

## TAXONOMY OF THE *BEGONIA TILIIFOLIA* GROUP, INCLUDING DESCRIPTIONS OF TWO NEW SPECIES

M. C. TEBBITT<sup>1</sup>, M. HUGHES<sup>2</sup>, Á. J. PÉREZ<sup>3</sup> & P. W. MOONLIGHT<sup>2,4,\*</sup>

*Begonia albomaculata* as circumscribed in the *Flora of Ecuador* and related publications is shown to be a misapplied name and represents an undescribed species. This is described as *Begonia botryoides* Moonlight & Tebbitt *sp. nov.*, and is recorded from the Pichincha, Santo Domingo de los Tsáchilas, Napo, Cotopaxi, Azuay and El Oro provinces in Ecuador, and the Antioquia and Chocó departments of Colombia. The taxonomic study of this species prompted a re-evaluation of related species. It was subsequently found that the Central American material previously included in *Begonia tiliifolia* C.DC. is distinct from the type and other South American material of this species and represents an undescribed species. This is described as *Begonia boreoharlingii* Tebbitt & Moonlight *sp. nov.*, and is recorded from the Limón province in Costa Rica, and the Bocas del Toro and Coclé provinces in Panama. Four species, *Begonia tiliifolia* C.DC., *Begonia harlingii* L.B.Sm. & Washh., *B. botryoides* and *B. boreoharlingii*, are placed in the informally named *Begonia tiliifolia* group. A key, descriptions, illustrations and distribution maps are provided for the members of the *Begonia tiliifolia* group, and its sectional classification is discussed.

**Keywords.** *Begonia harlingii*, *Begonia* sect. *Begonia*, *Begonia* sect. *Ruizopavonia*, *Begonia tiliifolia*, *Begonia albomaculata*, Colombia, Costa Rica, Ecuador, Panama.

### INTRODUCTION

Casimir de Candolle (1906) described *Begonia albomaculata* based on a single collection, *Huber* 1518, from the Pampa del Sacramento Range in northern Peru. In their account of the Begoniaceae for the *Flora of Peru*, Smith & Schubert (1941) excluded the species as a *nomen subnudum* because they considered its original description “insufficient for identification”. Smith & Schubert (1952) cite the collection *Camp* E-618 from Ecuador as representing *Begonia albomaculata* C.DC. Later, in a preliminary revision of *Begonia* published in preparation for the *Flora of Ecuador*,

<sup>1</sup> Department of Biological and Environmental Sciences, California University of Pennsylvania, California, PA 15419-1394, USA.

<sup>2</sup> Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, Scotland, UK.

<sup>3</sup> Herbario QCA, Escuela de Ciencias Biológicas, Pontificia Universidad Católica del Ecuador, Apartado 17-01-2184, Quito, Ecuador.

<sup>4</sup> Institute of Biodiversity, Animal Health and Comparative Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow G12 8QQ, Scotland, UK.

\* Author for correspondence. E-mail: [p.moonlight@rbge.ac.uk](mailto:p.moonlight@rbge.ac.uk)

Smith & Wasshausen (1979) categorised the original description as “legal but useless”. They stated that they had not seen the type and were identifying the species based on a photograph of *Sodiro* 590a (G; photograph F) from the Ecuadorian province of Pichincha determined as *Begonia albomaculata* by Casimir de Candolle. Smith & Wasshausen (1984) used three collections (*Camp* E-618 [NY, US]; *Harling, Eliasson & Andersson* 15551 [S, US]; and *Dodson, Gentry & Shupp* 8914 [SEL, US]), all from the Ecuadorian province of El Oro, to publish an emended description of *Begonia albomaculata*. A similar description was included in the *Flora of Ecuador* (Smith & Wasshausen, 1986), based on the same three specimens and *Sodiro* 590a. Our herbarium- and field-based studies indicate that *Begonia albomaculata* C.DC. is actually a close relative of *Begonia maynensis* A.DC. (Moonlight *et al.*, 2017), whereas *B. albomaculata sensu* Smith & Schubert (1952) and Smith & Wasshausen (1979, 1984, 1986) represents an undescribed species that is a close relative of *Begonia tiliifolia* C.DC. and *Begonia harlingii* L.B.Sm. & Wassh., sharing with these two species a unique inflorescence structure. This taxon is described here as *Begonia botryoides* Moonlight & Tebbitt *sp. nov.* The distribution of this species includes the Ecuadorian provinces of Pichincha, Santo Domingo de los Tsáchilas, Napo, Cotopaxi, Azuay and El Oro, as well as the Colombian departments of Antioquia and Chocó, and excludes Peru.

*Begonia tiliifolia* was originally described from material collected in Ecuador. Since then, material from Colombia (Smith & Schubert, 1946), Costa Rica and Panama (Burt-Utley, 2015) has also been recognised as belonging to this species. Although the collections from Colombia match the type of *Begonia tiliifolia*, the Central American material differs in several respects and requires recognition as a distinct taxon. This new species is described as *Begonia boreoharlingii* Tebbitt & Moonlight *sp. nov.* The distribution of this species includes the Costa Rican province of Limón, and the Panamanian provinces of Bocas del Toro and Coclé.

*Begonia botryoides* and *B. boreoharlingii* are obviously closely related to *B. tiliifolia* and *B. harlingii*, but the sectional classification of these four species requires amending. Doorenbos *et al.* (1998) classified *Begonia harlingii* in *Begonia* sect. *Begonia* and tentatively placed *B. tiliifolia* in the same section. However, they classify *Begonia albomaculata sensu* Smith & Wasshausen in *Begonia* sect. *Cyathocnemis* (Klotzsch) A.DC. Ongoing phylogenetic work based on chloroplast DNA sequences (Moonlight *et al.*, unpublished data) indicates that the *Begonia tiliifolia* group is monophyletic and is nested within one of two clades of species classified by Doorenbos *et al.* (1998) within *Begonia* sect. *Ruizopavonia* A.DC. This group of species shares elliptic or oblong anthers longer than the filaments, fewer than five tepals in female flowers (except *Begonia tiliifolia*, *B. harlingii* and *B. boreoharlingii*), and primary and secondary veins prominently raised on the undersides of the leaves. These characteristics are shared with *Begonia alnifolia* A.DC., the type of *Begonia* sect. *Ruizopavonia*. A second group of species currently classified within *Begonia* sect. *Ruizopavonia* forms a separate clade including *Begonia foliosa* Kunth, the type species of *Begonia* sect. *Lepsia* (Klotzsch) A.DC. These species share five tepals in female flowers, globose or subglobose anthers shorter than the filaments (except *Begonia foliosa*), and smooth leaf undersurfaces with

indistinct primary and secondary veins. Further work is ongoing to recircumscribe *Begonia* sect. *Lepsia* and *Begonia* sect. *Ruizopavonia* (Moonlight *et al.*, in preparation). We classify all species in the *Begonia tiliifolia* group within *Begonia* sect. *Ruizopavonia* according to our insights from phylogenetic and morphological data.

#### KEY TO THE *BEGONIA TILIIFOLIA* GROUP

- 1a. Stem and petioles glabrous; apex of leaf blade apiculate; stamens c.20; pistillate tepals 3; ovary wings rounded and following contour of ovary body  
**1. *B. botryoides***
- 1b. Stem and petioles villous; apex of leaf blade acuminate; stamens 6–20; pistillate tepals 5; ovary wings triangular \_\_\_\_\_ 2
- 2a. Leaf lamina oblong-elliptic; longest side of leaf blade more or less straight; leaf base subequal; leaf margin usually with a few small irregular lobe-like projections; bract margin fimbriate \_\_\_\_\_ **4. *B. harlingii***
- 2b. Leaf lamina usually ovate to broadly ovate, occasionally elliptic to oblong; longest side of leaf blade markedly convex; leaf base equal; leaf margin lacking small irregular lobe-like projections; bract margin entire \_\_\_\_\_ 3
- 3a. Stipules 1.2–2.5 cm long; peduncles 2–7 mm long; outer male tepals elliptic, 5–6 × 2–3 mm; ovary wings triangular with longest portion located halfway along ovary body, 1–2 mm broad \_\_\_\_\_ **3. *B. tiliifolia***
- 3b. Stipules 0.5–1.2 cm long; peduncles 10–20 mm long; outer male tepals ovate, 8–9 × 4–5 mm; ovary wings deltate with longest portion located at apex of ovary body, 6–8 mm broad \_\_\_\_\_ **2. *B. boreoharlingii***

#### TAXONOMIC TREATMENT

**1. *Begonia botryoides*** Moonlight & Tebbitt, **sp. nov.** § *Ruizopavonia* – Type: ECUADOR. El Oro. Road Piñas – Santa Rosa, above El Placer, partly primary mountain rain forest, alt. 800–1000 m, 15 x 1977, *G. Harling, U. Eliasson & L. Andersson* 15551 (holo GB; iso MO [MO-2271386], US [US00221535], S). **Figs 1, 4A.**

*Begonia albomaculata* auct. non. C.DC., L.B.Sm. & B. G. Schub., Mem. New York Bot. Gard. 8(1): 37, 1952.

