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Eleven new species of *Begonia* (Begoniaceae) from Sarawak, Borneo

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ABSTRACT: Diverse geological formations resulted in diverse terrains and varied microhabitats in Borneo where over 200 species of *Begonia* are currently known. The majority of *Begonia* species in Sarawak have a very narrow to moderately restricted distribution, and are often confined to a particular geology. An overwhelming number of new species were reported recently from Borneo. It was estimated that more than 600 species of *Begonia* occur in Borneo, which means that many more species are yet to be discovered and scientifically named. In continuation of our research on Sarawak *Begonia*, we discovered a number of unknown species of *Begonia* from southwestern Sarawak. Consultation of the literature, herbarium specimens and detailed morphological examination of plants in cultivation supports the recognition of eleven new species. Herein we name them as *B. aiensis*, *B. dinosauria*, *B. hirsuticarpa*, *B. iridifolia*, *B. lawii*, *B. lichenora*, *B. magnicarpa*, *B. metallicolor*, *B. nix*, *B. superciliaris* and *B. wallacei*, all of which belonging to sect. *Petermannia*. They are fully described and illustrated in this article.

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

INTRODUCTION

Diverse geological formations such as limestones, sandstones, granites, mudstones, lignites and siltstones resulted in diverse terrains and varied microhabitats in Borneo (Lin *et al.* 2014b) where over 200 species of Begonia are currently known (Girmansyah 2015; Hughes 2008; Joffre *et al.*, 2015; Julia *et al.* 2013, 2015a,b, 2016; Julia and Kiew 2014, 2016a,b; Kiew 2001; Kiew and Geri 2003; Kiew and Julia 2007, 2009; Kiew *et al.* 2015, 2016; Lin *et al.* 2014a,b, 2015; Lin and Peng, 2017; Low *et al.* 2016). An overwhelming majority of *Begonia* species in Sarawak have a very narrow to moderately restricted distribution, and are often confined to a particular geology. Julia and Kiew (2014) estimated that more than 600 species of *Begonia* occurring in Borneo, which means that many more species are yet to be discovered and scientifically named. In continuation of our recent work on Sarawak *Begonia* (Lin *et al.* 2014a,b, 2015), eleven new species are documented in this study. Most of them were discovered from mudstone and sandstone areas in the lowland mixed dipterocarp forest (below 300 m) and hill dipterocarp forest (300–800 m) near the border of Kalimantan. Many streams and tributaries result in intricate terrains with a variety of microhabitats, and the myriad underlying geological types create diverse soil characteristics and landscapes. All new species here reported belong to sect. *Petermannia*, which predominates the genus *Begonia* in Borneo. They are morphologically cohesive, with a usually cane-like habit, protogynous inflorescence, and pistillate flowers with three ovarian locules each usually with a bilamellate placenta. In addition to the taxonomic accounts, color plates, line drawings, a distribution map (Fig. 1) and comparison with phenetically similar species are provided to aid in identification.

1. *Begonia aiensis* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

— **TYPE:** MALAYSIA. Borneo, Sarawak, Sri Aman, Lubok Antu, Batang Ai, *ca.* 150 m elev. Type specimen pressed from plants cultivated in a private nursery in Hong Kong, 9 July 2014, *C. W. Lin 570* (holotype SAN) **艾河秋海棠 Figs. 2, 3**

Plant perennial, monoecious, epipetric or terrestrial. **Stem** erect, cane-like, olive to red brown, 40–70(100) cm tall, 5–13 mm across, glabrous or minutely appressed puberulous, internodes 2.5–9 cm long, nodes swollen. **Stipules** ovate, 1.5–2.3 cm long, 0.5–1 cm wide, hyaline, pale olive tinged reddish, strongly keeled, margin entire, apex cuspidate, cusp 0.3–0.5 cm long. **Petiole** terete, 5–12 cm long, 3.5–6 mm across, olive-red to crimson, glabrous or minutely appressed puberulous. **Leaves** 3–8, oblique, held downward; lamina ovate, basifixed, strongly asymmetric with a well-developed basal lobe on one side giving a cordate appearance, margin entire to sparsely denticulate, glabrous, apex acuminate, 13–28 cm long (basal lobes included), 8–17 cm wide, broad side 5–12.5 cm wide, base unequal, basal lobes cordate, 5–11 cm long, thinly succulent, adaxially emerald green to dark brown green, with silvery to pale grey green stripes or semicontinuous spots of variable sizes between veins, venation crimson, abaxially pale green to tinged reddish, adaxially scintillating and appearing finely velvety; venation palmate-pinnate, midrib distinguishable, 8–17

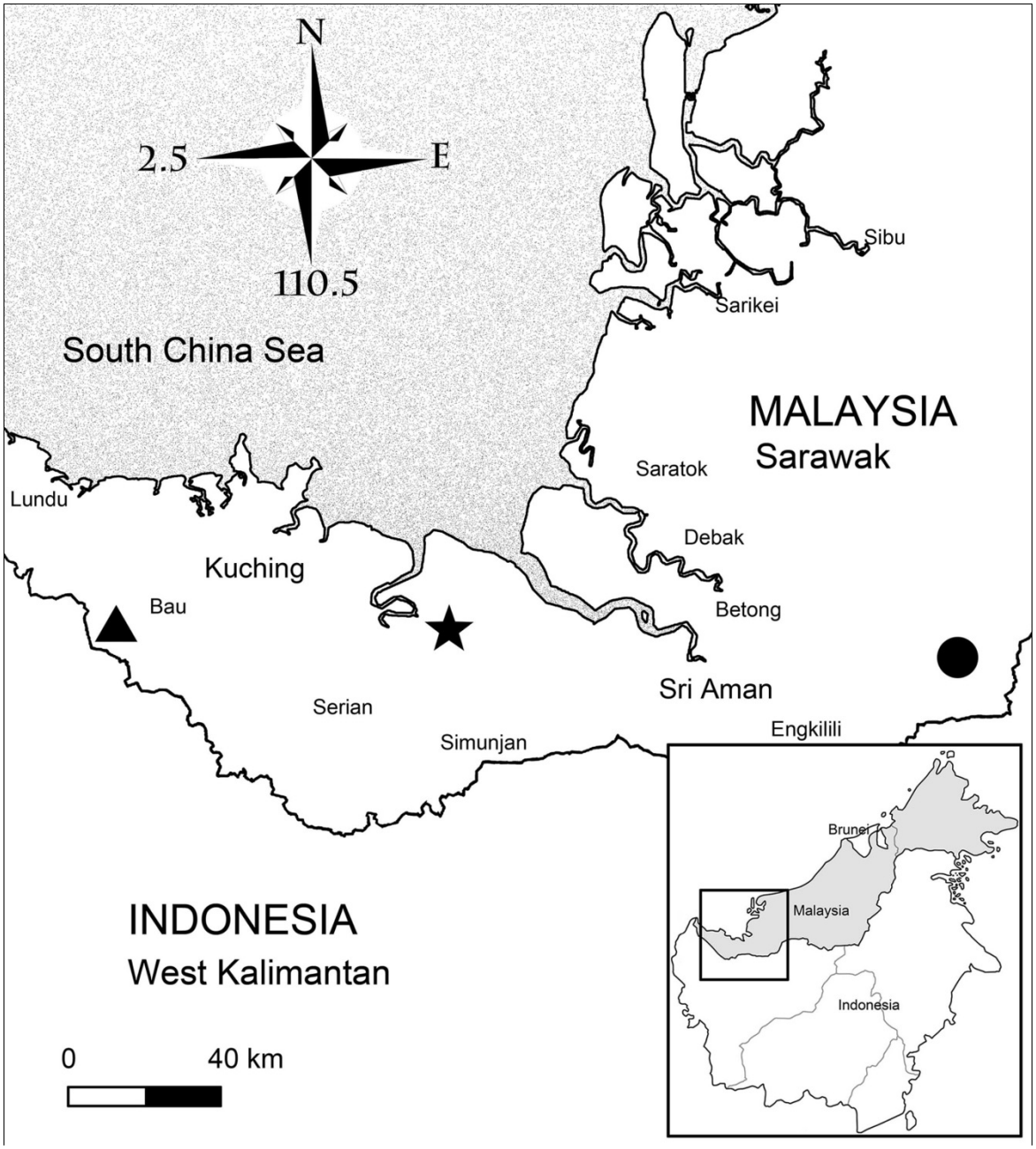

Fig. 1. Distribution map of ***Begonia aiensis***, ***B. iridifolia***, ***B. magnicarpa***, ***B. superciliaris***, ***B. hirsuticarpa*** (solid circle); ***B. lawii***, ***B. nix*** (solid triangle) and ***B. wallacei*** (Star) in Sarawak, Borneo.

cm long, *ca*. 3 major lateral veins on either side of midrib, other primary veins branching dichotomously. **Bracts** greenish to crimson, hyaline, deciduous, those at basal node of inflorescence in pistillate flower ovate-triangular, *ca*. 13 mm long, 7 mm wide, aristate at apex, arista 1.5–3 mm long, margin denticulate, denticles glanduliferous; bracts at summit of inflorescence with staminate flowers widely to very widely ovate, 2–10 mm long, 1.5–10 mm wide, apex attenuate to retuse, margin denticulate, denticles glanduliferous. **Inflorescence** a terminal, bisexual, cymosely branching panicle 13–22 cm long, peduncle up to 6 cm long, staminate cymes with up to 4 orders of branching and more than 10 flowers, erect or ascending, terminal or sometimes on lateral branches, crimson, glabrous; pistillate flowers up to 5, *ca*. 1.5–5 cm apart, produced singly from lower nodes of the inflorescence; protogynous. **Staminate flower:** pedicel 8–14 mm long, glabrous, tepals 4, yellow green tinged red toward base, glabrous, outer two elliptic, margin entire, 7–11 mm long, 6–10 mm wide, inner two narrowly oblong to narrowly elliptic, 4–7 mm long, 1.5–2.5 mm wide;

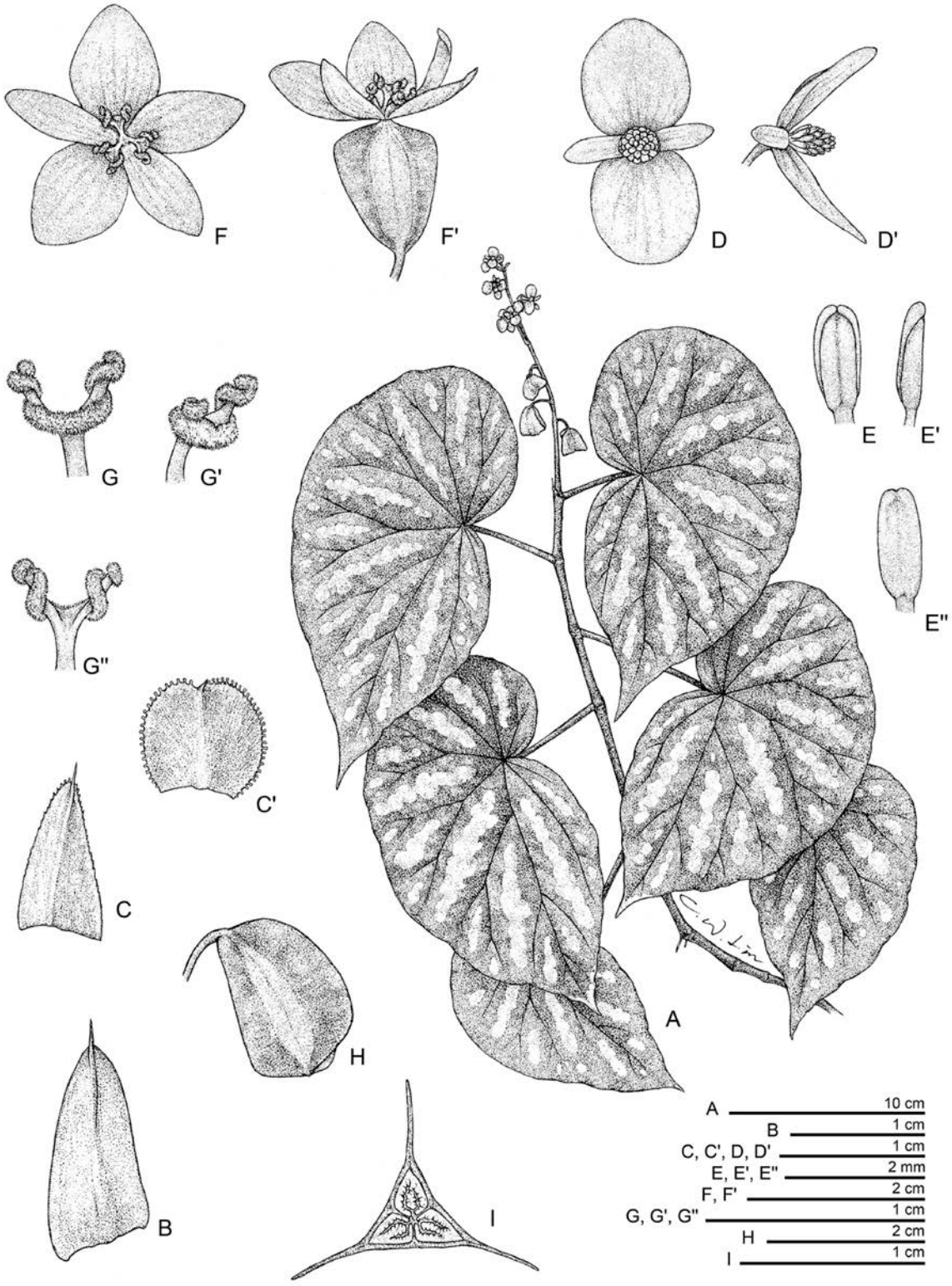

Fig. 2. ***Begonia aiensis*** C. W. Lin & C.-I Peng. **A.** Habit; **B.** Stipule; **C, C'.** Bracts at lowermost and uppermost parts of inflorescence; **D, D'.** Staminate flower, face and side views; **E, E', E".** Stamen, ventral, side, and dorsal views; **F, F'.** Pistillate flower, face and side views; **G, G', G".** Style, dorsal, side and ventral views; **H.** Fruit; **I.** Cross section of an immature fruit.

Fig. 3. ***Begonia aiensis*** C. W. Lin & C.-I Peng. **A, B, C.** Habit and habitat; **D.** Stipule; **E.** Bracts; **F.** Young staminate flower bud, showing bracts at summit of inflorescence; **G.** Staminate flower, face view; **H.** Staminate flower, side view; **I.** Pistillate flower, face view; **J.** Fruits; **K.** Cross section of an immature fruit.

Table 1. Comparison of ***Begonia aiensis*** C. W. Lin & C.-I Peng and ***B. jamilahanuiana*** S.Julia.

	B. aiensis (Figures 2, 3)	***B. jamilahanuiana*** (Julia & Kiew 2016: Figure 7)
Leaf		
shape	ovate	broadly lanceolate
size (cm)	13–28 × 8–17	6–13 × 2.5–5
maculation	with silvery to pale grey green stripes or semicontinuous spots between veins	white spots between veins above
Bracts		
margin	lower: denticulate upper: glanduliferous	lower: entire upper: toothed
Inflorescence	terminal	axillary in upper leaf axils
length (cm)	13–22	7–15
Staminate flower		
No. of tepals	4	2
size of outer tepals (mm)	7–11 × 6–10	6–7 × 5
No. of stamens	30–40	27–32
Pistillate flower		
pedicel length (cm)	1–1.7	0.5–0.6
size of tepals (mm)	outer: 10–15 × 5–10 inner: 9–14 × 2.5–5	outer: *ca.* 7 × 5 inner: *ca.* 6 × 3
Fruit		
size (cm)	2.1–3 × 1.5–1.9	1.1–1.7 × 1.1–1.5
wing	equal	unequal, one narrower than other two
Habitat	on cliffs nearly waterfall or wet steep slope of valley in lowland dipterocarp forest, elevation 100–300 m.	on shaded ridges in hills with mixed dipterocarp forest, below 600 m elevation

androecium actinomorphic, stamens 30–40, filaments shortly fused at base; anthers *ca.* 1.5 mm long, longer than filaments. **Pistillate flower:** pedicel 1–1.7 cm long, glabrous; ovary yellow green tinged crimson, body trigonous-ellipsoid, 12–15 mm long, *ca.* 5 mm across, 3-winged; wings narrowed to base, truncate distally, 13–18 mm long, 3–6 mm wide; ovary 3-locular, placenta bilamellate; tepals 5 (rarely 4), pale green or tinged reddish towards base, outer 2 tepals ovate to elliptic, 10–15 mm long, 5–10 mm wide, glabrous; inner tepals ovate to narrowly elliptic, 9–14 mm long, 2.5–5 mm wide; styles 3, yellow, bifid, *ca.* 5 mm long; stigmas in a spiral band and papillose all around. **Fruit** pendent on a stalk 1–1.8 cm long, capsule 2.1–3 cm long, 1.5–1.9 cm across (wings included), glabrous, wings rounded or truncate distally, rounded or narrowed proximally.

Distribution and ecology: *Begonia aiensis* is endemic to Batang Ai, Sarawak, Borneo (Figure 1). Known only from valley terrains or waterfall areas, on sunlit steep slope or cliff faces in wet dipterocarp forest, associated with scrubby/herbaceous vegetation, elevation 100–300 m.

Etymology: The specific epithet refers to Batang Ai, SW of Sarawak, where the new species was discovered.

Notes: The new species is somewhat similar to *B. jamilahanuiana* S. Julia (Julia and Kiew, 2016b) also from the Batang Ai District, but is distinct by the leaf size and shape, maculation, terminal inflorescence and the glanduliferous bract margin. Detailed comparison of the two species are presented in Table 1.

