S. kali* subsp. *tragus* and can only be distinguished with certainty from flowering time onwards. The fruits are the largest, and the stigmas the longest in the section. The species was hitherto known only from Transcaucasia.

12. *S.* ***Paulsenii*** LITW., Izv. Turkestansk. Otd. Imp. Russk. Geogr. Obšč. 4,5: 28 (1905).

Syn.: *S. pellucida* LITW., Sched. Herb. Fl. Ross. 8: 2434 (1922).

Icon.: LITW., l.c.: 28. KOMAR., Fl. URSS 6: tab. 11, fig. 6 (1936) sub *S. pellucida*. – Fig. 6-C; Tab. 113.

Type: Turkestania, Buchara, Farab ad fl. Amu Dar'ya, 14.IX.1903, N.V. ANDROSSOV & KELOW, HFR 1431, C!, LE!

Annual, 12–50 cm high, hemispherical in outline, rigid and spinescent from young stage, papillose to hispidulous, sometimes glabrous, without axillary hairs. Stem branched from base, primary shoot dominant, lowermost branches spreading-ascending, the others spreading, terminating in loose or dense spikes; cortex green, pale or purplish lined. Leaves linear, rigid, 38–16 x 2,5–0,7 mm, semi-terete, spine up to 1,5 mm long. Flowers solitary. Bracts and bracteoles spreading to recurved. Bracts 11,5–6 mm long, up to 2x length of bracteoles, abruptly narrowed into the 1–2,5 mm long spine. Bracteoles 8–4 mm long, exceeding the flower, spine 1,5–3,5 mm long. Tepals narrow-ovate, 1,9–2,9 mm long, the outer 0,6–1,2 mm wide, 3-veined, transverse line at 1/6–1/3, without a green blotch, densely papillose on back, acuminate, midrib of 3–5 tepals protruding and becoming hardened. Anthers oblong, sometimes ± triangular, 0,5–0,8 mm long including the minute appendage, divided for 1/3 to 1/2; filaments 1,6–2,2 mm long. Style 0,5–0,8 mm long; stigmas 0,7–1,3 mm long, up to 2x style length. Fruiting perianth 6–12 mm diam.; wings translucent to pale, the inner generally reduced to subulate scales; lobes above the wings indurated, at first incurved, then for 1/3–1/2 of their length rising into a long, slender, erect beak. Seed horizontal.

Hab.: Semi-stabilized sand dunes with *Stipagrostis Karelinii*-communities and disturbed vegetation on sand fields, with *Stipagrostis plumosa, Carex physodes, Sophora pachycarpa, Krascheninnikovia ceratoides* and numerous annuals; up to 1200 m. – Fl. V–X, fr. V–XI.

Persia: N: Maz.: Babolsar, RECH. 5633! 2 km E Mahmudabad, N Amol, –25 m, UOTILA 19276! 22 km W Mahmudabad, –30 m, GRANT 16502! – S: Kerm.: NW Kerman, between Zarand and Rafsanjan, DADASHZADEH in PABOT DK-205! – E: Khor.: 20–30 km N Gonabad, 70 km Torbat-e Heydarieh to Mashhad, 900 m, RUNEMARK & SARDABI 23624! Gonabad (Juymand), RECH. 56012! Neyshabur, Mausoleum Omar Khayan, 1100 m, 9.VII.1972, IRANSHAHR! 3,2 km from Tayyebat, ALAVA 10974! Tayyebat, 1000 m, FURSE 7616! 5 km W Tayyebat, 850 m, UOTILA 18955! Sabri, SAB. 535! – C: Shahr.-Bust.: Turan Prot. Reg., 15 km S Ahmadabad, Hizumi spring, BRECKLE 5119! Between Zalehabad and Talkhab, 1200 m, FREITAG 13638!, 13650! Delbar, 9 km NE Kuh-e Qalatiyeh, 1150 m, FREITAG 14157!
Turcomania: NE Ashkhabad, 300 m, 6.IX.1976, VASAK! Ashkhabad, LITW. 345!, 346!, SINT. 529!, 1207a! Bakharden, 16 km E of Bami, 350 m, 16.IX.1976, VASAK!
Afghanistan: N: Mazar-i Sharif: 25 km NW Tashkurghan, 10 km S Sar-e Namak, 330 m, BRECKLE 4654! 60 km NW Balkh, 280 m, BRECKLE 4667! Shibarghan: 40 km NE Shibarghan, 320 m, FREITAG 6545! Dasht-e Laili, 30 km W Shibarghan, 480 m, FREITAG 6658! 32 km SE Andkhui to Shibarghan, 290 m, PODLECH 16981! Andkhui, NEUB. 179! – NW: Maimana: 15–20 km W Andkhui, Karam Kul (Khwaja du Koh), 300 m, NEUB. 177!, RECH. 16127! 30 km S Andkhui, 7 km S Yusuf Mirzai, 360 m, BRECKLE 4713! Between Maimana and Andkhui, 400 m, HDG. & WDB. W-3838! Herat: Hari Rud valley, AITCH. 729! 80 km E Iranian border, 850 m, UOTILA 18937! 35 km E Kisil Islam Qaleh, UOTILA 18933! Zindajan, 50 km W Herat, LINDB. 13/1962! – E: Kabul: N Kabul, Koh-i Asmai, 1700 m, KERST. 2102! – NE: Kataghan: At Amu Darya before Qizil Qala, VII.1969, HAYON! Kunduz to Tashkurghan, 15 km W Kotal-e Erganak (Kotal-e Arganeh), 530 m, FREITAG 3848!, 3852-A!

Distr. gen.: East Transcaucasia and northern Caspian lowlands to C Asia southwards to southern C Persia and S Afghanistan.

S. Paulsenii can be easily confused with the closely allied *S. kali*. In fruit, it differs in the larger wings, distinctly veined from the base, and the longer, narrower spine-like upper tepal lobes. The colour of the stem (purplish lined or not) is sometimes used as differential character between various species, but this is misleading. Stems with and without deep purple-coloured stripes are found in several species.

13. *S. **praecox*** LITW., Sched. Herb. Fl. Ross. 4: 1131 (1902).
Icon.: KOROV., Fl. Uzbek. 2: tab. 26, fig. 4 (1953). – Tab. 114.
Type: Turkestania, Transkaspia pr. Repetek, 23.V.1900, D.I. LITWINOW, HFR 1131, isotypes C!, G!, H!, K!, LE!, W!

Very similar to *S. Paulsenii* and differing only in the following characters: plant more delicate, 12–35 cm high; leaves finer, longer and less spiny, 68–19 × 0,7–0,5 mm; anthers triangular, sometimes rectangular, 0,35–0,6 mm long. It flowers and fruits earlier.

Hab.: As in *S. Paulsenii*; up to 1400 m. – Fl. IV–VI, fr. IV–VI.

P e r s i a : W: Esf.: Rig-e Djin, 37 km to Chah Malek towards Chupunum, 800 m, RECH. 51928! 30 km W Chupunum towards Anarak, 800 m, RECH. 51984! – S: Kerm.: 13 km WSW Kerman, SOJÁK 2783! Hudiyan, Chah Kambar, 900 m, GABRIEL 26! W Hamun-e Jaz Murian, 370 m, LÉONARD 5758! Bal.: Khash, 1400 m, RECH. 54862! Makran: Bampur, 600 m, RECH. 55006! 13 km NNW of Espakeh, SOJÁK 1767!, 1768! – E: Khor.: Sarakhs, 400 m, RECH. 55715! 25 km SE Boshruyeh, 900 m, RECH. 51665!, IRANSHAHR 40191-E! Robat-e Khan to Tabas, 850 m, AMIN & REJAMAND 32906! Road of Tabas, Khvor to Robat-e Posht-e Badam, 1000 m, DINI & BAZARGAN 33071! E Dasht-e Lut, 930 m, LÉONARD 6093! – C: Kashan to Fakhreh, 900–1000 m, MOUSSAVI & TEHRANI 30715-E! Kashan to Marinjab, 900 m, AMIN & REJAMAND 32857!
T u r c o m a n i a : Between Annaju and Gjaurs, SINT. 333-b! Ashkhabad, 25.V.1900, SINT.!
A f g h a n i s t a n : NW: Maimana: 16 km S Andkhui, PABOT A-801! – SW: Farah: Jija Sarai, 1200 m, KOEIE 4080! – SE: Kandahar: Registan Desert, Mianpushta between Darweshan and Safar, 700 m, RECH. 34576! 30 km S of Darweshan, Helmand valley, 560 m, FREITAG 690! 5 km SE Safar, 700 m, FREITAG 701! 25–30 km S Kandahar, 1000 m, RECH. 35340! 40 km SE Kandahar near Takhta Pul at Dori River, 1100 m, FREITAG 2577!
P a k i s t a n : Makran: 30–50 km NE Panjgur towards Nag, 1100 m, RECH. 28205!

Distr. gen.: As *S. Paulsenii*.

S. praecox is maintained here with hesitation. In typical specimens, the differences from *S. Paulsenii* in the dimensions of the vegetative parts and the resulting habit are striking, but many intermediates have been seen. Both taxa are separated by their flowering and fruiting time. Because the morphologically transitional forms were collected in late summer, in between the fruiting times of both taxa, the differences may only represent seasonal dimorphism. Interestingly, there are scarcely any differences in floral and fruit characters. The problem is in need of study by cultivation experiments.

14. *S. **collina*** PALL., Illustr. Pl.: 34 (1803).
Syn.: *S. kali* L. subsp. *collina* (PALL.) BOLÒS & VIGO, Butl. Inst. Catalana Hist. Nat., Secc. Bot. 1: 89 (1974).
Icon.: PALLAS, l.c.: tab. 26. FEDTSCH., Fl. Ross. Austr.- Or. 4: tab. 284 (1930).

KOMAR., Fl. URSS 6: tab. 11, fig. 3, 4 (1936). SCHAPAUGH, Proc. Iowa Acad. Sci. 65: 119 (1958). – Tab. 115.
Type: "Inter Rhymnum et Samaram fl. a jugo Uralensi descendentium",? isotype LIV.!

Annual, 20–60(–100) cm high, erect, narrow to hemispherical in outline; ± hispidulous, rarely glabrous, axillary hairs sometimes present. Stem loosely branched from base, branches horizontally spreading or ascending, terminating in dense, elongated, narrow spikes; cortex green, often purplish striated. Leaves filiform, 4,5–2,4 × 1–0,5 mm, semi-terete, in upper part ± terete, apically with up to 0,8 mm long weak spine, lower margins hispid ciliate. Flowers solitary, sometimes in additional, highly condensed lateral spikes which often produce complex wingless fruits. Bracts and bracteoles with imbricate bases, blades erect to ascending; bracts 9–6 mm long, up to 2x longer than bracteoles, at base strongly dilated, with membranous margin, spine 0,5–1 mm long; bracteoles narrow lanceolate, 7–4 mm long, spine 0,6–1 mm long. Tepals oblong, 1,5–2,5 mm long, the outer 0,4–1 mm wide, all 1-veined, transverse line at 1/3–1/2, membranous throughout, without a green blotch, glabrous, apex with acute outline, but often crenulate to eroso-dentate. Anthers narrow oblong, 0,9–1,4 mm long including the minute appendage, divided for 1/2; filaments up to 2,3 mm long. Style 0,3–0,5 mm long; stigmas 0,8–1 mm long, c. 3x length of style. Fruit small, barrel-shaped, 1,5–2 mm wide and high, without wings but with crenulate scale-like outgrowths; lower part of tepals coriaceous and ± enclosed by bracts and bracteoles; top of tepal lobes ± erect, papery. Seed oblique or vertical.

Hab.: On sandy and other coarse-textured, non-saline soils; on drifting sands, along dry river beds, locally common as a weed and on ruderal sites in high-mountain areas; 1800–3600 m. – Fl. VI–VIII, fr. IX–X.

Afghanistan: NE: Munjan: Anjuman, 3100 m, PODLECH 12353! Munjan, 2800 m, FREY F-447! Wakhan: Ishmurgh, LINDB. 1103/1960! Warg, bank of Amu Darya, 2600 m, GRATZL 123! Baba-Tangi, 3000 m, ROEMER 320! Purtwurs, 10 km W Ptukh, 3570 m, RAUNIG in BRECKLE A-4048! Namatgut, 2700 m, PAULSEN 1426! Sergin, 2800 m, PAULSEN 1328! Badakhsh.: Sanglich, 3500 m, KOELZ 12646! Ribat-e Pain (Rubat), 2600 m, KOELZ 12831! – C: Bamian: Bamian, 2500 m, UOTILA 18717!

Distr. gen.: European part of Russia to N China and Japan, southwards to the Pamir, E Hindukush and driest parts of the Himalayas. Introduced in Europe and N America.

S. collina is polymorphic, but easily recognized by its slender spikes and absence of true fruit wings. It is a northern species restricted to high mountains in the northeastern-most part of our area where there are only small amounts of summer rain.

15. ***S. Griffithii*** (BUNGE) FREITAG & KHANI, Pl. Syst. Evol. 155: 50 (1987).
Syn.: *Noaea Griffithii* BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7 sér., 4, 11: 22 (1862).
Icon.: FREITAG & KHANI, l.c.: tab. 1, 2. – Tab. 116.

Type: (Afghanistan, SE of Kandahar): Dair Haj (Deh-i Haji), W. GRIFFITH, Journ. 581 (= Herb. East Ind. Comp. 1814), holotype P!, isotype K!

Small or dwarf spinescent shrub, 40–70 × 40–120 cm, greyish with a dense hispid indumentum, or glabrous and blue-green in colour, with very conspicuous persistent wool-like tufts of axillary hairs; stem loosely branched, branches divaricately spreading, terminating in loose spikes, with green cortex. Leaves spreading, rigid, 19–7 × 1,5–1,2 mm, semi-terete, spine c. 1 mm long. Flowers solitary. Bracts 12–4 mm long with 1–1,5 mm long spine; bracteoles 6–2 mm long, with 1,5–2 mm long spine. Tepals oblong, 3,1–4,5 mm long, the outer 1,3–1,8 mm wide, 3-veined, transverse line at 1/5–1/4, midrib inconspicuous, to upper 1/2, the back densely papillose, the margins ciliate, apex muticous, erose-dentate. Anthers 2–2,8 mm long, divided for 1/2; appendage oblong, 0,3–0,6 mm; filaments up to 4 mm long. Style large, 0,9–1,6 mm long; stigmas 0,9–1,6 mm long, about as long as style. Fruiting perianth 6–10 mm diam.; wings membranous to coriaceous without prominent nerves; tepals coalescent up to the wings; lobes above the wings membranous, lower parts incurved, upper parts erect, cylindrical, apices often somewhat recurved. Seed horizontal.

Hab.: Mobile and semi-stabilized sand dunes and sand fields; forming a distinct association with *Pennisetum divisum*, *Panicum turgidum*, *Cyperus conglomeratus* and other psammophytes; 400–1600 m. – Fl. V–VI, fr. VI–X.

P e r s i a : S: Kerm.: Esfandaqeh, 60 km W of Jiroft, 1600 m, ASSADI, EDMONDSON & MILLER 1961! Bal.: 30–40 km N-NE Bazman, at road Bazman to Eskelabad, SOJÁK 2011!
A f g h a n i s t a n : SW: Farah: 20 km E Farah near Khairabad to Dilaram, 690 m, FREITAG 3776! East edge of Jehil-e Puzak, 460 m, BRECKLE 4909! Marja, VOLK 2907! Dasht-e Margo, SW of Marja, PABOT A-355! – SE: Kandahar: SW Qala Bist (Lashkargah), 820 m, RECH. 34492! Between Lashkargah and Darweshan, at Mulla Jehadgul Qalay, 720 m, ANDERS 8462! SE of Darweshan, PABOT A-408! Registan at Mianpushta between Darweshan and Safar, 700 m, RECH. 34573! Bhagat, 600 m, RECH. 34649! 57 km W of Kandahar, PABOT A-309! Chihilgazi (Kushk-e Nakhud), 900 m, TONČEV in FREITAG 4228!, KERSTAN 278! 60 km W Kandahar, E of Kushk-e Nakhud, 900 m, FREITAG 498! Near Kandahar, Pirzada, 1000 m, KOEIE 2089!, 2089-b! 80 km W Kandahar towards Girishk, 1000 m, RECH. 32469! 20 km S Kandahar, edge of Registan, 1000 m, RECH. 35209! 25–30 km S Kandahar, Registan, 1000 m, RECH. 35335! Dori Rud, 50 km SE Kandahar, PABOT A-504! Dair Haj, GRIFF. Journ. 581=Herb. East Ind. Comp. 1814!
P a k i s t a n : Bal.: Chagai: 14 km SW Nushki, 1000 m, FREITAG & KOTHE 18749! – Makran: 40 km S Panjgur, near road to Hoshab, 1000 m, FREITAG & KOTHE 18597! 60 km S Panjgur, 800–850 m, RECH. 28084! 60 km SSW of Panjgur, 900 m, FREITAG & KOTHE 18595!, GHAFOOR & OMER 1877!

Distr. gen.: Restricted to SE Persia, S Afghanistan and Pakistani Baluchistan.

S. Griffithii is the only perennial species of sect. *Salsola*. Furthermore, it has the densest and most prominent tufts of axillary hairs, the longest anther appendages, longest style and thickest wings. In habit, it looks much like *S. kali*, and certainly it is related to it, although morphologically more advanced.

16. ***S. aperta*** PAULSEN, Vidensk. Meddel. Dansk Naturhist. Foren. Kjöbenhavn. 6, 5: 197 (1903).
Icon.: PAULSEN, l.c.: tab. 3. KOMAR., Fl. URSS 6: tab. 12, fig. 3 (1936). NIKITIN & GELDIKHANOV, Opred. Rast. Turkmen.: tab. 37, fig. 6 (1988). – Fig. 6-B; Tab. 117.
Type: (Uzbekistan): Kis-Kala ad fl. Amu Daria, inter Tshardshui (Chardzhou) et Chiwa, 23.VI.1899, O. PAULSEN 1868, holotype C!

Annual, 10–35 cm high, erect, pyramidal to hemispherical in outline, highly succulent; glabrous. Stem densely divaricately branched; branches spreading to ascending, the lowermost often as long as stem; cortex white or cream. Leaves linear, ligulate, rather flat, 60–20 x 7–4 mm, shortly cuspidate to mucronate, eventually the upper with up to 1 mm long weak spines. Bracts and bracteoles with prominent spines. Bracts oblong to ovate, 20–4 mm long, up to 4x length of bracteoles, spine 1–1,5 mm long. Bracteoles 7–3 mm long, shortly acuminate from an ovate base, spine 1–1,8 mm long, the lower bracteoles longer, the upper as long as flower. Flowers solitary. Tepals narrow ovate to lanceolate, 2,5–3,5 mm long, the outer 0,8–1,4 mm wide, 3-veined, acute or obtuse, midrib scarcely visible, transverse line at 1/5–1/4. Anthers oblong, 1,3–1,9 mm long, divided for 2/3, appendage 0,1–0,15 mm long, knob-like; filaments up to 3,5 mm long. Style 0,4–0,7 mm long; stigmas 3–4x length of style. Fruiting perianth broadly cup-shaped, 6–11 mm diam.; the 3 outer wings 2–3 mm long, the inner as triangular appendages; tepals on inner side opposite to the wings with a transverse rim, above the wings reflexed, forming a stellate structure and exposing the utricle by a 1,5–3 mm wide aperture, tepal lobes papery, 1/2x to as long as wings; tepals below the wings coriaceous, ± coalescent; seed horizontal.

Hab.: On sandy solonchaks in depressions and shallow runnels; usually associated with *Seidlitzia rosmarinus* and *Haloxylon aphyllum*-communities; up to 1700 m. – Fl. V–VII, fr. IV–XII.

P e r s i a : **S**: Kerm.: 13 km W Kerman, road to Yazd before Rafsanjan, DADASHZADEH in PABOT DK-204! Rafsanjan (Bahramabad) to Kurd Kuh, 21.IV.1859, BUNGE! S of Kerman, road to Baft, 1700 m, DADASHZADEH in PABOT DK(x)! W of Jaz Murian, 370 m, LÉONARD 5750! – **E**: Khor.: E Dasht-e Lut, 101 m, LÉONARD 6164! – **C**: Tehr.: Kavir Prot. Reg.: SE of Siah Kuh, 850 m, WDB. & FOROUGHI 15211! Shahr.-Bust. Turan Prot. Reg.: near Torud, 800 m, FREITAG 14901! Kashan: 6 km E Kashan, 900 m, BABAKHANLOU 23817! – Not localized: BUNGE "54"!, Bachtan, BUNGE!
A f g h a n i s t a n : **N**: Mazar-i Sharif: 25 km NW Deh Nau, 40 km NW Tashkurghan at Naisabad, Sar-e Namak, 330 m, BRECKLE 4726! – **SE**: Kandahar: Registan near Bhagat, 600 m, RECH. 34630!

Distr. gen.: Persia, Afghanistan and Transcaspian lowlands.

Differing from *S. sogdiana*, its closest relative, in shorter leaves and the unique aperture on the upper side of fruits. *S. sogdiana* replaces our species on corresponding habitats in the northern part of the Transcaspian lowlands. It approaches our area in the Kara Kum and around the Lower Amu Darya and might yet be found in adjacent parts of N Afghanistan.

17. ***S. soda*** L., Spec. Plant. 223 (1753).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 247 (1966). GROSSH., Fl. Kavk. 3: tab. 15, fig. 1 (1945). FEDTSCH., Fl. Ross. Austr.-Or. 4: tab. 283 B (1930). MAIRE, Fl. Afr. Nord 8: 136, fig. 959 (1962). – Tab. 118.
Type: (Spain), S. Ybes. ad littus, ? LOEFL., LINN. 315/7!

Annual to 70 cm high, erect, highly succulent, pale green to blue green, glabrous except for, eventually, some axillary hairs, often with compound salt crystals. Stem loosely branched, branches ascending, terminating in long, very loose spikes; cortex whitish or pale throughout. Leaves opposite except the uppermost, fleshy, linear, 60–20 × 3–1,5 mm, mucronulate. Flowers solitary or in axillary clusters of 3. Bracts leaf-like, the upper triangular, 15–6 mm long, up to 5× length of bracteoles, at base strongly dilated with wide hyaline margins, with up to 0,4 mm long apical spine. Bracteoles ovate, 6–3 mm long, shortly acuminate, surpassing or equalling the flower. Tepals ovate or obovate, glabrous, 1,7–2,6 mm long, the outer 0,8–1,9 mm, 3–5-veined, at apex crenate to serrate, transverse line at 1/2, with triangular green blotch. Anthers oblong, c. 1 mm long including the 0,06–0,12 mm long appendage, divided for c. 1/3; filaments 2–3,3 mm long. Style 0,3–0,6 mm long; stigmas 0,7–1,4 mm, 2–3x length of style. Fruit broadly barrel-shaped, 3–6 mm diam., without wings but with c. 0,5 mm long rims or triangular fragmentary wings; lower part of tepals much enlarged, coriaceous, prominently nerved; tepal lobes unchanged, incurved and covering the utricle, at top ± erect; fruit base flat, with 5 grooves surrounded by a broad rim developing from tepal bases; seed horizontal or oblique, rarely vertical.

Hab.: Temporarily flooded moist littoral and inland salt-marshes; in open communities with other annual hygro-halophytes, like *Suaeda maritima*, *Salicornia europaea* etc.; 1200–1500 m. – Fl. V–IX, fr. X–XI.

Persia: W: Azerb.: 31,5 km NE Tabriz, at road to Ahar, 1480 m, PABOT 5271! Tabriz, Shin dawur, 1.X.1884, KNAPP! NE shore of Rezaiyeh Lake (Urmia) at Sharaf Khaneh, 1220 m, AELLEN & BEHB. 2928! W shore of Rezayeh Lake at Golman Khaneh, 1220 m, AELLEN & BEHB. 1020!, 3004! Bonab W Maragheh, 1220 m, AELLEN & BEHB. 2958!, 2959!, 2960!, 3146! – C: Qazv.: 15 km from Mardabad towards Eshtahard, along Rud-e Shur, 1200 m, AKHANI & al. 2070!

Distr. gen.: C & S Europe, N Africa to E Asia, southwards to NW Persia and the Transcaspian lowlands.

S. soda is a most distinct species easily recognized by its very open inflorescences, the highly succulent, spineless leaves and the large, barrel-shaped fruits without true wings. Outwith its small area in NW Persia it might also be found along the Caspian Sea.

Sect. IV. *Caroxylon*

(THUNB.) FENZL in LEDEB., Fl. Ross. 3: 809 (1751).

Syn.: *Caroxylon* THUNB., Nov. gen. pl. 2: 37 (1782). *Salsola* Sect. *Irania* BOTSCH., Bot. Zhurn. 71: 1400 (1986).

Lit.: V.P. BOTSCHANTZEV (1970), Sectionis Caroxylon (THUNB.) FENZL generis Salsola L. species annuae. Novitates Systematicae Plantarum Vascularium, Leningrad (Novosti Sistematiki Vysčikh Rastenii) 7: 142–145 (1970); ibid., Species subsectionis Caroxylon sectionis Caroxylon (THUNB.) FENZL generis Salsola L., l.c. 11: 110–174 (1974); ibid., Species subsectionis Vermiculatae BOTSCH. sectionis Caroxylon (THUNB.) FENZL generis Salsola L., l.c. 12: 160–195 (1975); ibid., Irania – a new section of the genus Salsola (Chenopodiaceae). Botaničeskii Zhurnal SSSR. 71: 1400–1401 (1986); all in Russian.

Shrubs, dwarf shrubs, perennials or annuals; pilose or villous with smooth, warty, spinulose or branched hairs. Stems without green cortex. Leaves alternate, sessile, without sheathing bases, at least upper leaves and bracts near base beneath distinctly gibbose or saccate. Flowers solitary, ovoid. Tepals 1-veined, on back with a distinct triangular green blotch. Anthers ± ovate to sagittate, triangular in outline, divided at least for 1/2, exserted; appendages minute, fused with thecae, flat; disc absent or very small and than filaments narrow triangular, with c. 2 mm wide base fused at ovary base, or disc present and then filaments linear and inserted on outer side of disc. Ovary globular; style thick; stigmas flat, widened, with very long papillae; 2 species with short papillae. Fruiting perianth with 5 subequal wings; tepal lobes usually slightly hardened, forming a flat cap, a rounded dome or a cone. Seed horizontal. – Type of sect.: *S. aphylla* L.

With about 25 species (c. 130 sp. acc. to the revisions of BOTSCHANTZEV) the sect. *Caroxylon* is the largest in number and the most widespread in *Salsola*: Canary Is., S Europe, N Africa to C Asia, south to the Sahel and through E Africa to S Africa and Namibia. It is subdivided into several subsections, and except *S. cyclophylla* and *S. abarghuensis* (with shortly papillose stigmas, linear filaments and a distinct disc) our species all belong to subsect. *Vermiculatae*. 9 species are recognized for our area.

1a. Annuals 2
b. Shrubs or dwarf shrubs 3
2a. Tepal back with stiff, ascending hairs, in fruit thickened, the lobes hook-like incurved; upper bracts and bracteoles with persistent hairs .... 20. *S. incanescens* C.A. MEY.
b. Tepal back glabrous, in fruit not significantly thickened, the lobes not hook-like incurved; upper bracts and bracteoles glabrescent or glabrous .... 19. *S. nitraria* PALL.
3a. Dwarf or small shrub to 60 cm; foliage glaucous, drying black; glabrous except fugacious hairs on shoots and ciliate tepal margins (NW and C Persia) .... 24. *S. ericoides* M.B.

b. Plants neither glaucous nor drying black; at least the axes with persistent hairs 4
4a. Hairs smooth 5
b. Hairs warty, spinulose or branched 7
5a. Subshrubs, woody base caudex-like, only up to 5 cm high, annual shoots 20–100 cm, very densely branched; terminal parts of spikes without flowers; disc absent .... 21. *S. dendroides* PALL.
b. Shrubs or dwarf shrubs with more extended woody parts; spikes with flowers throughout; disc present 6
6a. Plant with divaricate, spinescent branches; leaves, bracts, bracteoles and tepals white with adpressed hairs .... 25. *S. cyclophylla* BAKER
b. Plant without divaricate or spinescent branches; leaves, bracts, bracteoles and tepals glabrous or glabrescent (C Persia) ..... 26. *S. abarghuensis* ASSADI
7a. Leaves all or predominantly scale-like; hairs warty; fruit 3–5 mm in diam. .... 18. *S. imbricata* FORSSK.
b. Leaves all or predominantly linear; hairs spinulose or branched; fruit 6–12 mm in diam. 8
8a. Leaves needle-like, 0,4–0,7 mm thick; anthers on c. 2 mm long filaments shortly exserted, appendage triangular; style 1–1,5 mm long, stigmas 0,5–0,7 mm long .... 22. *S. vermiculata* L.
b. Leaves 0,8–2 mm thick; anthers on 3–4 mm long filaments, long exserted, appendage semi-circular to trapezoid; style 0,5–1 mm long; stigmas 0,7–1 mm .... 23. *S. orientalis* S.G. GMELIN

18. ***S. imbricata*** FORSSK., Fl. Aegypt.-Arab.: 57 (1775).
Syn.: *Chenopodium baryosmon* SCHULT. in ROEMER & SCHULT., Syst. Veg. 6: 269 (1820); *Salsola baryosma* (SCHULT.) DANDY in ANDREWS, Flow. Pl. Anglo-Egypt. Sudan 1: 111 (1950). *S. foetida* DEL. ex MOQ., Chenopod. Monogr.: 143 (1840).
Lit.: H. FREITAG, Contributions to the chenopod flora of Egypt. Flora 183: 149–173 (1989). L. BOULOS, The identity, typification and distribution of Salsola imbricata FORSSKÅL. Kew Bull. 46: 137–140 (1991).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 256 (1966); Fl. Libya 58: 86, fig. 33 (1978) all sub *S. baryosma* COLLENETTE, Ill. Guide Flow. Saudi Arabia: 122, sub. *S. sp. aff. alopecuroides*; l.c.: 126, sub *Salsola* sp. 2768 (1985). BATANOUNY, Ecol. Fl. Qatar: tab. 28 (1981). – Tab. 119.
Type: Yemen, Hodeida, 9.IX.1976, J.R.J. WOOD 1184, neotype K!; cf. BOULOS, Kew Bull. 46: 137–140 (1991).

Dwarf shrub or small shrub, 30–120 cm high and wide; stems and lower leaves densely covered with spreading or ascending, curved, warty, short and to 1,5 mm long straight hairs, in young stage reddish brown, later glabrescent, bracts and bracteoles only sparsely and shorter hairy or glabrous. Stem to 2 cm thick, nodulated, densely branched in upper part; branches ascending, the upper often spreading, in terminal parts with regularly arranged, spreading lateral spikes; spikes 5–35 mm long, condensed or interrupted. Leaves linear to narrow triangular in lower parts, scale-like, cucullate, of ± circular outline in upper parts, obtuse, 7–1 × 1,3–0,5 mm; leaf axils of long shoots whith small rosulate scaly leaves. Bracts and bracteoles subequal, similar to upper leaves, 0,7–1,5 × 0,9–1,5 mm, usually glabrous and shorter than perianth. Tepals ovate, 1–2 mm long, the outer 0,8–1,2 mm wide, 1-veined, transverse line at 1/2, green blotch small, obtusely triangular, margins of outer tepals ciliate up to 1/2 with almost smooth curved hairs. Anthers 0,7–1,2 mm long, including the 0,1–0,15 mm long obtuse appendage, divided for c. 2/3; filaments 1,5–2,2 mm long; disc absent. Ovary globular; style 0,3–0,6 mm long; stigmas 2, 0,3–0,6 mm long, 1–2 × as long as style, inside long papillose. Fruiting perianth 3–5 mm diam., the wings silky, translucent, entire; upper part of tepals erect or incurved, forming an obtuse cone or a semiglobular dome. Seed semiglobular, flattened at top, 1–1,2 mm diam.

Hab.: Common on almost all types of soils, preferably ruderal sites and on naturally disturbed habitats, like dry river beds, eroded slopes and higher sea-shore lines, in very different plant communities; 1–800(–1000) m. – Fl. VIII–X, fr. IX–XI.

P e r s i a : **W**: Khuz.: Khuzistan, AHWAZ AGR. COLL. 16! – **S**: Fars.: Between Borozjan and Ganaveh, near Dalaki river, 70 m, BOKHARI & al. 14787!, 14789! Near Mand bridge, 70 m, BOKHARI & al. 14815! Between Cheghadek and Khvormuj, TERME & MOUSSAVI 35371-E! Bushehr, KOELZ 14832! Kerm.: Kanis-e Tazmorgan, between Qaleh Ganj and Chah Reza, 400 m, ERSHAD & al. 35412-E! Ziarat Pir-e Karkan, 350 m near Chah Reza, ERSHAD & al. 40081-E! 10km N Shahdad to Kavir-e Lut, 180m, TERME & MOUSSAVI 34391-E! Lar.: Qeshm, TERME & MOUSSAVI 34518-E!, 34562-E!, 35377-E! Henqam Island, PERRY 5/79! Between Bandar-e Lengeh and Dezhgan, IRANSHAHR & TERME 14799-E! 14844-E! 98 km W Bandar Abbas, 50 m, PABOT 6511! Bandar-e Khamir, 50 m, FREY & KRAMER VO 11344!, VO 11350! Bandar Abbas, BARKHORDARI 35378-E!, PROBST VO 11347!; 50–100 m, ZOHARY & ORSHAN B 712/1! NE Bandar Abbas near Isin, SOJÁK 4572! 14 km NE Bandar Abbas, 30 m, PABOT 6607! E Bandar Abbas, SOJÁK 4502!, 4506!, 4631!, 4632!, 4635!, 4646!, 4651! Bandar Abbas Airport, FREY & KRAMER VO 11341! Between Bandar Abbas and Minab, DADASHZADEH in PABOT DK 222! Biaban: Minab, SOJÁK 4775! Between Bemani and Gachineh, IRANSHAHR & MOUSSAVI 30306-E! Between Savan and Kargushki, BEHB. 886-E! Bunji, BEHB. 866-E! Makran: Jask, Bandar, BEHB. 850-E!, 873-E! Chah Bahar, 15 m, POPOV 64/8!, POZDENA B 15! 15 km SE Chah Bahar, SOJÁK 1248!, 1249!, 1250!, 1252!, 1254! Chah Bahar towards Jask, between Bandini and Tujak, 50 m, ERSHAD & al. 35388! 60 km W Tiz, 10 m, ERSHAD & al. 40059-E! Tiz, SOJÁK 1330! 15 km from Kollani to Gwatar, AKHANI 6687! 75 km S Rask, near Bahu Kalat, c. 50 m, AKHANI 6653!, 6655! Between Tang-e Sorkheh and Chah Bahar, SHAR. 1070! Bazman, SHAR. 853-E!, 1015! Between Chah Bahar and Nasirabad, 250–750 m, ERSHAD & al. 35390-E!, 40174-E! 70 km ENE Chah Bahar, near Delgan, 40 m, AKHANI 6658! 70 km from Iranshahr to Rask, 1100–1300 m, AKHANI 6643! 20 km Zahedan to Khash, 1700–1800 m, AKHANI 6609! – **E**: Sistan: Between Zahedan and Zabol, V.1948, RECH.! Between Kuh-e Malek Siah and Zabol, 700 m, RECH. 4100!, 4102-a! Tassouki, SW Zabol, PETTER 6! Sistan, AYAZI 5615! – Not localized: ALEXEENKO 970!

A f g h a n i s t a n : **SW**: Farah: 23 km ENE Zaranj (Kang), 475 m, PODLECH 16910! 15 km E Zaranj, road to Lukhi, 475 m, PODLECH 16897! 30 km E Chakhansur, near Sar-e Ghazi, 570 m, FREITAG 3734! 10 km WSW Sheshaba, road to Zaranj, 555 m, PODLECH 16889-a! – E: Nangarhar: Between Jalalabad and Torkham, 700 m, RECH. 19355! W Jalalabad, near Chaharbagh, 600–700 m, KERST. 647! 50 km W Torkham, 600 m, RECH. 31014! 15 km W border of Pakistan, main road, 500 m, UOTILA 18439!

Pakistan: Peshawar: Peshawar valley, 450 m, STEW. 280!, 320! 8 km from Peshawar on Warsak road, BURTT B 1510! Attock: Thatti, STEW. 28491! Mohmand: Warsak, CHAUDARY 13! – Kohat: CHAUDARY 3!, ZUBAIL & KHAN 201! – Bannu: Between Kaki and Akra, SHAHZAD & DILAWAR 435! Rakki Murnat, SHAHZAD & DILAWAR 563! – S-Waziristan: Between Daraban and Drazinda, NASIR 4679! – Dera Ismail Khan: Tank, coll. Herb. Med. Pl. 898! 22.IX.1957, MONSI! Musazai, KHAN 783! – Kurram: Kurram valley, KHAN 54! – Quetta: Fort Sandeman, 1500 m, 29.VIII.1967, SHARIQ! Qila Saifullah, 28.VII.1939, MOHINDAR NATH! Loralai, 1430 m, JAFRI & AKBAR 2323-A! Pishin, 1220–1500 m, 8.IX.1967, SHARIQ!, NASIR 28436! 32 km from Duki to Jelabad, QAISER & GHAFOOR 1517! Sibi, 90 m, LACE 3604! – Kalat: Wadh, OMER & al. 1889! 55 km SW Khuzdar, 1400 m, FREITAG & KOTHE 18949! 72 km SSW Khuzdar, 1300 m, FREITAG & KOTHE 18950! – Bal.: Makran: 35 km from Panjgur to Nag, ABEDIN & HUSAIN 6704! 97 km WSW Panjgur, Parom village, 910 m, FREITAG & KOTHE 18650! 38 km WSW Panjgur, at Hamun-e Parom, 900 m, FREITAG & KOTHE 18645! 20 km WSW Panjgur, near road to Hoshab, 970 m, FREITAG & KOTHE 18622! Panjgur, 900–995 m, FREITAG & KOTHE 18673!, POPOV 183! C Makran valley: 2 km S Turbat, road to Pasni, 180 m, FREITAG & KOTHE 18389! Makran Coastal Plain: 1 km N Suntsar, 30 m, FREITAG & KOTHE 18562! 29 km SW Suntsar, 40 m, FREITAG & KOTHE 18561! Pishukan, near sea, GHAFOOR & OMER 1840! Near Gwadar, ASHRAF & HUSSAIN 81!; 25 m, FREITAG & KOTHE 18519!, GHAFOOR & OMER 1811! 58 km W Pasni, 50 m, FREITAG & KOTHE 18514! Between Pasni and Gwadar, T. ALI 887!, GHAFOOR & OMER 1794!, 1808!, QAISER 7070! 6 km N Pasni, road to Turbat, FREITAG & KOTHE 18417! Pasni, ASHRAF & HUSSAIN 100!, 122! 29 km W Ormara, road to Pasni, 50 m, FREITAG & KOTHE 18445! 20 km NW Ormara, 20 m, FREITAG & KOTHE 18476! Ormara peninsula, 3 m, FREITAG & KOTHE 18463!, GHAFOOR & OMER 1770! Near Balgatan Resthouse, T. ALI 786! – Bela: Hala Range, foot-hills to Lak pass, 11 km WSW Bela, 100 m, FREITAG & KOTHE 18247! Las Bela, BEG! Bela plain: 26 km SE Uthal, road to Karachi, 30 m, FREITAG & KOTHE 18019! – Sind: Karachi: Karachi University Campus: 50 m, FREITAG & KOTHE 18096!, 5. I.1964, WAHEED!, 14.XII.1963, MAJEED!, QURESHI! 17.VI.1964, WALI! Drigh Road, RAHMAN 25701! Qaid-i Azam road, ASHRAF & LAL 13!, JAFRI 2590! Road to Cape Monze, LAMOND 239! 250!

Distr. gen.: W Sahara to the Indian desert; from tropical Africa to southern C Persia and S Afghanistan, and from India and Pakistan to easternmost Afghanistan.

The great variation in growth form, size of leaves, bracts, tepals and fruits, and in style/stigma proportions, has resulted in different views about the circumscription of the species. Specimens from Egypt westwards, including the type of *S. baryosma*, tend to produce one or few erect main stems. They have small leaves, bracts, tepals, fruits and a short style. In contrast, almost all specimens from Saudi Arabia to S Persia have slightly larger organs and tend to develop ascending main branches at the stem base. This may seem to justify the recognition of a western *S. baryosma* and an eastern *S. imbricata*, but in SW Pakistan as well as in S and E Afghanistan both types, and all intermediates, occur side by side. Furthermore, all specimens seen from the Arava valley and scattered individuals from Yemen represent a mixture of both sets of characters and, in contrast to the view of BOTSCHANTZEV (1975) but in agreement with BOULOS (1991), only one species is recognized here. For discussion of the special problems associated with FORSSKAL's name *S. imbricata* see FREITAG (1989) and BOULOS (1991).

The crushed leaves have a strong fishy smell and taste. The plant is not grazed, except by camels in periods of food shortage.

19. *S. nitraria* PALL., Illustr. Pl.: 25 (1803).
Syn.: *S. spissa* M.B., Mém. Soc. Imp. Nat. Mosc. 1: 140 (1806). *S. macera* LITW., Sched. Herb. Fl.. Ross. 49: no. 2438 (1913). *S. micranthera* BOTSCH., Bot. Mat. Gerb. Inst. Bot. Zool. Akad. Nauk Uzb. SSR 13: 5 (1952). *S. pseudonitraria* AELLEN & RECH. f., Anz. Math.-Nat. Kl. Österr. Akad. Wiss. 98: 26 (1961).
Icon.: PALL., l.c.: tab. 15 (1803). TAKHT., Fl. Armen. 2: tab. 109 (1956), sub *S. macera*. PAVLOV, Fl. Kazakhst. 3: tab. 15, fig. 4 (1960). OVCZ., Fl. Tadjik. SSR 3: tab. 64, fig. 5–8 (1968), sub *S. micranthera*. – Fig. 4-D, 6-G; Tab. 120.
Type: (Russia): "In colle ruderato nitroso Scharenoi Bugor, paulo supra Astrachaniam ad ipsam Volgam sito", P.S. PALLAS, holotype (?) BM!

Annual, 10–30(–50) × 5–40 cm, often hemispherical; grey with short, curled warty hairs, in lower part interspersed with up to 4 mm long hairs, in young stage often brownish, later glabrescent, rarely glabrous. Stem branched from base, branches ascending or spreading, the lowermost often longer than primary stem, all branches terminating in long, usually dense spikes. Leaves 20–3,5 × 1,2–1,5 mm, obtuse, the lower linear, with both types of hairs, the upper triangular, sparsely pilose with semi-adpressed short hairs. Bracts similar to upper leaves or scale-like, 6–1,5 × 1,5–2 mm, with hyaline margins sheathing, glabrous or sparsely pilose with semi-adpressed hairs, the lower longer than bracteoles and tepals, the uppermost shorter. Bracteoles like upper bracts, but shorter, with wider hyaline margins, enclosing the perianth or slightly surpassed by it. Tepals ovate, 1,3–2 mm long, the outer 0,8–1,3 mm wide, 1-veined, transverse line at 1/2, green blotch small triangular, all or the outer only ciliate along the margin up to 1/2 and at the apex with curved, warty hairs. Anthers 0,6–1,2 mm long, including the 0,1–0,15 mm long obtuse appendage, divided for c. 3/4; filaments 1,5–2 mm long; disc absent. Ovary globular; style 0,5–1 mm long, thin; stigmas 2, 0,5–0,7 mm long, inside long papillose. Fruiting perianth 5–10 mm diam., wings papery, usually smoke-coloured or translucent, more rarely pale, tepals above the wings ± flat, incurved, forming a flat dome covering the utricle fully or partly; seed 1,2–2,5 mm diam.

Hab.: In most parts of the area ubiquitous on slightly to moderately saline soils, preferably in drier salt-marshes, in many types of normal semi-desert vegetation, on naturally disturbed habitats and on ruderal sites; up to 1500(–2000) m. – Fl. VIII–X, fr. IX–XI.

Persia: N: Gorg.: Gorgan, VII.1858, BUNGE! Lake border at Tangeli, 52 km N Pahlavi Dezh, sea level, HEWER 4048! Between Tappeh-ye Moraveh and Holtan at Atrak river, 160–210 m, HEWER 4054!, 4056!, 4058!, 4061-A!, 4069! Gonbad-e Kavus, 16.X.1956, PETTER! Mohammad Reza Shah Prot. Reg.: Jangal-e Golestan, Almeh, 1450–1580 m, TERME & MATINE 41540-E! Maz.: Haraz valley: above Gaznak, 1750 m, WDB. 1463!, 10.I.1943, PETROV! At Mahmudabad, 10.I.1943, PETROV! Gilan: Between Lowshan and Manjil, 360 m, WDB. & SHIRDELPUR 14850! Rasht, XI.1868, HAUSSKN.! – W: Azerb.: 16 km S Mianeh, 1090 m, PABOT 5115! 56 km NE Tabriz, road to Ahar, PABOT 5252! Between Mehmetabad and Nahand, "Metschet Dagh", 24.IX.1856, SEIDL.! Mehmetabad, 24.X.1856, SEIDL.! Salt mine Nahand, 24.IX.1856, SEIDL.! N Tabriz at Achi Chai (Talheh Rud), 1450 m, AELLEN & BEHB. 3109! Merdise near Tabriz, 30.IX.1884, KNAPP! Near Tabriz, 1350–1530 m, AELLEN & BEHB. 2849!, DANIN &

PLITMANN 65–1185!, GILL.-SM. K 682!, 2135!, 2157!, PABOT 5169!, 18.IX.1856, SEIDL.! PABOT 5169! Komur Chai valley to Uli, 17.IX.1856, SEIDL.! Sufian, near railway-station, NW Tabriz, 1350 m, AELLEN & BEHB. 2962!, 2963! Jolfa, 13.X.1941, ULJANISHCHEV!; 810 m, DANIN & PLITMANN 65–1605! 42–55 km W Marand, 1000 m, RECH. 43836!, 43839! Between Khvoy and Maku, 1000 m, 15.X.1975, HAMID! 17,6 km E Maku, 1020 m, PABOT 5379! 55 km from Maku to Marand, 1000 m, TERME 40162-E! Between Marand and Khvoy, 1100 m, SAB. in GAUBA 1709! Ibid., edge of swamp, ZOHARY & BAUM 65–1625! 53–60 km W Marand, 1000 m, VOLK 71/613!, PABOT 5359! Pass from Khvoy to Shahpur [Salmas], 1700 m, AELLEN & BEHB. 3030!, BEHB. & AELLEN 30076-E! Sharaf Khaneh, BEHB. & AELLEN 30081-E! Lake Urmia (Rezaiyeh Orumiyeh), 12.X.1856, SEIDL.! Kangarlu, NW-bay, 12.X.1856, SEIDL.! Kordlar, 13 km E Rezaiyeh, 1380 m, RECH. 49426! 24 km N Rezaiyeh, 1200 m, MALCOLM 279! Golmankhaneh, 1220 m, 25.VI.1884, KNAPP!, AELLEN & BEHB. 2979–2983!!, 3006!, 3010!, 3018!, BEHB. & AELLEN 30074-E!, 30075-E!, 30129-E!, 40184-E!, 40261-E!, 40263-E! Hasanlu, 11 km NE Naqadeh, 1200 m, GRANT 16078! Ham.: Dow Sar, 53 km W Hamadan, 1850 m, PABOT 5579! Esf.: 30 km N Esfahan, 1700 m, PABOT 7285! Gavkhuni Swamp, STAPF 786! Lendjan [?Lenj], MOSTAFARI 30426-E! Arak: M Rasvand, IX.1889, STR.! – S: Fars.: Near Dalaki, ALEXEENKO 940!, 964! 15 km NW Ganaveh, 30 m, BOKHARI & al. 14800! Borazjan to Ganaveh, near Dalaki river, 70 m, BOKHARI & al. 14787!, 14789! Kerm.: W Jaz Murian, 370 m, LÉONARD 5724! Between Chah Reza and Ziarat Pir-e Karkan, 350 m, ERSHAD & al. 40139-E! Kuh-e Jupar, 1800–2000 m, KUHLE 1! Baghin, 1750 m, FOROUGHI 10604! 22 km E Rafsanjan to Kerman, 1670 m, TERME & MOUSSAVI! Lar.: 25 km S Bastak to Bandar-e Lengeh, 1. III.1971, IRANSHAHR & TERME! Bandar Abbas, 0–20 m, PABOT 132a!, 6541!, DADASHZADEH in PABOT DK 201!, SOJÁK 4500!, 4501!, 4505! 22 km NE Bandar Abbas near Baghu, SOJÁK 4921!, 4923! Jask, BEHB. 863-E! Henqam Island, VII.1877, FLOYER! Bal.: Road Chah Bahar to Jask, between Kahir and Ghottam, 112 km W Tis, ERSHAD & al. 35398-E! Between Chah Bahar and Nasirabad, road to Iranshahr, 250–750 m, ERSHAD, & al. 35394-E! Deh Jaji near Nasirabad, 1964, HENDERSON s.n.! Between Iranshahr and Bam, 60 km W Bazman, 1150 m, ERSHAD & al. 35411-E! Zahedan, airport, PROBST VO 11360!, VO 11361! 45 km NE Zahedan to Bam, 1270 m, 2.XI.1975, TERME & MOUSSAVI! – E: Sistan: Sistan salt marsh, HENDERSON 6! Khor.: Between Birjand and Zahedan, 20 km N Khunik, 970 m, TERME & MOUSSAVI 34378-E! Dorokhsh, NE Birjand, 2080 m, CZERNIAK. 275! Kerat [Karat] Kuh, 9.X.1858, BUNGE! 5 km S Sabzevar, 940 m, REJAMAND & ARAZM 32544! Between Shurab and (?)Besheragats, 19.X.1858, BUNGE! Between Ferdows and Ribat-e Shur, 1200 m, REJAMAND & ARAZM 32467! 87–97 km N Kashmar to Sabzevar, 1100–1200 m, FOROUGHI 10537!, 10561!, 10565!, 10566!, 10567!, 10592!, 10593! Sultanabad, KOELZ 16920! SE Mashhad, Experimental station, 1060 m, DANIN & al. 65–2431! Near Neyshapur, 8.IX.1929, SHCHERBINOVSKIJ! 50 km N Mashhad to Quchan, DREA 125!, 532! Bojnurd, VOLK 71/619! Between Dasht and Loveh, c. 125 km W Bojnurd, 1100–1200 m, ANDERSEN & PETERSEN 318!, RECH. 37603! – C: Tehr.: 30 km S Tehran, 1230 m, ZOHARY 1236! 60 km S Tehran to Qom, 1070 m, UOTILA 19403!, VOGT 1017! Sadrabad, NE Qom, 850 m, TERME & TEHRANI 40027-E! Sadrabad to Shahrud, 800 m, FOROUGHI 10589! Near Qom, HAUSSKN. 16!, 21! Near Qom and Howz(e Sultan) HAUSSKN. 25! Between Qom and Shur Ab, X.1868, HAUSSKN.! 50 km E Tehran, N Sharifabad, 1500 m, 5.VI.1957, DREA! Road Varamin to Qarachak, Eshghabad, BARKHORDARI 41730! Varamin, SHAR. & AELLEN 30084-E! Near Rud Shur, 50–55 km SW Tehran, 900– 980 m, AELLEN 2971!, BRECKLE 5398!, 5414!, FOROUGHI 10511! 5 km SE Rud Shur, DAVIS & DREA 13! 15 km W Garmsar, 1000 m, BRECKLE 5025! Kavir Prot. Reg.: Eyn or-Rashid, 1000 m, IRANSHAHR & MOUSSAVI 15374-E!, 40178-E! Eyn or-Rashid to Howz-e Agha Mohammad Khan, IRANSHAHR & MOUSSAVI 15387-E! Eyn or-Rashid to Safid Ab, IRANSHAHR & MOUSSAVI 40239-E! N of Siah Kuh to Talhe (Tuleh), 820 m, FREITAG 14012! Siah Kuh, Chashmeh Shah, IRANSHAHR & MOUSSAVI 40230-E! S border of "Char" desert, N of Siah Kuh, 770 m, AELLEN & SHAR. 2813!, 2815!, 2816!, 3063!, 3065!, 3066! 7 km E Bad Rud, 1050 m, RECH. 46486! At Caravan-Sarai Shah Abbas, 1100–1300 m, RECH. 46160a!, 46160b! 37 km NW Caravan-Sarai Shah Abbas, 800 m, WDB. & FOROUGHI 15193! 18 km of Chashmeh-yeSafid Ab, 900 m, RECH. 46389! Safid Ab, 940 m, TERME & TEHRANI 40049-E! 40053-E! Between Kush Kuh and Siah Kuh, 800 m, AELLEN & SHAR. 2994! Qazv.: 39 km SW Karaj to Shahdasht, 1250 m, BABAKHANLOU 2993! 70 km SW Karaj, 1000 m, AELLEN 2883!, 3142!, 3143! Near Mardabad, SW Karaj, 1300 m, AELLEN 2800!, 3141!, GAUBA 1709! W of Mardabad, 1250 m, HDG., WDB. & al. 14682! Near Qazvin, ALEXEENKO 506! Yazd: 30 km from Yazd to Robat Posht-e Badam, 1000 m, FOROUGHI & BAZARGAN 32431! 20–30 km from Jandaq to Hoseynian, 800–1000 m, TERME & MOUSSAVI 40104-E! Kashan: SE-border Daryacheh-ye Namak: Kush Kuh, 860 m, AELLEN & SHAR. 2814! 25 km E Marinjab, 860 m, AELLEN & SHAR. 2910! 12 km N Kashan, PABOT 30344-E! Robat-e Tork, SOJÁK 6892!, 6893! Between Kashan and Natanz, Shadian, SAB. 532!, 30068-E! 27 km SE Kashan, 1970 m, TERME & MOUSSAVI 34385-E! 8 km S Amirabad, 2070 m, KRAMER VO 11359! Damgh.-Semn.: Chashmeh-i Ali, SE Kuh-e Nizva, 2200 m, AELLEN & BEHB. 2805! 60 km N Damghan on way to Kalateh, 1900 m, ANDERSEN & JENSEN 7231! 30–40 km SE Semnan to Anjirab, 1050 m, TERME & MOUSSAVI 30214-E!, 30219-E!, 30259-E!, 40064-E!, 40071-E!, 40167-E!, 40195-E! 15 km of Anjirab, 1100 m, TERME & MOUSSAVI 40202-E! Shahr.-Bust.: Shahrud, KOELZ 16935! 19 km E Abbasabad, road Tehran to Mashhad, ZOHARY & ORSHAN 10206/8! Between Abbasabad and Mayamey, RECH. 5370! Mayamey, SAB. 534! Biarjmand, SE Shahrud, 1400 m, REJAMAND & ARAZM 32554! Bastan to Shahrud, 21.IX.1936, SAB.! Badlands near Miandasht, 2.XI.1942, PETROV! Turan Prot. Reg.: 2,5–14 km N Darb Ahang, 910–930 m, BRECKLE & BHADRESA 5131!, FREITAG 14173a! 15317! Ahmadabad, 2 km NNE to Darb Ahang, 975–990 m, FREITAG 13896! Between Talkhab and Garmab, 1200–1300 m, FREITAG 13719!, 13732! 2 km NE Delbar, 1200 m, FREITAG 13912! 1 km S Delbar, 1200 m, BRECKLE 5188! 10 km SE Delbar, at eastern road to Majrad, 1000 m, FREITAG 13969! Valley above Mohamad Abowl, E Chahjam, 1400 m, FREITAG 14104! 10 km N Chahjam at road Torud to Shahrud, 1150 m, FREITAG 14131! 3 km E Razveh, NE Torud, 1200 m, FREITAG 14112! 4 km ESE Razveh, 1200 m, FREITAG 14126! Torud, 1350 m, REJAMAND & ARAZM 32562!, 32570! 15 km SE Torud, 800 m, FREITAG 14895b! 100 km S Shahrud, 1420 m, REJAMAND & ARAZM 32599! Qurjin near Shakibir [Shakh-e Biar], 1.IX.1858, BUNGE! – Not localized: AUCH. 2769! a.1825, BELANGER!, BUNGE 55! Bibikabad, 25-VIII.1882, PICHLER! Gerina, Elburz, PICHLER 6! Azerb., WARREEN 57! Between Tehran and Tayyebat, HAGER 109! Tudee (Yudee ?), 14.XI.1858, BUNGE!

T u r c o m a n i a : Ashkhabad: Near Ashkhabad, LITW. 483! Germab, above Skobelevka, SINT. 1177a! Near Vannovskij, Firyuzinka valley, 600–700 m, 8.IX.1976, VASAK!

A f g h a n i s t a n : NW: Herat, Hari Rud valley, AITCH. 733! – SW: Farah: Farah-Rud, between Shindand and Dilaram, 1150 m, RECH. 33392! Farah, 500 m, KOELZ 13238! 33 km NW Chakhansur, Lash Juwain, 475 m, PODLECH 16916a! 20 km N Chakhansur, 500 m, FREITAG 3760! 4 km SSE Chakhansur, 475 m, PODLECH 17126! 23 km ENE Zaranj (Kang), 474 m, PODLECH 16910! 8–15 km E Zaranj, 485 m, BRECKLE 4907!, PODLECH 16902! – SE: Kandahar: SW border Registan desert near Bhagat, 720 m, FREITAG 740! Helmand valley, island opposite Lashkargah (Qala Bist), 800 m, FREITAG 2066! Near Lashkargah, bank of Helmand, BRECKLE 4842! Near Girishk, bank of Helmand, 840 m, PODLECH 19693! – E: NE Kabul, mountain, 1800 m, PABOT A 1403! Nangarhar: Torkham to Jalalabad, RECH. 37421! 8 km SW Ghaziabad, 550 m, PODLECH 19979a! Ghaziabad, 500 m, PODLECH 19930! 30–48 km E Jalalabad, 540–630 m, BRECKLE 4947!, FREITAG 7322! Jalalabad, 570 m, PODLECH 17089! Jalalabad University campus, 600 m, ANDERS 5377! W Jalalabad, confluence of Alingar and Kabul river, 600 m, KERST. 647! Laghman: Woresmin Tangi, between Sarobi and Jalalabad, 820 m, RASOUL 460! Woresmin Tangi, 10 km W Sarkundo Baba, 800 m, RASOUL 444! – C: Bamian: 16–24 km downstream from the Buddhas, 2500 m, VOGT 1916!, 1015! Before Bamian, 2000 m, VOLK 2406! "Dyane Syghan", GRIFF. Journ. 1127! – Not localized: AITCH. 24! GRIFF. Herb. East Ind. Comp. 1799!, 4212!

P a k i s t a n : Quetta: Qila Saifullah, MOHINDAR NATH 2186! Pishin, 1500 m, LACE 4080!, FARRUKH, SAFFAD & al. 7! Pishin Lora Valley, S Gulistan City, FAIRSERVIS 14e! Quetta, 1900 m, 29.V.1968, BEG!, 12.VIII.1980, HUSSAIN & DASKI!, QURESHI 1390! Urak, 13. VI.1978, MANZOOL & KHAN! Hanna Lake, MANZOOL & KHAN 431! Quetta-Mastung road, near Ras Lake, QAISER & GHAFOOR 4442! Ahmadwal, DATTA 14! Loralai, 1410 m, JAFRI & AKBAR 2323A! Dabar Kot, Loralai, FAIRSERVIS! Pak. Air Force base, SHAH & REHMAN 1154! Sibi: Ziarat, MANZOOL & MAQSOOD 1317!, 1345! – Kalat: 52 km NE Nushki, 1500 m, FREITAG & KOTHE 18768!, GHAFOOR & OMER 2062! Dune area 7 km S Mastung, 1680 m, FREITAG & KOTHE 18833!, GHAFOOR & OMER 2137! 30 km WSW Awaran at road to Hoshab, T. ALI 1457! 46 km from Jhal Jao to Bela, KAMAL & NAZIM 1161! – Bal.: Chagai: Near Nushki, 1500 m, POPOV 250!, V.1966, KHAN! 5–10 km E Nushki to Quetta, GHAFOOR & OMER 2047!, 2043!, GHAFOOR & YUSUF 1393! Between Galanger and Quetta, GHAFOOR & OMER 2062! 16 km from Nushki on road to Sanduri, AITCH. 24! Koh-e Sultan, 39 km N Nok Kundi, 1900 m, FREITAG & KOTHE 18699/24!, 18699/27!, GHAFOOR & OMER 1986!, 1988! – N Makran: Parom village 96 km W Panjgur, 895 m, FREITAG & KOTHE 18649!, 18650!, GHAFOOR & OMER 1921! 35 km from Panjgur on way to Nag, ABEDIN & HUSSAIN 6704! Near Panjgur, 900–995 m, POPOV 183!, FREITAG & KOTHE 18640!, 18674! 96 km WSW Panjgur, 895 m, FREITAG & KOTHE 18649! – C Makran: 8 km S Mand at road to Suntsar, GHAFOOR & QAISER 273! Makran Coast: Near Pasni, 100 m, POPOV 42! 10 km NNE Gwadar to Pasni, 30 m, FREITAG & KOTHE 18517!

Distr. gen.: Anatolia east to Pakistan and W China, and from the northern Caspian lowlands to N Saudi Arabia and Baluchistan.

A widespread, rather variable species; several local forms and races have been described as species. The types of *S. spissa* M.B. (described from N Caspian lowlands) and *S. macera* LITW. (from Lake Bejuk-Shor near Baku) merely represent delicate forms with a more horizontal branching system, as can often be seen in unfavourable habitats. The longer and more persistent leaves stressed by LITWINOW refer to the earlier phenophase, like the distinct cone formed from the tepal lobes on the immature fruits. *S. micranthera* (described from the Fergana Basin) differs according to BOTSCHANTZEV only by smaller anthers (0,5–0,7 mm), smaller fruits (5–7 mm diam.), and hairy tepals. Forms with the 2 first characters are common in Afghanistan, Pakistan and S Persia, and plants with sparsely hairy tepals occur scattered all over the distributional area (see *S. incanescens*, sp. no. 20, for discussion).

Another form with small fruits and slightly wider hyaline tepal margin is *S. pseudonitraria* from Iraq. It was, correctly, included in synonymy of *S. nitraria* by BOTSCHANTZEV (1972).

In the hot lower altitudes semi-deserts from Iraq to Baluchistan and E Afghanistan, the species often grows together with the shrubby *S. imbricata*. As both species are almost identical in their upper, flowering and fruiting parts, the identification of fragmentary herbarium specimens is difficult. Field studies and cultivation experiments carried out with both species in the greenhouse with seeds collected from the same localities in Pakistani Makran confirmed the strictly annual life form of *S. nitraria*, and the perennial one in *S. imbricata*. Young individuals of the latter start flowering not earlier than in their second year.

The crushed leaves have the same strong fishy smell and unpleasant taste as *S. imbricata* and are avoided by grazing animals.

20. *S. incanescens* C.A. MEY. in EICHW., Pl. Casp.-Cauc. 2: 35 (1833).
Syn.: *S. Volkensii* ASCHERS. & SCHWEINF., Ill. Fl. Egypte: 130 (1887). *S. Autrani* POST, Fl. Syria: 690 (1896).
Icon.: EICHW., Pl. Casp.-Cauc. 2: tab. 26 (1833). ZOHARY, Fl. Palaest. 1: tab. 250 (1966), sub *S. Volkensii*. COLLENETTE, Ill. Guide Flow. Saudi Arabia: 125 (1985), sub *S. Volkensii*. – Fig. 6-F.
Type: (Turcomania) Ad littora caspica prope Krasnowodsk, 1825, K.E. VON EICHWALD, lectotype LE! selected here.

Much like *S. nitraria*, but differing in the following characters; branches and leaves with denser indumentum; bracts and bracteoles with persistent hairs; tepal back pilose with stiff ascending hairs – in fruit thickened along a dorsal line, with distinctly incurved margins beak-like bent together and forming a 5-arched open or closed dome.

Hab.: Habitat preferences very similar to *S. nitraria*, but with an even more pronounced tendency for disturbed sites; ubiquitous in and around settlements, on ruderal places, along roads, in and at the edge of cultivation etc..

Iraq: Kurd.: Kirkuk: Hawija, BARKLEY & HADDAD 3929 L! – Diyala: S Mandali, HADDAD & AGNEW 3H!
Persia: N: Gorg.: 5 km E of Tappeh-ye Moraveh (Moraveh Tappeh), 210 m, HEWER 4069! Ghara-Gol, between Tappeh-ye Moraveh and Holtan by Atrak River, 180–230 m, HEWER 4056!, 4058! 46 km from Pahlavi Dezh, O'CONNELL 187!, Lake at Tangeli, 52 km from Pahlavi Dezh, HEWER 4048! 15 km E Caspean Sea, N Gonbad-e Kavus, 30 m, VOGT 1019! N Gonbad-e Kavus, 150 m, FISHWICK 12!, PETTER 2! Between Amol and Polur, 1050 m, ASSADI 15608! Gilan: Between Lowshan and Manjil, 360 m, WDB. & SHIRDELPUR 14850! – W: Azerb.: 103 km N Meshkinshahr to Moghan, 200 m, PABOT 2950! Esf.: Between Shah Reza (Qomisheh) and Esfahan, 1680 m, ARCH. 2954! Kavir-e Zavareh, N Ardestan, 900 m, FOROUGHI & BAZARGAN 32358! Khuz.: 30 km S Ahvaz, 20 m, PABOT 2589! NW Dow Gonbadan, FASSIHI 40146-E! – S: Fars: 8 km from Shiraz to Jahrom, ALAVA & BOKHARI 10710! Maharlu lake, 28–30 km SE Shiraz, 1470 m, KRAMER VO 11358!, BOKHARI & al. 14842! SW-bank Maharlu lake CARLÉ VO 1660! Near Mahluja (?Maharlu), 1620 m, BORNM. 4194 p.p.! Lake Neyriz (Bakhtegan-lake), 1600 m, BORNM. 4201!, 4296! W-bank of lake Neyriz, 1400 m, STARM. 46! Neyriz, 1680–1700 m, BORNM. 4202!, 5079! Between Neyriz and Shiraz at Sarvestan, 1600 m, BORNM. 4195! Between Rounis (Runiz-e Bala) and Sarvestan, 1600 m, BORNM. 4199! Between Bushehr and Borazjan, ZOHARY 1102! 10 km N Borazjan, KRAMER VO 11362! Kerm.: Baghin, SW Kerman, 1750 m, FOROUGHI 10604!, 10595! S Kerman to Baft, 1750 m, 6.VI.1960, DADASHZADEH in PABOT! 27 km S Sirjan to Hajjiabad, 2.VI.1960, DADASHZADEH in PABOT! Between Kerman and Sirjan-Ahmedabad, 1.VI.1960, DADASHZADEH in PABOT! 22 km E Rafsanjan to Kerman, 1670 m, TERME & MOUSSAVI 34381-E! Kerman, 1900 m, BORNM. 5076!, 5076b! Near Kerman, at Farahabad, DADASHZADEH in PABOT DK-220! Between Zarand and Rafsanjan, 27. VI.1960, DADASHZADEH in PABOT! N Kerman to Zarand, Kavir of Amirabad, DADASHZADEH in PABOT DK-224! Lar.: 22 km NE Bandar Abbas, Baghu, SOJÁK 4655!7 km E Gahkom (20 km S Hajjiabad), SOJÁK 4940B!, 4941! 20 km N Hajjiabad, PABOT 6739! Near Dowlatabad, c. 85 km E Hajjiabad, SOJÁK 4358! Bal.: 9 km NW Paskuh 27°34', 61°39' SOJÁK 599! – E: Sistan: salt marsh, HENDERSON 6! Khor.: Gonabad (Juymand) to Tabas, between Ferdows and Deyhuk, 1200 m, DADASHZADEH in PABOT DK-255! 40 km from Qayen to Gonabad (Juymand), 1600 m, RECH. 56248! Near Afghan border between Khvaf and Ghurian,

9.X.1858, BUNGE! Kerat (Karat) Kuh, 9.VIII.1858, BUNGE! Gurfah to Gurian, 3.VIII.1858, BUNGE! 4 km NE Sabzevar, 950 m, PABOT 8003! 140 km NW Mashhad, 1500 m, ZOHARY & ORSHAN 9964/26! NE Mashhad, BUNGE 59! – **C**: Tehr.: Between Tehran and Qom, 1300 m, ZOHARY 244!, 247! Khanabad (Chanabad), 1882, PICHLER! 55 km N Qom, Daryacheh-ye Howz-e Sultan, W-side, 800 m, BRECKLE & BHADRESA 5431! Daryacheh-ye Howz-e Sultan, 90 km S Tehran, 830 m, UOTILA 19383! 30 km N Qom, 800 m, PABOT 7479! Desert between Qom and Shur Ab, HAUSSKN. 16! Kuh-e Siah at Savehkhaneh, BOBEK 52! 80 km SE Tehran, Dasht, 1000 m, BRECKLE & BHADRESA 5020! Garmsar, 90 km E Tehran, railway-station, 1100 m, AELLEN 2795! 15 km W Garmsar, 1000 m, BRECKLE & BHADRESA 5029! Hableh Rud valley, Ban-e Kuh (Bonehkuh, Bun-e Kuh), 1100 m, AELLEN & MANUCH. 2793!, MANUCH. & AELLEN 30174-E! Hableh Rud valley between Simin Dasht and Kabutar Darreh, 1150 m, AELLEN & MANUCH. 2766! Bahram, 20 km E Tehran, railway-station, 1100 m, AELLEN 2792!, 2803!, 2842!, 2921! 27 km SE Tehran, 15 km NW Gadanak, 900 m, BRECKLE & BHADRESA 5435! Rey, FIELD & LAZAR 495! Highway Tehran to Qom, 950 m, VOGT 1018!, X.1956, DAVIS! Rud-e Shur bridge, 980 m, FOROUGHI 10500! 50 km SW Tehran, at Shur river, 900–950 m, AELLEN 2969!, 2970!, BRECKLE & BHADRESA 5413! Tehran to Saveh, DINI & BAZARGAN 23281! Kushk-e Nosrat, 800 m, AELLEN & SHAR. 3155! Kavir Prot. Reg.: Siah Kuh, Eyn or-Rashid, 1000–1050 m, IRANSHAHR & MOUSSAVI 15373-E!, 40181-E!, WDB. & FOROUGHI 15221! Desert S Siah Kuh between Daryacheh-ye Namak and Dasht-e Kavir, AELLEN & SHAR. 3055! Mobarakiyeh, 700 m, IRANSHAHR & MOUSSAVI 15370-E! Qazv.: Halkedar mts. near Mardabad, 1200 m, RECH. 6834! W Mardabad, mountains, 1250–1300 m, HDG., WDB. & al. 14675!, 14693!, AELLEN 2799!, 3140!, GAUBA 99! Kashan: S of Daryacheh-ye Namak, plain of Kadish, 800 m, AELLEN & SHAR. 3161! Marinjab, 860 m, AELLEN & SHAR. 2992! 26 km SE Kashan, IRANSHAHR & MOUSSAVI 15390-E!, 1070 m, TERME & MOUSSAVI 34402! Kavir-e Kashan: Ab-e Shirin to Fakhrabad, IRANSHAHR & MOUSSAVI 40180-E! Nushabad to Ab-e Shirin, 780 m, TERME & MOUSSAVI 30250-E!, 30277-E! Abu Zeydabad to Fakhreh, 900–1000 m, MOUSSAVI & TEHRANI 30714-E! Dastkan, 21.XI.1948, AELLEN & SHAR.! Abbasabad, SE Natanz, 1320 m, FOROUGHI & ASSADI 15170! Between Dudak (Dow Dehak) and Robat-e Tusa (?Robat-e Tork), ALEXEENKO 685! Yazd: Dasht-e Kavir: 30–50 km SE Jandaq to Khvor, 920 m, TERME & MOUSSAVI 40256-E!, 30275-E! 50 km from Nain to Ardakan, 1050 m, FOROUGHI & BAZARGAN 32363! 20–30 km from Jandaq to Hoseynian, 800–1000 m, TERME & MOUSSAVI 40102E! Chupunum, SAB. 16! Damgh.-Semn.: Chashmeh Ali, 3.IX.1909, BRUNS! 8 km W Semnan, 1150 m, HDG., WDB. & al. 14724! Sorkheh, SW Semnan, 1100 m, HDG., WDB. & al. 14755!, 14756! Shahr.-Bust.: Abbasabad, 820 m, FOROUGHI 10601! – Not localized: Persia BUNGE 55!, AUCH. 2780! Shadan, SAB. 531!, 533! Husseinabad, salt desert, c. 1500 m, ZHUMER 246! Near Durizan, road Hamadan to Tehran, 26.VIII.1882, RICHTER! Kuh-e Safid, 830 m, TERME & TEHRANI 40028-E!

T u r c o m a n i a : Near Babo-Durmas (Babadurmaz), LITW. 386! Near Ashkhabad, LITW. 292!, 318!, 400!, 400b,c! 401!, 407!, 483!, SINT. 1321b!, 7.IX.1976, VASAK!, 6.IX.1976, VASAK! Germab, above Skobelevka, SINT. 1211b! Vannovskoje, Firyuzinka valley, 600–700 m, 8.IX. 1976, VASAK! Bakharden, 16 km E to Bami, 16.IX.1976, VASAK! At "Podzemnoie ozero", 16.IX.1976, VASAK! Kizyl Arvat, Koper Dagh, SINT. 2199a! Kara Kala, SINT. 2199b!, ILJIN 864!, 876! LITW. 385!

A f g h a n i s t a n : **N**: Shiberghan: Near Akchah, NEUB. 192!, 195! – **NW**: Herat: Between Herat and Kizyl Eslam Qaleh, RECH. 32511b! – **SW**: Farah: 4 km S Adraskand to Dilaram, 1380 m, PODL. 32545!, 32548! – **SE**: Kalat-i Ghilzai: 30 km NE Kalat-i Ghilzai to Kabul, 1700 m, UOTILA 18917! C: Bamian: Kuh-e Baba, N-side above Naiak, c. 2700 m, THESIGER 92!

Distr. gen.: Northern Caspian lowlands, Anatolia and Lower Egypt east to W China and Pakistan, south to Yemen and Saudi Arabia.

S. incanescens is very closely related to *S. nitraria*. Both taxa are widely sympatric and so many transitional forms – maybe from hybridization – have been seen, that a lower taxonomic rank might be more appropriate. *S. Volkensii*, described from Lower Egypt, differs in no substantial character from *S. incanescens* and is therefore included in synonymy. BOTSCHANTZEV (1970, 1975) mentioned for *S. Volkensii* the absence of hairs on the lower back of the tepals, slightly smaller anthers and fruits and shorter bracts, but this can also be seen in many specimens from Persia and elsewhere (see also notes on *S. micranthera* BOTSCH. under sp. no. 19). Remarkable parallelism occurs in the branching system of the two taxa: in the hot southern parts of the area the branches tend to be denser and shorter, resulting in smaller, more compact plants, but specimens of *S. incanescens* with elongated branches have also been seen from Syria and northern Sinai.

21. ***S. dendroides*** PALL., Illustr. Pl.: 22 (1803).

Syn.: *S. suaedoides* MOQ., Chenopod. Monogr.: 148 (1840). *Halogeton Olivieri* MOQ., l.c.: 159 (1840). *Salsola Olivieri* (MOQ.) BUNGE in LEDEB., Fl. Ross. 3: 814 (1851). *Halogeton georgicus* MOQ. in DC., Prodr. 13,2: 205 (1849). *Salsola georgicus* (MOQ.) BUNGE in LEDEB., Fl. Ross. 3: 814 (1851). *S. ericoides* var. *leucoxylon* MOQ. in DC., Prodr. 13,2: 183 (1849). *S. dendroides* subsp. *trichantha* BOTSCH., Nov. Syst. Pl. Vasc., 11: 133 (1974). *S. trichantha* (BOTSCH.) BOTSCH., l.c. 19: 81 (1982).

Icon.: PALL., Illustr. Pl.: tab. 4 (1803). GROSSH., Fl. Kavk. 3, tab. 15, fig. 5 (1945). KARJAGIN, Fl. Azerb. 3: tab. 20, fig. 1 (1952). TAKHT., Fl. Armen.: tab. 110 (1956). – Tab. 121.

Type: (Kazakhstan): "In maxime australibus, salsuginosis et squalidis deserti Caspici, praesertim inter Volgae ostia et Cuman fluvium, ut et in Majaschnoi bugor, colle littorali inter Volgae et Rhymni ostia sito", P.S. PALLAS, lectotype BM!, syntypes P-MOQ!; selected here.

Subshrub or perennial herb, 20–80(–140) × 20–60 cm, erect; in young stage light brown with a dense indumentum of spreading or ascending, curved, smooth 0,5–0,75 mm long hairs, often interspersed with 1–2 mm long stiff hairs, later glabrescent. Base with up to 5(–10) cm high and 2,5 cm thick branched caudex; annual shoots densely and delicately branched from base, arising from globular buds with scale-like leaves, terminating into 8–50 mm long, usually loose spikes, upper parts of spikes without flowers. Leaves linear, triangular or almost circular in outline, 15–1,5 × 2–1 mm, sparsely hairy or glabrous. Lower bracts leaf-like, the others scaly, cucullate, down to 1 mm in length and width, broadly triangular to ovate, glabrous; bracteoles almost circular, 1–1,5 mm long and wide, glabrous, usually shorter than perianth. Tepals trullate to ovate, 1,7–2,2 mm long, the outer 1,0–1,2 mm wide, 1-veined, transverse line at 1/4–1/3, with a small triangular green blotch, ciliate all along the margins or basally and apically only with smooth flexuose hairs, rarely also the back pilose. Anthers 1,0–1,4 mm long, including the 0,05–0,1 mm long, obtuse appendage, divided for 1/2–3/5; filaments 1,5–1,9 mm long; disc absent. Ovary ovoid, tapering into the 0,5–0,7 mm long style; stigmas 2, almost as long as style, inside long papillose. Fruiting perianth 5-winged, 5–10 mm diam., the wings pale or brownish, more rarely pink, tepals above the wings forming a truncate cone or an open cylinder. Seed 1,7–2,0 mm diam.

Hab.: Locally common on slightly to moderately saline, preferably deep clayey or silty semi-desert soils of plains and gentle slopes; up to 2000 m, often dominant and forming a distinct community, or subdominant in association with *Artemisia Sieberi, Anabasis Haussknechtii, Reaumuria fruticosa* (Semnan) or *Haloxylon Griffithii, Anabasis turkestanica* etc. (N Afghanistan). – Fl VII–X, fr. IX–XI.

Persia: N: Gorgan: Tappeh-ye Moraveh, GAUBA 2137! 5 km E Tappeh-ye Moraveh, 220 m, HEWER 4067!, 4075! 14–37 km E of Caspian Sea, N Gonbad-e Kavus, 30 m, VOGT 1035!, 1038! Gonbad-e Kavus, PETTER 6! Ghaznavi between Khush-Yailaq and Shah Pasand, 800 m, TERME & al. 39357! 51 km SE Shah Pasand, 1250 m, PABOT 7596! 45 km SW Shah Pasand, 1500 m, BRECKLE 5224! Between Shah Pasand and Shahrud, s. coll. 40246-E! 46 km N Pahlavi Dezh, DREA & O'CONNELL 180! Ibid., 15 km NE, 25 m, BRECKLE & BHADRESA 5252! 3 km N Pahlavi Dezh, 50 m, PABOT 7658! N Pahlavi Dezh, –30 m, UOTILA 19225! Between Pahlavi Dezh and Gorgan, 100 m, SERAJ 5011! Turkmen plain N Gorgan, STREET 44! Near Dow Ab, STREET 46! Alkali plain to Gorgan, STUTZ 609! Behshahr, SAB. 567! Moh. Reza Shah Prot. Reg.: Jangal-e Golestan, Dasht-e Almeh, 1380–1450 m, TERME & MATIN 35099-E! Dasht-e Kalpoush, TERME & MATIN 35098-E! Almeh, 1250 m, UOTILA 19177! Maz.: Between Haraz and Amol, MANUCH. 785! Talar valley, Sorkhabad, 1400 m, RECH. 5598! 43 km S Keyasar (?Kiaseh), road to Fulad Mahalleh, 1850 m, MOUSSAVI & KARAVAR 34365-E! 5 km behind Veresk, road to Pol-e Safid, 1350 m, MATIN & TERME 41708! Reyneh, PICHLER 15! Chalus valley, 53 km N Siah Bisheh, 450 m, PABOT 4670! Gaznak, Haraz valley, near river, 1600 m, WDB. 1437! Gilan: Sefid Rud valley, 13.IX.1847, BUHSE! Rasht to "Pait-schinar", HAUSSKN. 186! Between Qazvin and Rasht, HAUSSKN.! – W: Azerb.: 16 km S Mianeh, 1090 m, PABOT 5123! 20 km E Mianeh to Khalkhal, 960 m, WDB. & SHIRDELPUR 14930! 10–24 km ENE Mianeh, at Qezel Owzan river, 1150 m, RECH. 43247! Dasht-e Moghan: near Aslanduz, GAUBA & SAB. 2135!, 25.IX.1958, SAB.! Eyvaz, 3 km SE Aslanduz, LAMOND in RECH. 40173!, IRANSHAHR 40228-E! 14 km SE Ali Rezaabad-e Jadid, RECH. 40131!, IRANSHAHR 30368-E! Sarigash, 180 m, DAMNABI 30382-E! 61,5 km NE Tabriz to Ahar, 1500 m, PABOT 5248! 28 km NE Tabriz, 1480 m, PABOT 5280! Near Tabriz, BAUM 65–1025! Between Tabriz and Marand, 1400 m, GAUBA & SAB. 2133!, s. coll. 40252-E! 30 km W Marand to Khvoy, PABOT 5343!, 5344! Sharafkhaneh, 1200–1400 m, AELLEN & BEHB. 2929!, 2931!, BEHB. & AELLEN 30112-E!, 30209-E!, RECH. 43644!, 43645! 27 km W Marand to Evowghli, 1000 m, RECH. 43819! From Khvoy to Shahpur (Salmas), 1700 m, AELLEN & BEHB. 3025! Between Shahpur and lake Rezaiyeh (Urmia, Orumiyeh), AHAI & MOJIB 14855-E! Rezaiyeh (Orumiyeh), 1300 m, BROWN 3362!, 30069-E! 20 km E Rezaiyeh, 1340 m, RECH. 49416! Lake Rezaiyeh (Orumiyeh), SE-bank, between Bonab and Khanian, RECH. 14773! Near Bonab, 1200 m, AELLEN & BEHB. 3147! N Bookan (?Bowkan), 1400 m, MALCOLM 265! Bandar Danalu, 1220 m, STARM. 57!, 67! Shendabad (Shindawar), 1.X.1889, KNAPP! Zanjan: Zanjan to Miameh, 1500 m, SAB. 3556! 48 km S Mianeh, 1200 m, PABOT 5098! 35–60 km NW Zanjan, 1250–1440 m, PABOT 5084!, RECH. 42308! Yangi Kand between Zanjan and Bijar, 1500 m, SAB. 3065! Ham.: Aq Bolagh, 100 km N Hamadan, 2000 m, RIOUX & GOLV. in PABOT AB-109! Esf.: Between Shahreza and Esfahan, 1680 m, ARCHIBALD 2955! At Dizi in Gav Khuni, 30.IX.1885, STAPF! – S: Fars.: N bank of lake Maharlu near Shiraz, 1470 m, KRAMER VO 11351!, VO 11354! Kohenjan to Fasa, 1550 m, FOROUGHI & ASSADI 15006! Lake Neyriz (Bakhteghan lake) near Kherameh, 1570 m, FOROUGHI & ASSSADI 15021! N-bank of lake Neyriz, 1400–1600 m, STARM. 25!, BORNM. 4195!, 4196 (type of *S. trichantha*)! Kerm.: 120 km S Saidabad (Sirjan), ZOHARY & ORSHAN 6952/8! Between Kerman and Neyriz, at Kheyrabad, distr. Sirjan BORNM. 5078!, 2000 m, BORNM. 4188! 60 km NE Bam to Mahan, Mahmudabad, 1720 m, TERME & MOUSSAVI 33403-E!, 34382-E!, 34383-E!, 34399-E! Between Bam and Kerman, 1750 m, BROWN 3430! 126 km S Kerman to Bam, 1900 m, LÉONARD 6031! Tahrud, 1500 m, RECH. 3584!, 3597! Khan-Khatun near Tahrud, 1810 m, FOROUGHI 10570! Deh-e Shuturun, 2100 m, BORNM. 4197! Between Yazd and Kerman, between Kush Kuh and Bahramabad, (Rafsanjan) 1800 m, BORNM. 5080! Between Zarand and Rafsanjan, NW Kerman, DADASHZADEH in PABOT DK-210! Between Jupar and Bahramjerd, 2200 m, BORNM. 4198! Between Kerman and Shiraz, IX/X. 1892, BORNM.! – E: Khor.: between Ruy-e Khvaf (Chaf), and Assadabad, 10.X.1858, BUNGE! Dasht-e Shah, E of Moh. Reza Shah Prot. Reg., 1500 m, BRAIG & FREY VO 11355! Tayyebat, RECH. 37593! Between Sarakhs and Mashhad, near Mozduran, 600 m, IRANSHAHR 30405-E! Tus, N Mashhad, BRENAN 4033! 112 km NW Mashhad, 1400 m, ZOHARY & ORSHAN 10032/5! 20 km W Shirvan, 950 m, UOTILA 19100! 47 km E Bojnurd, 1050 m, PABOT 7892! Atrak valley between Bojnurd and Shirvan, RECH. 1819! E Bojnurd, 1200 m, FURSE 8928! 125 km W Bojnurd, 1100 m, ANDERSEN & PETERSEN 313! Between Dasht and Loveh, 125 km W Bojnurd, 1200 m, RECH. 37608! 101–118 km E Gonbad-e Kavus, 1100–1260 m, 10.VII.1965, SERAJ in PABOT!, PABOT 7789! Sepid between Bojnurd and Tappeh-ye Moraveh, 1350 m, RECH. 32562! Garnia, KOELZ 16634!, 16638!, 16641! – C: Tehr.: Elburz near Ask, 11.IX.1882. PICHLER! Hableh Rud valley: Between Simin-Dasht and Kabutar-Darreh, 1150 m, AELLEN & MANUCH. 2794!, 3080! Damavand, POG 6886-E! Tehran, 1822, OLIVIER (type of *Halogeton Olivieri*)! Khanabad, a.1882, PICHLER! Qazv.: SW Karaj, near Mardabad, HDG., WDB. & al. 14675!, GAUBA 1708!, GAUBA & al. 2136! Salt-hills near Mardabad, BORNM. 96! 15 km from Mardabad to Eshtehard, along Rud-e Shur, 1200 m, AKHANI & al. 2064! 60 km NE Gonabad, 1300 m, REJAMAND & ARAZM 32487! 77 km W Karaj, road of Kamalabad, 2100 m, AMIN & BAZARGAN 2823! 38 km S Qazvin, 1150 m, PABOT 8329! Kashan: Kuh-e Qohrud, STR.! 50 km SW Qom, 1700 m, KOEIE 954! Damgh.-Semn.: Sorkheh SW Semnan, 1100 m, HDG., WDB. & al. 14755! 84 km W Semnan, 850 m, ZOHARY & ORSHAN 10663/2! Between Vardenow and Kalateh, 4 km Menghas, 1750 m, TERME & al. 39352!, 39361! Kuhha-ye Anjirab, 1500–1650 m, TERME & MOUSSAVI 30245-E!, 40169-E! Shahr.-Bust.: 116 km W Sabzevar, 6 km E Abbasabad, 760 m, PABOT 8051! 120 km W Sabzevar, 1400 m, REJAMAND & ARAZM 32525! Between Shahrud and Abbasabad, 820 m, FOROUGHI 10601! Bustam, SAB. 2134! Biarjmand, SE Shahrud, 1400 m, REJAMAND & ARAZM 32549! 5–10 km from Khaneh Khvodi to Delbar 1020 m, TERME & al. 41717! Turan Prot. Reg.: 0,5 km S Majrad, 1000 m, BRECKLE & BHADRESA 5073! 4 km SE Majrad, 950 m, FREITAG 13971! NW Dowchah to Chah Jam, 1150 m, FREITAG 14100! S of Char, N of Siah Kuh, 770 m, AELLEN & SHAR. 2812!, 3067!, 3070! – Not localized: Persia occid., BÉLANGER 436 (type of *S. suaedoides*)! Deserta Persiae, AUCH. 2770! Persia borealis, BUNGE! At Karü, Elburz, IX.1882, PICHLER! East Khorasan, VI.1913, DIEZ!

T u r c o m a n i a : Ashkhabad, SINT. 2184a! LITW. 314!, 315!, 436! Suluklü (Saratovka), SINT. 1084! Tjaze Nusoi (Novaja Nisa), 350 m, 20.IX.1976, VASAK! Distr. Bakharden, 16 km E Bami, 20.IX.1976, VASAK! Kizyl Arvat, Karakala, at Kizyl Owa, SINT. 2024b!, 2024c!

A f g h a n i s t a n : N: Mazar-i Sharif: Mazar-i Sharif, VOLK 2794!; 400 m, 25.V.1956, AMSEL! Balkh, 400 m, RECH. 16152! SE Tashkurghan to Haibak, 600–700 m, RECH. 16332! 30 km E Haibak (Aybak) pass, 1300 m, 26.X.1958, PABOT! Tang-i Sayad (Tang-i Tashkurghan), 570 m, FREITAG 3903! Tang-i Tashkurghan at Shashma-e Hindi, 640 m, PODLECH 32418! 7–10 km S Tashkurghan, 520–600 m, PODLECH 16995!, 32708! 2 km NW Sayad, 660 m, PODLECH 32449! 10 km SE Tashkurghan, PABOT A 1575! Near Tashkurghan, 450 m, GILLI 2161a! – NW: Bala Murghab: Bala Murghab, 900 m, KOELZ 13262! NE Qala-e Nau, pass, 1370 m, GREY-WILSON & HEWER 1276! Herat: Kisil Islam Qaleh, RECH. 37584!, LINDB. 62/1947! Hari Rud valley, AITCH. 720! – NE: Kataghan: 5 km N Pol-e Khomri, bank of Surkhab river, 660 m, PODLECH 19766a! Rabotak pass (Paigah Kotal, Kotal-i Mirza Atbili), 1300 m, BRECKLE 4638!, 4639!; 1420–1430 m, PODLECH 32038!, 32713!; N of pass, NEUB. 257!, 258! Jelowgir (Dschelaugir), NEUB. 181! – C: Bamian: Eshpushta, GILLI 2162b! Bamian (Qala Sarkari) 2100 m, KOELZ 13929!, VOLK 2408-B! Doab: Doab, 1500 m, KOELZ 13540! Between Doab and Shibar pass, NEUB. 168!, 170! 10 km S Doab, 1600 m, PABOT A 1594! S Doab, gorge, PABOT 1239! Surkhab valley near Doab-e Mekhe Zarin, 1480 m, PODLECH 18364! Ajar valley, 5–13 km W Doab, 1500 m, RECH. 37014! Between Doab and Shikari, c. 1830 m, VOGT 1036! Ghorat: Harirud valley, 3 km N Jam, 1970 m, PODLECH 21910! – Not localized: GRIFF. 1799!

Distr. gen.: SE Russia and NE Anatolia east to S Kirghistan, NE Afghanistan and NW Kazakhstan, south to the mountains of S Persia.

The most striking variation in *S. dendroides* is during its various phenophases. In spring and early summer, the resprouting annual shoots are only a few decimetres tall and have a very elegant feathery appearance, in contrast to the 0,8–1 m tall adult shoots in autumn which indeed look tree-like. Genetically fixed variation is expressed mainly in length and distribution of indumentum. *S. trichantha* (type from Neyriz lake in Fars) has been separated by BOTSCHANTZEV because of hairy tepal backs. As no other associated character has been found and because individuals with hairy tepals do occur in Fars and in many parts of C Persia (e.g. AELLEN 3070 from Kavir Protected Region, BRECKLE 5073 from Turan Biosph. Reserve) together with the normal type, it is regarded here as a minor variety.

A similar case is *S. Olivieri* (MOQ.) BUNGE (= *S. dendroides* subsp. *Olivieri* (MOQ.) BOTSCH.) The type (in P, OLIVIER, from near Tehran!) differs only by a somewhat shorter stem indumentum.

The species is avoided by all grazing animals. In earlier times it was used for soda production (STEVEN, in schedis, MARSCHALL-BIEBERSTEIN 1798). The lower branches often have globular galls 10–25 mm diam. They consist of very short leafy shoots densely covered with long brown hairs.

BOTSCHANTZEV placed *S. dendroides* in subsect. *Caroxylon* because of its smooth hairs, but because of its disc, linear filaments and other characters it is better placed in subs. *Vermiculatae*.

22. ***S. vermiculata*** L., Spec. Plant.: 223 (1753).

Syn.: *S. villosa* DEL. ex SCHULT. in ROEMER. & SCHULT., Syst. Veg. ed. 15, 6: 232 (1820). *S. vermiculata* subsp. *villosa* (DEL.) EIG, Palest. Journ. Bot. Jerusalem Ser. 3: 132 (1945). *S. vermiculata* var. *villosa* (DEL.) MOQ., Chenopod. Monogr.: 141 (1840). *S. rigida* PALL. var. *tenuifolia* BOISS., Fl. Or. 4: 963 (1879). *S. rigida* subsp. *tenuifolia* (BOISS.) BOTSCH., Nov. Syst. Pl. Vasc. 1964: 375 (1964). *S. damascena* BOTSCH., Bot. Zhurn. 60: 170 (1975). *S. camphorosmoides* ILJIN, Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 7: 206 (1938), non DESF. (1789). *S. camphorosma* ILJIN in GROSSH., Fl. Kavk. 3: 159 (1945). *S. Mandavillei* BOTSCH., Bot. Zhurn. 60: 502 (1975). *S. palaestinica* BOTSCH., l.c. 60: 503 (1975). *S. Rodinii* BOTSCH., l.c. 60: 505 (1975). *S. Chaudharyi* BOTSCH., Bot. Zhurn. 65: 687 (1984); etc.

Icon.: ILJIN, Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR 7: 206, fig. 1 (1938), sub *S. camphorosmoides*; MAIRE, Fl. Afr. N. 8: 152, fig. 965 (1962). ZOHARY, Fl. Palaest. 1: tab. 255 (1966). JAFRI & RATEEB, Fl. Libya 58: 84, fig. 32 (1978). MANDAVILLE, Fl. East. Saudi Arabia: fig. 41 (1990). – Fig. 3-G; Tab. 122.

Type: Hispania, L(OEFFLING) 200, holotype LINN. 315.20!

Dwarf or small shrub, 20–40(60) x 15–50 cm; in young stage brownish with spreading, curved, spinulose or branched hairs, in lower part interspersed with stiff, 1–2,5 mm long hairs, later glabrescent. Stem to 1 cm thick, at base usually divided into several prostrate to ascending woody branches. Annual shoots long, in upper part with ± numerous ascending to spreading branches forming a paniculate inflorescence of loose or condensed spikes; in addition to the flowering shoots often with numerous shorter vegetative shoots. Leaves ascending to spreading, needle-like, stiff, linear or triangular, 15–4 x 0,7–0,4 mm, straight or slightly incurved, obtuse, at base widened with narrow hyaline margins, semi-terete or almost terete in upper part; leaf axils with fascicles of shorter leaves. Lower bracts leaf-like, longer than bracteoles, the upper scale-like, only 2,5–1,5 mm long, ovate to almost circular in outline, keeled, as long as or shorter than bracteoles and tepals. Bracteoles similar to upper bracts. Tepals broad to narrow ovate, 1,5–2,5 mm long, the outer 1,2–1,5 mm wide, 1-veined, transverse line at 1/4–1/3, green blotch triangular, as long as wide or longer, margins and apex usually ciliate with denticulate or branched flexuose hairs, the back glabrous or hairy in varying extent and density. Anthers not or scarcely exserted, 1,5–1,8 mm long including the 0,1–0,15 mm long triangular, acutish appendage, divided for c. 2/3; filaments 1,8–2,0 mm long; disc very small. Ovary globular; style about 2 x as long as stigmas, 1–1,5 mm long; stigmas 2(–3), 0,5–0,7 mm long, inside long papillose. Fruiting perianth 6–9 mm diam., wings weakly crenate, straw- to smoke-coloured; upper part of tepals stiff, forming a closed or open cone. Seed semi-globular, 1,5–2,5 mm diam.

Hab.: Locally common on scree-covered slopes or other coarse-textured soils, more rarely on gypsum or on slightly saline habitats. (300–)500–1400(–2000) m. – Fl. VI–IX, fr. IX–XI.

I r a q : Kurd.: Mosul: Near Zakho, 5.IV.1953, C. REGEL! N Mosul, DINSMORE 396! – Diyala: Jabal Hamrin, SUTHERLAND 472!, EVANS M 26!, 25.X.1960, HADAČ! Valley between southern ridges and center of Jabal Hamrin, BARKLEY 3868! Above Injana, 200 m, GILLETT 12486! Khanaqin, ROGERS 406! 22.II.1957, HAINES! Al Muqdadiyah (Sharaban), c. 160 m, GUEST 15793!, HAINES 1363!, 1366! Koma Sanq near Mandali, HADAČ, & al. 4609!

P e r s i a : N: Maz.: Haraz valley, above Panjab, 36°20'N, 52°17'E, 1300 m, WDB. 1556! Gilan: N Rudbar, 250 m, PABOT 3620! Between Lowshan and Manjil, 360 m, WDB. & SHIRDELPUR 14851! – W: Azerb.: 21 km E Mianeh, road to Ardabil, 940 m, PABOT 2775! 10–24 km ENE Mianeh, 1150 m, RECH. 43245! Salt-mine Maman, 9.X.1856, SEIDL.! 20 km E Khvoy, 1120 m, PABOT 5364! Khvoy, SZOV. 537! 20,2 km SE Shapur (Salmas), 1300 m, PABOT 5436! Lake Rezaiyeh (Urmia), AKAI & MOJIB 14854-E! Qushchi, 1500 m, FARBODNIA 3231! 31,5 km N Rezaiyeh (Orumiyeh, Urmia), PABOT 5459! 31,7 km S Rezaiyeh, 1320 m, PABOT 5463! Near Haydarabad, BOBEK 88! Quyun Dagh, 1300 m, ZEHZAD 83/1076! Zanjan: 10 km W Zanjan to Tabriz, 1540 m, PABOT 3683!, 5082! 55,5 km SE Mianeh, 1200 m, PABOT 3397! 51 km NW Zanjan, road to Mianeh, 1320 m, AKHANI & LARI 5727! Kurd.: Mehrabad near Bijar, IRANSHAHR 13118! Ham.: 20 km NW Tafresh to Azzadin between Bazerjan and Dalaqan, 1500–2000 m, AKHANI 5834! Kermansh.: 4 km SE Qasr-e Shirin, road of Shahabad, 470 m, 25.VI.1965, SERAJ in PABOT! Karand (Kirrind) prob. 1851, NOË! Esf.: 27 km SE Ardestan, 67,5 km NW Nain, 1890–1960 m, PABOT 7134! 8 km S Amirabad, 2070 m, KRAMER VO 11363!, VO 11364!, VO 11365! Arak: Arak (Sultanabad), in mountains, 1889, STR.! Khuz.: 43 km SE

Mehran to Dehloran, 400 m, AKHANI 5590! – S: Fars.: Valley before Yazd-e Khvast (Jezdikhast), STAPF 782! Between Abadeh and Esfahan, S of Yazd-e Khvast, 2100 m, ARCHIBALD 2949! Shiraz, Naksh-i Rostam, BARKHOUDARI 30410-E! Persepolis, 11.VII.1885, STAPF!; 1500–1630 m, PABOT 2377!, PABOT 5984!, ZOHARY 1080! Takht-e Jamshed, PABOT 8310! N Shiraz, station Bajgah, 1750 m, PABOT 8303! Kerm.: Qariyat ol-Arab to Shirinak, 2400–2600 m, MOUSSAVI & TEHRANI 40068-E! – E: Khor.: Karat Kuh, 9. VIII.1858, BUNGE! Kashmar, Mozafarabad to Anarbat, 900 m, FOROUGHI 10607! – C: Tehr.: Tehran mountains, PAULSEN 2214! Farajabad, SAB. 569! 10 km W Farajabad, road to Karaj, 1220 m, PABOT 5598! Between Khanabad and Robat Karim, 24.VIII.1882, PICHLER! 60 km SW Tehran to Saveh, Rud Shur, PABOT 2594! 50 km SW Tehran, 950 m, BONVAN 9909! Railway station Rud Shur, 950 m, AELLEN 2804!, 2873!, 3038!, 3151! 19–24 km NNE Saveh, 1350 m, PABOT 7226!, PABOT 7249! Qazv.: Near Karaj, 1330 m, AELLEN 2807!, 2808!, 2809!, 2818!, 3042!, GAUBA 2128!, KOELZ 33431! Karaj, at Kalak, GAUBA 2127! 33 km E Eshtehard to Karaj, 1200 m, AKHANI & LARI 5745! – Not localized: AUCHER 2778! Perse, MICHAUX!

Distr. gen.: Canary Is., S Europe, N Africa, Mediterranean, east to W and western C Persia, northwards to Nakhichevan, southwards to Saudi Arabia.

A very polymorphic species with a pronounced tendency to form local races, as stated already by MAIRE (1962) for N Africa, ZOHARY (1966) for Palestine, and FREITAG (1989) for the E Mediterranean/SW Asia. Particularly subject to variation are the extent and density of tepal indumentum, length and shape of tepals, spike structure, shape and relative length of bracts and bracteoles, dimensions and structure of leaves, and growth form. The latter characters are often influenced by growth conditions (water supply, salinity, grazing effects, temperature regime) and seasonality. Based on such variations, a wealth of "species" were described by BOTSCHANTZEV. The list of synonyms above includes only those described from SW Asia. *S. camphorosma* ILJIN from the Aras valley in Nakhichevan is also regarded as a local race. As differential characters, ILJIN cited the dense, stiff, almost spiny leaves and large, glabrous tepals. Many Persian specimens (like others from Iraq and Syria) have that foliage, but in most of them the tepals are ± hairy. Other individuals and populations agree with E Mediterranean and even Iberian populations. A few specimens from ± saline habitats are densely hairy and superficially resemble *S. arabica* BOTSCH. from E Arabia, most obviously AKHANI 5590 from Ilam. Because all these characters vary independently and without a distinct geographical pattern, a wider concept of *S. vermiculata* is maintained here. It remains difficult enough to separate it from the northern *S. laricina* PALL., which enters into Caucasia and C Anatolia (it might occur also in NW Persia), and from *S. orientalis* which replaces it to the east, with intermediates in the area of overlap. *S. laricina* differs mainly by its extremely short style (1/3 of stigma length or less), the fasciculate leaves about as long as the regular leaves, and the smaller always completely glabrous tepals. For *S. orientalis* see under sp. no. 23.

The species is very palatable and preferred by grazing animals. Due to high grazing pressure, in many areas its cover abundance and natural dissemination are greatly reduced.

23. *S.* ***orientalis*** S.G. GMELIN, Reise Russland 4: 47 (1784).
Syn.: *S. rigida* PALL., Illustr. Pl.: 20 (1803). *S. heliaramiae* MOUTERDE, Nouv. Fl. Liban Syrie 1: 432 (1966). *S. syriaca* BOTSCH., Bot. Zhurn. 60: 505 (1975).
Icon.: GMELIN, l.c. 4: tab. V (1784). PALL., Illustr. Pl.: tab. XII (1803). – Tab. 123.
Type: (Kazakhstan): "Auf den kreidigen Anhöhen bei Manggischlak (Mangyshlak), 27.VII.1773", S.G. GMELIN (icono. S.G. GMELIN, l.c.: tab. V).

Much like *S. vermiculata*, but differing in: habit more stunted, with shorter more rigid annual branches; leaves and bracts much thicker and less rigid, 25–3 x 0,8–2 mm; anthers distinctly exserted on 3–4 mm long filaments; appendages with obtuse or flattened apices, semi-circular to trapezoid; style 0,5–1 mm long; stigmas 0,7–1,0 mm long, 1–2x length of style.

Hab.: Very common on fine- and coarse-textured, usually slightly saline semi-desert soils of slopes and plains; a subordinate or subdominant component of different semi-desert communities, often with *Artemisia Sieberi, Zygophyllum tetrapterum, Salsola tomentosa, Halothamnus auriculus, H. cinereus* and *Ephedra intermedia*; 0–2000(–2800) m. – Fl. VI–IX, fr. IX–X.

P e r s i a : N: Gorg.: Moh. Reza Shah Prot. Reg.: N Robat-e Qareh Bil to Almeh, "dasht", 1200 m, RECH. 52882! – W: Azerb.: Valley of Komur Chai, at Uli, 17.IX.1856, SEIDL.! 22 km NE Tabriz, road to Ahar, 1500 m, MALCOLM 297! 39 km W Marand, road to Khvoy, 1060 m, PABOT 5346! 42–55 km W Marand, road to Evowghli, 1000 m, RECH. 43851! Ham.: Aq Bolagh, 90 km N Hamadan, 2000 m, RIOUX & GOLV. AB 105! Esf.: Kavir Namak between Sefid Ab and Kush Kuh, IRANSHAHR & MOUSSAVI 15389! 88 km SE Shahreza (Qomisheh), between Esfahan and Shiraz, 2150 m, PABOT 2344! – S: Kerm.: Baft, 1900 m, MALEKI 24966! Between Kerman and Pariz, 2100 m, BORNM. 4192! Between Rafsanjan and Zarand, DADASHZADEH in PABOT DK-216! – E: Khor.: Ghare Makher, KALALI 30393-E! Kerat (Karat) Kuh, 9.X.1858, BUNGE! Gurfah, 9.X.1858, BUNGE! "Tudee", 9.X.1858, BUNGE! Tayyebad, RECH. 37596! Turbat (Torbat), Tabat Kuh, BUNGE 53d! 125 km W Bojnurd, 1100 m, ANDERSEN & PETERSEN 317! – C: Tehr.: Hableh Rud valley, 1–2 km above Ban-e Kuh (Bonehkuh, Bun-e Kuh), 1100 m, AELLEN & MANUCH. 2768!, 2788!, 2789!, 2846!, 3099!, 3100!, 3102!, 3130–3135!!, MANUCH. & AELLEN 30201-E! Hableh Rud valley, at Simin Dasht, MANUCH. & AELLEN 30205-E! Between Simin Dasht and Kabutar Darreh, 1150 m, AELLEN & MANUCH. 2779!, 2782!, 2900!, 3071!, 3072!, 3078!, 3084! 88 km E Tehran, near railway-station Kavir, 1000 m, AELLEN 2770!, 2927! Kavir near Varamin, AELLEN & SHAR. 30088-E! SE Varamin to Kavir, 950 m, AMIN & BAZARGAN 18295! Charta Khan near Varamin, BRUNS 207! Hesarak (Hassara) between Qazvin and Tehran, BUHSE 896c! 15 km S Tehran to Qom, 1030 m, UOTILA 19413! Hills near railway-station Rud Shur, 60 km SW Tehran, 950 m, AELLEN 2871!, 2872!, 3039!, 3149!, 3150! Near Parandak, 80 km SW Tehran, 900 m, AELLEN 4357! Kavir Prot. Reg.: Siah Kuh, pass S Eyn or-Rashid, 1150 m, WDB. & FOROUGHI 15216! 120 km SE Tehran, pediment plain N Siah Kuh, 850 m, AELLEN & SHAR. 2821! N Siah Kuh at road to Talheh, 820 m, FREITAG 14011! Siah Kuh, 700–1500 m, IRANSHAHR & MOUSSAVI 30311-E!, FREITAG 14007!, V.1841, BODE! South side of Siah Kuh, 1150 m, WDB. & FOROUGHI 14666! Qazv.: At Mardabad, GAUBA 95! Kashan: Muteh, 150 km NW Esfahan, 1950–2000 m, IRANSHAHR 30304!, RECH. 46862! Between Dudar (? Dudahak, Dow Dehak) and Robat-e Turk, ALEXEENKO 6!, 687! 46 km S Qom, 1350 m, PABOT 5705! Kuh-e Qohrud, S Kashan, VI.1908, STR.! Yazd: 9 km from Anarak to Chupunum, 1650 m, FOROUGHI & ASSADI 15134! 14 km from Anarak to Chupunum, pass, 1400 m, FOROUGHI & ASSADI 15138!, 15144! Damgh.-Semn.: 38 km S Firuzkuh, road of Semnan, 2000 m, AMIN 3022! 15–25 km from Semnan to Firuzkuh, 1400 m, HDG., WDB. & al. 14751! E Elburz, near Chashmeh-i Ali, BUHSE 1106! 8 km W Semnan, 1150m, HDG., WDB. & al. 14724! At Sorkheh, 1600 m, RECH. 2806! From Anjirab to Chah Shirin, Howz Mozaffar, 900–1000 m, TERME & MOUSSAVI 30262-E! Kuhha-ye Anjirab, 1000–1600 m, TERME & MOUSSAVI 30239-E! 31 km W Semnan, Momenabad, 1200–1350 m, TERME & ZARGANI 40079-E! 72 km SW Semnan, 1250 m, ZOHARY & ORSHAN 11653/7! Shahr.-Bust.: 100 km SE Shahrud, 1420 m, REJAMAND & ARAZM 32596! 49 km NE Shahrud to Shah Pasand, 1530 m, PABOT 8134! Kuh-e Chehel Dokhtar, road between Gorgan and Shahrud, ERSHAD 14862-E! 42 km E Shahrud, 1200 m, BRECKLE & BHADRESA 5194!, 5195! Mayamey, SAB. 515!, 541!, 542! Between Mayamey and Shahrud, RECH. 5310! Shahrud, KOELZ

16939! 11 km SW Shahrud, 1250 m, PABOT 8163! 15 km S Zeydar, 1300 m, BRECKLE 5035! 15 km SW Shahrud to Damghan, 1300 m, FOROUGHI 10516!, 10517! From Vardenow to Kalateh, 4 km Menghas, 1750 m, TERME, MOUSSAVI & al. 39360-E!, 39373-E! Turan Prot. Reg.: Qolleh-ye Allehkum, NW Ahmadabad, 1080 m, FREITAG 15297! 6 km NW Ahmadabad to Delbar, 1200 m, FREITAG 15514! 4 km NNE Ahmadabad to Darb Ahang, 1000 m, FREITAG 13899! 7 km W Tuchah, Taghook-pass, 15 km SE Tejur, 1300 m, BRECKLE & BHADRESA 5150! 25 km SSW Tuchah, at road to Kavir, 1000 m, FREITAG 14193! 29 km N Ghazazan to Miandasht, 1200 m, FREITAG 14145! 30 km SE Delbar, 820 m, FREITAG 13924! 16 km SSE Majrad, 750 m, BRECKLE & BHADRESA 5080! 30 km SW Garmab-e Poin, 850 m, BRECKLE & BHADRESA 5169! 12 km NE Razeh, Buzmin Kuh, 1220–1300 m, FREITAG 14975! Shutur Kuh, SE Chah Jam, 1450–1500 m, FREITAG 14745! Shak-e Biar, 1180 m, BRECKLE & BHADRESA 5094! Kavir Khurjan, 2.XII.1942, PETROV! Razveh NE Torud, 21 km ENE road to Jamil, 1320 m, FREITAG 14129! – Not localized: Karagadj, 1200 m, BROWN 768! Persia borealis, BUNGE!

T u r c o m a n i a : Near Babadurmaz, LITW. 343! Ashkhabad, 10.VIII.1900, SINT.! Germab, above Skobelevka, SINT. 1211a!, 1179! Near Chuli, LITW. 530! Between Chuli and Vannovskij, 600 m, 12.XI.1967, REDCHENKO! Distr. Bakharden, 16 km E Bami, 350 m, 16.IX.1976, VASAK! Kizyl Arvat: Kara Kala: at Sundsodagh, SINT. 1909! Kizyl Owa, SINT. 2200a! Nere, SINT. 2199b!

A f g h a n i s t a n : N: Baghlan: Andarab valley, 1100 m, RECH. 31762!, 31784! Surkhab valley, 10 km N Doshi, 840 m, FREITAG 3062! Mazar-i Sharif: 25–50 km NW Tashkurghan to Sar-e Namak, 330 m, BRECKLE 4655!, 4730!, FREITAG 3885! 60 km NW Tashkurghan, 350 m, FREITAG 3884! 60 km NW Balkh, 8 km S Islam Chomhar, 280 m, BRECKLE 4660! – NW: Herat: Hari Rud valley, AITCH. 613! – SW: Farah: 30 km N Chakhansur to Farah, 540 m, FREITAG 3763! 15 km SE Chakhansur, 520 m, FREITAG 3742! – E: Ghorband: 5 km above Siah Gird, near Pul-e Ranyar, 1900 m, FREITAG 3940! Urgun: Near Urgun, VOLK 71/220a! – C: Bamian: 2 km W Bulola, road to Bamian, Darrah Shikari, 2400 m, PODLECH 17037! Bamian, 2500 m, NEUB. 4472! Bamian valley, W of Buddha, 2500 m, VOGT 1028! Der Hadj, 5–8 km W Bamian, 2500–2750 m, BRECKLE 4766!, FREITAG 3956!, PODLECH 19515a!, IX.1968, FOHLEN & YOUNOS! Doab: 38 km S Doab, PABOT A 921! Kamard valley W Doab, 1630 m, GILLI 2160! Khussky pass, GRIFF. 2005! Lorinj, 2400 m, KOELZ 13667! – Not localized: GRIFF. Herb. East Ind. Comp. 4213! GRIFF. Herb. East Ind. Comp. 1803 = Journ. 1139! Gundawar, Mc ARTHUR 109A! Kariz-Mawri, Mc ARTHUR 103A!

Distr. gen.: From the NE shore of the Caspian Sea, NE Azerbaijan and NW Persia east to Kirghistan, westernmost China and Pakistan, outposts in E Syria and the mountains of C Sinai.

The species is heavily browsed by camels, goats and even sheep; this results in a stunted habit of most individual plants and causes the often caudex-like structure of the stem. Older leaves are often pustulate with small white nodules; the perennial branches sometimes have globular galls consisting of brachyblasts with crowded leaves embedded in long white or brown woolly hairs.

S. orientalis is the eastern vicariant of the closely related *S. vermiculata*. In the area of overlap hybridization occurs and several specimens combine characters of both species. Examples are AKHANI 5745 from Eshtehard near Karaj with habit and leaves of *S. vermiculata*, but stigmas and style of *S. orientalis*, and RECH. 46862 from Muteh with inverse combinations.

Infraspecific variation follows along the same lines as *S. vermiculata*, most obviously in indumentum. Individuals with glabrous leaves and axes (not seen in *S. vermiculata* from the area, but known from further west) described as var. *glabra* BOTSCH. from Turcomania, are rare (e.g. KOELZ 16939; TERME & MOUSSAVI 30239-E). Subglabrous forms with at least some long hairs on the axes occur here and there, (e.g. WDB. 1556, FREITAG 14975). On the other hand, a few individuals or even populations have a much denser and persistent hair cover giving a white colour to the bushes, but here also all intermediates occur. Highly variable are length of leaves, bracts and internodes, but this is mainly due to growth conditions, in particular to the water supply.

24. *S. ericoides* M.B., Mém. Soc. Imp. Nat. Mosc. 1: 141 (1806).
Syn.: *S. caesia* FISCH. & C.A. MEY., Mém. Soc. Imp. Nat. Mosc. 11: 357 (1838).
Icon.: GROSSH., Fl. Kavk. 3: tab. 15, fig. 6 (1945); KARJAGIN, Fl. Azerb. 3: tab. 20. fig. 2 (1952); TAKHT., Fl. Armen. 2: tab. 111 (1956). – Tab. 124.
Type: "In salsis deserti Cumani, tum in campis aridis and Cyram fluvium versus mare Caspicum", syntype LE!; isotypes B-WILLD.!, BM!

Dwarf or small shrub, 15–60 x 20–80 cm, erect or prostrate, glaucous green, often turning dark when dry; glabrous except for a fugacious indumentum of short spinulose and branched hairs on young axes and leaves. Stem up to 30 cm high, at base 2 cm thick, branched, sometimes reduced to a caudex, tuberculate with groups of 1–1,5 mm wide semi-globular gemmae of densely packed scale-like leaves. Annual shoots 15–40 cm high, richly branched from base. Leaves 12–3 x 0,5–1 mm, ericoid, semiterete, linear. Bracts leaf-like, only the uppermost shorter than bracteoles, linear to triangular, 5–1,5 mm long, at base 1–2 mm wide. Bracteoles cucullate, circular or transversely ovate in outline, 2–1,5 mm long, shorter than perianth. Tepals broad ovate or trullate, 1,2–1,8 mm long, the outer 1,2–1,8 mm wide, 1-veined, transverse line at 1/3–2/5, green blotch distinct, basally and apically ciliate by spinulose hairs. Anthers with appendage 0,8–1,3 mm long, divided for 1/2–3/5, appendage rectangular to trapezoid, 0,1–0,15 x 0,25–0,3; filaments narrow triangular, 1,5–2 mm long; disc absent. Ovary globular to ovoid; style 0,2–0,4 mm long; stigmas 0,5–1 mm long, with long papillae. Fruiting perianth 5–10 mm diam., pale or brownish, upper parts of tepals slightly indurated, forming a rounded cone; seed semi-globular to disc-shaped, 1,5–1,8 mm diam.

Hab.: Saline, clayey semi-desert soils, often dominant in plains and on undulating slopes, forming a distinct community, together with *S. verrucosa* and *Halothamnus glaucus* (observed in adajcent parts of formerly Russian Azerbaijan); up to 800(–1300) m. – Fl. VIII–X, fr. IX–XI.

P e r s i a : N: Gilan: Rasht to Pachenar, HAUSSKN. 186! – W: Azerb. (East): 56 km NE Tabriz, 1500 m, PABOT 5253! Dasht-e Moghan, 50–500 m, PABOT 5610!, SCHMID 6559! Between Ali Rezaabad and Borah, 50 m, PABOT 5604! Azerb. (West): Between Khvoy and Shahpur (Salmas), 1700 m, AELLEN & BEHB. 3026–3029!! Between Shahpur and Rezaiyeh (Orumiyeh), Kuh-e Aq Kan Dagh (Akhteh-Khaneh), 1300–1600 m, TERME 14810-E! Below (?)Skys Qala, W-bank of Rezaiyeh (Orumiyeh, Urmia)-lake, 11.X.1856, SEIDL.! Khamseh.: 42 km SE Mianeh to Zanjan, 1260 m, DANIN & PLITMANN 65–947! Ham.: Tafresh, Kuh-e Noghre-Kamar, ABAI & MODJIB 30378-E! – C: Tehr.: Railway station Kavir, 1000 m, AELLEN 2924!

Distr. gen.: Restricted to NE Anatolia, Transcaucasia and NW Persia.

Herbarium specimens of *S. ericoides* and *S. dendroides* have often been confused, even in MARSCHALL BIEBERSTEIN's own collections in LE. The annual parts look much alike, but the almost glabrous, glaucous or blackish leaves and the spinulose or branched hairs, to be found only on young stems, are highly characteristic for the first species. Hair type and growth form suggest closer relations to *S. vermiculata* and *S. orientalis*. Complete plants are very distinct by the knotty surface of their woody stems. With the nodule-like gemmae they resemble *S. verrucosa*, but the leaves are much longer and more spreading as in that species.

25. *S.* ***cyclophylla*** BAKER, Bull. Misc. Inform. (Kew Bull.) 1894: 340 (1894).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 251 (1966), sub *S. tetragona*; COLLENETTE, Ill. Guide Flow. Saudi Arabia: 126 (1985), (sub *S.* sp. 2840); CORNES, Flow. Pl. Bahrain 39, fig. 19b,c (sub *S. baryosma*), fig. 23a, b (1989); MANDAVILLE, Fl. East. Saudi Arabia: fig. 40 (1990). – Tab. 125.
Type: (S Yemen): Shari Burrock Valley, Mokalla, 200–300', 21.XII.1893, LUNT 53, lectotype K!; isotypes BM!, P!; cf. BOTSCHANTZEV 1975.

Dwarf shrub or small shrub, 20–60 x 30–60 cm; white with spreading (axes) and adpressed (outer side of leaves, bracts, bracteoles) 0,3–0,6 mm long smooth, thick-walled, flat hairs. Stem intricately branched from the to 2 cm thick base, nodulated; branches ascending to spreading, stiff, around the leaf bases with rings of persisting long hairs, becoming ± spinescent, developing from gemma-like buds; last order branches forming condensed, often regularly arranged 5–15 mm long spikes. Leaves scale-like, broadly triangular, obtuse, 1,6–1,0 mm long and wide, at base dorsally much thickened, upper surface concave, glabrous; leaf axils on long shoots with silvery, angled, globular gemmae. Bracts and bracteoles subequal, similar to the leaves but only c. 1 mm long and wider than long. Tepals ovate, 1,4–1,6 mm long, the outer 1–1,2 mm wide, 1-veined, transverse line at 1/3, green blotch covered by the densely adpressed indumentum. Anthers 0,7–0,9 mm long including the 0,15–0,2 mm long obtuse appendage, divided for c. 2/3; filaments linear, 1,2–1,5 mm long, inserted on outer base of disc; disc cup-like, thickened, glabrous, the margin undulate or lobed. Ovary globular; style 0,4–0,6 mm long; stigmas 2, 0,4–0,6 mm long, flat, inside shortly papillose. Fruiting perianth 4–5,5 mm diam., the wings pale, fresh often pinkish, entire or crenulate; upper parts of tepals stiff, straight, forming a cone. Seed semi-globular, flattened above, 1 mm diam.

Hab.: Gypsiferous sandy, loamy and rocky soils in the most severe hot deserts, in washes, on higher playa margins and on eroded slopes, often together with *Anabasis setifera*, *Halothamnus iranicus*, *Gymnocarpos decander*, *Stipagrostis plumosa* etc.; 3–500(–1000) m. – Fl. X–XI, fr. XI–XII.

P e r s i a : S: Lar.: Gohreh-pass, 700 m, RECH. 3439! E Bandar-e Khamir, 50 m, FREY & KRAMER VO 11336! 14 km NE Bandar Abbas, 30 m, PABOT 6600! Biaban: Between Gattan (Katan) and Bunji, BEHB. 884-E! Bunji, BEHB. 879-E!, SAB. 562! Bal.: Dasht-e Lut, 59°52'E, 30°28'N, LÉONARD 6107! – E: Sistan: Between Zahedan and Bam, 24 km E Nosratabad, 1220 m, 2. XI. 1975, TERME & MOUSSAVI! Between Kuh-e Malek Siah and Zabol, 700 m, RECH. 4102-c! Khor.: E Dasht-e Lut, N high dunes, 59°32'E, 30°57'N, 1100 m, LÉONARD 6219!
P a k i s t a n : Kalat: 10 km from Wadh, road to Khuzdar, GHAFOOR & OMER 2235! 80 km from Awaran on road to Hoshab, MALIK & NAZIMUDDIN 1101! 12 km S Khuzdar, road to Bela, 1250 m, FREITAG & KÖTHE 18937! – Bela: 30–50 km W Bela, 200 m, RECH., 27624! LAMOND 318! Road Bela-Awaran, 35 km W Lak pass, 355 m, FREITAG & KOTHE 18269! 27 km W Lak pass, FREITAG & KOTHE 18259!, GHAFOOR & OMER 1703! Kharan: 10 km W

Palantak, road to Qila Ladgasht, 700 m, FREITAG & KOTHE 18685a! – Makran: Between Siahan Rge. and Koh-e Sabz, 47 km NW Panjgur, 950 m, FREITAG & KOTHE 18682! Near Panjgur, 900 m, POPOV 146! New road to Hoshab, 20 km WSW Panjgur, 970 m, FREITAG & KOTHE 18623!, GHAFOOR & OMER 1896! 60 km SSW Panjgur, 1000 m, FREITAG & KOTHE 18596! 93 km S Panjgur, 850 m, FREITAG & KOTHE 18588! 20 km from Parom to Panjgur, GHAFOOR & OMER 1925! 140 km from Buleda to Panjgur, GHAFOOR & OMER 1876! 8 km S Hoshab at track to Pasni, 520 m, FREITAG & KOTHE 18344!, GHAFOOR & OMER 1768A! 48 km N Suntsar to Mand, 120 m, FREITAG & KOTHE 18568! 28 km SE Turbat to Pasni, 350 m, FREITAG & KOTHE 18392! – Makran Coastal Plain: 6km WNW Pasni, 20 m, FREITAG & KOTHE 18493!, GHAFOOR & OMER 1787! 6 km N Pasni to Turbat, 20 m, FREITAG & KOTHE 18420! 80–100 km S Turbat towards Pasni, RECH. 27850! 95 km E Pasni, near Makola, 25 m, FREITAG & KOTHE 18435!, GHAFOOR & OMER 1838A! 117 km E Pasni, 20 km E Makola, 20 m, FREITAG & KOTHE 18436! GHAFOOR & OMER 1754 (var. *glabrescens*)! 43 km W Ormara, 80 m, FREITAG & KOTHE 18443! 20 km NW Ormara, 20 m, FREITAG & KOTHE 18477!, 18478! Randuk, XI.1880, PIERCE!

