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SYNOPSIS OF *BEGONIA* (BEGONIACEAE) FROM THE NORTHERN ARM OF SULAWESI AND SANGIHE ISLAND, INDONESIA, INCLUDING THREE NEW SPECIES

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The *Begonia* diversity of the northern arm of Sulawesi and the adjacent Sangihe Talaud Islands, Indonesia, is reassessed, and distribution maps, proposed IUCN conservation category categories, and an identification key to 22 recognised species are presented. Three new species, namely *Begonia kinhoi*, *B. pitopangii* and *B. sojolensis*, are described and photographs provided. Newly available material allowed a reassessment of the morphological variability of several species that were originally described from very limited material (*Begonia carnosa*, *B. cuneatifolia*, *B. gemella*, *B. hispidissima*, *B. masarangensis*, *B. mendumiae* and *B. strachwitzii*), and revised descriptions and photographs of these species are provided. *Begonia heteroclinis* is reduced to synonomy of *B. carnosa*, and both names are lectotypified. Additionally, recircumscription and revised synonymy of *Begonia rieckei* are presented.

Keywords. Lectotypification, Southeast Asia, taxonomy.
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Introduction

As part of our ongoing revisionary taxonomic studies on *Begonia* from Sulawesi, Indonesia, we have carried out extensive fieldwork on the island over the past decade. This work, alongside additional botanical exploration by our collaborators, has resulted in the identification of a considerable number of new *Begonia* species on the island (Hughes, 2006; Thomas & Hughes, 2008; Girmansyah *et al.*, 2009; Thomas *et al.*, 2009a, 2009b, 2011; Wiriadinata, 2013; Ardi *et al.*, 2014; Lin *et al.*, 2017; Ardi *et al.*, 2018; Thomas *et al.*, 2018; Ardi & Thomas, 2019; Ardi *et al.*, 2019; Thomas & Ardi, 2019; Ardi & Thomas, 2020; Dayanti *et al.*, 2020; Thomas & Ardi, 2020; Ardi *et al.*, 2021). Additionally, two regional synopses of Sulawesi *Begonia*, focusing on southeast and southwest Sulawesi (Ardi *et al.*, 2018, and Thomas & Ardi, 2020, respectively), have recently been published. The substantial number of new discoveries indicates that: (i) the Sulawesi *Begonia* flora remains understudied; and (ii) vast areas of Sulawesi remain botanically under-explored, as also reflected in the low number of botanical collections from the island compared with several other major islands in tropical Southeast Asia (Cannon *et al.*, 2007; Middleton *et al.*, 2019).

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Sulawesi, the fourth largest Indonesian island, is located in the biodiversity hotspot of Wallacea, at the transition between the western Sunda and the eastern Sahul floras. The region harbours a diverse endemic flora and fauna. The northern arm of Sulawesi can be divided into four biogeographical regions: (i) western North Sulawesi, (ii) central North Sulawesi, (iii) eastern North Sulawesi, and (iv) the Sangihe Talaud Islands (**Figure 1**) (Cannon *et al.*, 2005). These biogeographical regions cover the provinces of North Sulawesi, Gorontalo and, in part, Central Sulawesi. The arm has a total extent of 3,888,825 ha (c.21% of Sulawesi), with an estimated 1,537,758 ha of old-growth to good-quality forest in 2007 (Cannon *et al*., 2007). The eastern part of the northern arm is botanically relatively well collected; however, a major collection gap has been identified in the central and western parts (Cannon *et al*., 2007).

Methods and results

An examination of herbarium material (B, BO, E, K, L, SING; abbreviations follow Thiers *et al.*, continuously updated) and specimen images from numerous other herbaria available via the Begonia Resource Centre (Hughes *et al.*, 2015–), as well as newly available material collected in eastern and western North Sulawesi in 2018 and 2019, indicated that there are several new species from the area awaiting description. Here we present a synopsis for *Begonia* of the northern arm of Sulawesi, including an identification key (modified from Ardi *et al.*, 2014), proposed IUCN conservation categories, and photographs and descriptions of three new species.

A total of 22 species of *Begonia* are known from the northern arm of Sulawesi, of which 20 are indigenous and two are naturalised (**Table**). Nineteen species are classified in *Begonia* sect. *Petermannia*, including all three new species (*Begonia kinhoi* Ardi & D.C.Thomas, *B. pitopangii* D.C.Thomas & Ardi, *B. sojolensis* D.C.Thomas & Ardi), and one species (*B. aptera* Blume) is placed in *Begonia* sect. *Platycentrum*. Two introduced and naturalised species belong to *Begonia* sect. *Ephemera* (*B. cucullata* Willd., *B. hirtella* Link).

Newly available material allowed a reassessment of the morphological variability of several species that were originally described from very limited material. Revised descriptions, distribution maps, and photographs of *Begonia carnosa* (Teijsm. & Binn.) Teijsm. & Binn, *B. cuneatifolia* Irmsch., *B. gemella* Warb. ex L.B.Sm. & Wassh., *B. hispidissima* Zipp. ex Koord., *B. masarangensis* Irmsch., *B. rieckei* Warb. and *B. strachwitzii* Warb. ex Irmsch. are presented. Revised synonymies of *Begonia carnosa* and *B. rieckei* are also provided. The specimens in this paper are cited first by the biogeographical regions of the northern arm identified by Cannon *et al*. (2005), then by province for those specimens collected outside the northern arm. Other specimens are subsequently listed for other Indonesian islands or island groups, and finally for other countries.

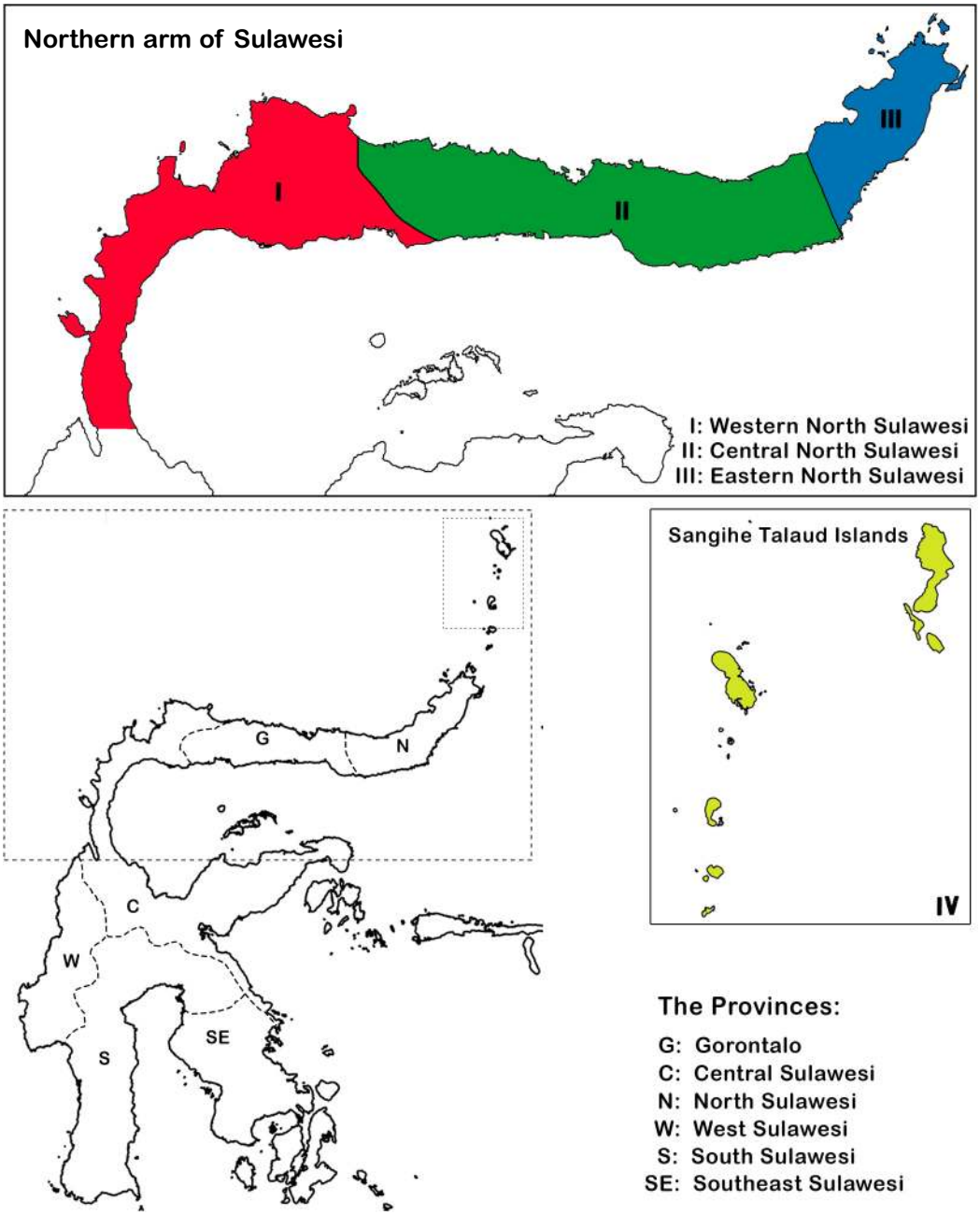

Figure 1. The biogeographical regions of the northern arm of Sulawesi and the Sangihe Talaud Islands.

Table. Recognised *Begonia* species of the northern arm of Sulawesi

Section	Species
Petermannia	*Begonia capituliformis* Irmsch.
	Begonia carnosa (Teijsm. & Binn.) Teijsm. & Binn.
	Begonia chiasmogyna M.Hughes
	Begonia cuneatifolia Irmsch.
	Begonia gambutensis Ardi & D.C.Thomas
	Begonia gemella Warb. ex L.B.Sm. & Wassh.
	Begonia hispidissima Zipp. ex Koord.
	Begonia insularum Irmsch.
	Begonia kinhoii Ardi & D.C.Thomas
	Begonia macintyreana M.Hughes
	Begonia masarangensis Irmsch.
	Begonia mendumiae M.Hughes.
	Begonia pitopangii D.C.Thomas & Ardi
	Begonia rieckei Warb.
	Begonia rolandfadlii Dayanti, Ramadanil & D.C.Thomas
	Begonia sidolensis Dayanti, Ramadanil & Ardi
	Begonia sojolensis D.C.Thomas & Ardi
	Begonia strachwitzii Warb. ex Irmsch.
	Begonia willemii Ardi, Girm. & D.C.Thomas
Platycentrum	*Begonia aptera* Blume
Ephemera	*Begonia cucullata* Willd.
	Begonia hirtella Link

Taxonomic treatment

Key to the Begonia *species of the northern arm of Sulawesi and the Sangihe Talaud Islands*

1a. Plants rhizomatous, creeping or decumbent _____ 2
1b. Plants erect _____ 6

2a. Plants rhizomatous _____ **13. *B. mendumiae***
2b. Plants creeping or decumbent, not rhizomatous _____ 3

3a. Petioles 0.5–2 cm long _____ **17. *B. sidolensis***
3b. Petioles 3–16 cm long _____ 4

4a. Adaxial leaf lamina with sparse indumentum of bristly hairs between the veins; female flower 2-tepalled _____ **20. *B. willemii***
4b. Adaxial leaf lamina glabrous; female flowers 5-tepalled _____ 5

5a. Petioles moderately hairy with white hairs; veins hairy on the abaxial leaf lamina surface; male flowers with 19–21 stamens _____ **3. *B. carnosa***
5b. Petioles glabrous except for very sparse indumentum on the joint of the petiole and lamina; abaxial surface of leaf lamina glabrous; male flowers with 75–77 stamens **7. *B. gemella***

6a. Male and female flowers occurring together in bisexual inflorescences and open at the same time _____ 7
6b. Female inflorescences or solitary flowers separated from the male inflorescences by at least one internode, protogynous _____ 10

7a. Male flowers with four tepals, anther connectives projecting at the apex _____ 8
7b. Male flowers with two tepals, anther connectives not projecting at the apex **15. *B. rieckei***

8a. Female flowers or fruit with persistent bracteoles; fruit dehiscent, a dry capsule, fruit wings well developed and unequal _____ 9
8b. Female flowers or fruit without persistent bracteoles; fruit indehiscent, fleshy, fruit wings poorly developed or sometimes wingless _____ **1. *B. aptera***

9a. Plant hairy, leaf lamina ovate, apex acuminate _____ **22. *B. hirtella***
9b. Plant glabrous, leaf lamina broadly ovate to suborbicular, leaf lamina apex rounded **21. *B. cucullata***

10a. Leaves elliptic, venation pinnate _____ 11
10b. Leaves ovate to elliptic or broadly ovate, venation palmate-pinnate _____ 14

11a. Female inflorescence peduncle < 1 cm long; female flower pedicels 3–7 mm long __ 12
11b. Female inflorescence peduncle > 1 cm and up to 2 cm long; female flower pedicels 8–12 mm long _____ **8. *B. hispidissima***

12a. Leaf lamina length-to-width ratio > 3:1, glabrous or sparsely hairy with bristly hairs between the veins, abaxially hairy on the veins only; female flower pedicel 3–4 mm long; ovary glabrous to glabrescent _____ 13
12b. Leaf lamina length-to-width ratio < 3:1, densely hairy on both surfaces, hairs sometimes branched; female flower pedicel c.7 mm long; ovary densely hairy **12. *B. masarangensis***

13a. Leaf lamina margin serrate or double serrate to shallowly lobed, leaf lamina adaxially with distinctly sunken primary and secondary veins; male flower tepals 5–6 × 6–7 mm, stamens 21–25 _____ **16. *B. rolandfadlii***
13b. Leaf lamina margin entire to serrulate in the distal third of the lamina, veins on adaxial lamina surface not sunken; the male flowers with larger tepals (10–13 × 10–11 mm) and more stamens (c.40) _____ **5. *B. cuneatifolia***

14a. Male inflorescences not subumbellate, showing dichasial or monochasial branching with at least the basal internodes > 1 mm long _____ 15
14b. Male inflorescences subumbellate, i.e. consisting of strongly condensed cymes with internodes < 1 mm long _____ **2. *B. capituliformis***

15a. Female flowers with 5 tepals _____ 16
15b. Female flowers with 4 tepals _____ **4. *B. chiasmogyna***

16a. Stem hairy _____ 17
16b. Stem glabrous _____ 20

17a. Stem densely hairy with bristle or pilose hairs (> 0.5 mm long); male inflorescence a thyrse with monochasially or dichasially branching partial inflorescences; male flower tepals 5–11.5 × 6–12 mm _____ 18
17b. Stem sparsely hairy with short bristle hairs (< 0.5 mm); male inflorescence a compound thyrse with multiple lateral branches, each with multiple cymose partial inflorescences; male flower tepals minute (4–5 × 4–5 mm), broadly ovate to suborbicular _____ **18. B. sojolensis**

18a. Plant covered with white hairs; male flower tepal margin entire, not ciliate; female flower tepals ovate; ovary glabrous _____ 19
18b. Plant covered with crimson hairs; male flower tepal margin ciliate; female flower tepals obovate; ovary hairy _____ **6. *B. gambutensis***

19a. Male inflorescence a thyrse composed of up to 4 lateral cymose partial inflorescences, each monochasially branching; female inflorescence or infructescence with short peduncle (1–2 mm long) _____ **14. B. pitopangii**
19b. Male inflorescence a thyrse composed of up to 6 lateral cymose partial inflorescences, each dichasially branching; female inflorescence with longer peduncle (5–10 mm long) **19. *B. strachwitzii***

20a. Infructescence peduncle 10–20 mm long _____ **11. *B. macintyreana***
20b. Infructescence peduncle < 5 mm long _____ 21

21a. Fruit pendulous on thin pedicel, fruit wings cuneate at base and truncate or subtruncate at the apex; seed-bearing part cylindrical _____ **10. B. kinhoi**
21b. Fruit pedicel deflexed, fruit wings rounded at base and truncate at the apex; seed-bearing part ellipsoid _____ **9. *B. insularum***

Species descriptions

1. **Begonia aptera** Blume [§ *Platycentrum*], Enum. Pl. Javae 1: 97 (1827). *Diploclinium apterum* (Blume) Miq., Fl. Ned. Ind. 1: 691 (1856). – Type: Indonesia, Sulawesi, Tondano, *s.coll.*, *s.n.* (lectotype L [Herb. Ludg. Bat. 898194-39], designated by Hughes [2008]).

Begonia cristata Warb. ex L.B.Sm. & Wassh., Phytologia 52: 442, pl. 2 (1983). – Type: Indonesia, Sulawesi, North Sulawesi, Minahasa, Tomohon, iv 1984, *K.F. & P.B. Sarasin* 288 (lectotype K [K000761122], designated by Smith & Wasshausen [1983]).

Begonia renifolia Imsch., Bot. Jahrb. Syst. 50: 379 (1913). – Type: Indonesia, Sulawesi, North Sulawesi, Minahasa, Bojong, *N. Wallich* 15188 (holotype B [B100238021]).

Begonia aptera subsp. *hirtissima* Girm. & D.C.Thomas, Reinwardtia 13(1): 72 (2009). – Type: Indonesia, Sulawesi, Southeast Sulawesi, Kolaka Regency, Ranteangin District, Tinukari Village, Mt Mekongga, 21 iii 2006, *D. Girmansyah* DEDEN654 (holotype BO; isotypes E [E00678415, E00678417], K, L, US).

Additional literature. Hughes (2008) [synonymy]; Tebbitt (2003) [as *Begonia cristata*, but emphasising likely conspecificity with *B. aptera*; drawing, distribution map]; Ardi *et al.* (2018) [synonymy, photographic plate, distribution map]; Hughes *et al.* (2018); Thomas & Ardi (2020) [photographic plate].

Distribution. Indonesia: Sulawesi (all provinces), Moluccas and western New Guinea (Yapen Island) (**Figure 2**).

Habitat. Primary to severely disturbed lowland to montane forests at 140–2000 m elevation.

Proposed IUCN conservation category. Least Concern (LC) (Ardi *et al.*, 2018).

