



A new species of *Sipapoaantha* (*Gentianaceae*: *Helieae*) from northern Brazil

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Key words

floristics
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Abstract A new species from *Gentianaceae* (tribe *Helieae*) is described from northern Brazil. *Sipapoaantha obtusisepala* sp. nov. is distinct from the previously single member of the genus, *Sipapoaantha ostrina*, by having a woody and branched habit, sessile and ovate leaves with an acute apex, and a smaller calyx with circular lobes. *Sipapoaantha obtusisepala* is based on somewhat incomplete material and tentatively placed in *Sipapoaantha* based on the presence of key generic characters such as coriaceous leaves with strongly revolute margins and blue corollas. It has only been recorded from one locality in the Brazilian-Guyana border area in the state of Roraima.

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INTRODUCTION

The rare genus *Sipapoaantha* Maguire & B.M.Boom is known from only a handful of herbarium specimens and until now has been considered a monotypic genus (Struwe et al. 1999). The type species, *S. ostrina* Maguire & B.M.Boom, is a perennial herb endemic to the Guayana Highlands region of Venezuela, and more specifically, it occurs only in the state of Amazonas on the tepui mountains (flat-topped mesas) of Cerro Sipapo, Cerro Cuao and Cerro Autana.

Sipapoaantha obtusisepala, described here for the first time, is a woody shrub known from only a single herbarium specimen collected on a mountain in the Brazilian-Guyana border area in the Brazilian state of Roraima. It differs from *S. ostrina* in its woody and branched habit, sessile ovate leaves with an acute apex, and a smaller calyx with circular lobes, but the two taxa share coriaceous leaves with strongly revolute margins that are sulphur yellow in colour when dry and blue corollas. A new morphological description of *Sipapoaantha* is provided due to its new circumscription, as well as a new generic key.

Sipapoaantha is a member of the neotropical tribe *Helieae* (*Gentianaceae*; Struwe et al. 2002, 2009). The latest phylogeny, based on 127 morphological characters and DNA sequences (*matK*, *trnL* intron and ITS), placed *Sipapoaantha* as part of a polytomy with the two major subclades, the *Macroparpea* clade and the *Symbolanthus* clade (note that this placement is tentative due to a lack of molecular data for *Sipapoaantha*; Struwe et al. 2009). *Sipapoaantha obtusisepala* has the typical *Helieae* characters of terminal compound cymes with a pair of scale-like bracts subtending each flower, calyx lobes rounded with a dorsal glandular area, medially dehiscent capsule with a woody pericarp, and numerous angular seeds (Struwe et al. 1999, 2002, 2009).

MATERIALS AND METHODS

Morphological characters were collected from herbarium specimens from IAN, K, MO, NY, U and US. All measurements and sketches were taken from dried, pressed material. A ruler was used to measure peduncle length and leaf dimensions, while all other measurements were observed using an eyepiece scale of an Olympus dissecting scope at 10× or 50× magnification. The terminology used to describe structures follows Stearn (1999). The abbreviations for herbaria follow 'Index Herbariorum' (Holmgren & Holmgren 1998).