Distr. gen.: Egypt to S Pakistan, throughout the Arabian Peninsula.

The species looks much like and sometimes grows with *S. imbricata*. The most important diagnostic characters are: branches more rigid, often pungent; appearance whitish, from the dense indumentum on leaves, bracts, bracteoles and tepals; hairs smooth; disc very conspicuous.

Because of the large disc, linear filaments and hair type, *S. cyclophylla* stands apart all other species dealt with here, except *S. abarghuensis*. BOTSCHANTZEV placed it in subsect. *Caroxylon*.

26. ***S. abarghuensis*** ASSADI, Iranian Journ. Bot. 2: 136 (1984).
Icon.: ASSADI, l.c.: 137, fig. 4 (1984).
Type: Iran, Yazd prov., 30 km S of Deshir, Kavir Abarghou, on soft solonchak soil, 1500 m, 16.X.1981, M. ASSADI & ABOUHAMZEH 36481, holotype TARI!

Lit.: V.P. BOTSCHANTZEV, Irania, a new section of the genus Salsola (Chenopodiaceae), Botaničeskii Zhurnal 71: 1400–1401 (1986); in Russian.

Shrub, 1–1,5(–2) × 1 m; in young stage densely villous with curled, 0,5–1,5 mm long smooth hairs, soon glabrescent. Stem up to 8 cm thick, loosely branched from base; branches ascending. Annual shoots long, leafy, in uppermost part with numerous short, spreading lateral branches forming a dense paniculate inflorescence. Leaves ascending to spreading, straight, the longest sometimes pendant, semi-terete or almost terete, obtuse, the lower 30–15 × 1,5–2,5 cm, arising from a hardening, persistent base, the upper shorter, slightly gibbous at base; leaf axils with dense tufts of 0,5–0,7 mm long curled hairs, usually with 1 or 2 shorter axillary leaves. Bracts cucullate, broad ovate or obovate in outline, 1,5 mm long and wide, apiculate, in lower half with hyaline margin, glabrous, almost as long as bracteoles and tepals. Bracteoles similar to bracts, transversely ovate, 1,5 × 2–1,7 mm, except for the apex with wide hyaline margins. Tepals ovate, 1,5–1,7 mm long, the outer 0,8–1 mm wide, all 1-veined, green blotch triangular, glabrous except flexuose hairs along lower margins. Anthers c. 1 mm long, divided up to the minute, obtusely triangular, 0,10–0,15 mm long appendage; filaments linear, c. 1 mm long, inserted at outer base of disc; disc thin, with 0,3–0,4 mm long semi-circular interstaminal lobes. Ovary globular; style 0,3 mm long; stigmas 2, 0,4 mm long, inside shortly papillose. Fruiting perianth 5–6 mm diam., wings obovate, not overlapping, straw-coloured, upper part of tepals stiff, forming a semi-globular dome. Seed c. 1,5 mm diam..

Hab.: Very rare on permanently moist, saline soils covered by a harsh salty crust, around springs, in *Tamarix hispida*-community with *Seidlitzia rosmarinus, Alhagi maurorum, Phragmites australis, Juncus rigidus, Suaeda arcuata, S. microphylla* etc.; 1200–1500 m. Fl. IX, fr. X.

P e r s i a : C: Shahr.-Bust.: Turan Prot. Reg., 4 km E Razveh, Chah Palang gorge, 2200 m, FREITAG 14122! AKHANI 4153! Yazd: 30 km S Deshir, Kavir Abarghou, on soft solonchák soil, 1500 m, ASSADI & ABOUHAMZEH 36481!

Distr. gen.: Endemic; restricted to C Persia.

To date, this enigmatic species is only known from 2 localities. ASSADI (1984) placed it in sect. *Anchophyllum* (= sect. *Arbuscula*) and compared it with *S. arbuscula* and *S. arbusculiformis*. BOTSCHANTZEV (1986) put it into his new section *Irania* and discussed its relations to sections *Coccosalsola* and *Belanthera*. In fact, the species provides a unique mix of characters of sections *Caroxylon* and *Coccosalsola*. The prominent tufts of axillary hairs and the large size and insertion of the lower leaves point to the latter, but most characters to the former section, e.g. insertion of upper leaves and bracts, indumentum on young stems and leaves, inflorescence structure (similar to *S. imbricata* and *S. cyclophylla*), shape of bracts and bracteoles, structure of fruiting perianth. The plants look much like inter-sectional hybrids, and their rarity might support this interpretation but, as no putative parents occur nearby, species rank is maintained here.

Sect. V. ***Malpighipila*** BOTSCH., Bot. Zhurn. 54: 990 (1969), the original citation by error is "*Malpigipila*".

Lit.; V. P. BOTSCHANTZEV, Malpigipila BOTSCH. – generis Salsola L. sectio nova. Novitates Systematicae Plantarum Vascularium, Leningrad (Novosti Sistematiki Vysšikh Rastenii) 6: 45–52 (1969); in Russian.

Dwarf shrubs or small shrubs, whitish or greyish with a dense indumentum of adpressed, smooth, thick- or thin-walled, 2–3-armed ("Malpighian") hairs beside smooth unbranched hairs. Stems with pale cortex. Leaves alternate, spiral, rarely distichous, subulate or scale-like, at base distinctly gibbous beneath. Bracts and bracteoles scale-like, the latter wider than long, keeled. Flowers solitary. Tepal backs with 1 or 2 green blotches. Anthers divided close to appendage; appendage 1/5–1/3 of anther body, triangular to oblong, connate with connective and thecae, flat; filaments linear, inserted on outer side of disc; disc cup-shaped, thick, with undulate margin. Ovary subglobular; style long, thin. Stigmas flat, inside very shortly papillose. Fruiting perianth above the wings stiff, dome- or cone-shaped, usually with persistent indumentum. Seeds horizontal. – Type of sect.: *S. gemmascens* PALL.

Seven geographically rather isolated species (BOTSCH. cited 4 sp.), from NW Africa to Mongolia, southward to the S part of Red Sea; 4 species in our area. They are highly specialized xerohalophytes. The species are very close to sect. *Caroxylon* subsect. *Caroxylon*, differing mainly by the branched hairs, longer anther appendages, sometimes by a more complex pattern of the green tepal blotch, and usually by a larger disc.

1a. Leaves and bracts ± distichous, branches without globular buds . . . . 30. *S. persica* BUNGE ex BOISS.
b. Leaves and bracts spiral; at least the base of current-year shoots with globular buds 2
2a. Plant 30–70 cm high, shoots in upper part with very numerous ascending branches which become subspinescent; tepal back with one distinct green blotch . . . . 29. *S. yazdiana* ASSADI
b. Plants smaller, with less regular branching, branches not spinescent; at least outer tepals with two distinct green blotches 3
3a. Plant 10–25 cm high; annual shoots at base 0,5–0,7 mm thick; gemma-like buds only on current-year shoots, 1,5–2 mm in diam., with even surface . . . . 27. *S. verrucosa* M.B.
b. Plant 20–40 cm high; annual shoots at base 1–1,5 mm thick; gemma-like buds also on woody branches, and there 3–4 mm in diam., with angular surface . . . . 28. *S. gemmascens* PALL.

27. ***S. verrucosa*** M.B., Mém. Soc. Imp. Nat. Mosc. 1: 141 (1806).
Syn.: *Caroxylon nodulosum* MOQ. in DC., Prodr. 13,2: 177 (1849). *Salsola nodulosa* (MOQ.) ILJIN, Trudy Glavn. Bot. Sada 43: 220 (1930); *S. gemmascens* PALL. subsp. *nodulosa* (MOQ.) BOTSCH., Nov. Syst. Pl. Vasc. 6: 50 (1970); non *S. verrucosa* sensu MOQ. et auct.
Icon.: KOMAR., Fl. URSS 6: tab. 13, fig. 4 (1936) GROSSH., Fl. Kavk. 3: tab. 15, fig. 7 (1945); KARJAGIN, Fl. Azerb. 3: tab. 22, fig. 1 (1952); TAKHT., Fl. Armen. 2: fig. 112 (1956). – Tab. 126.
Type: (Azerbaijan): "Frequentissime in planitiebus Caspio-Caucasicis"; syntype LE!, isosyntype B-WILLD.!, lectotype not yet selected.

Dwarf shrub, 10–30 × 5–20 cm; when young, grey with thin-walled, adpressed, 2-armed hairs, later glabrescent. Stem up to 6 mm thick, divaricately branched from base, nodulated, usually without buds. Annual shoots numerous, erect, at base 0,5–0,7 mm thick, in upper part with numerous short ascending branchlets forming a narrow conical inflorescence, in lower part densely beset with small subglobular buds. Leaves at primary shoots shortly subulate, 2,5–1 mm long, semi-terete; axillary buds 1–2,5 mm in diameter, consisting of minute, densely packed, almost circular leaves, white with densely adpressed hairs. Bracts leaf-like, 1,5–1 mm long, ovate to triangular, the lowermost as long as bracteoles, the others much shorter. Bracteoles scale-like, cucullate, circular, transversely ovate or obovate, 2–1,7 × 2,5–2,0 mm, keeled, shorter than tepals. Tepals narrow to broad ovate, with the upper part more or less ligulate, 2–3 mm long, the outer 1,5–2 mm wide and

3(–4)-veined, the others 1-veined, transverse line at 1/5–1/3, green blotch at least on the outer tepals deeply divided, the back densely hairy. Anthers with appendage 1,5–2 mm long, divided up to the appendage; appendage c. 0,3–0,5 mm long, lanceolate, with obtuse apex, often slightly separated from thecae; disc glabrous, with undulate margin. Style 0,4–0,8 mm long; stigmas 2, 0,7–1 mm long. Fruiting perianth 5–7 mm diam., upper part of tepals forming a cone with ± concave flanks, glabrescent in upper 1/3–1/2. Seed 1,8–2,3 mm diam.

Hab.: Very common and forming a community of its own on fine-textured dry saline or subsaline soils, preferably on gypsum, marl, and at the edge of salt-marshes; 300–1500(–1600) m. – Fl. VI–IX, fr. IX–XI.

P e r s i a : N: Gilan: Between Lowshan and Manjil, 360 m, WDB. & SHIRDELPUR 14851! Between Manjil and Rudbar, 150–200 m, XI.1868, HAUSSKN.! – W: Azerb.: Road of Zanjan to Mianeh, 1000 m, SAB. 2749! 19 km E Mianeh to Ardabil, 1000 m, PABOT 2762!, 3863! Left bank of Qezel Owzan (Kizil Uzun), 10–24 km ENE Mianeh, 1150 m, RECH. 43249! Plain between Sarab and Kuh-e Boz-Qush, 20.VIII.1856, CLAUS! 60 km NE Tabriz, road to Ahar, 1500 m, PABOT 5201! 20 km NE Tabriz, 1540 m, DANIN & PLITMANN 65–1284! 42–55 km W Marand to Evowghli, 1000 m, RECH. 43854! 15,6 km S Khvoy, 1180 m, PABOT 5416! 32,4 km E Maku, 940 m, PABOT 5390! Near Maku, 910 m, BROWN 3351! – Persia borealis, coll.. ign.!

Distr. gen.: Restricted to an area from Armenia and easternmost Anatolia to the SW Caspian lowlands and NW Persia.

The name *S. verrucosa* M.B. is re-instated here, instead of the later *S. nodulosa* (MOQ.) ILJIN which is used in most later Russian ("Soviet") Floras. MOQUIN (1849) applied MARSCHALL BIEBERSTEIN's name to specimens which belong to *S. dendroides* PALL. and changed the description accordingly. Indeed, most specimens of MARSCHALL BIEBERSTEIN's herbarium in LE named *S. verrucosa* by himself belong either to *S. dendroides* or to *S. ericoides*. But in his description he left no doubt about the identity of *S. verrucosa* in quoting "planta appareat penitus aphylla, totaque obtecta globulis confertis". BOTSCHANZEV (1970) reduced the taxon to a subsp. of *S. gemmascens* PALL., but a whole set of characters separates both and justifies specific rank for *S. verrucosa*: the much smaller size of the plant, thinner annual shoots, different structure and distribution of buds, smaller appendages and narrower stigmas.

The species is browsed by goats during winter. In earlier times it served as an important source for the production of soda.

28. ***S. gemmascens*** PALL., Illustr. Pl.: 24 (1803).
Icon.: PALL., l.c.: tab. 16 (1803). NIKITIN & GEL'DIKHANOV, Opred. Rast. Turkmen.: tab. 37, fig. 2 (1988). – Fig. 5-H; Tab. 127.
Type; (Kazakhstan): "In Turcomanico littore mari Caspii", S.G. GMELIN, holotype BM?, n.v.

Dwarf shrub, 20–40 cm high and wide; when young whitish with loosely adpressed thin-walled, 2-armed hairs, later glabrescent. Stem up to 1,5 cm thick, divaricately branched from base, like the woody branches with numerous globular buds of 3–4 mm in diam. Annual shoots erect to ascending, at base 1–1,5 mm thick, rigid, in upper part with ascending branches forming a conical inflorescence, in lower part with small oval axillary buds or condensed cylindrical branchlets 2–2,5 mm wide. Leaves of primary shoots shortly subulate, 4–2 mm long; leaves of lateral shoots densely imbricate, triangular, 2–1,5 mm long, with smaller buds in their axils. Bracts leaf-like, ovate to triangular, 2,5–1,2 mm long, the lowermost as long as bracteoles, the others much shorter. Bracteoles scale-like, cucullate, circular, transversely ovate or obovate, 2,2–1,7 × 2,5–1,7 mm, keeled, shorter than tepals. Tepals narrow to broad ovate, 2,5–3,2 mm long, the outer 1,6–2 mm wide, 3(–4)-veined, the others 1(2)-veined, transverse line at 1/4–1/3, green blotch at least in some tepals deeply divided. Anthers with appendage 1,5–2 mm long, divided up to the appendage; appendage 0,5–0,7 mm long, ovate-ligulate, with broad obtuse apex, slightly separated from thecae; disc smooth, with undulate margin. Ovary subglobular; style 0,4–0,7 mm long; stigmas 2, 0,5–0,8 mm long. Fruiting perianth 6–9 mm diam., straw- or smoke-coloured, upper part of tepals stiff, forming a cone. Seed 1,8–2,5 mm diam.

Hab.: Scattered but locally common on saline sandy and clayey soils, preferably on takyr plains and on solonchak covered by a thin sand layer; subdominant in halophytic communities, often together with *Tamarix ramosissima* and *Seidlitzia rosmarinus*; 250–350 m. – Fl. VII–IX, fr. IX–XI.

P e r s i a : E: Khor.: Between Qayen and Birjand, 1.VII.1942, SHERBJANOVSKIJ!
T u r c o m a n i a : Ashkhabad, VIII.1900, SINT.!
A f g h a n i s t a n : N: Mazar-i Sharif: 50 km NW Tashkurghan at road to Sar-e Namak, 330 m, FREITAG 3887A! Sar-e Namak, near Naisabad, 330 m, BRECKLE 4727! 25 km NW Tashkurghan, 10 km S Sar-e Namak, 330 m, BRECKLE 4648! 8 km N of road Mazar-e Sharif to Tashkurghan, at road to Termez, 320 m, PODLECH 32697!

Distr. gen.: Caspian lowlands to the Pamir Alaj, southwards to N Afghanistan.

29. *S. yazdiana* ASSADI, Iranian Journ. Bot. 2, 2: 140 (1984).
Syn.: *S. gemmascens* PALL. subsp. *kermanica* BOTSCH., Nov. Syst. Pl. Vasc. 6: 50 (1970).
Icon.: ASSADI, l.c.: 141, fig. 7. – Fig. 3-E, 6-E; Tab. 128.
Type: Iran, Yazd prov.: 61 km from Kerman junction on the road to Bafgh (Bafq), 1000 m, 13.X.1981, M. ASSADI & ABOUHAMZEH 36410, holotype TARI, n.v.

Small shrub, 30–70(–100) cm high, whitish with adpressed, thin-walled, 2(–3)-armed hairs. Stem up to 2 cm thick, from base with numerous ascending branches, lateral branches becoming spinescent, younger woody branches with subglobular buds 3–4 mm diam. Annual shoots at base 1–2 mm thick, rigid, in upper part evenly very richly branched, in lower part with small angular subglobular buds. Leaves 5–3 mm long, triangular, flat. Bracts leaf-like, 3–1,5 mm long, the lowermost as long as bracteoles, the others much shorter. Bracteoles scale-like, transversely ovate to obovate, 3–2 × 3,5–3 mm, keeled, shorter than tepals. Tepals narrow to broadly ovate, 3–4 mm long, the outer 2,2–2,7 mm broad, 3–4-veined, the others 1(2)-veined, transverse line at 1/4–1/3, green blotch undivided, hairy also in lower part with scattered 2-armed and simple retrorse hairs. Anthers with appendage 2,5–3 mm long, divided up to the appendage; appendage 0,5–0,7 mm long, flat, triangular, with obtuse apex, not separated from thecae; disc cup-shaped, with undulate margin, glabrous. Style 1–1,5 mm long; stigmas 2, 1–1,4 mm long. Fruiting perianth 7–9 mm diam., straw-coloured, upper part of tepals stiff, forming a cone. Seed 1,8–2,5 mm diam., horizontal.

Hab.: Semi-desert plains, no precise informations; 700–1500(–1700) m. Fl. VII–X, fr. X–XI.

Persia: E: Baluch.: Ladis mountains, 100 km W Zahedan (Duzdab), PREDTECHENSKIJ 143! – C: Yazd: Between Jandaq and Khvor at Farrokhi, 700 m, TERME & MOUSSAVI 30285-E! 15 km W Chah Malek at road to Chupunum, 800–900 m, RECH. 51875!, IRANSHAHR 40277-E! 14 km ENE Chupunum, 850 m, IRANSHAHR 40156-E!, Chupunum, 950 m, FOROUGHI & BAZARGAN 33164!, SAB. 514! Anarak, SAB. 40215-E! 30 km Robar-e Posht-e Badam road of Yazd, 1000 m, FOROUGHI & BAZARGAN 32427! Gerdeh Kuh (between Anar and Yazd), V.1859, BUNGE! 105 km SE Yazd, 1700 m, ZOHARY & ORSHAN 6316/1! 44 km NW Anar, 1530 m, PABOT 6998! Lut: Rizab, GABRIEL 260! – "Saghand Kavir near Chader Maheu", XI.1979, KHANI!

Distr. gen.: Restricted to SW central Persia.

As differential characters separating his *S. gemmascens* subsp. *kermanica* from *S. gemmascens* s.str., BOTSCHANZEV (1970) cited only the more extended tepal indumentum and the lanceolate anther appendages. ASSADI (1984) stressed the much taller size, the different branching system and the longer anthers. Another character which supports the specific rank is the much longer style in combination with shorter stigmas.

30. ***S. persica*** BUNGE ex BOISS., Fl. Or. 4: 964 (1879).
Icon.: Tab. 129.
Type: (Persia, Azerbaijan): Salzwerk Uli, 18.IX.1856, N. VON SEIDLITZ, holotype G!; isotype G-PAE!, P (3x)!

Dwarf shrublet, 5–15 cm high and wide; when young, grey with adpressed, thick-walled, 2-armed (occasionally the arms themselves 2–3-fid), sometimes brownish hairs. Stem up to 5 mm thick, densely branched at base or loosely branched from base. Annual shoots numerous, erect, at base 0,75–1,2 mm thick, flexuose, unbranched, in lower part with highly condensed lateral shoots or a few rosulate leaves in the leaf axils, in upper part forming loose, 2–5 cm long, few-flowered spikes. Leaves ± distichous, highly succulent, semi-amplexicaul, ascending, 10–5 × 2–1,5 mm, semi-terete; axillary leaves shorter, with persistent indumentum, at the condensed lateral shoots distichous and spreading. Bracts leaf-like, 5–2,5 mm long, almost as long as bracteoles, only the uppermost shorter. Bracteoles obtusely triangular, 4–3 × 5–4 mm, keeled, as long as tepals. Tepals broad ovate to triangular, 3–4 mm long, the outer 2,5–3 mm wide and 3–4-veined, the others 1–2-veined, transverse line at 1/5–1/4, green blotch on all tepals partly or completely divided, the back with densely adpressed hairs. Anthers with appendages 2,3–3 mm long, divided up to the appendage; appendage 0,6–0,7 mm long, triangular, with obtuse apex, not distinctly separated from thecae; disc cup-shaped, with undulate margin, glabrous. Style 0,5–1 mm long; stigmas 2, 0,7–1 mm long. Fruiting perianth 6–8 mm diam., wings not or only partly overlapping, the 2 inner much narrower, smoke-coloured, upper part of tepals forming a semi-globular dome, ± glabrescent. Seed 2,2–2,7 mm diam.

Hab.: Dry saline clayey soils, also on gypsiferous marls; 1400–1500 m. – Fl. VII–X, fr. IX–XI.

Persia: W: Azerb.: Talkheh Rud valley (Atchi Chay) 30–42 km NE Tabriz to Ahar, 1420–1500 m, PABOT 3306!, 5264!, 5302!, RECH. 14834! – Persia borealis, SEIDLITZ!

Distr. gen.: Restricted to Persian Azerbaijan.

A distinct species with a very small range and highly specialized ecologically. Because of the absence of gemmae, the thick-walled, sometimes 3–4-fid hairs, and the distichous leaves, it stands somewhat apart from the 3 other species in the section. Superficially it is similar to *S. rubescens*.

Sect. VI. ***Cardiandra*** AELLEN, Not. Roy. Bot. Gard. Edinb. 28: 32 (1968)

Syn.: *Salsola* sect *Aleurantha* ILJIN, Fl. URSS. 6: 256 (1936), descr. ross.

Lit.: V.P. BOTSCHANTZEV, Specierum clavis diagnostica sectionis Aleurantha ILJIN generis Salsola L., Botaničeskie Materialy Gerbarija Instituta Botaniki Akademii Nauk Uzbekskoj SSR 18: 5–7 (1967); ibid., Conspectus specierum sectionis Cardiandra AELLEN roda Salsola L., Novitates Systematicae Plantarum Vascularium, Leningrad [Novosti Sistematiki Vysšikh Rastenii 6: 53–63 (1969)]; all in Russian.

Annuals, in upper part grey or whitish with a farinose ("mealy") indumentum of bladder-like hairs, in lower parts also with long, thin or stiff, smooth or rough, deciduous hairs. Axes without chlorenchyma. Leaves and bracts alternate, obtuse, semiterete, succulent, gibbous at base. Bracteoles succulent, usually short, trullate or caudate. Flowers solitary. Tepals 1-veined, with 1 or 2 green blotches. Anthers cordate to narrow triangular, divided for 3/5 to close to the appendage; appendage 1/4–1/2 length of thecae, connate with connective and thecae, flat; filaments arising from outer side of disc. Seed horizontal. – Type of sect.: *S. inermis* FORSSK.

Seven species; except *S. stenoptera* WAGENITZ (C Anatolia) all occur in our area.

1a. Tepals with 2 parallel green blotches; bracts and bracteoles forming a c. 4 mm wide cupule . . . . 32. *S. jordanicola* EIG
b. Tepals with 1 green blotch; cupule much smaller 2
2a. Tepals 1,3–1,6 mm long; anthers 0,4–0,5 mm long; filaments not elongating after anthesis; style absent . . . . 31. *S. inermis* FORSSK.
b. Tepals longer; anthers at least 1 mm long; filaments elongating after anthesis; style present 3
3a. Plant procumbent; branches rigid; divaricate; tepals 1,6–1,7 mm long; fruit 4–6 mm wide . . . . 33. *S. chorassanica* BOTSCH.
b. Plant ± erect; branches slender, ascending; tepals more than 2 mm long; fruit larger 4

4a. Tepals near the margins with stiff hairs; anther appendages 0,8 mm long; stigma much widened towards the dentate apex . . . . . . 36. *S. forcipitata* ILJIN
b. Tepals near the margins with delicate, flexuose hairs; anther appendages 0,2–0,3 mm long, stigma linear, with rounded apex 5
5a. Anthers 1–1,2 mm long; fruit with fully overlapping wings, or ± star-like with narrower wings, then wings widest in lower half, usually all tepals distinctly keeled; long hairs smooth . . . . 34. *S. turkestanica* LITW.
b. Anthers 1,3–1,8 mm long; wings overlapping only in upper part, in lowermost part narrow, with parallel margins, eventually the inner tepals keeled; long hairs denticulate at least in upper cells . . . . 35. *S. sclerantha* C.A. MEY.

Key for non-flowering plants

1a. Long hairs delicate, interwoven, forming an arachnoid indumentum 2
b. Long hairs stiff, straight 3
2a. Long hairs smooth; leaves ascending or spreading, subulate or needle-like . . . . 34. *S. turkestanica* LITW.
b. Long hairs denticulate, at least in upper cells; leaves evenly recurved, semiterete to almost flat . . . . 35. *S. sclerantha* C.A. MEY.
3a. Long hairs reddish brown . . . . 36. *S. forcipitata* ILJIN
b. Long hairs white 4
4a. Long hairs rough from rounded warts . . . . 33. *S. chorassanica* BOTSCH.
b. Long hairs smooth 5
5a. Lower leaves up to 5(–8) mm long . . . . 31. *S. inermis* FORSSK.
b. Lower leaves up to 10(–15) mm long . . . . 32. *S. jordanicola* EIG

31. ***S. inermis*** FORSSK., Fl. Aegypt.-Arab. 57 (1775).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 242 (1966). – Fig. 3-C; Tab. 130.
Type: (Egypt) Al.(exandria) 8, ad port.(um), P. FORSSKÅL 163, lectotypus C!; conf. FREITAG, Flora 183: 160 (1989).

Annual, 5–25 × 10–30 cm, erect or prostrate. Stem at base densely and regularly branched, lower branches ascending or prostrate, often longer than stem. Long hairs in lower part stiff, up to 3 mm long, smooth, giving young plants a silky white colour, adult plants greyish to whitish with vesicular hairs, young growth yellowish. Lowermost leaves up to 8 mm long, ± linear, 0,5–0,75 mm wide, higher up to 2 mm long. Spikes dense, catkin-like. Bracts and bracteoles similar to upper leaves, scale-like, keeled in upper part, bracts triangular, 1,5 × 2–1,6 mm. Bracteoles broadly triangular to transversely ovate, 2,5–1,5 mm. Tepals ovate, 1,2–1,5 mm long, the outer 1–1,3 mm wide, apex acutish or obtuse, transverse line at 1/4–1/3, green blotch triangular, tepal back above the line densely covered by bladder-like hairs, in lower part and near margins sometimes with slightly flexuose hairs, at base with a ring of up to 1,5 mm long ± flexuose hairs. Anthers 0,4–0,5 mm long, cordate; appendage triangular, 0,15–0,2 × 0,15–0,2 mm, distinctly separated from the much wider anther body; filaments almost triangular, not elongating after anthesis; disc thin, with 0,2–0,25 mm long narrow triangular or linear glandular papillose interstaminal lobes. Ovary broadly ovoid to almost conical; style absent; stigmas 2(–3), 0,15–0,2 mm long, subulate, outside glabrous, inside shortly papillose. Fruit 6–10 mm diam., wings overlapping, light brown, in young stage sometimes pinkish; tepals below the wings with a basal ring of hairs and prominent middle veins, above forming a flat cap, often with 5 radial slits. Seed 1,5–2,2 mm diam., brown.

Hab.: Locally common and dominant on strongly saline soils, in Persia reported from *Tamarix* stands in association with various species of *Aeluropus*: up to 200 m. – Fl. VIII–X, fr. X–XI.

I r a q : Kurd.: Mosul: W of Buga station, BARKLEY & HADDAD 9171! – Kirkuk: Hawija in Little Zab valley, BARKLEY & HADDAD 3830-A! Jabal Hamrin supra Fatha, BARKLEY & BRAHIM 2544!, 2545! – Diyala: Jabal Hamrin near Shahraban, HAINES 1435! Canyon N Diyala river at edge of Jabal Hamrin, BARKLEY 3833! 30 km W Mandali, roadside, 3.VI.1965, HADDAD! 25 km SE Mandali, 130 m, 3.VI.1957, RAWI!
P e r s i a : W: Khuz.: 5 km SW Dehloran, AKHANI 5561!

Distr. gen.: NW Egypt, Cyprus and C Anatolia, the drier coasts of the Mediterranean through Jordan, N Saudi Arabia, Syria and Iraq to SW Persia.

The cited specimens are the easternmost localities of this E Mediteranean species. It is most distinct because of the extremely dense vesicular indumentum, very small anthers, wide filaments which look like small tepals, long and narrow interstaminal lobes and sessile subulate stigmas. The specimens from Mesopotamia and SW Persia differ from more western populations by a somewhat coarser habit and slightly larger fruits.

32. ***S. jordanicola*** EIG, Palest. Journ. Bot., Jerusalem Ser. 3,3: 130 (1945).
Icon.: EIG, l.c.: Fig. 3a-e. ZOHARY, Fl. Palaest. 1: Tab. 248 (1966). – Tab. 131.
Type: Palestine, Judean desert, Wadi Kelt, 6.X.1928, R. GABRIELITH 3813 p.p. lectotype HUJ!; isotypes K!; conf. BOTSCHANTZEV, Nov. Syst. Pl. Vasc. 6: 58 (1969).

Annual, 10–35 × 8–30 cm, erect. Stem regularly branched from base, primary shoot dominant; branches ascending. Long hairs in lower part stiff, up to 3 mm long, smooth, giving young plants a silky appearance; adult plants greyish to glaucous with ± adpressed vesicular hairs. Lowermost leaves to 15(–35) mm long, almost linear, semiterete, 1,5 mm wide, obtuse, near base 3,5 mm, higher up to 2 × 1 mm. Spikes loose. Bracts and bracteoles adpressed to and enclosing tepals, later forming a 4 mm wide plate, keeled at least in upper part, with wide hyaline margins; bracts broadly ovate, 2,1–1,8 × 2,5–2,3 mm, distinctly gibbose and sheathing at base. Bracteoles transversely ovate, 2–2,4 × 4–3,5 mm. Tepals broadly ovate to almost circular, 1,8–2,2 mm long, the outer 1,7–2 mm wide, apex ± protruding, with slightly concave flanks, transverse line at 1/4, with 2 small parallel elliptic to triangular green blotches, covered by adpressed, short, vesicular hairs, near the margins with longer, smooth, flexuose hairs, lower part of tepal back glabrous. Anthers 0,5–0,8 mm long, narrow triangular to sagittate; appendage broadly ovate, 0,2–0,4 x 0,2 mm, slightly separated from anther body, smooth, flat, upper side with ± incurved margins, light yellow; filaments almost linear; disc thin, unlobed, with glandular margins. Ovary broad conical; style 0,2–0,4 mm; stigmas 2, 0,3–0,4 mm long, ascending, flat, ± linear, 0,1–0,2 mm wide, outside glabrous, inside shortly papillose throughout. Fruit 10–12 mm diam., wings overlapping, shining, silvery white to straw-coloured, more rarely blackish tinged, when young often pinkish, tepals above wings forming a flat cap with a distinct radial pattern of 5 thickened bulges flanked by 10 green blotches and alternating with 5 hyaline tepal margin areas. Seed 2,3–2,7 mm diam., green.

Hab.: Rather common on sandy gravelly pediment plains with open semi-desert vegetation, in C Persia usually with *Ephedra sarcocarpa, Haloxylon ammodendron, Zygophyllum tetrapterum, Salsola orientalis, S. tomentosa, S. arbuscula, Anabasis setifera, Halothamnus subaphyllus, Stipagrostis plumosa* and numerous annuals including such other chenopods as *Girgensohnia oppositifolia, Kochia stellaris, Salsola turkestanica* and *Halimocnemis pilifera*, also on more salty and clayey plains and along dry wadis, from 0–1150 m. – Fl. VI–IX, fr. X–XI.

I r a q : Kurd.: Sul.: Sulaymaniyah, roadside, 28.X.1972, FAWZY! Mosul: Buga station, BARKLEY & HADDAD 9170! – Diyala: Jabal Hamrin between Khanaqin and Baquba, 28.XI.1918, EVANS!, HADAČ & al. 2992!, HAINES 1362! – Kut-al Imara: 30 km W Mandali, 9.VI.1965, HADDAD! 25 km SE Mandali, 130 m, 3.VI.1957, RAWI! Tursak, BARKLEY 2419! Ali al-Gharbi, at Persian border, 20.XII.1955, PETTER! 20 km N Badrah, RECH. 12736!
P e r s i a : W: Khuz.: Near Karkheh Dam NW Ahvaz, 30–50 m, PABOT 2578! Near Ahvaz, 20–30 m, XI.1960, DADASHZADEH in PABOT!; 8.III.1959, PABOT! 60 km SSW Ahvaz, 20 m, GUEST 25435! Cham-e Zeydan (Seytun, Zeytun), HAUSSKN.! Behbehan, HAUSSKN.! Bandar-e Deylam (Bandar Dilena), HAUSSKN.! – S: Fars.: Bandar-e Rig, STUTZ 932! Dashtestan near Dalaki, ALEXEENKO 938! Lar.: 15 km NW Genavi, 30 m, WDB. & al. 14801! Kerm.: Qaleh-ye Dokhtar (Kale-i Tuchtar), 2100 m, BORNM. 5071 p.p.! Lar.: 209 km from Bandar Abbas to Lar, 600 m, FOROUGHI & ASSADI 15079! – E: Khor.: Miandehi 30 km S Torbat-e Heydariyeh, PETTER 5! – C: Tehr.: Hableh Rud valley, 1–2 km above Ban-e Kuh (Bonehkuh, Bun-e Kuh), 1100 m, AELLEN & MANUCH. 2790!, 3106! 5 km E Garmsar, 900 m, FREITAG 14202! 15 km W Garmsar, 950 m, WDB. & al. 14772! Between Eyvanki and Garmsar, 780 m, DINI & BAZARGAN 23983! 13 km E Eyvanki, 1100 m, RENZ & IRANSHAHR 30414-E! Kavir railway station 88 km SE Tehran, 1000 m, AELLEN 2785!, 2881!, 3050! Kavir-e Garmsar, 850 m, REJAMAND & ARAZM 32510! Kavir Prot. Reg.: 3 km S Mobarakiyeh, 820 m, FREITAG 13980! Near Varamin, PETROV! Aivan-e Khar, PETROV! E Siah Kuh, 850 m, WDB. & FOROUGHI 15208! Plains N Siah Kuh, 820 m, FREITAG 14012-a!, AELLEN & SHAR. 2822!, 2853! Eyn or-Rashid to Safid Ab, IRANSHAHR & MOUSSAVI 40240-E! Damgh.-Semn.: 8 km W Semnan, 1150 m, WDB. & al. 14723! Anjirab, 1500–1650 m, TERME & MOUSSAVI 40106-E! Chah Shirin to Howz-e Mozaffar, 900–1000 m, TERME & MOUSSAVI 40146-E! 5 km below Namakeh, PETROV! 12 km SSE Razveh, 1000 m, FREITAG 14812! Shahr.-Bust.: Turan Prot. Reg.: Garmab-e Pain, 750 m, BRECKLE & BHADRESA 5170! 22 km W Tejur, Kavir border, 770 m, BRECKLE & BHADRESA 5159! Qom: Hassanabad, SAB. 513! Yazd: SE border of Darya-e Namak, 15 km E Marinjab, 860 m, AELLEN & SHARIF 2916! From Jandaq to Chupunum, 1000 m, FOROUGHI & BAZARGAN 32406! From Jandaq to Khvor 15 km E Farrokhi, 700 m, TERME & MOUSSAVI 40200-E! Hoseynian to Jandaq, 800–1000 m, TERME & MOUSSAVI 30254-E! Near Nain, road-

side, 1560 m, FOROUGHI 10532-E! – South Persia (Perse mérid.), BÉLANGER!, Persia, BÉLANGER 59!, 94!, AUCH. 782!

Distr. gen.: Palestine, Jordan and Saudi Arabia through Syria and Iraq to C and S Persia.

Easily recognized by its dense, regular branching system, the very long spikes, the large disc-like structures from bracteoles and fruits, and the very broad tepals with two green dorsal blotches.

33. ***S. chorassanica*** Botsch., Bot. Mat. Gerb. Inst. Bot. Akad. Nauk Uzbek. SSR. 18: 6 (1969).
Syn.: *S. gemmascens* Pall. subsp. *kandaharica* Botsch., Nov. Syst. Pl. Vasc. 19: 81 (1982).
Icon.: Tab. 132.
Type: Persia: Khorasan, E.G. Czerniakowska 246, holotype and isotype LE!

Annual, 10–30 x 15–45 cm, with distinct reddish juice, the colour often preserved in dried specimens. Stem shorter than the prostrate or ascending, straight, rigid lateral branches, irregularly divaricate. Long hairs in lower part stiff, to 3 mm long, warty, giving young plants a whitish colour, adult plants glaucous-grey with adpressed short, simple or two-armed vesicular hairs. Lowermost leaves 5–15 mm long, narrow triangular, acute, at base to 1 mm wide, higher up 2–1,5 x 1 mm. Spikes very dense. Bracts and bracteoles similar to upper leaves, keeled with the keel protruding into a rounded apex, adpressed to tepals, later forming a small cup 2–2,5 mm diam.; bracts ± triangular, 1,4–1,2 x 1,6–1,4 mm; bracteoles transversely ovate, 1,5–1,4 x 2–1,7 mm. Tepals ovate, 1,5–1,9 mm long, the outer 1–1,2 mm wide, transverse line at 1/3, green blotch triangular or elliptic, covered by vesicular hairs, towards the margins with simple, smooth, flexuose hairs extending usually also to the lower back and forming a ring at base. Anthers 1,1–1,5 mm long, sagittate; appendage slightly separated, lanceolate or narrow ovate, 0,4–0,6 x 0,2–0,3 mm, light yellow; filaments almost linear; disc thick, rim-like, ± unlobed, upper surface glandular. Ovary conical to ovoid; style 0,4–0,5 mm, in upper part often papillose; stigmas 2, 0,4–0,7 mm long, widest at the c. 0,2 mm broad obtuse apex, outside loosely, inside densely papillose throughout. Fruit 4–7 mm diam., wings overlappping, very thin, silvery white to straw-coloured, sometimes blackish tinged, tepals below the wings densely hairy, with prominent middle veins, above forming a regular closed dome, each tepal with a longitudinal bulge. Seed 1,5–1,8 mm diam., green.

Hab.: Locally common in very open semi-desert communities, on sands with *Salsola Griffithii*, *Pennisetum dichotomum*, *Dendrostellera Lessertii* and *Aeluropus macrostachya*, in gravel plains with *Salsola tomentosa*, *Halarchon vesiculosus*, *Anthochlamys afghanica* and *Atriplex leucoclada*, on rocky slopes with *Gymnocarpos decander* and *Halothamnus auriculus*, also on takyr plains and along wadi beds with *Aeluropus lagopoides*, along roads and other ruderal habitats; 450–1000(–1200) m. – Fl. VII–IX, fr. X–XI.

Persia: E: Sistan: 60 km N Zahedan, Hormak, 780–890 m, TERME & MOUSSAVI! 34388-E!, 34401-E! Inter Kuh-e Malik Siah et Zabol, 700 m, RECH, 4091-b!, 4102! 30 km E Zabol, frontier post Kuhak, PETTER 3! Between Birjand and Zahedan 20 km N Khunik, 970 m, TERME & MOUSSAVI 34389-E! Khor.: Between Qayen and Birjand, SHERBINOVSKY!
Afghanistan: SW: Farah: 250 km WNW Girishk to Shindand, RECH. 32480! 10 km S Khwaja Mard between Farah Rud and Herat, 1030 m, PODLECH 32556! 10 km SE Farah to Dilaram, VOLK 71.635-a! 75 km SW Farah, 680 m, BRECKLE 4895! N Dilaram, 850 m, ANDERS 8557! E border of Hamun-e Puzak (Jehile Puzak), 460 m, BRECKLE 4911! 15–37 km S Chakhansur, 500–520 m, FREITAG 3799!, PODLECH 17136! 15 km E Chakhansur, 475 m, PODLECH 22112! 5 km S Qala-e Fateh, 535 m, PODLECH 17141! Lower Kash Rud valley near Haleli, 540 m, FREITAG 2453! Between Dilaram and Girishk, 900–1050 m, PODLECH 19201!, 22139!, 28962!, RECH. 32476!, 37564!, VOLK 71.641! – SE: Kandahar: Girishk, VOLK 1340! 25 km NNE Girishk, 1000 m, FREITAG 5858! 30 km ESE Girishk to Kandahar, 870 m, PODLECH 19204-a! 6 km W Kushk-i Nakhud, 920 m, PODLECH 19622 (type of *S. gemmascens* subsp. *kandaharica*)! Near Kushk-i Nakhud, 1000 m, RECH. 37541! Between Girishk and Qala Bist (Qaleh-ye Bost), 800 m, GILLI 2168! 48 km N Lashkargah (Qala Bist), 900 m, FREITAG 774!, RECH. 34770! 25 km NE Lashkargah (Qala Bist), PABOT 421! 8 km W Lashkargah, 780 m, BRECKLE 4862! Marja SW Qala Bist, PABOT 331!, RECH. 34717!, VOLK 1304! Between Lashkargah and Darweshan near Mullah Jehadgul Qalay, ANDERS 8461! 30 km W Kandahar, 980 m, FREITAG 2048! S Kandahar, KASY 8! 18–35 km SE Kandahar, 1020–1080 m, BRECKLE 4838!, PODLECH 32647!
Pakistan: Quetta: Pishin, 1660 m, SHARIQ 6571! 37 km N Quetta, Pishin Lora valley, FAIRSERVIS 15! – Bal.: Ahmad Wal, WATTA!

Distr. gen.: Endem. (E Khorasan and Sistan, through SW and S Afghanistan and adjoining parts of Baluchistan to the Pishin Lora valley in Upper Baluchistan).

S. chorassanica differs from all other species of the sect. *Cardiandra* by its dense spikes and the rigid, divaricate branches. The recognition of the incomplete PODLECH 19622 and a few other specimens as *S. gemmascens* subsp. *kandaharica* BOTSCH. based on the lignification of the main branches and the adpressed two-armed hairs, suggesting a relationship in sect. *Malpighipila*.

34. ***S. turkestanica*** LITW., Trav. Mus. Bot. Acad. Sc. Imp. Pétersbg. (Trudy Bot. Muz. Akad. Nauk) 7: 78 (1910).
Syn.: *S. carinata* C.A. MEY. in EICHW., Pl. Nov. Casp.-Cauc. 2: 36 (1835), non SPRENG. (1825). *S. leptoclada* GAND., Bull. Soc. Bot. France 60: 421 (1913). *S. sclerantha* C.A. MEY. var. *carinata* (C.A. MEY.) MINKW. in FEDTSCH., Perec. Rast. Turkest. 6: 243 (1916). *S. Bornmülleri* GAND., Bull. Soc. Bot. France 60: 422 (1913). *S. carinatiformis* KINZ., Izv. Akad. Nauk Tadjik., Otd. Biol. Nauk 3: 26 (1962).
Icon.: (mostly sub *S. carinata*): EICHW., l.c.: tab. 28 (1835). KOMAR., Fl. URSS. 6: tab. 11, fig. 15 (1936). OVCZ., Fl. Tadjik. SSR 3: 402, tab. 66, fig. 1–4 (sub *S. carinatiformis*); 403: tab. 67 (1968). – Fig. 5-B; Tab. 133.
Type: (Uzbekistan) Distr. Tashkent, near Chanak at Syr Darya river, higher places, IX.1907, SOKOLOV 158, holotype LE!

Annual, 10–30(–60) × 10–40(–70) cm, erect. Stem with ascending, in upper part often spreading branches, the lowermost sometimes longer than stem. Long hairs in lower part delicate, interwoven, to 4 mm long, smooth, forming an arachnoid indumentum; upper parts greyish to glaucous with simple vesicular hairs. Lowermost leaves almost linear, 5–7(–10) × 0,5–0,75 mm, obtuse, the upper subulate to needle-like, to 3 mm long, at base up to 1,5 mm wide. Spikes loose. Lower bracts leaf-like, the upper shorter than bracteoles, triangular, 2–1,3 × 1,4–1,2 mm, strongly gibbous. Bracteoles semi-circular, the lower caudate, the upper apiculate, 2,2–1,5 × 3–2,5 mm. Tepals lanceolate, 1,8–3,5 mm long, the outer 1,1–1,3 mm wide, often purplish or yellowish, transverse line at 1/4, green blotch narrow triangular or almost linear, above the line densely covered by vesicular hairs, at margins also with flexuose hairs, below almost glabrous or towards the base with apically flexuose hairs forming sometimes a ring. Anthers 0,9–1,4 mm, narrow triangular, often sagittate, divided up to 3/5; appendages semi-circular to quadrangular with rounded edges, 0,2–0,3 × 0,2–0,25 mm, not distinctly separated from anther body; filaments linear; disc thick, rim-like, with broadly triangular to semi-globular lobes, glandular but without papillae. Ovary ovoid to almost conical; style 0,5–1,2 mm long; stigmas 2, 0,5–1 mm long, narrow linear. Fruit 7–10 mm diam., all wings with a prominent keel reaching to periphery or disappearing before, very variable in shape, semi-circular to broadly ovate and the margins completely overlapping or narrower throughout and margins fully free resulting in a ± star-like shape of the fruit, apex acute or more rounded, entire, crenate or dentate, wings usually light brown, in young stage sometimes yellow, tepals above the wings forming a 5-ribbed cone, below the wings with prominent middle veins and often with a basal ring of hairs. Seed 2–2,5 mm diam., brown.

Hab.: A most common component of diverse semi-desert communities on fine-textured soils, from stabilized sand dunes to loessic substrates and moderately saline loam and clay; up to 1300 (–1500) m, in S Persia and Baluchistan up to 2200 m. – Fl. VI–IX, fr. IX–X.

P e r s i a : N: Gorg.: Gonbad-e Kavus, SAB. 568!; 150 m, FISHWICK 11! 7 km from Kizyl Atrek, 9.VII.1942, PETROV! Sar-e Tash hills, 5.V.1914, MICHELSON! – S: Kerm.: Nabid between Kerman and Bam, DADASHZADEH in PABOT DK-221! Mahmudabad between Bam and Mahan, 1720 m, TERME & MOUSSAVI 34398-E! Qaleh-ye Dokhtar (Kale-i Tuchtar), 2100 m, BORNM. 5071 p.p. (type of *S. Bornmülleri*)! NNE Shahdab 20–40 km SE Khvor, 1150–1320 m, TERME & MOUSSAVI! Desert E Kerman, 24.X.1932, BIGGS! Bal: Between Zahedan and Khash, 1300–1600 m, RECH. 4212-b! Mirjaveh, MANUCH. 30189! Makran: Bampur "Sargadj, Tagh-e Zamand", 7.V.1900, GADD! – E: Khor.: Birjand, 1560 m, 26.IX.1925, CZERNJAK.! Tabas, VI. 1943, SHERBINOVSKY! Boshruyeh NE Tabas, 800 m, DINI & BAZARGAN 32888! 40 km N Tabas, 800 m, IRANSHAHR 40083-E! Between Ferdows and Deyhuk, 1200 m, DADASHZADEH in PABOT 254! 22–30 km from Ferdows, 1200 m, RECH. 51571! 24 km from Deh-e Mohammad to Tabas, 800 m, RECH. 51760! Between Asfak and Deh-e Mohammad W Boshruyeh, 1200 m, RECH. 51731! Khvaf (Chaf), BUNGE! Tayyebat near Afghan border, MARTINIĆ & WRABER 79! 70 km SW Torbat-e Heydariyeh between Jannatabad and Alui, 850 m, IRANSHAHR 40279-E!, RECH. 51385! SW Kashmar, 1200 m, REJAMAND & ARAZM 32614!, 32615! Doruneh W Kashmar, X.1913, DIEZ! W Sarakhs, 350 m, PABOT 5051! NE Mashhad between Tabat Kuh and Faz, 27.VII.1853, BUNGE! Sabzevar, PABOT 30333-E! – C: Tehran: 45–50 km S Tehran to Qom, 1000 m, BABAKHANLOU & BAZARGAN 2950!, DREA & O'CONNELL 141! Rudkhaneh-ye Shur, BRECKLE & BHADRESA 5415! Reneh, a.1882, PICHLER! 35 km S Qom to Kashan, 850 m, BABAKHANLOU & AMIN 3002! 15 km W Garmsar to Tehran, 950 m, WDB. & al. 14771! Kashan: From Jandaq to Chupunum, 950m, FOROUGHI & BAZARGAN 32408! Damgh.-Semn.: Between Damghan and Shahrud, 1100 m, 21.VII.1976, REJAMAND & BAZARGAN!, WDB. & FOROUGHI 12971! Shahr.-Bust.: Turan Prot. Reg.: S Sanjari, 770–950 m, FREITAG 13828!, 13835! 16 km S Ahmadabad, 1150 m, BRECKLE & BHADRESA 5142! 18 km NNE Ahmadabad, 800 m, RECH. 50675 p.p.! Qollah Allahkum 75 km WNW Ahmadabad, 1050 m, FREITAG 14185! 6–10 km E Zalehabad, 1200 m, FREITAG 13637! 30 km SW Garmab Pain, 850 m, BRECKLE 5171! 5 km NW Kuh-e Do Shakh, 850 m, FREITAG 14141! 11 km WSW Majerad, 850 m, FREITAG 15106! 29 km E Razveh, 1020 m, FREITAG 15003! 12 km SSE Razveh, FREITAG 14814! – Persia, BUNGE 58!

T u r c o m a n i a : Near Ashkhabad, LITW. 350!, 351! Near Mekrova, SINT. 1225! Garmab supra Skobelevka, SINT. 859!, 1176-a! Between Annaju and Gyaurs, SINT. 333-a! Near Uch-Adji, LITW. 352!.

A f g h a n i s t a n : N: Mazar-i Sharif: Shibaqli pass E Tashkurghan, 380 m, FREITAG 3862! 30 km E Tashkurghan to Kunduz, PABOT 1194! 25 km N Samangan, 30.IV.1958, PABOT! S Tashkurghan, 300 m, WDB. & EKBERG W-9049! 60 km NNW Tashkurghan to Namak Sar, 350 m, FREITAG 3883! NNW Tashkurghan 8 km N junction Mazar-Termez, 320 m, PODLECH 32696! Mazar-i Sharif, 400 m, PABOT 1189!, RECH. 34197! Imam Sahib (Sayid) NW Mazar-i Sharif, VOLK 594!, 694-a! Andkhui, NEUB. 173!, 174!, 175!, 4260! 15–20 km SW Andkhui, 300 m, RECH. 16125! 25 km N Andkhui near Aqina, 260 m, BRECKLE 4711! Shibarghan: Dasht-e Laili 50 km W Shibargan, 500 m, FREITAG 6662! Ali Moghul 30 km S Akcha, 440 m, BRECKLE 4704 p.p.!, 4704-a! – NW: Maimana: 40 km ENE Daulatabad to Shibarghan, 450 m, PODLECH 19813-a! Near Maimana, NEUB. 4231! Bala Murghab: Namak Shor valley near Maruchak, 400 m, 16.IV.1964, JAKES! Pass NE Qala Nau,1500 m, GREY-WILSON & HEWER 12771! Herat: Near Herat, SIDDIQUI 3583! Surkh pass 15 km N Herat, 1230 m, PODLECH 32492! 35 km W Herat, VOLK 71.871-a! Between Herat and Kisil Islam Qaleh, RECH. 32507!, 32511-a!, PODLECH 29380!, UOTILA 18936! Kisil Islam Qaleh, 1100 m, ANDERSEN & PETERSEN 366!, FURSE 7639! Kohsan in valle Hari Rud, AITCH. 730!, 733! – SW: Farah: Near Jija, 900 m, KOEIE 4085! Between Jija and Farah, 700 m, RECH. 19266! 21 km NW Dilaram, 850 m, RECH. 33505! 30 km E Dilaram, 1050 m, BRECKLE 4879!, RECH. 33520! – SE: Kandahar: 34 km ESE Dilaram, 1000 m, PODLECH 19201! 13 km W Girishk, RECH. 37565!, 37566! E Girishk, 900 m, RECH. 19289-B! SW Qala Bist near Helmand river, 820 m, RECH. 35409! SE Darweshan near Helmand river, 14.IV.1958, PABOT! 30–40 km W Kandahar, 940–1000 m, FREITAG 467!, KERST. 290! Pirzada, 900 m, KOEIE 2020! 20 km S Kandahar, 1000 m, RECH. 35267! 50 km SE Kandahar, PABOT 504! Kajakai, 1200 m, ANDERSEN & PETERSEN 444! – NE: Kataghan: W Kunduz, NEUB. 202! Erganak pass W Kunduz, 650 m, FREITAG 3843! N Kunduz near Kunduz river, NEUB. 321!, 1608! Qizil Qala along Amu Darya, 450 m, PELT! 3 km from Qizil Qala, HAYON! Paigah Kotal (Robatak, Rabotak, Mirza Atbili pass) NW Pul-i Khumri, 1300 m, BRECKLE 4643!, 4644!, PABOT 1584! Badakhsh.: Hazarbagh, 660 m, KOELZ 13152! – C: Bamian: "Bamian towards Turkestan", GRIFF. 1805! Doab: Ajar valley W Doab, 1500 m, RECH. 37010! – Not localized: GRIFF. 4214! Between Boy Mohammad and Chah-e Chakal, 11.VII.1955, McARTHUR! Bara Koh, 30.VI.1965, McARTHUR! Basfek, VOLK 542!

P a k i s t a n : Bal.: Chagai: 14 km SW Nushki to Dalbandin, 900 m, FREITAG & KOTHE 18755! Near Nushki, 1500 m, POPOV 242!

Distr. gen.: Caspian lowlands and C Persia eastwards to S Kazakhstan, S Kirghistan. NE, C and SE Afghanistan, south to the higher mountains of S Persia and Pakistani Baluchistan.

The name *S. turkestanica* is used here for populations which hitherto have often been called *S. carinata* or *S. leptoclada*. The type material of *S. carinata* C.A. MEY. agrees very well with *S. turkestanica* LITW. in the narrower sense. In addition *S. leptoclada* GAND. is also included in synonymy. *S. turkestanica* is the oldest available name to replace *S. carinata*, which has to be discarded as later homonym.

The species is most polymorphic with regard to the width and shape of the fruiting perianth wings which resulted in the description of several taxa, including the broad-winged and slightly larger flowered *S. leptoclada* GAND. maintained by most Russian authors, except ILJIN (1936). Here we agree with his view, because all over Afghanistan and Turcomania are individuals with smaller and larger flowers and wings, and all intermediates occur in the same localities and are often found together on the same herbarium sheet. BOTSCHANTZEV (1969) explained this by "mass hybridization". Another distinguishing character Russian authors mention is the dominating main stem in *S. leptoclada* in contrast to the longer basal laterals in *S. turkestanica*, but in this taxon the relative length of primary and secondary shoots has no value at all. Interestingly, small-flowered specimens have not been seen from Persia. The dominant form there has still larger flowers and more overlapping wings than the type of *S. leptoclada*. It has been described as *S. Bornmülleri* and marks the endpoint of variation. It is widespread also through N Afghanistan to Tadjikistan where it got the name *S. carinatiformis*. In many large-flowered specimens, the keel is less prominent and in the outer, broader tepals it does not reach the peripheral margin.

35. ***S. sclerantha*** C.A. MEY. in EICHW., Pl. Nov. Casp.-Cauc. 2: 35 (1835).
Syn.: *S. implicata* BOTSCH., Bot. Mat. Gerb. Inst. Bot. Akad. Nauk Uzbek. SSR. 13: 6 (1952).
Icon.: EICHW., l.c.: tab. 27 (1835). KOMAR., Fl. URSS. 6: tab. 11, fig. 14 (1936). OVCZ., Fl. Tadjik. SSR 3: 399, tab. 85 (1968). – Tab. 134.
Type: (Turcomania): "Meerbusen Balchasch, auf der Insel Dagada, bei Krasnowodsk, VIII/IX.1825", K.E. VON EICHWALD, lectotype LE!, selected here; iso- or syntypes: "Balchanischer Meerbusen", EICHWALD 157, HAL!; "Turkmenisches Ufer", EICHWALD, HAL!

Very similar to large-flowered forms of *S. turkestanica* but differing in arachnoid hairs distinctly dentate, at least in upper cells. Leaves 0,75–1,2 mm wide, evenly recurved even in young individuals. Tepals 3–3,5 mm long, the outer 1,4–1,7 mm wide, transverse line at 1/4–1/5. Anthers 1,3–1,8 mm long; appendages quadrangular to broadly rectangular. Style 0,8–1 mm long; stigmas 1–1,5 mm long, as long as or longer than style. Fruit 8–12 mm diam., the wings free or overlapping with outer parts, wedge- to broadly fan-shaped, their base narrow with parallel to slightly divergent margins, in lower half concave, keel absent, or present only on the narrower inner tepals.

Hab.: Locally common in open semi-deserts, mostly on semi-stabilized sand dunes in *Haloxylon persicum-Calligonum* communities with *Salsola Richteri*, *Stipagrostis plumosa*, *Agriophyllum latifolium*, *Salsola Paulsenii*, *S. turkestanica* etc., in N Afghanistan also on sandy saline flats in *Seidlitzia rosmarinus-Salsola gemmascens*-communities; from 300–600 m in N Afghanistan and from 500–1000 m, further south. – Fl. (V)VI–IX, fr. IX–X(XI).

P e r s i a : E: Khor.: Gonabad (Juymand), VI.1943, SHERBINSKY! – C: Shahr.-Bust.: Turan

Prot. Reg.: 18 km NNE Ahmadabad, 800 m, RECH. 50675! 0,5–2,5 km N Darb-Ahang, 910 m, FREITAG 15313-a!, 15318!
T u r c o m a n i a : Kara Kala near Nere, 10.VII.1901, SINT.!
A f g h a n i s t a n : N: Mazar-i Sharif: 60 km NW Balkh = 8 km S Islam Chongar, 280 m, BRECKLE 4659! 50 km NW Tashkurghan at road to Namak Sar, 330 m, FREITAG 3886! – SW: Sistan: Kash Rud valley 20 km NE Lukhi, 530 m, FREITAG 2463! S Registan, N Hamun-e Lora, AITCH. 1103 p.p.! – **SE**: Kandahar: From Kuhsk-i Nakhud to Girishk, 900 m, FREITAG 3688! Between Lashkargah (Qala Bist) and Darweshan near Mullah Jehadgul Kalay, 720 m, ANDERS 8461! Between Darweshan and Safar, 700 m, RECH. 3457-a!
P a k i s t a n : Bal.: Zangiabad near Nushki, SHAH & REHMAN 2591!

Distr. gen.: Caspian lowlands and C Persia eastwards to Dzungaria in westernmost China, NE Afghanistan, SE Afghanistan and adjacent parts of Pakistani Baluchistan.

S. sclerantha is very closely related to *S. turkestanica*. In our area, both species are widely sympatric but the former is less common and has an ecologically narrower range. BOTSCHANTZEV identified my specimens from C Persia as *S. implicata*, which he defined by recurved leaves and light yellow wings. It is included here in *S. sclerantha*, because its type and other specimens determined by BOTSCHANTZEV as *S. implicata* agree in all characters. Yellow wings occur here and there, usually in immature fruits, even in *S. turkestanica*.

The type material in LE consists of 3 sheets. The specimen with a handwrittten draft of the diagnosis has been chosen as lectotype despite the absence of a precise locality on the label.

36. ***S. forcipitata*** ILJIN, Bot. Zhurn. 18: 275 (1933).
Icon.: KOMAR., Fl. URSS. 6: tab. 13, fig. 2(1936). OVCZ., Fl. Tadjik. SSR 3: 407, tab. 68, fig. 1–5 (1968). NIKITIN & GELDIKHANOV, Opred. Rast. Turkmen.: Tab. 37, fig. 5 (1988). – Fig. 3-F; Tab. 135.
Type: (Tadjikistan): Sandy-salty terrace of the Amu Darya river between Ovrazno and Ormanek, 26.IX.1931, fl. & fr., N.F. GONTSCHAROV & MATVEEV 318, holotype LE!

Annual, 15–45 × 10–30 cm. Stem and branches erect or ascending. Long hairs in lower part stiff, 2–3 mm long, knotty, giving young plants a reddish-brown colour; adult plants greyish. Lowermost leaves 14–20 mm long, narrow triangular, acute, at base 0,6–1 mm wide, higher up 5–3 × 1 mm. Spikes dense. Bracts and bracteoles adpressed to tepals, later forming a distinct flat cup; bracts triangular, 1,5–2,5 mm long, 1,3–2 mm wide. Bracteoles embracing the longer tepals, transversely ovate, 3–2 × 4–3 mm, obtusely keeled in upper part, keel protruding into a short, rounded apex. Tepals lanceolate, 3–4 mm long, the outer 1,4–1,7 mm wide, apex often purplish, transverse line at 1/3, green blotch oval to triangular, more rarely longitudinally ± split, at least the 3 inner tepals in upper part outside the blotch in addition to vesicular hairs with stiff, adpressed, almost smooth, 0,2–0,3 mm long hairs, sometimes extending to lower part of tepal back and forming a ring at their base. Anthers 1,6–2 mm long, linear or sagittate; appendages broad ovate with often concave flanks, 0,5 × 0,3–0,4 mm, smooth, flat, yellow; filaments almost linear; disc thick, rim-like, unlobed, with glandular upper surface. Ovary ovoid to conical; style 0,3–0,7 mm long; stigmas 2(3), 0,8–1,5 mm long, flat to longitudinally furrowed, widened towards the dentate, 0,5 mm broad apex. Fruit 10–13 mm diam., wings overlapping, straw-coloured to pale brown, young sometimes pinkish, tepals above the wings forming a flat dome with longitudinal slits. Seed 2,5–3 mm diam., brown.

Hab.: Rather common in different semi-desert communities, on eroded slopes in loess, weak limestone and marl with *Atriplex moneta, Artemisia turanica* and *A. scoparia*, also in more closed associations on loess with *Carex pachystylis, Poa bulbosa, Anabasis turkestanica, Artemisia prasina* etc.; 400–1200(–1300) m. – Fl. VI–IX., fr. IX–XI.

Afghanistan: N: Mazar-i Sharif: 25 km E Mazar-i Sharif, PABOT A 1571 p.p.! Balkh prov., 330 m, KOZHEVNIKOV 98-d! 22 km S Tashkurghan = 2 km NW Ghaznigak, 700 m, PODLECH 16996! Shibarghan: "Dschelaugir", NEUB. 186! Ali Moghul 30 km S Akcha, 440 m, BRECKLE 4704 p.p.! – NW: Bala Morghab: Dahan-e Shor, 600 m, JAKES! – NE: Kataghan: Between Baghlan and Kunduz, GYSEL! W Kunduz, NEUB. 190! 10 km NE Aliabad to Khanabad, 550 m, PODLECH 16078-a! In valle Surkhab 10 km NNE Doshi, 800 m, VOLK 71/656! 25 km NNE Baghlan, 500 m, FREITAG 3832! 3–8 km E Paigah Kotal (Robatak, Rabotak, Mirza Atbili pass) NW Pul-i Khumri, 800–1300 m, BRECKLE 4643!, FREITAG 3919!, PABOT A 1584!, PODLECH 17012!, 19770!, 19772! W side Paigah Kotal, 1420 m, PODLECH 22133!

Distr. gen.: Restricted to southernmost Uzbekistan, S Tadjikistan and N Afghanistan.

In habit and ecology this species much resembles *S. turkestanica* and *S. sclerantha*, and sometimes they are mixed in the same collection. It differs in the large, broadly overlapping fruit wings, the longer anther appendages and the extraordinary shape of the stigmas. The widened lateral and apical parts of the stigmas are devoid of the normal glandular surface. It seems that they function only in gathering the pollen grains and forwarding them to the papillose tissue restricted to an inner central line at base of a longitudinal furrow.

Remarkable variation has been observed in length of style and stigma of *S. forcipitata* and in the absence or presence of hairs on the lower tepal backs.

Sect. VII. *Belanthera* ILJIN in KOMAR., Fl. URSS 6: 258 (1936), descr. ross.; Trudy Bot. Inst. Akad. Nauk URSS, ser. 1,3: 158 (1937).

Lit.: V.P. BOTSCHANTZEV, A review of the species belonging to the section Belanthera ILJIN of the genus Salsola, Botaničeskii Zhurnal SSSR. 53: 1440–1450 (1968); ibid., Species sectionis Belanthera ILJIN generis Salsola L., Novitates Systematicae Plantarum Vascularium, Leningrad (Novosti Sistematiki Vysšikh Rastenii) 17: 112–135 (1980); New species of the section Belanthera of the genus Salsola (Chenopodiaceae) Botaničeskii Zhurnal SSSR 75: 233–241 (1990); all in Russian.

Subshrubs or annuals; pilose with thin or stiff, smooth, warty, spinulose or branched hairs. Stems with pale cortex. Leaves alternate, spiral, rarely distichous, flat, semi-terete or almost terete, rarely laterally compressed, at least the lower with sheathing base, the succulent upper leaves never gibbous at base. Flowers solitary. Tepals ovate, after anthesis brown and ± canaliculate in upper part, without a distinct green blotch, sometimes without a transverse line and then fruiting perianth wingless. Anthers linear or sagittate, divided at least to 2/3, often up to the appendage, not or only partly exserted; appendage 1/2–1 × length of thecae, triangular in outline, upper side flattened, often papillose, connate with thecae or not, never stalked, during anthesis ± bent outwards; filaments linear; disc ± lobed. Stigmas flat, rarely almost subulate. Fruiting perianth with subequal wings, more rarely wingless. Seed horizontal, oblique or vertical. – Type of sect.: *S. tomentosa* (MOQ.) SPACH (selected by BOTSCHANTZEV 1968).

The section contains 12 species (BOTSCHANTZEV l.c. listed 27) which are distributed from the E Aegean to Pakistan, and from the Caspian lowlands to tropical E Africa; 9 species in our area. The section is remotely related to sect. *Caroxylon*. Morphologically it is advanced, particularly by more instricate hairs and appendage structures and in leaf insertion (see figs. on p. 158–160). In several species typical characters of genus *Halocharis* are obvious, e.g. bristle-like hairs, loss of wings, vertical seeds, and the replacement of the typical *Salsola*-diaspore by specialized spikelets. The traditional delimitation of both genera is rather weak and in need of reconsideration.

1a. Annuals 2
b. Dwarf shrubs 4
2a. At least lower part of plants and spikes densely woolly with delicate, long, interwoven hairs, without bristle-like hairs .... 44. *S. gossypina* BUNGE
b. Plant not woolly, delicate long hairs lacking, but bristle-like long hairs present 3
3a. Leaves opposite .... 43. *S. brachiata* PALL.
b. Leaves alternate .... 45. *S. Vvedenskyi* ILJIN & M. POP.
4a. Beside the flowering shoots, prostrate, condensed leafy shoots present; leaves flat, not or slightly succulent; anther appendages not separated from thecae 5
b. Prostrate leafy shoots absent; at least upper leaves and bracts succulent; anther appendages distinctly separated from thecae 6
5a. Tepals with a transverse line, in fruiting stage winged, the outer 5–7-veined .... 37. *S. canescens* (MOQ.) BOISS.
b. Tepals without a transverse line, in fruit wingless, the outer 1–3-veined .... 38. *S. Iljinii* BOTSCH.
6a. Annual shoots very robust, sparsely branched, few-flowered; bracts and bracteoles large, leaf-like; hairs smooth; tepals 4–5 mm long, 5–6-veined .... 39. *S. Aucheri* (MOQ.) BUNGE
b. Annual shoots less robust, richly branched, many-flowered; bracts and bracteoles smaller; hairs rough; tepals up to 3,5 mm long, 1–3-veined 7
7a. Leaves at least on the shortened lateral shoots distichous, half-clasping .... 42. *S. rubescens* FRANCH.
b. All leaves spiral, the upper not clasping 8
8a. Spikes deciduous at maturity, densely woolly with long, delicate, interwoven hairs; all tepals 1-veined, without a transverse line, in fruiting stage wingless; seed vertical .... 41. *S. lachnantha* (BOTSCH.) BOTSCH.
b. Spikes not deciduous at maturity, rarely woolly; outer tepals 2–3-veined,

with a transverse line, winged; seed horizontal or oblique . . . .
. . . . 40. *S. tomentosa* (MOQ.) SPACH

37. ***S. canescens*** (MOQ.) BOISS., Fl. Or. 4: 963 (1879).
Syn.: *Halimocnemis tomentosa* MOQ. var. *glabrescens* MOQ., Chenopod. Monogr. 152 (1840). *Noaea canescens* MOQ. in DC., Prodr. 13,2: 208 (1849). *Salsola Boissieri* BOTSCH., Bot. Zhurn. 53: 1442 (1968), nom. superfl. *S. Titovii* BOTSCH., Bot. Mat. Gerb. Inst. Bot. Akad. Nauk Uzbek. SSR 3: 3 (1941). *S. Podlechii* BOTSCH., Nov. Syst. Pl. Vasc. 17: 129 (1980).
Icon.: Fig. 5-C; tab. 136.
Type: (Iraq, Kurdistan, S of Amadiya) In cacumine M. Gara Kurdistan orientem versus frequens, TH. KOTSCHY 346, lectotype LE!, isotypes P (5x)!, G (2x)!, H!, JE!, K!, W!; cf. BOTSCH. (1968).

Dwarf shrub, 10–40(–55) × 15–35 cm; greyish green to whitish with ascending to semi-adpressed, 0,3–0,6(–1) mm long flexuose, smooth hairs. Stem densely branched at base, sometimes caudex-like and then up to 20 mm thick, flattened and blackish like the sturdy taproot; woody branches prostrate or ascending. Annual shoots of 2 types: flowering shoots few, erect, 3–40 cm long, usually unbranched, in upper 3/4–1/2 forming a loose spike, in lower part with rosulate leaves in the axils of the caducous leaves; vegetative shoots numerous, prostrate, much shorter, with persistent leaves. Leaves alternate, spiral, on flowering shoots 20–10 × 1,5–0,6 mm, flat, linear to narrow lanceolate, acuminate; leaves on vegetative shoots 3–7 × 0,5–0,7 mm, lanceolate, condensed. Bracts leaf-like, the lower usually much longer than bracteoles and tepals, the upper as long as or slightly shorter, to 3,5 mm. Bracteoles similar to upper bracts, the lower longer than tepals, the upper as long as or slightly shorter. Tepals lanceolate, 3,5–4,7 mm long, the outer 1,8–2,2 mm wide, 5–6(–7)-veined, the inner 3-veined, apex obtuse to acutish, transverse line at 1/3, above loosely hairy with 0,2–0,5 mm long, ascending, flexuose and straight smooth hairs. Anthers with appendage 2,7–3,7 mm long, divided almost up to the appendage; appendage not separated from thecae, 0,7–1,5 mm long, at base 0,3–0,5 mm wide, narrow triangular, obtuse; disc thick, glandular papillose, with short staminal and interstaminal lobes. Ovary globular; styles 0,4–1,2 mm long; stigmas 2(3), 1,2–2 mm long, flat, apex subdentate. Fruiting perianth 8–12 mm diam.; tepals above the wings forming a steep, truncate cone or an open cylinder. Seed 2,5–3,5 mm diam., horizontal, oblique or vertical.

Hab.: A common species in often rather dense subalpine and lower alpine plant communities, often with *Artemisia* ssp. and dwarf, thorny cushion plants like *Astragalus* ssp., *Acantholimon* ssp., *Polygonum* ssp., *Krascheninnikovia ceratoides*, *Cousinia* ssp., and perennial grasses of *Piptatherum*, *Stipa* and *Psathyrostachys*; (1300–)2000–3500 m. – Fl. VII–IX, fr. X–XI.

Iraq: Kurd.: Arbil: M. Qandil, 3500 m, RECH. 11790! Algurd Dagh (Arl Gird Dagh), 2100 m, GILLETT 9623! Sul.: M. Avroman (Hauraman), RAWI & al. 19753!, 19796! Mosul: Mountains N

Zakho near Sharanish, c. 2000 m, RECH. 10951! In cacumine M. Gara, KY. 346! Haw Raz 2620 m, HALEY 181! – "In alpinis Kurdistaniae", a. 1841, KY!

P e r s i a : N: Maz.: Elburz: Kandavan pass, 3048 m, DAVIS 830k!, 838k! Ridge and N side of Kandavan pass, 2800–3050 m, GAUBA 162B!, PABOT 4499! Ileka, 3500–4000 m, TERME 15294-E! – W: Khamseh: Kuhha-ye Takht, 140 km SE Zanjan, 2150–2550 m, TERME & MOUSSAVI 40090-E! Kurd.: M. Avroman ("Kuh-e Owraman") and Shahu, 2500–2750 m, VI.–VII. 1867, HAUSSKN.!; near snow, HAUSSKN. 862! Ham.: M. Alvand, AUCH. 2779!, BÉLANGER 6 (type of *Halimocnemis tomentosa* var. *glabrescens*)! Kuh-e Garru near Nahaband, VII.1902, STR.! 40 km SW Hamadan, 2350 m, PABOT 1530! Kermansh.: S Sonqor, 2400 m, DANIN & al. 65–438! Bakht.: Kuh-e Kukular (Kellal), Sabzekuh, a.1868, HAUSSKN.! Lur.: Dow Rud, 2440 m, KOELZ 18367! Between Chenar and Maregun, VIII.1868, HAUSSKN.! Oshtoran Kuh (Shuturun Kuh), near Tiun, STR. 306! – S: Fars.: Kuh-e Dinar (Kuh-e Daena), KY. 696 (type of *Noaea canescens* var. *glabriuscula*)! 13 km NW Ardekan, 2800 m, PABOT 2392! Kuh Chah Siah near Sivand, VII.1885, STAPF! Kuhha-ye Dashtak (Daeshtek) near Emamzadeh Ismael, STAPF 784! – C: Tehr.: 46 km E Tehran, 2200 m, AMIN & BAZARGAN 2896! Tehran, OLIV.! 10 km S Polur, 2550 m, PABOT 4246! Elburz, AUCH. 5962!, 9262! Elburz, near Pas Qaleh, KY. 504! – "Persia australis" AUCH. 2786!

A f g h a n i s t a n : SW: Ghorat: Dolaini, Darre Garmak, between Qala Sharak and Naourak, 2540 m, RECH. 18917 a! – E: Kabul: Kuh-e Khorogh, 2600 m, GILLI 2162! Unai-pass, 3150 m, GILLI 2163! Gardez: Safed Kuh, 23 km N Gardez, W of Altimur-pass, 2850–3200 m, RECH. 31810! Gardez, Ziarat near Gardez, 2300 m, VOLK 71/440b! Ninalay massif, 3150 m, LALANDE R 554-E 4! Ghazni: S Sabzak-pass, between Malestan and Nawar, 3530 m, PODLECH 31986! Between Sariab and Dasht-e Nawar, 3100 m, RECH. 37250! Dasht-e Nawar, 3120 m, BRECKLE 4591A! Near Qashe Amro, 3150 m, PODLECH 19257! Near road to Bini Dara-Ak pass, 3100 m, FREITAG 1437! N Ghazni, GRIFF. Journ. 861! Urgun: Near Urgun, VOLK 71/749 (type of *S. Podlechii*)! – C: Bamian: Shahtu-pass, 3380 m, PODLECH 22340! 20 km W Bamian, 3100 m, PABOT A-1287! Band-i Amir, 3300 m, VOLK 2837! Panjao: N Panjao, 3000 m, 15.X.1958 PABOT! Behzud (Diwal Kol) Dahan-e Abdila, 35 km E Sar-i Chashma, 2800 m, RECH. 18579! Farakulum, 2700 m, KOEIE 2529!

Distr. gen.: Mountains of C Anatolia and the Antilibanon, through the Zagros, Elburz and Hindukush up to the W Tian Shan.

The broad altitudinal range of the species is reflected in its very variable growth form. In subalpine and lower alpine conditions it grows adpressed to the ground as a cushion plant, whereas at lower altitudes the ascending woody branches might reach a height of 20 cm. As the plant is relished by herbivores, high grazing pressure often causes stunted growth and a caudex-like structure of the woody parts. Genetic variation seems to be expressed in the length of bracts and bracteoles, indumentum density (var. *glabriuscula* MOQ. from SW Persia), surface and length of appendages, and length of style. Except for the last character, all these variations are present in the very rich isotype material. Therefore *S. Podlechii* BOTSCH., described from E Afghanistan on the basis of shorter bracts and bracteoles in the upper part of the spikes and slightly shorter anthers, is not recognized here. BOTSCHANTZEV (1968) discarded *S. canescens* (MOQ.) BOISS. and introduced the new name *S. Boissieri*, because of the older name "*S. canescens* DESF.". However, DESFONTAINES (1804) used it only in an enumeration of garden plants, giving it neither a description or a diagnosis. Consequently, it has to be considered as nomen nudum and the BOTSCHANTZEV name as superfluous.

38. *S. Iljinii* BOTSCH., Nov. Syst. Pl. Vasc. 17: 131 (1980).
Type: Turcomania, Kopet Dagh occid., promontorio 8–10 km a pago Zau ad scaturiginem Bejramali, 8.XI.1954, LEONTJEVA 379, holotype LE!

Dwarf shrub, very similar and closely related to *S. canescens*. Differential characters are: plant white with a very dense silky indumentum; vegetative shoots often catkin like, the persistent sheathing leaf bases with silky axillary buds; tepals narrow ovate, 3,5–4 mm long, the outer 1,4–1,6 mm wide, (1–)3-nerved, the inner 1-nerved, transverse line absent, fruiting perianth wingless, perianth in lower 2/3 expanded, in upper part forming an open cylinder; seeds always vertical.

Hab.: Mountain semi-deserts, together with *S. tomentosa*, no precise informations available; 900–1400 m. – Fl. VII–X; fr. X–XI.

P e r s i a : E: Khor.: Near Sepid, W Bojnurd, 1350 m, RECH. 32530! 14 km E Bojnurd at road to Mashhad, 980 m, PABOT 7869!
T u r c o m a n i a : W Kopet Dagh near Zau, 1,5 km W of Bairam Ali, 14.VII.1982 BOTSCH. & KURBANOV!

Distr. gen.: Restricted to the lower mountain belt of the W Kopet Dagh; known from only a few localities, but probably not as rare as the few gatherings suggest.

In subsect. *Kochioides* this species is unique in its wingless perianth and the 1–3-nerved tepals. The closest relative is certainly *S. canescens*. Ecologically, *S. Iljinii* grows at lower altitudes and is more xerophytic than *S. canescens*.

39. *S. **Aucheri*** (MOQ.) BUNGE ex ILJIN, Bot. Zhurn. 18: 275 (1933).
Syn.: *Noaea Aucheri* MOQ. in DC., Prodr. 13,2: 207 (1849). *Salsola cana* C. KOCH, Linnaea 22: 190 (1849). *Noaea cana* (C. KOCH) LITW., Sched. Herb. Fl. Ross. 2: 11 (1900). *Salsola futilis* ILJIN, Not. Syst. Leningrad 7: 210 (1938). *S. samanganica* BOTSCH., Nov. Syst. Pl. Vasc. 17: 118 (1980).
Icon.: KOMAR., Fl. URSS. 6: tab. 13, fig. 5 (1936). ILJIN, Not. Syst. Leningrad 7: 209, fig. 2 (1938), sub *S. futilis*. TAKHT., Fl. Armen. 2: tab. 113 (1956), sub *S. cana*. – Tab. 137.
Type: In Persiae desertis, P.M.R. AUCHER-ELOY 3190, holotype P-MOQ!

Dwarf shrub, 20–50 × 10–25 cm; when young usually densely covered with ascending to semi-adpressed, 0,3–1 mm long smooth hairs, later glaucous green from thick waxy layers. Stem up to 17 mm thick, branched from base; woody branches ascending. Annual shoots few, erect, stout, at base 2–4 mm thick, terminated by a loose spike, usually in upper 1/2 with some lateral few-flowered spikes, leafy part sometimes with rosulate axillary leaves. Leaves alternate, 30–7 × 3–2,5 mm, the youngest flat, the others semi-terete or almost terete, linear, with obtuse apex, narrowed above the widened, slightly sheathing base. Bracts leaf-like, 15–4 × 2,5–1,5 mm, the lower longer than bracteoles and flowers, the upper shorter. Bracteoles leaf-like, 10–2,5 × 2–1,2 mm, with a very broad sheathing base, ± cucullate, the blade recurved, the lower much longer than tepals, the upper shorter. Tepals narrow ovate, 3,5–4,5 mm long, the outer 1,7–2,3 mm wide, 5(–6)-nerved, the inner (2–)3-nerved, apex acutish, obtuse or 2–3-lobed, transverse line at 1/4, above ± densely hairy, hairs semi-adpressed, persistent, 0,5–0,8 mm long, flexuose in lower, straight in upper part. Anthers with appendage 1,9–2,5 mm long, divided almost up to the appendage; appendage separated from thecae, 1,5–2 mm long, at base 0,35–0,45 mm wide, narrow triangular, obtuse; disc thick, slightly lobed, glandular papillose. Ovary subglobular; style 0,8–1 mm long; stigmas 2(–3), 1,5–2 mm long, erect, flat, up to 0,4 mm wide, apex subdentate. Fruiting perianth 10–13 mm diam., tepals above the wings first arched and forming a thickened cushion separated by a cleft from the wings, the upper 1/2–2/3 erect or recurved, forming a cylinder or funnel. Seed 2,5–3 mm diam., horizontal.

Hab.: Scattered but gregarious on soils rich in soluble salts, preferably on eroded slopes in gypsum-containing marl areas; in open semi-desert communities, often together with other halophytes like *Salsola tomentosa, Anabasis eriopoda, Gamanthus gamocarpus, Halimocnemis occulta, Reaumuria cistoides* and salt-tolerating species like *Zygophyllum tetrapterum, Cousinia neurocentra, Scorzonera pusilla*; from 800–1300 m. – Fl. VII–IX, fr. IX–XI.

P e r s i a : **W**: Azerb.: 38 km NE Tabriz, 1400 m, MALCOLM 308! 39 km W Marand, 1050 m, PABOT 5345! 70 km WNW Marand, 1000 m, IRANSHAHR in RECH. 41533! 44 km E Maku, 1010 m, PABOT 5400! – **S**: Kerman: Kerman, STARM. 319! – **E**: Khor.: Between Mashhad and Tabad Kuh, BUNGE 48a! Tabad Kuh, BUNGE 52! Shurab, 17.V.1858, BUNGE! Ahmadabad, 25.VII.1858, BUNGE! 20 km W Shirvan, 950 m, UOTILA 18104! Atrak valley between Bojnurd and Shirvan, RECH. 1817-a! E Bojnurd, 1220 m, FURSE 8918! 127 km E Gonbad-e Kavus, PABOT 8709! – **C**: Tehran: Hableh Rud valley, Ban-e Kuh, 1100 m, MANUCH. & AELLEN 30077-E!, AELLEN & MANUCH. 2786!, 3095!, 3096!, 3127! Between Simin-Dasht and Kabutar-Darreh, 1150 m, AELLEN & MANUCH. 2836! Qareh Agaj near Varamin, 1220–1250 m, BROWN 768!, BROWN 3399!, 3405! Plain of Kushk-e Nasrat between Tehran and Qom, 800 m, SHARIF & AELLEN 3153! Damgh.-Semn.: Bashm S Sorkheh, 3.VIII.1937, GAUBA & SAB.! Gardaneh Bashm to Sorkheh, GAUBA & MIRD. 2062! Shahr.-Bust.: Turan Prot. Reg.: S Salehabad to Sanjari, 1275 m, FREITAG 13821! 4 km N Garmab-e Poin, 1350 m, FREITAG 15423! 7 km W Tuchah, Taghook-pass, 1300 m, BRECKLE & BHADRESA 5151! Talkhab to Garmab SE Shahrud, 1240 m, FREITAG 13738! 15 km S Ahmadabad, 1200 m, FREITAG 14181! – "In Persiae desertis", AUCH. 3190!

T u r c o m a n i a : Ashkhabad: Germab, above Skobolevka, SINT. 1182! Distr. Bakharden, "Podzemnoie ozero", 300 m, 16.IX.1976, VASAK! Kopet Dagh: near Chuli, 650–700 m, 10. IX.1976, VASAK!, LITW. 303!, 303c! Between Chuli and Vannovski, 600 m, 19.XI.1967, REDTSCHENKO!

A f g h a n i s t a n : **SW**: Farah: 50 km E Farah, at pass between Khurmalik and Siah Ab, 800 m, FREITAG 3787! – **NE**: Kataghan: NE Pul-e Khumri, around Paigah Kotal (Rabotak-pass), 1430 m, FREITAG 3914! 30 km E Haibak (Aybak), 1300 m, PABOT A-893!, A-1586!, 8 km E Paigah Kotal, 1100 m, PODLECH 22432 (type of *S. samanganica*)!

Distr. gen.: Armenia to Turcomania and N Afghanistan, southwards to the higher mountains of S Persia and SW Afghanistan.

Most distinct because of its robust annual shoots, the glaucous-green, long and thick leaves, and the loose inflorescence of a few but large floral units. Of the 4 species into which it is split by BOTSCHANTZEV (1980), only the almost glabrous *S. futilis* ILJIN might merit recognition at varietal rank. It seems to be restricted to Nakhichevan, where it grows together with normal hairy forms. The latter was described as *S. cana* only one month later than *S. Aucheri*. It is maintained in most Russian ("Soviet") Floras as a distinct species reputedly differing from *S. Aucheri* in the more persistent, longer hairs and longer leaves. But these characters also occur in other parts of the area of *S. Aucheri*, up to SW and N Afghanistan. From the latter area (Paigah Kotal =Rabotak pass NW of Pul-e Khumri), *S. samanganensis* was described on the basis of slightly larger wings, inconspicuous interstaminal disc lobes and longer anthers, but it likewise comes within the range of *S. Aucheri*.

40. *S.* ***tomentosa*** (MOQ.) SPACH in KOTSCHY, Exsicc. Pl. Alepp. Kurd. Moss. no. 346 p.p. (1843).

Syn.: *Halimocnemis tomentosa* MOQ., Hist. Mém. Acad. Sci. Toulouse 5: 180 (1839). *Noaea tomentosa* (MOQ.) MOQ. in DC., Prodr. 13,2: 208 (1849). *Salsola aurantiaca* BUNGE in BOISS., Fl. Or. 4: 963 (1879). *S. Takhtadshanii* ILJIN in KOMAR., Fl. URSS 6: 261 (1936). *S. stellulata* KOROV. in KOMAR., Fl. URSS 6: 877 (1936). *S. flavovirens* ILJIN, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vysš. Rast. 7: 207 (1938). *S. tomentosa* subsp. *stellulata* (KOROV.) BOTSCH., subsp. *Bungeana* BOTSCH., subsp. *afghanica* BOTSCH., subsp. *kopetdaghensis* BOTSCH., subsp. *Buhseana* BOTSCH., Bot. Zhurn. 53: 1447–1448 (1968). *S. Bungeana, S. afghanica, S. kopetdaghensis, S. lasiantha* BOTSCH., Nov. Syst. Pl. Vasc. 17: 122 (1980). *S. Buhseana* (BOTSCH.) BOTSCH., Nov. Syst. Pl. Vasc. 17: 121–126 (1980). *S. badghysi, S. glabella, S. Kurbanovii* BOTSCH., Bot. Zhurn. 75: 237–239 (1990).

Icon.: KOMAR., Fl. URSS 6: tab. 13, fig. 6 (1936). TAKHT., Fl. Armen. 2: fig. 114, sub *S. Takhtadshanii*, fig. 115 (1956). NIKITIN & GELDIKHANOV, Opred. Rast. Turkmen.: tab. 37, fig. 3 (1988). – Fig. 3-H, 4-E; Tab. 138.

Type: Perse: (near Tehran) Poulidellak (Pul-e Dehlak), désert salé, C.P. BÉLANGER 595; holotype P-MOQ!; isotypes P!, G!

Dwarf shrub, 10–45 x 10–25 cm, ± densely hairy with 0,3–0,5 mm long spreading to ascending, flexuose, spinulose to branched, in young stage often brownish, hairs, in lower part to 1 mm long and interspersed with up to 5 mm long stiff spreading bristle-like hairs. Stem up to 15 mm thick, branched from base, more rarely caudex-like; woody branches ascending or prostrate. Annual shoots numerous, erect, rigid, arising from gemma-like, often woolly, buds, branched throughout or in upper part only. Leaves alternate, in unbranched lower part 10–5 x 1,5–1 mm, semi-terete, in upper parts shorter, densely hairy, linear to ± subulate, with obtuse apex, with slightly sheathing base, the upper obtusely keeled at the sessile base. Spikes loose, higher up ± condensed. Bracts 4–2 x 1,5 -1 cm, the lower shortly linear with widened base, the upper trullate, with hyaline margins, the lower slightly longer, the upper as long as or shorter than bracteoles. Bracteoles 3–2 x 2,5–1,5 mm, usually without blade, cucullate, often whitish with flexuose spinulose hairs. Tepals 2,5–3,5 mm long, the outer 1,2–1,4 mm wide, 2–3-veined or all 1-veined, apex obtuse or indistinctly lobed, transverse line at 1/3–2/5, above hairy (density, length and shape of hairs very variable) hairs exceeding the apex or not. Anthers with appendage 2,0–2,7 mm long, divided up to the appendage; appendage separated from thecae, 0,8–1,2 mm long, at base 0,2–0,3 mm wide, narrow triangular, acute, often purplish in lower part; disc thin, with short papillose interstaminal lobes. Ovary subglobular; style 0,7–1 mm long; stigmas 2, 0,7–1,2 mm long, flat, apex shortly dentate. Fruiting perianth 7–10 mm diam., in young stage often pink or orange, later pale brown or dark grey; tepals above the wings at first arched, then forming a steep cone covered by persistent hairs. Seed 1,5–2,2 mm diam., horizontal, more rarely oblique.

Hab.: One of the most common and widespread *Salsola*-species, associated with most semi-desert communities on ± salty soils; up to 2000(–2500) m. – Fl. VI–IX; fr. X–XII.

Persia: N: Gorg.: Between Tappeh-ye Moraveh and Holtan, near Atrak river at Gharag-gol, 170 m, HEWER 4059! Atrak valley, near Akgip-Qala, 1915, NIKITIN! 100–127 km E Gonbad-e Kavus, 1240–1340 m, PABOT 7792!, 7808! Bandar-i Gaz, SHAR. 30101-E! 45 km SW Shah Pasand, 1500 m, BRECKLE & BHADRESA 5226! Rahimabad between Farsian and Shah Pasand, 1550 m, TERME & al. 39368-E! Gilan: Between Loshan and Manjil, 360 m, WDB. & SHIRDELPUR 14846!, 14847! – W: Azerb.: 55 km SE Mianeh to Zanjan, 1200 m, PABOT 3398! 20 km E Mianeh to Khalkal, 960 m, WDB. & SHIRDELPUR 14920!, 14922!, 19 km E Mianeh, 1000 m, PABOT 2759! 19 km E Mianeh to Ardabil, 1000 m, PABOT 3860! 10–24 km ENE Mianeh, left bank of Qezel Owzan, 1150 m, RECH. 43231! 16 km S Mianeh to Zanjan, 980 m, PABOT 3749! Near Tabriz, GILL.-SM. 1312! Maman, salt-works, 9. and 18.IX.1856, SEIDLITZ! NE Tabriz, red hills, 1670–1700 m, DANIN & PLITMANN 65–1200!, RECH. 5180!, 43540! 28–61 km NE Tabriz to Ahar in Talkheh Rud valley (Atchi Chay), 1480–1500 m, PABOT 5244!, 5260!, 5285!, 5304!, RECH. 14836! 60 km NW Bonab, E-side of lake Rezaiyeh, 1350 m, WDB. & SHIRDELPUR 14942!, 14944! E-side of lake Rezaiyeh, SEIDLITZ! Khamseh: Zanjan: 30–40 km NW Zanjan, 1400–1440 m, PABOT 3698!, 5083!, RECH. 53822! Esf.: Near Esfahan, X. 1868, HAUSSKN.!, FIELD & LAZAR 1091! 30 km N Esfahan, 1700 m, PABOT 7284! 12 km NE Murcheh Khvort, 1900 m, PABOT 7287! Kuh-e Zufah (Kuh-e Sofeh ?) near Esfahan, STAPF 779! Murcheh Khvort (Murtschahchar), HAUSSKN. 12! Near Jolfa-Esfahan, HAUSSKN. 18! – S: Fars.: At lake Maharlu (Mahluja), 1600 m, BORNM. 4193!, 4194! Kuhenjan, between Shiraz and Fasa, 1550 m, FOROUGHI & ASSADI 15008! At Maharlu and Sarvestan, 1600 m, BORNM. 4190! Bakhtegan-lake near Kherameh, 1570 m, FOROUGHI & ASSADI 15023! W part of Neyriz-basin, Gomon-lake, BOBEK 119! Gatruyeh E of Neyriz, 1550 m, FOROUGHI & ASSADI 15040! 124,7 km SE Jahrom, 990 m, PABOT 6382! 32 km W Rostaq, 75 m, GRANT 16999! Kerman: 18–36,3 km W Rafsanjan, 1490–1730 m, PABOT 6965!, 6971! W Rafsanjan between Rezaabad and Anar, DADASHZADEH DK 218! Rafsanjan, 1500 m, BROWN 3411! Between Zarand and Rafsanjan, DADASHZADEH DK 219! Between Kerman and Zarand, Amirabad Kavir, 27.VI.1960, DADASHZADEH! Near Zarand, DADASHZADEH DK 215! S Kerman to Baft, 1750 m, 6.VII.1960, DADASHZADEH! Desert foothills of Jupar near Raz Kuh, BIGGS 13017! Between Kerman and Bam, 87 km SE Kerman, DADASHZADEH 214! 161 km S Kerman on Bam road, 1520 m, ZOHARY 8142/15! Nosratabad between Bam and Zahedan, 1400 m, RECH. 3920!, 3924! 60–64 km NW Bazman to Bam, 1000–1150 m, ERSHAD & al. 35408-E!, 35409-E!, 40121-E!, RECH. 55175! 24 km E Nosratabad to Bam, 1220 m, TERME & MOUSSAVI 34393-E! Kuh-e Jebal Barez between Bam and Jiroft, 1500 m, RECH. 3698! Shahdad, SAB. 524! E Dasht-e Lut, N of high dunes, 59°32'E, 30°57'N, 1100 m, LÉONARD 6224! Ibid., E of high dunes, 59°52'E, 30°28'N, 1100 m, LÉONARD 6119! Between Kerman and Neyriz, 2000–2200 m, BORNM. 4192!, 4192b! Deh-e Shuturun, BORNM. 4! Lar.: 31–38 km E Lar, 600–640 m, PABOT 6449!, 6450! 15 km N Bandar-e Lengeh, IRANSHAHR & TERME 14800–E! 86 km W Bandar-Abbas, 30 m, PABOT 6523!, 6527! 24 km S Kahorestan, IRANSHAHR & TERME 34377-E! 32 km SE Dezghan at Sayeh-Khosh, IRANSHAHR & TERME 34375-E! Bandar-e Khamir, 100 m, POPOV GP 64/133! NE part Qeshm Island, 40 m, KUNKEL 16630! Henqam Island, 40 m, KUNKEL 16860!, PERRY s.n.! 14 km NE Bandar Abbas, 30 m, PABOT 6602! Kafriz, between Sirjan and Hajjiabad, DADASHZADEH DK 217! Hajjiabad near Tarom, 900 m, RECH. 3336! 20,4 km N Hajjiabad, 1100 m, PABOT 6738! 50 km S Saidabad (Sirjan), MANUCH. 1129! Sarzeh, between Bandar Abbas and Sirjan, 300 m, IRANSHAHR & TERME 14841-E! Bal.: 155 km from Chahbahar to Rask, 200–300 m, AKHANI 6651! Shah-e Khudabaksh, 28 km NW Davar Panah, 1290 m, HOTSON in BLATTER 24275! 22 km N Zahedan to Malek, Siah Kuh, 1500 m, DADASHZADEH DE/110! 79 km N Zahedan, 640 m, ZOHARY & ORSHAN 8727/4! 100–126 km NW Zahedan, 1520 m, ZOHARY & ORSHAN 8483/5!, 8536/6! 39 km W Zahedan to Nosratabad, 1250 m, RECH. 54606! Zahedan, 30.XI.1956, PETTER! Between Zahedan and Khash, 1300–1600 m, 15.V.1948, RECH.! Zahedan, Gardaneh Khanik, 1180 m, FOROUGHI 10522! – E: Sistan.: Kuh-e Malik Siah to Zabol, 700 m, 22.V.1948 RECH.! 17 km S Safidabeh, W Zabol, 780 m, DADASHZADEH DE/84! 208 km SE Birjand, between Khunik and Safidabeh, 1100 m, DADASHZADEH DE/67! 20 km N Khunik, 970 m, TERME & MOUSSAVI 34400-E! Khor.: 49–94 km SE Birjand, 1700–1750 m, DADASHZADEH DE/10!, DE/23! 28 km NE Tal-e Kheshtak, 880 m, TERME & MOUSSAVI 34396-E! Tal-e Kheshtak, 120 km SW Birjand, 960 m, TERME & MOUSSAVI 34379-E! 15 km SE Fedeshk, 920–970 m, TERME & MOUSSAVI 34390-E! Birjand, 1580 m, FOROUGHI 10539!, MANUCH. 30122-E! Robat-e Khan, Taq plain, KOELZ 16811! Between Khor-Robat and Posht-e Badam, FOROUGHI & BAZARGAN 32401! Tabas, Shirgasht, RUTTNER 568! Between Ferdows and Deyhuk, 1200 m, DADASHZADEH DE/259! 40–43 km NW Tabas to Robat-e Gur, 600 m, RECH. 51769! 20–30 km SW Robat-e Gur to Robat-e Khan, 1000 m, RECH. 51779! Between Ferdows and Tabas, 1350 m, REJAMAND & ARAZM 32474! Near Tabas, 25.XI.1858, BUNGE! Namaksar lake near Mudzhiabad (Mozhnabad), CZERNIAK. 245 (type of *S. lasiantha*)! Between Assadabad and Naudeh (Now Deh-e Pashang), 11.X.1858 BUNGE! Naudeh, 12.X.1858, BUNGE! 87 km N Kashmar to Sabzevar, 1100 m, FOROUGHI 10560! 188 km N Birjand, ZOHARY & ORSHAN 9365/2! Doruneh, W of Kashmar, X.1913, DIEZ! Torbat-e Jam near Madjnabad, "Shikar Shur", 760 m, GABRIEL 2! Torbat-e Jam (Turbat), Tabad Kuh, BUNGE 53 (type of *S. Bungeana*)! Ahmadabad, a. 1858, BUNGE! Cheshme Gelas, 28.VII.1858, BUNGE! Between Mashhad and Torbat-e Heydariyeh, Mt. Robat Safid, c. 1700 m, RECH. 1514! Between Mashhad and Sarakhs, Mozduran, PETTER 4! 89 km E Mashhad, 800 m, RECH. 55603! 74 km W Mashhad, 1300 m, ANDERSEN & PETERSEN 347! 5 km S Sabzevar, 940 m, REZAMAND & ARAZM 32461! 17–21 km E Sabzevar to Soltanabad, 1150–1400 m, RECH. 53688! Baghjar, KOELZ 16923! 4 km NE Sabzevar, 950 m, PABOT 7989! Mountains E Sabzevar, RECH. 1315! Rivand, W Sabzevar, 910 m, FOROUGHI 10535! 14 km E Bojnurd, 980 m, PABOT 7869! – C: Tehr.: Pul-i Dehlak (Poulidellak), salt desert near Tehran, BÉLANGER 595! Plain of Kuhsk-e Nosrat between Tehran and Qom, 800 m, AELLEN & SHAR. 3152!, 3154! 15 km N Qom, 1000 m, SODER 8! N Kavir-e Meyghan, near Deh-e Namak, AKHANI 1071! Near Qom, X.1868, HAUSSKN.! Elburz, Gaduk Chashmeh AELLEN & BEHBOUDI 30193-E! Rey near Tehran, FIELD & LAZAR 1050! Varamin, AELLEN & SHAR. 30102-E! Qareh Agaj near Varamin, 1280 m, BROWN 3400! Hableh-Rud valley, 1–2 km above Ban-e Kuh, 1100 m, AELLEN & MANUCH. 2787!, 2845!, 3097!, 3098!, 3101!, 3103!, 3105!, 3123-3125!, 3137! MANUCH. & AELLEN 30096-E!, 30185-E! Hableh-Rud valley, between Simin-Dasht and Kebutar-Darreh, 1150 m, MANUCH. & AELLEN 30105-E!, AELLEN & MANUCH. 2781!, 2783! Rud Shur, 50 km SW Tehran, 900 m, AELLEN 2966! Qom highway, near Shur River, 915 m, DAVIS 12! 5 km S Shur River DAVIS & DREA 4! Qazv.: Between Qazvin and Tehran, BUHSE 886 (type of *S. Buhseana*)! Mardabad near Karaj, GAUBA 2129!; 1300 m, AELLEN 2798!, 3036! W Mardabad, 1250 m, HDG., WDB. & al. 14692!, 14973! 15 km from Mardabad to Eshtahard, 1200 m, AKHANI & al. 2079! Damgh.-Semn.: Sorkheh, 1600 m, RECH. 2796! 8 km NE Momenabad, 1400–1500 m, MOUSSAVI & KARAVAZ 34367-E! Assadabad, Chaleh-Dan, 1050 m, MOUSSAVI & TEHRANI 41715-E!, 41718-E! S Semnan to Kavir, 1000 m, REJAMAND

& ARAZM 32587! 15–25 km from Semnan to Firuzkuh, 1400 m, HDG., WDB. & al. 14728!, 14745! 8 km W Semnan, 1150 m, HDG., WDB. & al. 14724! Chashmeh-i Ali, SE Kuh-e Nizwa (Neyzva), 2200 m, BEHB. & AELLEN 2840! Anjirab between Chah Shirin and Howz-e Mozzafar, 900–1000 m, TERME & MOUSSAVI 40196-E!, 40170-E! Hoseynian to Jandaq, 800–1000 m, TERME & MOUSSAVI 30234-E!, 40116-E! Gandab, 28.IX.1848, BUHSE! Between Gandab and Damghan, SAB. 2080! Shahr.-Bust.: Between Shahrud and Sabzevar, 11.VIII.1858, BUNGE! 94–97 km W Sabzevar to Shahrud, 780 m, PABOT 8038!, 8041! 25–129 km E Shahrud to Sabzevar, 960–1350 m, BRECKLE & BHADRESA 5203!, PABOT 8055!, 8090!, 9.XI.1983, Karaj Fac. Staff! 40 km NE Shahrud to Shah Pasand, 1560 m, PABOT 8104! Jafarkan rangeland, E of Dowzeh Shahrud, 1500 m, 9.XI.1983, Karaj Fac. Staff! Shahrud, KOELZ 16939! Kuhha-ye Anjirab, 1500–1650 m, TERME & MOUSSAVI 30243-E!, 30291-E!, 40099-E!, 40171-E–40173-E!!, 40197-E!, 40201-E! Turan Prot. Reg.: 5 km NE Delbar, 1300 m, BRECKLE & BHADRESA 5041! 6 km NE Delbar at pass road to Ghazazan, 1200 m, FREITAG 14136! 35 km E Delbar, Qaleh Shor, 780 m, BRECKLE & BHADRESA 5116! S Delbar, 1200 m, BRECKLE & BHADRESA 5089!, 5189! Shakh-e Biar, 1180 m, BRECKLE & BHADRESA 5095! 7 km W Tuchah, SE Tejur, Taghook-pass, 1300 m, BRECKLE 5150! Biarjmand, SE Shahrud, 1400 m, REJAMAND & ARAZM 32550! N Biarjmand, E slope of Sukht-e Kuh, 1180 m, 9.XI.1983, Karaj Fac. Staff! Between Delbar and Ahmadabad, 1100 m, TERME & al. 41716-E! 8 km S Majrad, S Abol Yahya springs, 800 m, BRECKLE & BHADRESA 5061! 20–25 km W Delbar, 1300 m, BRECKLE & BHADRESA 5108! Torud, S Shahrud, 1350 m, REJAMAND & ARAZM 32559! SE Shahrud, 15 km SE Torud, 800 m, FREITAG 14895a! 15 km S Zeydar, 1300 m, BRECKLE & BHADRESA 5034! 100 km S Shahrud, 1420 m, REJAMAND & ARAZM 32595! Kavir Prot. Reg.: Shah Abbas Caravan-Sarai, RECH. 50116a! 5–35 km SE Caravan-Sarai Shah Abbas, RECH. 46272! E Siah Kuh, 800 m, WDB. & FOROUGHI 14647! S Siah Kuh, 1150 m, WDB. & FOROUGHI 14665! 28 km NW Shah Abbas Caravan-Sarai, 850 m, WDB. & FOROUGHI 15196!, 15197! Valley SW Shah Abbas Caravan-Sarai, 1050 m, WDB. & FOROUGHI 15199! Near Eyn or-Rashid, 850–1100 m, AELLEN & SHAR. 2823!, 2824!, IRANSHAHR & MOUSSAVI 15368-E!, 40179-E!, 15397-E!, WDB. & FOROUGHI 14626! Between Eyn or-Rashid and Safid Ab, IRANSHAHR & MOUSSAVI 15402-E!, 40237-E! N Siah Kuh to "Cairn", 770–850 m, AELLEN & SHAR. 2796!, 2819!, 2820!, 2947!, 3068! Between Darya-ye Namak and Siah Kuh, 800 m, AELLEN & SHAR. 2854!, 2906!, 2907!, 2943!, 3057! Kashan: Between Kashan, Qom and Howz-i Sultan, HAUSSKN. 19! 17 km NW Kashan, 960 m, PABOT 7197! Kavir-e Kashan, SHAR. & AELLEN 30126-E!, 30142-E!, 30194-E!, 30094-E! Between Sefid Ab and Kush Kuh, IRANSHAHR & MOUSSAVI 15392-E, 15399-E! 28 km from Sefid Ab to Marinjab, TERME & TEHRANI 40038-E! SE Darya-ye Namak, Kush Kuh, 860 m, AELLEN & SHAR. 2776! 15–25 km E Marinjab, 860 m, AELLEN & SHAR. 2913-2915!! Abu Zeydabad, Kuh-e Yakh-Ab, 1600–1700 km, TERME & TEHRANI 40048-E! 15 km W Kashan, 1370 m, ZOHARY 294! 27–40 km SE Kashan, 1070–1400 m, PABOT 3501!, TERME & MOUSSAVI 34392-E! 30 km S Kashan, 1200 m, M. & D. ZOHARY 398! Kavir-e Kashan, Dastkan, SHAR. & AELLEN 30142-E! Yazd: Khvor (Khaur), KOELZ 16824! Between Jandaq and Khvor near Farrokhi, 700 m, TERME & MOUSSAVI 30290-E!, 40134-E!, 40135-E! Between Jandaq and Chupunum, 1000 m, FOROUGHI & BAZARGAN 32409! Between Anarak and Chupunum, 1000–1650 m, FOROUGHI & ASSADI 15135!, FOROUGHI & BAZARGAN 32380!, 32381! Kavir-e Chupunum, SAB. 539! Ibid., Baiazeh to Robat, SAB. 523! Abbasabad SE Natanz, 1320 m, WDB. & FOROUGHI 15174! Agha Ali-Abbas, at road to Natanz, 1280 m, FOROUGHI 10496! 10576! 10585! Na'in, 1500–1560 m, FOROUGHI 10555!, FOROUGHI & ASSADI 15126! 13–42,7 km NW Na'in, PABOT 7109!, 7114! 20 km S Na'in, 1600 m, M. & D. ZOHARY 381! 48 km SE Na'in, 1240 m, PABOT 7085! Ardestan to Na'in, 1900 m, FOROUGHI & BAZARGAN 32418! 57–115 km SE Yazd, 1500–1520 m, PABOT 7040!, ZOHARY 6316/46! Gerdekuh, between Anar and Yazd, 25.IV.1859, BUNGE! Between Tabas and Yazd, 1220 m, RUTTNER 629!, TROTT 554! 30 km SW Robat-e Posht-e

Badam, road of Yazd, 1000 m, FOROUGHI & BAZARGAN 32432! Kuh-e Khurunaq (Khowrnag) NE Yazd, RUTTNER 631! Yazd, 1500 m, 2.IV.1892, BORNM.! – Persia, AUCH. 2784! Persia australis, in salsis Shurab, IX.1868, HAUSSKN.! Juwein valley, Kashlabada, 5.I.1943, NIKITIN!
Turcomania: Kopet Dagh: Kara Kala, ILJIN 866! Kara Kala, ad Nere, SINT. 2199-b ! Sundsodagh, SINT. 1909 ! Kizyl Owa, SINT. 2200-a ! Near Sekiz-Khana, KOROVIN 1075 (type of *S. stellulata*)! Kyuren-Dagh, near Lanata, PJATAJEVA 115 (type of *S. kopetdaghensis*)! Ortogos, PJATAJEVA 157! E Kopet Dagh, near Meana, 11.X.1978, BOTSCH. & KURBANOV!
Afghanistan: NW: Maimana: 30 km SSE Maimana, at road to Sar-e Hauz, 1200 m, FREITAG 6700! Bala Murghab: Murghab, 914 m, KOELZ 13263! Herat: Ghurian, Herat Livest. Dev. Corp. 103! Badghis: Langar N Qades, 1250 m, NEUB. 396! – SW: Farah: Shorab, c. 20 km S Shindand, 1400 m, BRECKLE 4936! At Farah Rud near road Herat – Kandahar, VOLK 71/875! Ibid., 14.XII.1976, BENEDIKT! 40 km S Farah, 580 m, FREITAG 3772! 7 km NW Khwaja Mard, at road Farah Rud – Herat, 1200 m, PODLECH 32554! 3 km N road Herat – Dilaram, at junction to Shindand, 1300 m, PODLECH 32550! Dilaram, desert, 914 m, KOELZ 13232!, 13236! S Khash, 6.VII.1942, SHERBENOVSKIJ! Khash Rud, 96 km SW Dilaram, 700 m, FREITAG 2445! 33–68 km N Chakhansur, RODIN 619!, 630!, 631! 75 km SW Farah, Daghale Dukhtar, 680 m, BRECKLE 4896! Dasht-e Bakva, near Khash Rud, 145–148 km S Farah, RODIN 647!, 655! E-side of Jehil-e Puzak, 460 m, BRECKLE 4912! 25 km SE Lash-e Joveyn, 476, m, PODLECH 16920! 10 km WSW Sheshaba, at road to Zaranj, 555 m, PODLECH 16888! 30 km E Dilaram to Girishk, 1050 m, RECH. 33521! At Koh Gerd, 800 m, BRECKLE 4874! Shorab, 60 km ESE Dilaram, 1050 m, PODLECH 17178! Boghra, VOLK 1312! – SE: Kandahar: 15 km W Girishk, 820 m, FREITAG 3700! Girishk, VOLK 1340!, 1390! 53–92 km W Kandahar, PABOT A-310!, A-291! Kandahar mountains, 10 km W, 1100 m, FREITAG 2032! Near Kandahar, Pirzada, 1000 m, KOEIE 2086! ESE Kandahar to Spin Boldak, 1020 m, PODLECH 32642-46!!, 32649!, BRECKLE 4837! Takhtapul, 45 km SE Kandahar, PODLECH 32651! 30–60 km NE Kandahar, 1200–1230 m, FREITAG 2028!, 3791! Near Lashkargah, 780 m, BRECKLE 4849!, PABOT A-411! – E: Urgun: At Gomal, VOLK 71/295! Valley above Gomal, 1850 m, FREITAG 3334! Ghorband: Ghorband valley, 10 km W Chordeh Gorband, near Farinjal, 2000 m, FREITAG 1119!; 5 km above Siagird, near Pul-e Ranyar, 1900 m, FREITAG 3934! Ghorband Valley near Burje Guljan, 1700 m, PODLECH 17054c! – C: Bamian: Kuh-e Baba, above Naiak, 2700 m, THESIGER 96! Khushky pass, GRIFF. 1823 = Herb. Late East Ind. Comp. 4213! Bamian, GRIFF. s.n.! Bamian valley, 2140–2600 m, KOEIE 3024!, NEUB. 405!, KOELZ 13928!, 13932!, VOGT 1029!, VOLK 2407! Bamian near Buddhas, 2400 m, PABOT A-1281!, PODLECH 17028! 10 km to Doab, PABOT A-675! Dragon valley (Deir Hadj), 2750 m, BRECKLE 4771!, HAYON G 10! 10 km W Bamian to Band-e Amir, 2500 m, BRECKLE A-2381! Yakawlang, 2600 m, DIETERLE 769! Lil valley, 1 km SE Yakawlang, 2600 m, DIETERLE 806!, 806a! Doab: Kunduz river valley near Eshpushta, 70 km N Doab, 1500 m, AGACHANJANC 7! Ajar valley, 5–13 km W Doab, 1500 m, RECH. 37008!, 37015! Doab, VOLK 1749! Kamard valley W Doab, 1630–2600 m, GILLI 2160!, 2161! – Afghanistan, GRIFF. 1765 = Herb. East Ind. Comp. 4711!, 1132 = Herb. East Ind. Comp. 1790!, 1803!, 1101!, 1102! AITCH. 56!

Distr. gen.: E Transcaucasia and SW Persia east to the Pamir Alaj, E Afghanistan and N part of Pakistani Baluchistan.

Highly polymorphic, depending upon growth conditions and with some regional and local genetic variation. In general, populations of higher mountain semi-deserts (Azerbaijan, Elburz Mts., Kopet Dagh, C Hindukush) are more delicate and less hairy, but almost and even completely glabrous forms also occur here and there at lower altitudes. Highly saline habitats often cause stunted growth. The shape (straight or flexuose), surface (almost smooth, scabrous or even branched, depending upon the length of projections), length and density of hairs on all vegetative parts and particularly on the tepals vary considerably and resulted in the splitting of *S. tomentosa* into

8 species by BOTSCHANTZEV (1968, 1980). After having investigated the types and hundreds of other specimens, they are included here within *S. tomentosa*, except *S. lachnantha*, which is indeed well separated. Likewise 3 more species recently described by BOTSCHANTZEV (1990), are considered as synonyms, although the types have not been seen.

The species not recognized here were defined by their authors as follows: *S. stellulata* – hairs of vegetative parts short, star-like branched (Kopet Dagh); *S. kopetdaghensis* (Kopet Dagh) and *S. Buhseana* (C Persia) projections longer than hair diameter, the latter with slightly different position of the wing and with longer stigmas; *S. lasiantha* and *S. Bungeana* (both from Khorasan) – tepal hairs exceeding apex, in the first species hairs flexuose, in the latter straight and more adpressed (both conditions have often been observed on the same plant!); *S. tomentosa* (s.str.) and *S. afghanica* (C Afghanistan) – tepal hairs not exceeding apex, both species differing in position of the wing and outer stigma surface (smooth vers. papillose). *S. badghysi* (S Turcomania) was based on shorter (up to 1,5 mm) long hairs on leaves, bracts and bracteoles, *S. glabella* (E Kopet Dagh, Afghanistan) on still shorter and deciduous hairs, and *S. Kurbanovii* (E Kopet Dagh, Afghanistan) on the upper bracteoles being shorter than tepals.

By using such variable characters, the number of "species" in *S. tomentosa* could easily be doubled. Indeed, some of the variants show geographical patterns, in particular the density, length and surface of hairs on tepals and bracteoles, but they intergrade continuously. For instance, populations with a longer indumentum on these organs (*S. Bungeana*, *S. lasiantha*) are restricted to the hot deserts south of a line Kashan-Sabzevar-Farah-Kandahar. But numerous intermediates exist on both sides of this line and many specimens collected from C Persia and even from lower altitudes in SE Persia correspond to normal *S. tomentosa*, or are intermediate. Extremely long, flexuose and sometimes almost smooth hairs occur in specimens from the lowlands of S Persia (Fars to Bander Abbas) and SW Afghanistan. They also approach *S. lachnantha* in the tendency to produce highly condensed lateral spikes and are perhaps caused by introgression.

41. ***S. lachnantha*** (BOTSCH.) BOTSCH., Nov. Syst. Pl. Vasc. 17: 124 (1980).

Syn.: *S. tomentosa* (MOQ.) SPACH subsp. *lachnantha* BOTSCH., Bot. Zhurn. 53: 1448 (1968). *S. canescens* sensu AELLEN in RECH. f., Fl. Lowl. Iraq: 202 (1964), non (MOQ.) BOISS.

Icon.: Tab. 139.

Type: W Persia (Khuzistan), "in arenosis Seytun (Zeydun)!", VI.1868, H. C. HAUSSKNECHT 11, holotype LE!; isotypes G!, JE!, K!, P (2x)!

Dwarf shrub, 10–35 × 10–30 cm, grey, in young stage brownish with 0,2–0,4 mm long stiff, spreading, straight or ± flexuose, spinulose hairs, interspersed with less numerous 3–7 mm long stiff, spreading, straight, bristle-like, scabrous hairs, the latter usually absent from upper parts of plant. Stem up to 15 mm thick, branched from base; woody branches ascending or prostrate. Annual shoots numerous, erect, rigid, arising from often gemma-like buds with short, woolly leaves, in lower 1/3 leafy, sometimes with rosulate axillary leaves, in upper part branched, laterals of last order very numerous, forming ovoid spikes of c. 5 × 3 mm, densely packed in white wool and consisting of 2–4 flowers with bracts and bracteoles. Leaves alternate, in lower part 20–10 × 1,5–1 mm, semi-terete, higher up shorter to 2,5 mm, densely hairy, linear to almost subulate, with obtuse apex, base slightly sheathing. Bracts leaf-like, 6–4 × 1,5–1 mm, white with wool-like, flexuose, delicately denticulate hairs interwoven with those of the bracteoles and bracts, always longer than bracteoles. Bracteoles 3,5–2 x 1,5–1 mm, ± ovate in outline, cucullate, blade absent or very short, densely woolly, about as long as tepals. Tepals narrow ovate, 3–3,5 mm long, the outer 1–1,3 mm wide, all 1-veined, apex obtuse or indistinctly lobed, hidden by very long, ascending, curled, smooth or denticulate hairs covering the upper 2/3 of the back, without a horizontal line. Anthers with appendage 2,1–3 mm long, divided up to the appendage; appendage separated from thecae, 0,9–1,2 mm long, at base 0,2–0,25 mm wide, narrow triangular, acute; disc thin, with low, papillose interstaminal lobes. Ovary obovoid; style 1,2–2 mm; stigmas 2, 0,6–0,9 mm long, flat, apex dentate. Fruiting perianth without wings, widened around the utricle and constricted at its top. Seed 1,2–1,5 mm diam., vertical. Fruiting spikes deciduous.

Hab.: On very dry, highly eroded semi-desertic slopes in gypsiferous marl; 0–300(–500) m. – Fl. VI.–IX, fr. X–XI.

I r a q : Kurd.: Sul.: Sulaymaniyah, roadside, 28.X.1972, FAWZI!
P e r s i a : W: Khuz: SE Shushtar, PABOT 2523! 15–19 km SE Shushtar, 200 m, PABOT 243!, 2060! 87 km E Ahvaz, PABOT 834! 4 km NW Agha-Jari, PABOT 630! 15 km W Behbehan, PABOT 1057! Near Cham-e Zeydun (Seytun) and Behbehan, HAUSSKN. 11!, 20! – S: Fars.: 124,7 km SE Jahrom, 129 m, PABOT 6382! – (To be expected in Ilam and in SW Kermanshah).

Distr. gen.: Restricted to the region from northernmost Arabia and W Iraq to SW Persia.

This is very similar to the widespread *S. tomentosa* and both species meet in S Fars. It differs in tepal structure (strictly 1-veined, lack of horizontal line, absence of wings), embryo position (always vertical) and in the very uniform ovoid spikes which with their dense wool, favouring seed dispersal. In spike structure and embryo position it is close to *S. gossypina*.

42. *S.* ***rubescens*** FRANCH. in RÉVOIL, Faune Fl. Çomalis: 60 (1882).
Syn.: *S. hadramautica* BAKER, Kew Bull. (93): 340 (1894).
Icon.: Tab. 140.
Type: Pays de Çomalis (Somalia, Bari prov.), Binder Gasem (Bandar Qasem), Medjourtines, 22.VII.1881, G. RÉVOIL no. 118, holotype P!

Dwarf shrub, 5–25 x 10–30 cm, grey to whitish with a very dense indumentum of 0,2–0,3(–0,4) mm long, stiff, straight or flexuose, spinulose hairs, spreading on the axes, adpressed on leaves and bracts. Stem up to 7 cm thick, branched from base, usually very short; woody branches ascending or prostrate. Annual shoots erect or ascending, leaf axils in lower part with condensed vegetative branches, higher up with condensed few-flowered spikes; in dry condition very fragile. Leaves distichous, 8–5 x 2–1 mm, semi-terete, half-clasping with broad, slightly sheathing, 2,5–1,5 mm high base, apex concealed by indumentum, leaves on side branches 5–3 mm long, often laterally flattened and somewhat keeled. Bracts similar to leaves of lateral shoots, strictly distichous, 4–2,5 x 2,5–2 mm, ovate in outline, about as long as the bracteoles and 0,5–2 mm shorter than tepals. Bracteoles 3,5–1,5 x 1,5 mm, keeled, slightly cucullate. Tepals narrow ovate, 2,5–3,5 mm long, the outer 1,3–1,5 mm wide, 2–3-veined, apex obtuse, lobed or subacute, transverse line at 1/4–1/3, above pilose with 0,5–1 mm long flexuose (in lower part) and straight (in upper part) hairs exceeding the apex. Anthers with appendages 2,2–3 mm long, divided up to the appendage; appendage separated from thecae, 0,8–1,3 mm long, at base 0,3–0,4 mm wide, narrow triangular, acute; disc thin, glabrous, almost unlobed. Ovary subglobular; style 1–1,3 mm long; stigmas 2, 0,7–1,2 mm long, flat. Fruiting perianth 7–11 mm diam., in young stage sometimes orange to reddish, later pale brown; tepals above the wings forming a flat, dome-like cone, loosely covered by persistent hairs. Seed 1,3–1,6 mm diam., horizontal.

Hab.: C Makran in Pakistan Baluchistan: in moderate semi-desert communities with *Agathophora alopecuroides*, *Salsola makranica* and *Zygophyllum tetrapterum*, and in more extreme semi-deserts with *Salsola cyclophylla* and *Anabasis setifera*, on gravelly slopes, in ravines and dry wadi beds; 950–1100 m. – Fl. IX.–X, fr. XI.–XII.

Pakistan: Bal.: N Makran: 40 km WNW Panjgur at new road to Palantak, near small pass, 1100 m, FREITAG & KOTHE 18679! 80 km NW Panjgur, plateau N Koh-e Sabz, 950 m, FREITAG & KOTHE 18683! 20 km WSW Panjgur, near road to Hoshab, 970 m, FREITAG & KOTHE 18620! Near Panjgur, 900 m, POPOV 145!

