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Sommera cusucoana, a new species of Rubiaceae from Honduras

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Abstract

Sommera cusucoana Lorence, D. Kelly & A. Dietzsch, **sp. nov.**, (Rubiaceae), a new species from Honduras, differs from the other Mesoamerican *Sommera* species by the combination of large, obovate leaves with long red petioles, glabrous or glabrate intervenal areas, red stipules, lax, sparsely pubescent inflorescences with red axes, flowers with red hypanthium and calyx, long fruiting pedicels, and dark red mature fruits. It is known only from the type locality in Cusuco National Park.

Resumen

Se describe e ilustra *Sommera cusucoana* Lorence, D. Kelly & A. Dietzsch, **sp. nov.** (Rubiaceae), especie nueva de Honduras. Se trata de un árbol que se difiere de las otras especies Mesoamericanas de *Sommera* por sus hojas grandes obovadas con peciolos largos rojos, áreas intervenales glabras o glabradas, estípulas rojas, inflorescencias laxas, escasamente puberulas, flores con hipanto y cáliz rojo, pedicelos fructíferos largos, y frutos maduros rojos. Se conoce sólamente de la localidad tipo en el Parque Nacional Cusuco.

Keywords

Rubiaceae, *Sommera*, Honduras, Cusuco, conservation

Palabras claves

Rubiaceae, *Sommera*, Honduras, Cusuco, conservación

Introduction

Sommera Schltdl. is a genus of Rubiaceae ranging from southwestern Mexico through Central America to South America, usually below 2000 m elevation in evergreen wet forests and riparian forests or less often in drier pine-oak forests (one species). The genus comprises about 10 species of shrubs or small trees characterized by relatively large and soon deciduous paired intrapetiolar stipules; relatively large leaves often strigose-pubescent on the veins beneath, with conspicuously parallel, lineolate minor venation; relatively few-flowered axillary or subaxillary cymes; small externally pubescent flowers; and fleshy 2-locular berries with numerous small, angulate seeds. Although traditionally placed in subfamily Cinchonoideae tribe Mussaendeae (e.g. Borhidi 2006, Dwyer 1980), recent molecular studies indicate *Sommera* belongs in subfamily Ixoroideae, tribe Condamineae (Bremer 2009).

L. O. Williams (1973) reviewed the Central American and Mexican *Sommera* species but failed to provide a diagnostic key or illustrate his four new species. Lorence (1993) described and illustrated *Sommera parva* Lorence, a diminutive new species from Chiapas. In his treatment of the genus for *Flora Mesoamericana* Lorence (2012) recognized six species from the Mesoamerican region (Chiapas and the Yucatán Peninsula to the Panamá/Colombia border). One additional species (*S. grandis* (Bartl. ex DC.) Standl.) occurs in southwestern to western Mexico outside the Mesoamerican region, and two more have been described from South America (in Colombia, Peru, and Brazil).

During the course of an ecological survey of montane rain forest vegetation in Cusuco National Park in Honduras (Figure 1), a striking new species of *Sommera* was discovered. Although only a single individual was collected, this new species is immediately distinguished from the other Mexican and Mesoamerican *Sommera* species by its red petioles, stipules, inflorescences, hypanthia, fruits and infructescences, and long flowering and fruiting pedicels.

Results

Sommera cusucoana **Lorence, D. Kelly & A. Dietzsch, sp. nov.**
urn:lsid:ipni.org:names:77150371-1
Figures 2, 3, 4

Type. Honduras. Prov. Cortes, W of San Pedro Sula. El Cortecito campsite (near left bank of river), Parque Nacional El Cusuco, Sierra de Merendón, UTM 361834 1716534 + 11 m, 1333 m alt., 5 July 2013, D. L. Kelly, A. C. Dietzsch & W. Lopez 15079 (Holotype TEFH!, Isotypes MO and TCD).

Diagnosis. Differs from its congeners by the combination of large, obovate leaves with long red petioles, glabrous or glabrate intervenal areas, red stipules, inflorescences 2–4-flowered, sparsely pubescent, with red axes, flowers with red hypanthium and calyx, and mature fruits dark red with long pedicels.

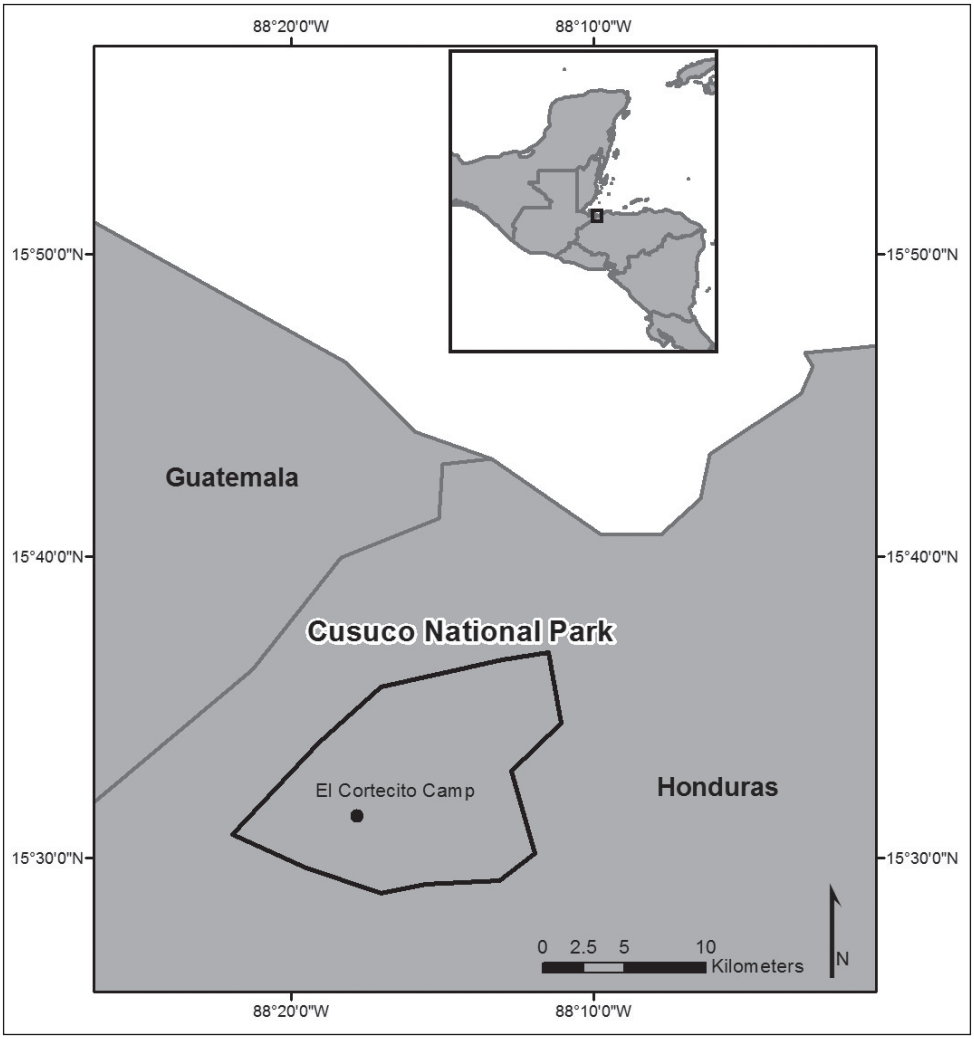

Figure 1. Map showing location of Cusuco National Park. Inset map showing position of Honduras.

Description. Tree 10 m high, branchlets 5–6 mm in diam., glabrous, finely ribbed when dry, with sparse, pale +/- ellipsoidal lenticels. **Leaves** opposite, blades 21.5–30 × 10.2–15 cm, obovate, acuminate, finely pointed, cuneate and +/- asymmetrical at base, drying membranaceous, glabrous above, strigillose beneath on costa and 2°–4° veins, intervenal areas glabrous, 2° veins 13–14 pairs, eucamptodromous, venation prominulous; petioles 4.5–9 cm long, sparsely strigillose, red when fresh; **stipules narrowly** deltate to lanceolate, 3–3.8 cm long, when fresh red with thin white margins, glabrous, caducous. **Inflorescences** 5.5–6.5 × 3–7 cm, dichasial, 2–3–4-flowered, axes sparsely strigillose, red when fresh; peduncle 2.5–3.8 cm long, bracts oblong-elliptic, c. 1 mm long, caducous; pedicels 1–2.8 cm long, with bract scars medially. **Flowers** with hypanthium 5 × 3–4 mm, turbinate to obovoid, glabrous;

Figure 2. Scan of Holotype specimen of *Sommera cusucoana* (to be deposited at TEFH).

calyx limb red, cupuliform, 2–3 mm long with the tube 0.6–1 mm long, externally glabrous, lobes 5, 1–1.2 × 2 mm, broadly triangular, obtuse, equal, margins densely ciliolate; corolla cylindrical-funnelform, yellowish-cream, fleshy, tube 10–11 × 2.8–3 mm, externally densely hirtellous-tomentose, lobes 5, 1.5 × 3 mm, triangular-ovate, densely papillose-puberulent internally; anthers, style and stigmas not seen. **Fruits** 12–15 × 9–13 mm, subglobose to broadly ellipsoid, dark red at maturitiy, glabrous. **Seeds** numerous, 1–1.8 mm long, irregularly polygonal-angulate, testa dark brown, reticulate. (Figures 3, 4).

Habitat and ecology. Only two individual trees were located, about the same size and within a few meters of each other. The site is within Cusuco National Park, in the upper slopes of the Sierra del Merendón. These upper slopes (highest point 2242 m) are largely covered by montane rain forest vegetation. The bedrock is composed of a mixture of gneiss and schist (The Nature Conservancy et al. 1994); slopes are steep and soils are strongly acidic (D.L. Kelly & A.C. Dietzsch, unpublished data).

The type locality, at 1333 m, is at the bottom of a deep, narrow valley, about 25–50 m from the bank of a small river. The site is riparian rain forest, dominated by tall trees, mainly *Liquidambar styraciflua* L. and *Cedrela odorata* L. The microclimate is moist and the vegetation lush and species-rich. The vicinity shows minor levels of disturbance: human disturbance due to the proximity of a seasonal camp-site with radiating trails, and natural disturbance due to wind-throw, and land-slips on the steeper slopes.

Etymology. The name honors the Cusuco National Park in which it was found.

Discussion. *Sommera cusucoana* differs from its Mesoamerican congeners by the combination of large, obovate leaves with long red petioles, glabrous or glabrate intervenal areas, red stipules, lax, sparsely pubescent 2–4-flowered inflorescences with red axes, flowers with red hypanthium and calyx, and long flowering and fruiting pedicels. Floral hypanthia and fruits of *S. cusucoana* are bright red at all developmental stages. Herbarium label notes for other *Sommera* species indicate fruits are green when immature and ripen red, at least in *S. chiapensis, S. donnell-smithii* and *S. montana,* and possibly white in *S. grandis* (Mexico). Only *S. chiapensis* Brandegee (Chiapas, Guatemala, Honduras) has flowers with similarly short, broadly triangular calyx lobes 1–2 mm long, but it differs in having shorter petioles 2–5 cm long, cymes with (4–)6–12 flowers, shorter corollas with tube 4–8 mm long, and smaller fruits 5–9 mm in diameter.

Updated key to the Mesoamerican *Sommera* species

1 Leaves glabrous beneath or strigillose only on the costa, even when young.
2 Leaves 3.5–10.5 cm long, 0.8–2.5 cm wide ..... **6. *S. parva***
2' Leaves 7–29 cm long, 1.8–12 cm wide.
3 Calyx lobes 2.5–8 mm long, ovate-lanceolate to oblanceolate .... ***S. arborescens* p. p.**
3' Calyx lobes 1–2 mm long, semicircular to narrowly triangular. ***S. chiapensis***
1' Leaves pilose-strigillose, strigillose, or sericeous beneath, at least when young.

Figure 3. *Sommera cusucoana*. **A** Tip of shoot with infructescence and leaf pair emerging between pair of stipules. Note red color of stipules, petioles, and infructescences **B** Freshly cut branch with inflorescence and infructescences. Photos by A.C. Dietzsch, 5 July 2013.

Figure 4. *Sommera cusucoana*. **A** Tip of shoot with flower, developing fruits, and leaf pair emerging between pair of stipules **B** Flower at anthesis and developing fruit (appearing dark because in shadow). Photos by A.C. Dietzsch, 5 July 2013.

4 Branchlets glabrous; petioles 4.5–9 cm long; inflorescences 2–4-flowered; pedicels 10–28 mm long; hypanthium and calyx tube glabrous..... ***S. cusucoana***

4' Branchlets densely strigillose to sericeous; petioles 0.1–5 cm long; inflorescences 3–25-flowered; pedicels (0)1–10 mm long; hypanthium and calyx tube densely strigillose-villous to sericeous.

5 Mature flowers with calyx lobes 2.5–8 mm long, calyx tube 0.5–1 mm long; pedicels 1–10 mm long; Mexico, Guatemala ..... ***S. arborescens* p.p.**

5' Mature flowers with calyx lobes 1–6 mm long, calyx tube 1–4 mm long; pedicels 0–4 mm long; Guatemala to Panama.

6 Mature flowers with calyx tube 3–4 mm long..... ***S. montana***

6' Mature flowers with calyx tube 0.6–2 mm long.

7 Mature flowers with calyx lobes 2.5–6 mm long, calyx tube 1–2 mm; Guatemala..... ***S. guatemalensis***

7' Mature flowers with calyx lobes 1–5 mm long, calyx tube 0.6–1 mm; Honduras, Nicaragua, Costa Rica and Panama ..... ***S. donnell-smithii***

This is the third species new to science discovered in Cusuco National Park by the Operation Wallacea Forest Botany team, the others being the tree *Hondurodendron urceolatum* Ulloa et al. (Aptandraceae: new genus and species) (Ulloa Ulloa et al. 2010, Kelly et al. 2011) and the herb *Calathea carolineae* H. Kenn. (Marantaceae) (Kennedy 2012). The type specimens of *C. carolineae* and *S. cusucoana* were collected at the same locality.

Sadly, this type locality is within 0.5 km distance of areas of extensive clear-fell, deep within the National Park, that were logged in the period 2010–13. Although the range of *Sommera cusucoana* has yet to be established, this relatively conspicuous and distinctive species has not been noted elsewhere within the Park, and its proposed conservation status must be Critically Endangered (IUCN 2000, 2013).

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References

Borhidi A (2006) Rubiáceas de México. Akadémiai Kiadó, Budapest, 512 pp.

Bremer B (2009) A review of molecular phylogenetic studies of Rubiaceae. Annals of the Missouri Botanical Garden 96: 4–26. doi: 10.3417/2006197

Dwyer JD (1980) Rubiaceae. In: Woodson RE, Schery RW (Eds) Flora of Panama IX. Annals of the Missouri Botanical Garden 67: 1–522.

IUCN (2000) IUCN Red List Categories and Criteria, Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge.

IUCN (2013) Guidelines for using the IUCN Red List Categories and Criteria. Version 10. Prepared by the Standards and Petitions Subcommittee of the IUCN Species Survival Commission. IUCN, Gland, Switzerland, and Cambridge.

Kelly D, Nickrent D, Ulloa Ulloa C (2011) New genus found in Honduran rainforest. Biodiversity Science: Developments in biodiversity & conservation management 1: 13–16. http://www.biodiversityscience.com/2011/01/01/new-genus-honduran-rainforest/

Kennedy H (2012) *Calathea carolineae* (Marantaceae), a new species endemic to Honduras. Journal of the Botanical Research Institute of Texas 6: 55–57.

Lorence DH (1993) New Species in Mexican and Mesoamerican Rubiaceae. Novon 4(2): 119–136. doi: 10.2307/3391581

Lorence DH (2012) *Sommera* (Rubiaceae). In: Davidse G, Sousa MS, Knapp S, Chiang F (Eds) Flora Mesoamericana 4(2). St. Louis, MO, 274–275.

The Nature Conservancy, Fundación Ecologista "Hector Rodrigo Pastor Fasquelle" & Paca 1994. Evaluación Ecológica Rápida (EER) Parque Nacional "El Cusuco" y Cordillera del Merendón. Unpublished report.

Ulloa Ulloa C, Nickrent DL, Whitefoord C, Kelly DL (2010) *Hondurodendron*, a new monotypic genus of Aptandraceae from Honduras. Annals of the Missouri Botanical Garden 97: 457–467. doi: 10.3417/2009040

Williams LO (1973) *Sommera* (Rubiaceae) in North America. Phytologia 26: 121–126.

