

FSA contributions 10: Trapaceae

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Aquatic floating herbs. *Leaves* dimorphic: floating leaves alternate, in rosettes, only present at upper nodes, petiole spongy and more or less inflated about the middle; lamina rhombic to deltoid, the upper margins toothed, stipules small, scarious, divided to the base and thus apparently more than two per leaf; submerged leaves opposite, sessile, linear, entire, caducous. Adventitious roots developing from leaf scars of submerged leaves, containing chlorophyll, pinnatisect into many filiform segments; in those from upper nodes, segments shorter or absent. *Flowers* hermaphrodite, regular, 4-merous, solitary, from upper axils, pedunculate. *Sepals* 4. *Petals* 4, white. *Stamens* 4, perigynous. *Ovary* half-inferior, bilocular; ovules pendulous, 1 per locule; stigma capitate. *Fruit* a 1-seeded, top-shaped drupe; pericarp soon disappearing; endocarp hard, variously 2–4-horned; horns derived from persistent sepals; testa woody; cotyledons very unequal, 1 almost vestigial and not developing.

A single recent genus often included in the Onagraceae and seemingly closely related but with very distinct morphology. Miki (1959) has suggested derivation from Lythraceae and Corner (1976: 274) states that seed structure supports such an alliance and mentions that Maheshwari claims that embryological evidence denies close relationship with Onagraceae. *Hemitrapa* Miki, first described from the Miocene of Japan, is clearly distinct from *Trapa* and belongs with *Trapella* in Trapellaceae (~ Pedaliaceae). The adventitious roots have also been considered to be leaves but all the evidence (Couillault 1973) supports the other view.

5829000 TRAPA

Trapa L., Species plantarum 1: 120 (1753); L.: 56 (1754); Nakano: 440–458 (1913); A.Arber: 245 (1920); Gams: 884 (1925); Gams: 39–41, Karten 25–27 (1927); Steenis: 43 (1949); V.N.Vassil.: 638 (1949); Brenan: 1 (1953); Gams: 108–115, figs 1–6 (1958); Miki: 289–294 (1959); Nakano: 159–167 (1964); Sculthorpe: 328 (1967); C.D.K.Cook et al.: 537 (1974); Cronquist: 638 (1981); C.D.K.Cook: 217 (1990). Type species: *Trapa natans* L.

Characters of the family.

About 70 species have been described, most of them from Russia and adjacent areas. Some 25–30 species are still maintained by Russian botanists but most others recognise only a few or even only one polymorphic species with numerous varieties. The latter appears to be the best course and is followed here, although Szafer

(1954) argues the contrary. Daniel *et al.* (1983: 596) would not even recognise varieties. There are many fossil species, the genus having occurred throughout the Tertiary and extending into the Upper Cretaceous. The generic name is a contraction of *calcitrappa* (Latin), a caltrop, a defensive weapon at one time used chiefly against cavalry and somewhat like the fruits of the plant.

Trapa natans L., Species plantarum 1: 120 (1753); Gams: 884, fig. 2263–2269, t. 190/1 (1925); Brenan: 1, fig. 1 (1953); Roessler: 1 (1966); Tutin: 303 (1968); D.F.Chamb.: 196 (1972); C.D.K.Cook et al.: fig. 262 (1974); Brenan: 346, fig. 85 (1978); Verdc.: 448 (1986). Type: S Europe, Italy, Mantua, L. Superiore, *Fiori* 471 (K, neo!).

Annual with slender main axis 0.5–4.0 m long according to depth of water, unbranched or with 2–14 branches each ending in a floating rosette 150–500 mm wide. *Leaves*: blades often broader than long, 10–65 × 10–80 mm, glabrous above and beneath or hairy on nerves or densely hairy all over; petiole up to 210 mm long. *Sepals* lanceolate to narrowly triangular, 4–7 mm long. *Petals* oblanceolate to obovate, 8–16 mm long. *Fruit* up to ± 25 mm wide, very variably 2–4-horned.

