

Two new species of large-leaved New Guinea lowland *Cryptocarya* (Lauraceae)

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ABSTRACT. Two species of *Cryptocarya* R.Br. are newly described for New Guinea. Both are shrubby to subarborescent lowland species bearing large leaves. *Cryptocarya azurea* Ezedin is described from the Sepik-Ramu basins, separated out from material formerly identified as *C. magnifolia* Teshner, whereas *C. hydrantha* Ezedin, recorded from Jayapura to Josephstaal, is validated based on an unpublished name.

Keywords. Indonesia, new species, Papua New Guinea

Introduction

Cryptocarya R.Br. (Lauraceae: Cryptocaryeae) is a large genus of over 350 species distributed pantropically and reaches its highest diversity in Malesia (de Kok, 2015; POWO, 2024). Within this region, it is clear that New Guinea contains the highest share of species. A recent collaborative checklist of the island's flora reported a total of 85 species (Cámara-Leret et al., 2020), cementing it as the centre of diversity for the genus. It is then followed by Australia with 49 species, Madagascar with 42, and the Philippines with 38 (POWO, 2024). Yet, with an insufficiently explored terrain and several undescribed species becoming apparent, New Guinea is poised to continue to far outpace other regions in species count. In this regard, it is perhaps fortunate that species limits within the genus are often readily distinguishable, using vegetative morphology alone. This is particularly useful in the field since the floral morphology is highly reduced and flowering times can be somewhat erratic.

Here, two new species are described following recent work in the field and herbaria. Both species are similar in that they exhibit a shrubby growth habit, bear large leaves, and densely-flowered panicles. These traits are rather distinctive among Papuan *Cryptocarya*, with only three other species that appear to share these features: *C. cordifolia* Kosterm., *C. elongata* Kosterm. and *C. magnifolia* Teshner. Together with the two new species, these five species also share a similar distribution that is seemingly restricted to the northern lowlands of the islands. Previously, Kostermans (1968) noted the similarity between *C. cordifolia* and *C. magnifolia*, hinting at their possible close relationship. However, further molecular investigation into the genus is needed to determine whether or not these five are closely related. A morphological comparison of the group is given in Table 1.

Table 1. Morphological comparison between the five large-leaved subarborescent species of *Cryptocarya* in New Guinea.

	<i>C. magnifolia</i>	<i>C. azurea</i>	<i>C. hydrantha</i>	<i>C. cordifolia</i>	<i>C. elongata</i>
Drainage basins	Sepik	Ramu, Sepik	Ramu, Sepik, Tami	Markham, Musa–Mt Victory	North Arfak, Digul, Ramu, Markham
Max height (m)	8	8	8	18	20
Inner stems	Hollow(?)	Solid	Hollow	Hollow	Solid
Petiole length (cm)	1.3	0.8–1.6	0.5–2.5	1.2–1.9	1.4–3
Lamina size (cm)	20–60 × 15–23	22–63 × 8–23	19–52 × 9–22	17–50 × 9–27	10–40 × 4–9
Lamina thickness	Coriaceous	Chartaceous, thick	Chartaceous, thin	Coriaceous	Coriaceous
Abaxial colour	Glaucous	Glaucous	Glaucous	Glaucous	Glaucous
Leaf base	Attenuate, symmetric	Rounded to cordate (to acute), symmetric	Cordate (to rounded or acute), symmetric	Cordate, symmetric	Acute to rounded, asymmetric
Leaf apex	Obtuse	Acute to rounded	Obtuse to acute	Obtuse to retuse (to acute)	Acute to rounded
Indument, abaxial lamina	Everywhere, glabrescent(?)	Equivocal	Everywhere, glabrescent	Everywhere, persistent	Veins only, glabrescent
Quaternary veins, abaxial	Faint, weakly raised(?)	Faint, raised	Prominent, weakly raised	Prominent, raised	Very faint, weakly raised
Midvein, adaxial	Sharply impressed	Weakly impressed	Flat to weakly impressed	Flat to weakly impressed	Sharply impressed
Tepals at anthesis	Partially open	Partially open	Fully open to reflexed	Partially open	Partially open