Distr. gen.: Scattered from N Somalia around the S and SE fringe of the Arabian peninsula (S Yemen, Dhofar, Muscat, Abu Dhabi) to Pakistan.

The recent discovery of this S Arabian species in C Makran (FREITAG 1992) was a surprise, as the nearest, disjunct, localities are in Muscat and Abu Dhabi, where it also reaches up to 1000 m. A similar distributional gap exists in *Agathophora alopecuroides*, and around Panjgur both species often grow together. The species looks somewhat like *S. tomentosa*, but differs by the distichous leaves and the highly condensed lateral shoots, furthermore by longer anthers, appendages, styles, and the very dense, adpressed leaf indumentum which resembles that of *S. cyclophylla*. The Makran specimens agree in all respects with most plants seen from the Arabian peninsula and even from Somalia.

43. ***S. brachiata*** PALL., Illustr. Pl.: 30 (1803).
Syn.: *Halimocnemis brachiata* (PALL.) RUPR., Mém. Acad. Imp. Sc. Pétersb. 7 sér., 14, 4: 71 (1869). *Salsola Pallasiana* VEST in ROEMER & SCHULTES, Syst. Veg. 6: 240 (1820). *Halimocnemis Rezniczenkoana* LITW., Trav. Mus. Bot. Acad. Sc. Imp. Pétersb. (Trudy Bot. Muz. Imp. Akad. Nauk) 7: 79 (1910). *H. tianschanica* LITW., l.c.: 80 (1910). *Climacoptera brachiata* (PALL.) BOTSCH. in Sborn. Posv. Akad. Sukachevu: 114 (1956).
Icon.: PALLAS, Illustr. Pl.: tab. 22 (1803). -- Tab. 141.
Type: (Russia, N Caspian lowlands): "In siccis squalidis salsis deserti australioris circa Volgum frequens," P.S. PALLAS, lectotype LE!; syntypes: Habitat in Siberia, PALL., LIV!, ex regno Kirgisie, PALL., M!; cf. PRATOV, Rod Climacoptera BOTSCH.: 25 (1986).

Annual, 5–35 x 5–20 cm, erect; densely hairy with 0,2–0,4 mm long ascending to semi-adpressed, spinulose hairs, interspersed with 1,5–3 mm long, spreading, smooth, bristle-like hairs. Stem with conspicuously long internodes and candelabralike branching from base; branches ascending, terminating in ± verticillate spikes. Leaves opposite, 15–20 x 1–2,5 mm, semi-terete or almost terete, linear, with a 0,2–0,5 mm long cartilaginous mucro, at base connate with sheathing hyaline margins. Bracts opposite, only the uppermost sometimes alternate, leaf-like, recurved, 10–6 x 2–1 mm, with an up to 3 mm wide sheathing base. Bracteoles 7–4 x 1–1,5 mm, usually as long as tepals, for 2/3–4/5 with wide hyaline margins, only in upper 2/3–1/2 green, often terminating in 1 or few long bristle-like hairs. Tepals narrow lanceolate, 3,5–4,5 mm long, the outer 0,7–1 mm wide, all 1-veined or the outermost up to 3-veined, the back densely covered with 0,05–0,15 mm long hairs, margins hyaline, glabrous, the apex mucronate, acuminate or obtuse. Anthers without appendage 0,5–1 mm x 0,25–0,3 mm, divided for 1/3–2/5, linear, usually exserted; appendage separated from thecae, ± spathulate, obtuse, 0,25–0,5 x 0,1–0,2 mm; disc narrow, thin, glabrous, indistinctly lobed. Ovary ± ovoid, vertically flattened; style 0,3–0,6 mm; stigmas 1,5–2,5 mm long, subulate. Fruiting perianth 7–12 mm diam., wings in young stage often pinkish, later pale to dark brown; tepals above the wings forming a 2,5–3,5 mm high, stiff cone or a cylinder with longitudinal slits towards the apex; below the wings forming a coriaceous, 2,5–3 mm high cup. Seed 1,5–2,5 mm diam., horizontal, vertical or oblique, brown or greenish.

Hab.: Locally common on eroded slopes in weak saline sedimentary rocks, usually in open communities dominated by annual chenopods, often with *Petrosimonia brachiata, Gamanthus commixtus, Girgensohnia oppositifolia, Halogeton glomeratus*, or *Seidlitzia florida*; 1200–2500 m. – Fl. VIII–IX, fr. IX–X.

P e r s i a : N: Maz.: Mohammad Reza Shah Prot. Reg.: Jangal-e Golestan, Dasht-e Almeh, 1380–1450 m, TERME & MATINE 35105-E! – W: Azerb.: 31,5–56 km NE Tabriz, at road to Ahar, 1480–1500 m, PABOT 5254!, 5278! Shindawur near Tabriz, 1.X.1884, KNAPP! Near Tabriz, GILL.-SM. 1315! – E: Khor.: 125–130 km W Bojnurd, between Dasht and Loveh, 1200 m, RECH. 37621! – C: Tehr.: Near Tehran, 1858–59, BUNGE! – Persia, AUCH.!, JENISCH!
T u r c o m a n i a : Ashkhabad, 8.VIII.1900, SINT.! Suluklü (Saratovka), SINT. 1087! Near Chuli, LITW. 348! Between Vannovskoje and Chuli, LITW. 435!
A f g h a n i s t a n : C: Bamian: Bamian valley, 2590 m, JÖRGENSEN 671!, NEUB. 396!, PELT B5!, VOGT 1042!, VOLK 2245! Citadel, FREITAG 3948! Shar-e Gulgola, 2550 m, GILLI 2165!, 2166!, NEUB. 4462!; 2400 m, PODLECH 16852! Near Gul-Gul (Gulgola ?), RODIN 110!, 111! Dragon Valley W Bamian, 2600–2750 m, BRECKLE A-855!, A-856!, 4753!, 4772!, 7076!; VIII. 1969, HAYON! 6 km W Bamian, FOHLEN & YOUNOS 2h!, 3f! Doab: Doab, VOLK 2671! – Afghanistan, GRIFF. Journ. 1789 = Herb. East Ind. Comp. 4215!

Distr. gen.: Crimea to W Sibiria and Mongolia; from Transcaucasia south into the mountain deserts of NW Persia, and from the Transcaspian lowlands into Kopet Dagh, Khorasan and C Afghanistan.

Varying much in growth form, caused by the degree of branching (sometimes absent in poor specimens), the length of internodes, leaf succulence and in colour (from yellowish green to purple). Some variation has been observed in tepal structure (some specimens have less stiff tepal apices), embryo position (so far only the vertical position has been recorded), and anther size (in the type only 0,5–0,6 mm long). However, at least in NW Persia, individuals agreeing completely with the type collections have been found, and the investigation of more material from the type area has yielded individuals with horizontal seeds, e.g. ILJIN & GRIGORIEV 1726 from near Astrakhan.

Sometimes *S. brachiata* has been found mixed with, and mistaken for, the superficially similar *Petrosimonia brachiata* and *Seidlitzia florida*. However, the long articulate hairs are highly distinctive. *Seidlitzia* is completely glabrous, and *Petrosimonia* is characterized by an indumentum of at least some 2-branched hairs. ILJIN placed the species in his monotypic section *Heterotricha*, and BOTSCHANTZEV and PRATOV transferred both to their genus *Climacoptera* (see p. 245). However, the flattened appendages, hair types, disc structure and leaf base characters militate against this classification, but are in accordance with sect. *Belanthera*, despite the comparatively small obtuse anther appendages.

44. *S.* ***gossypina*** BUNGE in BOISS., Fl. Or. 4: 956 (1879).
Syn.: *S. murgabica* BOTSCH., Bot. Zhurn. 75: 240 (1990).
Icon.: KOMAR., Fl. URSS 6: tab. 12, fig. 1 (1936). NIKITIN & GELDIKHANOV, Opred. Rast. Turkmen.: tab. 36, fig. 7 (1988). – Fig. 5-D; Tab. 142.
Type: (Persia) "Auf salzigem Boden zwischen den Bergen östlich von Mesched auf dem Wege von Tabat-Kuhi (near Ahmadabad) nach Föhs", 27.VII.1858, A. VON BUNGE 556, holotype P!, isotypes G (3x)!, K!, LE (2x)!

Annual, 10–35(–45) x 10–30 cm, erect; the whole plant or at least the spikes densely covered by white wool. Hairs in lower parts 5–7 mm long, spreading, densely interwoven, in upper parts shorter, distinctly articulate, denticulate; stems, leaves and bracts ± glabrescent. Main stem regularly branched from base, with ascending, later often recurved branches, these again regularly branched, each branch of 2nd order consisting of a woolly ovoid to short cylindrical spike; spikes 5–15 x 5–8 mm, dense, few-flowered, only the lowermost sometimes up to 6 cm long, loose. Leaves alternate, 15–5 mm long, near base 1,5–1,2 mm wide, the lowermost linear, the upper narrow triangular, semi-terete, at base slightly widened. Bracts leaf-like, 9–5 mm long, at base 2–2,5 mm wide with sheathing hyaline margins, longer than bracteoles. Bracteoles similar to bracts, with shorter blade, 6–3 mm long, longer than tepals. Tepals narrow lanceolate, 3,3–2,5 mm long, the outer 1,2–1,4 mm wide, 3–5-veined, apex obtuse or slightly lobed, hidden by dense and long semi-adpressed curled hairs, transverse line at 1/3–2/5. Anthers with appendages in cleistogamous flowers 1,3–1,5 x 0,2–0,3 mm, in others 2–2,3 mm long, divided to the appendage; appendage separated, 0,5–0,9 mm long, at base 0,2–0,25 mm wide, narrow triangular, acute; disc low, thick, with short, densely papillose lobes. Ovary subglobular to obovoid; style 0,4–0,5 x 0,3 mm; stigmas 2, 1,2–1,5 mm long, from the 0,2 mm wide base gradually tapering. Fruiting perianth 8–10 mm diam., ± smoke-coloured; tepals above the wings first incurved and forming a flat ring, the upper parts erect, forming an open cylinder or a very steep cone. Seed 2–2,5 mm diam., vertical or oblique.

Hab.: A rather rare species of the northern semi-deserts on sometimes moderately saline silty and sandy soils, predominantly in *Artemisia* communities (*A. turanica*, *A. scoparia*, *A. prasina*), higher up in *Pistacia vera* areas on open, eroded slopes; 280–600(–750) m. – Fl. VII–IX, fr. X–XI.

P e r s i a : E: Khor.: 6 km NW Salehabad, 700 m, RECH. 55776! Between Mashhad and Sarakhs, 600 m, SERAJ in PABOT 5060! 1,5–18 km W Sarakhs, ALAVA 11042!, IRANSHAHR 30400-E!, STUTZ 634! Between the mountains E Mashhad, BUNGE 56! Hari Rud valley, Guljardsha near Zurabad, CZERNJAK. 187! – C: Damgh.-Semn.: 15–25 km from Semnan to Firuzkuh, 1400 m, HDG. & WDB. W-14742!
T u r c o m a n i a : Ashkhabad: Ashkhabad, VIII. 1900, SINT.!, LITW. 30!, 229!, 331!, 332!; 350–500 m, 14. and 27.IX.1976, VASAK! Staraja Nessa, 350 m, 15.IX.1976, VASAK! Germab, above Skobelevka, ILJIN 790!, SINT. 1213!, Mts. near Mekrova, SINT. 1233! Kizyl Arvat, Kara Kala: at base of Sundsodagh, SINT. 2196! Near Nere, SINT. 2191a! Kopet Dagh, SINT. 2191b! Near Bredgori, ILJIN 874! Between Vannovski and Chuli, LITW. 333!
A f g h a n i s t a n : N: Mazar-i Sharif: Akupruk, 1520 m, KOELZ 13971! Shibarghan: 30 km S Aqcha, Ali Moghul, 440 m, BRECKLE 4703! Andkhui, NEUB. 187! – NW: Herat: Between Herat and Qisil Eslam Qaleh, RECH. 32509! Bala Murghab: 24 km S Bala Murghab near Sakhra-Arab Majnun, 530 m, PODLECH 16958 (type of *S. murgabica*)! 55 km S Bala Murghab, Darrah-e Bum, S Samira, 720–750 m, FREITAG 6778!, PODLECH 22120! Badghis: Langar, N Qades (Kadis), 1250 m, NEUB. 291! – "Kuteh Gundava", GRIFF. 1001!, 1187!, 1803!

Distr. gen.: Caspian lowlands east to the Kisyl-Kum and south to NE Persia and NW Afghanistan.

Because of the peculiar woolly habit, young individuals superficially resemble *Bassia eriophora* which differs in much wider and less succulent leaves. Older plants with the dense wool restricted to the short condensed spikes look much like *Halocharis* till the wings develop, but the long terminal bristles at the leaf apex, so typical for *Halocharis*, are absent.

A few specimens, e.g. RECH. 55776, differ by much sparser and shorter hairs. The type of *S. murgabica* consists of robust upper parts of a *S. gossypina* plant.

45. ***S. Vvedenskyi*** ILJIN & M. POP. in KOMAR., Fl. URSS 6: 876 (1936).
Icon.: KOMAR., Fl. URSS 6: tab. 13, fig. 3 (1936). KOROV., Fl. Uzbek. 2: tab. 26, fig. 1. OVCZ., Fl. Tadjik. SSR 3: tab. 68, fig. 6, 7. – Tab. 143.
Type: Turkestan, Bukhara area (Tadjikistan), gravelly-loamy slopes near Kelif at the Amu Darya), 12.IX.1916, N.V. ANDROSSOV, holo- and isotype LE!!

Annual, 15–60 x 4–20 cm, erect; grey with cuticular waxes and by 2 types of stiff, persistent, spinulose, ± straight hairs: the longer less dense, 3–8 mm long, spreading, bristle-like, projections much shorter than hair diameter; the shorter very dense on all vegetative parts, 0,1–0,5 mm long, spreading and ascending, much thinner, projections longer than hair diameter. Stem richly branched from the up to 7 mm thick base, with a short terminal spike, the branches of first order ascending, the upper forming continuous, 2,5–5 cm long spikes, the others producing 1–3 mm long axillary spikes. Leaves alternate, ± incurved, linear, 35–10 x 2–1,2 mm, semi-terete, obtuse, widened at base. Bracts narrow lanceolate, 15–5 mm long, at base c. 3 mm wide, sheathing, blade ± recurved, the lower slightly exceeding, the upper shorter than bracteoles. Bracteoles ovate in outline, 10–5 mm long, with up to 5 mm wide sheathing base and recurved apex. Tepals stiff, narrow ovate, in upper part ± ligulate, 2,5–4 mm long, the outer 1,5–2 mm wide, all 1-veined or the outermost 2-veined, apex obtuse or slightly lobed, transverse line at 1/4–1/3, above densely covered with stiff, semi-adpressed to ascending hairs. Anthers with appendages 2 mm long, divided to the appendage; appendage separated from thecae, narrow triangular, 1–1,1 × 0,2–0,25 mm, acute; disc low, thick, with shortly papillose, undulate margin. Ovary obovoid; style 0,3 mm long; stigmas 2, 1,6–2 mm long, gradually tapering from the 0,3 mm wide base. Fruiting perianth 10–15 mm diam., rather stiff, brownish; tepals above the wings first evenly incurved, strongly arched, the upper parts erect, forming an open cylinder or a very steep cone. Seed 2,5–3 mm diam., horizontal.

Hab.: Scattered, but locally common on eroded marl and limestone slopes in often somewhat saline conditions, in open communities of *Anabasis turkestanica, Haloxylon Griffithii* and *Artemisia turanica*, together with numerous other annuals, like *Atriplex moneta*; 400–700 m. – Fl. VII–VIII, fr. IX–XI.

T u r c o m a n i a : Near Ashkhabad, LITW. 299!
A f g h a n i s t a n : N: Mazar-i Sharif: E Tashkurghan, hills around Shibaqli pass, 470 m, FREITAG 3865! Tang-i Tashkurghan, 620 m, FREITAG 5108! Tang-i Sayad, 570 m, FREITAG 3904! 2 km NW Ghaznigak, near the road to Haibak (Aybak), 700 m, PODLECH 17001!

Distr. gen.: Restricted to the foothills and lower mountain zone along the W and S Pamir Alaj (E Turcomania, S Uzbekistan, S Tadjikistan) and the outermost ridges of the Hindukush in N Afghanistan.

The species has a somewhat isolated position. From the two other annual species in sect. *Belanthera* it differs by being much coarser in all parts, including the hairs and, most obviously, in the bracteoles. By their size, degree of succulence and enclosure of the flower, the bracteoles approach those of more derived genera like *Halimocnemis* and *Gamanthus*. The structure of the long hairs is identical with those of *S. brachiata* and of *Halocharis*.

Sect. VIII. *Physurus* ILJIN, Fl. URSS 6: 224 (1936), descr. ross.

Syn.: *Salsola* sect. *Nitraria* ULBR. in ENGLER. & PRANTL, Natürl. Pflanzenfam., ed. 2, 16c: 564 (1934) p.p. *Climacoptera* BOTSCH., Sborn. Posv. Akad. Sukachevu: 111 (1956).

Lit.: V.P. BOTSCHANTZEV in Akademia Nauk SSSR, Akademiku V.N. Sukachevu k 75-leti so dnja rozdenija. Sbornik rabot po geobotanike, lesovedeniju, paleogeografii i floristike: Dva novykh roda iz semeistva marevykh, 108–118 (1956); ibid., Species novae e familia Chenopodiaceae, Novitates Systematicae Plantarum Vascularium (Novosti Sistematiki Vysšikh Rastenii) 19: 74–81 (1982); U. PRATOV, Rod Climacoptera Botsch., 68 p. (Tashkent 1986); all in Russian.

Annuals; in lower part villous with long, delicate, caducous, smooth hairs, in addition often with short smooth hairs, rarely glabrous. Stems whitish, for a short distance below leaves and bracts with green cortex. Leaves and bracts alternate, obtuse, with a widened, ± sheathing base, semi-terete to almost terete, highly succulent. Flowers solitary. Tepals 1–5-veined, after anthesis in upper part brown, without green blotches. Anthers linear, divided up to 1/3, partly exserted; appendage large, vesicular, distinctly stalked; filaments narrow triangular; disc absent. Stigmas subulate or linear, erect or ascending. Fruiting perianth with overlapping wings, the 2 inner much narrower; tepals above the wings forming a peculiar cap, consisting of a basal circular cushion and a central cone or funnel, the cushion separated from the wings by a cleft. Seed in a thin, membranous pericarp, usually horizontal. Plants of highly saline habitats. – Type of sect.: *S. lanata* PALL. (selected by BOTSCHANTZEV, 1956).

Circa 6 species (PRATOV l.c. listed 42!), distributed from S Russia to W China, south to Syria, Iraq, S Persia and Pakistani Baluchistan; 3 species with several subspecies occur in our area. The section is very close to (and together with *Physandra* BOTSCH., which does not occur in our area) possibly better united with *Halanthium*. Therefore it is not validated here with a latin diagnosis.

1a. Style at least 3× longer than stigmas .... 46. *S. lanata* PALL.
b. Style at most as long as stigmas or lacking 2
2a. Tepals 3–6-veined, their apical parts ± stiff, forming a cone on top of fruit .... 47. *S. crassa* M.B.
b. Tepals 1-veined, their apical parts delicate, papery, forming a corona on top of fruit .... 48. *S. maimanica* FREITAG

46. ***S. lanata*** PALL., Reise russ. Reich 2: 736 (1773).

Annual, 15–40(–50) × 20–45 cm, usually semi-globular in outline, glaucous or grey, in young stage reddish-brown and densely villous with 2 types of spreading hairs: long hairs 4–6 mm, ± loose, at least some in upper part persistent; short hairs 0,5–1,5 mm, very dense; glaucous with a thick waxy layer. Stem erect, branched from the up to 9 mm thick base; branches ascending, terminating in rather dense spikes; whitish, with narrow triangular green areas below leaves and bracts, up to 2 mm long in the lower internodes and to 4 mm higher up. Leaves spreading or recurved, 20–6 mm long, the longer ± linear, 2–3 mm wide, the others narrow triangular from a 3–5 mm wide base, beneath obtusely keeled, with a prominent white line. Bracts leaf-like, 12–5 mm long, with 4–5 mm wide sheathing base, the lower longer, the upper shorter than bracteoles. Bracteoles 8–5 mm long, at base 3,5–1,5 mm wide. Tepals narrow ovate, 4,5–7 mm long, the outer 1,5–2 mm wide, 3–6-veined, transverse line at 1/5–1/3, from there to rounded apex with ascending, stiff, 0,5–1,5 mm long hairs. Thecae 0,8–2,0 × 0,3–0,5 mm, linear, divided for 1/4–1/3; appendages globular, ellipsoid, ovoid or obovoid, 0,7–2 × 0,5–1,1 mm, yellow, usually wider than thecae and 3/4–4/3 of its length. Ovary apically distinctly narrowed; style 2,5–7 × 0,1–0,2 mm, included or to 3 mm exserted; stigmas 0,3–0,7 mm long. Fruiting perianth 12–20 mm diam., wings in young stage pink, later light brown, papery, the 2 inner spathulate; cap 3–4,5 mm high, 4–5 mm in diameter, the upper part funnel-shaped from the recurved white, papery 2–3 mm long tepal apices. Seed 2,5–3,5 mm diam., horizontal, but at first sometimes vertical.

Distr. gen. of species: SE European Russia, E Anatolia and Syria to Dsungaria in westernmost China, Kirghistan, Tadjikistan and N Afghanistan.

1a. Style 2–4 mm long, not exserted; anther appendages 0,7–1,5 mm long .... subsp. *lanata*
b. Style 5–6,5 mm long, exserted; anther appendages 2–2,5 mm long .... subsp. *longistylosa* (ILJIN) FREITAG

–– subsp. ***lanata***
Syn.: *Climacoptera lanata* (PALL.) BOTSCH., Sborn. Posv. Akad. Sukachevu: 112 (1956).
Icon.: PALL., Illustr. Pl: tab. 21 (1803). KOMAR., Fl. URSS 6: tab. 11, fig. 8 (1936). NIKITIN & GELDIKHANOV: Opred. Rast. Turkmen.: tab. 36, fig. 10 (1988).
Type: (Russia, N Caspian lowlands) c. Saratschik, 18.VIII.1773, SOKOLOF, holotype LE!; isotype (prob.) BM!, LIV!

Thecae 0,8–1,5 mm long; appendages 0,7–1,5 x 0,5–1 mm; style 2–4 mm long, not exserted.

Hab.: Common on dry and on temporarily wet, moderately to strongly saline soils, usually in overgrazed semi-deserts and edges of irrigated fields, roadsides, open halophytic communities rich in chenopods on eroded marl slopes; up to 1200(–2000) m. – Fl. VII–IX, fr. IX–XI.

P e r s i a : W: Ham.: Bazerjan near Tafresh, ZARGANI 14858-E! Arak: Around Arak (Sultanabad): plain at Mt. Latetar at Emirabad, 20.VIII.1895, STR.! Distr. Japalak (Dshapelakh), a.1898, STR.! Esf.: 160 km N Esfahan, 1200 m, MALCOLM 331! At Zayandeh Rud (Sajende Rud), 29. IX.1885, STAPF! – S: Kerm.: 10–15 km S Rafsanjan, SOJÁK 130! – E: Khor.: Shur Rud valley, 11.VIII.1930/31, PREDTECHENSKIJ! 10 km to Mozhnabad (Mudjinabad), CZERNIAK. 237! Between Rui (Khvaf) and Atsetabad, BUNGE 57! Between Tayyebat and Afghan border, MARTINIC & WRABER 81! Tayyebat, RECH. 37589! Torbat-e Jam, 27.X.1858, BUNGE! Around Sarakhs, 300 m, SCHMID 6279! Between Mashhad and Sarakhs, 600 m, SERAJ in PABOT 5063!; 200 m, SERAJ in PABOT 5053! Ferdows, KOELZ 16798! Between Mozzafarabad and Anarbat, Shababad, KOELZ 16679! – C: Tehr.: Near railway-station Bahram, 20 km E Tehran, 1100 m, AELLEN 2802!, 2901!, 3002! Damgh.-Semn.: Sorkheh, SE Semnan, 1100 m, HDG., WDB. & al. 14752! Sorkheh, Chalehdan (Asadabad), 1050 m, MOUSSAVI & TEHRANI 41720-E! Kashan: Near Robat-e Tork, at spring, SOJÁK 6897!
T u r c o m a n i a : Ashkhabad: Germab, above Skobelevka, SINT. 857a!, 1216! Suluklü (Saratovka), SINT. 857b! Near Ashkhabad, LITW. 299!, 300!, 585! Annau, E Ashkhabad, 300 m, 13.IX.1976, VASAK! Near Chuli, LITW. 393!; 600 m, 12.IX.1967, REDTSCHENKO!, 650–700 m, 10.IX.1976, VASAK! Kizyl Arvat, SINT. 2037!
A f g h a n i s t a n : SW: Farah: 250 km WNW Girishk, road to Shindand, RECH. 32487! Hari Rud valley, AITCH. 719! – NE: Baghlan: Andarab valley between Khinjan and Banu, 1180–1250 m, 3.X.1924, BUKINICH! Pul-i Khumri, 800 m, AGAKHANJANC 6! – C: Bamian valley, 2530 m, VOGT 1023!

Distr. gen. of subspecies: Northern and western parts of the species area.

– – subsp. ***longistylosa*** (ILJIN) FREITAG, comb. et stat. nov.
Syn.: *S. longistylosa* ILJIN, Izv. Bot. Sada Akad. Nauk SSSR 30: 747 (1932). *Climacoptera longistylosa* (ILJIN) BOTSCH., Sborn. Posv. Akad. Sukachevu: 112 (1956).
Icon.: KOMAR., Fl. URSS 6: tab. 12, fig. 9 (1936). PAVL., Fl. Kazakhst. 3: tab. 27, fig. 3 (1960). OVCZ., Fl. Tadjik. SSR 3: tab. 69, fig. 1–5 (1968). – Tab. 144.
Type of subspecies: (Tadjikistan?): Golodnaja Step', 25–30 verst (27–32 km) from railway stat. Golodn. Step'., 4.X.1910, DIMO 9, holotype LE!

Thecae 1,5–3 mm long; appendages 2–2,5 mm long; style thread-like, 5–6,5 mm long, c. 2–3 mm exserted.

Hab.: As subsp. *lanata*, often with *Goebelia pachycarpa, Haloxylon Griffithii, Artemisia turanica, Salsola gemmascens, S. turkestanica, S. Vvedenskyi, Girgensohnia oppositifolia* etc.; 300–600(–1200) m. – Fl. VII–IX, fr. IX–XI.

Afghanistan: N: Mazar-i Sharif: Tashkurghan, 365 m, KOELZ 13186! 25–27 km E Mazar-i Sharif, at road to Tashkurghan, 400 m, PODLECH 16987!, 25.X.1958, PABOT! 5 km W Tashkurghan, at road to Mazar-i Sharif, 390 m, PODLECH 16990! Hills around Shibaghlu pass, E Tashkurghan, 470 m, FREITAG 3870! 70 km E Shibarghan on road to Mazar-i Sharif, PABOT A1568! 15 km N of road Mazar-i Sharif to Tashkurghan, at road to Termez, 320 m, PODLECH 32699! 2 km S Tashkurghan, road to Haibak, 410 m, PODLECH 16992! Between Akcha and Mazar-i Sharif, NEUB. 193!, 195! Between Akcha and Shibarghan, JÖRGENSEN GB 973–120!, 23.V.1956, AMSEL! 50 km NW Balkh, 15 km S Islam Chomgar, 310 m, BRECKLE 4677! Near Andkhui, NEUB. 185!, 566! - NW: Herat: Badghis: Langar N Qades, 1250 m, NEUB. 393!

Distr. gen. of subspecies: Restricted to semi-deserts from E Turcomania to S Kazakhstan and Kirghistan; southwards to the foothills of the Hindukush and Paropamisus in N Afghanistan.

In vegetative characters, both subspecies are identical. Transitional forms in size of style, anthers and appendages have been seen from the Kopet Dagh (SINT. 1216!, LITW. 393!), Turkmenian Badghys and from Sarakhs in NE Persia (PABOT 5053!).

47. *S.* ***crassa*** M.B., Mém. Soc. Imp. Nat. Mosc. 1: 137 (1806).

Annual, 10–60 × 20–30 cm, outline hemispherical, green, glaucous with a thick waxy layer, or grey, young plants at least in lower part often white with an arachnoid indumentum, adult plants glabrescent, rarely glabrous; long hairs 2–4 mm, very delicate, usually densely interwoven, short hairs 0,2–0,4 mm. Main stem erect or ascending, branched from the up to 10 mm thick base; branches usually ascending, terminating in dense spikes, green areas below leaves and bracts up to 2 mm long in lower part and 3–4 mm higher up. Leaves spreading or recurved, 20–5 mm long, the longer ± linear, 3–1,5 mm wide, the others triangular from a 4–3 mm wide base, beneath obtusely keeled, with prominent white line. Bracts leaf-like, 15–5 mm long, with a 5–4 mm wide sheathing base, the lower longer, the upper as long as or shorter than bracteoles. Bracteoles 7–4 mm long, at base 4–2,5 mm wide. Tepals narrow ovate, 4–6 mm long, the outer 1,5–2 mm wide, 3–5-veined, transverse line at 1/5–1/4, from there to the obtuse or acutish apex pilose throughout or in lower part only with 0,2–0,4 mm long hairs or glabrous. Anthers 1–3 x 0,3–0,5 mm, linear, divided for 1/5–1/3, partly exserted; appendages globular, ellipsoid, ovoid, obovoid or shortly cylindrical, 0,5–1,5 x 0,3–0,6 mm, usually about as wide as anther and 1/4–2/3 of its length, yellow. Ovary at apex not distinctly narrowed; style up to 1 mm long, 0,3–0,5 mm thick; stigmas thread-like, 1,5–4 mm long, included or up to 1,5 mm exserted. Fruiting perianth 12–20 mm diam., wings initially often pink, later light or dark brown, the 2 inner spathulate to linear, 1–3 mm wide, sometimes shorter; cap 2,5–4 mm high, 4–5 mm in diameter, the upper part forming a steep cone, an open cylinder or a narrow funnel, tepals stiff and brown up to the apex or apical part papery. Seed 2,5–3 mm diam., usually horizontal, but at first often vertical.

Distr. gen. of species: S Ukraine, C Anatolia and Syria east to westernmost China, N and SE Afghanistan, and N Pakistani Baluchistan.

1a. Style 1–1,3 mm long, ± equal to stigmas .... subsp. *crassa*
b. Style to 0,5 mm long or lacking; stigmas at least 1,5 mm long 2
2a. Stigmas 1,5–3 mm long, included ...... subsp. *turcomanica* (LITW.) FREITAG
b. Stigmas 3–4 mm long, exserted ..... subsp. *longipistillata* (BOTSCH.) FREITAG

– – subsp. ***crassa***

Syn.: *Climacoptera crassa* (M.B.) BOTSCH., Sborn. Posv. Akad. Sukachevu: 112 (1956). *Salsola rosacea* M.B., Beschr. Länder, app.: 143 (1800). *S. rosacea* PALL., Illustr. Pl.: 26 (1803), p.p.; ibid. PALL., l.c. (1803) p.p. (non *S. rosacea* L.).

Icon.: PALL., l.c.: tab. 18 (1803) sub *S. rosacea*. GROSSH., Fl. Kavk. 3: tab. 15, fig. 2 (1945). KARJAGIN, Fl. Azerb. 3: tab. 21, fig. 1 (1952). TAKHT., Fl. Armen. 2: tab. 107 (1956).– Fig. 4-F.

Type: "In planitiebus salsis Caucasico-Caspicis et Wolgico-Uralensibus", F.A. MARSCHALL VON BIEBERSTEIN, several syntypes LE!, isosyntypes B-WILLD!, H!

Style 1–1,3 mm long; stigmas 1–1,5 mm long, included.

Hab.: Common and gregarious on moderately and strongly saline and temporarily wet clayey soils in drier salt-marsh communities, usually with *Kalidium caspicum* and *Salsola verrucosa* (in Russian Azerbaijan).

Persia: The subspecies has not yet been seen in collections from our area, but as it is most common in the Transcaspian semi-desert plains and reported from many places near the mouth of the Kura river and the Aras valley, it should occur on the Persian side of the Moghan steppe in Azerbaijan, and the Aras valley opposite Nakhichevan.

Distr. gen. of subspecies: northwest and northern part of the species area, e.g. Anatolia, Transcaucasia, and the northern semi-desert belt from Ukraine through the north Caspian lowlands to W China.

-- – subsp. ***turcomanica*** (LITW.) FREITAG, comb. et stat. nov.
Syn.: *S. turcomanica* LITW. in Sched. Herb. Fl. Ross. 2: no. 230 (1900). *Climacoptera turcomanica* (LITW.) BOTSCH., Sborn. Posv. Akad. Sukachevu: 112 (1956). *Salsola crassa* var. *subglabra* C.A. MEY. in EICHW., Pl. Casp.-Cauc.: 35 (1833). *Halanthium Lipskyi* PAULSEN, Vidensk. Meddel. Dansk Naturhist. Foren. Kjöbenhavn, Ser. 6, 5: 203 (1903). *Salsola ferganica* DROB., Trudy Bot. Muz. Akad. Nauk 16: 141 (1916). *Climacoptera ferganica* (DROB.) BOTSCH., l.c.: 112 (1956). *Salsola transoxana* ILJIN, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1: 127 (1936). *Climacoptera transoxana* (ILJIN) BOTSCH., l.c.: 112 (1956). *Cl. glaberrima* BOTSCH., Nov. Syst. Pl. Vasc. 19: 75 (1982). *Cl. iraqensis* BOTSCH., l.c. 19: 76 (1982). *Cl. khalisica* BOTSCH., l.c. 19: 78 (1982). *Cl. chorassanica* PRATOV, Bot. Zhurn. 70: 681 (1985). *Cl. Botschantzevii* PRATOV, l.c. 70: 683 (1985).
Icon.: OVCZ., Fl. Tadjik. SSR 3: Tab. 69, fig. 6–9, sub *Climacoptera turcomanica*; tab. 66, fig. 5–10, sub *Cl. transoxana* subsp. *vachschii* (1968). GHAHREMAN, Fl. Iran 4: no. 469 (1984), sub *S. crassa*. – Fig. 5-E, I; Tab. 145.
Type of subspecies: Transcaspia (Turcomania): "In deserto argilloso subsalso pr. Ashkhabad, 23. IX.1898, D.I. LITWINOW, Herb. Fl. Ross. 230, holotype LE!; isotypes C!, H!, LE!, WU!

Style 0–0,5 mm long; stigmas 1,5–3 mm long, included.

Hab.: Very common and gregarious on strongly and moderately saline, temporarily wet or moist clay or marl, mostly in salt-marshes with *Halocnemum* and *Seidlitzia rosmarinus*, but also in drier *Tamarix* thickets, on almost barren takyr plains and on strongly eroded marl slopes, furthermore along ditches and at the edge of irrigated fields; up to 2000 m. – Fl. VII–IX, fr. IX–XI.

Persia: N: Gorg.: Near Ghara Gol, between Tappeh-ye Moraveh and Holtan, in hills, 170–220 m, HEWER 4046!, 4060! 4065! 5 km E Tappeh-ye Moraveh Tappeh, 220 m, HEWER 4068 (type of *Climacoptera glaberrima*)! Tangeli, 52 km N Pahlavi Dezh, HEWER 4045! 40–52 km N and 15 km N Pahlavi Dezh, –29 m below sea-level, BRECKLE & BHADRESA 5249B!, DREA & O'CONNELL 183!, 188!, 189! Gorgan (Asterabad) Region, NIKOLSKIJ! – W: Azerb.: 31,5–61,5 km NE Tabriz to Ahar, 1400–1500 m, MALCOLM 310!, PABOT 5243!, 5274!, 5275! Komur Chay valley, to Evli (Uli), 17.IX.1856, SEIDL.! Salt mine Uli, 17.IX.1856, SEIDL.! Near Tabriz, STARM. 61!; 1350 m, AELLEN & BEHB. 2940!, 2949!, BAUM 65–1024! 27 km W Marand, 1070 m, PABOT 5335!, 5336! 40 km SE Khvoy on road to Tabriz, MALCOLM 287! Marand to Khvoy, ABAI & MODJIB 30427-E! NE side Lake Rezaiyeh (Urmia, Orumiyeh), at Sharaf Khaneh, 1220 m, AELLEN & BEHB. 2936!, 4300!, BEHB. & AELLEN 30199-E!, 30171-E! 10 km S Ilkhchi, 1280 m, WDB. & SHIRDELPUR 14938!, 14939! Near Shendabad (Shindawur), 1.X.1884, KNAPP! Between Bonab and Khanian, RECH. 14766-a! 7 km NW Bonab to lake, 1350 m, RECH. 43156! Near Bonab, 1220 m, AELLEN & BEHB. 2957!, 3148!, 3.X.1856, SEIDL.! E bank of lake Rezaiyeh (Urmia, Orumiyeh) 1220 m, STARM. 47!; 1260 m, WARREN 55! At Sholduq, 7.X.1856, SEIDL.! SE side of lake, 1280 m, WDB. & SHIRDELPUR 14951! S bank of lake Rezaiyeh (Orumiyeh), 7.X.1856, SEIDL.! W side of lake at Gurmeh-Khaneh (Golmankhaneh), 1220 m, AELLEN & BEHB. 3008!, 3009!, 3016!, 3059!, BEHB. & AELLEN 30145-E! Lake Rezaiyeh (Orumiyeh), 7.X.1856, SEIDL.! Near Bandar Danalu, STARM. 75! Between Emirabad and Goutsch Bulagh, 5.X.1856, SEIDL.! Near Evogin (?Evowghli), 12.XI.1941, ULJANISHCHEV! Ham.: Aq Bolagh, 100 km N Hamadan, 2000 m, RIOUX & GOLV. in PABOT AB-109! Esf.: Shahreza, SAFAVI 40084-E! Arak: Near Teramis, 12 km E Arak, STR. 296! Teramis, shore of lake, STR. 345! 41 km E Esfahan to Na'in, 1400 m, MALCOLM 340! Zayendeh Rud (Sagende Rud), STAPF 781! Arak, 25.X.1892, STR.!, a.1898, STR.!, X.1910 STR.! Vismeh (Wisme), 23.X.1908, STR.! Khuz.: 30 km S Ahvaz, PABOT 2590! – S: Fars: At Pol-e Fasa river, 18 km SE Shiraz, 1600 m, GRANT 16799! Between Gachi and Fenundok (Fengunek ?), STAPF 2275! Maharlu-lake (Mahluja-lake) 1600 m, 11.X.1892, BORNM.! Between Neyriz and Shiraz, 1600 m, BORNM. 4189! Bakhtegan lake, 5.X.1892, BORNM.!, MIRZ. 899-E!; E bank, 1400 m, STARM. 23!; N bank, 1400 m, STARM. 34! Near Kerameh, 1570 m, FOROUGHI & ASSADI 15020!, 15031! E of Ganaveh, 20 m, BOKHARI & al. 14797! Kerm.: Between Kerman and Neyriz, at Kheyrabad, 2000 m, BORNM. 4188! S Kerman, road from Baft, 1700 m, DADASHZADEH in PABOT DK-223! Kuh-e Jupar, 1780 m, 4.VIII.1973, KUHLE! N Kerman, road from Zarand, Amirabad Kavir, 27.VI.1960, DADASHZADEH in PABOT! Bal.: Makran: Kuhak, 30 km E Zaboli, PETTER 43! Saravan, 1460 m, LACE s.n.! – E: Sistan: Deh Haj near Nasirabad, HENDERSON 5507! Between Qal-e Nau and Khodjiahmad, near Helmand, CZERNIAK. 333! Khor.: Kavir-e Lut, Shahdad to Birjand, 15–28 km SE Fedeshk, 920–970 m, TERME & MOUSSAVI 34394-E!, 34395-E! Gul near Birjand, VI.1943, SHCHERBINOVSKIJ! 43 km SW Ferdows, 1250 m, REJAMAND & ARAZM 32533! NW Ferdows and Robat-e Shur, 1200 m, REJAMAND & ARAZM 32468! Rud Shur, 12 km from Mudzhnabad [Mozhnabad], CZERNIAK. 240 (type of *Climacoptera chorassanica*)! 60 km NE Bonabad [Juymand], 1300 m, REJAMAND & ARAZM 32488! 87 km from Kashmar to Sabzevar, 1100 m, FOROUGHI 10588! Between Sabzevar and Kashmar, 1000 m, REJAMAND & ARAZM 32604! Anabat near Mozaffarabad, 900 m, FOROUGHI 10607! Sarakhs, 5.XI.1956, PETTER! Mashhad, to Quchan, 1820 m, DREA 138! 5 km S Sabzevar, 940 m, REJAMAND & ARAZM 32463!, 32541!, 32546! 44 km W Sabzevar to Shahrud, 13.VII.1965, SERAJ in PABOT! Sadrabad between Sabzevar and Shahrud, 800 m, FOROUGHI 10608! Between Dasht and Loveh, 1200 m, RECH. 37607! – C: Tehr.: Near Shimran (Tschemerin), 27.VIII.1882, PICHLER! Between Dudak [Dow Dehak] and Robat-e Tork, ALEXEENKO 646! Between Saveh and Haweh [?Aveh], ALEXEENKO 607 (type of *Climacoptera Botschantzevii*)! Distr. Japalak (Dshapelakh), V.1898, STR.! 5–15 km E Garmsar to Semnan, 900–1000 m, HDG, WDB. & al. 14767!, FREITAG 14201! 5 km W Garmsar, 950–1000 m, BRECKLE & BHADRESA 5026!, HDG., WDB. & al. 14769! Hableh Rud valley between Simin Dasht and Kabutar Darreh, 1150 m, AELLEN & MANUCH. 2780!, 3077! Hableh Rud valley, Ban-e Kuh (Bonehkuh, Bun-e Kuh), 1100 m, AELLEN & MANUCH. 2793!, MANUCH. & AELLEN 30144-E! Railway station Bahram, 20 km E Tehran, 1100 m, AELLEN 2998!, 3003! Near railway-station 'Kavir', 88 km E Tehran, 1000 m, AELLEN 2784! Mts. N Sharifabad, E Tehran, 1500–1800 m, DREA 136! 5 km SE Rud Shur, DAVIS & DREA 2! 50 km SW Tehran, near Rud Shur, 900 m, AELLEN 2967! 55 km S Tehran, Rud Shur, 950 m, BRECKLE & BHADRESA 5402! 50 km SW Tehran to Qom, 1000 m, VOGT 1022!, DREA & O'CONNEL 145! Between Qom and Tehran, BEHB. 892-E! Khanabad (Chanabad), a.1882, PICHLER! Camp Alborz, 15 km N Qom, 1000 m, SODER 3! Near Qom, SE Rud Shur, DAVIS 18! Qom, Pol-e Rud Shur, 980 m, FOROUGHI 10492!, 10504! Kavir-e Varamin, AELLEN & SHAR. 30085-E! Varamin, Qarchak, Eshghabad (?Asgarabad), BARKHOUDARI 41731-E! Kavir Prot. Reg.: 2 km S Mobarakiyeh, 780 m, FREITAG 13975! 50 km W Shah Abbas Caravan-Sarai, 780 m, WDB. & FOROUGHI 14600! E of Siah Kuh, 800 m, WDB. & FOROUGHI 14651! S of Dasht-e Char, N Siah Kuh, 770 m, AELLEN & SHAR. 2811!, 3064! Dasht S Siah Kuh, between Daryacheh-ye Namak and Dasht-e Kavir, 749 m, AELLEN & SHAR. 3056! Qazv.: Plain at Lija near Qazvin, ALEXEENKO 495! 27 km S Qazvin, 1200 m, PABOT 8328! Salty mountains at Mardabad, SW Karaj, GAUBA 98a!, 98i!, 2130!; 1300 m, AELLEN 2778! Near Mardabad, 1250 m, HEDGE, WDB. & al. 14678! 15 km from Mardabad to Eshtahard, along Rud Shur, 1200 m, AKHANI & al. 2072!, 2081!, 2087! Yazd: 30 km from Robat-e Posht-e Badam to Yazd, 1000 m, FOROUGHI & BAZARGHAN 32434! Aqda between Yazd and Na'in, 1150 m, FOROUGHI & ASSADI 15123! Hoseyna (Husain Nun) to Jandaq, Howz-e Jandaq, 700 m, TERME & MOUSSAVI 30230-E!, 30272-E!, 40194-E! Dasht-e Kavir: Between Jandaq and Khvor, 700 m, TERME & MOUSSAVI 30232-E!, 40136-E! Khvor, 800 m, FOROUGHI & BAZARGAN 32370!, 32374! Damgh.-Semn.: S Semnan to Kavir, 1000 m, REJAMAND & ARAZM 32586!, 32590! Kavir-e Damghan, 1200 m, REJAMAND & ARAZM 32495! Kavir-e Semnan, 1000 m, REJAMAND & ARAZM 32581! Shahr.-Bust.: Abbasabad, 1400 m, REJAMAND & ARAZM 32526! 19 km E Abbasabad, road Mashhad to Tehran, ZOHARY & ORSHAN 10206/6! Sabri, SAB. 522!, 540! Turan Prot. Reg.: 10 km SE Delbar, road to Majrad, 1000 m, FREITAG 13966! 2 km N bridge at road Delbar-Ahmadabad, 780 m, FREITAG 13930! 25 km E Delbar, Qal-e Shur, 780 m, BHADRESA 5442! 16 km SSE Majrad, 750 m, BRECKLE & BHADRESA 5081! Ahmadabad, 2 km NNE at road to Darb Ahang, 975–990 m, FREITAG 13897! S Zalehabad, road to Sanjari, FREITAG 13813! 15 km SW Razveh, Kavir road, FREITAG 14119! 6 km S Razveh, 1210 m, FREITAG 14108! 15 km N Rezaabad, 840 m, FREITAG 14178! – Not localized: Desert, AUCH. 2741!, 2744! Between Tehran and Esfahan, OLIVIER s.n.! Badzhistan-desert, PREDTECHENSKIJ 138!

T u r c o m a n i a : Ashkhabad, LITW. 289!, 290!, 291!, 293!, 294!, 316= Herb. fl. ross. 482 (type of *S. transoxana*)!, 317!, 319!, 334!, 392!, SINT. 640!, 1217!, VIII.1901, SINT.! NE Ashkhabad, 300 m, 6.IX.1976, VASAK!

A f g h a n i s t a n : N: Mazar-i Sharif: Qizil Qala, near Amu Darya, PELT 721!, 725/23! Near Amu Darya, 3 km from Qizil Qala, VII.1969, HAYON! 35 km N road Mazar-i Sharif to Tashkurghan, road to Termez, 300 m, PODLECH 32704! 4 km SE Ghaznigak, 28 km S Tashkurghan, road to Haibak, 720 m, PODLECH 17003! 35 km S Tashkurghan, bassin of Ghaznigak, 620 m, FREITAG 3910! 20 km NW Haibak, PABOT A 1146!; 840 m, PODLECH 17008! Mazar-i Sharif, salt lake, 400 m, GILLI 2164! 50 km NW Tashkurghan to Namak Sar, 330 m, FREITAG 3890! Akcha, 66°11'E, 36°54'N, 300 m, NEUB. 563! Shibarghan: 5 km NW Shibarghan, PABOT A 781! – NW: Maimana: Dasht-e Laili: Between Shibarghan and Daulatabad, 270 m, FREITAG 199! 15 km NE Daulatabad, 330 m, FREITAG 6689! Wadi-i Kafar Shur near Dahana-i Shur, 600 m, 3 X.1964, JAKES! Herat: Qizil Eslam Qaleh, RECH. 37852! – SW: Farah: Dilaram, desert, 900 m, KOELZ 13323! E-border of Jehile Puzak, 460 m, BRECKLE 4913! – SE: Kandahar: 25 km NNE Girishk, 1000 m, FREITAG 6871! E border of Registan near Chagray Qala, 40 km S Kandahar, 1050 m, BRECKLE 4832! At Dori Rud, 50 km SE Kandahar, PABOT A 476! – NE: Kataghan: Jelowgir (Dschelaugir), dry rocky slope, NEUB. 182!, 183!, 184!, 194!, 201!, DIETERLE 563! – Not localized: Karez Mawri, McARTHUR 102A!

P a k i s t a n : Quetta: Pishin-area, road Chaman to Quetta, 7.VI.1959, KHAN!; 1800 m, 24.IX. 1969, NASIR & Z. ALI! 6,5 km from Quetta to Chaman, FAROOQOI & QAISER 2330!, 2337! Pishin Lora valley, S Gulistan City, FAIRSERVIS 14a! Pishin, 1300 m, SHARIQ 6547! Paskuh, 51 km NW Sibi, 1230 m, "Chamagh", HOTSON 24290! Near Quetta, 1640 m, LACE 4092! Sultan, 1520 m, STEW. 27992! – Kalat: 93 km NE Nushki to Quetta, 1600 m, FREITAG & KOTHE 18781! 53 km NE Kalat, 1500 m, FREITAG & KOTHE 18771!, GHAFOOR & OMER 2055! Mastung, 1680 m, JAFRI & AKBAR 1754! – Not localized: AITCH. 1103!, X.1856, AITCH.!, XII.1985, BUK!

Distr. gen. of subspecies: Southern part of the species area, from Syria, Persian Azerbaijan and the SE side of the Caspian Sea eastwards.

–– subsp. ***longipistillata*** (BOTSCH.) FREITAG, comb. et stat. nov.

Syn.: *Climacoptera longipistillata* BOTSCH., Nov. Syst. Pl. Vasc. 19: 79 (1982). *Cl. afghanica* BOTSCH., l.c. 19: 74 (1982). *Cl. iranica* PRATOV, Bot. Zhurn. 70: 682 (1985).

Type of subspecies: Persia: Gonbad prov., Ghara-Gol, edge of Atrek River between

Moraveh Tappeh and Holtan; clay soil, 17.X.1977, F.T. HEWER 4055, holotype LE!, isotypes K!, LE!

Style 0,2–0,5 mm long; stigmas 3–4 mm long, exserted.

Hab.: As in subsp. *turcomanica*; in NE Persia up to 500 m, in SW Afghanistan from 500–1100 m. – Fl. VII–IX, fr. X–XI.

Persia: N: Gorg.: Gonbad-e Kavus, 16.X.1956, PETTER! N Gonbad-e Kavus, 0–50 m, DREA & O'CONNELL, 146–150!! 15 km N Gonbad-e Kavus, 30 m, VOGT 1021! Between Tappeh-ye Moraveh and Holtan, 160–220 m, HEWER 4055!, 4060!, 4061!, 4064! Pahlavi Dezh, DREA & O'CONNELL 182! 10–52 km N Pahlavi Dezh, DREA & O'CONNELL 171!, 175!, 176!, 178!, 188!, 189!, 190!, 191 (type of *Cl. iranica*)! HEWER 4045!, O'CONNELL 188! 15 km NE Pahlavi Dezh, –25 m, BRECKLE & BHADRESA 5248! Just N of Pahlavi Dezh, –30 m, UOTILA 19224! 56 km N Gorgan, 0–33 m, DREA & O'CONNELL 158! Turkmen plain N Gorgan, STREET 45! 12 km N Gumini. (? Gumini) Tepe, 17.VII.1942, PETROV!
Turcomania: Kizyl Arvat: Kara Kala, Kopet Dagh, ILJIN 869! Stara Kara Kala, SINT. 2200b!
Afghanistan: SW: Farah: 6 km E hotel Farah Rud, 800 m, BRECKLE 4890! 16 km SSW Khwajasarjoy, 82 km SW Lukhi, 490 m, PODLECH 17124! 15 km E Zaranj, 475 m, PODLECH 16897a! 15 km SE Chakhansur, 520 m, FREITAG 3738! Kash near Chakhansur, 600 m, FREITAG 3727! – SE: Kandahar: Kermak Dasht, 50 km SW Lashkargah, 750 m, BRECKLE 4856! 50–60 km W Girishk to Dilaram, 1000 m, RECH. 32477!, PODLECH 17101! Shorab, 60 km ESE Dilaram to Girishk, 1050 m, PODLECH 17177 (type of *Cl. afghanica*)!

Distr. gen. of subspecies: Known from N Persia with adjacent parts of Turcomania, and from the Sistan basin in S Afghanistan.

The species is extremely polymorphic with numerous local races, and often two or three of them occur in the same locality; several variants have been described as species. Growth form and leaf characters are highly dependent upon water supply and salt stress. Tall growing and narrow-leaved individuals occur in less saline habitats, and dwarf, sometimes even cushion-like and broad-leaved plants are most common in strongly saline localities. But exceptions have been seen, with almost unbranched erect specimens collected e.g. from highly saline salt-marshes in W Persia. Genetically controlled are probably the type and distribution of indumentum, the length and width of anthers and appendages (the app./anther ratio varies from 1/8 to 4/5!), the total and relative length of style and stigmas, and the fruiting perianth (diameter, dimensions of the 2 innner wings, structure of tepal apices). Most characters vary independently, and if one used the criteria of Russian authors, the result would be several more taxa without consistent distributional areas, and the resulting identification problems. It is not insignificant that numerous specimens from the Flora Iranica area in LE are given different names by BOTSCHANTZEV and PRATOV.

The subdivision into 3 subspecies in this account is based mainly on style and stigma dimensions, as in the closely related *S. lanata*. They are fairly stable and follow a distinct geographical patttern, but intergrade where the taxa meet.

Subsp. *crassa* is described as having always glabrous tepals. On the whole this is true but, sporadically in Transcaucasia (e.g. GROSSHEIM 27.IX.1925) and in Anatolia (e.g. RECH. 5250), individuals with pilose tepals do occur. Most specimens seen have a more delicate habit, due to slightly narrower leaves.

Subsp. *turcomanica* usually has tepals with a rather dense indumentum of short hairs. However, in W Persia from Tehran to Esfahan, forms with rather sparsely hairy and even glabrous tepals dominate. This could be explained by introgression with subsp. *crassa*. Other forms from N and C Persia are almost completely glabrous (*Climacoptera glaberrima* BOTSCH.). Plants from Azerbaijan approach subsp. *crassa* in the distinct short style (in the type of ssp. *turcomanica* the style is ± lacking) as in the type of *S. transoxana* (from Ashkhabad area), but this character occurs throughout the distributional area (types of *S. khalisica* and *S. iraqense* from Iraq, BRECKLE 4832 from SE Afghanistan etc.)

Subspecies *longipistillata* occurs in two separate areas, although climatologically similar, the foothills of the Kopet Dagh in the north, and the Seistan desert in the south. The latter plants could have arrived there by long distance dispersal from the strong long-lasting northerly winds in W Afghanistan, but parallel evolution is also possible.

48. ***S. maimanica*** FREITAG. spec. nov.

Icon.: Tab. 211, 212.

Type: NW Afghanistan, Faryab prov., 30 km SSE Maimana, at road to Sar-e Hauz, eroded marl slopes, 1200 m, 6.VIII.1969, H. FREITAG 6704, holotype KAS!; isotypes GOET!, TASH.

Differt a *S. crassa* M.B. subsp. *longipistillata* (BOTSCH.) FREITAG et *S. crassa* subsp. *turcomanica* (LITW.) FREITAG ramificatione sparsa, habitu robustiore, tepalis uninerviis, fructibus coronatis partibus ulterioribus tepaliorum papyraceis reflexo-inflexis; species habitu cum *Climacoptera oxyphylla* PRATOV et *Salsola soda* L. congruens, sed a primo foliis obtusis numquam mucronatis, a secundo antheris et appendicibus multo minoribus differt.

Robust annual, up to 40 cm high and 25 cm wide; glaucous-green, glabrous in all vegetative parts. Stem erect, branched from the up to 5 mm thick base; branches strictly ascending, terminating in loose spikes, only the longest with shorter branches of 2nd order; whitish, partly green from decurrent leaf and bract bases, green areas in lower part up to 20 mm long, in upper part 7–10 mm long. Leaves spreading, 30–20 mm long, highly succulent, semi-terete, almost linear, 3–2 mm wide, with 5–7 mm wide sheathing base, obtuse, at base with narrow hyaline margins and obtuse whitish keel. Bracts leaf-like, (25–)20–10(–8) mm long, always much longer than bracteoles, basal sheath hollowed, 5–7 mm wide. Bracteoles 6–4 mm long, ovate, in lower part up to 5 mm wide, with broad hyaline margins becoming narrower upwards and lacking at the obtuse to acutish apex, green only in upper part. Tepals in lower 3/5 ovate, in upper 2/5 narrow triangular with incurved wings, 6–7,5 mm long, the outer 2,5–3 mm wide, 1-veined, transverse line at 1/4–1/3, above the line thickened and densely covered by up to 0,3 mm long stiff ascending hairs, hairs straight or slightly flexuose, 2-celled, thick-walled, smooth or warty, tepals in upper part hyaline, glabrous, with obtuse apex, after flowering time increasingly recurved at their bases. Anthers without appendages 3–3,5 × 0,5–0,6 mm, linear, divided for 1/3–1/2, yellow, partly exserted; appendages 1,2–1,5 × 0,7–1 mm, inflated, broad conical to ovoid, not distinctly stalked; filaments band-shaped, up to 5 mm long, gradually tapering from the 0,9 mm wide base to the 0,4 mm wide apex, inserted on a very low hypogynous disc; disc glabrous, unlobed. Ovary globular to obovoid; style almost lacking; stigmas 3,5–4,5 mm long, exserted between the spreading upper parts of tepals, almost thread-like, tapering from 0,2–0,1 mm, with acute apex, inside flat, shortly papillate. Fruiting perianth 5-winged, the lower part hard and thickened, forming a globular 4–5 mm wide structure, wings 0,5–1,5 mm wide (in immature material), the densely hairy part above the wings forming a flat cap, and the papery upper tepals forming a delicate corona- or flower-like structure. Utricle globular, with flattened upper part, 3–4 mm wide, the empty upper part forming a cushion-like cap above the seed-bearing lower part, with membranous pericarp; seed horizontal or oblique; embryo flat, spiral, green.

Hab.: Known from the type locality only. There it is dominant on highly eroded 15–20°S-exposed slopes in gypsiferous marl, in association with *Halothamnus auriculus*, *Salsola tomentosa*, *Cousinia actinacantha*, *Allium caspium*, and some annuals like *Aegilops crassa*, *Hordeum distichum*. It may also occur in similar habitats in the *Pistacia vera*-belt of NW Afghanistan, but these seemingly are rather rare. – Fl. VII–VIII; fr. VIII–X.

A f g h a n i s t a n : NW: Maimana: 30 km SSE Maimana to Sar-e Hauz, 1200 m, FREITAG 6704!

Distr. gen.: Endem.

With its robust habit, 1-veined tepals and large anthers and anther appendages the new species approaches *Climacoptera oxyphylla* PRATOV and *Physandra halimocnemis* BOTSCH., but the latter differs in the clearly mucronate leaves and bracts and much longer bracteoles.

28. *Halothamnus*

G. KOTHE-HEINRICH, Groß-Zimmern

Halothamnus JAUB. & SPACH, Ill. Pl. Or. 2: 50, tab. 136 (1845).
Syn.: *Aellenia* ULBR. in ENGLER & PRANTL, Natürl. Pflanzenfam. ed. 2, 16c: 567 (1934). *Salsola* sect. *Sphragidanthus* ILJIN, Fl. URSS 6: 245 (1936), descr. ross. *Aellenia* emend. AELLEN, Verh. Naturf. Ges. Basel 61: 172 (1950). *Halothamnus* emend. BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 146 (1981).

Lit.: P. AELLEN, Ergebnisse einer botanisch-zoologischen Sammelreise durch den Iran. Verhandlungen der Naturforschenden Gesellschaft in Basel 61: 128–198 (1950). G. DE MARCO & A. DINELLI, A new species of Aellenia (Chenopodiaceae) from the Iranian Sistan depression. Webbia 33: 301–306 (1979). V.P. BOTSCHANTZEV, Revisio generis Halothamnus Jaub. et Spach (Chenopodiaceae). Notulae Systematicae ex Herbario V.L. Komarovii Academiae Scientiarum URSS (Botaničeskii Materialy Gerbarija Botaničeskogo Instituti Komarova Akademii Nauk SSSR) 18: 146–176 (1981), in russian. V.P. BOTSCHANTZEV, Novyj vid roda Halothamnus (Chenopodiaceae) iz Somali. Botaničeskii Zhurnal SSSR. 67, 4: 545–546 (1982). V.P. BOTSCHANTZEV, Novyj vid roda Halothamnus (Chenopodiaceae) iz Afghanistana, Botaničeskii Zhurnal SSSR. 68: 1122 (1983). G. KOTHE-HEINRICH, The genus Halothamnus (Chenopodiaceae) in Southwest Asia. Flora et Vegetatio Mundi 9: 43–52 (1991). G. KOTHE-HEINRICH, Revision der Gattung Halothamnus (Chenopodiaceae). Bibliotheca Botanica 143: 1–180 (Stuttgart 1993).

Shrubs, sub-shrubs or annuals, glabrous or hispidulous with 1-celled hairs. Branches green, olive or glaucous, often with whitish longitudinal stripes, ± verrucose. Leaves alternate, sessile or decurrent, entire, semiterete or flat, ± succulent, their axils occasionally with tufts of curly multi-celled hairs. Bracts and bracteoles leaf-like or scale-like, herbaceous, partly with membranous margins, persistent, their axils with curly hairs. Flowers sessile, solitary, in loose, simple or paniculate spikes, bisexual, protandrous. Tepals (perianth segments) 5, free (somewhat connate at base), erect, 3 of them wider, above a transverse line with ± triangular large green blotch and membranous margins, below colourless. Stamens 5, epipetalous. Filaments band-shaped, arising from outer side or from rim of disc. Anthers oblong to narrowly sagittate, divided for ± 1/2, with short sessile flat appendage not clearly separated from thecae. Hypogynous disc short, glabrous, fleshy, later membranous, often with interstaminal lobes. Stigmas 2, flat or concave, inside papillose, the tips exserted. Style in fruit thickened. Fruiting perianth 5-winged, wings horizontal, overlapping, membranous, radially veined, 3 of them wider; below the wings thickened and ± strongly indurated, forming a tube with a truncate base; tube base widened, flat, with 5 pits around the central scar (abscission zone) and a circular-pentagonal peripheral rim. Utricle enclosed, horizontally flattened; pericarp lignified on upper and lower sides, laterally membranous. Seed horizontal, lenticular; testa thin; albumen absent; embryo spiral, green or pale yellow. – Type of genus: *H. bottae* JAUB. & SPACH.

21 species, from Caucasus mountains and Middle-Asia through SW-Asia, and Arabia southward to the arid part of the Somalian peninsula, and from Middle East eastward to Dzungaria (China). Most species are Irano-Turanian. The centre of diversity is in Middle-Asia, northern Iran and Afghanistan. In our area 15 species occur, mostly semi-desertic, often halophytic, rarely psammophytic or ruderal. Many are economically important as grazing plants, some contain alkaloids. All are C4-plants with leaf anatomy of the salsoloid "Kranz" type. Additionally, in *H. subaphyllus* c. 2% of photosynthesis shows a CAM-pathway.

The genus is related to *Salsola*, the closest relationships existing with Sect. *Salsola*, as to the leaf insertion mode and the green cortex, and with Sect. *Arbuscula*, as to the included utricles and the band-shaped stigmas. It is clearly distinct from *Salsola* by the characteristic structure of the fruiting perianth with truncate, strongly indurated tube and 5 deep pits on its widened base, by the partially lignified pericarp, and by the flat, relatively short stigmas on a thick style.

The most important characters for infra-generic classification are provided by the fruiting perianth: insertion of the wings in relation to perianth height, shape and surface of the tube, outline, depth and location of the 5 pits, presence or absence of prominent radial ridges between them, and position of the tepal lobes above the wings (see Fig. 7, 8). Other useful characters are growth form, structure of inflorescence, bracts and bracteoles, insertion mode of filaments at the disc, size and apex of stigmas. The flowers are rather similar in all species, and leaf-shape is extremely variable, depending on soil conditions and water supply. Even on the same plant the spring and summer leaves may look quite different. Specimens that lack fruits often cannot be identified with accuracy.

Although there are some species-groups in SW Asia, a clear-cut sectional division is not possible. Thus, most species belong to sect. *Halothamnus*, which is separated from the monotypic sect. *Pungentifolia* KOTHE-HEINR. (*H. Beckettii*, Somalia).

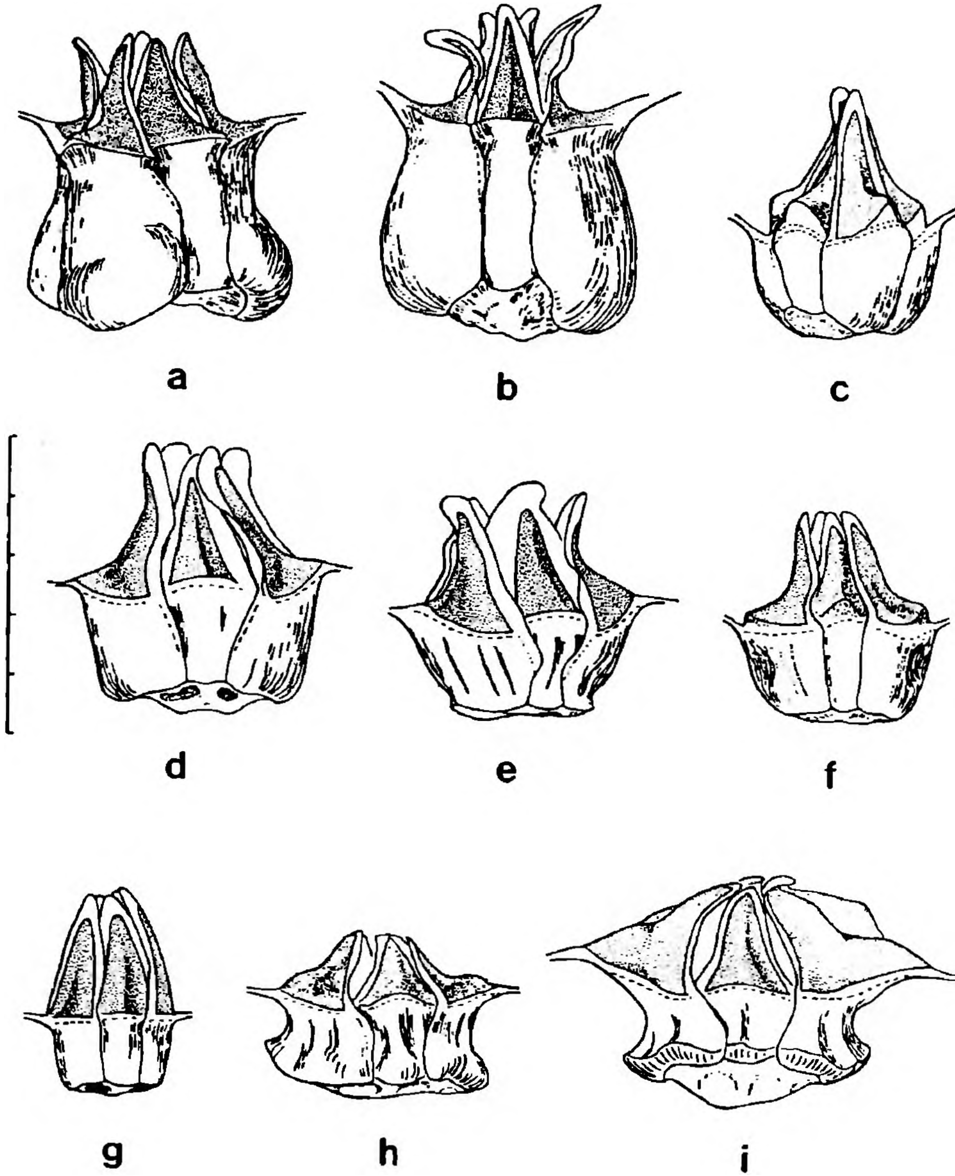


Fig. 7: Fruiting perianth of *Halothamnus*, lateral view (wings not shown). **a**: *H. cinerascens* subsp. *vestitus*, **b**: *H. auriculus* subsp. *acutifolius*, **c**: *H. kermanensis*, **d**: *H. glaucus* subsp. *glaucus*, **e**: *H. subaphyllus* subsp. *subaphyllus*, **f**: *H. sistanicus*, **g**: *H. iranicus*, **h**: *H. hierochunticus*, **i**: *H. iliensis*.

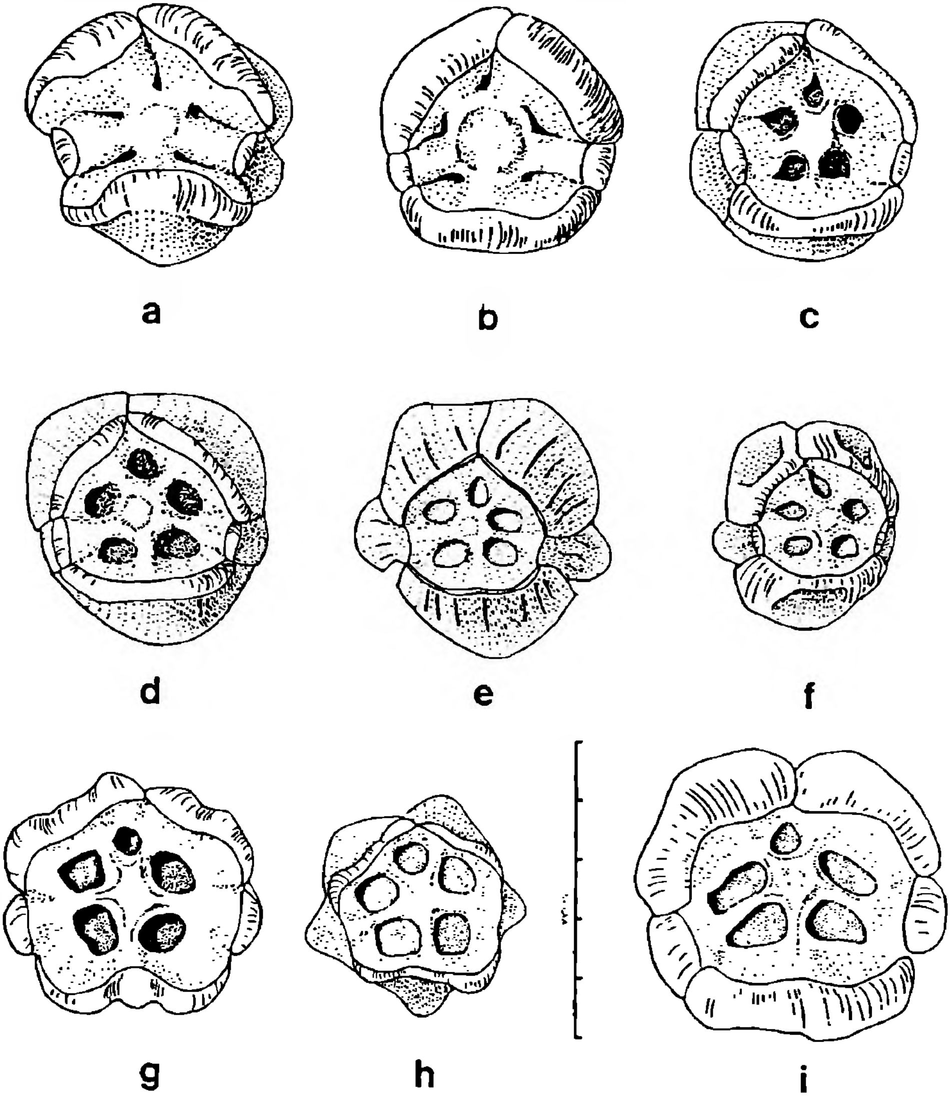


Fig. 8: Fruiting perianth of *Halothamnus*, basal view (wings not shown). **a**: *H. cinerascens* subsp. *vestitus*, **b**: *H. auriculus* subsp. *acutifolius*, **c**: *H. turcomanicus*, **d**: *H. glaucus* subsp. *glaucus*, **e**: *H. subaphyllus* subsp. *subaphyllus*, **f**: *H. sistanicus*, **g**, **h**: *H. hierochunticus*, **i**: *H. iliensis*.

1a. Annuals; tepals above wings strongly keeled, keels ± continuing on wings; tube 3–6 mm wide, with concave sides with sharply prominent veins (Fig. 7-h-i); bracteoles of upper flowers as long or somewhat longer than perianth 2
b. Sub-shrubs or shrubs; bracteoles of upper flowers mostly shorter than perianth, if as long then fruit characters different 3
2a. Plant glabrous; bracts of lower flowers linear, markedly longer than perianth; tepals lanceolate, 3,8–5,2 mm long; anthers 2,2–3,5 mm long; filaments wider than distance between them; disc with half-round interstaminal lobes; tube pits ovate (Fig 8-i) .... 2. *H. iliensis* (LIPSKY) BOTSCH.
b. Plant hispidulous; bracts of lower flowers lanceolate-triangular, somewhat longer than perianth; tepals triangular, 2,6–3,2 mm long; anthers 1,3–1,7 mm long; filaments as wide as distance between them; disc unlobed; tube pits rounded (Fig. 8-g-h) .... 1. *H. hierochunticus* (BORNM.) BOTSCH.
3a. Tube pits furrow-like, linear, ± curved, or very narrowly ovate (Fig. 8-a,b); leaves and bracts of lower flowers mostly flat (if semiterete or cylindrical, then bracteoles of lower flowers only basal with narrow membranous margins, and tube rim irregular, interrupted above bracteoles 4
b. Tube pits round or ovate (Fig. 8-c-f); leaves and bracts of lower flowers mostly semiterete (if flat, then stigmas tapering and bark whitish-beige) .. 7
4a. Stigmas apically rounded or tapering; bracteoles of lower flowers flat or semiterete, obliquely spreading, linear-triangular to lanceolate, longer than perianth or occasionally somewhat shorter, only basal with narrow membranous margins .... 7. *H. cinerascens* (MOQ.) KOTHE-HEINR.
b. Stigmas apically truncate; bracteoles of lower flowers scale-like, adpressed to perianth, triangular-lanceolate, -ovate or -cordate, shorter than perianth (rarely as long as, then tube barrel-shaped), basal with wide, lateral and mostly apical with narrow membranous margins 5
5a. Wings below the middle of fruiting perianth (Fig. 7-c); tube 1,3–2 mm high; green part of bracteoles rounded-rhomboid, apically right-angled; filaments hardly wider than distance between them .... 5. *H. kermanensis* KOTHE-HEINR.
b. Wings in or above the middle of fruiting perianth (Fig. 7-b); tube 1,7–4 mm high; green part of bracteoles ovate, apically acute-angled; filaments markedly wider than distance between them 6
6a. Tube broadly barrel-shaped, with convex or straight sides and a constriction at insertion of wings (Fig 7-b); fruit 4,2–6,2 mm high, 11–20 mm diam.; tepals ovate-triangular; leaves with conspicuous narrow membranous margins, lanceolate, ovate, cordate, or kidney-shaped, 2,5–45 mm wide; bark pale brown .... 4. *H. auriculus* (MOQ.) BOTSCH.
b. Tube in upper part concave, in lower part prominently convex; fruit 3,4–4,5 mm high, 10–14 mm diam.; tepals ovate; leaves not conspicuously margined, narrowly triangular-lanceolate, 2–4,9 mm wide; bark grey

. . . . 6. *H. afghanicus* KOTHE-HEINR.

7a. Bracteoles of lower flowers with membranous margins and apex, transversely ovate, apically rounded; bracts of upper flowers shorter than bracteoles, scale-like, with membranous margins and apex . . . . 15. *H. subaphyllus* (C.A. MEY.) BOTSCH.

b. Bracteoles of lower flowers without membranous apex; bracts of upper flowers somewhat longer than or as long as bracteoles 8

8a. Leaves, bracts, and bracteoles of lower flowers flat, linear to linear-triangular; stigmas apically tapering; bark whitish-beige . . . . 9. *H. bamianicus* (GILLI) BOTSCH.

b. Leaves and bracts of lower flowers semiterete (the lowermost sometimes flattened); bracteoles of lower flowers semiterete or scale-like 9

9a. Bracteoles of lower flowers semiterete (at least apically), linear or lanceolate, only basal with membranous margins; bracteoles of upper flowers without membranous apex 10

b. Bracteoles of lower flowers scale-like, rhombic, ovate, or broadly ovate-triangular, lateral with membranous margins; bracteoles of upper flowers with very narrow membranous apex 11

10a. Tube pits close to central scar, surrounded by a flat area; bracteoles of upper flowers transversely ovate-triangular; plants green; bracts of upper flowers lateral with narrow membranous margins; lower leaves 20–85 mm long . . . . 10. *H. schurobi* BOTSCH.

b. Tube pits ± at half distance between central scar and peripheral rim, often with radial ridges between them (Fig. 8-d); bracteoles of upper flowers lanceolate-ovate to triangular-ovate; plants glaucous or green; bracts of upper flowers only basal with narrow membranous margins; lower leaves 15–55 mm long . . . . 8. *H. glaucus* (M.B.) BOTSCH.

11a. Stigmas apically tapering, 0,25–0,35 mm wide; tube ± cylindrical, at the wings 2,2–2,6 mm wide (Fig. 7-g); tepals narrowly ovate, 3,2–3,7 × 1,6–2,1 mm; anthers 1,7–2,3 mm long; fruit 7–11 mm diam.; disc unlobed. . . . . 3. *H. iranicus* BOTSCH.

b. Stigmas apically rounded or truncate, 0,35–0,8 mm wide; tube broadly cylindrical or ± narrowing towards base, at the wings 2,6–4,5 mm wide; tepals ovate, ovate-triangular, or ovate-lanceolate, 3,4–5,5 × 2,1–3,2 mm; anthers longer; fruit 8–17 mm diam. 12

12a. Filaments arising from outer side of disc; disc with small half-round interstaminal lobes 13

b. Filaments arising from rim of disc; disc unlobed 14

13a. Tepals inside with curly hairs; flowers mainly on lateral branches; tube dish-shaped, its sides with prominent veins; tube base with sharp peripheral rim and shallow pits halfway between central scar and rim; anther appendages ± rounded; bark beige-brown . . . . 13. *H. oxianus* BOTSCH.

b. Tepals inside glabrous; flowers both on main and lateral branches; tube broadly cylindrical with smooth sides; tube base with rounded peripheral rim and deep pits close to central scar (Fig. 8-c); anther appendages obtuse; bark grey . . . . 11. *H. turcomanicus* BOTSCH.

14a. Tube sides with thickened, smooth tepal margins and concave grooves (Fig. 7-f); tube base with inconspicuous, rounded rim (Fig. 8-f); fruit 8–13 mm diam.; bracts of lower flowers linear-triangular, up to 8 mm long, longer than perianth; anthers 2,3–2,9 mm long; bark beige . . . . 12. *H. sistanicus* (DE MARCO & DINELLI) KOTHE-HEINR.

b. Tube sides with sharply prominent ridges (veins) (like Fig. 7-e); tube base with a distinct, ± sharp-edged rim; fruit 11–17 mm diam.; bracts of lower flowers linear-ovate, up to 4,2 mm long, somewhat shorter than perianth; anthers 2,9–4,1 mm long; bark grey . . . . 14. *H. iraqensis* BOTSCH.

1. ***H. hierochunticus*** (BORNM.) BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 156 (1981).
Syn.: *Salsola hierochuntica* BORNM., Beih. Bot. Centrbl. 29,2: 13 (1912). *S. Autrani* POST var. *hierochuntica* (BORNM.) EIG, Palest. Journ. Bot. Jerusal. Ser. 3,3: 129 (1945). *Aellenia hierochuntica* (BORNM.) AELLEN, Verh. Naturf. Ges. Basel 61: 180, Abb. 2b-c (1950). *Ae. Autrani* (POST) ZOH., Fl. Palaest. 1: 168, pl. 245 (1966) p.p. quoad plantam. *Ae. Autrani* (POST) ZOH. var. *hierochuntica* (BORNM.) ZOH., nom. inval., Fl. Palaest. 1: 168, in adnot. (1966). not syn.!: *Salsola Autrani* POST, Fl. Syr. Pal. Sin.: 690 (1896). cf. BOTSCH., Nov. Sist. vyssh. rast. 7: 142–145 (1970).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 245 sub *Aellenia Autrani* (1966); WERKER & MANY, Israel Journ. Bot. 23: tab. 1 (1974). KOTHE-HEINRICH, Biblioth. Bot. 143: tab. 19 (1993). – Fig. 7-h, 8-g-h; Tab. 146.
Type: (Israel): "Maris Mortui, ad viam ex Khan-Hadrur ad Jericho, in agris", 15.IX. 1905, J.E. DINSMORE 1001 lectotype JE!; isotype W!

Annual, 40–50 cm, erect, with rancid smell, hispidulous. Stem densely and regularly (sometimes sympodially) branched from base with oblique to divaricate flexuose lateral branches, glaucous, sometimes at base narrowly striate. Leaves semiterete, the lowermost linear, gradually pointed, mucronulate, 6–35 × 1,2–2,9 mm, basally widened, basal with narrow membranous margins, soon deciduous, higher up lanceolate-triangular, 3–6 × 2–3,4 mm. Flowers on all branches, at 6–13 mm distance. Bracts scale-like, the lowermost partly apically semiterete, lanceolate-triangular, higher up broadly ovate-triangular, acuminate, mucronulate, 2,8–7,5 × 2,2–3,6 mm, somewhat longer than perianth and bracteoles, in fruit basally widened, basal and partly lateral with narrow membranous margins. Bracteoles scale-like, broadly ovate-triangular (rarely lanceolate-triangular), acuminate, mucronulate, keeled, 2,6–5,1 × 2,2–4,2 mm, somewhat longer than (at uppermost flowers partly as long as) perianth, in fruit basally widened, basal and partly lateral with narrow to moderately wide membranous margins. Tepals triangular, 2,6–3,2 mm long, the outer 1,7–2,1 mm wide, transverse line at 1/4–1/3, green blotch triangular with colourless centre, membranous margin apically wider than laterally. Filaments arising from rim of disc, 0,4–0,5 mm wide. Anthers 1,3–1,7 mm long, appendage acutish-rounded. Disc unlobed. Style in fruit shortly ovate. Stigmas 0,9–1,1 × 0,25–0,35 mm, with truncate denticulate apex. Fruit 10–16 mm diam.; tube with concave sides with sharply prominent ridges (veins), at the wings 3,1–3,9 mm, at base 3–5,3 mm diam., 1,2–1,4 mm high; basal area obtusely pentagonal, with narrow, prominent, irregular peripheral rim; pits roundish, large; wings ± in the middle, pale green, yellowish or reddish, partly ± keeled by their joining inner veins. Tepals above wings distinctly keeled, forming a flat cone. Heterocarpic: lower fruits with 3,5–5 mm wide, strongly indurated tube, deep pits, thickened tepal lobes, long or short wings and yellow embryo; upper fruits with smaller tube, shallow pits, less thickened tepal lobes, long wings and green embryo.

Hab.: Ruderal and segetal on disturbed, often saline soils, on roadsides, in ruins, fields; up to 700 (–1500) m. – Fl. (VI) VII–VIII/IX, fr. VIII/IX–XI.

I r a q : Kurd.: Mosul: 15 km N Sharqat, BARKLEY & ABBAS AL ANI 9108! – Kirkuk: 4 km E Kirkuk, 5.IX.1933, EIG & al.! – Diyala: S of Mandali, 5.XI.1962, HADDAD & AGNEW!
P e r s i a : N: Gilan: 9 km from Lowshan to Rudbar, 300 m, AKHANI & LARI 5642! – W: Kermansh.: 4 km SE Qasr-e Shirin, 470 m, SERAJ in PABOT sj4a/5! Near Sar-e Pol, 7–20 km E Qasr-e Shirin, RECH. 14598! – S: Fars: Persepolis (Takht-e Jamshid), FIELD & LAZAR 1131! Daryacheh Maharlu, 20 km E Shiraz, 1450 m, BOKHARI & al. 14841!

Distr. gen.: Lebanon, Syria, Israel and Palestine, Jordan, Iraq, W-Persia and two disjunct sites in Persia. The cited specimens are the easternmost localities of the species. The two disjunct sites in Gilan and Fars could be due to ancient import as a weed.

2. ***H. iliensis*** (LIPSKY) BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 156 (1981).
Syn.: *Salsola iliensis* LIPSKY in B. FEDTSCH. Herb. Turkestan. Fl. 1: 6, no. 9 (1911); *S. iliensis* apud B. FEDTSCH., Trudy Petersb. Bot. Sada 32,1: 6 (1912). – *Aellenia iliensis* (LIPSKY) AELLEN, Verh. Naturf. Ges. Basel 61: 176 (1950).
Icon.: ILJIN in Fl. URSS 6: tab. 12, fig. 5 (1936). KINZIKAEVA in Fl. Tadjik. SSR 3: tab. 71, fig. 3–4 (1968). KOTHE-HEINRICH, Biblioth. Bot. 143: Tab. 20–21 (1993). – Fig. 7-i, 8-i; Tab. 147.
Type: (Kazakhstan): "In arena mobili ad fluvium Ili prov. Semiretschje distr. Kopal", 16.VIII.1909. A. MICHELSON, holotype LE; isotypes G!, G-PAE!, FR!, M!, LD!, BM!

Annual, 10–50 cm, erect, glabrous, regularly branched from base with oblique, often flexuose lateral branches. Branches glaucous, striate. Leaves semiterete, linear, gradually pointed, mucronulate, basally widened and with narrow membranous margins, the lower ones 10–50 × 0,8–1,5 mm, higher up 4–10 × 0,8–0,9 mm. Flowers on all branches, at 4–14 mm distance. Bracts of lower flowers similar to leaves, 5–35 × 0,7–1,5 mm, basally widened, longer than perianth and bracteoles; higher up scale-like, lanceolate, acuminate, mucronulate, 3–5 × 1,7–3,2 mm, ± as long as perianth and bracteoles; bracteoles of lower flowers semiterete, linear-lanceolate, gradually pointed, mucronulate, keeled, 5–13,5 × 0,9–1,5 mm, in fruit basally widened up to 4,5 mm, longer than perianth, basal with narrow membranous margins;

higher up scale-like, lanceolate to ovate-lanceolate, acuminate, 3,2–5 × 2,2–3,8 mm, somewhat longer than or as long as perianth, basal with moderately wide, lateral partly with narrow membranous margins. Tepals lanceolate, 3,8–5,2 mm long, the outer 1,8–2,2 mm wide, transverse line at 1/5–1/4, green blotch narrowly triangular, membranous margins apically distinctly wider than laterally. Filaments arising from outer side of disc, 0,6–0,75 mm wide. Anthers 2,2–3,5 mm long, appendage ovate-rounded. Disc with small half-round interstaminal lobes. Style in fruit ovoid. Stigmas 1,5–2,6 × 0,6–1 mm, with widened, ± rounded, denticulate-fringed apex. Fruit 10–15 mm diam., heterocarpic: partly with large tube and long to very short wings, partly with smaller tube and long wings; tube with concave sides with sharply prominent ridges (veins), at the wings 3,4–4,6 mm, at base 3,8–6,1 mm diam., 0,9–1,3 mm high; basal area rounded-pentagonal, with wide, sharp-edged, prominent, partly irregular peripheral rim; pits shallow or moderately deep, ovate, large. Wings below the middle, yellowish or pinkish, keeled by their joined inner veins. Tepal lobes with very thick, spongy keels, forming a flat 5-radiated cone.

Hab.: Scattered in *Artemisia-Salsola*-semidesert and *Salsola*-ephemeral-communities, on sandy, loess, clay and gravel soils, also on solonchaks, serozems, and in scree; up to 850 m. – Fl. V–VIII, fr. VII–IX/X.

Afghanistan: N: Mazar-i Sharif: Tashkurghan, 500 m, RECH. 34065! – NW: Maimana: 20 km SW Andkhui to Maimana, 340 m, PODLECH 16971! 38 km SW Andkhui, 360 m, PODLECH 16969! Halfway betw. Maimana and Andkhui, 400 m, HDG. & WDB. W-3831! Dasht-e Laili 40 km ENE Daulatabad, 450 m, PODLECH 22426! Dasht-e Laili, 50 km W Shibargan, 500 m, FREITAG 6665!

Distr. gen.: Kazakhstan, Turcomania, Uzbekistan, N-Afghanistan, Tadjikistan, Kirghistan. The cited specimens are the southernmost localities of this Middle Asian species.

Most distinct because of its 5-radiate fruiting perianth. In flower it can be identified by the lanceolate tepals with a membranous apical lobe, long anther appendages and long apically dilated fringed stigmas.

3. ***H. iranicus*** BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 153 (1981).
Icon.: KOTHE-HEINRICH., Biblioth. Bot. tab. 18 (1993). – Fig. 7-g; Tab. 148.
Type: Persia: "in ditione Daschtistan, in declivibus sterilissimis prope Daleki", 11.X.1902, ALEXEENKO 957, LE!

Sub-shrub to 45 × 100 cm, ± prostrate to ascending, hispidulous or ± glabrous (var. *glabratus* BOTSCH.), with rancid smell. Woody branches pale brown, rarely light grey. Annual branches straight, glaucous, with oblique to divaricate lateral branches. Lower leaves slightly clasping and 0–1 mm decurrent, their axils with some curly hairs, semiterete, linear, gradually pointed, mucronate, 3–14 × 1,1–1,9 mm, basal with very narrow membranous margins; higher up semiterete to three-edged, linear to triangular-ovate, acuminate, 1,5–3 × 1,4–2,4 mm, basal with narrow membranous margins. Flowers mainly on lateral branches, at 1–6 mm distance. Bracts of lower flowers semiterete, linear-lanceolate to ovate-triangular, acuminate, mucronate, keeled, 3–4,6 × 1,5–2,9 mm, somewhat shorter than perianth (rarely slightly longer), somewhat longer than or as long as bracteoles, basal with narrow membranous margins; higher up scale-like, broadly ovate-triangular, acute, mucronate, 1,4–3 × 1,5–2,9 mm, shorter than perianth, as long as bracteoles, basal and partly lateral with narrow membranous margins. Bracteoles scale-like, ovate with elongated apex or broadly ovate-triangular, ± acuminate, mucronate, ± keeled, 1,7–2,6 × 1,7–2,6 mm, shorter than perianth, basal with broad, lateral (at the highest flowers also apical) with narrow membranous margins. Tepals oblong-ovate, 3,2–3,7 mm long, the outer 1,6–2,1 mm wide, transverse line at 1/4–1/3, green blotch narrowly triangular, membranous margin apically wider than laterally. Filaments arising from rim of disc, 0,4–0,55 mm wide. Anthers 1,9–2,3 mm long, appendage rounded-acutish. Disc unlobed. Style in fruit bottle-shaped. Stigmas 1–1,4 × 0,25–0,35 mm, with tapering not denticulate apex. Fruit 7–11 mm diam. Tube ± cylindrical, with straight or slightly concave sides with prominent ridges (veins), at the wings 2,2–2,6 mm, at base 1,9–2,7 mm diam., 1,1–1,3 mm high; basal area rounded-pentagonal, with narrow, sharp-edged peripheral rim; pits moderately deep, ovate. Wings below the middle, straw-coloured or pinkish, the inner veins often joining. Tepals above wings in lower part distinctly keeled, forming a steep cone.

Hab.: Locally common in very dry and saline habitats with a mild winter climate: on coastal plains, desertic hills and mountains, on rocky slopes, in scree, debris, gravel, and in runnels of eroded marl hills, together with *Anabasis setifera*, *Salsola Drummondii*, *S. cyclophylla*, *Gymnocarpos* and *Reaumuria Stocksii*; 0–930 m. – Fl. (VII) VIII–X, fr. X–XI.

P e r s i a : W: Khuz.: 60 km N Ahvaz, 50 m, PABOT 2515! NE Ahvaz, begin of road to Naft-e Safid, 100 m, PABOT 2583! 16 km W Behbehan, 300 m, GRANT 15911! Near Behbehan, 300 m, POPOV 237! 21 km E Behbehan, 300 m, PABOT 1029! – S: Fars.: Bushehr: 15 km NW Ganaveh, 30 m, BOKHARI & al. 14805! Near Borazjan to Ganaveh, 70 m, BOKHARI & al. 14780! Near Dalaki, ALEXEENKO 957! Lar.: Bandar Abbas, 170 km to Lar, 450 m, FOROUGHI & ASSADI 15065! Bal.: Makran: 115 km from Chah Bahar to Rask, 50 m, AKHANI 6782! Between Chah Bahar and Nasirahad, 250–750 m, ERSHAD & al. 35392-E! 8 km N Negur, 30 m, AKHANI 6761! 7 km from Negur to Kulani, 20 m, AKHANI 6666! Between Kahir and Ghottam, 112 km W of Tis, ERSHAD & al. 35395-E! Between Tujak and Zarahad, 15 km E Zarahad, 100 m, ERSHAD & al. 40060-E!

P a k i s t a n : Bal.: 27 km N Suntsar to Mand, 100 m, FREITAG & KOTHE 18567! 29 km SW Suntsar, 40 m, FREITAG & KOTHE 18560! 58 km W Pasni to Gwadar, 50 m, FREITAG & KOTHE 18515!, 18516! 6 km NW Pasni, 30 m, FREITAG & KOTHE 18398! 25 km NE Pasni, near road to Ormara, 30 m, FREITAG & KOTHE 18421! 80 km S Panjgur, near road to Hoshab, 930 m, FREITAG & KOTHE 18588a! 2 km S Hoshab, 560 m, FREITAG & KOTHE 18347! 51 km WSW Awaran near road to Hoshab, 680 m, FREITAG & KOTHE 18305! – Bela: Ascent to Lak pass 11 km WSW Bela, 100 m, FREITAG & KOTHE 18246! 15 km N Khandewari, 40 m, FREITAG & KOTHE 18230!, 18230a! Near Khandewari at road to Kandrach, 35 m, FREITAG & KOTHE 18239!

Distr. gen.: Endemic to S Persia and SW Pakistan (Baluchistan). Var. *glabratus* BOTSCH. predominates in the eastern part, var. *iranicus* in the western part of its area.

In habit similar to the Arabian *H. bottae* JAUB. & SPACH, but easily distinguished by ± cylindrical tube without thickened tepal margins, flat tube base with distinct deep pits, sub-shrubby, prostrate to ascending growth, rancid smell, lacking spines, longer leaves, bracts and bracteoles, 5 crystal-filled "nests" at base of perianth, and apically wider tepal margins. *H. iranicus* has some times been misidentified as *H. hierochunticus*, from which it is distinct by the completely different shape of its fruits, bracteoles shorter than perianth, narrowly ovate tepals, longer anthers and tapering stigmas.

4. ***H. auriculus*** (MOQ.) BOTSCH., Bot. Zhurn. 66,1: 134 (1981).

Sub-shrub to 90 cm, erect, glabrous (rarely ± hispidulous). Woody branches pale brown, rarely brown-grey. Annual branches straight, olive-green-greyish, intensely glaucous, partly reddish tinged, broadly striate, partly winged by decurrent leaves, in the upper half with ascending or oblique, partly elongated lateral branches; leaves flat, very variably shaped (lanceolate, triangular, ovate, cordate, kidney-shaped or roundish), gradually or abruptly pointed or obtusely rounded, often mucronulate, often half-stem-clasping, partly 1–40 mm decurrent, partly auriculate, dorsal with whitish mid-rib, with distinct narrow membranous margins, the lower ones 10–68 x 2,5–45 mm, higher up 3,5–10 x 2–12 mm. Flowers both on main and lateral branches, at 1–19 mm distance. Bracts of lower flowers similar to leaves, 6–26 x 3–25 mm, longer than or as long as perianth, longer than bracteoles; bracts of upper flowers ± scale-like, triangular-ovate, ovate, cordate or roundish, 2–5 x 2–6 mm, as long as or shorter than perianth, somewhat longer than or as long as bracteoles. Bracteoles adpressed to perianth, scale-like, triangular-ovate or triangular-cordate, gradually pointed, mostly mucronulate, ± keeled, shorter than (very rarely ± as long as) perianth, at lower flowers 2–4 x 1,7–3,8 mm, higher up 1,5–3 x 1,5–3,6 mm, basal with wide, lateral and apical with narrow membranous margins. Tepals ovate-triangular, 3,3–4,6 mm long, the outer 2–2,6 mm wide, transverse line at 1/3, green blotch rather narrowly triangular, membranous margin of constant width. Filaments arising from outer side of disc, 0,55–0,9 mm wide. Anthers 2–3,2 mm long, appendage rounded or acutish. Disc with small half-round interstaminal lobes. Style in fruit ovoid to dome-shaped. Stigmas 1–2,1 x 0,35–0,8 mm, with widened, truncate, denticulate apex. Fruit 12–20 mm diam. Tube broadly barrel-shaped with convex or straight smooth sides (rarely with prominent base: var. *latifolius*), at insertion of wings constricted and 3–5,1 mm, at base 3–6,5 mm diam., 1,9–4 mm high; basal area rounded pentagonal, with rounded peripheral rim; pits deep, furrow-like, linear, ± curved, or rarely very narrowly ovate. Wings in or above the middle, yellowish or straw-coloured, their veins basally joining. Tepal lobes keeled, forming a cone with apically increasing steepness, apically often ± spreading. (Fig. 7-b, 8-b).

Distr. gen. of species: S Turcomania, Tadjikistan, Uzbekistan, Kirghistan, Persia, Afghanistan, Pakistan (Baluchistan).

Easily recognized by its fruits with a barrel-shaped tube, flat leaves with conspicuous membranous margins, adpressed scale-like ovate-triangular to cordate-triangular bracteoles with basally wide, laterally and apically narrow membranous margin, and truncate stigmas.

Most polymorphic with regard to leaf-shape, -size and -insertion. Every possible combination of auriculate or sessile, longly or shortly decurrent, large or small, narrow or broad, obtuse or acute leaves occur, not only within populations, but even on the same plant: often the lowest leaves are ± sessile, narrowly lanceolate, in lower and mid-part leaves are decurrent, broadly lanceolate or ovate, and the topmost are auriculate, ovate to kidney-shaped and obtuse. The largest leaves occur on loess soils with good water supply, the smallest on salty or marly soils. The species is a good grazing plant and is planted for re-cultivation of pasture. Its ash contains Boron.

1a. Lower leaves lanceolate-ovate, ovate, cordate, kidney-shaped or roundish, 8–45 mm wide, half-stem-clasping, partly long decurrent, partly auriculate; stigmas 1,2–2,6 × as long as wide .... subsp. *auriculus*
b. Lower leaves lanceolate, lanceolate-triangular or lanceolate-ovate, 2,5–9 mm wide, hardly clasping, 0–2 mm decurrent; stigmas 2,3–3,7 × as long as wide .... subsp. *acutifolius* (MOQ.) KOTHE-HEINR.

–– subsp. ***auriculus***

Syn.: *Salsola auricula* MOQ. in BÉLANGER, Voy. Ind.-Orient. Bot.: tab. sine numero, sine descr. (1834); MOQ., Chenopod. Monogr.: 135 (1840). *Salsola moquiniana* JAUB. & SPACH, Ill. Pl. Or. 2: 52, tab. 137 (1845). *Caroxylon auriculum* (MOQ.) MOQ. in DC., Prodr. 13,2: 172 (1849). *Aellenia auricula* (MOQ.) ULBR. in ENGLER & PRANTL, Natürl. Pflanzenfam. ed. 2, 16c: 567, fig. 214 A-J (1934). *Ae. auricula* (MOQ.) ULBR. var. *typica* AELLEN, Verh. Naturf. Ges. Basel 61: 190 (1950) nom. inval. *Halothamnus moquinianus* (JAUB. & SPACH) BOTSCH., Bot. Zhurn. 66,1: 133 (1981).

Icon.: MOQ. in BÉLANGER, l.c. (1834). JAUB. & SPACH, Ill. Pl. Or. 2: tab. 137 (1845) sub *Salsola moquiniana*. ILJIN in Fl. URSS 6: tab. 12, fig. 7 (1936). – Tab. 149.

Type: "Perse nord: désert salé", 1825, C.P. BÉLANGER 609, holo- and 2 isotypes P!

Hab.: Scattered or locally rather common in semidesert communities on clay-gravel, often saline soils, on chalk rocks, in scree and debris, hammada, gypsum marls, in *Artemisia-Chenopodiaceae*-semidesert, *Ferula assa-foetida*-community and *Artemisia-Dorema*-steppe; plains and slopes from 500–2550 m. – Fl. IV–VIII (at high altitudes VI–IX), fr. V–IX.

P e r s i a : W: Azerb. 38 km NE Tabriz to Ahar, 1400 m, MALCOLM 307! 20 km E Mianeh to Khalkhal, 960 m, WDB. & SHIRDELPUR 14931! Khamseh: 38–40 km NW Zanjan, 1400 m, PABOT 3706!, RECH. 53832! Lowshan between Zanjan and Mianeh, 1300 m, SAB. 30739! Arak: Yekab (Dschekab) between Arak (Sultanabad) and Kashan, 26.VI.1904, STR.! Esf.: Soh, sine coll.! Near Jolfa at foot of Kuh-e Sofeh, STAPF 789! 25 km SE Esfahan, 1700–2000 m, RECH. 46725! Kola Ghazi, 30 km S Esfahan, IRANSHAHR 30303-E! – S: Fars.: Between Deh-e Girdu and Yazd-e Khvast (Jezdikhast), STAPF 788! – E: Khor.: Doruneh W Kashmar (Turschis), X. 1913, DIEZ! East side of Kavir, Ozbagu, Chashmeh Shir (Tscheschme-Schir), RUTTNER 390! 12–18 km W Deyhuk, 1400 m, RECH. 51638! Between Ferdows and Tabas, 1100 m, REJAMAND & BAZARGAN 31964! Between Ferdows and Deyhuk, 1200 m, DADASHZADEH in PABOT 246! Near Ferdows, RUTTNER 477! Gerimenj between Qayen and Gonabad, 1560 m, FOROUGHI 10513! Between Qayen and Birjand, 1.VII.1942, SHTSHERBINOVSKIJ! 6 km NW

Salehabad, 700 m, RECH. 55774! Khvaf, Sengun, 930 m, CZERNIAK. 235! Kuh-e Ahangaran, near Qaleh Ahangaran, 2000–2300 m, RECH. 56136! – C: Tehr.: Anjil Avand between Qom and Tehran, RECH. 5801! Camp Alborz 15 km N Qom, 1000 m, SODER 7! 7 km NE Qom to Kuh-Sefid, 850 m, AKHANI 5808! 10 km SE Qom, Kuh-i Do Boradar, 1000–1200 m, SODER 95! 46–60 km S Qom, 1350 m, PABOT 3418!, 5685! Kashan: 18–30 km S Kashan, 1070–1330 m, ZOHARY & ORSHAN 5748/17!, ZOHARY 404! Shadan, SAB. 510! 26 km SE Kashan, 1070 m, IRANSHAHR & MOUSSAVI 15369-E!, TERME & MOUSSAVI 34413-E! N of Muteh (Mooteh), 1950–2000 m, RECH. 46858! Between Dudak and Robat-e Tork, ALEXEENKO 641! Robat-e Tork, ALEXEENKO 619!, 659! Well near Robat-e Tork, SOJÁK 6903!, 6904! Between Natanz and Kashan, FOROUGHI & ASSADI 15179!, MANUCH. 450! Between Tehran and Esfahan, a.1822, OLIVIER & BRUGUIERE! Shahr.-Bust.: Between Abbasabad and Mayamey, RECH. & al. 5356! 23 km W Abbasabad between Mashhad and Shahrud, 1200 m, ZOHARY & ORSHAN 10247/1! Abbasabad 120 km W Sabzevar, 1100–1400 m, REJAMAND & BAZARGAN 32047!, REJAMAND & ARAZM 32530! Between Asb Keshan and Bargh, 1100 m, IRANSHAHR 40190-E! Turan Prot. Reg.: 5 km NE Delbar, 1300 m, BRECKLE & BHADRESA 5050! Between Delbar and Ahmadabad, 18 km E of Qal-e Shor Bridge, 1000 m, BRECKLE & BHADRESA 5183! 48 km ESE Delbar to Ahmadabad, 1000 m, RECH. 50623! 0,5 km W Hajjaj, 1190 m, FREITAG 13656! Yazd: 20–30 km from Jandaq to Hoseynian, 800–1000 m, TERME & IRANSHAHR 30268-E! TERME & MOUSSAVI 40124-E! Tashtab between Khvor and Biabanak, TERME & MOUSSAVI 30279-E! 15 km W Chah Malek to Chupunum, 800–900 m, RECH. 51890! 18 km ENE Chupunum (Chupanan), 850 m, RECH. 51955! Robat-e Posht-e Badam near Khvor 1000 m, DINI & BAZARGAN 33072! 20–30 km SW Robat-e Gur to Robat-e Khan, 1000 m, RECH. 51792! 30 km Robat-e Posht-e Badam road of Yazd, 1000 m, BAZARGAN & FOROUGHI 32426! – Not localized: Gerdenah, 15 IV.1858 BUNGE! 1907 BUNGE! Persia, BODE! W Persia, Dzhand, GADD. 402! Achmedabad, Bedescht, Herat, Schurab, Rui etc., BUNGE 40!

Afghanistan: N: Mazar-i Sharif: Balkh, BLIGNY 15! Tang-i Tashkurghan, 600 m, FREITAG 5087! Koh-i Damesh Pass, S Tashkurghan (Khulm), 580 m, UOTILA 16977! SE Tashkurghan to Samangan (Haibak), 600–700 m, HDG. & WDB. W-3973!, RECH. 16349! – NW: Maimana: 30 km SSE Maimana to Sar-e Hauz, 1200 m, FREITAG 6703! Herat: 11 km N Khusan NW Herat, 760 m, FREITAG 5483! Hari Rud valley, AITCH. 600!, 716! 80 km E of Persian border along highway, 850 m, KUKKONEN 7578!, UOTILA 18941! – SW: Farah: 300 km WNW Girishk, at new road to Shindand, RECH. 32491! 30 km E Dilaram to Girishk, 1050 m, RECH. 33548! Koh Gerd between Girishk and Dilaram, 800 m, BRECKLE 4875! 25 km W Girishk, 900 m, BRECKLE 4934! 20 km E Girishk, 900 m, UOTILA 16481! 25 km NNE Girishk to Kajakai, 1000 m, FREITAG 6865! N Girishk near Germab, 1700 m, KERST. 406! 10 km E bifurcation Kandahar-Girishk-Lashkargah to Kandahar, 900 m, ANDERS 8658! – SE: Kandahar: 80 km W Kandahar to Girishk, 1100 m, RECH. 34834! Pirzada near Kandahar, 900 m, KOEIE 2070! 10 km W Kandahar, S of Arghandab-bridge, 1000 m, PODLECH 30761! 25–53 km W Kandahar, 960–1000 m, FREITAG 468!, 2044!, PABOT A-297! 45 km W Kandahar, 2 km N of main road, 1000–1250 m, FREITAG 788a! 8 km E Kushk-i Nakhud to Kandahar, 980–1000 m, KERST. 291!, PODLECH & JARMAL 28923! 13 km E Kushk-i Nakhud, 980 m, PODLECH 30681! Kandahar, 1050 m, MARTINČIČ & WRABER 89!, NEUB. 4202! 10–20 km NE Kandahar, 1100 m, RECH. 35255! 20–45 km E Kandahar, 1100–1200 m, UOTILA 18916!, 18920! 43 km N Kandahar to Arghandab Reservoir, 1100–1200 m, RECH. 34905! At Arghandab Reservoir 50 km N Kandahar, 1200 m, RECH. 34944! Orozgan: Orozgan, LINDB. 972! – NE: Kataghan: Aliabad distr., 830 m, FURSE 6059! Naqel between Khanabad and Taliqan, 620 m, ANDERS 6580! Sulani 18 km NE Khanabad to Taliqan, 620 m, PODLECH 21372! 3 km S Jelowgir, at road from Baghlan to Kunduz, 500 m, PODLECH & JARMAL 30084! Dasht-e Layqa, 15 km NE Surkh Kotal at road to Narin, 1100 m, PODLECH 21663! Dasht-e Besghaza, between Narin and Pul-i Khumri, 1500–1600 m, ANDERS 6865! 14 km E Kataghan, lower Andarab valley, 1100 m, LAMOND 2290!, RECH. 31761! Andarab valley below Khinjan, near Gazan, 1000–1050 m, FREITAG 3046!, PODLECH 22218! 8 km E Doshi, 970 m, PODLECH 32376! Darra-e Shikari above Doshi, 10 km S of Gandana, 2120 m, FREITAG 6437! – C: Bamian: 6 km W Bamian, 2550 m, FREITAG 1228a! Bamian, 2400 m, KOEIE 3035!, NEUB. 403!, VOLK 2247! Bamian, near Buddha-statues, 2400–2500 m, HDG. & WDB. W-4657!, PODLECH 12192! Ghulghula near Bamian, 2550 m, GILLI 2203!, PELT b6!, GRIFF.! Doab: Doab, VOLK 649! Basfak, VOLK 1742! Kamard valley W Doab, 1630 m, GILLI 2202! Ajar valley 5–13 km W Doab, 1500 m, RECH. 37016! 15 km W Doab, 1450 m, HDG. & WDB. W-3432! Hajir Valley 40 km W Doab, 2150 m, FURSE 8285! N Doab, PABOT A-1135! Near coal mine of Eshpushta, N Doab, 1500 m, GILLI 2201! – Not localized: Afghanistan, GRIFF. 776!, 1811!, 4224!

Distr. gen. of subspecies: S Turcomania, Tadjikistan, Uzbekistan, Kirghistan, Persia, Afghanistan. A broader leaved form, var. *latifolius* KOTHE-HEINR., occurs mainly in the NE part of the distribution area.

–– subsp. ***acutifolius*** (MOQ.) KOTHE-HEINR., Biblioth. Bot. 143: 74 (1993).
Syn.: *Salsola auricula* MOQ. β. *acutifolia* MOQ., Chenopod. Monogr. 136 (1840). *S. decurrens* JAUB. & SPACH, Ill. Pl. Or. 2: 63, tab. 138 (1845). *Caroxylon acutifolium* (MOQ.) MOQ., nom. illeg. in DC., Prodr. 13,2: 173 (1849). *S. acutifolia* (MOQ.) BUNGE, nom. illeg., Nouv. Mém. Soc. Imp. Nat. Mosc. 12: 189 (1860); Vestn. Russk. Geogr. Obshch. 28,1: 86 (1860). *Aellenia auricula* (MOQ.) ULBR. var. *acutifolia* (MOQ.) ULBR. in ENGLER & PRANTL, Natürl. Pflanzenfam. ed. 2, 16c: 567, fig. 214 A-J (1934). *Halothamnus acutifolius* (MOQ.) BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18:172 (1981), nom. illeg., p.p.
Icon.: JAUB. & SPACH, Ill. Pl. Or. 2: tab. 138 (1845) sub *Salsola decurrens*; KOTHE-HEINRICH, l.c.: tabs. 23–24 (1993). – Fig. 7-b, 8-b; Tab. 150.
Type of subspecies: (Persia) P.M.R. AUCHER-ELOY 2956, holotype P!; isotype G!

Hab.: Rather common and locally subdominant in semidesert-communities, on clay-gravel or clay, often saline soils, on chalk, wadi sides, on plains and slopes; 800–1600 (2300) m. – Fl. IV/V–VI, fr. V–VIII (IX).

P e r s i a : W: Azerb.: 27 km E Mianeh to Khalkhal, Qezel Owzan river bed, 1050 m, AKHANI & LARI 5708! Qaflan Kuh, Zanjan road, 1150 m, FOROUGHI & ASSADI 13705! Khamseh: 80 km from Mianeh to Zanjan, 1320 m, Qezel Owzan (Ghezel-Ouzun) river bank, ZEHZAD 83611! Lowshan road of Zanjan to Mianeh, 1300 m, SAB. 30739! – W: Ham.: 20 km NWN Tafresh, between Bazerjan and Dadeqan, 1500–2000 m, AKHANI 5867! Arak: Distr. Dshapelakh, VIII.1899, STR.! Latetar, 20.VIII.1895 STR.! Between Arak (Sultanabad) and Kashan, near Yekab (Dshekab), STR. 45! Near Akhmadabad, 10.VII.1903, STR.! – E: Khor.: 4 km NE Sabzevar, 950 m, PABOT 8009! 28 km W Davarzan, road to Sabzevar, 850 m, AKHANI 6430! – C: Shahr.-Bust.: Shahrud, Chehel Dokhtar, ERSHAD 40218-E!, MOUSSAVI & KARAVAR 34371-E! NE Shahrud to Khush-Yailaq pass, 1400 m, RECH. 5399! E Shahrud, 1200 m, IRANSHAHR 30401-E! 24–28 miles E Shahrud, 1200–1300 m, ALAVA & IRANSHAHR 10863!, IRANSHAHR 15281-E!, BRECKLE & BHADRESA 5199! Abbasabad 120 km W Sabzevar, 940 m, REJAMAND & BAZARGAN 32454! Turan Prot. Reg., 12 km NE Rasveh, Buzmin Kuh, 1220–1300 m, FREITAG 14973! Kuhha-ye Anjirab, 1500–1650 m, TERME & MOUSSAVI 40109-E! – Not localized: Tschehordeh im Elbursgebirge, 5.IX.1848, BUNGE! In Persia australis desertibus, AUCH. 2745!
A f g h a n i s t a n : SW: Herat: 34 km N Shindand, Ziarat-e Khwaja Orya, 1320 m, FREITAG

5264! Farah: Jija between Farah and Shindand, 900–1200 m, KOEIE 3903!, 4079! Koh Gerd 28 km N Farah Rud Deh, 1000 m, BRECKLE 4930! Farah Rud, 900 m, TONČEV 4209! 33 km NW Dilaram, 800 m, FREITAG 2474! Dilaram, 900 m, TONČEV 4223! 15 km N Dilaram, 900 m, PODLECH 21685a! – **SE**: Kandahar: Kajakai, near dam, 1000 m, FREITAG & BRECKLE 4608!, LINDB. 426!, 427!

P a k i s t a n : Quetta: 30 km NNE Quetta to Pishin, 1500 m, RECH. 28875! Pishin, 1700 m, ZAFFAR ALI 5629! 35 miles from Quetta to Ziarat, between Khanai and Kuch, QAISER & GHAFOOR 1396! Between Quetta and Ziarat, 2300 m, JAFRI & AKBAR 2043! Bal.: 93 km NE Nushki to Quetta, 1600 m, FREITAG & KOTHE 18777!, 18777a! – Not localized: Upper Belutschistan, 1851, STOCKS 996! Baluchistan, 1956, coll. ign., Gordon College Herb. 28484!

Distr. gen. of subspecies: Persia, SW Afghanistan, Pakistan (Baluchistan), doubtfully in Turcomania (NW Kopet-Dagh).

5. ***H. kermanensis*** KOTHE-HEINR., Biblioth. Bot. 143: 80 (1993).
Syn.: *Salsola auricula* MOQ. *β acutifolia* MOQ. f. *stenophylla* BORNM., nom. nud. in sched.
Icon.: KOTHE-HEINRICH, l.c.: tab. 25–26, phot. 1 (1993). – Fig. 7-c; Tab. 151.
Type: Persia austro-orient., prov. Kerman: Kerman, in apricis, 2000 m., 22.VIII. 1892, J.F.N. BORNMÜLLER 5062, holotype JE!; isotypes B!, G!, WU!

Differt a *H. auriculo* subsp. *acutifolio* fructibus minoribus, tubo breviore, alis infra medium longitudinis fructus insertis, lobis tepalorum sulco transverso ab alis distinctissime discretis, in conum altum conniventibus, magnopere conspicue carinatis; foliis bracteisque non (vel valde inconspicue) scarioso-marginatis; bracteolis ecarinatis parte centrali herbacea rotundo-rhomboidea apice obtusangula; tepalis minoribus apice aliquantum latius scarioso-marginato quam lateribus; filamentis angustioribus, basi 0,9–1,5-plo latioribus quam spatium inter ea.

Sub-shrub, up to 55 cm, erect, glabrous. Woody branches pale brown (to pale grey). Annual branches olive-green-grey, striate, straight, partly elongated, in or below the middle with ascending or oblique lateral branches. Leaves flat, ovate or cordate, often at the same plant also narrowly linear-lanceolate, gradually or abruptly pointed, mucronulate, half-stem-clasping, often auriculate, dorsal with whitish mid-rib, the lower ones 6–20 × 1,5–8(–13) mm, higher up 3–6 mm long. Flowers both on main stem and lateral branches, at 3–15 mm distance. Bracts of lower flowers similar to leaves, 4–15 × 3–8,5 mm, longer than or as long as perianth, longer than bracteoles; higher up scale-like, triangular-ovate or ovate-cordate, 1,7–3,5 × 1,5–2,5 mm, shorter than perianth, as long as bracteoles, basal with narrow membranous margins. Bracteoles adpressed to perianth, scale-like, broadly triangular-ovate or ovate-roundish to -cordate, gradually or abruptly pointed, higher up partly with rounded apex, mostly mucronulate, herbaceous part rounded-rhomboid with obtuse- or right-angled apex, shorter than perianth, 1,7–2,8 × 1,9–2,6 mm, apically somewhat plicate, basal with broad, lateral and apical with very narrow membranous margins. Tepals ovate or ovate-triangular, 3,3–4 mm long, the outer 2–2,6 mm wide, transverse line at 1/4 (–1/3), green blotch rather narrowly triangular-ovate, membranous margin apically ± wider than laterally. Filaments arising from outer side of disc, 0,45–0,7 mm wide. Anthers 2–2,7 mm long, appendage retuse-rounded. Disc with small half-round interstaminal lobes. Style in fruit ovoid. Stigmas 1–1,6 × 0,3–0,5 mm, with truncate denticulate apex. Fruit 9,5–13 mm diam. Tube dish- or bowl-shaped with widened base, with convex, smooth sides, at the wings partly ± constricted and 3,2–3,5 mm, at base 2,7–4,3 mm diam., 1,3–2 mm high. Basal area rounded pentagonal, with narrow-edged or wider, rounded or prominent peripheral rim; pits ± deep, furrow-like, linear, curved or very narrowly ovate. Wings below the middle, yellowish-beige, partly pinkish tinged, their veins often joining at base. Tepal lobes distinctly keeled, separated from wings by distinct transverse furrow, forming a steep cone, apically spreading. (Fig. 7-c).

Hab.: Semidesert communities, on clay, gravel and stony, often saline soils, at salt lakes and salt pans, with other chenopods as *Salsola* and *Halostachys*, on plains and slopes; 1000–2100 m. – Fl. VI–VIII, fr. VI–X.

Persia: S: Fars: Salt lake Darya-i Namak (Maharlu) between Neyriz and Shiraz, 1600 m, BORNM. 5064!, KY. 460! 55 km SE Abadeh, 2080 m, PABOT 2355! S shore of Daryacheh-e Bakhtegan, 70 km WNW Neyriz, 1700 m, BOHKARI & EDMONDSON 2097! Estahbanat, Rud-Ghoul, HAGHIGHI 30206-E! – Kerm.: Between Kerman and Zarand, Amirabad kavir, DADASHZADEH in PABOT 207! 9 km N Kerman, 1850 m, PABOT 6955! Kerman, 2000 m, BORNM. 5062!, MANUCH. 489! Kuh-Tagh Ali, 2100 m, BORNM. 5065! Sirch between Kerman & Shahbad, 1750 m, 31.X.1985, ZEHZAD! Road to Baft, S Kerman, 1750 m, DADASHZADEH in PABOT! Between Kerman and Bam near Nabid (Neybid), DADASHZADEH 206 in PABOT! Near Khatunabad, 70 km NW Bam, SOJÁK 2695! Bal.: 64 km NW Bazman at road to Bam, 1000 m, RECH. 55178! – C: Yazd: Bafq, Dasht-e Sheytur, 1850 m, MOUSSAVI & TEHRANI 35046-E!

Distr. gen.: S Persia, endemic.

Similar to *H. auriculus* subsp. *acutifolius*, but distinct in the remarkably different smaller fruits with wings below the middle, flat tube, tepal lobes strongly keeled and forming a steep cone distinctly separated from wings by a sharp transverse furrow. In addition the leaves lack conspicuous membranous margins, the bracteoles are unkeeled with rounded-rhomboid herbaceous part with obtuse- or right-angled apex, and the filaments are narrower and relatively widely distant.

6. ***H. afghanicus*** KOTHE-HEINR., Biblioth. Bot. 143: 84 (1993).
Icon.: KOTHE-HEINRICH, l.c.: tab. 27–28, phot 2 (1993). – Tab. 152.
Type: Afghanistan: "Kabul, c. 65 km E of Kabul, just E of Sarobi near the Laghman provincial border, gravel hills, slopes covered by *Artemisia* steppe", 1180 m, 14.VII. 1972, P. UOTILA 18455b, holotype H!; isotypes E!, LE.

Differt a *H. auriculus* ramis lignosis cinereis vel fusco-cinereis, foliis anguste triangularibus vel lanceolatis non (vel maxime inconspicue) scarioso-marginatis, tepalis ovatis brevioribus, fructibus minoribus, tubo late urceolato (superne lateribus concavis, basi valliculo laterale prominenti rotundato obducto). Differt a *H. lancifolius* bracteolis erectis brevioribus, basi late lateribus apiceque angustissime scarioso-marginatis, tepalis ovatis brevioribus sulco transverso ad 1/3–2/5 longitudinis, antheris brevioribus, stigmatibus truncatis latioribus, fructibus brevioribus, alis in medio longitudinis fructus insertis, lobis tepalorum in conum latum brevem conniventibus, tubo late urceolato. Differt a *H. cinerascens* ramis lignosis cinereis vel fusco-cinereis, bracteolis erectis brevioribus, basi late lateribus apiceque angustissime scarioso-marginatis, tepalis ovatis, stigmatibus truncatis latioribus, tubo late urceolato.

Sub-shrub up to 60 cm, erect, glabrous. Woody branches ash- to dark grey. Annual branches glaucous-grey, broadly striate, straight, with ascending to oblique, partly elongated lateral branches. Leaves flat, narrowly triangular to lanceolate, rarely linear-triangular, gradually pointed, mucronulate, dorsal with whitish mid-rib, the lower ones 10–40 × 2–4,9 mm, higher up 2,5–10 × 1,4–2 mm. Flowers both on main stem and lateral branches, at 1,5–6 mm distance. Bracts of lower flowers similar to leaves, 4–20 × 1,7–3,4 mm, longer than perianth and bracteoles; higher up scale-like, lanceolate, apically plicate, 2,1–3,2 × 1,1–2,2 mm, shorter than perianth, as long as or slightly longer than bracteoles, basal with narrow membranous margins. Bracteoles adpressed to perianth, scale-like, basally ± keeled, apically plicate, basal with wide and lateral and apical with very narrow membranous margins, at lower flowers lanceolate, acuminate, mucronulate, somewhat shorter than or as long as perianth, 2,4–3,6 × 2–2,7 mm; higher up triangular to triangular-cordate, 2–2,4 × 1,6–2,4 mm, shorter than perianth. Tepals ovate, 3,1– 3,6 mm long, the outer 2–2,6 mm wide, transverse line at 1/3–2/5, green blotch triangular, membranous margins ± of constant width. Filaments arising from outer side of disc, 0,45–0,7 mm wide. Anthers 1,7–2,9 mm long, appendage rounded (rarely obtusish). Disc with small half-round interstaminal lobes. Style in fruit domeshaped-ovoid to ± conical. Stigmas 0,8–1,4 × 0,5–0,7 mm, with widened, truncate, denticulate apex. Fruit 10–14 mm diam. Tube in upper part with concave, smooth sides, in lower part with prominent convex sides, at the wings 3,1–3,7 mm, basal 3,4–4,3 mm diam., 1,7–2,4 mm high; basal area rounded pentagonal, with broad, irregular peripheral rim; pits ± deep, furrow-like, linear, ± curved or very narrowly ovate. Wings in the middle, yellowish to straw-coloured or pinkish tinged, their veins basally partly fusing. Tepal lobes distinctly keeled, forming a flat cone, apically somewhat spreading.

