



Two new species of *Begonia* from Andean Peru

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Abstract

Two new species of *Begonia* from montane forests in Andean Peru are described and illustrated as *B. lamolina* and *B. amoeboides*. These two species are placed within *B.* section *Cyathocnemis* and are morphologically most similar to *B. lophoptera*, which is lectotypified, and a new description is provided. Preliminary IUCN Red List assessments are provided for all three species.

Resumen

Se describen e ilustran dos nuevas especies de *Begonia*, distribuidas en los bosques montanos del Perú, *B. lamolina* y *B. amoeboides*. La posición de ambas es comprendida dentro de *B.* Sección *Cyathocnemis*; las dos son morfológicamente afines a *B. lophoptera*.

Keywords: Andes, *Begonia* section *Cyathocnemis*, Neotropics, Peru

Introduction

Begonia is a mega-diverse, pantropically distributed genus including 1892 currently-accepted species (Hughes *et al.* 2015–, Accessed 5th May 2018). *Begonia* section *Cyathocnemis* (Klotzsch) A.DC. (1864: 332) includes 18 species from the northern and central Andes with a further 4 species doubtfully assigned to the section (Moonlight *et al.* 2018). The section consists of caulescent herbs lacking rhizomes and tubers with transverse, palmately compound leaves, staminate flowers with two tepals, female flowers with two, three or five tepals, and bifid placentae (Doorenbos *et al.* 1998). The section was resolved as sister to the primarily Bolivian *B.* sect. *Hydristyles* A.DC. (1859: 132) in a recent molecular phylogenetic analysis (Moonlight *et al.* 2018), however, we note that few species of the latter section were included in this study. *Begonia* sect. *Hydristyles* is distinguished from *B.* sect. *Cyathocnemis* by its mutifid rather than bifid styles, but recent fieldwork has demonstrated this character is shared by species placed phylogenetically within of *B.* sect. *Cyathocnemis* by Moonlight *et al.* (2018) including *B. obtecticaulis* Irmsch. (1949: 600) and *B. amoeboides* Moonlight (described below). We consider it likely that future taxonomic and phylogenetic work may result in *B.* sect. *Cyathocnemis* being synonymised with *B.* sect. *Hydristyles*.

Ongoing systematic work in Andean *Begonia* has uncovered several taxonomic novelties. Here we describe, illustrate, and provide provisional IUCN Red List Assessments for two new species of *B.* sect. *Cyathocnemis* from humid montane forests of the western slope of the Peruvian Andes. The new species described here is morphologically most similar to *B. lophoptera* Rolfe (1914: 28), which we lectotypify and for which we provide an emended description, plus a distribution map and IUCN Red List Assessment.

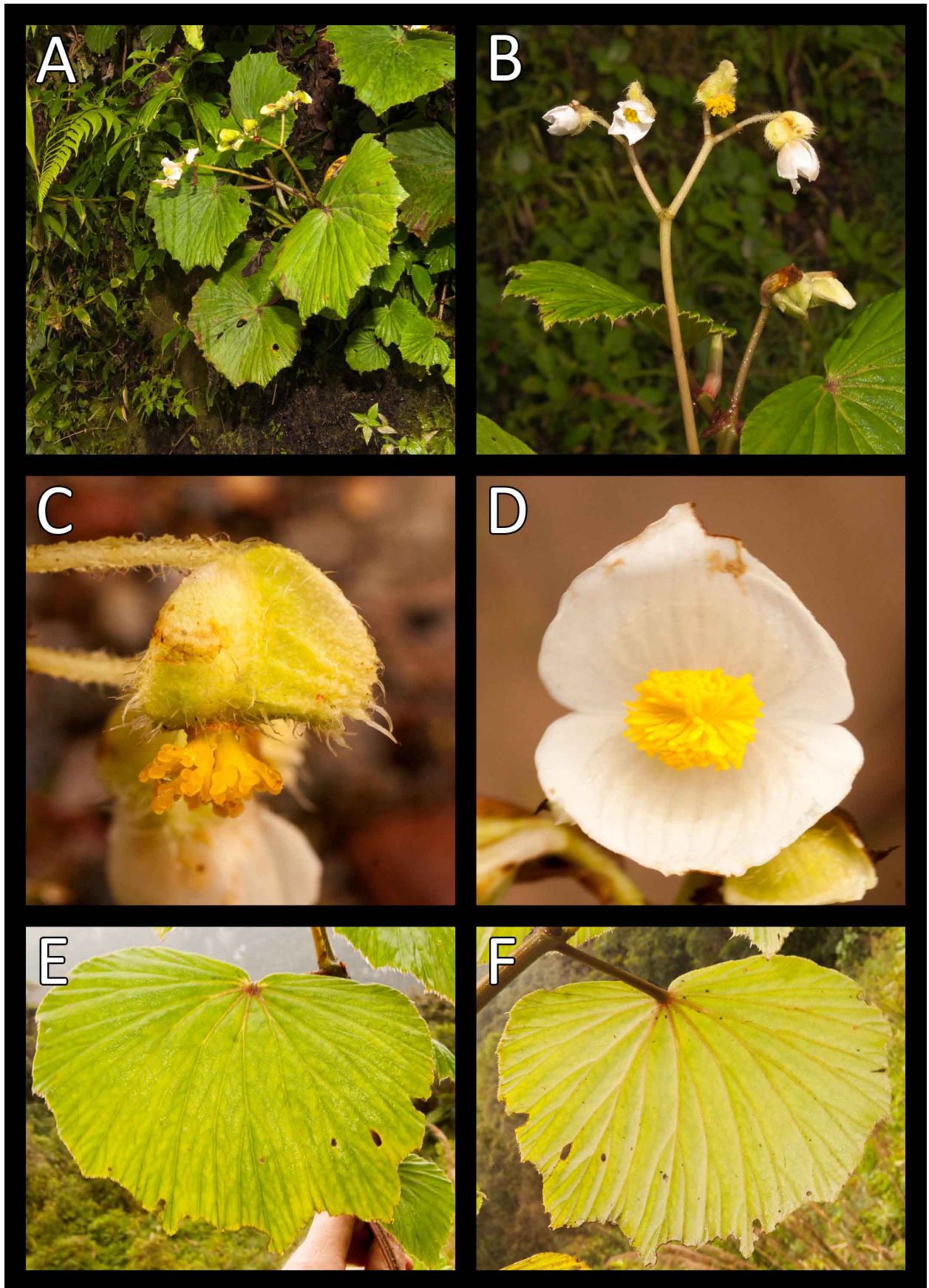


FIGURE 1. *Begonia amoeboides* Moonlight **A.** Habit; **B.** Branch of inflorescence; **C.** Developing fruit flower, side view; **D.** Staminate flower, front view; **E.** Upper leaf surface; **F.** Lower leaf surface; Photographs taken by Peter W. Moonlight from *P.W. Moonlight & A. Daza 150*.

