

**SALICACEAE**

杨柳科 yang liu ke

Fang Zhenfu (方振富 Fang Cheng-fu)<sup>1</sup>, Zhao Shidong (赵士洞)<sup>1</sup>; Alexei K. Skvortsov<sup>2</sup>

Trees or shrubs, deciduous or rarely evergreen, dioecious, rarely polygamous. Leaves alternate, rarely subopposite, usually petiolate, simple; stipules persistent or caducous. Catkins erect or pendulous; each flower usually with a cupular disc or 1 or 2(or 3) nectariferous glands. Male flowers with 2–many stamens; filaments filiform, free or united; to connate; anthers 2(or 4)-loculed, dehiscing longitudinally. Female flowers with 1 pistil, sessile or stipitate; ovary superior, 1- or 2-loculed; ovules several to many, anatropous, with a 1 integument; style 1, 2 in *Chosenia*; stigmas 2–4. Capsule dehiscing by 2–4(or 5) valves; placenta and inside wall of ovary with long hairs. Seeds 4–numerous, glabrous; hairs and seeds simultaneously deciduous when capsule matures.

Three genera and about 620 species: mainly N hemisphere, a few in S hemisphere; three genera and 347 species (236 endemic) in China, including at least nine hybrids and at least one introduced species.

Wang Chan & Fang Cheng-fu, eds. 1984. Salicaceae. Fl. Reipubl. Popularis Sin. 20(2): 1–403.

- 1a. Growth monopodial, buds with several outer scales, terminal bud present (except in *Populus* sect. *Turanga*); both male and female catkins pendulous; disc cupular; leaf blade usually 1–2 × as long as wide ..... 1. *Populus*
- 1b. Growth sympodial, buds with 1 scale, terminal bud absent; female catkin erect or spreading, very rarely pendulous; flowers without disc but glands sometimes connate and discoid; leaf blade often at least several × as long as wide.
- 2a. Male catkin pendulous; nectariferous gland absent; bases of filaments adnate to bracts ..... 2. *Chosenia*
- 2b. Male catkin erect; nectariferous gland present; filaments usually distinct from bracts (fused in *Salix* sect. *Urbanianae*) ..... 3. *Salix*

**1. POPULUS** Linnaeus, Sp. Pl. 2: 1034. 1753.

杨属 yang shu

Trees; trunk usually straight; bark furrowed or smooth, often gray or tan; pith mostly 5-angled in cross section. Terminal bud terete or angled; bud scales several, unequal. Stipules small, deciduous; petiole terete or laterally compressed; leaf blade usually ovate to deltoid-ovate. Flowering precocious; catkins pendulous. Flowers anemophilous; bracts apically lobed or lacinate, membranous, caducous; flowers with disc obliquely cupular. Male flower: stamens 4–many; filaments short, free; anthers dull red. Female flower: ovary 1-loculed; style 1, short or not; stigmas 2–4. Capsule 2–4(or 5)-valved. Seeds few to numerous, small. Cotyledons elliptic.

About 100 species: N Africa, Asia, Europe, North America; 71 species (47 endemic) in China, including at least nine hybrids.

The taxonomy of *Populus* in China, at species level, is at a preliminary stage. To reach an adequate understanding, it is necessary to make direct observations in natural populations of all morphological variations between individuals, for all species and at all seasonal developmental stages. Moreover, other methods beyond morphological studies need to be applied, especially anatomic and chemotaxonomic analyses.

- 1a. Leaves grayish blue on both surfaces; disc membranous, caducous (5. Sect. *Turanga*).
- 2a. Branchlets rarely pilose; leaves glabrous; capsule glabrous; leaf margin dentate distally ..... 70. *P. euphratica*
- 2b. Branchlets, leaves, and capsule shortly tomentose; leaf margin entire or with 2 or 3 teeth apically 71. *P. pruinosa*
- 1b. Leaves not grayish blue on both surfaces; disc persistent.
- 3a. Leaf margin lobed, incised, or with sinuous teeth or, if serrate, then petiole with 2 large glands at apex; bracts with long, straight marginal hairs (1. Sect. *Populus*).
- 4a. Leaves of long shoots 3–5-palmately lobed, leaves of short branchlets and petioles abaxially densely white tomentose ..... 1. *P. alba*
- 4b. Leaves of long shoots not palmately lobed, leaves of short branchlets and petiole abaxially glabrous or gray tomentose.
- 5a. Leaf margin incised or with sinuous teeth; buds pubescent.
- 6a. Leaf apex acuminate; leaves of short branchlets usually deltoid-ovate, 7–11(–18) × 6.5–10.5(–15) cm ..... 10. *P. tomentosa*
- 6b. Leaf apex acute or obtuse; leaves of short branchlets ovate, ovate-elliptic, ovate-orbicular, or suborbicular, 3–8 × 2–7 cm.

<sup>1</sup> Herbarium, Institute of Applied Ecology, Chinese Academy of Sciences, 72 Wenhua Road, Shenyang, Liaoning 110015, People's Republic of China.

<sup>2</sup> Herbarium, Main Botanic Garden, Russian Academy of Sciences, Botanicheskaya Street 4, Moscow 127276, Russia.

- 7a. Branchlets grayish; leaf margin obtusely notched, teeth blunt, not incurved; female catkin 5–10 cm ..... 2. *P. canescens*
- 7b. Branchlets grayish brown; leaf margin coarsely serrate, teeth acute, incurved, sometimes sinuous; female catkin 3–5 cm ..... 6. *P. ×hopeiensis*
- 5b. Leaf margin with sinuous teeth or, if serrate, then leaf blade with 2 glands at base; bud scales usually glabrous or pilose basally and ciliate.
- 8a. Leaves usually ovate to broadly ovate; petioles on short branchlets with 2 large glands at apex.
- 9a. Leaf blade long acuminate or caudate at apex; petiole with 2 raised, nearly stipitate glands at apex.
- 10a. Bracts palmatifid ..... 9. *P. adenopoda*
- 10b. Bracts subulate ..... 8. *P. qionghdaoensis*
- 9b. Leaf blade acute or shortly acuminate at apex; petiole with obscure, flattened glands at apex.
- 11a. Leaves of short branchlets broadly ovate, margin with sinuous teeth; bud scales ciliate ..... 12. *P. ningshanica*
- 11b. Leaves of short branchlets ovate-orbicular, margin coarsely serrate; bud scales glabrous ..... 11. *P. ×pseudotomentosa*
- 8b. Leaves usually suborbicular; petioles on short branchlets eglandular at apex (*P. davidiana* sometimes small glandular).
- 12a. Branchlets brown or dull brown; leaf apex shortly acuminate or obtuse ..... 7. *P. rotundifolia*
- 12b. Branchlets purplish or reddish brown, shiny; leaf apex obtusely rounded, acute, shortly acuminate, or acuminate.
- 13a. Leaf margin densely serrulate ..... 5. *P. wulianensis*
- 13b. Leaf margin with sparse or dense, sinuous teeth or serrate.
- 14a. Leaf margin with sparse, sinuous teeth, apex obtusely rounded ..... 4. *P. tremula*
- 14b. Leaf margin with dense, sinuous teeth or serrate, apex acute, shortly acuminate, or acuminate.
- 15a. Leaf margin serrate, apex acuminate ..... 39. *P. alaskanica*
- 15b. Leaf margin with dense, sinuous teeth, apex acute or shortly acuminate ..... 3. *P. davidiana*
- 3b. Leaf margin serrate or nearly entire; bracts without long, marginal hairs.
- 16a. Leaves with a well-defined, translucent margin (4. Sect. *Aigeiros*).
- 17a. Petiole compressed, at least distally, capsule with a longer, slender stipe.
- 18a. Leaves of short branchlets deltoid or deltoid-ovate, margin ciliate ..... 69. *P. ×canadensis*
- 18b. Leaves of short branchlets ovate, rhomboid, or rhombic-ovate, rarely deltoid, margin glabrous (only *P. ×beijingensis* loosely ciliate).
- 19a. Branchlets grayish green or red; leaves of long shoots broadly ovate or deltoid-broadly ovate, those of short branchlets ovate ..... 66. *P. ×beijingensis*
- 19b. Branchlets yellowish; leaves of long shoots and short branchlets uniformly shaped or not, those of short branchlets rhombic-ovate-orbicular, rhombic-deltoid, or rhombic ..... 62. *P. nigra*
- 17b. Petiole terete or subterete; capsule with stipe short.
- 20a. Leaves of short branchlets deltoid-orbicular or compressed orbicular, as wide as or wider than long, 2–7 cm ..... 68. *P. afghanica*
- 20b. Leaves of short branchlets ovate, rhombic-ovate, or rhombic-elliptic, apparently narrower than long, 5–10 cm.
- 21a. Petiole glabrous, leaf margin with loose hairs ..... 63. *P. ×xiaohai*
- 21b. Petiole pilose or with loose hairs; leaf margin glabrous.
- 22a. Branchlets pilose; leaf apex acuminate to long acuminate; petiole ca. as long as leaf blade; capsule 2- or 3-valved ..... 65. *P. ×jrtyschensis*
- 22b. Branchlets glabrous; leaf apex long acuminate to caudate; petiole ca. 1/3 as long as leaf blade; capsule 2-valved ..... 67. *P. ×berolinensis*
- 16b. Leaf margin not translucent.
- 23a. Petiole usually glandular at apex or, if eglandular, then ca. 4/5 as long as leaf blade; leaves greenish or

- grayish green abaxially or, if glaucous, then densely tomentose or downy and capsule densely tomentose; flower disc parted or sinuous (2. Sect. *Leucooides*).
- 24a. Buds, petioles, and capsules glabrous or subglabrous; petiole nearly equaling leaf blade; leaf blade broadly ovate, suborbicular, or broadly long ovate-elliptic, abaxially glabrescent ... 14. *P. wilsonii*
- 24b. Buds, petioles, and capsules pilose (if petiole glabrous, then also violet); petiole less than 1/2 to 2/3 as long as leaf blade; leaf blade usually ovate, abaxially often tomentose.
- 25a. Petiole violet, glabrous ..... 15. *P. violascens*
- 25b. Petiole red or green, not violet, pilose.
- 26a. Leaf blade to 30 cm, base deeply cordate, often auriculate, apex acuminate; capsule ovoid, 1–1.7 cm ..... 13. *P. lasiocarpa*
- 26b. Leaf blade to 20 cm, base cordate to rounded, rarely truncate, apex acute or shortly acuminate; capsule broadly ovoid to globose, less than 1 cm.
- 27a. Leaf blade to 20 cm, base subcordate to truncate; petiole downy; capsule 2-valved .... 16. *P. glauca*
- 27b. Leaf blade to 14 cm, base cordate or subrounded; petiole tomentose; capsule 3- or 4-valved ..... 17. *P. pseudoglauca*
- 23b. Petiole usually eglandular (except *P. shanxiensis* and *P. yutungensis*); leaves often glaucous, abaxially rarely yellowish green or greenish white (*P. iliensis* greenish); flower disc entire; capsule usually glabrous or rarely pilose (3. Sect. *Tacamahaca*).
- 28a. Petiole compressed throughout or only apically; leaves greenish or slightly greenish white abaxially.
- 29a. Young branchlets pilose; capsule 2- or 3-valved.
- 30a. Leaves ovate-orbicular or ovate, apex shortly acuminate, base rounded or broadly cuneate 46. *P. iliensis*
- 30b. Leaves rhombic-deltoid, rhombic-elliptic, or rhombic-ovate-orbicular, apex acuminate, base cuneate to broadly cuneate ..... 61. *P. ×xiaozhuanica*
- 29b. Young branchlets glabrous; capsule 2-valved.
- 31a. Capsule pilose ..... 38. *P. minhoensis*
- 31b. Capsule glabrous.
- 32a. Capsule 2-valved ..... 36. *P. ×gansuensis*
- 32b. Capsule (2 or)3-valved ..... 37. *P. wenzianica*
- 28b. Petiole terete; leaves yellowish green or glaucous abaxially.
- 33a. Leaf margin revolute ..... 20. *P. kangdingensis*
- 33b. Leaf margin not revolute.
- 34a. Leaf blade usually broadest at or above middle (especially on leaves of long shoots).
- 35a. Leaf blade rhombic-elliptic or rhombic-obovate, base cuneate (except *P. simonii* var. *rotundifolia*); capsule 2-valved.
- 36a. Petioles, veins on both leaf surfaces, catkin rachis, and capsule pilose ..... 19. *P. przewalskii*
- 36b. Petioles, veins on both leaf surfaces, catkin rachis, and capsule glabrous (catkin rachis pilose in *P. simonii* var. *liaotungensis*).
- 37a. Branchlets grayish yellow; leaf margin crenate-serrate, ciliate or glabrous .... 64. *P. manshurica*
- 37b. Branchlets yellowish brown; leaf margin serrulate, glabrous ..... 18. *P. simonii*
- 35b. Leaf blade suborbicular or elliptic to obovate-elliptic, base rounded or shallowly cordate; capsule 3- or 4-valved.
- 38a. Branchlets glabrous.
- 39a. Leaf blade of short shoots suborbicular, rarely ovate-orbicular or ovate, not wrinkled adaxially, greenish abaxially, often ± as long as broad; capsule usually 2-valved 22. *P. charbinensis*
- 39b. Leaf blade of short shoots elliptic to obovate-elliptic, conspicuously wrinkled adaxially, whitish or pinkish abaxially, longer than broad; capsule usually 4-valved ..... 31. *P. koreana*
- 38b. Branchlets pilose, at least when young.
- 40a. Leaves with veins glabrous, or only proximal veins with sparse hairs adaxially 29. *P. suaveolens*
- 40b. Leaves with veins pilose.

- 41a. Leaf blade of short shoots suborbicular, 5–8 cm; petiole more than 3/4 as long as leaf blade; capsule pilose ..... 45. *P. pamirica*
- 41b. Leaf blade of short shoots elliptic or, if suborbicular, then petiole less than 1/2 as long as leaf blade; capsule glabrous.
- 42a. Branchlets angled; catkin rachis pilose ..... 33. *P. ussuriensis*
- 42b. Branchlets terete; catkin rachis glabrous ..... 32. *P. maximowiczii*
- 34b. Leaves broadest below middle.
- 43a. Branchlets and catkin rachis glabrous or, if catkin rachis pilose, then buds or leaf margins glabrous.
- 44a. Leaves rhombic-elliptic, rhombic-ovate, or rarely ovate-lanceolate, margin alternating high and low serrate, teeth not arranged on same horizontal plane ..... 21. *P. pseudosimonii*
- 44b. Leaves neither rhombic-elliptic nor rhombic-ovate, margin with teeth arranged on same horizontal plane; if leaves ovate-lanceolate, then margin loosely serrate only distally.
- 45a. Petiole pilose or, if glabrous (*P. koreana*), then leaves clearly wrinkled.
- 46a. Catkin rachis glabrous; leaves 5–14 cm, apex obtuse, acute, or rarely shortly acuminate.
- 47a. Leaves broadly ovate or ovate, both surfaces long pubescent along veins, smooth; capsule (2 or)3-valved, pilose, rarely glabrous ..... 49 *P. pseudomaximowiczii*
- 47b. Leaves elliptic, elliptic-oblong, or obovate-elliptic, both surfaces glabrous; capsule (2 or)4-valved, glabrous ..... 31. *P. koreana*
- 46b. Catkin rachis pilose; leaves 4–7 cm, apex acuminate or shortly acuminate.
- 48a. Capsule glabrous, 3-valved ..... 28. *P. nakaii*
- 48b. Capsule pilose, 2- or 4-valved.
- 49a. Capsule 4-valved ..... 34. *P. amurensis*
- 49b. Capsule 2-valved ..... 27. *P. keerqinensis*
- 45b. Petiole glabrous, leaf surface never wrinkled.
- 50a. Bud scales ciliate; leaves suborbicular-cordate, rarely ovate-orbicular, apex shortly acuminate, usually twisted ..... 30. *P. hsonianica*
- 50b. Bud scales glabrous; leaf neither suborbicular nor orbicular-cordate, apex acuminate, long acuminate, or caudate, rarely mucronate or, if shortly acuminate, then apex not twisted.
- 51a. Catkin rachis pilose; capsule 2- or 3(or 4)-valved.
- 52a. Stipe pilose ..... 47. *P. talassica*
- 52b. Stipe glabrous ..... 48 *P. platyphylla*
- 51b. Catkin rachis glabrous; capsule 3- or 4-valved.
- 53a. Branchlets terete; leaves often with prominent lateral veins adaxially, to 7 cm.
- 54a. Branchlets reddish brown or yellowish brown; leaf apex caudate or long acuminate ..... 25. *P. trinervis*
- 54b. Branchlets yellowish green or grayish yellow; leaf apex mucronate or acuminate ..... 23. *P. cathayana*
- 53b. Branchlets and shoots angled; leaves with obscure lateral veins adaxially, more than 7 cm.
- 55a. Leaves pilose along veins of both surfaces, at least basally, apex acuminate, ciliate; bark exfoliating (except *P. purdomii* var. *rockii*) ..... 24. *P. purdomii*
- 55b. Leaves glabrous, or pilose only along veins abaxially, apex long acuminate, not ciliate; bark not exfoliating.
- 56a. Fruiting catkin to 35 cm; capsule (4 or)5-valved; leaves of short branchlets ovate or elliptic-ovate, 16–23 cm ..... 59. *P. yuana*
- 56b. Fruiting catkin less than 20 cm; capsule 3- or 4-valved; leaves of short branchlets broadly ovate, ovate-orbicular, long ovate, or ovate-lanceolate, to 18 cm.
- 57a. Branchlets purplish or greenish brown; leaf apex shortly acuminate, midvein yellowish green abaxially ..... 51. *P. szechuanica*

- 57b. Branchlets yellowish brown, with reddish tinge; leaf apex long acuminate, rarely obtuse, midvein usually reddish abaxially ..... 52. *P. yunnanensis*
- 43b. Branchlets or shoots and catkin rachis pilose or, if catkin rachis glabrous, then buds, petioles, and leaf margins pilose.
- 58a. Leaf margin glabrous; petiole with loose hairs ..... 26. *P. girinensis*
- 58b. Leaf margin pilose, at least at young leaf apices; petiole densely pubescent (*P. suaveolens* with loose hairs).
- 59a. Leaves glabrous or pilose along veins of one surface.
- 60a. Petiole with 2 glands at apex; branchlets reddish brown ..... 50. *P. shanxiensis*
- 60b. Petiole eglandular; branchlets yellowish brown to brown.
- 61a. Leaves ovate, 10–15 × 8–12 cm, base cordate or rounded, apex acute, downy along veins abaxially; capsule glabrous, 4-valved; stipe 5–10 mm ..... 57. *P. ciliata*
- 61b. Leaves ovate, 6–10 × 2.5–7 cm, base rounded, apex acuminate, pilose adaxially along veins; capsule densely downy, 2(or 3)-valved; stipe ca. 5 mm ..... 53. *P. qamdoensis*
- 59b. Leaves pilose, at least along veins on both surfaces.
- 62a. Leaf base rounded or cuneate.
- 63a. Branchlets waxy golden, angled ..... 40. *P. laurifolia*
- 63b. Branchlets not waxy golden, terete.
- 64a. Leaves ovate or narrowly ovate, base rounded; capsule pilose ..... 42. *P. schneideri*
- 64b. Leaves ovate-lanceolate to narrowly lanceolate, base cuneate; capsule glabrous ..... 41. *P. lancifolia*
- 62b. Leaf base shallowly cordate, cordate, or rarely rounded.
- 65a. Leaves of short branchlets mostly less than 10 cm.
- 66a. Buds with hairs, or bud scales ciliate.
- 67a. Capsule pubescent, 2-valved, sessile; leaves ovate or broadly ovate ..... 43. *P. pilosa*
- 67b. Capsule glabrous, with short stipe, (2 or)3(or 4)-valved, leaves long elliptic, ovate-elliptic, or rhombic-elliptic ..... 44. *P. intramongolica*
- 66b. Buds glabrous.
- 68a. Catkin rachis pilose; leaves usually elliptic; branchlets angled ..... 33. *P. ussuriensis*
- 68b. Catkin rachis glabrous; leaves usually broadly elliptic; branchlets terete ..... 32. *P. maximowiczii*
- 65b. Leaves of short branchlets mostly more than 10 cm.
- 69a. Leaf apex acute, shortly acuminate, or acuminate; branchlets terete.
- 70a. Branchlets pubescent; leaves of short branchlets ovate-orbicular or ovate ..... 55. *P. haoana*
- 70b. Branchlets tomentose; leaves of short branchlets broadly deltoid or broadly ovate-cordate.
- 71a. Leaf broadly deltoid, 12–16 × ca. 10 cm, apex acuminate; capsule 2-valved, long stipitate ..... 35. *P. candicans*
- 71b. Leaf broadly ovate-cordate, to 10 × 8 cm, apex acute; capsule 4-valved, subsessile ..... 54. *P. mainlingensis*
- 69b. Leaf apex long acuminate or rarely acuminate; branchlets angled, at least when young.
- 72a. Petiole glandular at apex ..... 60. *P. yatungensis*
- 72b. Petiole eglandular.
- 73a. Leaves of short branchlets leathery, ovate-lanceolate or broadly lanceolate, 8–18 × 3–10 cm; fruiting catkin to 30 cm; capsule glabrous ..... 58. *P. wuana*
- 73b. Leaves of short branchlets not leathery, ovate or broadly ovate, 7–14 × 4–10 cm; fruiting catkin 8–16 cm; capsule pilose ..... 56. *P. xiangchengensis*

### 1. Sect. *Populus*

白杨组 bai yang zu

Sect. *Leuce* Duby.

Bark usually grayish white, smooth, only becoming rough on old trunks. Buds tomentose or glabrous. Leaves with petioles flattened or subterete; leaf blade lobed, incised, or with sinuous teeth, abaxially tomentose or glabrous. Bracts laciniate, long ciliate. Disc sinuate. Stamens 5–12(–20). Stigma 2–4-lobed. Capsule long ellipsoid or long ovoid, usually 2-valved.

1. *Populus alba* Linnaeus, Sp. Pl. 2: 1034. 1753.

银白杨 yin bai yang

Trees to 30 m tall, suckering freely; crown broad. Branchlets at first white tomentose; shoots grayish green or brownish, terete, densely white tomentose. Buds russet, ovoid, 4–5 mm, densely white tomentose, glabrescent, shiny. Leaves of short branchlets with petiole slightly flattened, ca. as long as leaf blade; leaf blade ovate-orbicular or elliptic-ovate, 4–8 × 2–5 cm, both surfaces tomentose. Leaves of sprouts and long shoots ovate-orbicular, middle lobe much larger than lateral ones, 4–10 × 3–8 cm, adaxially white tomentose at first, somewhat glabrescent, base broadly cuneate, rounded, truncate, or subcordate, palmately 3–5-lobed; margin irregularly notched; lateral lobes spreading nearly obtusely, entire or notched-lobed. Male catkin 3–6 cm. Male flower: stamens 8–10. Female catkin 5–10 cm. Female flower: stipe short; stigma 2-lobed. Capsule narrowly conical, ca. 5 mm, glabrous, 2-valved. Fl. Apr–May, fr. May.

Native in Xinjiang; planted in Gansu, Hebei, Henan, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang [N Africa, SW and WC Asia, Europe].

- 1a. Crown narrowly columnar or tower-shaped ..... 1c. var. *pyramidalis*
- 1b. Crown broad.
  - 2a. Bark green-white; leaves of short branchlets abaxially white tomentose 1a. var. *alba*
  - 2b. Bark gray or bluish gray; leaves of short branchlets abaxially subglabrous ..... 1b. var. *bachofenii*

**1a. *Populus alba* var. *alba***

银白杨(原变种) yin bai yang (yuan bian zhong)

Bark usually gray-white, smooth. Crown broad. Leaves of short branchlets with leaf blade ovate-orbicular or elliptic-ovate, abaxially white tomentose, base broadly cuneate, rounded, rarely minutely cordate or truncate, margin irregularly dentate, teeth asymmetric.

Native in Xinjiang (Ertix He valley); often planted in Gansu, Hebei, Henan, S Liaoning, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi [N Africa, NW Asia, Europe].

**1b. *Populus alba* var. *bachofenii*** (Wierzbicki ex Rochel) Wesmael in A. de Candolle, Prodr. 16(2): 324. 1868.

光皮银白杨 guang pi yin bai yang

*Populus bachofenii* Wierzbicki ex Rochel, Banat. Reise 77. 1838.

Bark gray or bluish gray. Crown broad. Leaves of short branchlets with leaf blade abaxially subglabrous, base truncate, margin with nearly asymmetric, notched teeth. Planted in Xinjiang [native to WC Asia, SW Europe].

Only male specimens have been seen by the authors.

**1c. *Populus alba* var. *pyramidalis*** Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 7: 498. 1854.

新疆杨 xin jiang yang

*Populus alba* f. *pyramidalis* (Bunge) Dippel; *P. alba* var. *bolleana* (Lauche) Otto; *P. bolleana* Lauche.

Bark grayish white or bluish gray, smooth, slightly furrowed. Crown narrowly columnar or tower-shaped.

Leaf blade orbicular, palmately parted on sprouts and long shoots, abaxially green and subglabrous, base truncate, margin with nearly asymmetric, coarsely notched teeth.  $2n = 38^*$ ,  $40^*$ ,  $48^*$ .

Planted in Gansu, Hebei, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, more often in Xinjiang [native to WC Asia, Europe].

Only male specimens have been seen by the authors.

**2. *Populus canescens*** (Aiton) Smith, Fl. Brit. 3: 1080. 1804.

银灰杨 yin hui yang

*Populus alba* Linnaeus var. *canescens* Aiton, Hort. Kew. 3: 405. 1789.

Trees to 20 m tall, suckering freely; bark grayish or bluish gray, smooth, rough at base of trunk; crown spreading. Branchlets terete, often glabrous; short branchlets brownish, tomentose. Buds ovoid, brown tomentose. Leaves of short branchlets with petiole slightly compressed, nearly as long as blade, glabrous; leaf blade ovate-orbicular, ovate-elliptic, or rhombic- to ovate-orbicular, 4–8 × 3.5–6 cm, both surfaces glabrous or sometimes thinly tomentose abaxially, base broadly cuneate or rounded, margin with obtusely notched teeth, apex obtuse. Leaves of sprouts and long shoots with petiole gray tomentose; leaf blade broadly elliptic, abaxially gray tomentose, adaxially green, glabrous or sparsely tomentose, irregularly dentate. Male catkin 5–8 cm. Male flower: stamens 8–10. Female catkin 5–10 cm. Female flower: ovary glabrous; stipe short. Capsule long ovoid, 3–4 mm, 2-valved. Fl. Apr, fr. May.

Xinjiang [W Asia, Europe].

Regarded by many authors as a hybrid between *Populus alba* and *P. tremula*.

**3. *Populus davidiana*** Dode, Bull. Soc. Hist. Nat. Autun 18: 189. 1905.

山杨 shan yang

Trees to 25 m tall, suckering freely; trunk to 60 cm d.b.h.; bark grayish green or grayish white, smooth, but rough on basal part of old trunk; crown globose.

Branchlets reddish brown, terete; sprouts pubescent.

Buds ovoid or ovoid-globose, glabrous, slightly viscid.

Petiole laterally flattened; leaf blade deltoid-ovate-orbicular or suborbicular, 3–6 cm, larger and deltoid-ovate-orbicular on sprouts, reddish when very young, abaxially pilose, base rounded, truncate, or shallowly cordate, margin with dense, sinuate teeth, apex acute or shortly acuminate. Male catkin 5–9 cm. Male flower: stamens 5–12. Female catkin 4–7 cm, ca. 12 cm in fruit. Female flower: ovary conical; stigma red, 2-parted. Capsule ovoid-conical, ca. 5 mm, 2-valved, shortly stipitate. Fl. Mar–Apr, fr. Apr–May.  $2n = 38^*$ , 44.

Mountains; 100–3800 m. Anhui, Gansu, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan [Korea, Mongolia, E Russia].

- 1a. Branchlets, petioles, and leaf blades glabrous

or pilose when very young ..... 3a. var. *davidiana*

1b. Branchlets, petioles, and leaf blades  
abaxially pilose ..... 3b. var. *tomentella*

**3a. *Populus davidiana* var. *davidiana***

山杨(原变种) shan yang (yuan bian zhong)  
*Populus davidiana* f. *ovata* C. Wang & S. L. Tung; *P. davidiana* f. *pendula* (Skvortzov) C. Wang & Tung; *P. davidiana* var. *pendula* Skvortzov; *P. tremula* Linnaeus var. *davidiana* (Dode) C. K. Schneider; *P. wutanica* Mayr.

Branchlets, petioles, and leaf blades smooth.  
Mountains; 100–3800 m. Anhui, Gansu, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan [Korea, Mongolia, E Russia].

**3b. *Populus davidiana* var. *tomentella* (C. K. Schneider)**  
Nakai, Fl. Sylv. Kor. 18: 191. 1930.

茸毛山杨 rong mao shan yang  
*Populus tremula* var. *davidiana* f. *tomentella* C. K. Schneider in Sargent, Pl. Wilson. 3: 25. 1916.  
Branchlets, petioles, and leaf blades abaxially pilose.  
Mountain slopes; 2300–3000 m. Gansu (Laojun Shan), Sichuan, Yunnan [Korea].

**4. *Populus tremula* Linnaeus, Sp. Pl. 2: 1043. 1753.**

欧洲山杨 ou zhou shan yang  
Trees to 20 m tall; bark grayish green, smooth, irregularly fissured or scabrous at base of trunk; crown globose, open. Branchlets grayish brown, terete; 1-year-old branchlets reddish brown, shiny, glabrous or pubescent. Buds ovoid-globose. Petiole compressed, ca. as long as leaf blade; leaf blade suborbicular, 3–7 cm, both surfaces glabrous, or pilose at first, base truncate, rounded, or shallowly cordate, margin with remotely sinuous teeth or crenate, apex obtuse-rounded, rarely apiculate. Sprouts with leaf blade larger, deltoid-ovate-orbicular, base cordate or truncate, margin crenate-serrate. Male catkin 5–8 cm; rachis pubescent. Male flower: stamens 5–10 or more. Female catkin 4–6 cm, to 10 cm in fruit. Capsule narrowly conical, glabrous, 2-valved, subsessile. Fl. Apr, fr. May.  $2n = 38$ .

River valleys, open or scattered coniferous forests; 700–2300 m. Xinjiang [Kazakhstan, Mongolia, Russia; Europe].

**5. *Populus wulianensis* S. B. Liang & X. W. Li, Bull. Bot. Res., Harbin 6(2): 135. 1986.**

五莲杨 wu lian yang  
Trees to 12 m tall; trunk erect; bark grayish green or grayish white, rough on basal part of old trunk; crown long ovoid or ovoid. Juvenile branchlets russet, terete, pubescent at first, glabrescent. Buds russet, conical or ovoid-conical, slightly viscid. Petiole laterally flattened, apex with 2 cupular glands; leaf blade ovate-orbicular or deltoid-ovate, 4–7 × 4–7 cm, base cordate to subcordate, margin serrulate, apex shortly acute. Leaf blade of sprouts and vigorous shoots oblong-ovate, 9–13 × 7–11 cm, base subcordate or subtruncate abaxially.

Female catkin 4–8 cm, 5–8 cm in fruit; rachis pilose. Female flower: ovary glabrous; stigma 4-lobed. Capsule long ovoid, 2-valved. Fl. Apr, fr. May.

• Mountains; 300–500 m. Shandong (Muping Xian, Wulian Xian).

**6. *Populus ×hopeiensis* Hu & Chow in Hu, Bull. Fan Mem. Inst. Biol. 5: 305. 1931.**

河北杨 he bei yang  
Trees to 30 m tall; bark yellowish green to grayish white, smooth; crown large and rounded. Branchlets grayish brown, terete, glabrous, yellowish brown and pubescent when young. Buds long ovoid or ovoid-globose, pubigerous. Petiole laterally flattened, ca. as long as or shorter than blade; leaf blade ovate or suborbicular, 3–8 × 2–7 cm, abaxially greenish, tomentose when leaves unfold, adaxially dull green, pilose at first, base truncate, rounded or broadly cuneate, margin coarsely dentate, teeth sinuous or not, acute and incurved. Male catkin ca. 5 cm; rachis with dense hairs. Female catkin 3–5 cm; rachis pubescent. Female flower: ovary ovoid, glabrous; stigma 2-lobed. Capsule 2-valved, shortly stipitate. Fl. Apr, fr. May–Jun.  $2n = 38^*$ ,  $40^*$ ,  $46^*$ ,  $57^*$ .

• Along rivers, valleys, alluvial deposits; 700–1600 m. Gansu, Hebei, Nei Mongol, Shaanxi; often planted elsewhere.

A natural hybrid between *Populus davidiana* and *P. tomentosa*.

**7. *Populus rotundifolia* Griffith, Not. Pl. Asiat. 4: 382. 1854.**

圆叶杨 yuan ye yang

Trees to 20 m tall; bark grayish white, smooth. Old branches gray; branchlets dull brown, at first pilose, glabrescent. Buds reddish brown, ovoid or conical; scales white downy, viscid. Leaves of short branchlets with petiole compressed, 3.5–6.5 cm; leaf blade ovate-orbicular or deltoid-orbicular, 5.5–8.5 × 5–8 cm, larger on sprouts, abaxially grayish green, adaxially green, both surfaces white downy when leaves unfold, base shallowly to deeply cordate or truncate, margin sinuously obtusely serrate, apex shortly acuminate or obtuse. Leaves of sprouts with petiole shorter; leaf blade ovate-orbicular, larger, base cuneate or subcordate. Female catkin 4–7 cm, ca. 10 cm in fruit; rachis pilose. Female flower: ovary long ovoid, glabrous; style short or subsessile; stigma 2-parted. Capsule long ovoid, 2-valved.

Mountain slopes; ca. 2800 m. Gansu, Guizhou, Shaanxi, Sichuan, Xizang, Yunnan [Bhutan].

- 1a. Style short or subsessile; stigma 2-parted, each part diverging ..... 7a. var. *duclouxiana*  
1b. Style evident; stigma 2-lobed, each lobe broad, 3-parted or -lobed ..... 7b. var. *bonati*

**7a. *Populus rotundifolia* var. *duclouxiana* (Dode) Gombocz, Math. Termesz. Kozl. 30: 130. 1908.**

清溪杨 qing xi yang

*Populus duclouxiana* Dode, Bull. Soc. Nat. Hist. Autun. 18: 190. 1905.

Female flower: style short or sessile; stigma 2-parted, each part diverging.

- Mountain slopes; ca. 2800 m. Gansu, Guizhou, Shaanxi, Sichuan, Xizang, Yunnan.

This variety differs from var. *rotundifolia* (which occurs in Bhutan) as follows: leaves deltoid-orbicular, larger, apex shortly acuminate or obtuse; female catkin usually more than 10 cm.

**7b. *Populus rotundifolia* var. *bonatii*** (H. Léveillé) C. Wang & S. L. Tung, Fl. Reipubl. Popularis Sin. 20(2): 15. 1984.

滇南山杨 *dian nan shan yang*

*Populus bonatii* H. Léveillé, Monde Pl. 12: 9. 1910.

Female flower: style evident; stigma 2-lobed, each lobe broad, 3-parted or -lobed.

- Sichuan, Yunnan (Kunming to Dali).

**8. *Populus qionghaensis*** T. Hong & P. Luo, Bull. Bot. Res., Harbin 7(3): 67. 1987.

琼岛杨 *qiong dao yang*

Trees to 40 m tall; trunk to 1.7 m d.b.h.; bark grayish black, shallowly furrowed. Juvenile branchlets dark green; older branchlets brown to gray. Buds ovoid or narrowly ovoid, yellow-green, canescent or glabrous, brown at margin. Petiole 3–6 cm, laterally flattened, apex with 2 glands or eglandular; leaf blade ovate, narrowly ovate, or broadly ovate 7–13.5 × 5.5–10.5 cm, abaxially glaucous, pilose or glabrous along veins, adaxially grayish green, base rounded, truncate, or broadly cuneate, margin with loose, glandular saw teeth, apex acuminate to acute. Long shoots densely pubescent; petiole 2–3 cm, laterally flattened, apex with 2 glands; leaf blade broadly ovate, 9–13 × 6.5–10.5 cm, abaxially densely pubescent along veins, base truncate or subcordate, margin coarsely glandular dentate, apex shortly acuminate. Female catkin ca. 8 cm; rachis pilose; bracts subulate. Female flower: disc cupular, irregularly serrate; ovary ovoid, with 4 ovules; stigma reddish, cristate. Capsule 2-valved. Fl. Jan.

- Mountains; ca. 1200 m. Hainan (Bawangling).

**9. *Populus adenopoda*** Maximowicz, Bull. Soc. Imp. Naturalistes Moscou 54(1): 50. 1879.

响叶杨 *xiang ye yang*

Trees to 30 m tall; bark grayish white, smooth, becoming dark gray, furrowed; crown ovoid. Old branches grayish brown, glabrous; branchlets slender or robust, dull reddish brown pubescent. Buds conical, viscid, glabrous. Petiole very laterally flattened, 2–8(–12) cm, tomentose or downy; leaf blade ovate-orbicular or ovate, 5–15 × 4–7(–13) cm, abaxially grayish green, densely pubescent when young, adaxially dark green,

glabrous or downy along veins, shiny, base truncate or cordate, rarely subrounded or cuneate, with 2 raised glands, margin incurved, glandular crenate-serrate or loosely or coarsely dentate, apex long acuminate or caudate. Male catkin 6–10 cm. Male flower: disc dentate-lobed. Fruiting catkin 12–20(–30) cm; rachis pilose; bracts palmately parted, brown, obovate-elliptic, ca. 2.5 mm, ciliate. Capsule long ovoid-ellipsoid, (2–)4–6 mm, glabrous, 2-valved, shortly stipitate, apex acute. Seeds dark. Fl. Mar–Apr, fr. Apr–May.

- Mountain slopes; 300–2500 m. Anhui, Fujian, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang.

Used for timber, construction, making furniture, farm tools, and wood pulp.

- 1a. Branchlets slender; leaves 5–15 × 4–7 cm, margin incurved, crenate-serrate 9a. var. *adenopoda*
- 1b. Branchlets robust; leaves ca. 15 × 13 cm, margin sparsely dentate to coarsely saw dentate ..... 9b. var. *platyphylla*

**9a. *Populus adenopoda* var. *adenopoda***

响叶杨(原变种) *xiang ye yang* (yuan bian zhong)

*Populus adenopoda* f. *cuneata* C. Wang & S. L. Tung;

*P. adenopoda* f. *microcarpa* C. Wang & S. L. Tung; *P.*

*silvestrii* Pampanini; *P. tremula* Linnaeus var.

*adenopoda* (Maximowicz) Burkill.

Branchlets slender. Leaf blade 5–15 × 4–7 cm, margin incurved, crenate-serrate.

- Mountain slopes; 300–2500 m. Anhui, Fujian, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang.

**9b. *Populus adenopoda* var. *platyphylla*** C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 114. 1982.

大叶响叶杨 *da ye xiang ye yang*

Branchlets robust. Leaf blade ovate-orbicular, large, ca. 15 × 13 cm, margin sparsely dentate to coarsely saw dentate.

- Yunnan.

**10. *Populus tomentosa*** Carrière, Rev. Hort. 1867: 340. 1867.

毛白杨 *mao bai yang*

Trees to 30 m tall; trunk usually erect; bark at first dull gray, becoming grayish green to grayish white, later dark gray on basal part of trunk, furrowed, rough; crown conical to ovoid-globose, globose, or fastigiate. Lateral branches spreading, pendulous when old; branchlets at first gray tomentose, glabrescent. Buds ovoid, ovoid-globose, or subglobose, tomentulose. Leaves of short branchlets often smaller; petiole laterally flattened, slightly shorter than blade; leaf blade ovate or deltoid-ovate, 7–11 × 6.5–10.5 cm, abaxially tomentose when leaves unfold, glabrescent, adaxially dark green, shiny, base shallowly cordate to cordate or truncate, margin sinuate-dentate, apex acuminate. Long shoots with petiole 3–7 cm, compressed distally; leaf blade broadly ovate or deltoid-ovate, 10–15 × 8–13 cm,



abaxially densely tomentose, glabrescent, adaxially dull green, smooth, base cordate or truncate, usually 2(–4)-glandular, margin with deeply coarse or sinuate teeth, apex shortly acuminate. Male catkin 10–14(–20) cm. Male flower: stamens 6–12. Female catkin 4–7 cm, to 14 cm in fruit. Female flower: ovary long ellipsoid; style pink, 2-lobed. Capsule conical or long ovoid, 2-valved. Fl. Mar, fr. Apr–May.  $2n = 38^*$ ,  $40^*$ ,  $57^*$ .

• Plains; near sea level to 1500 m. Anhui, Gansu, Hebei, Henan, Jiangsu, S Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang.

Used for wood pulp, timber for construction, making farm tools, furniture, and matchwood; also commonly planted along streets and as an ornamental.

- 1a. Leaves of short branchlets with cordate bases ..... 10a. var. *tomentosa*  
 1b. Leaves of short branchlets with truncate bases ..... 10b. var. *truncata*

**10a. *Populus tomentosa* var. *tomentosa***

毛白杨(原变种) mao bai yang (yuan bian zhong)

*Populus glabrata* Dode; *P. pekinensis* L. Henry.

Crown conical to ovoid-globose or globose. Leaf blade of short branchlets cordate at base.

• Plains; near sea level to 1500 m. Anhui, Gansu, Hebei, Henan, Jiangsu, S Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang.

**10b. *Populus tomentosa* var. *truncata* Y. C. Fu & C. H. Wang, Acta Phytotax. Sin. 13(3): 95. 1975.**

截叶毛白杨 jie ye mao bai yang

Bark grayish green, smooth. Crown dense. Leaves appearing early; leaf blade of short branchlets usually truncate at base.

• Shaanxi.

Fast-growing trees.

**11. *Populus ×pseudotomentosa* C. Wang & S. L. Tung, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 4: 22. 1979.**

响毛杨 xiang mao yang

Trees. Juvenile branchlets purplish brown, smooth. Buds yellowish brown, ovoid, apex acute. Petiole and leaves of long shoots abaxially densely white tomentose; leaf blade of short branchlets ovate-orbicular, smaller, to 9 cm, base cordate and usually with 2 conspicuous glands, margin irregularly coarsely undulate dentate and shallowly small serrate, apex acute.

• Cultivated. Henan, Shandong, Shanxi.

Probably a natural hybrid between *Populus adenopoda* and *P. tomentosa*.

**12. *Populus ningshanica* C. Wang & S. L. Tung, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 4: 19. 1979.**

汉白杨 han bai yang

Trees to 18 m tall; trunk to 30 cm d.b.h.; bark of young trees bluish gray, becoming bluish white; crown narrowly oblong. Branches spreading; branchlets dull purplish brown, at first pubescent, glabrescent. Buds ovoid, slightly viscid, shiny; scales ciliate at margin. Petiole laterally flattened, terete near base, 1.5–5(–6) cm, pilose, with 2 large, flattened glands at apex; leaf blade broadly ovate, red when young, 3–10 × 3–8 cm, both surfaces pilose along veins, later glabrous, abaxially greenish, adaxially dark green, base shallowly cordate or rounded to rounded-cuneate, margin remotely glandular sinuate-serrate, apex shortly acuminate. Fruiting catkin ca. 10 cm. Capsule 2-valved.

• Forests; 700–800 m. Hubei, Shaanxi.

Similar to *Populus adenopoda* but 1-year-old branchlets dark purple, smooth, pilose; bud scales ciliate at margin; leaf blade remotely sinuate-serrate at margin, shortly acuminate at apex. Similar also to *P. davidiana* but bud scales ciliate at margin; petiole with 2 large glands at apex; leaf blade nearly deltoid-ovate, apex shortly acuminate.

**2. Sect. *Leucoides* Spach, Ann. Sci. Nat., Bot., sér. 2, 15: 30. 1841.**

大叶杨组 da ye yang zu

Bark exfoliating, rough. Buds conical, slightly viscid, smooth. Leaves of short branchlets and long shoots with petiole terete or slightly compressed distally; leaf blade suborbicular, base cordate or deeply cordate. Disc parted or sinuate, persistent. Male flower: stamens 12–40; anthers long elliptic, apex apiculate. Female flower: ovary downy (or glabrous); style elongate; stigma 2- or 3-lobed. Capsule pilose, 2- or 3(or 4)-valved.

**13. *Populus lasiocarpa* Olivier in Hooker's Icon. Pl. 20: t. 1943, 1890.**

大叶杨 da ye yang

Trees to 20 m tall; trunk to 50 cm d.b.h.; bark dark gray, furrowed; crown tower-shaped or rounded. Branchlets yellowish brown or slightly purplish brown, coarsely robust, loose, angled, tomentose when young, or pilose to glabrescent. Buds ovoid-conical, large, slightly viscid; basal scale tomentose. Petiole red, terete, 5–8 cm, pilose; leaf blade ovate, 15–30 × 10–15 cm, abaxially greenish, tomentose along veins, adaxially bright green, glabrous, densely downy at base, base

deeply cordate, often auriculate, often 2-glandular, margin glandular crenate-serrate, revolute, apex acuminate, rarely shortly acuminate. Male catkin 9–12 cm; rachis pilose; bracts russet, oblanceolate, smooth, apex lacinate. Male flower: stamens 30–40. Fruiting catkin 15–24 cm; rachis pilose. Capsule ovoid, 1–1.7 cm, tomentose, 3-valved, shortly stipitate or sessile. Seeds oblong, 3–3.5 mm. Fl. Apr–May, fr. May–Jun.

• Mountain slopes, riverside woods; 1300–3500 m. Guizhou, Hubei, Shaanxi, Sichuan, Yunnan.

1a. Capsule stipitate, 1–1.7 cm; fruiting catkin

15–24 cm ..... 13a. var. *lasiocarpa*

1b. Capsule sessile, 1.6–1.9 cm; fruiting catkin to 40 cm ..... 13b. var. *longiamenta*

**13a. *Populus lasiocarpa* var. *lasiocarpa***

大叶杨(原变种) da ye yang (yuan bian zhong)

Fruiting catkin 15–24 cm. Capsule 1–1.7 cm, stipitate.

• Mountain slopes, riverside woods; 1300–3500 m. Guizhou, Hubei, Shaanxi, Sichuan, Yunnan.

**13b. *Populus lasiocarpa* var. *longiamenta*** P. Y. Mao & P. X. He, Bull. Bot. Res., Harbin 6(2): 79. 1986.

长序大叶杨 chang xu da ye yang

Fruiting catkin to 40 cm. Capsule 1.6–1.9 cm, sessile.

• Mountain slopes; 1700–1900 m. Yunnan (Yiliang Xian, Zhenxiang Xian).

**14. *Populus wilsonii*** C. K. Schneider in Sargent, Pl. Wilson. 3: 16. 1916.

椅杨 yi yang

*Populus wilsonii* f. *brevipetiolata* C. Wang & S. L.

Tung; *P. wilsonii* f. *pedicellata* C. Wang & S. L. Tung.

Trees to 25 m tall; trunk to 1.5 m d.b.h.; bark dark grayish brown, slightly furrowed, exfoliating; crown broadly tower-shaped. Branchlets purple or dull brown when young, becoming grayish brown, terete, coarsely robust, smooth, pilose. Buds russet or purplish brown, ovoid-globose, large, glabrous, slightly viscid. Petiole purple, terete, (4–)6–16 cm, glabrous, apex slightly angled, sometimes glandular; leaf blade broadly ovate, suborbicular, or broadly ovate-elliptic, 8–20 × 7–15 cm, abaxially tomentose at first, glabrescent, grayish green, adaxially bluish green, pilose along veins or glabrous at base, base cordate to rounded-truncate, margin glandular crenate, apex obtuse; veins raised abaxially. Male catkin ca. 7 cm. Fruiting catkin to 15 cm; rachis pubescent. Capsule ovoid, subglabrous, stipitate. Fl. Apr–May, fr. May–Jun.

• Forests; 1300–3400 m. Gansu, Hubei, Shaanxi, Sichuan, Xizang, Yunnan.

**15. *Populus violascens*** Dode, Bull. Soc. Dendrol. France 31. t. 3. 1921.

**3. Sect. *Tacamahaca*** Spach, Ann. Sci. Nat., Bot., sér. 2, 15: 32. 1841.

青杨组 qing yang zu

Bark furrowed. Buds usually large, very viscid, with a strongly balsamic odor. Leaves of long shoots and short branchlets variously shaped; petiole terete or subquadrangular, of varying length, sulcate; leaf blade abaxially usually white, adaxially green, base cuneate or rounded to shallowly cordate, without translucent margin. Bracts not fringed. Male flower: stamens 8–60; anthers long elliptic to globose. Female flower: disc usually entire, persistent; style short or absent; stigma 2–4-lobed. Capsule 2–4(or 5)-valved.

**18. *Populus simonii*** Carrière, Rev. Hort. 1867: 360. 1867.

小叶杨 xiao ye yang

Trees to 20 m tall; trunk to 50 cm d.b.h.; bark grayish green when young, dark gray on old trees, furrowed; crown subrounded. Branchlets of young trees and sprouts usually russet, becoming yellowish brown, conspicuously angled; branchlets of old trees terete, slender, glabrous. Buds brown, elongate, viscid, apex

茎柄杨 jin bing yang

Trees to 20 m tall; bark dark gray, furrowed. Branchlets yellowish brown, coarsely robust. Leaves of short branchlets with petiole violet, 2–3 cm, glabrous; leaf blade ovate to lanceolate, margin glandular serrate; veins white villous abaxially, subglabrous adaxially. Long shoots with leaf blade elliptic-ovate to long elliptic-ovate, 10–15 cm, base subcordate, apex acute. Similar to *Populus lasiocarpa*. Described by L.-A. Dode using a plant cultivated in Paris, introduced from C China; to date, no specimens have been collected that agree with the original description.

**16. *Populus glauca*** H. H. Haines, J. Linn. Soc., Bot. 37: 408. 1906.

灰背杨 hui bei yang

Trees to 10 m tall; bark gray. Branchlets brown or purplish brown, villous when young. Buds pilose. Petiole terete, short, downy; leaf blade ovate, ca. 20 × 18 cm, abaxially pale, pilose along veins, adaxially green, pubescent along veins, base shallowly cordate or truncate, apex acute. Flowers usually bisexual; disc 5–7-lobed; stamens 6–12. Fruiting catkin very long; rachis pilose. Capsule subglobose, pilose, 2-valved.

Forests; 2500–3300 m. Sichuan, Xizang, Yunnan [India, Sikkim].

**17. *Populus pseudoglauca*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 191. 1974.

长序杨 chang xu yang

Trees to 7 m tall. One-year-old branchlets purplish brown, elongate, tomentose or subglabrous; juvenile branchlets grayish white, densely tomentose. Buds purple, villous, viscid. Petiole terete, 3–6 cm, densely tomentose; leaf blade ovate to broadly ovate, 11–14 cm, abaxially glaucous, densely tomentose, adaxially green, pubescent along veins, base cordate or subrounded, margin glandular crenate-serrate, apex acute or shortly acuminate. Fruiting catkin to 40 cm; rachis pilose. Capsule tomentose, 3- or 4-valved, subsessile. Fl. May, fr. Jun–Jul.

• Mountain slopes; 2100–2700 m. Sichuan, Xizang (Bomi Xian).

acuminate. Petiole yellowish green or reddish, terete, 0.5–4 cm; leaf blade rhombic-ovate, rhombic-elliptic, or rhombic-obovate, 3–12 × 2–8 cm, broadest above middle, abaxially grayish green or slightly white, adaxially brightly greenish, glabrous, base cuneate, broadly cuneate, or narrowly rounded, margin serrulate, apex abruptly acute or acuminate. Male catkin 2–7 cm; rachis glabrous; bracts greenish, lacinate, lobes brown,

glabrous. Male flower: stamens 8–9(–25). Female catkin 2.5–6 cm, to 15 cm in fruit. Female flower: stigma 2-lobed. Capsule small, glabrous or pubescent, 2(or 3)-valved. Fl. Mar–May, fr. Apr–Jun.  $2n = 38^*$   
Mountains, plains, alluvial deposits, valleys; near sea level to 3000 m. Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang [Mongolia].  
Used for timber.

- 1a. Leaves with short, soft hairs along veins adaxially and on petioles.  
2a. Leaves rhombic-broadly ovate, wider than long, pubescent with short, soft hairs only along veins adaxially; catkin rachis glabrous ..... 18b. var. *latifolia*  
2b. Leaves rhombic, longer than wide, axils pubescent with short, soft hairs along veins; catkin rachis pubescent with short, soft hairs ..... 18c. var. *liaotungensis*  
1b. Leaves and petioles glabrous.  
3a. Leaves rhombic ..... 18a. var. *simonii*  
3b. Leaves ovate-lanceolate, suborbicular, or obovate.  
4a. Leaves suborbicular or obovate ..... 18d. var. *rotundifolia*  
4b. Leaves ovate-lanceolate ..... 18e. var. *tsinlingensis*

**18a. *Populus simonii* var. *simonii***

小叶杨(原变种) xiao ye yang (yuan bian zhong)  
*Populus balsamifera* Linnaeus var. *simonii* Wesmæl; *P. laurifolia* Ledebour var. *simonii* Regel; *P. simonii* f. *fastigiata* C. K. Schneider; *P. simonii* f. *pendula* C. K. Schneider; *P. simonii* f. *robusta* C. Wang & S. L. Tung.

Leaves rhombic-ovate, rhombic-elliptic, or rhombic-obovate, glabrous.

Mountains, plains; near sea level to 2500 m. Hebei, Heilongjiang, Jiangsu, Jilin, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan, Yunnan [Mongolia].

**18b. *Populus simonii* var. *latifolia*** C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 116. 1982.

宽叶小叶杨 kuan ye xiao ye yang

Trunk straight. Juvenile branchlets pilose. Leaves of short branchlets with petiole proximally and distally pilose; leaf blade usually rhombic-broadly ovate, adaxially pubescent along veins, base broadly cuneate, apex acute.

• C Liaoning (Anshan Shi).

Used for timber.

**18c. *Populus simonii* var. *liaotungensis*** (C. Wang & Skvortzov) C. Wang & S. L. Tung, Fl. Reipubl. Popularis Sin. 20(2): 27. 1984.

辽东小叶杨 liao dong xiao ye yang

*Populus liaotungensis* C. Wang & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 119. 1955; *P.*

*simonii* var. *breviamenta* T. Y. Sun; *P. simonii* f. *liaotungensis* (C. Wang & Skvortzov) Kitagawa.

Petiole pilose; leaf blade pubescent along veins. Catkin rachis pubescent. Capsule pubescent, shortly stipitate.

• Plains, alluvial deposits. Hebei, Liaoning, Nei Mongol.

**18d. *Populus simonii* var. *rotundifolia*** S. C. Lu ex C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 116. 1982.

圆叶小叶杨 yuan ye xiao ye yang

Trees usually small. Leaf blade suborbicular or obovate-orbicular, abaxially pale, adaxially dark green, leathery, apex subrounded.

• Plains. Nei Mongol.

**18e. *Populus simonii* var. *tsinlingensis*** C. Wang & C. Y. Yu, Fl. Tsinling, 1(2): 597. 1974.

秦岭小叶杨 qin ling xiao ye yang

Leaf blade ovate-lanceolate, leathery, base broadly cuneate or subrounded, margin remotely serrulate and glandular distally; veins raised, midvein and 2 lateral veins more so at base.

• Valleys; 1000–3000 m. S Shaanxi (Qinling Mountains).

**19. *Populus przewalskii*** Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg 27: 540. 1882.

青甘杨 qing gan yang

*Populus simonii* Carrière var. *griseoalba* T. Y. Sun; *P. simonii* var. *ovata* T. Y. Sun; *P. simonii* f. *przewalskii* (Maximowicz) Rehder; *P. suaveolens* Fischer var. *przewalskii* (Maximowicz) C. K. Schneider.

Trees to 20 m tall; trunk straight; bark grayish white, smooth, furrowed near base. Petiole 2–2.5 cm, pilose; leaf blade rhombic-ovate, 4.5–7 × 2–3.5 cm, abaxially glaucescent, adaxially green, base cuneate, margin serrulate, entire near base, apex shortly acuminate; veins pilose on both surfaces. Male catkin slender, ca. 4.5 cm; rachis pilose. Disc slightly sinuate-nicked. Female flower: ovary ovoid, tomentose; stigma 2-lobed, each lobe forked. Capsule ovoid, pubescent, 2-valved.

• Gansu, Nei Mongol, Qinghai, Sichuan.

**20. *Populus kangdingensis*** C. Wang & S. L. Tung, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 4: 19. 1979.

康定杨 kang ding yang

Trees to 10 m tall; bark grayish white to gray, furrowed. Branchlets russet to brown, angled, pubescent. Buds dark russet, conical, ca. 1 cm, viscid. Petiole 1–3.5 cm, pilose; leaf blade rhombic-elliptic or long elliptic-lanceolate, rarely ovate, broadest at or below middle, 3–9 × 1–5 cm, abaxially yellowish, adaxially green, base cuneate or broadly cuneate, margin densely glandular serrulate, revolute, apex acute or acuminate.

• Meadows by rivers; ca. 3500 m. W Sichuan.

Similar to *Populus simonii*, but branchlets and petioles pilose; leaf blade rhombic-elliptic, veins pilose, margin revolute, glandular serrulate.

**21. *Populus pseudosimonii*** Kitagawa, Bull. Inst. Sci. Res. Manch. 3: 601. 1939.

小青杨 xiao qing yang

Trees to 20 m tall; bark grayish white, shallowly furrowed when mature; crown broadly ovate. Branchlets grayish or yellowish brown, green or brownish green and angled when young, terete; sprouts conspicuously angled. Buds yellowish red, conical, slender, viscid. Petiole terete, 1.5–5 cm, sometimes pubescent at apex; leaf blade rhombic-elliptic, rhombic-ovate-orbicular, ovate-orbicular, or ovate-lanceolate, 4–9 × 2–5 cm, broadest below middle, abaxially greenish white, adaxially dull green, glabrous, base cuneate, broadly cuneate, or rarely subrounded, margin alternating high and low serrate, ciliate, apex acuminate or shortly acuminate. Sprouts with petiole shorter; leaf blade larger, long elliptic, base suborbicular, margin crisped. Male catkin 5–8 cm. Female catkin 5.5–11 cm. Female flower: ovary globose or conical, glabrous; stigma 2-lobed. Capsule oblong, ca. 8 mm, 2- or 3-valved, sessile, apex acuminate. Fl. Mar–Apr, fr. Apr–May(–Jun).  $2n = 36^*, 38^*, 40^*, 41^*$ .

• Mountain slopes, valleys, along rivers; below 2300 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan.

- 1a. Catkin rachis glabrous; capsule sessile; branchlets slightly ascending 21a. var. *pseudosimonii*
- 1b. Catkin rachis sparingly pilose; capsule clearly stipitate; branchlets spreading or pendulous ..... 21b. var. *patula*

**21a. Populus pseudosimonii** var. **pseudosimonii**

小青杨(原变种) xiao qing yang (yuan bian zhong)  
Branchlets slightly ascending. Catkin rachis glabrous. Capsule sessile.

• Mountain slopes, valleys, along rivers; ca. 2300 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan.

**21b. Populus pseudosimonii** var. **patula** T. Y. Sun, J. Nanjing Forest. Univ. 4: 113. 1986

展枝小青杨 zhan zhi xiao qing yang  
Branchlets spreading or pendulous. Catkin rachis sparingly pilose. Capsule clearly stipitate.

• Nei Mongol (Hohhot, Wuchuan Xian).

**22. Populus charbinensis** C. Wang & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 550, 120. 1955.

哈青杨 ha qing yang

Trees to 20 m tall; bark grayish green at first, becoming dark gray on old trees; crown broadly ovoid. Branchlets reddish brown, subterete or slightly angled, glabrous. Buds brown, long ovoid, viscid, apex acuminate. Leaves on fruiting branchlets with petiole 4–4.5 cm; leaf blade usually suborbicular, rarely ovate-orbicular or ovate, broadest at or sometimes above middle, ca. as long as broad, pilose, abaxially greenish, glabrous, adaxially green, pubescent along veins, both surfaces pubescent along veins when young, base rounded or broadly cuneate, margin serrulate, entire proximally, ciliate. Sprouts with petiole terete, 1.5–2.3 cm; leaf blade obovate-orbicular, 5–6.5 × 3–4.2 cm, broadest

above middle, base broadly cuneate, margin serrulate, densely ciliate, apex acute or shortly acuminate. Male catkin ca. 6 cm; rachis pilose; bracts yellowish brown with brown lobes. Male flower: stamens 15. Female catkin ca. 9 cm, 10–12 cm in fruit; rachis glabrous or pilose at base; flowers shortly stipitate. Capsule glabrous, 2(or 3)-valved. Fl. Apr–May, fr. Jun.

• Heilongjiang, N Liaoning.

Probably a hybrid between *Populus xberolinensis* and *P. simonii*. Resembling the former in its grayish green, smooth bark, furrowed only at base of old trunks, and caducous leaves; resembling the latter in its branchlet color, viscid buds, angled sprouts, and shape of leaves of sprouts. Similar also to *P. cathayana* but leaf blade broadly cuneate basally, and to *P. pseudosimonii* but bark greenish; 1-year-old branchlets reddish; buds more viscid; leaf blade of sprouts obovate, caducous.

Both varieties are important for reforestation.

- 1a. Leaf margin and petiole glabrous 22a. var. *charbinensis*
- 1b. Leaf margin and petiole pubescent

..... 22b. var. *pachydermis*

**22a. Populus charbinensis** var. **charbinensis**

哈青杨(原变种) ha qing yang (yuan bian zhong)

Petiole and leaf margin glabrous.

• Heilongjiang.

**22b. Populus charbinensis** var. **pachydermis** C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 117. 1982.

厚皮哈青杨 hou pi ha qing yang

Trunk straight, terete; bark thick and deeply furrowed at base. Branches short. Petiole and leaf margin pubescent.

• Heilongjiang (Lindian Xian), N Liaoning.

**23. Populus cathayana** Rehder, J. Arnold Arbor. 12: 59. 1931.

青杨 qing yang

Trees to 30 m tall; crown broadly ovoid. Branchlets olive green when young, becoming orange to grayish yellow, terete, sometimes angled, glabrous. Buds purplish brown or yellowish brown, long conical, glabrous, viscid. Leaves of short branchlets with petiole terete, 2–7 cm, glabrous; leaf blade ovate, elliptic-ovate, elliptic, or narrowly ovate, sometimes broadly or orbicular-ovate, (4.5–)5–10 × 3.5–7(–8.5) cm, broadest below middle, abaxially greenish white, adaxially bright green, glabrous, base rounded, rarely subcordate or broadly cuneate, apex acuminate or mucronate; lateral veins 5–7 on each side, raised. Leaves on long shoots larger, ovate-oblong, 10–20 cm, base usually slightly cordate. Male catkin 5–6 cm. Male flower: stamens 30–35. Female catkin 4–5 cm, 10–15(–20) cm in fruit. Female flower: stigma 2–4-lobed. Capsule ovoid, 6–9 mm, (2 or)3- or 4-valved. Fl. Mar–May, fr. May–Jul.  $2n = 38^*, 40^*$ .

• Valleys, along rivers; 800–3000 m. S Gansu, Hebei, Liaoning, Nei Mongol, E Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang.

- 1a. Capsule with long stipe to 5 mm 23c. var. *pedicellata*

1b. Capsule with shorter stipe.

2a. Leaf blade broadly ovate ..... 23b. var. *latifolia*

2b. Leaf blade narrowly ovate 23a. var. *cathayana*

**23a. *Populus cathayana* var. *cathayana***

青杨(原变种) qing yang (yuan bian zhong)

Bark at first grayish green and smooth, becoming dull gray and furrowed when old. Leaf blade ovate, elliptic-ovate, elliptic, or narrowly ovate, margin glandular crenate-serrate.

• Valleys, along rivers; 800–3000 m. Hebei, Liaoning, Nei Mongol, Shaanxi, Shanxi, Sichuan.

Cultivated in plantations and shade belt forests.

**23b. *Populus cathayana* var. *latifolia*** (C. Wang & C. Y. Yu) C. Wang & S. L. Tung, Fl. Reipubl. Popularis Sin. 20(2): 32. 1984.

宽叶青杨 kuan ye qing yang

*Populus cathayana* f. *latifolia* C. Wang & C. Y. Yu, Fl. Tsinling. 1(2): 597. 1974.

Leaf blade broadly ovate or orbicular-ovate, 4.5–9.5 × 3.5–8.5 cm, apex mucronate, twisted.

• Valleys; 1600–1800 m. S Gansu, E Qinghai.

**23c. *Populus cathayana* var. *pedicellata*** C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 117. 1982.

长果柄青杨 chang guo bing qing yang

Leaf blade adaxially pubescent along veins. Capsule with long stipe to 5 mm.

• Valleys; ca. 1800 m. Hebei (Huailai Xian).

**24. *Populus purdomii*** Rehder, J. Arnold Arbor. 3: 325. 1922.

冬瓜杨 dong gua yang

Trees to 30 m tall; bark grayish green when young, becoming dark gray; crown globose. Branchlets yellowish brown or gray, terete, glabrous. Buds glabrous, viscid, apex acute. Petiole terete, 2–5 cm; leaf blade ovate or broadly ovate, 7–14 × 4–9 cm, long ovate and ca. 25 × 15 cm on sprouts, pilose along veins, glabrescent or not, abaxially shiny, adaxially bright green, base rounded or cordate, margin glandular serrulate or crenate-serrate, ciliate, apex acuminate. Fruiting catkin 11(–13) cm, glabrous. Capsule globose-ovoid, ca. 7 mm, (2 or)3- or 4-valved, sessile or subsessile. Fl. Apr–May, fr. May–Jun.

• Mountains, streamsides; 700–2600 m. Gansu, Hebei, Henan, Hubei, Shaanxi, Sichuan.

1a. Bark furrowed, exfoliating when old; leaf veins glabrescent ..... 24a. var. *purdomii*

1b. Bark smooth, not exfoliating; leaf veins pubescent ..... 24b. var. *rockii*

**24a. *Populus purdomii* var. *purdomii***

冬瓜杨(原变种) dong gua yang (yuan bian zhong)

Bark furrowed, exfoliating when old. Leaf blade glabrescent along veins.

• Mountains, streamsides; 700–2600 m. Gansu, Hebei, Henan, Hubei, Shaanxi, Sichuan.

According to A. Rehder's original description, *Populus purdomii* var. *purdomii* should have a 2-valved capsule; however, the authors have seen only 3- or 4-valved capsules on specimens collected at the type locality. This variety is similar to *P. cathayana* and *P. szechuanica*,

but differs from the former in its larger leaves, from the latter in its non-purple branchlets, and from both species in its exfoliating bark and pilose leaf veins.

Used for timber and wood pulp.

**24b. *Populus purdomii* var. *rockii*** (Rehder) C. F. Fang & H. L. Yang, Fl. Reipubl. Popularis Sin. 20(2): 34. 1984.

光皮冬瓜杨 guang pi dong gua yang

*Populus szechuanica* C. K. Schneider var. *rockii* Rehder in Rehder & Kobuski, J. Arnold Arbor. 13: 368. 1932.

Bark smooth, not exfoliating. Petiole and leaf blade abaxially ± pubescent along veins.

• Mountains; 1000–1800 m. SE Gansu.

**25. *Populus trinervis*** C. Wang & S. L. Tung, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 4: 23. 1979.

三脉青杨 san mai qing yang

Trees to 12 m tall; bark gray, furrowed. Branchlets reddish brown or yellowish brown, terete, slender, glabrous. Leaves of short branchlets with petiole terete, 2–4 cm, pilose at first, glabrescent; leaf blade broadly ovate or ovate, 4–7 × 2.5–5 cm, abaxially grayish white and smooth, adaxially green, pilose along veins, base rounded, margin shallowly crenate, entire near base, apex long caudate or acuminate; veins 3, adaxially raised, lateral veins curved at base. Fruiting catkin to 15 cm; rachis glabrous. Capsule long ovoid, ca. 5 mm, 2-valved. Fl. Mar, fr. Apr.

• Along streams; 1800–3000 m. Sichuan.

Similar to *Populus cathayana* but leaf veins pilose, lateral veins curved at leaf base; capsule 2-valved. Similar also to *P. simonii* but leaf blade broadest below middle, base rounded; fruiting catkin longer.

1a. Capsule subsessile ..... 25a. var. *trinervis*

1b. Capsule with stipe 2–4 mm .... 25b. var. *shimianica*

**25a. *Populus trinervis* var. *trinervis***

三脉青杨(原变种) san mai qing yang (yuan bian zhong)

Capsule subsessile.

• Along streams; 2100–3000 m. Sichuan.

**25b. *Populus trinervis* var. *shimianica*** C. Wang & N. Chao, Fl. Sichuan. 3: 285. 1985.

石棉杨 shi mian yang

Capsule with longer stipe 2–4 mm.

• Along streams; 1800–1900 m. SC Sichuan (Shimian Xian).

**26. *Populus girinensis*** Skvortzov, China J. 10: 337. 1929.

东北杨 dong bei yang

Trees to 12 m tall; trunk to 45 cm d.b.h.; bark furrowed; crown long ovoid. Branchlets terete, pubescent. Buds viscid, pilose or glabrous. Petiole 3–4 cm, pubescent; leaf blade broadly ovate or long ovate, 6.5–9 × 2.8–6 cm, abaxially shiny, ± pilose along veins, adaxially dull

green, pubescent along veins, base subcordate or cuneate, margin slightly crenate-serrate, apex shortly acuminate. Female catkin 10–14 cm; rachis glabrous. Capsule oblong, ca. 11 × 7 mm, glabrous, 3-valved, sessile. Fl. Apr, fr. May.

• Heilongjiang, Jilin.

According to B. V. Skvortzov (Not. Trees & Shrubs 10: 337. 1929), this is a hybrid that originated in Harbin, Heilongjiang around 1910.

1a. Buds pilose; leaf blade subcordate at base ..... 26a. var. *girinensis*

1b. Buds glabrous; leaf blade cuneate at base ..... 26b. var. *ivaschevitchii*

**26a. *Populus girinensis* var. *girinensis***

东北杨(原变种) *dong bei yang* (yuan bian zhong)

Buds pilose. Leaf blade subcordate at base.

• Cultivated. Heilongjiang, Jilin.

Similar to *Populus ussuriensis* but leaf blade broadly ovate; female catkin rachis glabrous.

**26b. *Populus girinensis* var. *ivaschevitchii*** Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 127, 551. 1955.

楔叶东北杨 *xie ye dong bei yang*

Buds glabrous. Leaf blade cuneate at base.

• Heilongjiang, Jilin.

**27. *Populus keerqinensis*** T. Y. Sun, Fl. Intramongol. 1: 277. 1985.

科尔沁杨 *ke er qin yang*

Trees to 30 m tall; trunk to 50 cm d.b.h., irregularly canaliculate. Juvenile branchlets thin, shiny, angled. Winter buds apiculate, glabrous, viscid. Leaves with petiole 1–4 cm, canaliculate, pilose; leaf blade ovate, long ovate, broadly ovate, or orbicular, subleathery, 3–7 × 2–4 cm; leaf blade on long shoots narrowly ovate, broadly ovate, or rhomboid, abaxially becoming pale, glabrous, and pubescent along veins, adaxially dull green, base cuneate, broadly cuneate, or rounded, margin loosely crenate only in distal 1/2; leaf blade on suckers obovate, adaxially pilose along midvein, base narrowly cuneate, margin with glandular teeth only distally. Male flower: Stamens (3 or)4–6(–10). Female catkin ca. 4 cm; rachis pilose. Capsule ca. 1 mm, pilose, 2- or 3(or 4)-valved, shortly stipitate. Fl. Apr, fr. May–Jun.

• Plains or damp places. Nei Mongol (Zhelimu Meng).

**28. *Populus nakaii*** Skvortzov, China J. 10: 336. 1929.

玉泉杨 *yu quan yang*

Trees to 13 m tall; bark gray, furrowed near base of trunk. Branchlets green, becoming yellowish gray, terete. Buds viscid, glabrous. Petiole 1.2–2.5 cm, villous; leaf blade ovate to ovate-lanceolate, 4–6.5 × 1.5–2.3 cm, abaxially pale, adaxially dark green, base subcordate, margin glandular serrulate or subentire distally when young, slightly serrate when mature, ± ciliate, apex acuminate. Fruiting catkin 8–10 cm; rachis pubescent. Capsule ovoid, 3-valved. Fl. Apr, fr. May.

• Cultivated. Hebei, Heilongjiang, Jilin, Liaoning.

Similar to *Populus ussuriensis* but leaf blade narrower, ovate to ovate-lanceolate. Similar also to *P. girinensis* but leaf blade narrower; catkin rachis pubescent.

**29. *Populus suaveolens*** Fischer, Allg. Gartenzeitung. 9: 404. 1841.

甜杨 *tian yang*

*Populus balsamifera* Linnaeus var. *suaveolens* Loudon, Arb. Brit. 3: 1674. 1838.

Trees to 30 m tall; bark grayish green and smooth when young, dull gray and furrowed when old; crown oblong. Branchlets gray or grayish brown, terete, slightly pubescent. Buds brown, elongate, viscid. Petiole terete, 0.5–3(–4) cm, glabrous or pilose; leaf blade elliptic, ovate-orbicular, elliptic-oblong, or obovate-elliptic, 5–12 × 2–5.5 cm, usually broadest at middle, base rounded or subcordate, margin crenate-serrate, ciliate, apex abruptly acuminate or shortly acuminate, often twisted. Sprouts with leaf blade to 18 cm, abaxially grayish white, glabrous or pilose, adaxially dull green, base subcordate; lateral veins 3–5 on each side. Male catkin 4–5 cm. Female catkin 6–8 cm, ca. 10 cm in fruit. Female flower: ovary conical; style 3-parted; stigma broadly ovate or reniform, with sinuous margin. Capsule glabrous, often 3-valved, subsessile. Fl. May, fr. Jun. 2n = 38.

Riversides. E Nei Mongol (Da Hinggan Ling Diqu), Shaanxi [Mongolia, Russia (E Siberia)].

Used for timber, industrial wood, and wood pulp.

**30. *Populus hsinganica*** C. Wang & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 124. 1955.

兴安杨 *xing an yang*

Trees to 20 m tall; bark greenish gray, deeply furrowed near base of trunk. Branchlets gray-tawny or russet, terete, glabrous. Buds oblong, viscid; scales ciliate along margin. Petiole 1.5–3.5 cm, glabrous; leaf blade suborbicular or orbicular-cordate, rarely ovate-orbicular, 3–10 × 2–9 cm, abaxially greenish and glabrous, adaxially dark green, pilose along veins, base cordate or rounded, margin serrulate and ciliate, apex shortly acuminate, often twisted. Male catkin 4–8 cm; rachis glabrous or pilose. Male flower: stamens 30–40. Fruiting catkin 13–16 cm; rachis glabrous or pilose. Capsule 3-valved. Fl. May, fr. May–Jun.

• Along rivers. Hebei, Nei Mongol.

Used for wood pulp, timber for construction, matchwood, and ship building.

1a. Petiole and catkin rachis glabrous 30a. var. *hsinganica*

1b. Petiole and catkin rachis pilose 30b. var. *trichorachis*

**30a. *Populus hsinganica* var. *hsinganica***

兴安杨(原变种) *xing an yang* (yuan bian zhong)

Petiole and catkin rachis glabrous.

• Along rivers. Hebei, Nei Mongol.

**30b. *Populus hsinganica* var. *trichorachis*** Z. F. Chen, Bull. Bot. Res., Harbin 8(1): 115. 1988.

毛轴兴安杨 *mao zhou xing an yang*

*Populus cana* T. Y. Sun.

Petiole and catkin rachis pilose.

• Hebei (Yanshan), Nei Mongol (Daqing Shan).

**31. *Populus koreana*** Rehder, J. Arnold Arbor. 3: 226. 1922.

香杨 *xiang yang*

Trees to 30 m tall; trunk to 1.5 m d.b.h.; bark grayish green and smooth when young, dull gray and deeply furrowed when old; crown broadly ellipsoid. Branchlets slightly yellowish russet at first, balsamic, terete, stout, glabrous. Buds chestnut colored or light russet, long ovoid or long conical, large, very viscid, odoriferous, apex acuminate. Leaves of short branchlets with petiole 1.5–3 cm, distally pubescent; leaf blade elliptic, elliptic-oblong, elliptic-lanceolate, or obovate-elliptic, 9–12 cm, abaxially pale or slightly pinkish, adaxially dull green, prominently wrinkled, base narrowly rounded or broadly cuneate, margin glandular crenulate-serrate, apex obtuse. Leaves of long shoots with petioles 4–10 mm; leaf blade narrowly ovate-elliptic, elliptic, or obovate-lanceolate, 5–15 × 8(–9) cm, base usually cuneate. Male catkin 3.5–5 cm; bracts suborbicular or reniform. Male flower: stamens 10–30; anthers dull purple. Female catkin ca. 3.5 cm; rachis glabrous. Capsule green, ovoid-globose, glabrous, (2 or)4-valved, sessile. Fl. Apr–May, fr. Jun.

Forests. Hebei, Heilongjiang (Da Hinggan Ling Diqu), Jilin (Changbai Shan), E Liaoning, Nei Mongol [Korea, Russia].

Similar to *Populus ussuriensis* but branchlets reddish, smooth, odorous; leaf blade wrinkled.

Used for wood pulp, timber for construction, plywood, and matchwood.

**32. *Populus maximowiczii*** A. Henry, Gard. Chron., ser. 3, 53: 198. 1913.

辽杨 *liao yang*

Trees to 30 m tall; bark grayish green or yellowish gray and smooth when young, gray and deeply furrowed when old; crown spreading. Branchlets reddish at first, becoming gray, terete, stout, densely pubescent. Buds brightly colored, conical, viscid. Leaves of fruiting branchlets with petiole terete, 1–4 cm, pilose; leaf blade broadly elliptic, obovate-elliptic, elliptic, or broadly ovate, 5–10(–14) × 3–6 cm, abaxially glaucous, adaxially dark green, wrinkled or ± smooth, both surfaces pubescent along veins, base subcordate or suborbicular, margin glandular crenate-serrate, ciliate, apex shortly acuminate or acute, usually twisted. Leaves of sprouts with leaf blade broadly ovate-orbicular or long ovate, larger than others, shorter than petiole. Male catkin 5–10 cm; rachis glabrous; bracts lacinate. Male flower: stamens 30–40. Fruiting catkin 10–18 cm. Capsule ovoid-globose, glabrous, 3- or 4-valved, sessile or subsessile. Fl. Apr–May, fr. May–Jun.

Woods; 500–2000 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi [Japan, Korea, Russia].

Used for wood pulp, timber for construction, ship building, and matchwood.

**33. *Populus ussuriensis*** Komarov, Bot. Zhurn. SSSR 19: 510. 1934.

大青杨 *da qing yang*

*Populus maximowiczii* A. Henry var. *barbinervis* Nakai.

Trees to 30 m tall; trunk to 2 m d.b.h.; bark grayish green and ± smooth when young, dull gray and furrowed when old; crown globose. Branchlets grayish green, rarely russet, pubescent when young, angled in cross section. Buds conical, viscid, apex acuminate. Petiole 1–4 cm, densely downy; leaf blade elliptic or broadly elliptic to suborbicular, 5–12 × 3–7(–10) cm, abaxially shiny, adaxially dull green, both surfaces ± downy along veins, base subcordate or rounded, margin crenate, densely ciliate, apex apiculate, twisted.

Flowering catkin 12–18 cm; peduncle pubescent; rachis densely pubescent. Capsule ca. 7 mm, glabrous, 3- or 4-valved, subsessile. Fl. Apr–May, fr. May–Jun.  $2n = 38^*$ .

Forests; 300–1400 m. E Heilongjiang, E Jilin, E Liaoning [Korea, Russia].

Similar to *Populus maximowiczii* but branchlets, leaves, and catkin rachis densely pubescent; fallen leaves blackened adaxially. Fallen leaves of both *P. maximowiczii* and *P. koreana* become rust colored adaxially.

Used for wood pulp, timber for construction, ship building, and matchwood.

**34. *Populus amurensis*** Komarov, Bot. Zhurn. SSSR 5: 510. 1934.

黑龙江杨 *hei long jiang yang*

Trees; bark grayish white. Branchlets reddish yellow, angled, glabrous. Petiole 2–3 cm, densely pubescent; leaf blade ovate to broadly ovate, 4.5–7 × 2–4 cm, abaxially pale, adaxially deep green, both surfaces densely pubescent along veins, base rounded or cordate, margin serrulate, apex shortly acuminate. Female catkin 6–7 cm, 9–10 cm in fruit; rachis densely white downy. Female flower: stigma 4-lobed. Capsule globose, ca. 5 mm, white pilose, 4-valved, subsessile.

Planted along rivers. N Heilongjiang, NE Nei Mongol (Butha Qi) [Russia].

Used for timber, tool making, and matchwood.

**35. *Populus candicans*** Aiton, Hort. Kew. 3: 406. 1789.

欧洲大叶杨 *ou zhou da ye yang*

*Populus balsamifera* Linnaeus var. *candicans* (Aiton) A. Gray; *P. balsamifera* var. *subcordata* Hylander.

Trees; crown wide. Branches stout and spreading; branchlets chestnut colored, terete, tomentose. Buds large, very viscid. Leaves of sprouts and mature trees nearly uniformly shaped; petiole terete, 3–5 cm, tomentose; leaf blade broadly ovate-deltoid, 12–16 × ca. 10 cm, abaxially whitish, adaxially dull green, both surfaces pilose, more densely so along veins, base cordate, rarely truncate, margin crenate-serrate, ciliate, apex acuminate. Fruiting catkin to 16 cm; rachis

pubescent. Capsule ovoid, glabrous, 2-valved, often sterile, stipitate. Fl. May.

Planted. Xinjiang [Asia, Europe, North America, but native range uncertain, probably of hybrid origin].

No male specimens have been seen by the authors.

**36. *Populus ×gansuensis*** C. Wang & H. L. Yang in C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 106. 1982.

二白杨 er bai yang

Trees to more than 20 m tall; trunk straight; bark grayish green, smooth, ± russet and shallowly furrowed at base of old trunk; crown long ovoid or narrowly ellipsoid. Branches stout, subwhorled, spreading from trunk at ca. 45°, on male trees at ca. 60°; sprouts and branchlets angled. Leaves of short branchlets with petiole terete, compressed distally, 3–5 cm; leaf blade broadly ovate or rhombic-ovate, broadest below middle, 5–6 × 4–5 cm, abaxially pale, adaxially green, base rounded or broadly cuneate, margin glandular serrulate, entire near base, apex acuminate. Sprouts and long shoots with leaf blade deltoid or deltoid-ovate, ca. as long as wide, 7–8 cm, base truncate or subrounded, margin obtusely serrate near base. Male catkin slender, 6–8 cm. Male flower: stamens 8–13; filaments ca. 3 × as long as anthers. Female catkin 5–6 cm, to 12 cm in fruit; rachis glabrous; bracts flabelliform, lacinate. Female flower: ovary glabrous. Capsule long ovoid, 4–5 mm, 2-valved; stipe ca. 0.5 mm. Fl. Apr, fr. May.

• Along irrigation canals and ditches, roadsides. Gansu (Jiuquan Xian, Wuwei Xian, Zhangye Xian); planted in Nei Mongol.

Probably a natural hybrid between *Populus nigra* var. *thevestina* and *P. simonii*. Similar to the latter but bark grayish green; crown long ovoid or narrowly ellipsoid, stratified; branches subwhorled; leaf blade of long shoots deltoid, those of shorter branchlets broadest below middle; petioles compressed distally; flowering catkin longer.

**37. *Populus wenshanica*** Z. C. Feng & J. L. Guo ex G. Zhu, Novon 8: 464. 1998.

文县杨 wen xian yang

Trees to 30 m tall; trunk straight, to 80 cm d.b.h.; bark gray-green or green-white, smooth, that of old trunk shallowly furrowed at base. Sprouts and long branchlets angled. Leaves on short branchlets with petiole terete, 3–5 cm, laterally flattened distally; leaf blade ovate-orbicular or rhombic-ovate, 6–10 × 2.5–8 cm, abaxially greenish white, adaxially dull green, base rounded or broadly cuneate, margin with glandular teeth, apex acuminate. Leaf blade of sprouts and long branchlets deltoid-ovate or broadly ovate, 11–18 × 7–12 cm, base subcordate, rounded or broadly cuneate, margin with obtusely glandular teeth. Male catkin 4–5 cm; rachis glabrous. Fruiting catkin 8–12 cm; bracts fan-shaped, 2–2.5 mm, intricately lacinate. Female flower: ovary glabrous; stigma large, 3-lobed. Capsule long ovoid, 4–7 mm, (2 or)3-valved; stipe ca. 1 mm. Fl. Apr, fr. May.

• Mountains, along rivers; 1200–1800 m. Gansu (Wen Xian).

**38. *Populus minhoensis*** S. F. Yang & H. F. Wu, Fl. Xylophyta Qinghai 77. 1987.

民和杨 min he yang

Trees to more than 20 m tall; trunk erect; bark gray-brown, shallowly furrowed at base; crown narrowly conical. Lateral branches thin, stratified; spreading at acute angles; 1-year-old branchlets green, angled, later grayish white. Winter buds conical, viscid. Leaves on short branchlets with petiole green or somewhat pink, thin, apically compressed, ca. as long as blade, sparingly puberulent; leaf blade rhombic-ovate, 5–7 × 2.5–3.5 cm, both surfaces pilose along veins, base cuneate, margin serrulate, ciliate, apex acuminate. Leaves on sprouts with petiole 2–3 cm; leaf blade larger, deltoid-ovate to rhombic-ovate. Female catkin 1.5–2 cm, 7–9 cm in fruit; rachis pilose; bracts brown, broadly elliptic, fringed-lacinate. Female flower: ovary broadly ovoid; stigma 2-lobed. Capsule ovoid, pilose, 2-valved, shortly stipitate. Fl. Apr, fr. May–Jun.

• Mountains, river valley banks; 1800–2500 m. E Qinghai (Minhe Xian).

**39. *Populus alaschanica*** Komarov, Repert. Spec. Nov. Regni Veg. 13: 233. 1914.

阿拉善杨 a la shan yang

Trees to 18 m tall; bark gray, slightly pruinose. Branchlets slender. Petiole slender; leaf blade ovate, 2–7 × 1–9 cm, abaxially pale, glabrous, base cuneate, serrate, apex acuminate; veins raised abaxially. Male catkin ca. 3 cm. Female catkin 10–17 cm, loose; rachis and stipes pubescent; bracts lobed, long pilose, caducous; flowers green, shortly stipitate.

• Nei Mongol (Alxa Youqi, Alxa Zuoqi).

V. L. Komarov (Repert. Spec. Nov. Regni Veg. 13: 233. 1914) supposed this species to be a hybrid between *Populus przewalskii* and *P. tremula*.

**40. *Populus laurifolia*** Ledebour, Fl. Altaic. 4: 297. 1833.

苦杨 ku yang

Trees to 15 m tall; bark grayish, darkened and furrowed toward base of trunk; crown wide. Sprouts and branchlets yellowish, angled, tomentose or rarely glabrous. Buds conical, very viscid; basal scales tomentose. Leaves of short branchlets with leaf blade elliptic, ovate, or oblong-ovate, 6–12 × 4–7 cm, base rounded or cuneate, margin crenulate, ciliate, apex acute or shortly acuminate. Leaves of sprouts with petioles terete, 2–5 cm, adaxially canaliculate, tomentose; leaf blade lanceolate or ovate-lanceolate, 10–15 cm. Male catkin 3–4 cm; bracts suborbicular, 3–5 mm, usually caducous, base cuneate, margin lacinate, with brown lobes. Male flower: stamens 30–40; anthers purplish red. Female catkin 5–6 cm, elongated in fruit; rachis tomentose. Capsule ovoid, 5–6 mm, glabrous or pilose, 2- or 3-valved. Fl. Apr–May, fr. Jun.

Riverbanks; 500–1900 m. Nei Mongol, Xinjiang (Altay Shan, Tacheng Diqu) [NW Mongolia, Russia].

Used for fuel, wood pulp, and making farm tools.

**41. *Populus lancifolia*** N. Chao, Fl. Sichuan. 3: 285. 1985.

瘦叶杨 shou ye yang



Trees to 8 m tall. Two-year-old branchlets gray-brown; 1-year-old branchlets ± puberulent; juvenile branchlets terete, densely rigidly puberulent. Leaves of short branchlets with petiole thin, terete, 1–4.5 cm, puberulent; leaf blade lanceolate or ovate-lanceolate, 5–8.5 × 1.4–3.4 cm, abaxially pale, adaxially dark green, pubescent, hairy along veins, base cuneate or obtuse, margin with glandular crenate saw teeth, ciliate, apex long acuminate; lateral veins raised on both surfaces, 5–7 on each side. Fruiting catkin to 16 cm; peduncle and rachis rigidly puberulent. Disc entire or irregularly crenate. Capsule ovoid, ca. 4 mm, glabrous, 3- or 4-valved; stipe ca. 1 mm. Fr. Jun.

• Mountains; 3100–3200 m. W Sichuan (Kangding Xian).

**42. *Populus schneideri*** (Rehder) N. Chao, Fl. Sichuan. 3: 50. 1985.

西南杨 xi nan yang

*Populus cathayana* Rehder var. *schneideri* Rehder, J. Arnold Arbor. 12: 63. 1931; *P. yatungensis* (C. Wang & P. Y. Fu) C. Wang & Tung var. *trichorachis* C. Wang & Tung.

Trees. Older branches gray brown, densely pilose; juvenile branchlets gray purple, angled. Petiole terete, 1.5–4 cm, densely puberulent; leaf blade ovate or narrowly ovate, 5.5–9.5 × 3–5.5 cm, abaxially glaucous, adaxially dark green, both surfaces densely puberulent along veins, base rounded, margin glandular crenate-serrate, ciliate; lateral veins ca. 7 each side of prominent midvein, conspicuous. Fruiting catkin 10–13 cm; rachis densely pubescent. Capsule ovoid, ca. 5 mm, villous, 3- or 4-valved; stipe ca. 1.5 mm or capsule subsessile. Fl. Apr, fr. May–Jun.

• Mountains; 2500–3000 m. Sichuan, Xizang, Yunnan.

**43. *Populus pilosa*** Rehder, Am. Mus. Novit. 1: 292. 1927.

柔毛杨 rou mao yang

Trees to 10 m tall; bark whitish gray, deeply furrowed. Branchlets stout, yellowish white, with short internodes and dense leaf scars, pubescent, glabrescent. Buds viscid, downy. Petiole subterete, 1–2.5(–4) cm, with dense, yellow hairs; leaf blade suborbicular or ovate to broadly ovate, 4.5–8 × 4–6 cm, abaxially yellowish white or white, trichiferous along veins, adaxially pilose, base shallowly cordate, truncate, or rounded, margin sinuolate-serrate, apex shortly acuminate. Fruiting catkin 5–8 cm; rachis pilose; bracts wider than long. Disc with sinuous teeth. Capsule globose-ovoid, 4–5 mm, pubescent or glabrous, 2- or 3-valved, sessile or shortly stipitate. Fl. May, fr. Jun.

River valleys, mixed woods; 1600–2400 m. Xinjiang [Mongolia].

1a. Capsule pubescent, 2-valved, sessile 43a. var. *pilosa*

1b. Capsule glabrous, 3-valved, shortly stipitate ..... 43b. var. *leiocarpa*

**43a. *Populus pilosa* var. *pilosa***

柔毛杨(原变种) rou mao yang (yuan bian zhong)

Capsule pubescent, 2-valved, sessile.

River valleys; 1600–2300 m. N Xinjiang [Mongolia].

Similar to *Populus laurifolia* but leaf blade broadly ovate or ovate, shorter, broader; capsule globose-ovoid, downy.

**43b. *Populus pilosa* var. *leiocarpa*** C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 116. 1982.

光果柔毛杨 guang guo rou mao yang

Capsule glabrous, 3-valved, shortly stipitate.

• Mixed woods; ca. 2400 m. Xinjiang (Aksu Xian, Tomort Shan).

**44. *Populus intramongolica*** T. Y. Sun & E. W. Ma, J. Nanjing Forest. Univ. 4: 109. 1986.

内蒙杨 nei meng yang

Trees to 22 m tall; bark gray-green, smooth. Juvenile branchlets green-brown, later grayish green. Winter buds very viscid; scales angled, ciliate, caudate. Leaves of short and long branchlets similar; petiole 2–10 cm, ± pubescent; leaf blade long elliptic, ovate-elliptic, or rhombic-elliptic, 5–10 × 2.5–6 cm, abaxially gray-white, glabrous or sparingly pubescent, adaxially green, pubescent along veins, base cuneate or broadly cuneate, margin crenate, densely ciliate, apex acuminate or long acuminate. Sprouts with leaf blade elliptic-lanceolate, narrowly oblong-elliptic, narrowly elliptic, or oblanceolate, abaxially whitish, base narrowly cuneate, margin glandular crenate. Male catkin with rachis hairy. Male flower: stamens 15–30(–47). Fruiting catkin 12–16 cm, sparsely hairy. Capsule glabrous, (2 or)3 (or 4)-valved, shortly stipitate.

• Mountains; 1400–2000 m. Hebei (Huailai Xian), Nei Mongol (Hohhot), Shanxi (Xing Xian).

**45. *Populus pamarica*** Komarov, Bot. Zhurn. SSSR 19: 510. 1934.

帕米杨 pa mi yang

Trees. Branches yellowish gray or brownish; branchlets angled, downy. Leaves of short branchlets with petiole terete, 3–7 cm, downy; leaf blade orbicular, 5–8 cm, abaxially greenish, slightly pubescent along veins, adaxially green, base rounded or broadly cuneate, margin coarsely sinuate dentate, ciliate, apex apiculate. Sprouts with leaf blade long elliptic, base cuneate, margin nearly doubly serrate, apex shortly acuminate, glabrous. Fruiting catkin ca. 6 cm; rachis pilose. Capsule ovoid, ca. 4 mm, 3-valved, sessile. Fl. May, fr. Jun.

Along rivers; 1800–3000 m. Xinjiang (W Kunlun Shan) [Tajikistan]. Similar to *Populus pilosa* but branchlets angled; petiole longer, to 7 cm; leaf blade suborbicular, base rounded or broadly cuneate, margin coarsely dentate.

**46. *Populus iliensis*** Drobow, Bot. Mater. Gerb. Bot. Inst. Uzbekistansk. Fil. Akad. Nauk S.S.S.R. 6: 12. 1941.

伊犁杨 yi li yang

Trees to 15 m tall; bark gray, furrowed. Juvenile branchlets brown, tomentulose or sometimes glabrescent; 2- and 3-year-old branchlets brownish. Leaves of sprouts and long shoots with petiole compressed, 2–4 cm; leaf blade ovate-orbicular or broadly ovate-orbicular, 3–7 × 3–6 cm, glabrous, abaxially greenish, pilose along veins, adaxially green, base broadly cuneate, rounded, or truncate, margin with

densely incurved gland-tipped teeth, at first ciliate, apex shortly acuminate or apiculate, usually twisted. Fruiting catkin 5–10 cm; rachis glabrous or pubescent. Disc yellowish white, orbicular, with a stalk 3–4 mm.

Capsule ovoid, ca. 6 × 4 mm, glabrous, 2(or 3)-valved.

• Along rivers. Xinjiang (Ili He valley).

A. K. Skvortsov believes that this species is synonymous with *Populus afghanica*.

**47. *Populus talassica*** Komarov, Bot. Zhurn. SSSR 19: 509. 1934.

密叶杨 mi ye yang

*Populus densa* Komarov.

Trees; bark grayish green; crown spreading. Suckers russet or gray, slightly angled, at first pilose, becoming nearly glabrescent; branchlets gray, subterete, glabrous; short branchlets russet, tomentulose. Leaves of short branchlets with petiole terete, 2–4 cm, subglabrous or glabrous; leaf blade ovate-orbicular or ovate-elliptic, 5–8 × 3–5 cm, lanceolate to broadly lanceolate and 5–10 × 1.5–3 cm on sprouts, abaxially pale along veins, often pilose, adaxially greenish, glabrous, base cuneate, broadly cuneate, or rounded, margin shallowly crenate, apex acuminate. Male catkin 3–4 cm; rachis glabrous. Male flower: anthers purple. Fruiting catkin 5–6 cm, elongated to 10 cm when mature; rachis pilose. Capsule ovoid, 5–8 mm, tomentose, 3-valved; shortly stipitate. Fl. May, fr. Jun.

Rivers; 500–1800 m. C Xinjiang (Tian Shan) [S Kazakstan, Kyrgyzstan, Tajikistan, Uzbekistan].

Similar to *Populus laurifolia*, but long shoots less elongate, not angled; leaves on short shoots smaller; geographical distribution different.

**48. *Populus platyphylla*** T. Y. Sun, Fl. Intramongol. 1: 277. 1985.

阔叶杨 kuo ye yang

*Populus platyphylla* var. *flaviflora* T. Y. Sun; *P. platyphylla* var. *glauca* T. Y. Sun.

Trees to 25 m tall; trunk to more than 50 cm d.b.h.; bark lacteous. Older branches yellow-brown; juvenile branchlets russet or green-brown, usually angled.

Winter buds erect, dark brown, long conical, viscid. Leaves on short branchlets with petiole 2–6 cm, at least sparsely pubescent apically; leaf blade broadly ovate, rhombic-ovate, or ovate, 4–9 × 3.5–7 cm, abaxially pale, usually with sparse hairs, adaxially dull deep green, pilose along veins, margin with incurved, glandular teeth, apex apiculate-acuminate. Sprouts with leaf blade obovate or obovate-elliptic, on long shoots broadly ovate or ovate-orbicular, apex slightly acute or shortly acuminate. Male catkin ca. 5 cm; bracts white villous adaxially. Male flower: stamens 12–24. Fruiting catkin 10–12 cm; rachis pilose. Capsule ovoid, 6–7 mm, 2- or 3(or 4)-valved, shortly stipitate. Fl. Apr, fr. Jun.

• Valleys; ca. 1600 m. Hebei, Nei Mongol (Hohhot, Wuchuan Xian), N Shanxi.

