

# CALLITRICHACEAE (C. A. Backer, Heemstede)

## 1. CALLITRICHE

LINNÉ, Sp. Pl. (1753) 969; Gen. Pl. ed. 5 (1754) no 13.

Delicate, annual or perennial herbs, aquatic and then either entirely submersed, or floating in the upper part, or, in humid localities, not rarely terrestrial and creeping, with slender stems. *Leaves* opposite, at the summits of floating stems often spuriously rosulate, exstipulate, small, linear, elliptic, oblong or spatulate, entire, herbaceous, in the *Mal. sp.* triplennerved. *Flowers* minute, unisexual, axillary, solitary or rarely one ♂ and one ♀ flower from the same axil, often with 2 caducous, transversal, opposite, tender concave bracts. Calyx and corolla absent. ♂: Stamen 1; filament thin, anther 2-celled, cells bursting lengthwise, the slits becoming confluent at the top. ♀: Ovary sessile or subsessile, 4-lobed, 4-celled. Ovule solitary in each cell, pendulous from the top of the cavity. Styles 2, free, often long, papillose. *Fruit* 4-lobed, with longitudinally margined or winged lobes. Testa membranous; endosperm fleshy; embryo terete, straight.

**Distr.** Only genus in the family, worldwide distributed, not yet known from S. Africa and in various regions scarce, in *Malaysia* apparently very rare, the only record proving its being indigenous is from the New Guinean highlands. Because of their small size terrestrial forms are easily overlooked.

**Ecol.** Stagnant or slowly moving fresh water, or, in humid localities, terrestrial, often gregarious.

**Notes.** The number of recognized species greatly depends on personal conception of specific delimitation, and so varies from few to  $\pm 25$ . The difficulties are partly due to the inconstancy of the vegetative characters under various ecological conditions. Submerged leaves of several species are narrowly linear with a notched apex as figured in HEGI, Ill. Fl. Mitt.-Eur. 5, 1 (1925) f. 1804, as, c3. See below under *C. verna*.

**Nomencl.** The nomenclature of the species is, if formal typification is applied, very much confused, according to HYLANDER (Uppsala Univ. Årsskr. 1945, no 7, p. 235-236). As SAMUELSSON has shown (Veröff. Geobot. Inst. Rübél 3, 1925, 603-628, fig. 1), the earliest Linnean species *C. palustris* embraces 5 species. LINNÉ himself split it into two others, one of which is, of course superfluous, and both of which also comprise more than one species. Following SAMUELSSON, the best, at least the most practical, solution is to reject these earlier Linnean names as *nomina ambigua*, and accept the species as defined or emended by LÖNNROTH in his Uppsala thesis of 1854, as has been done by most subsequent authors.

**Syst.** There is no unanimity about the systematical position of the genus which is placed in the *Geraniales* by ENGLER, and in the *Lythrales* by HUTCHINSON. C. A. JÖRGESEN (Jahrb. Wiss. Bot. 64, 1925, 440-442) is of opinion that it represents a reduced sympetalous type.

1. *Callitriche verna* LINNÉ, Fl. Suec. ed. 2 (1755) 2; KÜTZING in RCHB. Ic. Bot. Cent. 9 (1831) t. 881; Linnaea 7 (1832) 175; *emend.* LÖNNROTH, Thesis Uppsala (1854); KOCH, Syn. Fl. Germ. (1837) 212; HEGELM. Monogr. Callitriche (1864) 55; SAMUELSSON, Veröff. Geobot. Inst. Rübél 3 (1925) 623-624, f. 1e; HEGI, Ill. Fl. Mitt.-Eur. 5, 1 (1925) 290, f. 1804 d1-d9; PAX & HOFFM. in E. & P. ed. 2, 19c (1931) 239, f. 126 A-E; MERR. & PERRY, J. Arn. Arb. 29 (1948) 158.—*C. papuana* MERR. & PERRY, Journ. Arn. Arb. 22 (1941) 258.—Fig. 1.

SAMUELSSON *l.c.*, points attention to the extremely high vegetative polymorphism of this species, due to habitat. There seems to be no necessity to name all these forms.

The Malaysian materials belong to 3 forms, a terrestrial, an aquatic partly emersed, and an aquatic entirely submersed form. The first and the third form differ much in aspect.

