EDINBURGH JOURNAL OF BOTANY 79, *Begonia* special issue, Article 407: 1–66 (2022). https://doi.org/10.24823/EJB.2022.407

Published by the Royal Botanic Garden Edinburgh
ISSN (online): 1474-0036, ISSN (print): 0960-4286

AN UPDATED CHECKLIST AND KEY TO THE SPECIES OF BOLIVIAN *BEGONIA*, INCLUDING ONE NEW SPECIES

P. W. Moonlight[1] **& A. F. Fuentes**[2,3]

Bolivian *Begonia* are among the most poorly studied of American begonias. We provide here a checklist and key to the Bolivian *Begonia* flora, which currently includes ten sections, 43 species, three subspecies and three varieties. We also fully discuss the nomenclature and typification of all Bolivian *Begonia* species and designate 16 lectotypes. We describe and provide an illustration of one new species and provide emended descriptions for eight species. We have assessed six species for extinction risk under IUCN Red List criteria and provide four new synonyms. We compare our checklist with previous treatments of Bolivian *Begonia* and discuss all changes in detail.

Las begonias de Bolivia se encuentran entre las begonias americanas menos estudiadas. Proporcionamos una lista de verificación y una clave para la flora de begonias de Bolivia, que actualmente incluye diez secciones, 43 especies, tres subespecies y tres variedades. También proporcionamos una discusión completa de la nomenclatura y tipificación de todas las especies bolivianas de *Begonia* y designamos 16 lectotipos. Describimos e ilustramos una nueva especie y adicionamos descripciones corregidas para ocho especies. Evaluamos seis especies en riesgo de extinción según los criterios de la lista roja de la UICN y proponemos cuatro nuevos sinónimos. Comparamos nuestra lista de verificación con tratamientos anteriores sobre las begonias bolivianas y discutimos todos los cambios en detalle.

Keywords. *Begonia*, Bolivia, checklist, Neotropics, nomenclature.
Received 5 August 2021 Accepted 14 February 2022 Published 18 August 2022

Introduction

The Begoniaceae of South America are a relatively well-studied family because the Begoniaceae of all South American countries except Paraguay and Uruguay have been revised. The Brazilian Begoniaceae were last revised in full in the nineteenth century (de Candolle, 1861) and are currently being revised for the Flora do Brasil project (Brazil Flora Group, 2015). Most other South American country-level floristic accounts were carried out by US botanist Lyman B. Smith from 1941 to 1989, in collaboration with Bernice G. Schubert (Smith & Schubert, 1941a, 1941b, 1944a, 1944b, 1946a, 1946b, 1946c) and later with Dieter C. Wasshausen (Smith & Wasshausen, 1986, 1989).

Smith and Schubert's earliest floristic accounts are in urgent need of revision for three reasons. First, until the 1950s, Smith and Schubert worked exclusively on specimens housed

[1] Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, Scotland, UK. E-mail: p.moonlight@rbge.ac.uk.
[2] Herbario Nacional de Bolivia, Correo Central Cajón Postal 10777, La Paz, Bolivia.
[3] Missouri Botanical Garden, St Louis, Missouri 63166-0299, USA.

in herbaria in the USA. These herbaria include some photographs of type specimens in European herbaria (Grimé, 1987), but by no means do these cover all species. Their earlier floristic accounts therefore lack reference to specimens and sometimes species that were not represented in United States herbaria. For example, their account for the *Flora of Peru* includes only 41 of the 47 names described from Peru before their account was published (Smith & Schubert, 1941a) so was out of date even as it was published.

Second, contemporaneously to Smith and Schubert, the German botanist Edgar Irmscher was working intensively on the Begoniaceae of South America (Irmscher, 1949). Irmscher's work was based primarily on material, held in European herbaria, that were unavailable to Smith and Schubert. Also, Irmscher was inclined to split species much more finely than Smith and Schubert, so he recognised and described many new species. None of the names Irmscher described are represented in Smith and Schubert's early floras. Irmscher, and Smith and Schubert, also independently described several of the same species, including from duplicates of the same collection, for example *Begonia weberbaueri* Irmsch. (Irmscher, 1953) and *B. lichenoides* L.B.Sm. & B.G.Schub. (Smith & Schubert, 1963).

Third, more new species are currently being described in the genus *Begonia* than in any other group of angiosperms (Moonlight *et al.*, 2018). Since the year 2000, 13 new taxa have been described from Peru and nine from Bolivia, with several awaiting formal description. In January 2018, the number of accepted species of *Begonia* was 1870 (Moonlight *et al.*, 2018), but in January 2021 the total exceeded 2000 species for the first time (Hughes *et al.*, 2015–). Recent revisions of small groups of Andean *Begonia* (e.g. Tebbitt *et al.*, 2018a, 2020) and *Begonia* sect. *Australes* L.B.Sm. & B.G.Schub. (Tebbitt, 2020) have also published several new synonyms. The published floras of Peru and Bolivia therefore lack many recently published taxonomic novelties and synonyms.

Smith and Schubert's early floristic accounts of *Begonia*, and in particular their Peruvian and Bolivian accounts, are therefore in need of revision. Similarly, the checklists of Peru (Brako & Zarucchi, 1993) and Bolivia (Wasshausen *et al.*, 2013) are out of date and include many synonyms and misapplied names. The lead author is currently preparing a floristic account of the *Begonia* of Peru (Moonlight *et al.*, in review). During this process it has become clear that an up-to-date checklist of Bolivian *Begonia* is needed that includes the publication of undescribed species from Bolivia, the lectotypification of several Bolivian *Begonia* species, and emended descriptions of several species. We prioritised emended descriptions species with minimal, ambiguous descriptions against those covered in recent publications (e.g. Tebbitt, 2020). We were unable to provide descriptions for several species in *Begonia* sect. *Hydristyles* A.DC. and *Begonia* sect. *Ruizopavonia* A.DC. because their species delimitations remain dubious (see *Discussion*). We hope our contribution will stimulate further taxonomic work on the begonias of Bolivia, including a new floristic treatment.

Materials and methods

The checklist is based on the Begonia Resource Centre (Hughes *et al.*, 2015–), a relational database including all published names in the Begoniaceae, nomenclatural types and literature records for most names, and > 50 k specimen records. All Bolivian specimen records in Tropicos (Tropicos.org, continuously updated) were imported into the database and supplemented with manually entered records from the following herbaria: B, BM, BOL, BR, C, CAS, E, F, G, GB, G-BOIS, G-DC, GH, K, LBP, M, MO, NY, P, RB, S, UC, US, USM, W and Z (herbarium codes follow Thiers, continuously updated).

We have attempted to confirm the application of all names applied in Bolivia, either in the literature or in herbaria, by comparing specimens with nomenclatural types. All names misapplied in Bolivia in the literature are cited in our checklist. During this process we have also identified two species new to science. We describe one of these species but are unable to describe the second because the known material is insufficient. A full exsiccatae list is provided (see **Appendix**), but note that determinations for poorly known members of *Begonia* sect. *Hydristyles* and *Ruizopavonia* should be treated with caution (see *Discussion*).

Where possible, we have typified all names of currently accepted Bolivian *Begonia* species and synonyms with type material from Bolivia. We have not cited or typified synonyms of widespread *Begonia* species that have not been applied in Bolivia, for example synonyms of *Begonia fischeri* Schrank (Schrank, 1820) and *B. glabra* Aubl. (Aublet, 1775). For a full list of synonyms of widespread Bolivian species and their types, please refer to the Begonia Resource Centre (Hughes *et al.*, 2015–). All new typifications are discussed in full and we provide barcodes and stable identifiers for all specimens, where possible.

We have not attempted to resolve the species-level taxonomy of difficult Bolivian *Begonia* groups, a description that particularly applies to *Begonia* sect. *Hydristyles* and *Begonia* sect. *Ruizopavonia*. Several of the names we cite apply to extremely similar species concepts, and we consider it likely that that a full taxonomic revision of Bolivian *Begonia* will prove them to be synonyms. All likely synonyms are discussed in full in the notes for each species. Where species concepts are clear, we have included identification notes.

We have organised species in our checklist into sections. Our sectional classification is based on Moonlight *et al.* (2018), which is the most recent collaborative and consensus-led subgeneric classification of the Begoniaceae. We provide a key to the sections of *Begonia* found in Bolivia, but note that this key is intended only to work with only the species found in Bolivia.

We do not follow a more recent classification by Shui (2019), which places most Andean species in a much-expanded *Begonia* sect. *Begonia*. Shui distinguishes this section as including non-tuberous perennials, but it includes several tuberous or short-lived species, whereas many Bolivian non-tuberous perennials are placed elsewhere. Furthermore, many closely related species are placed by Shui in different subgenera. For example, *Begonia*

acerifolia Kunth is allied to species including *B. velata* Irmsch. and *B. monadelpha* (Klotzsch) A.DC. (Moonlight *et al.*, 2018) but is placed by Shui (2019) in *Begonia* subg. *Pritzelia* (Klotzsch) Y.M.Shui & W.H.Chen, whereas its relatives are placed in *Begonia* subg. *Gobenia* (A.DC.) Y.M.Shui & W.H.Chen. We do not consider the classification of Shui (2019) herein.

Results

We recognise 43 species in Bolivia, including two species new to science, one of which we are unable to describe because of the limited material available. These species are members of 10 sections of *Begonia*, with two species currently unplaced to section. The largest sections of Bolivian *Begonia* are *Begonia* sect. *Australes* (11 species), *Begonia* sect. *Hydristyles* (8 species) and *Begonia* sect. *Ruizopavonia* A.DC. (7 species).

Our checklist differs significantly from the list of species covered by the most recent floristic treatment of Bolivian *Begonia* (Smith & Schubert, 1944a) and both previous checklists of Bolivian *Begonia* (Foster, 1958; Wasshausen *et al.*, 2013; **Table**). The latest floristic treatment included 30 names (29 species, one variety). Of these, we treat 21 as accepted names of Bolivian begonias, and nine are synonyms of Bolivian species (Smith & Schubert, 1944a). This treatment was the latest to include a key to all Bolivian *Begonia* species but is no longer fit for purpose because it lacks 23 taxa now considered as accepted and native to Bolivia under their accepted names. Similarly, the first checklist of Bolivian *Begonia* (Foster, 1958) included 33 accepted species. Of those, 23 are now treated as accepted names of Bolivian species, nine are synonyms of Bolivian species, and one is a misapplied name. The most recent checklist of Bolivian *Begonia* (Wasshausen *et al*., 2013) included 53 species, of which 34 are now accepted names of Bolivian species, eight are synonyms of Bolivian species, nine are misapplied names, one remains unresolved, and one was presumed to occur in Bolivia but no record of its occurrence has been found in any national or local herbaria, and in this paper, it is considered to not occur in Bolivia.

Our treatment includes 10 names that have never been included in a floristic treatment or checklist of Bolivian *Begonia*: seven newly or recently described taxa, one new record, one reinstated synonym and one undescribed taxon.

Table. Comparison of this treatment of the Bolivian *Begonia* flora with the previous floristic treatment (Smith & Schubert, 1944) and two previous checklists (Foster, 1958; Wasshausen *et al.*, 2013).

Treatment	Smith & Schubert (1944)	Foster (1958)	Wasshausen *et al.* (2013)	This treatment
Accepted species	30	33	53	43
Currently accepted species	21 (72%)	23 (70%)	34 (64%)	–
Synonyms	8 (28%)	9 (27%)	8 (15%)	–
Misapplied names	0	1 (3%)	9 (17%)	–
Other	–	–	2 (2%)	–

Taxonomic treatment

Key to the sections of Bolivian Begonia *species*

1a. Plant tuberous ____ 2
1b. Plant lacking a tuber, lower stem rarely swollen and resembling a tuber ____ 4

2a. Plant caulescent, with an aerial stem ____ *Begonia* sect. *Australes* (**1**)
2b. Plant acaulescent, lacking an aerial stem ____ 3

3a. Staminate flower with 4 tepals, styles bifid ____ Unplaced to section (**10**)
3b. Staminate flower with > 5 tepals, styles multifid ____ *Begonia* sect. *Eupetalum* (**4**)

4a. Plants vines, rooting at the nodes; leaves 3-veined to the base *Begonia* sect. *Wagneria* (**9**)
4b. Plants terrestrial herbs, rarely rooting at the lower nodes; leaves with pinnate, palmate-pinnate or palmate venation but never 3-veined from the base ____ 5

5a. Leaf venation pinnate ____ 6
5b. Leaf venation palmate-pinnate or palmate ____ 7

6a. Inflorescence a symmetrical cyme ____ *Begonia* sect. *Ruizopavonia* (**8**)
6b. Inflorescence an asymmetrical cyme ____ *Begonia* sect. *Cyathocnemis* (**2**)

7a. Leaf margins lobed ____ 8
7b. Leaf margins lacking lobes ____ 9

8a. Leaves > 30 × 25 cm, glabrous or with a soft indumentum; inflorescences with < 75 flowers ____ *Begonia* sect. *Knesebeckia* (**6**)
8b. Leaves > 30 × 30 cm, with an abrasive indumentum; inflorescences with > 100 flowers *Begonia* sect. *Pritzelia* (**7**)

9a. Plants short-lived herbs, generally reaching maturity at < 50 cm high; venation palmate, lacking a clear primary vein ____ *Begonia* sect. *Ephemera* (**3**)
9b. Plants perrenials, generally reaching maturity at > 50 cm high; leaf venation palmate-pinnate or pinnate, with a clear primary vein ____ 10

10a. Styles bifid ____ *Begonia* sect. *Cyathocnemis* (**2**)
10b. Styles multifid ____ *Begonia* sect. *Hydristyles* (**5**)

Key to Bolivian Begonia *species*

1a. Plant tuberous or rhizomatous ____ 2
1b. Plant lacking a tuber or rhizome ____ 21

2a. Plant rhizomatous ____ 3
2b. Plants tuberous ____ 5

3a. Petiole with a collar of hairs where the petiole joins the leaf blade *B. leathermaniae* (**31**)
3b. Petiole glabrous where the petiole joins the leaf blade ____ 4

4a. Ovary and fruit with one long wing and two rib-like wings; leaf laminae peltate (in Bolivia) ____ *B. acerifolia* (**30**)
4b. Ovary and fruit with 3 subequal wings; leaf laminae basifixed or rarely peltate *B. wollnyi* (**32**)

5a. Plant caulescent, with an aerial stem ____ 6
5b. Plant acaulescent, lacking an aerial stem ____ 18

6a. Leaf blade symmetrical, reniform to orbicular, apex indistinct ____ *B. veitchii* (**10**)
6b. Leaf blade asymmetrical, lanceolate to ovate, rarely reniform, apex distinct, acute to acuminate ____ 7

7a. Leaf blades lanceolate; anthers united into a 4–25 mm long column ____ *B. boliviensis* (**1**)
7b. Leaf blades ovate, broadly ovate, orbicular or reniform; anthers free or united only at the base ____ 8

8a. Tepals yellow ____ 9
8b. Tepals white, pink, orange or red ____ 14

9a. Apex of the inner tepals on the staminate flower slightly notched ____ 10
9b. Apex of the inner tepals on the staminate flower not notched ____ 11

10a. Flowers vivid golden yellow; leaf upper surface dark green with pale green veins *B. chrysantha* (**2**)
10b. Flowers pale yellow; leaf upper surface concolorous green ____ *B. micranthera* (**7**)

11a. Indumentum glandular ____ *B. heliantha* (**Excluded names**)
11b. Indumentum non-glandular or lacking ____ 12

12a. Tepals spreading ____ *B. pearcei* (**8**)
12b. Tepals projecting forwards ____ 13

13a. Stem and petioles glabrous ____ *B. germaineana* (**4**)
13b. Stem and petioles tomentose ____ *B. krystofii* (**6**)

14a. Filaments attached to the anthers above their bases ____ 15
14b. Filaments attached to the base of the anthers ____ 16

15a. Tepal margins toothed; leaf margins irregularly dentate ____ *B. herrerae* (**5**)
15b. Tepal margins entire; leaf margins crenate ____ *B. weddelliana* (**11**)

16a. Tepals cinnabar red ____ *B. cinnabarina* (**3**)
16b. Tepals white or pink ____ 17

17a. Bract margins denticulate, ciliate _____ *B. phantasma* (**9**)
17b. Bract margins entire, aciliate _____ *B. micranthera* (**7**)

18a. Leaf blades peltate _____ *Begonia* sp. 1 (**43**)
18b. Leaf blades basifixed _____ 19

19a. Leaf upper surface concolorous green; staminate flowers with > 5 tepals, styles multifid _____ 20
19b. Leaf upper surface dark green, veins vivid green; staminate flowers with 4 tepals, styles bifid _____ *B. cremnophila* (**42**)

20a. Pistillate flower with paired bracteoles; tepals on the staminate flower > 13 mm wide *B. marinae* (**20**)
20b. Pistillate flower lacking bracteoles; tepals on the staminate flower < 11 mm wide *B. pleiopetala* (**21**)

21a. Leaves margins lobed _____ 22
21b. Leaves margins lacking lobes _____ 26

22a. Leaves > 30 × 30 cm, with an abrasive indumentum; inflorescences with > 100 flowers *B. parviflora* (**33**)
22b. Leaves < 30 × 25 cm, glabrous or with a soft indumentum; inflorescences with < 75 flowers _____ 23

23a. Stem green, succulent throughout; pistillate flowers with 2 tepals; largest fruit wing notched _____ *B. lophoptera* (**15**)
23b. Stem thickened, appearing woody at least at the base; pistillate flowers with 3 tepals; largest fruit wing not notched _____ 24

24a. Petiole apex with a ring of squamose hairs _____ *B. leathermaniae* (**31**)
24b. Petiole apex lacking a ring of squamose hairs _____ 25

25a. Leaf laminae basifixed or rarely peltate; ovary and fruit with three 3 subequal wings *B. wollnyi* (**32**)
25b. Leaf laminae peltate (in Bolivia); ovary and fruit with one long wing and two rib-like wings _____ *B. acerifolia* (**30**)

26a. Plant a climbing herb, rooting at the nodes; leaves 3-veined from base __ *B. glabra* (**41**)
26b. Plant a terrestrial to semi-scandent herb, not rooting from the nodes; leaves variously pinnate, palmate-pinnate or palmate but never 3-veined from the base _____ 27

27a. Leaf veins pinnate _____ 28
27b. Leaf veins palmate or palmate-pinnate _____ 33

28a. Stems sparsely to densely tomentose or hispid _____ 29
28b. Stems glabrous _____ 32

29a. Stipules persistent, transversely semi-orbicular or transversely ovate ____ *B. bangii* (**34**)
29b. Stipules deciduous or persistent, triangular _____ 30

30a. Leaf base rounded _____ *B. leptostyla* (**37**)
30b. Leaf base obliquely cordate _____ 31

31a. Stipules oblong-ovate; staminate tepals c.7.5 mm long _____ *B. varistyla* (**40**)
31b. Stipules elliptic; staminate tepals c.11 mm long _____ *B. buchtienii* (**35**)

32a. Leaves with 8–12 veins on the broad side of the lamina; pistillate flowers with 2 tepals *B. peruviana* (**39**)
32b. Leaves with 3–6 veins on the broad side of the lamina; pistillate flowers with 5 tepals *B. galea* (**14**)

33a. Pistillate flowers with 2 tepals _____ 34
33b. Pistillate flowers with 5 (or rarely 4) tepals _____ 35

34a. Leaves with a distinct apex and a clear primary vein; largest fruit wing unnotched ____ *B. bracteosa* (**13**)
34b. Leaf apices indistinct, without a clear, primary vein; largest fruit wing notched *B. lophoptera* (**15**)

35a. Plant generally reaching maturity at < 50 cm tall; leaf venation palmate, lacking a clear primary vein; usually rooting from the lower nodes _____ 36
35b. Plant generally reaching maturity at > 50 cm tall; leaf venation palmate-pinnate or pinnate, with a clear primary vein; never rooting from the lower nodes _____ 39

36a. Plant glabrous; leaf bases cucullate _____ *B. cucullata* (**17**)
36b. Plant variously pubescent; leaf bases truncate to cordate _____ 37

37a. Leaf blades reniform _____ *B. alchemilloides* (**16**)
37b. Leaf blades transversely ovate to deltate _____ 38

38a. Leaves with 3–7 veins from the base; inner tepals of the staminate flowers elliptic; stamens 12–20 _____ *B. fischeri* (**18**)
38b. Leaves with 7–9 veins from the base; inner tepals of the staminate flowers oblanceolate; stamens 8–12 _____ *B. subvillosa* (**19**)

39a. Styles bifid _____ 40
39b. Styles mutifid _____ 41

40a. Leaf blades lanceolate; stipules persistent _____ *B. comata* (**36**)
40b. Leaf blades transversely ovate; stipules deciduous _____ *B. alto-peruviana* (**12**)

41a. Leaf margins double-dentate _____ *B. unduavensis* (**28**)
41b. Leaf margins entire, serrulate, denticulate or crenulate _____ 42

42a. Leaf laminae lanceolate to oblanceolate ____ 43
42b. Leaf laminae transversely ovate ____ 44

43a. Stipule margins aciliate; inflorescences either unisexual or with staminate and pistillate flowers open at different times, bearing up to 4 flowers ____ *B. subcaudata* (**27**)
43b. Stipule margins long-ciliate; inflorescences with staminate and pistillate flowers open simultaneously, bearing up to 16 flowers ____ *B. oblanceolata* (**38**)

44a. Stipules persistent, retained on the stem after the leaves have been dropped ____ 45
44b. Stipules early deciduous, dropped before the leaf is mature ____ 46

45a. Leaves with 2–5 veins from the base; leaf margins entire to serrulate; tepals white to pink ____ *B. juntasensis* (**25**)
45b. Leaves with 7–12 veins from the base; leaf margins serrate; tepals red *B. santarosensis* (**26**)

46a. Plant sparsely to densely stellate-haired or lepidote-scaled ____ 47
46b. Plant glabrous or rarely sparsely pubescent, but never with stellate hairs or lepidote scales ____ 48

47a. Plant densely stellate haired ____ *B. andina* (**22**)
47b. Plant sparsely to densely lepidote scaled ____ *B. unilateralis* (**29**)

48a. Fruit wings subequal, the largest wing with straight edges and widest where it joins the ovary ____ *B. bridgesii* (**23**)

48b. Fruit wings unequal, the largest wing with rounded edges and widest halfway along its length ____ *B. fissistyla* (**24**)

Species descriptions

1. Begonia sect. **Australes** L.B.Sm. & B.G.Schub.

1.1. Begonia boliviensis A.DC., Ann. Sci. Nat. Bot. IV(11): 122 (1859). – Type: Bolivia, [Chuquisaca Department, Prov. Hernando Siles], 'Prov. Acero', xi–xii 1845, *H.A. Weddell* 3632 (lectotype P [P01900760] first stage designated in: Revista Univ. (Cuzco) 33(87): 78 (1944) by Smith, L.B. & Schubert, B.G.; second stage designated in: Fl. Argentina 17: 4 (2017) by Delfini, C.; isolectotypes F ex P [F0077407F], P [P01900761]); Bolivia, [Santa Cruz Department], Prov. Cordillera, xi–xii 1845, *H.A. Weddell* 4032 (syntype G-DC ex P [photograph F#7326], P [P05586847]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 78 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); M.C. Tebbitt, Begonian 79: 97 (2012); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 127: 383 (2013); Delfini, C. in Zuloaga, F.O. & Belgrano, M.J. (eds), Fl. Argentina 17: 4 (2017); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 69 (2020).

Distribution. Bolivia and Argentina.

Nomenclatural notes. Alphonse Pyramus de Candolle described *Begonia boliviensis* A.DC. based on material collected by H. A. Weddell. There are three sheets in Paris herbarium that were collected by Weddell and match de Candolle's description: *H.A. Weddell* 3632 (two sheets) and 4032 (one sheet). None of these sheets have determination slips on them to indicate they were seen by de Candolle, but there is a sheet of *H.A. Weddell* 4032 in de Candolle's herbarium in Geneva that he took from Paris herbarium and annotated as *Begonia boliviensis*, demonstrating that he considered this collection to be *B. boliviensis* (photograph F#7326). *H.A. Weddell* 4032 in Paris or Geneva would therefore be the logical choice of a lectotype. Unfortunately, Smith & Schubert (1944a) cited *H.A. Weddell* 3632 in Paris as the type. This counts as an effective first-stage lectotypification, because there are two sheets of this collection in Paris. Delfini (2017) selected sheet P01900760 as the lectotype, which effected the second stage of lectotypification.

Identification notes. This species is highly distinct and best recognised by its combination of a tuber, lanceolate leaf blades with a long-acuminate apex, and projecting tepals on both the staminate and pistillate flower. The androecium is also unique among Bolivian *Begonia* and consists of 30–100 stamens attached along the length of a 0.4–2.5 cm long column.

1.2. Begonia chrysantha Tebbitt, Brittonia 67(3): 224, fig. 2 (2015). – Type: Bolivia, Chuquisaca Department, Prov. Belisario Boeto, Nuevo Mundo, 18°59'S, 64°17'W, 2200 m, 3 i 1996, *J.R.I. Wood* 10351 (holotype HSB, isotype K).
M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 73 (2020).

Distribution. Endemic to Bolivia and Chuquisaca Department.

