TRAPACEAE

菱科 ling ke

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Herbs annual, aquatic, rooted or floating. Stem submerged, slender, unbranched, internodes elongate; adventitious roots developing from leaf scars, highly dissected, leaflike, photosynthetic. Leaves dimorphic; stipules deeply cleft; submerged leaves opposite, sessile, simple, linear, caducous; floating leaves crowded terminally into a rosette, petiolate; petiole inflated about the middle; leaf blade rhombic to deltoid, distal half of margin coarsely dentate. Flowers solitary in upper leaf axils, flowering at water surface, bisexual, 4-merous, actinomorphic. Floral tube (hypanthium) developed, partly epigynous. Sepals 4, valvate, persistent as hardened horns of fruit. Petals 4, white or lilac, deciduous. Stamens 4, antesepalous; anthers introrse, versatile. Ovary surrounded by a coronary disk, partly inferior, becoming inferior in fruit, 2-loculed; ovules anatropous, pendulous, 1 per locule, 1 ovule undeveloped after anthesis; placentation axile. Stigma capitate, deciduous. Fruit indehiscent, (0–)2–4-horned, turbinate, cup-shaped, or elongate rhombic, exocarp succulent, ephemeral, endocarp stony, with a thin to prominent crest between and along horns, fruit topped by a dome-shaped or tetragonal to rounded crown, crown apex a pointed beak or tuft of hairs. Seed 1; cotyledons unequal, 1 large, starchy, retained in fruit, 1 small, scalelike, germinating from fruit apex, through pore of stylar canal; endosperm absent.

One genus and two species: subtropical and temperate regions of Africa, Asia, and Europe; introduced in Australia and North America; two species in China.

Trapa is allied morphologically to the Lythraceae by the partly inferior position of the ovary together with a host of other features, including basically opposite, simple leaves, development of the floral tube which persists in fruit, valvate sepals, 4-merous flowers, introrse and versatile anthers, axile placentation, and seeds without endosperm. *Trapa* is sufficiently similar to the Lythraceae and Onagraceae to have been considered for membership within either family or, as has been done here, as a closely related family. Molecular evidence suggests the closest relative is *Sonneratia* (Lythraceae).

Dimensions for the fruit body are described as height × width × thickness.

Wan Wenhao. 2000. Trapaceae. *In:* Chen Chiajui, ed., Fl. Reipubl. Popularis Sin. 53(2): 1–26.

1. TRAPA Linnaeus, Sp. Pl. 1: 120. 1753.

菱属 ling shu

Morphological characters and geographic distribution are the same as those of the family.

Numerous species and infraspecific taxa have been proposed based on variations in size and ornamentation of the fruit. However, these variations overlap to such an extent that a more discrete definition of taxa is not supported here.

Plants are regionally cultivated for their fruit, which contain abundant starch and are consumed both raw and cooked. The seeds are ground into a flour used for medicine and making starch and wine. The fruit and fresh plants can be used for pig feed.

1a. Plants small; stem 1–2.5 mm in diam.; leaves alternate, terminal rosette loose, if present, leaf blade rhombic-triangular, 1.5–3 × 2–4 cm, straight lateral edges forming near right angles at mid-blade, margin incised dentate; fruit narrowly rhombic, 4-horned, horns conic, tapering to a sharp point ..... 1. *T. incisa*

1b. Plants stout; stem 2.5–6 mm in diam.; leaves in terminal rosettes, leaf blade deltoid-rhombic, 4–6 × 4–8 cm, lateral edges rounded, margin variously dentate; fruit variously turbinate to shortly rhombic, (0–)2–4-horned, horns variously triangular to conic, base thickened, apex blunt to sharp, or some horns reduced to a process ..... 2. *T. natans*

1. Trapa incisa Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4: 134. 1845.

细果野菱 xi guo ye ling

Trapa bispinosa Roxburgh var. *incisa* (Siebold & Zuccarini) Franchet & Savatier; *T. incisa* var. *quadricaudata* Glück; *T. maximowiczii* Korshinsky; *T. maximowiczii* var. *tonkinensis* Gagnepain; *T. natans* Linnaeus var. *incisa* (Siebold & Zuccarini) Makino.

Stem 1–2.5 mm in diam. Petiole 5–15 cm, slender, slightly swollen distally or not; leaf blade glossy and dark green adaxially, green or sometimes purplish abaxially, often black-brown or with 2 dark spots basally, rhombic-triangular, 1.5–3 × 2–4 cm, glabrous or sparsely pubescent on veins, adaxially glabrous, base broadly cuneate, margin coarsely and sharply incised-dentate distally. Petals pink to pale purplish or white, 5–7 mm. Fruit narrowly rhombic, 0.8–1.5 × 1.2–2 × 0.7–1 cm, 4-horned, surface variously ribbed to smooth, crest absent, crown dome-shaped to inconspicuous, 1–3 mm, beak finely conic; horns conic, 1–1.5 cm, unequal, lower horns descending, upper horns horizontal to ascending, apex barbellate. Fl. May–Oct, fr. Jul–Nov. 2*n* = 48, 88*, 90*, 92*, ?96.