The new species

Cryptocarya azurea Ezedin, **sp. nov.**

Differs from *C. magnifolia* in possessing laminas that are broadly lanceolate (vs rounded or broadly ovoid), up to 63 cm long (vs 40 cm), along with loosely flowered

inflorescences (vs congested) that bear larger thicker bracts and bracteoles. – TYPE: Papua New Guinea, East Sepik, Ambunti District, Waskuk Hills, ridge above Langu-Garuka track, 4°11'25"S 142°43'41"E, 70 m, 23 November 2004 (fr.), *Takeuchi et al.* 17370 (holotype A [A02538132, A02538134 – a single specimen over 2 sheets]; isotypes L [L.4331070, L.4331071], LAE [290667]). (Figs 1, 2)

Shrub or small tree to 8 m tall and 14 cm dbh. **Stems** terete, solid, densely dark orange-brown rusty tomentose late glabrescent or glabrous, light brown, sparsely lenticellate when older. **Leaves** simple, alternate, spiral, broadly lanceolate, (22–)38–48(–63) × (7.5–)8.5–14(–23) cm, thick (stiff) chartaceous, when fresh dark green semi-glossy above and glaucous blue-green dull below, when dry light to reddish brown above and whitish green-yellow below, laminae remaining densely tomentose below along veins or becoming entirely glabrous when older, base shortly rounded to cordate (to acute), apex blunt acute to rounded, margins entire; petioles 0.8–1.6 × 0.4–0.5 cm, glabrous or tomentose, drying blackish; venation eucamptodromous, sometimes the primary and secondary veins bifacially tomentose, drying dark orangish-reddish; primary vein adaxially sunken, abaxially prominently raised; secondary veins (16–)17–18(–20) pairs, regular, spaced 2–3.5 cm apart, angled within 45° from the costa; tertiary veins abaxially conspicuous but often fading, straight percurrent, broadly spaced, weakly raised below; quaternary veins inconspicuous. **Inflorescences** axillary, paniculate, openly branching, loosely flowered, (2–)7.5–15(–22) × 6–8.5(–15) cm, bifacially tomentose; bracts subtending 2° branches, subterete to subtriangular, 4–5.5 × 1.5–2 mm, bifacially tomentose. **Flowers** borne on the 2° or 3° branches, solitary or in terminal clusters of up to 3, each flower subtended by a bracteole; bracteoles c. 2 mm long, ±terete to weakly flattened, bifacially tomentose, often (early) caducous; perianth tube (2–)3.5 mm long, densely tomentose outside, villous inside towards the base; tepals 6, broadly elliptic, 1.5–2 × 1–1.5 mm, outer tepals mostly glabrous inside, apex acute, inner tepals villous inside towards the base and centre, apex rounded to weakly acute, partially open at anthesis; stamens 9 in 3 whorls, outer and middle stamens equal, triangular, c. 0.8 × 0.5 mm, introrse, weakly villous at base, inner stamens narrowly triangular, 1.1–1.6 × c. 0.4 mm, extrorse, villous towards base; glands 6, ±semicircular to subglobose, c. 0.2 × 0.4 mm, weakly villous at base; staminodes sagittate, 0.8–1 × 0.5–0.6 mm, abaxially villous; gynoecium 3–3.5 mm long, glabrous, style c. 2 mm long, basally notched, ovary c. 0.8 × 0.6 mm, ovoid. **Fruits** ovoid, 14–16 × 12–14 mm, tomentose when immature, glabrous to sparsely tomentose when mature, smooth or weakly ribbed when immature, longitudinally 12–14-ribbed when mature, without warts or lenticels, black. **Seed** 1, ovoid, slightly flattened, 9–10 × 5.5–6 mm, testa weakly many-ridged, dark brown with black circumferential scar.