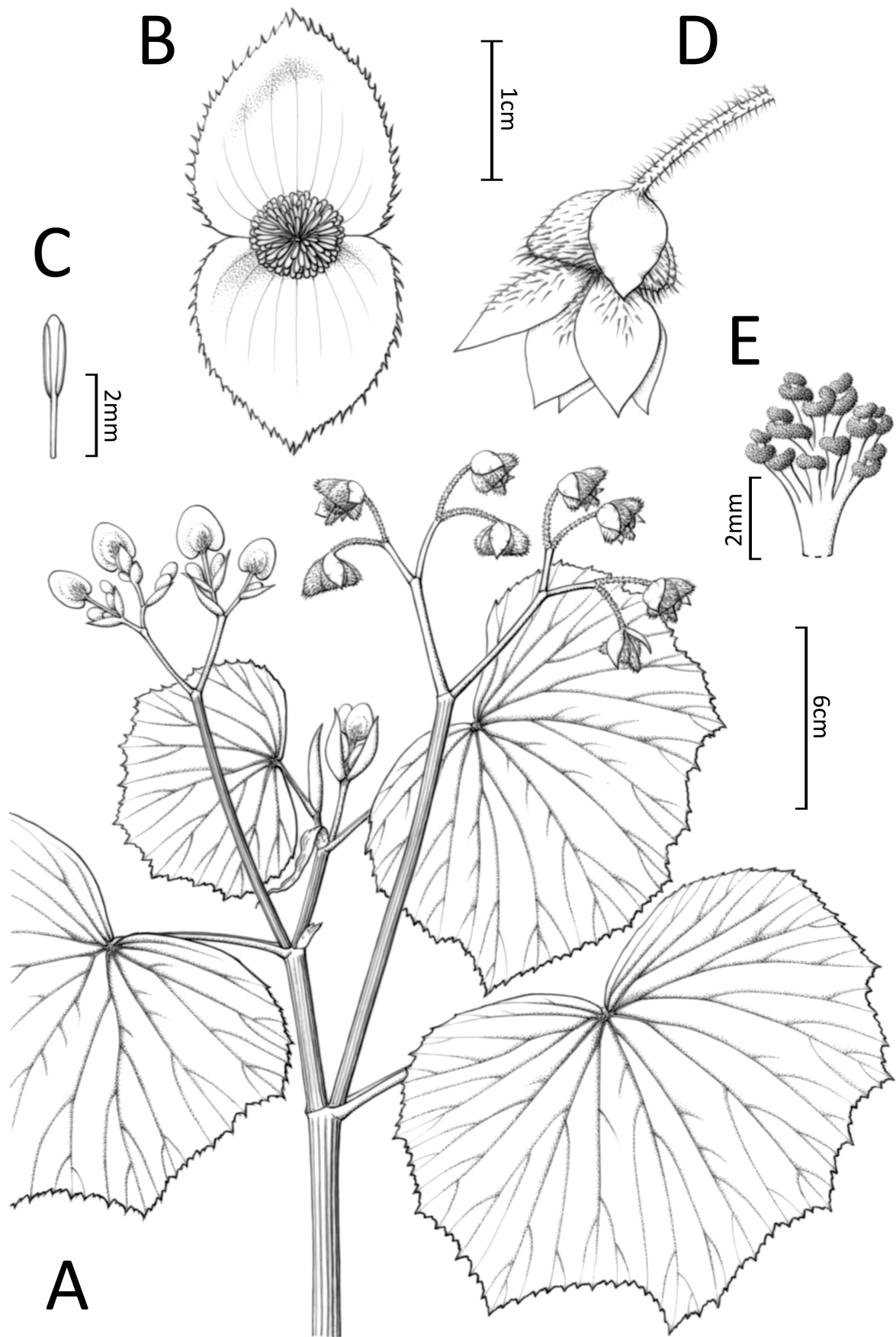


FIGURE 2. *Begonia amoeboides* Moonlight **A.** Habit, showing young inflorescence and young infructescence; **B.** Male flower, front view; **C.** Stamen, front view; **D.** Female flower, side view; **E.** Stigmas, side view. Illustration by Claire Banks from *P.W. Moonlight & A. Daza 150* (A, D, E) and *Valenzuela et al. 13842* (B, C).

Taxonomic Treatment

1. *Begonia amoeboides* Moonlight *sp. nov.* (Figs. 1–2, 5) § *Cyathocnemis*

Begonia amoeboides is most similar to *B. lophoptera* Rolfe, but differs in its deciduous and lanceolate stipules (persistent and ovate in *B. lophoptera*), five tepals on the female flower (two in *B. lophoptera*), multifid styles (bifid in *B. lophoptera*), and its stamen number (60–100 in *B. amoeboides*, 25–35 in *B. lophoptera*).

Type: PERU. Amazonas Department. Prov. Bongará: Dist. Yambrasbamba: Road from Amazonas to Rioja, 5°41'22"S, 77°47'11"W, alt. 2088 m, 31 January 2016, P.W. Moonlight & A. Daza 150 (holotype MOL; isotype E, K, MO, USM).

