

Two new species of *Begonia* (Begoniaceae) from Bukit Baka Bukit Raya National Park, Kalimantan, Indonesia

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Abstract

Two new species of *Begonia* were discovered during an expedition to Mount Bukit Raya, the highest peak in Kalimantan, Indonesian Borneo. Full descriptions with colour plates and distribution map are provided.

Key words: *Begonia bukitrayaensis*, *Begonia kalimantana*, herbs, national park, plant taxonomy, west Malesia

Introduction

Begonia L. (Begoniaceae) is common in Kalimantan (Indonesian Borneo) but remains poorly understood due to a lack of collections from the field (Randi *et al.* 2022). In 2014 only five species of *Begonia* were known to occur in Kalimantan, this number is much lower compared to Brunei which at the same time had recorded 16 species (Julia & Kiew 2014). This is a stark contrast when compared to the area where Kalimantan occupies 73% while Brunei occupies 1% of the island of Borneo which has an area of 743,330 km². At that time, all known species from Kalimantan were either fairly widespread taxa initially described from outside Kalimantan (Hughes *et al.* 2020).

Begonia mentewangensis Girmansyah (2015: 1) and *B. dolichobracteata* Girmansyah (2015: 2) were the first two *Begonia* species described from Kalimantan. After that, other species were described from Kalimantan such as by Girmansyah (2017), Ardi *et al.* (2019), Hughes *et al.* (2020), Wang *et al.* (2020), and the latest by Randi *et al.* (2022) who published three new species with an updated checklist *Begonia* in Kalimantan which brought the total number of *Begonia* in Kalimantan to 30 species. Although quite slow, this development is quite significant. *Begonia* is gradually getting attention for collection from the field in Kalimantan because of the still high opportunity to find undescribed species.

A biodiversity expedition was conducted in June 2024 in Mount Bukit Raya facilitated by Bukit Baka Bukit Raya National Park Agency (Balai Taman Nasional Bukit Baka Bukit Raya). During this expedition, we discovered about 15 species of *Begonia* growing on the hiking trail to the summit of Bukit Raya, the highest peak in Indonesian Borneo, two of which we describe as new species in this paper and increased the number of *Begonia* in Kalimantan to 32 species. Field observations, morphological measurements with both fresh and herbarium specimens as well as

comparisons with other *Begonia* species have been carried out carefully. The general terminology in the description is based on Beentje (2010), while the preliminary conservation assessments are based on the most recent version of the guidelines of the IUCN Standards and Petitions Subcommittee (2024) and supported by GeoCAT (Bachman *et al.* 2011).

Taxonomic treatment

Begonia bukitrayaensis Randi & Mustaqim, *sp. nov.* §. *Petermannia* (Fig. 1)

Type:—INDONESIA. West Kalimantan: Sintang Regency, Serawai District, Rantau Malam Village, Soa Tohotung camp area of Bukit Baka Bukit Raya National Park, 0°39'33.3"S, 112°39'44.7"E, 1500 m elev., 2 Jul 2024, *Mustaqim & Yudistira 3364* (holotype WAN!; isotypes BO!, FIPIA!).

Diagnosis:—*Begonia bukitrayaensis* is similar to *Begonia chakensis* S.Julia & C.Y.Ling (2015: 108) in its creeping habit and ovate, asymmetric leaves, but differs in having glabrous vegetative parts except for stiff red bristle-like trichomes between the veins on the adaxial leaf surface (vs. densely pilose stems, petioles, and abaxial veins in *B. chakensis*). The leaves of *B. bukitrayaensis* have red-dentate margins and a rounded to slightly cordate base (vs. minutely serrate margins and an acute or slightly cordate base). The stipules are falcate with recurved margins and a cuspidate apex (vs. broadly ovate, serrate, and acute). Male flowers bear fewer stamens (25–28 vs. 39–40).