*Begonia albomaculata* auct. non. C.DC., L.B.Sm. & Wassh. Phytologia 44(4): 246, 1979; Phytologia 54(7): 465, pl. 1, 1984; *Flora of Ecuador* 25: 46–48, 1986.

*Begonia botryoides* is most closely related to *B. tiliifolia* and *B. harlingii*, sharing with both these Andean species leaf blades with deeply impressed veins above, short almost umbellate axillary inflorescences and sessile stamens. *Begonia botryoides* differs from both species in its glabrous stems and petioles (those of *B. tiliifolia* and *B. harlingii* are villous), and its markedly asymmetrical leaf bases (those of *B. tiliifolia* are symmetrical, whereas those of *B. harlingii* are subsymmetrical), its more

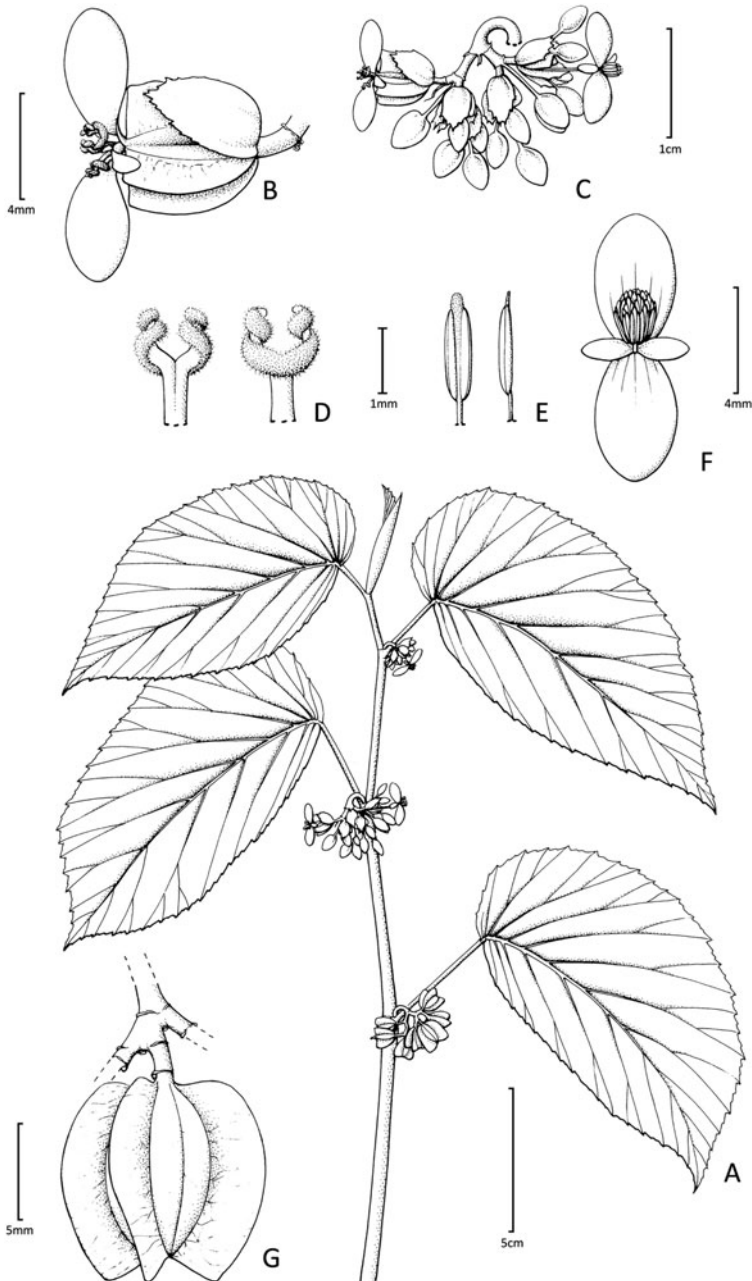


FIG. 1. *Begonia botryoides* Moonlight & Tebbitt *sp. nov.* A, Habit; B, female flower (side view); C, branch of inflorescence; D, stigma (back and front views); E, stamen (front and side views); F, male flower (front view); G, fruit. Scale bars: A, 5 cm; B and F, 4 mm; C, 1 cm; D and E, 1 mm; G, 5 mm. A, C, E, F and G drawn from isotype *G. Harling*, *U. Eliasson*, & *L. Andersson* 15551 (MO); and B and D drawn from *B. Sparre* 13804 (MO).

numerous stamens (c.20 versus 6–16), and its 3 pistillate tepals (*B. tiliifolia* and *B. harlingii* have 5 pistillate tepals).

Caulicent herb; glabrous throughout, 0.5–1 m tall; *stem* erect, succulent, straight to flexuous, unbranched or branching near base; *internodes* to 15 cm long, lime-green to red; *stipules* deciduous, narrowly lanceolate to lanceolate, 2–2.7 × 0.2–1.3 cm, apex acute, margins entire. *Leaves* alternate, spaced evenly along the stem, basifixed; *petioles* 2–7 cm long; *lamina* asymmetrical, usually elliptic, occasionally oblong-elliptic or ovate, 11–18.5 × 4–11 cm, base shallowly cordate, basal lobes unequal, apex apiculate, margins serrulate to dentate or irregularly double-dentate, teeth 0.25–2 mm long with a short hair at tip of and between each tooth, upper surface green, lower surface pale green; veins pinnately nerved, with 9–13 lateral veins on wider side of lamina, and 6–10 lateral veins on narrower side, in dried specimens the primary vein uniformly curving towards leaf apex and more prominent than secondary veins. *Inflorescences*: axillary, arising from the axil of most mature leaves, held at right angles to stem or slightly pendulous, a dichotomous cyme branching to 3 times, protandrous; *peduncle* 2–5 mm long, secondary and tertiary branches 1–2 mm long and so dense as to appear superficially umbellate, succulent; *bracts* deciduous, elliptic, light green, 5–10 × 3–6 mm, apex obtuse to acute, margin entire. *Male flowers*: *pedicels* 1–9 mm long; *tepals* 4, white, margins entire, outer 2 broadly ovate to broadly elliptic-ovate, 5–9 × 2–7 mm, apex obtuse, inner 2 oblong, 2–4 × c.1 mm, apex obtuse; *stamens*, c.20, projecting upwards; filaments < 0.5 mm, anthers ellipsoid, 1.5–2 mm, connective projecting, dehiscing by lateral slits. *Female flowers*: *pedicels* 1–2 mm long; *bracteoles* deciduous, lanceolate, light green, 5–6 × 2–3 mm, apex acute, margins ciliate-dentate in the upper half and entire in the lower half; *tepals* 3, deciduous in fruit, white, margins entire, outer 2 elliptic, 5–8 × 2–6 mm, apex obtuse to rounded or occasionally emarginate, inner oblong, 2–4 × 1–1.25 mm, apex obtuse; *ovary body* ellipsoid, 4–6 × 2–4 mm, subequally 3-winged, the wings rounded and following contour of ovary body, 4–7 mm tall × 1–2 mm broad, equally broad along length of ovary, base rounded, apex truncate to emarginate, margins entire; placenta axile, bilamellate, ovuliferous all over; *styles* 3, 2–3 mm long, bifid 1–1.5 mm from base, the branches erect, twice spirally twisted. *Fruiting pedicel* stout, elongating to 4 mm long. *Fruit* ellipsoid, to 10 × 6 mm, wings same shape as in ovary, enlarging to 12 mm long × 4 mm broad. *Seeds* globose, c.0.2 × 0.2 mm.

*Phenology*. *Begonia botryoides* has been collected flowering and fruiting from January to October and likely does so year-round.

*Distribution*. *Begonia botryoides* has been recorded from the Colombian departments of Antioquia and Chocó and the Ecuadorian provinces of Pichincha, Santo Domingo de los Tsáchilas, Cotopaxi, Azuay and El Oro. It has also been observed in Napo Province, near Sarayacu, 00°39'S, 77°45'W, 20 i 2014 (M. C. Tebbitt, personal observation).

*Habitat.* *Begonia botryoides* typically grows in wet soil or on large moss-covered rocks in or by the sides of small streams or secondary roads within dense, premontane to montane forest, at 300–1280 m altitude.

*IUCN conservation category.* Although we have not had the opportunity to observe *Begonia botryoides* in the field in Colombia, our fieldwork in Ecuador has shown this species to be widespread and locally common throughout the region from which it has been recorded. Accordingly, we assess *Begonia botryoides* as Least Concern (LC), according to IUCN criteria (2015).

*Etymology.* The name ‘*botryoides*’ emphasises the unusual clusters of fruit found in this species, as in a bunch of grapes.

