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## A new variety of *Cryptocoryne versteegii* (Araceae) from Irian Jaya Tengah, Indonesia

### Abstract

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A new variety, *Cryptocoryne versteegii* var. *jayaensis* N. Jacobsen, Bastm., P. J. Edwards, R. J. Johns, N. Takah. & Wongso, from the base of Mount Jaya, Irian Jaya, Indonesia, is described and illustrated. *Cryptocoryne versteegii* Engl. var. *versteegii* is a plant from the inner mangrove with short, almost triangular, stiff, rather upright leaves, whereas var. *jayaensis* from fresh water has rather flaccid leaves, which are 2–4 times as long as those of var. *versteegii*.

Additional key words: aroids, *Cryptocoryne versteegii* var. *jayaensis*, taxonomy, relationships

### Introduction

*Cryptocoryne* Fisch. ex Wydler is a genus of about 55 known species distributed in SE Asia. Only three have so far been recorded from New Guinea, viz. the widely distributed *C. ciliata* (Roxb.) Schott and the two endemic *C. dewitii* N. Jacobsen and *C. versteegii* Engl. (Bastmeijer 2014; Idei 2010; de Wit 1990).

*Cryptocoryne versteegii* var. *jayaensis* N. Jacobsen, Bastm., P. J. Edwards, R. J. Johns, N. Takah. & Wongso, **var. nov.**

Holotypus: Indonesia, Irian Jaya, Mount Jaya, PT Freeport Indonesia Project Area, Kali Kopi area, 60 m, in rain forest between Kali Kopi levee and the Kopi River, 9 Mar 1999, P. J. Edwards 4055 (BO; isotypus: K).

*Description* — Leaves 15–35 cm long; leaf blade 8–15 cm long, 1.5–2.5 cm wide, dark green on upper surface, lighter on lower surface, lanceolate-oblong to narrowly ovate, base truncate-acute, margin finely undulate, apex acute; petiole 8–20 cm long, longest in continuously submerged specimens; young leaves and upper leaves at low water light green. Spathe 6–10 cm long, fawn-coloured outside suffused with fine dots; tube 4–7 cm long, somewhat twisted-bent; kettle rather narrow, 1.5–2 cm long, 0.5–0.7 cm in diam., white inside; limb shortly acute, 1.5–2 cm long, 0.7–0.9 cm wide, ± dilated, obliquely forward-twisted, surface copper brown, rough, with irregular rounded protuberances, these especially pronounced along narrow brown margin surrounding bright yellow collar. Spadix with 7 or 8 female flowers, each c. 2.5 mm long, whitish; stigmas ovate on a short style, bent slightly outward; olfactory

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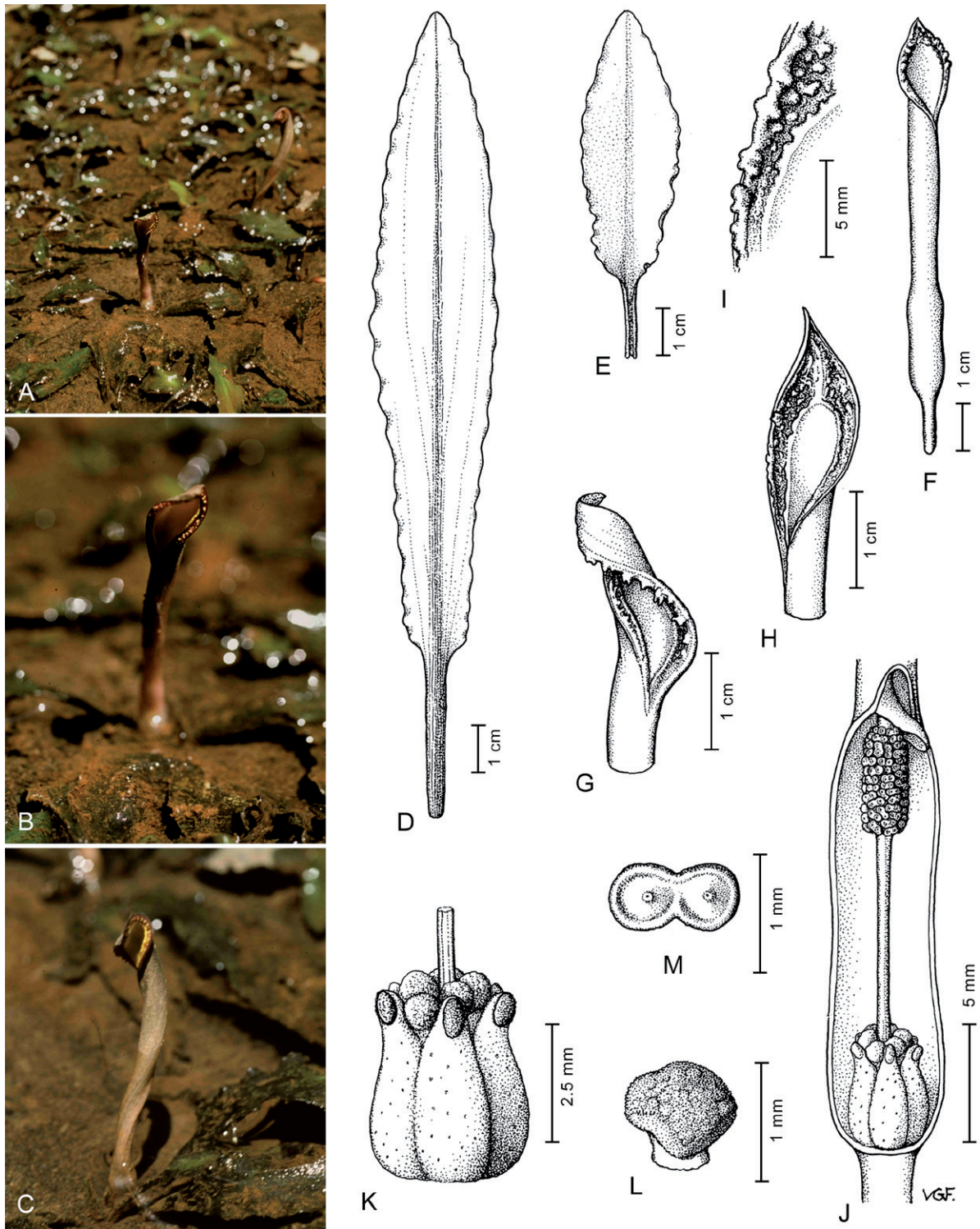