A terrestrial creeping herb up to 70 cm long, often branched; whole plant glabrous except the adaxial side of the leaf lamina. Stem succulent, 3–7 mm in diameter, plain green, sometimes reddish to light brown in old stem, rooting on each node when in contact with the substrate; nodes slightly swollen, internodes 1–5 cm apart. Stipules persistent, asymmetric, lanceolate to elliptic or falcate, 14–25 × 7–11 mm, glabrous and light green on both sides, midrib sunken on adaxial surface, strongly prominent abaxially, margin entire and becoming recurved with ageing, apex cuspidate with hardened and pointed ends. Leaves alternate, glossy and glabrous entirely; petiole 2–6 cm long, 2–4 mm diameter, channeled adaxially and rounded abaxially, light green or sometimes reddish at the ends; lamina strongly asymmetric, ovate to kidney-shaped, 7–14 × 5–9 cm, base rounded to slightly cordate, generally yellowish to reddish, margins broadly dentate with thin red along its edge, apex acuminate to caudate; adaxial surface light to emerald green, hairs are modified into red thick spine-like bristles resembling cat's claw, up to 2 mm long, sparsely distributed between the venations, bright red to crimson; abaxial surface pale green; venation palmate-pinnate, actinodromous, midrib distinguishable with 2–3 lateral veins each side, other primary veins branching dichotomously. Inflorescence protogynous, raised terminally, erect, up to 28 cm long, 1.6–3.5 mm diameter at base, light green; peduncles, pedicels, flower tepals, and ovary milky white when fresh; pistillate flowers in pairs on each node, up to 3 pairs along 2/3 of inflorescence length, each pair resting on a stalk 2–5 cm long; upper inflorescence up to 9 cm long with cymose branching to 2 orders containing up to 15 staminate flowers; bracts similar as stipules but often with symmetric base; bracteoles broadly ovate to suborbicular, 7–12 × 8–14 mm, margin entire, apex vary from acute, acuminate, rounded to shallowly emarginate. Staminate flower with 4 tepals, 2 outer and 2 inner, all with entire margins; pedicel slender, 9–14 mm long, 0.7–1.2 mm diameter; outer tepals broadly ovate to suborbicular, 9–14 × 8–14 mm, apex obtuse to rounded; inner tepals much narrower than outer ones, narrowly elliptic to linear, 5–8 × 1–2 mm, apex acute to rounded; androecium symmetric, 3–4 mm high, with 25–28 yellow stamens; filament slender, 0.6–1.4 mm long, anthers obovate, 0.8–1.5 × 0.5–1 mm, with divided apex, opened by slit. Pistillate flower 20–29 mm across at anthesis; pedicel 8–12 mm long, 0.8–1.1 mm diameter; ovary 3-locular, asymmetric, 12–15 × 13–17 mm (wings included), placentae bifid; tepals 5, 2 outer and 3 inner, all with entire margins; outer tepals ovate, 12–16 × 9.5–11 mm, apex obtuse to rounded; inner tepals with 2 broader and 1 smaller, broader ones asymmetric, broadly elliptic, 12–18 × 6–7.5 mm, apex rounded, smaller one distinctively smaller, narrowly elliptic, 10–14 × 2.5–3.5 mm, apex acute or sometimes obtuse; styles 3, 3–4 mm long, bifid, golden yellow; stigmas anchor-shaped, forming a short papillose spiral band. Fruit peduncle 14–36 mm long, light green; pedicel 12–23 mm long; capsules reflexed, 12–17 × 12–18 mm (wings included); milky white to light green, glabrous; wings 3, subequal, 3–5 mm wide at the widest point, apex rounded.

Distribution:—Endemic to Kalimantan, Borneo: found in Mount Bukit Raya in the Bukit Baka Bukit Raya National Park located on the border of West and Central Kalimantan Province (Fig. 3).