2. *Begonia dinosauria* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

—**TYPE:** MALAYSIA. Borneo, Sarawak, Kuching, Bau-Padawan, *ca.* 100 m elev. Type specimen pressed from plants obtained from a local market. 5 Dec 2014, *C. W. Lin 604* (holotype SAN)

恐龍皮秋海棠 Figs. 4, 5

Plant perennial, monoecious, epipetric or terrestrial. **Stem** creeping, olive to red brown, 15–40 cm long, 4–7 mm across, densely magenta hispid, internodes 2.5–7 cm long. **Stipules** pinkish-green to magenta, hyaline, ovate-triangular, 7–12 mm long, 3.5–8 mm wide, keeled, abaxially densely magenta-hispid, margin sparsely denticulate, apex cuspidate, cusp 2–4 mm. **Petioles** terete, 4.5–8 cm long, 3–5.5 mm across, olive to red brown, densely magenta hispid. **Leaves** 3–8, oblique, held horizontally; lamina broadly ovate to reniform, basifixed, leaves more or less asymmetric, with a well-developed basal lobe on one side giving a cordate appearance, margin crenulate to denticulate with rows of reddish hispid setae, rounded or obtuse at apex, 6–10 cm long (basal lobes included) and wide, broad side to 6 cm wide, base unequal, basal lobes cordate, 1.3–2.5 cm long, chartaceous to thinly succulent, adaxially lime green to olive green, venation reddish and impressed, bullate between veins giving lamina a rugose appearance, each bulla tipped with upstanding magenta hispid seta 1–3 mm long, abaxially pale green to reddish, glabrous, hispid on veins; venation palmate-pinnate, midrib distinguishable, 4.5–

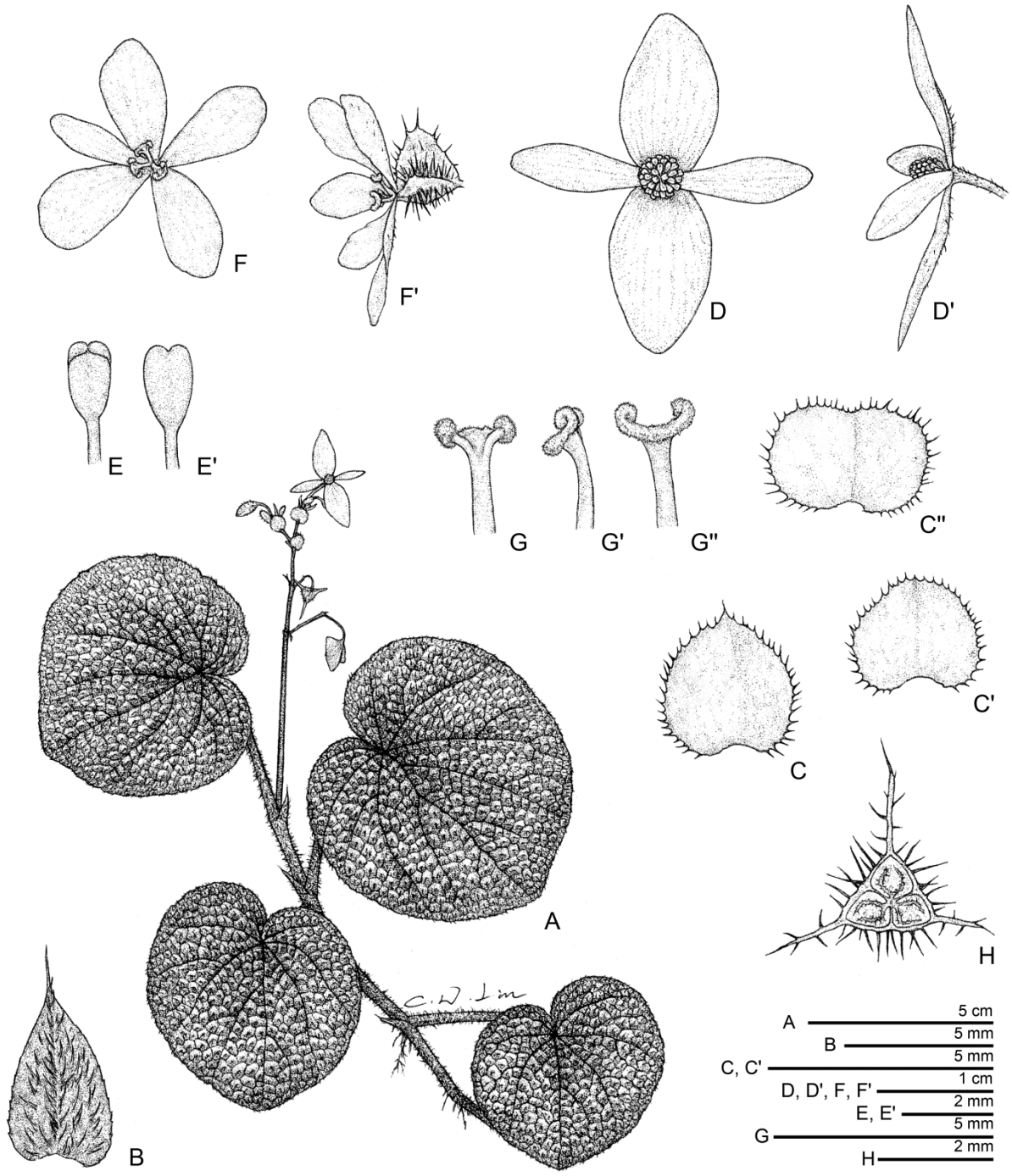

Fig. 4. ***Begonia dinosauria*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**, **C'**, **C"**. Bracts at lowermost to uppermost part of inflorescence; **D**,**D'**. Staminate flower, face and side views; **E**, **E'**. Stamen, ventral and dorsal views; **F**, **F'**. Pistillate flower, face and side views; **G**, **G'**, **G"**. Style, ventral, side and dorsal views; **H**. Cross section of an immature fruit.

7.5 cm long, with *ca*. 3 major lateral veins on each side, other primary veins branching dichotomously or nearly so, tertiary veins weakly percurrent or reticulate; all venation reddish and prominently raised abaxially. **Inflorescence** a bisexual, cymosely branching panicle 6–11 cm long, reddish, terminal or axillary in upper leaf axils, peduncle *ca.* 4 cm long, glabrous or sparsely scabrous; with 1 staminate flower and 1 pistillate flower at basal node; staminate cymes with *ca.* 2 orders of branching on upper part of inflorescence, erect or ascending, protogynous. **Bracts** pale yellowish green with pinkish veins, those at basal node of inflorescence

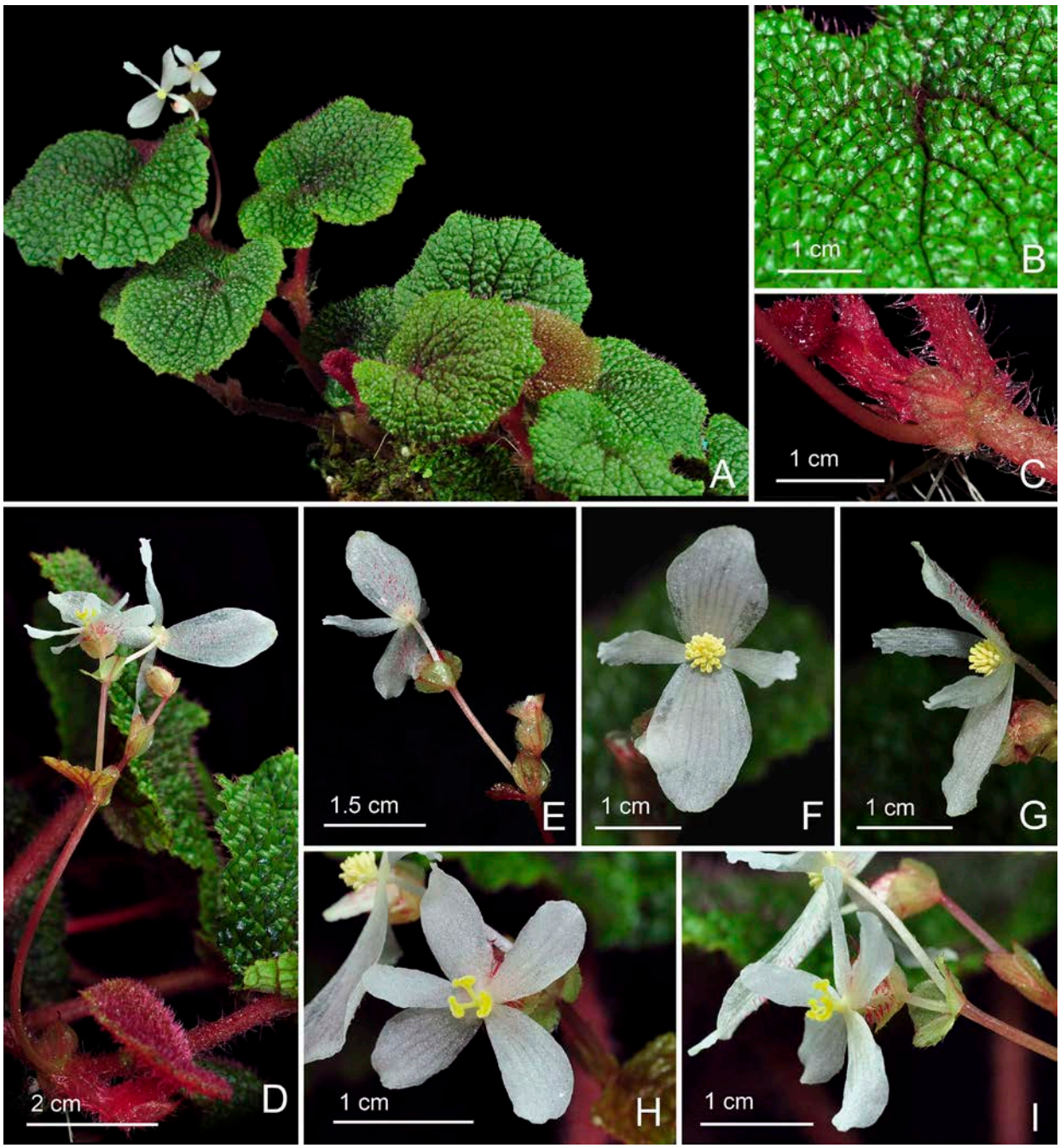

Fig. 5. ***Begonia dinosauria*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Portion of leaf, showing bullae on adaxial surface; **C**. Stipule on stem; **D**. Inflorescence; **E**. Inflorescence close view, showing bracts; **F**. Staminate flower, face view; **G**. Staminate flower, side view; **H**. Pistillate flower, face view; **I**. Pistillate flower, side view.

orbicular to ovate, 5–8 mm long, 5–7 mm wide, apex cuspidate, margin denticulate or ciliate; bracts of pistillate flowers depressed ovate, *ca.* 4 mm long, 6 mm wide, apex retuse, margin denticulate. **Staminate flower:** pedicel 9–15 mm long, sparsely scabrous, tepals 4, white, margin entire, outer 2 elliptic to ovate, 13–17 mm long, 7–10 mm wide, abaxially sparsely red scabrous, inner 2 narrowly elliptic to oblanceolate, glabrous, 11–16 mm long, 2.5–4 mm wide; androecium actinomorphic, stamens 30–40, filaments subequal, shortly fused at base; anthers obovate, *ca.*1 mm long, subequal to filaments. **Pistillate flower:** pedicel 3–5 mm long; ovary white to creamy pinkish, body trigonous-ellipsoid, 3.5–5.5 mm long, 2 mm across, red scabrous, 3-winged, wings subrectangular, subequal, *ca.* 5 mm long, 2–4 mm wide, red scabrous; ovary hirsute, 3-locular, placenta bilamellate; tepals 5, white, elliptic to oblanceolate, 8–11 mm long, 2.5–6 mm wide,

abaxially red scabrous, margin entire, apex obtuse or rounded, base cuneate; styles 3, yellow, bifid, 2.5 mm long, apically split; stigmas in a spiral band and papillose all around. **Fruit** not seen.

Distribution and ecology: Endemic to southwestern Kuching, Sarawak, Borneo, about Bau and Padawan. By streams around small hills in a very wet dipterocarp forest, with scrubby and herbaceous vegetation, on steep soil slopes or at base of rocky cliffs in deep to semi shade, elevation *ca*. 100 m.

Etymology: The epithet '*dinosauria*' refers to the resemblance of the densely bullate leaves to the rough, rugose skin of some fossilized dinosaurs.

Notes: *Begonia dinosauria* is distinct among Bornean begonias in having densely bullate lamina with impressed venation, resulting in an attractive appearance. The new species bears a superficial resemblance to *B. baik* C. W. Lin & C.-I Peng (Lin *et al*., 2015) that occurs also in Kuching. Both are creeping species with corrugated leaves, 4-tepalled staminate flowers and 5-tepalled pistillate flowers. *Begonia dinosauria*, however, differs from *B. baik* in the stipules hispid (vs. glabrous); leaf blade subsymmetric (vs. strongly asymmetric), upper side glossy (vs. velvet), apex rounded or obtuse (vs. cuspidate to acute); bracts pale yellowish green with pinkish veins (vs. snow white), margin denticulate or ciliate (vs. glandular hairy); tepals of both staminate and pistillate flowers red scabrous (vs. glabrous) on the outside; stamens 30–40 (vs. *ca.* 25); ovary body 3.5–5.5 × 2 mm (vs. 7–9 × 4.5–5 mm) and densely scabrous (vs. completely glabrous).

3. *Begonia hirsuticarpa* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

— TYPE: MALAYSIA. Borneo, Sarawak, Sri Aman, Lubok Antu, Batang Ai, *ca.* 100 m elev. Type specimen pressed from plants cultivated in a private nursery in Hong Kong, 9 July 2014, *C. W. Lin 571* (holotype SAN) **毛果秋海棠 Figs. 6, 7**

Plant perennial, monoecious, epipetric or terrestrial. **Stem** ascending and overhanging, greenish to pale brown, 5–10 cm tall, 2.5–4 mm across, densely appressed strigose, internodes 3–6 mm long at upper stem, 7–25 mm long at lower stem. **Stipules** pale green to reddish, hyaline, ovate-triangular, 4.5–7.5 mm long, 3.5–5 mm wide, keeled, abaxially strigose at midrib, margin entire, apex aristate, arista *ca*. 2.5 mm long. **Petioles** terete, non-oblique, slightly grooved above, 2.5–5 mm long on upper stem, to 10 mm long on lower stem, *ca*. 2.5 mm across, greenish to brownish, densely appressed strigose. **Leaves** 4–10 or more, held nearly horizontally; lamina obovate to narrowly obovate, slightly falcate, basifixed, asymmetric, base attenuate, unequal, basal lobe to 2.5 mm long on broad side, margin crenate to biserrate with larger teeth at end of veins, apex shortly acuminate, 6.5–11 cm long (basal lobes included), 2.5–4 cm wide, broad side 1.7–2.6 cm wide, succulent, adaxially silvery green or rich green to dark brown, glabrous or sparsely appressed strigillose, abaxially pale green to reddish, appressed strigose on veins; venation pinnate, midrib 6.4–9.8 cm long, with *ca.* 3 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 to reddish, narrowly ovate-triangular to lanceolate , 3–5 mm long, 1–2 mm wide, margin entire, apex aristate, arista *ca.* 2 mm long. **Inflorescence** very short, axillary, unisexual, pistillate flowers 1 or 2, staminate flowers 1 or few on a reduced cyme on upper stem, hidden by leaves; protogynous. **Staminate flower:** pedicel *ca.* 5 mm long, tepals 2, white, margin entire, widely obovate to orbicular, 5.5–8 mm long, 5–7.5 mm wide, glabrous; androecium actinomorphic, stamens 8–15, filaments subequal, shortly fused at base; anthers obovate, *ca.*1 mm long, subequal to filaments. **Pistillate flower:** subsessile, ovary white, trigonous-ellipsoid, *ca*. 4.5 mm long, 3 mm across, velutinous, 3-winged, wings triangular, subequal, 5–8 mm long, 3–5 mm wide, truncate and shortly beaked proximally, margin denticulate, hirsute; ovary 3-locular, placenta 1 per locule; tepals 5, white, elliptic to ovate, glabrous or sparsely hairy abaxially, apex obtuse to acute, base cuneate to obtuse, 5–8 mm long, 2–5 mm wide; styles 3, golden yellow, bifid, *ca.* 3 mm long, C-shaped; stigmas in a spiral band and papillose all around. **Fruit** subsessile, capsule pale yellowish green, 5–8 mm long, *ca*. 1 cm across (wings included), sparsely to densely hirsute, wings 3, subequal, triangular, margin denticulate and hirsute, *ca.* 6 mm long, 4 mm wide.

Distribution and ecology: Endemic to Batang Ai, Sarawak, Borneo (Figure 1), near the border with Indonesia. On vertical rock faces or soil slopes along stream banks, in deeply shaded lowland dipterocarp forest, elevation 100 to 250 m.

Etymology: The specific epithet refers to the hirsute fruits.

Notes: *Begonia hirsuticarpa* resembles *B. lambirensis* Kiew & S. Julia (Julia *et al*., 2015) in the obovate leaves and beaked, hirsute capsules, differering in the stipules 3.5–5 mm (vs. 2 mm) wide, varied leaf colors (silvery, green and dark brown vs. green), staminate flower tepals margin entire (vs. toothed), pistillate flower tepals 5 (vs. 4), ovary with snow-white (vs. red) hairs. *Begonia hirsuticarpa* also resembles *B. hullettii* Ridl. (Ridley, 1906), differing in the stems much shorter (5-10 cm vs. 25 cm), internodes more congested, stipule abaxially strigose at midrib (vs. densely pilose), leaf upper surface glabrous or sparsely appressed strigillose (vs. shortly bristled), pistillate flower 5 (vs. 2 or 3) tepals.

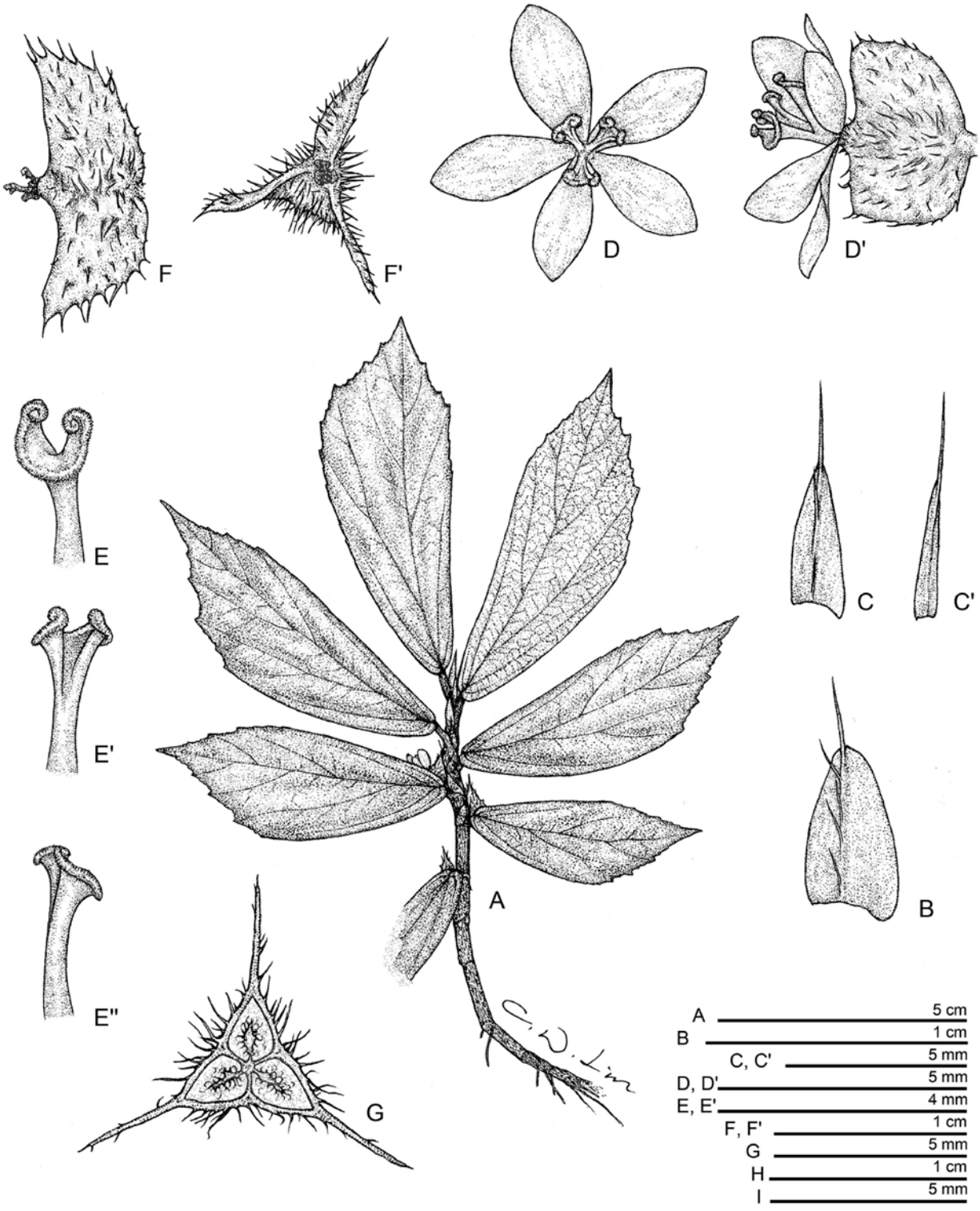

Fig. 6. *Begonia hirsuticarpa* C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**, **C'**. Bracts; **D**,**D'**. Pistillate flower, face and side views; **E**, **E'**, **E''**. Style, dorsal, ventral and side views; **F**, **F'**. Fruit, side and top views; **G**. Cross section of an immature fruit.