Identification notes. *Begonia chrysantha* is distinguished as a tuberous, caulescent species with notched, vivid golden-yellow tepals and a red indument. It can be distinguished from *Begonia heliantha* Tebbitt by its non-glandular hairs and from *B. pearcei* by its acute leaf apices (vs acuminate leaf apices). It also differs in its hairs, which are red throughout or red at the apices, whereas those of *Begonia pearcei* are white.

1.3. Begonia cinnabarina Hook., Bot. Mag. 75: t. 4483 (1849). – Type: t. 4883 in W.J. Hooker, Bot. Mag. 75: t. 4483, designated in: Edinburgh J. Bot. 75(2): 252 (2018) by Tebbitt, M.C., Andrada, A.R., Bulacio, E., Parada, G.A. & Ayharde, H.
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 77 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Washausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013); M.C. Tebbitt *et al.*, Edinburgh J. Bot. 75(2): 153 (2020); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 78 (2020).
Begonia aurantiaca hort. ex Planch. *nom. rej.*, Fl. Serres Jard. Eur. 8: 530 (1853).

Begonia micranthera var. *fimbriata* L.B.Sm. & B.G.Schub., Darwiniana 4: 98 (1941b). – Type: Argentina, Prov. Salta, Hills back of Tartagal, [22°30'S, 63°49'W], 500 m, 23 ii 1937, *J. West* 8413 (holotype GH [GH00068253], isotype MO [2: MO-313008, MO-1643427], NA [NA0026189], UC [UC565008]).
R.C. Foster, Contr. Gray Herb. 184: 137 (1958); M.C. Tebbitt *et al.*, Edinburgh J. Bot. 75(2): 153 (2020).

Distribution. Bolivia and Argentina.

Identification notes. *Begonia cinnabarina* is best recognised by its flowers with spreading, broadly ovate and bright cinnabar-red tepals with rounded apices. Two other tuberous Bolivian species have bright red tepals: *Begonia veitchii* Hook.f. and *B. boliviensis*. The former is best distinguished by its leaf blades, which have no distinct apex, whereas the tepals of *Begonia boliviensis* are lanceolate with acuminate apices and are held projecting.

1.4. Begonia germaineana Tebbitt, Brittonia 67(3): 222, fig. 1 (2015). – Type: Bolivia, Santa Cruz Department, Prov. Vallegrande, camino de Loma Larga a Algodonal, 18°46'S, 63°53'W, 1783 m, 28 i 2011, *G.A. Parada, Y. Inturias, S. Carreño & V.J. Rojas* 3016 (holotype USZ; isotypes FCQ, LPB, MO).
M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 83 (2020).

Distribution. Endemic to Bolivia and Santa Cruz Department.

Identification notes. *Begonia germaineana* is unique among tuberous, yellow-flowered *Begonia* in being glabrous throughout.

1.5. Begonia herrerae L.B.Sm. & B.G.Schub., Revista Univ. (Cuzco) 33(87): 91, fig. 15 (1944). – Type: Peru, Cuzco Region, Prov. Quispicanchis, San Pedro, Marcapata, [13°26'S, 70°54'W], 1200 m, 11 xii 1943, *C. Vargas C.* 3720 (lectotype GH [GH00068237] *designated here*, CUZ; isolectotypes LIL [LIL000954], MO [MO-2217106]).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 88 (2020).

Distribution. Bolivia and Peru.

Nomenclatural notes. The protologue of *Begonia herrerae* L.B.Sm. & B.G.Schub. cites duplicates of the type collection *Vargas* 3720 at CUZ and GH but does not specify either as the holotype (Smith & Schubert, 1944b). It is therefore appropriate to choose a lectotype from these duplicates. The sheet in GH (GH00068237) is an excellent specimen, including fruits and staminate and pistillate flowers. We therefore designate this sheet as the lectotype of *Begonia herrerae*.

Identification notes. *Begonia herrerae* is the only tuberous species of *Begonia* from Bolivia with serrated margins to its tepals.

1.6. Begonia krystofii Halda, Acta Mus. Richnov. Sect. Nat. 14: 110, t. II–V (2007). – Type: Bolivia, Chuquisaca Department, Wet vertical Rocks near Nuevo Mundo, [18°59'S, 64°18'W], 1750 m, *J.J. Halda* JJH7112003 (holotype PR).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 91 (2020).

Distribution. Endemic to Bolivia.

Identification notes. *Begonia krystofii* is the only yellow-flowered, tuberous species of Bolivian *Begonia* with a dense indumentum of white hairs on the leaf underside. These hairs turn red brown when handled (Tebbitt, 2020). It is also highly unusual among tuberous *Begonia* species in its unisexual inflorescences; however, this character should be used with care because most tuberous *Begonia* species are protandrous so may appear unisexual when young.

1.7.1. Begonia micranthera Griseb. subsp. **micranthera**, Abh. Konigl. Ges. Wiss. Gottigen 19: 148 (1874). – Type: Argentina, [Prov. Tucuman], Siambón, [26°42'S, 65°26'W], iii 1872, *P.G. Lorentz* 281 (lectotype GOET [GOET000317], designated in: Phytotaxa 314(1): 129 (2017) by Martín, C, Ospina, J.C. & Zanotti, C.A.).
A. Grisebach, Symb. Fl. Argent. 24: 136 (1879); L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 79 (1944); Tebbitt, Begonian 79: 99 (2012); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013); M.C. Tebbitt *et al.*, Edinburgh J. Bot. 75(2): 233 (2020); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 95 (2020).

Begonia crinita Oliv. ex Hook.f., Bot. Mag. 97, t. 5897 (1871). – Type: ex cult Veitch, 1866, *Unknown s.n.* (lectotype K [K000739955], designated in: Phytotaxa 407(1): 111 (2019) by Tebbitt, M.C.).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 78 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Begonia hirtella auct. non. Link, D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Begonia micranthera var. *venturii* auct. non. L.B.Sm. & B.G.Schub., L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 78 (1944).

Begonia micranthera var. *fimbriata* auct. non. L.B.Sm. & B.G.Schub., L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 78 (1944) *pro parte*.

Distribution. Bolivia and Argentina.

Synonymy notes. *Begonia hirtella* Link was included by Wasshausen *et al.* (2013) in their checklist of Bolivian *Begonia* based on the specimen *M. Liberman* 2148, which is held in LBP and US herbaria. This specimen represents a diminuative individual of *Begonia micranthera* subsp. *micranthera*.

Identification notes. *Begonia micranthera* is a widespread and common species that encompasses a large amount of morphological variation. It is the most common tuberous species of Bolivian *Begonia* with distinct leaf apices and can be distinguished from other such species by the combination of its small, inconspicuous bracts; its concolorous upper leaf surfaces; and its spreading tepals.

1.7.2. Begonia micranthera subsp. **albonervia** Tebbitt, Edinburgh J. Bot. 75(2): 248, figs 8–10 (2018). – Type: Bolivia, Santa Cruz Department, Prov. Florida, Bella Vista bosque Chiquitano, sendero ecológico 'El Chorro del El Fraile' sobre la orilla del río, 18°18'S, 63°40'W, 1210 m, 13 xii 2007, *D. Villarroel, N. Vargas, N. Vega, G. Córdova, O. Apaza & A. Yanana* 1687 (holotype MO [MO-2189224], isotype USZ).
M.C. Tebbitt *et al.*, Edinburgh J. Bot. 75(2): 248 (2020); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 102 (2020).

Distribution. Endemic to Bolivia.

Identification notes. This subspecies can be distinguished from the other subspecies of *Begonia micranthera* in Bolivia by its reniform to reniform-orbicular leaf blades, which have pale grey veins on the leaf blades (vs concolorous, elliptic to ovate leaf blades).

1.7.3. Begonia micranthera subsp. **rhacophylla** (Irmsch.) Tebbitt var. **rhacophylla** (Irmsch). L.B.Sm. & Wassh., Phytologia 54: 467 (1984). – Type: Argentina, Prov. Jujuy, Dep. Tumbaya, Volcan, Cerro Abra Paraguay, [23°55'S, 65°27'W], 2300 m, 14 ii 1927, *Venturi* 4948b (holotype US [US00115335]; isotypes B, LIL).

Begonia hieronymi var. *rhacophylla* Irmsch., Bot. Jahrb. Syst. 74: 619 (1949).
M.C. Tebbitt *et al.*, Edinburgh J. Bot. 75(2): 242 (2020); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 105 (2020).

Distribution. Bolivia and Argentina.

Identification notes. *Begonia micranthera* subsp. *rhacophylla* (Irmsch.) Tebbitt has two varieties, of which only the type variety is found within Bolivia. This taxon differs in its dioecious breeding system, its coriaceous leaves, and pistillate flowers that usually have four styles and locules (vs three) and six tepals (vs five; Tebbitt *et al.*, 2018a).

1.8. Begonia pearcei Hook.f., Bot. Mag. 91, t. 5545 (1865). – Type: Royal Botanic Gardens Kew, ex. Veitch & Sons Nursery, from a collection made in La Paz by Pearce, x 1865, *Unknown s.n.* (lectotype K [K000252027] designated in: Phytotaxa 407(1): 113 (2019) by Tebbitt, M.C.).

L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 78 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 107 (2020).

Distribution. Endemic to Bolivia.

Identification notes. *Begonia pearcei* is distinguished as a tuberous, caulescent herb with spreading yellow tepals and a white, non-glandular indument. It is most similar to *Begonia heliantha* and *B. chrysantha*, which are both also tuberous, caulescent species with transversely ovate leaves and yellow flowers. It differs from *Begonia heliantha* in its non-glandular indumentum, and from *B. chrysantha* in its white indumentum (vs red hairs with a white apex; Tebbitt, 2020).

1.9. Begonia phantasma Tebbitt, Novon 24(3): 319, fig. 1 (2015). – Type: Bolivia, Santa Cruz Department, Vallegrande Province, Rte. de Che S of town of Vallegrande, 18°42'58"S, 64°9'26"W, 12 i 2012, *M.C. Tebbitt* 721 (holotype USZ, isotype USZ).
M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 113 (2020).

Identification notes. *Begonia phantasma* is a difficult species to determine and shares individual characters with several other members of *Begonia* sect. *Australes*. It is best distinguished by its combination of transversely ovate leaves; its large and paired, denticulate bracts that surround the lower proportion of the inflorescence; and its cream to pink flowers with basifixed stamens. Vegetative characters that may aid in the identification of *Begonia phantasma* are its dark glaucous green leaves and its absent to sparse indumentum.

1.10.1. Begonia veitchii Hook.f. var. **veitchii**, Gard. Chron. I: 734, fig. *s.n.* (1867). – Type: Peru, on hills from Cuzco to Ayacucho, from Habaspamba, 1100–1200 ft, i 1867, *R. Pearce s.n.* (lectotype K [K000252032] designated in: Edinburgh J. Bot. 77(1): 130 (2020) by Tebbitt, M.C.).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 77 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 123 (2020).

Begonia barborkae Halda, Acta Mus. Richnov. Sect. Nat. 14: 105, t. I–V (2007). – Type: Bolivia, Chuquisaca Department, Oropeza Province, wet vertical rocks near Challcha, [18°26'S, 65°32'W], 2900 m, 18 xi 2007, *J.J Halda* JJH07111801 (holotype PR [#11970]).

Begonia baumannii Lemoine, Jardin 4: 273 (1890), fig. *s.n.* (as *'B. beaumannii'*). – Type: Plate in Lemoine, Jardin 4: 273 (1890) (lectotype designated in: Edinburgh J. Bot. 77(1): 131 (2020) by Tebbitt, M.C.).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 77 (1944); R.C. Foster, Contr.

Gray Herb. 184: 137 (1958); D.C. Washausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 127: 383 (2013); M.C. Tebbitt, Edinburgh J. Bot. 77(1): 131 (2020).

Begonia clarkei Hook.f., Bot. Mag. 93: t. 5675 (1867). – Type: Bolivia, [La Paz Department], Prov. Larecaja, viciniis Sorata, Cerro del Iminapi, [15°46'S, 68°39'W], 2650–2800 m, 16 ii 1858, *G. Mandon* 1090 (lectotype K [K000252024] designated in: Edinburgh J. Bot. 77(1): 130 (2020) by Tebbitt, M.C.; isolectotypes BM [BM001191436], G [G00034147], G-BOISS, GH [GH00257802], K [K000252025], NY [NY01085842], P [4: P00482213, P05494708, P06602680, P06602681], RB [RB00536678], S [S07-9359], US [US00313506], W [2: W0013092, W18890113269]).

L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 78 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Washausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013); M.C. Tebbitt, Edinburgh J. Bot. 77(1): 131 (2020).

Begonia coriacea A.DC. *later homonym non* Hassk., Ann. Sci. Nat. Bot. IV(11): 122 (1859). – *Begonia tominana* Golding *nom. nov.*, Phytologia 47(4): 295 (1981). – Type: Bolivia, Chuquisaca Department, Prov. Tomina, Pomabamba, [20°6'S, 64°25'W], xii 1845 – i 1846, *H.A. Weddell* 3791 (lectotype P [P00482209] designated in: Edinburgh J. Bot. 77(1): 130 (2020) by Tebbitt, M.C.; isolectotype P [P01900758]).

Begonia odoratissima hort. ex Lem. *pro. syn. Begonia baumannii* Lemoine

Begonia rosaeflora Hook.f., Bot. Mag. 93, t. 5663 (1867). – *Begonia veitchii* var. *rosaeflora* (Hook.f.) Voss, Vilm. Blumengärtn., ed. 3, 1: 354 (1894). – Type: Plate in J.D. Hooker, Bot. Mag. 93, t. 5663 (1869) (lectotype designated in: Edinburgh J. Bot. 77(1): 130 (2020) by Tebbitt, M.C.).

D.C. Washausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Distribution. Peru, Bolivia, and Argentina.

Nomenclatural notes. The typification of *Begonia veitchii* and its synonyms was covered in depth by Tebbitt *et al.* (2020). Several previous authors (Smith & Schubert, 1944a; Foster, 1958; Wasshausen *et al.*, 2013) cited the author of *Begonia baumannii* Lemoine as “Lem”, which is the standard form for Antoine Charles Lemaire, who died in 1872, 18 years before *B. baumannii* was published. Similarly, most authors who have applied the name *Begonia fulgens* in Bolivia (see *Excluded names*) have cited the authorship as “*Begonia fulgens* Lem.” The author of *Begonia baumannii* and *B. fulgens* was Victor Lemoine, so *B. baumannii* Lemoine and *B. fulgens* Lemoine are the correct author citations for these names, respectively.

Identification notes. *Begonia veitchii* is among the most common tuberous Bolivian *Begonia* species. It is easily distinguished from the remainder of Bolivian *Begonia* sect. *Australes*

in having symmetrical leaf laminae that lack a distinct apex. It is also the only member of its section that is frequently acaulescent. Members of *Begonia* sect. *Eupetalum* are also acaulescent and tuberous and often lack a distinct apex to their leaves, but all Bolivian species differ in having more than five tepals on their staminate flowers.

1.10.2. Begonia veitchii var. **lanatifolia** Tebbitt, Edinburgh J. Bot. 77(1): 139, fig. 3 (2019). – Type: Bolivia, Chuquisaca Department, Prov. Oropeza, Santuario de Chataquila, hacia Punila c.12 km, 19°0'5"S, 65°22'38"W, 3303 m, 25 ii 2007, *E. Cervantes* 137 (holotype MO [MO-2054071], isotype HSB).
M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 2020: 133.

Distribution. Endemic to Bolivia and Chuquisaca Department.

Identification notes. *Begonia veitchii* var. *lanatifolia* Tebbitt differs from the type variety of *B. veitchii* in having a dense cover of lanate hairs in their dense indumentum of white hairs (drying brown) on their petioles and leaf undersurfaces. It also differs in its three ovary and fruit wings, which are reduced and rib-like (vs non-reduced and wing-like).

1.11. Begonia weddelliana A.DC., Ann. Sci. Nat. Bot. IV(11): 122 (1859). – Type: Bolivia, [La Paz Department], Prov. Yungas, xii 1846, *H.A. Weddell* 4294 (lectotype P [P00482210, photograph F#38534] designated in: Revista Univ. (Cuzco) 33(87): 76 (1944) by Smith, L.B. & Schubert, B.G.; isolectotype G-DC ex P).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 76 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); M.C. Tebbitt, Brittonia 65(2): 145 (2013); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013); M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 138 (2020).

Begonia davisii Hook.f., Bot. Mag. 102, pl. 6252 (1876). – Type: Plate in J.D. Hooker, Bot. Mag., 93., t. 5680 (1867) (lectotype designated in: Brittonia 65: 145 (2013) by Tebbitt, M.C.).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 76 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); M.C. Tebbitt, Brittonia 65(2): 145 (2013).

Distribution. Endemic to Bolivia and La Paz Department.

Nomenclatural notes. The protologue of this species stated only that it was based on material collected by Weddell. Smith & Schubert (1944a) cited the type as *H.A. Weddell* 4294 in Paris, which is an effective lectotypification.

Identification notes. *Begonia weddelliana* is one of two species of *Begonia* whose filaments are attached to the back of the anthers rather than to the base, sharing this character with *B. herrerae*. Both species have red-orange tepals with acute apices, but the margins of these tepals are entire in *Begonia weddelliana* rather than serrate, as in *B. herrerae*.

2. Begonia sect. **Cyathocnemis** (Klotzsch) A.DC.

2.12. Begonia alto-peruviana A.DC., Ann. Sci. Nat. Bot. IV(11): 123 (1859). – Type: Bolivia, [La Paz Department], Prov. Larecaja, vallées entre Tipuani et Apolobamba, v 1847, *H.A. Weddell* 4556 (lectotype P [P05586898] first stage designated in: Field Mus. Nat. Hist. Ser. 13(4/1): 185 (1941a) by Smith, L.B. & Schubert, B.G.; second stage designated in: Revista Univ. (Cuzco) 33(87): 81 (1944) by Smith, L.B. & Schubert, B.G.).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 81 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 127: 383 (2013).

Distribution. Peru and Bolivia.

Nomenclatural notes. The protologue of *Begonia alto-peruviana* A.DC. cites material collected in 'Peruvia alta' in Bolivia by Weddell. In their revision of *Begonia* for the *Flora of Peru*, Smith & Schubert (1941a) cited the collection *H.A. Weddell* 4556 as the type. Although they did not specify a herbarium, this citation was sufficient for the first stage of lectotypification (see Article 9.16 of the Shenzhen Code; Turland *et al.*, 2018). The same authors later cited the same collection in Paris herbarium as the type of *Begonia alto-peruviana* (Smith & Schubert, 1944a). This constitutes the second stage of lectotypification.

Identification notes. *Begonia alto-peruviana* is recognised as a glabrous, caulescent perennial with deciduous stipules, transversely ovate leaves with serrulate to serrate leaf margins, five tepals on the pistillate flowers, and bifid styles.

Begonia alto-peruviana is part of a group including several Peruvian species of *Begonia* sect. *Cyathocnemis*, which all have five tepals on the pistillate flower and three bracteoles with serrate, ciliate margins. The other members of this complex are *Begonia brevicordata* L.B.Sm. & B.G.Schub., *B. lucifuga* Irmsch., *B. stenotepala* L.B.Sm. & B.G.Schub., *B. subspinulosa* Irmsch. and an unpublished species from Peru's Cuzco region. Within this group, *Begonia alto-peruviana* is most similar to *B. subspinulosa* and *B. brevicordata*, both of which also have serrate or serrulate leaf margins and white to pink, broadly ovate tepals on the staminate flowers. It can be distinguished from *Begonia subspinulosa* by its early deciduous (vs persistent) stipules and from *B. brevicordata* by its larger leaves (> 8 cm long vs < 7 cm long), which are transversely ovate (vs broadly ovate).

Begonia alto-peruviana is one of four members of *Begonia* sect. *Cyathocnemis* known with certainty from Bolivia. It is best distinguished from the other species by its pistillate flowers with five tepals, vs two in *Begonia bracteosa* A.DC., *B. galea* Moonlight & A.Fuentes and *B. lophoptera* Rolfe. In all vegetative respects and in its staminate flowers, *Begonia alto-peruviana* strongly resembles *B. bracteosa* and all members of *Begonia* sect. *Hydristyles*, which are also upright herbs with transversely ovate, palmately veined leaves, and whose staminate flowers have two tepals.

2.13. Begonia bracteosa A.DC., Ann. Sci. Nat. Bot. IV(11): 132 (1859). – Type: Peru, *sine loc.*, *Unknown s.n.* (holotype K [K000536745]).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 383 (2013) *pro parte*.

Distribution. Peru and Bolivia.

Identification notes. *Begonia bracteosa* is a widespread species in Peru and has been rarely collected in northern Bolivia. It is recognised as the only species in Bolivia with two tepals on pistillate flowers and transversely ovate leaves.

2.14. Begonia galea Moonlight & A.Fuentes, **sp. nov.**
Begonia galea is unique among South American *Begonia* as the only species whose inflorescence is a scorpioid cyme with a terminal pistillate flower. – Type: Bolivia, La Paz Department, Prov. Franz Tamayo, Santo Domingo, arroyo San Pedro, 14°47'53"S, 68°36'01"W, 1414 m, 20 x 2006, *A.F. Fuentes, M. Cornejo, E. Ticona, S. Sompero & C. Cuqui* 11158 (holotype E [E01004032]; isotypes BOLV, LPB, MO [MO-2080523], NOLS, US [US00966728]). **Figure.**

Caulescent herb, lacking a tuber or rhizome, sometimes rooting from the lower nodes, terrestrial or epiphytic on the base of tree trunks. *Stem* erect, 20–60 cm tall, 1.5–3 mm in diameter, unbranched or branching at the base, internodes 8–60 mm, glabrous, light green flushed red around the nodes. *Stipules* tardily deciduous, lanceolate, 3.5–9 × 1–3 mm, apex acuminate, aristate, glabrous, light green, margin entire, aciliate. *Leaves* alternate, basifixed; *petioles* joining blade at a slight angle, 4–15 mm long, glabrous; *blades* asymmetrical, elliptic to oblanceolate, (30–)45–85(–115) × 10–30 mm, apex acuminate, base oblique, cordate on the broader side, basal lobe to 3 mm, overlapping the petiole, cuneate on the narrower side, venation pinnate, with 3–6 secondary veins on the broader side, 2–4 secondary veins on the narrower side, upper surface dark green, very sparsely pilose, lower surface green, glabrous, margin irregularly dentate, ciliate. *Inflorescences* few, axillary, erect, arising close to the apex of the stem, a helicoid monochasial cyme, protandrous, c.4 staminate flowers developing before a terminal, pistillate flower; *peduncle* 18–55 mm long, glabrous, white flushed pink; *pedicels of staminate flowers* held vertically, sequentially shorter along the inflorescence with basal most flower held above the subsequent flowers in sequence, the basal-most pedicel to 12 mm long, apical pedicel to 4 mm long, glabrous, white flushed pink; *pedicels of pistillate flowers* 8–10 mm long, glabrous, white flushed pink; *bracts* tardily deciduous, elliptic to ovate, 2–6 × 1–5 mm, apex acute to rounded, white, margin entire to lacerate, glabrous. *Staminate flowers*: *tepals* 2, held horizontally, ovate, 8–10 × 4–6 mm, apex acute, margin entire, glabrous, white with a pink flush on outer surfaces; *stamens* 8–10, fused at the base, held spreading horizontally, filaments 1.5–2 mm long, anthers symmetrically basifixed, oblong, 1–1.5 mm long, dehiscing via lateral slits, connectives extended to 1 mm.