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New combinations in Neotropical Thelypteridaceae

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Abstract

288 new combinations of Neotropical Thelypteridaceae taxa are proposed in order to recognize monophyletic genera, based on the results of the most recent molecular phylogeny of the family, as well as the morphological uniformity of characters for each genus. The new nomenclatural combinations correspond to 186 *Amauropelta* taxa, 77 species of *Goniopteris*, and 25 *Steiropteris* taxa. A key to all native Neotropical genera of the family is also presented.

Keywords

Amauropelta, ferns, *Goniopteris*, *Steiropteris*, *Thelypteris*

Introduction

The Thelypteridaceae, comprising approximately 1,000 species, is one of the largest families of ferns (Smith et al. 2006). It has a cosmopolitan distribution, with most species occurring in tropical and subtropical regions (Smith 1992, Smith et al. 2006, 2008). The family is monophyletic as usually construed (Smith and Cranfill 2002, Schuettpelz and Pryer 2007, He and Zhang 2013, and Almeida et al. 2015). However, the classification within the family is controversial, with authors recognizing different numbers of genera: 32 (Pichi Sermolli 1977), 25 (Holttum 1971, 1982, Old World only), 20 (Ching 1978), 5 (Smith 1990a, Smith et al. 2006, 2008), or only one (Morton 1969, Tryon and Tryon 1982).

Recent molecular phylogenetic studies have recovered two main groups in the family: the phegopteroid and the thelypteroid lineages (Smith and Cranfill 2002, He and Zhang 2012, and Almeida et al. 2015). The phegopteroid lineage includes two paleotropical genera, *Macrothelypteris* (H.Itô) Ching (*ca.* 10 spp.), *Pseudophegopteris* Ching (*ca.* 20 spp.), and one north-temperate genus, *Phegopteris* Fée (4 spp.). In the thelypteroid lineage, *Thelypteris s.s.* (*Thelypteris palustris* Schott, *T. confluens* (Thunb.) C.V.Morton) is the basal group and sister to a clade that includes all other non-phegopteroid Thelypteridaceae. This confirms the status of *Thelypteris s.s.* as a small, isolated segregate genus of two species. The sister group to *Thelypteris s.s*. comprises two well supported, much larger clades: the amauropeltoid clade, comprising the genera *Amauropelta* Kunze, *Parathelypteris* (H. Itô) Ching, *Coryphopteris* Holttum, and *Metathelypteris* (H.Itô) Ching, and the cyclosoroid clade, comprising several genera from the Old World and the New World (He and Zhang 2012, and Almeida et al. 2015). Inside the cylosoroid clade, several groups in the Paleotropics are still ill-defined and probably not monophyletic (He and Zhang 2012, Almeida et al. 2015). Thus, the current infrafamilial classification for Thelypteridaceae is not in accordance with growing phylogenetic evidence and principles of monophyly.

The following native Neotropical genera of Thelypteridaceae are recognized: *Amauropelta*, *Christella* Lév. (a more precise circumscription still pending), *Cyclosorus* Link, *Goniopteris* (C.Presl) Duek., *Meniscium* Schreber, *Stegnogramma* Blume, *Steiropteris* C.Chr., and *Thelypteris* Schmidel, based on the recent molecular phylogenetic data for this family (Almeida et al. 2015) and the morphological uniformity recognized in previously proposed classifications (Holttum 1971, Pichi Sermolli 1977, Smith 1980, 1990a). With the exception of *Amauropelta* and *Thelypteris*, the other six genera belong to the cyclosoroid clade. In the most recent published floras for Neotropical areas, these monophyletic groups of Thelypteridaceae were treated as subgenera of *Thelypteris*. In the most recent fern classifications (Smith 1990a; Smith et al. 2006, 2008; Christenhusz et al. 2011), *Amauropelta* was treated within the genus *Thelypteris*, and *Christella*, *Cyclosorus*, *Goniopteris*, *Meniscium*, and *Steiropteris* within the genus *Cyclosorus*.

Utilizing our most recent results on molecular phylogeny of the family (Almeida et al. 2015), the monophyletic genera accepted here have strong support. They are also easily defined morphologically by characters in the key below.

Amauropelta, predominantly Neotropical, is most closely related to several Old World genera: *Coryphopteris*, *Metathelypteris*, and *Parathelypteris*. *Amauropelta* is recognized mainly by the laminar base usually gradually or abruptly reduced with one to many pairs of auriculiform or glanduliform pinnae, and by the veins from adjacent segments usually meeting the blade margins above the sinuses on pinnatifid pinnae.

Our results (Almeida et al. 2015) confirm that *Steiropteris* is monophyletic and sister to all remaining cyclosoroid genera except *Stegnogramma*. These results include an interesting novelty: *Thelypteris polypodioides* (Raddi) C.F.Reed and *T. villosa* (Link) C.F.Reed, from southern Brazil (previously *incertae sedis*), nest in *Steiropteris* with strong support. These two species were treated by Christensen (1913) as belonging to *Dryopteris* subg. *Leptogramma* (J.Sm.) C.Chr. (= *Stegnogramma*).

Goniopteris has long been recognized as a natural group (Christensen 1913, Tryon and Tryon 1982, Smith 1990a). It is also monophyletic (Smith and Cranfill 2002, Schuettpelz and Pryer 2007) and has been accorded generic status, e.g., by Copeland (1947), Brade (1972) and Pichi Sermolli (1977). The presence of furcate or stellate hairs on the blades and/or rhizome apex scales is a useful diagnostic character for *Goniopteris* (Salino 2002), but this character has apparently been secondarily lost in a few species: *G. mollis* Fée (Mexico and Central America; Mickel and Smith 2004; Smith 1995a), *G. macrotis* (Hook.) Pic.Serm., *G. semihastata* (Kunze) Salino & T.E.Almeida (both endemic to Peru; Smith 1992), *G. holodictya* (K.U.Kramer) Salino & T.E.Almeida (French Guiana; Smith 1993), and *G. clypeata* (Maxon & C.V.Morton) Salino & T.E.Almeida (Panama, Peru; Smith 1995a, and Colombia).

The narrow circumscription of *Cyclosorus* used here has already been adopted by some authors (e.g., Pichi Sermolli 1977, Holttum 1971, 1982). This clade (pantropical, with two species, only one of which, *C. interruptus* (Willd.) H.Itô, occurs in the Neotropics) is supported as monophyletic in the results of our molecular phylogeny (Almeida et al. 2015). Most native species previously considered in *Thelypteris* subg. *Cyclosorus* (Link) C.V.Morton in some floras (Mickel and Beitel 1988, Mickel and Smith 2004, Proctor 1977, 1985, 1989, Salino and Semir 2002, Smith 1981a,b, 1983, 1988, 1992, 1995a,b) are now treated in the genus *Christella*, as done by Pichi Sermolli (1977) and Holttum (1974, 1982). However, it appears likely that *Christella* sensu Holttum is not monophyletic (see Smith and Cranfill 2002; Schuettpelz and Pryer 2007; He and Zhang 2012).

Following Smith (1990a) and Smith et al. (2006, 2008), Mazumdar and Mukhopadhyay (2013) proposed new combinations in *Cyclosorus* for many species nested in the cyclosoroid clade. However, if this clade is to be considered as a single genus, the oldest generic name is *Meniscium* (Schreber 1791). In order to retain all the names recombined by Mazumdar and Mukhopadhyay (2013), Mazumdar (2015) subsequently proposed conservation of *Cyclosorus* against *Meniscium*. However, we believe conservation is unnecessary, because the cyclosoroid clade, considered by Mazumdar (2015) as a genus, corresponds to at least 10 genera according to recent molecular phylogenetic results (Almeida et al. 2015). We think it preferable that *Cyclosorus sensu stricto* be construed as comprising only two species (see above). At the same time, we interpret phylogenetic evidence to best support *Meniscium* as a genus comprising 26 species (Fernandes et al. 2014).

Meniscium, wholly Neotropical, appears to be monophyletic and more closely related to *Cyclosorus s.s.* (*Cyclosorus interruptus*), *Mesophlebium* Holttum, and *Ampelopteris* Kunze (Almeida et al. 2015). *Meniscium* is morphologically uniform and characterized by short-creeping rhizomes, pinnate leaves each with a conform apical pinna, and by regularly anastomosing veins resulting in parallel rows of areoles that include either a single free vein or a bisecting vein. Fernandes et al. (2014) made five new combinations for *Meniscium* species; combinations are already available for other recognized menisciums. Similarly, combinations are available for 38 species of *Amauropelta*, for nearly 40 species of *Goniopteris*, as well as for nine species of *Steiropteris*. New combinations in *Amauropelta*, *Goniopteris*, and *Steiropteris* are established for most

remaining Neotropical species, those that appear commonly recognized in existing floras and monographs. We refrain from addressing further *Christella* sensu Holttum in the Neotropics, because (as mentioned above) existing evidence suggests that it is not monophyletic – most of the neotropical species (sect. *Pelazoneuron* Holttum) appear to comprise a clade separate from the paleotropical species (sect. *Christella*). However, sampling of *Christella* in both the Old World and New World, as well as affiliated cyclosoroid genera circumscribed by Holttum (1982) in the Paleotropics, is still far too meager to construct a viable taxonomy.

Key to the native Neotropical Thelypteridaceae genera

1 Forked or stellate hairs present at least on the rachises and costae, and/or on the scales at apices of rhizomes, and may be present in other parts of the frond ..... ***Goniopteris***

– All hairs unbranched (hairs fasciculate, i.e., basally clustered, in some species of *Amauropelta*)

2 Laminae 1-pinnate, rarely simple; pinnae entire or with an serrate or undulate margin, rarely shallowly lobed; veins regularly anatomosing, areoles 3–25-seriate between costae and pinna margins **3**

– Laminae 1-pinnate-pinnatifid, rarely 2-pinnate; pinnae incised 1/3 their width or more; veins meeting the margins above sinuses, or connivent at sinuses, or with 1 or 2 pairs of anastomosing below sinuses..... **4**

3 Sori usually in a single row between adjacent costules (except *Meniscium andreanum*, which often has a double row of sori between main lateral veins), oblong or linear, rarely round; sori exindusiate ..... ***Meniscium***

– Sori usually in a double row between adjacent costules, usually round (except *G. holodictya*, which sometimes has only one row of somewhat elongate sori between costules); sori indusiate (indusial may be small, or hidden in mature sori!) or exindusiate..... ***Goniopteris***

4 Sporangia setose; sori elongate, exindusiate..... **5**

– Sporangia not setose, or if setose (in eight species of *Amauropelta*) then sori round; sori round, oblong, or rarely elongate; sori indusiate or exindusiate... **6**

5 Pinnae broadly adnate and decurrent onto rachises in the distal half of laminae; proximal pinnae not cuneate at bases..... ***Stegnogramma*** (***S. pilosa, S. burksiorum***)

– Pinnae neither adnate nor decurrent onto rachises, sometimes one distal pair adnate to rachises; proximal pinnae short- to long-cuneate at bases..... ***Steiropteris*** (***S. polypodioides, S. villosa***)

6 Laminae with all veins usually meeting margins above the sinuses **7**

– Laminae with at least some of the proximal veins running to the sinuses or forming an excurrent vein to the sinuses..... **9**

7 Laminae narrowed proximally with (1-) 2–20 pairs of greatly reduced pinnae, the proximal pinnae usually auriculiform or glanduliform, rarely proximal pinnae not reduced ..... ***Amauropelta***

– Laminae usually not narrowed proximally, or only slightly so, usually lacking greatly reduced pinnae **8**

8 Rhizomes long-creeping; laminae 1-pinnate-pinnatifid to 2-pinnate; veins of sterile laminae 1- or 2-forked, sometimes simple in the fertile laminae.... ***Thelypteris***

– Stems ascending to erect, rarely short-creeping; laminae 1-pinnate-pinnatifid; veins of sterile and fertile laminae simple .. *Steiropteris* (subg. *Glaphyropteris*)

9 Rhizomes long-creeping to 3 m or more, blackish, scaleless or nearly so .... ***Cyclosorus***

– Rhizomes short-creeping to ascending or erect, light brown, with conspicuous scales, at least at apices **10**

10 Cartilaginous keel (false vein) present below pinna sinuses, keels extending toward costa but not meeting it; aerophores (tuberculate or often threadlike) at pinna bases usually present, absent in a few species; indusia present or absent ..... ***Steiropteris* (subg. *Steiropteris*)**

– Cartilaginous keel absent below pinna sinuses; aerophores at pinna bases absent; indusia present, persistent ..... ***Christella***

New combinations

The names proposed as needing new combinations were obtained from taxonomic and floristic sources such as floras, monographs, or isolated published papers. All names were checked in IPNI.ORG and TROPICOS.ORG. The main floras consulted were ones for Mexico (Smith 1981a, 1988; Mickel and Beitel 1988, Mickel and Smith 2004), Lesser Antilles (Proctor 1977), Jamaica (Proctor 1985), Puerto Rico and the Virgin Islands (Proctor 1989), Cuba (Sánchez et al 2006), Mesoamerica (Smith 1995a), Guatemala (Smith 1981b), Venezuela (Vareschi 1969; Smith 1995b), Guianas (Smith 1993), Ecuador (Smith 1983), Peru (Smith 1992), Argentina (Ponce 1987), and from Brazil (Brade 1971, Sehnem 1979, Salino and Semir 2002, 2003, 2004, Ponce 2007, Salino and Almeida 2010). The monographs of reference were the works of Christensen (1907, 1913, 1920) and Smith (1980). In addition, the following works describing new species were consulted: Smith and Lellinger (1985), Smith (1990b), Salino (2002), Salino and Melo (2000), Smith and Kessler (2008), Matos et al. (2010), and Salino et al. (2011, 2014). The authorship of new combinations was established as follows: species in Venezuela are credited to Alan R. Smith; Alexandre Salino and Thais Elias Almeida are credited with authorship of the remaining species. We choose to cite only the basionym and the name in *Thelypteris* (when available) for all new combinations; this avoids citation of the often extensive synonymy, information that is available in many recent floristic and taxonomic studies.

New combinations in *Amauropelta*

***Amauropelta achalensis* (Hieron.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151259-1
Aspidium achalense Hieron., Bot. Jahrb. Syst. 22: 371. 1896.
Thelypteris achalensis (Hieron.) Abbiatti, Darwiniana 13: 566. 1964.

***Amauropelta aculeata* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150878-1
Thelypteris aculeata A.R.Sm., Fl. Ecuador 18: 15. F. 1A, 1B. 1983.

***Amauropelta acunae* (C.Sánchez & Zavaro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150879-1
Thelypteris acunae C.Sánchez & Zavaro, Fontqueria 31: 223. f.1. 1991.

***Amauropelta aliena* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150880-1
Dryopteris aliena C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16: 23. 1937.

***Amauropelta altitudinis* (Ponce) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151260-1
Thelypteris altitudinis Ponce, Darwiniana 28 (1-4): 345. 1987.

***Amauropelta amambayensis* (Ponce) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151261-1
Thelypteris amambayensis Ponce, Candollea 55: 310.

***Amauropelta amphioxypteris* (Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150881-1
Nephrodium amphioxypteris Sodiro, Recens. Crypt. Vasc. Quit. 51. 1883.
Thelypteris amphioxypteris (Sodiro) A.R.Sm., Fl. Ecuador 18: 17. 1983.

***Amauropelta andicola* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150882-1
Thelypteris andicola A.R.Sm., Fieldiana, Bot., n.s., 29: 16. 1992.

***Amauropelta appressa* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150883-1
Thelypteris appressa A.R.Sm., Fl. Ecuador 18: 19. 1983.

***Amauropelta araucariensis* (Ponce) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150884-1
Thelypteris araucariensis Ponce, Darwiniana 33: 270. 1995.

***Amauropelta arborea* (Brause) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151262-1
Dryopteris arborea Brause, Repert. Spec. Nov. Regni Veg. 13: 294. 1914.
Thelypteris arborea (Brause) A.R.Sm., Acta Bot. Venez. 14 (3): 7. 1984.

***Amauropelta arenosa* (A.R.Sm.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150885-1
Thelypteris arenosa A.R.Sm., Fl. Ecuador 18: 21. 1983.

***Amauropelta argentina* (Hieron.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151263-1
Aspidium argentinum Hieron., Bot. Jahrb. Syst. 22: 367. 1896.
Thelypteris argentina (Hieron.) Abbiatti, Revista Mus. La Plata, Secc. Bot. 9 (36-37): 19. 1958.

***Amauropelta arrecta* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150886-1
Thelypteris arrecta A.R.Sm., Fieldiana, Bot., n.s., 29: 36. 1992.

***Amauropelta atrorubens* (Mett. ex Kuhn) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151264-1
Aspidium atrorubens Mett. ex Kuhn, Linnaea 36. 112. 1869.
Thelypteris atrorubens (Mett. ex Kuhn) A.R.Sm., Fieldiana, Bot., n.s. 29: 24. 1992.