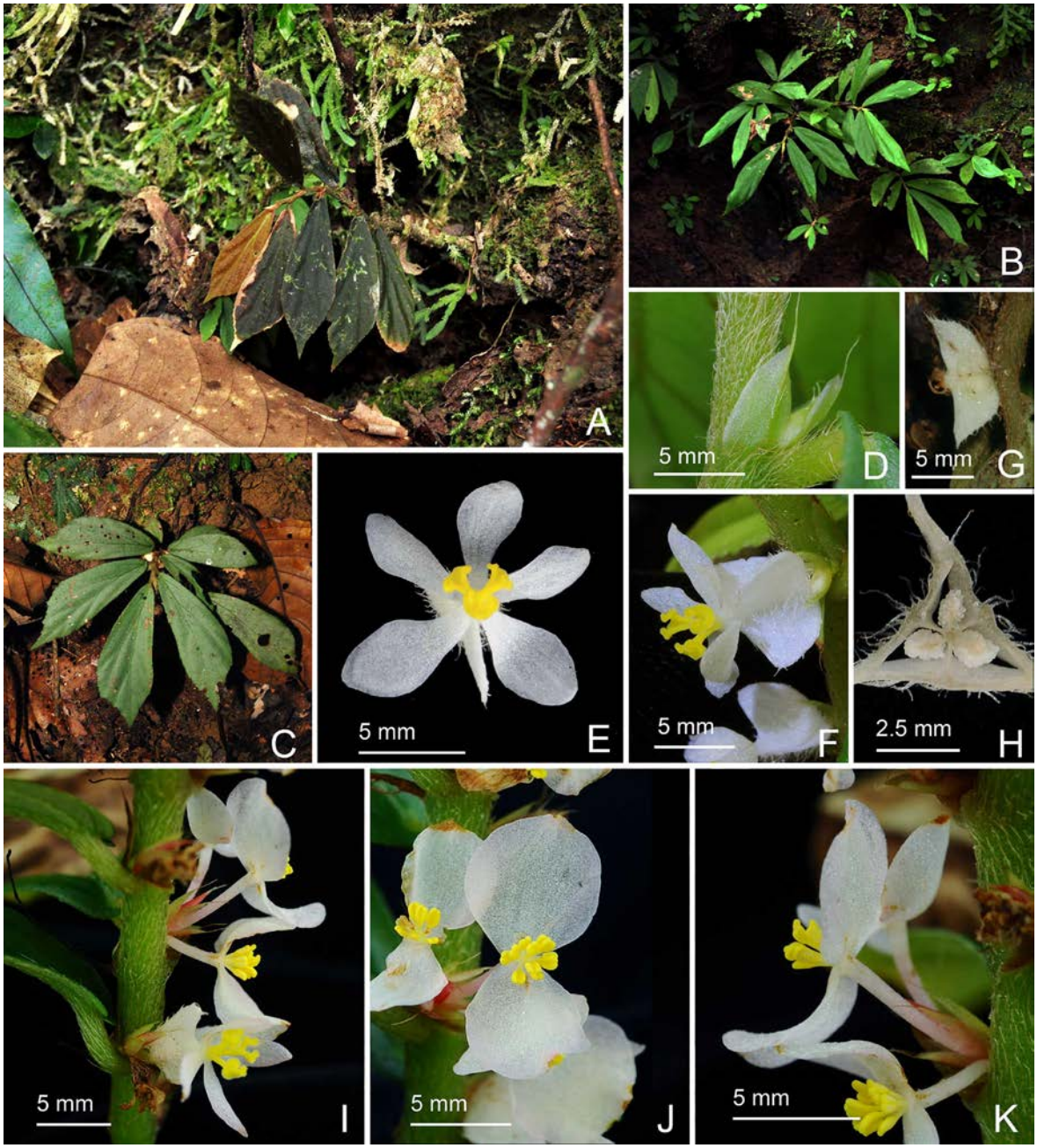

Fig. 7. ***Begonia hirsuticarpa*** C. W. Lin & C.-I Peng. **A**, **B**, **C**. Habit and habitat, showing varied leaf colors of dark brown, rich green and silvery green; **D**. Stipules; **E**. Pistillate flower, face view; **F**. Pistillate flower, side view; **G**. Fruit, **H**. Cross section of an immature fruit; **I**. Inflorescence, showing staminate and pistillate flowers; **J**. Staminate flower, face view; **K**. Staminate flower, side view.

4. *Begonia iridifolia* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

— **TYPE:** MALAYSIA. Borneo, Sarawak, Sri Aman, Lubok Antu, Batang Ai, *ca.* 150 m elev. Type specimen pressed from cultivated plant in a private nursery in Singapore, 10 July 2014, *C. W. Lin 579* (holotype SAN) **虹彩葉秋海棠 Figs. 8, 9**

Plant perennial, monoecious, epipetric or terrestrial. **Stem** creeping and rooting at nodes, crimson to olive green, 10–35 cm long, 2–3.5 mm across, sparsely to densely velutinous, glabrescent, internodes 0.8–6 cm long. **Stipules** persistent, reddish, ovate-triangular, acuminate at tip, 4–6.5 mm long, 2.5–3.5 mm wide, abaxially puberulous, keeled, margin entire to sparsely denticulate, apex cuspidate. **Petioles** terete, 0.8–3 cm long, 2–3 mm across, reddish, sparsely to densely velutinous. **Leaves** 3–9, oblique, nearly appressed to substrate; lamina sub-orbicular, broadly ovate to reniform, basifixed, oblique, with a well-developed

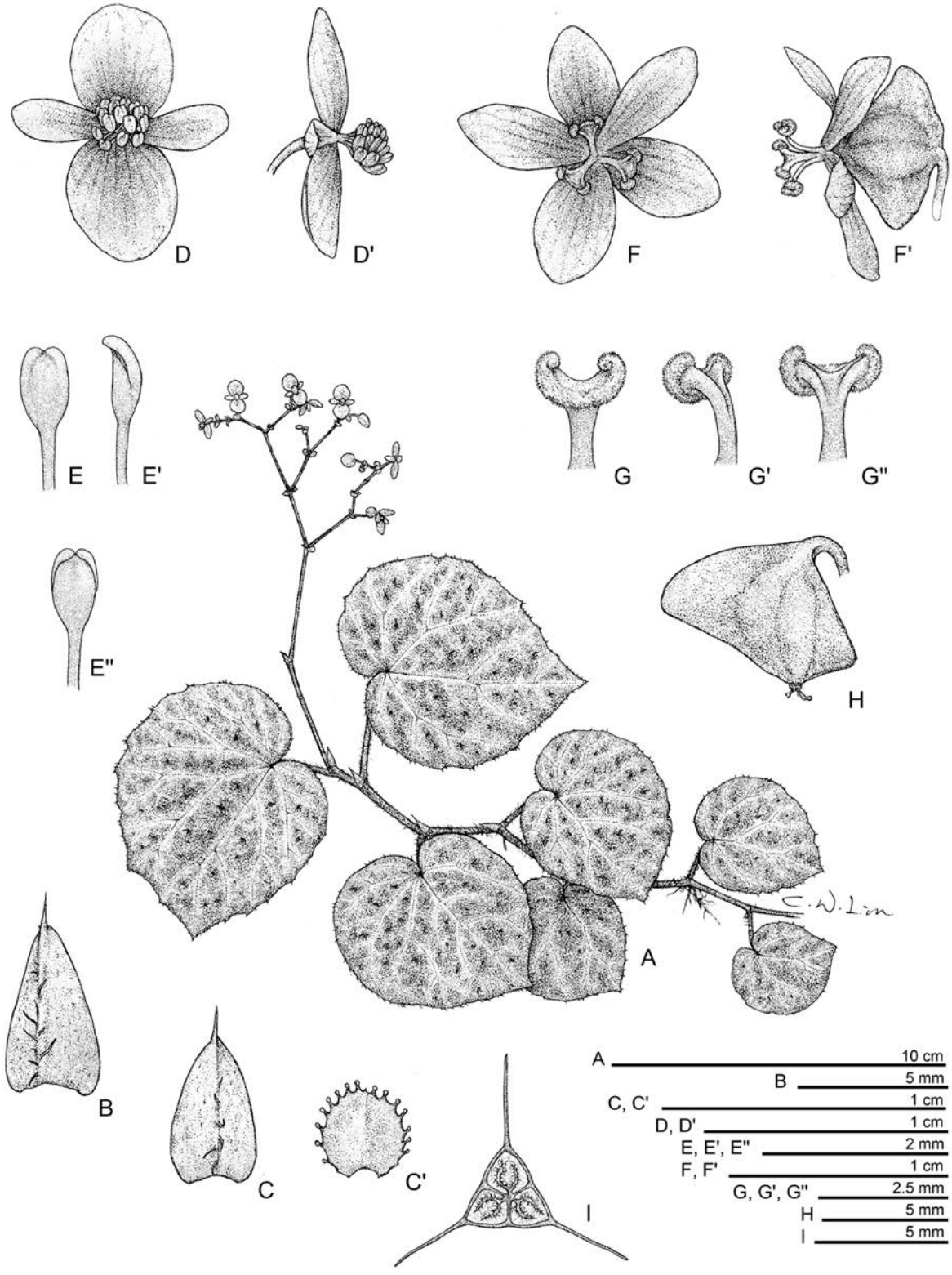

Fig. 8. ***Begonia iridifolia*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**, **C'**. Bracts at lowermost and uppermost parts of inflorescence; **D**,**D'**. Staminate flower, face and side views; **E**, **E'**, **E"**. Stamen, dorsal, side and ventral views; **F**, **F'**. Pistillate flower, face and side views; **G**, **G'**, **G"**. Style, dorsal, side and ventral views; **H**. Fruit; **I**. Cross section of an immature fruit.

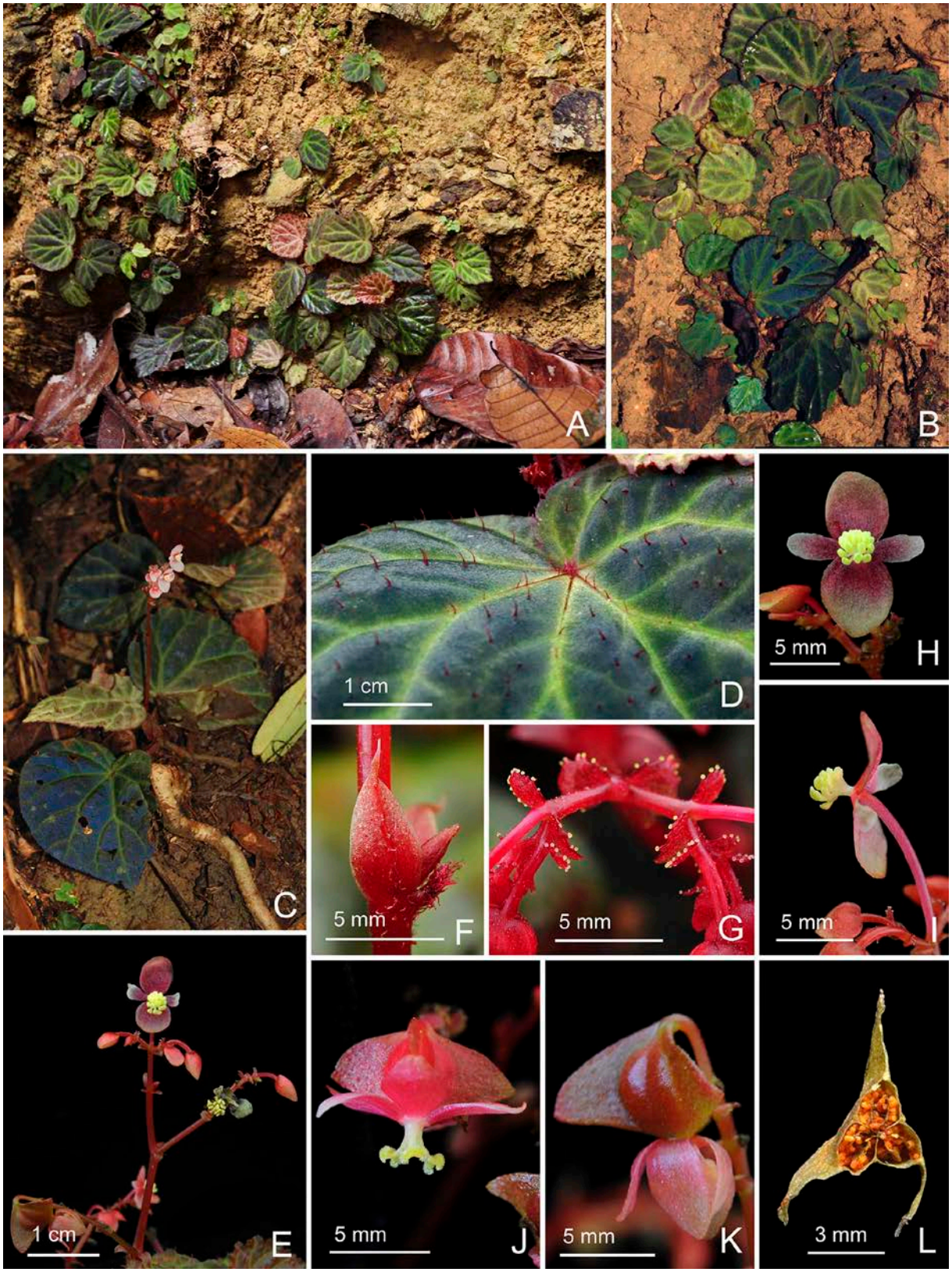

Fig. 9. ***Begonia iridifolia*** C. W. Lin & C.-I Peng. **A**, **B**, **C**. Habit and habitat, showing colorful leaves with bluish sheen; **D**. Portion of leaf, showing red-scabrous upper surface; **E**. Inflorescence; **F**. Bract at lowermost part of inflorescence; **G**. Uppermost part of inflorescence, showing glanduliferous bracts; **H**. Staminate flower, face view; **I**. Staminate flower, side view; **J**. Pistillate flower, side view; **K**. Fruit; **L**. Cross section of a mature fruit.

Table 2. Comparison of ***Begonia iridifolia*** C. W. Lin & C.-I Peng, ***B. lichenora*** C. W. Lin & C.-I Peng, ***B. benaratensis*** S. Julia and ***B. kasutensis*** K. G. Pearce.

	B. iridifolia (Figures 8, 9)	***B. lichenora*** (Figures 12, 13)	***B. benaratensis*** (Julia *et al.* 2013: Figure 4)	***B. kasutensis*** (Pearce 2003: Figure 4)
Leaf				
size (cm)	4–9.5 × 4–8.5	2.5–4.8 × 2–4.5	(2–)3.5–4 × (3–)3.5–5	4.7–6.2 × 3.9–5.5
adaxial surface				
color	malachite-green, red-brown to dark olive, venation emerald to lime green	pale red brown to olive with yellowish green to pale green veins	uniformly green	uniformly green, or with silvery grey variegation between veins
vestiture	sparsely red-scabrous	glabrous	glabrous	glabrous
apex	acute or obtuse	rounded	acute	cuspidate
texture	strongly velvety with iridescent blue	slightly velvety	slightly lustrous	slightly lustrous
Bracts				
margin	denticulate and glanduliferous	denticulate and glanduliferous	entire	entire
Staminate flower				
tepal number	4	4	2	2
stamen number	14–28	*ca.* 10	*ca.* 25–30	*ca.* 20
Fruit				
wing shape	triangular	rounded to subrectangular	crescent-shaped	narrowly crescent-shaped
Substrate	soil or sandstone	soil or sandstone	limestone	limestone

basal lobe on one side giving a cordate appearance, margin denticulate with rows of red bristles, acute or obtuse at apex, 4–9.5 cm long (basal lobes included), 4–8.5 cm wide, broad side to 5 cm wide, base unequal, basal lobes cordate, 1.2–3.5 cm long, chartaceous to thinly succulent, adaxially malachite green, red-brown to dark olive, venation emerald to lime green, slightly bullate between veins, sparsely scabrous, hairs red, 1–3 mm long, abaxially pale to reddish, glabrous or sparsely scabrous on veins, adaxially strongly scintillating and appearing finely velvety and tinged bluish; venation palmate, midrib distinguishable, 2.8–7 cm long, with *ca.* 3 major lateral veins on each side, other primary veins branching dichotomously or nearly so, tertiary veins reticulate; all venation reddish and prominently raised abaxially. **Bract** magenta, those at base of inflorescence ovate-triangular, 5–7.5 mm long, *ca.* 3 mm wide, margin entire, sparsely hairy abaxially, usually caducous, aristate at apex, arista *ca.* 1.5 mm long, at summit of inflorescence (with staminate flowers) widely to very widely ovate, 1–5 mm long, 0.8–5 mm wide, margin denticulate, denticles glanduliferous, apex attenuate to retuse. **Inflorescence** terminal and axillary on upper nodes, bisexual, cymosely branching panicle 5–13 cm long, peduncle 2–6.5 cm long, staminate cymes with 3 or 4 orders of branching, crimson, glabrous or with minute sessile glands; pistillate flowers usually solitary per branch with up to 3 branches bearing pistillate flowers on lower part of the inflorescence; protogynous. **Staminate flower:** pedicel 8–15 mm long, glabrous or with sparse glands, tepals 4, pink to scarlet red, glabrous, margin entire, outer two elliptic to widely ovate, 4–8 mm long, 4.5–6.5 mm wide, inner two narrowly elliptic to widely oblanceolate, 2.5–5 mm long, 1.2–3 mm wide; androecium zygomorphic, stamens 14–28, filaments fused at base; anther *ca.* 1.5 mm long, subequal to the filament. **Pistillate flower:** pedicel *ca.* 3.5 mm long, glabrous; ovary reddish, ovary body trigonous-ellipsoid, *ca.* 4 mm long, 2.5 mm across, 3-winged; wings reddish, triangular, 4–5 mm long, 2–3.5 mm wide; ovary 3-locular, placenta bilamellate; tepals 5 (rarely 6), pink and tinged reddish or scarlet red, outer 2 tepals ovate to elliptic, 5–6 mm long, 3–4 mm wide, glabrous; inner tepals ovate to narrowly elliptic, 4–6 mm long, 1.2–3.5 mm wide; styles 3, yellow, bifid, *ca.* 2.5 mm long, C-shaped and apically split; stigmas in a spiral band and papillose all around. **Fruit** recurved on a stalk 3–5 mm long, capsule *ca.* 6 mm long, 12 mm across (wings included), glabrous.

Distribution and ecology: Endemic to Batang Ai, Sarawak, Borneo (Figure 1). Prostrate on steep soil slope or damp mossy vertical cliff face, in dark, shady dipterocarp forest, elevation *ca.* 100–200 m.

Etymology: The specific epithet *iridifolia* is derived from the colorful foliage with shine blue iridescent sheen.