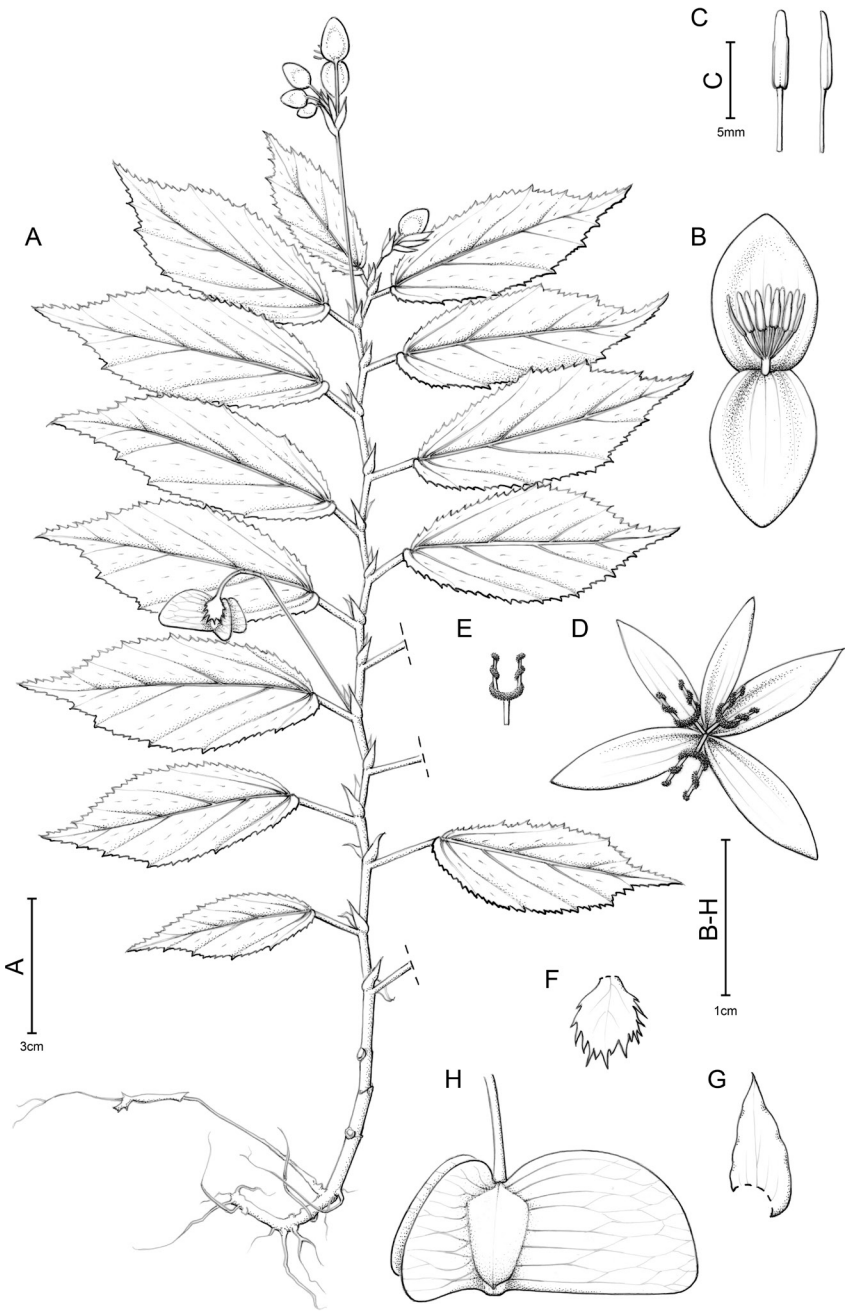

Figure. *Begonia galea* Moonlight & A.Fuentes, sp. nov. A, Habit; B, staminate flower (front view); C, stamen (front and side view); D, pistillate flower (front view); E, style and stigma (front view); F, bracteole; G, stipule; H, fruit (side view). Drawn from *L. Cayola, G. Chive, I. Loza, M. Cornejo, E. Ticona & A. Fuentes* 2513 (MO [MO-2143708]) by Claire Banks.

Pistillate flowers: *bracteoles* 3, tardily deciduous, ovate, 3–4 × 3 mm, apex obtuse, white, glabrous, margin lacerate, ciliate; *tepals* deciduous in fruit, 5, spreading, elliptic, 7–9 × 2–3.5 mm, apex acute, margin entire, glabrous, white with a pink flush on outer surfaces, loosely reticulate at the apex; *ovary body* ovoid, the base truncate, c.4 × 3 mm, glabrous, 3-winged, wings white flushed pink, the upper wing longer than the other two, semicircular, front edge truncate, apex acute, lower edge rounded, 10–12 × 7–13 mm, the lower two wings triangular to oblong, front edge truncate, apex obtuse, lower edge gently rounded to truncate 6–8 × 5–6 mm, 3-locular, placentas bifid, bearing ovules on both surfaces; *styles* 3, yellow, free at base, c.5 mm long, bifid from around a third of their length, stigmatic papillae in a twice spirally-twisted band. *Fruiting pedicel* to 1 cm long; *fruit* nutant, the base truncate, 6–9 × 2–4 mm, light brown, glabrous, wings same shape as in female flower, light brown, longest wing expanding to 10–12 × 12–13 mm, shorter two wings expanding to 6–8 × 5–6 mm.

Distribution and ecology. *Begonia galea* is known from six collections within 38 km of each other within the Franz Tamayo and Bautista Saavedra Provinces of La Paz Department, Bolivia. This species has been collected from 1250 to 1500 m within humid valleys in lower montane rain forest dominated by the palm *Dictyocaryum lamarckianum* H.Wendl. *Begonia galea* has been collected flowering and fruiting in October.

Etymology. The epithet *galea* is a Latin term referring to the helmets of Roman soldiers and gladiators; it emphasises the rounded appearance of the species' fruits.

Proposed IUCN conservation category. The known extent of occurrence (EOO) of *Begonia galea* is 53 km^2, which is sufficiently small for it to qualify as Critically Endangered (CR) under IUCN criteria (IUCN Standards and Petitions Subcommittee, 2019). Although its range falls partially in the Apolobamba protected area, these populations may be in decline due to intense human pressure (Jones *et al.*, 2018) from deforestation for agriculture (mainly coca plantations), gold mining and livestock (Romero-Muñoz *et al*., 2019). The same does not apply to the populations of Santo Domingo, an area currently unaffected by deforestation or major development projects that could threaten their conservation in the short term. However, considering the potential for gold mining in this entire region and the intensive mining activities in surrounding areas (Revollo & Campanini, 2014), it is possible that in the future these activities will expand and compromise the conservation of this species. We categorise *Begonia galea* as Near Threatened (NT) under IUCN criteria (IUCN Standards and Petitions Subcommittee, 2019) because most of its range remains intact and we have no evidence for any decline in its population.

Additional specimens examined. Bolivia. **La Paz Department**. ***Franz Tamayo Province***: Región Madidi, Santo Domingo, sector Lechemayu, en la Parcela Permanente 49. 14°46'09"S, 68°37'11"W, 1475 m, 19 viii 2010, *A.F. Fuentes, P. Miranda, C. Miranda, L. Vaquiata & E. Segales* 17037 (LPB); Santo Domingo,

sector Tintaya, parcela temporal 2, 14°47'09"S, 68°35'00"W, 1463 m, 13 x 2006, *A.F. Fuentes, M. Cornejo, E. Ticona, S. Sompero & C. Cuqui* 10998 (LPB, MO [MO-2080525]); Región Madidi, Santo Domingo, sector arroyo Tintaya, 14°47'43"S, 68°36'06"W, 1400 m, 10 x 2006, *L. Cayola, G. Chive, I. Loza, N. Chapi & P. Jørgensen* 2471 (LPB, MO [MO-2080524]); Región Madidi, Santo Domingo, sector arroyo Tintaya, 14°46'45"S, 68°35'30"W, 1468 m, 22 x 2006, *L. Cayola, G. Chive, I. Loza, M. Cornejo, E. Ticona & A. Fuentes* 2513 (LPB, MO [MO-2143708], LPB, US [US00966727]). ***Bautista Saavedra Province***: Area Natural de Manejo Integrado Apolobamba, Tolapampa, por la carretera Charazani-Apolo, sector loma Callawaya, parcela permanente 2, 15°04'32"S, 68°28'01"W, 1250 m, 10 iv 2010, *A.F. Fuentes, A. Escalante, R. Ticona & S. Quispe* 15831 (LPB, MO [MO-2773642]).

Notes. *Begonia galea* is unique among Andean *Begonia* in the structure of its inflorescence, a monochasial, scorpioid cyme that terminates in a pistillate flower. This structure is superficially reminiscent of the asymmetrical, thyrsoid inflorescences found in *Begonia* sect. *Pilderia* (Klotzsch) A.DC. (see Moonlight & Jara-Muñoz, 2017). However, the inflorescence of *Begonia galea* differs in that it is apical rather than terminal, and only has a single pistillate flower at the apex. *Begonia galea* also lacks the characteristic glandular hairs found in all members of *Begonia* sect. *Pilderia*. We consider the inflorescence of *Begonia galea* more likely to be a reduced form of the typical dichasial cyme found in most non-tuberous Andean species of *Begonia*, including *Begonia* sects. *Cyathocnemis*, *Hydristyles* and *Ruizopavonia*.

The sectional placement of *Begonia galea* is difficult because the species has a unique inflorescence structure and otherwise falls between *Begonia* sects. *Cyathocnemis* and *Ruizopavonia*. These two sections have very similar flowers and fruits and differ primarily in their leaves, which are straight with pinnate venation in *Begonia* sect. *Ruizopavonia* and transverse with palmate-pinnate venation in *Begonia* sect. *Cyathocnemis*. The leaves of *Begonia galea* are straight but have many fewer secondary veins than all Andean members of *Begonia* sect. *Ruizopavonia*. We suspect that *Begonia galea* is a member of *Begonia* sect. *Cyathocnemis* with straight leaves, similar to *B. obtecticaulis* Irmsch. (Moonlight *et al.*, 2018). The three bracteoles of *Begonia galea* positioned directly beneath the ovary are consistent with this hypothesis, because this character state is frequent in *Begonia* sect. *Cyathocnemis* whereas members of *Begonia* sect. *Ruizopavonia* have two bracteoles that are usually spaced out from the base of the ovary. We therefore tentatively place *Begonia galea* in *Begonia* sect. *Cyathocnemis*.

Identification notes. When the plant is fertile, it is easy to identify *Begonia galea* because of its unique inflorescence structure, which resembles the characteristic scorpioid cyme of members of the Boraginaceae. Sterile individuals may be confused with several species of Bolivian *Begonia*. The distichous, straight leaves of this species most resemble those of the Bolivian species of *Begonia* sect. *Ruizopavonia*, but unlike most Bolivian species in this section, *Begonia galea* is entirely glabrous. *Begonia peruviana* A.DC. is an often glabrous, Bolivian member of *Begonia* sect. *Ruizopavonia* and can be distinguished by its much more

numerous and prominent secondary veins (*B. peruviana* has 8–12 veins on the broader side of the leaf lamina vs 3–6 in *B. galea*). Finally, *Begonia galea* could be confused with either *B. comata* Kuntze or *B. oblanceolata* Rusby but has smaller (< 1 cm long), tardily deciduous stipules that do not clasp the stem and leaves, with an irregularly serrate margin (vs persistent stipules, > 1 cm long, that clasp the stem and leaves, with a denticulate or crenulate margin).

2.15. Begonia lophoptera Rolfe, Bull. Misc. Inform. Kew 1941(1): 28 (1914). – Type: Peru, Pasco Region, Prov. Oxapampa, Pozuzo, [10°4'S, 75°33'W], *R. Pearce* 556 (lectotype K [K000536718] designated by Moonlight, P.W. & Reynel, C. 2017).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Distribution. Peru and Bolivia.

Additional specimen examined. Bolivia. **La Paz Department**. ***Nor Yungas Province***: Serranía de Bella Vista, 16 km al N of Carrasco (37 km N of Caranavi) on road to Palos Blancos, 15°35'S, 67°34'W, 1500 m, *J.C. Solomon & M. Nee* 12673 (MO).

Notes. Moonlight & Reynel (2017) reviewed *Begonia lophoptera* and related species but did not report it from Bolivia. This was an omission, because *Begonia lophoptera* had previously been reported from Bolivia (Wasshausen *et al.*, 2013). We have not seen the specimen on which this report is based (*S.G. Beck* 17813) but confirm that *Begonia lophoptera* does occur in Bolivia, based on *J.C. Solomon & M. Nee* 12673.

Identification notes. *Begonia lophoptera* is distinct among Bolivian *Begonia* as a short (up to 1 m), succulent herb with cuspidate leaves with no single, distinct apex. Unlike other members of *Begonia* sect. *Cyathocnemis* or members of *Begonia* sect. *Hydristyles*, this species has no primary vein but several, equally prominent veins. It is also unique in its nodding fruits with a notched largest fruit wing. This species may occasionally be confused with young individuals of *Begonia parviflora* Poepp. & Endl., but it has a soft indumentum rather than the abrasive indumentum of *B. parviflora*.

3. Begonia sect. **Ephemera** Moonlight (2018: 291)

3.16. Begonia alchemilloides Meisn. ex A.DC., Ann. Sci. Nat. Bot. IV(11): 125 (1859). – Type: Brazil, Minas Gerais State, in camporum editorum runcationibus, ad Sera, Serro Frio, *C.F.P. von Martius s.n.* (lectotype M [M0009906] *designated here*).
A.P. de Candolle, Fl. Bras. 4: 344 (1861).

Caulescent herb, lacking a tuber or rhizome but sometimes with a swollen, tuber-like base to the stem, c.20 × 10 mm, rooting from the lower nodes. *Stem* erect, 5–10 cm tall, 1–3 mm in diameter, rarely branching, internodes 3–15 mm, sparsely villous, pale green. *Stipules* tardily deciduous, triangular to broadly ovate, 3–4 × 2.5–3 mm, apex acute, mucronate, glabrous,

light brown, margin serrulate, ciliate. *Leaves* alternate, basifixed; *petioles* joining blade at a slight angle, 4–15 mm long, sparsely villous; *blades* subsymmetrical, reniform to ovate, 10–25 × 15–35 mm, apex rounded, base truncate to cordate, basal lobes to 5 mm, not overlapping the petiole, venation palmate, 7 or 8 veins from the base, upper surface green, glabrous to sparsely villous, lower surface pale green, sparsely villous, margin crenate to dentate, ciliate. *Inflorescences* 1–3 per stem, axillary, erect, arising close to the apex of the stem, a dichasial cyme, protandrous, with up to 4 staminate flowers and 2 pistillate flowers; *peduncle* 15–25 mm long, glabrous, pale green; *pedicels of staminate flowers* 3–5 mm long, glabrous, pale green; *pedicels of pistillate flowers* 5–7 mm long, glabrous, pale green; *bracts* persistent, obovate, 1.5–2 × 1.5–2 mm, apex obtuse, pale green, glabrous, margin lacerate, ciliate. *Staminate flowers*: *tepals* 4, spreading, white, the inner two obovate, 4–5 × 2.5–3 mm, apex rounded, base cuneate, margin entire, glabrous, the outer two orbicular, c.6 × 6 mm, apex rounded, margin entire, glabrous; *stamens* 4–6, fused at the base, projecting, filaments 0.25–0.5 mm long, anthers symmetrically basifixed, oblong, 1–1.5 mm long, dehiscing via lateral slits, connectives extended c.0.1 mm. *Pistillate flowers*: *bracteoles* 3, c.1 mm below the ovary, persistent, oblanceolate, 4–6 × 1–2 mm, apex rounded, white, glabrous, margin lacerate, ciliate; *tepals* tardily deciduous in fruit, 5, spreading, obovate, 6–7 × 2–4.5 mm, apex obtuse to rounded, margin entire, aciliate, glabrous, white; *ovary body* broadly ovoid, 3–3.5 × 2–3.5 mm, pale green, 3-winged, wings pink, one wing longer than the other two, triangular, ascending, front edge truncate, apex acute, lower edge straight, c.5 × 4 mm, the shorter two wings triangular, front edge truncate, apex rounded, lower edge gently curved, c.4 × 2 mm, 3-locular, placentas bifid, bearing ovules on both surfaces; *styles* 3, yellow, free at base, c.2.5 mm long, bifid from around half their length, stigmatic papillae in a spirally twisted band. *Fruiting pedicel* to 8 cm long; *fruit* held erect, body ovoid, c.5 × 6 mm, light brown, glabrous, wings same shape as in pistillate flower, light brown, longest wing expanding to 7 × 6 mm, shorter two wings expanding to 6 × 5 mm.

Distribution and ecology. This is the first record of a species previously thought to be endemic to Brazil, where it has been collected in Goías and Minas Gerais States (Brazil Flora Group, 2015). The disjunction between the Cerro Manomó and the closest Brazilian populations is c.935 km, which is very large in the context of *Begonia* species. The habitats in the Brazilian and Bolivian parts of its range are remarkably similar. Most Brazilian collections have been made in shaded rock outcrops or ravines in areas of Central Brazilian Cerrado; for example, see the collection *P.W. Moonlight* 1909 on the Begonia Resource Centre database (Hughes *et al.*, 2015–) for images of typical habitat. The collection *J.R.I. Wood & D. Soto* 26405 was made from a population growing in cracks in humid rocks in an area of Cerrado. This is the type locality of *Mikania manomoi* D.J.N.Hind & Frisby, which was collected by John R.I. Wood and J. Soto on the same day as this record (Hind & Frisby, 2014). We refer to the protologue of *Mikania manomoi* for a full habitat description (Hind & Frisby, 2014).

Additional specimen examined. Bolivia. **Santa Cruz Department**. ***Velasco Province***: Cerro Manomó, aproximadamente 100 km al norte de San Ignacio de Velasco, 15°30'18"S, 60°41'50"W, 506 m, 12 xi 2009, *J.R.I Wood & D. Soto* 26405 (K, LPB).

Nomenclatural notes. The protologue of *Begonia alchemilloides* Meisn. ex A.DC. cited material collected by von Martius in Minas Gerais State in Brazil but cited no herbarium, so there is no holotype (see Article 9.1 of the Shenzhen Code; Turland *et al.*, 2018). There is a sheet that matches de Candolle's description in Munich herbarium (M0009906). This sheet was determined by de Candolle, who also cited material in 'hb. reg. Monac.' as *Begonia alchemilloides* in his revision of Brazilian *Begonia* (de Candolle, 1861). This does not constitute a type designation, because he did not use the word 'type' or equivalent in his citation (see Article 7.11 of the Shenzhen Code; Turland *et al.*, 2018). Jacques & Mamede (2005) cited this collection as the holotype, which also does not count as an effective type designation, because since 2001 it has been mandatory to include the phrase 'designated here' or equivalent (see Article 7.11 of the Shenzhen Code; Turland *et al.*, 2018). We designate the sheet M0009906 as the lectotype of *Begonia alchemilloides*.

Identification notes. Like all members of *Begonia* sect. *Ephemera*, *B. alchemilloides* is a delicate herb with palmately nerved leaves. It is best distinguished from other Bolivian species in the section by its subsymmetrical, reniform to broadly ovate leaves.

3.17. Begonia cucullata Willd., 4(1): 414 (1805). – Type: Unknown.
A.P. de Candolle, Fl. Bras. 4: 341 (1861); A. Grisebach, Symb. Fl. Argent. 24: 136 (1879); M.C. Tebbitt, Begonian 79: 99 (2012); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013); Delfini, C. in Zuloaga, F.O. & Belgrano, M.J. (eds), Fl. Argentina 17: 5 (2017).

Begonia obovatistipula C.DC., Bulletin de la Societe Botanique de Geneve, Ser. 2, 6: 124, fig. VI (1914). – Type: Paraguay, [Concepción Department], Zweischen río Apa und río Aquidaban, Villareal, Rieden Camp, [22°39'S, 57°45'W], 1908–1909, *K. Fiebrig* 4514 (lectotype G [G00077061 (2 sheets)] *designated here*; isolectotypes B [B100247915], G [2: G00077057 (2 sheets)]), **syn. nov.**

Distribution. Known from Brazil, Paraguay, Argentina and Bolivia, and widely introduced elsewhere.

Nomenclatural notes. The protologue of *Begonia cucullata* cites material collected in Brazil (Willdenow, 1805). It is unclear whether this refers to a herbarium collection, and if so, where it is deposited. We refrain from designating a neotype while it remains unclear whether any material suitable for lectotypification exists. The protologue of *Begonia obovatistipula* cites material of the collection *K. Fiebrig* 4515, for which we know of duplicates in Berlin and the general herbarium in Geneva (de Candolle, 1914). Anne Casimir Pyramus de Candolle was based in Geneva, so it is appropriate to designate a type from the material in Geneva.

We select the duplicate G00077061 as the lectotype, which has two sheets and a greater quantity of fertile material than the alternatives.

Synonymy notes. *Begonia cucullata* is a widespread species native to Brazil, Paraguay, Bolivia and Argentina, with scattered naturalised records throughout northwest South America and Central America (Hughes *et al.*, 2015–). Previous classifications recognised three varieties within this species (Smith & Schubert, 1941b), but Jaramillo (2017) recognised *Begonia cucullata* as a single, variable species with no varieties. The type specimens, description, and all Bolivian specimens of *Begonia obovatistipula* fall within the range of variation recognised by Jaramillo, so we transfer *B. obovatistipula* into synonymy with *B. cucullata* herein.

Identification notes. *Begonia cucullata* is a variable species but is easily recognised in Bolivia because it is a small (usually < 50 cm tall, always < 1 m tall), completely glabrous herb with cucullate leaf bases. All similar species are easily distinguished by their sparse to dense indumentums.

3.18. Begonia fischeri Schrank, Pl. Rar. Hort. Acad. Monac. 2, pl. 59 (1820). – Type: Brazil, Rio de Janeiro State, *C.F.P. von Martius s.n.* (*n.v.*).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013); Delfini, C. in Zuloaga, F.O. & Belgrano, M.J. (eds), Fl. Argentina 17: 8 (2017).

Begonia tovarensis Klotzsch ex Klotzsch, Abh. Kon. Akad. Wiss. Berlin 1854: 151 (1855). – *Begonia fischeri* var. *tovarensis* (Klotzsch ex Klotzsch) Irmsch. *nom. inval.*, Bot. Jahrb. Syst. 74: 24 (1953). – Type: Venezuela, Hort Berlin, vi 1853, *H. Wagener s.n.* (lectotype B [B100242120] designated in: Fl. Argentina 17: 8 (2017) by Delfini, C.).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 80 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958).

Distribution. Known from Cuba, Mexico, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Venezuela, Colombia, Ecuador, Peru, Bolivia, Argentina and Brazil.

Nomenclatural notes. The protologue of *Begonia fischeri* cites material collected by von Martius in Rio de Janeiro State. We know of two sheets of *Begonia fischeri* collected by von Martius. The first of these is held in Munich herbarium (M-0145727) and is a good match for the illustration in the protologue of *Begonia fischeri*. This sheet does not, however, have a label or determination slip that indicates it was considered *Begonia fischeri* by Schrank. Its collection label also does not specify Rio de Janeiro. The label instead reads ‘ad Mandioccam’. Other collection labels made by von Martius indicate that this locality is in Rio de Janeiro State, but it seems unlikely that Shrank would have omitted the locality ‘ad Mandioccam’ from his protologue if this was the specimen he used to describe the species. The second collection is held in New York herbarium and is a fragment of a specimen in

Munich herbarium (NY00453926). The label of this specimen reads 'cerca Mandioccam, Prov. Rio Jan' and is a therefore a slightly better match for the locality cited in the type of *Begonia fischeri*. The specimen is clearly *Begonia fischeri*, but it is an unusually large individual of the species and a relatively poor match for the individual shown in Shrank's illustration. We have not been able to visit Munich herbarium so cannot rule out the possibility that it holds a better candidate for lectotypification than either specimen, so we refrain from designating a lectotype of *Begonia fischeri*.

The protologue of *Begonia tovarensis* cites material grown in Berlin Botanical Garden by Moschkowitz and Siegling, from seed collected by H. Wagener in Venezuela (B100242120; Klotzsch, 1855). There is a single matching sheet in Berlin herbarium, which was collected in 1953. Jacques & Mamede (2005) did not see this collection and cited it as the holotype of *Begonia tovarensis*. This is not correct, because no herbarium was cited in the original protologue; however, because it is the only sheet that matches the original description, we designate this sheet as the lectotype of *Begonia tovarensis*. In 1953, Edgar Irmscher attempted to publish a new combination of *Begonia tovarensis* as a variety of *B. fischeri* (Irmscher, 1953). This name is invalid because Irmscher only provided an indirect reference to the protologues of the basionym (see Article 41.5 of the Shenzhen Code; Turland *et al.*, 2018) and the name would not otherwise be a validly published name of a new taxon (see Article 41.8d of the Shenzhen Code; Turland *et al.*, 2018).

Identification notes. *Begonia fischeri* is most similar to *B. cucullata* Willd. These species are succulent, spreading annuals or short-lived perennials with upright stems and found in the Bolivian lowlands. They also have palmate leaf venation and more or less cucullate leaves (i.e. hood-shaped leaves, and often loosely wrapped around the stem), although some leaves are held flat in *Begonia fischeri*. *Begonia fischeri* is best distinguished by its indumentum, which varies across its range but in Bolivia is sparsely pilose throughout to densely villous on young stems, petioles, and the major veins of the leaf underside. Bolivian specimens of *Begonia cucullata* are glabrous throughout.

3.19. Begonia subvillosa Klotzsch, Abh. Kon. Akad. Wiss. Berlin 1854: 152, (1855). – Type: Brazil, *sine loc.*, v*on Sello* 1571 (lectotype B [B10024925, photograph F#20903] *designated here*, first stage designated in: Abh. Kon. Akad. Wiss. Berlin 1854: 151, (1855) by Irmscher, E.; isolectotype B [2: B10024924, B10024926).
A.P. de Candolle, Fl. Bras. 4: 344 (1861); A.P de Candolle, Prodr. 15(1): 304 (1864); L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 79 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); E.L. Jacques & M.C.H. Mamede, Revista Brasil Bot. 28(3): 584 (2005).

