

*Parapholis* and a few other genera of mostly annual grasses adapted to saline conditions are sometimes placed in the tribe *Hainardiæ*. They are distinguished from typical *Poeae* by the distinctive rat-tail

inflorescence and glumes placed side-by-side. However, they are clearly related to other less specialized annual members of *Poeae*, and recent molecular evidence places them within this tribe.

## 12. Tribe AVENEAE

燕麦族 yan mai zu

Wu Zhenlan (吴珍兰), Lu Shenglian (卢生莲), Chen Shouliang (陈守良), Chen Wenli (陈文俐); Sylvia M. Phillips

Annual or perennial. Leaf blades linear to setaceous; ligule membranous. Inflorescence an open, contracted, or spikelike panicle. Spikelets all alike, somewhat laterally compressed, with 1 to several fertile florets; rachilla usually disarticulating below each floret, occasionally strictly 3 florets with lower 2 staminate or barren and of different appearance from upper fertile floret, then disarticulating above glumes and florets falling together; glumes persistent, often equal to spikelet or at least longer than first floret, commonly membranous with broad, shining, hyaline margins; floret callus bearded; lemmas hyaline to leathery, 3- to several-veined (*Coleanthus* 1-veined), apex entire or denticulate, awned from back, rarely awnless; awn usually geniculate with twisted column; palea hyaline, subequaling or much shorter than lemma. Lodicules 2, rarely absent. Stamens (2 or)3, rarely 1 (*Cinna*). Caryopsis mostly ellipsoid; hilum round or oval, endosperm sometimes soft or liquid. Starch-grains compound. Chromosomes large; basic number 7 (5 in *Anthoxanthum*). Leaf anatomy: non-Kranz, microhairs absent, silica-bodies oblong.

About 60 genera: temperate and cold regions of the world, extending to mountains in the tropics; 20 genera, one hybrid genus, and 144 species (40 endemic, 11 or 12 introduced) in China.

Recent molecular studies show the tribes *Poeae* and *Aveneae* to be closely related and to some extent interleaved, with certain genera traditionally placed in one tribe ordered at a molecular level within the other. On this account the tribes are sometimes united into a broadly defined *Poeae*. However, most genera can be easily assigned to one or other tribe on morphological characteristics, and therefore the traditional treatment is maintained here.

- 1a. Spikelets with 2 or more fertile florets.
  - 2a. Ovary hairy; spikelets large, 7–45 mm.
    - 3a. Perennial; glumes unequal, 1–7-veined ..... 75. *Helictotrichon*
    - 3b. Annual; glumes subequal, 7–11-veined ..... 77. *Avena*
  - 2b. Ovary glabrous or almost so; spikelets small, 2.5–10 mm.
    - 4a. Lemmas keeled.
      - 5a. Lemmas awned from back ..... 78. *Trisetum*
      - 5b. Lemmas awnless or with a subapical awn-point ..... 79. *Koeleria*
    - 4b. Lemmas rounded on back.
      - 6a. Annual; florets arising at about same level; rachilla extension absent ..... 82. *Aira*
      - 6b. Perennial; florets separated by an internode; rachilla extension present.
        - 7a. Panicle glistening; lemma apex erose ..... 80. *Deschampsia*
        - 7b. Panicle not glistening; lemma apex 4-toothed ..... 87. *Deyeuxia*
  - 1b. Spikelets with 1 fertile floret.
    - 8a. Inflorescence of several racemes along a central axis ..... 92. *Beckmannia*
    - 8b. Inflorescence a panicle, sometimes spikelike.
      - 9a. Fertile floret accompanied by staminate or sterile florets.
        - 10a. Spikelets with 2 florets.
          - 11a. Spikelet disarticulating above glumes; lower floret staminate ..... 76. *Arrhenatherum*
          - 11b. Spikelet disarticulating below glumes; upper floret staminate ..... 81. *Holcus*
        - 10b. Spikelets with 3 florets, the 2 lower staminate or barren (reduced to small scales in *Phalaris*).
          - 12a. Lower lemmas rudimentary; plants without coumarin ..... 83. *Phalaris*
          - 12b. Lower lemmas well developed; plants scented with coumarin ..... 84. *Anthoxanthum*
      - 9b. Fertile floret solitary, with or without a rachilla extension.
        - 13a. Spikelets in compact umbellate clusters; glumes absent ..... 85. *Coleanthus*
        - 13b. Spikelets in an open, contracted or spikelike panicle; glumes present.
          - 14a. Spikelets falling entire.
            - 15a. Spikelets shed with a basal stipe ..... 89. *Polypogon*
            - 15b. Spikelets shed without a basal stipe.
              - 16a. Panicle open.
                - 17a. Glumes indistinctly 3-veined; lemma with awnlet; stamen 1 ..... 90. *Cinna*
                - 17b. Glumes prominently 3-veined; lemma awnless; stamens 3 ..... 91. *Cyathopodus*
              - 16b. Panicle spikelike or capitate; stamens usually 3.
                - 18a. Lemma awned from back ..... 93. *Alopeurus*

- 18b. Lemma awnless ..... 94. *Phleum*
- 14b. Spikelets disarticulating above glumes.
- 19a. Glumes slightly shorter than floret ..... 87. *Deyeuxia*
- 19b. Glumes equaling or longer than floret.
- 20a. Glumes mucronate ..... 86a. *Agropogon*
- 20b. Glumes acute to acuminate.
- 21a. Spikelets usually less than 5 mm; callus glabrous or shortly hairy; lemma hyaline ..... 86. *Agrostis*
- 21b. Spikelets often more than 5 mm; callus bearded, hairs 1/3 as long as to longer than floret (if shorter, penicillate rachilla extension present); lemma membranous to firm.
- 22a. Lemma at least 3/4 as long as glumes, usually firm; callus hairs almost as long as to clearly shorter than floret; rachilla extension present, penicillate ..... 87. *Deyeuxia*
- 22b. Lemma 1/2–2/3 as long as glumes, membranous; callus hairs often much exceeding floret; rachilla extension absent, or if present glabrous or shortly hairy ..... 88. *Calamagrostis*

## 75. HELICTOTRICHON Besser ex Schultes & J. H. Schultes, Mant. 3 (Addit. I ad Mant. Cl. III): 526 [“326”]. 1827.

异燕麦属 yi yan mai shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

*Avenastrum* Opiz; *Avenula* (Dumontier) Dumortier; *Trisetum* sect. *Avenula* Dumortier.

Perennials, tufted, often rhizomatous. Leaf blades linear to setaceous, flat, folded or rolled; ligule membranous. Inflorescence a panicle, open or often contracted, sometimes without secondary branching. Spikelets with 2 to several fertile florets and 1 or 2 reduced sterile florets above; rachilla pilose, disarticulating below each floret; glumes lanceolate, slightly unequal, usually shorter than spikelet and often shorter than lemmas, hyaline to membranous, lower glume 1–3-veined, upper glume 3–5-veined, keel scaberulous, apex acute; floret callus shortly bearded; lemmas lanceolate, firmly membranous to leathery, rounded or weakly keeled, 5–7(–9)-veined, glabrous, awned from middle of back or slightly above, apex minutely to deeply 2–4-toothed; awn geniculate with twisted column, sometimes weakly so or almost straight; palea slightly shorter than lemma and enclosed within lemma margins, keels scabrid-ciliolate to ciliate. Ovary densely hairy toward apex. Caryopsis with linear hilum; endosperm sometimes liquid.

About 100 species: Europe eastward to Japan, North America, also on tropical mountains; 14 species (seven endemic) in China.

Most species provide good forage.

- 1a. Palea keels smooth, glabrous, back deeply sulcate; hairs at apex of each rachilla internode 4–6 mm ..... 1. *H. pubescens*
- 1b. Palea keels scabrid to ciliate, back flat at maturity; hairs at apex of each rachilla internode 1–3 mm.
- 2a. Leaf blades flat or folded,keeled, margins and abaxial midrib prominently white-thickened, adaxial surface not ribbed; leaf sheath margins connate for part of length; floret callus bearded on sides only.
- 3a. Rhizomes present, plant forming loose turf; leaf sheaths closed for more than 1/2 of length; leaf blades 5–12 mm wide; spikelets 2–2.5 cm ..... 2. *H. dahuricum*
- 3b. Rhizomes absent, plant forming dense turf; leaf sheaths closed for less than 1/4 of length; leaf blades 2–5 mm wide; spikelets 1–1.8 cm ..... 3. *H. hookeri*
- 2b. Leaf blades flat or rolled, margins and midrib not thickened, adaxial surface closely ribbed with deep grooves between; leaf sheath margins free to base; floret callus evenly bearded.
- 4a. Panicle open, sometimes nodding; branches ascending or spreading, up to 10 cm.
- 5a. Lemma apex subentire or minutely denticulate.
- 6a. Culms 20–45 cm; ligules to 0.5 mm; rachilla internodes hairy throughout length ..... 4. *H. abietetorum*
- 6b. Culms up to 80 cm tall; ligules ca. 1 mm; rachilla internodes hairy only in upper part ..... 5. *H. leianthum*
- 5b. Lemma apex 2-toothed.
- 7a. Panicle branches in whorls of up to 8, with branchlets almost to base; lower culm internodes and sheaths villous ..... 6. *H. yunnanense*
- 7b. Panicle branches 2–4 per node (up to 6 in *H. altius*), bare in lower part; lower culm internodes glabrous (sheaths sometimes pilose).
- 8a. Nodes of culm pubescent ..... 7. *H. altius*
- 8b. Nodes of culm glabrous.

- 9a. Leaf blades 10–25 cm, 3–5 mm wide; spikelets 1–1.4 cm ..... 8. *H. junghuhnii*  
 9b. Leaf blades 6–11 cm, ca. 2 mm wide; spikelets 0.8–1 cm ..... 9. *H. delavayi*
- 4b. Panicle laxly to densely contracted; branches erect or narrowly ascending, usually less than 4 cm.
- 10a. Panicle 10–17 cm; lemmas densely scabrid; awn arising from upper 1/3 of lemma, recurved, scarcely twisted ..... 10. *H. schmidii*
- 10b. Panicle 2–9(–14) cm; lemmas smooth, scaberulous or puberulous; awn arising near middle of lemma, geniculate with twisted column.
- 11a. Spikelets reddish violet; anthers 1–1.6 mm ..... 11. *H. potaninii*  
 11b. Spikelets brown or tinged violet; anthers 3–4.2 mm.
- 12a. Panicle densely contracted; axis and branches densely pubescent; culm pubescent below panicle; spikelets golden brown ..... 12. *H. tibeticum*
- 12b. Panicle laxly contracted; axis and branches scabrid or puberulent only in upper part; culm glabrous below panicle; spikelets pale yellowish brown tinged violet.
- 13a. Plant densely tufted; sheaths of culm leaves usually pilose; leaf blades scabrid on adaxial surface; anthers ca. 3 mm ..... 13. *H. tianschanicum*  
 13b. Plant loosely tufted; sheaths of culm leaves usually glabrous; leaf blades densely puberulous on adaxial surface; anthers ca. 4 mm ..... 14. *H. mongolicum*

**1. *Helictotrichon pubescens* (Hudson) Pilger, Repert. Spec. Nov. Regni Veg. 45: 6. 1938.**

毛轴异燕麦 mao zhou yi yan mai

*Avena pubescens* Hudson, Fl. Angl. 42. 1762; *Avenastrum pubescens* (Hudson) Opiz; *Avenula pubescens* (Hudson) Dumortier.

Perennial, shortly rhizomatous. Culms solitary or few, erect, 30–120 cm tall, 3–4-noded. Leaf sheaths of lower leaves pubescent, upper and infrequently also lower glabrous, closed to above middle; leaf blades linear-lanceolate, flat, 10–30 cm, 4–10 mm wide, usually pubescent on both surfaces, abaxial surface with thin midrib, margins only slightly thickened, apex subacute; ligule lanceolate, 3–6 mm. Panicle lax, oblong in outline, 8–15 cm or more; branches 4–6 per node, up to 5 cm, fine, scaberulous. Spikelets 1.2–1.7 cm, pale green or variegated purple, florets 2–4; rachilla hairs 4–6 mm; glumes hyaline, lower glume 10–11 mm, 1–3-veined, upper glume 13–17 mm, 3-veined; lemmas firmly herbaceous, hyaline above awn insertion, lowest 9–11 mm, scabrid, apex irregularly 2-denticulate; awn 1.5–2 cm, geniculate, column twisted, terete; palea subequal to lemma, keels close together, smooth, glabrous, hyaline between keels. Anthers 5–7 mm. Fl. and fr. Jun–Sep.

Grassy mountain slopes, forest margins, among shrubs; 1000–2600 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan; SW Asia (Caucasus, Turkey), Europe; introduced in North America].

This is a widespread, polymorphic species, varying especially in the degree of hairiness of the leaves and the width of the blades. The Chinese population probably corresponds to a broad-leaved, rather sparsely hairy form found in neighboring parts of Russia and C Asia, *Helictotrichon pubescens* var. *latifolium* (Printz) Tzvelev. No specimens from China have been seen. The typical variety has hairy leaves usually up to 5 mm wide.

*Helictotrichon pubescens* is distinguished from all other species in the genus by its palea with close, smooth keels. Molecular studies place it close to the group of species including *H. dahuricum* (see the comment under that species). However, it differs morphologically from those species in several characters besides the palea, including unthickened leaf blade margins, an evenly bearded (vs. laterally bearded) calyx, and a hilum as long as the caryopsis (vs. half as long).

**2. *Helictotrichon dahuricum* (Komarov) Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 3: App. 1, 77. 1939.**

大穗异燕麦 da sui yi yan mai

*Avena planiculmis* Schrader subsp. *dahurica* Komarov, Fl. Kamtschatka 1: 159. 1927; *Avenastrum dahuricum* (Komarov) Roshevitz; *Avenula dahurica* (Komarov) W. Sauer & H. Chmelistschek.

Perennial, rhizomatous, forming loose turf. Culms solitary or few, erect from decumbent base, 50–100 cm tall, 2–3-noded. Leaf sheaths of culm leaves closed for 1/2 or more of length; leaf blades linear-lanceolate, flat, 8–25 cm, 5–12 mm wide, abaxial surface smooth with thick white midrib, adaxial surface scaberulous, margins thick, white, scaberulous, base rounded, apex abruptly acute; ligule lanceolate, 5–7(–10) mm. Panicle loosely contracted, 7–15 cm; branches usually paired, ascending, scabrid or almost smooth. Spikelets 1.7–2.5 cm, golden brown and purple, florets 5–6; rachilla hairs 1.5–2.5 mm; glumes membranous, 3-veined, lower glume 9.5–11 mm, upper glume 12–15 mm; lemmas leathery, hyaline above awn insertion, lowest 11–14 mm, asperulous, apex irregularly 2-denticulate; awn 1.5–1.7 cm, geniculate, column twisted, flat; palea keels ciliolate. Anthers 6.5–7 mm. Fl. and fr. Jul–Sep.

Open forests, grassy places, among shrubs; 700–1000 m. Heilongjiang, Nei Mongol [Mongolia, E Russia].

*Helictotrichon dahuricum* and *H. hookeri* belong to a group of species that have been shown by molecular studies to be only distantly related to *Helictotrichon* s.s. This group is sometimes separated as the genus *Avenula*. Some of the most obvious morphological distinctions are given in key couplet 2. Unfortunately the type species of *Avenula* is *H. pubescens*, which shows major morphological differences from the other species placed in *Avenula*, as noted above. For this reason *Helictotrichon* is maintained here in the traditional sense. Further morphological and molecular studies are required to clarify relationships within the group.

**3. *Helictotrichon hookeri* (Scribnier) Henrard, Blumea 3: 429. 1940.**

异燕麦 yi yan mai

Perennial, rhizomes very short or absent, forming mats.

Culms tufted, erect, 20–70 cm tall, usually 2-noded. Leaf sheaths of caudine leaves closed for less than 1/4 of length; leaf blades flat or folded, 10–25 cm, 2–5 mm wide, smooth or scabrid, margins thick, white, base straight, apex subacute; ligule lanceolate, 3–6 mm. Panicle contracted, sometimes dense, 4–15 cm; branches usually paired, erect or ascending, scabrid, bearing 1–4 spikelets. Spikelets 1.1–1.7 cm, green or brown, florets 3–6; rachilla hairs 1–2 mm; glumes membranous, 3(–5)-veined, lower glume 9–12 mm, upper glume 10–13 mm; lemmas leathery, hyaline above awn insertion, lowest 10–13 mm, asperulous, apex 2-toothed; awn 1.2–1.5 cm, geniculate, column twisted, flat; palea keels minutely ciliolate. Anthers ca. 4 mm. Fl. and fr. Jun–Sep.

Hill slopes in steppe, forest margins, moist meadows in high mountains; 100–3500 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Yunnan [Kazakhstan, Kyrgyzstan, Mongolia, Russia; North America].

This is a variable species with higher-altitude forms distinguishable at subspecific rank. These forms correspond to plants from uplands in W North America, from where the species was first described.

- 1a. Panicle 4–8 cm, dense; spikelets golden brown ..... 3a. subsp. *hookeri*
- 1b. Panicle 5–15 cm, contracted; spikelets greenish ..... 3b. subsp. *schellianum*

### 3a. *Helictotrichon hookeri* subsp. *hookeri*

异燕麦(原亚种) yi yan mai (yuan ya zhong)

*Avena hookeri* Scribn., True Grasses 123. 1890; *A. tentoensis* Honda; *Avenastrum asiaticum* Roshevitz; *A. tentoense* (Honda) Kitagawa; *Helictotrichon asiaticum* (Roshevitz) Grossheim.

Plant 20–50 cm tall. Panicle 4–8 cm, dense, branches usually bearing a single spikelet. Spikelets golden brown.

Mountain meadows and rocky mountain slopes; below 3500 m. Qinghai, Sichuan, Xinjiang, Yunnan [Mongolia, Russia; North America].

**3b. *Helictotrichon hookeri* subsp. *schellianum*** (Hackel) Tzvelev, Novosti Sist. Vyssh. Rast. 8: 68. 1971.

奢异燕麦 she yi yan mai

*Avena schelliana* Hackel, Trudy Imp. S.-Peterburgsk. Bot. Sada 12: 419. 1892; *Avenula hookeri* (Scribn.) Holub subsp. *schelliana* (Hackel) M. N. Lomonosova; *A. schelliana* (Hackel) W. Sauer & H. Chmelitschek; *Helictotrichon schellianum* (Hackel) Kitagawa.

Plant 30–80 cm tall. Panicle 5–15 cm, contracted, branches bearing up to 4 spikelets. Spikelets silvery green, sometimes tinged brownish or violet.

Hill slopes in steppe, rocky slopes, forest margins. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia].

**4. *Helictotrichon abietetorum*** (Ohwi) Ohwi, Acta Phytotax. Geobot. 6: 151. 1937.

冷杉异燕麦 leng shan yi yan mai

*Avena abietetorum* Ohwi, Acta Phytotax. Geobot. 2: 162. 1933 ["*abietorum*"], emend. Ohwi, J. Jap. Bot. 17: 441. 1941; *Helictotrichon hideoi* (Honda) Ohwi subsp. *abietetorum* (Ohwi) T. Koyama.

Perennial. Culms tufted, erect, 20–45 cm tall, 1–3-noded. Leaf sheaths often longer than internodes, glabrous; leaf blades linear, flat or rolled, 10–30 cm, 2–4 mm wide, abaxial surface smooth, glabrous, adaxial surface densely puberulous; ligule ca. 0.5 mm or absent, margin ciliolate. Panicle loose, narrowly lanceolate in outline, 10–15 cm; branches 2–4 per node, ascending, 4–5 cm, scabrid, bare in lower part, each bearing 1 or 2 spikelets. Spikelets ca. 1 cm, yellowish green or purplish, florets usually 3; rachilla hairs 2–2.5 mm; lower glume narrow ovate, 4.2–7 mm, 1(–2)-veined, upper glume 6.3–8.3 mm, 3-veined; lemmas herbaceous with membranous apex, 7-veined, first lemma 7.5–9 mm, smooth, apex usually subentire, occasionally splitting into 2 teeth; awn arising at upper 2/5 of lemma, 1.2–1.6 cm, geniculate, column loosely twisted, terete; palea keels ciliolate. Anthers 2.5–3 mm.

• High mountain peaks; ca. 3000 m. Taiwan.

**5. *Helictotrichon leianthum*** (Keng) Ohwi, J. Jap. Bot. 17: 440. 1941.

光花异燕麦 guang hua yi yan mai

*Avena leiantha* Keng, Bull. Fan Mem. Inst. Biol., Bot. 7: 35. 1936.

Perennial. Culms tufted, erect, up to 80 cm tall, 2–3-noded, glabrous or sparsely retrorsely pubescent below nodes. Leaf sheaths lax, glabrous; leaf blades flat or involute when dry, 10–30 cm, 3–6 mm wide, abaxial surface glabrous, adaxial surface pubescent, apex acuminate; ligule truncate, ca. 1 mm. Panicle loose, 15–18 cm, nodding; branches in distant pairs, slender, often flexuous, scabrid, lower ca. 7 cm, bearing up to 4 spikelets in upper part. Spikelets 1–1.3 cm, pale green, florets 3–4; rachilla internodes glabrous toward base, hairs in upper part 1–2 mm; lower glume 4.6–5 mm, 1-veined, upper glume 5–7 mm, 3-veined; lemmas subleathery with hyaline apex, lowest 9–10 mm, 7-veined, smooth, apex subentire, minutely denticulate; awn 1.5–2 cm, weakly geniculate, column loosely twisted, terete; palea keels ciliate, hairs ca. 0.3 mm. Anthers 3–3.5 mm. Fl. and fr. May–Jul.

• Under forests in high mountains, mountain valleys, shady mountain slopes, damp places; 700–3700 m. Anhui, Gansu, Guizhou, Hubei, Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang (Lin'an).

This is an element of the *Helictotrichon junghuhnii* complex with rather short rachilla hairs confined to the upper part of the rachilla internode, a more or less undivided lemma apex, and conspicuously ciliate palea keels. It is very similar to *H. hideoi* (Honda) Ohwi from Japan, which also has a subentire lemma apex, but differs by its pubescent leaf sheaths and awn arising slightly higher on the lemma back.

**6. *Helictotrichon yunnanense*** B. S. Sun & S. Wang, J. Yunnan Univ. 15: 188. 1993.

滇异燕麦 dian yi yan mai

Perennial, shortly rhizomatous. Culms loosely tufted, 60–70 cm tall, 3–4-noded, lower internodes villous, especially be-

low nodes. Leaf sheaths densely villous, usually longer than internodes; leaf blades broadly linear, flat, tough, 15–18 cm, 5–8 mm wide, abaxial surface asperulous, adaxial surface prominently ridged, hispid, apex subacute; ligule truncate, ca. 1 mm, back hairy, margin ciliate. Panicle loose, 20–30 cm, many spiculate; branches in whorls of up to 8, lower 8–10 cm, scabrid, with branchlets and spikelets throughout length. Spikelets 1.2–1.5 cm, green or tinged purplish, florets 3–5, spaced; rachilla filiform, hairs ca. 3.5 mm; glumes lightly keeled, keel scabrid, apex acuminate, lower glume ca. 5 mm, 1-veined, upper glume ca. 10 mm, 3-veined; lemmas papery with membranous apex, lowest ca. 10 mm, 5-veined, smooth, apex acuminate or splitting into 2 acuminate-mucronate teeth; awn ca. 1.5 cm, gently curved or almost straight, slightly twisted in lower half, terete; palea keels scabrid-ciliolate. Anthers 3.2–3.5 mm. Fl. and fr. summer to autumn.

- Mountain slopes; ca. 3500 m. NW Yunnan (Zhongdian).

This distinctive species is easily recognizable by its densely villous leaf sheaths and lower culm internodes, many-spiculate panicle with whorled branches, slender, elongate rachilla internodes, and only slightly curved awn.

**7. *Helictotrichon altius* (Hitchcock) Ohwi, J. Jap. Bot. 17: 440. 1941.**

高异燕麦 gao yi yan mai

*Avena altior* Hitchcock, Proc. Biol. Soc. Washington 43: 96. 1930; *Avenastrum trisetoides* Kitagawa.

Perennial, shortly rhizomatous. Culms erect from shortly decumbent base, solitary or few, 1–1.2 m tall, 3–4-noded, nodes pubescent. Leaf sheaths usually shorter than internodes, densely puberulous or basal sheaths glabrous; leaf blades broadly linear, flat, ca. 15 cm, 3–8 mm wide, abaxial surface pubescent, scabrid, adaxial surface pilose, or sometimes glabrous; ligule truncate or erose, 1–2 mm, margin ciliolate. Panicle loose, lanceolate to oblong in outline, 10–20 cm; branches 4–6 per node, ascending, slender, often flexuous, up to 7 cm, scabrid, lower part bare, upper part bearing 1–3 spikelets. Spikelets 0.8–1.4 cm, yellowish green or purplish green, florets 3–4(–5); rachilla hairs 2–3 mm; glumes thinly membranous, lower glume 4–7 mm, 1-veined, upper glume 8–11 mm, 3-veined; lemmas leathery, lowest ca. 9 mm, 5–7-veined, smooth; awn 1–1.5 cm, geniculate, column twisted, terete; palea keels ciliolate. Anthers 4–5 mm. Fl. and fr. Jul–Aug.

- Moist grassy slopes, under shrubs, *Picea* forests; 2000–4000 m. Gansu, Heilongjiang, Ningxia, Qinghai, Sichuan.

This is an element of the *Helictotrichon junghuhnii* complex, mainly distinguished by the hairy culm nodes.

**8. *Helictotrichon junghuhnii* (Buse) Henrard, Blumea 3: 425. 1940.**

变绿异燕麦 bian lü yi yan mai

*Avena junghuhnii* Buse in Miquel, Pl. Jungh., Gramineae, preprint, 15. 1854; *A. aspera* Munro ex Thwaites var. *roylei* J. D. Hooker; *Helictotrichon virescens* (Nees ex Steudel) Henrard; *Trisetum virescens* Nees ex Steudel.

Perennial. Culms loosely tufted, erect, 60–120 cm tall, 3–

5-noded. Leaf sheaths usually longer than internodes, basal sheaths densely pubescent, upper sheaths glabrous; leaf blades flat or margins involute, 10–25 cm, 3–5 mm wide, scabrid or adaxial surface thinly pubescent, apex acuminate; ligule truncate, 1–2 mm. Panicle loose, up to 20 cm, erect or nodding; branches 2–4 per node, ascending or spreading, lower 5–12 cm, slender, scabrid, bare in lower part, with up to 9 spikelets. Spikelets 1–1.4 cm, greenish or purplish, florets 2–5; rachilla hairs 1–2 mm; glumes hyaline at margins and apex, lower glume 4–9 mm, 1–3-veined, upper glume 7–10 mm, 3–5-veined; lemmas subleathery with hyaline apex, lowest 9–11 mm, 5–7-veined, scabrid at least toward apex, apex 2-lobed, lobes acuminate or shortly awn-pointed; awn 1–2 cm, weakly geniculate, column loosely twisted, terete; palea keels minutely ciliolate to ciliate with 0.1–0.2 mm hairs. Anthers 2–3.5 mm. Fl. and fr. Jun–Aug.

Grassy mountain slopes, forests, damp places; 2000–3900 m. Guizhou, Henan, Qinghai, Shaanxi, Sichuan, E Xizang, Yunnan [Bhutan, India, Indonesia, Myanmar, Nepal, Pakistan].

The publication of the name *Avena junghuhnii* in Buse's preprint in February 1854 shortly predates the publication of *Trisetum virescens* by Steudel in April 1854.

This taxon lies at the center of a polymorphic complex extending from Pakistan and India to China and mountains in SE Asia. Variation within the complex is poorly understood and requires further investigation. Variable characters include lemma scabridity and apex, length and quantity of rachilla hairs, length of the cilia on the palea keels, and anther length. The midline of the lemma above the awn insertion is very fragile, frequently splitting into acuminate lobes, but sometimes remaining almost entire, even within the same panicle.

The name *Helictotrichon polyneurum* (J. D. Hooker) Henrard has been misapplied in China to specimens of *H. junghuhnii*. This member of the *H. junghuhnii* complex is known only from the Nilgiri Hills of S India. It is distinguished by its open, ovate panicle with smooth, widely spreading panicle branches and large, brownish spikelets with many prominent veins.

**9. *Helictotrichon delavayi* (Hackel) Henrard, Blumea 3: 427. 1940.**

云南异燕麦 yun nan yi yan mai

*Avena delavayi* Hackel, Oesterr. Bot. Z. 52: 189. 1902.

Perennial. Culms erect, slender, 35–50 cm tall, 2–3-noded. Leaf sheaths tight, shorter than internodes, puberulous near margins, otherwise glabrous; leaf blades narrowly linear, flat or margins involute, stiff, 6–11 cm, 1.5–2 mm wide, abaxial surface of lower blades pubescent, both surfaces scabrid, apex acute; ligule truncate, 1.5–2 mm. Panicle ovate-oblong in outline, 5–10 cm, slightly nodding; branches usually paired, lower ca. 6 cm, scabrid, bearing 2–4 spikelets in distal part. Spikelets 0.8–1 cm, green variegated yellow and purple, florets 3–4; rachilla shortly bearded; lower glume 5.5–7 mm, 1-veined, upper glume 7–8 mm, 3-veined; lemmas firm with scarious apex, lowest 7.5–9 mm, 5-veined, scaberulous, apex 2-toothed, teeth acuminate-mucronate; awn 1.3–1.5 cm, geniculate with twisted column, terete; palea slightly shorter than lemma, keels ciliolate. Anthers 2–2.5 mm. Fl. and fr. Jun–Aug.

- Montane meadows, forests; 2100–3700 m. Shaanxi, Sichuan, Yunnan.

This is a small, narrow-leaved variant from the *Helictotrichon junguhni* complex.

**10. *Helictotrichon schmidii* (J. D. Hooker) Henrard, Blumea 3: 427. 1940.**

粗糙异燕麦 cu cao yi yan mai

Perennial. Culms tufted, 50–70 cm tall, 3-noded. Leaf sheaths densely pubescent; leaf blades flat, folded or rolled, mainly basal, 7–12 cm, 2–4 mm wide, scabrid or pubescent; ligule truncate, ca. 2 mm, usually lacerate. Panicle narrowly contracted, linear-oblong, 10–17 cm; branches 2 or 3 per node, lowest up to 3.5 cm, erect, scaberulous or pubescent, bearing branchlets and short-pedicelled spikelets to base. Spikelets 0.7–1 cm, greenish or purplish, florets usually 3; rachilla hairs ca. 1 mm; glumes membranous, lower glume (1.5)–4–6 mm, 1-veined, upper glume (3)–5.5–7 mm, 3-veined, apex acuminate-mucronate; lemmas herbaceous with membranous apex, lowest 6–7 mm, 5–7-veined, densely scabrid, sometimes with a few scattered hairs, awned from upper 1/5–1/3, apex 2-toothed, teeth acuminate-aristulate; awn 0.5–1 cm, reflexed from near base, scarcely twisted, terete; palea keels scabrid-ciliolate, hairs ca. 0.1 mm. Anthers 1.4–2 mm. Fl. and fr. Apr–Aug.

Grassy clearings in forests, riversides, ditches; 2000–3300 m. Guizhou, Sichuan, Yunnan [S India].

This species is otherwise known only from the hills of S India. The awn arises higher on the lemma back than usual and is outwardly curved rather than geniculate. The Indian population has longer lemmas (7–9 mm).

*Trisetum lautum* Chrtk (Folia Geobot. Phytotax. 25: 333. 1990), described from Yunnan, may be the same as this species. The type has not been seen.

- 1a. Panicle densely spiculate; spikelets 0.8–1 cm; lower glume 4–6 mm, upper glume 5.5–7 mm ..... 10a. var. *schmidii*
- 1b. Panicle loose and delicate, branches spaced; spikelets ca. 0.7 cm; lower glume 1.5–3.5 mm, upper glume 3–5.5 mm ..... 10b. var. *parviflumum*

**10a. *Helictotrichon schmidii* var. *schmidii***

粗糙异燕麦(原变种) cu cao yi yan mai (yuan bian zhong)

*Avena aspera* Munro ex Thwaites var. *schmidii* J. D. Hooker, Fl. Brit. India 7: 277. 1896 ["1897"].

Culms relatively stout, erect. Panicle densely contracted, many spiculate; branches 2–3 per node. Spikelets 0.8–1 cm; lower glume 4–6 mm, upper glume 5.5–7 mm. Fl. and fr. Apr–Aug.

Grassy clearings in forests, ditches; 2000–3300 m. Guizhou, Sichuan, Yunnan [S India].

**10b. *Helictotrichon schmidii* var. *parviflumum* Keng ex Z. L. Wu, Acta Biol. Plateau Sin. 2: 15. 1984.**

小颖异燕麦 xiao ying yi yan mai

Culms slender, delicate. Panicle sparse; branches short,

spaced, bearing 1–3 spikelets. Spikelets ca. 0.7 cm; lower glume 1.5–3.5 mm, upper glume 3–5.5 mm. Fl. and fr. Apr–Sep.

- Riversides, moist places, forests; 2800–3300 m. Sichuan, Yunnan.

The identity and status of this taxon require confirmation.

**11. *Helictotrichon potaninii* Tzvelev, Rast. Tsentr. Azii 4: 101. 1968.**

短药异燕麦 duan yao yi yan mai

Perennial, loosely tufted. Culms erect from ascending base, 25–50 cm tall, 2–3-noded. Leaf sheaths smooth, glabrous; leaf blades narrowly linear, flat, 5–20 cm, 2–4 mm wide, adaxial surface slightly scabrid or sparsely pilose, abaxial surface almost smooth; ligule 1.5–3.5 mm, margin lacerate. Panicle dense, spikelike, narrowly oblong in outline, 5–9 cm, often interrupted, slightly nodding; branches very short, scabrid. Spikelets 0.7–0.9 cm, reddish violet, florets 3–4; rachilla hairs 2–4 mm; glumes unequal, lower glume ca. 5 mm, 1-veined, upper glume ca. 7 mm, 3-veined; lemmas firm with membranous apex, 6–9.5 mm, scaberulous, apex finely 2-toothed; awn 1–1.4 cm, geniculate, column twisted, terete; palea keels ciliolate. Anthers 1–1.6 mm. Fl. Jun–Jul.

- High mountain forests; 3900–4200 m. Sichuan.

**12. *Helictotrichon tibeticum* (Roshevitz) J. Holub, Preslia 31: 50. 1959.**

藏异燕麦 zang yi yan mai

Perennial, densely tufted. Culms erect, 15–100 cm tall, 2–3-noded, pubescent below panicle. Leaf sheaths densely pubescent or sometimes glabrous; leaf blades filiform, often rolled, 15–30 cm, 1–2 mm wide, densely pubescent on both surfaces, or sometimes scabrid; ligule 0.3–0.5 mm, margin ciliate. Panicle contracted, often dense and spikelike, ovate to oblong in outline, 2–6(–14) cm, rachis, branches, and pedicels all densely pubescent; branches suberect, 0.5–5 cm, lower with 4–7 spikelets. Spikelets 0.7–1.2 cm, golden brown or dark brown, florets 2–4; rachilla hairs 1.5–2 mm; glumes membranous, lower glume 7–9 mm, 1-veined, upper glume 8–11 mm, 3-veined; lemmas firmly papery, lowest 6–8.5 mm, 5–7-veined, scaberulous or puberulous, apex minutely 2-toothed or entire; awn 1–1.5 cm, weakly geniculate, column loosely twisted, terete; palea keels ciliolate. Anthers 3–4.2 mm. Fl. and fr. Jun–Sep.

- Rocky mountain slopes, alpine steppe, among shrubs; 2600–4600 m. Gansu, Nei Mongol, Qinghai, Sichuan, Xinjiang (Tian Shan), Xizang, Yunnan.

This is a handsome species with contracted, golden brown panicles.

- 1a. Panicle densely contracted, 2–6 cm; spikelets with 2(–3) florets ..... 12a. var. *tibeticum*
- 1b. Panicle laxly contracted, 6–14 cm; spikelets with 3–4 florets ..... 12b. var. *laxiflorum*

**12a. *Helictotrichon tibeticum* var. *tibeticum***

藏异燕麦(原变种) zang yi yan mai (yuan bian zhong)

*Avena tibetica* Roshevitz, Izv. Glavn. Bot. Sada RSFSR 27: 98. 1928; *A. suffusa* Hitchcock; *Helictotrichon suffuscum* (Hitchcock) Ohwi; *H. tibeticum* var. *suffuscum* (Hitchcock) Tzvelev.

Culms 15–70 cm tall. Panicle densely contracted, spike-like, ovate to oblong in outline, 2–6 cm; branches 0.5–1.3 cm. Spikelets with 2(–3) florets. Fl. and fr. Jun–Sep.

- Rocky mountain slopes, alpine steppe, among shrubs; 2600–4600 m. Gansu, Nei Mongol, Qinghai, Sichuan, Xinjiang (Tian Shan), Xizang, Yunnan.

**12b. *Helictotrichon tibeticum* var. *laxiflorum*** Keng ex Z. L. Wu, Acta Biol. Plateau Sin. 2: 16. 1984.

疏花藏异燕麦 shu hua zang yi yan mai

Culms 50–100 cm tall. Panicle laxly contracted, narrowly elliptic in outline, 6–14 cm; branches up to 5 cm. Spikelets with 3–4 florets. Fl. Jun–Jul.

- Mountain slopes, meadow steppe; 3200–3400 m. Qinghai, Sichuan.

**13. *Helictotrichon tianschanicum*** (Roshevitz) Henrard, Blumea 3: 429. 1940.

天山异燕麦 tian shan yi yan mai

*Avenastrum tianschanicum* Roshevitz, Izv. Glavn. Bot. Sada Akad. Nauk SSSR 30: 773. 1932.

Perennial, densely tufted. Culms erect, 14–50 cm tall, glabrous below panicle. Leaf sheaths usually densely pubescent; leaf blades filiform, 1/8–1/2 length of culms, 1.5–3 mm wide, scabrid on adaxial surface; ligule of basal leaves 2–3 mm, of culm leaves less than 1 mm. Panicle contracted, oblong in outline, 4–8 cm; branches suberect, short, puberulous, with few spikelets. Spikelets 0.9–1.1 cm, yellowish brown variegated violet, florets 2–3; rachilla bearded; lower glume 8–10 mm, 1–3-veined, upper glume 9–11 mm, 3–5-veined; lowest lemma 7–8 mm, 5–7-veined, apex denticulate; awn ca. 1.5 cm, genicu-

late, column twisted, terete; palea keels ciliolate. Anthers ca. 3 mm. Fl. and fr. Jul–Sep.

Shady places on mountain slopes, forests; 1400–2700 m. Xinjiang (Tian Shan) [Kazakhstan (Tien Shan), Tajikistan (Pamirs)].

Several species of *Helictotrichon*, including *H. tianschanicum* and *H. mongolicum*, have been described by Russian authors from the mountain ranges bordering Xinjiang and Mongolia. The described differences between them are very slight and may perhaps refer to geographic races rather than species. It has not been possible to study variation nor to verify their identity.

*Helictotrichon altaicum* Tzvelev (*H. desertorum* subsp. *altaicum* (Tzvelev) Holub), described from Mongolia, has been reported in Xinjiang. It differs mainly in the presence of a continuous ring of subepidermal sclerenchyma in the leaf blades, which is lacking in *H. tianschanicum* and *H. mongolicum*.

**14. *Helictotrichon mongolicum*** (Roshevitz) Henrard, Blumea 3: 431. 1940.

蒙古异燕麦 meng gu yi yan mai

*Avena mongolica* Roshevitz, Izv. Glavn. Bot. Sada SSSR 27: 96. 1928.

Perennial, densely tufted. Culms erect, 12–16 cm tall, glabrous or scabrid, 1–2-noded. Leaf sheaths glabrous or minutely puberulous; leaf blades filiform, 15–30 cm, 1.5–2 mm wide, puberulous on adaxial surface; ligule of basal leaves 2–3 mm, of culm leaves ca. 0.5 mm, margin puberulous. Panicle contracted or rather lax, 3–9 cm, often somewhat 1-sided; branches paired, 1–2 cm, puberulous. Spikelets 1–1.2 cm, yellowish brown or variegated violet, florets 3; rachilla bearded; glumes 9–11 mm, lower glume 1-veined, upper glume 3-veined; lowest lemma 8–10 mm, 5–7-veined, apex 2-toothed; awn 1.3–1.5 cm, geniculate, column twisted, terete; palea keels scabrid. Anthers ca. 4 mm. Fl. and fr. Jun–Sep.

Montane forests, subalpine meadows, riversides; 1200–2700 m. Xinjiang [Kazakhstan (Tarbagatai Mountains), Mongolia, Russia (Siberia)].

## 76. ARRHENATHERUM P. Beauvois, Ess. Agrostogr. 55. 1812.

燕麦草属 yan mai cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennial. Culms tall, basal internodes often swollen into globose corms. Leaf blades linear, flat. Inflorescence a moderately dense panicle. Spikelets weakly laterally compressed, florets 2, dimorphic, sometimes with an additional rudiment, lower floret staminate and strongly awned, upper floret bisexual and weakly awned or awnless; rachilla disarticulating above glumes but not between florets, extended beyond terminal floret; glumes unequal, thin, lower glume 1/2 spikelet length or more, 1-veined, upper glume as long as spikelet, 3-veined; lemmas firmly membranous to subleathery, rounded on back, 5–9-veined, apex 2-denticulate; lower lemma awned from near base, awn geniculate with twisted column, exserted from spikelet; upper lemma with a short straight awn or awnless; palea slightly shorter than lemma, keels ciliate. Ovary apex hairy; hilum linear.

Seven species: SW Asia, Europe, Mediterranean region; one species (introduced) in China.

**1. *Arrhenatherum elatius*** (Linnaeus) P. Beauvois ex J. Presl & C. Presl, Fl. Čech. 17. 1819.

燕麦草 yan mai cao

Culms erect or geniculate at base, rather stout, 1–1.5 m

tall, 4–5-noded. Leaf sheaths loose, glabrous; leaf blades 14–30 cm, 3–9 mm wide, scabrid or abaxial surface smooth, apex acuminate; ligule 1–3 mm, obtuse or truncate. Panicle lanceolate to oblong in outline, loose to rather dense, 10–25 cm, greenish or purplish, shining; branches clustered, scabrid. Spikelets oblong, 7–9 mm, florets separated by short rachilla inter-

node not more than 0.6 mm; glumes lanceolate, apex acute; lower glume 4–6 mm, upper glume equal to spikelet, punctiform scabrid; lemmas oblong-lanceolate, 7–9 mm, sparsely pubescent in lower 1/3 or glabrous, scabrid in upper 1/3; awn of lower lemma 1–2 cm, arising from lower 1/3 of lemma back; awn of upper lemma 1–2 mm, arising above middle or near apex. Anthers 4–5 mm.  $2n = 28$ .