Plant a caulescent herb, 40–150 cm high; *stem* erect, occasionally branching; *internodes* to 15 cm long, to 8 mm thick, ridged, succulent, dark green to dark red, sparsely to densely pilose; *stipules*, deciduous lanceolate, 10–40 × 5–10 mm, dark brown to pale green, glabrous, base surrounded by squamose hairs, attenuate, apex acute, margin entire, aciliate. *Leaves* alternate, spread evenly along stem, more than 5, basifixed; *petiole* 3.5–13.5 cm long, densely pilose; *lamina* subsymmetric, straight, reniform, 5.5–11 × 7–16 cm, apex broadly rounded, base truncate to cordate, to 2 cm deep, lobes not overlapping, with 2–8 cusps around the lamina, margin irregularly double-dentate, ciliate, upper surface even, green, sparsely pilose, lower surface even, pale green, sparsely pilose, densely tomentose on veins; venation palmate, 8–12 veins from base. *Inflorescence* protanderous, axillary, erect, cymose, branching to 3 times, sparsely to densely pilose; *peduncle* to 10 cm long, internodes to 3 cm long; *bracts* deciduous, lanceolate to ovate, 6–13 × 3–8 mm, translucent to white, glabrous to sparsely pilose, apex acute, margin ciliate. *Staminate flowers*: *pedicel* 8–15 mm; *tepals* 2, spreading, membranaceous, ovate, 8–18 × 7–15 mm, apex acute, base cordate, margin entire to irregularly serrate, aciliate to ciliate, white or rarely pink, upper surface glabrous, lower surface pilose; *stamens* 60–100, free, spreading, yellow, filaments 1–1.5 mm, anthers linear, 2–0.8 mm, obtuse, dehiscing through lateral slits, connective projecting to 0.4 mm. *Pistillate flowers*: *pedicels* 10–15 mm. *bracteoles* 3, lanceolate to rounded, 8–10 × 4–6 mm, apex acute, glabrous to short pilose, margin entire, aciliate to ciliate; *tepals* 5, projecting forwards, deciduous in fruit, membranaceous, lanceolate to ovate, 9–10 × 4–6 mm, apex acute to obtuse, base cuneate, margin entire, aciliate, white or rarely pink, upper surface glabrous, lower surface sparsely pilose; *ovary body* ovoid, 4–11 × 2–6 mm, sparsely pilose, pale green, unequally 3-winged, wings sparsely pilose, pale green, the largest wing triangular, 4–10 × 2–7 mm, apex truncate and notched, ciliate, margin entire, aciliate, the smaller 2 wings oblong to triangular, 4–9 × 1.5–2.6, margin entire, aciliate; *placentae* axile, bilamellate, ovuliferous all over; *styles* 3, deciduous in fruit, 5–6 mm long, irregularly multifid 1 mm from base, branches spreading, spirally twisted. *Fruiting pedicel* extending to 2.5 cm. *Fruit* pendulous, ovate, light brown, enlarging to 14 × 7 mm, the largest wing the same shape as in the ovary, enlarging to 14 × 11 mm, the smallest enlarging to a triangular wing 14 × 9 mm.

Distribution and habitat:—*Begonia amoeboides* has been collected in the Department of Amazonas, San Martín, and Pasco on the western slope of the Andes of northern Peru. It is typically found on moist banks in montane forest.

Taxonomic Comments:—All known specimens of *Begonia amoeboides* were previously determined as *B. lophoptera*. When flowering, it is trivial to tell these two species apart by the number of female tepals, however, determining sterile specimens can be problematic. *B. amoeboides* can be distinguished vegetatively by its straight, reniform leaves, which lack a distinct apex (transverse, ovate, and with a distinct apex in *B. lophoptera*) and its deciduous, lanceolate stipules (versus persistent and reniform to ovate or rarely broadly lanceolate).

Photographs of the type collection are available from the Begonia Resource Centre (Hughes *et al.* 2015–Present). The type collection was included in phylogenetic analyses by Moonlight *et al.* (2018).

Etymology:—The epithet “amoeboides” refers to the irregularly multifid stigmas of the species, which resemble the irregularly branching pseudopods of amoeba.

IUCN Redlist Assessment:—*Begonia amoeboides* is known from two small populations in the protected areas of Bosque de Protección Alto Mayo and Parque Nacional Yanachaga-Chemillén. The species is locally common in its known range and much of the 550 km between these two populations are poorly explored. Accordingly, we treat *B. amoeboides* as Data Deficient (DD) under IUCN Red List Categories and Criteria (IUCN, 2012).

Additional specimens examined:—PERU. **Department of San Martín: Prov. Rioja:** Dist. Pardo Miguel: Km 382–385 Moyabamba-Bagua road, alt 1850–1950 m, 5°41'S, 77°39'W, 17 February 1984, D.N. Smith 6005 (MO, USM);

