

REVISION OF BOLIVIAN *SYMBOLANTHUS* (GENTIANACEAE–HELIEAE)

LENA STRUWE¹

Abstract. A revision of *Symbolanthus* (Gentianaceae: Helieae) for *Catálogo de las Plantas Vasculares de Bolivia* resulted in the resurrection of *Symbolanthus brittonianus* and the description of the new species *S. australis*. Both species occur in the “Yungas” region of the Andes of Bolivia. *Symbolanthus rusbyanus* is treated as a synonym under *S. brittonianus*, and the problematic typification of this species is discussed. *Symbolanthus calygonus* has previously been reported from Bolivia but is endemic to Peru. A key to the only two species of *Symbolanthus* in Bolivia is provided.

Keywords: Gentianaceae, Helieae, Neotropics, new species, nomenclature, *Symbolanthus*, typification.

Symbolanthus G. Don is a genus of about 30 shrubby species of neotropical gentians that are widely distributed in the tropical, humid areas in the Andes of South and Central America (Struwe et al., 2002; Struwe, 2003). Many species have a striking appearance with large, bright red pink, or yellow corollas. During preparation of a checklist of Gentianaceae for *Catálogo de las Plantas Vasculares de Bolivia*, Bolivian material of this genus was investigated to clarify the taxonomy in the southern Andes. Presented here is the first revision of Bolivian *Symbolanthus*, which recognizes two species in the region, the new taxon *S. australis* Struwe and *S. brittonianus* Gilg. Ernst Gilg (1896) also described *S. rusbyanus* from Bolivia, a species that is here treated as a synonym to *S. brittonianus*. No thorough treatment of Bolivian gentians has ever been published, but Foster (1958) listed *S. brittonianus* in *A catalogue of the ferns and flowering plants of Bolivia*. In recent decades, the Peruvian species *S. calygonus* was expanded to include collections from most of the Andes, Bolivia included (e.g., Pringle, 1995). However, this species is endemic to a

small area in Huánuco, Peru, and does not occur in Bolivia (Struwe, 2003).

Bolivian gentians include representatives of all tribes of the family, except the paleotropical Exaceae. *Symbolanthus* belongs to tribe Helieae; other Bolivian representatives of this tribe include *Chelonanthus*, *Macrocarpaea*, and *Tetrapollinia* (Struwe et al., 2002). These are all neotropical genera that grow on eastern slopes of the Andes in wet, (sub)tropical habitats. All four genera are at their southernmost edge of distribution in Bolivia, with a majority of their species occurring in more northern Andean areas or in the Amazon basin. The most species-rich gentian genera in Bolivia are the more cold-tolerant *Gentianella* and *Halenia* (tribe Gentianeae), which are abundant in the higher-altitude zones. Other representatives are *Curtia* (tribe Saccifolieae), *Deianira* (Chironieae–Coutoubinae), *Potalia* (Potalieae–Potaliinae), and the saprophytic *Voyria* with an uncertain taxonomic position in the Gentianaceae. Despite not being particularly rich in tropical gentian species, Bolivia shows a diverse taxonomic array of members of this family.

KEY TO THE BOLIVIAN SPECIES OF *SYMBOLANTHUS* (SEE ALSO TABLE 1)

1. Stems terete (or slightly quadrangular), not winged; corolla tube at least 2.5 times longer than calyx; fruit at least (1.5–)2.0 times longer than calyx. 1. *S. australis*
1. Stems distinctly quadrangular, winged; corolla tube less than 2.5 times longer than calyx; fruit less than 1.5 times longer than calyx. 2. *S. brittonianus*

The author thanks Larry Dorr, Jason R. Grant, Michael Nee, and Max Weigend for important information and comments on earlier versions of this manuscript. Jason R. Grant provided the Latin diagnosis for the new taxon. This work was supported by funds provided by Rutgers University–Cook College. Bobbi Angell prepared the illustration of *Symbolanthus australis*. The following herbaria are thanked for loans or access to material: BM, F, G, K, MANCH, MO, NY, S, and US.

¹Department of Ecology, Evolution, and Natural Resources, Rutgers University–Cook College, 237 Foran Hall, 59 Dudley Rd., New Brunswick, New Jersey 08901, U.S.A. E-mail: struwe@aesop.rutgers.edu

1. *Symbolanthus australis* Struwe, sp. nov.