Fig. 1. *Cryptocoryne versteegii* var. *jayaensis* – A: habitat and habit of dense stands in slow-flowing water at Kali Kopi; B & C: spathes protruding above water; D & E: leaves; F: spathe; G & H: limb of spathe showing the rough surface of the limb above the collar; I: structure of surface of limb of spathe above collar; J: lower part of spathe, cut-open kettle; K: female flowers and olfactory bodies; L: olfactory body; M: male flower. – Photographs by P. J. Edwards; drawings by V. G. Friis.

*bodies* c. 1 mm in diam., yellowish, irregularly rounded; *male flowers* 60–70, thecae 2, c. 1 × 0.5 mm, light yellow; *appendix* somewhat acute, purplish. *Infructescence* almost globular with protruding points from styles/stigmas, c. 1 cm in diam. *Seeds* smooth, rounded; *testa*, thin,

whitish; *embryo* with 6 or more cilia-like green prophylls folded within testa; *endosperm* absent in mature seeds.

*Chromosome number* —  $2n = 34$ , reported here (as in var. *versteegii*, see Jacobsen 1977).





Fig. 2. *Cryptocoryne versteegii* var. *jayaensis* – A: habitat of dense stands (bottom right) in slow-flowing water at type locality in forest at Kali Kopi; B: habitat W of Timika showing forest clearing. – Photographs: A by P. J. Edwards; B by S. Wongso.





Fig. 3. *Cryptocoryne versteegii* var. *jayaensis*, habitat W of Timika – A: showing secondary tree growth along stream; B: showing photograph taken in A. – Photographs: A by S. Wongso; B by N. Takahashi.





Fig. 4. *Cryptocoryne versteegii* var. *jayaensis*, habitat W of Timika, showing a closer view of plants in Fig. 3B. – Photograph by S. Wongso.

**Distribution** — *Cryptocoryne versteegii* var. *jayaensis* was first known only from the type locality at Timika E of the Kopi River in Irian Jaya collected on 9 March 1999. However, in 1999 information also came from Mr Liem from the Aquarium firm “Vivarium” in Jakarta that they had a *Cryptocoryne* from Timika, and in 2003 S. Wongso saw plants in an aquarium of Mr Okky (commercial aquascaping company in Jakarta) and presented pictures of plants with narrow green leaves resembling the present var. *jayaensis*. On 3 May 2005 N. Takahashi and S. Wongso were not able to access the type locality but managed to collect var. *jayaensis* again at Timika W of the Ajkwa River, some 20 km W of the type locality: SW0502, alt. 25 m, SP V road, Timika (L, C).

**Ecology** — *Cryptocoryne versteegii* var. *jayaensis* is aquatic to amphibious, grows rooted in sand and pebbles and between small boulders, and spreads vegetatively through the river bottom by stolons.