**49. *Populus pseudomaximowiczii*** C. Wang & S. L. Tung, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 4: 20. 1979.

梧桐杨 wu tong yang

Trees to 15 m tall; bark gray, pruinose. Branchlets russet or yellowish russet, stout, glabrous. Buds brown, conical, large, ca. 2 cm, viscid. Leaves of short branchlets with petiole terete, 3–7 cm, pilose; leaf blade broadly ovate or ovate, 7–14 × 4–11 cm, abaxially pale, adaxially dark green, both surfaces whitish long pubescent along veins, base shallowly cordate or subrounded, margin crenate, ciliate, apex apiculate or shortly acuminate, often twisted. Leaves of sprouts with petiole terete, ca. 7 cm, subglabrous; leaf blade broadly ovate or ovate-elliptic, ca. 27 × 22 cm, abaxially pale, adaxially dark green, base cordate, margin irregularly and coarsely glandular dentate, apex apiculate. Male catkin 3–6 cm; bracts brown, laciniate, glabrous. Fruiting catkin to 15 cm; rachis glabrous. Capsule ovoid, downy, rarely glabrous, (2 or)3-valved, subsessile. Fl. Apr, fr. Jun.

• Forests; 1000–1600 m. Hebei (Wuling Shan), Shaanxi (Guanshan).

**50. *Populus shanxiensis*** C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 105. 1982.

青毛杨 qing mao yang

Trees to 15 m tall; trunk to 40 cm d.b.h.; bark grayish brown, furrowed. Branches yellowish gray, glabrous; branchlets reddish brown, angled, downy. Buds dull russet, conical, viscid; margin of scales downy. Petiole terete, 3–6 cm, pubescent, with 2 glands near apex; leaf blade ovate to broadly ovate, 5–10 cm, leathery, abaxially pale, adaxially dark green, base cordate, margin crenate, ciliate, apex shortly acuminate. Flowers and capsule unknown.

• Valleys; ca. 1600 m. W Shanxi.

This species is probably a hybrid between *Populus cathayana* and *P. tomentosa*. Similar to the former but petiole with 2 glands near base of leaf; leaf blade leathery. Similar to the latter but branchlets, buds, and petioles tomentose; leaf blade thicker.

**51. *Populus szechuanica*** C. K. Schneider in Sargent, Pl. Wilson. 3: 20. 1916.

川杨 chuan yang

Trees to 40 m tall; bark grayish white, rugged and fissured toward base of trunk, smooth above; crown ovoid-globose. Branchlets greenish brown or purplish, angled or only slightly angled, stout, glabrous; old branchlets at first yellowish brown, becoming gray, terete. Buds purplish, glabrous or pubescent, viscid, apex acute. Leaves appearing reddish, short branchlets with petiole 2.5–8 cm; leaf blade broadly ovate, ovate-orbicular, or ovate-lanceolate, 8–18 × 5–15 cm, glabrous or pubescent, base rounded, cuneate, or shallowly cordate, margin glandular dentate, at first ciliate. Sprouts with petiole 2–4 cm; leaf blade usually long ovate-elliptic, 11–20(–28) × 5–11(–16) cm, abaxially with yellowish green midvein, base subcordate or rounded, margin glandular crenate, apex acute or shortly acuminate. Fruiting catkin 10–20 cm or

more; rachis glabrous. Capsule ovoid, 7–9 mm, glabrous, 3- or 4-valved, subsessile. Fl. Apr–May, fr. May–Jun.

• Forests, mountains; 1100–4600 m. Gansu, Shaanxi, Sichuan, Xizang, Yunnan.

1a. Buds and leaves glabrous; branchlets angled ..... 51a. var. *szechuanica*

1b. Buds pubescent; leaves pubescent or glabrescent; branchlets only slightly angled ..... 51b. var. *tibetica*

**51a. *Populus szechuanica* var. *szechuanica***

川杨(原变种) *chuan yang* (*yuan bian zhong*)

Branchlets angled. Buds and leaves glabrous.

• Forests; 1100–4600 m. Gansu, Shaanxi, Sichuan, Yunnan.

Used for timber for construction and making furniture; also planted along roadsides as an ornamental.

**51b. *Populus szechuanica* var. *tibetica*** C. K. Schneider in Sargent, *Pl. Wilson*. 3: 33. 1916.

藏川杨 *zang chuan yang*

*Populus schneideri* (Rehder) N. Chao var. *tibetica* (C. K. Schneider) N. Chao.

Branchlets slightly angled. Buds and petioles pubescent. Leaf blade with both surfaces at first pubescent, later ± pilose or glabrescent only along veins.

• Mountains; 2000–4500 m. Sichuan, Xizang.

**52. *Populus yunnanensis*** Dode, *Bull. Soc. Hist. Nat. Autun* 18: 221. 1905.

滇杨 *dian yang*

Trees to 20 m tall; trunk to 60 cm d.b.h.; bark gray, furrowed. Old branches purplish brown, not angled; branchlets yellowish brown or reddish and glabrous when young, angled. Buds ellipsoid, glabrous, viscid. Petiole reddish, 1–4 cm, stout; leaf blade ovate, elliptic-ovate, broadly ovate, or deltoid-ovate, 5–16 × 2–7.5 cm, papery, abaxially grayish white and glabrous or pubescent along veins, usually reddish along midvein, adaxially green, shiny, pilose along midvein, base broadly cuneate or rounded, margin glandular crenulate, at first ciliate, glabrescent, apex long acuminate. Short branchlets with petiole 2–9 cm; leaf blade ovate, 7.5–17 × 4–12 cm, base rounded or shallowly cordate, rarely cuneate, apex long acuminate or obtuse. Male catkin 12–20 cm; rachis glabrous; bracts russet, palmately lacinate, glabrous. Male flower: stamens 20–40. Female catkin 10–15 cm. Capsule 3- or 4-valved, subsessile or shortly stipitate. Fl. Apr, fr. Apr–May.

• Mountains, forests; 1300–3700 m. Guizhou, Sichuan, Yunnan.

1a. Leaf blade ca. 6 × 5 cm ..... 52c. var. *microphylla*

1b. Leaf blade more than 6 × 5 cm.

2a. Leaves glabrous abaxially; capsule subsessile ..... 52a. var. *yunnanensis*

2b. Leaves pubescent along veins abaxially; capsule with stipe ca. 4 mm 52b. var. *pedicellata*

**52a. *Populus yunnanensis* var. *yunnanensis***

滇杨(原变种) *dian yang* (*yuan bian zhong*)

Leaf blade abaxially glabrous. Capsule subsessile.

• Mountains; 1300–2700 m. Guizhou, Sichuan, Yunnan.

**52b. *Populus yunnanensis* var. *pedicellata*** C. Wang & S. L. Tung, *Bull. Bot. Res.*, Harbin 2(2): 115. 1982.

长果柄滇杨 *chang guo bing dian yang*

Leaf blade abaxially pubescent along veins. Capsule with stipe ca. 4 mm.

• 3500–3700 m. Sichuan, Yunnan.

**52c. *Populus yunnanensis* var. *microphylla*** C. Wang & S. L. Tung, *Bull. Bot. Res.*, Harbin 2(2): 115. 1982.

小叶滇杨 *xiao ye dian yang*

Branchlets slender, conspicuously angled. Petiole on sprouts short, downy when young; leaf blade small, obovate on sprouts, ca. 6 × 5 cm, downy along veins when young.

• Forests; 2200–2300 m. Yunnan.

**53. *Populus qamdoensis*** C. Wang & S. L. Tung in C. Wang & C. F. Fang, *Acta Phytotax. Sin.* 17(4): 101. 1979.

昌都杨 *chang du yang*

Trees to 25 m tall. Branches yellowish gray; branchlets yellowish brown, slender, subglabrous, pilose when young. Buds viscid. Petiole terete, 1.5–3 cm; leaf blade ovate, 6–10 × 2.5–7 cm, abaxially greenish, glabrous, adaxially dull green, pilose along veins, base rounded, margin crenate-serrulate, ciliate, apex acuminate.

Fruiting catkin to 15 cm; rachis glabrous. Capsule ovoid, densely downy, 2(or 3)-valved; stipe to 5 mm.

• Along rivers; 1700–3800 m. Xizang.

Very similar to *Populus szechuanica* var. *tibetica* but branchlets yellowish brown, subglabrous, downy only when young; petiole shorter; leaf blade smaller, base rounded, margin ciliate; catkin rachis glabrous; capsule 2-valved, densely downy; stipe to 5 mm.

**54. *Populus mainlingensis*** C. Wang & S. L. Tung, *Acta Phytotax. Sin.* 17(4): 102. 1979.

米林杨 *mi lin yang*

Trees to 30 m tall. Branches grayish brown; branchlets tomentose. Buds ovoid, smooth, viscid. Petiole terete, ca. 4 cm, densely pubescent; leaf blade broadly ovate-cordate, ca. 10 × 8 cm, abaxially glaucous, with dense hairs, adaxially dull green, pilose along veins, base cordate, margin glandular serrulate, ciliate when young, apex acute. Fruiting catkin to 15 cm; rachis pubescent; bracts russet, suborbicular, lacinate. Disc sinuolate.

Capsule ovoid, densely tomentose when young, glabrescent, 4-valved, subsessile. Fl. May, fr. Jul.

• Mountain slopes, along rivers; 3000–3800 m. Xizang (Mainling Xian, Nyingchi Xian).

Similar to *Populus ciliata* but branchlets densely tomentose; petiole ca. 1/2 as long as leaf blade, eglandular distally; capsule subsessile, densely hairy when young. Similar also to *P. lasiocarpa* but petiole not red, smaller; leaf blade broadly ovate-cordate, smaller, ca. 10 cm, base cordate, apex acute; bracts suborbicular; disc sinuolate; capsule glabrescent, 4-valved.

**55. *Populus haoana*** W. C. Cheng & C. Wang in C. Wang & S. L. Tung, *Bull. Bot. Lab. N. E. Forest. Inst.*, Harbin 4: 17. 1979.

德钦杨 *de qin yang*

Trees to 20 m tall; bark gray, smooth. Branchlets dull brown or russet, stout, downy or glabrous. Buds downy, slightly viscid. Leaves of short branchlets with petiole terete, 4–7 cm, densely downy; leaf blade ovate-orbicular or ovate to long ovate-elliptic, 10–18(–22) × 5–11 cm, abaxially pale, pilose, densely downy along veins, adaxially dull green, downy along veins, base cordate or deeply so, margin glandular serrate or crenate-serrate, apex shortly acuminate, often twisted. Fruiting catkin 8–40 cm; rachis pubescent or glabrous. Capsule ovoid, 3- or 4-valved, subsessile or stipitate. Seeds brown, more than 1 mm.

• Forests, mixed woods, valleys, mountains; 2200–3600 m. SE Sichuan, NW and S Yunnan.

Similar to *Populus szechuanica* var. *tibetica* but branchlets, petiole, leaf veins, and catkin rachis densely pubescent; leaves larger.

1a. Fruiting catkin ca. 8 cm.

2a. Capsule ca. 5 mm ..... 55d. var. *microcarpa*

2b. Capsule ca. 12 mm ..... 55b. var. *macrocarpa*

1b. Fruiting catkin 10–40 cm.

3a. Leaf blade 10–18 cm, margin glandular serrate; fruiting catkin to 18 cm; rachis pubescent ..... 55a. var. *haoana*

3b. Leaf blade 22–35 cm, margin glandular crenate-serrate; fruiting catkin to 40 cm; rachis glabrous ..... 55c. var. *megaphylla*

**55a. *Populus haoana* var. *haoana***

德钦杨(原变种) de qin yang (yuan bian zhong)

Branchlets dull brown, downy, densely so when young. Leaf blade 10–18 × 5–11 cm, downy along veins, base cordate, margin glandular serrate. Fruiting catkin to 18 cm; rachis pubescent. Capsule densely tomentose when young, glabrescent, subsessile.

• Forests; 2200–3600 m. NW Yunnan.

**55b. *Populus haoana* var. *macrocarpa*** C. Wang & S. L. Tung, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 4: 17. 1979.

大果德钦杨 da guo de qin yang

Branchlets russet, slender, smooth. Leaf blade small, both surfaces pilose along veins. Catkin rachis stout. Capsule large, ca. 1.2 × 1 cm; stipe stout, densely pilose.

• Valleys; 3000–3300 m. SE Sichuan, NW Yunnan.

**55c. *Populus haoana* var. *megaphylla*** C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 118. 1982.

大叶德钦杨 da ye de qin yang

Branches sulcate; branchlets and petioles smooth. Leaf blade large, ca. 22 cm on short branchlets, to ca. 35 cm on sprouts, margin glandular crenate-serrate. Fruiting catkin to 40 cm; rachis densely downy. Capsule ovoid, shortly stipitate.

• Mixed woods; 2300–2700 m. S Yunnan.

**55d. *Populus haoana* var. *microcarpa*** C. Wang & S. L. Tung, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 4: 18. 1979.

小果德钦杨 xiao guo de qin yang

Leaf blade orbicular-ovate, ca. 15 cm, base deeply cordate. Fruiting catkin short, thin, ca. 8 cm, glabrous. Capsule ca. 5 mm, glabrous.

• Mountains; ca. 3200 m. NW Yunnan.

**56. *Populus xiangchengensis*** C. Wang & S. L. Tung, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 4: 22. 1979.

乡城杨 xiang cheng yang

Trees to 20 m tall; trunk to 1.5 m d.b.h. Branches stout, dull purplish brown, slightly angled; juvenile branchlets densely downy. Leaves of short branchlets with petiole terete, ca. 6 cm, pubescent; leaf blade ovate to broadly ovate, 7–14 × 4–10 cm, both surfaces with raised veins and hairs, abaxially pale, adaxially dull green, base cordate or rounded, margin crenate-serrulate, ciliate, apex acuminate or long acuminate. Fruiting catkin 8–16 cm; rachis downy. Capsule globose-ovate, densely tomentose, rarely pilose, 4-valved, sessile or shortly stipitate.

• Along rivers; 2000–3900 m. Sichuan.

Similar to *Populus szechuanica* but branchlets, petiole, leaf veins, catkin rachis, and capsule pubescent. Similar also to *P. szechuanica* var. *tibetica* but capsule densely tomentose.

**57. *Populus ciliata*** Wallich ex Royle, Ill. Bot. Himal. Mts. 1: 346. 1839.

缘毛杨 yuan mao yang

Trees to 20 m tall; bark gray; crown large and spreading. Branchlets brown, terete, pilose and glabrescent or tomentose. Buds ovoid, large, ca. 2 cm, usually glabrous, rarely downy, ± viscid. Petiole terete, 5–12 cm, downy; leaf blade ovate-cordate, 10–15 × 8–12 cm, abaxially grayish green, downy at least along veins, adaxially dull green, glabrous, base cordate or rounded, margin glandular crenate, densely ciliate, apex acute to acuminate. Male catkin ca. 6 cm; rachis glabrous. Female catkin to 22 cm; rachis glabrous or pubescent. Capsule glabrous or pilose, 4-valved; stipe 5–10 mm or capsule subsessile. Fl. May, fr. Jun. *2n* = 38.

Mountains, mixed woods, forests; 2200–3400 m. Xizang, Yunnan [Bhutan, India, Kashmir, N Myanmar, Nepal, Pakistan, Sikkim].

1a. Branchlets and catkin rachis tomentose

..... 57c. var. *gyirongensis*

1b. Branchlets glabrescent; catkin rachis pilose or glabrous.

2a. Catkin rachis and capsule pilose 57d. var. *weixi*

2b. Catkin rachis and capsule glabrous.

3a. Leaves with dense golden yellow hairs when young ..... 57b. var. *aurea*

3b. Leaves abaxially downy, adaxially glabrous ..... 57a. var. *ciliata*

**57a. *Populus ciliata* var. *ciliata***

缘毛杨(原变种) yuan mao yang (yuan bian zhong)

Branchlets pilose at first, glabrescent. Leaf blade abaxially downy, adaxially glabrous. Catkin rachis glabrous.

Mountains; 3300–3400 m. Xizang (Zayü Xian), Yunnan [Bhutan, India, Kashmir, N Myanmar, Nepal, Pakistan, Sikkim].

Used for timber for construction and making furniture; leaves used as forage for goats.

**57b. *Populus ciliata* var. *aurea*** C. Marquand & Airy Shaw in C. Marquand, J. Linn. Soc., Bot. 48: 223. 1929.

金色缘毛杨 *jin se yuan mao yang*

Leaf blade abaxially with dense golden yellow hairs when young.

- Mountains; ca. 2900 m. Xizang.

**57c. *Populus ciliata* var. *gyirongensis*** C. Wang & S. L. Tung, *Acta Phytotax. Sin.* 17(4): 102. 1979.

吉隆缘毛杨 *ji long yuan mao yang*

Branchlets, veins on both surfaces of leaves, petioles, and catkin rachis tomentose.

- Mixed woods; ca. 2400 m. Xizang.

**57d. *Populus ciliata* var. *weixi*** C. Wang & S. L. Tung, *Bull. Bot. Lab. N. E. Forest. Inst., Harbin* 4: 25. 1979.

维西缘毛杨 *wei xi yuan mao yang*

Leaf blade broadly ovate, apex shortly acuminate to long acuminate. Fruiting catkin to more than 20 cm. Catkin rachis and capsule pilose.

- Forests; 2200–2300 m. NW Yunnan.

**58. *Populus wuana*** C. Wang & S. L. Tung, *Bull. Bot. Lab. N. E. Forest. Inst., Harbin* 4: 23. 1979.

长叶杨 *chang ye yang*

Trees to 30 m tall; trunk to 1 m d.b.h.; bark grayish, fissured. Branches dull brown, angled; branchlets yellowish brown, downy, glabrescent. Buds dull purple, conical, with downy basal scales, viscid. Petiole terete, 2–4.5 cm, densely downy; leaf blade ovate-lanceolate to broadly lanceolate, 8–18 × 3–10 cm, leathery, abaxially white, pubescent on both surfaces, adaxially green, base shallowly cordate to rounded, margin glandular serrate, ciliate, slightly revolute, apex long acuminate. Fruiting catkin to 30 cm; rachis glabrous. Capsule ovoid, ca. 10 × 8 mm, at first pilose, 4- or 5-valved. Fr. Sep.

- Margins of woods, along streams. E Xizang.

**59. *Populus yuana*** C. Wang & S. L. Tung, *Bull. Bot. Lab. N. E. Forest. Inst., Harbin* 4: 24. 1979.

五瓣杨 *wu ban yang*

Trees to 30 m tall; trunk to 2 m d.b.h.; bark black, furrowed. Branches grayish brown to brown, stout; branchlets russet, angled, smooth. Petiole russet, terete, 5–10 cm, glabrous. Leaf blade ovate to elliptic-ovate, 16–23 × 10–15 cm, abaxially grayish white, pubescent along veins, adaxially dull green, smooth, base narrowly cordate, margin densely shallowly glandular serrate, apex acuminate to long acuminate; veins raised abaxially. Fruiting catkin to 35 cm; rachis glabrous. Capsule ovoid, ca. 5 mm, 4- or 5-valved, subsessile. Fr. May.

- Along rivers; ca. 2000 m. Xizang (Zayü Xian), NW Yunnan.

Similar to *Populus haoana* but branchlets, petioles, and leaf blade glabrous; capsule 5-valved, glabrous. Similar also to *P. yunnanensis* but leaf blade narrowly cordate at base, veins pilose; fruiting catkin longer; capsule usually smaller, 5-valved.

**60. *Populus yatungensis*** (C. Wang & P. Y. Fu) C. Wang & S. L. Tung, *Fl. Reipubl. Popularis Sin.* 20(2): 60. 1984.

亚东杨 *ya dong yang*

*Populus yunnanensis* Dode var. *yatungensis* C. Wang & P. Y. Fu, *Acta Phytotax. Sin.* 12: 192. 1974; *P.*

*pseudoglauca* C. Wang & P. Y. Fu var. *yatungensis* (C. Wang & P. Y. Fu) N. Chao.

Trees to 10 m tall; bark grayish green to grayish, furrowed. Branchlets yellowish brown or grayish brown, purplish brown when young, angled, yellowish villous. Buds purple, downy, viscid. Petiole terete, 4–7 cm, villous, glandular distally; leaf blade long ovate to broadly ovate, 14–16 × 6–11 cm, abaxially glaucous, sometimes with coarse, long hairs, adaxially dull green, both surfaces pilose along veins, base cordate, margin glandular serrulate or crenate-serrate, ciliate or glabrous, apex acuminate to long acuminate. Fruiting catkin to 22 cm; peduncle pilose; rachis purplish red, stout. Capsule globose-ovoid, glabrous or pilose, 4-valved, shortly stipitate or sessile.

- Mountain slopes; 2400–3600 m. SW Sichuan, Xizang, Yunnan.

1a. Leaf margin crenate-serrate, base deeply cordate ..... 60b. var. *crenata*

1b. Leaf margin serrulate or slightly serrulate, base cordate but not deeply so 60a. var. *yatungensis*

**60a. *Populus yatungensis* var. *yatungensis***

亚东杨(原变种) *ya dong yang* (*yuan bian zhong*)

Base of leaf blade shallowly cordate or cordate, margin serrulate. Capsule shortly stipitate.

- Mountain slopes; 2400–3600 m. SW Sichuan, Xizang, Yunnan.

Similar to *Populus yunnanensis* but young branchlets purplish brown; petiole and leaf veins pubescent; capsule shortly stipitate.

**60b. *Populus yatungensis* var. *crenata*** C. Wang & S. L. Tung, *Bull. Bot. Res., Harbin* 2(2): 115. 1982.

圆齿亚东杨 *yuan chi ya dong yang*

Petiole and leaf blade abaxially coarsely long hairy, glabrescent; base of leaf blade deeply cordate, margin crenate-serrate.

- Xizang.

**61. *Populus xiaozhuanica*** W. Y. Hsu & Liang in C. Wang & S. L. Tung, *Bull. Bot. Res., Harbin* 2(2): 107. 1982.

小钻杨 *xiao zuan yang*

Trees to 30 m tall; trunk erect, shallowly furrowed at base; bark brownish gray and smooth, grayish green, grayish white, or greenish gray when young; lenticels rhombic, crowded; crown conical or tower-shaped. Lateral branches diverging from trunk at less than 45°; young branchlets grayish yellow, slightly angled, pilose. Buds russet, long ellipsoid-conical, 0.8–1.4 cm, viscid, apex obtuse. Leaves of short branchlets with petiole 1.5–3.5 cm, terete, slightly flattened distally, pilose or glabrous; leaf blade rhombic-deltoid, rhombic-elliptic, or broadly rhombic-ovate, 3–8 × 2–5 cm, abaxially greenish, glabrous, adaxially green, pilose along veins, base cuneate to broadly cuneate, margin glandular serrate, entire near base, sometimes translucent, apex acuminate. Sprouts and long shoots with leaf blade

rhombic-deltoid, rarely obovate, larger, base broadly cuneate to rounded, apex mucronate. Male catkin 5–6 cm. Male flower: stamens 8–15. Female catkin 4–6 cm, 10–16 cm in fruit. Female flower: stigma 2-lobed. Capsule ovoid, large, 2(or 3)-valved. Seeds russet, obovate. Fl. Apr, fr. May.

• Cultivated. E Henan, Jiangsu, Jilin (Baicheng Xian), Liaoning, E Nei Mongol (Jirem Meng, Ju Ud Meng), Shandong.

A hybrid between *Populus nigra* var. *italica* and *P. simonii*.

A fast-growing tree important for timber, reforestation, and soil retention.

4. Sect. **Aigeiros** Duby, Bot. Gall. 1: 427. 1828.

黑杨组 *hei yang zu*

Bark furrowed. Buds viscid. Leaf blade usually deltoid-ovate or rhombic-ovate, both surfaces green, with stomata, base truncate or broadly cuneate, margin crenate-serrate, distinctly translucent at edge, apex long acuminate. Male flower: stamens 15–30(–60); anthers subglobose or elliptic. Female flower: disc entire, persistent; style absent; stigmas 2. Capsule 2(or 3)-valved.

62. **Populus nigra** Linnaeus, Sp. Pl. 2: 1034. 1753.

黑杨 *hei yang*

Trees to 30 m tall; bark dull gray, furrowed when older; crown broadly ovoid. Branchlets yellowish, terete, glabrous. Buds russet, ovoid, very viscid. Petiole ca. as long as or longer than leaf blade, laterally flattened, glabrous; leaf blade rhombic, rhombic-ovoid, or deltoid, 5–10 × 4–8 cm, thinly leathery, abaxially greenish, adaxially green, base cuneate or broadly cuneate, rarely truncate, margin crenate-serrate, ciliate, apex long acuminate. Flower buds outwardly curved at apex. Male catkin 5–6 cm; rachis glabrous; bracts brownish, 3–4 mm, membranous, laciniate. Male flower: stamens 15–30; anthers purplish red. Fruiting catkin 5–10 cm. Female flower: ovary ovoid, glabrous, stipitate; stigmas 2. Capsule ovoid, 5–7 × 3–4 mm, 2-valved, stipitate. Fl. Apr–May, fr. Jun. *2n* = ?19\*, 38\*, 57.

Along rivers. Native in Xinjiang; cultivated in Fujian, Hebei, Jiangsu, Liaoning, Nei Mongol, Shaanxi, Sichuan, Yunnan [N Africa, WC Asia, Europe].

1a. Leaf blade of long shoots and short branchlets uniformly shaped, rhombic, rhombic-ovate, or deltoid; crown broad 62a. var. *nigra*

1b. Leaf blade of long shoots and short branchlets not uniformly shaped, those of short branchlets rhombic-deltoid or rhombic-ovate; crown columnar.

2a. Leaf blade of short branchlets broadly cuneate to subrounded at base; those of long shoots wider than long; bark dull gray, rough ..... 62b. var. *italica*

2b. Leaf blade of short branchlets cuneate at base; those of long shoots ca. as long as wide; bark grayish white, smooth 62c. var. *thevestina*

62a. **Populus nigra** var. *nigra*

黑杨(原变种) *hei yang* (*yuan bian zhong*)

Crown broad. Leaf blade of long shoots and short branchlets uniformly shaped, rhombic, rhombic-ovate, or deltoid, 5–10 × 4–8 cm.

Along rivers. Xinjiang (Ertix He and Ulungur He valleys) [WC Asia, Europe].

Used for timber for construction and making furniture.

62b. **Populus nigra** var. *italica* (Moench) Koehne, Deut. Dendrol. 81. 1893.

钻天杨 *zuan tian yang*

*Populus italica* Moench, Verz. Ausländ. Bäume 79. 1785; *P. fastigiata* Poirlet; *P. nigra* var. *pyramidalis* (Bork.) Spach; *P. pyramidalis* Rozier.

Bark dull gray, rough. Crown columnar. Leaf blade of short branchlets and long shoots not uniformly shaped, pilose along veins on both surfaces; blade of short branchlets rhombic-deltoid or rhombic-ovate, 5–10 × 4–9 cm, broadly cuneate to subrounded at base; blade of long shoots deltoid, usually wider than long, ca. 7.5 cm. Fl. Apr, fr. May.

Widely planted and cultivated in the Chang Jiang and Huang He basins. Fujian, Hebei, Jiangsu, Liaoning, Nei Mongol, Shaanxi, Sichuan [native to WC Asia, Europe].

62c. **Populus nigra** var. *thevestina* (Dode) Bean, Not. Trees & Shrubs 2: 217. 1914.

箭杆杨 *jian gan yang*

*Populus thevestina* Dode, Bull. Soc. Hist. Nat. Autun 18: 210 [Extr. Monogr. Ined. Populus 52]. 1905.

Bark grayish white, smooth. Crown columnar. Leaf blade of short branchlets and long shoots not uniformly shaped; blade of short branchlets rhombic-deltoid or rhombic-ovate, base cuneate; blade of long shoots ca. as long as wide, small.

Cultivated. Hebei, Liaoning, Nei Mongol, Shaanxi, Yunnan [native to N Africa, WC Asia, Europe].

62. **Populus × xiaohei** T. S. Hwang & Liang in C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 109. 1982.

小黑杨 *xiao hei yang*

Trees to 20 m tall; trunk columnar, slightly furrowed at base when old; bark grayish green, when old dull grayish brown, smooth; lenticels loose; crown long ovoid. Lateral branches spreading from trunk at 45–

60°; sprouts grayish green, 3-angled below scars; short branchlets grayish brown or grayish white, terete. Buds slightly reddish brown, conical, apex acuminate. Leaves of short branchlets with petiole yellowish green, 2–4 cm, flattened at apex, glabrous; leaf blade rhombic-elliptic or rhombic-ovate, 5–8 × 4–4.5 cm, abaxially greenish, glabrous, adaxially bright green, base cuneate or broadly cuneate, margin crenate-serrate, entire near base, narrow and translucent at edge, apex long caudate or long acuminate. Leaves of long shoots with petiole reddish, flattened, short; leaf blade broadly ovate or rhombic-deltoid, base subcordate or broadly cuneate, apex shortly acuminate or mucronate. Male catkin 4.5–5.5 cm; bracts yellow, brown at apex, elliptic, laciniate. Male flower buds ox-horn-shaped, bent outward, often 3 or 4 together, viscid; disc yellow, flabelliform; stamens 20–30. Female catkin 5–7 cm, to 17 cm in fruit. Capsule ovoid-ellipsoid, large, 2-valved, stipitate. Seeds 5–10, russet, obovate. Fl. Apr, fr. May.

• Widely planted. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi.

A hybrid between *Populus nigra* and *P. simonii*.

Used for wood pulp, fibers, timber for construction, and matchwood; also planted for reforestation.

**64. *Populus manshurica*** Nakai, Rep. Exped. Manchoukuo Sect. IV: 73. 1936.

热河杨 re he yang

*Populus simonii* Carrière var. *manshurica* (Nakai) Kitagawa.

Trees. One-year-old branchlets grayish yellow, terete, glabrous; juvenile branchlets brown, densely glandular, glabrous. Buds brown, oblong-lanceolate, 0.8–1.4 cm, viscid, apex acute. Petiole terete, 1.7–5.2 cm; leaf blade rhombic-deltoid, rhombic-elliptic, or broadly rhombic-ovate, ca. 7.5 × 5.5 cm, subleathery, abaxially greenish, glabrous, adaxially green, not wrinkled, base rounded or widely cuneate, margin crenate-serrate, ciliate or glabrous, apex acuminate.

• W Liaoning, E Nei Mongol.

No specimens have been seen by the authors; the description follows the protologue.

**65. *Populus xjrtyschensis*** C. Y. Yang in C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 112. 1982.

额河杨 e he yang

Trees; trunk irregularly furrowed at base; bark grayish; crown spreading. Branchlets yellowish brown, pilose, rarely glabrous, slightly angled. Petiole slightly compressed distally, ca. as long as blade, pilose or sometimes glabrous; leaf blade ovate, rhombic-ovate, or deltoid-ovate, 5–8 × 4–6 cm, adaxially greenish, both surfaces tomentulose along veins, base cuneate or broadly cuneate, rarely rounded or truncate, margin crenate-serrate, narrowly translucent at edge, apex acuminate or long acuminate. Male catkin 3–4 cm.

Male flower: stamens 30–40; anthers purplish red.

Female catkin 5–6 cm, 15–20-flowered; rachis pilose or rarely glabrous. Capsule ovoid, 2(or 3)-valved. Fl. May, fr. Jun.

• Along rivers. Xinjiang (Ertix He valley).

**66. *Populus xbeijingensis*** W. Y. Hsu in C. Wang & S. L. Tung, Bull. Bot. Res., Harbin 2(2): 111. 1982.

北京杨 bei jing yang

Trees to 25 m tall; trunk erect; bark grayish green, smooth, with orbicular or long elliptic, crowded lenticels; crown ovoid or widely ovoid. Lateral branches spreading; branchlets grayish green or slightly red; juvenile branchlets light green or reddish, not angled. Stem apex of seedlings with white mucilage in leaf axil. Buds curved outward, long conical, viscid, apex brownish or dull red. Leaves of short branchlets with petiole laterally flattened, 2–4.5 cm; leaf blade ovate, 3–9 cm, abaxially bluish white, adaxially light green, base rounded or broadly cuneate to cuneate, margin glandular serrate, apex acuminate or long acuminate. Leaves of long shoots and sprouts broadly ovate or deltoid-ovate, base cordate or rounded, margin crisped, coarsely crenate-serrate, translucent at edge, sparsely ciliate, glabrescent, apex shortly acuminate. Male catkin 2.5–3 cm; bracts brownish, ca. 4 mm, irregularly laciniate. Male flower: stamens 18–21. Fl. Mar.  $2n = 38, 40$ .

• Widely planted. N China.

An artificial hybrid between *Populus cathayana* and *P. nigra* var. *italica*, with many cultivars.

**67. *Populus xberolinensis*** Dippel, Handb. Laubholzk. 2: 210. 1892.

中东杨 zhong dong yang

Trees to 25 m tall; bark grayish green, furrowed and dull when older; crown broadly conical. Branches spreading; branchlets yellowish gray, robust, angled, glabrous. Buds light green, ovoid, glabrous, viscid, apex acuminate. Petiole terete, pilose; leaf blade ovate or rhombic-ovate, 7–10 × ca. 5 cm, abaxially green or slightly white, adaxially deep green, base broadly cuneate or rounded, margin crenate-serrate, narrowly translucent at edge, apex long acuminate to caudate. Fruiting catkin to 18 cm. Capsule glabrous, 2-valved, stipitate.

Planted. Hebei, Heilongjiang, Jilin, Liaoning [Kazakstan, Kyrgyzstan, Uzbekistan; Europe].

Used for wood pulp and timber for construction; also planted for landscaping and reforestation.

**68. *Populus afghanica*** (Aiton & Hemsley) C. K. Schneider in Sargent, Pl. Wilson. 3: 36. 1916.

阿富汗杨 a fu han yang

Trees medium sized; bark grayish, darker at base of trunk; crown wide. Branchlets yellowish brown or light yellow, slightly angled, glabrous. Leaves on proximal part of short branchlets with petioles terete; leaf blade varying from obovate or ovate at base of branchlet through orbicular-ovate to deltoid-orbicular or compressed orbicular near apex, from 2–3 cm near base of branchlet to 6–7 cm at apex, both surfaces glabrous, base cuneate to broadly cuneate, rounded, or truncate, margin obtusely crenate-serrate, slightly translucent, apex acuminate or shortly acuminate. Sprouts with leaf blade rhombic-ovate or obovate, base cuneate. Male catkin ca. 4 cm. Female catkin 5–6 cm, elongated in fruit; rachis glabrous or tomentose. Female flower: style short; stigmas 2. Capsule 5–6 mm, 2-valved; stipe 4–5 mm. Fl. Apr–May, fr. Jun.

Along river valleys; 1400–2800 m. S Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan].

- 1a. Petiole and catkin rachis glabrous 68a. var. *afghanica*
- 1b. Petiole and catkin rachis tomentose

..... 68b. var. *tajikistanica*

**68a. *Populus afghanica* var. *afghanica***

阿富汗杨(原变种) a fu han yang (yuan bian zhong)  
*Populus nigra* Linnaeus var. *afghanica* Aiton & Hemsley, J. Linn. Soc., Bot. 18: 96. 1880; *P. usbekistanica* Komarov.

Petiole and catkin rachis glabrous.

Along river valleys; 1400–2800 m. S Xinjiang [Afghanistan, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan].

Similar to *Populus nigra* var. *thevestina* but crown wider; petiole terete.

**68b. *Populus afghanica* var. *tajikistanica* (Komarov) C. Wang & Chang Y. Yang, Fl. Reipubl. Popularis Sin. 20(2): 71. 1984.**

喀什阿富汗杨 ka shi a fu han yang

*Populus tajikistanica* Komarov, Bot. Zhurn. SSSR 19: 509. 1934; *P. usbekistanica* subsp. *tajikistanica* (Komarov) Bugala.

Petiole and catkin rachis tomentose.

• Along rivers, native and planted. S Xinjiang (Kax He valley).

**69. *Populus xcanadensis* Moench, Verz. Ausland. Baume 81. 1785.**

加杨 jia yang

*Populus euramericana* (Dode) Guinier.

Trees to more than 30 m tall; trunk erect; bark rough, thick, deeply furrowed; crown ovoid. Branches spreading; sprouts and seedling stem conspicuously angled or not; branchlets terete, slightly angled, glabrous, rarely pubescent. Buds large, at first green, becoming brownish green, very viscid, apex decurved. Petiole long, laterally flattened; leaf blade deltoid-ovate, 7–10(–20) cm, usually longer than wide, abaxially greenish, adaxially dull green, base truncate or broadly cuneate, with 1 or 2 glands or not, margin crenate, translucent, shortly ciliate, apex acuminate. Male catkin 7–15 cm; rachis glabrous; bracts greenish brown, lacerate. Male flower: disc yellowish green, margin entire; stamens 15–25(–40). Female catkin to 27 cm when mature, 45–50-flowered. Female flower: stigma 4-lobed. Capsule ovoid, ca. 8 mm, 2- or 3-valved. Fl. Apr, fr. May–Jun.  $2n = 36^*, 38^*$ .

• Widely planted. Anhui, Gansu, Hebei, Heilongjiang, Henan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang.

Used for timber and planted for reforestation.

**5. Sect. *Turanga* Bunge, Mém. Acad. Imp. Sci. Saint-Petersbourg (Sav. Etr.) 7: 498. 1851.**

胡杨组 hu yang zu

Growth sympodial, without terminal buds. Buds pilose, not resinous. Petiole subterete; leaf blade variably shaped, grayish blue on both surfaces, abaxially with stomata. Bracts white with purplish apex, spatulate, membranous. Male flower: disc membranous, lobed or parted, with sharp teeth, caducous; stamens 15–35; anthers long, apex apiculate. Female flower: ovary long ovoid; stigma large, 3- or 4-lobed. Capsule elongate, (2 or)3-valved, stipitate.

**70. *Populus euphratica* Olivier, Voy. Emp. Othoman 3: 449. 1807.**

胡杨 hu yang

*Balsamiflua euphratica* (Olivier) Kimura; *Populus ariana* Dode; *P. diversifolia* Schrenk; *P. litwinowiana* Dode; *Turanga euphratica* (Olivier) Kimura.

Trees to 15 m tall, rarely shrubby; bark grayish brown, furrowed on basal part of trunk. Branchlets brownish, tomentulose or glabrous, pilose when young. Sprouts terete, slender, smooth or slightly tomentose. Buds brown, ellipsoid, ca. 7 mm, glabrescent. Petiole at maturity slightly complanate, ca. as long as leaf blade; leaf blade ovate-orbicular, reniform, or deltoid-ovate, base cuneate, broadly cuneate, rounded, or truncate, with 2 glands, apex with coarse teeth. Leaves of

seedling stage and on sprouts shortly petiolate; leaf blade linear, lanceolate, linear-lanceolate, or oblanceolate, margin entire or with irregular, loose, undulate teeth. Male catkin slender, terete, 2–3 cm; rachis tomentulose. Male flower: anthers purplish red. Female catkin 2.5 cm, to 9 cm in fruit; rachis tomentulose or glabrous; ovary long ovoid, tomentulose or glabrous, long stipitate. Female flower: stigmas 3, yellowish green, each 2-lobed. Capsule 1–1.2 cm, glabrous, 2- or 3-valved. Fl. May, fr. Jul–Aug.

Plains, valleys, basins; 200–2400 m. Gansu, W Nei Mongol, Qinghai, Xinjiang [Afghanistan, ?India, Kazakstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

Used for timber; vulnerable.



**71. *Populus pruinosa*** Schrenk, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg, sér. 2, 3: 210. 1845.

灰胡杨 hui hu yang

*Balsamiflua pruinosa* (Schrenk) Kimura; *Turanga pruinosa* (Schrenk) Kimura.

Trees to 10(–20) m tall; bark grayish yellow; crown spreading. Sprouts densely gray tomentulose; branchlets gray tomentulose. Leaves of short branchlets with petiole 2–3 cm, slightly compressed; leaf blade

reniform, 2–4 × 3–6 cm, both surfaces grayish blue, densely tomentulose, margin entire or apex with 2 or 3 loose teeth. Sprouts with leaf blade elliptic, both surfaces tomentulose. Fruiting catkin 5–6 cm; rachis tomentulose. Capsule long ovoid, 5–10 mm, tomentulose, 2- or 3-valved, stipitate. Fl. May, fr. Jul–Aug.

Basins; 200–1500 m. Xinjiang [Kazakhstan, Tajikistan, Turkmenistan; SW Asia].

## 2. **CHOSENIA** Nakai, Bot. Mag. (Tokyo) 34: 68. 1920.

钻天柳属 zuan tian liu shu

Trees deciduous. Terminal bud absent; buds with single scale. Leaves alternate; stipules absent; petiole short; leaf blade with both surfaces uniformly colored. Flowering precocious; male catkin pendulous; female catkin upright or ascending; bracts entire. Flowers anemophilous, without perianth or gland at base. Male flower: stamens 5, glabrous, shorter than bracts; filaments adnate to base of bracts. Female flower: ovary glabrous, 1-loculed, 4-ovulate, shortly stipitate; styles 2, distinct, each divided to ca. 1/2 into 2 stigmas. Capsule 2-valved. Seeds exalbuminous.

One species: China, Japan, Korea, Russia (Far East).

**1. *Chosenia arbutifolia*** (Pallas) A. K. Skvortsov, Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 18: 43. 1957.

钻天柳 zuan tian liu

*Salix arbutifolia* Pallas, Fl. Ross. 1(2): 79. 1788; *Chosenia bracteosa* (Turczaninow ex Trautvetter) Nakai; *C. eucalyptoides* (Meyer ex. C. K. Schneider) Nakai; *C. macrolepis* (Turczaninow) Komarov; *C. splendida* (Nakai) Nakai; *S. bracteosa* Turczaninow ex Trautvetter; *S. eucalyptoides* Meyer ex. C. K. Schneider; *S. macrolepis* Turczaninow.

Trees to 30 m tall; trunk to 1 m d.b.h.; bark brownish gray; crown columnar. Branchlets slightly reddish yellow or purplish red, glabrous, pruinose. Buds flattened ovoid, shiny. Leaves petiolate; leaf blade oblong-lanceolate to lanceolate, 5–8 × 1.5–2.3 cm, both

surfaces glabrous, grayish green, abaxially often pruinose, base cuneate, margin serrulate or subentire, apex acuminate. Male catkin pendulous, 1(–3) cm; rachis glabrous; bracts obovate, abaxially glabrous, margin villous, persistent. Male flower: stamens 5; anthers yellow, globose. Female catkin 1–2.5 cm; rachis glabrous; bracts obovate-elliptic, abaxially glabrous, margin villous, caducous. Female flower: gland absent, sometimes with 1 or 2 reduced glandules; ovary sub-ovoid-cylindric, shortly stipitate; styles gradually caducous after anthesis. Fl. May, fr. Jun.  $2n = 38$ .

Along streams; 300–1000 m. Hebei, Heilongjiang, Jilin, Liaoning, E Nei Mongol [Japan, Korea, Russia (Far East)].

## 3. **SALIX** Linnaeus, Sp. Pl. 2: 1015. 1753.

柳属 liu shu

*Pleiarina* N. Chao & G. T. Gong.

Trees or shrubs deciduous, rarely evergreen (if shrubs, then erect, ascending procumbent, creeping, or cushion-shaped); pith terete. Branches terete. Terminal bud usually absent; buds with single scale. Leaves alternate, rarely subopposite or opposite; stipules small, free, deciduous or persistent, developed mainly on vigorous branchlets; petiole short; leaf blade variously shaped, often long and narrow. Flowering precocious, coetaneous, or serotinous; catkins upright or spreading, rarely pendulous; bracts entire, persistent or caducous. Flowers entomophilous or anemophilous, each with 1 or 2 glands: 1 abaxial (dorsal) or absent and 1 adaxial (ventral), i.e., abaxial gland between bract and stipe, adaxial gland between stipe and rachis. Male flower: stamens 2–many; filaments free or partly to completely connate, usually exceeding bracts; anthers 2-loculed (rarely 4-loculed if filaments connate), opening lengthwise. Female flower: ovary 2-loculed, sessile or stipitate; style 1, short, slender, or absent, entire or 2-cleft; stigmas 1 or 2, lobed or entire. Capsule 2-valved. Seeds mostly green or gray-green, small, surrounded by fine hairs.

About 520 species: cold and temperate regions of N hemisphere, a few in S hemisphere; 275 species (189 endemic, at least one introduced) in China.

A. K. Skvortsov indicates that sections *Caesia*, *Flavidae*, *Haoanae*, and *Helix* are in many ways interrelated and might, therefore, be united. *Salix hainanica* A. K. Skvortsov (Harvard Papers in Botany 3: 107. 1998), was published just after this account was finalized, and it should be

referred to sect. *Tetraspermae*. The genus *Pleiarina*, to which several taxa of *Salix* were transferred by N. Chao and G. T. Gong (J. Sichuan Forest. Sci. Tech. 17(2): 1–8. 1996), is here treated as a synonym of *Salix*.

**Key to sections based on male plants**

- 1a. Dwarf shrubs erect, ascending, procumbent, creeping, or cushion-shaped, usually less than 30(–50) cm tall.
  - 2a. Young leaves, young shoots, and flowers white woolly ..... 31. *Subviminalae*
  - 2b. Young leaves, young shoots, and flowers not white woolly.
    - 3a. Bracts 2-colored, distal 1/2 dark brown or brown, proximal 1/2 lighter in color.
      - 4a. Petiole of some of leaves ca. 1/4 as long as leaf blade or longer ..... 20. *Diplodictyae*
      - 4b. Petiole less than 1/4 as long as leaf blade ..... 21. *Myrtosalix*
    - 3a. Bracts yellowish green or apically pinkish, brown on dried specimens.
      - 5a. Male flower with only an adaxial gland ..... 7. *Fulvopubescentes*
      - 5b. Male flower with adaxial and abaxial glands.
        - 6a. Plant erect or ascending ..... 10. *Floccosae*
        - 6b. Plant creeping or cushion-shaped.
          - 7a. At least some young leaves retuse at apex ..... 16. *Retusae*
          - 7b. Young leaves not retuse at apex ..... 11. *Lindleyanae*
  - 1b. Shrubs or trees erect, almost always more than 30 cm tall.
    - 8a. Stamens 3 or more.
      - 9a. Stamens 3(or 4) ..... 5. *Amygdalinae*
      - 9b. Stamens (3 or)4–many.
        - 10a. Bracts membranous; stamens 5(–8), adnate to base of bracts ..... 2. *Urbanianae*
        - 10b. Bracts not membranous; stamens (3–)5–10, not adnate to bracts.
          - 11a. Catkin less than 4 cm, densely flowered ..... 4. *Pentandrae*
          - 11b. Catkin more than 4 cm, sparsely flowered at anthesis.
            - 12a. Catkin rachis usually woolly or densely grayish white pubescent; petiole eglandular .. 1. *Tetraspermae*
            - 12b. Catkin rachis not woolly or grayish white pubescent; petiole usually glandular at apex ..... 3. *Wilsonia*
      - 8b. Stamens 2(or 3) or connate into 1.
        - 13a. Male flower with adaxial and abaxial glands.
          - 14a. Catkin terminal on branchlets; plants 30–50 cm, rarely to 1 m tall ..... 10. *Floccosae*
          - 14b. Catkin lateral on branchlets; plants more than 1 m tall
            - 15a. Catkin stout, pedunculate or not, more than 8 mm thick or, if catkin only ca. 5 mm thick, then inflorescence more than 5 cm or nearly all filaments pubescent; young leaf blade already large at anthesis, usually 3–4 cm.
              - 16a. Young leaves densely silky on both surfaces or only abaxially, tomentose or comose along midvein, rarely with sparse hairs; filaments pilose ..... 13. *Psilostigmatae*
              - 16b. Young leaves glabrous on both surfaces; filaments glabrous (pilose at base in *S. radinostachya*) ..... 8. *Magnificae*
            - 15b. Catkin slender, less than 8 mm thick, rarely more than 1 cm thick and then mostly ellipsoid or shortly cylindric; young leaf blade less than 3 cm at anthesis.
              - 17a. Young leaf blade mostly lanceolate; trees ..... 6. *Salix*
              - 17b. Young leaf blade not lanceolate; shrubs, rarely small trees.
                - 18a. Catkin ellipsoid or shortly cylindric, 4(–5) × as long as thick ..... 12. *Sclerophyllae*
                - 18b. Catkin cylindric, more than 5 × as long as thick.
                  - 19a. Bracts usually glabrous or only ciliate or, if pilose on 1 or both surfaces, then gland ca. 1/2 as long as bracts or longer; ovary glabrous ..... 9. *Denticulatae*
                  - 19b. Bracts pilose, with at least 1 surface pilose and ciliate; ovary pilose ..... 14. *Eriocladae*
        - 13b. Male flower with only an adaxial gland.
          - 20a. Plants dwarf, usually 60(–100) cm tall.
            - 21a. Juvenile branchlets 1–1.5 mm thick; plants growing in marshes.
              - 22a. Branchlets and young leaves glabrous or rarely pilose; bracts mostly uniformly colored except for pink apex ..... 17. *Myrtilloides*
              - 22b. Branchlets and young leaves densely yellowish brown or white tomentose; bracts 2-colored 29. *Incubaceae*

- 21b. Juvenile branchlets more than 2 mm thick; plants not growing in marshes.
- 23a. Young leaves conspicuously wrinkled adaxially; bracts obovate-orbicular, margin densely shortly ciliate ..... 18. *Chamaetia*
- 23b. Young leaves adaxially smooth; bracts long elliptic, with long, soft hairs (shaggy) adaxially ..... 20. *Diplodictyae*
- 20b. Plants more than 1 m tall.
- 24a. Stamens 2, free, rarely connate at base within same catkin.
- 25a. Catkin pedunculate or sessile, with leaflets at base.
- 26a. Catkin peduncle more than 5 mm.
- 27a. Catkin less than 5 × as long as thick ..... 19. *Glaucæ*
- 27b. Catkin more than 5 × as long as thick.
- 28a. Young leaves abaxially silky downy or tomentose ..... 14. *Eriocladae*
- 28b. Young leaves abaxially glabrous or pubescent or, if ± silky, then most leaves not unfolded at anthesis ..... 9. *Denticulatae*
- 26b. Catkin peduncle less than 5 mm or nearly absent.
- 29a. Filaments downy basally.
- 30a. Young leaves pubescent, glabrescent ..... 15. *Heterochromæ*
- 30b. Young leaves often russet or white silky or appressed downy.
- 31a. Young leaves russet or white silky; bracts glabrous or with long hairs ..... 7. *Fulvopubescentes*
- 31b. Young leaves appressed downy; bracts pilose only at base ..... 9. *Denticulatae*
- 29b. Filaments glabrous (except in a few species of 23. *Arbuscella*).
- 32a. Young leaf blade dentate at margin.
- 33a. Young leaf blade lanceolate or oblanceolate, rarely elliptic or obovate at anthesis ..... 23. *Arbuscella*
- 33b. Young leaf blade narrowly obovate to suborbicular at anthesis ..... 22. *Hastatae*
- 32b. Young leaf blade entire at margin.
- 34a. Young leaves glabrous abaxially or tomentose only at base adaxially (except for cataphyll); bracts yellowish green or brown when dried ..... 23. *Arbuscella*
- 34b. Young leaves silky or tomentose abaxially; bracts dark colored toward apex.
- 35a. Filaments ca. 4 × as long as bracts; young leaf blade narrowly elliptic to elliptic ..... 25. *Lanatae*
- 35b. Filaments 2–3 × as long as bracts; young leaf blade undeveloped at anthesis or slightly oblanceolate to narrowly obovate ..... 27. *Argyraceae*
- 25b. Catkin sessile, without leaflets at base.
- 36a. Catkin ellipsoid to shortly cylindrical, rarely subglobose, 2–3.5 × as long as thick (sometimes cylindrical in 28. *Vimen*).
- 37a. Leaf blade elliptic, obovate, or oblong-obovate.
- 38a. Filaments ca. 2 × as long as bracts, glabrous ..... 27. *Argyraceae*
- 38b. Filaments nearly 3 × as long as bracts or longer, usually pilose at base ..... 24. *Vetrix*
- 37b. Leaf blade linear or linear-lanceolate to oblong.
- 39a. Young leaf blade linear; branchlets yellowish, glabrous; plants growing on sand dunes ..... 37. *Flavidæ*
- 39b. Young leaf blade linear-lanceolate to oblong; branchlets grayish green or reddish black, pilose or glabrous; plants not growing on sand dunes ..... 28. *Vimen*
- 36b. Catkin cylindrical, more than 4 × as long as thick.
- 40a. Bracts nearly black, apex acute ..... 26. *Daphnella*
- 40b. Bracts yellowish green to brown, apex obtuse or rounded ..... 15. *Heterochromæ*
- 24b. Stamens 2; filaments partly connate or completely connate into 1 stamen.
- 41a. Leaf blade more than 6 × as long as wide or, if nearly 6 × as long as wide, then young branchlets gray downy or tomentose.
- 42a. Branchlets and young leaves glabrous or slightly pilose, soon glabrescent ..... 36. *Helix*
- 42b. Branchlets and young leaves with appressed hairs or gray downy and tomentose.
- 43a. Anthers reddish purple; bracts black; young leaf blade linear-oblanceolate ..... 35. *Haoanæ*
- 43b. Anthers yellow or yellowish red; bracts yellowish green or apex reddish; young leaf blade linear ..... 34. *Cheilophilæ*
- 41b. Leaf blade less than 6 × as long as wide.
- 44a. Catkin with leaflets at base or, if leaflets absent, then catkins opposite or subopposite.
- 45a. Bracts yellowish green or brownish when dried, sometimes slightly pink distally; anthers yellow or reddish in distal part of catkin ..... 33. *Variegatæ*

- 45b. Bracts brown to black; anthers reddish purple or, if yellow, then catkin less than 1 cm thick.
- 46a. Catkins opposite or, if alternate, then young leaf blade elliptic; anthers reddish purple; shrubs ..... 32. *Caesia*
- 46b. Catkins alternate; young leaf blade lanceolate or oblanceolate, rarely long elliptic; anthers yellow or purple; trees ..... 6. *Salix*
- 44b. Catkin without leaflets at base.
- 47a. Catkin long and slender, more than 3 cm, 4–5 mm thick; gland linear, more than 0.9 mm, apex usually incurved ..... 30. *Sieboldiana*
- 47b. Catkin short and thick, 1–3 cm, ca. 1 cm thick; gland ovate or linear, apex not incurved.
- 48a. Bracts yellowish green, brown when dried, glabrous or pubescent proximally .. 12. *Sclerophyllae*
- 48b. Bracts nearly black, with long hairs.
- 49a. Anthers reddish purple ..... 31. *Subviminalis*
- 49b. Anthers yellow ..... 24. *Vetrix*

### Key to sections based on female plants

- 1a. Dwarf shrubs procumbent, creeping, or cushion-shaped, usually less than 30(–50) cm tall.
  - 2a. Young leaves, young shoots, and flowers white woolly ..... 31. *Subviminalis*
  - 2b. Young leaves, young shoots, and flowers not white woolly.
    - 3a. Bracts 2-colored, distal 1/2 dark brown or brown, proximal 1/2 lighter in color.
      - 4a. Petiole ca. 1/4 as long as leaf blade or longer ..... 20. *Diplodictyae*
      - 4b. Petiole less than 1/4 as long as leaf blade ..... 21. *Myrtosalix*
    - 3b. Bracts uniformly colored, yellowish green or apically pinkish, brownish in dried specimens.
      - 5a. Ovary long stipitate, stipe longer than gland to nearly as long as bracts; style short or absent 7. *Fulvopubescentes*
      - 5b. Ovary shortly stipitate, stipe shorter than gland to subsessile or, if distinctly stipitate, then style conspicuous or elongate.
        - 6a. Dwarf shrubs erect or ascending, to 30 cm tall ..... 10. *Floccosae*
        - 6b. Shrubs creeping or cushion-shaped.
          - 7a. Young leaf blade broadly elliptic or broadly oblong to orbicular (if long obovate or oblanceolate-obovate, then style to 1 mm: 23. *Arbuscella*), apex often retuse or obtuse, lateral veins campylodromous, basally densely spaced, distally more sparsely spaced; petiole extremely short ..... 16. *Retusae*
          - 7b. Young leaf blade usually elliptic to lanceolate, apex often acute, lateral veins pinnate; petiole prominently elongate ..... 11. *Lindleyanae*
  - 1b. Shrubs or trees erect, usually more than 30(–50) cm tall.
    - 8a. Ovary long stipitate.
      - 9a. Style absent or indistinct (usually less than 0.5 mm).
        - 10a. Adaxial gland falcate or broad, usually semiclasping stipe.
          - 11a. Flowering catkin more than 6 cm; fruiting catkin to 13 cm; rachis and bracts often densely grayish white pubescent or woolly at anthesis; young leaf blade lanceolate, 5–6 cm ..... 1. *Tetraspermae*
          - 11b. Flowering catkin less than 6 cm; fruiting catkin to 8(–9) cm; rachis and bracts neither grayish white pubescent nor woolly at anthesis; young leaf blade variably shaped, 2–3 cm ..... 3. *Wilsonia*
        - 10b. Adaxial gland not horseshoe-shaped, not clasping stipe.
          - 12a. Bracts yellowish green, brown after drying.
            - 13a. Leaves pilose at anthesis ..... 7. *Fulvopubescentes*
            - 13b. Leaves glabrous at anthesis.
              - 14a. Juvenile leaf blade linear ..... 36. *Helix*
              - 14b. Juvenile leaf blade lanceolate to elliptic.
                - 15a. Bracts ca. as long as to longer than stipes ..... 5. *Amygdalinae*
                - 15b. Bracts shorter than stipes ..... 3. *Wilsonia*
      - 12b. Bracts 2-colored, distal part brown to black.
        - 16a. Juvenile branchlets more than 2 mm in diam.; plants more than 1 m tall, not growing in marshes.
          - 17a. Ovary ovoid ..... 18. *Chamaetia*

- 17b. Ovary conical ..... 24. *Vetrix*
- 16b. Juvenile branchlets slender, less than 1.5 mm in diam.; plants usually ca. 60 cm tall, growing in marshes.
- 18a. Ovary and branchlets pilose ..... 29. *Incubaceae*
- 18b. Ovary and branchlets glabrous ..... 17. *Myrtilloides*
- 9b. Style conspicuous or usually more than 0.5 mm, lobed or entire.
- 19a. Flowering catkin long and slender, pendulous ..... 2. *Urbaniana*
- 19b. Flowering catkin not pendulous, fruiting catkin sometimes recurved.
- 20a. Catkin subsessile or with slightly lengthened peduncle in fruit, basally with 2 or 3 scalelike leaflets (longest to 1 cm) or not.
- 21a. Style ca. as long as ovary ..... 26. *Daphnella*
- 21b. Style much shorter than ovary.
- 22a. Ovary glabrous ..... 22. *Hastatae*
- 22b. Ovary pilose.
- 23a. Ovary conical to linear-conical; capsule linear-conical, valves revolute when dried ..... 24. *Vetrix*
- 23b. Ovary ovoid or narrowly ovoid; capsule sometimes ovoid-conical, valves curved outward when dried, not revolute.
- 24a. Catkin oblong to shortly cylindrical, 3–4(–5) × as long as thick ..... 28. *Vimen*
- 24b. Catkin cylindrical, more than 4 × as long as thick ..... 15. *Heterochromae*
- 20b. Catkin pedunculate, usually with (1 or)2 or 3 leaflets (more than 1 cm) that are rarely deciduous when capsule matures.
- 25a. Bracts usually yellowish green, brownish when dried.
- 26a. Young leaf blade more than 4 cm at anthesis; fruiting catkin to more than 10 cm ..... 8. *Magnificae*
- 26b. Young leaf blade very small at anthesis; fruiting catkin usually less than 10 cm.
- 27a. Ovary pilose; catkin more than 6 mm thick ..... 15. *Heterochromae*
- 27b. Ovary glabrous, or slightly pilose basally or adaxially; catkin 2–4(–6) mm thick.
- 28a. Bracts ca. as long as stipes ..... 10. *Floccosae*
- 28b. Bracts much longer than stipes ..... 9. *Denticulatae*
- 25b. Bracts dull brown to black distally.
- 29a. Ovary pilose.
- 30a. Bracts ca. 1 mm; ovary ca. 2 mm; young leaf blade oblanceolate ..... 23. *Arbuscella*
- 30b. Bracts more than 2 mm; ovary ca. 4 mm; young leaf blade obovate ..... 19. *Glaucosae*
- 29b. Ovary glabrous.
- 31a. Young leaf blade entire at margin; style more than 1 mm ..... 25. *Lanatae*
- 31b. Young leaf blade serrulate at margin; style less than 1 mm, or subsessile ..... 22. *Hastatae*
- 8b. Ovary sessile or very shortly stipitate.
- 32a. Catkin terminal; plant usually 30–50(–100) cm tall ..... 10. *Floccosae*
- 32b. Catkin lateral, rarely terminal; plant often more than 1 m tall.
- 33a. Adaxial gland narrowly oblong to linear, more than 0.5 mm.
- 34a. Ovary glabrous ..... 12. *Sclerophyllae*
- 34b. Ovary pilose.
- 35a. Bracts 2-colored, proximal part light colored, distal part dull brown to black.
- 36a. Catkin short and thick, more than 1 cm thick; young leaf blade obovate-oblong to broadly elliptic ..... 31. *Subviminalae*
- 36b. Catkin somewhat slender, usually less than 1 cm thick; young leaf blade usually linear to lanceolate or oblanceolate ..... 28. *Vimen*
- 35b. Bracts uniformly colored, yellowish green, brown in dried specimens.
- 37a. Bracts pilose only basally ..... 34. *Cheilophilae*
- 37b. Bracts with long hairs.
- 38a. Style very short or almost absent; young leaf blade obovate-oblong ..... 33. *Variiegatae*
- 38b. Style conspicuous; young leaf blade elliptic or ovate.
- 39a. Ovary sessile; young leaf blade dentate at margin ..... 30. *Sieboldianae*
- 39b. Ovary shortly stipitate; young leaf blade entire at margin ..... 15. *Heterochromae*

- 33b. Adaxial gland less than 0.5 mm, not linear, proximal part usually broad and thick.
- 40a. Catkin ellipsoid, oblong, or shortly cylindric (sometimes cylindric in *Salix alba* in 6. *Salix*), less than 4(–5) × as long as thick or, if more than 4(–5) × as long as thick, then style ca. 1/2 as long as ovary, entire.
- 41a. Catkin without leaflets, rarely with scalelike leaflets.
- 42a. Young leaf blade 1.5–3 × as long as wide.
- 43a. Bracts yellowish green, brown when dried ..... 15. *Heterochromae*
- 43b. Bracts dull brown to black distally ..... 31. *Subvminales*
- 42b. Young leaf blade 4–10 × as long as wide.
- 44a. Ovary glabrous; plants growing on sand dunes ..... 37. *Flavidae*
- 44b. Ovary pilose or glabrous; plants not growing on sand dunes.
- 45a. Young branchlets and leaves glabrous ..... 36. *Helix*
- 45b. Young branchlets and leaves usually tomentose ..... 35. *Haoanae*
- 41b. Catkin with leaflets at base.
- 46a. Ovary and capsule to 9 mm; young leaves extremely viscid, margin prominently regularly glandular serrulate ..... 4. *Pentandrae*
- 46b. Ovary and capsule usually less than 5 mm; young leaves not viscid, margin inconspicuously glandular dentate or entire.
- 47a. Leaves grayish blue or grayish green or, if green, then opposite or subopposite.
- 48a. Leaves grayish blue, opposite and subopposite ..... 32. *Caesiae*
- 48b. Leaves grayish green, alternate ..... 19. *Glauciae*
- 47b. Leaves not grayish blue or grayish green, alternate.
- 49a. Style usually 0.5–1.5 mm, entire
- 50a. Bracts uniformly colored ..... 23. *Arbuscella*
- 50b. Bracts 2-colored ..... 29. *Incubaceae*
- 49b. Style usually less than 0.5(–6) mm, rarely longer, lobed.
- 51a. Branchlets long; young leaf blade oblanceolate, lanceolate, or narrowly elliptic; trees .. 6. *Salix*
- 51b. Branchlets short; young leaf blade elliptic to orbicular, rarely lanceolate; shrubs 12. *Sclerophyllae*
- 40b. Catkin cylindric, more than 5 × as long as thick or, if shorter, then long pedunculate.
- 52a. Style more than ca. 0.6 mm or more than 1 mm, divided; ovary pilose or, if glabrous, then leaves very large at beginning of anthesis or style shallowly lobed or not.
- 53a. Style divided to 2-cleft, rarely shallowly lobed.
- 54a. Ovary pilose ..... 13. *Psilostigmatae*
- 54b. Ovary glabrous ..... 9. *Denticulatae*
- 53b. Style very shallowly lobed or not.
- 55a. Ovary glabrous ..... 25. *Lanatae*
- 55b. Ovary pilose.
- 56a. Young leaves densely silky or tomentose abaxially ..... 27. *Argyraceae*
- 56b. Young leaves glabrous or sparsely pilose.
- 57a. Bracts long hairy ..... 23. *Arbuscella*
- 57b. Bracts shortly hairy ..... 20. *Diplodictyae*
- 52b. Style less than 1 mm or, if longer, then catkins subopposite or ovary glabrous.
- 58a. Young leaf blade more than 4 cm, margin not revolute at anthesis ..... 8. *Magnificae*
- 58b. Young leaf blade very small or absent or, if to 4 cm, then margin revolute at anthesis.
- 59a. Style entire or absent; catkin usually sessile, rarely pedunculate.
- 60a. Young branchlets and leaves glabrous or subglabrous ..... 36. *Helix*
- 60b. Young branchlets and leaves pilose ..... 35. *Haoanae*
- 59b. Style completely divided to shallowly lobed, rarely entire; catkin pedunculate.
- 61a. Ovary glabrous, or sparsely pilose, subglabrous, or pilose only at base ..... 9. *Denticulatae*
- 61b. Ovary pilose.
- 62a. Bracts lanceolate or oblong-obovate ..... 23. *Arbuscella*
- 62b. Bracts neither lanceolate nor oblong-obovate.
- 63a. Leaflets on peduncle nearly all deciduous when capsule matures ..... 15. *Heterochromae*
- 63b. Leaflets on peduncle not deciduous when capsule matures.
- 64a. Young leaves pubescent (at least on veins) abaxially ..... 14. *Eriocladae*
- 64b. Young leaves densely silky abaxially or, if glabrous, then pruinose ..... 13. *Psilostigmatae*

**Key to sections based on vegetative characters**

- 1a. Dwarf shrubs erect, ascending, procumbent, creeping, or cushion-shaped, usually less than 30(–50) cm tall.
- 2a. Leaves adaxially white woolly, at least some young branchlets white woolly in autumn ..... 31. *Subviminalis*
- 2b. Leaves and young branchlets not white woolly.
- 3a. Petiole more than 1/4 as long as leaf blade.
- 4a. Leaves more than 2 cm ..... 20. *Diplodictyae*
- 4b. Leaves less than 2 cm ..... 11. *Lindleyanae*
- 3b. Petiole less than 1/4 as long as leaf blade.
- 5a. Plant erect or ascending.
- 6a. Branchlets brown or dull brown to nearly black ..... 10. *Floccosae*
- 6b. Branchlets light brown ..... 7. *Fulvopubescentes*
- 5b. Plant creeping or cushion-shaped.
- 7a. Leaf blade entire at margin, rarely crenate, at least some retuse at apex (or long obovate and acute at apex):
23. *Arbuscella*) ..... 16. *Retusae*
- 7b. Leaf blade dentate at margin, at least some sparsely serrate toward apex, usually not retuse at apex.
- 8a. Leaves with sharply pointed, nearly spinose teeth at margin or, if glandular serrulate, then generally  
2–3 × 1–2 cm ..... 21. *Myrtosalix*
- 8b. Leaves less than 1.5 cm, without spinose teeth at margin ..... 7. *Fulvopubescentes*
- 1b. Shrubs or trees erect, more than 30 cm tall.
- 9a. Leaf blade green, at least 5 × as long as wide, usually linear, lanceolate, or oblong-lanceolate.
- 10a. Leaf blade entire, subentire, or sinuate (sometimes serrate in 8. *Magnificae* and 34. *Cheilophilae*).
- 11a. Leaves abaxially pilose (or with rudimentary, comose indumentum along midvein).
- 12a. Leaves abaxially brown or white downy, at least pilose along veins ..... 7. *Fulvopubescentes*
- 12b. Leaves abaxially sericeous, white tomentose, or with rudimentary, comose indumentum or, if downy, then narrow and small, to 4.5 cm × 1–3 mm.
- 13a. Leaves in distal 1/2 of branchlets usually less than 5 cm (rarely slightly longer), abaxially with yellowish brown hairs, white sericeous, or ± silky.
- 14a. Leaf blade in distal 1/2 of branchlets (8–)9(–21) × as long as wide; branchlets usually red or reddish black, downy or glabrous ..... 34. *Cheilophilae*
- 14b. Leaf blade in distal 1/2 of branchlets 5–8 × as long as wide; branchlets densely brown tomentose.
- 15a. Branchlets ca. 1 mm thick, densely yellowish brown tomentose; plants 50–80 cm tall, growing in marshes ..... 29. *Incubaceae*
- 15b. Branchlets more than 2 mm thick, yellowish brown, dull colored, or grayish white tomentose; plants more than 1 m tall, not growing in marshes ..... 14. *Eriocladae*
- 13b. Leaves in distal 1/2 of branchlets usually more than 5 cm, abaxially sericeous, tomentose or with rudimentary, comose indumentum, rarely pilose.
- 16a. Leaf blade broadly linear to linear-lanceolate (oblong on shoots of *S. rehderiana*) ..... 28. *Vimen*
- 16b. Leaf blade lanceolate or obovate-lanceolate, rarely narrowly obovate.
- 17a. Leaves abaxially sparsely silky or downy; ovary glabrous, shortly stipitate.
- 18a. Leaves to 10 cm ..... 9. *Denticulatae*
- 18b. Leaves more than 10 cm ..... 8. *Magnificae*
- 17b. Leaves abaxially densely sericeous or tomentose, or with rudimentary, comose indumentum along midvein; ovary pilose, sessile.
- 19a. Leaf blade linear to linear-lanceolate ..... 28. *Vimen*
- 19b. Leaf blade not linear to linear-lanceolate.
- 20a. Leaf blade lanceolate or broadly lanceolate to oblanceolate, to 6 cm, abaxially yellowish tomentose ..... 14. *Eriocladae*
- 20b. Leaf blade lanceolate to elliptic-lanceolate, usually more than 6 cm, abaxially not yellowish tomentose ..... 13. *Psilostigmatae*
- 11b. Leaves abaxially glabrous (or slightly downy along midvein).
- 21a. Leaf margin sinuate or revolute ..... 28. *Vimen*
- 21b. Leaf margin neither sinuate nor revolute.
- 22a. Leaves usually more than 5 cm.

- 23a. Leaf blade (10–)15–20 × 3–5 cm ..... 8. *Magnificae*
- 23b. Leaf blade to 15 × 3 cm ..... 36. *Helix*
- 22b. Leaves usually less than 5 cm.
  - 24a. Leaves abaxially pale; ovary glabrous ..... 9. *Denticulatae*
  - 24b. Leaves abaxially light green; ovary hairy ..... 12. *Sclerophyllae*
- 10b. Leaf blade serrate.
  - 25a. Leaf apex obtuse or acute to shortly acuminate or, if acuminate, then margin thickened, bonelike, with glandular teeth; shrubs, rarely small trees.
    - 26a. Leaf blade ca. 17 × 1–4.5 cm ..... 13. *Psilostigmatae*
    - 26b. Leaf blade smaller.
      - 27a. Leaf blade margin with densely regularly spaced teeth 4 or 5 per cm ..... 5. *Amygdalinae*
      - 27b. Leaf blade margin remotely dentate, teeth more remote and inconspicuous toward leaf base.
        - 28a. Young branchlets and leaves glabrous; stipules linear.
          - 29a. Mature leaf blade more than 3 mm wide, usually broadest above middle ..... 36. *Helix*
          - 29b. Mature leaf blade less than 3 mm wide, usually more than 8 cm, proximal and distal parts nearly equally wide ..... 37. *Flavidae*
        - 28b. Young branchlets and leaves tomentose; stipules lanceolate, rarely reniform or ovate.
          - 30a. Mature leaf blade (4–)5–6(–8) × as long as wide ..... 35. *Haoanae*
          - 30b. Mature leaf blade 3–4(–5) × as long as wide ..... 31. *Subviminalales*
  - 25b. Leaf apex long acuminate or acuminate (acute in *S. tengchongensis*); trees.
    - 31a. Distal part of petiole ± glandular.
      - 32a. Stipules small, subulate, caducous; young branchlets and leaves very viscid ..... 4. *Pentandrae*
      - 32b. Stipules developed, especially on shoots, semicordate or semiovate-lanceolate; young branchlets and leaves not or only slightly viscid ..... 3. *Wilsonia*
    - 31b. Distal part of petiole eglandular.
      - 33a. Stipules small, subulate, semicordate-lanceolate, or caducous; branchlets usually slender, weak, pendulous or ± pendulous ..... 6. *Salix*
      - 33b. Stipules ovate-lanceolate, ovate, broadly ovate, or semicordate; branchlets thick, not pendulous.
        - 34a. Juvenile branchlets glabrous; buds longer than petioles; leaf margin regularly serrulate ..... 26. *Daphnella*
        - 34b. Juvenile branchlets ± pilose; buds shorter than petioles.
          - 35a. Leaves usually 9–10 cm ..... 1. *Tetraspermae*
          - 35b. Leaves 2.4–6.5 cm ..... 13. *Psilostigmatae*
- 9b. Leaf blade rarely slightly grayish blue, less than 5 × as long as wide, often elliptic to suborbicular or oblong to obovate-oblong.
  - 36a. Stipules semicordate, reniform, or suborbicular, large, broad, especially prominent on shoots, if semiovate or broadly lanceolate, then leaves slightly grayish blue.
    - 37a. Petiole glandular distally or, if eglandular, then leaf blade elliptic or oblong, abaxially silky, or ovate, basally cordate, with brown downy veins abaxially, or leaf margin serrulate or crenate-serrate ..... 3. *Wilsonia*
    - 37b. Petiole eglandular distally.
      - 38a. Leaf blade orbicular, suborbicular, or rhombic-elliptic, abaxially often glabrous, margin serrate ..... 22. *Hastatae*
      - 38b. Leaf blade broadly ovate, broadly elliptic, obovate, obovate-oblong, or elliptic to ovate-lanceolate, rarely suborbicular or, if lanceolate, then abaxially slightly grayish blue.
        - 39a. Leaves abaxially densely sericeous, with conspicuous, lateral veins, obovate-oblong or oblong ..... 31. *Subviminalales*
        - 39b. Leaves abaxially tomentose or glabrous, rarely silky, with indistinct, lateral veins, neither obovate-oblong nor oblong ..... 24. *Vetrix*
  - 36b. Stipules neither semicordate, reniform, nor suborbicular, sometimes caducous.
    - 40a. Petiole on distal part of branchlets usually more than 1/4 as long as leaf blade; plant usually 30–50 cm tall.
      - 41a. Leaf blade dentate, rarely entire ..... 10. *Floccosae*
      - 41b. Leaf blade entire.
        - 42a. Leaves more than 2 cm ..... 20. *Diplodictyae*
        - 42b. Leaves less than 2 cm ..... 12. *Sclerophyllae*



- 40b. Petiole on distal part of branchlets usually less than 1/4 as long as leaf blade; plants more than 50 cm tall.
- 43a. Leaves on distal 1/2 of branchlets less than 5 cm, those of a few species somewhat longer, with entire margins.
- 44a. Leaves grayish blue, opposite or subopposite ..... 32. *Caesia*
- 44b. Leaves not grayish blue, alternate.
- 45a. Leaf blade (narrowly) oblong or narrowly obovate-oblong ..... 33. *Variiegatae*
- 45b. Leaf blade neither oblong nor narrowly obovate-oblong.
- 46a. Leaves adaxially conspicuously wrinkled ..... 18. *Chamaetia*
- 46b. Leaves adaxially smooth.
- 47a. Leaves 1–2 cm, elliptic or oblong; 1-year-old branchlets ca. 1 mm thick; plants growing in marshes ..... 17. *Myrtilloides*
- 47b. Leaves usually more than 2 cm, variably shaped; 1-year-old branchlets more than 1 mm thick; plants not growing in marshes.
- 48a. Nodes relatively expanded, forming beaded chains; internodes of branchlets usually less than 1 cm.
- 49a. Mature leaf blade often obovate-oblong, ca. 3 × as long as wide; fallen leaves from previous year rust colored ..... 31. *Subviminalae*
- 49b. Mature leaf blade variably shaped, usually elliptic, 1.5–2 × as long as wide; fallen leaves from previous year not rust colored ..... 12. *Sclerophyllae*
- 48b. Nodes neither expanded nor forming beaded chains; internodes of branchlets more than 1 cm.
- 50a. Mature leaves abaxially pilose, at least with rudimentary hairs along veins abaxially.
- 51a. Mature leaves abaxially densely sericeous.
- 52a. Leaf margin serrate distally ..... 31. *Subviminalae*
- 52b. Leaf margin entire.
- 53a. Leaves white pubescent or with hairs only along veins ..... 25. *Lanatae*
- 53b. Leaves sericeous.
- 54a. Young leaves only abaxially sericeous ..... 27. *Argyreae*
- 54b. Young leaves yellowish sericeous on both surfaces ..... 29. *Incubaceae*
- 51b. Mature leaves abaxially neither densely sericeous nor with rudimentary hairs only along veins.
- 55a. Juvenile branchlets pilose or, if glabrous, then most leaves aggregated at apex of branchlets ..... 14. *Eriocladae*
- 55b. Juvenile branchlets glabrous, or pilose when young, glabrescent; leaves lateral, not aggregated at apex of branchlets.
- 56a. Branchlets russet ..... 13. *Psilostigmatae*
- 56b. Branchlets yellowish brown or brown ..... 6. *Salix*
- 50b. Mature leaves abaxially glabrous.
- 57a. Leaves on distal part of branchlets entire or only dentate distally, entire proximally; ovary glabrous.
- 58a. One-year-old branchlets ± pilose ..... 9. *Denticulatae*
- 58b. One-year-old branchlets glabrous ..... 15. *Heterochromae*
- 57b. Leaves on distal part of branchlets dentate.
- 59a. Leaves grayish blue ..... 19. *Glauciae*
- 59b. Leaves not grayish blue.
- 60a. Petiole 2–5 mm ..... 22. *Hastatae*
- 60b. Petiole 5–15 mm or, if less than 5 mm, then plants growing on Changbai Shan, NE China ..... 23. *Arbuscellae*
- 43b. Leaves on distal part of branchlets more than 5 cm.
- 61a. Leaf apex acute to acuminate.
- 62a. Leaves often more than (9–)10 cm.

- 63a. Leaves abaxially light green or slightly white, with inconspicuous, reticulate veins (plants growing S of 23° N latitude) ..... 1. *Tetraspermae*
- 63b. Leaves abaxially white, with conspicuous, reticulate veins ..... 2. *Urbanianae*
- 62b. Leaves less than 9 cm.
- 64a. Leaves on at least distal part of branchlets silky abaxially ..... 27. *Argyreae*
- 64b. Leaves abaxially neither silky nor glabrous.
- 65a. Leaves entire or subentire.
- 66a. Branchlets densely tomentose, yellowish green; leaves abaxially often pilose; stipules ovate to lanceolate ..... 25. *Lanatae*
- 66b. Branchlets sparsely pilose or glabrous, usually reddish purple or reddish black; leaves pilose or glabrescent; stipules often caducous ..... 15. *Heterochromae*
- 65b. Leaves dentate.
- 67a. Glandular dots at tips of teeth not developed; young leaves not viscid, usually with brown hairs or downy ..... 30. *Sieboldianae*
- 67b. Glandular dots at tips of teeth developed; young leaves viscid, glabrous ..... 4. *Pentandrae*
- 61b. Leaf apex acute, obtuse, or rounded.
- 68a. Leaf blade on distal part of branchlets usually more than 7 cm, usually broadest below middle, broadly ovate to suborbicular, abaxially glabrous; ovary glabrous ..... 8. *Magnifica*
- 68b. Leaf blade on distal part of branchlets usually less than 7 cm or, if longer, then abaxially pilose or at least pilose along veins, usually broadest above middle, obovate-elliptic to obovate-oblong, rarely elliptic or oblong-elliptic.
- 69a. Leaves glabrous, with thin texture ..... 23. *Arbuscella*
- 69b. Leaves abaxially often pilose or glabrescent and with rudimentary hairs only along veins, rarely glabrous and then leaf blade relatively thick.
- 70a. Leaves abaxially sericeous, shiny ..... 31. *Subviminalae*
- 70b. Leaves abaxially tomentose or glabrous.
- 71a. Juvenile branchlets pilose only on newly sprouted parts; 2-year-old branchlets glabrous, reddish purple or dark red, ca. 2 mm in diam. .... 15. *Heterochromae*
- 71b. Juvenile branchlets pubescent; some 2-year-old branchlets pilose, not reddish purple, ca. 2.5 mm or more in diam.
- 72a. Stipules caducous or inconspicuous ..... 13. *Psilostigmatae*
- 72b. Stipules prominent, ovate-lanceolate ..... 25. *Lanatae*

**1. Sect. Tetraspermae** (Andersson) C. K. Schneider in Sargent, Pl. Wilson. 3: 93. 1916.

四子柳组 si zi liu zu

*Salix* [unranked, as “stirps”] *Tetraspermae* Andersson, Kongl. Svenska Vetenskapsakad. Handl. 6, 1: 1. 1865.

Trees or shrubs. Leaf blade lanceolate or ovate-lanceolate, large, 5–6(–12) cm, apex long acuminate or acute. Catkins very long, to 15 cm, laxly flowered. Male flower: adaxial and abaxial glands present, usually forming a lobed disc; stamens 5–10 or more. Female flower: gland 1, adaxial, slightly clasping stipe; ovary glabrous, conspicuously stipitate; style absent or very short; stigma short and coarse, retuse or 2-cleft.

- 1a. Young leaves and branchlets glabrous, blade ovate- or linear-lanceolate, abaxially pale, pruinose; stamens (6–)8(or 9) ..... 1. *S. tetrasperma*
- 1b. Young leaves and branchlets densely grayish white downy, blade ovate- or obovate-lanceolate, abaxially greenish; stamens (4 or)5 or 6 ..... 2. *S. araeostachya*

**1. *Salix tetrasperma*** Roxburgh, Pl. Coromandel 1: 66. 1795.

四子柳 si zi liu

*Pleiarina tetrasperma* (Roxburgh) N. Chao & G. T. Gong; *Salix disperma* Roxburgh ex D. Don.

Trees to 10 m tall. Branches dull brown, glabrous; juvenile branchlets subglabrous. Buds narrowly ovoid, glabrous, apex acute. Stipules obliquely ovate,

glandular, serrate; petiole 1–1.5 cm, glabrous; leaf blade ovate to linear-lanceolate, 6–16 × 2.5–4.5 cm, abaxially pale, pruinose, adaxially green, glabrous, shiny, base cuneate or suborbicular, margin serrate, apex acuminate. Flowering serotinous. Male catkin ca. 10 cm × 6 mm; peduncle 1.5–2 cm, with 2 or 3 pilose leaflets; rachis densely pubescent or woolly; bracts elliptic, densely grayish white downy, apex acute or obtuse.

Male flower: glands usually connected, much lobed, discoid; stamens usually 8, rarely 6 or 9; filaments downy proximally; anthers yellow, ovoid. Female catkin nearly as long as male catkin; bracts like those of male catkin, ca. as long as stipes. Female flower: adaxial gland slightly clasping stipe; ovary ovoid, ca. as long as or slightly shorter than stipe; style short, 2-cleft; stigma 2-lobed. Capsule ovoid, glabrous. Fl. Sep–Oct or Jan–Apr, fr. Nov–Dec or May.  $2n = 76$ .

Below 1800 m. S Guangdong, Hainan, S Xizang, S and SW Yunnan [India, Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Thailand, Vietnam].

**2. *Salix araeostachya*** C. K. Schneider in Sargent, Pl. Wilson. 3: 96. 1916.

纤序柳 xian xu liu

Trees small or large shrubs. Branches purplish brown, glabrous; juvenile branchlets pubescent. Stipules semicordate, small; petiole ca. 1.2 cm; leaf blade ovate or obovate-lanceolate, ca.  $9 \times 3.5$  cm, abaxially

greenish, appressed pubescent when young, glabrescent, adaxially green, glabrous or pilose, base cuneate or obtuse, margin loosely serrate, apex shortly acuminate or shortly caudate. Male catkin 5–9 cm  $\times$  ca. 8 mm, laxly flowered; peduncle ca. 1.5 cm, with 2 or 3 downy bracts; rachis densely woolly or grayish white downy; bracts ovate-orbicular, densely woolly or abaxially thinner. Male flower: glands lobed, irregularly shaped; stamens 4–6, ca.  $2 \times$  as long as bracts; filaments downy proximally; anthers yellow. Female catkin ca. 6 cm, laxly flowered, to 11 cm in fruit; peduncle ca. 1.5 cm, with 2 or 3 bracts; rachis densely woolly or grayish white downy; bracts like those of male catkin, ca. as long as or shorter than stipes. Female flower: adaxial gland ca.  $1/5$  as long as stipe; ovary ovoid, glabrous, long stipitate; style 2–10-lobed, subsessile; stigma 2-parted. Capsule ovoid, 7–9 mm. Fl. and fr. Oct–Dec.

Below 2500 m. S and SW Yunnan [India, Nepal].

**2. Sect. *Urbanianae*** (Seemen) C. K. Schneider in Sargent, Pl. Wilson. 3: 103. 1916.

大白柳组 da bai liu zu

*Salix* [unranked] *Urbanianae* Seemen, *Salix* Jap. 15. 1903; *Toisusu* Kimura.

Trees. Bark grayish black, furrowed. Leaf blade ovate-lanceolate or ovate-oblong, abaxially white or glaucous, margin serrate; reticulate veins conspicuous. Male catkin with bracts membranous and 3–5-veined. Male flower: stamens 5(–8), adnate to bracts; adaxial glands 1 or 2, abaxial gland 1. Female catkin pendulous, slender; bracts caducous. Female flower: ovary glabrous, stipitate; adaxial glands 1 or 2.

**3. *Salix maximowiczii*** Komarov, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 18: 442. 1901.

大白柳 da bai liu

*Toisusu cardiophylla* (Trautvetter & Meyer) Kimura var. *maximowiczii* (Komarov) Kimura.

Trees to 20 m tall; trunk to 1 m d.b.h.; bark dull brownish gray. Branches slender; branchlets green or grayish green, yellowish in winter, glabrous. Buds ovoid, shiny. Stipules ovate-orbicular, dentate, caducous; petiole 0.5–1.8 cm; leaf blade ovate-oblong or ovate-lanceolate, ca.  $12 \times 3.4$  cm, abaxially pale, glabrous, adaxially dark green, pubescent along veins, glabrescent, base  $\pm$  obtuse, rarely cordate, margin serrate, apex long acuminate. Flowering coetaneous. Male catkin erect or spreading, 2.5–4.5 cm, pedunculate,

densely flowered; rachis glabrous; bracts obovate, 2–5 mm, ciliate, 3–5-veined. Male flower: glands 2; stamens 5, central 3 longer than lateral 2, 6–7 mm; filaments pubescent at base; anthers yellow. Female catkin pendulous, 4–6(–10) cm, loosely flowered, to 5–15 cm in fruit; bracts yellowish, oblong, abaxially pilose, apex acute, caducous. Female flower: adaxial glands 2, abaxial gland 1 or absent; ovary ovoid-lanceolate, glabrous, stipitate; style 2-lobed; stigma lanceolate, 2-parted; style and stigma caducous in fruit. Fl. May–Jun, fr. Jun–Jul.

300–800 m. Heilongjiang, Jilin, Liaoning [Korea, Russia (Far East)].

Used for timber, matchwood, and as a nectariferous plant.

**3. Sect. *Wilsonia*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, *Novon* 8: 470. 1998.

紫柳组 zi liu zu

Trees or shrubs. Leaf blade oblanceolate, lanceolate, or elliptic to broadly elliptic, margin dentate, subentire, serrulate, or crenate-serrate, apex long acuminate to acute. Flowering nearly coetaneous. Male catkin slender; bracts yellowish green. Male flower: glands adaxial and abaxial, connate at base to form multifid disc; stamens (3 or) 4–6(–8). Female catkin rarely with slightly dense flowers, usually pedunculate; peduncle with leaflets. Female flower: adaxial gland usually horseshoe-shaped, semiclasping stipe; ovary narrowly ovoid to ovoid, glabrous, long stipitate; style very short, to 0.3 mm, or absent; stigma capitate or 2-lobed;

A. K. Skvortsov indicates that and *Salix dunnii*, *S. mesnyi*, *S. nankingensis*, *S. neowilsonii*, *S. rosthornii*, *S. warburgii*, and *S. wilsonii* so closely resemble each other that they may be taken for one variable and widely distributed species.

### Key based on male plants

(*Salix balansaei*, *S. boseensis*, and *S. tengchongensis* unknown)

- 1a. Stamens 5–12; filaments with long, soft hairs at base.
  - 2a. Petiole ± glandular distally.
    - 3a. Catkin densely flowered at anthesis, more than 8 mm thick ..... 9. *S. cavaleriei*
    - 3b. Catkin laxly flowered at anthesis, less than 8 mm thick ..... 10. *S. chaenomeloides*
  - 2b. Petiole eglandular distally.
    - 4a. Bracts broadly ovate, abaxially subglabrous ..... 4. *S. mesnyi*
    - 4b. Bracts broadly elliptic or ovate, abaxially pilose ..... 6. *S. kusanoi*
- 1b. Stamens 3–6(–8); filaments pubescent or tomentose at base.
  - 5a. Male catkin densely flowered; rachis nearly completely covered by bracts and filaments.
    - 6a. Catkin less than 3 cm; stamens usually 5, rarely 3(or 6); bracts glabrous abaxially, pilose adaxially ..... 18. *S. nankingensis*
    - 6b. Catkin more than 3 cm (usually ca. 5 cm); stamens 5 or 6; bracts with sparse hairs abaxially only proximally, pilose adaxially ..... 7. *S. warburgii*
  - 5b. Male catkin laxly flowered; internodes between flowers slightly longer than bracts, i.e., rachis conspicuous.
    - 7a. Bracts long elliptic ..... 12. *S. neowilsonii*
    - 7b. Bracts narrowly ovate, ovate, or obovate.
      - 8a. Peduncle ca. 1 cm; catkin rachis villous.
        - 9a. Catkin ca. 5 cm; leaf apex obtuse or acute ..... 15. *S. dunnii*
        - 9b. Catkin ca. 3 cm; leaf apex acute to acuminate ..... 16. *S. chingiana*
      - 8b. Peduncle ca. 2 cm or longer; catkin rachis pubescent; leaf apex acuminate.
        - 10a. Bracts with hairs on proximal and middle parts and along margin; leaf blade elliptic to oblong ..... 11. *S. wilsonii*
        - 10b. Bracts downy only at base; leaf blade not elliptic to oblong.
          - 11a. Leaf blade lanceolate, elliptic-lanceolate, or oblong, 4–7 cm; stamens (3–)6; glands usually discoid ..... 13. *S. rosthornii*
          - 11b. Leaf blade oblong-lanceolate, 1.5–3.5 cm; stamens 4; glands not discoid ..... 14. *S. chekiangensis*

**Key based on female plants**

(*Salix chekiangensis* and *S. neowilsonii* unknown)

- 1a. Stipe less than 1 mm.
  - 2a. Ovary ovoid-conical; bracts broadly ovate; fruiting catkin to 6.5 cm ..... 4. *S. mesnyi*
  - 2b. Ovary ovoid-ellipsoid; bracts ovate or elliptic; fruiting catkin to 5 cm ..... 18. *S. nankingensis*
- 1b. Stipe 1–3 mm.
  - 3a. Female flowers glabrous (but seeds with hairs) ..... 17. *S. tengchongensis*
  - 3b. Female flowers ± pilose.
    - 4a. Ovary narrowly ovoid to lanceolate; bracts pilose on both surfaces basally.
      - 5a. Bracts ca. as long as stipes; adaxial gland only present, 3-lobed or entire ..... 15. *S. dunnii*
      - 5b. Bracts slightly shorter than stipes; adaxial and abaxial glands present; adaxial gland horseshoe-shaped, semiclapping stipe.
        - 6a. Bracts ovate; abaxial gland sometimes not developed; capsule ovoid ..... 13. *S. rosthornii*
        - 6b. Bracts not ovate; abaxial gland present; capsule ovoid-ellipsoid.
          - 7a. Catkin 2–4 cm; petiole inconspicuously glandular or not; bracts elliptic ..... 11. *S. wilsonii*
          - 7b. Catkin 4–5.5 cm; petiole gland-tipped; bracts elliptic-obovate ..... 10. *S. chaenomeloides*
    - 4b. Ovary ovoid, ellipsoid, or ellipsoid-oblong; bracts either pilose or glabrous on both surfaces or glabrous only abaxially.
      - 8a. Bracts generally glabrous on both surfaces, except for marginal hairs.
        - 9a. Bract margin ciliate ..... 7. *S. warburgii*
        - 9b. Bract margin not ciliate ..... 8. *S. balansaei*
      - 8b. Bracts pilose on at least 1 surface.
        - 10a. Ovary ovoid; bracts downy on 1 or both surfaces.
          - 11a. Bracts downy on both surfaces ..... 9. *S. cavaleriei*

- 11b. Bracts glabrous abaxially ..... 5. *S. boseensis*  
 10b. Ovary ovoid-oblong or ovoid-conical; bracts pilose adaxially or with fewer hairs abaxially.  
 12a. Bracts with long, soft hairs adaxially; ovary ellipsoid-oblong or ellipsoid; adaxial gland entire ..... 16. *S. chingiana*  
 12b. Bracts with short, soft hairs adaxially, with fewer hairs abaxially; ovary ovoid-conical; adaxial gland retuse or lobed ..... 6. *S. kusanoi*

#### Key based on vegetative characters

- 1a. Petiole glandular at apex, or at least some petioles glandular.  
 2a. Leaves greenish abaxially.  
 3a. Young branchlets, leaves, and petioles glabrous or inconspicuously pilose ..... 18. *S. nankingensis*  
 3b. Young branchlets, leaves, and petioles distinctly pilose.  
 2b. Leaves pale or glaucous abaxially, or both pale or glaucous and greenish ..... 9. *S. cavaleriei*  
 4a. Leaf blade lanceolate, pointed at both ends.  
 5a. Branchlets dark purple; leaf blade less than 10 × 2 cm ..... 16. *S. chingiana*  
 5b. Branchlets yellow or green; leaf blade to 14 × 2.5–4 cm ..... 12. *S. neowilsonii*  
 4b. Leaf blade elliptic, ovate, or ovate-lanceolate, base cuneate to rounded.  
 6a. Leaf blade ovate to elliptic-lanceolate; stipules glabrous or subglabrous; leaf and stipule margin conspicuously and densely glandular dentate ..... 10. *S. chaenomeloides*  
 6b. Leaf blade oblong to broadly lanceolate; young leaves and stipules abaxially with long hairs, margin with sparse, small, glandular teeth.  
 7a. Leaf blade elliptic-lanceolate or oblong, rarely elliptic, 4–7 cm ..... 13. *S. rosthornii*  
 7b. Leaf blade oblong-lanceolate or lanceolate, 1.5–3.5 cm (mature leaves unknown) 14. *S. chekiangensis*  
 1b. Petiole eglandular at apex (sometimes with inconspicuous, glandular dots in *S. wilsonii*).  
 8a. Branchlets and young leaves densely rust-colored or russet pubescent; leaves usually more than 7 cm.  
 9a. Juvenile branchlets purplish red to purplish black; leaves ovate or ovate-elliptic ..... 6. *S. kusanoi*  
 9b. Juvenile branchlets brown; leaves oblong or oblong-lanceolate ..... 4. *S. mesnyi*  
 8b. Branchlets and young leaves glabrous or with hairs neither rust colored nor russet; leaves usually less than 6 cm.  
 10a. Branchlets and young leaves glabrous  
 11a. Leaf blade oblong or obovate-oblong ..... 5. *S. boseensis*  
 11b. Leaf blade lanceolate, oblanceolate, or ovate-lanceolate.  
 12a. Leaf blade lanceolate or oblanceolate ..... 17. *S. tengchongensis*  
 12b. Leaf blade ovate-lanceolate ..... 8. *S. balansaei*  
 10b. Branchlets and young leaves white or gray pubescent.  
 13a. Branchlets dull brown, glabrous or pilose; leaf apex acuminate ..... 11. *S. wilsonii*  
 13b. Branchlets purple, densely pilose; leaf apex obtuse or acute.  
 14a. Leaf blade elliptic-lanceolate or elliptic, both surfaces white downy, hairs denser along veins or abaxially ..... 15. *S. dunnii*  
 14b. Leaf blade oblong-elliptic or elliptic, both surfaces glabrous ..... 7. *S. warburgii*

#### 4. *Salix mesnyi* Hance, J. Bot. 20(2): 38. 1882.

粤柳 yue liu

*Pleiarina mesnyi* (Hance) N. Chao & G. T. Gong.

Trees small; bark yellowish gray, exfoliating. Juvenile branchlets brown, rust-colored pubescent at apex, glabrescent. Buds shortly conical, large, pubescent. Petiole 1–1.5 cm; leaf blade oblong, narrowly ovate, or oblong-lanceolate, 7–9(–11) × 3–4(–5) cm, leathery, abaxially light colored, subglabrous, adaxially bright green, both surfaces rust-colored pubescent when young, base rounded or subcordate, rarely broadly cu-

neate, margin coarsely glandular serrate, apex acuminate or caudate; veins evident. Male catkin 4–5 cm; rachis pubescent; bracts broadly ovate, pubescent, abaxially subglabrous, apex obtuse. Male flower: glands usually lobed; stamens 5 or 6; filaments pilose at base; anthers yellow, ovoid. Female catkin 3–6.5 cm; bracts as in male catkin, 1–2 × as long as stipe. Female flower: adaxial gland slightly clasping stipe; ovary ovoid-conical, ca. 4 mm; style short, 2-cleft; stigma 2-cleft. Fl. Mar, fr. Apr.

