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Five new species of *Begonia* (sect. *Petermannia*, Begoniaceae) from western Sarawak, Borneo

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ABSTRACT: In this paper, five new species of *Begonia* from western Sarawak are described and illustrated: *B. cruentospirituna* C.W. Lin, *B. galaxia* C.W. Lin, *B. opaca* C.W. Lin & C.-I Peng, *B. suyenii* C.W. Lin and *B. zygia* C.W. Lin & C.-I Peng. All species belong to section *Petermannia*. The materials studied were mainly from plants cultivated in nurseries and measurements made in the description were mostly taken based on images of living plants in the field. In addition to the taxonomic accounts, color plates, line drawings, and comparisons with phenetically similar species are provided to aid in identification.

KEY WORDS: *Begonia*, Begoniaceae, Borneo, *Petermannia*, Sarawak, New species.

INTRODUCTION

Borneo is an island with significant levels of biodiversity, at the heart of Sundaland which is one of 36 global biodiversity hotspots (Myers *et al.,* 2000). Inventorying the *Begonia* diversity in Borneo continues to reveal an astonishing number of new discoveries as sites previously unexplored biologically are accessed. Many Bornean indigenous plants are surfacing on international trade recently and several *Begonia* species are amongst them, as they are charismatic taxa worthy of cultivation. Borneo harbors very high levels of *Begonia* diversity with 140 species named and described in Sarawak (Julia & Kiew, 2016a, b; Julia *et al*., 2016, 2018; Kiew *et al.,* 2015; Lin & Peng, 2017; Lin *et al.,* 2017; Ling *et al.,* 2018), 82 species in Sabah (Kiew *et al*., 2015), 22 species in Brunei (Kiew *et al.,* 2015, Ling *et al.,* 2016) and 9 species in Kalimantan (Girmansyah & Susanti, 2015; Girmansyah, 2017; Kiew *et al.,* 2015). Based on vegetative morphology, the species described in this paper belong to sect. *Petermannia*, one of the largest sections in the genus, and they are immediately distinct from other known Bornean species. The discovery of these undescribed species shows that there are still many regions in Borneo that have yet to be botanically explored. In this study, all species studied were from cultivated plants from nurseries in Taiwan. Color plates, line drawings, and comparisons with phenetically similar species are provided to aid in identification.

TAXONOMIC TREATMENTS

1. *Begonia cruentospirituna* C.W. Lin, ***sp. nov. Type***: MALAYSIA, Borneo, Sri Aman Division, Batang Ai, *ca*. 200 m elev. Type specimens pressed from plants cultivated in a Nursery in Taiwan, 8 July 2018, *Lin 650* (holotype TAIF; isotype HAST, K).

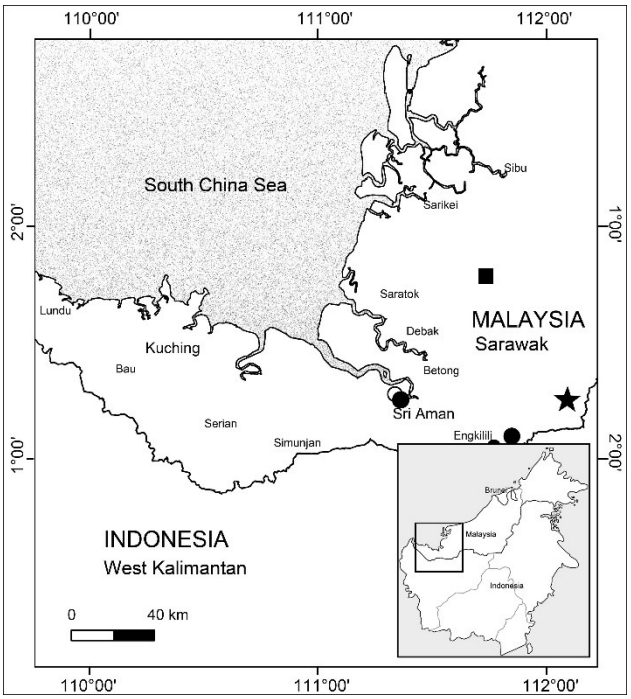

Fig. 1. Distribution map of ***Begonia cruentospirituna*** (star), ***B. galaxia*** (pentangle), ***B. opaca*** (square), ***B. suyenii*** (triangular) and ***B. zygia*** (circle) in western Sarawak, Borneo.

Sect. *Petermannia*

藏紅秋海棠 Figs. 2 & 3

Plant perennial, monoecious, terrestrial. **Stem** erect, few branched, sometimes sympodially branched, yellowish green to pale red, 30–100 cm tall, 3.5–7 mm across, densely red hispid, 5–9 mm long, internodes 0.5–

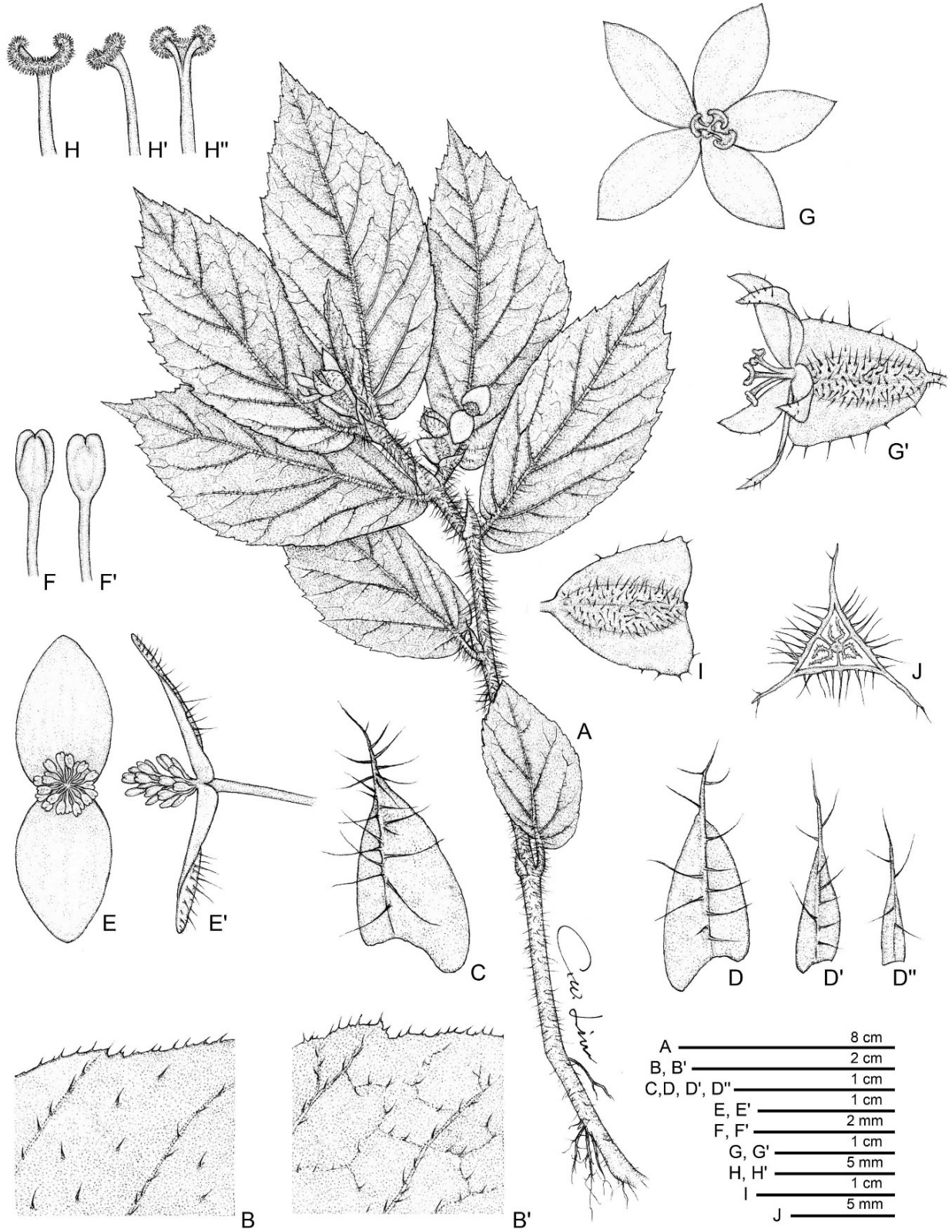

Fig. 2. ***Begonia cruentospirituna*** C.W. Lin**. A**. Habit; **B, B'**. Portion of leaf, adaxial and abaxial surface; **C**. Stipule, **D, D', D"**. Bracts at lowermost and uppermost parts of inflorescence; **E, E'**. Staminate flower, face and side views; **F, F'**. Stamen, ventral and dorsal views; **G, G'**. Pistillate flower, face and side views; **H, H', H".** Style and stigmatic band, dorsal, side and ventral views; **I**. Capsule; **J**. Cross section of an immature capsule. All from *Lin 650* (TAIF).

