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ARISTOLOCHIA STEVECHURCHILLII, A NEW PSEUDOSTIPULE-BEARING ARISTOLOCHIACEAE (PIPERALES) FROM BOLIVIA, WITH A KEY TO IDENTIFY THE SPECIES OF THE ´PSEUDOSTIPULOSAE´ GROUP IN THE COUNTRY.

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Abstract. González, F. & N. L. Pabón-Mora. 2023. *Aristolochia stevechurchillii*, a new pseudostipule-bearing Aristolochiaceae (Piperales) from Bolivia, with a key to identify the species of the ´Pseudostipulosae´ group in the country. *Darwiniana*, nueva serie 11(1): 265-271.

A new pseudostipule-bearing species of *Aristolochia*, *A. stevechurchillii*, is here described and illustrated, along with a key to identify all the species of the informal ´Pseudostipulosae´ group naturally occurring in Bolivia. The new species differs from its closely related species by the formation of two serial flowers per axil, the base of the utricle with six retrorse digitiform processes, and the perianth limb narrowly ovate, with acute apex. Along with *A. andina* and *A. lozaniana*, *A. stevechurchillii* is the third species of the genus endemic from mid-elevation (1600-2500 m) Tucumano-Bolivian forests of the departments of Cochabamba, Chuquisaca and Tarija (Bolivia). The new species is morphologically similar to *A. melanoglossa*, from northern Argentina, which provides additional evidence to floristic affinities previously proposed between the Tucumano-Bolivian forests and the Chaco vegetation.

Keywords. Andean Aristolochias; Bolivian endemics; inter-Andean flora; neotropical Aristolochiaceae; Tucumano-Bolivian forests; Yungas.

Resumen. González, F. & N. L. Pabón-Mora. 2023. *Aristolochia stevechurchillii*, una nueva Aristolochiaceae (Piperales) con pseudoestípulas de Bolivia, con una clave para identificar las especies del grupo ´Pseudostipulosae´ del país. *Darwiniana*, nueva serie 11(1): 265-271.

Se describe e ilustra aquí una nueva especie con pseudoestípulas de *Aristolochia*, *A. stevechurchillii*, junto con una clave para identificar todas las especies del grupo informal 'Pseudostipulosae' que ocurren naturalmente en Bolivia. La nueva especie difiere de sus especies cercanamente relacionadas por la formación de dos flores seriales por axila, la base del utrículo con seis procesos digitiformes retrorsos y el limbo del perianto angostamente ovado, con ápice agudo. Junto con *A. andina* y *A. lozaniana*, *A. stevechurchillii* es la tercera especie del género endémica de los bosques tucumano-bolivianos de altura media (1600-2500 m s.m.) de los departamentos de Cochabamba, Chuquisaca y Tarija (Bolivia). La nueva especie es morfológicamente similar a *A. melanoglossa*, del norte de Argentina, lo que aporta evidencia adicional a las afinidades florísticas propuestas previamente entre los bosques tucumano-bolivianos y la vegetación chaqueña.

Palabras clave. Aristolochiaceae neotropicales; Aristolochias de los Andes; bosques tucumano-bolivianos; endemismos bolivianos; flora inter-andina; yungas.

INTRODUCTION

The widespread family Aristolochiaceae (Piperales) is represented in the Neotropics by the genus *Aristolochia* L. Globally, the genus comprises nearly 560 species, most of them diversified in the tropics and subtropics of the Americas (González & Pabón-Mora, 2017; Freitas et al., 2020a).

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All members of *Aristolochia* possess alternate, distichous leaves, a perianth formed by the early fusion of three sepals, and an inferior ovary forming capsular fruits. The presence of pseudostipules is one of the most conspicuous and taxonomically consistent characters in a group of ca. 70 neotropical species of *Aristolochia,* which was informally described as the ´Pseudostipulosae´ group by Hoehne (1942). A pseudostipule in *Aristolochia* corresponds to the adaxial prophyll of an axillary bud, that becomes sessile and considerably smaller than the foliage leaves. These leaf homologs remain clasping the node as the first internode of the corresponding axillary bud is suppressed, falsely resembling a stipule (Duchartre, 1854; González, 1990). Several phylogenetic analyses based on morphological (González & Stevenson, 2002), molecular (Ohi-Toma et al., 2006), and combined (Wanke et al., 2006) datasets strongly support this group of species as monophyletic. Out of the approximately 30 species of *Aristolochia* known to occur naturally in Bolivia (Jørgensen et al., 2014), 11 of them have pseudostipules.

