

ALISMATACEAE

泽泻科 ze xie ke

Wang Qingfeng (王青锋)¹; Robert R. Haynes², C. Barre Hellquist³

Herbs, perennial or rarely annual, aquatic or of marshes, sometimes rhizomatous. Leaves basal, linear, lanceolate, elliptic to ovate or orbicular, or sagittate, with elongated sheathing petioles; principal veins parallel with margins and converging toward apex and connected by transverse veins. Flowers often whorled at nodes of scape forming racemes, panicles, or umbels, pedicellate, actinomorphic, bisexual, unisexual, or polygamous, usually bracteate. Sepals 3, persistent, green. Petals 3, deciduous, usually white, sometimes yellowish. Stamens 3 to numerous, whorled, with elongated filaments; anthers 2-celled, extrorse, opening by longitudinal slits. Carpels 3 to numerous, whorled or spirally arranged, free; ovules 1 to several; style persistent. Fruit a cluster or whorl of laterally compressed achenes, drupelets, or occasionally follicles. Seeds curved, with a horseshoe-shaped embryo; endosperm absent.

About 13 genera and ca. 100 species: cosmopolitan, especially abundant in temperate and tropical regions of the N Hemisphere; six genera (one introduced) and 18 species (three endemic, one introduced) in China.

Chen Yaodong. 1992. Alismataceae. In: Sun Xiangzhong, ed., Fl. Reipubl. Popularis Sin. 8: 127–145; Zhou Lingyun. 1992. *Butomopsis* and *Limnocharis*. In: Sun Xiangzhong, ed., Fl. Reipubl. Popularis Sin. 8: 147–151.

- 1a. Stamens 8 or 9, or numerous, with sterile staminodes in outermost whorl, filaments flattened; stigmas sessile, carpels 6–9 or numerous, crowded into a head; aquatic herbs with terminal umbels; bracts forming an involucre.
 - 2a. Petals white; stamens 8 or 9; carpels 6–9; pedicels slender 5. *Butomopsis*
 - 2b. Petals yellowish; stamens numerous; carpels numerous; pedicels thick 6. *Limnocharis*
- 1b. Stamens 3 to numerous; style persistent, carpels few to numerous; aquatic or marsh herbs with racemes, panicles, or umbels.
 - 3a. Flowers unisexual or polygamous 1. *Sagittaria*
 - 3b. Flowers bisexual.
 - 4a. Stamens 6; carpels arranged in a single whorl 4. *Alisma*
 - 4b. Stamens (6–)9 to numerous; carpels spirally arranged.
 - 5a. Inflorescences much branched, paniculate; fruitlets drupaceous, swollen, with woody endocarp and spongy exocarp 3. *Caldesia*
 - 5b. Inflorescences unbranched, flowers usually solitary or up to 3 in inflorescence; fruitlets achenelike, laterally compressed 2. *Ranalisma*

1. SAGITTARIA Linnaeus, Sp. Pl. 2: 993. 1753.

慈菇属 ci gu shu

Lophiocarpus (Kunth) Miquel (1870), not Turczaninow (1843); *Lophotocarpus* T. Durand; *Sagittaria* sect. *Lophiocarpus* Kunth.

Herbs, aquatic, often stoloniferous and tuberiferous. Leaves aerial, floating, or submerged, linear, lanceolate, deeply cordate, or sagittate. Inflorescences usually of 3-flowered whorls each with 3 bracts. Flowers unisexual or polygamous, upper ones male, with longer and slender pedicels, lower ones female or bisexual, with shorter and thickened pedicel. Stamens (6–)9 to numerous. Carpels numerous, spirally arranged, each with 1 ovule; styles apical or subaxial. Achenes laterally compressed, margins usually winged, with an apical or lateral stylar beak.

About 30 species: tropical and temperate regions; seven species (two endemic) in China.

- 1a. Persistent sepals not reflexed after anthesis.
 - 2a. Leaves floating or submerged, floating leaves broadly ovate to cordate-ovate; flowers polygamous; achenes with cristate wing 1. *S. guayanensis*
 - 2b. Leaves aerial or submerged, sagittate or lanceolate; flowers unisexual; achenes without cristate wing.
 - 3a. Aerial leaves linear-lanceolate; female flowers without or only with very short pedicel 6. *S. tengtsungensis*
 - 3b. Aerial leaves sagittate; female flowers pedicellate 4. *S. lichuanensis*
- 1b. Persistent sepals reflexed after anthesis.
 - 4a. Leaves sessile or only with very short petiole, linear or subspatulate; achenes cristate on back 7. *S. pygmaea*
 - 4b. Leaves petiolate; achenes not cristate on back.
 - 5a. Leaves floating or submerged 2. *S. natans*

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5b. Leaves aerial or submerged.