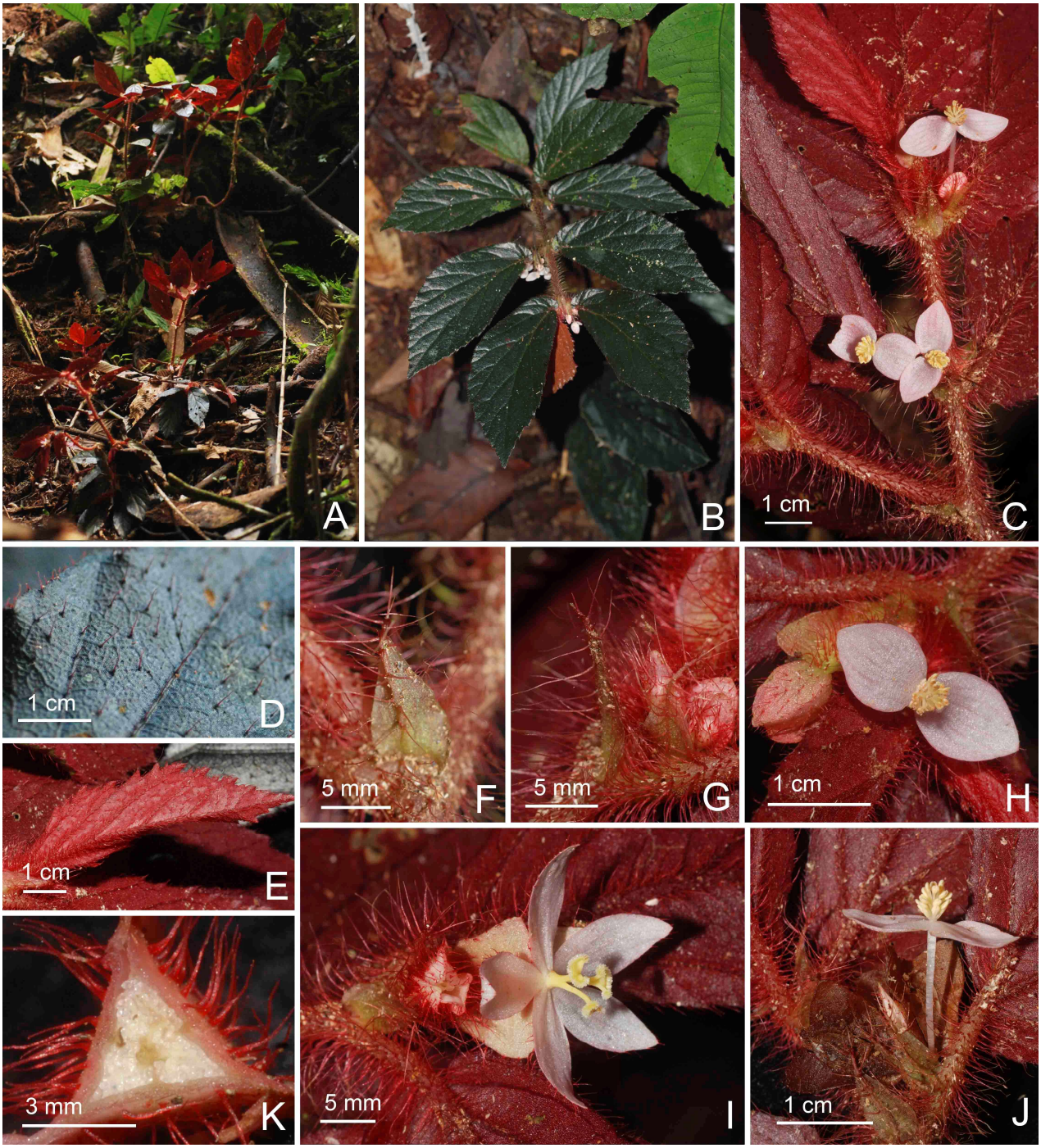

Fig. 3. ***Begonia cruentospirituna*** C.W. Lin**. A, B**. Habit and habitats; **C**. Sympodially branches, abaxial surface; **D**. Portion of leaf, adaxial surface; **E**. Young leaf; **F**. Stipule; **G**. Immature inflorescence, showing bracts and flower buds; **H**. Staminate flower and immature pistillate flower; **I**. Pistillate flower; **J**. Staminate flower and capsule; **K**. Cross section of an immature capsule. **C–J** from *Lin 650* (TAIF).

2 cm at upper stem, to 10 cm at lower stem. **Stipules** yellowish green to reddish, hyaline, ovate-triangular, 7–11 mm long, 5–7 mm wide, keeled, abaxially hispid at midrib, margin entire, apex aristate, arista *ca*. 5 mm long. **Petioles** slightly grooved above, 9–12 mm long, 2–3.5 mm across, greenish to reddish, densely red hispid. **Leaves** 6–15 or more, held nearly horizontally; lamina non-oblique, obovate, basifixed, slightly asymmetric, base unequally cordate, 8.5–12 cm long (basal lobes included), 3.5–5 cm wide, broad side 1.7–3.2 cm wide, basal lobe 5–8 mm long on broad side, margin denticulate to biserrate with larger teeth at end of veins, ciliate, apex shortly acuminate to attenuate, thinly succulent, adaxially dark olive green to malachite green

Table 1. Comparison of ***Begonia cruentospirituna*** C.W. Lin, ***B. edgariana*** S. Julia & Kiew, and ***B. hirtitepala*** S. Julia & Kiew

	B. cruentospirituna	***B. edgariana***	***B. hirtitepala***
Leaf			
size (cm)	8.5–12 × 3.5–5	6–14 × 2.5–6.5	12–18 × 5–10
vestiture			
abaxial surface	sparsely hispid to 4 mm long	densely appressed hairs *ca*. 2 mm long	spasely hairs *ca*. 1 mm long
adaxial surface	densely hispid on veins	appressed hairs	densely pilose on veins
Staminate flower			
pedicel (mm)	7–12	2–5	2–7
tepals size (mm)	7–12 × 4.5–8	4–5 × 3	5–7 × 4–5
no. of stamens	17–26	14–16	30–34
Pistillate flower			
tepals numbers	5	5	3 or 4
margin	entire	entire	toothed
ovary shape	narrowly elliptic	oblong	ovate
style length (mm)	5–6	3–4	2–3
Reference	Figures 1, 2	Julia & Kiew, 2016a: Figure 5	Julia & Kiew, 2016b: Figure 6

(rarely emerald green), sparsely red hispid to 4 mm long on veins, hairs magenta and slightly curved, abaxially scarlet to dull red (rarely pale green), densely hispid on veins, hairs 2–4 mm long; venation pinnate, midrib 7–11 cm long, with *ca.* 4 lateral veins on each side, veins branching dichotomously, tertiary veins obscure, weakly percurrent or reticulate; midrib and primary veins prominently raised abaxially. **Bracts** pale yellowish green to reddish, narrowly ovate-triangular to lanceolate , 5–8 mm long, 1–3.5 mm wide, margin entire, apex aristate, arista *ca.* 5 mm long. **Inflorescence** very congested, axillary on a short sympodial branch opposite the leaf from the adjacent leaf, branch 0.3–0.8 cm long bearing the inflorescence and a leaf that appears opposite the adjacent leaf, pistillate flowers 1 or 2-flowered, staminate flowers many, hidden by leaves; protogynous. **Staminate flower:** pedicel 7–12 mm long, tepals 2, white to pinkish, margin entire, ovate to elliptic, 7–12 mm long, 4.5–8 mm wide, abaxial covered with red hispid; androecium actinomorphic, stamens 17–26, filaments subequal, fused at base; anthers obovate, *ca.*1 mm long, subequal or shorter then filaments. **Pistillate flower:** subsessile, ovary pinkish, narrowly trigonous-ellipsoid, *ca*. 1 cm long, 3.5–4 mm across, hispid, 3-winged, wings narrowly triangular, subequal, *ca*. 1 cm long, 3.5–4.5 mm wide, narrowed to base, truncate distally, margin subentire, sparsely red hispid; ovary 3-locular, placenta bilamellate; tepals 5, white to pinkish, narrowly elliptic to ovate, sparsely red hispid abaxially, apex acute, base cuneate, 10–13 mm long, 3–5 mm wide; styles 3, golden yellow, bifid, 5–6 mm long, C-shaped; stigmas in a spiral band and papillose all around. **Fruit** subsessile, *ca*. 1 cm long, 1.2 cm across (wings included), hispid, wings 3, subequal, broadly acute proximally, truncate distally, margin subentire, *ca.* 12 mm long, 5 mm wide.

