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CHENOPODIACEAE

藜科 li ke

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Herbs annual, subshrubs, or shrubs, rarely perennial herbs or small trees. Stems and branches sometimes jointed (articulate); indumentum of vesicular hairs (furfuraceous or farinose), ramified (dendroid), stellate, rarely of glandular hairs, or plants glabrous. Leaves alternate or opposite, exstipulate, petiolate or sessile; leaf blade flattened, terete, semiterete, or in some species reduced to scales. Flowers monochlamydeous, bisexual or unisexual (plants monoecious or dioecious, rarely polygamous); bracteate or ebracteate. Bractlets (if present) 1 or 2, lanceolate, navicular, or scale-like. Perianth membranous, herbaceous, or succulent, (1–)3–5-parted; segments imbricate, rarely in 2 series, often enlarged and hardened in fruit, or with winged, acicular, or tuberculate appendages abaxially, seldom unmodified (in tribe Atripliceae female flowers without or with poorly developed perianth borne between 2 specialized bracts or at base of a bract). Stamens shorter than or equaling perianth segments and arranged opposite them; filaments subulate or linear, united at base and usually forming a hypogynous disk, sometimes with interstaminal lobes; anthers dorsifixed, incumbent in bud, 2-locular, extrorse, or dehiscent by lateral, longitudinal slits, obtuse or appendaged at apex. Ovary superior, ovoid or globose, of 2–5 carpels, unilocular; ovule 1, campylotropous; style terminal, usually short, with 2(–5) filiform or subulate stigmas, rarely capitate, papillose, or hairy on one side or throughout. Fruit a utricle, rarely a pyxidium (dehiscent capsule); pericarp membranous, leathery, or fleshy, adnate or appressed to seed. Seed horizontal, vertical, or oblique, compressed globose, lenticular, reniform, or obliquely ovoid; testa crustaceous, leathery, membranous, or succulent; embryo annular, semi-annular, or spiral, with narrow cotyledons; endosperm much reduced or absent; perisperm abundant or absent.

Probably about 100 genera and 1400 species (depending on taxonomic opinions): mainly in arid areas, deserts, and coastal and saline habitats of N and S Africa, Asia, Australia, Europe, and North and South America; 42 genera (two endemic, two introduced) and 190 species (21 endemic, six introduced) in China.

Many species of Chenopodiaceae are adapted to, and are major components of, arid or ruderal environments. They are often intimately involved with the daily life of people. For example, *Beta vulgaris* is one of the most important sources for sugar; *Chenopodium quinoa* is a new high-protein crop; *Spinacia oleracea* and *Beta vulgaris* are excellent vegetables; *Dysphania ambrosioides* and *Salsola collina* are used medicinally; seeds of *Agriophyllum squarrosum* are called "sand-rice" locally and are edible; seeds of *Corispermum declinatum* are used for making gin; the ash of *Halogeton arachnoideus* and some species of *Salsola* contains soda which is used in noodle-making; and *Anabasis aphylla* can be used as an insecticide. Many species are important as animal forage in desert, semidesert, and steppe regions, and some species make good windbreaks and soil binders. *Haloxylon ammodendron* has been used extensively in biological reconditioning of the desert.

Kung Hsien-wu, Chu Ge-lin, C. P. Tsien Cho-po, Ma Cheng-gung & Li An-jen. 1979. Chenopodiaceae. *In*: Kung Hsien-wu & C. P. Tsien Cho-po, eds., Fl. Reipubl. Popularis Sin. 25(2): 1–194.

1a. Embryo spiral; perisperm separated into two parts by embryo, or perisperm absent.
2a. Bractlets rudimentary, membranous, scale-like, hidden by perianth; stigmas papillose or hairy throughout; embryo planospiral.
3a. Flowers unisexual; perianth of female flowers pellucid-membranous, lobed at apex, enlarged, incrassate, and berrylike in fruit; perianth segments of male flower spreading, caducous; anther 0.6–0.7 mm ..... 27. *Borszczowia*
3b. Flowers bisexual; perianth segments not spreading; anther to 0.5 mm ..... 28. *Suaeda*
2b. Bractlets developed, herbaceous or succulent, navicular or similar to leaves, surrounding perianth (in *Sympegma* bractlets absent, but flowers fascicled at apex of branchlets); stigmas papillose only adaxially; embryo conic-spiral rarely planospiral (in tribe Salsoleae).
4a. Perianth segments connate into a tube, with 5 membranous teeth at apex; perianth adaxially with an acicular appendage adnate to it in fruit; axil of bractlets with a fascicle of villous hairs ..... 29. *Cornulaca*
4b. Perianth segments not connate into a tube, without an acicular appendage; axil of bractlets glabrous or ± hairy, but hairs not fascicular.
5a. Perianth segments without abaxial appendage; branchlets not jointed.
6a. Subshrubs cushionlike; perianth conspicuously enlarged and exposed in fruit; leaves subulate ..... 40. *Nanophyton*
6b. Herbs annual; perianth not exposed in fruit; leaves linear, semiterete.
7a. Perianth segments connate, hardening and forming an urceolate body in fruit; anther appendage inflated and bladderlike ..... 41. *Halimocnemis*
7b. Perianth segments free, proximally becoming leathery and adaxially concave in fruit; anther appendage thick, not inflated and bladderlike, with 3 teeth ..... 42. *Petrosimonia*
5b. Perianth segments with a well-developed or rudimentary wing or tuberculate appendage.
8a. Branchlets jointed; leaves opposite (except in *Horaninovia*).

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9a. Seed vertical.
10a. Subshrubs, or woody stems specialized into tuberous caudex, or absent; anthers without appendage; leaves obtuse or acute at apex, sometimes with blunt spines ..... 33. *Anabasis*
10b. Herbs annual; anthers with a slender, mucronate appendage at apex; leaves spinose at apex ..... 34. *Girgensohnia*
9b. Seed horizontal.
11a. Herbs annual; leaves and bracts with a long spine at apex ..... 30. *Horaninovia*
11b. Subshrubs, shrubs, or small trees; leaves and bracts without a long spine at apex.
12a. Shrubs or small trees; flowers emerging from lateral, dwarf branches on second year's growth; perianth membranous, with a winged appendage in fruit; utricle slightly concave; disk inconspicuous ..... 31. *Haloxylon*
12b. Subshrubs; flowers emerging from annual branches; perianth slightly succulent, with a rudimentary winged appendage; disk conspicuous ..... 32. *Arthrophytum*
8b. Branchlets not jointed; leaves alternate (except in *Salsola brachiata*).
13a. Flowers usually 3, borne at apex of a dwarf branchlet ..... 35. *Sympegma*
13b. Flowers solitary or glomerulate in leaf axils.
14a. Winged appendage of perianth segment attached subapically.
15a. Herbs annual; flowers glomerulate; perianth conic; leaves expanded at base ..... 36. *Halogeton*
15b. Subshrubs; flowers solitary; perianth subglobose; leaves not expanded at base ..... 37. *Iljinia*
14b. Winged appendage of perianth segment attached at middle.
16a. Portion of perianth segment below wing enlarged, hardened, and woody in fruit ..... 38. *Halothamnus*
16b. Portion of perianth segment below wing not enlarged, hardened, or woody in fruit ..... 39. *Salsola*
1b. Embryo annular or semi-annular; perisperm copious, surrounded by embryo.
17a. Fruit a pyxidium, dehiscent by a lid ..... 1. *Acroglochin*
17b. Fruit a utricle, indehiscent or irregularly dehiscent.
18a. Perianth basally adnate to ovary, enlarged, incrassate, and hardened in fruit ..... 2. *Beta*
18b. Perianth free from ovary, not enlarged, incrassate, or hardened in fruit (in tribe Atripliceae ovary is attached to 2 specialized bractlets).
19a. Flowers borne in axil of succulent bracts, appearing sunken into rachis; leaves reduced to scales or succulent-tuberculate, decurrent if terete.
20a. Herbs annual.
21a. Branches and leaves opposite ..... 3. *Salicornia*
21b. Branches and leaves alternate ..... 4. *Halopeplis*
20b. Shrubs or subshrubs.
22a. Branchlets not jointed; leaves alternate ..... 5. *Kalidium*
22b. Branchlets jointed; leaves opposite.
23a. Subshrubs; spikes sessile ..... 6. *Halocnemum*
23b. Shrubs; spikes pedunculate ..... 7. *Halostachys*
19b. Flowers free from rachis; leaves usually well developed.
24a. Flowers unisexual (plants monoecious or dioecious).
25a. Plant body covered with stellate or ramified indumentum.
26a. Female flowers with perianth ..... 9. *Axyris*
26b. Female flowers without perianth.
27a. Shrubs or subshrubs; bracts of female flowers united below middle, forming a tube, with 4 fascicles of villous hairs (with only ramified hairs in *Krascheninnikovia compacta*) ..... 10. *Krascheninnikovia*
27b. Herbs annual; bracts of female flowers connate to apex, both sides with an acicular appendage near apex ..... 14. *Ceratocarpus*
25b. Plant body glabrous or furfuraceous.
28a. Female flowers several, borne at base of a leaflike bract.
29a. Female flowers with evident perianth ..... 11. *Archiatriplex*
29b. Female flowers without evident perianth; bracts of female flowers 3-lobed, lateral lobes inflexed ..... 8. *Microgynoecium*
28b. Female flowers borne in axil of a leaflike bract in a cup formed by 2 connate bracts.
30a. Stigmas 4 or 5; plant body glabrous ..... 13. *Spinacia*
30b. Stigmas 2; plant body ± covered with furfuraceous indumentum ..... 12. *Atriplex*
24b. Flowers bisexual or plants sometimes polygamous.
31a. Perianth segments 1–3, white, membranous; utricles exposed, compressed, with 2-fid beak at apex; plant body ± covered with ramified hairs.
32a. Utricles convex on both sides; rostra nearly equal to length of kernel; seed free from pericarp; leaves and bracts acicular to spinulose at apex ..... 15. *Agriophyllum*

32b. Utricles convex abaxially, plane or slightly concave adaxially; rostra 1/8–1/5 length of kernel; seed adherent to pericarp; leaves and bracts acute but not acicular at apex ..... 16. *Corispermum*

31b. Perianth (3 to)5-parted, succulent or herbaceous; utricles flattened, rarely only compressed, without beak; plant body without ramified hairs.

33a. Plant body usually furfuraceous, sometimes glabrous, or glandular and strongly aromatic.

34a. Flowers with 2 scale-like, membranous bractlets; seed vertical.

35a. Leaves petiolate, leaf blade flattened ..... 17. *Baolia*

35b. Leaves sessile, filiform, semiterete ..... 18. *Polycnemum*

34b. Flowers without bractlets; seed horizontal or oblique or, if vertical, perianth 3- or 4-parted.

36a. Plants covered with glandular hairs (subglabrous in *Dysphania aristata*, but then terminal inflorescence branches without flowers, ending with acute setae) ..... 19. *Dysphania*

36b. Plants covered with vesicular hairs (furfuraceous), occasionally glabrous (but then terminal inflorescence branches bearing flowers) ..... 20. *Chenopodium*

33b. Plant body pubescent; leaves terete, semiterete, rarely flattened.

37a. Perianth segments with a winged, acicular, or tuberculate appendage abaxially in fruit.

38a. Appendage borne on distal portion of perianth segment; seed vertical or oblique ..... 23. *Panderia*

38b. Appendage borne on middle of perianth segment; seed horizontal.

39a. Perianth segment appendage winglike, veined ..... 21. *Kochia*

39b. Perianth segment appendage acicular, veinless ..... 22. *Bassia*

37b. Perianth segments without an appendage in fruit.

40a. Subshrubs; perianth teeth 4; stamens 4; leaves semiterete ..... 24. *Camphorosma*

40b. Herbs annual; perianth teeth 5; stamens 5; leaves flattened.

41a. Perianth adnate to utricle, densely villous, resembling a woolly ball; seed horizontal (vertical in bisexual flowers); stigmas smooth; anthers yellow, ca. 0.7 mm ..... 25. *Londesia*

41b. Perianth free from utricle, villous but not resembling a woolly ball; seed vertical; stigmas papillose; anthers usually purplish red, ca. 1.5 mm ..... 26. *Kirilowia*

1. ACROGLOCHIN Schrader in Schultes, Mant. 1: 69, 227. 1822.

千针苋属 qian zhen xian shu

Herbs annual, glabrous, sparsely branched. Leaves alternate, long-petiolate; leaf blade flattened, ovate, margin irregularly serrate. Inflorescence axillary, a compound dichasium; ultimate branches acicular. Flowers sessile, bisexual; bracts and bractlets absent. Perianth herbaceous, deeply 5-parted; segments ovate-oblong, equal or unequal, subacute at apex, spreading in fruit. Stamens 1(–3); filaments filiform, thickened toward base. Ovary subglobose; style short; stigmas 2, subulate. Fruit a pyxidium, apically plane or slightly convex; pericarp leathery, circumscissile, thickened along line of dehiscence. Seed horizontal, lenticular; testa leathery, lustrous; embryo annular; perisperm farinaceous.

One species: Bhutan, China, India, Kashmir, Nepal, Pakistan.

Some authors recognize two closely related species.

1. Acroglochin persicarioides (Poiret) Moquin-Tandon in Candolle, Prodr. 13(2): 254. 1849.

千针苋 qian zhen xian

Amaranthus persicarioides Poiret, Encycl., Suppl. 1: 311. 1810; *Acroglochin chenopodioides* Schrader; *A. obtusifolia* Blom; *A. persicarioides* var. *muliensis* T. P. Soong; *A. persicarioides* var. *multiflora* T. P. Soong.

Plants erect, 30–80 cm tall. Stem usually solitary, ribbed, striate, obliquely branched in upper part. Petiole 2–4 cm; leaf blade ovate to narrowly so, 1.5–7(–8.5) × 0.4–5(–5.5) cm, base cuneate, margin irregularly lobed (lobes acutely serrate), entire on upper leaves, apex acute. Inflorescence borne in axils of almost all leaves, erect or oblique, compoundly dichasiumlike, 0.5–6 cm; ultimate branches needle-like with no flowers. Perianth ca. 1 mm in diam., 5-parted to near base; segments narrowly ovate to oblong, slightly keeled abaxially, margin membranous, apex obtuse or subacute. Stamen usually 1; anthers small, exserted in flower, without an appendage. Pyxidium subglobose, ca. 1.5 mm in diam.; style persistent; pericarp free from testa. Seed ca. 1 mm in diam., rim obtuse. Fl. and fr. Jul–Nov.

Forest margins, riversides, open hillsides, fields, roadsides, wastelands. Gansu, Guizhou, Hubei, S Hunan, Shaanxi, Sichuan, Yunnan [Bhutan, India, Kashmir, Nepal, Pakistan].

Eona Aitken (pers. comm.) adds Bhutan to the general distribution based on a specimen at E collected in 1988.

2. BETA Linnaeus, Sp. Pl. 1: 222. 1753.

甜菜属 tian cai shu

Herbs annual, biennial, or perennial, smooth, glabrous. Stems prostrate or decumbent, ribbed, striate. Leaves alternate, petiolate;

leaf blade flattened, margin entire or subentire. Flowers solitary or in 2- or 3-flowered glomerules arranged in terminal spikes on upper part of branches, without bractlets, perfect, fused at base and falling together at utricle maturity. Perianth urceolate, 5-parted, mostly herbaceous, more rarely petaloid, united and hardened at base; segments erect or infolded, longitudinally keeled abaxially. Stamens 5, perigynous; filaments subulate, united proximally into a glandular disk; anthers oblong. Stigmas 2 or 3(–5), stigmatic surface papillate. Utricle proximally adnate to perianth; pericarp succulent or hardened distally. Seed horizontal, depressed globose; testa leathery, lustrous, free from pericarp; embryo annular or subannular; perisperm copious.

About ten species: N Africa, SW Asia, Europe; one species (introduced) in China.

1. Beta vulgaris Linnaeus, Sp. Pl. 1: 222. 1753.

甜菜 tian cai

Herbs annual or biennial. Root stout, tuberlike, and napiform or fusiform, or branched and not tuberlike. Stem erect, ± branched, ribbed, striate. Basal leaves long petiolate; petiole stout, abaxially convex, adaxially flattened or slightly concave; leaf blade oblong, 20–30 × 10–15 cm, adaxially crisped, sublustrous, abaxially with strongly protruding veins, base cuneate, truncate, or slightly cordate, margin entire or undulate, apex obtuse. Cauline leaves alternate, smaller than basal ones; leaf blade ovate or lanceolate-oblong, base gradually narrowed into petiole, apex attenuate. Flowers 2- or 3-glomerulate. Perianth united at base; segments linear or narrowly oblong, becoming leathery and incurved in fruit. Utricle basally sunken into perianth, distally subsucculent. Seed red-brown, sublustrous, lenticular, 2–3 mm in diam.; perisperm farinaceous. Fl. May–Sep, fr. Jul.

Commonly cultivated in China [native to N Africa, SW Asia, and Europe; widely cultivated].

This species is highly variable, with many subspecies, varieties, and forms described. Four cultivated varieties are here recognized in China.

1a. Root branched, not tuberlike ..... 1b. var. *cicla*
1b. Root tuberlike.
  2a. Root purple-red; leaf veins purple-red ..... 1a. var. *vulgaris*
  2b. Root orange-yellow or white; leaf veins not purple-red.
    3a. Root white ..... 1c. var. *altissima*
    3b. Root orange-yellow ..... 1d. var. *lutea*

1a. Beta vulgaris var. **vulgaris**

甜菜(原变种) tian cai (yuan bian zhong)

Beta vulgaris var. *rosea* Moquin-Tandon.

Root purple-red, tuberlike, fusiform to globose. Leaf veins purple-red.

Cultivated mostly in Beijing [of cultivated origin].

The roots are used as a vegetable (red beet).

1b. Beta vulgaris var. **cicla** Linnaeus, Sp. Pl. 1: 222. 1754.

君荠菜 jun da cai

Root branched, not tuberlike.

Cultivated mostly in S China [of cultivated origin].

The leaves are used as a vegetable (spinach beet, Swiss chard).

1c. Beta vulgaris var. **altissima** Döll, Rhein. Fl. 293. 1843.

甜萝卜 tian luo bo

Beta vulgaris var. *saccharifera* Alefeld.

Root white, fusiform.

Cultivated mainly in N China [of cultivated origin].

The roots are a commercial source of sugar (sugar beet).

1d. Beta vulgaris var. **lutea** Candolle in Lamarck & Candolle, Fl. Franç., ed. 3, 3: 383. 1805.

饲用甜菜 si yong tian cai

Root orange-yellow, fusiform to globose.

Cultivated mostly in Gansu and Nei Mongol [of cultivated origin].

The roots are used for fodder (yellow beet, mangold).

3. SALICORNIA Linnaeus, Sp. Pl. 1: 3. 1753.

盐角草属 yan jiao cao shu

Sarcocornia A. J. Scott.

Herbs or small shrubs. Stems erect or ascending, glabrous; branches opposite, fleshy, jointed. Leaves opposite, undeveloped, scale-like. Inflorescence terminal, pedunculate, spicate, cylindric. Flowers 1–3 borne on axil of a fleshy bract, sessile, appearing sunken into fleshy rachis, without bractlets, bisexual. Perianth 4- or 5-lobed, spongy and flattened apically in fruit, with top surface subrhomboid. Stamens 1 or 2. Style very short; stigmas 2, subulate. Fruit a utricle, enclosed by perianth. Seed vertical, compressed; embryo annular; perisperm absent.

Between 20 and 30 species: Africa, America, Asia, Europe: one species in China.

1. Salicornia europaea Linnaeus, Sp. Pl. 1: 3. 1753.

盐角草 yan jiao cao

Salicornia herbacea (Linnaeus) Linnaeus; *S. europaea* var. *herbacea* Linnaeus.

Herbs annual, 10–35 cm tall. Stems erect, much branched; branches green, fleshy. Leaves undeveloped, scale-like, to 1.5 mm, base united into a sheath, margin membranous, apex acute.

Inflorescence shortly pedunculate, spicate, 1–5 cm. Flowers axillary, 3 per bract, middle flower larger, located slightly above lateral flowers. Perianth fleshy, obconic. Stamens exserted; anthers oblong. Ovary ovoid; stigmas papillate. Pericarp membranous. Seed cylindric-ovoid, ca. 1.5 mm in diam.; testa subleathery, hooked hispid. Fl. and fr. Jan–Aug.

Alkaline and saline soils, salt-lake shores, beaches. Gansu, Hebei, Jiangsu, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang [India, Japan, Korea, Russia; SW Asia, Europe, North America].

This species is treated here in a broad sense. The *Salicornia europaea* aggregate is represented in Eurasia and North America by several diploid and tetraploid races. Most probably Chinese plants belong mostly (or exclusively) to the Eurasian continental race known as *S. prostrata* Pallas (Ill. Pl. 8. 1803). The taxonomy of this group in China is in need of revision.

4. HALOPEPLIS Bunge ex Ungern-Sternberg, Vers. Syst. Salicorn. 102. 1866.

盐千屈菜属 yan qian qu cai shu

Herbs annual or perennial. Stems branched; branches opposite; branchlets not jointed. Leaves alternate, lower ones sometimes opposite; leaf blade fleshy, ovoid or subglobose. Inflorescence spicate; bracts scale-like, spirally arranged. Flowers axillary, 3 per bract, bisexual. Perianth compressed, 3-lobed. Stamens 1 or 2; filaments very short. Fruit a utricle. Seed ovoid or globose; testa ± leathery, glabrous or papillate; embryo semi-annular; perisperm present.

Three species: N Africa, C and SW Asia, S Europe; one species in China.

1. Halopeplis pygmaea (Pallas) Bunge ex Ungern-Sternberg, Vers. Syst. Salicorn. 105. 1866.

盐千屈菜 yan qian qu cai

Salicornia pygmaea Pallas, Illustr. Pl.: 8. 1803.

Herbs annual, 5–15 cm tall. Stems erect, branched from base; branches ascending. Leaves gray-green, fleshy, subglobose, 2–3 mm, basally decurrent. Spikes alternate, 1–2.5 cm × ca. 3 mm. Flowers 3-glomerulate, small, slightly connate basally. Stamens 2, longer than perianth. Ovary compressed ovoid; stigmas 2, subulate. Pericarp membranous. Seed globose, 0.5–1 mm in diam.; testa yellow-brown, densely finely papillate. Fl. and fr. Jul–Sep.

Salt-lake shores. Xinjiang [C and SW Asia].

5. KALIDIUM Moquin-Tandon in Candolle, Prodr. 13(2): 46, 146. 1849.

盐爪爪属 yan zhua zhua shu

Shrubs small, much branched; branches not jointed. Leaves alternate, terete or undeveloped, fleshy, basally decurrent. Inflorescence pedunculate, spicate. Flowers spirally arranged, (1 or)3 borne in axil of a fleshy bract, appearing sunken into fleshy rachis, without bractlets, bisexual. Perianth 4- or 5-lobed, spongy in fruit, flat on top surface. Stamens 2. Ovary ovoid; stigmas 2, papillate. Fruit a utricle, enclosed by perianth. Seed vertical, compressed; testa subleathery; embryo semi-annular; perisperm present.

Five species: C and SW Asia, SE Europe; five species in China.

1a. Leaves 4–10 mm; spikes 3–4 mm in diam. ..... 1. *K. foliatum*
1b. Leaves less than 3 mm or undeveloped; spikes 1.5–3 mm in diam.
2a. Branchlets slender; flowers 1 per bract ..... 5. *K. gracile*
2b. Branchlets stout; flowers 3 per bract.
3a. Leaves developed, 1–3 mm, ovate, adaxially curved, apex acute ..... 2. *K. cuspidatum*
3b. Leaves undeveloped, tuberculate, less than 1 mm, apex obtuse.
4a. Plants 10–25 cm tall, branched from base; leaves of branchlets narrow and obconic at base ..... 3. *K. schrenkianum*
4b. Plants 20–70 cm tall, branched from middle; leaves of branchlets sheathing at base ..... 4. *K. caspicum*

1. Kalidium foliatum (Pallas) Moquin-Tandon in Candolle, Prodr. 13(2): 147. 1849.

盐爪爪 yan zhua zhua

Salicornia foliata Pallas, Reise Russ. Reich. 1: 482. 1771; *Halocnemum foliatum* (Pallas) Sprengel; *Kalidium foliatum* var. *longifolium* Fenzl.

Plants 20–50 cm tall. Stems erect or prostrate, much branched; branches gray-brown, annual ones yellow-green, nearly herbaceous. Leaves gray-green, terete, spreading or slightly adaxially curved, 4–10 × 2–3 mm, base decurrent, semiamplexicaul, apex obtuse. Spikes sessile, 8–15 × 3–4 mm. Flowers 3 per scale-like bract. Perianth pentagonal on top surface, margin narrowly winged. Stamens 2. Seed vertical, globose, ca. 1 mm in diam., with dense, papillate processes. Fl. and fr. Jul–Aug.

Alkaline soils, salt-lake shores. N Gansu, N Hebei, Heilongjiang, Nei Mongol, Ningxia, Qinghai, Xinjiang [Mongolia, Russia (S Siberia); C and SW Asia, SE Europe].

2. Kalidium cuspidatum (Ungern-Sternberg) Grubov, Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 19: 103. 1959.

尖叶盐爪爪 jian ye yan zhua zhua

Plants 20–40 cm tall. Stems branched from base, branches suberect, gray-brown, annual ones yellow-green. Leaves ovate, slightly adaxially curved, 1.5–3 × 1–1.5 mm, base decurrent

and semiamplexicaul, apex acute. Spikes terminal on upper branches, 5–15 × 2–3 mm. Flowers densely arranged, 3 per bract. Perianth top surface pentagonal in fruit, margin narrowly winged. Utricle subglobose; pericarp membranous. Seed light red-brown, subglobose, ca. 1 mm in diam., papillate. Fl. and fr. Jul–Sep.

Hills, slopes, margins of alluvial fans, salt-lake shores, alkaline soils. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Mongolia].

1a. Leaves 1.5–3 mm; plants sparsely branched ..... 2a. var. *cuspidatum*
1b. Leaves 1–1.5 mm; plants densely branched ..... 2b. var. *sinicum*

2a. Kalidium cuspidatum var. **cuspidatum**

尖叶盐爪爪(原变种) jian ye yan zhua zhua (yuan bian zhong)

Kalidium arabicum (Linnaeus) Moquin-Tandon var. *cuspidatum* Ungern-Sternberg, Vers. Syst. Salicorn. 93. 1866.

Plants sparsely branched. Leaves 1.5–3 mm.

Salt-lake shores, alkaline soils. Hebei, Nei Mongol, Xinjiang [Mongolia].

2b. Kalidium cuspidatum var. **sinicum** A. J. Li, Acta Phytotax. Sin. 16(1): 117. 1978.

黄毛头 huang mao tou

Plants densely branched. Leaves 1–1.5 mm.

● Hills, slopes, margins of alluvial fans. Gansu, Ningxia, Qinghai.

3. Kalidium schrenkianum Bunge ex Ungern-Sternberg, Vers. Syst. Salicorn. 95. 1866.

圆叶盐爪爪 yuan ye yan zhua zhua

Plants 10–25 cm tall. Stems branched from base; branches decumbent, gray-brown, with longitudinal fissures; annual branches dense, whitish, slender, easily broken. Leaves undeveloped, tuberculate, base decurrent, semiamplexicaul, apex obtuse-rounded; leaves of branchlets narrow and obconic at base. Spikes terete, ovoid, or subglobose, 3–8 × 1.5–3 mm. Flowers 3 per bract. Perianth top surface flattened in fruit, pentagonal. Seed subovoid, 0.7–1 mm in diam.; testa red-brown, densely papillate. Fl. and fr. Jun–Aug.

Saline and alkaline mud flats, salt-lake shores. Xinjiang [Kazakhstan].

4. Kalidium caspicum (Linnaeus) Ungern-Sternberg, Atti Congr. Bot. Intern. Firenze 1874: 317. 1876.

里海盐爪爪 li hai yan zhua zhua

Salicornia caspica Linnaeus, Sp. Pl. 1: 4. 1753.

Plants 20–70 cm tall. Stems suberect, usually branched from middle; branches gray-white, with longitudinal fissures; branchlets usually bearing inflorescences at apex. Leaves undeveloped, tuberculate, ca. 1 mm, base convex, decurrent, adnate to branch, distally touching base of next higher leaf, apex obtuse; leaves of branchlets sheathing and amplexicaul at base. Spikes terete, 5–25 × 1.5–3 mm. Flowers 3 per bract. Perianth top surface flattened in fruit, pentagonal, with 4 small teeth. Seed red-brown, ovoid or globose, 1.2–1.5 mm in diam., papillate. Fr. and fl. Jul–Aug.

Saline and alkaline mud flats, salt-lake shores. N Xinjiang [C and SW Asia, SE Europe].

5. Kalidium gracile Fenzl in Ledebour, Fl. Ross. 3(2): 769. 1851.

细枝盐爪爪 xi zhi yan zhua zhua

Plants 20–50 cm tall. Stems erect, much branched; older branches gray-brown, bark dehiscent; annual branches yellow-brown, slender, easily broken. Leaves yellow-green, undeveloped, tuberculate, base narrowed, decurrent, apex obtuse. Spikes terete, slender, 10–30 × ca. 1.5 mm. Flower 1 per bract. Perianth top surface flattened in fruit, pentagonal, with 4 membranous teeth. Seed light red-brown, ovoid, 0.7–1 mm in diam., densely papillate. Fl. and fr. Jul–Sep.

Alkaline plains, salt-lake shores. Nei Mongol, Xinjiang [Mongolia].

6. HALOCNEMUM Marschall von Bieberstein, Fl. Taur.-Caucas. 3: 3. 1819–1820.

盐节木属 yan jie mu shu

Subshrubs much branched. Branchlets opposite, jointed. Leaves opposite, undeveloped, scale-like. Inflorescences sessile, spicate; bracts peltate, opposite; bractlets absent. Flowers axillary, (2 or)3 per bract, bisexual. Perianth 3-parted; segments broadly ovate, apex obtuse. Stamen 1. Ovary compressed ovoid; ovule anatropous; stigmas 2, subulate, papillate. Fruit a utricle. Seed vertical; embryo semi-annular; perisperm present.

One species: N Africa, Asia, S Europe.

1. Halocnemum strobilaceum (Pallas) Marschall von Bieberstein, Fl. Taur.-Caucas. 3: 3. 1819–1820.

盐节木 yan jie mu

Salicornia strobilacea Pallas, Reise Russ. Reich. 1: 481. 1771.

Plants 20–40 cm tall. Stems branched from base; old branches nearly alternate, prostrate or ascending, brown-green, woody, bearing opposite, shortened, budlike, dwarf branchlets; young branchlets opposite, suberect, gray-green, jointed, glabrous. Leaves opposite, connate. Spikes borne on upper branches, decussate, 5–15 × 2–3 mm. Perianth with 2 lateral segments incurved, outline obdeltoid. Seed brown, ovoid or globose, 0.5–0.75 mm in diam., densely finely papillate. Fl. and fr. Aug–Oct.

Salt-lake shores, other moist saline-alkaline places. NW Gansu, Xinjiang [Afghanistan, Kazakhstan, Mongolia, Russia (SE European part, SW Siberia); N Africa, SW Asia, SE Europe].

7. HALOSTACHYS C. A. Meyer ex Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg, sér. 2, 1: 361. 1843.

盐穗木属 yan sui mu shu

Shrubs. Stems erect, branched; branches opposite, spreading, annual ones fleshy, jointed, densely papillate. Leaves opposite, undeveloped, scale-like. Inflorescences opposite, pedunculate, spicate; bracts opposite, scale-like; bractlets absent. Flowers axillary, 3 per bract, bisexual. Perianth 3-lobed; segments incurved. Stamens 1. Ovary compressed ovoid; stigmas 2, subulate, papillate. Fruit a utricle. Seed vertical, compressed ovoid; embryo semi-annular; perisperm present.

One species: Asia, SE Europe.

1. Halostachys caspica C. A. Meyer ex Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg, sér. 2, 1: 361. 1843.

盐穗木 yan sui mu

Salicornia caspica Pallas, Reise Russ. Reich. 1: 480. 1771, not Linnaeus (1753); *Arthrocnemum belangerianum* Moquin-Tandon; *Halocnemum caspicum* Marschall von Bieberstein; *Halostachys belangeriana* (Moquin-Tandon) Botschantzev.

Plants 15–200 cm tall. Stems erect, much branched; older branches usually leafless, annual ones blue-green, fleshy, jointed, densely finely papillate. Leaves opposite, scale-like, connate basally, apex acute. Spikes decussate, terete, 15–30 × 2–3 mm; peduncle jointed. Perianth obovoid, apically 3-lobed; lobes incurved. Ovary ovoid; stigmas 2, subulate, papillate. Utricle ovoid; pericarp membranous. Seed red-brown, ovoid or cylindric-ovoid, 6–7 mm in diam., subglabrous. Fl. and fr. Jul–Sep.

Saline-alkaline mud flats, valley salt-lake shores. W Gansu, Xinjiang [Afghanistan, Mongolia, Pakistan; SW Asia, SE Europe (Russian part)].

8. MICROGYNOECIUM J. D. Hooker in Bentham & J. D. Hooker, Gen. Pl. 3: 56. 1880.

小果滨藜属 xiao guo bin li shu

Herbs annual, with unicellular, vesicular hairs, becoming furfuraceous when dry. Leaves alternate, petiolate; leaf blade flattened, ovate, broadly so, or rhombic-ovate. Flowers minute, unisexual (plants monoecious). Male flowers enclosed in leaf axils at branchlet tips, without bractlets; perianth 5-parted to middle, submembranous; stamens 1–4, inserted at base of perianth; filaments exserted, filiform; anthers broadly elliptic, without an appendage. Female flowers 7-glomerulate, usually 1–3 developed, sessile, enclosed within a 3-lobed bract by folding of lateral lobes; perianth obscure, filiform; ovary ellipsoid, depressed and dorsiventrally compressed; ovule sessile; style very short; stigmas 2, capillary. Utricle obliquely ovoid, slightly dorsiventrally compressed, with small processes; pericarp membranous, adnate to seed. Seed vertical; testa crustaceous, puncticulate; embryo slender, horseshoe-shaped; perisperm farinaceous.

One species: China, Nepal, Sikkim; C Asia (Pamir mountains).

1. Microgynoecium tibeticum J. D. Hooker in Bentham & J. D. Hooker, Gen Pl. 3: 56. 1880.

小果滨藜 xiao guo bin li

Plants 8–25 cm tall. Stems branched from base, usually decumbent. Petiole 4–15 mm; leaf blade 6–12 × 5–7 mm, slightly succulent, base cuneate, margin entire or 3-lobed, apex subobtuse or acute; veins obscure. Male flowers: perianth light brown, ca. 0.8 mm; segments triangular, furfuraceous; anthers ca. 0.5 mm. Utricle black-brown, 1–1.5 mm. Seed testa black, lustrous; embryo light green or brownish. Fl. and fr. Jul–Sep.

Ruderal habitats in alpine zones; above 4000 m. Gansu, Qinghai, Xizang [Nepal, Sikkim; C Asia (Pamir mountains)].

9. AXYRIS Linnaeus, Sp. Pl. 2: 979. 1753.

轴藜属 zhou li shu

Herbs annual, covered with stellate hairs. Stems decumbent, ascending, or erect. Leaves alternate, petiolate; leaf blade flattened, lanceolate to ovate, margin entire. Flowers unisexual (plants monoecious). Male flowers sessile, several glomerulate in axils of upper branches and forming a spike; bracts and bractlets absent; perianth segments 3–5, obovate or elliptic, membranous, densely stellate pubescent abaxially, without appendages; disk absent; stamens 2–5; filaments linear; anthers broadly oblong; ovary rudimentary. Female flowers inserted on petiole of bract; bracts green, elliptic, midvein abaxially prominent; bractlets absent; perianth segments 3 or 4, membranous, without appendages, enlarged in fruit; ovary ovoid; style short; stigmas 2. Fruit a utricle, compressed, ellipsoid or ovoid, glabrous or wrinkled, usually with a crestlike appendage. Seed vertical; embryo semi-annular; radicle inferior; perisperm copious.

About six species: Asia, SE Europe; three species in China.

1a. Plants small; stems decumbent; petiole almost as long as leaf blade; leaf blade 0.5–1 cm; male inflorescences capitate; utricle obovoid, apical appendages small or obscure ..... 3. *A. prostrata*

1b. Plants large; stems erect, branches obliquely spreading or ascending; petiole much shorter than leaf blade; leaf blade 0.5–7 cm; male inflorescences spicate; utricle narrowly ellipsoid, ovoid, or broadly ellipsoid-obovoid, apical appendages small or larger and forming a crest.
2a. Leaf blade lanceolate, 3–7 cm; utricle narrowly ellipsoid or ovoid, compressed, not encircled by wrinkles though sometimes marked with lines, apical appendages larger, forming an emarginate crest ..... 1. *A. amaranthoides*
2b. Leaf blade ovate, elliptic, or oblong-lanceolate, 0.5–3.5 cm; utricle broadly ellipsoid-obovoid, encircled by wrinkles, apical appendages small, triangular ..... 2. *A. hybrida*

1. Axyris amaranthoides Linnaeus, Sp. Pl. 2: 979. 1753.

轴藜 zhou li

Axyris amaranthoides f. *dentata* (Baranov) Kitagawa; *A. amaranthoides* var. *dentata* Baranov.

Plants 20–80 cm tall. Stems erect, stout, slightly striate; branches mostly borne above middle, slender, 3–13 cm. Leaves shortly petiolate; leaf blade lanceolate, 3–7 × 0.5–1.3 cm, abaxially stellate hairy, later glabrous, base attenuate, margin entire, apex acuminate; veins prominent. Upper leaves and bracts smaller, narrowly lanceolate or narrowly ovate, ca. 10 × 2–3 mm, margin usually involute. Male flowers: perianth segments usually 3, narrowly oblong, abaxially densely stellate pubescent, margin involute, apex acute; stamens 3, exserted. Female flowers: perianth segments 3, membranous, abaxially densely hairy; central segment smaller, oblong; lateral segments broadly ovate, larger, apex entire or slightly emarginate. Utricle gray-black, narrowly ellipsoid or ovoid, compressed, 2–3 mm, sometimes marked with lines, glabrous, with an apical, emarginate, crestlike appendage. Fl. and fr. Aug–Sep.

Grasslands, slopes, sandy places, wastelands, riversides, fields, roadsides. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Xinjiang [Japan, Kazakhstan, Korea, Mongolia, S Russia; occasionally introduced in Europe and North America].

2. Axyris hybrida Linnaeus, Sp. Pl. 2: 980. 1753.

杂配轴藜 za pei zhou li

Axyris amaranthoides f. *nana* (W. Wang & P. Y. Fu) Kitagawa; *Axyris amaranthoides* var. *nana* W. Wang & P. Y. Fu.

Plants 5–40 cm tall. Stems erect, branched from base; branches often obliquely spreading or ascending, stellate hairy when young. Petiole shorter than leaf blade; leaf blade ovate, elliptic, or oblong-lanceolate, 0.5–3.5 × 0.2–1 cm, hairy on both surfaces, base cuneate or attenuate, margin entire, apex obtuse or acuminate; veins prominent abaxially. Male flowers: perianth segments 3, oblong, membranous, abaxially hairy, base attenuate, apex obtuse; stamens 3, exserted. Female flowers: perianth segments 3. Utricle broadly ellipsoid-obovoid, 1.5–2 × ca. 1.5 mm, encircled by wrinkles, with 2 small, triangular appendages apically. Fl. and fr. Jul–Aug.

Slopes, sand dunes, exposed river mud, field margins, roadsides. Gansu, Hebei, Heilongjiang, Henan, Nei Mongol, Qinghai, Shanxi, Xinjiang, Xizang, Yunnan [Kashmir, Mongolia, Nepal, SE Russia; C and SW Asia].

3. Axyris prostrata Linnaeus, Sp. Pl. 2: 980. 1753.

平卧轴藜 ping wo zhou li

Axyris pamirica B. Fedtschenko; *A. prostrata* f. *ovatifolia* T. P. Soong.

Plants 2–14 cm tall. Stems and branches prostrate or ascending, densely stellate pubescent. Petiole nearly as long as leaf blade; leaf blade broadly elliptic, ovate, or suborbicular, 0.5–1.5 × 0.4–0.9 cm, stellate hairy, base cuneate-attenuate, margin entire, apex rounded, mucronulate; midvein obscure. Male flowers in subcapitate inflorescences; perianth segments 3(or 5), obovate, membranous, abaxially densely hairy; stamens 3 or 5, exserted. Female flowers: perianth segments 3, membranous, hairy; ovary ovoid, compressed; style short; stigmas 2, slender. Utricle globose or obovoid, compressed, encircled by wrinkles, apical appendages 2, small or obscure. Fl. and fr. Jul–Aug.

High-elevation valleys, terraces, rocky slopes. Qinghai, Xinjiang, Xizang [Mongolia, Nepal, Russia (S Siberia), Sikkim, Tajikistan].

10. KRASCHENINNIKOVIA Gueldenstaedt, Novi Comment. Acad. Sci. Imp. Petrop. 16: 551. 1772.

驼绒藜属 tuo rong li shu

Eurotia Adanson.

Shrubs or subshrubs, covered with stellate and dendroid hairs in combination with simple (unbranched), uniseriate hairs. Leaves alternate, solitary or in fascicles, petiolate to subsessile; leaf blade flat, linear-lanceolate to ovate, base cuneate, rounded, or subcordate, margin entire, apex obtuse or acute. Flowers unisexual (plants monoecious or dioecious). Male flowers several in glomerules, forming an interrupted spike or subcapitate inflorescence, without bracts; perianth segments 4, ovate or elliptic, membranous, abaxially hairy, basally connate; stamens 4; anthers oblong; filaments linear, exserted. Female flowers axillary, 1 or 2 together; bractlets 2, united into a tube in proximal half or at base (here termed “female floral tube”), compressed, ellipsoid or obovoid, abaxially 4-fascicular villous or shortly hairy in fruit; perianth absent; ovary sessile, ellipsoid, hairy; style short; stigmas 2, pubescent. Utricle ellipsoid or narrowly obovoid, compressed; pericarp membranous, free from seed. Seed vertical; testa membranous; embryo semi-annular or horseshoe-shaped; radicle inferior.

Six or seven species: mainly in Eurasia, one or two species in W North America: four species (one endemic) in China.

Much controversy surrounds the nomenclature of this genus. The widely applied name *Ceratoides* Gagnebin should be rejected in favor of *Krascheninnikovia*. When establishing the new genus *Ceratoides*, Gagnebin (Acta Helv. Phys.-Math. 2: 59. 1755), instead of citing a description, cited a pre-Linnaean work by Tournefort, in which *Ceratoides* included the annual plant now known as *Ceratocarpus arenarius* Linnaeus, the type of *Ceratocarpus* Linnaeus. Consequently, *Ceratoides* in the strict sense is a nomenclatural synonym of *Ceratocarpus*.

1a. Female floral tube 2-auriculate apically, abaxially shortly hairy in fruit, or (in var. *longipilosa*) 4-fascicular long villous; plants usually low cushion-shaped with prostrate or ascending branches; petiole comparatively long, clearly separated from leaf blade (alpine areas) ..... 4. *K. compacta*

1b. Female floral tube 2-cornute apically, abaxially 4-fascicular villous in fruit; plants not cushion-shaped, branches normally ascending to erect; petiole short or nearly absent, not clearly separated from leaf blade.

2a. Female floral tube 1–2 × as long as free, 2-cornute part; leaf blade linear to linear-lanceolate, lateral veins obscure ..... 1. *K. ceratoides*

2b. Female floral tube 4–6 × as long as free, 2-cornute part; leaf blade lanceolate, ovate, or oblong-ovate, lateral veins prominent.

3a. Leaf blade ovate or ovate-oblong, base cordate; female floral tube 4-fascicular villous at base in fruit ..... 2. *K. ewersmannia*

3b. Leaf blade lanceolate or oblong-lanceolate, base broadly cuneate or rounded; female floral tube 4-fascicular villous near middle and distally in fruit ..... 3. *K. arborescens*

1. Krascheninnikovia ceratoides (Linnaeus) Gueldenstaedt, Novi Comment. Acad. Sci. Imp. Petrop. 16: 555. 1772.

驼绒藜 tuo rong li

Axyris ceratoides Linnaeus, Sp. Pl. 2: 979. 1753; *Ceratiodes latens* (J. F. Gmelin) Reveal & N. H. Holmgren; *C. papposa* (Persoon) Botschantzev & Ikonnikov; *Eurotia ceratoides* (Linnaeus) C. A. Meyer; *E. prostrata* Losina-Losinskaja; *Krascheninnikovia compacta* (Losina-Losinskaja) Grubov; *K. latens* J. F. Gmelin.

Plants 50–150 cm tall, much branched; branches spreading. Leaves linear to lanceolate, 1–5 × 0.2–1 cm, base attenuate, cuneate, or rounded, apex acute or obtuse; midvein prominent. Male inflorescence to 4 cm, dense. Female floral tube ellipsoid, 3–4 × ca. 2 mm, 1–2 × as long as 2-cornute free part. Utricle ellipsoid, hairy. Fl. and fr. Jun–Sep.

Gobi desert, semideserts, dry slopes. Gansu, Nei Mongol, Qinghai, Xinjiang, Xizang [Mongolia; arid regions of N Africa, Asia, and SE Europe].

2. Krascheninnikovia ewersmannia (Stschegleev ex Losina-Losinskaja) Grubov, Rast. Tsentral. Azii 2: 38. 1966.

心叶驼绒藜 xin ye tuo rong li

Eurotia ewersmannia Stschegleev ex Losina-Losinskaja, Izv. Akad. Nauk SSSR, Ser. 7, Otd. Fiz.-Mat. Nauk 9: 993. 1930; *Ceratoides ewersmannia* (Stschegleev ex Losina-Losinskaja) Botschantzev & Ikonnikov.

Plants 1–2 m tall, much branched above. Petiole short; leaf blade ovate or ovate-oblong, 2–3.5 × 1–2 cm, base cordate, apex acute or rounded; midvein and lateral veins prominent. Male flowers slender. Female floral tube ellipsoid, 2–3 mm, 5–6 × as long as short, slightly recurved free part, abaxially 4-fascicular villous at base in fruit. Utricle ellipsoid, hairy. Seed vertical. Fl. and fr. Jan–Sep.

Sandy deserts, dunes, wastelands. Xinjiang [Kazakhstan, Mongolia; EC Asia].

3. Krascheninnikovia arborescens (Losina-Losinskaja) Czerepanov, Vasc. Pl. Russia & Adj. States, 186. 1995.

华北驼绒藜 hua bei tuo rong li

Eurotia arborescens Losina-Losinskaja, Izv. Akad. Nauk SSSR, Ser. 7, Otd. Fiz.-Mat. Nauk 9: 999. 1930; *Ceratoides arborescens* (Losina-Losinskaja) C. P. Tsien & C. G. Ma.