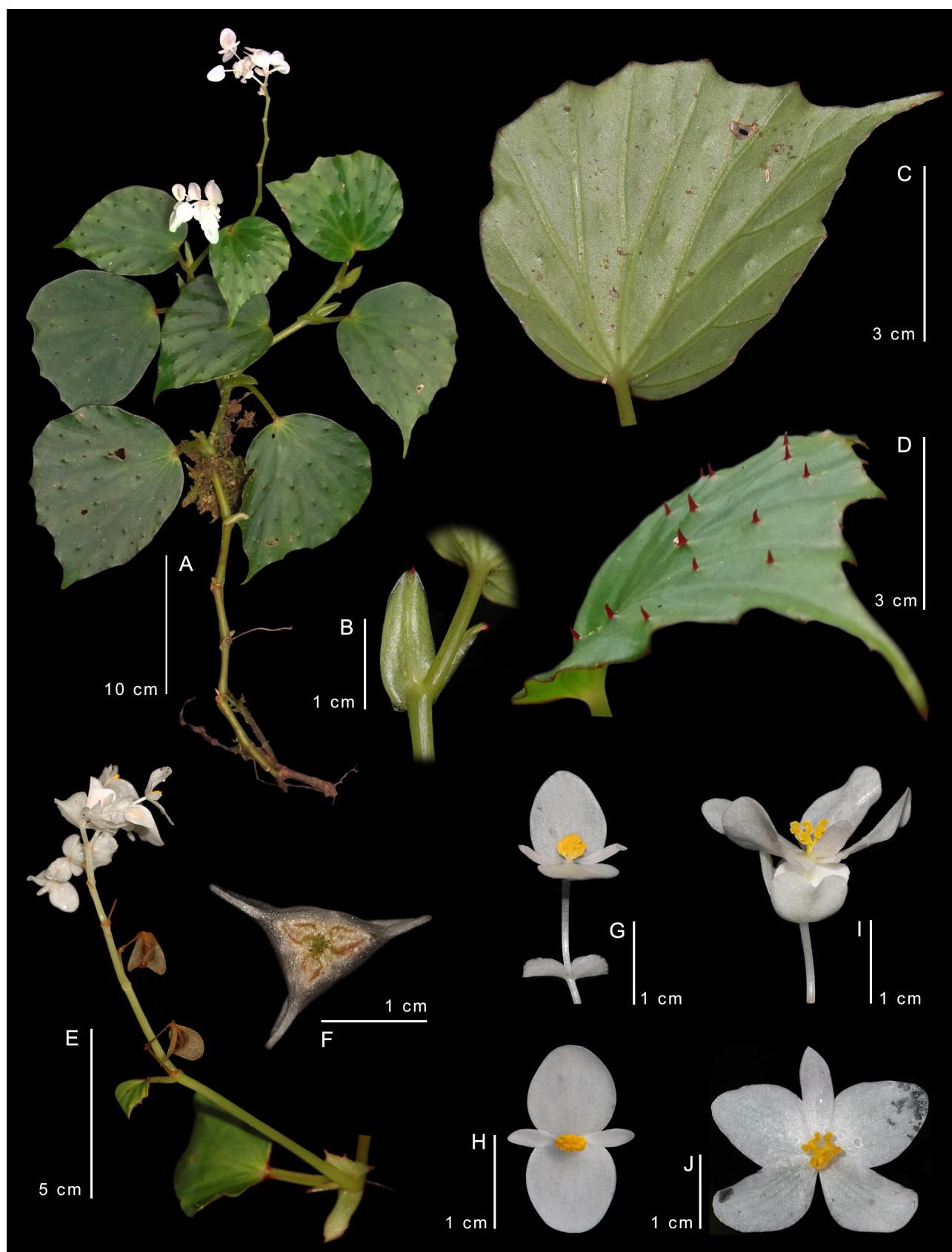


FIGURE 1. *Begonia bukitrayaensis* Randi & Mustaqim. **A.** Plant habit; **B.** Stipule and petiole; **C.** Leaves on abaxial surface; **D.** Hairs that harden like thorns on adaxial surface of leaves; **E.** Inflorescence; **F.** Cross section of fruit; **G–H.** Staminate flower (side and top view); **I–J.** Pistillate flower (side and top view). Photographs: A–D by A. Randi (from AR-406), E–J by Wendy A. Mustaqim (from Mustaqim *et al.* 3364).

Ecology and Habitat:—Terrestrial, creeping on mossy granite rocks in the banks of small rocky rivers and on the clay soils among granite-derived rocks on humid areas from the lowland mixed dipterocarp forest at 700 m elev. to the montane forest at 1650 m elev.

Etymology:—The epithet refers to the name of the location where this species was found, Mount Bukit Raya.