6a. Achenes with an adaxial beak; aerial leaves elliptic to ovate or sagittate, submerged leaves

lanceolate; stolons usually lacking 5. *S. potamogetonifolia*

6b. Achenes with an apical beak; leaves sagittate 3. *S. trifolia*

1. *Sagittaria guayanensis* Kunth subsp. *lappula* (D. Don)
Bogin, Mem. New York Bot. Gard. 9: 192. 1955.

冠果草 guan guo cao

Sagittaria lappula D. Don, Prodr. Fl. Nepal. 22. 1825;
Lophiocarpus lappula (D. Don) Miquel; *Lophocarpus formosanus* Hayata; *L. guayanensis* (Kunth) J. G. Smith var. *lappula* (D. Don) Buchenau.

Stolons usually lacking. Floating leaves broadly ovate to cordate-ovate, 1.2–9 × 1–10 cm, base deeply cordate, apex obtuse; submerged leaves linear or lanceolate, 3–11 cm × 5–10 mm. Inflorescences racemose, 8–40 cm, in 2–6 whorls of 3 flowers; bracts connate toward base. Bisexual flowers usually on lower 1–4 whorls; pedicels 1–1.5 cm, thickened. Male flowers with pedicel 2–5 cm. Sepals not reflexed after anthesis, ovate, 0.5–1.5 cm × 3–15 mm. Petals fugacious, obovate, subequal to sepals. Stamens 6 to numerous; anthers yellow. Achenes obovoid or elliptic, 2–4 × 1.5–3 mm, with cristate wing and oblique adaxial beak. Fl. May–Sep, fr. Jun–Nov. $2n = 22^*$.

Ponds, lakes, marshes, paddy fields and channels. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Taiwan, Yunnan, Zhejiang [Afghanistan, Cambodia, India, Indonesia, Malaysia, Nepal, Pakistan, Thailand, Vietnam; Africa].

2. *Sagittaria natans* Pallas, Reise Russ. Reich. 3: 757. 1776.

浮叶慈姑 fu ye ci gu

Plants stoloniferous. Floating leaves linear, lanceolate, elliptic, or sagittate, 5–17 cm, base cuneate to rounded or cordate with 2 short lobes, lateral lobes shorter than middle lobe; submerged leaves lanceolate or reduced to phyllodes. Inflorescences racemose, 5–25 cm, in 2–6 whorls of 3 flowers, at least lower bracts free. Flowers unisexual; female flowers on lower 1 or 2 whorls, pedicels 5–12 mm; male flowers with pedicels 1–2 cm. Sepals usually not reflexed, broadly ovate, 3–4 × ca. 3 mm. Petals obovate, 8–10 × ca. 5.5 mm. Stamens numerous; anthers yellow. Achenes obliquely obovoid, 2–3 × 1–2.5 mm, with a short, subadaxial beak. Fl. and fr. Jun–Sep. $2n = 22^*$.

Ponds, channels. Heilongjiang, Jilin, Liaoning, Nei Mongol, Xinjiang [Japan, Kazakhstan, Korea, Mongolia, Russia; Europe].

3. *Sagittaria trifolia* Linnaeus, Sp. Pl. 2: 993. 1753.

野慈姑 ye ci gu

Plants stoloniferous, stolons often ending in a tuber. Leaves aerial at least when mature, sagittate, sheathing, apex acuminate to rounded, lateral lobes longer than middle lobe. Inflorescences racemose, in 3 to many whorls of 3 flowers, lower 1–3 whorls usually branched; bracts free or connate toward base. Flowers unisexual; female flowers on lower 1–8 whorls, with short pedicels; male flowers with pedicels 0.5–1.5 cm. Sepals reflexed, ovate, 3–5 × 2.5–3.5 mm. Petals obovate, ca. 2 × as large as sepals. Stamens numerous; anthers yellow. Achenes obliquely obovoid, 4.5–5.5 × 4–5 mm, winged, with an erect,

apical beak. Fl. and fr. May–Nov. $2n = 22^*$.

Ponds, lakes, marshes, paddy fields and channels. Anhui, Beijing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Jiangsu, Liaoning, Qinghai, Shaanxi, Shandong, Sichuan, Taiwan, Xinjiang, Yunnan, Zhejiang [Afghanistan, India, Indonesia (Borneo, Java), Japan (including Ryukyu Islands), Kazakhstan, Korea, Kyrgyzstan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Russia, Tajikistan, Thailand, Uzbekistan, Vietnam; SW Asia, Europe].