Hab.: Arid, ± subtropical *Zizyphus nummularia*-shrubland and *Artemisia*-semidesert, on gravelly, sandy and marly soils, on plains and slopes; 500–1200 m. – Fl. VI–VIII (IX), fr. VII–IX (X).

Afghanistan: E: Kabul: 65 km E Kabul, E Sarobi near Laghman border, 1180 m, UOTILA 18455-a!, -b! 13 km E Kabul, near Charkhi, 1830 m, FREITAG 1969! 15 km from Kabul to Sarobi, PELT 524! Nangarhar: 20–30 km E Jalalabad to Torkham, 630–700 m, BRECKLE 4961!, FREITAG 7318!, RECH. 19358!, 37425! 50 km from Torkham to Jalalabad, 700 m, LAMOND 1907! 8 km SW Ghaziabad at road from Jalalabad to Torkham, 550 m, PODLECH 19985! ?Haray, TONČEV 4117!

Distr. gen.: Endemic in E-Afghanistan, mainly in the Jalalabad basin area.

Probably related to *H. auriculus* subsp. *acutifolius*, also in Afghanistan. It is distinct in the different shape of tube, smaller fruits, ovate shorter tepals, narrow leaves lacking conspicuous membranous margins and grey bark. Its habit is very similar to *H. lancifolius* (BOISS.) KOTHE-HEINR. (occurring in Middle East) and *H. cinerascens* (in Persia). It differs from both in the shorter bracte oles adpressed to perianth with basally wide and laterally and apically narrow membranous margins, ovate tepals, truncate stigmas, and completely different tube shape.

The determination of PELT 524 is uncertain.

7. ***H. cinerascens*** MOQ. emend. KOTHE-HEINR., Biblioth. Bot. 143: 93 (1993).

Sub-shrub, up to 70(100) cm, ascending to erect, glabrous or hispidulous. Woody branches pale brown. Annual branches glaucous to grey, broadly striate, straight, verrucose, in lower part loosely branched with ascending or oblique, often elongated lateral branches. Leaves flat or cylindrical to semiterete, gradually or abruptly pointed, mucronulate, dorsal in lower part with whitish mid-rib, the lower ones linear to lanceolate, 7–35 × 1,3–6,7 mm, higher up linear-triangular to oblong-ovate, 3,3–7 × 1,1–3,4 mm. Flowers from near base, both on main and lateral branches, at 1–5 (–12) mm distance. Bracts of lower flowers similar to leaves, 5–26 × 1,3–5,1 mm, longer than perianth and bracteoles; higher up scale-like, linear-lanceolate or lanceolate-ovate, 2–5 × 1,2–3,2 mm, as long as or shorter than perianth, somewhat longer than or as long as bracteoles, basal with very narrow membranous margins. Bracteoles of lower flowers obliquely spreading, flat or semiterete, linear-lanceolate or lanceolate, gradually or abruptly pointed, mucronulate, somewhat longer to somewhat shorter than perianth, 3–9 × 1,5–2,8 mm, dorsal in lower part with whitish mid-rib, basal with narrow membranous margins; higher up scale-like, lanceolate-ovate (to triangular-ovate), 1,9–3 × 1,3–2,5 mm, shorter than perianth, basally slightly keeled and with rather narrow (partly lateral with very narrow) membranous margins. Tepals ovate-triangular, 3–4 mm long, the outer 1,9–2,5 mm wide, transverse line at 1/3, green blotch rather narrowly triangular, membranous margin ± of constant width. Filaments arising from outer side of disc, 0,5–0,7 mm wide. Anthers 2,1–2,8 mm long, appendage trapezoidal or acutish-rounded. Disc with flat half-round interstaminal lobes. Style in fruit ± ovoid. Stigmas 1–1,5 × 0,3–0,5 mm, with rounded denticulate apex. Fruit 10–15 mm diam. Tube cylindrical or widened towards base, with straight or concave smooth sides, at the wings ± constricted and 2,3–4 mm, at base 2,5–5,2 mm diam., 1,7–3 mm high; basal area obtusely or rounded pentagonal, with rounded or partly prominent, irregular peripheral rim; pits deep, furrow-like, linear, ± curved. Wings in or above the middle, yellowish or straw-coloured, partly reddish tinged, their radial veins mostly fusing at base. Tepal lobes keeled, forming a moderately steep cone, apically often spreading. (Fig. 7-a, 8-a).

Hab.: Semidesert communities, with *Artemisia, Salsola* or *Seidlitzia florida*, on gravel, clay, often saline or gypsum soils, alluvial plains and slopes; 700–2200 m. – Fl. VI–VIII, fr. VI/VII–IX.

Distr. gen. of species: Endemic in N Persia.

1a. Leaves and bracts semiterete or cylindrical, linear to triangular-linear,

1,3–2,8 mm wide; tube not widened .... subsp. *cinerascens*
b. Leaves and bracts flat, triangular-lanceolate, 1,8–6,7 mm wide; tube often widened towards base .... subsp. *vestitus* (AELLEN) KOTHE-HEINR.

The name *H. cinerascens* is used here for populations which hitherto were grouped either as *Aellenia glauca* subsp. *cinerascens*, subsp. *brachyphylla*, or *Halothamnus hispidulus* var. *glabratus*, when their leaves were semiterete, or as *Aellenia glauca* subsp. *vestita* or *H. acutifolius* when their leaves were flat. These several taxa are now included as two subspecies of *H cinerascens*, because they are identical in all flower and nearly all fruit characters, except for the more often basally dilated tube in subsp. *vestitus*. Occasionally transitional forms between the subspecies occur.

The semiterete-leaved subsp. *cinerascens* is distinguished from *H. glaucus* by a completely different fruit tube with irregular peripheral rim and very small, furrow-like linear, ± curved or very narrowly ovate pits, pale brown bark, glaucous-grey branches, and broader bracteoles basally not dilated and not enclosing fruit tube, basal with only narrow membranous margins.

The flat-leaved subsp. *vestitus* differs from *H. auriculus* subsp. *acutifolius* by leaves lacking conspicuous membranous margins, spreading leaf-like bracteoles only basal with membranous margins, shorter tepals, apically rounded stigmas, and cylindrical or basally dilated tube with irregular peripheral rim.

With regard to habit, *H. cinerascens* is very similar to the Middle Eastern *H. lancifolius* (BOISS.) KOTHE-HEINR., from which it differs by pale brown bark, not decurrent leaves, shorter ovate-triangular tepals and wings in or above the middle of fruit.

H. cinerascens subsp. *cinerascens* occurs in two varieties differing in indumentum: the glabrous var. *cinerascens* and the hispidulous var. *hispidulus* KOTHE-HEINR. Likewise, two varieties of subsp. *vestitus* are known: the hispidulous var. *vestitus* and the glabrous var. *glaber* KOTHE-HEINR.

– – subsp. ***cinerascens***

Syn.: *Salsola glauca* M.B. β *cinerascens* MOQ., Chenopod. Monogr.: 140 (1840). *Caroxylon glaucum* (M.B.) MOQ. β *cinerascens* (MOQ.) MOQ. in DC., Prodr. 13,2: 173 (1849). *Salsola brachyphylla* BOISS. & HAUSSKN. in BOISS. Fl. Or 4,2: 959 (1879), nom. illeg., non SPRENGEL, Linn. Syst. Veg. 16. ed 1. I: 924 (1825). *Aellenia glauca* (M.B.) AELLEN subsp. *cinerascens* (MOQ.) AELLEN, Verh. Naturf. Ges. Basel 61: 187 (1950). *Ae. glauca* (M.B.) AELLEN subsp. *cinerascens* (MOQ.) AELLEN var. *eucinerascens* AELLEN, Verh. Naturf. Ges. Basel 61: 187 (1950), nom. inval. *Aellenia glauca* (M.B.) AELLEN subsp. *cinerascens* (MOQ.) AELLEN var. *brachyphylla* (BOISS.) AELLEN, Verh. Naturf. Ges. Basel 61: 188 (1950), comb. illeg. *Ae. glauca* (M.B.) AELLEN subsp. *cinerascens* (MOQ.) AELLEN var. *gypsicola* AELLEN, Verh. Naturf. Ges. Basel 61: 188 (1950). *Ae.* × *Manoutcherii* AELLEN, Verh. Naturf. Ges. Basel 61: 191 (1950). *Ae. cinerascens* (MOQ.) AELLEN, in schedis (1961) nom. nud. *Halothamnus hispidulus* (BUNGE) BOTSCH. var. *glabratus* BOTSCH., in schedis

Icon.: KOTHE-HEINRICH, Biblioth. Bot. 143: tab 31 and 33 (1993). – Tab. 153.

Type: Perse, désert salé, 1825, C.P. BÉLANGER 606 (P!); Paratype: Perse, 1825, C.P. BÉLANGER, P!, G-PAE!

Persia: W: Azerb. SE shore of lake Rezaiyeh (Urmia) between Bunab and Khanian, RECH. 14774! Khamseh: 10 km W Zanjan, 1600 m, RECH. 32570! – C: Tehr.: Rey, FIELD & LAZAR

994! Near Bahram station, 20 km E Tehran, 1100 m, AELLEN 316! 30 km S Tehran, 1230 m, ZOHARY 1221! 55 km S Tehran, Rudkhaneh Shur, 950 m, BRECKLE & BHADRESA 5410! 60 km S Tehran on Qom road, 1100 m, MALCOLM 326! Between Tehran and Qom, AKHANI 593!; 1430 m, ZOHARY 243!, 255! Near Varamin (Shihahrta-chan), BRUNS 201!, 348!, 208!, VAHEDI 1856! 13 km E Eyvanki, 1100 m, RENZ & IRANSHAHR 16782-E! 13 km W Garmsar, MOUSSAVI & KARAVAR 41701! Garmsar, 1100 m, AELLEN 310! Saruzan to Kahak, 700 m, IRANSHAHR & MOUSSAVI 40235-E! Hableh Rud valley, 1–2 km above Ban-e Kuh (Boneh-kuh, Bun-e Kuh), 1100 m, AELLEN & MANUCH. 308!, 309!, 313c!, 315!, 317!, 319!, 2974!, 3129! Hableh Rud valley between Simin Dasht and Kabutar Darreh, 1150 m, AELLEN & MANUCH. 298!, 306!, 320!, 321! Kuh-e Bibishahrbanu, 1400–1700 m, MOUSSAVI & al. 39812-E! Kavir Prot. Reg.: 12 km SE Mobarakiyeh, IRANSHAHR 30302-E! Mobarakiyeh, 40 km S Varamin, 900 m, RECH. 46086! Nar-e Khar Kuh SE Mobarakiyeh, 850–900 m, FREITAG 13994! Siah Kuh, near Shah Abbas Caravan-Sarai, 1100–1300 m, RECH. 46213! Eyn or-Rashid, 1150 m, WDB. & FOROUGHI 14634! Siah-Kuh, 770–950 m, AELLEN & SHAR. 318!, BRAUNE & al. vo6082!, WDB. & FOROUGHI 14638!, 14644! Qazv.: Near Qazvin, ALEXEENKO 501! 33 km E Eshtahard to Karaj, 1200 m, AKHANI & LARI 5746! Karaj, GAUBA 16! Ravandeh near Karaj, GAUBA 2118! Karaj river near Karaj, 1340 m, AELLEN 214!, 303!, 304!, 305! Damgh.-Semn.: Upper Chashmeh-i Ali valley, SE of Kuh-i Nizva, near Chashm (Djaschm), 2200 m, AELLEN & BEHB. 299!, BEHB. & AELLEN 30120-E!, 30177-E! – Sorkheh (Surkheh) near Semnan, 1600 m, RECH. 1261! Chalehdan, 1050 m, MOUSSAVI & TEHRANI 41700-E! Semnan, 860 m, AMIN & MOUSSAVI 2787! 8 km NE Momenahad, 1400–1500 m, MOUSSAVI & KARAVAR 34368-E! 30 miles E Semnan, 1600 m, IRANSHAHR 40266-E! Between Semnan and Damghan, RECH. 1267! – Qom: Howz-i Soltan, 20.V.1859, BUNGE!, HAUSSKN. 7!, 15! – Persia: salt desert, BÉLANGER 606!

Distr. gen. of subspecies: Endem.

–– subsp. ***vestitus*** (AELLEN) KOTHE-HEINR., Biblioth. Bot. 143: 98 (1993).

Syn.: *Aellenia glauca* (M.B.) AELLEN subsp. *vestita* AELLEN, Verh. Naturf. Ges. Basel 61: 184 (1950). *Ae. glauca* (M.B.) AELLEN subsp. *vestita* AELLEN var. *pilosa* AELLEN, Verh. Naturf. Ges. Basel 61: 185 (1950). nom. inval. *Aellenia glauca* (M.B.) AELLEN subsp. *vestita* AELLEN var. *pycnophylla* AELLEN, Verh. Naturf. Ges. Basel 61: 185 (1950). *Ae. glauca* subsp. *vestita* AELLEN var. *glabra* AELLEN, Verh. Naturf. Ges. Basel 61: 185 (1950). *Halothamnus acutifolius* (MOQ.) BOTSCH. var. *pilosus* (AELLEN) BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 173 (1981), comb. illeg. *Halothamnus acutifolius* (MOQ.) BOTSCH. var. *acutifolius*, in schedis.

Icon.: AELLEN, Verh. Naturf. Ges. Basel 61: tab. 2, fig. I (1950). KOTHE-HEINRICH, l.c.: tab. 32–33 (1993). – Fig. 7-a, 8-a.

Type of subspecies: Persia, Salzsteppenhügel bei Murdabad SW Keredj, 1300 m, 19.IX.1948, P. & Y. AELLEN 300, lectotype LE, sel. BOTSCHANTZEV; isotypes G-PAE!, G!, M!, NY!, TEH nr. 7220!

Persia: W: Azerb. SW shore of lake Rezaiyeh (Urmia), 1330 m, FURSE 3501! Gul, 22.VIII. 1884, KNAPP! N Tabriz, 1660 m, COWAN & DARL. 1815! Khamseh: 83 km from Zanjan to Bijar, 1480 m, ASSADI & AMINI 13564! Ham.: Aq Bulaq, 100 km N Hamadan, 2000 m, RIOUX & GOLV. AB-110! – C: Tehr.: Rud Shur, 50 km SW Tehran, 900–1000 m, AELLEN 281!, CRON-

QUIST & BABAKHANLOU 10723! Rud Shur station, 60 km SW Tehran, 950 m, AELLEN 279!, 311!, 312!, 3152!, 282! Hableh-Rud valley, between Simin-Dasht and Kabutar Darreh, 1150 m, AELLEN & MANUCH. 323! 61 km from Tehran to Saveh, 1260 m, ASSADI & SHIRDELPUR 13124! 51 km N Qom to Tehran, 900 m, PABOT 7198! Kushk-e Nasrat between Tehran and Qom, 800 m, AELLEN & SHAR. 280! Khanabad, 29.VIII.1882, PICHLER! Kavir Prot. Reg.: 34 km from Chashmeh-ye Safid Ab to Hajji Ali Abbas, 1100 m, RECH. 46469! SE Darya-ye Namak, Kush-Kuh, 860 m, AELLEN & SHAR. 283! 18 km N Chashmeh-ye Safid Ab, 900 m, RECH. 46391! Qazv.: Mardabad SW Karaj, 1300 m, AELLEN 284!, 300!, 322!, GAUBA 1032!, 1033!, 2122!, 2132! Halkedar hills at Mardabad, 1200–1300 m, HDG. & al. 14684!, RECH. 1040!, 6827!, TERME 40189-E! 15 km from Mardabad to Eshtahard, along Rud Shur river, 1200 m, AKHANI & al. 2071! Karaj river near Karaj, 1330 m, AELLEN 302! Qom: 1 km W of saltlake Daryacheh-ye Howz-i Soltan, 90 km S Tehran, 860 m, KUKKONEN 7871! Kashan, Kavir, Kuh-e Yakh Ab, IRANSHAHR 14815-E! Damgh.-Semn.: 30 km SE Semnan, IRANSHAHR & RIEDL 15889-E! Shahr.-Bust.: Bustan, SAB. in GAUBA 2131! 40 km NE Shahrud to Shah Pasand, 1560 m, PABOT 8105! – Not localized: Achmedabad, 25.IX.1858, BUNGE! BUNGE 47! Between Hamadan and Tehran, 20.VI.1882, PICHLER!

Distr. gen. of subspecies: Endem.

8. ***H. glaucus*** (M.B.) BOTSCH., Not Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 157 (1981).

Sub-shrub, 20–100 cm, erect, glabrous or hispidulous. Woody branches ash- to dark grey. Annual branches straight, glaucous, broadly striate, with erect or ascending lateral branches. Leaves semiterete, linear, gradually pointed, partly mucronulate, the lower ones 15–50 × 0,7–2,6 mm, higher up 3–10 × 0,7–1,5 mm. Flowers both on main and lateral branches, at 2–14 mm distance. Bracts of lower flowers similar to leaves, 7–40 × 0,9–1,5 mm, basally widened, longer than perianth and bracteoles, basal with very narrow membranous margins; higher up scale-like, lanceolate, partly with semiterete apex, 2,4–5 × 1,5–2,5 mm, as long or somewhat shorter than perianth, somewhat longer or as long as bracteoles, basal with narrow membranous margins. Bracteoles of lower flowers similar to leaves, linear or linear-lanceolate, 3,7–18 × 0,8–1,7 mm, basally widened, longer than or as long as perianth, basal with moderately wide membranous margins; higher up scale-like, lanceolate-ovate to triangular-ovate, 1,8–3,7 × 2–2,9 mm, shorter than perianth, partly ± keeled in lower part, basal with wide, lateral partly with very narrow membranous margins. Tepals lanceolate-ovate to triangular-ovate, 3,6–4,9 mm long, the outer 2,1–3 mm wide, transverse line at 1/4–1/3, green blotch rather narrowly triangular, membranous margins of constant width. Filaments arising from outer side of disc, 0,5–0,9 mm wide. Anthers 2,2–3,1 mm long, appendage rounded or acutish. Disc with flat half-round interstaminal lobes. Style in fruit dome-shaped to ovoid. Stigmas 1,2–2,1 × 0,35–0,6 mm, with rounded denticulate apex. Fruit 11–17 mm diam., ± heterocarpic: tube either thick, broadly cylindrical, often widened towards base, with straight (or ± concave) smooth sides, basal with broad, rounded-pentagonal, rounded or ± prominent peripheral rim and deep, ovate or roundish pits; higher up tube flat, narrowed towards base, lateral with ± prominent ridges (veins), basal with obtusely pentagonal, narrow, sharp-edged rim and shallow pits. Tube at the wings 3–4,5 mm, at base 2,5–4,8 mm diam., 1,4–2,3 mm high. Wings in or ± below the middle, straw-coloured, ± yellowish or reddish tinged. Tepal lobes distinctly keeled, forming a moderately steep cone, apically partly spreading. (Fig. 7-d, 8-d).

Distr. gen. of species: E Turkey, N Persia, Georgia, Armenia, Azerbaijan, Turcomania, Uzbekistan, Kirghistan, Kazakhstan, China (Dzungaria).

Very variable in leaf-length, -thickness and -density. BOTSCHANTZEV's *H. hispidulus, H. heptapotamicus*, and *H. tianschanicus* (not in our area) are now regarded as infraspecific taxa. Because of many characters considered as "primitive", an ancestor of *H. glaucus* could have been the starting point for the evolution of most *Halothamnus* species. The species is important as grazing plant and is locally cultivated. It contains alkaloids.

1a. Plants glabrous, branched mainly above the middle; filaments 0,6–0,9 mm wide; anthers 2,4–3,1 mm long .... subsp. *glaucus*
b. Plants densely hispidulous, branched mainly below the middle with flowers from near base; filaments 0,5–0,7 mm wide; anthers 2–2,5 mm long .... subsp. *hispidulus* (BUNGE) KOTHE-HEINR.

–– subsp. ***glaucus***

Syn.: *Salsola glauca* M.B., Tabl. prov. Mer Casp.: 112 (1798); Beschr. Länd. Casp.: 144 (1800); Mém. Soc. Imp. Nat. Mosc. 1: 138 (1806). *Salsola spicata* PALL., Illustr. Pl.: 27, tab. 19 (1803), nom. illeg., non WILLD. (1798). *Caroxylon glaucum* (M.B.) MOQ. in DC., Prodr. 13,2: 173 (1849). *Aellenia glauca* (M.B.) AELLEN, Verh. Naturf. Ges. Basel 61: 182 (1950). *Ae. glauca* (M.B.) AELLEN subsp. *eu-glauca* AELLEN, Verh. Naturf. Ges. Basel 61: 183, Abb. 2F (1950), nom. inval. *Ae. glauca* (M.B.) AELLEN subsp. *eu-glauca* AELLEN f. *reducta* AELLEN, Verh. Naturf. Ges. Basel 61: 184 (1950). *Ae. glauca* (M.B.) AELLEN subsp. *glauca* in CHEREPANOV: Additamenta et corrigenda ad Floram URSS: 182 (1973). *Halothamnus heptapotamicus* BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18:161 (1981). *Salsola gracilis* MOQ., nom. nud. *S. candida* SCHULLER, nom.nud. *S. iliensis* LIPSKY var. *transcaspica* LITW., nom. nud.

Icon.: PALL., Illustr. Pl. 27: tab. 19 (1803) sub *Salsola spicata*. Y. ISAEV, Fl. Azerb. 3: 243, tab. 21, fig. 2a-b (1953). KOTHE-HEINRICH, Biblioth. Bot. 143: tab. 34–35 (1993). – Fig. 7-d, 8-d; Tab. 154.

Type: (Azerbaijan): "Ex montibus Schirvanensibus et Armenia iberica", F.A. MARSCHALL VON BIEBERSTEIN, LE!

Hab.: Frequent and locally subdominant in *Artemisia-Chenopodiaceae* semidesert communities, on dry, ± saline soils, rocks, debris, gravel, clay, sandy clay or marl, plains and slopes up to c. 1700 m. – Fl. V–VIII, fr. VII–IX (X).

Persia: N: Gorg.: Tappeh-ye Moraveh, SHAR. 30166-E! 46 km N Pahlavi Dezh, DREA & O'CONNELL 168! Dasht-e Gorgan, SHAR. 595! Near Now Deh, 700 m, SAB. in GAUBA 2119!

Rahimabad between Farsian and Shah Pasand, 550 m, TERME & al. 39367-E! 45 km SW Shah Pasand, 21 km NE of pass to Shahrud, 1500 m, BRECKLE & BHADRESA 5227! Moh. Reza Shah Prot. Reg.: N Robat-e Qareh Bil to Almeh, 1200 m, RECH. 52884! Below Almeh, 1250–1400 m, WDB. & FOROUGHI 12710!, UOTILA 19176! Between road to Almeh and Bekadeh, 1300 m, WDB. & COBHAM 14237! Dasht-e Kalpush between Gorgan and Bojnurd, TERME & MATIN 35097-E! Maz.: Valley from Chalus to Hassanabad, 400 m, PABOT 3558! Haraz valley, above Panjab, 1300 m, WDB. 1555! Gilan: Near Pol-i ambu, ALEXEENKO 427! – W: Azerb.: 5 km S Maku, 1500 m, ANDERSEN & PETERSEN 71! 9 km from Marand to Zanuz, 1200 m, IRANSHAHR 14863-E! Between Maku and Khvoy, Evowghli, 1100 m, ASSADI & MOZAFFARIAN 30418! 94 km N Khvoy, between Shahabad and Maku, 1000 m, RECH. 32720! Pass between Khvoy and Shahpur, 1700 m, AELLEN & BEHB. 296!, -a!, -b!, -c!, 297! 20 km SE Shahpur, 1300 m, PABOT 5437! Valley of Komur Chai at Uli, 17.IX.1856, SEIDLITZ! 34–56 km W Marand, 1020 m, PABOT 5361!, RECH. 14921! Sha-Banli near Khvoy, 7.VII.1828, SZOV.! 24 km N Rezaiyeh, 1200 m, MALCOLM 280! Lake Rezaiyeh, Kabudan-island, 1320–1580 m, MOUSSAVI & ZARGANI 40112-E! Danalu landing place on E shore of lake Rezaiyeh (Urmia), 23.V.1916, SHELKOVNIKOV & SHIPCHINSKI! Sharafkhaneh, BEHB. & AELLEN 30121-E! 60 km NE Tabriz, road from Ahar, 1500 m, PABOT 5200! Dasht-e Moghan: Near Aslanduz, 200 m, SAB. in GAUBA 2120! Between Alirezaabad-e Jadid and Sarband, 200 m, RECH. 40192! Dasht-e Moghan, 50–500 m, AUBERT 5611!, DAMANAHI 14840-E!, SCHMID 6553!, 6567!, WHESTON 3474! Quri Chay, coll. ign. (IRAN) 40251-E! Meshgin, MIRD. 2121! Khamseh: 25 km E Zanjan to Qazvin, 1770 m, UOTILA 19534! – E: Khor.: Sepid between Bojnurd and Tappeh-ye Moraveh, 1350 m, RECH. 32563b! Between Dasht and Loveh, 125–130 km W Bojnurd, 1100–1200 m, ANDERSEN & PETERSEN 316! RECH. 37611! 100–139 km E Gonbad-e Kavus, 1120- 1460 m, SERAJ in PABOT 17b/3, 17d/2! Shahabad, KOELZ 16674!, 16678! Atrak valley E Bojnurd, 1330 m, FURSE 8924! Atrak valley between Bojnurd and Shirvan, RECH. 1817-b! 20 km W Shirvan, 950 m, UOTILA 19103! Between Quchan and Bojnurd, 950–1150 m, SCHMID 6356!, 6357! Neyshabur, 1100 m, IRANSHAHR 30412-E! 110 km NE Mashhad, near Sanganeh, 560 m, AKHANI 6459! 15 km from bifurcation of road Mashhad-Sarakhs to Salehabad, 700–900 m, RECH. 55745! 7 miles W Sarakhs to Mashhad, ALAVA 11041! – C: Shahr.-Bust.: Khush-Yailaq pass, 70 km E Shahrud, 2000–2200 m, RECH. & al. 5465! – Not localized: Am Übergange der Elbursgebirge bei Karü, 12.IX.1882 PICHLER! In glareosis montis Elburz ppe Gerena, 10.IX.1882 PICHLER! In Persiae provincia "Aderbeidschan", SZOV. 536! Gonbad, Ghari'makher, KALALI 30394-E!

T u r c o m a n i a : Distr. Kara Kala, Chandyr valley, Kizyl-Imam, MICHELSON 3930! Distr. Bakharden, 16 km E Bami, 350 m, 16.IX.1976 VASAK! Near Archman, 350 m, 16.IX.1976, VASAK! Germab, above Skobelevka, SINT. 860a!, 860b! Near Chuli, 650–700 m, 10.IX.1976, VASAK! Between Vannovskoje and Chuli, LITW. 334! Near Vannovskoje, 16.V.1911, MICHELSON!, MICHELSON 282! Firyuzinka valley, 500–600 m, 21.IX.1976, VASAK! Foot hills near Ashkhabad, LITW. 335!, 336! Near Ashkhabad, LITW. 397! Near Stara Ashkhabad, SINT. 1181! Ruins of Koine Nusai (Staraia Nisa), 300 m, 15.IX.1976 VASAK! Near Gyaurs station, 4.VI.1901, FEDTSCHENKO!

Distr. gen. of subspecies: from E Turkey through Georgia, Armenia, Azerbaijan, N Persia, to Turcomania and along the mountains of Middle-Asia to E Kazakhstan and W China (Dzungaria).

–– subsp. ***hispidulus*** (BUNGE) KOTHE-HEINR., Biblioth. Bot. 143: 109 (1993).
Syn.: *Caroxylon hispidulum* BUNGE, Beitr. Fl. Russl.: 293 (1852); Mém. Sav. Etrang. Acad. Imp. Sc. Pétersb. 7: 469 (1854). *Salsola hispidula* (BUNGE) BOISS., Fl. Or. 4,2:

960 (1879). *S. hispidula* (BUNGE) BUNGE, Acta Horti Petrop. (Trudy Imp. S.-Petersburgsk. Bot. Sada) 6,2: 437 (1880), nom. inval. *Aellenia glauca* (M.B.) AELLEN subsp. *hispidula* (BUNGE) AELLEN, Verh. Naturf. Ges. Basel 61: 186, Abb. 2A (1950). *Ae. hispidula* (BUNGE) BOTSCH., Fl. Uzbek. 2: 295 (1953). *Ae. hispidula* (BUNGE) AELLEN, nom. inval., in schedis (1958). – *Halothamnus hispidulus* (BUNGE) BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 155 (1981).
Icon.: KOTHE-HEINRICH, l.c.: tab. 35–36 (1993).
Type of subspecies: (Uzbekistan?) In der südlichen Kisilkum-Wüste, VII.1841, A. LEHMANN, holotype LE; isotypes G!, LE (2×), P!

Hab.: Scattered or locally frequent in *Artemisia-Salsola-* or *Artemisia*-ephemeroidal semidesert communities; debris, gravel, gravel-sand or clay, takyr-like or solonchak soils; plains and slopes up to 1500 m. – Fl. (IV) V–VIII, fr. VII–IX.

Persia: E: Khor.: Sepid between Bojnurd and Tappeh-ye Moraveh, 1350 m, RECH. 32563a! 127 km E Gonbad-e Kavus, road from Gorgan to Bojnurd, 1340 m, PABOT 7807!
Turcomania: Near Kazandzhik, SINT. 2197! Kizyl Arvat, a. 1883, BECKER!, BECKER 82!, 22.VII.1901, SINT.! Kara Kala, SINT. 1907! Suluklü (Saratovka) near Persian border, SINT. 1058a!, 1058b! ibid., 1.VII.1900, SINT.!, 22.VIII.1900, SINT.!

Distr. gen. of subspecies: Kazakhstan (Ust-Urt), Turcomania, Uzbekistan, NE Persia.

9. ***H. bamianicus*** (GILLI) BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 173 (1981).
Syn.: *Salsola bamianica* GILLI, Feddes Repert. 62,1: 24, Abb. 2 (1958).
Icon.: GILLI, Feddes Repert. 62,1: tab. 2 (1958). KOTHE-HEINRICH, Biblioth. Bot. 143: tab. 38–39 (1993). – Tab. 155.
Type: C Afghanistan: Kalkberg ONO von Bamian, Schlucht des Südhanges, 2800 m, 18.VII.1949, A. GILLI 2167, W!; isotype G-PAE!

Sub-shrub up to 70 cm, ± erect, glabrousor hispidulous (var. *hispidulus* BOTSCH.). Woody branches whitish-beige. Annual branches glaucous, broadly striate, straight, in upper half loosely branched with oblique lateral branches. Leaves flat, linear to linear-triangular, gradually pointed, mucronulate, dorsal in basal part with whitish mid-rib, the lower ones 10–55 × 1,2–2,3 mm, higher up 5–10 × 1–1,5 mm. Flowers both on main and lateral branches, irregularly at 1,5–13 mm distance. Bracts similar to leaves, at lower flowers 6–33 × 1,5–2,3 mm, longer than perianth and bracteoles; higher up scale-like, lanceolate, 2,6–6 × 1,1–1,5 mm, basally ± widened, shorter than or as long as perianth, somewhat longer than bracteoles (rarely as long as), basal with narrow membranous margins. Bracteoles of lower flowers flat, linear-triangular to lanceolate, gradually pointed, mucronulate, longer than or as long as perianth, 4–12 × 1,7–3 mm, basal with narrow membranous margins; higher up scale-like, lanceolate-ovate (rarely triangular-ovate), 2,1–3,8 × 1,7–3 mm, shorter than perianth, basally ± keeled, basal with moderately wide, lateral with very narrow membranous margins. Tepals lanceolate-ovate, 4,2–5,4 mm long, the outer 2,2– 2,9 mm wide, transverse line at 1/4–1/3, green blotch narrowly triangular, membranous margins apically ± wider than laterally. Filaments arising from outer side of disc, 0,6–0,9 mm wide. Anthers 2,3–3,2 mm long, appendage rounded. Disc with flat half-round interstaminal lobes. Style in fruit ovoid (to dome-shaped). Stigmas 1,3–2 × 0,4–0,55 mm, with tapering not denticulate apex. Fruit 11–13 mm diam. Tube with straight or convex, ± smooth sides, at the wings 3,3–4,1 mm, at base 2,1–4,2 mm diam., 1,5–2,1 mm high; basal area rounded pentagonal, with moderately narrow, rounded peripheral rim; pits shallow and ovate to moderately deep and drop-shaped (ovate with elongated apex). Wings below the middle, yellowish to straw-coloured. Tepal lobes somewhat keeled, forming a moderately steep cone, apically spreading.

Hab.: Scattered in mountain semideserts, with *Salsola montana*, *Artemisia tenuisecta* and *Arthrophytum Griffithii*; dry slopes, on semi-consolidated clay-sand-gravels; 2400–2800 m, – Fl. VI–IX, fr. IX–X.

Afghanistan: C: Bamian: Bamian, NEUB. 418! Bamian near Buddha statues, 2400 m, PODLECH 12194! 2 miles W of Buddha statues at Bamian, 2800 m, VOGT 1043! Dragon valley (Der Hadj), 2800 m, BRECKLE 4783!, a.1969, HAYON (NANCY)! Kalu valley between Bamian and Hajigak, 2700 m, FREITAG 6407! Foothills of Kuh-i Baba, N side above Naiak, THESIGER 100! Lil valley, side valley of Band-i Amir, 1 km E Yakawlang, 2600 m, DIETERLE 807!

Distr. gen.: Afghanistan, dry valleys of central Hindukush, endemic.

Similar to *H. glaucus* and often misidentified, but distinguished by the whitish-beige bark, flat leaves, bracts and bracteoles, and tapering stigmas.

10. ***H. schurobi*** BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk (SSSR) 18: 158 (1981).
Syn.: *Halothamnus samanganicus* BOTSCH., Bot. Zhurn. 68(8): 1122 (1983).
Icon.: KOTHE-HEINRICH, Biblioth. Bot. 143: tab. 40–41 (1993). – Tab. 156.
Type: S Uzbekistan, between Guzar and Sherabad, near Shurob, gypseous slopes, 21.V.1977, V.P. BOTSCHANTZEV 251, holo- and 3 isotypes LE!

Sub-shrub, 50(–150) cm, erect, glabrous or hispidulous (var. *hispidulus* KOTHE-HEINR.). Woody branches dark grey. Annual branches green, broadly striate, straight, in upper part with oblique lateral branches. Leaves semiterete (the lowermost flattened), linear, gradually pointed, partly mucronulate, the lower ones 22–80 × 1,5–2,3 mm, higher up 3–20 × 0,9–1,8 mm and basal with very narrow membranous margins. Flowers both on main and lateral branches, at 4–15 mm distance. Bracts of lower flowers similar to leaves, 6–65 × 1,1–1,3 mm, basally widened, longer than perianth and bracteoles, basal with narrow membranous margins; higher up scale-like (partly apically semiterete), lanceolate-ovate, 2–6 × 2–2,5 mm, as long as or shorter than perianth, longer than or as long as bracteoles, lateral with narrow membranous margins. Bracteoles of lower flowers semiterete (at least apically), on main stem linear, on lateral branches linear-triangular to lanceolate, gradually pointed and apically ± plicate, mucronulate, partly slightly keeled, 4–13 × 1,1 mm, basal 2,7–3,5 mm wide and with broad membranous margins, longer than or as long as perianth; higher up scale-like, broadly ovate to transversely ovate-triangular, 2,3–4 × 2,7–3,7 mm, shorter than perianth, basal with wide, lateral with narrow membranous margins. Tepals ovate-triangular, 3,6–4,4 mm long, the outer 2,5–3,3 mm wide, transverse line at 1/3 (–2/5), green blotch triangular, membranous margins of constant width, inside rarely with some curly hairs. Filaments arising from outer side of disc, 0,7–1 mm wide. Anthers 2,5–3,2 mm long, appendage acutish-rounded. Disc with small half-round interstaminal lobes. Style in fruit broadly ovate-conical. Stigmas 1,1–1,7 × 0,5–0,6 mm, with ± truncate, denticulate apex. Fruit 14–17 mm diam. Tube slightly narrowed towards base or broadly cylindrical, its sides in young stage with prominent ridges, later smooth, at the wings 3,7–4,6 mm, at base 3–5,2 mm diam., 1,6–2,8 mm high; basal area rounded pentagonal, with rounded or rather sharp-edged peripheral rim; pits deep, ovate, close to the central scar, surrounded by flat basal area. Wings nearly in the middle, straw-coloured or reddish tinged, their radial veins basally fusing. Tepal lobes ± keeled, forming a flat cone, apically spreading.

Hab.: Loess or marly, saline, often gypsum soils, on dry slopes; c. 1000–1450 m. – Fl. V/VI–VII, fr. VIII–IX.

Afghanistan: N: Mazar-i Sharif: Kotal-e Robatak (Ribat) NE Pol-e Khumri, 1410–1430 m, FREITAG 3152!, 3915! – NE: Kataghan: Paigah Kotal (Mirza Atbili pass) near road from Pul-i Khumri to Haibak, 1300–1420 m, PABOT A-1585!, PABOT a(x)! PODLECH & JARMAL 30075!, PODLECH 32037! 2 km E Paigah Kotal, 1380 m, PODLECH 31636 (typus *H. samanganici*)!, 32466!

Distr. gen.: N Afghanistan and S Uzbekistan.

Differing from *H. glaucus* in the tube pits close to the central scar surrounded by a flat area lacking prominent ridges, longer leaves, broadly ovate to transversely triangular, broader bracteoles of upper flowers, and tepals with broader blotch. Differing from *H. turcomanicus* in the spreading, apically semiterete, linear to lanceolate longer bracteoles of lower flowers, and broadly ovate or transversely triangular bracteoles of upper flowers, lacking an apical membranous margin.

11. ***H. turcomanicus*** BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 165 (1981).
Icon.: KOTHE-HEINRICH, Biblioth. Bot.: 143: tab. 42–43 (1993). – Fig. 8-c.
Type: SW Turcomania, in *Haloxylon aphyllum*-community near Gyaur well, 16.V. 1951, RODIN, RACHKOVSKAYA & SUKHOVERKO 1978, holo- and isotype LE!

Sub-shrub, 60(–100) cm, erect, glabrous. Woody branches dark grey. Annual branches straight, ± olive-green, striate, in upper half loosely branched with oblique lateral branches. Leaves semiterete, linear, gradually pointed, partly mucronulate, the lower ones 20–49 × 1,1–2,3 mm, the upper ones 3,5–10 × 1,1–2,3 mm and basal with very narrow membranous margins. Flowers both on main and lateral branches, at 3–8 mm distance. Bracts of lower flowers similar to leaves, 5–35 × 0,8–1,1 mm, basally ± widened, longer than perianth and bracteoles, basal with narrow membranous margins; higher up scale-like, (lanceolate-) ovate, apically slightly plicate, 1,8–4 × 1,8–2,3 mm, shorter than perianth, as long as bracteoles, lateral with narrow membranous margins. Bracteoles of lower flowers scale-like, ovate, gradually pointed, partly mucronulate, somewhat shorter than or rarely as long as perianth, 2,8–4,5 × 2,8–3,2 mm, slightly keeled, basal with wide, lateral with narrow membranous margins; higher up similar, but cordate, only 2,1–2,9 × 2,5–3,2 mm, also apical with narrow membranous margin. Tepals ovate, 3,8–4,4 mm long, the outer 2,8–3,2 mm wide, transverse line at 1/3, green blotch rather broadly triangular, membranous margin of constant width. Filaments arising from outer side of disc, 0,65–0,95 mm wide. Anthers 2,5–3,2 mm long, appendage obtuse. Disc with small half-round interstaminal lobes. Style in fruit dome-shaped to conical. Stigmas 1,3–1,7 × 0,35–0,75 mm, with truncate (rarely rounded) denticulate apex. Fruit 11–14 mm diam. Tube broadly cylindrical, with straight or slightly concave ± smooth sides, at the wings 3,7–4,5 mm, at base 3,4–4,2 mm diam., 1,5–1,9 mm high; basal area rounded pentagonal, with rounded peripheral rim; pits deep, ovate, close to the central scar, surrounded by a flat area. Wings ± in the middle, straw-coloured or reddish tinged. Tepals above wings slightly keeled, forming a rather flat cone, apically partly spreading. (Fig. 8-c).

Hab.: Rare or rather scattered in *Artemisia-Salsola*-semidesert and *Haloxylon aphyllum*-community, on stony, clay, marly or sandy soils, on plains and slopes; 100–500 m. – Fl. V–VI, fr. VII–IX (X).

T u r c o m a n i a : Kyurendag, Danata, AVERYNOV & al. 593!, PYATAEVA 195! Kazandzhik, SINT. 1628a!, 2197! Kizyl Arvat, between Khodzhakala and Kutenak, 1.VII.1901, SINT.! Kara Kala, ILJIN 867! Kara Kala, near Kizyl Ova, SINT. 1628b! Morgabirza, SINT. 1628c! Bakharden, 16 km E Bami, 350 m, 16.IX.1976, VASAK!

Distr. gen.: Endemic in SW Turcomania and yet to be found in adjoining parts of Kazakhstan and Persia.

Recognized by its characteristic fruits with tube pits close to the central scar and its short, adpressed, scale-like ovate bracteoles with lateral membranous margins, those of upper flowers cordate and also apically with membranous margin.

12. ***H. sistanicus*** (DE MARCO & DINELLI) KOTHE-HEINR., Flora et Vegetatio Mundi 9: 50 (1991).
Syn.: *Aellenia sistanica* DE MARCO & DINELLI, Webbia 33(2): 301, fig. 1 (1979).
Icon.: DE MARCO & DINELLI, Webbia 33 (2), tab. 1, figs. A-E (1979). KOTHE-HEINRICH, Biblioth. Bot. 143: tab. 46–47 (1993). – Fig. 7-f, 8-f.
Type: (Persia): Sistan depression: Kuh-e Khajeh, 480 m, 17.X.1975, G. DE MARCO 75047, Herb. DE MARCO. Paratypes: DE MARCO 76056, FI; 75048, 75049, 76060 Herb. DE MARCO; 76063, RO.

Sub-shrub, 45–100 cm, ± erect, glabrous. Woody branches beige. Annual branches green, sometimes very narrowly striate, straight, loosely and copiously branched with oblique, apically ± recurved, sometimes flexuose lateral branches. Leaves axillary with tufts of curly hairs, the lower ones semiterete, linear-triangular, gradually pointed, mucronulate, 10–30 × 1,9–3 mm, basal with very narrow membranous margins; higher up scale-like, broadly triangular (-ovate), 1,8–4,5 × 1,9–3 mm, lateral with (very) narrow membranous margins. Flowers mainly on lateral branches, at 2,5–10 mm distance. Bracts of lower flowers similar to lower leaves, 3,8–8 × 1,8–2,2 mm, somewhat longer than or as long as perianth, longer than bracteoles; higher up like higher leaves, 2–2,5 × 2,1–2,5 mm, shorter than perianth, as long as or somewhat shorter than bracteoles, basal and partly lateral with narrow membranous margins. Bracteoles adpressed to perianth, scale-like, ovate-rhombic, gradually pointed, apically somewhat plicate, of lower flowers 2,8–3,5 × 2,3–3,4 mm, somewhat shorter than perianth, basal with broad, lateral with narrow membranous margins; higher up 2–2,8 × 2,1–3 mm, ± half as long as perianth, also apical with narrow membranous margin. Tepals ovate-triangular, 3,8–4,5 mm long, the outer 2,1–2,3 mm wide, transverse line at 1/4–1/3, green blotch rather narrowly triangular, membranous margin of constant width. Filaments arising from rim of disc, 0,5–0,65 mm wide. Anthers 2,3–2,9 mm long, appendage rounded-acutish. Disc unlobed. Style in fruit dome-shaped. Stigmas 1,3–2,3 × 0,35–0,5 mm, with truncate, denticulate apex. Fruit 8–13 mm diam. Tube dish-shaped, with ± concave sides with thickened smooth tepal margins and 1–2 concave grooves on outer tepals, at the wings 2,6–3,4 mm, at base 1,9–2,8 mm diam., 1,2–1,5 mm high; basal area rounded pentagonal, with inconspicuous, rounded peripheral rim; pits shallow, ovate. Wings below the middle, pale yellowish, their veins basally distinctly fusing. Tepal lobes distinctly keeled, forming a steep cone, markedly separated from wings by the transverse furrow. (Fig. 7-f, 8-f.)

Hab.: Semideserts, detritic or gravelly soils; 480–1200 m. – Fl. from V, fr. to X.

P e r s i a : E: Sistan: Sistan, AYAZI 5875! Kuh-e Khvajeh, DE MARCO 75047, SHAR. 30165-E! Hormak, 60 km N Zahedan, 780–890 m, TERME & MOUSSAVI 34410-E!, 34411-E! Zahedan, Gardaneh Khunik, 1180 m, FOROUGHI 10521!

Distr. gen.: Endemic to the Sistan-depression. Very few localities in E Persia are as yet known, probably also occurring in adjoining parts of Afghanistan and Pakistan.

Differing from *H. subaphyllus* subsp. *Charifii* by its characteristic fruits: narrow tube, sides with thickened tepal margins lacking both prominent ridges and sharp-edged basal rim, tepal lobes forming a steep cone distinctly separated from wings; additionally, bracteoles of lower flowers ovate-rhombic, pointed, apically without membranous margin, and filaments arising from rim of unlobed disc.

13. ***H. oxianus*** BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 166 (1981).
Syn.: *H. babatagi* BOTSCH., l.c.: 164 (1981).
Icon.: KOTHE-HEINRICH, Biblioth. Bot. 143: tab. 48–49 (1993). – Tab. 157.
Type: Turcomania: Bukhara district, slopes near Kelif at Amu-Darya river, 12.IX. 1916, N.V. ANDROSSOV, holo- and isotype LE!

Sub-shrub, up to 80 cm, erect, glabrous. Woody branches beige to pale brown.

Annual branches ± green, very narrowly striate, straight, in upper half with oblique lateral branches. Leaves semiterete (the lowermost ± flattened), linear, gradually pointed, partly mucronulate, the lower ones 25–100 x 0,8–2,5 mm, higher up 3–10 x 0,8–1,5 mm. Flowers mainly on lateral branches, at 4–10 mm distance. Bracts of lower flowers similar to leaves, 5–25 x 1,3–2,6 mm, longer than perianth and bracteoles, basal with very narrow membranous margins; higher up scale-like, lanceolate, 2,1–4 x 1,3–2,6 mm, as long as or shorter than perianth, somewhat longer than or as long as bracteoles, lateral (partly also apical) with narrow membranous margins. Bracteoles of lower flowers adpressed to perianth, scale-like, ovate to triangular-ovate, gradually pointed, partly mucronulate, 2,2–4,5 x 2,5–3,6 mm, shorter than perianth, basal with wide, lateral with narrow membranous margins; higher up similar, but broadly triangular-ovate to cordate-ovate, 1,8–3 x 2,1–3,1 mm, also apical with narrow membranous margin. Tepals triangular-ovate, 3,4–4,2 mm long, the outer 2,3–2,6 mm wide, transverse line at 1/3–2/5, green blotch triangular, inside with curly hairs. Filaments arising from outer side of disc, 0,6–0,9 mm wide. Anthers 2,5–3 mm long, appendage rounded or obtusish. Disc with small half-round interstaminal lobes. Style in fruit ovoid. Stigmas 1,3–1,9 X 0,6–0,8 mm, with truncate, denticulate apex. Fruit 11–14 mm diam. Tube dish-shaped, with ± straight sides with prominent ridges, at the wings 4 mm, at base 2,8 mm diam., 1,3 mm high; basal area obtusely pentagonal, with narrow, sharp-edged peripheral rim; pits shallow, ovate. Wings below the middle, straw-coloured. Tepal lobes forming a flat cone, the innermost ± keeled.

Hab.: Rather rare in semideserts, on rocky, stony and clay-gravel soils, slopes and ravines; c. 500–1100 m. – Fl. V–VII, fr. VIII–IX.

P e r s i a : E: Khor.: Near Shorlugh, 45 km SE Sarakhs, 800 m, RECH. 55739! 40 miles from Sarakhs to Mashhad, 600 m, ALAVA & IRANSHAHR 11045!, IRANSHAHR 15283-E! NE Mozduran, between Mashhad and Sarakhs, 900–1000 m, RECH. 55691! 15 km from bifurcation of road Mashhad – Sarakhs to Salehabad, 700–900 m, RECH. 55746! 18 km from Torbat-e Jam to Salehabad, 1060 m, AKHANI!
A f g h a n i s t a n : N: Mazar-i Sharif: Koh-i Elburz, Chashmeh-i Shafal, 900 m, HDG. & WDB. W-3865! Chashmeh-i Shafal in Balkh valley SW Mazar-i Sharif, 500–800 m, RECH. 16190! SE Tashkurghan to Samangan (Haibak, Aybak), 600 m, HDG. & WDB. W.-3972!, RECH. 16348!

Distr. gen.: E Turcomania, NE Persia, S Uzbekistan, S Tadjikistan, N Afghanistan.

Habit intermediate between *H. glaucus* and *H. subaphyllus*. Recognized by beige to pale brown woody branches, long leaves, flowers mostly on lateral branches, ovate to ovate-triangular bracteoles of lower flowers lacking an apical membranous margin, and tepals inside with curly hairs. *H. babatagi* BOTSCH. is included in synonymy, because the only known (type-) specimen is very similar to *H. oxianus* and also has curly hairs on the inside of tepals.

14. ***H. iraqensis*** BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 152 (1981). •
Icon.: COLLENETTE, Ill. Guide Flow. Saudi Arabia: 115 (1985) sub *Aellenia subaphylla*. DAOUD, Fl. Kuwait: 184–187 (1985) sub *Aellenia glauca, Ae. subaphylla*.

MANDAVILLE, Fl. Eastern Saudi Arabia, Pl. 43, 44 (1990). KOTHE-HEINRICH, Biblioth. Bot. 143: tab. 52–53 (1993).
Type: Iraq, Southern Jazira (about 50 km NE of Ramadi), 16.XI.1954, E. GUEST, ALI AL-RAWI & ABD AL-KARIM NURI 13547, holotype K.

Sub-shrub to small shrub with short woody stem, 25–100 cm, erect to ascending, glabrous or hispidulous (var. *hispidulus* BOTSCH.). Woody branches ash- to dark grey. Annual branches ± glaucous, rarely very narrowly striate, straight, with spreading to divaricate lateral branches. Lower leaves semiterete, linear, abruptly pointed, mucronulate, axillary with some curly hairs, basal with narrow membranous margins, 4–22 × 0,9–2 mm, the lowermost up to 49 mm long and gradually pointed; higher up nearly scale-like, ovate, abruptly pointed or obtuse, 1,8–4 × 1,2–3 mm. Flowers mainly on lateral branches, at 2–9 mm distance. Bracts of lower flowers ± semiterete, linear-ovate, abruptly pointed, up to 4,2 × 1,7 mm, somewhat shorter than perianth, somewhat longer than bracteoles, basal with narrow membranous margins; higher up scale-like, broadly ovate or pear-shaped, 2–3 × 1,7–3 mm, shorter than perianth, as long as bracteoles, basal and partly lateral with narrow membranous margins. Bracteoles adpressed to perianth, scale-like, broadly ovate, acuminate, partly mucronulate, 2–3,9 × 2,3–3,6 mm, shorter than perianth, ± keeled, basal with wide, lateral with narrow membranous margins; the highermost ± transversely ovate, also apical with very narrow membranous margin. Tepals ovate-lanceolate, 4–5,5 mm long, the outer 2,3–2,8 mm wide, transverse line at 1/4–1/3, green blotch rather narrowly triangular, membranous margin apically ± wider than laterally. Filaments arising from rim of disc, 0,6–0,8 mm wide. Anthers 2,9–4,1 mm long, appendage rounded-acutish. Disc unlobed. Style in fruit ovoid. Stigmas 1,7–2,7 × 0,4–0,8 mm, with rounded, denticulate apex. Fruit 11–17 mm diam. Tube dish-shaped, with straight or concave sides with sharply prominent ridges (veins), at the wings 3,2–4,4 mm, at base 2,1–3,4 mm diam., 1,1–1,7 mm high; basal area obtusely to rounded pentagonal, with narrow, sharp-edged peripheral rim; pits ± shallow, ovate. Wings below the middle, pale yellowish or reddish, their inner veins mostly joining and fusing at base. Tepal lobes keeled, forming a rather steep cone, apically spreading.

Hab.: Scattered or occasionally common in deserts and semideserts, with *Zygophyllum coccineum, Cornulaca leucacantha, Haloxylon salicornicum, Salsola jordanicola, Seidlitzia rosmarinus*; mainly on sandy soil with underlying saline or gypsum layer, also on coastal sand dunes; usually 0–200 m. – Fl. VIII–X, fr. IX–XI.

I r a q : Diyala: Jabal Hamrin near Muqdadiyah (Shahraban), 160 m, GUEST 15800! Jabal Hamrin, between Khanaqin and Baqubah, HADAC 2990!, 2991! Between Shahraban and Jalula, RECH. 8080-a!, -b!

Distr. gen.: From the saline depressions of E Syria through the sand belt of W Iraq to Kuwait, and at some scattered sites in N Saudi Arabia.

In habit and the reduced summer leaves, *H. iraqensis* is similar to *H. subaphyllus* and has often been misidentified. It is distinguished by dark grey woody branches, bracts of upper flowers as long as bracteoles, broadly ovate, acuminate bracteoles of lower flowers lacking an apical membranous margin, ovate-lanceolate tepals, filaments arising from rim of unlobed disc, and long stigmas with rounded apex. Because of its long spring leaves, it has sometimes been misidentified as *H. glaucus*, from which, however, it is most distinct.

15. ***H. subaphyllus*** (C. A. MEY.) BOTSCH. Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 171 (1981).

Sub-shrub or shrub, 50–120(–250)cm high, hemispherical or ± erect, glabrous. Woody branches pale brown or beige, partly ash-grey tinged. Annual branches glaucous or green, straight or flexuose, with many spreading to divaricate, partly elongated lateral branches. Lower leaves semiterete, linear, gradually or abruptly pointed, 5–35(–60) x 0,6–2 mm, basal with very narrow membranous margins, their axils sometimes with tufts of curly hairs; higher up scale-like, triangular-ovate to semi-ovate, rounded or abruptly pointed (rarely semiterete and linear-triangular to lanceolate), apically ± plicate, 1,1–4 x 0,8–2,7 mm, basal and mostly lateral and apical with narrow membranous margins. Flowers on lateral branches, at 4–15 mm distance. Bracts of lower flowers either semiterete linear or scale-like triangular-ovate, gradually or abruptly pointed, apically ± plicate, 1,7–6(–14) x 1,1–3 mm, as long as or shorter than perianth (rarely longer), longer or as long as bracteoles, basal and partly lateral with narrow membranous margins; higher up scale-like, ovate to semi-ovate, ± rounded, apically ± plicate, 0,9–2,5 x 1,5–3 mm, shorter than perianth and bracteoles, lateral and mostly apical with narrow membranous margins. Bracteoles adpressed to perianth, scale-like, transversely ovate with rounded apex, 1,5–2,8 x 2,6–4 mm, shorter than perianth, lateral with wide, apical with narrow membranous margins. Tepals ovate (to triangular-ovate), 3–4,5 mm long, the outer 2,3–3 mm wide, transverse line at 1/3–2/5, green blotch triangular with ± rounded apex, membranous margin apically often wider than laterally. Filaments arising from outer side of disc, 0,65–1 mm wide. Anthers 1,8–3 mm long, appendage obtusely or acutishly rounded. Disc with small half-round interstaminal lobes. Style in fruit broadly ovate or dome-shaped to conical. Stigmas 1,1–2,1 x 0,5–0,8 mm, with truncate, denticulate apex. Fruit 11–20 mm diam. Tube dish-shaped, with straight or ± concave sides with prominent ridges, at the wings 3,4–4 mm, at base 2,3–3 mm diam., 1,2–1,8 mm high; basal area obtusely or rounded pentagonal, with narrow, sharp-edged peripheral rim; pits shallow, ovate to roundish. Wings ± below or nearly in the middle, partly bent downwards, pale green, yellowish or reddish, their inner veins ± joining at base. Tepal lobes ± keeled or vaulted, forming a flat cone or dome, apically often spreading. (Fig. 7-e, 8-e).

Distr. gen. of species: Middle Asia (Kazakhstan, Turcomania, Uzbekistan, Tadjikistan), Persia, Afghanistan, Pakistan (Baluchistan).

Easily recognized by the transversely ovate bracteoles with a membranous apex. It is extremely polymorphic with regard to the spreading angle of branches, surface glaucousness, length and reduction of leaves or bracts and development of axillary hairs. Because of numerous intermediate specimens, BOTSCHANTZEV's *H. psammophilus* and *H. subaphylloides* are reduced to infraspecific rank. – *H. subaphyllus*, especially subsp. *psammophilus*, is an important grazing plant with high protein content and a propitious amino acid composition and is very promising for sowing on recultivated pastures. It is also planted to stabilize mobile sand dunes. Besides its use as dye and several popular medicinal applications, its very high content of alkaloids (Salsolin, Subaphyllin) has been utilized for medicinal purpose. It contains large amounts of minerals, especially Na+ and K+ and accumulates Boron.

1a. Shrub to 250 cm, green, lateral branches obliquely spreading; flowering branches short, slender (0,8–2,2 mm diam.); upper leaves semiterete, linear-lanceolate, only basal with membranous margins; bracts of lower flowers mostly longer than perianth .... subsp. *psammophilus* (BOTSCH.) KOTHE-HEINR.

b. Sub-shrub to 120 cm, glaucous or green, lateral branches divaricate to right-angled; flowering branches often elongated and thicker; upper leaves often scale-like, ovate to semi-ovate (rarely semiterete, linear-ovate), lateral and mostly apical with membranous margins; bracts of lower flowers mostly shorter or as long as perianth, rarely somewhat longer 2

2a. Leaf axils glabrous or with sparse, very short hairs; filaments 0,7–1 mm wide; upper leaves scale-like; anther appendages obtusely rounded; style in fruit broadly ovoid .... subsp. *subaphyllus*

b. Leaf axils with tufts of long curly hairs; filaments 0,5–0,8 mm wide; upper leaves scale-like or semiterete, linear-ovate; anther appendages acutishly rounded; style in fruit dome-shaped to conically ovoid .... subsp. *Charifii* (AELLEN) KOTHE-HEINR.

–– subsp. ***subaphyllus***

Syn.: *Salsola subaphylla* C.A. MEY. in EICHW., Pl. nov. Casp.-Cauc. 2: 34, tab. 24 (1833). *Caroxylon subaphyllum* (C.A. MEY.) MOQ. in DC., Prodr. 13,2: 173 (1849). *Salsola subaphylla* C.A. MEY. var. *typica* DROBOV, Herb. Fl. Ross. Fasc. 56, no. 2782 (1919) nom. inval. and Sched. Herb. Fl. Ross. 8: 199 (1922), quoad nom. *S. subaphylla* C.A. MEY. subsp. *typica* (DROBOV) ILJIN, Fl. Turkmen. 2,1: 180 (1937). nom. inval., quoad nom. *Aellenia subaphylla* (C.A. MEY.) AELLEN, Verh. Naturf. Ges. Basel 61: 176 (1950). *Ae. subaphylla* (C.A. MEY.) AELLEN subsp. *eu-subaphylla* AELLEN, Verh. Naturf. Ges. Basel 61: 178 (1950) nom. inval. *Ae. subaphylla* (C.A. MEY.) BOTSCH. ex AELLEN in RECH. f., Fl. Lowl. Iraq: 204 (1964), quoad nom. *Ae. subaphylla* (C.A. MEY.) AELLEN subsp. *subaphylla* in CHER., Additamenta et corrigenda ad Floram URSS: 182 (1973). *Ae. subaphylla* (C.A. MEY.) AELLEN subsp. *Sabetii* AELLEN, Verh. Naturf. Ges. Basel 61: 179 (1950). *Salsola subaphylla* C.A. MEY. var. *arenaria* DROBOV, Herb. Fl. Ross. Fasc. 56, no. 2782, in adnot. (1919) and Sched. Herb. Fl. Ross. 8: 199, in adnot (1922). *S. arenaria* (DROBOV) ILJIN, in schedis, Fl. URSS 6: 246 (1936) in adnot., nom. nud. *S. subaphylla* C.A. MEY. subsp. *arenaria* (DROBOV) ILJIN, Fl. Turkmen. 2,1: 180 (1937). *Aellenia subaphylla* (C.A. MEY.)

AELLEN subsp. *turcomanica* AELLEN, Verh. Naturf. Ges. Basel 61: 180 (1950). *Ae. turcomanica* (AELLEN) CHER., Plantae vasculares URSS: 176 (1981).
Icon.: C.A. MEY. in EICHWALD, Pl. nov. Casp.-Cauc. 2: tab. 24 (1833). PAULSEN in OLUFSEN: Second Danish Pamir Expedition: fig. 13 (1912). KOTHE-HEINRICH, Biblioth. Bot. 143: tab. 54–55 (1993). – Fig. 7-e, 8-e.
Type: (Turcomania) In littoribus maris Caspii in sinu Balchanensi prope Krasnowodsk, in insula Dagada, 1825, K. VON EICHWALD, holotype and 4 isotypes LE!; isotype P!

Hab.: Common and locally dominant in semidesert *Artemisia-Dorema*-community, *Artemisia-Salsola*-desert, *Haloxylon-Salsola*-community, and with *Tamarix* sp., on often saline or gypsum, gravel, clay, takyr-like or sandy soils, from the lowlands up to c. 1500 m. – Fl. VII–IX, fr. VIII–XI.

Persia: E: Khor.: 15 km S Zeydar, 1300 m, BRECKLE & BHADRESA 5031!, 5032! 5 km S Sabzevar, 940 m, REJAMAND & ARAZM 32462! 20–30 km N Gonabad = 70 km from Torbat-e Heydarieh to Mashhad, 900 m, RUNEMARK & SARDABI 23623! – C: Qazv.: Near Mardabad, GAUBA 1030! – Damgh.-Semn.: Semnan, Sagssar, MIRZAJAN 30115-E! 15–25 km from Semnan to Firuzkuh, 1400 m, HDG. & al. 14729! 18 km ESE Semnan to Torud, AKHANI 4040! Between Gandab and Damghan, SABETI 2082! Kavir-e Damghan, 1200 m, REJAMAND & ARAZM 32492! Shahr.-Bust.: Shahrud, KOELZ 16971! Between Mayamey and Shahrud, RECH. & al. 5299! Between Mayamey and Miandasht, SAB. 2081! Between Abbasabad and Mayamey, RECH. & al. 5340! 10 km E Abbasabad, 1060 m, ZOHARY & ORSHAN 10213/6! 100 km SE Shahrud, 1420 m, REJAMAND & ARAZM 32598! Khush-Yailaq, Zardabeh, 1550–1640 m, TERME & al. 39369-E! Torud S Shahrud, 1350 m, REJAMAND & ARAZM 32560!, 32564!, 32565!, 32568! 8 km NE Razeh, AKHANI 4135! Turan Prot. Reg.: 40 km E Razeh, AKHANI 4160! 5 km NW Majrad, 1100 m. BRECKLE & BHADRESA 5085! 8 km S Majrad, S of Abul Yahya springs, 800 m, BRECKLE & BHADRESA 5059! N border of basin between Talkhab and Germab, 500 m E road to Talkhab, 1300 m, FREITAG 13729! – Not localized: Between Tehran and Tayyebat, HAGER 106!
Turcomania: Near Ashkhabad, LITW. 403!, 404!, 584!, 81!, X. 1896, LITW.!, VII.1900, SINT.!, SINT. 1206!, 1208! NE margin of Ashkhabad, 300 m, 6.IX.1976, VASAK!
Afghanistan: N: Mazar-i Sharif: 5–20 km N road Mazar - Tashkurghan, at road to Termez, 315–320 m, PODLECH 32694!, PODLECH 32701!

Distr. gen. of subspecies: Middle Asia (Kazakhstan, Turcomania, Uzbekistan), N Persia, N Afghanistan.

–– subsp. ***Charifii*** (AELLEN) KOTHE-HEINR., Biblioth. Bot. 143: 140 (1993).
Syn.: *Aellenia subaphylla* (C.A. MEY.) AELLEN subsp. *Charifii* AELLEN, Verh. Naturf. Ges. Basel 61: 179 (1950). *Ae. subaphylla* (C.A. MEY.) AELLEN subsp. *gracilenta* AELLEN, l.c. 61: 180 (1950). *Halothamnus subaphylloides* BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 170 (1981).
Icon.: KOTHE-HEINRICH, l.c.: tab. 55–56 (1993). – Tab. 158.
Type of subspecies: Persia, Teheran: Lehmhügel zwischen dem Darya-yi Namak und dem Siah Kuh, 800 m, 26.XI.1948, G. CHARIF & P. AELLEN 289, lectotype G-PAE!, isotypes B!, BR, G!, GB!, G-PAE (3x)!, H!, HBG!, LD!, M!, NY!, W!

Hab.: Common in semidesert and desert, in *Artemisia-Chenopodiaceae*-communities, with *Anabasis, Salvia santolinifolia, Salsola tomentosa, Cornulaca monacantha* or *Seidlitzia*; gravel, clay, marly or sandy, often saline soils, alluvial fans, salt pans, plains and slopes; c. 500–2400 m. – Fl. (VI) VII–IX, fr. IX–XI.

P e r s i a : W: Esf.: 173 km S Saveh, 1200 m, MALCOLM 342! 14 km N Hassanabad (S of Nain), 2230 m, ZOHARY 681!, 683! 8 km S Aminabad/Esfahan, 2070 m, BAUER & KRAMER VO2631! – S: Fars: 30 km from Abarqu to Yazd, 1520 m, FOROUGHI & ASSADI 15112! Kerman: Deh-i Shuturun, 2100 m, BORNM. 4207! Between Zarand and Rafsanjan NW Kerman, DADASHZADEH in PABOT dk209! Between Baghin and Mashiz, 2200 m, BORNM. 4206! Between Jupar and Lalehzar, 2400 m, BORNM. 4205! 158 km from Neyriz to Sirjan, Qatruyeh road, 1600–1700 m, FOROUGHI & ASSADI 15044!, MOUSSAVI & TEHRANI 34360-E! Between Sirjan and Hajjiabad, Kafriz, DADASHZADEH in PABOT dk208!, dk x ! Near Nosratabad Sipi, RECH. 27212! 45 km NW Zahedan to Bam, 1270 m, TERME & MOUSSAVI 34414-E! 30 km W Zahedan to Nosratabad, 1250 m, RECH. 54607! Bal.: Zahedan, 30.XI.1956 PETTER! 145 km from Zahedan to Khash, 1600–1700 m, AKHANI 6619! 74–100 km from bifurcation of road Khash – Iranshahr to Bazman, 1600 m, RECH. 54974! 10 km from Khash to Iranshahr, 1450 m, RECH. 54867! – E: Sistan: Sistan, near Lab-e Bereng, BOBEK 192! 79 km N Zahedan, 700 m, ZOHARY & ORSHAN 8727/1!, 8727/2! Khor.: SW Kashmar, 1200 m, REJAMAND & ARAZM 32618! 60 km NE Gonabad, 1300 m, REJAMAND & ARAZM 32489! Tayyebat, RECH. 37591! 2 miles from Tayyebat to Afghanistan, 700 m, ALAVA & IRANSHAHR 10979!, IRANSHAHR 15288-E! Rui & Assadabad, 10.X.1858, BUNGE! Road of Robat-e Posht-e Badam to Tabas, 900 m, FOROUGHI & BAZARGAN 32386!, 32387! 30 km from Robat-e Posht-e Badam to Yazd, 1000 m, FOROUGHI & BAZARGAN 32433! Ferdows to Tabas, 1350 m, REJAMAND & ARAZM 32475! Kavir-e Lut, 28 km NE Tal-e Kheshtak to Fedeshk, 880 m, TERME & MOUSSAVI 34412-E! 120 km SE Birjand to Zahedan, near Sahlabad, 1350 m, DADASHZADEH in PABOT DE-43! – C: Tehr.: Kavir station, 88 km E Tehran, 1000 m, AELLEN 295! Kavir-e Garmsar, 840 m, REJAMAND & ARAZM 32507! Hableh-Rud valley, between Simin-Dasht and Kabutar-Darreh, 1150 m, AELLEN & MANUCH. 307! Hableh-Rud valley, 1–2 km above Ban-e Kuh (Bonehkuh, Bun-e Kuh), 1100 m, AELLEN & MANUCH. 285!, 286!, 287!, 2894! Ban-e Kuh, MANUCH. & AELLEN 30117-E!, 30118-E-a!, 30119-E! Kavir Prot. Reg.: 25 km SE Mobarakieh, AKHANI 1339! Near Caravan-Sarai Shah Abbas, 800–850 m, AKHANI 1362! 50 km W Caravan-Sarai Shah Abbas, 780 m, WDB. & FOROUGHI 14604! Kavir-Namak, Siah Kuh to Baha-Hemmat, 700 m, IRANSHAHR & MOUSSAVI 15395-E! Between Darya-e Namak and Siah Kuh, 800 m, AELLEN & SHAR. 289! Char salt desert N of Siah Kuh, 770 m, AELLEN & SHAR. 294! NW of Siah Kuh to Darya-ye Namak, 800 m, AELLEN 290!, 291!, 292! Siah Kuh, 5–35 km SE Caravan-Sarai Shah Abbas, RECH. 46340! N of Siah Kuh at road to Talhe, 820 m, FREITAG 14016! E of Siah Kuh, 750–800 m, WDB. & FOROUGHI 14641!, 14642!, WDB. & FOROUGHI 14646! Eyn or-Rashid near Sefidab, IRANSHAHR & MOUSSAVI 15394-E! 25 km E Marinjab, 860 m, AELLEN & SHAR. 293! Damgh.-Semn.: 72 km W Semnan, 1360 m, ZOHARY & ORSHAN 11653/4! Kashan: Kavir: Sefidab, 940 m, TERME & TEHRANI 40034-E! Dastkan, SHAR. & AELLEN 30143-E! Kavir-e Kashan, SHAR. & AELLEN 30054-E! Abu Zeydabad, Kuh-e Yakh Ab, 1600–1700 m, TERME & TEHRANI 40051-E! Near Robat-e Tork, ALEXEENKO 661!, 662! Yazd: Yazd: Between Anarak and Chupunum, 1000–1400 m, FOROUGHI & ASSADI 15153!, FOROUGHI & BAZARGAN 32377!, 32379! – Not localized: Iter Persicum, 1858–59 BUNGE!, Yesd?, 1858–59, BUNGE!

A f g h a n i s t a n : NW: Herat: Hari Rud valley, Kafir Kalla (Islam Qala), AITCHISON 717! Between Herat and Kisil Islam Qala, RECH. 32512! 73 km S Herat, 1500 m, PABOT A-1528! – SW: Farah: Shorau, 20 km S Shindand, 1400 m, BRECKLE 4932! Jija, LINDBERG 110/1962! 10 km SE Farah Rud to Dilaram, VOLK 71/641! 10 km NW Dilaram to Farah Rud, 900 m, RECH. 37570! Farah-Seistan, 600 m, KOEIE 4082! S Farah-Juwain, VOLK 2919! 11 km SE Lase Juwain (Jowayn) to Chakhansur, 540 m, PODLECH 16925! Chakhansur, E of Jehil-e Puzak, 460 m, BRECKLE 4908! Lower Kash Rud valley near Haleli, 540 m, FREITAG 2451! 10 km WSW Sheshaba, (42 km SW Lokhi) to Zaranj, 555 m, PODLECH 16883! – Kandahar: SE Dilaram, 10 km W Shorab, 920 m, FREITAG 3705! 40 km WNW Girishk to Dilaram, 905 m, PODLECH 22425! Between Boghra and Girishk, VOLK 1317! Dasht-e Margo, 70 km N Khonnashin, 750 m, BRECKLE 4860! Dasht-e Margo SW Marja, PABOT A-354! 30 km ESE Girishk to Kandahar, 870 m, PODLECH 19204! 70–92 km W Kandahar, 1000–1100 m, PABOT A-311!, RECH. 34827!, UOTILA 18927! Near Kandahar, Pirzada, 1000 m, KOEIE 2060! Near Kushk-i Nahhud, 53 km W Kandahar, 1000 m, RECH. 37551! 30 km NE Kandahar, 1200 m, FREITAG 2029! 45 km E Kandahar, 1200 m, UOTILA 18914! 5 km N Cagray Qala, 35 km S Kandahar, at Tor Kotal, 1080 m, BRECKLE 4839! Takhtapul, 45 km SE Kandahar to Spin Boldak, 1060 m, PODLECH 32653! – Not localized: Affghanistan, GRIFF. 4218!

P a k i s t a n : Bal.: Chagai distr., Koh-e Sultan, 40 km N Nok Kundi, 1800–1900 m, FREITAG & KOTHE 18699/17! 39 km N Nok Kundi, 1800 m, FREITAG & KOTHE 18699/22!

Distr. gen. of subspecies: Persia, W and SW Afghanistan, Pakistan (Baluchistan).

–– subsp. ***psammophilus*** (BOTSCH.) KOTHE-HEINR., Biblioth. Bot. 143: 145 (1993).
Syn.: *Halothamnus psammophilus* BOTSCH., Not. Syst. Leningrad (Bot. Mat. Gerb. Bot. Inst. Akad. Nauk SSSR) 18: 168 (1981).
Icon.: KOTHE-HEINRICH, l.c.: tab. 55 and 57 (1993).
Type of subspecies: (Turcomania) Kara Kum, sand dunes E of Murgab river, towards Sultan-Bend station, 17.V.1909, V.A. DUBYANSKIJ, holotype + 3 isotypes LE!

Hab.: Locally common in psammophytic communities, with *Stipagrostis Karelinii, Haloxylon, Tamarix, Calligonum* or *Salsola Richteri*; sands and dunes, takyr-like solonchak, clay-schist slopes, up to 900 m. – Fl. V/VI – VIII/IX, fr. (VII) VIII–X.

P e r s i a : E: Khor.: W Sarakhs E Mashhad, 200–350 m, PABOT 5056!
T u r c o m a n i a : Ashkhabad, central botanical garden, 25.X.1967, METELINA!
A f g h a n i s t a n : N: Mazar-Sharif: 60 km NW Balkh, 8 km S Islam Chomgar, 280 m, BRECKLE 4658! 50 km WNW Tashkurghan, 350 m, FREITAG 3878! 27 km E Mazar-i Sharif at road to Tashkurghan, 400 m, PODLECH 22428!

Distr. gen. of subspecies: Kazakhstan, Turcomania, Uzbekistan, Tadjikistan, NE Persia, N Afghanistan.

Specimens of *H. subaphyllus* without infraspecific identification:

P e r s i a : S: Kerman: 53 km SE Sirjan, 1730 m, PABOT 6846! – E: Khor.: Sabri, SABETI 549! – C: Tehr.: Hableh-Rud valley, 1–2 km above Ban-e Kuh (Bonehkuh, Bun-e Kuh), 1100 m, AELLEN & MANUCH. 288! Damgh.-Semn.: Between Garmsar and Semnan, 900 m, RECH. 52139! 51 km NE Semnan, 1670 m, PABOT 8176! Shahr.-Bust.: 40 km NE Shahrud to Shahpasand, 1560 m, PABOT 8106! Mayamey, SAB. 561! 92 km E Shahrud, road Tehran – Mashhad, 1170 m, PABOT 8088! 109 km E Shahrud, 1200 m, PABOT 8080! Turan Prot. Reg.: Delbar E Qaleh Bala, RECH. 50491!

29. *Seidlitzia*

I.C. HEDGE, Edinburgh

Seidlitzia BUNGE ex BOISS., Fl. Or. 4: 950 (1879).

Lit.: M. ILJIN, De genere Seidlitzia BUNGE Notae criticae, Botaničeskie Materialy = Notulae systematicae ex Herbario Horti Botanici Petropolitani Leningrad 16: 86–93 (1954). V. BOTSCHANTZEV, Generis Seidlitzia BUNGE species oblivia, Novosti Sistematiki Vysših Rastenii = Novitates systematicae plantarum vascularium Leningrad 7: 145–146 (1970) – in Russian.

Annual herbs or shrubs, entirely glabrous or with only some tufts of white hairs in leaf axils. Stems shining white or not. Leaves well-developed, opposite, fleshy, terete, sessile, obtuse. Flowers hermaphrodite or unisexual, sessile, borne in axils of leaves, usually in clusters of 3–5. Perianth segments 5, obtuse, expanded and with broad membranous conspicuous spreading wings in fruit. Stamens 5; anthers without appendages. Stylar arms 2, linear. Fruit horizontal, rarely vertical, with a smooth pericarp. Seeds with a spiral embryo; endosperm absent. – Lectotype of genus: *S. florida* (M.B.) BUNGE ex BOISS. [see ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16c: 563 (1934)].

Two species in SW Asia. With strong affinities to *Salsola* on account of the 5-winged spreading fruiting perianth segments and horizontal seeds. ILJIN (l.c. 1954) transferred several, non-Persian, species of *Salsola* into *Seidlitzia*, but his views have not been generally adopted. SOLMS-LAUBACH, as long ago as 1901 (Bot. Zeit. 59, 1: 173), also pointed out that there were no constant characters to separate *Seidlitzia* from *Salsola*; it is, however, tentatively retained here as an independent genus.

1a. Shrub; leaves linear-clavate, 10–40 × 2–4 mm .... 1. *S. rosmarinus* EHRENB. ex BOISS.
b. Annual or short-lived perennial; leaves linear to ovoid-subglobose, 5–20 × 2–3,5 mm .... 2. *S. florida* (M.B.) BUNGE ex BOISS.

1. *S.* ***rosmarinus*** EHRENB. ex BOISS., Fl. Or. 4: 951 (1879).
Icon.: Iranian Journ. Bot. 1: 36, tab. 39 (1976). – Tab. 159.
Type: (? Gulf of Akaba): "In insula Maksuk Arabiae", C.G. EHRENBERG 123, G, K.

Sturdy much branched shrub, (20–)40–150 cm high and 40–100 cm across. Stems basally to 2 cm thick, with a greyish flaking bark; internodes elongated, c. 2–3 cm, young shoots smooth, shiny white, glabrous. Leaves opposite, sessile, fleshy, terete, often thicker towards apex, linear-clavate, c. 10–30(–40) × 2–3 (–4) mm, green, pale green or blue green, basally with some white hairs at junction with stem. Flowers axillary in leaf axils, solitary or in clusters of 3–5, sessile or shortly stipitate. Perianth segments slightly united at base; in fruit with 5 unequal spreading, semi-transparent, obovate, obtuse, veined wings, irregularly spreading, brown or slightly pink. Fruiting wings 3–10 mm in diameter. Fruit c. 2,5 mm diameter.

Hab.: Sandy or stony desert or semi-desert, gravel soil, salt flats, clay soil - sometimes dominant over large areas; 20–2000 m.

I r a q : Diyala: Ad confines Persiae, inter Mandali et Badra, c. 20 km a Badra septentr. versus, RECH. 12712!

P e r s i a : W: Esf.: Nain, 43 km to Anarak, 1000 m, FOROUGHI & ASSADI 15131! NE Ardestan, Kavir-e Zavareh, 900 m, FOROUGHI & BAZARGAN 32357! Lur.: Posht Kuh, Halat-e Mehran, BEHBOUDI 302! – S: Fars.: E Genaveh, 20 m, BOKHARI & al. 14796! Abarqu, 1520 m, FOROUGHI & ASSADI 15111! Neyriz, Qatruyeh 1550 m, FOROUGHI & ASSADI 15042! Kerm.: Deh-i Shuturun, 2000 m, BORNM. 5070! Bam to Fahraj, 800 m, RECH. 3909! Saidabad (Sirjan) to Bandar Abbas, 1700 m, FOROUGHI & ASSADI 15049! SW Nosratabad Sipi, RECH. 27172!, LAMOND 84! Kahurak, 62 km SW Zabol, 600 m, GRANT 15305!, SOJAK 227! N Dasht-e Lut, 650 m, LEONARD 5538! Dasht-e Lut, Shurgaz, BOBEK 70! W of Dasht-e Lut, 31°01'N, 58°03'E, 520 m, LEONARD 6234! – E: Sistan: Ad confines Afghaniae, Kuh-e Malik Siah versus Zabol, 700 m, RECH. 4092a!, 4094b! Khor.: 40 km NW Tabas versus Robat-e Gur, 600 m, RECH. 51764! W Tabas, Dasht-e Kavir, LEONARD 5430! E margin Great Kavir, Ozbagu (Ozba-Kuh), RUTTNER 399! 43 km SW Ferdows, 1250 m, REJAMAND & ARAZM 32540! Shahdad to Birjand, Kavir-e Lut, TERME & MOUSSAVI 34426-E!, 34427-E!, W Jaz Murian, 58°35'E 27°14'N, 380 m, LEONARD 5783! – C: Tehr.: 88 km E Tehran, 1000 m, AELLEN 408!, 410! 90 km Tehran to Qom, Daryacheh-ye Howz Soltan, UOTILA 19396! Kavir: Hoseynian to Jandaq, Howz Jandaq, 700 m, TERME & MOUSSAVI 30267-E! Kavir-e Garmsar, 840 m, REJAMAND & ARAZM 32508! Kavir Prot. Reg.: 50 km W Caravan-Sarai Shah Abbas, 780 m, WDB. & FOROUGHI 14606! 37 km NW Shah Abbas, 800 m, WDB. & FOROUGHI 15194! Siah Kuh, IRANSHAHR & MOUSSAVI 15393-E! Qazv.: Mardabad near Karaj, GAUBA 2143! Damgh.-Semn.: Semnan to Anjirab, 1050 m, TERME & MOUSSAVI 30217-E!, 30221! Kavir-e Damghan, 1200 m, REJAMAND & ARAZM 32497! Anjirab to Chah Shirin, Howz-e Mozafar, 1000 m, TERME & MOUSSAVI 30264! Semnan to Anjirab, 1050 m, TERME & MOUSSAVI 30221-E! Semnan to Firuzkuh, 1400 m, HDG. & al. 14741! Garmsar to Semnan, 680 m, DINI & BAZARGAN 24361!, RECH. 2782! Shahr.-Bust.: Torud, S Shahrud, REJAMAND & ARAZM 32561! Inter Abbasabad et Sabzevar, RECH. 1307! Sabzevar, Sadrabad to Shahrud, FOROUGHI 10605! Turan Prot. Reg.: Delbar to Ahmadabad, Biarjmand, 1100 m, TERME & al. 141721! S of Sanjari, 720 m, FREITAG 13632! Yazd: Chupunum, SAB. 14818-E! Near Aqda, 1150 m, FOROUGHI & ASSADI 15121! Nain to Aqda, 1000 m, RECH. 2702! Nain, Chah-e now, FOROUGHI 10493!, 10540! Yazd to Tabas, RUTTNER 630!, 631! Kashan: Kavir, Shahar taqi to Maranjab, 800 m, TERME & TEHRANI 40041! 5 km Maranjab to Sefidab, 800 m, TERME & TEHRANI 40025! SW Kashmar to Kavir, 1200 m, REJAMAND & ARAZM 32613! Kashan, Dastkan, SHARIF & AELLEN 30070-E!

A f g h a n i s t a n : N: Mazar-i Sharif: Mazar-i Sharif to Tashqurghan, 400 m, PODLECH 16988a! 25–40 km NW Tashqurghan, 330 m, BRECKLE 4648!, 4724! – SW: Farah: 10 km Sheshhaba to Kang (Zaranj), 555 m, PODLECH 16881! 96 km SW Dilaram, 700 m, FREITAG 2444! 13 km SE Chakhansur, 500 m, FREITAG 3743! Chakhansur, border of Khuspas Rud, 540 m, FREITAG 3764! – SE: Kandahar: Dasht-e Margo, 70 km N Khonnashin, 750 m, BRECKLE 4862! – "Lit de l'Amu Daria, pres de Qizil Qala, Jul. 1967," PELT.

Distr. gen.: Palestine, Sinai, Jordan, Syria, Iraq, Saudi Arabia, Kuwait, Bahrein, Oman, United Arab Emirates, Qatar, Socotra, Persia, Afghanistan, C Asia (Kara Qum, Pamir Alaj). – FREITAG, Fl. et Veg. Mundi 9: 289, fig. 7 (1991).

Can be usually recognized by the shrubby habit, the shiny white stems and the linear spreading leaves. Although there are few precise differences between *S. rosmarinus* and the annual *S. florida*, confusion should not normally occur using the features in the species key. The diameter of the (entire) fruiting wings of the perianth is generally clearly larger in *S. rosmarinus* (see also SOLMS LAUBACH, Bot. Zeit. 59, 1: 173 (1901). The leaves of *S. rosmarinus* are sometimes used to make a soap substitute.

2. ***S. florida*** (M.B.) BUNGE ex BOISS., Fl. Or. 4: 950 (1879).

Syn.: *Anabasis florida* M.B., Mém. Soc. Imp. Nat. Mosc. 1: 147 (1806). Fl. Taur.-Cauc. 1: 190 (1808). *Salsola florida* (M.B.) POIR. in LAMARCK, Encycl. Méth. Bot. Suppl. 5: 191 (1817). *Halogeton ? cinereus* MOQ., Chenopod. Monogr. 159 (1840). *Salsola pulla* C. KOCH, Linnaea 22: 190 (1849). *Anabasis cinerea* (MOQ.) MOQ. in DC., Prodr. 13, 2: 214 (1849). *Haloxylon floridum* (M.B.) FENZL in LEDEB., Fl. Ross. 3: 819 (1851). *Seidlitzia cinerea* (MOQ.) BUNGE ex BOTSCH., Nov. Syst. Leningrad 7 (1970): 145 (1971).

Icon.: M.B., Cent. Pl. Rar. 1: tab. 17 (1810). – Tab. 160.

Types: (Armenia): "in collibus aridis Armeniae ibericae versus Cyrum (Kura) fluvium", F.A. MARSCHALL VON BIEBERSTEIN, LE.

Lit.: Z.A. AKOPIAN, Biology of Seidlitzia florida, Botaničeski Zhurnal 68, 6: 788–794 (1983) (In Russian).

Annual or short-lived perennial. Stems branched from near base, herbaceous or somewhat woody, yellowish green to reddish when young becoming greyish white, erect or ascending, branches often opposite, glabrous; internodes elongated up to 3 cm or much abbreviated. Leaves opposite, sessile, fleshy, terete, variable in shape, linear and c. 20 × 2 mm to ovoid-subglobose and c. 5 × 3,5 mm, obtuse, acuminate or with a distinct mucro, lower sometimes spreading-reflexed; tufts of hairs present in leaf axils. Flowers axillary in upper leaf axils and ± subtended and hidden by cucullate leaves, usually in clusters of c. 3; flowers hermaphrodite or unisexual; often male flowers in centre of clusters. Perianth segments irregular in shape, oblong-ovate, semi-transparent, veined, obtuse, fringed, brownish, yellowish or purplish pink. Fruiting wings irregularly horizontally spreading, c. 3–5(–10) mm in diameter. Fruit c. 2 mm in diameter.

Hab.: Salt steppe, soil and sandy places, gypsum hills, on clay and gravel, edge of lake, disturbed habitats; 250–1800 m. - Fl. VIII–X, fr. X–XII.

Persia: N: Gilan: Lowshan to Manjil, 360 m, WDB. & SHIRDELPUR 14849! – W: Azerb.: in argillosis salsis 40–45 km ESE Maku, 1200 m, GRANT 16194!, RECH. 43855! Maku to Marand, TERME 40159-E! 40 km E Maku to Tabriz, VOLK 71/881!, 71/879! W Marand to Khvoy, ABAI & MOJIB 40223-E!, RECH. 14919! VOLK 71/611a! 27–50 km W Marand to Evowghli, 1000–1100 m, RECH. 43831!, 43837! Marand, ABAI & MOJIB 14845-E! Khvoy to Shahpur, 1200 m, SAB. in GAUBA 2145!, AELLEN & BEHB. 387 (RAWI! as var. *recurvata* AELLEN – nomen ?), BEHB. & AELLEN 392!, 30071-E! 94 km N Khvoy, Shahabad to Maku, RECH. 32712! Khvoy to Marand, ZOHARY & BAUM 65.1621! Moghan, Eyvaz, 3 km SE Aslanduz, 250 m, LAMOND 3202!, RECH. 40174! Dasht-e Moghan, SCHMID 6564! Alirezaabad-e Jadid to Sarband, RECH. 40193!, IRANSHAHR 30371-E! Qara Dagh, Darreh Diz S Jolfa, c. 1200 m, TERME in RECH. 43814! 20 km E Mianeh to Khalkhal, 960 m, WDB. & SHIRDELPUR 14929! N slope Kuhha-ye Savalan, JARDINE 577-A! Sharafkhaneh, BEHB. & AELLEN 30179-E! Tabriz, MIRD. 2095! 60 km NE Tabriz, 1500 m, PABOT 5205! Khamseh: In collibus argilloso-gypsaceis 60 km

NW Zanjan, RECH. 42307! Esf.: Nain, 1500 m, FOROUGHI & ASSADI 15125!, FOROUGHI 10515! 18 km Nain to Ardestan, near Aliabad, 1720 m, FOROUGHI & ASSADI 15155! Ardestan to Nain, 1700 m, FOROUGHI & BAZARGAN 32414! Arak: Davudabad, ABAI & MOJIB 14850-E! Arak (Sultanabad) in desertis ad "Wisme", STR.! – S: Fars: Surmaq near Faranshah, 1800 m, FOROUGHI & ASSADI 15117! Kerm.: Kerman, STARM. 173! Baghin, 1750 m, FOROUGHI 10543!, 10580!, 10590! In deserris salsis prope Deh-i Shuturun, BORNM. 510! 40 km Saidabad (Sirjan) to Bandar Abbas, 1700 m, FOROUGHI & ASSADI 15048! Bam to Mahan, Mahmudabad, 1720 m, TERME & MOUSSAVI 34407-E! 60 km N Zahedan, Hormak, c. 800 m, TERME & MOUSSAVI 34409! Zahedan to Bam, 24 km E Nosratabad, 1220 m, TERME & MOUSSAVI 34406! Iranshahr to Bam, 60 km W Bazman, 1150 m, ERSHAD & al. 35410! E Dasht-e Lut, 30°42'N 59°52'E, LÉONARD 6173! – C: Tehr.: 53–61 km SW Tehran to Saveh, 950–1260 m, ASSADI & SHIRDELPUR 13111!, AMIN & BAZARGAN 2798! Rud Shur, 60 km SW Tehran, 950 m, AELLEN 397! Hableh Rud, 1100 m, AELLEN & MANOUCH. 401!, 402!, MANOUCH. & AELLEN 30172-E! 88 km E Tehran, AELLEN 400! Qazv.: 30–70 km SW Karaj, 1000 m, AELLEN 393!, 397! Mardabad, GAUBA 2144! West of Mardabad, 1250 m, HDG. & al. 14691!, 14692! Kavir Prot. Reg.: Siah Kuh, 1550 m, FREITAG 14004! 20 km NW Caravan-Sarai Shah Abbas, 850 m, WDB. & FOROUGHI 15222! Howz-e Agha Mohammad Khan, IRANSHAHR & MOUSSAVI 15375-E! Siah Kuh, 1550 m, FREITAG 14004! East of Siah Kuh, WDB. & FOROUGHI 14650!, 15206! Kavir Namak, Siah Kuh to Baba Hemmat, IRANSHAHR & MOUSSAVI 15377-E! NE Ardestan, Kavir-e Zavareh, 1900 m, FOROUGHI & BAZARGAN 32416! Vardenow to Kalateh, 1750 m, TERME et al. 39364! Damgh.-Semn.: S Semnan to Kavir, 1000 m, REJAMAND & ARAZM 32582! Semnan to Anjirab, 1050 m, TERME & MOUSSAVI 30215-E! Anjirab to Chah Shirin, TERME & MOUSSAVI 30263-E!, 30261-E! Shahr.-Bust.: Shahrud to Sabzevar, RECH. 1298! Turan Prot. Reg.: SE Shahrud, 3 km E Miandasht, 1300 m, FREITAG 15530! Kashan: Robat-e Tork, SOJÁK 6886!
P a k i s t a n: Quetta: 6 km NE Quetta, Hanna Lake, 1730 m, GHAFOOR & OMER 2096!, FREITAG & KOTHE 18813! Spin Karez, A.H. KHAN 12491! Harnai to Spin Tangi, NATH 2445! Near Soranga, QAISER 2477!

Distr. gen.: Transcaucasus, E Turkey, Persia, Pakistan.

This is a more variable species than *S. rosmarinus*. In general, plants of *S. florida* from the NW of Persia are more clearly annual with longer leaves than the basally subshrubby plants with shorter ovoid leaves from the Yazd, Kerman, Baluchistan area. These two forms are very different looking in facies but apparently do not merit taxonomic distinction. Detailed information on growth form and floral structure of the species (in the Caucasus) is given by AKOPIAN (l.c.).

30. *Noaea*

I.C. HEDGE, Edinburgh

Noaea MOQ. in DC., Prodr. 13, 2: 207 (1849).
Syn.: *Noea* BOISS. & BAL. in BOISS., Diagn. Pl. Or. Nov. ser. 2, 4: 76 (1859) – orth. var.

Lit.: A. VON BUNGE, Noea in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg 7. ser., 4, 11: 21–28 (1862). P. AELLEN, Noaea, in Ergebnisse einer botanisch-zoologischen Sammelreise durch Iran, Botanische Ergebnisse III. Mitteilungen der Basler Botanischen Gesellschaft 1, 1: 10–14 (1953).

Annual or perennial herbs, glabrous, or with scabrid papillae or tufts of villous tangled hair in leaf axils. Stems not jointed, angular or terete, with branches spine-tipped or not. Leaves not or scarcely fleshy, alternate, linear-filiform, sessile, often subamplexicaul; leaf bases with a ± scarious margin. Inflorescence lax or clustered, spike-like or not. Flowers hermaphrodite, solitary and sessile in the upper leaf axils, subtended by 2 leaf-like bracts. Perianth segments 5, ± oblong, membranous in flower; in fruit developing 5 equal or unequal prominent spreading median wings. Stamens 5; anthers oblong, often sagittate; connective ending in a short distinct non-vesicular terminal appendage. Ovary globose-ovoid, erect; stylar arms prominent, sturdy. Seed vertical with a spiral embryo; endosperm absent. – Type of genus: *N. spinosissima* (L.f.) MOQ. (*Noaea mucronata* (FORSSK.) ASCHERS. & SCHWEINF.) – lecto. ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 574 (1934).

The genus has some similarity to *Girgensohnia* which, however, has opposite leaves and only 2–3 (or none) of the perianth segments develop wings. There are also clear similarities between *Noaea* and *Salsola*, but the former has an erect seed, the latter a horizontal one [cf. FREITAG & KHANI, Plant Syst. Evol. 155: 49–54 (1987), where they transfer *N. Griffithii* BUNGE to *Salsola*].

1a. Perennial; branches becoming spine-tipped; leaves erect-spreading .... 1. *N. mucronata* (FORSSK.) ASCHERS. & SCHWEINF.
b. Annual; branches not spine-tipped; leaves recurved ...... 2. *N. major* BUNGE

1. ***N. mucronata*** (FORSSK.) ASCHERS. & SCHWEINF., Mem. Inst. Egypt 2: 131 (1887).
Syn.: *Salsola mucronata* FORSSK., Fl. Aegypt.-Arab. 56 (1775). *Anabasis spinosissima* L. f., Suppl. Pl. Syst. Veg. 173 (1781). *Halogeton spinosissimus* (L. f.) C.A. MEY., Verz. Pfl. Cauc. 159 (1831). *Anabasis Tournefortii* JAUB. & SPACH, Ill. Pl. Or. 2: 43 (1845). *Noaea Tournefortii* (JAUB. & SPACH) MOQ. in DC., Prodr. 13, 2: 208 (1849). *N. mucronata* subsp. *Tournefortii* (SPACH) AELLEN, Mitt. Basler Bot. Ges. 1, 1: 13 (1953).
Icon.: JAUB. & SPACH, Ill. Pl. Or. 2: tab. 132 (1845); JAFRI & EL-GADI, Fl. Libya 58: 100, tab. 37 (1978). – Tab. 161.
Type (lectotype): Egypt, Alexandria, ad catacombas, FORSSKÅL, C – microfiche!; cf. FREITAG, Flora 183: 167 (1989).

Much branched perennial, clump-forming or sprawling, 15–80 cm, woody at least at base, glabrous or with very short scabrid papillae, glaucous. Stems angular or terete, rigid, with branches terminating in stiff spines at least when older. Leaves 5–2,5 × 0,5–1,5 mm, not or slightly fleshy, semi-terete, linear-filiform but widened and oblong-ovate at the clasping base, mucronulate. Flowers widely distributed over stem. Leaf-like bracts ± adpressed to stem enclosing the solitary flowers, hard-textured, shorter than to exceeding flowers. Perianth segments erect in flower, membranous, c. 2–3,5 × 1,5 mm, apiculate. Stamens with c. 1 mm broad filaments and c. 2–2,5 mm ± medifixed linear thecae with a short triangular apical extension (not vesicular) of the connective. Wings of fruiting perianth segments somewhat unequal, rose or purplish-pink, to 4–5 × 3,5 mm, entire or slightly erose, irregularly spreading, thin membranous; apical parts of perianth remaining erect. Seed erect, c. 1,5 × 0,8 mm.

Hab.: Semi-desert, rocky slopes, *Artemisia* & *Astragalus*-steppe, on gypsum, serpentine, salty ground, clay soil; 300–3300 m – Fl. VII–VIII, fr. IX–XI.

I r a q : Kurd.: Mosul: Sirsang, 1670 m, HAINES 432! In ditione pagi Sharanish, in jugo montis Zawita, 1800 m, RECH. 10928! Arbil: Montes Qandil ad confines Persiae, c. 2200 m, RECH. 11090!, 11214! Algurd Dagh (Mons Halgurd), in valle supra pagum Nowanda, 2400 m, RECH. 11357! – Diyala: Jabal Hamrin, inter Sharaban et Jalaula, RECH. 8073!

P e r s i a : N: Gorg.: Shahkuh, 3050 m, KOELZ 16331!, ASSAFI 30316-E! Mohammad Reza Shah Prot. Reg. (Golestan), Kuhha-ye Almeh, 1400–1500 m, TERME & MATIN 35101-E!, UOTILA 19135!, 19183! Maz.: In valle fluvii Chalus, 400 m, SAB. in GAUBA 2124! – W: Azerb.: in faucibus 122 km NW Zanjan versus Mianeh, 1050 m, RECH. 32590! 38 km NNW Marand versus Jolfa, 1100 m, RECH. 43656! 38 km NW Bonab, 1550 m, RECH. 43187! 10 km SE Maku, Tabriz to Bazargan, 1000 m, UOTILA 19527! SE Tabriz, 1540 m, WDB. & SHIRDELPUR 14936! Prope Tabriz, STARM. 58! Talkheh Rud (Achi Chay), BEHB. & AELLEN 30064-E! Khvoy to Shahpur, 1700 m, AELLEN & BEHB. 445! Dasht-e Moghan, SCHMID 6566! Khamseh: 10 km NW Zanjan, SOJAK 7467! Soltaniyeh, 1670 m, FURSE 3217! Kurd.: Montes Chehel Chashmeh, 44 km NE Marivan, RECH. 43057! Marivan, c. 2000 m, IRANSHAHR & TERME 14828-E! 50–140 km Marivan to Saqqez, c. 1500 m, RECH. 43086-C!, TERME 40273-E! Sanandaj to Saqqez, Hoseynabad, RECH. 14726! Sanandaj, IRANSHAHR & TERME 14827-E! Above Sardasht, 1830 m, FURSE 3490! Ham.: Faghire, SABETI 2125! Kermanshah: In collibus arenaceis prope Sar-e Pol, 7–20 km E Qasr Shirin, RECH. 14589! Esf.: Korde Sofla, 110 km WNW Esfahan, 2200 m, HARTL! Akhvoreh, Choghyunt to Tang-i Dozdan, 2650 m, MOUSSAVI & SATEI 40086-E! Kuh Sofeh, STAPF 775! Lur.: Dow Rud, KOELZ 18194!, 18497!, Chamchid, KOELZ 16000a! – S: Fars.: Kuh Dashtak, Emamzadeh Esmail, STAPF 773! Kuh Bul, STAPF 777! Kuh Abbas Ali, 3500 m, STAPF 776! 23 km Jahrom to Shiraz, 1010 m, FOROUGHI & ASSADI 15089! 95 km from Shiraz to Jahrom, ALAVA 10705! 4 km N Shiraz, 1800 m, GRANT 16805! Maharlu lake, GRANT 15085! Kuh-e Dinar (Adena), KY. 672! Above Asiab, SE of Tal-e Khosravi, 2420 m, ARCHIBALD 2830! Kerm.: Kuh-e Panj, MANUCH. 1119! Bam to Jiroft, Mahmudabad, 1820 m, ERSHAD et al. 40220-E! Bal.: In ditione vulcani Bazman, 15 km N Bazman, 1100 m, RECH. 55036! – E: Khor.: 15 km N Quchan, 1700 m, UOTILA 18967! Inter Mashhad et Torbat-e Heydariyeh, Robat-Safid, 1700 m, RECH. 1542! Torbat-e Heydarieh, KOELZ 16900! Sepid inter Bojnurd et Tappeh-ye Moraveh, 1350 m, RECH. 3255! Bojnurd, KOELZ 16650! 24 km SE Sabzevar, 1100 m, REJAMAND & ARAZM 32577! Mashhad, ASSADI & MASOUMI 21487! Mashhad to Neyshabur, 2300 m, TERME et al. 41500-E! Kuh-e Ahangaran, Zaidan, 1900 m, RECH. 56152! – C: Tehr.: 30 km NE Tehran, STARM. 217! Tehran to Qom, UOTILA 19397!, TERME & MOUSSAVI 30280-E! Karagatch near Varamin, 2100 m, BROWN 764! 20 km W Tehran, 1200 m, AELLEN 443! Simin Dasht to Kabutar-Darreh, 1150 m, MANUCH. & AELLEN 458!, 462! Damavand, GILLI!, WDB. 1436!, AELLEN 457! Qazv.: W of Mardabad, 1250 m, HDG., WDB. & al. 14695! Talaqan, Hasanjan, c. 2000 m, TERME 14805-E! Karaj, GAUBA 2123! Qazvin, 1200 m, SCHMID 6423! Qazvin to Zanjan, 1300 m, UOTILA 19442! Semn.-Damgh.: Semnan to Firuzkuh, 1400 m, HDG., WDB. & al. 14743!, FOROUGHI 10514! Shahr.-Bust.: Shahrud, KOELZ 16970!, 16942! Turan Prot. Reg.: 5 km NE Delbar, 1300 m, BRECKLE 5046! 18 km ESE Delbar. 980 m, FREITAG 13915! Yazd: Shir Kuh above Deh Bala, 3350 m, DAVIS 780-A!

T u r c o m a n i a : Ashkhabad, LITW. in HFR 8: 389!, 21a!, 22!, VASAK! Kopet Dagh, Chuli, VASAK! Bakharden, 16 km E Bami, VASAK! Bakharden, Archman, 350 m, VASAK! Berzengi, 300 m, VASAK!

A f g h a n i s t a n : NW: Herat: 35 km W Herat, 850 m, FREITAG 5428!

Distr. gen.: N Africa (Morocco eastwards), SE Europe, SW Asia, C Asia.

Very frequent in our area, but just reaching into Afghanistan and apparently absent from Pakistan; mainly restricted to semi-desertic places. Very variable in habit; some plants forming small dense spiny tufts (var. *humilis* BOISS.), others being tall, lax and of scarcely spiny habit. AELLEN, Mitt. Basler Bot. Ges. 1, 1: 11–13 (1953) recognized several varieties and forms (not given in synonymy above) based on this, continuous, habit variation. It is probable that the Caucasian *N. leptoclada* (WORON.) ILJIN should be added to the synonymy of *N. mucronata*.

2. *N. major* BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 27 (1862).
Icon.: Tab. 162.
Type: Afghanistan, "in rupestribus sterilibus prope Sokhtar", (? Hajigak pass), W. GRIFFITH 1766 = Journal 1113, K!

Annual, 6–40 cm, erect or sprawling, somewhat fleshy, with a sparse scabrid-papillose indumentum when young, glabrous later except for tufts of curled white hairs in leaf-bract axils. Stems simple or branched from base, often zig-zagged; root at apex to c. 4 mm. Leaves up to 15 mm and c. 0,5 mm wide, semi-amplexicaul, recurved, cuspidate or not, with a broad white membranous margin; younger leaves present in leaf axils, shorter, of firmer texture, ± pungent. Leaf-like bracts tightly enclosing the solitary flowers. Perianth segments erect in flower, c. 4 × 1,5 mm, thin-membranous, ± oblong, apically oblong. Stamens with linear thecae terminating in a short acute extension. Infrutescences often condensed on short lateral shoots. Wings of fruiting perianth irregularly spreading erect; lamina silvery to reddish violet, membranous, veined, c. 3 × 2 mm, rounded. Seed erect. c. 1,5 × 0,8 mm.

Hab.: Rocky slopes, dry plains, *Artemisia*-steppe; 1800–3200 m. – Fl. VIII; fr. IX–XI.

A f g h a n i s t a n : NW: Maimana: Zehnadis, 3050 m, KOELZ 14033! – E: Kabul: Kuh-i Asmai, 2000 m, GILLI 2172!, LAMOND 2120! Mountain near Aliabad, GILLI 2170!, 2171!, 2173! Band-e Kargha, 2000 m, BRECKLE 4812!, NEUB. 4768!, 3394! Karisimir NW Kabul, 1900 m, PODLECH 32618! Kabul, 2100 m, KOELZ 13480! Lataband, VOLK 1180! Paneshah, NEUB. 60! Ghazni: Jamrud 45 km SW Ghazni, 2010 m, FREITAG 2011! In jugo Shashgao N Ghazni, 2400 m, RECH. 19289! Dasht-i Nawar, 3250 m, BRECKLE 4610! Gardez: Tera Kotal E Gardez, 3200 m, FREITAG 56! Tera-Farm, 2300 m, VOLK 71/378c! Ralaq 10 km NE Said Karam, 2400 m, VOLK 71/693-a! – C: Bamian: Dragon valley, 2750 m, BRECKLE 4770! Band-i Amir, Band-i Zolfikar, DIETERLE 1412. Shibar Pass, NEUB. 255/1950! – Sokhtar, (? Hajigak pass), GRIFF. 1766 = Journal 1113!

Distr. gen.: Endem. (Afghanistan).

Clearly different from the perennial, usually spiny *N. mucronata*. Its clear relative is the small annual *N. minuta* BOISS. & BAL. from C Turkey and the Caucasus; although earlier description of *N. major* said it was completely glabrous (unlike *N. minuta*), immature specimens (e. g. LAMOND 2120 cited above) have a distinct covering of scabrid papillae.

31. *Girgensohnia*

I.C. HEDGE, Edinburgh

Girgensohnia BUNGE ex FENZL in LEDEB., Fl. Ross. 3: 835 (1851); Beitr. Fl. Russl. 302 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 478 (1854).

Lit A. VON BUNGE, Girgensohnia in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg 7. sér., 4, 11: 29–33 (1862).

Annual herbs, ± glabrous or with an indumentum of short scabrid papillae and with or without tufts of villous hairs in leaf axils. Stems much branched. Leaves present, opposite, well-developed or not, linear-subulate, entire, sessile, and ± amplexicaul, spine-tipped, straight or recurved; leaf bases with a scarious margin. Inflorescence loose or spike-like. Flowers hermaphrodite, solitary and sessile in the upper leaf axils, usually with 2 subtending leaf-like bracts. Perianth segments 5 well-developed, thin and membranous in flower; in fruit hardening and with 2 or 3 erect or spreading dorsal wings or wings absent. Stamens 5 with short filaments; connectives rarely with a very short terminal extension. Ovary globose-conical, erect with a capitate 2-lobed stigma borne on a short style. Seed vertical with a spiral embryo; endosperm absent. – Type of genus: *G. Pallasii* BUNGE = *G. oppositiflora* (PALL.) FENZL.

About 5 species in SW and C Asia; *G. oppositifolia* is widespread and frequent, the others are clearly related, much less common and have rather restricted distributions. The genus can be recognized by the opposite leaves, the usual presence of at least some scabrid papillae and the vertical seeds; the fruiting perianth segments may have wings, 2 or 3 in number, or do not develop wings.

1a. Inflorescence imbricate-condensed, spike-like 2
b. Inflorescence a clearly interrupted spike or not spike-like 3
2a. Wings on fruiting perianth segments 3 . . . . 4. *G. imbricata* BUNGE
b. Wings on fruiting perianth segments 2 . . . . 3. *G. diptera* BUNGE
3a. Basal stem leaves up to 7 mm long; indumentum of plant ± absent or sparingly scabridulous-papillose; 3 fruiting perianth segments clearly winged . . . . 1. *G. oppositiflora* (PALL.) FENZL
b. Basal stem leaves up to 25 mm long; indumentum of plant prominently scabridulous papillose; fruiting perianth segments without wings . . . . 2. *G. minima* E. KOROV.

1. ***G. oppositiflora*** (PALL.) FENZL in LEDEB., Fl. Ross. 3: 835 (1851).
Syn.: *Salsola oppositiflora* PALL., Reise 2: 735 (1773). *Chenopodium oppositifolium* (PALL.) L. fil., Suppl. 172 (1781). *Polycnemum oppositifolium* (PALL.) WILLD., Spec. Plant. 1: 193 (1797). *Anabasis oppositiflora* (PALL.) M.B., Mém. Soc. Imp. Nat. Mosc. 1: 148 (1806). *Halogeton oppositiflorus* (PALL.) MOQ., Chenopod. Monogr.

161 (1840). *Anabasis heteroptera* JAUB. & SPACH, Ill. Pl. Or. 2, 45, tab. 133 (1844–46). *Noaea oppositiflora* (PALL.) MOQ. in DC., Prodr. 13, 2: 209 (1849). *Girgensohnia Pallasii* BUNGE, Beitr. Fl. Russl. 303 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 479 (1854).
Icon.: PALL., Reise 2: 0 tab. (1773); JAUB. & SPACH, l.c. as *Anabasis heteroptera* OVCZ., Fl. Tadjik. 3: 427, tab. 72, fig. 5 (1968). – Tab. 163.
Type: (Russia, Ural river): "Crescit in aridis, limosis, australioribus ad Iaikum campis cum *S[alsola] rosacea*".

Annual, not fleshy, grey-glaucous, much-branched from near base. Stems 10–50 cm, erect or spreading-erect, stiffish, angular or ridged, glabrous or with some scabridulous papillae. Leaves at stem base or on juvenile plants up to 7 mm long, subulate-spinulose, recurved, with a broad scarious-margined basal part c. 2 mm wide; cauline and older leaves shorter, ± adpressed to stem, connate, without or with few villous hairs in leaf axils. Flowers often distributed over length of stem, opposite in leaf axils and navicular bract-like leaves, forming loose elongated spikes. Perianth segments in flower c. 2,7–3 x 1 mm, ovate-triangular acute; in fruit 3 segments developing, membranous pale brown, yellow or purplish pink or red horizontally spreading or erect suborbicular wings, up to 2,5 mm long and 3 mm wide. Fruit erect, compressed, c. 2 x 1,4 mm, brown with a smooth pericarp.

Hab.: Semi-desert, silty clayey, salty and sandy soil, hammada, limestone rocks, rock crevices, uncultivated ground; 300–1700(–2900) m. – Fl. VII, fr. IX–X.

P e r s i a : W: Azerb.: Tabriz, 1350 m, AELLEN & BEHB. 434!, 435! In declivibus siccis, inter Sufian et Shebestar, 1400 m, RECH. 43613! – S: Fars: Abadeh to Esfahan, S of Yazd-i Khvast, 2100 m, ARCHIBALD 2942! Kerman: In incultis ad Kerman, 1900 m, BORNM. 4173!, 4174! Baghin, 1750 m, FOROUGHI 10503! – E: Khor.: Inter Mashhad et Quchan, 1200 m, RECH. 5192! – C: Tehran: Bahram, 20 km E Tehran, 1000 m, AELLEN 440!, 443! Hableh Rud, Simin Dasht to Kabutar-Darreh, AELLEN & MANUCH. 442!, MANUCH. & AELLEN 30135-E!, 30197-E! Shahabad, 20 km W Tehran, 1200 m, AELLEN 441! 43 km SW Tehran, 930 m, AMIN & BAZARGAN 2847! 56 km SE Tehran to Garmsar, 1050 m, AMIN 2987! 75 km S Tehran to Qom, 1360 m, UOTILA 19409! Qomrud to Masileh, Kuh Sefid, IRANSHAHR & MOUSSAVI 15406-E!

Qazv.: Karaj, 1340 m, AELLEN 437! Mardabad, AELLEN 439! In collibus Halkedar ad Mardabad prope Karaj, 1200 m, RECH. 6813!, HDG., WDB. & FOROUGHI 14681! Kavir Prot. Reg.: 50 km W Shah Abbas Caravan-Sarai, 780 m, WDB. & FOROUGHI 14602! Siah Kuh, 900 m, IRANSHAHR & MOUSSAVI 30418-E! Damgh.-Semn.: 8 km W Semnan, 1150 m, HDG., WDB. & al. 14722! Anjirab to Chah Shirin, Howz Mozafar, c. 900 m, TERME & MOUSSAVI 30265-E! Shahr.-Bust.: Shahrud, KOELZ 16971-a! Shahrud, 1300 m, FOROUGHI 10512! Turan Prot. Reg.: Delbar, 1200 m, BRECKLE 5088!, 5191! SW Kashmar to Kavir, 1200 m, REJAMAND & ARAZM 32612! Kavir-e Zavareh, NE Ardestan, 900 m, FOROUGHI & BAZARGAN 32356! Yazd: Anarak to Chupunum, 1000 m, FOROUGHI & BAZARGAN 32376! 14 km Anarak to Chupunum, 1400 m, FOROUGHI & ASSADI 15137! Kashan: Abbasabad to Kashan, 1320 m, FOROUGHI & ASSADI 15171!
T u r c o m a n i a : Ashkhabad, prope pagum Nephton, BORNM. 1178! Ashkhabad, BORNM. 1178b!, LITW. 29!, 134!, 134a!, 134c! Ashkhabad, in vicinitate pagi Berzengi, 300 m, VASAK! In ruinis Tiaze Nusai, 300 m, VASAK! In ruinis Koine Nusai, 300 m, VASAK!
A f g h a n i s t a n : N: Mazar-i Sharif: In faucibus SE Tashkurgan versus Haibak, 650 m, RECH.

16336! Koh-i Elburz, Cheshma-i Shafa, 500 m, HDG. & WDB. W-3891!, RECH. 16188! Inter Cheshma-i Shafa et Akupruk, 900 m, RECH. 16273! SE Tash Kanda to Akupruk, 580 m, PODLECH 32421! Akcha to Mazar-i Sharif, NEUB. 180/1950! Akcha, 300 m, NEUB. 539! 35 km S Akcha, Ali Moghul, 450 m, BRECKLE 4708! 4 km SE TAralai to Chahar, 1200 m, PODLECH 32448! 8 km E Balkh to Mazar-i Sharif, 360 m, PODLECH 29786! Andkhui, 330 m, AMSEL! – NW: Herat: Badghiz, Herat to Kisil Islam Qaleh, RECH. 32510! Chashmeh Obeh, 1800 m, RECH. 19215! – SW: Farah: S Khwaja Mard, Herat to Dilaram, 1200 m, PODLECH 32478!, 32557! 10 km NW Dilaram, 900 m, RECH. 37575! 60 km S Farahbad, 1600 m, ANDERSEN & PETERSEN 431! 25 km NNE Girishk, 1000 m, FREITAG 6866! – SE: Kandahar: 44 km NE Qala Bist, 900 m, RECH. 34758! 45 km E Kandahar, 1200 m, UOTILA 18913! 15 km SW Kandahar, FREITAG in RECH. 34838! Kalat-i Ghilzai: 10 km NW Qalat-i Ghilzai to Mizan Alaqadari, 1620 m, PODLECH 31328! 24 km SE Mukur to Ab-e Istada-i Mukur, 1990 m, PODLECH 19417! – E: Kabul: In collibus ab urbe orientem versus, 1800 m, RECH. 19337! Kabul, GILLI 2178!, NEUB. 54/1950!, 56/1050!, PODLECH 16839! Kabul, Koh-i Asmai, 1700 m, KERST. 2102b! Bala Hissar, NEUB. 55/1950! Aliabad, NEUB. 3240!, 3379! 25 km W Jalalabad to Kabul, 660 m, UOTILA 18465! Chakewardak, 2200 m, GILLI 2179! Jabal us-Siraj, 1730 m, GILLI 2176! Ghazni: Qarabagh, 2400 m, KOELZ 13203-b! Urgun: Urgun, VOLK 71/768! – NE: Kataghan: Pul-i Khumri, 700 m, RECH. 16502! Kunduz, 450 m, RECH. 16100! Surkhab valley, Aliabad, 500 m, NEUBAUER 537! Surkhab valley, 10 km NNE Doshi, 800 m, VOLK 71/660! Doshi, 1150 m, BRECKLE 4737! Badakhsh.: Rustak, 1220 m, KOELZ 13125! – C: Bamian: Der Hadj (Drachental), 2800 m, BRECKLE 4755! Bamian, Buddha statues, 2400 m, PODLECH 12597! Ruins of Bamian citadel, 2550 m, FREITAG 3949! Bamian (Qala Sarkari), KOELZ 13925!, NEUB. 401/1951!, 406/1951! Ghulghula, NEUB. 4463!, GILLI 2180!, 2181! Doab: Kamard valley, W Doab, 1630 m, GILLI 2176! In valle Ajar 5–13 km W Doab, 1500 m, RECH. 37013! Ghorband: Shibar pass, 2900 m, VOLK 2226! – Afghanistan, GRIFF. Herb. East Ind. Comp. 4225!

P a k i s t a n : Quetta: Quetta to Ziarat, FAROOQI & QAISER 2362! Near Urak, FAROOQI & QAISER 2445! Maslakh Range, 600 m, R.R. STEW. 702! – Kalat: Kolpur, M. HANIF 23! Bal.: Chagai: 4 km E Nushki, 1100 m, FREITAG & KOTHE 18758! 93 km NE Nushki, 1600 m, FREITAG & KOTHE 16778!

Distr. gen.: Iraq, Persia, Turcomania, Afghanistan, Pakistan, SE Russia, C Asia, China (Sinkiang).

A widespread and common species found in a wide range of habitats within a wide altitudinal range. Variable in habit and degree of branching, but relatively constant in the structure and dimensions of the fruiting perianth segments. The core species of the genus.

2. ***G. minima*** E. KOROV., Not. Syst. Herb. Horti Petrop. 5, 11-12: 176 (1924).
Icon.: Tab. 164.
Type: (Turcomania): "Desertum Aralo-kaspium, Kara Kum prope Ungus (Bala-Ishem) in salso-argillosis", 8.VI.1916, E. KOROVIN, Tashkent, LE, RNMUT.

Annual, greenish white or yellowish green, branched or not from base, with a prominent (rarely inconspicuous) indumentum of scabridulous papillae on all parts. Stems 15–30 cm, divaricately branched or with short lateral branches, leafy. Leaves at base of stem or the cauline leaves up to 25 mm long, c. 1 mm wide, spinulose, spreading or spreading-recurved with a basal scarious margin; leaves subtending flowers much smaller. Inflorescence very lax. Perianth segments in flower c. 2,5–0,6 mm, oblong; apparently not winged in fruit.

Hab.: Semi-desert, sandy hills, steppe, loess slopes; 400–1200 m. – Fl. VI–VII.

Persia: E: Khor.: Torbat-e Jam, Kuh Bezg, IRANSHAHR 30402-E!
Turcomania: Ashkhabad, in collibus arenosis inter Annaju et Gyaurs, SINT. 333a!
Afghanistan: NW: Maimana: Maimana, NEUB. 4236! 7 km SE Maimana, Jam Shiri, 980 m, PODLECH & JARMAL 30011! Maimana to Andkhui, 400 m, HDG. & WDB. W-3828! 23 km NE Qaysar on road to Maimana, PODLECH & JARMAL 29937! 15 km NE Daulatabad, Dasht-i Laili, 400 m, FREITAG 6686! – SE: Kandahar: 15 km SW Kandahar, 1000 m, FREITAG 803 (det. uncertain)! 33 km WNW Girishk to Dilaram, 900 m, PODLECH & JARMAL. – E: Kabul: Kabul, VOLK 434!, 1232A! – NE: Kataghan: Pul-i Khumri, VOLK 2675! Andarab valley, Dahan-i-Badjga below Banu, PODLECH 11281! Andarab valley, 1100 m, RECH. 31795! Infra Khinjan, 1000 m, FREITAG 3047! E side Paigah Kotal (Kotal-e Mirza Atbili), 1200 m, PODLECH 18276! Taliqan: Nagel, Khanabad to Taliqan, 620 m, ANDERS 6576!, PODLECH 11281!

Distr. gen.: Persia ?, Turcomania, Afghanistan, C Asia (Kara Kum).

Doubtfully meriting specific status and certainly very closely allied to *G. oppositiflora*, of which it may only be a juvenile form. The characteristic features of a typical specimen are the yellowish-green colour of the plant, the long persisting leaves, the rather prominent scabridulous indumentum and apparently (no specimens in fruit have been seen) the absence of wings on all the segments of the fruiting perianth. In VVEDENSKY, Conspect. Fl. As. Med. 3: 112 (1972), *G. minima* is reduced to a synonym of *G. oppositiflora*. Some of the characters which E. KOROVIN gave in his original description to separate the two species certainly do not hold; he also indicated that *G. minima* has a distinct elongation of the staminal connective, but this feature has not been observed on the examined material.

The determination of IRANSHAHR 30402-E from Khorasan is uncertain – it is a juvenile plant with long leaves.

3. ***G. diptera*** BUNGE, Beitr. Fl. Russl. 303 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 479 (1854).
Icon.: OVCZ., Fl. Tadjik. 3: 427, tab. 72, fig. 7–9 (1968). – Tab. 165.
Type: (Uzbekistan): "In der Lehmsalzsteppe und auf dürren Hügeln um Samarkand, Octbr. 1841", A. VON BUNGE.

Annual, branched from base, grey or brown glaucous. Stems 10–25 cm, erect or spreading erect, angular or ridged, with few scabridulous papillae. Lowermost leaves up to 5 mm long, subulate-spinulose, with a broad basal membranous margin; upper leaves approximating, c. 2,5 × 1,8 mm, ovate-triangular, cuspidate, adpressed, dark brown. Inflorescence elongated, slender, spike-like, ± imbricate-congested, up to 90 × 2,5–3 mm. Perianth segments in flower oblong, c. 2 × 1 mm, acute; in fruit the two outer segments developing scarious spreading or reflexed wings, c. 1,8 mm long × 3,5 mm wide. Fruit c. 2,4 × 1,3 mm, dark brown.

Hab.: Steppe, semi-desertic slopes; 300–500 m. – Fr. X–XII(–I).

Afghanistan: N: Mazar-i Sharif: Akcha, 300 m, NEUB. 532! Akcha to Mazar-i Sharif, NEUB. 189/1950! Mazar-i Sharif to Hindukush, 400 m, GILLI 2182! Tashkurgan to Mazar-i Sharif, 400 m, GILLI 2183! E of Tashkurghan near Kotal-e Shibaqli, FREITAG 3867!

Distr. gen.: C Asia (Uzbekistan, Tadjikistan), N Afghanistan.

Similar in habit, especially inflorescence, to *G. imbricata*, but apparently always with only two wings developing on the outer fruiting perianth segments; the inner adaxial segment is without even a vestigial wing.

4. *G. imbricata* BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7 sér., 4, 11: 32 (1862).
Icon.: Tab. 166.
Type: (Persia E): "In collibus aridissimis Persiae mediae orientalis in prov. Kuhistan, inter Afris et Afsel-Abad atque prope Birchand", A. VON BUNGE & T. BIENERT, LE.

