

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

慈姑属 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. tengsungensis*

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*

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; *Lophotocarpus 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. Inflores-

cences 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, subaxial 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 suborbicu-

lar, 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.