TAXONOMIC TREATMENT

Sipapoaantha Maguire & B.M.Boom

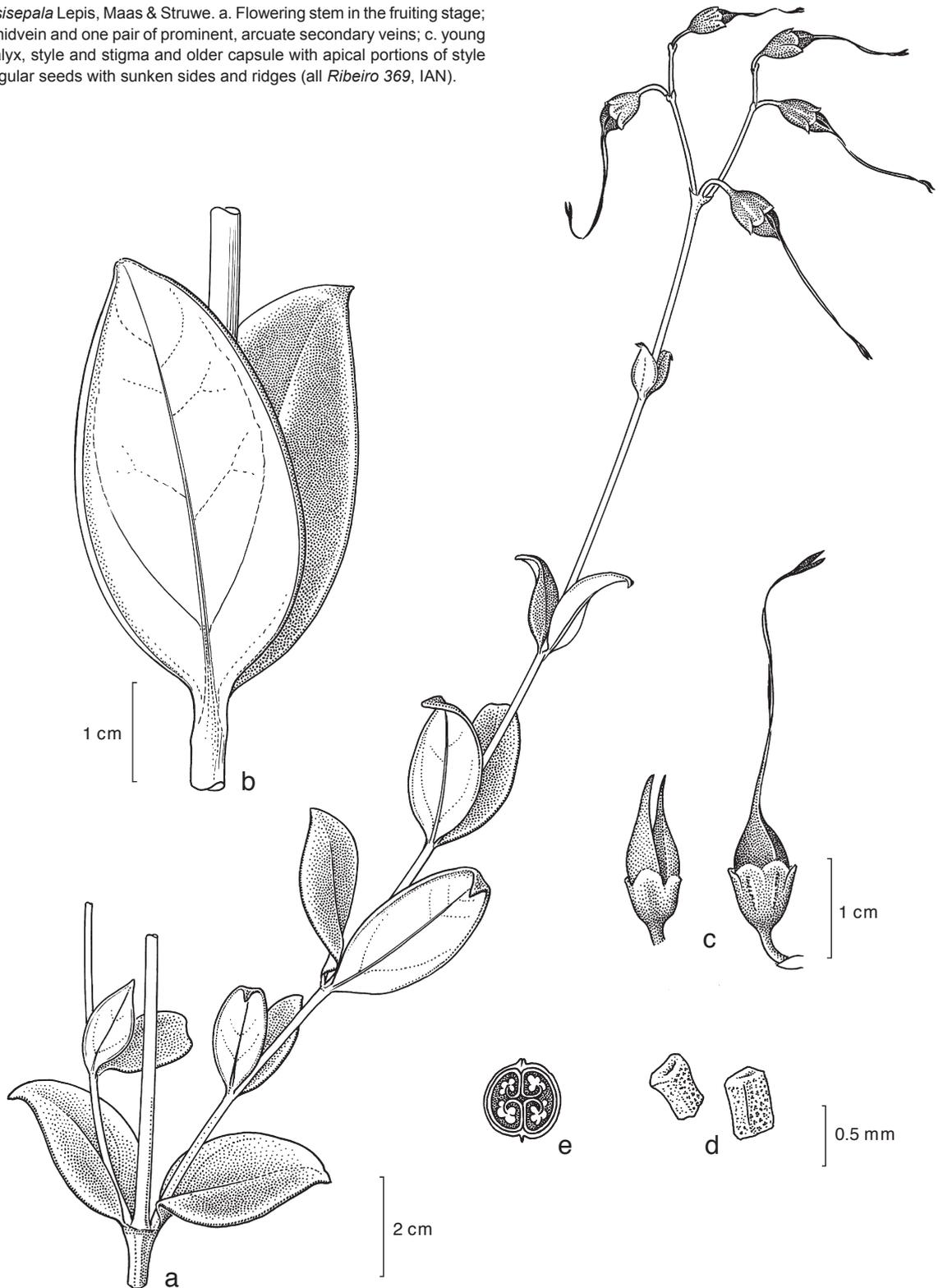
Sipapoaantha Maguire & B.M.Boom (1989) 23, 25, f. 17, 18. — Type: *Sipapoaantha ostrina* Maguire & B.M.Boom.

Plants herbaceous or woody shrubs, glabrous. *Stems* unbranched when herbaceous or branched when woody, quadrangular, with or without 4 narrow wings; interpetiolar line present. *Leaves* aggregated at the base or evenly dispersed along stem, sessile or petiolate; blade elliptic, ovate to obovate, 1–7.5 by 0.5–4 cm, yellow in colour when dry, very thick and coriaceous; margin revolute; midvein prominent below, sometimes with 1–2 visible pairs of lateral veins; base narrowly attenuate on basal leaves or obtuse on apical leaves; apex obtuse or acute. *Inflorescence* terminal, cymose, with 1–2 dichasial branches basally diverging into 2 or more monochasial branches, 1–12-flowered; peduncle up to 14.5 cm long; bracts either leaf-like, up to 10 mm long, or scale-like, about 2 mm long. *Flowers* pedicellate, 5-merous, showy, erect to nodding at anthesis; pedicel 6–9 mm long (flowers not known from *S. obtusisepala*). *Calyx* campanulate, 6–10 mm long, basally fused up to 2/3 of total calyx length, green, thick and coriaceous, persistent and spreading in fruit; lobes oblong or circular, with a thickened dorsal ridge, 3–6 mm long; apex acute or obtuse; margin hyaline. *Corolla* funnelform, dark blue to purple, 5–96 mm long, deciduous in fruit; lobes 25–32 by 25 mm, circular, overlapping slightly, mucronate; flower bud apex bluntly tapering.