Annual, branched from near base. Stems 10–20 cm, ± erect, crowded, glabrous or with few scabrid papillae, angular or ridged. Lower leaves c. 5 × 0,5 mm, ± horizontally spreading or spreading-recurved, basally scarious-margined; upper leaves c. 2 × 2 mm, broadly ovate-triangular, cuspidate. Inflorescence elongated, imbricate-condensed, spike-like, c. 40–80 × 3 mm. Wings on fruiting perianth segments 3, outer 2 spreading, adaxial adpressed, 2,5–3 × 2,5 mm, pink or pale brown. Fruit erect, c. 2,5 × 1,8 mm, brown with a smooth pericarp.

Hab.: Sandy or clay soil; c. 1600 m. – Fr. XI.

Persia: E: Khor.: Birjand, 1580 m, FOROUGHI 10541! Kuhistan: inter Afris et Afzalabad atque prope Birjand, BUNGE & BIENERT.

Distr. gen.: Endem. (E Persia).

Close to *G. oppositiflora*, but apparently distinct on the slender spike-like imbricated inflorescences and the dwarf habit. More gatherings are required to determine if these rather quantitative characters are constant.

32. *Horaninovia*

I.C. HEDGE, Edinburgh

Horaninovia FISCH. & C.A. MEY., Enum. Pl. Nov. Schrenk 1: 10 (1841).
Syn.: *Eremochion* GILLI, Feddes Repert. 62: 22 (1958).

Lit.: P. AELLEN, Horaninowia (sic), in Ergebnisse einer botanisch-zoologischen Sammelreise durch den Iran 1948/49, Verhandlungen der Naturforschenden Gesellschaft in Basel 61: 192–198 (1950).

Annual herbs with a ± prominent indumentum of short scabrid papillae and tufts of villous hairs in the leaf axils. Leaves well-developed, alternate or opposite, linear, filiform or subulate, terete, entire, sessile, ± amplexicaul, spine-like or spine-tipped; leaf bases with or without a narrow scarious margin. Flowers usually hermaphrodite, solitary and sessile in the axils of the upper usually clustered spiny upper leaves, often with 2 subtending leaf-like bracts. Perianth segments 5, thin and membranous in flower, ± oblong with obtuse or rounded apices, equal in size or not; in fruit hardening and ± thick-textured in lower part, with or without 5 dorsal or terminal winged appendages of varied size and shape. Stamens 5 with very short filaments; connective rarely (not ours) with a small tail-like extension. Style very short with capitate or clavate bifid stigmas. Fruit enclosed within the perianth segments. Seed horizontal with a spiral embryo; endosperm absent. – Type of genus (selected here): *H. ulicina* FISCH. & C.A. MEY.

A distinct genus of 7–8 species of mostly annuals with stiffly spiny leaves, a scabrid papillose indumentum on stems, very short capitate stigmas and variously winged fruiting perianth segments; they are mostly psammophytes or grow on clay. It is most closely allied to *Girgensohnia* in which only 2 or 3 of the fruiting perianth segments (not all 5) are winged and the seeds are erect. Although the limits of the genus are distinct, those of the individual species are not; this is partly because of the paucity of good fruiting specimens from our area. The differences between the species are mainly quantitative and possibly too many species are recognized; geographical distribution plays a complementary role in their identification.

1a. All leaves and branches opposite, or only topmost leaves alternate .... 1. *H. ulicina* FISCH. & C.A. MEY.
b. Leaves and branches, except the lowermost, alternate 2
2a. Stems of fruiting plants thick and woody, white; wings of fruiting perianth c. 1 mm long and 2 mm wide (SW Afghanistan, S Persia) .... 3. *H. pungens* (GILLI) BOTSCH.
b. Stems of fruiting plants scarcely woody, ± slender, brownish-white; wings of fruiting perianth up to 2,5 mm long and 3,2 mm wide (Persia) 3
3a. Inflorescence spike-like, congested, with spines of subtending leaves ± regularly spreading horizontally .... 2. *H. platyptera* SHARIF & AELLEN
b. Inflorescence not spike-like, of interrupted clusters; spines of flower-subtending leaves irregularly spreading .... 4. *H. anomala* (C.A. MEY.) MOQ.

1. ***H. ulicina*** FISCH. & C.A. MEY., Enum. Pl. Nov. Schrenk 1: 11 (1841).
Syn.: *H. ulicina* var. *longifolia* O. PAULSEN in Vidensk. Meddel. Dansk Naturhist. Foren. Kjöbenh. 55: 196 (1903).
Icon.:KOROV., Fl. Uzbek. 2: 293, tab. 27, fig. 3 (1953). – Tab. 167.
Type: (Turkmenia, Ogurchinski Island ?) shore of Caspian Sea, G.S. KARELIN, LE.

Annual, green or yellowish green, branched from base. Stems prostrate or erect-ascending, 4–20 cm, usually with a well-developed indumentum of scabrid papillae. Leaves all opposite or uppermost not, spine-tipped; lower c. 10–15 × 0,7 mm, basally widened and with a scarious margin; upper leaves shorter and broader with a sturdy spine up to 2,5 mm. Flowers in upper leaf axils, several. Perianth segments c. 1,5 × 0,8 mm, ± triangular, acute; in fruit cartilaginous, ± convex, with variously developed dorsal spreading wings.

Hab.: Among sand-dunes, Saxaul sand-desert, sandy and salty semi-desert; c. 300–1200 m. – Fl. VI–IX.

Persia: S: Kerm.: E Dasht-e Lut: 30°37'N, 59°52'E, with *Haloxylon*, 1100 m, LÉONARD 6145!; 30°57'N, 59°32'E, LÉONARD 6221! – C: Damgh.-Semn.: Semnan to Anjirab, 1050 m,

TERME & MOUSSAVI 3022-E! Shahr.-Bust.: Turan Prot. Reg.: 16 km S Ahmadabad, 2 km E Hizumi, 1150 m, BRECKLE 5141! Ahmadabad to Zamanabad, c. 1000 m, WDB. & FOROUGHI 18787, 18817, FREITAG 13904! SE Shahrud N Darb Ahang, 910 m, FREITAG 15316! In arenosis 56–60 km N Gonabad, inter Mahneh et Emrani, 900 m, RECH. 51443!
Turcomania: Ashkhabad, Annaju to Gyaurs, SINT. 333a.
Afghanistan: N: Mazar-i Sharif: NW Mazar-i Sharif Tash Guzar to Hazara Toghay, TONČEV in FREITAG 2228! 50 km NW Tashkurghan, 330 m, FREITAG 3888! 25 km NW Deh Nau, Naisabad (Nayiabad ?), Sar-e Namak, 330 m, BRECKLE 4725! Jowzjan, 60 km NW Balkh, Safaul sand-desert, BRECKLE 4673! – NE: Kataghan: Kunduz to Tashkurghan 15 km W Kotal-e Erganak, 530 m, FREITAG 3847!

Distr. gen.: Persia, Turcomania, Afghanistan, desert areas (Kara Kum, Kizil Kum etc.) of C Asia, China (Sinkiang).

Generally the opposite leaves are diagnostic for the species, but in other characters it is close to our other species; more adequate material, especially in fruit, is a desideratum. Apparently restricted to sands.

2. ***H. platyptera*** SHARIF & AELLEN, Verh. Naturf. Ges. Basel 61: 196 (1950).
Syn.: *H. aptera* SHARIF & AELLEN, l.c.: 195 (1950).
Icon.: l.c.: 195, fig. 3c – fruiting perianth. – Tab. 168.
Type: (C Iran) P. AELLEN 361, G!

Annual, often lime- or yellow-green, usually much branched from base. Stems ascending, 15–20 cm, brown, striate-angled or terete. Leaves alternate, c. 5–8 × 0,5 mm, with a c. 2 mm sturdy terminal spine, broader at clasping base. Inflorescence spike-like. Flowers numerous, solitary in axils of upper leaves or bract-like leaves. Perianth segments in flower c. 1,8 mm long, cucullate, acute or ± oblong, membranous; in fruit ± cartilaginous, initially convex-incurved then developing dorsal short, spreading entire or lobed broad brown, pink or colourless, wings up to 2,5 mm long and 3,2 mm wide when fully mature. Seed horizontal, flat, c. 2,3 mm wide.

Hab.: On sandy, clayey soil, hammada; 700–1250 m. – Fl. & fr. IX–XI.

Persia: C: Tehr.: SE Tehran, clayey hill between Darreh-ye Namak and Siah Kuh, 800 m, AELLEN 361! 15 km W Garmsar to Tehran, 950 m, HDG., WDB. & al. 14768!, 14770! Kavir Prot. Reg.: E Siah Kuh, c. 800 m, WDB. & FOROUGHI 14648!, 14652! Damgh.-Semn.: 12 km W Semnan to Firuzkuh, 1200 m, HDG., WDB. & al. 14746! Shahr.-Bust.: Turan Prot. Reg.: Ahmadabad to Zamanabad, 900 m, WDB. & FOROUGHI 18797. 1 km S Delbar, hamada, 1200 m, BRECKLE 5190! Kal-e Shur, SE Delbar, 700 m, WDB. & FOROUGHI 18927. 5 km NW Majerad, 1100 m, BRECKLE 5053! Yazd: Posht-e Badam to Tabas, 900 m, FOROUGHI & BAZARGAN 32391! Khvor (Khur) Biabanak, TERME & MOUSSAVI 30266-E!, 30278-E! Hoseynabad to Jandaq, c. 900 m, TERME & MOUSSAVI 30253-E!, 40125-E!

Distr. gen.: Endem. (C and S Persia).

A characteristic feature of this species is the rather elongated but compact inflorescence in which the spines of the flower-subtending leaves tend to stick out horizontally. The degree of development of the dorsal wings on the fruiting perianth seems to vary appreciably, although there is a limited amount of ripe fruiting material available for study; certainly there is no reason to maintain the wingless *H. aptera* AELLEN. It was described from the identical locality as *H. platyptera*. Cf. comments about the following species.

3. ***H. pungens*** (GILLI) BOTSCH., Bot. Zhurn. 63, 1: 51 (1978).
Syn.: *Eremochion pungens* GILLI, Feddes Repert. 62: 23 (1958). *Salsola pungens* (GILLI) PODLECH, Mitt. Bot. Staatssamml. München 12: 80 (1975).
Icon.: Tab. 169.
Type: S Afghanistan, A. GILLI, holotypus W!

Lit.: V. BOTSCHANTZEV, What is Eremochion pungens GILLI?, Botaničeskii Zhurnal SSSR. 63, 1: 51 (1978) (In Russian).

Annual with a ± sparse scabrid-papillose indumentum, glabrescent, branched from base, green; in fruit stems hardening, ± woody at base and up to c. 5 mm thick, white. Stems 4–30 cm, ascending-erect or prostrate, angular or terete. Leaves opposite below, alternate above, c. 4–6 × 1–1,5 mm with a c. 2–4 mm hard spine. Flowers solitary in axils of upper triquetrous-triangular spiny leaves and leaf-like bracts. Perianth segments c. 1,2 × 0,7 mm, triangular, pale-brown in flower, ± cucullate, soon hardening and incurved, flat-convex, developing a terminal transparent wing c. 1 mm long and 2 mm wide, margin entire or lacerate. Fruit c. 0,8 mm wide, flat, enclosed within the fruiting perianth segments.

Hab.: Sand or clay desert with *Haloxylon*, sand dunes, dried lake, river banks, edge of fields; 460–1250 m. – Fl. IV–VI, fr. VIII–IX.

Persia: S: Kerm.: 35 km NW Mahan to Bam, 1250 m, ERSHAD & al. 35405-E!
Afghanistan: SW: Farah: E margin of Hamun-e Puzak (Jehile Puzak), 460 m, BRECKLE 4920! 75 km SW Farah, Daghale Dukhtar, 680 m, BRECKLE 4899! – SE: Kandahar: In arenosis a Girishk orientem versus, 900 m, RECH. 19286 (as "*H. albisepala* AELLEN" – nomen)! Banks of Helmand river at Girishk, 840 m, PODLECH 19692! 20 km NNE Girishk, 980 m, FREITAG 6877! S Darweshan, Mohammad Rahim Kalay, 710 m, ANDERS 8486! W border of Registan desert, 25 km S Darweshan, 570 m, FREITAG 687! On sandy gravelly soil in semi-desert between Girishk and Qala Bist (Lashkargah), 880 m, 22.II.1951, GILLI! 7 km E Lashkargah, Registan desert, 900 m, FREITAG 2054! E border of Dasht-i Margo, 600 m, FREITAG 664! Kash Rud 85 km SW Dilaram, 590 m, FREITAG 3723!

Distr. gen.: Endem. (S Persia, SW Afghanistan).

With the specimens now available for study, this is clearly not such an isolated taxon as was thought when first described. In fact it is certainly a very close ally of the Persian *H. platyptera* and the differences between them are small. The Afghan plant seems to be more of a sandy desert species and apparently becomes much more woody at the end of the growing season.

4. ***H. anomala*** (C.A. MEY.) MOQ. in DC., Prodr. 13, 2: 170 (1849).
Syn.: *Salsola anomala* C.A. MEY. in EICHW., Pl. Nov. Casp.-Cauc. 14 (1831). *Horaninovia juniperina* C.A. MEY., Enum. Pl. Nov. Schrenk. 1: 11 (1841). *H. anomala* var. *amblyoptera* AELLEN, Verh. Naturf. Ges. Basel 61: 198 (1950).
Icon.: EICHW., Pl. Nov. Casp.-Cauc. tab. 12 (1831).
Type: (Turkmenia): Caspian Sea shore, near Krasnowodsk, LE.

Annual, pale yellow brown or purplish, branched from or near base. Branches 10–30 cm, prostrate or ascending, round, pale brown or whitish, sometimes glabrescent. Leaves alternate, or lowermost opposite, c. 5 × 0,4 mm, clustered at ± distant nodes; terminal spine c. 1–2 mm. Inflorescence axis interrupted. Flowers solitary in upper leaf axils. Perianth segments in flower c. 1,5–2 × 1,3 mm, brown; fruiting perianth segments cartilaginous, convex with dorsal wings of equal or unequal size, sometimes longer than broad.

Hab.: Sandy semi-desert; 800–1520 m. – Fl. VI–VII.

Persia: E: Khor.: 5 km W Tayyebat, 850 m, UOTILA 18956! Birjand to Torbat, MANUCH. 30315-E! 82–90 km S Mashhad, Kafar-Chaleh to Robat-e Safid, 1520 m, IRANSHAHR 40150-E! Persia orientalis media, BUNGE s.n. (cited in BOISS., Fl. Or. 4: 947. 1879 as *H. juniperina*).

Distr. gen.: Persia (Khorasan), C Asia (Aralo-Caspian, Kara Kum, Kizil Kum).

A psammophyte. The Khorasan specimens cited above are provisionally named as *H. anomala*; none is in mature fruit. They agree well with some specimens from the type locality (Krasnowodsk) of *H. anomala*, but better material is needed. Apparently very closely related to *H. platyptera*, but in that species the inflorescences are more condensed and the spines of the flower subtending leaves stick out in a ± regular horizontal form.

33. *Anabasis*

I.C. HEDGE, Edinburgh

Anabasis L., Spec. Plant. 223 (1753); Gen. Plant. ed. 5: 104 (1754).
Syn.: *Brachylepis* C.A. MEY. in LEDEB., Icon. Pl. Fl. Ross. 1: 12 (1829). *Esfandiaria* SHARIF & AELLEN, Verh. Naturf. Ges. Basel 63: 262 (1950).

Lit.: A. VON BUNGE, Anabasis in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg 7. sér., 4, 11: 34–47 (1862). SANEI CHARIAT-PANAHI, Contribution à l'étude du genre Anabasis (espèces de l'Iran et de l'Afrique du nord); Unpublished thesis, Université de Montpellier (1966). A.N. VASILJEVA, Materies ad systema Anabasis in Kazachstania, Botaničeskiei Materialy Gerbarija Instituta Botaniki. Akademija Nauk Kazahskoj SSR. = Notulae Systematicae ex Herbario Instituti Botanici Academiae Scientiarum Uzbekistanicae 10: 15–23 (1977).

Annual or perennial herbs or subshrubs, fleshy, glabrous except for tufts of hairs at nodes, rarely with minute papillae-like hairs or with the surface of caudex lanate-woolly. Stems clearly jointed. Leaves all opposite, vestigial or well-developed, with or without an apical mucro or bristle. Flowers solitary or up to 4, hermaphrodite, immersed in the axils of upper leaves, forming elongated or condensed spike-like inflorescences. Perianth segments 5, subequal, membranous, split to near base; in fruit, all or some, developing prominent membranous wings usually with 2 or 3 larger and broader than the others; or perianth segments without wings. Stamens 3–5, without appendages on connectives; staminodes present or obsolete. Ovary vertical with 2–3 short thick styles. Utricle at maturity baccate or not, vertical, compressed or subspherical. Seeds vertical, ± lenticular; embryo spiral; albumen absent. – Type of genus: *A. aphylla* L.

About 25 species from SW Europe and N Africa to Red Sea coast (Ethiopia) to SW and C Asia – the main area of morphological variation. Recognized by the clearly jointed stem, the opposite leaves (frequently vestigial) and the flowers sunk in the upper leaf nodes. It differs from *Arthrophytum* and *Haloxylon*, which also have these characters, in having a vertical seed. Well-represented in our area but not fully understood; it is a very late-fruiting genus and most species seem only to be at fruiting maturity in November. Several of our species have a characteristic vegetative facies not readily expressed in formal descriptions. An overall revision of *Anabasis* throughout its total range would be a very rewarding research project.

1a. Leaves clearly developed, 5–25 mm long, with or without a persistent or deciduous terminal bristle 2
b. Leaves absent or represented by adpressed vestigial scales 4
2a. Leaves 20–25 mm long; dwarf suffruticose ± caespitose herb . . . . 2. *A. Eugeniae* ILJIN
b. Leaves 2–12 mm long; annual or perennial, not caespitose herbs 3
3a. Leaves 5–12 mm long, with an apical often deciduous mucro; perianth segments in fruit with wings to 3 x 5 mm . . . . 1. *A. setifera* MOQ.
b. Leaves 2–4 mm long, without an apical mucro; perianth segments not winged in fruit . . . . 3. *A. salsa* (C.A. MEY.) BENTH. ex VOLKENS
4a. Perianth segments not or scarcely winged in fruit; utricle longer than perianth segments; leaf cusps with a 1,5–2 mm mucro . . . . 4. *A. eriopoda* (SCHRENK) BENTH. ex VOLKENS
b. Perianth segments clearly winged in fruit; utricle as long as or clearly shorter than fruiting perianth segments; leaf cusps without a mucro or if present 1 mm or less 5
5a. Stems arising from a capitate or hemispherical woody caudex, ± densely woolly lanate on its upper surface 6
b. Stems not arising from a capitate or hemispherical caudex or if so not woolly lanate 9
6a. Inflorescences of condensed cylindrical spikes 7
b. Inflorescence of elongated loose spikes 8
7a. Inflorescence of terminal and ± horizontally spreading spikes [Persia] . . . . 7. *A. calcarea* (SHARIF & AELLEN) BOKHARI & WENDELBO
b. Inflorescence of terminal spikes only (C Afghanistan) . 8. *A. macroptera* MOQ.
8a. Lateral stem branches ± candelabriform; stems to 6 mm in diam. at base . . . . 5. *A. turkestanica* ILJIN & KOROV.
b. Lateral stem branches horizontally spreading; stems c. 1,5–2 mm in diam. at base . . . . 6. *A. jaxartica* (BUNGE) BENTH. ex VOLKENS
9a. Internodes on current year's shoots no more than c. 7 mm; short lateral buds usually present at nodes . . . . 11. *A. lachnantha* AELLEN & RECH.f.
b. Internodes on current year's shoots 15–20 mm; no buds present at nodes 10
10a. Inflorescence branches erect, ± fastigiate; larger fruiting perianth wings c.

3,5 × 6,5 mm . . . . 9. *A. aphylla* L.
b. Inflorescence branches not fastigiate; larger fruiting perianth wings c. 5 × 7 mm . . . . 10. *A. Hausskenchtii* BUNGE ex BOISS.

1. ***A. setifera*** MOQ., Chenopod. Monogr. 164 (1840).
Syn.: *A. lutea* MOQ. in DC., Prodr. 13, 2: 215 (1849). *A. annua* BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 46 (1862).
Icon.: ZOHARY, Fl. Palaest. 1: tab. 261 (1966). LÉONARD, Contrib. Fl. Végét. Déserts Iran 7: 33, fig. 4, A-F (1987). – Tab. 170.
Type: "In Aegypto, Persia... v.s. in herb. DEL[ILE], BÉLANGER et Mus. Paris".

Perennial or annual, succulent, often becoming basally woody. Stems much branched, 10–40 cm, erect or ascending, glaucous, green, becoming greyish white, ± terete below, 4-angled above; internodes 10–20(–35) mm. Leaves distinct, 5–12 × 2–4 mm, often horizontally spreading, cylindrical or clavate, fleshy, basally stem-clasping, with or rarely without a terminal, 1–3 mm caducous or persistent mucro. Flowers 3–6 in glomerules in upper leaf axils, forming loose spike-like inflorescences. Perianth segments ovate-circular, c. 1–1,5 × 1–1,5 mm; in fruit all segments developing yellow-orange or green wings, usually 3 larger up to c. 3 × 5 mm, and 2 smaller, ± reniform. Utricle flattened c. 2,5 × 1,5 mm.

Hab.: Sandy-clay soil, among gravel, marl hills, dry river bed, salt-flats, sabkha, semi-desert, sand dunes; 20–1100(–1800) m. – Fl. VII–VIII, fr. IX–XII.

Persia: S: Fars: Abarqu, 1500 m, FOROUGHI & ASSADI 15107! Shulgistan, septent. versus Abadeh, 1830 m, PRAVITZ 239! Bushehr to Bandar-e Lengeh, TERME & MOUSSAVI 35372-E! E Genaveh, 20 m, BOKHARI & al. 14795! Taheri to Akhtar, 60 m, BOKHARI & al. 14831! Kerm.: Kerman, BORNM. 4211! Saidabad (Sirjan), 40 km on road to Bandar Abbas, 1700 m, FOROUGHI & ASSADI 15047! Abareq (Abghareh) to Darzin, RECH. 7544! W Dasht-e Lut, 31°01'N, 58°03'E, LÉONARD 6233! Shahdad to Birjand, Kavir-i Lut, Tal-e Kheshtak, TERME & MOUSSAVI 34408-E!, 34429-E! Mahan to Bam, ERSHAD et al. 40143-E! Khan-Khatun near Tahrud, 1810 m, FOROUGHI 10494!, 10506! Prope Nosratabad, inter Bam et Zahedan, 1400 m, RECH. 3912! Lar: Bandar Abbas: 209 km on road to Lar, FOROUGHI & ASSADI 15073! Qeshm island, TERME & MOUSSAVI 34564-E! – E: Sistan: Ad confines Afghaniae, inter Kuh-i Malik Siah et Zabol, 700 m, RECH. 4104! Between Baring et Safidab, BOBEK 155! – Khor.: E margin of Great Kavir, Ozbagu (Ozbah-Kuh), RUTTNER 129!, 419! 40 km NW Tabas versus Robat-e Gur, 600 m, RECH. 51767! NW Tabas, 800 m, REJAMAND & ARAZM 32481! Between Posht-e Badam and Tabas, FOROUGHI & BAZARGAN 32392! Sabzevar, Sadrabad, FOROUGHI 10603! Mayamey to Sabzevar, GAUBA & SAB. 2094! 43 km SW Ferdows, 1250 m, REJAMAND & ARAZM 32538! Inter Tun et Birjand [Bidshand] et inter Birjand et Isfesar, BUNGE & BIENERT (type of *A. annua*). – C: Tehr.: Tehran to Qum, Kushk-e Nosrat, 800 m, AELLEN & SHAR. 2865! Varamin, SHAR. & AELLEN 30181-E! Mobarakiyeh, 40 km S Varamin, 900 m, RECH. 46089! Kavir Prot. Reg.: E of Siah Kuh, 850 m, WDB. & FOROUGHI 14653!, 15207! S Siah Kuh, 1150 m, WDB. & FOROUGHI 14668! 37 km NW Shah Abbas Caravan-Sarai, 850 m, WDB. & FOROUGHI 15195! Hosseynabad to Jandaq, Hauz-e Jandaq, 1700 m, TERME & MOUSSAVI 30236-E!, 30274-E! In ditione ruinarum Caravan-Sarai Eyn or-Rashid, 1000–1200 m, IRANSHAHR & MOUSSAVI 15381-E!, 40182-E!, RECH. 50185! 18 km N Chashmeh-ye Safid-Ab, 900 m, RECH. 46394! Kuh-e Safid-Ab, IRANSHAHR & MOUSSAVI 15383-E! Between Ab Shirin

and Fakhrabad, IRANSHAHR & MOUSSAVI 15384-E! Damgh.-Semn.: 8 km W Semnan, 1150 m, HEDGE & al. 14718! 15–25 km Semnan to Firuzkuh, 1400 m, HEDGE & al. 14747! Inter Gandab et Damghan, SAB. in GAUBA 2093! Semnan to Damghan, RECH. 1272! S Semnan, 1000 m, REJAMAND & ARAZM 32585! Semnan to Anjirab, TERME & MOUSSAVI 30212-E!, 30213-E!, 30216-E! Anjirab, 1050 m, TERME & MOUSSAVI 40198-E! 25 km a Garmsar to Semnan, TERME & TEHRANI 40022-E! Shahr.-Bust.: E of Shahrud, FURSE & SYNGE 653! Torud, S of Shahrud, 1350 m, REJAMAND & ARAZM 32572! Turan Prot. Reg.: borders of Kavir, S of Sanjari, 800 m, FREITAG 13825! N and NE Dowchah, 1150 m, FREITAG 14095! Shakh-e Biar, BRECKLE 5092! Yazd: 15 km W Chah Malek versus Chupunum, 800 m, RECH. 51892! Near Aqda, on road to Nain, 1150 m, FOROUGHI & ASSADI 15122! Between Jandaq and Khvor, TERME & al. 30284-E! Kashan: Natanz, 38 km on road to Kashan, 1080 m, FOROUGHI & ASSADI 15177! Kuh Siah, BOBEK 53! Kashan: 20 km Sefidab to Marinjab, 800 m, TERME & TEHRANI 40055-E! Kavir-e Kashan, Dastkan, SHAR. & AELLEN 30055-E!, 30072-E!, 30141-E!
Afghanistan: SW: Farah: 15 km E Kang (Zaranj), 475 m, PODLECH 16896! 37 km S Zaranj to Chahar Burjak, 505 m, PODLECH 17135! 11 km SE Lase Jowayn (Juwain) to Chakhansur, 540 m, PODLECH 16924! Juwain, VOLK 2921! Dasht-e Margo, 70 km N Khonnashin, 750 m, BRECKLE 4861! Khash Rud, 96 km SW Dilaram, 700 m, FREITAG 2443! Khash Rud valley, 30 km W Haleli, 500 m, FREITAG 2457! – E: Kabul: Nangarhar: 8 km SW Ghaziabad, Jalalabad to Torkham, 550 m, PODLECH 19982a! 30 km E Jalalabad, 630 m, FREITAG 7320!
Pakistan: Quetta: Quetta, Sibi, LACE 3613! – Bal.: Chagai, 20–30 km E Mirjaveh, RECH. 27257!, 27258! Koh-e Sultan, 26–39 km N of Nok Kundi, 1100–1800 m, FREITAG & KOTHE 18699/10021! Makran: near Kappar, QAISER 7074. 58 km W Pasni to Gwadar, 50 m, FREITAG & KOTHE 18511! 13 km N of Pasni near road to Ormara, 25 m. FREITAG & KOTHE 18416! 93 km S Panjgur near road to Hoshab, 850 m, FREITAG & KOTHE 18584!

Distr. gen.: Egypt, Sinai, Palestine, Jordan, Iraq, Arabian peninsula (Kuwait to Oman), Persia, Afghanistan, Pakistan, NW India (Punjab).

The most frequent species of the genus in our area, recognized by the well-developed leaves with prominent (often deciduous) apical mucros. *A. annua* is considered here as merely an annual form of the perennating *A. setifera*; except for the annual life-form, there seem to be no other differences (anatomy included) between them. These annual variants are apparently more frequent in Persia, especially central areas, than in other parts of *A.setifera*'s wide range.

2. *A.* ***Eugeniae*** ILJIN, Not. Syst. Leningrad 7: 215 (1937).
Icon.: GROSSH., Fl. Kavk. 3: tab. 16, fig. 1 (1945). – Tab. 171.
Type: (Nachiczevan): "Prope pagum Dzhulfa, declivia montium, in solo argilloso, 18.X.1936, M.M. ILJIN 314", holotype LE.

Dwarf suffruticose herb, ± caespitose, c. 10–20 cm high and wide, with a much branched woody caudex. Stems woody except for current year's growth, 1,5–2,5 mm diam.; internodes 3–5, 15–30 mm. Leaves linear-oblong, 20–25 × 2–3 mm, flat-cylindrical, fleshy, spreading-erect, sessile, with or without a deciduous short (c. 0,5 mm) mucro. Flowers few, 2–4, in axils of upper leaves, among white wool. Perianth segments 5, free to base, c. 1,5 mm long; in fruit all winged with 2 larger c. 5,5 × 8 mm, ± reniform. Thecae scarcely exserted, 0,9 mm, oblong-ovoid. Utricle c. 3,5 × 3 mm, ± embedded in tissue of node.

Hab.: Rocky slopes, 1000–1450 m; Fl. VI, fr. X.

Persia: W: Azerb.: Maku to Marand, c. 86 km NWN Marand, 1050 m, LAMOND 3896! 42 km NW Tabriz, 1420 m, PABOT 5301!

Distr. gen.: Caucasus (Nakhichevan), NW Persia.

Very distinct and apparently isolated in the genus because of its dwarf suffruticose caespitose habit and long leaves. Known from only a few gatherings within a limited geographical area.

3. *A. salsa* (C.A. MEY.) BENTH. ex VOLKENS in ENGLER & PRANTL, Natürl. Pflanzenfam. ed. 1, 3, 1a: 87 (1893).
Syn.: *Brachylepis salsa* C.A. MEY. in LEDEB., Icon. Pl. Fl. Ross. 1: 12, tab. 48 (1829) et LEDEB., Fl. Alt. 1: 372 (1829). *Anabasis ramosissima* MINKW., Bull. Jard. Bot. Pierre Gr. 14: 232 (1914). *Brachylepis ramosissima* (MINKW.) ULBRICH in ENGLER & HARMS, Nat. Pflanzenfam. ed. 2, 16C; 577 (1934).
Icon.: PAULSEN, Bot. Tidsskr. 32: 198, tab. 56 (1912). OVCZ., Fl. Tadjik. 3: 433, tab. 73, fig. 1, 2 (1968). – Tab. 172.
Type: 3 localities in: W. Kazakhstan; Zaistan, shores of Caspian, C.F. VON LEDEBOUR, LE.

Low shrub, c. 12–10 cm high, forming tufts, basally with many woody branches with or without prominent tufts of wool at leaf clusters; current year shoots numerous, brown- or greyish green, erect, rather sturdy, angular or terete, c. 2 mm diameter. Leaves developed, fleshy, ± terete. 2–4 mm long, often recurved; upper cauline leaves obsolete, reduced to scale-like cusps. Flowers solitary or few subtended by cucullate leaf-like bracts, forming terminal not or little branched condensed spikes. Perianth segments broad ovate obtuse, c. 1,8 mm long, unchanged in fruit. Fruit ovoid, succulent, somewhat exserted from perianth, topped by 2 prominent squat blackish stylar arms.

Hab.: Clay flats; c. 1150 m. – Fl. VIII.

Persia: C: Shahr.-Bust.: Turan Prot. Reg.: NW Dowchah SE Shahrud at road to Chejam, 1150 m, FREITAG 14102! Shakh-e Biar, SW Biarjmand, 1150 m, FREITAG 15053!

Distr. gen.: Caucasus, W Siberia, Persia, lowland C Asia to Mongolia.

In Fl. URSS 6: 288 (1936), *A salsa* is noted as being "an exceedingly polymorphic species ... covering extensive areas". It appears to reach the southern boundary of its range in the Turan area. A distinct species on account of the presence of leaves and the absence of wings on the fruiting perianth segments. *A. aphylla* which occurs in the same area is apparently a near relative although it has well-developed wings on the fruiting perianth segments.

4. *A. eriopoda* (SCHRENK) BENTH. ex VOLKENS in ENGLER & PRANTL, Natürl. Pflanzenfam. ed. 1, 3, 1a: 87 (1893).
Syn.: *Brachylepis eriopoda* SCHRENK, Bull. Cl. Phys.-math. Acad. Imp. Sc. Pétersb. 1: 360 (1843).
Icon.: OVCZ., Fl. Tadjik. 3: tab. 73, fig. 5–6 (1968). – Tab. 173.
Type: (Turkestan) Chu river, A.G. VON SCHRENK, LE.

Perennial with a thick root and a woody or cork-like caudex, woolly at base of stems. Stems numerous, much branched with some horizontally spreading branches, 2–5 mm in diam., ± terete or 4-angled, readily breaking into segments; internodes c. 10–12, 8–20 mm long. Leaves represented by 0,5–1,5 mm cusps with distinct c. 1,5–2 mm hyaline mucro. Flowers solitary in leaf axils, almost all remote. Perianth segments ovate-semicircular, 1–1,5 × 1–1,5 mm, apically entire or irregularly serrulate; not winged in fruit. Utricle broad ovoid or subglobose, longer than perianth segments, yellowish or reddish orange, drying black.

Hab.: Sandy clay, silty soils, sabkha; 1000–1320 m. – Fl. VIII; fr. IX–XI.

Persia: C: Shahr.-Bust.: Turan Prot. Reg.: NW margin of Shakh-e Biar, BRECKLE 5106! Chajam to Dowchah, 1020 m, WDB. & FOROUGHI 18737, 18744. Chajam to Razeh, 1320 m, FREITAG & MOZAFFARIAN 28500! 6 km NE Delbar, 1200 m, FREITAG 14155! 89 km Shahrud to Sabzevar, 1300 m, (ASSADI, Iranian Journ. Bot. 2, 2: 131. 1984).
Afghanistan: NW: Herat: Kisil Eslam Qaleh (Islam Qala), VOLK 71/629! Hari-rud valley, AITCH. 774!

Distr. gen.: Persia, W Afghanistan, C Asia.

Only known from a few gatherings. The unwinged fruiting perianth segments and the distinct mucros on the leaf cusps are distinctive for the species.

5. ***A. turkestanica*** ILJIN & KOROV. in KOMAR., Fl. URSS 6: 666 (1936).
Icon.: OVCZ., Fl. Tadjik. 3: tab. 73, fig. 8–10 (1968). – Tab. 174.
Type: Uzbekistan, Golodnaja steppe, Kara-Kamysch, 19.VI.1915, SPIRIDONOV 408, holotype LE.

Perennial with an elongated vertical root and a ± woody caudex, white woolly at surface. Stems 30–50 cm, pale green, sturdy (to 6 mm diam. at base), terete-quadrangular below, clearly quadrangular above, with several horizontally spreading lateral branches, ± candelabriform; internodes to 20–25, c. 3 cm long below, approximating above to c. 5 mm; nodes often with dense white tufts of wool. Leaves represented by adpressed membranous triangular ovate scales with an apical mucro. Flowers solitary in upper leaf axils, forming elongated loose spike-like inflorescences. Perianth segments broad ovate-orbicular; in fruit with broadly ovate wings, c. 5 × 3 mm. Ovary ovoid with very short stigmas. Fruit c. 6 × 5 mm, berry-like, slightly longer than adpressed wings of fruiting perianth segments.

Hab.: Loess plains, Chenopod. semi-desert, dry earth banks; 250–1500 m. – Fl. VIII, fr. IX–XI.

Afghanistan: N: Mazar-i Sharif: 25 km NW Tashkurghan, 330 m, BRECKLE 4650! Kotal-i Shibagli E Tashkurghan, 380 m, FREITAG 3864! – NW: Maimana: 25 km N Andkhui, Aqina, 260 m, BRECKLE 4709! Andkhui, 330 m, 21.V.1956, AMSEL! Herat: Herat, 21.IV.1954, AMSEL! – NE: Kataghan: Halfway Kunduz to Tashkurghan, NEUB. 160! 5–8 km E Paigah Kotal (Kotal-i Mirza Atbili, Kotal-e Robatak), 1100 m, PODLECH 17014!, PODLECH 18281!, PODLECH 19773! Paigah Kotal (Kotal-i Mirza Atbili, Kotal-e Robatak) 1200–1520 m, FREITAG 3917!, 3131!, FURSE 7812!, NEUB. 254! Pul-i Khumri, VOLK 2659!

Distr. gen.: Northern Afghanistan, C Asia.

Apparently most closely related to the C Asiatic *A. ferganica* DROB. Also with some affinities to *A. eriopoda*, but this species does not apparently develop wings on the perianth segments at fruiting time. The unpublished nomen "*A. asparagoides* AELLEN" appears on some specimens; the epithet is quite relevant because the young vegetative shoots bear a definite resemblance to those of *Asparagus*.

6. ***A. jaxartica*** (BUNGE) BENTH. ex VOLKENS in ENGLER & PRANTL, Natürl. Pflanzenfam. ed. 1, 3, 1a: 87 (1893).
Syn.: *Brachylepis jaxartica* BUNGE, Acta Horti Petrop. 6: 443 (1879). *B. hispidula* BUNGE, Acta Horti Petrop. 6: 444 (1879). *Anabasis hispidula* (BUNGE) BENTH. ex VOLKENS in ENGLER & PRANTL, Natürl. Pflanzenfam. ed. 1, 3, 1a: 87 (1893).
Icon.: Tab. 175.
Type: (Uzbekistan) "In deserto inter fl. Ssyr-darja et urbem Taschkent", O. FEDTSCHENKO, LE.

Perennial with woody root and an irregularly hemispherical caudex from which the stems arise, ± woolly on upper surface. Stems divaricately branched from near base, 15–60 cm high, greyish green, terete below and c. 1,5–2 mm diam., angular above, glabrous or with very short papillae-like hairs (*A. hispidula*); internodes 10–20, to 3 cm. Vestigial leaves with scarious margins and inconspicuous mucros or bristles. Flowers almost embedded in axils of upper leaves, forming very loose spike-like inflorescences. Perianth segments broadly ovate to semicircular, c. 1,5–2 × 1,5–2 mm, apically serrulate; wings of fruiting segments (immature) c. 2,5 × 2,5 mm, irregular in size. Ovary ovoid, with very short dark-coloured stigmas. Utricle ± fleshy, c. 2,5 × 2,5 mm (immature).

Hab.: Semi-desert, rocky slopes; c. 1300 m. – Fl. VII–VIII, fr. IX–X.

P e r s i a : N: Gorgan: Mohammad Reza Shah Prot. Reg. (Golestan): 10 km E "Soole-gerd" towards "Lohon-dor", 1050 m, AKHANI 4521! – E: Khor.: Sepid inter Bojnurd et Tappeh-ye Moraveh, 1350 m, RECH. 32532! – C: Shahr.-Bust.: Shahrud, KOELZ 16940! Karak, KOELZ 16743!
T u r c o m a n i a : Ashkhabad, Suluklü ad fines Persiae, SINT. 938!

Distr. gen.: Persia, Kopet Dagh, C Asia.

No authenticated specimens of *A. jaxartica* have been seen and those cited above have been named e descriptione. Its affinities are not clear.

7. ***A. calcarea*** (SHARIF & AELLEN) BOKHARI & WENDELBO, Bot. Not. 131: 292 (1978).
Syn.: *Esfandiaria calcarea* SHARIF & AELLEN, Verh. Naturf. Ges. Basel 63: 262 (1952).
Icon.: Iranian Journ. Bot. 1: 39, fig. 6 (1976). Bot. Not. 131: 280, tab. 1 (1978). – Tab. 176.
Type: Persia: O. SHARIF & Y. & P. AELLEN 1000, holotype G; isotype E!

Lit.: M. BOKHARI & P. WENDELBO, On anatomy, adaptations to xerophytism and taxonomy of Anabasis incl. Esfandiaria, Botaniska Notiser. Lund Botanical Society 131: 279–292 (1978).

Perennial with a thick (to 20 mm diam.) deeply descending vertical root and a thick irregularly hemispherical woody caudex (to c. 10 cm diam.) from which the stems arise, ± lanate-woolly on surface. Stems several, erect or ascending-erect, 20–60 cm, fleshy cylindrical, c. 4 mm diam., readily breaking at joints, grey-green to white glaucous, aphyllous except for vestigial remains; internodes 15–25 mm. Inflorescence of terminal and horizontally spreading lateral condensed cone-like spikes. Flowers solitary or few in the ± densely white hairy axils, hermaphrodite or unisexual. Perianth segments 5, free to base, membranous; all segments winged in fruit, hyaline-brown or yellow green, usually 2–3 wings larger (to 5 × 8 mm) than others, irregularly spreading. Stamens 3–4(–5); thecae c. 0,5 mm, ovoid-oblong. Stigmas c. 0,5 mm. Utricle berry-like, reddish brown, purplish or orange, fleshy.

Hab.: On gypsum soil, with little other vegetation, salty marl and limestone hills, sand soil in semi-desert, shale; 950–2250 m. – Fl. VIII–IX, fr. X–XII.

Persia: S: Fars: Abarqu, 30 km on road to Yazd, 1520 m, FOROUGHI & ASSADI 15109! Kerman: Bam, BROWN 30053-E! – C: Tehran: Varamin to Ardestan, IRANSHAHR 30292-E! Kavir-e Namak, 1000 m, IRANSHAHR & MOUSSAVI 15362-E! Kavir Prot. Reg.: Near Shah Abbas Caravan-Sarai, c. 1100 m, WDB. & FOROUGHI 14635!, 15204!, RECH. 46258! In deserto 50 km a Chashmeh-ye Safid-Ab versus Hajji Ali Abbas, 950 m, RECH. 46479! Siah-Kuh: Near Eyn-or Rashid, 130 km SE Tehran, substr. calc. 850 m, SHAR. & AELLEN 1000!, IRANSHAHR & MOUSSAVI 15361-E! Damgh.-Semnan: In montibus prope Tuweh NW Damghan, 1900–2250 m, RECH. 56476! 8 km NE Momenabad, gypsum hills, 1400–1500 m, MOUSSAVI & KARAVAR 34366! 31 km W Semnan, Momenabad, 1250 m, TERME & ZARGANI 40078-E! Sorkheh, RECH. 2814!, 50209! Shahr.-Bust.: Turan Prot. Reg.: inter Qaleh Bala et Delbar, 1100 m, RECH. 50481! In jugo inter Asb Keshan et Bargh, 1200 m, RECH. 51022! Near Delbar, 1100–1300 m, IRANSHAHR 40205-E!, BRECKLE 5042! 5–10 km Khani Khudi to Delbar, 1020 m, TERME & al. 41698! Vardenow versus Kalateh, 1750 m, TERME & al. 39353!

Distr. gen.: Endem. (Persia).

A dramatic looking plant often growing in habitats where few other species can survive. A detailed description and a discussion of its anatomy is given by BOKHARI & WENDELBO (l.c.). Very few (and inadequate) specimens of *A. brachiata* FISCH. & C.A. MEY. from the Aralo-Caspian area have been seen, but it seems to be a very close ally of *A. calcarea*.

8. ***A. macroptera*** MOQ. in DC., Prodr. 12, 2: 213 (1849).
Type: "In Affghanistano" (near Bamian, Topchee), W. GRIFFITH 1785 = Journal 1126, holotype K!

Perennial with a thick (to 12 mm) vertical root and a sturdy rounded or flattened caudex (to 7 cm across) from which the stems arise, ± woolly lanate on surface. Stems several, erect, fleshy, cylindrical, to 7 (or more) cm, green, brittle, readily breaking into segments; internodes c. 5 mm. Inflorescence condensed, terminal. Flowers solitary in upper leaf axils. Perianth segments free to base; fruiting segments all winged, the largest 2–3 c. 6 × 10 mm, semi-orbicular, straw-coloured, hyaline. Stamens 3–5, scarcely exserted; thecae ovoid. Ovary ovoid; stigmas dark-coloured, recurved, very short. Utricle flattened, c. 2,5 × 2,5 mm.

Hab.: Dry clay, sand gravels, limestone, exposed summit of pass; 2600–3200 m. – Fl. VIII; fr. IX–X.

Afghanistan: C: Bamian: Kotal Shartun, 3200 m, VOLK 2408-A! 8 km W Bamian, 2600 m, FREITAG 3952! Bamian valley, above Shekari and 3 km W of Buddha statues, VOGT 1049!, 1051! ENE Bamian, 2680 m, GILLI 2184! Topchi near Bamian, GRIFF. 1785 = Journal 1126! Inter Bulola et jugum Shibar, 2700 m, RECH. 16863! Nil Kotal, 2600 m, KOEIE 2864! Dragon valley, 2750 m, BRECKLE 4773! Panjao: Kotal-i Dewali, Naiak to Panjao, 3000 m, DIETERLE 776!

Distr. gen.: (Endem.?) C Afghanistan.

With similarities to the C Asiatic *A. brachiata* FISCH. & C.A. MEY. and *A. cretacea* PALL. and to *A. calcarea*, but apparently differing in the dwarf habit, the unbranched inflorescences and all 5 wings of the fruiting perianth segments clearly developed.

The record from Tian Shan (KOMAR., Fl. URSS 6: 297. 1936) may refer to *A. tianshanica* BOTSCH.

9. ***A. aphylla*** L., Spec. Plant. 223 (1753).

Syn.: *A. aphylla* subsp. *australis* ILJIN and subsp. *rubra* ILJIN, Not. Syst. Leningrad 7: 214 (1937) – as vars. in GROSSH., Fl. Kavk. 3: 164 (1945).

Icon.: OVCZ., Fl. Tadjik. 3: tab. 73, fig. 3–4 (1968). – Tab. 177.

Type: "Hab. ad maris Caspii litora" LINN 316/1 – microfiche!

Shrub, greyish green, forming clumps, 30–60 cm high. Stems arising from a woody rhizome, branched from base, erect, almost fastigiate, rather slender, c. 1,5–2 mm diam., angular or terete, numerous; internodes c. 20–28, lower 15–20 mm, approximating above. Leaves reduced to adpressed scarcely visible scales. Inflorescence much branched; flowers solitary, numerous, in spike-like rather condensed branches. Perianth segments broad ovate, entire, 1,5–2 mm; in fruit all segments winged, the larger 3 suborbicular, c. 3,5 × 6,5 mm, spreading erect, yellow, brown or pink, the others ± erect with much smaller wings. Utricle flattened, globular succulent, reddish, topped by very short stigmas.

Hab.: Salty ground, semi-desert, sandy-clay soil, rocky slopes, dried river banks; 900–2400 m. – Fl. VIII–IX, fr. X–XII.

Persia: N: Gorg.: Mohammad Reza Shah Prot. Reg. (Golestan): Inter Dasht et Loveh, c. 125 km W Bojnurd, 1200 m, RECH. 37612! Jangal-e Golestan, Dasht-e Almeh, c. 1400 m, TERME & MATIN 35106-E! – W: Azerb.: 40 km S Maku, 1200 m, ANDERSEN & PETERSEN 75! Tabriz, RECH. 15844! SE Tabriz, outside town, 1540 m, WDB. & SHIRDELPUR 14934! 6 km SE Tabriz, 1500 m, PABOT 5158!, 30343-E! Ad lacum Rezaiyeh, in salsis versus Tabriz, STARM. 62! – E: Khor.: 20 km W Shirvan, 950 m, KUKKONEN 7656! In valle fluvii Atrak prope Shirvan, SAB. in GAUBA 2087!, GAUBA 2092!, RECH. 1848!, FURSE 8915!

Distr. gen.: SE Russia, N, NW & NE Persia, C Asia [map in GRUBOV, Pl. As. Centrbl. 2: map 8 (1966)].

Usually recognized by the slender fastigiate terminal branches; apparently restricted to northern parts of Persia. Records of the species from further south seem to be based on misidentifications of the closely related *A. Haussknechtii*.

10. *A.* ***Haussknechtii*** BUNGE ex BOISS., Fl. Or. 4: 909 (1879).
Syn.: *A. iranica* ILJIN, Not. Syst. Leningrad 20: 137 (1960).
Icon.: Tab. 178.
Type: "Abunde in collibus calcareis Persiae prope Ispahan", H.C. HAUSSKNECHT, G – microfilm!, JE!

Subshrub, c. 20–30 cm, greenish white, glaucous. Stems terete, sturdy, much branched, woody except for herbaceous current year's growth, erect or ascending-erect; lower internodes 15–20 mm, c. 1,8–2 mm., upper c. 5 mm long. Leaves represented by very small vestigial adpressed scales; nodes with tufts of white hairs. Flowers solitary in upper leaf axils, forming loose spike-like inflorescences, distinct or somewhat approximating above. Perianth segments broad ovate, c. 1,5– × 1,5 mm; wings of fruiting segments prominent, green yellow or pink, usually 3 larger, c. 5 × 7 mm, broad ovate-orbicular, spreading, and 2 smaller, ± erect. Fruit ± fleshy, c. 2,5 × 2 mm (immature).

Hab.: Sandy-clay soil, semidesert, salt desert; 1500–2000 m. – Fl. IX, fr. X–XI.

Persia: W: Arak: Tarmoz (Teramis) lake near Arak (Sultanabad), STR. 294!, 295! Esf.: Ardestan to Nain, 1900 m, FOROUGHI & BAZARGAN 32413! Ardestan, Zafar Qand to Nain, 1850–1900 m, FOROUGHI 10549!, 10571!, FOROUGHI & ASSADI 15156! In collibus calc. near Esfahan, HAUSSKN.! Mahyar, S Esfahan, 1600 m, PRAVITZ 231! 30 km N Esfahan, c. 1700 m, PABOT 7283! Esfahan, 22.XI.1976, sine coll. 40288-E! Kuh Sofeh near Esfahan, STAPF 761! Jolfa, STAPF 763! – S: Fars.: ad lacum Neyriz, ad ripam occident., 1400 m, STARM. 5! 30 km to Abadeh, SAFAVI & DEZF. 30395-E! 110 km Shahreza to Shiraz, 2000 m, FOROUGHI & ASSADI 14955! Abarqu, 1500 m, FOROUGHI & ASSADI 15104! Deh Girdu to Yazd-e Khvast, STAPF! Kerm.: Kuh-e Jupar, 1770–2400 m, KOHLE! In desertis ad Rayen, ditions Kuh-e Hazaran (Häsar), 2400 m, BORNM. 4217 – as "*A. aphylla* f. *patula*" (isotype of *A. iranica*), BORNM. 4216 – as "*A. aphylla* f. *stricta*". Rafsanjan, SAFAVI 15407-E! Baghin, 1750 m, FOROUGHI 10559! – C: Damgh.-Semn.: Mehmandust, Hematabad (Kavir), 1100 m, TERME & al. 41699! Inter Semnan et Damghan, RECH. 1269! 10 km E Damghan, FREITAG 14197! Kavir-e Damghan, 1200 m, REJAMAND & ARAZM 32496! Shahr.-Bust.: Bustan, SAB. in GAUBA 2091! Turan Prot. Reg.: 20 km S Shahrud, 1330 m, FREITAG 14134!
Pakistan: Nushki: 93 km NE Nushki, 1600 m, FREITAG & KOTHE 18775!, 18776!

Distr. gen.: Endem. (C & S Persia, Pakistan).

Related to *A. aphylla*, but with thicker not fastigiate branches usually clearly terete, and slightly larger wings on the fruiting perianth segments. The most characteristic forms of *A. Haussknechtii* are usually from the southernmost parts of its range, eg Fars, Kerman; those from the north of the Kavir grade towards *A. aphylla*. I have reduced *A. iranica* to synonymy with some hesitation. Forms with the thickest stems (as the type of *A. Haussknechtii*) appear to grow intermixed with narrower stemmed forms (*A. iranica*).

Also clearly related to the Palestinian-Jordanian *A. syriaca* ILJIN, with which it shares the rather sturdy stems.

11. *A.* ***lachnantha*** AELLEN & RECH.f., Anz. Math.-Nat. Kl. Österr. Akad. Wiss. 1961, 2: 26 (1961).
Icon.: Tab. 179.

Type: Iraq: Basra: Southern Desert, c. 28 km SW Samawa in arenosis lapidosis, K.H. RECHINGER fil. 8159, holotype W!; isotype E!

Dwarf greyish white or silvery shrub, very succulent, c. 30 cm high and 80 cm wide; caudex to c. 5 cm diameter. Stems much branched, prostrate or ascending, brittle, prominently angled or ridged (at least when dry); internodes on current year's shoots 10–15, c. 7 mm long, short lateral buds often present at nodes. Leaves reduced to scale-like cusps, scarcely 1 mm long. Flowers solitary, immersed in white-lanate tufts in upper leaf axils. Fruits in our area not known.

Hab.: Sandy, salty soil and clay, marl, in very dry habitats; 3–630 m.

Persia: S: Lar.: Bandar-e Charak to Hameiran, Tang-e Khizal, 40 m, TERME & al. 41713-E! 204 km from Bandar Abbas to Lar, 630 m, FOROUGHI & ASSADI 15672! Makran: Chah Bahar, Dashtiari, POZDENA B-6!
Pakistan: Makran: 93 km S Panjgur, 850 m, FREITAG & KOTHE 18586! Gwadar west bay near Pishukan, 3 m, FREITAG & KOTHE 18534! 170 km E Pasni at road to Ormara, 50 m, FREITAG & KOTHE 18439! Bela: 15 km N Khandewari, 40 m, FREITAG & KOTHE 18233!

Distr. gen.: Southern Iraq, Kuwait, E Saudi Arabia, S Persia, Pakistan (Makran area).

The identification of the cited specimens as *A. lachnantha* is doubtful because none is in flower or fruit. In the original description the species was related to *A. Haussknechtii*, but it is much more closely related to *A. articulata* (FORSSK.) MOQ. (from NW Africa to Egypt and the Arabian peninsula) and appears to be the eastern replacement of it. *A. lachnantha* apparently differs in the appreciably thicker and fleshier shoots. Further gatherings and observations, throughout its range, are much needed.

Species doubtfully recorded

A. brachiata FISCH. & C.A. MEY. ex KAR. & KIR., Bull. Soc. Imp. Nat. Mosc. 15: 433 (1842).

This is recorded by BOISSIER, Fl. Or. 4: 969 (1879) from N Persia, Gendab (E Shahrud). I have not seen the BUHSE specimen on which it is based; it may stem from a misidentification of *A. calcarea*.

A. ferganica DROB., Trav. Mus. Bot. Acad. Sc. Pétersb. 16: 143 (1916).

References to this C Asiatic species, e.g. FREITAG in Vegetatio 22: 316 (1971) seem to be misidentifications of the closely related *A. turkestanica*.

34. *Haloxylon*

I.C. HEDGE, Edinburgh

Haloxylon BUNGE ex FENZL in LEDEB., Fl. Ross. 3: 819 (1851) – exclud. *H. floridum* (= *Seidlitzia*); Beitr. Fl. Russl. 292 (1852); Mém. Sav. Etrang. Acad. Sc. Pétersb. 7: 468 (1854).

Syn.: *Hammada* ILJIN, Bot. Zhurn. 33, 6: 582 (1948). *Arthrophytum* auctt. p.p. non SCHRENK, Bull. Cl. Phys.-Math. Acad. Imp. Sc. Pétersb. 3: 211 (1845).

Lit.: D.J. LITWINOW, The genus Arthrophytum and the included species of Haloxylon, Travaux du Musée Botanique de l'Académie Impériale des Sciences de St. Pétersbourg 11: 27–49 (1913) (in Russian). E. KOROVIN & B.A. MIRONOV, Review of the genus Arthrophytum and the position of that genus in the system, Trudy Sredne-Aziatskogo Gosudarstvennogo Universiteta. Ser. 8b, Botanica = Acta Universitatis Asiae Mediae 15: 3–23 (1935) (in Russian). M. MONOSZON, Similarity and difference between pollen of Arthrophytum, Hammada, Haloxylon and Anabasis, Pustyni SSSR Ih Osvoinie 2: 746–749 (1854) (in Russian).

Suffruticose herbs, shrubs or low to medium-sized trees, fleshy or scarcely so, usually glabrous except for tufts of hairs at nodes. Stems clearly jointed. Leaves opposite, vestigial or well-developed, linear, short triangular or oblong. Flowers small, hermaphrodite or male, usually in axils of subtending bract-like leaves, forming condensed or loose spikes or wide-paniculate. Perianth segments 5, membranous; in fruit all segments developing spreading wings near middle of segment. Stamens 5; filaments usually basally united on a hypogynous disk, alternating with ovoid papillose staminodes. Ovary with 2–3 usually short thick styles. Seeds horizontal; albumen absent; embryo spiral. – Type of genus: *H. ammodendron* (C.A. MEY.) BUNGE ex FENZL [cf. ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 572 (1934)].

I have adopted a wider circumscription of the genus than most current authors; in particular, I have reduced ILJIN's *Hammada* to synonymy because after studying the relevant species I was unable to find any constantly reliable separating characters. The result is that *Haloxylon* now includes low-growing shrubs, tall shrubs and medium-sized trees. Whether or not the C Asiatic *Arthrophytum* SCHRENK merits independent generic status was not resolved during the preparation of this account, but undoubtedly it is very close to *Haloxylon*. *Anabasis* is also very closely related and seems only to differ in having an erect seed. The *Haloxylon* species recognized here are not easy to separate in a standard key, being often recognized by features of habit and habitat. Some bear galls, caused by insects, which may be of some use in separating species (e.g. *H. ammodendron* and *H. persicum*); it is of interest that galls of a similar type are found in some *Anabasis* species (e.g. *A. aphylla*).

1a. Leaves terete to 5 x 1,5 mm, ± ellipsoid, fleshy; inflorescence wide-paniculate with long horizontally spreading branches (E Afghanistan, Pakistan) .... 4. *H. Stocksii* (BOISS.) BENTH. & HOOK.
b. Leaves absent or up to 8 mm, linear, not or scarcely fleshy; inflorescence spicate or paniculate 2
2a. Psammophytes, 1–8(–12) m tall; older stems often with circular cracks (sand deserts of Persia and Afghanistan) 3
b. Non-psammophytes, 10–100 cm tall; older stems with or without circular cracks (throughout our area) 4
3a. Scale-like leaves longer than broad, with a yellow-brown adpressed arista 0,5–1(–1,5) mm .... 2. *H. persicum* BUNGE ex BOISS. & BUHSE
b. Scale-like leaves as long as broad, without a prominent arista ....

.... 1. *H. ammodendron* (C.A. MEY.) BUNGE ex FENZL

4a. Suffruticose herbs, 5–30 cm tall; leaves reduced to scale-like cusps (C & N Afghanistan) 5

b. Shrubs or suffruticose herbs (10–)30–100 cm; leaves of either scale-like cusps or herbaceous and up to 8 mm, usually much less 6

5a. Wings on fruiting perianth segments c. 1,5–2 × 2,5–3 mm (N Afghanistan: Balkh) .... 6. *H. gracile* (AELLEN) HEDGE

b. Wings on fruiting perianth segments, c. 4 × 5 mm (C Afghanistan-Bamian) .... 5. *H. multiflorum* (MOQ.) BUNGE ex BOISS.

6a. Leaves of cusp-like scales up to 1 mm; inflorescence usually condensed at ends of the horizontally spreading lateral and at end of terminal shoots .... 3. *H. salicornicum* (MOQ.) BUNGE ex BOISS.

b. Leaves cusp-like c. 1 mm or distinct and up to 8 mm; inflorescence paniculate of numerous ± loose lateral and terminal spikes .... 7. *H. Griffithii* (MOQ.) BOISS.

1. ***H. ammodendron*** (C.A. MEY.) BUNGE. ex FENZL in LEDEB., Fl. Ross. 3: 820 (1851).

Syn.: *Anabasis ammodendron* C.A. MEY. in LEDEB., Fl. Alt. 1: 375 (1829). *Arthrophytum ammodendron* (C.A. MEY.) LITW. var. *aphyllum* MINKW., Feddes Repert. 11: 478 (1912). *A. ammodendron* (C.A. MEY.) LITW., Trav. Mus. Bot. Acad. Imp. Sc. Pétersb. 11: 35 (1913). *A. haloxylon* LITW., Trav. Mus. Bot. Acad. Imp. Sc. Pétersb. 11: 45 (1913). *Haloxylon pachycladum* M. POP., App. ad Bull. Appl. Bot. Gen. Pl. Breed. 26, 3: 11 (1931). *Haloxylon aphyllum* (MINKW.) ILJIN, Bot. Zhurn. 19, 2: 171 (1934).

Icon.: OVCZ., Fl. Tadjik. 3: tab. 74, fig. 10–11 (1968). LÉONARD, Contrib Fl. Végét. Déserts Iran 7: fig. 5G (1987) – both as *A. aphyllum*.

Type: various syntypes from the Caspian shores, Altai, Songaria, Buchara, Persia.

Shrub or tree, c. (1–)2–8(–12) m tall, with a thick brown smooth trunk 4–10(–25) cm in diameter, profusely branched. Branches brown, grey to white, often with circular cracks; branches of current year green, c. 1,5 mm in diameter, terete, ascending or pendent, internodes c. 1 cm long. Leaves reduced to obtuse or acute cusp-like scales, connate, villous within. Inflorescences of short shoots borne on previous year's stems; flowers hermaphrodite or male, very small in short lateral shoots; bracteoles as long as or longer than perianth segments. Stamens exserted, 0,7 mm. Stigmas 2(–3), very short. Perianth segments in fruit all winged, spreading; fruit with wings 8 mm in diameter; wings c. 3,5–4 × 5–7 mm, pale brown or white. Seed c. 1,5 mm diameter.

Hab.: Sandy desert, mobile and fixed dunes, *Artemisia* steppe, sabkha, (halophytic steppe ?); 700–1600 m. – Fl. III–IV, fr. X–XI. (?)

P e r s i a : N: Gorg.: Mohammad Reza Shah Prot. Reg. (Golestan), Dasht-e Almeh, 1400 m, TERME & MATIN 35104-E! Almeh, 1500 m, KUKKONEN 5704!, UOTILA 18170! Shahpasand

to Bojnurd, 1250 m, TERME 4158(?)-E! – W: Esf.: Gav Khuni (Gawkhane), STAPF! – S: Kerm.: 13 km WSW Kerman, in arena mobili, SOJÁK 2774! 2779! E Dasht-e Lut, dunes, 1130 m, LÉONARD 6102! 35 km SE Zahedan versus Mirjaveh, RECH. 27232! Lar.: Lar to Bastak, Anbeh, 600 m, IRANSHAHR & TERME 14803-E! Bal.: in ditione montis Taftan prope Sangan, c. 1600 m, RECH. 4087! 2 km merid. a pago Kahurak, c. 60 km a vico Nosratabad, SOJÁK 242!, 252! Zahedan, 32 km N Khash to Mijareh, E side Kuh-i Taftan, GREY-WILSON & HEWER 336! Bampur, SOLTANI 30396-E! – E: Sistan, FURON S 15! Khor.: Shirgasht near Tabas, RUTTNER 563! Robat-e Khan W Tabas, KOELZ 16802! – C: Tehr.: 13 km W Garmsar, MOUSSAVI & KARAVAR 41702! Kavir Prot. Reg.: in deserto araneoso 7 km E Bad Rud, 1050 m, RECH. 46484! In deserto araneoso prope Mulkabad, 900 m, RECH. 46316! Shahr.-Bust.: 14 km S Zeydar versus Biarjmand in collibus arenosis, 1300 m, RECH. 50277! Damghan to Sabzevar, RECH. 1302! Turan Prot. Reg.: 22 km W Tejur, 770 m, BRECKLE 5163! 6 km E Chah Jam, 1180 m, BRECKLE 5105! 10 km ESE Garmab at road to Duruna, 1050 m, FREITAG 13679! Ahmadabad to Zamanabad, FREITAG 14190!, WDB. (Iranian Journ. Bot. 1: 164 (1977). NNE Ahmadabad versus Darb-Ahang, RECH. 50656! Yazd: in arenosis mobilibus 6 km SW Robat-e Khan, 1000 m, RECH. 51804! In arenosis 36 km NW Posht-e Badam, 750 m, RECH. 51835! Kashan: versus Fakhreh, cult., MOUSSAVI & TEHRANI 30732-E! Lut: E of Kuh-e Nay Band (Naibandan), 37°45'E, 32°30'N, 730 m, LÉONARD 5503!
T u r c o m a n i a : Ashkhabad sec. NIKITIN, Ill. Opred. Rast. Ashkhabad: 118 (1965).
A f g h a n i s t a n : SW: Farah: Juwain, VOLK 2928 (identification provisional)!

Distr. gen.: Persia, W Afghanistan (?), Turcomania, Aralo-Caspian – Amu Darya, lowland areas of C Asia, China (Mongolia, Sinkiang, Kansu).

In C Asia, where it is known as the black saxaul, this psammophyte often forms solid stands. In our area it appears to be mainly confined to, and usually scattered in, desertic or semi-desertic areas near the Dasht-i Kavir and the Dasht-i Lut. Plants frequently have characteristic dark coloured cone-like galls c. 5 mm long. A close ally of *H. persicum*, q.v. Very few of our specimens are ideal: the field notes frequently give no indication of the size of the plant and only one or two specimens are in fruit.

In the Turan Protected Region, there is a prostrate form which forms a community of its own; the plants reach a diameter of up to 2 m, but never are taller than 0,75 m – in habit, it is similar to *H. salicornicum*.

2. ***H. persicum*** Bunge ex Boiss. & Buhse, Nouv. Mém. Soc. Imp. Nat. Mosc. (Aufzähl. Reise Transkauk. Pers.) 12: 189 (1860).

Syn.: *Arthrophytum ammodendron* (C.A. Mey.) Litw. var. *acutifolium* Minkw., Feddes Repert. 11: 478 (1912). *A. arborescens* Litw., Trav. Mus. Bot. Acad. Imp. Sc. Petersb. 11: 44, tab. 3, 4 (1913). *A. persicum* (Bunge.) Sawicz, Not. Syst. Herb. Horti Petrop. 5: 45 (1924). *Haloxylon ammondendron* auctt. non (C.A. Mey.) Bunge.

Icon.: Ovcz., Fl. Tadjik. 3: tab. 74, fig. 7–8 (1968). Léonard, Contrib. Fl. Végét. Déserts Iran 7: fig. 5 A-F (1987). – Tab. 180.

Type: (Persia S of Kavir) "Grosse Salzwüste (Kavir) bei Dschendak (Jandaq) und Enarak (Anarak), gesellig wachsend im Flugsande, April 1849" F. Buhse.

Lit.: V.M. SAWICZ, A forgotten Saxaul species, Haloxylon persicum, Notulae Systematicae ex Herbario Horti Botanici Petropolitani 5; 41–47 (1924) [in Russian].

Shrub or tree, 1–4(–8) mm tall and to 4 m wide with a thick trunk 15–25(–40) cm in diameter, much branched. Branches grey or white, often with circular cracks; branches of current year green, 1–2 mm in diameter, usually erect in young plants and often pendent on older ones. Leaves reduced to acute adpressed scales narrowed into a prominent cusp or mucro 0,5–1(–1,5) mm long. Other characters as in *H. ammodendron*.

Hab.: Sandy deserts, mobile and fixed dunes, with *Calligonum*, sabkha; 280–1100 m. – Fl. III–VI, fr. X–XI. (?)

P e r s i a : S: Kerm.: 2 km S Kahurak, c. 60 km a vico Nosratabad, SOJÁK 240!, 241!. W of Jaz Murian, 58°35'E, 27°08'N, 370 m, LÉONARD 5752! E of Dasht e Lut, 59°42'E, 29°48'N, 750 m, LÉONARD 6081! – E: Sistan: ad confines Afghaniae, inter Kuh-i Malik et Zabol, 700 m, RECH. 4093! Zahedan to Zabol, RECH. 4093a! – C: Shahr.-Bust.: Turan Prot. Reg.: 22 km W Tejur, 780 m, BRECKLE 5162! Ahmadabad and Zamanabad, WDB. [Iranian Journ. Bot. 1: 164 (1977)]. Zamanabad to Ahmadabad, 2 km N Jowchah, 1100 m, FREITAG 13893! 15 km SE To-rud, 800 m, FREITAG 14891! Yazd: Robat-e Khan, W of Tabas, KOELZ 16803! 20–30 km Khvor to Biabanak, TERME & MOUSSAVI 40253-E! Jandaq, BUHSE. Anarak, BUHSE. Hoseynian to Jandaq, 900 m, TERME & MOUSSAVI 30237-E!, WDB. obs. [Iranian Journ. Bot. 1: 37 (1976)].
T u r c o m a n i a : Ashkhabad, sec. NIKITIN, Ill. Opred. Rast. Ashkhabad 118 (1956).
A f g h a n i s t a n : N: Mazar-i Sharif: 60 km NW Balkh, 280 m, BRECKLE 4663! 25 km NW Deh Nau, Naisabad, Sar-e Namak, 330 m, BRECKLE 4721! – SW: Farah: 10 km WSW Sheshaba to Zaranj (Kang), 555 m, PODLECH 16885! Dasht-e Margo, 50 km N Khonnashin, 710 m, BRECKLE 4867! 20 km S Safar Kalay, 750 m, PODLECH 19651! Lower Khash Rud Valley near Haleli, 540 m, FREITAG 2450! Chakhansur to Farah, 550 m, FREITAG 3766! – SE: Kandahar: in arenosis deserti Registan prope Bhagat, 600 m, RECH. 34652a! Registan desert SW border 5 km S Bhagat, 700 m, FREITAG 726!
P a k i s t a n : Chagai: 100–150 km E Nok Kundi, 28°49'N, 62°50'E, RECH. 27266! 42 km W Dalbandin, 620 m, FREITAG & KOTHE 18705! 15–25 km NE Qila Ladgasht, 500 m, FREITAG & KOTHE 18687!

Distr. gen.: Palestine, Egypt, Sinai, Jordan, S Iraq, Saudi Arabia, Oman, United Arab Emirates, C & S Persia, Turcomania, Aralo-Caspian–Amu Darya lowland areas of Soviet Central Asia, Pakistan (Baluchistan), China (Sinkiang).

A very close ally of the preceding species and like it almost entirely restricted to sand habitats; they are also sympatric. WENDELBO, Iranian Journ. Bot. 1: 37 (1976) suggests that hybrids between them may occur. BOISSIER, Fl. Or. 4: 948 (1879) considered *H. persicum* as a synonym of *H. ammodendron*. The adpressed and prominent mucronate cusps are usually a sufficiently characteristic feature to recognize the species (white saxaul), even in the vegetative state. It is an important species in stabilising sand dunes, as a source of fodder and fuel. Galls are frequently present and possibly are diagnostic. LÉONARD, Contrib. Fl. Végét. Déserts Iran 7: 40, fig. 5 D-E (1987) describes and illustrates 2 types; I have observed a further type – small c. 3 mm white balls. Very few of the cited specimens have flowers or fruit, but apparently, as with *H. ammodendron*, it is a spring flowering plant whose fruits mature in autumn. Field observations and anatomical studies on the 2 species are needed to confirm that they are indeed separate from each other.

3. ***H. salicornicum*** (MOQ.) BUNGE ex BOISS., Fl. Or. 4: 949 (1879).
Syn.: *Caroxylon salicornicum* MOQ. in DC., Prodr. 13, 2: 174 (1849). *Hammada*

salicornica (MOQ.) ILJIN., Bot. Zhurn. 33: 583 (1948). *H. elegans* (BUNGE) BOTSCH., Nov. Syst. Pl. Vasc. 1: 362 (1964).
Icon.: LÉONARD, Contrib. Fl. Végét. Déserts Iran 7: fig. 5, J-L (1987). – Tab. 181.
Type: "In Afghanistano, Barikabn Bassoulah, Huzarnow" (Peshawar to Jalalabad) W. GRIFFITH 1796, holotype K!

Clump-forming often greyish shrub, much branched, 25–50(–100) cm tall; woody stems below to c. 6 mm diameter, pale brown or white; new shoots borne on old wood, green, fleshy c. 1,5 mm diameter, horizontally spreading-ascending; internodes on new growth c. 6 mm. Leaves reduced to short adpressed cusp-like scales, white-membranous at margins, ± densely woolly within. Inflorescences on new growth, usually in short condensed spikes at end of shoots. Stamens 5 usually alternating with ovate, papillose fringed staminodes. Styles 2(–3), very short. Perianth segments in fruit all winged, spreading; fruit with wings 6–8 mm in diameter; wings c. 3 × 3,5 mm, pale brown, green or pink. Seed c. 1,3 mm in diameter.

Hab.: Sandy semi-desert, stony or pebbly ground, salty sand, sand dunes, sandy plains, dry river bed, limestone halophytic steppe; near sea level to 1400 m – Fl. X, fr. XI–XII.

P e r s i a : W: Khuz.: NW Ahvaz, PABOT 2577! Omidiyeh to Darahiyeh, Bibi-Hakimeh, TERME & MOUSSAVI 35364-E! – S: Fars.: 20 km E Khvormuj, 70 m. BOKHARI & al. 14812! Kerm.: S Dasht i Lut, SE margin of Kalut, 250 m, HALLIER! Bam to Fahraj, 800 m, RECH. 3907-a! Fahraj, 620 m, TERME & MOUSSAVI 34417-E!, 34419-E! Shahdad to Birjand, 400–800 m, TERME & MOUSSAVI 34415-E!, 34416-E!, 34418-E! N Dasht-e Lut, 58°35'E, 31°35'N, LÉONARD 5540! Bam to Zahedan, Hemmatabad, 800 m, FOROUGHI 10583!, 10558! Jaz Murian, Kahnuj to Sorkh Qaleh, 420 m, ERSHAD & al. 35403-E!, 40145-E! Lar.: Saidabad (Sirjan), Hajjiabad, 800 m, FOROUGHI & ASSADI 15057! 60 km SE Bastak, 400 m, GRANT 16982! 15 km SE Mand, 100 m, BOKHARI & al. 14817! Inter Hajjiabad prope Jarum et Bandar Abbas, Saadatabad, 730 m, RECH. 3341! 30 km N Bandar Abbas, KASY 346! Bandar Abbas, KOELZ 14163! 20 km W Kahorestan, GRANT 15145! Bal.: Makran: Chah Bahar to Nasirabad, c. 500 m, ERSHAD & al. 35391-E! Fannuj to Maskutan, 600 m, ERSHAD & al. 40129-E! Iranshahr to Bam, 15 km W Bazman, 950 m, ERSHAD & al. 40123-E! – C: Yazd: In arenosis 36 km NW Posht-e Badam versus Khvor, 750 m, RECH. 51834! Robat-e Posht-e Badam to Tabas, 900 m, FOROUGHI & BAZARGAN 32390! Sud du Dasht-e Kavir, 55°26'E, 33°00'N, LÉONARD 5428! Biabanak to Dashtab, TERME & MOUSSAVI 30242-E!, 30245-E!, 30270-E! Yazd to Tabas, Kuh-e Shurab, RUTTNER 632!
A f g h a n i s t a n : SW: Herat: 35 km W Herat, VOLK 71/871! Farah: 75 km SW Farah, 680 m, BRECKLE 4887! Farah, 460 m, KOELZ 13239! 50 km E Chakhansur near Haleli, 580 m, FREITAG 3729! 15 km NW Chahar Borjak to Kang (Zaranj), 530 m, PODLECH 13146! Chahar Borjak, banks of Helmand, 535 m, PODLECH 17144! 45 km SW Lukhi (Lokhi), S-bank of Kash Rud, 545 m, PODLECH 17116! 11 km NE Lukhi to Dilaram, 630 m, PODLECH 17167! 5 km S Khwajasarjoy, 500 m, PODLECH 17121! 25 km SE Lash Juwain, E bank of Hamun-i Puzak "Jehile Puzak", 475 m, PODLECH 16919! – SE: Kandahar: 3 km E Lakhi, 690 m, PODLECH 19648! 2 km N Khonnashin, margin of Dasht-e Margo, 660 m, BRECKLE 4870! 70 km N Khonnashin, 750 m, BRECKLE 4863! 3 km E Saffar (Safer) Kalay, 690 m, PODLECH 19649! W border of Registan desert 5 km SE Safer, 700 m, FREITAG 698! – E: Nangarhar: 12 km W Torkham, 600 m, BRECKLE 4956! 30 km E Jalalabad, 630 m, FREITAG 7321! Jalalabad to Torkham, 8 km SW Ghaziabad, 550 m, PODLECH 19982! Ghaziabad, 500 m, PODLECH 22376! Jalalabad to Sarobi, Shahidan, 710 m, PODLECH 28698! Jalalabad to Peshawar, GRIFF. 1796. Nuristan:

Between Chigha Sarai and Chauki, BRECKLE 3369! Nur.: Kunar valley, 3 km E Eslampur, 625 m, PODLECH 16828!
P a k i s t a n : Peshawar: Peshawar, R.R. STEWART 9670. – Las Bela: Las Bela McVEAN! Bela Plain, 42 km WSW Liari, 15 m, FREITAG & KOTHE 18228! 55 km SW Khuzdar, 1400 m, FREITAG & KOTHE 18748! Bal.: Chagai: Ahmed Wal, DATTA 13! Koh-e Sultan 75 km E Nok Kundi, 600 m, FREITAG & KOTHE 18701! 110 km SW Nushki, 900 m, FREITAG & KOTHE 18747! Ras Koh system, N side Koh Kambaran, 1400 m, FREITAG & KOTHE 18726! Makran: 6 km WNW Pasni, 20 m, FREITAG & KOTHE 18492! 94 km WSW Panjgur, Parom, 895 m, FREITAG & KOTHE 18262! Bela to Awaran 27 km W Lak Pass, 380 m, FREITAG & KOTHE 18262! – Sind: Karachi to Dadu, 15 km S Sehwani, LAMOND 867a!

Distr. gen.: Egypt, Sinai, Palestine, Jordan, S Iraq, Kuwait, C & E Arabian peninsula, Persia, Afghanistan, Pakistan.

In some regions a very common shrub. Mainly restricted to the southern, low altitude, parts of our area.

4. ***H. Stocksii*** (BOISS.) BENTH. & HOOK., Gen. Plant. 3: 70 (1883).
Syn.: *Salsola Stocksii* BOISS., Diagn. Pl. Or. Nov. Ser. 2, 4: 75 (1859). *Haloxylon recurvum* sensu BUNGE in BOISS., Fl. Or. 4: 950 (1879) exclud. type ("ad ripam Irwaddy" WALLICH)

Icon.: JAFRI, Fl. Karachi fig. 96 (1966) – as *H. recurvum*. – Tab. 182.
Type: (Pakistan) "in ditionibus Beloutschistan et Scinde Indiae finitimis", J.E. STOCKS, G – microfiche!

Sturdy shrub, 25–80 cm, glabrous or pruinose, with prostrate or ascending branches; main stem ± terete, to c. 5 mm diameter, pale to dark brown, internodes to 25 mm long. Leaves distinct, spreading, terete, to c. 5 × 1,5 mm, sessile, fleshy, ellipsoid to oblong. Branches opposite, ± horizontally spreading, often with circular cracks. Inflorescence wide paniculate with long spreading spike-like branches 3–12 cm; flowers numerous, condensed or distinct. Perianth segments 1,5 mm. Stamens 5, usually alternating with ovate staminodes. Fruit c. 6 mm in diameter; perianth segments curved inwards with spreading c. 1,5 × 2,5 mm brown wings. Seed 2,5–3 mm across.

Hab.: Sandy or loamy saline soils, limestone hills. – Fl. X, fr. XI–XII.

A f g h a n i s t a n : E: Nangarhar: 45 km SE Jalalabad to Torkham, RASOUL 490!
P a k i s t a n : Sibi: Sibi, LACE in WATT 4094! – Bal.: Makran: Pasni to Makran, Chapkali, QAISER 7069! 4 km S Pasni, Ras Saven, 30–100 m, FREITAG & KOTHE 18414! Haro Range SW Bela plain 15 km N of Khandewari, 40 m, FREITAG & KOTHE 18231! – Karachi: Karachi Dright Road, JAFRI! Karachi University Campus, 50 m, FREITAG & KOTHE 18958! – Sind: 10–15 km S Sehwan, RECH. 28714! Baluchestan and Sind, STOCKS.

Distr. gen.: Afghanistan, Pakistan, W India (Punjab, Rajasthan).

The rather sturdy ultimate branches, distinct leaves and wide-paniculate inflorescences are characteristic. Used as a source of crude sodium-carbonate – BARILLA (Wealth of India V: 5. 1959). HOOKER, Fl. Brit. Ind. 5: 15 (1890) called our plant *H. recurvum* (WALL. ex MOQ.) BOISS. saying that he could not separate the Burmese and S Indian plant from our one. I prefer to keep them distinct, but little material has been seen. The oldest validly published name for the S Indian species is *Caroxylon indicum* WIGHT (Icones tab. 1794, 1852).

5. ***H. multiflorum*** (MOQ.) BUNGE ex BOISS., Fl. Or. 4: 949 (1879).
Syn.: *Anabasis multiflora* MOQ. in DC., Prodr. 13, 2: 212 (1849). *Hammada multiflora* (MOQ.) ILJIN, Bot. Zhurn. 33: 583 (1948). *Anabasis bamianica* AELLEN, Årb. Univ. Bergen 1963 Math.-Nat. Ser. 18: 481 (1963). *Arthrophytum pallidiflorum* AELLEN ex PODLECH, Mitt. Bot. Staatssamml. München 12: 56 (1975).
Icon.: Tab. 183.
Type: "In Affghanistano", W. GRIFFITH 1098, lectotype K! (selected here).

Low-growing suffruticose herb, 5–20 cm, much branched; rootstock c. 6 mm in diam.; lower woody parts of stem 2,5–3 mm in diam., brown or grey-brown; shoots of current year ± erect and sturdy, green or bluish green; internodes 4–10 mm long and 1–2 mm in diam. Leaves represented by adpressed or scarcely erect-spreading triangular cusps, 0,5–2 mm. Inflorescence of lateral and terminal short dense spikes not elongating in fruit. Flowers condensed or distant subtended by ± distinct short adpressed-spreading leaves. Perianth segments incurved, broad ovate-orbicular, c. 1,5 × 1,5 mm, apically irregularly denticulate. Stamens 5 exserted; thecae 0,7 mm, ovoid; staminodes not or minutely papillose. Styles 2(–3) very short. Perianth segments all winged in fruit, spreading; wings c. 4 × 5 mm, pale brown. Seed c. 1,5 mm in diameter.

Hab.: Dry rocky limestone or clay slopes, 1400–2800 m. – Fl. V–VI, fr. VIII–IX.

Afghanistan: E: Ghorband: Near Surkh-o Parsa, 2050 m, FREITAG 1136! – C: Bamian: Dragon valley (Hadj), 2700 m, BRECKLE 4760! Bamian, central mountains, NEUB. 422/1951! 429/1951! Bamian, 2500 m, KOEIE 2807! 2820! Bamian, Buddha statue, 2400 m, PODLECH 12599 (type of *Arthrophytum pallidiflorum*)!, PABOT A-1286! ENE Bamian, 2800 m, GILLI 2154! Topchi (Topchee), GRIFF. 1786 = Journ. 1098! Ghulghula Citadel (Ghooghoola), GRIFF. 1787 = Journ. 1133 (syntype of *Anabasis multiflora*)! Shahr-e Shak (Sahre Zohak), 16 km E Bamian, 2400 m, PODLECH 17031!, 19591!, BRECKLE 2339! Yakawlang, 2600 m, DIETERLE 768! Doab: Bulola, 2780 m, GILLI 2153! 2 km W Bulola to Bamian, 2400 m, PODLECH 17041! Ajar valley, 1500 m, HDG. & WDB. W-4113 (type of *Anabasis bamianica*)!, RECH. 16620!, 37012! Doab, 1400 m, KOEIE 2874! Lorinj, 2400 m, KOELZ 1366!, 13673!, 13674! Ghorat: W side Shibar pass above Shumbula school, 2800 m, WDB. & EKBERG, W-9756!

Distr. gen.: Endemic to C Afghanistan.

Variable in stem thickness and texture, but apparently a distinct species; the north Afghan *H. gracile* is a close relative.

6. ***H. gracile*** (AELLEN) HEDGE, comb. nov.
Syn.: *Arthrophytum gracile* AELLEN, Årb. Univ. Bergen 1963 Math.-Nat. Ser. 18: 47 (1964).
Icon.: Tab. 184.
Type: Afghanistan: N: Mazar-i Sharif: I.C. HEDGE & P. WENDELBO, W-3900, holotypes BG!; isotypes E!

Low growing suffruticose herb, 10–20(–30) cm, much branched from base, forming large clumps; rootstock to 6 mm thick; lower woody stems c. 1–2 mm in diam.; shoots of current year yellow-green, erect, 0,8–1,5 mm diam.; internodes 3–8 mm long. Leaved reduced to ± adpressed stiffish cusps. Inflorescence of mostly terminal spikes; flowers condensed or distant, subtended by spreading bract-like leaves, shorter than flowers. Perianth segments scarious, incurved, ovate-orbicular, c. 1 mm long irregularly denticulate. Stamens 5, exserted; staminodes present, fringed-papillose. Styles 2, very short. Perianth segments all winged in fruit, spreading; wings c. 1,5–2 x 2,5–3 mm, pale brown or pink. Seed c. 1,5 mm in diameter.

Hab.: Rock crevices, among limestone rocks; 500–800 m. – Fl. V–VI, fr. XI.

Afghanistan: N: Mazar-i Sharif: Balkh: Koh-i Alburz, valley of Balkh river, Cheshma-e Shafa, 500–800 m. HDG. & WDB. W-3900!, RECH. 16192a!-b!, PODLECH 30891!, 31601!, 32440!, 32690! Koh-i Alburz, 13 km SW Mazar-i Sharif, 610 m, FURSE 7768! – NW: Bala Murghab: 33 km S Bala Morghab at road to Qala Nau. 620 m, FREITAG 6773!

Distr. gen.: Endemic to N Afghanistan.

I have transferred this species from *Arthrophytum* to *Haloxylon* with some uncertainty. It occupies, as does its clear ally *H. multiflorum*, a rather intermediate position between the 2 genera.

7. ***H. Griffithii*** (MOQ.) BOISS., Fl. Or. 4: 950 (1879).

Suffruticose herb, (10–)30–80 cm, much branched from near base, forming loose irregular clumps; rootstock to 10(–15) mm thick; shoots of current year green or greyish glaucous, (rarely with fugacious dense wool) not or scarcely fleshy, terete, 1–1,5 mm diameter, erect or spreading-erect internodes 5–10 mm long. Leaves very variable in size, 1–8 mm long, adpressed to erect-spreading, terete, rather sturdy. Inflorescence paniculate of numerous lateral and terminal spikes; flowers usually distant, subtended by spreading bract-like leaves shorter than flowers, ± scarious-margined. Perianth segments ovate, obtuse, 1–1,5 mm long, scarious with a membranous margin, denticulate. Stamens 5, exserted; thecae 0,7 mm; filaments basally connate on a hypogynous disc, alternating with fringed-papillose staminodes. Styles 2–3 with thick stigmas. Perianth segments all winged in fruit, spreading; fruit, with wings, 6–9 mm; wings to 2,5 x 4 mm, pale brown, yellow, green, pink or reddish violet. Seed 1,5–2 mm diam.

Distr. gen. species: Afghanistan, Pakistan, C Asia.

As a result of studying a very large number of Afghan and Pakistan specimens, I came to the conclusion that it was not possible to recognize 4 separate species in this complex – as has been done in the past. Some of the facets of variation look quite distinct but with the material now at hand all these facets merge into each other without any apparent discontinuity. PODLECH (Mitt. Bot. Staatssamml. München 12: 57. 1975) discussing 3 of the species, suggested that they might be better being treated as subspecies. Here I recognize two weakly separated subspecies: one more north-eastern, the other more northern, central and southern (type subspecies).

1a. Leaves c. 1–2,5 mm; plants up to 80 cm, with rather slender stems . . . . . .
. . . . subsp. *Griffithii*
b. Leaves c. 2,5–8 mm; plants to c. 40 cm, with rather sturdy stems . . . .
. . . . subsp. *wakhanicum* (PAULSEN) HEDGE

–– subsp. *Griffithii*

Syn.: *Caroxylon Griffithii* MOQ. in DC., Prodr. 13, 2: 175 (1849). *Arthrophytum Griffithii* (MOQ.) ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 570 (1934). *Arthrophytum leptocladum* M. POP. ex ILJIN, Bot. Zhurn. 19, 2: 171 (1934) et KOMAR., Fl. URSS 6: 667 (1936). *Haloxylon leptocladum* (M. POP. ex ILJIN) KOROV., Acta Univ. As. Med. ser. 8b, 12: 22 (1935). *Hammada Griffithii* (MOQ.) ILJIN, Bot. Zhurn. 33: 583 (1948). *Hammada leptoclada* (M. POP. ex ILJIN) ILJIN, Bot. Zhurn. 33, 6: 582 (1948).

Icon.: KOROV., Fl. Uzbek. 2: tab. 29, fig. 4 (1953) – as *Hammada leptoclada*. – Tab. 185.

Type: lectotype selected here: Afghanistan (Bamian, "Kulloo pass", "Topchee"), W. GRIFFITH Journ. 1103, K!

Afghanistan: N: Mazar-i Sharif: Balkh, AMSEL! 50–60 km NW Balkh, 280–310 m, BRECKLE 4662!, 4678! 20 km NW Shibarghan to Andkhui, Khwaja Do Koh, 310 m, PODLECH 16984! 10 km SE Andkhui to Shibarghan, 285 m, PODLECH 16975!, 16976!, NEUB. 176/1950! 20 km E Andkhui, Dasht-e Laila, 300 m, BRECKLE 4714! Kokjar, 15 km NNW of Haibak to Tashkurghan, 990 m, PODLECH 19776! 15 km SW Akcha to Shibarghan, 300 m, PODLECH 19805! Tashkurghan to Mazar-i Sharif, 400 m, GILLI 2142! Tang-i Tashkurghan, PODLECH 32707!, KOELZ 13166! 8 km SE Taralai to Chahar Mallah, 1300 m, PODLECH 32443! Khulm valley, 4 km S Sayad, 670 m, PODLECH 32711! – SW: Farah: Dasht-e Asad Khan, Dilaram to Herat, 900 m, PODLECH 32472!, 32473! 71 km NW Dilaram to Herat, 1300 m, PODLECH 32474! 10 km NW Dilaram to Farah Rud, 900 m, RECH. 37568!, 37569!, 37573!, 37574! Ad margines Dasht-i Margo prope Khormalik, inter Farah et Dilaram, 800 m, RECH. 19272! – SE: Kandahar: 45 km SE Kandahar to Spin Boldak, Takhtapul, PODLECH 32652! Tirin: Tirin, LINDB. 824/1960! Kalat-i Ghilzai: Khaleqdakhan, 20–22 km NO Kalat-i Ghilzai to Mukur, PODLECH 32633!, 32635!, Inter Kalat-i Ghilzai et Mukur, 1800 m, RECH. 19281-A!, 19282-A! 20 km SW Kalat-i Ghilzai, Marbolaq, 1480 m, PODLECH 31750! – E: Kabul: Kabul, NEUB. 61/1950!, 63/1950!, 89/1950! Ghorband: Dahane Botyan, 2500 m, PODLECH 17050! 30 km W Charikar, 2000 m, BRECKLE 4743! Ghorband valley, 1900 m RECH. 36881! Ghazni; Nani (Nanee) to Ghazni, GRIFF. 1794! Ghazni, GRIFF. s.n.! – NE: Kataghan: Paigah Kotal (Mirza Atbili, Robatak) 1140–1300 m, BRECKLE 4645!, NEUB. 169/1950! PODLECH 19777! Surkh-Kotal, 10 km S Pul-i Khumri to Doshi, 800 m, PODLECH 19750! Ashraf valley, Pazak, 1250 m, NEUB. 4391! Andarab valley, 8 km E Doshi, 970 m, PODLECH 32374! Darya-e Kayan, Dohan-e Kayan, 1300 m, ANDERS 4714! – C: Bamian: Kuh-i Baba, GILLI 2152! Bamian, Buddha statue, 2400 m, PODLECH 12193! Bamian, 2400 m, KOEIE 3034!, NEUB. 416/1951! Ghulgula, 2550 m, KOEIE 2782! 10 km W Bamian, Darrah-i Sokhtar, 2800 m, PODLECH 19521! Topchi (Topchee), GRIFF. Journ. 1103! Byani, Turkestan side of Kuh-i Baba, GRIFF. s.n.! 16 km E Bamian, Shahr-e Shak (Sahre Zohak), c. 2400 m, BRECKLE 4758!, PODLECH 15965!, 16031!, 17034!, 19590! 2 km W Bulola to Bamian, 2400 m, PODLECH 17036! Doab: In valle Ajar, W Doab, 1500 m, RECH. 37011!, PODLECH 12610!, 12608! N or Doab, Eshpushta, GILLI 2143! Doab, VOLK 495!, 1742! – Afghanistan (Bamian ?), GRIFF. 1791, 1793–95.

Pakistan: S. Waziristan: Wana, 1370 m, LOWNDES 663! – Quetta: 30 km S Quetta, 2000 m, ANDERSEN & PETERSEN 465! 5 km NE Quetta, 1750 m, FREITAG & KOTHE 18793!, 18784! Quetta, HEISS 5! Urak, Hanna valley, LACE IN WATT 3926!, FURON U4!, U6! Murdar range, SINCLAIR 2764! Loralai, MOHINDAR NATH 2002! 2 km Hirok to Quetta, FAROOQI & QAISER 2295! Kach, A. ALI 223! Khojak, 1700 m, KOEIE 3333! – Kalat: inter Basima et Surab, 1600 m, RECH. 28311! Basima prope Jangal, 1350 m, RECH. 28287! 10–12 km S Khuzdar, RECH. 27386!, FREITAG & KOTHE 18935! – Bal.: 40 km E Nushki, 1600 m, FREITAG & KOTHE 18762!

Hab.: dry slopes, overgrazed plains, clay soil, pediment plains. with *Artemisia*, saxaul sand desert, among sand dunes, sterile slopes, with *Tamarix*, limestone and salty slopes, 100–2800 m. – Fl. VIII–X; fr. X.

Distr. gen. of subspecies: Afghanistan, Soviet C Asia, Pakistan.

Generally a more slender plant than the following subspecies, but there are several specimens that cannot be assigned with certainty to either subspecies.

–– subsp. ***wakhanicum*** (PAULSEN) HEDGE, stat. nov.

Syn.: *Anabasis wakhanica* PAULSEN, Vidensk. Meddel. Dansk Naturhist. Fören. Kjöbenh. 201 (1903). *Arthrophytum wakhanicum* (PAULSEN) KOROV. ex ILJIN, Bot. Zhurn. 19, 2: 171 (1934). *Haloxylon wakhanicum* (PAULSEN) KOROV., Acta Univ. As. Med. ser. 8b, 12: 23 (1935). *Hammada wakhanica* (PAULSEN) ILJIN, Bot. Zhurn. 33, 6: 582 (1948); *Arthrophytum Lindbergii* AELLEN, Årb. Univ. Bergen 1963 Math.-Nat. Ser. 18: 47 (1964).

Icon.: OVCZ., Fl. Tadjik. 3: tab. 74, fig. 1–2 (1968) – as *Hammada wakhanica*.

Type of subspecies: (Pamir Vakhanskiy) Wakhan, Langarkisht, 3000 m, 10.IX.1898, O. PAULSEN 1354, C.

Hab.: Hot dry slopes, with *Artemisia, Ephedra*, granite silicate and loam banks, salt steppe, moraine; 900–3400 m. – Fl. VII–VIII, fr. X.

Afghanistan: SW: Farah: 10 km NW Dilaram versus Farah Rud, 900 m, RECH. 37572a!, b! 17 km ENE Share Safa, 1310 m, PODLECH 32641! – SE: Kalat-i Ghilzai: 30 km NE Qalat-i Ghilzai to Mukur, 1670 m, PODLECH 31753!, KOEIE 3033! – E: Kabul: Kabul, Sher Darwasah, 1810 m, GILLI 2145! Rishkhor and Qal'eh Kuh-i Nanagak, 1830 m, LINDBERG 1316/1962 (holotype of *Arthrophytum Lindbergii* – holo BG!; iso – G-AELLEN)! Surch Koh E of Charasiah, 2170 m, GILLI 2148! Kabul, 2100 m, GILLI 2147!, KOELZ 13490!, RECH. 19338!, VOLK 428!, 2220! Tang-i Gharu, 1800 m, HDG & WDB. W-5101! Logar valley, 1900 m, NEUB. 3390!, PODLECH 32717! Logar valley, Neasi, 1830 m, GILLI 2146! Chakewardak, 2200 m, GILLI 2149! Wardak, VOLK 855! Ghorband: In valle Ghorband, 1900 m, RECH. 36882! Ghazni: NE Ghazni, 2260 m, GILLI 2150! 24 km SE Mukur to Ab-e Istada-i Mukur, 1990 m, PODLECH 19419! Gardez: Gardez, 2440 m, KOELZ 11906! Urgun: Urgun, VOLK 71/755a! Gomal valley above Gomal, 1850 m, FREITAG 3351! – NE: Munjan: Munjan pass, 1650 m, EDELB. 2242! Wakhan: Langar Kisht, 3000 m, PAULSEN 1354! Warg, GRANCY 101! Central Wakhan, Qala Panjao, 2800 m, BRECKLE 1471! Qazi-Deh, 2600 m – throughout Wakhan to 3400 m – ROEMER 291! Khandud valley, 3100 m, ANDERS 8246! RENZ 89! Kataghan: lower Andarab valley, 1100 m, LAMOND 2285!, RECH. 31760! Takhar: Farkhar valley, 2700 m, PODLECH 12675! Khost-o Fereng, PODLECH 11961! Badakhshan: Kokcha valley, 8 km S Jurm, PODLECH 12726! 30 km E Faydzabad to Baharak, PODLECH 12720! – C: Bamian: inter Bamian et Band-i Amir, 2800–3000 m, RECH. 18155! Band-i Amir, 2900 m, RECH. 18298! Bamian, VOLK 2409-A! Pakistan: Chitral: Brep, N of Mastuj, 2440 m, STAINTON 3079! Shohgoz, Yarkhun, 2700 m, STAMM & WÖHRL 2321! Drosh, 1200–1500 m, SIDDIQUI 27123! Gahirat S Chitral, 1350 m, STAINT. 3265!

Distr. gen. of subspecies: Afghanistan, C Asia, Pakistan.

The longer leaves, sturdier habit and smaller size are the characteristic features of the subspecies, but not infrequently these characters break down or are not linked with geographic distribution.

Species doubtfully in our area

H. Thomsonii BUNGE ex BOISS., Fl. Or. 4: 950 (1879) – in obs. *Arthrophytum Thomsonii* (BUNGE ex BOISS.) ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 570 (1934). *Hammada Thomsonii* (BUNGE ex BOISS.) ILJIN, Bot. Zhurn. 33: 583 (1948).
Type: 'Tibet', T. THOMSON, E!

Recorded by R.R. STEWART, Cat. Vasc. Pl. Pakistan 217 (1972) from Chitral. One of the cited specimens, STAINTON 3079 is in fact *H. Griffithii* subsp. *wakhanicum*. *H. Thomsonii* is very closely related to *H. Griffithii* but apparently distinct on account of the long linear leaves up to 15 mm; it grows in Tibet, Gilgit, Baltistan and Ladak.

35. *Petrosimonia*

I.C. HEDGE, Edinburgh

Petrosimonia BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 19, 52 (1862).

Lit.: A. VON BUNGE, Mémoires de l'Académie Impériale des Sciences de Saint Pétersbourg, 7 série, 4, 11: 52–60 (1862).

Annual small or medium-sized herbs with a distinct indumentum of adpressed or spreading simple and "irregularly medifixed" flattened hairs (strong magnification needed), barbellate or not. Stems not jointed. Leaves well-developed, ± linear-cylindrical, sessile, fleshy or not, spreading or recurved, opposite or alternate, apiculate, without prominent apical bristles. Flowers inconspicuous, solitary in leaf axils, hermaphrodite with 2 tightly subtending leaf-like bracts which harden in fruit. Perianth segments 3–5, membranous, erect; in fruit without wings or appendages, hardening at base. Stamens 3–5, exserted or not, with or without short terminal extensions on connectives, apically fused (and forming an open ovoid cage) or not. Ovary ovoid with a 2-lobed style. Fruit hidden within subtending indurated bracts. Seed vertical with a prominent flat-spiral embryo; endosperm absent. – Lectotype of genus: *P. monandra* (PALL.) BUNGE (*Polycnemum monandrum* PALL.); cf. ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 2, 16C: 579 (1934).

About 10 species in Europe, SW and C Asia; mostly confined to salt marshes. The combination of annual habit, the presence of at least some "medifixed" hairs (but this requires careful observation and the character should not be overstressed as a generic feature) and the adpressed basally indurating bracts tightly enveloping the wingless fruiting perianth segments are diagnostic for the genus. Its closest relative is probably *Halimocnemis* in which genus MOQUIN-TANDON in his 1840 family monograph (Chenopodearum Monographica Enum. 150–156) placed all of our species. A little-known and under-collected genus in our area. It merits an overall revision.

1a. All leaves opposite 2
b. Lower leaves opposite, upper alternate 3
2a. Indumentum of at least some long spreading barbellate hairs; appendages of staminal connectives not cohering .... 2. *P. sibirica* (PALL.) BUNGE
b. Indumentum ± entirely of adpressed hairs, long spreading barbellate hairs absent; appendages of staminal connectives cohering .... 1. *P. brachiata* (PALL.) BUNGE
3a. Perianth segments 5; stamens 5; lateral stem branches and internodes short .... 3. *P. glauca* (PALL.) BUNGE
b. Perianth segments 3–4; stamens 3–5; lateral stem branches and internodes long .... 4. *P. triandra* (PALL.) SIMONKAI

1. ***P. brachiata*** (PALL.) BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7 sér., 4, 11: 59 (1862).
Syn.: *Polycnemum brachiatum* PALL., Illustr. Pl. 62 (1803). *Halimocnemis brachiata* (PALL.) C.A. MEY. in LEDEB., Fl. Alt. 1: 381 (1829).
Icon.: PALL., Illustr. Pl.: tab. 52 (1803-6). TAKHT., Fl. Armen. 2: tab. 120 (1956). – Tab. 186.
Type: (Caspian) "In deserto Caspico et Tatarico australiore, usque ad Irtin fluvium, locis salsuginosis et aquosis ...", P.S. PALLAS.

Annual, 20–35 cm, glaucous, with a pubescent indumentum. Stems branched from the base, or not, straw-brown, glabrescent. Leaves all opposite, 10–15 × 1,5–2 mm, spreading, basally scarcely enlarged. Flowers in short lateral branches arising from leaf axils; leaf-like subtending bracts tightly enclosing the solitary flowers. Perianth segments 5, broad oblong, c. 2,5 mm. Bracts and perianth segments basally hardening and somewhat accrescent in fruit. Stamens 5, apically connate; thecae linear, c. 1,5 mm, with short extensions to the connectives. Seeds 2 × 1,8 mm.

Hab.: Salty soils, from below sea level –1200 m.

T a l i s h : Talish sec. GROSSH., Fl. Kavk. 3: map 173 (1945).
P e r s i a : N: Gorg.: 5 km S Gomishan, 10 km N Bandar Shah, HEWER 4042-! – W: Azerb.: Golman Khaneh, BEHB. & AELLEN 40280-E! Tabriz near railway station, 1350 m, AELLEN 2948! N bank Rezaiyeh lake, 1220 m, BEHB. & AELLEN 2935!, 2940!

Distr. gen.: SE Europe, Turkey, Caucasus, Talish, N and W Persia, W Siberia.

Characterized by all the leaves being opposite. Although ILJIN in Fl. URSS 6:325 (1936) states that the anther appendages are not fused, this is not true for the Caucasian material examined. Material from our area is very sparse and inadequate. Rather similar in facies to *Salsola brachiata* PALL. in which the perianth is winged in fruit and the seed is horizontal.

2. *P. sibirica* (PALL.) BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 60 (1862).
Syn.: *Polycnemum sibiricum* PALL., Illustr. Pl. 61, tab. 51 (1803). *Halimocnemis sibirica* (PALL.) C.A. MEY. in LEDEB., Fl Alt. 1: 382 (1829).
Icon.: BOTSCH. in VVED., Fl. Uzbek. 2: tab. 30, fig. 1 (1953). – Tab. 187.
Type: (Siberia) "In planitie salsuginosa ad Irtin, a Samyscheva usque supra Semipalatnaja; occurrit etiam in salsis ulterioris Sibiriae...", P.S. PALLAS.

Annual, 10–40 cm, with a prominent indumentum of mostly spreading long barbellate (high magnification required) hairs; few adpressed "irregularly medifixed" hairs also present. Stems erect with elongated, ± slender, spreading lateral branches. All branches and leaves opposite. Leaves linear, cylindrical, up to 3,5 cm, widened at base and semi-clasping, spreading-erect. Leaf-like bracts adpressed to stem. Perianth segments 5, membranous, c. 3,5 mm. Stamens 5, thecae c. 2 mm, linear, not apically cohering.

Afghanistan: **SE**: Kandahar: 30 km ESE Girishk on road to Kandahar, 870 m, PODLECH 16987a. 25 km NNE Girishk on road to Kajakai, 1000 m, FREITAG 6864! – **E**: Gardez: 25 km S Gardez, 2100 m, FREITAG 3246!

Distr. gen.: W Siberia, Mongolia, C Asia, Afghanistan, China (Sinkiang).

Sharing with *P. brachiata* the character of opposite leaves. Afghan localities are geographically far distant from other records of the species; further studies are required. The determination of FREITAG 3246 is uncertain.

3. *P. glauca* (PALL.) BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 58 (1862).
Syn.: *Polycnemum glaucum* PALL., Illustr. Pl. 63 (1803).
Icon.: PALL., l.c.: tab. 54 (1803). – Tab. 188.
Type: (Caspian) "Haec species copiose crescit in limoso-salsuginosis circa lacunas et lacus salsos deserti Caspii, praesertim secundum Volgam...", P.S. PALLAS.

Annual, 5–30 cm, with a pubescent indumentum, ± glaucous. Stems branched from near base, pale brown or reddish, ± terete, glabrescent, leafy, lateral branches short. Leaves opposite below, alternate above, 5–20(–30) mm long, erect-spreading or recurved, basally enlarged and clasping-decurrent, acuminate. Leaf-like bracts adpressed to stem, recurved, longer than perianth. Perianth segments 5, membranous, c. 4 mm, basally somewhat hardening in fruit; inner perianth segments shorter and narrower than outer 2 or 3. Stamens 5, apically connate; thecae c. 1,5–2 (–2,5) mm, linear, reddish, forming an open cage, exserted.

Hab.: Salt flat, silty soil, dry river beds, with *Cressa*, edge of barren flats, Chenopod steppe; 700–1500 m. – Fl. V–VIII, fr. VIII–IX.

Persia: **W**: Azerb.: 50–70 km Tabriz to Ahar, Achi Chay valley, 1500 m, RECH. in LAMOND 3669! 22 km N Marand, 1070 m, PABOT 30330-E! 55 km from Maku to Marand, 1000 m, TERME 30353-E! Ad ripam australem salsam lacus Urmia (Rezayieh) inter Bunab et Khanian, RECH. 14769! Lake Urmia (Rezaiyeh), SW side, 1300 m, JACOBS 6874! Ham.: Ab-e Garm near Hamadan, SAB. in GAUBA 2139! Esf.: Locis subsalsis ad fontem prope Robat-e Tork, SOJÁK 6874! 6876-6878!, 6884!, 6885!, 6898! – **S**: Fars.: Saidabad (Sirjan) to Ghatrimeh, 1600 m, MOUSSA-

VI & TEHRANI 40148-E! – E: Khor.: Gonbad-e Kavus to Bojnurd, BAUM 65:2175! In valle fluvii Atrek inter Bojnurd et Shirvan, RECH. 1823! 74 km W Mashhad, 1300 m, ANDERSEN & PETERSEN 354! 20 km W Shirvan, 950 m, UOTILA 19098-a!, 19098-b! – C: Qazv.: Esmatabad, MAZAHERI 30309-E! Mardabad, 1400 m, GAUBA 1706! Turan Prot. reg.: N Dochah, 1030 m, WDB. & FOROUGHI 18745, FREITAG 14090! E Delbar, 700 m, WDB. & FOROUGHI 18926. Shakh-e Biar SW Bijarjmand, 1150 m, FREITAG 15066!
Turcomania: Ashkhabad sec. NIKITIN, Ill. Opred. Rast. Ashkhabad 124 (1963).

Distr. gen.: Caucasus, Persia, Turcomania, C Asia.

Although known from several gatherings, this is not a well-known species; hardly any of the field notes give supplementary information about the plant's habitat or field characteristics and none of the specimens are in ripe fruit.

4. ***P. triandra*** (PALL.) SIMONKAI, Enum. Pl. Transs. (Erdely edenyes Florajanak) 466 (1866).
Syn.: *Polycnemum triandrum* PALL., Reise 1: 483 (1771). *P. salsum* WILLD., Spec. Plant. 1: 192 (1797). *P. volvox* PALL., Illustr. Pl. 60 (1803). *Halimocnemis volvox* (PALL.) C.A. MEY. in LEDEB., Fl. Alt. 1: 383 (1829). *Petrosimonia nigdeensis* AELLEN, Notes Roy. Bot. Gard. Edinb. 28: 33 (1976).
Icon.: PALL., Illustr. Pl.: tab. 50 (1803-6) sub *P. volvox*. – Tab. 189.
Types: (Urals) "Inter arenosos colles deserti ultra Bogyidai fluentum, a Iaiko descendens..." [Ural'sk to Kalmykovskoe sec. Fl. URSS 6: 319 (1936)]; locis subsalsis, P.S. PALLAS.

Annual, 10–30 cm, with an adpressed indumentum at least when young. Stems much branched from base with long lateral branches and elongated internodes, glabrescent. Leaves except lowermost alternate, to 4 cm long, linear, cylindrical, clearly dilated at clasping base. Leaf-like bracts adpressed to stem, apically recurved; basally indurated in fruit. Perianth segments 3(–4) membranous. Stamens 3–5; thecae not (?) cohering. Fruit ± embedded in the cartilaginous covering of bracts and lower perianth segments.

Persia: W: Azerb.: Schindawur (Shendabad ?) near Tabriz, 1.X.1884, KNAPP! Esf.: 7–14 km Hoseynabad to Varzaneh sec. ASSADI, Iranian Journ. Bot. 2,2: 136 (1984)

Distr. gen.: SE Europe, Turkey, Persia, Caucasus, Siberia, Aralo-Caspia.

Species doubtfully determined or doubtfully in our area

P. oppositifolia(PALL.) LITW. – BOISSIER, Fl. Or. 4: 973 (1879) records this widespread species as *P. crassifolia* (PALL.) BUNGE, from Persia, Ispahan. The specimen "in deserto ad Murtchehar prope Ispahan, anno 1868, HAUSSKNECHT, (JE!) is difficult to identify being in an advanced fruiting stage. Further gatherings are needed, but it may in fact be an old, basally woody, specimen of *P. glauca*, which is known from the Esfahan area. The 2 species, *P. glauca* and *P. crassifolia*, are certainly close and readily confused.
P. squarrosa(SCHRENK)BUNGE is recorded by BOISSIER & BUHSE [Aufz. Reise Transkauk. in Nouv. Mém. Soc. Imp. Nat. Mosc. 12: 190 (1860)] from Persia "Albursgebirge, Tsches-

chme", but the record of this mainly C Asiatic species is not repeated in Flora Orientalis. It is probably a misidentification of *P. glauca*.

36. *Halocharis*

I.C. HEDGE, Edinburgh

Halocharis MOQ. in DC., Prodr. 13, 2: 201 (1849) pro parte.

Lit.: A. BUNGE, Anabasis in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg 7. série, 4, 11: 61–65 (1862). M.M. ILJIN, Revisio specierum generis Halocharis MOQ.-TAND., Notulae Systematicae ex Herbario Instituti Botanici V.L. Komarovii Academiae Scientiarum URSS 12: 74–81 (1949).

Annual herbs with a prominent indumentum of simple ± spreading barbellate (high magnification needed) hairs. Leaves well-developed, linear, alternate, thick or fleshy, sessile, at apex with a few or several bristle-like multicellular hairs. Flowers hermaphrodite, borne in leaf axils, solitary or in clusters, basally often with dense tufts of white hairs. Perianth segments well-developed 5, free to base, membranous, not enlarged in fruit. Stamens 5; thecae often diverging; connective terminating in an inflated, exserted, conspicuous coloured vesicle. Style divided to near base or only apically. Fruit vertical, included in perianth. Seeds vertical with a spiral embryo; endosperm absent. – Lectotype of genus: *H. sulphurea* MOQ., see ULBRICH in ENGLER & HARMS, Natürl. Pflanzenfam. ed. 3, 16c: 580 (1934).

About 8–10 species in C and parts of SW Asia. Well-represented in our area. Clearly related to such other genera with terminal inflated staminal vesicles as *Halarchon*, *Halanthium* and *Halimocnemis*; generic limits among them are not always clear. In *Halocharis*, the shape and colour of the vesicles provide important taxonomic characters for the species; observations on them should be made on living specimens. Relatively few of the large number of our gatherings have ripe fruit, but fruits do not seem to provide useful taxonomic characters.

1a. Staminal vesicle with a distinct stipe c. 0,6 mm long; vesicle pink to violet . . . . 4. *H. clavata* BUNGE
b. Staminal vesicle sessile or with a stipe to c. 0,1 mm; vesicle white, purplish to yellow 2
2a. Vesicle ± triangular in outline, apically ± distinctly acute, pale yellow . . . . 5. *H. hispida* (SCHRENK) BUNGE
b. Vesicle oblong-elliptic to ± spherical, yellow or rose-purple 3
3a. Perianth segments externally with a very dense indumentum of tangled hairs; axils of bract-like upper leaves densely woolly . . . . 3. *H. lachnantha* E. KOROV.
b. Perianth segments externally villous to pilose; axils of upper leaves not densely woolly 4
4a. Vesicles yellow, oblong-elliptic to ± spherical . . . . 1. *H. sulphurea* (MOQ.) MOQ.

b. Vesicles pink to violet, ± spherical to obovoid . . . . 2. *H. violacea* BUNGE

1. ***H. sulphurea*** (MOQ.) MOQ. in DC., Prodr. 13, 2: 201 (1849) exclud. Pl. Afghan.
Syn.: *Halimocnemis sulphurea* MOQ., Chenopod. Monogr. 152 (1840). *Halocharis farsistanica* ILJIN, Not. Syst. Leningrad 11: 78 (1949).
Icon.: Tab. 190.
Types: Persia, P.M.R. AUCHER-ELOY (1759, 1761), G.

Annual, glaucous or not, much branched from near base or scarcely branched, becoming woody towards the end of the growing season. Stems 2,5–40 cm, terete, prostrate, ascending or erect, often brown, with a spreading indumentum of long (up to 4 mm) and short hairs of varying density, persistent or glabrescent. Leaves 5–15(–25) × 0,7–1,8 mm, linear, solitary or clustered, sessile and almost clasping, fleshy, terete or channelled, with a similar indumentum to that on the stem, apically with few or several bristle-like hairs. Flowers in axils of upper smaller clustered leaves, few or several. Perianth segments membranous-transparent, 2–4 × 0,8–1 mm, with tangled fine hairs externally, glabrous internally. Staminal filaments 2–3,5 mm with or without glandular papillae; thecae 1,1–2 mm; vesicle clearly exserted, oblong-elliptic to subspherical, usually apically ± rounded, sometimes subacute or apiculate, yellow, (0,5–)1–2 × c. 0,9 mm, very shortly stipitate. Style 2,5–3 mm, with 2 spreading-recurved flattened arms.

Hab.: Semi-desert, stony hillsides, dry river beds, on loam, clay, silty and sandy ground, marl slopes, saline flats with *Tamarix*, disturbed ground; sea-level to 1800(–2450) m. – Fl. VI–XI, fr. XI–XII.

I r a q : Diyala: ad confines Persiae, inter oppida Mandali et Badra, RECH. 9683! 5 km W Mandali, substr. gyps., RECH. 9606! Jabal Hamrin, near Shahraban (Muqdadiya), HAINES 1453!
P e r s i a : W: Arak: Davudabad, ABAI & MOJIB 30428-E! Khuz.: 16 km W Behbehan, 300 m, GRANT 15910! 7 km SW Ram Hormoz, 150 m, IRANSHAHR & MOUSSAVI 30437-E!, 40188-E! Ahvaz, KOELZ 14925! Bandar-e Deylam to Bushehr, SOLTANI 14859-E! Bandar-e Deylam (Bandar Dilen), HAUSSKN.! – S: Fars.: Maharlu lake, ALAVA 10714! N shore Neyriz lake, STARM. 41!, 45! W shore Neyriz lake, BOBEK 26! Neyriz, in salsis ad pagum Chir, 1600 m, BORNM. 4186 (type of *H. farsistanica*)! Dowlatabad, SOJÁK 4356!, 4360!, 4361! Farrashband, Hoseynabad, MIRZAIAN & KASHKOULI 40209-E! Kemalabad, 19 km W Sarvestan, SOJÁK 5522!, 5522-B! Kerman: Aliabad to Gav Koshi (Esfandaqeh), 1550 m, ASSADI & al. 1931! W Jaz Murian, 27°21'N, 58°16'E, Kahn Mirza to Tumgiran, 370 m, LÉONARD 5715! Kavir-e Jaz Murian, Kahnuj to Sorkh-Qaleh, 420 m, ERSHAD & al. 40091-E!, 40142! Lar.: 12 km NW Minab, SOJÁK 4874! Hasan Langi, 62 km E Bandar Abbas, SOJÁK 4682! 10 km E Bandar Khamir (Khomyer), sea level, DAVIS & BOKHARI D.56138! Taheri to Akhtar, 60 m, BOKHARI & al. 14830! Borozjan to Genavi, 70 m, BOKHARI et al. 14781! Saadatabad between Hajjiabad and Bandar Abbas, RECH. 3289! 70 km N Bandar Abbas to Saidabad (Sirjan), 430 m, WDB. & FOROUGHI 15746! 40 km Saidabad (Sirjan) to Bandar Abbas, 1700 m, FOROUGHI & ASSADI 15050! Bahgu, 22 km from Bandar Abbas, SOJÁK 4662! Gachi to Fengunek, STAPF 768! Fengunek, STAPF 676! Bal.: Zahedan to Khash, c. 1400 m, RECH. 4219! Khash to Iranshahr, M. Karevandar, c. 1550 m, RECH. 4023! Bazman to Bampur, 900 m, RECH. 54990! Bazman, 1000 m, RECH. 54985! – E: Khor.: Doruneh, PARRIS 75.144! Inter Torbat-e Sheikh Jam et Tayyabad, RECH. 1383! 70 km SW Torbat-e Heydariyeh, Jannatabad to Alui, 850 m, RECH.

51377! – C: Tehr.: 15 km W Garmsar, 1000 m, BRECKLE 5021! Hableh Rud, MANUCH. & AELLEN 30093-E! Bahram 20 km E Tehran, 1100 m, AELLEN 3001! Qazv.: W Karaj, FORUGHIAN 2817!, 2871! 77 km W Karaj, 1100 m, BABAKHANLOU & AMIN 2922! Shah Dasht, 32 km W Karaj, FORUGHIAN! Mardabad, GAUBA 2106! Kavir Prot. Reg.: above Karavan-Sarai Shah Abbas, 1100 m, WDB. & FOROUGHI 14623!, RECH. 46228! In ditione ruinarum Karavan-Sarai Eyn or-Rashid, 1150 m, RECH. 46242! Kush Kuh, IRANSHAHR & MOUSSAVI 40183-E! Kush Kuh, IRANSHAHR & MOUSSAVI 40183-E! Kavir, IRANSHAHR 30288-E! Siah Kuh, Chashmeh Shah, IRANSHAHR & MOUSSAVI 15404-E! Damgh.-Semn.: Prope Semnan, 1600 m, RECH. 1958! 8 km W Semnan, 1150 m, HDG., WDB. & al. 14719! 3 km S Sangsar, 1650 m, RENZ & IRANSHAHR 16783! Ab Shirin, 780 m, TERME & MOUSSAVI 30251-E! Shahr.-Bust.: Turan Prot. Reg.: Sanjari S Kuh-e Peyghambar, 1050 m, FREITAG 13693! Kashan: 28 km S Kashan, MOUSSAVI & AMIN 2727! – Persia, AUCH. 1759, 1761.
Afghanistan: SW: Herat: 300 km WNW Girishk, near Shindand, RECH. 32493! Farah: 85 km NW Dilaram to Herat, 1030 m, PODLECH & JARMAL 29010! 25 km NNE Girishk, 1000 m, FREITAG 6869! 70 km WNW Girishk to Herat, 1020 m, UOTILA 18932! Dilaram to Girishk, 800–1000 m, ANDERS 8616!, 8634!, BRECKLE 4873!, PODLECH & JARMAL 28981!, RECH. 32479!, 32474!, 37559!, VOLK 71/652! N Girishk, 1200 m, KERST. 390! 4 km N Adraskan to Dilaram, PODLECH 32547! 26 km W Sabzevar (Shindand), VOLK 71/632! 4 km S Kwaja Mard, 1200 m, PODLECH 32479! 10 km NW Dilaram to Farah Rud, 900 m, RECH. 37571! Farah Rud, Shindand to Dilaram, 1150 m, RECH. 33395! Farah, 850 m, UOTILA 16453! Jamal Ghazi, 35 km N Anardara to Shindand, 1070 m, PODLECH & JARMAL 29152! E Tir Koh, 25 km NW Farah to Anardara, PODLECH & JARMAL 29029! 10 km WSW Shehshaba to Kang (Zaranj), 555 m, PODLECH 22430! 15 km SE Chakhansur, 520 m, FREITAG 3740! – **SE**: Kandahar to Girishk, 10 km E of branch to Qala Bist (Lashkargah), 900 m, ANDERS 8669! Kajakai, 1000 m, KOEIE 2124!, ANDERSEN & PETERSEN 448! – **E**: Kabul: Kabul, HONIGBERGER! Below Sarobi, 950 m, RECH. 31035! Laghman: Woresmin Tangi, Sarobi to Jalalabad, 820 m, RASOUL 438! Nangarhar: 30 km E Jalalabad, 630 m, FREITAG 7317! Tor Khama versus Jalalabad, 600–700 m, BRECKLE 4953!, RECH. 31015!, 37430!, RECH. 37424! 8 km SW Ghaziabad, 550 m, PODLECH 19986! – **C**: Bamian, 2450 m, PODLECH 21916! Ghorat: Jam, 2150 m, PODLECH 21916!
Pakistan: Peshawar: Peshawar, HASSAN DIN 135! 9 km Peshawar to Warsak, BURTT 1508! – Quetta: Saranan to Qila Abdullah, 1400 m, RECH. 28973a & b!, LAMOND 1030 (as *H. quettensis* AELLEN, nomen)! In collibus inter Duki et Gombaz, 900 m, RECH. 29622! Popalzae, 1400 m, LACE 3343! Mangi to Ziarat, 1800 m, LACE 3940! Sibi, LACE 3425! 6 km NE Quetta, NW Hanna Lake, 1745 m, FREITAG & KOTHE 18811! Qalal Abdullah, 1820 m, Y. NASIR & Z. ALI 9985! Qila Saifullah, NATH 2185! Pishin, E. NASIR! Galangor to Quetta, GHAFOOR & OMER 2059! – S.-Wazir.: Wana Camp, 1400 m, MARWAT! – Kalat: 52 km SW Kalat, 1800 m, FREITAG & KOTHE 18912! – Bal.: 8 km Nushki to Quetta, GHAFOOR & OMER 2044!