Additional specimens examined. Indonesia. Sulawesi. **Northern arm of Sulawesi**. **Western North Sulawesi**: Bukit Dako, Lakatan Distr., Toli-toli, 25 ii 1985, *Ramlanto & Z. Fanani* 527 (BO, L); Mt Sojol, 25 ii 2000, *G.C.G. Argent* et al. 151 (E); Gunung Sidole, 26 xii 2018, *E. Damayanti* et al. ED11 (CEB); Sojol foothill, Balungkang village, 7 viii 2018, *W.H. Ardi* WI305 (BO, KRB, SING). **Central North Sulawesi**. Gorontalo: Olama River, 9 iii 2002, *M. Mendum* et al. 49 (A, E, L); Gunung Boliohutu, 23 iii 2002, *M. Mendum* et al. 186 (E). **Eastern North Sulawesi**. Manado: Tonsealama, 13 xii 1932, *C.A. Wisse* 78 (BO); Mt Klabat: 27 vi 1956, *L.L. Forman* 248 (K, L, P); 30 i 2019, *W.H. Ardi* WI387 (BO, KRB, SING); Kali Waterfall, 31 i 2019, *W.H. Ardi* WI392 (BO, KRB, SING). Minahassa: Bojong, 1888, *O. Warburg* 15187 (B [2]); Gunung Lokon, 4 vii 1956, *L.L. Forman* 371 (K, L); Mt Soputan: 11 x 1973, *E.F. de Vogel* 2503 (L); *S.H. Koorders* 16244B (L); *S.H. Koorders* 16245B (B, L); *S.H. Koorders* 16246B (B); Mt Manimporok, East of Mt Soputan, 8 ii 2009, *D. Girmansyah* DEDEN1103 (BO); G. Potong, 28 ii 2001, *P.J.A. Kessler* 2951 (L). Tomohon: 6 vi 1954, *A.H.G. Alston* 15679 (A, BM, L). G. Masarang: 22 vi 1956, *L.L. Forman* 207 (K); 20 ii 2008, *M. Ardiyani* et al. 104 (BO, E); 17 iii 2006, *S. Sunarti* SSS06-010 (BO); 17 iii 2006, *S. Sunarti* SSS06-022 (BO); 2 ii 2019, *W.H. Ardi* WI397 (BO, KRB, SING). Lokon: *S.H. Koorders* 12648B(BO); Kayawu Village, 17 ii 2009, *D. Girmansyah* DEDEN1269 (BO). G. Mahawu: Rurukan Village, 15 ii 2009, *D. Girmansyah* DEDEN1233 (BO); xii 2003, *Ambriansyah* AA2641 (WAN); Nr Pangi, 7 iii 1990, *J.S. Burley* et al. 3717 (K, L). Bolaang-Mongondow: Goeroepahi, 27 iii 1917, *Kauderns* 61 (L). Dumoga Bone

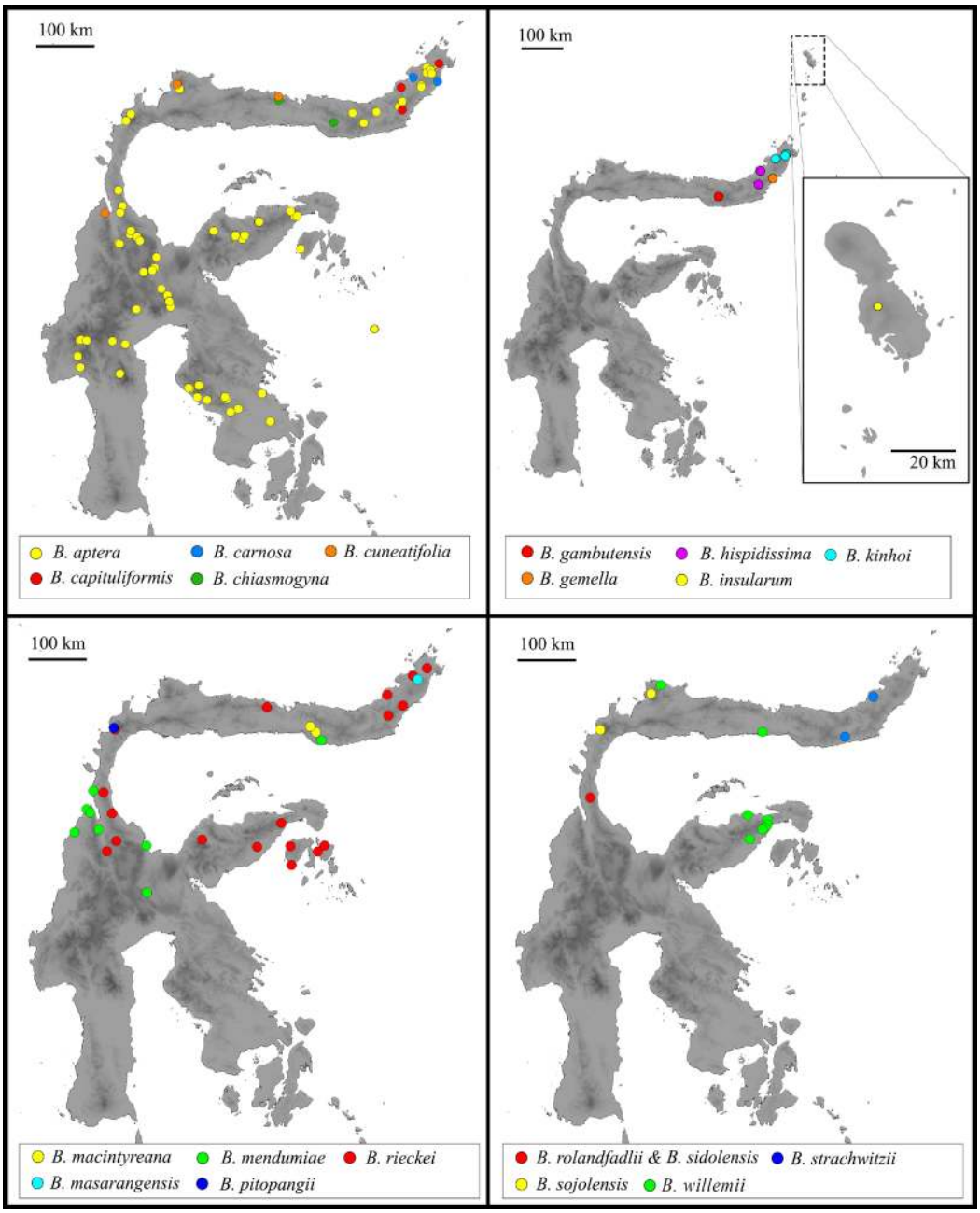

Figure 2. Distribution maps of *Begonia* species occurring on the northern arm of Sulawesi. Distribution points are from georeferenced collections from major herbarium collections (B, BO, E, K, KRB, L, SING), the Begonia Resource Centre (Hughes *et al.*, 2015–) and the Sulawesi Begonia Data Portal (Thomas *et al.*, 2013, continuously updated).

National Park: Gunung Mogogonipa: 6 iv 1985, *E.F. de Vogel & J.J. Vermeulen* 7020 (L); 6 i 1996, *M. Kato* et al. 382 (A); Bogani Nani Wartabone National Park, Mauk Malotong, 21 v 2002, *T. Uji* 4537 (BO); Paya-paya, Gunung Ambang Nature Reserve, 2 xi 2016, *Barber* et al. BAAK35 (BO, E).

Central Sulawesi Province: Todjamboe, 23 vi 1929, *G.K. Kjellberg* 1750 (B); Menado, Kampong Sidaoenta, 13 vii 1939, *S. Bloembergen* 4224 (BO); Palu-Parigi, 17 iv 1975, *W. Meijer* 9329 (BO, L); E of Tongoa, 24 ii 1981, *H. Johansson* et al. 58 (L); Tongoa, 25 ii 1981, *Johansson* 76 (K, L); Palolo, Kamarora, 15 iii 2001, *P.J.A. Kessler* 3025 (L); Takolekayu, 14 i 2008, *M. Ardiyani* et al. 152 (BO, E); Uwe lutu, C. Pangi Binangga, 20 vii 2018, *W.H. Ardi* WI214 (BO, KRB, SING); Saluopa waterfall, 31 vii 2018, *W.H. Ardi* WI254 (BO, KRB, SING); Pendolo, 2 viii 2018, *W.H. Ardi* WI283 (BO, KRB, SING); Gunung Mad, Pegunungan Biru, Poso-Napu Road Divided, 3 viii 2018, *W.H. Ardi* WI293 (BO, KRB, SING); Lonsi Waterfall, Taloyon, Pagimana, 14 ii 2019, *W.H. Ardi* WI426 (BO, KRB, SING). Lore Lindu National Park: Menado, G. Ngilalaki, 11 vii 1939, *S. Bloembergen* 4125 (L); Ponoh, 3 km NE of Toro Village, 6 xii 2007, *D. Cicuzza* 464 (E); Tambing Lake vicinity, 4 viii 2018, *W.H. Ardi* WI303 (BO, KRB, SING). Mt Nokilalaki: 6 iii 2008, *D. Cicuzza* 794 (E); M. shelter 1, 24 vii 2018, *W.H. Ardi* WI217 (BO, KRB, SING); track to shelter 2, 24 vii 2018, *W.H. Ardi* WI218 (BO, KRB, SING). Luwuk: Laumarang Waterfall, 9 ii 2019, *W.H. Ardi* WI414 (BO, KRB, SING); Batu Tikar Waterfall, 9 ii 2019, *W.H. Ardi* WI417 (BO, KRB, SING); Mt Loloa–Mt Beabis, 27 ix 1938, *P.J. Eyma* 3839 (BO, L); Hanga-hanga waterfall, 8 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-22 (BO, E). Bunta: Sumber Agung, Gunung Hek, 25 ii 2004, *Hendrian* et al. 884 (E); G. Hek, 9 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-27 (BO, E); Sumber Agung village, Mt Hek, 10 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-31 (BO, E); Mt Hek, 10 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-36 (BO, E). M. Katopas. Wotusongu Village: 6 v 2008, *D.C. Thomas & W.H. Ardi* DCT08-66 (BO, E); 11 v 2008, *D.C. Thomas & W.H. Ardi* DCT08-73 (BO, E). Mt Lumut: 10 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-54 (BO, E); 21 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-55 (BO, E); 21 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-57 (BO, E); 23 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-59 (BO, E). Banggai Islands: KM 13, Potongan Panjang, Tinakung Selatan, 18 ix 2014, *D. Girmansyah* DEDEN2039 (BO); Nandik, Tinakung Utara, 23 ix 2014, *D. Girmansyah* DEDEN2081 (BO); Road to Lumbi-lumbia waterfall, South Bulagi, 20 ix 2014, *D. Girmansyah* DEDEN2602 (BO). Sopu Valley: 24 iii 1979, *E. Hennipman* 5588 (A, BO, K, L); 2 v 1979, *E.F de Vogel* 5174 (L); 26 v 1979, *E. Hennipman* 5633 (BO, K, L). Road to Kulawi: 29 vii 2018, *W.H. Ardi* WI239 (BO, KRB, SING); 29 vii 2018, *W.H. Ardi* WI246 (BO, KRB, SING). Tentena-Bada Road: 1 viii 2018, *W.H. Ardi* WI267 (BO, KRB, SING); 1 viii 2018, *W.H. Ardi* WI273 (BO, KRB, SING). **West Sulawesi Province**: Stream about 60 km from Mamasa to Polewali road, 3 viii 1998, *W.S. Hoover & H. Wiriadinata* 889 (BO). Mamasa: Mamasa-Tabang, Polewali, 21 vi 1974, *Shuji Yoshida* 1236 (BO); Tabang, Tanduk Kalua Village, 21 xi 2019, *W.H. Ardi* et al. WI505 (BO, CEB, SING); Pesapa Kurrak Village, 23 xi 2019, *W.H. Ardi* et al. WI543 (BO, CEB, SING); Seppang Village, 24 xi 2019, *W. H. Ardi* et al. WI561 (BO); Tawalian Timur, 26 xi 2019, *W.H. Ardi* WI594 (BO, CEB, SING); Sumarorong, Sarambu Liawan, 27 xi 2019, *W.H. Ardi* et al. WI608 (BO, CEB, SING). G. Gandang Dewata. Tetean Waterfall: 21 iv 2016, *Kartonegoro* et al. ARK929; 21 iv 2016, *Kartonegoro* et al. ARK939 (BO). G. Mambulinin: 11 v 2009, *D.C. Thomas & W.H. Ardi* DCT09-126 (BO, E); Sulawesi Barat, 13 v 2009, *D.C.Thomas & W.H. Ardi* DCT09-130 (BO, E). **South Sulawesi Province**: Pasoei, 9 vi 1929, *G.K. Kjellberg* 1627 (B); Maboesa-Sae, 21 iii 1937, *P.J. Eyma* 1188 (BO); Masamba, 4 viii 1937, *P.J. Eyma* 1550 (BO); Masamba, 4 viii 1937, *P.J. Eyma* 1551 (BO); Faruhumpenai, Toromu village, Luwu Regency, 16 ii 1986, *Wardi* 004 (BO); Pantawanan, Eran Batu, Baraka district, 29 viii 1994, *D. Girmansyah* DEDEN014 (BO); Mt Pasaparan, Mts Latimojong, 27 x 1994, *Tahan Uji & M. Amir* 2506 (BO); stream about 25 km from Palopo to Rantepao Road, 3 xii 1998, *W.S. Hoover & H. Wiriadinata* 892

(BO); Road between Wotu and Lake Poso, 20 ii 2000, *G. Argent* et al. 116 (E); Buntu Area, Kpg Lokkok, 15 ix 2003, *J.J. Vermeulen* 2300 (L). Rantemario: 5 iii 2000, *G.C.G. Argent* et al. 238 (E); 7 xi 1993, *S. Kofman* 210 (L); 27 iv 2009, *D.C. Thomas & W.H. Ardi* DCT09-95 (BO, E); 27 iv 2009, *D.C. Thomas & W.H. Ardi* DCT09-99 (BO, E). Mangkutana-Pendolo: 3 ii 2004, *J.J. Vermeulen* 2524 (L); 3 v 2009, *D.C. Thomas & W.H. Ardi* DCT09-109 (BO, E); 3 v 2009, *D.C. Thomas & W.H. Ardi* DCT09-118 (BO, E); 3 v 2009, *D.C. Thomas & W.H. Ardi* DCT09-119 (BO, E). Tana Toraja. Rantepoa-palopo: 2 ii 2004, *J.J. Vermeulen* 2409 (L); 30 iv 2009, *D.C. Thomas & W.H. Ardi* DCT09-103 (BO, E). **Southeast Sulawesi Province**: Kendari-Kolaka, 23 v 2008, *A.R. Kartonegoro* ARK253 (BO); Mt Lasumowo, Mowewe District, 24 v 2008, *D. Girmansyah* DEDEN1037 (BO, K); Wawatobi-Lasolo road divide, 12 ii 2017, *W.H. Ardi* WI151 (BO, KRB, SING). North Kolaka: 17 iii 2006, *H. Wiriadinata* et al. 12976 (BO); along logging road between km 14 and km 17, 17 iii 2006, *H. Wiriadinata* et al., DEDEN573 (BO); along logging road between km 17 and pos 4, 18 iii 2006, *H. Wiriadinata* et al., DEDEN575 (BO). Rante Angin: Tinukari Village, 20 xii 2009, *E.A. Widjaja & A. Suyadi* EAW919 (BO); 7 viii 2009, *A. Hidayat* et al. 4186 (BO); 10 viii 2009, *A. Hidayat* et al. 4285 (BO); 3 viii 2009, *D. Potter* et al. 090803-15 (BO); 29 vi 2010, *E.A. Widjaja & A. Suyadi* EAW9058 (BO); 30 vi 2011, *E.A. Widjaja* et al. EAW9721 (BO). M. Watuwila: 25 iii 1929, *G.K. Kjellberg* 1032 (BO); Mt Pondunaa, 12 v 2008, *A.R. Kartonegoro* ARK 231 (BO); Mt Sophura, 12 v 2008, *D. Girmansyah* DEDEN859 (BO, K); Mt Pondunaah, 13 v 2008, *D. Girmansyah* DEDEN880 (BO, K). Kolaka: Kec. Uluiwoi, Ds. Ahiluhu, Marmer Cave, 17 iii 2006, *H. Wiriadinata* et al., DEDEN746 (BO); Bite forest, Lalingato, Tirawuta Subdistrict: 17 vii 2008; *A. Hidayat* AH 3677 (BO, K); 17 vii 2008, *A. Hidayat* AH 3678 (BO, K). **Province unknown**: iv 1894, K.F. *& P.B. Sarasin* 488 (B [2]); 16 vi 1894, *K.F. & P.B. Sarasin* 488 (B [2]); *unknown* 1721 (L); *Forst s.n* (BO); Todjambor, 21 iii 1929, *G. Kjellberg* 1701 (BO).

2. **Begonia capituliformis** Irmsch. [§ *Petermannia*], Bot. Jahrb. Syst. 50: 354 (1913). – Type: Indonesia, Sulawesi, Minahasa, Bojong, *O. Warburg* 15190 (holotype B [B100238013], isotype B [B100238014]).

Distribution. Indonesia: endemic to Sulawesi, North Sulawesi province (eastern North biogeographical region), Gunung Ambang, Gunung Lolombulan and Gunung Klabat (see Figure 2).

Habitat. Growing terrestrially in hill and upland forests at 600–900 m elevation.

Proposed IUCN conservation category. Endangered (EN), B1ab(iii)+B2ab(iii). This species is known from only a few collections from secondary forest at the periphery of the Gunung Ambang Nature Reserve, Gunung Lolombulan and Gunung Klabat. The collection localities are in forest patches close to human habitation and surrounded by land used for agricultural purposes (e.g. clove plantations) and other severely disturbed forest vegetation. Exploration of various hill forest localities on Gunung Klabat has not resulted in any additional collections, and therefore we must assume, until more extensive collection efforts reveal otherwise, that this species has a very restricted range. Because of its small extent of occurrence (EOO) (1344 km^2) and area of occupancy (AOO) (12 km^2), in combination with observed disturbance and loss of forest habitat at the border of the Gunung Lolombulan and Gunung Ambang Nature Reserve, we assess this species as Endangered (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Eastern North Sulawesi**: Mount Lolombulan, Above Boyong atas, 24 ii 2008, *J. Kinho & A.D. Poulsen* 169 (BO, E); Gunung Ambang, 22 ii 2008, *M. Ardiyani, A.D. Poulsen & Ale* 107 (BO, E); N.E. Celebes, 29 vi 1956, *L.L. Forman* 314 (K); Wiau Complex, G. Klabat, 30 vi 1956, *L.L. Forman* 344a,b (K).

Begonia capituliformis is endemic to the northern arm of Sulawesi. The species is characterised by a dense and strongly compressed subumbellate male inflorescence. This is a unique character among all member of Sulawesi *Begonia* sect. *Petermannia* but has some similarity to the inflorescence architecture of *B. johntania* Ardi & D.C.Thomas from North Konawe, Southeast Sulawesi, which is also in *Begonia* sect. *Petermannia*. However, the axis of the male inflorescence of the latter species is less compressed, the pedicels of the female flower are substantially longer, and the fruit are pendulous (Ardi *et al.*, 2018).