Plants 1–2 m tall, branching above; branches 35–80 cm. Leaves shortly petiolate; leaf blade lanceolate or oblong-lanceolate, 2–7 × 0.7–1.5 cm, base broadly cuneate or rounded, apex acute or obtuse; midvein and lateral veins prominent. Male inflorescence slender, to 8 cm. Female floral tube obovoid, ca. 3 mm, 4–5 × as long as slightly recurved, apically obtuse free part, abaxially 4-fascicular villous near middle and distally in fruit. Utricle narrowly obovoid, hairy. Fl. and fr. Jul–Sep.

● Dunes, sandy places, slopes, wastelands. S Gansu, Jilin, Liaoning, N Sichuan.

The combination *Krascheninnikovia arborescens* was published by Czerepanov in January 1995, slightly earlier than the same combination by Mosyakin (Novon 5: 52. 27 March 1995).

4. Krascheninnikovia compacta (Losina-Losinskaja) Grubov, Rast. Tsentral. Azii 2: 37. 1966.

垫状驼绒藜 dian zhuang tuo rong li

Plants small, cushion-shaped, 10–25 cm tall, densely branched; older branches stout, with persistent black-brown petioles; annual branches 1.5–5 cm. Leaves dense, small; petiole subequaling leaf blade, clasping, persistent; leaf blade elliptic or oblong-ovate, ca. 1 × 0.3 cm, base attenuate, margin revolute, apex rounded. Male inflorescence short, crowded, subcapitate. Female flowers 2; floral tube cylindric, ca. 0.5 cm, shorter than or equaling spreading, auriculate free part, abaxially shortly hairy or 4-fascicular long villous in fruit. Utricle ellipsoid, hairy. Fl. and fr. Jun–Aug.

Slopes, gravelly flats, high cold desert communities; 3500–5000 m. Gansu, Qinghai, Xinjiang, Xizang [Tajikistan].

1a. Female floral tube abaxially shortly hairy in fruit ..... 4a. var. *compacta*

1b. Female floral tube abaxially 4-fascicular long villous in fruit ..... 4b. var. *longipilosa*

4a. Kraschenninnikovia compacta var. **compacta**

垫状驼绒藜(原变种) dian zhuang tuo rong li (yuan bian zhong)

Eurotia compacta Losina-Losinskaja, Izv. Akad. Nauk SSSR, Ser. 7, Otd. Fiz.-Mat. Nauk 9: 995. 1930; *Ceratiodes compacta* (Losina-Losinskaja) C. P. Tsien & C. G. Ma.

Female floral tube abaxially shortly hairy in fruit.

Slopes, gravelly flats, high cold desert communities; 3500–5000 m. Gansu (Qilian Shan), Qinghai, Xinjiang, Xizang [Tajikistan].

4b. Kraschenninnikovia compacta var. **longipilosa** (C. P. Tsien & C. G. Ma) Mosyakin, Novon 5: 52. 1995.

长毛驼绒藜 chang mao tuo rong li

Ceratoides compacta var. *longipilosa* C. P. Tsien & C. G. Ma, Acta Phytotax. Sin. 16(1): 117. 1978.

Female floral tube abaxially 4-fascicular long villous in fruit.

● High cold desert communities; 4300–4800 m. Qinghai, Xizang.

11. ARCHIATRIPLEX G. L. Chu, J. Arnold Arbor. 68: 461. 1987.

单性滨藜属 dan xing bin li shu

Herbs annual. Leaves opposite or alternate, petiolate; leaf blade flattened, slightly succulent, with unicellular, inflated trichomes, margin serrate. Flowers unisexual (plants monoecious). Male flowers in interrupted, ebracteate spikes at apex of branchlets; perianth 5-parted; segments membranous, slightly succulent abaxially near apex, veinless; stamens 5, inserted on disk. Female flowers borne below male inflorescences, attached to base and petiole of bracts; bracts leaflike, shortly petiolate or subsessile, smaller than leaves; perianth 3- or 4-parted; segments with midvein, slightly enlarged in fruit; ovary obovoid, smooth; style inconspicuous; stigmas 2. Fruit a utricle, slightly compressed, papillate; pericarp membranous, adnate to seed. Seed laterally compressed, lenticular; testa crustaceous; embryo annular; radicle inferior; perisperm copious.

● One species.

1. Archiatriplex nanpinensis G. L. Chu, J. Arnold Arbor. 68: 462. 1987.

单性滨藜 dan xing bin li

Plants to 1.2 m tall. Stem erect or ascending, branched, slightly 4-angled, striate; branches ascending; branchlets 1–5 cm, usually slender. Petiole 0.5–8 cm; leaf blade abaxially light green, adaxially dark green, broadly ovate or triangular-hastate, 2–10 cm, nearly as broad as long, base cordate, margin irregularly coarsely serrate, apex shortly acuminate. Male flowers several glomerulate in slender, sometimes shortly branched inflorescences; perianth segments obovate or oblanceolate, ca. 1 mm, slightly succulent, basally connate, apically somewhat cucullate; stamens 5; filaments filiform, flattened, nearly equaling perianth; anthers broadly oblong or broadly ovate, ca. 0.3 mm. Female flowers 4–7 per glomerule, inserted at base and petiole of bracts; bracts ovate or cordate, 4–20 mm, margin entire or serrate; perianth segments (in fruit) patent, linear-elliptic or obovate, 0.7–1 mm, basally connate, margin entire or slightly lacerate; stigmas ca. 0.2 mm. Utricle obliquely ovoid; pericarp membranous, papillate. Seed red-brown or black, ca. 1–1.5 mm in diam.

● Beneath shrubs, shrubby slopes, river banks, near farm houses; ca. 2100 m. N Sichuan (Nanping).

12. ATRIPLEX Linnaeus, Sp. Pl. 2: 1052. 1753.

滨藜属 bin li shu

Herbs annual or perennial, subshrubs, or shrubs, usually furfuraceous. Leaves alternate, rarely opposite, petiolate or subsessile; leaf blade flattened, slightly succulent, linear, lanceolate, oblong, ovate, triangular, rhombic, or hastate, margin serrate, rarely entire. Flowers unisexual (plants monoecious or dioecious), borne in axillary glomerules arranged in panicles or short, leafy spikes. Male flowers ebracteate; perianth (3–)5-parted; segments oblong or obovate, apex obtuse; stamens 3–5, inserted at base of perianth; filaments usually united proximally; ovary rudimentary, conic or terete, rarely obsolete. Female flowers: bractlets 2, free or margins connate to varying lengths, slightly enlarged in fruit (here termed "fruiting bracts"), shape various, both sides usually with appendages; perianth and disk absent; ovary ovoid or globose; style very short; stigmas 2, subulate or filamentous. Utricle enclosed by fruiting bracts; pericarp adnate to seed. Seed vertical, compressed, compressed globose, or lenticular; testa membranous, leathery, or crustaceous; embryo annular; radicle lateral or superior; perisperm surrounded by embryo.

About 250 species: temperate and subtropical zones; 17 species (two introduced) in China.

1a. Subshrubs or shrubs; leaf blade margin entire.
  2a. Shrubs; flowers borne in short, leafy, spikelike inflorescences (Hainan) ..... 3. *A. repens*
  2b. Subshrubs; flowers borne in terminal, leafless panicles (Xinjiang).
    3a. Leaves opposite, leaf blade rhomboid to obovate-lanceolate; fruiting bracts tuberculate on surfaces ..... 1. *A. verrucifera*
    3b. Leaves alternate, leaf blade oblanceolate to linear; fruiting bracts without appendages ..... 2. *A. cana*
1b. Herbs annual; leaf blade margin ± serrate.

4a. Fruiting bracts orbicular, margin entire.
5a. Plants with male flowers and 2-bracteate female flowers; fruiting bracts of 2 sizes ..... 6. *A. micrantha*
5b. Plants with bisexual flowers (or stamens undeveloped and flowers appearing female) and 2-bracteate female flowers; fruiting bracts all of same size.
6a. Fruiting bracts acute at apex; leaves scarcely furfuraceous (cultivated) ..... 4. *A. hortensis*
6b. Fruiting bracts rounded or slightly emarginate at apex; leaves densely furfuraceous ..... 5. *A. aucheri*
4b. Fruiting bracts not orbicular, margin ± toothed.
7a. Leaves green, without Kranz anatomy.
8a. Leaf blade more than 2 × as long as wide, linear, or lanceolate to narrowly oblong.
9a. Fruiting bracts rhombic to ovate-rhombic, furfuraceous, margins united to middle ..... 7. *A. patens*
9b. Fruiting bracts ovate-lanceolate to subcordate, scarcely furfuraceous, margins united only basally .... 8. *A. laevis*
8b. Leaf blade up to 2 × as long as wide.
10a. Leaf blade subglabrous, margin entire ..... 9. *A. fera*
10b. Leaf blade furfuraceous, margin ± toothed.
11a. Leaf blade base hastate to subtruncate; perianth of male flowers yellow ..... 10. *A. prostrata*
11b. Leaf blade base cuneate; perianth of male flowers green ..... 11. *A. patula*
7b. Leaves gray-green, with Kranz anatomy.
12a. Fruiting bracts covered with thornlike appendages, only distal margins free ..... 12. *A. sibirica*
12b. Fruiting bracts appendaged near base at center or without appendages.
13a. Flowers glomerulate, axillary throughout plant.
14a. Leaf margins sparsely serrate; fruiting bracts flabellate, with soft, thornlike, tuberculate appendages ..... 13. *A. centralasiatica*
14b. Leaves entire, or with a pair of obtuse lobes near base; fruiting bracts cordate to sagittate, appendage a 3-parted process ..... 14. *A. dimorphostegia*
13b. Flowers axillary and forming distinct, spikelike inflorescences on upper branches; fruiting bracts without appendages or with a few irregular, tuberculate appendages.
15a. Herbs annual (W China) ..... 17. *A. tatarica*
15b. Herbs perennial (coasts of Fujian and Taiwan).
16a. Fruiting bracts shortly stalked, margins triangular serrate ..... 15. *A. maximowicziana*
16b. Fruiting bracts sessile, margins finely repand dentate ..... 16. *A. nummularia*

1. Atriplex verrucifera Marschall von Bieberstein, Fl. Taur.-Caucas. 2: 441. 1808.

疣苞滨藜 liu bao bin li

Atriplex glauca Pallas (1771), not Linnaeus (1763); *Halimione verrucifera* (Marschall von Bieberstein) Aellen; *Obione verrucifera* (Marschall von Bieberstein) Moquin-Tandon.

Subshrubs, 20–50 cm tall. Stems dwarf, woody; branches terete, bark light yellow to gray-brown; annual branches erect or decurrent, ribbed, slightly striate, densely furfuraceous, usually unbranched, or with axillary branchlets shorter than leaves. Leaves opposite (except several leaves beneath inflorescence alternate), shortly petiolate; leaf blade usually suberect, yellow-greenish to silver-gray, rhombic-ovate, or elliptic to obovate-lanceolate, 3–5 × 0.8–2.5 cm, densely furfuraceous on both surfaces, base attenuate, margin entire, apex obtuse or acute. Inflorescences terminal, interrupted panicles. Male flowers: perianth segments 5; stamens 5; ovary rudimentary, cylindric. Fruiting bracts shortly pedicellate, connate almost to apex, subglobose, 2–3 mm in diam., fleshy, both sides with tuberculate appendages. Utricle yellow-brown to brown; pericarp adnate to seed. Seed vertical, compressed, orbicular, 1.5–2 mm in diam. Fl. Jun–Aug, fr. Aug–Sep.

Saline and alkaline wastelands, inter-dunes, roadsides. N Xinjiang [W Mongolia, Russia (W Siberia); C and SW Asia (Iran), S Europe].

2. Atriplex cana C. A. Meyer in Ledebour, Icon. Pl. 1: 11. 1829.

白滨藜 bai bin li

Subshrubs, 20–50 cm tall, sometimes somewhat cushion-shaped. Stems much branched, woody, bark gray-brown, laciniate; annual branches erect, usually slightly zigzagged, 15–30 cm, terete, slightly ribbed, branched above. Leaves alternate, lower ones sometimes subopposite, shortly petiolate; leaf blade narrowly oblong, or oblanceolate to linear, 1–3 cm × 2–7 mm, densely silver-white furfuraceous on both surfaces, base attenuate, margin entire, apex obtuse; veins obscure. Inflorescences terminal panicles on annual branches. Male flowers: perianth segments 5; stamens 5. Fruiting bracts connate only at base, slightly compressed, densely furfuraceous on both surfaces, sometimes with a few tuberculate processes, margins with 3 obtuse teeth distally. Utricle compressed globose; pericarp light yellowish, membranous, adnate to seed. Seed vertical, dark red-brown, 1.5–2.25 mm in diam., slightly punctate. Fl. Jul–Oct, fr. Sep.

Semideserts, arid slopes, lake shores. N Xinjiang [Kazakhstan, Russia (SW Siberia); SW Asia (Caucasus), SE Europe].

3. Atriplex repens Roth, Nov. Pl. Sp. 377. 1821.

匍匐滨藜 pu fu bin li

Obione koenigii Moquin-Tandon.

Shrubs small, 20–50 cm tall. Stems ducumbent or prostrate, often rooting; branches alternate, light green, sometimes reddish purple, slightly ribbed. Leaves alternate; petiole 1–3 mm; leaf blade obovate to ovate, 1–2 × 0.8–1.5 cm, fleshy,

densely gray-green furfuraceous on both surfaces, base broadly cuneate to rounded, margin entire, apex rounded or obtuse. Inflorescences short, leafy spikes on upper branches. Male flower: perianth subulate, 4- or 5-parted; segments obovate, apically inflexed; stamens 4 or 5; filaments flattened, basally united; rudimentary ovary absent. Fruiting bracts connate only near base, triangular to ovate-rhombic, basal central part yellow-white, inflated, corky, each side of midline with an antrorse process, margins irregularly serrate. Utricle compressed ovoid; pericarp membranous. Seed red-brown to black, ca. 1.5 mm. Fr. Dec–Jan.

Open sandy areas on beaches. E Hainan [Afghanistan, India; SE Asia].

4. Atriplex hortensis Linnaeus, Sp. Pl. 2: 1053. 1753.

榆钱菠菜 yu qian bo cai

Herbs annual, to 2 m tall, slightly furfuraceous. Stem erect, stout; branches oblique or spreading, obtusely 4-angled, green striate. Petiole 1–3 mm; leaf blade green on both surfaces, ovate-oblong to ovate-triangular, 5–25 × 3–18 cm, adaxially slightly furfuraceous, base hastate to broadly truncate, margin entire or irregularly serrate, apex subobtuse. Inflorescences axillary and terminal panicles with bisexual and female flowers mixed in glomerules. Bisexual flowers ebracteate; perianth 5-parted; segments oblong; stamens 5, sometimes undeveloped and flowers appearing female; seed horizontal, lenticular, 1.5–2 mm in diam.; testa black, sublustrous, thinly leathery. Female flowers bracteate; perianth absent; fruiting bracts very shortly petiolate, connate only at base, suborbicular, 1–1.5 cm in diam., both surfaces reticulate veined and glabrous, base truncate or slightly emarginate, margins entire, apex acute; seed vertical, compressed globose, 3–4 mm in diam.; testa yellow-brown, not lustrous, usually membranous. Fl. and fr. Aug–Sep.

Cultivated. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi [native to SW Asia and Europe; introduced and cultivated in many regions of the world].

The young plants are used as a vegetable in N China.

5. Atriplex aucheri Moquin-Tandon, Chenop. Monogr. Enum. 51. 1840.

野榆钱菠菜 ye yu qian bo cai

Atriplex amblyostegia Turczaninow; *A. hortensis* Linnaeus subsp. *desertorum* (Iljin) Aellen; *A. nitens* Schkuhr subsp. *desertorum* Iljin.

Herbs annual, 30–90 cm tall. Stem erect, terete below, slightly 4-angled above, simple or with a few branches above; branches slender, obliquely spreading, furfuraceous. Petiole 1–3 cm; leaf blade triangular-hastate to triangular-lanceolate, 4–10 × 2–8 cm, abaxially densely gray-white furfuraceous, adaxially dark green and not furfuraceous, base cordate to broadly cuneate, margin serrate or serrately lobed (usually 2nd pair of teeth from base elongated), sometimes subentire, apex usually obtuse. Inflorescences terminal panicles. Bisexual flowers ebracteate; perianth 5-parted; segments linear-oblong; stamens 5 (or undeveloped and flowers appearing female); seed horizontal, depressed globose, ca. 1.5 mm in diam.; testa black, sublustrous, thinly leathery. Female flowers bracteate; perianth absent; fruiting bracts subsessile, free, broadly ovate to oblong, 6–10 mm, reticulate veined and furfuraceous on both surfaces, margin entire, apex rounded or emarginate; seed vertical, usually compressed globose, 3–4 mm in diam.; testa yellow-brown, not lustrous, membranous. Fl. and fr. Aug–Oct.

Gobi desert, deserts, arid valleys. Xinjiang [Afghanistan, Kazakhstan, Turkmenistan; SW Asia (Caucasus, Iran), SE Europe (SE European Russia, SE Ukraine)].

Atriplex sagittata Borkhausen (Rhein. Mag. Erweit. Naturk. 1: 477. 1793; *A. nitens* Schkuhr), another species of *A.* sect. *Atriplex* closely related to *A. aucheri* and *A. hortensis*, has occasionally been reported from China, as *A. nitens*. In most cases these records were based on misidentifications. However, it is possible that *A. sagittata* does indeed occur in western regions of China as a native species, or can be expected to occur elsewhere as an introduced species.

6. Atriplex micrantha C. A. Meyer in Ledebour, Icon. Pl. 1: 11. 1829.

异苞滨藜 yi bao bin li

Atriplex hastata Linnaeus var. *heterocarpa* Fenzl; *A. heterosperma* Bunge.

Herbs annual, 50–120 cm tall. Stem erect, ribbed, slightly furfuraceous, usually branched above middle. Petiole 0.5–1.5 cm; leaf blade triangular to hastate, 2–6 × 1.5–5 cm, abaxially densely gray furfuraceous, or both surfaces same color, base cuneate to broadly so, margin entire or coarsely serrate, with a pair of lobes near base, apex obtuse or acute. Inflorescences terminal panicles. Male flower: perianth 5-parted; stamens 5. Fruiting bracts connate at base, orbicular or suborbicular, furfuraceous when young, entire at margins, of 2 types: small fruiting bracts 1.5–2 mm; seed lenticular, ca. 0.5 mm in diam.; testa black, sublustrous, leathery; large fruiting bracts 3–4.5 mm in diam.; seed compressed globose, 2–3 mm in diam.; testa yellow-brown, not lustrous, membranous. Fl. Jun–Aug, fr. Aug–Sep.

Moist saline and alkaline places, lake shores, meadows, deserts. N Xinjiang [Kazakhstan, Russia (W Siberia); SW Asia, SE Europe; introduced in North America].

7. Atriplex patens (Litvinov) Iljin, Izv. Glavn. Bot. Sada SSSR 26: 415. 1927.

滨藜 bin li

Atriplex littoralis Linnaeus var. *patens* Litvinov, Sched. Herb. Fl. Ross. 5: 12. 1905; *A. laevis* C. A. Meyer var. *patens* (Litvinov) Grubov; *A. littoralis* subsp. *stepposa* Kitagawa.

Herbs annual, 20–60 cm tall. Stem erect or decumbent, slightly furfuraceous, ribbed and striate, branched above; branches slender, obliquely spreading. Leaves alternate or basal ones subopposite; leaf blade lanceolate to linear, 2–9 × 0.5–1 cm, both surfaces green and glabrous or slightly furfuraceous, base attenuate, margin irregularly curved serrate, sometimes subentire, apex subobtuse or acuminate. Inflorescences terminal, spicate or with short branches, usually forming a dense panicle. Male flowers: perianth 4- or 5-parted; stamens 4 or 5. Fruiting bracts connate below middle, rhombic to ovate-rhom-

bic, ca. 3 × 2.5 mm, furfuraceous, sometimes distally with tuberculate processes, margins usually finely serrate distally, apex acute or shortly acuminate. Seeds of 2 types: black or red-brown, depressed globose or lenticular, 1–2 mm in diam., finely punctate. Fl. and fr. Aug–Oct.

Slightly saline or alkaline moist meadows, beaches, sandy places. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Russia (SE European part, Far East, S Siberia); C and SW Asia, SE Europe].

Atriplex patens is closely related to *A. laevis* and is sometimes treated as a variety of that species.

8. Atriplex laevis C. A. Meyer in Ledebour, Icon. Pl. 1: 10. 1829.

光滨藜 guang bin li

Herbs annual, 20–30 cm tall. Stem erect, green striate, subglabrous; lower branches opposite, elongate, obliquely spreading. Leaves shortly petiolate; leaf blade linear to narrowly oblong, 2–5 cm × 3–8 mm, both surfaces green and glabrous, base attenuate, apex acute. Flowers axillary, glomerulate, forming a loose, spikelike inflorescence on upper stem and branches. Fruiting bracts connate only near base, ovate-triangular to subcordate, 3–8 × 3–6 mm, without appendages, scarcely furfuraceous, base broadly cuneate to subtruncate, margins entire or sparsely serrulate, with 1–3 pairs of serrate teeth near base, apex acute or acuminate. Seed compressed, lenticular, 1.5–2.5 mm. Fl. and fr. Aug–Oct.

Moist meadows. Nei Mongol, N Xinjiang [Mongolia, Russia (SE European part, SE Siberia); C and SW Asia, SE Europe].

9. Atriplex fera (Linnaeus) Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 27(8): 6. 1880.

野滨藜 ye bin li

Spinacia fera Linnaeus, Sp. Pl., ed. 2, 2: 1456. 1763; *Obione fera* (Linnaeus) Moquin-Tandon; *S. divaricata* Turczaninow ex Moquin-Tandon.

Herbs annual, 20–80 cm tall. Stem erect or decumbent, 4-angled or terete below, ribbed, green striate, usually branched throughout; branches slender, obliquely spreading, slightly furfuraceous. Petiole 6–12 mm; leaf blade ovate-oblong to ovate-lanceolate, 2–7 × 0.8–2 cm, both surfaces gray-green, base cuneate to broadly so, margin entire, rarely with 1 to several pairs of undulate, obtuse teeth, apex obtuse or shortly acuminate. Inflorescences of axillary glomerules. Male flowers 4-merous. Female flowers 3–10 per glomerule. Fruiting bracts connate throughout, inflated, ovoid or cylindric, hardened, with prominent, reticulate veins and 1 or 2 irregularly placed, thorny processes on both sides, apex with 3 short teeth; pedicel 3–4 mm. Utricle compressed globose; pericarp white, membranous, adnate to seed. Seed vertical, brown, 1.5–2 mm in diam.; radicle superior. Fl. and fr. Jul–Sep.

Lake shores, river banks, canyon sides, field margins, roadsides. Gansu, Hebei, Heilongjiang, Jilin, Nei Mongol, Qinghai, Shaanxi, Shanxi, Xinjiang [Mongolia, Russia (SE Siberia)].

10. Atriplex prostrata Boucher ex Candolle in Lamarck & Candolle, Fl. Franç., ed. 3, 3: 387. 1805.

戟叶滨藜 ji ye bin li

Atriplex latifolia Wahlenberg; *A. microsperma* Waldstein & Kitaibel.

Herbs annual, to 1 m tall. Stem erect, usually stout, terete, ribbed, green striate, subglabrous; branches cylindric, obliquely spreading. Leaves alternate or subopposite; petiole 1–3 cm; leaf blade triangular-hastate, 5–10 × 4–10 cm, abaxially slightly furfuraceous, adaxially glabrous, base slightly cordate or subtruncate, margin irregularly serrate or with 1–3 pairs of unequal, serrate lobes below middle, apex acute or acuminate. Inflorescences spikelike or paniculate on upper part of stem and branches. Male flower: perianth yellow, subglobose, 5-parted; stamens 5. Fruiting bracts connate only at base, rhombic to ovate-triangular, densely furfuraceous, margins usually entire. Utricle ca. 1.2 mm; pericarp yellow-white, adnate to seed. Seed black, sublustrous, compressed globose. Fl. Jul–Aug, fr. Sep–Oct.

Moist valley meadows, roadsides. N Xinjiang [N Africa, C and SW Asia, Europe; naturalized in many other regions of the world].

The rejected name *Atriplex hastata* Linnaeus was often misapplied to this species. The name *A. hastata* in the strict sense refers to the European coastal taxon now known as *A. calotheca* (Rafn) Fries.

11. Atriplex patula Linnaeus, Sp. Pl. 2: 1053. 1753.

草地滨藜 cao di bin li

Herbs annual, to 1 m tall. Stem erect, terete below, distinctly ribbed and colored striate above, densely furfuraceous, much branched above; branches obliquely spreading. Petiole 5–12 mm; leaf blade ovate-triangular to lanceolate, 4–6 × 1–3 cm, abaxially usually gray-white furfuraceous, base broadly cuneate, margin irregularly serrate on middle cauline leaves, with a pair of larger teeth near base, entire on lower and upper cauline leaves or with only 1 pair of teeth near base, apex shortly acuminate. Inflorescence laxly spikelike. Male flowers: perianth green, 4- or 5-parted; segments oblong, slightly fleshy; stamens 4 or 5; anthers broadly obovate, ca. 3 mm. Female flowers: ovary ellipsoid; stigmas filiform, ca. 3 mm. Fruiting bracts connate only near base, ovate to ovate-triangular, 2–5 mm, densely furfuraceous, margins entire, apex obtuse or acute. Utricle compressed subglobose; pericarp membranous. Seed red-brown or black, 1.5–2.5 mm in diam.; testa membranous or crustaceous. Fl. and fr. Aug–Oct.

Slopes. W Xinjiang; should be expected as naturalized in other parts of China [Asia, Europe, North America; also widely naturalized].

Atriplex oblongifolia Waldstein & Kitaibel (Descr. Icon. Pl. Hung. 3: 278. 1806–1812; *A. patula* Linnaeus var. *oblongifolia* (Waldstein & Kitaibel) Westerlund) is a distinct species related to *A. patula* and naturally occurring from Europe to SW and C Asia. Reports of *A. oblongifolia* from China need confirmation, because this species is easily confused with xeromorphic, farinose forms of *A. patula*.

12. Atriplex sibirica Linnaeus, Sp. Pl., ed. 2, 2: 1493. 1763.

西伯利亚滨藜 xi bo li ya bin li

Obione muricata Gaertner; *O. sibirica* (Linnaeus) Fischer.

Herbs annual, 20–50 cm tall. Stem usually branched from

base; branches decumbent or obliquely spreading, obtusely 4-angled, not striate, furfuraceous. Petiole 3–6 mm; leaf blade ovate-triangular to rhombic-ovate, 3–5 × 1.5–3 cm, abaxially densely gray-white furfuraceous, adaxially gray-green and not or only slightly furfuraceous, base rounded or broadly cuneate, margin sparsely serrate, with a pair of larger teeth near base or only 1 pair of lobes and the remainder entire, apex subobtuse. Inflorescences axillary glomerules. Male flowers: perianth 5-parted; segments ovate to broadly so; stamens 5; filaments flattened, basally united; anthers broadly ovate to shortly oblong, ca. 0.4 mm. Fruiting bracts connate proximally, inflated, subobovoid, 5–6 × ca. 4 mm, woody, with numerous irregular, tuberculate processes on both sides, base cuneate, distal margins thin, serrate. Utricle ovoid or subglobose, compressed; pericarp white, membranous, adnate to seed. Seed vertical, red-brown or yellow-brown, 2–2.5 mm in diam. Fl. Jun–Jul, fr. Aug–Sep.

Saline and alkaline deserts, stabilized dunes, lake shores, canyon sides. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang [Kazakhstan, Mongolia, Russia (Siberia); occasionally introduced in Europe].

13. Atriplex centralasiatica Iljin, Trudy Bot. Inst. Acad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 2: 124. 1936.

中亚滨藜 zhong ya bin li

Herbs annual, 15–30 cm tall. Stem often branched throughout; branches yellow-green, obtusely 4-angled, mostly furfuraceous. Leaves petiolate, upper ones subsessile; petiole (when present) 2–6 mm; leaf blade ovate-triangular to rhombic-ovate, 2–3 × 1–2.5 cm, abaxially densely gray-white furfuraceous, adaxially gray-green, base rounded to broadly cuneate, margin sparsely serrate, with a larger pair of lobelike teeth near base, or only 1 pair of lobes and remainder entire, apex subobtuse. Inflorescences axillary glomerules. Male flowers: perianth 5-parted; segments broadly ovate; stamens 5; filaments flattened, basally united; anthers broadly ovoid to shortly cylindric, ca. 0.4 mm. Fruiting bracts connate near base, triangular, rhombic, or 3-lobed, 1–4(–4.5) cm, basal central part thickened, woody, both sides with numerous tuberculate appendages, margins herbaceous, narrower and subentire, or broader and triangular-denticulate; pedicel 1–3(–5) cm. Utricle broadly ovoid or globose, compressed; pericarp white, membranous, adnate to seed. Seed vertical, red-brown or yellow-brown, 2–3 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

Gobi desert, salt deserts, wastelands, beaches, sometimes in fields, field margins. Gansu, Hebei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang, Xizang [Kazakhstan, Mongolia, Russia (Siberia); C Asia].

Atriplex centralasiatica is closely related to *A. sibirica*. Grubov (Rast. Tsentral. Azii 2: 33. 1966) proposed varietal rank for the former under the latter; however, Sukhorukov (Taxon. Chorol. Sp. Gen. *Atriplex* Russia Adjac. Countries, 2003) confirmed the specific status of *A. centralasiatica*.

1a. Fruiting bracts triangular or rhombic, 1.5–2 cm, margins narrower, subentire, pedicel usually less than 1.5 cm ..... 13a. var. *centralasiatica*

1b. Fruiting bracts mostly 3-lobed, 1–4(–4.5) cm, middle lobe larger than lateral ones, margins broader, triangular-denticulate, pedicel usually 1–3(–5) cm ..... 13b. var. *megalotheca*

13a. Atriplex centralasiatica var. **centralasiatica**

中亚滨藜(原变种) zhong ya bin li (yuan bian zhong)

Atriplex sibirica Linnaeus var. *centralasiatica* (Iljin) Grubov; *Obione centralasiatica* (Iljin) Kitagawa.

Fruiting bracts triangular or rhombic, 1.5–2 cm, margins narrower, subentire; pedicel usually less than 1.5 cm.

Gobi desert, salt deserts, wastelands, beaches, sometimes in fields. Gansu, Hebei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang, Xizang [Mongolia, Russia (Siberia); C Asia].

13b. Atriplex centralasiatica var. **megalotheca** (Popov ex Iljin) G. L. Chu in H. W. Kung & C. P. Tsien, Fl. Reipubl. Popularis Sin. 25(2): 41. 1979.

大苞滨藜 da bao bin li

Atriplex megalotheca Popov ex Iljin in Shishkin, Fl. URSS 6: 873. 1936.

Fruiting bracts mostly 3-lobed, 1–4(–4.5) cm, middle lobe larger than lateral ones, margins broader, triangular-denticulate; pedicel usually 1–3(–5) cm.

Wastelands, field margins. W Gansu, S Xinjiang [Kazakhstan].

According to a new taxonomic treatment of *Atriplex* by Sukhorukov (Taxon. Chorol. Sp. Gen. *Atriplex* Russia Adjac. Countries, 2003), *A. centralasiatica* and *A. megalotheca* are treated as distinct species belonging to different sections (*A.* sect. *Obione* (Gaertner) C. A. Meyer and *A.* sect. *Sclerocalymma* Ascherson, respectively). The taxonomy of these entities is in need of revision.

14. Atriplex dimorphostegia Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 15: 438. 1842.

犁苞滨藜 li bao bin li

Atriplex dimorphostegia var. *sagittiformis* Aellen.

Herbs annual, 15–30(–45) cm tall. Stem much branched; branches decumbent or obliquely spreading, not furfuraceous or upper part furfuraceous, lustrous sericeous. Leaves subsessile; leaf blade ovate, broadly so, deltoid, or cordate, succulent, 1–4(–5) × 1–3 cm, both surfaces gray-green, but abaxially often densely furfuraceous, base rounded to broadly cuneate, margin entire to shallowly irregularly sinuate-dentate, apex rounded, usually mucronulate. Inflorescences of axillary, usually 3–8-flowered glomerules. Male flowers 4- or 5-merous. Fruiting bracts connate only near base, cordate or suborbicular, furfuraceous, basal central part with prominent appendages, base emarginate, margins sparingly dentate, with green, reticulate veins, apex obtuse or acute; pedicel stout, 2–3 mm, usually thinner at base. Utricle ovoid; pericarp white, membranous, adnate to seed. Seed brown, not lustrous, compressed, ca. 1.5 mm. Fl. and fr. May–Jul.

Deserts, dunes, sandy places, alluvial fans, sometimes in fields.

Xinjiang [Afghanistan, Kazakhstan, Pakistan, Turkmenistan, Uzbekistan; N Africa, SW Asia].

At least two varieties of this very polymorphic species have been recognized in China. *Atriplex dimorphostegia* var. *sagittiformis* differs from var. *dimorphostegia* in having plants usually taller (30–40 cm), leaf blade margin with a pair of lobes near the base, and fruiting bracts triangular-hastate (not cordate or suborbicular) and apically acuminate.

15. Atriplex maximowicziana Makino, Bot. Mag. (Tokyo) 10: 2. 1896.

海滨藜 hai bin li

Herbs perennial, 30–100 cm tall. Stems erect, terete, much branched; lower branches subopposite, yellow-white, slightly ribbed, not striate, furfuraceous. Leaf blade rhombic-ovate to ovate-oblong, usually 2–3 × 1–2 cm, abaxially gray-white furfuraceous, adaxially gray-green furfuraceous, base cuneate to broadly so, decurrent, margin usually 3-lobed, proximal-middle lateral lobes entire, obtuse, middle lobes repand or entire, apex obtuse or acute, mucronulate. Inflorescences axillary glomerules, forming small, reduced panicles on upper branches. Male flowers: perianth 5-parted; stamens 5. Fruiting bracts connate only at base, rhombic-ovate to triangular-ovate, without appendages, basal central part mostly thickened and corky; pedicel 1–2 mm. Utricle compressed globose or lenticular; pericarp light yellow, membranous, adnate to seed. Seed red-brown, ca. 2 mm in diam.; perisperm white, solid. Fl. and fr. Sep–Dec.

Sandy and coral-rocky seashores; near sea level. Fujian [Japan (Ryukyu Islands); naturalized in Pacific Islands (Hawaii)].

This species was recently reported as naturalized in Hawaii (Wagner et al., Bishop Mus. Occas. Pap. 48: 51–65. 1997).

16. Atriplex nummularia Lindley in T. Mitchell, J. Exped. Trop. Australia, 64. 1848.

大洋洲滨藜 da yang zhou bin li

Herbs perennial, to 2 m tall. Stems erect, much branched, slightly ribbed. Leaves shortly petiolate; leaf blade ovate to rhombic-ovate, usually 1–1.5 × 0.6–1 cm, furfuraceous, base subcuneate to broadly cuneate, decurrent, margin with 1–3 pairs of undulate teeth, or entire, apex rounded to subobtuse. Inflorescences axillary glomerules borne toward apex of branches, forming small panicles. Fruiting bracts connate at base, semiorbicular, ca. 7 mm wide, basal central part swollen and hardened, margins green, with finely undulate teeth.

Naturalized. Taiwan (including Penghu Dao) [native to Australia].

One of us (Clemants) observes that the above description does not correspond with that of *Atriplex nummularia* given by Wilson (in George, Fl. Australia 4: 130. 1984). Among the characters that are different are: herbs (Taiwan) vs. shrubs (Australia); leaves 1–1.5 cm (Taiwan) vs. leaves 2–4 cm (Australia). The species is included in Fl. Taiwan, ed. 2, but no specimen was seen by us. The plants in Taiwan might be an aberrant form of *A. maximowicziana*.

17. Atriplex tatarica Linnaeus, Sp. Pl. 2: 1053. 1753.

鞑靼滨藜 da da bin li

Herbs annual, 20–80 cm tall. Stem erect or decumbent, usually much branched, bark of lower stem exfoliating; branches slender, obliquely spreading. Petiole short or to 2 cm; leaf blade linear-oblong to triangular-ovate, 2–7 × 1–4 cm, abaxially densely gray-white furfuraceous, adaxially green and not furfuraceous, base cuneate to broadly so, margin irregularly serrate, sinuately lobed, remotely toothed, or entire, apex acute or shortly acuminate, with pellucid tip. Inflorescences axillary glomerules forming panicles on upper stem and branches; rachis densely furfuraceous. Male flowers: perianth obconic, 5-parted; stamens 5; anthers oblong. Fruiting bracts connate proximally, rhombic-ovate to ovate, basal central part yellow-white with prominent veins, sometimes with a few tuberculate appendages, margins ± dentate. Utricle ovoid or subglobose, compressed; pericarp white, membranous, adnate to seed. Seed vertical, yellow-brown to red-brown, 1.5–2.5 mm in diam.; perisperm yellow-brown, solid. Fl. and fr. Jul–Sep.

Saline and alkaline deserts, Gobi desert, wet plains, sometimes on field margins. W Gansu, N Qinghai, Xinjiang, Xizang [Mongolia, N Pakistan, Russia (Siberia); N Africa, C and SW Asia, Europe; naturalized in many other regions of the world].

1a. Upper cauline leaf blade oblong to triangular-ovate, margin irregularly serrate or sinuately lobed ..... 17a. var. *tatarica*
1b. Upper cauline leaf blade linear-oblong, oblong, or narrowly triangular, margin entire or remotely toothed ..... 17b. var. *pamirica*

17a. Atriplex tatarica var. **tatarica**

鞑靼滨藜(原变种) da da bin li (yuan bian zhong)

Atriplex lehmanniana Bunge; *A. multicolora* Aellen; *A. rosea* Linnaeus var. *subintegra* C. A. Meyer; *Obione graeca* Moquin-Tandon.

Upper cauline leaf blade oblong to triangular-ovate, margin irregularly serrate or sinuately lobed.

Saline and alkaline deserts, Gobi desert, wet plains, sometimes on field margins. W Gansu, N Qinghai, Xinjiang [Mongolia, Russia (Siberia); N Africa, C and SW Asia, Europe; naturalized in many other regions of the world].

17b. Atriplex tatarica var. **pamirica** (Iljin) G. L. Chu in H. W. Kung & C. P. Tsien, Fl. Reipubl. Popularis Sin. 25(2): 46. 1979.

帕米尔鞑靼滨藜 pa mi er da da bin li

Atriplex pamirica Iljin, Trudy Bot. Inst. Acad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 2: 124. 1936.

Upper cauline leaf blade linear-oblong, oblong, or narrowly triangular, margin entire or remotely toothed.

Xizang [N Pakistan; C Asia (Pamir mountains)].

Atriplex schugnanica Iljin (Trudy Bot. Inst. Acad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 2: 123. 1936), a member of *A.* sect. *Sclerocalymma* Aellen, is closely related to *A. rosea* Linnaeus and *A. tatarica*. It occurs in the Pamir mountains and EC Asia, and was reported by Grubov (Rast. Tsentral. Azii 2: 32. 1966) from N and W Xinjiang (Shache near the Yarkant river and other localities).

Atriplex altaica Sukhorukov (Feddes Repert. 111: 176. 2000), also a representative of *A.* sect. *Sclerocalymma*, was recently described from the Altai mountains of Russia and reported from NW China, although no exact Chinese localities were cited in the protologue. According to Sukhorukov, it is closely related to *A. pamirica* (recognized here as *A. tatarica* var. *pamirica*) and belongs to the *A. tatarica* aggregate.

13. SPINACIA Linnaeus, Sp. Pl. 2: 1027. 1753.

菠菜属 bo cai shu

Herbs annual, erect, glabrous. Leaves alternate, petiolate; leaf blade flattened, triangular-ovate or hastate, margin entire or lobed-serrate. Flowers unisexual (plants dioecious), forming glomerules, male ones usually arranged in terminal, interrupted panicles, female ones axillary. Male flowers: perianth 4- or 5-parted; segments oblong, apex obtuse; stamens 4 or 5, inserted at base of perianth; filaments capillary; anthers exserted. Female flowers borne within 2 united, leathery, and hardening bractlets; perianth absent; ovary subglabrous; ovule subsessile; stigmas 4 or 5, filiform. Utricle compressed globose; pericarp membranous, adnate to seed. Seed vertical; embryo annular; perisperm copious, farinaceous.

Three species: Mediterranean region; one species (introduced) in China.

1. Spinacia oleracea Linnaeus, Sp. Pl. 2: 1027. 1753.

菠菜 bo cai

Plants to 1 m tall. Root reddish, rarely white, conic. Stem simple or few branched, hollow. Leaf blade light green, hastate to ovate, slightly succulent, margin entire or with a few lobelike teeth. Male flowers: perianth segments usually 4; filaments filiform, flattened; anthers without an appendage. Fruiting bracts slightly compressed, with a thornlike appendage on each side, apex with 2 teeth; stigmas exserted. Utricle ovoid or subglobose, compressed, ca. 2.5 mm in diam.; pericarp brown.

Commonly cultivated as a vegetable in China [unknown in the wild; widely cultivated in temperate and subtropical regions of the world].

14. CERATOCARPUS Linnaeus, Sp. Pl. 2: 969. 1753.

角果藜属 jiao guo li shu

Herbs annual, densely covered throughout with stellate hairs. Stem erect, dichasially branched from base to apex. Leaves alternate, sessile, flattened, linear-lanceolate to acicular, base attenuate, margin entire, apex acuminate; midvein prominent. Flowers unisexual (plants monoecious). Male flowers sessile or shortly pedicellate, usually 2 or 3 borne together on a short peduncle in leaf axils and forks of upper branches; bracts and bractlets absent; perianth tubular, 2-lobed, membranous; stamen 1, included, but slightly exserted at anthesis. Female flowers axillary, solitary; bractlets 2, united into a narrowly obovoid to trigonous tube, compressed, with an acicular appendage at apex of each side, densely stellate pubescent; perianth absent; ovary globose, hairy; style short; stigmas 2. Utricle obovoid or conic, compressed, midline prominent, densely stellate hairy, acicular appendages stiff, straight or slightly curved, apex truncate or concave. Seed vertical, brown, of same shape as utricle; embryo semi-annular; radicle inferior; perisperm scant.

One species: C and SW Asia, E Europe.

1. Ceratocarpus arenarius Linnaeus, Sp. Pl. 2: 989. 1753.

角果藜 jiao guo li

Ceratocarpus caput-medusae Bluket; *C. turkestanicus* Savicz-Ryczegorski ex Iljin; *C. utriculosus* Bluket.

Plants 5–30 cm tall. Leaves 0.5–4 × 0.1–0.5 cm. Male flowers: perianth yellow, ca. 1.5 mm, membranous; filaments short, filiform; anthers subglobose. Utricle 5–10 × 2–5 mm. Fl. and fr. Apr–Jul.

Gobi desert, arid slopes, sands, wastelands. N Xinjiang [Afghanistan, Mongolia, Pakistan, SE Russia; C and SW Asia, SE Europe (S Ukraine, rarely introduced elsewhere)].

This is a polymorphic but clearly outlined species. Attempts to segregate eastern forms as a separate species, *Ceratocarpus turkestanicus* (*C. utriculosus*), were based on minor, variable, and non-correlated characters, such as branching habit, broader vs. narrower leaves, obovoid vs. trigonous fruiting bractlets, etc.

The plant is a common ephemeral in deserts.

15. AGRIOPHYLLUM Marschall von Bieberstein, Fl. Taur.-Caucas. 3: 6. 1819–1820.

沙蓬属 sha peng shu

Herbs annual. Stem erect, branched from base, covered with ramified hairs, becoming glabrous. Leaves alternate, sessile or petiolate; leaf blade flattened, linear to lanceolate or ovate, base attenuate or rounded-cuneate, margin entire, apex mucronate; veins 3 to numerous. Inflorescence a bracteate spike; bracts imbricate, base broad, apex aristate, reflexed; bractlets absent. Flowers solitary in bract axils, sessile, bisexual. Perianth segments 1–5, free, white, oblong or lanceolate, membranous, apex erose. Stamens 1–5; filaments flattened, united only at base; anthers oblong. Ovary sessile, ovoid, compressed; style short; stigmas 2, filiform. Utricle cylindric to subglobose, sometimes with lateral wings, apex with a 2-fid beak; pericarp free from testa. Seed vertical, globose or ellipsoid, compressed; embryo annular; radicle inferior; perisperm copious.

Five or six species: C and SW Asia; three species in China.

1a. Utricle beak parted into 2 slightly recurved, linear, compressed beaks, each usually with a subapical, small, flattened tooth ..... 1. *A. squarrosum*
1b. Utricle beak above middle divided into 2 small, acicular beaks, each with a proximal, lateral, recurved or inflexed, firm, spinelike, glabrous process.
2a. Utricle not wing-margined distally ..... 2. *A. lateriflorum*
2b. Utricle distinctly irregularly wing-margined apically ..... 3. *A. minus*

1. Agriophyllum squarrosum (Linnaeus) Moquin-Tandon in Candolle, Prodr. 13(2): 139. 1849.

沙蓬 sha peng

Corispermum squarrosum Linnaeus, Sp. Pl. 1: 4. 1753; *Agriophyllum arenarium* Marschall von Bieberstein; *A. gobicum* Bunge; *A. pungens* (Vahl) Link ex A. Dietrich; *Corispermum pungens* Vahl.

Plants 15–50 cm tall. Stem erect, light green, firm, obscurely ribbed, covered with ramified hairs when young, branched from base; lowest branches often opposite or whorled, spreading; upper branches opposite, obliquely spreading. Leaves sessile, lanceolate to linear, 1.3–7 cm × 1–10 mm, base attenuate, apex acute; longitudinal veins 3–9, prominent. Spikes axillary, sessile, dense, ovoid or ellipsoid; bracts broadly ovate, reflexed in fruit, abaxially hairy, apex abruptly acute, mucronate. Perianth segments 1–3, membranous. Stamens 2 or 3; filaments subulate, pellucid; anthers ovoid. Utricle ovoid or ellipsoid, compressed, slightly convex abaxially, hairy when young, slightly wing-margined distally; beak parted into 2 slightly recurved, linear, compressed beaks, each usually with a subapical, small, flattened tooth. Seed subglobose, glabrous, sometimes speckled with light brown. Fl. and fr. Aug–Oct.

Dunes, sandy places. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang, Xizang [Kazakhstan, Mongolia, Russia; SW Asia (Azerbaijan)].

2. Agriophyllum lateriflorum (Lamarck) Moquin-Tandon in Candolle, Prodr. 13(2): 139. 1849.

侧花沙蓬 ce hua sha peng

Eryngium lateriflorum Lamarck, Encycl. 4: 726. 1798.

Plants 10–40 cm tall. Stem green, obscurely ribbed, densely covered with ramified hairs, becoming glabrous, branched from base; lowest branches whorled; upper branches alternate, obliquely spreading. Leaves sessile, narrowly lanceolate or linear, 1.5–4 cm × 1–7 mm, base attenuate; longitudinal veins 5–7. Spikes axillary, usually 1–3, tower-shaped; bracts ovate, slightly inflexed in fruit, apex acuminate, mucronate. Perianth segments usually 3, narrowly oblong, membranous, apex sometimes 2-lobed. Stamens 5; filaments united at base; anthers oblong, exserted. Utricle cylindric, compressed, not wing-margined distally; beak divided above middle into 2 small, acicular beaks, each with a proximal, lateral, recurved, firm, spinelike, glabrous process. Seed globose, with colored speckles. Fl. and fr. Jun–Sep.