1a. Inflorescences with 1 or 2(or 3) whorls

of branches at base; tubers 2–3 cm;

plants wild 3a. subsp. *trifolia*

1b. Inflorescences with 3 whorls of

branches at base; tubers 5–10 cm;

plants cultivated 3b. subsp. *leucopetala*

3a. *Sagittaria trifolia* subsp. *trifolia*

野慈姑(原亚种) ye ci gu (yuan ya zhong)

Sagittaria sagittifolia Linnaeus var. *longiloba* Turczaninow; *S. trifolia* var. *angustifolia* Kitagawa; *S. trifolia* f. *longiloba* (Turczaninow) Makino; *S. trifolia* var. *longiloba* (Turczaninow) Kitagawa; *S. trifolia* var. *retusa* J. K. Chen, S. C. Sun & H. Q. Wang.

Tubers usually 2–3 cm. Leaves larger, middle lobe not linear, more than 1.5 cm wide, apex acuminate, lateral lobes 1–1.4 × as large as middle lobe. Inflorescences with only 1 or 2(or 3) whorls of branches at base.

Ponds, lakes, marshes, paddy fields and channels. Anhui, Beijing, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Jiangsu, Liaoning, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Afghanistan, India, Indonesia (Borneo, Java), Japan (including Ryukyu Islands), Kazakhstan, Korea, Kyrgyzstan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Russia, Tajikistan, Thailand, Uzbekistan, Vietnam; SW Asia, Europe].

Most specimens determined as *Sagittaria sagittifolia* are, in fact, this taxon.

3b. *Sagittaria trifolia* subsp. *leucopetala* (Miquel) Q. F. Wang, comb. nov.

华夏慈姑 hua xia ci gu

Basionym: *Sagittaria sagittifolia* var. *leucopetala* Miquel, Ill. Fl. Archip. Ind. 2: 49. 1870; *S. edulis* Schlechtendal; *S. leucopetala* (Miquel) Bergmans; *S. sagittifolia* var. *edulis* (Schlechtendal) Siebold ex Miquel; *S. sagittifolia* subsp. *leucopetala* (Miquel) Hartog; *S. sagittifolia* f. *sinensis* (Sims) Makino; *S. sinensis* Sims; *S. trifolia* var. *edulis* (Schlechtendal) Ohwi ex W. T. Lee; *S. trifolia* var. *sinensis* (Sims) Makino.

Tubers 5–10 × 4–6 cm. Leaves large, middle lobe broadly ovate, apex obtuse. Inflorescences with 3 whorls of branches at base, each whorl 3- or more branched.

Cultivated S of the Chang Jiang. Anhui, Fujian, Guangxi, Guizhou, Hainan, Henan, Shaanxi, Yunnan, Zhejiang [also cultivated in Japan and Korea].

4. *Sagittaria lichuanensis* J. K. Chen, S. C. Sun & H. Q. Wang, Bull. Bot. Res., Harbin 4(2): 129. 1984.

利川慈姑 li chuan ci gu

Sagittaria wuyiensis J. K. Chen.

Stolons usually lacking. Leaves aerial, erect; blades sagittate, apex acuminate, lateral lobes 6–9 cm, middle lobe 4.5–8 × 2.5–6 cm, with 3–11 bulbs in each sheath. Inflorescences paniculate, 15–20 cm, in 4 to many whorls of (2 or)3 flowers, lowest whorl usually branched; female flowers on lowest 1(or 2) whorls; bracts free or connate toward base. Flowers unisexual. Sepals not reflexed, ovate, ca. 7 × 4 mm. Petals suborbicular, 6–7 × ca. 5 mm. Stamens 15–18; anthers yellow. Achenes 0.8–1 × 0.4–0.5 mm, narrowly winged, with a short beak. Fl. and fr. Jul–Aug. $2n = 22^*$.

• Marshes, paddy fields and channels; ca. 1700 m. Fujian, Guangdong, Guizhou, Hubei (Lichuan), Jiangsu, Jiangxi, Zhejiang.

5. *Sagittaria potamogetonifolia* Merrill, Sunyatsenia 1: 189. 1934 [*“potamogetifolia”*].