***Amauropelta atrovirens* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150887-1
Dryopteris atrovirens C.Chr., Bull. Herb. Boissier, sér. 2, 7 (4): 263. 1907.
Thelypteris atrovirens (C.Chr.) C.F.Reed, Phytologia 17 (4): 261. 1968.

***Amauropelta aymarae* (A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150888-1
Thelypteris aymarae A.R.Sm. & M.Kessler, Brittonia 60 (1): 49. 2008.

***Amauropelta balbisii* (Spreng.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150889-1
Polypodium balbisii Spreng., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 10: 228. 1821.
Thelypteris balbisii (Spreng.) Ching, Bull. Fan Mem. Inst. Biol. 10: 250. 1941.

***Amauropelta barvae* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150890-1
Thelypteris barvae A.R.Sm., Ann. Missouri Bot. Gard. 77 (1): 118. f. 2A-C. 1990.

Amauropelta basisceletica **(C.Sánchez, Caluff & O.Alvarez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151265-1
Thelypteris basisceletica C.Sánchez, Caluff & O.Alvarez, Amer. Fern J. 95 (1): 30. f. 1. 2005.

Amauropelta binervata **(A.R.Sm.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150891-1
Thelypteris binervata A.R.Sm., Acta Bot. Venez. 14 (3): 6. 1984.

Amauropelta bonapartii **(Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151266-1
Dryopteris bonapartii Rosenst., Repert. Spec. Nov. Regni Veg. 7: 303–304. 1909.
Thelypteris bonapartii (Rosenst.) Alston, J. Wash. Acad. Sci. 48: 233.1958.

Amauropelta brachypoda **(Baker) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150892-1
Nephrodium brachypodum Baker, Timehri 5: 213. 1886.
Thelypteris brachypoda (Baker) C.V.Morton, Fieldiana, Bot. 28: 10. 1951.

Amauropelta brachypus **(Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150893-1
Nephrodium brachypus Sodiro, Recens. Crypt. Vasc. Quit. 43. 1883.
Thelypteris brachypus (Sodiro) R.M.Tryon & A.F.Tryon, Rhodora 84: 128. 1982.

Amauropelta brausei **(Hieron.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150894-1
Dryopteris brausei Hieron., Hedwigia 46: 337, t. 6, f. 11. 1907.
Thelypteris brausei (Hieron.) Alston, J. Wash. Acad. Sci. 48: 233. 1958.

Amauropelta burkartii **(Abbiatti) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150895-1
Thelypteris burkartii Abbiatti, Darwiniana 13: 550, f. 4, t. 2. 1964.

Amauropelta campii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151267-1
Thelypteris campii A.R.Sm., Fl. Ecuador 18: 27. 1983.

Amauropelta canadasii **(Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150896-1
Nephrodium canadasii Sodiro, Recens. Crypt. Vasc. Quit. 48. 1883.
Thelypteris canadasii (Sodiro) Alston, J. Wash. Acad. Sci 48: 234. 1958.

***Amauropelta caucaensis* (Hieron.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151268-1
Nephrodium caucaense Hieron., Bot. Jahrb. Syst. 34: 444. 1904.
Thelypetris caucaensis (Hieron.) Alston, J. Wash. Acad. Sci 48: 233. 1958.

***Amauropelta chaparensis* (A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150897-1
Thelypteris chaparensis A.R.Sm. & M.Kessler, Brittonia 60 (1): 51. 2008.

***Amauropelta chiriquiana* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150898-1
Thelypteris chiriquiana A.R.Sm., Ann. Missouri Bot. Gard. 77 (1): 120. f. 3A-C. 1990.

***Amauropelta christensenii* (Christ ex C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151269-1
Dryopteris christensenii Christ ex C.Chr., Bull. Herb. Boissier, sér. 2, 7 (4): 263. 1907.
Thelypteris christensenii (Christ ex C.Chr.) C.F.Reed, Phytologia 17 (4): 267. 1968.

***Amauropelta cinerea* (Sodiro) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150900-1
Nephrodium cinereum Sodiro, Sert. Fl. Ecuad. II. 26. 1908.
Thelypteris cinerea (Sodiro) A.R.Sm., Phytologia 34: 233. 1976.

***Amauropelta cochaensis* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150901-1
Dryopteris cochaensis C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 152. 1913.

***Amauropelta cocos* (A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150904-1
Thelypteris cocos A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98 (4): 918. f. 3. 1985.

***Amauropelta comptula* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150906-1
Thelypteris comptula A.R.Sm., Fieldiana, Bot., n.s., 29: 23. 1992.

***Amauropelta conformis* (Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150908-1
Nephrodium conforme Sodiro, Recens. Crypt. Vasc. Quit. 45. 1883.
Thelypteris conformis (Sodiro) A.R.Sm., Fl. Ecuador 18: 37. 1983.

***Amauropelta consanguinea* (Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150910-1
Aspidium consanguineum Fée, Mém. Foug. 11 (Hist. Foug. Ant.): 76, t. 20, f. 3). 1866.
Thelypteris consanguinea (Fée) Proctor, Rhodora 61 (732): 306. 1959.

***Amauropelta cooleyi* (Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150912-1
Thelypteris cooleyi Proctor, Rhodora 68: 468. 1966.

***Amauropelta corazonensis* (Baker) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151270-1
Nephrodium corazonense Baker, J. Bot. 15: 163. 1877, as *carazanensis*".
Thelypteris corazonensis (Baker) A.R.Sm., Fl. Ecuador 18: 38. 1983.

***Amauropelta cornuta* (Maxon) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150914-1
Dryopteris cornuta Maxon, J. Wash. Acad. Sci. 19 (12): 245. f. 1. 1929.
Thelypteris cornuta (Maxon) Ching, Bull. Fan Mem. Inst. Biol. 10: 251. 1941.

***Amauropelta correllii* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150916-1
Thelypteris correllii A.R.Sm., Fl. Ecuador 18: 39. 1983.

***Amauropelta crassiuscula* (C.Chr. & Maxon) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150917-1
Dryopteris crassiuscula C.Chr. & Maxon, Amer. Fern J. 23: 75. 1933.
Thelypteris crassiuscula (C.Chr. & Maxon) Lellinger, Amer. Fern J. 67(2): 60. 1977.

***Amauropelta ctenitoides* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150920-1
Thelypteris ctenitoides A.R.Sm., Fieldiana, Bot., n.s., 29: 37. 1992.

***Amauropelta decrescens* (Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151271-1
Thelypteris decrescens Proctor, Amer. Fern J. 71(2): 57. 1981.

***Amauropelta decurtata* (Link) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151422-1
Asplenium decurtatum Link Fil. sp. 94. 1841.

***Amauropelta deflectens* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150922-1
Dryopteris deflectens C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 25, t. 3, f. 9-11. 1937.

Amauropelta delasotae **(A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150924-1
Thelypteris delasotae A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 919. f. 5. 1985.

Amauropelta demissa **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150926-1
Thelypteris demissa A.R.Sm., Fieldiana, Bot., n.s., 29: 21. 1992.

Amauropelta denudata **(C.Sánchez & Caluff) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150928-1
Thelypteris denudata C.Sánchez & Caluff, Willdenowia 35: 159. 2005.

Amauropelta dodsonii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150930-1
Thelypteris dodsonii A.R.Sm., Fl. Ecuador 18: 41. 1983.

Amauropelta dudleyi **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150932-1
Thelypteris dudleyi A.R.Sm., Fieldiana, Bot., n.s., 29: 33. 1992.

Amauropelta elegantula **(Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150933-1
Nephrodium elegantulum Sodiro, Crypt. Vasc. Quit. 243. 1893.
Thelypteris elegantula (Sodiro) Alston, J. Wash. Acad. Sci. 48: 233. 1958.

Amauropelta enigmatica **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150936-1
Thelypteris enigmatica A.R.Sm., Fieldiana, Bot., n.s., 29: 16. 1992.

Amauropelta eriosorus **(Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151278-1
Aspidium eriosorus Fée, Crypt. Vasc. Brésil, 2. 73. T. 101. 1873.
Thelypteris eriosorus (Fée) Ponce (as *T. eriosora*), Novon 8: 275. 1998.

Amauropelta euchlora **(Sodiro) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150938-1
Polypodium euchlorum Sodiro, Recens. Crypt. Vasc. Quit. 58. 1883.
Thelypteris euchlora (Sodiro) C.F.Reed, Phytologia 17(4): 275. 1968.

Amauropelta euthythrix **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150940-1
Thelypteris euthythrix A.R.Sm., Fl. Ecuador 18: 44. 1983.

Amauropelta exuta **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151279-1
Thelypteris exuta A.R.Sm., Fl. Ecuador 18: 44. 1983.

Amauropelta fasciola **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150942-1
Thelypteris fasciola A.R.Sm. & M.Kessler, Brittonia 60 (1): 51. 2008.

Amauropelta fayorum **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150944-1
Thelypteris fayorum A.R.Sm. & M.Kessler, Brittonia 60(1): 53. 2008.

Amauropelta firma **(Baker ex Jenman) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150946-1
Nephrodium firmum Baker ex Jenman., J. Bot. 17: 260. 1879.
Thelypteris firma (Baker ex Jenman) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 60. 1953.

Amauropelta fluminalis **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150948-1
Thelypteris fluminalis A.R.Sm., Fl. Ecuador 18: 46. 1983.

Amauropelta frigida **(Christ) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150949-1
Aspidium frigidum Christ, Bull. Herb. Boissier, sér. 2., 6: 160. 1906.
Thelypteris frigida (Christ) A.R.Sm. & Lellinger, Amer. Fern J. 75(1): 31. 1985.

Amauropelta funckii **(Mett.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150952-1
Aspidium funckii Mett., Ann. Sci. Nat., Bot., sér. 5, 2: 246. 1864.
Thelypteris funckii (Mett.) Alston, J. Wash. Acad. Sci. 48: 233. 1958.

Amauropelta furfuracea **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150954-1
Thelypteris furfuracea A.R.Sm., Fieldiana, Bot., n.s., 29: 34. 1992.

Amauropelta furva **(Maxon) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150956-1
Dryopteris furva Maxon, J. Wash. Acad. Sci. 34: 24. 1944.
Thelypteris furva (Maxon) R.M.Tryon, Rhodora 69: 6. 1977.

Amauropelta germaniana **(Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150958-1
Phegopteris germaniana Fée, Mém. Foug. 11 (Hist. Foug. Ant.): 55. 1866.
Thelypteris germaniana (Fée) Proctor, Rhodora 61: 306. 1959.

***Amauropelta glandulosolanosa* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150960-1
Dryopteris glandulosolanosa C.Chr., Dansk Bot. Ark. 9(3): 61. 1937.
Thelypteris glandulosolanosa (C.Chr.) R.M.Tryon, Rhodora 69: 6. 1967.

***Amauropelta glutinosa* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150962-1
Dryopteris glutinosa C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 18. 1937.
Thelypteris glutinosa (C.Chr.) C.V.Morton, Amer. Fern J. 53(2): 66. 1963.

***Amauropelta gomeziana* (A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150964-1
Thelypteris gomeziana A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 921. f 6. 1985.

***Amauropelta gracilenta* (Jenman) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150965-1
Polypodium gracilentum Jenman, Bull. Bot. Dept. Jamaica 4. 129. 1897.
Thelypteris gracilenta (Jenman) Proctor, Amer. Fern J. 71(2): 60. 1981.

***Amauropelta gracilis* (Heward) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150968-1
Gymnogramma gracilis Heward, Mag. Nat. Hist., n.s, 2: 457. 1838.
Thelypteris gracilis (Heward) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 60. 1953.

***Amauropelta grayumii* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150970-1
Thelypteris grayumii A.R.Sm., Ann. Missouri Bot. Gard. 77(1): 122. f 2D-E. 1990.

***Amauropelta harrisii* (Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151280-1
Thelypteris harrisii Proctor, Amer. Fern J. 71: 59. 1981.

***Amauropelta hastiloba* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150972-1
Dryopteris hastiloba C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 20. t 4, f 4-5. 1937.

***Amauropelta heineri* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150974-1
Dryopteris heineri C.Chr., Repert. Spec. Nov. Regni Veg. 6: 380. 1909.
Thelypteris heineri (C.Chr.) C.F.Reed, Phytologia 17(4): 282. 1968.

Amauropelta hutchisonii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150976-1
Thelypteris hutchisonii A.R.Sm., Fieldiana, Bot., n.s., 29: 29. 1992.

Amauropelta hydrophila **(Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150978-1
Phegopteris hydrophila Fée, Mém. Foug. 11 (Hist. Foug. Ant.): 56. pl 13, f 3. 1866.
Thelypteris hydrophila (Fée) Proctor, Rhodora 61: 306. 1959.

Amauropelta illicita **(Christ) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150980-1
Dryopteris illicita Christ, Bull. Soc. Bot. Genève sér. 2, 1(5): 225. 1909.
Thelypteris illicita (Christ) C.F.Reed, Phytologia 17(4) : 284. 1968.

Amauropelta inabonensis **(Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151281-1
Thelypteris inabonensis Proctor, Amer. Fern J. 75(2): 61. f 3. 1985.

Amauropelta inaequans **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150981-1
Dryopteris euchlora (Sodiro) C.Chr. var. *inaequans* C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 150. 1913.
Thelypteris inaequans (C.Chr.) Lellinger, Amer. Fern J. 67(2): 60. 1977.

Amauropelta inaequilateralis **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150984-1
Thelypteris inaequilateralis A.R.Sm. & M.Kessler, Brittonia 60(1): 53. 2008.

Amauropelta insignis **(Mett.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151282-1
Aspidium insigne Mett., Ann. Sci. Nat., Bot., sér. 5, 2: 247. 1864.
Thelypteris insignis (Mett.) Ching, Bull. Fan Mem. Inst. Biol. 10: 242. 1941.

Amauropelta intromissa **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150986-1
Dryopteris intromissa C.Chr., Kungl. Svenska Vetenskapsakad. Handl., ser. 3., 16(2): 22. t 4, f 9-10. 1937.

Amauropelta ireneae **(Brade) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150988-1
Dryopteris ireneae Brade, Sellowia 17: 57. f 4. 1965.
Thelypteris ireneae (Brade) Lellinger, Amer. Fern. J. 74(2): 60. 1984.

Amauropelta jimenezii **(Maxon & C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151283-1
Dryopteris jimenezii Maxon & C.Chr., Amer. Fern J. 4: 79. 1914.
Thelypteris jimenezii (Maxon & C.Chr.) C.F.Reed, Phytologia 17(4): 285. 1968.

Amauropelta juergensii **(Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150990-1
Nephrodium juergensii Rosenst., Festschrift Albert von Bamberg 63. 1905.
Thelypteris juergensii (Rosenst.) C.F.Reed, Phytologia 17(4): 286. 1968.

Amauropelta jujuyensis **(de la Sota) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150992-1
Thelypteris jujuyensis de la Sota, Darwiniana 18: 222. f 3, 8c. 1973.

Amauropelta laevigata **(Mett. ex Kuhn) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150994-1
Phegopteris laevigata Mett. ex Kuhn, Linnaea 36. 112. 1869.
Thelypteris laevigata (Mett. ex Kuhn) R.M.Tryon, Rhodora 69: 6. 1967.

Amauropelta leoniae **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77150996-1
Thelypteris leoniae A.R.Sm., Fieldiana, Bot., n.s., 29: 18. 1992.

Amauropelta lepidula **(Hieron.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77150997-1
Dryopteris lepidula Hieron., Hedwigia 46. 328, t. 4, f. 4. 1907.
Thelypteris lepidula (Hieron.) Alston, J. Wash. Acad. Sci. 48: 233. 1958.

Amauropelta longicaulis **(Baker) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151000-1
Nephrodium longicaule Baker, J. Bot. 19: 204. 1881.
Thelypteris longicaulis (Baker) C.F.Reed, Phytologia 17(4): 289. 1968.

Amauropelta longipilosa **(Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151284-1
Nephrodium longipilosum Sodiro, Anales Univ. Central Quito Ecuador 22(160): 103. 1908.
Thelypteris longipilosa (Sodiro) C.F.Reed, Phytologia 17(4): 290. 1968.

Amauropelta longisora **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151002-1
Thelypteris longisora A.R.Sm., Ann. Missouri Bot. Gard. 77(1): 123. f 3D-E. 1990.

Amauropelta loreae **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151003-1
Thelypteris loreae A.R.Sm., Mem. New York Bot. Gard. 88: 629–630. f 303A-E, 2004.

Amauropelta loretensis **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151006-1
Thelypteris loretensis A.R.Sm., Fieldiana, Bot., n.s., 29: 30. 1992.

Amauropelta lumbricoides **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151008-1
Thelypteris lumbricoides A.R.Sm. & M.Kessler, Brittonia 60(1): 54. 2008.