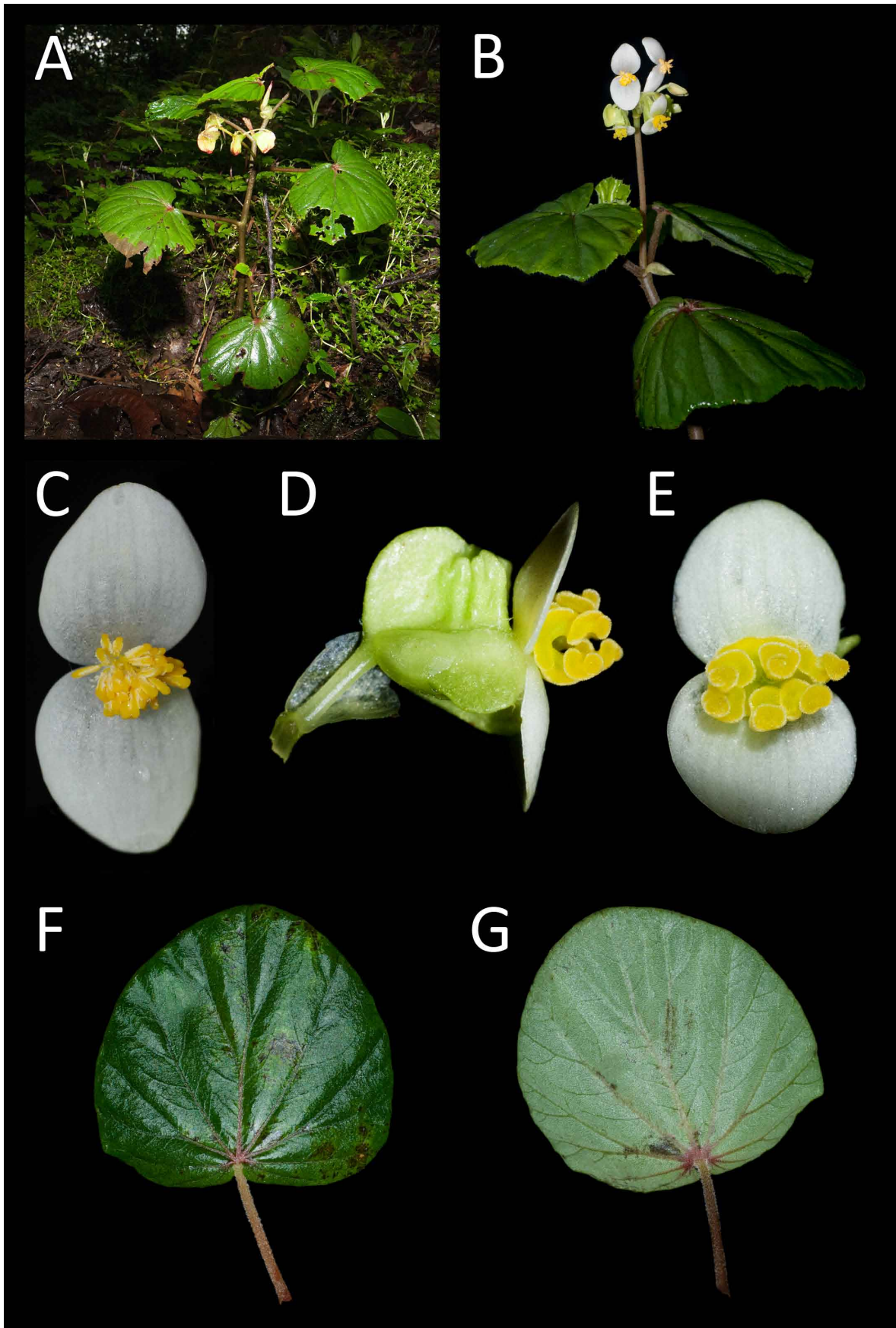


FIGURE 3. *Begonia lamolina* Moonlight **A.** Habit; **B.** Branch of inflorescence; **C.** Staminate flower, front view; **D.** Pistillate flower, side view; **E.** Pistillate flower, front view; **F.** Upper leaf surface; **G.** Lower leaf surface; Photographs taken by Peter W. Moonlight from RBGE Living Accession 20180174, grown from *P.W. Moonlight & A. Daza 144*.

Department of Amazonas. Prov. Bongará: Dist. Yamborasbamba: Road from Amazonas to Rioja, 5°41'16"S, 77°47'10"W, alt. 2075 m, 3 July 2018, *P.W. Moonlight 1258* (E, USM). **Department of Pasco: Prov. Oxapampa:** Dist. Huancabamba: Sector Oso Playa, camino hacia el campamento, alt. 2478 m, 10°18'52"S, 75°34'31"W, 22 October 2009, *L. Valenzuela, A. Monteagudo, M. Cueva, A. Peña, J. Mateo & R. Rivera 13842* (HOXA, E, MO); Zona de amortiguamiento del Parque Nacional Yanachaga-Chemillén, Sector Oso Playa, camino a la parcela Oso Playa, 2500 m, 10°19'20"S, 75°36'06"W, 17 June 2006, *A. Monteagudo, L. Cardenas, A. Peña, J.L. Mateo & R. Francis 12001* (HOXA, MO, USM); Oso Playa, alt. 2200 m, 10°19'21"S, 75°34'11"W, 26 June 2004, *R. Rojas & J. Perea 3101* (HOXA, MO); *ibid.*, 31 May 2004, *R. Rojas, M. Huaman, A. Peña & J. Mateo 2443* (HOXA, MO); Abra Yanachaga, Parque Nacional Yanachaga-Chemillén, alt. 2930 m, 10°22'46.3"S, 75°27'42.9"W, 3 August 2005, *E. Ortiz V. & R. Francis J. 734* (HOXA, MO); Trail to summit of Cordillera Yanachaga via río San Daniel, alt. 2700 m, 10°23'S, 75°27'W, 13 July 1984, *D.N. Smith 7801* (MO, USM); Parque Nacional Yanachaga-Chemillén, Grapanazú-Sector San Daniel, Naciente de la Quebrada Colmena, alt. 2200–2500 m, 10°26'35"S, 75°26'16"W, September 2005, *S. Vilca C., E. Ortiz V. & J. Mateo M 229* (HOXA, MO, USM); Localidad Grapanazú, sector San Daniel, zona de amortiguamiento del Parque Nacional Yanachaga-Chemillén, 2236 m, 10°26'36"S, 75°26'21"W, 10 July 2004, *J. Perea, R. Francis, H. Cristóbal & E. Camavilca 1472* (HOXA, MO); Parque Nacional Yanachaga-Chemillén, Sector San Daniel-Quebrada Colmena, 1951 m, 10°27'25"S, 75°27'20"W, 26 ii 2009, *R. Vásquez, L. Valenzuela & R. Rivera 35403* (HOXA, E, MO, USM).

2. *Begonia lamolina* Moonlight *sp. nov.* (Figs. 3, 5) § *Cyathocnemis*

Begonia lamolina is most similar to *B. lophoptera* Rolfe, differing in its deciduous and lanceolate stipules, acuspidate leaves, glabrous sepals on the staminate and pistillate flowers, pistillate flowers with 3 bracteoles, and its spreading styles.

Type: PERU. Department of Amazonas: Prov. Bongará: Dist. Yamborasbamba: Road from Amazonas to Rioja, 5°41'52"S, 77°48'35"W, alt. 2301 m, 31 January 2016, *P.W. Moonlight & A. Daza 144* (holotype MOL; isotype E).

Plant a caulescent herb, 30 cm high; *stem* erect, occasionally branching; *internodes* to 7.5 cm long, to 5 mm thick, succulent, green to red, glabrous to sparsely pilose; *stipules* deciduous, lanceolate, 11–15 × 3–9 mm, pale green, glabrous, base surrounded by pilose hairs, cuneate, apex acute, margin entire, aciliate. *Leaves* alternate, spread evenly along stem, more than 5, basifixed; *petiole* 2.5–8 cm long, densely pilose; *lamina* asymmetric, transverse, ovate, 4.5–12 × 3–8.5, apex acute, base cordate, to 0.7 cm deep, lobes not overlapping, acuspidate, margin irregularly dentate, ciliate, upper surface even, green with red veins, glabrous to densely pilose, denser on major veins, lower surface even, pale green, sparsely to densely pilose; venation palmate, 6–9 veins from base. *Inflorescence* protanderous, axillary, erect, cymose, branching to 3 times, sparsely pilose; *peduncle* to 6.5 cm long, internode to 0.7 cm long; *bracts* deciduous, lanceolate, 4 × 2 mm, white, glabrous, apex acute, margin aciliate. *Staminate flower*: *pedicel* ca. 8 mm long; *tepals* 2, spreading, membranaceous, ovate, 4 × 4 mm, apex acute, base cordate, margin entire, aciliate, white, both surfaces glabrous; *stamens* 35–40, free, spreading, yellow, filaments 0.5–1 mm, anthers linear, 1.5–2 mm, obtuse, dehiscing through lateral slits, connective projecting to 0.2 mm. *Pistillate flower*: *pedicel* 5 mm long; *bracteoles* 3, ovate, 2–4 × 2–3 mm, apex rounded, glabrous, margin entire, aciliate to ciliate; *tepals* 2, spreading, deciduous in fruit, membranaceous, ovate, 8 × 4 mm apex obtuse, base rounded, margin entire, aciliate, white, both surfaces glabrous; *ovary body* ovoid, 4 × 3 mm, glabrous, green, unequally 3-winged, wings glabrous, green, the largest wing triangular, 4 × 2 mm, apex truncate and notched, ciliate, margin entire, aciliate, the smaller 2 wings oblong, 4 × 0.5 mm, margin entire, aciliate; *placentae* axile, bilamellate, ovuliferous all over; *styles* 3, deciduous in fruit, 2–2.5 mm long, bifid 0.2 mm from base, branches spreading, spirally twisted. *Fruiting pedicel* extending to 1 cm. *Fruit* pendulous, ovate, light brown, enlarging to 8 × 4 mm, the largest wing the same shape as in the ovary, enlarging to 11 × 11 mm, the smallest enlarging to a triangular wing 8 × 5 mm.