小慈姑 xiao ci gu

Stolons usually lacking. Aerial leaves elliptic to ovate or sagittate, 3.5–11 cm, apex acuminate, lateral lobes 2–6 cm × 1.5–6 mm, middle lobe 1.5–5 × 2–10 mm, with 1 or 3 bulbs in each sheath; submerged leaves lanceolate, 2–9 cm × 2–4 mm. Inflorescences racemose, in 2 to many whorls of (2 or)3 flowers; bracts free. Flowers unisexual; female flowers 1 or 2(or 3), on lowest whorl, pedicels 2–7 mm; male flowers with pedicels 1.2–4 cm. Sepals reflexed, ovate, 3–4.5 × 2.5–3 mm. Petals broadly obovate, 4–10 × 6–6.5 mm. Stamens 9–21; anthers yellow. Achenes obovoid, 5–7 × 4.5–6 mm, with an abaxial undulate or smooth wing, and an adaxial beak. Fl. and fr. May–Sep. $2n = 22^*$.

• Paddy fields, marshes, and channels. Anhui, Fujian, Guangdong, Guangxi, Hainan, Hubei, Hunan, Jiangxi, Yunnan, Zhejiang.

6. *Sagittaria tengtsungensis* H. Li, Fl. Yunnan. 4: 767. 1986.

腾冲慈姑 teng chong ci gu

Plants stoloniferous. Aerial leaves linear-lanceolate, 7–10 cm × 7–12 mm, base attenuate, apex acuminate; submerged leaves linear or reduced to a phyllode, 4–5 cm × 2–4 mm. Inflorescences racemose, 7–12 cm, in 2–4 whorls of (2 or)3 flowers; bracts broadly ovate, usually connate at base. Flowers unisexual; female flowers not exceeding 2, restricted to lowest whorl, sessile or only with very short pedicel; male flowers with pedicel 2–3 cm. Sepals not reflexed, elliptic, 5–7.5 × 4–5 mm. Petals ca. 1 cm. Stamens numerous; anthers yellow. Achenes obovoid, ca. 2 mm, with smooth, entire wing and an adaxial beak. Fl. and fr. Jun–Sep. $2n = 22^*$.

Marshes; 1700–2100 m. Xizang, Yunnan [Bhutan, Nepal].

7. *Sagittaria pygmaea* Miquel, Ann. Mus. Bot. Lugduno-Batavi 2: 138. 1865.

矮慈姑 ai ci gu

Sagittaria altigena Handel-Mazzetti ex Samuelsson; *S. sagittifolia* Linnaeus var. *pygmaea* (Miquel) Makino.

Plants stoloniferous. Petiole indistinct; leaf blade linear or subspatulate, 2–29 cm × 2–11 mm, sheathing basally, apex acuminate or obtuse. Inflorescences racemose, 1–10 cm, in 2 or 3 whorls of 3 flowers; bracts elliptic. Flowers unisexual; female flowers not exceeding 2, restricted to lowest whorl, sessile or only with very short pedicels; male flowers with pedicels 0.5–3 cm. Sepals obovate, 5–7 × 3–5 mm. Petals orbicular, 1–1.5 × 1–1.6 cm. Stamens 6–21; anthers yellow. Achenes broadly obovoid, 3–5 × 3–3.5 mm, abaxially cristate, with a broad wing and an adaxial beak. Fl. and fr. May–Nov. $2n = 22^*$.

Paddy fields, marshes, and channels. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Sichuan, Taiwan, Yunnan, Zhejiang [Japan (including Ryukyu Islands), Korea, Thailand, Vietnam].

Specimens with one whorl of staminodes and leaves retuse at apex from Dongchuan, Yunnan, which were described as *Sagittaria altigena*, appear to be in the range of variety of this species rather than a distinct taxon.

2. RANALISMA Stapf, Hooker's Icon. Pl. 27: t. 2652. 1900.

毛茛泽泻属 mao gen ze xie shu

Herbs, aquatic or of marshes. Leaves aerial, floating, or submerged, all radical, erect, long petiolate, ovate to ovate-elliptic. Flowers usually solitary or up to 3 at apex of scape, bisexual, pedicellate. Petals usually larger than or ca. as large as sepals. Stamens 9. Carpels numerous in a subglobose head, free, spirally arranged, each with 1 ovule; style erect. Fruitlets achenelike. Achenes laterally compressed, with a long stylar beak.

About two species: Asia, also tropical and subtropical regions of Africa; one species in China.

1. *Ranalisma rostrata* Stapf, Hooker's Icon. Pl. 27: t. 2652. 1900.

长喙毛茛泽泻 chang hui mao gen ze xie

Echinodorus ridleyi Steenis; *E. rostratus* (Stapf) Gagnepain (1929), not (Nuttall) Engelm ex A. Gray (1848).