Notes: *Begonia iridifolia* resembles *B. kasutensis* K. G. Pearce (Pearce, 2003), which is also a member of sect. *Petermannia*, in the creeping habitats and suborbicular laminae. However, *B. iridifolia* is sharply distinct by the strongly velvetly and scabrous leaves, bract margin denticulate and glanduliferous, staminate tepals 4, and capsular wings triangular. A comparison of *B. iridifolia* and three other phenetically similar species are presented in Table 2.

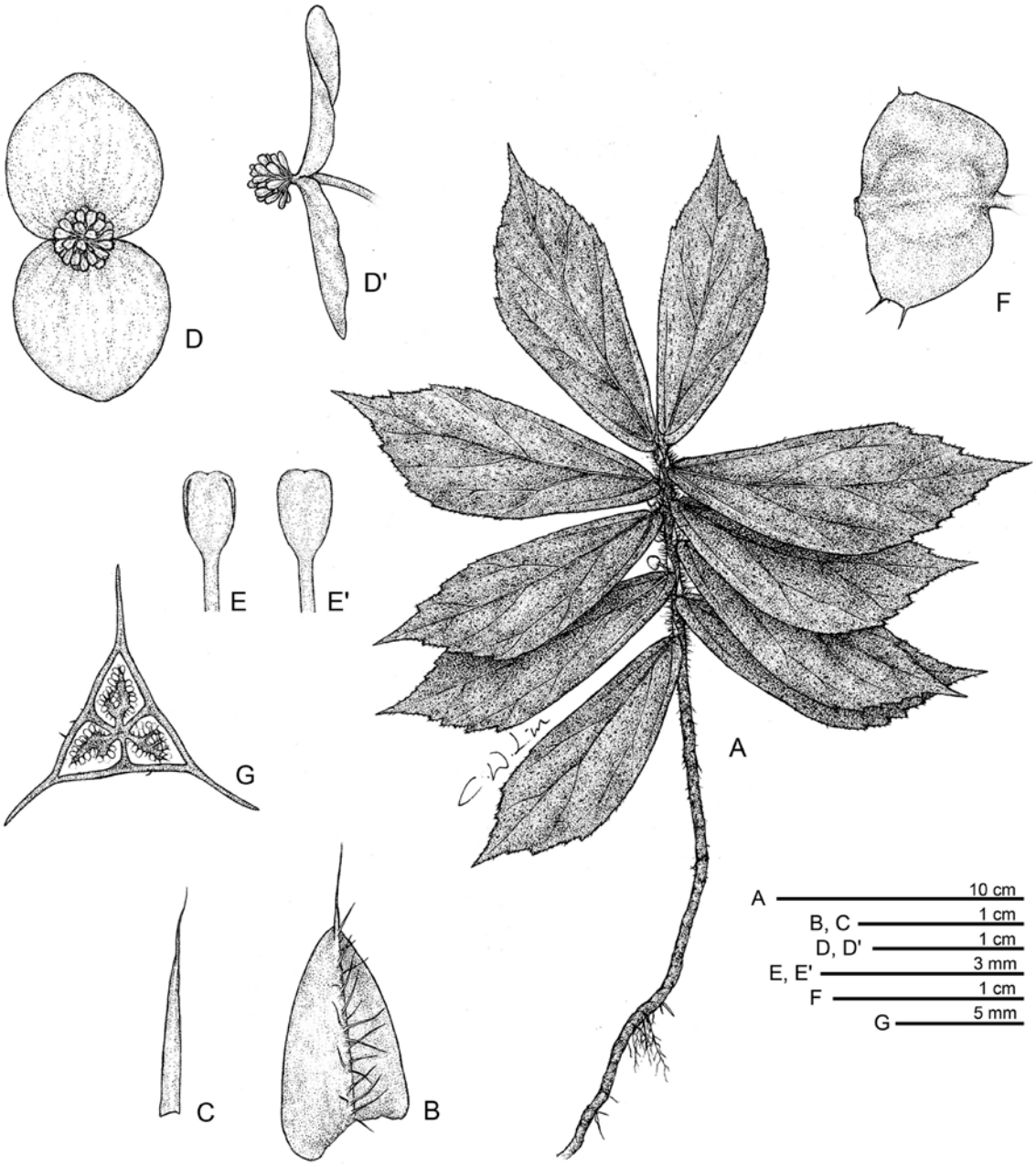

Fig. 10. ***Begonia lawii*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**. Bract; **D**,**D'**. Staminate flower, face and side views; **E**, **E'**. Stamen, ventral and dorsal views; **F**. Fruit; **G**. Cross section of an immature fruit.

5. *Begonia lawii* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

－**TYPE:** MALAYSIA. Borneo, Sarawak, Kuching, Serikin, *ca.* 100 m elev. Type specimen pressed from cultivated plants in a private nursery in Hong Kong, 13 July 2014, *C. W. Lin 587* (holotype SAN)

羅氏秋海棠 Figs. 10, 11

Plant perennial, monoecious, terrestrial. **Stem** erect or ascending, rooting at lower nodes when procumbent, pale green to brownish, to 80 cm tall, 5–8 mm across, densely covered with white hirtellous hairs, internodes 0.3–2 cm long. **Stipules** white to greenish, hyaline, ovate to widely ovate, 8–15 mm long, 6–9 mm wide, keeled, abaxial midrib scattered with white hirtellous hairs, margin entire, apex aristate, arista 5–7 mm long. **Petioles** pale yellow green to reddish, terete, 0.7–2 cm long, 3–5 mm across, shallowly grooved above, densely scabrous. **Leaves** 4–10, non-oblique, held horizontally; lamina obovate to narrowly obovate and slightly falcate, basifixed, slightly asymmetric, base unequally cordate, margin denticulate to biserrate, ciliate, apex acuminate

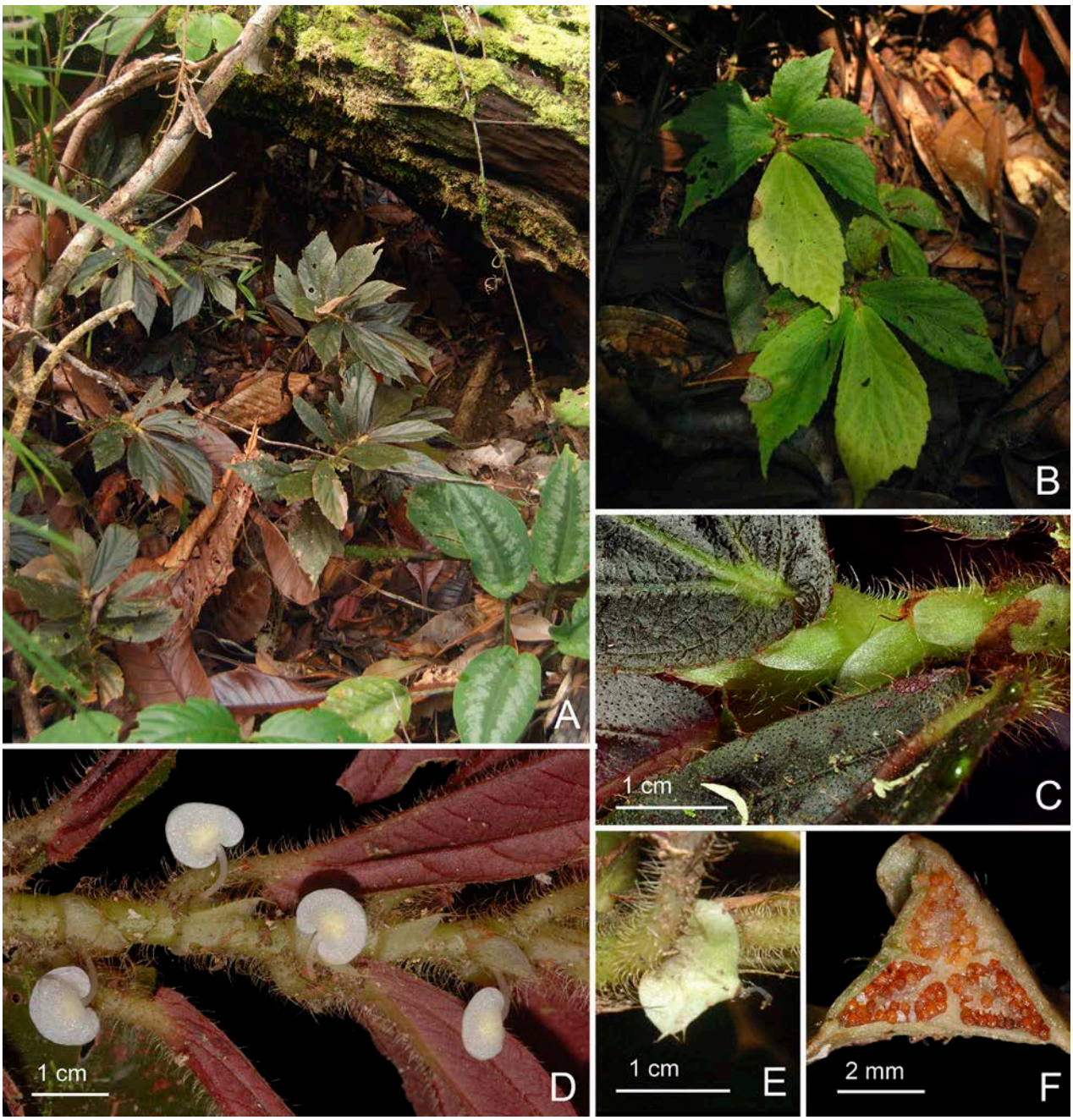

Fig. 11. ***Begonia lawii*** C. W. Lin & C.-I Peng. **A**, **B**. Habit and habitats, showing leaf color variations; **C**. Stipules on stem; **D**. Staminate flower buds; **E**. Fruit; **F**. Cross section of an immature fruit.

to attenuate, 10–17 cm long (basal lobes included), 4–7.5 cm wide, broad side 2.3–4.6 cm wide, slightly succulent, adaxially green to dark brown, scatteredly red-scabrous, hairs to 3 mm long, abaxially pale green to dark magenta, hirtellous on veins; venation pinnate, midrib 9.5–16 cm long, with *ca.* 4 major lateral veins on each side. **Bracts** pale green, very narrowly triangular to lanceolate , 4–8 mm long, 0.5–2 mm wide, margin entire to sparsely hirsute, apex aristate, arista *ca.* 1–2 mm long. **Inflorescence** axillary, unisexual, pistillate flower usually 1 on lower part of the sometimes leafless stem, staminate flowers 1 or few on a congested cyme on upper stem, beneath and hidden by the leaves; protogynous. **Staminate flower:** pedicel 7–10 mm long, glabrous, tepals 2, white, very widely ovate, glabrous, 6–10 mm long, 6–11 mm wide, margin entire; androecium actinomorphic, stamens 10–20, filaments subequal, shortly fused at base; anthers *ca.*1 mm long, equal to filaments. **Pistillate flower** not seen. **Fruit** subsessile, *ca.* 1 cm long, 1.3 cm across (wings

included), glabrous or sparsely hirtellous, wings 3, subequal, broadly rounded and truncate distally, rounded or subcordate proximally, *ca.* 1 cm long, 3–5 mm wide.

Distribution and ecology: Endemic to Serikin area, Sarawak, Borneo (Figure 1), near the border of Indonesia. Known only from lowland dipterocarp forest, along streams, on lower to upper part of soil-covered ledges, elevation 130–400 m.

Etymology: The specific epithet is named after Mr. Chi-Ka Law, an amateur enthusiast, who first discovered this new species.

Notes: *Begonia lawii* belongs to a distinct group of begonias within sect. *Petermannia* with a hispid stem, short petioles, sub-symmetric laminas with a poorly developed basal lobe, and the midrib does not forming an angle with the petiole. The group includes e.g., *B. berhamanii* Kiew, *B. caulifora* Sands, *B. magentifolia* Kiew & S. Julia, *B. pubescens* Ridley and *B. stichochaete* K. G. Pearce. *Begonia lawii* resembles *B. magentifolia* in having hirtellous stem; dark green leaf upper surface and magenta leaf lower surface; and the 2-tepalled staminate flower. Otherwise however they are distinct: the new species has ovate to widely ovate (vs. narrowly lanceolate) stipules that are 6–9 (vs. 3–4) mm wide; tepals of staminate flowers glabrous (vs. with magenta bristles) on the outside; ovary white (vs. scarlet); fruit wing 3–5 mm (vs. 2 mm) wide. Also, *Begonia lawii* grows on soil or sandstone areas in Serikin, southwestern Sarawak, whereas *B. magentifolia* is confined to limestone hills from Mulu National Park in northeastern Sarawak.

6. *Begonia lichenora* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

－TYPE: MALAYSIA. Borneo, Sarawak, Kuching, Bau-Padawan, *ca.* 100 m elev., plant obtained from a local market, 5 Dec. 2014, *C. W. Lin 605* (holotype SAN) **地衣狀秋海棠 Figs. 12, 13**

Plant perennial, monoecious, epipetric. **Stem** creeping, rooting at nodes, crimson to red brown, up to 50 cm long, 1.5–2.2 mm across, glabrous, internodes 1.5–5.5 cm long. **Stipules** pale yellow green or tinged pink, hyaline, widely ovate, 3–5 mm long, 2.2–3.5 mm wide, keeled, margin entire, apex cuspidate, cusp *ca.* 0.6 mm long. **Petioles** terete, 0.4–1.5 cm long, *ca.* 2 mm across, shallowly grooved, crimson, glabrous. **Leaves** many, oblique, almost appressed to substrate; lamina suborbicular to reniform, basifixed, strongly asymmetric with a well-developed basal lobe on one side giving a cordate appearance, margin subentire to undulate or inconspicuously denticulate, glabrous, apex rounded, 2.5–4.8 cm long (basal lobes included), 2–4.5 cm wide, broad side 1.4–3 cm wide, base unequal, basal lobes cordate, 0.9–2 cm long, succulent, adaxially pale red brown to olive with yellow-green to whitish green veins, slightly bullate between veins, abaxially pale and pinkish, glabrous, adaxially slightly velvety; venation palmate-pinnate, midrib distinguishable, 1.5–2.8 cm long, with *ca.* 2 major lateral veins on either side of the midrib, branched once or twice, other primary veins branching dichotomously, tertiary veins weakly percurrent or reticulate; all venation slightly impressed adaxially, pinkish and prominently raised on the underside. **Bracts** at base of inflorescence pale yellowish green to reddish, ovate to widely ovate, 3.5–5 mm long, 3–5 mm wide, margin entire, apex shortly cuspidate; bracts at summit of inflorescence snow white, 2–4.5 mm long, 2.5–5 mm wide, margin denticulate to biserrate, dotted with sessile glands, apex shortly mucronate, apiculate or rounded. **Inflorescence** a terminal, bisexual, cymosely branching panicle 6–12 cm long, peduncle 1.3–3(–5) cm long; usually with 1 pistillate flower and 1 staminate flower on a short peduncle 0.7–1.5 cm long arising from the first node of the inflorescence; staminate cymes terminal, up to 4 orders of branching, erect or ascending, pinkish to crimson, glabrous; protogynous. **Staminate flower:** pedicel 9–13 mm long, glabrous, tepals 4, white to pinkish, glabrous, margin entire, outer 2 elliptic to widely obovate, 4–7 mm long, 3.8–6.5 mm wide, inner 2 narrowly elliptic to oblanceolate, 3–4.5 mm long, 1–2.3 mm wide; androecium actinomorphic, stamens *ca.* 10, filaments shortly fused at base; anthers elliptic to widely obovate, *ca.*0.8 mm long. **Pistillate flower:** pedicel *ca.* 4 mm long, glabrous; ovary creamy white to pinkish, ovary body trigonous-orbicular, *ca*. 3.8–5 mm long, 4–5 mm across, glabrous, 3-winged, wings rounded to subrectangular, subequal, 4.5–5.5 mm long, *ca.* 3 mm wide; ovary 3-locular, placenta bilamellate; tepals 5, white to pinkish, glabrous, margin entire, outer ones elliptic to widely obovate, apex obtuse or rounded, base cuneate, 5.5–7 mm long, 3–5 mm wide, inner ones obovate to oblanceolate, 4–7 mm long, 1.5–4.5 mm wide; styles 3, golden yellow, bifid, 3 mm long, C-shaped and apically split; stigmas in a spiral band and papillose all around. **Fruit** recurved horizontally, pedicel 5–8 mm long, capsule 5–8 mm long, 8–12 mm across (wings included), glabrous, wings 3, subequal, rounded to subrectangular, rounded or truncate distally, rounded or narrowed proximally, *ca.* 10 mm long, 3–4.5 mm wide.

Distribution and ecology: Distributed in Sarawak, Borneo; known only from Bau to Padawan areas that are at border with West Kalimantan Province of Indonesia. Plants usually climb up the steep, slightly shaded soil slopes in wet dipterocarp forest, elevation *ca.* 100 m.

Etymology: The specific epithet refers to the small leaves that are nearly appressed to substrate, rendering a lichen-like appearance.

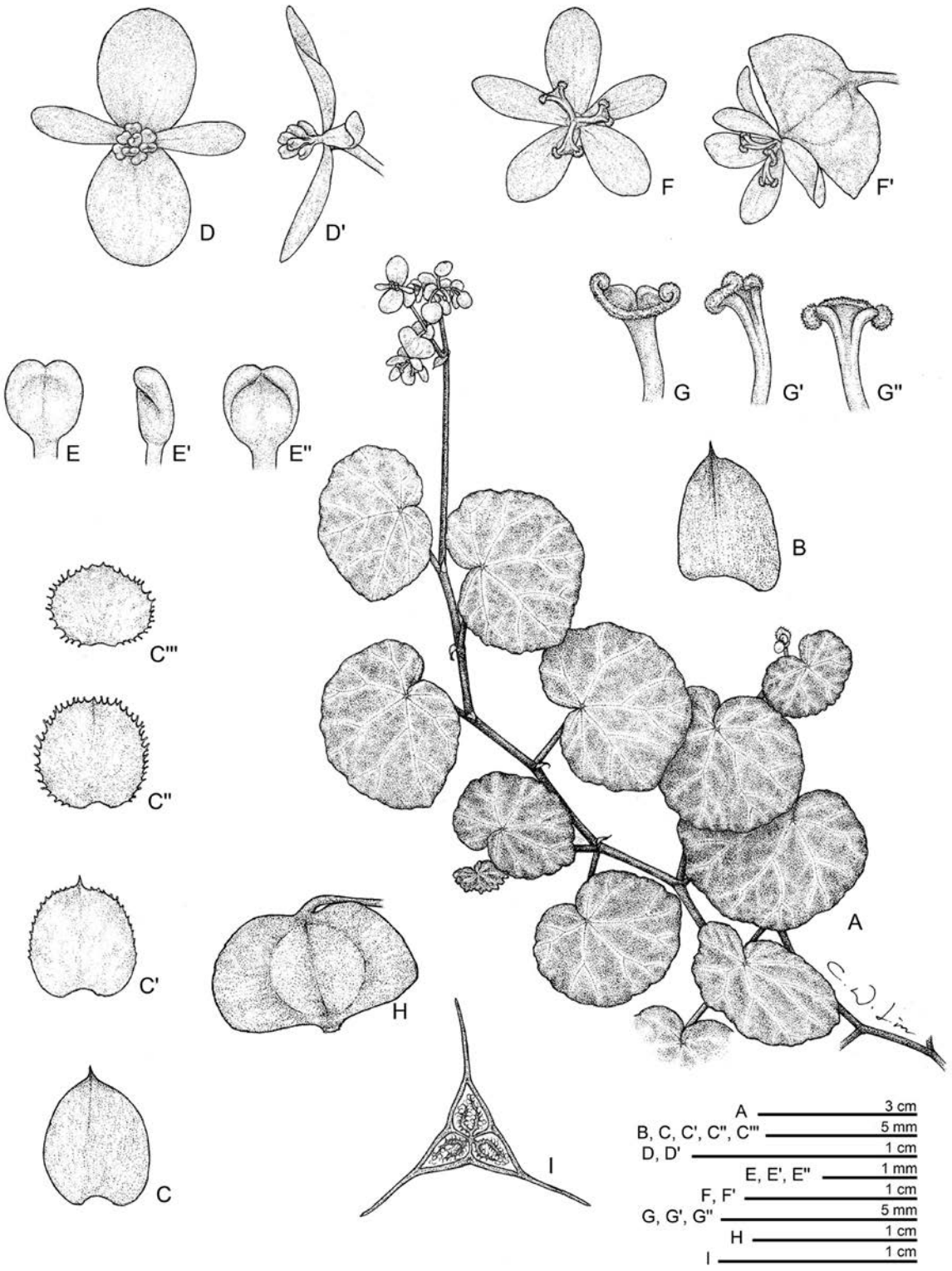

Fig. 12. ***Begonia lichenora*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**, **C'**, **C''**, **C'''**. Bracts at lowermost to uppermost parts of inflorescence; **D**,**D'**. Staminate flower, face and side views; **E**, **E'**, **E''**. Stamen, dorsal, side and ventral views; **F**, **F'**. Pistillate flower, face and side views; **G**, **G'**, **G''**. Style, dorsal, side and ventral views; **H**. Fruit; **I**. Cross section of an immature fruit.

