

MAYACACEAE

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Kunth, Abh. Königl. Akad. Wiss. Berlin 1840 (1842) 93, as ‘Mayaceae’, nom. cons.; Lourteig, Notul. Syst. (Paris) 14 (1952) 235; Stevenson in Kubitzki (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 294; Seberg in Heywood et al. Fl. Pl. Fam. World (2007) 381; Carvalho et al., Flora 204 (2009) 221 **Type:** *Mayaca* Aubl.

Aquatic to boggy ground perennial herbs; sometimes forming large colonies or forming submerged clumps. **Stems** with axillary branching, basally with lateral adventitious roots. **Leaves** simple, spirally arranged, sessile, leaf sheath and petiole absent. **Flowers** axillary, mostly solitary (rarely forming axillary umbellate inflorescences), pedicellate, supported by a bract, actinomorphic, bisexual, hypogynous, trimerous. **Sepals** 3, free, equal. **Petals** 3, free, equal. **Stamens** 3, opposite sepals; filaments free, linear; anthers basifixed, tetrasporangiate to bisporangiate, dehiscent by a pore or pore-like slit; pollen spherical, sulcate. **Ovary** superior, unilocular, syncarpous (composed of 3 fused carpels), placentation parietal; ovules atropous, few to numerous; style simple, terminal, topped by a single (somewhat capitate), slightly 3-lobed or trifid stigma. **Fruit** a loculicidal capsule. **Seeds** ovoid to globose, striate, with operculum; embryo small, globose, apical; endosperm copious.

Distribution. Mayacaceae is monogeneric with 4–6 species (Carvalho & Machado, Rodriguésia 66 (2015) 421). It is naturally widely distributed in the tropical and subtropical Americas, with one species in Western Africa. One species is naturalised in Australia, Sri Lanka and Singapore.

Ecology. All species occur on the margins of fresh water. The species are submerged or seasonally submerged aquatics or emergent marginal plants along shores.

Uses. Widely used as aquarium plants.

Taxonomy. The family level delimitation of the Mayacaceae has not been contested. The Mayacaceae was previously considered to be closely related to the Commelinaceae (e.g. Hutchinson, Fam. Fl. Pl., Monocot. (1959) 570), although possible affinities to the Xyridaceae were also considered (e.g. Cronquist, Integr. Syst. Classific. Fl. Pl. (1981) 1106). The latest evidence places Mayacaceae unambiguously in the Poales, with affinities to Xyridaceae and Eriocaulaceae (APG IV, Bot. J. Linn. Soc. 181 (2016) 1–20). The most recent overview of outstanding problems in the family was provided by Carvalho & Machado (Rodriguésia 66 (2015) 421). Notes on typification in the family were given by Pellegrini & Calvarho (Taxon 65 (2016) 605–609).

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MAYACA Aubl.

(etymology unknown, possibly after Mahaica River in Guyana
or Maiaca River in Northern Brazil)

Bogmoss (English)

Hist. Pl. Guiane 1 (1775) 42, pl. 15; Lourteig, Notul. Syst. (Paris) 14 (1952) 235; Stevenson in Kubitzki (ed.), Fam. Gen. Vasc. Pl. 4 (1998) 294, fig. 77; Carvalho et al., Flora 204 (2009) 221. **Synonym:** *Syena* Schreb., Gen. Pl., ed. 8[a], 1 (1789) 39, nom. illeg. superfl. **Type:** *Mayaca fluviatilis* Aubl.

Biaslia Vand., Fl. Lusit. Brasil. Spec. (1788) 4, fig. 2. **Type:** Not designated.

Coletia Vell., Fl. Flumin. (1829 [‘1825’]) 32. **Type:** *Coletia madida* Vell.

Perennial submerged aquatic herbs or rooted in boggy ground; sometimes forming large colonies or forming submerged clumps. **Stems** thin, porous, round in cross-section, branching axillary, basally with lateral adventitious roots. **Leaves** simple, spirally arranged, sessile with no leaf sheath and petiole, firmly attached to stem, narrowly triangular, linear to filiform, glabrous, usually with a bidentate apex. **Flowers** axillary (developing early and sometimes interpreted as terminal with a new axillary stem becoming dominant), solitary on short to long pedicels (only in *Mayaca longipes* Mart. ex Seub. several single flowers form umbellate heads), supported by a hyaline bract, actinomorphic, bisexual, hypogynous, trimerous with strongly differentiated calyx and corolla. **Sepals** 3, free, equal, narrowly triangular, green. **Petals** 3, free, equal, usually with a short claw basally, white (or white and pink). **Stamens** 3, opposite sepals; filaments free, linear, glabrous; anthers linear, basifixed, unithecate, tetrasporangiate to bisporangiate, dehiscing by an apical pore, a pore-like slit, or by a pore at the end of a tubular apical appendage; pollen spherical, sulcate. **Ovary** superior, unilocular, syncarpous (composed of 3 fused carpels), placentation parietal; ovules atropous, 2–30, biseriate on each of the three parietal placentas; style simple, terminal, stigma single (shortly capitate), slightly trifid or slightly 3-lobed. **Fruit** a loculicidal capsule, dehiscing by three valves (corresponding to carpels). **Seeds** ovoid to globose, striate, with operculum; embryo small, globose, apical; endosperm copious, composed of starch and aleurone.