Plants stoloniferous. Petiole 12–32 cm; leaves entire; floating or aerial leaves ovate to ovate-elliptic, 3–4.5 × 3–3.5

cm, base subcordate, apex subacute. Flowers 1–3 at apex of scape; bracts 2, spatulate, ca. 7 mm. Sepals broadly elliptic, ca. 5 mm. Petals obovate-elliptic, usually ca. as long as sepals. Stamens ca. 2.5 mm; anthers elliptic. Carpels crowded, with an apical, persistent style; receptacle oblong. Achenes ± obtriangular; beak 3–5 mm. Fl. and fr. Aug–Sep. $2n = 22^*$.

Marshes, very rare in China. Hunan, Jiangxi, Zhejiang [India, Malaysia (Peninsular), Vietnam].

3. CALDESIA Parlatore, Fl. Ital. 3: 598. 1860.

泽藨草属 ze tai cao shu

Herbs, aquatic, perennial, rhizomatous. Leaves all basal, aerial, floating, or submerged, ovate to elliptic; floating leaves deep green, large; aerial leaves subleathery, with erect petiole; submerged leaves usually smaller. Inflorescences paniculate or racemose, much branched; branches whorled, each whorl with 3–6 branches; bracts lanceolate. Flowers pedicellate, verticillate, bisexual. Petals usually larger than sepals. Stamens 6–12. Carpels few to numerous in a single whorl, free, each with 1 ovule. Fruitlets drupaceous, with woody endocarp and spongy exocarp, swollen or slightly compressed, with a short beak.

About three species: Africa, Asia, Australia, Europe; two species in China.

- 1a. Leaves longer than broad, apex obtuse, not ribbed, base deeply cordate; stamens 6 1. *C. parnassifolia*
 1b. Leaves shorter than broad, apex notched, ribbed, base not cordate; stamens 9–12 2. *C. grandis*

1. *Caldesia parnassifolia* (Bassi ex Linnaeus) Parlatore, Fl. Ital. 3: 599. 1860.

泽藨草 ze tai cao

Alisma parnassifolium Bassi ex Linnaeus, Syst. Nat., ed. 12, 3: 230. 1768; *A. parnassifolium* var. *majus* Micheli; *A. reniforme* D. Don; *Caldesia parnassifolia* var. *major* (Micheli) Buchenau; *C. reniformis* (D. Don) Makino; *Echinodoros parnassifolius* (Bassi ex Linnaeus) Engelm.

Rhizomes creeping. Petiole 5–100 cm; leaf blade ovate or elliptic, 2–10 × 1.5–7 cm, veins 9–15, base cordate to deeply so, apex obtuse. Scapes erect or not, 30–125 cm high; inflorescences paniculate, 20–35 cm. Flowers 3-verticillate; pedicels 2.5–4 cm. Sepals persistent, ovate, 3.5–5 × 2–3 mm. Petals ovate, larger than sepals. Stamens 6. Carpels 5–10, laterally compressed; style 2(–4) mm, slender. Fruitlets obovoid, ca. 3 × 2 mm, with 3–5 longitudinal ribs abaxially and an erect beak. Fl. and fr. May–Oct. $2n = 22^*$.

Lakes, ponds, marshes. Heilongjiang, Hunan, Jiangsu, Nei Mongol, Shanxi, Yunnan, Zhejiang [India, Japan, Korea, Nepal, Pakistan, Russia, Thailand, Vietnam; Africa, Australia, Europe].

2. *Caldesia grandis* Samuelsson, Svensk Bot. Tidskr. 24: 116. 1930.

宽叶泽藨草 kuan ye ze tai cao

Rhizomes erect. Petiole 15–55 cm; leaf blade suborbicular, 4.5–7 × 6–8 cm, veins 9–12, base usually subtruncate, apex notched, ribbed. Scapes erect, 30–60 cm high; inflorescences paniculate. Flowers 3-verticillate; pedicels 1.2–2 cm. Sepals persistent, reflexed, elliptic to broadly ovate, 3–4 mm. Petals reflexed, white, spatulate or subobovate, 6–7 mm. Stamens 9–12. Carpels usually 15–17; style ca. 1.5 mm, slender. Fruitlets subobovoid, ca. 2 mm, with 3–5 longitudinal ribs abaxially and an erect beak. Fl. and fr. Jul–Sep. $2n = 22^*$.

Lakes, marshes. Guangdong, Hubei, Hunan, Taiwan, Yunnan [Bangladesh, India, Malaysia].