Distribution. Papua New Guinea (Fig. 3).

Habitat and ecology. Lowland hill forests, occasionally in swamp forest, up to c. 400 m above sea level. This species tends to be more closely associated with steep hills and ridges, with the distribution of individuals weakly following topographic contour

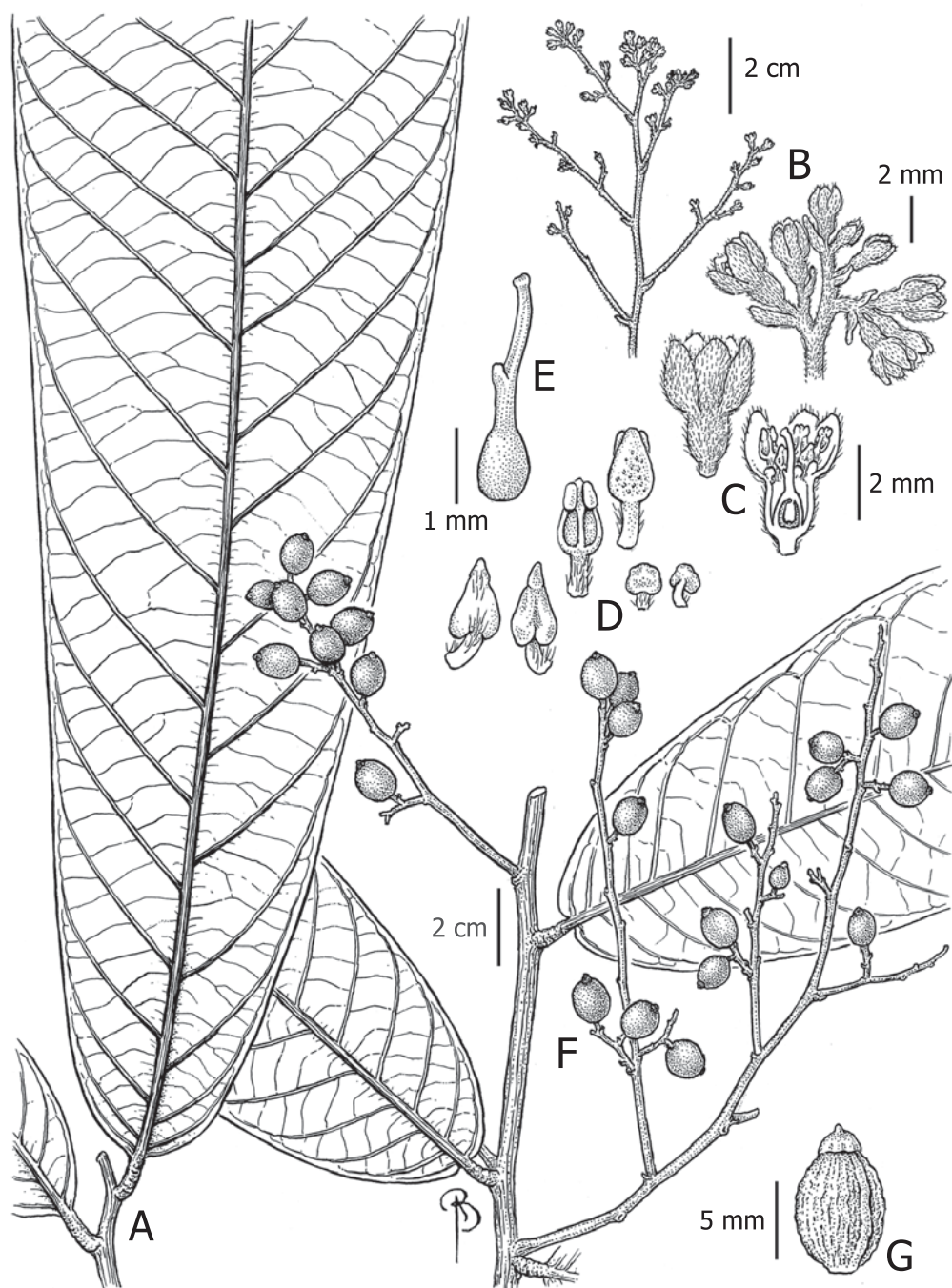


Fig. 1. *Cryptocarya azurea* Ezedin. **A.** Leaf. **B.** Inflorescence. **C.