Introduced to China as an ornamental garden plant and for forage [native to Russia; N Africa, SW Asia, Europe; introduced to Australia and North America].

- 1a. Basal internodes of culm not swollen into globose corms ..... 1a. var. *elatius*
- 1b. Basal internodes of culm swollen into globose corms ..... 1b. var. *bulbosum*

**1a. *Arrhenatherum elatius* var. *elatius***

燕麦草(原变种) yan mai cao (yuan bian zhong)

*Avena elatior* Linnaeus, Sp. Pl. 1: 79. 1753.

Basal internodes of culm not swollen into globose corms; nodes usually glabrous.

Introduced to China as an ornamental and for forage [native to Russia; N Africa, SW Asia, Europe].

**1b. *Arrhenatherum elatius* var. *bulbosum* (Willdenow) Spenner, Fl. Friburg. 1: 113. 1825.**

球茎燕麦 qiu jing yan mai

*Avena bulbosa* Willdenow, Ges. Naturf. Freunde Berlin Neue Schriften 2: 116. 1799; *Arrhenatherum avenaceum* P. Beauvois var. *nodosum* Reichenbach, nom. illeg. superfl.; *A. bulbosum* (Willdenow) C. Presl; *A. elatius* subsp. *bulbosum* (Willdenow) Schübler & G. Martens; *A. elatius* var. *nodosum* Hubbard, nom. illeg. superfl.; *Holcus avenaceus* Scopoli var. *bulbosus* (Willdenow) Gaudin; *H. bulbosus* (Willdenow) Schrader.

Basal internodes of culm swollen into globose corms 6–10 mm in diam.; nodes often hairy.

Cultivated in China as an ornamental garden plant [native to SW Europe].

A variegated form with white margins to the leaf blades has been named *Arrhenatherum elatius* f. *variegatum* Hitchcock (银边草 yin bian cao).

## 77. AVENA Linnaeus, Sp. Pl. 1: 79. 1753.

燕麦属 yan mai shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annuals. Culms erect, fairly robust. Leaf blades linear, flat; ligule membranous. Inflorescence a large loose panicle. Spikelets large, pendulous, oblong to gaping, florets 2 to several, the uppermost reduced; rachilla pilose or glabrous, disarticulating below each floret or only below the lowest, or not disarticulating (cultivated species); glumes lanceolate to elliptic, usually subequal and as long as spikelet, rarely strongly unequal or shorter than spikelet, herbaceous to membranous, 7–11-veined, back rounded, smooth, apex acuminate; floret callus acute to pungent, bearded; lemmas lanceolate-oblong, usually leathery, occasionally papery, back rounded, 5–9-veined, glabrous to hispid, awned usually from near middle of back, apex papery, 2-toothed to 2-fid, lobes sometimes extended into fine bristles, awn geniculate with twisted column, sometimes reduced or absent (cultivated species); palea usually shorter than lemma, keels ciliate. Ovary densely hairy. Caryopsis with long linear hilum.

About 25 species: centered on the Mediterranean region and SW Asia, extending to N Europe and N Asia, widely introduced to other temperate and cold regions; five species (all introduced) in China.

*Avena* includes several species cultivated as cereal crops (oats) and is also used for fodder and fiber production. A few species have become widespread as weeds of crops in temperate regions.

*Avena barbata* Pott ex Link and *A. eriantha* Durieu, native from the Mediterranean to C Asia, are mentioned (FRPS 9(3): 168. 1987) as cultivated in China.

- 1a. Rachilla tough, spikelets not regularly disarticulating; cultivated plants.
  - 2a. Glumes as long as spikelet; lemmas leathery, distinctly veined in upper half; rachilla internodes short, straight; grains not free threshing ..... 1. *A. sativa*
  - 2b. Glumes conspicuously shorter than spikelet; lemmas papery, distinctly veined throughout; rachilla internodes elongate, sometimes sinuous; grains free threshing.
    - 3a. Spikelets 2.5–3.5(–4.5) cm, florets 3–7; lemma apex shortly and obtusely 2–4-toothed; grain ca. 8 mm .... 2. *A. chinensis*
    - 3b. Spikelets 2–2.5(–3.5) cm, florets 2–4; lemma apex with 2 slenderly acuminate teeth; grain ca. 6 mm ..... 3. *A. nuda*
  - 1b. Rachilla disarticulating below each floret, or at least below lowest; wild plants.
    - 4a. Rachilla disarticulating only below lowest floret, only lowest floret with a basal callus.
      - 5a. Lower glume ± equal to upper glume ..... 4. *A. sterilis*
      - 5b. Lower glume much shorter than upper glume ..... *A. eriantha* (see note above)
    - 4b. Rachilla disarticulating below each floret, each floret with a basal callus.
      - 6a. Lemma apex 2-toothed or 2-fid, but lacking apical bristles ..... 5. *A. fatua*
      - 6b. Lemma apex 2-fid, each lobe with a fine apical bristle ..... *A. barbata* (see note above)

**1. Avena sativa** Linnaeus, Sp. Pl. 1: 79. 1753.

燕麦 yan mai

Annual. Culms solitary or tufted, erect, 40–180 cm tall, unbranched. Leaf sheaths usually glabrous; leaf blades 15–30 cm, 4–10 mm wide, glabrous, margins sometimes scaberulous; ligule 3–6 mm. Panicle loose and open or contracted, 20–40 cm, nodding; branches spreading or contracted. Spikelets 2–3 cm, florets 2(or 3); rachilla ± glabrous, straight, not disarticulating or fracturing irregularly at maturity, florets lacking a basal bearded callus, internodes short, less than 0.5 mm; glumes lanceolate, subequal, as long as spikelet, 7–9-veined; lemmas 1.2–2.5 cm, leathery in lower half, herbaceous and distinctly veined above, glabrous or nearly so, apex minutely and irregularly 2–4-denticulate; awn 2.5–3.5 cm, weakly geniculate or rudimentary or absent. Grain adherent to lemma and palea at maturity.  $2n = 42$ .

Widely cultivated in China [of cultivated origin].

This species is cultivated as a cereal crop (oats) in north-temperate regions of the world, and also as a green fodder crop. Genetic evidence points to *Avena sterilis* as the wild ancestor of *A. sativa*, and *A. fatua* as a weedy derivative. Hybrids between *A. sativa* and *A. fatua* with hairy florets or well-developed awns may occur where the two species grow together.

**2. Avena chinensis** (Fischer ex Roemer & Schultes) Metzger, Eur. Cereal. 53. 1824.

莜麦 you mai

*Avena nuda* Linnaeus var. *chinensis* Fischer ex Roemer & Schultes, Syst. Veg. 2: 669. 1817; *A. sativa* subsp. *chinensis* (Fischer ex Roemer & Schultes) Janchen ex Holub.

Annual. Culms 60–100 cm tall. Leaf blades 8–40 cm, 3–16 mm wide, scabrid. Panicle open, 12–20 cm; branches scabrid. Spikelets 2.5–3.5(–4.5) cm, florets 3–7; rachilla glabrous, not disarticulating at maturity, florets lacking a basal bearded callus, internodes elongate, sinuous, upper sometimes strongly curled; glumes broadly lanceolate, subequal, conspicuously shorter than spikelet, 1.5–2.5 cm, 7–11-veined; lemmas 2–2.5 cm, papery, distinctly veined throughout, glabrous, awned from upper 1/4 of lemma, apex with 2–4 small obtuse teeth; awn 1–2 cm, straight or bent, rarely awnless. Grain ca. 8 mm, free from lemma and palea at maturity (free threshing). Fl. and fr. Jun–Aug.

Cultivated, or naturalized along roadsides and on arable land; 1000–3200 m. Hebei, Henan, Hubei, Xinjiang, Yunnan [Russia; Europe].

More work is needed on *Avena chinensis*. It is very close to *A. nuda*, and may not be distinct from it. These naked wheats may be no more than free-threshing forms of *A. sativa*, caused by occasional mutations, and are perhaps better placed at infraspecific rank within *A. sativa*.

The name *Avena gracillima* Keng (Bull. Fan Mem. Inst. Biol., Bot. 7: 36. 1936), described from Hebei, is based on a very depauperate specimen with a panicle of only 1 or 2 spikelets. The spikelets are 1.4–1.8 mm long with herbaceous, glabrous lemmas and rudimentary awns. It is clearly a cultivated species, growing as a weed on grassy slopes, most likely referable to *A. chinensis*. The type has not been seen.

**3. Avena nuda** Linnaeus, Demonstr. Pl. 3. 1753.

裸燕麦 luo yan mai

*Avena sativa* Linnaeus var. *nuda* (Linnaeus) Koernicke.

Annual. Culms 45–90 cm tall. Leaf blades up to 20 cm, 3–7 mm wide, scaberulous. Panicle somewhat contracted, up to 25 cm. Spikelets 1.8–2.5(–3.5) cm, florets 2–4, lower 1 or 2 florets awned, upper florets awnless; rachilla glabrous, not disarticulating at maturity, florets lacking a basal bearded callus; glumes lanceolate, subequal, conspicuously shorter than spikelet, 7–9-veined; lemmas 1.5–2 cm, papery, distinctly veined throughout, glabrous, awned from ca. upper 1/3, apex 2-toothed, teeth slenderly acuminate, up to 4 mm; awn 1.5–2 cm, bent but not twisted. Grain ca. 6 mm, free from lemma and palea at maturity (free threshing).  $2n = 42$ .

Cultivated; 2300–3300 m. Hubei, C and N Yunnan [Russia; Europe].

This is a minor crop, seldom cultivated nowadays. It is used for flour and also for animal fodder. It is a European species, but has been recently recorded as cultivated in Yunnan.

The place of publication of this species is sometimes cited as Amoen. Acad. 3: 401. 1756. The *Amoenitates Academicae* are a collection of reissued Linnaean dissertations. *Avena nuda* was validly published in the original dissertation in 1753.

**4. Avena sterilis** Linnaeus subsp. ***ludoviciana*** (Durieu) Nyman, Consp. Fl. Eur. 810. 1882.

长颖燕麦 chang ying yan mai

*Avena ludoviciana* Durieu, Actes Soc. Linn. Bordeaux 20: 41. 1855.

Annual. Culms solitary or tufted, erect or ascending, 50–120 cm tall, unbranched, 2–4-noded. Leaf sheaths glabrous or basal sheaths puberulous; leaf blades up to 60 cm, 4–13 mm wide, scaberulous, glabrous; ligule 3–4 mm. Panicle loose, open, pyramidal, 13–30 cm, nodding; branches coarsely scabrid. Spikelets 2–3 cm, florets 2 or 3, 2-awned; rachilla disarticulating only below lowest floret, florets falling together at maturity, only lowest floret with a bearded callus, internodes glabrous; glumes narrowly elliptic-oblong, subequal, as long as spikelet, 7–9-veined, apex finely acuminate; callus hairs up to 5 mm; lemmas 1.8–2.5 cm, leathery, hispid, finally brown in lower half, green and scabrid above, awned at about lower 1/3, apex finely 2-fid; awn 3–6 cm, fairly slender, strongly geniculate, column dark brown, pubescent.  $2n = 42$ .

Arable weed, adventive. Yunnan [native to SW Asia and Europe].

This is a noxious weed of arable land, especially fields of cereals, native to the Mediterranean region and SW Asia, but now widespread in warm-temperate regions of the world. It has been recorded in China only from Yunnan.

The typical subspecies, *Avena sterilis* subsp. *sterilis*, is distinguished by its larger, 3–5 cm spikelets with 3–5 florets, 9–11-veined glumes, and stouter, 6–9 cm awns. Both subspecies occur over the whole range of the species.

**5. Avena fatua** Linnaeus, Sp. Pl. 1: 80. 1753.

野燕麦 ye yan mai

Annual. Culms erect or geniculate at base, 50–150 cm tall, unbranched, 2–4-noded. Leaf sheaths glabrous or basal sheaths puberulous; leaf blades 10–30 cm, 4–12 mm wide, scabrid or adaxial surface and margins pilose; ligule 1–5 mm. Panicle narrowly to broadly pyramidal, 10–40 cm, nodding; branches scabrid. Spikelets 1.7–2.5 cm, florets 2 or 3, all florets awned; rachilla easily disarticulating below each floret at maturity, each floret with a bearded callus, internodes hirsute or glabrous; glumes lanceolate, subequal, herbaceous, 9–11-veined, apex finely acute; callus hairs up to 4 mm; lemmas 1.5–2 cm, leathery, glabrous to densely hispid in lower half, green and scaberulous above, awned from near middle, apex shortly 2–4-toothed; awn 2–4 cm, geniculate, column twisted, blackish brown. Fl. and fr. Apr–Sep.  $2n = 42$ .

Weed of cultivated fields, grassy mountain slopes, roadsides and other disturbed places; below 4300 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Nei Mongol, Ningxia, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, India (Sikkim), Kazakhstan, Kyrgyzstan, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe].

This is a noxious weed, especially in fields of wheat and cultivated oats, native to Europe and C and SW Asia, but now spread throughout temperate regions of the world.

- 1a. Lemmas hispid in lower half, dark brown at maturity ..... 5a. var. *fatua*

- 1b. Lemmas glabrous, yellow at maturity ..... 5b. var. *glabrata*

**5a. *Avena fatua* var. *fatua***

野燕麦(原变种) ye yan mai (yuan bian zhong)

*Avena fatua* subsp. *meridionalis* Malzev; *A. meridionalis* (Malzev) Roshevitz.

Lemmas densely to sparsely hispid below middle with white or brownish hairs, becoming dark brown at maturity. Fl. and fr. Apr–Sep.

Disturbed places and as an arable weed; below 4300 m. Distribution as for the species.

- 5b. *Avena fatua* var. *glabrata* Petermann, Fl. Bienitz 13. 1841.

光稃野燕麦 guang fu ye yan mai

*Avena fatua* var. *mollis* Keng.

Lemmas glabrous (callus often bearded), yellowish at maturity.

Grassy mountain slopes, roadsides, farmlands; below 4300 m. Distribution as for the species.

Glabrous forms may be found growing with hairy forms, and are of little taxonomic importance.

## 78. TRISSETUM Persoon, Syn. Pl. 1: 97. 1805.

三毛草属 san mao cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennials, tufted, sometimes shortly rhizomatous. Leaf blades narrowly to broadly linear, usually flat; ligule membranous. Inflorescence a moderately lax to spikelike panicle, shining. Spikelets with 2 or 3 florets, disarticulating below each floret; rachilla shortly bearded, extended beyond uppermost floret, tipped by a reduced or vestigial floret; glumes lanceolate, unequal or subequal, shorter than spikelet, keeled, herbaceous or membranous, margins broad, hyaline, lower glume 1(–3)-veined, upper glume 3-veined, apex acute or acuminate; floret callus glabrous or shortly bearded; lemmas lanceolate, laterally compressed, membranous to thinly leathery, 5-veined, glabrous, awned from above middle of back, apex 2-toothed, teeth often aristulate; awn geniculate with twisted column or merely outwardly curved; palea hyaline, slightly to distinctly shorter than lemma, gaping free from lemma margins. Ovary glabrous or almost so. Caryopsis with punctiform hilum; endosperm sometimes liquid.

About 70 species: temperate regions of the world except Africa, also on tropical mountains; 12 species (five endemic) in China.

- 1a. Culm below panicle and panicle branches pubescent to tomentose (except *T. altaicum*); panicle contracted to dense and spikelike; plants often less than 50 cm tall.
- 2a. Culm glabrous; panicle branches smooth, glabrous ..... 1. *T. altaicum*
- 2b. Culm pubescent to tomentose; panicle branches pubescent.
- 3a. Plant rhizomatous; culms stout, 2–3 mm thick; panicle scarcely exserted from uppermost leaf sheath ..... 2. *T. kangdingense*
- 3b. Plant tufted; culms slender, 0.5–2 mm thick; panicle clearly exserted from uppermost leaf sheath.
- 4a. Palea keels densely ciliate; ovary pilose ..... 5. *T. debile*
- 4b. Palea keels scabrid; ovary glabrous.
- 5a. Panicle dense, spikelike, cylindrical to ovoid, 1.5–11 cm; branches erect, appressed; glumes and lemmas lanceolate; anthers 0.7–1.3 mm ..... 3. *T. spicatum*
- 5b. Panicle contracted but not dense and spikelike, lanceolate to subcylindrical, 5–18 cm; branches usually obvious, slightly spreading; glumes and lemmas narrowly lanceolate; anthers 1.3–1.6 mm ... 4. *T. clarkei*
- 1b. Culm and panicle branches glabrous; panicle lax; plants often more than 40 cm tall.
- 6a. Floret callus hairy.
- 7a. Lemmas conspicuously punctate-scabrid; palea 1/2–2/3 lemma length ..... 6. *T. bifidum*
- 7b. Lemmas smooth; palea subequal to lemma ..... 7. *T. yunnanense*

- 6b. Floret callus glabrous.
- 8a. Panicle branches single or paired; awns 9–14 mm, geniculate with twisted column; anthers 1–1.5 mm ..... 8. *T. scitulum*
- 8b. Panicle branches in whorls of 3–8; awns 4.5–9 mm, recurved or basally slightly twisted; anthers 2–3 mm.
- 9a. Culm stout, 4–5 mm in diam.; lemmas pale yellowish green, herbaceous with broad hyaline margins ..... 9. *T. henryi*
- 9b. Culm slender, 1.5–3 mm in diam.; lemmas brown at maturity, firm with narrow margins.
- 10a. Florets 2–4; lemmas 5–7 mm; awns up to 9 mm, strongly recurved ..... 10. *T. sibiricum*
- 10b. Florets 1 or 2; lemmas 4.5–5.5 mm; awns up to 6.5 mm, recurved or straight.
- 11a. Margins of leaf sheaths joined below middle; awns almost straight ..... 11. *T. umbratilis*
- 11b. Margins of leaf sheaths joined to middle or above; awns recurved ..... 12. *T. pauciflorum*

**1. Trisetum altaicum** Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 3: 85. 1922.

高山三毛草 gao shan san mao cao

Perennial, loosely tufted, shortly rhizomatous. Culms erect from ascending base, 15–45 cm tall, glabrous, 2–3-noded. Leaf sheaths pilose; leaf blades flat, 10–15 cm, 2–4 mm wide, pilose on both surfaces or only on margins; ligule 2–3 mm. Panicle contracted, fairly dense, linear to narrowly lanceolate-oblong in outline, 4–9 cm, greenish brown tinged violet; branches erect, up to 2.5 cm, smooth or rarely scaberulous. Spikelets 5–7 mm, florets 2 or 3; rachilla hairs 0.5–1 mm; glumes unequal, lower glume 3–4 mm, upper glume 4–5 mm, apex acuminate; lemmas ca. 5 mm, punctately scabrid; awned from slightly above middle to upper 1/3, apex 2-denticulate, teeth mucronate; awn 4–8 mm, recurved, lower part slightly twisted; palea keels scabrid. Anthers 0.8–1.2 mm. Fl. Jun–Sep. 2n = 14.

Alpine meadows, among rocks in coniferous forests, grassy mountain slopes; 1900–2800 m. Xinjiang [E Kazakhstan, Mongolia, Russia (Siberia)].

**2. Trisetum kangdingense** (Z. L. Wu) S. M. Phillips & Z. L. Wu, comb. et stat. nov.

康定三毛草 kang ding san mao cao

Basionym: *Trisetum clarkei* (J. D. Hooker) R. R. Stewart var. *kangdingense* Z. L. Wu, Acta. Biol. Plateau Sin. 2: 16. 1984 [“*kangdingensis*”].

Perennial with slender rhizomes. Culms usually solitary, erect from ascending base, 40–50 cm tall, 2–3 mm in diam., pubescent below panicle, 2–3-noded. Leaf sheaths longer than internodes, loose, lower sheaths pilose; leaf blades broadly linear, flat, 7–10 cm, 4–5 mm wide, scaberulous on both surfaces and margins; ligule 1.5–3 mm, truncate, margin ciliolate. Panicle scarcely exserted from uppermost leaf sheath, dense, elliptic in outline, lobed, 12–15 cm, pale yellowish; branches erect or slightly spreading, pubescent, densely clothed in branchlets and spikelets, lowest 6–8 cm. Spikelets 5.5–6 mm, florets 3; rachilla hairs ca. 1 mm; glumes slightly unequal, acuminate, lower glume narrowly lanceolate, ca. 5 mm, upper glume narrowly elliptic-oblong, 5.7–5.9 mm; lemma narrowly lanceolate-oblong, 5–5.3 mm, scabrid, awned from upper 1/4, apex entire; awn 3.2–3.4 mm, almost straight, slightly recurved at base, not twisted; palea keels scabrid. Anthers 1–1.1 mm. Fl. Aug.

• Damp ground near water; 3000–3700 m. Qinghai, Sichuan.

The spikelets of this species are the same as those of some forms of *Trisetum spicatum*, but it is excluded from both *T. spicatum* and *T.*

*clarkei* by its strikingly more robust rhizomatous habit and large, dense, scarcely exserted panicles.

**3. Trisetum spicatum** (Linnaeus) K. Richter, Pl. Eur. 1: 59. 1890.

穗三毛 sui san mao

Perennial, densely tufted. Culms erect, 3–60 cm tall, 1–2 mm in diam., pubescent to tomentose especially below panicle, 1–3-noded. Leaf sheaths pubescent; leaf blades flat or rolled, 2–15 cm, 2–4 mm wide, densely to sparsely hairy on both surfaces or only abaxial surface, or glabrous, margins often setose; ligule 1–2 mm. Panicle spikelike, dense, linear to ovate or oblong in outline, lower part sometimes interrupted, 1.5–11 cm; branches short, appressed, pubescent to tomentose. Spikelets 4–9 mm, florets 2(or 3); rachilla hairs 1–1.5 mm; glumes subequal or slightly unequal, lower glume 4–8 mm, upper glume 5–9 mm, apex acuminate, occasionally briefly aristulate; lemmas lanceolate, 4–7 mm, scaberulous to pubescent, awned from upper 1/4–1/3, apex usually 2-denticulate, teeth often mucronate, occasionally subentire; awn 2–7 mm, weakly geniculate with loosely twisted column, or recurved at base, or almost straight; palea keels scaberulous. Anthers 0.7–1.3 mm. Fl. and fr. Jun–Sep.

Grassy mountain slopes, alpine meadows, on glacial moraine, among bushes, montane forests; 1900–5600 m. Gansu, Hebei, Heilongjiang, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, N India, Japan, Kazakhstan, Kyrgyzstan, Korea, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia (Caucasus), Australia, Europe, North and South America].

This extremely polymorphic species is one of the most widespread of all flowering plants, being present in arctic and alpine parts of all continents except Africa. A large number of subspecies and varieties has been described, and these are only weakly correlated with geography. In spite of difficulties in applying infraspecific names, it seems unacceptable to include the very large range of forms present in China without subdivision under a single species name. Therefore subspecific names that have previously been applied are maintained here to indicate the main nodes of variation. However, variation is still very imperfectly understood, especially in the Himalayas, and it is not possible to place all specimens within the given subspecies descriptions.

- 1a. Plant up to 50 cm tall; panicle 5–11 cm, linear to narrowly elliptic or oblong, often interrupted below, pointed at apex, usually greenish or brownish.
- 2a. Lowest lemma 4–5.5 mm, awn 3–5 mm; spikelets usually with 2 florets ..... 3d. subsp. *virescens*
- 2b. Lowest lemma 5–7 mm, awn 5–7 mm; spikelets with 2 or 3 florets ..... 3e. subsp. *alaskanum*

- 1b. Plant up to 30 cm tall; panicle 1.5–5 cm, oblong to ovate, dense, not interrupted, rounded at apex, usually purple or grayish.
- 3a. Lemmas densely pubescent; plant 3–12 cm tall; leaf blades tomentose ..... 3b. subsp. *tibeticum*
- 3b. Lemmas scaberulous to puberulous; plant up to 30 cm tall; leaf blades pubescent to glabrous.
- 4a. Panicle narrowly oblong; awn 4–6 mm ..... 3a. subsp. *spicatum*
- 4b. Panicle ovate or oblong-ovate; awn 3–4 mm ..... 3c. subsp. *mongolicum*

**3a. *Trisetum spicatum* subsp. *spicatum***

穗三毛(原亚种) sui san mao (yuan ya zhong)

*Aira spicata* Linnaeus, Sp. Pl. 1: 64. 1753; *A. subspicata* Linnaeus, nom. illeg. superfl.; *Trisetum subspicatum* (Linnaeus) P. Beauvois, nom. illeg. superfl.

Plant up to 30 cm tall. Culms, leaf blades, and sheaths nearly glabrous to densely pubescent. Panicle narrowly oblong, 2–4 cm, usually purplish or brownish, dense. Spikelet with 2 florets; lower glume 4–5.5 mm, keel scabrid, upper glume 5–6 mm; lowest lemma 4–5 mm, smooth or scaberulous; awn 4–6 mm, weakly geniculate, twisted below. Fl. and fr. Jun–Sep.

Grassy mountain slopes, alpine meadows; above 1900 m. Gansu, Hebei, Heilongjiang, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang [Russia; Europe, North America].

This is a panarctic taxon, extending southward into the mountains of C Asia and W North America. It is not known from the Himalayas.

**3b. *Trisetum spicatum* subsp. *tibeticum* (P. C. Kuo & Z. L. Wu) Dickoré, Stapfia 39: 201. 1995.**

西藏三毛草 xi zang san mao cao

*Trisetum tibeticum* P. C. Kuo & Z. L. Wu, Fl. Xizang. 5: 188. 1987.

Plant 3–12 cm. Culms woolly, leaf blades and sheaths tomentose. Panicle ovate to oblong, dense, 1.7–3 cm, usually purplish or brownish. Spikelets with 2 florets; lower glume 4–7 mm, keel sometimes hispid, upper glume 5–7 mm; lowest lemma 4.8–5 mm, densely pubescent, apex 2-denticulate-aristulate; awn 5–5.6 mm, weakly geniculate, twisted below. Fl. and fr. Jun–Sep.

- Among boulders, glacial moraines; 4800–5500 m. Xizang.

Plants from very high altitudes in Xizang are distinguished by their low stature, extremely hairy leaves and culms, and especially by their pubescent lemmas. They grade into subsp. *mongolicum* through forms with shorter hairs on the lemma back and less densely hairy leaves and culms.

**3c. *Trisetum spicatum* subsp. *mongolicum* Hultén ex Veldkamp, Gard. Bull. Singapore 36: 135. 1983.**

蒙古穗三毛 meng gu sui san mao

Plant 9–20 cm. Culms pubescent, leaf blades and sheaths glabrous to densely pubescent. Panicle elliptic-oblong to ovate,

dense, 1.5–2.5 cm, greenish or brownish, rarely purple. Spikelets with 2 florets, lower glume 4–5.5 mm, upper glume 4.6–6.3 mm; lowest lemma 5–6 mm, scaberulous to shortly pubescent, apex entire or 2-denticulate-aristulate; awn 2–4 mm, straight or outwardly curved at base, not twisted. Fl. and fr. Jun–Sep.

Grassy mountain slopes, alpine meadows, among shrubs; 2000–5200 m. Nei Mongol, Qinghai, Sichuan, Xinjiang, Xizang [Bhutan, India (Sikkim), Kyrgyzstan, Mongolia, Russia (Siberia)].

This is a less hairy form than subsp. *tibeticum*, distinguished also by its relatively short, almost straight awns. Some specimens from above 5000 m in Xizang match subsp. *mongolicum* except for their longer (5–6 mm), twisted awns.

“*Trisetum spicatum* var. *mongolicum* (Hultén) P. C. Kuo & Z. L. Wu,” as given in FRPS (9(3): 140. 1987), was not validly published because “*T. spicatum* subsp. *mongolicum* Hultén” (Svensk Bot. Tidskr. 53: 214. 1959), on which it was based, was also not validly published because no type was indicated.

**3d. *Trisetum spicatum* subsp. *virescens* (Regel) Tzvelev, Novosti Sist. Vyssh. Rast. 7: 65. 1971 [“1970”].**

喜马拉雅穗三毛 xi ma la ya sui san mao

*Avena flavescens* var. *virescens* Regel, Bull. Soc. Imp. Naturalistes Moscou 41(2): 299. 1868; *A. virescens* (Regel) Regel; *Trisetum spicatum* subsp. *himalaicum* Hultén ex Veldkamp; *T. virescens* (Regel) Roshevitz (1924), not Nees ex Steudel (1854).

Plant (20–)30–60 cm. Culms pubescent, leaf blades and sheaths densely pubescent to glabrous. Panicle linear to narrowly oblong, often interrupted below, 5–7(–11) cm, green or brownish. Spikelets with 2(–3) florets; lower glume 3.5–4.8 mm, upper glume 4.3–5.6 mm; lowest lemma 4–5.5 mm, scaberulous, apex entire or 2-denticulate; awn 3–5 mm, outwardly curved near base, not twisted.

Alpine grasslands, meadows, often on damp sand or gravel; 3200–5000 m. Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Bhutan, N India, Kazakhstan, Kyrgyzstan, Nepal, N Pakistan, Tajikistan].

“*Trisetum spicatum* var. *himalaicum* (Hultén) P. C. Kuo & Z. L. Wu,” as given in FRPS (9(3): 141. 1987), was not validly published because “*T. spicatum* subsp. *himalaicum* Hultén” (Svensk Bot. Tidskr. 53: 213. 1959), on which it was based, was also not validly published because no type was indicated.

**3e. *Trisetum spicatum* subsp. *alaskanum* (Nash) Hultén, Svensk Bot. Tidskr. 53: 210. 1959.**

大花穗三毛 da hua sui san mao

*Trisetum alaskanum* Nash, Bull. New York Bot. Gard. 2: 155. 1901; *T. formosanum* Honda; *T. spicatum* var. *alaskanum* (Nash) Malte ex Louis-Marie; *T. spicatum* subsp. *formosanum* (Honda) Veldkamp; *T. spicatum* var. *formosanum* (Honda) Ohwi.

Plant up to 60 cm tall. Culms pubescent, leaf blades and sheaths glabrous or pilose. Panicle linear-elliptic, dense or slightly loose toward base, 5–11 cm, green or brownish. Spikelets with 2 or 3 florets; lower glume 5–8 mm, upper glume 5.5–9 mm; lowest lemma 5–7 mm, scabrid apex acute or 2-dentate;

awn 5–7 mm, slightly outwardly curved, not twisted. Fl. and fr. Jun–Sep.

Gravel slopes, alpine meadows; 3800–5600 m. Sichuan, Taiwan, Xizang, Yunnan [Bhutan, India (Sikkim), Japan, Korea, Russia (Far East); North America (Canada, United States)].

This is the most robust member of the complex in China and has the largest spikelets. It has a general distribution along the mountain chains on both sides of the N Pacific, but specimens with these dimensions also occur in the Himalayas, where it intergrades with subsp. *virescens*. Conversely, specimens with the slightly smaller spikelet dimensions of subsp. *virescens* are known from Tianjin.

A robust form from Kashmir with pubescent lemmas has been named *Trisetum spicatum* var. *pubiflorum* (Hackel) L. Liu (*T. pubiflorum* Hackel). This has also been reported from the Hengduan Shan.

**4. *Trisetum clarkei*** (J. D. Hooker) R. R. Stewart, Brittonia 5: 431. 1945.

长穗三毛草 *chang sui san mao cao*

*Avena clarkei* J. D. Hooker, Fl. Brit. India 7: 278. 1896 ["1897"].

Perennial, loosely tufted. Culms erect from ascending base, (30–)50–70 cm tall, 0.5–1 mm in diam., pubescent especially below panicle, 1–3-noded. Leaf sheaths pubescent; leaf blades flat, 5–20 cm, 1.5–2(–4) mm wide, pubescent or scaberulous; ligule 1–2 mm. Panicle contracted, linear to lanceolate in outline, usually slightly loose, at least lower branches obvious, 5–18 cm, brown, green, or yellowish green; branches slender, erect or slightly spreading, pubescent. Spikelets 4–8.5 mm, florets 2 or 3; rachilla hairs ca. 1.5 mm; glumes unequal, narrowly lanceolate, lower glume 4–6 mm, upper glume 5–7.5 mm, apex sharply acute; lemmas narrowly lanceolate, 3.5–7 mm, scabrid, awned from near upper 1/3, apex usually 2-denticulate, teeth mucronate, occasionally subentire; awn strongly recurved at base, 4–8 mm, fine, not twisted; palea keels scabrid. Anthers 1.3–1.6 mm. Fl. Jul–Sep.

Montane forests, among bushes, moist grassy mountainsides; 1900–4300 m. Gansu, Hubei, Qinghai, Shaanxi, Sichuan, Xinjiang, Xizang, Yunnan [E Afghanistan, NW India, Kashmir, Pakistan].

The boundary between *Trisetum spicatum* and *T. clarkei* is obscured by intermediates, which are probably the result of introgression between the two species. *Trisetum clarkei* tends to be a taller, more slender grass, with a slightly looser panicle of narrower spikelets with well-exserted awns.

**5. *Trisetum debile*** Chrtek, Folia Geobot. Phytotax. 25: 334. 1990.

柔弱三毛草 *rou ruo san mao cao*

Perennial. Culms slender, base ascending, ca. 25 cm tall, ca. 0.8 mm in diam., glabrous or appressed-pubescent, densely appressed-pilose with longer spreading hairs below panicle, 3-noded. Leaf blades narrowly linear, ca. 4 cm, 1–1.2 mm wide, both surfaces pubescent with scattered longer hairs, convolute toward acuminate apex; ligule ca. 0.7 mm. Panicle lanceolate in outline, dense, ca. 4 cm, with few spikelets; branches short, densely pubescent with scattered longer spreading hairs; pedicels ca. 2 mm. Spikelets 5–6 mm, florets 2, green or straw-colored; rachilla pilose; glumes lanceolate, unequal,

scabrid on keel, apex aristulate, lower glume 3–4 mm, 3-veined, upper glume 4–4.5 mm, 5-veined; lemmas 4–4.5 mm, inconspicuously 5-veined, keel scaberulous, awned from upper 1/3, apex 2-toothed; awn 5–7 mm, geniculate or recurved; palea subequal to lemma, keels densely ciliate. Ovary thinly pilose in upper part. Fl. Aug.

- Habitat unknown; ca. 3400 m. NW Yunnan.

This species is known only from the type gathering, which has not been seen.

**6. *Trisetum bifidum*** (Thunberg) Ohwi, Bot. Mag. (Tokyo) 45: 191. 1931.

三毛草 *san mao cao*

*Bromus bifidus* Thunberg in Murray, Syst. Veg., ed. 14, 119. 1784; *Avena bifida* (Thunberg) P. Beauvois; *Trisetum flavescent* (Linnaeus) P. Beauvois var. *bifidum* (Thunberg) Makino; *T. flavescent* var. *macranthum* Hackel; *T. flavescent* var. *papillosum* Hackel.

Perennial, tussocky. Culms erect or geniculate at base, 30–100 cm tall, glabrous, 2–5-noded. Leaf sheaths usually shorter than internodes, glabrous or pilose, margins joined in lower part; leaf blades flat, soft, up to 20 cm, 3–6 mm wide, glabrous or occasionally pilose; ligule 0.5–2 mm. Panicle lax, oblong to lanceolate-oblong in outline, 10–25 cm, often nodding, yellow-green or brown green; branches 2 or 3 at basal node, scaberulous, lowest up to 10 cm. Spikelets 6–8 mm, florets 2 or 3; rachilla hairs 0.2–0.5 mm; glumes unequal, lower glume 2–3.5 mm, upper glume 4–7 mm, apex acuminate; callus pubescent; lemmas 5–7 mm, firm, golden brown, punctate-scabrid, awned from upper 1/4, apex 2-toothed, teeth 1–2 mm, aristulate; awn 7–10 mm, fine, strongly recurved near base, not twisted; palea 1/2(–2/3) length of lemma, keels conspicuously convex, ciliolate. Anthers 0.5–1 mm. Fl. Apr–Jun.

Forests, roadsides, moist grassy ditch banks; 500–2500 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Japan, Korea, New Guinea].

**7. *Trisetum yunnanense*** Chrtek, Folia Geobot. Phytotax. 25: 334. 1990.

云南三毛草 *yun nan san mao cao*

Perennial, tufted, shortly stoloniferous. Culms 26–35 cm tall, ca. 1.5 mm in diam., glabrous, 2–3-noded. Leaf sheaths scabrid, pubescent with longer hairs toward blade; leaf blades linear, gray-green, 4–10 cm, 2–3 mm wide, abaxial surface prominently veined, both surfaces scaberulous, often pilose, margins long ciliate, apex acuminate; ligule 1.5–3 mm, margin ciliate. Panicle lanceolate in outline, fairly dense, 7–9 cm, spikelets many; branches scabrid; pedicels 2–6 mm, scabrid. Spikelets 6.5–9 mm, florets 3, uppermost reduced, green or violet tinged; rachilla densely pilose; glumes unequal, keel scabrid, margins narrowly hyaline, apex acuminate-aristulate, lower glume lanceolate, 4–5 mm, 1-veined, upper glume elliptic, 5–6.5 mm, 3-veined; callus hairs ca. 0.8 mm; lowest lemma 6.5–7 mm, upper part often violet-colored, keel scabrid, apex 2-toothed; awn 12–16 mm, geniculate or rarely recurved; palea subequal to lemma. Anthers 1.8–2.2 mm. Ovary long-pilose in upper part.

- Dry meadows; ca. 3000 m. Yunnan.

The hairy ovary is unusual in *Trisetum*. The type has not been seen.

#### 8. *Trisetum scitulum* Bor, Kew Bull. [11] 1956: 212. 1956.

优雅三毛草 you ya san mao cao

*Avena flavescens* J.D. Hooker (1896), not Linnaeus (1753).

Perennial, loosely tufted. Culms erect from geniculate base, 12–80 cm tall, 1.5–2 mm in diam., glabrous, 2–3-noded. Leaf sheaths usually shorter than internodes, glabrous, margins joined near base; leaf blades flat, soft, 10–20 cm, 2–8 mm wide, adaxial surface scattered pilose; ligule 1–4 mm. Panicle lax, lanceolate in outline, 7–15 cm, gray-green, brown or purplish; branches 1–3 at basal node, capillary, flexuous, smooth, glabrous, up to 5 cm. Spikelets 6.5–9 mm, florets 1–3; rachilla filiform, villous; glumes unequal, narrowly lanceolate, lower glume 4.5–5.3 mm, upper glume 6–7.2 mm, apex finely acuminate; callus glabrous; lemmas 6.5–8 mm, firm, golden brown, scaberulous around keel, otherwise smooth, awned from upper 1/4–1/3, apex 2-toothed, teeth 2.5–3 mm, slenderly acuminate-aristulate; awn 9–14 mm, weakly geniculate, column twisted; palea 1/2–2/3 length of lemma, keels slightly convex, scabrid. Anthers 1–1.5 mm. Fl. Jul–Sep.

Alpine scrub, meadows, gravel river banks; 4000–5000 m. Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), E Nepal].

This is a locally distributed, high-altitude species with a slender habit and large, brown, long-awned spikelets.

#### 9. *Trisetum henryi* Rendle, J. Linn. Soc., Bot. 36: 400. 1904.

湖北三毛草 hu bei san mao cao

Perennial, shortly rhizomatous; roots thick, villous. Culms stout, rooting at lower nodes, ascending, 80–140 cm tall, 4–5 mm in diam., glabrous, 5–9-noded. Leaf sheaths longer than internodes, lower pubescent, usually closed to above middle, upper glabrous, outer margin ciliate; leaf blades broadly linear, 15–35 cm, 5–15 mm wide, scabrid or adaxial surface puberulent, margins stiffly ciliate toward ligule; ligule brown, thick, 1–2 mm. Panicle lax, elliptic to narrowly elliptic-oblong in outline, 10–22 cm, much branched, densely spiculate, silvery yellowish green; branches 4–6 or more at lowest node, smooth, longest 6–8 cm. Spikelets 5–7 mm, florets 2 or 3; rachilla hairs 1–1.2 mm; glumes unequal, lower glume 3–4 mm, upper glume 4–6 mm; callus glabrous; lemmas thinly herbaceous with broad hyaline margins, 5–6 mm, finely scabrid, awned from middle to upper 1/3, apex subentire, 2-mucronate; awn 4.5–6 mm, recurved or with short twisted column; palea 3/4 lemma length, keels scaberulous. Anthers 2.5–3 mm. Fl. and fr. Jun–Sep.

• Grassy roadsides, damp places in forests; below 2400 m. Anhui, Henan, Hubei, Jiangsu, Jiangxi, Shaanxi, Shanxi (Ruicheng, Yuanqu), SE Sichuan, Zhejiang (Lin'an).

This is the most robust species in China, remarkable for its thick, hairy roots, stout culms, large panicle of pale spikelets, and thin-textured spikelets.

#### 10. *Trisetum sibiricum* Ruprecht, Beitr. Pflanzenk. Russ. Reichen 2: 65. 1845.

西伯利亚三毛草 xi bo li ya san mao cao

*Trisetum flavescens* (Linnaeus) P. Beauvois subsp. *sibiricum* (Ruprecht) T. Koyama; *T. flavescens* var. *sibiricum* (Ruprecht) Ohwi.

Perennial, loosely tufted, shortly rhizomatous. Culms solitary or few, 50–120 cm tall, 1.5–3 mm in diam., glabrous, 3–4-noded. Leaf sheaths mostly shorter than internodes, glabrous or lower shortly pubescent, margins joined near base; leaf blades broadly linear, 6–20 cm, 4–9 mm wide, glabrous or adaxial surface scattered pilose, ligule 1–2 mm. Panicle lax, narrowly oblong to lanceolate in outline, 10–20 cm, much branched, yellowish brown; branches 3–8 at lowest node, slightly scabrid, up to 6 cm. Spikelets 5–10 mm, florets 2–4; rachilla hairs ca. 1 mm; glumes unequal, lower glume 4–6 mm, upper glume 5–8 mm, apex acuminate; callus glabrous or with few very short hairs; lemmas 5–7 mm, firm, golden brown, finely but densely scabrid, awned from upper 1/3, apex 2-toothed, teeth triangular; awn 5–9 mm, strongly recurved, lower part straight or slightly twisted; palea 3/4 lemma length or longer, keels indistinctly scaberulous. Anthers 2–3 mm. Fl. and fr. Jun–Aug.