At the type locality many of the older leaves were almost black on the lower surface, due to encrusting cyanobacteria, mud, and caddisfly larvae/pupae. The plants formed large, dense mats in 10–30 cm of water over large parts of the stream in suitable places. In slower- to quicker-running water, the larger plants were growing in deeper water. The locality is in dappled sunlight and is a clear blackwater stream flowing into the Kopi River. Although there were many plants in flower, smelling of rotting meat, no insects were seen attending any of them (this was late morning). However, the alcohol-preserved

spathes revealed numerous small flies belonging to the family *Phoridae*, a family which has previously been reported to pollinate *Cryptocoryne* species.

At the second locality, W of the Ajkwa River, the landscape is located in an open area where most of the trees have been cut and only in some places is some shade found due to a secondary growth of trees. The stream is 2–3 m wide, with a water depth at that time of c. 20 cm. The substrate is a mixture of sand and gravel, and the clear and light tea-coloured water has a high flow rate; at 12 o'clock the pH was 6.6, ORP 135 mV, water temperature 26°C, and the EC 50  $\mu$ S/cm. There were no opened spathes, but many submerged spathe buds. At the second local-

ity the leaves were all green and not so much covered by cyanobacteria and caddis larvae/pupae. In the same stream a *Barclaya* cf. *motleyi* Hook. f. (*Nymphaeaceae*) was also found.

It appears that the two known localities for *Cryptocoryne versteegii* var. *jayaensis*, which are at altitudes of 25 m and 60 m, are above the zone of tide-influenced backed-up fresh water.

**Conservation status** — *Cryptocoryne versteegii* var. *jayaensis* is known with certainty only from the Timika area. It may well occur over a larger area in the region, but data are lacking. The pollution of the river systems around Timika, owing to mining activities, has no doubt affected the populations in the catchment area.

There are two parallel N–S-flowing rivers of which the Ajkwa River borders Timika town to the east, and the Kopi River (a tributary to the Minajerwi River) runs some 5 km further toward the east (at Timika), but due to recent sediment deposits from mine tailings the two river systems have actually merged SSE of Timika (Banks & al. 2005), perhaps leaving the populations in the region somewhat vulnerable.

**Relationships** — *Cryptocoryne versteegii* var. *jayaensis* was initially believed to be a new species from New Guinea, as neither *C. dewitii* nor *C. versteegii* has leaves resembling to any degree those of the Timika plants. However, the spathe proved to be similar to that of *C. versteegii* although longer. *Cryptocoryne versteegii* var.



