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Begonia mabberleyana (Begoniaceae), a new species from Central Sulawesi, Indonesia

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ABSTRACT. Based on collections from the Banggai Regency, Sulawesi, Indonesia, the new species *Begonia mabberleyana* D.C.Thomas & Ardi is described and illustrated. This species is restricted to limestone habitats and endemic to Central Sulawesi. A provisional conservation assessment indicates a Critically Endangered (CR) status for the species.

Keywords. *Begonia* section *Petermannia*, karst flora, limestone, Sulawesi Tengah

Introduction

Recent botanical exploration of the Indonesian island of Sulawesi has resulted in the description of numerous new species of *Begonia* L. (Hughes, 2006; Thomas & Hughes, 2008; Girmansyah et al., 2009; Thomas et al., 2009a, 2009b, 2011, 2018; Wiriadinata, 2013; Ardi et al., 2014, 2018; Lin et al., 2017). This alpha-taxonomic work has considerably improved our understanding of the Sulawesi *Begonia* diversity. The island harbours a rich and largely endemic *Begonia* flora (52 accepted indigenous species, 48 of them endemic to Sulawesi, and 1 naturalised species). These species belong to three sections: *Jackia* (3 species), *Petermannia* (46 species), and *Platycentrum* (3 species) (see checklist in Thomas et al., 2013, continuously updated).

Vast areas of Sulawesi remain botanically underexplored, however, and general collection densities on Sulawesi are among the lowest in tropical Southeast Asia (Cannon et al., 2007; Middleton et al., in press). One of the most poorly collected areas is the eastern arm of Central Sulawesi (Cannon et al., 2007). Despite its considerable size (> 17,000 km^2) and the presence of suitable habitats including lowland and upland rainforest, as well as suitable edaphic conditions including extensive areas of limestone karst (Cannon et al., 2005), only six *Begonia* species have been described from the area (Hughes, 2006; Thomas & Hughes, 2008; Thomas et al., 2009a). These include the more widespread *Begonia aptera* Blume (Sulawesi, Moluccas) and *B. rieckei* Warb. (Moluccas, New Guinea, Philippines, Sulawesi); *B. ozotothrix* D.C.Thomas, which is widespread in Sulawesi; and *B. hekensis* D.C.Thomas, *B. stevei* M.Hughes, and *B. varipeltata* D.C.Thomas, which form a clade of species endemic to the eastern arm of Central Sulawesi (Thomas et al., 2012).

An examination of herbarium material (B, BO, E, K, L, SING) and images of specimens from numerous other herbaria available in the *Begonia Resource Centre* (Hughes et al., 2015, continuously updated), as well newly available material collected in Central Sulawesi in February 2019, indicate that there are several new species from the area awaiting description. One of these new species is described below. This species is known from six collections from only two localities, and apparently endemic to eastern Central Sulawesi. A provisional IUCN conservation assessment indicates a Critically Endangered status (see below), and several plants were grown from stem cuttings and brought into cultivation at Bogor Botanic Gardens for research and *ex-situ* conservation purposes. Like the majority of Sulawesi *Begonia* species, the new species can be placed in the large *Begonia* section *Petermannia* (> 420 species, see Moonlight et al., 2018) based on the following characters: protogynous inflorescences, single-flowered female partial inflorescences or separate solitary female flowers, three-locular ovaries with bilamellate placentae, anthers with unilaterally positioned slits, and the absence of specialised underground organs such as rhizomes or tubers.

Species description

Begonia mabberleyana D.C.Thomas & Ardi, **sp. nov.** (§ *Petermannia*)
The many-flowered male inflorescences, male inflorescence architecture, small male flowers (tepals 3–7 × 3–7 mm), and variable male tepal coloration indicate a close relationship of *Begonia mabberleyana* with the morphologically similar *Begonia stevei* M.Hughes. *Begonia mabberleyana* can be differentiated by its shorter petioles (0.1–1 cm vs 1–4 cm); leaves which are coarsely toothed, serrate or shallowly lobed in the distal part only (vs lamina irregularly incised); pinnate lamina venation (vs venation palmate-pinnate); minute and caducous bracteoles of the male inflorescences (vs bracteoles well-developed and semi-persistent); and solitary female flowers and fruits, fruit pedicels that are up to 7 mm long and borne on strongly compressed branches to c. 1 mm long (vs female flowers and fruits in pairs, pedicels to 12 mm long, peduncles to 8 mm long). – TYPE: Indonesia, Sulawesi, Central Sulawesi, Banggai Regency, Lamala District, Sirom near Boloak village, 0°52′55.9″S, 123°16′46.2″E, 192 m, 12 February 2019, *W. H. Ardi 425* (holotype BO; isotypes KRB, SING). (Fig. 1 & 2)