Distribution and habitat:—Peru. Known only from five collections <7 km apart on the borders of the Department of Amazonas and San Martín. The species was also observed on Trocha Kovachi [ca. 5°40'50"S, 77°45'15"W] in Rioja Prov. Department of San Martín in February 2016 but not collected due to permit restrictions. The species is found at low densities as a terrestrial understory herb in montane forest.

Taxonomic Comments:—When sterile, *Begonia lamolina* is best distinguished from *B. lophoptera* by its deciduous, lanceolate stipules (rather than persistent and reniform to ovate or rarely broadly lanceolate in *B. lophoptera*).

Photographs of the type collection and *A. Orejuela, M. Cueva & J. Castillo 2758* are available on the *Begonia* Resource Centre (Hughes *et al.* 2015–). The type collection was included in phylogenetic analyses by Moonlight *et al.* (2018).

Etymology:—The specific epithet refers to the forestry department herbarium of the Universidad Nacional Agraria la Molina, and in particular its staff Carlos Reynel and Aniceto Daza. Their invaluable work on the flora of Peru is equalled only by their work assisting visiting researchers, which have contributed to the description of numerous new taxa including both new species described in this manuscript. We treat the epithet as a non-Latin noun in apposition.

IUCN Red List Assessment:—*Begonia lamolina* is known from five collections made within Bosque de Protección Alto Mayo. The known extent and area of occupancy of the species are both small enough for it to qualify as Critically Endangered, but its range likely includes much of the poorly-collected, continuous band of montane forest that extends 100 km to the north and south of its known range. Accordingly, we assess *B. lamolina* as Data Deficient (DD) under IUCN Red List Categories and Criteria (IUCN, 2012).

Additional specimens examined:—PERU: **Department of Amazonas: Prov. Bongará:** Dist. Yambrasbamba: Road from Bagua to Rioja, 5°41'16"S, 77°47'10"S, alt. 2075 m, 3 July 2018, *P.W. Moonlight 1259* (E, USM); Dist. Yambrasbamba: Road from Amazonas to Rioja, 5°41'42"S, 77°48'18"W, alt. 2261 m, 31 January 2016, *P.W. Moonlight & A. Daza 146* (E, MOL); límites con el departamento de San Martín, adelante de El Progreso, inmediaciones de la Reserva Abra Patricia, borde de carretera y entrando por las quebradas, 5°41'58"S, 77°48'2"W, alt. 2231 m, 12 February 2017, *A. Orejuela, M. Cueva & J. Castillo 2758* (USM); **Department of San Martín: Prov. Rioja:** Dist. Pardo Miguel: Road from Pedro Ruiz to Rioja. Km 383, 5°39'49"S, 77°45'10"S, *P.W. Moonlight 1268* (E, USM); Dist. Pardo Miguel: Path through chacre from km 182 of road from Pedro Ruiz to Rioja, ca 500m from trail head, 5°40'1"S, 77°45'13"S, alt. 1801 m, 4 July 2018, *P.W. Moonlight 1266* (E, USM).

Cultivated: Grown in the Royal Botanic Garden Edinburgh from *P.W. Moonlight & A Daza 146*, RBGE Living Accession 20180174, 5 March 2018, *P.W. Moonlight 1142* (E).

3. *Begonia lophoptera* Rolfe (Figs. 4, 5) § *Cyathocnemis*

Bull. Misc. Inform. Kew, 1914 (1): 28. (1914). Type: PERU. Department of Pasco: Prov. Oxapampa: Pozuzo, *K.G. Pearce 556* (Lectotype K [K000536718], *designated here*).

Plants a caulescent herb, 40–100 cm high; *stem* erect, occasionally branching; *internodes* to 8.5 cm long, to 8 mm thick, succulent, red, glabrous to sparsely pilose; *stipules* persistent, reniform to ovate or rarely broadly lanceolate, [6–] 10–19 × 6–14 mm, green, glabrous, base surrounded by pilose hairs, cordate, apex rounded to acute, margin entire, aciliate. *Leaves* alternate, spread evenly along stem, more than 5, basifixed; *petiole* 1.5–9 cm long, sparsely to densely pilose; *lamina* asymmetric, transverse, ovate, 4.5–11 × 6–12, apex acute to acuminate, base cordate, to 1.5 cm deep, lobes not overlapping, acuspidate or with up to 4 cusps along broad side of the lamina, margin irregularly double-dentate, ciliate, upper surface even, glaucous to vivid green, sometimes with red veins towards petiole insertion, glabrous to densely pilose, denser on major veins, lower surface even, pale green with red veins, sparsely to densely pilose; venation palmate, 6–9 veins from base. *Inflorescence* protanderous, axillary, erect, cymose, branching to 3 times, sparsely to densely pilose; *peduncle* to 8 cm long, internodes to 1.8 cm long; *bracts* deciduous, lanceolate, 7–25 × 4–7 mm, translucent to white, glabrous to sparsely pilose, apex acute, margin aciliate to ciliate. *Staminate flower*: *pedicel* 5–15 mm long; *tepals* 2, spreading, membranaceous, ovate, 6–19 × 6–17 mm, apex acute, base cordate, margin entire to irregularly serrate, ciliate, white, pink or red, upper surface glabrous, lower surface pilose; *stamens* 25–35, free, spreading, yellow, filaments 1.5–2 mm, anthers linear, 1.5–0.5 mm, obtuse, dehiscing through lateral slits, connective projecting to 0.5 mm. *Pistillate flower*: *pedicel* 5–12 mm long; *bracteoles* lacking; *tepals* 2, spreading, deciduous in fruit, membranaceous, ovate, 11–21 × 4.5–17 mm, apex acute, base rounded, margin entire, aciliate, white, pink or red, upper surface glabrous, lower surface glabrous to sparsely pilose; *ovary body* ovoid, 4–6 × 2.5–3.5 mm, sparsely pilose, white, pink or red, unequally 3-winged, wings glabrous, white, pink or red, the largest wing triangular, 5–8 × 3.5–10 mm, apex truncate and notched, ciliate, margin entire, aciliate, the smallest 2 wings oblong, 5–8 × 1–4 mm, margin entire, aciliate; *placentae* axile, bilamellate, ovuliferous all over; *styles* 3, deciduous in fruit, 3–5 mm long, bifid 1.5 mm from base, branches erect, spirally twisted. *Fruiting pedicel* extending to 2.5 cm. *Fruit* pendulous, ovate, light brown, enlarging to 11 × 6 mm, the largest wing the same shape as in the ovary, enlarging to 13 × 15 mm, the smallest enlarging to a triangular wing 10 × 6 mm.