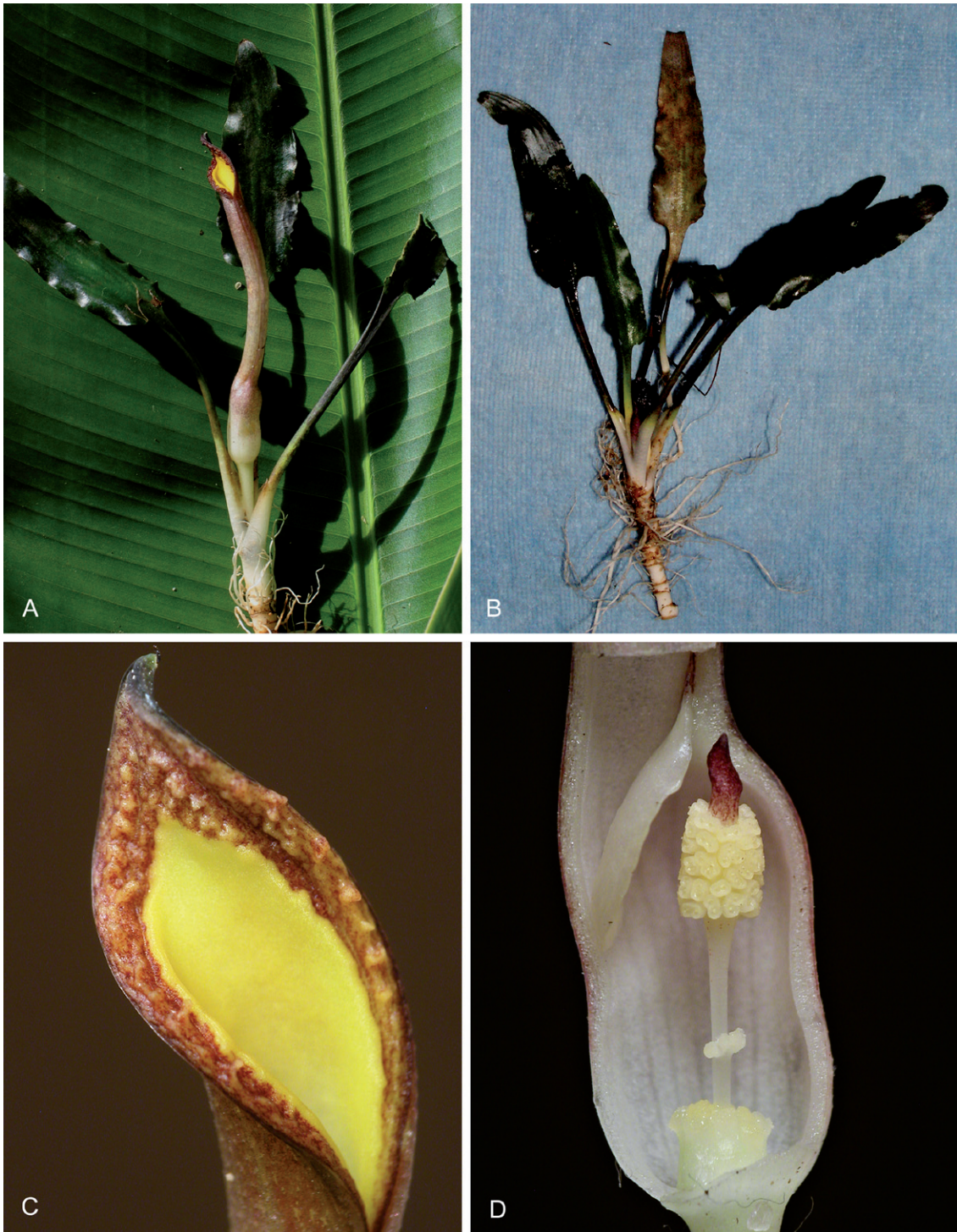


Fig. 5. *Cryptocoryne versteegii* var. *jayaensis* (plants from W of Timika) – A: habit of plant with open spathe; B: habit showing an almost mature fruit between leaf petioles; C: limb of spathe showing pronounced yellow collar/collar zone and brown rough distal part; D: cut-open kettle of spathe showing spadix with purple appendix and a few displaced male flowers on thin part of spadix axis (cultivated). – Photographs: A by N. Takahashi; B by S. Wongso; C & D by J. D. Bastmeijer.

*versteegii* is considered to be a mangrove plant (or a plant growing on tide-influenced mudflats), with green, triangular, short, thick leaf blades, their texture resembling those found in the other typical mangrove species, viz. *C. ciliata* and *C. lingua* Engl. (from Sarawak), while the Timika plants are freshwater plants with lanceolate,

non-fleshy leaf blades. A remaining dilemma, however, is that the type locality for *C. versteegii* var. *versteegii* is said to be at the Lorentz River some 200 km ESE of Timika, and this is probably outside the zones with a tidal influence – i.e. the type of var. *versteegii* is likely also a freshwater plant.

However, differences in leaf blade shape and size are also found in *Cryptocoryne crispatula* Engl. s.l. from mainland Asia (Jacobsen & al. 2012), where comparable differences between the different recognized varieties are linked to different ecological habitats, e.g. *C. crispatula* var. *crispatula* developing large emergent leaves and flowers during the dry season, while *C. crispatula* var. *balansae* (Gagnep.) N. Jacobsen has large submerged leaves during the rainy season, and also flowers during receding waters. Recently, evidence has accumulated that similar polymorphy is also to be found within *C. nurii* Furtado, which is usually regarded as a plant with lanceolate leaves, but for which plants with ovate to cordate leaves have been found, and all having rather similar spathe morphology (unpublished data). Thus leaf polymorphy is a known occurrence in the genus *Cryptocoryne*, although sometimes understanding is complicated by such different-looking leaves and by the plants growing in markedly different habitats. However, neither of these two above-mentioned species is found in the tidal zones, and *C. versteegii* is thus the only known species that has both a freshwater variety (var. *jayaensis*) and a distinct mangrove variety (var. *versteegii*).

*Cryptocoryne versteegii* var. *jayaensis* has the same peculiar embryo found in var. *versteegii*, with the six or more green, cilia-like, folded prophylls fully developed within the testa. Similar prophylls are found in *C. ciliata* ( $2n = 22$ ;  $2n = 33$  are triploids without seed-formation; Jacobsen & al. 2012), which is, as mentioned before, a mangrove species like *C. versteegii* var. *versteegii*. At Kikory, Papua New Guinea, *C. ciliata* and *C. versteegii* var. *versteegii* grow near each other in the inner mangrove (Bastmeijer 2014); and the “viviparous” multiciliate seedlings can be regarded as an adaptation to this special habitat. Recently, *C. dewitii* from the Fly River in Papua New Guinea has also proven to have many cilia-like prophylls fully developed within the testa. It is not known whether the prophylls found in all three New Guinea *Cryptocoryne* species are an indication of relationship (*C. ciliata* later having spread to most of SE Asia) or an indication of an adaptation to life in rivers that are tide influenced, even though they may not be salt-water influenced.

*Etymology* — This new variety is named after its place of origin at the base of Mount Jaya (Puncak Jaya), Irian Jaya Tengah, Indonesia.

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