• Streamsides. S Anhui, Fujian, Guangdong, Guangxi, S Jiangsu, Jiangxi, Zhejiang.

5. *Salix boseensis* N. Chao, Guihaia 4(2): 107. 1984.

桂柳 *gui liu*

*Pleiarina boseensis* (N. Chao) N. Chao & G. T. Gong. Shrubs. Flowering branchlets reddish brown, glabrous, 4–5 cm, some with full-sized leaves; juvenile branchlets brownish, robust, 4–5 mm in diam., pruinose, glabrous. Stipules greenish, suboblong or subovate, 3–4 mm, glabrous, margin irregularly glandular serrulate or denticulate, persistent. Petiole to 9 mm; leaf blade oblong or obovate-oblong, 6–9 × 2–3.5 cm, both surfaces glabrous, abaxially greenish, adaxially green, base cuneate to subrounded, margin crenate-serrate, sparsely subentire, apex rounded or obtuse; midvein robust; lateral veins ca. 12 on each side of midvein, raised. Male catkin unknown. Fruiting catkin erect, 7–10 mm; peduncle ca. 1 cm; leaflets and rachis gray pilose; bracts brown, irregularly ovate or oblong, 2–3 mm, abaxially glabrous, adaxially gray villous-glabrescent especially near margin, apex rounded or obtuse. Female flower: gland adaxial, nearly semiorbicular, clasping stipe; ovary ovoid; style indistinct; stigmas 2, small, flat and wide, entire or retuse, glabrous. Capsule conical-ovoid, ca. 5 mm; stipe to 4 mm. Fr. Dec.

• Guangxi (Bose Xian).

A. K. Skvortsov believes that further work may align this species with *Salix tetrasperma*.

6. *Salix kusanoi* (Hayata) C. K. Schneider in Sargent, Pl. Wilson. 3: 100. 1916.

水社柳 *shui she liu*

*Salix tetrasperma* Roxburgh var. *kusanoi* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 305. 1911; *Pleiarina kusanoi* (Hayata) N. Chao & G. T. Gong; *S. suishaensis* Hayata.

Trees to 6 m tall. One-year-old branchlets purplish red-black, glabrous; juvenile branchlets gray and brown downy. Buds purplish red, ovoid-conical, subglabrous. Petiole long; leaf blade ovate or ovate-elliptic, ca. 9 × 4 cm, abaxially light or slightly pale, at first brown silky, glabrescent except along veins, adaxially grass green, brown silky along midvein, base rounded, obtuse, or subcordate, rarely subauriculate, margin entire, apex acute or acuminate; lateral veins 16 or 17 on each side of midvein. Flowering precocious or coetaneous, rarely serotinous. Male catkin cylindrical, 8(–9) cm; peduncle with 2 or 3 leaflets or leaflets deciduous; bracts ovate or broadly elliptic, pubescent. Male flower: adaxial and abaxial glands usually 2-cleft; stamens 5 or 6; filaments pubescent at base. Female catkin ca. 3 × 1 cm, pedunculate; bracts as in male catkin. Female flower: glands adaxial and abaxial, retuse or lobed at apex; ovary ovoid-conical, 3–4 mm, long stipitate; style nearly absent; stigma crownlike.

• Riversides. Taiwan.

7. *Salix warburgii* Seemen, Bot. Jahrb. Syst. 23(Beibl. 57): 43. 1897.

水柳 *shui liu*

*Pleiarina warburgii* (Seemen) N. Chao & G. T. Gong; *Salix glandulosa* Seemen var. *warburgii* (Seemen) Koidzumi.

Trees small. Young branchlets slightly pilose. Stipules small (those of shoots large), reniform-ovate, caducous, margin serrate, apex acuminate; petiole 5–10 cm; leaf blade oblong-elliptic or elliptic, 4–6 × 1.2–2.2 cm, abaxially whitish or glaucous, glabrous, adaxially green, base broadly cuneate, margin serrulate, apex acute or obtuse, rarely acuminate. Male catkin to 5 cm, densely flowered; peduncle long, with 3–5 leaflets; rachis villous; bracts subovate or elliptic, ca. 1.5 mm, abaxially pilose, adaxially downy only proximally. Male flower: adaxial gland shortly terete, abaxial gland usually 2-cleft; stamens 3–6. Female catkin laxly flowered; bracts elliptic, ca. 1.6 mm, subglabrous, margin ciliate. Female flower: adaxial gland shortly cylindrical; ovary ovoid-ellipsoid, ca. 3 mm, glabrous; stipe ca. 1 mm; Fl. Jan–Mar, fr. Apr.

• Among shrubs, near water. Taiwan.

8. *Salix balansaei* Seemen, Bot. Jahrb. Syst. 23(Beibl. 57): 44. 1897.

中越柳 *zhong yue liu*

Trees ca. 5 m. One-year-old branchlets brown, glabrous. Buds glabrous; scales raised abaxially. Petiole ca. 1.3 cm, glabrous; leaf blade ovate-lanceolate, 4–9 × 2.5–3 cm, rarely to 18 cm on vigorous shoots, abaxially green or glaucous, adaxially dull green, shiny, both surfaces glabrous, base rounded or subcuneate, margin entire or glandular dentate, apex long acuminate to caudate. Male catkin unknown. Fruiting catkin to 13 cm including distinct peduncle; peduncle with 2 or 3 leaflets, lax; rachis glabrous; bracts brown, ovate, shorter than stipe, glabrous, apex obtuse. Female flower: gland adaxial; ovary long stipitate, apex acute; style indistinct; stigma short, rarely lobed. Capsule ovoid, glabrous, apex acute.

Along rivers. Guangxi, S Hunan [Vietnam].

1a. Bracts ovate, glabrous ..... 8a. var. *balansaei*

1b. Bracts oblong, villous at middle adaxially ..... 8b. var. *hunanensis*

8a. *Salix balansaei* var. *balansaei*

中越柳(原变种) *zhong yue liu* (yuan bian zhong)

*Pleiarina balansaei* (Seemen) N. Chao & G. T. Gong. Bracts ovate, glabrous.

Guangxi (Guilin Shi) [Vietnam].

8b. *Salix balansaei* var. *hunanensis* N. Chao, Guihaia 4(2): 109. 1984.

湘柳 *xiang liu*

Bracts oblong, villous at middle adaxially.

• S Hunan (Yizhang Xian).

9. *Salix cavaleriei* H. Léveillé, Bull. Soc. Bot. France 56: 298. 1909.

滇大叶柳 *dian da ye liu*

*Pleiarina cavalieriei* (H. Léveillé) N. Chao & G. T. Gong; *Salix polyandra* H. Léveillé; *S. pyi* H. Léveillé; *S. yunnanensis* H. Léveillé.

Trees to 18(–25) m tall; trunk to 50 cm d.b.h.; bark grayish brown, furrowed. Branchlets russet, slender, at first tomentulose, glabrescent, grayish brown when mature. Stipules deltoid-ovate, glandular serrulate; petiole 6–10 mm, downy, apex glandular; leaf blade broadly lanceolate, elliptic-lanceolate, or narrowly elliptic, 4–11 × 2–4 cm, abaxially greenish, adaxially green, both surfaces glabrous when mature, reddish when young, base cuneate or rounded, margin serrulate, apex acuminate to long acuminate, rarely acute. Flowering coetaneous. Male catkin 3–4.5 cm × ca. 8 mm; peduncle long, with 2 or 3(or 4) leaflets; bracts ovate-orbicular to deltoid, both surfaces downy and ciliate. Male flower: stamens 6–8(–12); glands 2. Female catkin 2–3.5 cm; bracts as in male catkin. Female flower: adaxial gland broad, semiclapping stipe, abaxial gland usually 2- or 3-lobed; ovary stipitate. Capsule ovoid, ca. 6 mm, glabrous, distinctly stipitate. Fl. Mar–Apr, fr. Apr–May.

• Riversides, damp forest margins; 1800–2500 m. Guangxi, Guizhou, Sichuan, Yunnan.

Grown to protect embankments; wood used for timber.

**10. *Salix chaenomeloides*** Kimura, Sci. Rep. Tohoku Imp. Univ., ser. 4, Biol. 13: 77. 1938.

腺柳 xian liu

Trees small. Branches dark or reddish brown, shiny. Leaves of shoots with stipules semiorbicular, reniform, or auriculate, glandular serrate, caducous. Petiole 5–12 mm, glands sometimes leafletlike, pubescent when young, glabrescent, apex glandular; leaf blade elliptic or ovate to elliptic-lanceolate, 4–8 × 1.8–3.5(–4) cm, abaxially pale or grayish white, adaxially green, both surfaces glabrous, base cuneate, rarely rounded or cordate, margin glandular serrate or dentate, apex acute. Male catkin 4–5 cm; peduncle and rachis downy; bracts ovate, ca. 1 mm. Male flower: stamens often 5; filaments ca. 2 × as long as bracts, pilose at base; anthers yellow, globose. Female catkin 4–5.5 × ca. 1 cm; peduncle ca. 2 cm; rachis tomentose; bracts elliptic-obovate, ca. as long as or slightly shorter than stipe. Female flower: adaxial gland large, abaxial gland small, both connate at base forming a nearly lobed false disc; ovary narrowly ovoid, glabrous, long stipitate; stigma capitate or retuse. Capsule ovoid-ellipsoid, 3–7 mm. Fl. Apr, fr. May.

Below 1100 m. Hebei, Jiangsu, Liaoning, Shaanxi, Sichuan [Japan, Korea].

1a. Leaf blade cuneate at base, margin serrate; glands of petiole ..... 10a. var. *chaenomeloides*

1b. Leaf blade rounded or rarely cordate at base, margin dentate; glands of petiole appearing leafletlike ..... 10b. var. *glandulifolia*

**10a. *Salix chaenomeloides* var. *chaenomeloides***

腺柳(原变种) xian liu (yuan bian zhong)

*Pleiarina glandulosa* (Seemen) N. Chao & G. T. Gong; *Salix glandulosa* Seemen.

Petiole glands not leafletlike; leaf blade cuneate at base, margin serrate.

About 1000 m. Hebei, Jiangsu, Liaoning, Shaanxi, Sichuan [Japan, Korea].

**10b. *Salix chaenomeloides* var. *glandulifolia*** (C. Wang & C. Y. Yu) C. F. Fang, Fl. Reipubl. Popularis Sin. 20(2): 107. 1984.

腺叶腺柳 xian ye xian liu

*Salix glandulosa* Seemen var. *glandulifolia* C. Wang & C. Y. Yu, Fl. Tsinling. 1(2): 597. 1974.

Petiole glands leafletlike; leaf blade rounded or rarely cordate at base, margin dentate.

• 800–1100 m. Shaanxi.

**11. *Salix wilsonii*** Seemen ex Diels, Bot. Jahrb. Syst. 36(Beibl. 82): 28. 1905.

紫柳 zi liu

Trees to 13 m tall. One-year-old branchlets dull brown, pilose when young, glabrescent. Stipules ovate, caducous, those of shoots large, reniform; petiole 7–10 mm, pubescent, usually eglandular; leaf blade elliptic or broadly elliptic to oblong, rarely elliptic-lanceolate, 4–5(–6) × 2–3 cm, abaxially pale, adaxially green, slightly red when young, base cuneate to rounded, margin crenate or crenate-serrate, apex acute to acuminate. Flowering coetaneous. Male catkin pedunculate, laxly flowered, (2.5–)6 cm × 6–7 mm; peduncle with 3(–5) leaflets; bracts elliptic, ca. 1 mm, downy and ciliate proximally. Male flower: adaxial and abaxial glands often lobed; stamens 3–5(or 6). Female catkin 2–4 cm × ca. 5 mm, to 6–8 cm in fruit, laxly flowered; peduncle and rachis 1–2 cm, white pubescent; bracts as in male catkin. Female flower: adaxial gland broad, thick, semiclapping stipe, lobed on both sides, abaxial gland small; ovary narrowly ovoid or ovoid, glabrous, long stipitate; style absent; stigma short, 2-cleft. Capsule ovoid-oblong. Fl. Mar–Apr, fr. May.

• Plains, riverbanks. Anhui, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang. **12. *Salix neowilsonii*** W. P. Fang, J. Wash. Acad. Sci. 38(9): 313. 1948.

新紫柳 xin zi liu

Trees 6–15 m tall; bark brownish gray, sulcate. Juvenile branchlets purplish green or yellowish green, slightly slender, glabrous. Buds conical, ca. 6 mm, brown pubescent. Stipules caducous; petiole purplish, becoming green or dull red, 1–2 cm, slender, notched, at first pubescent, glabrescent, apex with 2 glands; leaf blade lanceolate, 6–14 × 2.5(–4) cm, subleathery, glabrous, abaxially somewhat whitish, adaxially dull green, base cuneate, margin conspicuously serrulate, apex acuminate or acute; lateral veins 25–30 each side of raised midvein. Flowering coetaneous. Male catkin

columnar, 3.5–4.5(–6.5) cm, laxly flowered; peduncle 2–10 mm, white downy, with 2–6 leaflets; rachis pubescent; bracts yellow, long elliptic, ca. 2 mm, both surfaces sparsely pubescent, margin ciliate. Male flower: adaxial gland yellow, forming false disc, abaxial gland small; stamens (3 or)4(or 5), unequal; filaments ca. 4 mm, with long hairs at base; anthers yellow, ovoid. Female catkin unknown.

- Riversides or cultivated. C Sichuan.

Very similar to *Salix wilsonii* but branchlets glabrous; petiole with 2–4 glands at apex; leaf blade lanceolate, glabrous, pointed at both ends; bracts oblong, margin pilose adaxially. Similar also to *S. rosthornii* but young branchlets and leaves glabrous.

**13. *Salix rosthornii*** Seemen in Diels, Bot. Jahrb. Syst. 29: 276. 1900.

南川柳 nan chuan liu

*Pleiarina dictyoneura* (Seemen) N. Chao & G. T. Gong; *Salix angiolepis* H. Léveillé; *S. anisandra* H. Léveillé & Vaniot; *S. argyri* H. Léveillé; *S. dictyoneura* Seemen; *S. dodecandra* H. Léveillé; *S. glandulosa* Seemen var. *stenophylla* C. Wang & C. Y. Yu.

Trees or shrubs. Branchlets pilose when young, glabrescent. Stipules obliquely ovate, glandular serrate, caducous, those of shoots large, reniform or obliquely cordate, to 1.2 cm; petiole 7–12 mm, pubescent, apex glandular or not; leaf blade lanceolate, elliptic-lanceolate, or oblong, rarely elliptic, 4–7 × 1.5–2.5 cm, abaxially light green, adaxially shiny, green, both surfaces glabrous, pubescent along veins when young, base cuneate, margin regularly glandular serrate, apex acuminate. Flowering coetaneous. Male catkin 3.5–6 cm × ca. 6 mm, loosely flowered; peduncle 1–2 cm, with 3(–6) leaflets; rachis pubescent; bracts ovate, downy at base. Male flower: adaxial and abaxial glands usually connected, forming a multifid disc; stamens 3–6, pubescent at base. Female catkin 3–4 cm × ca. 5 mm. Female flower: adaxial gland large, often clasping stipe, abaxial gland sometimes absent; ovary narrowly ovoid, glabrous, long stipitate; style short, 2-lobed. Capsule ovoid, 5–6 mm. Fl. Mar–Apr, fr. May.

- Along rivers, streamsides. S Anhui, Guizhou, Hubei, Hunan, Jiangxi, S Shaanxi, SE Sichuan, Zhejiang.

**14. *Salix chekiangensis*** W. C. Cheng, Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 9(1): 62. 1933.

浙江柳 zhe jiang liu

Trees; bark dull brown. Branchlets brown, glabrous; juvenile branchlets brownish, pilose or subglabrous. Leaf blade when young oblong-lanceolate or lanceolate, 1.5–3.5 cm, abaxially greenish, at first densely appressed grayish white downy, glabrescent, adaxially green, pubescent along midvein or glabrous, margin obscurely glandular serrate. Flowering coetaneous. Male catkin 3.5–6.5 cm; peduncle 4–5 mm, without leaflets; rachis densely pubescent; bracts ovate, ca. 2 mm, both surfaces villous, abaxially sparsely ciliate, apex acute. Male flower: adaxial gland subrectangular, entire, abaxial gland large, 3-lobed; stamens 4, unequal,

proximally pilose; anthers yellow, ovoid. Female catkin unknown. Fl. Apr.

- Near water. Zhejiang.

Similar to *Salix rosthornii* but male catkin peduncle without leaflets; bracts about as long as stamens, villous; adaxial gland entire, abaxial gland 3-lobed; stamens 4.

**15. *Salix dunnii*** C. K. Schneider in Sargent, Pl. Wilson. 3: 97. 1916.

长梗柳 chang geng liu

Shrubs or small trees. Juvenile branchlets purple, densely downy, glabrescent. Stipules semicordate, glandular serrate, both surfaces pilose; petiole 2–3 mm, densely downy, on shoots glandular at apex; leaf blade elliptic or elliptic-lanceolate, 2.5–4 × 1.5–2 cm, abaxially grayish white, densely appressed villous, adaxially pilose, more densely so when young, or both surfaces densely grayish white or brownish pubescent, base broadly cuneate to rounded or shallowly cordate, sparsely serrate or rarely subentire, apex obtuse-rounded or acute, usually apiculate. Male catkin ca. 5 cm × 4 mm, loosely flowered; peduncle ca. 1 cm, with 3–5 leaflets; rachis grayish white downy; bracts ovate or obovate, ca. 1/3 as long as stamens, base of both surfaces downy and ciliate, apex acute or slightly obtuse. Male flower: adaxial gland shortly conical, abaxial gland 3-lobed or not, ca. 1/3 as long as bracts; stamens 3–6; filaments pubescent at base; anthers yellow, ovoid. Female catkin ca. 4 cm, to 6.5 cm in fruit; peduncle with 3–5(or 6) leaflets; rachis densely pubescent; bracts as in male catkin, ca. as long as stipe. Female flower: adaxial gland 3-lobed or not, ca. 1/3 as long as bracts; ovary narrowly ovoid, glabrous, long stipitate; style short; stigma 2-lobed. Fl. Apr, fr. May.

- Near streams. Fujian, N Guangdong, Jiangxi, Zhejiang.

1a. Leaves abaxially grayish white, densely appressed villous, adaxially pilose, more densely so when young ..... 15a. var. *dunnii*

1b. Both surfaces of leaves densely grayish white or brownish pubescent ..... 15b. var. *tsoongii*

**15a. *Salix dunnii* var. *dunnii***

长梗柳(原变种) chang geng liu (yuan bian zhong)

*Pleiarina dunnii* (C. K. Schneider) N. Chao & G. T. Gong; *Salix changchowensis* Metcalf.

Leaf blade abaxially grayish white, densely appressed villous, adaxially pilose, more densely so when young.

- Near streams. Fujian, N Guangdong, Jiangxi, Zhejiang.

**15b. *Salix dunnii* var. *tsoongii*** (W. C. Cheng) C. Y. Yu & S. D. Zhao, Fl. Reipubl. Popularis Sin. 20(2): 111. 1984.

钟氏柳 zhong shi liu

*Salix tsoongii* W. C. Cheng, Contr. Biol. Lab. Chin.

Assoc. Advancem. Sci., Sect. Bot. 10(1): 68. 1935;

*Pleiarina tsoongii* (W. C. Cheng) N. Chao & G. T.

Gong.



Leaf blade with both surfaces densely grayish white or brownish pubescent, base rounded, broadly cuneate, or shallowly cordate.

• E Zhejiang.

**16. *Salix chingiana*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, *Novon* 8: 468. 1998.

秦柳 qin liu

Trees to 7 m tall. Branchlets dull purple, glabrous. Stipules ovate or obliquely ovate; petiole ca. 1.3 cm, distal part glandular or not, glabrous; leaf blade lanceolate or narrowly lanceolate, 7–10 × 1.7–2 cm, abaxially pale glabrous, adaxially green, base cuneate, margin glandular serrate, apex acute or acuminate. Flowering serotinous. Male catkin ca. 3 cm × 6 mm, loosely flowered; peduncle with 2 or 3(–5) leaflets; rachis white villous, bracts narrowly ovate, ca. 1.7 mm, abaxially glabrous, adaxially villous. Male flower: adaxial and abaxial glands connate at base, forming 4 lobes, discoid; stamens (3 or)4(–6); filaments sparsely downy at base, ca. 2 × as long as bracts. Female catkin ca. 4 cm, to 10 cm in fruit; peduncle long, with 2 or 3 leaflets; rachis pilose; bracts with both surfaces sparsely downy or abaxially subglabrous. Female flower: adaxial gland cylindrical or subsquare; ovary ellipsoid-cylindrical or ellipsoid, rarely ovoid, glabrous, long stipitate; style indistinct; stigma 3-lobed. Fl. Jul, fr. Jul–Aug.

• Near water; 2600–3100 m. SE Gansu, E Qinghai.

**17. *Salix tengchongensis*** C. F. Fang in C. Wang & al., *Bull. Bot. Lab. N. E. Forest. Inst., Harbin* 9: 20. 1980.

腾冲柳 teng chong liu

Shrubs. Branchlets green or slightly red, glabrous; 1-year-old branchlets slightly brownish green. Petiole red, 6–10 mm, glabrous; leaf blade lanceolate or oblanceolate, 4.5–6 × 1–1.3 cm, papery, glabrous, abaxially pale, adaxially dark green with yellow midvein, base narrowly cuneate, margin sparsely serrate, with 3 or 4 teeth per cm, apex acute; lateral veins 12–14 each side of adaxially raised midvein. Male catkin

unknown. Fruiting catkin 5–6 × ca. 1.2 cm; peduncle long, with 3–5 oblanceolate leaflets; rachis glabrous; bracts obovate, distal part yellowish green, 1–1.2 mm, glabrous, apex truncate. Female flower: gland adaxial, shortly columnar, 1/3–1/2 as long as bracts; ovary ovoid, glabrous; stipe ca. 1.5 mm, ca. 1/2 as long as ovary. Capsule 3.5–4 mm. Fr. May.

• Riversides; ca. 1700 m. SW Yunnan.

**18. *Salix nankingensis*** C. Wang & S. L. Tung in C. Wang & al., *Bull. Bot. Lab. N. E. Forest. Inst., Harbin* 9: 12. 1980.

南京柳 nan jing liu

Shrubs or small trees. Branches dark purplish brown; branchlets russet, downy, glabrescent. Buds brown, ovoid, pilose. Stipules semiovalate, margin sparsely serrate; petiole ca. 7 mm; leaf blade lanceolate or oblong-lanceolate, rarely elliptic, 2–8 × 1–2 cm, abaxially light green, glabrous, sometimes pilose when young, adaxially green, glabrous, base broadly cuneate or subrounded, margin glandular serrulate, apex long acuminate to acuminate; midvein raised abaxially. Flowering coetaneous. Male catkin 2–3 cm × ca. 6 mm, sessile, with 2 or 3 scalelike leaflets at base, or leaflets absent; rachis pilose; bracts yellowish green, ovate, adaxially pilose, apex rounded. Male flower: glands 2, brownish yellow, lobed; stamens (3–)5(or 6); filaments villous at base, ca. 2 × as long as bracts; anthers yellow, globose. Fruiting catkin to 5 cm; peduncle ca. 1 cm, with 2 or 3 leaflets; rachis pubescent; bracts ovate or elliptic, abaxially sparsely villous at base, adaxially sparsely villous, longer than stipe. Female flower: adaxial glands 2, lobed, usually forming false disc; ovary ovoid-ellipsoid, shortly stipitate; style lobed. Capsule ca. 4 mm. Fl. Mar, fr. May–Jun.

• Near water. Jiangsu (Nanjing Shi).

Similar to *Salix wilsonii* but leaf blade light green abaxially; male and female flowers with lobed glands, adaxial gland of female flower usually forming false disc; stipe short.

#### 4. Sect. *Pentandrae* (Borrer ex Hooker) C. K. Schneider, *Ill. Handb. Laubholz.* 1: 29. 1904.

五蕊柳组 wu rui liu zu

*Salix* [unranked] *Pentandrae* Borrer ex Hooker, *Brit. Fl.* 416. 1830.

Shrubs or small trees. Buds and young leaves viscid. Petiole glandular; leaf blade obovate-elliptic, elliptic, or ovate-oblong, rarely broadly lanceolate or broadly elliptic, adaxially shiny, margin prominently regularly glandular serrulate, apex acute to acuminate. Flowering coetaneous. Catkins spreading, densely flowered; peduncle conspicuous, with leaflets; bracts of female catkin yellowish green, usually caducous at fruiting. Male flower: stamens 5–9(–12). Female flower: adaxial and abaxial glands lobed, rarely entire, abaxial gland sometimes absent; ovary ovoid-conical, shortly stipitate; style and stigma conspicuous.

#### Key based on male plants

(*Salix humaensis* unknown)

- 1a. Bracts lanceolate ..... 19. *S. burqinensis*  
1b. Bracts not lanceolate.

- 2a. Male catkin ca. 10 mm thick; stamens 3–4.5 mm; bracts ca. 2.5 mm; adaxial and abaxial glands cylindrical; branchlets grayish brown ..... 20. *S. pentandra*
- 2b. Male catkin ca. 8 mm thick; stamens 1–3 mm, unequal; bracts 1.5–2 mm; adaxial and abaxial glands broadly flattened; branchlets gray, rarely with a purplish tinge ..... 21. *S. paraplesia*

**Key based on female plants**

(*Salix burqinensis* unknown)

- 1a. Ovary slightly pilose ..... 22. *S. humaensis*
- 1b. Ovary glabrous.
  - 2a. Branchlets russet at anthesis; female flower with 1(or 2) adaxial glands, abaxial gland relatively small or sometimes absent; young leaves very viscid ..... 20. *S. pentandra*
  - 2b. Branchlets gray at anthesis; female flower with 1 or 2 adaxial glands; young leaves slightly viscid ..... 21. *S. paraplesia*

**Key based on vegetative characters**

- 1a. Leaves usually lanceolate to broadly lanceolate, margin coarsely glandular serrate, glands at tips of teeth indistinct ..... 19. *S. burqinensis*
- 1b. Leaves usually obovate-elliptic or elliptic-lanceolate, margin regularly glandular serrulate, glands at tips of teeth distinct.
  - 2a. Branchlets gray, rarely with a purplish tinge; leaves abaxially ± glaucous or pruinose; leaf blade obovate-elliptic or elliptic-lanceolate ..... 21. *S. paraplesia*
  - 2b. Branchlets grayish brown or grayish green; leaves abaxially greenish (white, pruinose, and blade broadly elliptic in *S. pentandra* var. *intermedia*).
    - 3a. Leaf blade obovate-oblong or nearly long elliptic, broadest above middle; ovary slightly pilose ..... 22. *S. humaensis*
    - 3b. Leaf blade broadly lanceolate, elliptic-lanceolate, or ovate-oblong; ovary glabrous ..... 20. *S. pentandra*

**19. *Salix burqinensis*** Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 102. 1980.

五蕊柳 wu rui liu

布尔津柳 bu er jin liu

Trees to 15 m tall; trunk to 50 cm d.b.h. Branchlets brownish or yellowish green, at first tomentulose, glabrescent. Buds brownish, ovoid-oblong, tomentulose. Stipules usually caducous; petiole 5–10 mm, apex glandular tomentose; leaf blade lanceolate or broadly lanceolate, 6–10 × 1.5–3 cm, abaxially light green, glabrous or pilose when young, adaxially green, base broadly cuneate or cuneate, margin coarsely glandular serrate, apex acuminate or long acuminate. Flowering nearly coetaneous. Male catkin 3–5 cm × 5–10 mm; peduncle tomentose, base with 3 or 4 leaflets; bracts brownish or yellowish green, lanceolate, adaxially downy. Male flower: stamens 3–8; filaments free, tomentose at base; anthers globose. Female catkin unknown. Fl. May.

Shrubs or trees to 5 m tall; bark gray or grayish brown. Juvenile branchlets brownish green, grayish green, or grayish brown, glabrous, shiny. Stipules when present oblong or broadly ovate, deciduous, sometimes absent; petiole 2–14 mm, apex glandular; leaf blade broadly lanceolate, ovate-oblong, or elliptic-lanceolate, 3–13 × 2–4 cm, leathery, viscid when young, abaxially greenish, pruinose or glabrous, adaxially dull green, shiny, base obtuse or cuneate, margin glandular serrate, apex acuminate. Male catkin 2–4(–7) × 1–1.2 cm; bracts green, lanceolate, oblong, elliptic, deltoid-obovate, or obovate-oblong, ca. 2.5 mm, 2- or 3-veined, margin glandular dentate or entire, apex rounded or obtuse. Male flower: glands cylindrical, ca. 1 mm, adaxial gland usually 2- or 3-lobed; stamens (5 or)6–9(–12); filaments ca. 4.5 mm, unequal, villous at base. Female catkin 2–6 cm × ca. 8 mm. Female flower: adaxial gland 1, rarely 2, 1- or 2-parted, narrowly ovate or ovate, apex truncate, abaxial gland sometimes absent; ovary ovoid-conical, glabrous, subsessile; style and stigma conspicuous, 2-parted. Capsule ca. 9 mm, shiny, shortly stipitate. Fl. Jun, fr. Aug–Sep. 2n = 76.

• Riversides, usually mixed with *Salix alba*; ca. 500 m. N Xinjiang.

Margins of woods near rivers, marshes and meadows within forests, valleys; 500–1700 m. Hebei, Heilongjiang, Jilin, Liaoning, E Nei Mongol, Xinjiang [Mongolia, Russia; Europe].

Similar to *Salix cavaleriei* but leaf blade coarsely glandular serrate at margin; bracts brownish, lanceolate; filaments tomentose at base. A. K. Skvortsov believes that *S. burqinensis* resembles *S. pentandra*. The specific epithet was spelled “*bulkingensis*” in FRPS.

A fast-growing tree, used for timber.

**20. *Salix pentandra*** Linnaeus, Sp. Pl. 2: 1016. 1753.

- 1a. Leaves exstipulate, abaxially pruinose; juvenile branchlets olive greenish or yellowish brown ..... 20b. var. *intermedia*
- 1b. Leaves stipulate, abaxially glabrous; juvenile branchlets brownish green, grayish green, or grayish brown.
- 2a. Bracts lanceolate, oblong, or elliptic, adaxial gland usually 2- or 3-lobed, abaxial gland sometimes absent ... 20a. var. *pentandra*
- 2b. Bracts deltoid-obovate or obovate-oblong; adaxial and abaxial glands often divided ..... 20c. var. *obovalis*

**20a. *Salix pentandra* var. *pentandra***

五蕊柳(原变种) wu rui liu (yuan bian zhong)

*Pleiarina pentandra* (Linnaeus) N. Chao & G. T. Gong.

Juvenile branchlets brownish green, grayish green, or grayish brown. Stipules present; leaf blade abaxially glabrous. Bracts lanceolate, oblong, or elliptic. Male flower: adaxial gland usually 2- or 3-lobed, abaxial gland sometimes absent.

Margins of woods near rivers, marshes and meadows within forests; 500–1200 m. Hebei, Heilongjiang, Jilin, Liaoning, E Nei Mongol, Xinjiang [Mongolia, Russia; Europe].

**20b. *Salix pentandra* var. *intermedia*** Nakai, Fl. Sylv. Kor. 18: 80. 1930.

白背五蕊柳 bai bei wu rui liu

*Salix pseudopentandra* (Floderus) Floderus.

Juvenile branchlets olive greenish or yellowish brown. Stipules absent; leaf blade abaxially pruinose.

• Marshes in forests. Jilin.

A. K. Skvortsov believes that this variety would be better treated as a separate species under the name *Salix pseudopentandra*, and that *S. humaensis* is probably synonymous with it.

**20c. *Salix pentandra* var. *obovalis*** C. Y. Yu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 30. 1980.

卵苞五蕊柳 luan bao wu rui liu

Bracts deltoid-obovate or obovate-oblong, both surfaces pilose, apex obtuse or subtruncate. Male flower: adaxial and abaxial glands often divided; stamens usually 6(or 7).

• Valleys; ca. 1700 m. E Nei Mongol.

**21. *Salix paraplesia*** C. K. Schneider in Sargent, Pl. Wilson. 3: 40. 1916.

康定柳 kang ding liu

Trees to to 7 m tall. Branchlets gray, rarely with a purplish tinge, glabrous or gray downy. Petiole 5–8 mm; leaf blade obovate-elliptic or elliptic-lanceolate, rarely lanceolate, 3.5–6.5 × 1.8–2.8 cm, abaxially slightly white, glabrous or gray downy, adaxially dull green, base cuneate, margin conspicuously glandular serrulate or entire throughout or only basally, apex acuminate or acute. Male catkin ca. 3.5(–6) cm × 7 mm; peduncle long, with 3–5 leaflets; rachis downy; bracts oblong or elliptic, ca. 2 mm, pilose on both surfaces or abaxially glabrous distally, margin glandular dentate, apex obtuse

or rounded-truncate. Male flower: glands broadly flattened, often connate at base, abaxial gland 2- or 3-lobed, adaxial gland 2-lobed; stamens 5–7, (1–) 3.5 mm, unequal; filaments downy at base; anthers broadly ellipsoid or subglobose. Female catkin 2–3(–4) cm, to 5 cm in fruit; bracts as in male catkin. Female flower: adaxial glands 1 or 2, sometimes 2-lobed; ovary long ovoid or ovoid-conical, 4–5 mm. Capsule ca. 9 mm, shiny. Fl. Apr–May, fr. Jun–Jul.

• Valleys, near rivers, or cultivated; 1500–3900 m. Gansu, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, E Xizang, Yunnan.

1a. Leaf margin entire, at least at base 21c. var. *subintegra*

1b. Leaf margin serrulate.

2a. Juvenile branchlets and young leaves glabrous ..... 21a. var. *paraplesia*

2b. Juvenile branchlets and young leaves gray downy ..... 21b. var. *pubescens*

**21a. *Salix paraplesia* var. *paraplesia***

康定柳(原变种) kang ding liu (yuan bian zhong)

*Pleiarina paraplesia* (C. K. Schneider) N. Chao & G. T. Gong.

Juvenile branchlets and young leaves glabrous. Leaf margin glandular serrulate. Capsule ca. 9 mm.

• 1500–3800 m. Gansu, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, E Xizang, Yunnan.

**21b. *Salix paraplesia* var. *pubescens*** C. Wang & C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 15. 1980.

毛枝康定柳 mao zhi kang ding liu

Juvenile branchlets, young leaves, and catkin peduncle gray downy. Capsule less than 9 mm.

• Valleys; ca. 2200 m. S Gansu.

**21c. *Salix paraplesia* var. *subintegra*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 201. 1974.

左旋康定柳 zuo xuan kang ding liu

*Salix alba* var. *subintegra* (C. Wang & P. Y. Fu) N. Chao.

Petiole eglandular; leaf blade silky when young, with appressed hairs abaxially when mature, sometimes subglabrous, margin entire, at least at base. Female catkin 4–5(–6) cm. Capsule ca. 5 mm.

• Near rivers or cultivated; 3600–3900 m. E Xizang.

**22. *Salix humaensis*** Y. L. Chou & R. C. Chou in Y. L. Chou, Acta Phytotax. Sin. 12: 5. 1974.

呼玛柳 hu ma liu

*Pleiarina humaensis* (Y. L. Chou & R. C. Chou) N. Chao & G. T. Gong.

Shrubs; bark brownish gray. One-year-old branchlets grayish green or olive green, glabrous, shiny; juvenile branchlets brown. Buds yellowish brown, long ellipsoid-ovoid. Stipules absent; petiole 4–5 mm, glabrous; leaf blade obovate-oblong, or long elliptic, broadest above middle, 3–8 × 1–2.5(–3) cm, glabrous,

abaxially greenish, adaxially green, shiny, base cuneate, rarely subrounded, margin glandular serrate, apex shortly acuminate or acute. Male catkin unknown. Female catkin 1.5–3.5 cm, pedunculate; rachis with dense, long, white hairs; bracts brownish, long elliptic, 2–2.5 mm, membranous, abaxially long pubescent proximally, adaxially villous, apex obtuse. Female

flower: adaxial gland forked, longer than stipe, rarely entire; ovary ovoid-conical, 4–5 mm, very shortly stipitate, sparsely long pubescent distally; style short, forked; stigma 2-lobed. Capsule yellowish brown, 6–7 mm, rarely glabrescent. Fl. Jun, fr. Jul–Aug.

- Stream and river margins; 300–400 m. N Heilongjiang.

5. Sect. *Amygdalinae* W. Koch, Syn. Deut. Schweiz. Fl. 644. 1837.

三蕊柳组 san rui liu zu

Sect. *Triandrae* Dumortier.

Trees or shrubs; bark exfoliating. Branchlets weak. Leaves usually stipulate; leaf blade lanceolate, both surfaces glabrous, margin regularly serrate, apex acute or acuminate. Flowering coetaneous. Catkins shortly pedunculate; bracts greenish yellow or yellowish. Flowers with adaxial and abaxial glands. Male flower: stamens 3(or 4), free. Female flower: ovary glabrous, long stipitate; style and stigma very short.

Key based on male plants

- 1a. Male catkin 5–7 cm; rachis subglabrous ..... 24. *S. songarica*
- 1b. Male catkin less than 5 cm; rachis pilose.
  - 2a. Male catkin 3–5 cm; bracts orbicular or ovate, both surfaces pubescent or subglabrous abaxially 23. *S. nipponica*
  - 2b. Male catkin 2–2.5(–3) cm; bracts obovate, both surfaces with long hairs; young leaves greenish abaxially ..... 25. *S. triandroides*

Key based on female plants

- 1a. Female catkin 5–7 cm; rachis subglabrous ..... 24. *S. songarica*
- 1b. Female catkin less than 5 cm; rachis pilose.
  - 2a. Female catkin more than 3 cm; bracts orbicular, both surfaces pilose or subglabrous abaxially 23. *S. nipponica*
  - 2b. Female catkin 2.5–3 cm; bracts oblong, abaxially pilose, adaxially subglabrous; young leaves abaxially greenish ..... 25. *S. triandroides*

Key based on vegetative characters

- 1a. Stipules with small, yellow warts adaxially; bark dark brown or nearly black ..... 23. *S. nipponica*
- 1b. Stipules not warty, or absent; bark brownish or yellowish gray to brownish gray.
  - 2a. Branchlets brown, tomentose during winter, glabrescent in spring; leaf blade adaxially dull green, abaxially greenish, margin glandular serrate ..... 25. *S. triandroides*
  - 2b. Branchlets brownish, glabrous or subglabrous; leaf blade green on both surfaces, margin entire or faintly shallowly dentate ..... 24. *S. songarica*

23. *Salix nipponica* Franchet & Savatier, Enum. Pl. Jap. 1: 495. 1875.

三蕊柳 san rui liu

Shrubs or trees to 10 m tall; bark dull brown or nearly black. Branchlets brown or grayish green-brown, sparsely to densely pubescent or glabrescent; 2-year-old branchlets glaucous. Buds brown, angled, glabrous, apex acute. Stipules obliquely broadly ovate or ovate-lanceolate, on shoots reniform to ovate, with conspicuous teeth, adaxially with small, yellow warts; petiole 5–6(–10) mm, often glandular distally; leaf blade broadly oblong-lanceolate or lanceolate to oblanceolate, 7–10 × 1.5–3 cm, abaxially glaucous or not, pubescent when young, glabrous when mature, adaxially dull green, shiny, base rounded or cuneate, margin glandular serrate, apex usually apiculate. Shoots with leaf blade lanceolate, ca. 15 × 2 cm, apex long

acuminate. Male catkin 3(–5) cm; peduncle with 2 or 3 serrate or entire leaflets; bracts yellowish green, oblong or ovate, 1.5–3 mm, both surfaces sparsely pubescent or abaxially subglabrous. Male flower: adaxial and abaxial glands 2- or 4- or 5-lobed; stamens (2 or)3(–5), pubescent at base. Female catkin ca. 3.5(–6) cm; bracts as in male catkin, ca. 1/2 as long as ovary. Female flower: abaxial gland generally smaller than adaxial gland, shorter than stipe; ovary ovoid-conical, 4–5 mm, glabrous; stipe 1–2 mm; style short; stigma 2-lobed. Fl. Apr, fr. May.  $2n = 38$ .

Along rivers or streams in forest regions; near sea level to 500 m. Hebei, Heilongjiang, Hunan, Jiangsu, Jilin, Liaoning, E Nei Mongol, Shandong, Xizang, Zhejiang [Japan, Korea, Mongolia, Russia (Far East)].

Chinese records of the Asian and European species *Salix triandra* Linnaeus are referable to *S. nipponica*.

- 1a. Buds glabrous; female flower with 2 glands (adaxial and abaxial) .... 23a. var. *nipponica*  
 1b. Buds pilose; female flower with only 1 gland (adaxial) ..... 23b. var. *mengshanensis*

**23a. *Salix nipponica* var. *nipponica***

三蕊柳(原变种) san rui liu (yuan bian zhong)

*Salix amygdalina* Linnaeus var. *nipponica* (Franchet & Savatier) C. K. Schneider; *S. triandra* Linnaeus var. *nipponica* (Franchet & Savatier) Seemen.

Buds glabrous. Female flower: adaxial and abaxial glands present.

Mountains, along rivers or streams in forest regions; near sea level to 500 m. Hebei, Heilongjiang, Hunan, Jiangsu, Jilin, Liaoning, E Nei Mongol, Shandong, Xizang, Zhejiang [Japan, Mongolia, Russia (Far East)].

Planted to protect embankments and used as a nectariferous plant.

**23b. *Salix nipponica* var. *mengshanensis*** (S. B. Liang) G. Zhu, *Novon* 8: 465. 1998.

蒙山柳 meng shan liu

*Salix triandra* var. *mengshanensis* S. B. Liang, *Bull. Bot. Res.*, Harbin 8(2): 63. 1988.

Buds pilose. Female flower: adaxial gland only present.

• Mountains; ca. 300 m. Shandong (Mengshan Xian).

**24. *Salix songarica*** Andersson, *Kongl. Svenska Vetenskap-sakad. Handl.* 4: 19. 1867.

准噶尔柳 zhun ga er liu

*Pleiarina songarica* (Andersson) N. Chao & G. T. Gong.

Trees to 6 m tall; bark brownish; crown dense. Juvenile branchlets brownish, slender. Buds oblong, small, coadnate. Stipules caducous; petiole 3–10 mm, glandular; leaf blade lanceolate or narrowly lanceolate, 3–7.5 cm × 5–12 mm, both surfaces green, glabrous, base cuneate, margin entire or slightly shallowly dentate, apex acuminate; lateral veins 12–16 on each

side of midvein, diverging from midvein at 40–45°. Male catkin slender, 5–7 cm; peduncle with 2 or 3 leaflets; rachis subglabrous; bracts yellowish, broadly obovate, with sparse hairs. Male flower: stamens 3(or 4), basally pilose; glands adaxial and abaxial. Female catkin with narrowly obovate bracts. Female flower: glands adaxial and abaxial, shorter than stipe; ovary ovoid-conical, ca. 4 mm, glabrous, shortly stipitate; style very short; stigma subentire or 4-lobed. Capsule 5–5.5 mm. Fl. May, fr. Jun.

Near rivers and streams of plains and deserts. Xinjiang [Afghanistan, Kazakstan, Turkmenistan, Uzbekistan].

**25. *Salix triandroides*** W. P. Fang, *J. Wash. Acad. Sci.* 38: 312. 1948.

川三蕊柳 chuan san rui liu

Shrubs or trees to 5 m tall; bark yellowish gray or brownish gray, smooth. Branchlets brown tomentose in winter, glabrescent in spring. Buds ca. 8 mm, tomentose. Petiole 2–3 mm; leaf blade lanceolate, rarely oblong-ovate or oblong-obovate, 3–5(–12) × 1–1.5(–2.2) cm, glabrous, abaxially greenish, adaxially dull green, base broadly cuneate, margin glandular serrate, apex shortly acuminate to caudate-acuminate. Male catkin 2–2.5(–3) cm; peduncle 5–8 mm, with 2 or 3 leaflets; rachis pilose; bracts obovate, ca. 2 mm, with long hairs. Male flower: stamens 3, with long hairs at base; glands adaxial and abaxial. Female catkin 2.5–3 cm, 3–3.5 cm in fruit; peduncle 1–1.5 cm, with 2 or 3 obovate leaflets; bracts oblong, 2–3 mm, abaxially with sparse hairs, adaxially glabrous. Female flower: gland adaxial; ovary conical-ovoid, ca. 5 mm, glabrous; stipe 1–1.5 mm; style short; stigma forked. Fl. Mar, fr. Apr.

• Sichuan.

**6. Sect. *Salix***

柳组 liu zu

Sect. *Albae* A. Kerner; sect. *Fragiles* Koch; sect. *Subalba* Koidzumi; sect. *Subfragiles* (Seemen) Nakai.

Trees, rarely shrubs; bark furrowed. Branchlets erect or slightly pendulous, rarely fully pendulous, slender. Leaves mostly lanceolate, abaxially slightly pubescent or glaucescent, margin serrulate, rarely entire, apex acuminate or long acuminate. Flowering coetaneous or slightly precocious. Bracts yellowish, rarely brown. Male flower: glands adaxial and abaxial, stamens 2. Female flower: glands 1 or 2; ovary glabrous or pilose, sessile or shortly stipitate.

**Key based on male plants**

(*Salix bangongensis*, *S. capitata*, *S. pingliensis*, *S. qinghaiensis*, *S. sphaeronymphoides*, and *S. weixiensis* unknown)

1a. Branchlets pendulous.

2a. Filaments ca. as long as or slightly longer than bracts; bracts lanceolate ..... 36. *S. babylonica*

2b. Filaments more than 2 × as long as bracts; bracts elliptic ..... 37. *S. pseudolasiogyne*

1b. Branchlets erect or spreading, not pendulous (except sometimes in *S. matsudana*).

3a. Stamens 2; filaments completely connate.

- 4a. Filaments 5–6 × as long as bracts ..... 47. *S. longistamina*  
4b. Filaments ca. 3 × as long as bracts ..... 46. *S. pierotii*
- 3b. Stamens 2, rarely 3 or 4(or 5) or with intermixture of 3 or 4(or 5 in same catkin); filaments free or connate proximally or at base.
- 5a. Branchlets brownish green ..... 28. *S. fragilis*  
5b. Branchlets not brownish green.
- 6a. Young branchlets tomentose; young leaves sericeous.
- 7a. Catkin 3–5 cm; peduncle 5–10 mm; bracts ciliate, adaxially glabrous, abaxially glabrous or pilose at base ..... 27. *S. alba*  
7b. Catkin less than 3 cm; peduncle 3–6 mm; bracts pilose on both surfaces.
- 8a. Filaments connate at base; bracts obovate ..... 35. *S. chienii*  
8b. Filaments free; bracts ovate-lanceolate or ovate-oblong ..... 29. *S. chikungensis*
- 6b. Young branchlets and leaves glabrous or pilose, neither tomentose nor sericeous.
- 9a. Catkin 3.5–4.5 cm; stamens usually 2, with some intermixture of 3 or 4(or 5) usually in proximal part of catkin ..... 26. *S. heteromera*  
9b. Catkin less than 3.5 cm; stamens 2.
- 10a. Peduncle 8–15 mm.
- 11a. Filaments glabrous ..... 45. *S. sericocarpa*  
11b. Filaments downy proximally ..... 30. *S. jishiensis*
- 10b. Peduncle less than 7 mm.
- 12a. Branchlets reddish brown or purplish brown; bracts obovate-orbicular ..... 44. *S. sphaeronymphe*  
12b. Branchlets not red or purple; bracts ovate, long ovate, or ovate-elliptic to oblong.
- 13a. Catkin peduncle 4–5 mm; bracts with long, yellow hairs abaxially and at margin, adaxially subglabrous ..... 39. *S. bikouensis*  
13b. Catkin sessile or shortly pedunculate; bracts without long, yellow hairs.
- 14a. Catkin shortly pedunculate; bracts ovate, pilose at base; anthers yellow ..... 32. *S. matsudana*  
14b. Catkin sessile; bracts ovate-oblong or ovate-elliptic; anthers usually red.
- 15a. Bracts pilose on both surfaces or adaxially subglabrous, apex acute; young leaves abaxially pale; filaments free, sometimes connate at base ..... 41. *S. koreensis*  
15b. Bracts yellowish pubescent, apex obtuse or retuse; young leaves abaxially with a bluish green tinge; filaments connate proximally, rarely free ..... 40. *S. eriocarpa*

### Key based on female plants

(*Salix fragilis* unknown)

- 1a. Branchlets pendulous.
- 2a. Ovary glabrous or slightly pilose at base; bracts lanceolate ..... 36. *S. babylonica*  
2b. Ovary downy proximally; bracts ovate ..... 37. *S. pseudolasiogyne*
- 1b. Branchlets erect or spreading, not pendulous (except sometimes in *S. matsudana*).
- 3a. Ovary pilose.
- 4a. Female flower with adaxial and abaxial glands.
- 5a. Branchlets yellowish gray or yellowish brown ..... 40. *S. eriocarpa*  
5b. Branchlets grayish brown, brown, or grayish chestnut colored.
- 6a. Catkin sessile; style slightly shorter than ovary; bracts ovate-oblong or ovate, apex acute or obtuse ..... 41. *S. koreensis*  
6b. Catkin pedunculate; style much shorter than ovary; bracts subrectangular, apex glandular dentate ..... 42. *S. qinghaiensis*
- 4b. Female flower with adaxial gland only.

- 7a. Flowering catkin 2–3 mm thick ..... 44. *S. sphaeronymphe*  
 7b. Flowering catkin less than 3 mm thick.  
   8a. Bracts obovate or obovate-orbicular; ovary broadly ovoid or subglobose ..... 46. *S. pierotii*  
   8b. Bracts long ovate or oblong; ovary conical, cylindrical-ovoid, ovoid, or narrowly ovoid.  
     9a. Catkin 2–2.5 cm; peduncle 0.8–1.5 cm ..... 45. *S. sericocarpa*  
     9b. Catkin 1.5–2 cm; peduncle less than 0.8 cm.  
       10a. Style 2-lobed; bracts long ovate, adaxially ciliate and with long hairs, abaxially  
         with long hairs proximally ..... 47. *S. longistamina*  
       10b. Style shallowly 2-lobed; bracts oblong, adaxially glabrous, abaxially with long  
         hairs at base and margin ..... 43. *S. bangongensis*
- 3b. Ovary glabrous or pilose at base.  
 11a. Young branchlets tomentose; young leaves silvery sericeous.  
   12a. Catkin 3–4.5 cm, to 5.5 cm in fruit; ovary ovoid-conical, 4.5–5 mm; bracts lanceolate or  
     ovate-lanceolate, both surfaces sericeous ..... 27. *S. alba*  
   12b. Catkin 1.2–1.8 cm, to 4 cm in fruit; ovary ovoid, ca. 2 mm; bracts ovate, both surfaces  
     glabrous,  
     ciliate ..... 35. *S. chienii*
- 11b. Young branchlets and leaves subglabrous or pilose, neither tomentose nor silvery sericeous.  
 13a. Glands adaxial and abaxial.  
   14a. Ovary pilose at base ..... 31. *S. weixiensis*  
   14b. Ovary glabrous.  
     15a. Catkin ca. 2 cm, less than 2.5 cm in fruit; bracts ovate, apex obtuse ..... 32. *S. matsudana*  
     15b. Catkin (2.5–)3–4 cm; bracts deltoid-lanceolate, apex acute.  
       16a. Bracts adaxially with dense hairs, abaxially subglabrous ..... 29. *S. chikungensis*  
       16b. Bracts downy on both surfaces ..... 30. *S. jishiensis*
- 13b. Gland adaxial only (rarely abaxial gland also present).  
 17a. Gland very large and broad, nearly surrounding base of ovary ..... 33. *S. pingliensis*  
 17b. Gland not large and broad.  
   18a. Peduncle with 2 or 3 normal leaflets; ovary pilose at base; bracts ovate-  
     orbicular ..... 34. *S. sphaeronymphoides*  
   18b. Peduncle without normal leaflets; ovary glabrous; bracts ovate to oblong.  
     19a. Peduncle 7–9 mm; bracts with long, yellow hairs on both surfaces; gland  
       large and broad, usually sharply lobed ..... 39. *S. bikouensis*  
     19b. Peduncle less than 5 mm; bracts without long, yellow hairs; gland narrow,  
       apex entire.  
       20a. Ovary with stipe extremely short; style short but conspicuous, 2-lobed;  
         catkin 0.8–1.2 cm ..... 26. *S. heteromera*  
       20b. Ovary sessile; style short, entire at apex; catkin 1.5–1.8 cm ..... 38. *S. capitata*

### Key based on vegetative characters

- 1a. Branchlets pendulous.  
 2a. Leaf base cuneate; ovary glabrous or pilose at base ..... 36. *S. babylonica*  
 2b. Leaf base narrowly cuneate; ovary downy proximally ..... 37. *S. pseudolasiogyne*
- 1b. Branchlets erect or spreading, not pendulous (except sometimes in *S. matsudana*).  
 3a. Branchlets brownish green, relatively stout, brittle; leaves adaxially dull green, pubescent along  
 midvein,  
 abaxially glaucous, glabrous ..... 28. *S. fragilis*
- 3b. Branchlets not brownish green; leaves not as above.  
 4a. Young branchlets tomentose; young leaves silvery sericeous, rarely subglabrescent ..... 27. *S. alba*  
 4b. Young branchlets glabrous or pilose, not tomentose; young leaves glabrous or pilose, not silvery  
 sericeous (except abaxially in *S. chienii*).  
   5a. Leaf margin indistinctly serrate or entire ..... 47. *S. longistamina*  
   5b. Leaf margin serrulate, rarely subentire.  
     6a. Leaves abaxially greenish or with a bluish green tinge.  
       7a. Leaf blade broadest at or above middle.  
       8a. Leaf blade oblanceolate or oblong-lanceolate ..... 40. *S. eriocarpa*





shortly stipitate; style short, 2-lobed; stigma 2-parted. Fl. Mar, fr. Apr.

• Roadsides; 1600–2300 m. Yunnan.

**27. *Salix alba*** Linnaeus, Sp. Pl. 2: 1021. 1753.

白柳 bai liu

Trees to 20(–25) m tall; trunk to 1 m d.b.h.; bark dull gray, fissured; crown spreading. Branchlets brownish, glabrous, tomentose when young. Buds coadnate, ca. 6 × 1.5 mm, apex acute. Stipules caducous; petiole 2–10 mm, sericeous; leaf blade lanceolate, oblanceolate, or obovate-lanceolate, 5–12 (–1.5) × 1–2(–3.5) cm, abaxially tomentose or subglabrous, adaxially often glabrous, both surfaces sericeous when young, base cuneate, margin serrulate, apex acuminate or long acuminate; lateral veins 12–15 on each side of midvein. Flowering coetaneous. Male catkin 3–5 cm; peduncle 5–8 mm; bracts yellowish, ovate-lanceolate or obovate-oblong, ciliate, abaxially glabrous, adaxially subglabrous or pilose at base, margin entire. Male flower: glands adaxial and abaxial; stamens 2, free; filaments pilose at base; anthers yellow. Female catkin 3–4.5 cm, to 5.5 cm in fruit; bracts yellowish, lanceolate or ovate-lanceolate, ciliate, caducous, abaxially cottony at base, adaxially sericeous. Female flower: glands adaxial and abaxial, adaxial gland rarely small; ovary ovoid-conical, 4.5–5 mm, glabrous, shortly stipitate or subsessile; style short, 2-lobed; stigma 2-parted. Fl. Apr–May, fr. May.  $2n = 76$ .

Along rivers, also cultivated; below 3100 m. Gansu, Nei Mongol, Qinghai, Xinjiang, Xizang [WC Asia, Europe].

Used for timber, weaving wicker baskets, and as a nectariferous plant.

**28. *Salix fragilis*** Linnaeus, Sp. Pl. 2: 1017. 1753.

爆竹柳 bao zhu liu

Trees to 20 m tall; trunk to 1 m d.b.h.; bark dark, furrowed; crown globose or oblong. Branchlets brownish green, stout, glabrous, shiny, at first pubescent, glabrescent, brittle. Buds oblong, apex acute. Stipules present or absent; petiole 2–7 mm, pubescent or glabrous, apex glandular; leaf blade lanceolate or broadly lanceolate, 8–10 × 1–1.6 cm, abaxially pale, glabrous, adaxially dull green, shiny, pubescent along midvein, base cuneate, margin glandular serrate, apex acuminate. Male catkin 3–5 cm × 4–6 mm; peduncle ca. 1 cm, with 0–3 leaflets; rachis pubescent; bracts yellow or dull yellow. Male flower: glands adaxial and abaxial; stamens 2; filaments sometimes pubescent at base; anthers yellow. Female catkin unknown.  $2n = 76$ , rarely 38, 114.

Naturalized. Heilongjiang, Liaoning, Nei Mongol [native to Europe].

A. K. Skvortsov doubts the presence of *Salix fragilis* in China because specimens he saw under this name from NE China belong to *S. pierotii*.

Planted for reforestation.

**29. *Salix chikungensis*** C. K. Schneider in Bailey, Gentes Herb. 1: 17. 1920.

鸡公柳 ji gong liu

Shrubs. Branchlets dark brown, tomentose when young, glabrescent. Buds yellowish brown, ovoid, glabrous. Stipules caducous; petiole ca. 8 mm, pilose; leaf blade elliptic, elliptic-lanceolate, ovate-lanceolate, or oblong-oblanceolate, 6–8.5 × 1.5–2 cm, abaxially glaucous, densely sericeous when young, glabrescent, adaxially dull green, at first pilose, glabrescent, base cuneate or broadly cuneate, margin serrulate, apex shortly acuminate or acute, rarely acuminate. Male catkin 2.4–2.7 cm; peduncle 5–6 mm; rachis tomentose; bracts brownish, ovate-lanceolate or ovate-oblong, ca. 2.5 mm, both surfaces pilose, apex obtuse. Male flower: glands adaxial and abaxial; stamens 2, free; filaments ca. 4 mm, basally downy. Female catkin cylindrical, slender, 3–4 cm × ca. 8 mm, loosely flowered; peduncle (2.5–)3–4 cm, with 3–5 leaflets; bracts brownish, deltoid-lanceolate, 1.5–2 mm, abaxially subglabrous or pilose at base, ciliate, adaxially pubescent, apex acute. Female flower: adaxial gland broadly ovate or obtuse, abaxial gland small; ovary 2.5–3 mm, glabrous; stipe ca. 0.5 mm; style and stigma short. Capsule ovoid-ellipsoid. Fl. Apr–May, fr. May–Jun.

• Along rivers; 1500–2500 m. Henan, Hubei, Jiangxi.

**30. *Salix jishiensis*** C. F. Fang & J. Q. Wang, Bull. Bot. Res., Harbin 1(4): 124. 1981.

积石柳 ji shi liu

Trees to 10 m tall. Branchlets brown-yellow or green-brown, glabrous or subglabrous; 1-year-old branchlets yellow-brown, puberulent. Petiole 4–8(–10) mm, pilose; leaf blade elliptic, or obovate-lanceolate, 3–12 × 1–3.5 cm, pilose when young, glabrescent, abaxially greenish, dictyogenous, adaxially green, shiny, both surfaces glabrous or pilose along midvein abaxially, base cuneate, margin serrate, apex obtuse, acute, or acuminate. Flowering coetaneous. Male catkin 2–3.5 × ca. 1 cm; peduncle 1–1.5 cm, downy, with 2 or 3 leaflets; rachis densely downy; bracts brown, ovate or long ovate, 1.6–2.2 mm, both surfaces downy proximally. Male flower: glands 2, adaxial gland ligulate, abaxial gland terete, smaller; stamens 2; filaments distinct, ca. 3.5 mm, downy proximally; anthers yellow, subovoid. Fruiting catkin 3–4 cm × 8–10 mm; bracts ovate, ca. 2.5 mm, downy, apex obtuse or acute. Female flower: glands 2, as in male flower; ovary ovoid, 1.5–2 mm, glabrous; style conspicuous, 2-lobed; stigma 2-lobed. Capsule ovoid or long ovoid, 4–6 mm, glabrous; stipe short. Fl. May, fr. Jun.

• Mountains. Gansu (Linxia Xian, Tianshui Xian, Xiahe Xian).

A. K. Skvortsov postulates that this species may be a form of *Salix babylonica* or *S. matsudana*.

**31. *Salix weixiensis*** Y. L. Chou, Bull. Bot. Res., Harbin 1(1–2): 165. 1981.

维西柳 wei xi liu

Shrubs or small trees to 7 m tall. Branchlets brown, glabrous; juvenile branchlets dull brown, pubescent, becoming subglabrescent. Buds ovoid, small, glabrous.

Stipules semicordate, 3–5 mm, margin sparsely glandular serrate, villous; petiole 3–6 mm, pubescent; leaf blade long elliptic-lanceolate, 7.5–11 × 2.3–3 cm, abaxially pale, adaxially dull green, both surfaces glabrous or downy along midvein, densely downy when young, base cuneate or broadly cuneate, margin coarsely glandular serrate, apex long acuminate. Male catkin unknown. Female catkin cylindrical, 1.4–1.6 cm, to 2 cm in fruit; peduncle 6–9 mm, with 2 or 3 leaflets; leaflets obovate-oblong, 1.5–1.8 cm × 6–8 mm, usually deciduous after anthesis; bracts brownish, ovate, abaxially long pubescent proximally, adaxially subglabrous or long pubescent at base, ciliate, apex rounded or obtuse. Female flower: adaxial gland broad, larger than abaxial gland; ovary ovoid or long ovoid, 1.5–2 × 1–1.6 mm, pilose at base; style very short; stigma 2-lobed. Capsule 2.8–4 mm, glabrous or pilose at base. Fl. Apr, fr. May.

• Thickets, mixed woods; 1900–2600 m. Yunnan.

**32. *Salix matsudana*** Koidzumi, Bot. Mag. (Tokyo) 29: 312. 1915.

旱柳 han liu

Trees to 18 m tall; trunk to 80 cm d.b.h.; bark dull grayish black, furrowed; crown broadly globose. Branchlets erect or spreading, brownish yellow or greenish, becoming brown, slender, glabrous, pilose when young. Buds slightly pubescent. Stipules when present lanceolate, margin glandular serrulate; petiole 5–8 mm, villous; leaf blade lanceolate, 5–10 × 1–1.5 cm, abaxially glaucous or slightly white, villous when young, adaxially green, shiny, base narrowly rounded, rarely cuneate, margin glandular serrulate, apex long acuminate. Male catkin cylindrical, 1.5–2.5(–3) cm × 6–8 mm, ± pedunculate; bracts yellowish green, ovate, ± pubescent at base or glabrous, apex obtuse. Male flower: glands 2; stamens 2, long pubescent at base; anthers yellow. Female catkin ca. 2 cm × 4 mm, with 3–5 leaflets at base; bracts as in male catkin. Female flower: glands adaxial and abaxial or only adaxial gland present; ovary long ellipsoid, glabrous, subsessile; style almost absent; stigma ovate, lobed. Fl. Apr, fr. Apr–May. 2n = 38\*.

• Commonly planted on plains, riverbanks. Anhui, Fujian, Gansu, Hebei, Heilongjiang, Henan, Jiangsu, Liaoning, Nei Mongol, Qinghai, Shaanxi, Sichuan, Zhejiang.

A. K. Skvortsov believes that this species may be synonymous with *Salix babylonica*.

- 1a. Leaf blade linear-lanceolate, broadest at middle; bark light grayish, shallowly furrowed ..... 32c. var. *anshanensis*
- 1b. Leaf blade lanceolate, broadest below middle; bark dull grayish black, furrowed.
  - 2a. Female flower with adaxial and abaxial glands; bracts ± pubescent at base ..... 32a. var. *matsudana*
  - 2b. Female flower with adaxial gland only; bracts glabrous 32b. var. *pseudomatsudana*

**32a. *Salix matsudana*** var. ***matsudana***

旱柳(原变种) han liu (yuan bian zhong)

*Salix jeholensis* Nakai.

Female catkin bracts ± pubescent at base. Female flower: adaxial and abaxial glands present.

• Commonly planted on plains. Anhui, Fujian, Gansu, Hebei, Henan, Jiangsu, Liaoning, Nei Mongol, Qinghai, Shaanxi, Sichuan, Zhejiang. Used for timber, weaving wicker baskets, reforestation, a street tree, an ornamental, and as a nectariferous plant.

This variety has three often-cultivated forms: f. *pendula* C. K. Schneider (branches pendulous), f. *tortuosa* (Vilm) Rehder (branches twisted), and f. *umbraculifera* Rehder (crown fan-shaped).

**32b. *Salix matsudana*** var. ***pseudomatsudana*** (Y. L. Chou & Skvortzov) Y. L. Chou, Fl. Reipubl. Popularis Sin. 20(2): 134. 1984.

旱垂柳 han chui liu

*Salix pseudomatsudana* Y. L. Chou & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 149. 1955. Female catkin bracts glabrous. Female flower: adaxial gland only present.

• Riverbanks. Hebei, Heilongjiang, Liaoning.

**32c. *Salix matsudana*** var. ***anshanensis*** C. Wang & J. Z. Yan, Bull. Bot. Res., Harbin 1(1–2): 176. 1981.

旱快柳 han kuai liu

Trunk erect; bark light grayish, shallowly furrowed. Leaf blade linear-lanceolate, broadest at middle. Male catkin bracts ovate.

• C Liaoning (Anshan Shi).

Cultivated.

**33. *Salix pingliensis*** Y. L. Chou, Bull. Bot. Res., Harbin 1(1–2): 163. 1981.

平利柳 ping li liu

Trees to 5 m tall. Branchlets greenish brown, thin, ca. 1 mm in diam., glabrous, pubescent when young. Stipules ovate or ovate-lanceolate, ca. 3.5 mm, margin serrate; petiole 2–3 mm, pubescent; leaf blade lanceolate, 6–8 × 1.4–1.6 cm, abaxially glaucous, adaxially green, when young sparsely long pubescent on both surfaces, base narrowly cuneate, margin glandular serrate, apex long acuminate, becoming awned. Male catkin unknown.

Female catkin very small, 1.2–1.4 cm at fruiting; peduncle 4–7 mm, densely pubescent, with 2 or 3 leaflets; rachis densely long pubescent; bracts brown, ovate-oblong, membranous, abaxially subglabrous or sparsely long pubescent at base, adaxially sparsely long pubescent at base. Female flower: gland adaxial, large, broad; ovary ovoid-conical, 1.5–1.8 mm, glabrous, long pubescent only at base, shortly stipitate; style short; stigma large. Capsule 3–3.5 mm. Fl. Mar, fr. Apr.

• Roadsides; 400–600 m. Shaanxi.

A. K. Skvortsov postulates that this species may be an individual clone of *Salix babylonica*.

**34. *Salix sphaeronymphoides*** Y. L. Chou, Acta Phytotax. Sin. 17(4): 104. 1979.

光果巴郎柳 guang guo ba lang liu

Trees to 10 m tall. Branchlets brown, slightly pilose or subglabrous, glabrescent. Petiole 2–3 mm, pubescent;

leaf blade lanceolate, 3–5.5 × 0.8–1.5 cm, abaxially glaucous, adaxially dull green, both surfaces glabrous, sparsely long pubescent when young, base cuneate, margin serrulate, apex shortly acuminate. Male catkin unknown. Female catkin 1.7–2.2 cm × 4–5 mm; peduncle 5–7 mm, with 2 or 3 normal leaflets; rachis densely downy; bracts greenish brown, ovate-orbicular, 1/3–1/2 as long as ovary, ciliate, abaxially glabrous, adaxially sparsely long pubescent, apex rounded. Female flower: gland adaxial, broad; ovary ovoid, ca. 2 mm, pilose only at base, subsessile; style short, 2-lobed; stigma 2-lobed. Capsule 3.5–4 mm, glabrous or only base pilose. Fl. May, fr. May–Jun.

• Open or scattered coniferous forests. NW Sichuan, E Xizang, Yunnan.

**35. *Salix chienii*** W. C. Cheng, Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 9(1): 59. 1933.

银叶柳 yin ye liu

Shrubs or trees to 12 m tall; bark dull, brownish gray. Juvenile branchlets light green, tomentose, becoming purplish brown, subglabrescent. Buds pubescent, apex obtuse. Petiole ca. 1 mm, sericeous; leaf blade long elliptic, lanceolate, or oblanceolate, 2–3.5(–5.5) × 0.5–1.1(–1.3) cm, abaxially pale, sericeous, rarely subglabrous, adaxially green, glabrous or subglabrous, both surfaces silky downy when young, base broadly cuneate or suborbicular, margin glandular serrulate, apex acute or obtuse; lateral veins 8–12 on each side of midvein. Male catkin cylindric, 1.5–2 cm; peduncle 3–6 mm, with 3–7 leaflets; bracts obovate, long pubescent, apex subrounded or obtuse. Male flower: stamens 2, connate and pilose at base; anthers yellow. Female catkin 1.2–1.8 cm, to 2–4 cm in fruit; peduncle short, with 3–5 leaflets at base; bracts ovate, ciliate, both surfaces glabrous, base obtuse or rounded. Female flower: gland adaxial; ovary ovoid, ca. 2 mm, glabrous, sessile; style conspicuous; stigma 2-lobed. Capsule ovoid-oblong, ca. 3 mm. Fl. Apr, fr. May.

• Along streams, thickets; 500–600 m. Anhui, Fujian, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang.

1a. Ovary glabrous ..... 35a. var. *chienii*

1b. Ovary densely pubescent ..... 35b. var. *pubigera*

**35a. *Salix chienii*** var. *chienii*

银叶柳(原变种) yin ye liu (yuan bian zhong)

Female flower: ovary glabrous.

• Along streams, thickets; 500–600 m. Anhui, Fujian, Hubei, Hunan, Jiangsu, Jiangxi, Zhejiang.

**35b. *Salix chienii*** var. *pubigera* N. Chao, Bull. For. Pl. Res. 3: 4. 1985.

常宁柳 chang ning liu

Female flower: ovary densely pubescent.

• Hunan (Changning Xian).

**36. *Salix babylonica*** Linnaeus, Sp. Pl. 2: 1071. 1753.

垂柳 chui liu

Trees to 18 m tall; bark grayish black, irregularly furrowed, Branchlets pendulous, brownish yellow,

brownish, or slightly purple, slender, glabrous. Buds linear, apex acute. Stipules lanceolate or ovate-orbicular, those of shoots obliquely lanceolate; petiole (3–)5–10 mm; leaf blade narrowly lanceolate or linear-lanceolate, 9–16 × 0.5–1.5 cm, abaxially light green, adaxially green, both surfaces glabrous or slightly pilose, base cuneate, margin serrate, apex long acuminate. Male catkin 1.5–2(–3) cm; peduncle short; bracts lanceolate, abaxially pilose. Male flower: glands 2; stamens 2, ca. as long as to longer than bracts, ± long pubescent at base; anthers reddish yellow. Female catkin 2–3(–6) cm, with 3 or 4 leaves on peduncle; bracts lanceolate, 1.8–2(–2.5) mm, abaxially pilose. Female flower: gland adaxial; ovary ellipsoid, glabrous or minutely pubescent proximally, sessile or subsessile; style short; stigma 2–4-parted. Capsule slightly greenish brown, 3–4 mm. Fl. Mar–Apr, fr. Apr–May.  $2n = 63, 72, 76$ .

Widespread throughout China [Asia, Europe].

Used for weaving wicker baskets, timber, and reforestation.

1a. Ovary and bracts without glandular hairs ..... 36a. var. *babylonica*

1b. Ovary and bracts glandular pubescent abaxially ..... 36b. var. *glandulipilosa*

**36a. *Salix babylonica*** var. *babylonica*

垂柳(原变种) chui liu (yuan bian zhong)

*Salix babylonica* var. *szechuanica* Goerz; *S. babylonica* f. *villosa* C. F. Fang; *S. cantoniensis* Hance; *S. chinensis* N. L. Burman.

Female flower: ovary and bracts without glandular hairs. Widespread throughout China [Asia, Europe].

**36b. *Salix babylonica*** var. *glandulipilosa* P. Y. Mao & W. Z. Li, Bull. Bot. Res., Harbin 6: 79. 1986.

腺毛垂柳 xian mao chui liu

Female flower: ovary and bracts glandular pubescent abaxially.

• About 2400 m. NW Yunnan (Lijiang Naxizu Zizhixian).

**37. *Salix pseudolasiogyne*** H. Léveillé, Repert. Spec. Nov. Regni Veg. Beih. 10: 436. 1912.

朝鲜垂柳 chao xian chui liu

Trees to 20 m tall; trunk to 80 cm d.b.h.; bark dull blackish gray, furrowed. Branchlets pendulous, grayish green or slightly yellow, at first with white hairs, glabrescent. Buds glabrous. Stipules oblong-ovate, small; petiole 1–4 mm; leaf blade lanceolate or narrowly lanceolate, 10–16 × 1–1.7 cm, abaxially whitish, adaxially green, slightly shiny, both surfaces usually puberulent along midvein, base narrowly cuneate, margin serrulate, apex long acuminate. Male catkin 1–2 cm; peduncle short, with 2 or 3 leaflets; bracts elliptic, ca. 1.5 mm, abaxially villous proximally, adaxially glabrous, apex obtuse. Male flower: adaxial gland broader than abaxial gland; stamens 2, ca. 3 × as long as bracts, base pilose; anthers yellow, globose.

Female catkin 1–2 cm; bracts ovate, abaxially pilose, adaxially glabrous, apex minutely rounded. Female flower: gland adaxial; ovary ovoid, proximally downy; style shorter than ovary; stigma 2–4-lobed. Fl. Apr, fr. May.

Liaoning [Korea].

A. K. Skvortsov postulates that this species may be an individual clone of *Salix babylonica*.

Used for weaving wicker baskets, timber, and reforestation.

1a. Anthers yellow ..... 37a. var. *pseudolasiogyne*

1b. Anthers red ..... 37b. var. *erythrantha*

**37a. *Salix pseudolasiogyne* var. *pseudolasiogyne***

朝鲜垂柳(原变种) chao xian chui liu (yuan bian zhong)

Male flower: anthers yellow.

Liaoning [Korea].

**37b. *Salix pseudolasiogyne* var. *erythrantha*** C. F. Fang, Bull. Bot. Res., Harbin 4(1): 125. 1984

红花朝鲜垂柳 hong hua chao xian chui liu

Male flower: anthers red.

• Cultivated. Liaoning.

**38. *Salix capitata*** Y. L. Chou & Skvortsov in Liou & al., Ill. Man. Woody Pl. N.-E. China 551. 1955.

圆头柳 yuan tou liu

Trees 10–15 m tall; bark dull gray, furrowed; crown round. Branchlets slender, pubescent, glabrescent; juvenile branchlets grayish green, brittle. Stipules broadly lanceolate, margin glandular serrate; petiole 2–4 mm, pubescent, glabrescent; leaf blade lanceolate, 3.5–7 cm × 5–12 mm, abaxially pale, adaxially green, pilose when young, when mature both surfaces pubescent or glabrescent along midvein, base cuneate, margin glandular serrulate, apex shortly acuminate or acuminate. Male catkin unknown. Female catkin 1.5–1.8 cm × ca. 7 mm; peduncle short, with 3 leaflets; bracts yellowish green, ovate, abaxially pubescent, adaxially glabrous, apex subacute, with ca. 3 veins. Female flower: gland adaxial; ovary ca. 1 mm, ca. as long as bracts, glabrous, sessile; style short; stigma 2-parted. Capsule yellowish brown, 4–6 mm. Fl. May, fr. Jan.

• 100–300 m. Heilongjiang, Liaoning, Nei Mongol; introduced in Hebei, Shaanxi.

A. K. Skvortsov postulates that this species may be an individual clone of *Salix babylonica*.

A fast-growing tree, used for timber and reforestation.

**39. *Salix bikouensis*** Y. L. Chou, Bull. Bot. Res., Harbin 1 (1–2): 160. 1981.

碧口柳 bi kou liu

Shrubs or small trees to 5 m tall. Branchlets brown or dark chestnut colored, glabrous, pubescent when young. Petiole 2–3 mm; leaf blade lanceolate, rarely oblanceolate, 3.5–6 × 1.4–1.6 cm, abaxially pale, adaxially green, both surfaces glabrous or pilose along midvein, downy when young, base rounded-cuneate, margin glandular serrate, apex shortly acuminate or acuminate. Male catkin narrowly cylindrical, 2–2.2 cm × 4–5 mm; peduncle 4–5 mm, densely downy, with 2 or 3 leaflets, blade oblanceolate or lanceolate; bracts brownish, long ovate, ca. 1/3 as long as filaments, abaxially and marginally with long, yellow hairs, adaxially subglabrous or sparsely long pubescent. Male flower: adaxial gland broader than abaxial gland, usually divided; stamens 2; filaments 2.4–2.5 mm, basally connate and pilose. Female catkin 1.6–2 cm × ca. 4 mm; peduncle 7–9 mm, densely downy, with 3 or 4 obovate-lanceolate leaflets; bracts brown, ovate, both surfaces yellow with long hairs, apex rounded. Female flower: gland 1(or 2), adaxial gland broad, lobed or entire, abaxial gland sometimes present, small; ovary cylindrical-ovoid, 2–2.2 mm, glabrous or downy proximally, subsessile; style short; stigma 4-lobed. Fl. Apr, fr. Apr–May.

• Near water, along rivers, or cultivated; 700–900 m. Gansu, Hubei, Shaanxi.

1a. Ovary glabrous ..... 39a. var. *bikouensis*

1b. Ovary downy proximally ..... 39b. var. *villosa*

**39a. *Salix bikouensis* var. *bikouensis***

碧口柳(原变种) bi kou liu (yuan bian zhong)

Female flower: ovary glabrous.

• Near water, along rivers; 700–900 m. Gansu, Hubei, Shaanxi.

**39b. *Salix bikouensis* var. *villosa*** Y. L. Chou, Bull. Bot. Res., Harbin 1(1–2): 162. 1981.

毛碧口柳 mao bi kou liu

Branchlets slightly pendulous. Female flower: ovary downy proximally.

• Hubei.

**40. *Salix eriocarpa*** Franchet & Savatier, Enum. Pl. Jap. 1: 459. 1875.

长柱柳 chang zhu liu

*Salix dolichostyla* Seemen; *S. mixta* Korshinsky.

Shrubs or trees to 20 m tall; trunk to 60 cm d.b.h.; bark grayish black, furrowed. Branchlets yellowish gray or yellowish brown, glabrous, villous when young. Buds oblong, glabrous or slightly pilose. Petiole 5–10 mm; leaf blade oblanceolate or oblong-lanceolate, broadest above middle, 6.5–9 × 1–1.7 cm, abaxially bluish green, long pubescent along midvein, adaxially green, base cuneate, margin sharply serrate, apex long acuminate.

Male catkin 2–4 cm × ca. 5 mm, sessile; bracts ovate-elliptic, 1/3–1/2 as long as filament, yellowish pubescent, rarely glabrescent distally, apex obtuse or retuse. Male flower: glands adaxial and abaxial; stamens 2; filaments distinct or semiconnate proximally, long yellow pubescent basally; anthers red. Female catkin 1.5–2 cm × ca. 5 mm; peduncle with 2 or 3 oblanceolate leaflets; bracts oblong ovate, pilose at base, apex rounded, obtuse, or retuse. Female flower: glands 2, adaxial and abaxial; ovary ovoid, pilose; style ca. 2/3 as long as ovary; stigma long, 2-cleft. Fl. May, fr. Jun.

Along rivers; near sea level to 600 m. Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia].

A. K. Skvortsov believes that this species is synonymous with *Salix pierotii*.

Planted to protect embankments, for reforestation, and for timber.

**41. *Salix koreensis*** Andersson in A. de Candolle, Prodr. 16(2): 271. 1868.

朝鲜柳 *chao xian liu*

Trees to 20 m tall; bark dull gray, furrowed; crown broadly ovate. Juvenile branchlets grayish brown or brownish green, pubescent or glabrous. Buds ovoid, 2–5 mm. Stipules oblique-ovate or ovate-lanceolate, margin serrate, apex long caudate; petiole 6–13 mm, subglabrous; leaf blade lanceolate, ovate-lanceolate, or oblong-lanceolate, 6–9(–13) × 1–1.8 cm, abaxially glaucous, pubescent along midvein or silky downy and glabrescent, adaxially green, pubescent or subglabrous, base cuneate to cuneate-rounded, margin glandular serrate, apex acuminate. Male catkin subsessile or long pedunculate; peduncle with (2 or)3–5 leaflets; bracts yellowish green, ovate-oblong, both surfaces pilose or subglabrous adaxially, apex acute. Male flower: glands adaxial and abaxial; stamens 2, long downy proximally, sometimes connate at base; anthers red. Female catkin ellipsoid to shortly cylindrical, 1–2 cm; peduncle with 3–5 leaflets; bracts greenish, ovate-oblong or ovate, both surfaces pilose or abaxially downy or subglabrous, apex acute or obtuse. Female flower: glands adaxial and abaxial (sometimes absent); ovary ovoid, downy, sessile; style slightly elongate to nearly absent; stigma red, 2–4-lobed. Fl. Mar, fr. Jun.

Along rivers, damp mountain slopes, or cultivated; near sea level to 700 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong [Japan, Korea, Russia (Far East)].

A. K. Skvortsov believes that this species is synonymous with *Salix pierotii*.

1a. Style nearly absent or very short 41b. var. *brevistyla*  
1b. Style distinct.

2a. Male catkin long pedunculate; peduncle 7–9 mm, with 2 or 3 leaflets 41d. var. *pedunculata*

2b. Male catkin subsessile, with 3–5 leaflets at base.

3a. Leaves abaxially pubescent along midvein; bracts ovate-oblong or ovate, both surfaces pilose or glabrous distally ..... 41a. var. *koreensis*

3b. Leaves abaxially silky downy at first, glabrescent; bracts broadly ovate, abaxially downy or subglabrous distally 41c. var. *shandongensis*

**41a. *Salix koreensis* var. *koreensis***

朝鲜柳(原变种) *chao xian liu* (yuan bian zhong)

Leaf blade abaxially pubescent along midvein. Bracts ovate-oblong or ovate, both surfaces pilose or glabrous distally.

Along rivers, damp mountain slopes; near sea level to 700 m. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong [Japan, Korea, Russia (Far East)].

Used for reforestation, timber, as a nectariferous plant, and for weaving wicker baskets.

**41b. *Salix koreensis* var. *brevistyla*** Y. L. Chou & Skvortsov in Liou & al., Ill. Man. Woody Pl. N.-E. China 558. 1955.

短柱朝鲜柳 *duan zhu chao xian liu*

Female flower: style nearly absent or very short.

• Heilongjiang, Liaoning.

**41c. *Salix koreensis* var. *shandongensis*** C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 11. 1980.

山东柳 *shan dong liu*

Young leaves reddish, abaxially silky downy, glabrescent, base cuneate. Bracts broadly ovate, abaxially downy or subglabrous distally. Female flower: style short, ca. 1/7–1/3 as long as ovary.

• Shandong (Muping Xian, Qingdao Shi).

**41d. *Salix koreensis* var. *pedunculata*** Y. L. Chou, Bull. Bot. Res., Harbin 1(1–2): 162. 1981.

长梗朝鲜柳 *chang geng chao xian liu*

Male catkin peduncle 7–9 mm, with 2 or 3 obovate-lanceolate leaflets 2–3 cm. Female catkin bracts subglabrous adaxially. Female flower: adaxial gland only present; style very short.

• Shaanxi.

**42. *Salix qinghaiensis*** Y. L. Chou, Bull. Bot. Res., Harbin 1(1–2): 164. 1981.

青海柳 *qing hai liu*

Trees or shrubs. One-year-old branchlets grayish chestnut colored, subglabrous or pubescent; juvenile branchlets pubescent. Buds brown, ovate-oblong, pilose, apex obtuse. Stipules ovate-lanceolate, small, caducous; petiole 4–7 mm, pubescent; leaf blade ovate-lanceolate or ovate-oblong, (1.8–)3.5–4.6 × 1.2–1.5 cm, abaxially whitish or pubescent along midvein, adaxially green, glabrous, base subrounded or rounded-cuneate, margin glandular serrate, apex acute. Male catkin unknown.

Female catkin cylindrical, 1.8–2.6 cm × 7–8 mm in fruit; peduncle 1–1.2 cm, with 2 or 3 leaflets; bracts dull

brown, subrectangular both surfaces, downy, base subtruncate, or rounded-truncate, margin glandular dentate. Female flower: abaxial gland cylindrical or absent, adaxial gland forked; ovary ovoid-conical, 2–2.4 mm, villous, very shortly stipitate; style forked; stigma 2-cleft. Capsule 2–3.5 mm, villous. Fl. Jul, fr. Aug.

• Along rivers; 2500–3100 m. Gansu, Qinghai.

1a. Leaf blade 3.5–4.6 cm; female flower with adaxial and abaxial glands ... 42a. var. *qinghaiensis*

1b. Leaf blade 1.8–3 cm; female flower with adaxial gland only ..... 42b. var. *microphylla*

**42a. *Salix qinghaiensis* var. *qinghaiensis***

青海柳(原变种) qing hai liu (yuan bian zhong)

Leaf blade ovate-lanceolate or ovate-oblong, 3.5–4.6 cm. Female flower: adaxial and abaxial glands present.

• Along rivers; 2500–3100 m. Gansu, Qinghai.

**42b. *Salix qinghaiensis* var. *microphylla*** Y. L. Chou, Bull. Bot. Res., Harbin 1(1–2): 165. 1981.

小叶青海柳 xiao ye qing hai liu

Leaf blade oblong-ovate, 1.8–3 cm. Female flower: adaxial gland only present.

• Gansu.

**43. *Salix bangongensis*** C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 103. 1979.

班公柳 ban gong liu

Trees to 5 m tall; bark grayish white. Branchlets yellowish brown, pilose when young, glabrescent, shiny. Petiole ca. 7 mm; leaf blade lanceolate or oblong-lanceolate, rarely oblanceolate, 3–4 × 0.8–1.2 cm, abaxially slightly bluish gray, glabrous or downy at base of midvein, adaxially green, glabrous, silky villous when young, margin glandular serrate; lateral veins of both surfaces indistinct. Male catkin unknown. Immature female catkin 1.5–3 × 1–1.2 cm; peduncle ca. 6 mm, with 2 or 3 leaflets; bracts nearly black, oblong, abaxially pubescent at base and margin, adaxially glabrous. Female flower: gland adaxial, longer than stipe; ovary narrowly ovoid or ovoid, pubescent, shortly stipitate or sessile; style conspicuous, 2-lobed; stigma 2-cleft. Fr. Jul.

• Near water. W Xizang (Banggong Xian).

**44. *Salix sphaeronymphe*** Goerz, Bull. Fan Mem. Inst. Biol. 6: 4. 1935.

巴郎柳 ba lang liu

Shrubs or trees to 8 m tall. Branchlets reddish brown or purplish brown, thin; juvenile branchlets pilose, glabrescent. Stipules linear-lanceolate, small, pilose; petiole 1.5–5 mm, tomentose or subglabrous; leaf blade lanceolate, sometimes narrowly lanceolate, 3.5–5 × 1–1.5 cm, abaxially greenish, adaxially dull green or green, both surfaces downy when young, glabrescent except veins subglabrous, base cuneate to rounded, margin glandular serrate, apex acuminate or acute. Male catkin ca. 2 cm × 4–6 mm; peduncle with 2 or 3 leaflets; bracts obovate-orbicular, 1–1.5 mm, downy.

Male flower: adaxial gland entire or 2- or 3-lobed, larger than abaxial gland; stamens 2, distinct, ca. 3 mm, villous at base; anthers yellow, elliptic. Female catkin 1–2.5(–3) cm × 2–3 mm, 2.5–4.5 cm × 7–9 mm in fruit; bracts brownish, obovate or suborbicular, ca. 1 mm, abaxially and marginally villous, adaxially pilose, glabrescent. Female flower: gland adaxial, rarely abaxial gland present; ovary ovoid, ca. 2 mm, white downy, sessile; style short, 2-lobed; stigma entire or 2-lobed. Capsule ovoid-conical, 3–4 mm; stipe short or absent. Fl. Apr–May, fr. May–Jun.

• Along rivers and roadsides of mountain slopes; 2600–3700 m. S Gansu, W Sichuan, E Xizang.

**45. *Salix sericocarpa*** Andersson, J. Linn. Soc., Bot. 4: 43. 1860.

绢果柳 juan guo liu

*Salix rehderiana* C. K. Schneider var. *lasiogyna* C. Wang & P. Y. Fu.

Trees small. Branchlets yellowish brown when young, becoming purplish brown or brown, pubescent, becoming subglabrous. Petiole 3–4 mm, pilose; leaf blade lanceolate, 5–8 × 1.2–1.8 cm, abaxially grayish white, pilose when young, when mature subglabrous or pilose, usually pilose along veins, adaxially green, base cuneate, margin serrulate, rarely nearly entire, apex acuminate. Male catkin 1.5–3 cm; peduncle 0.8–1.5 cm, with 2 or 3 leaflets; bracts ovate-oblong, abaxially glabrous, adaxially pilose at base. Male flower: stamens 2, distinct, ca. 4 × as long as bracts; filaments glabrous; anthers yellow. Female catkin 2–2.5 cm, 6–12 cm in fruit; bracts long ovate, both surfaces and margin pilose, sometimes apex glabrous, 1/3–2/3 as long as ovary, apex obtuse or subrounded. Female flower: adaxial gland linear-oblong or oblong; ovary conical, densely downy, sessile or subsessile; style long, 2-cleft distally; stigma 2-cleft. Fl. May, fr. Jun.

Valleys; ca. 4000 m. Xizang, Yunnan [Afghanistan, Kashmir, Nepal, Pakistan].

A. K. Skvortsov believes that this species might be better referred to sect. *Helix* because of its close resemblance to *Salix tenuijulis*.

**46. *Salix pierotii*** Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 37. 1867.

白皮柳 bai pi liu

Trees or shrubs to 8 m tall; bark dark grayish yellow or grayish brown. Branchlets brown, grayish green, or grayish yellow, pilose when young, glabrescent. Buds reddish brown, ovoid, pubescent when young, apex acute. Stipules lanceolate, small; petiole 2–5 mm, downy; leaf blade lanceolate or lanceolate-oblong, 8–12 × 2–3 cm, broadest below middle, abaxially glaucous, adaxially green, glabrous, downy along veins or glabrous, densely downy when young, base cuneate or broadly cuneate, margin serrulate, apex long acuminate. Male catkin ca. 2.5 cm × 5 mm, sessile, with leaflets at base; bracts obovate or long ovate, apex rounded or obtuse, pilose. Male flower: gland adaxial; stamens 2;

filaments completely connate, ca. 3 × as long as bracts, pubescent proximally; anthers reddish purple. Female catkin ellipsoid-oblong, 1–1.8 cm × 5–7 mm; bracts usually brown, obovate or obovate-orbicular, pubescent, shorter than ovary. Female flower: gland adaxial; ovary broadly ovoid or subglobose, 1–1.5 mm, tomentose; style short; stigma 4-lobed. Fl. Apr, fr. May.

Along rivers; 200–500 m. Heilongjiang, Jilin, Liaoning [Japan, Russia].

**47. *Salix longistamina*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 199. 1974.

长蕊柳 *chang rui liu*

Trees small. Branchlets yellowish brown, brown, or dark purple, pilose or glabrous when young. Buds yellowish brown or brown, ovoid. Petiole short; leaf blade long elliptic or elliptic-lanceolate, 3.5–5.5 × 1–2.3 cm, abaxially pilose, adaxially subglabrous or pilose, both surfaces silky when young, margin indistinctly serrate or entire, apex acute or acuminate. Male catkin 2–3 × ca. 1.5 cm; peduncle 3–7 mm, with 2 or 3 leaflets; bracts dark purplish brown, obovate or ovate, ciliate, abaxially long pubescent proximally, adaxially long pubescent, apex rounded. Male flower: gland adaxial, shortly terete, 1/3–1/2 as long as bracts; stamens 2; filaments connate throughout, (4–)5–6 × as long as bracts, basally pilose or glabrous. Female catkin 1.5–2 cm, shortly pedunculate, with 2 leaflets at base; bracts dull brown, long ovate, 2.5–3 mm, long pubescent, abaxially sometimes glabrous distally, apex subrounded or obtuse. Female flower: adaxial gland ovate-oblong,

apex sometimes 2-lobed to 2-parted; ovary long conical, 2.5–4 mm, densely pilose, subsessile; style conspicuous, 2-lobed; stigma 2-lobed. Fl. Apr–May, fr. May–Jun.

• Along streams, mountain slopes, or cultivated; ca. 3800 m. Xizang. A. K. Skvortsov believes that this species might be better referred to sect. *Helix* because of its close resemblance to *Salix tenuijulis*.

- 1a. Branchlets yellowish brown or brown; filaments basally pilose, 5–6 × as long as bracts ..... 47a. var. *longistamina*  
 1b. Branchlets dark purple; filaments glabrous, ca. 4 × as long as bracts ..... 47b. var. *glabra*

**47a. *Salix longistamina* var. *longistamina***

长蕊柳(原变种) *chang rui liu* (*yuan bian zhong*)

Branchlets yellowish brown or brown. Male flower: filaments 5–6 × as long as bracts, basally pilose.

• Along streams, mountain slopes, or cultivated; ca. 3800 m. Xizang.

**47b. *Salix longistamina* var. *glabra*** Y. L. Chou, Bull. Bot. Res., Harbin 1(1–2): 162. 1981.

无毛长蕊柳 *wu mao chang rui liu*

Branchlets dark purple. Male flower: filaments short, ca. 4 × as long as bracts, glabrous.

• Cultivated; ca. 3800 m. Xizang.

Very similar to both *Salix pycnostachya* var. *oxycarpa* and *S. sericocarpa* but filaments completely connate.

**7. Sect. *Fulvopubescentes*** C. F. Fang, Bull. Bot. Res., Harbin 9: 1. 1980.

褐毛柳组 *he mao liu zu*

Sect. *Taiwanalpinae* C. F. Fang.

Shrubs creeping, decumbent, or erect, rarely small trees. Branchlets with ± pilose, deciduous stipules. Leaf blade usually lanceolate or narrowly oblong to obovate-elliptic, both surfaces often pilose, margin entire, rarely sharply serrate. Catkins shortly pedunculate; peduncle with 2 or 3 leaflets. Male flower: stamens 2; filaments with sparse hairs or glabrous. Female flower: ovary long stipitate; style very short. Flowers with only an adaxial gland.

**Key based on male plants**

(*Salix okamotoana*, *S. tagawana*, and *S. taiwanalpina* unknown)

- 1a. Shrubs creeping or low, ca. 20 cm tall; catkin oblong or shortly cylindrical, 1–2 cm.  
 2a. Bracts oblong; plants creeping ..... 52. *S. takasagoalpina*  
 2b. Bracts lanceolate or linear-oblong; plants erect or decumbent, ca. 20 cm tall ..... 51. *S. morrisonicola*  
 1b. Shrubs large shrubs or small trees; catkin cylindrical, more than 2.5 cm.  
 3a. Stamens ca. 2 × as long as bracts; bracts pubescent and ciliate ..... 50. *S. doii*  
 3b. Stamens ca. 4 × as long as bracts; bracts pubescent or nearly glabrous ..... 48. *S. fulvopubescentes*

**Key based on female plants**

- 1a. Ovary pilose.  
 2a. Ovary ovoid; leaf margin sharply serrate ..... 54. *S. okamotoana*  
 2b. Ovary narrowly ovoid or ovoid-conical; leaf margin entire, at least in proximal 1/2 of leaf.  
 3a. Shrubs low, 20–30 cm tall; peduncle 4–8 mm; leaf blade elliptic, oblong-elliptic, or obovate, margin serrate in distal 1/2 of leaf ..... 53. *S. taiwanalpina*  
 3b. Shrubs large, more than 1 m tall; peduncle to 15 mm; leaf blade oblong-lanceolate, margin entire ..... 50. *S. doii*

1b. Ovary glabrous.

4a. Plants creeping; leaf blade ca. 1 cm, margin serrulate, lateral veins 4 on each side of midvein 52. *S. takasagoalpina*

4b. Plants erect, rarely decumbent; leaf blade more than 1.5 cm, margin entire, rarely with inconspicuous, glandular teeth.

5a. Catkin to 2 cm; low shrubs ca. 20 cm tall, growing in alpine zone on high mountains 51. *S. morrisonicola*

5b. Catkin more than 2.5 cm; shrubs or small trees more than 1 m tall, not growing on high mountains.

6a. Young leaves brown pubescent abaxially; stipe ca. as long as bracts ..... 48. *S. fulvopubescens*

6b. Young leaves white pubescent abaxially; stipe shorter than bracts ..... 49. *S. tagawana*

**Key based on vegetative characters**

1a. Leaf blade ca. 1 cm, lateral veins 4 on each side of midvein; plants creeping ..... 52. *S. takasagoalpina*

1b. Leaf blade more than 2 cm, lateral veins more than 7 on each side of midvein; plants erect, rarely decumbent.

2a. Leaf margin dentate, at least in distal 1/2 of leaf.

3a. Leaf blade elliptic, margin sharply serrate ..... 54. *S. okamotoana*

3b. Leaf blade elliptic to oblong-elliptic or obovate, margin serrate in distal 1/2 of leaf .... 53. *S. taiwanalpina*

2b. Leaf margin entire, occasionally indistinctly glandular.

4a. Leaf blade elliptic; low shrubs ca. 20 cm tall ..... 51. *S. morrisonicola*

4b. Leaf blade not elliptic; shrubs or small trees more than 1 m tall.

5a. Leaf blade oblong to obovate-oblong ..... 49. *S. tagawana*

5b. Leaf blade oblong-lanceolate to lanceolate.

6a. Leaves abaxially brown pubescent, at least along veins and petioles ..... 48. *S. fulvopubescens*

6b. Leaves abaxially white pubescent, at least along veins and petioles ..... 50. *S. doii*

**48. *Salix fulvopubescens*** Hayata, Icon. Pl. Formosan. 5: 202. 1915.

褐毛柳 he mao liu

*Salix transarisanensis* Hayata.

