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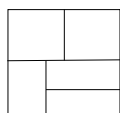
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Cover images: *Begonia mattampensis* Ardi & D.C.Thomas *spec. nov.* (§ *Petermannia*). Top left: Habit. Top right: Stipules. Below left: Male inflorescence. Middle: Male flower & female flower. Below right: Fruit & ovary cross section (middle part). Photos: W.H. Ardi.

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A NEW SPECIES OF *BEGONIA* (BEGONIACEAE) FROM SOUTH SULAWESI, INDONESIA, AND AN AUGMENTED DESCRIPTION OF *BEGONIA BONTHAINENSIS*

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ABSTRACT

ARDI, W. H. & THOMAS, D. C. 2018. A new species of *Begonia* (Begoniaceae) from South Sulawesi, Indonesia, and an augmented description of *Begonia bonthainensis*. Reinwardtia 18(1): 19–26. — Based on collections from South Sulawesi, Indonesia, an amended description of *B. bonthainensis* Hemsl. is provided, *B. grandipetala* Irmsch. is placed in synonymy of *B. bonthainensis*, and the new species *Begonia mattampensis* Ardi & D.C.Thomas is described and illustrated. Provisional conservation assessments indicate an Endangered (EN) status for *B. bonthainensis*, an endemic of Mt. Lompobatang and several adjacent mountains at the tip of the Southwestern arm of Sulawesi, and a Critically Endangered (CR) status for *Begonia mattampensis*, a limestone endemic only known from the Pangkadjene Karst.

Key words: Limestone, Lompobatang, *Petermannia*.

ABSTRAK

ARDI, W. H. & THOMAS, D. C. 2018. Jenis baru *Begonia* (Begoniaceae) dari Sulawesi Selatan, Indonesia dan perluasan pertelaan *Begonia bonthainensis*. Reinwardtia 18(1): 19–26. — Berdasarkan koleksi herbarium yang berasal dari Sulawesi Selatan, Indonesia, pertelaan *B. bonthainensis* Hemsl. diperbaharui, *B. grandipetala* Irmsch. disinonimkan ke dalam *B. bonthainensis*, serta satu jenis baru, *Begonia mattampensis* Ardi & D.C.Thomas dipertelakan dan dibuat gambar ilustrasinya. Evaluasi status konservasi untuk *B. bonthainensis*, yang merupakan jenis endemik Gunung Lompobatang dan gunung sekitarnya adalah Terancam (*Endangered*), dan Terancam Punah (*Critically Endangered*) untuk *B. mattampensis*, jenis endemik batu gamping yang hanya diketahui di Karst Pangkadjene.

Kata kunci: Batu gamping, Lompobatang, *Petermannia*.

INTRODUCTION

Begonia (Begoniaceae) is one of the largest genera of flowering plants and comprised of 1923 currently accepted species (Hughes *et al.*, 2015; Moonlight *et al.*, 2018). The genus has a pantropical distribution, with a centre of diversity in Asia > 1000 species (Hughes *et al.*, 2015; Moonlight *et al.*, 2018).

Several studies and extensive fieldwork focusing on the collection of begonias have been conducted on the Indonesia island of Sulawesi since 2006, including an expedition to South Sulawesi in 2009 organized by the Royal Botanic Garden Edinburgh and Bogor Botanic Gardens. These surveys and studies have resulted in descriptions of 26 new species (Hughes, 2006; Thomas & Hughes, 2008; Girmansyah *et al.*, 2009; Thomas *et al.*, 2009a & b; Wiriadinata, 2014; Ardi *et al.*, 2014 & 2018; Lin *et al.*, 2011; 2017 & 2018), raising the total number of Sulawesi

Begonia species to 51 (see continuously updated checklist and synonymy in Thomas *et al.*, 2013). Sixteen species have been reported from South Sulawesi (see Table 1; Thomas *et al.*, 2011 & 2013; Ardi *et al.*, 2014;). Although these studies have improved our understanding of the diversity of the Sulawesi *Begonia* flora, a close examination of herbarium specimens from BO, E, K, and SING indicates that there is still a considerable number of species from South Sulawesi awaiting description.