Grassy mountain slopes, open forest, marshy places among shrubs; 700–4200 m. Gansu, Hebei, Heilongjiang, Henan, Hubei (Shennongjia), Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang [Japan, Kazakhstan, Korea, Mongolia, Russia; SW Asia (Caucasus), E Europe, North America (Alaska)].

This species is a good forage grass, closely related to *Trisetum flavescens* (Linnaeus) P. Beauvois from Europe. *Trisetum flavescens* has been introduced into many temperate countries for forage. It can be distinguished from *T. sibiricum* by its pilose lower leaf sheaths, geniculate awn with twisted column, and bearded callus.

#### 11. *Trisetum umbratile* (Kitagawa) Kitagawa, J. Jap. Bot. 31: 302. 1956.

绿穗三毛草 lü sui san mao cao

*Trisetum sibiricum* Ruprecht var. *umbratile* Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 4: 77. 1940; *T. sibiricum* subsp. *umbratile* (Kitagawa) Tzvelev.

Culms erect, slender, 70–90 cm tall, glabrous. Leaf sheaths equaling or shorter than internodes, glabrous, outer margin ciliate at mouth, margins closed near base; leaf blades linear, 8–30 cm, 2–7 mm wide, scabrid; ligule 1–2 mm. Panicle lax, broadly lanceolate in outline, up to 22 cm, green; branches capillary, smooth in lower part, upper part scabrid. Spikelets 4–5(–6) mm, florets 1 or 2; rachilla hairs ca. 1.4 mm; glumes unequal, lower glume oblong-lanceolate, 2.5–4 mm, upper glume oblong, 4–5 mm; lemmas 4.5–5.5 mm, scabrid-papillose, awned from above middle, apex 2-toothed, teeth ca. 1.5 mm, acute; awn up to 6.5 mm, straight or almost so, not twisted; palea keels indistinctly scaberulous. Anthers ca. 2 mm. Fl. and fr. Jul–Sep.

Marshy meadows and in forest. Heilongjiang, Jilin, Liaoning, Nei Mongol (Yakeshi) [Korea, Russia (Ussuri)].

This is a locally distributed variant of *Trisetum sibiricum* with small spikelets and almost straight awns.

**12. Trisetum pauciflorum** Keng, Fl. Tsinling. 1(1): 441. 1976.

贫花三毛草 pin hua san mao cao

Perennial, shortly rhizomatous. Culms erect from ascending base, 50–100 cm tall, 2–2.5 mm in diam., glabrous, 4–7-noded. Leaf sheaths closed up to middle or more, basal sheaths longer than internodes, upper shorter, glabrous, sometimes ciliate at margin and mouth; leaf blades soft, 15–30 cm, 5–8 mm wide, smooth or scabrid; ligule brown, ca. 1 mm. Panicle lax, lanceolate-oblong in outline, ca. 15 cm, much branched with many spikelets, silvery brown or purplish; branches whorled, smooth, up to 5 cm. Spikelets 4.5–5.5 mm, florets 1 or 2;

glumes unequal, lower glume 2.5–3 mm, upper glume 4–4.5 mm; rachilla hairs ca. 1.5 mm; lemmas 4.5–5 mm, scabrid-papillose, awned from upper 1/3, apex subentire; awn 3–4 mm, recurved and slightly twisted near base; palea keels scaberulous. Anthers ca. 2.5 mm. Fl. and fr. Jul–Aug.

- Moist shady places in valleys, woodland margins on mountain-sides; 1600–2100 m. Henan, Shaanxi, Sichuan.

This is a little-known variant close to *Trisetum sibiricum* and perhaps does not merit specific rank. It has small spikelets like those of *T. umbratile*, but with recurved awns, and occurs outside the known distribution of that taxon.

**79. KOELERIA Persoon, Syn. Pl. 1: 97. 1805.**

莎草属 qia cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Perennials, tufted, sometimes shortly rhizomatous. Culms unbranched. Leaf sheaths of tillering leaves usually closed; leaf blades mainly basal, narrow, flat, or inrolled and filiform to setaceous; ligule membranous. Inflorescence a dense spikelike panicle, shining; branches short, erect, hispidulous to woolly. Spikelets with 2 to several florets; rachilla puberulous or glabrous, articulating below each floret; glumes narrow, unequal or subequal, equaling or shorter than florets, strongly keeled, thinly herbaceous, 1–3(–5)-veined, margins broad, hyaline, shining; floret callus small, glabrous or very shortly hairy; lemmas membranous or papery, strongly compressed, sharply keeled, 3–5-veined, margins hyaline, shining, apex obtuse to acuminate, awnless or with a subapical mucro; palea subequaling lemma, hyaline, gaping free from lemma margins. Stamens 3. Ovary glabrous. Endosperm sometimes liquid.

About 35 species: temperate regions throughout the world, also on tropical mountains; four species in China.

This is a genus of narrowly defined, closely related species. They provide good forage in mountain steppe.

- 1a. Lemmas shortly awned, awns 0.5–2.5 mm; rachilla with 0.3–1 mm hairs ..... 1. *K. litvinowii*
- 1b. Lemmas awnless or minutely mucronate; rachilla glabrous or puberulous.
  - 2a. Glumes and lemmas pilose ..... 2. *K. altaica*
  - 2b. Glumes and lemmas glabrous, smooth or scabrid.
    - 3a. Plant densely tufted; culms hairy mainly below panicle; spikelets punctate scabrid ..... 3. *K. macrantha*
    - 3b. Plant with short rhizomes, forming loose mats; culms hairy throughout; spikelets smooth ..... 4. *K. atroviolacea*

**1. Koeleria litvinowii** Domin, Biblioth. Bot. 14(65): 116. 1907.

芒莎草 mang qia cao

Perennial, loosely to densely tufted. Culms up to 50 cm tall, thinly pubescent to tomentose below panicle, 1- or 2-noded, or node basal and obscured. Leaf sheaths glabrous or pubescent; leaf blades flat, 4–15 cm, 1–4 mm wide, pubescent or glabrous, margins sometimes setose near ligule; ligule 1–2 mm. Panicle elliptic-oblong to narrowly oblong in outline, 1.5–12 cm, sometimes interrupted, silvery green, grayish or purplish; axis and branches densely pubescent. Spikelets 4.7–6 mm, florets 2 or 3; rachilla hairs 0.3–0.5(–1) mm; glumes slightly unequal, lower glume narrowly lanceolate, 3.5–5 mm, keel scabrid, upper glume elliptic-oblong, 4.3–5.8 mm, keel scabrid or ciliate, margins broadly membranous; lemmas lanceolate, 3.7–5.5 mm, finely scabrid to shortly pubescent, shortly awned from upper 1/4 or above, apex acute or 2-mucronate; awn 0.5–2.5 mm, straight; palea keels scabrid to ciliolate. Anthers 0.6–1.5 mm. Fl. and fr. Jun–Sep.

Grassy or stony mountain slopes, alpine meadows; 3000–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Kashmir, E Kazakhstan, Kyrgyzstan, Tajikistan (Pamirs)].

This species is intermediate between the closely related genera

*Trisetum* and *Koeleria*, especially in the possession of a short, straight awn. A hybrid origin has been postulated (*T. spicatum* × *K. macrantha*). Variation in the high mountains of W China and neighboring regions is poorly understood. In particular, the boundary with short-awned forms of *T. spicatum* is obscured by intermediates. Forms with a very short, straight awn are here all included in *K. litvinowii*.

- 1a. Leaf sheaths densely pubescent; panicle grayish violet ..... 1a. subsp. *litvinowii*
- 1b. Leaf sheaths glabrous or thinly pilose; panicle silvery green ..... 1b. subsp. *argentea*

**1a. Koeleria litvinowii** subsp. ***litvinowii***

芒莎草(原亚种) mang qia cao (yuan ya zhong)

*Koeleria enodis* Keng; *K. hosseana* Domin; *K. hosseana* var. *tafelii* Domin; *K. litvinowii* var. *tafelii* (Domin) P. C. Kuo & Z. L. Wu; *Trisetum litvinowii* (Domin) Nevski.

Perennial forming small dense tussocks. Culms tinged purple, tomentose below panicle. Leaf sheaths densely pubescent. Panicle grayish violet. Lemma apex acute.

Grassy or stony mountain slopes, alpine meadows; 3000–5200 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan [E Kazakhstan, Kyrgyzstan, Tajikistan (Pamirs)].

This subspecies tends to have a more northwestern distribution than subsp. *argentea*.

**1b. *Koeleria litvinowii* subsp. *argentea* (Grisebach) S. M. Phillips & Z. L. Wu, comb. nov.**

银莎草 yin qia cao

Basionym: *Koeleria argentea* Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 77. 1868; *K. argentea* var. *nepalensis* Domin; *Trisetum litvinowii* subsp. *argenteum* (Grisebach) Tzvelev; *T. litvinowii* var. *argenteum* (Grisebach) Tzvelev.

Perennial, loosely tufted. Culms green, pubescent or subglabrous below panicle. Leaf sheaths usually glabrous. Panicle pale silvery green. Lemma apex minutely 2-mucronate.

Damp meadows, alluvial gravel by rivers and mountain streams; ca. 4000 m. Qinghai, Xizang [Afghanistan, Kashmir].

**2. *Koeleria altaica* (Domin) Krylov, Fl. Sibir. Occid. 2: 261. 1928.**

阿尔泰莎草 a er tai qia cao

*Koeleria eriostachya* Pančić var. *altaica* Domin, Biblioth. Bot. 14(65): 163. 1907.

Perennial, densely tufted or shortly rhizomatous; old basal sheaths encircling 2 or 3 culms together into bunches, finally splitting into fibers. Culms slender, 13–50 cm tall, pubescent below panicle, otherwise glabrous. Leaf sheaths densely pubescent at base, upper culm sheaths subglabrous; leaf blades usually rolled, hard, recurved, 2–13 cm, 0.5–2.5 mm wide, hirsute or sometimes glabrous; ligule 1–2 mm. Panicle 2–3 cm, very dense, lower part interrupted, yellowish green or tinged grayish violet. Spikelets 3.5–5 mm, florets 2(–3); glumes unequal, lanceolate or oblong-lanceolate, appressed pilose, keel ciliate, lower glume 3–3.5 mm, upper glume 4–4.5 mm; lemmas lanceolate, ca. 4.5 mm, shortly pilose, apex mucronate. Fl. and fr. Jun–Jul.

Dry stony grassy hills. Nei Mongol, Xinjiang [Kazakhstan (Tara-gatai Mountains), Mongolia, Russia (S Siberia)].

This is a good forage grass.

**3. *Koeleria macrantha* (Ledebour) Schultes, Mant. 2: 345. 1824.**

莎草 qia cao

*Aira macrantha* Ledebour, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 5: 515. 1815; *Koeleria cristata* Persoon var. *poiformis* (Domin) Tzvelev; *K. cristata* subsp. *pseudocristata* (Domin) Domin; *K. cristata* var. *pseudocristata* (Domin) P. C. Kuo & Z. L. Wu; *K. gracilis* Persoon, nom. illeg. superfl.; *K. poiformis* Domin; *K. pseudocristata* Domin; *K. tokiensis* Domin.

Perennial, densely tufted; old basal sheaths papery, persistent around each culm base. Culms stiffly erect, 5–60 cm tall, woolly especially below panicle, 2–3-noded. Leaf sheaths glabrous or pubescent; leaf blades grayish green, usually rolled, sometimes flat, up to 30 cm, 1–2 mm wide, pubescent or adax-

ial surface glabrous; ligule 0.2–2 mm. Panicle linear-oblong in outline, 1.5–13 cm, lower part often interrupted and lobed, silvery green or tinged purple; axis and branches woolly. Spikelets 3–7 mm, florets 2–3(–4); rachilla hairs less than 0.4 mm or glabrous; glumes slightly unequal, punctate-scaberulous, keel scabrid, lower glume narrowly lanceolate, 1.5–4 mm, upper glume elliptic-oblong, 2.5–5.5 mm, apex acute; lemmas lanceolate, 2.6–5.5 mm, punctate-scaberulous, apex acute, cuspidate, or rarely keel extended up to 0.3 mm into apical mucro; palea keels ciliolate. Anthers 1.2–2.3 mm. Fl. and fr. May–Sep.

Mountain slopes, grassland, roadsides; sea level to 3900 m. Anhui, Fujian, Hebei, Heilongjiang, Henan, Hubei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Sichuan, Xinjiang, Xizang, Zhejiang [Afghanistan, NW India, Kashmir, Kazakhstan, Kyrgyzstan, Japan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; North America, SW Asia, Europe; introduced to Australia and elsewhere].

This species has usually been known in the past as *Koeleria cristata* Persoon, an illegitimate, superfluous name that included the types of two earlier names in its circumscription. It is a highly polymorphic species, widespread in temperate parts of the N hemisphere, to which many infraspecific names have been applied. Variable characters include hairiness, stiffness, rolling and color of the leaf blades, panicle color, and spikelet size and hairiness. These variants are mostly ill-defined, intergrading, and of negligible practical value.

**4. *Koeleria atrovirens* Domin, Biblioth. Bot. 14(65): 252. 1907.**

匍茎莎草 pu jing qia cao

*Koeleria asiatica* Domin subsp. *atrovirens* (Domin) Tzvelev; *K. asiatica* subsp. *ledebourii* (Domin) Tzvelev; *K. atrovirens* var. *tsinghaica* Tzvelev; *K. geniculata* Domin; *K. ledebourii* Domin.

Perennial, shortly rhizomatous, forming loose mats; old basal sheaths papery, persistent. Culms erect or geniculate at base, 10–50 cm tall, pilose throughout length, 2–3-noded. Leaf sheaths of cauline leaves inflated; leaf blades green, flat or rolled, 5–15 cm, 1–2 mm wide, smooth or scabrid, occasionally pilose; ligule ca. 0.2 mm. Panicle rather lax, pyramidal to oblong in outline, 2.5–8 cm, lower part often interrupted, grayish violet. Spikelets 4–6 mm, florets 2 or 3; glumes usually glabrous, occasionally shortly ciliate on keel, lower glume narrowly lanceolate, 3.5–4 mm, upper glume broadly lanceolate, 4.5–5 mm; lemmas narrowly ovate, ca. 5 mm, smooth, glabrous, awnless, apex acuminate; palea keels scabrid. Anthers ca. 2 mm. Fl. Jun–Aug.

Grassy places on dry mountain slopes; 2900–4600 m. Qinghai, Xizang [Mongolia, Russia (Altai and Sayan Mountains of S Siberia)].

This species is closely related to, and is sometimes regarded as a subspecies of, *Koeleria asiatica* Domin. That species, in the strict sense, is confined to arctic regions of E Europe, Russia, and W North America, and usually has densely hairy spikelets.

It is uncertain whether this grass does in fact occur in China, as was reported in FRPS (9(3): 134, fig. 33. 1987, as *Koeleria asiatica*), or whether that record relates to an unusually loosely tufted form of *K. macrantha*. No specimens have been seen.

## 80. DESCHAMPSIA P. Beauvois, Ess. Agrostogr. 91. 1812.

发草属 fa cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

*Avenella* (Bluff & Fingeruth) Drejer; *Aira* sect. *Avenella* Bluff & Fingerhuth.

Perennials, densely tufted. Leaf blades mainly basal, linear to setaceous, flat, folded or rolled; ligule membranous. Inflorescence usually an open panicle, infrequently contracted or spikelike; branches and pedicels usually filiform. Spikelets oblong to gaping, shining, laterally compressed, florets 2–3(–5), disarticulating below each floret; rachilla pilose, extended beyond uppermost floret; glumes lanceolate to oblong, subequal, ± equaling spikelet, membranous, shining, keeled, lower glume 1-veined, upper glume 1–3-veined; floret callus small, pubescent to conspicuously bearded; lemmas lanceolate to oblong, hyaline to shiny cartilaginous, back rounded, finely 4-veined (5th midvein extended into awn), glabrous, awned from near base or in lower half, apex membranous, broad, 4-toothed or denticulately truncate; awn straight or weakly geniculate, usually not exserted from spikelet; palea hyaline, subequal to lemma. Ovary glabrous. Caryopsis with solid endosperm.

About 40 species: temperate and cold regions of the world; three species in China.

- 1a. Awns geniculate, clearly exserted from spikelet; leaf blades setaceous, smooth ..... 1. *D. flexuosa*
- 1b. Awns straight or almost so, included in spikelet or only shortly exserted; leaf blades linear, usually adaxially scabrid.
  - 2a. Panicle dense, spikelike, 1–7 cm, ovate to oblong, brownish purple with golden sheen ..... 2. *D. koelerioides*
  - 2b. Panicle lax and open, or contracted but not spikelike, 6–30 cm, narrowly oblong to ovate ..... 3. *D. cespitosa*

**1. Deschampsia flexuosa** (Linnaeus) Trinius, Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 4, 2(1): 9. 1836.

曲芒发草 qu mang fa cao

*Aira flexuosa* Linnaeus, Sp. Pl. 1: 65. 1753; *A. kawakamii* Hayata; *Avenella flexuosa* (Linnaeus) Drejer; *Deschampsia kawakamii* (Hayata) Honda; *Lerchenfeldia flexuosa* (Linnaeus) Schur.

Perennial, tufted, sometimes rhizomatous; old basal sheaths tightly overlapping. Culms slender, erect, 15–60 cm tall, 2- or 3-noded. Leaf sheaths longer than internodes, smooth or scaberulous upward; leaf blades setaceous, rather stiff, 3–15 cm, 0.3–0.5 mm wide, abaxial (outer) surface smooth; ligule lanceolate, 2–4 mm. Panicle open, ovate in outline, 5–10 cm, silvery with purple or brown tinge; branches usually paired, capillary, flexuous, bearing spikelets on distal part. Spikelets 4–6(–8) mm, florets 2, rachilla internode short; glumes thinly membranous, 1-veined, lower shorter than upper, apex acute; callus hairs ca. 1 mm; lemmas 3.5–5(–6) mm, asperulous, awned from near base, apex denticulate or erose; awn 5–8 mm, exserted from spikelet, geniculate in middle, column dark brown, twisted. Anthers 1.5–2.5 mm. Fl. and fr. Jul–Sep. 2n = 28.

Exposed mountain peaks, on stony soil and rocky slopes. Taiwan [Japan, Philippines (Luzon), Russia; Africa (high mountains), SW Asia (Caucasus), Europe, North America, South America (S Argentina, S Chile)].

A variant of this widespread species found on Yu Shan (Mt. Morrison) in Taiwan has larger spikelets than usual (6–8 mm), since the glumes are drawn out into long caudate tips, with the upper glume 1–2 mm longer than the lower. This variant is the basis of *Deschampsia kawakamii*. Typical *D. flexuosa* also occurs in Taiwan.

**2. Deschampsia koelerioides** Regel, Bull. Soc. Imp. Naturalistes Moscou 41: 299. 1868.

穗发草 sui fa cao

*Deschampsia cespitosa* (Linnaeus) P. Beauvois subsp. *koelerioides* (Regel) Tzvelev.

Perennial, forming small dense tussocks. Culms erect, 5–40 cm tall, 1–1.7 mm in diam., 1(or 2)-nodded. Leaf sheaths loose, glabrous; leaf blades linear, flat or rolled, up to 20 cm, 1–3 mm wide, abaxial surface smooth, adaxial surface with coarse sharp ridges, smooth or scaberulous; ligule acuminate, up to 8 mm. Panicle densely contracted to spikelike, ovoid to oblong, 1–7 cm, brownish purple with golden sheen; branches very short, visible or not. Spikelets 4–6 mm, florets 2, rachilla internode ca. 1 mm; glumes subequal to spikelet, lower glume slightly shorter than or equaling upper glume, 1-veined, upper glume 3-veined, apex acute or obtuse, often lacerate; callus hairs ca. 1/3 lemma length; lemmas 3–4 mm, awned from or near lower 1/4, apex broadly 2-toothed, teeth irregularly lacerate; awn straight or slightly bent, equaling or slightly longer than lemma. Anthers 1.5–2.2 mm. Fl. Jul–Aug.

Damp alpine meadows, wet places near rivers and stream banks; 3500–5100 m. Gansu, Nei Mongol, Qinghai, Xinjiang, Xizang [E Afghanistan, Kashmir, Kazakhstan (Turbagatai Mountains), Kyrgyzstan, Mongolia, N Pakistan, Russia (S Siberia), Tajikistan (Pamirs), Uzbekistan].

This is a distinctive, high-altitude variant from the *Deschampsia cespitosa* complex, distinguished by its short, spikelike, purple-brown panicles.

A specimen collected in S Xizang (N of Kumaon, N India) has been assigned to *Deschampsia cespitosa* subsp. *sikkimensis* Noltie, which is otherwise known only from India (Sikkim). It is a small plant with compact panicles, close to *D. koelerioides*, but differing in its pyramidal panicle with the spikelets aggregated into fascicles.

**3. Deschampsia cespitosa** (Linnaeus) P. Beauvois, Ess. Agrostogr. 91. 1812.

发草 fa cao

*Aira cespitosa* Linnaeus, Sp. Pl. 1: 64. 1753.

Perennial, densely tufted. Culms erect, slender to stout,

30–150 cm tall, 1–3 mm in diam., 1–3-noded. Leaf sheaths loose, glabrous; leaf blades linear, flat or folded, up to 30 cm, 1–5 mm wide, abaxial surface smooth, adaxial surface with coarse sharp ridges, densely scabrid; ligule obtuse to acuminate, 2–7(–12) mm. Panicle usually open, often nodding, infrequently loosely contracted, ovate to narrowly oblong in outline, up to 30 cm or more, greenish or purplish sometimes with golden sheen; branches slender, bearing spikelets on distal part. Spikelets 2.5–7 mm, florets (1–)2(–3), rachilla internode ca. 1 mm; glumes slightly longer to slightly shorter than florets, lower glume slightly shorter than or equaling upper glume, 1-veined, upper glume 3-veined, apex acute; callus hairs ca. 1/3 lemma length; lemmas 2.5–3.5 mm, awned from near base to near middle, rarely awnless, apex broad, toothed or erose; awn straight or slightly bent, slightly shorter to longer than lemma. Anthers 1.2–2 mm. Fl. and fr. Jul–Sep.

Wet meadows, river sand and gravel, among bushes, wet places; 1500–4500 m. Gansu, Heilongjiang, Nei Mongol, Qinghai, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Bhutan, India (Sikkim), Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia, Europe, North America; introduced elsewhere].

*Deschampsia cespitosa* is an extremely polymorphic, widely distributed grass. Many regional and local variants have been accorded separate status, either at specific or infraspecific rank. Variation is complex due to polyploidy and introgression, and morphological and cytological variation often do not coincide. There is extensive overlapping of diagnostic characters leading to a lack of clear boundaries between taxa. Variation is nowadays usually consigned to subspecies, mostly strongly linked to geographic distribution. The main variants reported in China are given below.

The position of the awn on the lemma back refers to the lowest lemma. In general the awn arises higher up on the second lemma, and short awns arise higher on the lemma back than do longer awns. A specimen collected at 2800 m on a grassy spur in Shennongjia, Hubei, has been described as *Deschampsia cespitosa* var. *exaristata* Z. L. Wu (Acta Biol. Plateau Sin. 2: 15. 1984). In this plant the lower lemma has a ca. 0.5 mm awn arising from the upper 1/5, or both lemmas are awnless. It is not possible from the protologue to assign it to a subspecies.

- 1a. Panicle lax and open.
  - 2a. Plant robust, up to 120 cm tall; leaf blades 2–5 mm wide; panicle branches and adaxial leaf surface densely scabrid ..... 3a. subsp. *cespitosa*
  - 2b. Plant slender, up to 70 cm tall; leaf blades 1–2 mm wide, panicle branches and adaxial leaf surface scaberulous or smooth ..... 3b. subsp. *orientalis*
- 1b. Panicle loosely to densely contracted.
  - 3a. Spikelets 4.5–5 mm; glumes obtuse, subequal to adjoining lemmas .... 3c. subsp. *pamirica*
  - 3b. Spikelets 4.5–8 mm; glumes acuminate, much exceeding adjoining lemmas ..... 3d. subsp. *ivanovae*

### 3a. *Deschampsia cespitosa* subsp. *cespitosa*

发草(原亚种) fa cao (yuan ya zhong)

Culms up to 120 cm tall. Leaf blades 2–5 mm wide, adax-

ially densely scabrid. Panicle open, broadly pyramidal, erect, 8–30 cm, silvery green or tinged purple and gold; branches spreading, densely scabrid. Spikelets 4–4.5 mm; glumes equaling or slightly shorter than spikelet, apex acute; lemmas usually awned from near base; awn not or only slightly longer than lemma.

Meadows, river banks, among bushes; 1500–4500 m. Qinghai, Xinjiang, Yunnan [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Uzbekistan; SW Asia, Europe, North America; introduced elsewhere].

This is the most widely distributed subspecies, either native or introduced in most cold-temperate regions of the world.

### 3b. *Deschampsia cespitosa* subsp. *orientalis* Hultén, Kongl. Svenska Vetensk. Acad. Handl., ser. 3, 5: 109. 1927.

小穗发草 xiao sui fa cao

*Aira sukatschewii* Poplavskaja; *Deschampsia cespitosa* var. *festucifolia* Honda; *D. cespitosa* var. *microstachya* Roshevitz; *D. cespitosa* subsp. *sukatschewii* (Poplavskaja) Chiapella & Probatova; *D. orientalis* (Hultén) B. S. Sun; *D. sukatschewii* (Poplavskaja) Roshevitz; *D. sukatschewii* subsp. *orientalis* (Hultén) Tzvelev.

Culms 10–70 cm tall. Leaf blades 1–2 mm wide. Panicle open, 6–18 cm; branches flexuous, smooth or scaberulous. Spikelets 2.5–5 mm; glumes subequaling spikelet; lemmas awned between lower 1/3–1/2; awn usually longer than lemma.

Flood plains, river sand and gravel, wet meadows; below 3800 m. Heilongjiang, Nei Mongol, Qinghai, Taiwan, Xinjiang, Yunnan [Japan, Korea, Mongolia, Russia (Far East, Siberia); North America].

*Deschampsia cespitosa* subsp. *orientalis* is the most common subspecies in E Asia, where it is a vicariant of subsp. *cespitosa*, which is native in Europe and western parts of Asia and introduced in E Asia.

### 3c. *Deschampsia cespitosa* subsp. *pamirica* (Roshevitz) Tzvelev, Zlaki SSSR, 285. 1976.

帕米尔发草 pa mi er fa cao

*Deschampsia pamirica* Roshevitz in Komarov, Fl. URSS 2: 750. 1934.

Culms 30–80 cm tall. Leaf blades 2–3 mm. wide. Panicle contracted but not spikelike, narrowly elliptic or narrowly oblong in outline, erect, 6–15 cm, greenish yellow or gray-green, infrequently tinged violet-brown; branches suberect, smooth, lowest up to 5 cm. Spikelets 4.5–5 mm; glumes slightly shorter than or subequaling adjoining lemmas, apex obtuse, often lacerate; lemmas awned from slightly below middle to lower 1/4, or awnless; awn shorter than lemma. Fl. Jun–Aug.

Swampy, often saline, montane grasslands; 1800–3100 m. Xinjiang [Tajikistan (Pamirs)].

This is a local variant, intermediate between typical *Deschampsia cespitosa*, with an open panicle, and *D. koelerioides*. This subspecies is a taller, stouter plant than *D. koelerioides*, with a paler, less dense panicle, and occurs at somewhat lower altitudes.

### 3d. *Deschampsia cespitosa* subsp. *ivanovae* (Tzvelev) S. M. Phillips & Z. L. Wu, comb. et stat. nov.

短枝发草 duan zhi fa cao

Basionym: *Deschampsia ivanovaee* Tzvelev, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 21: 49. 1961; *D. littoralis* (Gaudin) Reuter var. *ivanovae* (Tzvelev) P. C. Kuo & Z. L. Wu; *D. multiflora* P. C. Kuo & Z. L. Wu.

Culms 30–70 cm. Leaf blades 1–3 mm wide. Panicle usually loosely contracted, often nodding, 5–15 cm, purplish brown tinged golden; branches flexuous, smooth or scaberulous, lowest up to 7 cm. Spikelets 4.5–8 mm; glumes much longer than adjoining lemmas, apex acuminate; lemmas awned from near base or near middle; awn not or only slightly longer than lemma. Fl. and fr. Jul–Sep.

## 81. HOLCUS Linnaeus, Sp. Pl. 2: 1047. 1753, nom. cons.

绒毛草属 rong mao cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

*Sorgum* Adanson (1763), not *Sorghum* Moench (1794).

Annuals or perennials. Leaf blades flat. Inflorescence a moderately to densely contracted panicle. Spikelets laterally compressed, disarticulating below glumes, florets 2, lower floret bisexual, upper floret staminate; rachilla usually curved and hooked below bisexual floret, often shortly extended above staminate floret; glumes subequal, papery, enclosing florets, strongly keeled, lower glume 1-veined, upper glume 3-veined; lemmas cartilaginous, shiny, rounded on back, veins indistinct, apex obtuse or 2-toothed, upper lemma or both awned; awn arising from upper 1/3 of lemma back, geniculate, hooked or straight; palea slightly shorter than lemma, membranous.

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

### 1. *Holcus lanatus* Linnaeus, Sp. Pl. 2: 1048. 1753.

绒毛草 rong mao cao

*Avena lanata* (Linnaeus) Koeler; *Notholcus lanatus* (Linnaeus) Nash ex Hitchcock.

Perennial, softly hairy. Culms tufted, erect or geniculate at base, 30–80 cm tall, pubescent, 4–5-noded. Leaf sheaths loose, tomentose with reflexed hairs; leaf blades flat, 6–18 cm, 3–9 mm wide, soft, both surfaces pubescent, apex acute; ligule 2–3 mm, truncate or toothed. Panicle lanceolate to oblong or ovate in outline, rather loose to very dense, 3–12 cm; branches narrowly ascending, pubescent. Spikelets oblong or gaping, 3.5–6

mm, pale grayish green or purplish; glumes lanceolate, keel and veins hispidulous, surface scabrid or puberulent to villous, lower glume apex acute, upper glume wider and sometimes slightly longer than lower glume, apex mucronate; florets subequal, 2–2.5 mm; rachilla ca. 0.5 mm; lower lemma awnless, anthers 1.8–2 mm; upper lemma with hooked 1–2 mm awn, anthers ca. 1.5 mm. Fl. and fr. May–Oct.

Open ground, meadows, moist places; an adventive occasionally cultivated as a meadow grass. Jiangxi, Taiwan, Yunnan [native to Europe].

This European grass is now introduced as a weed in most temperate parts of the world.

## 82. AIRA Linnaeus, Sp. Pl. 1: 63. 1753.

银须草属 yin xu cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annuals, small. Leaf blades rolled. Inflorescence an open or contracted panicle. Spikelets small, laterally compressed, florets 2, both alike, bisexual, separated by very short internode, disarticulating below each floret; rachilla not extended beyond upper floret; glumes persistent, equal, enclosing florets, ovate, membranous, shining, 1(–3)-veined, apex acute; floret callus small, usually shortly bearded laterally, rarely glabrous; lemmas ovate, rounded on back, membranous becoming firm at maturity, indistinctly 5-veined, glabrous, upper part scaberulous to scabrid, awned from lower back or lower floret awnless, apex 2-toothed; awn geniculate with twisted column; palea slightly shorter than lemma. Anthers small. Caryopsis fusiform.  $2n = 14, 28$ .

Eight species: centered on the Mediterranean region, extending northward to Scandinavia and eastward to Iran and Afghanistan; introduced in other temperate regions; one species in China.

### 1. *Aira caryophyllea* Linnaeus, Sp. Pl. 1: 66. 1753.

银须草 yin xu cao

Culms solitary or tufted, erect or slightly geniculate, very slender, 5–30 cm tall, scabrid. Leaf sheaths scaberulous; leaf

blades narrowly linear to filiform, 1–5 cm, 2–3 mm wide; ligule lanceolate, 1–4 mm, acute becoming lacerate. Panicle open, ovate in outline, up to 10 cm; branches 2–5 cm, capillary, scabrid, bearing spikelets in clusters toward tips; pedicels 2–4 mm, up to twice spikelet length, a pear-shaped swelling below spike-

let. Spikelets ovate-oblong in outline, 2–3.5 mm, shining, silvery-gray or tinged purplish; glumes as long as spikelet, keel scaberulous; florets both awned; lemmas brown, 3/4 length of glumes, scabrid, narrowed to 2-toothed apex; awn 2.5–4 mm, arising from lower 1/3 of lemma. Anthers 0.3–0.6 mm.

Dry grassy places in mountains; ca. 3600 m. W Xizang [India, Russia; N Africa, SW Asia, Europe; introduced in North and South America and Australia].

This pioneer of dry, open places is now widespread in temperate regions.

### 83. PHALARIS Linnaeus, Sp. Pl. 1: 54. 1753.

𬟁草属 ge cao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

Annual or perennial, tufted or rhizomatous. Leaf blades linear, flat; ligule membranous. Inflorescence a contracted or spikelike panicle. Spikelets strongly laterally compressed, florets 3 with lower 2 usually reduced to sterile lemmas and uppermost floret bisexual, disarticulating above glumes, rachilla not or very rarely extended beyond uppermost floret; glumes subequal, boat-shaped, as long as spikelet and enclosing florets, herbaceous, prominently 3-veined, strongly keeled and often winged along midvein; sterile lemmas up to 1/2 as long as fertile lemma, narrow, often hairy, or one or both reduced to a vestigial fleshy scale at base of fertile floret; fertile floret shorter than glumes, leathery often becoming cartilaginous and shiny, rounded on back, obscurely 5-veined, awnless; palea resembling lemma, 2-veined. Caryopsis tightly enclosed by lemma and palea; embryo small; hilum linear.  $x = 7$ .

Eighteen species: mainly in the Mediterranean region and warm-temperate parts of the New World, one species circumboreal; several species widely distributed as adventives; five species (four introduced) in China.

- 1a. Spikelets falling in clusters of 7, a single fertile spikelet encircled by 6 reduced sterile spikelets ..... 5. *P. paradoxa*
- 1b. Spikelets all alike, not in clusters, disarticulating above the persistent glumes.
  - 2a. Glumes not or very narrowly winged; perennial with spreading rhizomes ..... 1. *P. arundinacea*
  - 2b. Glumes winged; annual or tufted perennial.
    - 3a. Perennial, culm bases often bulbously thickened ..... 2. *P. aquatica*
    - 3b. Annuals, culm bases not thickened.
      - 4a. Sterile lemmas 2, equal; anthers ca. 3 mm ..... 3. *P. canariensis*
      - 4b. Sterile lemma 1; anthers 1.5–1.8 mm ..... 4. *P. minor*

#### 1. Phalaris arundinacea Linnaeus, Sp. Pl. 1: 55. 1753.

𬟁草 ge cao

*Typhoides arundinacea* (Linnaeus) Moench.

Perennial, rhizomatous; rhizomes extensively spreading. Culms reedlike, erect, leafy, 0.6–1.5 m tall, 6–8-noded. Leaf sheaths glabrous, not inflated; leaf blades 10–35 cm × 10–18 mm, tapering to a fine apex; ligule 2–3 mm. Panicle contracted, linear-oblong in outline, lobed, interrupted, 8–15 cm; branches short, erect, densely spiculate. Spikelets oblong, laterally compressed, 4–6 mm; glumes narrowly lanceolate, glabrous or puberulous, pale green streaked darker green or purplish, keel scabrid, wingless or very narrowly winged upward, apex sharply acute; sterile lemmas equal, subulate, 1.5–1.8 mm, villous; fertile lemma broadly lanceolate, 3–4 mm, appressed-pubescent upward, shiny; palea boat-shaped, keels ciliolate. Anthers 2.5–3 mm. Fl. and fr. Jun–Aug.  $2n = 28$ .

Marshy grassland, river and lake margins, forming colonies; 100–3200 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang (Lin'an) [widely distributed in temperate parts of the N hemisphere].

An ornamental form of this species with green- and cream-striped leaf blades, *Phalaris arundinacea* var. *picta* Linnaeus (丝带草 si dai cao), is sometimes cultivated in gardens.

#### 2. Phalaris aquatica Linnaeus, Cent. Pl. 1: 4. 1755.

水𬟁草 shui ge cao

Perennial, tufted. Culms 50–150 cm tall, often bulbously thickened at base. Uppermost leaf sheaths not inflated; leaf blades 3–8 mm wide; ligule 3–7 mm. Panicle spikelike, cylindrical, 1.5–11 cm, sometimes lobed at base. Spikelets elliptic-oblong; glumes 5–7 mm, winged, wing margin entire, apex acute; sterile lemma 1(–2), subulate, 0.2–2.2 mm, pubescent, second lemma (when present) up to 0.5 mm; fertile lemma lanceolate, 3–4.6 mm, densely pubescent. Anthers 3–3.5 mm.  $2n = 28$ .

Introduced for grazing; Yunnan [Pakistan (introduced); N Africa, SW Asia, S Europe].

This species is widely cultivated as a pasture and forage grass in many parts of the world. It is best suited to upland areas with high rainfall.

#### 3. Phalaris canariensis Linnaeus, Sp. Pl. 1: 54. 1753.

加那利𬟁草 jia na li ge cao

Annual, loosely tufted. Culms 30–60(–100) cm tall. Uppermost leaf sheaths inflated with short blade; leaf blades 3–10 mm wide; ligule 3–5 mm. Panicle spikelike, very dense, ovate to oblong-ovate in outline, 1.5–4 cm. Spikelets obovate, strongly flattened, 7–10 mm; glumes oblanceolate, glabrous or puberulent, whitish with green veins, keel broadly winged above middle, wing margin entire, apex acute; sterile lemmas 2, equal, narrowly elliptic, chaffy, 2.5–4 mm, appressed-pilose; fertile

lemma lanceolate, 5–6 mm, densely appressed-pubescent, shiny. Anthers 3–4 mm. Fl. and fr. Oct.

Roadsides and other disturbed places, introduced; below 3000 m. Hebei, Shanghai, Taiwan [W Mediterranean region, SW Asia (Caucasus)].

This species is widely cultivated for bird seed (Canary Grass) and is adventive in most warm-temperate countries.

**4. Phalaris minor** Retzius, Observ. Bot. 3: 8. 1783.

细薅草 xi ge cao

Annual, tufted. Culms 20–100 cm tall. Uppermost leaf sheaths not inflated; leaf blades 3–9 mm wide; ligule 4–6 mm. Panicle dense, ovate to oblong, 1–6 cm. Spikelets elliptic, 4.5–5.5 mm; glumes winged on upper part of keel, wing margin erose-denticulate; sterile lemma 1, ca. 1 mm, appressed-pilose; fertile lemma lanceolate-ovate, 2.7–4 mm, pubescent, becoming cartilaginous and shiny. Anthers 1.5–1.8 mm.  $2n = 28$ .

Wheat fields, introduced. Yunnan [Bhutan, N India, Pakistan; N Africa, SW Asia, S Europe].

This annual weed, native in the Mediterranean region, is now widely distributed in many parts of the world. It was introduced to

China accidentally in wheat seed imported from Mexico about 1974 and is becoming naturalized in parts of Yunnan.

**5. Phalaris paradoxa** Linnaeus, Sp. Pl., ed. 2, 2: 1665. 1763.

奇薅草 qi ge cao

Annual, tufted. Culms 15–100 cm tall. Uppermost leaf sheath inflated; leaf blades 2–9 mm wide; ligule 2–8 mm. Panicle dense, narrowly oblong, 4–10 cm, base enclosed in uppermost leaf sheath. Spikelets arranged in clusters composed of 1 fertile spikelet encircled by 6 sterile spikelets, clusters falling entire, sterile spikelets sometimes reduced to club-shaped clusters of glumes. Fertile spikelet: glumes 4.5–6 mm, prominently 7–9-veined, narrowly winged, wing expanded near middle into large tooth, pale green or straw-colored with dark green stripe above tooth, apex attenuate; sterile lemmas abortive, represented by 2 minute fleshy scales at base of fertile lemma; fertile lemma elliptic, 2.8–3.2 mm, cartilaginous, shiny, sparsely pilose toward apex. Anthers 1–1.8 mm.  $2n = 14$ .

Wheat fields, introduced. Yunnan [N Africa, SW Asia, S Europe].

Like the previous species, this widespread, annual weed was introduced to China accidentally in wheat seed imported from Mexico about 1974.

## 84. ANTHOXANTHUM Linnaeus, Sp. Pl. 1: 28. 1753.

黄花茅属 huang hua mao shu

Wu Zhenlan (吴珍兰); Sylvia M. Phillips

*Hierochloë* R. Brown.

Perennial, fragrant herbs. Inflorescence an open or contracted panicle. Spikelets lanceolate to plumply elliptic or oblong, weakly laterally compressed, florets 3, brown, lower 2 florets staminate or sterile, terminal floret bisexual; rachilla disarticulating above glumes but not between florets. Glumes persistent, unequal to subequal, lanceolate to ovate, lower glume shorter, 1(–3)-veined, upper glume 3(–5)-veined, about as long as spikelet, apex acute. Lower 2 florets subequal, with a palea and 3 stamens, or sterile and epaleate, or a combination of both; lemmas equal to or shorter than upper glume, firmly membranous to leathery, often brown-pilose on back and ciliate along margins, apex emarginate to deeply 2-lobed, awnless, with a short straight awn from above middle, or geniculately awned from near base. Bisexual floret equaling or shorter than 2 lower florets; lemma cartilaginous, glossy, 3–5-veined, margins convolute and covering palea, apex awnless, rarely mucronate; palea 1–3-veined, without keels; lodicules absent or 2; stamens 2; stigmas plumose.  $x = 5, 7$ .

About 50 species: temperate and cold regions of both hemispheres, also on tropical mountains; ten species (three endemic) in China.

All species are scented with coumarin ( $C_9H_6O_2$ ), and some are used medicinally for their coumarin content.