** Lateral view of flower and longitudinal section. **D.** Abaxial and adaxial views of staminodes, inner stamens, and glands (L to R). **E.** Carpel. **F.** Infructescence. **G.** Seed. A from Ezedin 769, B–G from Takeuchi *et al.* 21819. Illustration by B. Angell.

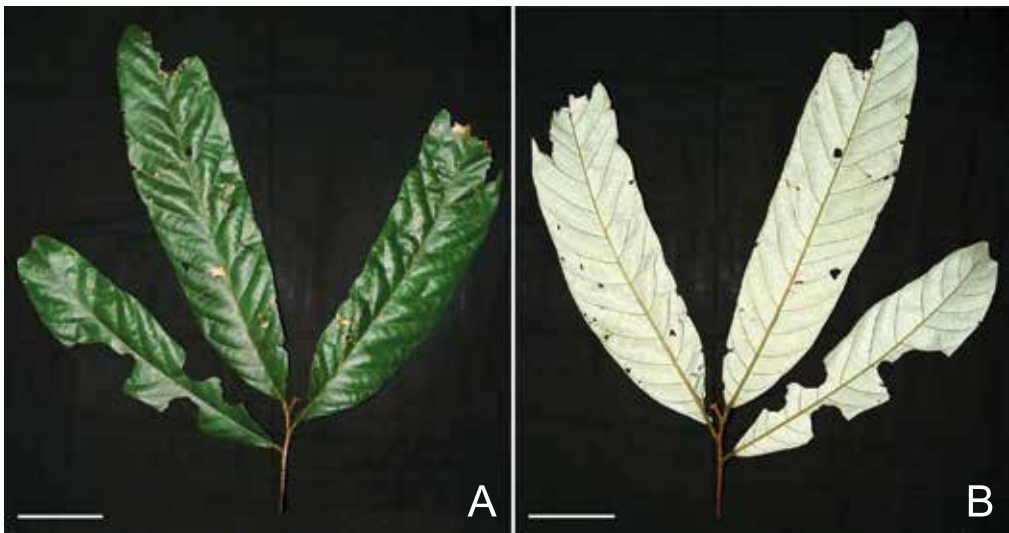


Fig. 2. Leaves of *Cryptocarya azurea* Ezedin from the Ramu basin. **A.** Adaxial side. **B.** Abaxial side. Scale = 10 cm. From Ezedin 768. (Photos: Z. Ezedin)