4. ALISMA Linnaeus, Sp. Pl. 1: 342. 1753.

泽泻属 ze xie shu

Herbs, aquatic or of marshes, usually with a tuber. Leaves aerial, floating, or submerged, all basal, petiolate, margin entire. Inflorescences paniculate or occasionally umbellate; branches whorled, each one usually secondarily branched and with bracts at base. Flowers bisexual. Petals usually larger than sepals. Stamens 6. Carpels numerous in a single whorl, free, each with 1 ovule. Achene laterally compressed, 1- or 2-grooved or canaliculate abaxially, with a usually adaxial beak.

About 11 species: temperate and subtropical regions; six species (one endemic) in China.

- 1a. Anthers broader than long; style 0.1–0.2 mm; plants slender 6. *A. nanum*
 1b. Anthers narrower than long; style longer than 0.4 mm; plants ± robust.
 2a. Aerial leaves usually elliptic to ovate, base subcordate or truncate.
 3a. Petals marginally denticulate; carpels regularly arranged; styles 0.7–1.5 mm 1. *A. plantago-aquatica*
 3b. Petals marginally undulate; carpels irregularly arranged; styles ca. 0.5 mm 2. *A. orientale*
 2b. Aerial leaves lanceolate to broadly lanceolate, base cuneate.
 4a. Lateral pericarp thin, translucent; styles substraight; anthers 1–1.2 mm 3. *A. lanceolatum*
 4b. Lateral pericarp thickish, opaque; styles recurved; anthers 0.5–0.8 mm.
 5a. Leaves ± falcate; achenes abaxially 1-caliculate; styles not cirriform-recurved 5. *A. canaliculatum*
 5b. Leaves not falcate; achenes abaxially 1- or 2-grooved; styles cirriform-recurved 4. *A. gramineum*

1. *Alisma plantago-aquatica* Linnaeus, Sp. Pl. 1: 342. 1753.

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Tubers 1–3.5 cm in diam. Aerial leaves with petiole 1.5–30 cm; leaf blade broadly lanceolate or elliptic to ovate, 2–11 × 1.3–7 cm, sometimes larger, veins 5, base subcordate or trun-

cate but sometimes cuneate, apex usually acuminate. Panicles 15–50 cm, in 3–8 whorls of 3–9 branches. Pedicel 1–3.5 cm. Sepals broadly ovate, 2.5–3.5 × 2–3 mm. Petals white or purplish white, suborbicular, larger than sepals, margin denticulate. Anthers elliptic, ca. 1 mm. Carpels regularly arranged; styles erect, filiform, longer than ovary, 0.7–1.5 mm, stigmatose in

upper 1/9–1/5 of their length. Achenes elliptic or suboblong, ca. 2.5×1.5 mm, 1- or 2-grooved abaxially; lateral pericarp thickish, opaque. Fl. and fr. May–Oct. $2n = 14^*$.

Margins of lakes, ponds, marshes, channels, slow-moving rivers. Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Xinjiang, Yunnan [Afghanistan, India, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Myanmar, Nepal, Pakistan, Russia, Tajikistan, Thailand, Uzbekistan, Vietnam; Africa, SW Asia, Australia, Europe, North America].

2. *Alisma orientale* (Samuelsson) Juzepczuk in Komarov, Fl. URSS 1: 281. 1934.

东方泽泻 dong fang ze xie

Alisma plantago-aquatica Linnaeus var. *orientale* Samuelsson, Acta Horti Gothob. 2: 84. 1926; *A. plantago-aquatica* subsp. *orientale* (Samuelsson) Samuelsson.

Tubers 1–2 cm in diam. Aerial leaves with petiole 3–34 cm; leaf blade broadly lanceolate to elliptic, $3.5\text{--}11 \times 1.3\text{--}7$ cm, sometimes larger, 5–7-veined, base rounded or subcordate, apex acuminate. Panicles 20–70 cm, in 3–9 whorls of 3–9 branches. Pedicel 0.5–2.5 cm. Sepals ovate, $2\text{--}2.5 \times$ ca. 1.5 mm. Petals white or pinkish, suborbicular, larger than sepals, margin undulate. Anthers ca. $0.5 \times 0.3\text{--}0.4$ mm. Carpels irregularly arranged; styles erect, ca. 0.5 mm, longer than ovary, stigmatose in upper ca. 1/5 of their length. Achenes elliptic, $1.5\text{--}2 \times$ ca. 1 mm, 1- or 2-grooved abaxially; lateral pericarp usually opaque, thickish. Fl. and fr. May–Sep. $2n = 28^*$.

Margins of lakes, ponds, marshes, channels; below 2500 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Yunnan, Zhejiang [India, Japan, Kashmir, Korea, Mongolia, Myanmar, Nepal, Russia, Vietnam].

This species is similar to *Alisma plantago-aquatica* but differs in having flowers and fruit smaller, styles only ca. 0.5 mm, and petal margins and carpels irregularly arranged.