3. Begonia carnosa (Teijsm. & Binn.) Teijsm. & Binn. [§ *Petermannia*], Epim. Ludg. Bat. 4 (1863). *Diploclinium carnosum* Teijsm. & Binn., Tijdschr. Ned.-Indië 25: 420 (1863). – Type: Indonesia, Sulawesi, Minahasa, Kapetaran, *Teijsmann s.n.* (lectotype K, designated here). **Figure 3.**

Begonia heteroclinis Miq. ex J.J.Sm., Meded. Lands Plantentuin 19: 484 (1898); Koorders, Natuurw. Tijdschr. Ned.-Indië (1904). – Type: Indonesia, Sulawesi, *de Vriese & Teijsmann s.n.* (lectotype L [L070107], designated here), **syn. nov.**

Perennial, monoecious herb with creeping stems, rooting at the nodes when in contact with the substrate, up to c.20 cm tall, sparsely hairy with white hairs up to c.1 mm long. *Stem* creeping, internodes 0.5–2 cm long, greenish or reddish. *Leaves* basifixed, alternate; *stipules* persistent, 5–6 × 3–5 mm, ovate, with an abaxially slightly prominent midrib projecting up to 3 mm at the apex, margin recurved in mature stipules, pinkish, glabrous; *petioles* 4.5–16 cm long, terrete, reddish, moderately hairy with white hairs up to 2 mm long; *lamina* 6.5–12 × 5–9 cm, asymmetrical, ovate to suborbicular, base cordate and lobes sometimes slightly overlapping, apex acuminate, margin entire to broadly dentate or sometimes shallowly lobed (up to 20% of leaf width), adaxial surface light green, glabrous, abaxial surface pale green, hairy on the veins, primary veins 6–8, actinodromous, secondary veins craspedodromous. *Inflorescences*: axillary, protogynous; *female inflorescences* 1- or 2-flowered, basal to male inflorescences, peduncles 1–5 cm long, pale green-reddish, glabrous, bracts persistent, ovate, 3–5 × 2–4 mm, pale green, translucent, glabrous; *male inflorescences* racemose-cymose (a thyrse), composed of up to 3 cymose partial inflorescences, branching dichasially or dichasially at the base and monochasially in distal part, each with 5–8 flowers, peduncles of partial inflorescences 2.5–7 cm long, pink-reddish, glabrous; bracts persistent, up to c.3 × 2 mm, ovate, pale green or creamy at base and reddish at the apex, midrib slightly prominent, apiculate. *Male flowers*: *pedicels* 13–16 mm long, white, glabrous; *tepals* 2, white, 7–12 × 9–14 mm, broadly ovate, base slightly cordate, margin entire, apex rounded; *androecium* of 19–21 stamens, yellow, filaments up to c.1.5 mm long, fused at the base

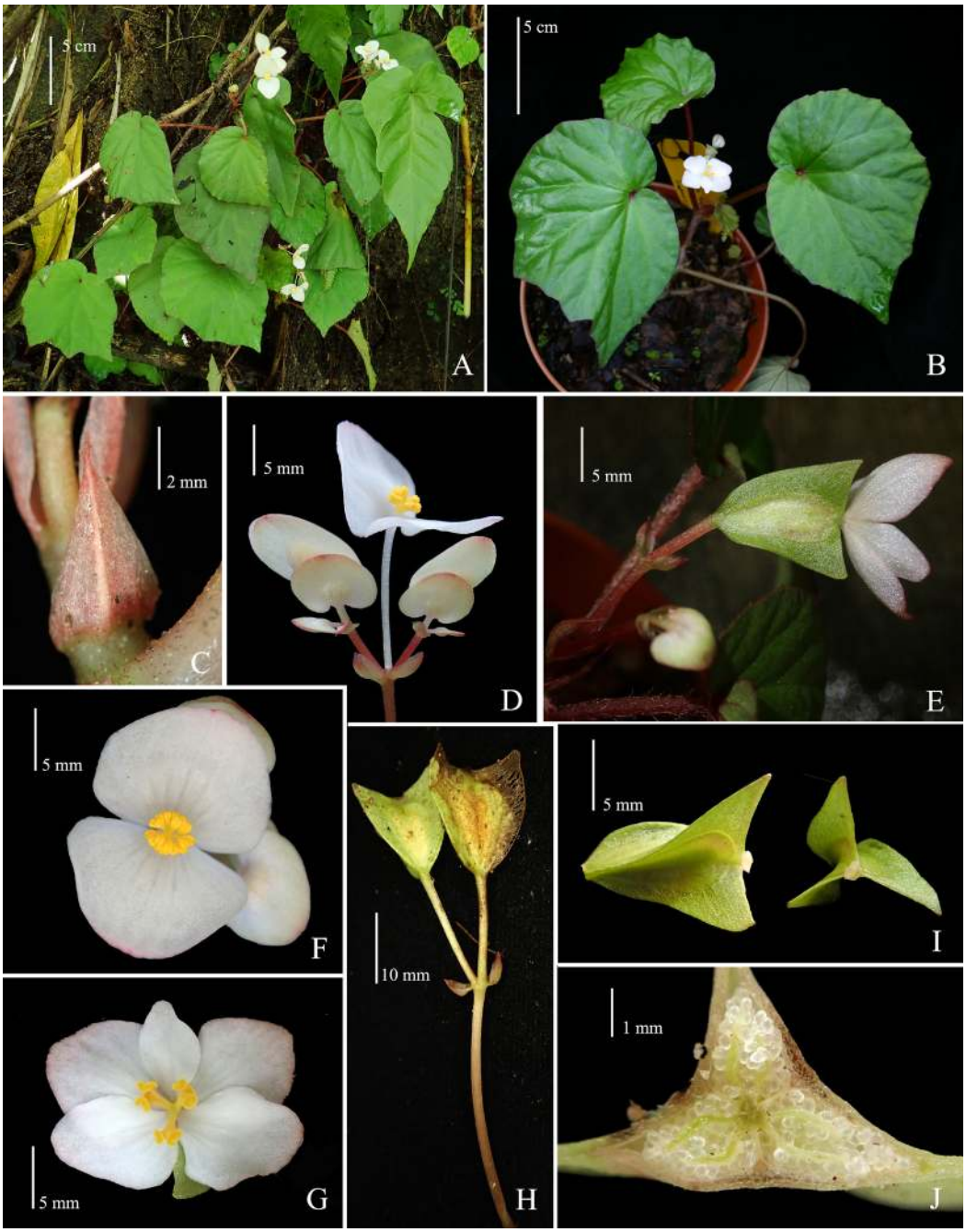

Figure 3. *Begonia carnosa*. A, Habit *in situ*; B, habit in cultivation; C, stipule; D, male inflorescence; E, female inflorescence; F, male flower (front view); G, female flower (front view); H, infructescence; I, fruit; J, ovary (cross-section of middle part). A–J from *W.H. Ardi* WI405. Photographs: W. H. Ardi.

for c.1 mm, anthers up to 1 mm long, obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* 3–10 mm long, reddish, glabrous; *tepals* 5, unequal, white, four larger 10–12 × 8–10 mm, ovate to broadly ovate, margin entire, apex rounded, one smaller, 8–10 × 4–6 mm, elliptic, margin entire, apex rounded; *ovary* (without wings) 7–9 × 4–5 mm, ellipsoid to narrowly obovoid, sometimes contorted, pale green, wings 3, subequal, base rounded, apex truncate, up to 6 mm long at the widest point (apically); *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. *Fruits*: *peduncle* 1–5 cm long; *pedicels* 3–15 mm long; *seed-bearing part* 7–11 × 4–6 mm (excluding the wings), ovoid, sometimes slightly twisted, glabrescent, dehiscent, splitting along the wing attachment, wings subequal, base rounded, apex truncate, up to 8 mm long at the widest point (apically). *Seeds* barrel-shaped, c.0.3 mm long.

Distribution. Indonesia: endemic to Sulawesi, North Sulawesi Province (eastern North biogeographical region), Kapetaran (Kapataran), Minahasa (see **Figure 2**).

Habitat. Lowland forest but also in village gardens, terrestrial in soil, in full shade, at c.5 m elevation.

Proposed IUCN conservation category. Critically Endangered (CR), B1ab(iii)+B2ab(iii). This species is known from only two collections, namely the type specimen from Kapetaran (Kapataran), Minahasa, and the recently collected specimens from Tumpaan, South Minahasa, neither of which is from a legally protected area. The recent collection and further observations were made in a residential area in the Tumpaan district, which shows significant anthropogenic disturbance. Most lowland forest both in the Tumpaan district and in Kapetaran is in very poor condition or has been converted for agricultural use. Because of its very restricted known distribution and associated small EOO and AOO, and the observed and ongoing habitat disturbances and habitat loss in Kapetaran and Tumpaan, we assess this species as Critically Endangered (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimen examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Eastern North Sulawesi**: Minahasa, Tumpaan District, 4 ii 2019, *W.H. Ardi* WI405 (BO, KRB, SING).

According to Teijsmann & Binnendijck (1863), *Begonia carnosa* was discovered in Kapetaran, Minahasa, Sulawesi. It can be recognised by a character combination including a recurved stipule margin; a reddish petiole, which is sparsely hairy with white, long, pilose hairs; ovate to suborbicular leaf laminas with dentate to broadly dentate or shallowly scalloped margin; a pseudoterminal male inflorescence, which has cymosely branching and subumbellate partial inflorescences; and female inflorescences or fruit with persistent bracts.

Despite the rather generic, relatively short, and incomplete description, which is missing several important characters such as the number of female flowers or fruits, the protologue is consistent with the morphology of a specimen that has been identified as *Begonia carnosa*

but has a different locality (Ternate, which Teijsmann and Binnendijck visited in March 1860 before traveling to North Sulawesi) indicated on the label (*Teijsmann s.n.*, K). This specimen is the only material found in major herbarium collections that could potentially represent original material. It seems to be consistent with the recently collected material from Minahassa (WI405), and it is likely that the mismatch between the locality indicated in the protologue and the specimen label was the result of an error during specimen labelling. Therefore, we designate *Teijsmann s.n.* (K) as the lectotype of *Begonia carnosa*.

The name *Begonia heteroclinis* was ascribed to Miquel and the species was described in a publication by Koorders (1898: 484) explicitly stating that the description was written by J.J. Smith. Koorders (1898) mentions living material of this species cultivated at Bogor Botanic Gardens as well as original material by Miquel in the Herb. Hort. Bogor, but without providing any collector information. Corresponding herbarium voucher could not be located in the Herbarium Bogoriense (BO), however, and the only currently available potentially original material is *Teijsmann & de Vriese s.n.* (L0701077), a specimen in the Leiden herbarium labelled "*Begonia heteroclinis*" in Miquel's handwriting. The specimen corresponds with the protologue, because it has a creeping stem with moderately long internodes, long petioles, ovate to suborbicular leaves, and female inflorescences or infructescences with two flowers or fruits. The specimen was collected when Teijsmann and de Vriese explored the Moluccas and Sulawesi. Therefore, we designate *Teijsmann & de Vriese s.n.* (L [L0701077]) here as the lectotype of *Begonia heteroclinis*.

Based on the newly available material from recent expeditions, including both herbarium specimens and cultivated plants in the living collections of the Bogor Botanic Gardens, a detailed description of the species could be completed and compared with the two original descriptions as well as with the illustrations in Koorders' *Flora van Celebes* (Koorders, 1898: 97). There are clearly strong similarities in crucial generative characters, such as male and female inflorescence architecture and fruit morphology, and also in some additional vegetative characters, such as the creeping stems with relatively long internodes (relatively rare character in *Begonia* sect. *Petermannia*) as well as the petiole length and leaf shape. Based on these observations, we propose to reduce *Begonia heteroclinis* to a synonym of *B. carnosa*.

4. Begonia chiasmogyna M.Hughes [§ *Petermannia*], Edinburgh J. Bot. 63: 193 (2006). – Type: Indonesia, Sulawesi, Gorontalo, Gunung Boliohutu, 23 iv 2002, *M. Mendum* et al. 167 (holotype E [E00163227]).

Distribution. Indonesia: endemic to Sulawesi, North Sulawesi and Gorontalo Provinces (see Figure 2).

Habitat. Stream embankment at 800 m elevation, in full shade.

Proposed IUCN conservation category. Data Deficient (DD). This species is known from three localities: Bogani Nani Wartabone National Park, Gunung Boliohutu, and Gunung Poniki.

Although the result of GeoCAT analysis recommend an Endangered status based on the EOO (1064 km^2) and AOO (12 km^2), the forests in the wider area of the three mountains is very poorly collected, and the species will probably also occur deeper in the forested areas. Because more detailed field observations of habitat conditions, population sizes and local abundance at the collection sites are lacking, we currently assess this species as Data Deficient (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Central North Sulawesi**: Gorontalo, Gunung Boliohutu, 9 iv 2002, *M. Mendum* et al. 46 (E, K, L); Gunung Boliohutu, 22 iv 2002, *M. Mendum* et al. 146 (E). **Eastern North Sulawesi**: Bolaang Mongondow, Dumoga-Bone National Park, Edward Camp, 28 iii 1985, *de Vogel & Vermeulen* 6790 (E); Bolaang Mongondow, Gunung Poniki, 30 x 2016, *S. Barber* et al. BAAK13 (BO, E).

Begonia chiasmogyna is similar to *B. gambutensis* Ardi & D.C.Thomas in terms of the dense indumentum on the vegetative parts and the cymose male inflorescence. In other characters, however, the two species are distinct. *Begonia chiasmogyna* can be easily differentiated from *B. gambutensis* by the colour of the indumentum, because the former species has a white indumentum (not red crimson). Other differentiating characters include the number and shape of the tepals of the female flowers: *Begonia chiasmogyna* has four obtrullate tepals, whereas *B. gambutensis* has five obovate tepals (Ardi *et al.*, 2014).

5. **Begonia cuneatifolia** Irmsch. [§ *Petermannia*], Bot. Jahrb. Syst. 50: 370 (1913). – Type: Indonesia, Sulawesi, Minahasa, Tomohon, 19 iv 1894, *K.F. & P.B. Sarasin* 494 (holotype B [B10238206], isotype K [K000761121]). **Figure 4**.

Perennial, small monoecious herb, erect, up to c.35 cm tall. *Stem* mostly branched in the basal part; internodes 2.5–7 cm long, slightly swollen at the nodes, brownish-reddish, sparse to moderately densely covered with strigose hairs. *Leaves* basifixed, alternate; *stipules* caducous, c.5.5–10 × 2 mm, elliptic, with an abaxially slightly prominent midrib, apex narrowed into bristle projecting up to 1 mm, margin entire, creamy, translucent, abaxially sparsely hairy; *petioles* 0.5–2.5 cm long, terete, concolorous with the stem, moderately to densely covered with strigose hairs; *lamina* 7–12 × 1.5–3 cm, asymmetrical, elliptic, base strongly oblique, lobes not or just slightly overlapping, apex acuminate, margin entire or serrulate in the distal two-thirds of the lamina, adaxial surface green, with reddish veins and margin, glabrous, abaxial surface maroon, hairy on the veins only; *venation* pinnate, secondary veins craspedodromous. *Inflorescences* protogynous, female inflorescences basal to male or solitary; *female inflorescences* 1- or 2-flowered, or frequently a male flower developed between the two female flowers (a dichasium), peduncles 1–2 mm long, green reddish, hairy; *male inflorescences* racemose-cymose (a thyrse), with up to 7 partial inflorescences, branching dichasially (the basal partial inflorescences), dichasially-monochasially, or monochasially (the distal partial inflorescences), with up to 8 flowers, peduncle of partial inflorescence 1.5–3 mm long, bracts stipule-like, c.7 × 2.5 mm, elliptic,

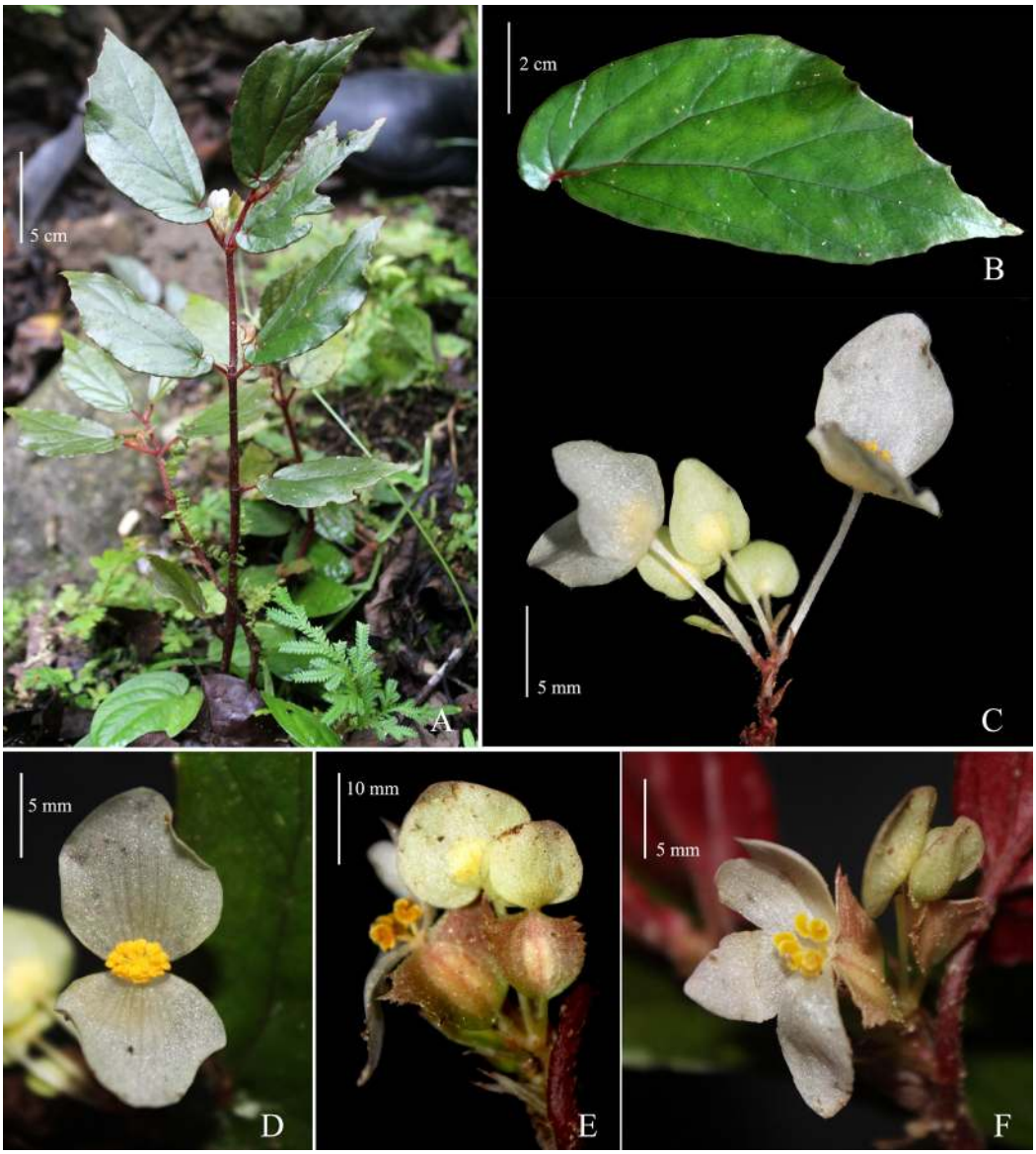

Figure 4. *Begonia cuneatifolia*. A, Habit; B, lamina; C, male inflorescence; D, male flower (front view); E, female inflorescence; F, female flower (front view). A–F from *Zulfadly* ZF43. Photographs: Zulfadly.

pale green, translucent, midrib slightly prominent, glabrescent, apex narrowed into bristle projecting up to 1 mm, caducous. *Male flowers*: *pedicels* 8–15 mm long, white-greenish or white-pinkish, sparsely hairy; *tepals* 2, white, 10–13 × 10–11 mm, ovate to elliptic, base slightly cordate and truncate when the flowers open, apex rounded, outer surface sparsely

hairy in the basal part; *androecium* of c.40 stamens, yellow, filaments c.0.5–1 mm long, slightly fused at the very base, anthers up to c.1 mm long, oblong to narrowly obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* 3–4 mm long, green-reddish, sparsely hairy; *tepals* 5, white, subequal, 8–10 × 4–6 mm, elliptic, outer surface glabrous; *ovary* (excluding wings) 7–9 × 3–5 mm, ellipsoid, pale green-reddish, glabrous, locules 3, placentation axile, placentae bilamellate, wings 3, equal, reddish, rounded to slightly cuneate at the base, truncate at the apex or sometimes rounded, wing margin entire to serrulate, up to 5 mm at the widest point (apically or subapically); *style* c.3.5 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruits*: *peduncles* c.5 mm long; *pedicels* 3–4.5 mm long; *seed-bearing part* ellipsoid, 11–13 × 4.5–6.5 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). *Seeds* barrel-shaped, c.0.2 mm long.

Distribution. Indonesia: endemic to Sulawesi, Central, North and Gorontalo Provinces, Toli-toli, Sigi (Gunung Gawalise) (see Figure 2).

Habitat. Disturbed lowland to upland forest at 300–1300 m elevation.

Proposed IUCN conservation category. Endangered (EN), B2ab(iii). This species' distribution includes lowland forest habitats on the northern arm of Sulawesi (Toli-toli and Tomohon) and also upland forest on Gunung Gawalise. Recently, small populations of *Begonia cuneatifolia* were observed in the unprotected area of Gunung Gawalise and the Malangga waterfall (Toli-toli). The species is known from only a few collections, and most collection localities were secondary forests in close proximity to settlements and agricultural land and showed signs of severe anthropogenic disturbance. Given the patchy and relatively small distribution (EOO, 21381 km^2; AOO, 12 km^2) and the poor state and pressures of lowland rain forest habitats on Sulawesi (Cannon *et al.*, 2007), an Endangered status is appropriate (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Central North Sulawesi**: Gorontalo, Gunung Boliohutu, 24 iv 2002, *M. Mendum* et al. 189 (E, K). **Eastern North Sulawesi**: Minahasa, Roeroekan, 1933, *C.A. Wisse s.n* (WAG).