Distribution and ecology**:** *Begonia cruentospirituna* is endemic to Batang Ai area, Sarawak, Borneo (Figure 1). Known only from lowland mixed dipterocarp forest, on deeply shaded steep slopes by riverbanks at 100–250 m elevation.

Etymology: *Cruentus* (bloody), referring to the gorgeous scarlet abaxial leaf surface; *spiritus* (spirit /ghost) is named for the locality because 'Lubok Antu' means 'Ghost Pool' in Malay.

Notes**:** In Batang Ai, three similar species occur: *B. cruentospirituna*, *B. edgariana* S. Julia & Kiew (2016a: 25), *B. hirtitepala* S. Julia & Kiew (2016b: 268). In appearance, these species are all hairy and sympodially branched, with an obovate lamina and 2-tepaled staminate flowers, but they are easily distinguished by their lamina vestiture type, number of tepals in the pistillate flowers and shape of the ovary. Detailed comparison of the three species is presented in Table 1.

2. *Begonia galaxia* C.W. Lin, ***sp. nov. Type*****:** MALAYSIA, Borneo, Kuching Division, Padawan. Type specimens pressed from plants cultivated in a Nursery in Taiwan, 24 December 2017, *Lin 669* (holotype TAIF; isotype K).

Sect. *Petermannia*

撒銀秋海棠 Figs. 4 & 5

Plant perennial, monoecious, lithophyte. **Stem** climbing vertically up cliffs, ascending and erect on upper part, cane-like, reddish to crimson, 20–50 cm tall, 2.5–5 mm across, sparsely to densely velutinous, internodes 1.5–6 cm or longer, nodes slightly swollen. **Stipules** ovate, 7–13 mm long, 4–7 mm wide, hyaline, pale green, strongly keeled, margin entire, apex cuspidate. **Petiole** terete, 1.2–4 cm long at upper stem, up to 7 cm at lower stem, 1.5–3 mm across, olive-red to magenta, glabrous or very sparsely velutinous. **Leaves** 5–13, oblique, held downward; lamina ovate, basifixed, strongly asymmetric with a well-developed basal lobe on one side giving a cordate appearance, margin denticulate, ciliate, apex acuminate to short caudate, 8.5–19.5 cm long (basal lobes included), 5.7–10 cm wide, broad side4–7.8 cm wide, base unequal, basal lobes cordate, 1.8–5 cm long, succulent, adaxially dark olive green to grey blueish green, sometime maroon with a red patch at base, densely silvery semicontinuous spots of variable sizes between veins, spots slightly bullate, each bulla tipped by an erect short hair, abaxially pale green to

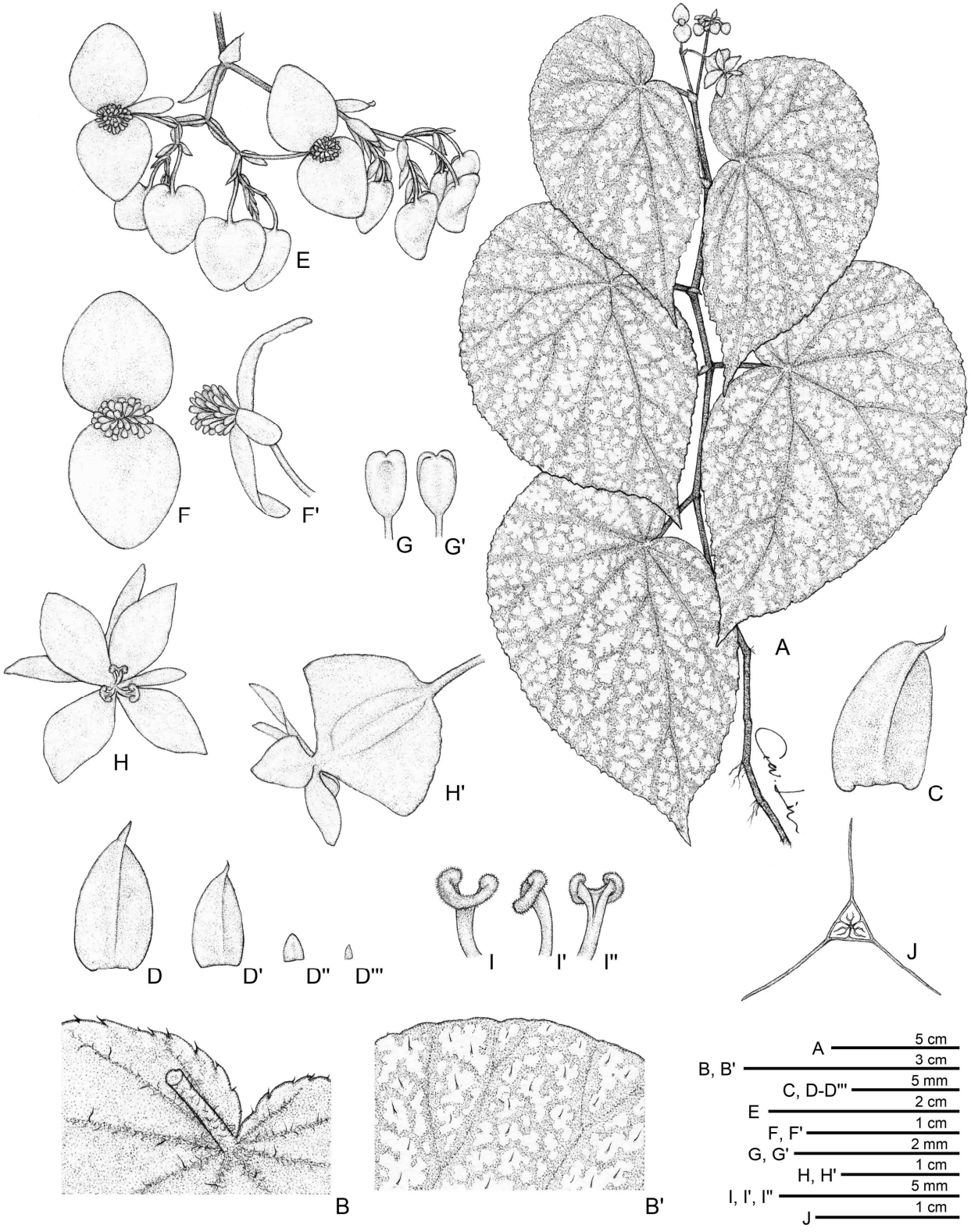

Fig. 4. ***Begonia galaxia*** C.W. Lin. **A**. Habit; **B**, **B'**. Portion of leaf, abaxial and adaxial surface; **C**. Stipule, **D**, **D'**, **D''**, **D'''**. Bracts at lowermost and uppermost parts of inflorescence; **E**. Inflorescence; **F**, **F'**. Staminate flower, face and side views; **G**, **G'**. Stamen, ventral and dorsal views; **H**, **H'**. Pistillate flower, face and side views; **I**, **I'**, **I''**. Style and stigmatic band, dorsal, side and ventral views; **J**. Cross section of an immature capsule. All from *Lin 669* (TAIF).