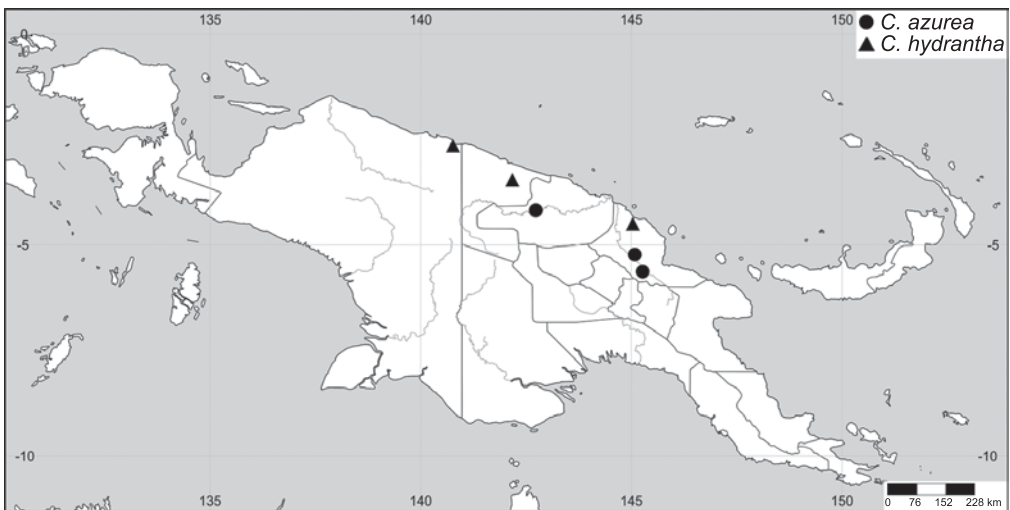


Fig. 3. Distribution map of the new species.

lines on a more local scale. In the Ramu, the laminas are often heavily damaged by herbivory.

Etymology. From the French *azur*, derived from Persian *lājward*, in reference to the bright bluish-green undersides.

Vernacular names. *Kubiŋ gubiŋ suku* (Magi), *Geikin me* (Glei Clan).

Additional specimens examined. PAPUA NEW GUINEA: **East Sepik:** Ambunti Subdistrict, Waskuk Hills, area around Langu and Garuka villages, 4°11'S 142°44'E, 150 m, 6 Jul. 1995 (fr.), *Regalado & Takeuchi 1501* (L [L.3907008]); Waskuk Hills, along the foot track between Garuka and Ambunti, in Glei Clan territory, 4°11'S 142°44'E, 30 m, 6 Jul. 1995 (fr.), *Takeuchi & Regalado 10294* (A [A02538400], L [L0079700]); Ambunti District, Waskuk Hills, Mt Musapien bivouac, 4°10'36"S 142°43'55"E, 360 m, 8 Nov. 2007 (fl., fr.), *Takeuchi et al. 21819* (A [A02538133, A02538135]); ibidem, 8 Nov. 2007 (fl., fr.), *Takeuchi et al. 21831* (A [A02538130, A02538131], L [L.4331072]); ibidem, 25 Nov. 2007 (fl., fr.), *Takeuchi & Ama 22405* (A [A02538129], L [L.4331073]). **Madang:** Wanang Forest Dynamics Plot, tag no. 124842, 5°13'39"S 145°04'47"E, 80–180 m, 5 Aug. 2022 (st.), *Ezedin 768* (MIN); ibidem, tag no. 120083, 5 Aug. 2022 (st.), *Ezedin 769* (MIN, BH); ibidem, tag no. 150419, 5 Aug. 2022 (st.), *Ezedin 770* (SING).

Notes. Specimens of this species collected in the Sepik were previously determined as *C. magnifolia*, the type of which also originates from the Sepik region. This species is also found within the Wanang 50 ha Forest Dynamics Plot (WFDP) in Madang Province where it is locally common and occasionally encountered in the understory (Fig. 4). In a recent revision of the plot's flora, it was referred to as *Cryptocarya* sp. 02 (Ezedin, 2023). It is likely to be found in other hilly areas of the Sepik-Ramu.

The species could readily be divided into two morphological subgroups that also appear to be separated by the two basins. Specimens from Ambunti district (Sepik) have a persistent indument and often short petioles whereas specimens from the Usino-Bundi district (Ramu) are very early glabrescent to glabrous, often with slightly longer petioles, and appear to on average have slightly larger maximum leaf sizes (up to 63 × 23 cm vs up to 48 × 14 cm). However, given these vegetative differences appear minor and are likely continuous, along with not having seen any fertile material from the Ramu, these morphotypes are not recognized as fundamentally separate taxa. It should be noted that descriptions of the flowers and fruits here are only based on Sepik material.