### *Terrestrial form.*—Fig. 1.

Minute delicate creeping herb rooting at the base, stem thin, branched, 1-2½ cm long, rather

densely leafy. Roots solitary from the lower nodes, thin, rather long. *Leaves* opposite, not pseudo-rosulate, elliptic-oblong-spatulate from a mostly cuneate or contracted, less often obtuse base, rounded at the apex, 1¼-1½ mm by ¾-1¼ mm; petioles either passing gradually into the blade (spatulate leaves) or distinctly set off (elliptic leaves), at best 1¼ mm long. *Flowers* in very many leaf-axils, sometimes in one axil only of a pair, mostly however in both axils and then either both of them ♀, or one ♀, the other male (pseudo-male?), subsessile; bracts not found. ♂: Filament erect, thin, at best ½ mm long; anther minute, yellow; cells bursting, but apparently effete; connective slightly produced between the cells. ♀: *Fruit* much compressed, broadly obovate or subcuneate, distinctly notched,  $\pm 1$  mm by ¾ mm; fruit-lobes rounded at the apex, very narrowly double-winged on the back; wings broadest at the apex ( $\pm 1/10$  mm), very thin, pairwise approximate and parallel; the pairs opposite. Styles spreading, very short, at best ½ mm, finally deciduous; pericarp translucent. Seeds obliquely ovoid-oblong, rather thick, brown,

finely reticulate-ribbed, fully  $\frac{3}{4}$  mm long,  $\frac{1}{3}$  mm broad.

Distr. *C. verna*, taken in a strict sense, occurs in N. and ?S. America, throughout Europe, ?N. Africa, temperate regions of Asia, ?Queensland, in *Malaysia*: Java.

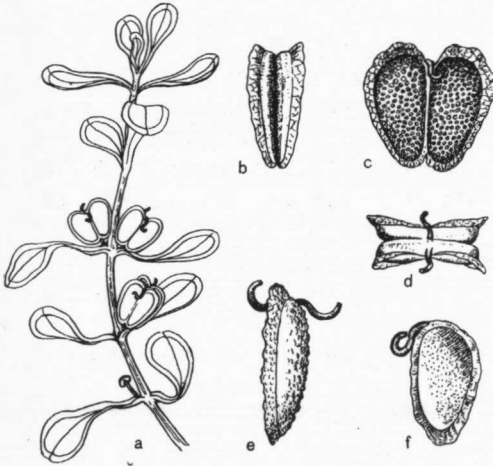


Fig. 1. *Callitriche verna* L. a. Tip of a stem, b-f. ripe fruit (b-c. lateral, d. seen on top, e-f. detached segments). All enlarged (after material from Tjibodas).

The above described terrestrial form in *Malaysia* was thus far collected only in the Mountain Garden Tjibodas (W. Java, alt.  $\pm 1450$  m); there possibly rather recently introduced but thriving very well and spontaneously reproducing. May be expected to spread outside of the garden.

Ecol. Humid, stony localities, there mixed with other small moisture-loving plants.

Note. Found in Java for the first time in 1950 by Dr S. J. VAN OOSTSTROOM & MR J. H. KERN; then already numerous but very local, easily escaping observation. The Java form seems to be closely related to *f. caespitosa* SCHULZ (see HEGI,

*l.c.*, 201, f. 1808), which mainly differs by its much larger dimensions. Though the stamens and the styles of the Javan plant seem to be abortive, ripe fruits are abundantly produced.

*Aquatic, partly emerged form.*

Much larger than the above described terrestrial form, 10 cm or more long, very much branched, forming dense masses. *Leaves* spatulate,  $\pm 10$  by  $\pm 3$  mm (including the long petiole), rounded at the apex, with many sessile, patent, circular shallowly lobed hairs, resembling dots. *Stamen* of  $\sigma$  4-5 mm; *ovary* of  $\rho$  as in the above described terrestrial form, but styles much longer (up to 4-5 mm); *fruit* as in the terrestrial form.

Distr. In *Malaysia*: NE. New Guinea (Morobe District), 2700 m (M. S. CLEMENS 5733, 41125).

*Entirely submersed aquatic form (C. papuana MERR. & PERRY, l.c.).*

*Leaves* very narrowly linear with a subcircular apical incision, 1-nerved, up to 15 mm by  $\frac{1}{3}$ - $\frac{1}{2}$  mm.  $\sigma$  *Flowers* unknown.  $\rho$  *Flowers* very shortly pedicelled. *Styles* divergent,  $1\frac{1}{2}$ -2 mm long. Almost ripe *fruit*  $\pm 1\frac{1}{2}$  mm long, ellipsoid-obovoid, slightly longer than broad, slightly notched at the apex, compressed but rather thick; wings along the narrower sides of the fruit, pairwise approximate, parallel, very narrow; seeds oblong.

Distr. In *Malaysia*: Central New Guinea (BRASS 9541).

Ecol. Rooting in shallows of Lake Habbema, 3225 m.

Note. Notwithstanding the different aspect of the plant the fruits of this submersed form agree fully with those of *C. verna* barring the slightly larger dimensions of the former.

**Excluded**

*Callitriche* sp. mentioned by KURZ (Nat. Tijd. N.I. 27, 1864, 167) from clear streams in the Menumbing Hills, Banka Island, seems very doubtful, firstly because KURZ's material was sterile and has not been traced in the herbarium, and secondly because all specimens of *Callitriche* hitherto found in the Malaysian tropics occur at much higher altitudes.