Here we provide an augmented description of *Begonia bonthainensis* Hemsl., which is distributed on several mountains on the tip of the southwestern arm of Sulawesi, and describe a new species based on material recently collected from the Pangkadjene Karst, South Sulawesi. The new species belongs to *Begonia* section *Petermannia* (Klotzsch) A.DC., as it shows characteristic features of the section: protogynous inflorescences, female inflorescences with two

Table 1. *Begonia* species reported from South Sulawesi.

Species	<i>Begonia</i> Section	Distribution [Sulawesi provinces; other]
<i>B. aptera</i> Blume	Platycentrum	N, C, S, SE, W Sulawesi, Gorontalo; New Guinea
<i>B. bonthainensis</i> Hemsl.	Petermannia	S Sulawesi
<i>B. comestibilis</i> D.C.Thomas & Ardi	Petermannia	S Sulawesi
<i>B. didyma</i> D.C.Thomas Ardi	Petermannia	S Sulawesi
<i>B. guttapila</i> D.C.Thomas & Ardi	Petermannia	S Sulawesi
<i>B. hooveriana</i> Wiriad.	Petermannia	S Sulawesi
<i>B. lasioura</i> D.C.Thomas & Ardi	Petermannia	S Sulawesi
<i>B. mekonggensis</i> Girm. & Wiriad.	Petermannia	S, SE Sulawesi
<i>B. ozotothrix</i> D.C.Thomas	Petermannia	C, S, SE Sulawesi
<i>B. prionota</i> D.C.Thomas & Ardi	Petermannia	S Sulawesi
<i>B. rantemarioensis</i> D.C.Thomas & Ardi	Petermannia	S Sulawesi
<i>B. robusta</i> Blume complex	Platycentrum	C, S Sulawesi; Sumatra, Java, Lesser Sunda Isles
<i>B. siccacaudata</i> J.Door.	Petermannia	S Sulawesi
<i>B. siregarii</i> Ardi & D.C.Thomas	Petermannia	S Sulawesi
<i>B. torajana</i> D.C.Thomas & Ardi	Petermannia	S Sulawesi
<i>B. vermeulenii</i> D.C.Thomas	Petermannia	S Sulawesi

Notes: N: North, C: Central, S: South, SE: South East, W: West

flowers, 3-locular ovaries with axile placentation and bilamellate placentae, fruits with equal wings, and anthers with unilaterally positioned slits (Doorenbos *et al.*, 1998; Moonlight *et al.*, 2018). All available *Begonia* specimens from BO, E, K, L and SING have been consulted, and only two collections of this species were found. Hence it must be assumed, at least until more intensive collecting reveals otherwise, that this species has a restricted range and is endemic to South Sulawesi.

TAXONOMIC TREATMENT

BEGONIA BONTHAINENSIS Hemsl. (§ *Petermannia*)

Bull. Misc. Inform. Kew 1896: 37 (1896). Hughes, An Annotated Checklist of Southeast Asian *Begonia* 17 (2008); Thomas *et al.*, Edinburgh J. Bot. 68(2): 252 (2011); Hughes *et al.*, Asian *Begonia*: 300 Species Portraits, 38 (2018). — Type: Sulawesi, Bonthain Peak, Oct. 1894, A.H. Everett 34 (Holo K!; iso SING!). (Fig. 1, 2). *Begonia grandipetala* Irmsch., Bot. Jahrb. Syst. 50: 377 (1913), *syn. nov.* Hughes, An Annotated Checklist of Southeast Asian *Begonia* 46 (2008); Thomas *et al.*, Edinburgh J. Bot. 68(2): 252 (2011); Hughes *et al.*, Asian *Begonia*: 300 Species Portraits, 123 (2018). — Type: Sulawesi, Bowonglangi, 24 Apr. 1902, K.F. & P.B. Sarasin 2154 (Holo B!).