Distr. gen.: Iraq, Persia, Afghanistan, Pakistan.

A common and widespread species in our area, variable in facies and indumentum, but fairly constant in its staminal characters. Despite the very large amount of material studied, relatively few specimens have ripe fruit. In common with many annual Chenopods, specimens gathered early in the year have a very different facies from the frequently quite woody specimens collected towards the end of the season; this seems particularly true in Pakistan Baluchistan where the species is very common.

2. ***H. violacea*** BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 63 (1862).
Icon.: Tab. 191.
Types: Several syntypes from SE Persia (Kerman), E and SW Afghanistan (Ghazni, Kandahar) and Pakistan (Baluchistan).

Very similar in habit and indumentum to *H. sulphurea*, but staminal vesicles pink, purple or violet and ± spherical or obovoid.

Hab.: Semi-desert, dried river beds, roadside, slightly saline soil, rocky slopes, sandy hills, sand desert; 800–1200(–2475) m. – Fl. III–VIII.

Persia: S: Bal.: 9 km NW Paskuh, SOJÁK 607! Fazlabad, Khash to Paskuh, SOJÁK 533!, 546!, 568! 30 km S Bampur, SOJÁK 1831! 60 km N Zahedan, 800 m, TERME & MOUSSAVI 34432-E!
Afghanistan: SE: Kandahar: 20 km E Girishk, 900 m, PODLECH 16482! 30 km ESE Girishk on road to Kandahar, 870 m, PODLECH 19205! 80 km W Kandahar to Girishk, 1000 m, RECH. 32467a! 10 km W Kandahar, S Arghandab bridge, 1000 m, PODLECH 30764! 17 km SW Qala Bist (Lashkargah), 780 m, PODLECH 30716! Girishk to Kandahar, at Lashkargah fork, 870 m, PODLECH 30701! 7–10 km E Girishk-Kandahar-Qala Bist (Lashkargah) junction, 900 m, PODLECH 8669!, 30748! SW Qala Bist, margin of Dasht-i Margo, RECH. 34501a!, -b!, 34527! 16 km NE Qala Bist, 900 m, RECH. 34746! Kandahar, HDG. & EKBERG W-7189!, MARTINCIC & WRABER 88!, 88a!, KERST. 357! 20–45 km E Kandahar, 1000–1200 m, HDG., WDB. & EKBERG W-7623!, KUKKONEN 6067!, UOTILA 18912! 15 km SE Kandahar, near airport, 1020 m, ANDERS 8693! Panjvai, LINDB. 387/1958! 48 km N Kandahar, towards Arghandab reservoir, 1150 m, RECH. 34908! Dahlah, LINDB. 421/1958! 10–20 km NE Kandahar, 1100 m, RECH. 35260! Margin of Registan desert, Kushk-i Nahhud, 1000 m, RECH. 37540! 13 km E Kushk-i Nakhud to Kandahar, 960 m, PODLECH & JARMAL 28919!, PODLECH 19618!, 30672! 15 km E Kandahar to Ghazni, 1045 m, PODLECH 16866! E Alaqadari Daman, 1040 m, PODLECH 31298! E margin Registan, Cagray Qala, 1050 m, BRECKLE 4819! 40 km NE Kandahar to Kalat-i Ghilzai, 1100 m, RECH. 35351! Near Kajakai, 1200 m, ANDERSEN & PETERSEN 458!
Pakistan: Quetta: Pishin, ZAFFAR ALI 4852! – Kalat: Khuzdar to Nal 9 km from Samandnal Levies Check-post, GHAFOOR & GOODMAN 5034!, 5036!

Distr. gen.: S Persia, SW & SE Afghanistan, Pakistan.

Possibly not meriting independent specific status from *H. sulphurea*, but further field studies are needed. Particularly common in the Kandahar region of Afghanistan, where *H. sulphurea* is also present. Herbarium specimens in which the colour of the vesicle has faded and which lack relevant field notes on colour are difficult to name with confidence.

3. ***H. lachnantha*** E. KOROV. in KOMAR., Fl. URSS 6: 880, 329 (1936).
Syn.: *H. lachnantha* var. *macrantha* ILJIN, Not. Syst. Leningrad 12: 81 (1949).
Icon.: Tab. 192.

Type: (Turcomania) in arenis Kara Kum austro-orientalibus inter puteos Czaryschly [Charyshly] et Ekizen, 21 IV.1925, E. KOROVIN", RNMUT

Annual with ascending or prostrate branches. Stems c. 20 cm with soft spreading or crisped short hairs. Leaves linear subterete, 10–20 mm long, with few soft spreading hairs or glabrescent. Upper leaves shorter, broader, clasping the stems. Flowers solitary or few, enclosed within the bract-like upper leaves. Perianth segments 3–3,5 × 1,5 mm broader at base, firm-membranous, oblong or oblong-ovate, densely covered on outer surface with long tangled hairs; inner surface glabrous. Staminal filaments c. 1,5 mm; thecae separated for most of their length; vesicle oblong-ovate, pale-rose.

Afghanistan: N: Mazar-i Sharif: Tang-e Tashkurghan, RODIN 484 (type of var. *macrantha*)! – NW: Bala Murghab: Murghab valley, 24 km S Bala Murghab, Sakhra-i Arab Majnum, 530 m, PODLECH 16958! 55 km S Bala Murghab, gorge of Darya-i Darrah-i Bum, S Samira, 720 m, PODLECH 22120.

Distr. gen.: C Asia (Kara Kum), NW Afghanistan.

Only 3 somewhat inadequate specimens of this species have been seen. It appears to be distinctive on account of the dense cotton-wool-like indumentum covering the flowers, but further specimens are needed.

4. ***H. clavata*** BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 64 (1862).
Icon.: Tab. 193.
Type: (Afghanistan – Ghazni) in arenosis prope Karabach (Mukur to Ghazni) et Jomy", W. GRIFFITH 1753 = Herb. East Ind. Comp. 4226, K!

Annual, prostrate, branched from base. Stems simple or branched, (2–)5–15(–30) cm, with long spreading hairs 1,5–2 mm long and shorter hairs, sometimes glabrescent. Leaves linear, fleshy, c. 3–5 × 0,5 mm, clustered. Inflorescence with a dense indumentum of long hispidulous adpressed-spreading hairs to 2 mm. Flowers clustered in upper leaf axils, subcapitate. Perianth segments c. 2 × 0,5 mm, membranous, oblong. Staminal filaments c. 1,8 mm; thecae c. 1,4 mm; stipe c. 0,6 mm; vesicle oblong clavate, c. 1 mm, pink, purple to violet, apically rounded. Style c. 2,5 mm.

Hab.: Salt marsh, dry steppe, river banks, damp places with *Aeluropus* and *Carex* sp., sandy ground; 1700–3150 m. – Fl. VI–VIII.

Afghanistan: SE: Kalat-i Ghilzai: W bank of Ab-e Istada, 1970 m, BRECKLE 4627A! Ab-i Istada near Mukur, 2100 m, FREITAG 6962! Between Mukur and Ghazni, GRIFF. 1753! – E: Kabul: Kabul, Morghab below Bala Hissar, 1780 m, HDG. & WDB. W-3219! Kabul, VOLK 453! Aliabad, VOLK 897! Panjeshah, NEUB. 313/1950! Qala-i Kizilbash, RECH. 18576! Kabul to Tang-i Gharu, 1770 m, GILLI 2189! W Botkhak, 1740 m, GILLI 2188! Logartal, E Charasiah, 1780 m, GILLI 2187! Ghazni: Okak, NE altoplanitiei Dasht-e Nawar, 3000 m, RECH. 17709!, 17763! Ad lacum Sabzak, Okak to Behzud, 2800 m, RECH. 17969! Dasht-i Nawar, 3100 m, BRECKLE 4595!, RECH. 37388! Dasht-e Nawar, slope on S shore, 3150 m, ANDERS 3947! In aridis inter Ghazni et Qarabagh, 2100 m, RECH. 17312! Qarabagh, 2430 m, KOELZ 13203! Gardez: Zormat, SW Gardez, VOLK 71/385! 25 km S Gardez, 2100 m, FREITAG 3245! Urgun: Urgun, VOLK 71/779a!
Pakistan: Quetta: Quetta, SINCLAIR 2777!, LACE 3797!

Distr. gen.: Afghanistan, Pakistan.

Easily recognized by the prostrate usually dwarf habit and the stipitate vesicles; apparently clearly distinct from our other species, but related to *H. violacea*. Specimens in which the staminal vesicles are not fully developed can be confused with *H. violacea*. Growing up to high altitudes.

5. ***H. hispida*** (SCHRENK) BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 62 (1862).
Syn.: *Halimocnemis hispida* SCHRENK, Bull. Cl. Phys.-Math. Acad. Imp. Sc. Pétersb. 1: 360 (1843). *Halocharis afghanica* ILJIN, Not. Syst. Leningrad 11: 80 (1949).
Icon.: KOMAR., Fl. URSS 6: tab. 14, fig. 7a, b (1936). – Tab. 194.
Type: (Kazakhstan): "In desertos salsis versus fluv. Ischu (Chu)", A.G. VON SCHRENK, LE.

Annual with erect, ascending or prostrate branches. Stems 20–40 cm with long spreading hairs up to 3 mm long and shorter ± adpressed hairs, variable in density, rarely glabrescent, leafy. Leaves linear, fleshy, c. 10 x 0,5–1 mm, solitary or clustered, densely hispidulous or hispidulous, with some hairs up to 4 mm. Upper leaves shorter, spreading-recurved. Flowers solitary or few in upper leaf axils, distant or clustered. Perianth segments c. 3 x 1,5 mm, membranous, with or without long spreading hairs. Staminal filaments c. 1,5 mm; thecae 1,6–2 mm; vesicle sessile, triangular in outline, finely papillose, 0,5–1 mm long, exserted, pale yellow, apically acute. Style c. 3 mm.

Hab.: Dry slopes, on loess and serpentine soils, bare hard earth, dry river bank, semi-desert, in Chenopod steppe; 250–1630 m. – Fl. VI–IX, fr. X.

P e r s i a : N: Gorg.: Gonbad-i Kavus, KOELZ 16622! – E: Khor.: In collibus aridis 89 km a Mashhad versus Sarakhs, 800 m, RECH. 55604!, 55605! Sarakhs, 300 m, SCHMID 6265! 10 km E Baghbaghu, 800 m, RUNEMARK & SARDABI 23421! In valle fl. Atrak prope Bojnurd, RECH. 1801b! In valle fl. Atrak, Bojnurd to Shirvan, RECH. 1821! 74 km W Mashhad, 1300 m, ANDERSEN & PETERSEN 347!, 351! 70 km SE Torbat-e Heydariyeh, Jannatabad to Alvi, 850 m, IRANSHAHR 40153-E! Tayyebat, in argillosis salsis, RECH. 37595! Inter Dasht et Loveh, c. 125 km W Bojnurd, 1200 m, RECH. 37601! SW Kashmar, 1200 m, REJAMAND & ARAZM 32616!
T u r c o m a n i a : In deserto argilloso prope Ashkhabad, LITW. 3549. In ruinis Tiaze Nusai, 300 m, VASAK.
A f g h a n i s t a n : N: Mazar-i Sharif: Mazar-i Sharif, 360 m, KOELZ 13191! 2 km S Tashkurghan to Haibak, 410 m, PODLECH 16993! Khulm valley, 6 km SSE Sayad, 680 m, PODLECH 32455! 3 km N Haibak (Aybak), 840 m, PODLECH 17009! 5 km W Tashkurghan to Mazar-i Sharif, 390 m, PODLECH 16991! 4 km SE Ghaznigak, 720 m, PODLECH 17002! Balkh, 400 m, RECH. 16146!, 16149!, AMSEL s.n.! Tashkurghan, 500 m, KOELZ 13181!, RECH. 34071! In faucibus SE Tashkurghan versus Haibak, c. 650 m, RECH. 16362!, 34047!, HDG. & WDB. W-3981! Akcha to Mazar-i Sharif, 400 m, HDG. & WDB. W-3841!, NEUB. 166/1950!, 167/1950!, 199/1950!, RECH. 16144!, 16145! 30 km S Akcha, Ali Moghul, 440 m, BRECKLE 4687!, 4705! 18 km E Tashkurghan, RECH. 34238! 60 km E Tashkurghan, 400 m, FREITAG 3872! – NW: Maimana: Dasht-i Laili, Daulatabad to Shibarghan, 450 m, HDG., WDB. & EKBERG W-8435!, PODLECH 19814!, 19819!, 22372! 25 km N Andkhui, Aqina, 260 m, BRECKLE 4710! S Andkhui to Maimana, c. 350 m, PODLECH 16967!, 16970! Andkhui, 330 m, AMSEL s.n.!, NEUB. 163/1950!, 165/1950! Maimana to Andkhui, 400 m, HDG. & WDB. W. 3829! Herat: Kisil Islam Qaleh, in argillosis salsis, RECH. 37585! – E: Kabul: Nangarhar: 12 km W Tor Khama, 600 m, BRECKLE 4953! – NE: Kataghan: Gultepa W Asqalan, 410 m, YARMAL 30! Kunduz, NEUB.

164/1950!, 198/1950! W Kunduz, in declivibus siccis, substr. Loess, 400 m, RECH. 16077b!, 16078b!, 16079! Kunduz, Bala Hissar, 400 m, RECH. 16077!, 16078-a! Kunduz to Khanabad, 550 m, ANDERS 5876! Isa Khan, Kunduz to Aq Tapa, 400 m, PODLECH 21252! Surkhab valley, Qezel Say, 500 m, ANDERS 6129! Doshi to Pul-i Khumri, 750–770 m, HDG. & WDB. W-4060a!, PODLECH 22365!, 32380! Pul-i Khumri, PODLECH 11323!, VOLK 2678 (type of *H. mollissima*)! Pul-i Khumri, in valle fluvii Kunduz, c. 700 m, RECH. 16513!, 16514! Inter Haibak et jugum Paigah Kotal, 1350 m, RECH. 16411! Lower Andarab valley, 1100 m, RECH. 31759!, LAMOND 2286! Baghlan: Surkh Kotal, 15 km NW Pul-e Khumri, 700 m, UOTILA 17051! Baghlan, 620 m, VOLK 71/664!, 774! 8 km E Paigah Kotal (Kotal-i Mirza Atbili), 1100 m, PODLECH 17015! Paigah Kotal (Kotal Rabotak, Kotal-e Mirza Atbili) 1300–1450 m, BRECKLE 4642!, VOLK 71/673!, NEUB. 253/1950!, 4304! Taliqan: Kalifgan, PODLECH 12767! Namakab valley, Taqcha Khana, 1450 m, PODLECH 11436! 4 km S Taqcha Khana, 1550 m, PODLECH 16090. – C: Doab: In valle Ajar, 5–13 km W Doab, 1500 m, RECH. 37007! Kamard valley, W Doab, 1630 m, GILLI 2186!

Distr. gen.: Persia, Turcomania, Afghanistan, C Asia.

The triangular shape of the vesicle is characteristic for the species. It is very variable in facies and density of indumentum; in some places it is a dominant species in the vegetation. With the large amount of material now available for study, it is impossible to maintain *H. afghanica* as an independent species. Some specimens of *H. sulphurea* with ± acute apices to the vesicle come close to *H. hispida*, but the latter can usually be recognized by the completely sessile vesicles which have a more strongly papillate surface than does *H. sulphurea*.

The specific epithet is misleading because the indumentum is not truly hispid, nor is it any different from that of the other species of the genus.

Doubtful species or species doubtfully recorded

H. beludshistanica ILJIN, Not. Syst. Leningrad 12: 79 (1949).
Type: "In Beludshia prope pagum Chuschak, Apr. 1943, V.I. ULJANITSCHEV" (?LE).

No specimens have been seen and I have been unable to trace the locality or to determine whether it is in Persian or Pakistan Baluchistan. From the description the species seems scarcely to differ from *H. sulphurea*.

H. turcomanica ILJIN, Acta Inst. Bot. Acad. Sc. URSS ser. 1, 2: 129 (1936).
Type: (Turcomania) "In valle flum. Murgab prope stationem viae ferraea Czervjak, S.I. KORSHINSKY (?LE).

Related in the original description to *H. hispida* and said to differ from it in having well-developed primary stems, flowers in spike-like inflorescences and the thecae partly united. Subsequently, ILJIN, Not. Syst. Leningrad 11: 81 (1949) indicated the species as being in Afghanistan, without citing any specimens, NIKITIN, Ill. Opred. Rast. Ashkhabad 224, (1965) records it from Ashkhabad. I have not seen any authentic specimens of it, but from its description it seems not to be different from *H. hispida*.

37. *Halimocnemis*

I.C. HEDGE, Edinburgh

Halimocnemis C.A. MEY. in LEDEB., Fl. Alt. 1: 381 (1829).
Syn.: *Halotis* BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 73 (1862).

Lit.: A. MOQUIN TANDON, Mémoire sur le genre Halimocnemis, Histoire et Mémoires de l'Académie Royale des Sciences, Inscriptions et belles lettres de Toulouse Sér. 2, 5: 177–184 (1839). M. ILJIN in V.L. KOMAROV, Fl. URSS 6: 253–260 (1936). A. VON BUNGE, Halimocnemis in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg 7. sér., 4, 11: 65–73 (1862).

Annual herbs with a pubescent to long-villous indumentum, rarely glabrous. Stems short, much branched, ± erect. Leaves well-developed, fleshy, alternate, linear, terete, with a distinct apical mucro, later often deciduous. Flowers hermaphrodite, sessile, solitary, in upper leaf axils, subtended by adpressed bracts. Perianth segments 5, ± oblong, free and membranous when young, hardening in fruit and flask-shaped below enveloping the fruit with erect connivent upper parts, without wing-like appendages or with short wing-like protuberances. Stamens (4–)5; anthers linear; connective appendages prominent, vesicular, usually yellow, ± sessile. Style bifid. Seeds vertical, with a spiral embryo; endosperm absent. – Type of genus: not designated (see below)

Together with his original description of the genus, C.A. MEYER gave adequate descriptions of its 7 species. At the end of the account he also noted "Hujus generis etiam sunt *Polycnemum sclerospermum* PALL. et *P. malacophyllum* M. BIEB.". With the exception of *H. sclerosperma* (PALL.) C.A. MEYER, the 7 species and *H. malacophylla* have subsequently been transferred by Russian authors into other genera – *Polycnemum*, *Petrosimonia* and *Nanophyton* : yet, at the same time, maintaining *Halimocnemis* as a genus for other species. No type species has ever been indicated or selected for the genus and the only one left from those in the original description, *H. sclerosperma*, can scarcely be considered as a suitable type. The situation is therefore that the type species of the genus, whatever it is, has been transferred into another genus. Article 69 of the Code allows 2 courses of action in a case where a name has been consistently used in a sense excluding the type: it can either be rejected, or conserved with a different type. This note merely draws attention to the nomenclatural problem and no attempt is made to rectify the confusion. Because *Halotis* BUNGE (1862) is certainly not different from *Halimocnemis* as currently interpreted, a practical course might be to reject the later name and take up *Halotis* making the necesssary new specific combinations. *Halimocnemis*, *Halanthium*, *Gamanthus* and *Petrosimonia* are very closely related and the essentially quantitative differences between them seem scarcely to merit generic separation. The perianth segments of *Halocnemis* become in fruit very hard and fused and to open them is very difficult indeed.

1a. Bracts round-ovate to orbicular, scarcely carinate, apically rounded or minutely apiculate . . . . 1. *H. Karelinii* MOQ.
b. Bracts linear-lanceolate, carinate, mucronate 2
2a. Leaves c. 1 mm broad; perianth segments 4–5 . . . . 2. *H. pilifera* MOQ.
b. Leaves 2–3 mm broad; perianth segments 5 3

3a. Leaves up to c. 10 mm long; some long hairs, up to c. 3,5 mm, present or absent on stem or leaves . . . . 5. *H. occulta* (BUNGE) HEDGE
b. Leaves 15–40(–70) mm long; some hairs up to 7 mm usually present on some parts of the plant 4
4a. Plant with a ± dense persistent indumentum of both short and much longer spreading hairs up to to 7 mm, the latter rufescent . . . . 3. *H. mollissima* BUNGE
b. Plant with a similar indumentum to above, but sparse and glabrescent . . . . 4. *H. Beresinii* ILJIN

1. ***H. Karelinii*** MOQ. in DC., Prodr. 13, 2: 196 (1849).
Icon.: KOMAR., Fl. URSS 6: 262, tab. 17, fig. 6 (1936) – male!
Type: "In littore orientali maris Caspii", G.S. KARELIN, MW.

Annual, 5–20 cm, glaucous, often bluish, with short spreading hairs when young, becoming glabrous. Stems much branched from the base. Leaves ± terete, lower 20–30 cm, upper 5–15 cm, often soon deciduous, semi-amplexicaul, very shortly mucronulate. Flowers solitary in upper leaf axils. Bracts round ovate to suborbicular, shorter than perianth segments, scarcely carinate, membranous-margined, minutely apiculate. Perianth segments 5, membranous, 4–5 mm long in flower to 7–8 mm in fruit and cone-like, connivent above. Thecae c. 2 mm long, linear; connective appendage yellowish white, subglobose.

Turcomania: Kopet Dagh – sec. VVEDENSKY, Conspect. Fl. As. Med. 3: 132 (1972).

Distr. gen.: Turcomania, C Asia (Kizil Kum, Kara Kum, Balkh), China (Sinkiang).

No specimens from our area have been seen. The species is apparently characterized by being glaucous and glabrous (when mature) and having round to suborbicular bracts.

2. ***H. pilifera*** MOQ., Hist. Mém. Acad. Sc. Toulouse 5, 1: 181 (1839).
Syn.: *H. pilosa* MOQ., Chenopod. Monogr. 152 (1840). *H. gibbosa* WOLOSZCZAK, Denkschr. Akad. Wiss. Wien Math.-Nat. Kl. 50–51: 277 (1885–1886). *Halotis pilosa* (MOQ.) ILJIN in KOMAR, Fl. URSS 6: 339 (1936). *Halimocnemis fragilis* TARASS, Not. Syst. Leningrad 13: 68 (1950). *Halotis pilifera* (MOQ.) BOTSCH., Nov. Syst. Leningrad 8: 262 (1971).
Icon.: Iranian Journ. Bot. 2, 2: tab. 3, 135 (1984). – Tab. 195.
Type: "In Persia", C.P. BÉLANGER, G.

Annual, (5–)10–30 cm high and ± as broad, of rather firm texture, glaucous, greyish brown, purplish or bluish green, covered with short hairs and longer bristle-like hairs. Stems divaricately and densely branched. Leaves round-triangular in section, 15–20(–40) x c. 1 mm, lowermost soon deciduous, semiamplexicaul and decurrent, ± straight and spreading, spine-tipped. Flowers distributed over stem. Bracts adpressed to perianth segments, carinate, somewhat gibbous, almost as long as perianth segments. Perianth segments 4–5, oblong-lanceolate, 7–10 mm, acute erect-connivent; in fruit at top of the flask like portion with or without an obsolete outgrowth. Thecae 2–3 mm; connective appendage yellowish white or purplish c. 1 mm, of varied shape, obtuse to acute. Seed c. 2,5–3 mm diameter.

Hab.: Salty areas, soil slopes, clay soil, alluvial plains, semi-desert, *Artemisia* steppe; 750–1600 m. – Fl. VIII, fr. IX–X.

Persia: N: Gorg.: Mohammad Reza Shah Prot. Reg. (Golestan): Almeh, 1050 m, UOTILA 19136! Gilan: 20 km E border of Azerbaijan to Zanjan, 1250 m, UOTILA 19489! – W: Azerb.: 34 km W Marand to Khvoy, RECH. 14916! Tabriz to Ahar, valley of Atschi Tschai (Talkheh Rud), c. 1500 m, RECH. 14846! Tabriz, 1350 m, BEHB. & AELLEN 2848!, 2892! 20 km E Mianeh to Khalkhal, 960 m, WDB. & SHIRDELPUR 14927! – S: Fars.: Bakhteghan lake, near Kharameh, 1570 m, FOROUGHI & ASSADI 15018! W end Neyriz basin, BOBEK 117! Kerm.: Kheyrabad, 1800 m, BORNM. 5103! – E: Khor.: 125 km W Bojnurd, 1100 m, ANDERSEN & PETERSEN 331! Valley of Atrak river, Bojnurd, RECH. 1801a!, 1822! Dasht to Loveh, 1200 m, RECH. 37599!, 37600! 120 km W Sabzevar, Abbasabad, 1400 m, REJAMAND & ARAZM 32527!, 32452! Ferdows, KOELZ 16796! Ferdows to Tabas, 1100 m, REJAMAND & BAZARGAN 31966! 20 km W Shirvan, 950 m, UOTILA 19101! Tayyebat, RECH. 37590a! Kavir-e Lut, W Birjand, 20–40 km SE Khur, TERME & MOUSSAVI 34424-E! – C: Tehr.: Rud Shur, 60 km SW Tehran, 950 m, AELL. 2890! 30 km S Tehran, 1230 m, ZOHARY & ZOHARY 1230! Kavir Prot. Reg.: 50 km W Shah Abbas Caravan-Serai, 780 m, WDB. & FOROUGHI 14599! E Siah Kuh, 750 m, WDB. & FOROUGHI 14654! N Siah Kuh, 770 m, AELLEN & SHAR. 1861! Kavir, STAPF 765! Varamin, SHAR. & AELLEN & 30063-E! Ad muros Khanabad, POLAK & PICHLER 29 VIII.1892 (type of *H. gibbosa* WOLOSZ.)! Qazv.: Mardabad prope Karaj, GAUBA 2067!, 2070! Between Qazvin and Rasht, 500–1200 m, SCHMID 6379! Semn.-Damgh.: 15–25 km Semnan to Firuzkuh, 1400 m, HDG. & al. 14744! Semnan to Anjirab, 1050 m, TERME & MOUSSAVI 30222-E! Shahr.-Bust.: In jugo Khush Yailaq 70 km E Shahrud, 2000 m, RECH. 5489! Biarjmand, SE Shahrud, 1400 m, REJAMAND & ARAZM 32555! Turan Prot. Reg.: 12 km ESE Asb Keshan, 1000 m, FREITAG 13860! 16 km SSE Majerad, 750 m, BRECKLE 5079! 5 km NE Delbar, 1300 m, BRECKLE 5047. 5 km NW Majerad, 1100 m, BRECKLE 5084! N border of basin between Talkhab and Garmab around temporary springs, 1300 m, FREITAG 13733!
Turcomania: In collibus prope Chuli, LITW. 154! Kopet Dagh sec. VVED., Consp. Fl. As. Med. 3: 134 (1972).

Distr. gen.: Persia, Turcomania, Kizil Kum, Kara Kum, Pamir Alaj.

H. pilifera is a fairly clear-cut species and its range of variation is not great. The leaf length in seedlings or young plants is appreciably larger than that of adult plants.

It is of interest that some specimens of this species are infected by a rust fungus and that some specimens of *Gamanthus* (e.g. *G. ferganicus* ILJIN and *G. commixtus*) also bear what seem to be the same rust.

3. ***H. mollissima*** BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 71 (1862).
Icon.: Ovcz., Fl. Tadjik. 3: 449, tab. 76, f. 3–4 (1968). – Tab. 196.
Types: (Persia, Khorasan): "In salsis Persiae boreali-orientalis prope Meschhed in montosis Tabat-kuh," A. VON BUNGE & T. BIENERT, LE, P.

Annual, 10–25 cm, glaucous, very fleshy, with a dense sericeous indumentum of short hairs and up to 7 mm long soft spreading hairs, white or rufescent. Stems sturdy, erect, to 5 mm at base, terete to somewhat angled, green or tinged purple.

Leaves linear, up to 40 x 3 mm, semi-terete, flattened on upper side, semiamplexicaul, with a rather hard spine 1,5–2,5 mm long. Flowers sessile in leaf axils. Bracts carinate, spine-tipped, c. as long as the perianth segments, adpressed to them, and falling as a unit with the fruit. Perianth segments 5, oblong-lanceolate, acuminate, 10–12 mm long. Thecae c. 3 mm long, separated to 1/3 or nearly half; connective appendage yellow, ± oblong, c. 2,5 mm long. Seed c. 4 x 3 mm embedded within the hard fused lower part of the perianth segments.

Hab.: Soil and clay slopes, salty ground; 300- 1200 m. – Fl. VII–VIII, fr. IX–XI.

P e r s i a : E: Khor.: Sarakhs, 300 m, SCHMID 6278! 48 km W Sarakhs, STUTZ 639! Tayyebat, in argillosis salsis, RECH. 37586! Tabat Kuh near Mashhad, BUNGE & BIENERT. – C: Qazv.: W of Mardabad, SW Karaj, 1250–1300 m, AELLEN 2864!, HDG., WDB. & al. 14680!, WDB. & al. 14974! In collibus Halkedar ad Mardabad prope Karaj, 1200 m, RECH. 6832! Ravandeh near Karaj, GAUBA 2068!

T u r c o m a n i a : Ashkhabad, in steppis ad Mekrowa, SINT. 986b! Kopet-Dagh, in vicinitate pagi Chuli, c. 650 m, VASAK
A f g h a n i s t a n : NW: Herat: Badghiz, inter Herat e Kisil Islam Qaleh, RECH. 32524!

Distr. gen.: Persia, Turcomania, NW Afghanistan, C Asia (Kara Kum, Kizil Kum, Tian Shan, Pamir Alaj).

See comments under *H. Beresinii*.

4. ***H. Beresinii*** ILJIN, Acta Inst. Bot. Acad. Sc. URSS 1, ser. 3: 162 (1937); in KOMAR., Fl. URSS 6: 257 (1936) – rossice.
Icon.: Tab. 197.
Type: "Turcomania, planities arenoso-argillacea prope Ischkaka, 27.VIII.1926", BASILEVSKA & DUBJANSKY 372, LE.

Annual, 10–30 cm, glaucous, greenish brown to brown at maturity or when dry, with some very long spreading hairs to 6 mm and much shorter hairs. Stems erect, sturdy, 3–5 mm wide at base, angular to subterete, branched. Leaves linear, 15–35(–70) x 2–3 mm, ± flat on adaxial surface, keeled abaxially, semi-amplexicaul, spreading, soon deciduous, with a rather hard spine or mucro c. 1,5 mm. Flowers solitary in axils of lower and upper leaves. Bracts carinate, shorter than and adpressed to perianth segments. Perianth segments 5, oblong-lanceolate, membranous, 7–9 mm long in flower, to 11 mm in fruit. Thecae c. 5 mm long, separated to near middle; connective appendage yellow or yellowish white, 2,5 mm long, oblong to globose. Seed c. 3 x 3 mm.

Hab.: Semi-desert, salty field margins, sand flats; 300–1300 m. – Fl. V–VIII, fr. X–XI.

A f g h a n i s t a n : N: Mazar-i Sharif: 23–25 km E Mazar-i Sharif to Tashkurghan, 400 m, RECH. 34207! 5 km W Tashkurghan to Mazar-i Sharif, 390 m, PODLECH 16989! 5–35 km from Mazar-i Sharif to Tashkurghan on road to Termez, 300 m, PODLECH 30048!, 32695!, 32698!, 32706! 25 km NW Tashkurghan, 10 km S Sar-e Namak, 330 m, BRECKLE 4646! Kunduz to Tashkurghan, NEUB. 122/1950! 30 km S Aqcha, Ali Moghul, 430 m, BRECKLE 4686! Mazar-i Sharif to Akcha, NEUB. 4312!

Distr. gen.: C Asia (Kizil Kum, Kara Kum, Amu Darya), N Afghanistan.

Although in the original description it was related to *H. longifolia* BUNGE, this is certainly a very close relative of *H. mollissima*, and apparently only differing in the less dense, glabrescent, indumentum. There is an apparent geographic disjunction between the essentially NE Iranian *H. mollissima* and the N Afghan *H. Beresinii*, but this may only be a lack of collecting in the intermediate zone. Some almost completely glabrous forms of *H. Beresenii* (e.g. PODLECH 32695) seem to approach closely *H. glaberrima* ILJIN, but this C Asiatic species is apparently not in our area.

5. ***H. occulta*** (BUNGE) HEDGE, comb. nov.
Syn.: *Halotis occulta* BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 74 (1862).
Icon.: Iranian Journ. Bot. 2, 2: 134, fig. 2 (1984). – Tab. 198.
Type: (Persia, Khorasan): "In collibus salsis inter Tun et Birdschand, haud procul a pago Afsel-abad", A. VON BUNGE & T. BIENERT, LE.

Annual, grey green or purplish, c. 7–15 cm high, very succulent and very brittle, with a rather dense indumentum of short hairs and with or without some much longer hairs up to 3,5 mm. Stems much branched from the base with rather thick branches. Leaves alternate, c. 10 mm long, terete, c. 2–2,5 mm thick, spreading or curved upwards, semi-amplexicaul, apically acute tapering into a 2–2,5 mm mucro. Flowers solitary in upper leaf axils. Perianth segments 5, linear-oblong, 5–7 mm, membranous, acute, externally pilose, erect-connivent, developing short or rudimentary wings. Thecae c. 2 mm with a yellow, pinkish or white 1,5–2 mm connective appendage, acute to obtuse.

Hab.: Silty salty soil, eroded marl slopes; c. 1000–1200 m. – Fl. VII–VIII, fr. IX–X.

Persia: E: Khor.: In collibus salsis inter Tun et Birjand haud procul a pago Afzalabad, BUNGE & BIENERT. – C: Damgh.-Semn.: 8 km W Semnan, 1150 m, HDG., WDB. & al. 14721! Shahr.-Bust.: Turan Prot. Reg.: Kavir Road 15 km SW Razveh, FREITAG 14118! S Zalehabad at road to Sanjavi, 1275 m, FREITAG 13814! N of Hojaj, 1150 m, WDB. & FOROUGHI 18824!

Distr. gen.: Endem. (Persia).

The low-growing very fleshy habit, prominently mucronate leaves and the vestigial wings/protuberances on the fruiting perianth lobes are characteristic features. WENDELBO, Iranian Journ. Bot. 1: 163 (1977), calling the plant *H. longifolia* BUNGE, remarked that it was an "extremely characteristic plant. To a certain degree reminding of *Gamanthus gamocarpus*". Originally described in the monotypic genus *Halotis* on account of the perianth protuberances. It is better placed in *Halimocnemis*. BUNGE pointed out in his original description of *Halotis occulta* that it might be better placed in a section of *Halimocnemis* which would link it with *Halanthium*.

The following new species from Persia was recently described:

Halotis pedunculata ASSADI, Iran. Journ. Bot. 5: 60 (1962).
Icon.: l. c.: fig. 2 (1992).
Type: S Persia, Lar.: 8 km from Bastak to Bandar-e Lengeh, 800 m, ASSADI & AKHANI 61930, holotype TARI – n.v.

It was distinguished from *H. (Halimocnemis) occulta* (BUNGE) HEDGE in having a more vigorous habit, outer perianth segments horned, stipitate anther appendages and bracts not gibbous at the base. From its description and illustration the problematical *Halanthium purpureum* (MOQ.) BUNGE, q. v. might also come into consideration.

38. *Piptoptera*

I.C. HEDGE, Edinburgh

Piptoptera BUNGE, Acta Horti Petrop. 5: 644 (1877); Acta Horti Petrop. 6: 448 (1879).

Annual, sturdy, with an all-over indumentum of adpressed simple hairs. Stems with many spreading-erect lateral branches. Leaves alternate, fleshy, linear-oblong, sessile, ± triquetrous, with an apical deciduous mucro. Flowers solitary in leaf axils, hermaphrodite, with 2 bracts. Perianth segments 5, erect, basally fused, acute, externally adpressed hairy, somewhat unequal; in fruit, segments hardening, naviculiform, outer 2 developing large, spreading, flabellately nerved wings which are readily deciduous along a clear line of separation; inner 3 not developing wings. Stamens 5 with linear filaments; thecae ovoid, terminating in a conical acute vesicle. Ovary compressed ovoid; styles 2, erect-spreading. Utricle enclosed within the hardened, ribbed, erect perianth segments. Seed vertical with a flat-spiral embryo; endosperm absent. – Type of genus: *P. turkestana* BUNGE.

Monotypic. Easily recognized by the annual sturdy habit, the adpressed indumentum, the erect adpressed hairy perianth segments, 2 of which develop large spreading wings in fruit, and the appendiculate anthers. Clearly different from the other genera with terminal vesicles on the thecae – with which it is usually placed. Of unclear affinities.

1. ***P. turkestana*** BUNGE, Acta Horti Petrop. 5: 645 (1877).
Icon.: KOROV., Fl. Uzbek. 2: tab. 31, fig. 4 (1953). – Tab. 199.
Type: (Uzbekistan): "in argilloso-salsis Schurachan, prope fortalitium Petro-Alexandrowsk (Turtkul), Amu-Darya," Aug. 1873, KOROLOW & KRAUSE", LE.

Annual, erect. c. 30 cm high, c. 6 mm diameter at stem base. Leaves to c. 14 mm long. Perianth segments brown below, scarious above, c. 6 mm long, erect, connivent; fruiting wings up to c. 8,5 x 14 mm, semiorbicular-reniform, prominently veined. Pericarp membranous, dark-brown. Seed flattened, c. 2,5 x 2,3 mm, with a prominent flat spiral embryo.

Hab.: Sandy places, edge of fields; 300–900 m. – Fr. IX.

P e r s i a : C: Kashan: 30 km ESE Kashan, 2 km N Abuzeidabad, 900 m, AKHANI 5775!
A f g h a n i s t a n : N: Mazar-i Sharif: 35 km N main road Mazar-i Sharif to Tashkurghan, way to Termez, 300 m, PODLECH 32705!

Distr. gen.: Persia, Kara Kum, Kizyl Kum, Amu Darya, N Afghanistan.

Distinct, but with some superficial similarity to *Salsola aperta*. In KOMAROV, Fl. URSS 6: 340 (1936), *Piptoptera turkestana* is mentioned as a "significant weed".

39. *Halanthium*

I.C. HEDGE, Edinburgh

Halanthium C. KOCH, Linnaea 17: 313 (1843).
Syn.: *Physogeton* JAUB. & SPACH, Ill. Pl. Or. 2: 48, tab. 135 (1845).

Lit.: A. VON BUNGE, Halanthium in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg 7. sér., 4, 11: 80–86 (1862). M. ILJIN in V.L. KOMAROV, Fl. URSS 6: 343–346 (1936); Z. AKOPIAN, On the species of the genus Halanthium, Botaničeskii Zhurnal SSSR 65, 5: 685–690 (1980).

Annual herbs, with a villous or pubescent indumentum of simple hairs, especially when young, glabrescent or not. Stems much branched, prostrate to spreading-erect. Leaves well-developed, alternate except for lowermost, fleshy, semi-amplexicaul, linear, terete, at least when young with an apical mucro. Flowers hermaphrodite, sessile, solitary, borne in upper leaf axils, subtended by clasping bracts. Perianth segments 5, oblong to oblong-lanceolate, free to the base; outer 2 in fruit developing small or prominent median wings, inner without wings in fruit. Stamens 5; anthers linear; connective appendages prominent, vesicular, yellow whitish or purplish, sessile or with a short stipe. Style apically bifid or split to near base. Seeds vertical with a spiral embryo; endosperm absent. – Type of genus: *H. rarifolium* C. KOCH.

About 5 species in SW Asia. With clear similarities to *Halimocnemis*, *Halocharis* and *Gamanthus*. Generic limits in this complex of genera are far from clear. Apparently the only character that distinguishes *Halanthium* is the form of fruiting perianth; the outer 2 segments have wing-like outgrowths. But as fruiting specimens are relatively few, it is not possible to assess the variability or constancy of this character. Field observations are needed to determine whether or not these wings always develop.

1a. Perianth segments acute, c. 7 mm long; leaves clearly recurved .... 1. *H. mamanense* BUNGE
b. Perianth segments obtuse or acute, 4–6 mm; leaves spreading-erect or recurved 2
2a. Leaves 20–25 mm, apically with or without a soft small deciduous mucro .... 2. *H. rarifolium* C. KOCH
b. Leaves 8–12(–24) mm, apically with a stiff prominent persistent or deciduous mucro .... 3. *H. purpureum* (MOQ.) BUNGE

1. ***H. mamanense*** BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7 sér., 4, 11: 82, tab. 1, fig. 18 [stamen] (1862).
Icon.: Tab. 200.
Types: (Persia, NW): "In salsis Persiae occidentalis prope Tebris, F. BUHSE, N. VON SEIDLITZ; et ad salinas Maman, N. VON SEIDLITZ", G – microfiche!

Annual, much branched, c. 15 cm, villous when young, glabrescent and subglaucous. Leaves except lowermost alternate, terete, thick-fleshy, linear, c. 12 mm long, clearly recurved, shortly but clearly mucronate with mucros often deciduous. Flowers in axils of upper leaves, few, in short lateral and terminal branches. Bract ± triquetrous, cuspidate, shorter than flowers. Perianth segments c. 7 mm, membranous, oblong-lanceolate, clearly acute, outer two with very small lateral outgrowths in fruit. Thecae linear-oblong; connective appendage yellow or white, globose-vesicular, c. 2 mm. Mature fruit not known.

Hab.: Salt steppe.

Persia: W: Azerb.: Inter Tabriz et Ahar, in jugo Bel, 83 km NE Tabriz, 1800 m, RECH. 14892! 20 km E Mianeh to Khalkhal, 960 m, WDB. & SHIRDELPUR 14928! Tabriz, BUHSE. 55 km Maku to Marand, TERME 40160-E!

Distr. gen.: Endem. (NW. Persia).

A poorly known species. I have not seen adequate type material. Characteristic features seem to be the very acute perianth segments and the recurved leaves.

2. ***H. rarifolium*** C. KOCH, Linnaea 17: 314 (1844).

Syn.: *H. Aucheri* MOQ. in DC., Prodr. 13, 2, 204 (1849). *Halimocnemis Belangeri* MOQ. in DC., Prodr. 13, 2: 196 (1849). *Halocharis Abichii* C. KOCH, Linnaea 24: 92 (1851). *H. pycnantha* C. KOCH l.c. *Halogeton rarifolius* (C. KOCH) FENZL in LEDEB., Fl. Ross. 3: 834 (1851). *Halanthium rarifolium* var. *Aucherianum* BUNGE ex BOISS., var. *Abichii* (C. KOCH) BUNGE ex BOISS., var. *Belangeri* (MOQ.) BUNGE ex BOISS., Fl. Or. 4: 982 (1879).

Icon.: TAKHT. & AN. A. FEDOR., Fl. Erevana tab. 18 (1972). – Tab. 201.

Type: (Turkey/Armenia): In planitie ad Araxem sito; in itinerario meo sub nomine *Halogeton kulpiana* C. KOCH commemoratum", C. KOCH

Annual, much branched, with procumbent or ascending branches, c. 20–30 cm, pilose, canescent to villous with long white hairs, (often densely so when young) rarely glabrescent. Leaves semiamplexicaul, fleshy, linear oblong, c. 20–25 mm, apically with or without a small deciduous soft mucro, obtuse. Flowers solitary in the leaf axils, few, scattered over the branches. Bracts shorter than or ± equal to perianth segments, leaf-like, basally membranous. Perianth segments c. 5 mm, membranous, pilose or not, oblong-lanceolate, obtuse, outer two in fruit with wing-like outgrowths. Thecae linear-oblong, 2,5–3,5 mm; connective appendage yellow, white or pale lilac, sessile or stipitate, variable in size, 0,5–1 mm, and form, oblong, subtriangular, obtuse to subacute. Style free nearly to base.

Hab.: Salt steppe, *Artemisia-Noaea* steppe; c. 900–1300 m. – Fl. VI–VIII.

Persia: W: Azerb.: Ad ripam austro-orientalem salsam lacus Urmia (Rezaiyeh), inter Bunab et Khanian, RECH. 14766-b! 7 km N Bonab to Tabriz, near lake Urmia (Rezaiyeh), 1350 m, LAMOND 4633! Ad litus occidentale lacus Urmia, PETROVITZ 127! 26 km Zonuz to Marand,

IRANSHAHR 30362-E! Marand to Jolfa, 1360 m, BAUM & ZOHARY 65–1172! Khvoy, SZOV. 535! (as *H. lanatum* BUNGE. – nomen). 16 km S Mianeh, 980 m, PABOT 30335-E! Urmia (Rezaiyeh): "Gömörchane", ad lacum, 28.VI.1884, KNAPP!

Distr. gen.: E Turkey, Armenia, NW Persia.

BOISSIER, Fl. Or. 4: 982 (1879) recognized 4 varieties of *H. rarifolium*, but with the material now available the morphological polymorphism seems to be continuous and indivisible. A variable species in the density and persistence of the overall indumentum. Few of the specimens studied have mature fruit.

3. ***H. purpureum*** (MOQ.) BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 85 (1862).

Syn.: *Halimocnemis purpurea* MOQ., Chenopod. Monogr. 153 (1840). *Physogeton acanthophyllus* JAUB. & SPACH, Ill. Pl. Or. 2: 48, tab. 135 (1846). *P. purpureus* (JAUB. & SPACH) MOQ. in DC., Prodr. 13, 2: 202 (1849). *Halogeton purpureus* FENZL in LEDEB., Fl. Ross. 3: 833 (1851) in nota.

Icon.: JAUB. & SPACH, l.c. – Tab. 202.

Type: Persia (prope Hamadan), P.M.R. AUCHER-ELOY [2777] G-DC, G-BOISS – microfiche!

Annual much branched with prostrate, procumbent or ascending-erect brittle branches, canescent to villous with ± long spreading hairs, glabrescent. Stems greyish green, whitish, yellow or reddish, 15–30 cm, brittle. Leaves semiamplexicaul, fleshy, terete, 8–12(–24) mm, spreading-erect or recurved, glaucous, green or purplish with a ± prominent triangular-terete persistent or deciduous mucro. Flowers solitary in leaf axils, scattered over stem. Bracts c. as long as perianth segments, carinate, pilose or pubescent. Perianth segments oblong, c. 4 mm, membranous, obtuse, in fruit hardening somewhat and increasing to 6 mm and becoming brown or dark red, outer two with distinct wing-like outgrowths. Thecae linear-oblong c. 3 mm; connective appendage yellow or purplish, obovoid, sessile or stipitate c. 1,3 mm long, subacute or obtuse.

Hab.: Salty soil, sandy clay, soil slopes, dry river bed; 850–1720 m. – Fl. VI–VIII, fr. VIII–X.

P e r s i a : W: Azerb.: Tabriz to Ahar, 40 km NE Tabriz, 1500 m, RECH. 14835! Inter Bunab et Khanian, lacus Urmia (Rezaiyeh), RECH. 14762a! Ham.: Hamadan, AUCH. 2801 (type of *Physogeton acanthophyllus*), – microfiche! – Esf.: 18 km Nain to Ardestan, near Aliabad, 1720 m, FOROUGHI & ASSADI 15154! – S: Fars.: Bakhteghan lake, near Kherameh, 1580 m, FOROUGHI & ASSADI 15027! (sterile – determination uncertain). – E: Khor.: Tayyebat, RECH. 37588! – C: Tehr.: 61 km Tehran to Saveh, 1260 m, ASSADI & SHIRDELPUR 13118! 60 km S Tehran to Qom, 1100 m, UOTILA 19406! In valle fl. Hableh Rud, 1100 m, MANUCH. & AELLEN 3116! Qazv.: Mardabad, 1200 m, GAUBA 2064!, 2071!, RECH. 6829! W Mardabad, 1250 m, HDG. & WDB. W-14679! Ravandeh, GAUBA 2063! Damgh.-Semn.: Sorkheh, Asadabad, Chalehdan, 1050 m, MOUSSAVI & TEHRANI 41719! Qom: Pol-e Rud-e Shur, 980 m, FOROUGHI 10584! Kavir Prot. Reg.: E of Siah Kuh, 850 m, WDB. & FOROUGHI 14649!, FREITAG 14003! Kashan: Natanz to Kashan, Abbasabad, 1320 m, FOROUGHI & ASSADI 15169!

Distr. gen.: (Endem.?) Persia.

I find this one of the most problematic of all our species, and even after studying type material and quite a wide range of other specimens, I do not feel confident about the description given above or the correctness of all the identifications. It is of interest that BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 83 (1862), dealing with the great polymorphism of the related *H. rarifolium*, remarked on his extended difficulties in classifying its variation – "diu me vexavit".

The type specimen of AUCHER from Hamadan is a rather sturdy plant, apparently erect and with leaves up to c. 24 mm, I have not seen any recently gathered specimens that are a clear match for either the AUCHER specimens or the HAUSSKNECHT specimen (inter Seytun et Behbehan – JE!), cited by BOISSIER in Fl. Or. 4: 983 (1879).

Most recent gatherings (see Iranian Journ. Bot. 1: 37, fig. 4 (1976) as *H. rariflorum*) are of prostrate plants – or ascending – and brittle with leaves c. 10 mm or less. They are certainly different in facies from the earlier gatherings. Amongst them there is a wide range of variation in indumentum – from subabsent to canescent, with or without longer spreading hairs.

The following specimens apparently also belong here:

Persia: E: Khor.: Shahabad, KOELZ 16679! Tayyebat, RECH. 37588!
Afghanistan: NW: Herat: Hari Rud, AITCH. 719! – SW: Farah: 6 km E Farah Rud Hotel, 800 m, BRECKLE 4890!

These 4 specimens mainly differ from the other Persian plants in their denser indumentum, but they are rather immature.

Since the account was prepared, the following new species has been described:

H. alaeflavum ASSADI, Iran Journ. Bot. 5: 58 (1992).
Icon.: l. c.: fig. 1 (1992)
Type: W Persia, Azerbaijan: 11 km from Maragheh to Bonab, 1450 m, 30.IX.1987, ASSADI & AKHANI 61296, holotype TARI – n. v.

It was related to *H. kulpianum* C. KOCH and *H. rarifolium* C. KOCH. From the description, though scarcely the illustration, it appears to be very close to the variable *H. rarifolium*, q.v., which grows in the same area.

40. *Gamanthus*

I.C. HEDGE, Edinburgh

Gamanthus BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 76 (1862).

Lit.: A. VON BUNGE, Gamanthus in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint Pétersbourg 7. série, 4, 11: 76–80 (1862).

Annual herbs, with a short pubescent indumentum of simple hairs or glabrous. Stems much branched, spreading-erect. Leaves well-developed, alternate or opposite, fleshy, semi-amplexicaul, linear, terete, with a short terminal sometimes dehiscent mucro. Flowers hermaphrodite sessile, solitary or few in leaf axils and almost hidden by the leaf bases. Bracts 2, hidden by subtending leaves. Perianth segments 5, oblong, membranous, free, scarcely hardening in fruit, not developing lateral wing-like appendages. Stamens 5; anthers linear; connective appendages prominent, vesicular, oblong-globose, yellow, stipitate. Styles 2, free to near base. At fruiting time the flower-subtending leaves and the bracts indurate and expand forming a very hard nut-like, structure, enclosing the 2 seeds, which falls as a single dispersal unit or disseminule. Fruit compressed. Seeds vertical with a spiral embryo; endosperm absent. – Type of genus: *G. pilosus* (PALL.) BUNGE (basionym *Salsola pilosa* PALL.).

The characteristic feature of the genus which separates it from its close allies, *Halanthium* and *Halimocnemis*, is the nut-like structure of the fruiting disseminule. It is not the perianth segments or the fruit that ossifies, but the basal parts of the flower-enveloping leaves (often called bracts).

1a. Flowers solitary (–2) in axils of opposite leaves; fruiting disseminule equally 2-horned .... 1. *G. gamocarpus* (MOQ.) BUNGE
b. Flowers (2–)3–7 clustered in axils of subopposite leaves; fruiting disseminule not or irregularly 2-horned 2
2a. Some long spreading hairs present on some part of the plant; perianth segments obtuse, bilobed (NW Persia) .... 3. *G. pilosus* (PALL.) BUNGE
b. Indumentum of entirely short ± adpressed hairs; perianth segments acute, entire .... 2. *G. commixtus* BUNGE

1. ***G. gamocarpus*** (MOQ.) BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 77 (1862).
Syn.: *Halimocnemis gamocarpa* MOQ., Chenopod. Monogr. 155 (1840). *Halocharis gamocarpa* (MOQ.) MOQ. in DC., Prodr. 13, 2: 201 (1849). *Halanthium gamocarpum* (MOQ.) VOLKENS in ENGLER & PRANTL, Natürl. Pflanzenfam. 3, 1a: 89 (1893). *Gamanthus kelifii* KOROV., Not. Syst. Herb. Horti Petrop. 5: 176 (1924). *G. subglaber* ILJIN, Fl. Turkmen. 2: 211 (1937) – nomen.
Icon.: ILJIN in KOMAR., Fl. URSS 6: 348, tab. 16, fig. 1 (1936); LÉONARD, Contrib. Fl. Végét. Déserts Iran 7: tab. 4, fig. J–M (1987). – Tab. 203.
Type: Persia, C.P. BELANGER (608).

Annual, 10–25 cm high and ± as broad, glaucous, greyish green, with a short canescent indumentum or glabrescent. Stems divaricately branched, prostrate or ascending, lateral branches often shorter. Leaves linear-filiform, semi-terete, 15–30 x 1–1,5(–3) mm, semiamplexicaul, spine-tipped, spreading-recurved; upper leaves subtending flowers always opposite, in fruit basally united and becoming stony-indurated. Flowers solitary, almost hidden by the subtending leaves and bracts. Bracts c. as long as the 5 perianth segments, c. 5–7 mm; both unchanged in size and texture in fruit. Thecae 2–3 mm linear, introrse; connective appendage yellow or yellowish white, oblong-globose 1,5–2 mm, stipitate. Fruiting disseminule consisting of 2 bony erect leaves straight or outwardly curved, basally fused and enlarged forming a globose structure that almost completely encloses the bracts, perianth segments and the 2 fruits. Seed c. 2 m.

Hab.: Salty places, clay soils, *Artemisia* steppe, semi-desert, dry hills; 280–110 m. – Fl. V–VI, fr. VIII–X.

P e r s i a : E: Khor.: In declivibus argillosis NE Mozduran, inter Mashhad et Sarakhs, c. 950 m, RECH. 55635! 89 km Mashhad to Sarakhs, 800 m, RECH. 55606! W Sarakhs, STUTZ 635! 74 km W Mashhad, 1300 m, ANDERSEN & PETERSEN 348! Tayyebat, in argillosis salsis, RECH. 37590-b! Birjand, SCHERBINOVSKY! Sabzevar, KOELZ 16925! E Dasht-e-Lut, 95°52'E 30° 37'N, 1100 m, LEONARD 6144! – C: Tehr.: Kavir Prot. Reg.: 50 km W Shah Abbas Caravan-Sarai, 780 m, WDB. & FOROUGHI 14601! Kavir-Namak, Siah Kuh to Baba Hemmat, 700 m, IRANSHAHR & MOUSSAVI 15365-E!, 40231-E! Qazv.: Mardabad prope Karaj, GAUBA 2069! Shahr.-Bust.: In desertis salsis Abbasabad, RECH. 1297! 125 km W Abbasabad, 1200 m, ZOHARY & ORSHAN 10244/5! Turan Prot. Reg.: near Majerad, 1000 m, BRECKLE 5072! Delbar to Ahmadabad, 1100 m, TERME et al. 41722! Kashan: In locis subsalsis ad fontem prope vicum Robat-e Tork, 33°45', 50°51', SOJAK 6880!, 6882!, 6889!, 6890!, 6891! – Persia, BELANGER (608).
T u r c o m a n i a : Kopet-dagh, in vicinitate pagi Chuli, 650 m, VASAK! Inter Wannowskoje et Chuli, LITW. 340!, 411-a!
A f g h a n i s t a n : N: Mazar-i Sharif: 25 km NW Tashkurghan, 10 km S Sar-e Namak, 330 m, BRECKLE 4647! 32 km E Mazar-i Sharif to Tashkurghan, 350 m, PODLECH & JARMAL 30047! – NW: Maimana: 10–26 km SE Andkhui to Shibargan, 280–310 m, PODLECH 16977!, 16980! – SW: Farah: Tir Koh, c.25 km NW Farah to Anardara, 670 m, PODLECH & JARMAL 29032! 15 km E Kang (Zaranj), 475 m, PODLECH 16892! 3 km S Chakhansur, 475 m, PODLECH 16892! 3 km S Chakhansur, 475 m, PODLECH 16914a! 15 km SE Chakhansur, 520 m, FREITAG 3737! – SE: Kandahar: 35–50 km SW Lashkargah, 610–750 m, BRECKLE 4853!, FREITAG 656! Ad marginam deserti Dasht-i Margo SW Qala Bist (Lashkargha), 820 m, RECH. 34506! In deserto Dasht-i Margo, 20 km NNW Darweshan, RECH. 34711! In lapidosis, 10–20 km NE Kandahar, 1100 m, RECH. 35254! – Afghanistan, GRIFF. 1754 = Herb. East Ind. Comp. 4228!
P a k i s t a n : Quetta: Ziarat, VI.1959, A. KHAN!

Distr. gen.: Persia, Turcomania, Afghanistan, Pakistan, C Asia.

A very characteristic species in the fruiting stage because of the regularly horned basally ossified disseminules. The three forms or varieties that BUNGE recognized when he made the combination in *Gamanthus* (l.c. 78), viz. *α Belangeriana* BUNGE, *β vulgaris* BUNGE and *γ villosula* BUNGE, are with the numerous collections now studied, not worth formal recognition. An ally of the following species but in addition to the morphological differences they are geographically almost discrete.

It is probably of some significance that some specimens (e.g. from Khorassan) are infected on the leaves by a rust fungus which is apparently the same as that infecting specimens of *Halimocnemis pilifera*.

2. *G.* ***commixtus*** BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 76 (1862).
Syn.: *G. ovinus* BUNGE in BOISS., Fl. Or. 4: 980 (1879). *Halanthium ovinum* (BUNGE) VOLKENS in ENGLER & PRANTL, Natürl. Pflanzenfam. 3, 1a: 89 (1893). *H. commixtum* (BUNGE) VOLKENS in ENGLER & PRANTL, l.c. (1893). *Gamanthus gamocarpus* auctt. non BUNGE.
Icon.: NIKITIN, Fl. Kirghiz. 5: 80, tab. 6, fig. 2 (1955). – Tab. 204.
Type: (C Afghanistan) "In planitiebus editis regni Kabulici, prope Byani, Syghan, Chuschki et in montibus Gulguli", W. GRIFITH 1755 = Herb. East Ind. Comp. 4229, G, K!

Very similar to *G. gamocarpus* in facies, indumentum, leaves and floral structure, but leaves subtending flowers indistinctly alternate and flowers aggregated in groups of (2–)3–7; fruiting disseminule of similar structure to the preceding species, but irregular and consisting of several indurated united subtending leaves, not regularly 2-horned with a globose base.

Hab.: Salty ground, clay hills, loess, sterile slopes, desert, rocky slopes; 300–2750 m. – Fl. V–VII, fr. VIII–X

Afghanistan: N: Mazar-i Sharif: In faucibus SE Tashkurghan versus Haibak, c. 650 m, RECH. 16346!, HDG. & WDB. W-3969! Tang-i Tashkurghan, 750 m, FREITAG 6527! Tashkurghan, RECH. 34087!, KOELZ 13185!, NEUB. 4295! Inter Haibak et Paigah Kotal, c. 1350 m, RECH. 16418! – NW: Maimana: Andkhui, 330 m, AMSEL! Bala Morghab: Manghan, 650 m, JAKEŠ! 33 km S at road to Qala Nau, 620 m, FREITAG 6771! Herat: Hari Rud, AITCH. 615! – NE: Kataghan: Baghlan, 620 m, VOLK 71/666! 3 km S Jelaw Bir, Baghlan to Kunduz, 500 m, PODLECH & JARMAL 30079! Aliabad, VOLK 674! Middle Andarab valley, Banu to Khinjan, PODLECH 11284! Lower Andarab valley, 1100 m, LAMOND 2287!, RECH. 31757! 2–3 km E Paigah Kotal (Kotal-e Mirza Atbili, Robatak) Pul-i Khumri to Haibak, 800–1380 m, PODLECH 19770a!, 32468! Pul-i Khumri, 700 m, RECH. 16506!, VOLK 670! W Pol-i Khumri to Doshi, HDG. & WDB. W-4059! 20 km S Doshi, 760 m, FREITAG 3825! 5 km W Doshi, FURSE 8232! – C: Bamian, at Buddha statues, 2400 m, PODLECH 12190!, 17025!, UOTILA 18679! Dragon valley, W Bamian, 2750 m, BRECKLE 4754!, 4769! Ghulghula, 2500 m, GILLI 2191! "Byani, Syghan, Chushki" et in montibus "Gulguli" = Ghulghula (all near Bamian), GRIFF. 1755 = Herb. East Ind. Comp. 4229! Doab: Kamard valley, W Doab, GILLI 2190! Doab, VOLK 1750!

Distr. gen.: Afghanistan, C Asia (Syr Darya, Tian Shan, Pamir Alaj).

Despite its similarity to the previous species (at first sight they can readily be confused), it is distinct in flower and fruit. A few immature specimens in northern Afghanistan where the two species (*G. gamocarpus* and *G. commixtus*) overlap are seemingly somewhat intermediate e.g. the specimen from Andkhui leg. AMSEL.

3. ***G. pilosus*** (PALL.) BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 79 (1862).
Syn.: *Salsola pilosa* PALL., Illustr. Pl. 28, tab. 20 (1803). *Halimocnemis malacophylla* C.A. MEY. in LEDEB., Fl. Alt. 1: 387 (1829). *Halanthium pilosum* (PALL.) VOLKENS in ENGLER & PRANTL, Natürl. Pflanzenfam. 3, 1a: 89 (1893).
Icon.: PALL., l.c. tab. 20 (1803). GROSSH., Fl. Kavk. ed. 2, 3: tab. 16, fig. 6 (1945). – Tab. 205.
Type: (Azerbaijan, Mugan steppe): "in maritimis Mediae et deserto Mogano collecta specimina retulit C. HABLITZL, et ad Araxem legit cl. GUELDENSTAEDT".

Annual to 30 cm high with an indumentum of short ± adpressed hairs and longer spreading hairs. Stems much branched. Leaves alternate, up to 30 × 2 mm, spine-tipped, upper leaves subtending flowers subopposite. Flowers in clusters of 3–4. Connective appendages yellow, oblong-globose. Fruiting disseminule consisting of several indurated united leaves ossified at base and enclosing bracts, perianth segments and seeds.

Talish: Talish sec. GROSSH., Fl. Kavk. 3: map 174 (1945).
Persia: W: Azerb.: Dasht-e Moghan, grande steppe, 160–500 m, SCHMID 6565!, HABLITZL.

Distr. gen.: Transcaucasia, adjacent parts of Persia.

I have not seen enough material to assess the status and affinities of this species; nor have I seen type material, although the PALLAS illustration gives a very good impression of the species. Its closest ally appears to be the eastern and rather more delicate *G. commixtus*. BUNGE in his original description stressed the obtuse, bilobed perianth lobes, but the specimen cited above is in fruit; although this perianth character is used in the key to the species, it should be regarded with suspicion.

41. *Halarchon*

I.C. HEDGE, Edinburgh

Halarchon BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 75 (1862).

Lit.: A. VON BUNGE, Halarchon in Anabasearum Revisio, Mémoires de l'Acádemie Impériale des Sciences de St. Pétersbourg 7. série, 4, 11:75,76 (1842).

Annual herb with a persistent indumentum of simple hairs. Leaves well-developed, linear, alternate, fleshy, terete-trigonous, semiamplexicaul, spine-tipped. Flowers hermaphrodite, sessile, solitary in leaf axils. Bracts 2–3. Perianth segments 5, oblong, membranous, free, unchanged at fruiting stage. Stamens 5; anthers linear, introrse; appendages very prominent, vesicular, persistent. Stigma 2-lobed, distinctive, enclosed before fertilization by a regularly dentate cup-shaped membranous fringe, later reflexing to form a conical cap. Fruit ± imbedded in surrounding somewhat indurated leaves and bracts, inconspicuous. Seed vertical with a spiral embryo; endosperm absent. Monotypic. – Type of genus: *Halocharis vesiculosa* MOQ. = *Halarchon vesiculosus* (MOQ.) MOQ.

Related to *Halimocnemis*, *Halocharis* and *Gamanthus*, but clearly differing from them in the structure of the ovary and the presence of the curious fringe on the stigma.

1. ***H. vesiculosus*** (MOQ.) BUNGE, l.c.
Syn.: *Halocharis vesiculosa* MOQ. in DC., Prodr. 13, 2: 202 (1849) – excl. GRIFFITH 1755.
Icon.: BUNGE l.c., tab. 1, fig. 12, 25, 26. – Tab. 206.
Type: Afghanistan, W. GRIFFITH 718, G-microfiche!; holotype K!

Annual, 5–25 cm high and ± as broad, glaucous, greyish white or green, with a rather dense indumentum of simple spreading-adpressed hairs not or scarcely glabrescent; stems much branched. Leaves 15–25 × 1–2 mm, spreading rucurved; apical spine 2–5 mm, persistent or deciduous; upper leaves clearly amplexicaul. Inflorescence showy, consisting of numerous flowers mostly borne on short lateral shoots. Perianth segments oblong, 4. 4,5 × 1 mm, membranous, apiculate, erect. Thecae linear, basal, c. 1 mm long. Staminal appendages very conspicuous, c. 5,5 × 2,8 mm, persistent, shortly stipitate, purplish-red, rose or magenta. Ovary c. 2 mm long, oblong, with a broader lower and narrower upper portion; indusium-like fringe surrounding stigma c. 0,7 mm in diameter, irregularly lacerate, erect and cup-shaped before fertilization, reflexed after. Stigma bilobed, hidden within the fringe when young. Perianth segments unchanged at fruiting time; bracts and subtending leaves somewhat indurated in fruit basally enclosing the fruit. Seed c. 2 x 1,5 mm.

Hab.: Semi-desert, sandy hills, banks at roadside; 600–1200 m. – Fl. V–IX, fr. X.

A f g h a n i s t a n : NW: Herat: Herat, NEUB. 3460! – SW: Farah: 64 km E Dilaram to Girishk, VOLK 71/653! 41 km E Dilaram, 609 m, HEWER 1340! Farah to Siah Ab, Khormalik, LINDB. 228/1957! Farah to Kandahar, Marroo desert, HORREUS DE HAAS 1630! Dilaram, 1200 m, 31.VIII.1973, RENZ!? 100 km E Shindand, BLIGNY 3! – SE: Kandahar: Kajakai, 1000 m, TONČEV IN FREITAG 4224! In collibus arenosis, c. 80 km Kandahar versus Girishk, 1000 m, RECH. 32468! c. 50 km W Girishk versus Dilaram, 1000 m, RECH. 32475! 35 km E Girishk, 940 m, UOTILA 18925! 30 km ESE Girishk to Kandahar, 870 m, PODLECH 19206!, VOLK 1342! 15 km W Kandahar, Kushk-i Nakhod, 1000 m, NEUB. 4203! 30 km W Kandahar, 980 m, FREITAG 2047! 100 km W Kandahar, 1000 m, ANDERSON & PETERSEN 462! 120 km W Kandahar to Herat, BOKHARI 1925! S Kandahar, KASY 7! 40 km S Kandahar, 3.VI.1966, AMSEL! Tor Kotal, 5 km N Cagray Qala, 1080 m, BRECKLE 4840! In arenosis and fluvium Turnuk [Tarnak – Kandahar to Mukur], GRIFFITH Journ. 718 = Herb. East Ind. Comp. 4236! – Afghanistan, GRIFF.!

Distr. gen.: Endem.

Probably the most strikingly conspicuous of all our Chenopod species on account of the very large magenta staminal appendages. Also a very distinct species taxonomically because of the curious ovary structure with a lacerated fringe on the style. Very few of the cited gatherings are in mature fruit.

42. *Cornulaca*

I.C. HEDGE, Edinburgh

Cornulaca DELILE, Flore d'Egypte – explic. des planches 72 (1813).
Syn.: *Cornulacca* MOQ.–TAND. Ann. Sc. Nat. Bot. ser. 2, 4: 211 (1835) – orth. var.

Lit.: A. VON BUNGE, Cornulaca in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg 7. série, 4, 11: 86–91 (1862). P. AELLEN, Cornulaca in Ergebnisse einer botanisch-zoologischen Sammelreise durch den Iran. Botanische Ergebnisse I, Verhandlungen der Naturforschenden Gesellschaft in Basel 61: 158–166 (1950). C.C. TOWNSEND, Cornulaca in Contributions to the Flora of Iraq XIII., Kew Bulletin 35: 391 (1980).

Annual herbs or shrubs, spiny, glabrous or finely papillose, with tufts of white hairs in leaf axils and at flower bases, somewhat fleshy or not. Stems much branched, not jointed. Leaves alternate, sessile, herbaceous or thorn-like, spine-tipped, ± amplexicaul and decurrent. Flowers hermaphrodite or unisexual, very small, solitary or in clusters up to 8 in leaf/bract axils. Perianth segments 5, oblong, ± free to base in flower, erect, membranous; in fruit coalescing and indurated forming a hard globose tube with 1(–2) elongated terminal perianth spine(s). Stamens 5; filaments basally united into a tube of varied length. Ovary ovoid, erect, with 2 prominent papillose spreading styles. Seed vertical; embryo spiral; albumen absent. – Type of genus: *C. monacantha* DELILE.

Easily recognized by the sturdy spiny habit, the dense tufts of white hairs in the axils of leaf and flower, the basally fused filaments and the elongated spine on the fruiting perianth. About 6 species in desertic areas of northern Africa, SW and C Asia. Its generic affinities are not clear. Our 2 species seem to be distinct, but I have not found constant floral or fruit features that separate them; greater reliance has to be placed on growth and vegetative characters.

1a. Annual, becoming woody at the end of the season, up to 30 cm high .... 2. *C. Aucheri* MOQ.

b. Subshrub or shrub, up to 60 cm high and to 1 m wide .... 1. *C. monacantha* DELILE

1. *C. **monacantha*** DELILE, Flore d'Egypte – explic. planches 62, tab. 22, fig. 3 (1813).
Syn.: *C. amblyacantha* BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 88 (1862).
Icon.: JAFRI & RATEEB, Fl. Libya 58: 103, fig. 38 (1978). LÉONARD, Contrib. Fl. Végét. Déserts Iran 7: 33, fig. 4, P–R (1987). – Tab. 207.
Type: Egypt "... dans la haute Egypte et près des pyramides de Gyzeh et de Saqqarah", A. DELILE, ? P or MPU.

Subshrub or shrub up to 60 cm high (or more) and to 1 m wide, much and intricately branched. Stems woody, prostrate or ascending-erect, pale brown, greenish or silvery grey, glabrous and glaucous or finely papillose. Leaves alternate, 3–7 mm long, ovate-triangular, recurved, amplexicaul, decurrent, with a prominent hard terminal spine; axils ± densely woolly. Flowers inconspicuous, 1–5, in axils of leaf-like bracts, embedded in dense brush-like tufts of white hairs. Perianth hyaline, with 5 initially free lobes, c. 2,5–3 mm long, hardening and accrescent in fruit, globular-ovoid, with (0–)1(–2) long spine(s) to 9 mm developing on 1 lobe. Stamens 5 with filaments basally fused forming a tube, variable in size. Style prominently 2-lobed, papillose. Seed sturdy with a vertical embryo.

Hab.: Margins of deserts, semi-deserts, clay and sandy soil, sandy gravel, rocky slopes, reg with little vegetation, wadis; near sea-level to 1800 m. – Fl. IX, fr. X–XII.

P e r s i a : S: Fars.: Abarqu, 30 km to Yazd, 1520 m, FOROUGHI & ASSADI 15110! Bushehr to Kazerun, Konar Takhteh, 500 m, GRANT 15117! Bushehr to Lengeh, TERME & MOUSSAVI 35373-E! Kerman: Saidabad (Sirjan), 122 km on road to Bandar Abbas, 1160 m, FOROUGHI & ASSADI 15054! 22 km E Rafsanjan to Kerman, 1670 m, TERME & MOUSSAVI 34439-E! Baghin, 1760 m, FOROUGHI 10563! 10 km N Shahdad to Kavir-e Lut, 180 m, TERME & MOUSSAVI 34421-E!, 34422-E!, 34423-E! W Dasht-e Lut, 31°01'N, 58°03'E, 520 m, LÉONARD 6236! Daristan, 29°08'N, 58°48'E, 820 m, LÉONARD 6054! SW Jaz Murian, 400 m, LÉONARD 5814! Lar.: 5 km W Taheri, 15 m, BOKHARI & al 14821!, 14823! Near Kaki, 60 m, BOKHARI & al. 14833!, 14834! Bandar Abbas in regione litorali, RECH. 3454! 30 km N Bandar Abbas, KASY 348! Anbeh between Lar and Bastak, 600 m, IRANSHAHR & TERME 14842-E! Hormoz island, TERME & MOUSSAVI 34489-E! Qeshm island, TERME & MOUSSAVI 35376-E! Bal.: Nosratabad Sipi, 1400 m, RECH. 3915!, TERME & MOUSSAVI 34420-E! 19 km SW Nosratabad Sipi, RECH. 27198! 100 km N Chah Bahar to Nikshahr, 100 m, ERSHAD & al. 35406-E! Chah Bahar, 42 km Rask road, SHIRDELPUR 10705! Tis, SOJÁK 1329! – E: Sistan: Zabol to Nęh:

60 km S Safidabeh, 1000 m, RECH. 4133! Khor.: NW Tabas, 800 m, REJAMAND & ARAZM 32479! – C: Tehr.: Ab-Barik, SHAR. & AELLEN 30167-E! Dasht-e Kavir: Maranjab to Sefidab, TERME & TEHRANI 40056-E! Hoseynian to Howz-e Aqa, 650 m, TERME & MOUSSAVI 30257-E! Kavir Prot. Reg.: In deserto lapidoso prope stationem viae ferreae Bad Rud, 1080 m, RECH. 46493! Yazd: 12 km W Chah Kharbozeh to Anarak, RECH. 51997! 15 km W Chah Malek to Chupunum, c. 800 m, RECH. 51894! 1329! Jask, SOLTANI 40222-E! Anarak to Chupunum, FOROUGHI & BAZARGAN 32378! Taq plain, Robat-i Khan, KOELZ 16812! Kashan: Dehabad to Abu Zeydabad, 1100 m, MOUSSAVI & TEHRANI 30697-E!
Afghanistan: SW: Farah, 60 km SE Shindand on Herat-Dilaram road, 1220 m, PODLECH 16927! 45 km SW Farah, Koragazi, 600 m, BRECKLE 4884! 20 km E Farah, Khairabad road to Dilaram, 690 m, FREITAG 3775!
Pakistan: Kalat: 25–50 km E Jhal Jhao, 400 m, RECH. 27651! Bal.: Chagai: 4 km E Nushki near road to Quetta, 1100 m, FREITAG & KOTHE 18759! Koh-e Soltan 39 km N Nok Kundi, 1800 m, FREITAG & KOTHE 18699/26! Makran: W Awaran to Hoshab, 62°50', 26°00', RECH. 27675! 30 km Turbat to Pasni, RECH. 27830! 2 km S Pasni, 15 m, FREITAG & KOTHE 18415!

Distr. gen.: Mauritania and Algeria through N Africa and Chad to Egypt, Sinai, Iraq, Arabian peninsula, Persia, Afghanistan, Pakistan (map in LEBRUN, Les bases flor. Afr. seche, Etud. Bot. 7: 137 fig. 47. 1981).

A most variable species in all characters; floral parts, including the length of the staminal filaments tube, are especially plastic (cf. AELLEN), 166. 1950). The type specimen of *C. amblyacantha* BUNGE (AUCHER 5263!) reduced here to synonymy, is presumably from S Persia without an indication of locality. It is a very dwarf pulvinate plant with all parts very congested. Some of the specimens cited above, both from S Persia and Kashan, agree with this type specimen, but there seems to be a complete gradation from these congested forms through to the often long-branched forms of typical (indeed type of) *C. monacantha*. The overall distribution of *C. monacantha* is typical of the Saharo-Sindian region, though extending in Chad as far south as c. 15°.

2. *C.* ***Aucheri*** MOQ., Chenopod. Monogr. 163 (1840); in DC., Prodr. 13, 2: 218 (1849).
Syn.: *C.* ***leucacantha*** SHARIF & AELLEN, Verh. Naturf. Ges. Basel 61: 161 (1950).
Icon.: LÉONARD, Contrib. Fl. Végét. Déserts Iran 7: 33, fig. 4, N–O (1987) – juvenile form; COLLENETTE, Fls. Saudi Arabia 120 (1985) – as *Cornulaca* sp. – Tab. 208.
Type: "In Assyriae desertis". P.M.R. AUCHER-ELOY 2801, G-microfiche!

Bushy annual, c. 10–30 cm high and wide, ± succulent, branched often from near base, with a ± woody vertical rootstock. Stems prostrate or ascending, silvery-white or – green or greyish, glabrous-glaucous or finely papillose, becoming sturdy and woody. Leaves linear-filiform to triquetrous, 4–10 mm, recurved, grey-green, with a broader base, ± amplexicaul and decurrent, with a long terminal often white spine; axils ± densely woolly, in juvenile specimens hairs up to 10 mm long, much shorter in adult plants. Flowers 1–8, in axils of leaf-like bracts, embedded in tufts of white hair. Perianth 1–3 mm long with 5 ± oblong free lobes which coalesce and harden in fruit; one lobe developing a terminal spine to 5 mm. Stamens 5 with a basally fused filament tube.

Hab.: Sand dunes, mobile sands, semi-desert, gravelly barren plains, on salty clay or soil, gypsiferous soil, salt flats; 40–1820 m. – Fl. IX, fr. X–XII.

Iraq: Diyala: Jabal Hamrin inter Sharaban et Jalaula, RECH. 8084!, Herb. Univ. Baghdad. 31!
Persia: W: Kermansh.: Qasr Shirin to Kermanshah, Sar-e Pol, RECH. 14600! Qasr Shirin, 400 m, GRANT 16021! Esf.: Nain, 1500 m, FOROUGHI & ASSADI 15124! Gav Khuni, STAPF 764! Zavareh, Jahanabad, 960 m, FOROUGHI 10554! Anarak, 850 m, FOROUGHI & ASSADI 15150! Khuz.: Ahvaz to Behbehan 8 km SE Hamidiyeh, PABOT 847! 153 km SE Ahvah to Hamidiyeh, PABOT 470! – S: Fars.: Darvahi, Borozjan to Genavi, 50 m, BOKHARI & al. 14791! 14 km W Borozjan, STUTZ 917! Jahrom, 23 km on road to Shiraz, 1010 m, FOROUGHI & ASSADI 15090!, 15091! 28 km SE Khormuz, 40 m, GRANT 17011! Kerm.: Baghin, 1750 m, FOROUGHI 10564! Kuh-e Jupar, 1820 m, KUHLE! – E: Sistan: Sistan, HENDERSON 57! 60 km N Zahedan, Hormak, c. 800 m, TERME & MOUSSAVI 34438-E! Khor.: Robat-e Posht-e Badam to Tabas, 900 m, FOROUGHI & BAZARGAN 32388! – C: Tehran: Istgah-e Kavir (railway station) 88 km E Tehran, 1000 m, AELLEN 362 (syntype of *C. leucacantha*)! Dasht-e Kavir: Hoseynian to Howz-e Aqa, 650 m, TERME & MOUSSAVI 30283-E!, 40115-E, 40192-E! 5 km from Maranjab to Sefidab, 800 m, TERME & TEHRANI 40024-E! Kavir Prot. Reg.: E Siah Kuh, 800 m, WDB. & FOROUGHI 14637!, 15214! 7 km E Bad Rud, 1050 m, RECH. 46483! 55 km NW Shah Abbas Caravan-Sarai, 800 m, WDB. & FOROUGHI 15191! Eyn or-Rashid to Sefidab, IRANSHAHR & MOUSSAVI 15364-E!, 15388-E! Damgh.-Semn: S of Semnan, 1000 m, REJAMAND & ARAZM 32591! Kashan: Aran, 850 m, FOROUGHI & ASSADI 15188! Chartaq E Kashan, 800 m, FOROUGHI & BAZARGAN 32445! Yazd: In arenosis mobilibus 6 km SW Robat-e Khan, 1000 m, IRANSHAHR 40127-E!, RECH. 51807!
Afghanistan: SW: Farah: 8 km E Kang (Zaranj), 485 m, BRECKLE 4902! 4 km SW Kang (Zaranj), 480 m, PODLECH 17128!

Pakistan: Bal.: Chagai: c. 25 km E Mirjaveh, 61°30', 29°01', RECH. 27260! 30 km S Nok Kundi, road to Qila Ladgasht, 630 m, FREITAG & KOTHE 18699/672!

Distr. gen.: E Arabian peninsula, Iraq, Persia, Afghanistan, Pakistan.

Although the name *C. Aucheri* has in the past been applied to delicate annuals collected usually in April or May, there now seems no doubt that these are merely the juvenile stages of the sturdy plant that much later was described as *C. leucacantha*. *C. Aucheri* appears to be most commonly an annual, though at the end of the season it frequently has a thick woody stem, but it is possible that it may also be a biennial. Usually there is no difficulty in separating the shrubby *C. monacantha* from the herbaceous *C. Aucheri*, but inadequate specimens with poor field-notes are sometimes difficult to assign. There seems to be no reliable floral or fruit character that separates them. AELLEN's (1950) comment that *C. leucacantha* had a foul smell (of urine) is not backed up by comments or field-notes of other collectors. Some specimens bear a superficial resemblance to *Horaninowia* species (e.g. *H. pungens* or *ulicina*).

43. *Agathophora*

I.C. HEDGE, Edinburgh

Agathophora (FENZL) BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 19, 92 (1862).
Syn.: *Halogeton* sect. *Agathophora* FENZL in LEDEB., Fl. Ross. 3: 831 (1851/2). *Halogeton* subgen. *Agathophora* (FENZL) MAIRE, Fl. Afrique du Nord 8: 186 (1962).

Lit.: A. VON BUNGE, Agathophora in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg 7. série, 4, 11: 92–93 (1862). V. BOTSCHANTZEV, The genus Agathophora (FENZL) BUNGE, Botaničeskii Zhurnal SSSR. 62, 7: 1447–1452 (1977). [in Russian].

Low growing sturdy subshrubs, glabrous or papillose, with tufts of long hairs in leaf axils. Stems woody, much branched, white when young. Leaves alternate, short, fleshy, ± terete, sessile, usually with a prominent deciduous apical bristle. Flowers hermaphrodite or male, in clusters among woolly tufts of hair, subtended by leaves, outer flowers with 2 bracts. Perianth segments 5, erose, free, membranous; outer 3(–4) developing wings in fruit. Stamens 5 with short terminal appendages. Disk with papillose lobes. Ovary ovoid with 2 subulate styles. Utricle included in perianth. Seeds vertical; embryo spiral without endosperm. – Type of genus: *Salsola alopecuroides* DELILE (= *Agathophora alopecuroides* (DELILE) BUNGE).

Related to *Halogeton*, but subshrubs and with only 3(–4) of the perianth segments developing wings in fruit. A mono- or oligotypic genus of Saharo-Sindian areas from N Africa to Pakistan; most of the several species recognized by BOTSCHANTZEV (1977) are untenable.

1. ***A. alopecuroides*** (DELILE) FENZL ex BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 92 (1862).

Syn.: *Salsola alopecuroides* DELILE, Flore d'Egypte – explic. planches 56, tab. 21, fig. 1 (1813). *Halogeton alopecuroides* (DELILE) MOQ., Chenopod. Monogr. 161 (1840). *Anabasis alopecuroides* (DELILE) MOQ. in DC., Prodr. 13, 2: 210 (1849). *Halogeton alopecuroides* var. *papillosa* MAIRE, Bull. Soc. Hist. Nat. Afr. Nord. 34: 190 (1943). *Agathophora iraqensis* BOTSCH., Bot. Zhurn. 62, 10: 1451 (1977).

Icon.: ZOHARY, Fl. Palaest. 1: tab. 263 (1966). – Tab. 209.

Type: "In Aegypto, circa Pyramides Gyzenses" DELILE, E(?)!, MPU, P.

Subshrub 30–40 cm, much branched. Stems angular, white with short internodes, glabrous or ± densely papillose [var. *papillosus* (MAIRE) BOULOS]. Leaves erect-spreading, c. 1 cm long, with a usually caducous bristle, ± densely woolly at axils. Flowers few, 3–7, in ± distant clusters in upper leaf axils. Perianth segments oblong-ovate, hyaline; in fruit 3(–4) developing c. 3 mm spreading wings arising from median parts of segments. Stamens 5; thecae c. 1 mm long with a c. 0,1 mm terminal appendage. Seed vertical, compressed.

Hab.: Semi-desertic limestone slopes; c. 800–900 m.

Pakistan: Kalat: W Bela 26°14'N, 66°19'E versus Jhal Jao, 26°10'N, 65°35'E, RECH.! Bal.: Makran: 20 km SW Panjgur to Hoshab, 970 m, FREITAG 18621! 93 km S Panjgur to Hoshab, 850 m, FREITAG 18585! 35 km Gichak to Panjgur, OMER & al. 2080!

Distr. gen.: NW Africa to Egypt, Sinai, Palestine, Syria, lower Iraq, Saudi Arabia, Kuwait, Pakistan.

BOTSCHANTZEV described 3 new species in 1977, raising the generic total to 5; his specific concept was certainly very narrow. I prefer taking a wider view, accepting *A. alopecuroides* as a variable species. The recent discovery of this species in Pakistan is rather surprising, because the previous easternmost locations for the genus were from the east of the Arabian peninsula; to date it is not known from Persia.

Galls sometimes occur on the branches. Forms that are either glabrous or densely papillose apparently occur indiscriminately throughout the range of the species, often growing side by side; sometimes they are given varietal status.

44. *Halogeton*

I.C. HEDGE, Edinburgh

Halogeton C.A. MEY. in LEDEB., Icon. Pl. Fl. Ross. 1: 10 (May-Dec. 1829); Fl. Alt. 1: 378 (Nov.-Dec. 1829).

Lit.: A. VON BUNGE, Halogeton in Anabasearum Revisio, Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg 7. série, 4, 11: 93–99 (1862).

Annual herbs or low shrubs, glabrous except for arachnoid hairs in leaf axils. Leaves well-developed, alternate, fleshy, linear-oblong, sessile, with a terminal persistent or deciduous mucro. Flowers male or hermaphrodite, sessile, few or solitary in leaf axils. Bracts 2. Perianth segments 5, transparent-membranous, all with prominently terminal wings in fruit. Stamens 2–3–5, without terminal appendages, alternating with small papillose staminode-like lobes on the disc; anthers linear. Ovary ovoid. Styles 2, filiform, free to or near base. Fruit erect, vertical; seed with a spirally coiled embryo; endosperm absent. – Type of species: *H. glomeratus* (M.B.) C.A. MEY.

3–4 species in Europe, SW and C Asia.

Related to *Agathophora* q.v. Characteristic features are the annual habit, the prominent 5 equally winged fruiting perianth segments, the frequently polygamous flowers and the staminode-like lobes between the 2–3–5 stamens. As presently constituted the genus contains 2 disparate elements: the W Mediterranean *H. sativus* (L.) MOQ. and the small group of species with *H. glomeratus* at its centre.

1. ***H. glomeratus*** (M.B.) C.A. MEY. in LEDEB., Icon. Pl. Fl. Ross. 1: 10 (1829); Fl. Alt. 1: 378 (1829).
Syn.: *Anabasis glomerata* M.B., Mém. Soc. Imp. Nat. Mosc. 1: 110 (1806). *Halogeton tibeticus* BUNGE, Mém. Acad. Imp. Sc. Pétersb. 7. sér., 4, 11: 94 (1862).
Icon.: LEDEB., Icon. Pl. Fl. Ross. 1: tab. 40 (1829). KOMAR., Fl. URSS 6: tab. 14, fig. 6a-c (1936). – Tab. 210.
Type: (? NE Kazakhstan) "Siberia".

Annual, forming small tufts, fleshy, glabrous, except for hairs in leaf axils, glaucous; root becoming ± woody. Stems pale brown, much branched, smooth, 5–30 cm; shoots ascending- or spreading-erect, ± densely leafy. Leaves ± terete, small, 3–10 mm long, semi-amplexicaul, with or without papillose-like excrescences and with some long arachnoid hairs in axils; terminal mucro c. 0,5–0,8 mm. Flowers

1–3 in most of leaf axils. Perianth segments oblong-ovate, acute, c. 0,7 mm long, membranous and delicate in flower; in fruit somewhat rigid-membranous, with an oblong, c. 2,5 mm long basal part and a c. 2 x 2,5 mm spreading terminal wing, brownish or pink. Flowers mostly hermaphrodite, sometimes male, small. Stamens 2–3(–5), somewhat exserted beyond perianth segments. Fruit a transparent orbicular utricle, readily releasing the c. 1,5 mm spirally coiled embryo.

Hab.: Sterile slopes, on limestone, semi-desertic plains, salt steppe, conglomerate, 2400–2900 m. – Fl. VI–VII, fr. IX–X.

Afghanistan: C: Bamian: Bamian, near large Buddha statue, BRECKLE 858!, 4751!, PODLECH 12600!, 17027!, 12189!, UOTILA 18678! Bamian, 2480 m, GILLI 2192!, NEUB. 4420! 6 km W Bamian, 2550 m, FREITAG 1215! Central mountains, NEUB. 409/1951!, 415/1951! Shar-e Ghulghula, 2400 m, NEUB. 4422!, PODLECH 17033! Dragon valley, BRECKLE 4759! Bamian to Bulola, VOLK 2240! Panjao: S side Kotal-e Dewali, Yakawlang to Panjao, 2820 m, PODLECH 19560! Ghorat: Shibar pass, 2900 m, VOLK 2228!

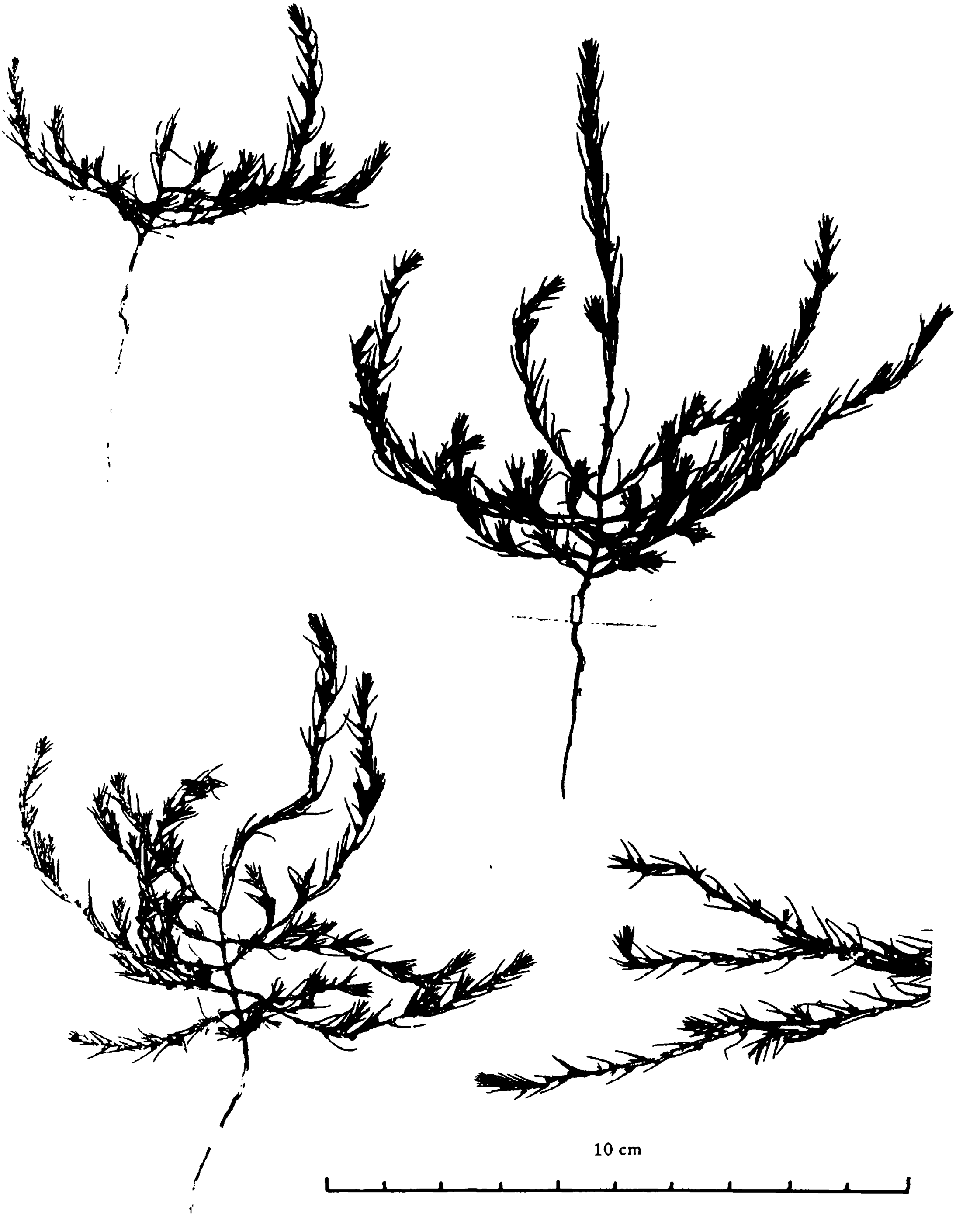
Distr. gen.: C Asia (incl. Kizil Kum, Kara Kum, Tian Shan, Pamir Alaj), C Afghanistan, Gilgit, Kashmir, China (Kansu, Sinkiang, Tibet).

A fairly clear-cut species. Despite the substantial geographical disjunctions between the central Afghanistan localities (all in the Bamian area) and those in Kashmir (Ladak) and the Pamir Alaj, there seems no reason with the available material to recognize infra-specific races.

ACKNOWLEDGEMENTS

The editor is very grateful to Mr. IAN C. HEDGE, Royal Botanic Garden, Edinburgh, for critically reading the whole manuscript, his helpful advice in many details and last but not least for his corrections of the english text. I am indebted to the artists who have made the drawings and photographs for the illustration of this volume. Details under the heading "Illustrations".

Tab. 1



Polycnemum arvense L. – Herb. Dörfler (Europe)

Tab. 2

Agroglochin persicarioides (POIR.) MOQ. – KAZMI 3562

Hablitzia tamnoides M. B. – coll. ign., 1 VII. 1959 (Armenia)

Tab. 4

Beta vulgaris L. subsp. *maritima* (L.) ARCHANGELI – RECHINGER 9255 (Iraq)

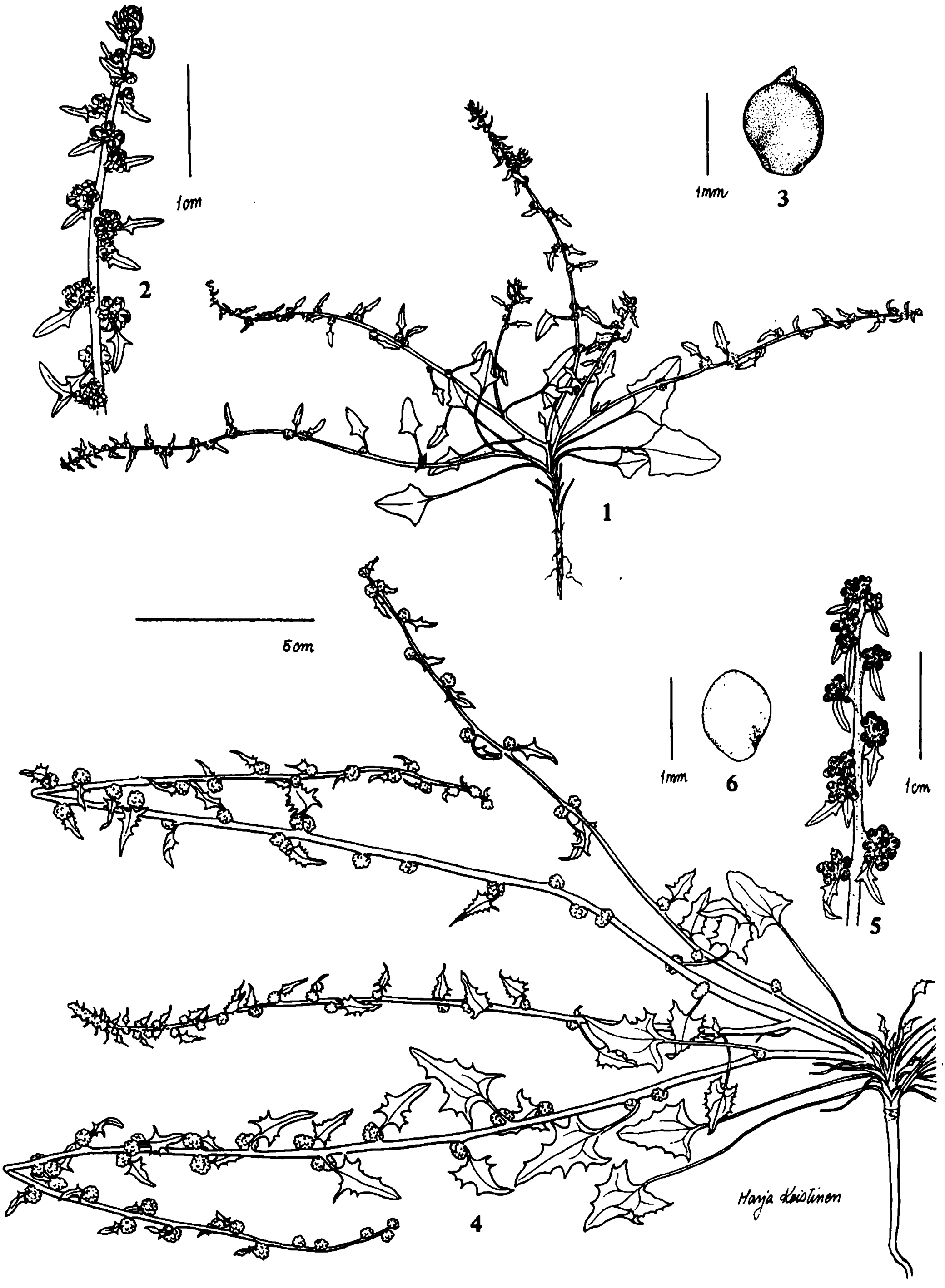
Tab. 5

Tab. 6

Beta corolliflora ZOSIMOVIC ex BUTTLER – RECHINGER 32831 (Turkey)

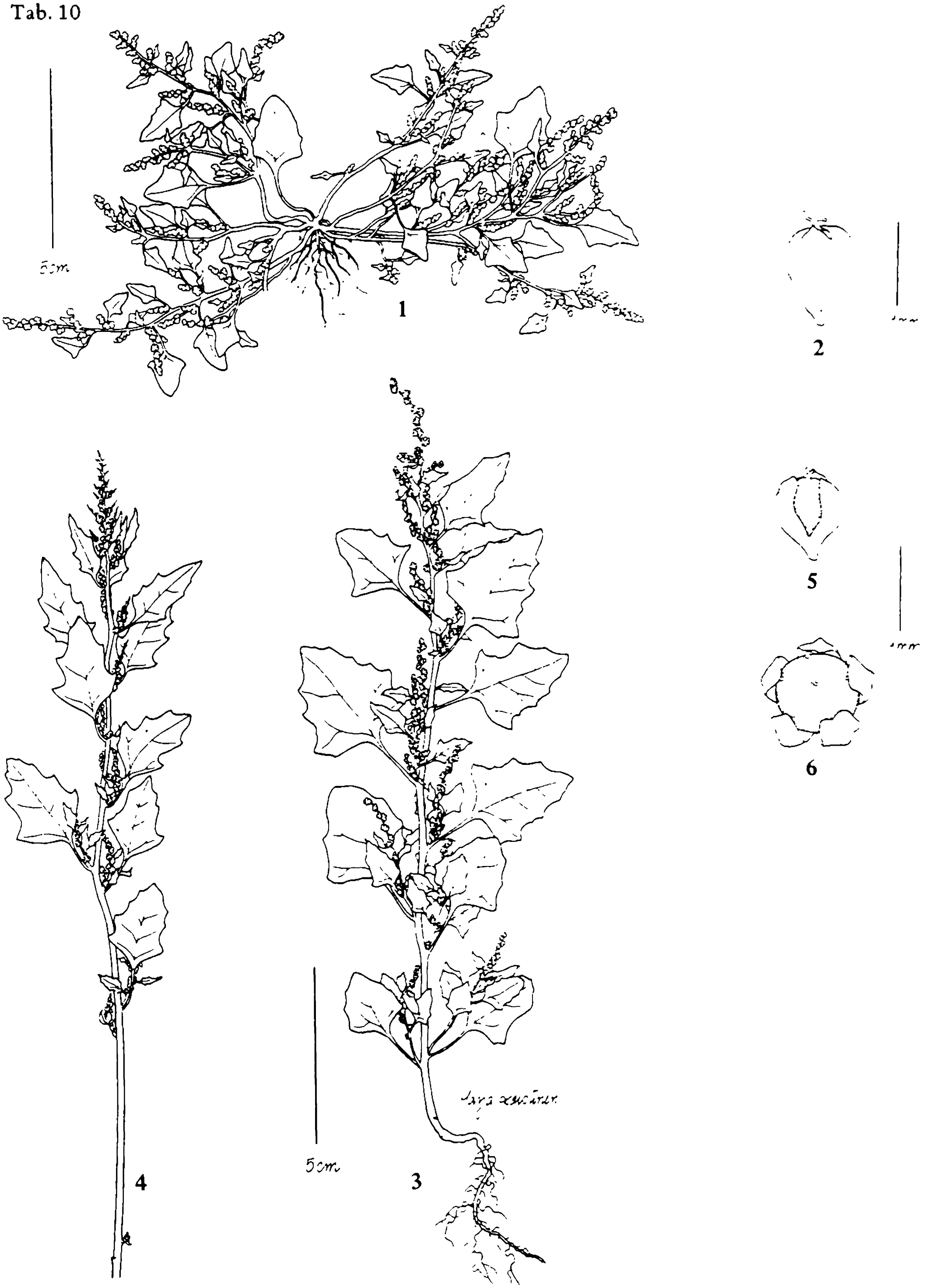
Beta macrorhiza STEV. – DAVIS 44274 (Turkey)

Chenopodium foliosum ASCHERS. subsp. *foliosum* **1**: Habit; **2**: End of branch – GRANT 16459; **3**: Seed – RECHINGER 32292



1–3: *Chenopodium foliosum* ASCHERS. subsp. *montanum* UOTILA **1**: Habit; **2**: End of branch; **3**: Seed – RECHINGER 6046-a; **4–6**: *C. Litwinowii* (PAULSEN) UOTILA **4**: Habit; **5**: End of branch – RECHINGER 37467: **6**: Seed – UOTILA 18770

Tab. 10

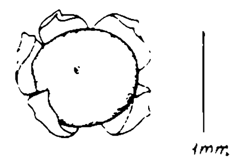


1–2: *Chenopodium chenopodioides* (L.) AELLEN **1**: Habit; **2**: Lateral flower – GILLI 2095; **3–6**: *C. rubrum* L. **3**, **4**: Habit – RECHINGER 3943; **5**: Lateral flower; **6**: terminal flower – GILLI 2082

1: *Chenopodium glaucum* L. – KERSTAN 572; 2: *C. urbicum* L. – THESIGER 304

Marja Koistinen

1

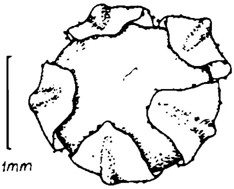


2

Chenopodium polyspermum L. 1: Habit; 2: Fruit with perianth – STEVEN (Caucasia)

Chenopodium murale L. 1: Habit – HEWER 3770; 2: Fruit with perianth – UOTILA 17354

Tab. 14



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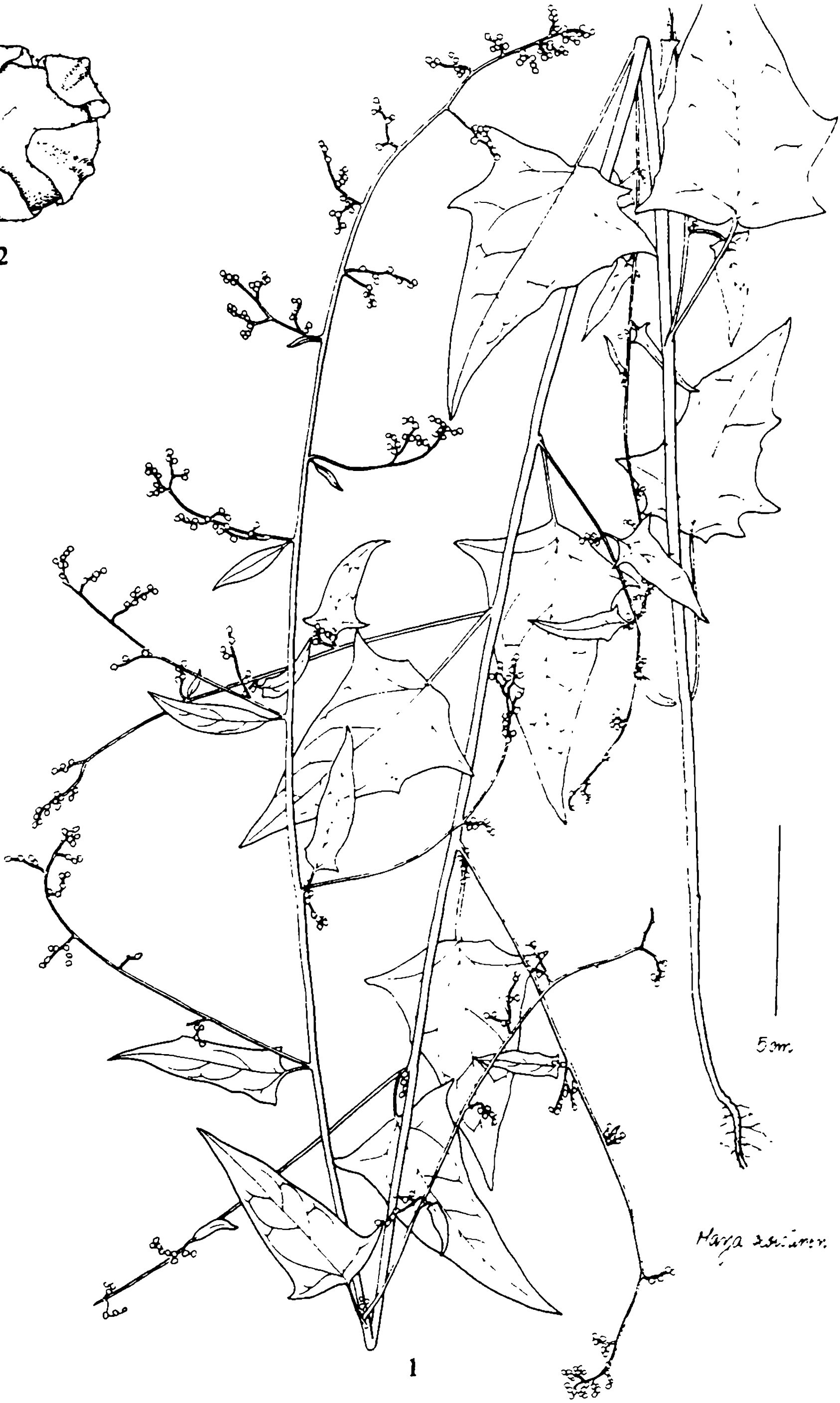


1

Chenopodium badachschanicum TZVEL. 1: Habit: 2: Fruit with perianth – RECHINGER 19544

Tab. 15

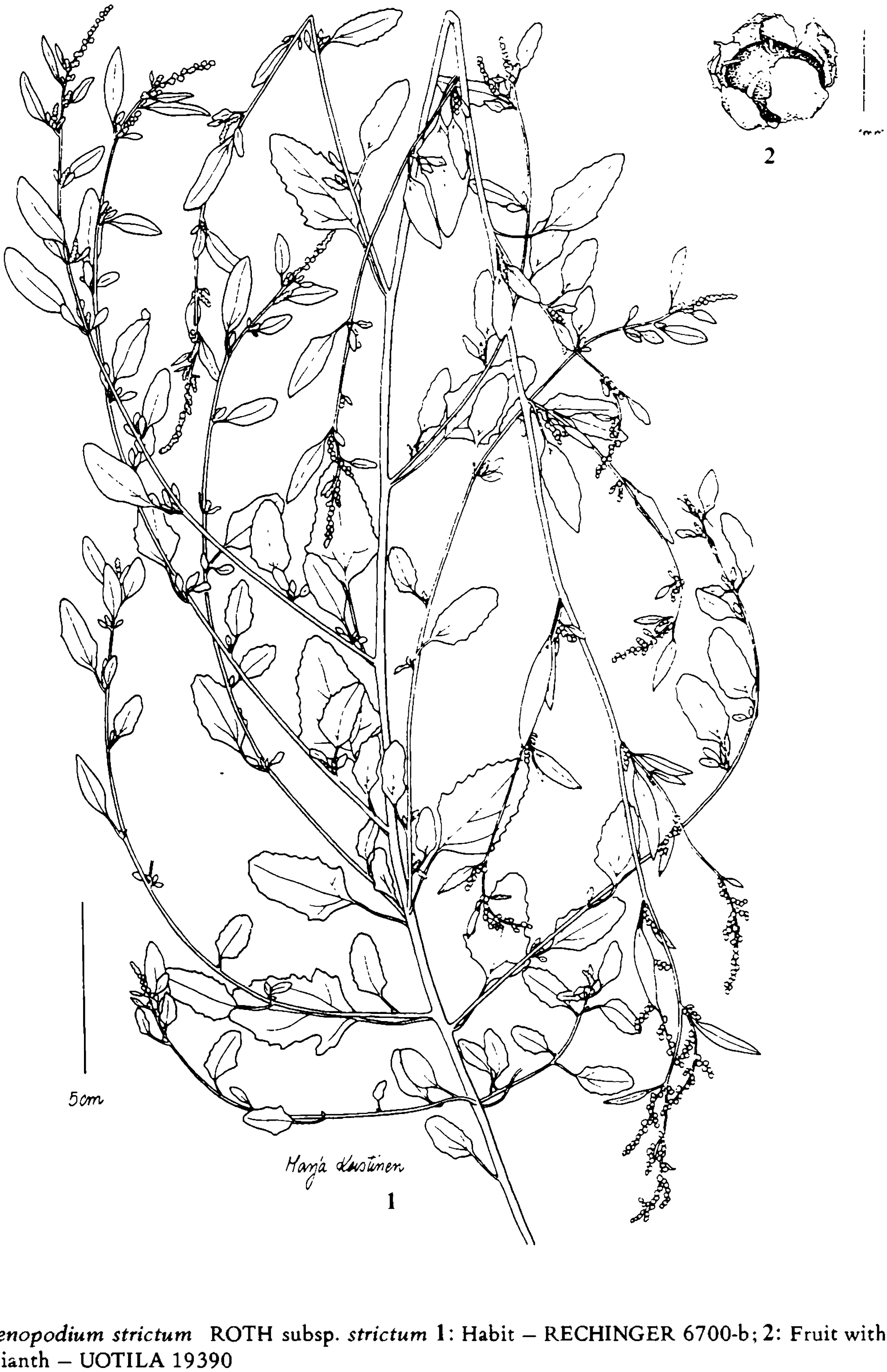
1: *Chenopodium ficifolium* SM. subsp. *ficifolium* – KOTSCHY 450 b; **2**: *C. ficifolium* subsp. *Blomianum* (AELLEN) AELLEN – UOTILA 17324

Tab. 16

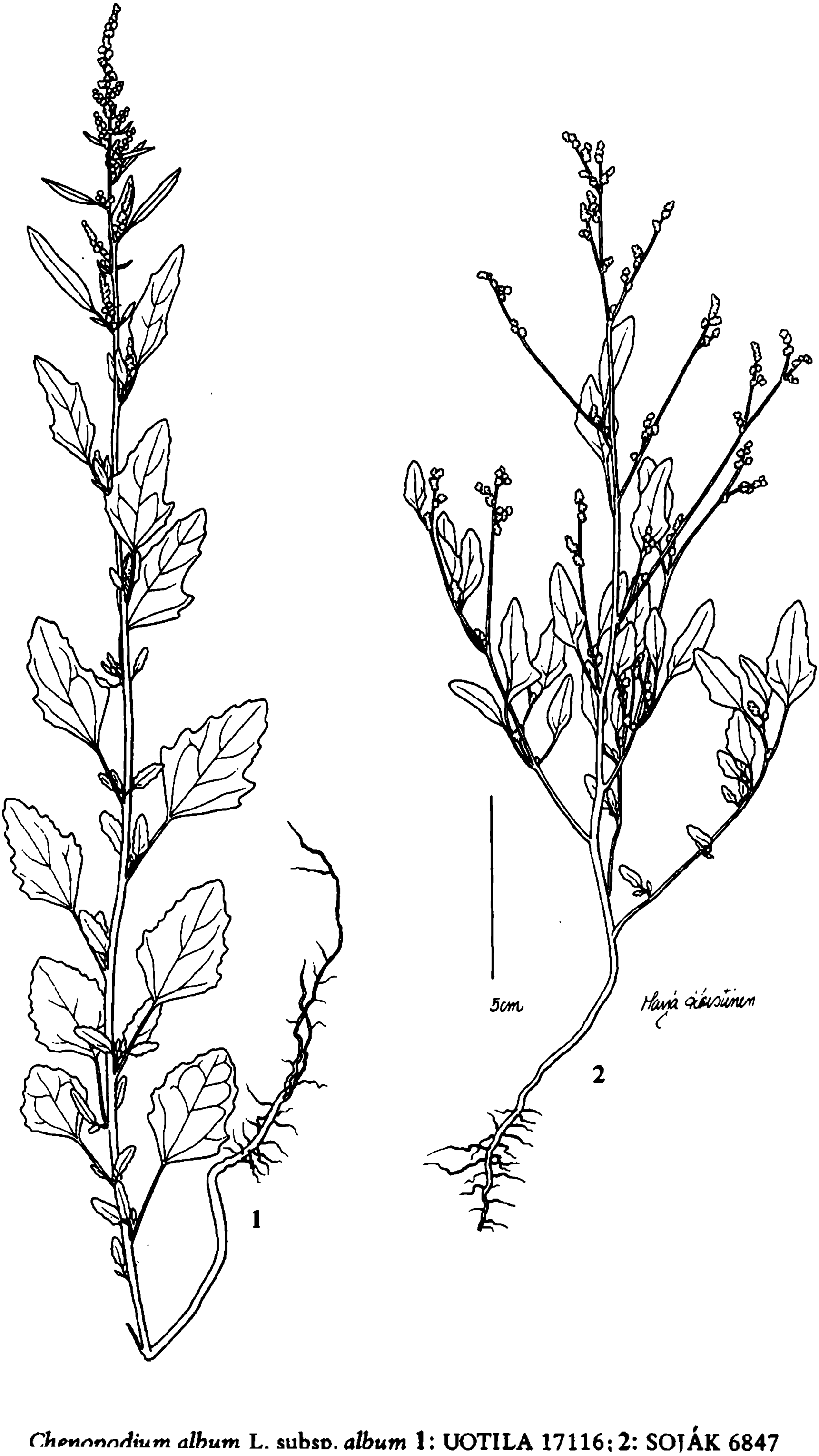
1: *Chenopodium vulvaria* L. – FURSE 2933; **2–3**: *C. Sosnowskyi* KAPELLER **2**: Habit – GILLI (Reneh); **3**: Fruit with perianth – RECHINGER 5930

Chenopodium Karoi (MURR) AELLEN 1: STAINTON 2982; 2: ANDERS 7620; 3: *C. Novopokrovskyanum* (AELLEN) UOTILA – UOTILA 19366

Tab. 18



Chenopodium strictum ROTH subsp. *strictum* **1**: Habit – RECHINGER 6700-b; **2**: Fruit with perianth – UOTILA 19390

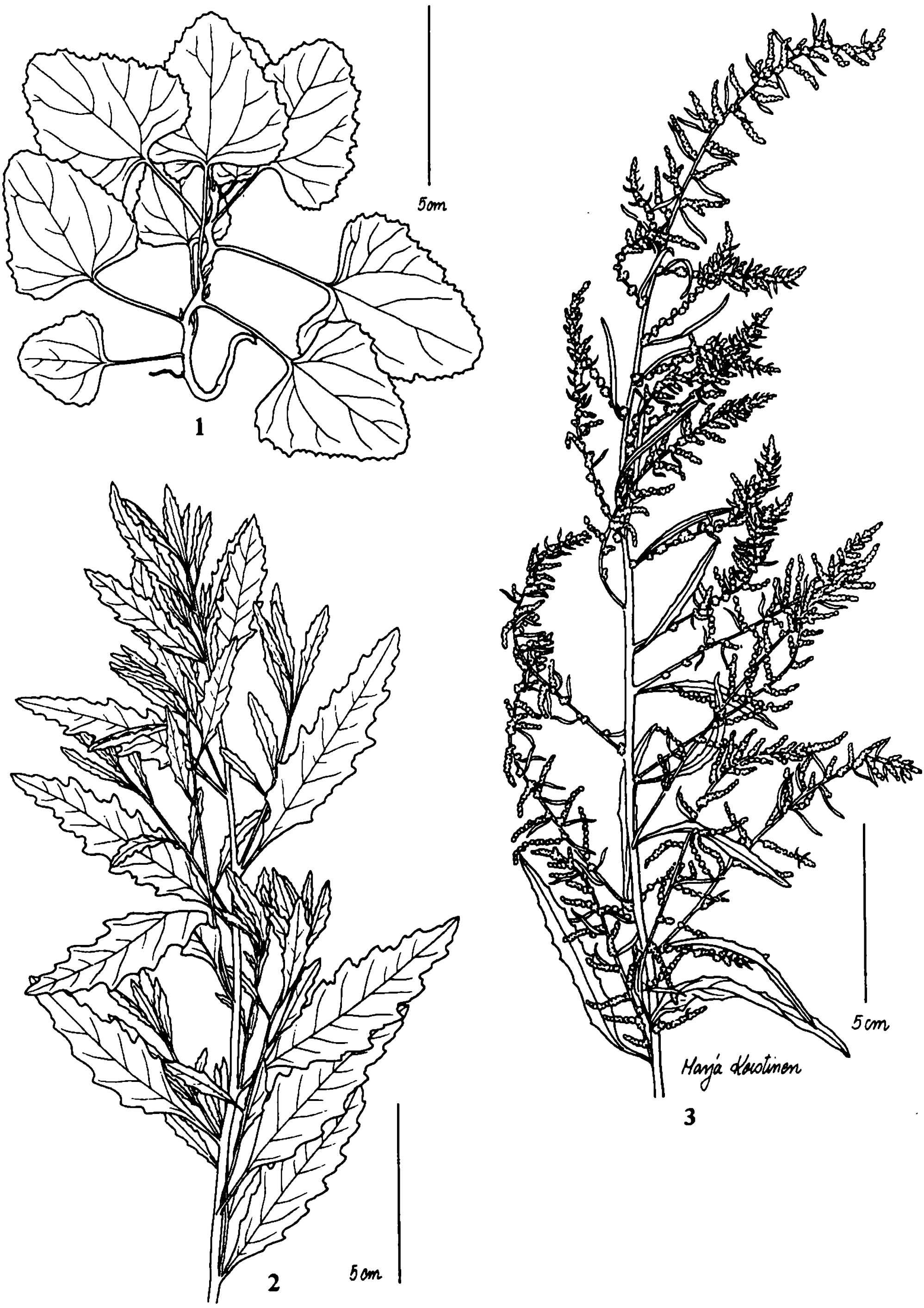


Chenopodium album L. subsp. *album* 1: UOTILA 17116; 2: SOJÁK 6847

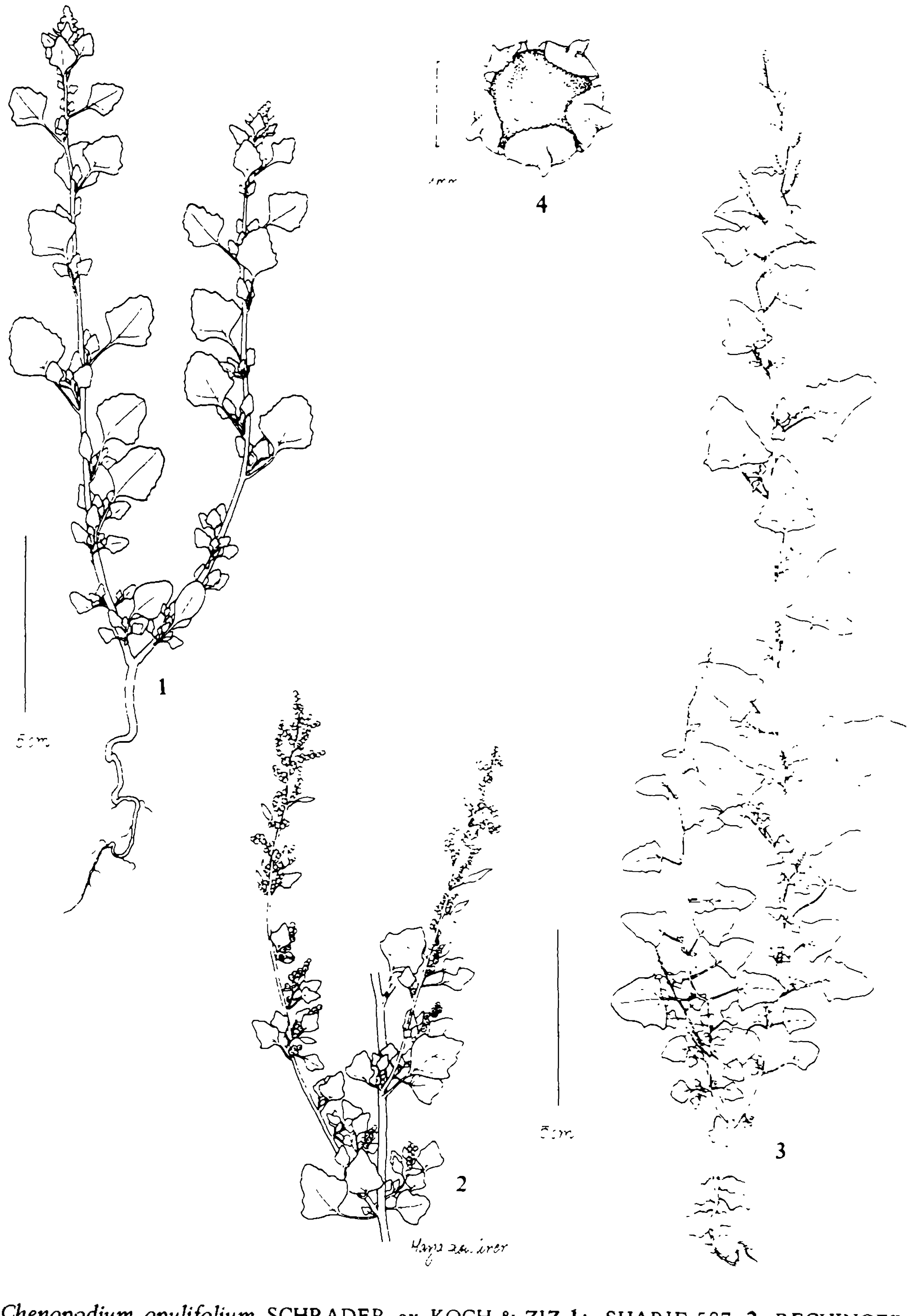
Tab. 20

Chenopodium album L. subsp. *iranicum* AELLEN – AELLEN 257

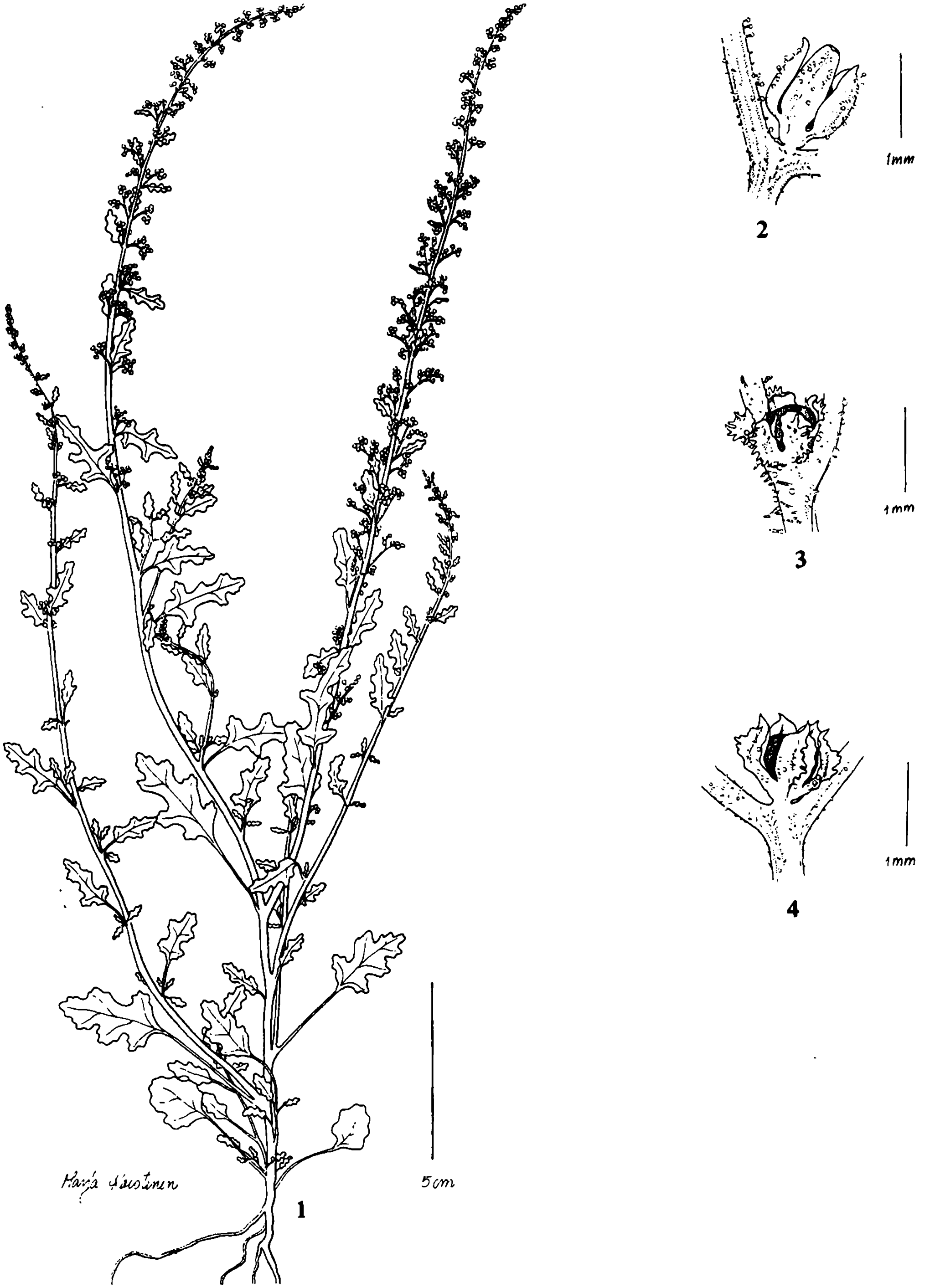
Tab. 21



1: *Chenopodium giganteum* D. DON – RECHINGER 4294; 2–3: *Chenopodium ambrosioides* L. 2: Leafy branch – BURTT 1009; 3: Flowering branch – WENDELBO & ASSADI 18313

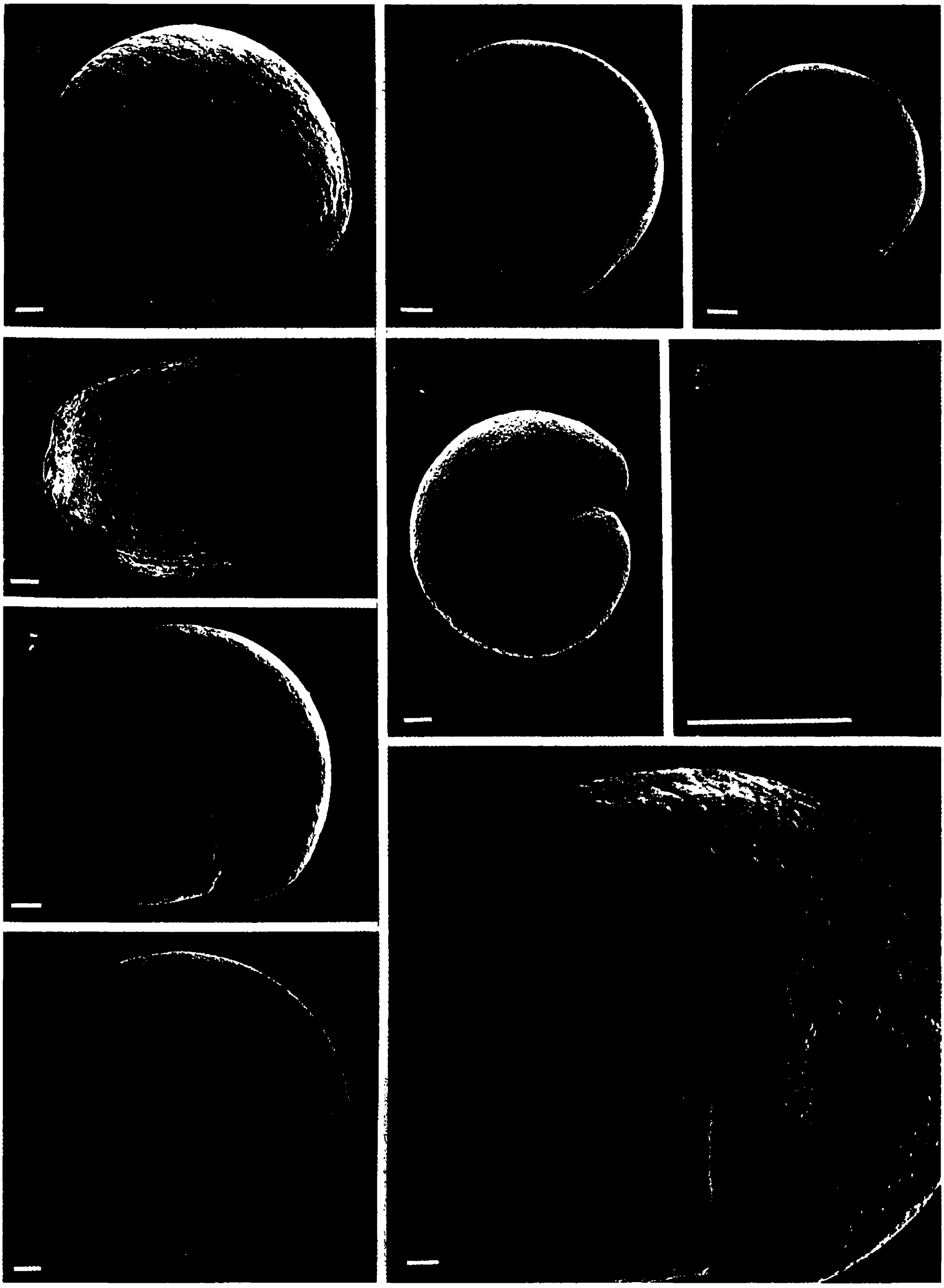


Chenopodium opulifolium SCHRADER ex KOCH & ZIZ **1**: SHARIF 587; **2**: RECHINGER 6696; **3–4**: *C. atripliciforme* J. MURR **3**: Habit; **4**: Fruit with perianth – AITCHISON 980

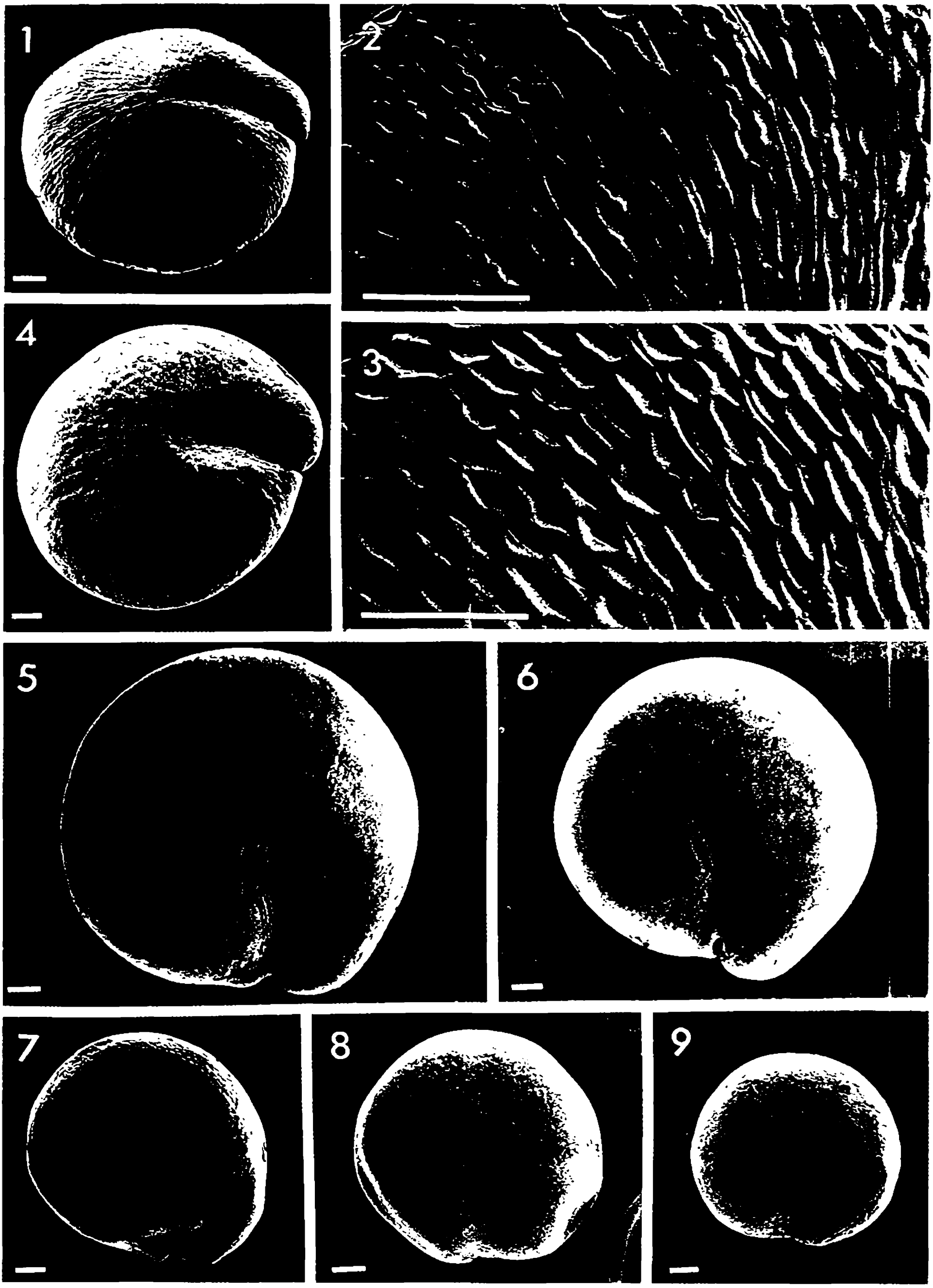


Chenopodium botrys L. **1**: Habit, **2**: Fruit with perianth – UOTILA 17069; **3**: *C. nepalense* COLLA: Fruit with perianth – PAULSEN 1346; **4**: *C. Schraderianum* SCHULT.: Fruit with perianth – AITCHISON 750

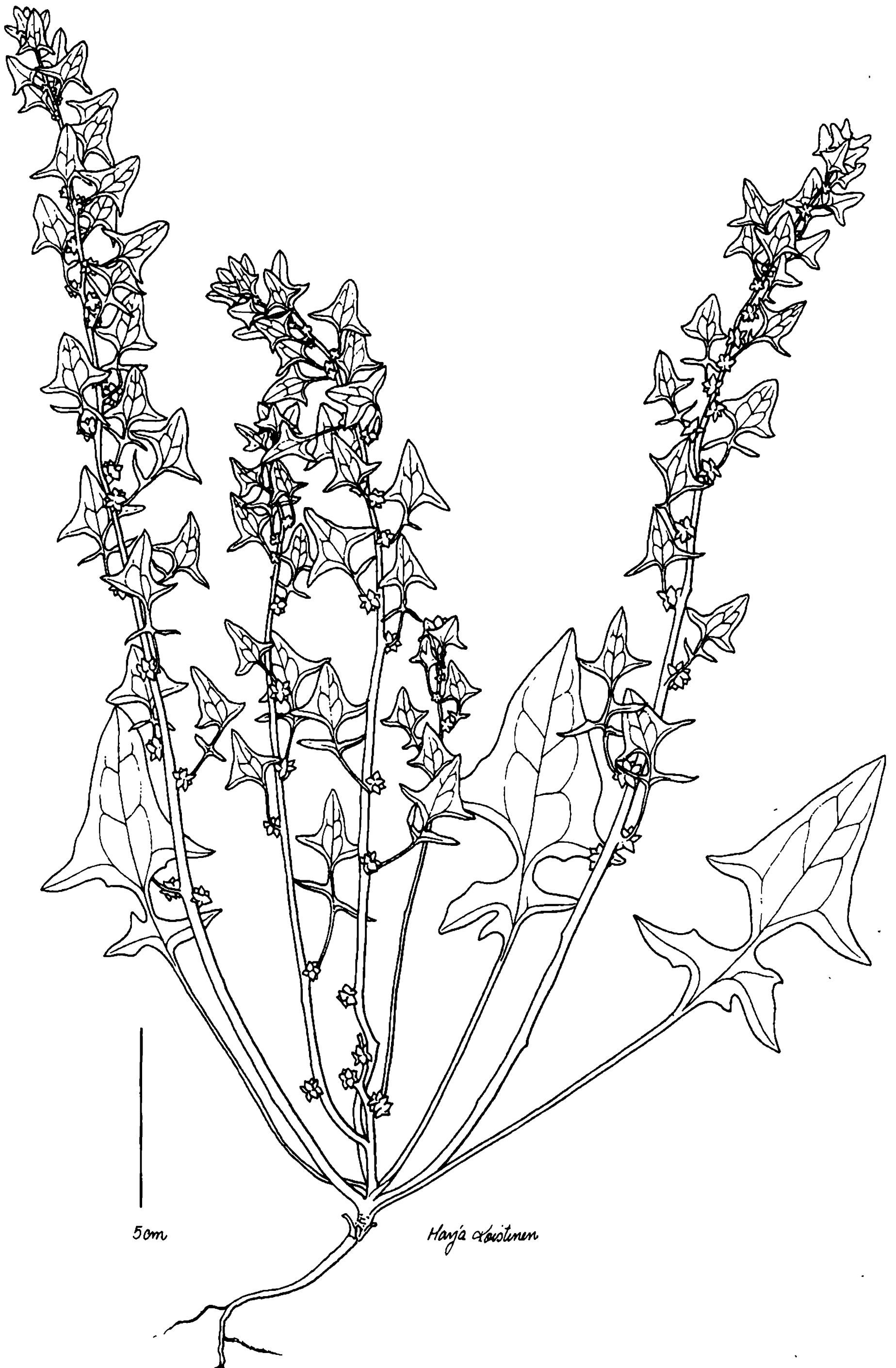
Chenopodium nepalense COLLA **1**: ANDERS 4960; **2**: KOELZ 12830; **3**: *C. Schraderianum* SCHULT. – LACE (a. 1887)



SEMs of *Chenopodium* seeds. **1**: *C. foliosum* ASCHERSON subsp. *foliosum* – RECHINGER 17295; **2**: *C. Litwinowii* (PAULSEN) UOTILA – UOTILA 18881; **3**: *C. glaucum* L. – UOTILA 18624; **4**, **5**: *C. rubrum* L. – PODLECH 19799; **6**: *C. polyspermum* L. – GABRIELIAN (Armenia, Aggaja a. 1983) **7**: *C. urbicum* L. – MAZAHERI 301314–E; **8**: *C. murale* L. – FURSE 2866; **9**: *C. badachschanicum* TZVEL. – RECHINGER 19544 – Scale bar 0.1 mm.