Amauropelta macra **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151010-1
Thelypteris macra A.R.Sm., Fl. Ecuador 18: 54. 1983.

Amauropelta madidiensis **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151012-1
Thelypteris madidiensis A.R.Sm. & M.Kessler, Brittonia 60(1): 54. 2008.

Amauropelta malangae **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151014-1
Dryopteris malangae C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 21. t. 4(6–8). 1937.
Thelypteris malangae (C.Chr.) C.V.Morton, Amer. Fern J. 53(2): 66. 1963.

Amauropelta melanochlaena **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151285-1
Dryopteris melanochlaena C.Chr., Smithsonian Misc. Collect. 52(3): 384. 1909.
Thelypteris melanochlaena (C.Chr.) C.F.Reed, Phytologia 17(4): 292. 1968.

Amauropelta mertensioides **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151016-1
Dryopteris mertensioides C.Chr., Kongel. Danske.Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 328, f. 50. 1907.
Thelypteris mertensioides (C.Chr.) C.F.Reed, Phytologia 17(4): 292. 1968.

Amauropelta metteniana **(Ching) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151017-1
Thelypteris metteniana Ching, Bull. Fan mem. Inst. Biol. 10: 252. 1941.

Amauropelta micula **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151020-1
Thelypteris micula A.R.Sm., Fieldiana, Bot., n.s., 29: 33. 1992.

Amauropelta minima **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151022-1
Thelypteris minima A.R.Sm. & M.Kessler, Brittonia 60(1): 55. 2008.

Amauropelta minutula **(C.V.Morton) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151024-1
Thelypteris minutula C.V.Morton, Amer. Fern J. 43(4): 173. 1953.

Amauropelta mombachensis **(L.D.Gómez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151286-1
Thelypteris mombachensis L.D.Gómez, Phytologia 52(3): 155–156. 1982.

Amauropelta mortonii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151026-1
Thelypteris mortonii A.R.Sm., Amer. Fern J. 63(3): 125. f 11. 1973.

Amauropelta mosenii **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151287-1
Dryopteris mosenii C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 300. f 27. 1907.
Thelypteris mosenii (C.Chr.) C.F.Reed, Phytologia 17(4): 294. 1968.

Amauropelta muscicola **(Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151028-1
Thelypteris muscicola Proctor, Rhodora 63: 33. 1961.

Amauropelta namaphila **(Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151030-1
Thelypteris namaphila Proctor, Amer. Fern J. 75(2): 56. f 1. 1985.

Amauropelta neglecta **(Brade & Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151032-1
Dryopteris neglecta Brade & Rosenst., Bol. Mus. Nac. Rio de Janeiro 7(3): 142, t.1, f 3, t. 7. 1931.
Thelypteris neglecta (Brade & Rosenst.) Ching, Bull. Fan Mem. Inst. Biol. Bot. 10: 253. 1941.

Amauropelta negligens **(Jenman) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151033-1
Nephrodium negligens Jenman, Bull. Bot. Dept. 3: 21. 1896.
Thelypteris negligens (Jenman) Proctor, Amer. Fern J. 71(2): 58. 1981.

Amauropelta nephelium **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151036-1
Thelypteris nephelium A.R.Sm. & M.Kessler, Brittonia 60(1): 57. 2008.

Amauropelta nitens **(Desv.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151038-1
Polypodium nitens Desv., Mém. Soc. Linn. Paris 6: 240. 1827.
Thelypteris nitens (Desv.) R.M.Tryon, Rhodora 69(777): 7. 1967.

Amauropelta novaeana **(Brade) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151288-1
Dryopteris novaeana Brade, Arq. Inst. Biol. Veg. 3: 2, t. 2, 4(4-6), 6(4-5). 1936.
Thelypteris novaena (Brade) Ponce, Novon 8(3): 275. 1998.

Amauropelta nubicola **(de la Sota) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151040-1
Thelypteris nubicola de la Sota, Darwiniana 18: 225. pl 4, 8b. 1973.

Amauropelta nubigena **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151042-1
Thelypteris nubigena A.R.Sm., Proc. Calif. Acad. Sci., ser. 4, 40(8): 229. f 7C. 1975.

Amauropelta oaxacana **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151044-1
Thelypteris oaxacana A.R.Sm., Amer. Fern J. 63(3): 125. f 7-8. 1973.

Amauropelta ophiorhizoma **(A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151046-1
Thelypteris ophiorhizoma A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 925. f 8. 1985.

Amauropelta oviedoae **(C.Sánchez & Zavaro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151048-1
Thelypteris oviedoae C.Sánchez & Zavaro, Fontqueria 31: 225. f 2. 1991.

Amauropelta pachyrhachis **(Kunze ex Mett.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151289-1
Aspidium pachyrhachis Kunze ex Mett., Abh. Senckenberg. Naturf. Ges. 2: 367. 1858.
Thelypteris pachyrhachis (Kunze ex Mett.) Ching, Bull. Fan Mem. Inst. Biol. 10: 253. 1941.

***Amauropelta paleacea* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151049-1
Thelypteris paleacea A.R.Sm., Fl. Ecuador 18: 62. 1983.

***Amauropelta patula* (Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151052-1
Gymnogramma patula Fée, Crypt. vasc. Brésil 1: 59, t. 14, f. 3. 1869.

***Amauropelta pavoniana* (Klotzsch) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151054-1
Polypodium pavonianum Klotzsch, Linnaea 20. 386. 1847.
Thelypteris pavoniana (Klotzsch) R.M.Tryon, Rhodora 69(777): 7. 1967.

***Amauropelta pelludia* (A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151056-1
Thelypteris pelludia A.R.Sm. & M.Kessler, Brittonia 60(1): 58. 2008.

***Amauropelta peradenia* (A.R.Sm.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151058-1
Thelypteris peradenia A.R.Sm., Ann. Missouri Bot. Gard. 77(2): 272, f. 11. 1990.

***Amauropelta peruviana* (Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151292-1
Dryopteris peruviana Rosenst., Repert. Spec. Nov. Regni Veg. 7: 298-299. 1909.
Thelypteris peruviana (Rosenst.) R.M.Tryon, Rhodora 69(777): 7. 1967.

***Amauropelta phacelothrix* (Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151293-1
Dryopteris phacelothrix Rosenst., Repert. Spec. Nov. Regni Veg. 11: 56. 1912.
Thelypteris phacelothrix (Rosenst.) R.M.Tryon, Rhodora 69(777): 7. 1967.

***Amauropelta physematioides* (Kuhn & Christ ex Krug) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151060-1
Aspidium physematioides Kuhn & Christ ex Krug, Bot. Jahrb. Syst. 24: 115. 1897.
Thelypteris physematioides (Kuhn & Christ ex Krug) C.V.Morton, Amer. Fern J. 43(4): 174. 1953.

***Amauropelta piedrensis* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151294-1
Dryopteris piedrensis C.Chr., Smithsonian Misc. Collect. 52: 372. 1909.
Thelypteris piedrensis (C.Chr.) C.V.Morton, Amer. Fern J. 53(2): 69. 1963.

***Amauropelta pilosissima* (C.V.Morton) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151062-1
Thelypteris pilosissima C.V.Morton, Fieldiana, Botany 28: 11. 1951.

***Amauropelta pilosohispida* (Hook.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151421-1
Nephrodium pilosohispidum Hook., Spec. Fil. 4: 105. 1862.
Thelypteris pilosohispida (Hook.) Alston, J. Wash. Acad. Sci. 48(7): 233. 1958.

***Amauropelta pleiophylla* (Sehnem) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151295-1
Dryopteris pleiophylla Sehnem, Fl. Ilustr. Catarin. 1(Aspid.): 245. f 61. 1979.
Thelypteris pleiophylla (Sehnem) Ponce, Darwiniana 33(1-4): 270. 1995.

***Amauropelta podotricha* (Sehnem) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151296-1
Dryopteris podotricha Sehnem, Fl. Ilustr. Catarin. 1(Aspid.): 232. f 57. 1979.
Thelypteris podotricha (Sehnem) Ponce, Darwiniana 33(1-4): 270. 1995.

***Amauropelta proboscidea* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151064-1
Thelypteris proboscidea A.R.Sm., Fieldiana, Bot., n.s., 29: 36. 1992.

***Amauropelta proctorii* (A.R.Sm. & Lellinger) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151297-1
Thelypteris proctorii A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 925. f 9. 1985.

***Amauropelta prolatipedis* (Lellinger) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151298-1
Thelypteris prolatipedis Lellinger, Amer. Fern J. 67(2): 60, 1977.
Dryopteris coarctata var. *longipes* C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 292. 1907.

***Amauropelta ptarmiciformis* (C.Chr. & Rosenst. ex Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151065-1
Dryopteris ptarmiciformis C.Chr. & Rosenst. ex Rosenst., Repert. Spec. Nov. Regni Veg. 12: 472. 1913.
Thelypteris ptarmiciformis (C.Chr. & Rosenst. ex Rosenst.) C.F.Reed, Phytologia 17(4): 307. 1968.

***Amauropelta pteroidea* (Klotzsch) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151068-1
Polypodium pteroideum Klotzsch, Linnaea 20. 389. 1847.
Thelypteris pteroidea (Klotzsch) R.M.Tryon, Rhodora 69(777): 8. 1967.

***Amauropelta pusilla* (Mett.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151070-1
Aspidium pusillum Mett., Ann. Sci. Nat., Bot., sér. 5, 2: 245. 1864.
Thelypteris pusilla (Mett.) Ching, Bull. Fan Mem. Inst. Biol. 10: 254. 1941.

***Amauropelta raddii* (Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151072-1
Dryopteris raddii Rosenst., Hedwigia 56: 367. 1915.
Thelypteris raddii (Rosenst.) Ponce, Darwiniana 33(1-4): 266. 1995.

***Amauropelta randallii* (Maxon & C.V.Morton ex C.V.Morton) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151074-1
Thelypteris randallii Maxon & C.V.Morton ex C.V.Morton, Amer. Fern J. 53(2): 69. 1963.

***Amauropelta recumbens* (Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151299-1
Dryopteris recumbens Rosenst., Hedwigia 46. 123. 1906.
Thelypteris recumbens (Rosenst.) C.F.Reed, Phytologia 17: 308. 1968.

***Amauropelta reducta* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151076-1
Dryopteris reducta C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 18, t. 2, f. 1-3. 1937.

***Amauropelta regnelliana* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151300-1
Dryopteris regnelliana C.Chr., Kongel. Danske.Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 284, f. 12. 1907.
Thelypteris regnelliana (C.Chr.) Ponce, Darwiniana 33(1-4): 264. 1995.

***Amauropelta retrorsa* (Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151078-1
Nephrodium retrorsum Sodiro, Recens. Crypt. Vasc. Quit. 51. 1883.
Thelypteris retrorsa (Sodiro) A.R.Sm., Fl. Ecuador 18: 71. 1983.

Amauropelta rheophyta **(Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151080-1
Thelypteris rheophyta Proctor, Amer. Fern J. 75(2): 58. f 2. 1985.

Amauropelta rigescens **(Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151081-1
Nephrodium rigescens Sodiro, Crypt. Vasc. Quit. 239. 1893.
Thelypteris rigescens (Sodiro) A.R.Sm., Fl. Ecuador 18: 72. 1983.

Amauropelta rivularioides **(Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151084-1
Aspidium rivularioides Fée, Crypt. Vasc. Brésil 1: 145, t. 50, f. 1. 1869.
Thelypteris rivularioides (Fée) Abbiatti, Revista Mus. La Plata, Secc. Bot. 9(36-37): 19. 1958.

Amauropelta roraimensis **(Baker) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151301-1
Polypodium roraimense Baker, Timehri 5: 214. 1886.
Thelypteris roraimensis (Baker) C.F.Reed, Phytologia 17(4): 310. 1968.

Amauropelta rosenstockii **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151086-1
Dryopteris rosenstockii C.Chr., Kongel. Danske.Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 4: 304, f. 30. 1907.
Thelypteris rosenstockii (C.Chr.) R.M.Tryon, Rhodora 69(777): 8. 1977.

Amauropelta rosulata **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151088-1
Thelypteris rosulata A.R.Sm. & M.Kessler, Brittonia 60(1): 60. 2008.

Amauropelta rudiformis **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151090-1
Dryopteris rudiformis C.Chr., Univ. Calif. Publ. Bot. 19(9): 305. 1941.
Thelypteris rudiformis (C.Chr.) A.R.Sm., Fl. Ecuador 18: 74. 1983.

Amauropelta rufa **(Poir.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151302-1
Polypodium rufum Poir., Encycl. 5: 532. 1804.
Thelypteris rufa (Poir.) A.R.Sm. Fl. Ecuador 18: 77. 1983.

Amauropelta ruiziana **(Klotzsch) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151092-1
Polypodium ruizianum Klotzsch, Linnaea 20: 385. 1847.
Thelypteris ruiziana (Klotzsch) A.R.Sm. Fieldiana, Bot., n.s. 29: 35. 1992.

***Amauropelta rupestris* (Klotzsch) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151094-1
Leptogramma rupestris Klotzsch, Linnaea 20. 415. 1847.
Thelypteris rupestris (Klotzsch) C.F.Reed, Phytologia 17(4): 310. 1968.

***Amauropelta rupicola* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151303-1
Dryopteris rupicola C.Chr., Repert. Spec. Nov. Regni Veg. 15: 24. 1917.
Thelypteris rupicola (C.Chr.) Ching, Bull. Fan Mem. Inst. Biol. 10: 254. 1941.

***Amauropelta rustica* (Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151096-1
Phegopteris rustica Fée, Mém. Foug. 11 (Hist. Foug. Ant.): 55, t. 13, f. 1. 1866.
Thelypteris rustica (Fée) Proctor, Rhodora 61(732): 306. 1959[1960].

***Amauropelta sanctae-catharinae* (Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151097-1
Dryopteris sanctae-catharinae Rosenst., Hedwigia 46: 126. 1906.
Thelypteris sanctae-catharinae (Rosenst.) Ponce, Darwiniana 33(1-4): 280. 1995.

***Amauropelta saxicola* (Sw.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151100-1
Polypodium saxicola Sw., Kongl. Vetensk. Acad. Handl. 1817: 59, t. 3, f. 5. 1817.
Thelpyteris saxicola (Sw.) C.F.Reed, Phytologia 17(4): 312. 1968.

***Amauropelta scalpturoides* (Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151102-1
Phegopteris scalpturoides Fée, Mém. foug. 11 (Hist. foug. Ant.): 51. 1866.
Thelypteris scalpturoides (Fée) C.F.Reed, Phytologia 17(4): 312. 1968.

***Amauropelta sellensis* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151104-1
Dryopteris sellensis C.Chr., Kungl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 24. t. 3(7–8). 1937.

***Amauropelta semilunata* (Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151106-1
Nephrodium semilunatum Sodiro, Recens. Crypt. Vasc. Quit. 46. 1883.
Thelyteris semilunata (Sodiro) A.R.Sm., Fl. Ecuador 18: 79. 1983.

***Amauropelta shaferi* (Maxon & C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151304-1
Dryopteris shaferi Maxon & C.Chr., Amer. Fern J. 4: 77. 1914.
Thelypteris shaferi (Maxon & C.Chr.) Duek, Adansonia, sér. 2, 11: 719. 1971 [1972].

Amauropelta soridepressa **(Salino & V.A.O.Dittrich) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151108-1
Thelypteris soridepressa Salino & V.A.O.Dittrich, Amer. Fern J. 98(4): 199. f 1. 2009.

Amauropelta steyermarkii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151110-1
Thelypteris steyermarkii A.R.Sm., Fl. Ecuador 18: 79. 1983.

Amauropelta stierii **(Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151305-1
Gymnogramma stierii Rosenst., Festschrift Albert von Bamberg 64. 1905.
Thelypteris stierii (Rosenst.) C.F.Reed, Phytologia 17(4): 316. 1968.

Amauropelta straminea **(Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151112-1
Nephrodium stramineum Sodiro, Recens. Crypt. Vasc. Quit. 43. 1883.
Thelypteris chimboracensis A.R.Sm., Fl. Ecuador 18: 34. 1993.

Amauropelta strigillosa **(A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151113-1
Thelypteris strigillosa A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 927. F 10. 1985.

Amauropelta struthiopteroides **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151306-1
Dryopteris struthiopteroides C.Chr., Smithsonian Misc. Collect. 52(3): 388. 1909.
Thelypteris struthiopteroides (C.Chr.) C.F.Reed, Phytologia 17(4): 316. 1968.

Amauropelta subscandens **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151116-1
Thelypteris subscandens A.R.Sm., Ann. Missouri Bot. Gard. 77(1): 123. f 4. 1990.

Amauropelta subtilis **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151118-1
Thelypteris subtilis A.R.Sm., Fl. Ecuador 18: 80. 1983.