Perennial, monoecious herb, up to c. 80 cm tall; stems erect, with microscopic glandular hairs and a sparse indumentum of multicellular, bristly hairs to c. 0.5 mm long. ***Stem*** branched, internodes 2–8 cm long, greenish or brownish-reddish. ***Leaves*** alternate; stipules caducous, 6–9 × 3–5 mm, ovate to elliptic, acuminate, apex narrowed into bristle up to 2 mm long, greenish, glabrous; petioles 0.1–1 cm long, greenish or reddish, sparsely hairy; lamina basifixed, 7–15 × 3.3–10 cm, asymmetric, obovate, base asymmetrically cuneate, convex or cordate (lobes not overlapping), apex acute, margin coarsely dentate to serrate and sometimes shallowly lobed in the distal lamina half, the teeth not bristle-pointed, adaxial surface green with red to green veins, sometimes variegated with white dots between the veins, glabrous or sometimes

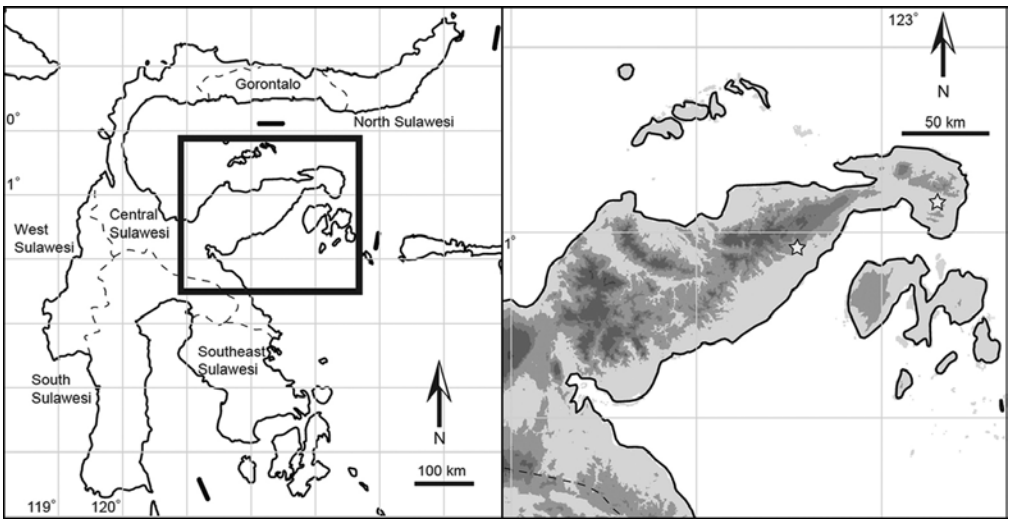

Fig. 1. Distribution map: *Begonia mabberleyana* D.C.Thomas & Ardi. Left: Overview of Sulawesi and provinces. Right: Species distribution in eastern Central Sulawesi. The yellow stars indicate collection localities. Elevation is indicated by five shades of grey: 0–500 m (the lightest shade), 500–1000 m, 1000–1500 m, 1500–2000 m, and > 2000 m (the darkest shade).