Distribution. Same as for the family.

Ecology. Same as for the family. In Singapore 1 naturalised species.

Taxonomy. No recent questions have arisen as to the circumscription of the genus, which includes species described in three other currently synonymous genera (*Biaslia* Vand., *Coletia* Vell. and *Syena* Schreb.). A revision of the genus has not been published since 1952 (Lourteig, Notul. Syst. (Paris) 14 (1952) 234–248). The most recent work on floral anatomy in *Mayaca* in tropical America (Carvalho et al., Flora 204 (2009) 220–227) recognised five species. Only one species has been described so far from Africa, the endemic *Mayaca baumii* Gürke. The existing taxonomic delimitations are based on morphological studies.

Mayaca fluviatilis Aubl.(Latin, *fluviatilis* = of wet places or rivers; referring to the habitat)

Hist. Pl. Guiane 1 (1775) 42, pl. 15 Niissalo & Leong-Škorničková, Nat. Singapore 12 (2019) 7–9. **Type:** *Aublet s.n.*, [French Guiana], ‘Cayenne, ad ripam & in aquâ rivuli defluentis ad fluvium Sinémari.’ (lectotype P-JJR 1:51 [P00680455], designated by Lanjouw & Uittien, Recueil Trav. Bot. Néerl. 37 (1940) 153; isoelectotypes BM [BM001191236], LINN [Herb. Smith 17.13] n.v.). **Fig. 1.**

Perennial aquatic herb with submerged and emergent forms, emergent forms reaching up to 20 cm in length (submerged forms reaching up to 1 m, often creating large floating mats). **Stems** porous with a solid pith, glabrous, 1–1.5 mm in diam., pale green, glabrous. **Leaves** spirally arranged, simple, with three major linear veins; blade narrowly triangular, 3.5–5.5 mm long (measured from emergent leaves; submerged leaves thinner, longer and less densely arranged), c. 1–1.1 mm wide at base gradually narrowing to c. 0.2 mm to a bluntly acute or minutely bi-dentate apex, teeth acute, barely 0.1 mm long. **Flowers** single, initially developing close to the apex and c. 5–6 mm below the apex at anthesis; pedicel (3–)5–6 mm long, c. 0.75 mm in diam. at base, thickening to c. 1.5–1.7 mm at receptacle, green, glabrous, supported by a bract; bract oval, often with an incised apex, 2–3 × 1.5–2 mm, membranaceous, semi-translucent pale green, glabrous. **Sepals** 3, linear to narrowly ovate, slightly boat-shaped, c. 5.6 mm long, c. 1.7 mm wide a 1/3 of the way from the base, then gradually narrowing to a bluntly acuminate tip, bright green, glabrous. **Petals** 3, obovate, 4.8–5 mm long, c. 0.9 mm wide at base, 4–5 mm wide distally, with c. 6 repeatedly bifurcate veins, each ending in a notch at the petal margin, light violet-pink, white in the basal 1/3. **Stamens** 3, 2.9–3 mm long, irregularly clavate; filaments c. 1.7 mm long, round in cross-section, light yellow; anthers c. 1.3 mm long, bright warm yellow, apical pore positioned slightly obliquely, introrse, 0.2–0.25 mm wide with minute lobes less than 0.1 mm long. **Ovary** broadly ovoid, almost globose, c. 1 × 1 mm, green, glabrous, with three longitudinal grooves opposite stamens; ovules up to 6, style c. 1.6 × 0.3 mm, linear, stigma obscurely trifid, each lobe c. 0.1 mm long. **Fruit** not observed. **Seeds** not observed.

Distribution. South America and southern North America, introduced and naturalised in Sri Lanka, Australia, Singapore and possibly Peninsular Malaysia. Only recently recorded and collected in Singapore from the shores of MacRitchie Reservoir and Lower Peirce Reservoir. Selected specimens: Lower Peirce Reservoir (*Leong-Škorničková & Niissalo SING2015-057*, 11 Mar 2015, SING [SING0213800]), MacRitchie Reservoir (*Leong-Škorničková SING2019-034*, 25 Jan 2019, SING [SING0262588]).

Ecology. In Singapore *Mayaca fluviatilis* forms extensive colonies on the shores of the reservoirs where it occurs. The species flowers profusely in Singapore but does not appear to set fruit easily suggesting that its rapid spread relies primarily on vegetative reproduction. It was possibly introduced to Singapore via the aquarium plant trade or as a weed with traded aquatic animals or plants (Niissalo & Leong-Škorničková, Nat. Singapore 12 (2019) 7–9). Given its rapid spread in recent years, and reports of its invasive potential from Sri Lanka (Yakandawala & Dissanayake, *Hydrobiologia* 656 (2010) 199–204) and Australia (Madigan & Vitelli in Eldershaw (ed.) 18th Australasian Weeds Conf. (2012) 30–33), further monitoring and active management of this species is needed.