Distribution and habitat:—Peru. Known from montane forests on the humid eastern slope of the Andes from the Department of Amazonas to Cuzco at an altitude of 700–2700 m. *Begonia lophoptera* is locally common around montane forest streams and on cliff faces and found at lower densities in the understory of montane forest.

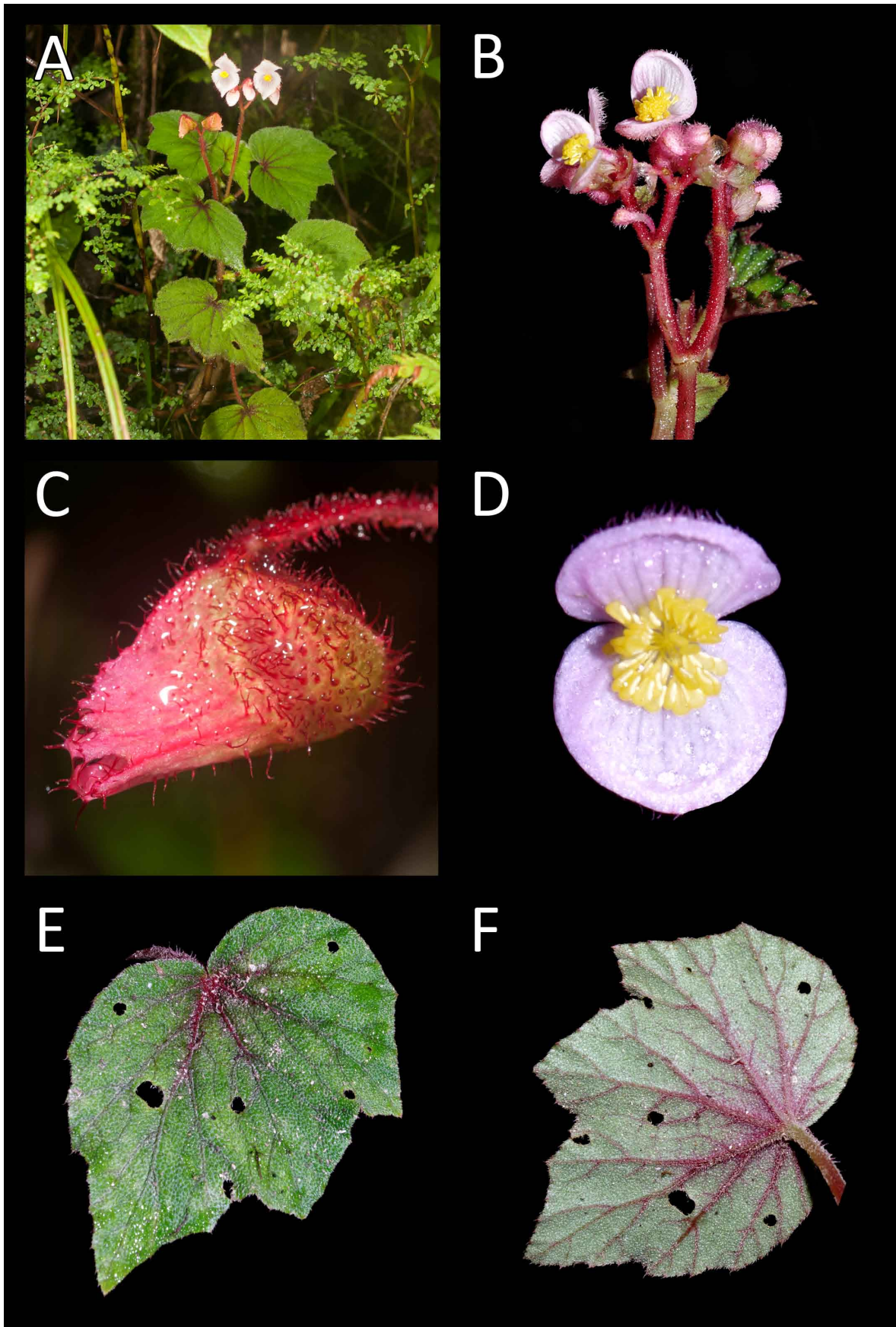


FIGURE 4. *Begonia lophoptera* Rolfe **A.** Habit; **B.** Branch of inflorescence; **C.** Developing fruit, side view; **D.** Staminate flower, front view; **E.** Upper leaf surface; **F.** Lower leaf surface; Photographs taken by Peter W. Moonlight from *P.W. Moonlight & A. Daza 231* (A, D) and Andres Orejuela from *A. Orejuela, J. Castillo & M. Suarez 2856* (E, F) and *2861* (B, D).