*Hierochloë* has traditionally been recognized on the basis of the two lower florets being staminate, paleate, and awnless or only shortly awned, in contrast to the sterile, epaleate, geniculately awned lower florets in typical *Anthoxanthum*. Lodicules are also absent in typical *Anthoxanthum*. However, it is now known that a considerable number of species is intermediate in these characters, including some in China, and also some (e.g., *A. hookeri*) where the sex of the lower florets is variable within the species. There is no justification for continuing to recognize two separate genera. The species are all clearly related by their unusual spikelet structure and by the presence of coumarin.

- 1a. Lemma of both lower florets awnless or mucronate.
  - 2a. Spikelets 3.5–6 mm; lower florets slightly shorter than glumes; plants up to 60 cm tall; panicle 4–10 cm ..... 1. *A. nitens*
  - 2b. Spikelets 2.5–4 mm; lower florets equal to or longer than glumes; plants up to 30 cm tall; panicle 3–6 cm ..... 2. *A. glabrum*
- 1b. Lemma of both lower florets awned, or at least lemma of second floret.
  - 3a. Lower florets both staminate, with a palea and stamens, or second floret sterile.
    - 4a. Culms 50–120 cm tall; leaf blades 6–15 mm wide; panicle 10–22 cm; 2 lower lemmas scabrid ..... 3. *A. potaninii*
    - 4b. Culms 10–50 cm tall; leaf blades 2–8(–10) mm wide; panicle 1.5–10 cm; 2 lower lemmas pubescent.
  - 5a. Panicle 1.5–5 cm; awn of second lemma arising near middle, 3–7 mm, straight or weakly geniculate; bisexual floret hairy toward apex.
    - 6a. Lemma of second floret with straight ca. 3 mm awn ..... 4. *A. tibeticum*
    - 6b. Lemma of second floret with weakly geniculate 4–7 mm awn ..... 5. *A. monticola*

- 5b. Panicle 6–10 cm; awn of second lemma arising near base, 6–11 mm, clearly geniculate; bisexual floret glabrous ..... 6. *A. hookeri*
- 3b. Lower florets both sterile, without a palea or stamens.
- 7a. Spikelets ca. 3 mm, obovate ..... 7. *A. pallidum*
- 7b. Spikelets more than 3 mm, lanceolate to oblong.
- 8a. Leaf blades up to 3 mm wide; spikelets 3–5 mm; glumes ovate ..... 8. *A. sikkimense*
- 8b. Leaf blades up to 7 mm wide; spikelets 4.3–9 mm; glumes lanceolate.
- 9a. Spikelets 4.3–5.5 mm; lower glume 3/4 length of the upper glume; sterile lemmas ca. 4/5 length of spikelet ..... 9. *A. horsfieldii*
- 9b. Spikelets 6–9 mm; lower glume 1/2 length of upper glume; sterile lemmas 1/2–2/3 length of spikelet ..... 10. *A. odoratum*

**1. Anthoxanthum nitens** (Weber) Y. Schouten & Veldkamp, Blumea 30: 348. 1985.

茅香 mao xiang

*Poa nitens* Weber, Prim. Fl. Holsat., Suppl. 2, no. 6. 1787; *Hierochloë bungeana* Trinius; *H. glabra* Trinius subsp. *bungeana* (Trinius) Peschkova; *H. odorata* (Linnaeus) P. Beauvois; *H. odorata* f. *pubescens* Krylov; *H. odorata* subsp. *pubescens* (Krylov) H. Hara ex T. Koyama; *Holcus odoratus* Linnaeus.

Plant with slender creeping rhizomes. Culms 20–60 cm tall, 3–4-noded. Leaf sheaths glabrous or ± pubescent, longer than internodes; basal leaf blades up to 30 cm, 3–10 mm wide, culm leaves much shorter, glabrous or adaxial surface puberulous, margins scabrid, apex acuminate; ligule 2–5 mm, obtuse. Panicle pyramidal, loose, 4–10 cm; branches spreading, smooth, bare in lower half. Spikelets plumply elliptic, 3.5–6 mm, light brown, shining; glumes subequal, as long as spikelet, 1–3-veined; callus of staminate florets stiffly hairy (or glabrous in E Asia); lower florets staminate, lemmas slightly shorter than glumes, puberulous on back above middle, margins shortly ciliate, apex acute or minutely mucronate; bisexual floret ca. 3.5 mm, appressed-pubescent toward apex; palea 1-veined; anthers ca. 2.5 mm. Fl. and fr. Jun–Sep.

Mountain slopes, floodplains, wet grasslands; 500–3800 m. Gansu, Guizhou, Hebei, Heilongjiang, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Afghanistan, Japan, Korea, Kyrgyzstan, Mongolia, Russia; SW Asia (Caucasus), Europe, North America].

Over much of the range of this species, the callus of the staminate florets bears a circlet of short, stiff bristles. However, forms from E Asia with a glabrous callus like that of *Anthoxanthum glabrum* and the panicle and spikelet characters of *A. nitens* are difficult to place and have been assigned to both species at infraspecific rank. The names *Hierochloë bungeana* and *H. odoratum* subsp. *pubescens* belong here.

Unfortunately, the epithet “*odorata*,” by which this widespread species has long been known in *Hierochloë*, cannot be used in *Anthoxanthum* because the heterotypic name *A. odoratum* Linnaeus already exists.

*Anthoxanthum nitens* is used for medicine, weaving, and soil retention.

**2. Anthoxanthum glabrum** (Trinius) Veldkamp, Blumea 30: 347. 1985.

光稃香草 guang fu xiang cao

*Hierochloë glabra* Trinius in Sprengel, Neue Entdeck.

Pflanzenk. 2: 66. 1821; *H. odorata* (Linnaeus) P. Beauvois subsp. *glabra* (Trinius) Tzvelev.

Plant with slender creeping rhizomes. Culms 10–30 cm tall, 2- or 3-noded. Leaf sheaths pubescent with reflexed hairs, longer than internodes; basal leaf blades 2–5 cm × ca. 3 mm, culm leaves much shorter, glabrous or adaxial surface puberulous, apex acuminate; ligule 2–5 mm, obtuse. Panicle ovate or oblong in outline, 3–6 cm; branches spreading or ascending, smooth. Spikelets plumply elliptic, 2.5–4(–4.5) mm, yellowish brown, shining; glumes subequal, slightly shorter than spikelet, 1–3-veined; callus of staminate florets glabrous; lower florets staminate, lemmas equal to or longer than glumes, subglabrous or minutely puberulous on back near apex, margins ciliate, apex obtuse or emarginate and mucronate, mucro up to 0.5 mm; bisexual floret 2–2.5 mm, pubescent toward apex; palea 1-veined; anthers 1.7–2 mm. Fl. and fr. Jun–Sep.

Mountain slopes in wet grassy places; 500–3300 m. Anhui, Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Xinjiang, Yunnan, Zhejiang (Lin'an) [Kazakhstan, Mongolia, Russia].

This species is very close to *Anthoxanthum nitens* and is not clearly separable from the Asian forms of that species that have a glabrous callus. There is a tendency in *A. glabrum* to smaller panicles and spikelets and relatively shorter glumes, thereby imparting a slightly different habit.

**3. Anthoxanthum potaninii** (Tzvelev) S. M. Phillips & Z. L. Wu, Novon 15: 476. 2005.

松序茅香草 song xu mao xiang cao

*Hierochloë potaninii* Tzvelev, Rast. Tsentr. Azii 4: 35. 1968.

Plant loosely tufted, shortly rhizomatous, brown scales at base. Culms 50–120 cm tall, 4-noded, nodes black-brown. Leaf sheaths glabrous, smooth or scaberulous, shorter than internodes below and longer above; leaf blades broadly linear, 15–25 cm, 6–15 mm wide, both surfaces scabrid; ligule up to 1 cm, lanceolate. Panicle fairly loose, 10–22 × 2–6 cm; branches smooth. Spikelets 3.5–6 mm; glumes unequal, lower glume about half spikelet length, 1-veined, upper glume a little shorter than spikelet, 3-veined; lower florets staminate, lemmas ca. 5 mm, scabrid on back, margins ciliate, apex emarginate; first lemma awnless or mucronate; second lemma with subapical awn up to 4 mm; bisexual floret similar to staminate but smooth on back, scabrid near apex; palea 1(–2)-veined; anthers 2–3.5 mm. Fl. Jun.

• Grassy places in mountain valleys, forest margins and among shrubs; 2500–3000 m. S Gansu, W Sichuan.

*Anthoxanthum laxum* (R. Brown ex J. D. Hooker) Veldkamp (*Hierochloë laxa* R. Brown ex J. D. Hooker) has been confused with this species. *Anthoxanthum laxum* occurs on high-mountain ledges and in alpine pastures above 3000 m in E Afghanistan, Kashmir, Nepal, and N Pakistan. It can be distinguished by its smooth leaf blades, subequal glumes, and pilose or hirsute apex of the bisexual floret.

**4. Anthoxanthum tibeticum** (Bor) Veldkamp, Blumea 30: 350. 1985.

藏茅香 zang mao xiang

*Hierochloë tibetica* Bor, Kew Bull. [8] 1953: 271. 1953.

Plants with slender creeping rhizomes. Culms 20–35 cm tall, 2-noded. Leaf sheaths smooth, glabrous; leaf blades flat or involute, basal 2–5 cm, 2–3 mm wide, culm blades shorter and broader, both surfaces smooth and glabrous, margins scabrid; ligule 2–2.5 mm. Panicle loose or contracted, 2.5–5 × 1–3 cm, with ca. 10 spikelets; branches capillary, smooth, flexuous, pubescent. Spikelets obovate, 5–6 mm, purplish; glumes subequal, as long as spikelet, broadly ovate-oblong, 3-veined, apex hyaline, otherwise purple, back glabrous or a few scattered hairs; lower florets staminate, lemmas densely pubescent; first lemma bilobed, awnless; second lemma 2-cleft to about middle, shortawned from sinus, awn straight, 2–3 mm; bisexual floret ca. 2.5 mm, pubescent above middle; palea 2-veined; anthers 1.2–1.5 mm.

- Exposed mountain ridges and slopes; ca. 5000 m. Xizang.

**5. Anthoxanthum monticola** (Bigelow) Veldkamp, Blumea 30: 347. 1985.

高山茅香 gao shan mao xiang

*Holcus monticola* Bigelow, New England J. Med. Surg. 5: 334. 1816; *Hierochloë alpina* (Swartz ex Willdenow) Roemer & Schultes; *H. monticola* (Bigelow) Å. Löve & D. Löve; *Holcus alpinus* Swartz ex Willdenow.

Plant forming loose mats, shortly rhizomatous, base clothed in papery old sheaths. Culms solitary or few, erect, 10–40 cm tall, 2–3-noded. Leaf sheaths smooth, glabrous, longer than internodes, upper slightly inflated; leaf blades glossy, basal inrolled, 20–30 cm, 2–3 mm wide, culm blades shorter, flat; ligule 1–2 mm. Panicle contracted, oblong or ovate in outline, 1.5–4 × 1–2 cm; branches short, paired. Spikelets broadly oblong, 5–6 mm; glumes subequal, as long as spikelet; lower 1–3-veined, upper 3–5-veined; lower florets staminate, lemmas scabrid-pubescent on back, hispid toward apex, margins ciliate; first lemma emarginate with 1–3 mm, straight subapical awn; second lemma 2-cleft to middle or below, awned from sinus, awn weakly geniculate, 4–7 mm; bisexual floret ca. 4 mm, pilose toward apex; palea 1-veined, ciliolate along upper part of vein; anthers ca. 2.5 mm. Fl. and fr. Jul–Aug. 2n = 56 (also 58, 63, 64, 66, 68, 71, 72, 74–78).

Alpine steppe; ca. 2300 m. NE China [Japan, Korea, Mongolia, Russia; N Europe, North America].

This is an arctic-alpine species of both the Old and New Worlds.

The specific epithet of *Holcus alpinus* cannot be used when this name is transferred to *Anthoxanthum* because the heterotypic name *A. alpinum* Å. Löve & D. Löve already exists.

**6. Anthoxanthum hookeri** (Grisebach) Rendle, J. Linn. Soc., Bot. 36: 380. 1904.

藏黄花茅 zang huang hua mao

*Ataxia hookeri* Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 77. 1868; *Anthoxanthum elongatum* (Handel-Mazzetti) Veldkamp; *A. latifolium* B. S. Sun & S. Wang; *A. latifolium* var. *purpurascens* B. S. Sun & S. Wang; *Hierochloë elongata* Handel-Mazzetti; *H. hookeri* (Grisebach) Maximowicz.

Plant loosely tufted, shortly rhizomatous. Culms 20–50 cm tall, 3–4-noded. Leaf sheaths glabrous or puberulous; leaf blades linear or broadly linear, 5–25 cm, 3–8 mm wide, pubescent or abaxial surface glabrous, apex acuminate; ligule 1.5–5 mm, truncate-lacerate. Panicle rather loose or contracted, lanceolate or lanceolate-oblong in outline, 6–10 cm. Spikelets lanceolate-oblong, 5.5–8 mm, green when young, maturing purplish brown; glumes unequal, lanceolate, lower glume 3–5(–6) mm, 1(–3)-veined, upper glume equal to spikelet, 3(–5)-veined; lower florets pubescent on back, apex 2-lobed, lobes acute; first floret usually staminate with palea (rarely stamens abortive), lemma 5–6 mm, lobed in upper 1/3, awned from sinus, awn fine, straight, 1–4 mm; second floret often sterile and epaleate (but sometimes staminate with palea), lemma awned from lower 1/4, apical lobes short or back splitting to awn insertion, awn geniculate, 6–11 mm; bisexual floret 2.5–3.2 mm, smooth, shiny, (3–)5-veined; palea veinless; anthers 2.5–3.5 mm. Fl. and fr. May–Dec.

Open grassy mountainsides, dry rocky ridges, forests; 2100–4000 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, NE India, N Myanmar, Nepal].

The sexuality of the 2 lower florets is very variable in this species. *Anthoxanthum latifolium* is based on a particularly broad-leaved form from Yunnan.

**7. Anthoxanthum pallidum** (Handel-Mazzetti) Tzvelev, Rast. Tsentr. Azii 4: 35. 1968.

淡色黄花茅 dan se huang hua mao

*Hierochloë pallida* Handel-Mazzetti, Akad. Wiss. Wien, Math.-Naturiss. Kl., Anz. 57: 273. 1920.

Culms geniculate at base, shortly stoloniferous, 7–16 cm tall. Leaf sheaths glabrous; leaf blades flat, lanceolate, 5–12 cm, 2–4 mm wide; ligule 1–2.5 mm. Panicle contracted, 2.5–4 × 0.4–0.5 cm; branches single or in pairs; pedicels very short, setulose-pilose. Spikelets obovate, ca. 3 mm; glumes subequal, ovate, pale with green keel, 3-veined, sparsely setose, apex acute; lower florets as long as glumes, sterile, composed only of lemmas, densely appressed-pilose on back, apex 2-lobed; first lemma with awn arising from middle, awn straight, equaling lemma body; second lemma deeply bifid, awned from sinus, awn straight; bisexual floret less than 1/2 length of glumes, smooth, shiny; anthers ca. 3 mm. Fl. and fr. spring to summer.

- Mountain slopes, damp meadows, ca. 2700 m. Sichuan, NE Yunnan.

**8. Anthoxanthum sikkimense** (Maximowicz) Ohwi, Bull. Tokyo Sci. Mus. 18: 8. 1947.

锡金黄花茅 xi jin huang hua mao

*Hierochloë sikkimensis* Maximowicz, Bull. Acad. Imp. Sci. Saint-Pétersbourg 32: 626. 1888; *Anthoxanthum gracillimum* (J. D. Hooker) Mez; *Hierochloë gracillima* J. D. Hooker.

Plant probably shortly rhizomatous. Culms solitary or few, very slender, 30–45 cm, 2–3-noded. Leaf blades narrowly linear, often involute when dry, 5–17 cm, ca. 0.3 mm wide; ligule 2–4 mm, truncate-erose. Panicle contracted, linear-oblong in outline, 3.8–5 cm; branches very short, with few spikelets. Spikelets oblong-ovate, 3–5 mm, yellow or purplish; glumes unequal, lower glume ovate, ca. 3 mm, upper glume oblong-ovate, as long as spikelet; lower florets sterile, composed only of lemmas, pilose on back, apex 2-lobed, lobes truncate-ciliolate; first lemma 3–3.8 mm, lobed in upper 1/3, awned from sinus, awn straight, 1.7–1.8 mm; second lemma 3.9–4 mm, awned from lower 1/4, awn geniculate, 6–6.7 mm; fertile floret ca. 2.3 mm, smooth, shiny; palea 1-veined.

Grassy mountainsides, among bushes; 2000–2500 m. Yunnan (Kunming, Chengjiang) [India (Sikkim), Nepal].

**9. Anthoxanthum horsfieldii** (Kunth ex Bennett) Mez ex Reeder, J. Arnold Arbor. 24: 327. 1950.

台湾黄花茅 tai wan huang hua mao

*Ataxia horsfieldii* Kunth ex Bennett, Pl. Jav. Rar. 8. 1838; *Anthoxanthum formosanum* Honda; *A. horsfieldii* var. *formosanum* (Honda) Veldkamp; *A. horsfieldii* var. *viridescens* (Honda) Veldkamp; *A. japonicum* (Maximowicz) Hackel ex Matsumura subsp. *luzoniense* (Merrill) T. Koyama; *A. luzoniense* Merrill; *A. viridescens* Honda; *Hierochloë horsfieldii* (Kunth ex Bennett) Maximowicz.

Plant loosely tufted, shortly rhizomatous. Culms 10–60 cm tall, 3–5-noded. Leaf sheaths glabrous or sparsely pilose; leaf blades loosely involute, 6–13 cm, 2–5 mm wide, glabrous or adaxial surface pubescent; ligule 2–4 mm, truncate. Panicle narrow, contracted, 2.5–7 cm; branches up to 5 cm; pedicels pubescent. Spikelets lanceolate-oblong, 4.3–5.5 mm; glumes unequal, glabrous, lower glume 2/3 to 3/4 length of upper glume, 1-veined, upper glume as long as spikelet, 3-veined; lower florets sterile, composed only of lemmas, ca. 4 mm, pilose on back, apex 2-lobed, lobes obtuse; first lemma awned from above middle, awn straight, 0.8–1.5 mm; second lemma awned from lower 1/4–1/3, awn geniculate, 4.5–6 mm; bisexual floret 2.5–3 mm, smooth, shiny; anthers 1.5–2 mm. Fl. Oct.

Mountains, grassy places, in sun or shade; 2500–3300 m. Guizhou, Taiwan [India, Japan, Malaysia, New Guinea, Philippines, Thailand].

*Anthoxanthum horsfieldii* is a variable species of mountains in SE Asia, extending into India. There are small differences between the populations from different islands or mountain areas, and these populations are sometimes recognized at varietal rank. However, this approach has led to a proliferation of varieties based on overlapping, only partially segregating characters and is not followed here.

Both lower florets appear to be sterile and epaleate in Taiwan, but in SE Asia the first floret may sometimes be staminate with a palea.

*Anthoxanthum horsfieldii* is in fact very close to *A. hookeri* from the Himalayas, which differs in little more than its rather looser panicle and acute lemma lobes.

**10. Anthoxanthum odoratum** Linnaeus, Sp. Pl. 1: 28. 1753.

黄花茅 huang hua mao

Plant loosely tufted, sometimes rhizomatous. Culms 15–60(–100) cm tall, 1–3-noded. Leaf sheaths glabrous or loosely pilose, mouth glabrous or bearded; leaf blades flat, up to 12 cm, 2–7 mm wide, glabrous or loosely pilose, smooth or scabrid, apex acuminate; ligule 1–3 mm, obtuse. Panicle dense, spike-like, lanceolate to narrowly oblong in outline, 2–7(–10) × 0.4–1 cm; branches short; pedicels pubescent or glabrous. Spikelets lanceolate, 6–9 mm; glumes unequal, pubescent or punctiform-scabrid, margins sometimes ciliate, lower glume ca. 1/2 length of upper glume, 1-veined, upper glume subequal to spikelet, 3-veined; lower florets sterile, composed only of lemmas, 2.5–3.5 mm, pilose on back, apex 2-lobed, lobes short, obtuse; first lemma awned from near middle, awn straight, 2–4 mm; second lemma awned near base, awn geniculate, 7–9 mm; bisexual floret 2–3 mm, smooth, shiny; palea 1-veined; anthers 3–4.5 mm. Fl. and fr. May–Aug.

Meadows, alpine steppe; 1400–2900 m. Jiangxi, Taiwan (introduced), Xinjiang, NE China [Japan, Korea, Mongolia, Russia; Europe].

1a. Pedicels and glumes pubescent ..... 10a. subsp. *odoratum*  
1b. Pedicels and glumes glabrous ..... 10b. subsp. *alpinum*

**10a. Anthoxanthum odoratum** subsp. ***odoratum***

黄花茅(原亚种) huang hua mao (yuan ya zhong)

Leaf blades hairy or glabrous. Panicle up to 7(–10) cm; pedicels pubescent. Spikelets with pubescent glumes.  $2n = 20$ .

Meadows, introduced. Jiangxi (Lu Shan), Taiwan [Russia; Europe].

This is a polymorphic grass, introduced in grass seed or adventive in many temperate countries.

**10b. Anthoxanthum odoratum** subsp. ***alpinum*** (Á. Löve & D. Löve) Tzvelev, Zlaki SSSR, 354. 1976.

日本黄花茅 ri ben huang hua mao

*Anthoxanthum alpinum* Á. Löve & D. Löve, Rep. Univ. Inst. Appl. Sci., Reykjavik, Dept. Agric., Ser. B 3: 105. 1948; *A. nipponicum* Honda; *A. nipponicum* var. *furumii* Honda; *A. odoratum* var. *alpinum* (Á. Löve & D. Löve) Uechtritz; *A. odoratum* subsp. *furumii* (Honda) Koyama; *A. odoratum* subsp. *nipponicum* (Honda) Tzvelev; *A. odoratum* var. *nipponicum* (Honda) Tzvelev.

Leaf blades always glabrous. Panicle 2–3 cm; pedicels glabrous. Spikelets with glabrous glumes. Fl. and fr. Jun–Aug.  $2n = 10$ .

Alpine bush and steppe; 1400–2900 m. Xinjiang, NE China [Japan, Korea, Russia; Europe].

Diploid variants of *Anthoxanthum odoratum* occur mainly in the arctic and on mountains. They tend to be glabrous, but cannot be reliably separated from the widespread, tetraploid form on the basis of morphological characters.

## 85. COLEANTHUS Seidel in Roemer & Schultes, Syst. Veg. 2: 11. 1817, nom. cons.

莎禾属 suo he shu

Chen Shouliang (陈守良); Sylvia M. Phillips

Dwarf ephemeral. Leaf blades broadly linear, flat or folded, falcate. Inflorescence a sparsely branched panicle, spikelets arranged in distant, compact, umbellate clusters, base enclosed in inflated, funnel-like uppermost leaf sheath. Spikelets laterally compressed, floret 1, rachilla extension absent; glumes absent; lemma ovate, hyaline, 1-veined, keeled, apex extended into a subulate cusplike awn; palea variable in size, frequently about 2/3 lemma length, broad, 2-toothed, keels extended into mucros. Lodicules absent. Stamens 2. Caryopsis elliptic-oblong, protruding from floret and shed from it at maturity; hilum oval.

One species: C and N Europe to NE Asia; probably introduced in North America.

This is a widely distributed, but rather rare little grass, occurring sporadically in scattered localities.

**1. Coleanthus subtilis** (Trattinnick) Seidel in Roemer & Schultes, Syst. Veg. 2: 276. 1817.

莎禾 suo he

*Schmidtia subtilis* Trattinnick, Fl. Österr. Kaiserth. 1: 12. 1816; *Wilibalda subtilis* (Trattinnick) Roth; *Zizania subtilis* (Trattinnick) Raspail.

Culms spreading, forming small mat, branching at lower nodes, ascending up to 5(–10) cm. Leaf sheaths inflated; leaf

blades ca. 1 cm × 1–4 mm, smooth, glabrous; ligule 0.5–3 mm. Panicle 0.5–3 cm; pedicels verticillate, 1–2 mm, setulose. Spikelets lanceolate; lemma 0.8–1.3 mm, vein scabrid; awn ca. 1 mm; palea 0.5–1 mm, keels scabrid or almost smooth. Anthers 0.3–0.4 mm. Caryopsis 1.7–2.1 mm, dark brown. Fl. and fr. spring to summer.  $2n = 14$ .

Muddy streamsides, lake margins, other wet places, forming colonies. NE China, Jiangxi [Russia; Europe; probably introduced in North America (NW United States)].

## 86. AGROSTIS Linnaeus, Sp. Pl. 1: 61. 1753.

剪股颖属 jian gu ying shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

*Pentatherum* Nábelek.

Annuals or perennials, tufted or sometimes with rhizomes or stolons. Leaf blades linear to filiform or setaceous, flat or rolled; ligule membranous. Inflorescence a panicle, open to contracted or spikelike. Spikelets with 1 floret, small, often gaping, without rachilla extension; rachilla articulating above glumes; glumes persistent, longer than floret, subequal or lower a little longer, membranous, 1-veined, apex subacute to acuminate; floret callus glabrous or shortly pilose; lemma oblong to elliptic, thinner than glumes, often hyaline, 5-veined, rounded on back, glabrous or hairy, lateral veins sometimes excurrent, awnless or awned from back, apex truncate or toothed; awn usually geniculate, sometimes weakly so or straight when short; palea shorter than lemma, sometimes very small. Stamens 3. Caryopsis oblong, sulcate on ventral side.

About 200 species: temperate and cold regions of the N hemisphere, also on tropical mountains; 25 species (eight endemic) in China.

The genus includes some good fodder and lawn plants.

Some species are superficially very similar, and correct identification depends on careful observation of spikelet details. It is also important to collect the basal parts to show the presence or absence of rhizomes and stolons. When the palea is long it is normally obvious, but small paleas usually adhere to the mature caryopsis and may appear to be absent. The presence or absence of awns is useful for identification, but awned species may have awnless variants, and vice versa, and the position of the awn on the lemma back can also be rather variable.

- 1a. Lemma hairy.
  - 2a. Spikelets 1.5–3 mm; palea almost equaling lemma ..... 1. *A. munroana*
  - 2b. Spikelets 3–4 mm; palea clearly shorter than lemma.
    - 3a. Palea ca. 1/3 length of lemma; ligule 2.5–6 mm ..... 2. *A. pilosula*
    - 3b. Palea ca. 2/3 length of lemma; ligule 1.5–2.5 mm ..... 3. *A. dshungarica*
- 1b. Lemma glabrous.
  - 4a. Palea well developed, more than 1/3 lemma length.
    - 5a. Culms up to 20 cm tall; alpine grass in Taiwan ..... 17. *A. fukuyamae*
    - 5b. Culms up to 130 cm tall; not alpine grasses.
      - 6a. Anthers 0.5–0.8 mm; palea slightly under 1/2 lemma length ..... 16. *A. arisan-montana*
      - 6b. Anthers 0.8–1.5 mm; palea 1/2–3/4 lemma length.
        - 7a. Plant stoloniferous, rhizomes absent; panicle contracted after anthesis ..... 4. *A. stolonifera*
        - 7b. Plant tufted or rhizomatous, stolons absent; panicle open after anthesis.
          - 8a. Ligule on non-flowering shoots shorter than wide; panicle branches almost smooth; plants up to 70 cm ..... 5. *A. capillaris*

- 8b. Ligule on non-flowering shoots as long as or longer than wide; panicle branches scabrid; plants up to 150 cm.
- 9a. Panicle green or violet tinged, branches moderately slender, branched from near base; floret callus shortly bearded, hairs 0.2–0.5 mm ..... 6. *A. gigantea*
- 9b. Panicle dark purple tinged brown, branches very fine, bare in lower 1/3; floret callus subglabrous ..... 7. *A. divaricatissima*
- 4b. Palea small, 1/3 length of lemma or less, often tiny.
- 10a. Lemma awnless (occasionally a short awnlet present, included within the spikelet).
- 11a. Panicle dense, spikelike, linear or linear-oblong; culms less than 30 cm.
- 12a. Leaf blades filiform, 0.4–0.8 mm wide; spikelets ca. 2.5 mm; callus subglabrous ..... 8. *A. mackliniae*
- 12b. Leaf blades linear, 1–3 mm wide; spikelets 2.8–4 mm; callus hairs ca. 0.2 mm ..... 9. *A. hugoniana*
- 11b. Panicle open to laxly contracted, not spikelike; culms 20–100 cm.
- 13a. Culms weak, scrambling, 100–130 cm long; panicle ovate, ca. 30 cm, very delicate, branches and pedicels divaricate ..... 10. *A. brachiata*
- 13b. Culms erect, tufted, usually less than 100 cm; panicle narrowly oblong to ovate, 3–25 cm, branches and pedicels not divaricate.
- 14a. Spikelets usually dark purple; glumes unequal; plant often less than 30 cm tall ..... 11. *A. nervosa*
- 14b. Spikelets usually green or grayish green, occasionally violet tinged; glumes subequal; plant (20–)40–100 cm tall.
- 15a. Anthers 0.3–0.5(–0.7) mm; spikelets 1.3–1.8 mm (if longer, anthers small).
- 16a. Leaf blades (2.5)–4–11 mm wide; glumes subacute; lemma 3/4–9/10 spikelet length; palea 0.3–0.6 mm ..... 12. *A. micrantha*
- 16b. Leaf blades 1–5 mm wide; glumes acuminate; lemma 2/3–3/4 spikelet length; palea less than 0.25 mm ..... 13. *A. clavata*
- 15b. Anthers 0.5–1.5 mm; spikelets 1.8–3.2 mm.
- 17a. Spikelets 2.5–3.2 mm; anthers 1–1.5 mm ..... 14. *A. kunmingensis*
- 17b. Spikelets 1.9–2.8 mm; anthers 0.5–1 mm.
- 18a. Panicle open, elliptic to narrowly ovate; branches bare in lower part; palea less than 0.2 lemma length ..... 15. *A. infirma*
- 18b. Panicle usually contracted, lanceolate-oblong; branches often bearing spikelets from base; palea 0.2–0.4 lemma length ..... 16. *A. arisan-montana*
- 10b. Lemma awned, awn flexuous or geniculate, exserted from spikelet.
- 19a. Awn usually arising from middle of lemma back or above; anthers 0.5–1.2 mm.
- 20a. Panicle open, ovate to broadly elliptic; branches widely spreading to divaricate, up to 10 cm, bare in lower part.
- 21a. Leaf blades 2–5 mm wide; panicle elliptic, branches ascending; spikelets 1.8–2.7 mm ..... 18. *A. sozanensis*
- 21b. Leaf blades 0.5–2 mm wide; panicle ovate, branches divaricate; spikelets 2.6–3.5 mm ..... 19. *A. hookeriana*
- 20b. Panicle laxly contracted, lanceolate; branches ascending, up to 3.5 cm, with spikelets from near base.
- 22a. Culms 12–20 cm tall; caudine leaf blades 1–2 mm wide; spikelets dark purple; awn arising from middle of lemma ..... 20. *A. sinorupestris*
- 22b. Culms 30–50 cm tall; caudine leaf blades 3–5 mm wide; spikelets greenish gray; awn arising from upper 1/4–1/3 of lemma ..... 21. *A. sinocontracta*
- 19b. Awn usually arising from below middle of lemma back; anthers 1–1.6 mm.
- 23a. Plant with creeping surface stolons ..... 22. *A. canina*
- 23b. Plant with subterranean rhizomes or tufted.
- 24a. Leaf blades smooth on abaxial surface; panicle branches smooth ..... 23. *A. flaccida*
- 24b. Leaf blades scabrid on abaxial surface; panicle branches smooth or scabrid.
- 25a. Rhizomes present, plant loosely tufted; panicle open, at least at anthesis; callus subglabrous, hairs 0.1–0.3 mm ..... 24. *A. vinealis*
- 25b. Rhizomes absent, plant densely tufted; panicle contracted; callus bearded, hairs 0.3–0.4 mm ..... 25. *A. turkestanica*

**1. Agrostis munroana** Aitchison & Hemsley, J. Linn. Soc., Bot. 19: 192. 1882.

*Calamagrostis munroana* (Aitchison & Hemsley) Boisier.

长稃剪股颖 chang fu jian gu ying

Annual. Culms solitary or in small tufts, erect or geniculate at base, 10–45(–70) cm high, 3–5-noded. Leaves all cau-

line; leaf sheaths loose, smooth; leaf blades linear, flat, 3–15 cm × 1.5–5 mm, smooth or slightly scaberulous; ligule 2.5–4 mm, apex obtuse. Panicle contracted to open, narrowly oblong to broadly lanceolate in outline, 3–15(–20) cm; branches 2–7 per node, ascending to spreading, capillary, scaberulous, bare in lower part. Spikelets 1.5–3 mm, usually purple tinged; glumes lanceolate-elliptic, equal, keel scabrid, apex acute; callus hairs ca. 0.5 mm; lemma 3/4–4/5 spikelet length, back villous, awnless or a fine straight awn up to 3 mm arising at or below middle, apex truncate-denticulate; palea almost as long as lemma. Anthers 0.4–0.8 mm.

Grassy slopes, moist meadows; ca. 3700 m. NE Xizang, Yunnan (Gongshan) [Afghanistan, NW India, Kashmir, Nepal, N Pakistan].

**2. *Agrostis pilosula*** Trinius, Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 6, 4(3–4): 372. 1841.

柔毛剪股颖 rou mao jian gu ying

*Agrostis beimushanica* J. L. Yang; *A. ciliata* Trinius (1845), not Thunberg (1784); *A. eriolepis* Keng ex Y. C. Yang; *A. muliensis* J. L. Yang; *A. pilosula* var. *wallichiana* (Steudel) Bor; *A. royleana* Trinius; *A. wallichiana* Steudel; *Calamagrostis pilosula* (Trinius) J. D. Hooker; *Pentatherum pilosulum* (Trinius) Tzvelev.

Annual or short-lived perennial, tufted. Culms loosely ascending or decumbent at base and rooting from lower nodes, 30–90 cm tall, 3- or 4-noded. Leaf sheaths glabrous; leaf blades linear, flat, 3–20 cm × 3–5 mm, both surfaces scabrid; ligule 2.5–6 mm, apex lacerate. Panicle lanceolate to ovate in outline, 10–30 cm, open or somewhat contracted; branches 2–7 at each node, 2–5 cm, scabrid, bearing branchlets mainly in distal half. Spikelets 3–4 mm, green or purple; glumes oblong-lanceolate, lower glume slightly longer than upper glume, keel conspicuously scabrid-hispidulous, apex acuminate, upper glume scabrid upward on keel, apex acute; callus hairs 0.4–0.5 mm; lemma ca. 2/3 spikelet length, back villous except below apex, awned at or near lower 1/3, apex truncate, erose; awn geniculate, 3–4 mm; palea usually ca. 1/3 length of lemma. Anthers 0.7–1.5 mm. Fl. Aug.

Grassy mountain slopes; 3600–4200 m. Qinghai, W Sichuan, Yunnan [Bhutan, India, Nepal, Pakistan, Sri Lanka].

This is a polymorphic species in which several rather ill-defined varieties have been distinguished. *Agrostis pilosula* var. *pilosula* has a large, effuse panicle with branches to 10 cm. The name *A. pilosula* var. *wallichiana* has been misapplied to a variant with a smaller, stiffly branched panicle and small, purple spikelets. The type of *A. wallichiana* has a pale green panicle with long, flexuous branches.

**3. *Agrostis dshungarica*** (Tzvelev) Tzvelev, Rast. Tsentr. Azii 4: 292. 2001.

线序剪股颖 xian xu jian gu ying

*Pentatherum dshungaricum* Tzvelev, Rast. Tsentr. Azii 4: 77. 1968; *Agrostis sinkiangensis* Y. C. Yang.

Annual or short-lived perennial, tufted. Culms 20–50 cm tall, 2–4-noded. Leaf sheaths smooth, glabrous; leaf blades nar-

rowly linear, flat, 4–10 cm × 1–3 mm, abaxial surface sub-smooth, adaxial surface scaberulous; ligule 1.5–2.5 mm. Panicle contracted, linear, 5–10 cm; branches short, erect, almost smooth, bearing spikelets to base; pedicels usually pubescent. Spikelets 3–4 mm, purple; glumes oblong-lanceolate, lower glume slightly longer than upper glume, keel scaberulous; callus hairs ca. 1 mm; lemma 1/2–2/3 spikelet length, back villous except below apex, awned from lower 1/3, apex irregularly toothed; awn weakly geniculate, 3–4.3 mm; palea ca. 2/3 length of lemma. Anthers 0.7–0.9 mm. Fl. and fr. Aug–Sep.

• Mountain slopes. Xinjiang.

This is a local variant of the variable species *Agrostis pilosula*, distinguished mainly by its longer palea in combination with a narrow, purple panicle. It is also geographically disjunct.

**4. *Agrostis stolonifera*** Linnaeus, Sp. Pl. 1: 62. 1753.

西伯利亚剪股颖 xi bo li ya jian gu ying

*Agrostis palustris* Hudson; *A. sibirica* V. A. Petrov.

Perennial, tufted, stoloniferous; stolons slender, leafy, widely spreading, developing after anthesis. Culms erect or geniculate and rooting at base, 30–50(–100) cm tall. Leaf sheaths smooth; leaf blades linear, flat or inrolled, 4–10 cm × 2–5 mm, scaberulous, apex acute to acuminate; ligule on non-flowering shoots 2–3.5 mm, rounded to truncate, often lacerate. Panicle narrow, linear to lanceolate in outline, 5–20 cm, open only at anthesis, otherwise contracted, often dense; branches several per node, closely divided, ascending, scabrous, main branch at a node often bare in lower 1/3, but accompanied by shorter branches bearing spikelets to base. Spikelets 1.8–3 mm, yellowish green; glumes lanceolate, subequal or lower glume slightly longer, lower glume scabrous along keel distally, upper glume often smooth, apex acute; callus minutely hairy; lemma 3/4 as long to subequaling spikelet, usually awnless, apex rounded; palea 1/2–3/4 length of lemma. Anthers 0.8–1.5 mm. Fl. Aug.

Moist places along roadsides. Anhui, Gansu, Guizhou, Heilongjiang, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Xinjiang, Xizang, Yunnan [Bhutan, India, Japan, Mongolia, Nepal, Russia; C and SW Asia, Europe].

This is a widespread and polymorphic species, adventive in many temperate countries.

**5. *Agrostis capillaris*** Linnaeus, Sp. Pl. 1: 62. 1753.

细弱剪股颖 xi ruo jian gu ying

*Agrostis sylvatica* Hudson; *A. tenuis* Sibthorp; *A. vulgaris* Withering.

Perennial, rhizomatous; rhizomes scaly, short. Culms tufted, geniculate or decumbent and rooting at base, 20–70 cm tall. Leaf sheaths smooth; leaf blades linear, flat or inrolled, 2–15 cm × 1–4 mm, scabrous or nearly smooth, apex acuminate; ligule on non-flowering shoots 1–2 mm, shorter than wide, truncate. Panicle elliptic in outline, up to 20 cm, open, very lax; branches 2–5 per node, spreading, capillary, 1.5–3.5 cm, slightly flexuous, smooth or almost so, bare in lower half, spikelets well spaced. Spikelets 1.5–2.5 mm, purplish brown; glumes

elliptic-lanceolate, subequal or lower glume slightly longer, lower glume scabrid along keel distally, upper glume often smooth, apex acute; callus minutely hairy; lemma 2/3–3/4 spikelet length, glabrous, midrib slightly prominent, usually awnless, apex truncate; palea 1/2–3/4 length of lemma. Anthers 0.8–1.5 mm. Fl. Aug.

Moist grassy places, probably introduced; 1000–1500 m. Henan, Nei Mongol, Ningxia, Shanxi, Xinjiang [Afghanistan, W Russia; N Africa, SW Asia (Caucasus, Turkey), Europe; introduced in North America and other temperate countries].

#### 6. *Agrostis gigantea* Roth, Tent. Fl. Germ. 1: 31. 1788.

巨序剪股颖 ju xu jian gu ying

*Agrostis stolonifera* Linnaeus var. *gigantea* (Roth) Koch; *A. stolonifera* subsp. *gigantea* (Roth) Maire & Weiler; *A. stolonifera* var. *ramosa* (S. F. Gray) Veldkamp; *Vilfa alba* (Linnaeus) P. Beauvois var. *ramosa* S. F. Gray.

Perennial, rhizomatous; rhizomes tough, scaly, spreading. Culms loosely tufted, ascending to prostrate at base, rooting and branching from lower nodes, up to 130 cm tall. Leaf sheaths smooth or scaberulous; leaf blades linear, flat, 5–30 cm × 3–10 mm, scabrid, apex acuminate; ligule on tillers 1.5–6 mm, as long as or longer than wide, toothed. Panicle oblong or conical in outline, 8–25 cm, contracted at first, open after anthesis; branches 5 or more per node, spreading, very scabrous, bearing branchlets nearly to base, spikelets clustered at the branch apices. Spikelets 2–3 mm, yellowish green or purplish; glumes elliptic-lanceolate, subequal or lower glume slightly longer, scabrid or pilosulous along upper keel and margins, apex acute; callus hairs 0.2–0.4 mm; lemma 2/3–3/4 spikelet length, glabrous, usually awnless, apex obtuse; palea 1/2–3/4 length of lemma. Anthers 1–1.5 mm. Fl. and fr. summer and autumn.

Moist ground, rough grasslands, as a field weed. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan, Zhejiang [Afghanistan, NW India, Japan, Korea, Mongolia, Nepal, Pakistan, Russia; N Africa, SW Asia, Europe].

This is a widespread and polymorphic species, introduced for pasture or adventive in Australia, North America, and elsewhere. The name *Agrostis alba* Linnaeus has sometimes been used for this species, but the correct application of that name is uncertain.

*Agrostis gigantea*, *A. capillaris*, and *A. stolonifera* are closely related, widespread weeds, which sometimes hybridize. While the lemma is usually awnless, a small awnlet from at or near the apex may be present in some spikelets.

#### 7. *Agrostis divaricatissima* Mez, Repert. Spec. Nov. Regni Veg. 18: 4. 1922.

歧序剪股颖 qi xu jian gu ying

*Agrostis koreana* Ohwi.