Two varieties are distinguished in southern Africa:

Fruit 2-horned ... var. *bispinosa*
Fruit 4-horned ... var. *pumila*

5829000-1 var. *bispinosa* (Roxb.) Makino in Iinuma, Somoku-Dzusetsu (?Iconography of plants in Japan) edn 3, 1: 137 (1907); Dubois: 399 (1954); Brenan: 3 (1953); R.Fern. & A.Fern.: 203 (1970); Brenan: 348 (1978). Type: India, *Roxburgh* (BM, lecto!).

T. bispinosa Roxb. 3: 29, t. 234 (1815); Rech.f. 127: 1 (1978). *T. bicornis* Osbeck var. *bispinosa* (Roxb.) Nakano: 165 (1964).

T. cochinchinensis Lour., Flora cochinchinensis: 86 (1790). *T. bicornis* Osbeck var. *cochinchinensis* (Lour.) C.M.H.Glück ex Steenis: 43 (1949); Backer & Bakf.: 265 (1963). Type: N Vietnam, Hanoi, *Balansa* 4526 (P, neo.).

T. chinensis Lour.: 86 (1790). Type: as for *T. bicornis* L.f., Plum.: t. 67 bottom (1693) (holo!).

T. austroafricana V.N.Vassil.: 192, t. 12 (1965). Type: Zambia, Chingola, *Fanshawe* 2535 (K, holo!; SRGH).

T. congolensis V.N.Vassil., op. cit. 184, figs 8, 9 (1965). Type: Zaire, Leopoldville, *Couteaux* 1014 (BR, holo.).

T. insperata V.N.Vassil., op. cit. 178, fig. 3 (1965). Type: Angola, R. Cubango, *Gossweiler* 2087 (P, holo.).

Leaves sometimes purplish beneath. *Fruit* ± 30–50 mm wide overall, 2-horned, horns arising from upper angles, erecto-patent to arcuate-ascending or almost horizontal, straight or somewhat curved, conical, or attenuate above, ± 10–18 mm long and ± 4–7 mm wide near

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FIGURE 1.—A–L, *Trapa natans* var. *bispinosa*: A, habit, $\times 0.8$; B, part of leaf margin, lower surface, $\times 3.8$; C, nodes showing stipules, $\times 2.5$; D, flower, $\times 2.5$; E, l.s. flower, $\times 3.8$; F, two sepals, $\times 3.8$; G, petal, $\times 3.8$; H, anther, two views, $\times 7.6$; I, ovary and disc, $\times 7.6$. J–L, fruit: J, endocarp, $\times 1.2$; K, side view, $\times 1.2$; L, apex of horn, $\times 2.5$. M–O, fruit of *T. natans* var. *pumila*: M, endocarp, $\times 1.2$; N, side view, $\times 1.2$; O, apex of horn, $\times 2.5$. A–D, Smith 2987; E–I, Biegel & Gibbs Russell 3714; J, K, Gibbs Russell 2786; L, Ellis 3073; M–O, Wager 37369.

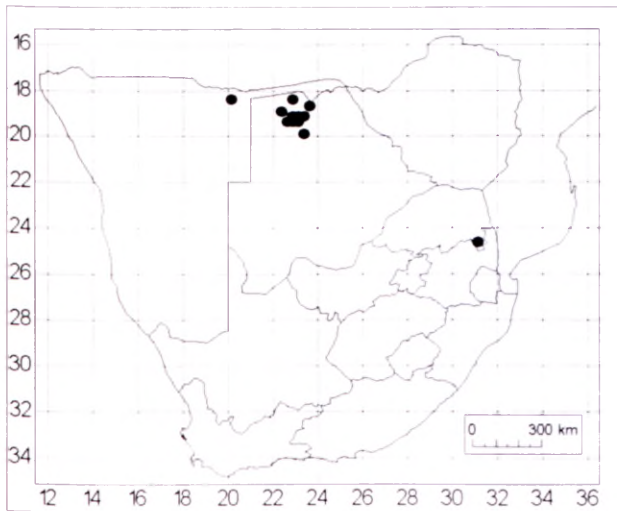


FIGURE 2.—Distribution of *Trapa natans* var. *bispinosa* in southern Africa.

base, sharp at point and usually reflexedly barbed for a little way below it; an additional inferior tubercle or short reflexed blunt horn may be present on each side and occasionally 2 further small projections above it. Figure 1A–L.