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Fig. 1 *Sipapoa obtusisepala* Lepis, Maas & Struwe. a. Flowering stem in the fruiting stage; b. leaves with prominent midvein and one pair of prominent, arcuate secondary veins; c. young capsule with persistent calyx, style and stigma and older capsule with apical portions of style and stigma missing; d. angular seeds with sunken sides and ridges (all *Ribeiro 369*, IAN).



Stamens included in corolla mouth; filaments flattened (when dry), of unequal length, 28–39 mm long, inserted very close to base of corolla tube, widened and winged at the base; anthers lanceolate sagittate, 7–8 mm long, straight after anthesis, versatile, with a sterile apex; pollen in tetrads with pilate to verrucose exine (fide Nilsson 2002). *Ovary* sessile, with a glandular disk below ovary; style flattened in fruit (when dry, then also twisted), persistent or deciduous; stigma broadly bilamellate (corolla, stamen and pistil characters not known from *S. obtusisepala*). *Capsule* ellipsoid, 10–18 mm long, green when immature, brown at maturity, woody, dehiscent medially, horizontal to nodding. *Seeds* angular, roughly cubical or conical, 0.2–0.8 mm diam, brown.

Additional Sipapoa ostrina examined. VENEZUELA, Amazonas, Dept. Atures, sandstones of Cerro Cuao, Caño Cabeza de Manteco, 73 km SE of Puerto Ayacucho, 1580 msnm, 05°06' N 67°24' W, Sept. 1989, *Ang. Fernández et al. 6236* (MO); Cerro Cuao, summit of the northern section, grasslands, shrubs and rock outcrops on south facing slope, 1600 m, 5°4' N 67°24' W, 11 Feb. 1993, *Huber 13541* (U); Cerro Sipapo (Park), North mountain at 2000 m, 6 Dec. 1948, *Maguire & Politi 27527* (holotype NY; isotypes GH n.v., S n.v., US, VEN n.v.); Cerro Sipapo (Park), North mountain at 2000 m, 6 Dec. 1948, *Maguire & Politi 27527A* (NY); Cerro Sipapo (Park), lower Caño Negro, at 1400 m, 1 Jan. 1949, *Maguire & Politi 28092* (K, NY); Cerro Sipapo (Park), Savanna Camp to Caño Profundo and East Terrace via Caño Negro, 1600 m, 8 Jan. 1949, *Maguire & Politi 28219* (NY, P n.v., VEN); Cerro Sipapo, 1500 m, 15 Jan. 1981, *Maguire et al. 65702* (NY (DNA voucher)); Cerro Autana, Summit of the Cerro Autana: savanna and dangerous outcrops, 1230–1240 m, 4°52' N 67°27' W, 20–22 Sept. 1971, *Steyermark 105123* (NY, U); Cerro

Table 1 A comparison of five taxa with *Sipapoaantha obtusisepala* using ten morphological characters. Characters in **bold** are those shared with the new *Sipapoaantha* species. Numbers in parentheses below each taxon name represent the number of characters shared with *S. obtusisepala*. Note: *Rogersonanthus* in this circumscription does not include *R. coccineus*, which has been moved to *Roraimaea* (Struwe et al. 2008).