SEMs of *Chenopodium* seeds. **1**, **2**: *C. ficifolium* SM. subsp. *Blomianum* (AELLEN) AELLEN – UOTILA 18749; **3**: *C. ficifolium* SM. subsp. *ficifolium* – Germany, Frankfurt 1982, cult H, UOTILA 33150; **4**: *C. Novopokrovskyanum* (AELLEN) UOTILA – UOTILA 18947; **5**: *C. vulvaria* L. – UOTILA 19076; **6**: *C. opulifolium* SCHRADER ex KOCH & ZIZ – MAKKI 543; **7**: *C. ambrosioides* L. – FREITAG 7359; **8**: *C. botrys* L. – UOTILA 18923; **9**: *C. Schraderianum* SCHULT. – Finland, Helsinki, cult., UOTILA 22361



Spinacia turkestanica ILJIN – UOTILA 16735

Tab. 28

Spinacia turkestanica ILJIN **1**: Male plant – UOTILA 16735; **2**: Fruit aggregate – UOTILA 16735; **3**: Fruit aggregate – PODLECH 21546

pinacia tetrandra STEVEN ex M. B. **1**: Female plant, habit – SZOVITS (Qareh Su); **2**: Female lants, fruit aggregate – PABOT 3117; **3**, **4**: Male plant, habit – SZOVITS

Spinacia oleracea L. Female plants, habits and fruit aggregates. 1, 2 – UOTILA 16468: 3, 4 WHEELER HAINES (Iraq: Baghdad Zafraniyah)

Atriplex micrantha LEDEB. – AELLEN & MANUCHERI 126

Tab. 32

Atriplex Aucheri MOQ. – TERME 14824–E

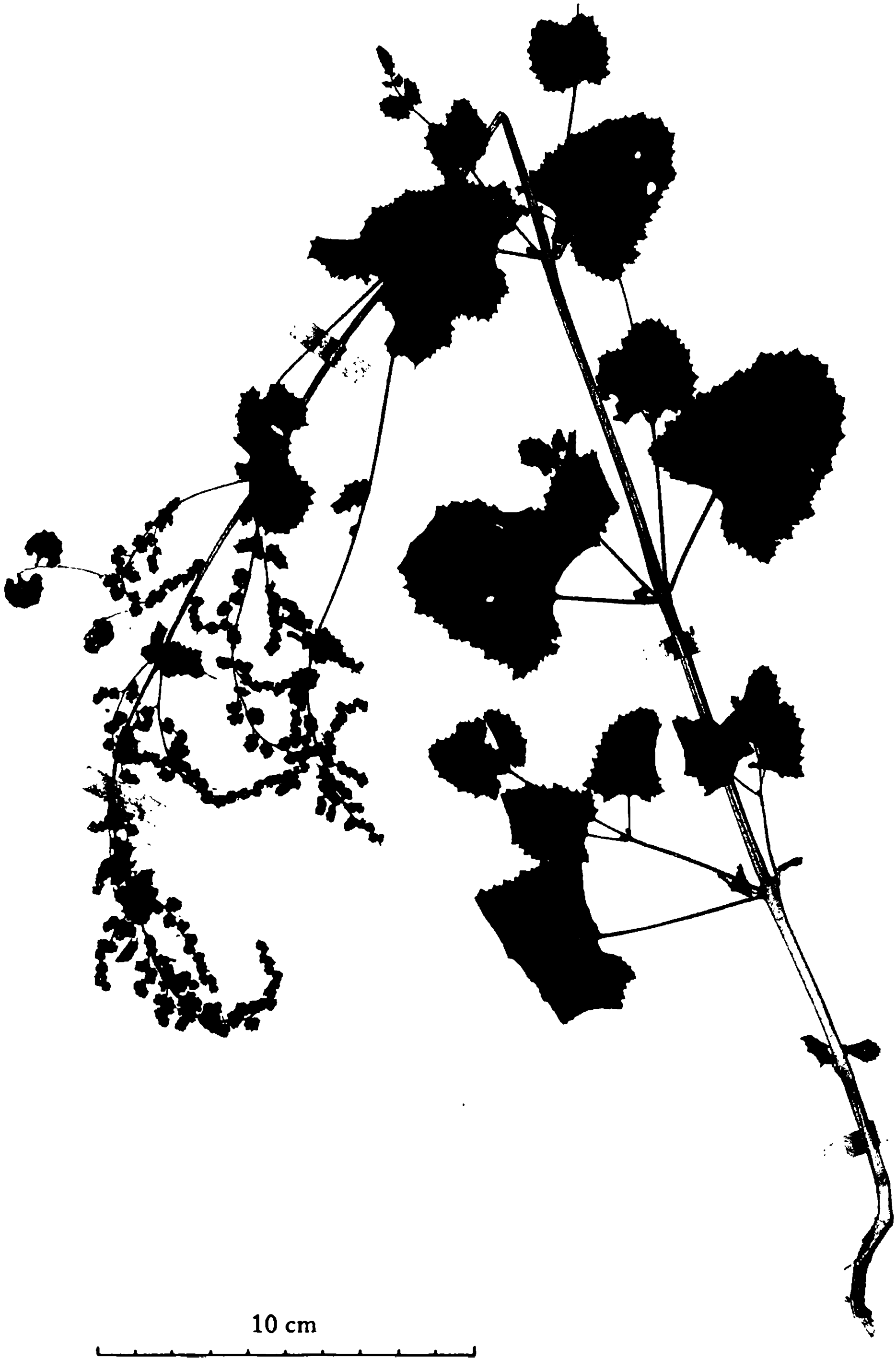
Atriplex laevis LEDEB. – RECHINGER 42162

Tab. 34

Atriplex patula L. – TERME & al. 36571–E

Atriplex dimorphostegia KAR. & KIR. – RECHINGER 51372

Atriplex moneta BUNGE ex BOISS. – HEDGE, WENDELBO & EKBERG W–8223

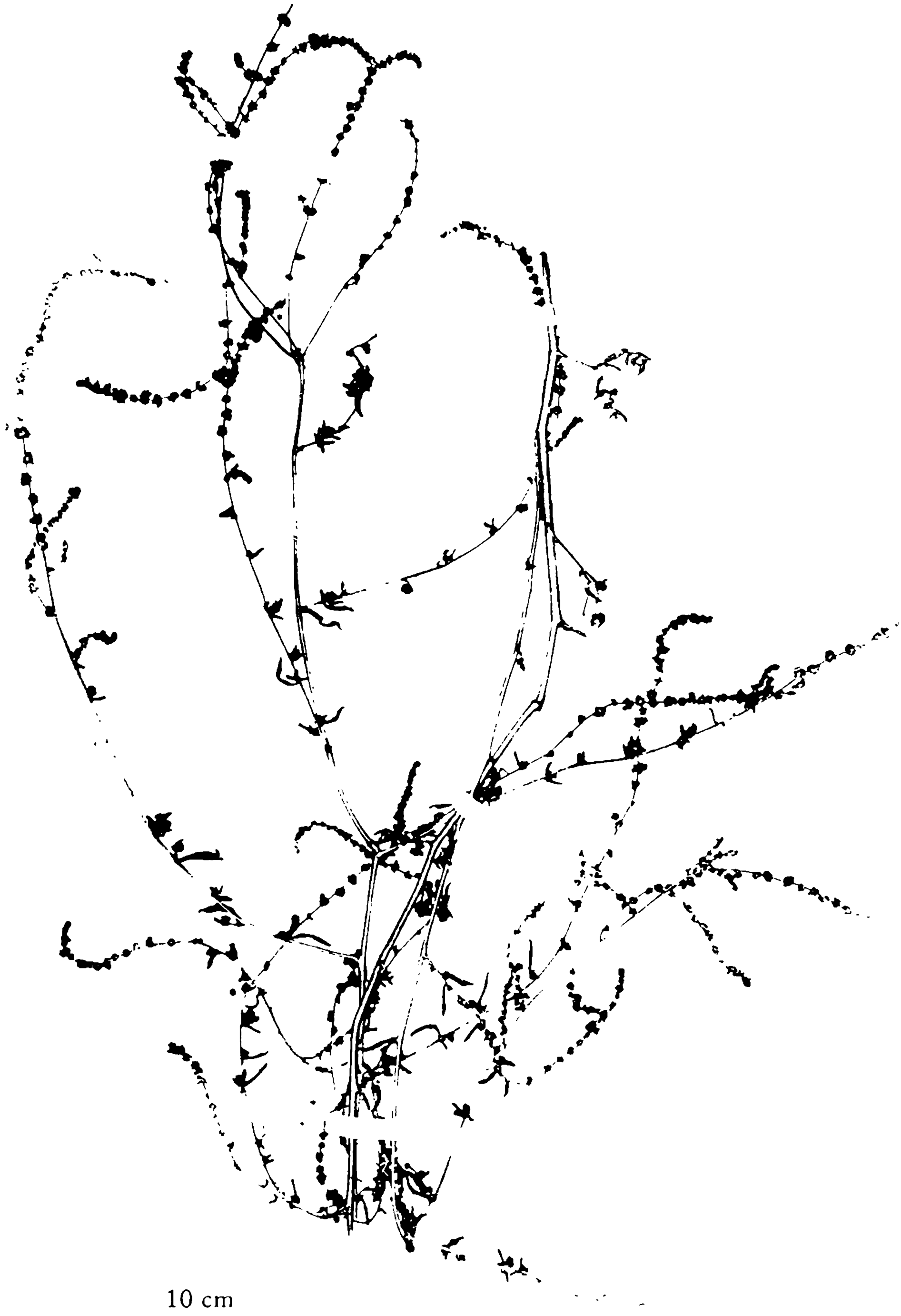


Atriplex flabellum BUNGE ex BOISS. – ANDERS 6032

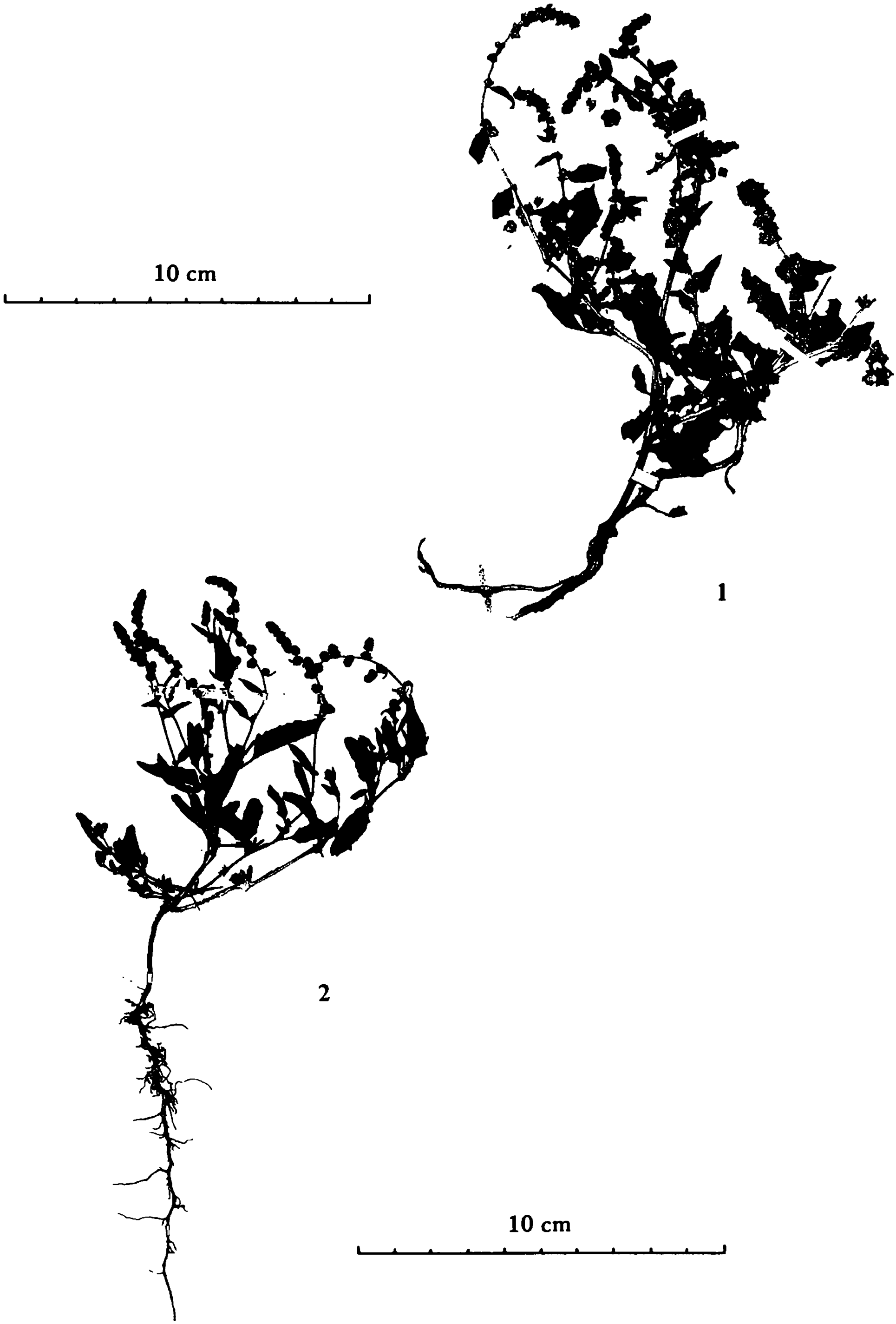
Atriplex Belangeri (MOQ.) BOISS. – RECHINGER 46157

Tab. 39

Atriplex tatarica L. – PODLECH 19101



Atriplex lasiantha BOISS. – PODLECH 17091



Atriplex pamirica ILJIN – **1**: BRECKLE 4601; **2**: ROEMER 395

Atriplex schugnanica ILJIN – RECHINGER 19425

10 cm

Atriplex ornata ILJIN – WENDELBO & FOROUGHI 12820

Tab. 44

Atriplex leucoclada BOISS. – UOTILA 19369

Atriplex verrucifera M. B. – RECHINGER 14833

Tab. 46

Atriplex Griffithii MOQ. – RECHINGER 16612

Atriplex Stocksii BOISS. – LAMOND 5319

Atriplex halimus L. – TERME & TEHRANI 40039–E

10 cm

1

2

10 cm

Atriplex canescens (PURSH) NUTT. – 1: TERME & TEHRANI 40045–E; 2: MOUSSAVI & KARAVAR 41703

Tab. 50

Atriplex spongiosa F. MUELLER – AMINI 11374

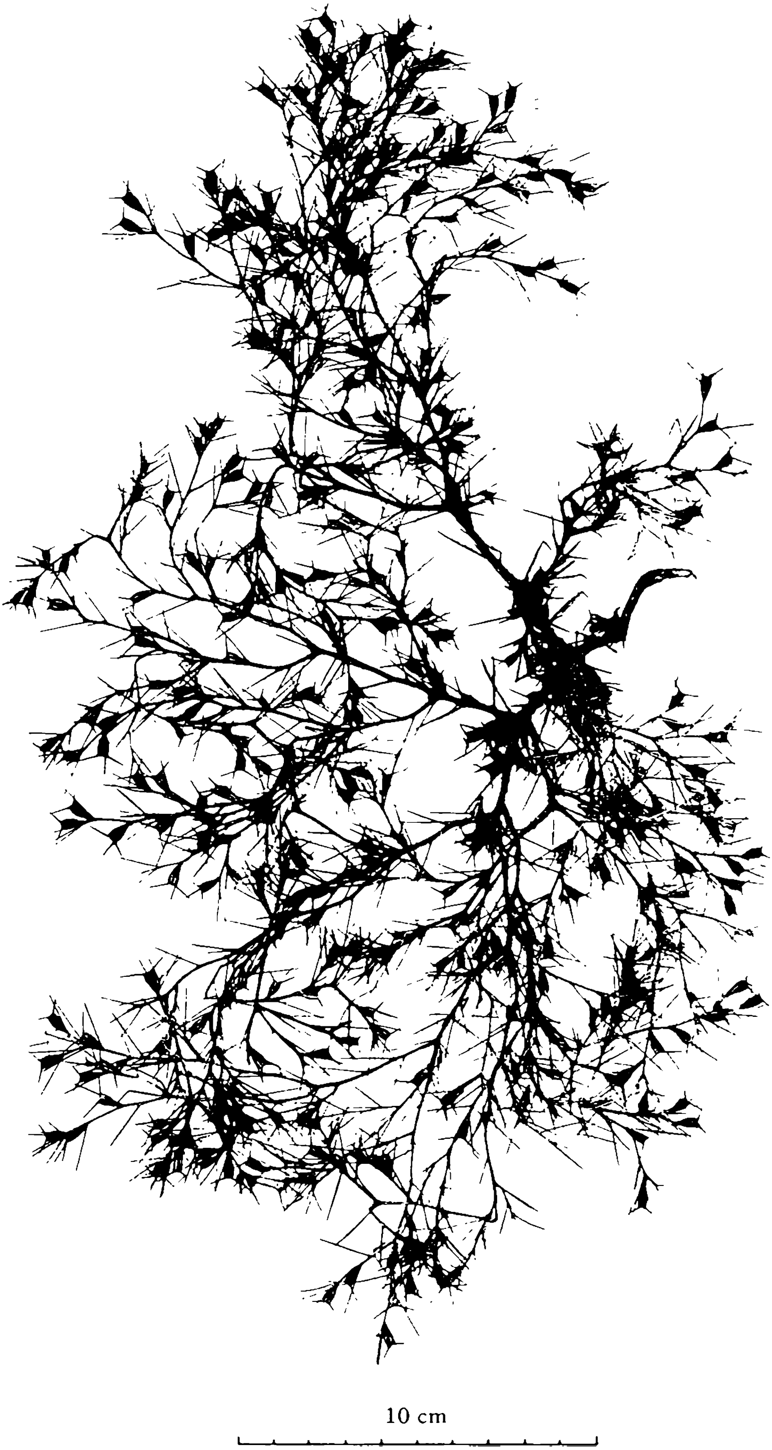
Krascheninnikovia ceratoides (L.) GUELDENST. – DAVIS & HEDGE 32745 (Turkey)

Tab. 52

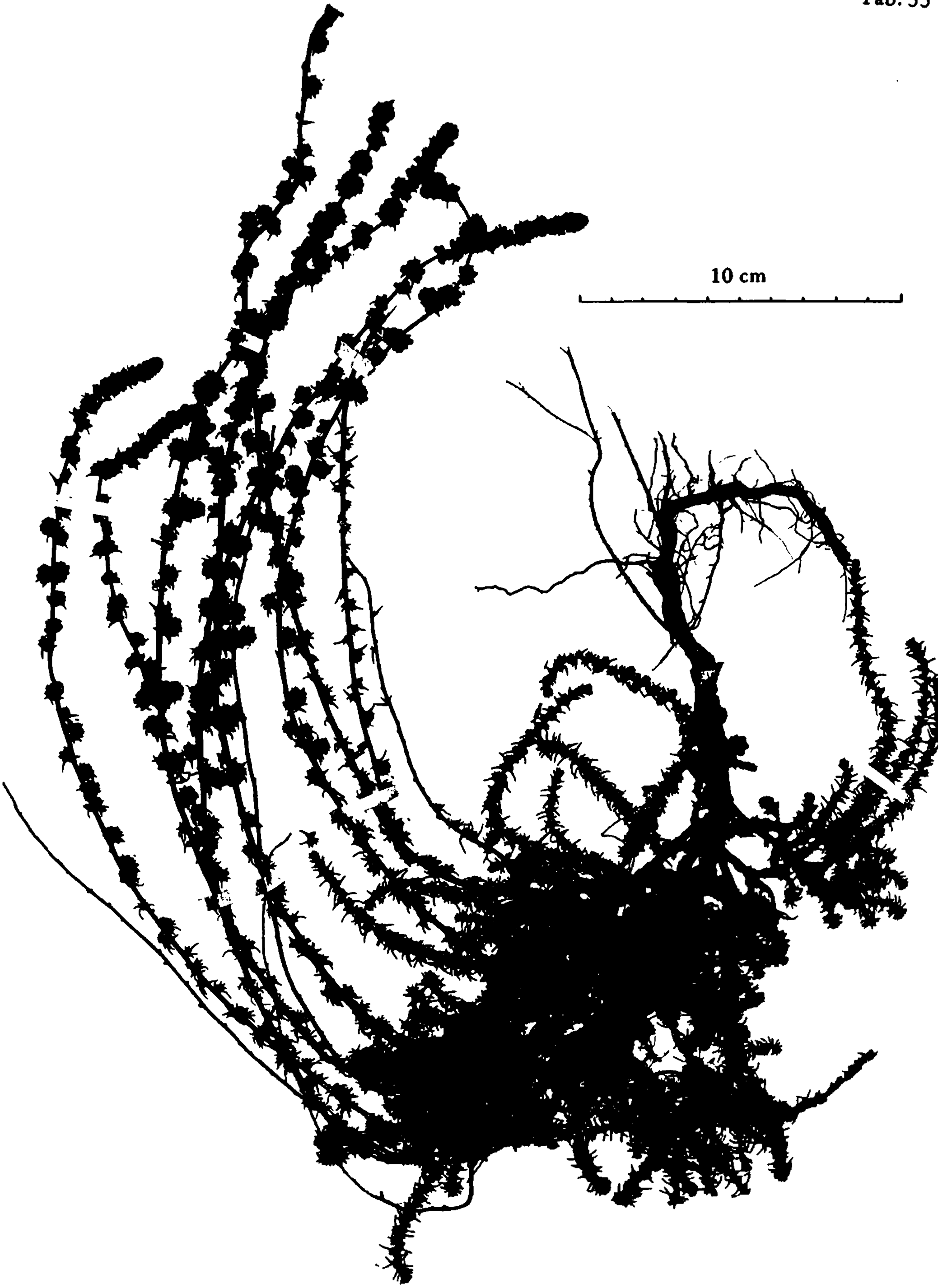
Krascheninnikovia ceratoides (L.) GUELDENST. – WATSON 3660 (Turkey)

Krascheninnikovia Ewersmanniana (STSCHEGL. ex LOSINSK.) GRUBOV – GILLI 2116

Tab. 54

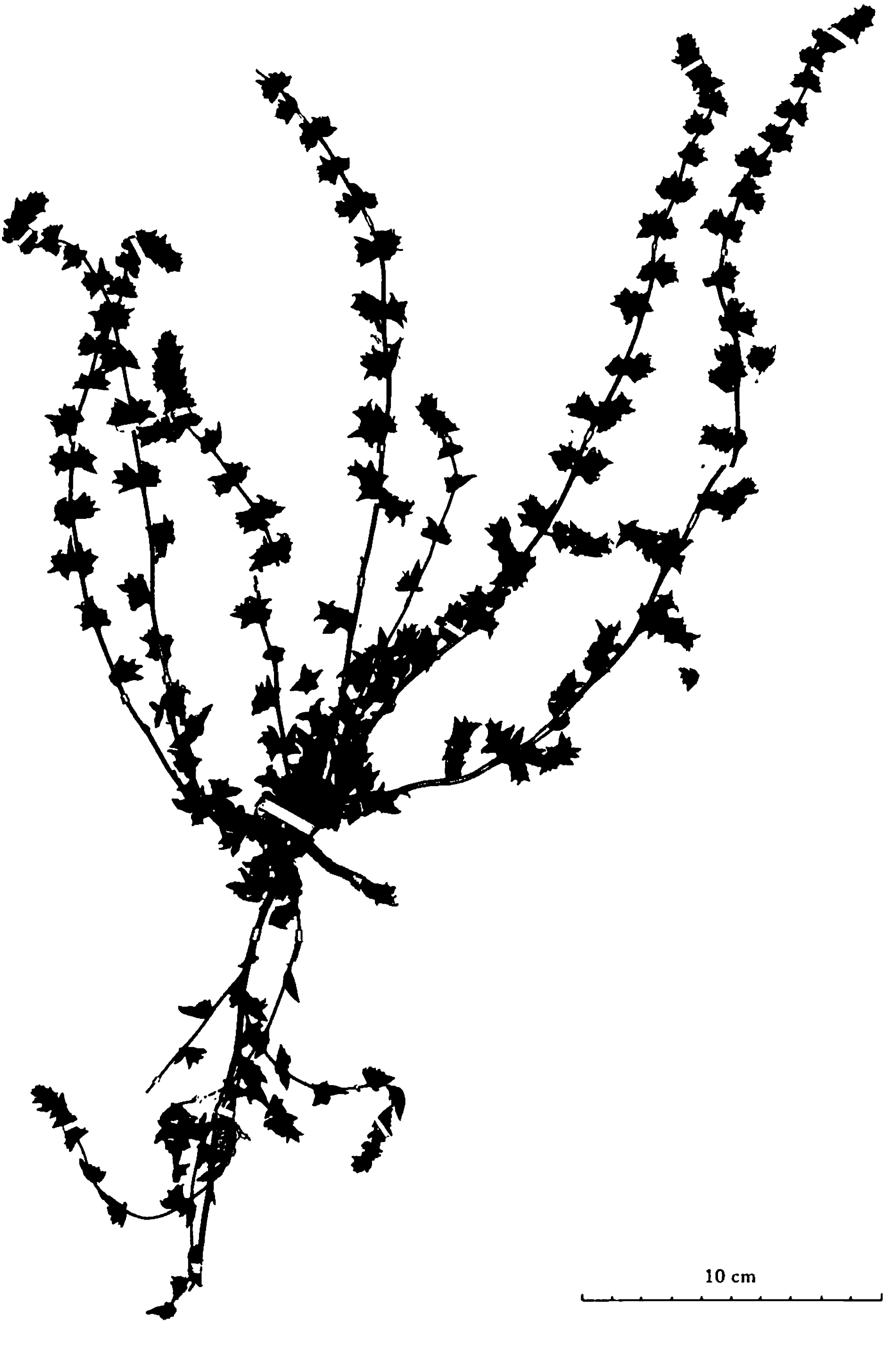


Ceratocarpus arenarius L. – FREITAG & KOTHE 18815



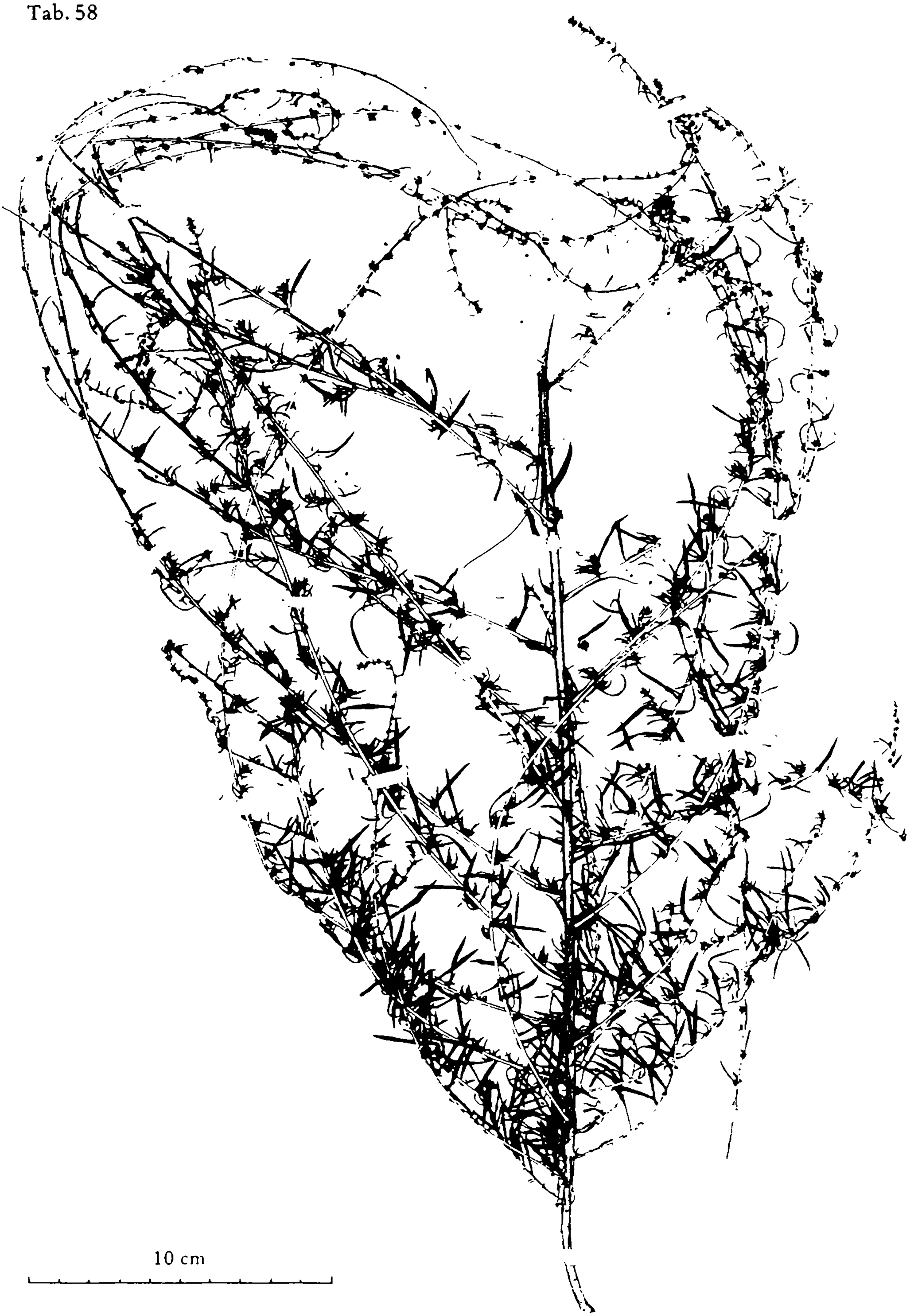
Camphorosma monspeliaca L. – FREITAG 6383

Panderia pilosa FISCH. & C. A. MEY. – TERME & al. 39363



Kirilowia eriantha BUNGE – RECHINGER 18196

Tab. 58



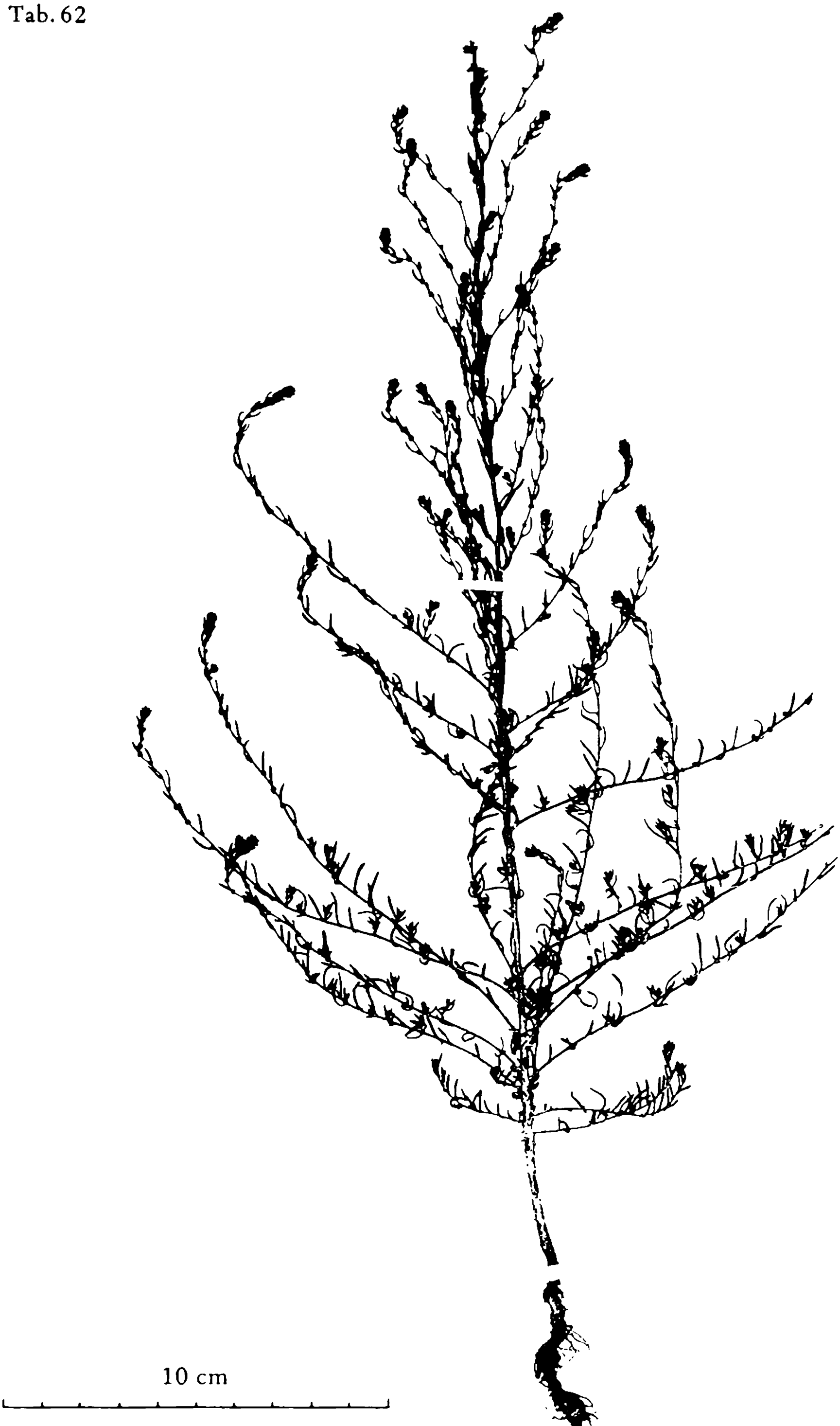
Bassia hyssopifolia (PALL.) O. KUNTZE – FREITAG 2064

Bassia muricata (L.) ASCHERS. – LÉONARD 5765

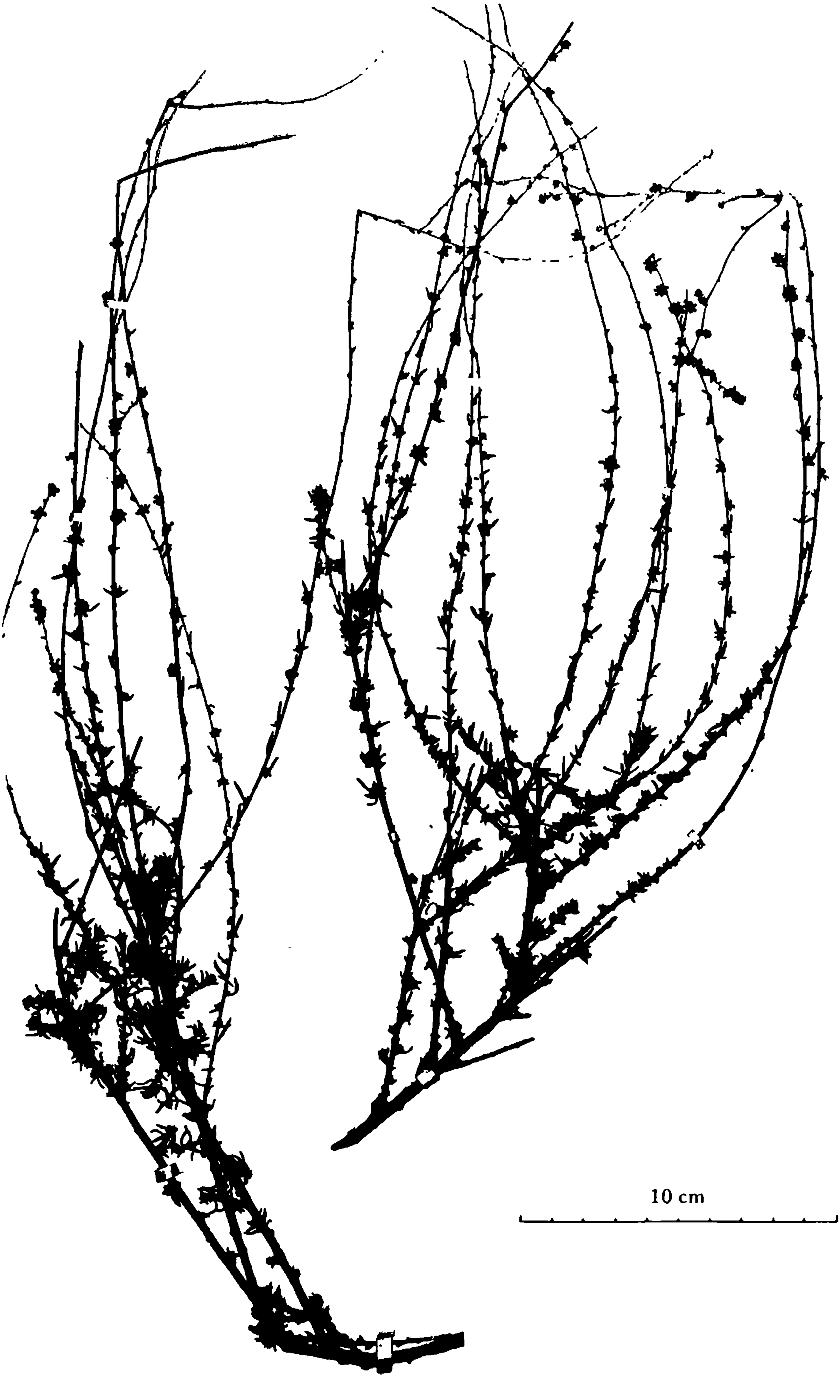
Bassia eriophora (SCHRAD.) ASCHERS. – PODLECH 30741

Bassia hirsuta (L.) ASCHERS. – WHITE 17 VIII. 1903 (France)

Tab. 62

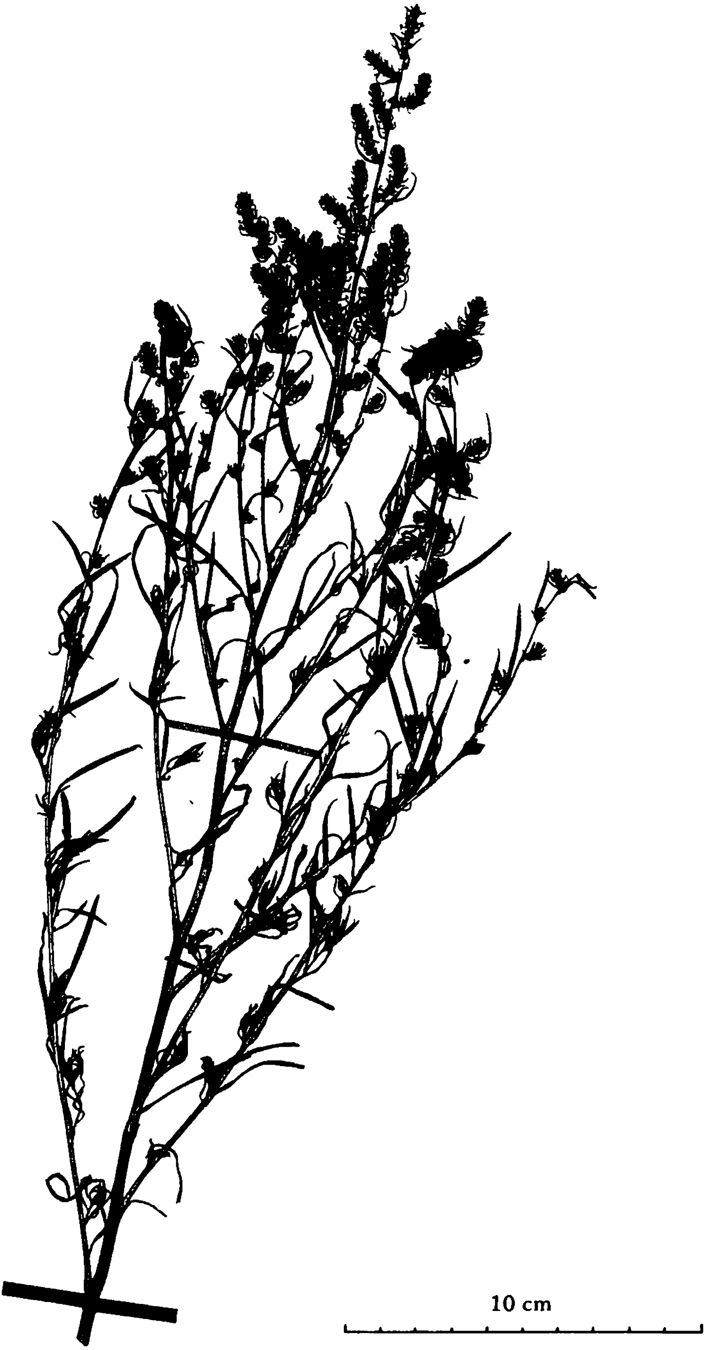


Bassia sedoides (PALL.) ASCHERS. – DORNER 10 X. 1870 (Europe)

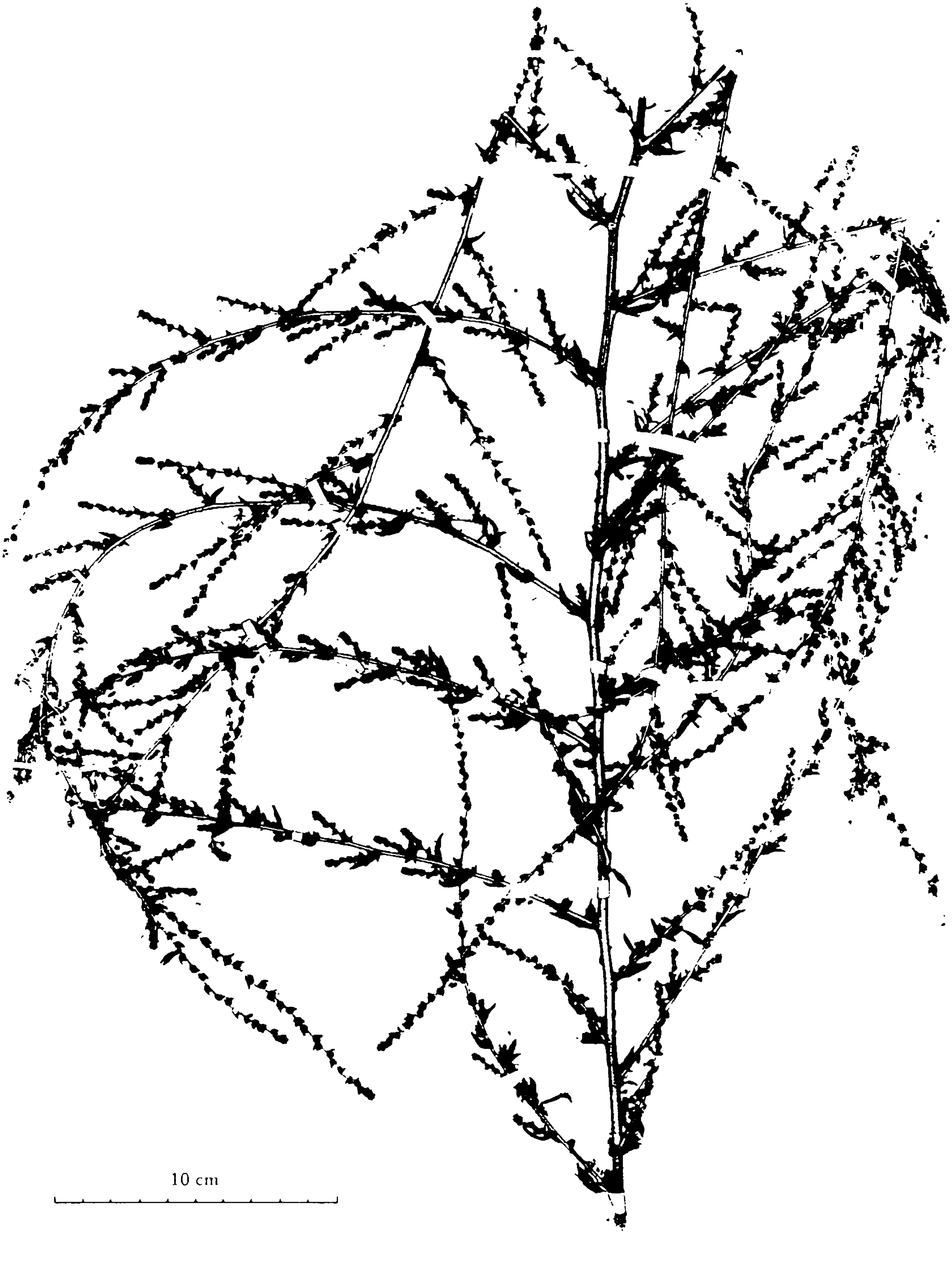


Kochia prostrata (L.) SCHRAD. – FREITAG & KOTHE 18792

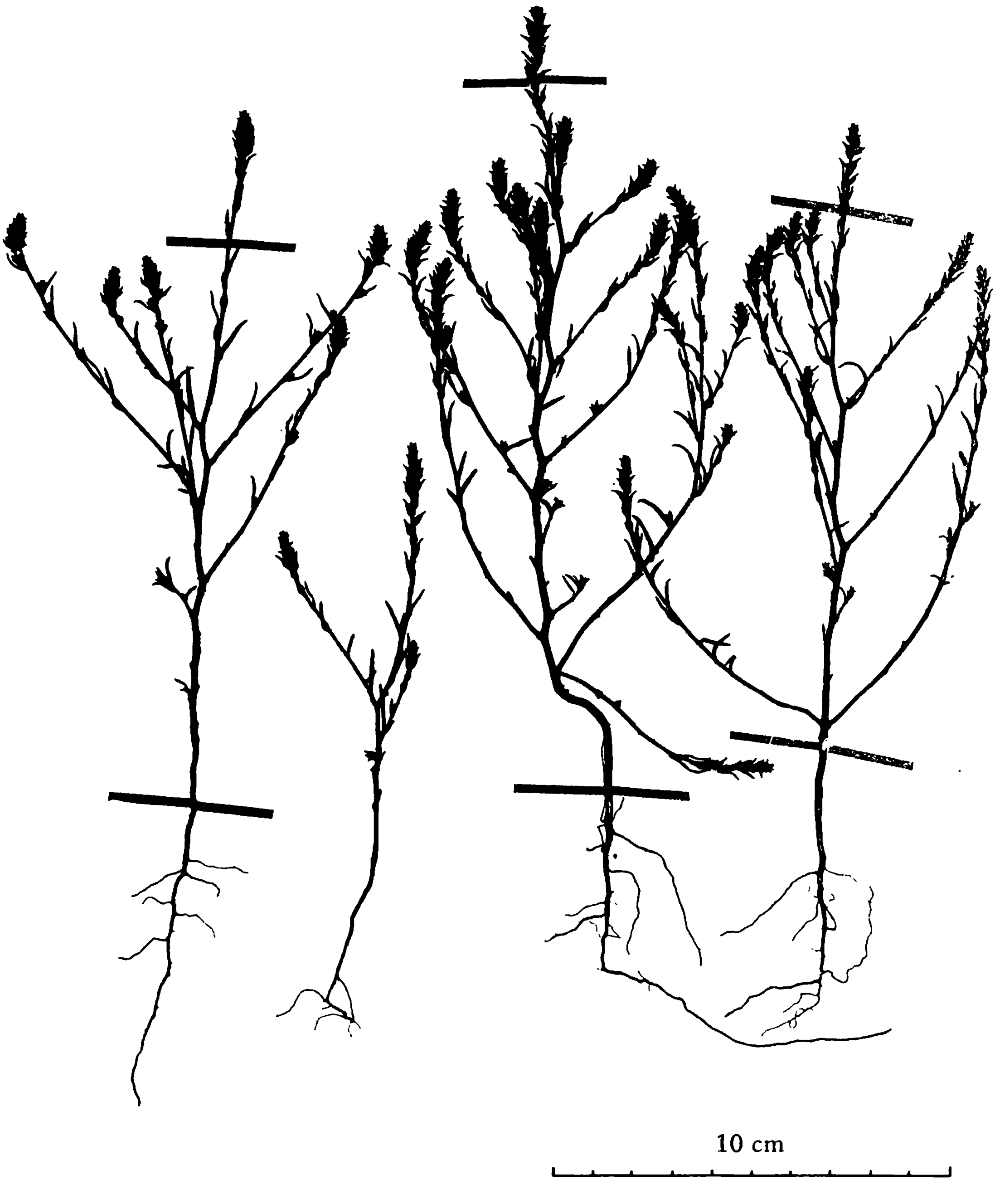
Kochia stellaris MOQ. – BORNMÜLLER 8109



Kochia scoparia (L.) SCHRAD. – FURSE 3296



Kochia indica WIGHT – ANDERS 5337



Corispermum orientale LAM. – GOGINA 132 (Russia, Volvograd)

10 cm

Corispermum afghanicum PODLECH – RECHINGER 37310

Tab. 69

Corispermum Lehmannianum BUNGE – FREITAG 15491

Tab. 70

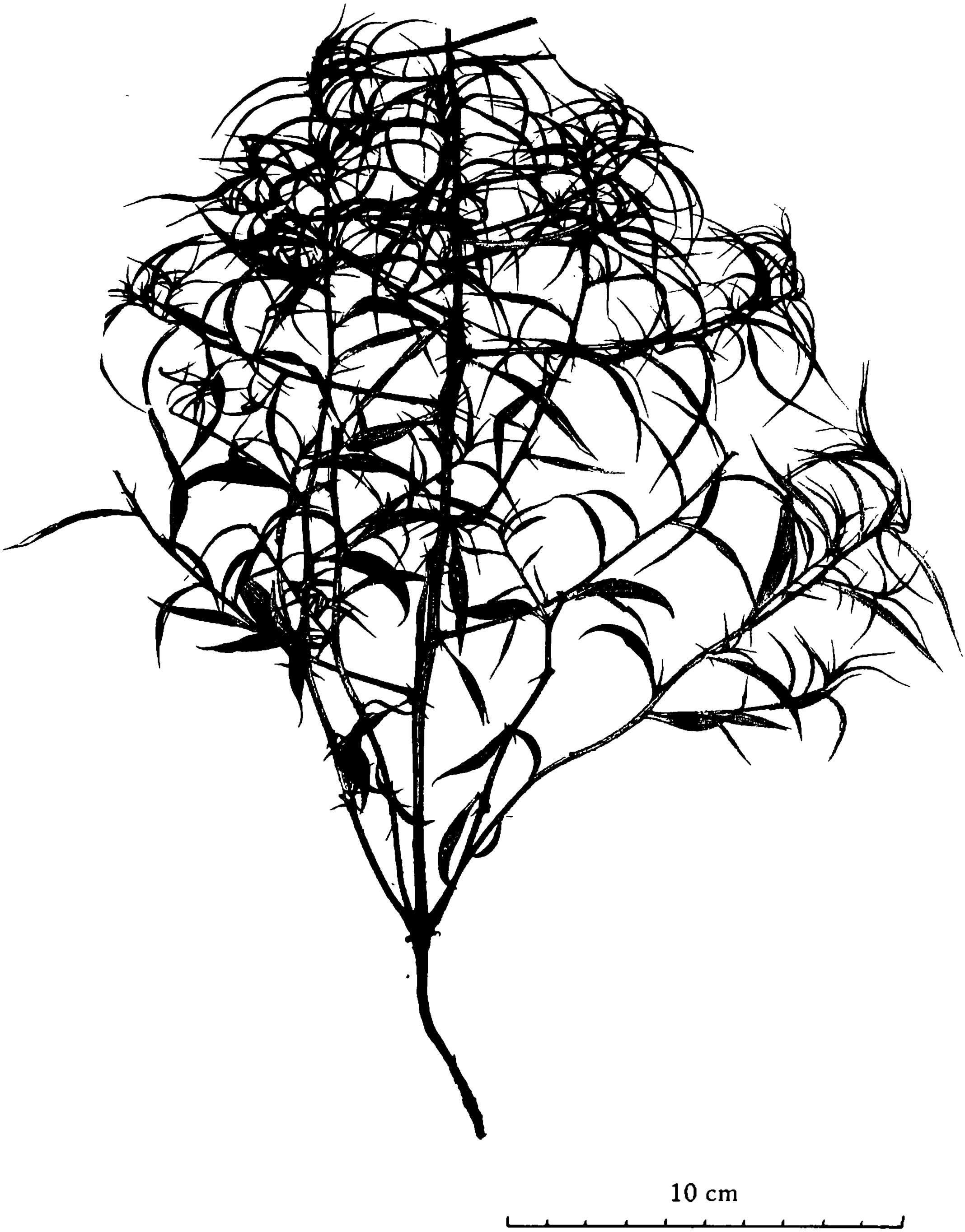
Corispermum papillosum (O. KUNTZE) ILJIN – NIKITIN (Ashkhabad)

Agriophyllum latifolium FISCH. & C. A. MEY. ex FENZL – RECHINGER 34613

Tab. 72

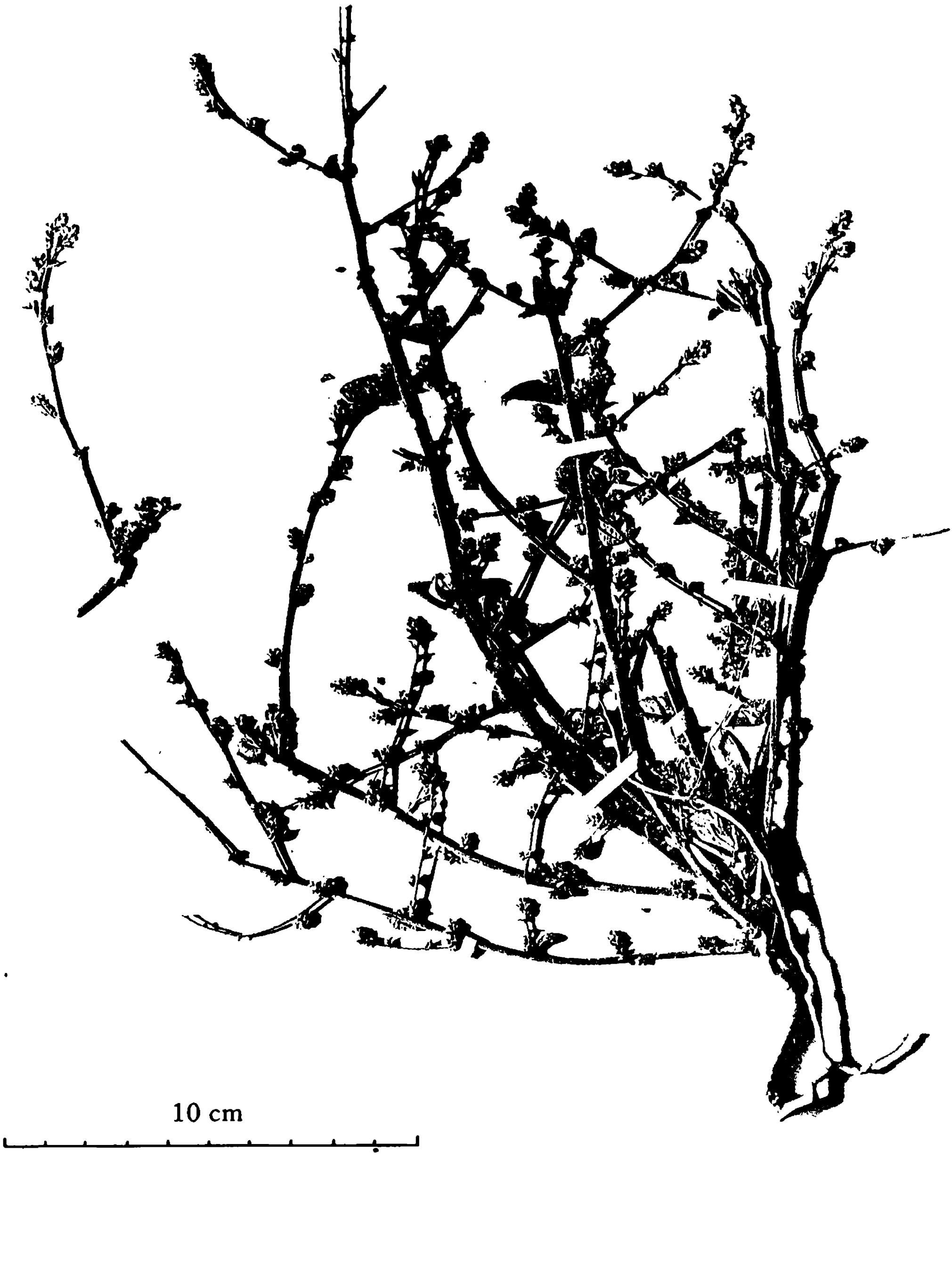
Agriophyllum minus FISCH. & C. A. MEY. ex FENZL – RECHINGER 51451

Tab. 73

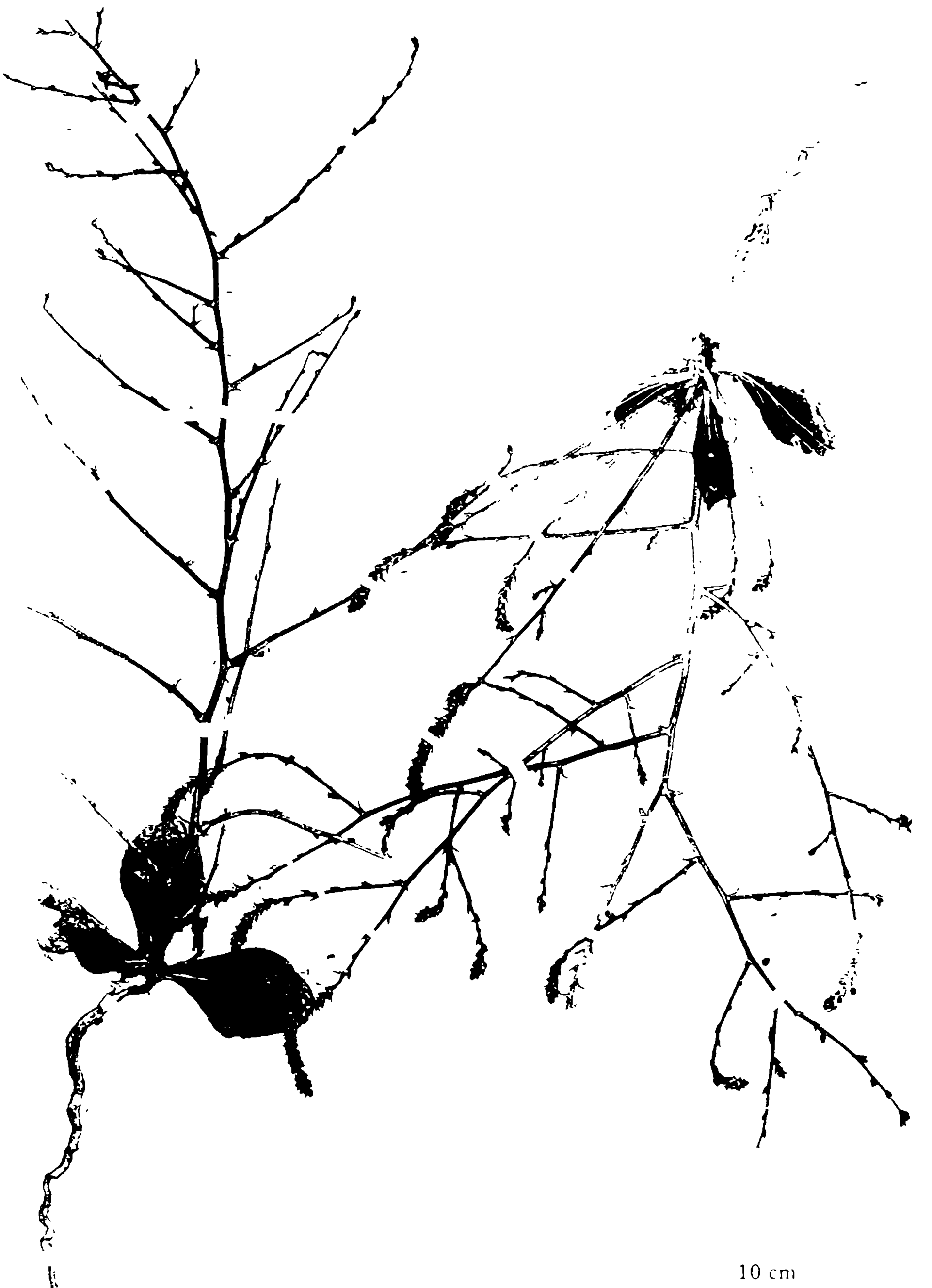


Agriophyllum squarrosum (L.) MOQ. – Herb. Bot. URSS. 87

Anthochlamys polygaloides (FISCH. & C. A. MEY.) FENZL – HEDGE, WENDELBO & FOROUGHI 14685



Anthochlamys multinervis RECH. f. – WENDELBO & FOROUGHI 14628



Anthochlamys afghanica PODLECH – RECHINGER 37549

Kalidium caspicum (L.) UNGERN–STERNB. – TERME & al. 41724

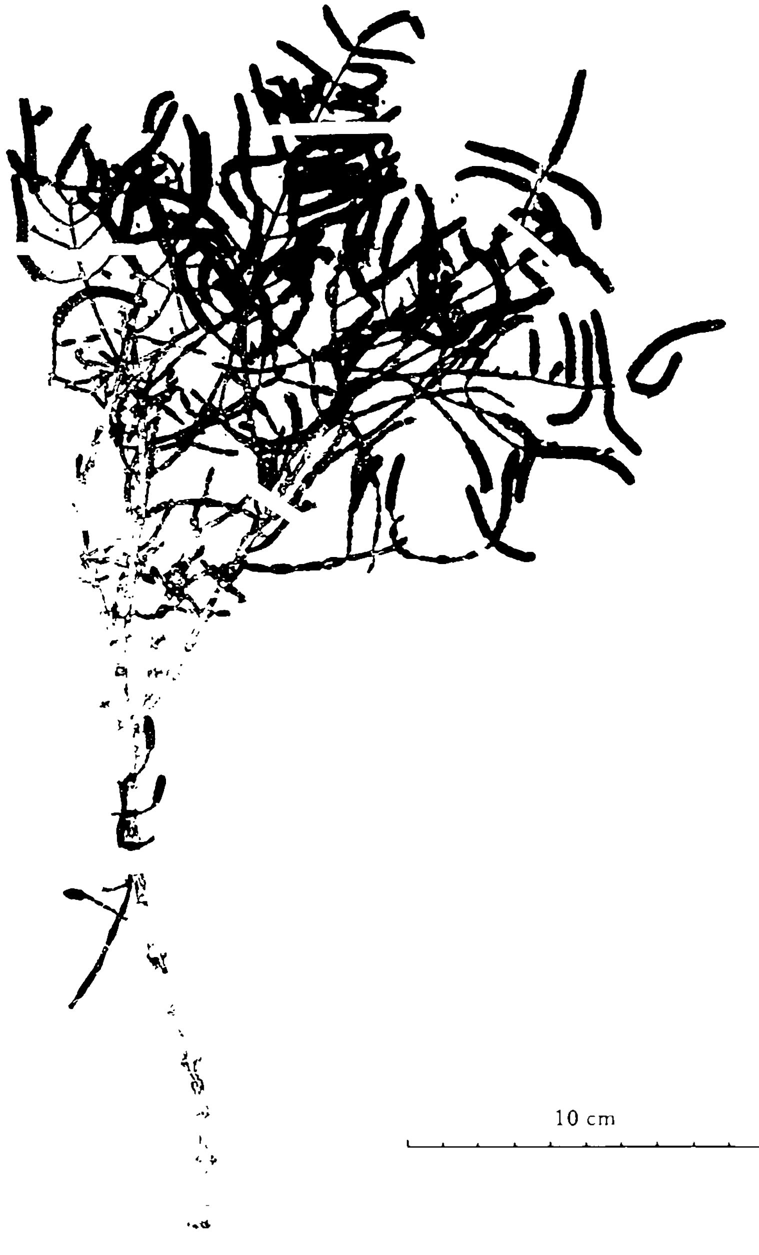
Tab. 78

10 cm

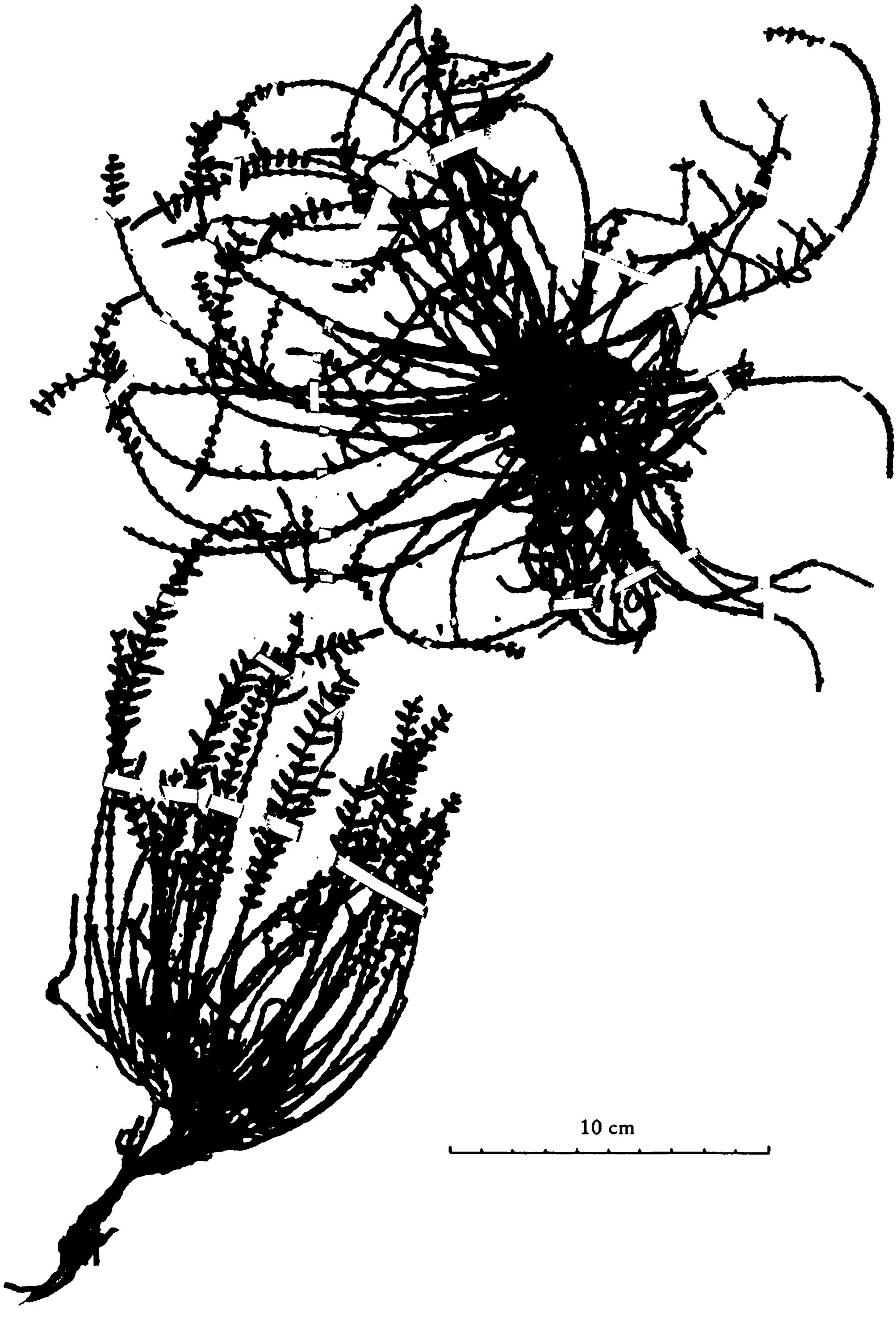
Halopeplis pygmaea (PALL.) BUNGE ex UNGERN-STERNB. – FOROUGHI & ASSADI 15003–A

Halopeplis perfoliata (FORSSK.) BUNGE ex ASCHERS. – SOJÁK 4517

Tab. 80



Halostachys Belangeriana (MOQ.) BOTSCH. – TERME & TEHRANI 40026–E



Halocnemum strobilaceum (PALL.) M. B. – HEDGE & al. 14761

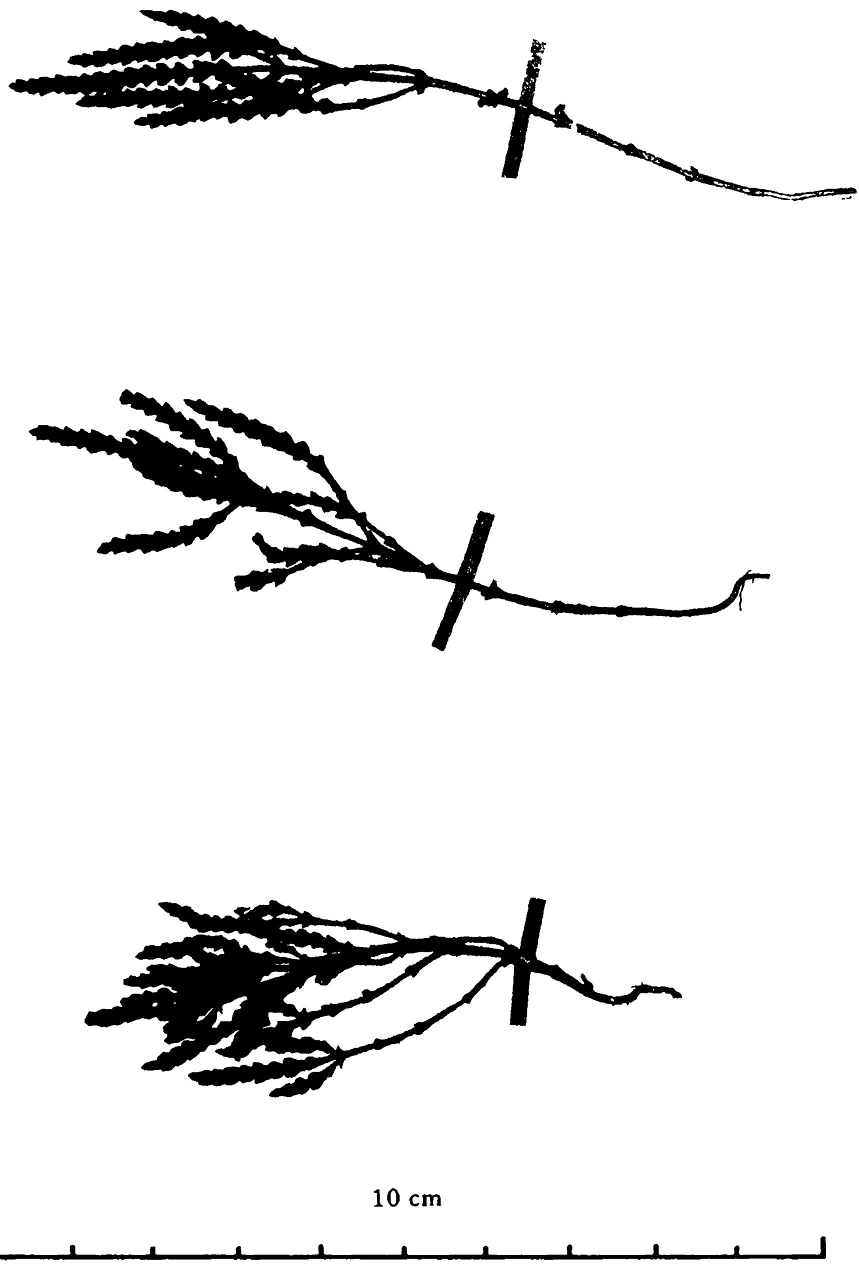
Arthrocnemum macrostachyum (MORIC.) C. KOCH – RECHINGER 27493

Tab. 83

Arthrocnemum indicum (WILLD.) MOQ. – WIGHT 828 (Madras)

Tab. 84

Salicornia europaea L. – WENDELBO & SHIRDELPUR 14952



Microcnemum coralloides (LOSCOS & PARDO) BUEN – DAVIS 14729 (Turkey)

Suaeda aegyptiaca (HASSELQ.) ZOHARY – BOKHARI, HEDGE & WENDELBO 14808

Suaeda arcuata BUNGE – UOTILA 19412

Suaeda altissima (L.) PALL. – UOTILA 19179

Suaeda paradoxa (BUNGE) BUNGE – ANDERS 4684

Tab. 90

Suaeda linifolia PALL. – YARMAL 34


10 cm

Tab. 92

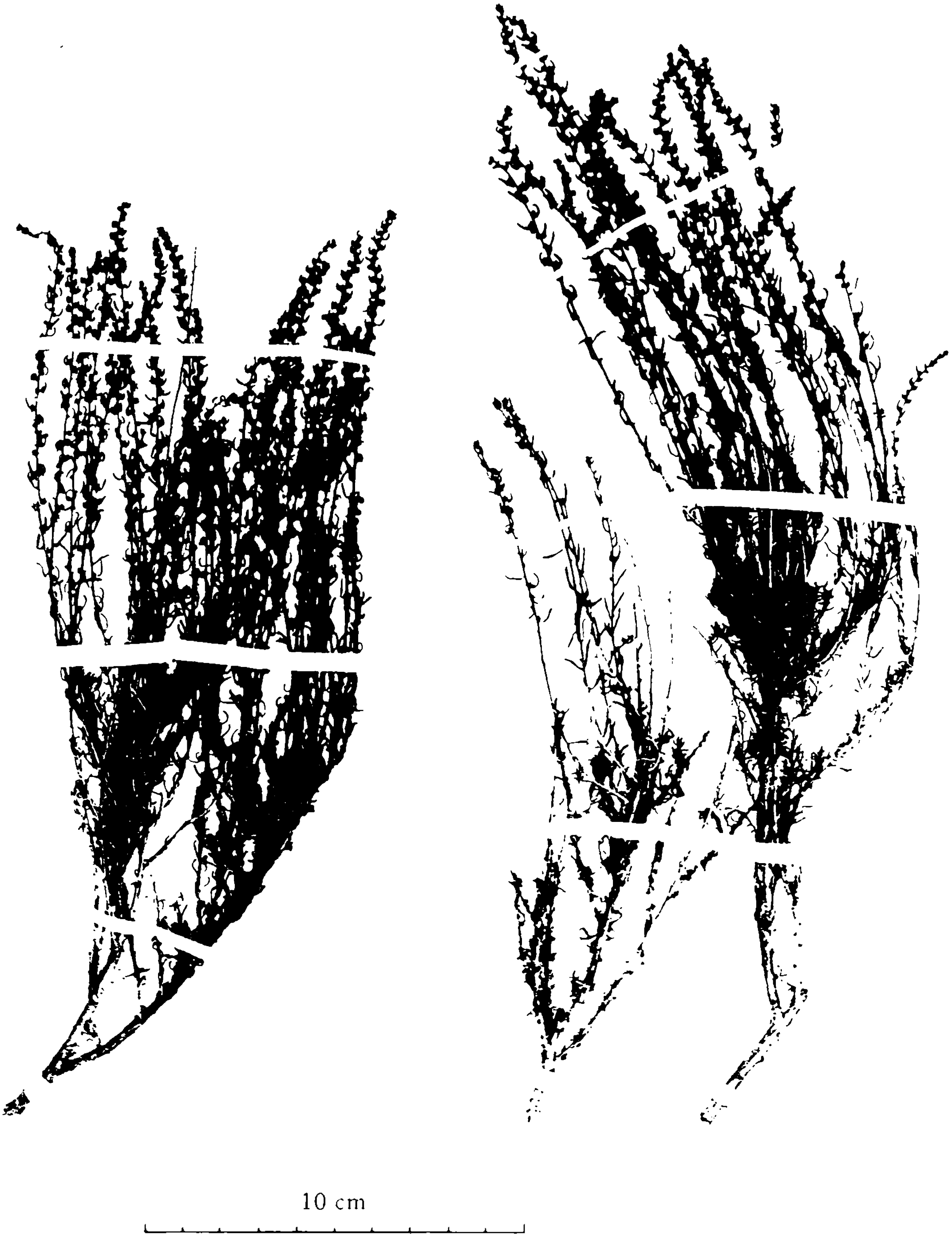

10 cm

Tab. 94

Tab. 95

Tab. 96

Suaeda microphylla PALL. – RECHINGER 37009



Suaeda dendroides (C. A. MEY.) MOQ. – SABETI 3103

Suaeda fruticosa J. F. GMELIN — WENDELBO & FOROUGHI 14629

Tab. 100

Suaeda baluchestanica AKHANI & PODLECH – AKHANI 6706

Bienertia cycloptera BUNGE ex BOISS. – HEDGE, WENDELBO & al. 14671

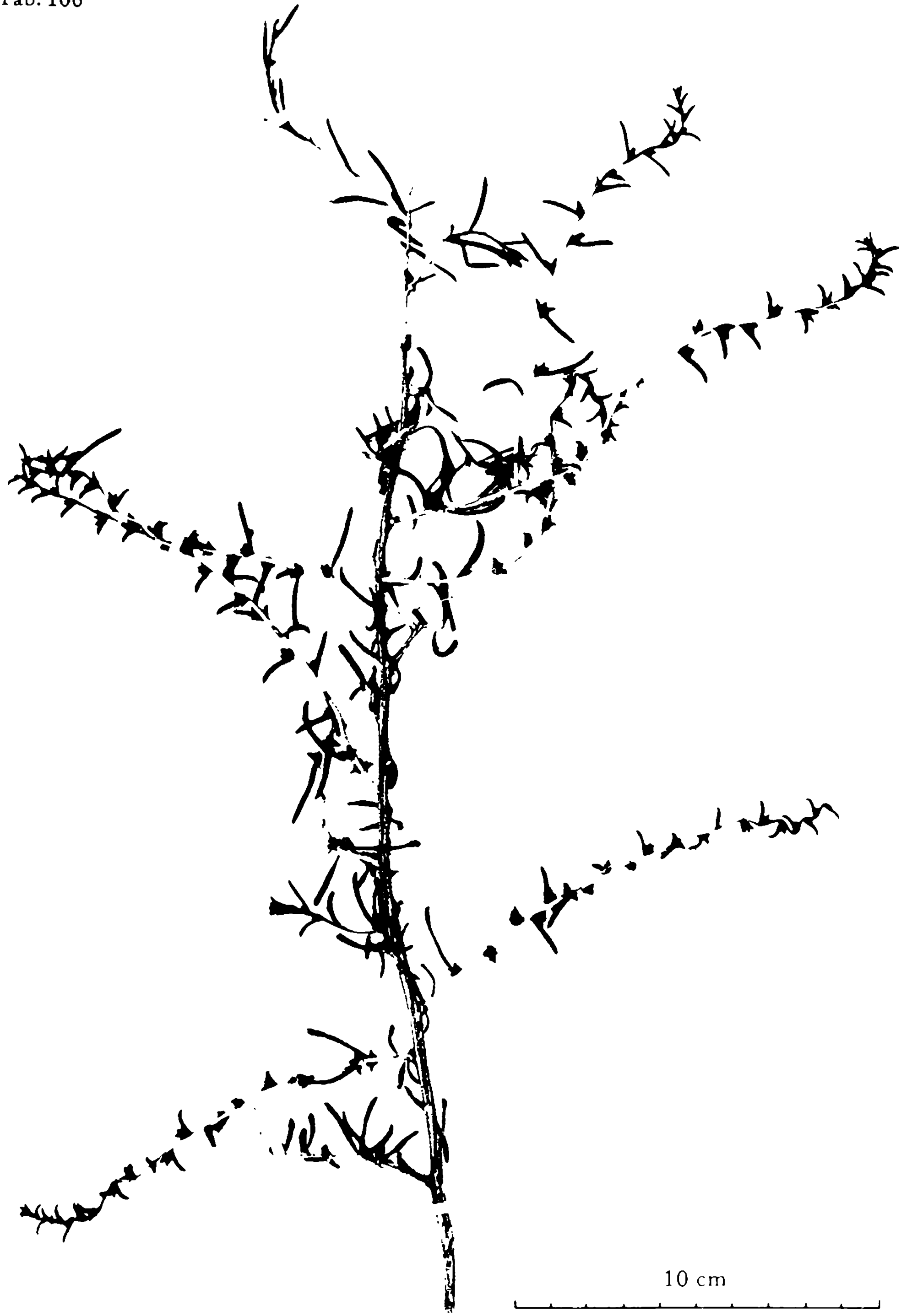
Salsola Drummondii ULBRICH – AKHANI 6687

Salsola makranica FREITAG – FREITAG & KOTHE 18652

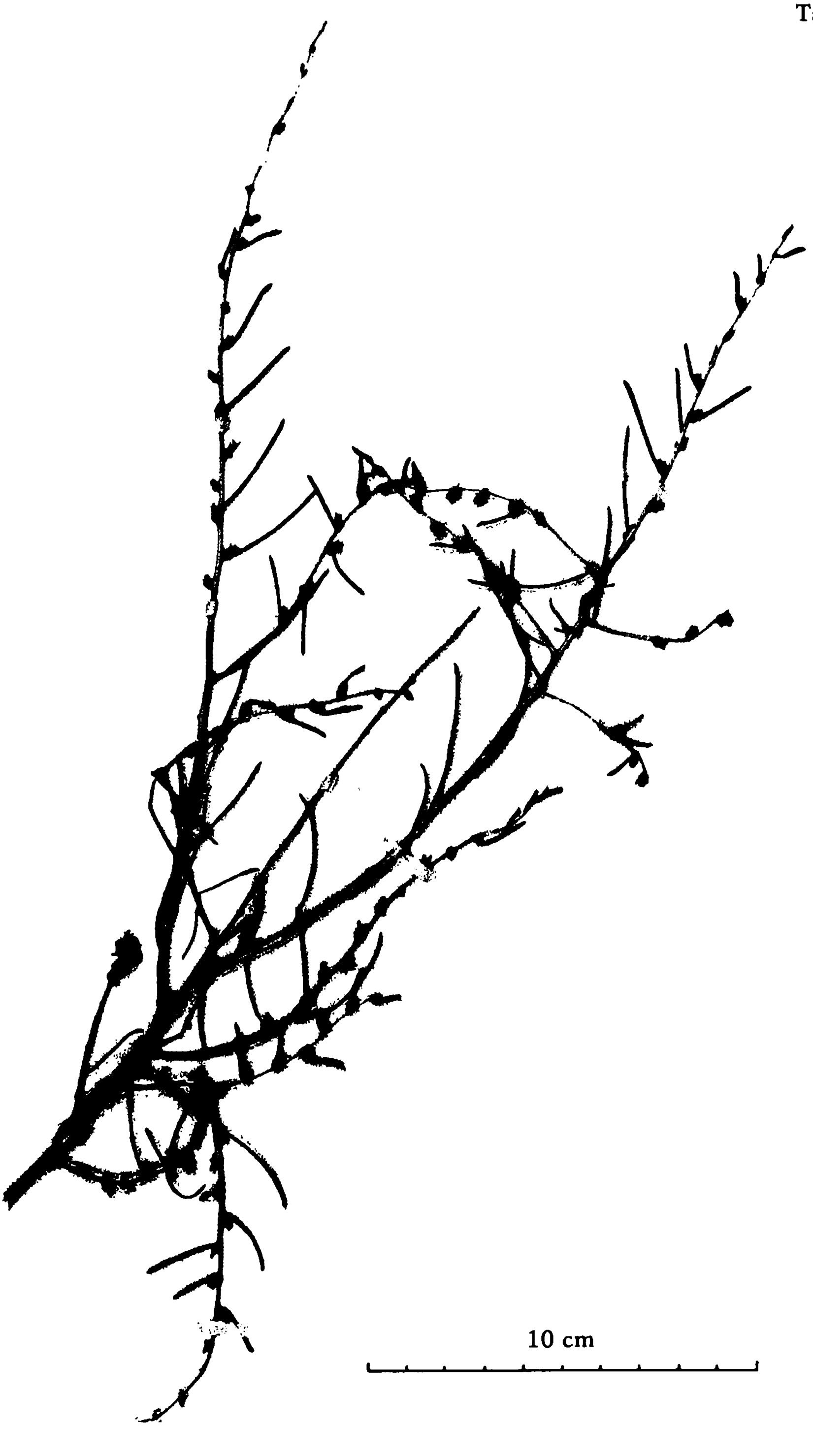
Tab. 104

Salsola montana LITW. – PABOT 5129

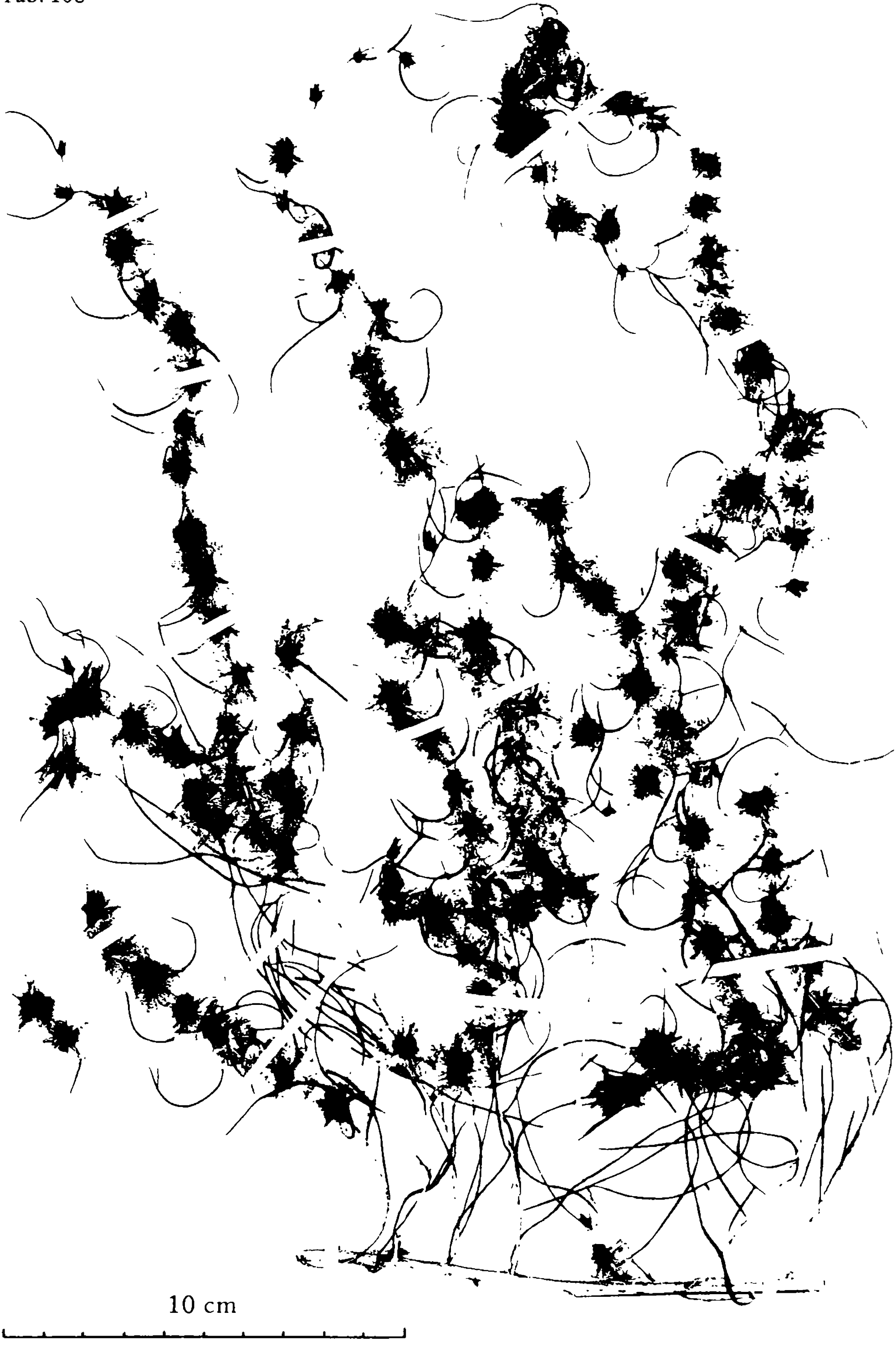
Salsola arbusculiformis DROB. – FREITAG 15282



Salsola arbuscula PALL. – FREITAG 15221



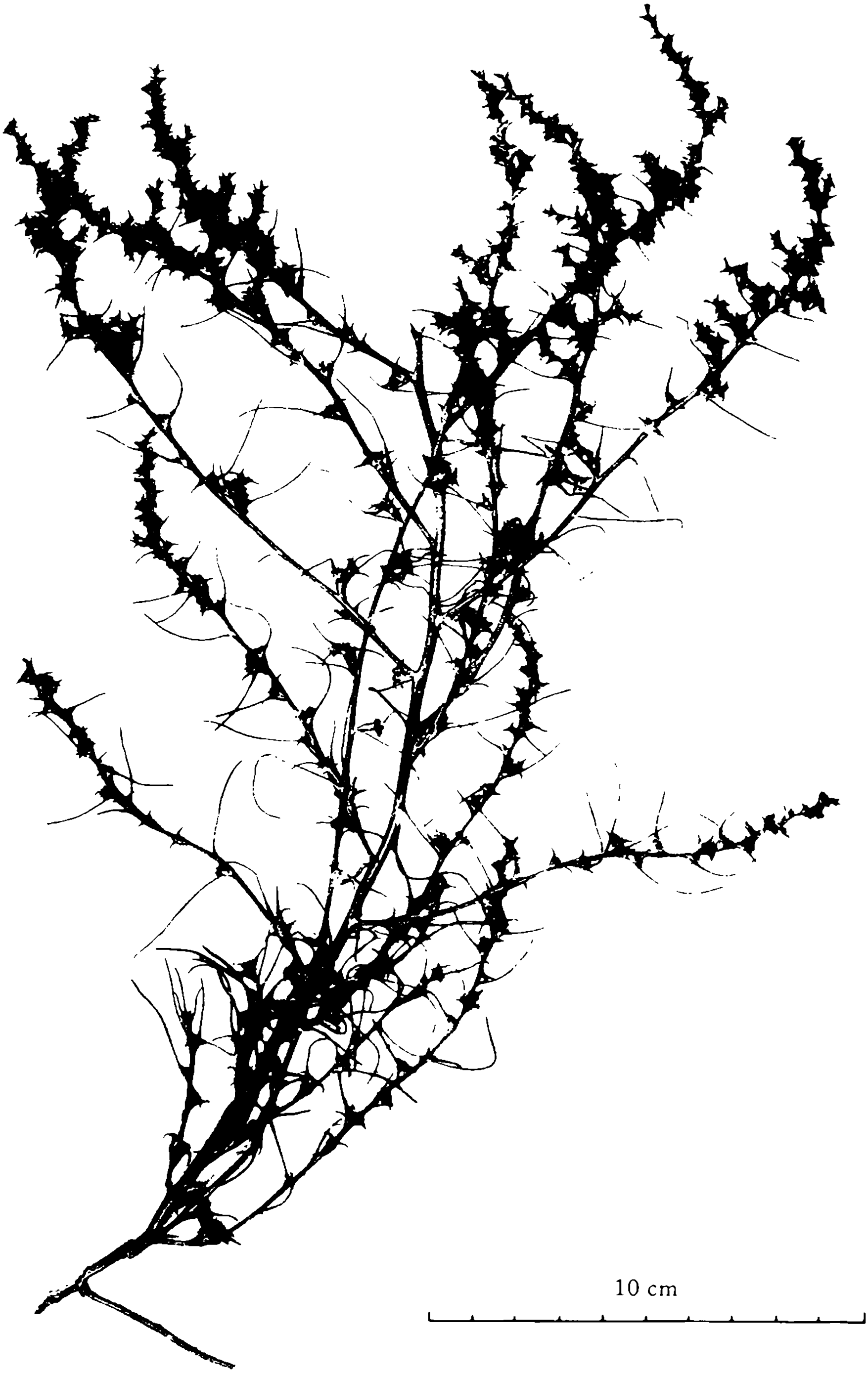
Salsola Richteri (MOQ.) KAREL. ex LITW. – FREITAG 14172-a



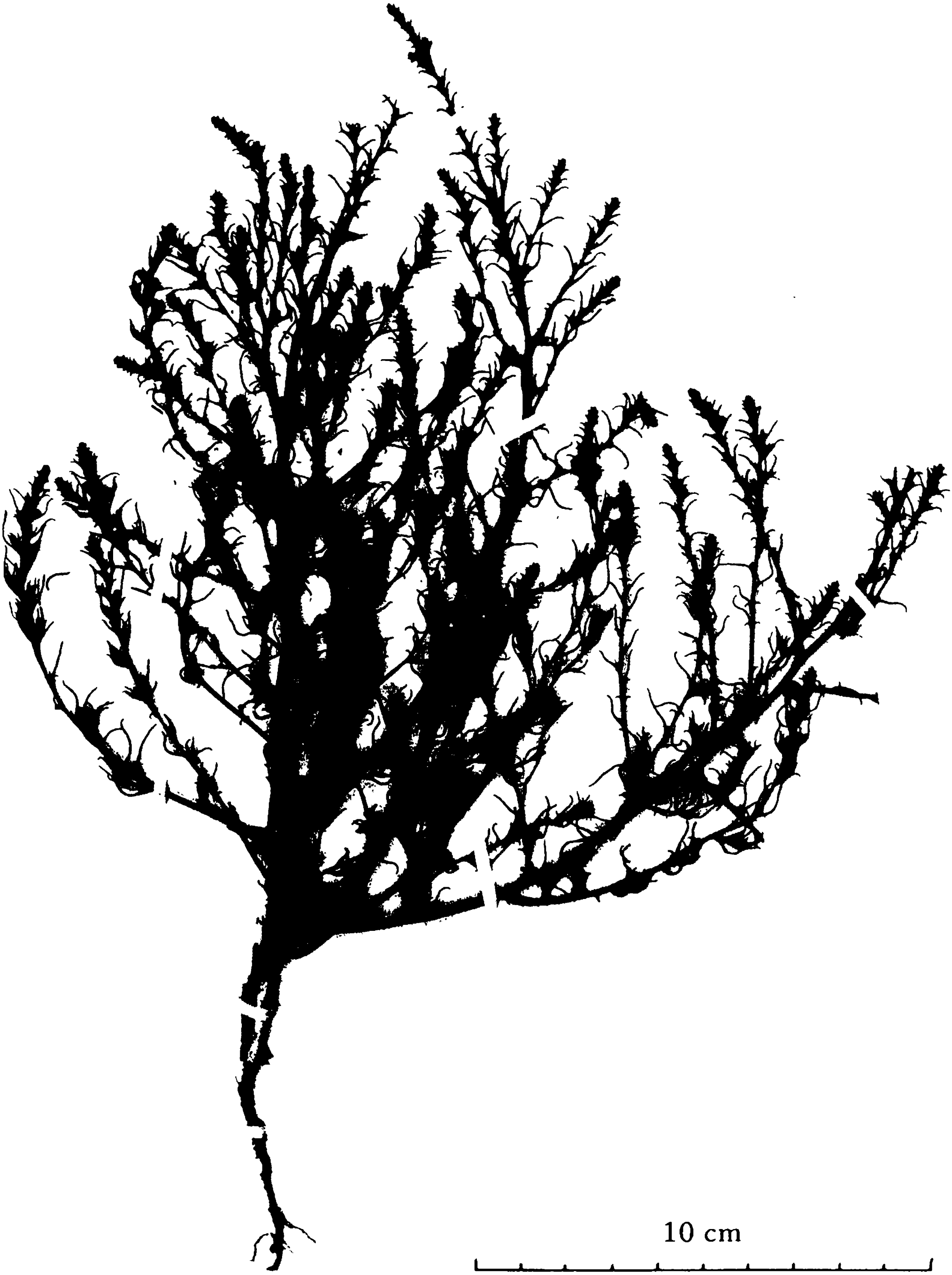
Salsola Paletzkiana LITW. -- SINTENIS 1261 (Turcomania: Krasnovodsk)

10 cm

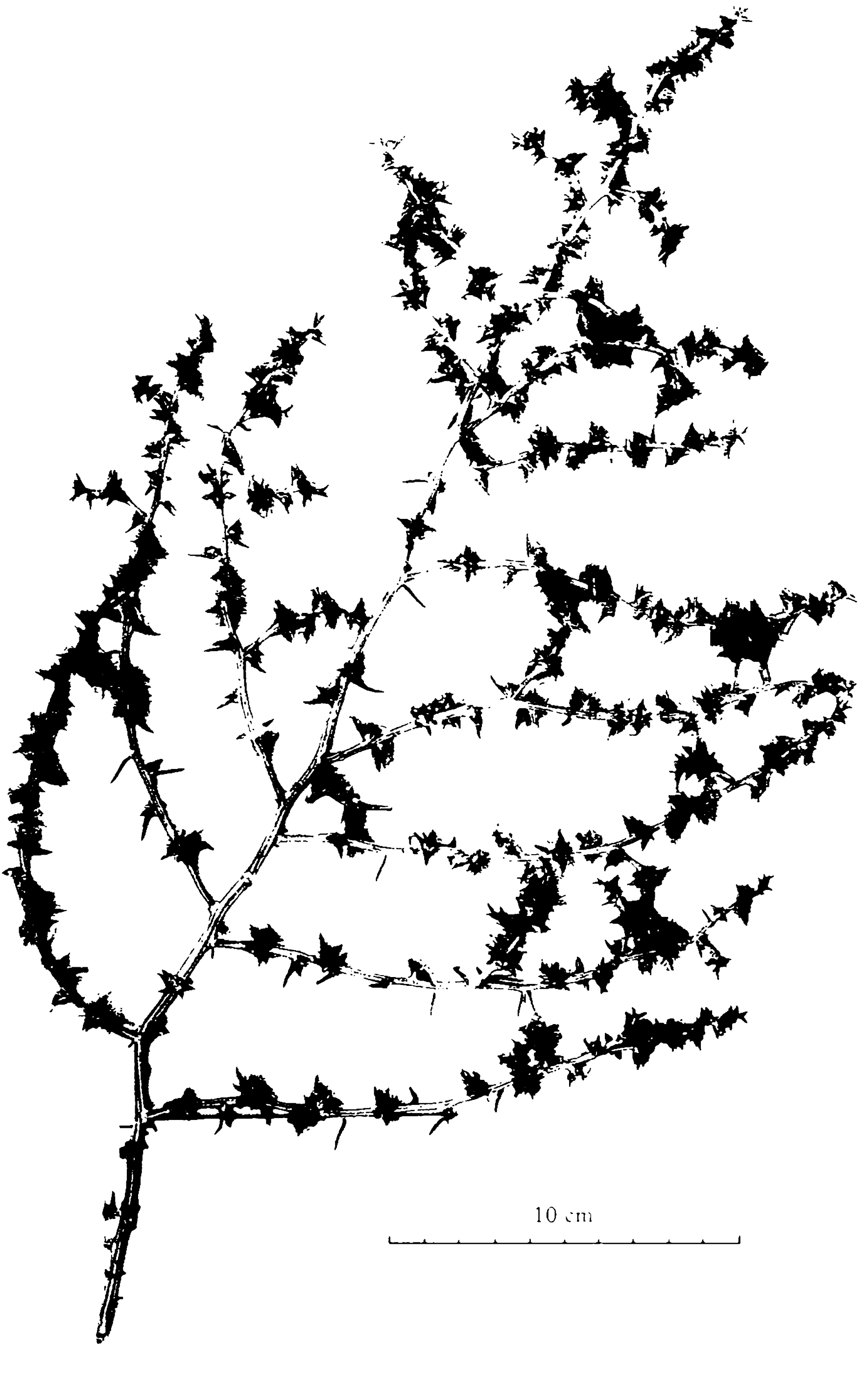
Salsola kali L. subsp. *Tragus* (L.) NYMAN – GHAFOOR & OMER 2100



Salsola kali L. subs. *iberica* (SENNEN & PAU) RILKE – PABOT A–1238



Salsola Jacquemontii MOQ. – STÖBER 85 (N Pakistan)



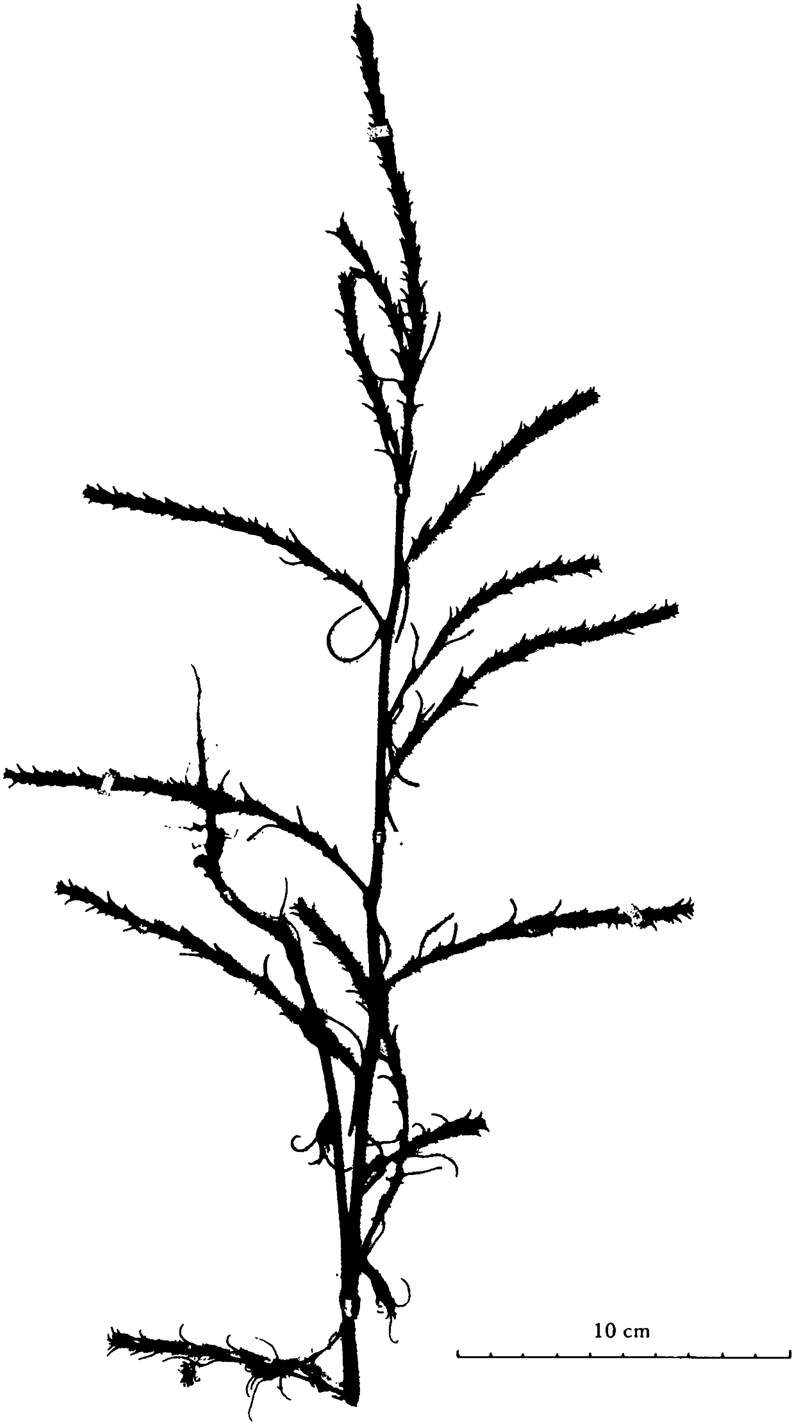
Salsola Tamamschjanae ILJIN – PABOT 5270

Salsola Paulsenii LITW. – FREITAG 3848

Tab. 114

Salsola praecox LITW. – DINI & BAZARGAN 33071

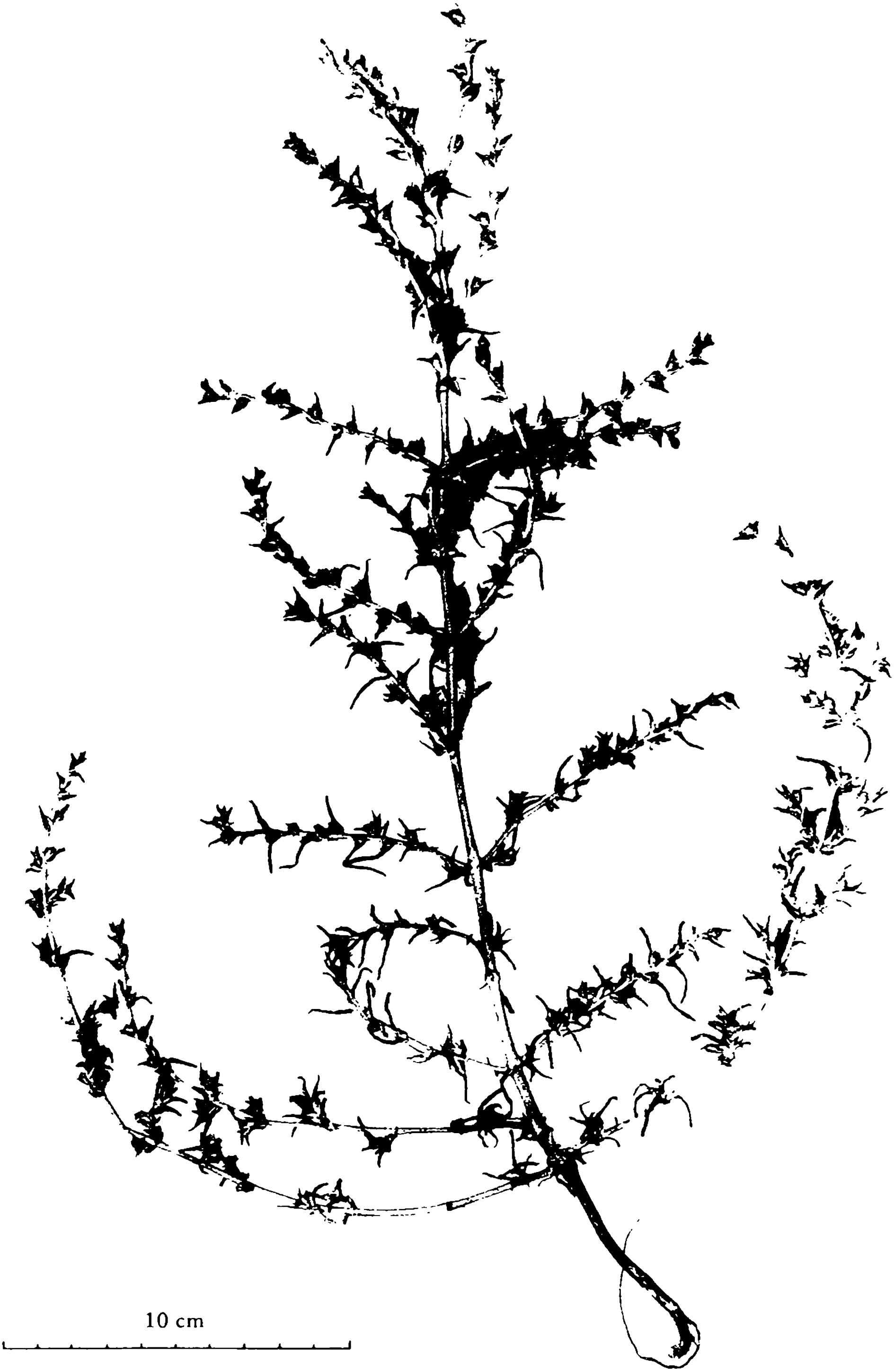
Salsola Griffithii (BUNGE) FREITAG & KHANI – RECHINGER 35335