3. *Alisma lanceolatum* Withering, Bot. Arr. Brit. Pl., ed. 3, 2: 362. 1796.

膜果泽泻 mo guo ze xie

Alisma plantago-aquatica Linnaeus var. *lanceolatum* (Withering) Lejeune.

Tubers 1–2 cm in diam. Aerial leaves with petiole 13–25 cm; leaf blade lanceolate to broadly lanceolate or elliptic, $9\text{--}13 \times 2.5\text{--}5$ cm, sometimes larger, 5–7-veined, base cuneate, apex acute to acuminate. Panicles 15–45, in 3–6 whorls of 3–6 branches. Pedicel 1.5–2.5 cm. Sepals broadly ovate, $1.5\text{--}3.2 \times 2\text{--}2.5$ mm. Petals white or pinkish, suborbicular, 4–6.5 mm, larger than sepals, margin irregular. Anthers elliptic or oblong, 1–1.2 mm. Carpels regularly arranged; styles \pm erect, 0.6–1 mm, equaling or shorter than ovary, stigmatose in upper 1/3–1/2 of their length. Achenes obovoid, 1.6–2(–3) mm, 1-grooved abaxially; lateral pericarp translucent, thin. Fl. and fr. Jun–Sep. $2n = 24, 26, 28$.

Margins of lakes, marshes, channels, slow-moving rivers. Heilongjiang, Jilin, Liaoning, Nei Mongol, Shaanxi, Xinjiang, Yunnan

[Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan; N Africa, SW Asia, Australia, Europe].

4. *Alisma gramineum* Lejeune, Fl. Spa 1: 175. 1811.

草泽泻 cao ze xie

Alisma loeselii Gorski ex Juzepczuk.

Tubers small or not evident. Aerial leaves with petiole 2–31 cm; leaf blade lanceolate, $3\text{--}12.5 \times 0.6\text{--}2$ cm, sometimes larger, 3–5-veined, base cuneate, apex acuminate. Panicles 6–56 cm, in 2–5 whorls of 3–9 branches. Pedicel 1.5–4.5 cm. Sepals broadly ovate, $2.5\text{--}4.5 \times 1.5\text{--}2.5$ mm. Petals white, suborbicular, larger than sepals. Anthers elliptic, ca. 0.5 mm. Carpels regularly arranged; styles erect, ca. 0.4 mm, shorter than ovary, cirriform-recurved, stigmatose in upper 1/3–1/2 of their length. Achenes obovoid or triangular, 2–3 mm, 1- or 2-grooved abaxially; lateral pericarp splendent, opaque, thickish. Fl. and fr. Jun–Sep. $2n = 14, 16$.

Margins of lakes, ponds, marshes, channels. Gansu, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang [Afghanistan, Kazakhstan, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan; Africa, SW Asia, Europe, North America].

5. *Alisma canaliculatum* A. Braun & C. D. Bouché, Index Seminum Hort. Berol. 1867(App.): 4. 1867.

窄叶泽泻 zhai ye ze xie

Alisma plantago-aquatica Linnaeus var. *canaliculatum* (A. Braun & C. D. Bouché) Miyabe & Kudô.

Tubers 1–3 cm in diam. Aerial leaves with petiole 9–30 cm; leaf blade slightly falcate, lanceolate, $6\text{--}45 \times 1\text{--}5$ cm, 3–5-veined, base cuneate or gradually attenuate to petiole, apex acuminate. Panicles 35–65 cm, in 3–6 whorls of 3–9 branches. Pedicel 2–4.5 cm. Sepals oblong, 3–3.5 mm. Petals white, suborbicular, margin irregular. Anthers ca. 0.8 mm. Carpels regularly arranged; styles recurved, ca. 0.5 mm, stigmatose in upper ca. 1/3 of their length. Achenes obovoid, 2–2.5 mm, 1-canaliculate on back; lateral pericarp opaque, thickish. Fl. and fr. May–Oct. $2n = 28, 34, 40, 42^*$.

Margins of lakes, ponds, marshes, streams. Anhui, Fujian, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Taiwan, Zhejiang [India, Japan (including Ryukyu Islands), Korea].

6. *Alisma nanum* D. F. Cui, Bull. Bot. Res., Harbin 12: 369. 1992.