*Additional specimens examined.* COLOMBIA. **Antioquia:** Municipio de Frontino, Km 27 of road Nutibara-Murri, 6°40'N, 76°26'W, 21 ix 1987, J.L. Zarucchi, A.E. Brant & C.J. Castaño 5526 (MO). – **Chocó:** Municipio de San José del Palmar, hoy del río Torito (afluente del río Habita), 8 iii 1980, E. Forero, R. Jaramillo, J.A. Espina & P.H. Palacios 6875 (COL, MO); Municipio de San José del Palmar, hoy del río Torito (afluente del río Habita), 10 iii 1980, E. Forero, R. Jaramillo, J.A. Espina & P.H. Palacios 6978 (MO); 7570 (COL).

ECUADOR. **Pichincha:** Mashpi Reserve, along San Vicente River, near road between entrance to reserve and hotel, 0°09'N, 78°52'W, 3 vi 2016, M. C. Tebbitt 877 (QCA); Quito Cantón, Parroquia Pacto, Reserva Mashpi, 736904N, 0018812W, 7 v 2007, E. Freire 7833 (QCNE); 4 km past bridge at bottom of old road to Quito, 29 i 1984, W.S. Hoover 488 (GH, MO); río Pilatón, Sodiro 590a (G, [photograph, F, K, MO]). – **Santo Domingo de los Tsáchilas:** Road Aloag – Santo Domingo, Toáchi, at the confluence between río Pilatón and río Toáchi, 3 i 1967, B. Sparre 13804 (MO, S, US). – **Cotopaxi:** Tenefuerte, km 55 Quevedo-Latacunga, 24 vii 1984, C. Dodson, A. Gentry, W. Palacios & J. Zaruma 14420 (QCNE, GH). – **Azuay:** Cuenca Cantón. Bosque protector Molleturo Pullopungo. Collections made near the village, Mantareal, and forest c.2 km E, 13 iv 1996, J.L. Clark, K. Berg & R.W. Dunn 2515 (QCNE, US); Cuenca Cantón, Parroquia Molleturo, Coop. Luchadores del Litoral Propiedad del Sr. Juan Villa, camino desde la propiedad hasta la Unión, 02°50'S, 79°20'W, A. Castellanos 255 (QCA, QCNE). – **El Oro:** Hacienda Duacay. Bosque del perezoso, 03°29'S, 79°45'W, 13 x 1993, X. Cornejo & C. Bonifaz 501 (QCNE, US); Balsas Cantón, old road from Balsas to Piñas, shady, 03°44'S, 79°48'W, 25 v 2016, M.C. Tebbitt 862 (QCA); Piñas Cantón, Road to Piñas, 03°39'S, 79°45'W, 16 i 2014, M.C. Tebbitt 777 (QCA, QCNE); Above Piedras towards Piñas, 14 x 1955, E. Asplund 18175 (S); Creek bed, road from Piñas to Santa Rosa, 7 x 1979, C.H. Dodson, A.H. Gentry & G. Shupp 8914 (MO, US, SEL); Moro-Moro region, c.30 km W of Portovelo, 1 x 1944, W.H. Camp E-618, (NY, US).

**2. *Begonia boreoharlingii* Tebbitt & Moonlight, sp. nov. § *Ruizopavonia*** – Type: PANAMA. Bocas del Toro, along road between Fortuna and Chiriqui Grande, 1.2 mi N of Continental Divide, 5.3 mi N of bridge over Fortuna Dam, 08°44'N, 82°17'W, 910 m, 12 March 1985, T.B. Croat & M.H. Grayum 60417 (holo MO [MO-2172301]). **Figs 2, 4B.**

*Begonia tiliifolia* auct. non. C.DC., Burt-Utley, Fl. Mesoamericana 2(3): cviii, 206, 2015.

*Begonia boreoharlingii* is most closely related to *B. harlingii* L.B.Sm. & Wassh. and *B. tiliifolia* C.DC., sharing with both these Andean species short almost umbellate axillary inflorescences and subsessile stamens. *Begonia boreoharlingii* is most similar

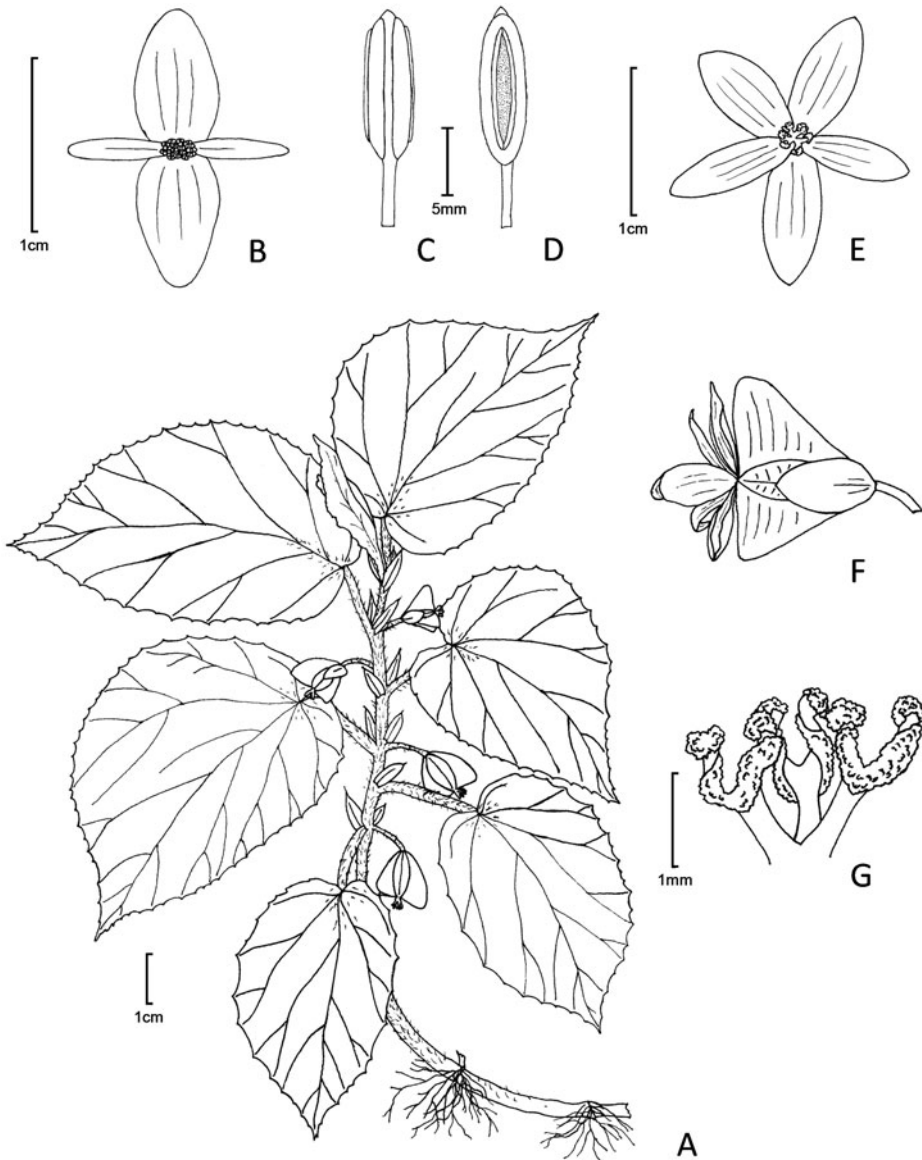


FIG. 2. *Begonia boreoharlingii* Tebbitt & Moonlight *sp. nov.* A, Habit; B, male flower (front view); C, stamen (front view); D, stamen (side view); E, female flower (front view); F, female flower (side view); G, styles and stigma (side view). A, B, E and F, 1 cm; C and D, 5 mm; G, 1 mm. A drawn from *B. Hammel* 3596 (MO); and B–G drawn from holo *T.B. Croat & M.H. Grayum* 60417 (MO).

to *B. harlingii*, differing principally in the shape of its leaf blades (ovate to broadly ovate with usually serrate to occasionally almost entire margins in *B. boreoharlingii* versus oblong-elliptic with irregularly dentate to irregularly double-dentate margins that usually also have a few small irregular lobe-like projections in *B. harlingii*) and by its bracts with entire margins (versus fimbriate in *B. harlingii*). From *Begonia tiliifolia* differing by its smaller stipules (0.5–1.5 cm long in *B. boreoharlingii* versus 1.2–2.5 cm long in *B. tiliifolia*), its longer peduncles (10–20 mm long in *B. boreoharlingii* versus 2–5(–7) mm long in *B. tiliifolia*), its longer male pedicels (6–9 mm long in *B. boreoharlingii* versus 1–2(–5) mm long in *B. tiliifolia*), the shape and size of its outer male tepals (ovate and  $0.8\text{--}0.9 \times 0.4\text{--}0.5$  cm in *B. boreoharlingii* versus narrowly elliptic and  $5\text{--}6 \times 2\text{--}3$  mm in *B. tiliifolia*), and the shape and size of its ovary wings (deltate triangular and 6–8 mm broad in *B. boreoharlingii* versus triangular and 1–2 mm broad in *B. tiliifolia*).