Amauropelta supina **(Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151307-1
Nephrodium supinum Sodiro, Crypt. Vasc. Quit. 241. 1893.
Thelypteris supina (Sodiro) A.R.Sm., Fl. Ecuador 18: 82. 1983.

***Amauropelta tablana* (Christ) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151120-1
Aspidium tablanum Christ, Bull. Herb. Boissier, sér. 2, 5: 727. 1905.
Thelypteris tablana (Christ) A.R.Sm., Amer. Fern J. 63(3): 127. 1973.

***Amauropelta tamandarei* (Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151122-1
Dryopteris tamandarei Rosenst., Hedwigia 56. 365. 1915.
Thelypteris tamandarei (Rosenst.) Ponce, Novon 8(3): 277. 1998.

***Amauropelta tapantensis* (A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151124-1
Thelypteris tapantensis A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): f 11. 927. 1985.

***Amauropelta tenerrima* (Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151126-1
Aspidium tenerrimum Fée, Crypt. Vasc. Brésil 1: 134. t 43, f 1. 1869.
Thelypteris tenerrima (Fée) C.F.Reed, Phytologia 17(4): 319. 1968.

***Amauropelta trelawniensis* (Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151308-1
Thelypteris trelawniensis Proctor, Amer. Fern J. 71(2): 58. 1981.

***Amauropelta uncinata* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151128-1
Thelypteris uncinata A.R.Sm., Fl. Ecuador 18: 86. 1983.

***Amauropelta vattuonei* (Hicken) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151129-1
Dryopteris vattuonei Hicken, Darwiniana 1: 100. 1924.
Thelypteris vattuonei (Hicken) Abbiatti, Darwiniana 13: 566. 1964.

***Amauropelta venturae* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151132-1
Thelypteris venturae A.R.Sm., Mem. New York Bot. Gard. 88: 638. f 302A-C. 2004.

***Amauropelta vernicosa* (A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151134-1
Thelypteris vernicosa A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 929. f 12. 1985.

***Amauropelta villana* (L.D.Gómez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151136-1
Thelypteris villana L.D.Gómez, Rev. Biol. Trop. 17(1): 106. f 1-4. 1970.

Amauropelta yungensis **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151138-1
Thelypteris yungensis A.R.Sm. & M.Kessler, Brittonia 60(1): 61. 2008.

Amauropelta zurquiana **(A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151140-1
Thelypteris zurquiana A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 929. f 13. 1985.

New combinations in *Goniopteris*

Goniopteris abdita **(Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151141-1
Thelypteris abdita Proctor. Amer. Fern J. 75(2): 63. f 4. 1985.

Goniopteris abrupta **(Desv.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151144-1
Polypodium abruptum Desv., Mém. Soc. Linn. Paris 6: 239. 1827.
Thelypteris abrupta (Desv.) Proctor, Rhodora 61: 305. 1960.

Goniopteris alan-smithiana **(L.D.Gómez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151354-1
Thelypteris alan-smithiana L.D.Gómez, Phytologia 50(7): 458. 1982.

Goniopteris amazonica **(Salino & R.S.Fernandes) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151310-1
Thelypteris amazonica Salino & R.S.Fernandes, Nordic J. Bot. 29(5): 611. f 1-2. 2011.

Goniopteris ancyriothrix **(Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151311-1
Dryopteris ancyriothrix Rosenst., Repert. Spec. Nov. Regni Veg. 7: 305-306. 1909.
Thelypteris ancyriothrix (Rosenst.) A.R.Sm., Fl. Ecuador 18: 140. 1983.

Goniopteris anoptera **(Kunze ex Kuhn) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151312-1
Aspidium anopteron Kunze ex Kuhn, Linnaea 36. 113. 1869.
Thelypteris anoptera (Kunze ex Kuhn) C.F.Reed, Phytologia 17(4): 260. 1968.

Goniopteris aureola **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151148-1
Thelypteris aureola A.R.Sm., Ann. Missouri Bot. Gard. 77(1): 118. f 1D-E. 1990.

Goniopteris beckeriana **(F.B.Matos, A.R.Sm. & Labiak) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151150-1
Thelypteris beckeriana F.B.Matos, A.R.Sm. & Labiak, Brittonia 62(2): 149. f 1. 2010.

Goniopteris berlinii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151152-1
Thelypteris berlinii A.R.Sm., Novon 16: 431. 2006.

Goniopteris bibrachiata **(Jenman) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151154-1
Nephrodium bibrachiatum Jenman, Gard. Chron., ser. 3, 15: 230. 1894.
Thelypteris bibrachiata (Jenman) Proctor, Ferns Jamaica 337. 1985.

Goniopteris biformata **(Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151355-1
Dryopteris biformata Rosenst., Repert. Spec. Nov. Regni Veg. 7: 300-301. 1909.
Thelypteris biformata (Rosenst.) R.M.Tryon, Rhodora 69(777): 5. 1967.

Goniopteris blanda **(Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151156-1
Phegopteris blanda Fée, Mém. Foug. 8: 91. 1857.
Thelypteris blanda (Fée) C.F.Reed, Phytologia 17(4): 264. 1968.

Goniopteris calypso **(L.D.Gómez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151157-1
Thelypteris calypso L.D.Gómez, Brenesia 8: 98. 1976.

Goniopteris chocoensis **(A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151160-1
Thelypteris chocoensis A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 916. f 1. 1985.

Goniopteris clypeata **(Maxon & C.V.Morton) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151162-1
Dryopteris clypeata Maxon & C.V.Morton, Bull. Torrey Bot. Club 66: 52. 1939.
Thelypteris clypeata (Maxon & C.V.Morton) K.U.Kramer, Acta Bot. Neerl. 18: 141. 1969.

Goniopteris cordata **(Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151164-1
Phegopteris cordata Fée, Mém. Foug. 5 (Gen. filic.): 244. 1852.
Thelypteris cordata (Fée) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 59. 1953.

Goniopteris costaricensis **Salino & T.E.Almeida, nom. nov.**
urn:lsid:ipni.org:names:77151356-1
Thelypteris crenata A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 919. f 4. 1985.
This needs a new name in *Goniopteris* because of the prior *Goniopteris crenata* C. Presl, 1836.

Goniopteris crassipila **(Caluff & C.Sánchez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151314-1
Thelypteris crassipila Caluff & C.Sánchez, Willdenowia 34: 513. 2004.

Goniopteris croatii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151168-1
Thelypteris croatii A.R.Sm., Ann. Missouri Bot. Gard. 77(1): 122. f 1A-C. 1990.

Goniopteris curta **(Christ) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151170-1
Dryopteris curta Christ, Bull. Herb. Boissier, sér. 2, 7(4): 263. 1907.
Thelypteris curta (Christ) C.F.Reed, Phytologia 17(4): 270. 1968.

Goniopteris dissimulans **(Maxon & C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151172-1
Dryopteris dissimulans Maxon & C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 215. 1913.
Thelypteris dissimulans (Maxon & C.Chr.) C.F.Reed, Phytologia 17(4): 273. 1968.

Goniopteris equitans **(Christ) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151173-1
Nephrodium equitans Christ, Bull. Herb. Boissier, sér. 2, 6(2): 163. 1906.
Thelypteris equitans (Christ) C.F.Reed, Phytologia 17(4): 275. 1968.

Goniopteris erythrothrix **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151176-1
Thelypteris erythrothrix A.R.Sm., Fieldiana, Bot., n.s., 29: 59. 1992.

Goniopteris gonophora **(Weath.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151357-1
Dryopteris gonophora Weath., Lloydia 2: 164. f. 1(1–3). 1939.
Thelypteris gonophora (Weath.) A.R.Sm., Ann. Missouri Bot. Gard. 77(1): 203. 1990.

Goniopteris hildae **(Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151315-1
Thelypteris hildae Proctor, Amer. Fern J. 75(2): 67. f 6. 1985.

Goniopteris holodictya **(K.U.Kramer) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151316-1
Thelypteris holodictya K.U.Kramer, Acta Bot. Neerl. 18: 140. f. 2. 1969.

Goniopteris hondurensis **(L.D.Gómez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151358-1
Thelypteris hondurensis L.D.Gómez, Phytologia 50(7): 458. 1982.

Goniopteris imitata **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151317-1
Dryopteris imitata C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 29, t. 6, f. 1-4. 1937.
Thelypteris imitata (C.Chr.) Alain, Moscosoa 3: 46. 1978.

Goniopteris indusiata **(Salino) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151182-1
Thelypteris indusiata Salino, Phytotaxa 156(5): 280. f 1-3. 2014.

Goniopteris jamesonii **(Hook.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151184-1
Nephrodium jamesonii Hook., Sp. fil. 4: 66. 1862.
Thelypteris jamesonii (Hook.) R.M.Tryon, Rhodora 69(777): 6. 1967.

Goniopteris jarucoensis **(Caluff & C.Sánchez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151186-1
Thelypteris jarucoensis Caluff & C.Sánchez, Willdenowia 34: 515. 2004.

Goniopteris killipii **(A.R.Sm. & Lellinger) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151188-1
Thelypteris killipii A.R.Sm. & Lellinger, Proc. Biol. Soc. Wash. 98(4): 923. f 7. 1985.

Goniopteris leonina **(Caluff & C.Sánchez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151189-1
Thelypteris leonina Caluff & C.Sánchez, Willdenowia 34: 517. 2004.

Goniopteris levyi **(E.Fourn.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151359-1
Aspidium levyi E.Fourn., Bull. Soc. Bot. France 19: 255. 1872.
Thelypteris levyi (E.Fourn.) C.V.Morton, Contr. U.S. Natl. Herb. 38: 37. 1967.

Goniopteris liebmannii **(Maxon & C.V.Morton) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151192-1

Polypodium meniscioides Liebm., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 5, 1: 211. 1849.

Dryopteris liebmannii Maxon & C.V.Morton, Bull. Torrey Bot. Club 65: 348. 1938.

Thelypteris meniscioides (Liebm.) C.F.Reed, Phytologia 17: 292. 1968.

The earliest species ephitet, *meniscioides*, has been used already in *Goniopteris* – *G. meniscioides* Fée, a synonym of *Ampelopteris prolifera* (Retz.) Copel., a Paleotropical species.

Goniopteris littoralis **(Salino) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151360-1

Thelypteris littoralis Salino, Brittonia 54(4): 332. f 1. 2002.

Goniopteris lugubriformis **(Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151319-1

Dryopteris lugubriformis Rosenst., Repert. Spec. Nov. Regni Veg. 7: 299. 1909.

Thelypteris lugubriformis (Rosenst.) R.M.Tryon, Rhodora 69(777): 7. 1967.

Goniopteris martinezii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151194-1

Thelypteris martinezii A.R.Sm., Mem. New York Bot. Gard. 88: 654-655. f 308I. 2004.

Goniopteris minor **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151196-1

Dryopteris nicaraguensis (E.Fourn.) C.Chr. var. *minor* C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 252. 1913.

Thelypteris minor (C.Chr.) A.R.Sm., Phytologia 34(4): 232. 1976.

Goniopteris minutissima **(Caluff & C.Sánchez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151198-1

Thelypteris minutissima Caluff & C.Sánchez, Willdenowia 34: 511. 2004.

Goniopteris montana **(Salino) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151361-1

Thelypteris montana Salino, Brittonia 54(4): 334. f 2D-F. 2002.

Goniopteris multigemmifera **(Salino) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151321-1

Thelypteris multigemmifera Salino, Brittonia 54(4): 336. f 3. 2002.

Goniopteris munchii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151200-1

Thelypteris munchii A.R.Sm., Amer. Fern J. 63(3): 120. f 9-10. 1973.

***Goniopteris nicaraguensis* (E.Fourn.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151202-1
Phegopteris nicaraguensis E.Fourn., Bull. Soc. Bot. France 19: 252. 1872.
Thelypteris nicaraguensis (E.Fourn.) C.V.Morton, Contr. U.S. Natl. Herb. 38(2): 55. 1967.

***Goniopteris nigricans* (Ekman & C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151204-1
Dryopteris nigricans Ekman & C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 31, t. 7, f. 1-2. 1937.

***Goniopteris oroniensis* (L.D.Gómez) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151325-1
Thelypteris oroniensis L.D.Gómez, Amer. Fern J. 68(1): 9. f 1. 1978.

***Goniopteris paranaensis* (Salino) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151323-1
Thelypteris paranaensis Salino, Brittonia 54(4): 337. F 2A-C. 2002.

***Goniopteris paucijuga* (Klotzsch) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151205-1
Aspidium paucijugum Klotzsch, Linnaea 20: 368. 1847.
Thelypteris paucijuga (Klotzsch) A.R.Sm., Univ. Calif. Publ. Bot. 59: 98. 1971

***Goniopteris paucipinnata* (Donn.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151362-1
Nephrodium fendleri D.C.Eaton var. *paucipinnatum* Donn.Sm., Bot. Gaz. 12: 134. 1887.
Thelypteris paucipinnata (Donn.Sm.) C.F.Reed, Phytologia 17(4): 302. 1968.

***Goniopteris pellita* (Willd.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151324-1
Aspidium pellitum Willd., Sp. Pl. ed. 4. 5: 242. 1810.
Thelypteris pellita (Willd.) Proctor & Lourteig, Bradea 5(40): 384. 1990.

***Goniopteris peripae* (Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151326-1
Nephrodium peripae Sodiro, Recens. Crypt. Vasc. Quit. 52. 1883.
Thelypteris peripae (Sodiro) C.F.Reed, Phytologia 17(4): 303. 1968.

***Goniopteris pilonensis* (A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151210-1
Thelypteris pilonensis A.R.Sm. & M.Kessler, Brittonia 60(1): 58. 2008.

Goniopteris pinnatifida **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151212-1
Thelypteris pinnatifida A.R.Sm., Fl. Ecuador 18: 110. 1983.

Goniopteris praetermissa **(Maxon) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151214-1
Dryopteris praetermissa Maxon, Proc. Biol. Soc. Wash. 57: 20. 1944.
Thelypteris praetermissa (Maxon) A.R.Sm., Phytologia 34(3): 232. 1976.

Goniopteris redunca **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151216-1
Thelypteris redunca A.R.Sm., Ann. Missouri Bot. Gard. 77(1): 123. f 1F-H. 1990.

Goniopteris resiliens **(Maxon) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151218-1
Dryopteris resiliens Maxon, Field Mus. Publ. Bot. 17: 302. 1938.
Thelypteris resiliens (Maxon) A.R.Sm., Amer. Fern J. 63(3): 121. 1973.

Goniopteris retroflexa **(L.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151327-1
Polypodium retroflexum L., Sp. Pl. 1089. 1753.
Thelypteris retroflexa (L.) Proctor & Lourteig, Bradea 5(40): 385. 1990.

Goniopteris rhachiflexuosa **(Riba) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151329-1
Thelypteris rhachiflexuosa Riba, Amer. Fern J. 79(3): 122. f 1. 1989.

Goniopteris ×rolandii **(C.Chr.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151328-1
Dryopteris ×rolandii C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 258. 1913.
Thelypteris ×rolandii (C.Chr.) R.M.Tryon, Rhodora 69: 8. 1967.

Goniopteris sapechoana **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151220-1
Thelypteris sapechoana A.R.Sm. & M.Kessler, Brittonia 60(1): 60. 2008.

Goniopteris schaffneri **(Fée) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151330-1
Nephrodium schaffneri Fée, Mém. Foug. 8: 108. 1857.
Thelypteris schaffneri (Fée) C.F.Reed, Phytologia 17(4): 312. 1968.

Goniopteris schippii **(Weath.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151331-1
Dryopteris schippii Weath., Amer. Fern J. 25: 52. 1935.
Thelypteris schippii (Weath.) A.R.Sm., Phytologia 34(3): 233. 1976.

Goniopteris schomburgkii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151221-1
Thelypteris schomburgkii A.R.Sm., Ann. Missouri Bot. Gard. 77(1): 202. f 1. 1990.

Goniopteris schunkei **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151224-1
Thelypteris schunkei A.R.Sm., Fieldiana, Bot., n.s., 29: 63. 1992.

Goniopteris semihastata **(Kunze) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151226-1
Aspidium semihastatum Kunze, Linnaea 9: 91. 1834.
Thelypteris semihastata (Kunze) Ching, Bull. Fan Mem. Inst. Biol. 10: 254. 1941.

Goniopteris semirii **(Salino & L.C.N.Melo) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151332-1
Thelypteris semirii Salino & L.C.N.Melo, Novon 10(1): 74. f 1A-e. 2000.

Goniopteris septemjuga **(C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151228-1
Dryopteris septemjuga C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 32, t. 7, f. 4-5. 1937.