Central Sulawesi Province: Tolitoli regency, Malangga district, 18 i 2019, *Zulfadly* ZF43 (BO); Gunung Gawalise, Donggala, 4 x 2020, *M. Fajri Ramadhan* 1724 (CEB).

Begonia cuneatifolia is a distinctive species among the members of *Begonia* sect. *Petermannia* in Sulawesi. It can be easily recognised by its short petiole, long and narrow leaves with pinnate venation, and short male and female inflorescence peduncles. At first sight, it is vegetatively similar to many species from Borneo, such as *Begonia bruneiana* Sands, *B. jugamensis* S.Julia & Kiew, *B. labiensis* (Sands) S.Julia and *B. lambirensis* Kiew

& S.Julia, but it can be easily distinguished by its terminal inflorescence, in contrast to the axillary inflorescences of those Bornean species.

6. **Begonia gambutensis** Ardi & D.C.Thomas [§ *Petermannia*], Edinburgh J. Bot. 71: 260 (2014). – Type: Indonesia, Cultivated in Bali Botanic Garden from vegetative material collected in the wild (Sulawesi, Gorontalo, Bone Bolango district, Suwawa Timur subdistrict, Gunung Gambuta, Desa Pinogu, side of river), 3 ix 2013, *Thomas D.C. & Ardi W.H.* 13-802 (holotype BO; isotypes E, L).

Distribution. Indonesia: endemic to Sulawesi, Gorontalo Province (central North biogeographical region), Gunung Gambuta (see Figure 2).

Habitat. Primary rain forest, forest floor at the side of a river, at c.700 m elevation.

Proposed IUCN conservation category. Data Deficient (DD). This species is known from only a single locality, in the Bogani Nani Wartabone National Park. The forests in the wider area are very poorly collected. Consequently, we assess this species as Data Deficient (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Central North Sulawesi**: Gunung Gambuta (cultivated at Bali Botanic Garden from material collected in the wild), 4 iv 2009, *D.C. Thomas & W.H. Ardi* 09-53 (BO, E); Dumoga Bone National Park, Gorontalo, 14 viii 1991, *W. Milliken* 364 (K); Dumoga Bone National Park, Bolaang Mongondow, 30 ix 1991, *W. Milliken* 1137 (E, K).

Begonia gambutensis is a very distinct species. It can be easily differentiated from other Sulawesi species by the dense crimson hairs on vegetative parts, male inflorescences showing basal dichasial branching with well-developed internodes and distal monochasial branching, and female flowers with obovate tepals distinctly tapering towards the base (Ardi *et al.*, 2014).

7. **Begonia gemella** Warb. ex L.B.Sm & Wassh. [§ *Petermannia*], Phytologia 52: 443 (1983). – Type: Indonesia, Sulawesi, Minahasa, *Koorders, S.H.* 16243B (lectotype K [K000761119], designated by Smith & Wasshausen [1983: 443]; isolectotype B [B100217767]). *Begonia gemella* Warb. ex Koord., Natuurw. Tijdschr. Ned.-Indië 63: 91 (1904), nom. nud. Figure 5.

Perennial, monoecious herb, creeping up to c.1 m long. *Stem* creeping, internodes 1.5–4 cm long, brownish-greenish, glabrous except for microscopical glandular hairs. *Leaves* basifixed, alternate; *stipules* persistent, 5–8 × 4–5 mm, isophyllus, ovate, with an abaxially slightly prominent midrib, apex narrowed into a bristle projecting up to 1 mm, margin entire, white-pinkish, translucent, abaxially glabrous; *petioles* 7.5–11 cm long, terete, concolorous with the stem, glabrous except for microscopic glandular hairs and very sparse pilose hairs on the joint of the petiole and lamina; *lamina* 5–9.5 × 4.5–8 cm, asymmetrical, broadly ovate to suborbicular, base cordate and lobes sometimes slightly overlapping, apex acuminate, margin denticulate to shallowly lobed, adaxial surface green, with red line along the margin, glabrous, abaxial surface pale green, glabrous; *venation* palmate-pinnate, primary veins 6–8,

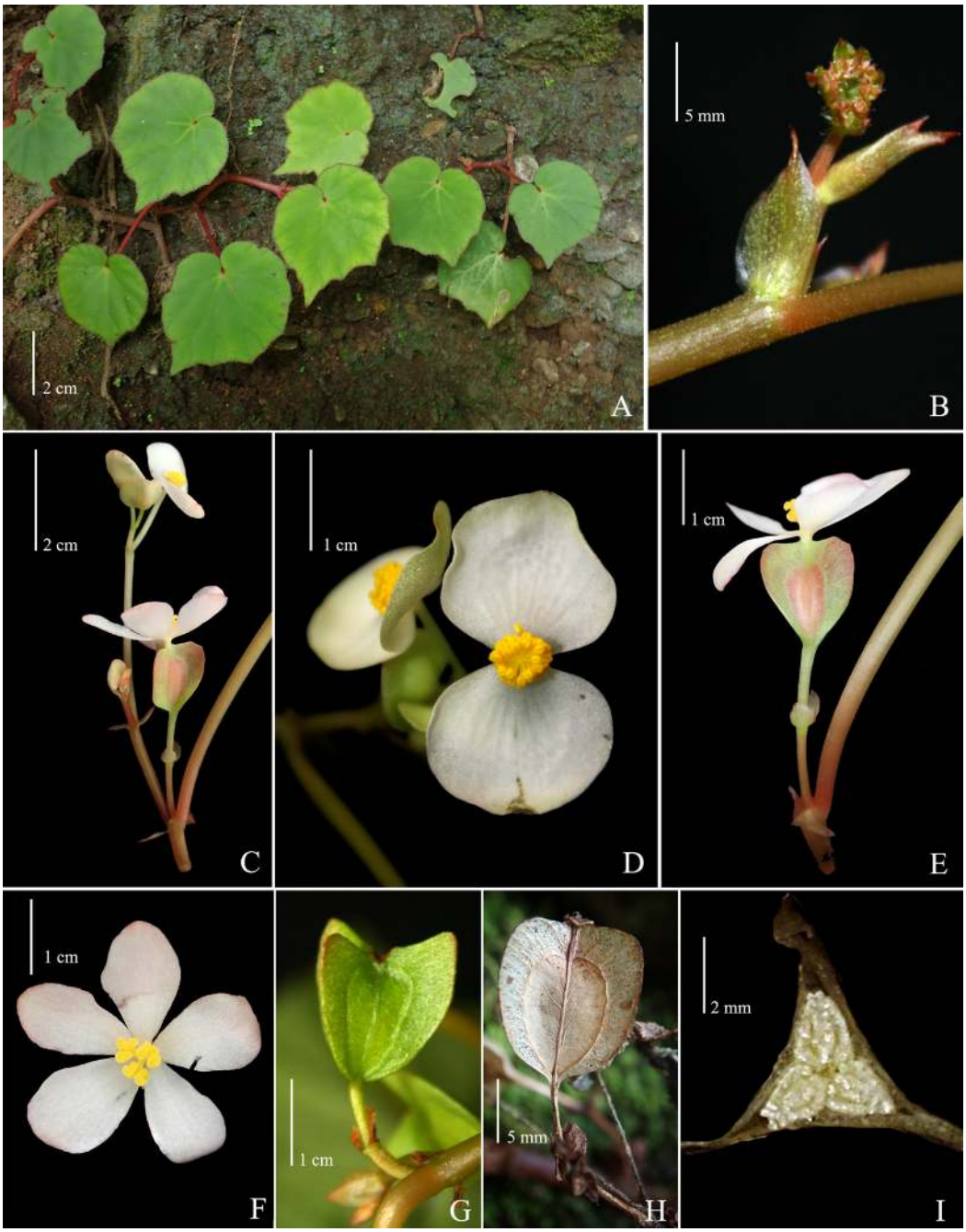

Figure 5. *Begonia gemella*. A, Habit; B, stipule; C, male and female inflorescence; D, male flower (front view); E, female flower (side view); F, female flower (front view); G, fruit; H, fruit, dry capsule; I, ovary (cross-section of middle part). A–I from *W.H. Ardi* WI403. Photographs: W. H. Ardi.

actinodromous, secondary veins craspedodromous. *Inflorescences* protogynous; *female inflorescences* basal to male, single-flowered, peduncles 7–11 mm long, green-reddish, glabrous, bracts stipule-like, 5–6 × 3 mm, ovate, reddish, glabrous, translucent, bracteoles persistent, anisophyllus, ovate to broadly ovate, c.3 × 4 mm, reddish, glabrous, translucent; *male inflorescence* a thyrse composed of up to 3 monochasial partial inflorescences with shortly developed internodes, each with up to 4 flowers, primary peduncle 1.5–2 cm long, partial inflorescence peduncle 1.5–4 cm long, shorter towards the apex, bracts persistent, stipule-like, 3–5 × 2–3 mm, ovate, reddish, translucent, midrib slightly prominent projecting up to 0.5 mm at the apex, bracteoles persistent, minute, hair-like. *Male flowers*: *pedicels* 15–18 mm long, white-pinkish, glabrous; *tepals* 2, white to white tinged with pink or greenish, 8.5–16.5 × 11–13 mm, broadly ovate, base slightly cordate, apex rounded, outer surface glabrous; *androecium* of 75–77 stamens, yellow, filaments up to c.1.5 mm long, slightly fused at the very base, anthers up to c.1 mm long, oblong to narrowly obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* 7–10 mm long, reddish-greenish, glabrous; bracteoles persistent, *tepals* 5, white tinged with pink, 10–16 × 5–8 mm, obovate, outer surface glabrous; *ovary* (excluding wings) c.10 × 5–6 mm, narrowly obovate, red, glabrous, locules 3, placentation axile, placentae bilamellate, wings 3, equal, greenish-reddish, base rounded apex truncate to rounded, up to 8 mm at the widest point (apically or subapically); *style* c.4 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruits*: *peduncles* 7–13 mm long; *pedicels* 8–11 mm long, bracteoles persistent; *seed-bearing part* (excluding the wings) 11–12 × 6–7 mm, obovate, glabrous, dehiscent, splitting along the wing attachment, wing shape as for ovary, up to 9 mm at the widest point (apically or subapically). *Seeds* barrel-shaped, c.0.2 mm long.

Distribution. Indonesia: endemic to Sulawesi, North Sulawesi Province (eastern North biogeographical region), Southeast Minahasa, Ratatotok (see **Figure 2**).

Habitat. This species grows on lowland limestone karst walls, in disturbed habitats, in half shade to full shade, at 20–250 m elevation.

Etymology. The name is derived from Latin *gemellus* ('a twin', 'twin-born'), probably in reference to the few-flowered male inflorescences.

Proposed IUCN conservation category. Critically Endangered (CR), B1ab(iii)+B2ab(iii). *Begonia gemella* is known from only two collections from small patches of limestone karst in Ratatotok, Southeast Minahasa. The area is not legally protected, and the type locality is in a very accessible area at a roadside. Potential threats, such as mineral mining activities and agriculture (coconut and cocoa plantations), were observed in the vicinity. Given the very small AOO (4 km^2), this indicates that the species should be considered Critically Endangered (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Eastern North Sulawesi**: Cultivated, Ratatotok, Minahasa, *W.H. Ardi,* WI *s.n.* (KRB); Sulawesi, Basaan, Ratatotok, Southeast Minahasa: 3 ii 2019, *W.H. Ardi* WI402 (BO, CEB, FIPIA; SING); 3 ii 2019, *W.H. Ardi* WI403 (BO, CEB, FIPIA, SING).

Creeping stems are relatively rare in the large *Begonia* section *Petermannia* but can be found in several species endemic to Sulawesi (*B. carnosa*, *B. flacca* Irmsch., *B. gemella*, *B. mattampensis* Ardi & D.C.Thomas). *Begonia gemella* is similar to *B. carnosa* in that it has a creeping stem and grows in limestone karst habitats, but it differs by its glabrous stem and petiole (vs sparsely to moderately hairy stem and petioles), 1-flowered female inflorescences and a shorter peduncle 0.7–1.1 cm long (vs [1- or] 2-flowered, peduncle 2–5 cm long), and the male inflorescence is a thyrse composed of up to 3 monochasial partial inflorescences with shortly developed internodes, each with up to 4 flowers, and partial inflorescence peduncle 1–4 cm long (vs a thyrse composed of up to 3 cymose partial inflorescences, each branching dichasially with up to 5–8 flowers, and peduncles of the partial inflorescences 2.5–7 cm long).

8. Begonia hispidissima Zipp. ex Koord. [§ *Petermannia*], Meded. Lands Plantentuin 19: 485 (1898). – Type: Indonesia, Sulawesi, Minahasa, 10 iv 1895, *Koorders, S.H.* 16241B (lectotype K [K00076118], isolectotypes B [B100238031], BO, L [L0701074], designated by Smith & Wasshausen [1983: 444]. **Figure 6.**

Perennial, monoecious herb, erect, up to c.35 cm tall. *Stem* densely hairy; internodes 2–5.5 cm long, slightly swollen at the nodes, brownish-reddish, densely hairy. *Leaves* basifixed, alternate; *stipules* semi-persistent, 5–8 × 2.5–4.5 mm, ovate, with an abaxially slightly prominent midrib, apex narrowed into a bristle projecting up to c.2 mm, margin entire, cream-coloured, abaxially hairy; *petioles* 1–3 cm long, terete, not channelled, concolorous with the stem, glabrous; *lamina* 6.5–9.5 × 3–7 cm, asymmetrical, elliptic, base oblique, slightly cordate and lobes not or just slightly overlapping, apex acuminate, margin serrate to biserrate, adaxial surface green, with red veins, densely hairy, abaxially pale green with red veins, hairy; *venation* pinnate, secondary veins craspedodromous. *Inflorescences* protogynous, female inflorescences on node basal to male or separated; *female inflorescences* 2-flowered, peduncles 1–2 cm long, hairy; *male inflorescences* racemose-cymose (a thyrse), with up to 3 cymose partial inflorescences, each dichasially or dichasially-monochasially branching with up to 4 flowers, peduncle of partial inflorescence up to c.15 mm long, bracts caducous. *Male flowers*: *pedicels* 10–15 mm long, white-pinkish, glabrous; *tepals* 2, white to white tinged with pink, 7–11.5 × 6–11.5 mm, ovate to broadly ovate, base slightly cordate, apex rounded, outer surface glabrous; *androecium* of 38–40 stamens, yellow, filaments up to c.1 mm long, slightly fused at the very base, anthers up to c.1 mm long, oblong to narrowly obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* 8–12 cm long, pale green,

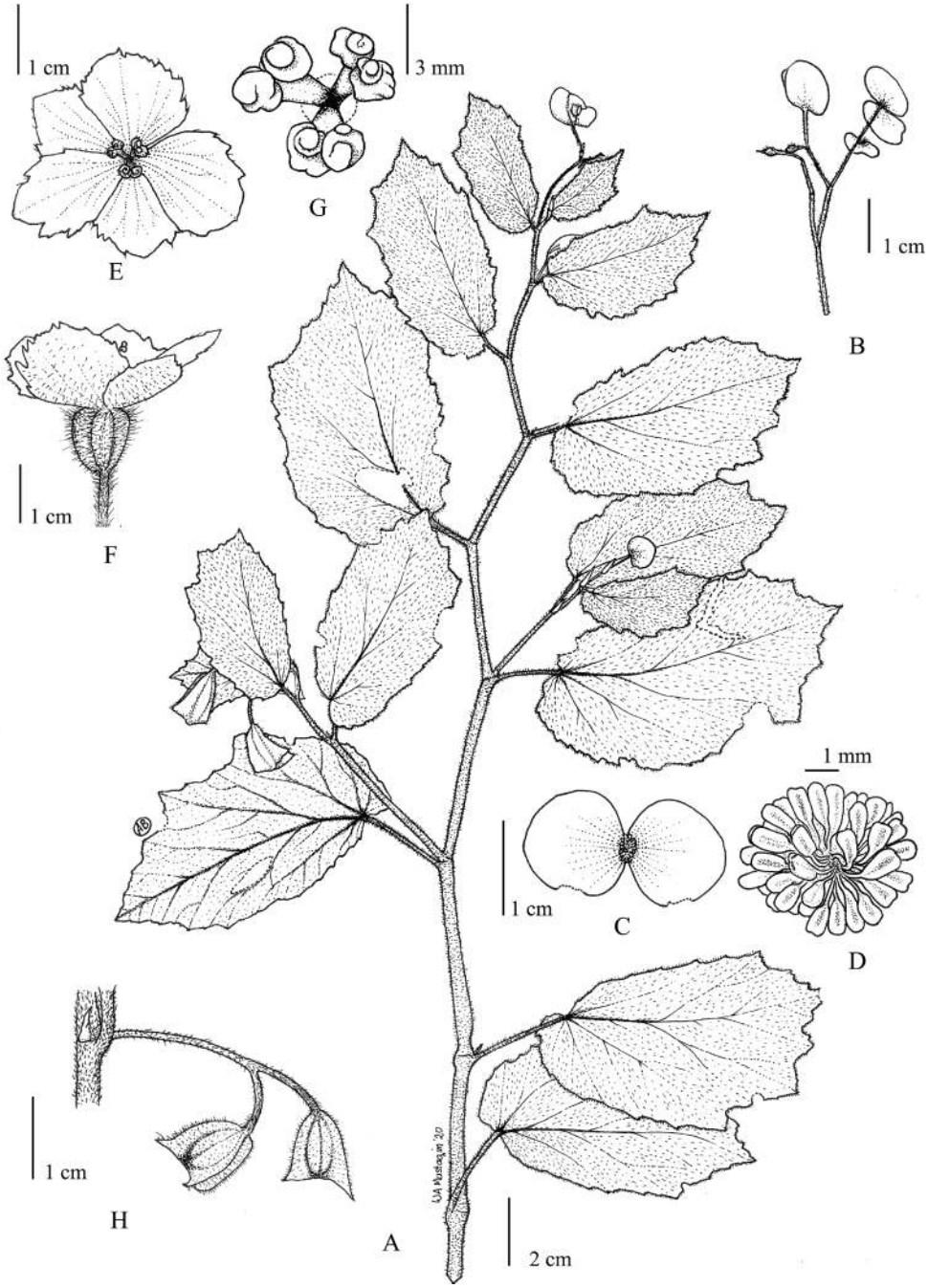

Figure 6. *Begonia hispidissima*. A, Habit; B, male inflorescence; C, male flower; D, androecium; E, female flower (front view); F, female flower (side view); G, style and stigmas; H, infructescence. Drawn from *S. Barber* BAKK45 by W. A. Mustaqim.

pubescent; *tepals* 5, white tinged pink, subequal, 9.5–16 × 6–12 mm, ovate to elliptic, margin serrulate, and ciliate, outer surface hairy; *ovary* (excluding wings) 7–13 × 3–4.5 mm, ellipsoid, pale green, hairy, locules 3, placentation axile, placentae bilamellate, wings 3, equal, light green, base mostly cuneate, sometimes rounded, apex truncate to subtruncate, up to 4 mm at the widest point (apically or subapically); *style* c.3.5 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruits*: *peduncles* c.2 cm long, pubescent; *pedicels* 13–23 mm long, pendulous, slightly recurved; *seed-bearing part* ellipsoid, 15–17 × 6.5–8 mm (excluding the wings), hairy, dehiscent, splitting along the wing attachment, wings shape as for ovary, up to 10 mm at the widest point (apically or subapically). *Seeds* barrel-shaped, c.0.2 mm long.

Distribution. Indonesia: endemic to Sulawesi, North Sulawesi Province (central North biogeographical region), Bolaang Mongondow, Minahassa (see **Figure 2**).