Begonia lindmanii auct. non. Brade, D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Caulescent herb, lacking a tuber or rhizome but sometimes with a swollen, tuber-like base to the stem, 10–40 × 12–40 mm, rooting from the lower nodes. Stem erect, 10–30 cm tall, 1.5–5 mm in diameter, branching, internodes 5–10(–42) mm, densely villous, red. *Stipules* persistent, triangular to broadly ovate, 5–10 × 3–7 mm, apex obtuse, mucronate, glabrous to densely villous, light brown, margin lacerate, long-ciliate. *Leaves* alternate, basifixed; *petioles* joining blade at a right angle, 5–35 mm long, densely villous; *blades* asymmetrical, transversely ovate, 40–65(–120) × 25–40(–65) mm, apex obtuse to acuminate, base cordate, basal lobes to 8 mm, not overlapping the petiole, venation palmate, 7–9 veins from the base, upper surface dark green, sparsely pilose, lower surface deep red, densely villous, margin irregularly dentate, ciliate. *Inflorescences* 1–3 per stem, axillary, erect to pendulous, arising close to the apex of the stem, a dichasial cyme, protandrous, with up to 8 staminate flowers and 8 pistillate flowers; *peduncle* 35–45 mm long, sparsely villous, pink to red; *pedicels of staminate flowers* 5–8 mm long, glabrous to sparsely villous, pink to red; *pedicels of pistillate flowers* 5–10 mm long, sparsely villous, pink; *bracts* persistent, elliptic to ovate, 1.5–5 × 1–2 mm, apex acute to rounded, pale pink, glabrous, margin lacerate, ciliate. *Staminate flowers*: *tepals* 4, spreading, white, sometimes flushed pink outside, the inner two oblanceolate, 4–9 × 2–5 mm, apex rounded, base narrowly cuneate, margin entire, glabrous, the outer two orbicular, 5–9 × 5–10 mm, apex rounded, margin entire, glabrous; *stamens* 8–12, fused at the base, spreading, filaments 0.25–1 mm long, anthers symmetrically basifixed, oblong, 1.5–2 mm long, dehiscing via lateral slits, connectives extended c.0.2 mm. *Pistillate flowers*: *bracteoles* 3, persistent, oblanceolate, 5–9 × 1.5–3.5 mm, apex obtuse, pink, glabrous, margin lacerate, ciliate; *tepals* tardily deciduous in fruit, 5, spreading, oblanceolate, 6.5–10 × 2–6 mm, apex acute to rounded or emarginate, margin entire, aciliate, glabrous, white with a pink flush on outer surfaces; *ovary body* ovoid, 6–12 × 4–6 mm, green or white flushed pink, 3-winged, wings pink, one wing longer than the other two, triangular, ascending, front edge truncate, apex acute, lower edge rounded, 7–13 × 6–13 mm, the shorter two wings semicircular to triangular, front edge truncate, apex rounded, lower edge gently curved, 7–12 × 5–6 mm, 3-locular, placentas bifid, bearing ovules on both surfaces; *styles* 3, yellow, free at base, bifid from around half their length, stigmatic papillae in a spirally twisted band. *Fruiting pedicel* to 12 cm long; *fruit* held erect, body ovoid, 8–12 × 6–8 mm, light brown, glabrous, wings same shape as in pistillate flower, light brown, longest wing expanding to 15 × 13 mm, shorter two wings expanding to 14 × 7 mm.

Distribution and ecology. *Begonia subvillosa* is known with certainty from Brazil (Rio Grande do Sul State) and Bolivia. It has been identified from herbarium specimens from Paraguay; however, we have not seen any such specimens so have been unable to confirm these identifications as part of the present study. Within Bolivia, *Begonia subvillosa* is known from two localities, approximately 55 km apart, in Chiquitos Province of Bolivia: the Cerro Chochís and the Serranía de Santiago. Together, these form a 120 km long, almost continuous

northwest–southeast ridge, which is highest in the north. The species has mostly been collected growing from crevices in exposed sandstone ridges on the highest parts of the ridge, but one collection (*H. Cutler* 7060) may have been collected growing on rocks in gallery forest on the southwest side of the ridge. *Begonia subvillosa* often has a swollen, hardened stem at the base and may die back to these stems each dry season. It has been collected in flower and fruit from January to April.

Etymology. The epithet refers to the sparsely to densely villous indumentum found over most of the stems and leaves in this species.

Proposed IUCN conservation category. Within Bolivia, *Begonia subvillosa* is known from two localities in the Serranías Chiquitanas. These populations are disjunct from the only other confirmed localities in Brazil. The species' known EOO is > 216,000 km^2, but its known area of occupancy is significantly smaller (40 km^2). The Serranías Chiquitanas remain relatively pristine but may in the future be threatened by mining, which is common on similar geological features in Brazil. A second potential threat is wildfires, which are an increasing threat in lowland Bolivia and has affected granitic outcrops northwest of the Serranías Chiquitanas. The Serranías are sandstone, and their relative topographical complexity compared with granitic outcrops may afford some protection against fire ingress. Finally, the incidence of drought in the area has increased markedly since 2010 (Maillard *et al.*, 2019). Within Bolivia, the species has an EOO of < 50 km^2, so we assess the Bolivian population of *Begonia subvillosa* as Critically Endangered (CR), B2ab(iii), under IUCN criteria (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. Bolivia. **Santa Cruz Department**. ***Chiquitos Province***: Cerro Chochís, on the meseta at the summit, [18°7'S, 60°0'W], 1200 m, 22 ii 2006, *J.R.I. Wood* 22239 (K); On ascent from top of pass on Santiago de Chiquitos to Susas road, to serrania immediately E of road, [18°20'S, 59°34'W], 650 m, 1 iv 2002, *J.R.I. Wood* 18003 (K, LPB); North slope of Serrania de Santiago, 10 km ENE of Santiago de Chiquitos, c.18°20'S, 59°28'W, 900 m, 21 vii 1983, *D.C. Daly, M.J.G. Hopkins, L.E. Forero, S. Beck, N. Hernandez, H. Phipps III & H. Wolf* 2234 (NY); 2 km northwest of Santiago, [18°19'S, 59°37'W], 630 m, 10 ix 1942, *H.C. Cutler* 7060 (GH); Serrania de Santiago de Chiquitos, E of pass on road to Sunsás, [18°20'S, 59°34'W], 850 m, 25 i 2001, *J.R.I. Wood & D.J. Goyder* 16955 (K); cerca de la cumbre de las serranías de Santiago, 18°20'47"S, 59°33'44"W, 803 m, 10 iv 2008, *J.R.I. Wood, N. Hind, P. Pozo & D. Villarroel* 24361 (K [K000374263], LPB); Santiago de Chiquitos, subida a el Mirador de la Serranía de Santiago de Chiquitos, sobre el camino a Santo Corazón, 18.3226°S, 59.5716°W, 846 m, 21 iii 2009, *J.R.I. Wood, D. Villarroel & S. Renvoize* 25847 (holotype K [K00374265], LPB).

Notes. *Begonia subvillosa* is a member of *Begonia* sect. *Ephemera* and is most similar to *B. leptotricha* C.DC. *Begonia leptotricha* is treated as a synonym of *B. subvillosa* by the most recent floras of Brazil (Brazil Flora Group, 2015) and Argentina (Delfini, 2017), following Jacques & Mamede (2005). We instead follow Irmscher (1953) and Jaramillo (2017) in recognising *Begonia leptotricha* as a distinct taxon.

The two species are best determined by their leaf margins (serrate in *Begonia subvillosa*, entire to crenate in *B. leptotricha*) and their leaf indumentum. The indumentum of *Begonia subvillosa* is persistent, pilose on the upper leaf surfaces and densely villous on the lower surfaces, whereas both leaf surfaces of *B. leptotricha* are densely arachnoid, easily rubbing off in patches.

Nomenclatural notes. In the protologue of *Begonia subvillosa*, Klotzsch cited material collected by von Sello in Brazil but did not cite any herbaria. Irmscher (1953) cited material in Berlin herbarium as the type; however, because there are three sheets in Berlin, this effected only the first stage of lectotypification. Jacques & Mamede (2005) incorrectly cited material in Berlin as the holotype, but this was incorrect because there is no holotype. We choose the sheet B10024925 as the lectotype of *Begonia subvillosa*, partially because this is the best of the three sheets in Berlin herbarium and partially because this sheet was photographed by staff of the Field Museum in the 1920s and has therefore served as a de facto type ever since.

Identification notes. Within Bolivia, *Begonia subvillosa* is most likely to be confused with *B. alchemilloides*. Both species are delicate herbs that grow in crevices in rock outcrops in the Bolivian lowlands and die back in the dry season to a perennial, swollen stem base. *Begonia subvillosa* is best distinguished by its transversely ovate leaves (vs reniform in *B. alchemilloides*) and its much larger staminate (up to 20 mm across vs 12 mm across) and pistillate flowers (15 mm across vs 11 mm across). *Begonia subvillosa* also differs in its densely villous stems, petioles, and lower leaf laminae, which contrast with the glabrous to sparsely villous stems, petioles, and lower leaf laminae of *B. alchemilloides*.

4. Begonia sect. **Eupetalum** (Lindl.) A.DC.

4.20. Begonia marinae Tebbitt, Novon 23(4): 481, fig. 1 (2015). – Type: Bolivia, Santa Cruz Department, Prov. Vallegrande, rd. from Pucara to Alto Seco, N & NE facing open slopes in remnant Tucumano forest, 18°44'S, 64°6'W, 2727 m, 12 i 2012, *M.C. Tebbitt* 724 (holotype USZ, isotype USZ [2]).

Begonia sp. nov. in M.C. Tebbitt, Begonian 79: 99 (2012). – *Begonia sp. nov.* in M.C. Tebbitt, Begonian 80: 105 (2013).

Begonia octopetala auct. non. L'Hér., R.C. Foster, Contr. Gray Herb. 184: 138 (1958).

Begonia octopetala auct. non. L'Hér., Wasshausen, D.C. *et al.* in Jørgensen, P.M. *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Begonia rosiflora auct. non. Hook.f., Wasshausen, D.C. *et al.* in Jørgensen, P.M. *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Begonia rubricaulis auct. non. Hook, D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Distribution. Bolivia and Argentina.

Identification notes. *Begonia marinae* is most similar to *B. pleiopetala* A.DC. Both species are acaulescent, geophytic herbs with orbicular leaf blades with a dentate margin. *Begonia marinae* is best distinguished by its paired bracteoles (*B. pleiopetala* lacks bracteoles) and the broader tepals on its staminate flowers (> 13 mm wide vs < 11 mm wide). Distinguishing these species when sterile is more difficult, but *Begonia marinae* is a larger plant with leaf blades reaching 16 cm vs 9 cm in length.

4.21. Begonia pleiopetala A.DC., Ann. Sci. Nat. Bot. IV(11): 121 (1859). – Type: Peru, Andibus, *J. McLean s.n.* (holotype K [K000252037]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 83 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013); M.C. Tebbitt, Novon 23(4): 484 (2015).

Begonia pusilla A.DC., Ann. Sci. Nat. Bot. IV(11): 120 (1859). – Type: Bolivia, [La Paz Department], Prov. Yungas, xii 1846, *H.A. Weddell* 4215 (lectotype G-DC ex P [photograph F#7327] designated in: Revista Univ. (Cuzco) 33(87): 78 (1944) by Smith, L.B. & Schubert, B.G.; isolectotype P [P00482207, photograph F#38530]).

Begonia tenuicaulis A.DC., Ann. Sci. Nat. Bot., IV(11): 120 (1859). – Type: Bolivia, [Prov. Larecaja-Franz Tamayo], Larecaja & Caupolicán, vallé entre Tipoani et Apolobamba, v 1847, *H.A. Weddell* 4592 (lectotype P [P00482211, photograph F#48533] designated in: Novon 23(4): 484 (2015) by Tebbitt, M.C.; isolectotype G-DC ex P).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013); M.C. Tebbitt, Novon 23(4): 484 (2015).

Begonia warburgiana Hieron., Bot. Jahrb. Syst. 21: 325 (1895). – Type: Bolivia, [La Paz Department], Illimani, entre Pongo y Apacheta, 3800 m, 17 xii 1876, *A. Stübel* 24b (lectotype B [B100186583, photograph F#20908] designated in: Revista Univ. (Cuzco) 33(87): 84 (1944) by Smith, L.B. & Schubert, B.G.).
R.C. Foster, Contr. Gray Herb. 184: 138 (1958); M.C. Tebbitt, Novon 23(4): 484 (2015).

Distribution. Peru and Bolivia.

Nomenclatural notes. Tebbitt (2015c) attempted to lectotypify *Begonia pusilla* A.DC. with the specimen *H.A. Weddell* 4215 (G-DC ex P). Smith & Schubert (1944a) had, however, already effected this lectotypification by citing the same specimen as the type. The earlier typification should be followed (see Article 9.19 of the Shenzhen Code; Turland *et al.*, 2018). The same is true of *Begonia warburgiana* Hieron. (Hieronymus, 1895), which Tebbitt attempted to lectotypify based on *A. Stübel* 24b (B [B100186583]) but cited the same sheet and barcode as the isolectotype. This lectotypification was also effected by Smith & Schubert (1944a).

We note that Tebbitt (2015c) cited the type of *Begonia gracillima* A.DC. as a Bolivian collection. This specimen was collected by C. Gay, who collected only in Peru and Chile. It was collected in Peru, as indicated by the label, which clearly states ‘Pérou’. This name has not been applied in Bolivia, so we exclude it from this treatment.

Identification notes. See the *Identification notes* for *Begonia marinae*.

5. Begonia sect. **Hydristyles** A.DC.

5.22. Begonia andina Rusby, Bull. New York Bot. Gard. 8: 108 (1912). – Type: Bolivia, [La Paz Department], Santa Barbara, [14°44'S, 68°37'W], 5000 ft, 30 viii 1902, *R.S. Williams* 1566 (lectotype NY [NY00112290] designated in: Revista Univ. (Cuzco) 33(87): 81 (1944) by Smith, L.B. & Schubert, B.G.; isolectotypes BM [BM001191441], K [K000322980], US [US00115238]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 81 (1944); L.J. Dorr, Brittonia 43(4): 223 (1991); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 127: 383 (2013).

Distribution. Endemic to Bolivia and La Paz Department.

Nomenclatural notes. The protologue of *Begonia andina* Rusby cited the collection *R.S. Williams* 1566 but did not mention a herbarium (Rusby, 1912). Smith & Schubert (1944a) cited the type as in New York herbarium, which is an effective lectotypification of the name. The protologue also cited a collection made by Richard Spruce in Chimborazo Province, Ecuador, in June 1860 as the same species. The only sheet we know of that matches this description is a collection of *Begonia holtonis* A.DC., which is a superficially similar but distantly related species (Moonlight *et al.*, 2018).

Identification notes. *Begonia andina* is an easy species to determine on account of the densely tomentose-stellate indumentum on its stems, petioles, and the underside of its leaves, which is unique among Bolivian *Begonia* species.

5.23. Begonia bridgesii A.DC., Ann. Sci. Nat. Bot. IV(11): 132 (1859). – Type: Bolivia, *T.C. Bridges s.n.* (holotype CGE n.v.; isotype BM [BM001191526], G-DC ex CGE).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 80 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Begonia cyathophora auct. non. Poepp. & Endl. in D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Distribution. Endemic to Bolivia.

Notes. *Begonia bridgesii* remains probably the least well-known but accepted species of *Begonia* from Bolivia. We have been unable to examine the holotype; however, from the isotypes we have seen, this appears to be a similar species to *Begonia fissistyla* Irmsch. but with a very different fruit shape. We have not observed any flowers of *Begonia bridgesii* and have seen only a single leaf.

Identification notes. *Begonia bridgesii* is most similar to *B. fissistyla*. Both species are upright, glabrous herbs with deciduous stipules. The two can be distinguished by the

shape of their fruit wings: the wings of *Begonia bridgesii* are triangular with straight sides and distinct apices, whereas those of *B. fissistyla* have rounded edges that merge into the apices. The largest fruit wings of *Begonia bridgesii* are broadest where they join the ovary, whereas those of *B. fissistyla* are broadest around half of the length to the apex.

5.24. Begonia fissistyla Irmsch., Bot. Jahrb. Syst. 74: 591 (1949). – Type: Bolivia, [La Paz Department, Sur Yungas Prov.], Unduavi Valley, [16°18'S, 67°50'W], 2000–2600 m, *B. Julio* 438 (syntype US [US00115312], isosyntype B ex US [B100467925]); La Paz Department, Prov. Nor-Yungas, Milluguaya, [16°22'S, 67°36'W], 1300 m, xii 1917, *O. Buchtien* 635 (syntypes B, HBG, US [US00222407]; isosyntype NY [NY01085495]).
R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Begonia suprafastigiata auct. non. Irmsch. in D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Distribution. Endemic to Bolivia.

Nomenclatural notes. The protologue of *Begonia fissistyla* cited material of the collection *B. Julio* 438 in the US herbarium and *O. Buchtien* 636 in the B, HBG and US herbaria (Irmscher, 1949). We have not been able to examine the duplicates of *O. Buchtien* 635 in B or HBG, and all the other cited sheets we have seen are poor. We therefore refrain from designating a lectotype.

Synonymy notes. *Begonia suprafastigiata* was included in the latest checklist of Bolivian *Begonia* based on the specimen *S.G. Beck* 17813 held at the LPB and US herbaria (Wasshausen *et al.*, 2013). This specimen has the multifid styles characteristic of *Begonia* sect. *Hydristyles* and the deciduous stipules and fruit wing shape characteristic of *B. fissistyla*.

Identification notes. *Begonia fissistyla* is superficially most similar to *Begonia alto-peruviana*. Both species are succulent, erect herbs with early-deciduous stipules and transversely ovate leaves with entire to serrulate margins. The two species are in different sections, and *Begonia fissistyla* can be distinguished by its pistillate flowers with multifid styles (vs bifid) and fruits with a largest wing widest in the middle (vs widest where they are attached to the ovary). We have not been able to find any characters that distinguish specimens of these two species that lack both fruits and pistillate flowers.

5.25. Begonia juntasensis Kuntze, Revis. Gen. Pl. 3(3): 106 (1898). – Type: Bolivia, [La Paz Department], río Juntas, [16°57'S, 65°47'W], 800 m, 13–21 vi 1892, *C.E.O. Kuntze s.n.* (lectotype NY [NY00118621] *designated here*, first stage designated in: Revista Univ. (Cuzco) 33(87): 82 (1944) by Smith, L.B. & Schubert, B.G.; isolectotype NY [NY01085499]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 82 (1944); R.C. Foster, Contr.

Gray Herb. 184: 137 (1958); D.C. Washausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Begonia cuninghamei Sprague, Bull. Misc. Inform. Kew 1912(7): 340 (1912). – Type: Cultivated in the Royal Botanic Gardens Kew, 14 vii 1912, *H.C. Baker* 437-11 (lectotype K [K000739941] *designated here*, isolectotype K [K000739940]), **syn. nov.**
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 80 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958).

Begonia subrectangula Rusby, Phytologia 1: 67 (1934). – Type: Bolivia, [La Paz Department], Nequejahuira, [16°20'S, 67°50'W], 8000 ft, 15–24 v 1926, *G.H.H. Tate* 656 (lectotype NY [NY00118702] *designated here*).
R.C. Foster, Contr. Gray Herb. 184: 138 (1958).

Begonia denticulata auct. non. Kunth, Rusby, Bull. Torrey Bot. Club 3: 40 (1893); Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Begonia sanguinea auct. non. Raddi, Rusby, Bull. New York Bot. Gard. 4: 312 (1907).

Begonia bracteosa auct. non. A.DC., Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013) *pro parte*.

Distribution. Endemic to Bolivia.

Nomenclatural notes. The protologue of *Begonia juntasensis* Kuntze (1898: 106) cites material collected by Kuntze at 800 m elevation along the río Juntas. Smith & Schubert (1944a) cited matching material in New York herbarium as the type, which counts as an effective first-stage lectotypification. There are two such sheets in the New York Botanical Garden herbarium, and we designate the sheet NY00118621 as the lectotype. This sheet has a determination slip that indicates Smith and Schubert considered it the type of *Begonia juntasensis*, despite an earlier slip indicating that the sheet is a co-type. We designate the only known sheet of *G.H.H. Tate* 656 in the New York Botanical Garden herbarium (NY00118702) as the lectotype of *Begonia subrectangula* Rusby.

The protologue of *Begonia cuninghamei* Sprague cites living material grown from seed received from H.C. Baker in 1911 (Sprague, 1912). The seeds were originally collected by L. Cuninghame, for whom the species was named. There are two sheets of *H.C. Baker* 437-11 in Kew herbarium. These were collected on 4 July 1912, which is before the protologue was published on 30 September 1912. These sheets are determined as this species and can be considered as original material of this name. We designate the sheet K000739941 as the lectotype, because it includes fruits, staminate material, and pistillate material.

Synonymy notes. *Begonia cuninghamei* was tentatively synonymised with *B. bridgesii* by Smith & Schubert (1944a), who had not seen type material of either species, based on the descriptions in the protologues. The types of *Begonia cuninghamei* differ from those

of *B. bridgesii* in several respects, including the persistent stipules (vs deciduous), the transversely obovate leaves (vs ovate), and the rounded (vs straight-sided) fruits. These characters are all shared with the type of *Begonia juntasensis*, so we transfer *B. cuninghamei* into synonymy with *B. juntasensis*.

Begonia denticulata Kunth is a common species from Colombia and Venezuela that superficially resembles several Bolivian species of *Begonia* sect. *Hydristyles*. This name was first cited in Bolivia by Rusby (1893), based on the collection *M. Bang* 333, and later by Wasshausen *et al.* (2013), who cited *T.B. Croat* et al. 84780. Both collections fall within our concept of *Begonia juntasensis*, so we include both citations as misapplied names. The specimen *M. Bang* 333 was also erroneously identified by Rusby (1907) as *Begonia sanguinea* Raddi, which is a distantly related species endemic to Brazil.

Identification notes. *Begonia juntasensis* is one of two members of *Begonia* sect. *Hydristyles* with persistent stipules and transversely ovate leaves. It differs from the other (*B. santarosensis* Kuntze) in its entire to serrulate leaf margins (vs serrate) and its white to pink tepals (vs red).

5.26. Begonia santarosensis Kuntze, Revis. Gen. Pl. 3(3): 106 (1898). – Type: Bolivia, [Conchabamba Department, Prov. Chapare], Santa Rosa to Tiraque, [17°16'S, 65°48'W], 2600 m, 1–4 vi 1892, *C.E.O. Kuntze s.n.* (lectotype NY [NY00118646] *designated here*, first stage designated in: Revista Univ. (Cuzco) 33(87): 82 (1944) by Smith, L.B. & Schubert, B.G.; isolectotype NY [NY00118647]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 82 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Caulescent herb, lacking a tuber or rhizome. Stem erect to semi-scandent, 30–400 cm tall, 1–4 mm in diameter, branching, internodes 50–125 mm, glabrous, dark red. *Stipules* persistent, triangular, 15–26 × 4–15 mm, apex acuminate, glabrous, red drying brown, margin entire, aciliate. *Leaves* alternate, basifixed; *petioles* joining blade at a right angle, 40–105 mm long, glabrous; *blades* asymmetrical, transversely ovate to transversely broadly ovate, 45–70 × 60–130 mm, apex long acuminate, base cordate, basal lobe to 22 mm, basal lobes not overlapping, venation palmate with 8–12 veins from the base, upper surface dark green, usually flushed red around the petiole insertion and margin, light green along the major veins, glabrous, lower surface dark red, glabrous, margin serrulate, ciliate. *Inflorescences* 1–3 per stem, axillary, erect, cymose, bearing up to 16 staminate and 16 pistillate flowers; *peduncle* to 12 cm long, glabrous, dark red; *pedicels of staminate flowers* held horizontally, to 8 mm long, dark red; *pedicels of pistillate flowers* to 28 mm long, glabrous, red; *bracts* deciduous, lanceolate to obovate, c.5 × 2 mm, apex rounded, red, glabrous, margin lacerate, ciliate. *Staminate flowers*: *tepals* 2, projecting, ovate, 8–10 × 4–6 mm, apex rounded, margin entire, glabrous, pink to red; *stamens* c.60, free, spreading,

filaments c.0.5–1 mm long, anthers symmetrically basifixed, linear, c.1–1.5 mm long, dehiscing via lateral slits, connectives extended to 0.1 mm. *Pistillate flowers*: *bracteoles* 2, deciduous, broadly ovate, c.6 × 6 mm, apex rounded, red, glabrous, margin lacerate, ciliate; *tepals* deciduous in fruit, 5, subequal, spreading, elliptic to ovate, 12–14 × 5–7 mm, apex obtuse, margin entire, glabrous, dark pink to dark red; *ovary body* broadly ovoid, c.5 × 5 mm, glabrous, 3-winged, dark pink to dark red, one wing longer than the other two, oblong, rounded, c.13 × 8 mm, the smaller two wings semicircular, c.2 mm wide, 3-locular, placentas bifid, bearing ovules on both surfaces; *styles* 3, yellow, free at base, irregularly multifid, stigmatic papillae in spirally twisted bands. *Fruiting pedicel* to 3.5 cm long; *fruit* nutant, body broadly ovoid, 6–12 × 6–10 mm, light brown, glabrous, wings same shape as in female flower, light brown, longest wing expanding to 15–30 × 8–12 mm tall, shorter wings not expanding.

Distribution and ecology. *Begonia santarosensis* is endemic to Bolivia and found in Cochabamba and Santa Cruz Departments. It is found within middle and upper montane forest at an elevation of 1040–3450 m. It is a semi-scandent species, typically found at the edge of montane forest. It has been collected in flower and fruit throughout the year.

Etymology. The type collection of this species was collected between Santa Rosa to Tiraque in Cochabamba Department of Bolivia. It is named for this locality.