Dunes. N Xinjiang [C Asia, SW Asia (S Caucasus, Iran)].

3. Agriophyllum minus Fischer & C. A. Meyer, Bull. Soc. Imp. Naturalistes Moscou 12: 170. 1839.

小沙蓬 xiao sha peng

Plants 5–40 cm tall. Stem erect, slender, ribbed, covered with ramified hairs when young. Leaves linear to subulate, 0.6–3.3 cm × 1–3 mm; longitudinal veins 5–7, prominent. Spikes axillary, usually 1–3, tower-shaped; bracts ovate, inflexed in fruit, apex acuminate, mucronate. Perianth segments small, membranous. Stamens 5, exserted. Utricle ovoid, compressed, abaxially convex, glabrous, distinctly irregularly wing-margined apically; beak apically divided into 2 small, acicular beaks, each with a proximal, inflexed, flat, firm, spinelike, glabrous process. Seed oblong, abaxially convex, adaxially plane or concave. Fl. and fr. May–Sep.

Deserts. N Xinjiang (Manas) [Afghanistan, Kazakhstan; C and SW Asia].

16. CORISPERMUM Linnaeus, Sp. Pl. 1: 4. 1753.

虫实属 chong shi shu

Herbs annual, usually covered with dendroid and stellate hairs. Leaves flat or flattened, filiform or linear to lanceolate, margin entire; veins 1–3. Flowers solitary in bract axils, bisexual, forming dense or loose, spikelike inflorescences on upper stem and branches; bractlets absent. Perianth segments 1–3 or absent, unequal, membranous, upper segment larger, lower 2 segments smaller or absent. Stamens 1–3 or 5; filaments linear, flattened, usually longer than perianth; anthers oblong, 2-loculed, longitudinally dehiscent. Ovary ovoid or ellipsoid, compressed; style short; stigmas 2. Fruit a utricle, compressed, oblong to orbicular in outline, abaxially convex, adaxially plane or slightly concave, margin usually winged, entire or erose, plane or crisped, apex emarginate or rounded to acute, beaked; beak with a 2-fid tip formed from style bases; pericarp adnate to seed. Seed vertical; embryo horseshoe-shaped; radicle inferior; perisperm copious.

About 60 species: N hemisphere, mostly in Asia, but several species in Europe and North America; 27 species (12 endemic) in China.

Despite several attempts at regional taxonomic revisions, representatives of this taxonomically complicated genus are still insufficiently known in China. Several entities (species and varieties) are reported in China from only one to several localities and probably represent local forms of more widespread, variable species. Characters used for segregation of some species and infraspecific entities are very unreliable and variable (e.g., plant size, branching habit, degree of pubescence, color, shape of inflorescence etc.). For example, young plants are normally more pubescent than old ones,

which sometimes become nearly glabrous at maturity. Many plants at maturity become yellowish or reddish to deep beet-red, which often greatly depends on environmental conditions. The branching habit depends, among other factors, on the populational structure: plants in dense stands are often less branched than plants growing in rarefied populations. The most reliable diagnostic characters are those of utricles; however, even these characters should be used carefully. When collecting *Corispermum*, representative series of specimens showing variability patterns and possible hybridization processes in populations are very desirable.

The number of species of *Corispermum* occurring in China is probably exaggerated. Variability ranges and hybridization patterns of taxa are also poorly understood. To reveal these peculiarities of *Corispermum* species in China, field observation and populational and experimental studies are desirable, with comparative data on *Corispermum* from adjacent territories.

In our opinion, the best solution at the present state of our knowledge of *Corispermum* in China would be to refrain from hasty decisions and attempts to reduce the number of taxa by uniting poorly known entities. Because of that, the present treatment mainly follows the treatment by Tsien and Ma in FRPS (1979), especially in the key and descriptions. However, we have inserted necessary taxonomic and nomenclatural comments drawing attention to particular problems.

1a. Utricle apex ± emarginate.
- 2a. Plants usually small, of montane habitats; branches prostrate or ascending.
  - 3a. Utricle ovate, covered with stellate hairs ..... 27. *C. lepidocarpum*
  - 3b. Utricle obovate or oblong-obovate, glabrous.
    - 4a. Plants much branched, branches crowded; bracts lanceolate to ovate, not sickle-shaped ..... 26. *C. lhasaense*
    - 4b. Plants few branched; bracts sickle-shaped.
      - 5a. Utricle yellow-green, obovate, ca. 5 × 4 mm, wing yellow-green, ca. 1 mm wide ..... 24. *C. pseudofalcatum*
      - 5b. Utricle dark green, oblong-obovate, 3.5–4 × 2.5–3 mm, wing light yellow, ca. 0.5 mm wide ..... 25. *C. falcatum*
- 2b. Plants large; branches ascending.
  - 6a. Spikelike inflorescence narrowly cylindric, slender, loose (dense in *C. platypterum*); bracts ovate to lanceolate, usually 1-veined, with narrowly membranous margin.
    - 7a. Utricle oblong-elliptic, wing 0.4–0.7 mm wide ..... 21. *C. elongatum*
    - 7b. Utricle suborbicular, wing ca. 1 mm wide.
      - 8a. Spikelike inflorescence dense; bracts ovate to lanceolate; utricle 4–5 × 3.5–4.5 mm ..... 22. *C. platypterum*
      - 8b. Spikelike inflorescence loose and interrupted; bracts lanceolate; utricle 4.5–5.5 × 3.9–5 mm .... 23. *C. stenolepis*
  - 6b. Spikelike inflorescence clavate, stout, crowded; bracts ovate to broadly so, usually 3-veined, with broadly membranous margin.
    - 9a. Utricle orbicular, suborbicular, or ovate.
      - 10a. Utricle yellow-green, brown punctate and bullate, obovate, 3.7–4.5 × 2.9–4 mm, wing light yellow ..... 19. *C. dilutum*
      - 10b. Utricle light yellow, dark punctate, orbicular or suborbicular, 3–4.5 × 3–4.3 mm, wing of lighter color than utricle body ..... 20. *C. confertum*
    - 9b. Utricle oblong-elliptic to broadly elliptic-obovate.
      - 11a. Utricle 4.9–6 × 3.5–4.2 mm; spikelike inflorescence 7–12 × 1–1.5 cm, bracts subherbaceous ..... 16. *C. macrocarpum*
      - 11b. Utricle less than 4.5 mm; spikelike inflorescence usually 3–6(–7) × 0.8–1 cm, bracts submembranous.
        - 12a. Utricle oblong-obovate, 3.5–4 × 2.5–3 mm, wing strongly twisted ..... 17. *C. retortum*
        - 12b. Utricle elliptic or oblong-elliptic, 3.7–4.5 × 2.8–3.2 mm, wing not twisted ..... 18. *C. puberulum*

1b. Utricle apex rounded or acute, not emarginate.
- 13a. Utricle discoid, orbicular, or suborbicular, marginal wing absent or very narrow, slightly involute; leaves narrowly oblong or oblanceolate, 3(or 5)-veined ..... 1. *C. patelliforme*
- 13b. Utricle not discoid, marginal wing (if present) not involute; leaves linear or oblanceolate, 1(or 3)-veined.
  - 14a. Spikelike inflorescence stout, dense.
    - 15a. Utricle elliptic to obovate ..... 15. *C. orientale*
    - 15b. Utricle elliptic, broadly so, or oblong-obovate.
      - 16a. Spikelike inflorescence usually cylindric, 3–8 mm wide; utricle 2–3.5 × 1.5–2 mm .... 11. *C. chinganicum*
      - 16b. Spikelike inflorescence usually clavate, 8–15 mm wide; utricle 3–6 × 2–3.5 mm.
        - 17a. Spikelike inflorescence 1–7 cm, bracts lanceolate, with narrowly membranous margin ..... 13. *C. huanghoense*
        - 17b. Spikelike inflorescence 1–25 cm, bracts linear-lanceolate to ovate, with broadly membranous margin.
          - 18a. Utricle oblong-obovate or broadly elliptic, 3–5 × 2–3.5 mm, hairy, base and apex rounded ..... 12. *C. candelabrum*
          - 18b. Utricle broadly elliptic, 3.5–4 × 2.5–3 mm, glabrous, base subcordate, apex rounded ..... 14. *C. stauntonii*

14b. Spikelike inflorescence linear to narrowly cylindric, long, thin, loose, and at maturity often interrupted.
19a. Plants small, of montane habitats, 3–20 cm tall; spikelike inflorescence 2.5–5 cm.
20a. Utricle 2–3 × 1.5–2 mm, wing very narrow, hairy ..... 8. *C. pamiricum*
20b. Utricle 3–4 × 2–2.5 mm, wing broad, slightly hairy.
21a. Plants usually reddish purple at maturity, stout; bracts oblanceolate to lanceolate; utricle oblong-obovate, wing slightly undulate or crisped, apex acute, distinctly subulate beaked ..... 9. *C. dutreuilii*
21b. Plants green at maturity, slender; bracts lanceolate; utricle broadly elliptic or oblong-elliptic, wing neither undulate nor crisped, apex rounded or acute ..... 10. *C. tibeticum*
19b. Plants usually large, 15–50 cm tall; spikelike inflorescence usually 5–10 cm.
22a. Utricle 1.5–3 mm, apex rounded.
23a. Utricle yellow-green, broadly obovate-elliptic, wing yellow-green ..... 2. *C. lehmannianum*
23b. Utricle gray-green, elliptic, wing light yellow.
24a. Utricle 2.5–3 × 1.5–2 mm, smooth, margin distinctly winged ..... 6. *C. heptapotamicum*
24b. Utricle 1.5–2.3 × 1–1.5 mm, abaxially sometimes tuberculate (i.e., with occasional “warts” formed by portions of pericarp not adherent to testa), margin nearly wingless ..... 7. *C. mongolicum*
22b. Utricle 3–5 mm, apex acute.
25a. Plants small, 7–10 cm tall, less branched; spikelike inflorescence broader; utricle oblong to broadly elliptic, 4–5 × 2.5–3.5 mm, wing ca. 1/2 as wide as utricle body ..... 5. *C. praecox*
25b. Plants large, usually ca. 35 cm tall, much branched; spikelike inflorescence slender; utricle obovate-oblong, 3–4 × ca. 2 mm, wing narrow, sometimes nearly absent.
26a. Utricle wingless or nearly so, never pubescent, margin usually entire; inflorescence narrowly cylindric, slender, normally interrupted and often reflexed at maturity ..... 3. *C. declinatum*
26b. Utricle narrowly winged, pubescent or glabrescent at maturity, margin entire to erose or undulate; inflorescence cylindric, interrupted or not, normally erect at maturity ..... 4. *C. tylocarpum*

1. Corispermum patelliforme Iljin, Izv. Glavn. Bot. Sada SSSR 28: 643. 1929.

碟果虫实 die guo chong shi

Plants 10–45 cm tall. Stem erect, much branched; branches obliquely spreading. Leaves narrowly elliptic or oblanceolate, 0.2–4.5 × 0.5–1 cm, base attenuate, apex rounded, mucronate. Spikelike inflorescence terete, crowded; bracts lanceolate to broadly ovate, 0.5–1.5 cm × 3–7 mm, base rounded, margin membranous, apex acute, mucronate. Perianth segments 3, upper one broadly ovate, ca. 1 × 1.5 mm, lower segments triangular, smaller. Stamens 5; filaments subulate, equaling or slightly longer than perianth segments. Utricle sublustrous, discoid, 2.6–4 mm, glabrous; wing very narrow, involute; beak obscure. Fl. and fr. Aug–Sep.

Dunes. NW Gansu, W Nei Mongol, Ningxia, Qinghai (Qaidam Pendi) [Mongolia].

This species, the only representative of *Corispermum* sect. *Patellisperma* Mosyakin, is probably the most ancient living representative of the genus, showing common characters with hypothetical ancestors of *Corispermum*, which were morphologically similar to modern species of *Anthochlamys* Fenzl.

2. Corispermum lehmannianum Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math. 7: 458. 1854.

倒披针叶虫实 dao pi zhen ye chong shi

Plants 7–35 cm tall. Stem erect, much branched; lower branches ascending, upper ones suberect. Leaves oblanceolate or oblong-lanceolate, 1.5–3.5 × 0.3–0.8 cm, 1-veined, base attenuate, apex rounded or acute, mucronate. Spikelike inflorescence slender, loose, usually 6–10 cm; bracts lanceolate to ovate, base rounded, apex acute or acuminate. Perianth segment 1, oblong or broadly elliptic, apex lacerate. Stamens 1(or 3). Utricle yellow-green, sublustrous, broadly elliptic, 2–3 × 1.5–2 mm, glabrous, base broadly cuneate, apex rounded; body obovate; wing distinct, margin irregularly denticulate; beak triangular, short, apex erect, bifid. Fl. and fr. May–Jul.

Dunes, sandy places, field margins. N Xinjiang [Afghanistan; C Asia, SW Asia (Iran)].

3. Corispermum declinatum Stephan ex Iljin, Trudy Prikl. Bot. 19(2): 69. 1928.

绳虫实 sheng chong shi

Plants 15–50 cm tall. Stem erect, much branched; lower branches ascending. Leaves linear, 2–6 cm × 1–3 mm, 1-veined, base attenuate, apex acuminate, mucronate. Spikelike inflorescence elongate, narrowly linear, loose and interrupted, at maturity often reflexed, 5–15 × 0.5 cm; bracts linear-lanceolate to lanceolate, 0.5–3 cm × 2–3 mm, 1-veined, base broadly cuneate, margin membranous, apex acuminate. Perianth segments 1(or 3), upper one broadly elliptic, apex entire or erose. Stamens 1(or 3); filaments ca. 1/2 as long as perianth segments. Utricle obovate-oblong, 3–4 × ca. 2 mm, glabrous, base broadly cuneate, apex triangular to rostrate, acute; body narrowly obovate to elongate, smooth or tuberculate; wing absent or obscure, margin entire; beak ca. 0.5 mm, apex erect, ca. 1/3 as long as beak. Fl. and fr. Jun–Sep.

Sandy wastelands, riversides, field margins, roadsides. Gansu, He-

bei, Liaoning, Nei Mongol, Shaanxi, Shanxi, Xinjiang [Mongolia, Russia (S Siberia); NC Asia; locally naturalized in E Europe].

The authorship of *Corispermum declinatum* has been constantly erroneously cited as "Stephan ex Steven." However, Steven (Mém. Soc. Imp. Naturalistes Moscou 5: 334. 1817) never accepted *C. declinatum* as a species, but cited it as a synonym of *C. hyssopifolium* Linnaeus var. "a." The first valid publication of the name was by Iljin in 1928.

4. Corispermum tylocarpum Hance, J. Bot. 6: 47. 1868.

毛果绳虫实 mao guo sheng chong shi

Corispermum declinatum Stephan ex Iljin var. *tylocarpum* (Hance) C. P. Tsien & C. G. Ma; *C. gmelinii* Bunge; *C. rostratum* A. Baranov & B. Skvortsov ex W. Wang.

Plants 10–50 cm tall. Stem erect, much branched. Leaves linear to linear-lanceolate, 2–6 cm × 2–4 mm, 1-veined, base attenuate, apex acuminate, mucronate. Spikelike inflorescence elongate, linear-cylindric, interrupted to ± dense, 5–10(–15) × 0.5–0.7 cm; bracts linear-lanceolate to narrowly ovate, 0.5–3 cm × 2–3 mm, 1(–3)-veined, base broadly cuneate, margin membranous, apex acuminate. Perianth segments 1(or 3). Stamens 1(or 3). Utricle obovate-oblong, 3–4 × ca. 2 mm, glabrous or covered with dendroid or stellate hairs, base broadly cuneate, apex acute; body narrowly obovate, smooth or slightly tuberculate; wing very narrow, margin entire or irregularly erose. Fl. and fr. Jun–Sep.

Sandy wastelands, riversides, field margins, roadsides. Hebei, N Jiangsu, Liaoning, Nei Mongol, Shanxi, Xinjiang [E Mongolia].

Corispermum tylocarpum is closely related to *C. declinatum*. Plants of typical *C. declinatum* never have pubescent utricles; they are usually more slender, and the utricles are normally narrower and wingless. Patterns of distribution of *C. declinatum* s.str. and *C. tylocarpum* in China are insufficiently known because of confusion of these closely related entities.

5. Corispermum praecox C. P. Tsien & C. G. Ma, Acta Phytotax. Sin. 16(1): 117. 1978.

早熟虫实 zao shu chong shi

Plants 7–10 cm tall. Stem erect, few branched. Leaves linear, 1.5–3 cm × ca. 1 mm, 1-veined, sparsely covered with stellate hairs, base attenuate, apex acute, mucronate. Inflorescence spikelike, elongate, loose; bracts linear-lanceolate to ovate, 0.5–2 cm × 2–3 mm. Perianth segment 1, broadly elliptic, apex irregularly denticulate. Stamens 1(or 3), ca. 1.5 × as long as perianth segment. Utricle oblong-elliptic, 4–5 × 2.5–3.5 mm, densely stellate hairy, base truncate or subcordate, apex acute; wing usually ca. 1/2 as wide as body, slightly crisped, margin irregularly denticulate; beak ca. 1 mm, apex 1/4–1/3 as long as beak. Fl. and fr. May–Jun.

● Dunes. NE Henan (Fengqiu, Kaifeng).

Judging from its elongate fruit body, this little-known species seems to be closely related to *C. tylocarpum*. However, the unusually broad wing makes its affiliation with that species doubtful.

6. Corispermum heptapotamicum Iljin, Trudy Bot. Inst. Acad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 3: 165. 1937.

中亚虫实 zhong ya chong shi

Plants 10–40 cm tall. Stem erect, much branched, densely hairy; lower branches ascending or subprostrate. Leaves linear or oblanceolate, 1.5–4 cm × 4–8 mm, 1-veined, hairy, base attenuate, apex acute, mucronate. Spikelike inflorescence elongate, 5–15 cm; bracts linear, lanceolate, or ovate, 0.4–1.7 cm × 1.5–2.5 mm, hairy, base attenuate or rounded, margin narrowly membranous, apex acute or acuminate. Perianth segments 1(or 3), upper one oblong, apex acute. Stamens 1(or 3). Utricle gray-green, elliptic, 2.5–3 × 1.5–2 mm, glabrous, base broadly cuneate, apex rounded; wing yellow-green, narrow, margin entire or erose; beak terete, apex erect. Fl. and fr. Jul–Sep.

Sandy places, dunes. W Gansu, S Xinjiang [E Kazakhstan].

Plants with pubescent utricles but otherwise almost identical to *C. heptapotamicum* were described as *C. korovinii* Iljin (Izv. Glavn. Bot. Sada SSSR 28: 641. 1929). Such plants may be found in W Xinjiang.

7. Corispermum mongolicum Iljin, Izv. Glavn. Bot. Sada SSSR 28: 648. 1929.

蒙古虫实 meng gu chong shi

Plants 10–35 cm tall. Stem erect, terete, hairy, branched; lowest branches prostrate or ascending, upper ones obliquely spreading. Leaves linear or lanceolate, 1.5–2.5 cm × 2–5 mm, 1-veined, base attenuate, apex acute, mucronate. Spikelike inflorescence elongate, terete, loose, 3–6 cm; bracts linear-lanceolate to ovate, 0.5–2 cm × ca. 2 mm, base attenuate, apex acuminate. Perianth segment 1, oblong or broadly elliptic, apex irregularly denticulate. Stamens 1–5. Utricle gray-green, sublustrous, broadly elliptic, 1.5–3 × 1–1.5 mm, sometimes with postulate processes, glabrous, base cuneate, apex rounded; wing narrow or obscure, margin entire; beak very short, apex ca. 1/2 as long as beak. Fl. and fr. Jul–Sep.

Sandy areas of Gobi desert, dunes, sandy meadows. Gansu, W Nei Mongol, Ningxia, W Xinjiang [Mongolia, Russia (W Siberia)].

8. Corispermum pamiricum Iljin, Trudy Bot. Inst. Acad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 3: 165. 1937.

帕米尔虫实 pa mi er chong shi

Plants 5–15 cm tall. Stem branched from base; branches prostrate or ascending. Leaves linear, 1–2.5 cm × ca. 1 mm, 1-veined, hairy, base attenuate, apex acute, mucronate. Spikelike inflorescence terete, slightly crowded, usually 3–5 cm; bracts linear-lanceolate to ovate, 0.5–1.5 cm × 1–2 mm, base rounded, margin distinctly membranous, apex acute or acuminate. Perianth segment 1, orbicular, apex irregularly lacerate. Stamens 1–3, exserted beyond perianth segment. Utricle brown with a few black spots, obovate-elliptic, 2–3 × 1.5–2 mm, glabrous, subglabrous, or densely covered with stellate hairs, base and apex rounded; wing same color as body, narrow, margin entire; beak thick, short, apex erect, ca. 1/3 as long as beak. Fl. and fr. Jul–Aug.

Sandy field margins and lake shores; ca. 4400 m. Gansu, Xinjiang, Xizang [C Asia (Pamir mountains)].

1a. Utricle glabrous or subglabrous ..... 8a. var. *pamiricum*
1b. Utricle densely covered with stellate hairs ..... 8b. var. *pilocarpum*

8a. Corispermum pamiricum var. **pamiricum**

帕米尔虫实(原变种) pa mi er chong shi (yuan bian zhong)

Utricle glabrous or subglabrous.

Sandy field margins; high elevations. Gansu, Xinjiang, Xizang [C Asia (Pamir mountains)].

8b. Corispermum pamiricum var. **pilocarpum** C. P. Tsien & C. G. Ma, Acta Phytotax. Sin. 16(1): 118. 1978.

毛果帕米尔虫实 mao guo pa mi er chong shi

Utricle densely covered with stellate hairs.

● Sandy lake shores; ca. 4400 m. W Xizang (Rutog).

Corispermum gelidum Iljin (described from the Pamir mountains), with undulate wing margins and pubescent utricles, is related to both *C. pamiricum* and *C. tibeticum*, and is probably even the same taxon as *C. pamiricum* var. *pilocarpum*. Additional studies of these rare and little-known entities would be desirable.

9. Corispermum dutreuilii Iljin, Trudy Bot. Inst. Acad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 3: 162. 1937.

粗喙虫实 cu hui chong shi

Corispermum tibeticum Iljin, p.p.

Plants 5–15 cm tall. Stem erect, green or reddish purple, sparsely hairy, few branched from base; lowest branches ascending or prostrate, upper ones obliquely spreading. Leaves linear or oblanceolate, to 3.5 cm × 3–5 mm, 1-veined, base attenuate, apex acute, mucronate. Spikelike inflorescence 2–14 cm, ± crowded; bracts oblanceolate or linear to lanceolate, 0.5–3 cm × 1–5 mm, 1-veined, base attenuate or rounded, margin usually membranous, apex acute, mucronate, erect in fruit. Perianth segment 1, ovate, apex irregularly lacerate. Stamens 1(or 3), longer than perianth segments. Utricle oblong-obovate, 3–4 × 2–2.5 mm; wing broad, thick, slightly crisped, margin irregularly denticulate-toothed. Fl. and fr. Jul–Aug.

Sandy places in valleys, sandy field margins. Gansu, Xinjiang, NW Xizang (Ngari) [C Asia (Pamir mountains)].

Grubov (Rast. Tsentral. Azii 2: 58. 1966) placed this name in the synonymy of *Corispermum tibeticum*. He stated that the main difference between these entities is the presence in utricles of *C. dutreuilii* of a winged rostrum ("a fruit crown") separated from the main part of the wing. According to Grubov, this is not a stable diagnostic character. Indeed, the "crown" is well developed only in some utricles of the type specimen deposited at LE (however, most of the fruits are immature). Additional studies of this species (or form?) would be desirable.

10. Corispermum tibeticum Iljin, Izv. Glavn. Bot. Sada SSSR 28: 644. 1929.

藏虫实 zang chong shi

Corispermum ladakhianum Grey-Wilson & Wadhwa.

Plants 5–20 cm tall. Stem branching mostly from base; lower branches ascending or prostrate, upper ones obliquely spreading. Leaves linear, 2–3.5 cm, 1-veined, base attenuate, apex acute, mucronate. Spikelike inflorescence elongate, terete, loose, 2–7 cm; bracts narrowly ovate, sometimes slightly sickle-shaped, narrower than or as wide as utricle, margin narrowly membranous. Perianth segment 1, suborbicular, apex irregularly denticulate. Stamens 1–5. Utricle broadly elliptic or oblong-elliptic, 3–4 × 2–2.5 mm, glabrous, base subcordate or rounded, apex acute or rounded; wing light yellow, 1/6–1/3 as wide as body, margin irregularly denticulate; beak ca. 1 mm, apex ca. 1/3 as long as beak. Fl. and fr. Jul–Sep.

Sandy places, riversides; high elevations. Qinghai, Xizang [Kashmir, Pakistan; C Asia (Pamir mountains)].

11. Corispermum chinganicum Iljin, Izv. Glavn. Bot. Sada SSSR 28: 648. 1929.

兴安虫实 xing an chong shi

Plants 10–50 cm tall. Stem green or reddish purple, branched from base, lower branches ascending, upper branches obliquely spreading. Leaves linear, 2–5 cm × ca. 2 mm, 1-veined, base attenuate, apex acuminate, mucronate. Spikelike inflorescence terete, 4–5 cm × 3–8 mm; bracts lanceolate, ovate, or broadly ovate, mostly 3-veined, margin broadly membranous, apex acute or acuminate. Perianth segments 3, rarely absent, upper one broadly elliptic, apex irregularly denticulate, lower segments subtriangular, smaller. Stamens 5, exserted from perianth. Utricle sublustrous, with a few brown spots, oblong-obovate or broadly elliptic, 2–4 × 1.5–2 mm, glabrous, subglabrous, or covered on both sides with stellate hairs, base cordate, apex rounded; wing distinct, light yellow, margin entire; beak apex 1/4–1/3 as long as beak. Fl. and fr. Jun–Aug.

Dunes, lake shores, meadows. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia [Mongolia, Russia (SE Siberia)].

Corispermum chinganicum seems to be related to *C. pallasii* Steven s.l., approaching narrow-winged and small-fruited plants of this aggregate (known in Europe as *C. membranaceum* Iljin or *C. pallasii* subsp. *membranaceum* (Iljin) Tzvelev) and some North American entities (*C. americanum* (Nuttall) Nuttall and *C. villosum* Rydberg), which, however, never have pubescent utricles. Relationships of these taxa of the *C. pallasii* group deserve special comparative studies throughout the range of the group.

1a. Utricle glabrous or subglabrous ..... 11a. var. *chinganicum*
1b. Utricle covered on both sides with stellate hairs ..... 11b. var. *stellipile*

11a. Corispermum chinganicum var. **chinganicum**

兴安虫实(原变种) xing an chong shi (yuan bian zhong)

Corispermum chinganicum var. *microcarpum* Iljin.

Utricle glabrous or subglabrous.

Dunes, lake shores, meadows. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia [Mongolia, Russia (SE Siberia)].

11b. Corispermum chinganicum var. **stellipile** C. P. Tsien & C. G. Ma, Acta Phytotax. Sin. 16(1): 118. 1978.

毛果虫实 mao guo chong shi

Utricle covered on both sides with stellate hairs.

● Dunes, lake shores, meadows. Heilongjiang, Nei Mongol.

12. Corispermum candelabrum Iljin, Izv. Glavn. Bot. Sada SSSR 28: 645. 1929.

烛台虫实 zhu tai chong shi

?*Corispermum macrocarpum* Bunge ex Maximowicz var. *elongatum* W. Wang & P. Y. Fu, p.p.; *C. thelelegium* Kitagawa.

Plants 10–60 cm tall. Stem erect, green or reddish purple, sparsely hairy, branched mostly from base; branches ascending. Leaves linear, to 4.5 cm × 2–5.5 mm, 1-veined, base attenuate, apex acute, mucronate. Spikelike inflorescence terete or clavate, crowded, usually 4–6 × 0.8–1 cm; bracts linear-lanceolate to broadly ovate, 0.5–1.6 cm × 2–4 mm, usually 3-veined, margin membranous, apex acute or acuminate. Perianth segments 1 or 3, upper one oblong or broadly obovate, 1–1.5 mm, apex rounded, irregularly denticulate, abaxial segments triangular, smaller. Stamens 5, exserted from perianth. Utricle oblong-obovate or broadly elliptic, 3–5 × 2–3.5 mm, abaxially sometimes tuberculate, base rounded or cordate, apex rounded; wing distinct, 1/4–1/2 as long as body, margin irregularly denticulate or entire; beak short, thick, apex 1/3–1/2 as long as beak. Fl. and fr. Jul–Sep.

● Dunes, sandy places on riversides. N Hebei, W Liaoning, Nei Mongol.

13. Corispermum huanghoense C. P. Tsien & C. G. Ma, Acta Phytotax. Sin. 16(1): 118. 1978.

黄河虫实 huang he chong shi

Plants 10–20 cm tall. Stem erect, green, covered with stellate hairs, branched from base; lower branches ascending, upper ones obliquely spreading. Leaves green, striate, linear, 5–8 cm × ca. 1 mm, 1-veined, base attenuate, apex acuminate, mucronate. Spikelike inflorescence broadly elliptic or clavate, crowded, usually 1–3 cm; bracts lanceolate to ovate, 0.5–2.5 cm × 2.5–5 mm, 1–3-veined, hairy, base rounded or attenuate, margin narrowly membranous, apex acuminate, mucronate. Perianth segment usually 1, apex denticulate. Stamens usually 3, slightly exserted from perianth. Utricle dark punctate abaxially, elliptic or broadly so, 4.5–6 × 3–3.5 mm, covered with stellate hairs, base broadly cuneate, apex acute; wing ca. 2/3 as wide or nearly as wide as body, margin irregularly denticulate; beak 1.2–1.8 mm, apex 1/4–1/3 as long as beak. Fl. and fr. May–Jun.

● Dunes. NE Henan (Fengqiu, Kaifeng).

Corispermum huanghoense seems to be closely related to *C. candelabrum*.

14. Corispermum stauntonii Moquin-Tandon, Chenop. Monogr. Enum. 104. 1840.

华虫实 hua chong shi

Plants 15–50 cm tall. Stem erect, green, terete, sparsely covered with stellate hairs, branched from base; lower branches ascending, upper ones obliquely spreading. Leaves linear, 2–4 cm × 2–3 mm, 1-veined, sparsely hairy, base attenuate, apex acuminate, mucronate. Spikelike inflorescence cylindric or clavate, crowded, usually 2–5 × 0.8–1 cm; bracts linear-lanceolate to ovate, 0.5–1 cm × 2–5 mm, usually 3-veined, base rounded, margin membranous, apex acute or acuminate, mucronate. Perianth segments usually 3, upper one broadly elliptic or ovate, apex rounded, irregularly denticulate, lower segments subtriangular, smaller, sometimes not developed. Stamens 3–5, exserted from perianth. Utricle brown punctate, broadly elliptic, 3.5–4 × 2.5–3 mm, glabrous, base usually cordate, apex rounded; wing 1/3–1/2 as wide as body, margin irregularly denticulate; beak short, thick, apex 1/4–1/3 as long as beak. Fl. and fr. Jul–Sep.

● Sandy places, dunes. Hebei, Heilongjiang, Liaoning, Nei Mongol.

This species is closely related to *Corispermum pallasii* Steven, *C. elongatum*, and some other species of *C.* subsect. *Pallasiana* Mosyakin.

15. Corispermum orientale Lamarck, Encycl. 2: 111. 1786.

东方虫实 dong fang chong shi

Plants 15–30 cm tall. Stem erect, terete, branched from base; lower branches ascending, upper ones obliquely spreading. Leaves linear, 1.5–3 cm × 1.5–3 mm, 1-veined, base attenuate, apex acute, mucronate. Spikelike inflorescence terete or clavate, slightly curved, crowded, 1–4 cm; bracts lanceolate to ovate, 3–5 × 2–3 mm, broader than utricle, 1–3-veined, densely hairy, base rounded, margin broadly membranous, apex acute or acuminate. Perianth segment 1, broadly elliptic, apex irregularly denticulate. Stamen usually 1, exserted from perianth. Utricle sublustrous, subovate, 2.5–3 × 2–2.5 mm, glabrous, base subcordate or rounded, apex rounded; wing yellow-green, broad, 1/4–1/3 as wide as body, margin entire; beak short, thin, apex 1/4–1/3 as long as beak. Fl. and fr. Jul–Sep.

Dunes. N Xinjiang [Kazakhstan, W Mongolia, Russia (SE European part, SW Siberia)].

Records of *Corispermum orientale* from Europe (except the Lower Volga region of Russia) and North America are based on misidentifications.

16. Corispermum macrocarpum Bunge ex Maximowicz, Prim. Fl. Amur. 226. 1859.

大果虫实 da guo chong shi

Corispermum macrocarpum var. *elongatum* P. Y. Fu & W. Wang, p.p.; *C. macrocarpum* var. *microstachyum* P. Y. Fu & W. Wang; *C. macrocarpum* var. *rubrum* P. Y. Fu & W. Wang.

Plants 20–50 cm. Stem erect, green or slightly reddish purple, much branched; lower branches ascending, upper ones obliquely spreading. Leaves green, linear, 4–7 cm × 1.5–5 mm, 1-veined, base attenuate, apex acuminate, mucronate. Spikelike inflorescence clavate, slightly curved, crowded, usually 7–12 × 1–1.5 cm; bracts lanceolate to ovate, smaller than leaves, subherbaceous, usually 3-veined, base rounded, margin membranous, apex acute or acuminate. Perianth segments 1(or 3). Stamens usually 5, exserted from perianth. Utricle usually dark brown punctate, broadly elliptic or obovate-oblong, 5–6 × 3.5–4.2 mm, glabrous or covered with stellate hairs, base rounded or cordate, apex emarginate; wing lighter colored than body, 1.2–1.5 mm wide, margin entire or slightly irregularly denticulate;

beak 1–1.5 mm, apex 1/5–1/4 as long as beak. Fl. and fr. Jul–Sep.

Dunes. Heilongjiang, W Liaoning [Russia (Far East)].

Several minor forms and varieties were described under this species (e.g., var. *elongatum* and var. *microstachyum*). Plants with pubescent utricles were treated as var. *rubrum*. However, pubescence of utricles and shape of inflorescences are very variable characters in this species. Sometimes initially pubescent utricles become glabrous at maturity.

17. Corispermum retortum W. Wang & P. Y. Fu, Fl. Pl. Herb. Chin. Bor.-Orient. 2: 110. 1959.

扭果虫实 niu guo chong shi

Plants 30–40 cm tall. Stem erect, much branched mostly from upper middle part. Leaves linear, 4–5 cm × ca. 2 mm, 1-veined, base attenuate, apex acuminate, mucronate. Spikelike inflorescence clavate, distally crowded, slightly arcuate, usually 5–6 cm × ca. 1 cm wide at widest point; lower bracts linear-lanceolate to lanceolate, 3–6 × as long as utricle, narrower than utricle, margin membranous only on basal bracts, apex acuminate, mucronate; upper bracts narrowly to broadly ovate, wider than utricle, 3-veined, margin membranous, apex acute to acuminate, mucronate. Perianth segment 1, elliptic, apex irregularly crenate or lacerate. Stamen 1, exserted from perianth. Utricle black-brown, with dark spots, sublustrous, oblong-obovate, 3.5–4 × 2.5–3 mm, glabrous, base cordate, apex emarginate; wing lighter colored than body, usually 1/3–1/2 as wide as body, margin strongly undulate or crisped; beak apex ca. 1/3 as long as beak. Fl. and fr. Jul–Sep.

● Sandy meadows. Heilongjiang.

One of us (Mosyakin) notes that *Corispermum retortum* is probably just a deviant form of a species of *C.* subsect. *Pallasiana* Mosyakin, perhaps *C. elongatum* s.l. Occasional plants with unusually dark and undulate-winged utricles rarely occur in populations of other representatives of that subsection, even among European plants of *C. pallasii* Steven (introduced in Europe, native to Siberia). The little-known plant *C. ulopterum* Fenzl (from the shores of Lake Baikal in Russia), also characterized by dark utricles and strongly undulate-crisped wings, is probably a local form or variety of *C. redowskii* Fischer ex Steven.

18. Corispermum puberulum Iljin, Izv. Glavn. Bot. Sada SSSR 28: 645. 1929.

软毛虫实 ruan mao chong shi

Corispermum puberulum var. *ellipsocarpum* C. P. Tsien & C. G. Ma.

Plants 15–35(–50) cm tall. Stem erect, branched mostly from base; lowest branches ascending, upper ones obliquely spreading. Leaves linear, 2.5–4 cm × 3–5 mm, 1-veined, base attenuate, apex acuminate, mucronate. Spikelike inflorescence terete or clavate, straight or slightly curved, crowded, usually 3–5(–7) × ca. 0.8 cm; bracts lanceolate to ovate, 0.5–1.5 cm × 3–4 mm, 1–3-veined, base rounded, margin membranous, apex acute or acuminate. Perianth segments 1–3, upper one broadly elliptic or suborbicular, apex irregularly denticulate, lower segments smaller or not developed. Stamens 1–5. Utricle broadly elliptic or obovate-oblong, 3.5–4(–4.5) × 2.8–3.5 mm, few tuberculate or dark punctate abaxially, hairy or sometimes glabrous, base truncate or caudate, apex distinctly emarginate; wing broad, 1/2–2/3 as wide as body, margin irregularly denticulate; beak apex 1/4–1/3 as long as beak. Fl. and fr. Jul–Sep.

● Sandy places on riversides and beaches. Hebei (Weichang), Heilongjiang (Harbin), W Liaoning, E Shandong (Yantai).

Corispermum puberulum was treated as a synonym of *C. elongatum* by Grubov (Rast. Tsentral. Azii 2: 54. 1966), who also noted the extreme variability in pubescence and dimensions of the utricle. However, Baranov (J. Jap. Bot. 44: 165–166, 199–200, 203–204. 1969) indicated some differences in utricle characters of these two entities and treated them as two distinct species.

Taller plants (30–50 cm) with longer inflorescences (5–7 cm) and larger (3.7–4.5 × 2.8–3.2 mm), glabrous utricles were described as *Corispermum puberulum* var. *ellipsocarpum* and reported from Hebei (Weichang), W Liaoning, and Heilongjiang (Harbin). The typical variety is reported from Heilongjiang (Harbin) and E Shandong (Yantai).

19. Corispermum dilutum (Kitagawa) C. P. Tsien & C. G. Ma, Acta Phytotax. Sin. 16(1): 119. 1978.

辽西虫实 liao xi chong shi

Corispermum thelelegium Kitagawa var. *dilutum* Kitagawa, Rep. First Sci. Exped. Manch., Sect. 4, 2: 105. 1935; *C. dilutum* var. *hebecarpum* C. P. Tsien & C. G. Ma.

Plants 10–30 cm tall. Stem erect, green or lower part purplish, terete, branched from base; lower branches ascending or prostrate, upper ones obliquely spreading. Leaves linear, 2.5–4.5 cm × 2–6 mm, 1-veined, sparsely hairy, base attenuate, apex acute, mucronate. Spikelike inflorescence obovoid or clavate, crowded, 3–10 × 1–1.5 cm; bracts lanceolate to ovate, 1–2 cm × 4–6 mm, 3-veined, base rounded, margin membranous, distinctly papillate, apex acute. Perianth segments 3, upper one broadly elliptic or suborbicular, ca. 1.2 mm, apex rounded, irregularly toothed, lower segments triangular, smaller. Stamens 3–5. Utricle yellow-green, brown punctate, obovate, 3.5–4.5 × 3–4 mm, with vesicular processes, glabrous or pubescent, base cordate or subcordate, apex distinctly emarginate; wing light yellow, ca. 0.7 mm wide, margin irregularly denticulate or entire; beak ca. 0.8 mm, apex 1/3–1/2 as long as beak. Fl. and fr. Jul–Sep.

● Dunes, inter-dunes, sandy places on riversides; ca. 600 m. W Liaoning (Chifeng), Nei Mongol (Ju Ud Meng).

Plants with pubescent utricles were described as *Corispermum dilutum* var. *hebecarpum*.

20. Corispermum confertum Bunge in Maximowicz, Prim. Fl. Amur. 225. 1859.

密穗虫实 mi sui chong shi

Plants 20–40 cm tall. Stem erect, terete, stout, rigid; lowest branches ascending, upper ones obliquely spreading. Leaves linear, 2–4 cm × ca. 2 mm, 1-veined, base attenuate, apex acuminate, mucronate. Spikelike inflorescence clavate, slightly curved, crowded, usually 30–50 × 6–10 cm; bracts lanceolate to broadly ovate, 1–3-veined, base rounded, margin broadly membranous, apex acute or acuminate. Perianth segments 3, upper one oblong or suborbicular, 1–1.5 mm, apex rounded,

irregularly denticulate, lower segments triangular, smaller, sometimes obscure. Stamens 5, longer than perianth. Utricle orbicular or suborbicular, 3–4.5 × 3–4.3 mm, base cordate, apex obtuse-emarginate; wing lighter colored than body, ca. 1 mm wide, margin entire; beak ca. 1 mm, apex ca. 1/3 as long as beak. Fl. and fr. Jul–Aug.

Sandy places, dunes. Jilin, Heilongjiang, Liaoning [Russia (Far East)].

Plants traditionally assigned to *Corispermum confertum* intergrade with *C. elongatum*. Consequently, the former species has been treated as a synonym of the latter in most recent treatments of the genus. We agree with this opinion, but at present prefer to leave these two taxa separated until a new, comprehensive treatment of *C.* subsect. *Pallasiana* Mosyakin is available. This subsection houses several closely related, Far Eastern, Siberian, North American, and partly C Asian taxa, one of which, *C. pallasii* Steven (*C. leptopterum* (Ascherson) Iljin; *C. sibiricum* Iljin subsp. *baicalense* Iljin), is widely naturalized in Europe and native or naturalized in North America. Other, related Asian taxa, such as *C. bardunovii* Popov ex Lomonosova, *C. elongatum*, *C. sibiricum*, *C. stauntonii*, and some others, may also be treated in the future as infraspecific entities (subspecies or varieties) under *C. pallasii* s.l.

21. Corispermum elongatum Bunge in Maximowicz, Prim. Fl. Amur. 224. 1859.

长穗虫实 chang sui chong shi

Plants 20–40 cm tall. Stem erect, terete, sparsely hairy, much branched; lowest branches ascending, upper ones usually obliquely spreading. Leaves dark green, linear, 3–5 cm × 2–4 mm, 1-veined, base attenuate, apex acuminate, mucronate. Spikelike inflorescence terete, loose, usually 5–8 × ca. 0.6 cm; bracts green, lanceolate to ovate, 1–3-veined, base rounded, margin membranous, apex acute. Perianth segments 3. Stamens 5, exserted from perianth. Utricle oblong-elliptic, 3–4 × 1.5–3 mm, glabrous, base broadly cuneate, apex emarginate; wing 0.4–0.7 mm wide, margin entire; beak ca. 0.7 mm, apex 1/5–1/3 as long as beak. Fl. and fr. Jul–Sep.

Sandy places on beaches, dunes, inter-dunes. Heilongjiang, Jilin, Liaoning, Ningxia (Zhongwei) [Russia (Far East, SE Siberia)].

22. Corispermum platypterum Kitagawa, Rep. First Sci. Exped. Manch., Sect. 4, 2: 100. 1935.

宽翅虫实 kuan chi chong shi

Plants 30–50 cm tall. Stem green, terete, sparsely hairy; branches slender, 10–25 cm. Leaves linear, 3–6 cm × 1–2 mm, 1-veined, base attenuate, margin entire, apex acuminate, mucronate. Spikelike inflorescence slender, terete, loose; bracts ovate to lanceolate, 1.5–3 cm × 1–1.5 mm, distinctly narrower than utricle, margin narrowly membranous. Perianth segments 1–3, upper one ovate, ca. 1.5 mm, membranous, base subrounded, apex rounded, irregularly denticulate, lower segments triangular, smaller. Stamens 3–5; filaments ca. 1.5 × as long as perianth segments. Utricle suborbicular, 4–5 × 3.5–4.5 mm, glabrous, base broadly cuneate or cordate, apex acute-emarginate; wing ca. 1 mm wide, margin irregularly denticulate; beak ca. 1.2 mm, apex ca. 1/4 as long as beak. Fl. and fr. Jul–Sep.

● Dunes, sandy places on beaches, sandy fields. NE Hebei, Jilin, Liaoning.

23. Corispermum stenolepis Kitagawa, Rep. First Sci. Exped. Manch., Sect. 4, 2: 102. 1935.

细苞虫实 xi bao chong shi

Corispermum stenolepis var. *psilocarpum* Kitagawa.

Plants 15–40 cm tall. Stem erect, terete, branched mostly from upper-middle part; branches slender, 10–35 cm. Leaves linear, 3.5–4.5 cm × ca. 1 mm, 1-veined, base attenuate, margin entire, apex acuminate, mucronate. Spikelike inflorescence slender, loose; bracts linear-lanceolate to lanceolate, 0.6–3.5 cm × 1–2 mm, narrower than utricle, apex acuminate, mucronate. Perianth segment 1, broadly elliptic, 0.9–1.2 × ca. 0.6 mm. Stamens 1–3; filaments longer than perianth segments. Utricle suborbicular, 4.5–5.5 × 4–5 mm, glabrous, subglabrous, or covered with stellate hairs, base cordate, apex deeply emarginate; wing equaling or slightly wider than body, margin irregularly denticulate; beak 1.5–1.7 mm, apex ca. 1/4 as long as beak, recurved. Fl. and fr. Aug–Sep.

● Riversides, dunes. W Jilin, W Liaoning (Chaoyang), Nei Mongol (Ju Ud Meng).

Plants with glabrous utricles were described as *Corispermum stenolepis* var. *psilocarpum* and reported from W Jilin. However, the typical variety also seems to have utricles glabrous or nearly so (there is no indication of utricle pubescence in the protologue of the species), and thus these infraspecific entities probably do not merit any formal taxonomic recognition.

Corispermum stenolepis and *C. platypterum* are related to *C. macrocarpum* and the North American *C. pallidum* Mosyakin (*C.* subsect. *Platyptera* Mosyakin).

24. Corispermum pseudofalcatum C. P. Tsien & C. G. Ma, Acta Phytotax. Sin. 16(1): 119. 1978.

假镰叶虫实 jia lian ye chong shi

Plants ca. 20 cm tall. Stem erect, terete, sparsely stellate hairy, branched from base; lower branches ascending, upper ones obliquely spreading. Leaves linear, 2–3 cm × ca. 3 mm, fleshy, 1-veined, sparsely stellate hairy, base attenuate, apex acute, mucronate. Spikelike inflorescence terete, crowded; bracts lanceolate to narrowly ovate, 0.6–1.5 cm × 2–3 mm, narrower than utricle, usually 1-veined, base attenuate to rounded, margin membranous on upper bracts, apex acute to acuminate. Perianth segment 1, ovate or oblong-ovate, ca. 1.5 mm, apex rounded, irregularly denticulate. Stamens 1(or 3), ca. 1.5 × as long as perianth. Utricle yellow-green, obovate, 4.5–5 × 3.5–4.5 mm, irregularly rugose abaxially, glabrous, base cordate or subcordate, apex shallowly emarginate; wing yellow-green, ca. 1 mm wide, margin irregularly denticulate; beak ca. 1.5 mm, apex 1/5–1/4 as long as beak. Fl. and fr. Jul–Aug.