Taxon (# of characters shared with new species)	Geographic distribution by region	Habit	Leaf position along stem	Leaf texture	Leaf colour when dry	Leaf margin	Flower merosity	Calyx texture / Calyx colour	Corolla colour
<i>Sipapoaantha obtusisepala</i>	Guayana Highlands	woody	evenly dispersed	coriaceous	yellow	revolute	5-merous	coriaceous / green	blue
<i>S. ostrina</i> (8)	Guayana Highlands	herbaceous	evenly dispersed or aggregated at the base or	coriaceous	yellow	revolute	5-merous	coriaceous / green	purple-blue
<i>Rogersonanthus</i> (7)	Guayana Highlands	woody	evenly dispersed or aggregated at branch apex	coriaceous	green	flat (revolute - <i>R. quelchii</i>)	5-merous	coriaceous / green	green, white, yellow
<i>Calolisianthus</i> (5)	Brazilian Highlands	herbaceous	evenly dispersed	subcoriaceous	green	revolute	5-merous	coriaceous / green	purple, blue, red
<i>Chelonanthus</i> (5)	Central America, Guayana Highlands , Amazon, Andes, Brazilian Highlands	herbaceous (sometimes woody at the base)	evenly dispersed	chartaceous (rarely subcoriaceous)	green	flat	5-merous	coriaceous / green	green, white, yellow (purple, blue - <i>Ch. purpurascens</i>*)
<i>Prepusa</i> (3)	Brazilian Highlands	herbaceous (woody - <i>P. montana</i>)	aggregated at base in herbs / aggregated at branch apex when woody	coriaceous	green	flat (revolute - <i>P. montana</i>)	6-merous	chartaceous / red, purplish-red, yellow, orange, or green	white, yellow

Sipapo, Dept. Atures, summit of northern section, savanna type vegetation along a small stream, 1500 m, 5°N 67°30' W, 17 Feb. 1981, *Steyermark et al.* 124554 (MO, NY).

KEY TO THE SPECIES OF SIPAPOANTHA

- 1. Woody, branching shrub; leaves widest at the base or in the middle, apex acute; calyx 6–7 mm long; calyx lobes circular, 3–4 mm diam *S. obtusisepala*
- 1. Single-stemmed herb; leaves widest above the middle, apex obtuse; calyx 8–10 mm long; calyx lobes oblong, 5–6 mm long *S. ostrina*

Sipapoaantha obtusisepala Lepis, Maas & Struwe, *sp. nov.*
— Fig. 1

Sipapoaantha ostrinae similis, sed habitu ligneo et ramoso, foliis sessilibus, ovatis, apice acutis, calyce minore, lobis circularibus differt. — Typus: *B. G. S. Ribeiro* 396 (holotype IAN), Brazil, Roraima, Serra Baeta, perto de Suriname, 11 Nov. 1973. Arbusto sobre pedra; flôr azulada.

Etymology. The name *obtusisepala* derives from the Latin 'obtusus' meaning rounded and 'sepalum' meaning sepal. This name was chosen to reflect the obtuse apices of the calyx lobes.

Shrub. *Stems* woody, branching, with four longitudinal ridges c. 0.1 mm wide. *Leaves* evenly dispersed along stem, sessile; blade elliptic or ovate towards the apex of plant, 1–2.5 by 0.5–1.2 cm, upper side more lightly coloured than lower side; base of lower leaves attenuate, base of upper leaves obtuse; apex acute. *Inflorescence* 5–12-flowered; peduncles 5.3–14.5 cm long; bracts scale-like with obtuse apex, 1.9–2.1 mm long; pedicels 6–9 mm long (in fruit). *Calyx* campanulate, 6–7 mm long, fused 0.4–0.6 of total calyx length; lobes circular, 3–4 mm diam; apex obtuse. Corolla not seen, reported as blue (*Ribeiro* 396). Stamens not seen. Gynecium not seen in flower. *Capsule* medially dehiscent, ellipsoid, 10–12 mm long; calyx in fruit c. 0.6 of capsule length, with a semi-persistent style, c. 30 mm long with some apical portions broken off in older capsules. *Seeds* roughly cubical, 0.2–0.5 mm diam.