Habitat. Secondary upland forest, on steep slopes, semi-shaded, at 1200–1400 m elevation.

Proposed IUCN conservation category. Data Deficient (DD). This species is known only from limited collections, including the type specimen in Minahassa and two other collections from Gunung Ambang Nature Reserve (Bolaang Mongondow). The forests in the wider area, especially on Gunung Ambang, are poorly explored. Consequently, we assess this species as Data Deficient (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Eastern North Sulawesi**: Bolaang Mongondow, Gunung Ambang Forest Reserve, 2 xi 2016, *S. Barber* BAAK37, BAAK45, BAAK46 (all BO, E).

Begonia hispidissima is similar to *B. masarangensis* in its dense indumentum on the stems and leaves, and the elliptic leaves with serrate to biserrate margin. However, it can be differentiated by several characters such as the male inflorescence thyrse consisting of 2 or 3 partial cymose inflorescences (vs male flowers in simple monochasia) and 2-flowered female inflorescences with 8–12 mm long pedicels (vs 1-flowered with pedicels ≤ 7 mm long).

9. **Begonia insularum** Irmsch. [§ *Petermannia*], Bot. Jahrb. Syst. 50: 353 (1913). – Type: Indonesia, Sulawesi, Sangir island, *Warburg, O.* 16107 (holotype B [B100238023]). **Figure 7**.

Distribution. Indonesia: endemic to Sulawesi, Sangihe (Sangir) Island (see **Figure 2**).

Habitat. Transition of upland to hill rain forest with palms or secondary forest at 800 m elevation.

Proposed IUCN conservation category. Vulnerable (VUD2). This species is known from only two collections, both of which have no exact locality information. Despite the legal

Figure 7. *Begonia insularum* in its natural habitat, Sangihe Island. A, Habit; B, infructescence and male inflorescence. Photographs: Ullie Rachmawaty.

protection of some areas on Sangihe (Sangir) Island due to being part of Sanger Gunung Api Uwu National Park, there are clear signs of anthropogenic disturbance, including habitation and nutmeg plantations, around the island. All available *Begonia* specimens from A, B, BM, BO, CEB, E, K, L and SING have been consulted, and therefore it must be assumed, at least until more intensive collecting on Sulawesi may reveal otherwise, that this species has a very restricted range. Therefore, this species is probably 'prone to the effects of human activities or stochastic events within a very short time period in an uncertain future' (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimen examined. INDONESIA. Sulawesi. **Sangihe Talaud Islands**: Sangihe Island, 5 xi 1998, *D. Hicks & Anius* 135 (K).

Begonia insularum is endemic to Sangihe (Sangir) Island. It is one of the most poorly known species in Sulawesi, being known from only a few specimen records and observations. Recently, the species was documented during a field survey by a colleague from Bogor Botanic Gardens (Ully Rachmawaty); however, no herbarium vouchers were made. *Begonia insularum* is similar to *B. isoptera* Dryand. ex Sm. from western Malesia (Java and Sumatra), but *B. insularum* can be distinguished from that species by several characters, including fewer stamens (25 vs 40 stamens), 5-tepalled female flowers (vs 3-tepalled female flowers) and fruit wings with a rounded base and truncate apex (vs fruit wings with cuneate base and truncate apex).

10. Begonia kinhoi Ardi & D.C.Thomas, **sp. nov.** § *Petermannia*

Most similar to *Begonia macintyreana* M.Hughes in its erect growth habit, glabrous stems and leaves, and compound thyrse with monochasial partial inflorescences, but it can be easily distinguished by the much shorter peduncles of the female inflorescences (c.1 mm long vs 14–20 mm long); smaller female flower tepals (12–16 × 7–9 mm vs c.20 × 13 mm) with rounded apex (vs apex acute); cylindrical ovary (vs ovary ellipsoid to obovoid); and longer, pendulous fruit pedicels, which are 13–23 mm long (vs fruit pedicel c.15 mm long, stiff and not pendulous). – Type: Indonesia, Sulawesi, North Sulawesi, Gunung Klabat, 30 i 2019, *W.H. Ardi W.I.* 386 (holotype BO; isotypes CEB, FIPIA, SING). **Figure 8**.

Perennial, monoecious herb, erect, up to c.60 cm tall. *Stem* branched; internodes 3–13 cm long, swollen at the nodes, brownish-reddish, glabrous except for the microscopic glandular hairs. *Leaves* basifixed, alternate; *stipules* semi-persistent, 7–14 × 4–6 mm, ovate to oblong, with an abaxially slightly prominent midrib, apex narrowed into bristle projecting up to 3 mm, margin entire and recurved, pale green, translucent at the margin, abaxially hairy; *petioles* 3–9 cm long, terete, not channelled, concolorous with the stem, glabrous; *lamina* 9.5–19 × 3–7 cm, asymmetrical, ovate to elliptic, base cordate and lobes not or just slightly overlapping, apex acuminate, margin scalloped, denticulate, adaxial surface green, with red

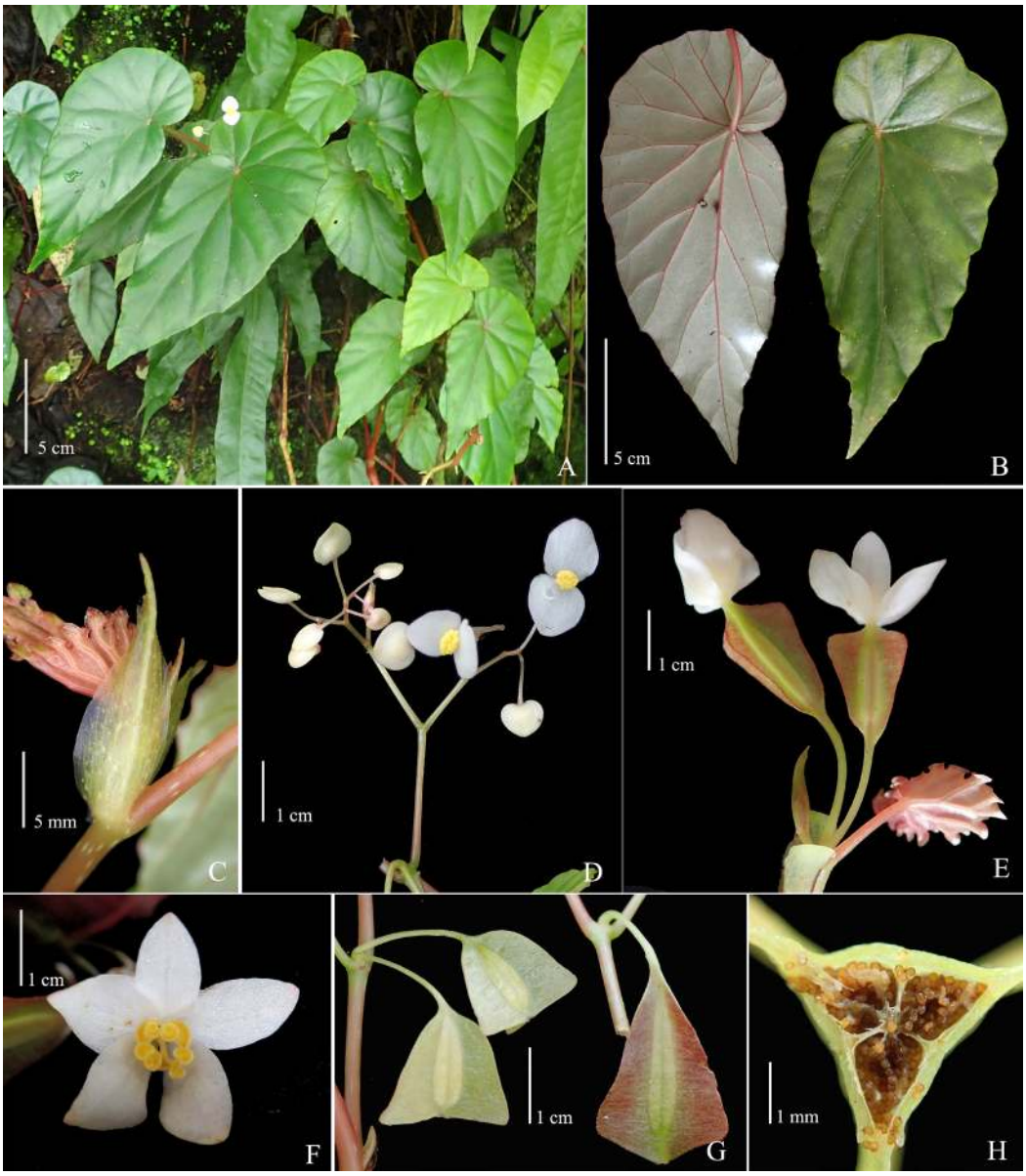

Figure 8. *Begonia kinhoi* Ardi & D.C.Thomas, sp. nov. A, Habit; B, lamina; C, stipule; D, male inflorescence; E, female inflorescence; F, female flower (front view); G, infructescence; H, ovary (cross-section of middle part). A–H from *W.H. Ardi* WI390. Photographs: W. H. Ardi.

veins, glabrous, abaxial pale green, glabrous; *venation* palmate-pinnate, primary veins 6–8, actinodromous, secondary veins craspedodromous. *Inflorescences* protogynous; *female inflorescences* basal to male, 2-flowered, peduncles c.1 mm long; *male inflorescence* a compound thyrse with up to 3 lateral partial inflorescences (thyrses or the upper partial inflorescences developed as simple cymes), each with up to 3 monochasial cymes, each with 2–5 flowers, peduncle of partial inflorescence c.15 mm long, bracts caducous. *Male flowers*: *pedicels* 10–15 mm long, white-pinkish, glabrous; *tepals* 2, white to white tinged with pink, 7–11.5 × 6–11.5 mm, ovate to broadly ovate, base slightly cordate, apex obtuse, outer surface glabrous; *androecium* of c.75 stamens, yellow, filaments up to c.1 mm long, slightly fused at the very base, anthers up to c.1 mm long, oblong to narrowly obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* 8–12 cm long, pale green, glabrous; *tepals* 5, white, subequal, 12–16 × 7–9 mm, ovate to elliptic, outer surface glabrous; *ovary* (excluding wings) 9–13 × 3–4.5 mm, cylindrical, pale green, glabrous, locules 3, placentation axile, placentae bilamellate, wings 3, equal, pale green, base mostly cuneate, sometimes rounded, apex truncate to subtruncate, up to 4 mm at widest point (apically or subapically); *style* c.3.5 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruits*: *peduncles* c.1 mm long; *pedicels* 13–23 mm long, pendulous; *seed-bearing part* cylindrical, 12–22 × 3.5–4.5 mm (excluding the wings), glabrous, dehiscent, splitting along the wing attachment, wing shape as for ovary, up to 10.5 mm at the widest point (apically or subapically). *Seeds* barrel-shaped, c.0.2 mm long.

Distribution. Indonesia: endemic to Sulawesi, North Sulawesi Province (eastern North biogeographical region), Gunung Klabat, Gunung Lokon (see **Figure 2**).

Habitat. Strongly disturbed lowland to upland secondary forest at 350–900 m elevation.

Etymology. The specific epithet of *Begonia kinhoi* is in honour of Julianus Kinho, researcher at the Forestry Research Institute of Manado, North Sulawesi.

Proposed IUCN conservation category. Critically Endangered (CR), B2ab(iii). *Begonia kinhoi* is known from only two localities (Gunung Klabat and Gunung Lokon), and two small populations were observed on Gunung Klabat. The type locality is a popular mountaineering track in North Sulawesi. The forests of Gunung Klabat and Gunung Lokon have no legal status as protected areas, and potential threats, such as tourism and agriculture, were observed in the area. Gunung Klabat is relatively poorly collected, and this species is likely to have a wider range in the forests of Gunung Klabat and Gunung Lokon. However, even if this is the case, its small EOO and AOO, in combination with the observed threats and anthropogenic disturbances (including coconut and vegetable plantations) would still support a Critically Endangered status (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimen examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Eastern North Sulawesi**: Gunung Klabat, 30 i 2019, *W.H. Ardi* WI390 (BO, FIPIA, SING); Gunung Lokon, *D. Girmansyah* DG1298 (BO).

Generative characters such as the shortly pedunculate female inflorescences and infructescences and pendulous fruit differentiate this new species from the similar species *Begonia macintyreana* (see diagnosis). This character combination can also be found in *Begonia johntania*, which can be easily distinguished, however, by its densely hairy stem and petioles, compressed paniculate-cymose male inflorescences, and smaller male flowers with tepals that are hairy on the abaxial surface.

11. Begonia macintyreana M.Hughes [§ *Petermannia*], Edinburgh J. Bot. 63: 194 (2006). – Type: Indonesia, Sulawesi, Gorontalo, near Tulabolo, 4 iv 2002, *M. Mendum* et al. 2 (holotype E [E00163204]; isotypes A, E [E00163204], K [K001235146], L [L0333856]).

Distribution. Indonesia: endemic to Sulawesi, North and Gorontalo Provinces (see **Figure 2**).

Habitat. This species was observed growing on a steep bank in secondary forest, in full shade, at c.180 m elevation.

Proposed IUCN conservation category. Data Deficient (DD). This species is known from only two collections, both of which were collected at the border of the Bogani Nani Wartabone National Park. There is no available information about current threats, habitat conditions and population sizes. Furthermore, the forests in the wider area of the national park are very poorly collected. Consequently, we assess this species as Data Deficient (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Central North Sulawesi**: Dumoga Bone National Park, Suwawa District, 27 xii 1994, *JJ. Afriastini & Rohajawati* JJA2918 (E, K). **Eastern North Sulawesi**: Sulawesi Utara, 27 xii 1994, *J. Juanda* 22 (K).

Begonia macintyreana is endemic to North and Gorontalo Provinces. It is known from only two collections. The species is characterised by a character combination including: an erect growth habit; a glabrous stem; ovate, bullate leaf lamina; complexly branching male inflorescences (a compound thyrse with monochasial partial inflorescences) with numerous flowers; and female flower tepals that are ovate to lanceolate and have an acute apex.

12. Begonia masarangensis Irmsch. [§ *Petermannia*], Bot. Jahrb. Syst. 50: 368 (1913). – Type: Indonesia, Sulawesi, Masarang, 23 iv 1894, *K.F. & P.B. Sarasin* 269 (holotype B [B100217759], isotype K [K000761116]). **Figure 9**.

Perennial, small, monoecious herb, erect, c.20–25 cm tall. *Stem* erect, few-branched; internodes 1–4 cm long, slightly swollen at the nodes, brownish-reddish, densely hairy with bristly hairs. *Leaves* basifixed, alternate; *stipules* persistent, 5–8 × 2.5–4.5 mm, anisophyllus, ovate, with an abaxially slightly prominent midrib, apex narrowed into bristle

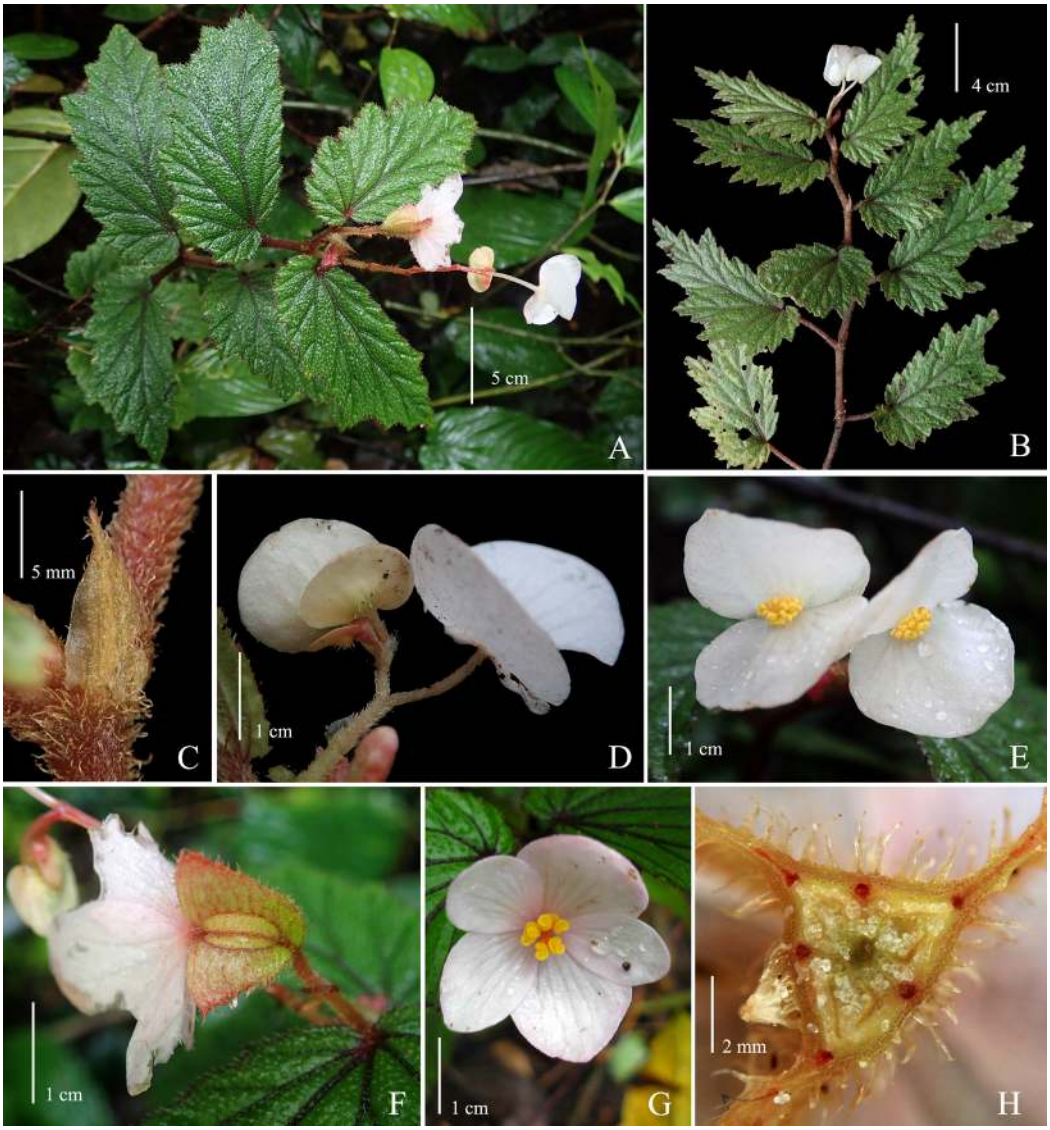

Figure 9. *Begonia masarangensis*. A and B, Habit; C, stipule; D, male inflorescence; E, male flowers (front view); F, female flower (side view); G, female flower (front view); H, ovary (cross-section of middle part). A–H from *W.H. Ardi* WI400. Photographs: W. H. Ardi.

projecting up to 6 mm, margin entire, cream-coloured, abaxially hairy; *petioles* 0.6–3 cm long, terete, not channelled, concolorous with the stem, densely hairy; *lamina* 3.7–9.5 × 2.5–4.5 cm, asymmetrical, elliptic, base cordate and lobes not or just slightly overlapping, apex acuminate, margin biserrate, adaxial surface green, with red veins, densely covered with strigose, simple or sometimes branched hairs, abaxial surface brownish, hairy;

venation pinnate, secondary veins craspedodromous. *Inflorescences* protogynous, female inflorescences basal to male or sometime solitary; *female inflorescences* 1-flowered, peduncles c.10 mm long, bract persistent, c.5 × 1–2 mm, elliptic; *male inflorescences* simple monochasia with up to 10 flowers, peduncle c.6 mm, hairy, bracts caducous. *Male flowers*: *pedicels* 9–16 mm long, white-cream, hairy; *tepals* 2, white, 12–17 × 17–22 mm, broadly ovate, base slightly cordate, apex rounded, outer surface hairy; *androecium* of 22–25 stamens, yellow, filaments up to c.1 mm long, slightly fused at the very base, anthers up to c.1 mm long, oblong to narrowly obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* c.7 mm long, pink, densely hairy; *tepals* 5, white, unequal, four larger c.15 × 17 mm, broadly ovate, one smaller 12–15 × 5–10 mm, obovate, adaxially hairy; *ovary* (excluding wings) 8 × 4.5 mm, ellipsoid, pale green with red longitudinal line, densely hairy, locules 3, placentation axile, placentae bilamellate, wings 3, subequal to unequal, pale green, base rounded, apex truncate, up to 9 mm at the widest point (apically or subapically); *style* c.6 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruits* not seen.