sparsely bristly between and on the veins, abaxial surface pale green and with red veins, sparsely hairy on the veins; venation pinnate, with 3–5 secondary veins on each side, these craspedodromus. ***Inflorescences*** protogynous; female flowers solitary, usually one node basal to male inflorescences or sometimes separate, peduncles to c. 1 mm long; male inflorescences racemose-cymose, composed of several cymose partial inflorescences each branching dichasially in the basal part and monochasially in the more distal part, or purely monochasially, each with several to numerous flowers; peduncles to 3 cm long; bracts minute, caducous. ***Male flowers***: pedicels 2–5 mm long, greenish, whitish-greenish, or white tinged with pink, glabrous; tepals 2, white, whitish-greenish, white tinged with pink or pinkish, ovate to suborbicular, 3–7 × 3–7 mm, margin entire, apex rounded, glabrous; androecium of c. 23–27 stamens, yellow, filaments c. 0.5 mm long, slightly fused at the very base, anthers to c. 1 mm long, oblong or narrowly obovate, dehiscing through unilaterally positioned slits c. 1/2 as long as the anthers. ***Female flowers***: pedicels 3–5 mm long, greenish, glabrous; tepals 5, whitish-greenish, subequal, 3–7 × 3–5 mm, ovate to elliptic, glabrous; ovary ellipsoid, 6.5–7 × 3–5 mm (excluding the wings), pale green, glabrous, locules 3, placentation axile, placentae bilamellate, wings 3, equal, base rounded, apex subtruncate to truncate, style c. 4 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, yellowish to orange. ***Fruits***: pedicels 6–7 mm long, curved downwards at apex; seed-bearing part ellipsoid, 8–12 × 4–7 mm (excluding the wings), glabrous, dehiscent, splitting along the wing attachment, wing shape as for ovary, up to 10 mm at the widest point (apically to subapically). ***Seeds*** barrel-shaped, c. 0.2–0.3 mm long.