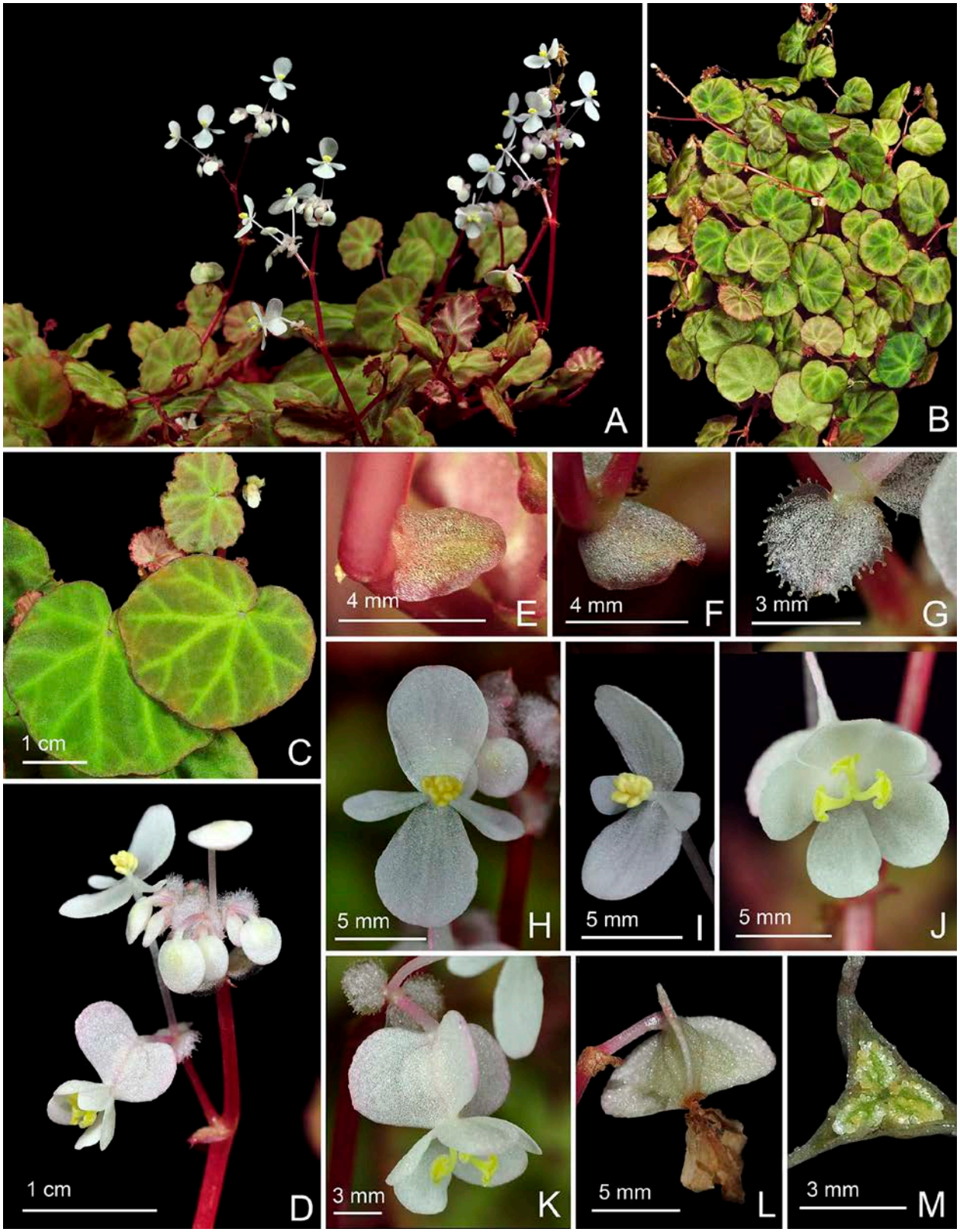

Fig. 13. ***Begonia lichenora*** C. W. Lin & C.-I Peng. **A**, **B**. Habit; **C**. Leaves; **D**. Inflorescence; **E**. Stipule; **F**. Bract at lowermost part of inflorescence; **G**. Bract at upper part of inflorescence; **H**. Staminate flower, face view; **I**. Staminate flower, side view; **J**, **K**. Pistillate flower, face and side view; **L**. Fruit, **M**. Cross section of an immature fruit.

Notes: *Begonia lichenora* resembles *B. kasutensis* K.G. Pearce in aspects, differing in its leaf margin subentire, glabrous (vs. irregularly, indistinctly and distantly serrulate, ciliate), apex rounded (vs. acute to cuspidate), bract margin denticulate with sessile glands (vs. entire), tepals of staminate flower 4 (vs. 2), fruit wings triangular to rounded (vs. narrowly crescent-shaped). The new species is also similar to *B. benaratensis* from Mulu National Park, Sarawak. A detailed comparison for the three species are presented in Table 2.

7. *Begonia magnicarpa* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

－TYPE: MALAYSIA. Borneo, Sarawak, Sri Aman, Lubok Antu, Batang Ai, 120 m elev. Type specimen pressed from cultivated plant in a private greenhouse in Hong Kong, 8 July 2014, *C. W. Lin 566* (holotype SAN) **巨果秋海棠 Figs. 14, 15**

Plant perennial, monoecious, terrestrial. **Stem** erect, reddish to olive green, to 2 m tall, 0.7–1.5 cm across, glabrous, internodes 4.5–15 cm long, nodes swollen. **Stipules** greenish or reddish, hyaline, narrowly triangular to ovate-triangular, 2.5–3.5 cm long, *ca*. 1 cm wide, strongly keeled, margin entire, apex cuspidate. **Petioles** terete, slightly grooved above, 1.5–4.5 cm long, 0.3–0.5 cm across, crimson, glabrous. **Leaves** 6–10, oblique, held horizontally; lamina elliptic to widely elliptic, basifixed, asymmetric with a well-developed basal lobe on one side giving a cordate appearance on broad side, margin irregularly biserrate and acute at the vein endings, apex attenulate or acuminate, 22–33 cm long (basal lobes included), 10–15 cm wide, broad side 6–9.5 cm wide, base unequal, basal lobes cordate, 1.8–3 cm long, slightly succulent, adaxially emerald green to dark green with a red patch at junction on lamina and petiole, venation red toward base, abaxially crimson, sometimes pale green, glabrous; venation palmate-pinnate, midrib distinguishable, 20–30 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 to obovate, *ca*. 2 cm long, 1 cm wide, margin entire, deciduous, at summit of inflorescence similar but smaller. **Inflorescence** terminal and lateral, bisexual, cymosely branching panicle 17–26 cm long, sessile or with a peduncle to 6 cm long, staminate cymes terminal, with up to 5 orders of branching, crimson, glabrous; pistillate flowers in pairs, *ca.* 3.5 cm apart, on a very short peduncle at lower part of the inflorescence; protogynous. **Staminate flower:** pedicel 5–7 mm long, glabrous, tepals 2, yellowish green tinged crimson basally, elliptic to orbicular, glabrous, *ca.* 7 mm long, 6 mm wide, margin entire, irregularly verrucose on upper surface; androecium actinomorphic, stamens 20–30, filaments subequal, shortly fused at base; anthers *ca.*1.5 mm long, longer than filaments. **Pistillate flower** (residual)**:** pedicel 5–8 mm long, glabrous; ovary pale green to reddish, ovary body narrowly trigonous-ellipsoid, *ca*. 4.5 cm long, 0.3 cm across, 3-winged, wings narrowly oblong, equal, 4.5–5.5 cm long, 0.6–0.9 cm wide; ovary 3-locular, placenta bilamellate; tepals cream to pale green tinged red basally, ovate to widely ovate, 1.5–2 cm long, 0.8–1.3 cm wide, glabrous, margin entire. **Fruit** recurved horizontally, 5–6.2 cm long, *ca*. 2.5 cm across (wings included), glabrous, wings 3, subequal, rounded distally and proximally, to 6.2 cm long, 1 cm wide; pedicel 5–9 mm long.

Distribution and ecology: Endemic to Batang Ai, Sarawak, Borneo (Figure 1). Associated with scrubby and herbaceous vegetation on soil slopes or cliffs in very wet dipterocarp forest, elevation 100–200 m.

***Etymology*:** The specific epithet refers to the new species that bears the largest fruits of *Begonia* in Borneo.

Notes: *Begonia magnicarpa* is glabrous throughout (seen with the naked eye; microscopic examination however reveals the stem to be very sparsely mimutely tomentose). It resemble *B. stenogyna* Sands (Sands, 1997) in habit, leaf and fruit shapes. A recent publication "A Guide to Begonias of Borneo" (Kiew *et al.* 2015) suggested that *B. stenogyna* has the largest fruit of any *Begonia* species in Borneo. However, *B. magnicarpa* bears even larger capsules (5–6.2 cm long) than those of *B. stenogyna* (3.5–4.3 cm long). In addition, *B. magnicarpa* differs from *B. stenogyna* in the glabrous (vs. brown pubescent) stem; larger leaves (22–33 × 10–15 cm vs. 15.5–22.5 × 6.2–12.5 cm); glabrous (vs. hairy) inflorescence and with entire (vs. toothed) tepals. In addition, the two species are distributed in different geographical regions. *B. magnicarpa* is an extremely local species available only in Batang Ai area in southwestern Sarawak, whereas *B. stenogyna* is occuring in Brunei and northeastern Sarawak, over 400 km away from Batang Ai area.

8. *Begonia metallicolor* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

－TYPE: MALAYSIA. Borneo, Sarawak, Kuching, Padawan, *ca*. 400 m elev. Type specimen pressed from plant obtained from a local market, 5 Dec 2014, *C. W. Lin 601* (holotype SAN) **釉藍秋海棠 Figs. 16, 17**

Plant perennial, monoecious, terrestrial. **Stem** ascending or overhanging, more or less branched, 10–30 cm tall, 3–6 mm across, appressed red strigose, brownish to red brown, internodes 1–4 cm long, nodes slightly swollen. **Stipules** reddish to scarlet red, hyaline, ovate-triangular to narrowly triangular, 7–12 mm long, 3–5.5 mm wide, keeled, abaxially appressed strigose, margin entire, apex cuspidate, cusp *ca.* 2.5 mm long. **Petioles** terete, 4–15 mm long, *ca.* 2.5 mm across, olive green to scarlet red, densely appressed red strigose.

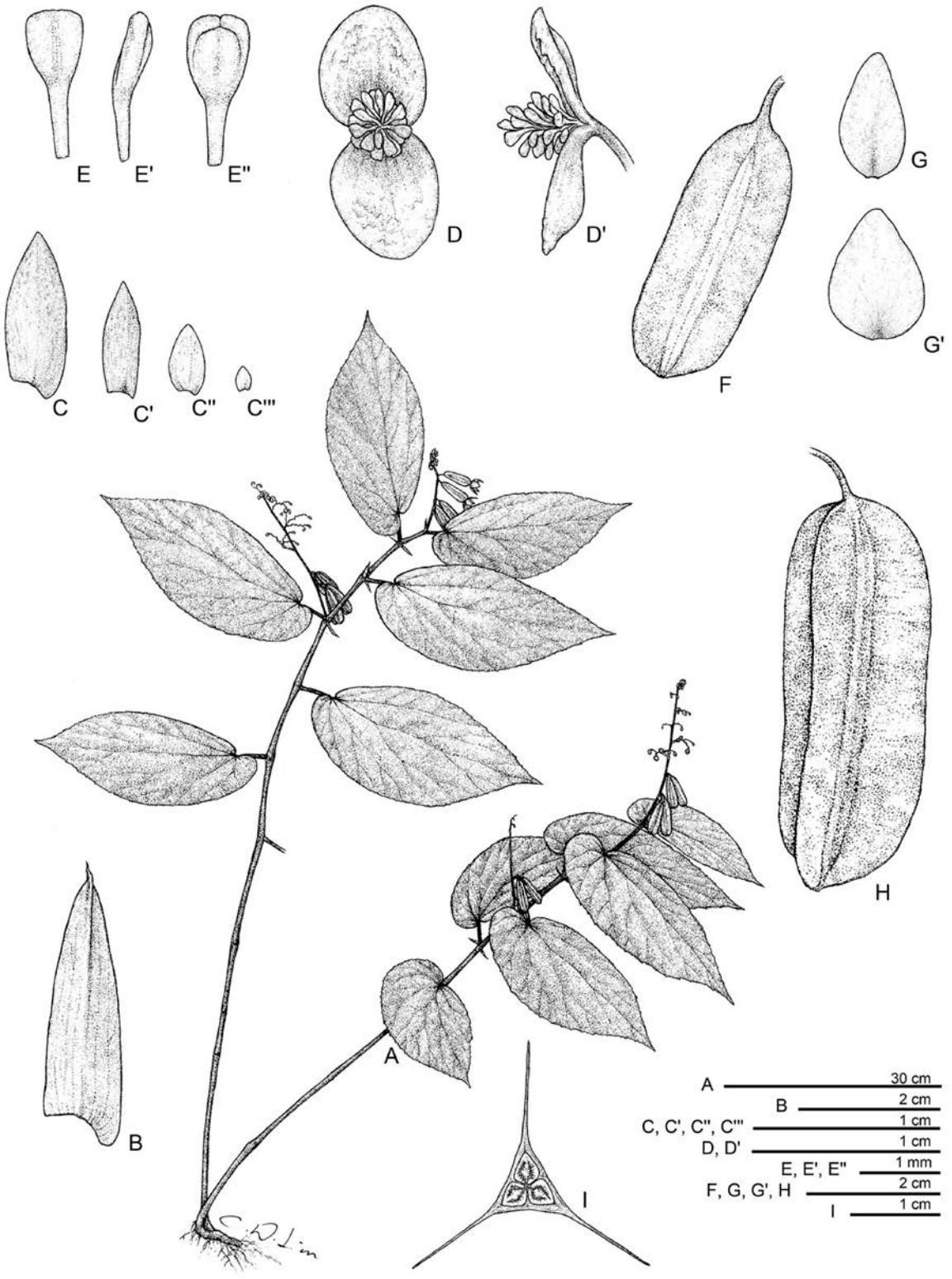

Fig. 14. ***Begonia magnicarpa*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**, **C'**, **C''**, **C'''**. Bracts at lowermost to uppermost parts of inflorescence; **D**,**D'**. Staminate flower, face and side views; **E**, **E'**, **E''**. Stamen, dorsal, side and ventral views; **F**. Ovary; **G**, **G'**. Tepals of pistillate flower; **H**. Fruit; **I**. Cross section of an immature fruit.

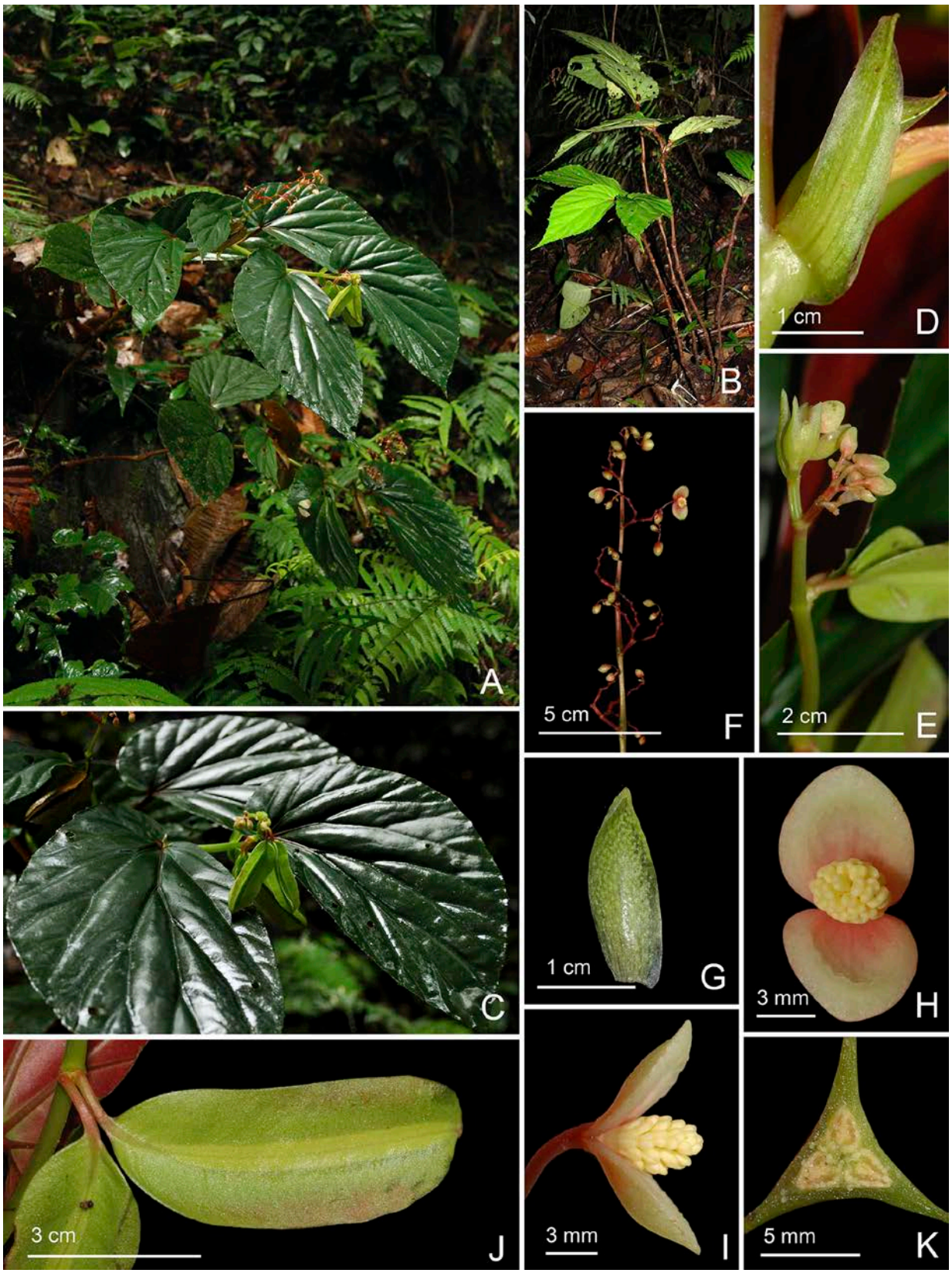

Fig. 15. ***Begonia magnicarpa*** C. W. Lin & C.-I Peng. **A**, **B**. Habit and habitat, **C**. Leafy upper stem; **D**. Stipule on stem; **E**, Inflorescence with young staminate flowers; **F**. Inflorescence with fully developed staminate flowers; **G**. Bract; **H**. Staminate flower, face view; **I**. Staminate flower, side view; **J**. Fruit; **K**. Cross section of an immature fruit.