小泽泻 xiao ze xie

Plants slender, without tubers. Aerial leaves with petiole 1.2–4 cm, slender; leaf blade broadly lanceolate or elliptic to ovate, $1.5\text{--}3.7 \times 0.6\text{--}2.3$ cm, base rounded or slightly cuneate, apex acute. Panicles 2–9 cm, in 1–3 whorls of 3–9 branches, rarely umbellate. Pedicel 1–2.5 cm. Sepals broadly ovate, ca. 1.5×1.2 mm. Petals white or pinkish, equaling or larger than sepals. Anthers ca. 0.2×0.5 mm. Carpels 8–12; styles 0.1–0.2 mm, shorter than ovary, stigmatose in upper 1/5–1/3 of their length. Achenes elliptic, ca. 1.5 mm, 1-grooved abaxially; lateral pericarp translucent, thin. Fl. and fr. Jul–Sep.

• Marshes; ca. 600 m. Xinjiang.

5. BUTOMOPSIS Kunth, Enum. Pl. 3: 164. 1841.

拟花蔺属 ni hua lin shu

Tenagocharis Hochstetter.

Herbs, annual, of marshes, with milky juice. Leaves petiolate, elliptic to elliptic-lanceolate. Scapes erect; umbels terminal; bracts forming an involucre. Pedicels slender. Sepals persistent, green, margin membranous. Petals white. Stamens usually 8 or 9, free. Carpels 6–9, 1-whorled. Follicles with a short beak. Seeds strongly curved; embryo horseshoe-shaped.

One species: tropical regions of N Africa and Asia, N Australia.

1. Butomopsis latifolia (D. Don) Kunth, Enum. Pl. 3: 165. 1841.

拟花蔺 ni hua lin

Butomus latifolius D. Don, Prodr. Fl. Nepal. 22. 1825; *Butomopsis lanceolata* (Roxburgh) Kunth; *Butomus lanceolatus* Roxburgh; *Tenagocharis lanceolata* (Roxburgh) Baillon; *T. latifolia* (D. Don) Buchenau.

Petiole 5–20 cm; leaf blade 5–15 × 1–5 cm, 3–7-veined,

base attenuate, apex acute. Scapes 10–30 cm; umbels 3–15-flowered; bracts ca. 1.3 cm. Pedicels 2–14 cm. Sepals broadly elliptic, ca. 5 × 3 mm, margin membranous, apex rounded or retuse. Petals ca. 6 × 4 mm. Filaments 1.5–3 mm; anthers 1–1.5 mm. Carpels ca. 5.5 mm. Follicles 1–1.2 cm. Seeds brown, ca. 0.5 mm. Fl. and fr. May–Sep.

Marshes, paddy fields. S Yunnan [Bangladesh, India, Indonesia (Java), Laos, Myanmar, Nepal, Thailand, Vietnam; N Africa, N Australia].

6. LIMNOCHARIS Bonpland in Humboldt & Bonpland, Pl. Aequin. 1: 116. 1807.

黄花蔺属 huang hua lin shu

Herbs, aquatic, with aerial leaves. Leaves petiolate, ovate to orbicular. Scapes erect; umbels terminal; bracts forming an involucre. Pedicels thick. Sepals persistent, green. Petals yellowish, thin. Stamens numerous, with sterile staminodes in outermost whorl; filaments flattened. Carpels numerous, free, crowded into a head, laterally compressed; stigmas sessile. Seeds numerous, strongly curved; embryo horseshoe-shaped.

One species: tropical and subtropical regions from S North to South America, naturalized throughout S and SE Asia.

1. Limnocharis flava (Linnaeus) Buchenau, Abh. Naturwiss. Vereins Bremen 2: 2. 1869.

黄花蔺 huang hua lin

Alisma flavum Linnaeus, Sp. Pl. 1: 343. 1753; *Dama-sonium flavum* (Linnaeus) Miller; *Limnocharis emarginata* Humboldt & Bonpland.

Petiole trigonous, 20–65 cm, stout; leaf blade 6–28 × 4.5–20 cm, veins 9–13, transverse veins numerous, parallel, base obtuse or subcordate, apex obtuse or retuse. Scapes upper tri-

gonous, 20–90 cm; umbels 2–15-flowered; bracts green, orbicular to broadly elliptic, 1.5–2 × 1–1.5 cm. Pedicels 2–7 cm. Petals yellowish but blackish toward base, broadly ovate to orbicular, 2–3 × 1–2 cm, apex rounded. Stamens shorter than petals; filaments green. Carpels yellowish green. Fruit cluster 1.5–2 cm in diam.; follicles suborbicular. Seeds brown. Fl. Mar–Apr.

Naturalized in marshes and shallow water; 600–700 m. Guangdong, S Yunnan [native to the Caribbean, Central America, North America (Mexico), and South America; naturalized throughout S and SE Asia].