Distribution. Indonesia: endemic to Sulawesi, North Sulawesi Province (eastern North biogeographical region), Gunung Masarang (see **Figure 2**).

Habitat. Disturbed or secondary upland to montane forest at 1000–1800 m elevation, in full shade.

Proposed IUCN conservation category. Critically Endangered (CR), B1ab(iii)+B2ab(iii). *Begonia masarangensis* is known from only two collections from a small forest remnant at its type locality, Gunung Masarang, Tomohon. The area is not legally protected, and currently most of the forest formerly surrounding the type locality has been converted into agricultural land. In combination with the very small AOO (4 km^2), this indicates that the species should be considered Critically Endangered (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Eastern North Sulawesi**: Minahassa, top of G. Masarang, 10 i 1949, *Koorders* 16240b (K); 20 ii 2008, *M. Ardiyani, A.D. Poulsen & Ale* 105 (BO); 2 ii 2019, *W.H. Ardi* et al. WI400 (BO, FIPIA).

See notes under *Begonia hispidissima*.

13. Begonia mendumiae M.Hughes [§ *Petermannia*], Edinburgh J. Bot. 62: 196 (2006).
– Type: Indonesia, Sulawesi, Gorontalo, Gunung Ali, 28 iv 2002, *M. Mendum* et al. 240 (holotype E [E00163221], isotype K [K001235163]). **Figure 10**.

Distribution. Indonesia: endemic to Sulawesi, Gorontalo and Central Sulawesi Provinces (Donggala, Poso) (see **Figure 2**).

Figure 10. *Begonia mendumiae* from different locations. A, Cultivated from type locality, Gorontalo (*M. Mendum* et al. 240); B, Pangansitoli Waterfall, Donggala, C. Sulawesi (*W.H. Ardi* WI690); C, Pesisir Utara Poso, C. Sulawesi (*W.H. Ardi* WI429); D, Batusuya, Donggala, C. Sulawesi (*W.H. Ardi* WI316); E, Bancea, Poso, C. Sulawesi (*W.H. Ardi* WI281); F, Gumbasalu Cave, Pasang kayu, W. Sulawesi (*W.H. Ardi* WI686). Photographs: A, Mark Hughes; B–F, W. H. Ardi.

Habitat. The species was observed growing on various substrates (soil, limestone rock, and other rock types) in secondary lowland to hill forest and even in a forest remnant in a cocoa plantation, in full to half shade, at 20–600 m elevation.

Proposed IUCN conservation category. Near Threatened (NT). *Begonia mendumiae* is endemic to Sulawesi and relatively widespread on the island (EOO, 45,962 km^2; AOO, 32 km^2), mostly occurring in disturbed lowland forest or limestone forest habitats. However, its known range does not include any legally protected areas in Sulawesi. Consequently, we assess this species as Near Threatened (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Western North Sulawesi**: Palu-Oti Road, 3 vii 1979, *M.M.J van Balgooy* 3597 (L); Donggala Regency, Batusuya, 10 viii 2018, *W.H. Ardi* et al. WI316 (BO, KRB, SING). **Central North Sulawesi**: Gorontalo: *Albert s.n* (BO).

Central Sulawesi Province: Poso Regency, Bancea, 2 viii 2018, *W.H. Ardi* et al. WI281 (BO, KRB, SING); Poso Regency, Pesisir Utara Poso: 15 ii 2019, *W.H. Ardi* et al. WI429 (BO, KRB, SING); 15 ii 2019, *W.H. Ardi* et al. WI434 (BO, KRB, SING). Donggala Regency, Air Terjun Pangansitoli, 5 iii 2020, *W.H. Ardi* et al. WI690 (BO, KRB, SING). **West Sulawesi Province**: Pasang Kayu Regency, Gumbasalu Cave, 3 iii 2020, *W.H. Ardi* et al. WI686 (BO, KRB, SING).

Based on observations in the field, *Begonia mendumiae* is morphologically highly variable, particularly regarding the indumentum density, leaf size and coloration, and ovary shape both among individuals in populations and among different populations. However, most generative characters are more stable, allowing clear identification of the species. Individuals from the Poso Pesisir Utara population have larger leaves, up to 21 × 14 cm, whereas distinctly smaller leaves (c.15 × 10 cm) are found in the other populations. Most of the populations show several variable characters such as adaxial leaf lamina colour, which can be reddish-dark green with irregular silvery variegation or light green without any variegation; short (up to 5 mm long) or long (up to 50 mm long) female inflorescence peduncles; 1- or 2-flowered female inflorescences; ovate or lanceolate female flower tepals; ellipsoid or cylindrical ovaries (without wings); and narrow or wider ovary and fruit wings, which can be rounded or cuneate at the base.

14. Begonia pitopangii D.C.Thomas & Ardi, **sp. nov.** § *Petermannia*

Most similar to *Begonia strachwitzii* Warb. ex Irmsch. in its growth habit (erect, up to 35 cm tall), densely hirsute stem, leaf morphology (an ovate to elliptic leaf lamina with palmate-pinnate venation) and female flowers with five tepals, but it differs in having male flowers in a thyrse composed of up to 4 partial inflorescences (monochasia) (vs composed of up to 6 partial inflorescences, which branch dichasially at the base), and a female inflorescence or infructescence with a shorter peduncle (1–2 mm long vs 5–10 mm long). – Type: Indonesia, Sulawesi, Central Sulawesi, Donggala Regency, Gunung Sojol, 7 viii 2018, *W.H. Ardi* WI306 (holotype BO; isotypes FIPIA, SING). **Figure 11**.

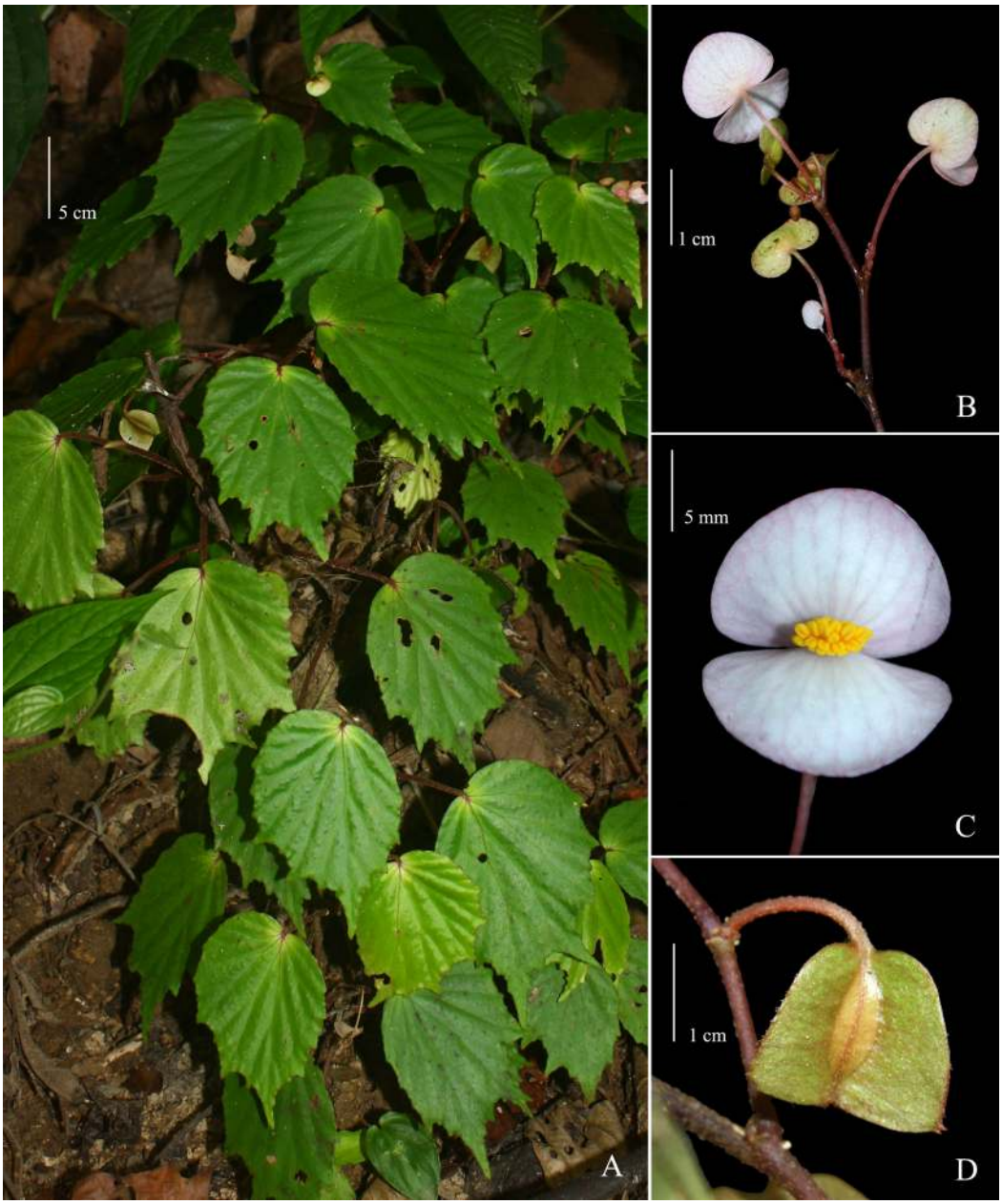

Figure 11. *Begonia pitopangii* D.C.Thomas & Ardi, sp. nov. A, Habit; B, male inflorescence; C, male flower (front view); D, fruit. A–D from *W.H. Ardi* WI306. Photographs: W. H. Ardi.

Perennial, monoecious herb, erect, up to c.35 cm tall. *Stem* branched; internodes 2–8.5 cm long, densely hairy with short bristly hairs, c.0.5 mm long. *Leaves* basifixed, alternate; *stipules* caducous, c.5 × 1.5 mm, elliptic, with a slightly prominent midrib on the abaxial surface, apex narrowed into bristle projecting up to 1 mm, brownish, abaxially hairy; *petioles* 4–8 cm long, concolorous with the stem, hairy, c.0.5 mm long; *lamina* 5.5–12 × 3–8 cm, asymmetrical, ovate to elliptic, base narrowly cordate or almost truncate, lobes rarely overlapping, apex acuminate, margin serrate to double serrate to shallowly lobed (up to 20% of lamina width), teeth bristle-pointed, adaxial surface green, prominent between the veins, glabrous to very sparsely bristly hairy between the veins, abaxial surface pale green, hairy on the veins only; *venation* palmate-pinnate, primary veins 6 or 7, actinodromous, secondary veins craspedodromous. *Inflorescences*: protogynous; *female inflorescences* 1(or 2)-flowered, positioned one node below the male inflorescences or single female flowers on multiple successive nodes below the male inflorescence, peduncles 1–2 mm long, sparsely hairy, bracts caducous; *male inflorescence* a thyrse consisting of 1–4 monochasial partial inflorescences, each with 2–6 flowers, peduncles of partial inflorescences up to 2 mm long. *Male flowers*: *pedicels* 10–17 mm long, reddish, glabrous; *tepals* 2, white, 5–10 × 9–12 mm, broadly ovate, base slightly cordate when young, truncate at anthesis, apex rounded, outer surface glabrous; *androecium* of c.31 stamens, yellow, filaments up to c.0.7 mm long, slightly fused at the very base, anthers up to c.1 mm long, oblong to narrowly obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* c.6 mm long, red, moderately hairy with bristle hairs; *tepals* 5, subequal, c.5 × 3 mm, ovate, creamy reddish, glabrous; *ovary* (excluding wings) c.4.5 × 2 mm, cylindrical, red, glabrescent, wings 3, subequal, rounded at base, truncate at the apex, widest point c.2 mm apically. *Fruits*: *peduncles* c.2 mm long; *pedicels* 10–12.5 mm long, reddish, hairy; *seed-bearing part* cylindrical, 8–10 × 3.5–4 mm (excluding the wings), greenish-reddish, glabrous, dry capsule, dehiscent, splitting along the wing attachment, wing base rounded, apex truncate, up to 9 mm at the widest point (apically or subapically), wing margins ciliate. *Seeds* barrel-shaped, c.0.2 mm.

Distribution. Indonesia: endemic to Sulawesi, Central Sulawesi (western North biogeographical region), Mount Sojol (see Figure 2).

Habitat. The species grows in lowland secondary forest, in full shade, at 20–250 m elevation.

Etymology. The specific epithet of *Begonia pitopangii* is in honour of Professor Ramadanil Pitopang, a plant taxonomist at University Tadulako, Palu, who is an expert on the Sulawesi flora and has collected extensively on the island.

Proposed IUCN conservation category. Data Deficient (DD). This species is known from only a single locality, the Mount Sojol Forest Reserve. The forests in the wider area are

botanically very poorly explored and collected. Consequently, we assess this species as Data Deficient (IUCN Standards and Petitions Subcommittee, 2019).

15. Begonia rieckei Warb. [§ *Petermannia*], Bot. Jahrb. Syst. 13: 387 (1891). – Type: Papua New Guinea, Sattelberg, *F.R.R. Schlechter* 20479 (holotype B [B100217759]). **Figure 12.**

Begonia axillipara Ridl., Trans. Linn. Soc. London, Bot. II(9): 60 (1916). – Type: Indonesia, New Guinea, Canoe Camp, 10 xi 1912, *C.B. Kloss s.n* (holotype BM [BM000017329]), **syn. nov.**

Begonia brachybotrys Merr. & L.M.Perry, J. Arnold Arbor. 24: 56 (1943). – Type: Indonesia, New Guinea, Irian Jaya, Bernhard Camp, Idenburg river, iv 1939, *L.J. Brass* 14112 (holotype A [A00055445]; isotypes BM, L [L0010281]), **syn. nov.**

Begonia brachyptera Merr. & L.M.Perry, J. Arnold Arbor. 29: 160 (1948). – Type: Papua New Guinea, Morobe Distr., Wantoat, 1940, *J. & M.S. Clement* 40896 (holotype A [A0005544], isotype MICH [MICH1115787]), **syn. nov.**

Begonia koordersii Warburg ex L.B.Sm. & Wassh., Phytologia 52(7): 444 (1983). – Type: Indonesia, Sulawesi, North Sulawesi, Minahassa, 1 iii 1895, *S.H. Koorders* 16246B (lectotype K [K000761117], designated by Smith & Wasshausen [1983: 444]; isolectotypes B [B100127763], BO), **syn. nov.**

Begonia peekelii Irmsch., Bot. Jahrb. Syst. 50: 360 (1913). – Type: Papua New Guinea, Bismarck Archipelago, New Ireland, New Mecklenburg, 21 ix 1910, *G. Peekel* 644 (holotype B [B100238530]), **syn. nov.**

Begonia pseudolateralis Warb. in Perkins, Fragm. Fl. Philipp. 1: 51 (1904). – Type: Philippines, Luzon, Isabela Prov., Malunu, *O. Warburg* 11793 (holotype B [B100238540]), **syn. nov.**

Mezierea salaziensis var. *calleryana* A.DC., Prodr. 15(1): 408 (1864). *Begonia aptera* var. *calleryana* (A.DC) Fern.-Vill., Fl. Filip. 4: 99 (1880). – Type: Philippines, Luzon, Laguna, Caluan, 1840, *J.M.M. Callery s.n.* (holotype P [P0190078]).

Begonia strictipetiolaris Irmsch., Bot. Jahrb. Syst. 50(4): 348 (1913). – Type: Indonesia, Sulawesi, North Sulawesi, Tomohon, 23 v 1894, *K.F. & P.B. Sarasin 400a* (holotype B [B100238028], isotype K [K000761115]), **syn. nov.**

Begonia lateralis Elmer ex Merr. nom. nud., Enum. Philipp. Fl. Pl. 3: 127 (1923).

Perennial, monoecious herb, erect, up to c.1 m tall; stems glabrous except for microscopic glandular hairs. *Stem* branched, internodes 2–15 cm long, swollen at the nodes, green or red or brownish red with white spots. *Leaves* basifixed, alternate; *stipules* caducous, 2.5–3 × 1.2–1.8 cm, elliptic, boat-shaped, thick, midrib abaxially prominent, glabrous, apex acute, margin entire, reddish to reddish-greenish; *petioles* 8–23 cm long, adaxially shallowly channelled, concolorous with the stem, glabrous, except for the microscopic glandular hairs; *lamina* basifixed, 10–26.5 × 7–14 cm, asymmetrical, broadly ovate to broadly elliptic, margin entire to dentate to scalloped and denticulate between the larger teeth, base cordate and

Figure 12. *Begonia rieckei*. A, Habit, reddish leaves with white dots along the margin and between the veins; B, inflorescence; C, male flowers; D, female flower; E and F, infructescence; G, ovary (cross-section of middle part). A from *W.H. Ardi* WI410; B, D and F from *W.H. Ardi* WI207; C, E and G from *W.H. Ardi* WI391. Photographs: W. H. Ardi.

lobes sometimes overlapping, apex acute to acuminate, adaxial surface green or reddish-greenish, with white spots between the veins in juvenile stage, glabrous, smooth velvety or glossy, abaxially pale green or maroon red, sparsely hairy on the veins, veins reddish green; *venation* palmate-pinnate, primary veins 7–8, actinodromous, secondary veins craspedodromous. *Inflorescences*: bisexual; compressed cymose with up to 12 female flowers and 25 male flowers in a mixed inflorescence, peduncles c.1(–10) mm long, green-reddish, glabrous, bracts broadly elliptic to suborbicular, 2–2.5 × 1.8–2.4 cm, thick, pale green or reddish-greenish, glabrous. *Male flowers*: *pedicels* 11–15 mm long, white or white tinged with pink, glabrous; *tepals* 2, white or white tinged with pink, 5–12 × 2–12 mm, elliptic to suborbicular, apex rounded, outer surface glabrous; *androecium* yellow, symmetrical, on a c.1 mm long column; *stamens* c.60, free filaments 0.5–1 mm long, fused at the base, anthers up to c.0.5–1.5 mm long, narrowly obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* c.6 mm long, green-reddish, glabrous; *tepals* 5, white or white tinged with pink, subequal, 6–12 × 2–7 mm, ovate to elliptic, abaxially glabrous; *ovary* (excluding wings) 6–12 × 6–12 mm, ellipsoid, ovoid or globoid, glabrous, red or greenish or white, locules 3, placentation axile, placentae bilamellate, wingless or with 3 poorly developed wings, very narrow, green, widest point up to 1 mm (apically to subapically); *style* c.3 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruits*: *peduncles* 5–15 mm long; *pedicels* 12–25 mm long; *seed-bearing part* ellipsoid, ovoid, or globoid, 15–20 × 10–15 mm (excluding the wings), glabrous, fleshy, indehiscent, wing shape as for ovary, up to 2 mm at the widest point (apically to subapically). *Seeds* barrel-shaped, c.0.3 mm long.

Distribution. Widespread in east Malesia (Sulawesi, Philippines, Moluccas, New Guinea, Pacific Islands). In Sulawesi from North, Gorontalo and Central Provinces. See **Figure 2**.