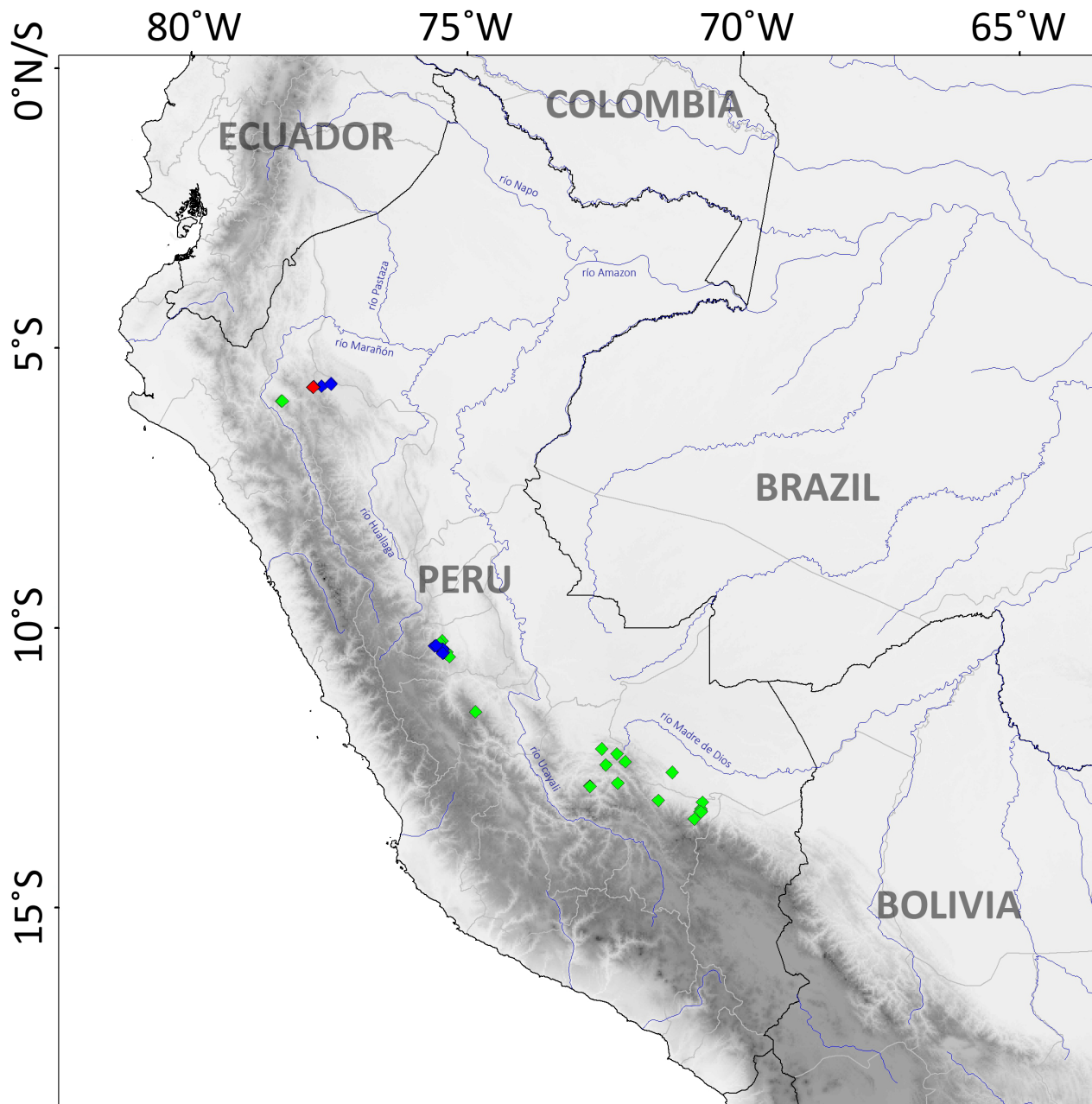


FIGURE 5. Distributions of *Begonia amoeboides* Moonlight (blue), *Begonia lamolina* Moonlight (red), and *Begonia lophoptera* Rolfe (green). Shading indicates altitude.

Taxonomic Comments:—A number of specimens of *Begonia lophoptera* have erroneously been determined as *B. microcarpa* A.DC. (1864: 311). The range of these species does not overlap, and they can be distinguished readily by their habit (*B. microcarpa* is decumbent and roots at the nodes) and the number of tepals in both the male and female flowers (4 and 5 respectively in *B. microcarpa*; 2 and 2 respectively in *B. lophoptera*).

Photographs of the specimens *M. C. Tebbitt & A. Daza* 807 and 821; *P.W. Moonlight & A. Daza* 231; *A. Orejuela, J. Castillo & M. Suarez* 2856 and 2861 are available on the *Begonia* Resource Centre (Hughes *et al.* 2015–).

Etymology:—The specific epithet is derived from the Greek words *lophos* (ridge or tuft) and *pteron* (wing), and refers to the unusual projections found on the largest fruit wing of the species and its closest relatives.

IUCN Redlist Assessment:—*Begonia lophoptera* is widespread and locally common throughout its range, in which it has been collected in Parque Nacional Yanachaga-Chemillén, Parque Nacional Manu, and Área de Conservación Privada Bosque Berlin. While the species requires primary montane forest habitat, which is generally threatened in Peru, it is still relatively undisturbed within the species' range. We assess *B. lophoptera* as Least Concern (LC) under IUCN Red List Categories and Criteria (IUCN, 2012).