Caulесcent herb, 10–40 cm tall; *stem* erect, succulent, flexuous, unbranched or branching near the base; *internodes* to 4 cm long, sparsely to densely villous; *stipules* deciduous, lanceolate,  $0.5\text{--}1.2 \times 0.2\text{--}0.5$  cm, apex acute to mucronate, margins entire. *Leaves* alternate, spaced evenly along stem, basifixed; *petioles* 1–5 cm long, densely villous; *lamina* more or less symmetrical, ovate to broadly ovate,  $4\text{--}9 \times 3.5\text{--}7.5$  cm, base shallowly cordate, basal lobes equal, not overlapping, apex acuminate, margins usually serrulate, occasionally almost entire, teeth 0.25–2 mm, eciliate to sparsely ciliate, upper surface green, sparsely villous on the lamina and minor veins, densely villous on major veins towards petiolar insertion, lower surface densely villous on major veins and sparsely to densely villous on lamina; veins palmate-pinnately nerved, 6- or 7-veined from base, with 6–7 lateral veins on wider side of lamina, and 5–6 lateral veins on narrower side. *Inflorescences*: axillary, arising from the axil of every mature leaf, a cyme branching once or rarely twice, protandrous; *peduncle* 1–2 cm long, succulent, villous; *bracts* deciduous, ovate, light green,  $3.5\text{--}10 \times 2.5\text{--}5$  mm, apex acute, margin entire. *Male flowers*: *pedicels* 6–9 mm long, puberulent; *tepals* 4, white, margins entire, the outer ovate,  $0.8\text{--}0.9 \times 0.4\text{--}0.5$  cm, apex obtuse, the inner narrowly elliptic,  $c.0.7 \times 1$  mm, apex obtuse; *stamens*, 10–20, projecting upwards; filaments 0.4–1 mm, anthers ellipsoid, 1–1.5 mm, connective projecting, dehiscent by lateral slits. *Female flowers*: *pedicels* c.1 mm long, puberulent; *bracteoles* 2, like the bracts; *tepals* 5, deciduous in fruit, white, elliptic,  $5\text{--}7 \times 2\text{--}4$  mm, apex obtuse, margins entire, subequal; *ovary body* narrowly ellipsoid,  $6\text{--}8 \times 2\text{--}4$  mm, subequally or unequally 3-winged, the wings deltate triangular, the largest to 6–8 mm long  $\times$  6–8 mm broad, broadest point at apex of ovary, base rounded, apex truncate, margins entire; placentae axile, bilamellate, ovuliferous all over; *styles* 3, c.2 mm long, bifid c.1 mm from base, branches erect, spirally twisted. *Fruiting pedicel* stout, elongating to 1.5 cm long. *Fruit* ellipsoid, to  $1.3 \times 0.5$  cm, wings same shape as in ovary, enlarging to 9 mm long  $\times$  13 mm broad. *Seeds* broadly ellipsoid,  $c.0.2 \times 0.15$  mm.

*Phenology.* *Begonia boreoharlingii* has been collected flowering and fruiting year-round.



*Distribution.* *Begonia boreoharlingii* has been recorded along the eastern side of the Cordillera Central from the Costa Rican province of Limón and the Panamanian provinces of Bocas del Toro and Coclé.

*Habitat.* *Begonia boreoharlingii* grows on moist earth slopes and on rocks along stream-sides within rain forest, at 300–1089 m altitude.

*IUCN conservation category.* This species is a narrow endemic recorded from just seven localities along a narrow strip of land measuring approximately 300 km long. Within this area, the species occurs within multiple protected areas. Accordingly, we assess *Begonia boreoharlingii* as Vulnerable (VU D2), according to IUCN criteria (2015).

*Additional specimens examined.* COSTA RICA. **Limón:** Cantón de Limón, Along río Segundo (upper tributary of río Banano), Atlantic slope of Cordillera de Talamanca, 9°53'N, 83°12'W, 10 ii 1990, *M.H. Grayum, G. Herrera & R. Warner* 9653 (MO); Cantón de Limón, Z.P. río Branco, Cuenca del banano, Valle de la Estrella, faldas de Fila Matama, cerca de 9 km NW del pueblo de Aguas Zarcas, sitio “El Hotel”, 9°49'26"N, 83°9'42"W, 2 xi 2007, *D. Santamaría* 6792 (MO); *ibid.*, 2 xi 2007, *D. Solano, A. Rodríguez, B. Gamboa, D. Santamaría, E. Boza, M. Hernández et al.* 4917 (MO); Cantón de Limón, El Progreso, entre Cerro Muchilla y Cerro Avioneta, cabeceras de río Suruy, Fila Matama, Valle de la Estrella, 9°47'25"N, 83°6'30"W, 16 iv 1989, *G. Herrera & A. Chacón* 2637 (MO).

PANAMA. **Bocas del Toro:** Changuinola, Parque Internacional La Amistad, region Caribe, Punto 13, ± 4 km del Campamento de Cerro Frio, 4 horas del río Tskui, 9°25'54"N, 82°50'54"W, 23 x 2008, *A. De Sedas, D. Solano & F. González* 861 (MO); Changuinola, Parque Internacional La Amistad, Punto 16, 9°25'43"N, 82°50'43"W, 24 xi 2008, *D. Solano, F. González & A. De Sedas* 5773 (MO); Bosque Protector Palo Seco, Sendero El Verrugoso, 8°46'55"N, 82°20'31"W, 6 ii 2013, *O.O. Ortiz, A. Zapata, A. Guevara & F. Miranda* 1262 (MO). – **Coclé:** New works 7 km north of El Copé, area around the Rivera Sawmill, Alto Calvario, 5 vii 1977, *J.P. Folsom* 4129 (MO); El Copé, on Pacific side, ½ hour walk from sawmill, 16 x 1979, *T. Antonio* 2087 (MO); Along road from La Pineda to El Copé by way of Piedras Gordas, Sawmill above El Copé, 20 iv 1978, *B. Hammel* 2573 (MO); East of El Copé sawmill along small stream, 21 vi 1978, *B. Hammel* 3596 (MO).

**3. *Begonia tiliifolia* C.DC.** § *Ruizopavonia*, Bull. Herb. Boissier ser. 2, 8: 324, 1908; L.B. Smith & D.C. Wasshausen (1986), *Flora of Ecuador* 25 (133): 46; *Caldasia* 4(17): 99–100, fig. 12, 1946. – Type: ECUADOR, in regione tropicali et subtropicali, locis opacis udis, *Sodiroides 584bis* (lecto G, designated by Smith & Wasshausen, 1979). **Fig. 4 C.**

Cauliscent herb; covered with villous hairs, 0.3–1 m tall; *stem* erect, succulent, flexuous, unbranched or rarely branching near the base, covered with villous hairs; *internodes* to 10 cm long, lime green to vivid red; *stipules* deciduous, narrowly lanceolate, 1.2–2.5 × 0.2–0.4 cm, apex acute, margins entire. *Leaves* alternate, spaced evenly along stem, basifixed; *petioles* 2–7(–8.5) cm long, covered with villous hairs; *lamina* asymmetrical, ovate, occasionally elliptic to oblong, 6–18 × 4–11 cm, base shallowly cordate, basal lobes equal, not overlapping, apex acuminate, margins serrulate to dentate or irregularly double-dentate, teeth 0.25–1(–2) mm long with a short hair at tip of and between each tooth, upper surface green, lower surface pale green; veins pinnately nerved, with 10–12 lateral veins on the wider side of lamina, and

8–10 lateral veins on narrower side. *Inflorescences*: axillary, arising from the axil of every mature leaf, held at right angles to stem or slightly pendulous, a dichotomous cyme branching up to 3 times, protandrous; *peduncle* 2–5(–7) mm long, secondary and tertiary branches c.2 mm long and so dense as to appear superficially umbellate, succulent; *bracts* deciduous, elliptic, membranous, light green or red (e.g. Clark 6160 [MO]), 5–13 × 3–5 mm, apex obtuse to acute, margin entire. *Male flowers*: *pedicels* 1–2(–5) mm long; *tepals* 4, white to pale pink, margins entire, the outer narrowly elliptic, 5–6 × 2–3 mm, apex obtuse, the inner narrowly oblong, 2–4 × 1 mm, apex acute; *stamens*, 8–12, projecting upwards; filaments < 0.5 mm, anthers ellipsoid, 1.5–2 mm, obtuse, connective projecting, dehiscent by lateral slits. *Female flowers*: *pedicels* 1–2 mm long; *bracteoles* deciduous, lanceolate, membranous, light green, 5–6 × 2–3 mm, apex acute, margins entire to lacerate towards apex; *tepals* 5, deciduous in fruit, same colour as males, margins entire, outer 2 elliptic, 5–7 × 2–3 mm, apex obtuse to rounded or occasionally emarginate, inner oblong, c.2 × 1 mm, apex acute; *ovary body* ellipsoid, 4–6 × 2–4 mm, subequally 3-winged, wings triangular, 4–6 mm long × 1–2 mm broad, broadest point halfway along ovary; placentae axile, bilamellate, ovuliferous all over; *styles* 3, c.2 mm long, bifid c.0.5 mm from base, branches erect, twice spirally twisted. *Fruiting pedicel* stout, elongating to 6 mm long. *Fruit* ellipsoid, to 12 × 6 mm, wings same shape as in ovary, enlarging to 12 mm long × 4 mm broad. *Seeds* globose, c.0.2 × 0.2 mm.