Perennial, monoecious herb, sometimes slightly woody at base, up to *ca.* 2 m tall; stems erect with microscopic glandular hairs and otherwise glabrous to moderately hairy with multicellular whitish hairs up to *ca.* 1 mm long. *Stem* branched,

internodes (1.5)2–13.5 cm long, swollen at the nodes, red or brownish red. *Leaves* alternate; *stipules* caducous, 10–35 × 3.5–12 mm, oblong, apex acute, midrib abaxially prominent, projecting up to 10 mm at the apex, margin entire, translucent, reddish to reddish-greenish; *petioles* (3.5)5–15.5 cm long, adaxially shallowly channelled, glabrous to moderately hairy, reddish to pale green; *lamina* basifixed, 9–19.5 × 5–13.5 cm, asymmetric, ovate to elliptic, margin dentate or serrate to biserrate, to shallowly lobed (up to *ca.* 20% of the lamina width), base cordate and lobes not or rarely slightly overlapping, apex acuminate, adaxial surface green, sometimes blue iridescent, glabrous to hairy, abaxially pale green or maroon, glabrous to hairy; primary veins 5–7(–8), actinodromous, secondary veins craspedodromous. *Inflorescences*: protogynous; female inflorescence positioned one node below the male inflorescences or sometimes solitary, peduncles 1–4.1 cm long, reddish-brownish to red, glabrous to sparsely hairy; *male inflorescences* dichasially branching, with 5–12 flowers, peduncles 1.9–4.5 cm long, reddish, glabrous to sparsely hairy; bracts *ca.* 12–20 × 10–12 mm, glabrous, ovate, pale green, thin and papery, caducous. *Male flowers*: *pedicels* 8–15 mm long, white, glabrous; *bracteoles* 5–7 × 2–4 mm, pale green, translucent, thin and papery, caducous; *tepals* 2–4, white, 2 outer tepals 1.8–2.9 × 1.7–2.7 cm, suborbicular to broadly ovate, base slightly cordate, apex rounded, outer surface glabrous, 0–2 inner tepals 0.6–1.6 × 0.2–0.9 cm, oblong, elliptic or obovate; *androecium* yellow, symmetric; *stamens ca.* 90, filaments *ca.* 1–2 mm long, fused at the base, anthers up to *ca.* 1 mm long, obovate, dehiscing

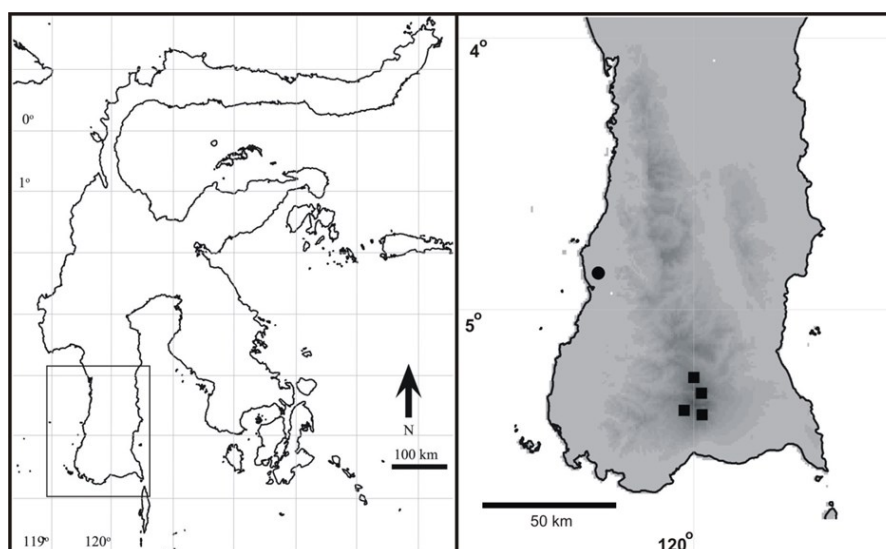


Fig. 1. Distribution map. Left: Overview of Sulawesi. Right: Species distributions in South Sulawesi. Square (■): *B. bonthainensis*, circle (●): *B. mattampensis*. Elevation is indicated by five shades of grey: 0–500 m (the lightest shade), 500–1,000 m, 1,000–1,500 m, 1,500–2,000 m, and > 2,000 m (the darkest shade).