● High elevations. Xizang (Xigazê).

Corispermum pseudofalcatum is closely related to *C. falcatum*. Additional studies of the variability patterns of these entities would be desirable to clarify their status.

25. Corispermum falcatum Iljin, Izv. Glavn. Bot. Sada SSSR 28: 644. 1929.

镰叶虫实 lian ye chong shi

Plants 5–12 cm. Stem few branched, mostly in lower part; branches obliquely spreading or prostrate, longer than main stem, terete. Leaves green, linear, 1.5–2.5 cm × 1.5–2.5 mm, slightly fleshy, 1-veined, base attenuate, margin entire, apex acute, mucronate. Spikelike inflorescence terete, crowded; bracts lanceolate, usually sickle-shaped, 1–2 cm × 2.5–3 mm, slightly narrower than or equaling utricle, 1-veined, base attenuate or rounded, margin entire, narrowly membranous, apex acute, mucronate. Perianth segments 1(or 3), upper one ovate or oblong-ovate, apex lacerate, denticulate, lower segments very small or absent. Stamens 1–3, 1.5–2 × as long as perianth segments. Utricle dark green, obovate-elliptic, 3.5–4 × 2.5–3 mm, glabrous, base rounded, apex widely emarginate; wing light yellow, ca. 0.5 mm wide, margin irregularly denticulate; beak ca. 1 mm, apices 2, crossed, ca. 1/2 as long as beak. Fl. and fr. Jul–Sep.

● Sandy places in valleys. Qinghai (Qaidam Pendi), Xizang (Gyangzê, Xigazê).

26. Corispermum lhasaense C. P. Tsien & C. G. Ma, Acta Phytotax. Sin. 16(1): 119. 1978.

拉萨虫实 la sa chong shi

Plants 15–20 cm tall. Stem terete, finely ribbed, much branched; branches crowded, 10–20 cm. Leaves linear, 2–3 cm × 2–3 mm, subfleshy, 1-veined, base attenuate, apex pungent, mucronate. Spikelike inflorescence terete, crowded, usually 3–5 × ca. 0.7 cm; bracts usually lanceolate to ovate, equaling or broader than utricle, slightly keeled abaxially, rough, usually 1-veined, base rounded, margin broadly membranous, apex acute, mucronate. Perianth segment 1, oblong or broadly elliptic, ca. 1.4 × 0.4 mm. Stamen 1; filament 1–1.5 × as long as perianth. Utricle sublustrous, oblong-obovate, 4–5 × 3–3.5 mm, glabrous, base subcordate, apex obtuse-emarginate; wing ca. 1.7 mm wide, margin irregularly shallowly toothed; beak ca. 1 mm, apices 2, ca. 1/2 as long as beak. Fl. and fr. Jul–Sep.

● Sandy places on riversides; ca. 3600 m. Xizang (Lhasa).

Corispermum lhasaense is very closely related to *C. falcatum*. Additional studies would be desirable to clarify the status of this little-known entity.

27. Corispermum lepidocarpum Grubov, Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 21: 125. 1961.

鳞果虫实 lin guo chong shi

Plants 10–12 cm tall. Stem few branched from base; branches obliquely spreading, equaling or longer than stem, terete. Leaves linear, 2–2.5 cm × ca. 2 mm, 1-veined, base attenuate, apex acute, mucronate. Spikelike inflorescence terete or clavate, crowded; bracts lanceolate to ovate, 0.6–2 cm × 2–3 mm, narrower than utricle, 1-veined, base attenuate to rounded, margin membranous, apex acuminate, mucronate. Perianth segment 1, ovate or broadly so, 1–1.5 × ca. 1 mm, apex truncate or rounded, erose, Stamens 1–3; filament of middle one ca. 2 × as long as perianth, others usually not developed. Utricle with a few brown spots, sublustrous, ovate, 4.5–5.5 × 3–4.5 mm, covered with stellate hairs, base truncate or subcordate, apex acute, deeply and narrowly emarginate; wing ca. 1 mm wide, margin irregularly incised; beak ca. 1.5 mm, apex ca. 1/5 as long as beak, slightly curved. Fl. and fr. Jul–Aug.

● Sandy places near rivers. E Xizang (Gyaca, Mainling, Nyingchi).

17. BAOLIA H. W. Kung & G. L. Chu, Acta Phytotax. Sin. 16(1): 119. 1978.

苞藜属 bao li shu

Herbs annual, lightly covered with sordid furfuraceous pubescence. Leaves alternate, petiolate; leaf blade complanate, margin entire. Inflorescences axillary, glomerulate. Flowers bisexual, each with a bract and 2 bractlets. Perianth green, subglobose, 5-parted, slightly fleshy, persistent and enlarged in fruit; segments slightly concave adaxially, cucullate, slightly succulent near apex abaxially, 3-veined. Stamens 5, inserted on an annular disk; filaments flattened; anthers minute, subglabrous, without an appendage. Ovary narrowly ovoid, glabrous; style obscure; stigmas 2, capillary, extremely short, persistent and recurved in fruit. Fruit a utricle; pericarp yellow-brown, adnate to seed. Seed vertical, slightly compressed; testa black-brown, crustaceous, distinctly foveolate pitted; embryo annular; radicle inferior; perisperm copious, farinose.

● One species.

1. Baolia bracteata H. W. Kung & G. L. Chu, Acta Phytotax. Sin. 16(1): 120. 1978.

苞藜 bao li

Plants 10–20 cm tall. Stem erect, usually purple tinged, branched. Petiole 1–2 mm; leaf blade ovate-oblong to ovate-lanceolate, 1–2.2 × 0.5–1 cm, sparsely sordid furfuraceous, base cuneate, apex shortly acuminate; veins evident abaxially. Glomerules usually 2–4-flowered; bracts narrowly ovate, adaxially slightly concave, ca. 0.5 mm, membranous, central part green and slightly thickened; bractlets narrowly ovate or triangular, 0.3–0.5 mm, membranous. Perianth parted to middle; segments 0.8–1 mm in fruit, brown veined, margin membranous. Filaments pellucid, attenuate distally, ca. 0.75 mm; anthers ca. 0.15 mm. Stigma filiform, ca. 0.1 mm, slightly recurved. Utricle dark brown, ca. 2 × 1.7 mm, surface regularly foveolate, base with a protrusion at point of attachment, apex protruding from perianth. Seed black-brown, adherent to pericarp; perisperm white. Fl. and fr. Aug–Oct.

● Sunny steppe slopes; ca. 1900 m. S Gansu (Têwo).

18. POLYCNEMUM Linnaeus, Sp. Pl. 1: 35. 1753.

多节草属 duo jie cao shu

Herbs annual or subshrubs. Leaves alternate, sessile, subulate. Flowers solitary in leaf axils, minute, bisexual; bracteoles 2,

scarious. Perianth segments 5, free. Stamens (1–)3(–5), inserted on an annular, hypogynous disk. Stigmas 2; style extremely short. Fruit a utricle; pericarp thin, scarious, indehiscent. Seed vertical, black when ripe; testa leathery, granulate; embryo annular; perisperm present.

Between six and eight species: C Asia and Siberia, Europe; one species in China.

1. Polycnemum arvense Linnaeus, Sp. Pl. 1: 35. 1753

多节草 duo jie cao

Herbs annual, 10–15 cm tall. Stem erect, covered with short, crisped hairs, branched from base; branches ascending or decumbent, nearly as long as main stem, somewhat glabrescent. Leaves obliquely ascending, rarely appressed to stem, subulate, 3–10 mm, subglabrous, base expanded, margin narrowly membranous below middle, apex mucronate, spinescent. Bracteoles triangular-lanceolate, near as long as perianth in fruit, keeled abaxially, apex long acuminate. Perianth segments imbricate, narrowly ovate-lanceolate, ca. 1 × 0.4 mm, slightly enlarged in fruit to 1.5 mm, membranous, slightly longitudinally ribbed, sparsely covered with crisped hairs abaxially, apex shortly acuminate. Filaments filiform, ca. 1.5 mm; anthers shortly oblong, ca. 0.2 mm. Ovary broadly ovoid; style obscure; stigmas minute. Utricle enclosed in perianth, slightly compressed, broadly elliptic, ca. 1.1 × 1 mm; pericarp slightly thickened apically, easily separated from seed. Seed ovoid, laterally compressed, granulose sculptured. Fl. and fr. Jul–Aug.

Sandy soils, wastelands. Xinjiang [C and SW Asia, C and S Europe; occasionally naturalized in other regions].

Polycnemum, as well as the two other genera of tribe Polycnemeae (or subfam. Polycnemoideae), share some characters typical of Amaranthaceae, i.e., two bracteoles, membranous perianth segments, etc. Probably this tribe should be transferred to the Amaranthaceae.

This species is a good forage plant.

19. DYSPHANIA R. Brown, Prodr. 411. 1810.

刺藜属 ci li shu

Neobotrydium Moldenke; *Roubieva* Moquin-Tandon; *Teloxys* Moquin-Tandon.

Herbs annual or short-lived perennial, usually aromatic, covered with stalked, glandular trichomes and/or subsessile or sessile glands and/or uniseriate, multicellular trichomes, sometimes glabrescent. Stems branched, rarely nearly simple, erect, ascending, decumbent, or prostrate. Leaves alternate; leaf blade simple, margin entire, dentate, serrate, or pinnately lobed. Inflorescences terminal and axillary, loosely flowered, simple or compound cymes, spikelike, condensed cymes, or dense, axillary glomerules; bracts absent, but glomerules often subtended by reduced leaves (“leaflike bracts”). Flowers bisexual (rarely functionally unisexual). Perianth segments 1–5, usually united only at base or nearly free, in some species fused to form a sac surrounding utricle. Stamens 1–5. Ovary superior, unilocular with 1 basal ovule; styles 1–3, stigmas 1–3, filiform. Fruit a utricle, often enclosed in perianth; pericarp membranous, non-adherent. Seed 1, horizontal or vertical, subglobose to lenticular; embryo annular or incompletely so, surrounding copious perisperm; radicle inferior or centrifugal.

About 30 species: worldwide, mostly from tropics and subtropics to warm-temperate zones; four species (one introduced) in China.

The generic name *Dysphania* was traditionally applied to some 7–10 species endemic to Australia. Its taxonomic position, as understood by various authors, was very obscure—from a mere section in *Chenopodium* to the sole genus of a separate family Dysphaniaceae—but its close affinity to “glandular” species of *Chenopodium* s.l. is now evident.

Here, the genus *Dysphania* is accepted in a redefined circumscription, including also all other “glandular” taxa previously treated in *Chenopodium* subgen. *Ambrosia* A. J. Scott, or segregated in genera *Neobotrydium* Moldenke, *Roubieva* Moquin-Tandon, *Teloxys* Moquin-Tandon, etc. *Dysphania* in its traditional circumscription has no distinct characters clearly separating it from other “glandular” species previously placed in *C.* subgen. *Ambrosia* (see Mosyakin & Clemants, Ukrayins’k. Bot. Zhurn. 59: 380–385. 2002).

1a. Inflorescence paniculate or spicate ..... 4. *D. ambrosioides*
1b. Inflorescence a compound dichasium.
2a. Terminal branches of inflorescence without flowers, ending with acicular, sterile branches ..... 1. *D. aristata*
2b. Terminal branches of inflorescence without acicular, sterile branches.
3a. Plants (especially adaxially on leaves and perianth) with both articulated, stalked glands and sessile (rarely subsessile) glands; perianth segments abaxially longitudinally keeled or crested, spreading in fruit ..... 2. *D. schraderiana*
3b. Plants with sessile (rarely subsessile) glands; perianth segments not abaxially keeled or with a weak keel, erect in fruit (N Xinjiang) ..... 3. *D. botrys*

1. Dysphania aristata (Linnaeus) Mosyakin & Clemants, Ukrayins’k. Bot. Zhurn. 59: 383. 2002.

刺藜 ci li

Chenopodium aristatum Linnaeus, Sp. Pl. 1: 221. 1753; *C. minimum* W. Wang & P. Y. Fu; *C. sinense* hort ex Moquin-Tandon; *C. tibeticum* A. J. Li; *Teloxys aristata* (Linnaeus) Moquin-Tandon.

Herbs annual, often tinged purple-red, usually appearing conic, 10–40 cm tall, glabrous. Stem erect, terete or with colored ribs, glabrous or slightly glandular pubescent, much branched. Petiole short; leaf blade linear to narrowly lanceolate, to 7 × 1 cm, base attenuate, merging into petiole, margin entire to indistinctly erose-dentate, apex acute to acuminate; midvein yellow-white. Compound dichasia borne in leaf axils from near base of plant and on upper part of branches, apical branchlets of inflorescence acicular. Flowers not pedunculate, bisexual. Perianth segments 5, spreading in fruit, narrowly elliptic, slightly fleshy abaxially, margin membranous, apex obtuse or abruptly acute. Utricle depressed, orbicular; pericarp pellucid, adnate to seed. Seed horizontal, depressed, ca. 1 mm in diam., rim margin truncate or with a rib. Fl. Aug–Sep, fr. Oct.

A weed, often in fields, sometimes in wastelands and on slopes. Hebei, Heilongjiang, Henan, Jilin, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang [Asia, SE Europe; introduced in North America].

Several "microspecies" and infraspecific entities were proposed within this species (s.l.). These segregate taxa differ mostly in such variable characters as size of plant, degree of pubescence (glabrous to sparsely glandular pubescent), leaf shape (margin entire to serrate-dentate), and occasional presence of flowers on some terminal branches. These characters show no clear geographic pattern and thus cannot be considered specifically diagnostic. For example, glandular pubescent plants with an erose-serrate leaf margin (described as *Chenopodium tibeticum*) occur throughout the range of *Dysphania aristata*.

2. Dysphania schraderiana (Roemer & Schultes) Mosyakin & Clemants, Ukrayins'k. Bot. Zhurn. 59: 383. 2002.

菊叶香藜 ju ye xiang li

Chenopodium schraderianum Roemer & Schultes, Syst. Veg. 6: 260. 1820; *Ambrina foetida* Moquin-Tandon; *C. foetidum* Schrader (1808), not Lamarck (1778); *C. foetidum* subsp. *tibetanum* Murr; *Teloxys foetida* Kitagawa; *T. schraderiana* (Roemer & Schultes) W. A. Weber.

Herbs annual, 20–60 cm tall, with a strong odor, covered with articulated, glandular hairs and sessile (rarely subsessile) glands. Stem erect, green striate, usually branched. Petiole 2–10 mm; leaf blade oblong, 2–6 × 1.5–3.5 cm, abaxially glabrous or slightly hairy when young, adaxially pubescent with articulated hairs and yellow, granular glands, rarely almost glabrous, base attenuate, margin pinnately lobed to parted, apex obtuse or acuminate, sometimes mucronate. Compound dichasia axillary. Flowers bisexual. Perianth 1–1.5 mm in diam.; segments 5, spreading in fruit, ovate to narrowly so, longitudinally keeled or crested abaxially, pubescent and with sessile glands, margin narrowly membranous. Stamens 5; filaments flattened; anthers subglobose. Utricle depressed globose; pericarp membranous. Seed horizontal, red-brown or black, sublustrous, 0.5–0.8 mm in diam., finely lineate, rim margin obtuse; embryo semi-annular, surrounding perisperm. Fl. Jul–Sep, fr. Sep–Oct.

Forest margins, meadows, riversides, around houses, sometimes in fields. Gansu, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan [Africa, SW Asia, S Europe; naturalized in North America and locally elsewhere].

For practical and nomenclatural reasons, *Dysphania schraderiana* is accepted here in a broad sense. Probably most (or all) records of this species from China belong to a distinct Asian entity (closely related species or subspecies) known as *Chenopodium nepalense* Link ex Colla (Herb. Pedem. 5: 571. 1836; *C. multiflorum* Moquin-Tandon), for which no combination in *Dysphania* is yet available. Judging from its characters, this plant occupies a transitional position between *D. botrys* and *D. schraderiana*. According to Uotila (in Fl. Iranica), *C. nepalense* differs from *D. schraderiana* s.str. in having perianth segments rather weakly keeled (not distinctly crested), and the keel bearing simple, eglandular hairs (in *D. schraderiana* s.str. the perianth segments are abaxially glabrous or subglabrous). Taxonomic relationships and distributional patterns of these related species or infraspecific taxa need clarification.

3. Dysphania botrys (Linnaeus) Mosyakin & Clemants, Ukrayins'k. Bot. Zhurn. 59: 383. 2002.

香藜 xiang li

Chenopodium botrys Linnaeus, Sp. Pl. 1: 219. 1753; *Ambrina botrys* (Linnaeus) Moquin-Tandon.

Herbs annual, yellow-green, 20–50 cm tall, with a strong odor, covered with stalked, glandular hairs. Stem erect, mostly branched from base. Petiole 2–10 mm; leaf blade oblong, 2–4 × 1–2 cm, base cuneate, margin pinnately parted, apex subobtuse, sometimes mucronulate; lobes obtuse, usually obtusely toothed; upper leaves lanceolate, smaller, margin entire. Compound dichasia axillary, forming tower-shaped panicles on upper branches. Flowers bisexual. Perianth segments (4 or)5, erect in fruit, yellow-green, oblong, abaxially glandular, not longitudinally keeled or only weakly keeled, margin membranous, apex subobtuse or acuminate. Stamens 1–3. Stigmas 2, filiform. Utricle depressed globose; pericarp whitish, membranous . Seed horizontal, black, sublustrous, depressed, 0.75–1 mm in diam., almost unpitted, rim margin obtuse, slightly sulcate. Fl. Jul–Aug, fr. Aug–Sep.

Valleys, river terraces, around houses, roadsides. N Xinjiang [N Africa, C and SW Asia, S Europe; locally naturalized in other subtropical to warm-temperate regions].

4. Dysphania ambrosioides (Linnaeus) Mosyakin & Clemants, Ukrayins'k. Bot. Zhurn. 59: 382. 2002.

土荆芥 tu jing jie

Chenopodium ambrosioides Linnaeus, Sp. Pl. 1: 219. 1753; *Ambrina ambrosioides* (Linnaeus) Spach, nom. illeg.; *Atriplex ambrosioides* (Linnaeus) Crantz; *Blitum ambrosioides* (Linnaeus) G. Beck.

Herbs annual or perennial, 50–80 cm tall, with strong odor. Stem erect, much branched, striate, obtusely ribbed; branches usually slender, pubescent and articulated villous, sometimes subglabrous. Petiole short; leaf blade oblong-lanceolate to lanceolate, abaxially with scattered glands, slightly hairy around veins, adaxially glabrous, base attenuate, margin sparsely and irregularly coarsely serrate, apex acute or acuminate; lower leaves ca. 15 × 5 cm, upper ones gradually reduced and margin subentire. Flowers borne in upper leaf axils, usually 3–5 per glomerule, bisexual and female. Perianth segments (3 or)5, usually nearly closed in fruit. Stamens 5; anthers ca. 0.5 mm. Style obscure; stigmas 3(or 4), filiform, exserted from

perianth. Utricle enclosed by perianth, depressed globose. Seed horizontal or oblique, black or dark red, sublustrous, ca. 0.7 mm in diam., glabrous, rim margin obtuse. Fl. and fr. over a lengthy period.

Naturalized; often cultivated for medicine in N China. Fujian, Guangdong, Guangxi, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [native to tropical America; now widely naturalized in tropical, subtropical, and warm-temperate regions of the world].

Dysphania ambrosioides s.l. is a taxonomically complicated aggregate of several closely related segregate "microspecies" and/or infraspecific taxa. Judging from the herbarium material available, there are several entities naturalized in China. However, their taxonomy and distribution in the Flora area are not well understood, and because of that they are not discussed here.

20. CHENOPODIUM Linnaeus, Sp. Pl. 1: 218. 1753.

藜属 li shu

Herbs annual or perennial, rarely subshrubs, covered with vesicular or terete hairs (in several species sometimes also with uniseriate, multicellular hairs), farinose ("mealy") when dry, rarely glabrous. Leaves alternate, petiolate; leaf blade complanate, margin entire or irregularly serrate or lobed. Inflorescence usually of several flowers forming a glomerule (rarely solitary flowers), these arranged in axillary or terminal spikes, panicles, or dichasia; bracts and bractlets absent. Flowers bisexual or some female. Perianth green, globose, 5-parted, in some species (2 or)3- or 4-parted; segments abaxially slightly fleshy at center or longitudinally keeled, adaxially concave, remaining unchanged in fruit, rarely enlarged or becoming juicy, without appendages. Disk usually absent. Stamens 5 or fewer; filaments sometimes basally united, filiform or capillary; anthers oblong, without an appendage. Ovary globose, slightly depressed, rarely ovoid; ovule subsessile; style obscure or very short; stigmas 2(–5). Fruit a utricle; pericarp membranous or slightly fleshy, adnate to seed or free, indehiscent. Seed horizontal, in some species oblique and/or vertical, ovoid, lenticular, or depressed globose; testa lustrous, leathery, smooth or pitted; embryo annular, semi-annular, or horseshoe-shaped; perisperm copious, farinaceous.

About 170 species: almost worldwide, but most abundant in temperate and subtropical zones; 15 species (one introduced) in China.

1a. Perianth 3- or 4-parted; seeds horizontal, vertical, or oblique.
  2a. Flowers arranged in dense, axillary, globose inflorescences; perianth becoming red and succulent in fruit ..... 1. *C. foliosum*
  2b. Flowers not arranged in axillary, globose inflorescences; perianth not becoming red and succulent in fruit.
    3a. Perianth segments mostly united to near apex ..... 4. *C. chenopodioides*
    3b. Perianth segments united only at base.
      4a. Plants farinose; leaves grayish white abaxially ..... 2. *C. glaucum*
      4b. Plants glabrous to weakly farinose; leaves concolorous ..... 3. *C. rubrum*
1b. Perianth mostly 5-parted; seeds always horizontal (sometimes oblique or vertical in *C. urbicum* subsp. *sinicum*).
  5a. Leaf blade margin entire, or with a pair of simple or divided lateral lobes below middle.
    6a. Inflorescences shorter than leaves.
      7a. Leaves 1.5–3 cm; seed finely foveolate ..... 8. *C. karoi*
      7b. Leaves 0.5–1.5 cm; seed subsmooth ..... 9. *C. iljinii*
    6b. Inflorescences longer than leaves.
      8a. Inflorescence crowded, rachis or beneath flowers with fascicles of terete hairs; leaf blade margin narrowly pellucid; perianth mostly thickened in fruit and becoming star-shaped ..... 5. *C. acuminatum*
      8b. Inflorescence slender and loose, rachis without fascicles of terete hairs; leaf blade margin not pellucid; perianth not thickened in fruit.
        9a. Leaf blade margin with distinct, lateral lobes, sometimes lobes 2-divided; perianth segments ovate; seed radially lineate ..... 6. *C. bryoniifolium*
        9b. Leaf blade margin entire or with obscure, lateral lobes; perianth segments narrowly obovate to linear; seed pitted ..... 7. *C. gracilispicum*
  5b. Leaf blade margin ± toothed.
    10a. Plants glabrous throughout ..... 10. *C. urbicum*
    10b. Plants ± farinose.
      11a. Leaf blade margin palmately lobed; seed usually 2–3 mm in diam., distinctly orbicular pitted ..... 11. *C. hybridum*
      11b. Leaf blade margin not palmately lobed; seed less than 2 mm in diam., not orbicular pitted.
        12a. Plants 2–3 m tall; lower leaves to 20 cm; inflorescence pendulous ..... 12. *C. giganteum*
        12b. Plants usually smaller; lower leaves less than 8 cm; inflorescence not pendulous.
          13a. Leaf blade margin distinctly 3-lobed, middle and lateral lobes serrate; seed hexagonally pitted; perianth segments valvate in bud and remaining closed at anthesis ..... 13. *C. ficifolium*
          13b. Leaf blade margin not 3-lobed; seed lightly lineate; perianth segments imbricate in bud and spreading in flower.
            14a. Leaf blade margins nearly parallel, apex rounded or obtuse ..... 14. *C. strictum*
            14b. Leaf blade margins distinctly non-parallel, apex acute or acuminate ..... 15. *C. album*

1. Chenopodium foliosum Ascherson, Fl. Brandenburg 1: 572. 1864.

球花藜 qiu hua li

Morocarpus foliosus Moench, Methodus, 342. 1794, nom. illeg. superfl., based on *Blitum virgatum* Linnaeus, Sp. Pl. 1: 4. 1753; *Chenopodium blitum* J. D. Hooker; *C. virgatum* (Linnaeus) Ambrosi (1857), not Thunberg (1815).

Herbs annual, 20–70 cm tall. Stem mostly branched from base; branches erect or oblique, light green, slender, glabrous. Leaf blade of lower leaves light green on both surfaces, narrowly triangular-ovate, 2–5 × 2–3 cm, equaling or longer than petiole, not or only slightly farinose, base cuneate, truncate, or hastate, margin irregularly dentate, apex acuminate; teeth near base slightly recurved; leaves gradually reduced on upper stem and branches, lanceolate or ovate-hastate, margin with 1–4 pairs of teeth bilaterally or entire. Flowers bisexual and female, borne on short, axillary branches, forming globose or cylindric-globose, linear arranged glomerules. Perianth light green, usually 3-parted, becoming red and succulent in fruit. Stamens 1–3. Style very short; stigmas 2, slightly divaricate. Utricle compressed globose; pericarp membranous, adnate to seed. Seed vertical, red-brown to black, sublustrous, ca. 1 mm in diam., rim margin obtuse or slightly concave; embryo semi-annular. Fl. Jun–Jul, fr. Aug–Sep.

Forest margins, valleys, slopes. W Gansu, E and N Xinjiang [N Africa, C and SW Asia, Europe; occasionally naturalized in other regions].

The variable *Chenopodium foliosum* aggregate is represented in the mountains of C and SW Asia by several weakly differentiated and closely related races, which are often treated as separate species or at least as subspecies. Probably these entities are high-mountain subspecies or varieties of *C. foliosum* s.l. They include: (1) *C. foliosum* subsp. *montanum* Uotila (Ann. Bot. Fenn. 30: 190. 1993), reported from SW Asia eastward to Iraq and Iran; (2) *C. korshinskyi* (Litvinov) Minkwitz (in B. Fedtschenko, Rastit. Turkestana, 332. 1915; *Blitum korshinskyi* Litvinov, Trudy Bot. Muz. Imp. Akad. Nauk 7: 76. 1910), described from Tajikistan and reported from the Pamir-Alai and Karakoram mountains; and (3) *C. litwinowii* (Paulsen) Uotila (Ann. Bot. Fenn. 30: 190. 1993; *Monolepis litwinowii* Paulsen, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 6(5): 187. 1903), described from the Pamir mountains and reported from the Hindu Kush and Karakoram mountains. *Chenopodium foliosum* s.str. has stem normally erect, branches spreading, and both rather stout; leaf blade of lower leaves longer than broad, margin dentate-serrate to uppermost bracts; fruiting glomerules at least 4 mm, usually red and succulent; seed 1–1.4 mm in diam.; *C. korshinskyi* has stem and branches ascending, slender; leaf blade of lower leaves as long as broad, margin entire but for basal lobes; fruiting glomerules 2–4 mm, dry; *C. litwinowii* has stem and branches prostrate or nearly so; leaf blade of lower leaves longer than broad, margin dentate-serrate (but on upper bracts entire but for a pair of basal lobes); seed 0.8–1.2 mm in diam. Several taxa of the *C. foliosum* aggregate could be expected to occur in China. However, the taxonomic status and distributional patterns of these entities remain rather problematic and, because of that, this group in China needs additional collecting and special taxonomic studies.

2. Chenopodium glaucum Linnaeus, Sp. Pl. 1: 220. 1753.

灰绿藜 hui lü li

Blitum glaucum (Linnaeus) W. D. J. Koch.

Herbs annual, 20–40 cm tall. Stem decumbent or diffuse, green or purple-red striate, ribbed. Petiole 5–10 mm; leaf blade oblong-ovate to lanceolate, 2–4 × 0.6–2 cm, fleshy, abaxially gray-white farinose, sometimes slightly reddish purple, adaxially glabrous, base attenuate, margin irregularly erose to dentate (sometimes indistinctly lobed), apex acute or obtuse; midvein prominent, yellow-green. Flowers bisexual and female, usually several per glomerule, arranged on branches in spicate or paniculate inflorescences (and/or in axillary glomerules), these shorter than leaves and interrupted. Perianth segments 3 or 4, light green, narrowly oblong or obovate-lanceolate, less than 1 mm, slightly succulent, usually not farinose, apex usually obtuse. Stamens 1 or 2; filaments not exserted from perianth; anthers globose. Stigmas 2, very short. Utricle protruding from perianth; pericarp yellow-white, membranous. Seed horizontal, oblique, or vertical, dark brown or red-brown, compressed globose, ca. 0.75 mm in diam., pitted, rim margin obtuse. Fl. and fr. May–Oct.

Fields, vegetable gardens, peripheries of villages, slightly saline-alkaline soils. Fujian, Guangdong, Guangxi, Guizhou, Jiangxi, Yunnan [N and S temperate zones].

Chenopodium glaucum is a variable species represented by various forms of little or no taxonomic significance. However, throughout its extremely wide range it is also differentiated into several morphologically intergrading but geographically defined subspecies or microspecies.

Chenopodium amurense Ignatov (Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 91: 111. 1986) was described from the Amur River area of the Russian Far East. This little-known entity clearly belongs to the *C. glaucum* aggregate (as a species or subspecies), differing from *C. glaucum* s.str. by having 3-lobed leaves and distinctly spatulate perianth segments. Such plants probably also occur in NE China. It should be noted, however, that 3-lobed leaves are characteristic of the rare hybrid, *C.* ×*schulzeanum* Murr (*C. glaucum* × *C. rubrum*).

3. Chenopodium rubrum Linnaeus, Sp. Pl. 1: 218. 1753.

红叶藜 hong ye li

Blitum polymorphum C. A. Meyer, p.p.; *B. rubrum* (Linnaeus) Reichenbach.

Herbs annual, 30–80 cm tall. Stem erect or obliquely spreading, light green or reddish, obscurely striate, ribbed, glabrous; upper branches usually 2–8 cm. Leaf blade green or often red tinged on both surfaces, ovate to rhombic-ovate, 4–8 × 2–6 cm, 3–5 × as long as petiole, succulent, adaxially slightly farinose to subglabrous, base cuneate, margin serrate-dentate to lobed, rarely entire, apex acuminate; teeth in 3–5 pairs, triangular, unequal, usually slightly incurved, apex subobtuse. Flowers bisexual and female, several per glomerule, arranged in spikelike panicles on upper branches. Perianth segments 3 or 4(or 5), green, often becoming red at maturity, obovate, abaxially slightly fleshy at center, adaxially concave, remaining unchanged in fruit, glabrous or slightly farinose. Stigmas 2, very short. Pericarp membranous, whitish, not adnate to seed. Seed vertical, oblique, or horizontal, red-black to black, globose or broadly ovoid, slightly depressed, 0.75–1 mm in diam., distinctly oblong pitted, rim margin obtuse. Fl. and fr. Aug–Oct.

Slightly saline-alkaline places. N Gansu, W Heilongjiang, Nei Mongol, Ningxia, Xinjiang [C and SW Asia, Europe, North America; naturalized in other regions].

Chenopodium gubanovii Sukhorukov (Feddes Repert. 110: 493. 1999) was recently described from the Mongolian Altai Mountains and reported from NE Kazakhstan, W Mongolia, and Russia (Altai and Tuva). Judging from its known distribution pattern, this species can be expected in NW Xinjiang. It differs from *C. rubrum* in having leaf blades broadly ovate to rhombic-ovate, almost entire at the margin; perianth segments oblanceolate, enlarged and distinctly keeled in fruit; and seeds with an acute rim margin. In general habit this taxon resembles *C. chenopodioides*, but evidently differs in the aforementioned perianth and seed characters.

4. Chenopodium chenopodioides (Linnaeus) Aellen, Ostenia (Montevideo) 1933: 98. 1933.

合被藜 he bei li

Blitum chenopodioides Linnaeus, Mant. Pl. 2: 170. 1771; *B. polymorphum* C. A. Meyer, p.p.; *Chenopodium botryodes* Smith.

Herbs annual, 20–50 cm tall. Stem erect, much branched, green striate, ribbed, usually not farinose. Leaf blade green abaxially, dark green adaxially, broadly triangular, 3–4 cm, slightly broader than long, ca. 2 × as long as petiole, slightly succulent, glabrous or slightly farinose, base truncate or broadly cuneate, decurrent to base of petiole, margin serrate or subentire, apex obtuse or shortly acuminate. Glomerules arranged in spikelike panicles on branches; central flowers of glomerules bisexual, lateral ones female. Female flowers: perianth obconic, 2–4-lobed, succulent; lobes cochleariform, unequal, abaxially keeled. Bisexual flowers: perianth depressed hemispheric, 4- or 5-parted; stamens as many as perianth segments. Seed vertical in female flowers, horizontal in bisexual flowers, yellow-brown, sublustrous, depressed ovoid, 0.5–0.75 mm in diam., slightly pitted, rim margin obtuse; embryo annular. Fl. and fr. Aug–Sep.

Gobi desert. N Xinjiang [N Africa, C and SW Asia, Europe, North America].

The distribution of this species is insufficiently known because of confusion with *Chenopodium rubrum*. However, *C. chenopodioides* is confined to saline habitats (coastal and inland salt-marshes).

5. Chenopodium acuminatum Willdenow, Ges. Naturf. Freunde Berlin Neue Schriften 2: 124. 1799.

尖头叶藜 jian tou ye li

Herbs annual, 20–80 cm tall. Stem erect, much branched, green striate, sometimes reddish purple striate, ribbed; branches obliquely spreading, slender. Petiole 1.5–2.5 cm; leaf blade broadly to narrowly ovate, lanceolate, or oblong, 2–4 × 1–3 cm, abaxially ± gray-white farinose, adaxially light green and not farinose (or only moderately so), base broadly cuneate, rounded, or subtruncate, margin entire, pellucid, apex cuneate or shortly acuminate, mucronate. Glomerules arranged into dense or interrupted spikes or spikelike panicles on upper part of branches; rachis with fascicles of terete, multicellular hairs. Flowers bisexual. Perianth compressed globose, 5-parted; segments broadly ovate, mostly thickened abaxially and becoming star-shaped in fruit, reddish or yellowish farinose, margin membranous. Stamens 5; anthers ca. 0.5 mm. Utricle globose or ovoid, depressed. Seed horizontal, black, ca. 1 mm in diam., slightly pitted. Fl. Jun–Jul, fr. Aug–Sep.

River banks, lake shores, beaches, field margins, wastelands. Fujian, Gansu, Guangdong, Guangxi, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Taiwan, Xinjiang, Zhejiang [Japan, Korea, Mongolia, Russia (S Siberia), NE Vietnam; C Asia].

1a. Leaf blade mostly ovate to broadly so, sometimes ovate-lanceolate on upper stem ..... 5a. subsp. *acuminatum*

1b. Leaf blade narrowly ovate, lanceolate, or oblong, obviously longer than wide ..... 5b. subsp. *virgatum*

5a. Chenopodium acuminatum subsp. **acuminatum**

尖头叶藜(原亚种) jian tou ye li (yuan ya zhong)

Chenopodium acuminatum var. *ovatum* Fenzl; *C. album* Linnaeus var. *acuminatum* (Willdenow) Kuntze.

Leaf blade mostly ovate to broadly so, sometimes ovate-lanceolate on upper stem.

River banks, field margins, wastelands. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang, Zhejiang [?Japan, Korea, Mongolia, Russia (S Siberia); C Asia].

5b. Chenopodium acuminatum subsp. **virgatum** (Thunberg) Kitamura, Acta Phytotax. Geobot. 20: 206. 1962.

狭叶尖头叶藜 xia ye jian tou ye li

Chenopodium virgatum Thunberg, Nova Acta Regiae Soc. Sci. Upsal. 7: 143. 1815, not (Linnaeus) Ambrosi (1857); *C. vachelii* Hooker & Arnott.

Leaf blade narrowly ovate, lanceolate, or oblong, obviously longer than wide.

Lake shores, beaches, wastelands. Fujian, Guangdong, Guangxi, Hebei, Jiangsu, Liaoning, Taiwan, Zhejiang [Japan, NE Vietnam].

This predominantly littoral and alluvial taxon is certainly of Sino-Japanese distribution and is sometimes treated as a separate species (*Chenopodium virgatum* or *C. vachelii*). However, there was much controversy regarding the taxonomic affiliation of *C. virgatum*: some authors believed that the name refers to narrow-leaved forms of the *C. album* aggregate or to *C. strictum*.

Judging from the presence of characteristic multicellular hairs (especially in the inflorescence) and leaf and inflorescence morphology, *C. acuminatum* s.l. (*C.* sect. *Acuminata* Ignatov) is related to the Asian perennial *C. fruticosum* C. A. Meyer, the Australian shrubby *C. auricomum* Lindley (the latter, together with the annual *C. auricomiforme* Murr, is placed in *C.* sect. *Auricoma* Aellen), and probably to some other shrubby species.

6. Chenopodium bryoniifolium Bunge, Delect. Sem. Hort. Petrop. 10. 1876.

菱叶藜 ling ye li

Chenopodium koraiense Nakai.

Herbs annual, 50–80 cm tall. Stem erect, much branched

above, terete below, green striate and slightly obtusely ribbed above; branches obliquely spreading, slender. Petiole slender; leaf blade of lower and middle leaves ovate-triangular to ovate-rhombic, usually 3–4 × 2–3 cm, 2–3 × as long as petiole, slightly farinose abaxially, not farinose adaxially, base broadly cuneate, margin distinctly 3-lobed, apex acute; middle lobe triangular, lateral lobes near base, usually 2-toothed; upper leaves smaller, leaf blade subhastate. Glomerules borne on upper branches, arranged into slender, spikelike panicles. Flowers bisexual. Perianth segments 5, slightly spreading in fruit, ovate, abaxially keeled, farinose. Pericarp dark brown, adnate to seed. Seed horizontal, black, very slightly lustrous, lenticular, 1.3–1.5 mm in diam., distinctly radially lineate. Fl. and fr. Jul–Sep.

Forest margins, meadows. Hebei, Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia (Far East, SE Siberia)].

The name *Chenopodium atripliciforme* Murr (sometimes incorrectly cited as "*atriplicifolium*") has often been treated as a synonym of *C. bryoniifolium*, or misidentified as *C. opulifolium* Schrader ex Candolle. However, *C. atripliciforme* is a separate species reported from NE Afghanistan, N India, and N Pakistan. Judging from several herbarium specimens available, it probably also occurs in the mountains of SC Asia. It may also be expected to occur in W China.

7. Chenopodium gracilispicum H. W. Kung, Acta Phytotax. Sin. 16(1): 120. 1978.

细穗藜 xi sui li

Herbs annual, 40–70 cm tall, slightly farinose. Stem erect, sparsely slender branched above, green striate, terete, ribbed. Petiole slender, 0.5–2 cm; leaf blade abaxially gray-green, adaxially fresh green, subglabrous, rhombic to ovate, 3–5 × 2–4 cm, adaxially subglabrous, base broadly cuneate, margin entire or with 2 lateral lobes near base, not pellucid, apex acute or shortly acuminate. Flowers bisexual, usually 2 or 3 per glomerule, these arranged into interrupted spikes on slender branches, forming a narrow, terminal panicle. Perianth 5-parted; segments narrowly obovate or linear, united only at base, abaxially slightly fleshy at center, keeled, margin membranous, apex obtuse. Stamens 5, inserted on base of perianth. Utricle depressed, lenticular; pericarp adnate to seed. Seed horizontal, black, sublustrous, of same shape as utricle, 1.1–1.5 mm in diam., distinctly pitted. Fl. Jul, fr. Aug.

Forest margins, slope grasslands, river banks. S Gansu, Guangdong, Hebei, Henan, Hunan, Jiangsu, Jiangxi, Shaanxi, E Shandong, Sichuan, Taiwan, Zhejiang [Japan].

The name *Chenopodium koraiense* has often been misapplied to this species but is in fact a synonym of *C. bryoniifolium*.

8. Chenopodium karoi (Murr) Aellen, Repert. Spec. Nov. Regni Veg. 26: 149. 1929.

平卧藜 ping wo li

Chenopodium album Linnaeus subsp. *karoi* Murr, Neu. Übers. Bl.-Pfl. Vorarlberg 1: 97. 1923; *C. prostratum* Bunge ex Herder (1889), not Roemer & Schultes (1820), nor Jacquemont ex Moquin-Tandon (1849), nor Roxburgh ex J. D. Hooker (1886); *C. prostratum* subsp. *karoi* (Murr) Lomonosova.

Herbs annual, 20–40 cm tall. Stem prostrate or obliquely spreading, much branched, green striate, terete or obtusely ribbed. Petiole 1–3 cm, slender; leaf blade abaxially pallid, adaxially gray-green, ovate to broadly so, 1.5–3 × 1–2.5 cm, abaxially densely farinose, prominently 3-veined, adaxially not or only slightly farinose, base broadly cuneate, margin usually 3-lobed, apex obtuse or acute and mucronate; central lobe margin entire, rarely slightly crenate; lateral lobes positioned near middle of leaf blade, margin obtuse and entire. Flowers several per glomerule, these arranged on branchlets into axillary panicles shorter than leaves. Perianth segments (4 or)5, usually closed in fruit, ovate, abaxially slightly keeled, margin yellowish, membranous, apex obtuse. Stamens as many as perianth segments; anthers exserted at anthesis. Stigmas 2(or 3), filiform. Pericarp yellow-brown, membranous, adnate to seed. Seed horizontal, black, sublustrous, lenticular, 1–1.2 mm in diam., finely pitted. Fl. and fr. Aug–Sep.

Mountains, often around livestock corrals, wastelands, around houses, vegetable gardens; 1500–4000 m. W Gansu, N Hebei, Qinghai, NW Sichuan, Xinjiang, Xizang [Mongolia, Russia (Far East, Siberia); C Asia].

This species is closely related to *Chenopodium iljinii* and the C Asian *C. pamiricum* Iljin on the one hand, and to *C. bryoniifolium* on the other.

9. Chenopodium iljinii Goloskokov, Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 13: 65. 1950.

小白藜 xiao bai li

Chenopodium bryoniifolium Bunge var. *kapelleriae* Aellen ex Iljin.

Herbs annual, 10–30 cm tall, farinose throughout. Stem usually prostrate or obliquely spreading, much branched, sometimes branched only from base. Petiole slender, 0.4–1 cm; leaf blade gray-green, ovate to ovate-triangular, usually 0.5–1.5 × 0.4–1.2 cm, farinose on both surfaces, base broadly cuneate, margin entire or 3-lobed, apex subobtuse or acute; lateral lobes attached near base of leaf blade, apex obtuse. Glomerules forming short spikes on axillary branchlets. Perianth segments (4 or)5, obovate-linear to oblong, not keeled, abaxially densely farinose. Filaments slightly shorter than perianth; anthers broadly oblong. Style obscure; stigmas 2, filiform. Utricle depressed. Seed horizontal, rarely oblique, black, sublustrous, lenticular, sometimes depressed ovoid, 0.8–1.2 mm in diam., subsmooth or slightly pitted. Fl. and fr. Aug–Oct.

Valley terraces, slopes, drier grasslands; 2000–4000 m. W Gansu, Ningxia, Qinghai (Qilian Shan), NW Sichuan, Xinjiang [Kazakhstan].

The closely related, C Asian *Chenopodium pamiricum* Iljin (in Shishkin, Fl. URSS 6: 873. 1936) may be expected to occur in the mountains of W China. Probably some Chinese records of *C. iljinii* refer to that species.

10. Chenopodium urbicum Linnaeus, Sp. Pl. 1: 281. 1753.

市藜 shi li

Herbs annual, 20–100 cm tall, not farinose (but young leaves and inflorescence rachis sometimes slightly tomentose). Stem erect, branched or unbranched, striate, ± stout, ribbed.

Petiole 2–4 cm; leaf blade concolorous, triangular or rhombic-ovate, 3–8 cm (lower ones sometimes to 15 cm), narrower than or as wide as long, slightly succulent, base subtruncate or broadly cuneate, margin irregularly serrate, apex acute or acuminate. Glomerules few or many flowered, forming axillary or terminal, erect, spikelike panicles. Flowers bisexual and female. Perianth segments 3–5. Filaments slightly shorter than perianth; anthers oblong. Utricle lenticular; pericarp brown. Seed horizontal, oblique, or vertical, red-brown to black, sublustrous, 0.5–1 mm in diam., obscurely or obviously pitted, rim margin obtuse or acute. Fl. and fr. Jul–Oct.

Gobi desert, wastelands, saline-alkaline places, field margins. Hebei, Heilongjiang, N Jiangsu, Jilin, Liaoning, Nei Mongol, N Shaanxi, Shandong, Shanxi, N Xinjiang [N Africa, C and SW Asia, Europe; introduced in North America and some other regions].

1a. Leaf blade triangular, 3–8 cm; glomerules few flowered, forming axillary, spikelike panicles; perianth segments 5; seed horizontal, ca. 1 mm in diam., obscurely pitted, rim margin obtuse ..... 10a. subsp. *urbicum*

1b. Leaf blade rhombic-ovate, lower ones to 15 cm; glomerules many flowered, forming mainly terminal, spikelike panicles; perianth segments 3–5; seed horizontal, oblique, or vertical, 0.5–0.7 mm in diam., obviously pitted, rim margin acute ..... 10b. subsp. *sinicum*

10a. Chenopodium urbicum subsp. **urbicum**

市藜(原亚种) shi li (yuan ya zhong)

Leaf blade triangular, 3–8 cm, margin irregularly serrate. Glomerules few flowered, forming axillary, spikelike panicles. Perianth segments 5. Seed horizontal, ca. 1 mm in diam., obscurely pitted, rim margin obtuse. Fl. Aug–Sep, fr. Oct.

Gobi desert, field margins. N Xinjiang [N Africa, C and SW Asia, Europe; introduced in North America and some other regions].

10b. Chenopodium urbicum subsp. **sinicum** H. W. Kung & G. L. Chu, Acta Phytotax. Sin. 16(1): 121. 1978.

东亚市藜 dong ya shi li

Leaf blade rhombic-ovate, lower ones to 15 cm, margin with a pair of larger teeth near base. Glomerules many flowered, forming mainly terminal, spikelike panicles. Perianth segments 3–5, narrowly obovate to spatulate. Seed horizontal, oblique, or vertical, 0.5–0.7 mm in diam., obviously pitted, rim margin acute. Fl. and fr. Jul–Oct.

● Wastelands, saline-alkaline places, field margins. Hebei, Heilongjiang, N Jiangsu, Jilin, Liaoning, Nei Mongol, N Shaanxi, Shandong, Shanxi, N Xinjiang.