Proposed IUCN conservation category. *Begonia santarosensis* has a relatively small range, and its EOO is c.4500 km^2. This area is subject to some deforestation but still contains significant tracts of undisturbed montane forest. It has been collected frequently since the year 2000, including in Parque Nacional Amboro in Caballero Province, Santa Cruz Department. Accordingly, we assess *Begonia santarosensis* as Least Concern (LC) under IUCN criteria (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. Bolivia. **Cochabamba Department**: Km 104 camino Chapare, 3100 m, 14 xii 1966, *R.F. Steinbach* 612 (NY). ***Arani Province***: El Limbo, 17°8'38"S, 65°35'19"W, 2180 m, 16 vi 2003, *S. Altamirano, E. Zurita, T. Camacho, M. Aliaga & A. Lacaze* JA913 (MO). ***Chapare Province***: Tablasmonte, a unos 110 km de la cuidad de Cochabamba, 17°5'5"S, 65°56'33"W, 2300 m, *J. Terán, D. Souz & E. Rodríguez* 3695 (MO); 23.8 km N of Colomi (junction of the road to Candelaria) on road to the Chapare, then 2.2 km NW (left) on side road, upper río Cayani, 17°10'S, 65°53'W, 2700 m, 19 x 1985, *J.C. Solomon* 14393 (LPB, MO); Zona del Sillar, km 92 a 1 km al este de la carrtera, 17°11'44"S, 65°47'24"W, 1040 m, 21 xi 2008, *J. Terán, D. Soux & E. Rodríguez* 3072 (MO); El Cañadón-Corani, zona muy próxima a la represa Corani a 60 km de la ciudad de Cochabamba, 17°12'41"S, 65°12'18"W, 3436 m, *J. Terán, D. Soux & E.A. Rodríguez* 836 (MO). [***Ayopaya Province***]: Incachaca, [17°14'S, 65°49'W], 2300 m, 2 iii 1929, *J. Steinbach* (BM, E, G, K, MO); ibid., 2420 m, 15 viii 1950, *W.M.A. Brooke* 6734 (BM, NY), faldas bosques del Cerro Incachaca, 3000 m, 20 x 1920, *J. Steinbach* 5012 (G, NY); Incachaca oeste, 17°14'3"S, 65°49'58"W, 2600 m, *J. Terán, D. Soux, M. Aliaga & E.A. Rodríguez* 3998 (MO). ***Carrasco Province***: Sehuencas area, 17°31'38"S, 65°15'17"W, 2386 m, 21 ii 2003, *L. Rico, T. Windsor-Shaw, A. McRobb & L. Alvarez* 1314 (K, MO, NY); 28 km al NE de Comarapa por el camino

entre Santa Cruz y Cochabamba (20 km en línea recta al NE de Comarapa), 17°49'S, 64°41'W, 2450 m, 10 ii 1987, *J.C. Solomon & M. Nee* 15996 (MO); Siberia, próximo a la carretera, 17°49'40"S, 64°45'17"W, 2986 m, 25 ix 2007, *J. Terán, E.A. Rodríguez & D. Soux* 1191 (MO); 11 km ENE del pueblo de Siberia, 17°50'S, 64°42'W, 2600 m, 5 iii 1988, *M. Saldias P.* 289 (NY[2]). **Santa Cruz Department**. ***Caballero Province***: Khara Huasi, alrededores del pueblo y tramo de 1–2 km subiendo el río Chua Khocha, 17°44'3"S, 64°44'5"W, c.1850 m, 20 vii 1996, *I.G. Vargas C.* 4850 (NY); Old trail Pojo-Kara Huasi, c.3 km NW of Locotal, 17°46.12'S, 64°45.62'W, 2200–2500 m, 2 ii 2000, *B. Ståhl* 5544 (GB); Parque Nacional Amboró, Cerro Bravo, 15 km N of Comarapa, [17°47'S, 64°33'W], 2500 m, 23 v 1996, *D.C. Wasshausen, R.K. Brummitt & J.R.I. Wood* 2035 (K, LPB); Amboro National Park, Cerro Bravo area, c.10 km N of Comarapa, near permanent plot, 17°49'5"S, 64°32'5"W, 2500 m, 20 vi 1995, *J. Abbott & A. Jardim* 17105 (G, MO); Astillero, 17°49'26"S, 64°41'22"W, 2550 m, 14 viii 2003, *E. Fernández, S. Durán, D. Rivera, C. Patzi & A. Romero* EF2029 (LPB, MO); a 26 km de Comarapa, Carretera a Cochabamba, camino hacia el empalme, 17°49'64'S, 64°39'10"W, 2650 m, 17 iv 2003, *D. Soto, E. Calzadilla & M. Muñoz* 56 (MO); Entre el Empalme y Locotal, 17°50'38"–47'21"S, 64°41'34"–43'10"W, 2100–2850 m, 8 iv 2004, *E. Calzadilla* et al. 153 (MO, NY). ***Florida Province***: Comunidad de Bella Vista, quebrada que esta presente en el cerro la piedra bordada, 18°17'35"S, 63°39'5"W, 1520 m, 6 ii 2006, *D. Villaroel, M. Vargas & F. Seidel* 343 (MO).

Nomenclatural notes. Kuntze cited material collected between Santa Rosa and Tiraque in the protologue of *Begonia santarosensis* (Kuntze, 1898). Smith & Schubert (1944a) cited material in NY herbarium as the type, which is an effective first-stage lectotypification. We designate the sheet NY00118646 as the lectotype because it is the only sheet in NY with fruits. This sheet does, however, lack flowers, so further authors may wish to designate a fertile epitype.

Identification notes. *Begonia santarosensis* is most easily confused with *B. juntasensis* on account of the two species' large, persistent stipules that become reflexed with age. Both species also have transversely ovate leaves. They are best distinguished by their venation. *Begonia santarosensis* has 8–12 prominent veins from the base and *B. juntasensis* has 2–5 veins from the base, which are much less prominent. We also suspect that the habits of the two species differ. *Begonia santarosensis* is frequently described as vine-like and reaches 4 m in height, whereas *B. juntasensis* rarely exceeds 50 cm in height.

5.27. Begonia subcaudata Rusby ex L.B.Sm. & B.G.Schub., Revista Univ. (Cuzco) 33(87): 81 (1944). – Type: Bolivia, Yungas, 6000 ft, 1885, *H.H. Rusby* 683 (holotype NY [NY00118650], isotype NY).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 81 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Distribution and ecology. Endemic to Bolivia.

Etymology. The specific epithet *subcaudata* refers to the species' subcaudate leaf base.

Nomenclatural notes. Smith and Schubert cited a sheet of *H.H. Rusby* 683 in the New York Botanical Garden herbarium in their protologue of *Begonia subcaudata* Rusby ex L.B.Sm. & B.G.Schub. (Smith & Schubert, 1944a). There are two sheets of this collection in New York, so following the recommendations of McNeill (2014) these would normally both be treated as syntypes. The second, unbarcoded specimen was, however, deposited in New York in 1948, 3 years after publication of the protologue. The first, barcoded specimen is therefore the holotype of *Begonia subcaudata*.

Identification notes. *Begonia subcaudata* is the only species of Bolivian *Begonia* sect. *Hydristyles* with leaves that are less than half as wide as they are long.

5.28. Begonia unduavensis Rusby, Descr. S. Amer. Pl. 64 (1920). – Type: Bolivia, [La Paz Department, Prov. Sud Yungas], Unduavi, [16°19'S, 67°54'W], 8000 ft, x 1885, *H.H. Rusby* 677 (lectotype NY [NY00118708] designated in: Revista Univ. (Cuzco) 33(87): 80 (1944) by Smith, L.B. & Schubert, B.G.; isolectotypes F [F0052644F], GH [GH00068294], NY [NY01477261], US [US00115484]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 80 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Begonia lignosa Rusby, Descr. S. Amer. Pl. 65 (1920). – Type: Bolivia, [La Paz Department], Prov. Sud Yungas, Unduavi, [16°19'S, 67°54'W], 3100 m, xi 1910, *O. Buchtien* 2899 (lectotype NY [NY00118625] *designated here*, first stage designated in: Revista Univ. (Cuzco) 33(87): 81 (1944) by Smith, L.B. & Schubert, B.G.; isolectotypes NY [NY01477266], US [2: US00115367, US00074725]).
R.C. Foster, Contr. Gray Herb. 184: 137 (1958).

Begonia obtecticaulis auct. non. Irmsch., D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Caulescent herb, lacking a tuber or rhizome. *Stem* erect, to 50 cm tall, 1.5–4 mm in diameter, branching, internodes (5–)25–50 mm, glabrous to sparsely pilose, red. *Stipules* persistent, triangular, 7–18 × 2–4 mm, apex acuminate, mucronate, glabrous, light brown, margin entire, aciliate. *Leaves* alternate, basifixed; *petioles* joining blade at almost a right angle, 5–28 mm long, glabrous to sparsely pilose; *blades* asymmetrical, transversely deltoid, 30–95 × 15–35 mm, apex acuminate, base cuneate on the narrow side of the blade, auriculate on the broad side of the blade, venation palmate-pinnate, 4 or 5 veins from the base, 3 or 4 veins on the broad side of the blade, 2 or 3 on the narrow side, upper surface dark green, sometimes with a red line around the margin, sparsely pilose, lower surface pale green to red, sparsely pilose, margin double-dentate, ciliate. *Inflorescences* 1–3 per stem, axillary, erect, arising close to the apex of the stem, a dichasial cyme, protandrous, with up to 16 staminate flowers and 8 pistillate flowers; *peduncle* 22–33 mm long, glabrous, red; *pedicels*

of staminate flowers 5–22 mm long, glabrous, red; *pedicels of pistillate flowers* 7–16 mm long, glabrous, red; *bracts* persistent, elliptic to lanceolate, 4–7 × 1–3 mm, apex obtuse to acute, red to brown, glabrous, margin lacerate, ciliate. *Staminate flowers*: *tepals* 2, spreading, white to pink, orbicular, 6–14 × 7–14 mm, apex rounded, base rounded, margin entire, glabrous; *stamens* c.75, fused at the base, spreading, filaments 1.5–2 mm long, anthers symmetrically basifixed, oblong, 1.2–1.5 mm long, dehiscing via lateral slits, connectives extended 0.3–0.5 mm. *Pistillate flowers*: *bracteoles* lacking; *tepals* deciduous in fruit, 5, spreading, elliptic to ovate, 9–14 × 3–6 mm, apex rounded, margin entire, aciliate, glabrous, white to pink; *ovary body* ovoid, 4.5–5 × 3.5–4 mm, pink, 3-winged, wings pink, one wing longer than the other two, rectangular, ascending, front edge truncate, apex truncate, lower edge slightly rounded, 6–9 × 7–13 mm, the shorter two wings semicircular to triangular, front edge truncate, apex rounded, lower edge gently curved, 4.5–5 × 1–2 mm, 3-locular, placentas bifid, bearing ovules on both surfaces; *styles* 3, yellow, free at base, irregularly multifid from around half their length, stigmatic papillae in a spirally twisted band. *Fruiting pedicel* to 3.2 cm long; *fruit* held erect, body ovoid, 9.5–12.5 × 7.5–12 mm, light brown, glabrous, wings same shape as in pistillate flower, light brown, longest wing expanding to 17 × 30 mm, shorter two wings expanding to 10.5 × 3 mm.

Distribution. Endemic to Bolivia.

Nomenclatural notes. The name *Begonia unduavensis* Rusby was published based on the collection *H.H. Rusby* 677, but no herbaria were cited. Rusby's protologue cited material collected at an elevation of 8000 ft, and the known sheets of this material state either 8000 ft or 12,000 ft. The two sheets that state 8000 ft are one in the New York Botanical Garden herbarium (NY00118708) and one in the Field Museum in Chicago (F0052644F). Smith & Schubert (1944a) cited the type of *Begonia unduavensis* in the New York Botanical Garden herbarium, which is an effective lectotypification. We cite as syntypes all sheets that were collected at 12,000 ft.

The protologue of *Begonia lignosa* Rusby cited the collection *O. Buchtien* 2899, but no herbarium (Rusby, 1920). Smith & Schubert (1944a) cited material in the New York Botanical Garden herbarium as the type, which counts as an effective lectotypification because there are two matching sheets in New York. We select the duplicate NY00118625 as the lectotype, because it has both flowers and fruits.

Identification notes. *Begonia unduavensis* is most similar to *B. unilateralis* Rusby, with both species having relatively small (< 8 cm long), obliquely lanceolate to ovate leaves that are truncate at the base. They are best distinguished by their indumentum. *Begonia unduavensis* has stems, petioles and leaf laminae that are sparsely to densely pilose, whereas *B. unilateralis* has an indumentum of peltate scales. This indumentum is densest on the stems, petioles, and veins on the leaf lower surface (although it can rub off); moderately dense on the lower leaf surface; and sparse on the upper leaf surface.

5.29. Begonia unilateralis Rusby, Descr. S. Amer. Pl. 68 (1920). – Type: Bolivia, [La Paz Department], Nequejahuira [16°20'S, 67°50'W], 8000 ft, 15–24 v 1926, *G.H.H. Tate* 657 (lectotype NY [NY00118710] designated in: Revista Univ. (Cuzco) 33(87): 81 (1944) by Smith, L.B. & Schubert, B.G.).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 81 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Distribution. Endemic to Bolivia.

Nomenclatural notes. The protologue of *Begonia unilateralis* Rusby cited the collection *G.H.H. Tate* 657 but no herbarium (Rusby, 1934). Smith & Schubert (1944a) cited a sheet of this collection in the New York Botanical Garden herbarium as the type. Only one sheet in New York matches this description, so this is an effective lectotypification.

Identification notes. This is the only species of *Begonia* in Bolivia with an indumentum of peltate scales.

6. Begonia sect. **Knesebeckia** (Klotzsch) A.DC.

6.30. Begonia acerifolia Kunth, Nov. Gen. Sp. (quarto ed.) 7: 186, t. 644 (1825).– Type: Ecuador, [Loja Province], Loxam, 1060 m, *A.J.A. Bonpland* 3333 (lectotype P [P00679517] designated in: Phytologia 44(4): 246 (1979) by Smith, L.B. & Wasshausen, D.C.).
M.C. Tebbitt in Edinburgh J. Bot. 74(2): 221 (2017).

Begonia erythrocarpa A.DC., Ann. Sci. Nat. Bot. IV(11): 121 (1859). – Type: Bolivia, La Paz Department, Prov. Larecaja, v 1847, *H.A. Weddell* 4729 (lectotype P [P01900755] designated in: Edinburgh J. Bot. 74(2): 221 (2017) by Tebbitt, M.C.; isolectotypes G-DC ex P, P [P01900754]).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013); M.C. Tebbitt in Edinburgh J. Bot. 74(2): 221 (2017).

Distribution. Ecuador, Peru and Bolivia.

Nomenclatural notes. The protologue of *Begonia acerifolia* Kunth (1825: 186, pl. 644) does not cite a specimen or a herbarium, so this species does not have a holotype (see McNeill, 2014). Smith & Wasshausen (1979) cited specimens collected by Humboldt and Bonpland and held in Paris herbarium as the 'holotype'. We are not aware, however, of any unnumbered material of this species in Paris herbarium. The authors did, however, cite a photograph of their 'holotype' in the US herbarium, which clearly shows the specimen *A.J.A. Bonpland* 3333 in Paris herbarium (P00679517), so we can interpret Smith and Wasshausen's citation as an effective lectotypification of *Begonia acerifolia*. Smith & Wasshausen (1986) later repeated the same citation. Tebbitt (2017) correctly identified the specimen as *A.J.A. Bonpland* 3333 but incorrectly cited it as a holotype.

Identification notes. All specimens of *Begonia acerifolia* we have seen from Bolivia have peltate leaves, although many populations in northern Peru and Ecuador have basifixed leaves (Tebbitt, 2017). *Begonia wollnyi* Herzog is the only other caulescent species of Bolivian *Begonia* that can have peltate leaves, although they are usually basifixed, and this species differs in having three, well-developed wings on its fruit and ovaries (vs two wings reduced to ribs in *B. acerifolia*).

6.31. Begonia leathermaniae O'Reilly & Kareg. *nom. nov.* Begonian 50: 146, fig. *s.n.* [2] (1983). – *Begonia platanifolia* var. *acuminatissima* Kuntze, Revis. Gen. Pl. 3(3): 106 (1898). – Type: Bolivia [Cochabamba Department], Santa Rosa, [17°18'S, 65°33'W], 2000 m, 1–4 iv 1892, *C.E.O. Kuntze s.n.* (lectotype NY [NY00118642] *designated here*; isolectotypes B [B100243080, photograph F#20884], NY [NY00118643]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 84 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); M.C. Tebbitt, Begonian 79: 99 (2012); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Distribution. Endemic to Bolivia.

Nomenclatural notes. In his protologue of *Begonia platanifolia* var. *acuminatissima* Kuntze (1898: 106), the author cited his own collections made at 2000 m elevation in Santa Rosa in Bolivia. Smith & Schubert (1944a) cited material of a matching but unnumbered collection in the New York Botanical Garden herbarium as the type. There are two matching sheets in the herbarium, so Smith and Schubert's citation effected the first stage of lectotypification. O'Reilly & Karegeannes (1983) later cited the same material in New York as the type of this name, and their new name and combination *Begonia leathermaniae* O'Reilly & Karegeannes (1983: 146). We designate the sheet *Kuntze s.n.* (NY [NY00118642]) as the lectotype of *Begonia platanifolia* var. *acuminatissima* and *B. leathermaniae*. This sheet was chosen because it has a determination slip with this name written in Otto Kuntze's handwriting.

Identification notes. *Begonia leathermaniae* is a distinctive species with more than five sinuous, deeply cut lobes on its leaf laminae. It may be confused with the superficially similar *Begonia acerifolia* but can be distinguished by the ring of hairs at its petiole apex.

6.32. Begonia wollnyi Herzog, Repert. Spec. Nov. Regni Veg. 7: 63 (1909). – Type: Bolivia, Im Bergwald der Quebrada de Cuñucú (Cordillera de Sta. Cruz), c.800 m, x 1907, *T.C.J. Herzog* 86 (holotype Z).
R.C. Foster, Contr. Gray Herb. 184: 138 (1958); Tebbitt, Begonian 79: 99 (2012); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013); M.C. Tebbitt, Edinburgh J. Bot. 75(2): 218 (2018).

Begonia williamsii Rusby & Nash *later homonym non* B.S.Williams., Torreya 6(3): 47, fig. *s.n.* (1906). – Type: Bolivia, San Buena Ventura, [14°27'S, 67°33'W], 1400 ft, 14 xi 1901, *R.S. Williams* 600 (lectotype NY [NY00118714] designated in: Revista Univ. (Cuzco) 33(87): 84 (1944) by Smith, L.B. & Schubert, B.G.; isolectotypes BM [BM000043984], K [K000536789], US [US00115497]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 84 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); L.J. Dorr, Brittonia 43(4): 223 (1991); M.C. Tebbitt, Edinburgh J. Bot. 75(2): 218 (2018).

Begonia parodiana L.B.Sm. & B.G.Schub., Darwiniana 5: 88 (1941b). – Type: Argentina, Prov. Salta, Dept. Oran, Cerros de río Ytau, 54 km west of Manuela Pedraza, [24°30'S, 65°0'W], 800 m, 29 x 1939, *W.J. Eyerdam & A.A. Beetle* 22726 (holotype GH [GB00068261]; isotypes K, G [G00034152]).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013); Delfini, C. in Zuloaga, F.O. & Belgrano, M.J. (eds), Fl. Argentina 17: 11 (2017); M.C. Tebbitt *et al.*, Edinburgh J. Bot. 75(2): 218 (2018).

Distribution. Peru, Bolivia, Brazil, Venezuela and Argentina.

Nomenclatural notes. In the protologue of *Begonia williamsii* Rusby & Nash (1906: 47), the authors cited material collected by R. S. Williams north of San Buena Ventura in Bolivia between 1901 and 1902. In their account of the Begoniaceae of Bolivia, Smith & Schubert (1944a) cited a sheet of *R.S. Williams* 600 in New York as the type of this name. There is only one sheet matching this description in the New York Botanical Garden herbarium, so this counts as an effective lectotypification. This proceeds an attempt by Tebbitt *et al.* (2018b) to lectotypify *Begonia williamsii*, thus Smith and Schubert's earlier typification should be followed (see Article 9.19 of the Shenzhen Code; Turland *et al.*, 2018).

Identification notes. In Bolivia, *Begonia wollnyi* is most likely to be confused with either *B. acerifolia* or *B. leathermaniae*. It can be distinguished from the former species by its usually basifixed leaves and its three, well-developed wings on its ovaries and fruits (vs two wings reduced to small, rib-like projections). *Begonia leathermaniae* is best distinguished by its ring of trichomes where its petiole joins the leaf lamina.

7. Begonia sect. **Pritzelia** (Klotzsch) A.DC.

7.33. Begonia parviflora Poepp. & Endl., Nov. Gen. Sp. 1: 7, pl. 12 (1835). – *Scheidweilera parviflora* (Poepp. & Endl.) Klotzsch, Abh. Kon. Akad. Wiss. Berlin 1854: 179 (1855). – Type: Peru, [Huánuco Region, Pampayacu], in Andim Peruviae orientalis ad Pampayaco, [8°29'S, 76°26'W], vi–ix, *E.F. Poeppig s.n.* (lectotype W, *designated here*).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 83 (1944); Rusby, H.H., Bull. Torrey Bot. Club 3: 40 (1893); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); D.C.

Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Begonia micrantha Steud *nom. nud.*, Nomencl. Bot. (Steudel), ed. 2, 1: 194 (1840).

Begonia myriantha Britton, Bull. Torrey Bot. Club 18: 35 (1891). – Type: Bolivia, [La Paz Department, Prov. Sud Yungas], Unduavi, [16°19'S, 67°54'W], 8000 ft, *H.H. Rusby* 691 (lectotype NY [NY00118634] *designated here*; isolectotypes BM [BM001191446], F [F0052634F], GH [2: GH00068258, GH00068259], K [K000536739], MICH [MICH1115795], NY [2: NY00118633], PH [PH00007795], US [2: US00222465, US00115399], WIS [WISv0257074WIS]).
R.C. Foster, Contr. Gray Herb. 184: 138 (1958).

Distribution. Costa Rica, Panama, Colombia, Ecuador, Peru and Bolivia.

Nomenclatural notes. *Begonia myriantha* Britton was described based on the collection *H.H. Rusby* 691 (Britton, 1891: 35). Both the collector and the author were based at the New York Botanical Garden herbarium, and there are three sheets of this collection in New York. All three are good material, and we choose NY00118634 as the lectotype because it has '*Begonia myriantha* Britton *n.sp.*' handwritten on the label and a copy of the protologue attached as a second label.

Identification notes. *Begonia parviflora* is a very distinctive species. It is the only species of Bolivian *Begonia* that regularly reaches maturity at over 2 m in height and may reach 10 m tall. It is also the only upright species of Bolivian *Begonia* with leaves that exceed 50 cm in diameter and with well over 100 flowers per inflorescence. Immature plants may be confused with *Begonia acerifolia*, *B. leathermaniae* or *B. wollnyi* but can be distinguished by the rough, sandpaper-like texture of its leaves, which is due to the cystoliths in the leaf laminae.

8. Begonia sect. **Ruizopavonia** A.DC.

8.34. Begonia bangii Kuntze, Revis. Gen. Pl. 3(3): 105 (1898). – Type: Bolivia, Yungas, 1890, *M. Bang* 406 (holotype B [B100467645]; isotypes B ex M [B100467896], BM [BM001191454], F [F0077666F], G, GH [GH00068215], K [2: K000322981, K000322982], M [M0113295], NDG [NDG34423], NY [NY00112292], PH [PH00007770, PH00025179], US [2: US00222368, US00115248]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 75 (1944). – *Begonia sp.* in H.H. Rusby, Bull. Torrey Bot. Club 3: 40 (1893); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 127: 383 (2013).

Begonia chaetocarpa Kuntze var. *chaetocarpa*, Revis. Gen. Pl. 3(3): 105 (1898). – Type: Bolivia, [Cochabamba Department], Santa Rosa, [17°18'S, 65°33'W], 2000 m, 1–4 iv 1892, *C.E.O. Kuntze s.n.* (lectotype NY [NY00112296] *designated here* first stage designated in:

Revista Univ. (Cuzco) 33(87): 76 (1944) by Smith, L.B. & Schubert, B.G.; isolectotypes B [B100242167, photograph F#20885], MO [MO-266441], NY [NY00112297]); [Cochabamba Department], río Juntas, [16°52'S, 65°53'W], 1000 m, iv 1892, *C.E.O. Kuntze s.n.* (syntypes F [F0052623F], NY [NY00112298], US [US00222384]), **syn. nov.**

L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 76 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Washausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Begonia chaetocarpa var. *glabriflora* L.B.Sm. & B.G.Schub., Revista Univ. (Cuzco) 33(87): 76 (1944). – Type: Bolivia, La Paz Department, Yungas, 1800 m, 1885, *H.H. Rusby* 690 (holotype F [F0052624F]; isotypes BM [BM001191453], E [E00265151], GH [GH00068218], K [K000536728], MO [MO-266442], NY [5: NY01477262, NY01477263, NY01477264, NY01477265, NY00112299], P [P06872624], PH [PH00007799], US [US00222366], WIS [WISv0257072WIS]), **syn. nov.**

R.C. Foster, Contr. Gray Herb. 184: 137 (1958).

Begonia ulmifolia Bang ex Kuntze *pro. syn. Begonia bangii* Kuntze, Revis. Gen. Pl. 3(3): 105 (1898).

Begonia antioquensis auct. non. (A.DC.) Warb., Rusby, Bull. Torrey Bot. Club 4: 207 (1895).