Although most *Aristolochia* species from Bolivia grow in lowland forests, a small group of species are exclusively found in Tucumano-Bolivian forests and xerophytic inter-Andean thickets, also known as Yungas, at elevations above 1500 m a.s.l. Several specimens collected in Cochabamba and Chuquisaca called out attention, as they do not match any of the species previously described from Bolivia or neighbouring countries (cf. Masters, 1875; Malme, 1904; Ule, 1905; Hauman, 1923; Hoehne, 1927, 1942; Schmidt, 1927, 1932, 1935, 1936, 1938; Macbride, 1937; Foster, 1958; Ahumada, 1967, 1977, 1979, 2010; González, 1990, 1991, 1994, 1998, 2000; Brako & Zarucchi, 1993; Vásquez, 1997; Nee, 2004; León & La Torre, 2006; González et al., 2015; Freitas et al., 2020b), including *A. andina* F. González & I. Vargas (González, 2000) and *A. lozaniana* F. González (González, 2001), two species endemic from mid-elevation Tucumano-Bolivian forests and xerophytic thickets of Cochabamba, Chuquisaca, Santa Cruz, and Tarija. Thus, we described and key out a third *Aristolochia* species from this biogeographically interesting region of Bolivia, as the specimens consistently exhibit unique traits on the number of flowers initiated per axil, the digitiform utricle base, and the shape and size of the perianth limb. The new species is morphologically similar to *A. melanoglossa* Speg., from northwestern Argentina.

MATERIAL AND METHODS

The original material of the new species is deposited at the Herbario Nacional Forestal "M. Cárdenas" (BOLV), and the herbaria at the Missouri Botanical Garden (MO), and the Royal Botanic Gardens (K). Extensive herbarium search for additional specimens of the new species and those used to prepare the key presented below was carried out at A, B, BM, COL, CONN, CTES, F, GH, K, MO, NY, and US (acronyms after Thiers, 2023). Measurements of leaves, flowers, and fruits were taken from fully formed organs. Terminology used to describe *Aristolochia* flowers follows Pfeifer (1966), and González (1990, 1994).

TAXONOMY

Aristolochia stevechurchillii F. González & Pabón-Mora, **sp. nov.** TYPE: Bolivia, Cochabamba, Prov. Campero, a 23 km sobre la ruta Peña Colorada-Pasorapa, 2070 m s.m., quebrada de microclima húmedo, bosque xerofítico caducifolio en valle interandino, 25-I-1993 (fl), *E. Saravia 561* (Holotype BOLV 00010519!, isotype MO 5897075!). Figs. 1, 2.

Diagnosis. Species similar to *Aristolochia melanoglossa*, from which it differs by the initiation of two serial flowers per axil, the base of the utricle with six retrorse digitiform processes at its base, each 0.5-1 mm long, and the perianth limb 2-2.5 × 0.6-0.8 cm, with acute apex (*versus* solitary, axillary flowers, the base of the utricle lacking retrorse digitiform processes, and the perianth limb 2.5-4.5 x 0.8-1.4 cm, with acuminate apex in *A melanoglossa*). The two species have a disjunct geographic distribution.

Description. Glabrescent vines. Pseudostipules triangular, 3-8 × 2-6 mm, sessile, adaxial surface surface glabrescent, abaxial surface puberulous.