11. Chenopodium hybridum Linnaeus, Sp. Pl. 1: 219. 1753.

杂配藜 za pei li

Herbs annual, 0.4–2.2 m tall. Stem erect, sparsely branched above, stout, light yellow or purple ribbed, glabrous or sparsely farinose. Petiole 2–7 cm; leaf blade fresh green on both surfaces, broadly ovate to ovate-triangular, 6–15 × 5–13 cm, glabrous or slightly farinose, base rounded, truncate, or subcordate, margin palmately lobed to deeply erose-dentate, apex acute or acuminate; lobes in 2 or 3 pairs, unequal, apex usually acute to acuminate; upper leaves smaller, leaf blade mostly triangular-hastate, margin with a few lobelike teeth, sometimes subentire. Flowers bisexual and female, usually several per glomerule, these arranged in spreading panicles on upper branches. Perianth segments 5, narrowly ovate, abaxially keeled, slightly farinose, margin membranous, apex obtuse. Stamens 5. Utricle lenticular; pericarp white dotted, membranous, adnate to seed. Seed horizontal, black, not lustrous, of same shape as utricle, usually 2–3 mm in diam., distinctly orbicular pitted; embryo annular. Fl. and fr. Jul–Sep.

Forest margins, scrub, valleys, slopes. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [NE India, Japan, Korea, Mongolia, Russia (Siberia); C Asia, Europe; represented by a vicariant race in North America].

The *Chenopodium hybridum* aggregate is represented in China by at least two entities (subspecies or even species) which differ from the typical European and SW Asian plant (*C. hybridum* subsp. *hybridum*): (1) C Asian plants which were described as *C. badachschanicum* Tzvelev (Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 20: 434. 1960), and (2) E Asian plants which may be an as yet undescribed taxon. The plants from E China somewhat approach in their characters the North American species (or subspecies) *C. simplex* (Torrey) Rafinesque (*C. gigantospermum* (Aellen) Aellen). A new taxonomic revision of the *C. hybridum* aggregate throughout its range could clarify the situation.

12. Chenopodium giganteum D. Don, Prodr. Fl. Nepal. 75. 1825.

杖藜 zhang li

Chenopodium amaranticolor Coste & Reynier; *C. mairei* H. Léveillé.

Herbs annual, large, to 3 m tall. Stem erect, much branched above, stout, reddish green or reddish purple striate, ribbed, base to 5 cm in diam. Leaf blade abaxially light green, adaxially dark green, rhombic to ovate, to 20 × 16 cm, 1.5–2 × as long as petiole, abaxially farinose or glabrescent, adaxially not farinose, base broadly cuneate, margin irregularly undulate serrate, apex usually obtuse; upper leaf blades gradually becoming smaller, ovate to ovate-lanceolate, reddish or golden yellow vesicular hairy when young, margin serrate or entire. Inflorescence of large, terminal panicles, farinose, usually pendulous in fruit. Flowers bisexual, several per glomerule or solitary. Perianth segments 5, green or dark purple, ovate, margin membranous. Stamens 5. Utricle lenticular; pericarp membranous. Seed horizontal, black or red-black, ca. 1.5 mm in diam., reticulate lineate, rim margin obtuse. Fl. Aug, fr. Sep–Oct.

Long cultivated in China and becoming naturalized. Beijing. Gansu, Guangxi, Guizhou, Hebei, Henan, Hunan, Liaoning, Shaanxi, Sichuan, Taiwan, Yunnan [native origin unknown; commonly cultivated in many countries of the world].

This plant most probably represents a cultivar, which originated in India, of the *Chenopodium album* aggregate. Similar cultivated plants of E Asia were described as *C. centrorubrum* (Makino) Nakai. Other similar plants (probably of different origin) are known as *C. amaranticolor*, *C. purpurascens* Jacquin, etc. A new taxonomic revision of cultivated members of the *C. album* aggregate is badly needed.

The stout stems are used for making walking sticks.

13. Chenopodium ficifolium Smith, Fl. Brit. 1: 276. 1800.

小藜 xiao li

Herbs annual, 20–50 cm tall. Stem erect, green striate, ribbed. Leaf blade ovate-oblong, 2.5–5 × 1–3.5 cm, margin usually 3-lobed; central lobe margins almost parallel, subentire to sinuate-dentate, apex obtuse or subacute, mucronate; lateral lobes positioned in proximal 1/3 or near base of leaf blade, margin entire or shallowly dentate. Flowers bisexual, several per glomerule, these arranged in spreading, terminal panicles on upper branches. Perianth subglobose, 5-parted; segments valvate in bud, remaining closed at anthesis, broadly ovate, abaxially longitudinally keeled, densely farinose. Stamens 5, exserted at anthesis. Stigmas 2, filiform. Utricle included in perianth, falling together with it from plant; pericarp adnate to seed. Seed horizontal, black, sublustrous, ca. 1 mm in diam., distinctly hexagonally pitted, rim margin subobtuse; embryo annular. Fl. Apr–May.

Common weed of waste places, garbage dumps, roadsides, etc. Anhui, Chongqing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [Asia, Europe; naturalized in North America and some other regions of the world].

Chenopodium ficifolium is represented in China by two subspecies: subsp. *ficifolium* and subsp. *blomianum* (Aellen) Aellen (Hegi, Ill. Fl. Mitt.-Eur., ed. 2, 3(2): 624. 1960; *C. blomianum* Aellen, Bot. Not. 1928: 203. 1928). The latter differs from the typical subspecies in having leaf blades with an often shorter middle lobe and less prominent lateral lobes, and seeds with shallower and less evident pits and a sinuous rim margin. It is distributed from Iraq to S and SE Asia. However, the typical subspecies also occurs within the range of subsp. *blomianum*. Both subspecies are variable, and several varieties have been described.

Chenopodium ficifolium occasionally hybridizes with other species of *C.* sect. *Chenopodium*.

The name *Chenopodium serotinum* Linnaeus has often been misapplied to this species but in fact refers to a species of *Atriplex*.

14. Chenopodium strictum Roth, Nov. Pl. Sp. 180. 1821.

圆头藜 yuan tou li

Chenopodium betaceum Andrzejowski; *C. striatum* (Krašan) Murr.

Herbs annual, 20–50 cm tall. Stem erect, basal branches ascending, upper branches usually erect; stem and branches green and red striate, often becoming deep beet red at maturity, ribbed. Leaf blade abaxially whitish gray to dark green, ovate-oblong to oblong, usually 1.5–3(–6) × 0.8–2.5 cm, 2–3 × as long as petiole, abaxially moderately to densely farinose, adaxially slightly or moderately farinose, base broadly cuneate, margin above base subentire to serrate or dentate, apex rounded, sometimes shortly mucronate; teeth gradually becoming smaller distally on margin. Glomerules arranged into narrow, interrupted, spikelike or moniliform panicles on upper part of branches. Flowers bisexual. Perianth segments 5, obovate, abaxially slightly keeled, margin membranous. Stigmas 2, filiform, recurved. Utricle depressed; pericarp adnate to seed. Seed black or black-red, sublustrous, depressed ovoid, ca. 1 mm in diam., slightly lineate, rim margin acutely ribbed. Fl. and fr. Jul–Sep.

Valleys, river banks, roadsides. Gansu, Hebei, Shaanxi, Shanxi, S Xinjiang; also NE China [Japan, Korea, Russia (S Siberia); C and SW Asia, Europe; naturalized in North America and occasionally elsewhere].

The *Chenopodium strictum* group includes several closely related, predominantly (or exclusively?) tetraploid (2*n* = 36) species or infraspecific taxa, such as *C. novopokrovskyanum* (Aellen) Uotila, *C. striatiforme* Murr, *C. strictum*, and some others. *Chenopodium novopokrovskyanum* (Aellen) Uotila (Ann. Bot. Fenn. 30: 192. 1993; *C. album* Linnaeus subsp. *novopokrovskyanum* Aellen, Trudy Rostovsk. Otd. Vsesoyuzn. Bot. Obshch. 2: 3. 1938) differs from *C. strictum* in having leaf blades narrow, densely farinose (grayish green to silvery), and with the margin entire or subentire, occasionally with 1, rarely 2, pairs of teeth. In its overall habit, *C. novopokrovskyanum* is superficially similar to North American species of *C.* subsect. *Leptophylla* Clemants & Mosyakin, but it is not directly related to them. *Chenopodium novopokrovskyanum* is known from the steppe and desert zones of SE Europe (SE European Russia and SE Ukraine), C and SW Asia, and probably also NW China, W Mongolia, and S Siberia. The distribution of this taxon in China needs clarification.

15. Chenopodium album Linnaeus, Sp. Pl. 1: 219. 1753.

藜 li

Herbs annual, 15–150 cm tall. Stem erect, much branched, green or purple-red striate, stout, ribbed; branches oblique or spreading. Leaf blade rhombic-ovate to broadly lanceolate, 3–6 × 2.5–5 cm, 1–2 × as long as petiole, abaxially ± farinose, adaxially usually glabrous, or sometimes reddish purple vesicular hairy on young leaves, base cuneate to broadly so, margin irregularly serrate, apex subobtuse or acute. Glomerules arranged into large or small panicles or spikelike panicles on upper part of branches. Flowers bisexual. Perianth segments 5, broadly ovate to elliptic, abaxially longitudinally keeled, farinose, margin membranous, apex acute or slightly emarginate. Stamens 5; anthers exserted. Stigmas 2. Pericarp adnate to seed. Seed horizontal, black, sublustrous, lenticular, 1–1.5 mm in diam., lineate, rim margin obtuse. Fl. and fr. May–Oct.

Fields, waste places, roadsides, a difficult weed to control. Throughout China [probably throughout temperate and tropical regions of the world].

Chenopodium album s.l. in its more or less traditional circumscription is a diverse aggregate of predominantly hexaploid (2*n* = 54) taxa. It is represented in China by many insufficiently known and poorly delimited infraspecific entities. Some of them are, however, rather distinct from European plants. The taxonomic situation is further obscured by exceptional variability and widespread hybridization in the group. Consequently, no attempt has been made here to classify the Chinese infraspecific entities of *C. album* s.l. The precise global

distribution is uncertain because many plants reported as *C. album* in the literature in fact belong to other, closely related species.

21. KOCHIA Roth, J. Bot. (Schrader) 1800(1): 307. 1801.

地肤属 di fu shu

Herbs annual, less often subshrubs, villous or pubescent, rarely glabrous. Stem erect or oblique, usually much branched. Leaves alternate, sessile or subsessile, terete, semiterete, or narrowly complanate, margin entire. Flowers axillary, sessile, usually 1–3-glomerulate, bisexual, sometimes some female, without bractlets. Perianth subglobose, 5-parted, herbaceous, usually hairy; segments incurved, abaxially with transverse, winglike, membranous, veined appendages in fruit. Disk absent. Stamens 5, inserted at base of perianth; filaments flattened; anthers broadly oblong, exserted. Ovary broadly ovoid; ovule subsessile; style obscure; stigmas 2 or 3, filiform, papillose. Utricle depressed globose; pericarp membranous, not adnate to seed. Seed horizontal, globose or ovoid, depressed, slightly emarginate near hilum; testa membranous, glabrous; embryo slender, annular; perisperm not copious.

Between ten and fifteen species: temperate zones of N Africa, Asia, Europe, and SW North America; seven species in China.

Scott (Feddes Repert. 89: 101–119. 1978) proposed to submerge *Kochia* and several other related genera into *Bassia*. A traditional circumscription of *Kochia* is accepted here.

1a. Subshrubs ..... 1. *K. prostrata*
1b. Herbs annual.
2a. Leaves terete or semiterete.
3a. Winglike appendages of perianth segments unequal; leaves blue-green ..... 7. *K. melanoptera*
3b. Winglike appendages of perianth segments equal; leaves green.
4a. Plants crowded branched; perianth glabrous, margin of winglike appendage entire ..... 5. *K. krylovii*
4b. Plants sparsely branched; perianth densely pilose, margin of winglike appendage not entire ..... 6. *K. laniflora*
2b. Leaves narrowly complanate.
5a. Winglike appendage of perianth segments elongate, narrow, margin lacerate, apex long acuminate to caudate ..... 2. *K. odontoptera*
5b. Winglike appendage of perianth segments not shaped as above.
6a. Plants densely gray-white pilose throughout; branches irregularly spreading, rigid; margin of winglike appendages of perianth segments erose ..... 3. *K. stellaris*
6b. Plants subglabrous or only inflorescences ferruginous villous; branches ascending, slender; margin of winglike appendages of perianth segments repand or incised ..... 4. *K. scoparia*

1. Kochia prostrata (Linnaeus) Schrader, Neues J. Bot. 3: 85. 1809.

木地肤 mu di fu

Subshrubs 20–80 cm tall. Woody stem usually less than 10 cm; annual branches simple or branched, not striate, slightly ribbed, densely light yellow-brown, light reddish, or gray-white pilose, densely white crisped pilose, or subglabrous. Leaves alternate, usually clustered on dwarf, axillary branchlets, sessile, linear, semiterete, 0.8–2 cm × 1–1.5 mm, spreading sericeous or densely appressed sericeous on both surfaces, base shortly attenuate, apex obtuse or acute; veins obscure. Flowers bisexual and female, usually 2 or 3 per glomerule, these arranged in spikes on upper part of annual branches. Perianth globose, densely sericeous; segments ovate or oblong, incurved, apex obtuse; winglike appendages with purple-red or black-brown veins, flabellate or obovate, membranous, margin irregularly crenate or erose. Filaments filiform, slightly exserted. Stigmas 2, purple-brown, filiform. Utricle depressed globose; pericarp gray-brown, thickly membranous. Seed black-brown, subglobose, ca. 1.5 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

Slopes, sandy places, valleys, Gobi desert, deserts. W Gansu, Hebei, Heilongjiang, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi, Xinjiang, Xizang [C and SW Asia, S Europe].

Kochia prostrata is a very variable species. Several infraspecific taxa have been described, differing mostly in pubescence and some other minor characters, probably environmentally affected, but partly also dependent on geographic and karyological races. No consensus of infraspecific taxonomy is currently available for this species. The following varieties have been reported from China.

The species provides good fodder for animals.

1a. Leaves appressed sericeous ..... 1b. var. *canescens*
1b. Leaves spreading sericeous.
2a. Annual branches densely light yellow-brown or light reddish pilose, or subglabrous ..... 1a. var. *prostrata*
2b. Annual branches densely white crisped pilose ..... 1c. var. *villosissima*

1a. Kochia prostrata var. **prostrata**

木地肤(原变种) mu di fu (yuan bian zhong)

Salsola prostrata Linnaeus, Sp. Pl. 1: 222. 1753; *Kochia suffruticosa* Lessing.

Annual branches densely light yellow-brown or light reddish pilose, or subglabrous. Leaves spreading sericeous.

Slopes, sandy places, valleys, deserts. W Gansu, Hebei, Heilongjiang, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi, Xinjiang, Xizang [C and SW Asia, S Europe].

1b. Kochia prostrata var. **canescens** Moquin-Tandon, Chenop. Monogr. Enum. 93. 1840.

灰毛木地肤 hui mao mu di fu

Annual branches densely gray-white pilose. Leaves densely appressed sericeous.

● Slopes, sandy places. W Gansu, Nei Mongol, Ningxia, Xinjiang.

1c. Kochia prostrata var. **villosissima** Bongard & C. A. Meyer, Verz. Saisang-nor Pfl. 67. 1841.

密毛木地肤 mi mao mu di fu

Annual branches densely white crisped pilose. Leaves spreading sericeous.

● Gobi desert, sandy places, arid slopes. N Xinjiang.

2. Kochia odontoptera Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg, sér. 2, 1: 361. 1843.

尖翅地肤 jian chi di fu

Kochia odontoptera var. *schrenkiana* Moquin-Tandon; *K. schrenkiana* (Moquin-Tandon) Iljin.

Herbs annual, 15–30 cm tall. Stem erect, not striate, ribbed, gray-white cottony pubescent; branches sparse, ascending or oblique, slender, usually slightly curved. Leaves linear, complanate, 0.5–1.2 cm × 1–2.5 mm, densely sericeous on both surfaces, base attenuate, apex shortly acute. Flowers bisexual, usually 2 or 3 per axillary glomerule. Perianth greenish, subglobose, semiappressed light yellowish pilose; segments broadly ovate, apex acute; winglike appendages usually spreading, light brownish yellow, sublanceolate, 2–3.5 mm, membranous, margin lacerate, apex caudate-acuminate. Stamens 5; filaments exserted; anthers oblong, ca. 0.4 mm. Style very short; stigmas 2, light brown, filiform. Utricle obovoid; pericarp slightly whitish, membranous, glabrous. Seed horizontal, dark red-brown, ca. 0.8 mm; perisperm coherent, brown. Fl. and fr. May–Jul.

Dunes, terraces. N Xinjiang [C Asia].

3. Kochia stellaris Moquin-Tandon, Chenop. Monogr. Enum. 93. 1840.

伊朗地肤 yi lang di fu

Bassia iranica (Litvinov ex Bornmüller) Bornmüller; *Kochia iranica* Litvinov ex Bornmüller; *K. odontoptera* Schrenk var. *altera* Schrenk.

Herbs annual, to 50 cm tall, densely gray-white cottony pubescent. Stem erect, woody below, usually with crowded branches; branches irregularly spreading, whitish yellow or reddish purple, rigid. Leaves sessile, semiappressed villous, base attenuate, apex acute or shortly acuminate; lower leaves linear to oblong-lanceolate, to 1.8 cm; upper leaves ovate to oblong, 1.5–3 × 1–2 mm. Flowers bisexual, usually 2 or 3 per axillary glomerule. Perianth green, densely pilose; winglike appendages rhombic to fan-shaped, membranous, brownish yellow veined, apical margin erose. Stigmas 2, exserted, filiform. Style very short, ca. 1/4 as long as stigma. Utricle ovoid; pericarp thinly membranous. Seed dark brown, not lustrous, ca. 1 mm in diam., glabrous; perisperm coherent, brown. Fl. and fr. Jul–Oct.

Gobi desert. W Gansu, Xinjiang [Afghanistan, Pakistan; C Asia, SW Asia (Iran)].

Plants with perianth segments rhombic, narrowed at base, and not erose at margin correspond to *Kochia stellaris* s.str., whereas plants with perianth segments orbicular, erose at margin, have been segregated as *K. iranica*. The difference between these two entities is problematic.

4. Kochia scoparia (Linnaeus) Schrader, Neues J. Bot. 3: 85. 1809.

地肤 di fu

Chenopodium scoparium Linnaeus, Sp. Pl. 1: 221. 1753.

Herbs annual, 50–100 cm tall. Root fusiform. Stem erect, terete, light green or reddish purple, ribbed, slightly pubescent or subglabrous below; branches sparse, oblique. Leaves lanceolate or linear-lanceolate, complanate, 2–5 cm × 3–7 mm, usually with 3 distinct main veins, glabrous or slightly hairy, base attenuate into petiole, margin sparsely ferruginous ciliate, apex shortly acuminate; upper leaves sessile, smaller, 1-veined. Flowers bisexual or female, usually 1–3 per glomerule in axils of upper leaves and forming sparse, spikelike panicles; rachis beneath flowers sometimes ferruginous pilose. Perianth light green, subglobose; segments subtriangular, glabrous or apex slightly hairy, rarely wholly pubescent; winglike appendages triangular to obovate, sometimes subflabellate, membranous, obscurely veined, margin repand or incised. Filaments filiform. Style very short; stigmas 2, usually brownish purple. Utricle depressed globose; pericarp membranous, free from seed. Seed black-brown, sublustrous, ovoid, 1.5–2 mm; perisperm coherent. Fl. Jun–Sep, fr. Jul–Oct.

Valleys, river banks, beaches, wastelands, field margins, roadsides; also cultivated. Throughout China [Asia, Europe; widely naturalized in Africa, Australia, and North and South America].

Kochia scoparia is an extremely variable species. Several forms, varieties, and subspecies have been described. Of these taxa, the most widespread in China is probably var. (or subsp.) *scoparia*, whereas plants with lower branches arcuate, axis of inflorescence distinctly pubescent, and flowers surrounded by a dense tuft of long hairs exceeding the perianth segments have been called var. *subvillosa* Moquin-Tandon (in Candolle, Prodr. 13(2): 131. 1849). The nomenclature of this latter variety is extremely confused; in particular, it has been called *K. densiflora* Turczaninow ex B. D. Jackson (*K. scoparia* subsp. *densiflora* (Turczaninow ex B. D. Jackson) M. Velayos & S. Cirujano; *K. scoparia* var. *albovillosa* Kitagawa), and the names *K. sieversiana* (Pallas) C. A. Meyer and *K. scoparia* var. *sieversiana* (Pallas) Ulbrich ex Ascherson & Graebner have been misapplied to this entity.

This species also has a horticultural form, f. *trichophylla* (A. Voss) Stapf ex Schinz & Thellung, which is characterized by plants appearing ovoid or obovoid (“cypresslike”), with crowded branches, and leaves narrower. It is cultivated in the countryside for brooms. In late autumn, the branches and leaves become red or orange and can be used ornamentally.

The young plants are eaten as a vegetable, and the utricles are used medicinally.

5. Kochia krylovii Litvinov in Krylov, Fl. Altai Government

Tomsk 5: 1121. 1909.

全翅地肤 quan chi di fu

Herbs annual, 10–20 cm tall, densely villous throughout except perianth. Stem much branched; branches crowded, green striate, ribbed. Leaves terete, 0.3–1.5 cm × 0.5–1 mm, base attenuate, apex acute or obtuse. Flowers bisexual, usually 1–3 per glomerule, these borne throughout branches in leaf axils. Perianth discoid, 5-lobed, glabrous; winglike appendages obovate to linear, membranous, usually with purple-red veins, margin entire. Filaments slightly exserted; anthers 0.3–0.4 mm. Style very short; stigmas 2, exserted, recurved, plumose. Utricle broadly ovoid, ca. 1.5 mm; pericarp membranous. Seed black-brown; embryo dark green; perisperm coherent. Fl. Aug, fr. Sep–Oct.

Riversides, wastelands. NE Xinjiang [W Mongolia, Russia (SW Siberia)].

6. Kochia laniflora (S. G. Gmelin) Borbás, Balaton Fl. 340. 1900.

毛花地肤 mao hua di fu

Salsola laniflora S. G. Gmelin, Reise Russland 1: 160. 1770–1774; *Kochia arenaria* (Maerklin) Roth; *Salsola arenaria* Maerklin; *S. dasyphylla* Pallas.

Herbs annual, 20–50 cm tall. Stem erect, simple or sparsely branched, usually reddish purple, not striate, slightly ribbed, slightly cottony pilose; branches obliquely spreading, slender; basal branches suberect. Leaves subsessile, spreading or slightly incurved, semiterete, apex acuminate. Flowers usually 2 or 3 per axillary glomerulate, these forming interrupted spikes on upper branches. Perianth densely long sericeous; segments green, slightly fleshy above winglike appendages; winglike appendages rhombic-ovate to linear, membranous, brown veined, margin erose. Stamens 5; filaments black-brown; anthers exserted, oblong, ca. 1 mm. Style very short; stigmas 2 or 3. Utricle depressed globose; pericarp whitish, membranous, free from seed. Seed black-brown or black, sublustrous, broadly ovoid, 1.5–2 mm; embryo greenish. Fl. and fr. Jul–Sep.

Sunny slopes, riversides, sandy places. N Xinjiang [N Africa, C and SW Asia, Europe].

This species provides good fodder and is enjoyed by camels and sheep.

7. Kochia melanoptera Bunge, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 417. 1880.

黑翅地肤 hei chi di fu

Herbs annual, 15–40 cm tall. Stem erect, much branched, obscurely striate, ribbed; branches oblique, pilose. Leaves shortly petiolate; leaf blade bluish green, terete or clavate, 0.4–2 cm × 0.5–0.8 mm, pubescent or becoming glabrous at maturity, base attenuate, apex obtuse or acute. Flowers bisexual, usually 1–3 per glomerule in almost all leaf axils. Perianth greenish, pubescent or occasionally subglabrous; 3 larger appendages spreading, black-brown, purple-red, or brown veined, winglike, lanceolate to narrowly ovate; 2 other appendages usually erect, subulate or tuberculate; sometimes all 5 appendages winglike but then 2 wings small. Stamens 5; filaments slightly exserted; anthers oblong. Style very short; stigmas 2, light yellow. Pericarp thickly membranous. Seed ovoid; perisperm white, farinose. Fl. and fr. Aug–Sep.

Slopes, sandy places, valley terraces, old river bottoms, waste places. W Gansu, Ningxia, N Qinghai, Xinjiang [Kazakhstan, Mongolia].

22. BASSIA Allioni, Mélanges Philos. Math. Soc. Roy. Turin 3: 177. 1766.

雾冰藜属 wu bing li shu

Echinopsilon Moquin-Tandon.

Herbs annual. Leaves alternate, sessile, linear to lanceolate, complanate, semiterete, or terete, membranous or fleshy, densely hairy. Flowers solitary or forming a spike, sessile, without bracts or bractlets, bisexual. Perianth discoid, 5-lobed, hairy; segments equal; abaxial appendages uncinate, subulate, or triangular in fruit. Stamens 5. Ovary broadly ovoid; style short; stigmas 2 or 3. Utricle depressed ovoid; pericarp membranous, free from seed. Seed horizontal, depressed globose; embryo annular.

Between ten and twelve species: warm-temperate and subtropical zones of the Old World; three species in China.

1a. Leaves oblanceolate or linear-lanceolate, complanate, herbaceous; inflorescence spicate; abaxial appendages of perianth segments uncinate in fruit ..... 3. *B. hyssopifolia*
1b. Leaves semiterete or terete, fleshy; inflorescence not spicate; abaxial appendages of perianth segments subulate or triangular in fruit.
2a. Branches spreading, branching angle usually more than 45°, densely villous; abaxial appendages of perianth segments subulate in fruit ..... 1. *B. dasyphylla*
2b. Branches obliquely spreading, branching angle usually less than 45°, densely lanate; abaxial appendages of perianth segments triangular in fruit ..... 2. *B. sedoides*

1. Bassia dasyphylla (Fischer & C. A. Meyer) Kuntze, Revis. Gen. Pl. 2: 546. 1891.

雾冰藜 wu bing li

Kochia dasyphylla Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 12. 1841; *Chenolea divaricata* (Karelin & Kirilov) J. D. Hooker; *Echinopsilon divaricatus* Karelin & Kirilov.

Plants extremely branched, appearing globose, 20–50 cm

tall, densely villous. Leaves alternate, terete or semiterete, 0.3–1.5 cm × 1–1.5 mm, fleshy, base attenuate, apex obtuse. Flowers bisexual, solitary or paired, usually only 1 flower developing. Perianth 5-lobed, villous; abaxial appendages of segments subulate in fruit. Stamens 5; filaments exserted, filiform. Ovary ovoid; style short; stigmas 2 or 3. Seed depressed subglobose, smooth. Fl. and fr. Jul–Sep.

Gobi desert, saline-alkaline places, dunes, steppes, river banks, terraces, alluvial fans. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Shanxi, Xinjiang, Xizang [Mongolia, Russia (S Siberia); C and SW Asia].

2. Bassia sedoides (Schrader) Ascherson in Schweinfurth, Beitr. Fl. Aethiop. 187. 1867.

肉叶雾冰藜 rou ye wu bing li

Kochia sedoides Schrader, Neues J. Bot. 3: 86. 1809, based on *Salsola sedoides* Pallas, Reise Russ. Reich. 1: 492. 1771, not Linnaeus (1759); *Chenolea sedoides* (Schrader) J. D. Hooker; *Echinopsilon sedoides* (Schrader) Moquin-Tandon; *Willemetia sedoides* Moquin-Tandon.

Plants 10–60 cm tall. Stem erect, branched mostly from near middle, lanate-pilose. Leaves linear, terete, 0.3–1.7 cm × ca. 1 mm, fleshy, densely appressed pubescent and with a few villous hairs, base attenuate, apex obtuse. Flowers usually 2 or 3 per axillary glomerule. Perianth 5-lobed; abaxial appendages of segments triangular, subequaling perianth. Utricle broadly ovoid, smooth. Fl. and fr. Aug–Sep.

Gobi desert, saline and alkaline meadows. N Xinjiang [Mongolia, Russia (S Siberia); C and SW Asia, C and SE Europe].

3. Bassia hyssopifolia (Pallas) Kuntze, Revis. Gen. Pl. 2: 547. 1891.

钩刺雾冰藜 gou ci wu bing li

Salsola hyssopifolia Pallas, Reise Russ. Reich. 1: 491. 1771; *Echinopsilon hyssopifolius* (Pallas) Moquin-Tandon; *Kochia hyssopifolia* (Pallas) Schrader.

Plants much branched, 20–70 cm tall, densely lanate-villous when young; branches obliquely spreading. Leaf blade oblanceolate to linear, 0.8–2.5 cm × 1–3 mm, densely villous on both surfaces, base attenuate, apex obtuse or acute. Flowers usually 2 or 3 per glomerule, these arranged in dense spikes on upper part of branches. Perianth 5-lobed; segments reflexed at apex; abaxial appendages uncinate, exceeding perianth. Seed horizontal, smooth. Fl. and fr. Jul–Sep.

Saline-alkaline places, meadows, valleys, garbage dumps. Gansu (Zhangye), Xinjiang [Mongolia, Russia (SE European part, SW Siberia); NE Africa, C and SWAsia, SE Europe; naturalized in North America].

23. PANDERIA Fischer & C. A. Meyer, Index Sem. Hort. Petrop. 2: 21. 1836.

兜藜属 dou li shu

Herbs annual. Stem erect, much branched, densely villous or also pubescent. Leaves alternate, sessile, linear, linear-lanceolate, oblong, or ovate, base attenuate or broadly cuneate, margin entire, apex obtuse or acute. Flowers axillary, solitary, or several forming a short, dense spike, bisexual and female (plants polygamous), densely pilose, without bractlets. Perianth cylindric-ellipsoid, 5-lobed; segments with an abaxial, cornate or horizontal, winglike appendage distally in fruit. Stamens 5, exserted; filaments filiform, somewhat short. Sigmas 2, exserted, papillate. Utricle depressed ovoid. Seed vertical; embryo horseshoe-shaped; radicle inferior; perisperm copious.

Three species: C and SW Asia; one species in China.

1. Panderia turkestanica Iljin, Izv. Bot. Sada Akad. Nauk SSSR 30: 364. 1932.

兜藜 dou li

Plants 20–45 cm tall, densely villous. Stem branched throughout, reddish purple; lower branches ascending or obliquely spreading. Leaves oblong-ovate, complanate, 0.6–1.2 cm × 3–4 mm, fleshy, densely pubescent on both surfaces, base broadly cuneate, apex acute; upper leaves smaller. Perianth slightly succulent; winglike appendages of segments broadly ovate or suborbicular, base hairy, margin entire or slightly serrulate. Fl. and fr. Jul–Sep.

Gobi desert, deserts, sandy places, wastelands, roadsides. Xinjiang [Kazakhstan; SW Asia (S Caucasus)].

24. CAMPHOROSMA Linnaeus, Sp. Pl. 1: 122. 1753.

樟味藜属 zhang wei li shu

Herbs or subshrubs. Stem erect, densely tomentose; branches ascending. Leaves alternate, solitary, or fascicular on dwarf branches, sessile, linear, semiterete. Inflorescence spicate, without bractlets. Flowers bisexual. Perianth 4-lobed, herbaceous; segments equal, or lateral 2 longer than others, oblong, remaining unchanged in fruit. Stamens 4; filaments exserted, filiform; anthers oblong. Ovary ovoid; ovule sessile; style long; stigmas 2, filiform. Utricle compressed; pericarp membranous, free from seed. Seed vertical; testa leathery; embryo horseshoe-shaped; radicle inferior.

About ten species: C and SW Asia extending to China, Mongolia, and Russia, S Europe; one species in China.

1. Camphorosma monspeliaca Linnaeus, Sp. Pl. 1: 122. 1753.

樟味藜 zhang wei li

Subshrubs. Annual branches diffuse, ascending, or erect, 10–50 cm × 4–10 mm, densely lanate, tomentose, and villous. Leaves semiterete, 3–10 mm, densely hairy, with fascicles on axillary dwarf branches. Inflorescences dense spikes on upper part of branches, 4–10 mm in diam.; bracts slightly reflexed, lanceolate or narrowly so, shorter than or equaling perianth, abaxially long hairy, apex obtuse. Flowers solitary, bisexual. Perianth cylindric, compressed, 3–3.5 mm, hairy; segments 4, slightly recurved, unequal, lateral ones subequaling to ca. 1.5 × as long as middle ones. Stamens 4, exserted; filaments filiform; anthers oblong. Ovary ovoid; style terete; stigmas 2, exserted, filiform. Utricle compressed, elliptic, 1–2 mm; pericarp membranous, not adnate to seed. Seed black-brown, of same shape and size as utricle. Fl. and fr. Jul–Sep.

Gobi desert, deserts, arid slopes, dunes, wastelands. Xinjiang [Mongolia, Russia (SW Siberia); C and SW Asia, SE Europe].

1a. Lateral perianth segments ca. 1.5 × as long as middle ones; plants large; leaves 5–10 mm; inflorescence 4–10 mm in diam.; utricle 1.3–2 mm in diam. ..... 1a. subsp. *monspeliaca*

1b. Lateral perianth segments subequaling middle ones; plants slender, with shorter, densely crowded annual branches; leaves ca. 5 mm; inflorescence ca. 4 mm in diam.; utricle ca. 1 mm in diam. ..... 1b. subsp. *lessingii*

1a. Camphorosma monspeliaca subsp. **monspeliaca**

樟味藜(原亚种) zhang wei li (yuan ya zhong)

Camphorosma ruthenica Marschall von Bieberstein.

Plants large. Leaves 5–10 mm. Inflorescence 4–10 mm in diam. Lateral perianth segments ca. 1.5 × as long as middle ones. Utricle 1.3–2 mm in diam.

Arid slopes, dunes, wastelands. Xinjiang (Tian Shan) [Mongolia, Russia (SW Siberia); C and SW Asia, SE Europe].

1b. Camphorosma monspeliaca subsp. **lessingii** (Litvinov) Aellen, Notes Roy. Bot. Gard. Edinburgh 28: 31. 1967.

同齿樟味藜 tong chi zhang wei li

Camphorosma lessingii Litvinov, Trudy Bot. Muz. Imp. Akad. Nauk 2: 96. 1905.

Plants slender, with shorter, densely crowded annual branches. Leaves ca. 5 mm. Inflorescence ca. 4 mm in diam. Lateral perianth segments subequaling middle ones. Utricle ca. 1 mm in diam. Fl. and fr. Jul–Sep.

Gobi desert, deserts, arid slopes. Xinjiang (Altay Shan) [Mongolia, Russia (SW Siberia); C Asia, extreme SE Europe].

This variety is often treated as a separate species, *Camphorosma lessingii*. An annual (occasionally biennial) species, *C. songorica* Bunge (Trudy Imp. S.-Peterburgsk. Bot. Sada 6(2): 451. 1880), may be expected to occur in W China; it was reported from W Xinjiang by Iljin (in Shishkin, Fl. URSS 6: 119. 1936), but without exact localities or reference to herbarium specimens.

25. LONDESIA Fischer & C. A. Meyer, Index Sem. Hort. Petrop. 2: 15. 1836.

绒藜属 rong li shu

Herbs annual. Stem erect, much branched from base; branches ascending, slender, pubescent. Leaves alternate, sessile or shortly petiolate, lanceolate, oblong-lanceolate, oblong-ovate, or ovate, complanate. Flowers bisexual and female (plants polygamous), without bractlets. Perianth tubular, mostly 5-lobed, membranous, cottony, without appendages, adnate to pericarp. Stamens 5, exserted. Style short; stigmas 2 or 3. Seed vertical in bisexual flowers, horizontal in female flowers; embryo horseshoe-shaped.

One species: C and SW Asia extending to China and Mongolia.

1. Londesia eriantha Fischer & C. A. Meyer, Index Sem. Hort. Petrop. 2: 40. 1836.

绒藜 rong li

Plants 3.5–35 cm tall. Leaves 0.5–1.5 cm × ca. 2 mm, with purple-red veins, villous, base attenuate, margin entire, apex acute. Fl. and fr. Apr–Jun.

Sandy places, valleys, bottomlands. N Xinjiang [Mongolia; C and SW Asia].

This taxon has been regarded as a synonym of *Bassia eriophora* (Schrader) Ascherson. However, opinions differ (see Assadi, Iranian J. Bot. 8: 233–240. 2000), and thus the issue should be studied in more detail.

26. KIRILOWIA Bunge, Delect. Seminum Hort. Bot. Dorpat. 1843: 7. 1843.

棉藜属 mian li shu

Herbs annual. Leaves alternate, sessile, complanate, herbaceous. Flowers axillary, solitary or forming short spikes, bisexual and female (plants polygamous), without bractlets. Perianth 4- or 5-lobed, membranous, remaining unchanged in fruit; segments without appendages. Stamens 4 or 5, exserted; filaments filiform; anthers oblong, minutely appendiculate. Ovary compressed, obovate; style short; stigmas 2, filiform. Utricle not adnate to perianth. Seed vertical; embryo horseshoe-shaped; radicle inferior.

One species: C Asia.

1. Kirilowia eriantha Bunge, Delect. Seminum Hort. Bot. Dorpat. 1843: 7. 1843.

棉藜 mian li

Plants 10–40 cm tall, densely pubescent and sparsely villous. Stem erect, much branched; branches ascending or oblique, slender. Leaves ovate to narrowly so, with reddish purple veins, villous, base broadly cuneate, apex acute. Inflorescence rachis densely villous. Perianth segments narrowly elliptic, densely villous or appressed pubescent. Stigmas hairy. Utricle obovate. Seed compressed ovoid. Fl. and fr. Jul–Aug.

Gobi desert, alkaline places, waste places. N Xinjiang [C Asia].

27. BORSZCZOWIA Bunge, Trudy Imp. S.-Peterburgsk. Bot. Sada 5: 643. 1877.

异子蓬属 yi zi peng shu

Herbs annual, glabrous. Stem erect, much branched; branches alternate, only lower ones opposite. Leaves alternate, sessile, fleshy; lower leaves linear, semiterete; upper leaves narrowly elliptic, flattened. Flowers borne in axillary glomerules, sessile, unisexual (plants monoecious), each with 2 membranous, scale-like bractlets. Male flowers: perianth 5-parted; stamens 5, inserted at base of perianth; filaments filiform, sinuate; anthers subglobose, without an appendage; ovary rudimentary. Female flowers: perianth membranous, veinless, enlarging with ovary in fruit and enclosing utricle, apex 5-lobed or entire; ovary subovoid, slightly compressed; ovule stalked; style obscure; stigmas 2 or 3, subulate. Utricle baccate, of 2 types. Large utricles obovate; pericarp fleshy; endocarp membranous, not adherent to seed; seed vertical, globose, compressed; testa leathery. Small utricles pyriform; seed vertical, ovoid or lenticular; testa thinly crustaceous. Embryo planospiral; perisperm scant, glutinous.

One species: China, Kazakhstan, Uzbekistan.

New morphological, anatomical, and molecular studies of *Suaeda* and related genera (Schütze et al., Pl. Syst. Evol., in press) indicate that *Borszczowia* is closely related to *S.* sect. *Schanginia* (C. A. Meyer) Volkens. Schütze et al. transferred *B. aralocaspica* to *Suaeda* and placed it in a monotypic section.

1. Borszczowia aralocaspica Bunge, Trudy Imp. S.-Peterburgsk. Bot. Sada 5: 643. 1877.

异子蓬 yi zi peng

Suaeda ampullacea Bunge.

Stem 20–50 cm tall, base woody; branches obliquely spreading, pallid to gray-brown, terete, slightly ribbed. Leaves obliquely spreading, gray-green, straight or slightly curved, 1–3 cm × 1–3 mm, base attenuate, apex obtuse or acute. Male and female flowers mixed in glomerules. Male flowers: perianth slightly fleshy; segments spreading, triangular, with 3 veins confluent at tip, apex slightly cucullate; anthers 0.6–0.7 mm. Female flowers: stigmas black-brown. Large utricles 6–8 mm; pericarp finely green veined; seed brown, 2.5–3 mm in diam. Small utricles ca. 3 mm; seed black, sublustrous, ca. 2 mm in diam. Fl. and fr. Aug–Sep.

Gobi desert, strongly saline-alkaline sandy soils. Xinjiang [Kazakhstan, Uzbekistan].

28. SUAEDA Forsskål ex J. F. Gmelin, Onomat. Bot. Compl. 8: 797. 1776, nom. cons.

碱蓬属 jian peng shu

Herbs annual, subshrubs, or shrubs, sometimes glaucous, glabrous, rarely pubescent. Stem erect, obliquely spreading, or prostrate. Leaves usually sessile and linear, terete or semiterete, rarely clavate or slightly compressed, fleshy, margin entire. Flowers small, bisexual, sometimes also female, usually 3 to numerous in glomerules, these axillary or on dwarf, axillary branchlets, sometimes dwarf branchlet base fused to leaf base and glomerule thus appearing to arise from petiole; bractlets 2 per flower, white, scale-like, membranous. Perianth subglobose, hemispheric, or urceolate, 5-parted or -lobed, slightly fleshy or herbaceous; segments abaxially thickened or becoming winglike or hornlike, rarely not modified, adaxially concave or cucullate. Stamens 5; filaments short, flattened; anthers cylindric, ellipsoid, or subglobose, without an appendage. Ovary ovoid or globose; stigmas 2 or 3(–5), usually recurved, papillate throughout. Utricle enclosed by perianth; pericarp membranous, free from seed. Seed horizontal or vertical, lenticular, reniform, ovoid, or globose; testa thinly leathery or membranous; embryo green or whitish, planospiral, slender; perisperm scant or absent.

About 100 species: Asia, Europe, North America, and seashores worldwide: 20 species (two endemic) in China.

1a. Glomerule borne on dwarf, axillary branchlet, dwarf branchlet base fused with petiole and thus glomerule

appearing to be borne on petiole.
2a. Subshrubs.
3a. Leaves usually 3–5 mm, abruptly contracted at base; perianth parted to middle ..... 1. *S. microphylla*
3b. Leaves usually 5–15 mm, attenuate into short petiole at base; perianth parted to base ..... 2. *S. dendroides*
2b. Herbs annual.
4a. Seed horizontal or oblique, ca. 2 mm in diam.; perianth appearing star-shaped in fruit ..... 3. *S. glauca*
4b. Seed vertical, not exceeding 1.5 mm in diam.; perianth not star-shaped in fruit.
5a. Leaves filiform, semiterete, to 1 mm wide; seed sublustrous, without granular processes ..... 4. *S. altissima*
5b. Leaves linear, slightly compressed, 1.5–3 mm wide; seed not lustrous, with granular processes.
6a. Flowers 3 or 4 per glomerule; perianth hemispheric to cupular, about as long as wide, 5-parted, segments slightly spreading at anthesis ..... 5. *S. paradoxa*
6b. Flowers mostly solitary, rarely 2 or 3 per glomerule; perianth cylindric to obovoid, longer than wide, 5-lobed, segments remaining closed at anthesis ..... 6. *S. linifolia*
1b. Glomerule borne in leaf axil or on dwarf, axillary branchlet, dwarf branchlet base not fused with petiole.
7a. Inflorescence ± a terminal panicle; perianth saccate inflated in fruit ..... 7. *S. physophora*
7b. Inflorescence not a terminal panicle; perianth not inflated in fruit.
8a. Perianth segments distinctly veined; stigmas 3–5; seed extremely convex, scarcely pitted.
9a. Perianth segments with a longitudinal, winglike keel abaxially.
10a. Leaf apex with a bristle; perianth segments keeled near apex, keel protruding beyond apex ..... 8. *S. acuminata*
10b. Leaf apex without a bristle; perianth segments keeled throughout length ..... 9. *S. pterantha*
9b. Perianth segments without a keel abaxially.
11a. Glomerules numerous flowered; stigmas 3, plumose; plants large, woody ..... 10. *S. rigida*
11b. Glomerules 3–6-flowered; stigmas 3–5, not plumose; plants small, slender, herbaceous ..... 11. *S. arcuata*
8b. Perianth segments veinless; stigmas 2; seed slightly depressed, ± pitted.
12a. Leaves obovate, succulent, apex rounded or obtuse; glomerules mostly borne on dwarf, axillary branchlets.
13a. Perianth with a transverse, narrow, winglike process; seed distinctly pitted ..... 12. *S. przewalskii*
13b. Perianth with a more developed transverse wing; seed obscurely pitted ..... 13. *S. kossinskyi*
12b. Leaves not obovate, apex subobtuse or acute; glomerules all axillary.
14a. Seed obscurely pitted; anthers 0.3–0.5 mm.
15a. Shrubs small; leaf base articulate; stigmas erect, subulate ..... 18. *S. australis*
15b. Herbs annual; leaf base not articulate; stigmas divaricate or slightly curved, filiform.
16a. Leaves usually sickle-shaped, apex obtuse ..... 19. *S. crassifolia*
16b. Leaves straight or irregularly curved, apex acute ..... 20. *S. salsa*
14b. Seed distinctly pitted; anthers ca. 0.2 mm.
17a. Perianth segments appearing unequally cornate ..... 14. *S. corniculata*
17b. Perianth segments not as above.
18a. Leaf apex obtuse or acute, not mucronate; plants usually prostrate ..... 17. *S. prostrata*
18b. Leaf apex usually distinctly mucronate; plants erect.
19a. Perianth segments each with a developed transverse wing, wings together appearing dish-shaped and 2.5–3.5 mm in diam. ..... 15. *S. heterophylla*
19b. Perianth segments each with a triangular, short, winglike process, processes together appearing star-shaped and not more than 2 mm in diam. ..... 16. *S. stellatiflora*

1. Suaeda microphylla Pallas, Ill. Pl. 52. 1803.

小叶碱蓬 xiao ye jian peng

Chenopodina microphylla (Pallas) Moquin-Tandon; *Lerchea microphylla* (Pallas) Kuntze; *Schoberia microphylla* (Pallas) C. A. Meyer.

Subshrubs to 1 m tall. Stems erect, much branched, gray-brown, somewhat glaucous when young, terete, ribbed, densely pubescent when young; branches spreading, rigid. Leaves gray-green, terete, slightly arcuate, lower ones to 1 cm × 1 mm, upper ones shorter, usually not more than 3 mm, base abruptly contracted, apex mucronate. Glomerules inserted on petiole, usually 3–5-flowered. Flowers bisexual and sometimes female. Perianth gray-green, 5-parted to middle, fleshy; segments oblong, abaxially convex, slightly enlarged in fruit, proximally slightly swollen, apex cucullate. Stamens 5; anthers oblong, ca. 0.5 mm. Style obscure; stigmas 2 or 3. Utricle enclosed by perianth; pericarp black-brown, membranous. Seed vertical or horizontal, black, sublustrous, ovoid, ca. 1.1 mm, obscurely pitted, rim margin obtuse.

Gobi desert, saline-alkaline deserts, dunes, lake shores. N Xinjiang [C Asia, SW Asia (Caucasus)].

2. Suaeda dendroides (C. A. Meyer) Moquin-Tandon, Chenop. Monogr. Enum. 126. 1840.

木碱蓬 mu jian peng

Schoberia dendroides C. A. Meyer, Verz. Pfl. Casp. Meer. 159. 1831; *Chenopodina dendroides* (C. A. Meyer) Moquin-

Tandon.