TYPE: BOLIVIA: La Paz: Prov. Sud Yungas, 9 km from Huanacáné, 16°22'S, 67°32'W, on the road to San Isidro, 2540 m, Bosque de alta montaña con *Podocarpus*, disturbed by logging, small, liana-like tree, flowers pinkish-red, yellow in throat area, calyx green, anthers white, 12 December 1989, L. J. Dorr, L. C. Barnett, D. N. Smith, & V. Garcia 6691 (Holotype: NY; isotype: LPB [n.v.]). A color photo of the holotype is posted at the Gentian Research Network website (<http://www.rci.rutgers.edu/~struwe/gentnet/>)

Species novae cui Symbolanthus brittonianus similis sed caulibus teretibus non-alatis, tubo corollae et fructibus longioribus differt.

Vine, small tree, or shrub, at least 1 m tall, much-branched, also close to branch apices; branching at 50–75° angles from main stem. Branches of flowering stems terete (sometimes slightly quadrangular), 2–4 mm diam. below inflorescence, branches woody, not crushed on herbarium sheets, unwinged (older stems sometimes with 4 low, decurrent ridges); internodes below inflorescence 4–11 mm long. Leaves lanceolate to narrowly elliptic, 2.0–4.0 longer than wide, broadest below middle, short-petiolate, membranaceous; lamina 44–76 × 11–26 mm; leaf apex acuminate; leaf base acute; petiole 2–7 mm long. Inflorescence 1- to 3-flowered; subtending bracts and bracteoles elliptic, with mucronate apex, 3–6 mm long, 2–4 mm wide at base; pedicel (20–)32–48 mm long at anthesis, 1–2 mm diam. Calyx divided down to 0.8–0.9 of its length, at anthesis 16–25

× 8–11 mm; lobes ovate, 12–17(–22) × 6–11 mm, ecarinate, nonthickened glandular area present dorsally; apex obtuse; margin hyaline. Corolla salver-shaped, actinomorphic to slightly zygomorphic (dorsiventrally compressed *fide Davidson 4962*), 49–70 mm long, basic color red, crimson, or magenta, with 2 dark red or 2 white stripes in mouth or throat yellowish; tube cylindric, not widening toward mouth, straight, 32–44 mm long, 2.5–2.8 times longer than calyx, 9–12 mm wide below insertion of stamens, 9–12 mm wide at mouth; lobes ovate, 15–26 × 11–19 mm, 1.2–1.4 times longer than wide, reflexed at anthesis, apex acuminate; corolla apex in bud tapering. Stamens inserted ca. 7 mm from the base of the corolla; corona present, 7–8 mm high at anthesis, as a cylindrical tube with uneven edge filament attached to anther c. 1/3 from base of anther, anthers 7–8 mm long, white (*fide Dorr et al. 6691*). Ovary c. 8 mm long; style 24–39 mm long; stigma lobes ovate, 3 mm long. Fruit (only 1 indehiscent[?] fruit seen) elliptic, c. 35 × c. 20 mm, 2.0–2.1 times longer than calyx, calyx lobes c. 18 mm long in fruit, persistent basal part of style up to 24–39 mm long; seeds not seen.

Symbolanthus australis is endemic to the “Yungas” area of Depto. La Paz in Bolivia, where it occurs in *Podocarpus* forests, in wet rain forests, and along roadsides at 1500 to 2550 m altitude. It is a small tree to lianoid shrub and has characteristic woody, terete branches that are branched close to the tip of the branches. The corollas are showy and brightly red with white streaks on the inside of

TABLE 1. Selected morphological differences between *Symbolanthus australis* and *S. brittonianus*.

	STEMS	LEAF SIZE	PEDICELS	COROLLA TUBE: CALYX LENGTH RATIO	FRUIT: CALYX LENGTH RATIO
<i>S. australis</i>	Terete, not winged (sometimes with 4 low ridges), firmly woody	44–76 × 11–26 mm	(20–)32–48 mm long, 1–2 mm diam,	Corolla tube 2.5–2.8 times longer than calyx	Fruit 2.0–2.1 times longer than calyx
<i>S. brittonianus</i>	Quadrangular, distinctly winged, softly woody, easily flattened	60–145(–170) × 22–76(–85) mm	15–30 mm long, straight, 2–3 mm diam.	Corolla tube 1.5–2.2 times longer than calyx	Fruit 1.1–1.3 times longer than calyx



FIGURE 1. *Symbolanthus australis* Struwe. A, habit of flowering stem; B, flower; C, cross section of flower; D, inside of corolla showing anther and corona at base of anthers; E, pistil with glandular disk at base; F, mature fruit. A from Dorr *et al.* 6691 (NY), B–E from Solomon 14975 (MO), and F from Smith & Smith 13080 (MO).

the lobes and the corolla mouth. It appears that the corollas are pendent since the branch tips are pendent; the pedicels themselves are not nodding but are instead thin and rigid. The corolla lobes are reflexed, and both the anthers and stigma are distinctly exerted from the corolla mouth. Flowers have been collected from November to January, as well as in May. Only one fruiting herbarium specimen has been seen, and this was collected in January. No vernacular names are known for this species.