Perennial, loosely tufted, sometimes shortly rhizomatous. Culms usually many, erect, 40–100 cm tall, ca. 2 mm in diam., 4–5-noded. Leaf sheaths smooth; leaf blades linear, soft, 7–8 cm × 1–3 mm, sharply scabrid on both surfaces, narrowly acuminate; ligule on tillers 2–2.5 mm, on culm leaves 2.5–4 mm. Panicle ovate in outline, 10–25 cm, remaining open after

anthesis; branches 6–8 per node, widely spreading, very slender, slightly flexuous, up to 15 cm, sharply scabrid, bare in lower half. Spikelets 1.8–2.3 mm, dark purple; glumes lanceolate, equal, keel of lower glume scabrid above middle, apex acuminate; callus glabrous or nearly so; lemma 2/3–3/4 spikelet length, awnless or sometimes with awnlet up to 1 mm, apex obtuse; palea 1/2–2/3 length of lemma. Anthers 0.8–1.2 mm. Fl. and fr. Jul–Aug.

Riversides, lakesides, marshy meadows, often on saline soils; 500–1500 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Korea, Mongolia, Russia].

*Agrostis mongolica*, from Mongolia and Siberia, is very similar, but has a shorter panicle rarely exceeding 12 cm and smaller 1.5–2 mm spikelets. There is some overlap, and it is sometimes placed in synonymy under *A. divaricatissima*.

#### 8. *Agrostis mackliniae* Bor, Kew Bull. [12] 1957: 417. 1958.

歧颖剪股颖 qi ying jian gu ying

*Agrostis inaequiglumis* Grisebach var. *nana* Y. C. Yang.

Perennial; rootstock present, tough. Culms erect from an ascending base, up to 30 cm tall, 0.5–0.8 mm in diam., 2–3-noded. Leaf sheaths glabrous, lower scarious; leaf blades filiform, rolled, basal blades 8–10 cm × 0.4–0.8 mm, culm blades 2–4 cm, abaxial (outer) surface scabrid toward apex, otherwise smooth, adaxial (inner) surface closely ribbed, scabrid on ribs; ligule 0.7–1 mm, ca. 2 mm on culm leaves. Panicle linear, dense, spikelike, 5–8 cm; branches short, erect, bearing spikelets from base; pedicels scabrid. Spikelets ca. 2.5 mm, green tinged pale purple; glumes narrowly oblong-lanceolate, slightly unequal with lower longer, keel scabrid, apex acuminate; callus subglabrous; lemma 2/3 spikelet length, smooth, usually awnless, apex acute; palea to 0.25 mm. Anthers ca. 1 mm. Fl. Aug.

Alpine grassy slopes; 3000–4000 m. SE Xizang, NW Yunnan [N Myanmar].

*Agrostis mackliniae* usually has awnless lemmas, but rarely a few lemmas have a short, straight awn from above the middle. *Agrostis inaequiglumis* Grisebach is a similar, small species, occurring in Bhutan, India (Sikkim), and Nepal. It also has a narrow, spikelike panicle and awnless spikelets, but is distinguished by its delicate, annual habit.

#### 9. *Agrostis hugoniana* Rendle, J. Linn. Soc., Bot. 36: 389. 1904.

甘青剪股颖 gan qing jian gu ying

*Agrostis shensiana* Mez.

Perennial, densely tufted; old basal sheaths fibrous. Culms erect or geniculate at base, 8–30 cm tall, 1–2 mm in diam., 2-noded. Leaf sheaths lax, overlapping; leaf blades linear, 2–8 cm × 1–3 mm, scabrid on both surfaces; ligule ca. 2 mm, back scabrid, apex rounded. Panicle dense, spikelike, linear-oblong in outline, 3–9 cm; branches 3–6 at each node, short, erect, up to 4 cm, smooth or scabrid, bearing spikelets from base; pedicels 0.7–2 mm, scabrid. Spikelets 2.8–4 mm, green flushed dark purple; glumes lanceolate, unequal, lower glume ca. 0.2 mm longer than upper glume, keel scabrid, upper back and margins puberulous, apex acuminate; callus hairs ca. 0.2 mm; lemma ca. 2/3 spikelet length, awnless or with short awnlet below apex, apex obtuse or slightly toothed; palea 0.45–0.5 mm. Anthers 0.7–1 mm. Fl. and fr. Aug–Sep.

- Alpine grasslands, rocky slopes; 2500–4200 m. Gansu, Qinghai, W Shaanxi, NW Sichuan.

This species is similar in habit to *Agrostis mackliniae*, which has filiform leaf blades, shorter spikelets, a subglabrous callus, and a shorter palea.

**10. *Agrostis brachiata*** Munro ex J. D. Hooker, Fl. Brit. India 7: 256. 1896 ["1897"].

大锥剪股颖 da zhui jian gu ying

*Agrostis megathyrsa* Keng ex P. C. Keng.

Perennial, tufted from a rootstock. Culms weak, scrambling, 1–1.3 m tall, 5–7-noded. Leaf sheaths smooth or scabrid, leaf blades linear, thin, 7–20 cm × 2–7 mm, both surfaces scabrid, base contracted, apex acuminate; ligule 2–4 mm, back scabrid, apex truncate. Panicle large, effuse, delicate, ovate in outline, 27–30 cm; branches 3–5 per node, branches, branchlets, and pedicels all divaricate, slightly flexuous, capillary, scabrid or smooth; pedicels 1.5–3 mm. Spikelets hyaline, 1.5–1.8 mm, green or greenish purple at maturity; glumes finally deciduous from pedicel, narrowly ovate, subequal, scarcely keeled, lower glume scabrid on vein below apex, upper glume smooth, apex acute; callus glabrous or almost so; lemma 3/4 spikelet length or more, midvein terminating at middle of back, awnless, apex narrowly truncate; palea ca. 0.5 mm. Anthers 0.5–0.7 mm. Fl. and fr. Jul–Sep.

Mountain tops, roadsides; 600–2500 m. Gansu, Guizhou, Hubei, Sichuan, Yunnan [Bhutan, Nepal].

This distinctive species is readily recognizable by its scrambling habit, very large, delicate panicle with divaricate branchlets, and thin-textured spikelets with deciduous glumes. The panicle is remarkably reminiscent of *Sporobolus*.

**11. *Agrostis nervosa*** Nees ex Trinius, Mém. Acad. Imp. Sci. Saint-Pétersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 6, 4(3–4): 328. 1841.

泸水剪股颖 lu shui jian gu ying

*Agrostis clarkei* J. D. Hooker; *A. limprichtii* Pilger; *A. lushuiensis* B. S. Sun & Y. Cai Wang; *A. schneideri* Pilger; *A. schneideri* var. *brevipes* Keng ex Y. C. Yang; *A. sikkimensis* Bor; *A. taliensis* Pilger.

Perennial, tufted. Culms very slender, erect, 20–30(–50) cm tall, 0.5–0.8 mm in diam., 1–4-noded. Leaf sheaths loose, smooth; leaf blades narrowly linear to setaceous, flat or involute, 3–13 cm × 0.8–3 mm, abaxial surface smooth, adaxial surface scabrid; ligule 0.5–3 mm, back smooth or scaberulous, apex obtuse. Panicle open to laxly contracted, narrowly lanceolate to ovate in outline, 3–15 cm; branches 2–5 per node, very fine, ascending to spreading, 1–6.5(–8) cm, smooth or almost so, bare below middle. Spikelets 1.7–3.2 mm, dark purple or purplish green; glumes lanceolate, unequal, lower glume 1.7–3.2(–3.5) mm, keel scabrid above middle, long acuminate, upper glume 1.6–2.9 mm, apex acute; callus glabrous; lemma 2/3–4/5 spikelet length, awnless or a fine awnlet up to 0.6 mm below apex, apex obtuse or emarginate; palea 0.2–0.5 mm, 0.2–0.4 lemma length. Anthers 0.5–0.75 mm. Fl. and fr. Aug–Sep.

Grassy or stony mountain slopes, meadows, broad-leaved wood-

lands, bamboo forests; 2000–4000 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, India (Darjeeling, Sikkim), N Myanmar, Nepal].

This is a variable species with a wide range of spikelet size, but usually with clearly unequal, purple glumes and awnless lemmas. The name *Agrostis sikkimensis* refers to slender, delicate variants with small spikelets and very fine leaf blades, often growing among moss on rocks. There is continuous variation to taller forms with larger spikelets growing in meadows and woodlands. Forms with a short, straight, subapical awnlet (*A. limprichtii*, *A. lushuiensis*) may have arisen by hybridization with *A. sinorupestris*.

*Agrostis szechuanica* (Y. C. Tong ex Y. C. Yang) L. Liu (Vasc. Pl. Hengduan Mts. 2: 2247. 1994; *A. clavata* Trinius var. *szechuanica* Y. C. Tong ex Y. C. Yang, Bull. Bot. Res., Harbin 4(4): 99. 1984) may belong here. The type, from Sichuan (Hanyuan), has not been seen. It is also reported from Yunnan.

**12. *Agrostis micrantha*** Steudel, Syn. Pl. Glumac. 1: 170. 1854.

多花剪股颖 duo hua jian gu ying

*Agrostis clavata* Trinius subsp. *micrantha* (Steudel) Y. C. Tong; *A. micrandra* Keng ex J. L. Yang; *A. miloides* Mez; *A. myriantha* J. D. Hooker; *A. myriantha* var. *yangbiensis* B. S. Sun & Y. Cai Wang.

Perennial, tufted. Culms weak, erect to decumbent and rooting at lower nodes, 40–100 cm tall, 4(–8)-noded. Leaf sheaths smooth, loose; leaf blades linear to lanceolate, flat, thin, 5–14 cm × (2.5)–4–11 mm, both surfaces scaberulous, margins finely scabrid; ligule 2–3(–6) mm, back scabrid, apex truncate, lacerate. Panicle effuse, 10–15(–20) cm, usually narrowly oblong in outline when young, spreading at flowering, usually contracted in fruit; branches several at each node, capillary, up to 10 cm, bare in lower part. Spikelets 1.3–1.8(–2.2) mm, olive green, occasionally violet tinged; glumes narrowly lanceolate-oblong, lower glume usually slightly longer than upper, sometimes equal, keeled, keel scabrid to aculeate, apex subacute; callus glabrous or nearly so; lemma 3/4–9/10 spikelet length, awnless, apex obtuse; palea 0.3–0.6 mm, (1/4)–1/3(–1/2) lemma length. Anthers 0.3–0.5(–0.7) mm. Fl. and fr. Jul–Sep.

Roadsides, riversides, forests, swampy places; 1600–3500 m. Anhui, Fujian, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, NE India, N Myanmar, Nepal].

This variable species is the most common *Agrostis* in the E Himalayas. It is a lush, leafy species, with a green panicle of small, awnless spikelets with subacute glumes, a relatively long floret, and short anthers. Habit is greatly influenced by environmental factors, from compact tufts to much laxer, almost stoloniferous growth in moister situations. Forms with short, lanceolate leaf blades differ in appearance from those with longer, narrower leaf blades, but the variation is continuous.

**13. *Agrostis clavata*** Trinius, Neue Entdeck. Pflanzenk. 2: 55. 1821.

华北剪股颖 hua bei jian gu ying

*Agrostis clavata* subsp. *matsumurae* (Hackel ex Honda) Tateoka; *A. clavata* var. *nukabo* Ohwi; *A. formosana* Ohwi; *A. matsumurae* Hackel ex Honda.

Annual or short-lived perennial, loosely tufted. Culms erect or geniculate at base, slender, 30–70 cm tall, 2–4-noded. Leaf sheaths smooth; leaf blades linear, flat, thin, 6–15 cm × 1–

5 mm, both surfaces scabrid; ligule 1.5–3 mm, back scabrid, apex obtuse or lacerate. Panicle lax, lanceolate to narrowly oblong in outline, 8–25 cm; branches 2–7 at each node, ascending, capillary, 8–15 cm, scabrid, bare in lower 1/3–1/2 or sometimes with spikelets from base. Spikelets 1.5–2.5 mm, yellowish green; glumes lanceolate, subequal, lower slightly longer, keeled, keels aculeate-scabrid, apex acuminate; callus glabrous or nearly so; lemma 2/3–3/4 spikelet length, awnless, apex obtuse; palea to 0.25 mm. Anthers 0.3–0.5 mm. Fl. and fr. summer and autumn.

Roadsides, riversides, forest margins, disturbed grassy places, often in moist situations; below 4000 m. Anhui, Fujian, Gansu, Guangdong, Guizhou, Hebei, Henan, Heilongjiang, Jilin, Nei Mongol, Shaanxi, Shandong, Sichuan, Taiwan, Xizang, Yunnan [Japan, Korea, Mongolia, Russia; SW Asia (Caucasus), N Europe, North America (Alaska)].

*Agrostis clavata* is distinguished by the combination of scabrid leaves and panicle branches, small, pale green spikelets, acuminate glumes, an awnless lemma, and very small palea and anthers.

*Agrostis clavata* subsp. *matsumurae* (*A. clavata* var. *nukabo*) is often recognized, mainly on the basis of a dense, narrow panicle bearing spikelets from the base of the primary branches. In contrast, subsp. *clavata* has panicle branches divergent at flowering and bare in the lower 1/3–1/2. However, short, densely spiculate branches are often present at the panicle nodes among the longer, bare-based branches in subsp. *clavata*, contributing to a denser panicle appearance when frequent. All the panicle branches become erect in the fruiting stage, further blurring the boundary with subsp. *matsumurae*. It has not been possible to distinguish two subspecies satisfactorily in herbarium material.

#### 14. *Agrostis kunmingensis* B. S. Sun & Y. Cai Wang, Acta Phytotax. Sin. 30: 364, pl. 2. 1992.

昆明剪股颖 *kun ming jian gu ying*

*Agrostis hookeriana* (C. B. Clarke ex J. D. Hooker) var. *longiflora* Y. C. Tong ex Y. C. Yang; *A. poluninii* Bor var. *longiflora* (Y. C. Tong ex Y. C. Yang) B. S. Sun.

Perennial, rhizomatous. Culms erect from geniculate base, up to 70(–100) cm tall, 1–2.5 mm in diam., 3–7-noded. Leaf sheaths smooth; leaf blades linear, flat or rolled when dry, 10–16 cm × 2.5–4 mm, both surfaces scabrid, apex acuminate; ligule 2–4.5 mm, back scabrid, apex obtuse. Panicle open or laxly contracted, narrowly lanceolate to narrowly ovate in outline, 15–20(–25) cm; branches 2–6 per node in well-spaced whorls, ascending to laxly spreading, slender, 7–12 cm, scabrid, bare below middle. Spikelets 2.5–3.2 mm, green tinged purplish gray or purple; glumes narrowly lanceolate, subequal, keel scabrid, upper indistinctly keeled, almost smooth, acute; callus hairs ca. 0.3 mm; lemma ca. 2/3 spikelet length, awnless or with up to 1 mm awnlet from middle or above, lateral veins slightly keeled and scaberulous above middle, apex truncate; palea 0.2–0.5 mm, 0.15–0.3 lemma length. Anthers 1–1.5 mm. Fl. and fr. Jun–Aug.

- Moist grassy slopes, riversides; 2000–3600 m. Sichuan, Yunnan.

*Agrostis kunmingensis* closely resembles awnless forms of *A. canina* in spikelet size and anther length, but appears to lack the spreading stolons typical of that species. It is also close to *A. infirma*, a predominantly SE Asian species.

#### 15. *Agrostis infirma* Buse, Pl. Jungh., Gramineae, preprint, 2. 1854.

玉山剪股颖 *yu shan jian gu ying*

*Agrostis flaccida* Hackel var. *morrisonensis* (Hayata) Honda; *A. macilenta* Keng; *A. morrisonensis* Hayata; *A. rigidula* Steudel; *A. shandongensis* F. Z. Li; *A. sozanensis* Hayata var. *exaristata* Handel-Mazzetti; *A. wulingensis* Honda.

Perennial, densely tufted. Culms slender, erect or geniculate at base, 20–100 cm tall, 0.5–2.5 mm in diam., 2–3-noded. Leaves mainly basal, leaf sheaths smooth; leaf blades often involute and acicular or narrowly linear and flat, 4–14 cm × 0.3–5 mm, smooth or slightly scaberulous; ligule of culm blades 2.25–2.75 mm, apex rounded. Panicle open or slightly contracted, elliptic in outline, 8–14(–25) cm; branches 4–6 per node, laxly ascending, 3–8(–10) cm, smooth, lower part bare. Spikelets 2–2.8 mm, purplish green; glumes lanceolate, unequal with lower longer, keel scabrid, apex acute; callus glabrous or almost so; lemma 3/4 spikelet length, awnless or rarely mucronate above middle, apex obtuse; palea 0.15–0.35 mm, less than 0.2 lemma length. Anthers 0.5–1 mm. Fr. Nov.

Mountains; 2600–4000 m. Heilongjiang, Hunan, Shandong, Taiwan, Yunnan [Indonesia, New Guinea, Philippines].

*Agrostis infirma* is a variable species widespread in SE Asia. *Agrostis sozanensis* is very similar, but has awned spikelets.

#### 16. *Agrostis arisan-montana* Ohwi, Acta Phytotax. Geobot. 2: 161. 1933.

阿里山剪股颖 *a li shan jian gu ying*

*Agrostis arisan-montana* var. *megalandra* Y. C. Yang; *A. megathyrsa* Keng ex P. C. Keng var. *angustispicata* D. Z. Ma & J. N. Li; *A. perarta* Keng.

Perennial, loosely tufted. Culms geniculate at base, rooting at lower nodes, 40–100 cm tall, 1–1.7 mm in diam., 3–6-noded. Leaf sheaths smooth; leaf blades linear, soft, 5–14 cm × 2–6 mm, both surfaces scabrid, abaxial surface densely so, apex acuminate; ligule 2–3.5 mm, back scabrid, apex obtuse. Panicle contracted, narrowly lanceolate-oblong in outline, 10–20 cm, much branched; branches 3 per node or rebranched at base, narrowly ascending, longest 5–8 cm, scabrid, bearing spikelets from base. Spikelets 1.9–2.3 mm, yellowish green often with purplish tinge; glumes narrowly ovate-oblong, subequal, keel scabrid, apex subacute or acute; callus glabrous; lemma ca. 3/4 spikelet length, midvein terminating from slightly below middle to apex, awnless, apex broadly rounded, minutely denticulate; palea 0.35–0.75 mm, 0.2–0.4 lemma length. Anthers 0.5–0.8 mm. Fr. Jul.

- Grassy mountain slopes; 900–3200 m. Guangxi, Henan, Ningxia, Shaanxi, Sichuan, Taiwan, Yunnan.

In this species the lemma is awnless, with the midvein terminating anywhere from slightly below the middle up to the apex, varying even within the same panicle. The length of the palea is also rather variable, sometimes almost reaching the middle of the lemma.

*Agrostis arisan-montana* is close to *A. micrantha*, but tends to have a narrower panicle and more sharply acute glumes. It is also close to *A. infirma*, but with a more open panicle. The relationship between

these three taxa, extending from the Himalayas through China into SE Asia, requires further investigation. *Agrostis fukuyamae* and *A. sozanensis* also belong to this group.

**17. *Agrostis fukuyamae*** Ohwi, Repert. Spec. Nov. Regni Veg. 36: 39. 1934.

舟颖剪股颖 zhou ying jian gu ying

*Agrostis infirma* Buse var. *fukuyamae* (Ohwi) Veldkamp; *A. rigidula* Steudel subsp. *fukuyamae* (Ohwi) T. Koyama; *A. rigidula* var. *fukuyamae* (Ohwi) Veldkamp.

Perennial, tufted. Culms erect, 15–20 cm tall, 0.5–1 mm in diam., 2-noded. Leaf sheaths longer than internodes, smooth; leaf blades narrowly linear to setaceous, folded, 5–10 cm × 0.6–1 mm (when folded), abaxial surface smooth or scaberulous, adaxial surface scabrid; ligule 0.8–1.5 mm, apex rounded or truncate. Panicle contracted when young, later open, narrowly ovate in outline, 7–10 cm; branches 3–4 per node, ascending to spreading, longest 3.5–6 cm, almost smooth, bearing spikelets from near base. Spikelets 1.5–2 mm, purplish green; glumes lanceolate-oblong, equal, keel scaberulous toward apex, apex acute; callus hairs 0.2–0.3 mm; lemma more than 3/4 spikelet length, awnless, midvein terminating near middle of back, apex broadly obtuse; palea 0.6–0.8 mm, slightly less to slightly more than 1/2 lemma length. Anthers 0.7–1 mm. Fl. Jul.

- Exposed rocks near mountain summits. Taiwan.

This species is perhaps no more than a local, high-altitude variant of *Agrostis infirma*, differing by its smaller spikelets with a relatively longer lemma and longer palea.

**18. *Agrostis sozanensis*** Hayata, Icon. Pl. Formosan. 7: 85. 1918.

台湾剪股颖 tai wan jian gu ying

*Agrostis canina* Linnaeus var. *formosana* Hackel; *A. transmorrisonensis* Hayata; *A. transmorrisonensis* var. *opienensis* Keng ex Y. C. Yang.

Perennial, loosely tufted, shortly rhizomatous. Culms erect or ascending, up to 90 cm tall, 1–1.2(–2.5) mm in diam., 3–5-noded. Leaf sheaths smooth; leaf blades narrowly linear, flat or weakly involute toward apex, 7–20 cm × 2–5 mm, both surfaces scabrid; ligule 2–6 mm, apex obtuse or truncate. Panicle open, lax, broadly elliptic to narrowly ovate in outline, 15–30 cm; branches 2–4(–10) per node, capillary, widely ascending, flexuous, up to 10 cm, scabrid, lower 1/2–2/3 bare. Spikelets 1.8–2.7(–3) mm, green or tinged purplish red; glumes subequal or lower glume slightly longer than upper glume, keel scabrid, apex acute or acuminate; callus hairs 0.1–0.2 mm; lemma 2/3–3/4 spikelet length, awned from middle or above, apex obtuse or truncate; awn variable, up to 2(–3) mm, straight or slightly bent; palea 0.25–0.5 mm, 1/4–1/3 lemma length. Anthers 0.7–1.2 mm. Fl. and fr. summer and autumn.

- Moist ground, near roads, on slopes; below 2700 m. Anhui, Fujian, Guangdong, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang.

The development and position of the awn are variable in this species. It is usually bent and exserted from the spikelet, but may be shorter and straight. It may arise from the middle to the upper quarter of the

lemma back. Occasionally, awnless spikelets may occur in a panicle where most spikelets are awned. The distinction from *Agrostis infirma* is based mainly on the presence of awns, coupled with slightly longer paleas and anthers.

*Agrostis sozanensis* is very close to *A. canina* Linnaeus. *Agrostis canina* is distinguished by the presence of creeping surface stolons, an awn arising from the lower part of the lemma back, and anthers 1–1.5 mm.

The name *Agrostis perennans* (Walter) Tuckerman has been misapplied to *A. sozanensis*. *Agrostis sozanensis* and *A. transmorrisonensis* were published simultaneously, but *A. sozanensis* has priority when they are regarded as synonyms, since *A. sozanensis* was chosen first, by Koyama (Grasses Japan Neighboring Regions, 485. 1987). The identity of the taxon named *A. transmorrisonensis* var. *kunyuhanensis* F. Z. Li (Bull. Bot. Res., Harbin 11(2): 28. 1991), described from Shandong (Kunyu Shan), is uncertain. The type has not been seen.

**19. *Agrostis hookeriana*** C. B. Clarke ex J. D. Hooker, Fl. Brit. India 7: 256. 1896 [“1897”].

疏花剪股颖 shu hua jian gu ying

*Agrostis perlaxa* Pilger; *A. poluninii* Bor; *A. pubicallis* Keng ex Y. C. Yang.

Perennial, tufted. Culms erect or slightly geniculate at base, up to 50 cm tall, 0.5–1.2 mm in diam., 2–4-noded. Leaf sheaths smooth; leaf blades very narrowly linear, flat, 5–10 cm × 0.5–2 mm, smooth except toward apex; ligule 2–3 mm, apex lacerate. Panicle very lax, ovate in outline, 7–20 cm, open at and after anthesis; branches 2–3 per node, whorls distant, widely ascending to divaricate, capillary, slightly flexuous, longest up to 9 cm, smooth or slightly scabrid, lower half bare. Spikelets 2.6–3.5 mm, usually violet tinged; glumes unequal, lower glume narrowly lanceolate, longer than upper, upper glume oblong-lanceolate, keel scabrid, apex acuminate; callus hairs ca. 0.2 mm; lemma 2/3 spikelet length, back smooth or scaberulous, awned from just above middle, apex truncate-denticulate; awn weakly geniculate, 2–4 mm; palea ca. 0.3 mm. Anthers 0.6–1 mm. Fl. and fr. Aug–Sep.

Montane forests, among bushes, ditches, damp places; 1900–3600 m. Qinghai, W Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

The spikelets of *Agrostis hookeriana* are similar to those of *A. sozanensis*, but in the former species the panicle is very open and broad, with divaricate branches, and the geographic distribution is more westerly.

**20. *Agrostis sinorupestris*** L. Liu ex S. M. Phillips & S. L. Lu, sp. nov.

岩生剪股颖 yan sheng jian gu ying

Type: China. Yunnan: E slopes of Lijiang Snow Range, Yangtze watershed, 1923–1924, J. F. Rock 10774 (holotype, US-1214302).

*Haec species A. rupestris Allioni affinis, sed ab ea arista ex medio (non prope basim) lemmatis exorienti atque antheris brevioribus (0.6–0.8 mm, non 1–2 mm) differt.*

*Agrostis hugoniana* Rendle var. *aristata* Keng ex Y. C. Yang.

Perennial, densely tufted. Culms erect, slender, 12–20(–30) cm tall, ca. 0.5 mm in diam., 2–3-noded. Leaf sheaths longer or shorter than internodes; leaf blades linear, flat or involute, 3–15 cm × 1–2 mm, scabrid; ligule very short, apex round or truncate. Panicle slightly contracted, lanceolate in outline, 3–8 cm; branches 2–6 per node, up to 4 cm, smooth or sparsely scabrid. Spikelets 2.8–3.5 mm, dark purple; glumes lanceolate, unequal, lower glume ca. 0.3 mm longer than upper glume, keel scabrid, apex acute; callus hairs ca. 0.2 mm; lemma ca. 2 mm, awned from middle of back, apex slightly toothed; awn weakly geniculate, 3.5–5 mm; palea 0.4–0.6 mm. Anthers 0.6–0.8 mm. Fl. and fr. summer and autumn.

• Stony mountain slopes; 3500–4000 m. Sichuan, Xizang, Yunnan.

There is a good illustration of *Agrostis sinorupestris* in Keng (Fl. Ill. Pl. Prim. Sin. Gram. 545. 1959, as “*Agrostis rupestris*”). The species is very similar to delicate forms of *A. nervosa*, but differs by the presence of awns.

The name “*Agrostis sinorupestris* L. Liou” (Vasc. Pl. Hengduan Mts. 2: 2252. 1994) belongs here, but was not validly published because no Latin description was provided. The name *Agrostis rupestris* Allioni has been misapplied to this species in the Chinese literature. That species is confined to mountains in Europe and differs by its lower awn insertion on the lemma back (near the base to the lower 1/3) and longer anthers 1–2 mm.

#### 21. *Agrostis sinocontracta* S. M. Phillips & S. L. Lu, nom. nov.

紧序剪股颖 jin xu jian gu ying

Replaced synonym: *Agrostis contracta* Y. C. Tong ex Y. C. Yang, Bull. Bot. Res., Harbin 4(4): 100. 1984, not *Agrostis contracta* F. Mueller ex J. D. Hooker, Fl. Tasman. 2: 116. 1858.

Perennial, tufted. Culms erect, 30–50 cm tall, 1–2 mm in diam., 3–4-noded. Leaf sheaths loose, smooth; leaf blades linear, soft, culm blades 10–14 cm × 3–5 mm, blades of tillers ca. 1 mm wide, abaxial surface scabrid or almost smooth, adaxial surface scabrid; ligule 1–2.5 mm, apex truncate. Panicle laxly contracted, lanceolate in outline, 10–15 cm; branches 1–3 at each node or sometimes secondary branching from base, narrowly ascending, 2.5–3.5 cm, almost smooth, a few widely scattered scabridities, bearing spikelets for most of length. Spikelets 2.5–3 mm, green tinged purplish gray; glumes narrowly lanceolate, lower glume slightly longer than upper glume, keel scabrid, apex acuminate; callus hairs 0.1–0.2 mm; lemma ca. 1/2 spikelet length, awned from upper 1/4–1/3, apex emarginate-denticulate; awn recurved in right angle from lower 1/3, slightly twisted below bend, 3–3.3 mm; palea ca. 0.25 mm. Anthers 0.5–0.7 mm. Fl. and fr. Aug–Oct.

• Alpine meadows; ca. 4000 m. NW Yunnan (Bijiang, Gongshan).

*Agrostis filipes* J. D. Hooker, from Kashmir and the Khasi Hills of NE India, also has awns arising from above the middle of the lemma back and a small palea. It differs in having narrower culm leaf blades 1–2.5 mm wide, a densely contracted panicle, and a fine awn 1–2 mm.

#### 22. *Agrostis canina* Linnaeus, Sp. Pl. 1: 62. 1753.

普通剪股颖 pu tong jian gu ying

Perennial, loosely tufted, stoloniferous, turf-forming. Culms erect or geniculate at base, 20–60 cm tall, 1–1.2 mm in diam., 3–5-noded. Leaf sheaths smooth; leaf blades linear, flat or involute toward apex, 3–20 cm × 1–3 mm, scaberulous; ligule 1.5–4 mm, back scaberulous, apex obtuse or acute. Panicle lax, lanceolate to ovate in outline, 5–12(–20) cm; branches 3–6 per node, spreading at anthesis, usually erect in fruit, capillary, up to 8 cm, scabrid, bare in lower half. Spikelets 1.5–3 mm, purplish brown; glumes lanceolate, subequal, keel scabrid, apex acute; callus hairs ca. 0.2 mm; lemma 2/3 spikelet length, awned from near base to slightly below middle of back, lateral veins minutely exserted, apex obtuse-denticulate; awn weakly geniculate, up to 4.5 mm; palea ca. 0.5 mm. Anthers 1–1.5 mm. Fl. Jul.

Damp grasslands; 1400–3800 m. Xinjiang, Xizang, Yunnan [Japan, Kashmir, Mongolia, Russia; Europe, NE America].

This is a European species, introduced as a lawn grass or adventive in some other temperate countries. Some variants are awnless or have poorly developed awns. It is distinguished from *Agrostis vinealis* and other awned species with short paleas by the combination of leafy stolons and long anthers.

#### 23. *Agrostis flaccida* Hackel, Bull. Herb. Boissier 7: 649. 1899.

柔软剪股颖 rou ruan jian gu ying

Perennial, tufted, shortly rhizomatous. Culms erect or geniculate at base, slender, 15–30(–50) cm tall, ca. 1 mm in diam., 3-noded. Leaf sheaths smooth; leaf blades narrowly linear, weakly rolled or infrequently flat, soft, 5–10 cm × 0.5–2 mm, smooth, uppermost culm blade elongate, widely divergent from culm; ligule 1–2 mm, apex obtuse. Panicle open, diffuse, narrowly ovate in outline, 4–8 cm; branches 2–5 per node, spreading, capillary, 5–7 cm, smooth or almost so, bare in lower half. Spikelets 2.5–3 mm, purple or purplish green; glumes lanceolate, slightly unequal, keel scabrid, apex acuminate; callus hairs 0.2–0.5 mm; lemma 2/3–3/4 spikelet length, indistinctly granular-scaberulous, awned from lower 1/4–1/3 of back, lateral veins sometimes minutely exserted, apex truncate-denticulate; awn weakly geniculate, 3–5 mm; palea ca. 0.25 mm. Anthers 1–1.6 mm. Fl. and fr. Jul–Aug. 2n = 14.

Rocky slopes, open forest; 1500–2300 m. E Jilin, Liaoning [Japan, Korea, Russia (Kamchatka, Kuril Islands, Sakhalin)].

*Agrostis flaccida* is distinguished from other members of the *A. vinealis* complex mainly by its smooth leaf blades and panicle branches (see the comment under the next species).

#### 24. *Agrostis vinealis* Schreber, Spic. Fl. Lips. 47. 1771.

芒剪股颖 mang jian gu ying

*Agrostis canina* subsp. *montana* (Hartman) Hartman; *A. canina* subsp. *trinii* (Turczaninow) Hultén; *A. canina* var. *montana* Hartman; *A. coarctata* subsp. *trinii* (Turczaninow) H. Scholz; *A. flaccida* subsp. *trinii* (Turczaninow) T. Koyama; *A. flaccida* var. *trinii* (Turczaninow) Ohwi; *A. trinii* Turczaninow; *A. vinealis* subsp. *trinii* (Turczaninow) Tzvelev.

Perennial, tufted, shortly rhizomatous. Culms erect from a geniculate base, 30–60 cm tall, ca. 1 mm in diam., 3-noded. Leaf sheaths smooth; leaf blades narrowly linear, flat or weakly rolled, grayish green, 5–8 cm × 0.5–2 mm, scabrid; ligule 1.5–3 mm, apex obtuse. Panicle lanceolate to narrowly ovate, 7–12 cm; branches 2–5 per node, laxly ascending, slender, moderately scabrid. Spikelets 2–2.5 mm, purple; glumes oblong-lanceolate, subequal, lower slightly longer, keel scabrid or almost smooth on upper glume, apex acuminate; callus hairs ca. 0.2 mm; lemma 2/3 spikelet length, awned from slightly below middle to lower 1/3, or awnless, apex obtuse; awn geniculate, 3–3.5 mm; palea very small. Anthers 1–1.5 mm. Fl. and fr. summer and autumn.

Damp grassy places; 1500–1700 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Mongolia, Pakistan, Russia; America, Europe].

*Agrostis vinealis* lies at the center of a complex of closely related taxa, including in China *A. flaccida* and *A. turkestanica*. Characters separating the taxa are very slight, which has led to differences in opinion as to their taxonomic status. *Agrostis vinealis* itself is widespread in Eurasia, but other members are usually of more restricted distribution. *Agrostis trinii*, based on an E Asian element with very scabrid leaf blades, has been reported from NE China. Other characters used to

distinguish it are conflicting in the literature, and it seems impossible to maintain it as distinct.

**25. *Agrostis turkestanica*** Drobow, Fl. Uzbekistan. 1: 537. 1941.

北疆剪股颖 bei jiang jian gu ying

*Agrostis vinealis* subsp. *turkestanica* (Drobow) Tzvelev.

Perennial, densely tufted. Culms slender, slightly geniculate at base, 20–35 cm tall, ca. 1 mm in diam., 2-noded. Leaves mainly crowded in basal tuft; leaf sheaths lax, smooth, longer than internodes; leaf blades setaceous, involute or flat, 3–4 cm × 0.8–1 mm; ligule 1.5–3 mm, apex rounded. Panicle contracted, linear-oblong, 4–9 cm; branches 1–3 per node, ca. 2 cm, smooth or scabrid. Spikelets 2–2.2 mm, dull purple; glumes lanceolate, subequal or lower glume slightly longer, lower glume aculeolate along keel, apex acute; lemma ca. 1.9 mm, distinctly 5-veined, awned from upper 2/3–4/5, apex obtuse or subrounded; awn weakly geniculate, 2.5–3 mm; palea ca. 0.2 mm. Anthers ca. 1.2 mm. Fl. and fr. Aug–Sep.

River valleys, roadsides; 2300 m. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan; SW Asia (NE Iran)].

This is a regional variant from the *Agrostis vinealis* complex, with a densely tufted habit, fine leaf blades, and a contracted panicle.

## 86a. ×AGROPOGON P. Fournier, Quatre Fl. France 50. 1934.

剪棒草属 jian bang cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

*Agrostis* Linnaeus × *Polypogon* Desfontaines.

**1. ×Agropogon lutosus** (Poiret) P. Fournier, Quatre Fl. France 50. 1934.

糙颖剪股颖 cao ying jian gu ying

*Agrostis lutescens* Poiret, Encycl., Suppl. 1: 249. 1810, based on *A. littoralis* Withering, Arr. Brit. Pl., ed. 3, 2: 129. 1796, not Lamarck (1791); ×*Agropogon littoralis* C. E. Hubbard, nom. illeg. superfl.; *Agrostis subaristata* Aitchison & Hemsley; *Polypogon littoralis* Smith, nom. illeg. superfl.; *P. lutescens* (Poiret) Hitchcock; *P. subaristatus* (Aitchison & Hemsley) Bhattacharya & S. K. Jain; *Vilfa lutescens* (Poiret) P. Beauvois.

Perennial, often shortly stoloniferous. Culms solitary or loosely tufted, ascending or decumbent and rooting at lower nodes, up to 80 cm tall. Leaf sheaths loose, glabrous; leaf blades linear, 9–20 cm, 2–10 mm wide, scabrid along margins and veins, apex acute or acuminate; ligule 5–8 mm, scarious, scabrid on back, lacerate at apex. Panicle densely contracted, lanceolate to oblong in outline, lobed, 2–18 cm; branches subverticillate; pedicels pubescent. Spikelets 2–3 mm, disarticulating above glumes; glumes persistent, subequal or upper glume

slightly shorter than lower, elliptic, hispidulous, apex acute or emarginate with awn to 0.5(–3) mm; callus glabrous; lemma oblong, 1.4–1.6 mm, firmly hyaline, glossy, 5-veined, apex truncate-denticulate, awnless or with subapical awn up to 3 mm; palea 2/3 length of lemma. Anthers 0.5–1 mm, indehiscent. Fl. Jun–Jul.

Moist and saline ground; 1000–3000 m. S Gansu, Sichuan, Xizang, Yunnan [Afghanistan, NW India, Pakistan; NE Africa, Europe].

This is the name given to hybrids between *Agrostis stolonifera* and *Polypogon monspeliensis*. The spikelets resemble *Polypogon* in their scabrid, often shortly awned glumes, but these lack clearly 2-lobed tips, whereas spikelet disarticulation is usually like *Agrostis*. The plants are infertile, producing neither good pollen nor ripe seed.

The name ×*Agropogon littoralis*, based on *Polypogon littoralis* (1816), in turn a *nomen novum* for *Agrostis littoralis* Withering, has frequently been used in the literature. However, *A. lutescens* (1810), also a *nomen novum* for *A. littoralis*, is the earliest legitimate name and provides the correct specific epithet. Therefore both *P. littoralis* and ×*A. littoralis* were nomenclaturally superfluous when published and are consequently illegitimate.

## 87. DEYEUXIA Clarion ex P. Beauvois, Ess. Agrostogr. 43. 1812.

野青茅属 ye qing mao shu

Lu Shenglian (卢生莲), Chen Wenli (陈文俐); Sylvia M. Phillips

*Anisachne* Keng.

Perennials, tufted or also rhizomatous. Leaf blades linear, usually flat, sometimes inrolled; ligule membranous. Inflorescence a panicle, loosely contracted to spikelike, rarely open. Spikelets with 1 floret (very rarely 2), rachilla disarticulating above glumes, with penicillate extension lying against the palea; glumes subequal, usually slightly longer than the floret, rarely slightly shorter, membranous, 1–3-veined, apex acute or acuminate; floret callus bearded, hairs usually 1/3 as long up to about equaling floret; lemma thinly to firmly membranous, (3–)5-veined, dorsally awned or awnless, apex erose, denticulate or 2–4-toothed; awn geniculate or straight, its position varying from near base to near apex, usually inconspicuous, up to twice length of lemma but occasionally reduced to a subapical mucro or absent; palea 2/3 as long to subequaling lemma. Stamens usually 3, rarely 2 or 1.

About 200 species: temperate regions throughout the world, also on tropical mountains; 34 species (15 endemic) in China.

The genera *Agrostis*, *Calamagrostis*, and *Deyeuxia* form an intergrading complex of three incompletely separated entities. The majority of species can be placed without difficulty, but there is a number of troublesome intermediates, and no character combinations provide a definitive way of distinguishing the genera. *Agrostis*, with small spikelets and short callus hairs, has always been maintained separately, while *Deyeuxia* is sometimes maintained and sometimes sunk into *Calamagrostis*. However, the boundary between *Agrostis* and *Calamagrostis* is just as ill-defined as that between *Calamagrostis* and *Deyeuxia*. For this reason, three separate genera are maintained here, which complies with the usual practice in Chinese floras and avoids the need for many new combinations.

The taxonomy of this group is complicated by the presence of a number of apomictic complexes and frequent hybridization. Many infraspecific taxa have been described in an attempt to order this variation. However, intermediates are to be expected in an actively evolving group such as this, and most of these infraspecific taxa have not been enumerated separately here.