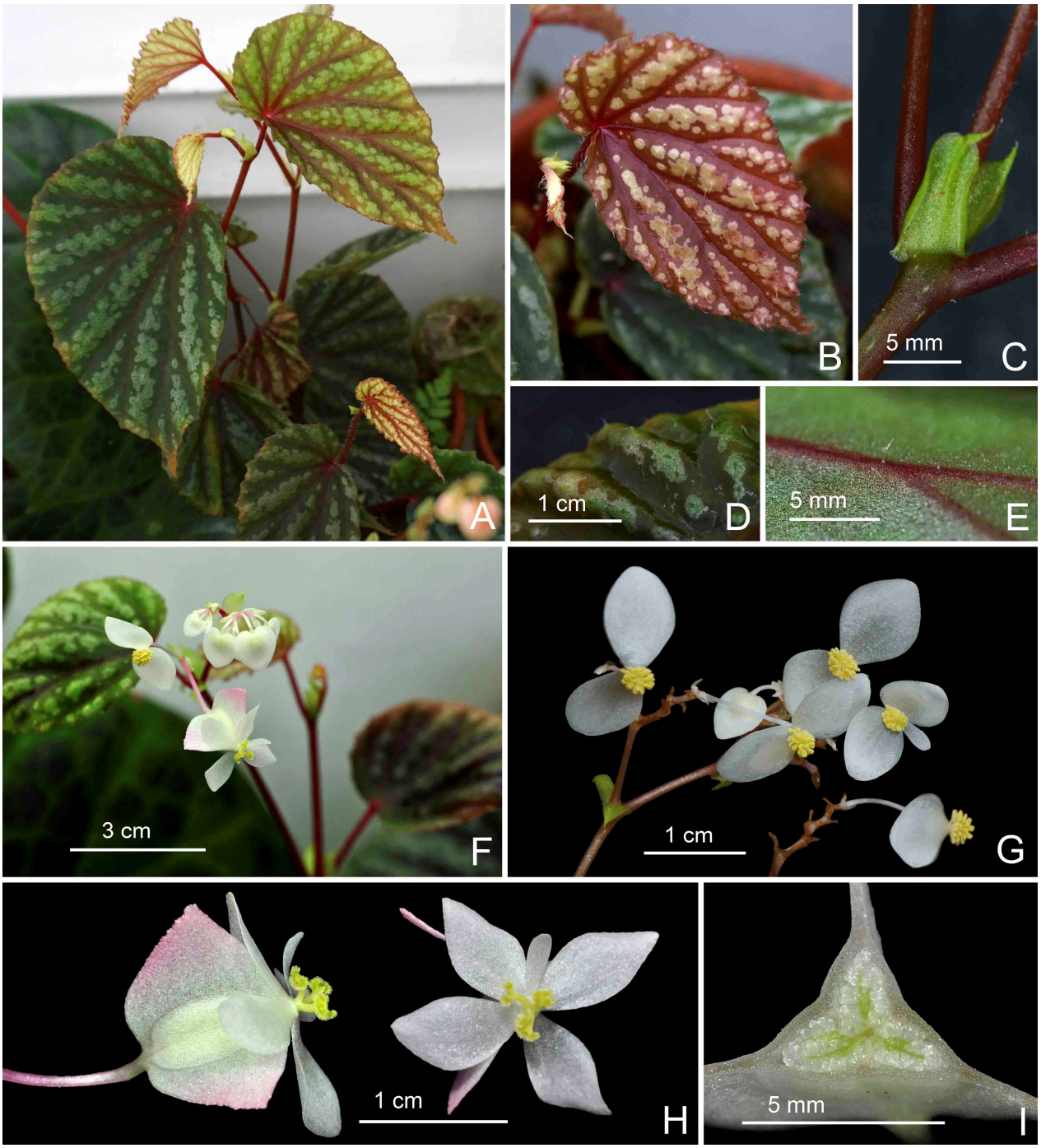

Fig. 5. ***Begonia galaxia*** C.W. Lin. **A**. Habit; **B**. Young Leaf; **C**. Stipule; **D**, **E**. Portion of leaf, adaxial and abaxial surface; **F**. Inflorescence; **G**. Staminate flowers; **H**. Pistillate flower, face and side views; **I**. Cross section of an immature capsule. All from *Lin 669* (TAIF).

tinged reddish; venation palmate-pinnate, midrib distinguishable, 6.5–14 cm long, *ca.* 2 major lateral veins on either side of midrib, other primary veins branching dichotomously; midrib and primary veins reddish and prominently raised abaxially, sparsely velutinous. **Bracts** greenish to white, hyaline, glabrous, usually persistent, those at basal node of inflorescence ovate-triangular, *ca.* 5 mm long, 3 mm wide, cuspidate at apex, margin entire, bracts at summit of inflorescence ovate to triangular, 1–4.5 mm long, 1–2.5 mm wide. **Inflorescence** bisexual, terminal and axillary on upper upper leaf axils, crimson, subglabrous, erect, cymose, cymosely branching panicle 5–10 cm long, peduncle up to 5.5 cm long, staminate cymes with up to 4 orders of branching and more than 10 flowers, pistillate flower usually singular, with singular staminate flower at base

of the short branches on inflorescence; protogynous. **Staminate flower:** pedicel *ca*. 1 cm long, glabrous, tepals 2 or 3, white, glabrous, outer two ovate to widely elliptic, margin entire, 6.5–8.5 mm long, 6–7.5 mm wide, inner one narrowly elliptic, 3.5–5 mm long, 1.5–2 mm wide; androecium actinomorphic, stamens 32–54, filaments fused at base; anthers *ca.* 0.7 mm long, subequal to filaments. **Pistillate flower:** pedicel *ca*. 1.4 cm long, sparsely glands; ovary creamy white, sometimes tinged pinkish, body trigonous-ellipsoid, *ca*. 7 mm long, 4.5 mm across, 3-winged; wings subequal, triangular, obtuse to base, truncate distally, *ca*. 1 cm long, 4–6.5 mm wide; ovary 3-locular, placenta bilamellate; tepals 5, white, outer 4 tepals rhombic, *ca*. 10 mm long, 4.5 mm wide, glabrous; inner 1 tepals narrowly elliptic or oblanceolate, *ca*. 5 mm long, 1.5 mm wide; styles 3, yellow, bifid, *ca.* 2.5 mm long; stigmas in a spiral band and papillose all around. **Fruit** not seen.

***Distribution and ecology*:** *Begonia galaxia* is endemic to limestone hills in Padawan.

Etymology: The specific epithet *galaxia* refers to the resemblance of the showy silvery spots on dark upper surface lamina of this new species to a starry night.

***Notes*:** *Begonia galaxia* bears a superficial resemblance to *B. penrissenensis* Kiew & S. Julia (2007: 221) that also occurs in limestone hills in Padawan area. Both share a similar cane-like habit and slivery spotted leaves. However, *B. galaxia* differs in having velutinous (vs. glabrous) surface on the stem, hairs on both surface of lamina (vs. glabrous), longer inflorescence 5–10 (vs. 1.3–5.2) cm long, 2 or 3-tepaled (vs. 2-tepaled) staminate flower and 5-tepaled (vs. 4-tepaled) in pistillate flower.

3. *Begonia opaca* C.W. Lin & C.-I Peng, ***sp. nov. Type*:** MALAYSIA, Borneo, Sarikei Division, Pakan, *ca*. 100 m elev. Type specimens pressed from plants cultivated in a Nursery in Taiwan, 24 December 2017, *Lin 664* (holotype TAIF).

Sect. *Petermannia*

紺碧秋海棠 Figs. 6 & 7

Plant perennial, monoecious, terrestrial. **Stem** multi-branched, erect to ascending, few branched, sometomes with sympodially branched, reddish, to 40 cm or longer, 2.5–5 mm across, densely red velutinous, hairs appressed or curued toward summit of stem; internodes 0.8–5 cm long, nodes slightly swollen. **Stipules** reddish, hyaline, widely ovate-triangular, 4.5–7 mm long, 3.5–5 mm wide, keeled, abaxially appressed velutinous at midrib, margin entire, apex aristate, arista *ca*. 2 mm long. **Petioles** terete, non-oblique, slightly grooved above, 2.5–5 mm long on upper stem, *ca.* 2 mm across, reddish, densely appressed velutinous. **Leaves** held more or less horizontally; lamina lanceolate to narrowly obovate, slightly falcate, basifixed, asymmetric, base attenuate, unequal, basal lobe to 5 mm long on broad side, margin subentire and slightly recurved, apex shortly attenuate, 7.5–12.5 cm long (basal lobes included), 2.3–4 cm wide, broad side 1.2–2.4 cm wide, succulent, adaxially malachite green to reddish green (sometimes with white to rosy pink spots between veins in young plants), strongly glossy, with malachite blue iridescence, sparsely puberulous on veins, hairs appressed or toward apex, sometimes with very sparsely puberulous between veins; abaxially reddish or magenta, appressed puberulous on veins; venation pinnate, midrib 7.2–12 cm long, with *ca.* 4 lateral veins on each side, veins branching dichotomously, tertiary veins obscure, weakly percurrent or reticulate; midrib and primary veins prominently raised abaxially. **Bracts** reddish, ovate-triangular to widely ovate-triangular, 2.5–5 mm long, 1.5–3.5 mm wide, margin entire, apex aristate, arista *ca.* 2 mm long. **Inflorescence** very congested, axillary on a short sympodially branch opposite the leaf from the adjacent leaf, branch *ca*. 0.5 cm long bearing the inflorescence and a leaf that appears opposite the adjacent leaf, pistillate flowers usually 1-flowered, staminate flowers many, hidden by leaves; protogynous. **Staminate flower:** pedicel *ca.* 1 cm long, tepals 2, pinkish, margin entire, elliptic, 8–10 mm long, 4–5 mm wide, puberulous on abaxially, hairs more or less appressed; androecium actinomorphic, stamens 17–22, filaments subequal, shortly fused at base; anthers widely obovate, *ca.*1 mm long, shorter than filaments. **Pistillate flower:** subsessile, ovary white, narrowly trigonous-ellipsoid, *ca*. 8 mm long, 3 mm across, puberulous, 3-winged, wings triangular, subequal, *ca*. 11 mm long, 4.5–7 mm wide, truncate proximally, margin subentire, sparsely puberulous; ovary 3-locular, placenta bilamellate; tepals 5, pinkish, elliptic, sparsely red puberulous abaxially, apex acute, base cuneate, 7–10 mm long, 2.5–5 mm wide; styles 3, golden yellow, bifid, *ca*. 5 mm long, Y-shaped; stigmas in a spiral band and papillose all around. **Fruit** subsessile, *ca*. 1.2 cm long, 1.4 cm across (wings included), wings 3, subequal, cuneate proximally, truncate distally, margin subentire.