Salsola collina PALL. – PODLECH 12353

Salsola aperta PAULSEN – RECHINGER 34630

Tab. 118



Salsola soda L. – AELLEN & BEHBOUDI 2928

Salsola imbricata FORSSK. – AKHANI 6653

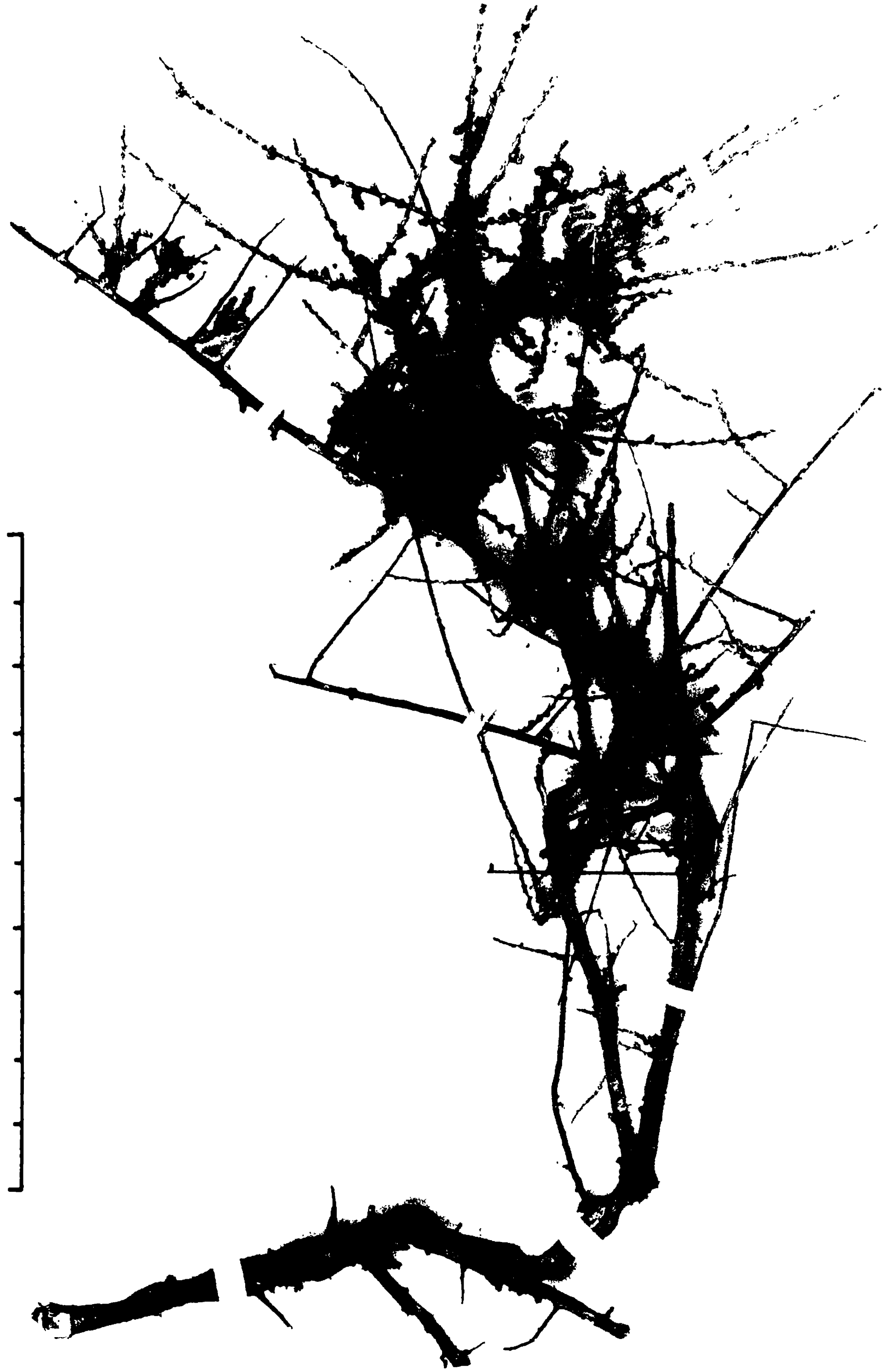
Salsola nitraria PALL. – RECHINGER 46486

Salsola dendroides PALL. – RECHINGER 32562

Salsola vermiculata L. – RECHINGER 43245

Salsola orientalis S. G. GMELIN – ANDERSEN & PETERSEN 317

Salsola ericoides M. B. – PABOT 5253



Salsola cyclophylla BAKER – FREITAG & KOTHE 18435

Tab. 126

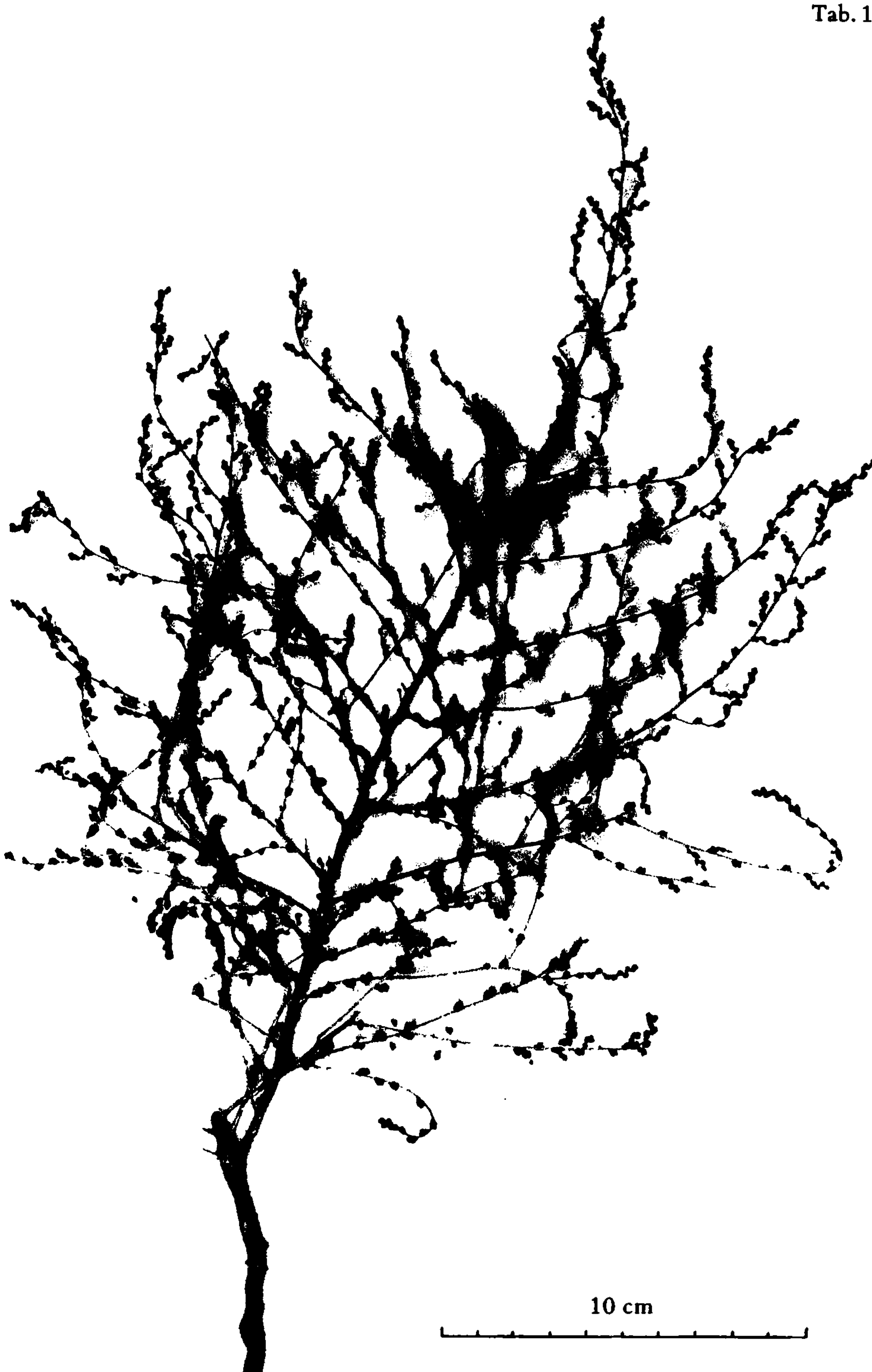
Salsola verrucosa M. B. – PABOT 5416

Salsola gemmascens PALL. – FREITAG 3887–A

Salsola yazdiana ASSADI – PABOT 6998

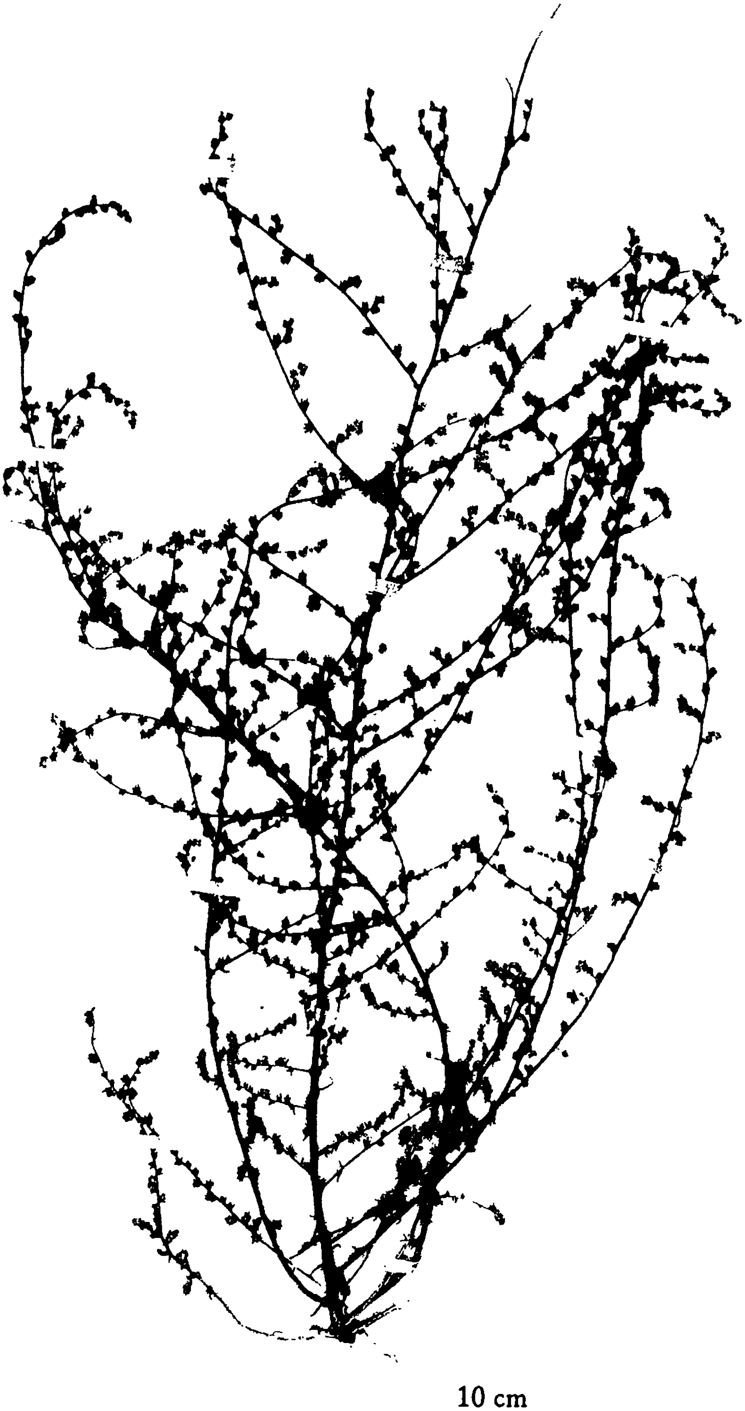
Salsola persica BUNGE ex BOISS. – RECHINGER 14834

Salsola inermis FORSSK. – AKHANI 5561



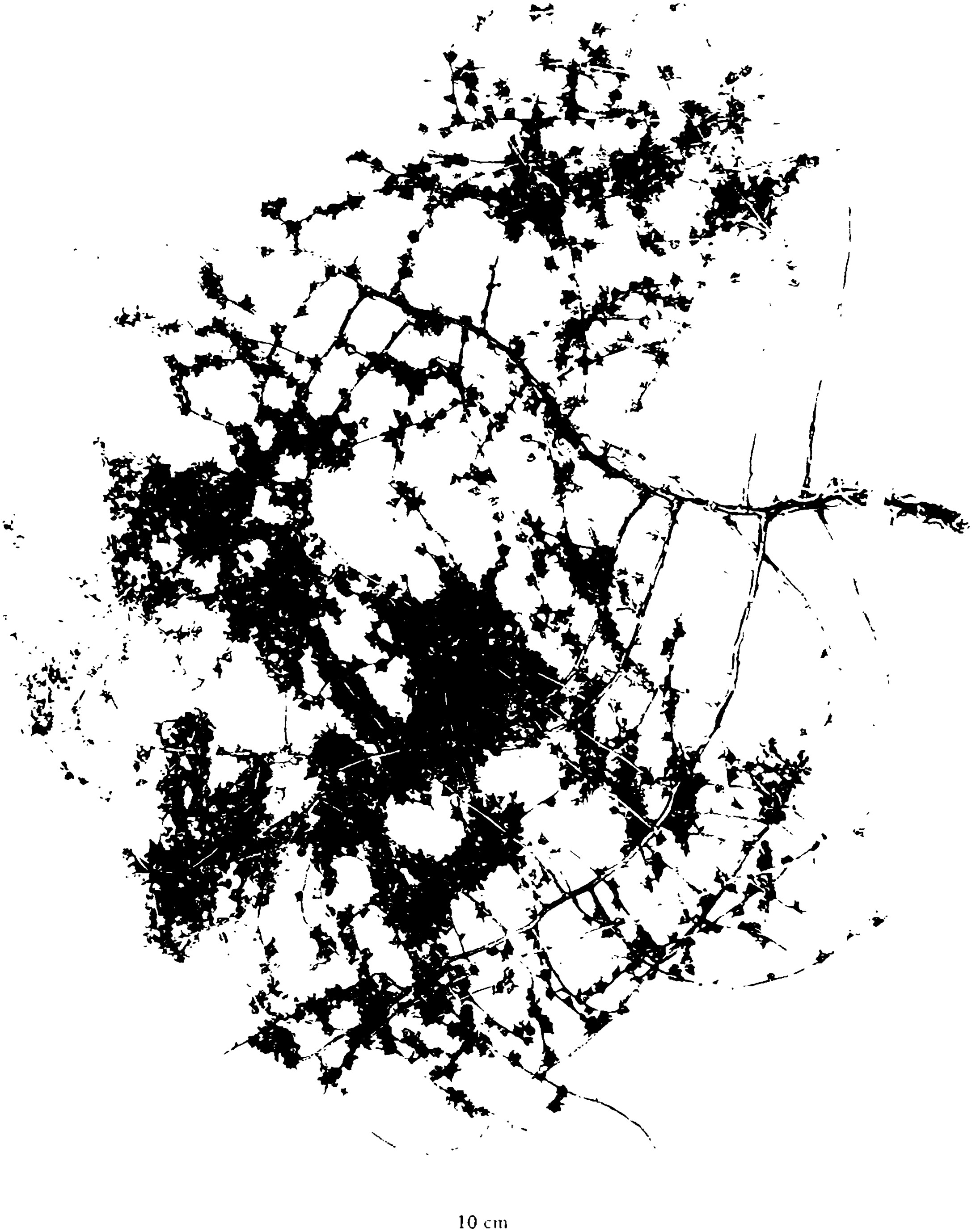
Salsola jordanicola EIG – AELLEN 3050

Salsola chorassanica BOTSCH. – RECHINGER 32480



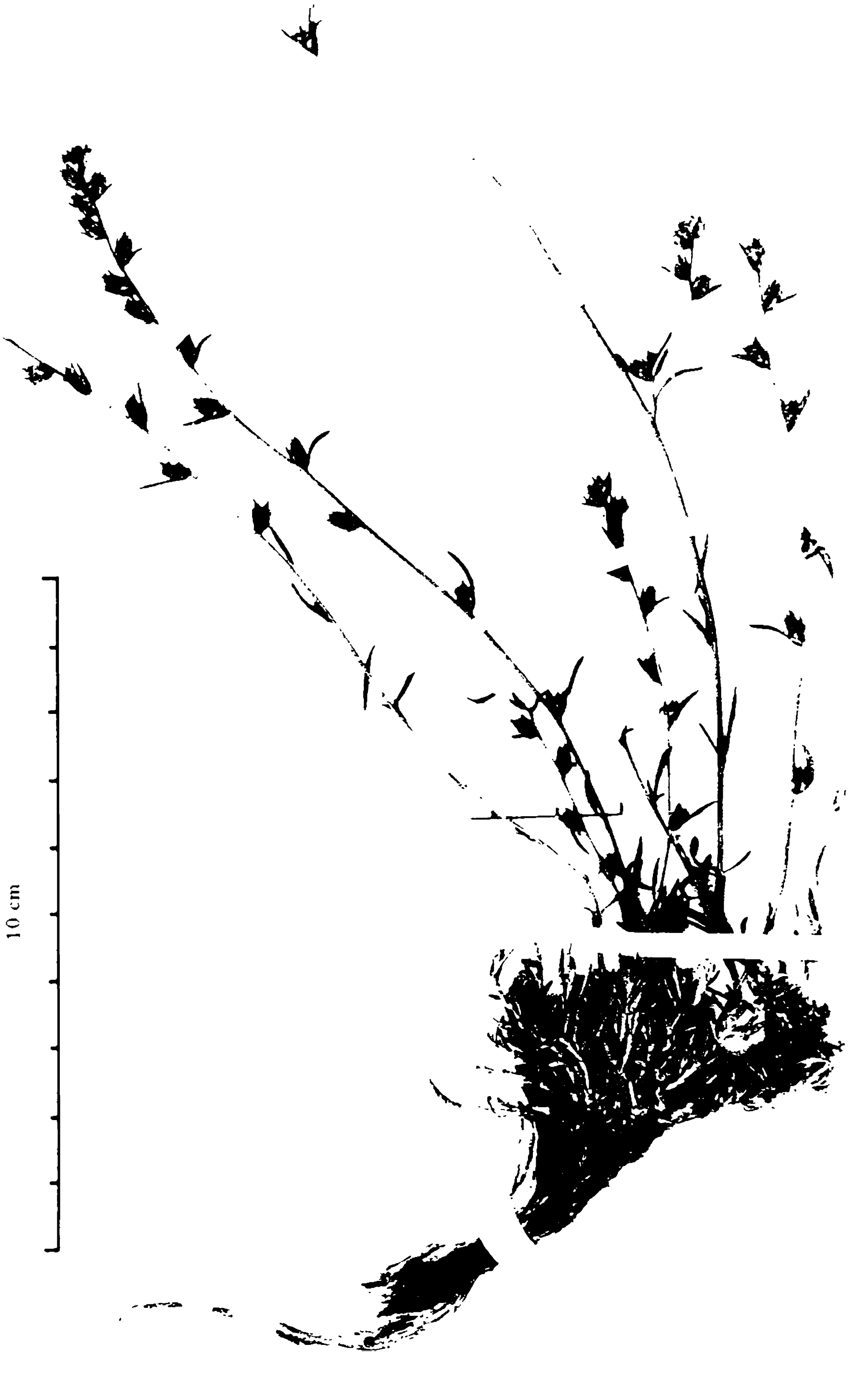
10 cm

Salsola turkestanica LITW. – FREITAG 13637



Salsola sclerantha C. A. MEY. – FREITAG 3886

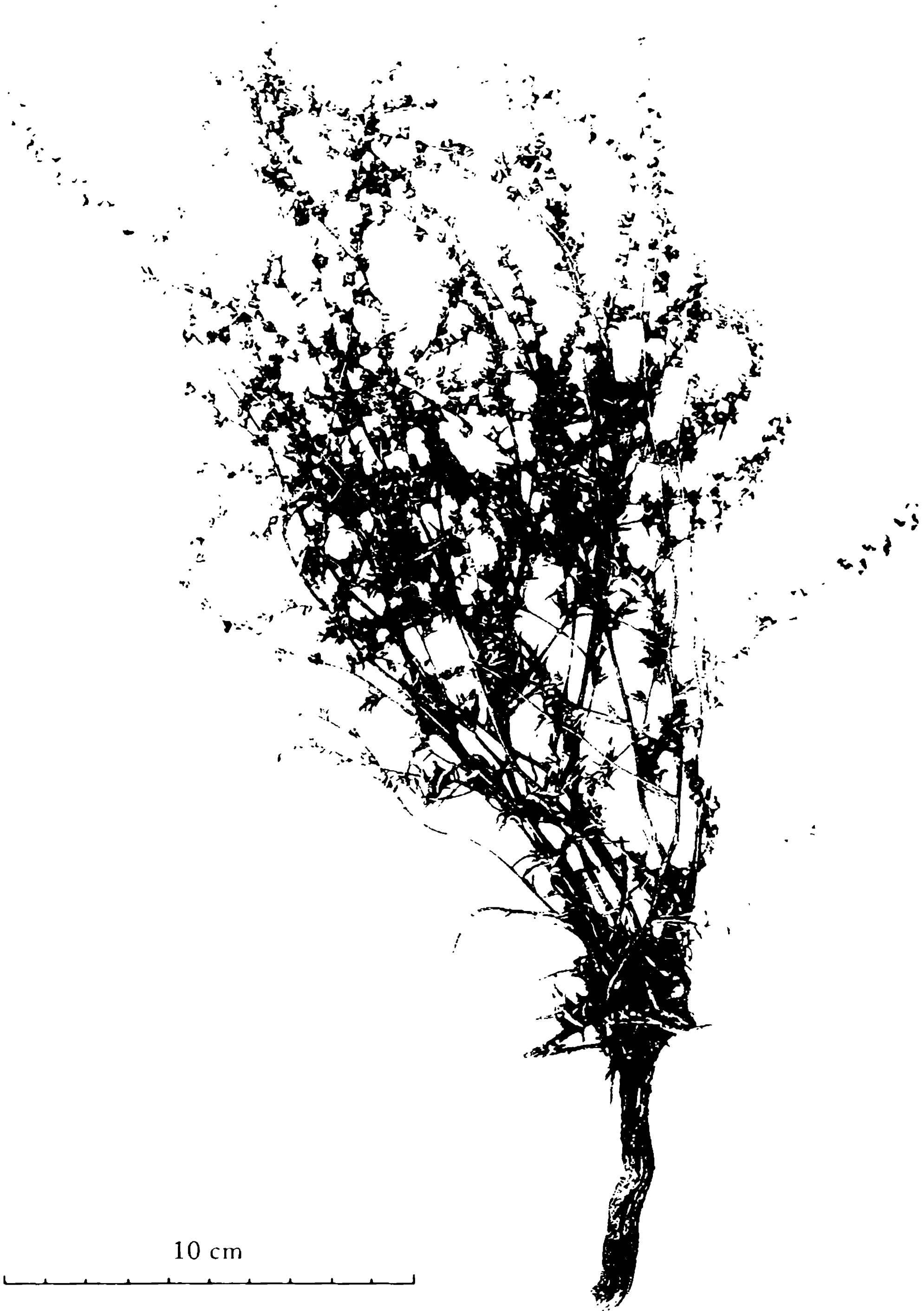
Salsola forcipitata ILJIN – PABOT A–1584



Salsola canescens (MOQ.) BOISS. – KOEIE 2529

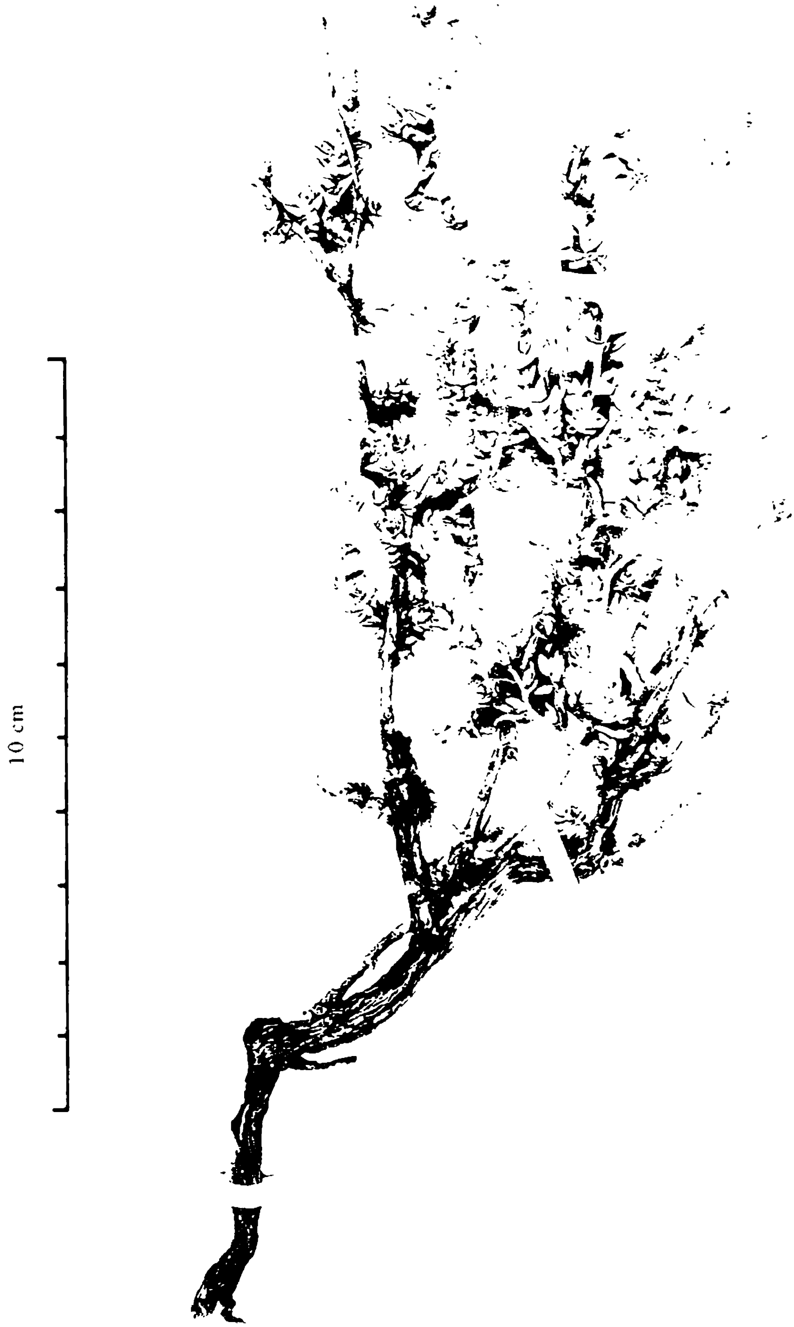
[illegible] (MOQ.) BUNGE ex ILJIN AELLEN & MANUCH 2786

Tab. 138



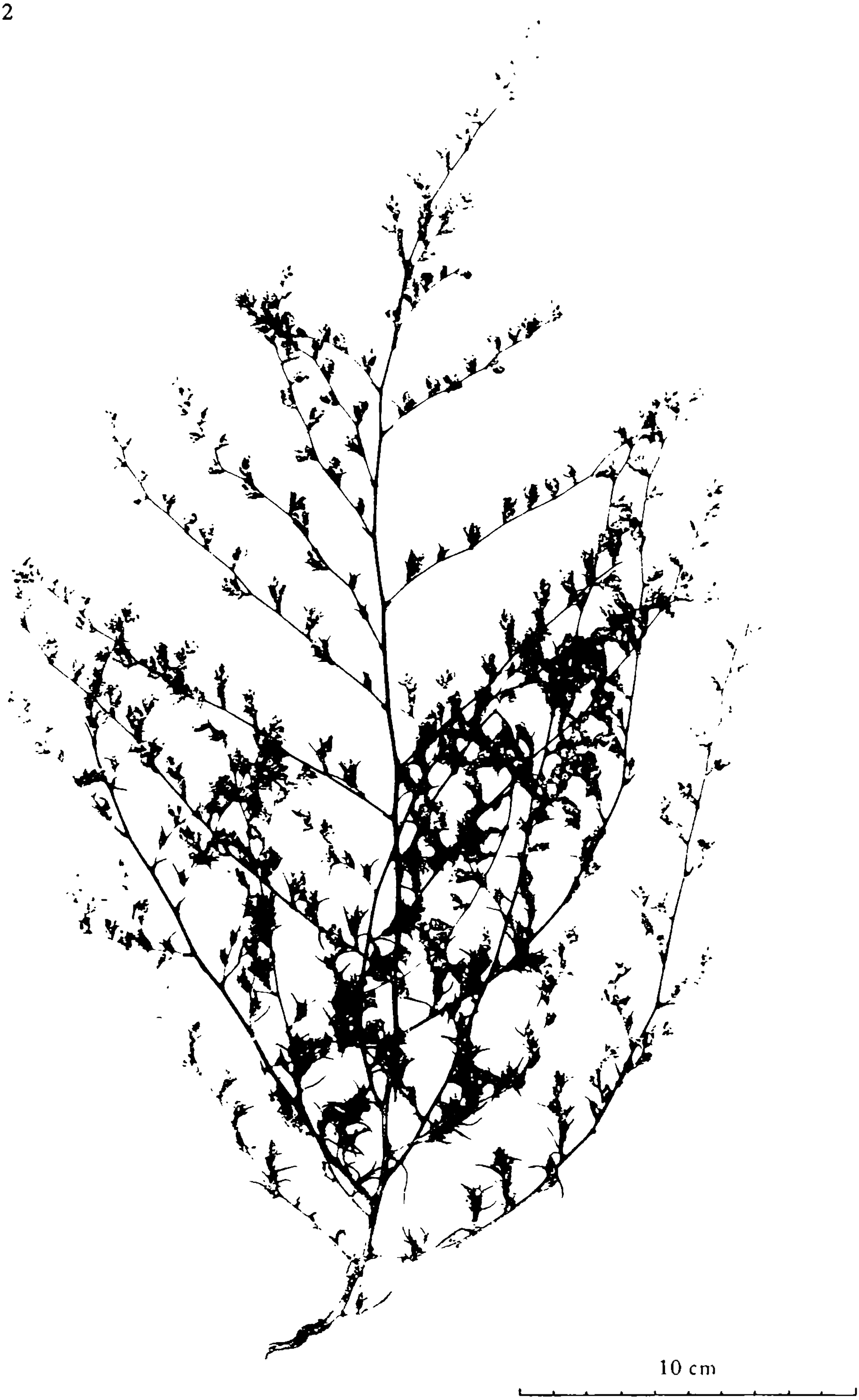
Salsola tomentosa (MOQ.) SPACH – PABOT 5083

Salsola lachnantha (BOTSCH.) BOTSCH. – PABOT 1057



Salsola rubescens FRANCH. – FREITAG & KOTHE 18620

Salsola brachiata PALL. – JÖRGENSEN 671

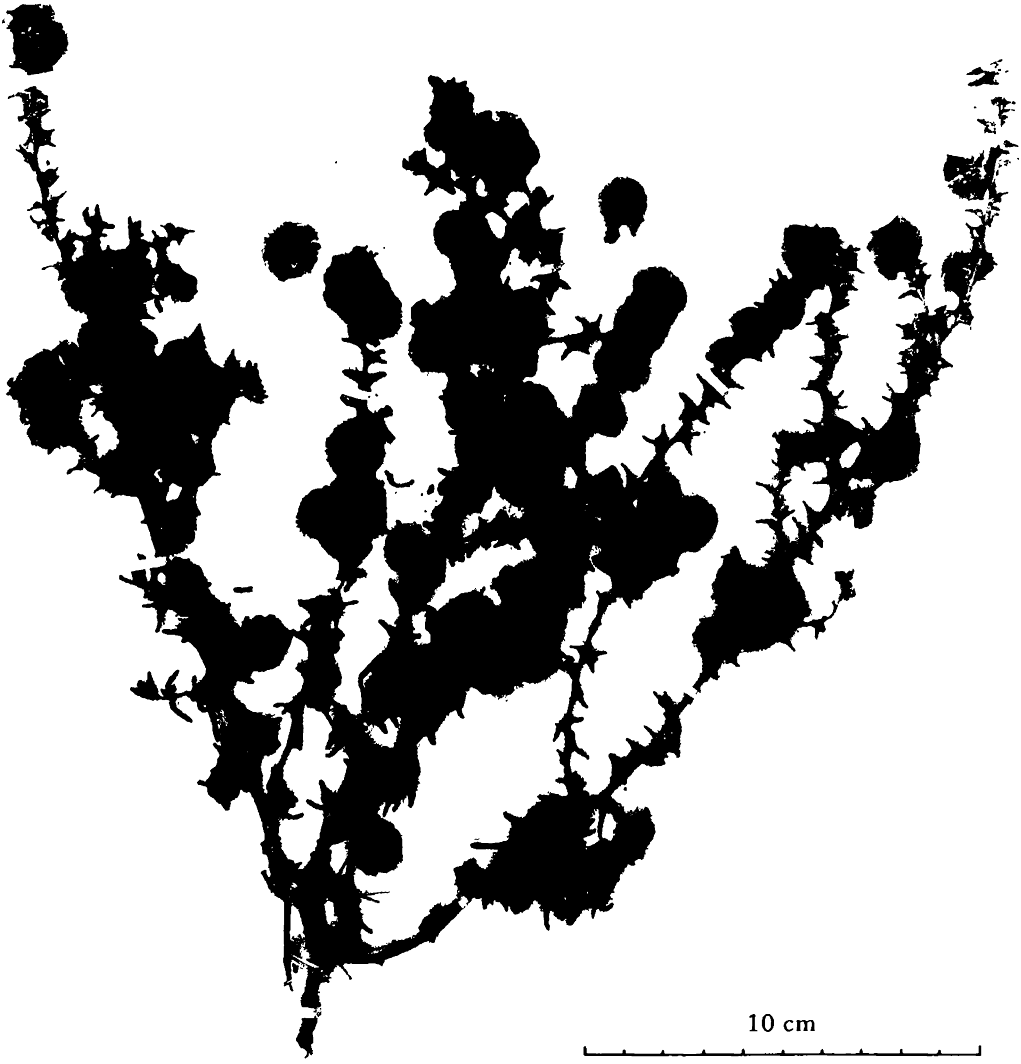


Salsola gossypina BUNGE – ALAVA 11042

Salsola Vvedenskyi ILJIN & M. POP. – FREITAG 3865

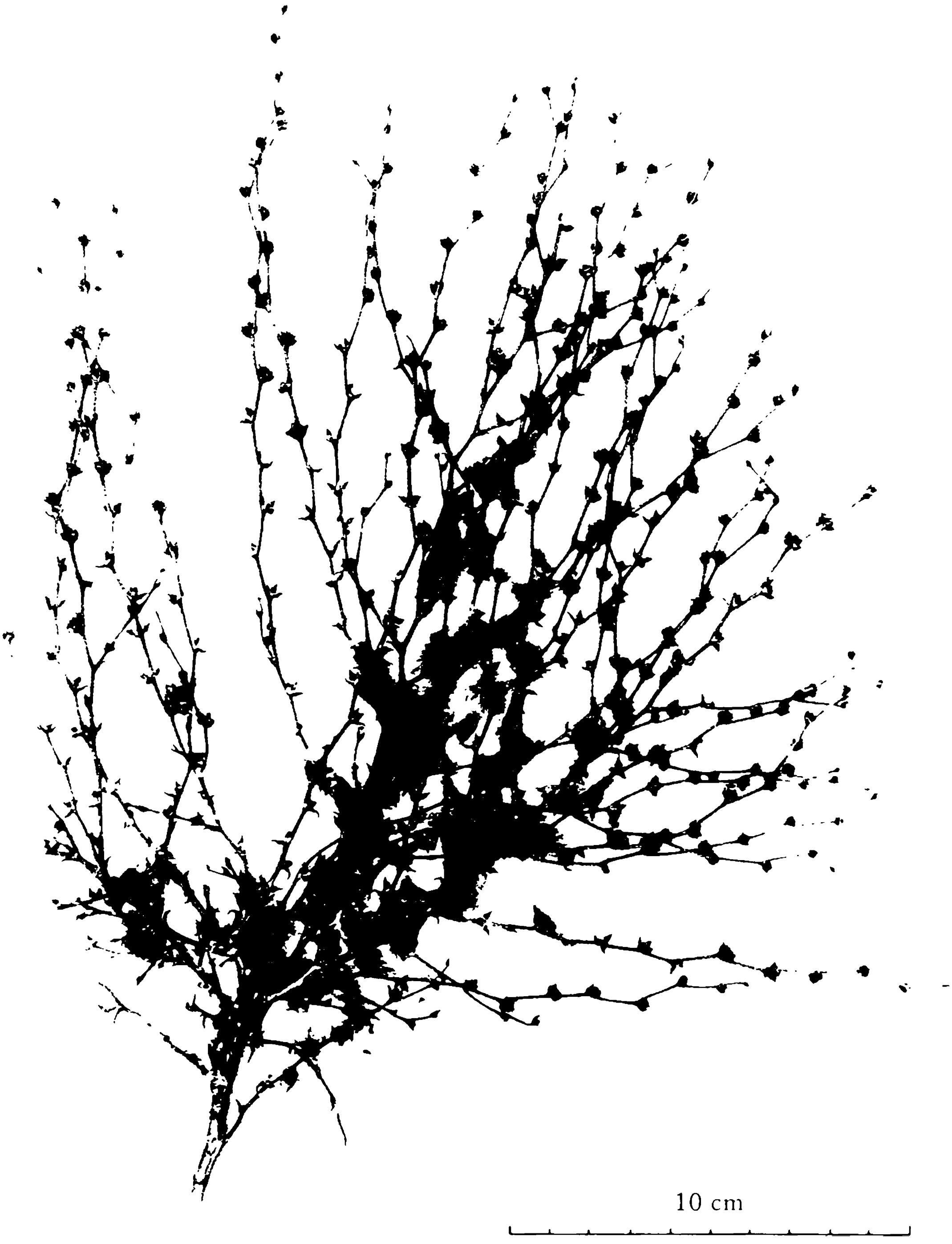
Tab. 144

Salsola lanata PALL. subsp. *longistylosa* (ILJIN) FREITAG – PODLECH 16987



Salsola crassa M. B. subsp. *turcomanica* (LITW.) FREITAG – AKHANI & al. 2072

Tab. 146



Halothamnus hierochunticus (BORNM.) BOTSCH. – P. BERTON 472 (Syria)

Halothamnus iliensis (LIPSKY) BOTSCH. – A. MICHELSON (isotype)

Halothamnus iranicus BOTSCH. var. *glabratus* BOTSCH. – AKHANI 6782

Halothamnus auriculus (MOQ.) BOTSCH. subsp. *auriculus* – PODLECH & JARMAL 30084

Tab. 150

Halothamnus auriculus (MOQ.) BOTSCH. subsp. *acutifolius* (MOQ.) KOTHE–HEINR. – FOROUGHI & ASSADI 13705

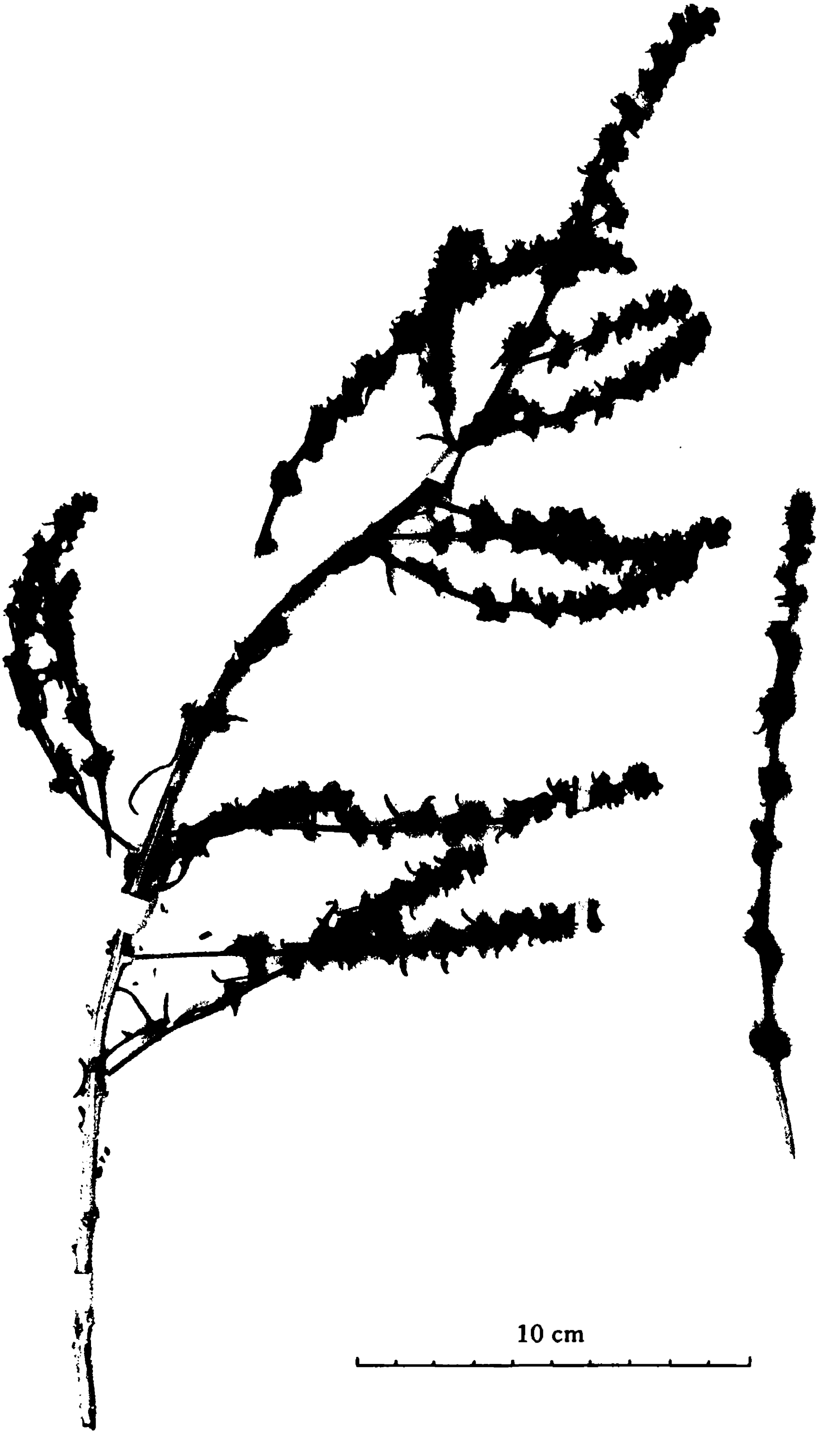
Halothamnus kermanensis KOTHE–HEINR. – BORNMÜLLER 5062

Halothamnus afghanicus KOTHE–HEINR. – UOTILA 18455b

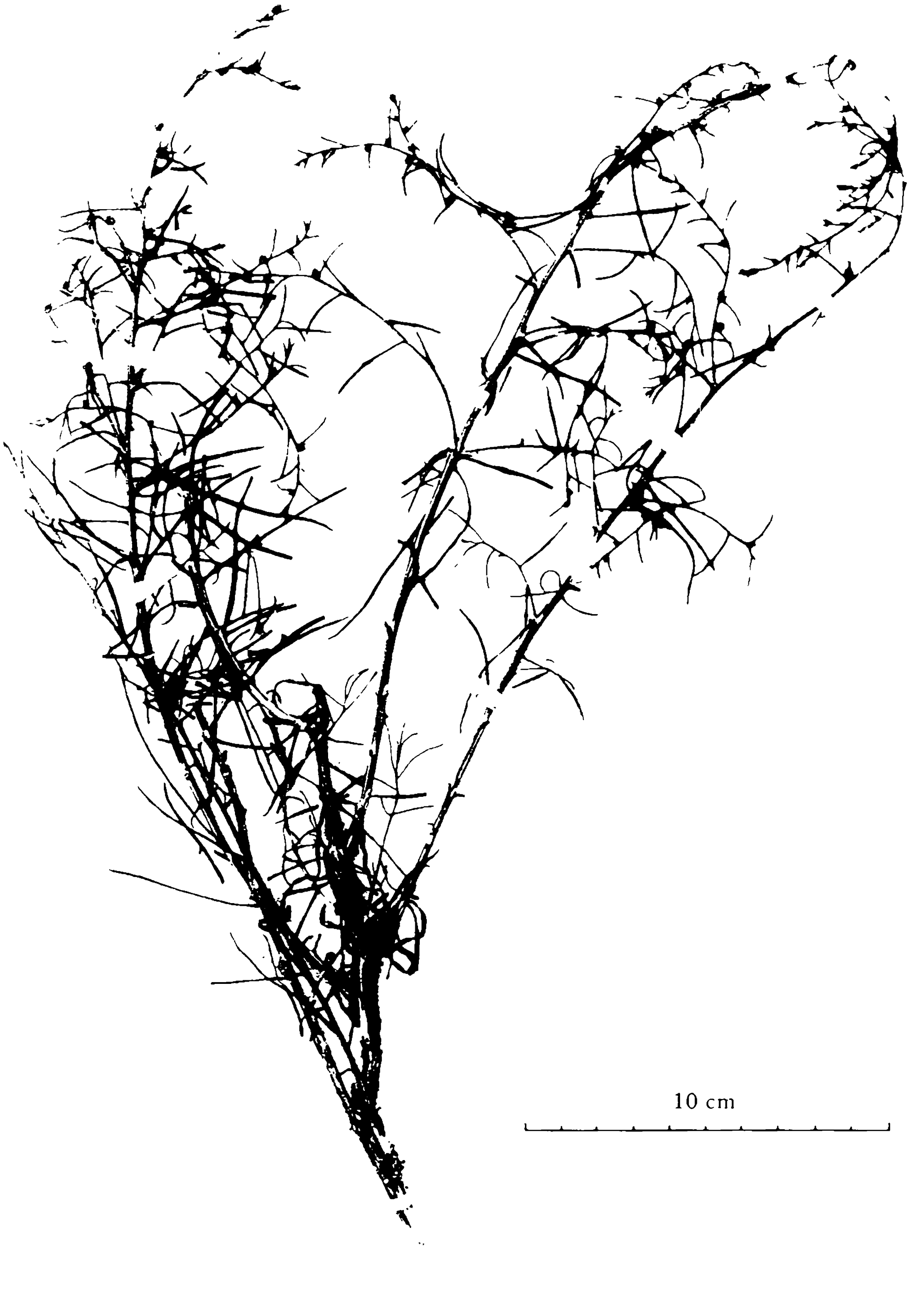
Halothamnus cinerascens (MOQ.) KOTHE–HEINR. subsp. *cinerascens* – FREITAG 13994

Tab. 154

Halothamnus glaucus (M. B.) BOTSCH. subsp. *glaucus* – WENDELBO & FOROUGHI 12710

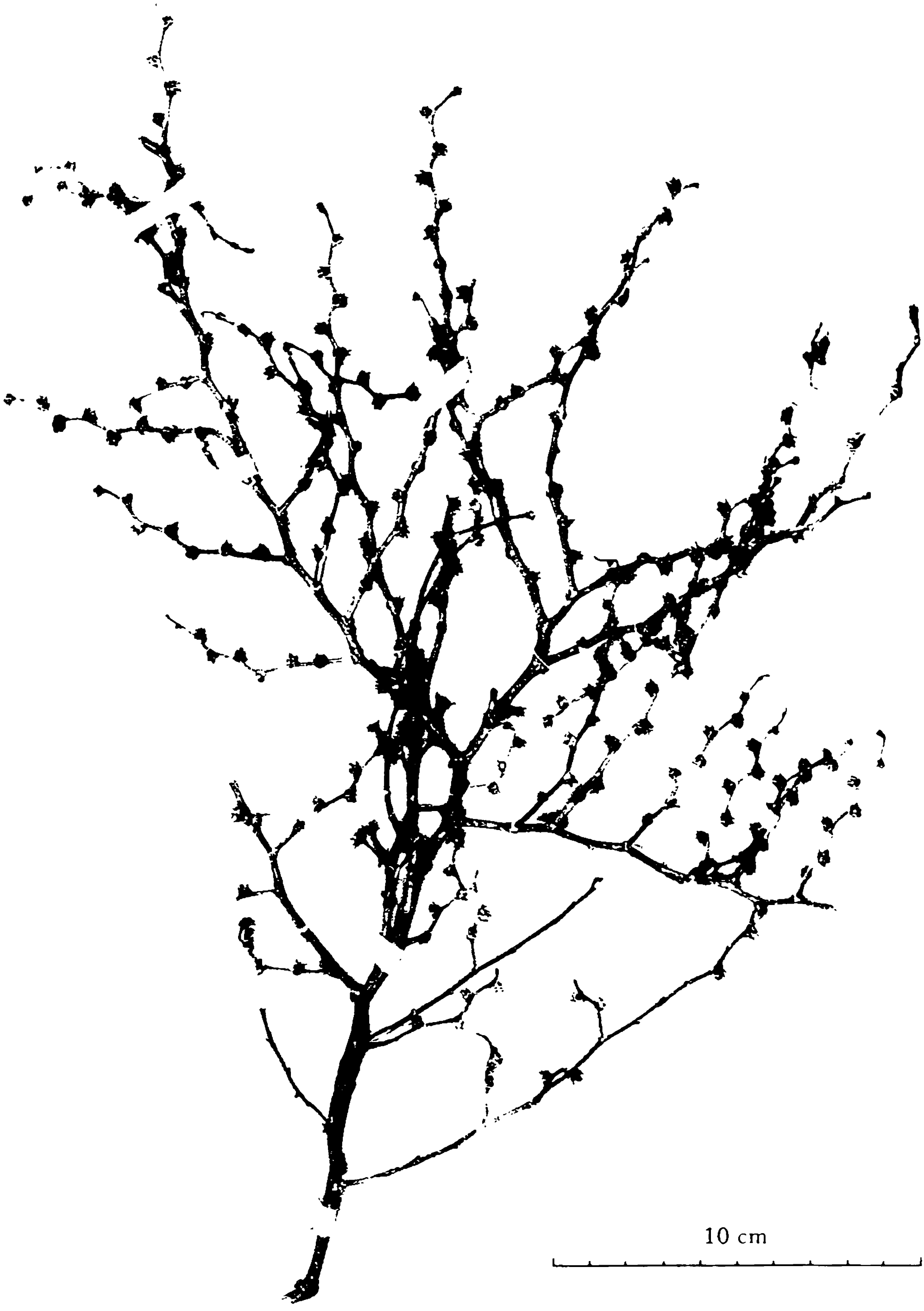


Halothamnus bamianicus (GILLI) BOTSCH. – PODLECH 12194



Halothamnus schurobi BOTSCH. – FREITAG 3152

Halothamnus oxianus BOTSCH. – RECHINGER 16348



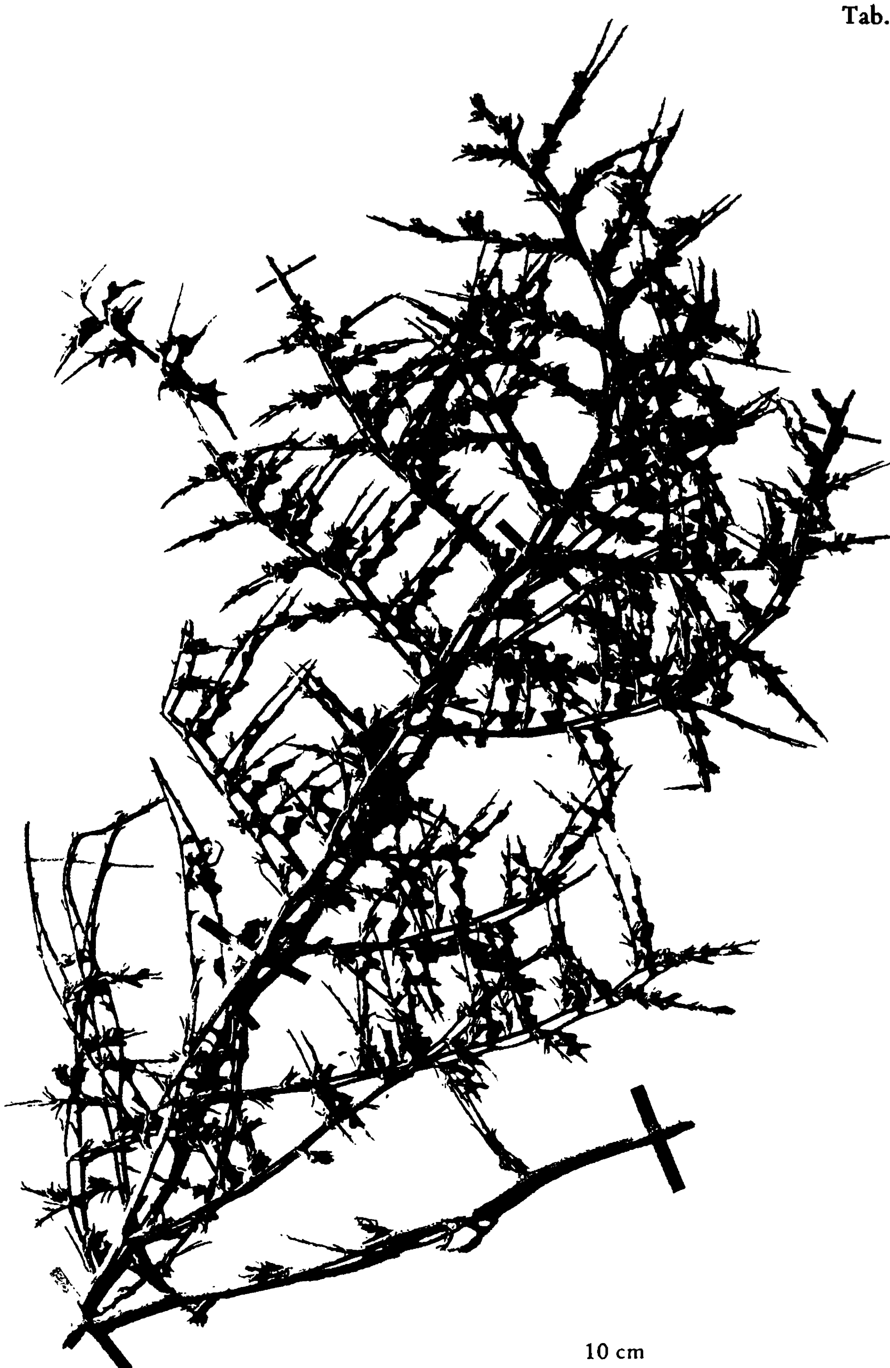
Halothamnus subaphyllus (C. A. MEY.) BOTSCH. subsp. *Charifii* (AELLEN) KOTHE–HEINR. – PODLECH 19204

Tab. 159

Seidlitzia rosmarinus EHRENB. ex BOISS. – FOROUGHI 10540

Seidlitzia florida (M. B.) BUNGE ex BOISS. – UOTILA 19531

Tab. 161



Noaea mucronata (FORSSK.) ASCHERS. & SCHWEINF. – UOTILA 19944 (Turkey)

Tab. 162

Noaea major BUNGE – KOELZ 14033


10 cm

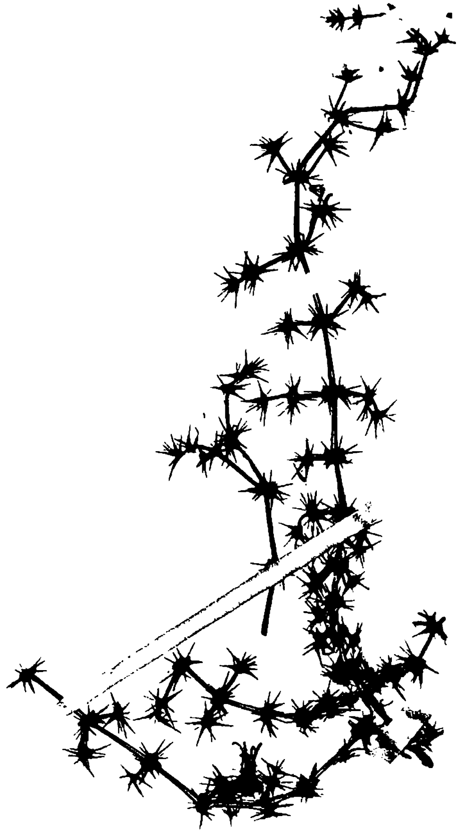

10 cm


10 cm

10 cm

1

10 cm



2


10 cm

10 cm


10 cm

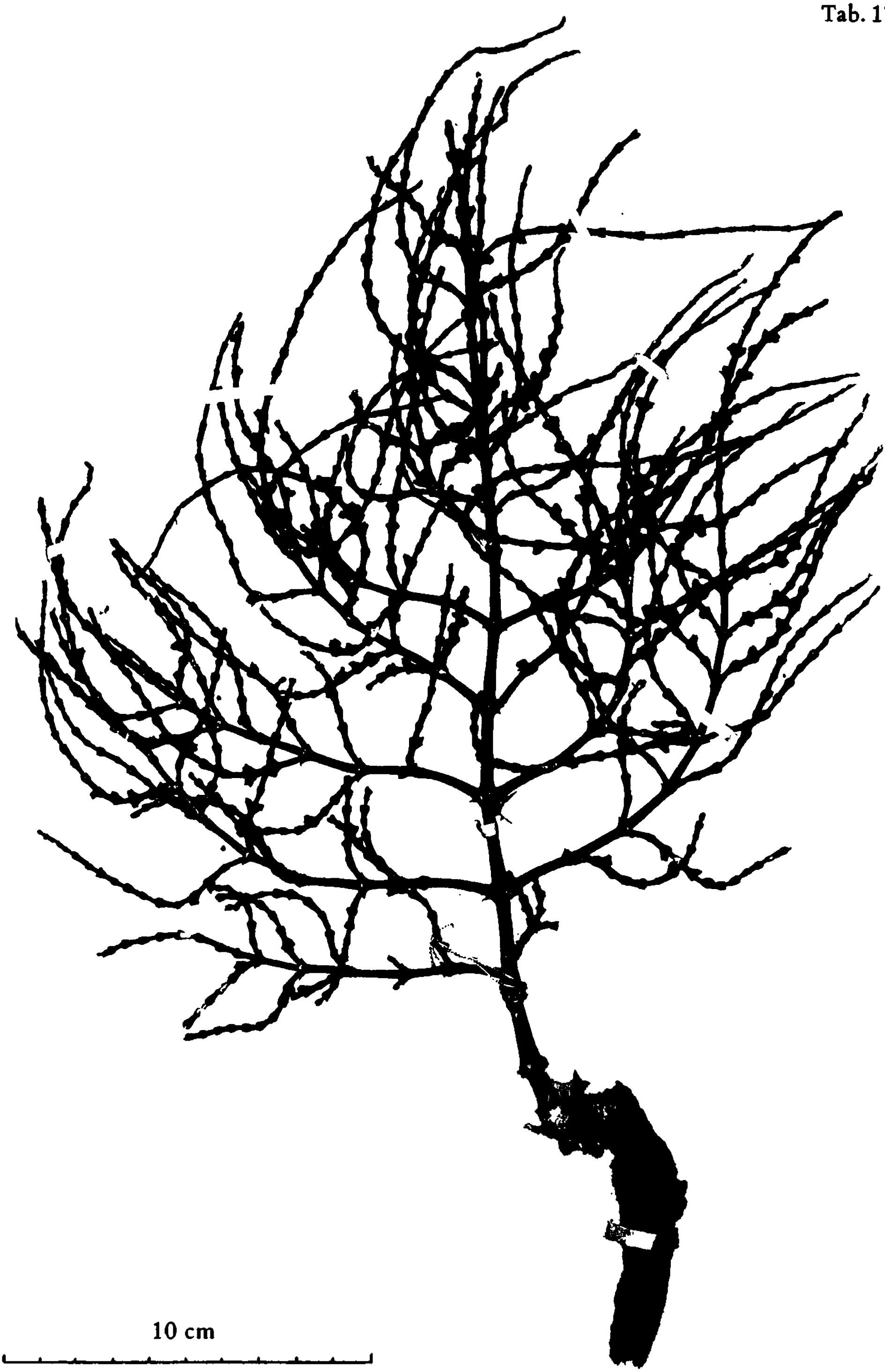
Tab. 172

10 cm

10 cm

Tab. 174

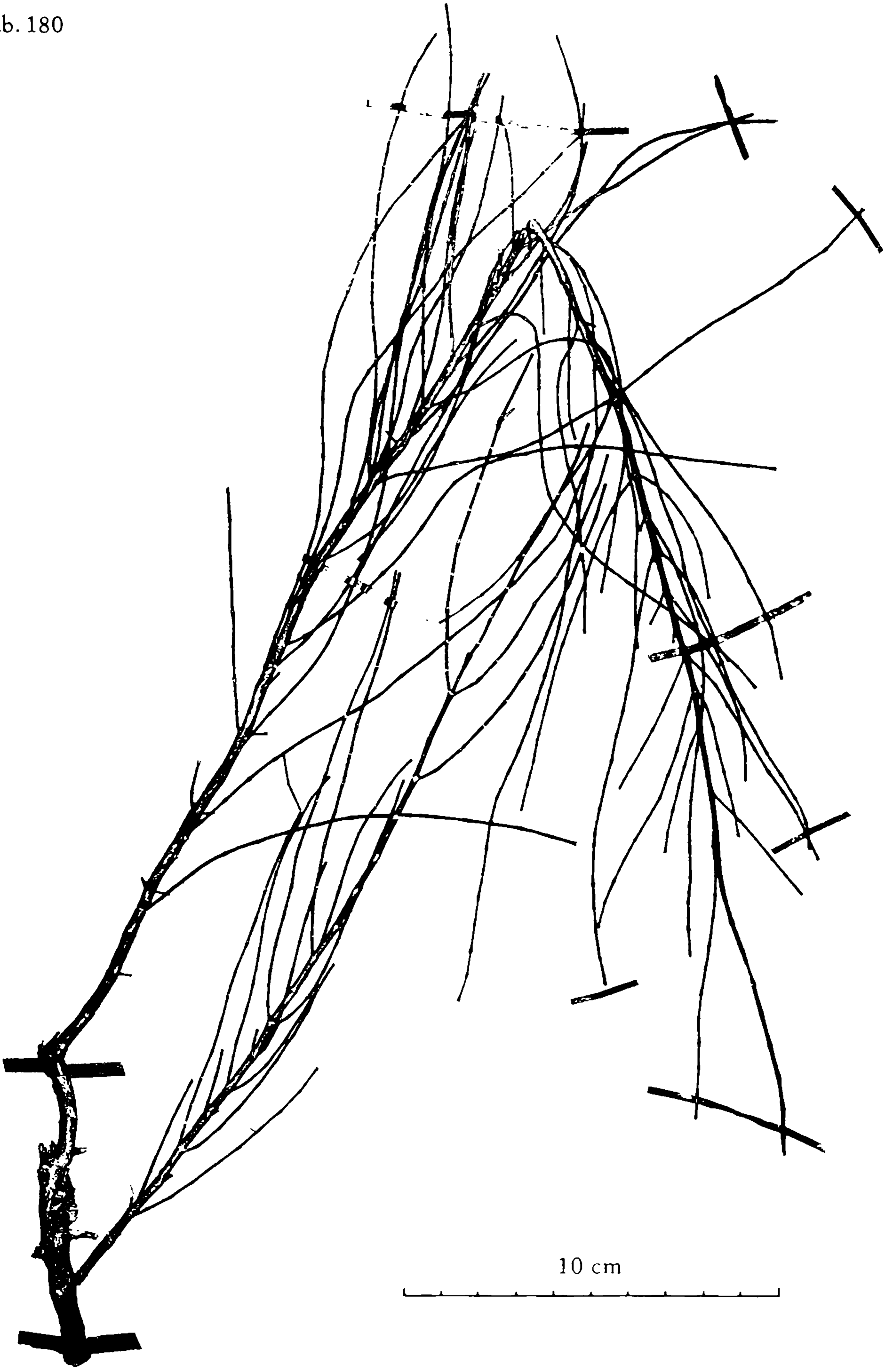
Tab. 176

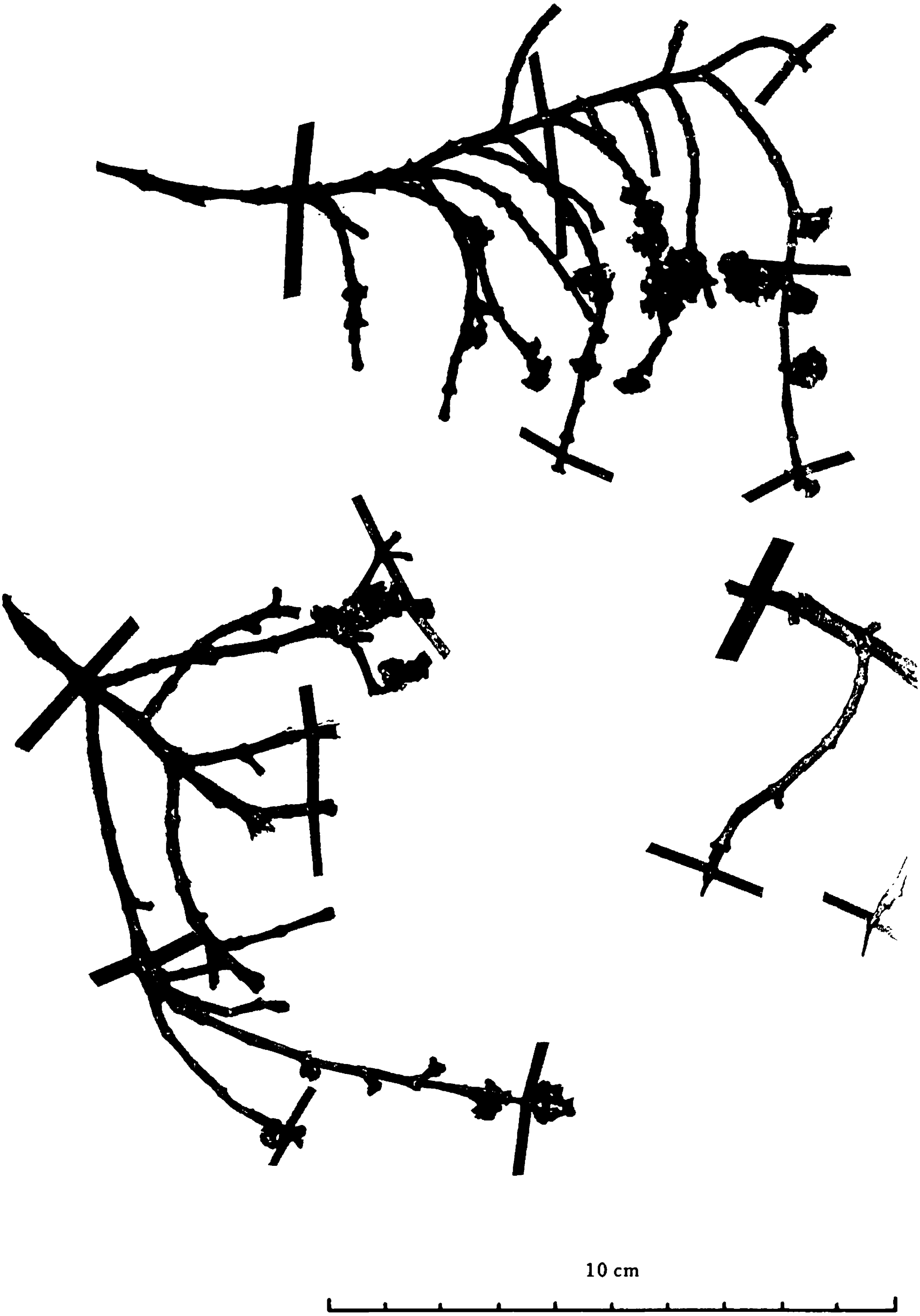

10 cm

Tab. 178


10 cm

Tab. 180





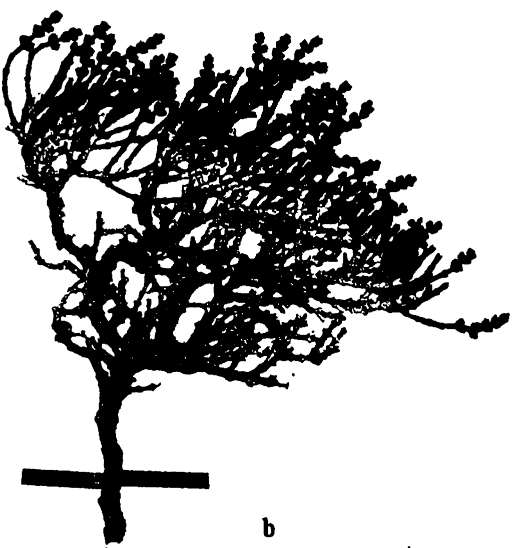
Haloxylon salicornicum (MOQ.) BUNGE & BOISS. – PODLECH 17167

Tab. 182

Haloxylon Stocksii (BOISS.) BENTH. & HOOK. – FREITAG & KOTHE 18231

a

10 cm



b

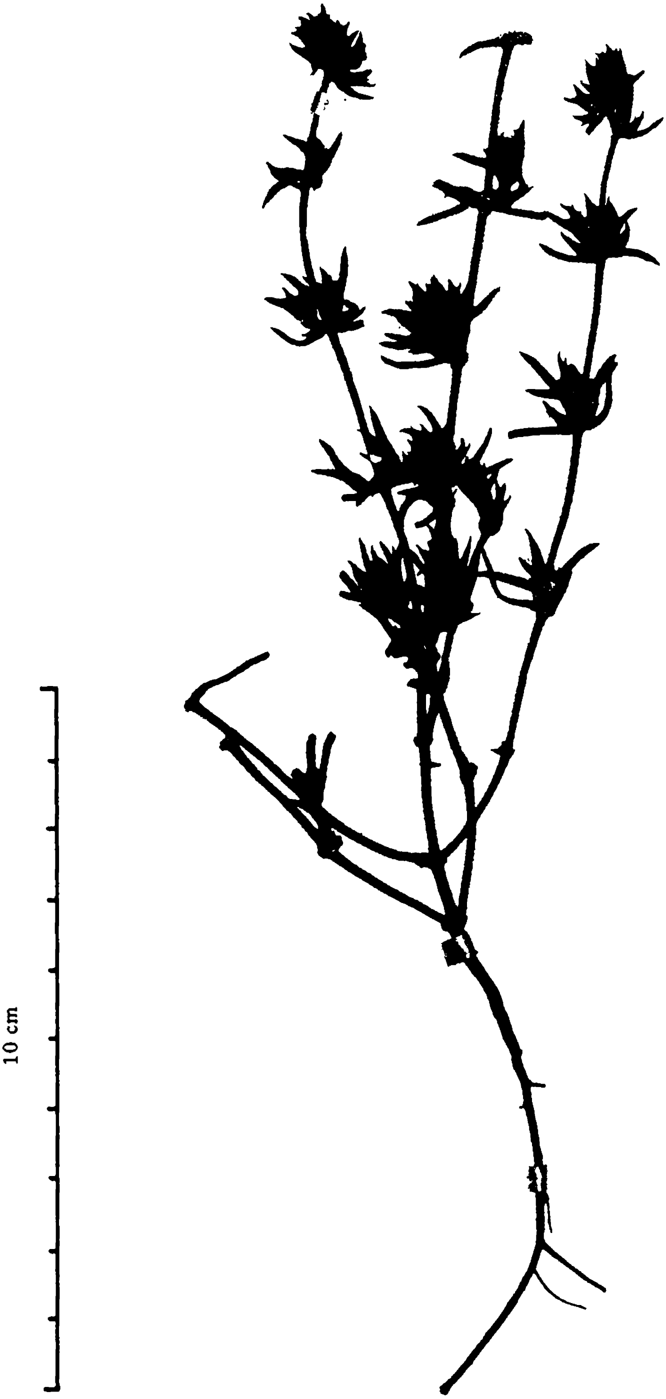
10 cm

Tab. 184

10 cm

Haloxylon Griffithii (MOO.) BOISS. subsp. *Griffithii* – FREITAG & KOTHE 18784

Petrosimonia brachiata (PALL.) BUNGE – HEWER 4042



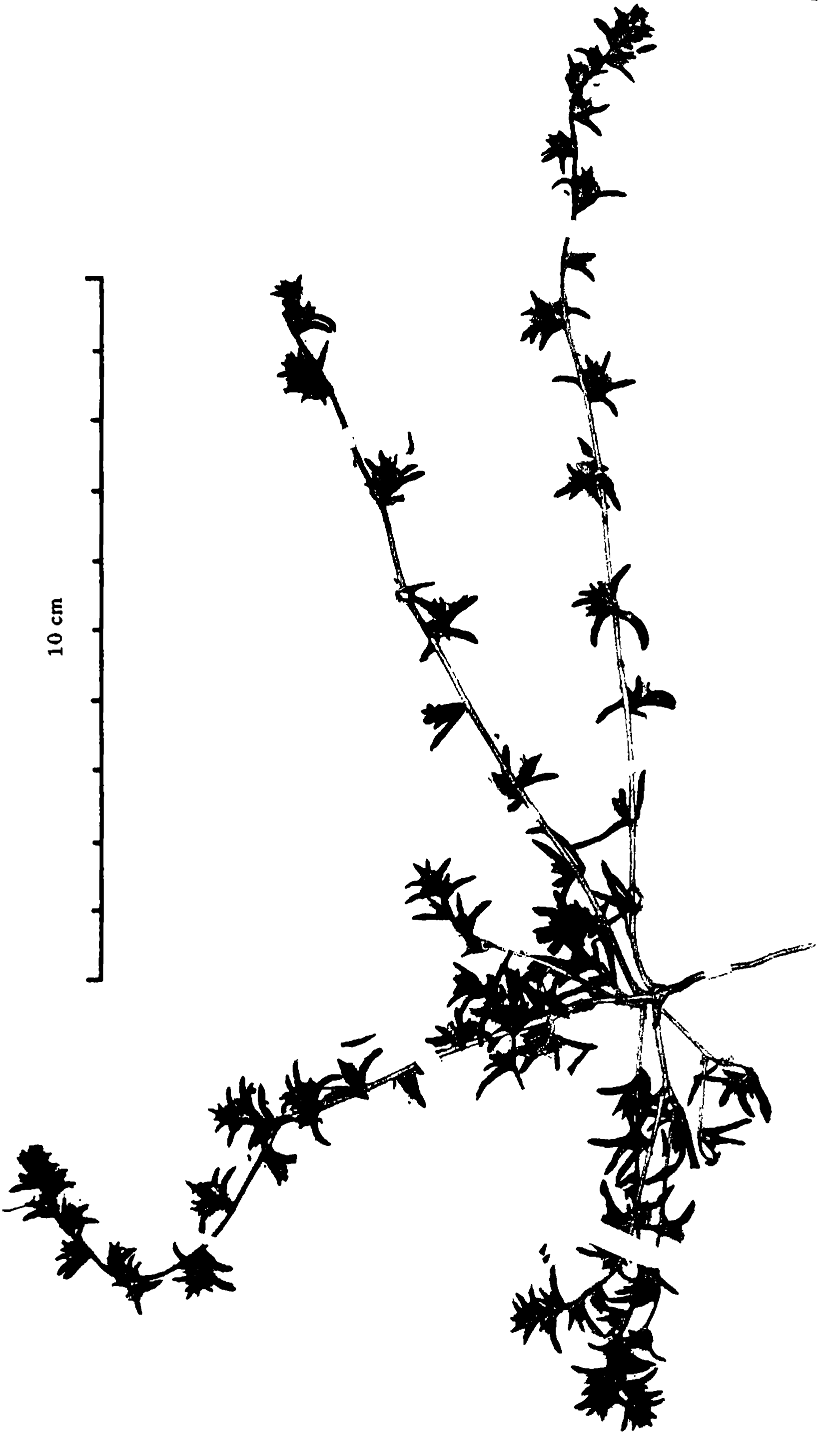
Petrosimonia sibirica (PALL.) BUNGE – FREITAG 6864

Tab. 188

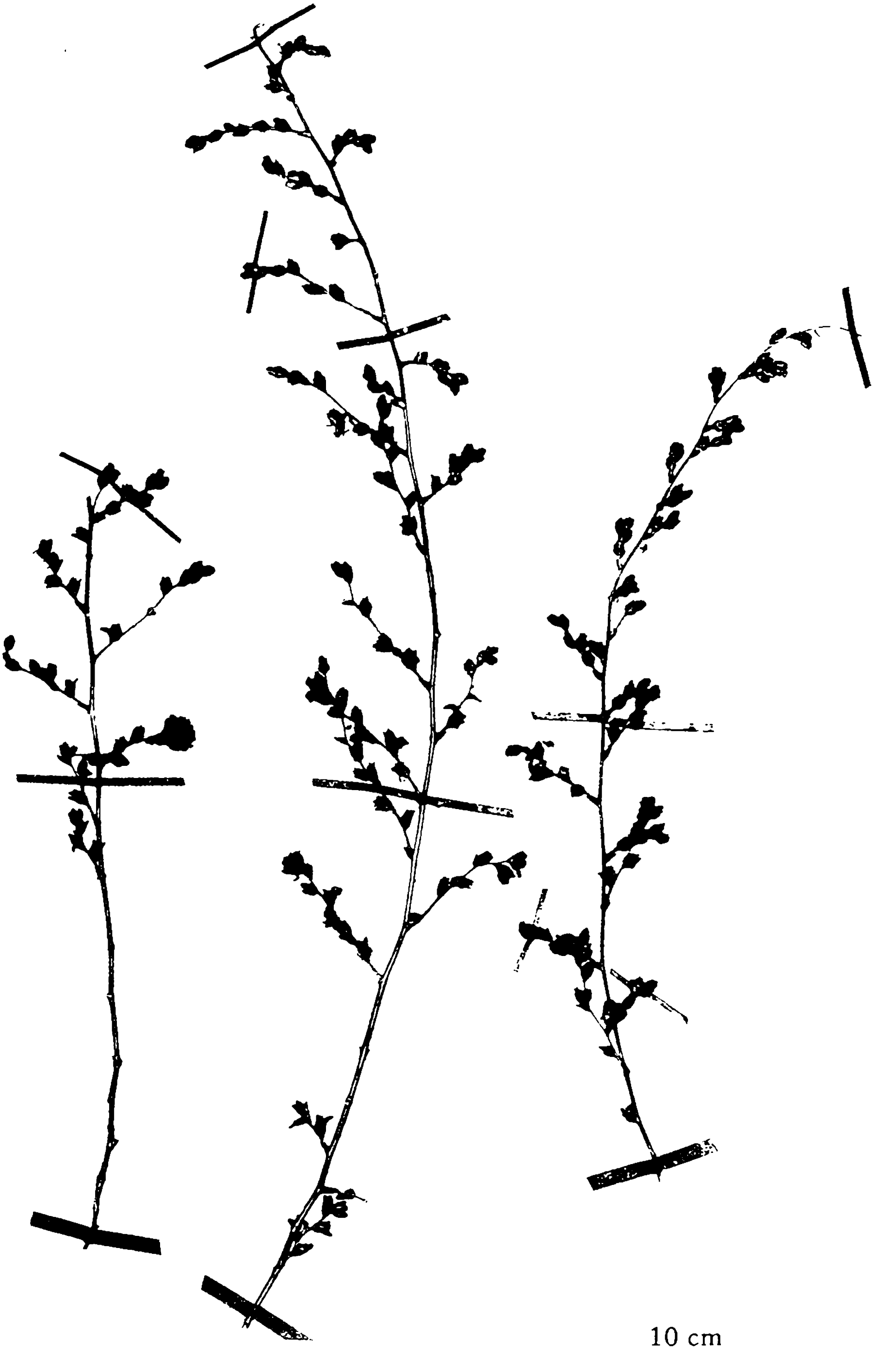
Petrosimonia glauca (PALL.) BUNGE – JACOBS 6874

Petrosimonia triandra (PALL.) SIMONKAI – WAGENITZ 299 (Turkey)

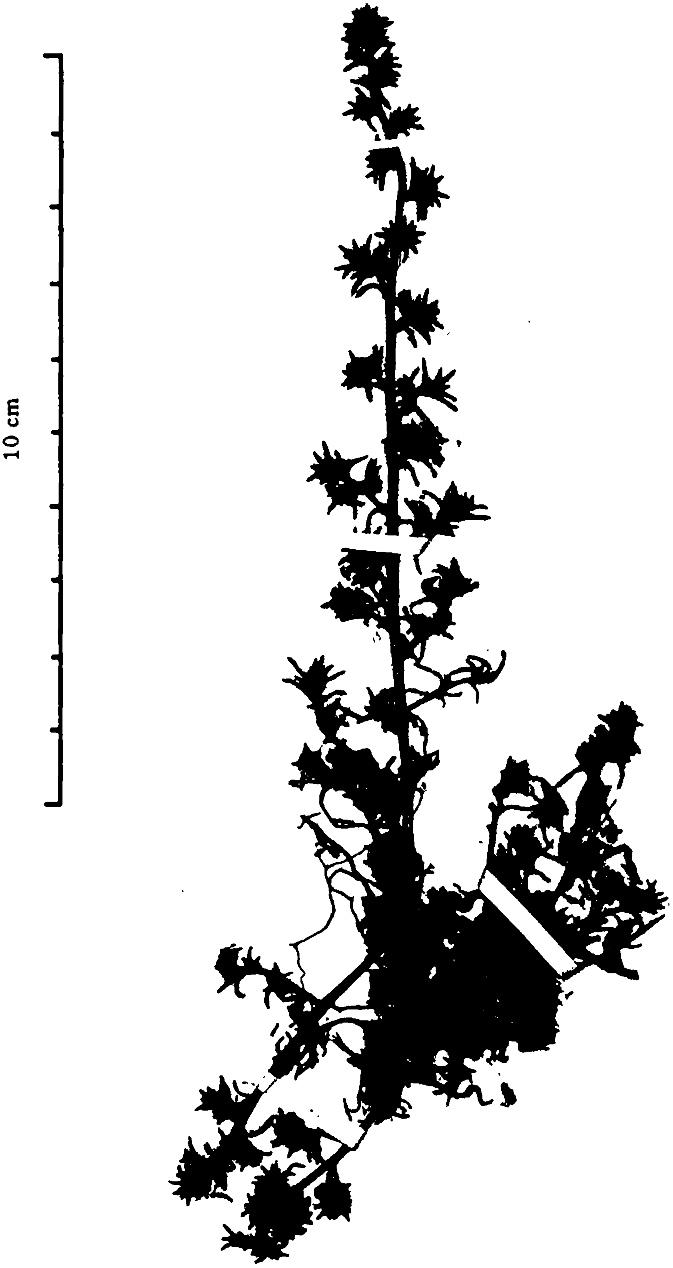
Halocharis sulphurea (MOQ.) MOQ. – RECHINGER 46228



Halocharis violacea BUNGE – RECHINGER 34908

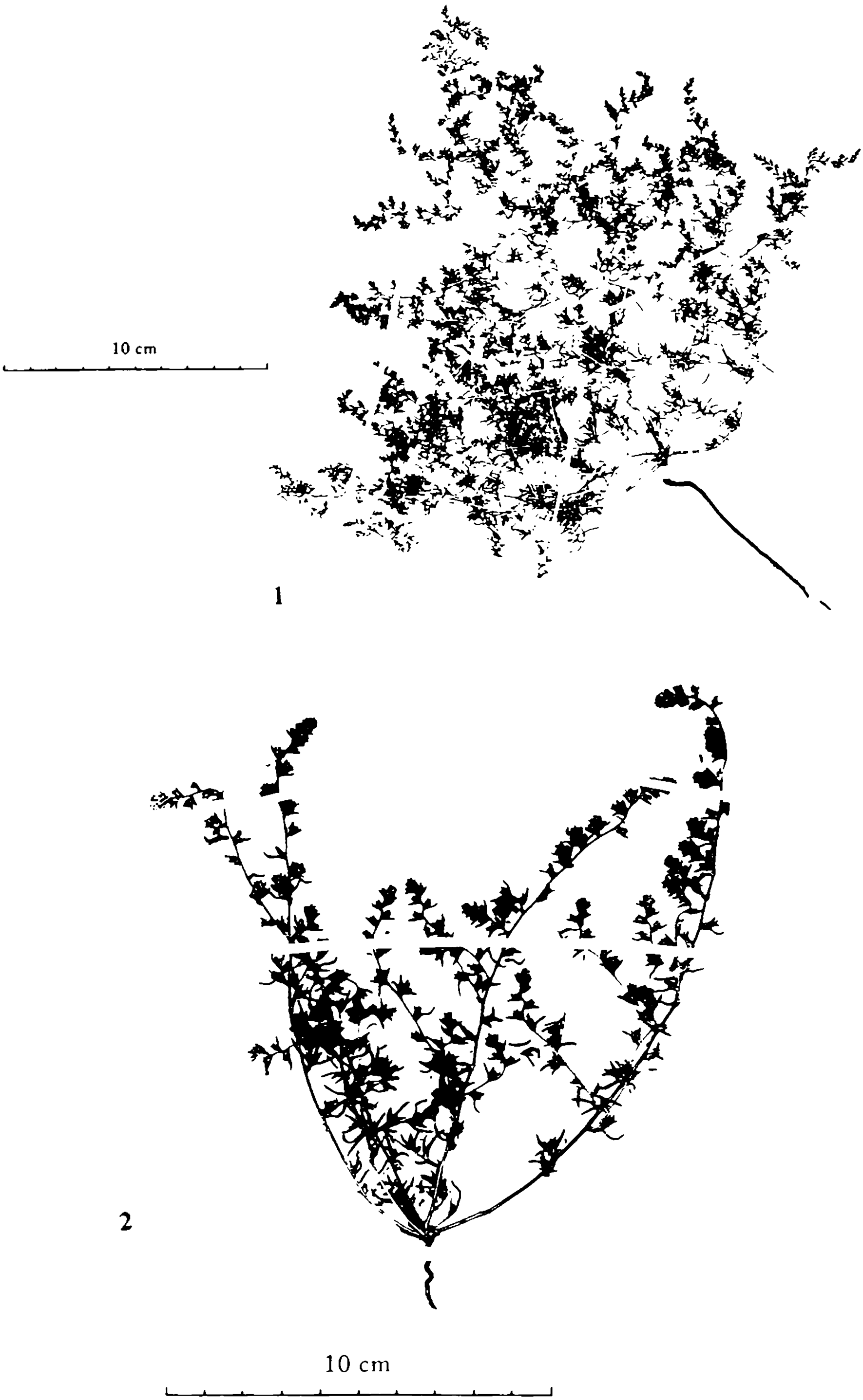


Halocharis lachnantha E. KOROV. – PODLECH 16958

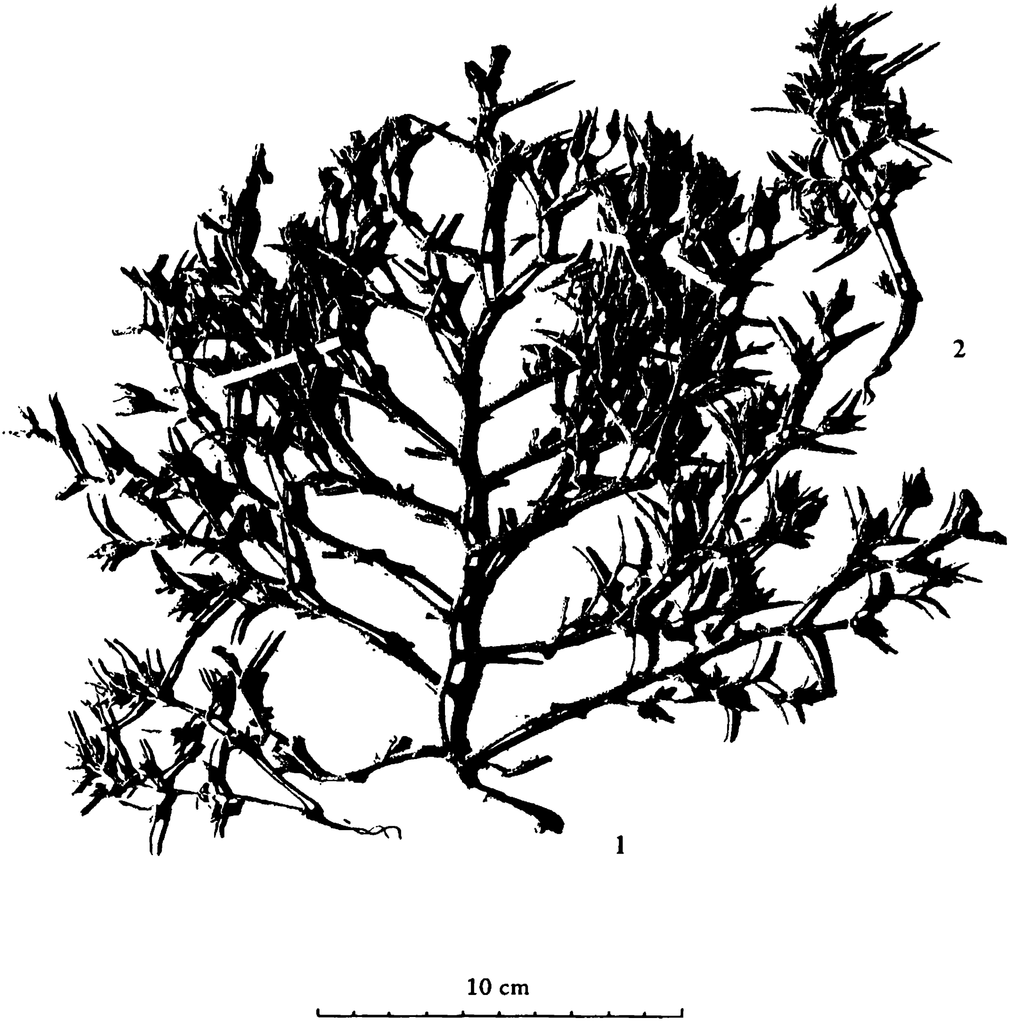


Halocharis clavata BUNGE – RECHINGER 17312

Tab. 194



Halocharis hispida (SCHRENK) BUNGE – 1: RECHINGER 16078-a; 2: RECHINGER 16144



Halimocnemis pilifera MOQ. – **1**: GAUBA 2070; **2**: FREITAG 13733

Tab. 196

Halimocnemis mollissima BUNGE – **1**: STUTZ 639; **2**: HEDGE & al. 14680

Tab. 198

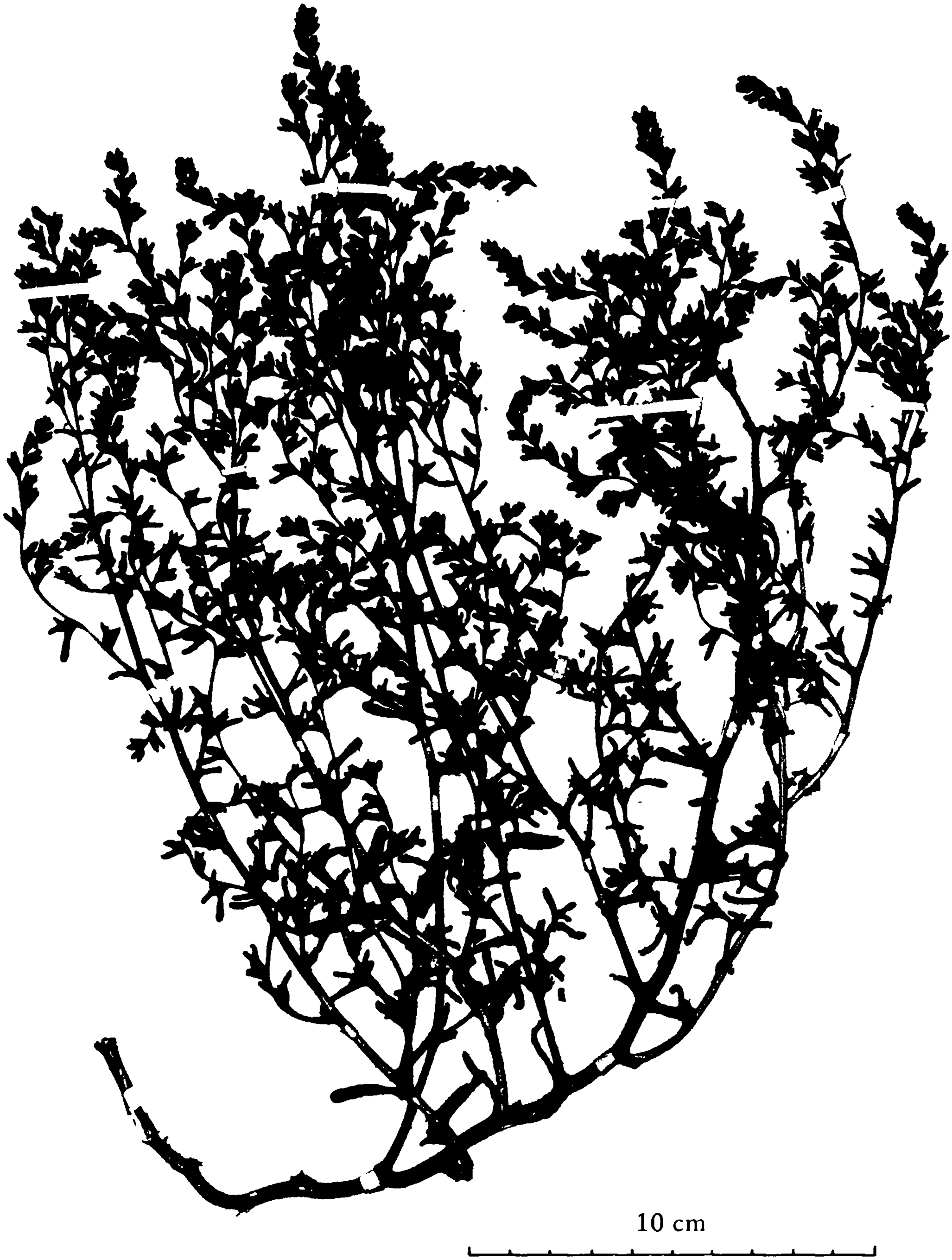
10 cm

10 cm

Piptoptera turkestana BUNGE – PODLECH 32705

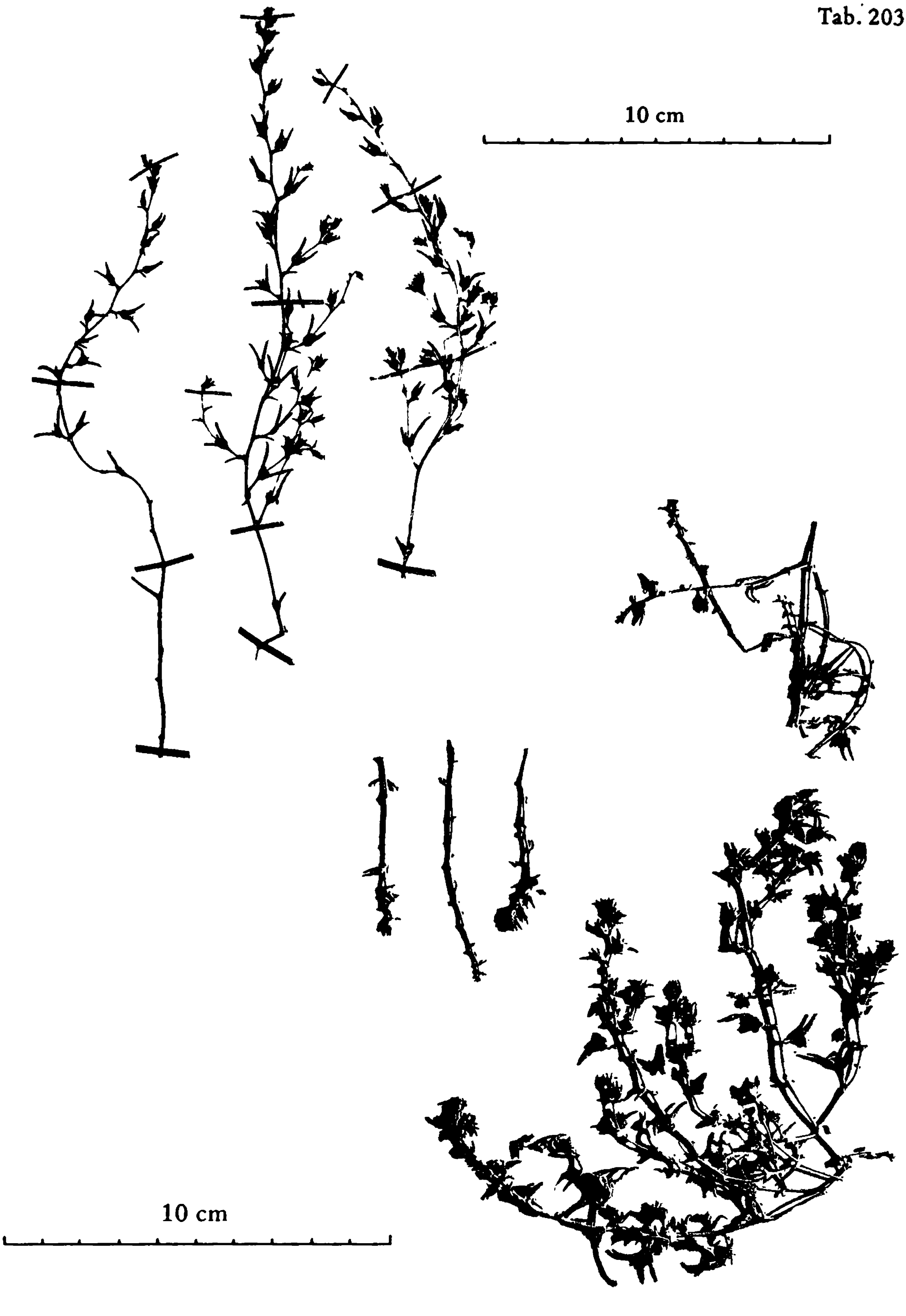
10 cm

Halanthium mamanense BUNGE – RECHINGER 14892

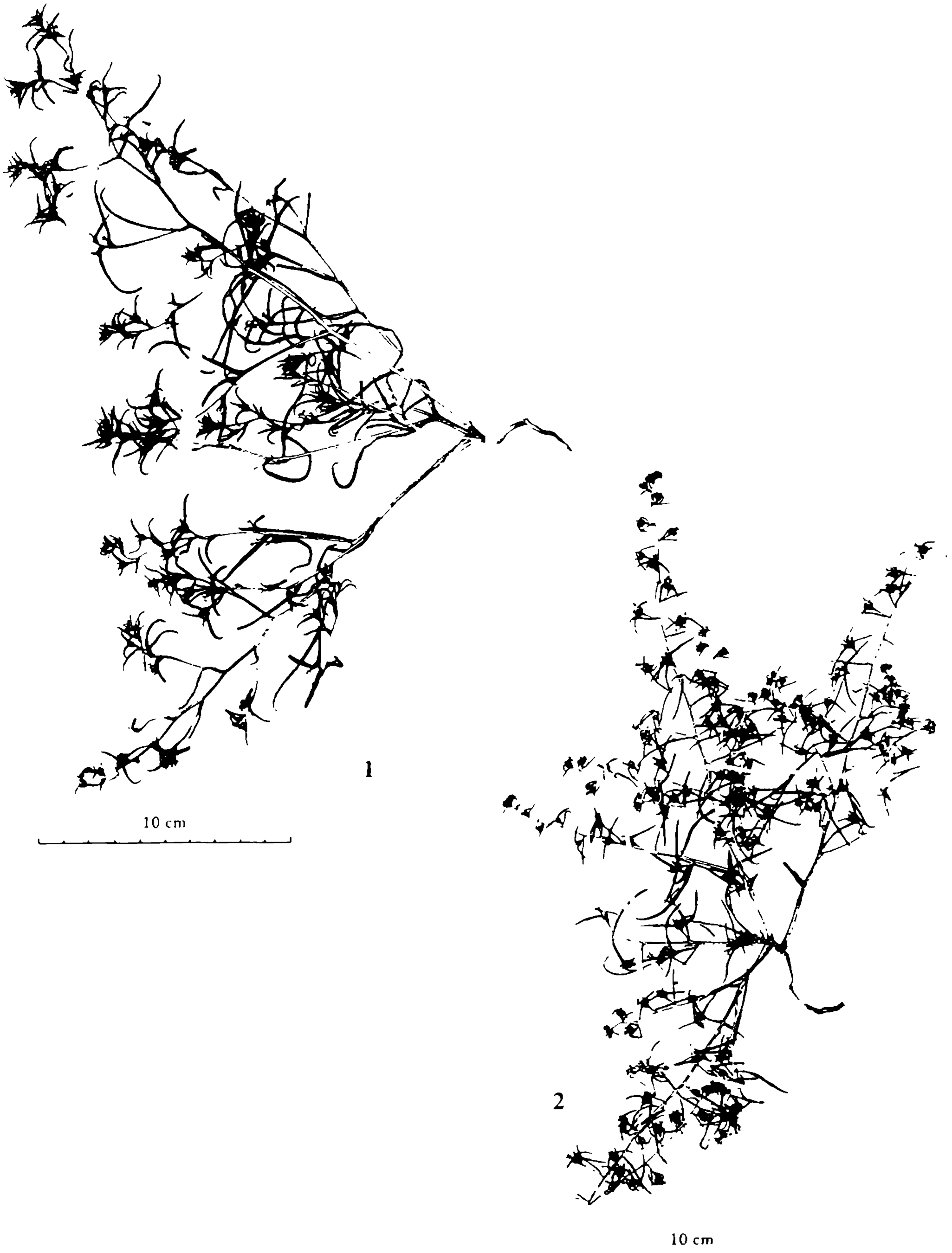


Halanthium rarifolium C. KOCH — RECHINGER 14766 b

Halanthium purpureum (MOQ.) BUNGE – FOROUGHI & ASSADI 15154



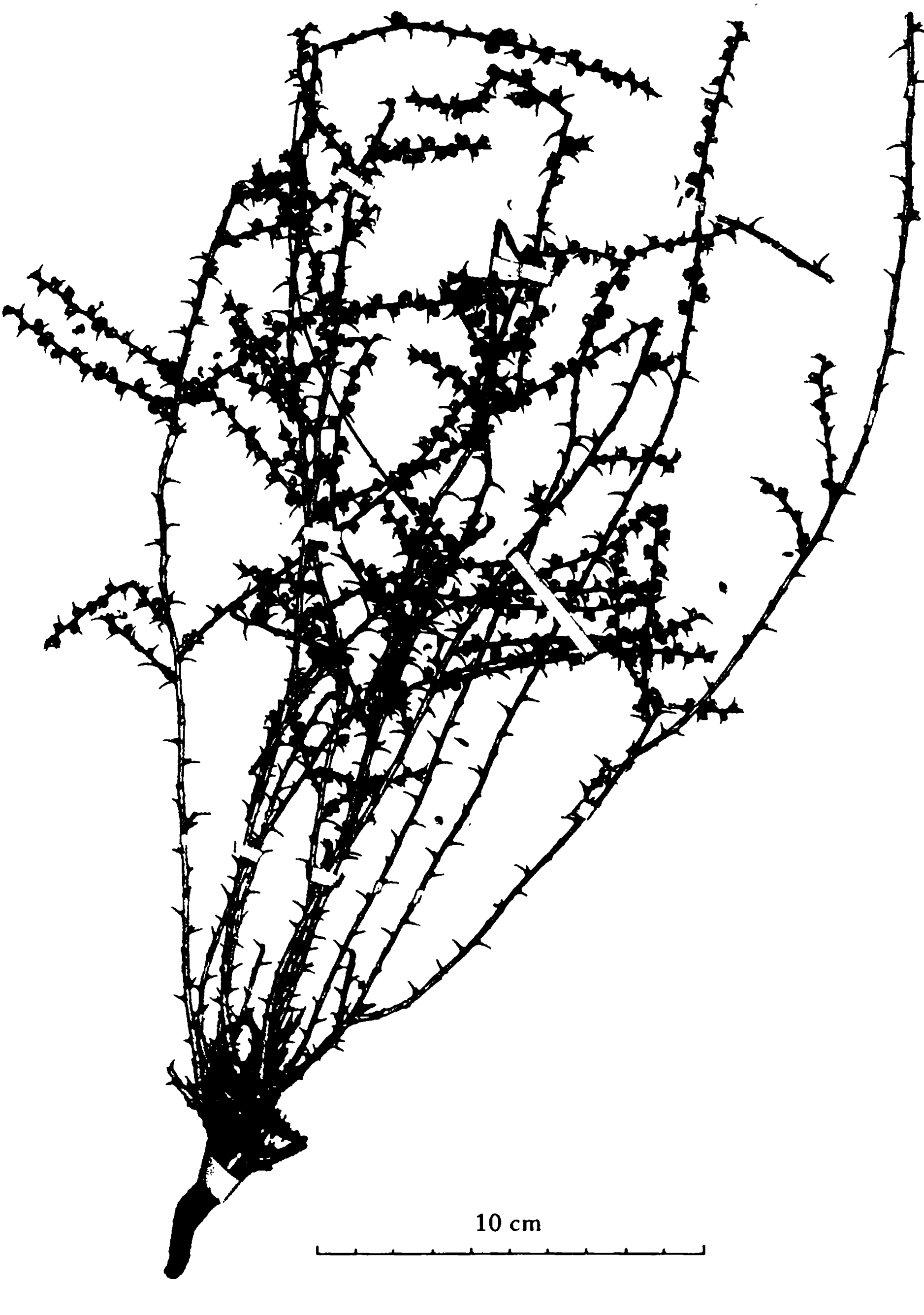
Gamanthus gamocarpus (MOQ.) BUNGE – VASAK (Turcomania) & PODLECH 16977



Gamanthus commixtus BUNGE – **1**: PODLECH & JARMAL 30079; **2**: RECHINGER 16346

Gamanthus pilosus (PALL.) BUNGE – Herb. Inst. Bot. RSS Georgia

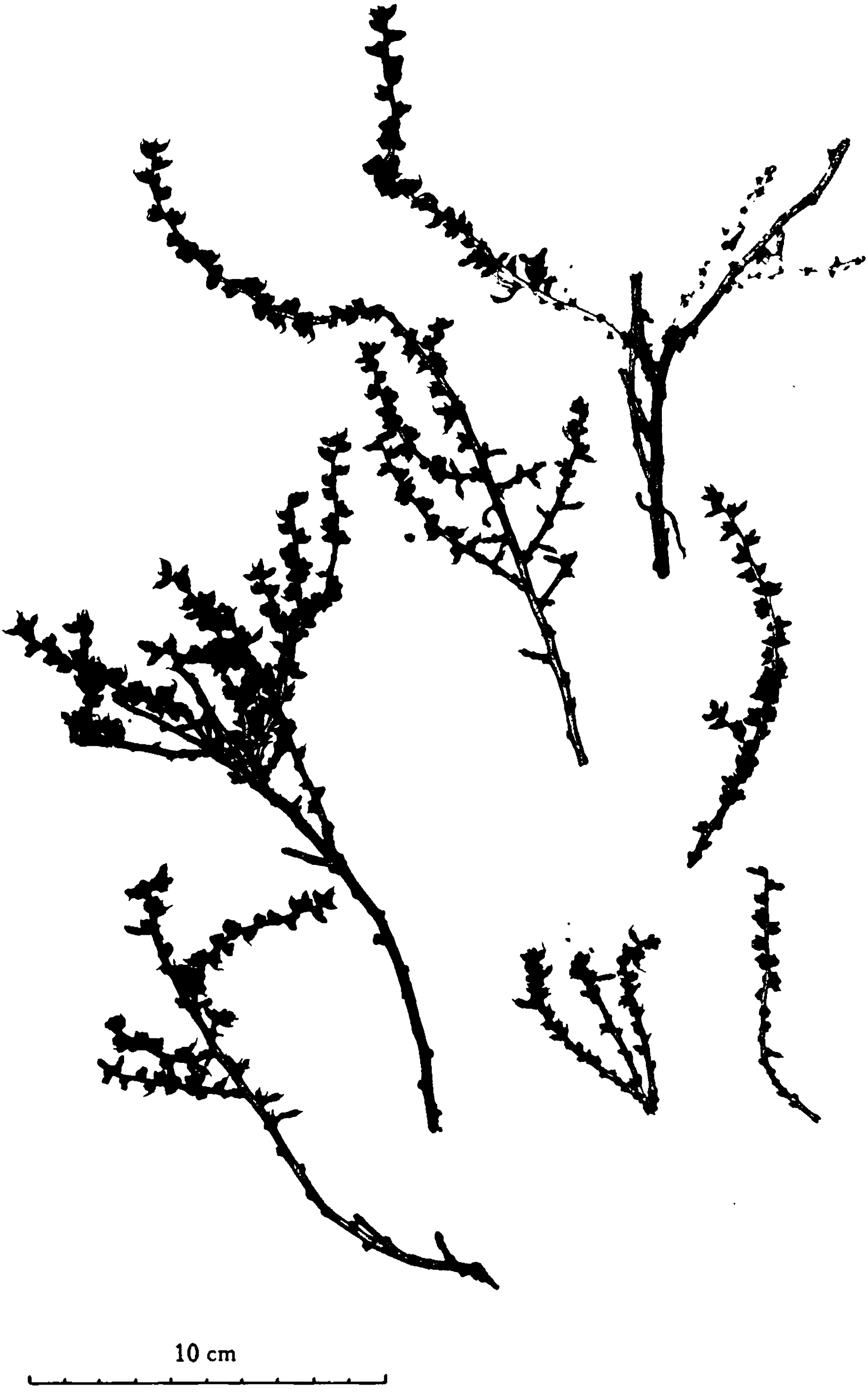
Halarchon vesiculosus (MOQ.) BUNGE – UOTILA 18925



Cornulaca monacantha DELILE – TERME & MOUSSAVI 34420–E

Tab. 208

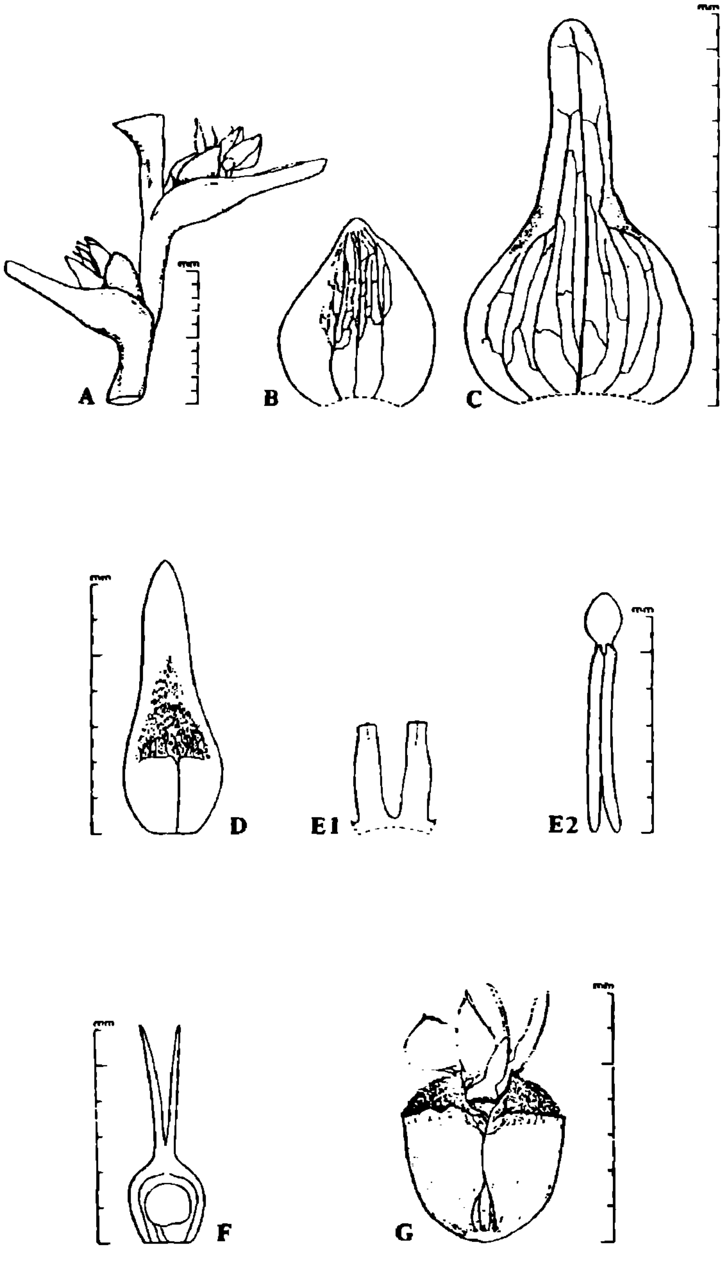
Cornulaca Aucheri MOQ. – **1**: WENDELBO & FOROUGHI 14637; **2**: IRANSHAHR 40127–E



Agathophora alopecuroides (DELILE) FENZL ex BUNGE – FREITAG 18621

Halogeton glomeratus M. B., C. A. MEY. – FREITAG 1215

Tab. 212



Salsola maimanica FREITAG – FREITAG 6704; A: detail of a spike; B: bract; C: bracteole; D: outermost tepal; E: stamen: E1: filaments and part of hypogynous disc; E 2: anther with appendage; F: ovary; G: young fruit

SYSTEMATISCHE ANORDNUNG DER FAMILIEN

Familien mit vorangestellter Continuatio-Nummer sind bereits erschienen.

Cont. Nr.		Engler & Diels	Wettstein	De Candolle Boissier	Bentham & Hooker	Hutchinson 2.ed.
	PTERIDOPHYTA					
	Equisetaceae	1	2	143	(2)	(2)
	Lycopodiaceae	2	1	142	(1)	(1)
	Marsileaceae	5	5	144	(4)	(4)
	Ophioglossaceae	3	3	140	(6)	(6)
	Polypodiaceae	4	4	141	(3)	(3)
	Salviniaceae	6	6	145	(5)	(5)
	GYMNOSPERMAE					
50	Cupressaceae	9	8	136	(8)	(8)
3	Ephedraceae	10	10	138	(10)	(10)
14	Pinaceae	8	9	135	(7)	(9)
12	Taxaceae	7	7	137	(9)	(7)
	ANGIOSPERMAE					
24	Acanthaceae	138	110	84	86	135
61	Aceraceae	86	83	30 a	42 a	76
113	Aizoaceae	48	27	50	57	106
78	Alismataceae	16	127	115	124	146
76	Alliaceae	26	133	128	116	155
91	Amaranthaceae	45	23	93	92	112
67	Amaryllidaceae	27	134	128	114	162
74	Ampelidaceae	91	91	32	41	66
63	Anacardiaceae	81	81	46	43	75
162	Apiaceae	113	94	54	58	127
103	Apocynaceae	125	117	82	75	82
25	Aquifoliaceae	82	86	70	38	58
1	Araceae	22	143	120	122	158
102	Araliaceae	112	93	55	59	19
26	Aristolochiaceae	40	35	103	97	96
73	Asclepiadaceae	126	118	74	76	84
165	Asparagaceae	26	133	129	116	155,7pp.
48	Asperifoliaceae	129	104	80	79	142
90/I	Asteraceae	146	126	61	13	131
122/II, 139a/III, 139b/III, 145/IV, 154/V, 158/VI, 164/VII						
131	Avicenniaceae	130	111	86	88	88
129	Balanophoraceae	42	20	102	103	63
143	Balsaminaceae	89	85	25	33 b	140
111	Berberidaceae	54	40	3	13	96
96	Betulaceae	33	11	112	108	25
44	Bignoniaceae	137 a	108 a	76 a	85 a	86 a
48	Boraginaceae	129	104	80	79	142
57	Brassicaceae	60	46	7	16	101
45	Buddleiaceae	123	115	75	77	80
107	Burseraceae	75	78	33	36	72
79	Butomaceae	17	128	116	124 a	145
27	Buxaceae	80	31	105	104 a	23
160	Caesalpiniaceae	68 b	59 b	38 b	45 b	13
118	Callitrichaceae	79	32	47	50 b	117
13	Campanulaceae	145	125	62	66	130
138	Cannabaceae	37	17 a	106	105	30
68	Capparidaceae	59	45	8	17	36

Cont. Nr.		Engler & Diels	Wettstein	De Candolle Boissier	Bentham & Hooker	Hutchinson 2.ed.
10	Caprifoliaceae	141	121	57	61	40
144/I, 163/II	Caryophyllaceae	50	29	13	23	[illegible]
64	Celastraceae	83	87	35	39	[illegible]
28	Ceratophyllaceae	52	42	15	110	94
172	Chenopodiaceae	44	22	92	93	111
46	Cistaceae	99	49	10	19	33
170	Colchicaceae	26	133	128	116	155
132	Commelinaceae	24	138	132	117	154
90/I, 122/II	Compositae	146	126	61	65	121
139a/III, 139b/III, 145/IV, 154/V, 158/VI, 164/VII						
2	Convolvulaceae	127	102	78	80	133
54	Cornaceae	114	92	56	60	18
97	Corylaceae	33	11	112	108	27
72	Crassulaceae	63	56	51	48	123
57	Cruciferae	60	46	7	16	101
123	Cucurbitaceae	144	124	48	55	42
77	Cupuliferae	334	11-2	111-2	108	25-7
8	Cuscutaceae	128	103	79	80 a	141
39	Cynocrambaceae	111	25	91	105 c	113
129	Cynomoriaceae	110 a	20 a	102	103	63
	Cyperaceae	20	139	134	126	169
136	Cytinaceae	41	36	101	96	98
29	Datiscaceae	101	54	49	56	43
104	Dioscoreaceae	28	137	131	115	164
168	Dipsacaceae	143	123	60	64	129
30	Ebenaceae	121	100	69	72	68
48	Ehretiaceae	129	104	80	79	87
55	Elaeagnaceae	103	61	97	100	64
16	Elatinaceae	96	52	18	26	103
11	Ericaceae	116	99	63	67	51
89	Ericaulaceae	23 a	138 b	-	125 a	154 a
6	Euphorbiaceae	78	30	104	104	49
140/I	Fabaceae	68	59	38	45	13-5
77	Fagaceae	34	12	111	108 a	26
113	Ficoidaceae	48	27	50	57	106
99	Frankeniaceae	97	51	17	22	38
110	Fumariaceae	58	44	6	15 a	100
41	Gentianaceae	124	116	76	78	118
69	Geraniaceae	70	74	26	33	138
17	Globulariaceae	137	108	85	87	142
134	Goodeniaceae	145 a	125 a	62 a	66 a	130 a
70	Gramineae	19	140	135	127	170
47	Grossulariaceae	64	57	52	47	17
49	Guttiferae	95	55	19	27	54
18	Halorag(id)aceae	109	67	46	50	115
53	Hamamelidaceae	65	33	53	49	21
171	Helleboraceae	53	39	1	11	90
92	Hippocastanaceae	87	84	30 b	42 b	77
31	Hippuridaceae	110	68	45	50 a	116
19	Hydrangeaceae	64	57	52	47	16 a
127	Hydrocaryaceae	108 a	66 a	44 a	54	115 a

Cont. Nr.		Engler & Diels	Wettstein	De Candolle Boissier	Bentham & Hooker	Hutchinson 2.ed.
80	Hydrocharitaceae	18	129	114	111	146
49	Hypericaceae	95	55	19	27	54
25	Ilicineae	82	86	70	38	58
144/I	Illecebraceae	50	29	13	23	109
112	Iridaceae	29	135	126	113	163
121	Juglandaceae	32	13	109	107	28
75	Juncaceae	25	136	133	118	168
82	Juncaginaceae	14 a	130	117 a	125 b	148
150	Labiatae	131	112	87	89	144
150	Lamiaceae	131	112	87	89	144
141	Lauraceae	56	37	98	98	11
140/I, 157/II	Leguminosae	68	59	38	45	13-5
119	Lemnaceae	23	144	119	123	159
58	Lentibulariaceae	136	107	65	84	137
151/I	Liliaceae	26	133	128	116	155
165/II, 170/III	Liliaceae					
106	Linaceae	71	72	23	31	47
45	Loganiaceae	123	115	75	77	79
116	Loranthaceae	39	19	100	101	61
51	Lythraceae	104	62	43	53	114
120	Malvaceae	93	69	20	28	46
133	Meliaceae	76	79	31	37	73
137	Menispermaceae	55	38	2	12	95
41	Menyanthaceae	124	116	76	78	119
161	Mimosaceae	68 a	59 a	38 a	45 a	14
114	Molluginaceae	48	27	50	57	105
94	Monotropaceae	115	98	64	67 a	52
153	Moraceae	36	15	107	105 a	31
135	Morinaceae	143	123	60	64	129
109	Moringaceae	62	48	37	44	37
130	Myrsinaceae	117	97	67	70	67
32	Myrtaceae	107	64	40	52	55
86	Najadaceae	15	132	118	125	153
115	Nyctaginaceae	46	26	95	91	35
33	Nymphaeaceae	51	41	4	14	93
7	Oenotheraceae	108	66	44	54	115
52	Oleaceae	122	119	71	73	81
7	Onagraceae	108	66	44	54	115
126	Orchidaceae	30	141	125	112	167
5	Orobanchaceae	135	108	83	83	136
40	Oxalidaceae	69	73	24	33 a	139
60	Paeoniaceae	53	39	1	11	89
146	Palmae	21	142	121	119	165
34	Papaveraceae	57	43	5	15	99
140/I, 157/II	Papilionaceae	68 c	59 c	38 c	45 c	15
20	Parnassiaceae	64	57	52	47	126
128	Pedaliaceae	134	109	77	85	86
73	Periplocaceae	126	118	74	76	83
19	Philadelphaceae	64	57	52	47	16
35	Phytolaccaceae	47	24	90	94	110
15	Plantaginaceae	139	114	89	90	122
21	Platanaceae	66	34	110	106	22
108	Plumbaginaceae	119	95	88	68	121
70	Poaceae	19	140	135	127	170
101	Podophyllaceae	54	40	3	13	93
124	Polygalaceae	77	80	12	21	41
56	Polygonaceae	43	21	94	95	108
167	Pontederiaceae	24 a	133 a	-	116 a	155 a
117	Portulacaceae	49	28	14	24	107
83	Potamogetonaceae	14	131	117	125 a	150
9	Primulaceae	118	96	66	69	120
22	Punicaceae	105	65	42	53	57
93	Pyrolaceae	115	98	64	67 a	50
136	Rafflesiaceae	41	36	101	96	98
171	Ranunculaceae	53	39	1	11	91
149	Resedaceae	61	47	9	18	102
125	Rhamnaceae	90	90	36	40	65
166	Rhizophoraceae	106	63	41	51	56
66/I, 152/II	Rosaceae	67	58	39	46	12
	Rubiaceae	140	120	58	62	85
84	Ruppiaceae	14	131	117	125 a	151
165	Ruscaceae	26	133	129	116	157
36	Rutaceae	73	76	28	34	70
65	Salicaceae	31	14	113	109	24
37	Salvadoraceae	84	88	72	74	59
155	Santalaceae	38	18	99	102	62
38	Sapindaceae	88	82	30	42	74
159	Sapotaceae	120	101	68	71	69
42	Saxifragaceae	64	57	52	47	124
82	Scheuchzeriaceae	-	130	117 a	125 b	148
147/I	Scrophulariaceae	133	106	82	82	134
147/I	Selaginaceae	137	108	85	87	-
165	Smila(ca)ceae	26	133	130	116	156
100	Solanaceae	132	105	81	81	132
59	Sparganiaceae	13	146	123	121 a	160
88	Sphenocleaceae	145	125	62 a	66	130
87	Staphyleaceae	85	89	30 c	42 c	78
156	Sterculiaceae	94	71	21	29	45
4	Tamaricaceae	98	50	16	25	39
39	Theligonaceae	111	25	91	105 c	113
63	Therebinthaceae	81	81	46	43	75
95	Thymelaeaceae	102	60	96	99	34
148	Tiliaceae	92	70	22	30	44
127	Trapaceae	108 a	66 a	44 a	54	115 a
71	Typhaceae	11	147	124	121	161
142	Ulmaceae	35	16	108	105 b	29
162	Umbelliferae	113	94	54	58	127
105	Urticaceae	37	17	106	105	32
11	Vacciniaceae	116	99	63	67	53
23	Vahliaceae	64	57	52	47	125
62	Valerianaceae	142	122	59	63	128
43	Verbenaceae	130	111	86	88	88
169	Violaceae	100	53	11	20	40
74	Vitaceae	91	91	32	41	66
85	Zannichelliaceae	14	131	117	125 a	152
81	Zosteraceae	14	131	117	125 a	149
98	Zygophyllaceae	72	75	27	32	48