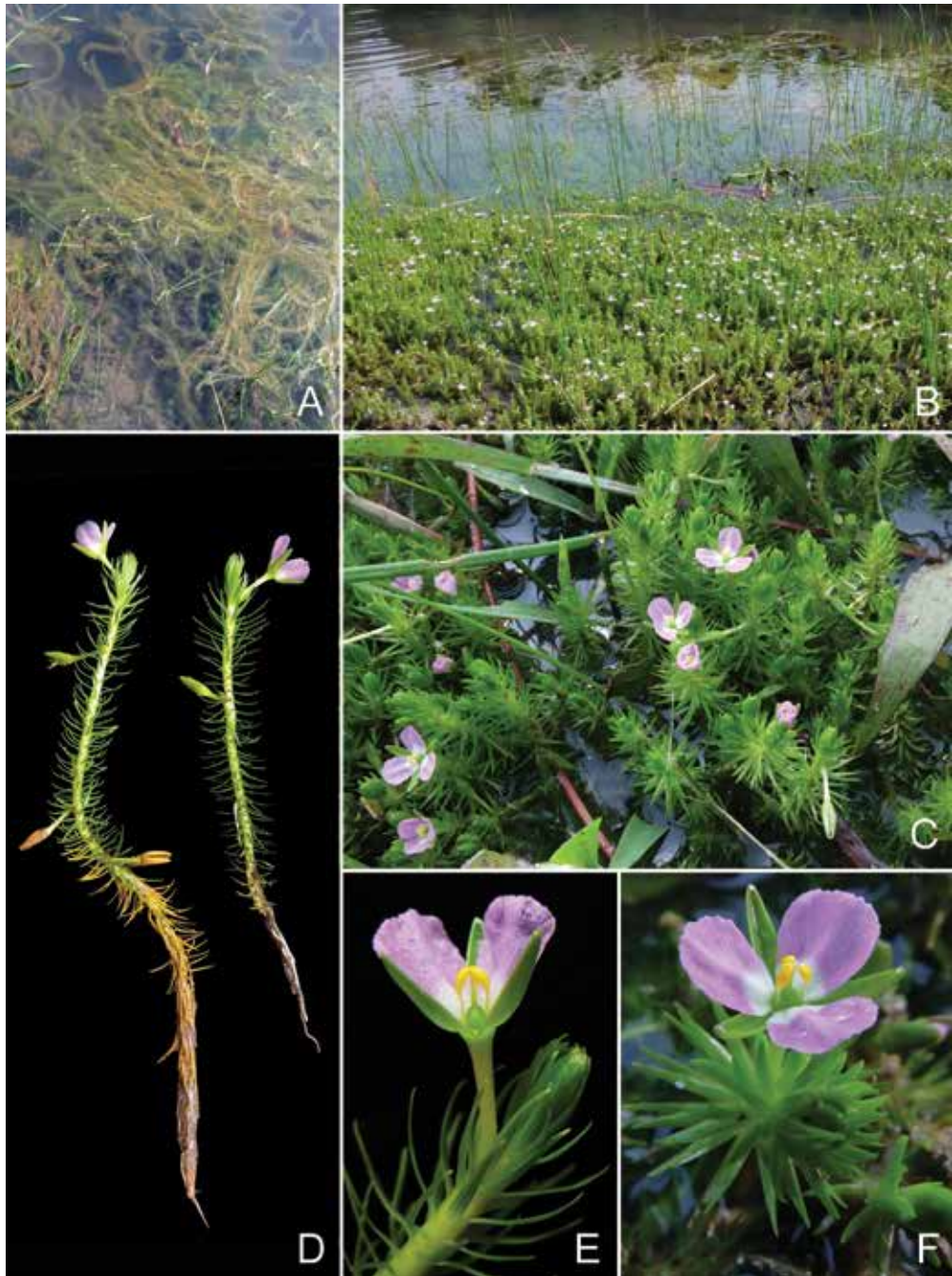


Figure 1. *Mayaca fluviatilis* Aubl. **A.** Habit (submerged form). **B.** Habit (emergent form in front, submerged form behind) **C.** Close-up of emergent form. **D.** Emergent form. **E.** Flower (side view, one petal removed). **F.** Flower (top view). (From Singapore, MacRitchie Reservoir, *Leong-Škorničková SING2019-034*. Photos: J. Leong-Škorničková).

Provisional conservation assessment. Globally Least Concern (LC). This species is widespread in its natural range and often locally common. Not native in Singapore.

Vernacular name. *Stream bogmoss* (English).

Taxonomy. Numerous heterotypic synonyms exist for this species but none have been used in the Asian literature and are therefore not listed in this treatment.