Habitat. Primary to secondary lowland to upland forest, in half to full shade, at 10–1500 m elevation.

Proposed IUCN conservation category. Least Concern (LC). *Begonia rieckei* has a wide distribution in central and eastern Malesia (EOO, 5,791,908 km^2) and occurs in various habitats including primary to strongly disturbed lowland to upland forests, and even oil palm plantations. Some of the populations are found in protected areas in Central Sulawesi Province, such as Pangi Binangga Forest Reserve and Lore Lindu National Park. Consequently, we assess this species as Least Concern (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. Indonesia. Sulawesi. **Northern arm of Sulawesi**. **Western North Sulawesi**: Sojol foothill: 7 viii 2018, *W.H. Ardi* WI304 (BO); 8 viii 2018, *W.H. Ardi* WI309 (BO). **Central North Sulawesi**: Gorontalo: Gunung Boliohutu, 22 iv 2002, *M. Mendum* et al. 141 (E). **Eastern North Sulawesi**: Manado: *J.E. Tiejsmann* (BO); *anonym* 41 (B); Goeroepahi, 18 iii 1917, *Kauderns* 18 (L, S); Bolaang Mongondow, 15 iii 1985, *E.F. de Vogel & J.J. Vermeulen* 6556 (L); Sulawesi Utara: Motomboto,

23 xii 1994, *J.J. Afriastini* et al. 2872 (L). Minahasa: Tomohon 11 vii 1894, *K.F. & P.B. Sarasin* 400 (B); 23 v 1894, *K.F. & P.B. Sarasin* 400a (BAS); Bojong, *s.d.*, *O. Warburg* 15189 (B); Wiau Complex, 29 vi 1956, *L.L. Forman* 319 (K).

Central Sulawesi Province: Mount Lumut, on river bank, 24 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-62 (BO, CEB, E); Kulawi road divide, Lore Lindu National Park, 29 vii 2018, *W.H. Ardi* et al. WI244 (BO, SING); Mount Sojol, Balungkang II villane, Donggala, 7 viii 2018, *W.H. Ardi* et al. WI304 (BO, SING); Sigi, Sidaoenta, 12 vii 1939, *S. Bloembergen* 4200 (BO, L); Sungai Pehoeia, 25 iv 1975, *W. Meijer* 9603 (L). Pangi Binangga Forest Reserve: Parigi, 20 vii 2018, *W.H. Ardi* et al. WI207 (BO, SING, FIPIA); 20 vii 2018, *W.H. Ardi* et al. WI208 (BO, FIPIA, SING). Luwuk: Batui River, 15 x 1989. *M. Coode* 5945 (BO, L); Hanga-hanga waterfall, 8 iv 2008, *D.C. Thomas & W.H. Ardi* DCT08-23 (E). **Province unknown**: *A.B. Meyer s.n* (B); *J.G.F. Riedegel s.n* (K).

Moluccas. Sula Islands, Mangoli, 26 ix 1939, *S. Bloembergen* 4689 (BO, L); Moluccas, 1888, *Jaheri* 231 (BO); Halmahera: Ternate Island, 10 i 1921, *Anonymous* 1295 (BO); Baccan Islands: Gunung Sibela, 27 x 1974, *E.F. de Vogel* 3701 (L). Buru: *M.M.J.v Balgooy* 5048 (K, L); Fakal, 30 viii 1921, *L.J. Toxopeus* 460 (BO); Wae Duna River, 25 xi 1984, *M.M.J.v Balgooy* 4911 (L); 26 xi 1984, *M.M.J.v Balgooy* 4917 (L); 11 x 1984, *Mogea & Ismail* JPM 5237 (BO); 22 xi 1984, *H.P. Nooteboom* 5222 (L); 25 xi 1984, *H.P. Nooteboom* 5277 (L); Wae Langa, 9 xi 1984, *H.P. Nooteboom* 5087 (BO, L); 9 xi 1984, *H.P. Nooteboom* 5089 (BO); Waekosi, 4 xi 1984, *M.M.J.v Balgooy* 4596 (K, L). Seram: Roemoga, 4 ix 1938, *P. Buwalda* 5945 (L); Mon Valley, 7 iii 1996, *R.F. Ellen* 1203 (K); Sikeu Walala, 20 xii 1996, *M. Kato* et al. 1114 (L); Buria, 3 ii 1985, *M. Kato* et al. 6001 (L); Lelesiru, 24 xii 1996, *M. Kato* 1167 (L); 3 vii 1918, *Kornasi* 1507 (BO); 4 vii 1918, *Kornasi* 1532 (BO), 1507 (BO); 20 xi 1917, *Kornasi* 471 (BO), 472 (BO); 23 xi 1917, *Kornasi* 515 (BO); 18 i 1918, *Kornasi* 837 (BO); 10 xii 1983, *Ramlanto* 357 (BO); 1 x 1918, *L.M.R. Rutten* 1764 (BO); Beka, 7 x 1918, *L.M.R. Rutten* 1772 (BO); 10 iii 1919, *L.M.R. Rutten* 2106 (BO); 10 x 1917, *L.M.R. Rutten* 242 (BO); Manusela National Park, 15 ii 1985, *M. Kato* 6673 (A, L); Hatumete, 20 ii 1985, *M. Kato* et al. 6947 (L); Maraina, 2 i 1985, *Ueda K., Okamoto, M. & Mahjar U.W.* 2834 (L).

New Guinea. West Papua: 9 v 1973, *J. Raynal* 17645 (P); vi–viii 1928, *E. Mayr* 546 (B); Yapen Island, 18 ii 2009, *G.C.G. Argent* et al. 147 (E); Aru Islands, Wokam Islands, Dosinamaloe, 29 v 1938, *P. Buwalda* 5069 (L); Upper Ramu, ix 1939, *J. & M.S. Clemens* 40750 (MICH); Sorong, 19 viii 1948, *D.R. Pleyte* 617 (L); Sentani, 9 iii 1973, *J. Raynal* 16685 (P); Cycloop Mts: Faika River, 8 viii 1961, *P.v. Royen & H. Sleumer* 6536 (L); Jappen-Biak: G. Wawah, 22 vii 1939, *L.J.V. Dijk* 44 (L); G. Wawah, 22 vii 1939, *L.J.V. Dijk* 215 (L); 16 ix 1939, *L.J.V. Dijk* 802 (L); Arijom, 29 ix 1939, *L.J.V. Dijk* 923 (L). Vogelkopf: Ije River Valley, 2 xi 1961, *P.v. Royen & H. Sleumer* 7650 (L); Arfak Mts: Mupi Dessa, Trail from Mupi village to G. Humibou, near Sungai Mupi, between Kali Umera (stream) and K. Ngwes, 11 iv 1995, *M.J.S. Sands* 6741 (E); Arfak Mts: Minjambau, 22 v 1962, *C. Versteegh* 12685 (L). Mamberamo: 3 iv 1914, *A.C.T. Thompson* 643 (L); 28 viii 1953, *C. Versteegh* 47 (L). Rouffaer River: viii 1926, *Doctors v. Leeuwen-Reynvaan* 9744 (L); viii 1926, *Doctors v. Leeuwen-Reynvaan* 9905 (L), 9743 (L); Koode River, 16 viii 1938, *E. Meijer Dress* 653 (L). Mt Jaya: 7 xii 1998, *M.J.S. Sands* 7210 (L); 7 v 2000, *T. Utteridge* et al. 10615 (L); 18 xi 2000, *S. Atkins* et al. 640 (L).

Papuasia. Bismarck Archipelago. New Britain: Hoskins Subdistr., Dakamanu, 21 xii 1967, *M. Coode* 32645 (L); Kandrian Subdistr., Alimbit River, 8 x 1965, *A. Gillison* 22466 (L); Ulamona Mission, 6 vi 1973, *R.S. Isles & A.N. Vinas* 32353 (L); 20 ii 1989, *P. Katik* 64088 (L); Pomio Subdistr., Mt Lululua, 4 v 1973, *P.F. Stevens & Y. Leiean* 58247 (E, L); Kokopo Subdistr., Valilie River, 14 viii 1969, *H. Streimann* 44374 (L). Manus: Mt Dremsel, 26 x 1974, *D. Foreman & P. Katik* 59195 (E, L); Buyang, 11 iii 1981, *K. Kerenga & J. Croft* 77357 (L); Rambutyo Island, 16 iii 1981, *K. Kerenga & J. Croft* 77376 (L). New Ireland: Kavieng

Subdistr., Schieinitz Range, Logagon Village, 24 x 1974, *J. Croft & Y. Leiean* 65630 (L); Konos Province, NE of Lelet Farm, 26 x 1984, *O. Gideon* 77137 (L); Logging concession N of Danfu river, 25 v 2013, *A.D. Poulsen* et al. 10001 (E).

Papua New Guinea. Baridi, 18 xi 1935, *C.E. Carr* 14995 (BM, L), 14975 (B); Bewepi Creek, 3 ix 1962, *Henry* 14820 (E, L); Mt Bosavi, 27 viii 1986, *O. Gideon* 57420 (L); Aitape Subdistr. Pes Village, 8 vi 1961, *P.J. Darbyshire & R.D. Hoogland* 7896 (L); Nassau Mts, x 1926, *Doctors v. Leeuwen-Reynvaan* 10545 (L); Yodda Valley, 19 ix 1953, *R.D. Hoogland* 3941 (L); Hozeke, 29 xi 1984, *K. Kerenga & C. Baker* 56917 (L); Kokoda, 25 vii 1964, *A.N. Millar* 23496 (L); Western Highland Province: Hagen Subdistrict: Trauna Creek, 7 vii 1968, *A.N. Millar* 37627 (L); Kar Kar Island, 16 vii 1968, *A.N. Millar* (L). Sepik District: Maprik Subdistr: Prince Alexander Range: Mt Turu, 24 viii 1959, *R. Pullen* 1582 (L); Madang Prov.: Saidor Subdistr., Wumundi, 11 viii 1984, *C.D. Sayers* 19778 (L); Chimbu Province: Crater Mt Wildlife Management area, 12 ix 1996, *W.N. Takeuchi* 11125 (A, E, L); Sangwep Logging Area, 13 iii 1975, *J.F. Veldkamp* 6168 (L); Baiyer River, 28 vi 1981, *A.N. Vinas* 3286 (L); East Sepik Province: Maprik subprovince, 24 vii 1980, *J. Wiakabu* 73419 (L); 18 xi 1935, *C.E. Carr* 14975 (B); Isuarava, 15 ii 1936, *C.E. Carr* 15598 (B, L); Kokoda, 15 ii 1936, *C.E. Carr* 16124 (B, L). Morobe District: Sattelberg, 28 iii 1936, *J. & M.S. Clemens* 2244 (B); Yunzaing, 11 vi 1936, *J. & M.S. Clemens* 3281 (B); Sattelberg, *J. & M.S. Clemens* 379a (B); Wantoat, 6 iv 1940, *J. & M.S. Clemens* 41205 (MICH); Sattelberg, 31 x 1935, *J. & M.S. Clemens* 655 (B); Wafi River, 4 iii 1985, *B.J. Conn* 1800 (L); Mt Kaindi, 29 iv 1992, *R. Hoft* 2186 (L); Bulolo: Crooked Logging Area, 5 ix 1966, *H. Streinmann & A. Kairo* 27900 (L); Bulolo: Dengalu Village, *Floyd* 5245 (L); Kipu, 13 xi 1968, *A. Gillison & A. Kairo* 25692 (L); Sopa, 19 vii 1962, *T.G. Hartley* 10354 (L); Bumbu Loggin Area, ix 1961, *Henry* 14321 (L); Lae Subprovince: Musom Village, 19 vi 1978, *P. Katik* 70827 (L); Wantoat, 9 viii 1968, *A.N. Millar* 12139 (L); Garaina, 10 v 1971, *B.C. Stone* 10169 (L); Atzera Range, 10 vii 2001, *W.N. Takeuchi* et al. 15424 (L); Bubia, xii 2001, *W.N. Takeuchi* 15806 (L); Bubia, 17 vii 2001, *W.N. Takeuchi* 16398 (L); Sankwep logging area, 23 iv 1968, *J.S. Wormsley* 37119 (L). **Northeast New Guinea**. West Sepik Province: Bewani, 31 viii 1982, *K. Kerenga* 55469 (L); Wutung Patrol Post, 8 ix 1982, *K. Kerenga* 56405 (L); Vanimo, 30 xi 1971, *H. Streimann* 52967 (L); Bewani: Mt Yungat, 20 ix 1982, *J. Wiakabu* 50578 (L). Kaiser-Wilhelmsland: 10 iv 1889, *F.C. Hellwig* 601 (B); Simmpliqe Stellen au Mimjeiu lei Kelel, 24 vi 1907, *F.R.R. Schlechter* 16175 (E). Josephstaal: 22 vii 1999, *W.N. Takeuchi* 13422 (A, L); 28 vii 1999, *W.N. Takeuchi* 13420 (A, L).

Philippines. Catanduanes Island: Catanduanes, 7 xi 1996, *Reynuso & R.S. Majaducon* 24877 (L); 9 xi 1996, *Reynuso & R.S. Majaducon* 24958 (L). Cebu Island: Cantipla, 26 iii 1971, *Anon.* 10 (L); i 1994, *D. Bicknel* 804 (K). Leyte Island: 30 viii 1913, *C.A. Wenzel* 517 (BM). Luzon Island: 1861, *A.F. Jagor* 814 (B); Aurora, Brgy. Bianoan, 19 iii 1993, *Barbon* et al. 9299 (PNH); Cagayan Province: Claveria, 3 viii 1995, *Garcia* et al. (L); Leyte, 10 iii 1914, *C.A. Wenzel* 634 (BM); Mt Dimaxinggay, 13 iii 1993, *Barbon* et al. 9202 (L, PNH); Ilocos Norte Province: Bangui, viii 1918, *M. Ramos* 33037 (L); Apayao, v 1917, *E. Fenix* 28141 (BO, K, P); Ifugao: Lake Ambuaya, 29 iii 1991, *Reynoso* et al. 7283 (K); Camarines: Mt Isaro(g), xi–xii 1913, *M. Ramos* 22017 (BM, L); Cavite Province: Mt Palay Palay Nat. Park., 22 iii 1995, *Reynoso* et al. 14957 (L); Quezon: Polillo Island, *C.B. Robinson* 6903 (BO, L, P); Labra Prov.: Poblacion Gangal, 14 xi 1996, *A.F. Fuentes* 38594 (L); San Jose Village: San Mariano: Bo. Disulap, 26 iv 1961, *H. Gutierrez* 78078 (L); Laguna, vi–viii 1915, *R.C. McGregor* 22801 (P); Bataan: Mt Mariveles: Lamao River, 13 i 1904, *R.S. Williams* 523 (K); Tayabas: iii 1888, *O. Warburg* 13086 (B); Atimonan, iii 1905, *E.D. Merrill* 4409 (B, K, P); Casiguran, v–vi 1925, *M. Ramos & G. Edano* 45733 (BM); Mauban, i 1913, *M. Ramos* 19481 (BM, L); Albay Province, Mt Malinao, 29 i 1956, *G. Edano* 34447 (L); Mayon Volcano, 2 vi 1953, *D.R.*

Mendoza 18312 (L); Taqui River, 27 x 1995, *Reynoso* et al. 21272 (L); Mt Malinao, 29 x 1995, *Reynoso* et al. 21354 (L); Mt Mayon, 17 ix 1991, *Reynoso* et al. 3506 (K, L). Isabela Province: San Jose Village, 6 iii 1997, *Reynoso* et al. 2008 (L); Malunu, O. Warburg 11792 (B); 6 iii 1997, *P. Wilkie* et al. 29008 (E, K). Sorsogon: vii–viii 1915, *M. Ramos* 23437 (B, P); Irosin, v 1957, *G. Edano & H. Guiterrez* 38546 (BM, K, L); Mt Bulusan, vii 1915, *A.D.E. Elmer* 16661 (BM, BO, K, L). Mindanao Island: Agusan: Mt Urdaneta, viii 1912, *A.D.E. Elmer* 13494 (BM, BO, E, K, L, U); Butuan: Ojot River, 21 vi 1961, *D.R. Mendoza* 42468 (L); Zamboanga: Mt Tubuan, x 1919, *M. Ramos & G. Edano* 36654 (BM, BO); Basilan, viii–ix 1912, *J. Reillo* 16142 (BM, L, P). Mindoro Island: Sibuang River, 12 ii 1985, *C.E. Ridsdale* 831 (L); Mt Halcon, i–ii 1948, *G. Edano* 2492 (BO); i–ii 1948, *G. Edano* 3492 (BO); iii 1922, *M. Ramos & G. Edano* 40679 (K); Lantuyan, 29 iii 1991, *Anon.* 440 (K, L); Baco River, *E.D. Merrill* 991 (B, K, P). Negros: Negros Occidental: Mt Katugasan, iii 1954, *G. Edano* 21819 (K, L). Panay Island: Capiz: Libacao, v–vi 1919, *A. Martelino* 35397 (B, BM, K, P); Aklan Province: Libacao: Poblacion, *C.I. Peng & R.R. Rubite* 23801 (HAST). Samar Island: Laquilacon, vi 1924, *McGregor* 437559 (BM).

Begonia rieckei is a common species in eastern Malesia and is morphologically highly variable. Several species have been described in the *Begonia rieckei* complex, but the distinguishing characters are often minor and therefore we advocate a wider concept (see Hughes, 2008).

Previously, some of the taxa in the *Begonia rieckei* complex, including *B. axillipara*, *B. brachybotrys* and *B. pseudolateralis*, were incorrectly classified under *Begonia* sect. *Sphenanthera* (the section is now synonymised under *Begonia* sect. *Platycentrum*, see Moonlight *et al.*, 2018), primarily based on the presence of fleshy fruits. Tebbitt (2000) revised and transferred them into *Begonia* sect. *Petermannia* because they have some typical characters of the section, such as female flowers with five tepals, male flowers with two tepals, and anthers dehiscing through unilaterally positioned slits, and the anther connectives are not extended as is typical for species in *Begonia* sect. *Platycentrum*. This placement was confirmed by chloroplast DNA data, which indicated that the *Begonia rieckei* complex is nested within a clade of Sulawesi endemics (Thomas *et al.*, 2012).

Tebbitt (2000) and Tebbitt & Dickson (2000) kept some taxa in the species complex separate, including *Begonia brachybotrys* (New Guinea) and *B. pseudolateralis* (the Philippines), based on differences in the leaf margin and venation characters. However, all the species have very characteristic generative structures in common, including compressed, cymose, bisexual inflorescences with up to 12 female flowers and 25 male flowers, and fleshy indehiscent fruit that are wingless or have poorly developed wings.

16. Begonia rolandfadlii Dayanti, Ramadanil & D.C.Thomas [§ *Petermannia*], Phytotaxa 439(2): 140 (2020). – Type: Indonesia, Sulawesi, Central Sulawesi, Gunung Sidole, Aloo Village, 26 xii 2018, *E.P. Dayanti* ED9 (holotype BO, isotype CEB).

Distribution. Indonesia: endemic to Sulawesi, Central Sulawesi Province (western North biogeographical region). Known from only Gunung Sidole (see **Figure 2**).

Habitat. Primary upland forest, terrestrially on steep slopes with thick leaf litter layer, in dense shade, at c.930 m elevation.

Proposed IUCN conservation category. Vulnerable (VU D2) (Dayanti *et al.*, 2020).

17. Begonia sidolensis Dayanti, Ramadanil & Ardi [§ *Petermannia*], Phytotaxa 439(2): 137 (2020). – Type: Indonesia, Sulawesi, Central Sulawesi, Gunung Sidole, Aloo Village, 2 xii 2018, *E.P. Dayanti* ED12 (holotype BO, isotype CEB).