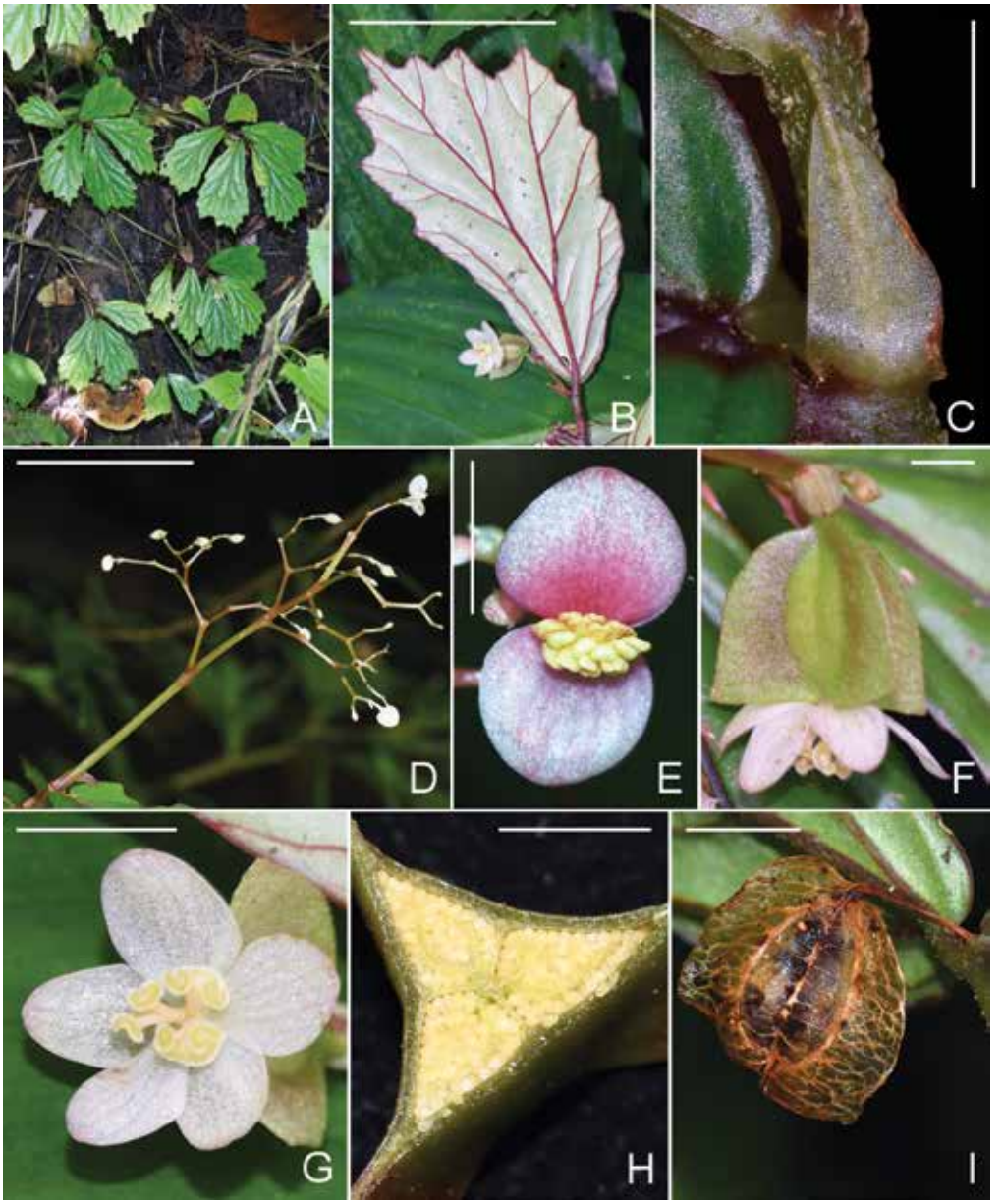

Fig. 2. *Begonia mabberleyana* D.C.Thomas & Ardi. **A.** Habit. **B.** Leaf, abaxial, and female flower; scale bar: 7 cm. **C.** Stipule; scale bar: 4 mm. **D.** Male inflorescence; scale bar: 5 cm. **E.** Male flower, front view; scale bar: 5 mm. **F.** Female flower, side view; scale bar: 4 mm. **G.** Female flower, front view; scale bar: 6 mm. **H.** Ovary cross-section, axile placentation and bilamellate placentae; scale bar: 3 mm. **I.** Fruit, side view; scale bar: 6 mm. A–I from *Ardi 425*. (Photos: W.H. Ardi)

Habitat. Growing terrestrially or lithophytically in lowland rain forest, along small streams and rivers, on limestone soils or directly on limestone rock, in dense to partial shade, at c. 50–300 m elevation.

Distribution. Endemic to Central Sulawesi, Sulawesi, Indonesia. Known from only two localities in Banggai Regency: near Sirom in Lamala District and inland from Batui in Batui District (Fig. 1).

Etymology. This species is named in honour of David Mabberley; a prominent tropical botanist and determined champion of the *Flora Malesiana* project (*floramalesiana.org*).

Notes. Begonia mabberleyana shows considerable tepal colour variation. Within the Lamala population, individuals with male flowers with either greenish, white, white tinged with pink, or pink tepals were observed. Such wide range of tepal coloration is rare in Sulawesi *Begonia*, but similar to the closely related *Begonia stevei*. Individuals derived from a single seed collection of *Begonia stevei* were reported to have a male tepal colour range from pale green to coral orange-pink (Hughes, 2006).

Provisional IUCN conservation assessment. Critically Endangered CR B1ab(iii), B2ab(iii). *Begonia mabberleyana* is known from two localities of lowland rain forest on limestone, neither of which is in a legally protected area. About 30 individuals were observed in the Lamala District population, but this locality is in disturbed forest surrounded by agricultural land. The other locality is only known from two collections by Coode from 1989 (*Coode 5952, 6013*). Exploration of several localities in lowland forest in the Banggai Regency including areas north of Batui, presumably close to where the Coode specimens were collected, did not result in any additional collections of this species. The small extent of occurrence (EOO) and area of occupancy (AOO), in combination with the fragmented distribution, observed threats, and generally poor state and ongoing reduction of lowland forest habitats in the area (see Cannon et al., 2007), indicate a Critically Endangered status.

Additional specimens examined. INDONESIA: **Central Sulawesi:** Luwuk area, inland from Batui and Seseba on Batui R., at Sinsing camp, c. 1°09′S, 122°31′E, 70–100 m, 15 Oct 1989, *Coode 5952* (K); Luwuk area, inland from Batui and Seseba on Batui R., at Totop camp, 2 hrs upriver from Sinsing, c. 1°09′S, 122°31′E, 150 m, 19 Oct 1989, *Coode 6013* (E, K, L); Banggai, west of Boloak village, May 2016, *Trethowan 286* (BO); Banggai, c. 2 hour hike west from Boloak village, 0°51′51.1″S, 123°16′50.8″E, 278 m, Oct 2016, *Trethowan 1032* (BO); ibid., Oct 2016, *Trethowan 1033* (BO).