*Phenology*. *Begonia tiliifolia* has been collected flowering and fruiting year-round.

*Distribution*. *Begonia tiliifolia* has been recorded from the Colombian departments of Antioquia, Cauca and Nariño and the Ecuadorian provinces of Carchi, Imbabura, Esmeraldas, Pichincha, Santo Domingo de los Tsáchilas, Napo, Cotopaxi, Morona-Santiago and Cañar.

*Habitat*. *Begonia tiliifolia* grows on moist slopes and stream-sides within primary or disturbed wet premontane to montane forest, at 400–2300 m altitude.

*IUCN conservation category*. This species is widespread and locally common throughout the region from which it has been recorded. Accordingly, we assess *Begonia tiliifolia* as Least Concern (LC), according to IUCN criteria (2015).

*Additional specimens examined*. COLOMBIA. **Antioquia**: Municipio de Frontino, corregimiento Nutibara, cuenca de río Cuevas, 13 iv 1987, D. Sánchez et al. 1116 MO [2]; de Frontino Mpio., road between Nutibara and La Blanquita, region of lower Murri, quebrada c.17 km below and W of high point of road, c.28 km from Nutibara, 06°40'N, 76°27'W, 7 ii 1989, J.M. MacDougal, D. Restrepo & D.S. Sylva 3696 (MO, US); de Frontino Mpio, Vereda Venados, Parque Nacional Natural Las Orquideas Quebrada La Manzanares, 06°31'N, 76°18'W, 1 ii 1995, J. Pipoly et al. 18216 (K, MO, NY, US). – **Cauca**: Mpio. El Tambo, Parque Nacional Munchique, via La Romelia a la Galera, 13 iv 1994, C. Acevedo, F. González & J. Alvarez 12 (COL); Parque Nacional Munchique, El Tambo, vereda La Romelia, camino a Nueva Granada, 28 vii 1993, M. Velayos et al. MV7041 (COL); Parque Nacional Munchique, El Tambo, vereda La Romelia, La Gallera, C. Barbosa et al. CB8675 (COL); “La Gallera”, Micay Valley, 29–30 vi 1922, E.P. Killip 7697 (US); km 54 of road from Timbío to Veinte de Julio, 15 x 1974, P.J.M. Maas & T. Plowman

2133 (COL); near Veinte de Julio, 21 vii 1973, *W.S. Hoover* 14 (COL, MO, US [2]); near top of trail from Veinte de Julio to Huizito, 19 i 1984, *W.S. Hoover* 469 (COL, GH, MO); west slope of Cordillera Occidentalis, W of Tambo, 6 xi 1946, *O. Haught* 5194 (COL, US); ad pag. El Tambo, ad La Costa, 3 vii 1935, *K. von Sneidern* 439 (COL, MO, US). – **Nariño**: Barbacoas Mpio, Corregimiento Altaquer, Vereda El Barro, Reserva Natural río Nambi, vertiente occidental andina, 1°18'N, 78°08'W, 6 xii 1993, *J. Betancur, A. Guzmán, R. López & S. Vargas* 4653 (MO, US), 4886 (COL, US); La Planada Biological Reserve, c.7 km S of Chucunéz, forest trail to El Hondón, 1°10'N, 77°55'W, 13 viii 1990, *J.L. Luteyn & D.S. Sylva* S. 14016 (MO, US); Reserva La Planada, Quebradas, El Mar – La Calladita, 1°10'N, 77°58'W, 30 iv 1988, *O. de Benavides* 9684 (MO, US); Reserva La Planada, a 7 km de Chucunés, 13 xii 1987, *O. de Benavides* 9048 (MO); *ibid.*, 10 vi 1989, *B.R. Ramírez P.* 1619 (MO); Ricaurte, Reserva Natural La Planada, 5 ix 1999, *H. Mendoza, G. Oliva, L. Ortiz & M. Vallejo* 8530 (COL); Reserva Natural La Planada, 7 km above Chucunés (along road between Tuquerres and Ricaurte) along trail to El Hondón, beginning at Quebrada Tejón and for 0.5 km beyond, 1°8'N, 77°54'W, 15 iii 1990, *T.B. Croat* 71479 (MO); La Planada, Salazar Finca 7 km above Ricaurte, 1°8'N, 77°58'W, 28 xi 1981, *A.H. Gentry et al.* 35141 (COL, MO [2]); Reserva Natural La Planada, 7 km above Chucunés (on road between Tuquerres and Ricaurte), along Sendero Vieja, along ridge top in direction of La Pina, 1°06'N, 77°54'W, 9 iii 1990, *T.B. Croat* 71222 (MO, US). Mpio. Ricaurte, La Planada Reserve, near Ricaurte, 1°5'N, 78°1'W, 21 xii 1987, *A.H. Gentry, O. de Benavides & P. Keating* 59670 (MO); Mpio. Ricaurte, La Planada, trail to El Hondón, 6–12 km SW of La Planada, 1°4'N, 78°2'W, 5 i 1988, *A.H. Gentry, O. de Benavides & P. Keating* 60393 (MO).

ECUADOR. **Carchi**: trail from Pailon to Gualpi Chico area of Awá Reservation, 1.5 km past río Blanco, 14 i 1988, *W.S. Hoover, P. Gelpi, R.A. Lorentzen & A. Arguello* 2431 (MO, QCA); Tulcán Cantón, Parroquia Chical, path from village of Chical towards an area known locally as “Crystal”, walked along río Blanco via the Cordillera Gualchan (c.6–8 km SW of Chical), 7 xii 2001, *J.L. Clark* 6344 (QCA, QCNE, US); 20 km east of Maldonado, 25 ix 1985, *L. Besse, H. Luther, A. Besse & J. Halton* 2275 (US); Trail to Pailon encampment, Gualpi Chico area of Awá Reserve, 0°58'N, 78°16'W, 21 i 1988, *W.S. Hoover, A. Arguello, P. Gelpi & R.A. Lorentzen* 3639 (MO); Trail from Rafael Quindís Finca back towards Untal to stream, c.0.5 km from finca, 0°53'N, 78°9'W, 25 xi 1987, *W.S. Hoover & S. Wormley* 1613 (MO, QCA); stream by Rafael Quindís Finca flowing into río Verde, above Untal (along road to Chical), 0°53'N, 78°8'W, 25 xi 1987, *W.S. Hoover & S. Wormley* 1530 (MO, QCA); Ridge to Rafael Quindís mountain finca, 0°52'N, 78°8'W, 27 xi 1968, *W.S. Hoover* 1841 (MO); *ibid.*, 28 xi 1987, *W.S. Hoover & S. Wormley* 1768 (MO); *ibid.*, 29 xi 1987, *W.S. Hoover* 2029 (MO); Reserva Golondrinas, El Corazón, Sendero a río El Corazón, 00°50'N, 78°08'W, 24 i 2004, *H. Vargas, E. Narváez, W. Torres & P. Escobar* 4412 (MO, QCNE); Espejo, Bosque Protector Mirador de Golondrinas, between the village, Las Juntas, and La Cabaña del Corazón, 00°49'N, 78°01'W, 10 iv 1996, *J.L. Clark & R.W. Dunn* 2453 (MO, QCNE, US), 2454 (QCNE, US). – **Imbabura**: Cotacachi Cantón, Parroquia García Moreno, Cordillera de Toisán, Cerro de la Plata, Bosque Protector Los Cedros, Sendero de las Cascadas, (1–2 km west of Lodge), 00°18'N, 78°46'W, 20 iii 2003, *J.L. Clark* 7456 (QCNE, US). – **Esmeraldas**: San Lorenzo Cantón, Awá Indigenous Territory, río Bogotá community, 2 km S of Lita-San Lorenzo road, near Quebrada Pambilar, below waterfall, 00°59'N, 78°35'W, 12 vi 2002, *D. Neill, A. Diaz, G. Zapata, J. Murtaugh, D. Pay & S. Casaluzan* 13985 (MO, QCNE). – **Pichincha**: Mashpi Reserve, small stream by waterfall between entrance to reserve and hotel, 00°09'455'N, 78°49'606'W, 3 vi 2016, *M.C. Tebbitt* 872 (QCA); along road between Pacto to San Miguel de los Bancos, between La Delicia and Cielo Verde (Imbabura), 11.3–11.8 km east of central plaza in Pacto, 5.1–5.6 km east of La Delicia, 0°09'27"N–00°49'30"N, 78°49'44"W–78°49'46"W, 9 ix 2007, *T.B. Croat & G. Ferry* 98445 (MO, US); Maquipucuna, 5 km E of Nanegal, 0°7'N, 78°37'W, 11 ii 1991, *A.H. Gentry & R. Valencia* 73248 (MO); Quito Cantón, Parroquia Nanegal, Reserva Maquipucuna, Cerro