Subshrubs, 20–60 cm tall. Stems erect, much branched; bark gray-brown to gray-white; branchlets light yellow, slender, ribbed. Leaves gray-green, linear, compressed, 0.8–1.5 cm × 1–1.5 mm, base attenuate into a short petiole, apex obtuse. Glomerules inserted on petiole, usually 5–10-flowered. Flowers bisexual. Perianth green, subglobose, fleshy; segments oblong to ovate, distinctly veined, margin membranous, apex cucullate. Stamens 5; anthers oblong to broadly ovate, ca. 0.8 mm. Style obscure; stigmas 2 or 3. Seed horizontal or vertical, sublustrous, not pitted. Fl. Jun.

Rocky slopes, deserts. N Xinjiang [C Asia, SW Asia (Caucasus)].

3. Suaeda glauca (Bunge) Bunge, Bull. Acad. Imp. Sci. Saint-Pétersbourg 25: 362. 1879.

碱蓬 jian peng

Schoberia glauca Bunge, Enum. Pl. China Bor. 56. 1833; *Chenopodina glauca* (Bunge) Moquin-Tandon; *Salsola asparagoides* Miquel; *Suaeda asparagoides* (Miquel) Makino; *Suaeda stauntonii* Moquin-Tandon.

Herbs annual, to 1 m tall. Stem erect, much branched above, light green, stout, ribbed; branches ascending or oblique, long, slender. Leaves gray-green, filiform-linear, slightly upcurved, semiterete, usually 1.5–5 × ca. 0.15 cm, glabrous, base contracted, apex subacute. Glomerules mostly inserted near base of leaves, 1–5-flowered. Flowers bisexual or sometimes some female. Perianth yellow-green, cupular, 1–1.5 mm (in bisexual flowers) or gray-green, subglobose, ca. 0.7 mm in diam., fleshy (in female flowers); segments ovate-triangular, enlarged in fruit, becoming black when dry, and together star-shaped, apex obtuse. Stamens 5; anthers obovate to oblong, ca. 0.9 mm. Stigmas 2, black-brown, slightly recurved. Utricle enclosed in perianth; pericarp membranous. Seed horizontal or oblique, black, sublustrous, lenticular, ca. 2 mm in diam., distinctly granular pitted, rim margin obtuse or acute; perisperm scant. Fl. and fr. Jul–Sep.

Saline-alkaline soils on beaches, wastelands, canal banks, field margins. Gansu, Hebei, Heilongjiang, Henan, Jiangsu, Nei Mongol, Ningxia, Qinghai, Shandong, Shanxi, Xinjiang, Zhejiang [Japan, Korea, Mongolia, Russia (Far East, SE Siberia)].

The seed oil is used in industry.

4. Suaeda altissima (Linnaeus) Pallas, Ill. Pl. 49. 1803.

高碱蓬 gao jian peng

Chenopodium altissimum Linnaeus, Sp. Pl. 1: 221. 1753; *Lerchea altissima* (Linnaeus) Medikus; *Schoberia leiosperma* C. A. Meyer.

Herbs annual, to 1 m tall. Stem erect, much branched, stout; branches obliquely spreading, terete, slightly ribbed. Leaves dense, filiform, usually irregularly curved, semiterete, 0.5–2 cm × 0.6–0.8 mm, base constricted into short petiole, apex acuminate. Glomerules inserted on petiole, 2–5-flowered or more. Flowers bisexual. Perianth obovoid to subglobose, 1–1.4 mm; segments ovate to suborbicular, abaxially fleshy near apex, slightly cucullate, margin membranous. Stamens 5, usually not all developed; anthers shortly oblong, 0.4–0.5 mm. Style obscure; stigmas usually 3, plumose. Utricle enclosed in perianth; pericarp brown, membranous. Seed vertical, black, ovoid, ca. 1.2 mm, obscurely pitted, rim margin obtuse; radicle inferior. Fl. and fr. Jul–Sep.

Gobi desert, wastelands, pool banks. N Xinjiang [Russia (SW Siberia); C and SW Asia, S Europe].

5. Suaeda paradoxa (Bunge) Bunge, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 427. 1880.

奇异碱蓬 qi yi jian peng

Belovia paradoxa Bunge, Beitr. Fl. Russl. 286. 1852.

Herbs annual, to 1 m tall. Stem erect, much or little branched, terete, slightly ribbed, glabrous, base to 7 mm in diam.; branches obliquely spreading. Leaves obliquely spreading, linear, straight or lower ones slightly curved, abaxially convex, adaxially plane, usually 1–3 cm × 1.5–2.5 mm, base attenuate into short petiole, apex acute. Glomerules inserted on petiole on upper branches, usually 3- or 4-flowered. Flowers bisexual. Perianth hemispheric or subcupular, about as long as wide, 5-parted; segments spreading at anthesis, oblong, unequal, keeled abaxially near apex, obscurely 3-veined, apex cucullate. Anthers exserted, oblong, ca. 0.6 mm. Stigmas 3 or 4, minute. Utricle enclosed in perianth; pericarp membranous, adnate to seed. Seed vertical, black, obliquely ovoid, slightly compressed, ca. 1.5 × 1.1 mm, granular pitted, rim margin obtuse; radicle inferior. Fl. and fr. Jul–Oct.

Moist saline-alkaline soils in mountain ravines, wastelands, beside water, roadsides. Qinghai (Qaidam Pendi), N Xinjiang [C Asia].

6. Suaeda linifolia Pallas, Ill. Pl. 47. 1803.

亚麻叶碱蓬 ya ma ye jian peng

Chenopodium linifolium (Pallas) Roemer & Schultes; *Lerchea linifolia* (Pallas) Kuntze; *Schanginia linifolia* (Pallas) C. A. Meyer.

Herbs annual, 20–70 cm tall. Stem erect, densely or sparsely branched, terete, slightly striate, base to 6 mm in diam.; branches obliquely spreading, long, usually thin. Leaves usually obliquely spreading or suberect, linear, semiterete or compressed, 1–2.5 cm × 2–3 mm, base contracted, appearing shortly petiolate, apex acuminate. Glomerules inserted on petiole, not or only shortly pedunculate, usually 1-flowered, sometimes 2- or 3-flowered; bracts and bractlets ovate, membranous. Flowers bisexual and female. Perianth cylindric to obovoid, 1.5–3 × 1–2 mm, 5-lobed, fleshy; segments usually remaining closed at anthesis, slightly cucullate. Anthers oblong, ca. 0.4 mm. Stigmas 2 or 3, exserted, filiform, very short. Utricle completely enclosed by perianth; pericarp membranous. Seed vertical, black, glaucous, not lustrous, obliquely ovoid, slightly compressed, 1.5–2 × 1.2–1.5 mm, pitted, rim margin obtuse; radicle inferior. Fl. and fr. Jul–Oct.

Gobi desert, strongly saline-alkaline deserts, dry prairies, wet banks. Xinjiang [Russia (SE European part, SW Siberia); C Asia].

7. Suaeda physophora Pallas, Ill. Pl. 51. 1803.

囊果碱蓬 nang guo jian peng

Chenopodium physophorum (Pallas) Moquin-Tandon; *Lerchea physophora* (Pallas) Kuntze; *Salsola physophora* (Pallas) Schrader.

Subshrubs usually 30–80 cm tall. Stems much branched; bark gray-brown, laciniate; annual branches erect or slightly decumbent, pallid. Leaves sessile, blue-gray-green, linear, usually slightly arcuate, semiterete, 3–6 cm × 2–3 mm, base slightly contracted, apex acute to acuminate. Glomerules 1–3-flowered, inserted in bract axils, forming a paniculate inflorescence at apex of dwarf branchlets. Flowers bisexual and female. Perianth subglobose, 5-lobed; segments ovate, incurved, unequal, not keeled, apex obtuse; fruiting perianth enclosing utricle, slightly red tinged, enlarged, appearing saccate, ca. 5 mm in diam. Anthers oblong, ca. 0.8 mm. Style very short; stigmas 2 or 3. Seed horizontal, depressed globose, ca. 3 mm in diam.; testa not lustrous, membranous; radicle not protruding. Fl. and fr. Jul–Sep.

Gobi desert, arid saline-alkaline slopes and alluvial plains. W Gansu, N Xinjiang [Russia (NE Caucasus, SE European part, W Siberia); C Asia].

8. Suaeda acuminata (C. A. Meyer) Moquin-Tandon, Ann. Sci. Nat. (Paris) 23: 309. 1831.

刺毛碱蓬 ci mao jian peng

Schoberia acuminata C. A. Meyer in Ledebour, Icon. Pl. 1: 11. 1829.

Herbs annual, 20–50 cm tall. Root gray-brown. Stem erect, usually much branched, terete; branches gray-green, sometimes light reddish, slightly compressed, subglabrous. Leaves sessile, gray-green, linear, terete, 0.5–1.5 cm × 1–1.5 mm, apex obtuse or subacute and with a bristle, bristle light yellow, ca. 3 mm. Glomerules axillary, usually 3-flowered, central flower larger, bisexual, lateral flowers female; bractlets ovate or ovate-lanceolate, margin slightly serrate, apex acuminate. Perianth segments abaxially with a longitudinal keel near apex and keel extending beyond apex as a longitudinal wing, abaxially slightly keeled in fruit, apex cucullate. Anthers broadly ovate to oblong, ca. 0.6 mm. Ovary narrowly ovoid, apex slightly concave; style obscure; stigmas 3, minute. Utricle enclosed by perianth; pericarp free from seed. Seed horizontal, vertical, or oblique, red-brown to black, sublustrous, subovoid, 0.8–1 mm, smooth, rim margin obtuse; radicle inferior. Fl. and fr. Jun–Sep.

Saline-alkaline deserts, slopes, dunes. N Xinjiang [Mongolia, Russia (SE European part, SW Siberia); C and SW Asia, SE Europe].

9. Suaeda pterantha (Karelin & Kirilov) Bunge, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 430. 1880.

纵翅碱蓬 zong chi jian peng

Schoberia pterantha Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 14: 734. 1841; *Lerchea pterantha* (Karelin & Kirilov) Kuntze; *S. pygmaea* Karelin & Kirilov; *Suaeda pygmaea* (Karelin & Kirilov) Iljin (1936), not Moquin-Tandon (1840); *S. roborowskii* Illjin.

Herbs annual, 15–60 cm tall. Root brown. Stem erect, much branched, terete; branches obliquely or slightly spreading, usually slightly curved above. Leaves gray-green, linear to narrowly elliptic, 0.5–1 cm × 1–2 mm, abaxially convex, adaxially plane, base attenuate, apex shortly acuminate. Glomerules axillary, usually 3–6-flowered; bractlets ovate to ovate-lanceolate, margin slightly toothed. Flowers bisexual and female. Perianth segments usually oblique, 3-winged, abaxially with a longitudinal keel throughout length, apex cucullate. Anthers broadly ovate to oblong, ca. 0.6 mm. Ovary ovoid, apex slightly concave; style absent; stigmas 2 or 3, minute. Utricle enclosed by perianth; pericarp free from seed. Seed horizontal, vertical, or oblique, red-brown to black, sublustrous, ovoid, 0.8–1 × 0.7–0.8 mm, smooth, rim margin obtuse. Fl. and fr. Jul–Oct.

Arid slopes, wastelands. Xinjiang [Russia (SW Siberia); C Asia].

Suaeda pterantha is most probably a synonym of *S. acuminata*.

10. Suaeda rigida H. W. Kung & G. L. Chu, Acta Phytotax. Sin. 16(1): 121. 1978.

硬枝碱蓬 ying zhi jian peng

Herbs annual, large. Stem erect, stout, woody, brown to gray-brown, somewhat smooth, base to 1.5 cm in diam.; branches obliquely spreading, rigid; branchlets slender, somewhat curved. Leaves subhorizontal, linear, terete, 1–1.5 cm × 1.5–2 mm, base attenuate, apex subobtuse or acute. Glomerules axillary, densely numerous flowered. Flowers bisexual and female. Perianth green, parted to below middle; segments narrowly oblong, usually unequal, 3-winged, abaxially fleshy near apex in fruit, margin membranous, apex cucullate. Stamens 5; filaments not exserted, filiform; anthers broadly ovate to shortly oblong, ca. 0.5 mm. Ovary ovoid; style very short; stigmas 3, sometimes 4 or 5, usually exserted, black, plumose. Pericarp membranous, free from seed. Seed vertical, red-brown to black, obliquely ovoid, ca. 1.1 × 0.9 mm, somewhat reticulate lineate.

● Under *Populus* trees by desert streams. S Xinjiang.

Suaeda rigida may be a synonym of *S. turkestanica* Litvinov.

11. Suaeda arcuata Bunge, Beitr. Fl. Russl. 285. 1852.

五蕊碱蓬 wu rui jian peng

Suaeda lipskii Litvinov.

Herbs annual, 10–20 cm tall. Stem erect, few-branched, slender. Leaves linear, somewhat compressed, usually 0.5–1.5 cm × 0.7–2 mm, base attenuate, apex acute. Glomerules axillary, densely 3–6-flowered; bractlets ovate, margin slightly toothed, apex mostly caudate. Flowers bisexual and female. Perianth 5-parted; segments cucullate, unequal, 3-veined, margin membranous. Stamens 5; anthers oblong-elliptic, 0.5–0.8 mm. Ovary narrowly ovoid, apex slightly concave; style absent; stigmas 3–5, exserted, capillary. Utricle not seen. Fl. Sep.

Under *Tamarix* by desert streams. SW Xinjiang [C Asia].

12. Suaeda przewalskii Bunge, Bull. Acad. Imp. Sci. Saint-Pétersbourg 25: 260. 1879.

阿拉善碱蓬 a la shan jian peng

Herbs annual, green, purplish, or reddish purple, 20–40 cm tall. Stems several, prostrate or decumbent, branched, usually somewhat curved, terete; branches sparse, slender. Leaves sessile or subsessile, appearing somewhat ovoid, 1–1.5 cm × ca. 5 mm at widest point, fleshy, succulent, base attenuate, apex rounded. Glomerules borne in leaf axils and on dwarf, axillary branchlets, usually 3–10-flowered; bractlets entire at margin. Flowers bisexual and female. Perianth depressed subglobose, 5-parted; segments broadly ovate, with narrowly triangular, unequal wings extending at base abaxially in fruit. Anthers oblong, ca. 0.5 mm. Stigmas 2, minute. Utricle enclosed by perianth; pericarp adnate to seed. Seed horizontal, reniform or subglobose, ca. 0.5 mm, margin obtuse; testa black, scarcely lustrous, thinly leathery or membranous, clearly foveolate pitted. Fl. and fr. Jun–Oct.

Inter-dunes, lake shores, saline-alkaline bottomlands. W Gansu, W Nei Mongol, Ningxia [Mongolia].

13. Suaeda kossinskyi Iljin, Izv. Glavn. Bot. Sada SSSR 25: 201. 1926.

肥叶碱蓬 fei ye jian peng

Bienertia kossinskyi (Iljin) Tzvelev.

Herbs annual, 10–20 cm tall. Root black-brown, terete. Stem erect, mostly branched from base; branches prostrate or ascending, yellow-white, terete, somewhat ribbed above, glabrous. Leaves subsessile, fleshy, base broadly cuneate, apex rounded; leaves on stem and main branches linear, semiterete, to 1.5 cm × 2 mm; leaves on lateral branches narrowly ovate to obovate, slightly compressed, 3–4 × 2–3 mm. Glomerules borne in leaf axils and on axillary, dwarf, usually bifurcate, leafless branchlets, usually 2–5-flowered. Flowers bisexual and female. Perianth depressed, 5-parted; segments subtriangular, base extended into an irregular, transverse wing in fruit. Stamens 1 or 2 developed; filaments not exserted, flattened filiform; anthers ovate-oblong, ca. 0.3 mm. Style obscure; stigmas 2, divaricate, minute. Seed horizontal, depressed globose or lenticular, 0.8–1.2 mm in diam.; testa red-brown to black, sublustrous, membranous or thinly leathery, obscurely reticular lineate. Fl. and fr. Aug–Oct.

Moist strongly saline-alkaline soils. N Xinjiang [C Asia, SE Europe (Lower Volga region of Russia)].

14. Suaeda corniculata (C. A. Meyer) Bunge, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 429. 1880.

角果碱蓬 jiao guo jian peng

Herbs annual, to 60 cm tall, glabrous. Stem prostrate, decumbent, or erect, light green, somewhat curved, terete, slightly ribbed; branches obliquely spreading, slightly curved, slender. Leaves sessile, linear, straight or lower ones slightly curved, semiterete or compressed, 0.3–2 cm × 0.5–2 mm, base somewhat contracted, apex obtuse or acute. Glomerules arranged into spikes on upper branches, usually 3–6-flowered. Flowers bisexual and female. Perianth depressed, 5-parted; segments unequal, abaxially extended and thickened, appearing unequally cornate, apex obtuse. Filaments slightly exserted, short; anthers yellow-white, subglobose, minute, 0.15–0.2 mm. Style obscure; stigmas 2. Utricle depressed globose; pericarp free from seed. Seed horizontal or oblique, lenticular, 1–1.5 mm in diam.; testa black, sublustrous, leathery, distinctly pitted, rim margin subobtuse. Fl. and fr. Aug–Sep.

Saline-alkaline deserts, lake shores, riversides. W Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, N Qinghai, Xinjiang, Xizang [Mongolia, Russia (S European part, S Siberia); C Asia, SE Europe (SE Ukraine)].

1a. Stem decumbent or erect; leaves semiterete, 1–2 cm × 0.5–1 mm ..... 14a. var. *corniculata*
1b. Stem prostrate; leaves compressed, 0.3–1.2 cm × 1.5–2 mm ..... 14b. var. *olufsenii*

14a. Suaeda corniculata var. **corniculata**

角果碱蓬(原变种) jiao guo jian peng (yuan bian zhong)

Schoberia corniculata C. A. Mey in Ledebour, Fl. Alt. 1: 399. 1829; *Lerchea corniculata* (C. A. Meyer) Kuntze; *Suaeda corniculata* Bunge var. *microcarpa* Fu & W. Wang.

Stem decumbent or erect. Leaves semiterete, 1–2 cm × 0.5–1 mm.

Saline-alkaline deserts, lake shores, riversides. W Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, N Qinghai, Xinjiang [Mongolia, Russia (S European part, S Siberia); C Asia, SE Europe (SE Ukraine)].

14b. Suaeda corniculata var. **olufsenii** (Paulsen) G. L. Chu in H. W. Kung & C. P. Tsien, Fl. Reipubl. Popularis Sin. 25(2): 128. 1979.

藏角果碱蓬 zang jiao guo jian peng

Suaeda olufsenii Paulsen, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 6(5): 194. 1903.

Stem prostrate. Leaves compressed, 0.3–1.2 cm × 1.5–2 mm.

River banks, sandy places on lake shores. Xizang [C Asia (Pamir mountains)].

This taxon should perhaps be treated at specific rank.

15. Suaeda heterophylla (Karelin & Kirilov) Bunge, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 429. 1880.

盘果碱蓬 pan guo jian peng

Schoberia heterophylla Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 14: 734. 1841; *Breza heterophylla* (Karelin & Kirilov) Moquin-Tandon; *Lerchea heterophylla* (Karelin & Kirilov) Kuntze.

Herbs annual, 20–50 cm tall. Stem erect or decumbent, much branched, terete, slightly ribbed; upper branches usually ascending. Leaves blue-gray-green, slightly glaucous, linear to filiform-linear, terete, 1–2 cm × 1–1.5 mm, base attenuate, apex subobtuse, awned; upper leaves shorter and broader. Glomerules axillary, usually 3–5-flowered. Flowers sessile, bisexual. Perianth green, depressed, 5-parted; segments triangular, base extending into a triangular wing, wing usually rounded, wings together appearing dish-shaped, 2.5–3.5 mm in diam.

Anthers subglobose, minute, ca. 0.2 mm in diam. Style obscure; stigmas 2. Seed horizontal, black or red-brown, sublustrous, depressed ovoid or lenticular, ca. 1 mm in diam., distinctly pitted. Fl. and fr. Jul–Sep.

Strongly saline-alkaline places of Gobi desert, riversides, lake shores, sometimes in fields. W Gansu, Ningxia, N Qinghai, Xinjiang, Xizang [C Asia, SW Asia (Caucasus, Iran), SE Europe (Lower Volga region of Russia)].

16. Suaeda stellatiflora G. L. Chu, Acta Phytotax. Sin. 16(1): 122. 1978.

星花碱蓬 xing hua jian peng

Herbs annual, 20–80 cm tall. Stem prostrate or decumbent, usually much branched, somewhat ribbed. Leaves subsessile, linear, slightly curved, semiterete, 0.5–1 cm × ca. 1 mm, base slightly depressed, apex acute or obtuse, awned; leaves of upper stem and branches lanceolate to ovate, shorter, abaxially convex, adaxially plane. Glomerules axillary, usually 2–5-flowered. Flowers bisexual. Perianth depressed, 5-parted, somewhat fleshy; segments extended at base into a transverse, obtusely triangular, equal wing, wings together appearing star-shaped, 1.5–2 mm in diam. Stamens 5; filaments not exserted, filiform; anthers hemispheric, ca. 0.5 mm in diam. Style obscure; stigmas 2, minute. Pericarp free from seed. Seed horizontal, lenticular, 0.9–1 mm in diam.; testa red-brown to black, thinly leathery or membranous, distinctly pitted, rim margin obtuse. Fl. and fr. Jul–Sep.

● Inter-dunes, saline-alkaline wastelands, lake shores, canal banks; 900–2200 m. W Gansu, Xinjiang.

17. Suaeda prostrata Pallas, Ill. Pl. 55. 1803.

平卧碱蓬 ping wo jian peng

Suaeda maritima (Linnaeus) Dumortier var. *vulgaris* Moquin-Tandon; *Chenopodina maritima* (Linnaeus) Moquin-Tandon var. *vulgaris* (Moquin-Tandon) Moquin-Tandon.

Herbs annual, 20–50 cm tall, glabrous. Stem prostrate or obliquely spreading, somewhat ribbed, base branched and slightly woody; upper branches subhorizontal, equal. Leaves gray-green, linear, semiterete, slightly compressed, 0.5–1.5 cm × 1–1.5 mm, base slightly contracted, apex subobtuse or acute; leaves of lateral branches shorter than others, equaling or longer than perianth. Glomerules axillary, 2- to numerous flowered. Flowers bisexual. Perianth green, 5-parted, somewhat fleshy; segments thickened and cucullate in fruit, base extending into an irregular, winglike or tonguelike process. Filaments slightly exserted; anthers broadly oblong or subglobose, ca. 0.2 mm. Style obscure; stigmas 2, black-brown. Utricle depressed; pericarp light yellow-brown, membranous. Seed black, sublustrous, depressed ovoid or lenticular, 1.2–1.5 mm in diam., distinctly pitted. Fl. and fr. Jul–Oct.

Strongly saline-alkaline places. W Gansu, Hebei, N Jiangsu, Nei Mongol, Ningxia, N Shaanxi, Shanxi, N Xinjiang [Russia (S European part, S Siberia); C and SW Asia, SE Europe].

18. Suaeda australis (R. Brown) Moquin-Tandon, Ann. Sci. Nat. (Paris) 23: 318. 1831.

南方碱蓬 nan fang jian peng

Chenopodium australe R. Brown, Prodr. 407. 1810.

Shrubs small, 20–50 cm tall. Stems much branched, usually bearing adventitious roots below, gray-brown to light yellow, leaf scars remaining distinct. Leaves usually obliquely spreading, gray-green or reddish purple, linear, straight or slightly curved, semiterete, 1–2.5 cm × 2–3 mm, base attenuate, articulated, apex acute or obtuse; upper leaves shorter, narrowly ovate to elliptic, abaxially convex, adaxially plane. Glomerules axillary, 1–5-flowered. Flowers bisexual. Perianth green or reddish purple, slightly depressed, 5-parted, somewhat fleshy; segments ovate-oblong, thickened in fruit, veinless, margin submembranous. Anthers broadly ovate, ca. 0.5 mm. Style obscure; stigmas 2, not recurved, yellow-brown to black-brown, nearly subulate, papillate. Utricle depressed globose; pericarp membranous, free from seed. Seed black-brown, sublustrous, lenticular, 0.8–1 mm in diam., slightly pitted. Fl. and fr. Jul–Nov.

Mangrove forest margins, sandy places on beaches, seashores. Fujian, Guangdong, Guangxi, Jiangsu, Taiwan [S Japan; SE Asia, Australia].

19. Suaeda crassifolia Pallas, Ill. Pl. 54. 1803.

镰叶碱蓬 lian ye jian peng

Schoberia obtusifolia Bunge; *Suaeda drepanophylla* Litvinov.

Herbs annual, 20–50 cm tall. Stem erect, usually much branched, pallid or yellow-white, terete below, slightly ribbed above, glabrous. Leaves usually blue-green, upcurved sickle-shaped, linear, terete, 0.5–1.5 cm × 1.5–2 mm, base somewhat contracted, apex obtuse; upper leaves shorter, broadly elliptic to suborbicular. Glomerules 4–12-flowered or more, forming an interrupted spikelike panicle; bractlets ovate or obovate, apical margin slightly toothed. Flowers bisexual and sometimes female. Perianth star-shaped, 1.5–2 mm in diam.; segments ovate, unequal, base extended into cornate and triangular processes. Stamens 5; anthers broadly elliptic, ca. 0.3 mm. Style obscure; stigmas 2, black-brown. Seed horizontal or oblique, red-brown to black, sublustrous, ovoid or slightly depressed, ca. 1 × 0.8 mm, finely lineate. Fl. Jun–Jul, fr. Aug–Sep.

Saline-alkaline deserts, river banks, lake shores. S Xinjiang [C Asia, SW Asia (E Caucasus, N Iran), SE Europe (Lower Volga region of Russia)].

20. Suaeda salsa (Linnaeus) Pallas, Ill. Pl. 46. 1803.

盐地碱蓬 yan di jian peng

Chenopodium salsum Linnaeus, Sp. Pl. 1: 221. 1753; *Chenopodina salsa* (Linnaeus) Moquin-Tandon; *Lerchea salsa* (Linnaeus) Medikus; *Salsola salsa* (Linnaeus) Linnaeus; *Schoberia salsa* (Linnaeus) C. A. Meyer; *Suaeda heteroptera* Kitagawa; *S. heteroptera* var. *tenuiramea* P. Y. Fu & W. Wang; *S. ussuriensis* Iljin.

Herbs annual, green or purple-red, 20–80 cm tall. Stem erect, branching mostly above, yellow-brown, terete, somewhat ribbed, glabrous; branches spreading or oblique, slender. Leaves sessile, linear, semiterete, usually 1–2.5 cm × 1–2 mm, apex subobtuse or acute; upper leaves shorter. Glomerules axillary, usually 3–5-flowered, arranged into interrupted spikes on branches; bractlets ovate, margin subentire. Flowers bisexual and sometimes female. Perianth hemispheric, abaxially plane; segments ovate, somewhat fleshy, abaxially slightly thickened in fruit, sometimes base extended into a triangular or narrow, winglike process, margin membranous, apex obtuse. Anthers ovoid or oblong, 0.3–0.4 mm. Style obscure; stigmas 2, usually black-brown, papillate. Utricle enclosed in perianth; pericarp membranous, usually broken after ripening. Seed horizontal, black, sublustrous, lenticular or obliquely ovoid, 0.8–1.5 mm in diam., obscurely reticulate lineate, rim margin obtuse. Fl. and fr. Jul–Oct.

Saline and alkaline soils on beaches, lake shores. NW Gansu, Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, N Shaanxi, Shandong, Shanxi, Xinjiang, Zhejiang [Korea, Mongolia; Asia, Europe].

29. CORNULACA Delile, Descr. Egypte, Hist. Nat. 206. 1813–1814.

单刺蓬属 dan ci peng shu

Herbs annual or small shrubs. Stem and branches stout, not jointed. Leaves sessile, alternate, subulate or acicular, base expanded, apex pellucid; leaf axils fascicular villous. Flowers solitary or clustered in leaf axils, minute, bisexual, with 2 bractlets. Perianth segments 5, free or fused, apex with a free, membranous lobe; fruiting perianth enlarged, hardened, and bearing an acicular appendage abaxially, forming a narrowly conic spine, apex of segment remaining unchanged, persistent at junction of perianth and spine. Disk present or absent. Stamens up to 5; anthers narrowly oblong, appendage obscure or absent. Ovary ovoid; stigmas 2, filiform. Utricle enclosed in enlarged perianth, ovoid, slightly compressed; pericarp membranous, adnate to seed. Seed vertical; testa membranous; embryo conic-spiral; perisperm absent.

About six species: NW Africa (Egypt), SW Asia (Syria, Iran, Caspian region), China; one species (endemic) in China.

1. Cornulaca alaschanica C. P. Tsien & G. L. Chu, Acta Phytotax. Sin. 16(1): 122. 1978.

阿拉善单刺蓬 a la shan dan ci peng

Herbs annual, 15–20 cm, pyramidal. Root pallid, usually curved, slender, terete. Stem erect, densely branched, slightly lustrous, terete, ribbed above, smooth; branches alternate, obliquely or subhorizontally spreading; lower branches 3–6 cm, with numerous branchlets; upper branches gradually becoming shorter and without branchlets. Leaves slightly spreading, yellow-green, acicular, straight or somewhat arcuate, 5–8 mm, glabrous, base ovate-triangular or broadly expanded ovate, margin membranous. Flowers 2- or 3-clustered, or solitary; bractlets navicular, apex with a spine 2–4 mm. Perianth segment apex white, narrowly triangular, ca. 0.4 mm; perianth conic spine ca. 6.5 mm. Stamens 5; anthers ca. 0.5 mm, apex obscurely appendaged, anther sacs free in basal 1/5. Ovary minute; style filiform; stigmas exserted. Utricle 1–1.2 mm.

● Inter-dunes, margins of dune fields, alluvial fans. Gansu (Minqin), W Nei Mongol (Alxa Zuoqi).

The protologue cited the holotype from Alxa Zuoqi in “Ningxia,” although that locality is some 20 km to the west in Nei Mongol.

30. HORANINOVIA Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 10. 1841.

对节刺属 dui jie ci shu

Herbs annual, glabrous or hispidulous; branches dichotomous or opposite. Leaves opposite or alternate, acicular or terete, stiff, base expanded. Flowers solitary or clustered in glomerules in leaf axils, bisexual or unisexual. Perianth 4- or 5-parted; segments broadly ovate to oblong, membranous or leathery, abaxially usually transversely winged in fruit, apex obtuse, acute, or awned. Disk

cupular; lobes semiorbicular. Stamens 5, inserted between lobes of disk; filaments subulate; anthers cylindric to broadly elliptic, with or without an awnlike appendage. Ovary base sunken in disk; ovule sessile; style very short; stigma capitulate, 2- or 3-lobed. Utricle abaxially convex, adaxially slightly concave; pericarp membranous, more fleshy basally, free from seed. Seed horizontal or oblique, depressed globose; testa membranous; embryo spiral, slender; perisperm absent.

About seven species: from the Caspian region to NW China (Xinjiang); one species in China.

1. Horaninovia ulicina Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 10. 1841.

对节刺 dui jie ci

Plants 20–40 cm tall, densely papillate-hispidulous. Stem much branched, slender; branches opposite, oblique, straight, thin, terete or obscurely ribbed. Leaves opposite, sessile, green, acicular, straight or slightly arcuate, 5–10 mm, base slightly expanded, margin membranous. Inflorescence of axillary, globose, usually numerous-flowered glomerules, pilose; bract 1 and bractlets 2 per flower; bract of same shape as leaves; bractlets yellow-white, stiffly acicular, shorter than leaves, glabrous, base expanded, appearing ovate or suborbicular. Flowers bisexual. Perianth segments 5, oblong-lanceolate, membranous, perianth below wing slightly thickened, distal part incurved and enclosing utricle; wings unequal, dry membranous, margin erose. Filaments not exserted, short; anthers ovoid to cylindric, apex obtuse or acute, without an appendage. Utricle 1–1.5 mm in diam.; pericarp light brown. Embryo yellow-brown. Fl. and fr. Jul–Oct.

Dunes. N Xinjiang [Afghanistan, Iran, Kazakhstan, Turkmenistan].

Horaninovia minor Schrenk (in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 11. 1841) has been reported from Xinjiang (Tacheng) by Grubov (Rast. Tsentral. Azii 2: 100. 1966), based on a specimen collected in 1840 by Schrenk “near Chuguchak” and preserved at LE. No specimen has been seen by the present authors. It differs from *H. ulicina* in having leaves and bracts arcuate curved, perianth wingless, and anthers with a linear appendage.

31. HALOXYLON Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 7: 468. 1851.

琐琐属 suo suo shu

Shrubs or trees, glabrous, or cottony in leaf axils. Stem erect, much branched; older branches terete, annual ones green or blue-green, pointed. Leaves opposite, reduced to scales or nearly absent, bases united, apex obtuse or with a short awn. Flowers solitary in leaf axils, bisexual, with 2 bractlets. Perianth segments 5, free, papery or dry membranous, abaxially with a distal, transverse wing in fruit, adaxially concave, base usually arachnoid; wing horizontal, membranous, longitudinally veined. Disk cupular. Stamens 5, inserted on disk; anthers elliptic, without an appendage. Ovary base sunken into disk; style very short; stigmas 2–5. Utricle hemispheric, apically slightly concave; pericarp fleshy, adnate to seed. Seed horizontal; embryo green, spiral; perisperm absent.

About 11 species: from the Mediterranean region to C Asia; two species in China.

1a. Leaves appressed to stem, triangular, apex awned ..... 1. *H. persicum*
1b. Leaves slightly spreading, broadly triangular, apex awnless ..... 2. *H. ammodendron*

1. Haloxylon persicum Bunge ex Boissier & Buhse in Nouv. Mém. Soc. Imp. Naturalistes Moscou 12: 189. 1860.

白琐琐 bai suo suo

Arthrophytum acutifolium (Minkwitz) Minkwitz; *A. ammodendron* (C. A. Meyer) Litvinov var. *acutifolium* Minkwitz; *A. persicum* (Bunge) Savicz-Ryczegorski.

Trees small, 1–7 m tall. Bark gray-white; wood hard, brittle; older branches gray-brown or light yellow-brown, usually fissured annular; annual branches pendulous, internodes 0.5–1.5 cm × ca. 1.5 mm. Leaves appressed to branch, scale-like, triangular, apex awned; leaf axil cottony. Flowers borne on dwarf, lateral spurs of previous year’s branches; bractlets navicular, ovate, equaling perianth, margin membranous. Perianth segments ovate, apex obtuse or subacute; abaxial wing borne 1/4 of distance from apex, light yellow, flabellate or suborbicular, 4–7 mm wide, obscurely veined, base broadly cuneate to rounded, margin repand or subentire. Disk obscure. Utricle light yellow-brown; pericarp not adnate to seed. Seed ca. 2.5 mm in diam.; embryo spiral, abaxially convex, turbinate, adaxially plane. Fl. May–Jun, fr. Sep–Oct.

Dunes. N Xinjiang [NE Africa, SC and SW Asia].

This species is very useful for sand-binding and afforestation. It has been introduced to sand areas of Gansu, Nei Mongol, and Ningxia for this purpose.

2. Haloxylon ammodendron (C. A. Meyer) Bunge in Ledebour, Fl. Ross. 3: 820. 1851.

琐琐 suo suo

Anabasis ammodendron C. A. Meyer in Ledebour, Fl. Altaic. 1: 375. 1829; *Arthrophytum ammodendron* (C. A. Meyer) Litvinov; *A. ammodendron* var. *aphyllum* Minkwitz; *Haloxylon aphyllum* (Minkwitz) Iljin.

Trees small, 1–9 m tall. Trunk to 50 cm in diam. at ground level; bark gray-white; wood hard, brittle; older branches gray-brown or light yellow-brown, usually fissured annular; annual branches obliquely spreading or pendulous, long, thin, internodes 0.4–1.2 cm × ca. 1.5 mm. Leaves slightly spreading, scale-like, broadly triangular, apex obtuse, awnless; leaf axil cottony. Flowers borne on dwarf, lateral spurs of previous year's branches; bractlets navicular, broadly ovate, nearly equaling perianth, margin membranous. Perianth segments oblong, portion above abaxial wing slightly incurved, surrounding utricle, apex obtuse; abaxial wing borne ca. 1/3 of distance from apex, obliquely spreading or horizontal, kidney-shaped to suborbicular, 5–8 mm wide, base cordate to cuneate, margin undulate or erose. Disk obscure. Utricle yellow-brown; pericarp not adnate to seed. Seed black, ca. 2.5 mm in diam.; embryo dark green, spiral, abaxially convex, turbinate, adaxially plane. Fl. May–Jul, fr. Sep–Oct.

Dunes, saline-alkaline deserts, sandy places on riversides. W Gansu, Nei Mongol, NW Ningxia, N Qinghai, Xinjiang [Mongolia; C Asia].

32. ARTHROPHYTUM Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg, sér. 2, 3: 211. 1845.

节节木属 jie jie mu shu

Subshrubs or shrubs, glabrous or with papillate processes. Annual branches terete or obtusely 4-angled, jointed, slightly fleshy. Leaves opposite, sessile, linear, semiterete or clavate, fleshy, rarely subulate or scale-like, base slightly expanded, apex obtuse or with a short, acicular awn; leaf axil usually cottony. Flowers solitary in leaf axils, bisexual, with 2 bractlets. Perianth subglobose; segments 5, orbicular to broadly elliptic, herbaceous, abaxially somewhat thickened, bearing a transverse, winglike process a little below apex in fruit, adaxially convex, margin membranous, apex usually recurved. Disk cupular or discoid, usually with 5 interstaminal lobes. Stamens 5, inserted on disk; filaments subulate, compressed; anthers broadly ovate-cordate, apex without an appendage or mucronate. Style very short, apex slightly contracted; stigmas 2–5-lobed. Utricle enclosed in perianth, hemispheric, apex truncate or somewhat convex; pericarp fleshy. Seed horizontal; embryo spiral; perisperm absent.

About 20 species: C Asia; three species in China.

1a. Annual branches with more than 10 internodes; disk membranous; leaves subulate or scale-like; plants not cushion-shaped ..... 3. *A. iliense*
1b. Annual branches with 2–4 internodes; disk fleshy; leaves clavate or semiterete; plants cushion-shaped.
2a. Leaves linear, semiterete, covered with papillate processes; disk discoid ..... 1. *A. longibracteatum*
2b. Leaves clavate, smooth; disk cupular ..... 2. *A. korovinii*

1. Arthrophytum longibracteatum Korovin, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 29: 15. 1935.

长叶节节木 chang ye jie jie mu

Subshrubs cushion-shaped, 8–12 cm tall. Woody stems strongly branched; branchlets gray-white; annual branches usually geminate at apex of branchlets, unbranched (or with a branch of only 1 internode), light green, terete or slightly sulcate, 1–3 cm, with 2–4 internodes and dense, papillate processes. Leaves horizontal or obliquely spreading, linear, semiterete, 4–8 mm, with papillate processes, base slightly expanded and decurrent, apex subobtuse, mucronate; leaf axil cottony. Bractlets of same shape as leaves but shorter, usually ca. 2 × as long as perianth. Perianth subglobose, 1.5–2 mm in diam.; segments broadly elliptic, abaxially slightly keeled in fruit, tuberculate thickened distally, with a transverse, black, winglike process, adaxially cottony near base, margin membranous, apex inflexed. Disk discoid, fleshy; lobes semiorbicular or obscure. Anther ovate. Style very short; stigma black, capitate, 2-lobed. Utricle hemispheric, adaxially convex. Fl. and fr. Aug–Oct.

Sunny slopes. S Xinjiang [E Kazakhstan].

2. Arthrophytum korovinii Botschantzev, Bot. Mater. Gerb. Inst. Bot. Zool. Akad. Nauk Uzbeksk. SSR 11: 6. 1948.

棒叶节节木 bang ye jie jie mu

Subshrubs cushion-shaped, 10–20 cm tall, surface rough. Woody branches tortuous, strongly branched, gray-brown; branchlets silver-gray; annual branches usually geminate at apex of branchlets, unbranched, light green or yellow-green, 1–2 cm, with 3 or 4 internodes. Leaves obliquely spreading, clavate, 3–5 mm, smooth, base slightly expanded, apex obtuse or acute; leaf axil cottony. Bractlets suborbicular, equaling or slightly longer than perianth, abaxially slightly fleshy and slightly keeled, adaxially concave, margin membranous, apex obtuse. Perianth subglobose, ca. 1.5 mm in diam.; segments broadly elliptic, abaxially with a distal, transverse, black-brown, winglike process in fruit, glabrous, apex inflexed. Disk cupular, fleshy; lobes triangular. Anthers ovate, base cordate, apex subobtuse. Ovary ovoid, smooth; style short; stigma black, 2-lobed. Utricle hemispheric, adaxially flat. Fl. and fr. Aug–Oct.

River bank terraces, clayey-rubbly or clayey-pebbly slopes. N Xinjiang [Kazakhstan].

3. Arthrophytum iliense Iljin, Bot. Zhurn. SSSR 19: 171. 1934.

长枝节节木 chang zhi jie jie mu

Anabasis iliensis (Iljin) Korovin & Mironov.

Subshrubs not cushion-shaped, to 30 cm tall. Woody stems decumbent or prostrate, tortuous, gray-brown, relatively stout; bark slightly rough, exfoliating; branchlets irregularly spreading, gray-brown to gray-white, slender; annual branches lateral or terminal on branchlets, simple or few branched, light green, straight or slightly curved, terete or upper internodes slightly ribbed, usually with 10–20 internodes; lateral annual branches opposite, obliquely spreading, with 1 to several internodes. Leaves obliquely spreading, subulate, 2–4 mm, base expanded, decurrent, apex acute; leaf axil cottony; upper leaves subtriangular, thickened, adaxially concave, slightly shorter than or equaling perianth, apex obtuse or mucronulate. Bractlets suborbicular, adaxially concave, subequaling perianth, fleshy, margin membranous. Perianth segments broadly elliptic, central part slightly hardened, abaxially with a distal, erect, semiorbicular or reniform wing, adaxially cottony near base, margin membranous, apex obtuse. Disk cupular, membranous, lobes 2-divided. Anthers ovate-oblong, base cordate, apex obtuse. Style very short; stigmas 3–5. Utricle hemispheric, adaxially truncate. Fl. Jun–Aug, fr. Sep–Oct.

Sunny rocky or rubbly slopes. Xinjiang (Tian Shan) [Kazakhstan].

33. ANABASIS Linnaeus, Sp. Pl. 1: 223. 1753.

假木贼属 jia mu zei shu

Subshrubs. Woody stem much branched, or reduced to an enlarged, tuberculate caudex; annual branches green, jointed, glabrous or with papillate processes. Leaves opposite, semiterete and fleshy, subulate, scale-like, or obscure, bases united, apex obtuse or acute, sometimes with an acicular awn; leaf axil usually cottony. Flowers solitary in leaf axils, rarely clustered, bisexual; bractlets 2, navicular, usually shorter than perianth. Perianth segments 5, membranous; outer 3 segments broadly elliptic or suborbicular; inner 2 segments ovate; outer 3 or all 5 segments with a winglike appendage abaxially, rarely without such an appendage. Disk cupular, 5-lobed; lobes interstaminal, semiorbicular or linear, adaxially ± granulose glandular. Stamens 5, inserted on disk; filaments subulate, slightly compressed; anthers oblong-ovate, apex obtuse or mucronate. Ovary ovoid, glabrous or papillate; style short; stigmas 2, erect or recurved. Utricle subglobose to broadly ellipsoid, compressed; pericarp fleshy. Seed vertical; embryo spiral; perisperm absent.

About 30 species: from the Mediterranean region to China, Mongolia, and Russia (Siberia); eight species in China.

1a. Woody stems much branched.
  2a. Perianth segments without a winglike appendage in fruit ..... 4. *A. salsa*
  2b. Perianth segments with a winglike appendage in fruit (at early anthesis slightly thickened abaxially).
    3a. Leaves obscure, slightly scale-like, broadly angular, apex awnless ..... 3. *A. aphylla*
    3b. Leaves distinct, subulate or semiterete, apex with an acicular awn.
      4a. Disk lobes linear, apex pectinate; leaves appressed to branch or slightly spreading, usually subulate ..... 1. *A. elatior*
      4b. Disk lobes semiorbicular, apex entire; leaves spreading, semiterete or subclavate ..... 2. *A. brevifolia*
1b. Woody stems reduced to an enlarged, tuberculate caudex.
  5a. Leaves linear, semiterete, densely covered with papillate processes ..... 5. *A. pelliotii*
  5b. Leaves scale-like to subulate, smooth.
    6a. Perianth segments without a winglike appendage in fruit; disk lobes semiorbicular; leaves subulate, apex with an acicular awn ..... 8. *A. eriopoda*
    6b. Perianth segments with a winglike appendage in fruit (at early anthesis slightly thickened abaxially); disk lobes linear; leaves scale-like, apex awnless.
      7a. Annual branches simple, with 5–8 internodes ..... 6. *A. cretacea*
      7b. Annual branches branched, with 8–12 internodes ..... 7. *A. truncata*

1. Anabasis elatior (C. A. Meyer) Schischkin in Krylov, Fl. Sibir. Occid. 4: 961. 1930.

高枝假木贼 gao zhi jia mu zei

Brachylepis elatior C. A. Meyer, Bull. Sci. Acad. Imp. Sci. Saint-Pétersbourg 8: 341. 1840; *Anabasis korovinii* Iljin; *A. phyllophora* Karelin & Kirilov.

Subshrubs 15–30 cm tall. Woody stem much branched, gray-brown to gray-white; annual branches erect or slightly obliquely spreading, with 10–20 internodes, with short, obliquely spreading branches above; internodes terete or upper ones slightly compressed, usually 1–1.5 cm × 1.5–3 mm. Leaf apex subobtuse, with a short, pellucid, acicular awn; lower and middle leaves spreading or recurved, subulate, ca. 3 mm; upper leaves appressed against branch, scale-like, ca. 2 mm. Flowers axillary, solitary on upper part of branches and forming a short spike; bractlet apex subacute, without an acicular awn. Perianth segments membranous, proximally slightly thickened; outer 3 segments broadly ovate, abaxially with a developed, transverse wing; inner 2 segments narrower, without a wing or sometimes with a narrow wing in fruit; wing usually erect, yellow-white or pink, reniform. Disk lobes linear, apex pectinate. Ovary ovoid, glabrous; stigmas recurved, adaxially finely papillate. Utricle ovoid to broadly so, 2–3 mm; pericarp yellow-brown or pink, fleshy. Fl. and fr. Jul–Oct.

Gobi desert, saline soils in deserts, sunny slopes. N Xinjiang [Kazakhstan, Mongolia, Russia (W Siberia)].

2. Anabasis brevifolia C. A. Meyer in Ledebour, Icon. Pl. 1: 10. 1829.

短叶假木贼 duan ye jia mu zei

Anabasis abolinii Iljin; *A. affinis* Fischer & C. A. Meyer.