This species is similar to *Symbolanthus brittonianus* but differs in several important characters (Table 1). In fact, part of the type material of *S. rusbyanus*, a synonym of *S. brittonianus*, appears to be a mixed collection of *S. australis* and *S. brittonianus* (see below for further discussion).

Etymology: *Symbolanthus australis* is named after its southern location in the distribution range of the genus.

Paratypes: BOLIVIA: La Paz: Yungas, 1890, *Bang* 339 (BM, G, MANCH, NY, US); Prov. Larecaja, Cocapuncu, between Sorata and Mapiri, 2800 m, shrub 1.0–1.2 m high, at wet soil, Aug 1933 (fl), *Cárdenas* 1168 (NY); Prov. Nor Yungas, Carretera fundam. 3, 23.5 km SW of Yolosa jct., toward Unduavi, Holdridge life zone, very humid montane subtropical rainforest, ca. 8500 ft. elev., vine scrambling over roadside shrubs, corolla dorsiventrally compressed, red but whitish toward the center with two dark red lines in middle of perianth lobes, 12 Nov 1976, *Davidson* 4962 (US); Mapiri, 5,000 ft., May 1886, *Rusby* 1227 pro parte (BM, NY) (mixed collection; see note on typification of *S. rusbyanus* below); Nor Yungas Province, 13.7 km NW of San Pedro on road through Incahuara-Mejillones and along trail to 12 de Octubre, mixture of moist forest with little disturbance and small fields, 15°58'S, 67°37'W, 1500 m, shrub 1 m, corollas dark pink, 15–16 January 1983, *Solomon* 9284 (MO [n.v.], NY).

2. *Symbolanthus brittonianus* Gilg, Engl. Bot. Jahrb. Syst. 22: 342. 1896. TYPE: BOLIVIA. La Paz: Tipuani-Guanai, December 1892, *Bang* 1697 (Lectotype, here designated: NY; Isolectotypes: BM, F, G, GH, K, MO [image available at W3Tropicos], NY; original holotype in B lost).

Symbolanthus rusbyanus Gilg, Engl. Bot. Jahrb. 22: 344. 1896. —*Lisianthus rusbyanus* (Gilg) J. F. Macbr., Field Mus. Nat. Hist., Bot. Ser. 13 (5): 290. 1959. TYPE: BOLIVIA. La Paz: Mapiri, 5000 ft., May 1886, *Rusby* 1227 pro parte (Lectotype, here designated: NY; Isolectotypes: GH, MANCH, MO [image available at W3Tropicos], NY; excluded non-type material: BM, K, NY (p.p.), photo of original lost holotype from B available at F, US [negative no. 10242]; see discussion below regarding typification).

Shrub or small tree, at least up to 1.6 m tall, at apices of branches unbranched or sparsely branched, but strongly branched lower down, branching at 70–85° angle from main stem. Branches of flowering stems quadrangular, 3–7 diam. below inflorescence, branches soft-wooded, often crushed on herbarium sheets, distinctly winged with 1–3 mm wide, decurrent, sometimes wavy wings; internodes below inflorescence 5–40 mm long. Leaves elliptic-ovate, 2.0–2.5 times longer than wide, broadest in the middle, sessile or short-petiolated, membranaceous; lamina 60–145(–170) × 22–76(–85) mm; leaf apex acute to acuminate; leaf base attenuate; petiole 0–6 mm long. Inflorescence 1- to 4-flowered; subtending bracts and bracteoles triangular, with acute apex, 4–6 mm long, 2–3 mm wide at base; pedicel 15–30 mm long at anthesis, 2–3 mm diam. Calyx divided down to 0.9 of its length, at anthesis 18–25 × 9–13 mm; lobes elliptic to ovate, 16–20 × 8–11 mm, thickened (slightly keeled) or flat glandular area present dorsally; apex acute to obtuse; margin broadly hyaline, especially toward apex. Corolla salver-shaped, slightly zygomorphic, 48–75 mm long, basic color red to carmine, with yellow streaks; tube (slightly) widened toward mouth, straight, 28–51 mm long, 1.5–2.2 times longer than calyx, 7–10 mm wide below insertion of stamens, 11–24 mm wide at mouth; lobes broadly ovate, 19–27 mm × 14–25 mm, 0.9–1.4 times longer than wide, reflexed (upper lobes erect, lower lobes reflexed) at anthesis, apex acuminate; corolla apex in bud tapering. Stamens inserted 14–16 mm from the base of the corolla; corona present, 11–12 mm high at anthesis, as a cylindrical tube with uneven edge; filament attached to anther c. 1/4–1/3 from base of anther, anthers ca. 3–4 mm long. Ovary 8–10 mm long; style 2–38 mm long;