Provisional Conservation Status:—Least Concern (LC) (IUCN, 2024). *Begonia bukitrayaensis* is found in the lowland to montane forest of Mount Bukit Raya. The location is open to tourists who climb to the top of the mountain, which is one of the seven summits in Indonesia, but the localities of the populations of this new species are not easy to find and are relatively hidden. Although based on EOO = 0.735 km², and AOO = 12 km² this species potentially qualifies for the critically endangered category, but we have observed that this species is growing commonly in undisturbed forests and in fully protected forest areas of the national park.

Additional specimen examined:—INDONESIA. West Kalimantan: Sintang Regency, Serawai District, Rantau Malam Village, Soa Tohotung camp area on the hiking trail to the Bukit Raya's summit, 0°39'34.5"S, 112°40'14.3"E, 1640 m elev., 3 July 2024, *Mustaqim & Yudistira* 3373 (BO!, FIPIA!, WAN!); Bukit Raya summit trail, 1650 m elev., 6 June 2015, *A. Randi* AR-406 (BO!).

Notes:—Imbricate bract and bracteoles are a rare character in the section *Petermannia*, and primarily found in the Bornean species such as *B. chakensis*, *B. imbricata* Sands (1990: 68), *B. dolichobracteata* Girmansyah (2015: 19), *B. bosuangiana* S.Julia (Repin *et al.* 2015a: 6), and *B. kumangiana* S.Julia & C.Y.Ling (Julia & Ling 2022: 18). Among of these species, *B. chakensis* bears the most resemblance to *B. bukitrayaensis*, and the differences between these two species are discussed in the diagnosis. The new species also superficially resembles *B. bosuangiana* and *B. kumangiana* in having a creeping habit, but these two species can easily be distinguished from their stems and petioles that are consistently hirsute (vs. glabrous in *B. bukitrayaensis*). Meanwhile, *B. imbricata* and *B. dolichobracteata* are clearly different from *B. bukitrayaensis* from their erect habit (vs. creeping).

***Begonia kalimantana* Randi & Ardi, sp. nov. §. *Petermannia* (Fig. 2)**

Type:—INDONESIA. West Kalimantan: Sintang Regency, Serawai District, Rantau Malam Village, near Sungai Mangan base camp on the hiking trail to the Bukit Raya's summit, 0°37'49.19"S, 112°37'27.01"E, 620 m elev., 3 July 2024, *A. Randi* AR-1366 (holotype WAN!; isotypes BO!, FIPIA!).

Diagnosis:—*Begonia kalimantana* resembles *Begonia eutricha* Sands (1997: 434) in erect habit with distichous and falcate leaves, however it can be easily distinguished by striking consistent color pattern, dark olive green with shiny silvery white stripe along the midrib (vs. plain green), lamina surface hirtellous (vs. densely hispid); shorter male flower pedicels 8–12 mm long (vs. 22–24 mm long); ovary reddish and glabrous (vs. ovary white tinged with pink, and covered with soft white erect hairs), wings margin glabrous (vs. ciliate), and longer ovary beaked 3–5 mm long (vs. 1 mm long).