Sosa, c.5 km airline SE of Nanegal, 00°07'N, 78°38'W, 14 vii 1990, *G.L. Webster* 28218 (MO, QCA, QCNE, US); Quito Cantón, Parroquia Nanegal, Montañas de Maquipucuna, Cerro Sosa, 00°05–5.5'N, 78°37'W, 3 vii 1991, *G.L. Webster* 28690 (QCNE); Quito Cantón, Bosque Protector Maquipucuna, Quebrada Santa Rosa, c.10 km airline WNW of Calacalí, 0°05'N, 78°36'W, 27 vi 1997, *G.L. Webster* 32437 (QCNE); Quito Cantón, Parroquia Nanegal, Bosque Protector Maquipucuna, Montañas de Maquipucuna, main ridge of Cerro Sosa, c.7 km airline SE of Nanegal, 00°04.5'N, 78°36.5'W, 8 vii 1991, *G.L. Webster* 29200 (QCNE); Quito Cantón, Bosque Protector Maquipucuna, above río Pichán, 7.5 km airline SE of Nanegalito, 0°02.5'N, 78°37'W, 1 ix 1993, *G.L. Webster* 30149 (QCNE); San Miquel de los Bancos Cantón, Nanegalito-Mindo Road, 16.5 km SSW of Nanegalito, 0°01'14''N, 78°24'23''W, 21 vii 1998, *T.B. Croat* 82770 (MO, QCNE); vicinity of Bellavista km 12 on road from Tandayapa to Mindo, 00°01'02''N, 78°44'49''W, 14 ii 2005, *T.B. Croat* 94576 (MO, QCNE, US); Quito Cantón, along road between Calacalí and Nanegalito, 24.6 km W of Mital del Mundo, 16.8 km W of Calacalí, 0°01'N, 78°34'W, 11 iii 1992, *T.B. Croat* 72884 (QCNE); Bellavista Reserve, 10 km SE of Nanegalito, 00°01'S, 78°41'W, 18 i 1997, *P.J.M. Maas, L.W. Chatrou, C.P. Repetur & J.L. Clark* 8540 (K, US); Quito Cantón, Parque Orchideológica El Pahuma, carretera Calacalí-Nanegalito, km 30, Sendero hacia la cascada, 00°01'N, 78°38'W, *E. Freire, M. Reina & M. Andi* 1496 (QCNE); Quito Cantón, Reserva Orchideológica El Pahuma, carretera Calacalí-Los Bancos, km 22, 00°01'42''N, 78°37'50''W, *M. Mantuano & Grupo Post-Grado MO-QCNE* 23 (MO, QCNE); San Miquel de los Bancos Cantón, El Pahuma Orchid Reserve, Sendero El Refugio Guarida del Oso, 00°01'523''N, 78°38'057''W, 18 v 2016, *M.C. Tebbitt* 851 (QCA); Nono-Nanegalito road, 0°02'S, 78°35'W, 12 km from Nono, *B.A. Stein* 2864 (MO, QCNE); Nanegalito, 00°04'S, 78°41'W, 16 iii 1967, *B. Sparre* 14887 (US); Reserva Las Tangaras, a dos horas y media de Quito, 0°4'59.2S, 78°46'10.45''W, 20 ii 2010, *E. Veloz* 2 (QCA); Saloya, descenso W. de la Cord. Occ., 9 ix 1943, *M. Acosta* S 5824 (F); Quito Cantón, Chiriboga, en la carretera vieja Quito-Sto. Domingo Reserva Forestal “La Favorita”, Minist. de Agricultura, 0°12'S, 78°47'W, 5 xii 1989, *C.E. Cerón, G. Benavides & E. Guzmán* 7915 (MO, QCNE), 7964 (MO, QCNE). – **Santo Domingo de los Tsáchilas**: km 59 de la carretera Antigua Quito-Santo Domingo de los Colorados, a 3 km al NE de la carretera, estribaciones occidentales del Volcán Pichincha, 0°13'53S, 78°48'10''W, 28 vi 1991, *J. Jaramillo & E. Grijalva* 13628 (QCA); in silvis tropic reg. Angamarca, xi 1900, *Sodiño* 554e (syn G; isosyn F); Las Palmeras, old road Quito-Sto. Domingo, km 59, trail leaving to the South, just opposite sign saying “Estación Científica río Guajalito”, 0°16'S, 78°50'W, 27 x 1989, *F. Borchsenius* 91415 (QCA, QCNE). – **Napo**: El Chaco Cantón, Proyecto Hidroelectrico Coca, Punte ST3, Márgen derecho del río Quijos, c.10 km al sur de Reventador 0°11'S, 77°39'W, 3–5 ix 1990, *W. Palacios* 5899 (MO, QCNE); El Chaco Cantón, Márgen derecho del río Quijos, Finca “La Ave Brava: de Segundo Pacheco”, 0°12'S, 77°39'W, 7–10 ix 1990, *W. Palacios* 5299 (QCNE). – **Cotopaxi**: Sigchos Cantón, Parroquia San Francisco de las Pampas, Bosque Integral Otonga, 27 i 2001, *J.L. Clark* 6160 (MO, QCNE, US); Reserva Otonga, entre Quito y Sto. Domingo, cerca de San Francisco de las Pampas, vi 1997, *C. Nowicki & J. Mutke* 1208 (QCA); Maná Cantón, Reserva Ecológica Los Ilinizas, Sector Brasil, acceso desde La Carmela, Cordillera Occidental, vertiente occidental, 0°40'28''S, 79°05'03''W, 17 vii 2003, *P. Silverstone-Sopkin, N. Paz, A. Giraldo & M. Cerna* 9255 (MO, QCNE, US); La Maná Cantón, Reserva Ecológica Los Ilinizas, Sector Brasil, acceso desde La Carmela, Cordillera Occidental, vertiente occidental, 0°40'37''S, 79°05'09''W, 13 vii 2003, *P. Silverstone-Sopkin, N. Paz, A. Giraldo & M. Cerna* 9143 (MO, QCNE, US); La Maná Cantón, Reserva Ecológica Los Ilinizas, Cerro Tilipulo, vertiente norte, Cordillera Tilinche, 0°45'46''S, 79°06'14''W, 24 vii 2003, *P. Silverstone-Sopkin, N. Paz, A. Giraldo & M. Cerna* 9452 (QCNE); La Maná Cantón, Reserva Ecológica Los Ilinizas, Sector II (Sector Sur), sector Chuapitambo, al occidente de Choasillí, Cordillera Occidental, vertiente occidental, 0°58'42''S, 79°06'22''W, 6 viii 2003, *P. Silverstone-Sopkin, N. Paz, A. Giraldo & M. Cerna* 9882 (QCNE, US). – **Morona-Santiago**: Parque Nacional Sangay, Lagunas de

Sardinayacu, colecciones a los alrededores del refugio 3, 2°04'26''S, 78°13'06''W, 21 i 2015, A. J. Pérez, N. Zapata, W. Santillán & D. Uwijint 7991 (QCA). – Cañar: km 9 vía Cochaancay-Cuenca, 02°28'S, 79°17'W, 10 vii 2000, X. Cornejo & C. Bonifaz 7078 (QCNE).