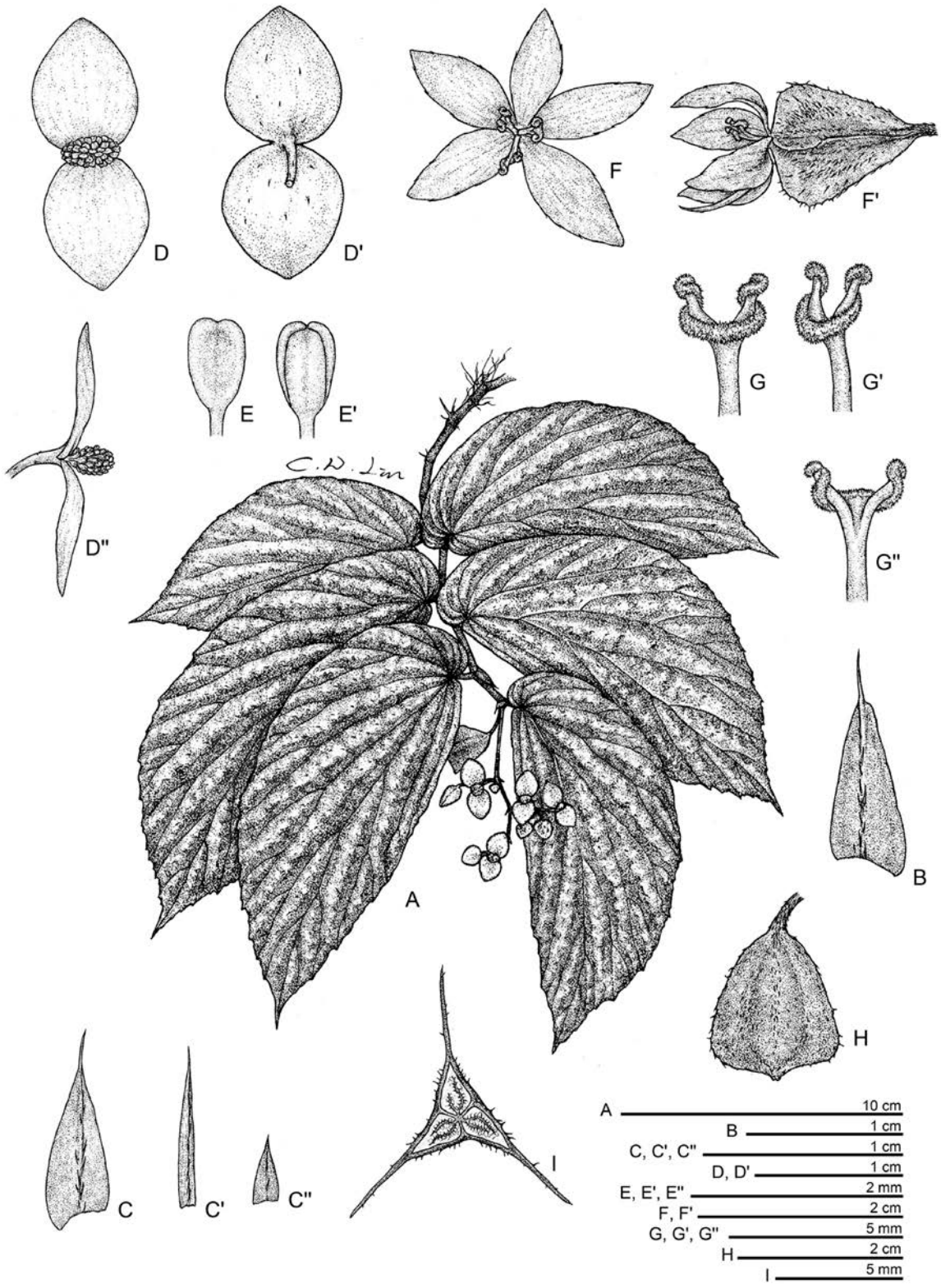

Fig. 16. ***Begonia metallicolor*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**, **C'**, **C"**. Bracts at lowermost to uppermost parts of inflorescence; **D**, **D'**, **D"**. Staminate flower; **E**, **E'**. Stamen, dorsal and ventral views; **F**, **F'**. Pistillate flower; **G**, **G'**, **G"**. Style, dorsal, side and ventral views; **H**. Fruit; **I**. Cross section of an immature fruit.

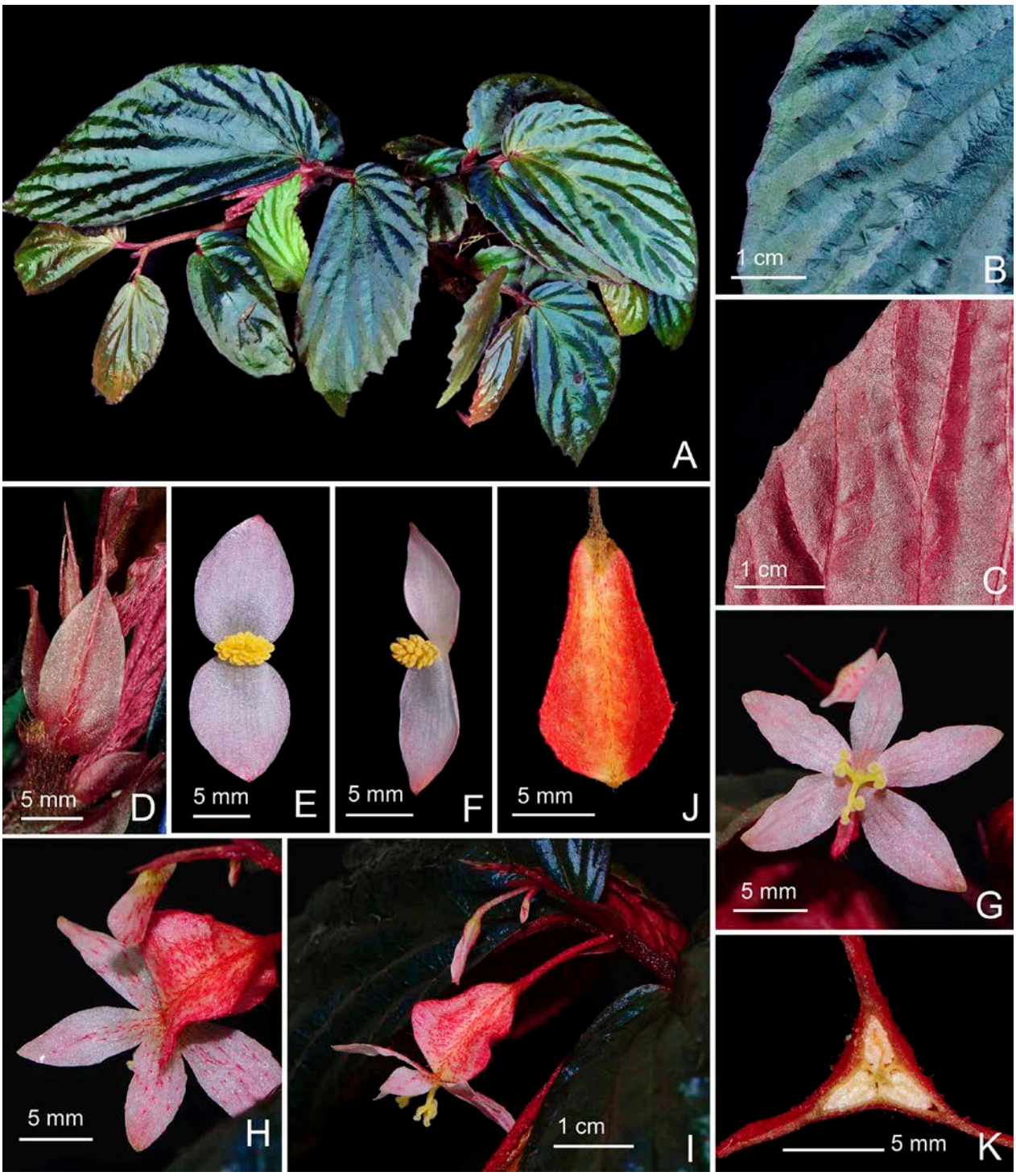

Fig. 17. ***Begonia metallicolor*** C. W. Lin & C.-I Peng. **A**. Habit; **B**, **C**. Portion of leaf, showing strong iridescent blue on upper surface and crimson colored lower surface; **D**. Stipule; **E**, **F**. Staminate flower, face and side views; **G**, **H**. Pistillate flower, face and back views; **I**. Pistillate flower at base of inflorescence; **J**. Fruit; **K**. Cross section of an immature fruit.

Leaves 3–8, oblique, pendant, lamina elliptic to obovate, sometimes oblanceolate, basifixed, asymmetric, cordate at base, margin denticulate or scalloped, apex acuminate to attenuate, 9–15 cm long (basal lobes included), 4–7 cm wide, broad side 2.5–4.5 cm wide, basal lobe 0.6–1.5 cm long on broad side, thinly succulent, adaxially malachite green to dark olive, strongly glossy, with metallic indigo blue to malachite green iridescence giving a dazzling appearance, abaxially crimson to pale green, bullate, with a row of

erect, short bristles between sunken veins; venation palmate-pinnate, with *ca.* 4 major lateral veins on each side; all veins prominent abaxially. **Bracts** at base of inflorescence crimson to reddish, triangular to ovate-triangular, 4.5–7 mm long, 2.5–4 mm wide, margin entire, at summit of inflorescence linear triangular to narrowly triangular, 2–8 mm long, 0.5–1.5 mm wide. **Inflorescence** terminal and on upper axils, bisexual, cymosely branching panicle 3–7 cm long, red, appressed red strigose, peduncle 1– 2 cm long, staminate cymes with up to 3 orders of branching, ascending or overhanging, terminal, appressed red strigose; pistillate flowers 1or 2 arising from lower part of the inflorescence; protogynous. **Staminate flower:** pedicel *ca.* 1 cm long, sparsely appressed red strigose, tepals 2, white to pinkish, orbicular to elliptic, 7.5–12 mm long, 5.5–8.5 mm wide, abaxially glabrous to sparsely red strigose, margin entire, apex acute to rounded; androecium actinomorphic, stamens *ca.* 35, filaments subequal, shortly fused at base; anthers obovate to widely so, apex retuse, *ca.* 1 mm long, equal or longer than filaments. **Pistillate flower:** pedicel 2–15 mm long, densely appressed red strigose; ovary pink to scarlet red, red strigose, ovary body trigonous-ellipsoid, *ca*. 12 mm long, 5 mm across, 3-winged, subequal, wings 11–17 mm long, 4–7 mm wide, truncate or rounded distally, obtuse to subcordate proximally; ovary 3-locular, placenta bilamellate; tepals 5, pale pink, elliptic to narrowly elliptic, 8–15 mm long, 3–7 mm wide, abaxially sparsely red strigose, margin entire to sparingly serrulate, apex obtuse or rounded, base cuneate; styles 3, golden yellow, bifid, *ca*. 5 mm long, apically split and spiraling; stigmas in a spiral band and papillose all around. **Fruit**: pedicel 0.5–1.8 cm long, capsule 1.5–1.9 cm long, 1.3–1.8 cm across (wings included), sparsely red strigose, wings subequal, rounded or truncate distally, rounded or narrowed proximally, 1.5–1.9 cm long, 0.4–0.6 cm wide.

Distribution and ecology: Endemic to Padawan, Sarawak, Borneo, near the border of Indonesia. On deeply shaded soil slopes in a dipterocarp forest, elevation 100–400 m.

Etymology: The specific epithet is derived from the strongly metallic blue color on leaf upper surface.

Notes: *Begonia metallicolor*, a gorgeous new species, bears a superficial resemblance to *B. nagaensis* Kiew & S. Julia (Kiew and Julia, 2009) in the iridescent blue leaves, differing in the shorter stem (to *ca*. 30 cm vs. 75 cm) that is appressed strigose (vs. with erect bristles); leaves smaller, 9–15 × 4–7 cm (vs. 17.5–19 × 8.5–9 cm) with sparse, erect bristles (vs. glabrous) and the much stronger iridescent metallic blue on the upper surface; inflorescence appressed strigose (vs. bristly); and the much larger tepals in staminate flower (7.5–12 × 5.5–8.5 cm vs. 4–5 × 3.5–4 cm).

9. *Begonia nix* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

－TYPE: MALAYSIA. Borneo, Sarawak, Kuching, Serikin, *ca*. 150 m elev. Type specimen pressed from cultivated plant in a private nursery in Taiwan, 13 July 2014, *C. W. Lin 620* (holotype SAN)

飄雪秋海棠 Figs. 18, 19

Plant perennial, monoecious, epipetric or terrestrial. **Stem** erect, cane-like, olive to crimson, 30–60 cm tall, 3–6.5 mm across, glabrous or minutely brown puberulous, internodes 1.5–4(7) cm, nodes swollen. **Stipules** ovate, *ca*. 8 mm long, 3.5–4.5 mm wide, hyaline, pale green, strongly keeled, margin entire, apex cuspidate, cusp *ca*. 1.5 mm long. **Petiole** terete, 1.3–7 cm long, 2.2–3.5 mm across, crimson, glabrous or minutely brown puberulous. **Leaves** 3–6, oblique, more or less pendent; lamina widely ovate, basifixed, strongly asymmetric with a well-developed basal lobe on one side giving a cordate appearance, margin denticulate, glabrous, apex caudate, 8–16 cm long (basal lobes included), 3.9–8.2 cm wide, broad side 3.4–6.7 cm wide, base unequal, basal lobes cordate, 2.6–5.6 cm long, succulent, adaxially emerald green, venation crimson towards base, young plants with white or rosy-pink stripes or spots between veins, sometimes also with a narrow, white or pink ring along margin; abaxially pale green; venation palmate-pinnate, midrib distinguishable, 5.3–11.5 cm long, *ca.* 2 major lateral veins on either side of midrib. **Bracts** pale green, hyaline, deciduous, those at basal node of inflorescence (with 1 or 2 pistillate flowers) ovate-triangular, 3.5–6.5 mm long, 2.5–3 mm wide, aristate at apex, arista 1–1.5 mm long, margin entire; bracts at summit of inflorescence (with staminate flowers) ovate to widely ovate, 0.5–3 mm long, 0.3–1.5 mm wide, apex cuspidate to obtuse, margin entire. **Inflorescence** a terminal, bisexual, cymosely branching panicle 2–5 cm long, peduncle 1.2–3.3 cm long, staminate cymes with up to 4 orders of branching and more than 10 flowers, erect or ascending, terminal, crimson, glabrous or minutely brown puberulous; pistillate flowers usually in pairs on a peduncle at lower part of the inflorescence; protogynous. **Staminate flower:** pedicel 2.5–4.5 mm long, glabrous or minutely puberulous, tepals 4, pale green, outer two suborbicular, abaxially glabrous or minutely puberulous, margin entire, 2–2.3 mm long, 2–3 mm wide, inner two narrowly oblong, 2–2.3 mm long, 1 mm wide; androecium actinomorphic, stamens *ca.* 25, filaments shortly fused at base; anthers *ca.* 0.5 mm long, longer than filaments. **Pistillate flower** (immature): pedicel minutely puberulous; ovary pale green, body trigonous-ellipsoid , 3-winged; placenta bilamellate; tepals 5, pale green, abaxially glabrous or minutely puberulous. **Fruit** pendent on a stalk 1–1.5 cm long, capsule 0.9–1.4 cm long, 0.9–1.6 cm across

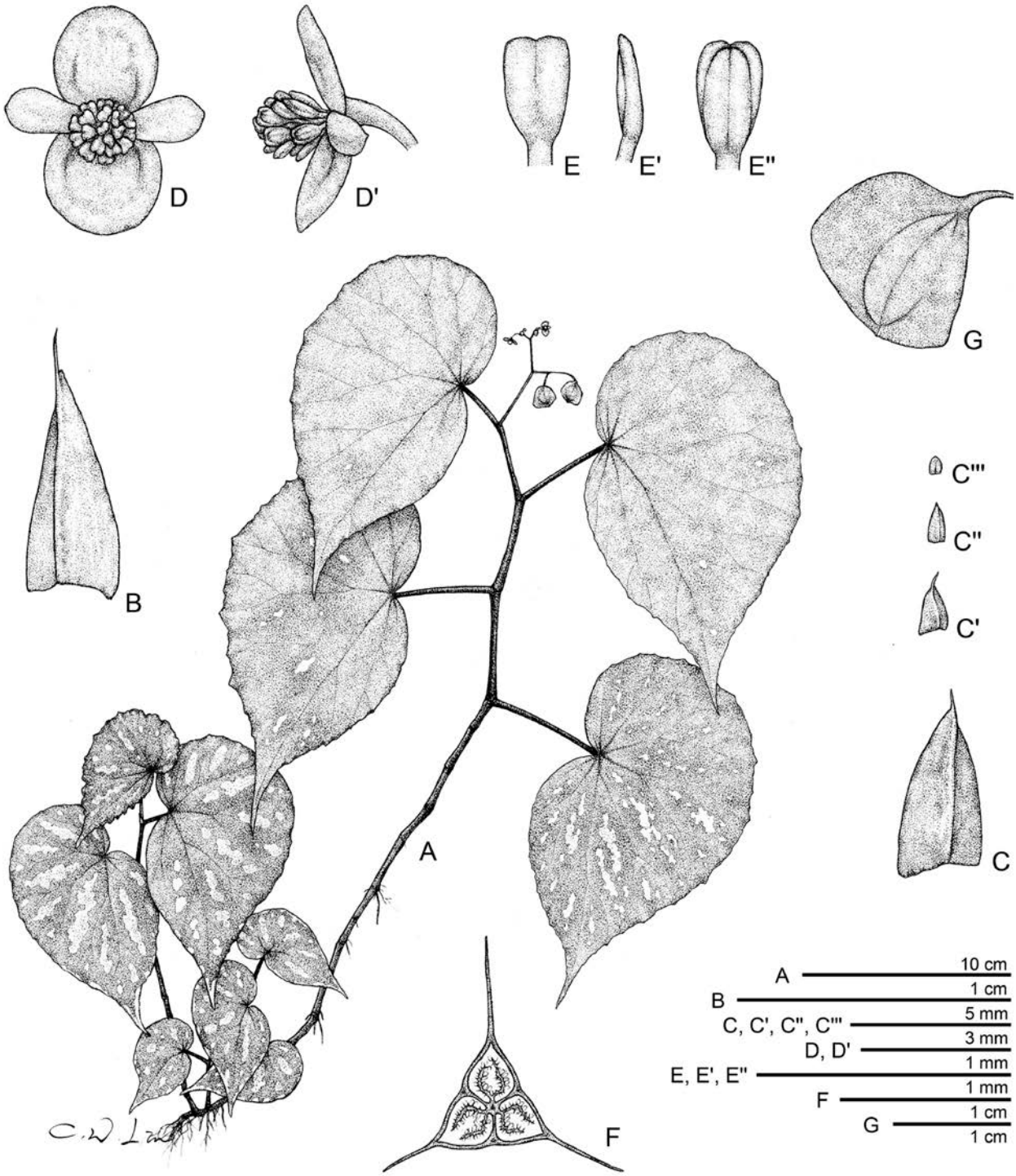

Fig. 18. ***Begonia nix*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**, **C'**, **C''**, **C'''**. Bracts at lowermost to uppermost parts of inflorescence; **D**, **D'**. Staminate flower; **E**, **E'**, **E''**. Stamen, dorsal, side and ventral views; **F**. Cross section of an immature fruit; **G**. Fruit.