Shrubs or small trees. Branchlets brown pubescent. Petiole 5–8 mm, densely brown pubescent; leaf blade lanceolate or oblong-lanceolate, 5–10 × 1.5–3 cm, abaxially brown pubescent, adaxially glabrous or pubescent along veins, base rounded or obtuse, margin entire, apex acute to acuminate; lateral veins ca. 12 on each side of midvein. Flowering coetaneous. Male catkin cylindrical, short, ca. 4 cm; peduncle with 1 or 2 leaflets or not; bracts elliptic or oblong, pubescent or subglabrous. Male flower: adaxial gland stout; stamens 2, free; filaments with loose hairs proximally; anthers yellow. Female catkin laxly flowered; bracts as in male catkin. Female flower: ovary ovoid-conical, glabrous; stipe ca. as long as bracts; style very short; stigma 4-lobed.

• Mountain slopes; ca. 2000 m. Taiwan.

**49. *Salix tagawana*** Koidzumi, Acta Phytotax. Geobot. 9: 75. 1940.

花莲柳 hua lian liu

*Salix fulvopubescens* Hayata var. *tagawana* (Koidzumi) K. C. Yang & T. C. Huang.

Shrubs. Branchlets yellowish to dark brown, thick, pilose, when young silky downy. Stipules on shoots obliquely ovate, deciduous; petiole 1–1.5 cm, densely pubescent; leaf blade oblong to obovate-oblong, 3–7 cm,

abaxially glabrous or pubescent, adaxially white downy when young, glabrescent, base subrounded, margin entire, apex acute to obtuse; lateral veins 9–13 on each side of midvein. Male catkin unknown. Female catkin 3.5–5.5 cm, laxly flowered; bracts brown at apex, elliptic to obovate, 1–2 mm, densely villous. Female flower: gland adaxial; ovary ovoid-conical, glabrous; stipe shorter than bracts; style short; stigma 4-lobed.

• Mountains; 2800–3000 m. Taiwan.

**50. *Salix doii*** Hayata, Icon. Pl. Formosan. 5: 201. 1915.

台湾柳 tai wan liu

*Salix eriostroma* Hayata; *S. fulvopubescens* Hayata var. *doii* (Hayata) K. C. Yang & T. C. Huang; *S. morii* Hayata.

Shrubs to 3 m tall. Branchlets ± villous. Petiole 0.8–1.5 cm, pubescent; leaf blade oblong-lanceolate, 3–4 × ca. 1 cm, abaxially pubescent, adaxially sparsely villous, base cuneate-rounded to rounded, margin entire, apex acute; lateral veins 10 on each side of midvein. Male catkin cylindrical, 2.5–3(–4) cm; peduncle usually with 1 or 2 squamate leaflets; bracts oblong or elliptic, ca. 1/2 as long as filaments, pubescent, ciliate. Male flower: adaxial gland shortly cylindrical; stamens 2, free; filaments pilose proximally. Female catkin ca. 3 cm, 6–8 × ca. 1.5 cm in fruit; peduncle ca. 1.5 cm, with 2 or 3 leaflets; bracts as in male catkin. Female flower: gland adaxial; ovary narrowly ovoid, pilose, long stipitate; style short; stigma 4-lobed. Capsule slightly pilose.



- Open places, near streams; 2000–2800 m. Taiwan.

**51. *Salix morrisonicola*** Kimura, Sci. Rep. Tohoku Imp. Univ., ser. 4, Biol. 10(3): 557. 1935.

玉山柳 *yu shan liu*

*Salix taiwanalpina* Kimura var. *morrisonicola* (Kimura) K. C. Yang & T. C. Huang.

Shrubs low, to 20 cm tall, much branched. Branchlets pubescent when young, glabrescent. Stipules small, deciduous; petiole ca. 5 mm; leaf blade elliptic, 1.5–3 × 0.5–1.3 cm, glabrous, abaxially glaucous, base obtuse, margin entire or indistinctly glandular dentate, apex acute; lateral veins 7–9 on each side of midvein. Flowering coetaneous. Catkins cylindrical, 1.5–2 cm; peduncle short, with 2 or 3 leaflets; bracts lanceolate or linear-oblong, ciliate. Male flower: stamens 2, free. Male and female flowers with only an adaxial gland. Capsule conical-ovate, ca. 5 mm, glabrous; stipe long pubescent.

- Mountains; 3000–3900 m. Taiwan.

**52. *Salix takasagoalpina*** Koidzumi, Acta Phytotax. Geobot. 8: 112. 1939.

高山柳 *gao shan liu*

*Salix maboulasensis* Ying; *S. taiwanalpina* Kimura var. *takasagoalpina* (Kimura) Ying.

Shrubs creeping. Branchlets white pubescent when young. Stipules small, deciduous or absent; petiole 1–2 mm, glabrous; leaf blade elliptic, ca. 10 × 7 mm, leathery, abaxially glaucous, adaxially subglabrous, base obtuse, margin serrulate, apex acute; lateral veins 4 on each side of midvein. Male catkin shortly cylindrical or oblong, ca. 1 cm, densely flowered; bracts reddish at apex, oblong, 1–1.8 mm, both surfaces villous. Male flower: stamens 2, free, glabrous; glands adaxial. Female flower: gland adaxial; ovary lanceolate, glabrous, stipitate; style short; stigma 2-cleft.

- Mountain slopes. Taiwan.

**53. *Salix taiwanalpina*** Kimura, Sci. Rep. Tohoku Imp. Univ., ser. 4, Biol. 10(3): 555. 1935.

台湾山柳 *tai wan shan liu*

*Salix chingshuishanensis* S. S. Ying.

Shrubs low, to 30 cm tall, much branched. Branchlets brown pubescent. Stipules ovate, small, deciduous; petiole ca. 7 mm; leaf blade elliptic to oblong-elliptic or obovate, 2–4 × 1–2 cm, abaxially densely pubescent, adaxially sparsely pubescent, base acute or obtuse, margin slightly serrulate distally, entire proximally, apex acute or shortly acuminate; lateral veins 7 on each side of midvein. Male catkin unknown. Fruiting catkin ca. 3 × 1.5 cm; peduncle 4–8 mm, with elliptic to lanceolate leaflets; bracts lanceolate-oblong. Female flower: ovary dark red, narrowly ovoid-conical, pubescent; stipe 1–2 mm; style short; stigma short, 2-cleft. Capsule ca. 6.5 mm, pilose.

- Mountain slopes and summits; 2400–3900 m. Taiwan.

**54. *Salix okamotoana*** Koidzumi, Acta Phytotax. Geobot. 8: 113. 1939.

关岭柳 *guan ling liu*

Shrubs low, to 25 cm tall, sparingly branched. Branchlets greenish to reddish, stout, glabrous. Stipules linear, small, deciduous or not developed; petiole short, densely villous; leaf blade elliptic, 4–5 × 2.5–3.5 cm, abaxially silky pubescent, adaxially slightly pubescent, base rounded, margin sharply serrate, apex obtuse or acute; lateral veins 12 or 13 on each side of midvein. Male catkin unknown. Female catkin cylindrical, 2–4 cm; bracts oblong, apex obtuse, sparsely villous. Female flower: gland adaxial; ovary ovoid, tomentose, long stipitate; style short; stigma 2-cleft.

- Mountain slopes; 2900–3200 m. Taiwan.

A. K. Skvortsov suggests that the sectional position of this species is uncertain because it is very poorly known.

### 8. Sect. *Magnificae* C. K. Schneider in Sargent, Pl. Wilson. 3: 113. 1916.

大叶柳组 *da ye liu zu*

Shrubs or small to large trees. Branchlets dull red to purplish black, stout. Leaves large; petiole long; leaf blade elliptic to obovate-orbicular, subleathery, smooth, glabrous, abaxially grayish blue or glaucous, margin entire or serrate, apex obtuse, rounded, or acute; lateral veins raised. Flowering coetaneous. Catkins long, to 30 cm in fruit; peduncle long, with 2–5 normal leaflets. Male flower: adaxial gland stout, usually depressed at apex, or 2- or 3-lobed, abaxial gland small, sometimes absent; stamens 2, distinct. Female flower: gland usually 1, adaxial, abaxial gland usually absent; ovary glabrous, sparsely pilose, sessile or stipitate; style conspicuous, 2-cleft; stigma thick, short, 2-lobed.

#### Key based on male plants

(*Salix contortiapiculata*, *S. medogensis*, and *S. pella* unknown)

- 1a. Catkin rachis glabrous.  
 2a. Filaments glabrous ..... 55. *S. magnifica*  
 2b. Filaments pilose at base ..... 59. *S. xiaoguangshanica*  
 1b. Catkin rachis pilose.  
 3a. Filaments glabrous ..... 57. *S. moupinensis*

3b. Filaments pilose.

4a. Catkin 7–10(–13) cm; leaf blade usually oblanceolate when young ..... 60. *S. radinostachya*

4b. Catkin less than 6 cm; leaf blade long ovate-elliptic when young ..... 58. *S. omeiensis*

**Key based on female plants**

1a. Catkin rachis glabrous.

2a. Catkin more than 6 cm; young leaves entire at margin ..... 55. *S. magnifica*

2b. Catkin to 4 cm; young leaves serrate at margin ..... 59. *S. xiaoguangshanica*

1b. Catkin rachis pilose, rarely subglabrous.

3a. Ovary sessile.

4a. Bracts villous abaxially ..... 61. *S. medogensis*

4b. Bracts subglabrous on both surfaces ..... 62. *S. contortiapiculata*

3b. Ovary stipitate.

5a. Adaxial gland linear or shortly cylindric ..... 60. *S. radinostachya*

5b. Adaxial gland broadly ovate or semiorbicular.

6a. Stipe to 1.5 mm; adaxial gland semiorbicular ..... 56. *S. pella*

6b. Stipe less than 1 mm; adaxial gland broadly ovate.

7a. Leaf margin glandular serrate ..... 57. *S. moupinensis*

7b. Leaf margin indistinctly glandular serrulate or entire ..... 58. *S. omeiensis*

**Key based on vegetative characters**

1a. Young branchlets glabrous.

2a. Leaf blade to 20 × 11 cm, margin entire or irregularly glandular serrulate ..... 55. *S. magnifica*

2b. Leaf blade to 8 × 3.5 cm, margin serrate, entire or loosely dentate.

3a. Leaf margin serrate ..... 59. *S. xiaoguangshanica*

3b. Leaf margin entire or loosely dentate ..... 62. *S. contortiapiculata*

1b. Young branchlets pilose.

4a. Leaf margin entire; petiole 4–8 mm ..... 61. *S. medogensis*

4b. Leaf margin dentate; petiole 10–17 mm.

5a. Leaf blade with lateral veins more than 20 on each side of midvein ..... 60. *S. radinostachya*

5b. Leaf blade with lateral veins less than 16 on each side of midvein.

6a. Leaves abaxially greenish ..... 57. *S. moupinensis*

6b. Leaves abaxially pale or grayish white.

7a. Leaf apex rounded or obtuse ..... 56. *S. pella*

7b. Leaf apex acute to acuminate ..... 58. *S. omeiensis*

**55. *Salix magnifica*** Hemsley, Bull. Misc. Inform. Kew 1906: 163. 1906.

大叶柳 da ye liu

Shrubs or small trees. Branchlets stout, pruinose when young, glabrous. Buds large, glabrous. Petiole red when young, to 4 cm, stout; leaf blade elliptic, ovate, or obovate-oblong, to 20 × 11 cm, leathery, abaxially glaucous, adaxially dark green, base rounded or subcordate, rarely broadly cuneate or attenuate, margin entire when young, irregularly glandular serrulate, apex rounded, obtuse, mucronate, or acute; lateral veins ca. 15 each side of often purplish red midvein, diverging from midvein at nearly 90°, raised on both surfaces, at first villous, soon glabrescent. Catkins to 10 × 1.5 cm, glabrous throughout; peduncle ca. 7 cm, with 2–5 normal leaflets; rachis stout; bracts broadly obovate to oblong, 1.5–3 mm, apex obtuse-rounded, or truncate and irregularly dentate. Male flower: adaxial gland large, usually 2-parted, abaxial gland smaller; stamens 2, distinct or partly connate, ca. 5 mm. Fruiting catkin to 23 cm. Female flower: adaxial gland broadly ovate,

truncate, depressed or 2-cleft; ovary ovoid-cylindric, ca. 5 mm; stipe to 2 mm; style ca. 1 mm, apex 2-lobed or abruptly contracted; stigma 2-cleft. Capsule ovoid-ellipsoid or ovate, 5–7 mm, subsessile or stipe to 4 mm. Fl. May–Jun, fr. Jun–Jul.

• Near water, woodlands on mountain slopes; 2100–3000 m. N and W Sichuan.

1a. Leaf blade obovate-oblong, base attenuate, apex acute or obtuse ..... 55b. var. *apatela*

1b. Leaf blade elliptic or ovate, base rounded or subcordate, apex rounded, obtuse, or mucronate.

2a. Ovary 2-lobed at apex; capsule ovoid-ellipsoid, ca. 5 mm ..... 55a. var. *magnifica*

2b. Ovary abruptly contracted at apex; capsule ovoid, ca. 7 mm ..... 55c. var. *ulotricha*

**55a. *Salix magnifica* var. *magnifica***

大叶柳(原变种) da ye liu (yuan bian zhong)

Leaf blade elliptic or ovate, base rounded or subcordate, apex rounded, obtuse, or mucronate. Female flower: ovary with 2-lobed apex. Capsule ovoid-ellipsoid, ca. 5 mm.

• Near water; 2100–2800 m. W Sichuan.

Grown as an ornamental plant. Vulnerable to extirpation in its native habitat.

**55b. *Salix magnifica* var. *apatela*** (C. K. Schneider) K. S. Hao, Repert. Spec. Nov. Regni Veg. Beih. 93: 59. 1936.

倒卵叶大叶柳 *dao luan ye da ye liu*

*Salix apatela* C. K. Schneider in Sargent, Pl. Wilson. 3: 46. 1916.

Leaf blade obovate-oblong, base attenuate, apex acute or obtuse. Catkin bracts ovate, apex truncate. Male flower: gland 1, adaxial, square.

• Woodlands on mountain slopes; 2600–3000 m. N Sichuan.

**55c. *Salix magnifica* var. *ulotricha*** (C. K. Schneider) N. Chao, Fl. Reipubl. Popularis Sin. 20(2): 157. 1984.

卷毛大叶柳 *juan mao da ye liu*

*Salix ulotricha* C. K. Schneider in Sargent, Pl. Wilson. 3: 44. 1916.

Female flower: ovary abruptly contracted at apex, white villous, shortly stipitate. Capsule ovoid, ca. 7 mm, subglabrous.

• Near water; 2100–2800 m. W Sichuan.

**56. *Salix pella*** C. K. Schneider in Sargent, Pl. Wilson. 3: 45. 1916.

黑枝柳 *hei zhi liu*

Shrubs. Juvenile branchlets dark purple, usually villous basally. Buds glabrous. Petiole to 1.5 cm, pilose or glabrous, sometimes glandular; leaf blade elliptic, obovate-elliptic, or oblong, to 11 × 5 cm, abaxially pale, silky villous or glabrous, adaxially green, glabrous along veins, base cuneate to rounded, margin serrulate or glandular crenate-serrate, rarely sharply serrate or subentire, apex rounded or obtuse; lateral veins 10–12 on each side of midvein. Male catkin unknown. Female catkin to 13 × 1 cm; peduncle 1–2.5 cm, with leaflets; rachis villous; bracts oblong, 1–1.5 mm, abaxially villous, adaxially glabrous, apex rounded or obtuse, flowers subwhorled. Female flower: adaxial gland semiorbicular, shorter than stipe; ovary long ellipsoid-ovoid, 2–2.5 mm, glabrous; stipe ca. 1.5 mm; style ca. 0.5 mm, 2-lobed; stigma 2-lobed. Fl. May.

• Mountains; 2200–3000 m. W Sichuan.

**57. *Salix moupinensis*** Franchet, Nouv. Arch. Mus. Hist. Nat., ser. 2, 10: 82. 1887.

宝兴柳 *bao xing liu*

Trees. Juvenile branchlets silky villous, glabrescent. Buds subglobose or ovoid, glabrous. Stipules small, deciduous; petiole to 1.7 cm, at first pilose, glabrescent, usually with 1 gland at apex; leaf blade oblong, elliptic, obovate, or ovate, ca. 13 × 6 cm, abaxially light green, adaxially dark green, glabrous, villous along veins when young, glabrescent, base rounded to cuneate, margin glandular serrate, apex acute or shortly acu-

minate; lateral veins ca. 15 on each side of midvein. Catkins to 6 cm; peduncle 1–2 cm, with normal leaflets; rachis with loose hairs or glabrescent; bracts long elliptic, ca. 1.5 mm, sparsely villous, apex rounded.

Male flower: adaxial gland nearly semiorbicular, sometimes 2-cleft, abaxial gland broadly ovate, smaller than adaxial gland; stamens 2, glabrous, distinct; anthers yellow. Fruiting catkin to 15 cm; bracts glabrous or subglabrous. Female flower: adaxial gland broadly ovate; ovary glabrous; stipe short; style short, 2-cleft; stigma 2-lobed. Capsule long ellipsoid-ovoid, ca. 4 mm. Fl. Apr, fr. May–Jun.

• Mountains; 1500–3000 m. W Sichuan, N Yunnan.

**58. *Salix omeiensis*** C. K. Schneider in Sargent, Pl. Wilson. 3: 122. 1916.

峨眉柳 *e mei liu*

Shrubs or small trees. Juvenile branchlets glabrous, sometimes basally silky villous. Buds ovoid-ellipsoid, pilose. Petiole 1–1.5 cm, glabrous, sometimes glandular; leaf blade long ovate-elliptic, to 13 × 5 cm, abaxially grayish white, sparsely villous, adaxially dark green, with rust-colored hairs along midvein when young, base usually rounded, margin indistinctly serrulate or entire, apex acute to acuminate; lateral veins to 15 on each side of midvein. Male catkin 4–5 cm × 6–8 mm; peduncle with leaflets; bracts subovate, abaxially villous or glabrescent distally, ciliate, apex rounded. Male flower: abaxial gland smaller than adaxial gland; stamens 2, villous at base; anthers yellow. Fruiting catkin to 12 × 1 cm; peduncle 1–1.5 cm, with leaflets; rachis villous; bracts suboblong, abaxially villous, apex rounded to acute. Female flower: adaxial gland broadly ovate; style conspicuous, 2-cleft. Capsule ca. 3 mm, glabrous. Fl. May, fr. Jun.

• Mountains; ca. 1600 m. C Sichuan.

A. K. Skvortsov believes that this species seems to be the same as *Salix moupinensis*.

**59. *Salix xiaoguangshanica*** Y. L. Chou & N. Chao in N. Chao, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 27. 1980.

小光山柳 *xiao guang shan liu*

Shrubs to 1 m tall. Branchlets yellowish green, glabrous. Petiole purple, 6–10 mm, glabrous; leaf blade elliptic, 4–8 × 2.5–3.5 cm, abaxially pruinose, adaxially green, both surfaces glabrous, base rounded, margin indistinctly shallowly glandular serrate, apex acute to obtuse; lateral veins 11–13 on each side of midvein. Flowering coetaneous or slightly serotinous. Male catkin ca. 5–8 cm × 6–8 mm; peduncle ca. 1 cm, with leaflets or not; rachis glabrous; bracts obovate, glabrous. Male flower: adaxial gland broad, abaxial gland shortly terete; stamens 2, sparsely villous at base, ca. 2 × as long as bracts; anthers yellow. Female catkin ca. 3.5 cm × 8 mm; peduncle ca. 1 cm, glabrous, with 2 suborbicular leaflets; rachis glabrous; bracts subobovate, slightly longer than stipe, glabrous, apex truncate or retuse. Female flower: adaxial gland shortly terete, ca.

1/4 as long as stipe; ovary narrowly ovoid, ca. 1.5 mm, glabrous; stipe ca. 1.2 mm; style short, 2-cleft; stigma capitate. Capsule ovoid, 2.5–3 mm, pruinose. Fl. May, fr. Jun.

• Thickets; 2500–2600 m. C Yunnan (Jingdong Xian).

**60. *Salix radinostachya*** C. K. Schneider in Sargent, Pl. Wilson. 3: 116. 1916.

长穗柳 *chang sui liu*

Shrubs large. Branchlets purplish brown, pilose when young, glabrescent. Petiole 1–1.5 cm, pubescent; leaf blade lanceolate or oblong-lanceolate, rarely narrowly elliptic or oblanceolate when young, (10–)15–20 × 3–4.5 cm, abaxially pilose along veins or densely tomentose, greenish or slightly white, adaxially green, when young both surfaces silky villous or abaxially tomentose, base broadly cuneate or rounded, margin entire or indistinctly glandular serrate; lateral veins more than 20 on each side of midvein. Flowering coetaneous. Male catkin slender, 7–10(–13) cm × 5–7 mm; bracts obovate-elliptic, ca. 1 mm, abaxially pubescent, adaxially glabrous. Male flower: glands adaxial and abaxial; stamens 2, distinct, basally villous, ca. as long as bracts. Fruiting catkin to 20 cm; peduncle 1.5(–2) cm, with 2 or 3(or 4) leaflets; bracts ovate-oblong, ca. as long as ovary, apex brown, nearly truncate. Female flower: gland adaxial, abaxial gland absent; ovary narrowly ovoid, glabrous, shortly stipitate; style conspicuous; stigma 2-cleft. Capsule to 5 mm. Fl. May, fr. Jun.

Mountain slopes, thickets, forests; 2600–3200 m. W Sichuan, E Xizang, NW Yunnan [Sikkim].

1a. Mature leaves pilose along veins abaxially ..... 60a. var. *radinostachya*

1b. Mature leaves densely tomentose abaxially ..... 60b. var. *pseudophanera*

**60a. *Salix radinostachya* var. *radinostachya***

长穗柳(原变种) *chang sui liu* (yuan bian zhong)

*Salix balansaei* Seemen var. *szechuanica* Goerz; *S.*

*caloneura* C. K. Schneider; *S. radinostachya* var.

*szechuanica* (Goerz) N. Chao.

Mature leaves pilose along veins abaxially.

Mountain slopes; 2600–3200 m. W Sichuan, E Xizang, NW Yunnan [Sikkim].

**60b. *Salix radinostachya* var. *pseudophanera*** C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 15. 1980.

绒毛长穗柳 *rong mao chang sui liu*

Mature leaves densely tomentose abaxially, apex truncate. Male flower: adaxial gland square.

• Thickets, forests; ca. 3000 m. NW Yunnan.

**61. *Salix medogensis*** Y. L. Chou, Acta Phytotax. Sin. 17(4): 107. 1979.

墨脱柳 *mo tuo liu*

Trees to 3 m tall. Branchlets dark brownish purple, at first tomentose, becoming subglabrous. Petiole 4–8 mm, pubescent; leaf blade obovate-oblong, 5–9 × 2.4–3.8 cm, both surfaces tomentose when young, abaxially grayish green, glabrous or sparsely pilose, adaxially green, pilose, base broadly cuneate, margin entire, apex acute or obtuse. Flowering coetaneous. Male catkin unknown. Female catkin 3.5–5 cm, to 6–6.5 cm in fruit; peduncle 1.5–1.8 cm, with 2 or 3 normal leaflets; rachis villous or tomentose; bracts ovate-oblong or long ovate, nearly as long as ovary, ciliate. Female flower: adaxial gland ovate-square, ca. 1/4 as long as bracts; ovary conical-ovoid, glabrous, sessile; style nearly as long as ovary, 2-cleft; stigma short, 2-lobed. Capsule ca. 4 mm, glabrous. Fl. beginning of Jul, fr. middle to end of Jul.

• Mixed woods; 3600–3900 m. E Xizang.

Similar to *Salix magnifica* var. *apatela* but young branchlets, leaf blade, and petiole tomentose; bracts ovate-oblong or long ovate, long pubescent abaxially and at margin; style long, 2-parted. A. K. Skvortsov indicates that *S. medogensis* closely resembles *S. ernestii* and might be referred to sect. *Psilostigmatae*.

**62. *Salix contortiapiculata*** P. Y. Mao & W. Z. Li, Acta Bot. Yunnan. 9: 43. 1987.

扭尖柳 *niu jian liu*

Shrubs to 4 m tall. Branchlets dark purple-red, glabrous. Buds purple-red, broadly ovate, ca. 5 mm, glabrous, apex obtuse. Petiole 0.6–1.4 cm, russet pubescent adaxially; leaf blade obovate-oblong, 5–9 × 2.2–4.2 cm, abaxially pale or somewhat glaucous, villous at first, glabrescent, adaxially green and glabrous or russet pubescent along midvein near leaf base; base subrounded or broadly cuneate, margin entire or sparsely denticulate, apex contorted apiculate. Male catkin unknown. Fruiting catkin 5–7 cm × ca. 7 mm; peduncle 2.5–4 cm, with 3 or 4 leaflets; rachis puberulent; bracts broadly oblong, ca. 2.5 mm, abaxially and marginally loosely pilose or subglabrous, adaxially glabrous, apex obtuse-rounded or undulate-denticulate. Female flower: gland adaxial; ovary ovoid-conical, glabrous, sessile or subsessile; style ca. 1 mm, 2-lobed; stigma 2-lobed. Fr. Jul.

• Mountains near rivers; 1300–1900 m. Yunnan (Gongshan Drungzu Nuzu Zizhixian).

**9. Sect. *Denticulatae*** C. K. Schneider in Sargent, Pl. Wilson. 3: 117. 1916.

繁柳组 *fan liu zu*

Shrubs. Branches short. Leaves usually small or medium-sized; leaf blade elliptic, oblong, or ovate to obovate, rarely suborbicular or lanceolate, abaxially greenish, pale or pruinose, pubescent when young, margin entire or dentate. Flowering nearly coetaneous, but young leaves very small at anthesis. Catkins slender, pedunculate; bracts yellowish green or reddish, usually nearly spatulate at apex, usually glabrous or ciliate. Male flower: gland solitary,

adaxial; stamens 2, distinct, pilose proximally; anthers yellow, rarely red. Female flower: ovary ovoid, glabrous or rarely pilose, sessile or shortly stipitate; style short; stigma 2-lobed.

**Key based on male plants**

(*Salix macroblasta*, *S. minjiangensis*, *S. ochetophylla*, *S. parvidenticulata*, *S. pseudotangii*, *S. xizangensis*, *S. zangica*, and *S. zhouquensis* unknown)

- 1a. Filaments glabrous.
- 2a. Filaments distinct or partly connate; bracts ovate or oblong-ovate, with long hairs on both surfaces or adaxially subglabrous ..... 92. *S. etosia*
- 2b. Filaments completely free; bracts long obovate-elliptic, glabrous on both surfaces, ciliate 94. *S. austrotibetica*
- 1b. Filaments villous at base.
- 3a. Adaxial gland present (sometimes also abaxial gland in *S. mictotricha*).
- 4a. Bracts glabrous.
- 5a. Bracts broadly ovate or oblong.
- 6a. Bracts oblong, apex 2-notched; catkin 1–2.5 cm; adaxial gland terete ..... 78. *S. wangiana*
- 6b. Bracts broadly ovate, apex rounded or subtruncate; catkin 1–1.5 cm; adaxial gland broad 82. *S. rhoophila*
- 5b. Bracts obovate.
- 7a. Adaxial gland ovate; bracts ca. 1/2 as long as stamens; catkin 2.5–4.5 cm ..... 75. *S. hypoleuca*
- 7b. Adaxial gland terete; bracts ca. 1/3 as long as stamens; catkin generally less than 2.5 cm.
- 8a. Catkin 1.8–2.5 cm; filaments downy at base; leaf abaxially greenish, margin entire 84. *S. tangii*
- 8b. Catkin ca. 2.5 cm; filaments villous in proximal 1/2; leaf abaxially pale, margin dentate ..... 88. *S. denticulata*
- 4b. Bracts pilose.
- 9a. Bracts not ciliate, pilose at least on 1 surface.
- 10a. Catkin 3–4 cm; bracts pilose adaxially; gland 1, adaxial ..... 83. *S. polyclona*
- 10b. Catkin ca. 2.8 cm; bracts tomentose abaxially; sometimes also with abaxial gland present ..... 81. *S. mictotricha*
- 9b. Bracts ciliate, pilose or glabrous on both surfaces.
- 11a. Cilia longer than bracts; bracts yellowish green or brown distally ..... 80. *S. luctuosa*
- 11b. Cilia shorter than or ca. as long as bracts; bracts brown or yellowish green.
- 12a. Peduncle 5–15 mm ..... 86. *S. cathayana*
- 12b. Peduncle ca. 3 mm ..... 87. *S. maerkangensis*
- 3b. Adaxial and abaxial glands present.
- 13a. Bracts glabrous.
- 14a. Catkin 2–6 cm × (3–)5–7 mm; branchlets yellow, yellowish brown, or blackish.
- 15a. Bracts suborbicular; branchlets yellow or yellowish brown ..... 68. *S. dissa*
- 15b. Bracts ovate-elliptic; branchlets blackish ..... 72. *S. longiflora*
- 14b. Catkin 1–2.5 cm × 3–4 mm; branchlets dull brown, brownish red, or purplish.
- 16a. Young branchlets glabrous ..... 64. *S. tenella*
- 16b. Young branchlets tomentulose ..... 65. *S. pseudowolohoensis*
- 13b. Bracts pilose.
- 17a. Bracts without long hairs, sparsely ciliate.
- 18a. Bracts oblong-elliptic, yellowish green or apically brown ..... 79. *S. delavayana*
- 18b. Bracts obovate to orbicular, yellowish brown or dull brown.
- 19a. Catkin to 6 cm × 3–5 mm ..... 63. *S. guebriantiana*
- 19b. Catkin 1–1.5 cm × ca. 3 mm ..... 69. *S. heishuiensis*
- 17b. Bracts with long hairs.
- 20a. Branchlets densely tomentulose and dirty colored ..... 67. *S. praticola*
- 20b. Branchlets pilose or glabrous, neither tomentulose nor dirty colored.
- 21a. Bracts ciliate, glabrous on both surfaces ..... 70. *S. zhegushanica*
- 21b. Bracts with long hairs on both surfaces or at least on 1 surface and on margin.
- 22a. Bracts with long hairs only on 1 surface and on margin; young branchlets pilose ..... 73. *S. paratetradenia*

- 22b. Bracts with long hairs on both surfaces and margin; young branchlets  
pilose  
or glabrous
- 23a. Young leaf blade elliptic or obovate-elliptic ..... 74. *S. oreinoma*
- 23b. Young leaf blade oblong-lanceolate ..... 66. *S. daguanensis*

**Key based on female plants**

- 1a. Ovary pruinose ..... 94. *S. austrotibetica*
- 1b. Ovary not pruinose.
  - 2a. Ovary sessile or subsessile.
    - 3a. Ovary sessile.
      - 4a. Ovary pilose (only at base in *S. tenella* var. *trichadenia*) ..... 76. *S. pseudotangii*
      - 4b. Ovary glabrous.
        - 5a. Bracts pilose.
          - 6a. Bracts pilose at base only.
            - 7a. Bracts oblong; style 2-lobed; stigma 2-lobed ..... 81. *S. mictotricha*
            - 7b. Bracts obovate to orbicular; style short, entire.
              - 8a. Ovary ovoid; stigma 2-lobed ..... 63. *S. guebriantiana*
              - 8b. Ovary ovoid-ellipsoid; stigma capitate, entire ..... 69. *S. heishuiensis*
            - 6b. Bracts pilose or ciliate.
              - 9a. Bracts white villous on both surfaces ..... 66. *S. daguanensis*
              - 9b. Bracts villous only adaxially or marginally.
                - 10a. Bracts suborbicular; ovary ovoid; capsule conical ..... 67. *S. praticola*
                - 10b. Bracts obovate-oblong; ovary ellipsoid; capsule subglobose ..... 86. *S. cathayana*
          - 5b. Bracts glabrous.
            - 11a. Bracts broadly ovate.
              - 12a. Adaxial gland terete ..... 84. *S. tangii*
              - 12b. Adaxial gland ovate or quadrangular ..... 82. *S. rhoophila*
            - 11b. Bracts not broadly ovate.
              - 13a. Branchlets yellow or yellowish brown ..... 68. *S. dissa*
              - 13b. Branchlets neither yellow nor yellowish brown.
                - 14a. Branchlets dark brown or with a blackish tinge; catkin 2.5–6 cm; bracts broadly elliptic-oblong ..... 78. *S. wangiana*
                - 14b. Branchlets brownish red or purplish; catkin 1–2.5 cm; bracts obovate ..... 64. *S. tenella*
    - 3b. Ovary subsessile.
      - 15a. Bracts glabrous or slightly ciliate.
        - 16a. Bracts obovate-oblong or obovate; ovary ovoid-oblong or narrowly ovoid ... 77. *S. macroblasta*
        - 16b. Bracts broadly ovate or suborbicular; ovary ovoid.
          - 17a. Branches dark brown, not angled; catkin 2.5–5 cm; stigma entire ..... 75. *S. hypoleuca*
          - 17b. Branches black, angled; catkin 4–7 cm; stigma 2-lobed ..... 72. *S. longiflora*
      - 15b. Bracts pilose.
        - 18a. Bracts subglabrous on both surfaces.
          - 19a. Young branchlets pilose; young leaves dentate at margin ..... 88. *S. denticulata*
          - 19b. Young branchlets glabrous; young leaves entire at margin ..... 70. *S. zhegushanica*
        - 18b. Bracts pilose on both surfaces.
          - 20a. Cilia 2–3 × as long as bracts ..... 80. *S. luctuosa*
          - 20b. Cilia nearly as long as bracts.
            - 21a. Peduncle ca. 3 mm ..... 87. *S. maerkangensis*
            - 21b. Peduncle ca. 20 mm ..... 83. *S. polyclona*
    - 2b. Ovary distinctly shortly stipitate (sometimes subsessile in *S. delavayana* and *S. ochetophylla*).
      - 22a. Bracts glabrous or adaxially pilose at middle or base.
        - 23a. Bracts glabrous or abaxially pilose at base ..... 89. *S. parvidenticulata*
        - 23b. Bracts adaxially pilose at middle.
          - 24a. At least young leaves pilose abaxially; bracts glabrous; stipe glabrous ..... 65. *S. pseudowolohoensis*
          - 24b. Young leaves glabrous abaxially; bracts adaxially pilose at middle; stipe densely pubescent ..... 71. *S. zangica*

- 22b. Bracts pilose.
- 25a. Bracts pilose on both surfaces.
- 26a. Petiole with 1–3 glands apically ..... 93. *S. minjiangensis*
- 26b. Petiole non glandular.
- 27a. Leaf blade orbicular or suborbicular ..... 91. *S. zhouquensis*
- 27b. Leaf blade not orbicular.
- 28a. Bracts ovate or oblong-ovate, apex obtuse ..... 92. *S. etosia*
- 28b. Bracts elliptic, apex rounded ..... 85. *S. xizangensis*
- 25b. Bracts pilose or glabrous on both surfaces, ciliate.
- 29a. Bracts with long hairs abaxially and at margin.
- 30a. Bracts yellowish green, obovate or suborbicular ..... 73. *S. paratetradenia*
- 30b. Bracts brownish distally, ovate ..... 90. *S. ochetophylla*
- 29b. Bracts pubescent on both surfaces, margin  $\pm$  ciliate.
- 31a. Bracts orbicular, pilose on both surfaces, ciliate ..... 74. *S. oreinoma*
- 31b. Bracts oblong-elliptic or long elliptic, brown distally, both surfaces pilose or glabrous, margin  $\pm$  pilose.
- 32a. Flowers with only adaxial gland present ..... 79. *S. delavayana*
- 32b. Flowers with adaxial and abaxial glands present ..... 71. *S. zangica*

### Key based on vegetative characters

- 1a. Petiole less than 5 mm; leaf margin entire.
- 2a. Leaf abaxially glabrous.
- 3a. Leaf blade lanceolate or oblong-lanceolate ..... 77. *S. macroblasta*
- 3b. Leaf blade neither lanceolate nor oblong-lanceolate.
- 4a. Branchlets yellow or yellowish brown; leaves sessile ..... 68. *S. dissa*
- 4b. Branchlets neither yellow nor yellowish brown; petiole 2–5 mm.
- 5a. Petiole pubescent; leaf abaxially pruinose, very smooth ..... 94. *S. austrotibetica*
- 5b. Petiole glabrous; leaf abaxially neither pruinose nor smooth.
- 6a. Leaf blade ovate to elliptic, abaxially glaucous ..... 88. *S. denticulata*
- 6b. Leaf blade elliptic or elliptic-oblong, abaxially green ..... 84. *S. tangii*
- 2b. Leaf abaxially pilose (including hairs present on leaves of young branchlets).
- 7a. Leaf blade obovate-elliptic or obovate-oblong ..... 89. *S. parvidenticulata*
- 7b. Leaf blade neither obovate-elliptic nor obovate-oblong.
- 8a. Leaves tufted villous abaxially only near base ..... 87. *S. maerkangensis*
- 8b. Leaves not tufted villous.
- 9a. Branches dull brown or dark grayish brown; stipules small or absent.
- 10a. Leaf downy abaxially; petiole ca. 2.5 mm ..... 76. *S. pseudotangii*
- 10b. Leaf pilose along midvein abaxially; petiole 2–4 mm ..... 85. *S. xizangensis*
- 9b. Branches usually purplish brown; stipules oblique or broadly ovate.
- 11a. Petiole 3–5 mm, sericeous ..... 81. *S. mictotricha*
- 11b. Petiole 1–3(–4) mm, downy or tomentose.
- 12a. Leaf glaucous abaxially ..... 83. *S. polyclona*
- 12b. Leaf not glaucous abaxially.
- 13a. Leaf densely pubescent abaxially ..... 69. *S. heishuiensis*
- 13b. Leaf subglabrous abaxially except along veins which are pubescent ..... 80. *S. luctuosa*
- 1b. Petiole more than 5 mm; leaf margin dentate or entire.
- 14a. Leaf margin dentate or inconspicuously dentate.
- 15a. Leaf margin remotely dentate or subentire when young.
- 16a. Leaf blade elliptic or ovate, rarely obovate glabrous on both surfaces, base rounded or broadly cuneate, apex obtuse; petiole 5–12 mm ..... 78. *S. wangiana*
- 16b. Leaf blade lanceolate or oblong-lanceolate pilose on both surfaces, base cuneate, apex acute; petiole 3–6 mm ..... 65. *S. pseudowolohoensis*
- 15b. Leaf margin inconspicuously dentate or margins of some leaves entire.
- 17a. Young leaves near apex of branchlets pilose abaxially; veins with yellowish brown hairs; branchlets tomentulose ..... 67. *S. praticola*

- 17b. Young leaves near apex of branchlets usually glabrous abaxially; veins without yellowish brown hairs; branchlets glabrous or subglabrous.
- 18a. Young branchlets glabrous.
  - 19a. Leaf blade generally less than 3 cm (except on shoots and robust branchlets) abaxially not pruinose ..... 64. *S. tenella*
  - 19b. Leaf blade generally more than 3 cm, usually pruinose abaxially.
    - 20a. Branchlets thick, usually pruinose; leaf blade elliptic or broadly elliptic, 3–5.5 cm ..... 71. *S. zangica*
    - 20b. Branchlets thin, not pruinose; leaf blade oblong or elliptic, to 3.5 cm ..... 70. *S. zhegushanica*
- 18b. Young branchlets pilose.
  - 21a. Petiole with 1–3 glands apically ..... 93. *S. minjiangensis*
  - 21b. Petiole eglandular.
    - 22a. Petiole reddish; branchlets reddish or reddish black, shiny . 90. *S. ochetophylla*
    - 22b. Petiole not reddish; branchlets dull brown or purplish brown to blackish purple, not shiny.
      - 23a. Leaf blade usually greenish abaxially, sometimes whitish but not pruinose, elliptic to lanceolate, broadest below middle 63. *S. guebriantiana*
      - 23b. Leaf blade grayish white and pruinose abaxially, elliptic or obovate-elliptic.
        - 24a. Leaf blade oblong-lanceolate ..... 66. *S. daguanensis*
        - 24b. Leaf blade not oblong-lanceolate ..... 74. *S. oreinoma*
- 14b. Leaf margin entire.
  - 25a. Branchlets glabrous ..... 75. *S. hypoleuca*
  - 25b. Branchlets pilose.
    - 26a. Leaf blade lanceolate to elliptic-lanceolate or long elliptic, obtuse or acute at both ends.
      - 27a. Branchlets blackish, angled; leaves lanceolate or elliptic-lanceolate, 4–6 cm × 7–10 mm ..... 72. *S. longiflora*
      - 27b. Branchlets brown or grayish brown; leaves elliptic-lanceolate or long elliptic, 1.5–5.2 cm × 6–15 mm ..... 86. *S. cathayana*
    - 26b. Leaf blade orbicular, elliptic, elliptic-oblong, or oblong, rarely obovate-elliptic, base usually rounded or broadly cuneate, rarely obtuse, apex acute or shortly acuminate.
      - 28a. Leaf blade orbicular.
        - 29a. Petiole with 1–3 glands apically ..... 93. *S. minjiangensis*
        - 29b. Petiole eglandular apically ..... 91. *S. zhouquensis*
      - 28a. Leaf blade not orbicular.
        - 30a. One-year-old branchlets densely dirty downy or tomentose ..... 92. *S. etosia*
        - 30b. One-year-old branchlets pilose or pilose when young, neither dirty downy nor tomentose.
          - 31a. Leaf apex rounded or slightly acute, rarely retuse ..... 73. *S. paratetradenia*
          - 31b. Leaf apex acute, shortly acuminate, or obtuse.
            - 32a. One-year-old branchlets ± villous; leaf blade elliptic to oblong, base rounded, apex acute or obtuse ..... 82. *S. rhoophila*
            - 32b. One-year-old branchlets glabrous (except for some young branchlets); leaf blade oblong-elliptic to broadly elliptic, base cuneate to rounded, apex acute to shortly acuminate ..... 79. *S. delavayana*

**63. *Salix guebriantiana*** C. K. Schneider, Bot. Gaz. 64(2): 139. 1917.

细序柳 xi xu liu

*Salix tetradenia* Handel-Mazzetti.

Shrubs. Branchlets greenish brown to blackish purple, pubescent when young. Leaves petiolate; leaf blade elliptic to lanceolate, 5(–7) × ca. 2.5 cm, abaxially greenish, sometimes whitish, glabrous or only



pubescent along veins, adaxially green, base rounded or rounded-cuneate, margin entire or indistinctly dentate, apex obtuse or acute; fallen leaves of previous year rust colored. Flowering precocious or coetaneous. Catkins erect, ca. 6 cm × 3–5 mm; peduncle with 2–5 leaflets at base; rachis pilose; bracts obovate to orbicular or apex spatulate, ca. 1 mm, glabrous or basally pilose. Male flower: adaxial gland sometimes 3- or 4-lobed, abaxial gland small; filaments ca. 2 mm, base downy; anthers yellow or partly reddish. Female flower: gland adaxial; ovary ovoid, glabrous, sessile; style short; stigma 2-lobed. Fl. Apr–May.

• Mountain slopes, valleys; 2800–3300 m. Sichuan (Kangding Xian, Yanyuan Xian), NW Yunnan.

**64. *Salix tenella*** C. K. Schneider, Bot. Gaz. 64(2): 137. 1917.

光苞柳 *guang bao liu*

Shrubs. Branchlets brownish red or purplish. Petiole 5–8 mm; leaf blade elliptic-oblong to obovate-oblong, rarely obovate, ca. 2.5 × 1 cm, 1–2 cm at anthesis, to 6.5 × 2.5 cm on shoots and robust branchlets, abaxially whitish, adaxially green, base rounded, margin entire or indistinctly dentate, apex acute; fallen leaves of previous year brownish black. Flowering nearly coetaneous. Male catkin 1–2.5 × 0.3–0.4 cm; peduncle short, with 2 or 3 leaflets; bracts obovate, ca. 1 mm, glabrous, apex rounded, rounded-truncate, or spatulate. Male flower: adaxial and abaxial glands divided or entire; stamens 2, distinct, 1.3–2 mm, basally downy; anthers yellow or golden-yellow, subglobose. Fruiting catkin to 4 cm; peduncle ca. 1.5 cm; bracts ovate-orbicular, ca. as long as ovary, glabrous or slightly ciliate. Female flower: adaxial gland present, divided or entire, abaxial gland sometimes present; ovary ovoid or broadly ovoid, glabrous or pubescent at base, sessile; style indistinct; stigma 2-lobed. Capsule conical, ca. 2.5 mm; stipe very short or absent. Fl. beginning of May, fr. Jun.

• Mountain slopes, valleys; 2600–3800 m. SW Sichuan, NW Yunnan.

1a. Ovary glabrous; usually adaxial and abaxial glands present ..... 64a. var. *tenella*

1b. Ovary pubescent at base; only adaxial gland present ..... 64b. var. *trichadenia*

**64a. *Salix tenella* var. *tenella***

光苞柳(原变种) *guang bao liu* (yuan bian zhong)

*Salix longiflora* Wallich ex Andersson var. *psilolepis* Handel-Mazzetti.

Female flower: usually adaxial and abaxial glands present, abaxial gland sometimes absent; ovary glabrous.

• Mountain slopes, valleys; 2600–3800 m. SW Sichuan, NW Yunnan.

**64b. *Salix tenella* var. *trichadenia*** Handel-Mazzetti, Symb. Sin. 7: 68. 1929.

基毛光苞柳 *ji mao guang bao liu*

Female flower: only adaxial gland present; ovary pubescent at base

• 2600–3800 m. SW Sichuan, NW Yunnan.

**65. *Salix pseudowolohoensis*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 469. 1998.

西柳 *xi liu*

Shrubs to 2 m tall. Branches dull brown or brownish red, tomentulose. Petiole 3–6 mm, adaxially canaliculate, white tomentose; leaf blade lanceolate or oblong-lanceolate, 3–5 × 0.8–1.2 cm, abaxially densely silky tomentose, adaxially green, tomentose, base cuneate, margin indistinctly remotely glandular denticulate or subentire, apex acute. Male catkin thinly cylindrical, ca. 1.5 cm × 3 mm; peduncle short; rachis downy; bracts obovate, glabrous. Male flower: adaxial gland larger than abaxial gland or latter sometimes absent; stamens 2 or 3, distinct; filaments downy at base; anthers yellow, ellipsoid. Female catkin thinly cylindrical, 1–1.5 cm × 2–3 mm; peduncle short, with 3–5 pubescent leaflets; rachis densely white downy; bracts yellowish brown, obovate or ovate, glabrous. Female flower: gland adaxial; ovary ovoid or ovoid, glabrous, shortly stipitate; style short; stigma capitate, 2-lobed. Capsule ovoid-oblong, shortly stipitate. Fl. Apr, fr. May–Jun.

• Damp mountain slopes; 1100–3500 m. Sichuan, NW Yunnan.

**66. *Salix daganensis*** P. Y. Mao & P. X. He, Acta Bot. Yunnan. 9: 45. 1987.

大关柳 *da guan liu*

Shrubs to 2 m tall. Juvenile branchlets brown pubescent at apex. Buds large, long ellipsoid, brown pubescent. Petiole 6–10 mm; leaf blade oblong-lanceolate, 4–8 × 1.2–2.4 cm, slightly sericeous when young, later only veins pilose abaxially, abaxially glabrous pubescent along midvein basally, adaxially green, base broadly cuneate or subrounded, margin indistinctly glandular serrate; veins raised abaxially. Flowering serotinous. Catkins slender, terete, 3–7 cm × ca. 4 mm; peduncle to 1.5 cm rarely absent, with 2 or 3 leaflets; rachis pilose; bracts yellow, oblong, margin white villous, apex rounded. Male flower: glands 2, rarely 1, adaxial and abaxial, entire or 2-parted or only one divided; stamens 2, rarely 3; filaments free, abaxially white pilose, ca. 2 × as long as bracts. Female flower: gland adaxial; ovary ovoid-conical, glabrous, sessile; style ca. 1 mm, 2-parted; stigma 2-lobed. Fl. Jul–Aug, fr. Oct.

• Mountains; 1700–2000 m. Yunnan (Daguan Xian, Yiliang Xian).

**67. *Salix praticola*** Handel-Mazzetti ex Enander, Akad. Wiss. Wien., Math.-Naturwiss. Kl., Anz. 63: 95. 1926.

草地柳 *cao di liu*

Shrubs. Branches fastigiate; branchlets dirty colored, densely thin tomentose, glabrescent. Buds chestnut colored, ovate, subglabrous. Petiole 4–6 mm, tomentose; leaf blade elliptic-lanceolate, elliptic, or obovate-oblong, 3.5–5.5 × 1.5–2 cm, to 9 cm on shoots, leathery, abaxially subglabrous, grayish or slightly pruinose, tomentose or with yellowish brown hairs

along veins when young, adaxially green or dull green, glabrous except at base of midvein, base narrowly rounded, margin denticulate, apex acute or shortly acuminate. Male catkin cylindrical, 3–3.5 cm. Male flower: adaxial gland oblong, apex retuse, abaxial gland smaller; stamens 2, distinct, 3–4 mm; filaments villous proximally; anthers yellow, subglobose. Female catkin to 6 cm; peduncle 0.5–1.5 cm, with 2–4 leaflets; bracts brown, suborbicular, ca. 1 mm, adaxially and marginally villous. Female flower: adaxial gland oblong or ovate; ovary ovoid, distally attenuate, glabrous, sessile; style conspicuous, 2-parted; stigma short, 2-cleft. Capsule subconical, ca. 4 mm. Fl. Jul–Aug, fr. Aug–Sep.

- Mountain slopes; 1000–1500 m. N Guangxi, Guizhou, W Hubei, Hunan, SE Sichuan, NE Yunnan.

Similar to *Salix cathayana* but branchlets and abaxial leaf surface tomentose; anthesis later; male flower with adaxial and abaxial glands.

**68. *Salix dissa*** C. K. Schneider in Sargent, Pl. Wilson. 3: 52. 1916.

异型柳 *yi xing liu*

Shrubs to 1 m tall. Branches spreading; juvenile branchlets yellow or yellowish brown, pilose or glabrous, short and thin. Stipules absent; petiole short; leaf blade oblong or oblong-elliptic to oblong-ovate, rarely oblong-lanceolate, 1–3(–4) × 0.5–1.8 cm, abaxially whitish, glabrous, adaxially yellowish green, rarely dull green, base rounded (subcordate on shoots), margin entire, apex acute or obtuse. Flowering coetaneous. Male catkin 2–4 cm × 5–7 mm; peduncle ca. 1 cm, with 3 leaflets; rachis pilose; bracts brown distally, broadly ovate or suborbicular, glabrous. Male flower: glands (1 or) 2, adaxial and abaxial or abaxial gland absent; stamens 2, free; filaments thicker, basally downy; anthers yellow, subglobose. Female catkin slender, 1.5–3 cm × 2–4 mm; peduncle elongated to 2.5 cm in fruit, with 3–5 leaflets; bracts as in male catkin. Female flower: adaxial gland ovate, sometimes divided; ovary ovoid, glabrous, sessile; style short; stigma 2-lobed. Capsule ovoid-oblong, ca. 4 mm. Fl. early May, fr. Jun.

- Near streams, open places, mountain slopes; 900–3000 m. S Gansu, W Sichuan, NW Yunnan.

- 1a. Male flower with adaxial and abaxial glands present ..... 68a. var. *dissa*
- 1b. Male flower with only adaxial gland present ..... 68b. var. *cereifolia*

**68a. *Salix dissa* var. *dissa***

异型柳(原变种) *yi xing liu (yuan bian zhong)*

*Salix dissa* f. *angustifolia* C. F. Fang.

Male flower: adaxial and abaxial glands present.

- Near streams, open places, mountain slopes; 900–3000 m. W Sichuan, NW Yunnan.

**68b. *Salix dissa* var. *cereifolia*** (Goerz ex Rehder & Kobuski) C. F. Fang, Fl. Reipubl. Popularis Sin. 20(2): 172. 1984.

单腺异型柳 *dan xian yi xing liu*

*Salix cereifolia* Goerz ex Rehder & Kobuski, J. Arnold Arbor. 13: 393. 1932.

Male flower: adaxial gland only present.

- S Gansu.

**69. *Salix heishuiensis*** N. Chao, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 24. 1980.

黑水柳 *hei shui liu*

Shrubs to 4 m tall. One-year-old branchlets ± pilose; juvenile branchlets slender, gray tomentose. Buds downy. Petiole thin, 2–5 mm, pilose, small glandular; leaf blade narrowly lanceolate to narrowly oblong, ca. 4.5 × 1 cm, abaxially densely appressed pubescent, rarely less densely so, adaxially tomentose at first, glabrescent, base cuneate, margin entire or indistinctly glandular denticulate, apex obtuse or acute; lateral veins thin. Male catkin 1–1.5 cm × ca. 3 mm; peduncle very short, with 1 or 2 leaflets or not; rachis tomentose; bracts obovate-elliptic, ca. 1 mm, base pilose, apex rounded or subtruncate. Male flower: adaxial gland shortly terete, abaxial gland small or absent; stamens 2, distinct; filaments villous at base. Fruiting catkin ca. 2.5 cm × 7 mm; bracts suborbicular, base pilose. Female flower: adaxial gland broadly ovate; ovary ovoid-ellipsoid, glabrous, distally attenuate, sessile; style short, thick; stigma shortly forked. Capsule 2.5–3 mm; stipe very short. Fl. May–Jun, fr. Jun–Jul.

- Mountains; 3200–4100 m. Sichuan.

**70. *Salix zhegushanica*** N. Chao, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 27. 1980.

鹈鹕柳 *zhe gu liu*

Shrubs to 4.5 m tall. Branchlets glabrous. Buds pubescent. Stipules short; petiole thin, 5–7 mm, slightly pilose, sometimes small glandular; leaf blade elliptic, long elliptic, or oblong, ca. 3.5 × 1.5 cm, abaxially glaucous, glabrous, adaxially dull green, tomentose along midvein, glabrescent, base cuneate to rounded, margin entire or ± small glandular dentate, apex acute or rounded; lateral veins thin abaxially. Male catkin ca. 4 cm × 9 mm; rachis tomentose; bracts subrectangular, ca. 2.5 mm. Male flower: glands adaxial and abaxial; stamens 2; filaments distinct, basally villous. Female catkin to 5.5 cm × 8 mm; peduncle to 1 cm, with leaflets or not; rachis gray tomentose; bracts oblong, 1–2 mm, ± ciliate, apex rounded or truncate. Female flower: adaxial gland broadly ovate or oblong; ovary ellipsoid-ovoid, glabrous, subsessile; style ca. 1 mm, entire; stigma 2-lobed. Capsule ovoid-ellipsoid, 3–4 mm, glabrous, subsessile. Fl. Jun, fr. Jul.

- Mountains; 3400–3700 m. NW Sichuan.

**71. *Salix zangica*** N. Chao, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 26. 1980.

藏柳 *zang liu*

*Salix magnifica* Hemsley var. *microphylla* P. Y. Mao. Shrubs. Branchlets brown, stout, glabrous, glaucous. Buds subconical, large, ca. 1 cm, pilose. Petiole 0.7–1.5 cm, pubescent; leaf blade elliptic or broadly elliptic, 3–5.5 × 1.7–3.7 cm, thinly leathery, abaxially grayish white, glabrous, adaxially green, white pubescent along midvein, base cuneate to rounded, margin entire or irregularly obtuse-serrate, apex rounded; lateral veins 8–10 on each side of midvein, raised. Male catkin unknown. Fruiting catkin to 4 × 1.3 cm; peduncle ca. 1 cm, glabrous, with 2 leaflets; rachis villous; bracts long elliptic, ca. 2 mm, abaxially glabrous, adaxially villous at middle, apex rounded or truncate. Female flower: adaxial gland lanceolate, ca. 1 mm, abaxial gland small; ovary ellipsoid, ca. 1 mm, glabrous; stipe ca. 0.5 mm, stout, pubescent; style ca. as long as ovary, 2-cleft. Capsule ovoid-ellipsoid, ca. 5 mm, glabrous; stipe ca. 1.5 mm, densely pubescent. Fr. Sep.

• Hills; ca. 4500 m. E Xizang, Yunnan.

**72. *Salix longiflora*** Wallich ex Andersson, J. Linn. Soc., Bot. 4: 50. 1860.

长花柳 chang hua liu

Shrubs to 3 m tall. Branches black, glabrous, angled. Buds small, pubescent. Petiole ca. 5 mm, subglabrous; leaf blade lanceolate or elliptic-lanceolate, rarely obovate or elliptic, (1.6–)4–6(–8) × 0.7–1(–2) cm, both surfaces glabrous except along midvein or pilose when young, glabrescent, base cuneate, margin entire, apex acute. Male catkin cylindrical, 2–6 cm × (3–)6 mm; peduncle with 2 or 3 leaflets at base; rachis villous; bracts brown, ovate-elliptic, margin glabrous or nearly sparsely ciliate. Male flower: glands adaxial and abaxial; stamens 2; filaments ca. 3 × as long as bracts, base downy; anthers yellow, ellipsoid-globose. Female catkin spreading, becoming pendulous, 4–7 cm × ca. 5 mm, densely flowered; peduncle with 2–4 leaflets at base; rachis villous; bracts suborbicular, glabrous or slightly ciliate. Female flower: gland adaxial; ovary ovoid, glabrous, subsessile; style 2-cleft; stigma 2-lobed. Capsule ovoid, glabrous, subsessile; Fl. May, fr. Jun–Jul.

Among shrubs on mountain slopes and in valleys; 500–4000 m. W Sichuan, Xizang, Yunnan [Bhutan, India, Nepal, Sikkim].

1a. Leaf blade lanceolate or elliptic-lanceolate, rarely obovate-lanceolate, 4–6(–8) cm, glabrous except along midvein 72a. var. *longiflora*

1b. Leaf blade obovate or elliptic, 1.6–3 × 1–2 cm in fruit, pilose when young, becoming glabrous ..... 72b. var. *albescens*

**72a. *Salix longiflora* var. *longiflora***

长花柳(原变种) chang hua liu (yuan bian zhong)

Leaf blade lanceolate or elliptic-lanceolate, rarely obovate-lanceolate, 4–6(–8) cm, glabrous except along midvein.

Among shrubs on mountain slopes and in valleys; 500–4000 m. W Sichuan, Xizang, Yunnan [Bhutan, India, Nepal, Sikkim].

**72b. *Salix longiflora* var. *albescens*** Burkill in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 530. 1899.

小叶长花柳 xiao ye chang hua liu

Leaf blade obovate or elliptic, 1.6–3 × 1–2 cm in fruit, pilose when young, glabrescent.

• Mountain slopes. W Sichuan.

This variety usually grows together with *Salix luctuosa*. Hybridization and the presence of male individuals with adaxial and abaxial glands makes identification difficult.

**73. *Salix paratetradenia*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 202. 1974.

类四腺柳 lei si xian liu

Shrubs to 5 m tall. Branchlets blackish brown or grayish brown; juvenile branchlets pilose, glabrescent. Petiole 2–9(–15) mm, pilose; leaf blade oblong-elliptic, elliptic, long obovate-elliptic, or long elliptic-lanceolate, 2.5–6 × 1.5–2.5(–3) cm, abaxially greenish or whitish, adaxially green, both surfaces glabrous or downy at base of midvein, base rounded or attenuate, margin entire, apex rounded or slightly acute, rarely retuse. Flowering coetaneous. Catkins 2.5–3.5(–4) cm × 4–6(–7) mm; peduncle short, with 2 or 3 leaflets; rachis villous; bracts yellowish green, obovate or suborbicular, abaxially villous or glabrous distally, adaxially glabrous or subglabrous, long ciliate, apex subrounded or shallowly dentate. Male flower: adaxial gland ovate-terete, 1/2 to ca. as long as bracts, abaxial gland smaller or absent; stamens 2; filaments free, villous proximally. Fruiting catkin to 5.5 cm. Female flower: adaxial gland 1(or 2), ca. as long as bracts; ovary ovoid or ovoid-conical, glabrous or pilose at base, shortly stipitate; style conspicuous; stigma 2-lobed. Capsule ca. 3 mm, glabrous. Fl. Apr–May, fr. Jun.

• Along rivers, mountain slopes; 2500–4300 m. W Sichuan, E and S Xizang.

1a. Leaf blade base rounded; male flower with adaxial gland 1/2–2/3 as long as bracts, abaxial gland sometimes present 73a. var. *paratetradenia*

1b. Leaf blade base usually attenuate; male flower with adaxial gland ca. as long as bracts, abaxial gland absent .. 73b. var. *yatungensis*

**73a. *Salix paratetradenia* var. *paratetradenia***

类四腺柳(原变种) lei si xian liu (yuan bian zhong)

Leaf blade base rounded. Male flower: adaxial gland 1/2–2/3 as long as bracts, abaxial gland sometimes present.

• Along rivers; 2500–4300 m. E Xizang (Bomi Xian, Lhari Xian).

**73b. *Salix paratetradenia* var. *yatungensis*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 203. 1974.

亚东柳 ya dong liu

Leaf blade long elliptic to long elliptic-lanceolate, base usually attenuate, apex slightly acute. Male catkin ca. 2 cm. Male flower: adaxial gland ca. as long as bracts, very stout, abaxial gland absent.

• Mountain slopes; ca. 3000 m. W Sichuan (Garzê Xian), S Xizang (Yadong Xian).

**74. *Salix oreinoma*** C. K. Schneider in Sargent, Pl. Wilson. 3: 138. 1916.

迟花矮柳 *chi hua ai liu*

Shrubs to 3 m tall. Branchlets dull brown; young branchlets dull brown or purplish brown, short and thick, glabrous or subglabrous. Petiole 4–10 mm, pubescent; leaf blade elliptic or obovate-elliptic, 1.5–4 × 1–2.5 cm, abaxially grayish white, pruinose when young, glabrescent, adaxially dark green, pubescent along midvein, base obtuse or subrounded, margin glandular serrate or entire, apex acute or obtuse; veins conspicuous. Catkins terminal on juvenile branchlets. Male catkin 3–3.5 × ca. 1 cm; peduncle ca. 1 cm, with leaflets; rachis pubescent; bracts oblong, both surfaces sparsely downy and ciliate, apex obtuse or slightly acute. Male flower: adaxial and abaxial glands usually divided; stamens 2, ca. 3 × as long as bracts; filaments basally downy; anthers yellow, ovoid. Female catkin to 2–6 × ca. 1.5 cm in fruit; bracts as in male catkin. Female flower: adaxial gland present, abaxial gland sometimes present. style conspicuous in fruit, 2-cleft; stigma 2-lobed. Capsule glabrous, shortly stipitate; Fl. Jul–Aug, fr. Aug–Sep.

• Thickets on mountains; 3700–4300 m. W Sichuan, E Xizang, NW Yunnan.

In FRPS, the species described under *Salix oreinoma* is, in fact, *S. opsimantha*, and vice versa. The synonym *S. faxoniana*, given there under both species, belongs only to *S. opsimantha*. The illustration captioned *S. oreinoma* on plate 54 in FRPS depicts *S. opsimantha*.

**75. *Salix hypoleuca*** Seemen ex Diels, Bot. Jahrb. Syst. 36 (Beibl. 82): 31. 1905.

小叶柳 *xiao ye liu*

Shrubs to 3.5 m tall. Branches dull brown, glabrous; branchlets rarely pilose. Petiole 3–9 mm, glabrous, rarely pilose; leaf blade elliptic, lanceolate, or elliptic-oblong, rarely ovate, 2–4(–5.5) × 1.2–2.4 cm, abaxially glaucous, glabrous, rarely pilose when young, adaxially dull green, glabrous or subglabrous, base broadly cuneate, attenuate, or rounded, margin entire, apex acute or apiculate; veins raised abaxially. Male catkin 2.5–4.5 cm × 5–6 mm; peduncle 3–10 mm; rachis glabrous or pilose; bracts brown, obovate, glabrous. Male flower: adaxial gland ovoid, ca. 1/2 as long as bracts, apex retuse, abaxial gland absent; stamens 2; filaments villous proximally; anthers yellow, globose. Female catkin 2.5–5(–7.5) cm × 5–7 mm, densely flowered, shortly pedunculate; bracts broadly ovate, ca. 1/4 as long as capsule, glabrous, apex acute. Female flower: gland adaxial; ovary long ovoid; style 2-cleft; stigma short. Capsule ovoid, ca. 2.5 mm, subsessile. Fl. May, fr. May–Jun.

• Mountain slopes, roadsides, valleys; 1400–2700 m. Gansu, Hubei, Shaanxi, Sichuan.

1a. Leaf blade base broadly cuneate or attenuate, apex acute; fruiting catkin to 5 cm *75a. var. hypoleuca*

1b. Leaf blade base rounded, apex apiculate; fruiting catkin to 7.5 cm ..... *75b. var. platyphylla*

**75a. *Salix hypoleuca* var. *hypoleuca***

小叶柳(原变种) *xiao ye liu* (yuan bian zhong)

*Salix hypoleuca* var. *kansuensis* Goerz ex Rehder & Kobuski.

Leaf blade base broadly cuneate or attenuate, apex acute. Fruiting catkin to 5 cm.

• Mountain slopes, valleys; 1400–2700 m. Gansu, Hubei, Shaanxi, Sichuan.

**75b. *Salix hypoleuca* var. *platyphylla*** C. K. Schneider in Sargent, Pl. Wilson. 3: 54. 1916.

宽叶翻白柳 *kuan ye fan bai liu*

Leaf blade broadly elliptic, 2.3–4.7 × 1–3 cm, base rounded, apex apiculate. Fruiting catkin to 7.5 cm.

• Roadsides on mountain slopes; ca. 1600 m. S Shaanxi, Sichuan.

**76. *Salix pseudotangii*** C. Wang & C. Y. Yu, Fl. Tsinling. 1(2): 600. 1974.

山柳 *shan liu*

Shrubs. Branchlets dull brown; juvenile branchlets densely white downy, becoming sparsely white downy. Petiole ca. 2.5 mm, pubescent; leaf blade oblong or elliptic, 0.8–1.6 × 0.5–1.2 cm, abaxially whitish, sparsely villous, adaxially green, pubescent along midvein, both ends rounded, margin entire. Male catkin unknown. Female catkin 1.5–2 cm; peduncle with 5 leaflets; rachis downy; bracts elliptic, 1/3–1/2 as long as ovary, margin villous. Female flower: gland adaxial; ovary long ovoid-ellipsoid, pilose, sessile; style short; stigma 2-lobed, rarely 4-lobed. Capsule ovoid-oblong. Fl. May, fr. Jun.

• Woods of mountain slopes; ca. 2300 m. Shaanxi.

**77. *Salix macroblasta*** C. K. Schneider in Sargent, Pl. Wilson. 3: 58. 1916.

灌西柳 *guan xi liu*

Shrubs to 6 m tall. Branchlets yellowish brown, sparsely villous when young, glabrescent. Buds yellowish red, oblong, usually longer than petiole, glabrous or subglabrous. Petiole 1–3 mm, pilose; leaf blade lanceolate or oblong-lanceolate, 1.4–4(–5) × 0.5–1.2(–2) cm, abaxially glaucous, adaxially dull green, base rounded or broadly cuneate, margin entire, apex acute or acuminate. Male catkin unknown. Female catkin cylindrical, 2.5–3 cm × ca. 6 mm, densely flowered; peduncle conspicuous, with 4 leaflets often deciduous in fruit; rachis villous; bracts brown, obovate-oblong or obovate, glabrous. Female flower: adaxial gland ovate-oblong; ovary ovoid-cylindrical, glabrous, subsessile; style very short; stigma lobed. Capsule oblong, ca. 4 mm. Fl. Apr–May, fr. Jun.

• Thickets on mountain slopes and ridges; 1600–2000 m. Gansu, Sichuan (Baoping Xian, Guan Xian).

**78. *Salix wangiana*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 469. 1998.

眉柳 *mei liu*

*Salix rhododendroides* C. Wang & C. Y. Yu.

Shrubs to 3 m tall. Branchlets usually erect, dark brown or blackish. Petiole 5–12 mm, glabrous; leaf blade elliptic or ovate-orbicular, rarely obovate-orbicular, 3–5 × 2–3.2 cm, glabrous, abaxially whitish, adaxially dull green, base rounded or broadly cuneate, margin remotely denticulate, rarely entire when young, apex obtuse, rarely rounded or acute to rounded-obtuse. Male catkin 1–2.5 cm; peduncle short; rachis villous; bracts oblong, glabrous, apex 2-notched. Male flower: stamens 2; filaments ca. 3 × as long as bracts, villous at base; anthers globose. Fruiting catkin 3–6 cm; bracts broadly elliptic-oblong, glabrous. Female flower: glands 1 or 2, adaxial and abaxial, or abaxial gland absent; ovary ellipsoid-cylindric, glabrous, sessile; style thin, ca. 1.5 mm; stigmas 2. Capsule with persistent style, 6–8 mm. Fl. May, fr. Jun–Aug.

• Mountain slopes, ridges, thickets; 2600–4700 m. Shaanxi, E Xizang. The name *Salix wangiana* var. *tibetica* C. Wang & C. F. Fang (Acta Phytotax. Sin. 17(4): 103. 1979), accepted in FRPS and treated here as a synonym of *S. wangiana*, is invalid because *S. wangiana* itself was not validated until 1998.

**79. *Salix delavayana*** Handel-Mazzetti, Symb. Sin. 7: 78. 1929.

腹毛柳 fu mao liu

Shrubs or small trees, to 6 m tall. Branchlets blackish brown, pubescent when young, glabrescent. Buds brown, ovoid. Stipules small, obliquely ovate, margin glandular serrate; petiole ca. 1 cm; leaf blade oblong-elliptic to broadly elliptic, 3–8 × 1–3.5 cm, abaxially pale or pruinose, adaxially bright green, both surfaces yellowish tomentose when young, glabrescent, base cuneate to rounded, margin entire, apex acute or shortly acuminate; lateral veins 7–14 on each side of midvein. Flowering coetaneous. Male catkin 2–4(–5) cm × ca. 7 mm; peduncle short or absent; rachis pilose; bracts brown distally, oblong-elliptic, pilose or glabrous, ± ciliate. Male flower: adaxial and abaxial glands cylindric, ca. 1/3 as long as bracts, sometimes lobed, abaxial gland shorter than adaxial; stamens 2, distinct; filaments 2.3–3.5 mm, distal part villous; anthers yellow or red in distal part of catkin. Female catkin 2–3 cm × 4–6 mm; peduncle with 2–4 leaflets; bracts as in male catkin. Female flower: adaxial gland ovate or shortly cylindric; ovary ovoid, glabrous adaxially or pubescent at base only, or pilose adaxially and at adaxial and abaxial sutures, sessile or shortly stipitate; style conspicuous, 2-lobed; stigma thick, 2-lobed. Capsule ca. 5 mm. Fl. Apr–May, fr. Jun.

• Mountain slopes, along streams in woods, near rivers, damp places in *Picea* forests; 2800–4000 m. W Sichuan, E Xizang, W Yunnan.

1a. Ovary glabrous adaxially or pubescent at base only ..... 79a. var. *delavayana*

1b. Ovary pilose adaxially and at adaxial and abaxial sutures ..... 79b. var. *pilososuturalis*

**79a. *Salix delavayana* var. *delavayana***

腹毛柳(原变种) fu mao liu (yuan bian zhong)

Female flower: ovary glabrous adaxially or pubescent at base only.

• Mountain slopes, along streams in woods; 2800–3800 m. W Sichuan, E Xizang, W Yunnan.

**79b. *Salix delavayana* var. *pilososuturalis*** Y. L. Chou & C. F. Fang in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 105. 1979.

毛缝腹毛柳 mao feng fu mao liu

*Salix delavayana* var. *pilososuturalis* f. *glabra* C. F. Fang.

Female flower: ovary pilose adaxially and at adaxial and abaxial sutures. Fl. May, fr. Jun.

• Near rivers, damp places in *Picea* forests; 3600–4000 m. E Xizang.

**80. *Salix luctuosa*** H. Léveillé, Repert. Spec. Nov. Regni Veg. 13: 342. 1914.

丝毛柳 si mao liu

*Salix dyscrita* C. K. Schneider; *S. huiana* Goerz; *S. huiana* var. *tricholepis* Goerz.

Shrubs to 3 m tall. Branches erect; branchlets greenish brown or dark brown, silky tomentose when young, glabrescent or subglabrous, shiny. Petiole 1–3 mm, pilose; leaf blade elliptic or narrowly elliptic, 1–4 × 0.5–1.5 cm, abaxially silky downy at first, becoming subglabrous except along midvein, adaxially green, glabrous or pilose along midvein, both ends obtuse, margin entire. Male catkin 3–4.5 cm × 6–9 mm; peduncle with 3 or 4 leaflets; rachis villous, densely flowered; bracts yellowish green or distally brown, broadly ovate, long ciliate or abaxially subglabrous. Male flower: gland adaxial, abaxial gland sometimes absent; stamens 2; filaments basally villous; anthers yellow, ovoid. Female catkin ca. 3 cm × 6 mm, to 5 cm in fruit; peduncle with 3 leaflets; bracts ovate, villous. Female flower: gland adaxial; ovary ovoid, glabrous, sessile or subsessile; style 2-cleft; stigma small. Capsule ca. 3 mm. Fl. Apr, fr. Apr–May.

• Near water, mountain slopes, valleys; 1500–3200 m. Guizhou (Fanjing Shan), SW Shaanxi (Taibai Shan), Sichuan, E Xizang, Yunnan.

**81. *Salix mictotricha*** C. K. Schneider in Sargent, Pl. Wilson. 3: 56. 1916.

兴山柳 xing shan liu

Shrubs to 6 m tall. Branchlets purplish brown or blackish, villous when young, glabrescent. Petiole 3–5 mm, silky; leaf blade elliptic or ovate, 1.5–2(–2.6) × 0.9–1.5(–1.8) cm, abaxially pale, at first downy, glabrescent, adaxially green, pilose, base rounded, margin entire, apex subacute or subrounded. Male catkin ca. 2.8 cm × 4 mm, densely flowered, subsessile; rachis villous; bracts brownish, obovate or suborbicular, abaxially tomentose, apex obtuse. Male flower: adaxial gland long elliptic, divided or entire, abaxial gland sometimes absent; stamens 2, 3–4 × as long as bracts; filaments pilose at base; anthers yellow, ovoid. Female catkin terete, 2–2.5 cm; peduncle short, with 2 or 3 leaflets; rachis pilose; bracts yellowish brown, oblong, ca. as long as ovary, pilose at base. Female flower:

gland adaxial; ovary ovoid-ellipsoid, glabrous, sessile; style 2-lobed; stigma 2-lobed. Capsule shortly stipitate. Fl. May, fr. May–Jun.

• Mountains; 1300–1700 m. NW Hubei, Sichuan.

**82. *Salix rhoophila*** C. K. Schneider in Sargent, Pl. Wilson. 3: 54. 1916.

房县柳 fang xian liu

Shrubs to 2.5 m tall. Branchlets purplish brown or slightly blackish, villous or pilose when young, glabrescent. Petiole 4–10 mm, pilose; leaf blade elliptic to oblong, 2–4.5(–8) × 1–1.5(–2) cm, both surfaces glabrous, or pilose when young, rarely tomentose abaxially, base rounded, margin entire, apex acute or obtuse. Male catkin cylindrical, 1–1.5 cm × ca. 6 mm; peduncle short or absent, with 2 leaflets; rachis villous; bracts yellowish brown, broadly ovate, 1/3–1/2 as long as filaments, glabrous, apex rounded or truncate. Male flower: gland adaxial; stamens 2; filaments villous at base; anthers yellow. Female catkin 1.2–2.5 cm × 3(–4) mm; peduncle with 2 or 3 leaflets; rachis pilose; bracts brown, broadly ovate, glabrous, or pilose abaxially, apex obtuse. Female flower: adaxial gland ovate or quadrangular; ovary ovoid, glabrous, sessile; style short, 2-cleft; stigma 2-lobed. Fl. Mar, fr. Apr–May.

• Along rivers, mountain slopes; 800–2600 m. Hubei, Sichuan.

**83. *Salix polyclona*** C. K. Schneider in Sargent, Pl. Wilson. 3: 55. 1916.

多枝柳 duo zhi liu

Shrubs to 3.5 m tall; usually branched. Branchlets purplish brown, subglabrous. Petiole 1–3(–4) mm, white downy or tomentose; leaf blade elliptic or elliptic-oblong, 1.5–3 cm × 5–7 mm, abaxially glaucous, densely downy, adaxially white tomentose along midvein, base rounded, margin entire, apex obtuse or acute. Male catkin 3–4 × ca. 4 mm, densely flowered; peduncle with 2 or 3 leaflets; rachis downy; bracts obovate, adaxially pilose. Male flower: adaxial gland terete; stamens 2; filaments downy at base; anthers yellow, globose. Female catkin 2–3 cm × ca. 5 mm, ca. 4 cm in fruit; peduncle 3–5 mm, to 2 cm in fruit, white downy, with 2 or 3 leaflets; rachis downy; bracts brown, both surfaces downy, margin long ciliate. Female flower: adaxial gland oblong; ovary ovoid-cylindric, glabrous, subsessile; style 2-lobed; stigma 2-cleft. Capsule ovoid-conical, shortly stipitate. Fl. May, fr. Jun.

• Mountain slopes; ca. 2100 m. Hubei, Shaanxi.

**84. *Salix tangii*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 469. 1998.

周至柳 zhou zhi liu

Shrubs to 2 m tall. Branchlets reddish purple, glabrous; branchlets of male plants slightly pubescent. Petiole 4–5 mm, glabrous or densely pubescent; leaf blade oblong, elliptic-oblong, lanceolate, or narrowly lanceolate, 1.5–4 × 1–1.5 cm, abaxially greenish, pilose when young, glabrescent, adaxially green, base rounded, broadly cuneate, or cuneate, margin entire, apex acute, obtuse,

or shortly acuminate. Male catkin cylindrical, 1.8–2.5 cm × ca. 4 mm; rachis villous; bracts obovate, ca. 1/2 as long as filaments, glabrous. Male flower: adaxial gland terete; stamens 2; filaments downy at base. Female catkin cylindrical, to 4 cm in fruit; bracts ovate, glabrous. Female flower: adaxial gland terete, ca. 1/2 as long as bracts; ovary ovoid, glabrous, sessile; style 2-cleft; stigma short. Fl. May–Jun, fr. Jun.

• Mountain slopes, valleys, woods; 1200–3000 m. Gansu, Shaanxi, Shanxi.

1a. Leaf blade oblong or elliptic-oblong, base rounded or broadly cuneate, apex acute or obtuse; petiole glabrous ..... 84a. var. *tangii*

1b. Leaf blade lanceolate or narrowly lanceolate, base broadly cuneate or cuneate, apex shortly acuminate; petiole densely pubescent ..... 84b. var. *angustifolia*

**84a. *Salix tangii* var. *tangii***

周至柳(原变种) zhou zhi liu (yuan bian zhong)

Petiole glabrous; leaf blade oblong or elliptic-oblong, abaxially pilose when young, glabrescent, base rounded or broadly cuneate, apex acute or obtuse.

• Mountain slopes, woods; 2500–3000 m. Gansu, Shaanxi, Shanxi.

**84b. *Salix tangii* var. *angustifolia*** C. Y. Yu, Fl. Tsinling. 1(2): 599. 1974.

细叶周至柳 xi ye zhou zhi liu

Petiole densely pubescent; leaf blade lanceolate or narrowly lanceolate, abaxially glaucous, pilose, adaxially dull green, base broadly cuneate or cuneate, apex shortly acuminate.

• Mountain slopes, valleys; 1200–2400 m. S Gansu, Shaanxi.

**85. *Salix xizangensis*** Y. L. Chou in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 105. 1979.

西藏柳 xi zang liu

Shrubs erect, to 50 cm tall. Branchlets dull gray or greenish brown; young branchlets pilose, glabrescent. Petiole 2–4 mm, pubescent, rarely pilose; leaf blade oblong or elliptic, 2–3 × 0.9–1.1 cm, adaxially dull green, sometimes pilose at base of midvein, both ends obtuse, rarely subrounded, margin entire. Flowering coetaneous. Male catkin unknown. Female catkin 1.4–1.6 cm × 3–4 mm; peduncle 4–5 mm, pubescent, with 2 or 3 leaflets; bracts elliptic, ca. 1/2 as long as ovary, both surfaces sparsely long pubescent, apex rounded. Female flower: adaxial gland shortly linear, slender, slightly shorter than bracts; ovary oblong-ovoid, basally pilose, shortly stipitate; style short, 2-cleft; stigma 2-lobed. Fl. Jul.

• Thickets on high mountains; ca. 4000 m. Xizang.

Similar to *Salix luctuosa* but plants smaller; leaf blade larger, not silky downy abaxially; female catkin 1.4–1.6 cm; bracts sparsely long pubescent; adaxial gland slender; ovary shortly stipitate.

**86. *Salix cathayana*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 281. 1912.

中华柳 zhong hua liu

*Salix hsinhuaniana* Fang.

Shrubs to 1.5 m tall; much branched. Branchlets brown or grayish brown; juvenile branchlets tomentose. Buds ovoid or oblong, slightly shorter than petiole, tomentose, apex obtuse. Petiole 2–5 mm, pilose; leaf blade elliptic or elliptic-lanceolate, 1.5–5.2 × 0.6–1.5 cm, abaxially glaucous, glabrous, adaxially dull green, sometimes tomentose, both ends obtuse or acute, margin entire. Male catkin 2–3.5 cm × 5–8 mm, densely flowered; peduncle 0.5–1.5 cm, villous, usually with 3 or more leaflets; bracts yellowish brown, ovate or obovate, ciliate, apex rounded. Male flower: adaxial gland ovate-oblong, slightly shorter than bracts; stamens 2, free; filaments 3–4 × as long as bracts, sparsely long downy proximally; anthers yellow, ovoid or subglobose. Female catkin 2–3(–5) cm, densely flowered, shortly pedunculate; bracts obovate-oblong, ciliate. Female flower: gland adaxial; ovary ellipsoid, ca. 3 mm, glabrous, sessile; style short, 2-cleft; stigma short, 2-lobed. Capsule subglobose, sessile or subsessile. Fl. May, fr. Jun–Jul.

• Thickets on mountain slopes, valleys; 1800–3000 m. Guizhou (Fanjing Shan), Hebei, Henan, Hubei, Shaanxi, Sichuan, Yunnan.

**87. *Salix maerkangensis*** N. Chao, Fl. Sichuan. 3: 286. 1985.  
簇毛柳 *cu mao liu*

Shrubs to 2.5 m tall. One-year-old branchlets ± pilose; juvenile branchlets densely brown or brown-gray pubescent. Buds pubescent, apex obtuse. Petiole thin, 1–2 mm, villous; leaf blade elliptic or oblong, 0.8–1.5(–3.6) cm × 4–6(–18) mm, abaxially greenish, tufted villous only near base, adaxially dark green, pubescent along veins, base subcordate to cuneate, margin entire, apex rounded or obtuse; lateral veins ca. 7 on each side of midvein, raised abaxially. Catkins 1–2 cm × ca. 4 mm; peduncles ca. 3 mm; rachis pubescent; bracts suborbicular, ca. 0.8 mm, villous. Male flower: adaxial gland sublinear, ca. 0.3 mm. stamens 2; filaments pubescent basally, Fruiting catkin 3.5–7 mm. Female flower: adaxial gland narrowly ovate, ca. 0.2 mm; ovary glabrous, subsessile; style ca. 0.4 mm, 2-lobed; stigma 2-lobed. Capsule ca. 3 mm. Fl. Apr, fr. May.

• Mountains; 2600–3000 m. Sichuan (Danba Xian, Jinchuan Xian, Maerkang Xian).

**88. *Salix denticulata*** Andersson, Kongl. Vetensk. Akad. Handl. 1850: 481. 1851.

齿叶柳 *chi ye liu*

*Salix elegans* Wallich ex Andersson.

Shrubs to 6 m tall. Branchlets pubescent when young, glabrescent. Petiole ca. 2 mm, glabrous; leaf blade ovate or elliptic-oblong, 3–5 × 1.2–2.2 cm, abaxially pale, adaxially green, both surfaces glabrous, base rounded or broadly cuneate, margin serrulate, apex acute or obtuse. Male catkin ca. 2.5 cm; peduncle short, with 3 or 4 leaflets; rachis pilose; bracts elliptic-orbicular or obovate, ca. 1/3 as long as filaments, glabrous. Male flower: gland adaxial, cylindrical, ca. 1/2

as long as bracts; stamens 2; filaments villous proximally; anthers yellow. Female catkin ca. 4 cm, to 9 cm in fruit; peduncle with leaflets; rachis pilose; bracts obovate, abaxially glabrous, adaxially pilose at base. Female flower: gland adaxial; ovary ovoid-cylindrical or ovoid, glabrous, subsessile; style 2-lobed; stigma short. Capsule ellipsoid-oblong, ca. 4 cm. Fl. Apr, fr. May.

Along rivers; ca. 2500 m. Sichuan, Xizang, Yunnan [Afghanistan, India, Kashmir, Nepal, Pakistan].

**89. *Salix parvidenticulata*** C. F. Fang in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 105. 1979.

小齿叶柳 *xiao chi ye liu*

Shrubs. Mature branchlets greenish gray; juvenile branchlets densely tomentose, nearly black when dried, pilose, glabrous proximally. Buds narrowly ovoid, downy or tomentose. Petiole 1–2 mm, tomentose; leaf blade obovate-elliptic or obovate-oblong, rarely oblanceolate or elliptic, 2–2.5 cm × 7–1 mm, abaxially whitish, adaxially green, downy when young, base rounded-cuneate to cuneate, margin serrate, apex acute; veins slightly raised, villous and tomentose, glabrescent. Male catkin unknown. Female catkin 4–5 cm × 4–6 cm; peduncle ca. 7 mm, with 1 or 2 leaflets; rachis tomentose; bracts obovate, ca. 1 mm, submembranous, glabrous or pubescent at base, margin entire, slightly undulate, apex subtruncate or rounded. Female flower: adaxial gland shortly cylindrical, longer than stipe, apex truncate or retuse; ovary ovoid-cylindrical or narrowly ovoid, ca. 1.5 mm, glabrous, shortly stipitate; style conspicuous, 2-cleft; stigma subcapitate, divided or entire. Capsule to 5 mm. Fl. May, fr. Jun.

• Mountain slopes; ca. 2400 m. Xizang.

**90. *Salix ochetophylla*** Goerz, Bull. Fan Mem. Inst. Biol. 6: 7. 1935.

汶川柳 *wen chuan liu*

Shrubs to 1.5 m tall. Branchlets reddish or reddish black, slightly thick, shiny, pilose when young, glabrescent. Buds russet, ovoid-conical, shiny. Petiole red, 5–8 mm; leaf blade elliptic or obovate-elliptic, 3–5 × 1–2 cm, abaxially greenish, adaxially green, glabrous, clustered villous along midvein when young, base broadly cuneate or obtuse, margin entire or indistinctly glandular serrate distally, apex acute or obtuse; lateral veins 5–7 on each side of midvein. Flowering coetaneous. Male catkin unknown. Female catkin 2–4.5 cm × 5–7 mm, densely flowered; peduncle ca. 1 cm, with 2 or 3 leaflets; bracts brownish distally, ovate, ca. 1/2 as long as ovary, abaxially villous, adaxially glabrous, ciliate. Female flower: adaxial gland ovate or suborbicular, abaxial gland occasionally present, small; ovary conical, glabrous, shortly stipitate or sessile; style slightly elongate, usually forked at obtuse angle; stigma 2-cleft. Capsule unknown. Fl. May–Jun.

• Mountain slopes; ca. 2800 m. NW Sichuan.

Similar to *Salix delavayana* but young leaf blade densely villous on midvein abaxially; bracts villous abaxially and at margin; style obtusely forked.

**91. *Salix zhouquensis*** X. G. Sun, Bull. Bot. Res., Harbin 17: 357. 1997.

舟曲柳 *zhou qu liu*

Shrubs to 1.5 m tall. Juvenile branchlets yellowish gray silky villous, 1-year-old branchlets  $\pm$  pilose. Buds glabrous. Petiole 2–4 mm; leaf blade orbicular, broadly elliptic, or obovate, 1.5–2.5(–3)  $\times$  1.2–2 cm, abaxially greenish, densely silky villous, adaxially dull green, glabrous, base rounded or subrounded, margin entire, apex rounded; lateral veins 5–7 on each side of midvein; reticulate veins conspicuous. Flowering coetaneous. Male catkin unknown. Female catkin 1.7–2 cm  $\times$  ca. 5 mm. Female flower: ovary narrowly ovoid, ca. 3.5 mm, sessile, glabrous; style ca. 2.5 mm, 2-lobed; stigma lobed, distinctly revolute. Fl. May.

• Near woods; ca. 2700 m. Gansu (Zhouqu Xian).

**92. *Salix etosia*** C. K. Schneider in Sargent, Pl. Wilson. 3: 73. 1916.

巴柳 *ba liu*

*Salix camusii* H. Léveillé.

Shrubs or trees. Branchlets brown or russet, juvenile branchlets stout, densely dirty pubescent or tomentose, glabrescent. Buds dirty brown, ovoid, pilose. Petiole 5–7 mm, pubescent or tomentose; leaf blade elliptic or oblong-elliptic, 4–6.5  $\times$  1.8–2.5 cm, abaxially greenish or slightly white, pubescent along midvein, glabrous, villous when young, glabrescent, adaxially green, both ends acute or base cuneate-rounded, margin entire; lateral veins 10–15 on each side of midvein. Flowering precocious or coetaneous. Male catkin, yellowish green or brown distally, cylindrical 3–3.5 cm  $\times$  8–1 mm; peduncle 5–10 mm, with 2–4 leaflets ca. 1 cm; bracts ovate or oblong-ovate, ca. 2 mm, villous or adaxially subglabrous. Male flower: gland adaxial; stamens 2; filaments distinct or partly connate, to 5 mm, glabrous; anthers yellow. Female catkin 4–6 cm  $\times$  6–8 mm; bracts as in male catkin. Female flower: adaxial gland oblong, slightly shorter than stipe; ovary ovoid-cylindrical to conical, 2–3.5 mm, glabrous or adaxially slightly pubescent, stipitate; style conspicuous; stigma

ovate, sometimes divided. Capsule 6–7 mm. Fl. Mar–Apr, fr. May.

• Near streams; 1300–2000 m. Guizhou, W Hubei, Sichuan.

Similar in its immature leaves and male catkin to *Salix wallichiana* but male catkin effuse, somewhat elongate; female catkin slender at anthesis; ovary glabrous.

**93. *Salix minjiangensis*** N. Chao, Fl. Sichuan. 3: 288. 1985.

岷江柳 *min jiang liu*

Shrubs. One-year-old branchlets  $\pm$  pilose; juvenile branchlets yellowish gray silky villous. Buds pubescent. Petiole 5–7 mm, silky villous, apically with 1–3 glands; leaf blade orbicular, broadly elliptic, or broadly obovate, 2.7–4.4  $\times$  2.3–3.3 cm, abaxially greenish, silky villous along midvein, adaxially dull-green, puberulent along midvein or glabrous, base rounded or subrounded, margin obscurely glandular serrulate or entire, apex rounded or retuse; lateral veins 6–10 on each side of midvein, raised abaxially; reticulate veins conspicuous. Male catkin unknown. Fruiting catkin silky villous, 1–1.5 cm; peduncle leafy; rachis villous; bracts broadly ovate, ca. 1 mm, silky villous, apex rounded. Female flower: adaxial gland subsquare, ca. 0.3 mm; style in fruit ca. 2 mm, lobed; stigma lobed. Capsule narrowly ovoid, ca. 4 mm, glabrous; stipe ca. 0.7 mm.

• Upper reaches of Min Jiang. Sichuan (Li Xian).

**94. *Salix austrotibetica*** N. Chao, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 23. 1980.

藏南柳 *zang nan liu*

Shrubs to 1.5 m tall. Juvenile branchlets at first sparsely white villous, glabrescent. Buds glabrous. Petiole 2–6 mm, at first villous; leaf blade long obovate-elliptic, 1.5–4.5  $\times$  0.6–1.8 cm, papery, abaxially pale, pruinose, adaxially green, both surfaces villous, glabrescent, base attenuate, margin entire or irregularly glandular dentate, apex obtuse or acute; lateral veins ca. 5 each side of raised midvein. Male and female catkins 2.5–3.5 cm; rachis glabrous or subglabrous; bracts long obovate-elliptic, ca. 2.5 mm, ciliate, apex rounded or subtruncate. Male flower: glands 2, linear, adaxial gland slightly longer than abaxial gland; stamens 2, ca. 4 mm, free, glabrous. Female flower: adaxial gland linear; ovary ellipsoid, ca. 2.5 mm, glabrous, white pruinose; stipe ca. 0.5 mm; style purplish, ca. 1.5 mm, 2-cleft; stigma 2-lobed. Fl. Aug.

• Mountain slopes; ca. 3300 m. E Xizang.

**10. Sect. *Floccosae*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 470. 1998.

青藏矮柳组 *qing zang ai liu zu*

Shrubs low, usually less than 50(–100) cm tall. Catkins usually terminal or sometimes lateral, cylindrical, with leaflets at base. Male flower: stamens 2, distinct; adaxial and abaxial glands present (abaxial rarely absent). Female flower: adaxial gland only present, rarely a small abaxial gland; ovary pilose or glabrous, sessile or subsessile (except in a few species).

**Key based on male plants**

(*Salix jingdongensis* and *S. zayulica* unknown)



- 1a. Male flower with only an adaxial gland.
- 2a. Bracts glabrous ..... 97. *S. microphyta*
- 2b. Bracts adaxially densely white villous ..... 99. *S. vaccinioides*
- 1b. Male flower with adaxial and abaxial glands.
- 3a. Filaments glabrous.
- 4a. Filaments connate, connate in part, or free ..... 98. *S. kungmuensis*
- 4b. Filaments free.
- 5a. Catkin rachis pilose; leaf blade broadly obovate to ovate, margin entire or sparsely glandular serrate ..... 100. *S. resectoides*
- 5b. Catkin rachis glabrous; leaf blade elliptic or obovate-elliptic, sometimes suboblong, margin crenate ..... 96. *S. faxonianoides*
- 3b. Filaments pilose.
- 6a. Leaves abaxially floccose ..... 102. *S. floccosa*
- 6b. Leaves abaxially glabrous, or downy when young.
- 7a. Mature leaves adaxially sparsely pubescent, abaxially villous when young, becoming glabrous or glaucous ..... 104. *S. coggygia*
- 7b. Mature leaves adaxially glabrous or sparsely pilose when young.
- 8a. Filaments villous for proximal 3/4 to all their length; bracts pubescent; leaf blade obovate-elliptic, elliptic, or oblong, 2–5 × 1.5–2.5 cm ..... 105. *S. annulifera*
- 8b. Filaments pilose proximally; bracts pilose only at base; leaf blade obovate-elliptic, elliptic, or oblong, 1.5–3.5 × 1–1.8 cm ..... 101. *S. opsimantha*

#### Key based on female plants

- 1a. Ovary densely pilose, sometimes glabrescent in fruit.
- 2a. Ovary glabrescent in fruit or pilose at base ..... 101. *S. opsimantha*
- 2b. Ovary not glabrescent in fruit.
- 3a. Leaves abaxially floccose ..... 102. *S. floccosa*
- 3b. Leaves abaxially glabrous, or downy when young.
- 4a. Leaf blade obovate, adaxially pilose, abaxially pruinose ..... 104. *S. coggygia*
- 4b. Leaf blade obovate-elliptic, obovate-oblong, or oblanceolate, adaxially appressed villous or glabrous, abaxially densely villous or grayish white pubescent, glabrescent.
- 5a. Leaf blade obovate-oblong or oblanceolate, adaxially appressed villous, abaxially densely villous ..... 103. *S. zayulica*
- 5b. Leaf blade obovate-elliptic, adaxially glabrous, abaxially grayish white pubescent when young, glabrescent ..... 105. *S. annulifera*
- 1b. Ovary glabrous or pilose only at base.
- 6a. Catkin rachis glabrous; leaves elliptic or obovate-elliptic.
- 7a. Leaf margin dentate ..... 96. *S. faxonianoides*
- 7b. Leaf margin entire ..... 95. *S. jingdongensis*
- 6b. Catkin rachis pilose.
- 8a. Ovary pilose at base ..... 100. *S. resectoides*
- 8b. Ovary glabrous.
- 9a. Leaf blade ovate or suborbicular, margin entire ..... 99. *S. vaccinioides*
- 9b. Leaf blade ovate, obovate, oblong, or spatulate, margin dentate.
- 10a. Leaf margin conspicuously glandular crenate ..... 97. *S. microphyta*
- 10b. Leaf margin serrate only distally ..... 98. *S. kungmuensis*

#### Key based on vegetative characters

- 1a. Leaf blade broadly obovate-orbicular, ovate, or suborbicular, apex obtuse, rarely acute.
- 2a. Leaf blade pale abaxially.
- 3a. Leaf blade broadly obovate-orbicular, rust-colored or white pubescent when young, margin entire or crenate ..... 104. *S. coggygia*

- 3b. Leaf blade ovate to suborbicular, glabrous, margin entire ..... 99. *S. vaccinioides*
- 2b. Leaf blade greenish abaxially.
- 4a. Leaf blade obovate-elliptic, 2–5 × 1.5–2.5 cm, adaxially dull green, abaxially light green, remotely crenate-serrate ..... 105. *S. annulifera*
- 4b. Leaf blade broadly obovate to orbicular-elliptic, 1.5–4 × 1.2–2.5 cm, adaxially dull green, abaxially grayish green, or sparsely glandular serrate ..... 100. *S. resectoides*
- 1b. Leaf blade elliptic, ovate, or obovate, apex acute, rarely obtuse.
- 5a. Leaf blade floccose abaxially ..... 102. *S. floccosa*
- 5b. Leaf blade glabrous or downy abaxially, not floccose.
- 6a. Leaves appressed villous on both surfaces ..... 103. *S. zayulica*
- 6b. Leaves adaxially glabrous or pubescent along veins, abaxially glabrous or downy when young, glabrescent.
- 7a. Leaf margin conspicuously incurved glandular crenate, blade ovate, obovate, oblong, or spatulate, 1–2(–3) × 0.8–1.3(–2.2) cm ..... 97. *S. microphyta*
- 7b. Leaf margin entire, crenate, or remotely glandular dentate, not incurved, blade elliptic, obovate-elliptic, or oblong, longer and broader.
- 8a. Leaf margin entire ..... 95. *S. jingdongensis*
- 8b. Leaf margin dentate.
- 9a. Young branchlets pilose; leaf margin indistinctly sparsely glandular serrate ..... 101. *S. opsimantha*
- 9b. Young branchlets glabrous; leaf margin crenate or crenate-serrate.
- 10a. Leaf margin crenate or crenate serrate ..... 96. *S. faxonianoides*
- 10b. Leaf margin serrate distally ..... 98. *S. kungmuensis*

**95. *Salix jingdongensis*** C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 8. 1980.

景东矮柳 *jing dong ai liu*

Shrubs low, to 50 cm tall, glabrous throughout. Branchlets dull red; juvenile branchlets dirty brown when dried. Buds dull red, ovoid. Petiole 5–8 mm; leaf blade broadly elliptic, 2–3 × 1.5–1.8 cm, abaxially with whitish bloom, adaxially green, base broadly cuneate, margin entire, apex acute or mucronate; midvein raised abaxially, retuse adaxially; lateral veins 7 on each side of midvein. Flowering coetaneous. Male catkin unknown. Female catkin shortly cylindrical, ca. 1.5 × 0.5 cm; peduncle ca. 1 cm, with 1 or 2 leaflets at base; bracts yellowish green, obovate, ca. as long as or slightly longer than stipe, apex rounded-truncate, retuse. Female flower: adaxial gland shortly cylindrical, ca. 1/2 as long as stipe; ovary ovoid, ca. 2 mm; stipe ca. 1.2 cm; style short; stigmas 1, or slightly divided, or 2. Capsule unknown. Fl. May.