Distribution and ecology: *Begonia opaca* is endemic to Pakan, Sarawak, Borneo (Figure 1). Grows in riparian forest on steep slopes.

Etymology: The specific epithet *opaca* refers to the dark colour on upper surface of the leaf.

***Notes*:** *Begonia opaca* bears superficial resemblance to *B. anserina* C.W. Lin & C.-I Peng (2014: 136). Both are sympodially branched cane-like species with obovate leaves, 2-tepalled staminate flowers and 5-tepalled pistillate flowers. However, the new species differs from *B. anserina* in the leaf blade subentire (vs. denticulate on upper half), apex attenuate (vs. apex shortly caudate), staminate flower pedicel *ca*. 10 (vs. 3–4) mm long, tepals pinkish (vs. whiteish green), anthers *ca*. 1 (vs. 0.5) mm long and shorter than filaments (vs. subequal to filament); pistillate flowers tepals margin entire (vs. denticulate), style *ca*. 5 (vs. 2.5–3) mm long.

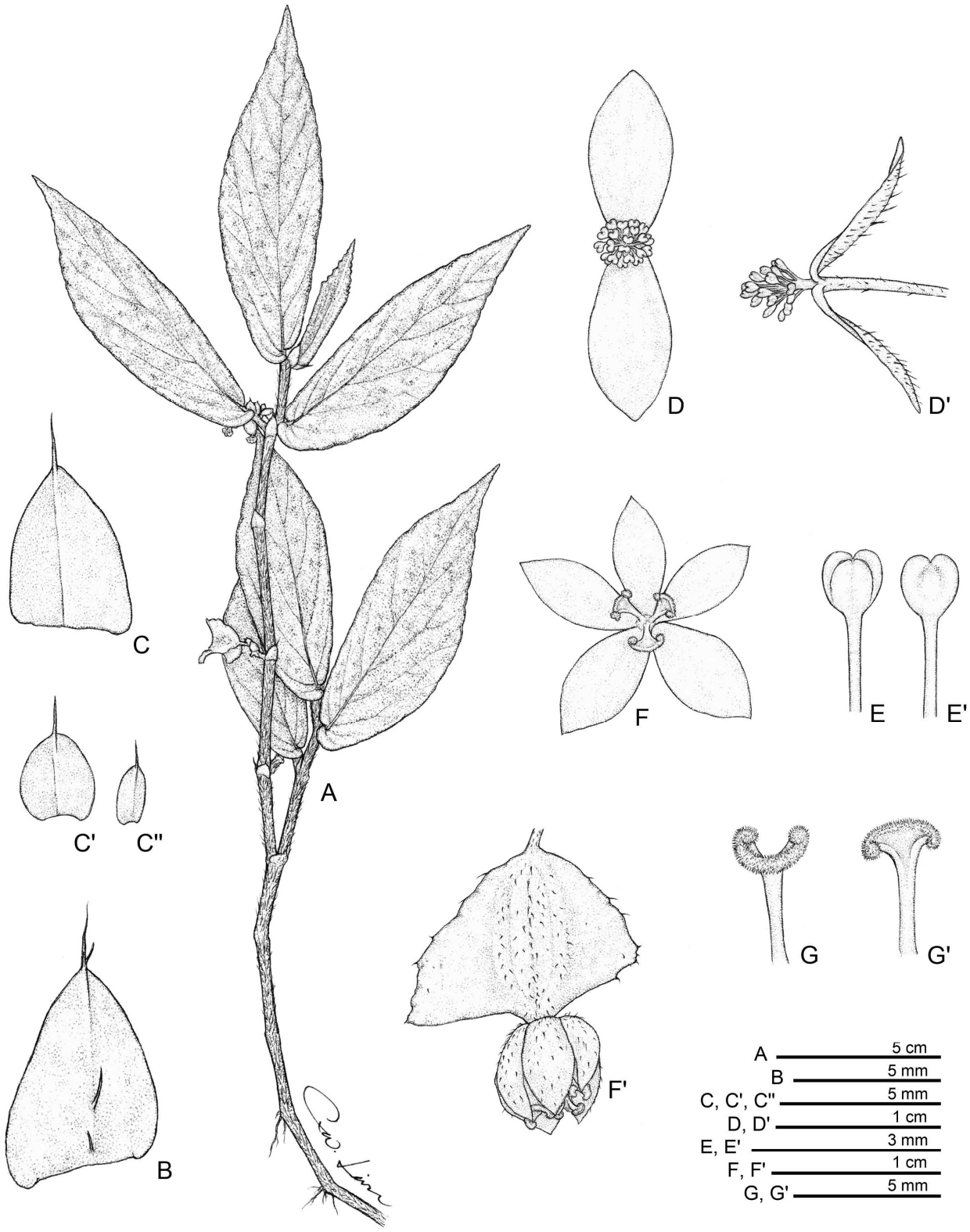

Fig. 6. ***Begonia opaca*** C.W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule, **C**, **C'**, **C"**. Bracts at lowermost and uppermost parts of inflorescence; **D**, **D'**. Staminate flower, face and side views; **E**, **E'**. Stamen, dorsal and ventral views; **F**, **F'**. Pistillate flower, face and side views; **G**, **G'**. Style and stigmatic band, dorsal and ventral views. All from *Lin 664* (TAIF).

Fig. 7. ***Begonia opaca*** C.W. Lin & C.-I Peng. **A**, **B**. Habit; **C**. Sympodially branches, adaxial surface; **D**. Stipule and bracts; **E**. Inflorescence, showing staminate flowers; **E**, **E'**. Stamen, dorsal and side views; **F**. Stipule; **G**. Staminate flower, face view; **H**, **I**. Pistillate flower, face and side views. All from *Lin 664* (TAIF).

4. *Begonia suyenii* C.W. Lin, ***sp. nov. Type*:** MALAYSIA, Borneo, Sri Aman Division, Lubok Antu, near Town of Lubok Antu, *ca*. 100 m elev. Type specimens pressed from plants cultivated in a Nursery in Taiwan, 9 July 2018, *Lin 651* (holotype TAIF; isotype HAST, K, E).

Sect. *Petermannia*

素燕秋海棠 Figs. 8 & 9

Plant perennial, monoecious, terrestrial, overall glabrous when seen with the naked eye; magnifying lens examination however reveals the stem/petiole/inflorescence to be very sparsely mimutely puberulous. **Stem** erect or ascending, much-branched crimson to pale green, 20–120 cm tall, 0.4–1.7 cm across, internodes shorter at upper stem, more longer at lower stem, 1.7–19 cm long,

Table 2. Comparison of ***Begonia. suyenii*** C.W. Lin, ***B. acidulenta*** S. Julia & Kiew and ***B. magnicarpa*** C.W. Lin & C.-I Peng.