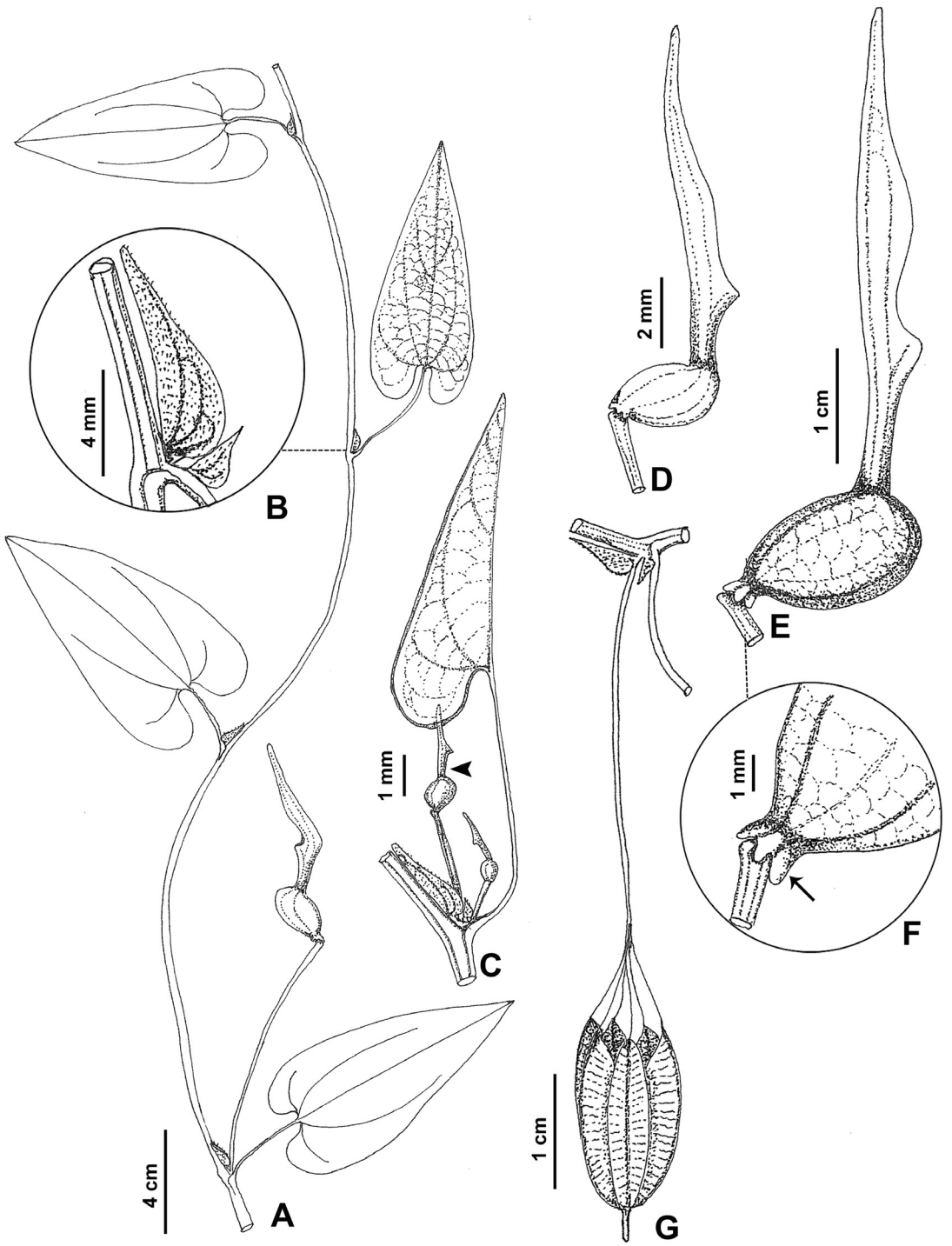

Fig. 1. *Aristolochia stevechurchillii.* **A,** habit. **B,** pseudostipules. **C,** young node with two axillary, serial flowers; note the adaxial (upper) flower (arrowhead) more developed than the abaxial (lower) flower. **D,** flower at preanthesis. **E,** flower at anthesis. **F,** base of the utricle; note retrorse, digitiform processes (arrow). **G,** capsule. A-F from *E. Saravia 561*, type; G from *C. Antezana 645*.

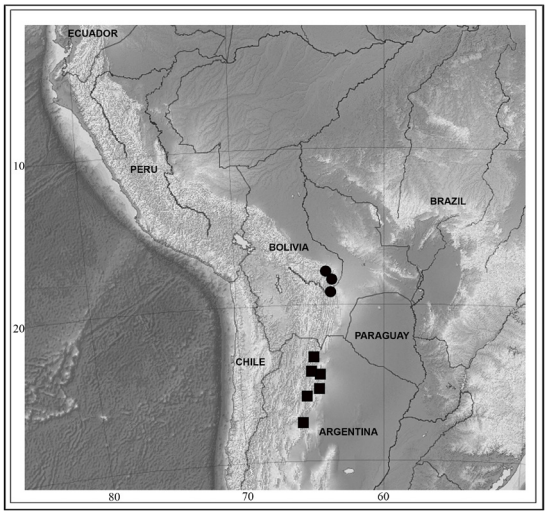

Fig. 2. Geographical distribution of *Aristolochia stevechurchillii* (circles) and its close relative *A. melanoglossa* (squares).