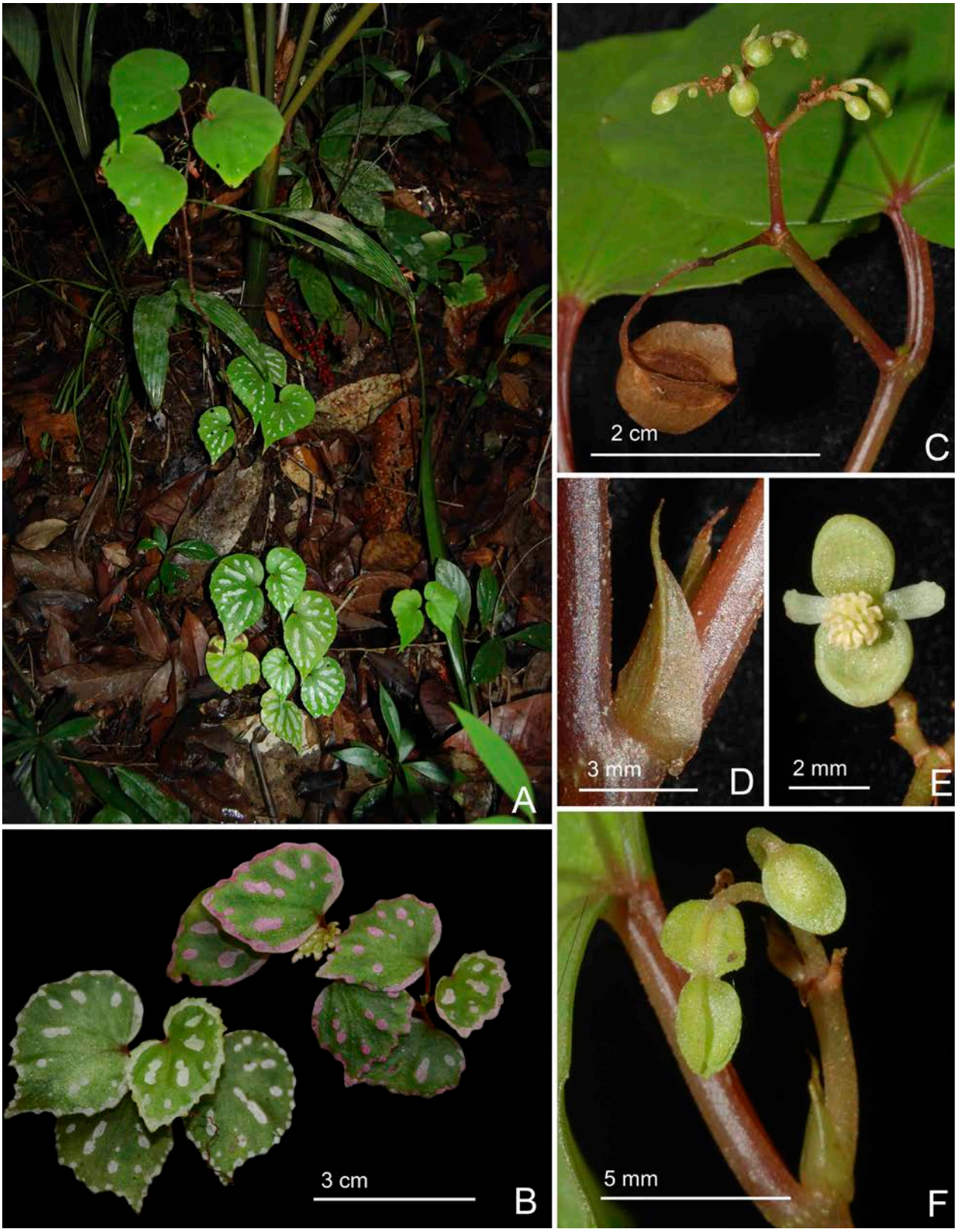

Fig. 19. ***Begonia nix*** C. W. Lin & C.-I Peng. **A**. Habit and habitat; **B**. Young plants, showing pink and white spots on upper surface; **C**. Inflorescence with a matured fruit; **D**. Stipule; **E**. Staminate flower; **F**. Staminate and pistillate flower buds.

Table 3. Comparison of ***Begonia nix*** C. W. Lin & C.-I Peng, ***B. wallacei*** C. W. Lin & C.-I Peng (see below), and ***B. roseopunctata*** Kiew.

	B. nix (Figures 18, 19)	***B. wallacei*** (Figures 22, 23)	***B. roseopunctata*** (Julia *et al.* 2015: Figure 9)
Stem			
length (cm)	30–60	50–80	15–30
internodes (cm)	1.5–4	4–13	5–7.5
Stipules size (mm)	*ca*. 8 × 3.5–4.5	11–17 × 5.5–8	*ca.* 6 × 2
Leaf size (cm)	8–16 × 3.9–8.2	13–26 × 8–20	10.5–13.5 × 9–9.5
Inflorescence length (cm)	2–5	11–16	7–13
Bracts			
shape			
lower inflorescence	ovate-triangular	ovate-triangular	lanceolate
upper inflorescence	ovate to widely ovate	ovate to suborbicular	not available
Staminate flower			
tepals size			
outer (cm)	2–2.3 × 2–3	5–7 × 4.5–6.5	4–6 × 4–5
Inner (cm)	2–2.3 × 1	4–5 × 1.5–2	4–5 × 2
no. of stamens	*ca.* 25	40–50	*ca.* 26
anther length (mm)	*ca.* 0.5	*ca.* 1	*ca.* 1
Pistillate flower			
tepals number	5	6	5
style length (mm)	not available	*ca.* 4	2–3

(wings included), glabrous, wings rounded or truncate distally, rounded or narrowed proximally.

Distribution and ecology: Endemic to Serikin area, Sarawak, Borneo (Figure 1). Known only from lowland mixed dipterocarp forest, growing on steep slopes by seasonal streams or on very wet, semishady forest, elev. 130–400 m.

Etymology: The specific epithet *nix* refers to the showy snow white dots and stripes on the leaves.

Notes: *Begonia nix* bears a superficial resemblance to *B. roseopunctata* Kiew (Julia *et al*., 2015a). Both species have widely ovate foliage with white to pink spots, staminate flower with 4 pale green tepals, and pistillate flower with 5 pale green tepals. However, *B. nix* differs in having taller stems 30–60 cm (vs. 15–30 cm), much shorter inflorescence (2–5 cm vs. 7–13 cm long), smaller outer tepals in staminate flower (2–2.3 × 2–3 mm vs. 4–6 × 4–5 mm). Detailed comparison of the new species with two phenetically similar species are presented in Table 3.

10. *Begonia superciliaris* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

– TYPE: MALAYSIA. Borneo, Sarawak, Sri Aman, Lubok Antu, Batang Ai, 100 m elev. Type specimen pressed from cultivated plant in a private nursery in Singapore, 10 July 2014, *C. W. Lin 577* (holotype SAN) **畫眉秋海棠 Figs. 20, 21**

Plant perennial, monoecious, epipetric or terrestrial. **Stem** erect or ascending, greenish to red brown, 8–35 cm tall, 4–6.5 mm across, densely appressed red strigose, hairs becoming pale brown with age, internodes 1–4 mm long on upper stem, 3–10 mm long on lower stem. **Stipules** pale green to reddish, hyaline, ovate, 6–12 mm long, 3.5–5.5 mm wide, keeled, abaxially appressed strigose on midrib, margin entire, apex aristate, arista 1.5–4 mm long. **Petioles** terete, slightly grooved above, 2.5–5 mm long on upper stem, 5–15 mm long on lower stem, 1.2–3 mm across, greenish to brownish, densely appressed strigose. **Leaves** many, non-oblique, held horizontally or vertical to the ground; lamina oblanceolate to narrowly obovate, slightly falcate, basifixed, slightly asymmetric, base attenuate, unequal, with a basal lobe 0.8–1.5 mm long on wide side, margin biserrate with larger teeth at vein endings, apex shortly acuminate, 7–14 cm long (basal lobes included), 1.8–4 cm wide, broad side 1–2.4 cm wide, adaxially olive green to rich green, appressed or slightly curved scabrous between veins and on veins and midrib, abaxially pale olive green to reddish, densely appressed strigose on veins, succulent; venation pinnate, with up to 5 lateral veins on each side; all veins elevated adaxially giving a finely rough texture, midrib and primary veins reddish and prominently raised abaxially. **Bracts** pale green to reddish, lanceolate to ovate-triangular, those at base of inflorescence to *ca*. 8 × 3 mm, margin entire, apex aristate, bracts at summit of inflorescence similar but smaller. **Inflorescence** axillary, unisexual, beneath and hidden by the leaves; pistillate flowers usually in pairs on lower part of the sometimes leafless stem; staminate inflorescence a simple congested cymosely branching panicle to 5 mm long on upper axils; protogynous. **Staminate flower:** pedicel 4–8 mm long, glabrous, tepals 2, white, elliptic to orbicular, glabrous, 4–6 mm long, 4–6 mm wide, margin entire; androecium actinomorphic, stamens *ca.* 8, filaments subequal, shortly fused at base; anthers lanceolate to narrowly oblanceolate, *ca.*1 mm long, cream yellow, longer than filaments. **Pistillate flower:** subsessile, glabrous or very

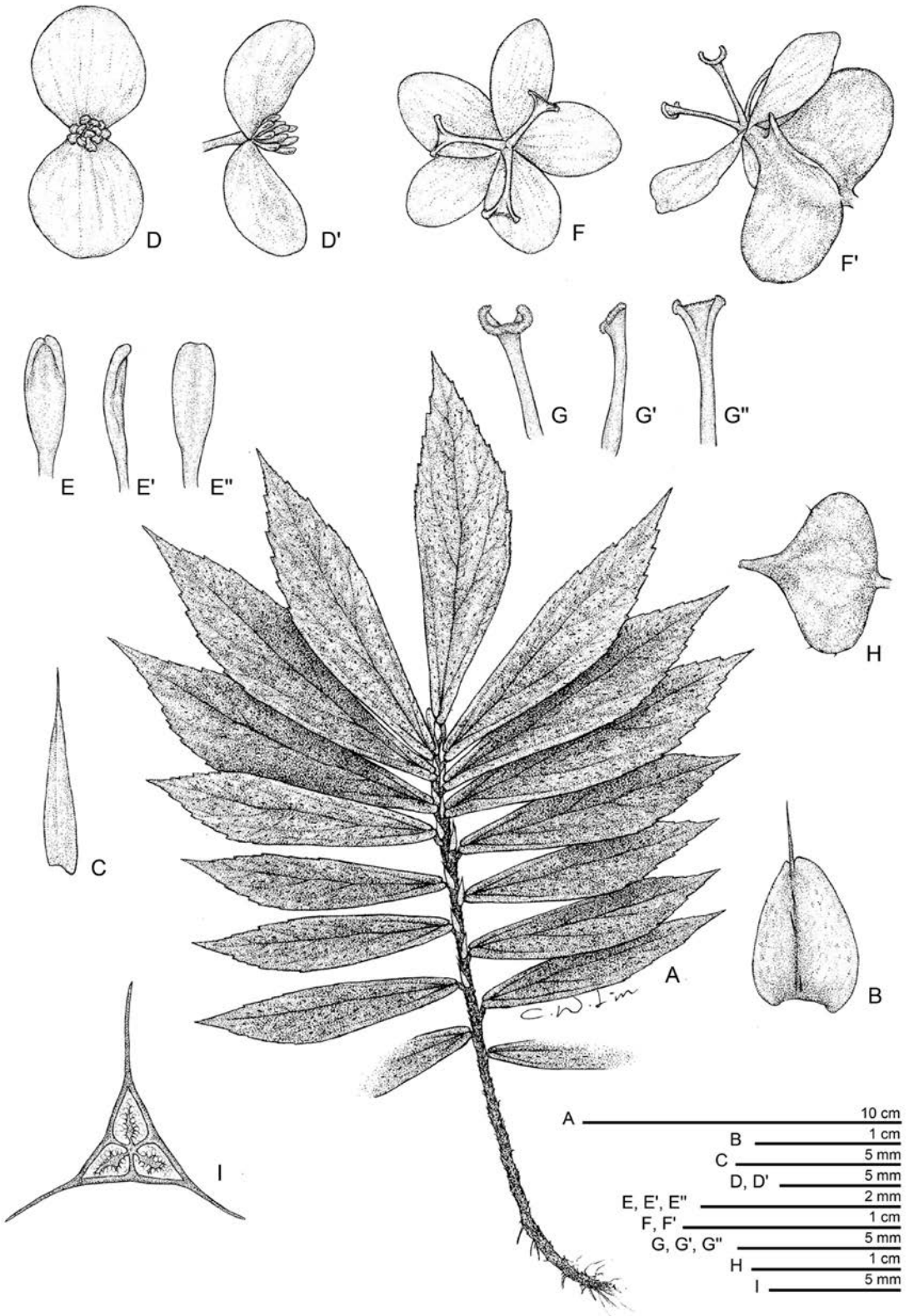

Fig. 20. ***Begonia superciliaris*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**. Bract; **D**,**D'**. Staminate flower, face and side views; **E**, **E'**, **E''**. Stamen, dorsal, side and ventral views; **F**, **F'**. Pistillate flower, face and side views; **G**, **G'**, **G''**. Style, dorsal, side and ventral views; **H**. Fruit; **I**. Cross section of an immature fruit.

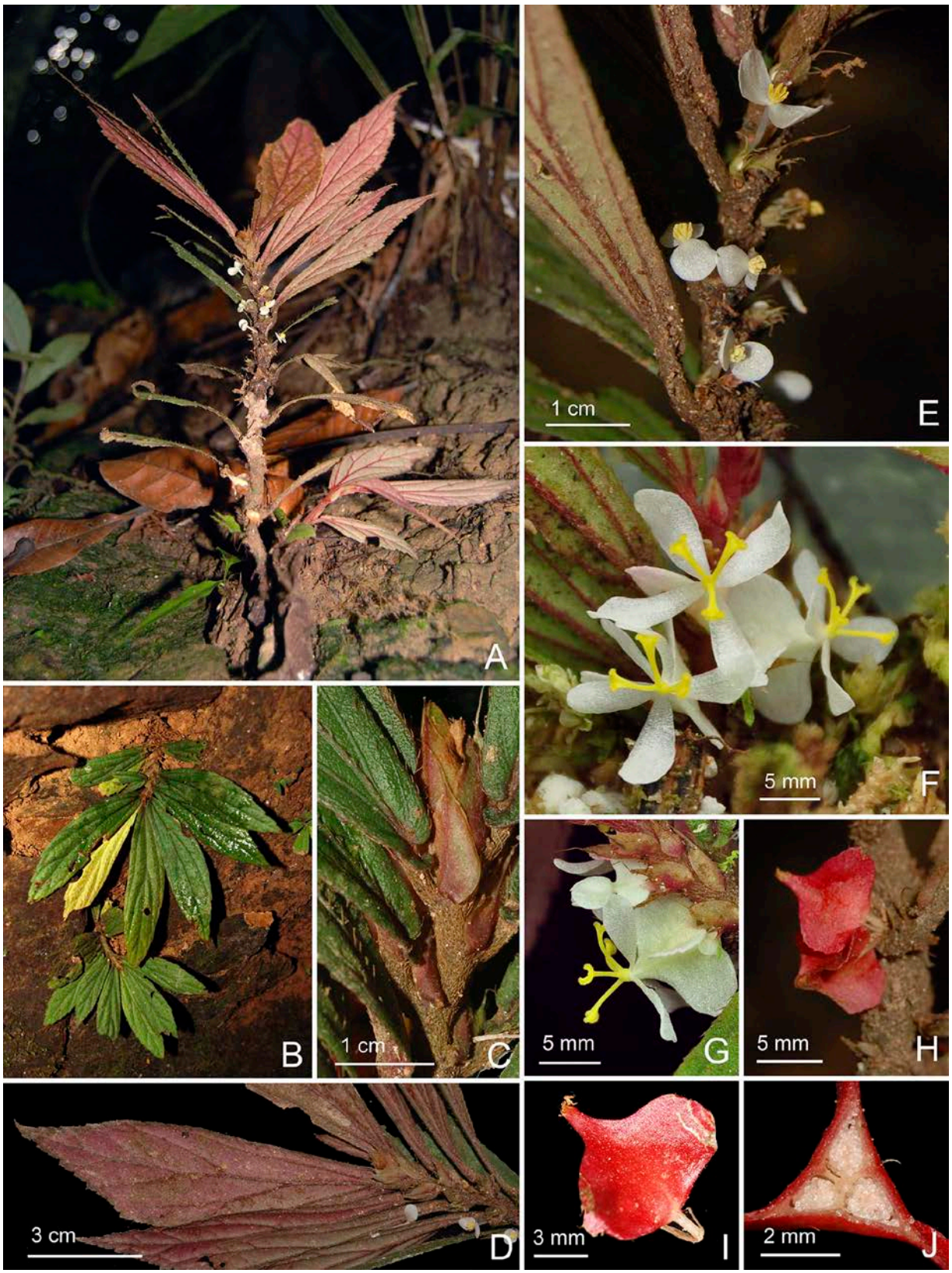

Fig. 21. ***Begonia superciliaris*** C. W. Lin & C.-I Peng. **A**, **B**. Habit and habitat; **C**. Stipules on stem; **D**. Leaves, showing abaxial surface; **E**. Staminate inflorescences on upper stem; **F**. Pistillate flowers, face view; **G**. Pistillate flower, side view; **H**. A pair of fruits; **I**. Fruit; **J**. Cross section of an immature fruit.

sparsely strigose; ovary white, ovary body trigonous-ellipsoid, *ca*. 5 mm long, 4 mm across, glabrous or scatteredly strigose, 3-winged, wings rounded triangular to widely crescent-shaped, subequal, 4–7.5 mm long, 3–5 mm wide; ovary 3-locular, placenta undivided; tepals 5, white, subequal, elliptic to obovate, glabrous, apex obtuse or rounded, base cuneate, 6–10 mm long, 3–5 mm wide; styles 3, deep yellow, prolonged and bifid, *ca.* 5 mm long, C-shaped and slightly apically split; stigmas in a spiral band and papillose all around. **Fruit** scarlet red, 1.2 cm across (wings included), glabrous or sparsely strigose, wings 3, subequal, *ca.* 1 cm long, 4–7 mm wide; pedicel 2–3 mm long; apically beaked, the beak 2.5–3 mm long.

Distribution and ecology: Endemic to Batang Ai, Sarawak (Figure 1). The new species grows in deep shade at base of vertical cliffs or on mossy rocks in lowland dipterocarp forest, elevation 100–250 m.

Etymology: The specific epithet *superciliaris* refers to the resemblance of the narrow and slightly fulcate lamina of this new species to the eyebrows.