Distribution. Indonesia: endemic to Sulawesi, Central Sulawesi Province (western North biogeographical region), Mount Lolombulan (see **Figure 2**).

Habitat. Montane rain forests growing terrestrially on steep slopes in dense shade at 1700–1900 m elevation.

Proposed IUCN conservation category. Vulnerable (VU D2) (Dayanti *et al.*, 2020).

18. Begonia sojolensis D.C.Thomas & Ardi, **sp. nov.** § *Petermannia*
Differs from all other Sulawesi species in *Begonia* sect. *Petermannia* by its inflorescence morphology. The female flowers are solitary, borne one node below the male inflorescence on a very short side branch (equivalent to the peduncle in species with 2-flowered inflorescences), and the male inflorescence is a compound thyrse with lateral branches bearing 1–3 monochasia, each with short but clearly developed internodes (not strongly compressed like in many other Sulawesi species). This inflorescence morphology, in combination with other distinctive characters such as small male flower tepals (4–5 × 4–5 mm) and the recurved fruit pedicel, differentiate this species from other species in the section. – Type: Indonesia, Sulawesi, Central Sulawesi, Donggala Regency, Gunung Sojol, 8 viii 2018, *W.H. Ardi* WI311 (holotype BO; isotypes FIPIA, SING). **Figure 13**.

Perennial, monoecious herb, erect, up to c.40 cm tall. *Stem* branched, sparsely hairy with bristly hairs and microscopic glandular hairs; internodes 5–8.5 cm long, brownish. *Leaves* basifixed, alternate; *stipules* caducous, 6–8 × 2.5–4 mm, elliptic, with an abaxially slightly prominent midrib, apex narrowed into a bristle projecting up to 1 mm, brownish-reddish, abaxially sparsely pubescent; *petioles* 3–8 cm long, glabrescent, concolorous with the stem; *lamina* 12.5–19 × 6.5–8.5 cm, asymmetrical, elliptic to obovate, base cordate and lobes not overlapping, apex acuminate, margin subentire, adaxial surface green with very sparse indumentum of bristly hairs between the veins, abaxial surface pale green, hairy with bristle hairs on the veins; *venation* palmate-pinnate, primary veins (5–)6–7, actinodromous, secondary veins craspedodromous. *Inflorescences* protogynous; female flowers solitary, borne on short side branches 1–1.5 mm long (equivalent to the peduncle in species with 2-flowered female inflorescences); *male inflorescence* a compound thyrse with multiple lateral branches, each carrying 1–4 monochasial partial inflorescences, each with 2–10

Figure 13. *Begonia sojolensis* D.C.Thomas & Ardi, sp. nov. A, Habit; B, stipule; C, male inflorescence; D, female flower (side view); E, male flower (front view); F, female flower (front view); G, male inflorescence and fruit; H, ovary (cross-section of middle part). A–E, G and H from *W.H. Ardi* WI311; F from *Zulfadly* ZF44. Photographs: A–E, G and H, W. H. Ardi; F, Zulfadly.

flowers, peduncle of partial inflorescences up to 1.5 mm long, bracts caducous. *Male flowers*: *pedicels* 3–4.5 mm long, white, puberulent; *tepals* 2, white or white with greenish margin, 4–5 × 4–5 mm, broadly ovate to suborbicular, base slightly cordate, apex rounded, outer surface puberulent; androecium of 23–35 stamens, yellow, filaments 0.5–1 mm long, slightly fused at the very base, anthers 0.5–1 mm long, oblong to obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* c.5 mm long, reddish, scabrous; *tepals* 5, white or white tinged with green, unequal, one smaller, 5 × 2.5 mm, elliptic, four larger tepals 5–9 × 5–7 mm, ovate, outer surface hairy with microscopic, glandular hairs; *ovary* (excluding wings) 11.5 × 2.5 mm, cylindrical, white-cream, sparsely hairy with short bristly hairs and microscopic glandular hairs, locules 3, placentation axile, placentae bilamellate, wings 3, equal, green, base rounded to cuneate, margin entire, apex truncate, up to 3.5 mm at the widest point (apically or subapically); *style* c.3.5 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruits*: *peduncles* 1–2 mm long; *pedicels* 6.5–10 mm long; *seed-bearing part* cylindrical, 12–16 × 4–6 mm (excluding the wings), glabrous, dehiscent, splitting along the wing attachment, wing shape as for ovary, up to 6 mm at the widest point (apically or subapically). *Seeds* barrel-shaped, c.0.15 mm long.

Distribution. Indonesia: endemic to Sulawesi, Central Sulawesi Province (western North biogeographical region), Gunung Sojol, Toli-toli (see **Figure 2**).

Habitat. *Begonia sojolensis* grows in lowland forest, in disturbed habitats, on stream embankments and rocky slopes, in full shade, at c.200 m elevation.

Etymology. The specific epithet refers to the type locality, Mount Sojol, where the type specimen was collected.

Proposed IUCN conservation category. Data Deficient (DD). This species is known from only two localities (the Mount Sojol Forest Reserve and Toli-toli). The forests of Mount Sojol and the wider area are very poorly collected and explored. Consequently, we assess this species as Data Deficient (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Western North Sulawesi**: Mt Sojol, 25 ii 2000, *Argent* et al. 00152 (E, L); Toli-toli, 18 i 2019, *Zulfadly* ZF44 (BO, FIPIA).

The complex inflorescence architecture (a compound thyrse) with lateral branches bearing multiple monochasia with short but clearly developed internodes (not compressed-subumbellate) immediately differentiate *Begonia sojolensis* from other Sulawesi *Begonia* species. This inflorescence morphology, in combination with the relatively small-tepalled male flowers, seems more similar to that of several species of *Begonia* sect. *Petermannia* from Borneo, such as *B. stenogyna* Sands. However, the new species is otherwise morphologically very different: it can be easily differentiated by its smaller habit (up to

40 cm tall) and smaller elliptic stipules (6–8 × 2.5–4 mm), in contrast to *B. stenogyna*, which is much more robust (up to 2.5 m tall) and has much larger, lanceolate stipules (18–25 × 6–9 mm). The leaf lamina of *Begonia sojolensis* is elliptic to slightly obovate, as well as smaller (12.5–19 × 6.5–8.5 cm), and the adaxial surface is sparsely hairy with bristly hairs between the veins (vs leaf lamina broadly lanceolate, 15.5–22.5 × 6.2–12.5 cm, and adaxially glabrous). Moreover, the fruit morphology is different and the seed-bearing part of the fruit of *Begonia sojolensis* is much smaller (1.2–1.6 × 0.4–0.6 cm vs 3.5–4.3 × 0.4–0.7 cm; measurements excluding the wings).

19. Begonia strachwitzii Warb. ex Irmsch. [§ *Petermannia*], Bot. Jahrb. Syst. 50: 357 (1913). – Type: Indonesia, Sulawesi, Minahasa, Bojong, *O. Warburg* 15192 (holotype B [B100238025], isotype B [B100238026]). **Figure 14.**

Perennial, monoecious herb, erect, up to c.30 cm tall. *Stem* branched; internodes 2.5–7.5 cm long, slightly swollen at the nodes, brownish-reddish, densely hairy. *Leaves* basifixed, alternate; *stipules* semi-persistent, 6.5–8 × 3–4 mm, ovate to oblong, with an abaxially slightly prominent midrib, apex narrowed into bristle projecting up to 3 mm, margin entire and keeled, pale green, translucent at the margin, abaxially hairy; *petioles* 3–9.5 cm long, terete, not channelled, concolorous with the stem, densely hirsute; *lamina* 7.5–12 × 4.5–9 cm, asymmetrical, ovate to suborbicular, base cordate and lobes not or just slightly overlapping, apex acuminate, margin dentate-denticulate, adaxial surface green, with red veins, glabrous, abaxial pale green, glabrous; *venation* palmate-pinnate, primary veins 6–8, actinodromous, secondary veins craspedodromous. *Inflorescences* protogynous; *female inflorescences* basal to male, 2-flowered, peduncles 5–10 mm long; *male inflorescence* a thyrse, with up to 5 (or 6) cymose partial inflorescences, each branching dichasially or dichasially at the base and monochasially in the distal part, with up to 10 flowers, peduncle of partial inflorescence c.15 mm long, bracts caducous. *Male flowers*: *pedicels* 10–15 mm long, white-pinkish, glabrous; *tepals* 2, white to white tinged with pink, 7–11.5 × 6–11.5 mm, ovate to broadly ovate, base slightly cordate, apex rounded, outer surface glabrous; *androecium* of c.20–25 stamens, yellow, filaments up to c.1 mm long, slightly fused at the very base, anthers up to c.1 mm long, oblong to narrowly obovate, dehiscing through unilaterally positioned slits that are c.1/2 as long as the anthers. *Female flowers*: *pedicels* 7–12 cm long, pale green, glabrous; *tepals* 5, white, subequal, 9–12 × 3–5 mm, ovate to elliptic, outer surface hairy; *ovary* (excluding wings) c.6–8 × 3 mm, cylindrical, pale green with red longitudinal lines along the middle of the ovary and along the wing attachment, glabrous, locules 3, placentation axile, placentae bilamellate, wings 3, equal, pale green, base mostly cuneate, sometimes rounded, apex truncate, up to 4 mm at the widest point (apically or subapically); *style* c.2.5 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. *Fruits*: *peduncles* c.5–10 mm long; *pedicels* 5–15 mm long, recurved; *seed-bearing*

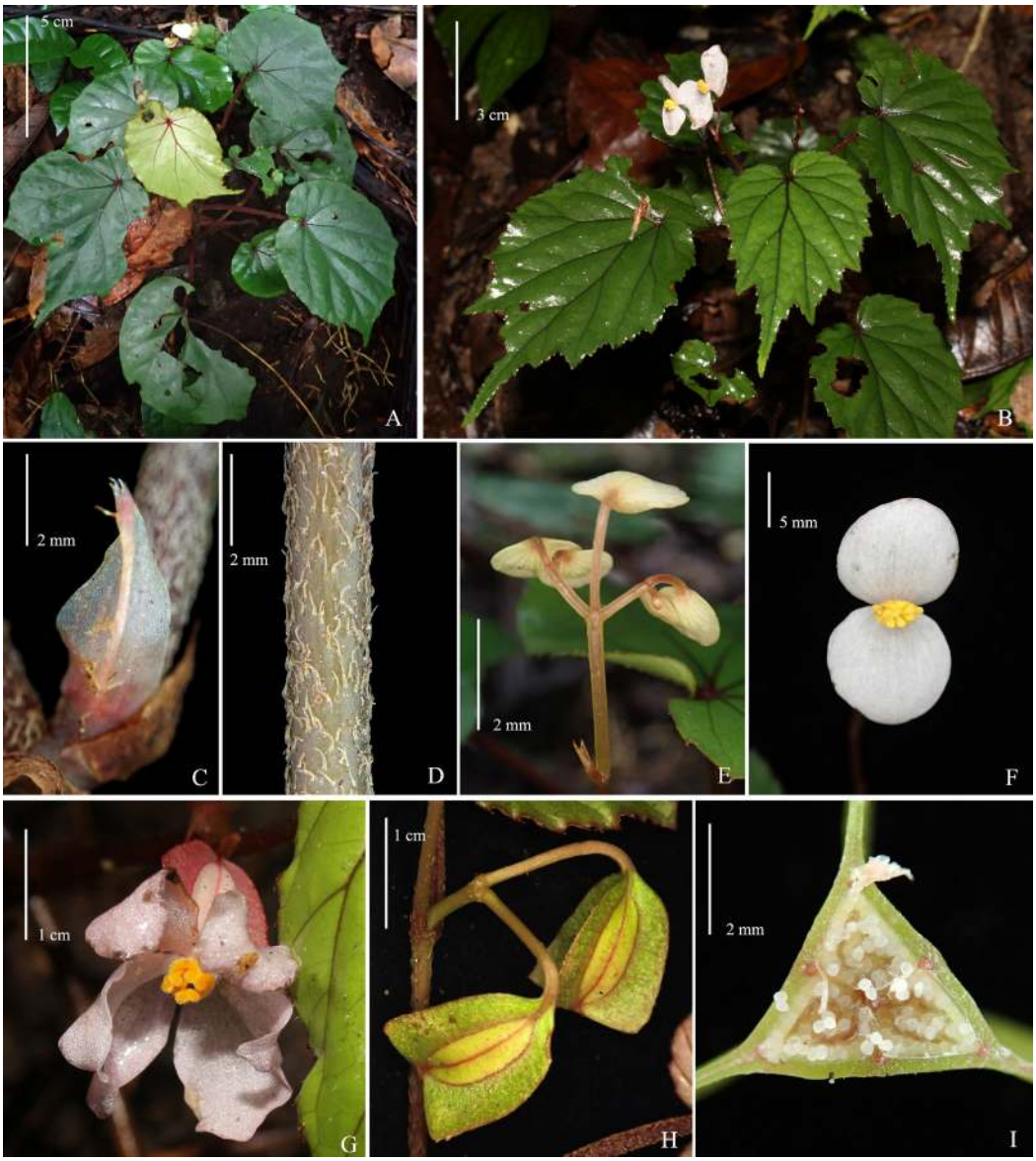

Figure 14. *Begonia strachwitzii*. A, Habit (WI407); B, habit (BAAK 6); C, stipule; D, hairy petiole; E, male inflorescence; F, male flower (front view); G, female flower; H, infructescence; I, ovary (cross-section of middle part). A, C–F, H and I from *W.H. Ardi* WI407; B and G from *S. Barber* et al. BAAK6. Photographs: A, C–F, H and I, W.H. Ardi; B and G, S. Barber.

part ellipsoid, 10–13 × 3–4.5 mm (excluding the wings), light green with red longitudinal lines along the middle part and the wing attachment, glabrous, dehiscent, splitting along the wing attachment, wing shape as for ovary, up to 7 mm at the widest point (apically or subapically). *Seeds* barrel-shaped, c.0.2 mm long.

Distribution. Indonesia: endemic to Sulawesi, North Sulawesi Province (eastern and central North biogeographical regions), Mount Lolombulan and Bolaang Mongondow (see **Figure 2**).

Habitat. Growing terrestrially on the humus-covered slopes of secondary lowland to hill forest, in full shade, at 190–800 m elevation.

Proposed IUCN conservation category. Vulnerable (VU D2). *Begonia strachwitzii* is known from a few collections from the northern arm of Sulawesi (Gunung Lolombulan and Tapakolintang). The forest at the type locality and the wider area around it is in relatively fair condition. There are, however, signs of anthropogenic threats, such as clove plantations, in the lower montane forest of Gunung Lolombulan. Because of the very restricted range (EOO, 54 km^2; AOO, 8 km^2), the limited number of observed populations, and the poor state of and pressures on lowland rain forest habitats on Sulawesi, the status of Vulnerable seems warranted (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. Indonesia. Sulawesi. **Northern arm of Sulawesi**. **Eastern North Sulawesi**: Minahasa, Bojong, *s.d.*, *O. Warburg* 15191 (B); Mongondow Selatan, Tapakolintang, 29 x 2016, *S. Barber* et al BAAK 6 (BO, E); Mount Lolombulan, above Boyong atas, 24 ii 2008, *J. Kinho & A.D. Poulsen* 170 (BO, E); Desa Boyong, 4 ii 2019, *W.H. Ardi* WI407 (BO, SING).

20. Begonia willemii Ardi, Girm. & D.C.Thomas [§ *Petermannia*], Taiwania 66(3): 374 (2021). – Type: Indonesia, Sulawesi, Central Sulawesi, Luwuk Banggai District, Hanga-hanga waterfall, 4 vi 2016, *D. Girmansyah* 2470 (holotype BO; isotypes CEB, E).

Distribution. Indonesia: endemic to Sulawesi, Gorontalo and Central Sulawesi Provinces (see **Figure 2**).

Habitat. Lowland forest on limestone karst, on limestone rock walls or terrestrially at the base of limestone cliffs, in partial to dense shade, at 10–50 m elevation.

Proposed IUCN conservation category. Near Threatened (NT) (Ardi *et al.*, 2021).

Additional specimens examined. Indonesia. Sulawesi. **Northern arm of Sulawesi**. **Western North Sulawesi**: Toli-toli regency, 16 i 2019, *Zulfadli* ZF42 (BO, SING). **Central North Sulawesi**: Gorontalo, Gunung Boliohutu, 22 iv 2002, *M. Mendum* et al. 155 (BO, E); 14 iii 2008, *K. Amstrong* 364 (E).

Central Sulawesi Province: Buol, 15 viii 1894, *Sarasin* 683 (K); 15 viii 1894, *Sarasin* 689 (B); Luwuk Banggai regency: Hanga-hanga Waterfall, 8 ii 2019, *W.H. Ardi* et al. WI413 (BO, KRB, SING); Batu tikar waterfall, 9 ii 2019, *W.H. Ardi* et al. WI415 (BO, KRB, SING); 9 ii 2019, *W.H. Ardi* et al. WI416 (BO, KRB, SING); Salodik, 11 ii 2019, *W.H. Ardi* et al. WI422 (BO, SING); Bunta, 14 ii 2019, *W.H. Ardi* et al. WI428 (BO, KRB, SING).

Introduced species

21. Begonia cucullata Willd. [§ *Ephemera*], Sp. Pl. 4: 414 (1805). – Type: Habitat in Brasilia, *s. coll.*, *s.n.* (type B-W 17567).

Additional literature. Kiew (2005) [description, line drawing and photographic plate]; Martin *et al.* (2017) [synonymy].

Distribution. Native to South America (Bolivia, Brazil and North Argentina); naturalised in many areas of Asia, including Bangladesh, China, India, Indonesia (Bali, Java, Sulawesi, Sumatra), Malaysia, the Philippines, Taiwan; Africa (South Africa, Mauritius); and Central and North America (Mexico, USA). In Sulawesi, recorded from the North and Central Provinces.

Habitat. This species is often found naturalised in strongly disturbed vegetation, including forest borders, home gardens, plantations, and other open areas.

Proposed IUCN conservation category. Least Concern (LC). *Begonia cucullata* is an introduced species from the Neotropics. The species has been naturalised in many regions of Indonesia.

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Eastern North Sulawesi**: Minahasa, Kongkoan, 4 ii 2019, *W.H. Ardi* WI404 (BO).

Central Sulawesi Province: Poso, Napu Valley, 4 viii 2018, *W.H. Ardi* WI294 (BO).

22. Begonia hirtella Link [§ *Ephemera*], Enum. Hort. Berol. Alt. 2: 396 (1822). – Type: Brazilia, *Sellow F.* 2192 (neotype B [B100243031], designated by Kollmann [2020]; isoneotypes B [2 sheets]).

Additional literature. Kiew (2005) [description, line drawing and photographic plate]; Girmansyah (2014) [distribution map]; Kollmann (2020) [lectotypification].

Distribution. Native to South America (Bolivia, South Brazil, Southeast Brazil, Colombia, Jamaica, Peru, Venezuela). Naturalised in many areas in Asia, including Sri Lanka, Taiwan, Malaysia and Indonesia (Bali, Java, Sulawesi, Sumatra), as well as in Australia. In Sulawesi, recorded from the North and West Provinces.

Habitat. This species is often found naturalised in strongly disturbed vegetation, including forest borders, home gardens, plantations, and other open areas.

Proposed IUCN conservation category. Least Concern (LC). *Begonia hirtella* is an introduced species from the Neotropics. The species has been naturalised in many regions in Indonesia.

Additional specimens examined. INDONESIA. Sulawesi. **Northern arm of Sulawesi**. **Eastern North Sulawesi**: Kali Waterfall, 31 i 2019, *W.H. Ardi* WI394 (BO); Tomohon, Masarang, 2 ii 2019, *W.H. Ardi* WI396 (BO); Minahasa, Tumpaan–Kongkoan Road divide, 5 ii 2019, *W.H. Ardi* WI411 (BO).

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