Caulescent herb to 1 m tall. *Stem* erect, branching; internodes to 14.5 cm long, to 4.5 mm thick, succulent, green to brown, hispid to densely hispid or densely tomentose. *Stipules* persistent, transversely reniform to transversely orbicular, 5–11.5 × 8–21 mm, apex acute to rounded, opaque, green to brown, sparsely hispid, margin lacerate, long-ciliate. *Leaves* > 5 per stem, alternate, basifixed; petiole 1–5.5 cm long, green to brown, densely hispid; blade asymmetrical, transversely lanceolate to oblanceolate, 4.5–16 × 2–8.5 cm, membranaceous, apex acuminate, base cordate on the broad side of the bade, cuneate on the narrow side, margin irregularly serrate to double serrate, ciliate, upper surface green, sometimes with a red line around the edge, hispid, lower surface pale green, hispid, densely hispid on the veins, veins pinnate, with 8–10 secondary veins on the broader side, 5–8 secondary veins on the narrower side. *Inflorescences* 1–3 per branch, bisexual, axillary, erect, cymose, with 1–3 branches, bearing up to 8 staminate flowers and 16 pistillate flowers, protandrous; peduncle to 9.5 cm long, brown, densely hispid, bracts deciduous, lanceolate, 7–10 × 2–3 mm, brown, hispid to densely hispid, apex acuminate, margin lacerate, long-ciliate. *Staminate flowers*: pedicels to 15.5 mm long, glabrous; *tepals* 2, spreading, broadly ovate, 4–7.5 × 3.5–7 mm, apex rounded, base truncate, white, hispid, margin entire, aciliate; stamens c.30, spreading, yellow, filaments 1–3 mm long, free, anthers ellipsoid, c.1 × 0.2 mm long, dehiscing via lateral slits, connectives extended to 0.5 mm, symmetrically basifixed. *Pistillate flowers*: pedicels to 12 mm long; bracteoles 2, positioned directly beneath the ovary, lanceolate, 4–6 × 1.5–3.6 mm, apex truncate, brown, glabrous to hispid, margin lacerate, long-ciliate; *tepals* 5, subequal, deciduous in fruit, spreading, ellipsoid to ovoid, 4–10.5 × 1–4.5 mm,

apex acuminate to rounded, white, glabrous, margin entire, aciliate; ovary body ovoid, 2.5–7 × 2–5.5 mm, white, glabrous to sparsely hispid, unequally 3-winged, wings semi-orbicular, largest 5.5–10 × 5–12.5 mm, smallest 5–8.5 × 1–5 mm; 3-locular, placentation axillary, branches divided, bearing ovules on both surfaces; styles 3, colour, fusion, 2–4 mm long, divided one to four times, stigmatic papillae in spirally twisted bands. *Fruiting pedicel* to 40 mm long. *Fruit* a capsule, body ovoid, to 8 × 6 mm, drying brown, wings same shape as in ovary, the largest expanding to 14.5 × 26 mm, the smallest expanding to 10 × 7 mm.

Distribution and ecology. Endemic to Bolivia and known from La Paz, Cochabamba and Santa Cruz Departments. Found within lower and middle montane forest at an elevation of 550–2371 m. It is a semi-scandent herb, typically collected on the edge of montane forest patches. *Begonia bangii* has been collected flowering and fruiting throughout the year, with a possible peak in July and August, which is the dry season.

Etymology. Named after Miguel Bang, who collected the type specimen of the species.

Proposed IUCN conservation category. *Begonia bangii* has a known EOO of c.17,000 km^2, which includes several protected areas and a high proportion of undisturbed forest. It has been frequently collected in the past 20 years, including close to major roads. We conclude that *Begonia bangii* is not under threat of extinction and assess it as Least Concern (LC) under IUCN criteria (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. Bolivia. **La Paz Department**. ***Nor Yungas Province***: 5 km beyond Suapi, c.15 km NNW of Corioco, [16°5'S, 67°42'W], 1300 m, 6 vi 1996, *D.C. Wasshausen, R.K. Brummitt, R. Ríos & A. Freire* 2100 (LPB, MO, NY, US); 13 km al noroeste del camino entre Yolosa y Caranavi, por el camino a Suapi, al lado del río Khusillani, c.1 km antes de la comunidad Khusillani, 16°8'S, 67°46'W, 1500 m, 27 v 1988, *J.C. Solomon* 18459 (MO); Parque Nacional ANMI Cotapata, Estación Biológica Tunquini, NW of Coroico, NNE of La Paz, vic of Chairo, 23 km NW of Yolosa, 16°12'S, 67°50'W, 1300–1500 m, 21 viii 2000, *T.B. Croat, A.C. Acebey & T. Kromer* 84746 (MO [2]); ibid., *T.B. Croat, A.C. Acebey & T. Kromer* 84779 (MO); 4.6 km below Yolosa, then 19.1 km on the road up río Huarinilla, 16°12'S, 67°53'W, 1700 m, 12 xi 1982, *J.C. Solomon* 8775 (MO, NY). ***Sud Yungas Province***: Carretera de Huancané a San Isidro, 16°20'52.9"S, 67°31'33.9"W, 2371 m, 2 vi 2011, *M.F. Gardner, E. Nieto & D. Alanes* 49 (E). ***Chapare Province***: In river gorge c.4 km below El Palmar, 650 m, 6 vii 1997, *J.R.I. Wood* 12399 (K [2]); 7 km SW of Villa Tunari, 13.5 km up road to El Palmar (to edge of Carrasco Parque) from main tar road, [17°0'S, 65°29'W], 550 m, 31 v 1996, *D.C. Wasshausen, R.K. Brummitt, J.R.I. Wood & N. Ritter* 2078 (K, LPB, NY); Antahuacana, Espíritu Santo, [17°4'S, 65°39'W], 750 m, vi 1969, *O. Buchtien s.n.* (K); Sillar, km 120 de la Carretera Cochabamba-Villa Tunari, 17°7'34"S, 65°41'26"W, 1021 m, 27 vi 2008, *J. Terán, E. Rodríguez & D. Soux* 2712 (MO); ibid., 30 vi 2008, *J. Teran, E. Rodríguez & D. Soux* 2752 (MO); San Onofre, [17°9'S, 65°46'W], 1600 m, 28 ii 1929, *J. Steinbach* 9308 (BM, K); Santa Isabel, 17°11'16"S, 65°49'54"W, 1748 m, 29 x 2008, *J. Terán, D. Soux & M. Aliaga* 2937 (MO). **Cochabamba Department**. ***Arani Province***: El Limbo, 17°08'11"S, 65°37'35"W, 2100 m, 15 viii 2003, *S. Altamirano, E. Zurita, M. Allen Z., T. Camacho, M. Aliaga & A. Lacaze* JA1042 (MO); ibid., 17°08'7.9"S, 65°37'32.8"W, 2030 m, 21 viii 2003, *S. Altamirano, E. Zurita, M. Allen Z., T. Camacho, M. Aliaga & A. Lacaze* JA1269 (MO [2]). [***Ayopaya***

Province]: Incachaca, small power station about 80 miles NE of Cochabamba, [17°12'S, 66°35'W], 21 viii 2003, *W.M.A. Brooke* 6759 (BM). **Santa Cruz Department**. ***Manuel Maria Caballero Province***: Khara Huasi, trayecto de 5 km al W de la escuelita, subiendo el río Khara Huasi, 17°44'S, 64°44.5'W, 1850–1900 m, *I.G. Vargas C.* 4827 (NY).

Nomenclatural notes. Otto Kuntze described *Begonia bangii* from material of the collection *M. Bang* 406 in the herbarium of Berlin Botanical Garden. Smith & Schubert (1944a) presumed that this material was destroyed during the bombing of Berlin in the Second World War, but the herbarium's *Begonia* collections were on loan to Edgar Irmscher and therefore survived. There are two sheets of *M. Bang* 406 in Berlin, but only one of these (B100467645) was in Berlin in 1898 and is therefore the holotype. The second sheet (B100467896) is an isotype and includes leaves and flowers taken from a sheet in Munich herbarium (M0113295) by Irmscher, accompanied with a pencil drawing of the Munich specimen. This most likely occurred in the 1940s, when Irmscher was preparing his revision of the South American Begoniaceae (Irmscher, 1949).

The protologue of *Begonia chaetocarpa* cites material of two unnumbered collections by Otto Kuntze: one from Santa Rosa and a second from the valley of the río Juntas. Smith and Schubert cited material collected in Santa Rosa and held in New York herbarium as the type of *Begonia chaetocarpa*. There are two sheets matching this description in New York, so this counts as the first stage of lectotypification. Both sheets are relatively poor material, with few leaves, several fruits, and no pistillate flowers. We designate the sheet NY00112296 as the lectotype of *Begonia chaetocarpa*, because of the two available specimens, it has a single tepal on a developing fruit. Future authors may decide to designate an epitype matching this sheet but with well-preserved staminate and pistillate flowers.

Synonymy notes. *Begonia chaetocarpa* Kuntze (1898: 105) was separated from *B. bangii* Kuntze (1898: 105) by Kuntze on the basis of its hispid fruits and its larger wings in fruit. Smith & Schubert (1944a) also noted that the two species differed in their styles, which are bifid in the type of *Begonia bangii* and multifid in the type of *B. chaetocarpa*. They also, however, described the variety of *Begonia chaetocarpa* var. *glabriflora* Smith & Schubert (1944a: 76), which shared the bifid styles of *B. chaetocarpa* but has a glabrous ovary. This variety was treated as a synonym of *Begonia chaetocarpa* in the latest checklist of Bolivian *Begonia* (Wasshausen *et al.*, 2013). Our investigations show that the style of the type collection of *Begonia chaetocarpa* var. *glabriflora* varies from bifid to multifid, so this character cannot be used to separate *B. chaetocarpa* from *B. bangii*. Furthermore, the fruits of this variety are smaller than those of the type variety and closer in size to those of the type of *Begonia bangii*. Together with other collections, there is a continuum from *Begonia bangii* to *B. chaetocarpa*, so we synonymise the latter and its variety with *B. bangii*.

Identification notes. Best recognised as a frequently branching herb with a densely hispid to tomentose indumentum on its stems and persistent, transversely semi-orbicular or

transversely ovate stipules. This species is superficially similar to *Begonia unduavensis*, *B. unilateralis* and *B. leptostyla* Irmsch., which are frequently branching herbs and sometimes have a hispid stem (except *B. unilateralis*) and persistent stipules. The stipules of these species are, however, symmetrical and triangular to lanceolate rather than asymmetrical and ovate to semicircular.

8.35. Begonia buchtienii Irmsch., Bot. Jahrb. Syst. 74: 595 (1949). – Type: Bolivia, [Cochabamba Department, Prov. Chapare], Antahuacana, im Tal des Espiritu Santo, 160 km von Cochabamba enfernt, [17°4'S, 65°39'W], 750 m, vi 1909, *O. Buchtien* 2263 (lectotype US [US00115264] *designated here*; isolectotypes B ex US [B100467926], NY [2: NY03091040, NY03091041]); ibid., vi 1909, *O. Buchtien* 4653 (syntype US [US00222383]). D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Distribution. Endemic to Bolivia.

Notes. *Begonia buchtienii* is one of four Bolivian members of *Begonia* sect. *Ruizopavonia* with a sparse to dense indumentum on the stem. It can be distinguished with ease from *Begonia bangii*, which has persistent, asymmetrical and ovate to semicircular stipules, but the differences between *B. buchtienii*, *B. leptostyla* and *B. varistyla* Irmsch. are unclear. Irmscher distinguished both *Begonia buchtienii* and *B. varistyla* from *B. bangii* on the basis of stipule shape and their having four tepals in the pistillate flower. *Begonia leptostyla* was not distinguished against any similar species, so it is unclear how Irmscher believed it to be different. We cannot distinguish these species based on Irmscher's descriptions or type specimens, and there are numerous specimens that represent intermediates between these descriptions. We consider it likely that these three names represent only one or two species.

Nomenclatural notes. Edgar Irmscher described *Begonia buchtienii* Irmsch. (1949: 595) from material of *O. Buchtien* 2263 and 4653 in Washington herbarium. We select the sheet of the former (US00115264) as the lectotype of *Begonia buchtienii* because there is a specimen including six staminate flowers and one leaf from this collection in Berlin (B100467926). This sheet also has a line drawing by Irmscher of the lectotype in Washington, and writing indicating that Irmscher considered *O. Buchtien* 2263 as the type. Unfortunately, none of the known type material of *Begonia buchtienii* includes pistillate flowers or fruits, despite Irmscher providing a full description of the pistillate flowers. Further authors may decide to designate an epitype with pistillate flowers matching Irmscher's description.

Identification notes. Distinguished as the only Bolivian *Begonia* with pinnate venation; a tomentose indument on its stem; deciduous, triangular stipules; a transversely cordate leaf base; and large (> 1 cm long) tepals on the staminate flower (but see *Notes* above).

Based on Irmscher's description, *Begonia buchtienii* differs from *B. leptostyla* in its transversely cordate leaf base (vs rounded), and from *B. varistyla* in its elliptic stipules (vs oblong-ovate) and its c.11 mm long staminate tepals (vs c.7.5 mm long).

8.36. Begonia comata Kuntze, Revis. Gen. Pl. 3(3): 105 (1898). – Type: Bolivia, [Cochabamba Department], Tunari, [17°3'S, 66°43'W], 1800 m, iv 1892, *C.E.O. Kuntze s.n.* (lectotype NY [NY00118604] *designated here* first stage designated in: Revista Univ. (Cuzco) 33(87): 83 (1944) by Smith, L.B. & Schubert, B.G.; isolectotypes B [B100366049], NY [NY00118603]); ibid., 2300 m, iv-v 1892, *C.E.O. Kuntze s.n.* (syntype US [US00115287]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 83 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Caulescent herb, to 70 cm tall. *Stem* erect, rarely branching; internodes to 4.5 cm long, to 10.5 mm thick, succulent, green, glabrous. *Stipules* persistent, lanceolate, 8–27 × 3–10 mm, apex rounded, translucent, brown, glabrous, margin lacerate, long-ciliate. *Leaves* > 5 per stem, alternate, basifixed; petiole 0.3–2.2 cm long, red, glabrous; blade asymmetrical, lanceolate, to 9.5 × 3 cm, membranaceous, apex acuminate, base auriculate on the broader side, the basal lobe usually overlapping the petiole, cuneate on the narrower side, margin serrulate, ciliate, upper surface green, glabrous, lower surface pale green with red spots, glabrous, veins palmate-pinnate, secondary veins indistinct. *Inflorescences* > 3 per stem, either unisexual or bisexual and strongly protandrous, axillary, erect, cymose, with 2 or 3 branches, bearing up to 8 staminate flowers and/or 8 pistillate flowers; peduncle to 6.5 cm long, red, glabrous, bracts deciduous, broadly ovate, 4–6.5 × 4–7 mm, colour unknown, glabrous, apex acute, margin serrulate, long-ciliate. *Staminate flowers*: pedicels to 15.5 mm long, glabrous; tepals 2, spreading, ovate broadly ovate, 10–16 × 10–17 mm, apex obtuse to rounded, base cordate to rounded, red, glabrous, margin entire, aciliate; stamens c.12, projecting, yellow, filaments 0.75 mm long, free, anthers linear, 1–1.5 × 0.2 mm, dehiscing via lateral slits, connectives not extended, symmetrically basifixed. *Pistillate flowers*: pedicels to 10 mm long; bracteoles 3, positioned directly beneath the ovary, ovate, 10–13 × 6–7.5 mm, apex acute, red, glabrous, margin serrulate, ciliate; tepals 5, subequal, late deciduous in fruit, spreading, ovate, 8–10 × 5–9 mm, apex obtuse, red, glabrous, margin entire, aciliate; ovary body ovoid, 3–5 × 2.5–4 mm, red, glabrous, unequally 3-winged, wings semicircular, largest c.6 × 3 mm, smallest c.6 × 2 mm; 3-locular, placentation axillary, branches divided, bearing ovules between the placental branches; styles 3, yellow, free, 1.5–2.5 mm long, bifid, stigmatic papillae in a spirally twisted band. *Fruiting pedicel* to 14 mm long. *Fruit* a capsule, body ovate, to 8 × 9.5 mm, drying brown, wings same shape as in ovary, the largest expanding to 12 × 20.5 mm, the smallest expanding to 12 × 5 mm.

Distribution and ecology. Endemic to Bolivia and known from La Paz and Cochabamba Departments. It is typically collected around rocks in semideciduous montane forests at an

elevation of 980–1800 m. *Begonia comata* has been collected in flower and fruit from April to December.

Etymology. The epithet derives from the Latin word *comatus*, meaning 'long-haired'. This refers to the species' long-ciliate stipule margins.

Proposed IUCN conservation category. *Begonia comata* is known from a narrow elevational band and has an EOO of c.5500 km^2. This area includes a large percentage of original forest cover and the species has population known from the Area Natural de Manejo Integrado Apolobamba. However, the species has been rarely collected and appears to have a patchy distribution. We assess *Begonia comata* as Vulnerable (VU), B1abiii, under IUCN criteria (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. Bolivia. **La Paz Department**. ***Bautista Saavedra Province***: Area Natural de Manejo Integrado Apolobamba, c. del cruce para subir a Camata por la carretera a Charazani, 15°12'59"S, 68°41'3"W, 1290 m, 3 ix 2004, *A. Fuentes & C. Aldana* 6690 (LPB, MO). ***Sud Yungas Province***: Chulumani, 52 km hacia Asunta, [16°12'S, 67°12'W], 980 m, 8 viii 1983, *S.G. Beck* 8596 (LPB, MO); Bajada de Chulumani a Asunta, comunidad de Zona Esperanza, mas abajo de villa Barrientos, 16°17.69'S, 67°23.78'W, 1009 m, 2 iv 2004, *J.R.I. Wood, M. Atahuachi & M. Mendoza* 20611 (K). ***Inquisivi Province***: "Puente Alegre", the area where the Cajuata-Siquimirani road crosses the río Suri, 1 km SE of Cajuata, 16°43'S, 67°10'W, 1500 m, 28 xii 1989, *M. Lewis* 36911 (LPB, MO).

Notes. *Begonia comata* is most similar and, we believe, most closely related to *Begonia oblanceolata* (see *Identification notes*). These two species were treated in *Begonia* sect. *Warburgina* and *Begonia* sect. *Ruizopavonia*, respectively, in the latest two sectional classifications of *Begonia* (Doorenbos *et al.*, 1998; Moonlight *et al.*, 2018). *Begonia comata* was the only species in *Begonia* sect. *Warburgina* in both classifications, and this section was maintained as separate from *Begonia* sect. *Ruizopavonia* on account of *Begonia comata*'s four tepals in the pistillate flower and having a unisexual inflorescence. The original description of *Begonia comata* cites four tepals in the pistillate flowers, but an isotype held in New York (NY00118603) has a dissected pistillate flower that clearly shows five tepals. A second isotype held in Berlin (B100366049) is less clear but also appears to show five tepals on the pistillate flower.

Kuntze also described *Begonia comata* as having a unisexual inflorescence. All known inflorescences of this species have either staminate or pistillate flowers, which is consistent with this theory. However, all staminate flowers are on relatively small inflorescences, which appear young. In contrast, all known pistillate flowers and fruits are held towards the apex of larger, more developed inflorescences that appear old and have scars that may represent the former position of staminate flowers. We believe it is more likely that the inflorescences of *Begonia comata* are strongly protandrous rather than unisexual, perhaps with no temporal overlap between the staminate and pistillate flowers. The inflorescences of *Begonia oblanceolata* are similar but have always been treated as bisexual in the literature. Because

no unambiguous characters remain to separate *Begonia* sect. *Warburgina* from *Begonia* sect. *Ruizopavonia*, we transfer *B. comata* into *Begonia* sect. *Ruizopavonia* and treat *Begonia* sect. *Warburgina* as a synonym of *Begonia* sect. *Ruizopavonia*.

Nomenclatural notes. Otto Kuntze cited material collected in Tunari, Bolivia, from 1800 to 2300 m elevation in the protologue of *Begonia comata*. This citation matches what appears to be two separate collections made by Kuntze: one from 1800 m and a second from 2300 m. Smith & Schubert (1944a) cited material collected from 1800 to 2300 m and held in the New York Botanical Garden herbarium as the type, which is a first-stage lectotypification. We designate the sheet NY00118604 as the lectotype because it is the only sheet in New York where the flowers remain attached to the vegetative material.

Identification notes. Distinguished as a glabrous herb with persistent stipules with long-ciliate margins, lanceolate leaves with palmate-pinnate venation, and bifid styles.

Begonia comata is most similar to *B. oblanceolata*. The two have a similar habit, with upright, rarely branching stems reaching around a metre in height. They both also have persistent stipules with long-ciliate margins, few-flowered inflorescences with persistent bracts, staminate flowers with two tepals, and pistillate flowers with five tepals. They are also unique within Bolivian *Begonia* sect. *Ruizopavonia* in having glabrous, lanceolate to oblanceolate leaves with palmate-pinnate venation and indistinct, strongly camptodromous secondary venation. The two species differ in the number of bracteoles in the pistillate flower (*Begonia comata* has three and *B. oblanceolata* has one), the shape of their fruit body (ovoid in *B. comata*, obdeltoid in *B. oblanceolata*) and wings (semicircular in *B. comata*, triangular and ascending in *B. oblanceolata*), and their styles (bifid in *B. comata*, multifid in *B. oblanceolata*). When sterile, the two species are best distinguished by their leaf bases. Both species have cuneate leaf bases on the narrower side of the leaf but the base of the broader side of the leaf is rounded in *Begonia oblanceolata* and auriculate, often overlapping the petiole in *B. comata*.

8.37. Begonia leptostyla Irmsch., Bot. Jahrb. Syst. 74: 609 (1949). – Type: Bolivia, [La Paz Department, Prov. Abel Iturralde], Tumupasa, [14°9'S, 67°54'W], 1800 ft, 11 xii 1901, *R.S. Williams* 455 (holotype US [US00115362]; isotypes BM [BM001191455], K [K000544024], NY [NY03091191]).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Distribution. Endemic to Bolivia.

Identification notes. The only Bolivian *Begonia* with pinnate venation; stems with a tomentose indumentum; deciduous, triangular stipules; and a rounded leaf base.

Begonia leptostyla is distinguished from *B. buchtienii* and *B. varistyla* by its rounded leaf bases (but see *Notes* for *B. buchtienii*) and from *B. bangii* in its symmetrical oblong-ovate stipules (vs symmetrical and ovate to reniform).

8.38. Begonia oblanceolata Rusby, Descr. S. Amer. Pl. 65 (1920). – Type: Bolivia, [Cochabamba Department], Antahuacana, Espiritu Santo, 160 km al noreste de Cochabamba [17°4'S, 65°39'W], 750 m, vi 1909, *O. Buchtien* 2283 (lectotype NY [NY00118638] designated in: Revista Univ. (Cuzco) 33(87): 83 (1944) by Smith, L.B. & Schubert, B.G.; isolectotype US [US00115404]).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 83 (1944); R.C. Foster, Contr. Gray Herb. 184: 138 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Caulescent herb, to 70 cm tall. *Stem* erect, rarely branching; internodes to 3 cm long, to 6 mm thick, succulent, green, glabrous. *Stipules* late deciduous to persistent, lanceolate, 10–16 × 3–6 mm, apex acuminate, translucent, brown, glabrous, margin entire, long-ciliate. *Leaves* > 5 per stem, alternate, basifixed; petiole 0.5–1.5 cm long, red, tomentose; blade asymmetrical, lanceolate, to 10.5 × 3 cm, membranaceous, apex long-acuminate, base rounded to cordate on the broader side, cuneate on the narrower side, margin serrulate, ciliate, upper surface green, glabrous, lower surface flushed red, pilose to tomentose, veins palmate-pinnate, secondary veins indistinct. *Inflorescences* > 3 per stem, either unisexual or bisexual and strongly protandrous, axillary, erect, cymose, with 2 branches, bearing up to 4 staminate flowers and/or 4 pistillate flowers; peduncle to 4.5 cm long, red, granular, bracts deciduous, ovate, 3.5–5 × 1.6–3 mm, colour unknown, glabrous, apex acute, margin serrulate, long-ciliate. *Staminate flowers*: pedicels to 17 mm long, glabrous; tepals 2, projecting, ovate, 13–15 × 8–11 mm, apex acuminate, base rounded, red, glabrous, margin entire, aciliate; stamens c.12, projecting, yellow, filaments 0.5 mm long, free, anthers linear, 1.5–3 × 1 mm, dehiscing via lateral slits, connectives not extended, symmetrically basifixed. *Pistillate flowers*: pedicels to 5 mm long; bracteoles 1, positioned directly beneath the ovary, lanceolate, 10–12 × 4–6 mm, apex acuminate, red, glabrous, margin lacerate, long ciliate; tepals 5, subequal, deciduous in fruit, spreading, elliptic, 12–17 × 2–5.5 mm, apex rounded, red, glabrous, margin entire, aciliate; ovary body obdeltoid, 12–13 × 7–8 mm, red, glabrous, unequally 3-winged, wings triangular, ascending, largest c.15 × 20 mm, smallest c.15 × 8 mm; 3-locular, placentation axillary, branches divided, bearing ovules on both surfaces; styles 3, yellow, free, 4–6.5 mm long, irregularly c.4 times-divided, stigmatic papillae in a spirally twisted band. *Fruiting pedicel* to 20 mm long. *Fruit* a capsule, body obdeltoid, to 13 × 8 mm, drying brown, wings same shape as in ovary, not expanding.