stigma lobes elliptic, 5–6 mm long. Fruit broadly elliptic, 20–28 × 15–20 mm, dehisces apically, but fused at apex by persistent style, persistent basal part of style up to 2–38 mm long, 1.1–1.3 times longer than calyx, calyx lobes 20–25 mm long in fruit; seeds angular, c. 1 mm diam., light brown.

Symbolanthus brittonianus is a shrub or small tree found in wet Andean forests in Bolivia (Cochabamba and La Paz) and Peru (Puno). It grows at an altitude of 850 to 1950 m. Flowering specimens have been collected during December to May, and fruiting plants have been found during December–January and March–May. No indigenous names have so far been noted for this plant.

Symbolanthus brittonianus and *S. rusbyanus* was described simultaneously by Gilg (1896) and therefore have equal priority. No decision on priority between these two names has been made previously. The problems relating to the typification of *S. rusbyanus* (see below) makes *S. brittonianus* the best name choice for this species. Type material of both species are very similar and no consistent differences between them could be found, so they are here treated as synonymous.

Etymology: *Symbolanthus brittonianus* was named by Gilg (1896) after Nathaniel Lord Britton (1859–1934). Britton was the founder and first director of the New York Botanical Garden (Rose, 1999). In the same publication, Gilg named *S. rusbyanus*, after Britton's colleague and collaborator Henry Hurd Rusby (1855–1940), who was an economic botanist at the New York Botanical Garden. Rusby collected plants in Bolivia during a 2-year expedition for medicinal plants funded by Parke, Davis & Co. (Fraser, 1999). It was during this expedition that the type material of *S. rusbyanus* was collected.

Typification of *Symbolanthus rusbyanus*: The type material of *Symbolanthus rusbyanus* was collected in Bolivia in 1886 by Rusby. This species was described by Gilg (1896), and the holotype of the species was destroyed during WWII when the Berlin herbarium was largely ruined. Rusby's material was widely distributed, and isotypes are found in many herbaria. Closer examination of this material showed that this is a mixed collection of both Bolivian species of *Symbolanthus*. Photographs of the holotype are available in F and US, and show

that the holotype material was *S. rusbyanus* (= *S. brittonianus*), not *S. australis*. The original description of *S. rusbyanus* also fits this conclusion. The isotypes of *Rusby 1227* found in the herbaria of G, GH, MANCH, MO, and NY are true *S. rusbyanus*. NY also has one sheet with a mixed collection, with one branch of *S. australis* and *S. rusbyanus* mounted on the same sheet. *Rusby 1227* sheets with only *S. australis* are present in the herbaria of BM and K should be excluded from the type material of *S. rusbyanus*.

There is also confusion regarding the collecting month for this collection. Sheets are marked as collected in either April or May 1886. All material found so far that is *S. australis* has been marked as collected in April (BM, K, and NY p.p.), however, there are also true *S. rusbyanus* material collected in April deposited in MO. The Berlin holotype was collected in May, and several sheets have the note "im Mai blühend" (= flowering in May). These discrepancies in dates and specimens might be somewhat explained by the logistical problems and scope during Rusby's first collecting trip to Bolivia. His main focus of the trip was to investigate and collect barks and the source of cocaine for the United States pharmaceutical industry, but he also collected plant and bird specimens (Dorr, 1991; Rusby, 1933). Apparently he numbered and "consolidated" some of these collections at a later date to put together suitably sized specimen sets that he considered to belong to the same species (M. Nee, pers. comm.).

Collections by Rusby are often found in sets of three at NY from three different origins. First there is the original NY specimen, then a set from Columbia University's College of Pharmacy that was given to the New York Botanical Garden in 1948, and finally a set from Princeton University's herbarium that was donated to NY in the later part of the 20th century. In 1896, the same year *S. rusbyanus* was published but presumably after his description had been written, Gilg appears to have annotated a herbarium sheet from the *Rusby 1227* collection in NY (this sheet is originally from the College of Pharmacy Herbarium at Columbia University) that was collected in May. As far as I can tell, this is the only material except the holotype that Gilg saw. At the same time he annotated one of the isotypes of *S. brittonianus* now at NY.