Additional specimens examined:—PERU: **Department of Amazonas: Prov. Bagua:** Dist. Yamborasbamba: Área de Conservación Privada Bosque Berlin cerca Santa Clara, trilha das cascadas, 5°53'56"S, 78°23'38"W, 1958 m, *P.W. Moonlight 1273*; *ibid*, 5°54'3"S, 78°25'46"W, 1993 m, *P.W. Moonlight 1274*; *ibid*, 5°54'8"S, 78°24'55"W, 2064 m, *P.W. Moonlight 1275*; **Department of Pasco: Prov. Oxapampa:** Dist. Oxapampa: río San Alberto, abra Esperanza, alt. 2400–2700 m, 28 June 1985, *R.B. Foster, B. d'Achille & A. Brack 10289* (MOL, USM); Parque Nacional Yanachaga-Chemillén, quebrada Yanachaga, alt. 2370 m, 10°23'31"S, 75°28'29"W, 10 June 2003, *R. Vasquez, A. Monteagudo et al. 28093* (HOXA, MO); Dist. Chontabamba: Headwaters of río Tunqui, trail to Chuchurras-Palcazu, 10°14'S, 75°28'W, 2 January 1984, *R.B. Foster, M. Chanco, J. Albán & D.N. Smith 7751* (MO); Dist. Pozuzo: Sector Tunqui, camino al valle del Palcazú, alt. 2006 m, 10°16'24"S, 75°30'37"W, 15 September 2007, *L. Hernani, M. Corrales M., G. Castillo P. & V. Flores M. 336* (HOXA, E, MO, USM); Dist. Huancabamba: Parque Nacional Yanachaga-Chemillén, parte media de la quebrada Muchuy Mayo, sector Tunqui, alt. 1800 m, 10°17'30"S, 75°31'5"W, 29 October 2007, *A. Monteagudo, D. Rodriguez, J. Mateo & V. Flores 15718* (HOXA, E, MO, USM); Sector Oso Playa, camino hacia el campamento, alt. 2478 m, 10°18'52"S, 75°34'31"W, 22 October 2009, *L. Valenzuela, A. Monteagudo, M. Cueva, A. Peña, J. Mateo & R. Rivera 13875* (HOXA, E, MO); Zona de amortiguamiento del Parque Nacional Yanachaga-Chemillén, Sector Oso Playa, camino a la parcela Oso Playa, alt. 2400 m, 10°19'20"S, 75°36'6"W, 17 June 2006, *A. Monteagudo, L. Cardenas, A. Peña, J.L. Mateo & R. Francis 12003* (HOXA, USM); Puromayo, alt. 2287 m, 10°23'2"S, 75°30'6"W, 30 September 2009, *R. Vásquez & L. Valenzuela 36360* (HOXA, E, MO, USM); Sector Grapanazu, límite Parque Nacional Yanachaga-Chemillén, alt. 2210m, 10°26'12"S, 75°23'13"W, 15 October 2003, *R. Rojas, K. Meza, J. Lingan, E. Camavilea & M. Villarán 1777* (HOXA, MO); **Department of Junín: Prov. Satipo:** route from Comas to Satipo, ca. Km 145, alt. 2810 m, 75°51'48"S, 11°30'7"S, 13 February 2016, *P.W. Moonlight & A. Daza 231* (MOL, E); **Department of Ayacucho: Prov. La Mar:** Dist. Anco: camino de Chinquintirca a Toccate, altura de los km 206–207 del gasoducto, alt. 2300–2400 m, 24 March 2005, *J. Roque 4476* (USM); **Department of Madre de Dios: Prov. Manu:** Cerro de Pantiacolla, río Paltoa 10–15 km NNW of Shintuya, transect to ridgetop, alt. 700–1300 m, 71°17'W, 12°35'S, 14 December 1985, *R.B. Foster, R. Fernández & E. Vivar 10844* (USM); **Department of Madre de Dios-Cusco:** Road Puerto Maldonado-Urcos, between Quince Mil and Marcapata, alt. ca. 800 m, 6 October 1987, *F. Kahn & J.A. Llosa 2253* (NY); **Department of Cusco:** Near río Yanamayo, below "Pillahuata", alt. 2000–2300 m, 4–5 May 1925, *F.W. Pennell 14069* (F, NY); **Prov. Calca:** Dist. Yanatile: Camino hacia Lacco Yavero, alt. 1567 m, 12°15'S, 72°18'W, 27 February 2005, *L. Valenzuela, E. Suclli & J. Farfán 5310* (MO); Estrella, alt. 1567 m, 12°26'50"S, 72°30'5"W, *E. Suclli, C. Astete, A. Carazas & J. Torre 2592* (MO, USM); **Prov. La Convención:** Along río Mapituriá, a tributary of the río Apurímac, alt. 1000 m, 21 September 1976, *D.C. Wasshausen & F. Encarnación 683* (K); Dist. Echarati: Kapiromashi, alt. 750 m, 12°9'48"S, 72°34'31"W, 26–30 April 2004, *N. Salinas, H. Beltran, R. Foster & C. Vriesendorp 6584* (USM); Dist. Ocobamba: Versalles, Santa Elena, alt. 1917 m, 12°46'29"S, 72°17'8"W, 20 November 2007, *L. Valenzuela, C. Astete, F. Zamora, N. Suzres & M. Atausupa 10305* (MO); Dist. Santa Ana: "Quillabamba", alt. 2009 m, 12°50'4.5"S, 72°47'20.8"W, 16 March 2017, *A. Orejuela, J. Castillo & M. Suarez 2861* (E); **Prov. Paucartambo:** Suecia, alt. 1900 m, 24 December 1952, *F. Woytkowski 161* (MOL, USM); Pavayoc, alt. 2600 m, 11 February 1953, *F. Woytkowski 510* (USM); Dist. Kosñipata: [Dist. Marachea], Achirani, alt. 2700 m, 29 July 1939, *C. Vargas 11113* (K); *ibim*, alt. 2650 m, 30 July 1934, *C. Vargas 1566* (CUZ [photo MO]); Abajo de Buenos aires, km 133 de la carretera Paucartambo-Pilcopata, alt. 2000 m, 16 February 1990, *A. Cano & K. Young 2968* (HUT, USM); *ibid*, 18 February 1990, *A. Cano & K. Young 3044* (HUT, USM); 14 miles from Pilcopata along road to Cuzco, quebrada de Pillahuata, 28 September 1968, *B. Maguire & C. Maguire 61581* (MO, NY); road from Paucartambo to Manu National Park, alt. 1857 m, 13°5'S, 71°33'W, 13 January 2015, *M.C. Tebbitt & A. Daza 821* (MOL); Dist. Quellouno: Route de Laco, alt. 2167 m, 12°39.289'S, 72°14.977'W, 23 November 2006, *S. France s.n.* (USM); Kosñipata Valley, Km 150, San Pedro, Río Unión and Río Kosñipata junction, alt. 1800 m, 20 March 1990, *P. Nuñez 11935* (MO); Trocha Unión km 8, 19L 0220816, alt. 2500 m, UTM 8551070, 23 July 2003, *V.H. Quellón 4* (MO); **Prov. Quispicanchis:** Dist. Camanti: Río Araza (N.E. of Cuzco), alt. 3500 ft., January 1943, *C. Sandeman 3665* (K); *ibid, ibim*, *C. Sandeman 3729* (K, OXF); Community of Vitobamba, trocha Huarapascay, 22 March 2011, *J.D. Wells 763* (BRIT, USM); Propiedad del sr. Bustamante Camanti esta ubicado en un valle, alt. ca. 800m, 13°13'55"S, 70°46'34"W, 19 March 2008, *B.R. Chambi 821* (BRIT); Cerro Camanti, alt. 880 m, 13°17'19"S, 70°46'27"W, 26 January 2007, *L. Valenzuela, E. Suclli, J. Farfán & A. Carazas 8649* (E); Maniri, 8 km oeste de Quincemil, en el camino hacia la represa de la quebrada Yanamayo, alt. 720 m, 13°17'S, 70°48'W, 22 July 1990, *M. Timaná & H. Astete 701* (MO, USM [2]); Maniri, ascendiendo por la quebrada Chilimayo (Supaycumbre), alt. 720 m, 13°17'S, 70°48'W, 23 October 1990, *M. Timaná 1115* (MO, USM); *ibid*, 27 August 1990, *M. Timaná 793* (MO); Maniri, vertiente del Yanamayo, alt. 720 m, 13°17'S, 70°45'W, 1 September 1990, *M. Timaná 814* (MO, USM); Dist. Marcapata: Mandor, alt. 1200 m, 11 December 1945, *C. Vargas 3727* (MO); Between San Miquel (a small hamlet formerly known as San Pedro) and Puenti Capiri, alt. 1294 m, 13°25'S, 70°54'W, 8 January 2015, *M.C. Tebbitt & A. Daza 807* (MOL).

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