• Mountain slopes. C Yunnan (Jingdong Xian).

Similar to *Salix vaccinioides* but plants glabrous throughout; stipules absent; adaxial gland of female flower ca. 1/2 as long as stipe; stipe long, ca. 1.2 cm. The female flower is similar to that of sect. *Wilsonia*, but the plants differ in habit and other characteristics (although the male flower is unknown). *Salix jingdongensis* is provisionally placed in sect. *Floccosae*, but more specimens and further research are needed to verify its sectional placement.

**96. *Salix faxonianoides*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 194. 1974.

藏匐柳 *zang fu liu*

Shrubs low, to 40 cm tall. Branchlets supine or ascending, russet or dark brown. Petiole short; leaf blade elliptic or obovate-elliptic, sometimes suboblong, abaxially glaucous, glabrous, adaxially green, base rounded or cuneate, margin crenate or crenate-serrate, apex acute or obtuse. Flowering coetaneous. Catkins shortly cylindrical or elliptic; rachis glabrous or pilose; bracts broadly elliptic, slightly ciliate, both surfaces glabrous. Male flower: adaxial and abaxial glands usually 2- or 3-lobed, or abaxial gland 2-lobed, rarely entire; stamens 2; filaments distinct, glabrous; anthers purplish red. Female flower: adaxial gland long and broad, sometimes 2-cleft, abaxial gland sometimes 2-lobed or absent; ovary glabrous, sessile; style 2-cleft; stigma 2-lobed. Capsule narrowly ovoid or ovoid, ca. 5 mm. Fl. May, fr. Jun.

• Thickets on mountain slopes; 3600–4300 m. E Xizang, W Yunnan.

1a. Catkin rachis glabrous ..... 96a. var. *faxonianoides*

1b. Catkin rachis pilose ..... 96b. var. *villosa*

**96a. *Salix faxonianoides* var. *faxonianoides***

藏匐柳(原变种) *zang fu liu (yuan bian zhong)*

Catkin rachis glabrous.

• Thickets on mountain slopes; 3600–3700 m. E Xizang, W Yunnan.

**96b. *Salix faxonianoides* var. *villosa*** S. D. Zhao in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 8. 1980.

毛轴藏匐柳 *mao zhou zang fu liu*

Catkin rachis pilose.

• Thickets; 4000–4300 m. E Xizang, W Yunnan.

**97. *Salix microphyta*** Franchet, Nouv. Arch. Mus. Hist. Nat., ser. 2, 10: 83. 1887.

宝兴矮柳 *bao xing ai liu*

Shrubs low, to 30 cm tall; trunk rooting. Branchlets erect or ascending, dull brown, russet when young, slender; juvenile branchlets downy, glabrescent. Petiole ca. 1 cm, glabrous; leaf blade ovate, obovate, oblong, or spatulate, 1–2(–3) × 0.8–1.3 (–2.2) cm, abaxially greenish, glabrous, adaxially dull green, glabrous, slightly shiny, margin incurved glandular genate; veins slightly raised, reticulate. Flowering coetaneous. Catkins lateral, basally leafy. Male catkin 2–4 cm; peduncle with leaflets usually sparsely villous; rachis pilose; bracts obovate, glabrous, apex truncate. Male flower: glands adaxial; stamens 2; filaments downy proximally; anthers reddish, ovoid. Female catkin 2–4 cm, to 5 cm in fruit; bracts as in male catkin. Female flower: gland adaxial; ovary ovoid-cylindric, glabrous, sessile or subsessile; style entire or 2-lobed; stigma 2-cleft. Fl. Jul, fr. Aug–Sep.

• Thickets; 2300–3700 m. W Sichuan, W Yunnan.

**98. *Salix kungmuensis*** P. Y. Mao & W. Z. Li, Bull. Bot. Res., Harbin 6(2): 80. 1986.

孔目矮柳 *kong mu ai liu*

Shrubs low, to 50 cm tall. Juvenile branchlets fastigiata, crowded together at apex of branches, dark brown, glabrous. Buds dull yellow, oblong, slightly flat, glabrous. Petiole 3–8 mm, glabrous; leaf blade broadly oblong, 1–2 × 0.6–1.2 cm, woolly when young, glabrescent; base broadly cuneate or subrounded, margin serrate distally, apex slightly obtuse or subacute. Flowering coetaneous. Catkins at apex of branchlets. Male catkin ca. 1.5 cm × 6 mm; rachis pilose; bracts elliptic, ciliate. Male flower: glands 2; stamens 2; filaments partly connate or free, glabrous. Female catkin ca. 10 × 9 mm; rachis glabrous; bracts broadly elliptic or orbicular-obovate, glabrous at margin or loosely ciliate. Female flower: gland adaxial; ovary glabrous; stipe short; style ca. 2 mm, lobed; stigma 2-lobed, apex subtruncate, sometimes shallowly undulate. Fl. Jul.

• 3500–3800 m. Yunnan (Gongshan Drungzu Nuzu Zizhixian).

A. K. Skvortsov indicates that this species may be the same as *Salix paraflabellaris*.

**99. *Salix vaccinioides*** Handel-Mazzetti, Symb. Sin. 7: 63. 1929.

乌饭叶矮柳 *wu fan ye ai liu*

Shrubs low, to 30 cm tall. Branchlets dull brown, glabrous, shiny. Stipules oblique or broadly ovate; petiole 2–5(–6) mm, glabrous; leaf blade ovate or ovate to suborbicular, 1–2.5 × 0.9–2 cm, abaxially glaucous, glabrous, adaxially dull green, base rounded, margin entire, usually revolute, apex obtuse. Male catkin terete, 2–2.8 cm × 4–7 mm, with 2 or 3 leaflets at base; rachis downy; bracts brown, obovate-oblong, abaxially pilose, adaxially densely white villous. Male flower: gland

adaxial; stamens 2; filaments white villous at base; anthers yellow, ovoid-oblong. Female catkin 2.5–4.5 cm × ca. 4 mm, with 3–5 normal leaflets at base; rachis brownish yellow, pilose; bracts brownish purple, suborbicular, glabrous. Female flower: adaxial gland terete, ca. as long as bracts. style 2-cleft; stigma short. Capsule glabrous. Fl. Apr, fr. May–Jun.

• Mountain slopes; 2500–4000 m. E Xizang, NW Yunnan.

**100. *Salix resectoides*** Handel-Mazzetti, Symb. Sin. 7: 80. 1929.

藏截苞矮柳 *zang jie bao ai liu*

*Salix floccosa* Burkill var. *leiogyna* P. Y. Mao & W. Z. Li; *S. heterostemon* Floderus.

Shrubs low, to 50 cm tall, rarely taller; trunk stout, rooting. Branchlets russet; juvenile branchlets pilose, glabrescent. Buds ovoid, ca. 5 mm, glabrous. Petiole to 1.3 cm; leaf blade broadly obovate to orbicular-elliptic, 1.5–4 × 1.2–2.5 cm, abaxially grayish green, pruinose, pilose when young, glabrescent, adaxially dull green, shiny, pilose along midvein, base broadly cuneate, margin entire or sparsely glandular serrate, apex or both ends obtuse. Flowering coetaneous. Catkins terminal, terete, 1.5–3 cm, with leaflets at base; rachis pilose; bracts obovate, glabrous or sparsely ciliate, apex obtuse or subtruncate. Male flower: glands adaxial and abaxial; stamens 2, glabrous. Female flower: adaxial gland large, divided or entire, abaxial gland very small or absent; ovary ovoid, glabrous or pilose at base, sessile. Fl. Jun, fr. Aug.

• High mountains; 3500–4200 m. E Xizang, NW Yunnan.

Similar to *Salix oreinoma* but leaf blade broadly obovate to orbicular-elliptic and filaments glabrous. Similar also to *S. annulifera* but ovary glabrous.

**101. *Salix opsimantha*** C. K. Schneider in Sargent, Pl. Wilson. 3: 63. 1916.

迟花柳 *chi hua liu*

*Salix faxoniana* C. K. Schneider.

Shrubs small, to 50 cm tall. Branchlets russet when young, sparsely villous, when mature dull brown, glabrous. Buds oblong, glabrous. Petiole 0.5–1.5 cm, puberulent; leaf blade obovate-elliptic, elliptic, or oblong, 1.5–3.5 × 1–1.8 cm, abaxially greenish, white villous when young, glabrescent, adaxially dull green, shiny, glabrous, or pubescent along midvein, base broadly cuneate or slightly obtuse, margin indistinctly sparsely glandular serrate, apex acute or obtuse; veins conspicuous. Flowering coetaneous. Male catkin terminal, 2–3 cm, with leaflets at base; rachis pubescent; bracts oblong, ca. 1/2 as long as filaments, ciliate, pubescent at base, apex obtuse-rounded. Male flower: glands adaxial and abaxial; stamens 2, ca. 5 mm, basally pilose. Female catkin similar to male; bracts oblong, margin irregularly dentate, apex obtuse or rounded-truncate. Female flower: gland adaxial; ovary ovoid-cylindric, pubescent, glabrescent in fruit except

at base, sessile; style 2-cleft; stigma 2-lobed. Fl. Jul, fr. Aug–Sep.

• Mountains; 3200–4800 m. W Sichuan, E Xizang, Yunnan. In FRPS, the species described under *Salix opsimantha* is, in fact, *S. oreinoma*, and vice versa.

- 1a. Bracts pilose only at base abaxially, ciliate; branchlets and young leaves pilose ..... 101a. var. *opsimantha*  
1b. Bracts of male catkin glabrous; bracts of female catkin pilose on both surfaces; branchlets and young leaves yellowish downy ..... 101b. var. *wawashanica*

**101a. *Salix opsimantha* var. *opsimantha***

迟花柳(原变种) *chi hua liu* (yuan bian zhong)

Branchlets and young leaves pilose. Bracts pilose only at base abaxially, ciliate.

• Mountains; 3600–4800 m. W Sichuan, E Xizang, NW Yunnan.

**101b. *Salix opsimantha* var. *wawashanica*** (P. Y. Mao & P. X. He) G. Zhu, *Novon* 8: 465. 1998.

娃娃山柳 *wa wa shan liu*

*Salix oreinoma* C. K. Schneider var. *wawashanica* P. Y. Mao & P. X. He, *Acta Bot. Yunnan.* 9: 47. 1987.

Branchlets and young leaves yellowish downy. Bracts of male catkin glabrous; bracts of female catkin pilose on both surfaces.

• Mountain slopes; 3200–4700 m. Yunnan (Jingdong Xian, Yangbi Xian).

**102. *Salix floccosa*** Burkill in F. B. Forbes & Hemsley, *J. Linn. Soc., Bot.* 26: 529. 1899.

丛毛矮柳 *cong mao ai liu*

Shrubs low, to 50 cm tall, much branched. Branchlets dull brown, darker when mature, glabrous; juvenile branchlets downy. Buds russet, ovoid, 3–4 mm, glabrous. Petiole ca. 6 mm; leaf blade obovate or obovate-elliptic, 2–5 × 1–2 cm, abaxially grayish white villous when young, becoming floccose or glabrous, adaxially green, glabrous, often shiny, base narrow, margin entire or serrulate, apex obtuse. Flowering coetaneous. Catkins terminal. Male catkin 1–3 cm; rachis downy; bracts obovate, abaxially glabrous, adaxially sparsely villous, apex obtuse-rounded. Male flower: abaxial gland thinner than adaxial gland; stamens 2, long pubescent at base. Female catkin ca. 2 cm; bracts obovate, both surfaces pilose, apex obtuse-rounded. Female flower: gland adaxial, oblong; ovary ovoid, densely downy, sessile, style conspicuous, 2-cleft; stigma 2-lobed. Fl. Jul, fr. Aug–Sep.

• Thickets; 3600–4000 m. E Xizang, NW Yunnan.

**103. *Salix zayulica*** C. Wang & C. F. Fang, *Acta Phytotax. Sin.* 17(4): 108. 1979.

察隅矮柳 *cha yu ai liu*

Shrubs low, to 30 cm tall; trunk ascending, rooting. Branchlets purple, glabrous; juvenile branchlets densely villous. Petiole short; leaf blade obovate-oblong or oblong-elliptic, rarely oblanceolate, 2–4.5 × 0.7–1.2 cm, abaxially grayish white, densely appressed villous, adaxially dull green, appressed villous, base cuneate, margin entire or indistinctly glandular dentate, apex acute; lateral veins 6 or 7 on each side of midvein, raised abaxially, impressed adaxially. Male catkin unknown. Fruiting catkin terminal, ca. 4 cm × 7–8 mm; bracts elliptic, ca. 1/2 as long as ovary, abaxially and marginally densely long white pubescent. Female flower: adaxial gland ovate, apex red, truncate; ovary ovoid, ca. 2 mm, densely downy, sessile; style red, ca. 1 mm, 2-parted; stigma 2-cleft, with elliptic or subcapitate lobes. Capsule ca. 3 mm. Fr. Jul.

• Mountain slopes; ca. 3600 m. SE Xizang.

**104. *Salix coggygia*** Handel-Mazzetti, *Symb. Sin.* 7: 79. 1929.

怒江矮柳 *nu jiang ai liu*

Shrubs low, to 50 cm tall. Branchlets dull brown, glabrous, when young gray or brownish tomentose. Buds brown, ovoid, 4–7 mm. Stipules deltoid-ovate, pilose; petiole 2–5 mm, with dense hairs; leaf blade obovate-orbicular, 1.5–4.5 × 1.5–3.5 cm, abaxially pale, glaucous, adaxially green, when young densely white villous abaxially, glabrescent, adaxially densely rust-colored pubescent, both ends obtuse-rounded, margin entire, rarely sparsely serrate near apex, apex often with a pleated mucro. Flowering coetaneous. Catkins terminal, 2–3 cm, densely flowered, with leaflets at base; rachis tomentose; bracts obovate-oblong, ca. 3 mm, pilose, apex obtuse or subtruncate. Male flower: adaxial and abaxial glands cylindrical; stamens 2, ca. 6 mm; filaments pilose proximally; anthers yellow, ovoid. Female flower: ovary ovoid, densely grayish white pubescent, sessile; style 2-cleft; stigma 2-lobed. Fl. Jun, fr. Jul.

• Among shrubs; 3400–4700 m. E Xizang, NW Yunnan.

**105. *Salix annulifera*** C. Marquand & Airy-Shaw, *J. Linn. Soc., Bot.* 48: 222. 1929.

环纹矮柳 *huan wen ai liu*

Shrubs low, to 50 cm tall. Branches erect or ascending, stout; young branchlets brown, blackish when dried; juvenile branchlets white pubescent, glabrescent. Petiole to 1.5 cm, pubescent; leaf blade obovate-elliptic, 2–5(–8) × 1.5–2.5(–3.5) cm, abaxially light green, at first young grayish white downy, glabrescent, adaxially dull green, glabrous, base cuneate, rarely obtuse-rounded, margin remotely crenate, apex obtuse-rounded. Flowering coetaneous. Catkins terminal. Male catkin 2–4 cm; rachis pubescent; bracts obovate-oblong, ca. 1/2 as long as stamens, densely pubescent, margin slightly

irregularly dentate or densely dentate, apex subtruncate. Male flower: glands adaxial and abaxial; stamens 2, 5–6 mm; filaments downy for 3/4 to full length. Female catkin ca. 3.5 cm, to 11 cm in fruit; bracts obovate-oblong, sparsely pubescent, abaxially with denser hairs, apex retuse. Female flower: gland adaxial; ovary grayish white pubescent; style conspicuous, entire or 2-lobed; stigma 1, 2-cleft or 2. Fl. Jul–Aug, fr. Aug.

• Among shrubs on mountain slopes, thickets; 3400–4100 m. E Xizang, NW Yunnan.

1a. Filaments and bracts glabrous .... 105d. var. *glabra*

1b. Filaments and bracts pilose.

2a. Leaf blade ca. 8 × 3.5 cm; fruiting catkin to 11 cm ..... 105c. var. *macroula*

2b. Leaf blade 2–5 cm; fruiting catkin to 7 cm.

3a. Bract margin slightly and irregularly dentate ..... 105a. var. *annulifera*

3b. Bract margin densely dentate ..... 105b. var. *dentata*

**105a. *Salix annulifera* var. *annulifera***

环纹矮柳(原变种) huan wen ai liu (yuan bian zhong)

Bract margin slightly and irregularly dentate. fr. May–Jun.

• Among shrubs on mountain slopes; 3400–4000 m. E Xizang, NW Yunnan.

Similar to *Salix cogygia* but leaf blade neither rusty brown pubescent adaxially nor white villous abaxially when immature, not pruinose when mature, margin entire, rarely remotely dentate; bracts slightly and irregularly dentate at margin, subtruncate at apex; filaments pubescent for 3/4 to all their length.

**105b. *Salix annulifera* var. *dentata*** S. D. Zhao in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 3. 1980.

齿苞矮柳 chi bao ai liu

*Salix rivulicola* P. Y. Mao & W. Z. Li.

Bract margin densely dentate.

• Thickets; ca. 4000 m. NW Yunnan.

**105c. *Salix annulifera* var. *macroula*** C. Marquand & Airy-Shaw, J. Linn. Soc., Bot. 48: 222. 1929.

匙叶矮柳 chi ye ai liu

Petiole long; leaf blade large, ca. 8 × 3.5 cm. Fruiting catkin to 11 cm.

• Among shrubs on mountain slopes; 3400–4000 m. E Xizang, NW Yunnan.

**105d. *Salix annulifera* var. *glabra*** P. Y. Mao & W. Z. Li, Acta Bot. Yunnan. 9: 49. 1987.

五毛矮柳 wu mao ai liu

Bracts glabrous, apex entire. Male flower: Filaments glabrous.

• Mountains; ca. 4100 m. NW Yunnan (Dêqên Xian).

**11. Sect. *Lindleyanae*** C. K. Schneider in Sargent, Pl. Wilson. 3: 144. 1916.

青藏垫柳组 qing zang dian liu zu

Sect. *Serpylla* C. K. Schneider.

Shrubs procumbent, creeping, or cushion-shaped. Stems rooting. Leaves small, elliptic to lanceolate, margin entire or dentate. Catkins terminal or lateral, capitate, few flowered. Male flower: adaxial and abaxial glands present; stamens 2, distinct. Female flower: only adaxial gland present, rarely with adaxial and abaxial glands; ovary glabrous or pilose, sessile or stipitate.

**Key based on male plants**

(*Salix glareorum* unknown)

1a. Flowering precocious ..... 110. *S. clathrata*

1b. Flowering coetaneous.

2a. Filaments pilose proximally.

3a. Juvenile branchlets densely yellowish brown hirsute ..... 111. *S. hirticaulis*

3b. Juvenile branchlets not yellowish brown hirsute.

4a. Bracts glabrous on both surfaces, or sparsely pilose only at base ..... 125. *S. ludingensis*

4b. Bracts abaxially villous, adaxially glabrous.

5a. Juvenile branchlets villous; leaf blade ovate-oblong or obovate-oblong, abaxially glaucous and sericeous ..... 115. *S. pilosomicrophylla*

5b. Juvenile branchlets coarsely hispid; leaf blade obovate or elliptic, abaxially greenish, with long hairs along veins, pubescent when young ..... 112. *S. kamanica*

2b. Filaments glabrous or pilose at base.

6a. Filaments pilose at base.

7a. Leaf blade elliptic, obovate-elliptic, or ovate.

8a. Leaf blade ca. 8 × 3.5(–5.5) mm ..... 109. *S. crenata*

8b. Leaf blade (5–)10(–20) mm.

9a. Juvenile branchlets with sparse, long hairs or glabrous; catkin ovate-orbicular; bracts glabrous ..... 107. *S. brachista*

- 9b. Juvenile branchlets densely white villous; catkin cylindrical; bracts pilose adaxially and at margin ..... 120. *S. kangdingensis*
- 7b. Leaf blade oblong, obovate-oblong, or obovate-lanceolate.
  - 10a. Leaf blade 12–16 × 4–6 mm ..... 121. *S. lindleyana*
  - 10b. Leaf blade 4–10 × 1–4 mm.
    - 11a. Catkin few flowered; leaf blade oblong, cuneate at both ends, margin entire ..... 124. *S. gyirongensis*
    - 11b. Catkin many flowered; leaf blade obovate-oblong, base cuneate, margin dentate distally ..... 116. *S. serpyllum*
- 6b. Filaments glabrous.
  - 12a. Leaves very small, usually less than 4 mm ..... 117. *S. ovaticromyphylla*
  - 12b. Leaves more than 4 mm.
    - 13a. Leaf margin entire, or dentate on distal part of branchlets (dentate in *S. piptotricha* and *S. paraflabellaris*).
      - 14a. Leaf blade elliptic, ovate-elliptic or ovate-elliptic, margin entire
        - 15a. Petiole 3–4 mm ..... 114. *S. souliei*
        - 15b. Petiole 1–2 mm ..... 123. *S. scopulicola*
      - 14b. Leaf blade obovate, obovate-orbicular, or elliptic, margin entire or dentate.
        - 16a. Bracts obovate ..... 126. *S. piptotricha*
        - 16b. Bracts ovate-oblong ..... 118. *S. paraflabellaris*
    - 13b. Leaf margin dentate (sometimes subentire in *S. calyculata* var. *gongshanica*).
      - 17a. Leaf margin in distal 1/2 of leaves with 3–5 deeply indented teeth, entire proximally ..... 119. *S. oreophila*
      - 17b. Leaf margin crenate or subentire.
        - 18a. Bracts sparsely ciliate ..... 108. *S. anticecrenata*
        - 18b. Bracts glabrous.
          - 19a. Catkin ca. 1.5 cm, many flowered; leaf blade abaxially greenish, margin dentate ..... 113. *S. flabellaris*
          - 19b. Catkin ca. 5 mm, few flowered; leaf blade abaxially pale, margin indistinctly dentate or subentire ..... 106. *S. calyculata*

**Key based on female plants**

(*Salix kangdingensis*, *S. pilosomicromyphylla*, and *S. scopulicola* unknown)

- 1a. Flowering precocious ..... 110. *S. clathrata*
- 1b. Flowering coetaneous.
  - 2a. Ovary pilose.
    - 3a. Bracts abaxially sparsely pilose ..... 126. *S. piptotricha*
    - 3b. Bracts glabrous.
      - 4a. Leaf blade ovate-oblong ..... 124. *S. gyirongensis*
      - 4b. Leaf blade obovate or elliptic ..... 125. *S. ludingensis*
  - 2b. Ovary glabrous.
    - 5a. Ovary long stipitate.
      - 6a. Leaf blade cuneate at base, margin remotely regularly glandular serrate ..... 109. *S. crenata*
      - 6b. Leaf blade obtuse-rounded or broadly cuneate at both ends, margin remotely dentate distally ..... 106. *S. calyculata*
    - 5b. Ovary sessile, subsessile, or shortly stipitate (stipe relatively prominent in fruit).
      - 7a. Leaves very small, usually less than 4 mm ..... 117. *S. ovaticromyphylla*
      - 7b. Leaves very large, more than 4 mm.
        - 8a. Leaf margin entire.
          - 9a. Leaf blade linear ..... 122. *S. glareorum*
          - 9b. Leaf blade not linear.
            - 10a. Leaf blade obovate-oblong, oblong, or obovate-lanceolate ..... 121. *S. lindleyana*
            - 10b. Leaf blade elliptic or ovate-elliptic ..... 114. *S. souliei*
        - 8b. Leaf margin dentate.
          - 11a. Leaf margin with 2–4 teeth on each side distally.
            - 12a. Catkin capitate; leaf blade oblong, obovate, or cuneate, margin with 3–5(–7) deeply indented teeth ..... 119. *S. oreophila*

- 12b. Catkin capitate or ellipsoid, conspicuously elongated in fruit, to 5 cm; leaf blade obovate-oblong or long elliptic, margin with 7 or 9 fairly prominent, remote, glandular saw teeth ..... 116. *S. serpyllum*
- 11b. Leaf margin dentate or with more than 4 teeth on each side distally, rarely entire.
- 13a. Young branchlets densely yellowish brown hirsute ..... 111. *S. hirticaulis*
- 13b. Young branchlets glabrous or with grayish white hairs.
- 14a. Juvenile branchlets hispid ..... 112. *S. kamanica*
- 14b. Juvenile branchlets glabrous or villous.
- 15a. Young leaves glabrous.
- 16a. Leaf blade spatulate-obovate, rarely elliptic; bracts oblong 113. *S. flabellaris*
- 16b. Leaf blade elliptic or obovate-elliptic; bracts orbicular 108. *S. anticecrenata*
- 15b. Young leaves pilose, or at least pilose abaxially.
- 17a. Bracts obovate; young leaves glabrous adaxially ..... 107. *S. brachista*
- 17b. Bracts ovate-oblong; young leaves densely grayish white villous ..... 118. *S. paraflabellaris*

### Key based on vegetative characters

- 1a. Leaves usually less than 5 mm.
- 2a. Leaf margin with a few conspicuous teeth in distal 1/2, proximally entire.
- 3a. Leaf blade obovate, ca. 3(–7) mm, green on both surfaces, base cuneate or rounded-cuneate, apex truncate and deeply indented with 3–5 teeth ..... 119. *S. oreophila*
- 3b. Leaf blade obovate-oblong or long elliptic, 4–10 × 1–4 mm, base attenuate, margin distally with a few remote, glandular saw teeth, apex obtuse ..... 116. *S. serpyllum*
- 2b. Leaf margin entire.
- 4a. Leaves abaxially slightly glaucous, sericeous, 3–5(–7) mm ..... 115. *S. pilosomicrophylla*
- 4b. Leaves abaxially greenish, glabrous, usually ca. 4 mm ..... 117. *S. ovatomicrophylla*
- 1b. Leaves usually more than 5 mm.
- 5a. Leaf margin entire or margin of some leaves with inconspicuous teeth (usually dentate in *S. piptotricha* and *S. paraflabellaris*).
- 6a. Leaves abaxially sericeous ..... 115. *S. pilosomicrophylla*
- 6b. Leaves abaxially sparsely pubescent or villous when young.
- 7a. Leaves greenish or slightly gray.
- 8a. Leaf blade linear or ovate-oblong.
- 9a. Leaves linear ..... 122. *S. glareorum*
- 9b. Leaves ovate-oblong.
- 10a. Leaf base attenuate ..... 124. *S. gyirongensis*
- 10b. Leaf base obtuse or rounded ..... 123. *S. scopulicola*
- 8b. Leaf blade obovate, elliptic, or ovate.
- 11a. Juvenile branchlets hispid ..... 112. *S. kamanica*
- 11b. Juvenile branchlets white villous.
- 12a. Juvenile branchlets densely pilose; leaf blade elliptic or ovate ..... 120. *S. kangdingensis*
- 12b. Juvenile branchlets sparsely pilose; leaf blade obovate, rarely elliptic.
- 13a. Leaves abaxially pale, villous ..... 126. *S. piptotricha*
- 13b. Leaves abaxially greenish, villous at first, later glabrescent ..... 125. *S. ludingensis*
- 7b. Leaves abaxially pale or pruinose.
- 14a. Leaf blade obovate-oblong, oblong, or obovate-lanceolate ..... 121. *S. lindleyana*
- 14b. Leaf blade elliptic, obovate-elliptic, or obovate.
- 15a. Trunk stout, with numerous branches and appearing fencelike ..... 110. *S. clathrata*
- 15b. Trunk relatively slender, few branched, not appearing fencelike.
- 16a. Leaf blade elliptic or ovate-elliptic, margin entire ..... 114. *S. souliei*
- 16b. Leaf blade obovate or obovate-elliptic, margin entire or glandular crenate 118. *S. paraflabellaris*
- 5b. Leaf margin dentate.
- 17a. Leaf margin with teeth only at apex, entire proximally.

- 18a. Leaf blade oblong or obovate, base cuneate, apex acute, shortly acuminate, or slightly obtuse, deeply indented with 3–5(–7) teeth ..... 119. *S. oreophila*
- 18b. Leaf blade obovate-oblong or long elliptic, base attenuate, apex obtuse, sometimes sparsely glandular serrate ..... 116. *S. serpyllum*
- 17b. Leaf margin entire or with numerous teeth distally and entire proximally.
  - 19a. Leaf margin dentate distally, entire or remotely dentate proximally.
    - 20a. Juvenile branchlets yellowish brown hispidulous ..... 111. *S. hirticaulis*
    - 20b. Juvenile branchlets not yellowish brown hispidulous.
      - 21a. Juvenile branchlets coarsely hirsute; leaf blade obovate or elliptic, ca. 10 × 5 mm ..... 112. *S. kamanica*
      - 21b. Juvenile branchlets sparsely villous or glabrous; leaf blade elliptic or obovate-elliptic, ca. 15 × 7 mm ..... 108. *S. anticecrenata*
  - 19b. Leaf margin dentate.
    - 22a. Leaves abaxially pale or pruinose ..... 106. *S. calyculata*
    - 22b. Leaves abaxially greenish.
      - 23a. Leaf blade spatulate-obovate or elliptic ..... 113. *S. flabellaris*
      - 23b. Leaf blade elliptic, obovate-elliptic, or ovate.
        - 24a. Leaf blade ovate, ca. 8 × 3.5(–5) mm, base cuneate ..... 109. *S. crenata*
        - 24b. Leaf blade elliptic, obovate-elliptic, or ovate, (5–)10(–20) × 4–6 mm, base broadly cuneate ..... 107. *S. brachista*

**106. *Salix calyculata*** J. D. Hooker ex Andersson, J. Linn. Soc., Bot. 4: 55. 1860.

长柄垫柳 *chang bing dian liu*

Shrubs low; trunk slightly erect. Petiole ca. 1/4–1/3 as long as leaf blade; leaf blade spatulate-ovate, (5–)8–15 × (5–)6–9 mm, abaxially slightly white, pilose when young, adaxially green, glabrous, base cuneate, margin crenate, apex rounded. Male catkin broadly ellipsoid; bracts ligulate-obovate, glabrous. Female catkin ellipsoid; bracts as in male catkin. Female flower: gland adaxial, ca. 1/2 as long as bracts; ovary ellipsoid, slightly obovoid, or ovoid, glabrous. Capsule glabrous. Gravelly places, rock crevices; 3400–4700 m. S Xizang, NW Yunnan [Bhutan, Sikkim].

1a. Leaves 8–15 × 6–9 mm; stipe longer than ovary; ovary ellipsoid or slightly obovoid ..... 106a. var. *calyculata*

1b. Leaves 5–12 × 5–8 mm; stipe shorter than ovary; ovary ovoid .... 106b. var. *gongshanica*

**106a. *Salix calyculata* var. *calyculata***

长柄垫柳(原变种) *chang bing dian liu* (*yuan bian zhong*)

*Salix calyculata* var. *glabrifolia* Handel-Mazzetti.

Leaf blade 8–15 × 6–9 mm. Female flower: ovary ellipsoid or slightly obovoid; stipe longer than ovary.

Gravelly places; 3400–3600 m. S Xizang (Yadong Xian) [Bhutan, Sikkim].

**106b. *Salix calyculata* var. *gongshanica*** C. Wang & C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 4. 1980.

贡山长柄垫柳 *gong shan chang bing dian liu*

Leaf blade small, 5–12 × 5–8 mm. Female flower: ovary ovoid; stipe shorter than ovary.

• Rock crevices; 4100–4700 m. NW Yunnan.

**107. *Salix brachista*** C. K. Schneider in Sargent, Pl. Wilson. 3: 145. 1916.

小垫柳 *xiao dian liu*

Shrubs cushion-shaped; trunk and lateral branches creeping, yellowish brown. Branchlets suberect, russet, glabrous when mature. Buds ovoid, small, glabrous. Petiole ca. 3 mm, densely villous when young; leaf blade elliptic, obovate-elliptic, or ovate, (5–)10(–20) × 4–8 mm, abaxially greenish and densely appressed villous, adaxially green, glabrous, base broadly cuneate, margin sparsely glandular serrate distally, remotely dentate or entire proximally, or all entire, apex acute; veins raised abaxially, impressed adaxially. Flowering coetaneous. Catkins ovoid-globose, ca. 1 cm, ca. 10-flowered; rachis densely villous; bracts yellow, obovate, glabrous, apex truncate, obtuse-rounded, or coarsely dentate. Male flower: adaxial gland terete, longer than abaxial gland, short and broad, sometimes 2-parted; stamens 2, ca. 3 mm, ca. 3 × as long as bracts, villous at base; anthers dull yellow, ellipsoid, small. Female flower: gland terete, adaxial; ovary ovoid, glabrous or pilose, sessile; style 2-lobed; stigma ovoid, 2-lobed. Capsule long ovoid, ca. 4 mm, glabrous. Fl Jun–Jul, fr. Jul–Aug.

• Mountain slopes, thickets; 2600–3900 m. W Sichuan, E Xizang, W Yunnan.

1a. Leaf margin entire ..... 107c. var. *integra*



1b. Leaf margin sparsely glandular serrate distally, remotely dentate or entire proximally.

- 2a. Ovary glabrous ..... 107a. var. *brachista*  
 2b. Ovary pilose ..... 107b. var. *pilifera*

**107a. *Salix brachista* var. *brachista***

小垫柳(原变种) xiao dian liu (yuan bian zhong)  
*Salix pominica* C. Wang & P. Y. Fu.

Leaf margin sparsely glandular serrate distally, remotely dentate or entire proximally. Female flower: ovary glabrous.

- Mountain slopes; 2600–3900 m. W Sichuan, E Xizang, NW Yunnan.

**107b. *Salix brachista* var. *pilifera*** N. Chao in C. Wang & C. F. Fang, *Acta Phytotax. Sin.* 17 (4): 109. 1979.

毛果小垫柳 mao guo xiao dian liu

Female flower: ovary pilose. Fl. and fr. Jun–Jul.

- Mountain slopes; 3300–3500 m. E Xizang.

**107c. *Salix brachista* var. *integra*** C. Wang & C. F. Fang in C. Wang & al., *Bull. Bot. Lab. N. E. Forest. Inst., Harbin* 9: 4. 1980.

全缘小垫柳 quan yuan xiao dian liu

Leaf margin entire.

- Thickets on mountain slopes. W Yunnan.

**108. *Salix anticecrenata*** Kimura in H. Ohashi, *Fl. E. Himal., Third Rep.* 14. 1975.

圆齿垫柳 yuan chi dian liu

Shrubs cushion-shaped, to a few cm tall. Petiole ca. 1 mm; leaf blade elliptic or obovate-elliptic, ca. 1.5 cm × 7 mm, abaxially greenish, both surfaces subglabrous, adaxially green, slightly wrinkled, base cuneate, margin crenate distally, apex acute; lateral veins 4 on each side of midvein. Flowering coetaneous or serotinous.

Catkins terminal, ellipsoid-capitate, 5- or 6-flowered; bracts usually orbicular, nearly as long as filaments, submembranous, glabrous, sparsely ciliate, 3-veined. Male flower: glands adaxial and abaxial; stamens 2, distinct, glabrous, 2–2.5 mm; anthers yellow, ellipsoid. Female flower: gland adaxial, ca. as long as stipe or slightly shorter; ovary narrowly ovoid, 1.3–1.5 mm, glabrous, shortly stipitate; style short, 2-cleft; stigma 2-lobed.

Mountain slopes; 3300–4200 m. W Sichuan, Xizang, NW Yunnan [Nepal].

**109. *Salix crenata*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, *Novon* 8: 468. 1998.

锯齿叶垫柳 ju chi ye dian liu

Shrubs cushion-shaped; trunk dull brown, short, twisted, rooting. Branchlets yellowish brown; young branchlets dense, short; juvenile branchlets sparsely pubescent, glabrescent. Buds ovoid, small, glabrous. Leaves crowded, covering branchlets; petiole ca. 4 mm; leaf blade ovate, ca. 8 × 3.5(–5) mm, leathery, abaxially greenish, villous when young, adaxially green, glabrous, wrinkled, shiny, base cuneate, margin with loosely and regularly spaced, glandular saw teeth, apex acute; midvein raised abaxially, impressed adaxially. Catkins very small, ca. 5-flowered; bracts yellowish green, obovate, membranous, marginally and adaxially pubescent at base, apex rounded. Male flower: adaxial gland cylindric, abaxial gland thinner than adaxial gland, sometimes 2-lobed; stamens 2, ca. 3.5 mm, ca. 3 × as long as bracts; filaments pubescent at base; anthers yellow. Female flower: adaxial gland cylindric, nearly as long as stipe; ovary cylindric, ca. 3 mm, glabrous, ca. as long as bracts, long stipitate; style short, 2-parted; stigma 2-lobed. Capsule long ovoid. Fl. Jul, fr. Aug–Sep.

- Thickets, rock crevices; 4300–4800 m. E Xizang, NW Yunnan.

**110. *Salix clathrata*** Handel-Mazzetti, *Symb. Sin.* 7: 86. 1929.

栅枝垫柳 zha zhi dian liu

*Salix clathrata* var. *rockiana* Handel-Mazzetti.

Shrubs procumbent; trunk and branches spreading, not rooting, stout, many branched, appearing fencelike, dull brown. Young branchlets russet, shortly hirsute, glabrescent. Buds ovoid, ca. 3 mm, sparsely pubescent. Petiole red, 4(–7) mm; leaf blade elliptic or obovate, 1.5(–3) × 1(–1.5) cm, leathery, abaxially grayish white, with bloom, glabrescent, adaxially bright green, glabrous, wrinkled, shiny, both ends subrounded, margin entire, revolute; veins raised abaxially, conspicuously impressed adaxially. Flowering precocious. Catkins ellipsoid, ca. 6 × 3 mm, densely flowered; peduncle very short, with 2 or 3 leaflets; rachis stout, pubescent; bracts purplish red distally, obovoid, abaxially and marginally sparsely villous. Male flower: adaxial gland cylindric, abaxial gland broad and short; stamens 2, ca. 3 mm, ca. 3 × as long as bracts, basally villous; anthers red. Fruiting catkin to 2 cm. Female flower: adaxial gland cylindric; ovary ovoid, glabrous, sessile; style conspicuous, 2-cleft; stigma 2-lobed. Capsule narrowly ovoid, ca. 4 mm; stipe short or absent. Fl. Jul, fr. Aug–Sep.

- Rocks; ca. 4000 m. W Sichuan, Xizang, NW Yunnan.

A. K. Skvortsov indicates that this species resembles *Salix sclerophylla* and might be better placed in sect. *Sclerophyllae*.

**111. *Salix hirticaulis*** Handel-Mazzetti, *Symb. Sin.* 7: 84. 1929.

毛枝垫柳 mao zhi dian liu

Shrubs procumbent, to 3 cm tall; trunk creeping, russet, glabrous. Juvenile branchlets slightly erect, densely

yellowish brown hispidulous-hirsute. Petiole present; leaf blade obovate-oblong or oblong or orbicular, 4–14 × 1.5–5 mm, abaxially grayish green, glabrous, adaxially green, glabrous, base cuneate, margin glandular serrate distally, entire proximally or throughout, apex acute or obtuse. Flowering coetaneous. Catkins terminal. Male catkin capitate, few flowered; rachis yellowish brown hispidulous; bracts yellowish green, ovate, ca. 1/2 as long as filaments, glabrous or sparsely ciliate, apex subacute. Male flower: glands 2, cylindrical; stamens 2; filaments pilose proximally; anthers globose. Female catkin ellipsoid, with more flowers than male catkin; bracts ca. as long as ovary, glabrous, margin sometimes irregularly sinuate, apex rounded or truncate. Female flower: gland adaxial; ovary long ovoid, glabrous, shortly stipitate; style very short, 2-cleft; stigma 2-lobed. Fl. Jun–Jul.

- Rock crevices; above 3500 m. NW Yunnan.

Similar to *Salix oreophila* but juvenile branchlets and catkin rachis yellowish brown, hispidulous; leaf blade shallowly dentate at margin, apex obtuse.

**112. *Salix kamanica*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 196. 1974.

卡马垫柳 ka ma dian liu

Shrubs cushion-shaped, creeping, much branched. Branches dull purple or dull brown; juvenile branchlets grayish white hispid, glabrescent. Petiole very short; leaf blade obovate or elliptic, ca. 10 cm × 5 mm, abaxially greenish, sparsely long pubescent along veins, densely pubescent when young, adaxially green, subglabrous, base obtuse, margin entire or crenate distally, apex obtuse or acute. Flowering coetaneous. Catkins terminal. Male catkin ca. 10 × 7 mm; rachis densely pubescent; bracts narrowly ovate or suboblong-elliptic, abaxially with long hairs, ciliate, adaxially glabrous, apex subtruncate, rounded, or irregularly nicked. Male flower: adaxial gland usually broad and short, abaxial gland sometimes 2-cleft, 1/3–1/2 as long as ovary; stamens 2, distinct, basally villous. Female flower: adaxial gland linear, ca. 3 × as long as stipe; ovary glabrous, shortly stipitate; style very short, 2-cleft; stigma 2-lobed. Fl. Jun–Jul, fr. Aug–Sep.

- Mountain slopes; 4000–4200 m. E Xizang, NW Yunnan.

**113. *Salix flabellaris*** Andersson, J. Linn. Soc., Bot. 4: 54. 1860.

扇叶垫柳 shan ye dian liu

Shrubs creeping. Branches russet; juvenile branchlets grayish white villous at base. Buds russet, ovoid, small. Leaf blade spatulate-obovate or elliptic, 0.9–1.5 cm × 5–10 mm, base rounded or broadly cuneate, margin regularly glandular serrate or crenate, more densely so distally, apex rounded or obtuse. Flowering coetaneous. Catkins lateral, ca. 1.5 cm, many and slightly loosely

flowered; peduncle slightly elongate, with several leaflets; rachis sparsely downy; bracts obovate-oblong, glabrous, apex rounded-truncate. Male flower: adaxial gland larger than abaxial one or 2-cleft; stamens 2, free; filaments glabrous, ca. 5 mm; anthers ellipsoid. Bracts of female catkin oblong, glabrous. Female flower: gland adaxial; ovary glabrous, shortly stipitate; style coarse; stigma 2-lobed.

Mountains; 3600–4000 m. W Sichuan, Xizang, NW Yunnan [Bhutan, Kashmir, Sikkim].

**114. *Salix souliei*** Seemen, Repert. Spec. Nov. Regni Veg. 3: 23. 1906.

黄花垫柳 huang hua dian liu

Shrubs cushion-shaped; trunk dull brown, creeping. Juvenile branchlets russet, glabrous or sparsely white downy. Buds broadly ovoid, small. Petiole 4–7 mm, pilose when young; leaf blade elliptic or ovate-elliptic, 0.8–1.3 cm × 4–6 mm, to ca. 2.7 × 1.2 cm on shoots, leathery, abaxially pale or pruinose, densely white villous when young, glabrescent, adaxially bright green, wrinkled, glabrous, base cuneate or obtuse, margin entire, apex obtuse; midvein raised abaxially. Flowering coetaneous. Catkins terminal, ellipsoid, few flowered; rachis sparsely downy; bracts yellowish green, oblong, sparsely ciliate or glabrous, apex obtuse or rounded. Male flower: glands 2, shortly cylindrical; stamens 2, glabrous, ca. 2 × as long as bracts; anthers yellow, ovoid. Female flower: adaxial gland ca. 1/3 as long as bracts, abaxial gland sometimes present, small; ovary ovoid, glabrous, shortly stipitate; style short, 2-cleft; stigma oblong, 2-lobed. Capsule to 3 mm. Fl. Jun, fr. Jul–Aug.

- Mountains, on rocks; 4200–4800 m. SE Qinghai, W Sichuan, E Xizang, NW Yunnan.

**115. *Salix pilosomicrophylla*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 203. 1974.

毛小叶垫柳 mao xiao ye dian liu

Shrubs creeping. Branches prostrate or slightly ascending; juvenile branchlets villous, glabrescent. Buds globose, small, glabrous. Leaves petiolate; leaf blade ovate-oblong, oblong, or obovate-elliptic, 3–5(–7) × 1.5–2.5(–3.5) mm, abaxially glaucous, sericeous, adaxially green, glabrous or subglabrous, base cuneate, margin entire, apex obtuse or acute. Male catkin terminal, capitate, ca. 5 mm, 10–20-flowered; bracts ovate or subelliptic, ca. 1/2 as long as stamens, abaxially and marginally pilose, adaxially glabrous, apex rounded-truncate or irregularly dentate. Male flower: stamens 2, free, basally pilose; glands 2, linear, equal, ca. 1/2 as long as bracts, adaxial gland occasionally 2-cleft. Female catkin unknown.

- Moist mountain meadows; ca. 4200 m. E Xizang, Yunnan. Similar to *Salix ovatomicrophylla* but leaf blade larger, glaucous and sericeous abaxially; catkins numerous flowered; bracts pilose abaxially and at margin; filaments pilose. In the protologue, the

specific epithet was spelt "*pilosomicrophylla*" whereas, in FRPS, it was changed to "*trichomicrophylla*" with an indication that the former was an error (Greek and Latin words are combined in the epithet, which might be considered linguistically unacceptable). However, there is no mechanism within the ICBN for allowing such a change.

**116. *Salix serpyllum*** Andersson, J. Linn. Soc., Bot. 4: 55. 1860.

多花小垫柳 duo hua xiao dian liu

*Salix brachista* C. K. Schneider var. *multiflora* C. Wang & P. Y. Fu; *S. chumulamanica* C. Wang & P. Y. Fu; *S. nelamunensis* C. Wang & P. Y. Fu.

Shrubs creeping, to 3 cm tall. Juvenile branchlets yellowish brown, slender, sparsely pubescent. Buds small, pilose. Leaves petiolate; leaf blade obovate-oblong or long elliptic, 4–10 × 1–4 mm, abaxially glaucous, glabrous, adaxially green, glabrous, base attenuate, margin 7–9-dentate distally, entire proximally and when young, apex obtuse; midvein raised abaxially. Flowering coetaneous. Catkins terminal, ca. 1 cm, many flowered; rachis pubescent; bracts obovate, ciliate or glabrous, apex rounded, sometimes retuse. Male flower: adaxial gland nearly equal to abaxial gland, sometimes 2-cleft; stamens 2, basally pubescent; anthers oblong. Fruiting catkin to 5 cm × 7 mm. Female flower: adaxial gland cylindrical, ca. 1/3 as long as bracts; ovary ovoid-cylindrical, glabrous, sessile; style conspicuous; stigma oblong, 2-cleft. Fl. May–Jun, fr. Jul.

Mountain slopes, river margins; 3200–4500 m. Xizang [Bhutan, N India, Nepal, Sikkim].

**117. *Salix ovaticomicrophylla*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 468. 1998.

卵小叶垫柳 luan xiao ye dian liu

Shrubs cushion-shaped, creeping; trunk dull brown. Young branchlets russet, glabrous or subglabrous. Buds small, glabrous. Leaves very small, crowded, covering branchlets; petiole 1–2 mm; leaf blade ovate or ovate-elliptic, elliptic, or oblong, usually 2–4 × 1–2 mm, abaxially greenish, at first pilose, glabrescent, adaxially green, glabrous, base broadly cuneate or subrounded, margin entire, rarely remotely dentate distally, apex obtuse or acute; midvein conspicuously raised abaxially, impressed adaxially. Flowering coetaneous. Catkins terminal. Male catkin capitate, ca. 6 mm; bracts elliptic, adaxially sparsely pubescent. Male flower: adaxial and abaxial glands cylindrical, sometimes divided, ca. 1/3 as long as bracts; stamens 2; filaments glabrous or pilose at base; anthers ovoid. Female catkin bracts yellow, obovate, ca. 2 mm, apex rounded, or retuse. Female flower: gland adaxial, terete, nearly as long as stipe; ovary long ovoid, glabrous, shortly stipitate; style conspicuous, 2-cleft; stigma 2-lobed. Capsule ovoid, glabrous. Fl. Jun, fr. Jul–Aug.

• Thickets, rocks; 4200–4700 m. W Sichuan, Xizang, NW Yunnan.

**118. *Salix paraflabellaris*** S. D. Zhao in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 14. 1980.

类扇叶垫柳 lei shan ye dian liu

Shrubs procumbent, to 3 cm tall; trunk creeping, dull brown. Juvenile branchlets slightly erect, dull russet, glabrous. Buds russet, broadly ovoid, glabrous. Leaf blade obovate or obovate-elliptic, 1–1.7 × 0.7–1.2 cm, abaxially pale and pruinose, densely grayish white villous when young, becoming comose or glabrous, adaxially green, glabrous, base obtuse, rarely rounded or cuneate, margin remotely crenate or entire, apex rounded or slightly obtuse, rarely acute. Catkins terminal, capitate, ca. 5 mm in diam.; bracts ovate-oblong, ca. 3 mm, both surfaces glabrous, ciliate, with conspicuous veins, apex rounded. Male flower: glands 2, terete, adaxial gland broader than abaxial gland; stamens 2, free; filaments glabrous, ca. 6 mm; anthers ovoid. Female flower: gland adaxial; ovary ca. 3.5 mm, glabrous, sessile; style conspicuous, 2-lobed; stigma 2-cleft. Fl. Jun, fr. Jul–Sep.

• Rock crevices; 3500–4000 m. NW Yunnan.

Similar to *Salix flabellaris* but leaf blade densely villous abaxially when young, becoming pale, pruinose, and comose or glabrous when mature; bracts ciliate; ovary sessile.

**119. *Salix oreophila*** J. D. Hooker ex Andersson, J. Linn. Soc., Bot. 4: 57. 1860.

尖齿叶垫柳 jian chi ye dian liu

Shrubs cushion-shaped, to 3 cm tall; trunk dull brown, short, much branched. Juvenile branchlets slightly erect, russet, glabrous. Leaf blade oblong to obovate, 5–7 × 2–3 mm, to 8 mm on shoots, adaxially greenish, glabrous, base cuneate, margin with 3–5(–7) coarse teeth (teeth lobulelike distally, entire proximally), apex acute, shortly acuminate, obtuse, or rounded-truncate and 3–5-dentate; midvein raised adaxially. Flowering coetaneous. Catkins terminal, capitate, few flowered; bracts narrowly elongate, glabrous or pilose, margin rarely irregularly dentate, apex acute, obtuse, or subrounded. Male flower: adaxial gland larger than abaxial gland; stamens 2; filaments glabrous, ca. 3 × as long as bracts; anthers globose. Female flower: adaxial gland ca. as long as stipe; ovary glabrous, shortly stipitate or sessile; style cleft; stigma 2-lobed. Fl. Jul, fr. Aug.

Rocks, mountain meadows; 4000–4600 m. Xizang, NW Yunnan [Bhutan, India, Nepal, Sikkim].

- 1a. Leaf apex acute, shortly acuminate, or obtuse; ovary shortly stipitate; bracts acute or obtuse ..... 119a. var. *oreophila*  
 1b. Leaf apex rounded-truncate and deeply 3–5-dentate; ovary sessile; bracts subrounded ..... 119b. var. *secta*

**119a. *Salix oreophila* var. *oreophila***

尖齿叶垫柳(原变种) jian chi ye dian liu (yuan bian zhong)

Leaf apex acute, shortly acuminate, or obtuse. Bracts acute or obtuse. Female flower: ovary shortly stipitate. Rocks; 4000–4600 m. Xizang, NW Yunnan [Bhutan, India, Nepal, Sikkim].

**119b. *Salix oreophila* var. *secta*** (J. D. Hooker ex Andersson) Andersson in A. de Candolle, Prodr. 16(2): 297. 1868.

五齿叶垫柳 wu chi ye dian liu

*Salix secta* J. D. Hooker ex Andersson, J. Linn. Soc., Bot. 4: 57. 1860.

Leaf apex rounded-truncate and deeply 3–5-dentate. Bracts subrounded. Female flower: ovary sessile. Rocks, mountain meadows; ca. 4600 m. Xizang [Sikkim].

**120. *Salix kangdingensis*** S. D. Zhao & C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 9. 1980.

康定垫柳 kang ding dian liu

Shrubs procumbent to 3 cm tall; trunk russet, slender. Juvenile branchlets suberect, yellowish brown, densely white villous, glabrescent. Buds broadly ovoid, small, pilose. Petiole ca. 3 mm; leaf blade elliptic or ovate, ca. 1.4 × 0.8 cm, abaxially greenish, densely villous along midvein, or glabrous, adaxially green, sparsely pilose when young, glabrescent, base broadly cuneate, margin entire, rarely indistinctly sparsely glandular serrate, apex acute or obtuse; reticulate veins conspicuously raised abaxially. Flowering coetaneous. Male catkin terminal, cylindric, ca. 1.3 cm × 4 mm; peduncle nearly equal to catkin, with 3–5 leaflets; rachis villous; bracts elliptic, abaxially subglabrous, adaxially sparsely villous and ciliate, apex rounded. Male flower: glands 2, red, thinly cylindric, ca. 1/2 as long as bracts; stamens 2, ca. 2.5 mm, ca. 3 × as long as bracts; filaments villous proximally; anthers yellow, oblong. Female catkin unknown. Fl. May.

• Thickets on mountain slopes; ca. 3000 m. W Sichuan. Similar to *Salix brachista* but juvenile branchlets densely pubescent; leaf blade entire; male catkin slender; bracts sparsely villous and ciliate adaxially; glands thinly cylindric; filaments villous proximally.

**121. *Salix lindleyana*** Wallich ex Andersson, Kongl. Vetensk. Akad. Handl. 1850: 499. 1851.

青藏垫柳 qing zang dian liu

Shrubs procumbent, to 3 cm tall; trunk creeping, dull brown. Juvenile branchlets ascending, russet, sparsely villous or glabrous. Buds yellowish green, ovoid, small, glabrous. Petiole 3–6 mm; leaf blade obovate-oblong, oblong, or obovate-lanceolate, 1.2–1.6 cm × 4–6 mm, to 2.5 cm × 9 mm on shoots, abaxially pale, glabrous, pilose when young, adaxially bright green, glabrous, base cuneate, margin entire, usually slightly revolute, apex acute, rarely obtuse; midvein conspicuously raised abaxially. Flowering coetaneous. Catkins terminal, ovoid, only few flowered; bracts purplish red, broadly ovate, ciliate, apex rounded. Male flower: glands 2, ca. 1/3 as long as bracts; stamens 2; filaments villous at base; anthers broadly ovoid. Female flower: adaxial gland ca. 2/3 as long as bracts; ovary ovoid-conical,

glabrous, subsessile; style short, thick, 2-cleft; stigma 2-lobed. Capsule shortly stipitate. Fl. Jun, fr. Jul–Sep.

Moist rock crevices; above 4000 m. Xizang, NW Yunnan [Bhutan, Nepal, Pakistan, Sikkim].

**122. *Salix glareorum*** P. Y. Mao & W. Z. Li, Acta Bot. Yunnan. 9: 49. 1987.

石流垫柳 shi liu dian liu

Shrubs low, to 50 cm tall; trunk procumbent, not rooting, russet. Branches ascending; juvenile branchlets yellow-green, pubescent, 1-year-old branchlets chestnut colored, smooth, glabrous. Petiole 1–3 mm, villous at first; leaf blade linear, 5–9 × 2–4 mm, abaxially dull green, pilose when young, glabrescent, adaxially green and glabrous, base obtuse, apex obtuse or acute; midvein raised abaxially, impressed adaxially; lateral veins indistinct. Male catkin unknown. Female catkin terminal on leafy shoots, ca. 10 × 6 mm, ca. 25-flowered; rachis slightly downy; bracts obovate, margin glabrous, slightly ciliate, apex obtuse-rounded. Female flower: adaxial gland 1, terete, ca. 1/4 as long as bracts; ovary ovoid-conical, glabrous, subsessile; style ca. 1.5 mm, 2-parted; stigma 2-lobed. Fl. May.

• Along streams; ca. 3000 m. NW Yunnan (Lijiang Naxizu Zizhixian).

**123. *Salix scopulicola*** P. Y. Mao & W. Z. Li, Acta Bot. Yunnan. 9: 51. 1987.

岩壁垫柳 yan bi dian liu

Shrubs cushion-shaped, to 10 cm tall; trunk creeping. Branches procumbent or decumbent; juvenile branchlets villous, 1-year-old branchlets chestnut brown, glabrous. Buds reddish, ovate, subglabrous. Petiole 1–2 mm, downy; leaf blade ovoid-oblong, 4–8 × 2–4 mm, abaxially pale, dark downy when young, later glabrescent, adaxially green, subglabrous, papillate, base obtuse or rounded, margin entire, apex acute or subacute; midvein raised abaxially, impressed adaxially; lateral veins conspicuous, ca. 4 on each side of midvein abaxially, obscure adaxially. Catkins terminal on young shoots, ca. 5 cm × 4 mm, 6–8-flowered; bracts oblong, abaxially dark crisped downy at margin, apex rounded, densely ciliate. Male flower: glands adaxial and abaxial, subequal, ca. 1/2 as long as bracts; stamens 2, free; filaments glabrous, slightly longer than bracts. Female catkin unknown. Fl. Jul.

• About 4000 m. Yunnan (Gongshan Drungzu Nuzu Zizhixian: Dulong Jiang valley).

A. K. Skvortsov notes that this species is very near or possibly the same as *Salix oreophila*.

**124. *Salix gyirongensis*** S. D. Zhao & C. F. Fang in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 109. 1979.

吉隆垫柳 ji long dian liu

Shrubs procumbent, to 3 cm tall; trunk creeping. Juvenile branchlets yellowish brown or reddish, pilose. Buds ovoid, glabrous. Leaf blade ovate-oblong, 7–10 × 2–4 mm, leathery, abaxially greenish or pale, pilose, adaxially bright green, glabrous, base attenuate margin

entire, usually revolute, apex slightly acute or cuneate, margin entire, usually revolute. Catkins terminal, ovoid. Male catkin ca. 1 cm, few flowered; rachis pilose; bracts purple, ovate, ca. 1/2 as long as filaments, adaxially pilose at base, apex obtuse. Male flower: adaxial gland broader than abaxial gland; stamens 2; filaments pilose at base; anthers purple, globose. Female catkin with bracts ovate, ca. as long as ovary, glabrous. Female flower: adaxial gland often divided, ca. 1/3 as long as bracts or more; ovary ovoid, densely grayish white pubescent, shortly stipitate; style short, 2-lobed; stigma 2-cleft. Fl. Jul, fr. Aug–Sep.

• Thickets; ca. 4400 m. Sichuan, E Xizang.

Similar to *Salix lindleyana* but leaf blade short, broad; adaxial gland of female flower often divided; ovary densely pubescent.

**125. *Salix ludingensis*** T. Y. Ding & C. F. Fang, Acta Phytotax. Sin. 31(3): 277. 1993.

泸定垫柳 lu ding dian liu

Shrubs cushion-shaped, to 20 cm tall. Juvenile branchlets pilose, 1-year-old branchlets russet, glabrous. Petiole 2–5 mm, glabrous; leaf blade obovate or elliptic, abaxially greenish, at first pilose, glabrescent, adaxially green, shiny, glabrous, base cuneate or cuneate-rounded, margin entire or obscurely crenate distally, apex rounded. Catkins terminal. Male catkin 1–2 cm; rachis densely white pubescent; bracts obovate-oblong, both surfaces glabrous or slightly villous at base, apex subtruncate. Male flower: stamens 2, distinct; filaments villous; adaxial and abaxial glands terete, abaxial longer, ca. 1/2 as long as filaments, or 3/4 as long as bracts. Female catkin 1–1.5 cm; rachis pilose; bracts as in male. Female flower: ovary narrowly ovoid, densely

white villous, subsessile; style distinct, parted-divided; stigma 2-lobed, only adaxial gland present, terete, ca. as long as ovary (excluding style) bracts. Fl. Jun.

• Mountain slopes; 2400–3600 m. Sichuan (Luding Xian: Gongga Shan).

**126. *Salix piptotricha*** Handel-Mazzetti, Symb. Sin. 7: 84. 1929.

毛果垫柳 mao guo dian liu

Shrubs procumbent; trunk creeping, dull brown. Juvenile branchlets russet, pilose. Buds ovoid, small, glabrous. Petiole 2–4 mm, pilose; leaf blade obovate, rarely elliptic, 0.5–1.5 cm × 2–7 mm, abaxially glaucous, sparsely villous, densely pilose when young, adaxially green, glabrous, base narrowly cuneate, margin indistinctly glandular serrate distally or entire, apex subacute. Flowering coetaneous. Catkins terminal, capitate. Male catkin ca. 1 cm, few flowered; rachis pilose; bracts obovate, ca. 1/2 as long as filaments or more, sparsely ciliate, apex rounded. Male flower: glands 2, cylindric, ca. 1/5 as long as bracts; stamens 2; filaments glabrous; anthers oblong. Female catkin bracts abaxially pilose, ciliate, adaxially glabrous. Female flower: adaxial gland ca. as long as stipe; ovary narrowly ovoid, grayish white pilose, shortly stipitate; style short, 2-cleft; stigma 2-lobed.

• Mountain slopes, rock crevices; above 3500 m. NW Yunnan.

Similar to *Salix brachista* but leaf blade villous abaxially, margin serrate or entire, indistinctly glandular; ovary densely grayish white pubescent.

## 12. Sect. *Sclerophyllae* C. K. Schneider in Sargent, Pl. Wilson. 3: 112. 1916.

硬叶柳组 ying ye liu zu

Shrubs. Leaf blade ovate, elliptic, or elliptic-oblong, rarely oblong-lanceolate to orbicular, usually small. Flowering coetaneous, rarely serotinous. Catkins ellipsoid to shortly cylindric; peduncle short or indistinct, with (sometimes deciduous) leaflets. Male flower: glands adaxial and abaxial, divided or entire; stamens 2; filaments downy proximally. Female flower: abaxial gland sometimes absent; ovary pilose, rarely glabrous, sessile or subsessile; style ca. 1/2 as long as ovary, 2-lobed.

### Key based on male plants

(*Salix dalungensis*, *S. gyamdaensis*, *S. jinchuanica*, *S. kongbanica*, *S. sclerophylloides*, and *S. wuxuhaiensis* unknown)

1a. Catkin more than 1.5 cm, shortly terete to terete.

2a. Catkin more than 10 mm thick.

3a. Glands usually basally connate; young leaflets of peduncle elliptic; catkin ellipsoid ..... 132. *S. oritrepha*

3b. Glands not basally connate; young leaflets of peduncle oblong; catkin shortly terete or terete 145. *S. gilashanica*

2b. Catkin less than 8 mm thick.

4a. Peduncle very short.

5a. Adaxial gland narrowly oblong, 1/3–1/4 as long as bracts ..... 135. *S. biondiana*

5b. Adaxial gland broadly ovate, ca. 1/5 as long as bracts ..... 136. *S. qinlingica*

4b. Peduncle more than 5 mm.

6a. Young leaves lanceolate ..... 134. *S. atopantha*

6b. Young leaves elliptic or long elliptic.

7a. Male flower with only an adaxial gland ..... 143. *S. juparica*

- 7b. Male flower with adaxial and abaxial glands ..... 129. *S. maizhokunggarensis*
- 1b. Catkin less than 1.5 cm (sometimes to 2.3 cm in *S. taipaiensis*), ellipsoid or capitate.
  - 8a. Filaments connate proximally; bracts ca. 5 mm ..... 144. *S. pseudospissa*
  - 8b. Filaments usually distinct; bracts less than 3 mm.
    - 9a. Glands usually basally connate, forming a multilobed false disc ..... 127. *S. cupularis*
    - 9b. Glands not basally connate, not forming a false disc.
      - 10a. Young branchlets glabrous ..... 128. *S. taipaiensis*
      - 10b. Young branchlets ± pilose.
        - 11a. Catkin either lacking leaflets at base with only 2 scalelike leaflets.
          - 12a. Young leaves dentate at margin, rarely entire; catkin grayish white ..... 142. *S. rockii*
          - 12b. Young leaves entire at margin; catkin yellow or brownish yellow ..... 137. *S. muliensis*
        - 11b. Catkin with leaflets at base.
          - 13a. Young leaves abaxially with densely appressed dull red or rust-colored hairs  
130. *S. occidentalisinensis*
          - 13b. Young leaves abaxially glabrous or with grayish white hairs
            - 14a. Leaf blade at anthesis elliptic or ovate; bracts abaxially pubescent, adaxially glabrous ..... 141. *S. sclerophylla*
            - 14b. Leaf blade at anthesis oblanceolate or long obovate-elliptic; bracts white pubescent on both surfaces ..... 131. *S. neoamnematchinensis*

**Key based on female plants**

- 1a. Ovary glabrous (rarely partly pilose).
  - 2a. Branchlets villous ..... 129. *S. maizhokunggarensis*
  - 2b. Branchlets glabrous.
    - 3a. Glands 2 (adaxial and abaxial), basally connate, forming a multilobed false disc ..... 127. *S. cupularis*
    - 3b. Gland 1 (adaxial), ovate-terete ..... 128. *S. taipaiensis*
- 1b. Ovary pilose.
  - 4a. Leaflets at base of catkin or on peduncles oblong or lanceolate.
    - 5a. Leaflets 3 or more at base of catkin, abaxially glabrous; adaxial gland 2- or 3-lobed ..... 134. *S. atopantha*
    - 5b. Leaflet only 1 at base of catkin, abaxially shortly woolly; gland usually entire ..... 138. *S. kongbanica*
  - 4b. Leaflets at base of catkin or on peduncles elliptic to suborbicular.
    - 6a. Bracts ca. 5 mm ..... 144. *S. pseudospissa*
    - 6b. Bracts less than 3 mm.
      - 7a. Catkin capitate to oblong; leaves small, 8–14 mm at anthesis.
        - 8a. Female flower with adaxial and abaxial glands.
          - 9a. Bracts pilose ..... 141. *S. sclerophylla*
          - 9b. Bracts glabrous or sparsely ciliate ..... 140. *S. wuxuhaiensis*
        - 8b. Female flower with only an adaxial gland.
          - 10a. Bracts glabrous ..... 139. *S. sclerophylloides*
          - 10b. Bracts pubescent.
            - 11a. Leaves elliptic, long elliptic or obovate-oblong, margin serrulate 130. *S. occidentalisinensis*
            - 11b. Leaves oblanceolate or long obovate-elliptic, margin entire 131. *S. neoamnematchinensis*
      - 7b. Catkin shortly terete or terete; leaves larger, more than 15 mm at anthesis (sometimes not opening in *S. muliensis*).
        - 12a. Female flower with adaxial and abaxial glands.
          - 13a. Glands basally usually connate, forming a multilobed false disc, or adaxial gland 2- or 3-lobed ..... 132. *S. oritrepha*
          - 13b. Glands not connate, not forming a false disc.
            - 14a. Young leaves densely tomentose; petiole much shorter than leaf blade; adaxial gland entire ..... 133. *S. gyamdaensis*
            - 14b. Young leaves glabrous or sparsely silky; petiole ca. 1/4–1/3 as long as leaf blade, reddish; adaxial gland sometimes lobed ..... 145. *S. gilashanica*
        - 12b. Female flower with only adaxial gland.
          - 15a. Catkin ca. 5 mm thick.
            - 16a. Petiole ca. 1/5 as long as leaf blade ..... 135. *S. biondiana*

- 16b. Petiole short or almost absent ..... 136. *S. qinlingica*  
 15b. Catkin usually more than 8 mm thick.  
 17a. Young leaves usually inconspicuously dentate; bracts oblong; ovary ± stipitate.  
 18a. Ovary sessile or subsessile ..... 142. *S. rockii*  
 18b. Ovary with stipe ca. 0.5 mm ..... 143. *S. juparica*  
 17b. Young leaves entire; bracts obovate or obdeltoid; ovary sessile.  
 19a. Bracts orbicular-ovate ..... 147. *S. jinchuanica*  
 19b. Bracts obovate.  
 20a. Bracts subtruncate at apex ..... 137. *S. muliensis*  
 20b. Bracts rounded at apex ..... 146. *S. dalungensis*

### Key based on vegetative characters

- 1a. Leaf margin dentate, sometimes entire in leaves in proximal 1/2 of branchlets.  
 2a. Leaf blade 3–5 cm, not lanceolate.  
 3a. Petiole 1/4–1/3 as long as leaf blade, red ..... 145. *S. gilashanica*  
 3b. Petiole less than 1/4 as long as leaf blade.  
 4a. One-year-old branchlets purplish black ..... 144. *S. pseudospissa*  
 4b. One-year-old branchlets brown ..... 143. *S. juparica*  
 2b. Leaf blade 1–2.4 cm, rarely to 4 cm and then lanceolate.  
 5a. Leaves abaxially densely appressed dull red or rust-colored pubescent ..... 130. *S. occidentalisinensis*  
 5b. Leaves abaxially glabrous or sparsely gray villous.  
 6a. Leaf blade elliptic-oblong or oblong, rarely lanceolate ..... 134. *S. atopantha*  
 6b. Leaf blade elliptic or obovate, rarely oblong.  
 7a. One-year-old branchlets sparsely pilose ..... 142. *S. rockii*  
 7b. One-year-old branchlets densely villous ..... 136. *S. qinlingica*  
 1b. Leaf margin entire, or glandular dentate only distally.  
 8a. Leaves abaxially glabrous or pilose along veins.  
 9a. Petiole 1/4–1/3 as long as leaf blade.  
 10a. Young branchlets glabrous ..... 127. *S. cupularis*  
 10b. Young branchlets pilose.  
 11a. Leaves usually 1–1.5(–2.4) cm ..... 132. *S. oritrepha*  
 11b. Leaves usually 2–3 cm ..... 135. *S. biondiana*  
 9b. Petiole 1/6–1/5 as long as leaf blade.  
 12a. Leaf blade obovate-oblong or obovate-elliptic, rarely elliptic, broadest above middle.  
 13a. Lateral veins (7–)10–13 on each side of midvein ..... 137. *S. muliensis*  
 13b. Lateral veins usually less than 7 on each side of midvein ..... 131. *S. neoamnematchinensis*  
 12b. Leaf blade long elliptic or elliptic to suborbicular, broadest at middle.  
 14a. Leaves abaxially glaucous, glabrous ..... 129. *S. maizhokunggarensis*  
 14b. Leaves abaxially ± pilose.  
 15a. Leaves ± pilose abaxially ..... 141. *S. sclerophylla*  
 15b. Leaves glabrous abaxially ..... 147. *S. jinchuanica*  
 8b. Leaves abaxially pilose, at least at base.  
 16a. Leaves 4–6 cm.  
 17a. Branchlets purplish red, tomentose when young ..... 133. *S. gyamdaensis*  
 17b. Branchlets blackish purple, pubescent when young.  
 18a. Nodes of branchlets raised; leaf blade long elliptic, apex obtuse or subrounded, abaxially densely shortly sericeous ..... 146. *S. dalungensis*  
 18b. Nodes of branchlets not raised; leaf blade long elliptic-lanceolate or long elliptic, apex acute or shortly acuminate, abaxially densely shortly woolly ..... 138. *S. kongbanica*  
 16b. Leaves less than 4 cm.  
 19a. Leaf blade elliptic or obovate to suborbicular; juvenile branchlets pruinose or tomentulose.  
 20a. One- and 2-year-old branchlets usually pruinose ..... 141. *S. sclerophylla*  
 20b. One- and 2-year-old branchlets usually tomentulose ..... 140. *S. wuxuhaiensis*  
 19b. Leaf blade oblong, elliptic-oblong, or elliptic; juvenile branchlets neither pruinose nor tomentulose.

- 21a. Branchlets dull grayish purple, pilose ..... 139. *S. sclerophylloides*  
 21b. Branchlets purplish brown or dull brown, glabrous ..... 128. *S. taipaiensis*

**127. *Salix cupularis*** Rehder, J. Arnold Arbor. 4: 140. 1923.

杯腺柳 bei xian liu

Shrubs small. Branchlets purplish brown or blackish purple, gray when old, with conspicuous nodes. Buds brownish red, narrowly oblong, ca. 4 mm, shiny. Stipules suborbicular, ca. 5 mm; petiole yellowish, 1/3–1/2 as long as leaf blade; leaf blade elliptic or obovate-elliptic, rarely suborbicular, 1.5–2.7 × 1–1.5 cm, abaxially greenish, adaxially dull green glabrous, base rounded or broadly cuneate, margin entire, apex subrounded and apiculate, or acuminate; lateral veins 6–9 on each side of midvein. Flowering coetaneous or slightly serotinous. Male catkin to 2 cm; peduncle short, with 3 leaflets; bracts obovate, ca. 1/2 as long as filaments, downy or abaxially glabrous distally, apex rounded-truncate. Male flower: adaxial and abaxial glands narrowly ovate-terete, basally connate; stamens 2; filaments downy proximally. Female catkin elliptic to shortly cylindric, ca. 1 cm, pedunculate; bracts ovate or broadly ovate, 1.5–2 mm, apex rounded. Female flower: abaxial gland slightly smaller than adaxial gland, adaxial gland 2- or 3-parted, gland bases connate, forming false disc; ovary long ovoid, glabrous, shortly stipitate; style ca. 1 mm; stigma 2-cleft. Capsule ca. 3 mm. Fl. Jun, fr. Jul–Aug.

- Mountain slopes; 2500–4000 m. Gansu, Nei Mongol, Qinghai, Shaanxi, Sichuan.

- 1a. Leaf apex subrounded, apiculate; male catkin ca. 1 cm ..... 127a. var. *cupularis*  
 1b. Leaf apex acuminate; male catkin to 2 cm ..... 127b. var. *acutifolia*

**127a. *Salix cupularis* var. *cupularis***

杯腺柳(原变种) bei xian liu (yuan bian zhong)

Leaf blade apex subrounded, apiculate. Male catkin ca. 1 cm.

- Mountain slopes; 2500–4000 m. Gansu, Qinghai, Shaanxi, Sichuan.

**127b. *Salix cupularis* var. *acutifolia*** S. Q. Zhou, Acta Bot. Bor.- Occid. Sin. 4: 4. 1984.

尖叶杯腺柳 jian ye bei xian liu

Leaf blade apex acuminate. Male catkin to 2 cm.

- About 3200 m. Nei Mongol (Alashan Mountains).

**128. *Salix taipaiensis*** Chang Y. Yu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 106. 1980.

太白柳 tai bai liu

Shrubs small, 50 cm tall. Branchlets purplish brown or dull brown, glabrous, shiny. Petiole 3–5(–7) mm, glabrous or tomentulose; leaf blade elliptic or elliptic-oblong, sparsely pubescent, abaxially whitish, adaxially

green, base rounded, rarely subcordate, margin entire, apex acute or obtuse. Male catkin 1.3–2.3 × ca. 1 cm, densely flowered; peduncle short, with leaflets; bracts obovate, ca. 2 mm, adaxially pilose, ciliate, apex obtuse. Male flower: adaxial gland larger than abaxial one, narrowly deltoid-ovate, apex entire, abaxial gland cylindric; stamens 2, distinct; filaments basally downy; anthers yellow. Female catkin ca. 2 cm × 8 mm; peduncle with leaflets; bracts obovate-oblong, margin with loose hairs. Female flower: gland adaxial, ca. 2/3 as long as ovary; ovary narrowly ovoid, glabrous, sessile; style ca. 1/3 as long as ovary; stigma 2-lobed. Fl. Jun, fr. Jul.

- Mountain slopes; ca. 3100 m. SW Shaanxi (Taibai Shan).

Similar to *Salix cathayana* but bracts of male catkin pilose adaxially; male flower with adaxial and abaxial glands; female catkin shorter; stigma 2-lobed. Similar also to *S. maizhokunggarensis* but bracts of male catkin adaxially pilose; adaxial gland of male flower narrowly deltoid-ovate, apex entire, abaxial gland cylindric; ovary sessile.

**129. *Salix maizhokunggarensis*** N. Chao in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 109. 1979.

墨竹柳 mo zhu liu

Shrubs to 2 m tall. Older branchlets black, stout, glabrous; juvenile branchlets villous. Leaves petiolate; leaf blade elliptic or long elliptic, 1.5–3.5 × 0.8–1.4 cm, abaxially pale, pruinose, adaxially green, villous or pubescent along midvein, base cuneate to shallowly cordate, margin entire or indistinctly serrate, apex obtuse or rounded; lateral veins 6–8 each side of abaxially raised midvein. Male catkin 1.5–2.5 cm × 5–6 mm (not including elongate filaments); peduncle to 9 mm, with leaflets; bracts yellowish brown or dull brown, obovate, adaxially white villous, apex rounded to truncate. Male flower: stamens 2, ca. 5 mm; filaments distinct, densely villous proximally; glands 2, adaxial gland ± 2-cleft, ca. 0.5 mm. Female catkin with bracts broadly obovate, abaxially glabrous or sparsely white villous proximally, adaxially villous, apex rounded. Female flower: adaxial gland ovate-lanceolate, ca. 1 mm, 2-lobed; ovary ellipsoid, ca. 3 mm, glabrous, rarely partly villous; stipe ca. 0.5 mm; style stout, ca. 2-lobed; stigma 2-cleft.

- Mountain slopes; ca. 4200 m. E Xizang (Maizhokunggar to Wusi River).

**130. *Salix occidentalisinensis*** N. Chao, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 25. 1980.

华西柳 hua xi liu

Shrubs to 1.5 m tall. One-year-old branchlets glabrous; juvenile branchlets gray tomentulose. Petiole short; leaf blade elliptic, long elliptic, or obovate-oblong, 1–2.4(–3.5) cm × 6–1 mm, abaxially densely appressed dull red or rust-colored pubescent, adaxially at first densely white sericeous, later pilose only along veins, base cuneate, margin usually glandular serrulate, apex obtuse



or subrounded, rarely acute; lateral veins ca. 8 on each side of midvein. Catkins ca.  $10 \times 6$  mm; peduncle short; bracts suborbicular, ca. 1 mm,  $\pm$  pubescent. Male flower: adaxial gland sublanceolate, larger than abaxial one; stamens 2; filaments free, basally villous. Fruiting catkin to 3 cm. Female flower: adaxial gland narrowly ovate; ovary densely white pubescent, sessile; style ca. 0.5 mm; stigma 2-cleft. Capsule narrowly ovoid, ca. 3 mm. Fl. Jun, fr. Jul.

• Mountains; 3400–3800 m. Sichuan, E Xizang, NW Yunnan.

**131. *Salix neoammematchinensis*** T. Y. Ding & C. F. Fang, Acta Phytotax. Sin. 31(3): 279. 1993.

新山生柳 xin shan sheng liu

Shrubs to 1 m tall. Branches purple-red; juvenile branchlets brown green or yellow-red. Buds ovoid or narrowly ovoid, pubescent. Petiole 1–4 mm; leaf blade oblanceolate or narrowly obovate-oblong, 0.8–1.5(–3) cm  $\times$  6–8 mm, abaxially greenish, glabrous, adaxially green, white pubescent, base cuneate to rounded, margin entire, apex acute. Flowering coetaneous. Male catkin terete, ca.  $8 \times 3$  mm; peduncle short, with 1 or 2 leaflets basally; bracts ovate or long ovate, pilose at margin, apex obtuse. Male flower: glands adaxial and abaxial, terete, abaxial gland shorter than adaxial; stamens 2, distinct; filaments pilose proximally. Female catkin ovoid, ca. 5 mm, ca. 1 cm in fruit; peduncle short; bracts similar to those of male catkin. Female flower: gland adaxial, terete, longer than stipe; ovary conical; stipe short, densely pubescent; style indistinct; stigma (2 or)3- or 4-lobed. Capsule pilose; stipe short, reddish.

• Mountain slopes; 2700–3700 m. Qinghai (Datong Xian, Maqên Xian, Tongde Xian).

**132. *Salix oritrepha*** C. K. Schneider in Sargent, Pl. Wilson. 3: 113. 1916.

山生柳 shan sheng liu

Shrubs to 1.2 m tall. Branchlets grayish tomentose when young, glabrescent. Petiole purple, 5–8 mm, pubescent or subglabrous; leaf blade elliptic, ovate, elliptic-ovate, or elliptic-lanceolate, 1–1.5 cm  $\times$  4–8 mm, robust, to  $2.4 \times 1.5$  cm on shoots, abaxially gray or slightly pale, sparsely pubescent, glabrescent, adaxially green, sparsely pubescent or glabrous, base rounded or obtuse, margin entire, apex obtuse or acute; reticulate veins prominent abaxially. Male catkin ellipsoid, 1–1.4  $\times$  0.5–1 cm, densely flowered; peduncle short, with 2 or 3 obovate-elliptic leaflets; bracts obovate, villous. Male flower: glands 2, usually basally connate; stamens 2, free; filaments villous proximally; anthers yellow, partly red. Female catkin 1–1.5  $\times$  ca. 1 cm; peduncle 3–7 mm, with 2 or 3 leaflets; rachis downy; bracts dull purple, broadly obovate, pilose, ca. as long as ovary. Female flower: glands 2, basally connate, forming false disc, adaxial gland usually 2- or 3-lobed; ovary ovoid,

villous, sessile; style 2-cleft; stigma 2-lobed. Fl. Jun, fr. Jul.

• Mountain slopes, thickets; 3000–4300 m. Gansu, Ningxia, Qinghai, Sichuan, E Xizang, ?Yunnan.

1a. Leaves elliptic or ovate ..... 132a. var. *oritrepha*

1b. Leaves elliptic-ovate or elliptic-lanceolate ..... 132b. var. *ammematchinensis*

**132a. *Salix oritrepha* var. *oritrepha***

山生柳(原变种) shan sheng liu (yuan bian zhong)

*Salix cupularis* Rehder var. *lasiogyne* Rehder.

Leaf blade elliptic or ovate.

• Mountain slopes, thickets; 3200–4300 m. SE Gansu, Ningxia, SE Qinghai, Sichuan, E Xizang, ?Yunnan.

**132b. *Salix oritrepha* var. *ammematchinensis*** (K. S. Hao ex C. F. Fang & A. K. Skvortsov) G. Zhu, Novon 8: 465. 1998.

青山生柳 qing shan sheng liu

*Salix ammematchinensis* K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 467. 1998.

Leaf blade elliptic-ovate or elliptic-lanceolate.

• Mountain slopes; 3000–3500 m. Gansu, Qinghai, NW Sichuan.

**133. *Salix gyamdaensis*** C. F. Fang in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 104. 1979.

江达柳 jiang da liu

Shrubs to 1–2 m tall. One-year-old branchlets purplish red, glabrous; juvenile branchlets tomentose. Petiole 8–10 mm, tomentose; leaf blade oblong-elliptic, rarely elliptic, 4–6  $\times$  ca. 2 cm, both surfaces villous, glabrescent, abaxially greenish, adaxially green, base cuneate or rounded, margin entire, apex acute; veins conspicuously raised abaxially; lateral veins 11–13 on each side of midvein. Flowering coetaneous. Male catkin unknown. Female catkin shortly terete, 2–2.5 cm  $\times$  7–8 mm, to 1 cm in fruit; peduncle ca. 1 cm, villous, with normal leaflets; bracts obovate-orbicular, densely villous. Female flower: glands 2, adaxial and abaxial, subovate, apex truncate, adaxial gland larger than abaxial one; ovary ovoid, downy, sessile; style ca. 1.5 mm, 2-lobed; stigma 2-cleft. Capsule ovoid, ca. 5 mm, pilose, sessile, apex attenuate. Fl. Jul, fr. Aug.

• Mountain slopes; 3800–3900 m. E Xizang (Gongbo'gyamda).

Similar to *Salix kongbanica* but leaf blade villous, not shortly woolly; peduncle of female catkin longer, with normal leaflets; style longer; ovary ovoid. Similar in its ovary to *S. gilshanica* but petiole tomentose; leaf blade oblong-elliptic,  $\pm$  villous, margin entire; female flower with adaxial and abaxial glands.

**134. *Salix atopantha*** C. K. Schneider in Sargent, Pl. Wilson. 3: 43. 1916.

奇花柳 qi hua liu

Shrubs to 1–2 m tall. Branchlets blackish purple or yellowish red, at first pilose, glabrescent. Petiole 2–6 mm; leaf blade elliptic-oblong or oblong, rarely lanceolate, 1.5–2.5(–4) cm  $\times$  5–10 mm, abaxially whitish, glabrous, adaxially dull brown, at first downy, glabrescent, base cuneate to rounded, margin indistinctly glandular,

serrate, rarely entire, apex acute or obtuse; lateral veins 6 or 7 on each side of midvein; fallen leaves of previous year rust colored. Flowering coetaneous. Male catkin oblong to shortly terete, 1.5–2 cm × 5–6 mm; peduncle 4–10 mm, with 3 or 4 leaflets; bracts obovate, 1/3–1/2 as long as filaments, apex rounded-truncate or irregularly shallowly crenate, yellow or apex brownish pubescent and ciliate. Male flower: glands 2, usually cylindric, ca. 1/2 as long as bracts, rarely divided; stamens 2; filaments nearly villous throughout; anthers yellow or in distal part of catkin red, globose. Female catkin with bracts dark russet, obovate or elliptic, nearly equal to ovary, abaxially woolly or sparsely pubescent distally, adaxially subglabrous, margin usually indistinctly crenulate, apex rounded. Female flower: adaxial gland usually 2- or 3-lobed, abaxial gland small or absent; ovary ovoid, woolly, sessile; style and stigma red, conspicuously 2-parted. Fl. Jun, fr. Jul.

• Mountain slopes, valleys, by rivers; 2900–4100 m. S Gansu, SE Qinghai, NW Sichuan, E Xizang.

1a. Ovary sessile ..... 134a. var. *atopantha*  
1b. Ovary distinctly stipitate ..... 134b. var. *pedicellata*

**134a. *Salix atopantha* var. *atopantha***

奇花柳(原变种) *qi hua liu* (*yuan bian zhong*)

Female flower: ovary sessile.

• Mountain slopes, valleys; 3700–4100 m. S Gansu, SE Qinghai, NW Sichuan, E Xizang.

**134b. *Salix atopantha* var. *pedicellata*** C. F. Fang & J. Q. Wang, *Bull. Bot. Res.*, Harbin 1(4): 123. 1981

长柄奇花柳 *chang bing qi hua liu*

Female flower: ovary with distinct stipe ca. 0.2 mm.

• By rivers; ca. 2900 m. S Gansu (Xiahe Xian).

**135. *Salix biondiana*** Seemen ex Diels, *Bot. Jahrb. Syst.* 36 (Beibl. 82): 32. 1905.

庙王柳 *miao wang liu*

Shrubs, rarely small trees. Branchlets dull brown, shiny. Buds russet, smooth. Petiole to 1 cm, glabrous; leaf blade oblong to obovate, to 3.5 × 1.7 cm, abaxially grayish green, glabrescent, adaxially dull green, glabrous, base attenuate, margin entire, apex obtuse, acute, or mucronate. Male catkin ca. 1.5 cm × 5 mm, pedunculate; bracts oblong or obovate-oblong, sparsely ciliate. Male flower: stamens 2; filaments villous at base, slightly longer than bracts; glands adaxial and abaxial, narrowly oblong, 1/4–1/3 as long as bracts, abaxial gland small, sometimes absent. Female catkin terete, 2–3 cm × ca. 8 mm, densely flowered; rachis brown pubescent; bracts as in male catkin, ca. 1/2 as long as ovary. Female flower: gland adaxial; ovary densely pilose, sessile; style short; stigma ovate. Capsule ovoid-conical, pilose. Fl. Apr, fr. May.

• Mountain slopes, valleys; ca. 3500 m. Gansu, Hubei, Qinghai, Shaanxi.

**136. *Salix qinlingica*** C. Wang & N. Chao, *Acta Bot. Bor.-Occid. Sin.* 5(2): 116. 1985.

陕西柳 *shan xi liu*

Shrubs. One-year-old branchlets ± pilose; juvenile branchlets densely downy. Petiole 1–3 mm, villous; leaf blade elliptic, oblong, or obovate-oblong, 1–2 cm × 6–8 mm, abaxially loosely villous when young, adaxially pubescent proximally, base cuneate, margin densely glandular serrulate, apex rounded or obtuse. Catkins slender, 1.5–2.5 cm × ca. 4 mm, densely flowered; peduncle ca. 1 cm, with leaflets; rachis pubescent; bracts elliptic-ovate, ca. 1 mm, apex rounded, margin edges villous. Male flower: adaxial gland broadly ovate ca. 0.2 mm, apex attenuate abaxial gland suboblong, ca. 0.2 mm; stamens 2; filaments distinct, basally densely villous. Female flower: adaxial gland subsquare, ca. 0.4 mm; ovary densely villous, sessile; style ca. 0.5 mm, glabrous, not divided; stigma small, entire. Fl. Jul.

• Mountains; ca. 1800 m. Shaanxi (Ningshan Xian).

**137. *Salix muliensis*** Goerz ex Rehder & Kobuski, *J. Arnold Arbor.* 13: 389. 1932.

木里柳 *mu li liu*

Shrubs to 2 m tall. Branchlets with many nodes and short internodes; 2- and 3-year-old branchlets greenish brown; 1-year-old branchlets brownish black; juvenile branchlets pilose, glabrescent. Petiole 4–8 mm, densely dirty pubescent; leaf blade obovate-oblong, obovate-elliptic, or elliptic, 1.8–4.5 × 1–2 cm, abaxially greenish, at first white villous, glabrescent, or villous along midvein, adaxially dull green, rarely sparsely pubescent, base rounded, margin entire or indistinctly glandular dentate, apex rounded or apiculate; lateral veins (7–)10–13 on each side of midvein. Flowering precocious. Male catkin ellipsoid to shortly terete, yellow or brownish yellow, sessile, with 1 or 2 scalelike leaflets at base; bracts brown, obovate or oblong, ca. 1/2 as long as filaments, abaxially yellow or white long pubescent, adaxially glabrous, apex rounded-truncate, sometimes dentate. Male flower: adaxial and abaxial glands barred, ca. 1/3 as long as bracts; stamens 2; filaments distinct, basally downy; anthers yellow, red in distal part of catkin. Fruiting catkin shortly pedunculate; bracts as in male catkin, ca. as long as ovary or slightly shorter. Female flower: gland adaxial; ovary ovoid or long ovoid, 1.5–2 mm, white downy, sessile; style conspicuous, 2-lobed; stigma entire or divided. Capsule conical-ovoid, ca. 4 mm, pilose. Fl. May–Jun, fr. Jul.

• Mountain slopes, thickets; 3000–4000 m. SW Sichuan, NW Yunnan.

**138. *Salix kongbanica*** C. Wang & P. Y. Fu, *Acta Phytotax. Sin.* 12: 197. 1974.

康巴柳 *kang ba liu*

Trees small. Branches dull purple; juvenile branchlets pubescent. Petiole 5–7 mm, pubescent; leaf blade long elliptic-lanceolate, 4–5 × 1–1.5 cm, both surfaces shortly woolly, becoming yellowish when dried, base subrounded, margin usually entire, rarely remotely glandular crenate, apex acute or shortly acuminate. Male catkin unknown. Female catkin ca. 1.1 cm; peduncle with 1 leaflet at base; rachis densely pubescent; bracts brown when dried, obovate-oblong or suboblong-elliptic, ca. 1/2 as long as ovary, pilose, margin irregularly dentate, apex subtruncate. Female flower: adaxial gland oblong, divided or entire, 1/4–1/3 as long as bracts; ovary gray, densely pubescent, sessile; style shortly cleft; stigma purple or red, 2-lobed. Fl. Aug.

- Mountain slopes. Xizang (Gamba Xian).

**139. *Salix sclerophylloides*** Y. L. Chou in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 103. 1979.

近硬叶柳 jin ying ye liu

Shrubs to 1.2 m tall. Branchlets dark grayish purple, pilose. Petiole 1–3 mm, densely downy; leaf blade oblong or elliptic, 1.5–2.5 × 0.8–1.1 cm, abaxially grayish brown, densely downy, adaxially pilose, densely downy on both surfaces when young, base obtuse or rounded-cuneate, margin entire, apex obtuse. Flowering coetaneous. Male catkin unknown. Female catkin 8–10 mm, shortly pedunculate or sessile, with 3(or 4) leaflets at base; bracts obovate, glabrous, margin sparsely ciliate. Female flower: adaxial gland cylindrical; ovary long ovoid, downy, sessile; style short, 2-lobed; stigma divided. Capsule downy. Fl. Jun, fr. Jun–Jul.

- Streamsides; ca. 3800 m. E Xizang.

Similar to *Salix sclerophylla* but branchlets and leaves densely downy; leaf blade oblong or elliptic; bracts of female catkin glabrous, margin sparsely ciliate; female flower with adaxial gland only.

**140. *Salix wuxuhaiensis*** N. Chao, Bull. Forest Pl. Res. 3: 6. 1985.

伍须柳 wu xu liu

Shrubs to 50 cm tall. Juvenile branchlets brownish yellow, gray tomentulose; 1-year-old branchlets dark brown, ± tomentulose. Buds flat, pubescent. Petiole slender, ca. 1.5 × 4 mm, tomentulose; leaf blade usually elliptic or broadly elliptic, 6–11 × 3–7 mm, abaxially pale, with waxy bloom, ± gray or yellow pubescent, adaxially dark green, shiny, tomentulose along veins, base broadly cuneate to subrounded, margin entire, ciliate, apex obtuse or rounded; lateral veins 5 or 6 each side of abaxially raised midvein. Male catkin unknown. Fruiting catkin 6–12 × 5–6 mm, pubescent, with 1–3 leaflets on peduncle; rachis tomentulose; bracts red, oblong, 1.2–2 mm, membranous, glabrous or loosely ciliate, apex rounded. Female flower: glands 2, abaxial

gland suboblong, ca. 0.3 mm, adaxial gland ovate-lanceolate, ca. 0.7 mm; ovary narrowly ovoid, pubescent; style ca. 0.6 mm, 2-lobed; stigma short, lobed. Capsule ovoid-ellipsoid, ca. 3 mm, gray pubescent, shortly stipitate. Fr. Jun.

- Mountain slopes; ca. 4200 m. Sichuan (Jiulong Xian).

**141. *Salix sclerophylla*** Andersson, J. Linn. Soc., Bot. 4: 52. 1860.

硬叶柳 ying ye liu

Shrubs erect, to 2 m tall. Branchlets with many nodes, tortuous, dull purplish red, or pruinose, glabrous. Buds russet, ovoid. Petiole 1–2 mm; leaf blade elliptic, obovate, or ovate to suborbicular, 2–3.4 × 1–1.6 cm, to 1 cm at anthesis, leathery, pilose on both surfaces, rarely subglabrous, abaxially greenish, adaxially green, both surfaces pubescent or subglabrous, or abaxially brown downy, base cuneate to rounded, margin entire, apex acute to rounded. Catkins ellipsoid to oblong-ellipsoid, ca. 1 cm, sessile or shortly pedunculate, with 1 or 2 leaflets or not; bracts brown or brownish purple, elliptic or obovate, ca. 1/2 as long as filaments, abaxially downy or adaxially glabrous, shortly ciliate, apex rounded-truncate or truncate. Male flower: adaxial and abaxial glands sometimes divided; stamens 2; filaments ca. 3 mm, base downy. Female flower: glands 2, sometimes divided, abaxial gland rarely absent; ovary narrowly ovoid, ca. 2 × as long as bracts; densely downy; style short; stigma 4-lobed. Capsule ovoid-conical, ca. 3.2 mm, downy, sessile or shortly stipitate.

Mountain slopes, thickets; 2800–4800 m. SE and W Gansu, Qinghai, W Sichuan, E Xizang, Yunnan [India, Kashmir, Nepal, Pakistan].

- 1a. Leaves abaxially brown downy; bracts truncate apically ..... 141b. var. *obtusata*
- 1b. Leaves abaxially subglabrous or white pubescent; bracts rounded-truncate apically.
  - 2a. Leaves and catkins relatively large; leaf blade 2–3.4 × 1–1.6 cm 141a. var. *sclerophylla*
  - 2b. Leaves and catkins very small 141c. var. *tibetica*

**141a. *Salix sclerophylla* var. *sclerophylla***

硬叶柳(原变种) ying ye liu (yuan bian zhong)

Leaf blade 2–3.4 × 1–1.6 cm, abaxially subglabrous or pubescent. Bracts rounded-truncate apically.

Mountain slopes, thickets; 4000–4800 m. SE Gansu, Qinghai, W Sichuan, E Xizang, Yunnan [India, Kashmir, Nepal, Pakistan].

**141b. *Salix sclerophylla* var. *obtusata*** (C. Wang & P. Y. Fu) C. F. Fang, Fl. Reipubl. Popularis Sin. 20(2): 231. 1984.

宽苞金背柳 kuan bao jin bei liu

*Salix spodiophylla* Handel-Mazzetti var. *obtusata* C.

Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 206. 1974.

Leaf blade abaxially brown downy. Bracts truncate at apex.

- Mountain slopes, thickets; ca. 4200 m. W Sichuan, E Xizang.

**141c. *Salix sclerophylla* var. *tibetica*** (Goerz ex Rehder & Kobuski) C. F. Fang, Fl. Reipubl. Popularis Sin. 20(2): 231. 1984.

小叶硬叶柳 *xiao ye ying ye liu*

*Salix oritrepha* C. K. Schneider var. *tibetica* Goerz ex Rehder & Kobuski, J. Arnold Arbor. 13: 388. 1932.