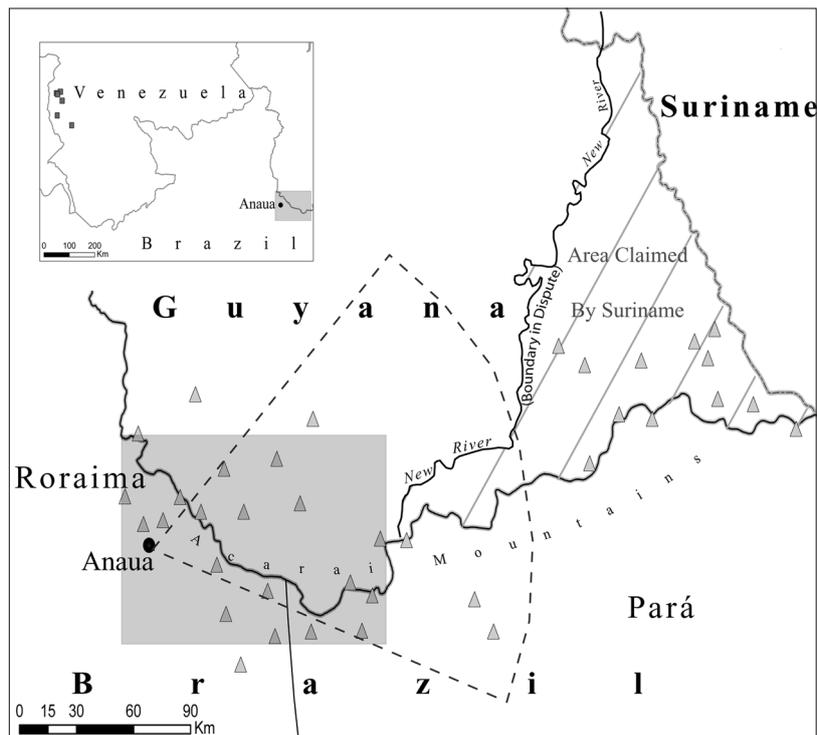
Distribution — Brazilian state of Roraima, in the Brazilian-Guyana border area.

Habitat & Ecology — *Sipapoaantha obtusisepala* is known from only one specimen growing among rocks on the Sierra Baeta mountain.

DISCUSSION

The species described here has been tentatively placed within *Sipapoaantha* based on shared macroscopic morphological characters. Table 1 provides a character comparison of *S. obtusisepala*, *S. ostrina* and other *Helieae* taxa with which the newly described species share diagnostic characters. The coriaceous leaves of *S. obtusisepala* are similar to those of *S. ostrina*, *Prepusa* Mart., and *Rogersonanthus* Maguire & B.M.Boom. The revolute leaf margin is also a character found in *Sipapoaantha* and *Calolisianthus*, as well as, in one species of *Prepusa* (*P. montana* Mart.) and *Rogersonanthus* (*R. quelchii* Maguire & B.M.Boom). Although there are similarities, it does not seem likely that the new species is part of *Prepusa* due to the 6-merous flowers and the chartaceous, showy and inflated calyx characteristics of that genus. *Calolisianthus* is another genus with vegetative similarities to *S. obtusisepala*, but with subcoriaceous leaves, this genus does not appear to be the best choice. In addition, *Prepusa* and *Calolisianthus* are endemics to the Brazilian Highlands, making the placement of the new species into these unlikely from a geographic standpoint.

Chelonanthus Gilg has many species found in the Guayana Highlands, but the vegetative morphology and habit fail to point



Map 1 Map illustrating the disjunct distribution of the genus *Sipapoantha* as well as the proposed collection site of the *S. obtusisepala* type. The smaller map inserted in the upper left corner of Brazil, Guyana and Venezuela, shows the type species, *S. ostrina* (symbol ■) found on the tepuis in the western part of the Guayana Highlands in Venezuela. The location of the newly described species, *S. obtusisepala*, is believed to have been collected in the grey area near the town of Anauá, on the border of Brazil and Guyana. The larger map shows the proposed collection area in greater detail (see discussion for details). The area in grey represents the RADAM Project quadrat NA-21-YA. The area outlined by ---- represents a 200 km distance from the town of Anauá. The ▲ symbol represents mountain peaks.

to this genus as the best choice. When comparing the generic characters, it is apparent that *S. ostrina* and *Rogersonanthus* share the most characters with the new species, *S. obtusisepala* (Table 1). All three taxa have coriaceous leaves evenly dispersed along the stem, revolute leaf margins and 5-merous flowers with a coriaceous, green calyx. The characters that *S. ostrina* shares with the new species, and which exclude it from *Rogersonanthus*, are the sulphur yellow colour of the dried leaves and blue corollas. *Rogersonanthus*, on the other hand, shares with the new species a woody habit. Both genera occur in the Guayana Highlands region, making each a good candidate geographically. Considering there are a number of genera in *Helieae* that are composed of woody and herbaceous species (*Macrocarpaea* (Griseb.) Gilg, *Neblinantha* Maguire, *Prepusa*, *Rogersonanthus* and *Symbolanthus* G.Don), placement of the new species within *Rogersonanthus* based on that character seems inappropriate. Therefore, the most logical placement for the new species is in *Sipapoantha*, based on the colour and texture of its dried leaves and blue corollas.