through unilaterally positioned slits that are *ca.* $\frac{1}{2}$ as long as the anthers. *Female flowers*: pedicels 9–17 mm long, green–reddish, glabrous; bracteoles caducuous, $1\text{--}1.8 \times 1\text{--}1.6$ mm, broadly ovate, margin entire, apex mucronate, pale green, translucent, thin and papery, glabrous; *tepals* 5, white, subequal to unequal, *ca.* $1.8\text{--}2.8 \times 1\text{--}2$ cm, elliptic, glabrous, margin entire, apex rounded to obtuse; *ovary* (excluding wings) $7\text{--}13 \times 4\text{--}9.5$ mm, ellipsoid, white or pale green, glabrous, locules 3, placentation axile, placentae bilamellate, wings 3, equal, green, base rounded to cuneate, apex truncate, widest point at the apex 2–8 mm, style up to 9 mm long, basally fused, 3–branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruit*: peduncle *ca.* 1–4 cm long; pedicels 1–2 cm long; seed-bearing part $10\text{--}17 \times 7\text{--}12$ mm (excluding the wings), globoid to ellipsoid, glabrous, dehiscent, splitting along the wing attachment, wing shape as in ovary, up to 10–14 mm at the widest point (apically to subapically). *Seeds* barrel-shaped, *ca.* 0.3 mm long.

Distribution. Endemic to Indonesia, Sulawesi, South Sulawesi: Mt. Lompobatang massif (including Mt. Bawakaraeng), Mt. Bowonglangit and Tompobulu.

Habitat. On stream or river embankments in upland rainforest, in dense shade, at *ca.* 1,500–1,800 m asl.

Etymology. The species epithet refers to Bonthain Peak (Mt. Lompobatang) in South Sulawesi, where the type material was collected.

Provisional IUCN conservation assessment.

Endangered EN B1ab(iii)+B2ab(iii). *Begonia bonthainensis* is only known from several mountains at the Southern tip of South Sulawesi (Mt. Lompobatang, Mt. Bawakaraeng, Mt. Bowonglangit and Mt. Tompobulu) and is locally abundant on Mt. Bawakaraeng. However, none of the localities has a legal status as protected area and potential threats (agriculture, tourism) were observed in the area. This in combination with GeoCAT (Bachman *et al.*, 2011) estimates of an EOO smaller than 5,000 km² (112 km²) and an AOO of 24 km², indicates that this species should be considered Endangered.

Additional specimens examined. South Sulawesi.

Bonthain Peak, 12 Dec. 1976, *W. Meijer 11035* (E); Bonthain Peak, 12 Dec. 1976, *W. Meijer 11036* (BO, L); Bonthain Peak, 18 May 1921, *H.A.B. Bunnemeijer 11067* (BO); Lombasang, 26 May 1921, *H.A.B. Bunnemeijer 11729* (BO); Bonthain Peak, 10 June 1921, *H.A.B. Bunnemeijer 12030* (BO); Bonthain Peak, 11 June 1921, *H.A.B. Bunnemeijer 12046* (BO); Gunung Bawakaraeng, South Sulawesi, 12 Apr. 2009, *D.C. Thomas & W.H. Ardi, DCT 09-63* (BO, E, L); South Sulawesi, Malino, Gunung Bawakaraeng, 12 Apr. 2009, *D.C. Thomas & W.H. Ardi, DCT 09-69* (BO, E, L); Gowa District, Tompobulu, Cikoro village, 29 Oct. 2010, *Agus Suyadi et al. EAW 9164* (BO, E); South Sulawesi, Malino, Lembana Waterfall, 14 Apr. 2018, *W.H. Ardi WI 362* (BO, FIPIA, SING).