Leaves and catkins very small.

• Mountain slopes; 2800–4000 m. W Gansu, W Sichuan, NW Yunnan.

**142. *Salix rockii*** Goerz ex Rehder & Kobuski, J. Arnold Arbor. 13: 393. 1932.

拉加柳 *la jia liu*

Shrubs to 3 m tall. One-year-old branchlets russet, shiny or slightly downy. Buds purplish red, long ovoid, downy. Petiole 2–4 mm; leaf blade elliptic or obovate, 1.5–3 × 0.8–1.2 cm, abaxially sparsely grayish white villous, becoming glabrous or only slightly pilose along midvein, pale, adaxially dull green, glabrous, base rounded-cuneate, margin serrulate, rarely entire, apex acute; lateral veins (8–)10–12 on each side of midvein. Flowering coetaneous. Male catkin grayish white, oblong to shortly cylindrical, 1–1.5 (–2) cm × ca. 8 mm; peduncle very short, without leaflets or only with 1 scalelike leaflet; bracts obovate-oblong, ca. 1/2 as long as filaments, abaxially villous, adaxially pubescent, yellowish green or reddish at apex. Male flower: glands 2; stamens 2; filaments free, basally downy; anthers yellow, ovoid. Female catkin cylindrical, 1.5–2.5 × 0.8–1 cm, ca. 3.5 cm in fruit; peduncle short, with 2 or 3 often caducous leaflets, bracts elliptic, ca. as long as ovary, abaxially villous (usually glabrescent in fruit), adaxially subglabrous. Female flower: adaxial gland long ovate, abaxial gland sometimes present; ovary conical-ovoid, ca. 2 mm, downy, sessile or subsessile; style conspicuous, 2-lobed; stigma 2-cleft. Capsule ovoid, ca. 5 mm. Fl. May, fr. Jul.

• Mountain slopes, *Picea* forests; ca. 3700 m. Gansu, E Qinghai (Tongde Xian).

**143. *Salix juparica*** Goerz ex Rehder & Kobuski, J. Arnold Arbor. 13: 391. 1932.

贵南柳 *gui nan liu*

Shrubs to 4 m tall. Branches gray; branchlets dull brown or brown, stout; juvenile branchlets downy. Petiole 2–5 mm, downy; leaf blade elliptic, rarely ovate, 2–4(–5) × 1.8–2.2 cm, abaxially whitish, glabrous except pubescent along midvein, adaxially dull green, base cuneate-rounded, margin serrulate or crenulate, rarely entire, apex acute; lateral veins ca. 10 on each side of midvein. Flowering coetaneous. Male catkin terete, ca. 2 cm × 4–5 mm; peduncle 4–8 mm, with 2 or 3 leaflets; bracts obovate-oblong, ca. 1 mm, pubescent. Male flower: gland adaxial; stamens 2, distinct, ca. 3 mm; filaments downy proximally; anthers golden yellow, subglobose. Female catkin shortly terete, ca. 2.5 cm × 9 mm, more than 1 cm thick in fruit; bracts oblong or obovate-oblong, ca. 2 mm, downy proximally on both surfaces. Female flower: adaxial gland

narrowly ovate, ca. as long as stipe; ovary narrowly ovoid, ca. 2 mm, gray downy or glabrous; stipe ca. 0.5 mm; style ca. 0.5 mm; stigma capitate or 2-lobed.

Capsule ovoid-conical, ca. 4.5–6 mm. Fl. Jun, fr. Jun–Jul.

• Mountain slopes; 3100–3300 m. SE Qinghai.

1a. Ovary gray downy ..... 143a. var. *juparica*

1b. Ovary glabrous ..... 143b. var. *tibetica*

**143a. *Salix juparica* var. *juparica***

贵南柳(原变种) *gui nan liu* (*yuan bian zhong*)

Female flower: ovary gray downy.

• Mountain slopes; 3100–3300 m. SE Qinghai.

**143b. *Salix juparica* var. *tibetica*** (Goerz ex Rehder & Kobuski) C. F. Fang, Fl. Reipubl. Popularis Sin. 20(2): 232. 1984.

光果贵南柳 *guang guo gui nan liu*

*Salix tibetica* Goerz ex Rehder & Kobuski, J. Arnold Arbor. 13: 391. 1932.

Female flower: ovary glabrous.

• Mountain slopes; 3100–3300 m. SE Qinghai.

A. K. Skvortsov believes that this variety might be better treated at the rank of species.

**144. *Salix pseudospissa*** Goerz ex Rehder & Kobuski, J. Arnold Arbor. 13: 395. 1932.

大苞柳 *da bao liu*

Shrubs to 2 m tall. Branchlets purplish black or dull colored, stout, with many nodes, glabrous. Petiole short; leaf blade obovate, 3–5 cm, glabrous, abaxially whitish, adaxially dull green, base rounded, margin distinctly serrate, apex acute to acute; lateral veins 8–10 on each side of midvein. Flowering coetaneous. Catkins oblong-cylindrical, ca. 3 × 1.2 cm, sessile or very shortly pedunculate, usually with 1–3 leaflets at base; bracts obovate-oblong, ca. 5 mm, submembranous, downy, 5 (–7)-veined, margin sinuate-nicked, apex rounded-truncate, overlapping surrounding filaments or ovary. Male flower: adaxial gland ovate; stamens 2, ca. 5.5 mm; filaments partly united to nearly completely connate, basally downy; anthers yellow. Female flower: glands 1 or 2, adaxial gland ovate-terete, ca. 1.3 mm, abaxial gland very small or absent; ovary conical, ca. 3.5 mm, golden yellow pubescent, shortly stipitate; style 1.5–1.8 mm, 2-parted to 2-lobed, pubescent proximally; stigma long, cleft. Capsule unknown. Fl. Jun.

• Thickets on mountain slopes; ca. 4600 m. SE Gansu, Qinghai, N Sichuan.

**145. *Salix gilashanica*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 196. 1974.

吉拉柳 *ji la liu*

*Salix kulashanensis* C. Wang & P. Y. Fu.

Shrubs. Branchlets dark purple or brown, stout, smooth, glabrous. Buds 7–10 mm. Petiole reddish, 5–13 mm, glabrous; leaf blade obovate-elliptic, obovate, or elliptic, 3–5 × 1–3 cm, glabrous or puberulent along midvein, abaxially dull green, adaxially greenish or pruinose, base obtuse or subrounded, margin glandular serrate or

subentire, apex acute to subrounded. Catkins 1.5–2.5(–3.5) cm; peduncle short, with 1–3 leaflets at base; bracts elliptic to broadly obovate, pilose, apex rounded to truncate. Male flower: adaxial and abaxial glands shortly linear or terete, divided or entire; stamens 2; filaments distinct, woolly from base to middle, ca. 2 × as long as bracts; anthers yellow, ellipsoid. Fruiting catkin to 5 cm. Female flower: glands 1 or 2, abaxial gland slightly smaller than adaxial gland or abaxial gland absent; ovary ovoid, densely downy; style ca. as long as ovary, 2-cleft. Capsule to 6 mm. Fl. Jul, fr. Aug. • Mountain slopes; 3100–4700 m. SE Qinghai, W Sichuan, E Xizang, NW Yunnan.

**146. *Salix dalungensis*** C. Wang & P. Y. Fu, *Acta Phytotax. Sin.* 12: 194. 1974.

节枝柳 *jie zhi liu*

Trees to 5 m tall. Branchlets dark purple, with raised nodes, densely pubescent when young. Petiole to 8 mm, pubescent; leaf blade elliptic, 4–5 × 1.4–2 cm (at anthesis), abaxially densely shortly sericeous, glabrescent, adaxially pilose or pilose only along veins, base usually rounded or subrounded, rarely cuneate, margin entire, apex obtuse or subrounded, rarely subacute. Male catkin unknown. Female catkin ca. 2 cm × 3 mm, densely flowered; peduncle ca. 5 mm, with 2 or 3 leaflets; rachis villous; bracts elliptic or obovate, ca. 1/2 as long as ovary, ca. 2 mm, sparsely villous, or subglabrous distally abaxially, apex rounded. Female

flower: gland adaxial, linear-oblong, 1/4–1/3 as long as bracts; ovary villous, sessile; style ca. 0.5 mm, 2-lobed; stigma 2-cleft. Fl. Jun.

• Mountain slopes, cultivated places; ca. 4400 m. Xizang (Daglung, Nagarzê Xian).

**147. *Salix jinchanica*** N. Chao, *Fl. Sichuan.* 3: 287. 1985.

金川柳 *jin chuan liu*

Shrubs to 2 m tall. One-year-old branchlets glabrous, blackish brown, shiny juvenile branchlets pubescent. Buds pubescent. Petiole to 1.3 cm, adaxially pubescent; leaf blade oblong or obovate-oblong, ca. 5 × 2 cm, abaxially glaucous, greenish, adaxially dark green, glabrous except pilose along midvein, base cuneate, margin entire, apex acute or obtuse; lateral veins ca. 10 each side of abaxially raised midvein. Male catkin unknown. Female catkin ca. 2.2 cm × 7 mm, densely flowered, ca. 2.5 × 1.5 cm in fruit; rachis velvety; bracts ovate-orbicular, 2–3 mm, villous, apex rounded or subtruncate. Female flower: adaxial gland suboblong or broadly lanceolate, ca. 1 mm, sometimes lobed; ovary narrowly ovoid, densely red-brown or gray villous, sessile; style 1–1.5 mm, pilose, apex 2-lobed; stigma 2-lobed. Capsule 3–5 mm (not including style), sessile. Fl. Aug, fr. Aug–Sep.

• Mountains; 4000–4600 m. Sichuan (Maerkang Xian, Xiaojin Xian).

**13. Sect. *Psilostigmatae*** C. K. Schneider in Sargent, *Pl. Wilson.* 3: 115. 1916.

裸柱头柳组 *luo zhu tou liu zu*

Shrubs. Leaves highly variable, often large, both surfaces pilose or pilose only abaxially, rarely pilose along veins, subglabrous or glabrous when mature, margin entire or indistinctly serrate. Catkins cylindrical, peduncle, rarely subsessile long, with 2–5 leaflets; bracts pilose at least on one surface.

**Key based on male plants**

(*Salix argyrotrichocarpa*, *S. divergentistyla*, and *S. nujiangensis* unknown)

- 1a. Flowering precocious; catkin sessile or shortly pedunculate, with 2 or 3 scalelike leaflets.
  - 2a. Catkin opposite ..... 158. *S. salwinensis*
  - 2b. Catkin alternate.
    - 3a. Catkin ellipsoid or shortly cylindrical, ca. 2.5 × 1.5 cm; bracts prominently dentate, abaxially with hairs longer than bracts ..... 164. *S. sikkimensis*
    - 3b. Catkin cylindrical, 2–4 cm, less than 1 cm thick; bracts not dentate, hairs ca. 1/2 as long as bracts.
      - 4a. Unfurling young leaf blade obovate-elliptic to obovate-lanceolate, rarely elliptic, abaxially glabrous or usually comose along veins, base cuneate or rounded-cuneate, apex rounded or rounded-obtuse, not tomentose; fallen leaves from previous year rust colored ..... 155. *S. spodiophylla*
      - 4b. Unfurling young leaf blade elliptic or oblong abaxially tomentose, base rounded, apex acute; fallen leaves from previous year adaxially grayish brown, abaxially grayish white, persistently tomentose ..... 156. *S. balfouriana*
- 1b. Flowering coetaneous or slightly serotinous; catkin long pedunculate, with 2–5 leaflets.
  - 5a. Young leaves abaxially sericeous, shiny; largest leaves of peduncles to 1–4 cm at anthesis.
    - 6a. Peduncle less than 1 cm; leaflets on peduncle oblanceolate or obovate-oblong, base cuneate, apex rounded or rounded-obtuse.

- 7a. Catkin more than 6 mm thick ..... 159. *S. psilostigma*
- 7b. Catkin 4–6 mm thick ..... 160. *S. daliensis*
- 6b. Peduncle 1–2 cm; leaflets on peduncles broadly oblong or elliptic, base rounded, apex acute or rounded-obtuse.
  - 8a. Catkin long and slender, 7–10 × ca. 0.5 cm; young leaf blade lanceolate, apex acute to acuminate ..... 153. *S. phaidima*
  - 8b. Catkin 3.5–6 × ca. 1 cm; young leaf blade oblong or narrowly elliptic, rarely lanceolate, apex acute ..... 163. *S. daltoniana*
- 5b. Young leaves abaxially white tomentose or sparsely villous, largest leaves of peduncle 3–9 cm at anthesis.
  - 9a. Catkin 1–1.5 cm thick.
    - 10a. Catkins terminal on leafy branchlets; bracts truncate at apex ..... 166. *S. bistyla*
    - 10b. Catkins lateral; peduncle with 3 or 4 leaflets; bracts obtuse-rounded at apex ..... 167. *S. fengiana*
  - 9b. Catkin less than 1 cm thick.
    - 11a. Catkin long, slender, 7–12 × 0.7–0.9 cm at anthesis.
      - 12a. Bracts with 3 or 4 prominent, glandular teeth at apex; filaments downy throughout 152. *S. phanera*
      - 12b. Bracts without glandular teeth at apex, entire or somewhat incised; filaments glabrous or downy proximally.
        - 13a. Filaments glabrous; bracts narrowly obovate ..... 148. *S. fargesii*
        - 13b. Filaments pilose proximally; bracts ovate-orbicular ..... 157. *S. argyrophegga*
    - 11b. Catkin shorter, thicker, 4(–7) × ca. 1 cm at peak of anthesis.
      - 14a. Leaf margin entire, glandular dentate, or indistinctly loosely serrulate distally.
        - 15a. Young leaf blade elliptic or obovate-elliptic ..... 149. *S. ernestii*
        - 15b. Young leaf blade obovate to oblanceolate ..... 150. *S. eriostachya*
      - 14b. Leaf margin serrate, at least on distal part of branchlets.
        - 16a. Young leaf blade obovate-elliptic to obovate-lanceolate ..... 151. *S. plocotricha*
        - 16b. Young leaf blade obovate-oblong or narrowly obovate-elliptic, rarely elliptic 154. *S. spathulifolia*

#### Key based on female plants

- 1a. Flowering precocious; catkin sessile or subsessile or, if peduncle 1–2 cm, then leaflets absent.
  - 2a. Catkin more than 1 cm thick.
    - 3a. Bracts with long hairs only abaxially, submembranous, apex truncate, dentate, 3-veined 164. *S. sikkimensis*
    - 3b. Bracts with long hairs on both surfaces, not submembranous, apex rounded, entire, with obscure veins ..... 161. *S. argyrotrichocarpa*
  - 2b. Catkin less than 1 cm thick.
    - 4a. Style deeply lobed, ca. as long as ovary; young leaf blade obovate to obovate-oblong, rarely oblanceolate, abaxially comose along midvein ..... 155. *S. spodiophylla*
    - 4b. Style 2-lobed, ca. 1/2 as long as ovary; young leaf blade elliptic, rarely broadest above middle, abaxially tomentose ..... 156. *S. balfouriana*
- 1b. Flowering coetaneous or slightly serotinous; peduncle more than 1 cm, with leaflets; young leaves moderately large at anthesis.
  - 5a. Style ca. as long as ovary, lobed to at least middle, deeply lobed to completely divided.
    - 6a. Young leaf blade lanceolate.
      - 7a. Catkin and leaves opposite ..... 158. *S. salwinensis*
      - 7b. Catkin and leaves alternate ..... 159. *S. psilostigma*
    - 6b. Young leaf blade not lanceolate.
      - 8a. Style twisted; stigma filamentous.
        - 9a. Stigma usually curled; flowering coetaneous; young leaf blade elliptic or narrowly elliptic, rarely obovate-oblong ..... 149. *S. ernestii*
        - 9b. Stigma not curled; flowering serotinous; young leaf blade obovate-oblong or narrowly obovate-elliptic, rarely elliptic ..... 154. *S. spathulifolia*
      - 8b. Style not twisted; stigma not filamentous.
        - 10a. Leaf blade obovate or oblong-obovate; bracts obtuse-rounded at apex, not dentate 167. *S. fengiana*

- 10b. Leaf blade obovate-elliptic, narrowly elliptic, or narrowly ovate; bracts often truncate at apex,  $\pm$  denticulate.
- 11a. Style completely divided, divergent; stigma short, 2-lobed or not; catkin more than 1.3 cm thick ..... 166. *S. bistyla*
- 11b. Style deeply lobed to shallowly lobed; stigma long, usually lobed; catkin less than 1 cm thick.
- 12a. Style shallowly lobed; catkin 6–8 cm ..... 148. *S. fargesii*
- 12b. Style deeply lobed; catkin less than 5.5 cm ..... 162. *S. divergentistyla*
- 5b. Style  $1/3$ – $1/2$  as long as ovary, completely divided to 2-cleft, rarely shallowly lobed.
- 13a. Young leaf blade lanceolate to elliptic-oblong or narrowly elliptic, abaxially sericeous, shiny, margin often entire.
- 14a. Catkin more than 7 cm; young leaf apex acuminate to acute ..... 153. *S. phaidima*
- 14b. Catkin 3–6 cm; young leaf apex acute.
- 15a. Style completely divided; bracts obovate-deltoid, white villous on both surfaces or only abaxially, margin entire, apex truncate to rounded-truncate; young leaf blade abaxially white sericeous, cuneate at base ..... 160. *S. daliensis*
- 15b. Style 2-cleft, sometimes to more than  $1/2$  length of ovary; bracts spatulate-oblong, adaxially glabrous, margin sometimes crenate or with 2 nicked teeth, apex obtuse or subtruncate; young leaf blade abaxially lead gray sericeous, rounded at base ..... 163. *S. daltoniana*
- 13b. Young leaf blade ovate-lanceolate, elliptic to broadly elliptic, tomentose or villous abaxially, margin serrate or sinuous-crenate or, if leaf blade obovate-elliptic to obovate-lanceolate, then margin entire or inconspicuously remotely glandular dentate.
- 16a. Catkin long and slender, more than 6 cm, to more than 10 cm in fruit; mature leaves large, more than 7 cm, abaxially white tomentose.
- 17a. Bracts with 3 or 4 conspicuous, glandular teeth at apex; young leaf blade entire or irregularly sinuolate-crenate at margin, oblong-elliptic to ovate-lanceolate and crenate in fruit ..... 152. *S. phanera*
- 17b. Bracts entire at apex; young leaf blade gland-tipped or dentate only distally, elliptic to broadly elliptic and serrate in fruit ..... 157. *S. argyrophegga*
- 16b. Catkin 4–6 cm, to 10 cm in fruit; mature leaves less than 7(–9) cm, abaxially subglabrous.
- 18a. Ovary shortly stipitate ..... 165. *S. nujiangensis*
- 18b. Ovary sessile.
- 19a. Catkin ca. 5 cm; bracts ovate or oblong ..... 151. *S. plocotricha*
- 19b. Catkin ca. 3.5 cm; bracts obovate ..... 150. *S. eriostachya*

### Key based on vegetative characters

(Mature leaves of *Salix sikkimensis* unknown)

- 1a. Leaf margin dentate.
- 2a. Leaf blade more than 7 cm, elliptic, narrowly ovate, or oblong, rarely obovate-lanceolate.
- 3a. Leaf margin crenate or irregularly sinuolate-crenate ..... 152. *S. phanera*
- 3b. Leaf margin glandular serrulate.
- 4a. Juvenile branchlets with filamentous hairs at base ..... 148. *S. fargesii*
- 4b. Juvenile branchlets densely gray woolly ..... 157. *S. argyrophegga*
- 2b. Leaf blade less than 7 cm, obovate-oblong or obovate-elliptic, rarely oblong or elliptic.
- 5a. Leaves abaxially tomentose ..... 166. *S. bistyla*
- 5b. Leaves abaxially glabrous.
- 6a. Leaf margin serrulate ..... 154. *S. spathulifolia*
- 6b. Leaf margin remotely crenate-serrulate, sometimes entire ..... 151. *S. plocotricha*
- 1b. Leaf margin entire, rarely with inconspicuous, gland-tipped teeth.
- 7a. Leaves opposite ..... 158. *S. salwinensis*

- 7b. Leaves alternate.
- 8a. Leaves sessile or subsessile ..... 161. *S. argyrotrichocarpa*
- 8b. Leaves conspicuously petiolate.
- 9a. Lateral veins diverging at almost 90° ..... 165. *S. nujiangensis*
- 9b. Lateral veins diverging at 45° or less.
- 10a. Leaves abaxially sericeous.
- 11a. Leaves abaxially lead gray sericeous ..... 163. *S. daltoniana*
- 11b. Leaves abaxially white sericeous.
- 12a. Leaf margin serrulate, rarely entire, apex acuminate to long acuminate; petiole more than 10 mm ..... 153. *S. phaidima*
- 12b. Leaf margin sometimes with gland-tipped teeth, apex acute, rarely acuminate; petiole 6–7 mm ..... 160. *S. daliensis*
- 10b. Leaves not abaxially sericeous.
- 13a. Leaves abaxially glabrous, comose along veins.
- 14a. Leaf blade oblanceolate or obovate-elliptic, abaxially comose along veins ..... 155. *S. spodiophylla*
- 14b. Leaf blade narrowly elliptic, abaxially glabrous ..... 162. *S. divergentistyla*
- 13b. Leaves abaxially pilose.
- 15a. Leaf blade lanceolate ..... 159. *S. psilostigma*
- 15b. Leaf blade not lanceolate.
- 16a. Leaves abaxially greenish.
- 17a. Leaves abaxially tomentose ..... 149. *S. ernestii*
- 17b. Leaves pilose or subglabrous ..... 150. *S. eriostachya*
- 16b. Leaves abaxially whitish.
- 18a. Leaf blade elliptic, rarely narrowly elliptic, abaxially tomentose or glabrescent, margin entire or with inconspicuous, gland-tipped teeth ..... 156. *S. balfouriana*
- 18b. Leaf blade obovate or oblong-obovate, abaxially downy, occasionally inconspicuously crenate ..... 167. *S. fengiana*

**148. *Salix fargesii*** Burkill in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 528. 1899.

川鄂柳 chuan e liu

Trees or shrubs. Juvenile branchlets with filamentous hairs at base. Buds pilose at apex. Petiole to 1.5 cm, usually with several glands; leaf blade elliptic or narrowly ovate, ca. 11 × 6 cm, abaxially greenish, white villous along veins, adaxially dull green, glabrous or ± downy, base rounded to cuneate, margin glandular serrulate, apex acute to rounded; lateral veins 16–20 on each side of midvein. Catkins 6–8 cm; peduncle 1–3 cm, with leaflets; bracts narrowly obovate, ca. 1 mm, densely villous, apex rounded. Male flower: adaxial gland rectangular, abaxial gland broadly ovate, very small; stamens 2, glabrous. Fruiting catkin to 12 cm. Female flower: adaxial gland broadly ovate; ovary long pubescent or glabrous, shortly stipitate; style ca. 1 mm, 2-lobed; stigma 2-cleft. Capsule oblong-ovoid, pilose or glabrous, shortly stipitate.

• Mountains; 1400–1600 m. Gansu, Hubei, Shaanxi, Sichuan.

In the original description of *Salix fargesii*, the ovary was described as pilose; however, because glabrous ovaries were found in the isotypes by K. O. Seemen (Bot. Jahrb. Syst. 29: 277. 1900), his opinion was that the ovary of the type was glabrous. According to observations of the authors, as well as many other collections from the type location, the ovaries are either of two forms: pilose or glabrous. Therefore, it seems that the type collection (*A. Henry 5678*)

is probably a mixture of these forms. The authors follow I. H. Burkill's opinion, and treat the form with the pilose ovary as the autonymic variety. The name *Salix fargesii* var. *hypotricha* N. Chao (Bull. For. Pl. Res. 3: 5. 1985), requires further study as to its identity.

1a. Ovary long pubescent; capsule pilose 148a. var. *fargesii*  
1b. Ovary and capsule glabrous . 148b. var. *kansuensis*

**148a. *Salix fargesii* var. *fargesii***

川鄂柳(原变种) chuan e liu (yuan bian zhong)

Female flower: ovary long pubescent; capsule pilose.

• Mountains; 1400–1600 m. Gansu, Hubei, Shaanxi, Sichuan.

**148b. *Salix fargesii* var. *kansuensis*** (K. S. Hao ex C. F. Fang & A. K. Skvortsov) G. Zhu, Novon 8: 464. 1998.

甘肃柳 gan su liu

*Salix kansuensis* K. S. Hao ex C. F. Fang & A. K.

Skvortsov, Novon 8: 468. 1998.

Female flower: ovary and capsule glabrous.

• Mountains; 1400–1600 m. Gansu, Hubei, Shaanxi, Sichuan.

**149. *Salix ernestii*** C. K. Schneider in Sargent, Pl. Wilson. 3: 47. 1916.

银背柳 yin bei liu

*Salix daltoniana* Andersson var. *franchetiana* Burkill; *S. ernestii* f. *glabrescens* Y. L. Chou & C. F. Fang; *S. ernestii* var. *wangii* (Goerz) N. Chao; *S. franchetiana* (Burkill) Handel-Mazzetti; *S. pseudoernestii* Goerz; *S. wangii* Goerz.

Shrubs. Branchlets at first gray villous, glabrescent.

Buds long pubescent. Petiole to 1 cm, filamentous



villous; leaf blade elliptic or obovate-elliptic, ca. 11 × 4 cm, abaxially filamentous tomentose, when mature rarely glabrescent, adaxially downy, base rounded to cuneate, margin entire or indistinctly glandular denticulate distally, apex rounded, obtuse, or acute; veins raised on both surfaces; lateral veins 9–11 on each side of midvein. Flowering coetaneous. Male catkin 4–5 × ca. 1 cm; peduncle 1–3.5 cm, with normal leaflets; rachis villous; bracts obovate or obovate-oblong, ca. 2.5 mm, abaxially villous, apex rounded. Male flower: adaxial gland broader than abaxial gland; stamens 2; filaments villous proximally. Female catkin thinner than male, to 13 cm in fruit. Female flower: adaxial gland ovate-oblong, abaxial gland very small or absent; ovary downy; style ca. 1.5 mm, 2-divided; stigma filamentous, usually twisted. Capsule ca. 5 mm, pilose. Fl. May–Jun, fr. Jul–Aug.

• Mountain slopes; 2700–3500 m. Sichuan, Xizang, Yunnan.

**150. *Salix eriostachya*** Wallich ex Andersson, Kongl. Vetensk. Akad. Handl. 1850: 493. 1851.

绵穗柳 mian sui liu

Shrubs. Branchlets black or dark brown, glabrous or subglabrous. Buds pilose. Stipules ovate, ca. 1 mm, glabrous, dentate; petiole to 1.3 cm, adaxially pubescent; leaf blade oblong, obovate, or oblanceolate, 4–11 × 1.5–3 cm, abaxially greenish, adaxially dark green, both surfaces pubescent or villous, glabrescent, base cuneate or broadly cuneate, margin entire or with remote, indistinct, glandular teeth, apex acute or shortly acuminate; veins raised abaxially; lateral veins 15–20 on each side of midvein; reticulate veins conspicuous. Catkins ca. 3.5 × 6 mm; peduncle ca. 2.5 cm, with leaflets; rachis velvety; bracts obovate, 2–3 mm, downy, margin entire or incised, apex rounded or truncate. Male flower: abaxial gland very small, adaxial gland ovate, ca. 0.5 mm; stamens 2, distinct; filaments downy proximally; anthers yellow. Fruiting catkin ca. 9 × 1.5 cm. Female flower: glands 2, abaxial gland sometimes absent, adaxial gland broadly ovate, ca. 0.5 mm; ovary white villous, sessile; style ca. 2 mm, 2-parted; stigma linear, parted. Capsule narrowly ovoid, ca. 6 mm, pilose. Fl. Jun, fr. Jul–Aug.

Mountains; 3000–5000 m. Sichuan, Xizang, Yunnan [India, Nepal, Sikkim].

A. K. Skvortsov indicates that these plants may in fact be *Salix ernestii* because *S. eriostachya* is of Himalayan distribution.

1a. Ovary sessile; peduncle ca. 2.5 cm; bracts 2–3 mm ..... 150a. var. *eriostachya*

1b. Ovary shortly stipitate; catkin almost sessile; bracts ca. 1.5 mm .... 150b. var. *lineariloba*

**150a. *Salix eriostachya*** var. *eriostachya*

绵穗柳(原变种) mian sui liu (yuan bian zhong)

Catkin peduncle ca. 2.5 cm; bracts 2–3 mm. Female flower: ovary sessile.

Mountains; 3000–5000 m. Sichuan, Xizang, Yunnan [India, Nepal, Sikkim].

**150b. *Salix eriostachya*** var. *lineariloba* (N. Chao) G. Zhu, Novon 8: 464. 1998.

线裂绵穗柳 xian lie mian sui liu

*Salix dolia* C. K. Schneider var. *lineariloba* N. Chao, Bull. For. Pl. Res. 3: 4. 1985.

Catkins almost sessile; bracts ca. 1.5 mm. Female flower: ovary shortly stipitate.

• Mountain slopes; ca. 3900 m. Sichuan (Jiulong Xian, Wuxuhai).

**151. *Salix plocotricha*** C. K. Schneider in Sargent, Pl. Wilson. 3: 49. 1916.

曲毛柳 qu mao liu

*Salix allochroa* C. K. Schneider.

Shrubs. Two-year-old branchlets glabrous; juvenile branchlets with filamentous hairs at base. Petiole to 2 cm, sometimes with 1–several glands; leaf blade oblong or obovate-elliptic, ca. 9 × 3.5 cm, abaxially greenish, adaxially green, both surfaces glabrous or subglabrous when mature, base cuneate to rounded, margin remotely crenate-serrulate, rarely subentire, apex obtuse or acute; lateral veins ca. 10 on each side of midvein. Catkins ca. 5 × 0.6 cm; peduncle ca. 3.5 cm, with leaflets; rachis villous; bracts ovate or oblong, 1–1.5 mm, sparsely pubescent, apex obtuse or rounded. Male flower: stamens 2; filaments distinct, basally villous; glands 2. Fruiting catkin to 10 × 1 cm. Female flower: adaxial gland broad, apex nearly truncate; ovary narrowly ovoid, ca. 1.5 mm, gray pubescent, sessile; style nearly 1 mm, 2-lobed; stigma short, 2-cleft. Capsule ca. 5 mm, pilose. Fl. Jun, fr. Jul.

• Mountains; 2200–2500 m. S Gansu, W Sichuan, E Xizang.

**152. *Salix phanera*** C. K. Schneider in Sargent, Pl. Wilson. 3: 50. 1916.

长叶柳 chang ye liu

Trees small, or large shrubs. Branchlets at first white woolly, glabrescent. Buds glabrous. Stipules large, glandular dentate, dictyogenous, at first woolly; petiole ca. 2 cm, pilose; leaf blade ovate-lanceolate, elliptic-lanceolate, or elliptic, ca. 17 × 4.5 cm, abaxially at first white woolly, glabrescent, adaxially ± white tomentose, particularly along veins, base broadly cuneate to subcordate, margin glandular denticulate when young, later crenate or sinuolate-crenate, apex acuminate, acute, or obtuse; veins raised; lateral veins numerous, conspicuously dictyogenous. Catkins ca. 10 cm × 5 mm; peduncle 2–3 cm, with normal leaflets; rachis densely tomentose; bracts broadly ovate, broadly elliptic, or oblong, 1–1.5 mm, abaxially with filamentous hairs, apex glandular dentate or not. Male flower: adaxial gland ca. 1 mm, 2-parted, abaxial gland sublinear; stamens 2; filaments distinct, villous. Fruiting catkin ca. 1 cm thick. Female flower: adaxial gland linear-lanceolate, ca. 1.5 mm, sometimes 2-parted; ovary tomentose, sessile; style conspicuous, 2-cleft; stigma

cleft. Capsule 4–5 mm, tomentose, sessile. Fl. Jun, fr. Jun–Jul.

• Streamsides, mountain slopes, woods; 2200–3000 m. S Gansu, W Sichuan, NW Yunnan.

1a. Bracts broadly ovate or broadly elliptic, apex glandular dentate ..... 152a. var. *phanera*

1b. Bracts oblong, apex rounded, without glandular teeth ..... 152b. var. *weixiensis*

**152a. *Salix phanera* var. *phanera***

长叶柳(原变种) chang ye liu (yuan bian zhong)

*Salix phaneroide*s Goerz.

Bracts broadly ovate or broadly elliptic, apex glandular dentate.

• Streamsides; 2200–3000 m. S Gansu, W Sichuan, NW Yunnan.

**152b. *Salix phanera* var. *weixiensis*** C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 15. 1980.

维西长叶柳 wei xi chang ye liu

Bracts oblong, apex rounded, without glandular teeth. Fl. May.

• Mountain slopes, woods; ca. 2500 m. NW Yunnan.

**153. *Salix phaidima*** C. K. Schneider in Sargent, Pl. Wilson. 3: 51. 1916.

纤柳 xian liu

Trees or shrubs. Two-year-old branchlets glabrous; juvenile branchlets ± gray villous. Buds pilose. Stipules small; petiole 4–7 mm, pilose; leaf blade linear-lanceolate to ovate-lanceolate, ca. 9 × 2 cm, abaxially at first white tomentose, shiny, becoming sparsely pilose or subglabrous, adaxially with filamentous hairs, glabrescent, base rounded to cuneate, margin entire, rarely indistinctly glandular serrulate, rarely entire, apex acute to acuminate; midvein abaxially raised; lateral veins indistinct. Male catkin slender, recurved, 7–10(–12) cm × 5 mm; peduncle ca. 3 cm, with normal leaflets; rachis pilose; bracts oblong, ca. 1.5 mm, abaxially filamentous villous, apex obtuse to subtruncate. Male flower: glands 2, subequal, adaxial gland oblong or sublinear, ca. 1 mm, sometimes 2-cleft, abaxial gland rarely broader, 2- or 3-parted; stamens 2; filaments distinct or connate proximally, villous. Female catkin pendulous in fruit. Female flower: gland adaxial, sublinear, ca. 1 mm. stigma 2-lobed. Capsule ca. 3 mm, sessile, with filamentous hairs. Fl. May, fr. Jun.

• Mountains; 1600–2300 m. Sichuan.

**154. *Salix spathulifolia*** Seemen ex Diels, Bot. Jahrb. Syst. 36(5, Beibl. 82): 31. 1905.

匙叶柳 chi ye liu

*Salix spathulifolia* f. *lobata* C. F. Fang & J. Q. Wang. Shrubs. Branches brown, glabrous. Buds yellowish brown, ovoid-globose, glabrous. Petiole to 1.5 cm; leaf blade obovate-oblong, narrowly obovate-elliptic, or

broadly oblanceolate, rarely elliptic, 4–9 × 1.5–2.5(–3.5) cm, abaxially pale or pruinose, at first villous, glabrescent, adaxially dark green, pilose when young, glabrescent, base broadly cuneate, margin irregularly serrulate, rarely subentire, apex acute or sharply obtuse; veins raised abaxially. Flowering serotinous. Catkins 2–4 cm × 6–8 mm; peduncle with 2–4 leaflets; bracts broadly elliptic, ca. 2 mm, abaxially downy proximally, ciliate, apex rounded-truncate or irregularly shallowly dentate. Male flower: adaxial and abaxial glands rarely lobed; stamens 2, free; filaments downy proximally, ca. 3 mm. Fruiting catkin to 6.5 cm. Female flower: gland adaxial, ovate; ovary ovoid, downy, sessile; style slender, 2-parted, twisted; stigma 2-cleft. Capsule ovoid-oblong, grayish white pubescent, sessile or shortly stipitate. Fl. Jun, fr. Jul.

• Mountain slopes; 1800–2900 m. Gansu, Qinghai, Shaanxi, N Sichuan.

*Salix jennisensis* (F. Schmidt) Floderus (from Russia) is very similar; it differs as follows: bracts often brownish or blackish at apex; glands quadrangular, not exceeding stipe; style only slightly cleft; ovary shortly stipitate. *Salix spathulifolia* var. *glabra* C. Wang & C. F. Fang ex T. Y. Ding, Fl. Qinghai. 1: 506. 1997, was described from Qinghai (Minhe). It is said to differ from var. *spathulifolia* in having a glabrous ovary.

**155. *Salix spodiophylla*** Handel-Mazzetti, Symb. Sin. 7: 77. 1929.

灰叶柳 hui ye liu

Shrubs 1–3 m tall. Branchlets brownish red or purplish red, stout, with many nodes and short internodes, shiny. Leaves petiolate; leaf blade oblanceolate or obovate-elliptic, rarely obovate, 4–9 × 1–2.9 cm, leathery, abaxially glabrous or comose along veins, adaxially glabrous or with sparse, filamentous hairs, base cuneate, margin entire, apex acute or obtuse; veins raised abaxially; fallen leaves of previous year rust colored. Flowering coetaneous. Male catkin cylindrical, 2–3 cm × 6–8 mm; peduncle short, with 2 or 3 leaflets caducous usually; bracts obovate, ca. 2 mm, abaxially long white pubescent, adaxially glabrous, apex rounded-truncate or retuse. Male flower: glands 2, ovate-oblong, adaxial gland larger than abaxial one; stamens 2; filaments distinct or partly united, 5–6 mm, base downy; anthers yellow, oblong. Female catkin 3.5–4.5 cm × ca. 8 mm, to 5.5 cm in fruit; peduncle to 1.5 cm, with sometimes caducous leaflets; bracts obovate or obovate-oblong, ca. 3 mm, longer than ovary, abaxially long white pubescent, adaxially glabrous or downy proximally. Female flower: adaxial gland ovate-oblong; ovary ovoid-conical; pilose or sparsely pubescent; style ca. as long as ovary, 2-lobed; stigma 2-cleft. Capsule broadly ovoid, ca. 3.5 mm. pilose. Fl. Jun, fr. Jul–Aug.

• Mountain slopes, thickets; 2500–4300 m. Sichuan, NW Yunnan. Similar to *Salix ernestii* but leaf blade not elliptic, abaxially comose, not tomentose; peduncle shorter, leaflets usually caducous; style 2-parted to -cleft.

1a. Ovary pilose or pubescent . 155a. var. *spodiophylla*

1b. Ovary glabrous ..... 155b. var. *liocarpa*

**155a. *Salix spodiophylla* var. *spodiophylla***

灰叶柳(原变种) hui ye liu (yuan bian zhong)

Female flower: ovary pilose or pubescent.

• Thickets; 2500–4300 m. Sichuan, NW Yunnan.

**155b. *Salix spodiophylla* var. *liocarpa*** (K. S. Hao ex C. F. Fang & A. K. Skvortsov) G. Zhu, Novon 8: 466. 1998.

光果灰叶柳 guang guo hui ye liu

*Salix spodiophylla* f. *liocarpa* K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 469. 1998.

Female flower: ovary glabrous.

• Mountain slopes. Sichuan, NW Yunnan.

**156. *Salix balfouriana*** C. K. Schneider, Bot. Gaz. 64(2): 137. 1936.

白背柳 bai bei liu

Shrubs or trees to 5 m tall. Two-year-old branchlets glabrous or slightly pilose; juvenile branchlets reddish black, tomentose. Buds blackish brown, pilose. Leaves very small at anthesis; petiole 1–1.5 cm, pilose; leaf blade elliptic, elliptic-oblong, or obovate-oblong, 6–8(–12) × 2–4 cm, to 18 cm on shoots, glandular dentate, abaxially tomentose, usually rust-colored sericeous when young, when mature glabrescent, whitish, adaxially glabrous or pubescent along veins, dark green, base rounded or broadly cuneate, margin entire or inconspicuously glandular dentate, apex obtuse or acute, contorted; fallen leaves of previous year grayish brown. Flowering precocious or coetaneous. Catkins 2(–4) cm × 6–10 mm; peduncle short to nearly absent, with 1 or 2 leaflets at base or not; bracts obovate-oblong, abaxially reddish yellow distally, downy, ciliate, adaxially glabrous or slightly pilose, apex rounded-truncate or notched. Male flower: adaxial and abaxial glands sometimes divided; stamens 2, free; filaments pilose nearly throughout; anthers yellow, rarely red. Fruiting catkin to 8 cm, with elongated peduncle. Female flower: gland adaxial; ovary reddish purple, ovoid-conical, pubescent, sessile; style long, 2-lobed; stigma 2-cleft. Capsule to 5.5 mm, subglabrous. Fl. Apr–May, fr. Jun–Jul.

• Mountain slopes, thickets; 2800–4000 m. Sichuan, NW Yunnan.

**157. *Salix argyrophegga*** C. K. Schneider in Sargent, Pl. Wilson. 3: 49. 1916.

银光柳 yin guang liu

*Salix wenchuanica* Goerz.

Trees or shrubs. Two-year-old branchlets glabrous; juvenile branchlets gray villous. Buds villous. Stipules ovate, elliptic, or semicordate, 4–5 mm, abaxially villous, margin glandular serrate, apex acute; petiole 0.5–1.5 cm, pilose; leaf blade elliptic, ovate-elliptic, or oblong, 3–11 × 2–5.5 cm, abaxially gray or yellowish tomentose, glabrescent, adaxially gray villous, glabrescent except along midvein, base rounded, subcordate, or cuneate, margin glandular serrate, rarely subentire, apex acute, shortly acuminate, or obtuse.

Flowering coetaneous. Catkins 4–8 cm × 7–8 mm; peduncle 2–4 cm, villous, with several leaflets; rachis villous; bracts ovate-orbicular, ca. 1 mm, apex rounded, villous. Male flower: adaxial and abaxial glands sublinear, ca. 1 mm. Stamens 2; filaments villous proximally. Fruiting catkin to 14 cm. Female flower: adaxial gland oblong, ca. 1 mm; ovary villous, sessile; style conspicuous, 2-cleft; stigma 2-lobed. Capsule ovoid-ellipsoid, 5–6 mm, pilose. Fl. Apr–May, fr. Jun–Aug.

• Mountain slopes, thickets; 2100–3000 m. W Sichuan, E Xizang.

**158. *Salix salwinensis*** Handel-Mazzetti ex Enander, Sitzungsber. Kaisler. Akad. Wiss. Wien., Math.-Naturwiss. Cl. 63: 95. 1926.

对叶柳 dui ye liu

*Salix salwinensis* var. *radinostachya* Handel-Mazzetti.

Shrubs to more than 1 m tall. Young branchlets and buds densely pilose. Leaves opposite, stipulate, shortly petiolate; stipules lanceolate; leaf blade lanceolate or oblanceolate, 4–8 × 1.5–2 cm, abaxially tomentose, greenish, adaxially tomentose or pubescent, green, base cuneate or subrounded, margin entire, apex acute or acuminate. Male catkin sessile; bracts obovate, abaxially and marginally downy, adaxially subglabrous, apex subtruncate. Male flower: adaxial gland slightly larger than abaxial one; stamens 2, distinct; filaments downy for ca. 1/2 their length or nearly throughout. Female catkin cylindrical, 4–6 cm; peduncle 5–10 mm, with 2–4 oblong leaflets; bracts oblong, as long as or slightly longer than ovary at anthesis, abaxially and marginally villous, adaxially subglabrous, apex subtruncate or obtuse. Female flower: gland adaxial, ovate-oblong; ovary ovoid, ca. 2.5 mm, downy, sessile; style long, 2-parted; stigma 2-lobed. Capsule ca. 5 mm. Woods; 2900–3200 m. NW Yunnan [Bhutan, E Nepal, Sikkim].

- 1a. Leaves lanceolate; male catkin ca. 3 × 0.5 cm ..... 158a. var. *salwinensis*  
 1b. Leaves oblanceolate; male catkin ca. 11.5 × 0.8 cm ..... 158b. var. *longiamentifera*

**158a. *Salix salwinensis* var. *salwinensis***

对叶柳(原变种) dui ye liu (yuan bian zhong)

Leaf blade lanceolate. Male catkin ca. 3 cm × 5 mm.

Woods; 2900–3200 m. NW Yunnan [Bhutan, E Nepal, Sikkim].

**158b. *Salix salwinensis* var. *longiamentifera*** C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 17. 1980.

长穗对叶柳 chang sui dui ye liu

Leaf blade oblanceolate. Male catkin ca. 11.5 cm × 8 mm. Fl. Jun.

• Woods; 3000–3200 m. NW Yunnan.

**159. *Salix psilostigma*** Andersson, Kongl. Vetensk. Acad. Handl. 1850: 496. 1851.

裸柱头柳 luo zhu tou liu

*Salix eriophylla* Andersson

Shrubs, rarely small trees. Branchlets brown, pilose when young, glabrescent. Stipules on shoots obliquely semiovate-lanceolate; petiole ca. 1 cm; leaf blade lanceolate, rarely narrowly elliptic-lanceolate, 4–8 × 1.5–2 cm, to 16 cm on shoots, abaxially white tomentose, adaxially green or dark green, tomentulose to subglabrous, base cuneate or cuneate-rounded, margin entire or indistinctly sparsely glandular serrate, apex acuminate, rarely acute; lateral veins more than 18 each side of abaxially raised midvein. Flowering coetaneous or slightly serotinous. Male catkin cylindrical; 4–6 cm × ca. 8 mm; peduncle with 2–5 leaflets; bracts subobovate, both surfaces white downy, margin irregularly dentate, apex subtruncate. Male flower: adaxial and abaxial glands narrowly ovate; stamens 2; filaments distinct, downy nearly throughout, ca. 2 × as long as bracts; anthers yellow. Female catkin 6–8 × 0.8–1 cm. Female flower: gland adaxial; ovary ovoid, grayish white downy; style long, cleft to 2-parted; stigma shortly 2-cleft. Capsule narrowly ovoid, sessile. Fl. May–Jun, fr. Jul–Aug.  $2n = 38$ .

Mountain slopes; 3000–3600 m. Sichuan, Xizang, Yunnan [Bhutan, India, Nepal, Sikkim].

**160. *Salix daliensis*** C. F. Fang & S. D. Zhao in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 5. 1980.

大理柳 da li liu

Shrubs. Branchlets pilose when young, glabrescent. Buds brownish red, ovoid. Petiole (3–)6–7 mm, densely downy; leaf blade lanceolate or oblong-lanceolate to narrowly ovate, (3–)5–6(–8) × 0.6–1.5(–2) cm, abaxially densely white sericeous, shiny, adaxially green to dark green, subglabrous, base cuneate-rounded, margin entire or indistinctly remotely gland tipped, apex acute; lateral veins more than 20 each side of abaxially raised midvein. Flowering coetaneous. Catkins cylindrical, 1.5–6 cm (–15) × 4–6 mm; peduncle with 2–5 leaflets; bracts obdeltoid or deltoid-obovate, densely white downy, ciliate, apex truncate. Male flower: adaxial and abaxial glands ovate or oblong-ovate, ca. 1/2 as long as bracts, apex truncate or retuse; stamens 2, free; filaments downy nearly throughout, ca. 2 × as long as bracts; anthers yellow, ellipsoid. Female flower: gland adaxial, oblong-ovate, ca. 1/3 as long as ovary; ovary ovoid, ca. 2 mm, white downy, sessile; style 1/3–1/2 as long as ovary, completely divided or 2-lobed; stigma short, 2-lobed. Capsule densely pubescent. Fl. Apr, fr. Jun.

• Valleys, mountain slopes, mixed woods; 1500–2700 m. SW Hubei, S Sichuan, Yunnan.

Similar to *Salix wolohoensis* but leaf blade sericeous and shiny abaxially; style 2-divided or -parted. Similar also to *S. psilostigma* but leaf blade acute at apex; petiole short; catkins slender; style shorter, 2-divided; ovary small.

**161. *Salix argyrotrichocarpa*** C. F. Fang in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 107. 1979.

银毛果柳 yin mao guo liu

Shrubs to 3 m tall. Branchlets purplish brown, stout, ca. 5 mm in diam., glabrous; juvenile branchlets glabrous or slightly pilose, glabrescent. Leaves sessile or subsessile; leaf blade obovate-elliptic, 5–7 × 2.5–3 cm, both surfaces uniformly colored or abaxially greenish, glabrous, adaxially wrinkled, slightly pilose when young, glabrescent except along veins, base cuneate-rounded to rounded, margin entire, apex acute, rounded, or apiculate. Flowering precocious or nearly coetaneous. Male catkin unknown. Female catkin 6–7 × ca. 1.3 cm; peduncle 1–2.5 cm, without leaflets; rachis white villous; bracts obovate-oblong, both surfaces densely long silky, apex subrounded. Female flower: adaxial gland subovate; ovary narrowly ovoid, ca. 3 mm, white downy, shortly stipitate; style long, ca. 1/2 as long as ovary, 2-lobed; stigma 2-cleft. Fl. Jul.

• Mountain slopes; ca. 3900 m. SE Xizang (Médog Xian).

Similar to *Salix sikkimensis* but leaf blade slightly pilose when young, margin not gland-tipped; peduncle long; bracts not membranous, densely long silky, rounded at apex. Similar also to *S. spodiophylla* but leaves sessile or subsessile; blade glabrous or slightly pilose along veins abaxially; peduncle without leaflets; bracts long silky.

**162. *Salix divergentistyla*** C. F. Fang in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 108. 1979.

叉柱柳 cha zhu liu

Shrubs or small trees. Branchlets brownish red, glabrous. Petiole ca. 6 mm; leaf blade narrowly elliptic, 3–4.5 × 1.3–1.6 cm, abaxially greenish, villous, glabrescent or subglabrous, adaxially green, with impressed veins, glabrous, both ends sharply pointed, margin entire; lateral veins 9–12 each side of abaxially raised midvein; all veins impressed adaxially. Male catkin unknown. Fruiting catkin 3.5–5.5 × ca. 1 cm; peduncle long, with 2 or 3 leaflets; rachis pubescent; bracts broadly elliptic or broadly oblong, ca. as long as ovary, abaxially downy proximally, adaxially glabrous, slightly ciliate, apex subrounded, rounded-truncate, or retuse. Female flower: gland adaxial, ovate or rectangular, entire or divided; ovary ovoid, ca. 2.5 mm, densely downy, sessile; style long, nearly divided, divergent; stigma 2-cleft. Capsule ca. 5 mm, pilose.

• Mountain slopes, valleys; ca. 3400 m. E Xizang (Zayü Xian).

**163. *Salix daltoniana*** Andersson, J. Linn. Soc., Bot. 4: 49. 1860.

褐背柳 he bei liu

Shrubs or small trees. Branchlets blackish purple, sparsely downy when young. Buds ovoid, shorter than petiole, rarely pruinose. Petiole ca. 1 cm; leaf blade lanceolate, oblong, or elliptic, 4.5–9 × 1.5–2.5 cm, abaxially densely lead gray sericeous, shiny, adaxially dull green, glabrous or pubescent along veins, when young sparsely downy, base cuneate to rounded, margin entire, rarely indistinctly glandular serrulate, apex acute;

lateral veins 11–14(–16) each side of adaxially conspicuous midvein; veins indistinct abaxially. Flowering coetaneous. Male catkin cylindrical, 3.5–6 × 0.8–1 cm; peduncle with 2–5 leaflets; bracts yellowish brown, spatulate-oblong, abaxially downy and villous, adaxially glabrous, margin entire, crenate, or 2-cleft, apex obtuse or subtruncate. Male flower: stamens 4–5.5 mm, basally downy; anthers yellow, oblong. Female catkin 4–6(–7) cm × 5–6 mm, more than 10 cm in fruit; bracts as in male catkin. Female flower: gland adaxial, 1/3–1/2 as long as bracts; ovary ovoid, densely downy; style ca. as long as ovary, 2-lobed; stigma purplish red, 2-cleft. Capsule ovoid-conical, pilose or glabrescent, attenuate, sessile or shortly stipitate. Fl. May–Jun, fr. Jul.  $2n = 38$ .

Thickets on mountain slopes; 3000–4400 m. Xizang [Bhutan, India, Nepal, Sikkim].

Similar to *Salix balfouriana* and *S. ernestii* but leaf blade densely lead gray sericeous, shiny, and indistinctly veined abaxially; style and stigma not twisted.

**164. *Salix sikkimensis*** Andersson in A. de Candolle, Prodr. 16(2): 268. 1868.

锡金柳 xi jin liu

Shrubs to 1–2 m tall. Two-year-old branchlets stout, with conspicuous angles and nodes, dull purplish red, glabrous, smooth, shiny. Leaves very small at anthesis, mature leaves unknown; leaf blade elliptic, rarely narrowly elliptic, abaxially densely white sericeous-pubescent, appressed, shiny, glabrescent, adaxially green, glabrous or downy along veins, margin entire. Flowering precocious, rarely nearly coetaneous. Male catkin thick, 2–2.5 × ca. 1.6 cm, sessile; bracts nearly obdeltoid, ca. 4 mm, submembranous, abaxially with dense, long, white hairs, adaxially subglabrous, apex subtruncate, dentate, 3-veined. Male flower: glands adaxial and abaxial; stamens 2; filaments distinct, ca. 8 mm, base downy; anthers yellow or partly red, ellipsoid. Female catkin 3.5–4.5(–8) × 1.3–1.6 cm; bracts as in male catkin. Female flower: gland adaxial; ovary conical-ovoid, ca. 3.5 mm, downy, shortly stipitate; style long, 2-parted; stigma entire. Capsule unknown. Fl. Jun.

Streamsides; 3700–4500 m. Xizang, NW Yunnan [Bhutan, India, Nepal, Sikkim].

Similar to *Salix bistyla* but leaf blade indistinctly veined abaxially when young; catkins lateral, sessile, leafless; flowering precocious.

**165. *Salix nujiangensis*** N. Chao, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 25. 1980.

怒江柳 nu jiang liu

Shrubs to 1.5 m tall. Branchlets dull russet, stout, glabrous, shiny. Buds large. Petiole 5–10 mm, pilose; leaf blade obovate-elliptic to obovate-lanceolate, 4–9 × 2–3.2 cm, subleathery, abaxially grayish white,

adaxially dull green, both surfaces usually glabrous except villous along midvein, base broadly cuneate or subcordate, margin entire or indistinctly irregularly remotely glandular dentate, apex acute or obtuse; lateral veins ca. 12 each side of abaxially raised midvein, diverging from midvein at almost 90°. Male catkin unknown. Fruiting catkin stout, more than 10 cm, ca. 1.3 cm wide; peduncle 3–4.5 cm, with several leaflets; rachis pilose; bracts brown, suboblong, 2–3 mm, abaxially villous, adaxially glabrous, margin often irregularly shallowly dentate, apex subtruncate. Female flower: adaxial gland ovate-oblong, subtruncate, ca. 0.5 mm; ovary conical, pilose, subsessile; style ca. 1 mm, furcate; stigma 2-lobed. Capsule 5–6 mm, ± pilose, subsessile. Fr. Oct.

• Mountains; ca. 2800 m. NW Yunnan (Gaoligong Shan).

**166. *Salix bistyla*** Handel-Mazzetti, Symb. Sin. 7: 76. 1929.

双柱柳 shuang zhu liu

Shrubs. Branchlets villous at first, glabrescent. Buds glabrous. Stipules ca. 5 mm, abaxially tomentose, margin glandular serrate; petiole ca. as long as stipules, tomentose; leaf blade narrowly elliptic or narrowly obovate-elliptic, ca. 7 × 2.5 cm, abaxially densely gray tomentose, adaxially villous along veins, base cuneate, margin glandular serrate, apex acute or obtuse; lateral veins 10(–12) on each side of midvein. Flowering coetaneous. Catkins terminal, 4–6 × 1–1.5 cm, densely flowered; rachis tomentose; bracts obovate-flabelliform, large, ca. 5 mm, abaxially white silky, margin indistinctly dentate, apex truncate. Male flower: adaxial gland long elliptic, abaxial gland sublinear; stamens 2, distinct; filaments downy throughout. Female catkin stout, to 16 × 2 cm in fruit. Female flower: adaxial gland linear, ca. 1 mm, abaxial gland small or absent; ovary narrowly ovoid, densely white tomentose, sessile; style ca. 4–5 mm, basally tomentose, completely divided, divergent; stigma entire or 2-lobed. Capsule ovoid, to 9 mm, tomentose, usually with persistent style, sessile. Fl. Jun–Jul, fr. Aug–Sep.

Mountains; 2600–3400 m. E Xizang, NW Yunnan [Nepal].

**167. *Salix fengiana*** C. F. Fang & Chang Y. Yang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 7. 1980.

贡山柳 gong shan liu

Shrubs to 1.5 m tall. One-year-old branchlets purplish black, glabrous; juvenile branchlets densely gray downy. Buds ovoid, tomentose. Petiole 5–6 mm, tomentose; leaf blade obovate or oblong-obovate, 4–8 × 3–4 cm, abaxially pale, pubescent along midvein, downy, adaxially green, downy, base rounded, broadly cuneate, or cuneate, margin entire, on long shoots remotely crenate distally, apex obtuse-rounded and obliquely apiculate. Flowering coetaneous or serotinous. Male catkin terminal, cylindrical, 4–5 cm; peduncle 2–3 cm, gray tomentose, with 3 or 4 leaflets; bracts

yellowish brown, oblong or orbicular-obovate, ca. 1/2 as long as ovary, abaxially downy, adaxially subglabrous, apex obtuse-rounded or nearly truncate. Male flower: adaxial gland usually larger than abaxial gland; stamens 2; filaments distinct, 5–6 mm, villous nearly throughout, downy. Female catkin 4–8 × ca. 1 cm. Female flower: ovary ovoid-conical, grayish white tomentose, sessile; style cleft; stigma 2-lobed-cleft. Capsule brown, sparsely tomentose. Fl. Jul, fr. Oct.

- Mountains; 3400–3700 m. NW Yunnan.

1a. Ovary and capsule white tomentose 167a. var. *fengiana*<sup>Zizhixian</sup>.

1b. Ovary and capsule glabrous 167b. var. *gymnocarpa*

**167a. *Salix fengiana* var. *fengiana***

贡山柳(原变种) gong shan liu (yuan bian zhong)

Ovary and capsule white tomentose.

- 3500–3700 m. NW Yunnan.

**167b. *Salix fengiana* var. *gymnocarpa*** P. Y. Mao & W. Z. Li, Acta Bot. Yunnan. 9: 53. 1987.

裸果贡山柳 luo guo gong shan liu

Ovary and capsule glabrous.

- Mountains; ca. 3400 m. NW Yunnan (Gongshan Drungzu Nuzu

**14. Sect. *Eriocladae*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 470. 1998.

绵毛柳组 mian mao liu zu

Shrubs. Petiole short to almost absent; leaf blade very small, 8–20 mm at anthesis, elliptic, elliptic-lanceolate, or lanceolate, rarely broadly lanceolate to oblanceolate. Flowering precocious or coetaneous. Catkins cylindrical, pedunculate (sometimes male catkin sessile), with leaflets. Male flower: glands adaxial and abaxial; stamens 2, distinct. Female flower: adaxial gland only present; ovary ovoid or ovoid-conical, pilose, sessile; style conspicuous, 2-lobed to -cleft.

**Key based on male plants**

(*Salix dibapha* and *S. hupehensis* unknown)

1a. Male catkin less than 5 mm thick (rarely to 7 mm).

2a. Young leaf blade lanceolate ..... 174. *S. wolochoensis*

2b. Young leaf blade elliptic.

3a. Young leaves with rust-colored hairs; bracts suborbicular ..... 168. *S. inamoena*

3b. Young leaves with white or yellowish hairs; bracts obovate or ovate ..... 169. *S. amphibola*

1b. Male catkin more than 6 mm thick.

4a. Bracts truncate at apex; filaments ca. 5 mm; young branchlets glabrous ..... 175. *S. resecta*

4b. Bracts rounded or obtuse at apex; filaments 3–4 mm; young branchlets pilose.

5a. Male flower with only an adaxial gland; filaments ca. 4 mm ..... 170. *S. driophila*

5b. Male flower with adaxial and abaxial glands; filaments ca. 3 mm ..... 171. *S. erioclada*

**Key based on female plants**

1a. Bracts truncate or rounded-truncate at apex.

2a. Bracts obovate-oblong, ca. 2 mm, nearly as long as ovary ..... 175. *S. resecta*

2b. Bracts obovate to suborbicular, ca. 1 mm, shorter than ovary.

3a. Bracts with long hairs on both surfaces, ca. as long as adaxial gland; young leaf blade elliptic 170. *S. driophila*

3b. Bracts adaxially glabrous, ca. 2 × as long as adaxial gland; young leaf blade lanceolate 174. *S. wolochoensis*

1b. Bracts rounded or obtuse at apex.

4a. Bracts suborbicular, obovate, or ovate, ca. 1 mm.

5a. Young leaves with rust-colored hairs ..... 168. *S. inamoena*

5b. Young leaves with white or yellowish gray hairs ..... 169. *S. amphibola*

4b. Bracts elliptic or elliptic-oblong, 1.5–2 mm.

6a. Bracts with long hairs on 1 surface ..... 171. *S. erioclada*

6b. Bracts adaxially glabrous, abaxially glabrescent distally.

7a. Young leaf blade elliptic or elliptic-oblong; gland ovate-oblong ..... 172. *S. dibapha*

7b. Young leaf blade ovate-lanceolate to linear-lanceolate; gland orbicular ..... 173. *S. hupehensis*

**Key based on vegetative characters**

1a. Branchlets glabrous, brown or purplish brown, shiny; leaves often clustered at apex of branchlets 175. *S. resecta*

1b. Branchlets pilose at least distally, ± dull; leaves not clustered at apex of branchlets.

2a. Leaf blade lanceolate to ovate-lanceolate.

3a. Leaf blade ovate-lanceolate ..... 173. *S. hupehensis*

3b. Leaf blade lanceolate to oblanceolate, rarely broadly lanceolate ..... 174. *S. wolochoensis*

2b. Leaf blade usually rather broad, not lanceolate.

- 4a. Leaf blade with rust-colored hairs along veins or on petiole abaxially ..... 168. *S. inamoena*  
 4b. Leaf blade without rust-colored hairs.  
 5a. Mature leaves whitish, pruinose, or glaucous abaxially.  
 6a. Branchlets reddish chestnut colored or yellowish; leaf blade ovate-lanceolate to elliptic, abaxially downy at least along veins, base obtuse-rounded, apex obtuse or rounded 171. *S. erioclada*  
 6b. Branchlets blackish brown; leaf blade elliptic or elliptic-oblong, glabrous on both surfaces, base cuneate to subrounded, apex acute or shortly acuminate ..... 172. *S. dibapha*  
 5b. Mature leaves greenish or pinkish green abaxially.  
 7a. Leaves abaxially tomentose or downy ..... 170. *S. driophila*  
 7b. Leaves abaxially glabrous or subglabrous, pilose along veins ..... 169. *S. amphibola*

**168. *Salix inamoena*** Handel-Mazzetti, Symb. Sin. 7: 69. 1929.

丑柳 *chou liu*

Shrubs small. Branchlets thin; juvenile branchlets white or yellowish downy or tomentose, glabrescent. Petiole rust-colored pubescent; leaf blade elliptic, 2–4.5 × 1–2.2 cm, abaxially greenish or whitish, yellowish or rust-colored downy, adaxially bright green, yellow pubescent along veins when young, base rounded, margin indistinctly glandular dentate, apex apiculate; lateral veins 6–8 on each side of midvein, raised abaxially. Flowering coetaneous. Male catkin cylindric, 2–6 cm × 3–5(–7) mm; peduncle short, with 2–4 leaflets; bracts greenish yellow or slightly brown, suborbicular, glabrous or abaxially pubescent at base, ca. 1 mm. Male flower: adaxial and abaxial glands shortly terete; stamens 2; filaments distinct, ca. 2 mm, downy at least to middle; anthers yellow, subglobose. Fruiting catkin 8–10 mm wide; bracts suborbicular, abaxially sparsely villous or glabrous, adaxially glabrous. Female flower: gland adaxial; ovary ovoid, ca. 1.5 mm, white downy or glabrous; style short; stigma 2-lobed. Capsule russet, ovoid-oblong, to 4 mm. Fl. Apr, fr. May–Jun.

• Valleys, mountain slopes, roadsides; ca. 2000 m. Yunnan.

Similar to *Salix praticola* but bracts glabrous. A hybrid between *S. guebriantiana* (as *S. tetradenia*) and *S. inamoena* was recorded by Handel-Mazzetti (Symb. Sin. 7: 71. 1929); it was treated in FRPS under the invalid name *S. inamoena* var. *glabra* C. F. Fang.

**169. *Salix amphibola*** C. K. Schneider in Sargent, Pl. Wilson. 3: 60. 1916.

九鼎柳 *jiu ding liu*

Shrubs. Branchlets ± villous. Leaves petiolate; leaf blade elliptic or broadly elliptic, 1.2–4 × 0.7–1.7 cm, abaxially pinkish green, villous along midvein, adaxially dull green, yellowish gray pubescent along midvein, both ends rounded, margin entire; lateral veins ca. 10 each side of abaxially raised midvein, dictyogenous. Catkins to 2.5 cm × 4–5 mm, densely flowered; peduncle ca. 5 mm, villous, with leaflets; rachis pilose; bracts obovate or ovate, ca. 1 mm, margin villous. Male flower: adaxial gland subovate; stamens 2; filaments free, pilose at base. Fruiting catkin ca. 3.5 cm × 8 mm. Female flower: adaxial gland subovate, ca. 0.2

mm; ovary ± villous, sessile or subsessile; style ca. 0.3 mm, 2-lobed; stigma 2-cleft. Capsule ellipsoid-lanceolate, ca. 4 mm, sparsely villous. Fl. Apr–May, fr. Jun.

• Mountain slopes; 2300–3000 m. Sichuan (Li Xian, Maowen Qiangzu Zizhixian).

**170. *Salix driophila*** C. K. Schneider in Sargent, Pl. Wilson. 3: 59. 1916.

林柳 *lin liu*

Shrubs. Branchlets purplish brown or yellowish brown; juvenile branchlets purplish green, tomentose. Leaves petiolate; leaf blade elliptic, oblong, or rounded, abaxially greenish, silky tomentose or downy, adaxially green, slightly pubescent or subglabrous, margin entire, apex obtuse or acute. Flowering coetaneous. Male catkin erect, (2.5–)4–4.5 cm × 6–8 cm; peduncle 1–2 cm, with 2–5 leaflets; bracts obovate-oblong, ca. 1.5 mm, curved, villous, apex greenish, obtuse. Male flower: gland adaxial, oblong-cylindric, ca. 0.6 mm, stout; stamens 2; filaments distinct, 3.5–4 mm, pilose at base. Fruiting catkin to 5.5 cm; bracts suborbicular, ca. 1 mm, villous or adaxially glabrous. Female flower: adaxial gland ovate-cylindric, stout, ca. as long as bracts; ovary ovoid, ca. 2 × as long as bracts, densely white downy, sessile; style conspicuous, 2-lobed; stigma entire or 2-cleft. Capsule ovoid, ca. 3 mm, pilose, sessile. Fl. and fr. May.

• Woods on mountain slopes; 2100–3100 m. Sichuan, E Xizang, NW Yunnan.

**171. *Salix erioclada*** H. Léveillé & Vaniot in H. Léveillé, Repert. Spec. Nov. Regni Veg. 3: 22. 1906.

绵毛柳 *mian mao liu*

Shrubs or small trees. Branchlets reddish chestnut or yellow, densely white pubescent, glabrescent. Petiole short; leaf blade ovate-lanceolate to elliptic, ca. 5 × 1.5 cm, abaxially pruinose or glaucous, downy, glabrescent, adaxially dull green, base narrowly rounded or cuneate, margin entire, apex acute; young leaves convolute, silky downy, abaxially white tomentose, apex obtuse or rounded; lateral veins 7–12 on each side of midvein adaxially. Flowering precocious or coetaneous. Male catkin narrowly terete, (2.5–)6 cm × 6–7 mm; peduncle ca. 1.5 cm, with 2 or 3 leaflets; rachis downy; bracts

yellowish green, obovate, silky villous or abaxially subglabrous, ca. 1/2 as long as filaments. Male flower: adaxial and abaxial glands entire or divided; stamens 2; filaments free, base downy; anthers yellow, globose, small. Female catkin 3–6 cm × 4–6 mm; bracts yellowish green (brown when dry), elliptic, ca. 2 mm, densely long silky. Female flower: gland adaxial; ovary ovoid or narrowly ovoid, silky tomentose, sessile or shortly stipitate; style ca. 1/3 as long as ovary, cleft; stigma 2-lobed. Capsule narrowly ovoid to ovoid-conical, 4–6 mm, subglabrous. Fl. Apr, fr. May.

• Margins of woods, mountain slopes, marshes; 600–1800 m. Hubei, Hunan, Qinghai, Shaanxi, Sichuan.

**172. *Salix dibapha*** C. K. Schneider, Bot. Gaz. 64(2): 146. 1917.

异色柳 *yi se liu*

Shrubs to 4 m tall. Branchlets blackish brown, downy when young and glabrescent, or glabrous. Petiole 4–7 mm; leaf blade elliptic or elliptic-oblong, 4–6(–8) × 1.4–2(–2.4) cm, glabrous, abaxially whitish, adaxially greenish or green, reddish when young or pubescent only veins, base cuneate or subrounded, margin entire, apex acute or shortly acuminate. Flowering coetaneous or precocious. Male catkin unknown. Female catkin pedunculate; peduncle ca. 5 mm, to ca. 1 cm in fruit, with (1 or) 2 or 3 sometimes caducous leaflets; bracts dark brown or yellowish green, elliptic-oblong, obovate, or obovate-oblong, abaxially villous and ciliate or sparsely villous, sometimes glabrescent distally, adaxially glabrous, apex obtuse or subacute. Female flower: glands 1 or 2, adaxial and abaxial or adaxial only, entire or 2-cleft; ovary narrowly ovoid, ca. 2 mm, white downy, sessile; style 1/3–1/2 as long as ovary, 2-lobed to cleft; stigma 2-cleft. Capsule ca. 4 mm; stipe short or absent. Fl. Apr, fr. May–Jun.

• Mountain slopes, sandy shores, near water; 2600–3100 m. Gansu, E Xizang, NW Yunnan.

- 1a. Branchlets downy when young, glabrescent; peduncle ca. 1 cm; bracts dark brown, elliptic-oblong, abaxially villous and ciliate, sometimes glabrescent distally; female flower with adaxial gland only; fl. Apr 172a. var. *dibapha*  
1b. Both older and juvenile branchlets glabrous; peduncle ca. 5 mm; bracts yellowish green, obovate or obovate-oblong, abaxially sparsely villous; female flower with adaxial and abaxial glands; fl. Jun–Jul 172b. var. *biglandulosa*

**172a. *Salix dibapha*** var. *dibapha*

异色柳(原变种) *yi se liu* (*yuan bian zhong*)

Branchlets downy when young, glabrescent. Catkin peduncle ca. 1 cm; bracts dark brown, elliptic-oblong, abaxially villous and ciliate, sometimes glabrescent distally. Female flower: adaxial gland only present. Fl. Apr.

• Mountain slopes, sandy shores, near water; 2600–2700 m. E Xizang, NW Yunnan.

**172b. *Salix dibapha*** var. *biglandulosa* C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 6. 1980.

二腺异色柳 *er xian yi se liu*

Older and juvenile branchlets glabrous. Catkin peduncle ca. 5 mm; bracts yellowish green, obovate or obovate-oblong, abaxially sparsely villous. Female flower: adaxial and abaxial glands present. Fl. Jun–Jul.

• Mountain slopes; ca. 3100 m. Gansu (Yuzhong Xian).

**173. *Salix hupehensis*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 468. 1998.

湖北柳 *hu bei liu*

Shrubs. Branches blackish brown, glabrous; branchlets villous. Petiole 3–5 mm, downy; leaf blade ovate-lanceolate, rarely linear-lanceolate, 3–5 × 1–1.4 cm, adaxially dull green, glabrous or pilose along veins, base attenuate or broadly cuneate, margin entire, apex acuminate or acute. Male catkin unknown. Female catkin to 4 × 0.4 cm; peduncle short, with 2 or 3 leaflets; bracts elliptic-oblong, ca. as long as ovary, abaxially densely downy, adaxially subglabrous. Female flower: adaxial gland orbicular; ovary ovoid-ellipsoid, ca. 1.5 mm, pubescent, sessile; style short; stigma slender, 2-lobed.

• Hubei (Changyang Xian).

**174. *Salix wolohoensis*** C. K. Schneider, Bot. Gaz. 64(2): 140. 1917.

川南柳 *chuan nan liu*

Shrubs. Branchlets dull green, tomentose. Leaves petiole; leaf blade lanceolate to oblanceolate, rarely broadly lanceolate, 3–5 × 1–1.6 cm, abaxially yellowish tomentose, adaxially slightly pilose, base broadly cuneate to rounded, margin entire or indistinctly glandular dentate, apex acute. Male catkin 2–3 cm × ca. 4 mm, subsessile; bracts obovate, ca. 1 mm, abaxially villous, ciliate, adaxially subglabrous, apex subtruncate, curved. Male flower: gland adaxial; stamens 2, distinct, base villous; anthers yellow, ellipsoid. Fruiting catkin 3.5–6 × ca. 1 cm; peduncle with 2–4(–6) leaflets; bracts obovate, ca. 1/2 as long as ovary, abaxially villous and ciliate, adaxially subglabrous, apex subtruncate. Female flower: gland adaxial; ovary ovoid or narrowly ovoid, ca. 1.5 mm, densely white tomentose; style conspicuous, entire or 2-lobed; stigma 2-cleft. Capsule ca. 3.5 mm. Fl. May, fr. Jun.

• Valleys, mountain slopes; 1600–3000 m. Sichuan (Yanyuan Xian), Yunnan.

Similar to *Salix polyclona* and *S. pseudowolohoensis* but ovary pilose. Similar also to *S. psilostigma* but male flower with adaxial gland only; bracts of female catkin ca. 1/2 as long as ovary; style entire or 2-lobed, not divided or 2-parted.



**175. *Salix resecta*** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 281. 1912.

截苞柳 jie bao liu

Shrubs to 2 m tall. Lateral branches usually together on distal part of trunk or main branches, brown or purplish brown, stout, glabrous, shiny. Leaves clustered at apex of branchlets; petiole short; leaf blade oblong or slightly obovate-elliptic, 2–2.5(–3.5) × 0.5–1.3(–1.6) cm, abaxially pale, downy, adaxially pilose, base obtuse, margin entire, apex obtuse or acute. Catkins lateral on distal part of branchlets. Male catkin ca. 3 cm × 6–8 mm; peduncle with 36 leaflets; bracts suborbicular to

obovate-oblong, ca. 1/2 as long as filaments, downy, ciliate, apex truncate or rounded-truncate, rarely retuse. Male flower: glands adaxial and abaxial; stamens 2; filaments free, ca. 5 mm, downy nearly throughout; anthers golden yellow. Female catkin 2–5.5 cm × 4–7 mm; bracts obovate-oblong, nearly as long as ovary. Female flower: adaxial gland ca. 1/3 as long as bracts, abaxial gland rarely present and small; ovary ovoid to long ovoid, white or yellowish pubescent, sessile; style long, 2-cleft; stigma 2-lobed. Capsule ca. 3 mm; stipe short. Fl. May, fr. Jun.

• Mountain valleys; 2800–4300 m. Sichuan, Yunnan.

**15. Sect. *Heterochromae*** C. K. Schneider in Sargent, Pl. Wilson. 3: 121. 1916.

紫枝柳组 zi zhi liu zu

Branchlets generally purplish red, slender. Leaf blade narrowly oblong, elliptic, ovate, or broadly ovate, papery, abaxially pale, silky when young, glabrescent or glabrous, margin entire, apex acute to acuminate. Flowering coetaneous. Catkins cylindrical, pedunculate; peduncle, with 2 or 3 leaflets deciduous in fruit or leaflets absent; bracts yellowish green to brown. Male flower: gland solitary, adaxial; stamens 2, distinct, rarely united at base; filaments downy proximally. Female flower: ovary silky, stipitate; style conspicuous, 2-cleft; stigma 2-lobed.

**Key based on male plants**

(*Salix paraheterochroma*, *S. trichocarpa*, and *S. yadongensis* unknown)

- 1a. Catkin 3–5.5 cm; bracts oblong; gland obovate ..... 176. *S. heterochroma*  
 1b. Catkin 1.5–3 cm; bracts obovate or elliptic; gland narrowly ovate or terete.  
     2a. Bracts obovate; anthers yellow; gland narrowly ovate ..... 181. *S. alfredii*  
     2b. Bracts elliptic; anthers red, rarely yellow at base of catkin; gland terete ..... 178. *S. taishanensis*

**Key based on female plants**

- 1a. Catkin (1–)1.5–6 cm; ovary shortly stipitate; stipe less than 0.6 mm.  
     2a. Catkin 4–6 cm, shortly pedunculate; ovary ovoid ..... 181. *S. alfredii*  
     2b. Catkin ca. 1.5 cm, sessile; ovary ovoid-conical ..... 178. *S. taishanensis*  
 1b. Catkin 6–10 cm; ovary long stipitate; stipe more than 0.6 mm.  
     3a. Bracts lanceolate, villous ..... 176. *S. heterochroma*  
     3b. Bracts not lanceolate, glabrous.  
         4a. Ovary pilose; bracts truncate at apex ..... 180. *S. yadongensis*  
         4b. Ovary densely pilose; bracts rounded or acute at apex.  
             5a. Ovary ovoid; bracts obovate-oblong, long ciliate, apex acute ..... 177. *S. paraheterochroma*  
             5b. Ovary ovoid-conical; bracts elliptic, not ciliate, apex rounded ..... 179. *S. trichocarpa*

**Key based on vegetative characters**

- 1a. Shrubs or small trees; branches dark purplish red or yellowish brown; leaf blade elliptic to lanceolate or ovate-lanceolate ..... 176. *S. heterochroma*  
 1b. Shrubs; branches russet, brownish green, or brownish purple; leaf blade ovate-orbicular, ovate, broadly rhomboid-ovate, or elliptic to narrowly elliptic.  
     2a. Leaves broadly ovate, broadly rhomboid-ovate, or ovate.  
         3a. Leaf base rounded; branchlets purplish brown ..... 181. *S. alfredii*  
         3b. Leaf base shallowly cordate to rounded; branchlets brownish red to russet ..... 178. *S. taishanensis*  
     2b. Leaf blade elliptic, narrowly elliptic, or oblong-elliptic.  
         4a. Leaf blade abaxially glabrous, base cuneate ..... 177. *S. paraheterochroma*  
         4b. Leaf blade abaxially ± pilose, based rounded.  
             5a. Bracts abaxially with dense, long hairs; ovary narrowly ovoid-conical, downy ..... 179. *S. trichocarpa*  
             5b. Bracts abaxially glabrous or pilose at apex; ovary slightly oblong-ovoid, glabrous proximally  
                 ..... 180. *S. yadongensis*

**176. *Salix heterochroma*** Seemen, Bot. Jahrb. Syst. 21(Beibl. 53): 56. 1896.

紫枝柳 *zi zhi liu*

Shrubs or trees to 10 m tall. Branches dull purplish red or yellowish brown, at first downy, glabrescent. Petiole 0.5–1.5 cm; leaf blade elliptic to lanceolate or ovate-lanceolate, 4.5–10 × 1.5–2.7 cm, abaxially pruinose, sparsely silky, adaxially dull green, base cuneate, margin entire or remotely serrulate, apex acuminate or acute. Male catkin 3–5.5 cm, subsessile; rachis sericeous; bracts yellowish brown, oblong, silky villous and ciliate, or glabrous and sparsely long ciliate. Male flower: gland adaxial, long ovate or obovate, 1/2–2/3 as long as bract; stamens 2; filaments sparsely downy, ca. 3 × as long as bracts; anthers yellow, ovoid-oblong. Female catkin cylindrical, to 6–10 cm in fruit; peduncle ca. 1 cm; rachis downy; bracts lanceolate to elliptic, pilose. Female flower: adaxial gland long ovate, 1/3–1/2 as long as bracts; ovary ovoid-cylindric, pilose or glabrous, stipitate; style ca. 1/3 as long as ovary; stigma 2-cleft. Capsule ovoid-oblong, ca. 5 mm, gray pubescent, apex acute. Fl. Apr–May, fr. May–Jun.

• Mountain slopes, margins of woods, valleys; 1400–2100 m. Gansu, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

1a. Ovary pilose; bracts silky villous and ciliate ..... 176a. var. *heterochroma*

1b. Ovary glabrous; bracts glabrous, sparsely long ciliate ..... 176b. var. *glabra*

**176a. *Salix heterochroma* var. *heterochroma***

紫枝柳(原变种) *zi zhi liu* (*yuan bian zhong*)

*Salix henryi* Burkill; *S. heterochroma* var. *concolor* Goerz.

Bracts silky villous and ciliate. Female flower: ovary pilose.

• Margins of woods, valleys; 1400–2100 m. Gansu, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

**176b. *Salix heterochroma* var. *glabra*** C. Y. Yu & C. F. Fang in C. Y. Yu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 29. 1980.

无毛紫枝柳 *wu mao zi zhi liu*

Bracts glabrous, sparsely long ciliate. Female flower: ovary glabrous.

• Mountain slopes, margins of woods. S Gansu.

Similar to *Salix hypoleuca* but leaves larger; peduncle with only 1 leaflet or not; bracts sparsely long ciliate, ligulate; ovary stipitate.

**177. *Salix paraheterochroma*** C. Wang & P. Y. Fu in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 107. 1979.

藏紫枝柳 *zang zi zhi liu*

Shrubs to 3 m tall. One-year-old branchlets brown, glabrous; juvenile branchlets at first woolly tomentose, glabrescent. Buds brownish red, ellipsoid, glabrous. Stipules obliquely ovate-lanceolate, small, glandular dentate; petiole 5–8 mm; leaf blade elliptic or narrowly elliptic, 5–9 × 1.5–3.4 cm, glabrous or pilose at base of midvein, both ends attenuate, abaxially greenish, adaxially dull green, base cuneate, margin entire or

indistinctly glandular dentate, apex acute; veins yellow, raised; lateral veins ca. 14 on each side of midvein.

Flowering serotinous. Male catkin unknown. Immature fruiting catkin ca. 8 × 1 cm; peduncle ca. 3 cm, with 2–5 leaflets; bracts obovate-oblong, ca. as long as ovary, abaxially downy and ciliate, adaxially glabrous, apex acute. Female flower: gland adaxial, subovoid, apex truncate or retuse; ovary ovoid, pilose; stipe ca. as long as style; style conspicuous, cleft; stigma short, entire or divided. Capsule purplish red, ovoid, ca. 5 mm, apically attenuate. Fr. Aug.

• Woods on mountain slopes; 3300–3400 m. S Xizang.

**178. *Salix taishanensis*** C. Wang & C. F. Fang in C. Wang, al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 18. 1980.

泰山柳 *tai shan liu*

Shrubs to more than 1 m tall. Second-year branchlets slightly primose; branchlets russet when young, reddish black when dried. Petiole 5–7 mm; leaf blade ovate or elliptic, ca. 3.5 × 2 cm, abaxially grayish green, glabrous, adaxially green, pubescent when young and along midvein, base shallowly cordate to rounded or cuneate to rounded-cuneate, margin entire, apex obtuse or acute; midvein conspicuous adaxially; cataphyll abaxially long silky. Flowering coetaneous. Male catkin 2.5–3 × ca. 1 cm, sessile; bracts yellowish green, elliptic, densely white villous, or adaxially glabrous or subglabrous. Male flower: gland adaxial; stamens 2; filaments distinct, villous at base; anthers red, rarely yellow at base of catkin, ovoid. Female catkin 1–2 cm × ca. 4 mm; bracts as in male catkin, ca. 1 mm. Female flower: gland adaxial, cylindrical or ovate, ca. as long as stipe; ovary ovoid-conical, ca. 2 mm, gray downy or glabrous; stipe ca. 0.4 mm; style ca. 0.5 mm, 2-parted; stigma 2-cleft or entire. Fl. Apr–May.

• Thickets on mountain slopes; ca. 1400 m. Hebei, Henan, Shandong, Shanxi.

1a. Ovary glabrous ..... 178c. var. *glabra*

1b. Ovary pilose.

2a. Leaf blade ovate, base shallowly cordate to rounded; adaxial gland cylindrical; bracts densely white villous 178a. var. *taishanensis*

2b. Leaf blade elliptic, base cuneate to rounded-cuneate; adaxial gland ovate; bracts adaxially glabrous or subglabrous ..... 178b. var. *hebeinica*

**178a. *Salix taishanensis* var. *taishanensis***

泰山柳(原变种) *tai shan liu* (*yuan bian zhong*)

Leaf blade ovate, base shallowly cordate to rounded. Bracts densely white villous. Male flower: adaxial gland cylindrical.

• Thickets on mountain slopes; ca. 1400 m. Hebei, Henan, Shandong, Shanxi.

Similar to *Salix alfredii* but leaf blade rounded to shallowly cordate at base; bracts long pubescent; anthers red; female catkin short, 1–2 cm; style 2-parted; ovary ovoid-conical; stipe conspicuous.

**178b. *Salix taishanensis* var. *hebeinica*** C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 19. 1980.

河北柳 *he bei liu*

Leaf blade elliptic, base cuneate to rounded-cuneate. Bracts adaxially glabrous or subglabrous. Male flower: adaxial gland ovate.

• Mountain slopes. Hebei.

Frequently misidentified in China as the circumboreal species *Salix phylicifolia* Linnaeus.

**178c. *Salix taishanensis* var. *glabra*** C. F. Fang & W. D. Liu in C. F. Fang, Bull. Bot. Res., Harbin 4(1): 126. 1984.

光子房泰山柳 *guang zi fang tai shan liu*

Female flower: ovary glabrous.

• Mountain slopes. Shanxi (Wenshui Xian).

**179. *Salix trichocarpa*** C. F. Fang in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 106. 1979.

毛果柳 *mao guo liu*

Trees to 5 m tall. Juvenile branchlets tomentose. Stipules ovate; petiole 3–6 mm, tomentose; leaf blade oblong-elliptic, 5–8 × 2–3 cm, abaxially whitish, ± pilose, or pilose along midvein, adaxially grass green, base rounded, margin very indistinctly serrulate or subentire, apex acute; lateral veins indistinct abaxially. Flowering coetaneous. Male catkin unknown. Female catkin 6–8 × ca. 1 cm; peduncle long, with 5 leaflets; rachis downy; bracts elliptic, small, abaxially densely long pubescent, adaxially glabrous, apex rounded. Female flower: adaxial gland shortly ligulate, ca. as long as stipe; ovary ovoid-conical, downy, stipitate; style more than 1/2 as long as ovary; stigma 2-cleft. Capsule narrowly ovoid-conical, to 5 mm. Fl. Jun, fr. Jun–Jul.

• Mountain valleys; ca. 3200 m. Xizang (Gyirong Xian).

Similar to *Salix paraheterochroma* but leaf blade oblong-elliptic, base rounded, margin indistinctly serrate; style long; ovary ovoid-conical. Similar also to *S. yadongensis* but bracts long pubescent abaxially, glabrous adaxially; flowers with adaxial glands only; ovary ovoid-conical, densely downy.

**180. *Salix yadongensis*** N. Chao in C. Wang & C. F. Fang, Acta Phytotax. Sin. 17(4): 106. 1979.

亚东毛柳 *ya dong mao liu*

*Salix bhutanensis* Floderus var. *yadongensis* (N. Chao) N. Chao.

Shrubs or small trees. Juvenile branchlets densely tomentose, slightly brownish green. Stipules ovate; petiole short, tomentose; leaf blade elliptic or oblong-elliptic, 5–7 × 2(–3) cm, abaxially whitish, ± pilose, at least along midvein, adaxially grass green, base rounded, margin entire or indistinctly serrate, apex acute. Male catkin unknown. Female catkin terete, 4–5 × ca. 1 cm; peduncle long, with 3–5 leaflets; bracts

obovate, pilose only abaxially at base, margin usually irregularly dentate, apex truncate. Female flower: adaxial gland shortly ligulate, ca. as long as or shorter than stipe; ovary cylindrical-ovoid, pilose, long stipitate; style 1/3–1/2 as long as ovary. Fl. May–Jun.

• Riversides; ca. 2800 m. S Xizang (Yadong Xian).

Similar to *Salix trichocarpa* but bracts obovate, base pilose abaxially, margin usually irregularly dentate, ciliate, apex truncate; style shorter; ovary oblong-ovoid.

**181. *Salix alfredii*** Goerz ex Rehder & Kobuski, J. Arnold Arbor. 13: 403. 1932.

秦岭柳 *qin ling liu*

Shrubs or trees to 4.5 m tall. One-year-old branchlets purplish brown, thin, glabrous, shiny. Petiole 3–5 mm; leaf blade elliptic or ovate-elliptic, 2.5–4(–4.5) × 1.5–2(–2.5) cm, abaxially greenish or grayish blue, at first pubescent, glabrescent, villous along midvein when young, adaxially green, base rounded, margin entire, apex acute. Male catkin to 4–6 cm × 6–10 mm; bracts obovate, ca. 1.5 mm, pilose. Male flower: adaxial gland 1, rarely 2, narrowly ovate, ca. 0.4 mm, rarely divided, abaxial gland sometimes present and small; stamens 2, distinct; filaments ca. 4.3 mm, base downy; anthers yellow, globose. Female catkin (in young fruit) 2.5–4 cm × 4–5 mm; peduncle short or absent; leaflets caducous or none; bracts obovate, ca. 1/2 as long as ovary, abaxially villous, long ciliate, adaxially subglabrous. Female flower: gland adaxial, 0.4–0.5 mm, shortly ligulate; ovary ovoid, ca. 2.2 mm, villous or glabrous, shortly stipitate; style short; stigma 4-lobed. Capsule subglobose, ca. 3 mm, pilose; stipe conspicuous. Fl. May–Jun, fr. Jul.

• Mountain slopes. Gansu, Qinghai, Shaanxi.

Similar to *Salix hylonoma* but leaf blade entire, whitish abaxially; filaments free; style and stigma short; ovary ovoid, stipitate in fruit. Similar also to *S. heterochroma* but catkins short, thin; glands longer; capsule shortly stipitate.

1a. Ovary villous ..... 181a. var. *alfredii*

1b. Ovary glabrous ..... 181b. var. *fengxianica*

**181a. *Salix alfredii* var. *alfredii***

秦岭柳(原变种) *qin ling liu* (*yuan bian zhong*)

Female flower: ovary villous.

• Mountain slopes. Gansu (Min Shan), Qinghai, Shaanxi.

**181b. *Salix alfredii* var. *fengxianica*** (N. Chao) G. Zhu, Novon 8: 464. 1998.

凤县柳 *feng xian liu*

*Salix fengxianica* N. Chao, Acta Bot. Bor.-Occid. Sin. 5 (2): 115. 1985.

Female flower: ovary glabrous.

• Shaanxi (Feng Xian).

16. Sect. *Retusae* A. Kerner, Verh. Zool.-Bot. Ges. Wien 10: 195 (Nied.-Oesterr. Weid. 73). 1860.

长白柳组 *chang bai liu zu*

Sect. *Herbaceae* (Hooker) A. Camus.

Shrubs procumbent, alpine. Petiole short; leaf blade orbicular, ovate, or broadly elliptic, subleathery, apex acute, rounded, obtuse, or retuse; lateral veins 4 or 5 on each side of midvein. Flowering coetaneous. Catkins terminal, capitate or ellipsoid, 3–20-flowered. Male flower: glands adaxial and abaxial; stamens 2; filaments glabrous. Female flower: abaxial gland divided or entire, sometimes absent; ovary glabrous, stipitate; style conspicuous.

1a. Bracts of catkins yellowish brown, uniform in color; leaf blade suborbicular, obovate-elliptic, or elliptic, 0.5–1.7 cm, base rounded, cordate, or rounded-cuneate, margin entire, apex rounded, obtuse, or retuse 182. *S. nummularia*

1b. Bracts of catkins yellowish, apex purplish red; leaf blade elliptic, obovate-elliptic, or ovate-elliptic, 1.5–2 cm, base cuneate, margin serrulate, apex acute or obtuse ..... 183. *S. turczaninowii*

182. *Salix nummularia* Andersson in A. de Candolle, Prodr. 16(2): 298. 1868.

多腺柳 *duo xian liu*

*Salix polyadenia* Handel-Mazzetti; *S. polyadenia* var. *tschanbaischanica* (Y. L. Chou & Y. L. Chang) Y. L. Chou; *S. tschanbaischanica* Y. L. Chou & Y. L. Chang.

Shrubs procumbent, dwarf; bark russet. Branches to 80 cm, (2–)10 mm thick; branchlets yellowish brown, pilose when young, glabrescent. Buds oblong-ovoid, 2–3 mm, glabrous. Stipules present; petiole ca. 3 mm, pilose when young, glabrescent; leaf blade obovate-elliptic, suborbicular, or elliptic, 0.5–1.7 × 0.5–1.5 cm, leathery, abaxially green, villous when young, glabrescent, adaxially dull green, base rounded or rounded-cuneate, margin entire, apex rounded, obtuse, or retuse. Flowering coetaneous. Catkins terminal. Male catkin ovoid, ca. 8 mm, 10–20-flowered; bracts yellowish brown, orbicular, ca. 1 mm, long pubescent. Male flower: glands 2, 0.3–0.4 mm, adaxial gland ovate or orbicular, sometimes 2-cleft, abaxial gland 2- or 3-parted or entire; stamens 2, distinct, glabrous. Female catkin 5–8 mm, 10–20-flowered; bracts as in male catkin. Female flower: adaxial gland usually 2- or 3(or 4)-lobed, ca. 2 × as long as stipe, abaxial gland shorter than adaxial gland; ovary sublanceolate, apex acuminate, 3–4 mm, glabrous; stipe ca. 1 mm,

elongated in fruit; style ca. 0.5 mm; stigma 4-lobed. Fl. Jul, fr. Jul.

Alpine tundra; 2200–2600 m. Jilin (Changbai Shan) [Russia].

The Chinese record in FRPS of the the NW North American species *Salix rotundifolia* Trautvetter is referable to *S. nummularia*.

183. *Salix turczaninowii* Lakschewitz, Herb. Fl. Ross. 50. 1914.

蔓柳 *man liu*

Shrubs creeping. Branches brownish yellow, 5–10(–30) cm. Buds brownish red, small, glabrous. Petiole 5–7 mm; leaf blade elliptic, obovate-elliptic, or ovate-elliptic, 1.5–2.5 cm × 7–10 mm, glabrous, base cuneate, margin serrulate, apex acute or obtuse. Flowering coetaneous. Catkins terminal, 1–2 cm × 3–7 mm, laxly flowered; peduncle pilose, with 2 leaflets; bracts yellowish, obovate, abaxially glabrous, adaxially pilose, ciliate, apex purplish red. Male flower: glands adaxial and abaxial; stamens 2; filaments pilose at base. Fruiting catkin to 5 cm. Female flower: adaxial and abaxial glands 4–5 × as long as stipe; ovary ovoid-conical, glabrous, shortly stipitate; style nearly absent; stigma 2-cleft. Fl. Jun–Jul, fr. Jul. 2n = 22.

Alpine tundra; above 2600 m. Xinjiang (Altay Shan, Tian Shan) [Kazakstan, Mongolia, Russia (S Siberia)].

17. Sect. *Myrtilloides* (Borrer ex Loudon) Koehne, Deut. Dendrol. 89. 1893.

越桔柳组 *yue ju liu zu*

*Salix* [unranked] *Myrtilloides* Borrer ex Loudon, Arbor. Frutic. Brit. 3: 1587. 1838.

Shrubs dwarf, to 80 cm tall. Branchlets slender. Leaf blade ovate or oblong-elliptic to suborbicular, thin, usually glabrous, with conspicuous veins, blackened when dried. Catkins pedunculate, with leaflets on peduncle; bracts 2-colored. Male flower: gland solitary, adaxial; stamens 2; filaments distinct. Female flower: gland as in male flower; ovary glabrous, long stipitate.

184. *Salix myrtilloides* Linnaeus, Sp. Pl. 2: 1019. 1753.

越桔柳 *yue ju liu*

Branches with gray bark; 1-year-old branchlets yellow or russet, glabrous or pilose. Buds ovoid, glabrous. Stipules lanceolate or ovate, small; petiole 2–4 mm; leaf blade elliptic or long elliptic, 1–3.5 × 0.7–1.5 cm, glabrous, abaxially whitish, black when dried, adaxially

dull green or slightly purplish, base rounded, rarely broadly cuneate, margin entire, rarely dentate, apex obtuse or rounded. Flowering coetaneous. Male catkin terete, with leaflets at base; bracts green or yellowish green, elliptic, sparsely villous, apex purple. Male flower: adaxial gland ca. 1/2 as long as bracts; stamens 2; filaments glabrous. Female catkin ovoid, with leaflets at base; bracts elliptic, sparsely pubescent. Female flower: gland adaxial; ovary cylindrical, glabrous; stipe ca. 1/3 as long as ovary; style short; stigma 2-cleft. Fl. May, fr. Jun.  $2n = 38$ .

Marshes; 300–500 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Korea, Mongolia; N Asia, Europe].

1a. Juvenile leaves glabrous ..... 184a. var. *myrtilloides*

1b. Juvenile leaves white or yellow

silky ..... 184b. var. *mandshurica*

**184a. *Salix myrtilloides* var. *myrtilloides***

越桔柳(原变种) yue ju liu (yuan bian zhong)

Juvenile leaves glabrous.

Marshes; 300–500 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Mongolia; N Asia, Europe].

**184b. *Salix myrtilloides* var. *mandshurica*** Nakai, Fl. Sylv. Kor. 18: 154. 1930.

东北越桔柳 dong bei yue ju liu

Juvenile leaves white or yellow silky.

Heilongjiang [Korea].

**18. Sect. *Chamaetia*** Dumortier, Bijdr. Natuurk. Wetensch. 1(1): 56. 1826.

皱纹柳组 zhou wen liu zu

Sect. *Reticulatae* Pax.

Shrubs alpine. Stipules absent; leaf blade suborbicular or elliptic, leathery, abaxially conspicuously reticular, pilose or glabrous, adaxially wrinkled, margin usually entire. Catkins lateral, thinly cylindrical; peduncle long; bracts brownish, reddish, or purple, orbicular or obovate, ciliate. Male flower: gland solitary, adaxial; stamens 2, distinct; filament downy at base. Female flower: gland solitary, adaxial; ovary ovoid, downy; style shortly 2-cleft.