In the circumscription presented here, *Sipapoantha* is a montane genus endemic to the Guayana Highlands, albeit strongly disjunct (Map 1). *Sipapoantha ostrina* is known from only a few herbarium specimens from tepuis in the western part of the mountain range, and *S. obtusisepala* is found on a mountain outlier in the southeast, c. 1000 km from *S. ostrina*. It is likely that additional collections in this understudied area of the Neotropics will find additional populations of *Sipapoantha* taxa.

Sipapoantha obtusisepala is unique in the genus in its woody, branching habit. It also differs in having sessile leaves that are smaller in size with an acute apex, as opposed to *S. ostrina*'s petiolate leaves with an obtuse apex. The 6–7 mm long calyx of *S. obtusisepala* is smaller than the 8–10 mm long calyx of *S. ostrina*. Calyx lobe shape differs as well, with a circular shape found in *S. obtusisepala* and an ovate-oblong shape found in *S. ostrina*.

The collection site of the *S. obtusisepala* type specimen is not clearly stated on the herbarium label. The label reads "Roraima, Serra Baeta, perto de Suriname", which means "Serra Baeta, nearby Suriname". It is not clear from the label if the location is referring to Roraima, the state in Brazil, or Mt Roraima on the tri-border of Brazil, Guyana and Venezuela. In addition, neither the state nor the mountain is located near the Suriname border. All efforts to locate Serra Baeta had been fruitless until a specimen of a different genus was found that was likely collected during the same expedition. This specimen of another *Helieae* gentian, *Aripuana cullmaniorum* Struwe, Maas & V.A. Albert, was collected from the same mountain, on the same day, by B.S. Pena (Pena 365, IAN). This second (and remarkable, see below) collection of *A. cullmaniorum* provided enough information to narrow down the location to several peaks on the border of the Brazilian states of Roraima and Pará with Guyana. The *Aripuana* label reads, "On Serra Baieta 200 km from Anauá, quadrat NA-21-Y-A, RADAM Project, Federal Territory of Roraima." We located the mentioned quadrant on the RADAM website (<http://www.adimb.com.br/radam.htm>) and were able to pinpoint the village Anauá on 'A Traveller's Reference Map of Amazon Basin', map # 421 (International Travel Maps 1998). A second map, 'The Guianas and Guyana' (International Travel Maps 2004) shows multiple peaks within the area as well as the area east of the New River in Guyana as under dispute and claimed by Suriname. This would explain Ribeira's description of "... perto de Suriname ...". Map 1 illustrates all of the location evidence we currently have from these two collections. Searches through online databases of specimens at MO, NY and US have not revealed any other collections from Serra Baeta (Baieta).

The collection of *A. cullmaniorum* is also interesting because it reveals a highly disjunct population of this species. *Aripuana* was previously thought to be endemic to the lowland white sand areas of southeastern Amazonas in the border area of the

states Rondônia, Mato Grosso and Pará (Struwe et al. 1997). The new genus *Roraimaea*, also in the tribe *Helieae*, was recently described from white sand areas of Roraima (Struwe et al. 2008). *Gentianaceae* are not heavily collected in this state and we expect new and interesting populations, and possibly species, to be added to the scientific record in the future.

The generic placement of *S. obtusisepala* is tentative, but we are confident that our study has revealed a new species. When working with rare specimens it is often difficult to come across herbarium material suitable for DNA extraction and additional data is needed to have greater confidence in the generic placement presented here. It is apparent, however, that the new species is distinct. Considering the rarity of *S. obtusisepala*, we believe its documentation crucial. Making others aware of this unique taxon will aid in data collection and understanding.

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