Notes. The original descriptions of *B. bonthainensis* and *B. grandipetala* were based on only single collection from type localities on mountains

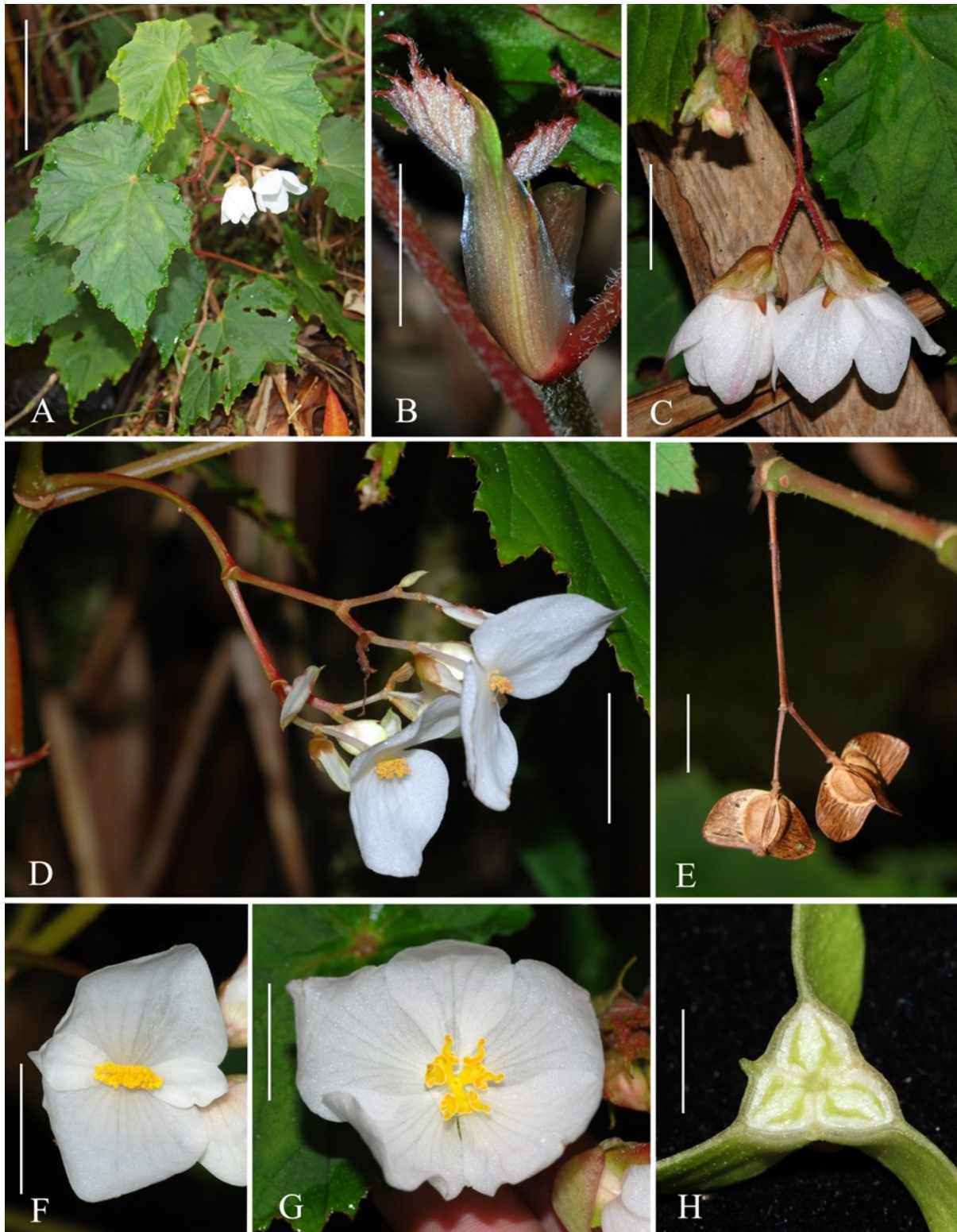


Fig. 2. *Begonia bonthainensis* Hemsl. (§ *Petermannia*). A. Habit; scale bar: 10 cm. B. Stipule; scale bar: 10 mm. C. Female inflorescence; scale bar: 2 cm. D. Male inflorescence (dichasium); scale bar: 2 cm. E. Infructescence; scale bar: 10 mm. F. Male flower, front view; scale bar: 2 cm. G. Female flower, front view; scale bar: 10 mm. H. Ovary, cross section, axile placentation and bilamellate placentae; scale bar: 5 mm. A–H from *DCT 09-63*. Photos: D.C. Thomas & W.H. Ardi.

in South Sulawesi which are separated by about 25 km. The protologues indicate qualitative and quantitative characters differentiating the species. According to Hemsley (1896), *B. bonthainensis* is glabrous to glabrescent, has a dentate to denticulate leaf margin, and male flowers with two tepals. These characters seem distinct from *B. grandipetala* which has hairy stems, the leaf margin is serrate to biserrate, and shallowly lobed, and the male flowers have four tepals (Irmscher, 1913).