	B. suyenii	***B. acidulenta***	***B. magnicarpa***
Stem			
branched	little-branched	little-branched	branching near the base
length (cm)	20–120	20–50	to 200 or longer
Leaf			
numbers	4–7	*ca*. 5	6–10
angle of leaf	slightly pointing upward	held downward	held horizontally
ratio of base lobe/leaf	1/3.5–5	1/3	1/4–5
Staminate flower			
tepal number	2	4	2
tepal color	pale yellowish green tinged red toward base	pale green	yellowish green tinged crimson basally
Pistillate flower			
tepals			
margin	entire	entire	denticulate
apex	obtuse to acute	broadly acute	acuminate
Capsule size (cm)	2–3.2 × 1–2.6	1.3–1.5 × 1.2–2.8	5–6.2 × *ca*. 2.5
Reference	Figures 10, 11	Julia & Kiew 2016a: Figure 2	Lin et al. 2017: Figure 14, 15

nodes swollen. **Stipules** greenish, hyaline, ovate, narrowly ovate to ovate-triangular, 8–35 mm long, 5.5–19 mm wide, strongly keeled, margin entire, apex cuspidate. **Petioles** slightly grooved above, 0.7–13 cm long at upper stem, prolong at lower stem to 22 cm long, 1.8–9 mm across, green to crimson. **Leaves** 4–7, oblique, slightly pointing upward; lamina ovate to widely ovate, basifixed, asymmetric with a well-developed basal lobe on one side giving a cordate appearance on broad side, margin subentire to denticulate, apex caudate to acuminate, 10–39 cm long (basal lobes included), 5–22.5 cm wide, broad side 3.3–15 cm wide, base unequal, basal lobes cordate, 1.3–10 cm long, slightly succulent, adaxially emerald green to dark brown green, with a red patch at junction on lamina and petiole, venation red toward base, abaxially pale green to crimson; venation palmate-pinnate, midrib distinguishable, 8.5–29 cm long, with *ca.* 3 major lateral veins on each side, other primary veins branching dichotomously. **Bracts** pale green, keeled, those at base of inflorescence ovate, 0.7–3 cm long, 0.5–1.6 cm wide, margin entire, apex cuspidate, deciduous, at summit of inflorescence similar but smaller. **Inflorescence** terminal, bisexual, cymosely branching panicle 6–18 cm long, sessile or with a peduncle 0.8–7 cm long, staminate cymes terminal, with up to 5 orders of branching, crimson to green, glabrous; pistillate flowers in pairs, on a very short peduncle at lower part of the inflorescence, sometimes solitary; protogynous. **Staminate flower:** pedicel 4.5–8 mm long, tepals 2, pale yellowish green tinged red toward base, widely elliptic to obovate, 4.5–6 mm long, 3.5–5 mm wide, margin entire; androecium actinomorphic, stamens 22–38, filaments subequal, fused at base; anthers *ca.*1 mm long, widely obovate, subequal to filaments. **Pistillate flower:** pedicel 8–15 mm long, ovary pale green to reddish, narrowly trigonous-ellipsoid, 10–20 mm long, 3–4.5 mm across, 3-winged, wings narrowly triangular, subequal, 12–28 mm long, 3–7 mm wide, rounded to truncate distally, margin subentire, glabrous; ovary 3-locular, placenta bilamellate; tepals 5, pale green, ovate to obovate, apex obtuse to acute, base cuneate, 7–12 mm long, 4–7.5 mm wide; styles 3, yellow to pale orange, bifid, *ca*. 5 mm long, Y-shaped; stigmas in a spiral band and papillose all around. **Fruit** recurved on a stalk 1.8–2.7 mm long, capsule 2–3.2 cm long, 1–2.6 cm across (wings included), wings 3, subequal, rounded to truncate distally, cuneate proximally.

Distribution and ecology: *Begonia suyenii* is endemic to Sri Aman Division, Sarawak, Borneo (Figure 1). Growing on steep slopes or cliff faces in a lightly to deeply shaded area at 50–200 m elevation, locality common.

Etymology: Named in honor of Su-Yen Hung, a plant enthusiast, Yau-De Huang's mother. Mr. Huang, a friend of the author, first discovered this new species, and the specific epithet commends his mother's support for him.

Notes: *Begonia suyenii* slightly resembles *B. acidulenta* S. Julia & Kiew in its habit, the whole plant glabrous, the ovate leaves and 5-tepaled pistillate flower, but is distinguishable by the young plants leaves absent spot (vs. white or pink spots) and 2-tepaled (vs. 4-tepaled) staminate flower. The new species also resembles *B. magnicarpa* C. W. Lin & C.-I Peng which is also from Sri Aman Division. However, it is differentiated by the leaf shape, entire margin pistillate tepals and shorter fruits. Detailed comparison of the new species with other phenetically similar species are compared in Table 2.

Additional specimen examined: MALAYSIA, Borneo, Sri Aman Division, near Nanga Entulang, ca. 150 m elev. Specimens pressed from plants cultivated in a Nursery in Taiwan, 10 July 2018, *Lin 653* (paratypes TAIF, E).

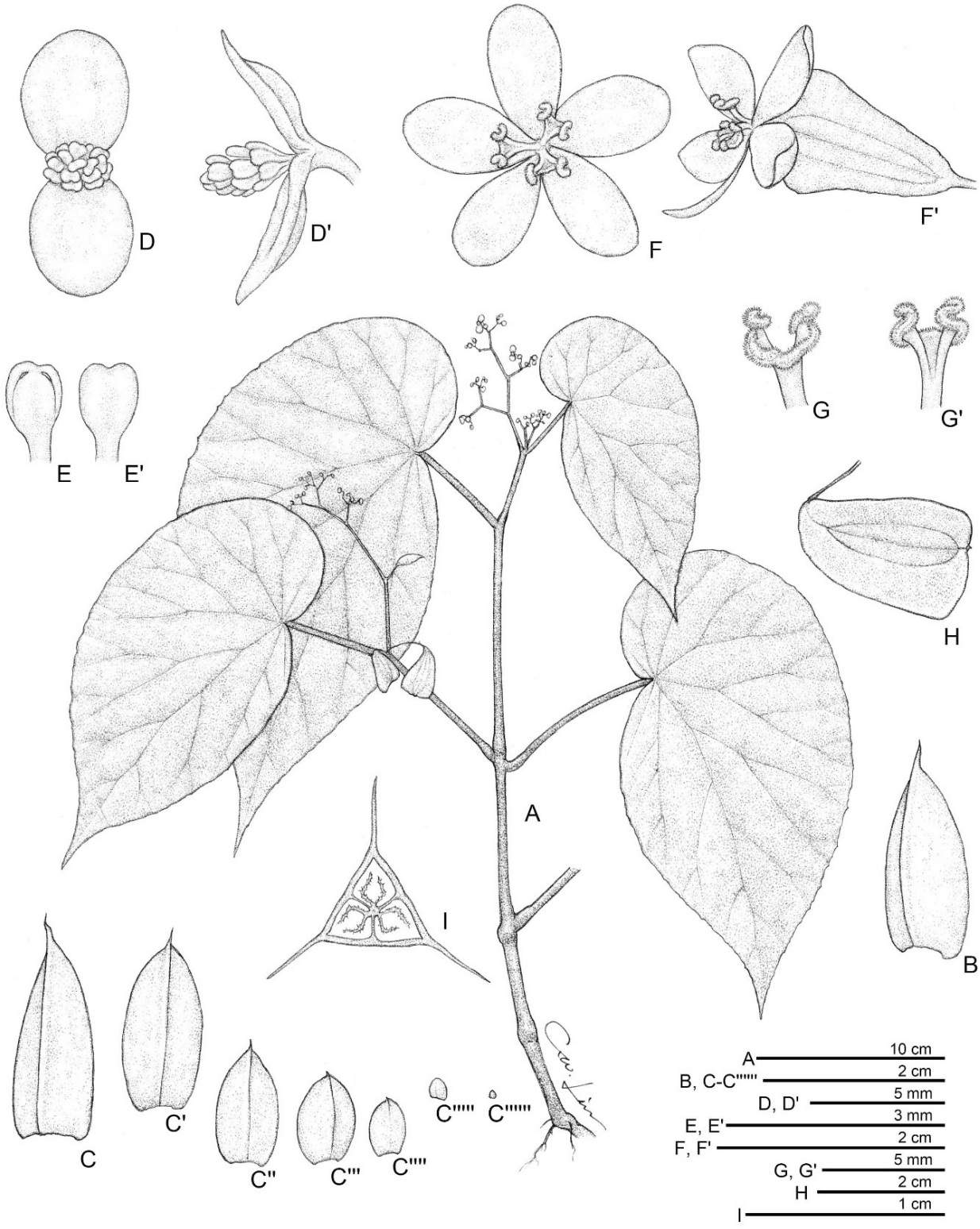

Fig. 8. ***Begonia suyenii*** C.W. Lin. **A**. Habit; **B**. Stipule; **C**-**C''''''**. Bracts at lowermost and uppermost parts of inflorescence; **D**, **D'**. Staminate flower, face and side views; **E**, **E'**. Stamen, dorsal and side views; **F**, **F'**. Pistillate flower, face and side views; **G**, **G'**. Style and stigmatic band, dorsal and ventral views; **H**. Capsule; **I**. Cross section of an immature capsule. All from Lin 651 (TAIF).