This species is similar to *C. magnifolia* and *C. elongata*, with the former it appears to share similarities in growth habit, venation, and laminar morphology. However, the new species differs in its much longer, narrowly lanceolate laminas, inconspicuous quaternaries, along with the sparsely flowered, laxly branched inflorescences with larger, more conspicuous bracts and bracteoles. Although this species is quite distinct even when sterile, it may potentially be confused with other large, elongate-leaved species including *C. fluminensis* Kosterm., *C. multipaniculata* Tescher, and perhaps even *C. caloneura* (Scheff.) Kosterm. It may be readily distinguished from all of these by its larger and longer laminas, larger and loosely flowered inflorescences, thick chartaceous leaves, and inconspicuous quaternary veins.

***Cryptocarya hydrantha* Ezedin, sp. nov.**

Differs from *C. cordifolia* in its thinner, chartaceous laminas (vs thick coriaceous), with glabrescent or glabrous undersides (vs persistently hairy), shorter and denser panicles (vs more openly branched), and tepals that are fully open to reflexed at



Fig. 4. Lowland hill forest at Wanang, Madang Province, Papua New Guinea. (Photo: Z. Ezedin)

anthesis (vs partially). – TYPE: Indonesia, Hollandia [=Jayapura], Bernhard bivak, 65 m, 8 August 1938 (fl.), *Neth. Ind. For. Service* bb 25749 (holotype L [L0036257]; isotype A [A02538622]). (Fig. 5)

Shrub or small tree to 8 m tall. **Stems** terete, hollow, with perforations at the nodes and internodes, sometimes becoming large cavities at the nodes, dark reddish brown tomentose when young, glabrescent, reddish dark brown, sparsely lenticellate and smooth when older. **Leaves** simple, alternate, spiral, broadly lanceolate, (18.5–)24–48(–52) × (9–)14–18(–22.5) cm, thin chartaceous, when fresh dark green above and glaucous bluish white below, when dry light to dark reddish brown to black above and whitish light brown below, laminae shortly tomentose below especially along veins, base strongly cordate to rounded (to acute), apex obtuse to acute, margins entire; petioles 0.5–2.5 cm, tomentose, drying blackish; venation eucamptodromous, tomentose below, abaxially pubescent, drying dark brown above and orangish below; primary vein adaxially flat to weakly sunken, abaxially prominently raised; secondary veins 9–16(–23) pairs, spaced 1.4–4.5 cm apart, angled $\pm 45^\circ$ from the costa; tertiary veins abaxially prominent and clear, straight percurrent, quaternary veins prominent and clear, straight (to forked) percurrent. **Inflorescences** axillary, large panicle, weakly branching towards base, densely flowered, 5–13 × 0.7–7.2 cm, 1° branch



Fig. 5. *Cryptocarya hydrantha* Ezedin. **A.** Flowering branch showing inflorescences and adaxial leaves. **B.** Abaxial leaves. **C.** Close-up of the stem showing small perforations along the internodes and nodes (above) and a large perforation at a node with small black ants (below). **D.** Close-up of inflorescence showing conspicuous rusty orange bracts. **E.** Close-up of inflorescence showing densely packed individual flowers. From Ezedin 1611. (Photos: Z. Ezedin)

tomentose towards the base and rusty orange, 2° branches (sub)glabrous and creamy white; bracts subtending all branched nodes, broadly triangular, laterally flattened, thickened towards base, $3.5\text{--}6 \times c. 1$ mm, bifacially tomentose. **Flowers** borne on the 3° branches but often in dense clusters appearing sessile on the 2° branches, solitary or in terminal pairs, each flower pair subtended by a bracteole; bracteoles 1–1.5 mm long, ±terete to weakly flattened, bifacially pubescent, often early caducous; perianth tube 2–3 mm long, subglabrous to tomentose outside, weakly villous inside towards the base; tepals 6, outer and inner tepals ±equal, $1.3\text{--}2.1 \times 0.8\text{--}1.3$ mm, glabrous inside, apex acute, inner tepals slightly smaller with prominently thickened centre, weakly villous inside towards the base and centre, fully reflexed at anthesis; stamens 9, in 3 whorls; outer and middle stamens equal, deltoid, $0.7\text{--}0.8 \times 0.2\text{--}0.3$ mm, introrse, glabrous at base; inner stamens narrowly triangular, $1\text{--}1.2 \times 0.4\text{--}0.5$ mm, extrorse, glabrous to weakly villous at base; glands 6, ±semicircular to subglobose, $0.15\text{--}0.25 \times 0.3\text{--}0.4$ mm, glabrous to weakly villous at base; staminodes sagittate, $c. 0.7 \times 0.4$ mm; gynoecium 2.3–2.8 mm long, glabrous, style 1.6–2 mm long, slender, basally notched, apex weakly flattened, ovary $0.7\text{--}0.8 \times 0.2\text{--}0.25$ mm, long ellipsoid. **Fruits** unknown.