Hughes *et al.* (2018) included both species in their photo guidebook and noted that *Begonia bonthainensis* differs from *B. grandipetala* by its slightly smaller male flowers with two tepals, and the identification key in Thomas *et al.* (2011) uses leaf margin and male flower characters to differentiate the two species. However, the type material also shows conspicuous similarities such as male flowers in dichasially branching inflorescences with well-developed internodes, female inflorescences with relatively long peduncles and long pedicels, and very similar fruit shapes, which clearly indicates a close relationship. During expeditions to the Mt. Lompobatang massif including Mt. Bawakaraeng in 2009 and 2018, considerable variation of the indumentum of the stem and petioles (glabrous to moderately hairy), leaf margin serration and leaf-lobing, and number of male flowers tepals (two to four) were observed within and between populations (e.g. *Ardi* 362 [BO, FIPIA, SING]; *DCT* 09-69 [E]; *EAW* 9164 [BO]). The observed variation on Mt. Bawakaraeng in combination with the similarity of crucial generative characters (inflorescence, fruits) of the type specimens, and variation observed in additional specimens examined (see above) from localities connecting the two type localities, lets us conclude that the differences in the type material are at the individual or population level in a continuous morphospace. Consequently, we propose to put the more recent name, *Begonia grandipetala*, in synonymy.

Begonia mattampensis Ardi & D.C.Thomas, *spec. nov.* (§ *Petermannia*). — Type: Indonesia, Sulawesi, South Sulawesi, Pangkadjene, Mattampa cave, 02 November 2018, *Wisnu Ardi* WI 322 (Holotype BO!; isotypes FIPIA!, BOHB!, SING!) (Fig. 3).

Diagnosis. This species has a creeping stem, which is rare in *Begonia* section *Petermannia*. Of the Sulawesi species in *Begonia* sect. *Petermannia* with creeping stems (*Begonia gemella* Warb. ex L.B.Sm. & Wassh., *B. heteroclinis* Miq. ex Koord., and *B. flacca* Irmsch.) it is most similar to *B. flacca*, but differs from it in its leaf shape (elliptic to suborbicular with entire margin and rounded

apex vs ovate to elliptic with serrate or biserrate to shallowly lobed margin and acuminate apex), male partial inflorescences arranged in strongly compressed monochasia (vs simple, elongate monochasia), fewer stamens (24–27 vs 52–62) and larger and differently shaped fruit (ovoid, 10–17 × 8–9 mm, widest point of fruit wing subapically to middle of the seed-bearing part, up to 13 mm wide vs ellipsoid, obovoid or cylindrical, 10–12 × 4.5–6.5 mm, widest point at the apex or subapically, to 8 mm wide).