Foliage leaves with petiole 1.5-2.5 cm long, glabrous, lacking a basal abscission zone; leaf blade ovate, 7-8.5 × 3.5-5.2 cm, with puberulous indumentum scattered above, glabrous below, membranose, base cordate, lobes parallel, not overlapping, forming sinuses 1-1.5 cm deep, apex obtuse, venation palmate, basal veins 3(5). Flowers two per axil, serially initiated in a descending succession, the abaxial (lower) flower smaller and abortive. Floral peduncle plus ovary 3.5-6 cm long, ebracteolate, slender, glabrous. Perianth glabrous on its outer surface; utricle oblong, 1.3-1.6 × 0.4-0.5 cm, with six retrorse digitiform processes at its base, each 0.5-1 mm long; tube subinfundibuliform, 1.2-1.5 cm long, 2-3 mm proximal diameter, 3-4 mm distal diameter, forming an angle of 90°-100° with respect to the utricle; limb narrowly ovate, 2-2.5 × 0.6-0.8 cm, efimbriate, forming an angle of 150°-170° with respect to the tube, base truncate, apex acute; gynostemium hexamerous, 4.5-5.5 cm long; anthers six, oblong, 3-4 mm long, equidistant; ovary 6-carpellate, with an unequilateral rostrum to 0.5 mm long, located at the dorsal portion of its apex. Capsule cylindrical, 1.5-2 × 0.5-0.7 cm, including an apical rostrum to 2 mm long, dehiscent from the base, glabrous and transversely ribbed, midvein of each carpel prominent, septa entire but with teared margins. Seeds unknown.

Etymology. The species is named in memory of late Dr. Steven P. Churchill, the friend, the pioneer bryologist, and the human being. Steve spent several years carrying out research and extensive field work in Bolivia.

Distribution, phenology, and habitat. *Aristolochia stevechurchillii* inhabits dry forests, xerophytic thickets, and subhumid to seasonally high-montane Tucumano-Bolivian forests (as defined by Gallegos et al., 2019), at elevations between 1300 and 2390 m a.s.l., in areas dominated by *Schinopsis lorentzii* (Griseb.) Engl. (Anacardiaceae) and *Piptadenia boliviana* Benth. (Fabaceae). The species sets flowers in January through March, and fruits in March. The percentage of vascular plants endemic to this phytogeographically interesting region and the neighbouring dry interandean valleys in Bolivia has been estimated in 16-18 % (López, 2003).

Provisional conservation status. According to the IUCN Red List criteria (IUCN, 2014, 2022), *Aristolochia stevechurchillii* should be provisionally considered as Endangered (EN B1ab(iii) + 2ab(iii), D), due to population reduction based on the number of mature individuals known (<1000), small extent of occurrence, small area of occupancy with just one station of occurrence, and habitat reduction in the area.

Comments. Among the species bearing pseudostipules, the new species is similar to *Aristolochia melanoglossa*, from northwestern Argentina (Hauman, 1923; González et al., 2015). This affinity concurs with other floristic similarities between the central valleys and Tucumano-Bolivian forests of Bolivia and the Chaco vegetation of Argentina described by Beck et al. (1993) and López (2003).

Additional specimens examined

BOLIVIA**. Cochabamba.** Prov. Campero, camino de Aiquile a Quiroga, 2390 m s.m., 23-III-1993 (fl, fr), *C. Antezana 645* (BOLV, MO)**. Chuquisaca.** Prov. Luis Calvo, Mun. Villa Vaca Guzmán, c 10 km de Muyupampa sobre el camino principal hacia Camiri, 19º48´S, 63º43´W, 1300 m s.m., 16-II-2006 (fl), *A. Lliully et al. 700* (MO); Chuquisaca, Zudañez, on descent to Sacha Pampa, c. 10-11 km NE of Mojocoya, 2000 m a.s.l., 22-III-1998 (fl), *J. R. I. Wood & M. Serrano 13354* (K).

Key to the pseudostipule-bearing species of *Aristolochia* from Bolivia and its closely related *A. melanoglossa*