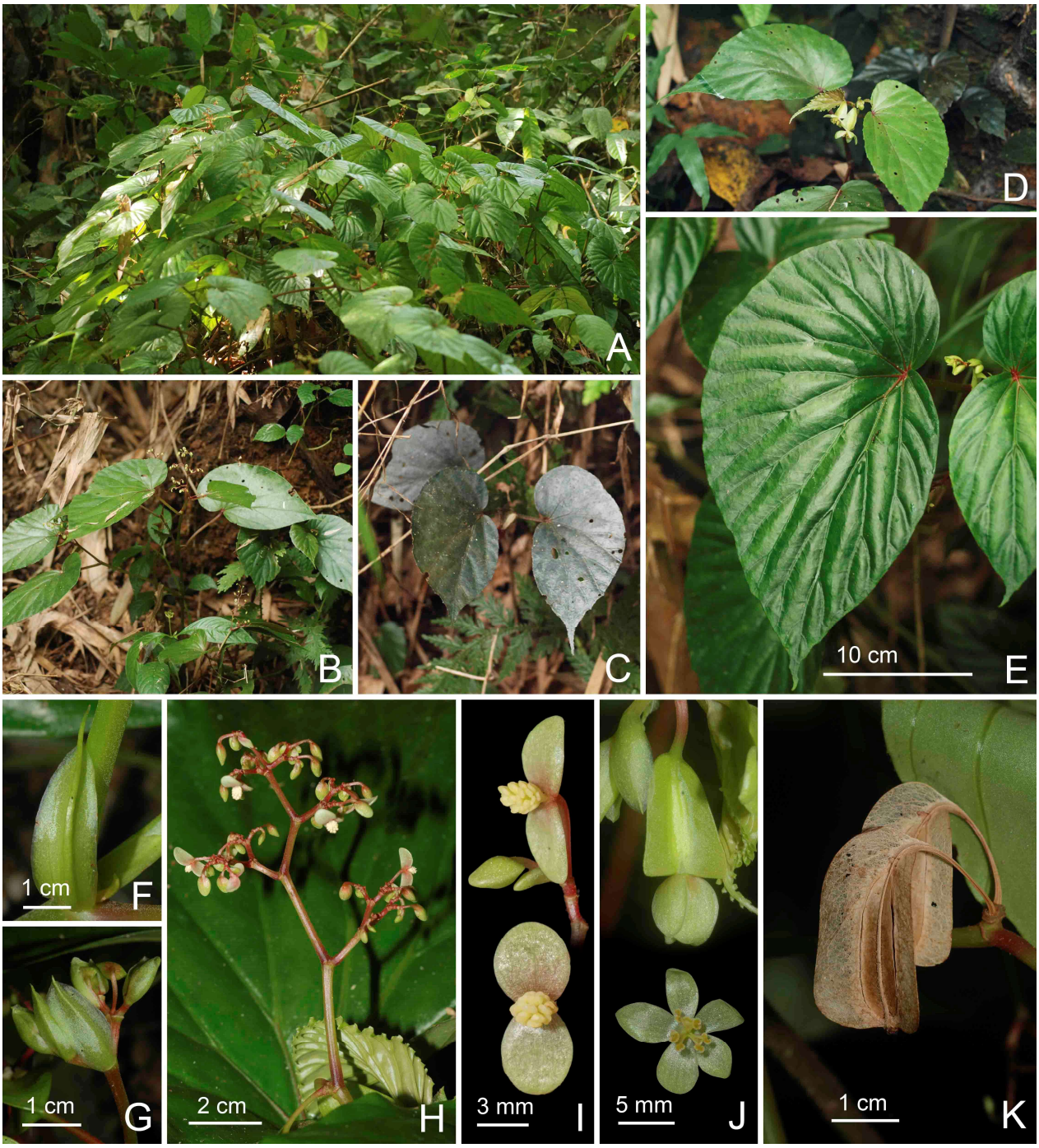

Fig. 9. ***Begonia suyenii*** C.W. Lin**. A**, **B**, **C**, **D**. Habit and habitats; **E**. Leaf; **F**. Stipule; **G**. Bracts of immature staminate inflorescence; **H**. Inflorescence, showing staminate flowers; **I**. Staminate flower, side and face views; **J**. Pistillate flower, side and face views; **K**. Capsules. **F**–**H** from *Lin 653* (TAIF); **I**–**K** from *Lin 651* (TAIF).

5. *Begonia zygia* C.W.Lin & C.-I Peng, ***sp. nov. Type*:** MALAYSIA, Borneo, Sri Aman Division, near Nanga Entulang, *ca*. 100 m elev. Type specimens pressed from plants cultivated in a Nursery in Taiwan, 11 July 2018, *Lin 652* (holotype TAIF; isotype HAST, K).

Sect. *Petermannia*

對葉秋海棠 Figs. 10 & 11

Plant perennial, monoecious, terrestrial. **Stem** erect or ascending, rooting at lower nodes when procumbent, sympodially branched, olive green to reddish, to 80 cm tall, 3.5–8 mm across, densely erect long strigose (to 3.5mm long) and shortly appressed puberulous, internodes (0.5)1–7 cm. **Stipules** pale green, hyaline, narrowly ovate-triangular to lanceolate, 5–9 mm long,

2.5–4 mm wide, keeled, abaxially puberulous at midrib, margin entire, apex aristate, arista 3–4.5 mm long. **Petioles** slightly grooved above, 3–7 mm long, *ca.* 2.5 mm across, reddish, densely erect long strigose and shortly appressed puberulous. **Leaves** 4–16 or more, held nearly horizontally; lamina non-oblique, narrowly obovate to oblanceolate, slightly falcate, basifixed, slightly asymmetric, 9–15 cm long (basal lobes included), 3–5 cm wide, broad side 1.7–2.7 cm wide, base attenuate, unequal, basal lobe 5–7 mm long on broad side, margin denticulate to biserrate with larger teeth at end of veins, apex attenuate, succulent, adaxially dark green, raised between veins giving lamina a rugose appearance, with sparse curved scabrous hairs between veins and midrib; abaxially pale green to reddish, appressed puberulous and erect strigose on veins; venation pinnate, midrib 8–14 cm long, with *ca.* 4 lateral veins on each side, veins branching dichotomously, tertiary veins obscure, weakly percurrent or reticulate; midrib and primary veins reddish and prominently raised abaxially. **Bracts** pale green, narrowly ovate-triangular to lanceolate, those at base of inflorescence *ca*. 5 mm long, 2 mm wide, margin entire, apex aristate, arista 3–4 mm long, at summit of inflorescence similar but smaller. **Inflorescence** axillary on a short sympodially branch opposite the leaf from the adjacent leaf, branch 0.4–1 cm long bearing the inflorescence and a leaf that appears opposite the adjacent leaf, pistillate flowers 1 or 2-flowered, staminate flowers many, hidden by leaves; protogynous. **Staminate flower:** pedicel 4–6 mm long, puberulous, tepals 2, creamy white to pale green, margin entire, widely ovate, 5–7 mm long, 5–6.5 mm wide, abaxially puberulous; androecium actinomorphic, stamens 23–28, filaments subequal, shortly fused at base; anthers widely obovate, *ca.*1 mm long, subequal to filaments. **Pistillate flower:** subsessile, ovary white, trigonous-ellipsoid, *ca*. 8 mm long, 3.5–4.5 mm across, puberulous, 3-winged, wings triangular, subequal, 9–12 mm long, 3–6 mm wide, truncate distally, margin subentire, puberulous; ovary 3-locular, placenta bilamellate; tepals 4 or 5, creamy white to pale green, ovate to obovate, margin sparsely denticulate, apex acute, base cuneate, 8–10 mm long, 2.2–6 mm wide; styles 3, yellow to pale orange, bifid, *ca*. 4.5 mm long, Y-shaped; stigmas in a spiral band and papillose all around. **Fruit** subsessile, ca. 10 mm long, 1–1.5 cm across (wings included), puberulous, wings 3, subequal.

Distribution and ecology: *Begonia zygia* is endemic to Sri Aman Division, Sarawak, Borneo (Figure 1). Growing on steep slopes or mossy sandstone boulders in shaded and wet areas near streams at 50–350 m elevation.

Etymology: The specific epithet is derived from its oppositely arranged leaves.

Notes: *Begonia zygia* similar to *B. anserina* C.W. Lin & C.-I Peng in its sympodially branching habit, narrowly obovate lamina and 2-tepaled staminate flowers.

But the new species is different in its stem and petiole being erect long strigose and shortly appressed puberulous (vs. only shortly appressed puberulous), lamina conspicuously bullate between veins (vs. nearly flat), with sparse curved scabrous hairs between veins and midrib (vs. subglabrous, or rarely minutely hairs raised between veins), stamens 23–28 (vs. *ca*.18), pistillate flower 4 or 5-tepaled (vs. only 5-tepaled).