Perennial, monoecious herb with creeping stems, rooting at the nodes when in contact with the substrate, up to *ca.* 25 cm long, sparsely hairy with white hairs up to *ca.* 2 mm long. *Stem* creeping, internodes 1.5–4 cm long, greenish. *Leaves* alternate; *stipules* persistent, 12–13 × 5–8 mm, ovate, with an abaxially slightly prominent midrib projecting up to 5 mm at the apex, greenish-reddish, glabrous; *petioles* 8.5–18.5 cm long, terete, red, sparsely to moderately hairy; *lamina* 6.5–12.5 × 5–10 cm, asymmetric, elliptic to suborbicular, base cordate and lobes slightly overlapping, apex rounded, margin entire and undulate in the larger leaves, adaxial surface green to dark green, glabrous, abaxial surface reddish, glabrous; primary veins 5–7, actinodromous, secondary veins craspedodromous. *Inflorescences*: protogynous; *female inflorescences* 1-flowered (female flowers solitary), basal to male inflorescences, peduncles *ca.* 1 mm long, pale green, glabrous; *male inflorescences* composed of up to 7 partial inflorescences, each partial compressed monochasial with up to 5 flowers, peduncles 2.5–5 cm long, pink, glabrous; bracts 5–10 × 3–5 mm, ovate, midrib slightly prominent projecting up to 1 mm at the apex. *Male flowers*: *pedicels* 17–20 mm long, white-pinkish, glabrous; *tepals* 2, white and tinged pink at the margin, 9–11 × 11–14 mm, broadly ovate, base slightly cordate, margin entire, apex rounded; *androecium* of 24–27 stamens, yellow, filaments up to *ca.* 1.5 mm long, fused at the base for *ca.* 1 mm, anthers up to 1.5 mm long, obovate, dehiscing through unilaterally positioned slits that are *ca.* 1/2 as long as the anthers. *Female flowers*: *pedicels* 4–9 mm long, pale green, glabrous; *tepals* 5, subequal, white or white tinged pink, 10–14.4 × 6.5–12 mm, elliptic, margin entire, apex rounded; *ovary* (without wings) 8–11.5 × 7.5–8.5 mm, ovoid, sometimes beaked at the apex, pale green, wings 3, subequal to unequal, one wing larger than the other two, base rounded, apex cuneate, up to 8 mm long at the widest point (subapically to middle of the ovary), style up to 4 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruit*: *peduncle* *ca.* 1 mm long; *pedicels* 4–6 mm long; *seed-bearing part* 10–17 × 8–9 mm