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References

Ardi, W.H., Ardaka, I.M., Hartutiningsih, Lugrayasa, I.N. & Thomas, D.C. (2014). Two new species of *Begonia* (Begoniaceae) from Sulawesi, Indonesia. *Edinburgh J. Bot.* 71: 259–268.

Ardi, W.H., Chikmawati, T., Witono, J.R. & Thomas, D.C. (2018). A synopsis of *Begonia* (Begoniaceae) from Southeastern Sulawesi including four new species. *Phytotaxa* 381(1): 027–050.

Cannon, C.H., Harting, J., Salim, A. & Summers, M. (2005). *The vegetation of Sulawesi: Coarse filter analysis.* Report. Bogor: The Nature Conservancy.

Cannon, C.H., Summers, M., Harting, J.R. & Kessler, P.J.A. (2007). Developing conservation priorities based on forest type, condition, and threats in a poorly known ecoregion: Sulawesi, Indonesia. *Biotropica* 39: 747–759.

Girmansyah, D., Wiriadinata, H., Thomas, D.C. & Hoover, W.S. (2009). Two new species and one new subspecies of *Begonia* (Begoniaceae) from Southeast Sulawesi, Indonesia. *Reinwardtia* 13: 69–74.

Hughes, M. (2006). Four new species of *Begonia* (Begoniaceae) from Sulawesi. *Edinburgh J. Bot.* 63: 191–199.

Hughes, M., Moonlight, P., Jara, A., Tebbitt, M. & Pullan, M. (2015, continuously updated). *Begonia Resource Centre*. http://elmer.rbge.org.uk/begonia/. Accessed 20 Apr. 2019.

Lin, C.W., Thomas, D.C., Ardi, W.H. & Peng, C.-I (2017). *Begonia ignita* (sect. *Petermannia*, Begoniaceae), a new species with orange flowers from Sulawesi, Indonesia. *Gard. Bull. Singapore* 69(1): 89–95.

Middleton, D.J. et al. [22 authors] (In press, 2019). Progress on Southeast Asia's Flora projects. *Gard. Bull. Singapore* 71(2).

Moonlight, P.W. et al. [28 authors] (2018). Dividing and conquering the fastest growing genus: towards a natural sectional classification of the mega-diverse genus *Begonia* (Begoniaceae). *Taxon* 67(2): 267–323.

Thomas, D.C. & Hughes, M. (2008). *Begonia varipeltata* (Begoniaceae): a new peltate species from Sulawesi, Indonesia. *Edinburgh J. Bot.* 65: 369–374.

Thomas, D.C., Ardi, W.H. & Hughes, M. (2009a). Two new species of *Begonia* (Begoniaceae) from Central Sulawesi, Indonesia. *Edinburgh J. Bot.* 66: 103–114.

Thomas, D.C., Ardi, W.H., Hartutiningsih & Hughes, M. (2009b). Two new species of *Begonia* (Begoniaceae) from South Sulawesi, Indonesia. *Edinburgh J. Bot.* 66: 229–238.

Thomas, D.C., Ardi, W.H. & Hughes, M. (2011). Nine new species of *Begonia* (Begoniaceae) from South and West Sulawesi, Indonesia. *Edinburgh J. Bot.* 68: 225–255.

Thomas, D.C., Hughes, M., Phutthai, T., Ardi, W.H., Rajbhandary, S., Rubite, R., Twyford, A.D. & Richardson, J.E. (2012). West to east dispersal and subsequent rapid diversification of the mega-diverse genus *Begonia* (Begoniaceae) in the Malesian archipelago. *J. Biogeogr.* 39(1): 98–113.

Thomas, D.C., Ardi, W.H., Girmansyah, D. & Hughes, M. (2013, continuously updated). *Sulawesi Begonia Data Portal*. http://portal.cybertaxonomy.org/flora-malesiana-prospective/. Accessed 20 Apr. 2019.

Thomas, D.C., Bour, A. & Ardi, W.H. (2018). *Begonia* of the Matarombeo karst, Southeast Sulawesi, Indonesia, including two new species. *Gard. Bull. Singapore* 70(1): 161–174.

Wiriadinata, H. (2013). A new species of *Begonia* (Begoniaceae) from South Sulawesi, Indonesia. *Reinwardtia* 13: 445–448.