Subshrubs 5–20 cm tall. Root black-brown, stout. Woody stem extremely branched, gray-brown; branchlets gray-white, usually fissured annular; annual branches mostly terminal on branchlets, simple or upper ones few branched, yellow-green, usually with 4–8 internodes; internodes smooth or papillate, lower ones subterete, to 2.5 cm, upper ones shorter, ribbed. Leaves spreading and arcuate recurved, linear, semiterete, 3–8 mm, apex obtuse or acute, with a semitransverse, acicular awn; lower leaves appressed to branch, triangular, usually shorter. Flowers axillary, solitary; bractlets ovate, adaxially concave, margin membranous, apex slightly fleshy. Perianth segments ovate, ca. 2.5 mm, abaxially winged in fruit, apex subobtuse; wing erect or slightly spreading, yellow-apricot or purple-red, occasionally dark brown, membranous; wing of outer 3 perianth segments reniform or suborbicular; wing of inner 2 segments orbicular or obovate. Disk lobes orange-yellow, semiorbicular, slightly fleshy. Anthers 0.6–0.9 mm, apex acute. Ovary usually papillate; stigmas erect or slightly recurved, black-brown, adaxially papillate. Utricle ovoid to broadly so, ca. 2 mm; pericarp yellow-brown. Seed dark brown, suborbicular, ca. 1.5 mm in diam. Fl. Jul–Aug, fr. Sep–Oct.

Gobi desert, arid slopes, alluvial fans. W Gansu, W Nei Mongol, Ningxia, Xinjiang [Kazakhstan, Mongolia, Russia (SW Siberia)].

3. Anabasis aphylla Linnaeus, Sp. Pl. 1: 223. 1753.

无叶假木贼 wu ye jia mu zei

Anabasis tatarica Pallas.

Subshrubs 20–50 cm tall. Woody stem much branched; branchlets gray-white, usually fissured annular; annual branches erect or obliquely spreading, simple or branched, fresh green; internodes numerous, terete, 0.5–1.5 cm. Leaves obscure or slightly scale-like, broadly triangular, apex obtuse or acute. Flowers 1–3 in leaf axils, forming spikes on upper part of branches; bractlets shorter than perianth, margin membranous. Outer 3 perianth segments suborbicular, proximally with a transverse wing abaxially; wing erect, light yellow or pink, flabellate, orbicular, or reniform, membranous; inner 2 perianth segments elliptic, wingless or small winged. Disk lobes linear, apex pectinate. Utricle vertical, subglobose, 1.5–2 mm in diam.; pericarp dark red, fleshy, smooth. Fl. Aug–Sep, fr. Oct.

Gobi desert, inter-dunes, gravelly alluvial fans, sometimes on arid slopes. W Gansu, Xinjiang [Russia (SW Siberia); C Asia, Europe].

This species is used medicinally and for stabilizing dunes. The annual branches contain the alkaloid anabasine ($C_{10}H_{14}N_2$), a botanical insecticide.

4. Anabasis salsa (C. A. Meyer) Bentham ex Volkens in Engler & Prantl, Nat. Pflanzenfam. 3(1a): 87. 1893.

盐生假木贼 yan sheng jia mu zei

Brachylepis salsa C. A. Meyer in Ledebour, Fl. Altaic. 1: 372. 1829; *Anabasis ramosissima* Minkwitz; *Microlepis salsa* (C. A. Meyer) Eichwald.

Subshrubs 10–20 cm tall. Woody stem much branched, gray-brown to gray-white; annual branches numerous, erect or obliquely spreading, upper ones with 5–10 internodes; internodes usually 0.6–2 cm, terete or slightly ribbed, smooth. Lower and middle leaves spreading and recurved, linear, semiterete, 2–5 mm, apex with a pellucid, acicular, caducous awn; upper leaves scale-like, triangular, apex subobtuse, awnless. Flowers solitary in leaf axils, forming short spikes on upper part of branches; bractlets abaxially fleshy, margin membranous. Perianth segments 1.5–2 mm, unchanging in fruit, without abaxial wing; outer 3 segments suborbicular; inner 2 segments broadly ovate, apex obtuse. Disk lobes obscure or slightly semiorbicular. Ovary ovoid, smooth; stigmas black-brown. Utricle broadly ovoid, apex protruding from perianth; pericarp yellow-brown or slightly reddish, fleshy.

Gobi desert, saline-alkaline deserts. N Xinjiang [Kazakhstan, Mongolia, Russia (Lower Volga region, SW Siberia); SW Asia (E Caucasus)].

Camels eat this plant in winter.

5. Anabasis pelliotii Danguy in Lecomte, Notul. Syst. (Paris) 2(6): 146. 1912.

粗糙假木贼 cu cao jia mu zei

Herbs perennial. Caudex densely pilose; annual branches numerous, growing from caudex, diffuse or obliquely ascending, branched, usually with 4–8 internodes, papillate; internodes

slightly 4-angled, usually 1–3 cm, brittle. Leaves slightly recurved, linear, semiterete, 0.6–1.2 cm × 1–2 mm, adaxially plane or slightly sulcate, apex somewhat swollen, with a short, acicular awn. Flowers usually 1–3 in leaf axils; bractlets shorter than perianth. Perianth segments broadly elliptic, ca. 2.5 mm, enlarged in fruit, proximally with a crescent-shaped, winglike process abaxially, margin entire or erose. Disk lobes semiorbicular, ovoid, or conic, papillate. Stamens 5; filaments narrowly fusiform, slightly compressed; anthers oblong, apex muticous. Style obscure; stigmas black-brown, subulate. Fl. and fr. Aug–Oct.

Arid slopes. SW Xinjiang [Tajikistan, Uzbekistan].

6. Anabasis cretacea Pallas, Reise Russ. Reich. 1: 493. 1771.

白垩假木贼 bai e jia mu zei

Anabasis tianschanica Botschantzev.

Herbs perennial, 5–15 cm tall. Root stout, to 3 cm in diam. Caudex brown to dark brown, densely tomentose; annual branches numerous, borne on caudex, erect, simple, yellow-green, usually with 5–8 internodes; internodes subterete, 2–3 mm in diam., smooth, sometimes with leaf scars. Leaves scale-like, terete, 1–2 mm, margin membranous, apex obtuse, awnless. Flowers solitary in leaf axils; bractlets ovate-oblong, apex slightly obtuse. Outer 3 perianth segments broadly elliptic, usually only these segments winged in fruit; inner 2 segments narrower; wing pink, reniform or suborbicular, membranous. Disk lobes linear, apex pectinate. Ovary smooth; stigmas usually recurved. Utricle dark red or orange-yellow, 2–2.5 mm. Fl. and fr. Aug–Oct.

Gobi desert, saline-alkaline deserts, arid slopes. N Xinjiang [Russia (SE European part, W Siberia); C Asia].

The general distribution of this species needs clarification, as well as its occurrence in China. Grubov (Rast. Tsentral. Azii 2: 107. 1966) considered C Asian records to belong to *A. truncata*.

7. Anabasis truncata (Schrenk) Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 4(11): 38. 1862.

展枝假木贼 zhan zhi jia mu zei

Brachylepis truncata Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 2: 193. 1844.

Herbs perennial, 10–20 cm tall. Root stout, terete, to 3 cm in diam. Caudex brown to dark brown, densely tomentose; annual branches numerous, borne on caudex, erect, branched above, with 8–12 internodes; branches opposite, horizontal or apically recurved, 2–3 cm; internodes terete, 2–3 mm in diam., smooth, sometimes with leaf scars. Leaves scale-like, semiorbicular, 1–2 mm, margin submembranous, apex obtuse or acute, awnless. Flowers solitary in leaf axils, arranged into short spikes on upper branches and branchlets; bractlets with membranous margin. Outer 3 perianth segments broadly elliptic to oblong, winged in fruit; wing slightly spreading, elliptic to suborbicular; inner 2 perianth segments narrower, wingless or with a short, winglike process. Disk lobes linear, apex subtruncate. Ovary broadly ellipsoid, smooth; styles erect, black, short. Utricle of same shape as ovary; pericarp yellow-brown, 2.5–3 mm in diam., fleshy. Fl. and fr. Aug–Oct.

Gobi desert, arid slopes. Xinjiang [Russia (SW Siberia); C Asia].

8. Anabasis eriopoda (Schrenk) Bentham ex Volkens in Engler & Prantl, Nat. Pflanzenfam. 3(1a): 87. 1893.

毛足假木贼 mao zu jia mu zei

Brachylepis eriopoda Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 1: 360. 1843.

Herbs perennial, usually appearing hemispheric, 15–30 cm tall. Caudex densely white villous; annual branches numerous, borne on caudex, erect or decumbent, with obliquely spreading branches above, blue-green, slightly white-glaucous, with 10–15 internodes, smooth; internodes 4-angled, basal ones slightly terete, 0.5–3 cm. Leaves horizontal or slightly recurved, subulate or triangular, 2–5 mm, apex with a straight or recurved, aristate awn 2–5 mm. Flowers solitary in leaf axils, bisexual; bractlets green, shorter than perianth, abaxially fleshy, margin membranous, apex with an aristate awn. Perianth segments 2–3 mm, without winglike appendages in fruit, apex obtuse or acute; outer 3 segments broadly elliptic; inner 2 segments narrowly ovate. Disk lobes semiorbicular, slightly fleshy. Stigmas yellow-green. Utricle broadly ovoid to subglobose, compressed, 3–4 mm, protruding from perianth in fruit; pericarp yellow or orange-yellow, fleshy. Fl. and fr. Jun–Aug.

Gobi desert, deserts, arid slopes. N Xinjiang [Afghanistan, Mongolia; C Asia, SW Asia (Iran)].

34. GIRGENSOHNIA Bunge in Ledebour, Fl. Ross. 3: 835. 1851.

对叶盐蓬属 dui ye yan peng shu

Herbs annual or subshrubs, glabrous or shortly hairy. Stem much branched; branches jointed, terete or ribbed. Leaves opposite, sessile, triangular-ovate, leathery, margin entire or denticulate, apex acute. Flowers small, bisexual, with 2 bractlets. Perianth segments 5, oblong or oblong-lanceolate, papery, 1-veined, abaxially with a recurved, winglike appendage. Disk 5-lobed; lobes obtuse at apex. Stamens 5, inserted on disk; filaments subulate; anthers ovate-cordate, apex obtuse or finely mucronate. Ovary ovoid or subglobose, compressed; ovule subsessile; style short; stigma capitate, 2-divided. Utricle enclosed in perianth; pericarp membranous. Seed vertical, ovoid or globose, compressed; testa membranous; embryo spiral or planospiral; perisperm absent.

About six species: mainly in C Asia; one species in China.

1. Girgensohnia oppositiflora (Pallas) Fenzl in Ledebour, Fl. Ross. 3: 835. 1851.

对叶盐蓬 dui ye yan peng

Salsola oppositiflora Pallas, Reise Russ. Reich. 2: 735. 1773; *Girgensohnia pallasii* Bunge, nom. illeg. superfl.; *Halogeton oppositiflorus* (Pallas) C. A. Meyer.

Herbs annual, 15–40 cm tall. Stem erect; branches opposite, obliquely spreading, green or reddish, hispid; internodes 0.5–1.5 cm, ribbed. Leaves 5–10 mm, margin membranous, apex subulate, with an acicular awn; leaf axil hispid. Bractlets navicular, slightly shorter than perianth, apex pungent. Perianth segments oblong-lanceolate, membranous, slightly enlarged and becoming papery in fruit; outer 3 segments abaxially winged; wing erect on upper segment, usually recurved on lower segments, ovate to broadly so, finely veined. Anthers minute, apex with a mucronate appendage. Utricle ovoid or cylindric-ovoid, compressed, 2–2.5 mm. Pericarp yellow-brown, glabrous, not adnate to seed. Testa yellow-brown; embryo green, planospiral. Fl. and fr. Jul–Oct.

Gobi desert, deserts, arid slopes. Xinjiang [Afghanistan, Pakistan; C Asia, SW Asia (Iran), SE Europe (Lower Volga region of Russia)].

35. SYMPEGMA Bunge, Bull. Acad. Imp. Sci. Saint-Pétersbourg 25: 351, 371. 1879.

合头草属 he tou cao shu

Subshrubs. Stem much branched, glabrous; bark fissured, corky. Leaves alternate, loosely arranged, linear, terete, fleshy. Flowers usually 1–3-clustered, borne on apex of dwarf, single-internode branches, bisexual; bractlets in 1(or 2) pairs below flower cluster, resembling leaves. Perianth laterally compressed; segments 5, 2 outer and 3 inner, oblong, adaxially concave, hardened in fruit, with an abaxial, transverse wing borne below apex. Stamens 5; filaments narrowly linear, flattened, bases expanded and connate; anthers oblong-cordate, apex without an appendage. Ovary cylindric, somewhat compressed; style short; stigmas 2, recurved, subulate. Utricle enclosed in perianth, globose, slightly compressed laterally; pericarp membranous, free from seed. Seed vertical; testa membranous; embryo planospiral; perisperm absent.

One species: China, Kazakhstan, Mongolia.

1. Sympegma regelii Bunge, Bull. Acad. Imp. Sci. Saint-Pétersbourg 25: 371. 1879.

合头草 he tou cao

Plants to 30–150 cm tall. Roots black-brown, stout. Older branches much branched, yellow-white to gray-brown, usually fissured; annual branches gray-green, slightly papillate, with numerous axillary, dwarf, single-internode branches; dwarf branches 3–8 mm, basally articulated, caducous. Leaves obliquely spreading, straight or somewhat arcuate, 4–10 × ca. 1 mm, base contracted, apex acute. Bractlets basally connate. Perianth segments erect, herbaceous, prominently veined, margin membranous, apex subobtuse; wing light yellow, broadly ovate to suborbicular, unequal, membranous, longitudinally veined. Seed 1–1.2 mm in diam.; embryo yellow-green. Fl. and fr. Jul–Oct.

Slightly saline-alkaline deserts, arid slopes, ravine sides, alluvial fans. NW Gansu, Ningxia, N Qinghai, Xinjiang [Kazakhstan, Mongolia].

This species provides forage in desert and semidesert areas; sheep and camels eat the annual branches.

36. HALOGETON C. A. Meyer in Ledebour, Icon. Pl. 1: 10. 1829.

盐生草属 yan sheng cao shu

Herbs annual. Stem erect, much branched, glabrous or arachnoid hairy. Leaves alternate, sessile, terete, fleshy, base expanded, apex obtuse or aristate awned; leaf axil fascicular pilose. Flowers borne in axillary glomerules, bisexual and female (plants polygamous), with 2 bractlets. Perianth conic, 5-parted; segments lanceolate or broadly so, in fruit with a membranous wing near apex abaxially. Stamens 2 or 5; anthers oblong, without an appendage. Ovary ovoid, laterally compressed; style short; stigmas 2, filiform. Fruit a utricle, enclosed by perianth; pericarp membranous, adnate to seed. Seed vertical or horizontal, orbicular; testa membranous or subleathery; embryo spiral; perisperm absent.

About three species: N Africa, C and SW Asia, S Europe; two species in China.

1a. Branches arachnoid hairy when young; leaf apex obtuse, sometimes mucronate; flowers usually 2 or 3 per glomerule; stamens 5; seed horizontal ..... 2. *H. arachnoideus*
1b. Branches not arachnoid hairy when young; leaf apex aristate awned, awn sometimes deciduous; flowers usually 4–6 per glomerule; stamens usually 2; seed vertical ..... 1. *H. glomeratus*

1. Halogeton glomeratus (Marschall von Bieberstein) C. A. Meyer in Ledebour, Icon. Pl. 1: 10. 1829.

盐生草 yan sheng cao

Plants 5–30 cm tall. Branches alternate, basal ones subopposite, gray-green, smooth or densely papillate, not arachnoid hairy when young. Leaves 4–12 × 1.5–2 mm, apex aristate awned, awn sometimes deciduous. Flowers usually 4–6 per glomerule. Perianth segments lanceolate, membranous, abaxially 1-veined; abaxial wing semiorbicular, subequal, membranous, distinctly veined, sometimes not developed and then perianth thickened, becoming leathery. Stamens usually 2. Seed vertical. Fl. and fr. Jul–Sep.

Gobi desert, foothills, arid slopes. W Gansu, Qinghai, Xinjiang, Xizang [Mongolia, Russia (S Siberia); C Asia; naturalized and highly invasive in SW North America].

1a. Stem and branches smooth ..... 1a. var. *glomeratus*
1b. Stem and branches densely papillate ..... 1b. var. *tibeticus*

1a. Halogeton glomeratus var. **glomeratus**

盐生草(原变种) yan sheng cao (yuan bian zhong)

Anabasis glomerata Marschall von Bieberstein, Mém. Soc. Imp. Naturalistes Moscou 1: 110. 1806.

Stem and branches smooth.

Gobi desert, foothills. W Gansu, Qinghai, Xinjiang, Xizang [Mongolia, Russia (S Siberia); C Asia].

1b. Halogeton glomeratus var. **tibeticus** (Bunge) Grubov, Rast. Tsentral. Azii 2: 117. 1966.

西藏盐生草 xi zang yan sheng cao

Halogeton tibeticus Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 4(11): 94. 1862.

Stem and branches densely papillate.

Arid slopes. Qinghai, Xinjiang, Xizang [C Asia].

2. Halogeton arachnoideus Moquin-Tandon in Candolle, Prodr. 13(2): 205. 1849.

白茎盐生草 bai jing yan sheng cao

Micropeplis arachnoidea (Moquin-Tandon) Bunge; *Salsola aptera* Handel-Mazzetti.

Plants 10–40 cm tall. Branches alternate, gray-white, arachnoid hairy when young, later glabescent. Leaves 3–10 × 1.5–2 mm, apex obtuse, sometimes mucronate. Flowers usually 2 or 3 per glomerule; bractlets ovate, margin membranous. Perianth segments broadly lanceolate, membranous; abaxial wing semiorbicular, subequal, pellucid membranous, distinctly veined. Stamens 5; filaments narrowly linear. Seed horizontal, 1–1.5 mm in diam. Fl. and fr. Jul–Aug.

Arid slopes, sandy places, riversides. Gansu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang [C Asia].

Local people burn the plants to obtain soda for cooking.

37. ILJINIA Korovin in Shishkin, Fl. URSS 6: 309, 877. 1936.

戈壁藜属 ge bi li shu

Subshrubs. Branches not jointed; annual branches terete. Leaves alternate, obliquely spreading, subclavate, straight or slightly upward arcuate, somewhat fleshy. Flowers solitary in leaf axils, sessile, bisexual, with 2 bractlets. Perianth slightly depressed, herbaceous, becoming slightly hardened and papery in fruit, glabrous; segments 5, free, ovate to suborbicular, veinless, abaxially with a transverse wing near apex, adaxially concave, margin membranous. Disk cupular, 5-lobed; lobes semiorbicular, margin slightly fleshy. Stamens 5, inserted on disk; filaments filiform, flattened, short; anthers ovoid, apex with a mucronate appendage. Ovary ovoid or depressed globose; style very short; stigmas 2, expanded. Utricle hemispheric, adaxially plane or slightly concave. Seed horizontal, slightly depressed; embryo planospiral; perisperm absent.

One species: China, Kazakhstan, Mongolia.

1. Iljinia regelii (Bunge) Korovin in Shishkin, Fl. URSS 6: 309, 878. 1936.

戈壁藜 ge bi li

Haloxylon regelii Bunge, Bull. Acad. Imp. Sci. Saint-Pétersbourg 25: 368. 1879; *Arthrophytum regelii* (Bunge) Litvinov; *Salsola regelii* (Bunge) Litvinov ex Popov.

Plants 20–50 cm tall. Woody branches gray-white, usually fissured annular, smooth, glabrous; annual branches gray-green, slightly ribbed. Leaves 0.5–1.5 cm × 1.5–2.5 mm, glabrous, base decurrent, apex obtuse; leaf axil cottony. Bractlets suborbicular, slightly shorter than perianth, abaxially fleshy and convex at center, margin narrowly membranous. Wing of perianth segments horizontal or slightly reflexed, semiorbicular, dry membranous, margin entire or incised. Ovary smooth; stigma adaxially papillate. Pericarp black-brown, somewhat fleshy. Seed ca. 1.75 mm in diam.; testa yellow-brown, membranous. Fl. and fr. Jul–Sep.

Gobi desert, alluvial fans, dunes, arid slopes. W Gansu, Xinjiang [Kazakhstan, Mongolia].

38. HALOTHAMNUS Jaubert & Spach, Ill. Pl. Orient. 2: 50. 1845.

新疆藜属 xin jiang li shu

Aellenia Ulbrich.

Herbs or subshrubs. Stems erect, much branched. Leaves alternate, linear, semiterete. Flowers borne in bract axils, forming a spicate inflorescence, bisexual, with 2 bractlets. Perianth 5-parted; segments narrowly ovate, in fruit proximally enlarged and woody, expanded at base forming a flat basal surface, 5-ribbed, with a transverse, membranous wing near middle abaxially. Stamens 5; filaments expanded proximally; anthers without an appendage. Ovary depressed globose; style very short; stigmas 2, narrowly lanceolate, apex obtuse. Fruit a utricle. Seed horizontal; embryo spiral.

About six species: C and SW Asia extending to China and Mongolia; one species in China.

1. Halothamnus glaucus (Marschall von Bieberstein) Botschantzev, Novosti Sist. Vyssh. Rast. 18: 157. 1981.

新疆藜 xin jiang li

Salsola glauca Marschall von Bieberstein, Tabl. Prov. Mer. Casp. 112. 1798; *Aellenia glauca* (Marschall von Bieberstein) Aellen; *Caroxylon glaucum* (Marschall von Bieberstein) Moquin-Tandon; *Salsola spicata* Pallas (1803), not Willdenow (1798).

Subshrubs 30–50(–70) cm tall. Branches spreading, gray-green, glabrous. Leaves 1.5–3 cm × 2–3 mm, base slightly decurrent, apex pungent. Spikes loose; bracts ovate, nearly equaling perianth, margin membranous; bractlets shorter than perianth, apex acuminate. Wing of perianth segments yellow-brown, orbicular or obovate, margin irregularly crenate; wings together 1.5–2.5 cm in diam. Fl. and fr. Jun–Aug.

Gobi desert, semideserts, arid slopes. N Xinjiang [C and SW Asia].

The only infraspecific entity currently known from China is subsp. *glaucus* var. *heptapotamicus* (Botschantzev) Kothe-Heinrich (Biblioth. Bot. 143: 108. 1993; *H. heptapotamicus* Botschantzev, Novosti Sist. Vyssh. Rast. 18: 161. 1981), which otherwise occurs in SE Kazakhstan and Kyrgyzstan.

39. SALSOLA Linnaeus, Sp. Pl. 1: 222. 1753.

猪毛菜属 zhu mao cai shu

Herbs annual, subshrubs, or shrubs, glabrous, pilose, hispid, or papillate. Leaves alternate, rarely opposite, sessile, terete or semiterete, rarely linear, base usually expanded, sometimes decurrent, apex obtuse or with an acicular awn. Flowers bisexual, solitary or glomerulate in bract axils, forming a spicate or paniculate inflorescence on upper part of branches; bracts ovate or broadly lanceolate; bractlets 2. Perianth 5-parted; segments ovate-lanceolate or oblong, adaxially concave, membranous, becoming hardened later, glabrous or pilose, with a transverse, winglike appendage near middle abaxially; distal portion of segments incurved, apices usually connivent, together embracing utricle and appearing conic; abaxial appendage spreading, membranous in fruit, sometimes undeveloped and appearing crestlike or tuberculate. Stamens 5; filaments subulate or narrowly linear, flattened; anthers oblong, apex appendaged, appendage apex acute or obtuse, variously shaped, or very small. Ovary broadly ovoid or globose, depressed; style long or very short; stigmas 2, erect or recurved, subulate or filiform, adaxially papillate. Fruit a utricle, globose; pericarp membranous or fleshy. Seed horizontal, vertical, or oblique; embryo spiral; perisperm absent.

About 130 species: Africa, Asia, Europe, a few species in North America; 36 species (three endemic) in China.

In its traditional circumscription, *Salsola* s.l. is a paraphyletic or probably even polyphyletic group of taxa rather than a phylogenetically justified genus. Recent studies indicate that several widely recognized genera of Salsoleae (e.g., *Girgensohnia*, *Halothamnus*, *Haloxylon*, and *Noaea* Moquin-Tandon) as well as many proposed segregate genera (e.g., *Caroxylon* Thunberg, *Climacoptera* Botschantzev, *Darniella* Maire & Weiller, *Hypocylix* Wołoszczak, *Neocaspia* Tzvelev, *Nitrosalsola* Tzvelev, and *Xylosalsola* Tzvelev), are probably phylogenetically rooted in *Salsola sensu latissimo*. However, more research is needed for justification of any dramatic taxonomic changes in that group. Because of that, *Salsola* is accepted here in its traditional circumscription.

1a. Leaf apex acicular awned; herbs annual, papillate, hispid, or glabrous.
2a. Leaves broadly linear, proximally 5–7(–10) mm wide; perianth segment above wing reflexed, not embracing utricle; anthers free from base to near apex ..... 21. *S. aperta*
2b. Leaves terete, semiterete, or narrowly lanceolate, proximally not more than 4 mm wide; perianth segments above wing embracing utricle; anthers free from base to middle.
3a. Perianth segments abaxially wingless or with an irregular process in fruit.
4a. Plants glabrous; leaves semiterete.
5a. Stem and branches striate; leaves all alternate; utricle 2–2.5 mm in diam. ..... 23. *S. komarovii*
5b. Stem and branches not striate; lower leaves opposite, upper ones alternate; utricle 3–4 mm in diam. ..... 22. *S. soda*
4b. Plants papillate or hispid; leaves filiform-terete or narrowly lanceolate.
6a. Leaves filiform-terete; flowers forming spikes on upper branches; bracts and bractlets tightly appressed to rachis; anthers 1–1.5 mm ..... 24. *S. collina*
6b. Leaves narrowly lanceolate; flowers distributed throughout plant; bracts and bractlets spreading; anthers ca. 0.5 mm ..... 25. *S. zaidamica*
3b. Perianth segments abaxially winged in fruit.
7a. Perianth with only 1 segment abaxially winged in fruit; anthers ca. 0.3 mm ..... 26. *S. monoptera*
7b. Perianth with all segments abaxially winged in fruit; anthers 0.5–1 mm.
8a. Perianth segments above wing abaxially green and fleshy keeled.
9a. Perianth segment apex pungent, together connivent and forming a cone, perianth (including wings) 5–7 mm in diam. ..... 27. *S. tamariscina*
9b. Perianth segment apex obtuse, together embracing utricle and not forming a cone, perianth (including wings) 8–10 mm in diam. ..... 28. *S. rosacea*
8b. Perianth segments above wing abaxially neither green nor fleshy keeled.
10a. Perianth segment apex acicular, together connivent and forming a cone, rarely apex membranous and thinly long aristate.
11a. Wing margin irregularly dentate; perianth segments above wing hardened, together connivent and forming a cone; leaf base distinctly expanded ..... 29. *S. chinghaiensis*

11b. Wing margin subentire; perianth segments above wing together connivent and forming a cone, or apex membranous and thinly long aristate; leaf base slightly expanded.
12a. Plants slender, not more than 30 cm tall, fr. May–Jun ..... 30. *S. praecox*
12b. Plants stout, to 50 cm tall, fr. Aug–Sep.
13a. Stems light red-brown, yellow-brown after drying; perianth (including wings) 5–8 mm in diam. in fruit, apex of segments hardened, becoming acicular ..... 31. *S. paulsenii*
13b. Stems green; perianth (including wings) 7–12 mm in diam. in fruit, apex of segments becoming acicular or membranous and thinly long aristate ..... 32. *S. pellucida*
10b. Perianth segment apex not acicular, neither connivent nor forming a cone.
14a. Leaves 0.5–0.8 mm wide; perianth (including wings) 4–6 mm in diam. in fruit; anthers ca. 0.5 mm ..... 33. *S. sinkiangensis*
14b. Leaves 1–2 mm wide (sometimes 0.5–0.7 mm wide in *S. tragus*); perianth (including wings) 5–10 mm in diam. in fruit; anthers 0.8–1 mm.
15a. Bracts and bractlets reflexed in fruit; stigma nearly equaling style ..... 34. *S. ikonnikovii*
15b. Bracts and bractlets spreading in fruit; stigma 3–4 × as long as style.
16a. Stem and branches densely long hispid; perianth (including wings) ca. 5 mm in diam. in fruit ..... 35. *S. nepalensis*
16b. Stem and branches hispid or subglabrous; perianth (including wings) 7–10 mm in diam. in fruit ..... 36. *S. tragus*

1b. Leaf apex obtuse, not acicular awned; shrubs, subshrubs, or annual herbs, with other types of hairs or glabrous.
17a. Herbs annual.
18a. Leaves opposite, apex mucronate; seed vertical ..... 19. *S. brachiata*
18b. Leaves alternate, apex obtuse, not mucronate; seed horizontal.
19a. Leaves clavate; utricle berrylike; style obscure, stigmas very short ..... 12. *S. foliosa*
19b. Leaves not clavate; utricle not berrylike; style distinct, stigmas subulate or filiform.
20a. Plants densely furfuraceous and sparsely pilose; space present between wings of adjacent perianth segments in fruit ..... 11. *S. implicata*
20b. Plants not furfuraceous, but pilose or tomentose; space not present between wings of adjacent perianth segments in fruit.
21a. Leaf base not decurrent; perianth (including wings) 5–10 mm in diam. in fruit ..... 20. *S. affinis*
21b. Leaf base decurrent; perianth (including wings) 10–18 mm in diam. in fruit.
22a. Perianth segments glabrous.
23a. Stigmas 3–4 × as long as style; perianth segments above wing apex reflexed, forming a star shape ..... 13. *S. subcrassa*
23b. Stigmas 2–3 × as long as style; perianth segments above wing connivent, forming a cone ..... 14. *S. heptapotamica*
22b. Perianth segments hairy.
24a. Stigmas very short, 1/7–1/5 as long as style ..... 15. *S. lanata*
24b. Stigmas longer, nearly equaling or 3–8 × as long as style.
25a. Stigmas nearly equaling style; plants covered with suberect, long hairs when young ..... 16. *S. korshinskyi*
25b. Stigmas 3–8 × as long as style; plants with sinuous hairs.
26a. Anther appendage 1/10–1/8 as long as anther; perianth (including wings) 10–15 mm in diam. in fruit ..... 17. *S. ferganica*
26b. Anther appendage ca. 1/2 as long as or nearly equaling anther; perianth (including wings) 15–18 mm in diam. in fruit ..... 18. *S. sukaczevii*
17b. Shrubs, subshrubs, or annual herbs.
27a. Shrubs or subshrubs, glabrous; leaf base expanded, constricted above point of expansion, appearing petiole-like.
28a. Perianth segments above wing membranous, slightly reflexed in fruit, together rosettelike; bractlets equaling or longer than perianth ..... 5. *S. arbuscula*
28b. Perianth segments above wing leathery, not reflexed but embracing utricle, connivent, and together forming a cone in fruit; bractlets shorter than perianth.
29a. Leaves of older branches alternate; inflorescence paniculate ..... 7. *S. junatovii*
29b. Leaves of older branches clustered at apex of dwarf branches; inflorescence spicate.

30a. Shrubs small; perianth (including wings) 8–14 mm in diam. in fruit, portion above wing together connivent and forming a cone.
30b. Shrubs creeping; perianth (including wings) 5–7 mm in diam. in fruit, portion above wing tightly appressed to utricle, not forming a cone ..... 6. *S. abrotanoides*
31a. Bract base decurrent; bractlet margin membranous laterally, but apex herbaceous, acute; anther appendage apex pungent ..... 8. *S. laricifolia*
31b. Bract base not decurrent; bractlet margin membranous throughout, apex obtuse; anther appendage apex obtuse ..... 9. *S. arbusculiformis*
27b. Subshrubs or annual herbs, hairy; leaf base not constricted and petiole-like.
32a. Subshrubs, densely covered with T-shaped hairs; globose, dwarf branches present ..... 10. *S. passerina*
32b. Subshrubs or annual herbs, pilose; globose, dwarf branches absent.
33a. Subshrubs; leaves persistent.
34a. Perianth segments densely pilose ..... 1. *S. orientalis*
34b. Perianth segments glabrous, except apex ciliate ..... 2. *S. dshungarica*
33b. Herbs annual; leaves usually deciduous in fruit.
35a. Perianth segment margin ciliate; anthers ca. 0.5 mm; perianth (including wings) 5–7 mm in diam. in fruit ..... 3. *S. micranthera*
35b. Perianth segment margin not ciliate, or only apex ciliate; anthers ca. 1 mm; perianth (including wings) 7–9 mm in diam. in fruit ..... 4. *S. nitraria*

1. Salsola orientalis S. G. Gmelin, Reise Russland 4: 47. 1784.

东方猪毛菜 dong fang zhu mao cai

Caroxylon orientale (S. G. Gmelin) Tzvelev; *Salsola rigida* Pallas.

Subshrubs 20–50 cm tall. Stem branched from base; woody branches gray-brown, fissured; annual branches herbaceous, densely shortly sinuate pilose. Leaves semiterete, straight, 7–10 × 1–1.5 mm, densely pilose, base slightly expanded, apex obtuse. Inflorescence spicate-paniculate; bracts leaflike; bractlets broadly ovate, densely pilose, margin membranous, apex obtuse. Perianth (including wings) 7–10 mm in diam. in fruit; segments narrowly ovate, abaxially somewhat fleshy and winged from middle, densely pubescent, margin membranous; portion of segment above wing connivent with others, forming a short cone; 3 wings yellow-brown or dark brown, reniform, with numerous veins; other 2 wings smaller. Stigmas subulate, ca. 2 × as long as style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

Deserts, dunes, slopes. N Xinjiang [C and SW Asia].

2. Salsola dshungarica Iljin, Trudy Bot. Inst. Acad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 2: 129. 1936.

准噶尔猪毛菜 zhun ga er zhu mao cai

Subshrubs 10–30 cm tall. Woody branches much branched, gray-brown, short, stout; annual branches borne at apex of woody branches, crowded, white, branched in middle and upper part, densely shortly sinuate pilose. Leaves alternate, sometimes fascicled, terete, 5–10 × 0.7–1 mm, sparsely villous, base expanded, not constricted, apex obtuse. Inflorescence usually spicate-paniculate; bracts broadly lanceolate or ovate, apex obtuse; bractlets broadly ovate, margin membranous. Perianth (including wings) 6–8 mm in diam. in fruit; segments green, narrowly ovate, abaxially somewhat fleshy and winged from distal middle part, glabrous except apex ciliate, margin membranous; portion of segment above wing connivent with others, enclosing utricle, forming a short cone; wings membranous, 3 yellow-brown or light purple-brown, reniform, with numerous fine veins; other 2 wings obovate, smaller. Anther appendage very small. Stigmas subulate, nearly equaling style. Seed horizontal. Fl. Aug–Sep, fr. Sep–Oct.

Gobi desert, arid slopes. N Xinjiang [C Asia].

3. Salsola micranthera Botschantzev, Bot. Mater. Gerb. Inst. Bot. Akad. Nauk Uzbeksk. SSR 13: 5. 1952.

小药猪毛菜 xiao yao zhu mao cai

Herbs annual, 20–80 cm tall. Stem erect, much branched; branches obliquely spreading, white, densely pilose, rarely villous. Leaves gray-green, semiterete, 1–1.5 cm × 1.5–2 mm, villous, often deciduous, base slightly expanded, not decurrent, apex obtuse. Inflorescence spicate-paniculate; bracts broadly ovate, margin membranous; bractlets suborbicular, shorter than perianth. Perianth (including wings) 5–7 mm in diam. in fruit; segments narrowly ovate, herbaceous, abaxially winged from distal middle part in fruit, margin membranous, sparsely ciliate; portion of segment above wing connivent with others, tightly appressed to utricle, margin membranous, ciliate; 3 wings reniform, membranous, with numerous fine veins; other 2 wings obovate, smaller. Anthers ca. 0.5 mm. Stigmas filiform, nearly equaling style. Seed horizontal. Fl. Jul–Sep, fr. Sep–Oct.

Deserts, sandy areas. S Xinjiang [C Asia].

Freitag and Rilke (in Fl. Iranica) considered this taxon to be conspecific with *Salsola nitraria*. They indicated that forms with smaller anthers and smaller utricles are common in Afghanistan, Pakistan, and S Iran, and plants with sparsely hairy perianth segments occur scattered all over the distributional area.

4. Salsola nitraria Pallas, Ill. Pl. 23. 1803.

钠猪毛菜 na zhu mao cai

Nitrosalsola nitraria (Pallas) Tzvelev.

Herbs annual, 10–40 cm tall. Stem branched from base; lower branches subopposite, pubescent and sparsely villous. Leaves semiterete, 0.8–1.5 cm × 1–1.5 mm, sparsely villous, deciduous in fruit, base slightly expanded, apex obtuse. Inflo-

rescence spicate-paniculate; bracts broadly ovate, margin membranous, nearly equaling bractlets; bractlets suborbicular, slightly shorter than perianth. Perianth (including wings) 7–9 mm in diam. in fruit; segments narrowly ovate or lanceolate, green, abaxially nearly fleshy and winged from distal middle part in fruit, margin membranous, not ciliate or only apex ciliate; portion of segment above wing connivent with others, tightly appressed to utricle, broadly triangular, glabrous; 3 wings yellow-brown or black-brown, broadly ovate or semiorbicular, larger, membranous, with fine, dense veins, margin colorless; other 2 wings broadly linear, smaller. Anthers ca. 1 mm. Stigmas filiform, nearly equaling style. Seed horizontal or oblique. Fl. Jul–Aug, fr. Sep–Oct.

Gobi desert, dunes. N Xinjiang [Afghanistan, Pakistan; SW Asia, SE Europe (Lower Volga region of Russia)].

5. Salsola arbuscula Pallas, Reise Russ. Reich. 1: 487. 1771.

木本猪毛菜 mu ben zhu mao cai

Salsola arborescens Linnaeus f.; *Xylosalsola arbuscula* (Pallas) Tzvelev.

Shrubs 50–100 cm tall. Stem much branched; branches spreading, older ones light gray-brown, with longitudinal fissures; branchlets white, smooth. Leaves alternate, fascicled on dwarf branches, light green, semiterete, 1–3 cm × 1–2 mm, glabrous, base white, expanded and thickened, above base constricted and petiole-like, leaf often deciduous from this point, apex obtuse or acute. Inflorescence spikelike; bracts longer than bractlets; bractlets ovate, equaling or longer than perianth, margin membranous at base, apex pungent. Perianth (including wings) 8–12 mm in diam. in fruit; segments oblong, abaxially with distinct midvein and winged from proximal middle part in fruit; portion of segment above wing connivent with others, enclosing utricle, slightly reflexed and appearing rosettelike, apex mucronate; 3 wings semiorbicular; other 2 wings narrower. Anther appendages narrowly lanceolate, apex acute. Stigmas subulate, 2–4 × as long as style. Seed horizontal. Fl. Jul–Oct, fr. Sep–Oct.

Deserts, slopes. W Gansu, Nei Mongol, Ningxia, Xinjiang [Afghanistan, Mongolia, Pakistan; SW Asia (Iran), SE Europe (Lower Volga region of Russia)].

6. Salsola abrotanoides Bunge, Bull. Acad. Imp. Sci. Saint-Pétersbourg 25: 366. 1879.

蒿叶猪毛菜 hao ye zhu mao cai

Subshrubs 15–40 cm tall. Woody branches gray-brown, longitudinally fissured; annual branches crowded, yellow-green, herbaceous, finely ribbed, papillate. Leaves alternate, fascicled on dwarf branches of older branches, semiterete, 1–2 cm × 1–2 mm, base expanded, above base constricted and petiole-like, leaf often deciduous from this point, apex obtuse or mucronate. Inflorescence spikelike, slender, loose; bracts longer than bractlets; bractlets narrowly ovate, shorter than perianth, margin membranous. Perianth (including wings) 5–7 mm in diam. in fruit; segments ovate, abaxially fleshy and winged from middle, margin membranous; portion of segment above wing tightly appressed to utricle, abaxially fleshy, margin membranous, apex obtuse; 3 wings yellow-brown, semiorbicular, larger; other 2 wings obovate, smaller. Anther appendages very small. Stigmas subulate, ca. 2 × as long as style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

Arid slopes, alluvial fans, rocky riversides. W Gansu, Qinghai, Xinjiang [Mongolia].

7. Salsola junatovii Botschantzev, Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 22: 105. 1963.

天山猪毛菜 tian shan zhu mao cai

Subshrubs 20–50 cm tall. Stem much branched; woody branches gray-brown, longitudinally fissured; annual branches white below, green above, glabrous or papillate. Leaves alternate, semiterete, slightly incurved, 1–2.5 cm × 1.5–2.5 mm, glabrous or papillate, base expanded, slightly decurrent, above base constricted and appearing petiole-like, leaf often deciduous from this point, apex slightly inflated, obtuse or mucronate. Inflorescence spicate-paniculate; bracts leaflike; bractlets broadly triangular, abaxially fleshy and slightly keeled, margin membranous, apex acute. Perianth (including wings) 8–9 mm in diam. in fruit; segments narrowly ovate, hardened in fruit, winged from proximal middle part abaxially; portion of segment above wing connivent with others, forming an obtuse cone, apex obtuse; 3 wings semiorbicular, larger; other 2 wings oblong, smaller. Anther appendage apex obtuse. Style slightly stout; stigmas subulate, 2–3 × as long as style. Seed horizontal. Fl. Aug–Sep, fr. Sep–Oct.

● Arid slopes, rocky deserts. S Xinjiang.

8. Salsola laricifolia Turczaninow ex Litvinov, Herb. Fl. Ross. 49: No. 2443. 1913.

松叶猪毛菜 song ye zhu mao cai

Shrubs small, 40–90 cm tall. Stem much branched; older branches black-brown or brown, slightly fissured; branchlets white, glabrous, sometimes papillate. Leaves alternate, fascicular on dwarf branches, yellow-green, semiterete, 1–2 cm × 1–2 mm, fleshy, base expanded and slightly thickened, not decurrent, above base constricted and appearing petiole-like, leaf deciduous from this point, apex obtuse or acute. Inflorescence spikelike; bracts leaflike, base decurrent; bractlets green, broadly ovate, abaxially fleshy, margin membranous, apex acute. Perianth (including wings) 8–11 mm in diam.; segments light green, narrowly ovate, abaxially slightly hardened and winged from proximal middle part, glabrous, margin membranous; portion of segment above wing connivent with others into a cone, apex obtuse; 3 wings reniform, larger; other 2 wings obovate or suborbicular, smaller. Anther appendage apex acute. Stigmas subulate, ca. 2 × as long as style. Seed horizontal. Fl. Jun–Aug, fr. Aug–Sep.

Slopes, dunes, rocky deserts; N Xinjiang [Mongolia; C Asia].

9. Salsola arbusculiformis Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 16: 142. 1916.

白枝猪毛菜 bai zhi zhu mao cai

Shrubs 40–100 cm tall. Stem much branched; older branches gray-brown or black-brown, longitudinally fissured; branchlets white, slightly sublustrous. Leaves alternate, fascicu-

lar on dwarf branches of older branches, gray-green, semiterete, 1–1.5 cm × 1–1.5 mm, slightly fleshy, base somewhat expanded, not decurrent, above base constricted and petiole-like, leaf deciduous from this point, apex obtuse. Inflorescence spikelike; bract base not decurrent; bractlets suborbicular, margin membranous, apex obtuse. Perianth (including wings) 8–14 mm in diam. in fruit; segments abaxially yellow-green, narrowly ovate, winged from proximal middle part in fruit, glabrous, margin membranous; portion of segment above wing connivent with others into a cone, apex obtuse; 3 wings yellow-brown or light purple-brown, reniform; other 2 wings smaller. Anther appendage apex obtuse. Stigmas subulate, equaling style. Seed horizontal. Fl. Aug–Sep, fr. Sep–Oct.

Gobi desert, arid slopes. N Xinjiang [C Asia].

10. Salsola passerina Bunge, Linnaea 17: 4. 1843.

珍珠猪毛菜 zhen zhu zhu mao cai

Salsola gemmascens Pallas subsp. *passerina* (Bunge) Botschantzev.

Subshrubs 15–30 cm tall, densely covered with T-shaped hairs. Stem branched from base; woody branches spreading, gray-brown; annual branches yellow-green, with globose, dwarf branches. Leaves subulate or triangular, 2–3 × ca. 2 mm, abaxially slightly keeled, usually early deciduous, base expanded, apex acute. Inflorescence spikelike; bracts ovate; bractlets broadly ovate, margin membranous, apex acute. Perianth (including wings) 7–8 mm in diam. in fruit; segments narrowly ovate, abaxially slightly fleshy and winged from middle in fruit, margin membranous; portion of segment below wing glabrous; portion above wing connivent with others and forming a cone, T-shaped hairy; 3 wings yellow-brown or light purple-red, reniform; 2 other wings obovate, smaller. Anthers free from base to near apex, oblong; anther appendage lanceolate, apex acute. Stigmas filiform. Seed horizontal or vertical. Fl. Jul–Sep, fr. Aug–Sep.

Slopes, rocky alluvial fans. W Gansu, Nei Mongol, Ningxia, Qinghai [Mongolia].

11. Salsola implicata Botschantzev, Bot. Mater. Gerb. Inst. Bot. Akad. Nauk Uzbeksk. SSR 13: 6. 1952.

密枝猪毛菜 mi zhi zhu mao cai

Herbs annual, 10–40 cm tall. Stem branching from base, densely furfuraceous hairy, sparsely sinuate pilose; branches dense, spreading or slightly flexuous, white, slender. Leaves terete, 5–10 × 1–1.5 mm, usually early deciduous, base slightly expanded and recurved, apex obtuse. Flowers solitary, borne throughout plant; bracts broadly lanceolate; bractlets broadly triangular, margin membranous, apex acute. Perianth (including wings) 8–10 mm in diam. in fruit; segments lanceolate, abaxially winged from middle in fruit, furfuraceous hairy and pilose; portion of segment above wing connivent with others, tightly appressed to utricle, lanceolate, subfleshy, hairy; wing with a space between wings of adjacent segments, yellow-brown, obovate or rhomboid, pellucid, subpapery, several veined. Anthers free from base to apex; anther appendage ovate. Stigmas linear, apex obtuse. Seed horizontal. Fl. Jul–Aug, fr. Sep–Oct.

Deserts, dunes. N Xinjiang [C Asia].

According to Freitag and Rilke (in Fl. Iranica), *Salsola implicata* differs from *S. sclerantha* C. A. Meyer only by such unstable characters as recurved leaves and yellow perianth wings, and thus it is better treated as a synonym of the latter species.

12. Salsola foliosa (Linnaeus) Schrader ex Roemer & Schultes, Syst. Veg. 6: 235. 1820.

浆果猪毛菜 jiang guo zhu mao cai

Anabasis foliosa Linnaeus, Sp. Pl. 1: 223. 1753; *Caspia foliosa* (Linnaeus) Galushko; *Neocaspia foliosa* (Linnaeus) Tzvelev; *Salsola clavifolia* Pallas.