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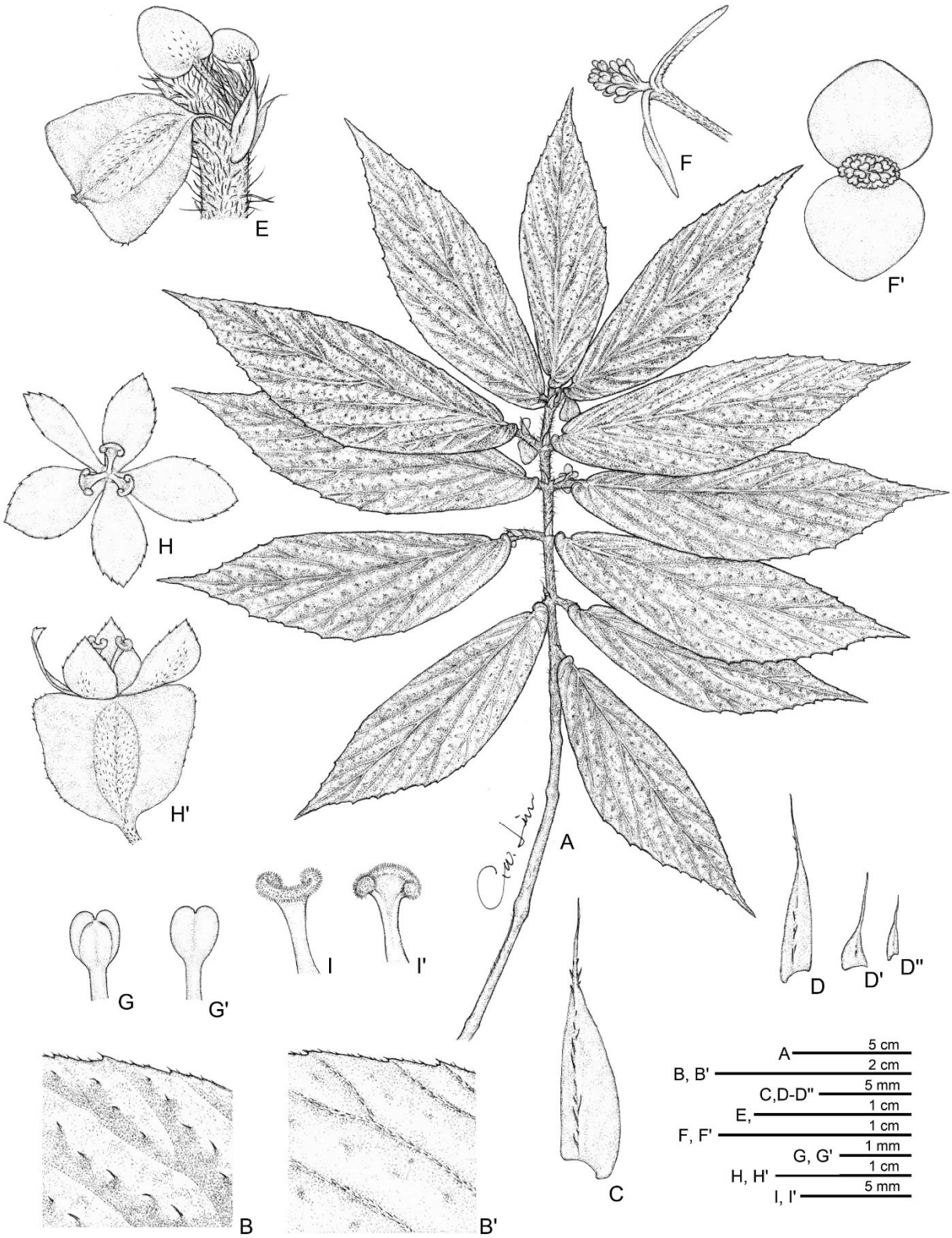

Fig. 10. ***Begonia zygia*** C.W. Lin & C.-I Peng**. A**. Habit; **B**, **B'**. Portion of leaf, adaxial and abaxial surface; **C**. Stipule, **D**, **D'**, **D"**. Bracts at lowermost and uppermost parts of inflorescence; **E**. Capsule and staminate flowers; **F**, **F'**. Staminate flower, face and side views; **G**, **G'**. Stamen, dorsal and ventral views; **H**, **H'**. Pistillate flower, face and side views; **I**, **I'**. Style and stigmatic band, dorsal and ventral views. All from *Lin 652* (TAIF).

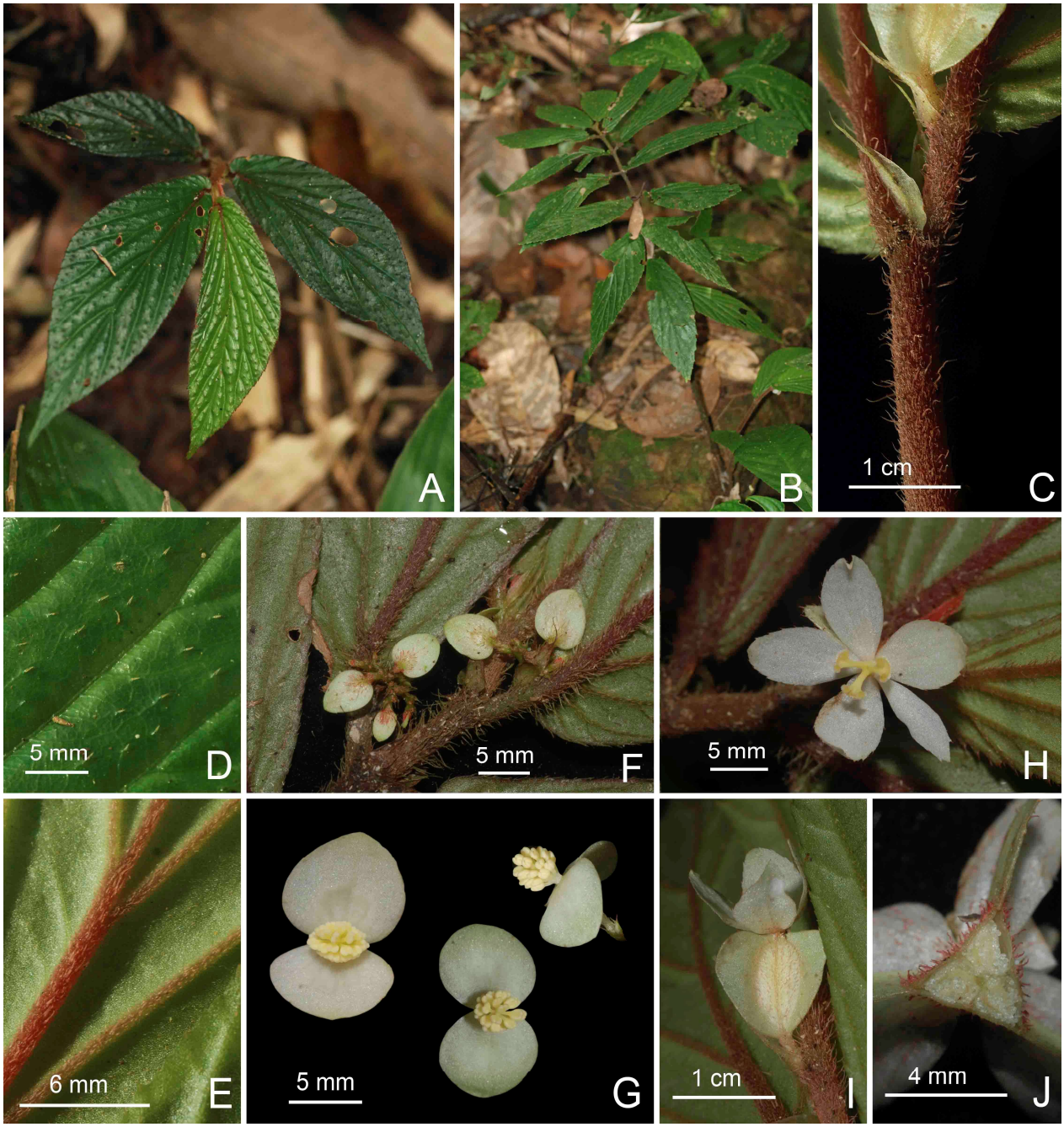

Fig. 11. ***Begonia zygia*** C.W. Lin & C.-I Peng**. A**, **B**. Habit and habitats; **C**. Stipule on Stem; **D**, **E**. Portion of leaf, adaxial and abaxial surface; **F**. Inflorescens; **G**. Staminate flower, face and side views; **H**, **I**. Pistillate flower, face and side views; **J**. Cross section of an immature capsule. **C**–**J** from *Lin 652* (TAIF).