- 1a. Lemma awnless; panicle open.
  - 2a. Callus hairs 2/3 as long as lemma or more; culms up to 120 cm; panicle 15–30 cm.
    - 3a. Spikelets 2–3 mm; lemma 1.5–2.5 mm; callus hairs equaling or subequaling lemma ..... 1. *D. diffusa*
    - 3b. Spikelets 3–4.2 mm; lemma 3–4 mm; callus hairs 2/3–4/5 as long as lemma ..... 2. *D. flaccida*
  - 2b. Callus hairs not more than 1/2 as long as lemma; culms up to 60 cm; panicle 6–12 cm.
    - 4a. Spikelets 3–3.7 mm; rachilla 1.5–2.5 mm; anthers ca. 2 mm ..... 3. *D. yanyuanensis*
    - 4b. Spikelets 2–2.5 mm; rachilla ca. 0.6 mm; anthers ca. 0.5 mm.
      - 5a. Spikelets 1.9–2.5(–3) mm; glumes slightly shorter than floret; callus hairs less than 1 mm, not visible between glumes; leaf sheaths smooth ..... 4. *D. petelotii*
      - 5b. Spikelets 2.5–3.5 mm; glumes equaling or longer than floret; callus hairs 1.2–2 mm, visible between glumes; leaf sheaths scabrid ..... 5. *D. abnormis*
- 1b. Lemma awned; panicle open or contracted.
  - 6a. Callus hairs less than 1/2 as long as lemma.
    - 7a. Awn arising near or above middle of lemma.
      - 8a. Spikelets with 2 florets ..... 6. *D. himalaica*
      - 8b. Spikelets with 1 floret.
        - 9a. Plant with slender, elongate, creeping rhizomes.
          - 10a. Awn 1–2.5(–6) mm, arising from upper 1/3 of lemma or above; glumes scabrid ..... 7. *D. pulchella*
          - 10b. Awn 5–6 mm, arising from middle of lemma; glumes smooth or scabrid only on keel ..... 8. *D. rosea*
        - 9b. Plant tufted or shortly rhizomatous.
          - 11a. Panicle contracted, branches straight, scabrid; lower glume ciliolate on margins; anthers 2–3 mm ..... 9. *D. scabrescens*
          - 11b. Panicle open, branches capillary, curving, smooth; lower glume not ciliolate on margins; anthers ca. 1 mm ..... 10. *D. nytingchiensis*
      - 7b. Awn arising from below middle of lemma.
        - 12a. Panicle loosely contracted to dense, sometimes spikelike.
          - 13a. Anthers 0.5–1.2 mm; culms 1–2-noded ..... 11. *D. nivicola*
          - 13b. Anthers 2–3 mm; culms (2–)3–5-noded.
            - 14a. Glumes membranous, shining ..... 25. *D. anthoxanthoides*
            - 14b. Glumes not shining.
              - 15a. Leaf blades involute, filiform; spikelets 4–5.5 mm ..... 12. *D. mazzettii*
              - 15b. Leaf blades flat, stiff; spikelets 5–7 mm ..... 14. *D. korotkyi*
          - 12b. Panicle open with spreading branches, (5–)15–35 cm wide.
            - 16a. Callus hairs less than 1/5 length of lemma; ligule 0.5–2(–4) mm.
              - 17a. Plant ca. 65 cm tall; panicle 5–9(–16) cm; spikelets with 1(–2) florets ..... 15. *D. suizanensis*
              - 17b. Plant 80–120 cm tall; panicle 20–35 cm; spikelets with 1 floret ..... 16. *D. effusiflora*
            - 16b. Callus hairs 1/5–2/5 length of lemma; ligule 2.5–20 mm.
              - 18a. Lemma apex erose; anthers (1.3–)2–3 mm ..... 17. *D. pyramidalis*
              - 18b. Lemma apex with 0.5–1.5 mm mucros; anthers 0.5–1.2 mm ..... 13. *D. flavens*
          - 6b. Callus hairs 1/2 as long as lemma or longer.
            - 19a. Panicle open or slightly contracted.

- 20a. Panicle branches usually paired; glumes smooth, scabrid on keel only; ligule 1–1.5 mm ..... 18. *D. hakonensis*  
 20b. Panicle branches fascicled; glumes scabrid; ligule 3–20 mm.
- 21a. Awn sub-basal ..... 19. *D. sinelatior*  
 21b. Awn arising near or above middle of lemma.
- 22a. Culms (4–)6–8-noded, usually branched ..... 20. *D. purpurea*  
 22b. Culms 2–4-noded, unbranched.
- 23a. Lemma awned from near middle; awn ca. 1.2 mm, not exserted from spikelets ..... 21. *D. sichuanensis*  
 23b. Lemma awned from near apex; awn 3–6 mm, exserted from spikelet ..... 22. *D. nepalensis*
- 19b. Panicle dense, often spikelike.
- 24a. Awn geniculate with twisted column, conspicuously exceeding glumes.
- 25a. Culm densely pubescent below panicle; panicle branches pubescent ..... 26. *D. tibetica*  
 25b. Culms scabrid below panicle; panicle branches scabrid.
- 26a. Anthers 1.5–2 mm; spikelets 4–6 mm, purple ..... 27. *D. tianschanica*  
 26b. Anthers 2–4 mm; spikelets 5–9 mm, yellowish brown, purplish at base ..... 28. *D. holciformis*
- 24b. Awn slender, straight, slightly curved or indistinctly twisted in lower part, included within glumes (exserted in *D. moupinensis*).
- 27a. Lemma apex deeply 2-lobed; awn arising from between lobes; ligule ca. 0.5 mm ..... 29. *D. moupinensis*  
 27b. Lemma apex denticulate or minutely 4-toothed; ligule 1.5–7 mm.
- 28a. Anthers ca. 0.5 mm; culms 15–45 cm tall ..... 30. *D. debilis*  
 28b. Anthers 1.5–2.2 mm.
- 29a. Awn arising from lower 1/3 of lemma or slightly above.
- 30a. Awn poorly developed, 1–2 mm; spikelets 3–4 mm ..... 23. *D. neglecta*  
 30b. Awn 3–6 mm; spikelets 4–7 mm.
- 31a. Panicle 10–25 cm; glumes subequal ..... 24. *D. lapponica*  
 31b. Panicle 5–8 cm; glumes unequal ..... 31. *D. zangxiensis*
- 29b. Awn sub-basal.
- 32a. Callus hairs equal to or slightly longer than lemma ..... 32. *D. conferta*  
 32b. Callus hairs 1/2–4/5 as long as lemma.
- 33a. Leaf sheaths scabrid; spikelets purple with bronze at apex ..... 33. *D. kokonorica*  
 33b. Leaf sheaths smooth; spikelets yellowish green or pinkish ..... 34. *D. macilenta*

**1. Deyeuxia diffusa** Keng, Sunyatsenia 6(2): 94. 1941.

散穗野青茅 san sui ye qing mao

*Calamagrostis diffusa* (Keng) P. C. Keng, Bull. Bot. Res., Harbin 4(3): 195. 1984.

Perennial, very loosely tufted, stoloniferous; stolons long, slender. Culms slender, decumbent, 30–80 cm tall, 1–2 mm in diam., 4–6-noded. Leaf blades flat or inrolled, 10–20 cm, 1–3 mm wide; ligule 1.5–3 mm, toothed. Panicle loose, open, 15–30 × 5–15 cm; branches paired or in whorls, up to 15 cm, very slender, flexuous, bare below middle, di- or trichotomously branched above, smooth, branchlets and pedicels capillary, drooping. Spikelets 2–3 mm, brownish purple; glumes unequal, lower glume narrowly lanceolate, 2–2.5 mm, apex acuminate, upper glume broadly lanceolate, 1.5–2 mm, apex obtuse; callus hairs equal to or slightly shorter than lemma; lemma 1.5–2.5 mm, apex obtuse or emarginate, awnless; palea 1/2–2/3 as long as lemma; rachilla ca. 0.5 mm, including hairs up to 1–1.5 mm. Anthers ca. 0.5 mm. Caryopsis oblong, ca. 1.5 mm. Fl. and fr. summer and autumn.  $2n = 28^*$ .

• Grassy slopes, among shrubs, on wasteland; 1900–3800 m. Guizhou, Sichuan, Yunnan.

The name “*Deyeuxia agrostoides* L. Liou” (Vasc. Pl. Hengduan Mts. 2: 2240. 1994) belongs here, but was not validly published because no Latin description was provided.

**2. Deyeuxia flaccida** (P. C. Keng) Keng ex S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 223. 1987.

柔弱野青茅 rou ruo ye qing mao

*Calamagrostis flaccida* Keng ex P. C. Keng, Bull. Bot. Res., Harbin 4(3): 195. 1984.

Perennial, very loosely tufted. Culms slender, weakly ascending, 60–120 cm tall, 1–2 mm in diam., 4–6-noded. Leaf sheaths scabrid; leaf blades flat, thin, 5–20 cm, 1–4 mm wide, glabrous, apex acuminate; ligule 1–4 mm, usually tattered. Panicle loose, open, soft, 15–20 × 8–14 cm; branches in whorls of 2–5, up to 10 cm, slender, flexuous, bare below middle, di- or trichotomously branched above, smooth, branchlets and pedicels capillary, drooping. Spikelets 3–4.2 mm, gray-green or purplish at apex; glumes lanceolate, lower glume 3–4 mm, 1-veined, scabrid along vein, apex acute, upper glume 2.5–3.5 mm, 3-veined with lateral veins obsolete, midvein smooth, apex obtuse; callus hairs 2/3–3/4 length of lemma; lemma 3–4 mm, awnless; palea 1/2–2/3 as long as lemma; rachilla ca. 0.8 mm, including hairs up to 1.5–2 mm. Anthers 0.5–0.7 mm. Caryopsis brown, fusiform, ca. 2 mm. Fl. and fr. Jul–Aug.

• Bamboo forests, roadsides on moist ground; 2000–2600 m. Sichuan, Yunnan.

**3. Deyeuxia yanyuanensis** (J. L. Yang) L. Liu, Vasc. Pl. Hengduan Mts. 2: 2241. 1994.

盐源野青茅 yan yuan ye qing mao

*Calamagrostis yanyuanensis* J. L. Yang, Acta Bot. Yunnan. 5: 48. 1983.

Perennial, loosely tufted. Culms slender, erect, 40–60 cm, ca. 1 mm in diam., 2- or 3-noded. Leaf sheaths scabrid; leaf blades involute, 5–9.5 cm, ca. 1.5 mm wide, scabrid; ligule oblong, ca. 3 mm. Panicle lanceolate, rather loose, 6–11 × 2–3 cm; branches ascending, lowermost whorled, ca. 2.5 cm, capillary, smooth. Spikelets 3–3.7 mm, yellowish; glumes lanceolate, subequal, smooth, apex acute; callus hairs 1/7–1/5 length of lemma; lemma 2.7–3.5 mm, apex obtuse, awnless or with a very small apical mucro; palea 2/3–3/4 as long as lemma; rachilla 1.5–2.5 mm, including hairs 2–3 mm. Anthers ca. 2 mm.

• Woodlands; 2600 m. Sichuan.

This species is known only from the type.

**4. Deyeuxia petelotii** (Hitchcock) S. M. Phillips & Wen L. Chen, Novon 13: 319. 2003.

异颖草 yi ying cao

*Aulacolepis petelotii* Hitchcock, J. Wash. Acad. Sci. 24: 291. 1934; *Agrostis continentalis* Handel-Mazzetti; *A. petelotii* (Hitchcock) Noltie; *Anisachne gracilis* Keng; *A. gracilis* var. *multinodis* Y. Y. Qian; *Aniselytron gracilis* (Keng) N. X. Zhao; *A. petelotii* (Hitchcock) Soják; *Calamagrostis petelotii* (Hitchcock) Govaerts; *Deyeuxia continentalis* (Handel-Mazzetti) L. Liu; *Neaulacolepis petelotii* (Hitchcock) Rauschert.

Perennial, densely tufted, old basal sheaths fibrous. Culms slender, erect or geniculate at base, 11–25 cm tall, 2–4-noded. Leaf sheaths smooth; leaf blades linear to filiform, flat or involute, 2–10 cm, 0.5–4 mm wide, scabrid, apex acute; ligule 0.5–2 mm, truncate to lacerate. Panicle narrowly pyramidal, lax, 6–16 cm; branches ascending, lowest in whorls of 2–6, 3–8 cm, capillary, scabrid, bare below middle, secondary branches usually short. Spikelets 2–3 mm, pale green or tinged purple; glumes lanceolate, shorter than floret, 1.8–2.3 mm, lower glume 1-veined, upper glume 1–3-veined, keel scabrid, apex subacute; callus hairs ca. 0.5 mm; lemma as long as spikelet, apex acute or midvein exserted into ca. 0.2 mm mucro; palea 2/3–3/4 as long as lemma; rachilla penicillate, including hairs 0.9–2 mm. Anthers 0.5–0.8 mm. Fl. Jul. 2n = 28\*.

Grassy places on sandy acid soils; 1400–3000 m. Guizhou, Yunnan [Bhutan, NE India, N Vietnam].

The type of *Anisachne gracilis* var. *multinodis* has not been seen.

**5. Deyeuxia abnormis** J. D. Hooker, Fl. Brit. India 7: 268. 1896 ["1897"].

不育野青茅 bu yu ye qing mao

*Agrostis nagensis* Bor; *Calamagrostis abnormis* (J. D. Hooker) U. Shukla; *Deyeuxia nagensis* (Bor) Veldkamp.

Perennial, loosely tufted. Culms laxly ascending from a decumbent base, often scrambling, 30–90 cm tall, 4–10-noded,

sometimes branched. Leaf sheaths scabrid; leaf blades linear, flat, 9–12 cm, 2–5 mm wide, apex acute; ligule 1–2 mm, truncate. Panicle effuse, 8–30 cm; branches loosely spreading, secondary and tertiary branches well developed. Spikelets 2.5–3.5 mm, green or purplish; glumes lanceolate, equaling or slightly exceeding floret, lower glume 2.6–3.4 mm, upper glume 2.5–3.1 mm, keel scabrid above middle, apex acuminate; callus hairs 1/3–1/2 length of lemma; lemma slightly shorter than or subequaling glumes, apex narrowly obtuse, awnless; palea 2/3 as long as lemma; rachilla penicillate, including hairs 1.8–2.6 mm. Anthers ca. 0.5 mm. Fl. and fr. Nov.

Grassy and stony places in uplands; ca. 1900 m. Yunnan [Bhutan, NE India].

This grass lies on the boundary between *Agrostis* and *Deyeuxia*. It has an open panicle of small spikelets as in *Agrostis*, but a bearded callus and rachilla extension as in *Deyeuxia*. It is sometimes known as *A. zenkeri* Trinius (*Calamagrostis zenkeri* (Trinius) Davidse; *D. zenkeri* (Trinius) Veldkamp), a name which probably applies only to a grass from S India. *Deyeuxia abnormis* is very similar to *D. petelotii*, with which it is often confused, but is more robust with a laxer, spreading habit and a larger, more branched panicle. Other differences are given in the key.

**6. Deyeuxia himalaica** L. Liu ex Wen L. Chen, Acta Phytotax. Sin. 39: 447. 2001.

喜马拉雅野青茅 xi ma la ya ye qing mao

Perennial, subdensely tufted, rhizomatous; rhizomes elongate, slender. Culms erect, 15–60 cm tall, 2–3 mm in diam., smooth, (2–)3–4-noded. Leaf sheaths smooth or slightly scabrid; leaf blades flat or involute, 9–20 cm, 2–5 mm wide, cm, slightly scabrid, apex long-acuminate; ligule 2–4 mm, toothed. Panicle loosely contracted, lanceolate-oblong in outline, 6–17 × 3–6 cm; branches in whorls of 3–5, ascending, 3.5–8 cm, slightly scabrid. Spikelets 5–6.5 mm, dark purple, florets (1–)2, upper floret slightly smaller; glumes subequal, 1-veined, slightly scabrid, lower glume broadly lanceolate, apex acute or slightly obtuse, upper glume lanceolate, apex acuminate; callus hairs 1/4–1/3 length of lemma; lower lemma 4–5 mm, upper lemma 3–3.5 mm, upper part purplish and scabrid, margins white, membranous, apex 4-toothed; awn arising from upper 1/5–2/5 of lemma, 8–10 mm, geniculate; palea 2/3 as long as lemma; rachilla internode between florets and extension above upper floret ca. 1 mm, pilose with hairs 0.8–1.5 mm. Anthers 2–2.5 mm. Fl. Sep.

• Alpine meadows, under alpine shrubs; 3900–4000 m. Xizang.

This species is unusual in *Deyeuxia* in that most spikelets have 2 florets. However, spikelets with 2 florets do occur sporadically in other normally 1-flowered species. The rachilla is also well developed, so possibly this species represents a primitive state within the genus. The spikelets are otherwise typical of *Deyeuxia*.

**7. Deyeuxia pulchella** J. D. Hooker, Fl. Brit. India 7: 268. 1896 ["1897"].

小丽茅 xiao li mao

*Calamagrostis pulchella* Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 78. 1868, not Reichenbach (1830); *C. lahulensis* Singh; *C. megalantha* (Keng ex P. C. Keng) P. C. Keng; *Deyeuxia gyirongensis* P. C. Kuo & S. L.

Lu; *D. megalantha* Keng ex P. C. Keng; *D. pulchella* var. *laxa* P. C. Kuo & S. L. Lu.

Perennial, densely tufted, rhizomatous; rhizomes elongate, slender. Culms erect, 10–40 cm tall, 1–1.5 mm in diam., scabrid below panicle, 2–3-noded. Leaf sheaths scabrid; leaf blades flat or involute when dry, 2–13 cm, 1–4 mm wide, scabrid, apex acute; ligule 2–4 mm, lacerate. Panicle dense, spikelike, lanceolate-oblong in outline, or sometimes laxer, 3–7(–13) × 0.8–1.5(–5) cm; branches 1–5 cm, scabrid. Spikelets 3–5(–6) mm, dark purple; glumes lanceolate, subequal or lower glume slightly shorter than upper, lower glume 1-veined, upper glume 3-veined, scabrid, apex acuminate; callus hairs ca. 1/3 length of lemma; lemma 3–4.5 mm, papery, hyaline at margins and apex, sometimes scabrid; apex irregularly 4-toothed; awn arising from upper 1/3 of lemma back or above, 1–2.5(–6) mm, straight or slightly curved; palea ca. 2/3 as long as lemma; rachilla conspicuously penicillate, 1.5–2 mm, including hairs up to 5 mm. Anthers 1.4–2.3 mm. Fl. Jul–Aug.

Alpine meadows, in woodlands, among bushes; 2700–5200 m. Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, Nepal].

This is a polymorphic species, varying especially in the compactness of the panicle and the length and position of the awn on the lemma back. Looser-panicked forms (var. *laxa*) are somewhat intermediate with *Deyeuxia scabrescens*. These two species are closely related, and hybridization is possibly occurring.

The spikelets in the type of *Deyeuxia megalantha* are enlarged due to nematode infection.

#### 8. *Deyeuxia rosea* Bor, Kew Bull. [9] 1954: 498. 1954.

玫红野青茅 mei hong ye qing mao

*Calamagrostis borii* Tzvelev.

Perennial, tufted, rhizomatous; rhizomes elongate, slender. Culms erect, 25–35 cm tall, smooth, 2–3-noded. Leaf sheaths smooth or scabrid at base; leaf blades flat, 4–8 cm, 3–4.5 mm wide, scabrid; ligule 3–7 mm. Panicle dense, spikelike, narrowly oblong in outline, 6–9 × 1.5–2 cm; branches erect, appressed, scabrid. Spikelets 4.5–6(–7) mm, rose or purplish red; glumes lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, smooth or scabrid only along keel, apex sharply acuminate; callus hairs 1/3–1/2 length of lemma; lemma 4–5 mm, membranous, upper part scabrid, apex obtuse or denticulate; awn arising from or a little below middle of lemma, straight or slightly geniculate, 5–6 mm; palea ca. 3/4 as long as lemma; rachilla conspicuously penicillate, 1.5–2 mm, including hairs 4–5 mm. Anthers 2–2.5 mm. Fl. and fr. Jul–Sep.

- Alpine meadows, grassy mountainsides; 3500–5000 m. W Sichuan, Xizang.

This species is very close to *Deyeuxia pulchella*, but has a more compact panicle and an awn arising lower down the lemma back.

#### 9. *Deyeuxia scabrescens* (Grisebach) Munro ex Duthie in E. T. Atkinson, Himalayan Districts N.W. Prov. India, 628. 1882.

糙野青茅 cao ye qing mao

*Calamagrostis scabrescens* Grisebach, Nachr. Königl. Ges.

Wiss. Georg-Augusts-Univ. 3: 79. 1868; *C. scabrescens* var. *humilis* Grisebach; *Deyeuxia scabrescens* var. *humilis* (Grisebach) J. D. Hooker; *D. sikangensis* Keng.

Perennial, tufted, shortly rhizomatous. Culms erect, 60–150 cm tall, 1–4 mm in diam., scabrid or almost smooth below panicle, 2–4-noded. Leaf sheaths smooth or scabrid; leaf blades erect, convolute or flat, stiff, 10–45 cm, 2–8 mm wide, scabrid; ligule 2–6 mm, obtuse. Panicle loosely contracted, narrowly lanceolate in outline, 6–25 × 1.5–4 cm; branches several per node, erect or ascending, scabrid; pedicels very scabrid. Spikelets 4–6 mm, yellowish green or purple; glumes oblong-lanceolate, subequal or lower glume slightly longer than upper, densely scabrid, lower glume ciliolate along margin, 1-veined, upper glume 3-veined at base, apex sharply acuminate; callus hairs ca. 1/3 lemma length; lemma 3.5–5 mm, scabrid, apex denticulate; awn arising from or above middle of lemma, 5–9 mm, weakly geniculate; palea 2/3–3/4 as long as lemma; rachilla conspicuously penicillate, 1.5–2 mm, including hairs 3–4 mm. Anthers 2–3 mm. Fl. and fr. Jul–Oct.

Grassy slopes, among shrubs, in woods; 2000–4600 m. Gansu, Hubei, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Myanmar, Nepal, Pakistan].

This is one of the more common species of *Deyeuxia* in China, occurring mainly at higher altitudes in the southwest. *Deyeuxia pyramidalis* is a closely related species with a similarly robust habit, but this occurs mainly at lower altitudes in eastern and northern areas. *Deyeuxia scabrescens* is very variable, but recognizable by its very scabrid panicle and spikelets, conspicuously penicillate rachilla, but short callus hairs, and awn arising from the upper part of the lemma back.

*Deyeuxia scabrescens* intergrades with *D. pulchella*, and intermediates occur causing problems for identification. *Deyeuxia scabrescens* var. *humilis* is based on a short plant with an almost straight awn, which is probably an introgression product of these two species.

The name “*Deyeuxia dispar* L. Liou” (Vasc. Pl. Hengduan Mts. 2: 2237. 1994) belongs here, but was not validly published because no Latin description was provided. The specimen indicated as the holotype has some enlarged spikelets, typical of nematode infection.

#### 10. *Deyeuxia nyngchiensis* P. C. Kuo & S. L. Lu, Fl. Xizang. 5: 221. 1987.

林芝野青茅 lin zhi ye qing mao

Perennial, tufted. Culms erect, 50–80 cm tall, 2–3-noded. Leaf sheaths smooth or scabrid; leaf blades flat or involute, 10–15 cm, 1–3 mm wide, scabrid; ligule 4–5 mm. Panicle open, ovate in outline, 7–12 × 5–8 cm; branches in whorls of 3–6, curving, spreading or ascending, 2–8 cm, smooth or scabrid, lower 1/2–2/3 bare; pedicels curved, slightly scabrid. Spikelets 5–7 mm, purple; glumes narrowly lanceolate, subequal or lower glume slightly longer than upper, lower glume 1-veined, upper glume 3-veined, scabrid, apex acuminate; callus hairs ca. 1/3 length of lemma; lemma ca. 3 mm, apex 4-toothed; awn arising from upper 1/4–1/3 of lemma, straight, ca. 4 mm; palea ca. 2/3 as long as lemma; rachilla 1–1.5 mm, including hairs 3.5–4 mm. Anthers ca. 1 mm. Fl. Aug.

- Grassy mountainsides, among alpine shrubs; 3500–4700 m. Sichuan, Xizang.

Specimens from Xizang are sometimes confused with *Deyeuxia*

*pulchella* or *D. scabrescens*, but can be distinguished by the laxer panicle with curving branches and by the narrower glumes.

**11. Deyeuxia nivicola** J. D. Hooker, Fl. Brit. India 7: 267. 1896 ["1897"].

微药野青茅 wei yao ye qing mao

*Calamagrostis nivicola* (J. D. Hooker) Handel-Mazzetti; *Deyeuxia levipes* Keng.

Perennial, tufted, rhizomatous; rhizomes slender, spreading. Culms erect or ascending, very slender, up to 20 cm tall, 0.5–1 mm in diam., smooth, 1–2-noded. Leaf sheaths tight, smooth; leaf blades flat or involute, 1–10 cm, 1–3 mm wide, adaxial surface scabrid, apex acute; ligule 1–3 mm, entire or irregularly denticulate. Panicle contracted, spikelike, linear to narrowly oblong in outline, 1.5–8 × 0.3–1 cm; branches 1–2 cm, erect, smooth. Spikelets 4–7 mm, purple or green tinged purple; glumes narrowly lanceolate, lower glume slightly longer than upper, both 1-veined, smooth or slightly scabrid along vein, apex acuminate; callus hairs 1/5–1/4 length of lemma; lemma 3–4.5 mm, herbaceous, scabrid above middle, apex distinctly 4-toothed, lateral veins shortly excurrent; awn sub-basal, 5–7 mm, geniculate; palea 2/3–3/4 as long as lemma; rachilla 2–3.5 mm, including hairs 3–4 mm. Anthers 0.5–1.2 mm. Fl. and fr. Aug–Sep.  $2n = 28^*$ .

Grassy and stony mountain slopes; 3000–5000 m. Qinghai, Sichuan, Xizang, Yunnan [Bhutan, India (Sikkim), Nepal].

See the comment on dimorphic anthers under *Deyeuxia flavens* (species no. 13).

**12. Deyeuxia mazzettii** Veldkamp, Gard. Bull. Singapore 37: 222. 1985 ["1984," as "mazzettii"].

会理野青茅 hui li ye qing mao

*Calamagrostis stenophylla* Handel-Mazzetti, Symb. Sin. 7: 1298. 1936; *Deyeuxia grata* Keng; *D. stenophylla* (Handel-Mazzetti) P. C. Kuo & S. L. Lu (1987), not Jansen (1952).

Perennial, tufted. Culms erect, 20–60 cm tall, ca. 1 mm in diam., 3–5-noded. Leaf sheaths smooth; leaf blades filiform, involute, 10–20 cm, ca. 0.5 mm wide, both surfaces smooth, margins scabrid, apex subacute; ligule 1–3 mm, truncate or lacerate. Panicle loosely contracted, broadly lanceolate, 6–14 × 2–5 cm; branches whorled, 2–4 cm, smooth, lower 1/3–1/2 bare. Spikelets 4–5.5 mm, greenish or purple; glumes lanceolate, subequal or lower glume slightly longer than upper, margins broadly membranous, smooth, lower glume 1-veined, upper glume 3-veined, apex acuminate; callus hairs 1/5–1/4 length of lemma; lemma 3.8–4.8 mm, scabrid, apex minutely 2-toothed or erose; awn sub-basal, long exserted, 8–10 mm, geniculate; palea 2/3–3/4 length of lemma; rachilla 1.5–2 mm, including hairs up to 3.5 mm. Anthers 2–2.5 mm. Fl. Jul–Aug.

- Alpine meadows, shrubby and grassy mountainsides, montane woodlands, sometimes dominant; 2200–3800 m. Sichuan, Yunnan.

The name "*Deyeuxia stenophylla* var. *muliensis* L. Liou" (Vasc. Pl. Hengduan Mts. 2: 2236. 1994) belongs here, but was not validly published because no Latin description was provided.

The name *Deyeuxia grata* was applied to specimens of this species with some spikelets with 2 florets.

*Deyeuxia filipes* Keng (*Calamagrostis filipes* (Keng) P. C. Kuo & S. L. Lu ex J. L. Yang) may be based on a hybrid between *D. mazzettii* and *D. flavens*.

**13. Deyeuxia flavens** Keng, Sunyatsenia 6: 67. 1941.

黄花野青茅 huang hua ye qing mao

*Calamagrostis longiflora* P. C. Keng; *C. venusta* (Keng) Tzvelev; *Deyeuxia longiflora* (P. C. Keng) B. S. Sun & Y. H. Wang; *D. venusta* Keng.

Perennial, loosely tufted. Culms erect or geniculate at base, slender, (12)–30–60 cm tall, 1–2 mm in diam., glabrous, 2–3-noded. Leaf sheaths smooth; leaf blades flat, 3–12 cm, 2–5 mm wide, scabrid; ligule 2.5–6 mm, toothed. Panicle open, very loose, 4–15 × 2–12 cm; branches usually paired, rarely in whorls of 3–4, distant, ascending or widely spreading, scabrid, lower 1/2 bare. Spikelets 3–7 mm, yellowish brown or purple; glumes ovate-lanceolate, lower glume slightly longer than upper, 1-veined or obscurely 3-veined, scabrid, apex acuminate; callus hairs 1/4–1/3 length of lemma; lemma 3.5–5 mm, equaling or slightly shorter or longer than glumes, lateral and intermediate veins prolonged into 0.5–1.5 mm mucros with the outermost mucros longest; awn sub-basal, 5–6 mm, geniculate with twisted column; palea ca. 2/3 as long as lemma; rachilla 0.5–1 mm, including hairs up to ca. 2.5 mm. Anthers dimorphic, 0.5–0.6 mm when ovary sterile, 1–1.2 mm when ovary fertile. Fl. and fr. Aug–Sep.  $2n = 28^*$ .

- Alpine meadows, grassy slopes, open woodlands or shrublands, especially along river banks; 2700–4500 m. Gansu, Qinghai, Sichuan, Xizang, Yunnan.

*Deyeuxia flavens* is close to *Agrostis triaristata* (J. D. Hooker) Bor (*D. triaristata* J. D. Hooker; *Calamagrostis tripilifera* J. D. Hooker) from Bhutan and India (Sikkim), but that species has smooth panicle branches, a smaller floret, more pronounced mucros at the lemma apex, and a minute rachilla extension. *Deyeuxia flavens* lies on the boundary between *Agrostis* and *Deyeuxia* because of the short callus hairs but penicillate rachilla extension. Dimorphic anthers are also known in other species from the Himalayas, e.g., *D. mazzettii*, *D. nivicola*, and *D. nytingchiensis*.

**14. Deyeuxia korotkyi** (Litvinov) S. M. Phillips & Wen L. Chen, Novon 13: 321. 2003.

兴安野青茅 xing an ye qing mao

*Calamagrostis korotkyi* Litvinov, Schedae Herb. Fl. Ross. 55: no. 2750. 1918; *C. korotkyi* subsp. *turczaninowii* (Litvinov) Tzvelev; *C. turczaninowii* Litvinov; *Deyeuxia turczaninowii* (Litvinov) Y. L. Chang ex S. L. Lu.

Perennial, tufted. Culms erect, 30–80 cm tall, 1.5–3 mm in diam., 2–3-noded. Leaf sheaths smooth, rarely puberulous; leaf blades grayish green, flat, stiff, (4)–10–20 cm, 4–11 mm wide, both surfaces smooth, margins scabrid, apex finely acuminate; ligule 3–5 mm, truncate. Panicle dense, spikelike, 3–15 × 1–1.5 cm; branches in whorls of 3–5, appressed to rachis, 1–2 cm, scabrid. Spikelets 5–7 mm, yellowish green or purplish; glumes

lanceolate, subequal or lower glume ca. 1 mm longer than upper, lower glume 1-veined, upper glume 3-veined, smooth or scabrid only along midvein, apex acuminate; callus hairs ca. 1/3 length of lemma, sparse, unequal; lemma 4–5 mm, firmly membranous, apex denticulate; awn sub-basal, 7–11 mm, well exserted from spikelet, geniculate with twisted column; palea subequal to or slightly shorter than lemma; rachilla 1.5–2 mm, including hairs 2.5–4 mm. Anthers ca. 3 mm. Fl. Aug.

Grassy slopes, dry woodlands; 300–2500 m. N Heilongjiang, N Nei Mongol, NW Xinjiang [Mongolia, E Russia].

*Deyeuxia turczaninowii* var. *nenjiangensis* S. L. Lu (Acta Biol. Plateau Sin. 2: 19. 1984) has been described from N Heilongjiang and Nei Mongol. It may be the hybrid *D. korotkyi* × *Calamagrostis epigeios*. It differs from typical *D. korotkyi* by its looser panicle, narrower glumes, and longer callus hairs ca. 3/4 as long as the lemma. It is intermediate between the putative parents in these characters.

**15. *Deyeuxia suizanensis* (Hayata) Ohwi, J. Jap. Bot. 33: 211. 1958.**

水山野青茅 shui shan ye qing mao

*Agrostis suizanensis* Hayata, Icon. Pl. Formosan. 7: 83. 1918; *Calamagrostis filifolia* Merrill; *C. suizanensis* (Hayata) Honda; *Deyeuxia biflora* Keng; *D. chaseana* Bor; *D. stenophylla* Jansen (1952), not (Handel-Mazzetti) P. C. Kuo & S. L. Lu (1987).

Perennial, densely tufted. Culms slender, erect, up to 65 cm tall, 2–3-noded, retrorsely puberulent below nodes. Leaf sheaths glabrous or retrorsely puberulent toward base; leaf blades filiform, stiff, strongly involute, 6–8(–15) cm, 3–5 mm wide, apex acute; ligule 0.75–2.5 mm, minutely erose. Panicle contracted, narrowly oblong in outline, 5–16 × 0.6–1 cm, axis scaberulous; lowest branches in groups of 2–3(–4), 2.5–5 cm. Spikelets 4–5.5(–6) mm, florets (1–)2, upper floret slightly smaller and bisexual or sometimes rudimentary; glumes lanceolate, slightly unequal with upper glume as long as spikelet, lower glume 1-veined, upper glume 1–3-veined, midvein scabrid, apex acuminate; callus hairs 1/8–1/5 length of lemma; lemma 3.5–4.6(–5.5) mm, scaberulous, apex usually erose; awn arising from lower 1/4–1/3 of lemma, 5–8 mm, geniculate; palea 3/4–7/8 as long as lemma; rachilla 1.6–3 mm including hairs. Anthers 1–2 mm.

Montane grasslands; ca. 3000 m. Taiwan [New Guinea, Philippines].

Specimens from Malesia tend to have longer leaf blades and ligules and a shorter rachilla extension. They have been referred to different varieties from the typical variety in Taiwan: var. *stenophylla* (Jansen) Veldkamp in the Philippines and var. *chaseana* (Bor) Veldkamp in New Guinea. Cleistogamous forms with anthers ca. 0.5 mm are known from the Philippines. The name *Deyeuxia biflora* applies to an aberrant form with a well-developed second floret.

**16. *Deyeuxia effusiflora* Rendle, J. Linn. Soc., Bot. 36: 392. 1904.**

疏穗野青茅 shu sui ye qing mao

*Calamagrostis effusiflora* (Rendle) P. C. Kuo & S. L. Lu ex J. L. Yang; *Deyeuxia arundinacea* P. Beauvois var. *laxiflora*

(Rendle) P. C. Kuo & S. L. Lu; *D. sylvatica* (Schrader) Kunth var. *laxiflora* Rendle.

Perennial, densely tufted. Culms erect, 80–120 cm tall, 3–5 mm in diam., pubescent just below panicle and on nodes, 2–4-noded. Leaf sheaths with minute retrorse hairs between veins; leaf blades flat or slightly involute, 30–70 cm, 5–10 mm wide, adaxial surface densely pubescent, abaxial surface scabrid; ligule 1–2(–4) mm, truncate or obtuse. Panicle large, open, 20–35 × 15–23 cm; branches in whorls of 3–5, spreading, scabrid, lower part bare. Spikelets 3–4.5 mm, grayish green or purple at base; glumes lanceolate, equal, lower glume 1-veined, upper glume 3-veined, scabrid; callus hairs 1/7–1/5 length of lemma; lemma slightly shorter than glumes, apex 4-toothed; awn sub-basal, 4–5.5 mm, weakly geniculate, column slightly twisted; palea subequal to lemma; rachilla 0.5–0.7 mm, including hairs 2–3 mm. Anthers 1.5–2 mm. Fl. and fr. Jul–Oct.

• Wet places, especially river banks; 600–2900 m. Gansu, Guizhou, Henan, Ningxia, Shaanxi, Sichuan, Yunnan, Zhejiang.

*Deyeuxia arundinacea* var. *laxiflora* is not taxonomically a variety of *D. arundinacea*, which is a different grass; see the comment under *D. pyramidalis* below.

**17. *Deyeuxia pyramidalis* (Host) Veldkamp, Blumea 37: 230. 1992.**

野青茅 ye qing mao

*Calamagrostis pyramidalis* Host, Icon. Descr. Gram. Austriac. 4: 28, 1809; *Agrostis arundinacea* Linnaeus; *Arundo sylvatica* Schrader, nom. illeg. superfl.; *C. arisanensis* Honda; *C. arundinacea* (Linnaeus) Roth; *C. arundinacea* var. *brachytricha* (Steudel) Hackel; *C. arundinacea* var. *ciliata* Honda; *C. arundinacea* var. *hirsuta* Hackel; *C. arundinacea* var. *latifolia* (Rendle) Kitagawa; *C. arundinacea* var. *robusta* (Franchet & Savatier) Honda; *C. arundinacea* var. *sciurooides* (Franchet & Savatier) Hackel; *C. austrojeholensis* Honda; *C. brachytricha* Steudel; *C. brachytricha* var. *ciliata* (Honda) Y. Ibaragi & H. Ohashi; *C. collina* Franchet; *C. formosana* Hayata; *C. matsudana* Honda; *C. morrisonensis* Hayata; *C. niitakayamensis* Honda; *C. nipponica* Franchet & Savatier; *C. robusta* Franchet & Savatier; *C. sciurooides* Franchet & Savatier, nom. hom. illeg.; *Deyeuxia ampla* Keng; *D. brachytricha* (Steudel) Chang; *D. collina* (Franchet) Pilger; *D. formosana* (Hayata) C. C. Hsu; *D. henryi* Rendle; *D. hupehensis* Rendle; *D. matsudana* (Honda) Keng; *D. sylvatica* Kunth, nom. illeg. superfl.

Perennial, tufted, sometimes shortly rhizomatous. Culms erect, slender or robust, (40)–100–150 cm tall, 2.5–5 mm in diam., 2–3-noded. Leaf sheaths glabrous to densely pubescent, or sheath-collar pilose; leaf blades flat or involute, 5–60 cm, 2–12 mm wide, smooth, scabrid or pubescent; ligule 4–13 mm, obtuse or lacerate. Panicle contracted to slightly open, lanceolate-ovate in outline, 6–35 × 1–10 cm; branches in whorls, ascending, erect or appressed, 1–2 cm; pedicels scabrid. Spikelets 3–5(–6.5) mm, yellowish green or purplish green; glumes lanceolate, subequal or lower glume slightly longer than upper, 1–3-veined, scabrid, apex acute; callus hairs 1/5–2/5 length of lemma; lemma 3.8–6.5 mm, subequal to glumes, scabrid, apex erose; awn arising from ca. lower 1/5 of lemma, 7–12 mm, geniculate with twisted column; palea as long as or slightly

shorter than lemma; rachilla (0.5–)1.5–2 mm, including hairs 2.5–4 mm. Anthers (1.3–)2–3 mm. Fl. and fr. Jun–Oct.

Grassy slopes, open woods; 100–4200 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Heilongjiang, Hubei, Hunan, Jilin, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Japan, Kashmir, Korea, Pakistan, Russia; Europe].

This is a highly polymorphic complex, with many local variants.

The name *Deyeuxia sylvatica* Kunth, based on *Arundo sylvatica* Schrader (1806), is illegitimate because Schrader cited *Agrostis arundinacea* Linnaeus (1753) in synonymy. Varietal combinations under *D. sylvatica* should be transferred to *D. pyramidalis* if it is wished to maintain them (*D. sylvatica* var. *borealis* Rendle, var. *brachytricha* (Steudel) Rendle, var. *hirsuta* (Hackel) Rendle, var. *latifolia* Rendle, var. *ligulata* Rendle, and var. *sciuroides* (Franchet & Savatier) Rendle).

The name *Deyeuxia arundinacea* P. Beauvois is often presumed to be based on *Agrostis arundinacea* Linnaeus, but this is not the case. In fact, *D. arundinacea* is a synonym of the Mediterranean grass *Amphelodesmos mauritanicus* (Poiret) T. Durand & Schinz. Varietal combinations under *D. arundinacea* should be transferred to *D. pyramidalis* if it is wished to maintain them (*D. arundinacea* var. *borealis* (Rendle) P. C. Kuo & S. L. Lu, var. *brachytricha* (Steudel) P. C. Kuo & S. L. Lu, var. *ciliata* (Honda) P. C. Kuo & S. L. Lu, var. *hirsuta* (Hackel) P. C. Kuo & S. L. Lu, var. *latifolia* (Rendle) P. C. Kuo & S. L. Lu, var. *ligulata* (Rendle) P. C. Kuo & S. L. Lu, var. *robusta* (Franchet & Savatier) P. C. Kuo & S. L. Lu, and var. *sciuroides* (Franchet & Savatier) P. C. Kuo & S. L. Lu).

The name “*Calamagrostis zhongdianensis* L. Liou” (Vasc. Pl. Hengduan Mts. 2: 2235. 1994) belongs here, but was not validly published because no Latin description was provided.

#### 18. *Deyeuxia hakonensis* (Franchet & Savatier) Keng, Sinen-sia 11: 411. 1940.

箱根野青茅 xiang gen ye qing mao

*Calamagrostis hakonensis* Franchet & Savatier, Enum. Pl. Jap. 2: 599. 1879.

Perennial, subloosely tufted from a short, knotty rhizome. Culms slender, erect or base geniculate, 30–70 cm tall, 0.5–1 mm in diam., 2–4-noded. Leaf sheaths glabrous or with caducous retrorse hairs between veins, margins ciliate, mouth auriculate, auricles shortly pilose; leaf blades flat or involute, 10–25 cm, 2–8 mm wide, adaxial surface pubescent, abaxial surface glabrous, apex acute; ligule 1–1.5 mm, obtuse or truncate. Panicle open or slightly contracted, 6–15 × 1–4 cm; branches 2(–3) per node, scabrid, usually bare below middle. Spikelets 3.5–6 mm, yellowish green or purplish; glumes lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, flanks smooth, slightly glossy, midvein scabrid, apex subacute; callus hairs 3/4–4/5 length of lemma; lemma 3–4 mm, conspicuously scabrid-hirtellous, apex obtuse or denticulate; awn sub-basal, 2–4 mm, straight, included within spikelet; palea subequal to lemma; rachilla 1–1.5 mm, including hairs 2.5–3 mm. Anthers 1.5–2 mm. Fl. Jul–Aug.

Forests, streamsides, shady valleys; 600–2500 m. Anhui, Guangdong, Guizhou, Hebei, Hubei, Jiangxi, Sichuan, Zhejiang [Japan, Russia (Kamchatka, Kuril Islands, Sakhalin)].

#### 19. *Deyeuxia sinelatior* Keng, Fl. Tsinling. 1(1): 441. 1976.

华高野青茅 hua gao ye qing mao

*Calamagrostis sinelatior* (Keng) P. C. Kuo & S. L. Lu ex J. L. Yang.