Herbs annual, 20–40 cm tall. Stem erect, branched from base; branches gray-green, black-brown after drying, subfleshy, glabrous except slightly hairy in leaf axils. Leaves gray green, clavate, 1–2 cm × 1.5–2.5 mm, fleshy, glabrous, apex usually incurved, slightly inflated, obtuse. Flowers 3–5-glomerulate, borne throughout plant; bractlets broadly ovate, margin membranous, apex obtuse. Perianth (including wings) 5–7 mm in diam. in fruit; segments obovate or suborbicular, 0.8–1.1 mm, submembranous, abaxially with 1 protruding vein and winged from distal middle part; portion of segment above wing slightly curved, not enclosing utricle, broadly triangular, membranous, apex obtuse; wings yellow-brown, semiorbicular, subequal, margin entire. Anthers ca. 0.6 mm; appendage obscure. Style obscure; stigmas ca. 0.2 mm. Utricle berrylike, globose, juicy. Seed horizontal. Fl. Aug–Sep, fr. Sep–Oct.

Saline soils in deserts, semideserts. N Xinjiang [Mongolia, Russia (SW Siberia); C Asia, SW Asia (Caucasus), SE Europe].

13. Salsola subcrassa Popov ex Iljin in Shishkin, Fl. URSS 6: 875. 1936.

粗枝猪毛菜 cu zhi zhu mao cai

Climacoptera subcrassa (Popov ex Iljin) Botschantzev.

Herbs annual, 15–40 cm tall. Stem branched from base; lower branches elongate, stout, sparsely pilose below, pubescent or subglabrous above. Leaves yellow-green, semiterete, 1–2 cm × 1.5–2.5 mm, glabrous, margin membranous at base, decurrent, apex obtuse; lower leaves sometimes sparsely villous. Inflorescence spikelike; flowers solitary; bracts ovate, longer than bractlets; bractlets ovate, shorter than perianth, margin membranous. Perianth (including wings) 10–15 mm in diam. in fruit; segments lanceolate, membranous, abaxially winged from middle in fruit, glabrous; portion of segment above wing reflexed, with others appearing starlike, apex membranous; wings obovate. Anther appendage shortly stalked, white, shorter than anther. Stigmas subulate-filiform, 3–4 × as long as style. Seed horizontal. Fl. Aug–Sep, fr. Sep–Oct.

Gobi desert, saline lake shores. N Xinjiang [C Asia].

14. Salsola heptapotamica Iljin, Trudy Bot. Inst. Acad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 2: 127. 1936.

钝叶猪毛菜 dun ye zhu mao cai

Climacoptera obtusifolia (Schrenk) Botschantzev; *Halimocnemis obtusifolia* Schrenk.

Herbs annual, 15–40 cm tall. Stem erect, branched from base, sinuate-villous below, sparsely pubescent or subglabrous

above. Leaves terete, 1–1.5 cm × 1–2 mm, lower leaves densely crisped villous, upper ones glabrous, base expanded, decurrent, apex obtuse. Inflorescence terminal, spikelike, loose; bracts narrowly ovate, equaling or slightly longer than bractlets, glabrous, apex acute; bractlets broadly lanceolate, shorter than perianth, with 1 prominent vein, apex acute. Perianth (including wings) 10–12 mm in diam. in fruit; segments lanceolate, membranous, glabrous, abaxially winged from proximal middle part in fruit; portion of segment above wing connivent with others into a cone, submembranous distally, glabrous, apex acuminate; 3 wings yellow-brown, semiorbicular; other 2 wings narrower. Anther appendage yellow, vesicular, ovate, 1/3–1/2 as long as anther. Stigmas filiform-subulate, 2–3 × as long as style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

Gobi desert, sandy areas, saline lake shores. N Xinjiang [E Kazakhstan].

15. Salsola lanata Pallas, Reise Russ. Reich. 2: 736. 1773.

短柱猪毛菜 duan zhu zhu mao cai

Climacoptera lanata (Pallas) Botschantzev.

Herbs annual, 15–40 cm tall. Stem erect, branched from base, gray-green, densely tomentose mixed with erect, long, jointed hairs. Leaves spreading, gray-green, semiterete, 1–1.5 cm × 1.5–2 mm, densely pubescent mixed with erect, long hairs, base decurrent, apex obtuse. Inflorescence spikelike; bracts narrowly ovate, apex acute; bractlets lanceolate, shorter than or equaling bracts, longer than perianth. Perianth (including wings) 14–16 mm in diam. in fruit; segments lanceolate, membranous, hardened in fruit, abaxially winged from proximal middle part, pubescent; portion of segment above wing connivent into a cone, pubescent, apex acuminate; 3 wings light red or dark brown, semiorbicular or reniform, larger, membranous; other 2 wings narrower. Anther appendage shortly stalked, purple-red, vesicular, elliptic, subequaling anther. Stigmas subulate, very short, 1/7–1/6 as long as style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

Saline lake shores, saline soils of Gobi desert. N Xinjiang [Pakistan, Russia; SW Asia (Iran)].

The Chinese plants belong to subsp. *lanata*.

16. Salsola korshinskyi Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 16: 142. 1916.

褐翅猪毛菜 he chi zhu mao cai

Climacoptera korshinskyi (Drobow) Botschantzev.

Herbs annual, 30–60 cm tall. Stem erect, much branched above; branchlets obliquely spreading, densely pubescent mixed with erect, long hairs when young. Leaves spreading, gray-green, semiterete, 1–1.5 cm × 1.5–2.5 mm, densely pubescent mixed with suberect, long hairs, base decurrent, apex obtuse. Inflorescence spicate; bracts narrowly ovate, subequaling bractlets; bractlets ovate, slightly shorter than or subequaling perianth. Perianth (including wings) 10–12 mm in diam. in fruit; segments lanceolate, membranous, abaxially winged from middle, pubescent; portion of segment above wing connivent with others into a cone; 3 wings yellow-brown or red-brown, reniform or obovate; other 2 wings smaller. Anther appendage shortly stalked, purple-red or white, narrowly ovate, 1/3–1/2 as long as anther. Stigmas subulate, subequaling style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

Gobi desert, saline lake shores. N Xinjiang [C Asia].

17. Salsola ferganica Drobow, Trudy Bot. Muz. Imp. Akad. Nauk 16: 141. 1916.

费尔干猪毛菜 fei er gan zhu mao cai

Climacoptera ferganica (Drobow) Botschantzev.

Herbs annual, globose, 10–30 cm tall. Stem branched from base; branches densely numerous, densely pubescent mixed with sinuate, long hairs. Leaves spreading, gray-green, semiterete, 1–1.5 cm × 1–2 mm, densely pubescent mixed with sinuate, long hairs, base decurrent, apex obtuse. Inflorescence spikelike; bracts narrowly ovate, longer than bractlets, densely pubescent, apex obtuse; bractlets ovate, subequaling perianth. Perianth (including wings) 10–15 mm in diam. in fruit; segments lanceolate, abaxially winged from proximal middle part in fruit, pubescent; portion of segment above wing connivent with others into a cone, lanceolate, pubescent, apex acuminate; wings purple-red or dark brown, 3 semiorbicular and larger, 2 narrower. Anther appendage vesicular, minute, 1/10–1/8 as long as anther. Stigmas subulate, 3–4 × as long as style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

N Xinjiang [C Asia].

This taxon was treated as *Salsola crassa* Marschall von Bieberstein subsp. *turcomanica* (Litvinov) Freitag by Freitag and Rilke (in Fl. Iranica), but, according to Grubov (Rast. Tsentral. Azii 2: 97. 1966), the name *S. turcomanica* Litvinov was misapplied to this taxon.

18. Salsola sukaczevii (Botschantzev) A. J. Li in H. W. Kung & C. P. Tsien, Fl. Reipubl. Popularis Sin. 25(2): 172. 1979.

长柱猪毛菜 chang zhu zhu mao cai

Climacoptera sukaczevii Botschantzev, Sborn. Rabot, Posvyaschch. Akad. Sukachevu, 112. 1956.

Herbs annual, globose, 15–30 cm tall. Stem much branched, gray-green, densely pubescent mixed with sinuate, long hairs when young. Leaves semiterete, 1–2 cm × 1.5–2 mm, base decurrent, apex obtuse. Inflorescence spikelike, loose; bracts broadly lanceolate, apex obtuse; bractlets long ovate, slightly shorter than or subequaling perianth, apex acute. Perianth (including wings) 15–18 mm in diam. in fruit; segments lanceolate, membranous, hardened in fruit, abaxially winged from proximal middle part, densely pubescent; portion of segment above wing connivent with others into a long, thin cone, narrowly lanceolate, densely pubescent; 3 wings light purple-red or yellow-brown, semiorbicular, larger, submembranous; other 2 wings linear, smaller. Anther appendage shortly stalked, purple-red, vesicular, elliptic, slightly shorter than or subequaling anther. Style very short; stigmas subulate, 6–8 × as long as style. Seed horizontal. Fl. Jul–Aug, fr. Sep–Oct.

Sandy places, dunes. N Xinjiang [C Asia].

19. Salsola brachiata Pallas, Ill. Pl. 30. 1803.

散枝猪毛菜 san zhi zhu mao cai

Climacoptera brachiata (Pallas) Botschantzev.

Herbs annual, 10–30 cm tall. Stem erect, branched from base; branches opposite, sometimes upper ones alternate; branchlets spreading, thin, hard, densely pubescent mixed with sparse, long, jointed hairs. Leaves opposite, semiterete, 1.5–2 cm × 2–2.5 mm, densely pubescent mixed with sparse, long hairs, base slightly expanded, not decurrent, apex mucronate. Inflorescence spikelike; bracts leaflike, longer than bractlets, base expanded; bractlets broadly lanceolate, densely pubescent mixed with sparse, long hairs, margin broadly membranous at base, apex acute. Perianth (including wings) 10–13 mm in diam. in fruit; segments narrowly lanceolate, hardened in fruit, abaxially winged from proximal middle part, densely pubescent, margin membranous; portion of segment above wing connivent with others into a long, thin cone, narrowly lanceolate, subleathery, densely pubescent; 3 wings yellow-brown or purple-brown, reniform; other 2 wings obovate, smaller. Anther appendage cochleate. Style very short; stigmas subulate, 7–8 × as long as style. Seed vertical. Fl. Jul–Aug, fr. Sep–Oct.

Gobi desert, slopes, ravines. N Xinjiang [Mongolia, Russia (SW Siberia); C Asia, SW Asia (Caucasus), SE Europe].

20. Salsola affinis C. A. Meyer, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 1: 360. 1843.

紫翅猪毛菜 zi chi zhu mao cai

Climacoptera affinis (C. A. Meyer) Botschantzev; *C. roborowskii* (Iljin) Grubov; *Salsola roborowskii* Iljin.

Herbs annual, 10–30 cm tall. Stem branched from base; branches alternate or lower ones subopposite, ascending or decumbent, white, densely pilose. Leaves semiterete, alternate, 1–2.5 cm × 2–3 mm, densely pubescent, base slightly expanded, not decurrent, apex obtuse; lower leaves subopposite, usually curved. Inflorescence terminal, spikelike; bracts broadly ovate, shorter than bractlets, margin membranous, apex obtuse; bractlets ovate, shorter than perianth. Perianth (including wings) 5–10 mm in diam. in fruit; segments lanceolate, membranous, abaxially winged from proximal middle part, glabrous or sparsely villous; portion of segment above wing connivent with others into a cone, lanceolate, membranous, apex acute; 3 wings purple-red or dark brown, reniform; 2 other wings obovate, smaller. Anther appendage white, elliptic. Stigmas subequaling or slightly longer than style. Seed horizontal or sometimes vertical. Fl. Jul–Aug, fr. Aug–Sep.

Deserts, hills, dry clayey soils. Xinjiang [C Asia, SE Europe (Lower Volga region of Russia)].

21. Salsola aperta Paulsen, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 6(5): 197. 1903.

露果猪毛菜 lu guo zhu mao cai

Herbs annual, 10–30 cm tall. Stem branched from base; branches alternate or lower ones subopposite, white, sublustrous, ribbed, glabrous. Leaves light gray-green, broadly linear, 2–5 cm × 5–7 mm, fleshy, glabrous, base slightly decurrent, apex spinose mucronate; midvein distinct abaxially. Flowers solitary, borne throughout plant; bracts leaflike, longer than bractlets. Perianth (including wings) 5–8 mm in diam. in fruit; segments lanceolate, membranous, below middle hardened in fruit, abaxially winged from middle, glabrous; portion of segment above wing reflexed, with others appearing starlike, not enclosing utricle, lanceolate, membranous, apex abruptly acute; 3 wings semiorbicular, larger, with several sparse, stout veins; other 2 wings very small. Anthers free from base to near apex, 1.5–2 mm; appendage ovate, apex obtuse. Stigmas 3–4 × as long as style. Seed horizontal. Fl. Jun–Jul, fr. Jul–Aug.

Dunes, sandy places. Xinjiang [Afghanistan, S Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia (Iran)].

22. Salsola soda Linnaeus, Sp. Pl. 1: 223. 1753.

苏打猪毛菜 su da zhu mao cai

Herbs annual, 20–70 cm tall. Stem branched from base; branches alternate or lower ones opposite, spreading, light green, sometimes whitish, not straight, glabrous. Lower leaves opposite, upper ones alternate, all semiterete, 2–7 cm × 2–4 mm, glabrous, base expanded, slightly decurrent, margin membranous, apex minutely mucronate. Inflorescence spicate, loose; flowers usually solitary; bracts longer than bractlets; bractlets narrowly ovate, margin narrowly membranous near base, apex acute. Perianth segments ovate, membranous, hardened in fruit, abaxially with a triangular process on distal middle part, glabrous; portion of segment above process strongly inflexed, with others forming a truncate surface tightly appressed to utricle, apex obtuse. Anthers oblong, 1–1.5 mm; appendage minute. Stigmas filiform, 2–3 × as long as style. Utricle obovoid, 3–4 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

Saline lake shores, meadows with saline soils. Xinjiang [N Africa, C and SW Asia, S Europe; locally naturalized in North America (C California) and South America (Argentina)].

23. Salsola komarovii Iljin, Bot. Zhurn. SSSR 18: 276. 1933.

无翅猪毛菜 wu chi zhu mao cai

Herbs annual, 20–50 cm tall. Stem erect, branched from base; branches alternate, spreading, yellow-green, white or purple-red striate, glabrous. Leaves alternate, horizontally or slightly obliquely spreading, semiterete, 2–5 cm × 2–3 mm, base expanded, slightly decurrent, margin membranous at base, apex mucronate. Inflorescence terminal, spicate; bracts linear, longer than bractlets, apex mucronate; bractlets narrowly ovate, longer than perianth, thickened in fruit and tightly appressed to perianth, margin membranous at base, apex mucronate. Perianth segments ovate-oblong, membranous, hardened and leathery in fruit, abaxially with a pectinate process on distal middle part, glabrous; portion of segment above process inflexed, with others forming a truncate surface, apex connivent with others into a short cone, acute, membranous. Style very short; stigmas filiform, 3–4 × as long as style. Utricle obovoid, 2–2.5 in diam. Fl. Jul–Aug, fr. Aug–Sep.

Beaches, sandy soils on riversides. Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Shandong, N Zhejiang [Japan, Korea, Russia (Far East)].

24. Salsola collina Pallas, Ill. Pl. 34. 1803.

猪毛菜 zhu mao cai

Salsola chinensis Gandoger.

Herbs annual, 20–100 cm tall. Stem branched from base; branches alternate, spreading, green, white or purple-red striate, hispid or subglabrous. Leaves spreading or slightly curved, filiform-terete, 2–5 cm × 0.5–1.5 mm, hispid, base slightly expanded, decurrent, margin membranous, apex spinose mucronate. Inflorescence spikelike; bracts and bractlets tightly appressed to rachis; bracts ovate, abaxially longitudinally keeled, margin membranous, apex spinose mucronate; bractlets narrowly lanceolate, apex spinose mucronate. Perianth segments ovate-lanceolate, membranous, hardened in fruit, abaxially crested; portion of segment above crest inflexed, with others forming a plane surface tightly appressed to utricle or sometimes connivent distally into a small cone, subleathery, apex acute, membranous. Anthers 1–1.5 mm. Stigmas filiform, 1.5–2 × as long as style. Seed horizontal or oblique. Fl. Jul–Sep, fr. Sep–Oct.

Around farm houses, roadsides, waste places. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hunan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Korea, Mongolia, Pakistan, Russia; C Asia; naturalized in C and W Europe and North America].

This plant is used in Chinese medicine to reduce blood pressure.

25. Salsola zaidamica Iljin, Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 17: 122. 1955.

柴达木猪毛菜 chai da mu zhu mao cai

Herbs annual, 8–15 cm tall. Stem branched from base; basal branches subopposite, spreading, densely papillate. Leaves alternate, crowded, narrowly lanceolate, compressed, densely papillate, margin membranous and usually reflexed near base, apex spinose mucronate. Flowers solitary, borne nearly throughout plant; bracts longer than bractlets, apex spinose mucronate; bractlets ovate, densely papillate, margin membranous at base. Perianth segments narrowly ovate, submembranous, hardened in fruit and appearing leathery, abaxially with a thickened process at middle, glabrous; portion of segment above process inflexed, with others forming a truncate surface tightly appressed to utricle, apex membranous, usually caducous and forming a circular hole. Anthers oblong, ca. 0.5 mm. Style very short; stigmas filiform. Seed horizontal, ca. 1.5 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

Saline areas in deserts. N Gansu, Qinghai, E Xinjiang [Mongolia].

The actual distribution of *Salsola zaidamica* requires additional studies.

26. Salsola monoptera Bunge, Bull. Acad. Imp. Sci. Saint-Pétersbourg 25: 364. 1879.

单翅猪毛菜 dan chi zhu mao cai

Herbs annual, 10–30 cm tall. Stem branched from base, densely hispid; branches alternate, horizontally spreading, lowest ones subopposite. Leaves yellow-green, filiform, semiterete, 1–1.5 cm × 0.5–1 mm, hispid, base slightly expanded, apex spinose mucronate. Inflorescence spikelike, or sometimes flowers borne throughout plant; bracts lanceolate, longer than bractlets. Perianth segments narrowly ovate, membranous, hardened and leathery in fruit, only 1 segment abaxially winged, others with a toothlike process, all glabrous; portion of segment above wing or process connivent with others and forming a plane surface, apex acute. Stamens longer than perianth; anthers ca. 0.3 mm; appendage very small. Style very short; stigmas filiform, 4–6 × as long as style. Seed horizontal, ca. 1 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

Riversides, sandy slopes. Nei Mongol, Qinghai, Xinjiang, Xizang [Mongolia, Russia (Altai)].

27. Salsola tamariscina Pallas, Reise Russ. Reich. 3: 604. 1776.

柽柳叶猪毛菜 cheng liu ye zhu mao cai

Herbs annual, 15–50 cm tall. Stem erect; branches usually gray-green, long, straight, and glabrous, sometimes white striate and rough. Leaves gray-green, semiterete, 0.5–1.5 cm × 1.5–2 mm, glabrous, base expanded, slightly decurrent, margin membranous, apex mucronate. Flowers solitary throughout plant; bracts narrowly ovate, subequaling or longer than bractlets, abaxially white keeled, margin membranous at base, apex extended, mucronate; bractlets ovate-lanceolate, subequaling perianth, apex mucronate. Perianth (including wings) 5–7 mm in diam. in fruit; segments narrowly ovate, submembranous, hardened in fruit, abaxially winged from middle, perianth segments above wing connivent with others and forming a cone, narrowly lanceolate, submembranous, abaxially green fleshy keeled, apex acute, long mucronate; 3 wings semiorbicular or suborbicular; other 2 wings yellow-brown, obovate, with veins united at base. Style very short; stigmas filiform, 2–3 × as long as style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

Saline-alkaline meadows, Gobi desert. N Xinjiang [Mongolia, Russia (Altai, N Caucasus, SE European part); C Asia, SE Europe (SE Ukraine)].

28. Salsola rosacea Linnaeus, Sp. Pl. 1: 222. 1753.

蔷薇猪毛菜 qiang wei zhu mao cai

Herbs annual, 15–40 cm tall. Stem erect, branched, rarely simple, gray-green, white striate, sometimes light red-brown below, glabrous. Leaves gray-green, semiterete, 1–3 cm × 1.5–2 mm, glabrous, base expanded with membranous margin, decurrent, apex mucronate. Flowers axillary, solitary, borne throughout plant; bracts narrowly lanceolate, sometimes slightly curved, longer than bractlets, apex pungent; bractlets ovate-lanceolate, longer than perianth, margin membranous at base, apex acute. Perianth (including wings) 8–10 mm in diam. in fruit; segments narrowly ovate, submembranous, abaxially winged from distal middle part, glabrous; portion of segment above wing tightly appressed to utricle, broadly lanceolate or triangular, abaxially green fleshy keeled, margin submembranous, apex obtuse; 3 wings reniform; other 2 wings purple-red or yellow-brown, obovate. Anthers oblong, 0.5–0.7 mm. Style very short; stigmas filiform, 2–3 × as long as style. Seed horizontal. Fl. Jul–Aug, fr. Sep–Oct.

Gobi desert, ravines, saline soils. N Xinjiang [W Mongolia, Russia (Altai); C Asia].

29. Salsola chinghaiensis A. J. Li, Acta Phytotax. Sin. 16(1): 122. 1978.

青海猪毛菜 qing hai zhu mao cai

Herbs annual, 40–50 cm tall. Stem branched from base, green, white striate, densely hispid. Leaves alternate, semiterete, 2–3 cm × 1.5–3 mm, fleshy, hispid, base expanded, apex hardened mucronate. Inflorescence terminal, spikelike; flowers solitary; bracts broadly lanceolate, longer than bractlets, apex elongate, spinose mucronate; bractlets spreading, lanceolate. Perianth (including wings) 10–12 mm in diam. in fruit; segments lanceolate, membranous, hardened in fruit, abaxially winged from proximal middle part; portion of segment above wing connivent with others into a long cone, subleathery, densely very shortly hispid, apex acute, thinly mucronate; 3 wings semiorbicular, with veins united at base, margin irregularly toothed; other 2 wings narrower. Anthers oblong, ca. 1 mm. Stigmas filiform, 2–3 × as long as style. Seed horizontal, ca. 2 mm in diam. Fl. Jul–Aug, fr. Aug–Sep.

● Saline soils in meadows. Qinghai (Qaidam Pendi).

Salsola chinghaiensis may be a synonym of *S. ikonnikovii* (see Rilke, Biblioth. Bot. 149: 152. 1999).

30. Salsola praecox (Litvinov) Iljin in Shishkin, Fl. URSS 6: 216. 1936.

早熟猪毛菜 zao shu zhu mao cai

Salsola kali Linnaeus var. *praecox* Litvinov, Sched. Herb. Fl. Ross. 4: 66. 1902; *S. paulsenii* Litvinov subsp. *praecox* (Litvinov) Rilke.

Herbs annual, 5–25 cm tall. Stem branched from base; branches green, white striate, slender, hispid or subglabrous; lowest branches elongate. Leaves spreading or curved, filiform, semiterete, 1.5–3.5 cm × 0.7–1.5 mm, hispid, base slightly expanded, apex spinose mucronate. Inflorescence spikelike, loose, or sometimes flowers borne throughout plant; bracts narrowly ovate, longer than bractlets, margin membranous at base, apex elongate, spinose mucronate; bractlets ovate, longer than perianth, apex spinose mucronate. Perianth (including wings) 6–8 mm in diam. in fruit; segments narrowly lanceolate, membranous, hardened in fruit, abaxially winged from proximal middle part, hispid; portion of segment above wing connivent with others into a long, thin cone, shortly bristly, apex long, hard, spinose mucronate; 3 wings reniform, larger; other 2 wings narrowly lanceolate, smaller, leathery. Anthers ca. 0.5 m, apex spinose mucronate. Stigmas filiform, 2–3 × as long as style. Seed horizontal. Fl. Apr–May, fr. May–Jul.

Dunes, sandy places. N Xinjiang [Afghanistan, SW Pakistan; SC Asia, SW Asia (E Iran)].

Salsola praecox is very closely related to *S. paulsenii* and would perhaps be better treated as *S. paulsenii* subsp. *praecox*.

31. Salsola paulsenii Litvinov, Izv. Turkestansk. Otd. Russk. Geogr. Obshch. 4(5): 28. 1905.

长刺猪毛菜 chang ci zhu mao cai

Herbs annual, 15–40 cm tall. Stem branched from base, usually light red-brown, rigid, densely hispid. Leaves semiterete, straight, 1.5–3 cm × 1.5–2 mm, rigid, hispid, base slightly expanded, apex spinose mucronate. Inflorescence spikelike, loose; bracts narrowly ovate, apex elongate, spinose mucronate; bractlets slightly reflexed, broadly lanceolate, longer than perianth. Perianth (including wings) 6–8 mm in diam. in fruit; segments broadly lanceolate, submembranous, hardened in fruit, abaxially winged from proximal middle part, hispid; portion of segment above wing connivent with others into a long, thin cone, densely hispid, apex long acuminate, rigidly spinose mucronate; 3 wings reniform or semiorbicular, larger; other 2 wings narrower. Stigmas filiform, longer than style. Seed horizontal. Fl. Jul–Aug, fr. Sep–Oct.

Gobi desert, saline sandy places. N Xinjiang [Afghanistan, W Mongolia; C and SW Asia, SE Europe; naturalized in SW North America].

Salsola ×*gobicola* Iljin (Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 17: 124. 1955) is a hybrid between *S. paulsenii* and *S. tragus* (see Rilke, Biblioth. Bot. 149: 164. 1999).

32. Salsola pellucida Litvinov, Sched. Herb. Fl. Ross. 8: 16. 1922.

薄翅猪毛菜 bao chi zhu mao cai

Herbs annual, 20–60 cm tall. Stem erect, much branched, green; branches white-striate, stout, densely hispid. Leaves semiterete, 1.5–2.5 cm × 1.5–2 mm, apex spinose mucronate. Inflorescence spikelike; bracts longer than bractlets. Perianth (including wings) 7–12 mm in diam. in fruit; segments hardened in fruit, abaxially winged from proximal middle part, glabrous or rough; portion of segment above wing connivent with others into a long, thin cone, apex subrigidly spinose mucronate or thinly membranous mucronate; 3 wings semiorbicular; 2 other wings narrower. Stigmas filiform, longer than style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

Gobi desert, ravines, riversides. Gansu, Nei Mongol, Ningxia, Qinghai, Xinjiang [C Asia, SW Asia (E Caucasus)].

Most authors regard *Salsola pellucida* as a synonym of *S. paulsenii* s.str.

33. Salsola sinkiangensis A. J. Li, Acta Phytotax. Sin. 16(1): 122. 1978.

新疆猪毛菜 xin jiang zhu mao cai

Herbs annual, 15–30 cm tall. Stem branched from base; branches crowded, white striate, densely hispid. Leaves alternate, green, filiform, semiterete, 1–1.5 cm × 0.5–0.8 mm, fleshy, hispid, base slightly expanded, not decurrent, apex spinose mucronate. Flowers axillary, solitary, borne throughout plant; bracts broadly lanceolate, longer than bractlets, apex elongate, spinose mucronate; bractlets lanceolate. Perianth (including wings) 5–6 mm in diam. in fruit; segments ovate-lanceolate, membranous, hardened in fruit, abaxially winged from middle, glabrous; portion of segment above wing connivent with others into a short cone, apex acute; wings light purple-red or yellow-brown, 3 obovate, other 2 narrower. Filaments narrowly linear; anthers oblong, ca. 0.5 mm; appendage white, small. Stigmas filiform, ca. 2 × as long as style. Seed horizontal, 1.5–2 mm in diam. Fl. Jul–Aug, fr. Sep–Oct.

● Sandy and rocky deserts, valley terraces; 900–2500 m. Gansu, Xinjiang.

Salsola sinkiangensis may be a synonym of *S. jacquemontii* Moquin-Tandon (see Rilke, Biblioth. Bot. 149: 139. 1999).

34. Salsola ikonnikovii Iljin, Izv. Bot. Sada Akad. Nauk SSSR 30: 748. 1932.

蒙古猪毛菜 meng gu zhu mao cai

Herbs annual, 30–40 cm tall. Stem branched from base, green; branches white striate, sparsely hispid along striae; basal branches ascending, elongate. Leaves semiterete, 2–3 cm × 1.5–2 mm, glabrous, base expanded, apex spinose mucronate. Inflorescence spicate; flowers axillary, solitary; bracts narrowly ovate, longer than bractlets, apex elongate, spinose mucronate; bractlets reflexed in fruit, narrowly ovate, abaxially with a white, stout vein, base expanded, margin membranous at base, apex elongate, spinose mucronate. Perianth (including wings) 7–10 mm in diam. in fruit; segments narrowly ovate, hardened and leathery in fruit, abaxially winged from middle, glabrous; portion of segment above wing connivent with others into a short cone, rigid; 3 wings reniform or obovate, larger, apex irregularly dentate; 2 other wings very narrow. Anthers ca. 1 mm; appendage extremely small. Stigmas equaling style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

Dunes, sandy places. Nei Mongol [Mongolia].

35. Salsola nepalensis Grubov, Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 21: 127. 1961.

尼泊尔猪毛菜 ni bo er zhu mao cai

Herbs annual, 20–40 cm tall. Stem branched from base, densely long hispid; basal branches subopposite, decumbent, elongate, upper branches alternate, all branches light purple-red or white-ribbed. Leaves sessile, terete, 1.5–4 cm × ca. 1 mm, hispid, apex spinose mucronate. Inflorescence spikelike; flowers solitary; bracts spreading, abaxially white veined, base expanded, margin ciliate near base. Perianth (including wings) ca. 5 mm in diam. in fruit; segments membranous, leathery in fruit, abaxially winged, glabrous; portion of segment above wing connivent with others into a cone, apex acute, membranous; wings with black-brown veins, margin slightly crenate. Anthers ca. 0.8 mm, without an appendage. Stigmas filiform, 3–4 × as long as style. Seed horizontal. Fl. Jul–Aug, fr. Aug–Sep.

Valleys, arid slopes, sandy or rocky places. Xizang [Nepal].

Salsola nepalensis may be a synonym of *S. jacquemontii* Moquin-Tandon (see Rilke, Biblioth. Bot. 149: 139. 1999).

36. Salsola tragus Linnaeus, Cent. Pl. 2: 13. 1756.

刺沙蓬 ci sha peng

Salsola australis R. Brown; *S. dichracantha* Kitagawa; *S. iberica* (Sennen & Pau) Botschantzev ex Czerepanov; *S. kali* Linnaeus var. *angustifolia* Fenzl; *S. kali* var. *pseudotragus* G. Beck; *S. kali* subsp. *ruthenica* Soó; *S. kali* var. *tenuifolia* Tausch; *S. kali* var. *tragus* (Linnaeus) Moquin-Tandon; *S. pestifer* A. Nelson; *S. ruthenica* Iljin, nom. illeg. superfl.; *S. ruthenica* var. *filifolia* A. J. Li; *S. tragus* subsp. *iberica* Sennen & Pau.

Herbs annual, 30–100 cm tall. Stem erect, branched from base, white, or purple-red striate, densely hispid or subglabrous. Leaves semiterete or terete, 1.5–4 cm × 0.5–1.5 mm, glabrous or hispid, base expanded, margin membranous at base, apex spinose mucronate. Inflorescence spikelike; bracts narrowly ovate, longer than bractlets, margin membranous at base, apex spinose mucronate; bractlets ovate, apex spinose mucronate. Perianth (including wings) 7–10 mm in diam. in fruit; segments narrowly ovate, membranous, hardened in fruit, abaxially 1-veined and winged from middle, glabrous; portion of segment above wing connivent with others and enclosing utricle, subleathery, apex membranous; 3 wings sometimes light purple-red, reniform or obovate, larger; other 2 wings narrower. Stigmas filiform, 3–4 × as long as style. Seed horizontal, ca. 2 mm in diam. Fl. Aug–Sep, fr. Sep–Oct.

Dunes, sandy places, rocky places in Gobi desert, valleys, seashores. N Gansu, Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang, Xizang [native to C and SW Asia and SE Europe; now widely naturalized in S Africa, Asia, Australia, Europe, and North and South America].

In its present circumscription, *Salsola tragus* still remains an extremely polymorphic species probably consisting of several distinct races (subspecies or even segregate species). Studies of allozymes and DNA markers in some North American and Eurasian representatives of *S. tragus* also indicate that there are several cryptic, genetically divergent populations (Ryan & Ayres, Canad. J. Bot. 78: 59–67. 2000). Several varieties and forms have been recognized within *S. tragus*, but they are mostly morphological variants of little or no taxonomic value.

40. NANOPHYTON Lessing, Linnaea 9: 197. 1834.

小蓬属 xiao peng shu

Subshrubs cushion-shaped, glabrous or cottony in leaf axils. Leaves alternate, sessile, triangular-ovate, adaxially concave, leathery, base semiamplexicaul, margin membranous, apex subulate or pungent. Flowers solitary in leaf axils and usually 1–4-clustered at each annual branch apex, bisexual, with 2 bractlets. Perianth segments 5, free, in 2 whorls, 2 in outer whorl, 3 in inner whorl, twisted into a cone, lanceolate, adaxially concave, membranous, distinctly enlarged and becoming papery in fruit, without abaxial appendages, apex acute or acuminate. Disk cupular, with 5 semiorbicular, fleshy lobes. Stamens 5, inserted between lobes of disk; filaments complanate; anthers sagittate, apex with a mucronate appendage. Ovary ovoid, compressed; style terete, slightly longer than stigmas; stigmas 2, recurved or erect, linear. Utricle enclosed in perianth, ovoid or broadly so, abaxially convex, adaxially concave; pericarp membranous, adnate to seed. Seed vertical; testa membranous; embryo spiral or planospiral; perisperm absent.

Probably one highly variable species: C Asia, extending to China, Mongolia, and Russia; one species in China.

1. Nanophyton erinaceum (Pallas) Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 4(11): 51. 1862.

小蓬 xiao peng

Polycnemum erinaceum Pallas, Ill. Pl. 58. 1803; *Halimocnemis juniperina* C. A. Meyer.

Plants to 30 cm tall. Stem twisted, sinuate, gray-brown to black-brown, rough; older branches crowded, with numerous lateral, dwarf, dry branches; annual branches green, usually 5–10 mm. Leaves 1.5–5 mm, abaxially papillate; leaf axil cottony. Bracts and bractlets similar, proximal margin membranous. Perianth segments sublustrous, white-yellow, veinless, 8–12 mm in fruit. Anther appendage slightly whitish. Style light yellow, ca. 1.25 mm; stigmas slightly shorter than style. Utricle yellow-brown, ca. 2.25 mm. Embryo yellow-green. Fl. and fr. Aug–Sep.

Gobi desert, rocky slopes, arid clayey soils. Xinjiang [Mongolia, Russia (SW Siberia); C Asia].

This species provides good forage for livestock.

41. HALIMOCNEMIS C. A. Meyer in Ledebour, Fl. Altaic. 1. 381. 1829.

盐蓬属 yan peng shu

Herbs annual, hairy or glabrous. Branches terete or 3-angled, stout. Leaves alternate, terete or semiterete, fleshy, apex obtuse or easily deciduous spinose mucronate. Flowers solitary in bract axils, bisexual, with 2 bractlets. Perianth segments 4 or 5, lanceolate, membranous, proximally hardened and usually connate into an urceolate tube, without an appendage, hairy or rarely glabrous. Disk entire. Stamens 4 or 5, inserted on disk; filaments filiform, compressed; anthers oblong, base free, apex with a vesicular appendage. Ovary ovoid, laterally compressed; ovule pendulous on long funicle; style slender; stigmas 2. Utricle broadly ovoid to globose; pericarp membranous, free from seed. Seed vertical, globose, laterally compressed; testa slightly fleshy, embryo planospiral; perisperm absent.

About 12 species: from the Black Sea region through the Caspian region to C Asia; three species in China.

1a. Perianth segments and stamens 4; perianth tube basal surface with 4 radial ribs; plants densely pubescent mixed with jointed, villous hairs ..... 1. *H. villosa*
1b. Perianth segments and stamens 5; perianth tube basal surface with 5 radial ribs, or segments not proximally connate; plants subglabrous or only pubescent.
2a. Bracts and bractlets shorter than or equaling perianth; anther appendage narrowly elliptic, distinctly narrower than anther; plants glabrous below, slightly pubescent above ..... 2. *H. karelinii*
2b. Bracts and bractlets distinctly longer than perianth; anther appendage broadly ovate, subequaling or broader than anther; plants densely pubescent ..... 3. *H. longifolia*

1. Halimocnemis villosa Karelin & Kirilov, Bull. Soc. Imp. Naturalistes Moscou 14: 434. 1841.

柔毛盐蓬 rou mao yan peng

Plants 15–40 cm tall, densely pubescent mixed with jointed, villous hairs. Stem much branched; branches obliquely spreading, usually ribbed. Leaves spreading, linear, slightly arcuate, semiterete, 2–3 cm × 1–2 mm, abaxially convex and slightly keeled, adaxially plane or slightly sulcate, base expanded, decurrent, apical spine subulate, 1.5–2.5 mm. Bracts similar to bractlets but longer; bractlets with base expanded and margin membranous at base. Perianth tube ovoid, 4–5 × 3–4 mm, densely appressed pubescent, basal surface with 4 radial ribs; segments 4, 4–6 mm, abaxially hairy, apex acute. Stamens 4; anthers ca. 2.5 mm excluding appendage; appendage subsessile, white or light yellow, ovate-oblong, slightly shorter and broader than anther. Style 1.5–2 mm; stigmas linear, apex inflated. Utricle broadly ovoid, laterally compressed, ca. 3 × 2.5 mm. Fl. and fr. Jul–Oct.

Gobi desert. N Xinjiang [Kazakhstan].

2. Halimocnemis karelinii Moquin-Tandon in Candolle, Prodr. 13(2): 196. 1849.

短苞盐蓬 duan bao yan peng

Plants appearing blue-green, 10–20 cm tall. Stem strongly branched, glabrous below, slightly pubescent above. Lower leaves linear, terete or semiterete, 0.5–2 cm, usually early withering, apex obtuse or acute. Bracts triangular-ovate, 3–4 mm, slightly shorter than bractlets, fleshy, adaxially concave, base decurrent, margin membranous, apex shortly yellow-brown spinose mucronate. Bractlets similar to bracts, broadly ovate, abaxially papillate. Perianth segments 5, linear-lanceolate, 4–5 mm, slightly enlarged in fruit, membranous, glabrous; proximal part hardened and appearing cochleate; distal part connivent with other segments and protruding from bractlets, apex obtuse or acuminate. Stamens 5; anthers free in proximal ca. 1/3, narrowly oblong, 1.5–2 mm; appendage shortly stalked or subsessile, light yellow, narrowly elliptic, ca. 1/2 as long as and distinctly narrower than anther. Ovary laterally compressed; style obscure; stigmas linear, apex not inflated. Fl. Jul, fr. Aug–Sep.

Gobi desert, deserts. N Xinjiang [Kazakhstan].

3. Halimocnemis longifolia Bunge, Trudy Imp. S.-Peterburgsk. Bot. Sada 5: 643. 1877.

长叶盐蓬 chang ye yan peng

Plants gray-green, 10–25 cm tall, densely pubescent. Stem much branched; branches ribbed. Leaves subhorizontally spreading, linear, straight or slightly curved, semiterete, 2–5 cm × 1.5–2 mm, abaxially convex, adaxially plane or sulcate near

base, base expanded, decurrent, apex yellow-brown, subulate, shortly spinose mucronate. Bractlets shorter than bracts, but both distinctly longer than perianth, abaxially longitudinally keeled. Perianth tube hooded campanulate, basal surface plane or slightly concave, with 5 radial ribs; segments 5, lanceolate, membranous, abaxially villous, apex acuminate. Stamens 5; anthers basally free, narrowly oblong, 1.5–2 mm; appendage subsessile, broadly ovate, subequaling or broader than anther. Style terete; stigmas distinctly shorter than style, apex inflated. Utricle light yellow, broadly ovoid, 2.5–3 mm in diam. Fl. and fr. Jun–Aug.

Dunes, sandy areas on lake shores. N Xinjiang [Kazakhstan].

42. PETROSIMONIA Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg, Ser. 7, 4(11): 19, 52. 1862.

叉毛蓬属 cha mao peng shu

Herbs annual, ephemeral, appressed sericeous-villous, rarely glabrous. Stem much branched, terete. Leaves sessile, linear, terete or semiterete, apex acute or acuminate. Flowers axillary, solitary, bisexual, with 2 navicular, embracing bractlets. Perianth segments 2, 3, or 5, narrowly ovate-lanceolate to elliptic, slightly enlarged in fruit, membranous or papery, proximally becoming leathery and adaxially concave, without an appendage, veinless, glabrous or abaxially slightly hairy near apex. Stamens 1–5, inserted on an obscure disk; filaments compressed; anthers oblong or sagittate, exserted from perianth; connective protruding, becoming a thickened, solid appendage. Ovary broadly ovoid, compressed; ovule subsessile; style cylindric; stigmas 2, filiform. Utricle enclosed in perianth, ovate or broadly oblong; pericarp membranous or thinly papery, slightly fleshy distally, glabrous, not adnate to seed. Seed vertical, globose or subglobose, compressed; testa membranous; embryo planospiral; perisperm absent.

Between 11 and 15 species; C and SW Asia, SE Europe; four species in China.

1a. Branches and leaves all opposite; perianth segments 5 ..... 1. *P. sibirica*
1b. Branches and leaves opposite below, alternate above; perianth segments 2 or 3.
2a. Branches and leaves opposite, except apical ones (in inflorescence) alternate; plants densely pubescent with long, semiappressed hairs ..... 2. *P. squarrosa*
2b. Branches and leaves opposite only on lower stem, all others alternate; plants pubescent with short, appressed hairs or subglabrous.
3a. Plants blue-gray; lower branches suberect; bracts recurved or reflexed at apex, all longer than subtended flower ..... 3. *P. glaucescens*
3b. Plants reddish or yellowish green; lower branches prostrate; bracts erect, upper ones shorter than subtended flower ..... 4. *P. oppositifolia*

1. Petrosimonia sibirica (Pallas) Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg, Ser. 7, 4(11): 60. 1862.

叉毛蓬 cha mao peng

Polycnemum sibiricum Pallas, Ill. Pl. 61. 1803; *Halimocnemis sibirica* (Pallas) C. A. Meyer.

Plants 15–40 cm tall, densely pilose. Stem simple or branched from base, erect or decumbent; branches all opposite, obliquely spreading. Leaves all opposite, linear, usually appearing slightly sickle-shaped, semiterete, 1–3.5 cm × 1–1.5 mm, adaxially plane or sulcate, base slightly expanded, expanded part usually becoming leathery in fruit, apex acuminate. Bractlets navicular, margin membranous, apex subulate, recurved. Perianth segments 5, membranous, outer 3 elliptic-ovate, inner 2 lanceolate, slightly shorter than or equaling bractlets, proximally thickened and becoming leathery in fruit, abaxially villous near apex, apex acuminate. Stamens 5; filaments exserted from perianth, compressed, ca. 2 × as long as perianth; anthers purple-red or orange-red, ca. 2.5 mm; appendage apex 2-toothed. Stigmas equaling style. Utricle light yellow, broadly ovate; pericarp distally slightly fleshy. Seed vertical, subglobose, compressed, ca. 1.5 mm in diam. Fl. and fr. Jul–Sep.

Gobi desert, saline-alkaline deserts, arid slopes. N Xinjiang [Russia (S Siberia); C Asia].

2. Petrosimonia squarrosa (Schrenk) Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg, Ser. 7, 4(11): 57. 1862.

粗糙叉毛蓬 cu cao cha mao peng

Halimocnemis squarrosa Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 1: 360. 1843.

Plants grayish, 5–15 cm tall, densely pubescent with long, semiappressed hairs. Stem simple or branched from base, erect or slightly decumbent, slender, terete; branches opposite, except apical ones (in inflorescence) alternate, obliquely spreading. Leaves opposite, except alternate on apical branches, linear, slightly recurved, semiterete, 0.5–1 cm × ca. 1 mm, base slightly expanded, apex acuminate. Bractlets slightly longer than perianth, apex acute. Perianth segments 3, ovate-elliptic, ca. 2.5 mm, membranous, abaxially hairy near margin and apex. Stamens 3(or 4); anthers free in proximal 1/5, 1.5–1.75 mm; appendage very short, slightly 2-lobed. Stigmas subequaling style.

Gobi desert, terraces, ravine banks. N Xinjiang [Kazakhstan; C and SW Asia].

3. Petrosimonia glaucescens (Bunge) Iljin, Mater. Komiss. Ěksped. Issl. 26: 280. 1930.

灰绿叉毛蓬 hui lü cha mao peng

Petrosimonia crassifolia (Pallas) Bunge var. *glaucescens*

Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg, Ser. 7, 4(11): 56. 1862; *Polycnemum glaucum* Pallas.

Plants blue-gray, 10–20 cm tall, hairy to subglabrous. Stem erect, much branched; lower branches suberect, usually lower 1–3 pairs opposite; other branches obliquely spreading. Leaves opposite on lower branches, alternate on upper branches, linear, mostly recurved, semiterete or subterete, usually 1–4 cm × 1–1.5 mm, base slightly expanded, apex acuminate. Bracts distinctly recurved or reflexed, 5–10 mm, shorter than leaves, all longer than subtended flower. Bractlets navicular, equaling or slightly longer than perianth, apex shortly acuminate, recurved. Perianth segments 2, elliptic or narrowly ovate, ca. 2.5 mm, membranous, somewhat hardened in fruit, abaxially slightly hairy at margin and near apex, apex subobtuse or acute. Stamens 5; anthers free in proximal ca. 1/3, 2–2.5 mm including appendage; appendage ca. 0.4 mm, apex usually 3-lobed, appendages attached by lateral margins making joined anthers umbrella-shaped. Stigmas subequaling style. Fl. and fr. Jul–Sep.

Dunes, saline-alkaline deserts. N Xinjiang [Kazakhstan, Russia (SE European part); SW Asia (Caucasus)].

4. Petrosimonia oppositifolia (Pallas) Litvinov, Spisok Rast. Gerb. Russk. Fl. Bot. Muz. Imp. Acad. Nauk 7: 13. 1911.

对生叶叉毛蓬 dui sheng ye cha mao peng

Polycnemum oppositifolium Pallas, Reise Russ. Reich. 1: 484. 1771; *Halimocnemis crassifolia* (Pallas) C. A. Meyer; *H. oppositifolia* (Pallas) Eichwald; *Petrosimonia crassifolia* (Pallas) Bunge; *Polycnemum crassifolium* Pallas.

Plants reddish or yellowish green, 5–40 cm tall, appressed hairy to subglabrous. Stem erect, much branched; lower branches prostrate, usually lower 1–3 pairs opposite. Leaves opposite on lower branches, alternate on upper branches, erect, linear, semiterete or subterete, base dilated, apex acuminate. Bracts erect, shorter than leaves, upper ones shorter than subtended flower, base strongly dilated. Bractlets constricted, laterally gibbous, subequaling subtended flower. Perianth segments 2, membranous, cartilaginous in fruit, glabrous, apex acuminate. Stamens 5; anther appendage scarious, (2 or)3-toothed, lateral teeth usually larger than the central one. Stigmas equaling style in fruit. Fl. and fr. Jul–Sep.

Dunes, saline-alkaline deserts. N Xinjiang [C Asia, SW Asia (Caucasus), SE Europe].

CHENOPODIACEAE