1. Perianth limb formed by two unequal lobes, one upper forming the dorsal portion of the limb, and one lower, forming the ventral portion. Seeds with a triangular or rhomboid peripheral wing; raphe prominulous, lineariform 2
1. Perianth limb unilobed or, in *A. ridicula* N.E. Br., with two equal lobes flanking the dorsal portion of the limb. Seeds (if known) not winged or with a vestigial wing, or (in *A. odoratissima* L.) with a sticky aril; raphe massive, usually with lateral membranose extensions smaller than the seed itself 7
2(1). Leaves often narrowly ovate to subhastate. Upper lobe of the perianth prolonged into a long, tapering cauda to 85 × 0.1-0.3 cm; lower lobe much smaller, broadly ovate, 1-2 × 1.0-1.5 cm. Amazonian forests of Colombia, Ecuador, Peru, Brazil and Bolivia ..... *A. mishuyacensis* O.C. Schmidt
2. Leaves ovate to very widely ovate. Upper lobe of the perianth ecaudate; lower lobe longer to slightly shorter than the upper lobe. Extra-Amazonian forests, caatingas, or cerrados from Brazil, Bolivia, Paraguay and Argentina (except *A. lingulata* Ule ex Pilg. primarily from Amazonian forests) 3
3(2). Floral peduncle plus ovary 3-4 cm long. Perianth to 7 cm long; utricle 1.5-2.6 × 0.5-0.8 cm; lobes of ca. same length or sometimes the upper lobe shorter; upper lobe 1,5-3 cm long, including an apical mucro 2-5 mm; lower lobe (1.7-)2-3 cm long ..... *A. gibertii* Hook.
3. Floral peduncle plus ovary 6-22 cm long. Perianth ≥ 7.5 cm long; utricle 3-8 × 1-4 cm; upper lobe (> 4 cm long) longer than the lower lobe 4
4(3). Lobes of the leaf blade usually convergent and overlapping. Ecuador, Peru and Bolivia; western Amazonian forests ..... *A. lingulata* Ule ex Pilg.
4. Lobes of the leaf blade not overlapping. Brazil, Bolivia, Paraguay, Argentina; mostly extra-Amazonian 5
5(4). Utricle 3-4 cm long; upper lobe of the perianth narrowly ovate, 3-8 cm long, with its distal portion neither spathulate nor broadened; lower lobe 1.5-4.5 cm long ..... *A. esperanzae* Kuntze
5. Utricle > 4 cm long; upper lobe of the perianth ≥ 8 cm long, with its distal portion spathulate or circular; lower lobe > 4.5 cm long 6
6(5). Upper lobe with its 1/3 or ½ basal portion narrowed, gradually expanded onto a circular to ovate distal portion ..... *A. galeata* Mart.
6. Upper lobe with its 1/3 or ½ basal portion narrowed, abruptly expanded onto a cordiform, rounded, distal portion ..... *A. labiata* Willd.
7(1). Stems, leaves and flowers densely hirsute, trichomes unbranched. Leaf blade widely ovate, 8-14(-20) × 10-16(-22) cm. Perianth limb with two equal lobes flanking the dorsal portion of the limb, oblong to widely-ovate, 1.5-3 × 1-2 cm ..... *A. ridicula* N.E. Br.
7. Stems, leaves and flowers glabrescent or glabrous (except *A. andina*, with dense, villous indumentum formed by branched trichomes) 8
8(7). Stems, leaves and flowers with dense, villous indumentum formed by branched trichomes ..... *A. andina* F. González & I. Vargas
8. Stems, leaves and flowers glabrescent to glabrous 9
9(8). Perianth tube 3-5 cm long; limb 8.5-20 cm long. Capsule narrowly cylindrical, 4.5-8 × 1-1.5 cm, slightly falcate prior dehiscence; seeds 3-3.5 × 2-2.5 mm, flattened, not winged, with a sticky, chalazal aril. Widespread from SE United States to N Argentina ..... *A. odoratissima* L.
9. Perianth tube 1-2.5 cm long; limb 1-4.5 cm long. Capsule (where known) cylindrical, 1.5-3.1 × 0.9-1.7 cm, not falcate; seeds (where known) 4-5 × 2.5-3 mm with a vestigial wing, exarillate 10
10(9). Pseudostipules circular, 1-1.5 cm. Leaf blade glabrous on both sides. Perianth limb broadly ovate, nearly as long as wide, apex obtuse ..... *A. argentina* Griseb.
10. Pseudostipules triangular, 3-8 × 2-6 mm. Leaf blade puberulous above. Perianth limb ovate to narrowly ovate, at least 3 times longer than wide, apex acute to acuminate 11
11(10). Flowers always one per axil. Base of the utricle truncate (i.e. lacking retrorse digitiform processes); perianth limb 2.5-4.5 x 0.8-1.4 cm, apex acuminate. Endemic to NW Argentina (Catamarca, Jujuy, Salta and Tucumán) ..... *A. melanoglossa* Speg.
11. Flowers one per axil, or two serial flowers initiated per axil (if so, the abaxial one smaller and abortive). Base of the utricle with six retrorse digitiform processes at its base, each 0.5-1 mm long; perianth limb 2-2.5 × 0.6-0.8 cm, apex acute. Endemic to Bolivia (Cochabamba and Chuquisaca) ..... *A. stevechurchillii*

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