**185. *Salix vestita*** Pursh, Fl. Amer. Sept. 2: 610. 1814.

皱纹柳 zhou wen liu

Shrubs to 1 m tall. Branchlets erect or ascending, chestnut brown, slightly thick, glabrous, shiny. Buds brown, ovoid, sparsely tomentose. Petiole ca. 5 mm, notched adaxially, glabrous; leaf blade elliptic, ovoid, or obovoid, 4–5 × 1–2 cm, densely long white pubescent, adaxially fresh green, wrinkled, base rounded or broadly cuneate, margin entire or remotely crenate, apex obtuse; veins raised abaxially, impressed adaxially. Flowering nearly coetaneous or serotinous.

Catkins 1–2 cm × 3–4 mm; bracts brown or brownish red, subobovate, ciliate, apex obtuse. Male flower: stamens 2, free, downy at base; anthers yellow, ovoid. Fruiting catkin to 4 cm. Female flower: adaxial gland 2-lobed, ca. 1 mm; ovary long ovoid, tomentose, stipitate; style nearly absent; stigma 2-parted, yellowish brown. Capsule yellowish brown, ovoid, 3–5 mm, downy. Fl. Jun, fr. Jul–Aug.  $2n = 38$ .

Woods; 1900–2000 m. Xinjiang (Altay Shan, Burqin Xian) [Mongolia, Russia (S Siberia); N North America].

**19. Sect. *Glaucæ*** Pax, Nat. Pflanzenfam. 3(1): 37. 1887.

绿叶柳组 lu ye liu zu

Shrubs dwarf alpine. Branchlets usually tomentose. Leaf blade obovate when young, thick, margin entire or denticulate. Flowering coetaneous or serotinous. Catkins lateral, with leaflets at base; bracts nearly uniformly colored, or slightly dull distally. Male flower: gland solitary, adaxial, entire or 2-cleft; stamens 2, distinct; filaments tomentose or glabrous. Female flower: ovary downy, shortly stipitate.

1a. Leaf margin entire; style divided to at least middle; filaments pilose at base only ..... 186. *S. glauca*

1b. Leaf margin dentate or denticulate; style shallowly 2-lobed; filaments with long hairs nearly throughout.

2a. Leaf blade obovate or ovate abaxially greenish, margin densely denticulate to densely serrulate; bracts

brown, oblong, apex obtuse-rounded; ovary sessile; anthers globose ..... 187. *S. alatavica*

2b. Leaf blade elliptic or oblong both surfaces grayish green, margin remotely and shallowly dentate; bracts

nearly black, apex acute or obtuse; ovary shortly stipitate; anthers ovoid ..... 188. *S. metaglauca*

**186. *Salix glauca*** Linnaeus, Sp. Pl. 2: 1019. 1753.

灰蓝柳 hui lan liu

Shrubs to 1 m tall. Branchlets russet, glabrous or pilose. Stipules present; petiole present; leaf blade oblong-obovate, 3–5 × 1–2.5 cm, sparsely downy, abaxially grayish blue, base broadly cuneate, margin entire, apex

shortly acuminate. Flowering coetaneous or serotinous. Catkins 2–4 cm; peduncle elongated in fruit; bracts long obovate, villous, apex obtuse. Male flower: stamens 2; filaments distinct, downy proximally. Female flower: ovary cylindrical-ovoid, white tomentose, shortly stipitate;

style deeply 2-lobed; stigma forked. Capsule 5–8 mm, gray tomentose; Fl. Jun–Jul.  $2n = 76, 96, 114, 144, 152$ . Alpine places; 2500–3000 m. Xinjiang (Altay Shan) [N Mongolia, Russia; Europe, North America].

**187. *Salix alata*** Karelin & Kirilow ex Stscheglejew, Bull. Soc. Imp. Naturalistes Moscou 27(1): 197. 1854.

阿拉套柳 a la tao liu

*Salix spissa* Andersson.

Shrubs to 1.5 m tall. Branchlets brownish or chestnut colored, glabrous, purplish red and pubescent when young. Buds purplish red, shiny, apex acuminate. Stipules small, ovate, membranous, caducous; petiole 2–5 mm, pilose or glabrous; leaf blade oblong-ovate or elliptic, 3–6 × 2–2.5 cm, abaxially greenish, glabrous, silky pubescent when young, adaxially green, base cuneate, margin glandular serrulate, apex obliquely shortly acuminate. Flowering coetaneous or serotinous. Catkins lateral on distal part of branchlets, 4–5 × 1–1.5 cm; peduncle with 2–4 leaflets, gray tomentose; bracts brownish, black toward apex, oblong, tomentose. Male flower: gland adaxial; stamens 2; filaments distinct, gray tomentose; anthers yellow, globose. Female catkin elongated in fruit. Female flower: gland adaxial; ovary long ovoid, usually bending, gray tomentose, shortly stipitate; stigma 2-cleft. Fl. Jun–Jul, fr. Jul–Aug.

Mountain slopes; 2700–2800 m. W Xinjiang [Mongolia, Russia (SC Siberia)].

**188. *Salix metaglauca*** Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 89. 1980.

绿叶柳 lu ye liu

Shrubs to 1 m tall. Branchlets chestnut colored, glabrous, shiny, tomentulose at first. Buds ovoid, pilose or glabrous. Stipules obliquely ovate, caducous; petiole 2–3 mm, tomentose; leaf blade elliptic or oblong-obovate, 3–5 × 1–2 cm, both surfaces grayish green, glabrous or pilose along midvein abaxially, tomentulose when young, base cuneate, margin remotely shallowly serrulate, apex shortly acuminate; veins conspicuous. Flowering serotinous. Catkins 2–4 × 0.8–1.3 cm; peduncle tomentose, with 3 or 4 leaflets; bracts dull brownish red to black, ovate-elliptic, long pubescent, apex obtuse or acuminate. Male flower: gland adaxial; stamens 2; filaments free, tomentose; anthers yellow, ovoid, apex acute. Female flower: gland adaxial, rectangular, shorter than stipe; ovary long conical, densely tomentose; stipe short; style short; stigma 2-parted. Capsule grayish green, 6–7 mm, tomentose. Fl. Jun, fr. Jul–Aug.

• Rock crevices; 2700–2800 m. Xinjiang (Altay Shan). Similar to *Salix glauca* but branchlets glabrous when mature; leaf blade grayish green on both surfaces, margin remotely dentate. Similar also to *S. alata* but leaf blade uniformly colored on both surfaces, margin remotely and shallowly dentate; bracts dull brownish red to black, apex acute; anthers ovoid; stipe longer than glands; capsule long conical.

**20. Sect. *Diplodictyae*** C. K. Schneider in Sargent, Pl. Wilson. 3: 136. 1916.

北极柳组 bei ji liu zu

Sect. *Arcticae* (Rydberg) Nasarow.

Shrubs dwarf, ascending, alpine. Branches short, thick. Leaves leathery, glabrous, rarely pilose, margin entire. Catkins lateral, long pedunculate; bracts dull at apex. Male flower: gland adaxial, entire or 2-lobed; stamens 2, distinct, glabrous. Female flower: gland as in male flower; ovary densely tomentose; stipe short; style long.

A. K. Skvortsov indicates that this section is only slightly different from sect. *Glaucæ* and might, therefore, be united with it.

**189. *Salix arctica*** Pallas, Fl. Ross. 2: 86. 1788.

北极柳 bei ji liu

Branchlets yellowish, becoming russet or chestnut colored, glabrous. Petiole (3–)5–10 mm, rather thick, notched, pilose; leaf blade long obovate, elliptic, or ovate, 2–3 × 1–2 cm, abaxially greenish, glabrous or along midvein sparsely long pubescent, pilose when young, adaxially green, base broadly cuneate, margin entire, apex obtuse. Catkins borne on distal part of branchlets, thinly cylindrical, 2–3 cm; bracts russet, long

elliptic, adaxially villous. Male flower: stamens 2, free. Fruiting catkin elongated; peduncle with leaflets, tomentose. Female flower: ovary long cylindrical, tomentulose; style ca. 1 mm; stigma 2-parted. Capsule russet, 5–6 mm, slightly pilose. Fl. Jun–Jul, fr. Aug.  $2n = 76, 100, 114$ .

Alpine tundra; 2000–2800 m. Xinjiang (Altay Shan) [N Russia; N Europe, N North America].

**21. Sect. *Myrtilis*** A. Kerner, Verh. Zool.-Bot. Ges. Wien. 10: 203 (Nied.-Oesterr. Weid. 81) 1860.

欧越桔柳组 ou yue ju liu zu

Sect. *Myrsinites* (Borrer) C. K. Schneider.

Shrubs cushion-shaped, alpine. Leaves leathery, shiny, margin glandular denticulate or sharply serrate, rarely entire. Catkins lateral near apex of branchlets; peduncle slender, with leaflets; bracts dark, villous. Male flower: gland solitary, adaxial; stamens 2, distinct, glabrous. Female flower: gland as in male flower; ovary pilose or glabrous, usually purplish red; stipe short; style brown, rather long.

1a. Anthers yellow; ovary or capsule glabrous; leaf margin sharply serrate ..... 190. *S. berberifolia*

1b. Anthers dull purplish red; ovary or capsule tomentose; leaf margin glandular serrate ..... 191. *S. rectijulis*

**190. *Salix berberifolia*** Pallas, Reise Russ. Reich. 3: 321, 759. 1776.

刺叶柳 ci ye liu

*Salix brayi* Ledebour.

Shrubs cushion-shaped. Branches brownish, glabrous. Leaf blade elliptic or obovoid, 0.5–2 × 0.4–1 cm, leathery, base rounded-cuneate or cuneate, margin sharply serrate, apex obtuse or acute, shiny. Flowering coetaneous or serotinous. Catkins densely flowered; peduncle 1–2 cm, leafy; bracts dull brown, obovate, densely villous. Male flower: stamens 2; anthers yellow. Fruiting catkin ca. 2 cm. Female flower: ovary cylindrical, shortly stipitate; style 2-cleft. Capsule brownish, glabrous; stipe longer than gland. Fl. Jun–Jul.

Alpine tundra; 2700–2800 m. Xinjiang (Altay Shan) [N Mongolia, Russia (S Siberia)].

**191. *Salix rectijulis*** Ledebour ex Turczaninow, Nouv. Mém. Soc. Imp. Naturalistes Moscou 2: 213. 1832.

欧越桔柳 ou yue ju liu

Shrubs cushion-shaped. Branchlets spreading or nearly erect, yellowish or chestnut-brown. Leaf blade elliptic or ovate, 1–3 × 0.5–2 cm, gray downy when young, glabrescent, base cuneate, margin glandular denticulate, apex obtuse or acute. Catkins lateral on distal part of branchlets; peduncle thick, long, villous, leafy; bracts dull colored, obovoid or broadly elliptic, densely villous. Male flower: stamens 2; filaments distinct, occasionally united at base, glabrous; anthers dull purplish red. Fruiting catkin 3–5 cm. Female flower: ovary tomentose, shortly stipitate; style short; stigma 2-cleft. Capsule conical, tomentose. Fl. Jun–Jun.

Alpine tundra; 2700–2800 m. Xinjiang (Altay Shan) [N Mongolia, Russia (S Siberia)].

**22. Sect. *Hastatae*** A. Kerner, Verh. Zool.-Bot. Ges. Wien 10: 241. 1860.

鹿蹄柳组 lu ti liu zu

Shrubs, rarely small trees. Stipules often present; leaf blade ovate, elliptic, reniform, or suborbicular, usually glabrous, margin serrate. Male flower: gland solitary, adaxial; stamens 2; filaments distinct, glabrous. Female flower: gland as in male flower; ovary glabrous, stipitate; style conspicuous to subsessile.

**Key based on male plants**

1a. Catkin pedunculate; peduncle with normal leaflets.

2a. Stipules ca. as long as petioles; filaments usually distinct, rarely partly connate ..... 192. *S. hastata*

2b. Stipules small, caducous; filaments distinct ..... 193. *S. karelinii*

1b. Catkin sessile or peduncle with scalelike, caducous leaflets.

3a. Bracts oblong; filaments to 8 mm ..... 194. *S. pyrolifolia*

3b. Bracts ovate; filaments to 4–5 mm ..... 195. *S. fedtschenkoi*

**Key based on female plants**

1a. Catkin peduncle with scalelike leaflets or leaflets absent.

2a. Adaxial and abaxial surfaces of leaves differently colored; bracts oblong or oblong-spatulate; stipe longer than gland ..... 194. *S. pyrolifolia*

2b. Adaxial and abaxial surfaces of leaves uniformly colored; bracts ovate; stipe shorter than gland ..... 195. *S. fedtschenkoi*

1b. Catkin peduncle with normal (foliage) leaflets.

3a. Stipules obliquely ovate or reniform; stipe longer than gland ..... 192. *S. hastata*

3b. Stipules small, lanceolate or long ovate; stipe shorter than gland ..... 193. *S. karelinii*

**Key based on vegetative characters**

1a. Stipules ca. as long as or longer than petiole.

2a. Leaves thin, leaf blade orbicular, orbicular-ovate, or ovate-elliptic, abaxially whitish ..... 194. *S. pyrolifolia*

2b. Leaves comparatively thick; leaf blade ovate, oblong, elliptic, or lanceolate, abaxially greenish ..... 192. *S. hastata*

1b. Stipules small or absent.

3a. Adaxial and abaxial leaf surfaces differently colored ..... 193. *S. karelinii*

3b. Adaxial and abaxial leaf surfaces uniformly colored ..... 195. *S. fedtschenkoi*

**192. *Salix hastata*** Linnaeus, Sp. Pl. 2: 1017. 1753.

戟柳 ji liu

Shrubs to 2 m tall. Branchlets yellowish, chestnut colored, or grayish black, at first pubescent, glabrescent or subglabrous. Stipules obliquely ovate or semicordate, margin serrate; petiole 2–5 mm, usually shorter than

stipules; leaf blade ovate, oblong, or oblong-obovate, 2–8 × 1–4 cm, abaxially greenish, adaxially green, base cuneate to cuneate-rounded, margin serrulate, apex shortly acuminate. Flowering coetaneous. Catkins 2–4 cm; peduncle tomentose, with leaflets; bracts brownish, oblong, densely grayish white villous. Male flower:

stamens 2; filaments distinct, rarely united at base, glabrous; anthers yellowish. Fruiting catkin elongated. Female flower: ovary ovoid, glabrous, shortly stipitate; style conspicuous, sometimes 2-cleft; stigma short, 2-lobed. Capsule green or brown, glabrous. Fl. May–Jun, fr. Jun–Jul. *2n* = 35, 37–39.

Riverbanks; 1000–1800 m. Xinjiang (Altay Shan) [Kazakstan, Mongolia, Russia; Europe, NW North America].

**193. *Salix karelinii*** Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 27(2): 393. 1854.

獐子叶柳 *xun zi ye liu*

*Salix himalayensis* (Andersson) Floderus.

Shrubs to 1.2 m tall. Branchlets brown or chestnut colored, at first tomentulose or woolly, glabrescent. Buds russet, ovoid, glabrous. Stipules lanceolate or long ovate, small, margin glandular serrate; petiole 2–5 mm, thick; leaf blade oblong-obovate or elliptic, 1–5 × 0.5–2 cm, abaxially greenish, pilose only along midvein, when young both surfaces appressed pubescent, adaxially green, base broadly cuneate or rounded, margin serrulate, apex obtuse. Flowering coetaneous. Catkins 2–3 cm, woolly; peduncle tomentose, with leaflets; bracts brown to russet, oblong, villous, apex acute. Male flower: stamens 2; filaments distinct, 4–5 mm, glabrous. Female flower: ovary long ovoid, glabrous, shortly stipitate; style conspicuous; stigma 2-cleft. Capsule brownish, 5–6 mm. Fl. Jun, fr. Jul. Mountain slopes; 2700–3000 m. W Xinjiang [Afghanistan, Kyrgyzstan, Nepal, Pakistan, Tajikistan].

**194. *Salix pyrolifolia*** Ledebour, Fl. Altaic. 4: 270. 1833.

鹿蹄柳 *lu ti liu*

*Salix subpyroliformis* Y. L. Chang & Skvortzov.

Shrubs or small to large trees. Branchlets yellowish brown or chestnut colored, pilose when young. Buds yellowish brown, pilose or glabrous. Stipules reniform,

large, margin serrate; petiole 2–7 mm, at first pubescent, glabrescent; leaf blade orbicular, ovate, or ovate-elliptic, 2–8 × 1.5–6 cm, abaxially whitish, glabrous, adaxially green, base rounded or shallowly cordate, margin serrulate, apex shortly acuminate to rounded; veins conspicuous abaxially. Flowering precocious or coetaneous. Catkins 3–4 cm; peduncle short, with caducous, scalelike leaflets or not; bracts russet or brown, oblong or oblong-spatulate, villous, apex obtuse or acute. Male flower: stamens 2, free, glabrous; anthers yellow. Fruiting catkin elongated. Female flower: gland oblong; ovary conical, glabrous; stipe ca. 0.5 mm; style conspicuous; stigma 2-cleft. Capsule brownish, 6–7 mm. Fl. May–Jun, fr. Jun–Jul.

Along rivers, margins of woods; 1300–1700 m. N Heilongjiang, E Nei Mongol, N Xinjiang [Mongolia, N Russia; Europe (Finland)].

**195. *Salix fedtschenkoi*** Goerz, Salic. Asiat. 1: 21. 1931.

山羊柳 *shan yang liu*

Shrubs to 1.5 m tall. Branchlets brownish, glabrous. Buds subglobose, glabrous. Stipules obliquely ovate or lanceolate, caducous, margin dentate; petiole short, enlarged at base, notched, at first pubescent, glabrescent; leaf blade elliptic or oblong-obovate, of 1 color, abaxially whitish, glabrous, base cuneate or rounded, margin serrate, apex shortly acuminate, usually oblique; veins conspicuous abaxially. Flowering precocious or coetaneous. Male catkin cylindrical, 2–3 × 0.8–1 cm, sessile; bracts brownish, ovate, villous. Male flower: stamens 2; filaments free, 4–5 mm. Fruiting catkin elongated; peduncle short, with leaflets. Capsule cylindrical, glabrous, shortly stipitate or subsessile. Fl. Jun, fr. Jul.

Valleys; 3300–3400 m. Xinjiang (Taxkorgan Tajik Zizhixian) [Afghanistan, Tajikistan].

**23. Sect. *Arbuscella*** Seringe ex Duby, Bot. Gall. 1: 426. 1828.

灌木柳组 *guan mu liu zu*

Sect. *Arbusculoideae* (Seringe) Floderus.

Shrubs. Branchlets dull, at first tomentulose, glabrescent. Stipules usually absent; leaf blade ovate, elliptic, or oblong-obovate, glabrous when mature, margin usually serrate. Catkins pedunculate or sessile; bracts brownish or yellowish green. Male flower: gland adaxial; stamens 2; filaments distinct, glabrous or pilose. Female flower: gland as in male flower; ovary pilose; stipe short; style conspicuous or rather long.

**Key based on male plants**

1a. Filaments distinct.

2a. Filament glabrous; bracts lanceolate or oblong-obovate ..... 196. *S. saposchnikovii*

2b. Filament pilose; bracts broadly ovate ..... 197. *S. paraphylicifolia*

1b. At least some filaments within catkin united to different extents.

3a. Filaments glabrous; catkin near apex of branchlets ..... 199. *S. divaricata*

3b. Filaments pubescent at base; catkin at middle of branchlets ..... 198. *S. tianschanica*

**Key based on female plants**

1a. Catkin near apex of branchlets ..... 199. *S. divaricata*

1b. Catkin at middle of branchlets.

2a. Catkin peduncles without leaflets ..... 198. *S. tianschanica*

2b. Catkin peduncles with leaflets.



- 3a. Bracts lanceolate or oblong-obovate ..... 196. *S. saposhnikovii*  
 3b. Bracts broadly ovate ..... 197. *S. paraphylicifolia*

### Key based on vegetative characters

- 1a. Juvenile branchlets yellowish, not shiny ..... 199. *S. divaricata*  
 1b. Juvenile branchlets chestnut colored or brown, shiny.  
 2a. Young branchlets pilose; leaf blade long elliptic to lanceolate or oblong-obovate ..... 196. *S. saposhnikovii*  
 2b. Young branchlets glabrous; leaf blade elliptic or obovate-elliptic.  
 3a. Leaf blade thick, not translucent on drying; margin densely dentate with curving, sharply pointed teeth ..... 198. *S. tianschanica*  
 3b. Leaf blade thin, translucent on drying; margin remotely shallowly denticulate or entire 197. *S. paraphylicifolia*

**196. *Salix saposhnikovii*** A. K. Skvortsov, Repert. Spec. Nov. Regni Veg. 64: 77. 1961.

灌木柳 guan mu liu

Shrubs to 1 m tall. Juvenile branchlets chestnut-brown, usually tomentulose, glabrescent, shiny. Petiole short; leaf blade long elliptic to lanceolate or oblong-obovate, 2–6 × 0.5–2 cm, abaxially greenish, adaxially green, base cuneate, margin remotely dentate, rarely subentire, apex acute; veins conspicuous abaxially. Flowering coetaneous or serotinous. Male catkin shortly cylindrical or cylindric, 1–2 cm × ca. 6 mm; bracts brownish or dull brown, lanceolate or oblong-obovate, long pubescent, apex obtuse. Male flower: gland adaxial; stamens 2; filaments free, glabrous. Fruiting catkin 3–3.5 cm; peduncle tomentose, with leaflets; bracts as in male catkin. Female flower: gland as in male flower; ovary ovoid-conical or long ovoid, tomentulose; stipe ca. 0.5 mm; style ca. as long as stipe; stigma 2-cleft. Capsule brown, tomentulose. Fl. May–Jun, fr. Jun–Jul. Riverbanks; 1800–2000 m. Xinjiang (Altay Shan) [N Mongolia, Russia].

**197. *Salix paraphylicifolia*** Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 92. 1980.

光叶柳 guang ye liu

Shrubs to 4 m tall. Branchlets brown, brownish, or russet, glabrous. Buds ovoid or long ovoid, downy or glabrous. Young leaves brownish, thin, translucent when dried; stipules obliquely ovate, caducous, margin denticulate; petiole 1–1.5 cm, notched, tomentulose; leaf blade elliptic, 3–7 × 2–3 cm, 9–10 × 3–4 cm on shoots, abaxially pale, tomentulose only at base of midvein, rarely downy, adaxially greenish, base cuneate or broadly cuneate, margin remotely shallowly denticulate or entire, apex obtuse. Flowering nearly coetaneous. Catkins 2–4 × 0.7–1 cm; peduncle densely gray tomentose, with long pubescent leaflets; bracts brown, broadly ovate, villous, apex obtuse. Male flower: gland adaxial; stamens 2, distinct, sparsely downy at base; anthers yellow. Female flower: ovary long conical, tomentose; stipe 0.7–1 mm; style 1–1.5 mm, 2- or 3-lobed. Capsule yellowish, tomentose. Fl. May–Jun, fr. Jul.

• Riverbanks, margins of woods; 1800–2000 m. Xinjiang (Altay Shan).

Similar to *Salix jensenseensis* (F. Schmidt) Floderus (from Russia) but leaf blade shallowly dentate at margin; catkins short; style and stipe short; ovary tomentose. Similar also to the circumboreal species *S. phylicifolia* Linnaeus, but branchlets not tomentose, brownish when young; leaf blade not tomentose, margin remotely obtuse-dentate or entire, thin and translucent when dry; peduncles with leaflets; bracts uniformly colored; style and stipe longer.

**198. *Salix tianschanica*** Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 471. 1880.

天山柳 tian shan liu

Shrubs to 3 m tall, much branched. Branchlets chestnut red, glabrous, shiny. Buds lanceolate, small. Stipules obliquely ovate, glandular dentate; petiole 8–10 mm; leaf blade elliptic or obovate-elliptic, abaxially greenish, glabrous, pilose when young, adaxially green, base cuneate, margin with dense, curving, sharp teeth, apex obtuse, acute, or shortly acuminate; lateral veins 10–12 on each side of midvein. Flowering nearly coetaneous. Catkins 2–3 cm; peduncle short, with caducous, scalelike leaflets at base; bracts chestnut colored to nearly black, long ovate, long pubescent. Male flower: gland adaxial; stamens 2; filaments distinct, rarely partly united, downy at base; anthers yellow. Female flower: ovary ovoid, tomentose, stipitate; style ca. 1 mm; stigma short. Capsule brown, ca. 5 mm, sparsely pilose. Fl. May, fr. Jun.

Thickets, riversides; 1700–2700 m. Xinjiang (Tian Shan) [Kazakstan, Kyrgyzstan].

**199. *Salix divaricata*** Pallas var. ***metaformosa*** (Nakai) Kitagawa, Neo-Lineam. Fl. Manshur. 205. 1979.

长圆叶柳 chang yuan ye liu

*Salix metaformosa* Nakai, Bot. Mag. (Tokyo) 33: 42. 1919; *S. divaricata* var. *orthostemma* (Nakai) Kitagawa; *S. orthostemma* Nakai.

Shrubs ascending, rarely creeping, to 80 cm tall. Branchlets yellowish, at first pilose, glabrescent. Stipules lanceolate, caducous; petiole 2–5 mm; leaf blade obovate, elliptic, oblong-obovate, or oblanceolate, 2–5 × 0.6–2 cm, abaxially grayish green, glabrous, adaxially green, base cuneate, margin serrate or entire, apex shortly acuminate; veins brownish, conspicuous, adaxially impressed. Flowering coetaneous or slightly

precocious. Male catkin 2–2.5(–3) × 0.8–1 cm, sessile or shortly pedunculate, with 2 or 3 scalelike leaflets; bracts purplish reddish black, yellowish green proximally, elliptic-oblong or long obovate, ca. 1.3 mm, villous, apex rounded or slightly acute. Male flower: adaxial gland yellow, ovate or shortly cylindrical; stamens 2; filaments partly connate, rarely distinct, glabrous; anthers yellowish red or yellow, globose. Female

catkin pedunculate; peduncle tomentose, with leaflets; bracts brown, obovate, villous, apex obtuse or acute. Female flower: gland adaxial; ovary reddish, tomentose, shortly stipitate; style conspicuous, ca. 1 mm; stigma red, 2-lobed. Capsule russet, pilose or subglabrous to glabrous. Fl. May, fr. Jul.  
Damp places, roadsides; 1800–2300 m. E Jilin (Changbai Shan) [Korea].

**24. Sect. *Vetrix*** Dumortier, Bijdr. Natuurk. Wetensch. 1(1): 55. 1826.

黄花柳组 *huang hua liu zu*

*Salix* [unranked] *Capreae* Bluff & Fingerhuth.

Shrubs or small trees. Branchlets pubescent when young. Stipules reniform, semicordate, or semiorbicular, large; leaf blade ovate, elliptic, obovate, or obovate-oblong to obovate-lanceolate. Flowering precocious, rarely coetaneous or serotinous. Catkins globose to cylindrical, usually thick and short; male catkin sessile female catkin sessile; peduncle short, rarely slightly long, often without leaflets; bracts 2-colored, densely long pubescent. Flowers with an adaxial gland. Male flower: stamens 2, distinct, rarely partly united. Female flower: ovary narrowly conical, rarely ovoid-conical, pilose, long stipitate; style short. Capsule valves usually revolute when dried.

**Key based on male plants**

(*Salix shandanensis* unknown)

- 1a. Filaments pilose.
  - 2a. Filaments partly connate ..... 210. *S. pseudowallichiana*
  - 2b. Filaments distinct.
    - 3a. Bracts obovate-oblong, 2-colored: light proximally, apex black ..... 205. *S. iliensis*
    - 3b. Bracts oblong, rarely ovate, uniformly green or yellowish green ..... 202. *S. hsinganica*
- 1b. Filaments glabrous or with sparse hairs at base.
  - 4a. Catkin usually more than 1.5 cm thick.
    - 5a. Catkin elliptic or broadly elliptic at anthesis, rarely subglobose.
      - 6a. Bracts nearly uniformly dull brown or black; filaments ca. 6 mm, 2–3 × as long as bracts ..... 208. *S. sinica*
      - 6b. Bracts 2-colored: light proximally, black distally; filaments ca. 8 mm, 4–5 × as long as bracts ..... 204. *S. caprea*
    - 5b. Catkin shortly cylindrical at anthesis.
      - 7a. Bracts oblong ..... 203. *S. insignis*
      - 7b. Bracts ovate-elliptic ..... 207. *S. raddeana*
  - 4b. Catkin usually less than 1.5 cm thick.
    - 8a. Catkin shortly cylindrical to cylindrical ..... 209. *S. wallichiana*
    - 8b. Catkin ovoid, ellipsoid, or oblong.
      - 9a. Flowering branchlets often glabrous ..... 200. *S. taraikensis*
      - 9b. Flowering branchlets usually pilose.
        - 10a. Bracts spatulate ..... 206. *S. cinerea*
        - 10b. Bracts not spatulate ..... 201. *S. floderusii*

**Key based on female plants**

- 1a. Catkin usually with peduncle more than 5 mm, longer in fruit.
  - 2a. Bracts obovate-oblong; young leaf blade broadly elliptic to suborbicular ..... 205. *S. iliensis*
  - 2b. Bracts oblong or elliptic-obovate; young leaf blade elliptic or lanceolate.
    - 3a. Bracts yellowish green or green; stipe ca. 3.5 mm in fruit, 2–3 × as long as bracts ..... 202. *S. hsinganica*
    - 3b. Bracts brown or black; stipe ca. as long as or 2 × as long as bracts in fruit.
      - 4a. Young leaves densely silky tomentose abaxially ..... 201. *S. floderusii*
      - 4b. Young leaves downy abaxially ..... 200. *S. taraikensis*
- 1b. Catkin usually sessile or with peduncle less than 5 mm, subsessile in fruit.
  - 5a. Catkin 1–2.5 cm; bracts ca. as long as stipe.
    - 6a. Stipe ca. 1/3–1/2 as long as ovary; bracts yellowish green; fruiting catkin ca. 3 cm; flowering coetaneous; leaves 1–2 cm ..... 211. *S. shandanensis*
    - 6b. Stipe ca. 1/2 as long as to as long as ovary; bracts black at least distally; fruiting catkin to 8 cm; flowering precocious; leaves to 11 cm.

- 7a. Catkin generally ca. 1.5 cm just after opening; stipe ca. 2/3 as long as to nearly as long as ovary ..... 204. *S. caprea*  
 7b. Catkin generally 2–2.5 cm just after opening; stipe ca. 1/2 as long as ovary ..... 207. *S. raddeana*  
 5b. Catkin usually more than 2.5 cm; bracts usually longer than stipe, rarely nearly as long as stipe.  
 8a. Bracts spatulate, apex rounded-obtuse ..... 206. *S. cinerea*  
 8b. Bracts oblong, elliptic-lanceolate, or lanceolate, apex acute, rarely obtuse.  
 9a. Young leaf blade lanceolate.  
 10a. Catkin 2.5–4 × 1–1.2 cm; bracts oblong ..... 209. *S. wallichiana*  
 10b. Catkin ca. 5 × 0.5–0.8 cm; bracts lanceolate ..... 203. *S. insignis*  
 9b. Young leaf blade elliptic to suborbicular.  
 11a. Fruiting catkin 3–4 cm ..... 210. *S. pseudowallichiana*  
 11b. Fruiting catkin 6(–10) cm ..... 208. *S. sinica*

### Key based on vegetative characters

- 1a. Leaves usually adaxially wrinkled, usually conspicuously so when fresh.  
 2a. Leaves abaxially with inconspicuous, reticulate veins ..... 208. *S. sinica*  
 2b. Leaves abaxially with conspicuous reticulate veins.  
 3a. Leaf blade thick, 6–8(–11) cm, margin not recurved; lateral veins joining together before reaching margin.  
 4a. Leaf blade broadly ovate to obovate-oblong or ovate-oblong ..... 204. *S. caprea*  
 4b. Leaf blade suborbicular, obovate-orbicular, ovate, or elliptic ..... 207. *S. raddeana*  
 3b. Leaf blade thin, usually less than 4 cm, margin recurved; lateral veins separate ..... 202. *S. hsinganica*  
 1b. Leaves adaxially smooth.  
 5a. Leaf blade lanceolate, oblong-lanceolate, ovate-oblong, or long elliptic.  
 6a. Leaf blade usually lanceolate, margin dentate ..... 203. *S. insignis*  
 6b. Leaf blade rarely lanceolate, margin usually entire, rarely remotely dentate ..... 209. *S. wallichiana*  
 5b. Leaf blade neither lanceolate, oblong-lanceolate, ovate-oblong, nor long elliptic.  
 7a. Mature leaves tomentose abaxially.  
 8a. Leaves abaxially silky tomentose, shiny ..... 201. *S. floderusii*  
 8b. Leaves abaxially gray tomentose, not shiny ..... 206. *S. cinerea*  
 7b. Mature leaves glabrous abaxially (sometimes pubescent in *S. illiensis*).  
 9a. Leaves abaxially white.  
 10a. Leaf blade usually elliptic or subobovate-elliptic, rarely lanceolate or ovate, base cuneate, rarely rounded ..... 200. *S. taraikensis*  
 10b. Leaf blade usually obovate, base rounded, rarely cuneate ..... 210. *S. pseudowallichiana*  
 9b. Leaves abaxially greenish or grayish blue.  
 11a. Leaf blade usually 1–2 cm ..... 211. *S. shandanensis*  
 11b. Leaf blade 3–7 cm ..... 205. *S. iliensis*

**200. *Salix taraikensis*** Kimura, J. Fac. Agric. Hokkaido Univ. 26(4): 419. 1934.

谷柳 gu liu

Shrubs or small trees. Branchlets chestnut brown, glabrous. Stipules reniform or obliquely ovate, dentate; petiole 5–7 mm, glabrous; leaf blade elliptic, rarely suborbicular or oblanceolate, (2–)6–10 × (1.5–)4–5 cm, both surfaces glabrous, slightly puberulent when young, abaxially pale, adaxially green or dull green, base broadly cuneate or rounded, margin entire, or on shoots or distal part of branchlets, irregularly dentate, apex acute, obtuse, or rounded. Flowering coetaneous or slightly precocious. Male catkin ellipsoid or shortly cylindric, 1.5(–2.5) × 1–1.2 cm; peduncle short, with a few leaflets; bracts elliptic-obovate, apex brownish or nearly black. Male flower: gland 1; stamens 2; filaments glabrous, 5–6 × as long as bracts.

Female catkin 1–3 × 0.8–1 cm; peduncle ca. 5 mm, to 1 cm in fruit, pubescent, with a few leaflets at base; bracts as in male catkin. Female flower: gland adaxial, 5–7 × shorter than stipe; ovary narrowly conical, ca. 2 mm, downy; stipe ca. as long as ovary; style short; stigma 2-cleft. Capsule ca. 7 mm, pilose. Fl. Apr, fr. Jun.

Mountain slopes, woods. Heilongjiang, Jilin, Liaoning, Nei Mongol, Xinjiang (Altay Shan) [Japan, Mongolia, Russia].

A. K. Skvortsov indicates that the European species *Salix starkeana* Willdenow, as treated in Fl. Intramongol., was based on misidentified specimens of *S. taraikensis*.

- 1a. Leaf blade broadest distally 200c. var. *oblanceolata*  
 1b. Leaf blade broadest at middle.  
 2a. Leaf blade elliptic-obovate or elliptic-ovate, adaxially green ... 200a. var. *taraikensis*  
 2b. Leaf blade elliptic or broadly elliptic, rarely suborbicular, adaxially light green ..... 200b. var. *latifolia*

**200a. *Salix taraikensis* var. *taraikensis***

谷柳(原变种) gu liu (yuan bian zhong)

*Salix floderusii* Nakai f. *glabra* Nakai; *S. livida* Wahlenberg; *S. xerophila* Floderus f. *glabra* (Nakai) Kitagawa.

Leaf blade elliptic-obovate or elliptic-ovate, adaxially green.

Mountain slopes, woods. Heilongjiang, Jilin, Liaoning, Nei Mongol, Xinjiang (Altay Shan) [Japan, Mongolia, Russia].

**200b. *Salix taraikensis* var. *latifolia*** Kimura, J. Fac. Agric. Hokkaido Univ. 26(4): 421. 1934.

宽叶谷柳 kuan ye gu liu

Leaf blade elliptic or broadly elliptic, rarely suborbicular, 5–9 cm, thick, adaxially light green.

Mountain slopes. Heilongjiang, Jilin [Japan, Russia].

**200c. *Salix taraikensis* var. *oblanceolata*** C. Wang & C. F. Fang in C. F. Fang, Bull. Bot. Res., Harbin 4(1): 126. 1984.

倒披针谷柳 dao pi zhen gu liu

Leaf blade broadly oblanceolate. Male flower: filaments partly connate.

• C Liaoning (Shenyang Shi).

**201. *Salix floderusii*** Nakai, Fl. Sylv. Kor. 18: 123. 1930.

崖柳 ya liu

*Salix floderusii* Nakai f. *manshurica* Nakai; *S. xerophila* Floderus f. *manshurica* (Nakai) Kitagawa. Shrubs, rarely small trees. Branchlets white tomentose when young, glabrescent. Buds pilose. Stipules ovate-elliptic or ovate-lanceolate, small (large on shoots), pilose, deciduous; petiole 4–10 mm; leaf blade long elliptic, lanceolate-elliptic, or obovate-elliptic, rarely oblanceolate, 4–6(–7) × 1.5–2.5 cm, abaxially greenish, silky tomentose or white tomentulose, slightly shiny, adaxially dull green, tomentose, when mature usually subglabrous or slightly pubescent, base rounded or broadly cuneate, margin subentire, rarely dentate, apex acute or shortly acuminate. Flowering precocious or nearly coetaneous. Male catkin sessile; bracts brown, ovate-elliptic, 2.5–2.7 cm, apex dark brown or nearly black, villous. Male flower: gland 1; stamens 2, glabrous; anthers yellow. Female catkin 3.5(–6) cm, pedunculate, elongated in fruit; bracts oblong, 1.4–1.7 mm, villous. Female flower: gland 1; ovary narrowly ovoid-conical, (4–)5–7 mm, sericeous; stipe ca. 5.5 mm, 6–10 × as long as gland; style conspicuous; stigma 2-parted. Capsule ovoid-conical, sericeous. Fl. May. fr. Jun.

Marshes, damp mountain slopes. N Hebei, Heilongjiang, Jilin, Liaoning, E Nei Mongol, Shanxi [Korea, E Russia].

**202. *Salix hsinganica*** Y. L. Chang & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 566. 1955.

兴安柳 xing an liu

*Salix geminata* Y. L. Chang & Skvortzov; *S. ilectica* Y. L. Chou; *S. ilectica* var. *integristyla* Y. L. Chou; *S.*

*xerophila* Floderus var. *ilectica* (Y. L. Chou) Y. L. Chou.

Shrubs to 1 m tall. One-year-old branchlets dark russet, glabrous or with rudimentary hairs; juvenile branchlets tomentose. Buds pubescent, glabrescent, apex acute. Stipules semiovate-lanceolate or obliquely semicordate; petiole 3–5 mm, villous; leaf blade ovate, elliptic, or obovate, 1–4.5 × 0.5–2.5 cm, thick, abaxially greenish or slightly white, adaxially green, slightly wrinkled, conspicuously so when fresh, both surfaces downy, when mature glabrescent, base cuneate or rounded, margin entire or irregularly shallowly dentate, slightly recurved, apex acute or shortly acuminate; lateral veins 5–7 on each side of midvein; reticulate veins raised. Flowering precocious. Male catkin ellipsoid to shortly cylindrical, 1–2.5 cm, sessile; bracts yellowish green, oblong, rarely ovate, long pubescent, sometimes glabrescent, apex purplish red. Male flower: gland adaxial; stamens 2; filaments distinct, downy; anthers yellow. Fruiting catkin 4–5 cm, pedunculate, with 3–5 leaflets. Female flower: ovary narrowly ovoid or ovoid-conical, rarely ovoid, villous, long stipitate; style short or sessile; stigma 2–4-lobed. Capsule narrowly conical, downy; stipe very long. Fl. Jun, fr. Jun–Jul.

• Open woodlands, mountain slopes. Heilongjiang, E Nei Mongol.

**203. *Salix insignis*** Andersson, J. Linn. Soc., Bot. 4: 47. 1860.

藏西柳 zang xi liu

Trees or shrubs. Branchlets russet or chestnut colored, glabrous, shiny, rarely grayish blue, thick. Buds ovoid-conical, glabrous or slightly pilose, apex acute. Stipules semiovate or broadly lanceolate, margin serrulate; petiole ca. 5 mm; leaf blade lanceolate, ca. 7.5 × 2.5 cm, papery, abaxially pale or slightly grayish blue, adaxially bright green, shiny, base attenuate, margin indistinctly serrulate, apex long acuminate; lateral veins conspicuous and curved abaxially. Male catkin oblong or broadly oblong-ellipsoid, ca. 2.5 cm, thick, sessile, with leaflets at base or not; bracts broadly elliptic-ovate, apex black, obtuse, long pubescent. Male flower: stamens 2; filaments ca. 3 × as long as bracts; anthers nearly yellowish brown, small. Female catkin long terete, ca. 5 cm × 5–8 mm, sessile, with leaflets at base, sparsely flowered; bracts black, lanceolate, subglabrous or pilose at base. Female flower: gland adaxial; ovary narrowly conical, gray sericeous; stipe longer than gland; stigma thick.

W Xizang [Kashmir].

**204. *Salix caprea*** Linnaeus, Sp. Pl. 2: 1020. 1753.

黄花柳 huang hua liu

Shrubs or small trees. Branchlets yellowish green to yellowish red, pilose or glabrous. Stipules semiorbicular, apex acute; petiole ca. 1 cm; leaf blade ovate-oblong, broadly ovate to obovate-oblong 5–7 ×

2.5–4 cm, slightly thick, abaxially tomentose or downy, adaxially dull green, wrinkled, more conspicuously so when fresh, glabrous, base rounded, margin irregularly notched, dentate, or subentire, usually slightly recurved, apex acute or apiculate, usually contorted; reticulate veins conspicuous abaxially. Flowering precocious. Male catkin ellipsoid or broadly ellipsoid, 1.5–2.5 × ca. 1.5 cm, sessile; bracts 2-colored, light proximally, black distally, lanceolate, ca. 2 mm, long pubescent. Male flower: gland adaxial; stamens 2, distinct; filaments 6–8 mm, slender; anthers yellow, oblong. Female catkin shortly cylindrical, ca. 2 × 0.8–1 cm, to 6 × 1.8 cm in fruit, shortly pedunculate; bracts as in male catkin. Female flower: gland as in male flowers; ovary narrowly conical, 2.5–3 mm, downy; stipe ca. 2 mm; style short; stigma 2–4-lobed. Capsule to 9 mm. Fl. Apr, fr. May–Jun.  $2n = 38$ .

Mountain slopes, woods. Heilongjiang, Jilin, Liaoning, Nei Mongol [N Asia, Europe].

Specimens of *Salix sinica* from N and NW China have been misidentified as this species. *Salix caprea* differs from *S. sinica* follows: leaves thick, pubescent; filaments longer, 6–7 × as long as than bracts; ovary slightly longer than stipe.

**205. *Salix iliensis*** Regel, Trudy Imp. S.-Peterburgsk. Bot. Sada 6: 464. 1880.

伊犁柳 yi li liu

Shrubs large; bark dull gray. Branchlets yellowish, at first tomentulose, glabrescent. Buds flattened oblong-lanceolate. Stipules reniform, margin dentate; petiole 3–4 mm; leaf blade elliptic, obovate-elliptic, broadly elliptic, or obovate to suborbicular, 3–7 cm, abaxially greenish, glabrous, tomentulose when young, adaxially dull green, base cuneate or broadly cuneate, margin entire, rarely irregularly remotely dentate, apex acute. Flowering precocious or nearly coetaneous. Male catkin sessile; bracts obovate-oblong, apex dull brown to nearly black, obtuse. Male flower: gland adaxial; stamens 2, distinct; filaments downy at base. Female catkin 1–2 cm, to 4 cm in fruit, with short peduncle and leaflets. Female flower: ovary long conical, densely gray tomentose; stipe ca. 1 mm; style short; stigma capitate. Capsule ca. 5 mm, gray pubescent. Fl. May, fr. Jun.

Woods; 1400–2700 m. Xinjiang (Kunlun Shan, Tian Shan) [Afghanistan, S Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan].

Chinese records of the European *Salix aurita* Linnaeus are referable to *S. iliensis*.

**206. *Salix cinerea*** Linnaeus, Sp. Pl. 2: 1021. 1753.

灰柳 hui liu

Shrubs to 5 m tall; bark dull gray. Branchlets densely gray tomentose. Buds brown, flattened oblong, gray tomentose. Stipules reniform or semiovate; petiole 5–7 mm; leaf blade long obovate or obovate-lanceolate, 4–

10 × 1–1.5 cm, larger on shoots, abaxially densely gray tomentose, adaxially dull green or grayish green, base attenuate, margin shallowly serrulate, rarely entire, apex acute; lateral veins raised abaxially. Flowering precocious or coetaneous. Male catkin 1–2 cm; bracts brown, spatulate, long pubescent. Male flower: stamens 2, distinct, glabrous; glands adaxial. Female catkin 3–4 cm; bracts as in male catkin. Female flower: gland as in male flower; ovary long conical, densely gray tomentose; stipe rather long; style short; stigma divided. Fl. May, fr. May–Jun.  $2n = 76$ .

Damp places. Xinjiang (Ertix He valley) [Kazakstan, Russia; Europe].

**207. *Salix raddeana*** Lakschewitz ex Nasarow in Komarov, Fl. URSS 5: 707. 1936.

大黄柳 da huang liu

Shrubs or trees. Branchlets dull red or russet, gray villous when young, glabrescent. Buds dull brown, large, pilose or abaxially glabrous, apex acute. Petiole 1–1.5 cm, densely pubescent; leaf blade obovate-orbicular, ovate, suborbicular, or elliptic, 3.5–9(–10) × 3–4(–6) cm, leathery, abaxially gray tomentose, glabrous, or sparsely pubescent, adaxially dull green, usually with conspicuous wrinkles, base rounded or cuneate-rounded, margin entire or irregularly dentate, apex shortly acuminate or acute. Flowering precocious. Male catkin ca. 2.5 × 1.6–2 cm, sessile; rachis downy; bracts black distally or nearly throughout, ovate-elliptic, densely villous, apex acuminate. Male flower: gland adaxial; stamens 2; filaments slender, glabrous or sparsely downy at base, 5–6 × as long as bracts; anthers yellow, oblong. Female catkin 2–2.5 × 0.8–1 cm, 7–8 × ca. 2 cm in fruit, shortly pedunculate, with 1–3 scalelike leaflets; bracts as in male catkin. Female flower: gland as in male flower; ovary long conical, gray sericeous; stipe 2–2.5 mm; style ca. 1 mm; stigma (2 or)4-lobed. Capsule to 1 cm. Fl. Apr, fr. May.

Mountain slopes, woods. Heilongjiang, Jilin, Liaoning, E Nei Mongol [Korea, E Russia].

- 1a. Leaves gray tomentose abaxially, margin entire or irregularly dentate .... 207a. var. *raddeana*
- 1b. Leaves glabrous or sparsely pubescent abaxially, margin conspicuously dentate 207b. var. *subglabra*

**207a. *Salix raddeana*** var. *raddeana*

大黄柳(原变种) da huang liu (yuan bian zhong)

*Salix caprea* Linnaeus f. *elongata* (Nakai) Kitagawa; *S. liangshuiensis* Y. L. Chou & C. Y. King; *S. raddeana* var. *liangshuiensis* (Y. L. Chou & C. Y. King) Y. L. Chou.

Leaf blade lanceolate, oblong-lanceolate, ovate-oblong, or narrowly elliptic, abaxially gray tomentose, margin entire or irregularly dentate.

Mountain slopes, woods. Heilongjiang, Jilin, Liaoning, E Nei Mongol [Korea, E Russia].

**207b. *Salix raddeana* var. *subglabra*** Y. L. Chang & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 558. 1955.

稀毛大黄柳 xi mao da huang liu

*Salix caprea* f. *subglabra* (Y. L. Chang & Skvortzov) Kitagawa.

Leaf blade lanceolate, oblong-lanceolate, ovate-oblong, or narrowly elliptic, abaxially glabrous or sparsely pubescent, margin conspicuously dentate. Flower buds flattened sharp at apex.

• Mountain slopes. Heilongjiang.

**208. *Salix sinica*** (K. S. Hao ex C. F. Fang & A. K. Skvortsov) G. Zhu, Novon 8: 465. 1998.

中国黄花柳 zhong guo huang hua liu

Shrubs or small trees. Branchlets russet, glabrous; juvenile branchlets downy. Stipules semiovalate to subreniform; petiole pilose; leaf blade highly variable, usually elliptic, elliptic-lanceolate, elliptic-rhomboid, or obovate-elliptic, rarely lanceolate, ovate, or broadly ovate, 3.5–6 × 1.5–2.5 cm, abaxially whitish, often wrinkled, usually tomentose, adaxially dull green, pilose when young, glabrescent, base cuneate, rounded-cuneate, or subrounded, margin entire or dentate, apex shortly acuminate, acute, or obtuse. Flowering precocious. Male catkin broadly ellipsoid to subglobose, 2–2.5 × 1.8–2 cm, sessile; bracts dull brown or nearly black, elliptic-ovate or slightly obovate-lanceolate, ca. 3 mm, villous. Male flower: gland subsquare; stamens 2, distinct; filaments ca. 6 mm, slender, sparsely downy at base; anthers yellow, oblong. Female catkin shortly cylindrical, 2.5–3.5 cm × 7–9 mm, sessile, with 2 tomentose scalelike leaflets at base; bracts dull brown or black, elliptic-lanceolate, ca. 2.5 mm, long pubescent. Female flower: gland 1; ovary narrowly conical, ca. 3.5 mm, pilose; stipe ca. 1.2 mm; style short; stigma 2-cleft. Capsule linear-conical, ca. 6 mm; stipe ca. as long as bracts. Fl. Apr, fr. May.

• Mountain slopes, woods. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi.

1a. Ovary subsessile ..... 208c. var. *subsessilis*

1b. Ovary distinctly stipitate.

2a. Leaf base cuneate or rounded-cuneate, margin entire or irregularly dentate, apex shortly acuminate or acute .... 208a. var. *sinica*

2b. Leaf base subrounded, margin regularly dentate, apex obtuse or acute 208b. var. *dentata*

**208a. *Salix sinica* var. *sinica***

中国黄花柳(原变种) zhong guo huang hua liu (yuan bian zhong)

*Salix caprea* Linnaeus var. *sinica* K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 467. 1998.

Leaf base cuneate or rounded-cuneate, margin entire or irregularly dentate, apex shortly acuminate or acute. Female flower: ovary distinctly stipitate.

• Mountain slopes, woods. Gansu, Hebei, Nei Mongol, Qinghai.

**208b. *Salix sinica* var. *dentata*** (K. S. Hao ex C. F. Fang & A. K. Skvortsov) G. Zhu, Novon 8: 465. 1998.

齿叶黄花柳 chi ye huang hua liu

*Salix caprea* var. *dentata* K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 467. 1998.

Leaf blade ovate, base subrounded, margin rather regularly dentate, apex obtuse or acute. Female flower: ovary distinctly stipitate.

• Mountain slopes. Hebei, Ningxia, Shaanxi, Shanxi.

**208c. *Salix sinica* var. *subsessilis*** (K. S. Hao ex C. F. Fang & A. K. Skvortsov) G. Zhu, Novon 8: 466. 1998.

无柄黄花柳 wu bing huang hua liu

*Salix caprea* var. *subsessilis* K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 468. 1998.

Female flower: ovary subsessile. Fl. Jun.

• Hebei (Xiaowutai Shan).

**209. *Salix wallichiana*** Andersson, Kongl. Vetensk. Akad. Handl. 1850: 477. 1851.

皂柳 zao liu

Shrubs or trees. Branchlets russet, blackish brown, or greenish brown, at first pilose, glabrescent. Buds russet or chestnut colored, ovoid, glabrous, angled, apex acute, recurved. Stipules small, semicordate; petiole ca. 1 cm; leaf blade lanceolate, oblong-lanceolate, ovate-oblong, or narrowly elliptic, 4–8(–10) × 1–2.4(–3) cm, abaxially silky pubescent, densely tomentose, or glabrous, greenish to pruinose, reddish when young, adaxially with filamentous hairs at first, glabrescent, smooth, margin usually entire (serrulate on shoots), apex acute to acuminate; reticulate veins indistinct. Flowering precocious or coetaneous. Male catkin 1.5–2.5(–3) × 1–1.3(–1.5) cm, sessile, rarely pedunculate, with 2 or 3 leaflets at base; bracts brown to blackish brown, oblong or obovate, long white pubescent or abaxially sparsely pubescent, apex acute. Male flower: gland 1, ovate-rectangular; stamens 2; filaments 5–6 mm, slender, distinctly glabrous or downy at base; anthers yellow, ellipsoid, large. Female catkin cylindrical, distally attenuate, 2.5–4 × 1–1.2 cm, to 12 × 1.5 cm in fruit; bracts brown to blackish brown, oblong, long pubescent, apex acute. Female flower: gland 1; ovary narrowly conical, 3–4 mm, pubescent, shortly stipitate; style short to conspicuous; stigma 2–4-lobed. Capsule to 9 mm, pilose, rarely subglabrous; stipe elongate, ca. as long as bracts; valves revolute. Fl. Apr–May, fr. May. 2n = 18.

Mountain slopes, margins of woods, riversides. SE Gansu, Guizhou, Hebei, Hubei, Hunan, Nei Mongol, S Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Bhutan, India, Nepal].

This species hybridizes easily with *Salix sinica*. Together, they produce many hybrids, with intermediate states, overlapping in their distributions. A. K. Skvortsov indicates that there are many herbarium specimens labelled as *S. wallichiana*, but they require further study because that species is W Himalayan.

- 1a. Leaves abaxially silky pubescent or glabrous; filaments glabrous or sparsely downy at base ..... 209a. var. *wallichiana*  
 1b. Leaves abaxially densely tomentose; filaments downy proximally 209b. var. *pachyclada*

**209a. *Salix wallichiana* var. *wallichiana***

皂柳(原变种) zao liu (yuan bian zhong)

*Salix funebris* H. Léveillé; *S. mairei* H. Léveillé; *S. wallichiana* var. *grisea* Andersson.

Leaf blade abaxially silky pubescent or glabrous. Filaments glabrous or sparsely downy at base.

Mountain slopes, margins of woods, riversides. SE Gansu, Guizhou, Hebei, Hubei, Hunan, Nei Mongol, S Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan, Zhejiang [Bhutan, India, Nepal].

Used for weaving wicker articles.

**209b. *Salix wallichiana* var. *pachyclada*** (H. Léveillé & Vaniot) C. Wang & C. F. Fang, Fl. Reipubl. Popularis Sin. 20(2): 307. 1984.

绒毛皂柳 rong mao zao liu

*Salix pachyclada* H. Léveillé & Vaniot, Repert. Spec. Nov. Regni Veg. Beih. 3: 22. 1906.

Leaf blade abaxially densely tomentose. Filaments downy proximally.

• Mountain slopes. Guizhou, Hubei, Hunan, Sichuan, Yunnan, Zhejiang.

**210. *Salix pseudowallichiana*** Goerz ex Rehder & Kobuski, J. Arnold Arbor. 13: 397. 1932.

青皂柳 qing zao liu

Shrubs or trees to 6 m tall. Branchlets dull red or yellowish brown, glabrous, downy when young. Buds russet, glabrous. Stipules absent or small, semicordate; petiole 5–7 mm; leaf blade broadly ovate-elliptic, broadly elliptic, or obovate-elliptic, rarely ovate-lanceolate, 3–5 × 1.5–3 cm, glabrous or only veins

pilose, abaxially greenish or whitish, adaxially dull green, base rounded or cuneate-rounded, margin entire or irregularly serrate distally, apex acute; lateral veins 7–10 on each side of midvein. Flowering slightly precocious or coetaneous. Male catkin broadly ellipsoid, ca. 2 × 1.5 cm; bracts purplish black distally, oblong-elliptic or obovate-oblong, ca. 2 mm, abaxially villous, apex rounded-obtuse. Male flower: gland 1; stamens 2; filaments united nearly throughout, ca. 6.5 mm, downy proximally; anthers red or golden yellow. Female catkin cylindrical, ca. 3.5 × 1.5 cm; peduncle very short; bracts purplish black distally, oblong-elliptic or obovate-oblong, apex acuminate to rounded-obtuse. Female flower: gland small; ovary long conical, ca. 5 mm, downy, long stipitate; style short; stigma 2-cleft. Capsule with valves revolute. Fl. May, fr. Jun.

• Riverbanks. E Qinghai, Shanxi, N Sichuan.

Very similar to *Salix sinica* but leaf blade generally wider, apex shorter; filaments partly united, downy. A. K. Skvortsov indicates that the circumboreal species *S. phyllicifolia* Linnaeus, as treated in Fl. Tsinling., was based on misidentified specimens of *S. pseudowallichiana* or *S. characta*. R. Goerz considered that *S. pseudowallichiana* might be a hybrid between *S. wallichiana* and *S. rockii*.

**211. *Salix shandanensis*** C. F. Fang in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 17. 1980.

山丹柳 shan dan liu

Shrubs to 1.5 m tall. Branches gray; 1-year-old branchlets purplish black when dried, gray downy. Stipules semioval, small, apex acute; petiole purplish red, 1–2 mm, downy; leaf blade elliptic or ovate-elliptic, 1.5–2 × 0.8–1.2 cm, abaxially greenish, glabrous, adaxially dull green, with sparse, filamentous hairs, base rounded or rounded-cuneate, margin serrulate, rarely subentire, apex acute; lateral veins 7 or 8 on each side of midvein. Flowering coetaneous or slightly serotinous. Male catkin unknown. Female catkin cylindrical, ca. 2 × 0.9 cm; peduncle short, with 2 or 3 leaflets; bracts yellowish green, oblong, abaxially sparsely long pubescent, adaxially subglabrous. Female flower: gland 1, shortly terete; ovary conical, ca. 3 mm, downy; stipe ca. 1.2 mm, ca. as long as bracts; style short or absent; stigma 4-lobed. Capsule narrowly conical, ca. 9 mm; stipe to 1.5 mm; valves revolute. Fl. Jun, fr. Jul.

• Mountain slopes; ca. 2700 m. Gansu (Shandan Xian), Ningxia (Liupan Shan), Qinghai.

**25. Sect. *Lanatae*** Koehne, Deut. Dendrol. 1: 87, 93. 1893.

毛柳组 mao liu zu

Sect. *Chrysanthae* (Koch) C. K. Schneider.

Shrubs erect or cushion-shaped. Branchlets brown, thick. Stipules ovate to lanceolate; leaf blade ovate-orbicular, broadly elliptic, or elliptic, rarely broadly lanceolate, both surfaces sericeous, white pubescent, or with hairs only along veins, margin entire or irregularly serrate, abaxially conspicuously veined. Catkins shortly pedunculate; bracts 2-colored, apex nearly black. Male flower: gland solitary, adaxial; stamens 2; filaments distinct or united at base,

glabrous. Female flower: glands sometimes 2, adaxial and abaxial; ovary ovoid-conical, glabrous, stipitate; style long; stigma 2-cleft.

- 1a. Bracts ovate-lanceolate or lanceolate, with long hairs; female flowers with only an adaxial gland; leaf blade elliptic, apex acute ..... 212. *S. bhutanensis*
- 1b. Bracts ovate or obovate, pubescent; female flowers with adaxial and abaxial glands; leaf blade oblong-lanceolate or oblong, apex shortly acuminate or acute ..... 213. *S. lasiopes*

**212. *Salix bhutanensis*** Floderus, Bot. Not. 1940: 227. 1940.  
 不丹柳 bu dan liu  
*Salix filistyla* C. Wang & P. Y. Fu; *S. himalayensis* (Andersson) Floderus var. *filistyla* (C. Wang & P. Y. Fu) C. F. Fang.

Shrubs or trees to more than 3 m tall. Branchlets spreading; 2-year-old branchlets ca. 4 mm thick; juvenile branchlets densely brownish green tomentose. Stipules ovate to lanceolate, pilose, margin dentate; petiole ca. 3 mm, densely downy; leaf blade elliptic, 3–5.5 × 1.5–2.5 cm, abaxially grayish green, adaxially yellowish green, base obtuse or rounded, margin entire, rarely slightly indistinctly dentate, apex acute; lateral veins 8–11 on each side of midvein, white downy later, only veins pilose, or abaxially more pubescent. Flowering precocious or nearly coetaneous. Male catkin unknown. Female catkin cylindric, ca. 5 × 1.3 cm, densely flowered; peduncle ca. 1 cm, with 1–3 leaflets; bracts brown, ovate-lanceolate or lanceolate, ca. 1.8 mm, abaxially long pubescent, adaxially dull brown. Female flower: gland adaxial, shortly terete, square, or flattened square, ca. as long as or shorter than stipe; ovary narrowly ovoid-conical, 4–5 mm, glabrous, adaxially reddish; stipe ca. 0.3–1 mm; style 1–1.5 mm

or longer; stigma suberect, 2-cleft. Capsule 6–7 mm. Fl. May–Jun.

Mountain slopes, valleys, thickets, open woods; 2800–3500 m. Xizang [Bhutan, Nepal].

**213. *Salix lasiopes*** C. Wang & P. Y. Fu in C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 198. 1974.

毛柄柳 mao bing liu

*Salix bhutanensis* Floderus var. *lasiopes* (C. Wang & P. Y. Fu) N. Chao.

Shrubs to 2 m tall. Juvenile branchlets densely long gray pubescent; 2-year-old branchlets ± long gray pubescent. Stipules sublanceolate or ovate-lanceolate, ca. 3.5 mm, pilose, margin dentate; petiole 4–8 mm, long gray pubescent; leaf blade oblong-lanceolate or oblong, 4–6 × 1.8–2.5 cm, abaxially pale or greenish except glabrous along midvein, adaxially green, base rounded to cuneate, margin entire, apex acute or shortly acuminate; lateral veins ca. 11 on each side of midvein. Male catkin unknown. Fruiting catkin 6–9 × ca. 1.5 cm; peduncle 3–9 mm, with 2 or 3 leaflets, pilose; rachis pilose; bracts dull purplish brown when dried, ovate or obovate, proximally downy on both surfaces, apex retuse. Female flower: adaxial and abaxial glands ca. as long as stipe; style long, 2-cleft; stigma 2-lobed. Capsule glabrous, stipitate.

• Mountain slopes; ca. 3000 m. Xizang.

**26. Sect. *Daphnella*** Seringe ex Duby, Bot. Gall. 1: 424. 1828.

粉枝柳组 fen zhi liu zu

Trees. One-year-old branchlets reddish or reddish black, rarely pruinose. Stipules present; leaf blade lanceolate or oblong-lanceolate, glabrous, margin serrulate or serrate, apex acuminate. Flowering precocious. Catkins cylindric, sessile; bracts 2-colored (or nearly reddish black), densely long pubescent. Male flower: gland solitary, adaxial; stamens 2, distinct; anthers yellow or yellowish red. Female flower: ovary glabrous or pilose, long stipitate; style long, usually entire; stigma slender, entire or 2-lobed.

**Key based on male plants**

(*Salix baileyi* unknown)

- 1a. Branchlets russet, 2-year-old branchlets pruinose ..... 215. *S. rorida*
- 1b. Branchlets green or yellowish green, sometimes reddish, not pruinose.
  - 2a. Filaments free or connate proximally; leaf buds long pubescent; leaf apex acute ..... 217. *S. kangensis*
  - 2b. Filaments distinct; leaf buds glabrous; leaf apex acuminate ..... 216. *S. skvortzovii*

**Key based on female plants**

- 1a. Stigma 2–4-lobed; bracts elliptic or ovate-elliptic ..... 217. *S. kangensis*
- 1b. Stigma 2-cleft; bracts obovate, obovate-oblong, or elliptic.
  - 2a. Ovary pilose; bracts obovate or elliptic ..... 216. *S. skvortzovii*
  - 2b. Ovary glabrous; bracts obovate-oblong or obovate.
    - 3a. Bracts obovate-oblong, base with 3 or 4 prominent glandular dots on each side (except in *S. rorida* var. *roridiformis*), apex black; branchlets russet or dull brown, 2-year-old branchlets pruinose ..... 215. *S. rorida*



- 3b. Bracts obovate, base eglandular, apex russet; branchlets green or reddish ..... 214. *S. baileyi*

### Key based on vegetative characters

- 1a. Branchlets russet; 2-year-old branchlets pruinose; stipules ovate or broadly ovate (except in *S. rorida* var. *roridiformis*) ..... 215. *S. rorida*
- 1b. Branchlets green or yellowish green, sometimes reddish, not pruinose; stipules lanceolate, apex acute.
- 2a. Leaf blade abaxially pilose ..... 217. *S. kangensis*
- 2b. Leaf blade abaxially glabrous.
- 3a. Shrubs; petiole 5–8 mm; stipules ovate-lanceolate ..... 216. *S. skvortzovii*
- 3b. Trees; petiole ca. 10 mm; stipules absent or very small ..... 214. *S. baileyi*

**214. *Salix baileyi*** C. K. Schneider in Bailey, Gentes. Herb. 1: 16. 1920.

井冈柳 jing gang liu

Trees; bark gray, sulcate. Branchlets green or reddish, glabrous. Stipules absent or very small; petiole ca. 1 cm; leaf blade lanceolate, broadest at middle, ca. 7.5 × 1.3 cm, abaxially pale green, glabrous, adaxially green, base attenuate, margin serrate, apex long acuminate. Flowering precocious or nearly coetaneous. Male catkin unknown. Female catkin cylindrical, ca. 5 × 1 cm, sessile or shortly pedunculate, nearly parallel to branchlets; rachis villous; bracts obovate, ca. as long as to shorter than stipe, white villous, apex russet. Female flower: gland 1, oblong; ovary ovoid, glabrous; stipe long; style long; stigma 2-cleft. Fl. Mar.

• 500–600 m. Anhui, Henan, Hubei, Jiangxi.

**215. *Salix rorida*** Lakschewitz, Herb. Fl. Ross. 7: 131. 1911.

粉枝柳 fen zhi liu

Trees to 15 m tall; bark grayish brown, at first grayish green; crown tower-shaped or globose. Branchlets russet, glabrous; 2-year-old branchlets pruinose. Buds glabrous. Stipules absent or, when present, ovate or broadly ovate, rarely obliquely ovoid, to 4–8 mm, dentate; petiole ca. 8 mm; leaf blade lanceolate or oblanceolate, 8–12 × 1–2 cm, glabrous, pubescent when young, abaxially pruinose, adaxially dull green, shiny, base cuneate, margin glandular serrate, apex acuminate. Flowering precocious. Male catkin cylindrical, 1.5–3.5 × 1.8–2 cm, sessile; bracts black distally, obovate-oblong, base sometimes with 3 or 4 glands on each side, long pubescent. Male flower: gland adaxial; stamens 2, 7–8.5 mm; filaments glabrous. Female catkin cylindrical, 3–4 × 1–1.5 cm, to 5 cm in fruit; bracts as in male catkin. Female flower: adaxial gland ca. 1/2 as long as stipe; ovary green, ovoid-conical, 2–3 mm, glabrous; stipe 1–1.5 mm; style 1–2 mm, shorter than ovary; stigma 2-cleft. Fl. May, fr. Jun.

Woods, mountains, streamsides; 300–600 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Mongolia, Russia].

- 1a. Leaf stipules 4–8 mm; bracts with 3 or 4 glands on each side of base ..... 215a. var. *rorida*

- 1b. Leaf stipules very small or absent; bracts eglandular ..... 215b. var. *roridiformis*

### 215a. *Salix rorida* var. *rorida*

粉枝柳(原变种) fen zhi liu (yuan bian zhong)

*Salix rorida* var. *oblanceolata* Y. L. Chou & Skvortzov; *S. rorida* var. *pendula* Skvortzov.

Stipules 4–8 mm. Bracts with 3 or 4 glands on each side of base.

Woods, streamsides. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Mongolia, Russia].

Grown to protect embankments; used for timber, weaving wicker articles, and as a nectariferous plant.

**215b. *Salix rorida* var. *roridiformis*** (Nakai) Ohwi, Fl. Japan 405. 1956.

伪粉枝柳 wei fen zhi liu

*Salix roridiformis* Nakai, Bot. Mag. (Tokyo) 33: 5. 1919.

Stipules very small or absent. Bracts eglandular.

Mountain woods; 300–600 m. Heilongjiang, Jilin, Liaoning [Japan, Korea].

**216. *Salix skvortzovii*** Y. L. Chang & Y. L. Chou in Y. L. Chou & al., Woody Pl. Xiao Hingan Mts. 86. 1955.

司氏柳 si shi liu

Shrubs to 4 m tall. Branchlets green or yellowish green, rarely reddish, glabrous. Bud dull red or russet, large, glabrous. Stipules ovate-lanceolate, ca. as long as petiole, margin dentate; petiole 5–8 mm, glabrous; leaf blade lanceolate, 5–10 × 0.8–1.7 cm, abaxially pale, glabrous, adaxially dull green, glabrous, sparsely long pubescent when young, base cuneate, margin glandular serrate, apex acuminate. Flowering precocious. Male catkin sessile, cylindrical, 2–4 × 1–1.3 cm; bracts yellowish green proximally, nearly black distally, yellowish green proximally, obovate or broadly obovate, ca. 1.5 mm, long pubescent, apex rounded. Male flower: gland adaxial; stamens 2; filaments distinct, ca. 4 mm, slender, glabrous; anthers yellow, subglobose. Female catkin cylindrical, 4–5 × 0.6–1 cm; bracts dull brown or black, obovate or elliptic, ca. 3 × as long as stipe, densely long pubescent, apex acute or obtuse. Female flower: adaxial gland ca. 1/2 as long as stipe; ovary ovoid-conical, ca. 3.5 mm, pilose; stipe 1–1.5 mm; style 1.5–1.7 mm, glabrous; stigma 2-cleft. Fl. May, fr. Jun.

• Damp margins of woods, streambanks; 400–600 m. Heilongjiang, Jilin, Liaoning.

Similar to *Salix kangensis* but buds, stipules, petioles, and abaxial leaf surface glabrous. Similar also to *S. kangensis* var. *leiocarpa* but ovary pilose.

Used as a nectariferous plant and for weaving wicker articles.

**217. *Salix kangensis*** Nakai, Bot. Mag. (Tokyo) 30: 275. 1916.

江界柳 *jiang jie liu*

Trees to 6 m tall. Branchlets green or greenish yellow, glabrous; shoots usually long pubescent. Buds long pubescent. Stipules ovate-lanceolate, pilose; petiole 0.8–1.7 cm, pilose; leaf blade lanceolate or linear-lanceolate, 4–10 × 1–3 cm, abaxially long pubescent or subsericeous, adaxially green, pilose along midvein, base cuneate, margin serrulate, apex acute. Flowering precocious. Male catkin 2.5–4 × ca. 1.5 cm, sessile; rachis pilose; bracts obovate, long pubescent, apex black. Male flower: adaxial gland ovate or subovate; stamens 2; filaments free or connate proximally; anthers yellow, subglobose. Female catkin 2–3 cm, to 4–4.5 × ca. 1 cm in fruit; bracts black, elliptic or ovate-elliptic, ca. 1.5 × 1 mm, long pubescent. Female flower: gland adaxial; ovary lanceolate, contracted toward base,

pubescent or glabrous; stipe ca. 1 mm; style long, nearly as long as ovary; stigma 2–4-lobed. Capsule pilose. Fl. May, fr. Jun.

Riverbanks; 300–600 m. Jilin, Liaoning [Korea].

1a. Ovary pubescent ..... 217a. var. *kangensis*

1b. Ovary glabrous ..... 217b. var. *leiocarpa*

**217a. *Salix kangensis* var. *kangensis***

江界柳(原变种) *jiang jie liu* (*yuan bian zhong*)

Female flower: ovary pubescent.

Riverbanks; 400–600 m. Jilin (Changbai Chaoxianzu Zizhixian) [Korea].

The flower characteristics were based on T. Nakai's description and comments in the protologue.

**217b. *Salix kangensis* var. *leiocarpa*** Kitagawa, Rep. Inst. Sci. Res. Manchoukuo 1: 263. 1937.

光果江界柳 *guang guo jiang jie liu*

*Salix kangensis* f. *leiocarpa* (Kitagawa) Kitagawa; *S. fenghuangschanica* Y. L. Chow & Skvortzov.

Female flower: ovary glabrous; stipe pubescent.

• Riverbanks; 300–500 m. Liaoning.

**27. Sect. *Argyraceae*** Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 90. 1980.

银柳组 *yin liu zu*

Shrubs. Leaf blade oblong, oblong-obovate, or obovate, abaxially densely grayish white silky. Male flower: gland solitary, adaxial; stamens 2, distinct, glabrous. Female flower: gland longer than stipe; ovary gray tomentose; style ca. 1 mm.

A. K. Skvortsov believes that this section might well be included in sect. *Vimen*.

1a. Anthers ovoid, apex obtuse; style ca. as long as stigma; stigma lobes diverging; branchlets and buds glabrous;

leaves abaxially densely silvery gray silky, shiny ..... 218. *S. argyracea*

1b. Anthers ellipsoid, apex mucronate; style usually shorter than stigma; stigma lobes procumbent or recurved;

branchlets and buds tomentulose; leaves abaxially pilose to glabrous, not shiny ..... 219. *S. neolapponum*

**218. *Salix argyracea*** E. L. Wolf, Isw. Liesn. Inst. 13: 50, 57. 1905.

银柳 *yin liu*

*Salix argyracea* f. *obovata* Goerz.

Shrubs to 5 m tall; bark gray. Branchlets yellowish to brown, glabrous, tomentulose when young. Buds brown, ovoid, at first tomentulose, glabrescent. Stipules lanceolate or ovate-lanceolate, caducous; petiole brown, 5–10 mm, tomentose; leaf blade obovate, oblong-obovate, rarely oblong-lanceolate or broadly lanceolate, 4–10 × 1.5–2 cm, abaxially densely tomentose, shiny, adaxially green, glabrous, base cuneate, margin glandular serrulate, apex shortly acuminate, when young gray tomentose; lateral veins 8–18 each side of brownish midvein. Flowering precocious. Male catkin ca. 2 cm, subsessile; bracts black, ovate, densely long gray pubescent, apex acute or slightly obtuse. Male flower: gland adaxial; stamens 2, distinct, glabrous; anthers ovoid, apex obtuse. Female catkin 2–4 cm, shortly

pedunculate, elongate in fruit; bracts as in male catkin.

Female flower: gland adaxial; ovary ovoid-conical, densely gray tomentose, subsessile; style brown, ca. 1 mm; stigma ca. as long as style, lobes diverging. Fl. May–Jun, fr. Jul–Aug.  $2n = 76$ .

Margins of woods, *Picea* woods on mountains. Xinjiang [S Kazakhstan, Kyrgyzstan].

**219. *Salix neolapponum*** Chang Y. Yang, Bull. Bot. Lab. N.-E. Forest. Inst., Harbin 9: 91. 1980.

绢柳 *juan liu*

Shrubs to 40 cm tall. Branchlets brownish or chestnut colored, rather thick; juvenile branchlets tomentulose, glabrescent. Buds long ovoid, tomentulose. Stipules lanceolate, tomentose, usually caducous; petiole short; leaf blade oblong-obovate, 4–6 × 2–3 cm, abaxially gray, pilose or glabrous, when young both surfaces densely silky, adaxially greenish, base cuneate, margin entire, rarely remotely glandular denticulate, apex

shortly acuminate. Flowering nearly coetaneous. Male catkin cylindric, 2–3 × 0.8–1 cm; peduncle short, tomentose, with scalelike leaflets and usually easily detached hairs; bracts dull brown or russet, broadly ovate, densely long gray pubescent, apex acute. Male flower: adaxial gland rectangular; stamens 2; filaments distinct, glabrous; anthers yellow, ellipsoid, apex mucronate. Fruiting catkin 4–5 cm; bracts as in male

catkin. Female flower: gland as in male flower; ovary ovoid-conical, densely tomentose, shortly stipitate; style 1–1.5 mm; stigma usually shorter than style, 2-cleft, lobes procumbent or recurved. Capsule gray, tomentose. Fl. Jun, fr. Jul.

- Damp places on mountains; ca. 2000 m. Xinjiang (Altay Shan).

**28. Sect. Vimen** Dumortier, Bijdr. Natuurk. Wetensch. 1(1): 56. 1825.

蒿柳组 hao liu zu

Sect. *Viminales* (Seringe) Koch.

Trees or shrubs. One-year-old branchlets slender, pilose. Leaf blade linear to lanceolate, oblanceolate, or oblong, margin entire, usually revolute, rarely sinuate or serrulate; midvein often raised abaxially. Flowering precocious or coetaneous. Catkins oblong to shortly cylindric, shortly pedunculate or sessile; bracts 2-colored, long white pubescent. Male flower: gland solitary, adaxial; stamens 2, distinct; anthers golden yellow. Female flower: ovary sericeous, sessile or stipitate; style long; stigma 2-lobed or entire.

**Key based on male plants**

(*Salix sajanensis* unknown)

- 1a. Branchlets densely gray tomentose ..... 226. *S. turanica*
- 1b. Branchlets glabrous or pilose, not gray tomentose.
  - 2a. Branchlets pubescent ..... 225. *S. sachalinensis*
  - 2b. Branchlets either pubescent with long, grayish white hairs, or sparsely pubescent, or subglabrous.
    - 3a. Catkin 2.5–4 × ca. 1.8 cm ..... 224. *S. dasyclados*
    - 3b. Catkin 1.5–3 cm, less than 1.5 cm thick.
      - 4a. Catkin ellipsoid-ovoid, 2–3 × ca. 1.5 cm ..... 227. *S. schwerinii*
      - 4b. Catkin ellipsoid, shortly cylindric, or cylindric, 2.5–3 × ca. 1 cm.
        - 5a. Young branchlets densely pilose; bracts oblong ..... 223. *S. rehderiana*
        - 5b. Young branchlets sparsely pilose or subglabrous; bracts lanceolate to liguliform or elliptic to oblong.
          - 6a. Bracts of male catkin lanceolate or liguliform ..... 221. *S. siuzevii*
          - 6b. Bracts of male catkin elliptic to oblong ..... 220. *S. characta*

**Key based on female plants**

- 1a. Ovary pilose proximally, glabrous distally; capsule pilose only proximally ..... 220. *S. characta*
- 1b. Ovary and capsule pilose throughout (sometimes subglabrous in *S. rehderiana*).
  - 2a. Branchlets densely gray tomentose ..... 226. *S. turanica*
  - 2b. Branchlets pilose or glabrous, not gray tomentose.
    - 3a. Bracts ovate, with dense, long, gray hairs ..... 222. *S. sajanensis*
    - 3b. Bracts oblong or oblong-ovate to lanceolate, pilose, without long, gray hairs.
      - 4a. Catkin ca. 1.2 cm thick ..... 224. *S. dasyclados*
      - 4b. Catkin less than 1 cm thick.
        - 5a. Catkin (2–)3–7 cm, 4–11 cm in fruit (except *S. rehderiana* var. *dolia*); ovary more than 3 mm ..... 223. *S. rehderiana*
        - 5b. Catkin 1.2–3(–3.5) cm, 2.5–4 cm in fruit; ovary less than 2 mm.
          - 6a. Ovary sessile; young leaves silvery silky abaxially ..... 227. *S. schwerinii*
          - 6b. Ovary shortly stipitate; young leaves not silvery silky abaxially.
            - 7a. Catkin 3–3.5 cm; bracts narrowly ovate; branchlets pubescent ..... 225. *S. sachalinensis*
            - 7b. Catkin ca. 2 cm; bracts lanceolate or liguliform; branchlets glabrous or sparsely pilose ..... 221. *S. siuzevii*

**Key based on vegetative characters**

- 1a. Leaf blade broadest above middle.

- 2a. Branchlets dull chestnut colored; plants of sandy or gravelly ground ..... 222. *S. sajanensis*
- 2b. .... Branchlets brown; plants of shores of rivers and lakes ..... 224. *S. a*
- 1b. Leaf blade broadest below middle.
  - 3a. Leaf blade narrowly lanceolate or linear-lanceolate, abaxially silvery silky, shiny ..... 227. *S. schwerinii*
  - 3b. Leaf blade lanceolate or oblong, abaxially gray tomentose, dull silvery silky, white downy, or subglabrous.
    - 4a. Branchlets and leaves densely gray tomentose ..... 226. *S. turanica*
    - 4b. Branchlets and leaves glabrous or pilose, not gray tomentose.
      - 5a. Branchlets pubescent ..... 225. *S. sachalinensis*
      - 5b. Branchlets glabrous or with sparse hairs (young branchlets sometimes with short, soft hairs).
        - 6a. Leaf margin serrulate ..... 220. *S. characta*
        - 6b. Leaf margin entire, undulate, or irregularly remotely dentate.
          - 7a. Leaf margin undulate, subentire ..... 221. *S. siuzevii*
          - 7b. Leaf margin not undulate, margin crenate, irregularly remotely dentate, or entire 223. *S. rehderiana*

**220. *Salix characta*** C. K. Schneider in Sargent, Pl. Wilson. 3: 125. 1916.

密齿柳 mi chi liu

Shrubs. Branchlets grayish yellow-brown or russet, downy when young. Buds russet, ovoid. Petiole 1–3(–4) mm, villous; leaf blade lanceolate or oblong-lanceolate, rarely oblong, 3.5 (–7) × 0.6–1(–1.3) cm, abaxially grayish green, villous along midvein, adaxially green, puberulent, both ends acute, rarely base subobtuse and apex shortly acuminate, margin serrulate, revolute; veins raised abaxially. Catkins 1.5–2.5 cm, densely flowered, sessile or shortly pedunculate; rachis downy; bracts brown, elliptic, oblong, or ovate, long pubescent, apex acute or obtuse. Male flower: adaxial gland linear or oblong, ca. 1/2 as long as bracts; stamens 2, glabrous. Fruiting catkin to 4 cm. Female flower: ovary narrowly ovoid, proximally downy; stipe pubescent, ca. as long as gland; style 1/3–1/2 as long as ovary, lobed; stigma short, entire or 2-lobed. Capsule ca. 4 mm, basally pilose, stipitate. Fl. May, fr. Jun–Jul.

• Mountain slopes, valleys; 2200–3200 m. Gansu, Hebei (Xiaowutai Shan), Nei Mongol (Ningcheng Xian), Qinghai, Shaanxi, Shanxi.

**221. *Salix siuzevii*** Seemen, Repert. Spec. Nov. Regni Veg. 5: 17. 1908.

卷边柳 juan bian liu

Shrubs or trees to 6 m tall; bark greenish gray. Branchlets yellowish green or reddish, slender. Buds oblong, at first pubescent, glabrescent. Stipules lanceolate, small, caducous; petiole 2–10 mm; leaf blade lanceolate, 7–12 × 0.8–1.2 cm, to 14 × 2 cm on shoots, abaxially pruinose, glabrous or sparsely appressed pubescent, adaxially dull green, shiny, glabrous, base broadly cuneate, margin undulate, subentire, slightly revolute, apex acuminate. Flowering precocious. Male catkin cylindrical, ca. 3 × 1 cm, sessile; bracts brownish, lanceolate or liguliform, pilose, apex black. Male flower: adaxial gland oblong-linear, 0.6–1.5 mm; stamens 2, distinct, glabrous; anthers golden-yellow. Female catkin cylindrical, ca. 2 cm × 6 mm, with leaflets or not; bracts as in male catkin. Female flower: gland ca. as long as stipe; ovary ovoid-conical, 1.5–1.7

mm, downy, shortly stipitate; style 0.2–0.6 mm; stigma yellow, forked. Fl. May, fr. Jun.

Mountain slopes, along rivers. Heilongjiang, Jilin, Nei Mongol [Korea, Russia].

A. K. Skvortsov believes that this species is synonymous with *Salix sachalinensis*.

Grown to protect embankments; used for weaving wicker articles and as a nectariferous plant.

**222. *Salix sajanensis*** Nasarow in Komarov, Fl. URSS 5: 141. 1936.

萨彦柳 sa yan liu

Shrubs or trees to 4 m tall. Branchlets brown or chestnut colored, slightly thick, tomentulose when young, glabrescent, shiny. Buds chestnut colored, ovoid, at first gray tomentose. Stipules lanceolate, caducous; petiole 7–10 mm, slightly shorter than leaf bud, pilose; leaf blade obovate-lanceolate, 4–8 × 0.9–1.5 cm, larger on shoots, abaxially greenish, tomentulose, when young silky, adaxially dull green, base attenuate, margin entire or indistinctly remotely glandular dentate, usually revolute, apex shortly acuminate; veins conspicuous, brown. Male catkin unknown. Female catkin 4–5 × ca. 1 cm in fruit, shortly pedunculate; bracts russet, light proximally, ovate, densely long gray pubescent, apex acute. Female flower: gland oblong; stigma linear, nearly as long as style. Capsule oblong or oblong-ovoid, gray tomentose. Fl. Jun. fr. Jul.

Margins of woods, sandy or gravelly places; ca. 1800 m. Xinjiang (Burqin Xian) [N Mongolia, Russia].

**223. *Salix rehderiana*** C. K. Schneider in Sargent, Pl. Wilson. 3: 66. 1916.

川滇柳 chuan dian liu

Shrubs or small trees. Branchlets brown or dull brown, glabrous or sparsely pubescent. Buds yellowish brown, ovoid-oblong. Stipules semioval-elliptic, 7–8 mm, margin glandular dentate, apex long acuminate; petiole 2–8 mm, white downy; leaf blade lanceolate to oblanceolate, 5–11 × 1.2–2.5 cm, abaxially greenish, white downy or glabrous, adaxially dark green, pubescent, base cuneate, rarely rounded, margin subentire or glandular crenate, rarely entire, apex

obtuse, acute, or shortly acuminate. Flowering precocious or nearly coetaneous. Male catkin ellipsoid to shortly terete, sessile; bracts oblong, villous. Male flower: adaxial gland narrowly oblong; stamens 2; filaments free or united at base, glabrous or sparsely long pubescent at base; anthers golden yellow or purple. Female catkin terete; peduncle short, with 2 or 3 leaflets. Female flower: ovary cylindrical-ovoid, 4–6 mm, downy or subglabrous, subsessile; style long, ca. 1/2 as long as ovary; stigmas 2(–4). Capsule brownish, pilose or glabrous. Fl. Apr–May, fr. May–Jun.

• Mountain slopes, thickets, streamsides; 1400–4000 m. Gansu, Ningxia, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan.

- 1a. Female catkin 2–6 cm; male catkin ca. 2.5 cm; fl. Apr ..... 223a. var. *rehderiana*  
 1b. Female catkin 1–1.5 cm; male catkin 1–2 cm; fl. May ..... 223b. var. *dolia*

**223a. *Salix rehderiana* var. *rehderiana***

川滇柳(原变种) *chuan dian liu* (yuan bian zhong)  
*Salix luctuosa* H. Léveillé var. *pubescens* C. Wang & P. Y. Fu; *S. melea* C. K. Schneider; *S. rehderiana* var. *brevisericea* C. K. Schneider

Male catkin ca. 2.5 cm. Female catkin 2–6 cm. Fl. Apr.  
 • Mountain slopes, thickets; 1400–4000 m. Gansu, Ningxia, Qinghai, Shaanxi, Sichuan, Xizang, Yunnan.

**223b. *Salix rehderiana* var. *dolia*** (C. K. Schneider) N. Chao, Fl. Reipubl. Popularis Sin. 20(2): 324. 1984.

灌柳 *guan liu*

*Salix dolia* C. K. Schneider in Sargent, Pl. Wilson. 3: 65. 1916.

Male catkin 1–2 cm. Female catkin 1–1.5 cm. Fl. May.  
 • Streamsides, rarely on mountain slopes; 3000–3300 m. Gansu, Sichuan (W Guan Shan).

**224. *Salix dasyclados*** Wimmer, Flora 32: 35. 1849.

毛枝柳 *mao zhi liu*

Shrubs or trees to 8 m tall; bark brown or yellowish brown. Branchlets brown, grayish white villous or subglabrous. Buds brown, ovoid, downy. Stipules ovate-lanceolate, margin serrate; petiole shortly downy; leaf blade broadly lanceolate, oblanceolate, oblong-lanceolate, or obovate-lanceolate, 5–20 × 2–3.5 cm, abaxially gray silky pubescent, adaxially dirty green, subglabrous, base cuneate, margin entire or glandular serrate, revolute, apex shortly acuminate; lateral veins 10–12 on each side of midvein. Flowering precocious. Male catkin 2.5–4 × ca. 1.8 cm; bracts 2-colored, long pubescent, apex black. Male flower: stamens 2, free, glabrous; anthers yellow. Female catkin cylindrical, 4–5.5 × ca. 1.2 cm; bracts as in male catkin. Female flower: gland ca. 3 × as long as stipe; ovary ovoid-conical, villous, shortly stipitate; style long; stigma 2-parted, slightly revolute. Fl. Apr, fr. May.  $2n = 76$ . Streamsides, riverbanks, lakeshores. Heilongjiang, Jilin, Nei Mongol, Shaanxi, Shandong, Xinjiang [Japan, Mongolia, Russia; Europe]. A. K. Skvortsov doubts if species grows in the wild in China. Grown to protect embankments and used for making baskets.

**225. *Salix sachalinensis*** F. Schmidt, Mém. Acad. Imp. Sci. Saint Pétersbourg, sér. 7, 12: 173. 1868.

龙江柳 *long jiang liu*

*Salix opaca* Andersson ex Seemen.

Shrubs or trees to 8 m tall; bark yellowish brown, shiny. Branchlets tomentulose. Buds brown, tomentulose. Stipules lanceolate or narrowly ovate, ca. 1/2 as long as petiole, glabrous or pilose, margin dentate, apex acute; petiole ca. 3–8 mm, white pubescent; leaf blade broadly lanceolate or oblong-lanceolate, 6–15 × 1.5–3.5 cm, abaxially pale downy, when mature rarely subglabrous, adaxially dull green, silky pubescent, base cuneate, margin subentire, apex acute to acuminate. Flowering precocious or coetaneous. Male catkin cylindrical, sessile or subsessile; rachis villous; bracts narrowly ovate, long pubescent, apex dark brown or nearly black. Male flower: adaxial gland ca. 1 mm; stamens 2, distinct, glabrous. Female catkin 3–3.5 × 0.7–1 cm. Female flower: ovary ovoid-conical 1.6–1.9 mm, villous, shortly stipitate; style 1–1.2 mm, glabrous; stigma 2-cleft, lobes recurved. Fl. May, fr. Jun.

Along rivers. Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia (Far East, E Siberia)].

According to C. V. B. Marquand & H. K. Airy-Shaw (J. Linn. Soc., Bot. 48: 223. 1929), *Salix opaca* was found in Zétang (SC Xizang); however, the authors have not seen the specimens.

Grown to protect embankments; used for making baskets.

**226. *Salix turanica*** Nasarow in Komarov, Fl. URSS 5: 709. 1936.

吐兰柳 *tu lan liu*

*Salix viminalis* Linnaeus var. *songarica* Andersson

Shrubs to 3 m tall. Branchlets yellowish brown, grayish white tomentose. Petiole 2–5 mm, tomentose; leaf blade broadly lanceolate, oblong, or ovate-oblong, 4.5–14 × 1–3 cm, abaxially dull silvery silky, adaxially dirty green or grayish green, tomentose, base broadly cuneate, margin entire or sinuate, revolute, apex acuminate; veins brown, diverging from midvein at obtuse angle. Flowering precocious or coetaneous. Male catkin 2–4 cm, sessile; rachis villous; bracts brown or nearly black, oblong, apex obtuse or acute. Male flower: adaxial gland linear, 0.5–1.5 mm; stamens 2, free, glabrous. Female catkin 3–4 cm, elongated in fruit. Female flower: ovary long conical, 5–6 mm, densely gray tomentose, sessile; style 0.8–1.5 mm, longer than 2-cleft stigma. Fl. Apr, fr. May.  $2n = 38$ .

Along rivers. Xinjiang (Ili He valley) [Afghanistan, NW India, Kazakstan, Kyrgyzstan, Mongolia, Pakistan, Tajikistan].

A. K. Skvortsov indicates that the NW Asian and European species *Salix lapponum* Linnaeus, as treated in Fl. Xizang., was based on misidentified specimens of *S. turanica*.

**227. *Salix schwerinii*** E. L. Wolf, Mitt. Deutsch. Dendrol. Ges. 407.1929.

蒿柳 *hao liu*

*Salix dailingensis* Y. L. Chou & C. Y. King; *S. gmelinii* Pallas; *S. viminalis* Linnaeus var. *gmelinii* Turczaninow.

Shrubs or small trees, to 10 m tall; bark grayish green. Branchlets glabrous or pubescent, usually gray pubescent when young. Buds yellow or russetish, ovoid-oblong, pilose. Stipules narrowly lanceolate or falcate, margin dentate; petiole 5–12 mm, silky pubescent; leaf blade linear-lanceolate, 15–20 cm, abaxially densely long silky pubescent, silvery shiny, adaxially dull green, glabrous or slightly pubescent, base narrowly cuneate, margin entire or slightly sinuate, sometimes revolute, apex acuminate or acute. Flowering precocious or coetaneous. Male catkin oblong-ovoid, 2–3 × ca. 1.5 cm, sessile; bracts brownish, oblong-ovate, with long, loose hairs or

pubescent, apex black, obtuse or acute. Male flower: gland 1; stamens 2; filaments distinct, rarely united at base, glabrous; anthers golden yellow, becoming brown. Female catkin terete, (2–)3–4 cm; bracts as in male catkin. Female flower: gland as in male flower; ovary ovoid or ovoid-conical, densely silky pubescent, sessile or subsessile; style 0.3–2 mm, ca. 1/2 as long as ovary, longer than stigma; stigma 2-cleft or subentire. Fl. Apr–May, fr. May–Jun. 2n = 38.

Streamsides, riverbanks; 300–600 m. Hebei, Heilongjiang, Jilin, Liaoning, E Nei Mongol [Japan, Korea, Mongolia, Russia (Far East, E Siberia)].

29. Sect. *Incubaceae* A. Kerner, Verh. Zool.-Bot. Ges. Wien 10: 264 (Neid.-Oesterr. Weid. 142) 1860.

沼柳组 zhao liu zu

Shrubs dwarf. Leaves alternate or subopposite; stipules present; leaf blade linear-lanceolate, rarely to long ovate-elliptic, both surfaces or only abaxially densely white or yellow silky, margin entire. Flowering precocious or coetaneous. Catkins sessile or shortly pedunculate, with leaflets at base; bracts 2-colored. Male flower: glands adaxial; stamens 2, distinct, rarely partly connate; anthers yellow or red. Female flower: ovary sericeous, conspicuously stipitate; style short; stigma long elliptic.

- 1a. Young leaf blade linear-lanceolate or lanceolate ..... 228. *S. rosmarinifolia*
- 1b. Young leaf blade obovate or elliptic ..... 229. *S. schugnanica*

228. *Salix rosmarinifolia* Linnaeus, Sp. Pl. 2: 1020. 1753.

细叶沼柳 xi ye zhao liu

Shrubs to 1 m tall; bark brown. Branchlets brown or yellowish brown, slender, glabrous, white or yellowish brown tomentose or villous when young. Buds russet, ovoid, at first tomentose or pubescent, glabrescent, apex obtuse. Stipules when present narrowly lanceolate or lanceolate, caducous; petiole short; leaf blade linear-lanceolate or lanceolate, 2–6 cm × 3–10 mm, abaxially pale, downy or white tomentose, when young silky villous or white or yellowish brown tomentose, adaxially usually dull green, glabrous, base attenuate or rounded, margin entire, apex attenuate or long acuminate; lateral veins 10–12 on each side of midvein. Male catkin 1.5–2 cm, sessile; bracts obovate or obtuse, pilose, apex dull brown. Male flower: stamens 2, distinct, glabrous; anthers yellow or dull red; gland 1. Female catkin subglobose to shortly cylindrical, subsessile; bracts as in male catkin. Female flower: gland as in male flower ovary ovoid-conical, villous, long stipitate; style short; stigma entire or lobed. Fl. May, fr. Jun.

Mountain slopes, margins of woods; 300–3200 m. Gansu, Heilongjiang, Jilin, Liaoning, Nei Mongol, Xinjiang [Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia, Tajikistan; Europe].

- 1a. Leaf base rounded, apex long acuminate ..... 228d. var. *tungbeiana*
- 1b. Leaf base attenuate, apex attenuate.
  - 2a. Leaves exstipulate; stigma 4-parted ..... 228c. var. *gannanensis*
  - 2b. Leaves stipulate; stigma entire or lobed.
    - 3a. Young branchlets and leaves silky villous or white tomentose, blackened when dry 228a. var. *rosmarinifolia*

- 3b. Young branchlets and leaves densely yellowish brown tomentose, not blackened when dry ..... 228b. var. *brachypoda*

228a. *Salix rosmarinifolia* var. *rosmarinifolia*

细叶沼柳(原变种) xi ye zhao liu (yuan bian zhong)

*Salix pubescens* (E. L. Wolf) K. S. Hao; *S. repens* Linnaeus var. *rosmarinifolia* (Linnaeus) Wimmer & Grab; *S. sibirica* Pallas.

Young branchlets and leaves silky villous or white tomentose, blackened when dry. Stipules present. Leaf base and apex attenuate. Female flower: stigma entire or lobed.

300–600 m. Heilongjiang, Jilin, E Liaoning, E Nei Mongol, Xinjiang [Kazakhstan, Korea, Kyrgyzstan, Mongolia, Russia, Tajikistan; Europe].

Used for weaving wicker baskets.

228b. *Salix rosmarinifolia* var. *brachypoda* (Trautvetter & C. A. Meyer) Y. L. Chou, Fl. Reipubl. Popularis Sin. 20(2): 331. 1984.

沼柳 zhao liu

*Salix repens* var. *brachypoda* Trautvetter & C. A.

Meyer, Midd. Sibir. Reise 2(2): 79. 1856; *S.*

*brachypoda* (Trautvetter & C. A. Meyer) Komarov; *S.*

*repens* var. *flavicans* Andersson; *S. sibirica* var.

*brachypoda* (Trautvetter & C. A. Meyer) Nakai.

Young branchlets and leaves densely yellowish brown

tomentose, not blackened when dry. Stipules present.