An erect terrestrial herb up to 30 cm tall, generally unbranched. Stem ascending and curving, 5–12 mm diameter, light green to reddish or brownish green, covered by densely pale yellowish green hispid hairs, internodes 6–22 mm apart. Stipules persistent, flat, covering the stem, petioles and bracts, sometimes also pedicels and ovaries; asymmetric, broadly ovate, 14–18 × 11–15 mm, light green to crimson, glabrous on both sides or with sparse strigose on outer side midrib, margin entire to minutely undulated, translucent, apex acute to retuse, with a long bristle point. Leaves distichous, arranged alternately; petiole short, 3–8 mm long, 2–4 mm diameter, yellowish green to reddish, covered by dense hispid hairs; lamina slightly falcate, elliptic to lanceolate, 11–22 × 3–7 cm, hirtellous on both sides; base cordate, subequal, overlapping, with an auriculate lobe on one side only, margin dentate, or sometimes crenate, ciliate, apex attenuate; adaxial surface has a striking color pattern, dark olive green with shiny silvery white stripe along the midrib and about half the length of lateral veins, minutely bullate; abaxial surface pink with ivory white to cream stripe along its main veins; venation pinnate, midrib conspicuous, slightly raised above, strongly prominent below, lateral veins 6–15 on each side, sunken above, prominent below. Inflorescences protogynous, appear in the leaf axils spread along the stem; male inflorescence a simple cyme, bracts small, triangular with long pointed apex, 3–5 × 1–2 mm, arranged tightly on a short peduncle, 4–6 mm long. Staminate flower: pedicel white, 8–12 mm long; tepals 2, ovate to suborbicular, 6.1–8.0 × 6.4–8.0 mm, white tinged with pink at the margin, glabrous, margin entire, apex rounded or obtuse; stamens yellow, in a loose conical cluster, 20–24, stalk ca. 1 mm long; filaments white tinged with yellow, 1.0–1.9 mm long; anthers yellow, ca. 1.0 × 0.6 mm, obovate, apex emarginate. Pistillate flower solitary on leaf axils, or sometimes on leafless older stem; with very short pedicel, ca. 1.3 mm long, pink; ovary generally hidden by two stipules, reddish, glabrous, 4–6 × 8–11 mm (wings included), with conspicuous beak, 3–5 mm long; wings falcate, curving upward toward the apex, apex obtuse; locules 3, placentas 2 per locule with many ovules on both surfaces;