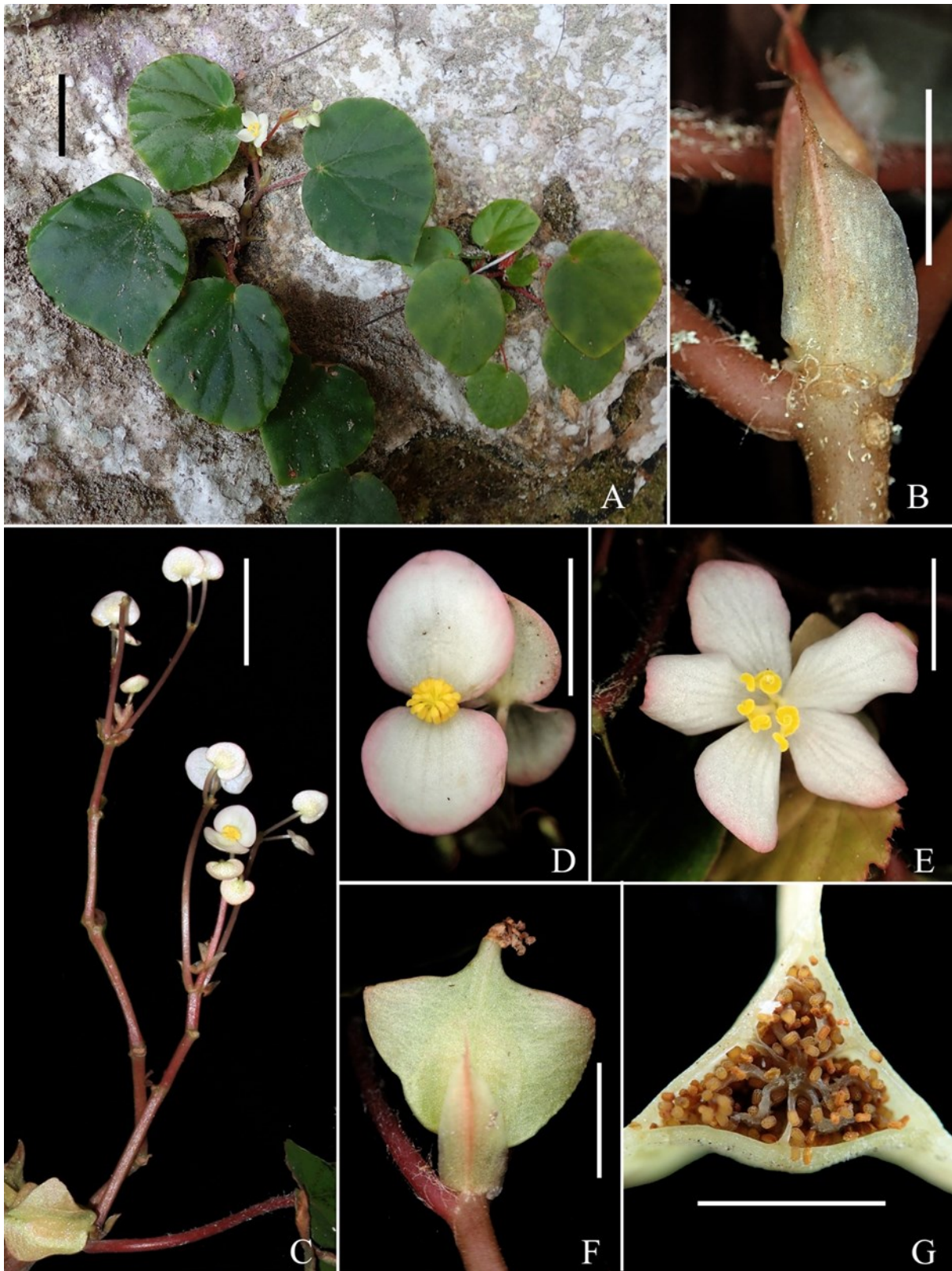


Fig. 3. *Begonia mattampensis* Ardi & D.C.Thomas, *spec. nov.* (§ *Petermannia*). A. Habit; scale bar: 5 cm. B. Stipules; scale bar: 10 mm. C. Male inflorescence; scale bar: 2 cm. D. Male flower; scale bar: 10 mm. E. Female flower; scale bar: 10 mm. F. Fruit; scale bar: 10 mm. G. Ovary cross section (middle part); scale bar: 5 mm. A, B, D–G from *Wisnu Ardi WI 322*; C from *Hamrullah s.n.* Photos: W.H. Ardi.

(excluding the wings), ovoid, glabrescent, dehiscent, splitting along the wing attachment, wings subequal to slightly unequal, base rounded, apex subtruncate to rounded, up to 13 mm long at the widest point (subapically to middle of the seed-bearing part). *Seeds* barrel-shaped, *ca.* 0.3–0.4 mm long.

Distribution. Endemic to Indonesia, Sulawesi, South Sulawesi: Pangkadjene.

Habitat. Growing on limestone walls and cave entrances, at low elevation (*ca.* 5–10 m).

Etymology. The species epithet refers to the Mattampa cave in Pangkadjene, South Sulawesi, where the type material was collected.

Provisional IUCN conservation assessment. Critically Endangered CR B1ab(iii)+B2ab(iii). *Begonia mattampensis* is known from only three collections from the Pangkadjene Karst (Mattampa karst). The karst area is not legally protected, and currently the type locality is part of a tourist attraction (Dufan Mattampa waterpark). In combination with the very small EOO and AOO (4 km²), this indicates that the species should be considered Critically Endangered.

Additional specimens examined. Celebes, Sub. Div. Pangkadjene, 12 June 1938, *P.J. Eyma 301* (BO, K, L, U). South Sulawesi, Pangkajene, Mattampa Cave, 01 Feb. 2017, *Hamrullah s.n.* (BO, FIPIA, BOHB, SING).

Notes. *Begonia mattampensis* is very distinct among the creeping species from Sulawesi or the Moluccas. The differences between *B. flacca* are discussed in the diagnosis above. *Begonia mattampensis* also has some similarities with *B. siccacaudata* J.Door. (Doorenbos, 2000), which is endemic to the Maros karst in close proximity to the type location. Both species show solitary female flowers and subumbellate male partial inflorescences. However, *Begonia mattampensis* has a creeping stem with much longer internodes (*vs* stem thickened and tuberlike with internodes only up to 3.5 mm long), longer petioles (8.5–18.5 cm *vs* up to 5 cm), thick and coriaceous leaves (*vs* thin and papery), and shorter fruit pedicels (4–6 mm *vs* 8–10 mm).

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