Goniopteris skinneri **(Hook.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151230-1
Aspidium skinneri Hook., Icon. Pl. 10: t. 924. 1854.
Thelypteris skinneri (Hook.) C.F.Reed, Phytologia 17(4): 314. 1968

Goniopteris stephanii **(A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151232-1
Thelypteris stephanii A.R.Sm. & M.Kessler, Brittonia 60(1): 61. 2008.

Goniopteris stolzeana **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151333-1
Thelypteris stolzeana A.R.Sm., Phytologia 34(3): 231. 1976.

Goniopteris subsagittata **(Maxon & C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151253-1
Dryopteris subsagittata Maxon & C.Chr., Kongl. Svenska Vetenskapsakad. Handl., ser. 3, 16(2): 28, t. 6, f. 5–6. 1937.

Goniopteris tenebrica **(Jenman) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151234-1
Nephrodium tenebricum Jenman, J. Bot. 20: 326. 1882.
Thelypteris tenebrica (Jenman) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 65. 1953.

Goniopteris tryoniorum **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151334-1
Thelypteris tryoniorum A.R.Sm., Fieldiana, Bot., n.s., 29: 62. 1992.

Goniopteris tuxtlensis **(T.Krömer, Acebey & A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151236-1
Thelypteris tuxtlensis T.Krömer, Acebey & A.R.Sm., Amer. Fern J. 97(3): 137–139. 2007.

Goniopteris urbani **(Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151335-1
Polypodium urbani Sodiro, Crypt. Vasc. Quit. 301. 1893.
Thelypteris urbani (Sodiro) A.R.Sm., Fl. Ecuador 18: 116. 1983

Goniopteris verecunda **(Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151237-1
Thelypteris verecunda Proctor, Amer. Fern J. 75(2): 65. f 5. 1985.

Goniopteris yaucoensis **(Proctor) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151336-1
Thelypteris yaucoensis Proctor, Mem. New York Bot. Gard. 53: 208. 1989.

New combinations in *Steiropteris*

Steiropteris **subg.** ***Glaphyropteris*** **(Fée) A.R.Sm., comb. et stat. nov.**
urn:lsid:ipni.org:names:77151337-1
Glaphyropteris C.Presl ex Fée, Crypt. Vasc. Brésil, 2. 40. 1873.
Dryopteris subg. *Glaphyropteris* (C.Presl. ex Fée) C.Chr., Biol. Arb. Til. Eug. Warming 80. 1911.
Thelypteris subg. *Glaphyropteris* (C.Presl. ex Fée), Alston, J. Wash. Acad. Sci. 48: 234. 1958.

Steiropteris buchtienii **(A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151338-1
Thelypteris buchtienii A.R.Sm., Univ. Calif. Publ. Bot. 76: 10. 1980.

***Steiropteris clypeolutata* (Desv.) Pic.Serm. var. *holmei* (Baker) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151240-1
Nephrodium holmei Baker, Ann. Bot. 5: 317. 1891.
Thelypteris clypeolutata (Desv.) Proctor var. *holmei* (Baker) A.R.Sm., Univ. Calif. Publ. Bot. 76: 11. 1980.

***Steiropteris comosa* (C.V.Morton) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151242-1
Dryopteris comosa C.V.Morton, J. Wash. Acad. Sci. 28: 528. 1938.
Thelypteris comosa (C.V.Morton) C.V.Morton, Amer. Fern J. 51(1): 38. 1961.

***Steiropteris decussata* (L.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151339-1
Polypodium decussatum L., Species Plantarum 2: 1093. 1753.
Thelypteris decussata (L.) Proctor, Bull. Inst. Jamaica, Sci. Ser. 5: 59. 1953.

***Steiropteris decussata* (L.) A.R.Sm. var. *brasiliensis* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151340-1
Dryopteris decussata var. *brasiliensis* C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 161. 1913.
Thelypteris decussata var. *brasiliensis* (C.Chr.) A.R.Sm., Univ. Calif. Publ. Bot. 76: 15. 1980.

***Steiropteris decussata* var. *costaricensis* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151341-1
Thelypteris decussata var. *costaricensis* A.R.Sm., Univ. Calif. Publ. Bot. 76: 16. 1980.

***Steiropteris decussata* var. *mapiriensis* (Rosenst.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151342-1
Dryopteris mapiriensis Rosenst., Repert. Spec. Nov. Regni Veg. 6: 313. 1909.
Thelypteris decussata var. *mapiriensis* (Rosenst.) A.R.Sm., Univ. Calif. Publ. Bot. 76: 16. 1980.

***Steiropteris decussata* var. *velutina* (Sodiro) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151343-1
Polypodium velutinum Sodiro, Recens. Crypt. Vasc. Quit. 59. 1883.
Thelypteris decussata var. *velutina* (Sodiro) A.R.Sm., Univ. Calif. Publ. Bot. 76: 17. 1980.

***Steiropteris fraseri* (Mett. ex Kuhn) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151344-1
Aspidium fraseri Mett. ex Kuhn, Linnaea 36: 109. 1869.
Thelypteris fraseri (Mett. ex Kuhn) A.R.Sm., Univ. Calif. Publ. Bot. 76: 32. 1980.

***Steiropteris glandulosa* (Desv.) Pic.Serm. var. *brachyodus* (Kunze) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151256-1
Polypodium brachyodus Kunze, Linnaea 9: 48. 1834.
Thelypteris glandulosa var. *brachyodus* (Kunze) A.R.Sm., Phytologia 34: 233. 1976.

***Steiropteris glandulosa* (Desv.) Pic.Serm. var. *longipilosa* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151345-1
Thelypteris glandulosa (Desv.) Proctor var. *longipilosa* A.R.Sm., Univ. Calif. Publ. Bot. 76: 22. 1980.

***Steiropteris hatschbachii* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151346-1
Thelypteris hatschbachii A.R.Sm., Univ. Calif. Publ. Bot. 76: 22. 1980.

***Steiropteris hottensis* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151244-1
Dryopteris hottensis C.Chr., Kongl. Svenska Vetenskapsacad. Handl., ser. 3, 16(2): 26. t 2(4-6). 1937.
Thelypteris hottensis (C.Chr.) A.R.Sm., Univ. Calif. Publ. Bot. 76: 23. 1980.

***Steiropteris leprieurii* (Hook.) Pic.Serm. var. *costalis* (Baker) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151347-1
Nephrodium costale Baker, Syn Fil, 2. 495.1874.
Thelypteris leprieurii (Hook.) R.M.Tryon var. *costalis* (Baker) A.R.Sm., Univ. Calif. Publ. Bot. 76: 25. 1980.

***Steiropteris leprieurii* (Hook.) Pic.Serm. var. *glandifera* (A.R.Sm) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151348-1
Thelypteris leprieurii (Hook.) R.M.Tryon var. *glandifera* A.R.Sm., Univ. Calif. Publ. Bot. 76: 25. 1980.

***Steiropteris leprieurii* (Hook.) Pic.Serm. var. *incana* (Christ) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151258-1
Aspidium incanum Christ, Hedwigia 44: 367. 1905.
Thelypteris leprieurii (Hook.) R.M.Tryon var. *incana* (Christ) A.R.Sm., Univ. Calif. Publ. Bot. 76: 26. 1980.

***Steiropteris leprieurii* (Hook.) Pic.Serm. var. *subcostalis* (A.R.Sm.) A.R.Sm., comb. nov.**
urn:lsid:ipni.org:names:77151349-1
Thelypteris leprieurii (Hook.) R.M.Tryon var. *subcostalis* A.R.Sm., Univ. Calif. Publ. Bot. 76: 26. 1980.

***Steiropteris mexiae* (C.Chr. ex Copel.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151246-1
Dryopteris mexiae C.Chr. ex Copel., Univ. Calif. Publ. Bot., 17: 32. 1932.
Thelypteris mexiae (C.Chr. ex Copel.) Ching, Bull. Fan Mem. Inst. Biol. 10: 252. 1941.

***Steiropteris parva* (A.R.Sm. & M.Kessler) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151350-1
Thelypteris parva A.R.Sm. & M.Kessler, Brittonia 60(1): 57. 2008.

***Steiropteris pennellii* (A.R.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151351-1
Thelypteris pennellii A.R.Sm., Univ. Calif. Publ. Bot. 76: 28. 1980.

***Steiropteris polyphlebia* (C.Chr.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151248-1
Dryopteris polyphlebia C.Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd., ser. 7, 10: 161. 1913.
Thelypteris polyphlebia (C.Chr.) C.V.Morton, Amer. Fern J. 51(1): 38. 1961.

***Steiropteris polypodioides* (Raddi) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151250-1
Ceterach polypodioides Raddi, Opusc. Sci. 3: 284. 1819.
Thelypteris polypodioides (Raddi) C.F.Reed, Phytologia 7: 305. 1968.

***Steiropteris seemannii* (J.Sm.) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151353-1
Phegopteris seemannii J.Sm., in Seem., Bot. Voy. Herald. 228. 1854.
Thelypteris seemannii (J.Sm.) A.R.Sm., Univ. Calif. Publ. Bot. 76: 30. 1980.

***Steiropteris villosa* (Link) Salino & T.E.Almeida, comb. nov.**
urn:lsid:ipni.org:names:77151252-1
Gymnogramma villosa Link, Hort. Berol. 2: 51. 1833.
Thelypteris villosa (Link) C.F.Reed, Phytologia 7: 323. 1968.

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References

Almeida TE, Hennequin S, Schneider H, Smith AR, Batista JAN, Ramalho AJ, Proite K, Salino A (2015) Towards a phylogenetic generic classification of Thelypteridaceae: additional sampling suggests alterations of neotropical taxa and further study of paleotropical genera. Molecular Phylogenetic and Evolution.

Brade AC (1972) O gênero *Dryopteris* (Pteridophyta) no Brasil e sua divisão taxonômica. Bradea 1: 191–261.

Christenhusz MJM, Zhang XC, Schneider H (2011) A linear sequence of extant families and genera of lycophytes and ferns. Phytotaxa 19: 7–54.

Ching RC (1978) The Chinese fern families and genera: systematic arrangement and historical origin. Acta Botanica Sinica 16(3): 1–37.

Christensen C (1907) The American species of *Dryopteris* of the group of *Dryopteris opposita*. Det Kongelige Danske Videnskabernes Selksabs Skrifter, Naturdidenskabeliger og Mathematisk Afdeling, ser. 7, 4: 248–336.

Christensen C (1913) A monograph of the genus *Dryopteris*. Part I. The tropical American pinnatifid-bipinnatifid species. Det Kongelige Danske Videnskabernes Selskabs Skrifter, Naturvidenskabelig og Mathematisk Afdeling, ser. 7, 10: 55–282.

Christensen C (1920) A monograph of the genus *Dryopteris*. Part II. The tropical American bipinnate-decompound species. Det Kongelige Danske Videnskabernes Selskabs Skrifter, Naturvidenskabelige og Mathematiske Afdeling, ser. 8, 6: 9–130.

Copeland EB (1947) Genera Filicum. Annales Cryptogamici et Phytopathologici 5: 1–247.

Fernandes RS, Yesilyurt JC, Salino A (2014) New species and combinations in *Meniscium* (Thelypteridaceae). Phytotaxa 184: 01–011. doi: 10.11646/phytotaxa.184.1.1

He LJ, Zhang XC (2012) Exploring generic delimitations within the fern family Thelypteridaceae. Molecular Phylogenetics and Evolution 65: 757–764. doi: 10.1016/j.ympev.2012.07.021

Holttum RE (1971) Studies in the family Thelypteridaceae III. A new system of genera in the Old World. Blumea 19: 2–52.

Holttum RE (1974) Thelypteridaceae of Africa and adjacent islands. Journal of South African Botany 40: 123–168.

Holttum RE (1982) Thelypteridaceae. In: Flora Malesiana, ser. II. Pteridophyta 1(5): 331–560. Martinus Nijhoff, The Hague.

Matos FB, Smith AR, Labiak PH (2010) A new sepcies of *Thelypteris* (Thelypteridaceae) from southern Bahia, Brazil. Brittonia 62: 149–152. doi: 10.1007/s12228-009-9121-9

Mazumdar J, Mukhopadhyay R (2013) Nomenclatural notes on some members of Thelypteridaceae. II. Bionature 33: 13–34.

Mazumdar J (2015) "(2343) Proposal to conserve the name *Cyclosorus* against *Meniscium* (Thelypteridaceae). Taxon 64(1): 170–170. doi: 10.12705/641.9

Mickel JT, Beitel JM (1988) Pteridophyte flora of Oaxaca, Mexico. Memoirs of the New York Botanical Garden 46: 1–568.

Mickel JT, Smith AR (2004) The pteridophytes of Mexico. Memoirs of the New York Botanical Garden 88: 1–1054.

Morton CV (1969) The classification of *Thelypteris*. American Fern Journal 53: 149–154. doi: 10.2307/1546152

Pichi Sermolli REG (1977) Tentamen pteridophytorum genera in taxonomicum ordinem redigendi. Webbia 31: 315–512. doi: 10.1080/00837792.1977.10670077

Ponce M (1987) Revisión de las Thelypteridaceae (Pteridophyta) argentinas. Darwiniana 28: 317–390.

Ponce M (2007) Sinopsis de las Thelypteridaceae de Brasil central y Paraguay. Hoehnea 34: 283–333. doi: 10.1590/s2236-89062007000300003

Proctor GR (1977) Pteridophyta. In: Howard RA (Ed.) Flora of the Lesser Antilles. Arnold Arboretum, Harvard University.

Proctor GR (1985) Ferns of Jamaica: a Guide to the Pteridophytes. British Museum (Natural History), London, 631 pp.

Proctor GR (1989) Ferns of Puerto Rico and the Virgin Islands. Memoirs of the New York Botanical Garden 53: 1–389.

Salino A (2002) New species and combinations in *Thelypteris* subg. *Goniopteris* (Thelypteridaceae). Brittonia 54: 331–339. doi: 10.1663/0007-196X(2003)54[331:NSACIT]2.0.CO;2

Salino A, Almeida TE (2010) Thelypteridaceae. In: Forzza RC, Baumgratz JFA, Bicudo CE de M, Canhos D, Carvalho Jr. AA, Costa A, Costa DP, Hopkins M, Leitman PM, Lohmann LG, Lughadha EN, Maia LC, Martinelli G, Menezes M, Morim MP, Nadruz M, Peixoto AL, Pirani JR, Prado J (Org) Catálogo de Plantas e Fungos do Brasil. Jardim Botânico do Rio de Janeiro, Rio de Janeiro, 562–566.

Salino A, Fernandes RS, Pietrobom MR (2011) *Thelypteris amazonica* sp. nov. (Thelypteridaceae) from Amazonian Brazil. Nordic Journal of Botany 29: 1–4. doi: 10.1111/j.1756-1051.2011.01332.x

Salino A, Melo LCN (2000) A new species of the fern genus *Thelypteris* (Thelypteridaceae) from Southeastern Brazil. Novon 10: 74–77. doi: 10.2307/3393190

Salino A, Semir J (2002) Thelypteridaceae (Polypodiophyta) do Estado de São Paulo: *Macrothelypteris* e *Thelypteris* subgêneros *Cyclosorus* e *Steiropteris*. Lundiana 3: 9–27.

Salino A, Semir J (2003) Notas sobre duas espécies de *Thelypteris* Schmidel (Thelypteridaceae – Pterophyta) do Brasil. Acta Botanica Brasilica 17: 515–521. doi: 10.1590/s0102-33062003000400004

Salino A, Semir J (2004) *Thelypteris* subg. *Amauropelta* (Kunze) A.R. Sm. (Thelypteridaceae – Pteridophyta) no Estado de São Paulo, Brasil. Lundiana 5: 83–112.

Salino A, Souza MGM, Arruda AJ (2014) *Thelypteris indusiata* (Thelypteridaceae), a new fern species from Amazonian Brazil. Phytotaxa 156: 279–284. doi: 10.11646/phytotaxa.156.5.3

Sánchez C, Calluff MG, Regalado L (2006) Flora de la República de Cuba: Thelypteridaceae. Serie A. Plantas Vasculares, Fascículo 11(13): 1–124.

Schuettpelz E, Pryer KM (2007) Fern phylogeny inferred from 400 leptosporangiate species and three plastid genes. Taxon 56: 1037–1050. doi: 10.2307/25065903

Sehnem A (1979) Aspidiáceas. In: Reitz R (Ed.) Flora Ilustrada Catarinense. Herbário Barbosa Rodrigues, Itajaí, 1–356.

Smith AR (1980) Taxonomy of *Thelypteris* subgenus *Steiropteris* including *Glaphyropteris* (Pteridophyta). University of California Publications in Botany 76: 1–39.

Schreber JCD (1791) *Meniscium*. In: Linnaeus C (Ed.) Genera Plantarum. Vol II. 8 Ed. 757.

Smith AR (1981a) Flora of Chiapas. Part 2. Pteridophytes. California Academy of Science, San Francisco, 370 pp.