Distribution and ecology. Endemic to Bolivia and known from La Paz and Cochabamba Departments. Found in lower montane forest at an elevation of 750–1450 m, where it is typically collected within wet gullies and around small streams. *Begonia oblanceolata* has been collected in flower and fruit from March to July.

Etymology. Named for the species' oblanceolate leaves.

Proposed IUCN conservation category. *Begonia oblanceolata* has an EOO of c.1250 km^2 and is known from three populations within that area. None of these populations are within protected areas, so we assess the species as Endangered (EN), EN B1abiii, under IUCN criteria (IUCN Standards and Petitions Subcommittee, 2019).

Additional specimens examined. Bolivia. *sine loc.*, 1921, *H.H. Rusby* 445 (NY). **La Paz Department**. ***Sud Yungas Province***: Valley of río Boopi [Bopi], at unnamed village below Las Mercedes on road to Villa Barientos, 16°17'S, 67°20'W, 1000 m, 13 iii 1999, *C.A. Pendry, R.T Pennington & C. Chumacero* 566 (E [E00183993]); Basin of río Bopi, San Bartolome (near Calisaya), [c.16°21'S, 67°16'W], 750–900 m, 1–22 vii 1939, *B.A. Krukoff* 10495 (G [2], K, MO, NY); Espía, head of Bopi River, [c.16°29'S, 67°18'W], 3500 ft, 8 viii 1921, *H.H. Rusby* 137 (NY); ibid., 3500 ft, 1921, *White* (NY). **Cochabamba Department**. ***Ayopaya Province***: río Altamachi, 16°44'11"S, 66°10'2"W, 1450 m, 22 v 2004, *E. Fernandéz & S. Altamirano* 3852 (MO).

Notes. See *Notes* under *Begonia comata* for a discussion of whether the inflorescences of the two species are bisexual and strongly protandrous or unisexual.

Nomenclatural notes. The protologue of *Begonia oblanceolata* cites a type collection but no herbarium. Smith & Schubert (1944a) cited a duplicate in New York as the type, which is an effective lectotypification.

Identification notes. See *Identification notes* for *Begonia comata*.

8.39. Begonia peruviana A.DC., Ann. Sci. Nat., Bot. IV(11): 133 (1859). – Type: Peru, Amazonas Region, Prov. Bongará, Yambrasbamba, [5°44'S, 77°54'W], *M. Matthews* 1337 (syntypes K [K000536743], OXF [OXF00058708]).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Distribution. Peru and Bolivia.

Additional specimens examined. Bolivia. **La Paz Department**. ***Abel Iturralde Province***: Parque Nacional Madidi, sobre el camino de Apolo a San Jose de Uchupiamonas, cerca Mamacona, 14°27'9"S, 68°11'15"W, 1540 m, 30 vi 2002, *S. Seidel & M. Villanueva* 9242A (LPB, MO); Parque Nacional Madidi, Mamacona, 38 km en linea recta al este de Apolo por el camino a San José de Uchupiamonas, trayecto de 7.5 km entre Mamacona y campamento Jatun Chiriuno, 14°44'17"S, 68°8'18"W, 10 vii 2002, *A.F. Fuentes, A. Araujo, F. Bascopé, R. Alvares & H. Pariamo* 4906 (LPB, MO [MO-1427110]); Madidi, Apolobamba, Pelechuco to río Abajo, Tanhuara Area Natural de Manejo, 14°44'44"S, 68°56'43"W, 1808 m, *I. Loza, S. Achá, M. Roguerin, F. Delgado & F. Miranda* 968 (LPB, MO); Parque Nacional Madidi, sector Pilcobamba, por el antiguo camino Pelechuco-Apolo, 14°44'43"S, 68°56'26"W, 1794 m, *A.F. Fuentes, J. Salas & R. Huasurco* 14688 (LPB, MO [MO-2314979], US).

Notes. *Begonia peruviana* was included in the checklist of Bolivian *Begonia* (Wasshausen *et al.*, 2013) based on a single specimen. We include three further specimens of this species from Bolivia, all from La Paz Department.

Nomenclatural notes. We refrain from designating a lectotype of *Begonia peruviana* here. We will designate a lectotype in an upcoming treatment of the *Begonia* of Peru, which will also include new synonyms of *B. peruviana* and a full discussion of their nomenclature (Moonlight *et al.*, in review).

Identification notes. Like the other members of *Begonia* sect. *Ruizopavonia*, *B. peruviana* is a semi-scandent species with oblong leaves and pinnate venation. It is unique among glabrous Bolivian members of the section in its deciduous stipules. *Begonia peruviana*, *B. comata* and *B. oblanceolata* are the only glabrous members of the section in Bolivia, and *B. peruviana* can be distinguished by the distinct (rather than indistinct) secondary veins on the leaf lamina.

8.40. Begonia varistyla Irmsch., Bot. Jahrb. Syst. 76: 80 (1953). – Type: Bolivia, Santa Cruz Department, Cerro Hosana, [17°50'S, 64°9'W], 1300 m, 10 viii 1917, *J. Steinbach* 3360 (lectotype B [B100243044] *designated here*).
R.C. Foster, Contr. Gray Herb. 184: 138 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 386 (2013).

Distribution. Endemic to Bolivia.

Nomenclatural notes. Irmscher cited the collection *J. Steinbach* 3360 in the protologue of *Begonia varistyla* (Irmscher, 1953). We lectotypify based on the only known duplicate of this collection, which is in Berlin herbarium.

Identification notes. See *Identification notes* for *Begonia buchtienii*.

9. Begonia sect. **Wageneria** (Klotzsch) A.DC.

9.41. Begonia glabra Aubl., Hist. Pl. Guiane 2: 916, t. 349 (1775). **–** Type: [French Guiana], Cayanne Arrondissement, entre la riviere de Sinémari & le crique de Galibis, 5°8'N, 52°38'W], *J.B.C.F. Aublet s.n.* (lectotype BM [BM001008462], designated in: Phytologia 44(4): 239 (1979) by Smith, L.B. & Wasshausen, D.C.).
L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 82 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Distribution. Jamaica, Cuba, Mexico, Guatemala, Belize, Nicaragua, Costa Rica, Panama, Trinidad and Tobago, Venezuela, Guyana, Suriname, French Guiana, Colombia, Ecuador, Peru, Bolivia and Brazil.

Identification notes. *Begonia glabra* is the only scandent species of *Begonia* in Bolivia that roots at its nodes. It is also unique in Bolivia in its straight, subsymmetrical and ovate leaves, which are three-veined from the base.

10. Unplaced to section

10.42. Begonia cremnophila Tebbitt, Brittonia 65(2): 142, fig. 1 (2013). – Type: Bolivia, Santa Cruz Department, Prov. Andrés Ibáñez, 'Espejillas' [Espejillos], a waterfall of a small tributary of the río Espejillas, c.12 km W of La Guardia, c.17°53'S, 63°26'W, 550–600 m, 21 ii 1987, *M. Nee* 34217 (holotype LPB [LPB0000854], isotypes MO [MO-2285375], NY [NY01085841], US [US00520357]).
D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 384 (2013).

Distribution. Endemic to Bolivia.

Identification notes. *Begonia cremnophila* is only acaulescent species of *Begonia* confirmed from Bolivia with a basifixed, asymmetrical leaf lamina and four tepals on the staminate flower. It is most similar to an undescribed species from Puno Region, Peru, which may also occur in northern Bolivia (Moonlight *et al.*, in review). It differs from this species in its pilose indumentum on the veins of the underside of the leaf (vs glabrous); its obovate bracts with denticulate, ciliate margins (vs lanceolate with entire margins); and its tepals that persist in fruit.

10.43. Begonia sp. 1
Bolivia, Beni Department, Prov. Ballivián, río Beni, Rurrenabaque, Encañada Suse, 1 km upstream, 14°28'S, 67°31'W, 320 m, 18 v 1990, *D.C. Daly, N. Limpias & R. Sastre* 6487 (NY).

Distribution. Endemic to Bolivia.

Notes. This specimen includes one tuber, one leaf, and a single developing inflorescence with immature staminate flowers. The leaf is significantly larger than the leaves of any other tuberous species of Bolivian *Begonia*. The species differs from most tuberous Bolivian *Begonia* species in lacking stems, and from the remainder in its peltate leaf bases. The species' habitat is also distinct from that of all other tuberous Bolivian *Begonia* species, which are typically found at > 1500 m elevation. In habit, the species perhaps most resembles Colombian *Begonia hydrophylloides* L.B.Sm. & B.G.Schub., which also has a tuber, few large leaves held close to the ground, and few upright, strongly protandrous inflorescences. Without more material, we are unable, however, to describe this species or confirm its relationship to other *Begonia* species. It is surprising how rarely the species has been collected given the long collecting history in Beni Department. The first *Begonia* collections in the area were made in 1901 by R. S. Williams, and more recently the area has been the focus of floristic inventory work in and surrounding the nearby Parque Nacional Madidi. This suggests that the species is either very rare or perhaps, given its tuberous habit, remains dormant for much of the year.

Identification notes. This is the only acaulescent species of *Begonia* in Bolivia with a peltate leaf lamina.

Excluded names

Begonia fulgens Lemoine, Hort. Lemoine 119: IV (1891). – Type: Unknown.
V. Lemoine, Hort. Lemoine 127: 82 (1894); L.B. Smith & B.G. Schubert, Revista Univ. (Cuzco) 33(87): 78 (1944); R.C. Foster, Contr. Gray Herb. 184: 137 (1958); D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Notes. *Begonia fulgens* Lemoine was included in Smith and Schubert's revision of the Begoniaceae for the *Flora of Bolivia* (Smith & Schubert, 1944a) and the first checklist of Bolivian *Begonia* (Foster, 1958). Wasshausen *et al.* (2013) excluded the species from their treatment, stating that these earlier records were based on incorrectly identified material. Smith & Schubert (1944a), however, only cited the protologue of *Begonia fulgens* (Lemoine, 1891) and its citation in the *Index Kewensis* (1905: pp. 493), whereas Foster only cited the protologue. Neither citation can therefore be a misapplied name.

The protologue of *Begonia fulgens* describes it as a caulescent, tuberous species with four tepals on the staminate flower and five (or six) tepals on the pistillate flowers. All aspects of the description are consistent with Tebbitt's concept of *Begonia veitchii* Hook.f. var. *veitchii* (Tebbitt, 2020) except the occasional six tepals on the pistillate flower. Tebbitt refrained from including *Begonia fulgens* in the synonymy of *B. veitchii* var. *veitchii* and suggested the six tepals may indicate it is of hybrid origin. Recent photographs from Sandia Province, Puno Region, Peru do, however, show some individuals of *Begonia veitchii* var. *veitchii* with six tepals on the pistillate flowers (Josh Allen, unpublished).

An illustration published in Wiener illustrirte Garten-Zeitung (without author, 1893: fig. 9) may show a plant from the original illustration of *B. fulgens*, and clearly shows a plant with five tepals on the pistillate flower. The origins of this plant are, however, unclear. The text accompanying the illustration states that the plant was exhibited in Lyon, and it is unclear whether this is true of the original introduction of *Begonia fulgens*. The text also mentions hybridisation, but it is unclear whether the authors are referring to the illustrated plant as a hybrid or a general increase in the number of hybridised tuberous begonias. The claimed size of the flowers of this plant reaches 12–15 cm across, which may indicate that the plant is a hybrid or it could equally be the result of cultivating a plant in optimal conditions. A further possibility is a nursery exaggerating the size of the blooms of their latest product.

We strongly suspect that the original description of *Begonia fulgens* refers to the same species as *B. veitchii* but are unable to conclusively demonstrate this. There is no known type of the name and little prospect of one arising, the original horticultural descriptions are

ambiguous, and it is unclear whether later citations (e.g. without author, 1893) refer to the same introduction as the protologue. We suggest that future authors reject this name.

Begonia geraniifolia Hook.f., Bot. Mag. 62, pl. 3387 (1835).

D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Notes. Wasshausen *et al.* (2013) excluded *Begonia geraniifolia* Hook. from their checklist of Bolivian *Begonia* and stated that an earlier citation (Adolfo María, 1966) was based on misidentified material. We have been unable to locate a copy of the earlier reference so cannot confirm either that this is a misapplied name or to what specimens and species it was misapplied.

Begonia heliantha Tebbitt, Edinburgh J. Bot. 73(1): 145 (2016).

M.C. Tebbitt, Tuberous Begonias, a Monograph of *Begonia* sect. *Australes* 87 (2020).

Notes. Tebbitt's monograph of *Begonia* sect. *Australes* includes a map (Tebbitt, 2020: 87) showing two localities for *B. heliantha* Tebbitt in northern Bolivia: one in La Paz Department and one in Cochabamba Department. These are tentative records based on identifications from photographs (Tebbitt, 2016: 148). We exclude this species from our checklist of Bolivian *Begonia* but include it in our key.

Begonia micranthera var. ***venturii*** L.B.Sm. & B.G.Schub, Darwiniana 4: 97 (1941b).

R.C. Foster, Contr. Gray Herb. 184: 138 (1958); Delfini, C. in Zuloaga, F.O. & Belgrano, M.J. (eds), Fl. Argentina 17: 10 (2017).

Notes. This variety was included by Foster in his checklist of Bolivian *Begonia* (Foster, 1958) but is endemic to Argentina (Tebbitt *et al.*, 2018a). Foster cited no specimens, so we cannot confirm to which taxon Foster misapplied this name.

Begonia micranthera var. ***foliosa*** L.B.Sm. & B.G.Schub., Darwiniana 5: 92 (1941b).

R.C. Foster, Contr. Gray Herb. 184: 138 (1958).

Notes. This variety was described from Argentina by Smith & Schubert (1941b). A citation in their treatment of the begonias of Bolivia (Smith & Schubert, 1944a) showed that they still considered it as endemic to Argentina, but Foster (1958) probably misinterpreted this citation and included the variety in his Bolivian checklist. Tebbitt (2020) shows that this variety is endemic to Argentina and is a hybrid between *Begonia micranthera* Griseb. subsp. *micranthera* and *B. micranthera* subsp. *rhacophylla* (Irmsch.) Tebbitt

Begonia monadelpha (Klotzsch) A.DC.

D.C. Wasshausen *et al.* in P.M. Jørgensen *et al.* (eds), Cat. Bolivia, Monogr. Syst. Bot. Missouri Bot. Gard. 129: 385 (2013).

Notes. This species was included in the latest checklist of Bolivian *Begonia* (Wasshausen *et al.*, 2013) on the expectation that it might occur in Bolivia, based on its occurrence in Sandia Province, Puno Region, Peru, close to the Bolivian Border. In fact, this species is known from no further south than Cusco Region. We do not expect it to occur in Bolivia.

Discussion

Although this paper is not a full floristic treatment of the *Begonia* of Bolivia, we hope the provisional annotated checklist presented will stimulate further taxonomic work within the genus in Bolivia. The taxonomic key we provide is the first that attempts to cover all Bolivian *Begonia* since 1944 (Smith & Schubert, 1944a) and covers 22 currently accepted names that were not covered by that publication. Our paper summarises the taxonomic work completed in Bolivian *Begonia* since both the last floristic account (Smith & Schubert, 1944a) and previous two checklist of Bolivian *Begonia* (Foster, 1958; Wasshausen *et al.*, 2013) and discusses misapplied names in those works. The first floristic treatment (Smith & Schubert, 1944a) and checklist (Foster, 1958) of *Begonia* were very similar, covering 30 and 33 species of which 72% and 70%, respectively, are now treated as accepted names (see the **Table**). The second checklist (Wasshausen *et al.*, 2013) included a lower percentage of synonyms than the previous treatments (64%), but also included many more misapplied names (9, 17% of the names in the checklist). Although this treatment is not a full floristic account and will be improved on in the future, it aims to summarise and act as an aid to identifying all currently accepted species of Bolivian *Begonia*.

Two sections of Bolivian *Begonia* remain among the most poorly studied in all South American *Begonia*, with several outstanding taxonomic questions. These are *Begonia* sects. *Ruizopavonia* and *Hydristyles*, and we outline the knowledge gaps in these sections below. It is notable that the two poorly known sections of Bolivian *Begonia* are caulescent. The botanist Mark Tebbitt is currently working towards a revision of geophytic Andean species of *Begonia* sect. *Eupetalum* (Lindl.) A.DC. and has published extensively on tuberous species within Bolivia (Tebbitt, 2019; Tebbitt *et al.*, 2018a, 2020), including descriptions of several new species (Tebbitt, 2013, 2015a, 2015b, 2015c), a monograph of *Begonia* sect. *Australes* (Tebbitt, 2020), and revisions of species complexes within *Begonia* sect. *Knesebeckia* (Klotzsch) A.DC. (Tebbitt, 2017; Tebbitt *et al.*, 2018b). This demonstrates the effect that taxonomic effort can have on a country's flora and highlights the need for a similar focus on the other sections of Bolivian *Begonia*. This should happen in conjunction with a phylogenetic study of *Begonia* sects. *Hydristyles* and *Ruizopavonia*, their synonyms, and closely related sections to determine whether these are monophyletic sections with reliable characters and are thus worthy of continued recognition.

Begonia sect. *Ruizopavonia*

The Bolivian members of *Begonia* sect. *Ruizopavonia* are particularly poorly known. Our checklist recognises seven species, all of which are endemic to Bolivia except *Begonia peruviana* A.DC. Members of this section are recognised as erect herbs with pinnate venation, two tepals on the staminate flowers, and five tepals on the pistillate flowers. The Bolivian endemic species of the section have multifid (rather than bifid) styles, persistent stipules, and a dense indumentum, although *Begonia oblanceolata* is glabrous (Rusby, 1920) and *B. buchtienii* Irmsch. has four tepals on the pistillate flowers. An undescribed Peruvian species also falls within this group (Moonlight *et al.*, in review). No Bolivian endemic members of *Begonia* sect. *Ruizopavonia* have been included in a molecular phylogeny so their placement within the section remains unconfirmed. We consider it equally likely that these species are more closely allied to *Begonia* sect *Hydristyles*, which includes erect herbs with multifid styles and transversely ovate leaves.

Begonia sect. *Hydristyles*

This section was described by Alphonse Pyramus de Candolle based on *Begonia bridgesii* A.DC., which was then unique among caulescent Andean *Begonia* species in its multifid styles. The section was later expanded to include several Bolivian species that shared this character and had transversely ovate leaves (Doorenbos *et al.*, 1998). Doorenbos *et al.* noted, however, that the boundaries of this section have become less clear following the discovery of several species of *Begonia* sect. *Ruizopavonia* with multifid styles. This refers to the endemic, Bolivian members of *Begonia* sect. *Ruizopavonia* (see above). The latest circumscription of *Begonia* sect. *Cyathocnemis* (Klotzsch) A.DC. now also includes two species with multifid styles (Moonlight *et al.*, 2018). These are *Begonia obtecticaulis* Irmsch. and *B. amoeboides* Moonlight, whose inclusion within *Begonia* sect. *Cyathocnemis* is supported by molecular data (Moonlight & Reynel, 2017; Moonlight *et al.*, 2018). Two members of *Begonia* sect. *Hydristyles* were included in a molecular phylogeny by Moonlight *et al.* (2018), where they formed a clade sister to sampled members of *Begonia* sect. *Cyathocnemis*. If the unsampled species of the section are placed in this clade, we suggest an expanded *Begonia* sect. *Cyathocnemis* that includes species with both bifid and multifid styles would be an ideal solution, as sterile individuals could be assigned to a section with confidence. However, a single species of *Begonia* sect. *Hydristyles* was included in Tseng *et al.* (2022), where it was resolved as sister to *Begonia* sect. *Lepsia* (Klotzsch) A.DC.; therefore, the relationships among *Begonia* sects. *Cyathocnemis* and *Hydristyles* remain unclear.

Doorenbos *et al.* (1998) noted that around half of the members of *Begonia* sect. *Hydristyles* are known from incomplete descriptions. This situation has not improved since this publication, although we are able to provide emended descriptions of two species

herein and two more will be provided in an upcoming treatment of Peruvian *Begonia* (Moonlight *et al.*, in review). Furthermore, the type collections of several species are poor, with several including only one or two of the following: staminate flowers, pistillate flowers, fruits. This section is long overdue a full revision, which, because of the poor quality of many type specimens, would need to be supported by extensive fieldwork.

Acknowledgements

This checklist is based on data held on the Begonia Resource Centre (Hughes *et al.*, 2015–) and we thank Martin Pullan for creating and running the database. We thank John Wood and Jose Balderrama for sending photographs of Bolivian *Begonia*, and the following herbaria for allowing us access to their Bolivian *Begonia* collections, or providing loans or data: B, BM, BOLV, BR, C, CAS, CGE, E, F, FCQ, FHO, G, GB, GH, HBG, HSB, INPA, K, LIL, LPB, M, MA, MEXU, MO, NDG, NOLS, NY, P, PH, PR, RB, S, SPF, TEX, U, UC, US, USM, USZ, W, WIS, Z. Mark Tebbitt is gratefully acknowledged for his excellent publications on Bolivian tuberous begonias.

ORCID iDs

P. W. Moonlight https://orcid.org/0000-0003-4342-2089
A. F. Fuentes https://orcid.org/0000-0003-4848-4182

References

Adolfo María H. 1966. Nómina de las plantas recolectadas en el valle de Cochabamba, vol. 2. Cochabamba, Bolivia: Colegio La Salle. pp. 1–86.

Aublet JBCF. 1775. *Begonia glabra*. In: Histoire des Plantes de la Guiane Françoise, vol. 2. London: P. F. Didot jeune. p. 916.

Brako L, Zarucchi JL. 1993. Catalogue of the flowering plants and gymnosperms of Peru. Monographs in Systematic Botany from the Missouri Botanical Garden, no. 45. pp. 1–1286.

Brazil Flora Group. 2015. Growing knowledge: an overview of Seed Plant diversity in Brazil. Rodriguésia. 66(4):1085–1113. https://doi.org/10.1590/2175-7860201566411

Britton NL. 1891. An enumeration of the plants collected by Dr. H. H. Rusby in South America, 1885–1886, XV. Bulletin of the Torrey Botanical Club. 18: 35.

De Candolle AP. 1861. Begoniaceae. In: von Martius CFP, editor. Flora Brasiliensis, enumeratio plantarum in Brasilia hactenus detectarum: quas suis aliorumque botanicorum studiis descriptas et methodo naturali digestas partim icone illustratas, vol. 4(1). pp. 338–388.

De Candolle AC. 1914. Plantae paraguariensis novae. Bulletin de la Socete Botanique de Geneve, Ser. 2 6:107–126.

Delfini C. 2017. Begoniaceae. In: Zuloaga FO, Belgrano MJ, editors. Flora Argentina, vol. 17. Buenos Aires: Estudio Sigma, pp. 1–16.

Doorenbos J, Sosef MSM, de Wilde JJFE. 1998. The sections of *Begonia* including descriptions, keys

and species lists (Studies in Begoniaceae VI). Wageningen Agricultural University Papers 98(2):1–266. https://library.wur.nl/WebQuery/wurpubs/fulltext/282968

Foster RC. 1958. A catalogue of the ferns and flowering plants of Bolivia. Contributions from the Gray Herbarium of Harvard University. 184:1–223.

Grimé WE. 1987. Type photographs at the Field Museum of Natural History. Taxon. 36(2):425–426. https://doi.org/10.2307/1221436

Hieronymus GHEW. 1895. Plantae Stubelianae novae. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie. 21:306–378.

Hind DJN, Frisby S. 2014. *Mikania manomoi* (Compositae: Eupatorieae: Mikaniinae), a new, but epappose, species from the Cerro Manomó, Santa Cruz, Eastern Bolivia. Kew Bulletin. 69:9502. https://doi.org/10.1007/s12225-014-9502-4

Hughes M, Moonlight PW, Jara-Muñoz A, Tebbitt MC, Wilson HP, Pullan M. 2015–. Begonia Resource Centre. Online database. http://padme.rbge.org.uk/begonia/

Index Kewensis. 1905. Index Kewensis, Suppl. 2, Addenda 2: pp. 493.

Irmscher E. 1949. Beiträge zue kenntnis der Begoniaceen Südamerikas. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie. 74:570–632.

Irmscher E. 1953. Systematische studien über Begoniaceen des tropischen Südamerikas, besonder Brasiliens. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie 76:1–102.

IUCN Standards and Petitions Subcommittee. 2019. Guidelines for Using the IUCN Red List Categories and Criteria, version 14. Prepared by the Standards and Petitions Subcommittee. Downloadable from http://www.iucnredlist.org/documents/RedListGuidelines.pdf

Jacques EL, Mamede MCH. 2005. Notas nomenclaturais em *Begonia* L. (Begoniaceae). Revista Brasileira de Botanica. 28(3):579–588. https://doi.org/10.1590/S0100-84042005000300014

Jaramillo JC. 2017. Sinopse taxonômica do gênero *Begonia* L. (Begoniaceae) para a Região sul do Brasil. Dissertation, Universidade Federal de Santa Catarina. pp. 1–91.

Jones KR, Venter O, Fuller RA, Allan JR, Maxwell SL, Negret PJ, Watson JEM. 2018. One-third of global protected land is under intense human pressure. Science. 360(6390):788–791. http://doi.org/10.1126/science.aap9565

Klotzsch JF. 1855. Begoniaceen – Gattungen und Arton, Abhandlungen der Königlich Preussischen Akademie der Wissenschaften. 1854:121–255.

Kunth KS. 1825. *Begonia*. In: Nova Genera et Species Plantarum (quarto ed.), vol. 7, pp. 136–144.