Notes: The new species belongs to a group of begonias with narrowly obovate, almost symmetric, non-oblique leaves and short petioles. It bears a superficial resemblance to *B. hullettii* Ridl. (Ridley, 1906), differing in the pistillate flower with 5 (vs. 2 or 3) tepals and the prolonged styles (*ca.* 5 mm vs. 1.5 mm in the holotype specimen: *Ridley11776*, K); stipules 3.5–5.5 mm (vs. 2 mm) wide; and subglabrous (vs. pilose) capsules.

11. *Begonia wallacei* C. W. Lin & C.-I Peng, ***sp. nov.***

Sect. *Petermannia*

－**TYPE:** MALAYSIA. Borneo, Sarawak, Kuching Division, Padawan, Gunung Angob, *ca.* 100 m elev. Type specimen pressed from cultivated plant in a nursery in Taiwan, 22 Aug. 2013, *C. W. Lin 552* (holotype SAN) **華萊士秋海棠 Figs. 22, 23**

Plant perennial, monoecious, epipetric or terrestrial. **Stem** erect, cane-like, climbing on vertical slope when young, branched from below; olive to crimson, 50–80 cm tall, 4–8.5 mm across, glabrous or minutely brown puberulous, internodes 4–13 cm long, nodes swollen. **Stipules** ovate, 1.1–1.7 cm long, 5.5–8 mm wide, hyaline, pale green, strongly keeled, margin entire, apex cuspidate, cusp 2–3 mm long. **Petiole** terete, 2–10 cm long, 3–6 mm across, crimson, glabrous or minutely brown puberulous. **Leaves** 5–8, oblique, more or less downward; lamina widely ovate, basifixed, strongly asymmetric with a well-developed basal lobe on one side giving a cordate appearance, margin denticulate, glabrous, apex acuminate, 13–26 cm long (basal lobes included), 8–20 cm wide, broad side 5–12.8 cm wide, base unequal, basal lobes cordate, 2.7–8 cm long, thinly succulent, adaxially chartreuse to emerald green, venation crimson towards base, young plants with sparse to dense rose pink spots between veins; abaxially pale green; venation palmate-pinnate, midrib distinguishable, 10–16 cm long, *ca.* 2 major lateral veins on either side of midrib. **Bracts** pale green, hyaline, deciduous, those at basal node of inflorescence (with pistillate flowers) ovate-triangular, *ca.* 12 mm long, 6 mm wide, aristate, arista 1.5–3 mm long, margin entire; bracts at summit of inflorescence (with staminate flowers) ovate to suborbicular, 3–10 mm long, 2–5 mm wide, apex attenuate to rounded, margin entire. **Inflorescence** a terminal, bisexual, cymosely branching panicle 11–16 cm long, peduncle 3–7 cm long or sessile, staminate cymes with up to 5 orders of branching and more than 20 flowers, erect or ascending, terminal, crimson, glabrous; pistillate flowers in pairs, or single, at lower part of the inflorescence; protogynous. **Staminate flower:** pedicel 5–11 mm long, glabrous, tepals 4, pale green, outer 2 elliptic, abaxially glabrous or minutely puberulous, margin entire, 5–7 mm long, 4.5–6.5 mm wide, inner 2 narrowly oblong to narrowly elliptic, 4–5 mm long, 1.5–2 mm wide; androecium actinomorphic, stamens 40–50, filaments shortly fused at base; anthers *ca.* 1 mm long, longer than filaments. **Pistillate flower:** pedicel 7–10 mm long, glabrous or minutely puberulous; ovary pale green, body trigonous-ellipsoid, 7–11 mm long, *ca.* 5 mm across, 3-winged; wings narrowed or rounded to base, truncate distally, 13–18 mm long, 2.5–5 mm wide; ovary 3-locular, placenta bilamellate; tepals 6, pale green, outer 3 tepals obovate to elliptic, *ca.* 10 mm long, 2–5 mm wide, abaxially glabrous or minutely puberulous; inner 3 tepals ovate to narrowly obovate, 7–8 mm long, 2.2–3 mm wide; styles 3, dark orange, bifid, *ca.* 4 mm long; stigmas in a spiral band and papillose all around. **Fruit** pendent on a stalk 1.2–2.1 cm long, capsule 1.2–1.5 cm long, 1–1.4 cm across (wings included), glabrous, wings rounded or truncate distally, rounded or narrowed proximally.

Distribution and ecology: Endemic to northern Simunjan, Sarawak, Borneo (Figure 1). It grows on steep slopes in riparian forest or at margin of lowland mixed dipterocarp forest at 50 to 150 m elevation.

Etymology: Named in honor of Alfred Russel Wallace, the noted naturalist who explored Simunjan in the19th century and discovered many wild animals and plants therein.

Notes: The new species is somewhat similar to *Begonia roseopunctata* Kiew, from which it can be distinguished by having taller stem (50–80 cm vs. 15–30 cm), larger leaves (13–26 × 8–20 cm vs. 10.5–13.5 × 9–9.5 cm) and bracts are ovate-triangular to ovate to suborbicular (vs. lanceolate), more stamens (40–50 vs. *ca.* 26), and 6-tepalled (vs. 5-tepalled) pistillate flower. Detailed comparison of the two species are presented in Table 3.

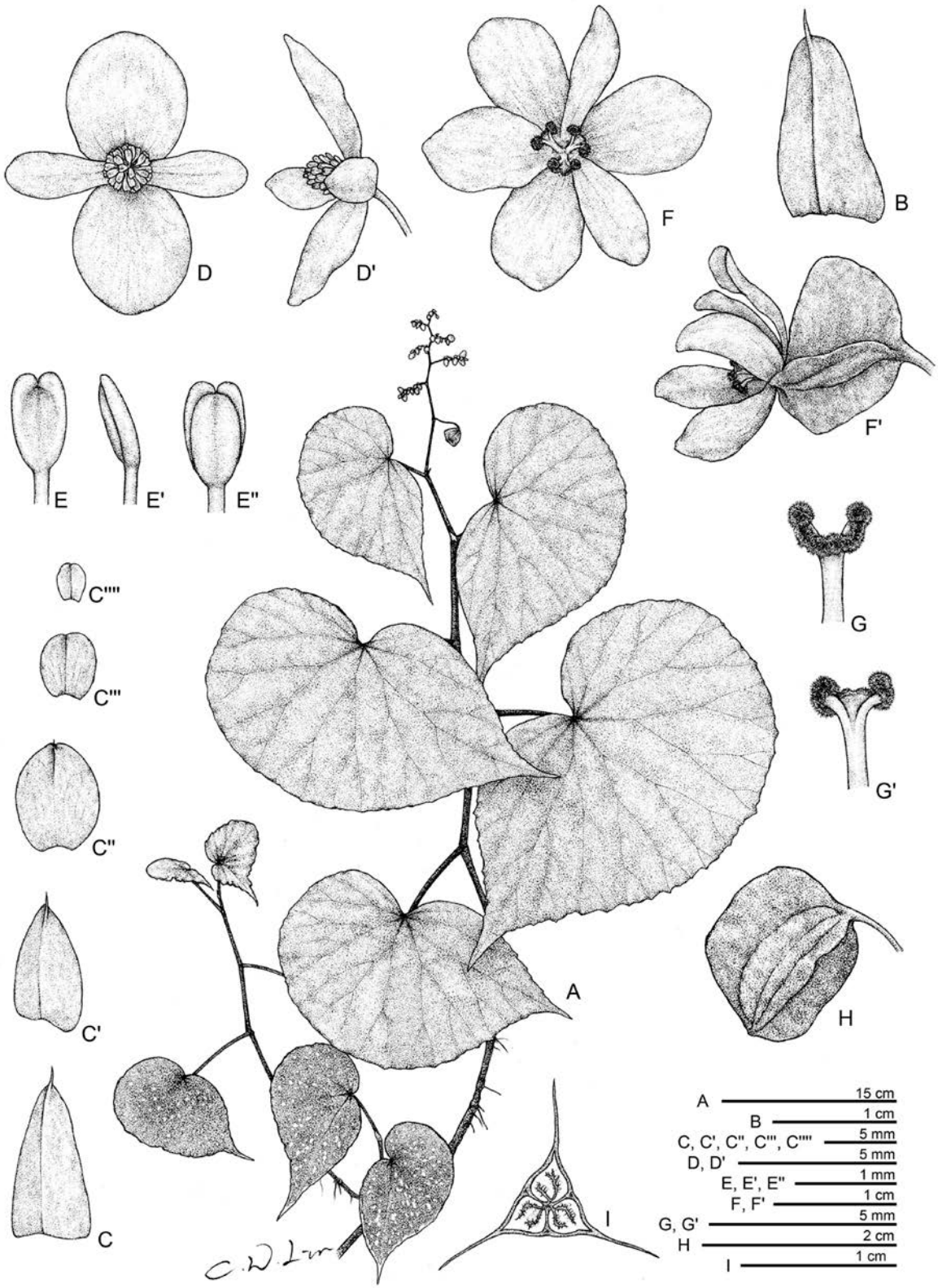

Fig. 22. ***Begonia wallacei*** C. W. Lin & C.-I Peng. **A**. Habit; **B**. Stipule; **C**, **C'**, **C''**, **C'''**, **C''''**. Bracts at lowermost to uppermost parts of inflorescence; **D**,**D'**. Staminate flower, face and side views; **E**, **E'**, **E''**. Stamen, dorsal, side and ventral views; **F**, **F'**. Pistillate flower, face and side views; **G**, **G'**. Style, dorsal and ventral views; **H**. Fruit; **I**. Cross section of an immature fruit.

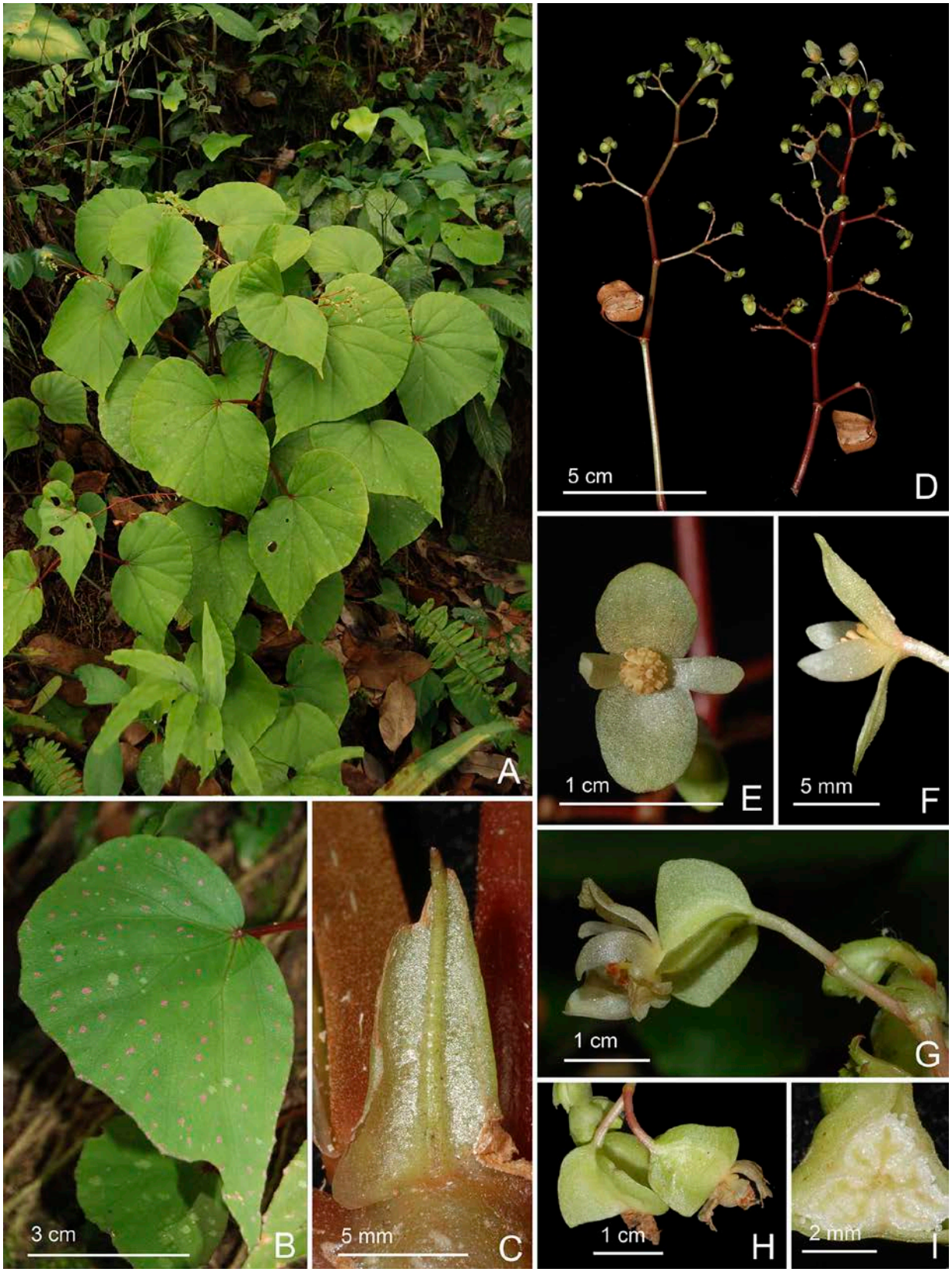

Fig. 23. ***Begonia wallacei*** C. W. Lin & C.-I Peng. **A**. Habit and habitat; **B**. Leaf of young plant, showing rosy-pink spots; **C**. Stipule; **D**. Two inflorescences each with a mature fruit; **E**, **F**. Staminate flower, face and side views; **G**. Pistillate flower, side view; **H**. A pair of immature fruits; **I**. Cross section of an immature fruit.

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LITERATURE CITED

Girmansyah, D and R. Susanti. 2015. Two new species of *Begonia* (Begoniaceae) from Borneo. Kew Bull. **70(2)**: e19.

Hughes, M. 2008. An Annotated Checklist of Southeast Asian *Begonia*. Royal Botanic Garden Edinburgh.

Joffre, A. A., R. Kiew, S. Julia and R. Rimi. 2015. The Begoniaceae of Brunei Darussalam, Borneo, including two new species. Sandakania **20**: 7-50.

Julia, S. and R. Kiew. 2014. Diversity of *Begonia* (Begoniaceae) in Borneo - how many species are there? Reinwardtia **14(1)**: 233-236.

Julia, S. and R. Kiew. 2016a. *Begonia* (Begoniaceae) from Batang Ai National Park and vicinity, Sarawak, Borneo, including six new species. Phytotaxa **252(1)**: 17-30.

Julia, S. and R. Kiew. 2016b. Eight new *Begonia* (Begoniaceae) species from the Lanjak Entimau Wildlife Sanctuary and Batang Ai National Park, Sarawak, Borneo. Gard. Bull. Singapore **68(2)**: 257-277.

Julia, S., R. Kiew and C. Geri. 2013. Revision of *Begonia* (Begoniaceae) from the Melinau limestone in Gunung Mulu National Park and Gunung Buda National Park, Sarawak, Borneo, including thirteen new species. Phytotaxa **99(1)**: 1-34.

Julia, S., R. Kiew and C.Y. Ling. 2015a A decade of *Begonia* (Begoniaceae) from Sarawak, Borneo. Sandakania **20**: 129-154.

Julia, S., R. Kiew, C.Y. Ling. and C. Geri. 2015b *Begonia* (Begoniaceae) from Kubah National Park and Environs, Sarawak, Borneo, including a new species. Sandakania **20**: 87-106.

Julia, S., R. Kiew and C.Y. Ling. 2016. Six new species of *Begonia* (Begoniaceae) from Central Sarawak, Borneo. Phytotaxa **277(2)**: 171-191.

Kiew, R. 2001. The Begonias of Sabah, Borneo-Flagship Species for Conservation. Gard. Bull. Singapore **53**: 241-286.

Kiew, R. and C. Geri, 2003. Begonias from the Bau Limestone, Borneo, including a new species. Gard. Bull. Singapore **55**: 113-123.

Kiew, R. and S. Julia. 2007 *Begonia* (Begoniaceae) from Limestone Hills in the Kuching Division, Sarawak, Borneo, including nine new species. Gard. Bull. Singapore **58**: 199-232.

Kiew, R. and S. Julia. 2009. Seven new species of *Begonia* (Begoniaceae) from the Ulu Merirai and bukit Sarang limestone areas in Sarawak, Borneo. Gard. Bull. Singapore **60**: 351-372.

Kiew, R., S. Julia, R. Rimi and A.A. Joffre. 2015. A Guide to Begonias of Borneo. Natural History Publications (Borneo), Kota Kinabalu. Pp. 1-293.

Kiew, R., S. Julia and C. Y. Ling. 2016. The Calcarea group of *Begonia* (Begoniaceae) from Borneo, including four new species from Sarawak. Gard. Bull. Singapore **68(2)**: 239-255.

Lin, C.W. and C.-I Peng. 2017. Three new species of *Begonia* (Begoniaceae) from Limestone hills in southwestern Sarawak, Borneo. Taiwania **62(2)**: 105-115.

Lin, C.W., S.W. Chung and C.-I Peng. 2014a. *Begonia hosensis* (sect. *Reichenheimia*), a new species from Sarawak, Malaysia. Taiwania **59(4)**: 326-330.

Lin, C.W., S.W. Chung and C.-I Peng. 2014b. Three new species of *Begonia* (sect. *Petermannia*, Begoniaceae) from Sarawak, Borneo. Phytotaxa **191(1)**: 129-140.

Lin, C.W., S.W. Chung and C.-I Peng. 2015. *Begonia baik* and *B. padawanensis* spp. nov. (Begoniaceae) from sandstone areas in Sarawak, Malaysia. Nord. J. Bot 33: 555-561.

Low, Y.W., A.A. Joffre and A.K. Muhammad Ariffin, 2016. Novitates Bruneienses, 2. remarkable new species of *Begonia* sect. *Petermannia* (Begoniaceae) from Brunei Darussalam. Gard. Bull. Singapore **67(1)**: 61-68.

Pearce, K.G. 2003 Five new *Begonia* species (Begoniaceae) from the Niah National Park, Sarawak, Malaysia. Gard. Bull. Singapore 55: 73-88.

Ridley, H. N. 1906. Begonias of Borneo. J. Straits Branch Roy. Aisat. Soc. 46: 247-261.

Sands, M.J.S. 1997. In: Code, M.J.E., Dransfield, J., Forman, L.L., Kirkup, D.W. & Idris, M.S. (eds). A Checklist of Flowering Plants and Gymnospermsof Brunei Darussalam. Department and The Royal Botanic Gardens, Kew. Pp. 38-41, 432-434.

Appendix 1. Herbarium specimens examined

Begonia baik C. W. Lin & C.-I Peng, Malaysia. Borneo, Sarawak, Kuching District, Padawan, 01°08'N, 110°16'E, *ca.* 130 m, 22 Aug 2013, C. W. Lin 554 (TAIF 458841).

Begonia hullettii Ridl. Borneo, Sarawak, Kuching District, Matang. August 1905. *Ridley 11776* (K 000761070)

Begonia kasutensis K. G. Pearce. Borneo, Sarawak, Miri District, Niah, Subis Gunong, Great Cave. *J. A. R.. Anderson S31940* (SING 0067981)

Begonia stenogyna Sands. Borneo, Brunei, Temburong District, Amo, Batu Apoi FR, Kuala Belalong. July 1993. *Sands et al. MS 5782* (K 000761114)