Perennial, densely tufted. Culms erect, 1.3–1.8 m tall, 2–5 mm in diam., scabrid below panicle, otherwise smooth, 3–5-noded. Leaf sheaths smooth or rarely scabrid; leaf blades linear, 10–60 cm, 8–12 mm wide, adaxial surface puberulous, abaxial surface scabrid; ligule oblong-elliptic, 4–20 mm, apex lacerate. Panicle open, 22–35 × 6–18 cm; branches in whorls of 3–5, spreading or ascending, scabrid, lower 1/4–1/2 bare. Spikelets 4–6 mm, yellowish or purplish green; glumes subequal or upper glume shorter than lower, lower glume 1-veined, scabrid along vein, apex acuminate, upper glume 3-veined, scabrid along upper part of veins, apex obtuse; callus hairs 2/3–3/4 length of lemma; lemma 3.5–4 mm, apex obtuse, denticulate; awn sub-basal, ca. 5 mm, geniculate with twisted column; palea subequal to or slightly shorter than lemma; rachilla ca. 1 mm, including hairs up to 4 mm. Anthers ca. 2 mm. Fl. Aug–Sep.

- Forests, forest margins; 1000–3200 m. Henan, Shaanxi, Sichuan.

#### 20. *Deyeuxia purpurea* (Trinius) Kunth, Révis. Gramin. 1: 77. 1829.

大叶章 da ye zhang

*Arundo purpurea* Trinius in Sprengel, Neue Entdeck. Pflanzenk. 2: 52. 1820 [“1821”]; *A. langsdorffii* Link; *Calamagrostis angustifolia* Komarov; *C. langsdorffii* (Link) Trinius; *C. langsdorffii* var. *angustifolia* (Komarov) Jaroschenko; *C. langsdorffii* subsp. *angustifolia* (Komarov) Voroshilov; *C. langsdorffii* var. *manshurica* (Baranov & Skvortzov) Kitagawa; *C. manshurica* Baranov & Skvortzov; *C. purpurea* (Trinius) Trinius; *C. purpurea* subsp. *langsdorffii* (Link) Tzvelev; *Deyeuxia angustifolia* (Komarov) Y. L. Chang (1959), not Vickery (1940); *D. langsdorffii* (Link) Kunth.

Perennial, tufted, rhizomatous; rhizomes short or elongate. Culms erect, slender to stout, up to 1.5 m tall, 1–4 mm in diam., usually branched, (4–)6–8-noded. Leaf sheaths smooth, glabrous; leaf blades linear, flat, 10–30 cm, 4–20(–40) mm wide, scabrid; ligule oblong-elliptic, 3–10 mm, obtuse or lacerate. Panicle loosely contracted, narrowly elliptic in outline, 5–20 × 2.5–8 cm; branches slender, ascending or spreading, 2–8 cm, scabrid, bare below middle. Spikelets 3.5–5 mm, yellowish green, purplish, or yellowish brown; glumes lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, scabrid, ciliolate along midvein, apex acute or acuminate; callus hairs equaling or slightly longer than lemma; lemma 3–4 mm, membranous, apex 2-denticulate; awn arising near or above middle of lemma, 1–4 mm, slender, straight; palea 1/2–2/3 as long as lemma; rachilla 0.5–1 mm, including hairs 2–4 mm. Anthers 2–2.5 mm. Fl. Jul–Sep.

Moist meadows, grassy slopes, woodlands; below 100–3600 m. Hebei, Heilongjiang, Hubei, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Xinjiang [Japan, Korea, Mongolia, Russia; Europe, North America].

*Deyeuxia purpurea* encompasses a widespread, apomictic complex of morphologically very variable and intergrading forms. These have been treated by different authors either as separate species, or at subspecific or varietal rank within *D. purpurea*. Most are based on types from outside China, and no attempt is made here to relate these names to variation in the complex within China.

The name *Calamagrostis angustifolia* refers to a particularly narrow-leaved form (blades 1.5–3.5 mm wide) from NE China.

**21. *Deyeuxia sichuanensis* (J. L. Yang) S. M. Phillips & Wen L. Chen, Novon 13: 320. 2003.**

四川野青茅 si chuan ye qing mao

*Calamagrostis sichuanensis* J. L. Yang, Acta Bot. Yunnan. 5: 47. 1983.

Perennial, rhizomatous; rhizomes slender. Culms up to 80 cm tall, 2–3 mm in diam., unbranched, 2–3-noded. Leaf sheaths smooth; leaf blades flat, 11–25 cm, 4–5 mm wide, adaxial surface smooth, abaxial surface scabrid; ligule 3–4 mm, truncate. Panicle open or lightly contracted, 11–22 × 1–6 cm; branches in whorls of 3–4, slender, flexuous, almost smooth, often bare below middle; pedicels scabrid. Spikelets 3.5–4 mm, yellowish green, tinged purple; glumes lanceolate, the upper slightly shorter than the lower, scabrid, apex acute; callus hairs about as long as lemma; lemma 2.5–2.8 mm, scabrid, apex 2-denticulate; awn arising from near middle of lemma, not exserted from spikelet, ca. 1.2 mm, straight; palea ca. 2/3 as long as lemma; rachilla ca. 0.8 mm, including hairs ca. 2.3 mm. Anthers ca. 1 mm.

- Woodland margins, among shrubs; 2800–4300 m. Gansu, Sichuan.

**22. *Deyeuxia nepalensis* Bor, Kew Bull. [12] 1957: 411. 1958.**

顶芒野青茅 ding mang ye qing mao

*Calamagrostis staintonii* G. Singh.

Perennial, loosely tufted, shortly rhizomatous. Culms 50–90 cm tall, 2–3 mm in diam., smooth, unbranched, 3–4-noded. Leaf sheaths smooth; leaf blades usually involute, ca. 25 cm, 2–5 mm wide, both surfaces glabrous, smooth or sometimes scabrid on margin; ligule 3–5(–7) mm, obtuse or subacute. Panicle open, 10–18 × ca. 12 cm; branches ascending or spreading, lowermost whorled, 4–8 cm, smooth, bare below middle. Spikelets 3.5–4.5 mm, greenish or yellowish green tipped with purple; glumes lanceolate, lower glume 1-veined, upper glume 3-veined, scabrid, apex acute or abruptly acuminate; callus hairs about as long as lemma; lemma 2.5–3 mm, scabrid, apex 4-toothed; awn arising from upper 1/5–1/4 of lemma, well exserted from spikelet, 3–6 mm, very slightly bent; palea ca. 2/3 as long as lemma; rachilla 1–1.5 mm, including hairs 2.5–3 mm. Anthers ca. 2 mm. Fl. Jul–Aug.

Dry slopes; 3100–3500 m. Sichuan, Yunnan [Nepal].

*Calamagrostis staintonii* is the correct name for this species in *Calamagrostis* because the heterotypic name *C. nepalensis* Nees ex Steudel already exists.

**23. *Deyeuxia neglecta* (Ehrhart) Kunth, Révis. Gramin. 1: 76. 1829.**

小花野青茅 xiao hua ye qing mao

*Arundo neglecta* Ehrhart, Beitr. Naturk. 6: 137. 1791; *Calamagrostis micrantha* Kearney; *C. neglecta* (Ehrhart) Gaertner; *Deyeuxia micrantha* (Kearney) L. Liu.

Perennial, tufted. Culms erect, 60–100 cm tall, 1–3 mm in diam., smooth or slightly scabrid below panicle, usually 2–3-noded. Leaf sheaths smooth, glabrous; leaf blades flat or involute, 10–30(–60) cm, 1–5 mm wide, adaxial surface scabrid with obvious veins, abaxial surface smooth; ligule 1.5–4 mm, obtuse or truncate, denticulate. Panicle dense, interrupted, lanceolate to narrowly ovate in outline, 5–20 × 2–4 cm, axis smooth or scabrid; branches short, fascicled, scabrid. Spikelets 3–4(–4.5) mm, pale green to purplish brown; glumes narrowly ovate, subequal, lower glume 1-veined, upper glume 3-veined, prominently scabrid throughout, apex acute; callus hairs 2/3–3/4 length of lemma; lemma 2.5–3.5 mm, apex obtuse, denticulate; awn arising near or below middle of lemma, poorly developed, 1–2 mm, straight; palea 2/3 as long as lemma; rachilla ca. 2 mm, including hairs up to 3.5 mm. Anthers ca. 2 mm. Fl. and fr. Aug–Sep. 2n = 42\*.

Grassy places in forests, damp ground near ditches; 1200–4300 m. Gansu, Hebei, Heilongjiang, Liaoning, Nei Mongol, Shanxi, Sichuan, Xinjiang [Japan, Kyrgyzstan, Mongolia, Russia, Tajikistan; Europe, North America].

This is a widespread, highly polymorphic species, to which the name *Deyeuxia kashmeriana* Bor has been misapplied (by Liou, Vasc. Pl. Hengduan Mts. 2: 2241. 1994). *Deyeuxia kashmeriana* is a synonym of *Calamagrostis decora* J. D. Hooker from Kashmir, which has slightly larger spikelets and a longer, sub-basal awn.

**24. *Deyeuxia lapponica* (Wahlenberg) Kunth, Révis. Gramin. 1: 76. 1829.**

欧野青茅 ou ye qing mao

*Arundo lapponica* Wahlenberg, Fl. Lapp. 27. 1812; *Calamagrostis lapponica* (Wahlenberg) Hartman.

Perennial, loosely tufted, shortly rhizomatous. Culms erect from a geniculate base, 60–130 cm tall, 2–3 mm in diam., smooth, 3-noded. Leaf sheaths smooth; leaf blades flat or involute, 10–30 cm, 2–6 mm wide, adaxial surface loosely pubescent, abaxial surface scabrid; ligule 2–4(–6) mm, lacerate. Panicle loosely contracted, (5–)10–25 × 2–3(–8) cm; branches erect or ascending, 1–3(–4) cm, scabrid, lower 1/3 bare. Spikelets 4–6 mm, purplish brown or yellowish green; glumes ovate-lanceolate, subequal, 4–5 mm, lower glume 1-veined, upper glume 3-veined, scabrid on upper back and veins, apex acuminate; callus hairs 3/4–4/5 length of lemma; lemma 3–4(–5) mm, apex denticulate; awn arising from lower 1/3 of lemma, ca. 3 mm, weakly geniculate, slightly twisted; palea 2/3 as long as lemma; rachilla 1–1.5 mm, including hairs 3–4 mm. Anthers ca. 2 mm. Fl. Jul–Aug.

Grassy slopes, forests, among shrubs, especially along river banks; 400–4100 m. Gansu, Heilongjiang, Nei Mongol, Sichuan, Xinjiang, Xizang [Mongolia, Korea, Russia; Europe, North America].

**25. *Deyeuxia anthoxanthoides* Munro ex J. D. Hooker in Henderson & Hume, Lahore to Farkand, 339–340, pl. opp. p. 340. 1873.**

短毛野青茅 duan mao ye qing mao

*Calamagrostis anthoxanthoides* (Munro) Regel; *Stilpno-phleum anthoxanthoides* (Munro) Nevski.

Perennial, subloosely tufted, shortly rhizomatous. Culms erect, 10–35 cm, 2–3-noded. Leaf sheaths smooth or slightly scabrid; leaf blades flat, 3–8(–15) cm, 2–5 mm wide, scabrid or almost smooth, apex acuminate; ligule 4–6 mm. Panicle very dense, spikelike, broadly oblong to ovate in outline, 2–6 × 1.2–2 cm, light brownish purple becoming golden; branches abbreviated, spikelets crowded close to main axis. Spikelets narrowly lanceolate, 5–7 mm, shining; glumes lanceolate, subequal, ca. 1/3 longer than lemma, membranous, smooth, 1-veined, apex finely acuminate; callus hairs 1/6–1/3 length of lemma; lemma 4–6 mm, ca. 2/3 length of glumes, hyaline, apex 4-denticulate; awn sub-basal, 6–9 mm, geniculate; palea as long as lemma; rachilla 1–1.5 mm, including hairs 2–2.5 mm. Anthers 2–2.5 mm. Fl. and fr. Jun–Jul.

Rocky hillsides, screes, moraines; 3100–4500 m. Xinjiang, Xizang [NE Afghanistan, Tajikistan, Uzbekistan].

The typical subspecies is described above. A second subspecies, *Calamagrostis anthoxanthoides* subsp. *laguroides* (Regel) Tzvelev (which name has never been transferred to *Deyeuxia*), occurs in Tajikstan. It is distinguished by a somewhat laxer, paler panicle and a lemma less than 2/3 as long as the glumes.

**26. *Deyeuxia tibetica* Bor, Kew Bull. [4] 1949: 66. 1949.**

藏野青茅 zang ye qing mao

Perennial, loosely tufted, rhizomatous; rhizomes elongate, slender. Culms erect or decumbent, (5–)10–20 cm tall, ca. 1 mm in diam., densely pubescent below panicle, 1–2-noded. Leaf sheaths scabrid, tight on tillers, inflated on culm; leaf blades involute, rarely flat, 0.5–8 cm, 1.5–2.5 mm wide, scabrid, apex obtuse; ligule 2–4 mm, hirtellous, lacerate. Panicle very dense, spikelike, broadly oblong to ovate in outline, 1–2.5 × 1–1.5 cm, axis densely pubescent; branches abbreviated. Spikelets 4.5–6 mm, purple or brownish purple; glumes lanceolate, subequal, thin, margins subhyaline, dorsally densely villous to scabrid-hirtellous or subglabrous, lower glume 1-veined, upper glume 3-veined, apex acute to apiculate; callus hairs ca. 3/4 length of lemma; lemma ca. 4 mm, apex 4-denticulate; awn sub-basal, 5–8 mm, geniculate with twisted column; palea subequal to lemma; rachilla 2–3 mm, including hairs 4–5 mm. Anthers 2–2.5 mm. Fl and fr. Jul–Aug.

Alpine meadows, grassy slopes, wet sandy or gravelly places in montane regions; 3000–5500 m. Qinghai, Xizang [India].

This species occurs at higher altitudes than any other species of *Deyeuxia* in China.

- 1a. Glumes densely villous ..... 26a. var. *tibetica*
- 1b. Glumes scabrid-hirtellous to subglabrous ..... 26b. var. *przevalskyi*

**26a. *Deyeuxia tibetica* var. *tibetica***

藏野青茅(原变种) zang ye qing mao (yuan bian zhong)

*Calamagrostis tibetica* (Bor) Tzvelev.

Glumes densely villous.

Alpine meadows, grassy slopes, wet sandy or gravelly places; 3000–5500 m. Qinghai, Xizang [India].

**26b. *Deyeuxia tibetica* var. *przevalskyi* (Tzvelev) P. C. Kuo & S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 212. 1987.**

矮野青茅 ai ye qing mao

*Calamagrostis przewalskyi* Tzvelev, Rast. Tsentr. Azii 4: 85. 1968.

Glumes scabrid-hirtellous to subglabrous.

- Alpine meadows, wet sandy places; 3000–5000 m. Qinghai, Xizang.

**27. *Deyeuxia tianschanica* (Ruprecht) Bor, Kew Bull. [4] 1949: 66. 1949.**

天山野青茅 tian shan ye qing mao

*Calamagrostis tianschanica* Ruprecht, Sert. Tianschan. 34. 1869.

Perennial, loosely tufted, rhizomatous; rhizomes slender, spreading. Culms erect, 15–50 cm tall, 1–2 mm in diam., scabrid below panicle, 2–3-noded. Leaf sheaths smooth or scabrid, slightly inflated; leaf blades flat with involute margins, 4–10 cm, 2–3 mm wide, adaxial surface scabrid with numerous short spinules, apex acute; ligule 3–4 mm, lacerate. Panicle contracted, spikelike, dense or branches distinct, 3–8 × 1–1.5 cm; branches 1–2 cm, scabrid. Spikelets 4–6 mm, purple; callus hairs 1/3–1/2 length of lemma; glumes narrowly lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, scabrid, apex acuminate; lemma 3–4.5 mm, apex 4-denticulate; awn arising from lower 1/4 of lemma, 5–6 mm, geniculate with twisted column; palea slightly shorter than lemma; rachilla ca. 2 mm, including hairs up to 3.5 mm. Anthers 1.5–2 mm. Fl. Jul–Sep.

Stony mountain slopes and alpine meadows, especially along riversides; 1000–5200 m. Gansu, Qinghai, Xinjiang [Kyrgyzstan, Tajikistan (Pamirs)].

This species is close to the variable *Deyeuxia holciformis*, but the different upper leaf surface provides a definite distinguishing character.

**28. *Deyeuxia holciformis* (Jaubert & Spach) Bor, Grasses Burma, Ceylon, India, Pakistan, 398. 1960.**

青藏野青茅 qing zang ye qing mao

*Calamagrostis holciformis* Jaubert & Spach, Ill. Pl. Orient. 4: 61. 1851; *C. compacta* (Munro ex J. D. Hooker) Hackel ex Paulsen; *Deyeuxia compacta* Munro ex J. D. Hooker.

Perennial, loosely tufted, rhizomatous; rhizomes slender, spreading. Culms erect, 15–30 cm tall, 1–3 mm in diam., scabrid below panicle, 2–3-noded. Leaf sheaths scabrid, culm sheaths loose, subinflated; leaf blades involute, rarely flat, stiff, glaucous, 2–5(–12) cm, 2–7 mm wide, adaxial surface scabrid with fairly long setiform spinules, apex acute; ligule 1–4 mm, lacerate. Panicle spikelike, oblong-ovate in outline, dense, sometimes lobed, 1.5–6(–10) × 1–1.5 cm; branches 1–2 cm, scabrid. Spikelets 5–9 mm, yellowish brown, purplish at base; glumes narrowly to broadly lanceolate, subequal, lower glume 1–

veined, upper glume 3-veined, scaberulous, apex acute to acuminate; callus hairs ca. 1/2 length of lemma; lemma 4–6 mm, scabrid, apex 4-denticulate; awn sub-basal, 5–7 mm, weakly geniculate, lower part slightly twisted; palea 2/3 as long to equaling lemma; rachilla 1.5–2.5 mm, including hairs 3–4.5 mm. Anthers 2–4 mm. Fl. and fr. Aug–Sep.

Grassy slopes and wet sandy places in montane regions; 3800–4500 m. Gansu, Qinghai (Yushu), Xizang [Kashmir, Kyrgyzstan (W Tien Shan), Tajikistan (Pamirs)].

*Deyeuxia compacta*, with a small panicle and unusually broad glumes, represents an extreme form of this variable species.

**29. *Deyeuxia moupinensis* (Franchet) Pilger, Bot. Jahrb. Syst. 29: 225. 1901 ["1900"].**

宝兴野青茅 bao xing ye qing mao

*Calamagrostis moupinensis* Franchet, Nouv. Arch. Mus. Hist. Nat., ser. 2, 2: 106. 1888.

Perennial, loosely tufted, shortly rhizomatous. Culms erect, 40–70 cm tall, 2–3 mm in diam., 3–4-noded. Leaf sheaths retrorsely pubescent or glabrous; leaf blades flat or involute, 10–25 cm, 2–6 mm wide, both surfaces scabrid; ligule ca. 0.5 mm, truncate. Panicle contracted or slightly loose, base usually included in terminal leaf sheath, 8–14 × 1.5–3 cm; branches in whorls of 2–5, very slender, densely spiculate, erect or narrowly ascending. Spikelets 3.5–4 mm, yellowish green or purplish; glumes narrowly lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, scabrid, apex acute; callus hairs as long as lemma; lemma ca. 3 mm, apex bidentate or 2-lobed to awn insertion; awn arising below apex or between lobes, 5–6 mm, slender, almost straight, much exceeding spikelet; palea 2/3 as long as lemma; rachilla ca. 0.5 mm, sparsely penicillate, 2.5–3.5 mm including hairs. Anthers ca. 1.2 mm. Fl. Aug–Sep. 2n = 28\*.

• Grassy places in montane forests; 1300–2600 m. Sichuan.

**30. *Deyeuxia debilis* (J. D. Hooker) Veldkamp, Gard. Bull. Singapore 37: 220. 1985 ["1984"].**

细弱野青茅 xi ruo ye qing mao

*Calamagrostis debilis* J. D. Hooker, Fl. Brit. India 7: 262. 1896 ["1897"]; *Agrostis debilis* (J. D. Hooker) Bor (1960), not Poiret (1810); *A. neodebilis* Bennet & Raizada.

Perennial, rhizomatous; rhizome very slender. Culms loosely tufted, very slender, ascending, 15–45 cm, ca. 1 mm in diam., 2–3-noded, sparsely leafy. Leaf sheaths scaberulous near blade, otherwise smooth; leaf blades narrowly linear, thin, 2–5 cm, 1.5–2 mm wide, smooth, apex acute; ligule 1.5–2 mm, truncate-lacerate. Panicle narrow, loosely contracted, 2.5–12.5 × 1–2 cm; branches in whorls of 2–5, narrowly ascending to suberect, up to 3 cm, smooth; pedicels capillary. Spikelets 3–4 mm, light brownish purple to grayish; glumes subequal, lanceolate, 1-veined, smooth on keel, apex acuminate; callus hairs equal to or exceeding lemma; lemma 2.2–2.8 mm, hyaline, smooth, apex minutely toothed; awn arising from upper 1/4–1/3 of lemma back, weakly geniculate, 4.5–5 mm; palea slightly

shorter than lemma; rachilla extension absent. Anthers ca. 0.5 mm.

Alpine meadows; 3300–3400 m. Xizang [India (Sikkim)].

This is a very seldom collected species with a delicate habit and exceptionally small anthers. Its generic position is anomalous, as it lies on the boundaries with both *Agrostis* (small spikelets, no rachilla extension) and *Calamagrostis* (long callus hairs, hyaline lemma). It is retained here in *Deyeuxia* because of its relatively long floret in relation to the glumes and its general similarity to other slender montane species of *Deyeuxia*.

**31. *Deyeuxia zangxiensis* P. C. Kuo & S. L. Lu, Fl. Xizang. 5: 228. 1987.**

藏西野青茅 zang xi ye qing mao

Perennial, tufted, shortly rhizomatous. Culms erect, 15–30 cm tall, ca. 1.5 mm in diam., 2-noded. Leaf sheaths glabrous; leaf blades usually involute, stiff, 4–10 cm, 1–3 mm wide, both surfaces scabrid; ligule 5–7 mm, lanceolate, acute or lacerate. Panicle dense, spikelike, 5–8 × ca. 1 cm; branches fascicled, short, scabrid. Spikelets 6–7 mm, purple; glumes narrowly lanceolate, lower glume 6–7 mm, 1-veined, upper glume 5–6 mm, 3-veined, keel scabrid, apex acuminate; callus hairs equal to or slightly shorter than lemma; lemma 4–5 mm, awned, apex shortly toothed; awn arising from lower 1/3 of lemma back, 5–6 mm, slender, straight or slightly curved; palea 3/4 as long as lemma; rachilla ca. 0.5 mm, loosely penicillate, up to 4 mm including hairs. Anthers ca. 2 mm. Fl. Jul–Aug.

• Alpine meadows, especially along river banks; 3200–4600 m. Gansu, W Xizang.

**32. *Deyeuxia conferta* Keng, Sunyatsenia 6: 68. 1941.**

密穗野青茅 mi sui ye qing mao

*Calamagrostis conferta* (Keng) P. C. Kuo & S. L. Lu.

Perennial, loosely tufted. Culms erect, 60–120 cm tall, 2–3 mm in diam., 2–3-noded. Leaf sheaths smooth or scabrid at base; leaf blades involute or flat, 10–45 cm, 3–6 mm wide, both surfaces scabrid or abaxial surface smooth; ligule 4–6 mm, lacerate. Panicle dense, spikelike, rarely interrupted at base, 9–20 × 1–3 cm; branches 1–3 cm, scabrid. Spikelets 4–6(–7) mm, yellowish green or purplish; glumes narrowly lanceolate, subequal or upper glume slightly shorter than lower, lower glume 1-veined, upper glume 3-veined, scabrid along veins, apex acuminate; callus hairs equal to or slightly longer than lemma; lemma 3.5–4(–5) mm, apex 2-lobed or denticulate; awn sub-basal, 2.5–4 mm, straight; palea ca. 2/3 as long as lemma; rachilla ca. 0.5 mm, including hairs up to 3 mm. Anthers 1.5–2.2 mm. Fl. and fr. Jul–Sep.

• Light shade in woodlands, forming colonies, wet sandy places along rivers; 3000–3500 m. Gansu, Nei Mongol, Qinghai, Shaanxi.

*Deyeuxia conferta* var. *guoxuniana* N. X. Zhao & M. F. Li (Acta Bot. Yunnan. 16: 230. 1994), described from Xizang, does not agree well with this species, and is perhaps of hybrid origin. It has not been possible to see the type specimen.

**33. Deyeuxia kokonorica** (Keng ex Tzvelev) S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 216. 1987.

*Calamagrostis kokonorica* Keng ex Tzvelev, Rast. Tsentr. Azii 4: 84. 1968.

青海野青茅 qing hai ye qing mao

Perennial, loosely tufted. Culms erect, 10–40 cm tall, 1–1.5 mm in diam., usually 2–3-noded. Leaf sheaths scabrid; leaf blades flat or involute, 3–10(–12) cm, (0.5)–1.5–4 mm wide, adaxial surface and margins scabrid, abaxial surface smooth; ligule 1–3 mm, obtuse, denticulate. Panicle contracted, spike-like, narrowly oblong in outline, 2–6.5 × 0.6–1 cm; branches short, erect, scabrid. Spikelets 3–5 mm, purple, bronze at apex; glumes broadly lanceolate, subequal, lower glume 1-veined, upper glume 3-veined, scabrid or minutely hispid, apex acute; callus hairs laterally 2/3–4/5 length of lemma, much shorter at lemma back; lemma 2.5–3.5 mm, scabrid or minutely hispid above middle, apex denticulate; awn sub-basal, 2–3 mm, erect or slightly curved, lower part slightly twisted; palea slightly shorter than lemma, purple along keels; rachilla ca. 1.5 mm, including hairs 2.5–3.5 mm. Anthers ca. 2 mm. Fl. Aug–Sep.

• Alpine meadows, especially lakeside banks; 3000–4500 m. Gansu, Qinghai.

**34. Deyeuxia macilenta** (Grisebach) Keng ex S. L. Lu, Fl. Reipubl. Popularis Sin. 9(3): 215. 1987.

瘦野青茅 shou ye qing mao

*Calamagrostis varia* P. Beauvois var. *macilenta* Grisebach in Ledebour, Fl. Ross. 4: 427. 1852; *C. macilenta* (Grisebach) Litvinov.

Perennial, shortly rhizomatous, mat-forming. Culms erect, 15–60 cm tall, ca. 1.5 mm in diam., usually 3-noded. Leaf sheaths smooth, usually purplish at base; leaf blades flat or involute, stiff, 5–15 cm, 2–4(–7) mm wide, adaxial surface very scabrid; ligule 1.5–3 mm, triangular or irregularly dentate. Panicle narrowly spikelike, dense, 6–9 × 0.8–1.5 cm; branches short, fascicled, scabrid. Spikelets 4–5 mm, usually yellowish green or pinkish; glumes lanceolate, subequal, scabrid, lower glume 1-veined, upper glume 3-veined, apex acute; callus hairs 1/2 length of lemma; lemma 3–4 mm, upper part scabrid, apex obtuse or denticulate; awn sub-basal, about as long as lemma, 2.5–3 mm, weakly geniculate; palea slightly shorter than lemma; rachilla 1.5–2.2 mm, including hairs 3.5–4 mm. Anthers 2–2.2 mm. Fl. summer.

Meadows, damp sand-pebble ground; 2700–3400 m. Nei Mongol, Qinghai, Xinjiang [Mongolia, E Russia].

## 88. CALAMAGROSTIS Adanson, Fam. Pl. 2: 31, 530. 1763.

拂子茅属 fu zi mao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennials, often robust, sometimes rhizomatous. Leaf blades linear, usually flat; ligule membranous. Inflorescence a panicle, loosely contracted to dense and spikelike, often plumose, branches usually whorled, bearing numerous spikelets. Spikelets with 1 floret; rachilla disarticulating above glumes, extension beyond floret absent or small and glabrous, rarely better developed and penicillate; glumes persistent, subequal or unequal with lower longer, narrowly lanceolate, much exceeding floret, lower glume 1-veined, upper glume 3-veined at base, apex finely acuminate or subulate; floret callus conspicuously bearded, hairs much exceeding floret; lemma ca. 1/2 as long as glumes, hyaline, 3–5-veined, awned, apex erose, denticulate or deeply 2-lobed; awn very slender, straight or almost so, arising from lemma back, apex or between teeth; palea 1/2 as long to slightly shorter than lemma. Stamens usually 3, rarely 1.

About 20 species: N temperate and arctic regions; six species (one endemic) in China.

*Calamagrostis* intergrades with both *Agrostis* and *Deyeuxia*, and the number of species in the genus is very uncertain. As in *Deyeuxia*, the taxonomy is complicated by polymorphic species complexes arising from polyploidy, apomixis, and hybridization.

1a. Awn arising from lemma apex or between apical teeth.

2a. Lemma 5-veined, apex deeply 2-toothed; awn 5–9 mm, arising between teeth; stamen 1 ..... 1. *C. emodensis*

2b. Lemma 3-veined, apex entire or slightly toothed; awn 0.5–3 mm, arising from apex; stamens 3.

3a. Culms 40–150 cm; nodes (2)–3–6; panicle fairly lax, 10–30 cm ..... 2. *C. pseudophragmites*

3b. Culms 20–70 cm; nodes 2–3; panicle dense, 4–13 cm ..... 3. *C. hedinii*

1b. Awn arising from lemma back.

4a. Spikelets 7–11 mm; glumes unequal, upper 1–1.5 mm shorter than lower ..... 4. *C. macrolepis*

4b. Spikelets 3–7 mm; glumes subequal, upper less than 1 mm shorter than lower.

5a. Culms 15–45 cm; spikelets 3–4 mm; awn 4.5–5 mm ..... 30. *Deyeuxia debilis* (see p. 358)

5b. Culms 45–150 cm; spikelets 4–7 mm; awn 1.5–3 mm.

6a. Awn arising near middle of lemma back; lemma 3–3.5 mm; rachilla extension absent or glabrous if present ..... 5. *C. epigeios*

6b. Awn arising from upper 1/3 of lemma back; lemma 4–5 mm; rachilla extension present, penicillate ..... 6. *C. kengii*

**1. Calamagrostis emodensis** Grisebach, Nachr. Königl. Ges. Wiss. Georg-Augusts-Univ. 3: 80. 1868.

单蕊拂子茅 dan rui fu zi mao

*Calamagrostis garwhalensis* Hubbard & Bor.

Perennial, densely tufted, rhizomatous; rhizomes spreading. Culms erect, stout, 1–1.3 m tall, 3–4 mm in diam., smooth

or slightly scabrid below panicle. Leaf sheaths with auricle on one side; leaf blades broadly linear, flat, 25–45 cm, 5–20 mm wide, adaxial surface scabrid, abaxial surface smooth, apex finely acuminate; ligule 0.5–3 mm, truncate. Panicle loosely contracted, lanceolate in outline, 15–25 cm, nodding, plumose; branches in whorls, bare at base, slightly scabrid. Spikelets silvery-green or tinged pale purple, 5.5–8 mm; glumes linear-lanceolate, subequal or lower glume slightly longer, keel scabrid, apex subulate; callus hairs 2–3 times length of lemma; lemma ca. 1/2 as long as glumes, 2–2.7 mm, 5-veined, deeply 2-toothed by up to 1/3 its length; awn 5–9 mm, arising between teeth, straight, usually projecting beyond glumes; palea slightly shorter than lemma; rachilla extension absent or rudimentary, glabrous. Stamen 1, anther 0.7–1 mm. Fl. and fr. Aug–Sep.

Grassy slopes in montane regions; 1900–5000 m. Shaanxi, Sichuan, Xizang, Yunnan [Bhutan, N India, Kashmir, N Pakistan].

This is a well-defined species with relatively broad leaf blades, a pale, shining panicle, and a deeply toothed lemma. The floret contains a single plump anther.

**2. *Calamagrostis pseudophragmites* (A. Haller) Koeler, Descr. Gram. 106. 1802.**

假苇拂子茅 jia wei fu zi mao

*Arundo pseudophragmites* A. Haller, Arch. Bot. (Leipzig), 1(2): 11. 1797; *Calamagrostis nepalensis* Nees ex Steudel.

Perennial, tufted, rhizomatous; rhizomes spreading. Culms erect, 40–150 cm tall, 1.5–4 mm in diam., 2–6-noded, scabrid below panicle. Leaf sheaths smooth or scabrid; leaf blades flat or weakly inrolled, 10–30 cm, 2–5(–7) mm wide, adaxial surface and margins scabrid, abaxial surface smooth; ligule 4–10 mm, obtuse or lacerate. Panicle oblong-lanceolate, rather lax, 10–30 × 2–5 cm, primary branches distinct, nodding; branches in dense whorls, scabrid. Spikelets 5–9 mm, yellowish green or purple; glumes linear-lanceolate, unequal, upper glume 2/3–3/4 length of lower glume, keel scabrid, apex acuminate-subulate; callus hairs 2–3 times length of lemma; lemma about 1/2 as long as glumes, 3–4 mm, 3-veined, apex entire or 2-denticulate; awn arising just below lemma apex, 1–3 mm, scarcely projecting from glumes, straight; palea 1/2–2/3 as long as lemma. Stamens 3; anthers 1–2 mm; rachilla not extended. Fl. and fr. Jul–Sep.

Damp grassy slopes, near riversides; 300–2500 m. Gansu, Guizhou, Hubei, Nei Mongol, Qinghai, Sichuan, Xinjiang, Xizang, Yunnan and NE China [Bhutan, India (Darjeeling), Japan, Kazakhstan, Korea, Pakistan, Turkmenistan, Kyrgyzstan, Mongolia, Russia, Tajikstan, Uzbekistan; SW Asia, Europe].

**3. *Calamagrostis hedinii* Pilger in Hedin, S. Tibet, Bot. 6(3): 93. 1922.**

短芒拂子茅 duan mang fu zi mao

*Calamagrostis littorea* (Schrader) P. Beauvois var. *tartarica* J. D. Hooker; *C. pseudophragmites* (A. Haller) Koeler subsp. *tartarica* (J. D. Hooker) Tzvelev; *C. pseudophragmites* var. *tartarica* (J. D. Hooker) R. R. Stewart; *C. tartarica* (J. D. Hooker) D. F. Cui, nom. illeg. superfl.

Perennial, densely tufted, rhizomatous. Culms erect, 20–70 cm tall, 1–3 mm in diam., 2–4-noded, smooth. Leaf sheaths smooth; leaf blades often involute, 5–10(–20) cm, 1–3 mm wide, adaxial surface and margin scabrid, abaxial surface smooth; ligule 3–5 mm, apex lacerate. Panicle dense, cylindrical, 4–13 cm, slightly lobed but primary branches congested; branches scabrid. Spikelets 4.5–6.5 mm, grayish brown or purplish; glumes narrowly lanceolate, unequal, upper glume 2/3–7/8 length of lower glume, keel scabrid, apex acuminate-subulate; callus hairs equaling or longer than lemma; lemma about 1/2 as long as glumes, 2–4 mm, apex slightly denticulate; awn arising from apex, 0.5–1(–2) mm, straight, not projecting from glumes; palea 1/2 as long as lemma; rachilla not extended. Stamens 3, anthers ca. 2 mm. Fl. Aug–Sep.

Damp sandy or stony places; 700–3000 m. Qinghai, Sichuan, Xinjiang, Xizang [NW India, Kashmir, Kyrgyzstan, Pakistan, Tajikistan].

This taxon represents a small form of *Calamagrostis pseudophragmites* with a congested, usually purple panicle. It is often recognized at infraspecific rank (*C. pseudophragmites* subsp. *tartarica*), but at the specific rank the epithet “*hedini*” has priority.

**4. *Calamagrostis macrolepis* Litvinov, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 2: 125. 1921.**

大拂子茅 da fu zi mao

*Calamagrostis epigeios* (Linnaeus) Roth subsp. *macrolepis* (Litvinov) Tzvelev; *C. macrolepis* var. *rigidula* T. F. Wang.

Perennial, densely tufted, rhizomatous; rhizomes spreading. Culms erect, 90–120 cm tall, 3–4 mm in diam., 4–5-noded, scabrid below panicle. Leaf sheaths smooth; leaf blades flat or margins involute, grayish green, 15–40 cm, 5–10 mm wide, scabrid; ligule 5–12 mm, apex tattered. Panicle fairly dense, lobed, 15–25 × 3–4.5 cm; branches erect, 1–3 cm, scabrid. Spikelets 7–11 mm, greenish, purplish or yellowish green; glumes lanceolate-subulate, unequal, lower glume 7–11 mm, upper glume 1–1.5 mm shorter, keel scabrid; callus hairs 1.5 times length of lemma; lemma 3–5 mm, 3-veined, smooth or scabrid, apex slightly 2-lobed; awn arising near middle of lemma back, 3–4 mm, straight or slightly curved; palea 2/3 as long as lemma. Rachilla extension usually absent. Stamens 3, anthers 2.5–3 mm. Fl. and fr. Jul–Sep.

Grassy slopes in montane regions, sandy places near rivers, on waste ground; 100–3200 m. Hebei, Heilongjiang, Jilin, Nei Mongol, Qinghai, Shanxi, Xinjiang [SW Asia (Caucasus), Japan, Mongolia, Russia, Tajikistan].

This is an element from the *Calamagrostis epigeios* complex and is often included within that species.

**5. *Calamagrostis epigeios* (Linnaeus) Roth, Tent. Fl. Germ. 1: 34. 1788.**

拂子茅 fu zi mao

Perennial, tufted, rhizomatous; rhizomes spreading. Culms erect, 45–150 cm tall, 2–3 mm in diam., 4–7-noded, smooth or scabrid below panicle. Leaf sheaths smooth or scabrid; leaf blades flat or weakly inrolled, 15–30 cm, 4–8(–13) mm wide, adaxial surface and margins scabrid, abaxial surface smooth, apex finely acuminate; ligule 5–9 mm, oblong, lacerate. Panicle

densely contracted, linear to lanceolate in outline, spikelike or interrupted, erect, 10–30 × 1.5–4 cm; branches erect or ascending, scabrid. Spikelets (4–)5–7 mm, silvery green or tinged light purple; glumes equal or upper glume slightly shorter, linear-lanceolate, scaberulous, keel scabrid, apex acuminate; callus hairs ca. 2 times length of lemma; lemma ca. 1/2 length of glumes, 3-veined, smooth, apex shortly 2-toothed; awn arising near middle of lemma back, (1.5–)2–3 mm, straight, scarcely projecting from glumes; palea ca. 2/3 length of lemma; rachilla extension absent or rarely present, glabrous. Stamens 3, anthers ca. 1.5 mm. Fl. and fr. May–Sep.

Damp places, especially riversides; 100–3900 m. Common in China [Japan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan; SW Asia, Europe].

This is a polymorphic, polyploid complex, in which some forms have been given separate infraspecific names. However, intermediates are common and such names are of very limited use.

This species provides forage and has soil-holding qualities.

- 1a. Spikelets 5–7 mm; lemmas 3–3.5 mm; awn 2–3 mm ..... 5a. var. *epigeios*
- 1b. Spikelets 4–4.5 mm; lemmas ca. 2.5 mm; awn ca. 1.5 mm ..... 5b. var. *parviflora*

#### 5a. *Calamagrostis epigeios* var. *epigeios*

拂子茅(原变种) fu zi mao (yuan bian zhong)

*Arundo epigeios* Linnaeus, Sp. Pl. 1: 81. 1753; *Calamagrostis epigeios* var. *densiflora* Grisebach; *Calamagrostis epigeios* var. *sylvatica* T. F. Wang.

Panicle dense, interrupted, 10–30 cm. Spikelets 5–7 mm; lemma 3–3.5 mm; awn 2–3 mm; rachilla extension absent or rudimentary.

Moist ground near ditches and along riversides; 100–3900 m. Common in China [Japan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan; SW Asia, Europe].

A small, glabrous rachilla process is occasionally present (the basis of var. *sylvatica*), but this is of no taxonomic significance.

#### 5b. *Calamagrostis epigeios* var. *parviflora* Keng ex T. F. Wang, Acta Phytotax. Sin. 10: 309. 1965.

小花拂子茅 xiao hua fu zi mao

Plants dwarfish. Panicle spikelike, 6–9 cm. Spikelets 4–4.5 mm, lemma ca. 2.5 mm; awn ca. 1.5 mm.

Moist ground near ditches and along riversides. Heilongjiang, W Sichuan (alpine regions) [E Russia].

*Calamagrostis extremiorientalis* (Tzvelev) Probatova (*C. epigeios* subsp. *extremiorientalis* Tzvelev; *C. epigeios* var. *extremiorientalis* (Tzvelev) Kitagawa), from the Russian Far East and NE China, has similar dimensions to this variety, but the awn arises further up the lemma back. It has not been possible to see any authentic material.

#### 6. *Calamagrostis kengii* T. F. Wang, Acta Phytotax. Sin. 10: 312. 1965.

东北拂子茅 dong bei fu zi mao

Perennial, densely tufted. Culms 90–135 cm tall. Leaf sheaths glabrous; leaf blades linear, involute when dry, 25–35 cm, ca. 5 mm wide, adaxial surface very scabrid, abaxial surface smooth, margin scabrid; ligule 3–4(–7) mm, truncate or lacerate. Panicle lanceolate in outline, often lobed in lower half, 12–17(–22) × 1.2–1.5 cm. Spikelets 6–7 mm; glumes lanceolate-subulate, subequal, scabrid along keel, apex long acuminate; callus hairs 5.5–6.8 mm; lemma 4–5 mm, 3-veined, apex 2-toothed; awn arising from upper 1/3 of lemma back, 2.5–3 mm, straight; palea 3/4 as long as lemma; rachilla 0.5–0.8 mm, upper part or apex penicillate with a few or many long silky hairs. Fl. and fr. Jul–Aug.

• Forests, forest margins, moist places, waste ground. Heilongjiang, Jilin.

## 89. POLYPOGON Desfontaines, Fl. Atlant. 1: 66. 1798.

棒头草属 bang tou cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annual or perennial. Leaf blades linear, flat; ligule membranous. Panicle contracted to dense and spikelike, often bristly with numerous small deciduous spikelets. Spikelets with 1 floret, laterally compressed, without rachilla extension, falling entire, pedicel or upper part of it articulated and remaining attached to spikelet as a stipe; glumes equal, longer than floret, papery, scabrid, 1-veined, apex entire to 2-lobed, often with slender awn from apex; lemma about 1/2 as long as glumes, rounded, thin, smooth, shiny, obscurely 5-veined, veins usually shortly excurrent from truncate apex, awnless or with fine subapical awnlet or geniculate dorsal awn; palea 1/2 as long to equaling lemma. Stamens 1–3.