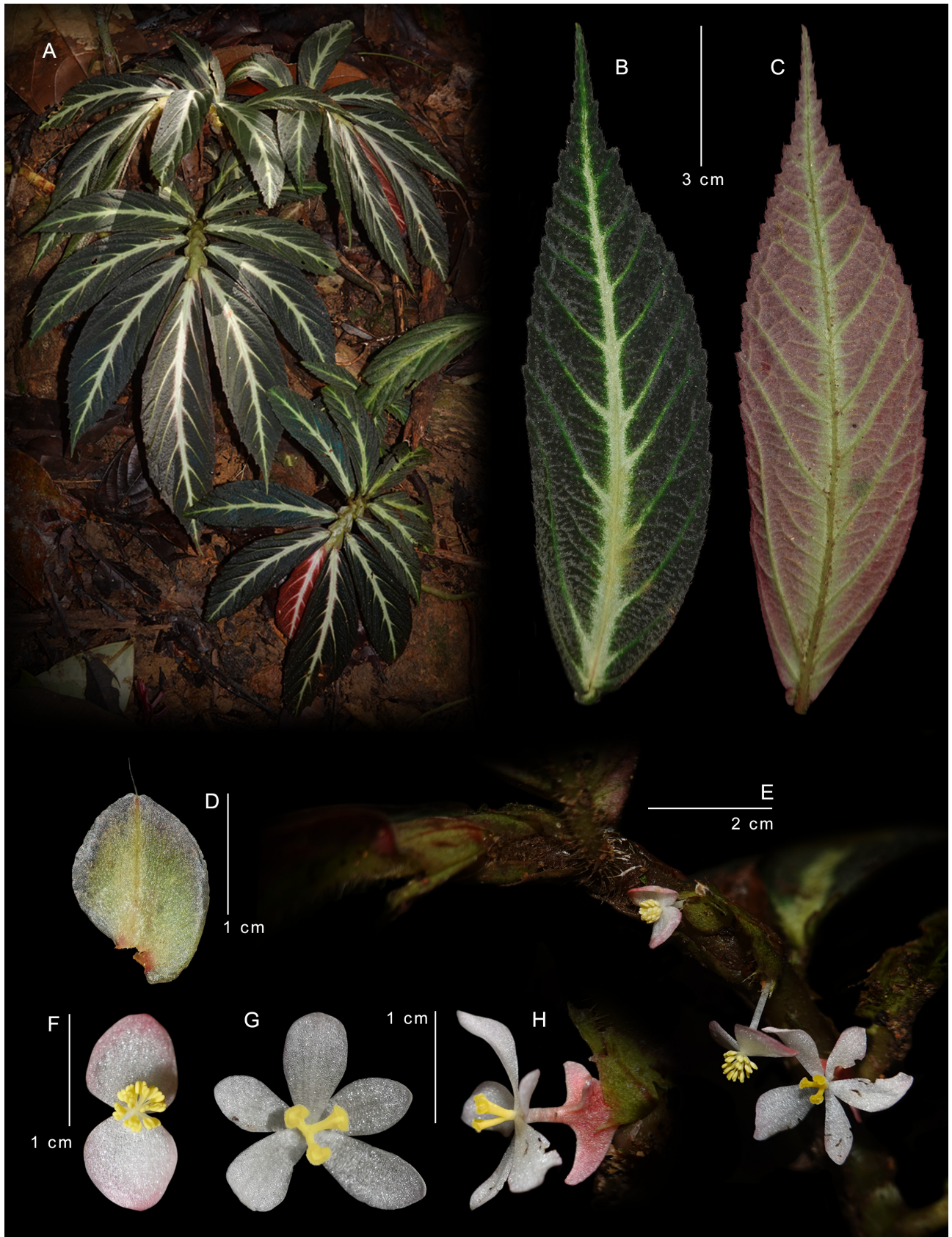


FIGURE 2. *Begonia kalimantana* Randi & Ardi. **A.** Plant habit in the wild; **B–C.** Adaxial and abaxial surface of leaves; **D.** Stipule; **E.** Stem and inflorescences; **F.** Staminate flower (top view); **G–H.** Pistillate flower (top and side view). Photographs: A. Randi (all from Randi AR-1366).

tepals 5, all glabrous, white or white tinged with pink at apex and margin, margins entire, apex acute to rounded; outermost tepals 2, oblanceolate, $7-8 \times 3-4$ mm; innermost 3 tepals, oblanceolate to spatulate, white, $8-11 \times 3-6$ mm; styles 3, persistent, pale yellow, 2–3 mm long, divided near the base, Y-shaped with twisted tips; stigma pale yellow, papillose forming a continuous twisted band. Fruit erect, single in leaf axil, $5-6 \times 6-8$ mm (wings included), pinkish green when fresh, glabrous, beak persistent, 5–7 mm long; wings 3, subequal, apex rounded, 2–3 mm long; pedicel 1–2 mm long, glabrous.

Distribution:—Endemic to Kalimantan, Borneo. So far only known from Schwaner Mountains of West and Central Kalimantan Province. Two locations are recorded, namely on the Bukit Raya hiking trail near Sungai Mangan base camp in Bukit Baka Bukit Raya National Park in West Kalimantan, and in the Forest Village Tumbang Habangoi in Central Kalimantan (Fig. 3).



FIGURE 3. Distribution map of *Begonia bukitrayaensis* (blue circle), and *B. kalimantana* (red circles).

Ecology and habitat:—Lowland mixed dipterocarp forest at 200–700 m.elev. in valleys with dense forest canopy cover, often found growing on slopes near small rivers.

Etymology:—From Kalimantan, Indonesian Borneo.

Provisional Conservation Status:—Least Concern (LC) (IUCN, 2024). *Begonia kalimantana* grows in relatively undisturbed primary forests and is located in fully protected forest areas, namely in the national park and the village forest.

Additional examined specimens:—INDONESIA. Central Kalimantan: Katingan Regency, Tumbang Habangoi Forest Village, $0^{\circ}47'28.23''S$, $112^{\circ}57'13.19''E$, 270 m. elev., 26 November 2022, *A. Randi* AR-882 (WAN!, BO!).

Notes:—*Begonia kalimantana* belongs to an informal ‘bruneiana’ group which has reclinate, short, unbranched, stout stems that arch, axillary and sessile inflorescences, and beaked ovary or capsule. Among the species in this group, *B. kalimantana* is most similar to *B. eutricha* as discussed in the diagnosis above. Regarding the beaked ovary or capsule *B. kalimantana* is also similar to *B. gusilii* Rimi (Repin *et al.* 2015b: 175), and *B. rambutan* Rimi (Repin *et al.* 2015a: 16), but it can be easily differentiated by glabrous (vs. hairy) and distinctly winged (vs. wingless) ovary.

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