Smith AR (1981b) The genus *Thelypteris.* In: Stolze RG (Ed.) Fern and fern allies of Guatemala. Part II. Polypodiaceae. Fieldiana, Botany, new series, 6: 473–514.

Smith AR (1983) Polypodiaceae – Thelypteridoideae. In: Harling G, Sparre B (Eds) Flora of Ecuador. Swedish Research Councils, Stockholm, 18–148.

Smith AR (1988) *Thelypteris*. In: Mickel JT, Beitel JM (Eds) Pteridophyte flora of Oaxaca, Mexico. Memoirs of the New York Botanical Garden 46: 361–388.

Smith AR (1990a) Thelypteridaceae. In: Kramer KU, Green PS (Eds) The Families and Genera of Vascular Plants. Springer-Verlag, Berlin, 263–272. doi: 10.1007/978-3-662-02604-5_45

Smith AR (1990b) New *Thelypteris* (Thelypteridaceae) from Central America. Annals of the Missouri Botanical Garden 77: 118–124. doi: 10.2307/2399631

Smith AR (1992) Thelypteridaceae. In: Tryon RM, Stolze RG (Eds) Pteridophyta of Peru. Part III. Fieldiana, Botany, new series, 29: 1–80.

Smith AR (1993) Thelypteridaceae. In: Görts-Van Rijn ARA (Ed.) Flora of the Guianas. Koeltz Scientific Books, Königstein, 77–126.

Smith AR (1995a) Thelypteridaceae. In: Davidse G (Ed.) Flora Mesoamericana. Psilotaceae a Salviniaceae. Universidad Nacional Autónoma de México, México, D.F., 164–195.

Smith AR (1995b) Thelypteridaceae. In: Berry PE, Holst BK, Yatskievych K (Eds) Flora of the Venezuelan Guayana – Pteridophytes and Spermatophytes (Acanthaceae-Araceae). Missouri Botanical Garden & Timber Press, Portland, 325–326.

Smith AR, Cranfill RB (2002) Intrafamilial relationships of the thelypteroid ferns. American Fern Journal 92: 131–149. doi: 10.1640/0002-8444(2002)092[0131:IROTTF]2.0.CO;2

Smith AR, Kessler M (2008) Sixteen new species of *Thelypteris* (Thelypteridaceae) from Bolivia. Brittonia 60: 49–62. doi: 10.1007/s12228-008-9003-6

Smith AR, Lellinger DB (1985) New tropical American species of *Thelypteris* (Pteridophyta). Proceedings of the Biological Society of Washington 98: 916–930.

Smith AR, Pryer KM, Schuettpelz E, Korall P, Schneider H, Wolf PG (2006) A classification for extant ferns. Taxon 55: 705–731. doi: 10.2307/25065646

Smith AR, Pryer KM, Schuettpelz E, Korall P, Schneider H, Wolf PG (2008) Fern classification. In: Ranker TA, Haufler CH (Eds) Biology and Evolution of Ferns and Lycophytes. Cambridge University Press, Cambridge, 417–467. doi: 10.1017/cbo9780511541827.017

Tryon RM, Tryon AF (1982) Fern and Allied Plants, with Special Reference to Tropical America. Springer-Verlag, Berlin, 1–857. doi: 10.1007/978-1-4613-8162-4_1

Vareschi V (1969) Helechos. In: Lasser T (Ed.) Flora de Venezuela. Instituto Botánico, Caracas, 473–1033.

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RESEARCH ARTICLE

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Aporosa tetragona Tagane & V. S. Dang (Phyllanthaceae), a new species from Mt. Hon Ba, Vietnam

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Abstract

A new species, *Aporosa tetragona* Tagane & V. S. Dang, **sp. nov.**, is described and illustrated from Mt. Hon Ba located in the Khanh Hoa Province, South Vietnam. This species is characterized by tetragonal pistillate flowers and fruits, which are clearly distinguishable from the other previously known species of the genus. The morphology and phylogeny based on *rbcL* and *matK* of this species indicated that the new species belongs to section *Appendiculatae* Pax & K. Hoffm.

Keywords

Aporosa, Hon Ba Nature Reserve, new species, Phyllanthaceae, Vietnam

Introduction

The genus *Aporosa* Blume (1825) (Phyllanthaceae) comprises 82 species of small to medium sized trees distributed in various environments in South and Southeast Asia. They can be found in both primary and secondary forests, from lowland rain to dry deciduous, and as well as montane forest (up to 2200 m altitude in New Guinea) (Gagnepain 1927, Hô 2003, Schot 2004, Schot and van Welzen 2005). The genus is characterized by a dioecy, indumentum of simple hairs, petioles pulvinate at both base and apex, two glands on adaxial base of lamina (occasional), often with scattered disk-like glands on lower surface of lamina, axillary inflorescences, absence of petals, styles and disks, tiny staminate flowers with a minute or absent pistillode, and dehiscent regmata with persistent stigmas, sometimes beaked and/or stiped (Pax and Hoffmann 1922, Schot 2004).

The recent revision (Schot 2004) classified the genus *Aporosa* into five sections based on morphological analyses: sect. *Aporosa*, sect. *Appendiculatae* Pax & K. Hoffm., sect. *Benthamianae* Schot, sect. *Papuanae* Schot and sect. *Sundanenses* Schot. In Vietnam, two sections including 11 species with two varieties of *Aporosa* are recorded (Gagnepain 1927, Hô 2003, Schot 2004). Nine species with two varieties are included in *Aporosa* sect. *Appendiculatae*: *A. ficifolia* Baill., *A. macrophylla* Müll. Arg., *A. octandra* var. *octandra* (Buch.-Ham. ex D. Don) A. R.Vickery (synonym: *A. dioica* Müll. Arg. and *A. oblonga* Müll. Arg.), *A. octandra* var. *malesiana* Schot (synonym, *A. microcalyx* (Hassk.) Hassk.), *A. planchoniana* Baill., *A. serrata* Gagnep., *A. tetrapleura* Hance, *A. villosa* Baill. (synonym: *A. sphaerosperma* Gagnep.), *A. wallichii* Hook. f. and *A. yunnanensis* (Pax & K. Hoffm.) F. P. Metcalf. Two species are included in *Aporosa* sect. *Sundanenses*: *A. duthieana* King ex Pax & K. Hoffm. and *A. microstachya* Müll. Arg.

During a botanical survey of Mt. Hon Ba in Khanh Hoa Province, South Vietnam in 2014, an undescribed species of *Aporosa* sect. *Appendiculatae* was found at the margin of a broad-leaved evergreen forest near a stream, at 200–400 m altitude. Here, we describe and illustrate this plant as a new species, *Aporosa tetragona* Tagane & V. S. Dang.

In addition to the morphological examination, DNA sequences and phylogenetic analysis are extremely helpful for delimiting species (Hebert and Gregory 2005, Dick and Webb 2012). Here, we sequenced two DNA barcode regions, the partial genes for the large subunit ribulose-1,5-bisphosphate carboxylase oxygenase (*rbcL*) and matturase K (*matK*) (CBOL Plant Working Group 2009) to compare with related taxa.

Materials and methods

Morphological observations

The new species was recognized by detailed comparisons with morphologically similar species through literature review, dry specimens from the herbaria ANDA, BK, BKF, BO, HN, KYO, SING, TNS, VNM, and digitized plant specimens available on the web (e.g. JSTOR Global Plants (https://plants.jstor.org/)).

DNA barcoding

Total DNA was extracted from silica-gel dried leaves collected in the field. DNA extraction was performed by a modified CTAB protocol (Doyle and Doyle 1987), as described in detail in Toyama et al. (2015). Amplification and sequencing of the two DNA barcodes regions, *rbcL* and *matK*, were performed according to published protocols (Kress et al. 2009, Dunning and Savolainen 2010).

Phylogenetic analysis

In total, 22 accessions representing 14 species of *Aporosa* were included in phylogenetic analyses using DNA barcoding regions of *rbcL* (362 bp) and *matK* (392 bp) (Table 1). In addition to the new species, *Aporosa tetragona* Tagane & V. S. Dang, four species, *A. aurea* Hook. f., *A. microstachya* (Tul.) Müll. Arg., *A. penangensis* (Ridl.) Airy Shaw and *A. tetrapleura* Hance, were newly sequenced in the present study. The remaining sequences were obtained from GenBank. *Phyllanthus bokorensis* Tagane was used as an outgroup. The sequence alignment was performed by ClustalW with default parameter implemented in MEGA v 6.06 (Tamura et al. 2013).

The Neighbor-joining methods (Saitou and Nei 1987) with Maximum Composite Likelihood distance matrix (Tamura et al. 2004) implemented in MEGA v 6.06 was used to construct the phylogenic trees. Confidence values for individual branches were determined by bootstrap analysis with 10,000 repeated samplings of the data.

Results and discussion

The new species belongs to the section *Appendiculatae* as the leaf lamina has basal adaxial glands (Fig. 2C), disc-like glands unevenly scattered within the arches of the marginal veins throughout the abaxial surface of the lamina (Fig. 2B), papillate stigmas (Fig. 2D), and pubescent septae and column in the ovary (Fig. 2E) (Schot 2004), but is distinguished from previously known species by its tetragonal ovary of the pistillate flower and the fruit.

The Neighbor-joining tree based on *rbcL* and *matK* supports the separation of each morphologically defined section and the monophyly of sect. *Appendiculatae*, sect. *Benthamianae* and sect. *Sundanenses* with 98 %, 76 % and 85 % bootstrap probability, respectively (Fig. 3). The new species was placed in sect. *Appendiculatae* and clearly separated from other species of this section with a sister relationship to the clade including *A. ficifolia*, *A. odctandra* var. *octandra*, *A. planchoniana* and *A. villosa*.

Thus, the species is morphologically distinct from known taxa and the phylogeny supports the separation from related species. Here, we define the new species *Aporosa tetragona* Tagane & V. S. Dang.

Table 1. List of taxa used in this study with vouchers and GenBank accession number.

Section	Species	Vouchers	GenBank accession no.	
			rbcL	***matK***
Sect. *Aporosa*	*Aporosa frutescens* Blume	BT0095962054	KJ594599	KJ708827
Sect. *Appendiculatae*	*Aporosa aurea* Hook. f.	*Tagane et al. T4249*, FU	LC089033	LC089037
	Aporosa ficifolia Baill.	KYUM:5	AB925289	AB924682
	Aporosa octandra var. *octandra* (Buch.-Ham. ex D. Don) A. R.Vickery	SCBG007-1	KP094163	KP093256
	Aporosa octandra var. *octandra* (Buch.-Ham. ex D. Don) A. R.Vickery	SCBG007-2	KP094164	KP093257
	Aporosa planchoniana Baill. ex Müll. Arg.	KYUM:315	AB925549	AB924927
	Aporosa planchoniana Baill. ex Müll. Arg.	KYUM:945	AB925759	AB925129
	Aporosa planchoniana Baill. ex Müll. Arg.	KYUM:29	AB925313	AB924702
	Aporosa tetrapleura Hance	*Toyama et al. 1426*, FU	LC089030	LC089034
	Aporosa tetragona Tagane & V. S. Dang	*Tagane et al. V1976*, FU	LC050338	LC050339
	Aporosa villosa (Lindl.) Baill.	KYUM:994	AB925783	AB925152
	Aporosa villosa (Lindl.) Baill.	KYUM:127	AB925406	AB924795
	Aporosa yunnanensis (Pax & K.Hoffm.) F. P. Metcalf	J578	KR528750	KR530383
	Aporosa yunnanensis (Pax & K.Hoffm.) F. P. Metcalf	BB0195	KR528747	KR530380
	Aporosa yunnanensis (Pax & K.Hoffm.) F. P. Metcalf	G202	KR528748	KR530381
	Aporosa yunnanensis (Pax & K.Hoffm.) F. P. Metcalf	BB0194	KR528746	KR530379
Sect. *Benthamianae*	*Aporosa benthamiana* Hook. f.	BT0070230656	KJ594594	KJ708826
	Aporosa lunata (Miq.) Kurz	BT0070234186	KJ594600	KJ708829
Sect. *Sundanenses*	*Aporosa microstachya* (Tul.) Müll. Arg.	BT0070234330	KJ594602	KJ708830
	Aporosa microstachya (Tul.) Müll. Arg.	*Tagane et al. T4172*, FU	LC089032	LC089036
	Aporosa penangensis (Ridl.) Airy Shaw	*Tagane et al. T4012*, FU	LC089031	LC089035
Sect. *Papuanae*	*Aporosa papuana* Pax & K. Hoffm.	*Damas 004*, KYO	AB233915	AB233811
Outgroup	*Phyllanthus bokorensis* Tagane	*Toyama et al. 1740*, FU	AB936022	AB936023

Taxonomy

***Aporosa tetragona* Tagane & V. S. Dang, sp. nov.**
urn:lsid:ipni.org:names:77151272-1
Figs 1, 2

Diagnosis. *Aporosa tetragona* is distinct from all other *Aporosa* species by having a tetragonal ovary and fruit. The leaves are similar to *Aporosa acuminata* Thwaites, but differing in not only fruit shape but also wider leaves (vs. 2–4 cm wide), larger pistillate flowers (vs. 2–3.5 mm long), and glabrous fruits (vs. sparsely puberulous).

Type. VIETNAM. Khanh Hoa Province, Mt. Hon Ba, edge of evergreen forest near stream, 12°06'30.60"N, 108°59'15.70"E, alt. 393 m, 22 November 2014, with female fl. and fr., *Toyama H., Tagane S., Dang. V. S., Nagamasu H., Naiki A., Tran H., Yang C. J. V1976* (holotype KYO!, isotypes BKF!, FU!, K, NTU!, P, VNM!, the herbarium of Hon Ba Nature Reserve!).

Description. Small tree, 3 m tall. Twigs glabrous, young branchlets green *in vivo*, dull yellowish green to pale yellow *in sicco*, old branchlets light grayish brown. Stipules caducous, not seen. Leaves: petiole 0.8–1.7 cm long, sunken above, rounded below, pulvini distinct, glabrous; blade ovate to elliptic, (6.8–)9–16.5 × 3.9–7.0 cm, length/width ratio 2.0–2.9, chartaceous to subcoriaceus, completely glabrous, dull yellowish green to dull pale yellow above and beneath *in sicco*, base cuneate to rounded, or shallowly subcordate, basal glands present, margin entire, foliar glands abaxially scattered mostly within the arches of the marginal veins, apex acuminate, acumen up to 2.3 mm long; midrib prominent on both surfaces, or rarely sunken only on the upper surface, secondary veins 10–14 pairs, raised on the lower surface, tertiary veins reticulate, visible on both surfaces of young leaves *in sicco*, inconspicuous on lower surface of old leaves. Staminate inflorescences not seen. Pistillate inflorescences in axils of leaves near the top of branchlets, solitary, flowers up to 7, rachis 2–5 mm long, densely pubescent; bracts broadly triangular, ca. 1 × 1.1 mm, margin ciliate, very sparsely pubescent outside, glabrous inside. Pistillate flowers (6–)8–10 mm long, (1.8–)2.5–3 mm in diam., sessile, yellowish *in vivo*, reddish brown *in sicco*; sepals 4, triangular, 0.8–1.1 × 1.1 mm, glabrous to very sparsely hairy outside, glabrous inside except near base, margin ciliate; ovary obclavate, 5–9 mm long, tetragonal, 2-locular, glabrous outside; ovules 2 per locule; stigmas slightly raised, elongated, ascending from the top of the ovary, stigma bilobed, lobes ca. 0.6–1 mm long, each stigma lobe apically deeply bifid, papillate and hairless above, smooth and very sparsely hairy beneath, style remnant present. Fruits tetragonal ellipsoid with sharp ridges, 21–25 × 7–9 mm, stiped, beaked, fleshy, reddish *in vivo*, pinkish orange to reddish brown *in sicco*, glabrous; septae and column pubescent with hairs of 0.4–0.6 mm long. Seeds 2 or 3, ellipsoid, flattened, ca. 9.0 × 5.0 × 3.5–4 mm, covered by fleshy, yellow aril *in vivo*, yellowish brown *in sicco*.

Other specimen examined. Vietnam. Khanh Hoa Province, Mt. Hon Ba, in evergreen forest near river, 12°06'33.41"N, 108°59'24.89"E, alt. 367 m, 19 Feb. 2014, with female fl., *Toyama* et al. *V829* (FU!, VNM!, the herbarium of Hon Ba Nature Reserve!).