Distribution. Indonesia (Papua Province) and Papua New Guinea (Fig. 3).

Habitat and ecology. Lowland hill forests up to 830 m above sea level; often found in low-lying areas. This species is a known myrmecophyte, with stems that are internally hollow and with large, conspicuous perforations at some nodes and smaller perforations interspersed in between along the length of the stem, facilitating the movement of ants. The perforations may become enlarged cavities following herbivory damage, likely from the ants themselves. The flowers are strongly fragrant, and the scent can be detected several meters away; the odour is initially sweet and somewhat citrusy-lemon but with a noticeably rank base note that lingers. Although the pollinators of this species are unknown, ants could be seen swarming the inflorescences during anthesis.

Etymology. Named after the thin reflexed tepals on the dried flowers, which bear resemblance to tentacles of the cnidarian genus *Hydra* L. (Hydrozoa: Hydridae).

Vernacular names. *Andreuwol* (Elkei).

Additional specimens examined. PAPUA NEW GUINEA: **Madang:** Josephstaal District, $4^{\circ}30'S$ $145^{\circ}02'E$, 160 m, Jun. 2006 (fl.), *Ama & Takeuchi s.n.* (A [A02538346, A02538439], L [L.3973803]). **Sandaun:** Nuku District, Tolo forest, near Yomoum village, Torricelli Range, $3^{\circ}27'59.6''S$ $142^{\circ}10'46.8''E$, 830 m, 20 Jul. 2024 (fl.), *Ezedin 1611* (A, MIN, SING, US).

Notes. On both duplicate specimens of the type designated here, Kostermans had placed a determination slip in 1967 reading “*Cryptocarya subsessilifolia* Kosterm.” with “sp. nov.” following it, presumably indicating his intention to designate it as the type specimen of a new species; however, he never formally published the name.

Following examination of the material housed at the Harvard University Herbaria (HUH), the novelty of this species is here confirmed. Following examination of the material housed at HUH, the novelty of this species is here confirmed. However, Kostermans' proposed epithet is not retained here as it would be quite inappropriate given that the conspecific Madang specimen exhibits much longer petioles than the type. Not to mention, the leaves of *C. azurea* can be just as "subsessile" as this species.

Vegetatively, it could be easily compared to *C. azurea* in its laminar morphology, which also has broadly lanceolate leaves in similar shape and size and less so with *C. cordifolia* or *C. magnifolia*. However, the floral morphology of *C. hydrantha* is unlike either of those two which have more robust, openly branched inflorescences, and only partially opened flowers. The type specimen from the Jayapura area slightly differs from the other two specimens in its cordate leaf bases (vs acute to rounded) and subsessile petioles at 0.5 cm long (vs 2–2.5 cm long). These appear to be minor variations as the overall morphology remains consistent.

The single fruit included in the packet of *Ana & Takeuchi s.n.* (sheet 1 of 2 at A) appears to belong to Myristicaceae as it bears a single prominent circumferential suture line. The dried fruit also differs from *Cryptocarya* in that its surface is heavily wrinkled, typical of Myristicaceae.

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