Leaf base and apex attenuate. Female flower: stigma

entire or lobed.

300–600 m. Gansu, Heilongjiang, Jilin, Liaoning, Nei Mongol

[Russia].

**228c. *Salix rosmarinifolia* var. *gannanensis*** C. F. Fang in C. Wang & al., Bull. Bot. Lab. N.E. Forest. Inst., Harbin 9: 16. 1980.

甘南沼柳 gan nan zhao liu

Stipules absent. Leaf base and apex attenuate. Female flower: stigma ca. 0.8 mm, 4-parted, sessile.

• Mountain slopes, margins of woods; 2200–3200 m. SW Gansu (Linxia).

**228d. *Salix rosmarinifolia* var. *tungbeiana*** Y. L. Chou & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 556. 1956.

东北细叶沼柳 dong bei xi ye zhao liu

Leaf blade lanceolate, base rounded, apex long acuminate.

• 300–500 m. Heilongjiang (Xiao Hinggan Ling).

**229. *Salix schugnanica*** Goerz, Trudy Tadzhijsk. Bazy 2: 173. 1936.

阿克苏柳 a ke su liu

Shrubs. Branchlets spreading or nearly erect, coarse; 1-year-old branchlets brown or dull brown, rarely gray-yellow, glabrous; juvenile branchlets white, pilose. Buds oblong-conical, 6–7(–10) mm, glabrescent. Petiole 2–3 mm, tomentose; leaf blade obovate, 2–4.5(–12) × 1–3 cm, 1–1.5 cm × 5–8 mm at anthesis, both surfaces gray-white, shiny, densely velvety, abaxially nearly sericeous-villous, adaxially gray pubescent, margin entire, rarely dentate; lateral veins 8–12 on each side of midvein, pubescent abaxially. Male catkin unknown. Fruiting catkin ovoid-oblong, ca. 3 cm × 9 mm, sessile or subsessile, with 1 or 2 scalelike leaflets or not; bracts 2-colored, russet distally, obovate, ca. 2.8 mm, both surfaces villous. Female flower: ovary ovoid, 2–3 mm, pilose; stipe short or absent; style ca. 1 mm; stigma 2-lobed, ca. as long as style, adaxial gland 1. Fl. May–Jun, fr. Jun–Jul.

Near water in valleys; ca. 1900 m. Xinjiang (Aksu Diqu) [C Asia].

**30. Sect. *Sieboldianae*** (Seemen) C. K. Schneider in Sargent, Pl. Wilson. 3: 161. 1916.

川柳组 chuan liu zu

*Salix* [unranked] *Sieboldianae* Seemen, Salic. Jap. 21. 1903.

Shrubs or small trees. Leaf blade ovate-lanceolate to obovate-oblong or elliptic, abaxially light, pilose or glabrous, when young usually with brown hairs or downy, margin serrulate, rarely entire, apex acute or acuminate. Flowering coetaneous. Catkins slender; peduncle short or absent, with 1–3 leaflets deciduous in fruit. Male flower: gland solitary, adaxial; stamens 2; filaments distinct to connate throughout. Female flower: gland as in male flower; ovary narrowly ovoid, sericeous, sessile or subsessile; style conspicuous; stigma 2-cleft.

Male plants of *Salix shihtsuanensis* and *S. yuhuangshanensis* are unknown.

**Key based on female plants**

1a. Catkin (4–)5–7 cm; bracts with long, golden hairs; gland involute at apex ..... 230. *S. hylonoma*

1b. Catkin 1.5–3.2 cm; bracts without golden hairs; gland not involute at apex.

2a. Leaflets of peduncle acuminate at apex, ca. as long as leaves of branchlets; ovary sessile 232. *S. yuhuangshanensis*

2b. Leaflets of peduncle obtuse at apex, smaller than leaves of branchlets; ovary shortly stipitate 231. *S. shihtsuanensis*

**Key based on vegetative characters**

1a. Leaves ovate or rhombic-ovate ..... 232. *S. yuhuangshanensis*

1b. Leaves elliptic, oblong-lanceolate, ovate-lanceolate, or ovate.

2a. Petiole eglandular at apex ..... 230. *S. hylonoma*

2b. Petiole glandular at apex ..... 231. *S. shihtsuanensis*

**230. *Salix hylonoma*** C. K. Schneider in Sargent, Pl. Wilson. 3: 68. 1916.

川柳 chuan liu

*Salix chuniana* Fang; *S. hylonoma* var. *isochroma* (C. K. Schneider) C. K. Schneider; *S. isochroma* C. K. Schneider.

Trees to 6 m tall. Branchlets russet, glabrous, pilose when young. Buds conical-ovoid. Leaves petiolate; leaf blade elliptic, oblong-lanceolate, ovate-lanceolate, or ovate, 2.5–7 (–8.5) × 1.5–2.3 cm, abaxially greenish, glabrous or pilose, rarely tomentose, golden-downy when young, adaxially green, usually russet when young, base broadly cuneate to subcordate, margin indistinctly serrulate, rarely entire, apex acuminate; veins conspicuous. Flowering coetaneous or slightly

precocious. Male catkin 3–4(–6) cm × ca. 6 mm, golden, shiny, subsessile; bracts elliptic or obovate, long golden, pubescent. Male flower: gland narrowly terete, ca. as long as bracts; stamens 2; filaments connate in part or throughout, base downy; anthers reddish purple, broadly ellipsoid. Female catkin 5–7 cm × ca. 7 mm, to 8(–12) cm in fruit; bracts as in male catkin. Female flower: gland as in male flower; ovary reddish, ovoid, pubescent, sessile or shortly stipitate; style conspicuous, 2-cleft; stigma 2-parted. Capsule ca. 4 mm, pilose, rarely subglabrous or glabrous; stipe short.

• Woods on mountain slopes; below 3000 m. NW Anhui, S Gansu, Guizhou, Hebei, Shaanxi, Shanxi, Sichuan, NW Yunnan.

1a. Ovary pubescent ..... 230a. var. *hylonoma*

1b. Ovary glabrous ..... 230b. var. *liocarpa*

**230a. *Salix hylonoma* var. *hylonoma***

川柳(原变种) *chuan liu* (*yuan bian zhong*)

Female flower: ovary pubescent.

- Woods on mountain slopes; ca. 3000 m. NW Anhui, S Gansu, Guizhou, Hebei, Shaanxi, Shanxi, Sichuan, NW Yunnan.

**230b. *Salix hylonoma* var. *liocarpa* (Goerz) G. Zhu, Novon 8: 465. 1998.**

光果川柳 *guang guo chuan liu*

*Salix hylonoma* f. *liocarpa* Goerz, Bull. Fan Mem. Inst. Biol. 6: 17. 1935.

Female flower: ovary glabrous.

- Sichuan (Emei Xian).

**231. *Salix shihtsuanensis* C. Wang & C. Y. Yu, Fl. Tsinling. 1 (2): 598. 21. 1974.**

石泉柳 *shi quan liu*

Shrubs or small trees, to 5(–8) m tall. Branchlets grayish brown or russet, downy when young, glabrescent. Buds russet, ovoid-ellipsoid, shiny. Petiole 3–6 mm, pubescent, glandular at apex; leaf blade elliptic-lanceolate, lanceolate, elliptic, or elliptic-oblong, 2.4–6.5 × 0.9–1.8 cm, abaxially pale pruinose, white downy along veins, adaxially green, downy along yellow midvein, base broadly cuneate, margin glandular serrate, apex acuminate. Male catkin unknown. Female catkin 2.5–3.2 cm; peduncle with 2 or 3 leaflets; rachis pubescent; bracts ovate, white villous. Female flower: ovary ovoid-cylindric or globose, pubescent or glabrous, shortly stipitate or sessile; style conspicuous; stigma 2- or 4-lobed. Capsule ovoid-oblong. Fl. May, fr. Jun.

- Mountain slopes, riverbanks, along streams, margins of woods, roadsides, valleys; 1000–1400 m. E and S Gansu, S Shaanxi.

- 1a. Leaf blade elliptic, rarely elliptic-oblong; ovary globose, densely pubescent; stigma 4-lobed ..... 231b. var. *globosa*
- 1b. Leaf blade elliptic-lanceolate or lanceolate; ovary ovoid-oblong, downy, villous, or glabrous; stigma 2-cleft.
  - 2a. Ovary densely villous, sessile; gland oblong ..... 231c. var. *sessilis*
  - 2b. Ovary downy or glabrous, shortly stipitate; gland thinly terete or large and broad.
  - 3a. Ovary downy; gland thinly terete ..... 231a. var. *shihtsuanensis*

- 3b. Ovary glabrous; gland large and broad ..... 231d. var. *glabrata*

**231a. *Salix shihtsuanensis* var. *shihtsuanensis***

石泉柳(原变种) *shi quan liu* (*yuan bian zhong*)

Leaf blade elliptic-lanceolate or lanceolate. Female flower: gland thinly terete; ovary ovoid-cylindric, downy; stigma 2-cleft.

- Mountain slopes, riverbanks; ca. 1200 m. S Gansu, S Shaanxi (Shiquan Xian).

**231b. *Salix shihtsuanensis* var. *globosa* C. Y. Yu, Fl. Tsinling. 1(2): 599. 1974.**

球果石泉柳 *qiu guo shi quan liu*

Leaf blade elliptic, rarely elliptic-oblong, margin serrulate. Female flower: ovary globose, densely pubescent; stigma 4-lobed.

- Margins of woods; ca. 1200 m. SE Gansu (Xiaolang Shan), SW Shaanxi.

**231c. *Salix shihtsuanensis* var. *sessilis* C. Y. Yu, Fl. Tsinling. 1(2): 599. 1974.**

无柄石泉柳 *wu bing shi quan liu*

Leaf blade acuminate at apex. Female flower: gland oblong; ovary densely villous, sessile; style 2-cleft; stigma 2-cleft.

- Roadsides on mountain slopes, valleys; 1000–1300 m. S Shaanxi (Shiquan Xian).

**231d. *Salix shihtsuanensis* var. *glabrata* C. F. Fang & J. Q. Wang, Bull. Bot. Res., Harbin 1(4): 125. 1981.**

光果石泉柳 *guang guo shi quan liu*

Female flower: gland large and broad, not thinly terete; ovary and capsule glabrous.

- Along streams; ca. 1400 m. E Gansu.

**232. *Salix yuhuangshanensis* C. Wang & C. Y. Yu, Fl. Tsinling. 1(2): 600. 1974.**

玉皇柳 *yu huang liu*

?*Salix yuhuangshanensis* var. *weiheensis* N. Chao.

Shrubs to 4 m tall. Branches brown or russet, glabrous. Buds yellowish red, ovoid, ca. 4 mm. Petiole 3–8 mm, downy; leaf blade ovate or rhombic-ovate, (2–)3–6(–8) × 1–3(–4.5) cm, abaxially pale, white pilose, adaxially green, blackened when dry, slightly wrinkled, pilose, base rounded, margin shallowly serrate, apex shortly acuminate or acute. Male catkin unknown. Female catkin ca. 1.5 × 0.7 cm; peduncle with 2 leaflets; rachis pubescent; bracts oblong, abaxially pilose, adaxially villous. Female flower: gland terete; ovary ovoid, densely pubescent, subsessile; style ca. 1/4 as long as ovary; stigma 2-cleft. Fl. May, fr. Jun.

- Mountain slopes; 2600–2900 m. SW Shaanxi (Baoji: Yuhuang Shan).

**31. Sect. *Subviminales* (Seemen) C. K. Schneider, Ill. Handb. Laubholz. 1: 66. 1904.**

细柱柳组 *xi zhu liu zu*

*Salix* [unranked] *Subviminales* Seemen, Salic. Jap. 20. 1903; sect. *Gracilistylae* C. K. Schneider.

Shrubs rarely creeping. Branchlets at first pilose, glabrescent. Leaf blade obovate, narrowly obovate-oblong, or obovate-elliptic, rarely suborbicular, margin serrate, rarely entire. Flowering precocious. Catkins terete or ellipsoid, sessile; bracts 2-colored or nearly black, ovate to narrowly oblong-lanceolate. Male flower: gland solitary, adaxial;



stamens 2, rarely connate throughout, or only filaments connate or partly connate; anthers red. Female flower: ovary densely pubescent, sessile; style slender, rarely short; stigma narrowly oblong.

A. K. Skvortsov indicates that this is a very heterogeneous section. Of it, *Salix lanifera*, *S. myrtillacea*, and *S. taoensis* seem to be more related to sect. *Caesia*, while *S. obscura* may belong to sect. *Vimen*.

#### Key based on male plants

(*Salix obscura* unknown)

- 1a. Filaments partly connate ..... 233. *S. rhododendrifolia*  
 1b. Filaments completely connate into 1.  
 2a. Gland terete.  
 3a. Gland ca. 2 mm, ca. as long as bracts ..... 238. *S. gracilistyla*  
 3b. Gland ca. 1 mm, ca. 2/3 as long as bracts ..... 237. *S. taoensis*  
 2b. Gland not terete.  
 4a. Filaments 2–3 × as long as bracts; anthers distinct ..... 236. *S. lanifera*  
 4b. Filaments ca. 1/2 as long as bracts; anthers generally connate, rarely distinct ..... 234. *S. myrtillacea*

#### Key based on female plants

- 1a. Shrubs creeping or erect, less than 50 cm tall ..... 236. *S. lanifera*  
 1b. Shrubs more than 1 m tall.  
 2a. Gland oblong or ovate-oblong.  
 3a. Style ca. 1/2 as long as ovary or slightly longer ..... 234. *S. myrtillacea*  
 3b. Style ca. 1/3 as long as ovary or shorter ..... 233. *S. rhododendrifolia*  
 2b. Gland terete, ca. 1 mm.  
 4a. Style longer than or nearly as long as ovary; fruiting catkin to 8 cm ..... 238. *S. gracilistyla*  
 4b. Style shorter than ovary; fruiting catkin 2.5–3(–4) cm.  
 5a. Style ca. 1/2 as long as ovary; young leaves abaxially sericeous ..... 235. *S. obscura*  
 5b. Style ca. 1/3 as long as ovary; young leaves not abaxially sericeous ..... 237. *S. taoensis*

#### Key based on vegetative characters

- 1a. Shrubs creeping or erect, less than 50 cm tall; leaf blade obovate or elliptic 0.8–1.5 × 0.3–0.8 cm, densely grayish white woolly when young ..... 236. *S. lanifera*  
 1b. Shrubs more than 1 m tall; leaf blade longer and larger, not grayish white woolly when young.  
 2a. Leaves abaxially sericeous, pubescent, or tomentose; branchlets brown, usually tomentose.  
 3a. Leaves serrate at margin, abaxially with prominently raised lateral veins; stipules semiovate ..... 238. *S. gracilistyla*  
 3b. Leaves entire at margin, abaxially with inconspicuous lateral veins; stipules small or caducous ..... 235. *S. obscura*  
 2b. Leaves glabrous; branchlets usually glabrous, red or reddish black, shiny.  
 4a. Leaves entire at margin, blade elliptic or obovate-elliptic ..... 233. *S. rhododendrifolia*  
 4b. Leaves usually serrulate at margin, blade obovate-oblong or oblanceolate, rarely obovate-elliptic.  
 5a. Leaf blade 3–6 × 1–2 cm ..... 234. *S. myrtillacea*  
 5b. Leaf blade 2–4 × 0.5–1 cm ..... 237. *S. taoensis*

**233. *Salix rhododendrifolia*** C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 205. 1974.

杜鹃叶柳 du juan ye liu

Shrubs to 2(–3) m tall. Branchlets dull purple or blackish purple, glabrous. Petiole short or almost absent, to 2 mm; leaf blade elliptic or obovate-elliptic, 1.3–2.5 × 0.7–1.2 cm, glabrous, abaxially usually greenish, base rounded-cuneate or attenuate, margin entire, apex obtuse, rounded, or slightly acute. Flowering precocious. Catkins ca. 2 × 1 cm, sessile; bracts black or blackish purple, long elliptic, densely villous, apex obtuse. Male flower: gland 1; stamens 2; filaments partly connate, glabrous; anthers purplish red. Female flower: ovary ovoid or narrowly ovoid, downy, subsessile or sessile; style both short and conspicuous;

stigma 2–4-lobed. Capsule shortly stipitate. Fl. May, fr. Jun.

• Thickets in valleys; 4000–4200 m. W Sichuan, S Xizang, Yunnan. Very similar to *Salix myrtillacea* but petiole shorter; filaments partly connate; style short.

**234. *Salix myrtillacea*** Andersson, J. Linn. Soc., Bot. 4: 51. 1860.

坡柳 po liu

*Salix squarrosa* C. K. Schneider; *S. subpyncnostachya* Burkill.

Shrubs. Branchlets dull purplish red or grayish black, glabrous, shiny. Buds oblong-lanceolate. Petiole short; leaf blade obovate-oblong or oblanceolate, rarely obovate-elliptic, 3–6 × 1–2 cm, glabrous, abaxially

greenish, base subrounded to cuneate, margin serrulate, apex acute; midvein raised abaxially. Flowering precocious. Catkins sessile, 2–3 × 1–1.3 cm; bracts black or brownish yellow proximally, elliptic or ovate, villous, often glabrescent distally, apex shortly acuminate or acute. Flower buds ovoid. Male flower: adaxial gland russet; stamens 2, connate throughout or only filaments united, glabrous or pilose at base. Female flower: ovary ovoid, densely pubescent; style ca. 1/2 as long as ovary. Fl. Apr, fr. Jun.  $2n = 76$ .

Mountain slopes, streamsides; 2700–4800 m. SE Gansu, Qinghai, W Sichuan, Xizang, NW Yunnan [Bhutan, India, Myanmar, Nepal, Sikkim].

**235. *Salix obscura*** Andersson in A. de Candolle, Prodr. 16(2): 269. 1868.

毛坡柳 mao po liu

Shrubs to 2 m tall. Branchlets at first pubescent, glabrescent, dirty grayish black. Buds reddish chestnut colored, ovoid, pilose, slightly shiny, apex slightly obtuse. Petiole short; leaf blade narrowly elliptic to narrowly oblong, 3–4 × 1–1.5 cm in juvenile fruit, abaxially nearly bluish gray, silky pubescent, slightly shiny, adaxially dull green, sometimes silky pubescent, base cuneate, margin entire, apex acute; lateral veins 10–12 on each side of midvein. Flowering coetaneous. Male catkin unknown. Female catkin shortly terete, ca. 2.5 × 1 cm, sessile, without leaflets; bracts black, lanceolate, ca. as long as ovary, both surfaces villous, apex acute or slightly obtuse. Female flower: gland green, terete, ca. 1/2 as long as ovary, apex purplish red; ovary ovoid or narrowly ovoid, tomentose, sessile; style ca. 1/2–2/3 as long as ovary; stigma short, 2-cleft. Capsule pilose, sessile. Fl. May, fr. Jun.

Mountain slopes, along streams; ca. 3000 m. S Xizang (Yadong Xian, Zayü Xian) [Bhutan, Sikkim].

Similar to *Salix myrtilleacea* but branchlets pubescent; leaf blade sericeous-pubescent and slightly shiny at least abaxially; ovary smaller. Similar also to *S. rehderiana* but female catkin sessile; bracts black, nearly as long as ovary; style shorter, only 1/2–2/3 as long as ovary.

**236. *Salix lanifera*** C. F. Fang & S. D. Zhao in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 11. 1980.

白毛柳 bai mao liu

*Salix obscura* Andersson var. *lanifera* (C. F. Fang & S. D. Zhao) N. Chao.

Shrubs appressed or dwarf, to 50 cm tall, much branched. First-year-old branchlets brown, pubescent, glabrescent. Buds chestnut colored, oblong, ca. 8 mm, pilose, apex acute. Petiole very short; leaf blade obovate or elliptic, 0.8–1.5(–4) cm × (3–) 5–8 mm, white woolly when young, abaxially glabrous except sometimes along veins, adaxially white woolly, base rounded, margin glandular crenate or entire, apex acute or shortly acute; midvein raised abaxially; fallen leaves of previous year rust colored. Catkins pinkish purple, ellipsoid to shortly terete, 1.2–2 × ca. 1 cm; bracts

brownish black, oblong-obovate, villous, apex acute or somewhat obtuse. Male flower: gland yellowish red or red, ovate, ca. 0.5 mm; stamens 2; filaments united throughout, 2–3 × as long as bracts; anthers red. Female flower: ovary ovoid, ca. 1.5 mm, woolly, sessile or subsessile; style conspicuous; stigmas 2, purplish red, oblong-ovate. Capsule white woolly. Fl. May, fr. Jun.

• Mountain slopes; 3600–3800 m. W Sichuan (Kangding Xian).

**237. *Salix taoensis*** Goerz ex Rehder & Kobuski, J. Arnold Arbor. 13: 401. 1932.

洮河柳 tao he liu

Shrubs large. Branchlets russet or purplish red to blackish purple, sometimes pruinose; 2-year-old branchlets grayish brown. Buds ovoid, pilose. Petiole short; leaf blade narrowly obovate-oblong to narrowly oblanceolate, 2–4 cm × 5–10 mm, base cuneate to rounded, margin serrate or entire proximally. Flowering precocious or nearly coetaneous. Male catkin 1.2–2(–2.5) × ca. 1 cm, sessile; bracts yellowish black, yellowish green proximally, obovate, ca. 1 mm, long pubescent, apex acute or obtuse. Male flower: gland terete; stamens 2; filaments connate throughout, ca. 3 mm, glabrous; anthers red, distinct or slightly united. Female catkin ca. 10 × 7 mm, 1.5–2(–4) cm in fruit, sessile; bracts obovate or subrounded, 2-colored, abaxially sparsely long pubescent. Female flower: ovary ovoid, densely pubescent, sessile. Capsule pilose. Fl. May.

• Along streams. Gansu, Qinghai.

Has been considered a hybrid between *Salix myrtilleacea* and *S. wilhelmsiana*.

1a. Ovary glabrous or loosely pilose

basally ..... 237c. var. *leiocarpa*

1b. Ovary pilose.

2a. Ovary sessile ..... 237a. var. *taoensis*

2b. Ovary stipitate ..... 237b. var. *pedicellata*

**237a. *Salix taoensis* var. *taoensis***

洮河柳(原变种) tao he liu (yuan bian zhong)

Female flower: ovary pilose, sessile.

• Along streams. Gansu, E Qinghai (Tongde Xian).

**237b. *Salix taoensis* var. *pedicellata*** C. F. Fang & J. Q. Wang, Bull. Bot. Res. Harbin 1(4): 126. 1981.

柄果洮河柳 bing guo tao he liu

Female flower: ovary pilose; stipe ca. 0.7 mm.

• Gansu (Diebu Xian).

**237c. *Salix taoensis* var. *leiocarpa*** T. Y. Ding & C. F. Fang, Acta Phytotax. Sin. 31: 280. 1993.

光果洮河柳 guang guo tao he liu

Female flower: ovary glabrous or loosely pilose only at base.

• Along streams. Qinghai (Menyuan Huizu Zizhixian).

**238. *Salix gracilistyla*** Miquel, Ann. Mus. Bot. Lugduno-Batavi 3: 26. 1867.

细柱柳 xi zhu liu

*Salix gracilistyla* var. *acuminata* Skvortzov; *S. gracilistyla* var. *latifolia* Skvortzov.

Shrubs. Branchlets yellowish brown or russet; at first tomentose, glabrescent. Buds yellowish brown, oblong-ovoid, downy, apex acute. Stipules semiovalate, large; petiole present; leaf blade elliptic-oblong or obovate-oblong, rarely oblong, 5 (–12) × 1.5–2 (–3.5) cm, abaxially gray, silky downy (young leaves in spring and early summer glabrous or subglabrous, densely sericeous in summer and early autumn), adaxially dull green, glabrous, base cuneate, margin serrate, apex acute; veins raised abaxially. Flowering precocious.

Catkins sessile, 2.5–3.5 × 1–1.5 cm; bracts black distally, elliptic-lanceolate, long pubescent, apex acute. Male flower: adaxial gland russet, slender; stamens 2; filaments connate throughout, ca. 6 mm, glabrous; anthers red or russet. Fruiting catkin to 8 cm. Female flower: ovary ellipsoid, tomentose, sessile; style slender; stigma 2-cleft. Capsule densely pilose. Fl. Apr. fr. May.  $2n = 38$ .

Along streams. E Heilongjiang [Japan, Korea, Russia].

Grown to protect embankments and as an ornamental plant; used for weaving wicker baskets.

**32. Sect. Caesia** A. Kerner, Verh. Zool.-Bot. Ges. Wien 10: 205. 1860.

杞柳组 qi liu zu

Shrubs. Branches glabrous. Leaf blade oblong, elliptic, obovate, or obovate-lanceolate, glabrous, margin entire, very rarely serrate distally. Flowering coetaneous. Catkins subsessile. Male flower: gland solitary, adaxial; stamens 2; filaments partly connate or connate throughout. Female flower: ovary shortly stipitate or sessile; style short; stigma oblong.

1a. Leaves and catkins usually opposite, rarely alternate or subwhorled ..... 242. *S. integra*  
1b. Leaves and catkins alternate.

2a. Juvenile branchlets downy; mature leaf blade 0.5–3 × 0.3–1 cm; male catkin ovoid, 0.5–1 cm; flowering serotinous; shrubs less than 1 m tall ..... 239. *S. caesia*

2b. Juvenile branchlets glabrous; mature leaf blade 30–70 × 10–30 cm; male catkin cylindrical, 2–3 cm; flowering precocious or coetaneous; shrubs more than 1 m tall.

3a. Leaves greenish on both surfaces; male catkin bracts downy on both surfaces; ovary ovoid 241. *S. tarbagataica*

3b. Leaves adaxially green, abaxially pale; male catkin bracts pilose only at base; ovary conical 240. *S. kochiana*

**239. *Salix caesia*** Villars, Hist. Pl. Dauphine 3: 768. 1789.

欧杞柳 ou qi liu

*Salix minutiflora* Turczaninow ex E. L. Wolf; *S. myricifolia* Andersson.

Shrubs dwarf. Branchlets russet or chestnut colored; juvenile branchlets downy, when mature yellowish, glabrous. Stipules membranous, usually caducous; petiole short, tomentulose; leaf blade ovate, elliptic, or lanceolate, 0.5–3 cm × 3–10 mm, abaxially grayish white, when mature glabrous, adaxially green, base broadly cuneate, margin entire, apex shortly acuminate. Flowering serotinous. Catkins short, thick, 5–10 (–20) mm, with scalelike leaflets at base; bracts oblong or obovate, densely gray downy, rarely glabrous, apex obtuse. Male flower: gland entire or 2- or 3-lobed; stamens 2; filaments partly connate or connate throughout, base downy; anthers yellow. Female flower: ovary ovoid-conical, 3–4 mm, tomentose; stipe shorter than gland; style short; stigma entire or 2-lobed. Capsule yellowish to russet, tomentose. Fl. May, fr. Jun.

Marshes or damp places in mountain regions; 1500–3000 m. Xinjiang (Altay, Ili), Xizang [Afghanistan, Kyrgyzstan, Mongolia, Russia (Siberia), Tajikistan; Europe].

**240. *Salix kochiana*** Trautvetter, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 3: 632. 1837.

沙杞柳 sha qi liu

Shrubs to 2 m tall. Branchlets greenish or yellowish, glabrous. Buds yellowish brown, ovoid, glabrous. Stipules small, usually caducous; petiole 2–5 mm; leaf blade obovate-elliptic or elliptic, 3–7 × 2–3 cm, abaxially pale, adaxially green, base broadly cuneate, margin entire, rarely remotely dentate, apex obtuse or acuminate. Flowering coetaneous. Catkins 2–3 cm; peduncle short, with leaflets; bracts russet, oblong or obovate, pilose at base. Male flower: gland entire or 2-lobed; stamens 2, connate, downy. Female flower: ovary conical, tomentose, stipitate or subsessile; style short; stigma 2-cleft. Capsule 5–6 mm, long pubescent. Fl. May, fr. Jun.

Damp places. Nei Mongol [Mongolia, Russia (SC Siberia)].

**241. *Salix tarbagataica*** Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 96. 1980.

塔城柳 ta cheng liu

Shrubs to 5 m tall. Branchlets yellowish, glabrous. Buds brownish, ovate. Stipules long ovoid, small, usually caducous; petiole 3–8 mm, glabrous; leaf blade obovate-oblong or oblanceolate, 4–6 × 1–1.5 cm, both

surfaces greenish, glabrous, base cuneate, margin entire or remotely shallowly dentate distally, apex acuminate; lateral veins 8–10 each side of conspicuous, yellowish midvein. Flowering precocious or coetaneous. Catkins conical, 2–3 cm; peduncle short, with scalelike leaflets; bracts brown to reddish brown, elliptic, downy, apex rounded. Male flower: gland rectangular; stamens 2, connate throughout, tomentose proximally, ca. 2 × as long as bracts. Female flower: ovary ovoid, tomentose, subsessile; style short or absent; stigma 2-cleft. Capsule densely gray tomentose. Fl. May, fr. Jun.

Riverbanks; 1400–1500 m. N Xinjiang [Kazakhstan].

**242. *Salix integra*** Thunberg in Murray, Syst. Veg., ed. 14, 880. 1784.

杞柳 qi liu

*Salix multinervis* Franchet & Savatier; *S. purpurea* Linnaeus subsp. *amplexicaulis* (Chaubard) C. K. Schneider var. *multinervis* C. K. Schneider.

Shrubs to 3 m tall; bark grayish green. Branchlets yellowish or reddish, glabrous, shiny. Buds yellowish brown, ovoid, glabrous, apex acute. Leaves subopposite or opposite, sometimes in whorls of 3 on shoots; petiole short or subsessile, somewhat clasping; leaf blade elliptic-oblong, 2–5 × 1–2 cm, both surfaces pale green, glabrous, base rounded or retuse, margin entire or sharply dentate distally, apex shortly acuminate; midvein brown, russet when young. Flowering precocious. Catkins 1–2(–2.5) cm, with leaflets at base; bracts brown to nearly black, obovate, downy, rarely glabrous. Male flower: stamens 2, connate, glabrous; anthers red or dull red. Female flower: ovary long ovoid, downy, subsessile; style short; stigma red, 2–4-lobed. Capsule 2–3 mm, pilose. Fl. May, fr. Jun.

Riverbanks, moist meadows. Hebei (Yan Shan), Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, Korea, Russia].

**33. Sect. *Variegatae*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, Novon 8: 470. 1998.

秋华柳组 qiu hua liu zu

Shrubs. Leaves small; petiole short; leaf blade obovate to oblong, abaxially usually pilose, margin remotely glandular serrate, revolute, apex obtuse or acute. Flowering precocious or rarely coetaneous. Catkins ellipsoid to shortly cylindrical; peduncle indistinct, with 1–3(–5) leaflets, elongated in fruit; bracts uniformly colored or apex more deeply colored, sometimes slightly pink, at least abaxially long pubescent. Male flower: stamens 2; filaments distinct or connate throughout. Fruiting catkin of previous year marcescent. Female flower: ovary pilose, sessile.

A. K. Skvortsov indicates that this and sect. *Cheilophilae* are very close to one another, especially in flower structure.

1a. Filaments partly connate, rarely completely connate or distinct; male catkin usually 2–4 cm × 5–6 mm; ovary ovoid-oblong; bracts oblong or obovate-oblong; glands 2, 2- or 3-lobed; large shrubs or small trees,

more than 3 m tall; leaf blade subglabrous when mature ..... 243. *S. kouytchensis*

1b. Filaments completely connate; male catkin usually 1.5–2.5 cm × 3–4 mm; ovary ovoid; bracts elliptic-lanceolate; gland 1, entire; shrubs, ca. 1 m tall; leaf blade abaxially sericeous ..... 244. *S. variegata*

**243. *Salix kouytchensis*** (H. Léveillé) C. K. Schneider in Sargent, Pl. Wilson. 3: 171. 1916.

贵州柳 gui zhou liu

*Salix duclouxii* H. Léveillé var. *kouytchensis* H. Léveillé, Bull. Soc. Bot. France 16: 298. 1909; *S. schneideriana* K. S. Hao ex C. F. Fang & A. K. Skvortsov.

Shrubs, rarely small trees, to 4 m tall. Branches crowded; juvenile branchlets pinkish purple, downy or tomentose, glabrescent. Buds ellipsoid or subovoid, angled, longer than petioles. Petiole short; leaf blade elliptic-lanceolate or oblong-oblong, 1.5–2 × ca. 5 cm, to 4 cm on vigorous shoots, abaxially greenish, grayish white sericeous when young, glabrescent, when mature subglabrous, adaxially dark green, margin indistinctly loosely serrate, both ends obtuse or apex rounded or acute; veins raised. Male catkin terete, 2–4 cm × 5–8 mm, sessile or shortly pedunculate, with 1 or 2 leaflets at base or not; bracts elliptic, villous, apex obtuse or subacute. Male flower: glands 2, russet or red,

terete, 2- or 3-parted or entire, connate at base; stamens 2; filaments partly connate, rarely distinct or connate throughout, glabrous or pilose at base; anthers yellow or reddish yellow, small, glabrous. Female catkin ca. 2.5 × 1 cm, shortly pedunculate, with 1 or 2 leaflets at base; bracts oblong or obovate-oblong, villous. Female flower: adaxial gland 2- or 3-lobed; ovary ovoid-cylindrical, pilose, absent; style absent; stigma oblong, 2-cleft. Fl. Jul–Aug.

• Riverbanks. Guizhou, Sichuan, Yunnan.

**244. *Salix variegata*** Franchet, Nouv. Arch. Mus. Hist. Nat., ser. 2, 10: 82. 1887.

秋华柳 qiu hua liu

*Salix andropogon* H. Léveillé; *S. bockii* Seemen; *S. densifoliata* Seemen; *S. duclouxii* H. Léveillé.

Shrubs usually to 1 m tall. Branchlets pinkish purple, tomentose when young, glabrescent. Petiole short; leaf blade usually oblong-oblong or obovate-oblong, variable, ca. 1.5 cm × 4 mm, abaxially appressed sericeous when mature, rarely subglabrous, adaxially

pilose, base cuneate or attenuate, rarely cuneate-rounded, margin entire or serrate, apex acute or obtuse. Flowering serotinous, rarely coetaneous. Male catkin 1.5–2.5 cm × 3–4 mm; peduncle short, with 1 or 2 leaflets; bracts elliptic-lanceolate, ca. 1/2 as long as filaments, abaxially villous. Male flower: gland 1, cylindric, to 1 mm; stamens 2; filaments connate throughout, glabrous; anthers yellow. Female catkin

1.5–2.5 cm × 7–8 mm, to 4 × 1–1.2 cm in fruit, pedunculate; bracts as in male catkin. Female flower: gland adaxial; ovary ovoid, densely downy, sessile; style indistinct or absent; stigma 2-cleft. Capsule narrowly ovate, to 4 mm. Fl. Apr–May or Jul–Aug.

• Streamsides. SE Gansu, Guizhou, Henan, W Hubei, S Shaanxi, Sichuan, E Xizang, N Yunnan.

**34. Sect. *Cheilophilae*** K. S. Hao ex C. F. Fang & A. K. Skvortsov, *Novon* 8: 470. 1998.

乌柳组 wu liu zu

Leaf blade linear or rarely narrowly lanceolate, 3–4.5(–6) cm × 2–5 mm, abaxially usually downy. Male catkin cylindric, 1–1.5 cm, subsessile or shortly pedunculate, with leaflets at base; bracts uniformly yellowish green or apex reddish. Male flower: gland 1, adaxial; stamens 2, connate throughout. Female catkin shortly cylindric. Female flower: ovary sessile or shortly stipitate; style short; stigma capitate.

**Key based on male plants**

- 1a. Bracts obovate-oblong; branchlets grayish black or reddish black, tomentose.  
 2a. Young leaves linear ..... 245. *S. cheilophila*  
 2b. Young leaves linear-oblong ..... 246. *S. cyanolimnea*  
 1b. Bracts ovate or long ovate; branchlets glabrous or slightly pilose.  
 3a. Bracts oblong, apex truncate; branchlets yellowish or yellowish brown ..... 247. *S. microstachya*  
 3b. Bracts ovate or oblong, apex acute or obtuse; branchlets purplish red or chestnut colored ..... 248. *S. wilhelmsiana*

**Key based on female plants**

- 1a. Bracts suborbicular; branchlets somewhat stout, tomentose or downy when young; leaf blade 6–7 × as long as wide, usually broader distally.  
 2a. Ovary pilose ..... 245. *S. cheilophila*  
 2b. Ovary glabrous ..... 246. *S. cyanolimnea*  
 1b. Bracts ovate or oblong; branchlets slender, glabrous or pilose; leaf blade ca. 7 × as long as wide.  
 3a. Bracts oblong, apex truncate; branchlets yellowish or yellowish brown ..... 247. *S. microstachya*  
 3b. Bracts ovate, apex acute or dentate; branchlets chestnut colored or purplish red ..... 248. *S. wilhelmsiana*

**Key based on vegetative characters**

- 1a. Branchlets yellowish or yellowish brown, at first pilose, glabrescent ..... 247. *S. microstachya*  
 1b. Branchlets not yellowish or yellowish brown, pilose or glabrous.  
 2a. Branchlets purplish red or chestnut colored, subglabrous or pilose; leaf blade linear, ca. 11 × as long as wide ..... 248. *S. wilhelmsiana*  
 2b. Branchlets grayish black or blackish red, tomentose or downy; leaf blade usually broader, 8–9 × as long as wide, distally.  
 3a. Leaves linear ..... 245. *S. cheilophila*  
 3b. Leaves linear-oblong ..... 246. *S. cyanolimnea*

**245. *Salix cheilophila*** C. K. Schneider in Sargent, *Pl. Wilson* 3: 69. 1916.

乌柳 wu liu

Shrubs or small trees, to 5 m tall. Branchlets grayish black or reddish black, at first tomentose, glabrescent. Buds villous. Petiole very short; leaf blade linear, linear-oblong, or oblong, 2.5–3.5(–6) cm × 3–5(–1) mm, abaxially grayish white, densely sericeous, adaxially green, pilose, base attenuate, rarely obtuse, margin glandular serrate distally, revolute, apex acuminate or apiculate; midvein raised abaxially.

Flowering coetaneous. Male catkin 1.5–2.3 cm × 3–4 mm, subsessile, with 2 or 3 leaflets at base; bracts obovate-oblong, base downy, apex obtuse or retuse. Male flower: gland narrowly oblong, rarely 2-lobed; stamens 2, connate throughout, glabrous; anthers yellow, 4-lobed. Fruiting catkin to 2.5 cm; bracts suborbicular. Female flower: gland narrowly oblong; ovary ovoid or ovoid-cylindric, densely pilose or glabrous, sessile or shortly stipitate; stigma small. Capsule ca. 3 mm. Fl. Apr–May, fr. May.

• Riverbanks, streamsides, or cultivated; 700–3000 m. Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Xizang, Yunnan.  
Very similar to *Salix wilhelmsiana*; the two species may, in the broad sense, be conspecific.

1a. Bracts villous abaxially ..... 245d. var. *villosa*  
1b. Bracts glabrous abaxially.

2a. Leaf blade oblanceolate, 4–6 × 0.7–1 cm, apex acuminate; ovary shortly stipitate; style long, ca. 1/3 as long as ovary ..... 245b. var. *acuminata*

2b. Leaf blade linear or linear-oblanceolate, 2.5–3.5(–5) × 0.3–0.5(–0.7) cm, apex acuminate or apiculate; ovary sessile; style short or absent.

3a. Female catkin 13–20 × 1–2 mm; bracts ca. 2/3 as long as ovary 245a. var. *cheilophila*

3b. Female catkin 5–6 × 2–3 mm; bracts usually nearly as long as ovary ..... 245c. var. *microstachyoides*

**245a. *Salix cheilophila* var. *cheilophila***

乌柳(原变种) wu liu (yuan bian zhong)

Leaf blade linear or linear-oblanceolate, 2.5–3.5(–5) cm × 3–5(–7) mm, apex acuminate or apiculate. Female catkin 1.3–2 cm × 1–2 mm; bracts ca. 2/3 as long as ovary. Female flower: ovary densely pilose, sessile; style short or absent.

• Riverbanks; 700–3000 m. Gansu, Hebei, Henan, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, E Xizang, Yunnan.

**245b. *Salix cheilophila* var. *acuminata*** C. Wang & Y. L. Chou in C. Wang & al., Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 4. 1980.

宽叶乌柳 kuan ye wu liu

Leaf blade oblanceolate, 4–6 × 0.7–1 cm, apex acuminate. Female flower: ovary shortly stipitate; style long, ca. 1/3 as long as ovary.

• Streamsides. Hebei.

**245c. *Salix cheilophila* var. *microstachyoides*** (C. Wang & P. Y. Fu) C. Wang & C. F. Fang, Fl. Reipubl. Popularis Sin. 20 (2): 355. 1984.

大红柳 da hong liu

*Salix microstachyoides* C. Wang & P. Y. Fu, Acta Phytotax. Sin. 12: 200. 1974.

Female catkin short, thick, 5–6 × 2–3 mm; bracts usually nearly as long as ovary. Female flower: adaxial and abaxial glands present.

• Mostly cultivated. Xizang (Lhasa Shi, Lhünzhub Xian).

**245d. *Salix cheilophila* var. *villosa*** G. H. Wang, Bull. Bot. Res., Harbin 15: 429. 1995.

毛苞乌柳 mao bao wu liu

Bracts abaxially villous. Female flower: style elongate, to 3 mm.

• Hebei (Wanping Xian: Xiaoloumen).

**246. *Salix cyanolimnea*** Hance, J. Bot. 2: 294. 1882.

光果乌柳 guang guo wu liu

*Salix cheilophila* C. K. Schneider var. *cyanolimnea* (Hance) C. Y. Yang.

Shrubs to 3 m tall. Branchlets gray-black to reddish black, tomentose at first, glabrescent. Buds ovoid, villous. Petiole 1–3 mm; leaf blade oblanceolate, 2.5–6 cm × 5–10 mm, abaxially grayish white, densely sericeous, adaxially green, pilose, base attenuate, rarely obtuse, margin glandular serrate distally, revolute, apex acuminate or acute; lateral veins 8–10 on each side of midvein. Flowering coetaneous. Male catkin 1.5–2 cm × 3–4 mm, subsessile, with 2 or 3 leaflets at base; bracts obovate-oblong, downy at base, apex obtuse or retuse. Male flower: gland 1, narrowly oblong, sometimes 2-lobed; stamens 2; filament 1, glabrous; anthers yellow. Female catkin to 2(–2.5) cm, to 2.5 cm in fruit; bracts suborbicular. Female flower: gland 1, narrowly oblong; ovary ovoid or ovoid-cylindric, glabrous, sessile; stigma small, lobed. Capsule shortly stipitate, glabrous, ca. 3 mm. Fl. Apr, fr. May.

• By rivers; 2500–3000 m. Qinghai, Sichuan, Yunnan.

**247. *Salix microstachya*** Turczaninow ex Trautvetter, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 3: 628. 1837.

小穗柳 xiao sui liu

Shrubs to 2 m tall. Branchlets yellowish or yellowish brown or grayish purplish brown, rarely grayish green, glabrous or slightly pilose. Buds ovoid, with filamentous hairs. Stipules very small or absent; petiole short; leaf blade linear, linear-oblanceolate, or falcate-oblanceolate, 1.5–4 cm × 2–4 mm, at first filamentous downy, becoming subglabrous, base attenuate, margin subentire or indistinctly serrulate, apex long acuminate; midvein conspicuous abaxially. Flowering precocious or nearly coetaneous. Catkins terete, 1–1.5(–2) cm, subsessile, with 1 or 2 scalelike leaflets at base; rachis pilose; bracts brownish or yellowish green, brown at apex, oblong, sparsely villous at margin, apex truncate or obtuse. Male flower: adaxial gland small; stamens 2, connate throughout. Female flower: ovary greenish brown, ovoid-conical, glabrous, sessile; style conspicuous; stigma russet, 2-lobed. Fl. May, fr. Jun–Jul.

Riverbanks, damp places between dunes. Hebei, W Heilongjiang, Jilin, Liaoning, E Nei Mongol [Mongolia, Russia (C and S Siberia)].

1a. Plants to 2 m tall; branchlets yellowish or yellowish brown; anthers yellow ..... 247a. var. *microstachya*

1b. Plants dwarf, to 1 m tall; branchlets grayish purplish brown, rarely grayish green; anthers red ..... 247b. var. *bordensis*

**247a. *Salix microstachya* var. *microstachya***

小穗柳(原变种) xiao sui liu (yuan bian zhong)

Plants to 2 m tall. Branchlets yellowish or yellowish brown. Anthers yellow.

Riverbanks, damp places between dunes. E Nei Mongol [Mongolia, Russia (C and S Siberia)].

**247b. *Salix microstachya* var. *bordensis*** (Nakai) C. F. Fang, Fl. Reipubl. Popularis Sin. 20(2): 355. 1984.

小红柳 xiao hong liu

*Salix bordensis* Nakai, Rep. Exped. Manchoukuo Sect. IV: 74. 1936.

Plants dwarf, to 1 m tall. Branchlets grayish purplish brown, rarely grayish green. Anthers red. Fl. May, fr. Jun.

• Hebei, W Heilongjiang, Jilin, Liaoning, E Nei Mongol.

Used for making baskets and planted to stabilize sand.

**248. *Salix wilhelmsiana*** Bieberstein, Fl. Taur.-Caucas. 3: 627. 1819.

线叶柳 xian ye liu

Shrubs or small trees, to 6 m tall. Branchlets purplish red or chestnut colored, slender, pilose, rarely subglabrous or glabrous. Buds ovoid, apex tomentose and obtuse. Stipules very small, caducous; petiole short; leaf blade linear or linear-lanceolate, 2–6 cm × 2–4(–7) mm, tomentose when young, becoming pilose abaxially, margin serrulate, rarely subentire. Flowering coetaneous. Catkins dense, on 1-year-old branchlets. Male catkin subsessile; bracts yellowish or yellowish green, ovate or long ovate, glabrous or pilose. Male flower: stamens 2, connate throughout, glabrous; anthers at first red, becoming yellow, globose. Female catkin thinly terete, 2–3 cm, elongate in fruit, shortly pedunculate, with leaflets at base; bracts yellowish green, ovate, base downy. Female flower: gland adaxial; ovary ovoid, densely gray tomentose or glabrous, sessile; style short; stigma entire or 2-parted. Fl. May, fr. Jun.

**35. Sect. *Haoanae*** C. Wang & Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 94. 1980.

郝柳组 hao liu zu

Shrubs, rarely small trees. Leaves opposite or alternate; stipules reniform or ovate, large; leaf blade linear to rarely elliptic-ob lanceolate, densely tomentose when young, margin glandular dentate. Catkins sessile; bracts black or reddish brown, villous. Male flower: glands adaxial; stamens 2; filaments connate partly or throughout, glabrous. Female flower: ovary densely tomentose; style long or short.

#### Key based on male plants

(*Salix permollis* unknown)

1a. Anthers yellow or reddish; filaments glabrous; bracts black.

2a. Branchlets purplish red or reddish green; bracts downy ..... 249. *S. haoana*

2b. Branchlets greenish or yellowish; bracts villous ..... 253. *S. sinopurpurea*

1b. Anthers red; filaments purplish red, pilose at base; bracts yellowish green proximally, purplish red distally.

3a. Catkin 8–10 mm thick; filaments pilose or glabrous at base; branchlets yellowish brown or russet 250. *S. liouana*

3b. Catkin ca. 7 mm thick; filaments with dense hairs at base; branchlets blackish ..... 252. *S. pseudopermollis*

#### Key based on female plants

1a. Catkins alternate; flowering branchlets tomentose.

2a. Style short or nearly absent; branchlets yellowish brown or russet; catkin 1–2.5 × 0.6–0.7 cm; scalelike leaflet elliptic; bracts dull brown or chestnut colored; young leaf blade obovate ..... 250. *S. liouana*

2b. Style markedly longer; branchlets nearly black; catkin ca. 2 × 0.4 cm; scalelike leaflet lanceolate; bracts black; young leaf blade oblanceolate ..... 252. *S. pseudopermollis*

1b. Catkins opposite or alternate; flowering branchlets glabrous or subglabrous.

Along rivers in desert and semidesert regions, plains, alongside irrigation canals and ditches. Gansu, Nei Mongol, Ningxia, Xinjiang [India, Kazakstan, Kyrgyzstan, Pakistan, Uzbekistan; SW Asia, Europe].

1a. Branchlets pilose, rarely subglabrous; ovary and capsule densely gray tomentose ..... 248a. var. *wilhelmsiana*

1b. Branchlets glabrous; ovary and capsule glabrous.

2a. Leaf blade 2–4 mm wide, 10–15 × as long as wide ..... 248b. var. *leiocarpa*

2b. Leaf blade 6–7 mm wide, 3–10 × as long as wide ..... 248c. var. *latifolia*

**248a. *Salix wilhelmsiana* var. *wilhelmsiana***

线叶柳(原变种) xian ye liu (yuan bian zhong)

Branchlets pilose, rarely subglabrous. Female flower: ovary and capsule densely gray tomentose.

Along rivers in desert and semidesert regions. Gansu, Nei Mongol, Ningxia, Xinjiang [India, Kazakstan, Kyrgyzstan, Pakistan, Uzbekistan; SW Asia, Europe].

**248b. *Salix wilhelmsiana* var. *leiocarpa*** Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 94. 1980.

光果线叶柳 guang guo xian ye liu

Branchlets purplish red, slender, glabrous. Leaf blade linear, 2–4 mm wide, 10–15 × as long as wide. Female flower: ovary and capsule glabrous.

• Plains. Gansu, Nei Mongol.

**248c. *Salix wilhelmsiana* var. *latifolia*** Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 95. 1980.

宽线叶柳 kuan xian ye liu

Branchlets and capsule glabrous. Leaf blade 6–7 mm wide, 3–10 × as long as wide.

• Alongside irrigation canals and ditches. S Xinjiang.

- 3a. Style short or nearly absent; bracts pubescent ..... 249. *S. haoana*
- 3b. Style markedly longer; bracts with long hairs.
  - 4a. Flowering coetaneous; catkins opposite, with linear, scalelike leaflets at base; bracts longer than ovary ..... 251. *S. permollis*
  - 4b. Flowering precocious; catkins opposite or rarely alternate, with elliptic, scalelike leaflets at base or not; bracts shorter than ovary ..... 253. *S. sinopurpurea*

**Key based on vegetative characters**

- 1a. Leaves alternate, broadest above middle.
  - 2a. Leaf blade oblanceolate or lanceolate, 6–10 × 1.5–2.5 cm ..... 250. *S. liouana*
  - 2b. Leaf blade narrowly oblanceolate, 3–4 × 7–8 mm ..... 252. *S. pseudopermollis*
- 1b. Leaves opposite or alternate, broadest below middle.
  - 3a. First-year juvenile branchlets brown, gray downy; leaf blade lanceolate or elliptic-lanceolate, base rounded ..... 251. *S. permollis*
  - 3b. First-year juvenile branchlets not brown, tomentose, glabrescent; leaf blade lanceolate, base cuneate or broadly cuneate.
    - 4a. Branchlets purple or reddish green; leaves blackish when dry, margin entire or glandular dentate 249. *S. haoana*
    - 4b. Branchlets greenish or yellowish; leaves not black when dry, margin sharply glandular serrate 253. *S. sinopurpurea*

**249. *Salix haoana*** Fang, J. W. China Border Res. Soc. 15: 178. 1945.  
 川红柳 chuan hong liu

Shrubs to 3 m tall; bark gray, smooth. Branchlets purple or reddish green, blackish when dry, thin, tomentose, glabrescent. Buds black, ovoid, villous. Leaves opposite or obliquely opposite to alternate; stipules reniform, shorter than petiole, margin serrate; petiole 3–5 mm, at first pilose, glabrescent; leaf blade lanceolate, 4–7(–14) × 0.5–1(–1.2) cm, abaxially grayish blue, adaxially dull green, glabrous, base cuneate, margin entire or obtusely glandular dentate, apex shortly acuminate; veins raised, nearly at obtuse angle to midvein. Flowering nearly coetaneous. Male catkin terete, 2–3.5 cm, sessile, with 2 or 3 lanceolate, scalelike leaflets; bracts at first grayish green, becoming black, ovate or oblong-ovovate, ca. 2 mm, downy. Male flower: stamens 2, connate throughout, ca. 2.5 × as long as bracts; anthers yellow, 4-loculed. Female flower: ovary grayish green, conical, white tomentose, sessile; style short or nearly absent; stigma 2-parted, nearly as long as style. Capsule 2–3 mm. Fl. Mar, fr. Apr–May.

• Alongside irrigation canals and ditches. Guizhou, Sichuan (Chengdu Shi).

**250. *Salix liouana*** C. Wang & Chang Y. Yang in Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 97. 1980.  
 黄龙柳 huang long liu

Shrubs; bark yellowish. Branchlets yellowish brown or russet, tomentulose near buds; 1- and 2-year-old branchlets densely gray tomentose. Buds flattened-ovoid, densely tomentose. Leaves alternate; stipules lanceolate, longer than petiole; petiole 5–10 mm, densely tomentose; leaf blade oblanceolate or lanceolate, usually broadest distally, 6–10 × 1.5–2.5 cm, abaxially pale, tomentulose when young, when mature

only veins pilose, adaxially greenish, base cuneate or broadly cuneate, margin glandular serrate, slightly revolute, apex shortly acuminate; veins brownish, raised. Flowering nearly coetaneous. Male catkin 2–3 × 0.8–1 cm, sessile, with 2 or 3 scalelike leaflets at base; bracts purplish red distally, yellowish green proximally, obovate or obovoid, ca. 1.7 mm, villous. Male flower: stamens 2, connate throughout, ca. 3 mm; anthers purplish red, globose, 4-loculed. Female catkin ovoid to shortly terete, 1–2.5 cm × 6–7 mm; bracts dull brown or chestnut colored, obovate or nearly orbicular, white villous. Female flower: gland small, thin; ovary conical, gray tomentose, sessile; style short or absent; stigma entire or 2-lobed. Fl. Apr, fr. May.

• Along rivers; 1000–1300 m. Henan, N Hubei, S Shaanxi (Luochuan Xian), Shandong.

**251. *Salix permollis*** C. Wang & C. Y. Yu, Fl. Tsinling. 1(2): 601. 1974.

山毛柳 shan mao liu

Trees. Branches grayish green; branchlets brown, gray downy when young. Buds yellowish brown, ca. 3 mm, tomentulose. Leaves opposite, rarely subopposite; petiole ca. 1.3 mm, tomentose; leaf blade lanceolate or elliptic-lanceolate, 1.8–4.5 × 0.7–1.5 cm, abaxially whitish, downy, adaxially dull green, with white, filamentous hairs, base rounded, margin rarely broadly cuneate, remotely denticulate, apex shortly acuminate; midvein yellow, densely tomentose or downy.

Flowering nearly coetaneous. Male catkin unknown. Female catkin opposite, 3.5–4.5 cm × ca. 7 mm in juvenile fruit, sessile, with 2 linear leaflets; rachis downy; bracts black, elliptic, longer than ovary, villous. Female flower: ovary ovoid, downy; style 1/3–1/2 as long as ovary; stigma capitate, 4-lobed. Capsule ovoid-oblong, downy. Fl. Mar, fr. Apr.

• Mountain slopes; 1000–1300 m. S Shaanxi (Qinling Mountains).



**252. *Salix pseudopermollis*** C. Y. Yu & Chang Y. Yang in Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 101. 1980.

小叶山毛柳 xiao ye shan mao liu

Shrubs or trees. Branchlets slender; 1- and 2-year-old branchlets blackish, densely tomentulose. Buds reddish brown, glabrous. Leaves alternate; petiole 3–5 mm, tomentose; leaf blade oblanceolate, broadest distally, ca. 3–4 cm × 7–8 mm, abaxially greenish, at first tomentulose, glabrescent, adaxially green, base cuneate, margin serrate, apex shortly acuminate. Flowering precocious. Catkins alternate. Male catkin 2–3 cm × ca. 7 mm, subsessile, with 2 or 3 leaflets at base; bracts yellowish green proximally, purple distally, ca. 1.5 mm, villous. Male flower: stamens 2, connate throughout, 3–4 mm, with dense hairs at base; anthers globose, 4-loculed. Female catkin terete, ca. 2 cm × 4 mm, elongate in fruit, sessile, with 2 lanceolate leaflets at base; bracts black, ovate, ca. as long as ovary, sparsely long pubescent. Female flower: ovary ovoid, tomentose, sessile; style long, nearly as long as ovary; stigma capitate, entire or 2-lobed. Fl. Mar, fr. Apr–May.

• Roadsides; 500–800 m. S Shaanxi (Hanzhong Shi), Shandong.

**253. *Salix sinopurpurea*** C. Wang & Chang Y. Yang in Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 98. 1980.

红皮柳 hong pi liu

*Salix purpurea* Linnaeus var. *longipetiolata* C. Y. Yu.

Shrubs to 4 m tall. Branchlets greenish or yellowish, glabrous; juvenile branchlets tomentulose at first, glabrescent. Buds russet, long ovoid or oblong, at first pilose, glabrescent. Leaves opposite or obliquely opposite; stipules ovate-lanceolate or obliquely ovate; petiole 3–10 mm, tomentose; leaf blade lanceolate, 5–10 × 1–1.2 cm, to 11 × 2–3 cm on shoots, tomentulose when young, glabrescent, abaxially glaucous, adaxially greenish, base cuneate, margin glandular serrate, apex shortly acuminate; lateral veins diverging from yellowish midvein at obtuse angle. Flowering precocious. Catkins opposite or alternate, terete. Male catkin ellipsoid, 2–3 cm × 5–6 mm, sessile; leaflets 2 or 3, scalelike, with long hairs at base abaxially; bracts black, ovate, villous, apex obtuse or subacute sharp. Male flower: stamens 2, connate throughout; filaments slender, glabrous; anthers 4-loculed, yellow or reddish, globose. Female flower: ovary ovoid, densely gray tomentose, shortly stipitate; style 0.1–0.2 mm; stigma capitate. Fl. Apr, fr. May.

• Thickets, along rivers; 1000–1600 m. Gansu, Hebei, Henan, Hubei, Shaanxi, Shanxi.

Similar to the mainly European species *Salix purpurea* Linnaeus, but shrubs taller and larger; juvenile branchlets tomentulose; leaf blade lanceolate, larger; catkin leaflets with long hairs at base abaxially; anthers yellow or reddish; style long.

**36. Sect. *Helix*** Dumortier, Bijdr. Natuurk. Wetensch. 1(1): 56. 1826.

筐柳组 kuang liu zu

Shrubs. Leaf blade lanceolate to linear. Flowering coetaneous or precocious. Catkins pedunculate or subsessile; bracts uniformly colored or 2-colored. Male flower: glands adaxial; stamens 2, connate throughout or filaments partly united; anthers 2- or 4-loculed. Female flower: ovary pilose or glabrous, stipitate or subsessile; style and stigma short or nearly absent.

**Key based on male plants**

(*Salix blakii*, *S. carmanica*, *S. lamashanensis*, *S. leveilleana*, and *S. michelsonii* unknown)

- 1a. Catkins opposite ..... 263. *S. koriyanagi*  
 1b. Catkins alternate.  
 2a. Catkin 3–4(–5) mm thick.  
 3a. Peduncle of catkin 5–10 mm.  
 4a. Mature shoots purplish brown; young leaf blade lanceolate, margin not serrate ..... 259. *S. kirilowiana*  
 4b. Mature shoots yellowish; leaf blade linear-lanceolate, margin serrate ..... 261. *S. gracilior*  
 3b. Catkin sessile or subsessile.  
 5a. Bracts uniformly colored, long obovate ..... 271. *S. suchowensis*  
 5b. Bracts 2-colored, ovate-oblong or obovate.  
 6a. Bracts ovate-oblong ..... 272. *S. psammophila*  
 6b. Bracts obovate ..... 269. *S. linearistipularis*  
 2b. Catkin 4–7 mm thick.  
 7a. Bracts 2-colored, blackened distally ..... 265. *S. tenuijulis*  
 8a. Filaments connate throughout length ..... 270. *S. sungkianica*  
 8b. Filaments connate proximally ..... 257. *S. yumenensis*  
 7b. Bracts uniformly colored, rarely dull brown at apex.  
 9a. Anthers red or in proximal part of catkin yellow.  
 10a. Catkin pedunculate, bearing 2 or 3 leaflets ..... 262. *S. yanbianica*

- 10b. Catkin sessile or subsessile, leafless or bearing 2 leaflets ..... 268. *S. donggouxianica*
- 9b. Anthers yellow.
  - 11a. Bracts very small; filaments pilose at base ..... 267. *S. caspica*
  - 11b. Bracts wide and large; filaments downy proximally.
    - 12a. Bracts spatulate or long ovate, abaxially wrinkled ..... 260. *S. pycnostachya*
    - 12b. Bracts oblong or oblong-obovate, abaxially not wrinkled ..... 255. *S. capusii*

**Key based on female plants**

- 1a. Ovary and capsule glabrous.
  - 2a. Bracts hairy.
    - 3a. Bracts long sericeous abaxially ..... 256. *S. leveilleana*
    - 3b. Bracts villous only proximally and at margin ..... 257. *S. yumenensis*
  - 2b. Bracts glabrous abaxially.
    - 4a. Bracts abaxially wrinkled, persistent ..... 260. *S. pycnostachya*
    - 4b. Bracts not wrinkled, completely or partly caducous after anthesis.
      - 5a. Bracts brownish or blackish; leaf blade of fruiting branchlets 11–16 × as long as wide 254. *S. michelsonii*
      - 5b. Bracts pale; leaf blade of fruiting branchlets 5–10 × as long as wide.
        - 6a. Mature shoots dark; young leaves tender, abaxially silvery pubescent ..... 259. *S. kirilowiana*
        - 6b. Mature shoots pale; leaves somewhat rigid, glabrous or sparsely pubescent.
          - 7a. Capsule conical, normally developed; branchlets chestnut-brown ..... 255. *S. capusii*
          - 7b. Capsule linear-lanceolate; branchlets yellowish ..... 258. *S. carmanica*
  - 1b. Ovary and capsule pilose.
    - 8a. Catkins opposite, rarely alternate, sessile; flowering precocious ..... 263. *S. koriyanagi*
    - 8b. Catkins alternate; flowering nearly coetaneous.
      - 9a. Catkin pedunculate; leaflets on peduncle not deciduous (except sometimes in *S. tenuijulis*).
        - 10a. Leaf blade of flowering branchlets linear, ± equally wide proximally and distally.
          - 11a. Juvenile branchlets tomentose ..... 265. *S. tenuijulis*
          - 11b. Juvenile branchlets glabrous ..... 264. *S. blakii*
        - 10b. Leaf blade of flowering branchlets usually broadest above middle.
          - 12a. Margin of young leaves dentate.
            - 13a. Leaf blade 11–16 × as long as wide; bracts glabrous or pilose ..... 261. *S. gracilior*
            - 13b. Leaf blade 6–7 × as long as wide; bracts white downy ..... 262. *S. yanbianica*
          - 12b. Margin of young leaves nearly entire.
            - 14a. Bracts abaxially wrinkled, persistent ..... 260. *S. pycnostachya*
            - 14b. Bracts abaxially not wrinkled, caducous during fruiting ..... 258. *S. carmanica*
      - 9b. Catkin sessile or shortly pedunculate; scalelike leaflets on peduncle readily deciduous.
        - 15a. Shrubs dwarf, alpine; branchlets blackened ..... 266. *S. lamashanensis*
        - 15b. Shrubs of low mountains or plains; branchlets not blackened.
          - 16a. Style very short to absent.
            - 17a. Bracts 2-colored; leaves coarsely serrate ..... 269. *S. linearistipularis*
            - 17b. Bracts uniformly colored; leaves entire or obtusely serrate.
              - 18a. Leaves entire ..... 267. *S. caspica*
              - 18b. Leaves loosely obtusely serrate ..... 268. *S. donggouxianica*
          - 16b. Style conspicuous to relatively large.
            - 19a. Catkin 4–6 cm × 5–8 mm; bracts densely gray tomentose, black distally 270. *S. sungkianica*
            - 19b. Catkin 1–4 cm × 3–5 mm; bracts uniformly colored or 2-colored.
              - 20a. Scalelike leaflets on peduncle abaxially glabrous or pilose; bracts uniformly colored; branchlets yellowish or purplish red; leaf blade lanceolate 271. *S. suchowensis*
              - 20b. Scalelike leaflets on peduncle abaxially densely villous; bracts 2-colored; branchlets yellowish; leaf blade linear ..... 272. *S. psammophila*

**Key based on vegetative characters**

(Branchlets and leaves of *Salix leveilleana* unknown)

- 1a. Leaves opposite (except rarely shoot leaves), glabrous ..... 263. *S. koriyanagi*
- 1b. Leaves alternate, pilose or glabrous.

- 2a. Leaves ca. 10 cm.
- 3a. Leaf margin entire or remotely dentate.
- 4a. Leaf blade usually broader distally ..... 260. *S. pycnostachya*
- 4b. Leaf blade broadest at middle, attenuate toward ends ..... 265. *S. tenuijulis*
- 3b. Leaf margin conspicuously serrate.
- 5a. Branchlets glabrous; petiole not inflated ..... 265. *S. tenuijulis*
- 5b. Branchlets ± tomentose; petiole inflated at base.
- 6a. Branchlets dark; young leaves abaxially densely tomentose ..... 271. *S. suchowensis*
- 6b. Branchlets yellowish; young leaves abaxially glabrous or pilose.
- 7a. Petiole 1–3(–5) mm ..... 270. *S. sungkianica*
- 7b. Petiole 8–12 mm ..... 269. *S. linearistipularis*
- 2b. Leaves usually less than 8 cm (except on shoots).
- 10a. Leaf blade more than 11 × as long as wide.
- 11a. Leaf margin coarsely dentate.
- 12a. Leaf apex long acuminate; stipules large, not caducous ..... 272. *S. psammophila*
- 12b. Leaf apex obtuse or shortly acuminate; stipules usually caducous ..... 261. *S. gracilior*
- 11b. Leaf margin entire or shallowly dentate.
- 13a. Leaf uniformly colored adaxially and abaxially ..... 267. *S. caspica*
- 13b. Leaf 2-colored adaxially and abaxially.
- 14a. Leaf margin entire or shallowly dentate, not bony ..... 264. *S. blakii*
- 14b. Leaf margin remotely sharply dentate, bony ..... 254. *S. michelsonii*
- 10b. Leaf blade 6–7(–8) × as long as wide.
- 15a. Branchlets black; shrubs dwarf, alpine ..... 266. *S. lamashanensis*
- 15b. Branchlets not black; shrubs or small trees.
- 16a. Leaf margin glandular dentate.
- 17a. Leaf blade lanceolate or oblanceolate ..... 262. *S. yanbianica*
- 17b. Leaf blade linear-lanceolate ..... 268. *S. donggouxianica*
- 16b. Leaf margin entire, subentire, shallowly serrulate, or indistinctly loosely serrulate.
- 18a. Leaf margin indistinctly loosely serrulate or subentire ..... 257. *S. yumenensis*
- 18b. Leaf margin entire or shallowly serrulate.
- 19a. Branchlets purplish brown ..... 259. *S. kirilowiana*
- 19b. Branchlets yellow or chestnut colored.
- 20a. Branchlets (pale) chestnut colored, often pruinose; trees not cultivated ..... 255. *S. capusii*
- 20b. Branchlets yellow; trees cultivated ..... 258. *S. carmanica*

**254. *Salix michelsonii*** Goerz ex Nasarow in Komarov, Fl. URSS 5: 711. 1936.  
米黄柳 *mi huang liu*  
*Salix caspica* Pallas var. *michelsonii* (Goerz ex Nasarow) Pojak.  
Shrubs to 4 m tall; bark bluish gray. Branchlets pendulous, yellow, slender, glabrous, shiny. Buds yellowish brown, small, slightly tomentose, apex acute. Leaves petiolate; leaf blade linear-lanceolate, 4–10 cm × 4–6 mm, slightly tomentulose when young, glabrescent, nearly uniformly colored on both surfaces, base cuneate, margin remotely sharply dentate, apex acuminate; lateral veins diverging from yellowish midvein at acute angle. Flowering precocious or coetaneous. Male catkin unknown. Female catkin 3–5 cm × ca. 4 mm; peduncle 5–10 mm, with 2 or 3 leaflets; bracts brownish, oblong, abaxially glabrous, adaxially white downy at base, acute at apex, wholly or partly caducous in fruit. Female flower: ovary ovoid-conical, glabrous; stipe 0.5–2 mm; style short or absent; stigma

2-cleft. Capsule brown, ca. 5 mm, glabrous. Fl. May, fr. Jun.

Alongside desert rivers. W Xinjiang [S Kazakhstan].

**255. *Salix capusii*** Franchet, Ann. Sci. Nat., Bot., sér. 6, 18: 251. 1884.

蓝叶柳 *lan ye liu*

*Salix coerulea* E. L. Wolf (1903), not Smith (1812); *S. niedzwieckii* Goerz.

Shrubs to 6 m tall; bark dull gray. Branchlets chestnut-brown, slender, glabrous; juvenile branchlets yellowish, pilose. Stipules linear, caducous; petiole 2–4 mm, at first pilose, glabrescent; leaf blade linear-oblanceolate or narrowly oblanceolate, usually broadest distally, 4–5 cm × ca. 6 mm, nearly uniformly grayish blue, tomentulose when young, glabrous when mature, base cuneate, margin entire or serrulate, apex shortly acuminate. Flowering nearly coetaneous. Male catkin 4–4.5 cm × 6–8 mm, sessile or shortly pedunculate, with leaflets at base; bracts yellowish green, oblong or oblong-obovate, ca. 1/2 as long as filaments, abaxially

glabrous or sparsely villous, adaxially white downy at base, apex nearly truncate. Male flower: stamens 2; filaments connate, basally pilose; anthers yellow, globose. Female catkin 1.5–2.5 cm, elongated in fruit; peduncle with leaflets; bracts as in male catkin but wholly or partly caducous in fruit. Female flower: ovary thinly conical, glabrous; stipe ca. 1 mm; style short; stigma conspicuous. Capsule greenish or yellowish, conical, 4–5 mm. Fl. Apr–May, fr. May–Jun.

Mountain river valleys; 1000–2800 m. Xinjiang [Afghanistan, Pakistan, Tajikistan].

**256. *Salix leveilleana*** C. K. Schneider in Sargent, Pl. Wilson. 3: 176. 1916.

荞麦地柳 qiao mai di liu

Shrubs or trees. Flowering branchlets silky villous. Buds oblong, shortly pilose. Leaves unknown. Flowering precocious. Male catkin unknown. Female catkin thinner toward apex, usually curved, to 5 × 1 cm, densely flowered, sessile; rachis villous; bracts brownish, oblong, ca. 2 × as long as stipe, long sericeous, apex subobtuse. Female flower: adaxial gland obtusely rectangular; ovary ovoid, glabrous, shortly stipitate; style ca. as long as ovary, puberulent; stigma linear, 2- or 3-lobed. Capsule unknown.

• About 3000 m. NE Yunnan (Qiaojia Xian).

The description is based on the protologue. This species is temporarily placed in this section; additional specimens need to be collected to understand more fully its characteristics and position.

**257. *Salix yumenensis*** H. L. Yang, Fl. Desertis Reipubl. Popularis Sin. 1: 521. 1985.

玉门柳 yu men liu

Shrubs to 3 m tall. Branches grayish white; branchlets yellowish green or russet, glabrous, shiny. Buds conical-ovoid, 3–5 mm, apex yellow-green, obtuse. Petiole 4–7 mm, glabrous; leaf blade linear to linear-oblongate, broadest above middle, attenuate toward ends, 7–8 cm × 4–10 mm, both surfaces nearly uniformly colored, young leaves pilose, glabrescent, margin indistinctly loosely serrulate or subentire; midvein raised abaxially. Flowering coetaneous. Male catkin ellipsoid, 1–2.5 cm × 5–8 mm, subsessile; with 2 or 3 scalelike leaflets at base; rachis pubescent; bracts basally yellow-green, apically black or brown, oblong, both surfaces villous at base, margin ciliate and loosely villous, apex obtuse. Male flower: gland 1, adaxial, terete or deltoid-ovate; stamens 2; filaments connate at first, later distinct distally, glabrous; anthers red. Female catkin 1–1.5 × 0.6–0.8 cm, subsessile; bracts similar to those of male catkin. Female flower: glands 2, yellowish, abaxial gland usually very small, 3-lobed, rarely entire, adaxial gland as in male; ovary ovoid, glabrous; style ca. as long as ovary; stigma brown, 2- or 3-lobed. Fl. Apr–May.

• Near canals and ditches. NW Gansu (Yumen).

**258. *Salix carmanica*** Bornmüeller in C. K. Schneider, Bot. Centralbl. 33(2): 202. 1915.

黄皮柳 huang pi liu

Shrubs to 6 m tall; bark bluish green, smooth. Branchlets pendulous, yellowish, slender, glabrous. Stipules linear, ca. 2 mm, margin serrulate, caducous; leaf blade oblanceolate, 3–5 cm × 5–7 mm, larger on shoots, uniformly colored on both surfaces, slightly tomentulose when young, when mature subglabrous, base cuneate, margin remotely serrulate, apex shortly acuminate. Flowering nearly coetaneous. Male catkin unknown. Female catkin 1–2.5 cm; peduncle ca. 1 cm, tomentose, with 2 or 3 leaflets; bracts yellowish green, long obovate, ca. 1.5 mm, abaxially glabrous, apex truncate, retuse, caducous in fruit. Female flower: ovary linear-lanceolate, sterile, glabrous or slightly pilose; stipe ca. 1 mm; style ca. 0.4 mm; stigma 2–4-lobed. Fl. May.

Cultivated. S Xinjiang [Afghanistan; SW Asia].

**259. *Salix kirilowiana*** Stscheglejew, Bull. Soc. Imp. Naturalistes Moscou 27(1): 148. 1854.

天山筐柳 tian shan kuang liu

Shrubs or small trees; crown low and broad. Branches arcuate, slender; 2- and 3-year-old branchlets usually dark purplish brown. Leaf blade narrowly lanceolate to linear-lanceolate, thin, somewhat glaucous, abaxially silvery when young, margin entire, rarely with extremely tiny denticles, apex thinly sharpened. Peduncles 3–12 cm, with 1–3 small leaflets; bracts pale, yellowish or pinkish, glabrous or very slightly pubescent, obtuse. Male flower: filaments wholly connate, densely hairy at base. Female catkin with bracts at least partly caducous. Female flower: gland adaxial, quadrangular, shorter than pedicel; style and stigma minute. Capsule narrowly conical, glabrous, shortly pedicellate.

• Mountain river valleys, especially on pebbles and gravelly alluvium; below 2500 m. Xinjiang (Tian Shan).

**260. *Salix pycnostachya*** Andersson, J. Linn. Soc., Bot. 4: 44. 1860.

密穗柳 mi sui liu

Shrubs to 6 m tall; bark yellowish green. Branchlets yellowish green, glabrous, shiny; juvenile branchlets tomentulose or glabrescent. Buds yellowish brown, tomentulose. Stipules linear, caducous or not; petiole 5–10 mm, glabrous; leaf blade oblanceolate, usually broader distally, 8–10 × 1–1.5 cm, both surfaces nearly uniformly colored, slightly pilose or appressed pubescent when young, glabrescent or subglabrous, base cuneate, margin entire or remotely shallowly dentate, apex acuminate. Flowering nearly coetaneous. Catkins 2–3 cm × ca. 5 mm; peduncle ca. 1 cm, with 2 or 3 leaflets; rachis downy; bracts brownish, spatulate or long ovate, abaxially glabrous, wrinkled, villous at

base and margin, apex rounded, brown or russet. Male flower: adaxial gland elliptic; stamens 2, connate at least in part, glabrous or downy at base. Fruiting catkin bracts not caducous. Female flower: ovary conical, glabrous or pubescent, shortly stipitate; style short; stigma 2-cleft. Fl. Jun, fr. Jul.

River valleys, mountain slopes; ca. 4400 m. S Xinjiang, W Xizang [Afghanistan, ?Bhutan, India, Kyrgyzstan, Nepal, Pakistan, Tajikistan, Uzbekistan].

- 1a. Leaf blade slightly pilose when young, glabrescent; stipules caducous; filaments connate throughout, downy at base; ovary glabrous or pilose .. 260a. var. *pyncnostachya*  
 1b. Leaf blade appressed pubescent on both surfaces, becoming subglabrous; stipules not caducous; filaments partly connate, glabrous; ovary pubescent ..... 260b. var. *oxycarpa*

**260a. *Salix pyncnostachya* var. *pyncnostachya***

密穗柳(原变种) mi sui liu (yuan bian zhong)

Stipules caducous. Leaf blade slightly pilose when young, glabrescent. Male flower: filaments connate throughout, downy at base. Female flower: ovary glabrous or pilose.

River valleys. S Xinjiang [Afghanistan, India, Kyrgyzstan, Nepal, Pakistan, Tajikistan, Uzbekistan].

**260b. *Salix pyncnostachya* var. *oxycarpa* (Andersson) Y. L. Chou & C. F. Fang, Fl. Reipubl. Popularis Sin. 20(2): 369. 1984.**

尖果密穗柳 jian guo mi sui liu

*Salix oxycarpa* Andersson, J. Linn. Soc., Bot. 4: 45. 1860.

Stipules persistent. Leaf blade appressed pubescent on both surfaces, becoming subglabrous. Male flower: filaments partly connate, glabrous. Female flower: ovary pubescent.

Mountain slopes; ca. 4400 m. W Xizang [Afghanistan, ?Bhutan, India, Pakistan].

**261. *Salix gracilior* (Siuzev) Nakai, Rep. Exped. Manchoukuo Sect. IV: 7. 1936.**

细枝柳 xi zhi liu

*Salix mongolica* (Franchet) Siuzev f. *gracilior* Siuzev, Trudy Bot. Muz. Imp. Akad. Nauk 9: 90. 1912.

Shrubs to 3 m tall; bark gray. Branchlets yellowish or greenish, slender, glabrous. Stipules linear or lanceolate, usually caducous; petiole 3–5 mm, glabrous; leaf blade linear or linear-lanceolate, usually wider distally, 3–6 cm × 3–4 mm, abaxially greenish, glabrous, adaxially green, base cuneate, margin glandular dentate, apex obtuse or shortly acuminate; lateral veins diverging from yellowish midvein at acute angle. Flowering nearly coetaneous. Catkins thinly terete, 2–4 cm × 3–5 mm; peduncle 5–10 mm, with leaflets; bracts brownish, long obovate, rarely 2-colored, glabrous or sparsely pubescent. Male flower: adaxial gland brownish, small; stamens 2; filaments connate, downy at base; anthers yellow. Fruiting catkin elongated, thick, dense. Female

flower: ovary ovoid or ellipsoid, tomentose, subsessile; style short; stigma capitate. Capsule tomentose. Fl. May, fr. May–Jun.

• Plains. Hebei, Heilongjiang, Jilin (Dehui Xian), Liaoning, E Nei Mongol.

Grown to protect embankments and to stabilize sand; used for weaving wicker articles.

**262. *Salix yanbianica* C. F. Fang & Chang Y. Yang in Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 103. 1980.**

白河柳 bai he liu

*Salix mongolica* (Franchet) Siuzev var. *yanbianica* (C. F. Fang & Chang Y. Yang) Y. L. Chou.

Shrubs; bark gray. Branchlets yellowish green, glabrous; juvenile branchlets brownish, tomentulose. Stipules lanceolate, margin remotely dentate; petiole 2–3 mm, tomentose; leaf blade lanceolate or oblanceolate, 3–6 × 0.7–1 cm, 6–8 × 1–1.5 cm on shoots, abaxially greenish, at first pilose, glabrescent, adaxially green, base cuneate, margin densely glandular serrate, apex obtuse or shortly acuminate; lateral veins diverging from brownish midvein at 45°. Male catkin terete, 2–3 cm × ca. 7 mm; peduncle with 2 or 3 leaflets; bracts brownish, dull brown distally, spatulate, ca. 1.2 mm, villous. Male flower: adaxial gland greenish brown, long ovate; stamens 2, connate throughout; filaments pilose at base, ca. 2.5 mm; anthers red or in proximal part of catkin yellow. Female catkin 1–3 cm × ca. 5 mm. Female flower: ovary ovoid, densely white tomentose, subsessile; style short to absent; stigma red, 2-cleft. Capsule brownish, tomentose. Fl. Apr, fr. Jun.

• Sunny, open places by rivers; 100–800 m. E Jilin.

Similar to *Salix gilgiana* Seemen, from Japan and Korea, but leaves smaller; ovary subsessile; style short to absent. According to the specimens the authors have examined, *S. gilgiana* does not occur in China.

**263. *Salix koriyanagi* Kimura ex Goerz, Salic. Asiat. 1: 17. 1831.**

尖叶紫柳 jian ye zi liu

*Salix purpurea* Linnaeus var. *japonica* Nakai.

Shrubs. Branchlets russet or purplish red, slender, glabrous. Buds purplish red, rarely yellowish brown, ovoid, longer than petiole, at first pilose at apex, glabrescent, shiny. Leaves opposite, rarely alternate, thinly leathery; petiole 2–5 mm; leaf blade oblanceolate or linear-oblanceolate, 5–10 × 0.6–1.5 cm, glabrous, abaxially pale, adaxially green, base cuneate, margin entire proximally, serrulate distally, apex acuminate or acute; midvein yellowish; lateral veins dense, curved. Flowering precocious. Catkins opposite, rarely alternate, thinly terete, 2–3 cm × 3–4 mm, sessile; bracts black, obovate or long obovate, ca. 1.5 mm, villous, apex obtuse. Male flower: stamens 2, connate throughout, rarely only filaments united, glabrous; anthers purplish red, globose, 4-loculed, rarely 2-loculed. Female flower: ovary ovoid, densely grayish white tomentose, sessile;

style short to absent; stigma entire or 2-lobed. Fl. May, fr. Jun.

Cultivated in gardens. E Liaoning [Japan, Korea].

Similar to *Salix integra* but young branchlets purplish red; leaf blade longer and narrower; bracts black. Similar also to the mainly European species *S. purpurea* Linnaeus, but young branchlets, winter buds, and petioles purplish red.

**264. *Salix blakii*** Goerz, Repert. Spec. Nov. Regni Veg. 36: 31. 1934.

黄线柳 huang xian liu

*Salix linearifolia* E. L. Wolf (1903), not Rydberg (1901).

Shrubs to 5 m tall. Branchlets brownish, thin, glabrous. Leaves petiolate; leaf blade linear-lanceolate or linear, 4–8 cm × 4–5 mm, both surfaces glabrous, silky when young, abaxially greenish, adaxially dull green, base cuneate, margin entire or denticulate, apex long acuminate; lateral veins obscure. Flowering nearly coetaneous. Male catkin unknown. Female catkin 3–4 cm, elongate in fruit; peduncle 5–10 mm, with lanceolate leaflets; rachis gray tomentose; bracts brownish, long obovate, with 3 veins, abaxially glabrous, basally and marginally downy, completely or partly caducous in fruit. Female flower: ovary conical, gray tomentose, sometimes subglabrous near base, shortly stipitate; style ca. as long as stigma; stigma brown, 2-cleft. Fl. Apr, fr. May.

Riverbanks; 500–600 m. S Xinjiang [Afghanistan, Kazakstan, Tajikistan, Uzbekistan; SW Asia (Iran)].

**265. *Salix tenuijulis*** Ledebour, Fl. Altaic. 4: 262. 1833.

细穗柳 xi sui liu

*Salix albertii* Regel; *S. serrulatifolia* E. L. Wolf.

Shrubs to 4 m tall; bark gray. Branchlets yellowish, at first appressed pubescent, glabrescent. Buds yellowish or brownish, ovoid, glabrous, apex acute. Stipules ovate-lanceolate, usually caducous; petiole 2–5 mm, tomentulose; leaf blade oblanceolate, oblong-spatulate, or linear-lanceolate, 5–10 × 0.7–1.5 cm, abaxially grayish white or grayish green, slightly shortly silky when young, when mature glabrous or rarely silky tomentose, adaxially greenish, base cuneate or broadly cuneate, margin densely glandular denticulate, apex shortly acuminate; veins conspicuous. Flowering nearly coetaneous. Male catkin unknown. Female catkin thinly terete, 2.5–3.5 cm × 3–5 mm; peduncle 5–10 mm; bracts brownish, elliptic, long white pubescent at base, abaxially pilose at apex. Female flower: ovary ovoid, shorter than gland, sessile or shortly stipitate; style shorter than gland, subsessile; stigma blackish brown, short, 2-parted. Fl. May, fr. Jun.

Along rivers in mountains; 1200–1500 m. W Xinjiang [Kazakstan, Kyrgyzstan, Mongolia].

**266. *Salix lamashanensis*** K. S. Hao ex Fang & A. K. Skvortsov, Novon 8: 468. 1998.

拉马山柳 la ma shan liu

Shrubs dwarf. Branchlets blackened, glabrous. Petiole 5–10 mm, tomentulose; leaf blade oblanceolate, 4–6 ×

0.5–1.2 cm, tomentulose when young, glabrescent, abaxially grayish white, adaxially green, base cuneate, margin sparsely serrate, apex acuminate; lateral veins diverging from yellowish midvein at acute angle. Male catkin unknown. Female catkin ovoid, ca. 1 cm, sessile, with 2 lanceolate, scalelike leaflets at base; bracts russet, elliptic-oblong, ca. 1/2 as long as ovary, abaxially sparsely villous. Female flower: adaxial gland terete; ovary ovoid, densely tomentose, subsessile; style short; stigma capitate, 2-cleft. Capsule yellowish, tomentose. Fl. Jun, fr. Jun–Jul.

• Open woods on shaded mountain slopes; 2700–3500 m. Gansu (Min Xian), Qinghai, Shaanxi.

**267. *Salix caspica*** Pallas, Fl. Ross. 1(2): 74. 1788.

油柴柳 you chai liu

Shrubs to 5 m tall; bark gray. Branchlets yellowish, slender, shiny. Buds ca. 5 mm, apex acute. Stipules linear, caducous; petiole 3–5 mm, glabrous; leaf blade linear-lanceolate or linear, usually broader distally, both surfaces uniformly colored, glabrous, slightly tomentose when young, 5–8 cm × 4–5 cm, base cuneate, margin entire, apex long acuminate. Flowering precocious. Catkins terete, subsessile, with readily deciduous, scalelike leaflets at base, densely flowered; rachis tomentose; bracts brownish, pilose, apex obtuse. Male flower: stamens 2; filaments connate, basally downy; anthers yellow. Female flower: ovary ovoid-conical, densely tomentose, subsessile; style very short; stigma capitate. Capsule brownish, pubescent. Fl. Apr–May, fr. Jun.

Open woodlands along rivers. W Xinjiang [Kazakstan, Russia].

Grown to protect embankments and to stabilize sand; used for weaving wicker articles.

**268. *Salix donggouxianica*** C. F. Fang, Bull. Bot. Res., Harbin 4 (1): 128. 1984.

东沟柳 dong gou liu

Shrubs to 2 m tall; bark gray-brown, smooth. Branchlets thin, glabrous, slightly yellow, black spotted; juvenile branchlets green-yellow. Buds ovoid; scales brown-yellow, glabrous. Petiole 1.5–2 mm, glabrous; leaf blade linear-lanceolate, broadest at middle, 3.5–4.5 × 7–8 mm, abaxially pale, adaxially green, both surfaces glabrous, base cuneate, margin loosely obtusely serrate, apex obtusely acute. Male catkin oblong to shortly terete, 1–2 cm × 6–7 mm; peduncle short, with 1 or 2 scalelike leaflets; bracts russet, obdeltoid, ca. 1 mm, ciliate, villous proximally abaxially, apex truncate. Male flower: gland adaxial, terete, ca. 0.3 mm; stamens coadnate; filament 1, villous at base; anther red, ovoid, 4-loculed. Female catkin terete, 1–2.5 cm × 3.5–5 mm; bracts spatulate, ca. 1.4 mm, villous-ciliate proximally abaxially, apex subtruncate. Female flower: gland 1, shortly terete, ca. 0.4 mm; ovary ovoid or ellipsoid, 1.2–1.5 mm, pubescent, shortly stipitate; style absent; stigma 2-lobed. Fl. Apr, fr. May.

• Beach plains. Liaoning (Donggou Xian).

**269. *Salix linearistipularis*** K. S. Hao, Repert. Spec. Nov. Regni Veg. Beih. 93: 102. 1936.

筐柳 kuang liu

*Salix purpurea* Linnaeus var. *stipularis* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2 (Pl. David. 1: 284). 1884; *S. mongolica* (Franchet) Siuzev f. *bicolor* Y. L. Chang & Skvortzov; *S. mongolica* f. *latifolia* Nasarow; *S. mongolica* f. *sericea* Y. L. Chang & Skvortzov.

Shrubs or trees to 8 m tall; bark yellowish gray to dull gray. Branchlets slender. Buds brownish or yellowish brown, ovoid, glabrous. Stipules linear or linear-lanceolate, to 1.2 cm, on shoots to 3 cm, margin glandular dentate; petiole (0.7–)0.8–1.2 cm; leaf blade lanceolate or linear-lanceolate, 8–15 cm × 5–10 mm, abaxially glaucous, adaxially green, attenuate toward both ends, or broader distally, margin glandular serrate, revolute. Flowering precocious or nearly coetaneous. Male catkin terete, 3–3.5 cm × 2–3 mm, sessile, with 2 oblong scalelike leaflets at base; bracts obovate, long pubescent, apex black. Male flower: stamens 2; filaments connate, basally downy; anthers yellow. Female catkin 3.5–4 cm × ca. 5 mm; bracts ovate, long pubescent, apex black. Female flower: gland as in male flower; ovary ovoid-conical, pubescent, sessile; style short; stigma 2-cleft. Fl. May, fr. May–Jun.

• Shores of rivers or lakes, damp places on plains. Gansu, Hebei (Yutian), Henan, Shaanxi, Shanxi.

Grown to protect embankments and to stabilize sand; used for weaving wicker articles.

**270. *Salix sungkianica*** Y. L. Chou & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 552. 1955.

松江柳 song jiang liu

Shrubs to 6 m tall; bark dull gray. Branchlets reddish green or yellowish, slender, glabrous. Buds ovoid. Stipules linear, 5–7 mm, margin serrate; petiole 1–3(–5) mm, glabrous; leaf blade lanceolate or oblanceolate, 8–10 × 0.8–1.2 cm, to 16 × 1.6 cm on shoots, abaxially pale, adaxially dull green, base cuneate, glabrous, margin glandular serrate, apex shortly acuminate. Flowering precocious. Male catkin terete, 3–4.5 cm × ca. 5 mm, sessile, with 2 scalelike leaflets at base; bracts brown, black distally, obovate, ca. 1 mm, long pubescent, apex rounded. Male flower: stamens 2, connate throughout; filaments downy at base; anthers yellow. Female catkin 4–6 cm × 5–8 mm. Female flower: ovary conical, 1.5–2 mm, pubescent, shortly stipitate; style conspicuous, 0.3–0.5 mm; stigma 2–4-lobed. Capsule ca. 4 mm. Fl. May, fr. Jun.

• Alongside rivers. Heilongjiang (Harbin Shi).

Grown to protect embankments; used for weaving wicker articles and as a nectariferous plant.

**271. *Salix suchowensis*** W. C. Cheng ex G. Zhu, Novon 8: 466. 1998.

簸箕柳 bo ji liu

Shrubs. Branchlets yellowish green or purplish red, glabrous; juvenile branchlets sparsely tomentose at first, becoming subglabrous. Stipules linear to lanceolate, 1–1.5 cm; petiole ca. 5 mm, margin remotely glandular dentate, usually tomentulose; leaf blade lanceolate, 7–11 × ca. 1.5 cm, abaxially pale, both surfaces glabrous, tomentulose when young, adaxially dull green, base cuneate, margin glandular denticulate, apex shortly acuminate; lateral veins diverging from brownish midvein at 45–90°. Flowering precocious. Male catkin terete, 3–4 cm × 4–5 mm, sessile or subsessile, with scalelike leaflets at base; rachis gray tomentose; bracts brown, long obovate, abaxially villous, apex obtuse-rounded, slightly darker. Male flower: glands adaxial; stamens 2, connate throughout. Female catkin ca. 4 mm thick. Female flower: ovary conical, densely gray tomentose; stipe short to absent; style conspicuous; stigma 2-cleft. Capsule pilose. Fl. Mar, fr. Apr–May.

• Plains, cultivated. E Henan, Jiangsu, S Shandong, N Zhejiang.

Very similar to *Salix linearistipularis* but branchlets more richly colored; catkins thinner; style longer.

Used for weaving wicker articles.

**272. *Salix psammophila*** C. Wang & Chang Y. Yang in Chang Y. Yang, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 9: 104. 1980.

北沙柳 bei sha liu

Shrubs to 4 m tall. One-year-old branchlets yellowish, usually slightly tomentulose near buds. Juvenile branchlets at first pubescent, becoming subglabrous. Stipules linear, acuminate or acute, often longer on shoots; petiole ca. 1 cm; leaf blade linear, 4–8 cm × 2–4 mm, to 12 cm on shoots, abaxially grayish white, tomentulose when young, glabrescent, adaxially greenish, base cuneate, margin sparsely serrate, apex acuminate. Flowering precocious or nearly coetaneous. Catkins 1–2 cm; peduncle short, with leaflets; rachis tomentose; bracts ovate-oblong, abaxially brown, glabrous, villous at base, apex obtuse-rounded. Male flower: adaxial gland short; stamens 2, connate throughout; filaments pilose at base; anthers 4-loculed, yellow. Female flower: ovary ovoid, tomentose, sessile; style ca. 1/2 as long as ovary, ca. 0.5 mm; stigma 2-cleft. Fl. Mar–Apr, fr. May.

• Sands. Nei Mongol, Ningxia (Yanchi Xian), Shaanxi, Shanxi.

Similar to *Salix gordejvii* but branchlets slightly tomentulose near buds; leaf blade not revolute at margin in autumn; stamens completely connate; capsule tomentose. Similar also to *S. gracillior* but leaf blade linear; style conspicuous, short.

Used for weaving wicker articles and stabilizing sand.

37. Sect. **Flavidae** Y. L. Chang & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 557. 1955.

黄柳组 *huang liu zu*

Shrubs. Branchlets yellow, shiny. Leaf blade linear-lanceolate, glabrous, margin glandular serrate. Flowering precocious. Bracts 2-colored. Male flower: glands adaxial; stamens 2, distinct; filaments glabrous. Female flower: ovary glabrous or subglabrous, sessile; style short. Capsule glabrous.

273. ***Salix gordejewii*** Y. L. Chang & Skvortzov in Liou & al., Ill. Man. Woody Pl. N.-E. China 553. 1955.

黄柳 *huang liu*

*Salix flavida* Y. L. Chang & Skvortzov.

Shrubs to 2 m tall; bark grayish white. Branchlets yellow or yellowish, glabrous, shiny. Buds russet, oblong. Stipules lanceolate, 3–6 mm, usually caducous, margin glandular dentate; petiole 2–3 mm, glabrous; leaf blade linear or linear-lanceolate, 2–8 cm × 3–6 mm, abaxially slightly white, tomentulose when young, glabrescent, adaxially greenish, base cuneate, margin

glandular serrate, apex shortly acuminate. Catkins ellipsoid to shortly terete, 1.5–2.5 cm × 7–8 mm, sessile; bracts oblong, gray villous, apex obtuse. Male flower: stamens 2; filaments distinct, glabrous; anthers yellow, oblong, 2-loculed. Female flower: ovary long ovoid, slightly pilose or glabrous; style short; stigma ca. as long as style, 4-parted. Capsule brownish yellow, ca. 4 mm, glabrous. Fl. Apr, fr. May.

Dunes. Liaoning, E Nei Mongol; cultivated in N Gansu [Mongolia].

Grown to stabilize dunes; used for weaving wicker articles.

**Uncertain species**

274. ***Salix limprichtii*** Pax & Hoffmann in Limpricht, Repert. Spec. Nov. Regni Veg. Beih. 12: 353. 1922.

黑皮柳 *hei pi liu*

Shrubs. Branchlets dark brown, glabrous, pruinose. Leaves alternate; petiole 2–10 mm, glabrous; leaf blade broadly oblong or elliptic, 1–3.4 × 1–1.7 cm, abaxially pale, gray or pruinose, dictyogenous, adaxially dull green, base acute or obtuse, rarely subrounded or subcordate, apex obtuse in proximal branchlets. Flowering coetaneous. Male catkin 4–6 cm × ca. 8 mm, densely flowered; peduncle with leaflets; rachis villous; bracts russet when dried, oblong, white villous, apex obtuse. Male flower: gland 1, terete, ca. 0.5 mm; stamens 2, completely or partly connate. Female catkin unknown.

• Mountains; ca. 1500 m. Sichuan (Wenchuan Xian).

275. ***Salix longissimipedicellaris*** N. Chao ex P. Y. Mao, Bull. Bot. Res., Harbin 6(2): 81. 1986.

苍山长梗柳 *cang shan chang geng liu*

Shrubs erect, to 1 m tall. First-year branchlets glabrous; juvenile branchlets tomentose. Petiole ca 3 mm, tomentose; leaf blade ovate-oblong, ca. 2 cm × 8 mm at anthesis, abaxially greenish, grayish villous, adaxially green, downy along midvein basally, base broadly cuneate, margin entire, apex shortly acuminate; midvein raised abaxially; lateral veins indistinct. Flowering coetaneous. Male catkin unknown. Female catkin terete, 5–8 cm × ca. 6 mm; peduncle 5–10 mm, tomentose, with 2 or 3 leaflets; rachis villous; bracts lanceolate, ca. 3 mm, abaxially villous, adaxially subglabrous. Female flower: adaxial gland 1, linear, ca. 0.7 mm; ovary obclavate or ovoid-cylindric, ca. 2 × 0.8 mm, pubescent;

stipe pubescent proximally, ca. 4 mm, ca. 2 × as long as ovary; style ca. 0.7 mm, 2-lobed; stigma entire or slightly lobed. Fl. May.

• Mountain slopes; ca. 3000 m. Yunnan (Dali Xian: Changshan).

A. K. Skvortzov indicates that this taxon is problematic because he observed malformed ovaries and intermediate transitions from ovaries to anthers.