**4. *Begonia harlingii*** L.B.Sm. & Wassh., *Phytologia* 44(4): 246, 1979; *Flora of Ecuador* 25 (133): 50–52, 1986. – Type: ECUADOR. Los Ríos. Hacienda Clementina, virgin forest Samama, 750 m, 18 iii 1947, G. Harling 487 (holo S [S04-729], photo US).  
**Figs 3, 4 D.**

Cauliscent herb, 30–60 cm tall; *stem* erect, succulent, gently curved, unbranched or branching, covered with villous hairs; *internodes* to 5 cm long, dull yellowish green; *stipules* deciduous, lanceolate, 0.6–1.2 × 0.4–0.7 cm, apex acute and apiculate to 6 mm long, margins entire. *Leaves* alternate, spaced evenly along stem, basifixed; *petioles* 2.5–7.5 cm long, covered with villous hairs; *lamina* asymmetrical, oblong-elliptic, with longer side almost straight and shorter side convex, 5–15.5 × 3–6 cm, base shallowly cordate, basal lobes subequal, not overlapping, apex acuminate, margins irregularly dentate to irregularly double-dentate, usually also with a few small irregular lobe-like projections, lobe-like projections 0.4–1.5 cm long, teeth 0.5–2 mm long with ends of veins shortly projecting to form a point, upper surface dark green, lower surface pale green with reddish brown primary, secondary and tertiary veins; veins pinnately nerved, with 9–13 lateral veins on wider side of lamina, and 9–13 lateral veins on narrower side. *Inflorescences*: axillary, arising from the axil of most mature leaves, held at right angles to the stem or slightly pendulous, a cyme composed of one male and one female flower or two male flowers and one female; *peduncle* 1.2–2.7 cm long, succulent, moderately covered with villous hairs; *bracts* deciduous, ovate, light green, 4–6 × 1.5–3.5 mm, apex acute, margin fimbriate. *Male flowers*: *pedicels* 0.5–1.5 cm long, moderately covered with villous hairs; *tepals* 4, white to roseate, margins entire, the outer ovate to elliptic, 0.5–1 × c.0.5 cm, apex obtuse, the inner narrowly elliptic to narrowly obovate, 0.5–0.8 × c.2 mm, apex obtuse; *stamens*, 6–16, projecting upwards; filaments < 0.5 mm, anthers ellipsoid, 1.5–2 mm, connective projecting, dehiscing by lateral slits. *Female flowers*: *pedicels* c.1 mm long, moderately covered with villous hairs; *bracteoles* 2, like the bracts; *tepals* 5, deciduous in fruit, white to roseate, margins entire, subequal, narrowly elliptic to elliptic, 6–10.5 × 2–4 mm, apex obtuse; *ovary body* narrowly ellipsoid, c.8 × 2.3–3 mm, subequally 3-winged, wings deltate triangular, 6–11 mm long × 6–8 mm broad, broadest point at apex of ovary, base rounded, apex truncate and narrowing and projecting upwards for 1–2 mm, margins entire to fimbriate; placenta axile, bilamellate, ovuliferous all over; *styles* 3, 4–5.5 mm long, bifid 0.5–0.75 mm from base, branches erect, twice spirally twisted. *Fruiting pedicel* stout, elongating to 3.5 cm long. *Fruit* ellipsoid, to 1.5 × 0.5 cm, wings same shape as in ovary, enlarging to 15 mm long × 8 mm broad. *Seeds* globose, c.0.2 × 0.2 mm.

*Phenology.* *Begonia harlingii* has been collected flowering and fruiting year-round.

*Distribution.* *Begonia harlingii* has been recorded from the Ecuadorian provinces of Esmeraldas, Pichincha, Santo Domingo de los Tsáchilas, Los Ríos, Bolívar and Cañar.

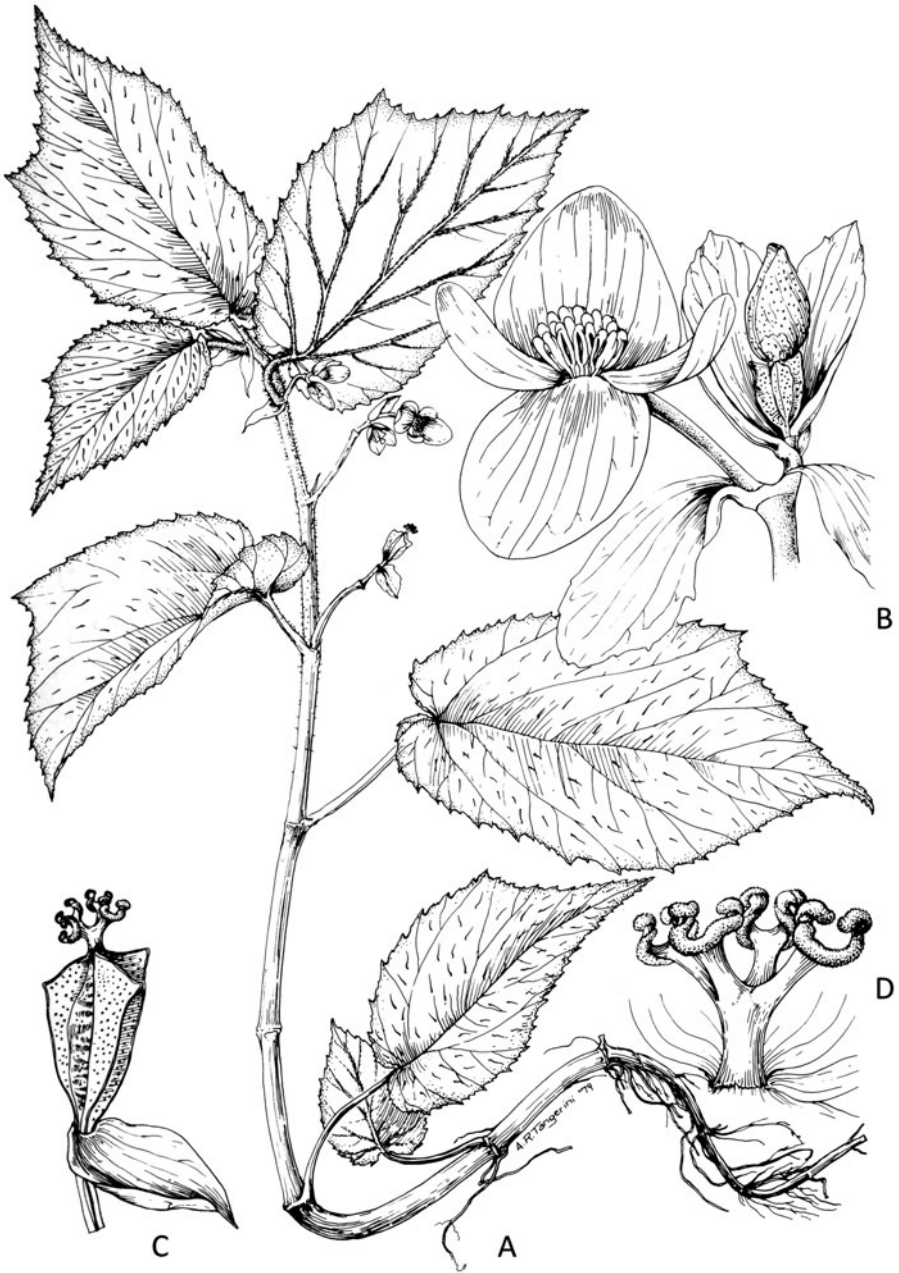


FIG. 3. *Begonia harlingii* L.B.Sm. & Wassh. A, Habit; B, inflorescence; C, fruit (side view); D, style. Reproduced from Smith & Wasshausen (1979), with the permission of *Phytologia*.

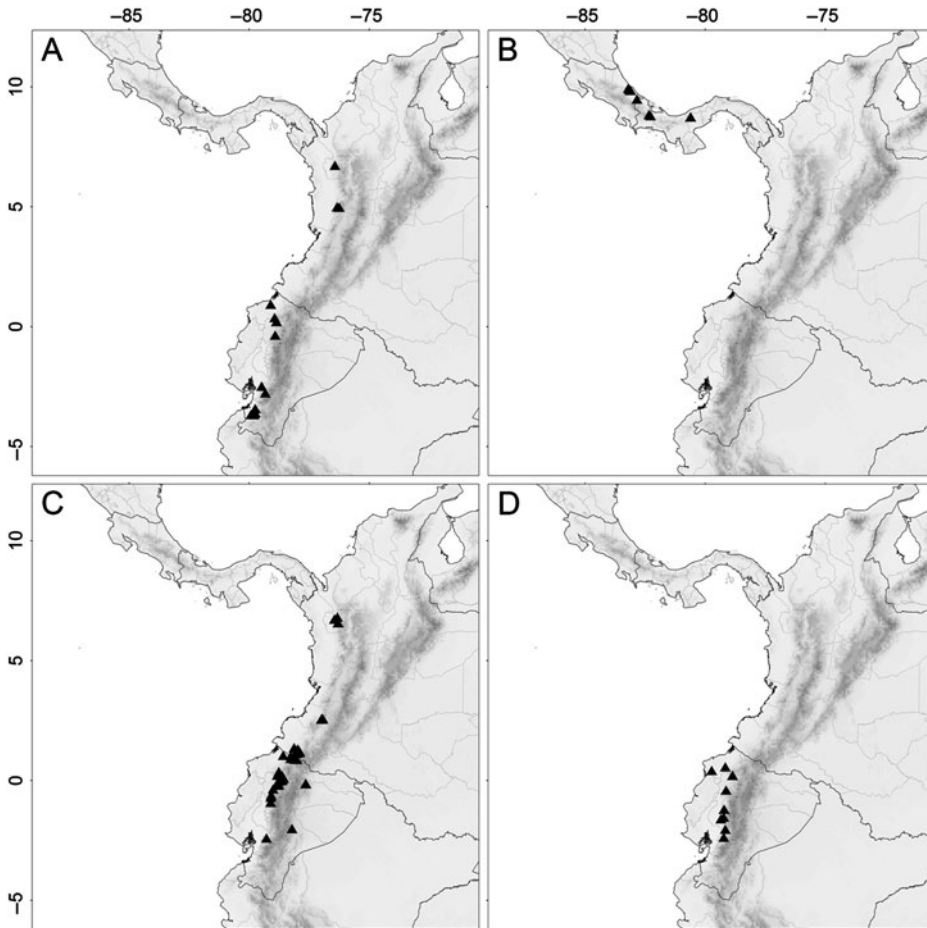


FIG. 4. Distribution of species of the *Begonia tiliifolia* group of *Begonia* sect. *Ruizopavonia* A.DC. A, *Begonia botryoides* Moonlight & Tebbitt; B, *B. boreoharlingii* Tebbitt & Moonlight; C, *B. tiliifolia* C.DC.; D, *B. harlingii* L.B.Sm. & Wassh.