The holotype of *S. brittonianus* was presumably also present in Berlin. Gilg never indicated the herbarium location of his type material, but he listed type collections in his publications. Miguel Bang (1853–1895), the collector of the type material, lived in Bolivia until his death and sold specimens to herbaria around the world (M. Nee, pers. comm.). Bang made many important collections, but locality information is often scarce.

Because of the problems outlined above, selection of new lectotypes is necessary for both *Symbolanthus brittonianus* and *S. rusbyanus*. The original holotypes were lost in Berlin (Art. 9.9), and in the case of *S. rusbyanus*, the type collection represents more than one species (Art. 9.9). To solve these issues, the NY isotypes annotated by Gilg are hereby selected as the lectotypes for *S. brittonianus* and *S. rusbyanus*, respectively.

Paratypes: BOLIVIA. La Paz: Prov. Larecaja, km. 14, Guanay-Tipuani Old Road, 1260 m, vine, leaves glossy green, calyx green, corolla

carmine streaked yellow, very attractive, frequent, 24–26 January 1983, *Besse et al. 1795* (NY, SEL [n.v.]); Mapiri-region, San Carlos, 850 m, Strauch, Blüten rot, 15 January 1927, *Buchtien 1185* (BM, NY); San Antonio, region de Mapiri, 15 lat., arbusto, December 1907, *Buchtien 2461* (US); Hacienda Simaco sobre el camino a Tipuani, altura sobre el mar, 1,400 m, Halbstrauch viz 2 m, Blüten rot, February 1920, *Buchtien 5523* (G, S, US); Prov. Larecaja, 19.0 km al SO de Guanay por el camino a Tipuani, bosque húmedo, 15°34'S, 67°59'W, 1200 m, arbusto, 1.5 m, corolas lilas-rojizas muy vivas, 23 January 1988, *Solomon 17684* (G, MO, NY); road from Pararani to Mapiri, part of Sorata-Mapiri Road, 6000 ft., 30 March 1926, *Tate 399* (NY). Cochabamba: Prov. Chapare, Wald, Locotal, Strauch, 2 bis 4 m, 6 February 1929, *Steinbach 9049* (BM, G, NY). Locality unknown: 6500 ft. [ca. 1970 m], 5 ft. [ca. 1.5 m] high & 3/4 in [ca. 1.9 cm] diam., 17 August 1902, *Williams 1446* (BM, NY, US).

LITERATURE CITED

- DORR, L. J. 1991. The vascular plant collections of R. S. Williams from Bolivia and Peru (1901–1902). *Brittonia* 43: 211–239.
- FOSTER, R. C. 1958. A catalogue of the ferns and flowering plants of Bolivia. Contributions from the Gray Herbarium of Harvard University 184: 1–223.
- FRASER, S. 1999. Henry Hurd Rusby records (1885–1928). Records of the herbarium (RG4). Archives and manuscript collections, Luesther T. Mertz Library, New York Botanical Garden, NY. <http://www.nybg.org/bsci/libr/Rusbyw.htm>
- GILG, E. 1896. Beiträge zur Kenntnis der Gentianaceae—I. *Bot. Jahrb. Syst.* 22: 301–347.
- PRINGLE, J.S. 1995. Gentianaceae. In G. HARLING AND L. ANDERSSON, EDs., *Flora of Ecuador* 53: 1–132.
- ROSE, S. 1999. Nathaniel Lord Britton Records (1875–1934). Records of the herbarium (RG4). Archives and manuscript collections, Luesther T. Mertz Library, New York Botanical Garden, NY. <http://www.nybg.org/bsci/libr/Britwb2.htm>
- RUSBY, H. H. 1933. *Jungle Memories*. Whittlesey House, McGraw-Hill, New York.
- STRUWE, L. 2003. Two new winged species of *Symbolanthus* (Gentianaceae: Helieae) from Colombia. *Novon* 13: 133–140.
- STRUWE, L., J. W. KADEREIT, J. KLACKENBERG, S. NILSSON, M. THIV, K. B. VON HAGEN, AND V. A. ALBERT. 2002. Systematics, character evolution, and biogeography of Gentianaceae including a new tribal and subtribal classification. Pages 210–309 in L. STRUWE, AND V. A. ALBERT, EDs., *Gentianaceae: Systematics and Natural History*. Cambridge University Press, Cambridge.