In NE Namibia along the Okavango River, N Botswana (Okavango Swamp) and Northern Province—formerly northeastern Transvaal (Figure 2). Also in W Africa, Zaïre, Sudan, Tanzania, Zambia, Zimbabwe, Malawi, Mozambique and Angola, throughout India, Indochina, China and Japan, also in Java. Rooted in soft mud in slowly flowing water, reedswamps, permanent pans etc.; 940–1 030 m.

Vouchers: Biegel & Russell 3714 (K: SRGH); De Winter & Marais 4473, 4765 (K: PRE); Dinter 7198 (K: PRE); Ellis 3073 (PRE).

The form with additional blunt horns (Van Cuong & Vidal *loc. cit.* 1973: t. 6/9) corresponds to var. *jinumai* Nakano.

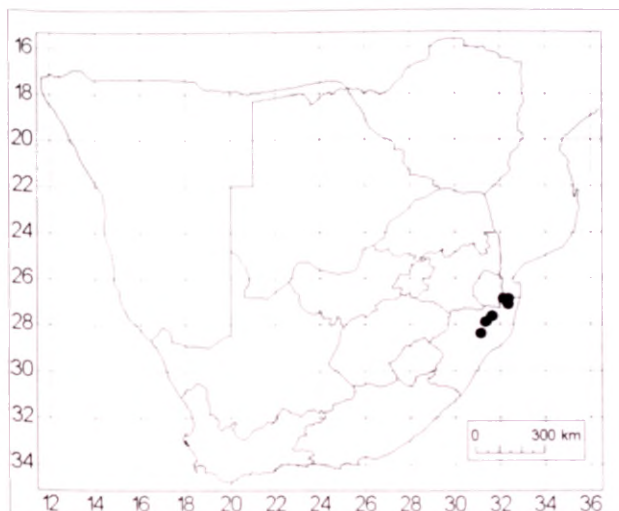


FIGURE 3.—Distribution of *Trapa natans* var. *pumila* in South Africa.

5829000-2 var. *pumila* Nakano ex Verdc. in Kew Bulletin 41: 448 (1986). Type: Vietnam, Hanoi, *Balansa 4721* (P, holo.!; K, iso.!).

T. natans L. var. *incisa* Makino in Botanical Magazine, Tokyo 22: 172 (1908); Nakano: 454, t. 2/33–34 (1913) 'grosse Formen'; *T. natans* L. var. *pumila* Nakano: 166 (1964); Van Cuong & J.E. Vidal: 46, t. 7/5–6 (1973) based on var. *incisa* 'grosse Formen' but no type cited, nom. invalid.

Fruit ± 40 mm wide overall, 4-horned, 2 fairly slender horns slightly ascending from upper angles 10–15 mm long and 2 strongly deflexed curved inferior horns mostly ± 10 mm long, all sharp and usually with reflexed barbs. Sometimes 2 additional short projections above inferior horns. Figure 1M–O.

In KwaZulu-Natal, Tongoland, Ingwavuma (Figure 3), also in Cameroon (*Saxer 275*), Japan, Indochina, Vietnam, India? Mainly in swamps and pans; 0–100 m.

Vouchers: Moll 1762 (PRE); Musil 46 (Univ. Nat.); Wager NH 37369 (NH, PRE).

Very likely *T. quadrispinosa* Roxb. (Type locality: Bangladesh, Sylhet) is this variant, but neither a specimen nor a drawing has been found; Vassiljev has chosen *Stewart 3351½* from Kashmir as 'lectotype' although presumably neotype was meant. It is also what Glück was going to call *T. incisa* var. *quadricaudata* forma *laevigata* and forma *tuberculosa* in his proposed monograph. *T. natans* var. *africana* has much longer more slender ± equal spines.

The various forms of water chestnut are much cultivated, particularly in E Asia, and extensively used in Chinese cuisine. Nakano's careful work over half a century has shown these are well-marked taxa but I have preferred to treat them as varieties. Unfortunately he did not follow normal taxonomic procedure of typification.

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