Kuntze CEO. 1898. Begoniaceae. In: Revisio Generum Plantarum, vol. 3, part 3, pp. 105–106.

Lemoine V. 1891. *Begonia fulgens*. Extrait du prix-courant et supplement de plantes nouvelles: Suppl. IV.

Maillard O, Cesar Salinas J, Angulo S, Vides-Almonacid R. 2019. Riesgos ambientales en las unidades hidrográficas de las serranías chiquitanas, departamento de Santa Cruz, Bolivia. Ecología en Bolivia. 54(2):84–97.

McNeill J. 2014. Holotype specimens and type specimens: general issues. Taxon. 63(5):1112–1113.

Moonlight PW, Jara-Muñoz A. 2017. A revision and recircumscription of *Begonia* section *Pilderia* including one new species. Phytotaxa. 307(1):1–22.

Moonlight PW, Reynel C. 2017. Two new species of Andean *Begonia*. Phytotaxa. 381(1):116–126.

Moonlight PW, Ardi WH, Padilla LA, Chung K-F, Fuller D, Girmansyah D, Hollands R, Jara-Muñoz A, Kiew R, Leong W-C, Liu Y, Mahardika A, Marasinghe LDK, O'Connor M, Peng C-I, Pérez ÁJ, Phutthai T, Pullan M, Rajbhandary S, Reynel C, Rubite RR, Sang J, Scherberich D, Shui Y-M, Tebbitt MC, Thomas DC, Wilson HP, Zaini NH, Hughes M. 2018. Dividing and conquering the fastest-growing genus: towards a natural sectional classification of the mega-diverse genus *Begonia* (Begoniaceae). Taxon. 67(2):267–323. https://doi.org/10.12705/672.3

Moonlight PW, Jara-Muñoz OA, Purvis DA, Delves J, Allen JP, Reynel C. In review. The genus *Begonia* (Begoniaceae) in Peru. *European Journal of Taxonomy*.

O'Reilly T, Karegeannes C. 1983. *Begonia leathermanniae*, a new Bolivian species. *Begonian* 50(11–12):144–147.

Revollo A, Campanini O. 2014. La minería del oro amenaza ambiental y de soberanía: el caso del río Suches y el ANMI Apolobamba, Bolivia. Petropress. 9:4–13.

Romero-Muñoz A, Fernández-Llamazares A, Moraes R M, Larrea-Alcázar DM, Wordley CFR. 2019. A pivotal year for Bolivian conservation policy. Nature Ecology and Evolution. 3:866–869. https://doi.org/10.1038/s41559-019-0893-3

Rusby HH. 1893. On the collections of Mr. Miguel Bang in Bolivia. Memoirs of the Torrey Botanical Club. 3(3):1–67.

Rusby HH. 1907. An enumeration of the plants collected in Bolivia by Miguel Bang, part 4. Bulletin of the New York Botanic Garden. 4(14):309–470.

Rusby HH. 1912. New species from Bolivia, collected by R.S. Williams. Bulletin of the New York Botanic Garden. 8(28):89–135.

Rusby HH. 1920. Three hundred new species of South American Plants. New York: published by the author. pp. 1–170.

Rusby HH. 1934. New species of plants of the Ladew expedition to Bolivia. Phytologia. 1: 49–80.

Rusby HH, Nash GV. 1906. A new *Begonia* from Bolivia. Torreya. 6:45–58.

Schrank F von P von. 1820. *Begonia fischeri*. Plantae Rariores Horti Academici Monacensis, vol. 2, folio 59. Munich: Venditur in Instituto lithographico Scholae festivalis.

Shui YM. 2019. Taxonomy of Begonias. Yunnan: Yunnan Science and Technology Press.

Smith LB, Schubert BG. 1941a. Begoniaceae. In: Macbride JF, editor. Flora of Peru. 13(4):181–202.

Smith LB, Schubert BG. 1941b. Revisión de las espices Argentinas del género *Begonia*. Darwiniana. 5:78–117.

Smith LB, Schubert BG. 1944a. Revisión de las especies Bolivianas de género Begonia. Revista Universitat [Universidad Nacional de Cusco]. 87:71–87.

Smith LB, Schubert BG. 1944b. Una nueva Begonia del Perú. Revista Universitat [Universidad Nacional de Cusco]. 33(87):91.

Smith LB, Schubert BG. 1946a. The Begoniaceae of Colombia. Caldasia. 4(16):3–38.

Smith LB, Schubert BG. 1946b. The Begoniaceae of Colombia. Caldasia. 4(17):77–107.

Smith LB, Schubert BG. 1946c. The Begoniaceae of Colombia. Caldasia. 4(18):179–209.

Smith LB, Schubert BG. 1963. Nuevas especies Peruanas de la familia Begoniaceae. Publicaciones del Museu de Historia Natural 'Javier Prado', Serie B (Botánica). 17:1–11.

Smith LB, Wasshausen DC. 1979. Begonia of Ecuador. Phytologia. 44(4):233–256.

Smith LB, Wasshausen DC. 1986. *Begonia* L. In: Harling G, Andersson L, editors. Flora of Ecuador. 25(133):4–65.

Smith LB, Wasshausen DC. 1989. Begoniaceae. In: Lasster T, editor. Flora of Venezuela, vol. 4, part 1, pp. 5–78.

Sprague TA. 1912. Plantarum Novarum in herbario horti regiii, decas LXVI. Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew). 1912:339–345.

Tebbitt MC. 2013. A new species and a new synonym of *Begonia* from Bolivia. Brittonia 65(2):142–147. https://doi.org/10.1007/s12228-012-9272-y

Tebbitt MC. 2015a. A new tuberous *Begonia* species (Begoniaceae) from Bolivia. Novon. 24(3):319–323. https://doi.org/10.3417/2014005

Tebbitt MC. 2015b. Two new yellow-flowered tuberous species of *Begonia* (Begoniaceae) from Bolivia. Brittonia. 67(3):221–226. https://doi.org/10.1007/s12228-015-9376-2

Tebbitt MC. 2015c. Two new species of Andean tuberous *Begonia* in the *B. octopetala* group (Begoniaceae). Novon. 23(4):479–489. https://doi.org/10.3417/2013027

Tebbitt MC. 2016. Two new species of Andean *Begonia* (Begoniaceae). Edinburgh Journal of Botany. 73(1):143–152. https://doi.org/10.1017/S0960428615000335

Tebbitt MC. 2017. Recircumscription and new synonyms of *Begonia acerifolia* (Begoniaceae) and amended descriptions of the poorly known *B. hydrophylloides* and *B. velata*. Edinburgh Journal of Botany. 74(2):217–228. https://doi.org/10.1017/S0960428617000105

Tebbitt MC. 2019. New synonyms and lectotypification in *Begonia* section *Australes* (Begoniaceae). Phytotaxa. 407(1):111–115. https://doi.org/10.11646/phytotaxa.407.1.13

Tebbitt MC. 2020. Tuberous Begonias: A Monograph of *Begonia* Section *Australes*. Sacramento, California: American Begonia Society. pp. 1–199.

Tebbitt MC, Andrada AR, Bulacio E, Parada GA, Ayarde H. 2018a. An infraspecific taxonomic revision of *Begonia micranthera* (Begoniaceae). Edinburgh Journal of Botany. 75(2):227–254. https://doi.org/10.1017/S0960428618000070

Tebbitt MC, Andrada AR, Kollmann LJC, Moonlight PW. 2018b. Taxonomy of *Begonia wollnyi* Herzog and *Begonia arrogans* Irmsch. Edinburgh Journal of Botany. 75(2):215–226. https://doi.org/10.1017/S0960428618000069

Tebbitt MC, Reynel C, Huaylla-Limachi L, Martín CM. 2020. A taxonomic revision of *Begonia veitchii* (Begoniaceae). Edinburgh Journal of Botany. 77(1):127–144. https://doi.org/10.1017/S0960428619000295

Thiers B. Continuously updated. Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff. New York Botanical Garden's Virtual Herbarium. https://sweetgum.nybg.org/science/ih/

Tropicos.org. Continuously updated. Missouri Botanical Garden. 20 November 2020. https://tropicos.org

Tseng YH, Hsieh CL, Campos-Domínguez L, Hu AQ, Chang CC, Hsu YT, Kidner CA, Hughes M, Moonlight PW, Hung CH, Wang YC, Wang YT, Liu SH, Girmansyah D, Chung KF. 2022. Insights into the evolution of the chloroplast genome and the phylogeny of *Begonia*. Edinburgh Journal of Botany. 79, *Begonia* special issue, Article 408: 1–32. https://doi.org/10.24823/EJB.2022.408

Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber W-H, Li D-Z, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ, Smith GF, editors. 2018. International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) Adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159. Glashütten: Koeltz Botanical Books. https://doi.org/10.12705/Code.2018.

Wasshausen DC, Beck SG, Nee M, Jørgensen PM. 2013. Begoniaceae. In: Jørgensen PM, *et al.*, editors. Catálogo de las Plantas Vasculares de Bolivia. Monographs in Systematic Botany from the Missouri Botanical Garden, no. 129, pp. 383–386.

Willdenow CL. 1805. *Begonia cucullata*. Species Plantarum, vol. 4, part 1. Berlin: G. C. Nauk. p. 414.

Without author. 1893. *Begonia fulgens*. Wiener Illustrirte Garten-Zeitung, Jahr 18:69.

Appendix

1.1 *Begonia boliviensis*
1.2 *Begonia chrysantha*
1.3 *Begonia cinnabarina*
1.4 *Begonia germaineana*
1.5 *Begonia herrerae*
1.6 *Begonia krystofii*
1.7.1 *Begonia micranthera* subsp. *micranthera*
1.7.2 *Begonia micranthera* subsp. *albonervia*
1.7.3.1 *Begonia micranthera* subsp. *rhacophylla* var. *rhacophylla*
1.8 *Begonia pearcei*
1.9 *Begonia phantasma*
1.10.1 *Begonia veitchii* var. *veitchii*
1.10.2 *Begonia veitchii* var. *lanatifolia*
1.11 *Begonia weddelliana*
2.12 *Begonia alto-peruviana*
2.13 *Begonia bracteosa*
2.14 *Begonia galea*
2.15 *Begonia lophoptera*
3.16 *Begonia alchemilloides*
3.17 *Begonia cucullata*
3.18 *Begonia fischeri*
3.19 *Begonia subvillosa*

4.20 *Begonia marinae*
4.21 *Begonia pleiopetala*
5.22 *Begonia andina*
5.23 *Begonia bridgesii*
5.24 *Begonia fissistyla*
5.25 *Begonia juntasensis*
5.26 *Begonia santarosensis*
5.27 *Begonia subcaudata*
5.28 *Begonia unduavensis*
5.29 *Begonia unilateralis*
6.30 *Begonia acerifolia*
6.31 *Begonia leathermanniae*
6.32 *Begonia wollnyi*
7.33 *Begonia parviflora*
8.34 *Begonia bangii*
8.35 *Begonia buchtienii*
8.36 *Begonia comata*
8.37 *Begonia leptostyla*
8.38 *Begonia oblanceolata*
8.39 *Begonia peruviana*
8.40 *Begonia varistyla*
9.41 *Begonia glabra*
10.42 *Begonia cremnophila*
10.43 *Begonia* sp. 1

Abbott, J.R. 17105 (**5.26**); *Acevado-Rodriguez P.* 6597 (**7.33**); *Acha, S.* 60 (**4.21**); *Alanes, D.* 209 (**9.40**); *Altamirano, S.* 54, 1492 (**9.40**); 913 (**5.26**); 977, 1015, 3040 (**7.33**); 1042, 1219, 1269 (**8.34**); 1069 (**5.28**); 1401 (**8.35**); 1548 (**6.32**); *Apaza, O.* 24 (**1.3**); 88 (**1.1**); *Arajuo-Murakami, A.* 773, 833 (**8.37**); 824, 2836, 4020 (**7.33**); 1381, 1683 (**6.32**); 4021 (**9.40**); 4022 (**5.22**); *Arellano G.* 161, 278, 342a, 475, 489, 1146 (**7.33**); *Arrazola, S.* SA492A, SA520 (**1.3**); *Arroyo, L.P.* 815 (**6.32**); 1810 (**1.1**); 1811, 1860, 1905 (**1.7.1**); 1873, 4474, 5487 (**1.7.3**); 4073 (**8.40**); 4139 (**7.33**)

Badcock, W.J. 72 (**1.11**); 346 (**9.40**); 761 (**1.1**); *Balls, E.K.* 6124 (**1.7.1**); *Balslev H.* 1130 (**4.21**); *Bang, M.* 87, 333, 553 (**5.25**); 334, 2665 (**7.33**); 406 (**8.34**); 1016, 1862 (**1.10.1**); 1509, 2414 (**9.40**); 2480 (**6.32**); 2838 (**2.12**); 2837 (**2.13**); *Bascopé, F.* 240 (**7.33**); *Beck, S.G.* 554, 8723 (**1.11**); 841, 27263 (**1.7.1**); 1669, 12974 (**9.40**); 1761, 2753, 4644 (**4.21**); 1767, 3627, 7370, 8530, 12975, 13535, 13950 (**5.25**); 3053, 3096 (**7.33**); 3579 (**2.12**); 4691, 8610, 19886 (**5.28**); 4710, 4885, 6073 (**5.27**); 4822 (**6.32**); 6326 (**1.7.3**); 6355, 9603 (**1.1**); 6690, 8596, 12609, 12651 (**8.36**); 9228 (**8.40**); 9253 (**8.37**); 9607 (**6.32**); 13724 (**3.18**); 13827,

13951, 22768 (**5.24**); 17812, 23094, 23132, 25542 (**8.34**); 18201 (**6.30**); *Besse, L.* 645, 1819b (**5.24**); 1755 (**2.12**); 5622 (**5.26**); *Braun, O.* 40 (**5.28**); *Bridges, T.C. s.n.* (**4.21**, **5.23**); *Brooke, W.M.A.* 1755 (**9.40**); 5507, 6405, 6449, 6591, 6753, 6877, 6932 (**5.28**); 5393, 6049, 6753 (**1.7.1**); 5675 (**8.40**); 5707 (**6.32**); 6009, 6230, 6458 (**1.10.1**); 6162 (**4.21**); 6184, 6539, 6607, 6672 (**5.24**); 6566 (**7.33**); 6734 (**5.26**); 6759 (**8.34**); *Brummitt, R.K.* 19416 (**7.33**); *Buchtien, O. s.n.*, 234 (**8.34**); 126, 653, 4056 (**4.21**); 296, 634 (**1.11**); 353, 917, 1381, 2264, 3854 (**7.33**); 635, 5996, 7386 (**5.24**); 910, 2242 (**9.40**); 1667 (**3.18**); 2240 (**5.25**); 2263, 4653 (**8.35**); 2283 (**8.38**); 2899, 8944 (**5.28**); 3855 (**2.12**)

Calzadilla, E. 127 (**6.31**); 153 (**5.26**); *Cardenas, M.* V-66, 2201, 3989 (**5.26**); 685 (**5.23**); 687 (**5.28**); 3947 (**8.34**); 4576, 6000 (**5.26**); 4686, 5341 (**1.1**); 4693 (**1.7.1**); 4696 (**10.42**); 4710 (**1.3**); 5978 (**7.33**); 5983 (**9.40**); 6252 (**3.19**); *Carrasco, J.A.G.* 109 (**5.28**); 109a (**6.31**); *Carretero, A.* 975, 976, 1026 (**1.3**); 1075 (**1.1**); 1169 (**1.9**); *Casas, F.* 7754 (**1.7.1**); *Cayola, L.E.* 861 (**6.32**); 1019 (**8.37**); 1136, 2484, 2675, 2837, 3225 (**7.33**); 1344, 2404, 3216, 3235 (**9.40**); 2471, 2513 (**2.14**); 2893, 3234 (**5.29**); 3140 (**4.21**); *Cervantes, E.* 74 (**1.1**); 137 (**1.10.2**); 300 (**1.3**); *Clark, J.L.* 6718, 6795 (**8.34**); 6806 (**6.32**); 6848 (**2.12**); *Colque O.* 424 (**7.33**); *Cornejo M.* 339 (**7.33**); *Croat, T.B.* 51320, 51359, 84777 (**7.33**); 51321, 84283, 84320, 84358, 84445, 84469 (**9.40**); 51480 (**5.28**); 51640 (**6.32**); 84746 (**8.34**); 84780 (**5.25**); 84695 (**8.37**); 84792, 84818 (**2.12**); *Cutler, H.C.* 7060 (**3.19**)

D'Arcy, W.G. 13825 (**1.7.1**); *Daly, D.C.* 6487 (**10.43**); 6646 (**8.35**); *Davidson, C.* 4896 (**5.25**); 4897 (**1.7.1**); *de Michel, R.* 182 (**3.17**); 183 (**1.1**); *Deginani, N.B.* 822 (**1.1**); *Dereims s.n.* (**5.23**); *Diels, L.* 648 (**5.28**); 649 (**6.31**); 656 (**5.26**); *Dorr, L.J.* 6935 (**1.7.1**)

Erich, R. 416 (**1.3**); 436 (**1.8**); 446 (**1.7.1**); 450 (**3.17**); *Eyerdam, W.J.* 24825, 24833 (**5.25**)

Fernandez, E. 2029 (**5.26**); 2858, 4037 (**5.24**); 3852 (**8.38**); 4054, 4281 (**7.33**); 4350 (**5.28**); *Fernández-Casas, J.* 8493 (**3.18**); *Feuillet, C.* 15032 (**5.24**); *Fiebrig, K.A.G.* 2043, 3123 (**1.7.1**); 2713 (**1.8**); *Flores, A.* 29 (**6.32**); 55 (**1.3**); *Forzza, R.C.* 2359 (**1.7.2**); *Foster, P.F.* 778 (**6.32**); *Fournet* 599, 863 (**9.40**); *Fuentes, A.F.* 309 (**10.42**); 439 (**3.17**); 4906, 14688 (**8.39**); 4940, 8988, 14706 (**9.40**); 6376 (**6.32**); 6685, 7900 (**8.37**); 6882, 13306 (**6.30**); 9795, 10020 (**4.21**); 10245, 12849, 12865, 14684, 14994 (**5.29**); 10810 (**2.13**); 10988, 11158, 15831, 17037 (**2.14**); 11239 (**3.18**); 11435, 11675, 12219, 12937 (**7.33**); 12020 (**1.10.1**)

García, E. 834 (**5.24**); *Gardner, M.F.* 17 (**5.24**); 32 (**3.18**); 48 (**2.12**); 49 (**8.34**); 57, 58, 59, 60, 61 (**5.29**); 79 (**2.13**); *Gentry, A.H.* 44225 (**1.7.1**); 71007 (**7.33**); *Gerold* 112 (**1.7.1**); *Golding, J. s.n.* (**6.32**); *Graf, K.* (**5.28**); *Guillén* 1619, 4037 (**3.18**); *Gutiérrez, J.* 304, 983 (**1.1**); 512, 580, 593 (**1.7.1**); 591, 1634 (**4.20**); 594, 1065 (**1.3**); 702 (**1.10.1**); 1171 (**8.40**)

Halda, J.J. JJH07112003 (**1.6**); *Hawkes, J.G.* 4558, 4622, 4642, 6432, 6511, 6577 (**1.7.1**); 4658, 6511, 6514 (**1.7.3**); *Helme, N.* 927 (**9.40**); *Herzog, T.C.J.* 86 (**6.32**); *Hunziker, J.H.* 12710 (**1.1**); *Huaylla, H.* 629 (**1.9**); 653, 953 (**1.7.1**); 654 (**1.3**); 672 (**1.7.3**); 2620, 2790, 2857 (**5.29**); 2788 (**7.33**)

Ibisch, P. 93.12XX (**1.1**); 94.0349 (**5.26**)

(**9.40**); 13746 (**5.28**); *Smith, E.E.* 163 (**9.40**); *Solomon, J.C.* 4917, 6002, 8415, 8679, 12322, 16383, 17556 (**5.28**); 5035, 9719, 11528, 13086, 16123, 16487 (**4.21**); 7340, 7530, 12905, 13934 (**5.25**); 7520, 9114, 12093, 17222, 18432 (**7.33**); 8047, 8110, 8435, 9131, 10729, 12588, 14333 (**5.24**); 8626 (**5.25**); 8775, 18459 (**8.34**); 9874, 13119 (**1.1**); 10063, 10257, 10443, 16053 (**1.7.1**); 12673 (**2.15**); 13919 (**9.40**); 14170 (**8.40**); 14393, 15996 (**5.26**); 14587 (**3.18**); 15138 (**1.10.1**); 15998 (**6.31**); 18462 (**2.12**); *Soto, D.J.* 56 (**5.26**); *Soux D.* 134 (**7.33**); *Sperling, C.R.* 6576 (**3.18**); *Ståhl, B.* 5277 (**5.24**); 5544 (**5.26**); *Steinbach, J.* 612, 5012, 9499 (**5.26**); 521 (**5.25**); 3360 (**8.40**); 5715, 8492 (**7.33**); 7218a (**6.32**); 9308 (**8.34**); *Steinbach, R.F.* 460 (**3.18**); *Stübel, A.* 24b (**4.21**); *Suksuwan, S.* 27 (**3.17**)

Tate, G.H.H. 273 (**4.21**); 657, 657a (**5.29**); 656 (**5.25**); 736, 933 (**5.24**); 934 (**6.30**); *Tebbitt, M.C.* 700, 714, 753 (**10.42**); 701 (**1.6**); 704, 710, 728 (**1.1**); 705, 706, 711, 713, 727, 730, 731, 745 (**1.3**); 709 (**1.4**); 712, 717, 719, 723, 734, 760, 761 (**1.10.1**); 716, 720, 724, 743, 758 (**4.20**); 718, 721, 722, 751 (**1.9**); 738, 739 (**1.10.2**); 748 (**1.2**); *Terán, J.A.* 836, 1191, 3072, 3998 (**5.26**); 906 (**3.17**); 974 (**6.32**); 1376 (**5.28**); 1618, 3230 (**1.7.1**); 1930, 2216, 2881, 3050, 3153, 3334 (**7.33**); 1981 (**3.17**); 2585 (**5.24**); 2712, 2752, 2937 (**8.34**); 2894, 2911, 3830 (**9.40**); 3695 (**5.23**); *Torrez, V.* 351, 396, 425, 472 (**5.29**); *Townsend, W.R.* 15 (**3.18**); *Türpe* 5060 (**1.3**); *Tutin T.G.* 1395 (**5.28**)

Ugent, D. 4791 (**1.10.1**)

Vargas, M. 179 (**7.33**); 180 (**8.40**); 312, 1687 (**1.7.2**); 316 (**1.1**); 448 (**6.32**); *Vargas, N.* 331 (**1.10.1**); *Vargas Caballero, I.G.* 884 (**1.7.3**); 2034 (**5.23**); 3044 (**1.6**); 3081 (**1.7.1**); 3700 (**1.3**); 4827 (**8.34**); 4850 (**5.26**); *Villalobos, J.L.* 26, 342, 1196, 1465 (**8.40**); 169 (**7.33**); 389 (**1.10.1**); 907, 911, 1300 (**1.3**); 1348 (**1.8**); 1345 (**1.9**); 1680 (**6.32**); *Villarroel, D.* 316, 439, 1005, 1318, 1627 (**1.1**); 343 (**5.26**); *Vuilleumier, B.B.* 371, 419 (**1.1**); 416 (**1.3**); 421 (**1.9**)

Wasshausen, D.C. 2035, 2079 (**5.26**); 2041 (**5.23**); 2042 (**8.40**); 2044 (**7.33**); 2078, 2100 (**8.34**); 2085 (**3.17**); 2086, 2208 (**5.25**); 2132 (**5.24**); 2168 (**9.40**); 2172, 2190, 2110 (**8.37**); 2246, 2251, 2279 (**6.32**); 2272 (**8.35**); *Weddell, H.A.* 3634, 3656, 4033 (**1.3**); 3791 (**1.10.1**); 4215, 4592 (**4.21**); 4294 (**1.11**); 4566 (**2.12**); 4729 (**6.30**); *West, J.* 8255 (**1.1**); 8313, 8330 (**1.7.1**); 9322, 16805 (**1.3**); *White, O.E.* 643 (**5.25**); 920 (**6.32**); 2385 (**3.18**); *Williams, R.S.* 38 (**3.18**); 455 (**8.37**); 541 (**9.40**); 600 (**6.32**); *Wood, J.R.I* 8421 (**8.40**); 8557, 15194, 18424 (**7.33**); 10351 (**1.2**); 10613, 20521, 21683 (**1.7.1**); 11621 (**1.1**); 11642 (**1.9**); 10779 (**1.10.2**); 12393 (**9.40**); 12398 (**5.25**); 12399 (**8.34**); 12996, 15485, 21645 (**1.11**); 15872 (**1.8**); 16105 (**10.42**); 16955, 18003, 22239, 24361, 25847 (**3.19**); 17024 (**1.10.1**); 17627, 21005, 24216 (**3.17**); 18044 (**4.21**); 18972 (**6.30**); 19028 (**4.20**); 19062, 19406, 21683, 22552 (**1.7.1**); 19500 (**1.7.3**); 20611 (**8.36**); 26405 (**3.16**)

Zurita, E. 85 (**6.32**); 89 (**5.25**); 91 (**8.35**)

Unknown s.n. (**1.8**)