Twenty-five species: warm-temperate regions of the world and on tropical mountains, especially in damp places; six species (one endemic) in China.

*Polygong* is closely related to *Agrostis*, with which it hybridizes. It is distinguished mainly by its deciduous spikelets falling with a slender, basal stipe attached.

- 1a. Glumes awnless.
- 2a. Spikelets 1.5–2.5 mm; palea almost as long as lemma; anthers 0.5–0.7 mm ..... 1. *P. viridis*
- 2b. Spikelets 3–4 mm; palea 2/3 lemma length; anthers 1–1.5 mm ..... 2. *P. hissaricus*
- 1b. Glumes awned.
- 3a. Awn of glumes shorter than or up to 1.5 times as long as glume body.

- 4a. Panicle very dense; spikelet stalks short, the longest articulated much above their base; palea almost as long as lemma ..... 3. *P. fugax*  
 4b. Panicle lax; spikelet stalks long, all articulated only at their base; palea 2/3 lemma length ..... 4. *P. ivanovae*  
 3b. Awn of glumes 2.5–4 times as long as glume body.  
 5a. Glumes emarginate; lemma with 1.5–2 mm awn ..... 5. *P. monspeliensis*  
 5b. Glumes deeply 2-lobed; lemma awnless ..... 6. *P. maritimus*

**1. Polypogon viridis** (Gouan) Breistroffer, Bull. Soc. Bot. France 110(89 Sess. Extraord.): 56. 1966.

苔绿棒头草 tai lü bang tou cao

*Agrostis viridis* Gouan, Hortus Regius Monspeliensis: 546. 1762; *Agrostis semiverticillata* (Forsskål) C. Christensen; *Phalaris verticillata* Forsskål; *Polypogon semiverticillatus* (Forskål) Hylander.

Perennial, stoloniferous; stolons slender, spreading, rooting at nodes. Culms geniculately ascending, 20–100 cm tall. Leaf blades linear, flat, 3–12 cm, 2–8 mm wide, scaberulous on both surfaces, apex acute; ligule 2–5 mm. Panicle contracted, lanceolate to oblong, lobed and often interrupted, 5–15 cm; branches semiervicillate, ascending, bearing densely clustered spikelets. Spikelets narrowly oblong, 1.5–2.5 mm; glumes narrowly elliptic-oblong, scabrid, lightly keeled upward, apex obtuse, awnless; lemma broadly elliptic, ca. 1 mm, awnless, apex truncate, minutely denticulate; palea almost as long as lemma. Stamens 3, anthers 0.4–0.7 mm. Caryopsis oblong, ca. 1 mm.

Aquatic grass rooting in sand and mud of streams, marshy grasslands; ca. 2600 m. Yunnan [Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia, S Europe, NW India; introduced in S Africa, America, Australia].

**2. Polypogon hissaricus** (Roshevitz) Bor in K. H. Rechinger, Fl. Iran. 70: 307. 1970.

糙毛棒头草 cao mao bang tou cao

*Agrostis hissarica* Roshevitz, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 4: 93. 1923; *A. hissarica* subsp. *pamirica* (Ovczinnikov) Tzvelev; *A. pamirica* Ovczinnikov; *A. stewartii* Bor; *A. tianschanica* Pavlov.

Perennial. Culms erect or procumbent and rooting from lower nodes, 60–110 cm tall. Leaf blades linear, flat, 7–25 cm, 3–7.5 mm wide, scabrid on both surfaces, apex acute; ligule 3–6 mm. Panicle lanceolate to narrowly lanceolate, lobed, rather dense or sometimes loose, 10–20 cm; branches subverticillate, densely spinulose. Spikelets lanceolate, 3–4 mm; glumes oblong, scabrid or shortly bristly, apex acute, awnless; lemma 2–2.5 mm, apex obtuse or with deciduous awnlet up to 1.5 mm; palea 2/3 as long as lemma. Stamens 3, anthers 1–1.5 mm.

Wet meadows in river valleys; 2000–3000 m. Xinjiang [Afghanistan, SE Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan; SW Asia (NE Iran)].

**3. Polypogon fugax** Nees ex Steudel, Syn. Pl. Glumac. 1: 184. 1854.

棒头草 bang tou cao

*Nowodworskya fugax* (Nees ex Steudel) Nevski; *Polypogon demissus* Steudel; *P. higegaweri* Steudel; *P. littoralis* var. *higegaweri* (Steudel) J. D. Hooker.

Annual, tufted. Culms geniculate, sometimes trailing and rooting at lower nodes, 10–75 cm tall. Leaf blades linear or broadly linear, 2.5–15 cm, 3–10 mm wide, scabrid or adaxial surface smooth, apex acute; ligule 3–8 mm. Panicle densely cylindrical, slightly lobed, or looser and narrowly ovate, 4–15 cm, pale green or flushed purple; branches narrowly ascending, up to 4 cm, bearing densely clustered spikelets. Spikelets narrowly oblong, 2–2.5 mm; glumes narrowly oblong, puberulous, vein scabrid-aculeate, margins shortly ciliate in lower half, apex emarginate, awned from sinus; awn shorter than or up to 1.5 times as long as glume body; lemma elliptic, 1–1.2 mm, apex slightly 4-toothed, midvein extended into a fine, straight, ca. 2 mm awn; palea as long as lemma. Stamens 3, anthers ca. 0.7 mm. Caryopsis elliptic, ca. 1 mm. Fl. and fr. Apr–Sep.

Moist places, near farmlands; 100–3600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Jiangsu, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Bhutan, N India, Japan, Kazakhstan, Korea, Kyrgyzstan, Myanmar, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia; introduced elsewhere].

The names *Polypogon littoralis* Smith and *P. lutosus* (Poir.) Hitchcock have both been misapplied to this species. They are in fact synonyms of *Agropogon lutosus*.

**4. Polypogon ivanovae** Tzvelev, Rast. Tsentr. Azii 4: 72. 1968.

伊凡棒头草 yi fan bang tou cao

Perennial, forming small loose tufts. Culms geniculately ascending, 8–20 cm, scaberulous below panicle. Leaf blades linear, flat or folded, 3–20 cm × 0.8–2.5 mm wide, scabrid on both surfaces; ligule 2–4.5 mm. Panicle narrow, fairly lax, 2.5–7 cm; tinged pinkish violet; branches short, scabrid. Spikelets 2.2–2.8 mm; glumes oblong, scabrid, apex obtuse, awned, awn straight, 0.5–2 mm; lemma ovate, 1.4–1.8 mm, apex aristulate-denticulate, midvein extended into a straight or curved 2.3–3.5 mm awn; palea 2/3 lemma length. Stamens 3, anthers 0.5–0.8 mm. Fl. Jun.

• Wet valley arable land, flooded meadows; 1300–1700 m. Xinjiang (Kunlun Shan).

**5. Polypogon monspeliensis** (Linnaeus) Desfontaines, Fl. Atlant. 1: 67. 1798.

长芒棒头草 chang mang bang tou cao

*Alopecurus monspeliensis* Linnaeus, Sp. Pl. 1: 61. 1753.

Annual, tufted. Culms erect or geniculate, up to 60 cm tall. Leaf blades narrowly to broadly linear, 2–13 cm, 2–9 mm wide, adaxial surface and margins scabrid, abaxial surface smooth, apex acute; ligule 2–8 mm. Panicle narrowly oblong in outline, dense, spikelike, sometimes slightly lobed, 1–10 cm, pale green,

thickly clothed in yellow bristles. Spikelets narrowly oblong, 1.5–2.5 mm; glumes narrowly obovate-oblong, puberulous, vein scabrid-aculeate, margins ciliate, apex emarginate, apex of lobes slightly acute, awned from sinus; awn 2.5–4 times as long as glume body; lemma obovate, 1–1.2 mm, apex slightly 4-toothed, midvein extended into a fine, straight, readily deciduous, 1.5–2 mm awn; palea as long as lemma. Stamens 3, anthers ca. 0.8 mm. Caryopsis obovate-oblong, ca. 1 mm. Fl. and fr. May–Oct.

Moist places, streamsides; below 3000 m. Anhui, Fujian, Gansu, Guangdong, Hebei, Henan, Jiangsu, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N and S Africa, SW Asia (Caucasus), Europe].

This is a widely introduced weed naturalized in most warm-temperate regions.

**6. Polypogon maritimus** Willdenow, Ges. Naturf. Freunde Berlin Neue Schriften 3: 442. 1801.

裂颖棒头草 lie ying bang tou cao

Annual, tufted. Culms erect or geniculate, up to 35 cm tall. Leaf sheaths scabrid, uppermost slightly inflated; ligule 1–6 mm, apex irregularly toothed; leaf blades linear, 5–10 cm, 1–5 mm wide, both surfaces scabrid, apex acuminate. Panicle dense, spikelike, sometimes lobed, 5–7 cm, often purple tinged. Spikelets 2–3 mm, yellowish green; glumes obovate-oblong, hispid, margins ciliate, apex deeply 2-lobed, lobes obtuse, awned from sinus; awn 6–7 mm; lemma 1–1.2 mm, awnless; palea as long as lemma. Stamens 3, anthers 0.3–0.4 mm. Caryopsis obovate-oblong, 0.7–0.9 mm. Fl. and fr. Jun–Aug.

Moist grassland on mountain slopes, marshy meadows; 400–3300 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Turkmenistan, Uzbekistan; N Africa, SW Asia, Europe; introduced in North America].

## 90. CINNA Linnaeus, Sp. Pl. 1: 5. 1753.

单蕊草属 dan rui cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennials. Leaf blades flat; ligule membranous. Inflorescence an open panicle. Spikelets laterally compressed, floret 1, rachilla extension usually present, varying from minute stub to slender bristle, disarticulating below glumes; glumes equal or lower somewhat shorter, lanceolate, membranous with broad hyaline margins, 1–3-veined, apex acute; lemma herbaceous with hyaline margins, equal to or slightly shorter than glumes, keeled, 3–5-veined, awnless or with mucro or short straight awn arising below apex, apex subacute; palea as long as or slightly shorter than lemma, 1-keeled, 1-veined or 2-veined with veins very close together, keel scabrid. Stamens 1(2). Ovary oblong, styles united at base. Endosperm liquid.

Four species: temperate regions of the N hemisphere, Mexico to Peru; one species in China.

**1. Cinna latifolia** (Treviranus ex Göppert) Grisebach in Ledebour, Fl. Ross. 4: 435. 1852 ["1853"].

单蕊草 dan rui cao

*Agrostis latifolia* Treviranus ex Göppert, Beschr. Bot. Gaert. Breslau 82. 1830.

Culms solitary or loosely tufted, 0.6–1.6 m tall, 2–3 mm in diam., smooth or scabrid below nodes, 7–9-noded. Leaf sheaths scabrid; leaf blades broadly linear, 15–30 cm, 10–15 mm wide, both surfaces and margin scabrid; ligule 3–6 mm. Panicle droop-

ing, 15–40 cm; branches slender, 3–6 per node, up to 10 cm, ascending or spreading with spikelets in clusters along branchlets, scabrid. Spikelets 2.5–4 mm, green; glumes subequal, narrowly lanceolate, lower glume 1-veined, upper glume 1–3-veined; floret raised on 0.1–0.5 mm stipe; lemma oblong-lanceolate, 2.5–3.8 mm, 3(–5)-veined, scabrid; awnlet 0.2–1(–2) mm. Anthers 0.6–0.8 mm. Caryopsis ca. 2 mm. Fl. and fr. Jul–Sep. 2n = 28.

Damp places in woodlands, thickets, along riversides. Heilongjiang, Jilin [Japan, Korea, Mongolia, Russia; N Europe, North America].

## 91. CYATHOPUS Stapf, Hooker's Icon. Pl. 24: t. 2395. 1895.

杯禾属 bei he shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Perennial, tufted, scabrid throughout. Culms ascending, moderately stout, unbranched. Leaf blades linear, flat; ligule membranous. Inflorescence an open panicle; branches whorled, distant, bare in lower part; pedicels densely scabrid, apices pale, shallowly cuplike. Spikelets laterally compressed, floret 1, rachilla extension absent or almost so, disarticulating below glumes; glumes equal, lanceolate, papery, prominently 3-veined, apex cuspidate; lemma membranous, slightly shorter than glumes, weakly keeled, 5-veined, apex subacute, awnless; palea as long as lemma, 2-keeled. Stamens 3.

One species: Bhutan, China, India (Sikkim).

**1. Cyathopus sikkimensis** Stapf, Hooker's Icon. Pl. 24: t. 2395. 1895.

锡金杯禾 xi jin bei he

Culms ca. 80 cm tall, 3–4 mm in diam., scabrid, 4–5-noded, nodes dark. Leaf sheaths subequaling internodes, papery, scaberulous; leaf blades 20–35 cm, 7–7.5 mm wide, scabrid, apex acute; ligule 6–9 mm, lacerate. Panicle 23–27 cm;

branches 3–5 per node, up to 10 cm, laxly ascending, densely scabrid. Spikelets lanceolate, 2–3 mm, green; glumes as long as spikelet, scabrid on back and veins, apices exceeding floret; lemma lanceolate, 1.7–2.5 mm, pallid, scaberulous near apex, glabrous below. Anthers ca. 0.9 mm. Fl. Sep.

Conifer forests (*Abies-Tsuga*) and bamboo thickets (*Fargesia*) on steep slopes; 2900–3200 m. W Yunnan [Bhutan, India (Sikkim)].

This apparently rare grass is known from only a few gatherings.

## 92. BECKMANNIA Host, Icon. Descr. Gram. Austriac. 3: 5. 1805.

薙草属 wang cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annual or perennial. Leaf blades linear, flat; ligule membranous. Inflorescence composed of many unilateral racemes along a central axis; racemes dense, the lower often branched; spikelets subsessile, closely imbricate, biserrate. Spikelets orbicular, disarticulating below glumes, bisexual floret 1, with or without a second staminate floret above it; rachilla extension absent; glumes equal, gibbosely inflated, enclosing all but apex of floret, not or weakly keeled, herbaceous with thinner white margins, 3-veined, apex obtuse or acute; floret callus short, glabrous; lemma lanceolate, cartilaginous, rounded on back, 5-veined, apex acute or tapering to a cusplike awn-point; palea somewhat shorter than lemma. Caryopsis terete.

Two species: temperate regions of the N hemisphere; one species in China.

The second species in the genus, *Beckmannia eruciformis* (Linnaeus) Host, occurs from Europe and the Mediterranean region to C Asia and E Russia. It is a perennial with short, creeping rhizomes, sometimes with tuberous basal internodes, spikelets usually with 2 florets, globose, inflated glumes, and longer anthers 1.2–1.8 mm.

**1. Beckmannia syzigachne** (Steudel) Fernald, Rhodora 30: 27. 1928.

薙草 wang cao

Annual. Culms tufted, erect, soft, 15–90 cm tall, 2–4-noded. Leaf sheaths glabrous, usually longer than internodes; leaf blades 5–20 cm, 3–10 mm wide, grayish green, scabrid or abaxial surface smooth, apex acute; ligule 3–8 mm. Inflorescence 10–30 cm; racemes erect or narrowly ascending, 1–4 cm. Spikelets orbicular-cuneate in outline, flattened, 2.5–3 mm, gray-green, floret 1(–2); glumes glabrous or hispid, slightly inflated, laterally compressed, veins prominent, linked by oblique transverse veinlets; lemma scaberulous, apex cuspidate-aristate. Anthers 0.4–1 mm. Caryopsis oblong, ca. 1.5 mm, with a tuft of hairs at apex. Fl. and fr. Apr.–Oct. 2n = 14.

Riversides, swampy meadows, damp places; below 3700 m. Anhui, Fujian, Gansu, Guizhou, Hebei, Heilongjiang, Hubei, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Shandong, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia; Europe, North America].

- 1a. Glumes glabrous, or almost so; anthers usually 0.6–1 mm ..... 1a. var. *syzigachne*
- 1b. Glumes densely hispid throughout; anthers usually 0.4–0.6 mm ..... 1b. var. *hirsutiflora*

**1a. Beckmannia syzigachne** var. **syzigachne**

薙草(原变种) wang cao (yuan bian zhong)

*Panicum syzigachne* Steudel, Flora 29: 19. 1846; *Beckmannia baicalensis* (I. V. Kusnezow) Hultén; *B. eruciformis* subsp. *baicalensis* (I. V. Kusnezow) Koyama & Kawano; *B. eruciformis* var. *baicalensis* I. V. Kusnezow.

Glumes glabrous or with a few short stiff hairs at base; anthers usually 0.6–1 mm.

Riversides, swampy meadows, damp places; below 3700 m. Gansu, Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Sichuan, Xizang, Yunnan, Zhejiang [Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia; Europe, North America].

**1b. Beckmannia syzigachne** var. **hirsutiflora** Roshevitz in Komarov, Fl. URSS 2: 291. 1934.

毛颖薙草 mao ying wang cao

*Beckmannia hirsutiflora* (Roshevitz) Probatova; *B. syzigachne* subsp. *hirsutiflora* (Roshevitz) Tzvelev.

Glumes hispid; anthers usually 0.4–0.6 mm.

Streamsides, moist meadows; below 3000 m. NE China [E Russia].

## 93. ALOPECURUS Linnaeus, Sp. Pl. 1: 60. 1753.

看麦娘属 kan mai niang shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annual or perennial. Leaf blades linear, flat; ligule membranous. Inflorescence a spikelike panicle, densely cylindrical, spikelets

numerous, closely packed; pedicels very short, apices cuplike. Spikelets protogynous, strongly laterally compressed, floret 1, falling entire from pedicel; rachilla extension absent; glumes equal,  $\pm$  equaling and enclosing floret, broadly lanceolate to oblong, membranous to thinly leathery, prominently 3-veined, strongly keeled, keel usually ciliate, infrequently winged, lower margins almost free or connate for up to half their length, apex obtuse, acute or shortly awned; lemma broadly lanceolate to ovate, usually thinly membranous, keeled, obscurely 5-veined, smooth, glabrous, lower margins often connate, awned from lower back, apex truncate to acute; awn straight when short or geniculate when longer, column smooth, usually twisted at maturity, bristle scabrid; palea absent or very small. Lodicules absent; ovary glabrous. Caryopsis obliquely obovate in side view; endosperm sometimes liquid.

Between 40 and 50 species: temperate and cold regions of the N hemisphere, South America; eight species in China.

- 1a. Perennial; short or long creeping rhizomes present.
  - 2a. Panicle 1.5–4 cm, ovoid or shortly and broadly cylindrical; glumes densely and conspicuously hairy with 1.5–3 mm hairs.
    - 3a. Glume apex sharply acuminate to awnlike; lemma shorter than glumes ..... 1. *A. himalaicus*
    - 3b. Glume apex subacute; lemma subequal to glumes ..... 2. *A. brachystachyus*
  - 2b. Panicle (3–)4–8 cm, cylindrical; glumes ciliate on keel, otherwise glabrous or shortly hairy on lateral veins.
    - 4a. Glume apices divergent; awn usually included, arising near middle of lemma ..... 3. *A. arundinaceus*
    - 4b. Glume apices straight or slightly converging; awn long exserted, arising from lower 1/4 of lemma ..... 4. *A. pratensis*
- 1b. Annual; rhizomes absent.
  - 5a. Spikelets 2–3 mm; anthers bright orange, 0.5–0.8 mm.
    - 6a. Awn 1.5–3.5 mm, included within spikelet or exserted up to 1.2 mm ..... 5. *A. aequalis*
    - 6b. Awn 6–10 mm, exserted 3 mm or more from spikelet ..... 6. *A. longearistatus*
  - 5b. Spikelets 4–6 mm; anthers pale yellow or white, 1–4 mm.
    - 7a. Glumes winged on keel; glume margins connate in lower 1/3–1/2; anthers 2.5–4 mm ..... 7. *A. myosuroides*
    - 7b. Glumes not winged on keel, ciliate; glume margins almost free; anthers ca. 1 mm ..... 8. *A. japonicus*

**1. *Alopecurus himalaicus* J. D. Hooker, Fl. Brit. India 7: 238. 1896 ["1897".]**

喜马拉雅看麦娘 xi ma la ya kan mai niang

Perennial, loosely tufted or culms solitary, rhizomatous. Culms erect, 15–50 cm tall, 3-noded. Leaf sheaths smooth, upper sheaths inflated; leaf blades 5–12 cm, 3–7 mm wide, abaxial surface smooth, adaxial surface scabrid; ligule 2–3 mm. Panicle ovoid to shortly and broadly cylindrical, densely hairy, 1.5–3 cm, gray-green or tinged light purple. Spikelets narrowly ovate-oblong, slightly urn-shaped, 4–6 mm; glumes submembranous, densely villous on keel, lateral veins and near margins, hairs soft, spreading, 2–3 mm, margins connate at base, apices sharply acuminate to mucronate, slightly divergent; lemma shorter than glumes, margins connate in lower 1/3–1/2, upper margins shortly pubescent, awned from lower 1/5–1/4, apex broadly acute; awn exserted 4–8 mm from spikelet, geniculate. Anthers yellow, 2–3 mm. Fl. Jun. 2n = 56.

Damp alpine grasslands, wet places on rocky slopes; 3000–4100 m. SW Xinjiang (Taxkorgan) [NE Afghanistan, Kashmir, Kyrgyzstan, N Pakistan, Tajikistan].

**2. *Alopecurus brachystachyus* M. Bieberstein, Fl. Taur.-Caucas. Suppl. 3: 56. 1819.**

短穗看麦娘 duan sui kan mai niang

Perennial, with long slender rhizomes. Culms solitary, erect, 15–80 cm tall, 3–5-noded. Leaf sheaths smooth, uppermost sheath inflated; leaf blades gray-green, 3–15 cm, 2–6 mm wide, abaxial surface smooth, adaxial surface scabrid; ligule 1–4 mm. Panicle shortly and broadly cylindrical to ovoid, 1.5–4 cm, yellow-green tinged violet. Spikelets ovate-elliptic, 3.5–5 mm; glumes thinly herbaceous, keels ciliate with 1.5–2 mm silky hairs, lateral veins and flanks silky pilose, margins connate near base, apices subacute, straight or indistinctly diver-

gent; lemma subequaling or slightly shorter than glumes, margins connate in lower 2/5, awned from lower 1/4–1/3, apex puberulous, obliquely truncate; awn exserted 4–8 mm from spikelet, geniculate. Anthers yellow, 2–2.5 mm. Fl. and fr. Jun–Sep.

Damp montane grasslands, alpine meadows, other wet places; below 3800 m. Hebei, Heilongjiang, Nei Mongol, Qinghai [Mongolia, Russia (Far East, Siberia)].

**3. *Alopecurus arundinaceus* Poiret, Encycl. 8: 776. 1808.**

苇状看麦娘 wei zhuang kan mai niang

Perennial, loosely tufted, with long, slender rhizomes. Culms sometimes solitary, erect, up to 100 cm tall, 3–5-noded. Leaf sheaths loose, smooth, upper sheaths slightly inflated; leaf blades gray-green, 5–20 cm, 3–8 mm wide, abaxial surface smooth, adaxial surface scabrid; ligule 2–5 mm. Panicle broadly cylindrical, 4–8 cm, gray-green, blackish at maturity. Spikelets narrowly oblong, slightly urn-shaped, 4–6 mm; glumes herbageous, upper part scabrid, keels densely pilose, glabrous or thinly pilose near margins or more generally on flanks, margins connate in lower 1/5, apices acute, slightly divergent (keel shallowly concave below apex); lemma slightly shorter than glumes, margins connate in lower 1/3–1/2, awned from slightly below middle, apex puberulous, obliquely truncate; awn usually included in spikelet, sometimes exserted up to 2.5 mm, usually straight, weakly geniculate with twisted column when longer. Anthers yellow, 2–3 mm. Fl. and fr. Jul–Sep. 2n = 28.

Damp grasslands; 600–3300 m. Gansu, Heilongjiang, Nei Mongol, Ningxia, Qinghai, Xinjiang [Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, N Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe; introduced in North America].

**4. *Alopecurus pratensis* Linnaeus, Sp. Pl. 1: 60. 1753.**

大看麦娘 da kan mai niang

*Alopecurus alpinus* Smith var. *songaricus* Schrenk ex Fischer & Meyen; *A. songaricus* (Schrenk ex Fischer & Meyen) V. Petrov.

Perennial, loosely tufted, shortly rhizomatous. Culms erect, slightly geniculate at base, up to 100 cm tall, 3–5-noded. Leaf sheaths loose, smooth, slightly inflated; leaf blades 5–25 cm, 3–10 mm wide, abaxial surface smooth, adaxial surface scaberulous; ligule 2–4 mm. Panicle cylindrical, 3–8 cm, gray-green. Spikelets elliptic, 4–6 mm; glumes herbaceous, smooth, keels stiffly ciliate, lateral veins shortly pilose, margins connate in lower 1/3, apices acute, slightly convergent; lemma equaling or slightly shorter than glumes, margins connate below middle, awned from lower 1/4, apex puberulous, subacute; awn exerted 3–6 mm from spikelet, weakly geniculate, column not twisted. Anthers yellow, 2–3.5 mm. Fl. and fr. Apr–Aug.  $2n = 28$ .

Montane meadows, forest margins, river valleys; 1500–2500 m. Heilongjiang, Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Uzbekistan; SW Asia, Europe; introduced elsewhere].

This species has been introduced to Japan, North America, and some other temperate countries as a pasture and forage grass.

**5. *Alopecurus aequalis*** Sobolewski, Fl. Petrop. 16. 1799.

看麦娘 kan mai niang

*Alopecurus aequalis* subsp. *amurensis* (Komarov) Hultén; *A. aequalis* var. *amurensis* (Komarov) Ohwi; *A. aequalis* subsp. *aristulatus* (Michaux) Tzvelev; *A. aequalis* var. *aristulatus* (Michaux) Tzvelev; *A. amurensis* Komarov; *A. aristulatus* Michaux; *A. geniculatus* var. *aequalis* (Sobolewski) Paunero.

Annual, loosely tufted. Culms weak, geniculately ascending, occasionally rooting and branching from lower nodes, 15–40 cm tall. Leaf sheaths smooth, glabrous, slightly inflated; leaf blades light green, soft, 3–10 cm, 2–6 mm wide, abaxial surface smooth, glabrous, adaxial surface closely ribbed, scaberulous; ligule 2–5 mm. Panicle narrowly cylindrical, 2–7 cm, pale gray-green. Spikelets elliptic or oblong, 2–3 mm; glumes membranous, smooth, keels ciliate-hispida, lateral veins hispid on lower part, margins connate at base, apices obtuse; lemma equaling or slightly longer than glumes, margins connate below middle, awned from lower 1/4–1/3, apex obtuse; awn included within spikelet or exerted up to 1.2 mm, straight. Anthers orange, 0.5–0.8 mm. Fl. and fr. Apr–Aug.  $2n = 14$ .

Irrigation ditches, rice fields, damp grasslands, other wet weedy places; below 3500 m. Anhui, Fujian, Guangdong, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Jiangsu, Jiangxi, Nei Mongol, Shaanxi, Shandong, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [Bhutan, Japan, Kashmir, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe, North America].

This is a widespread, semi-aquatic weed of N temperate regions of the world, now introduced to Australia and elsewhere.

East Asian forms tend to have more obvious awns than usual, perhaps due to introgression from *Alopecurus longearistatus*. *Alopecurus amurensis* and *A. aristulatus* are both based on such forms. A form from South America with glabrous glumes has been separated as *A.*

*hitchcockii* Parodi. A specimen of this species has been found on waste ground in Chengdu, Sichuan.

**6. *Alopecurus longearistatus*** Maximowicz, Prim. Fl. Amur. 327. 1859.

长芒看麦娘 chang mang kan mai niang

*Alopecurus mandshuricus* Litvinov.

Annual, loosely tufted. Culms geniculately ascending, 15–30 cm tall. Leaf sheaths lax, smooth, glabrous, upper sheaths sometimes inflated; leaf blades soft, 3–9 cm, 1–3.5 mm wide, abaxial surface smooth, glabrous, adaxial surface closely ribbed, scaberulous; ligule 2–4 mm. Panicle narrowly cylindrical, 4–7 cm, pale green, appearing villous from long slender awns, base often included in uppermost leaf sheath. Spikelets narrowly oblong, 2.5–3 mm; glumes membranous, smooth, keels and lateral veins ciliate, margins connate at base, apices obtuse; lemma equaling or slightly longer than glumes, margins connate below middle, awned from lower 1/4–1/3, apex obtuse; awn exerted 3 mm or more from spikelet, straight. Anthers orange, 0.4–0.8 mm. Fl. and fr. May–Jun.  $2n = 14$ .

Damp sandy or muddy river banks and lake shores. Heilongjiang [Russia (Far East)].

**7. *Alopecurus myosuroides*** Hudson, Fl. Angl. 1: 23. 1762.

大穗看麦娘 da sui kan mai niang

*Alopecurus agrestis* Linnaeus.

Annual, tufted. Culms erect or geniculately ascending, up to 80 cm tall. Leaf sheaths smooth, glabrous, upper sheaths slightly inflated; leaf blades 3–16 cm, 2–9 mm wide, glabrous, abaxial surface smooth or scabrid, adaxial surface scabrid; ligule 2–5 mm. Panicle narrowly cylindrical, up to 10 cm, tapering toward apex, yellow-green, pale green, or purplish. Spikelets narrowly oblong, 4.5–7.5 mm; glumes leathery, punctate-scabrid, keels narrowly winged, wings shortly pilose below, scabrid above, lateral veins very shortly pilose near base, margins connate in lower 1/3–1/2, apices acute; lemma slightly longer than glumes, margins connate in lower 1/3–1/2, awned from near base, apex acute; awn exerted 4–8 mm from spikelet, geniculate. Anthers pale yellow, 2.5–4 mm.  $2n = 14$ .

Fields, introduced. Taiwan (Taipei) [Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe].

This species is adventive or introduced as a fodder grass in North America, Australia, and other temperate regions.

**8. *Alopecurus japonicus*** Steudel, Syn. Pl. Glumac. 1: 149. 1854.

日本看麦娘 ri ben kan mai niang

Annual, tufted, often forming large clump. Culms erect or geniculately ascending, sometimes branching from lower nodes, 25–50 cm tall, 3–4-noded. Leaf sheaths lax, smooth, glabrous, upper sheaths inflated; leaf blades soft, glaucous, 3–12 cm, 3–7 mm wide, abaxial surface smooth, adaxial surface scaberulous; ligule 2–5 mm. Panicle cylindrical, 3–10 cm, yellow-green.

Spikelets ovate-oblong, 4.8–7 mm; glumes herbaceous, smooth, keels wingless, stiffly ciliate, lateral veins pubescent near base or glabrous, margins connate only at extreme base, apices subacute; lemma slightly longer than glumes, herbaceous, margins connate in lower 2/5, awned from near base, apex subacute;

awn exserted 5–8 mm from spikelet, weakly geniculate, column not twisted. Anthers white, ca. 1 mm. Fl. and fr. Feb–May.

Wet places; below 2000 m. Anhui, Fujian, Guangdong, Guizhou, Henan, Hubei, Jiangsu, Shaanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

## 94. PHLEUM Linnaeus, Sp. Pl. 1: 59. 1753.

梯牧草属 ti mu cao shu

Lu Shenglian (卢生莲); Sylvia M. Phillips

Annual or perennial, often shortly rhizomatous. Leaf blades linear, flat. Inflorescence a spikelike, cylindrical panicle, elongate to ovoid or capitate; branches short, sometimes adnate to axis, spikelets densely crowded, subsessile. Spikelets strongly laterally compressed, floret 1, disarticulating above glumes; rachilla extension present or absent; glumes equal, oblong or obovate in side view, longer than and enclosing floret, herbaceous, 3-veined, strongly keeled, keel often pectinate-ciliate, margins overlapping but not connate, apex truncate to acute, with stout mucro or short stiff awn; lemma broadly oblong or ovate, thinly membranous, dorsally convex, 3–7-veined, apex truncate to subacute, awnless or mucronate; palea slightly shorter than lemma, ciliate along keels; lodicules 2; stamens 3. Caryopsis ellipsoid to ovoid.

Sixteen species: temperate and cold regions of the N hemisphere, extending southward in America along mountain chains into Chile; four species in China.

- 1a. Annual, lacking non-flowering shoots at anthesis; spikelets obovate-cuneate; glumes firm, inflated ..... 1. *P. paniculatum*
- 1b. Perennial, with non-flowering shoots at anthesis; spikelets oblong; glumes membranous, not inflated.
  - 2a. Panicle broadly cylindrical or ovoid; glumes with 1.5–3 mm awns; spikelets purplish ..... 2. *P. alpinum*
  - 2b. Panicle narrowly cylindrical; glumes with 0.3–1.5 mm awns; spikelets gray-green.
    - 3a. Glumes pectinate-ciliate along keel; culms swollen at base ..... 3. *P. pratense*
    - 3b. Glumes scabrid along keel; culms not swollen at base ..... 4. *P. phleoides*

### 1. *Phleum paniculatum* Hudson, Fl. Angl. 23. 1762.

鬼蜡烛 gui la zhu

*Chilochloa paniculata* (Hudson) P. Beauvois; *Phleum asperum* Jacquin; *P. japonicum* Franchet & Savatier.

Annual, tufted. Culms erect or geniculate at base, slender, 3–45 cm tall, 3–5-noded. Leaf sheaths glabrous, upper slightly inflated; leaf blades soft, 1.5–15 cm, 2–6 mm wide, glabrous, margins scabrid, apex acute; ligule 2–4 mm, obtuse. Panicle narrowly cylindrical, 1–10 × 0.4–0.8 cm, yellowish green; branches free from central axis. Spikelets obovate-cuneate, 2–3 mm; rachilla extension present; glumes inflated toward apex, narrowed toward base, deeply channeled between veins, scabrid, keel glabrous or shortly pectinate, apex truncate, cuspidate into a hard 0.3–0.6 mm mucro; lemma 1.3–2 mm, 5-veined, sparsely appressed-pubescent, apex subobtuse; anthers 0.4–0.8 mm. Caryopsis ca. 1 mm. Fl. and fr. Apr–Aug.  $2n = 28$ .

Mountain slopes, riversides, field margins, roadsides; ca. 1800 m. Anhui, Gansu, Henan, Hubei, Jiangsu, Shaanxi, Shanxi, Sichuan, Xinjiang, Zhejiang (Lin'an) [Afghanistan, NW India, Japan, Kashmir, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia, Europe].

### 2. *Phleum alpinum* Linnaeus, Sp. Pl. 1: 59. 1753.

高山梯牧草 gao shan ti mu cao

*Phleum commutatum* Gaudin.

Perennial, shortly rhizomatous. Culms loosely tufted, erect or decumbent at base, 5–40(–60) cm tall, 3–4-noded. Leaf sheaths glabrous, upper slightly inflated; leaf blades broadly linear, 2–13 cm, 2–9 mm wide, the upper shorter than the low-

er, glabrous, apex acute; ligule 2–3 mm, obtuse. Panicle broadly cylindrical to ovoid, 1–6 × 0.6–1.2 cm, usually purplish; branches adnate to central axis. Spikelets oblong, 3–4 mm (excluding awns); rachilla extension absent; glumes oblong, membranous, scaberulous, lower softly hairy on margins, keel conspicuously pectinate-ciliate, apex truncate, cuspidate into a stiff, 1.5–3 mm, glabrous or ciliate awn; lemma ca. 2 mm, 5-veined, veins puberulent, apex truncate; anthers 1–1.5 mm. Caryopsis ca. 1.5 mm. Fl. and fr. Jun–Oct.  $2n = 14, 28$ .

Wet alpine meadows, damp soil around bushes, riversides; 2500–3900 m. Gansu, Heilongjiang, Henan, Hubei, Shaanxi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan [Afghanistan, Bhutan, India (Sikkim), Japan, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan; SW Asia, N Europe, North America, South America (Andes)].

This is a species of arctic and alpine regions of the N hemisphere, extending down the Andes in South America as far as Chile.

### 3. *Phleum pratense* Linnaeus, Sp. Pl. 1: 59. 1753.

梯牧草 ti mu cao

Perennial forming loose or dense tussocks. Culms erect or geniculately ascending, 40–120 cm tall, 5–6-noded, lowest nodes usually swollen and cormlike. Leaf sheaths glabrous, loose; leaf blades 10–50 cm, 3–8 mm wide, glabrous, both surfaces and margins scabrid, apex acuminate; ligule 2–5 mm, rounded. Panicle narrowly cylindrical, 4–15 × 0.5–1 cm, gray-green; branches adnate to central axis. Spikelets obovate-oblong, 3–3.5 mm; rachilla extension absent; glumes oblong, membranous, scaberulous, lower softly hairy on margins, keel conspicuously pectinate-ciliate, apex truncate with stout, 0.5–

1.5 mm, scabrid awn; lemma ca. 2 mm, 7-veined, puberulent, especially along veins, apex obtuse; anthers 1.5–2 mm. Caryopsis ca. 1 mm. Fl. and fr. Jun–Aug.  $2n = 28, 42$ .

Grasslands, steppe, forest margins; ca. 1800 m. Anhui, Hebei, Heilongjiang, Henan, Shaanxi, Shandong, Xinjiang (Zhaosu), Yunnan [Russia; Europe].

This is a native of Europe and Russia, now widely introduced in temperate regions of the world as a pasture grass (Timothy Grass).

**4. Phleum phleoides** (Linnaeus) H. Karsten, Deut. Fl. 374. 1880.

假梯牧草 jia ti mu cao

*Phalaris phleoides* Linnaeus, Sp. Pl. 1: 55. 1753.

Perennial, densely tufted. Culms erect or often geniculate

at base, 15–75 cm tall, 2–4-noded. Leaf sheaths smooth, loose; leaf blades 2–20 cm, 1–5 mm wide, the upper shorter than the lower, adaxial surface and margins scabrid, apex acuminate; ligule 1–3 mm, obtuse. Panicle narrowly cylindrical, gradually tapering to apex, 2.5–10 × 0.4–0.7 cm, gray-green; branches free from central axis. Spikelets oblong, 2–3 mm; rachilla extension present; glumes oblong, membranous, keel scabrid, apex obtuse, abruptly narrowed into a stout, 0.3–0.7 mm, scabrid mucro; lemma 1.5–2 mm, 5-veined, glabrous or puberulent, apex obtuse; anthers 1–1.5 mm. Caryopsis 1.3–1.5 mm. Fl. and fr. Jun–Sep.  $2n = 14$ .

Grassy mountain slopes, among shrubs, forest margins; 800–2600 m. Heilongjiang, Nei Mongol, N Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan; NW Africa, SW Asia (Caucasus), Europe].

### 13. Tribe BRACHYPODIEAE

短柄草族 duan bing cao zu

Chen Shouliang (陈守良); Sylvia M. Phillips

Perennials, or rarely annual. Leaf blades linear or convolute; ligule membranous. Inflorescence a loose raceme; spikelets (rarely only 1 spikelet) alternating on opposite sides of, and lying broadside to the rachis; rachis tough; pedicels very short. Spikelets elongate, with 5–20 florets, subterete to lightly laterally compressed, rarely strongly laterally compressed, disarticulating above glumes and between florets; glumes unequal, lanceolate, shorter than lowest lemma, herbaceous to membranous, rounded on back, distinctly 3–9-veined, apex obtuse to shortly awned; lemmas lanceolate, herbaceous to firmly membranous, sometimes becoming leathery at maturity, rounded on back, 7–9-veined, awned from entire acuminate apex; awn straight; palea subequal to lemma, ciliate on keels. Lodicules ciliate. Stamens 3. Ovary with hairy apical appendage. Caryopsis tightly enclosed by lemma and palea, ventrally furrowed, apex hairy, embryo small, hilum elongate, linear.  $x = 5, 7, 9$ .

One genus and ca. 16 species: temperate Asia and Europe, mountains in Africa, America from Mexico to Bolivia; five species (two endemic) in China.

### 95. BRACHYPODIUM P. Beauvois, Ess. Agrostogr. 100. 1812.

短柄草属 duan bing cao shu

Description and distribution as for tribe.

- 1a. Annual; spikelets laterally compressed; anthers 0.5–1 mm ..... 1. *B. distachyon*
- 1b. Perennial; spikelets subterete; anthers 3–5 mm.
  - 2a. Raceme with 1–3 spikelets; culms 10–30 cm tall; leaf blades needle-like ..... 2. *B. kawakamii*
  - 2b. Raceme with 3–6(–15) spikelets; culms usually more than 30 cm tall; leaf blades linear.
    - 3a. Lemmas of all florets with 1–6 mm awn; plant with spreading rhizomes ..... 3. *B. pinnatum*
    - 3b. Lemmas of upper florets with 5–14 mm awn; plant without rhizomes.
      - 4a. Pedicels of spikelets less than 2 mm ..... 4. *B. sylvaticum*
      - 4b. Pedicels of spikelets 2–5.5 mm ..... 5. *B. pratense*

**1. Brachypodium distachyon** (Linnaeus) P. Beauvois, Ess. Agrostogr. 155. 1812.

二穗短柄草 er sui duan bing cao

*Bromus distachyos* Linnaeus, Cent. Pl. 2: 8. 1756; *Agropyron distachyon* (Linnaeus) Chevallier; *Festuca distachya* (Linnaeus) Roth; *Trachynia distachya* (Linnaeus) Link; *Zerna distachya* (Linnaeus) Panzer ex B. D. Jackson.

Annual. Culms tufted, usually ascending, infrequently erect, up to 15(–40) cm tall. Leaf sheaths loosely to densely pilose; leaf blades lanceolate, flat, rather stiff, glaucous, 1–12

cm, 3–4 mm wide, loosely pilose, margins scabrous-pectinate, apex acuminate; ligule ca. 1 mm. Raceme 2–4 cm, spikelets 1–3 crowded at apex of peduncle. Spikelets 2–3 cm, laterally compressed, florets 10–16; glumes pilose or glabrous, apex acute, lower glume lanceolate, 5–6 mm, 5-veined, upper glume lanceolate-oblong, 7–8 mm, 7-veined; lemmas 7.5–10 mm, glabrous, thinly setose or pubescent; awn 7–15 mm. Anthers 0.5–1 mm.

Dry stony places. Xizang (Mainling) [Afghanistan, Pakistan, Tajikistan, Turkmenistan; N Africa, SW Asia, S Europe; introduced elsewhere].