*Habitat.* *Begonia harlingii* grows on moist earth slopes and stream-sides within primary or disturbed wet premontane forest, at 400–1400 m altitude.

*IUCN conservation category.* *Begonia harlingii* appears to have a scattered distribution within an area measuring approximately 325 × 100 km, and is known only from six localities. Accordingly, we assess *B. harlingii* as Vulnerable (VU D2), according to IUCN criteria (2015).

*Additional specimens examined.* ECUADOR. **Esmeraldas:** Quininde Cantón, Sector Cristóbal Colón, Terrenos de la Sra. Emma Revilla, a 10 km de Cristóbal Colón, 0°30'N, 79°10'W, 15 iii 2004, *H. Vargas, E. Narváez, A. Moreira, J. Celi & L. Lewinsohn* 4629 (MO, QCNE); Quininde Cantón, Bilsa Biological Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, Manuel Tapia's cacao plantation, 00°21'N, 79°44'W, 17 ix 1994, *N. Pitman* 969 (MO,

QCNE); Quininde Cantón, Bilsa Biological Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, southeast ridge trail, 00°21'N, 79°44'W, 22 ix 1994, *N. Pitman, J. Clark, B. Adnepos & L. Kueppers* 701 (MO, QCNE); Quininde Cantón, Bilsa Biological Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, 3rd lot W of Station following road towards Piedrita, 00°21'N, 79°44'W, 12 v 1995, *J.L. Clark & C. Watt* 866 (MO, QCNE); Quininde Cantón, Bilsa Biological Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, along ridge of La Loma de los Guerrilleros, 00°21'N, 79°44'W, 27 ix 1996, *J.L. Clark* 2915 (MO, QCNE); Quininde Cantón, The Mache-Chindul Ecological Reserve, Bilsa Biological Station, Mache Mountains, 35 km W of Quinindé, 00°21'N, 79°44'W, 1–10 i 1997, *J.L. Clark, E. Austen, S. Bennett & D. Kapan* 3697 (MO, QCNE); Quininde Cantón, Bilsa Biological Station, Montañas de Mache, 35 km W of Quinindé, 5 km W of Santa Isabel, large waterfall SE of Station, upstream of station shower, 00°21'N, 79°44'W, 12 v 1995, *M.S. Bass & J.R. Abbott* 51 (MO, QCNE). – **Pichincha**: Quito Cantón, Mashpi Reserve, along San Vicente River, near road between entrance to reserve and hotel, 0°09'N, 78°52'W, 14 ix 2014, *A.J. Pérez, N. Zapata, C. Morochz & J.C. Narváez* 7547 (QCA); Quito Cantón, Mashpi Reserve, along San Vicente River, near road between entrance to reserve and hotel, 0°09'N, 78°52'W, 3 vi 2016, *M.C. Tebbitt* 876 (QCA). – **Santo Domingo de los Tsáchilas**: c. km 36 along road to the SE from la Aurora (km 7 on Sto. Domingo-Quevedo road), passing through La Reforma, 0°28'S, 79°08'W, *B. Øllgaard* 90464 (QCNE), 98064 (MO, QCA). – **Los Ríos**: Hacienda Clementina, virgin forest Samama, 25 iii 1947, *G. Harling* 521 (S); Hacienda Clementina, cerro Samana, 1°40'S, 79°21'W, 5 iv 1996, *X. Cornejo, C. Cornejo & C. Bonifaz* 4959 (K). – **Bolívar**: Guaranda. Parroquia San Luis de Pambil, Bosque Cerro Piedras Blancas, a 9 km al sur este del centro poblado, cerca del río Blanco parcela permanente 01, 1°16'S, 79°13'W, 5 i 2004, *N. Saltos* 241 (QCNE); Caluma Cantón, Monte Grande, 1°32'S, 79°00'W, 24 xi 1991, *C.E. Cerón* 17576 (MO); Hacienda Changuil, La 16, 2°6'S, 79°10'W, 18 viii 1995, *X. Cornejo & C. Bonifaz* 4354 (K). – **Cañar**: Cañar Cantón, Parroquia Chontamarca, comunidad Yanayacu, base occidental de los Andes, 02°26'05"S, 79°13'53"W, 2 viii 2005, *H. Vargas & W. Defas* 6168 (MO, QCNE).

Smith & Wasshausen (1979) describe and illustrate *Begonia harlingii* as having four pistillate tepals and four styles. This appears to be a mistake, because all of the material we examined, including the holotype, has five pistillate tepals and three styles.

#### ACKNOWLEDGEMENTS

We thank the curators of AAU, B, BKL, BM, BR, BRIT, C, CAS, CGE, COL, CPUN, CUZ, E, E-GL, F, G, GB, G-BOISS, G-DC, GH, GOET, HOXA, HUT, K, LIL, LPB, MEDEL, MO, MOL, MOL-WEB, NY, OXF, P, QCA, QCNE, QPLS, S, SEL, TEX, UC, US, USM, USZ, W and Z for loaning material or allowing us to work in their herbaria. We thank Jacky Duruisseau for providing us with photographs of *Begonia botryoides* taken in Buenaventura Reserve, Ecuador. We thank the Ecuadorian Ministerio del Ambiente for granting A.P. and M.T. permission to conduct the fieldwork and collect specimens (001-14 IC-FLO-DNB/MA and 006-2016 IC-FLO-DNB/MA) and the American Begonia Society for funding the fieldwork. We thank Claire Banks for providing the artwork of *Begonia botryoides* and the James and Eve Bennett Trust for funding it. We also thank the M.L. MacIntyre Begonia Trust for scholarship support to P.M. The Royal Botanic Garden Edinburgh is supported by



the Scottish Government's Rural and Environment Science and Analytical Services Division.

## REFERENCES

- BURT-UTLEY, K. (2015). *Begonia*. In: DAVIDSE, G., SOUSA SÁNCHEZ, M., KNAPP, S. & CHIANG CABRERA, F. (eds) *Flora Mesoamericana*, vol. 2, part 3, pp. v–xvii, 1–347. St Louis, Missouri: Missouri Botanical Garden.
- DE CANDOLLE, C. (1906). In: HUBER, C. *Materiales para a Flora Amazonica*. *Bol. Mus. Paraense Hist. Nat.* 4: 593–594.
- DOORENBOS, J., SOSEF, M. S. M. & DE WILDE, J. J. F. E. (1998). The sections of *Begonia* including descriptions, keys, and species lists. *Wageningen Agric. Univ. Pap.* 98–2.
- IUCN (2015). *The IUCN Red List of Threatened Species*, version 2014-3. Online. Available: <http://www.iucnredlist.org>.
- MOONLIGHT, P. W., HUGHES, M. & TEBBITT, M. C. (2017). Taxonomy of *Begonia albomaculata* and description of two new species endemic to Peru. *Edinburgh J. Bot.* 74(2).
- SMITH, L. B. & SCHUBERT, B. G. (1941). Begoniaceae. In: MACBRIDE, J. F. (ed.) *Flora of Peru*, vol. 13, part 4, pp. 181–202. Chicago: Field Museum of Natural History (Botany).
- SMITH, L. B. & SCHUBERT, B. G. (1946). The Begoniaceae of Colombia. *Caldasia* 4(16): 3–38; 4(17): 77–107.
- SMITH, L. B. & SCHUBERT, B. G. (1952). Plants collected in Ecuador by W. H. Camp. Begoniaceae. *Mem. New York Bot. Gard.* 8(1): 36–40.
- SMITH, L. B. & WASSHAUSEN, D. C. (1979). *Begonia* of Ecuador. *Phytologia* 44(4): 233–256.
- SMITH, L. B. & WASSHAUSEN, D. C. (1984). Notes on Begoniaceae – III. *Phytologia* 54(7): 465–473, pl. 1.
- SMITH, L. B. & WASSHAUSEN, D. C. (1986). Begoniaceae. In: HARLING, G. & ANDERSSON, L. (eds) *Flora of Ecuador*, vol. 25, pp. 1–66. Stockholm: Swedish Research Councils.

*Received 27 October 2016; accepted for publication 30 January 2017;  
first published online 9 March 2017*