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Swamps, ponds; near sea level to 1000 m, to 2000 m in SW China. Anhui, Fujian, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Laos, Malaysia, Russia (Far East), Thailand, Vietnam].

2. Trapa natans Linnaeus, Sp. Pl. 1: 120. 1753.

欧菱 ou ling

Trapa acornis Nakano; *T. amurensis* Flerow; *T. amurensis* var. *komarovii* Skvortsov; *T. arcuata* S. H. Li & Y. L. Chang; *T. bicornis* Osbeck; *T. bicornis* var. *acornis* (Nakano) Z. T. Xiong; *T. bicornis* var. *bispinosa* (Roxburgh) Nakano; *T. bicornis* var. *cochinchinensis* (Loureiro) Steenis; *T. bicornis* var. *quadrispinosa* (Roxburgh) Z. T. Xiong; *T. bicornis* var. *taiwanensis* (Nakai) Z. T. Xiong; *T. bispinosa* Roxburgh; *T. bispinosa* var. *iinumae* Nakano; *T. chinensis* Loureiro; *T. cochinchinensis* Loureiro; *T. dimorphocarpa* Z. S. Diao; *T. japonica* Flerow; *T. japonica* var. *jeholensis* (Nakai) Kitagawa; *T. japonica* var. *longicollum* Z. T. Xiong; *T. japonica* var. *magnicorona* Z. T. Xiong; *T. japonica* var. *tuberculifera* (V. N. Vassiljev) Tzvelev; *T. jeholensis* Nakai; *T. korshinskyi* V. N. Vassiljev; *T. litwinowii* V. N. Vassiljev; *T. litwinowii* var. *chihuensis* S. F. Guan & Q. Lang; *T. manshurica* Flerow; *T. manshurica* var. *bispinosa* Flerow; *T. manshurica* f. *komarovii* (Skvortsov) S. H. Li & Y. L. Chang; *T. natans* var. *amurensis* (Flerow) Komarov; *T. natans* var. *bicornis* (Osbeck) Makino; *T. natans* var. *bispinosa* (Roxburgh) Makino; *T. natans* var. *japonica* Nakai; *T. natans* var. *pumila* Nakano ex Verdcourt; *T. natans* f. *quadrispinosa* (Roxburgh) Makino; *T. natans* var. *quadrispinosa* (Roxburgh) Makino; *T. potaninii* V. N. Vassiljev; *T. pseudoincisa* Nakai; *T. pseudoincisa* var. *aspinosa* Z. T. Xiong [*"aspinfa"*]; *T. pseudoincisa* var. *complana* Z. T. Xiong; *T. pseudoincisa* var. *nanchangensis* W. H. Wan; *T. pseudoincisa* var. *potaninii* (V. N. Vassiljev) Tzvelev; *T. quadrispinosa* Roxburgh; *T. quadrispinosa* var. *yongxiuensis* W. H. Wan; *T. saissanica* (Flerow) V. N. Vassiljev; *T. sibirica* Flerow; *T. sibirica* var. *saissanica* Flerow; *T. sibirica* var. *ussuriensis* Flerow; *T. taiwanensis* Nakai; *T. transzchelii* V. N. Vassiljev; *T. tuberculifera* V. N. Vassiljev.

Stem 2.5–6 mm in diam. Petiole (2–)5–18 cm, stout, ± swollen distally, pubescent; leaf blade glossy and dark green adaxially, greenish purple abaxially, often with colored spots between veins, deltoid-rhombic to oblate-rhombic, 4–6 × 4–8 cm, abaxially pubescent, adaxially glabrous, base broadly cuneate, margin irregularly dentate distally. Petals white, 7–10 mm. Fruit turbinate to shortly rhombic, 1.8–3 × 2–4.5 × 1–2.8 cm, (0–)2–4-horned, crest a prominent bulge to a thin rib, crown tetragonal to rounded, or dome-shaped, rarely crownless, 1–8(–11) mm, beak conic or a tuft of hairs; horns horizontal, ascending, or recurved, flat-triangular or broadly conic, 2–3.5 cm, apex barbellate or cultivated without barbs. Fl. May–Oct, fr. Jul–Nov. $2n = 44^*, 46^*, 48^*, 76^*, 90^*, ?96$.

Slow-moving rivers, lakes, swamps, ponds, also widely cultivated in China; near sea level to 2700 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang [India, Indonesia, Japan, Korea, Laos, Malaysia, Pakistan, Philippines, Russia, Thailand, Vietnam; Africa, SW Asia (Iran), Europe; widely cultivated in tropical and subtropical Asia; naturalized in Australia and North America].

In FRPS (53(2): 7, 9. 2000), the names *Trapa macropoda* Miki, *T. mammillifera* Miki, and *T. octotuberculata* Miki, all of which are based on fossil types, were misapplied to plants of *T. natans*.