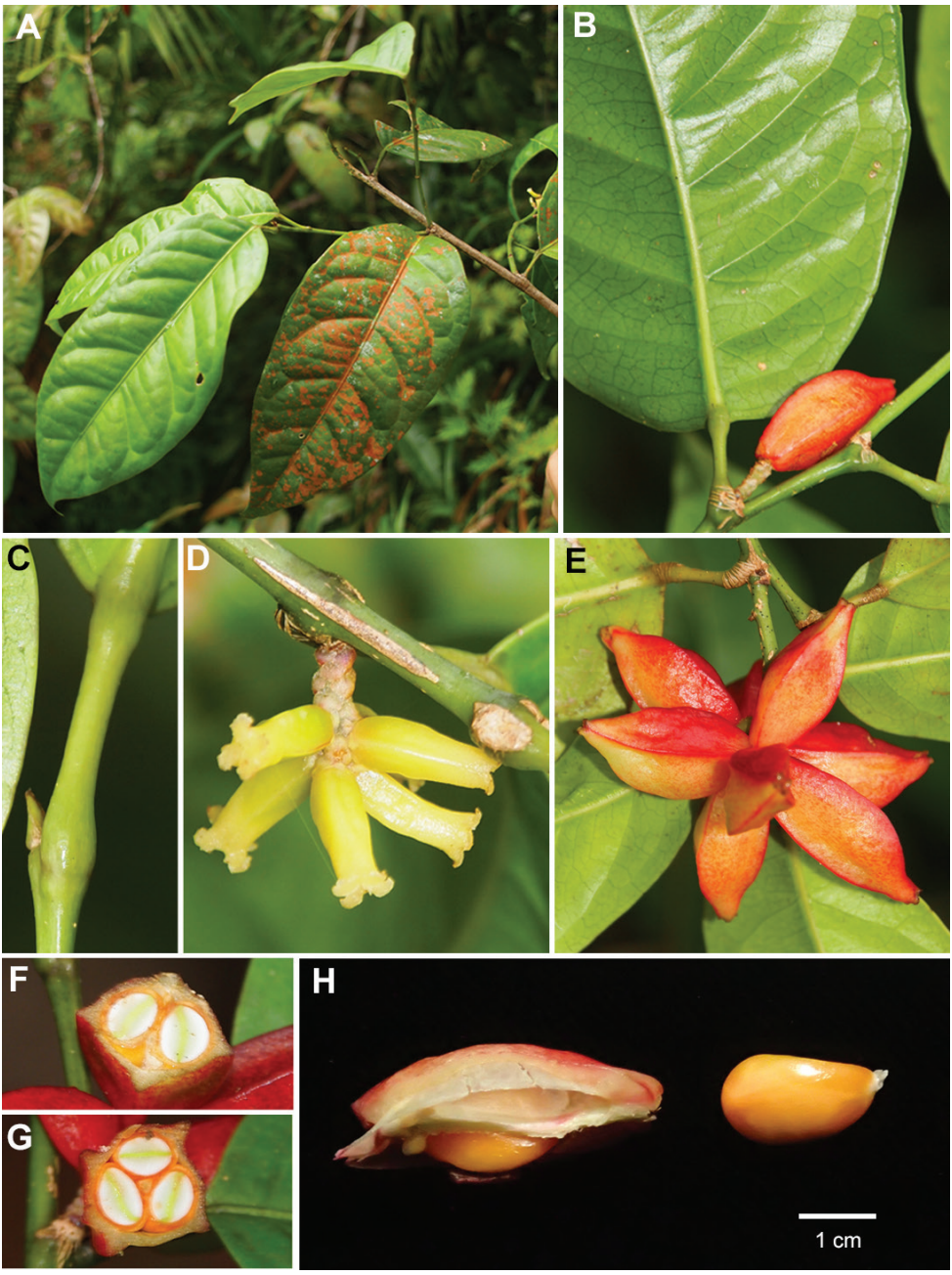

Figure 1. *Aporosa tetragona* sp. nov. **A** Leafy branch **B** Fruits and portion of abaxial surface of young leave **C** Apical bud and pulvinate petiole at both base and apex **D** Pistillate inflorescence **E** Fruits **F, G** Transverse section of fruits **H** Seeds taken from fruits. Materials: *Toyama* et al. *V1976*.

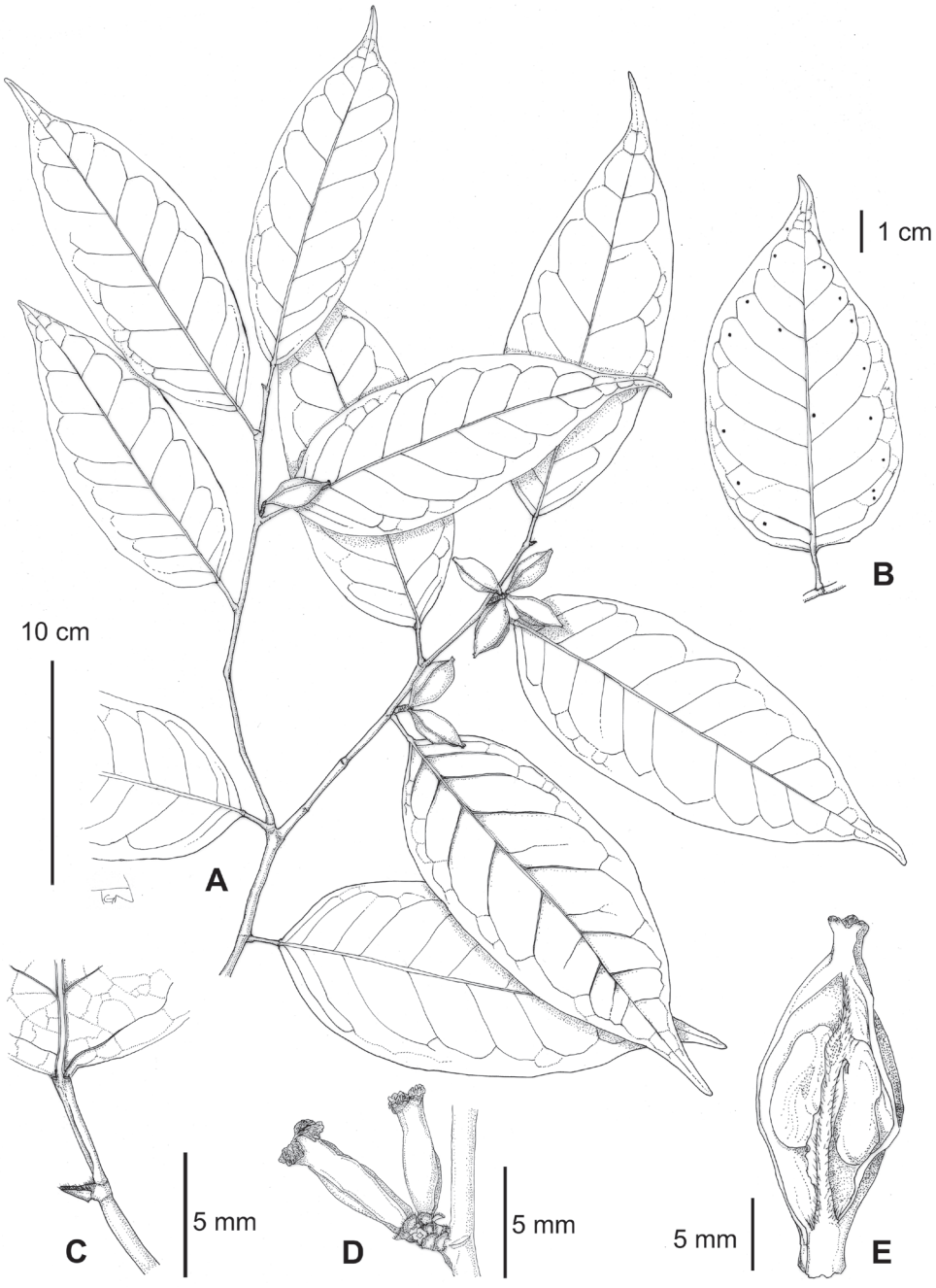

Figure 2. *Aporosa tetragona* sp. nov. **A** Fruiting branch **B** Schematic of the placement of the disc-like glands on the lower side of the leaf **C** Apex of branch **D** Pistillate inflorescence **E** Longitudinal section of fruits. Materials: **A**–**C**, **E** from *Toyama* et al. *V1976* (KYO), **D** from *Toyama* et al. *V829* (FU).

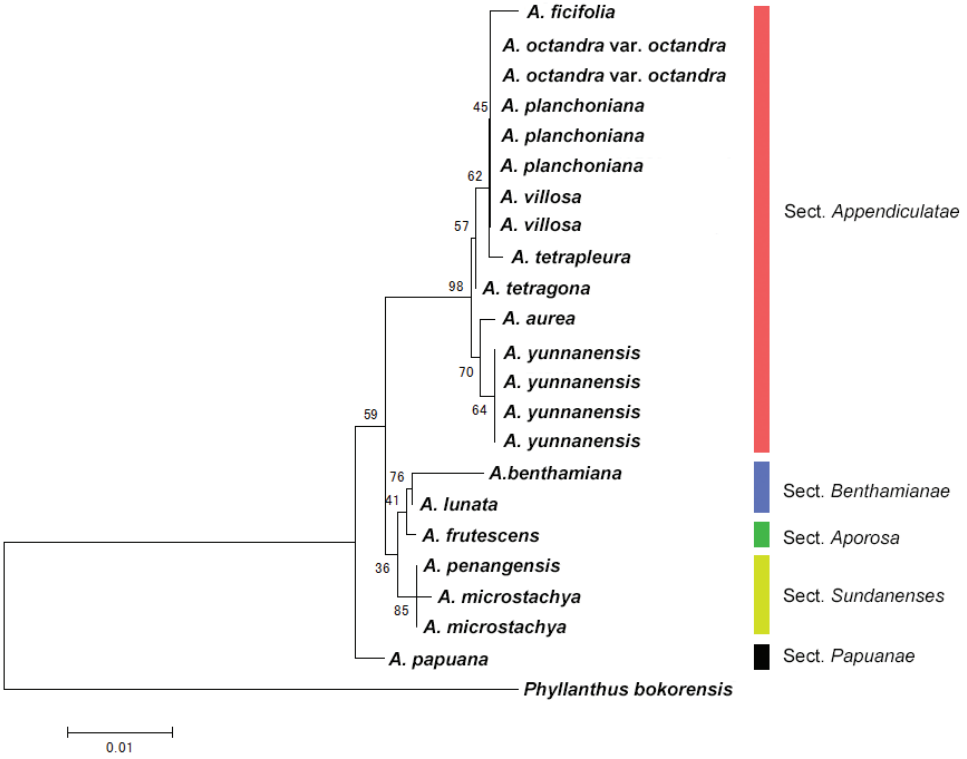

Figure 3. NJ tree of *Aporosa* species based on *rbcL* and *matK*. Branches are labeled with bootstrap support (% of 10,000 replicates).

Phenology. Flowering specimens were collected in July and November; fruiting in November.

Distribution and habitat. This species is currently known only from Hon Ba Nature Reserve, Khanh Hoa Province, South Vietnam. The small populations were found at the edge of humid broad-leaved evergreen forest close to a stream, altitude 200–400 m.

Etymology. The specific epithet *tetragona* reflects the quadrangular shape of the ovaries in the pistillate flowers and fruits.

GenBank accession No. *Toyama* et al. *V1976*: LC050338 (*rbcL*), LC050339 (*matK*).

Conservation status. The species is known only from the type locality in Mt. Hon Ba at 200–400 m altitude. It is suggested that *Aporosa tetragona* should be placed under the IUCN category 'Critically Endangered' (CR) (IUCN 2012) because of its limited distribution with an area of occupancy estimated to be less than 10 km^2 (criterion B2 a) and a small number of individuals estimated to be less than 250. Recent botanical inventories carried out in this narrow area along stream discovered several new species, including *Dillenia tetrapetala* Joongku Lee, T. B. Tran & R. K. Choudhary (Choudhary et al. 2012), *Goniothalamus flagellistylus* Tagane & V. S. Dang (Tagane et

al. 2015) and *Vanilla atropogon* Schuit., Aver. & Rybková (Schuiteman et al. 2012), all of which are rare and endemic to Mt. Hon Ba. Therefore further collection efforts around this area are necessary to accurately understand the flora there and to update the conservation status of the species.

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References

Blume C (1825) Bijdragen tot de Flora van Nederlandsch Indië: 514. Lands drukkerij, Batavia.

CBOL Plant Working Group (2009) A DNA barcode for land plants. Proceedings of the National Academy of Sciences of the United States of America 106: 12794–12797. doi: 10.1073/pnas.0905845106

Choudhary RK, Bach TT, Nong LV, Hai DV, Quang BH, Lee YM, Park SH, Lee C, Lee J (2012) *Dillenia tetrapetala* (Dilleniaceae), a new species from Hon Ba Nature Reserve, Vietnam. Annales Botanici Fennici 49: 369–376. doi: 10.5735/085.049.0608

Dick CW, Webb CO (2012) Plant DNA barcodes, taxonomic management, and species discovery in tropical forests. In: Kress WJ, Erickson DL (Eds) DNA Barcodes. Springer, New York, NY. Methods and Protocols 858: 379–393. doi: 10.1007/978-1-61779-591-6_18

Doyle JJ, Doyle JL (1987) A rapid DNA isolation procedure for small quantities of fresh leaf tissue. Phytochemical Bulletin 19: 11–15.

Dunning LT, Savolainen V (2010) Broad-scale amplification of *matK* for DNA barcoding plants, a technical note. Botanical Journal of the Linnean Society 164: 1–9. doi: 10.1111/j.1095-8339.2010.01071.x

Gagnepain F (1927) *Aporosa*. In: Lecomte MH, Gagnepain F (Eds) Flore générale de l'Indo-Chine. Masson, Paris, 5: 552–563.

Hebert PDN, Gregory TR (2005) The promise of DNA barcoding for taxonomy. Systematic Biology 54: 852–859. doi: 10.1080/10635150500354886

Hô PH (2003) Cay Co Viet Nam: An Illustrated Flora of Vietnam Vol. 2. Montreal. Published by the author, 951 pp.

IUCN (2012) IUCN red list categories and criteria, version 3.1. IUCN Species Survival Commission, Gland/Cambridge, 1–32.

Kress WJ, Erickson DL, Jones FA, Swenson NG, Perez R, Sanjur O, Bermingham E (2009) Plant DNA barcodes and a community phylogeny of a tropical forest dynamics plot in Panama. Proceedings of the National Academy of Sciences of the United States of America 106(44): 18621–18626. doi: 10.1073/pnas.0909820106

Pax F, Hoffmann K (1922) Euphorbiaceae–Phyllanthoideae–Phyllantheae. In: Engler A (Ed.) Das Pflanzenreich 4, 147, 15: 80–105. Leipzig.

Saitou N, Nei M (1987) The neighbor-joining method: a new method for reconstructing phylogenetic trees. Molecular Biology and Evolution 4: 406–425.

Schot AM (2004) Systematics of *Aporosa* (Euphorbiaceae). Blumea Suppl. 17: 1–377. Nationaal Herbarium Nederland.

Schot AM, van Welzen PC (2005) *Aporosa*. In: Chayamarit K, van Welzen PC (Eds) Euphorbiaceae (Genera A-F). Flora of Thailand 8(1): 1–303.

Schuiteman A, Averyanov L, Rybková R (2013) *Vanilla atropogon*, a new species from Vietnam. Orchideen Journal 1: 10–16.

Tagane S, Dang VS, Yahara T, Toyama H, Tran H (2015) *Goniothalamus flagellistylus* Tagane & Dang VS (Annonaceae), a new species from Mt. Hon Ba, Vietnam. PhytoKeys 50: 1–8. doi: 10.3897/phytokeys.50.4427

Tamura K, Nei M, Kumar S (2004) Prospects for inferring very large phylogenies by using the neighbor-joining method. Proceedings of the National Academy of Sciences of the United States of America 101: 11030–11035. doi: 10.1073/pnas.0404206101

Tamura K, Stecher G, Peterson D, Filipski A, Kumar S (2013) MEGA6: Molecular Evolutionary Genetics Analysis Version 6.0. Molecular Biology and Evolution 30: 2725–2729. doi: 10.1093/molbev/mst197

Toyama H, Kajisa T, Tagane S, Mase K, Chhang P, Samreth V, Ma V, Sokh H, Ichihasi R, Onoda Y, Mizoue N, Yahara T (2015) Effects of logging and recruitment on community phylogenetic structure in 32 permanent forest plots of Kampong Thom, Cambodia. Philosophical Transactions of the Royal Society B: Biological Sciences 370(1662): 20140008. doi: 10.1098/rstb.2014.0008

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RESEARCH ARTICLE

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The genus *Fleischmannia* in Argentina, Bolivia, Brazil and Paraguay (Eupatorieae, Asteraceae)

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Abstract

Species of the genus *Fleischmannia* from Argentina, Bolivia, Brazil and Paraguay are reviewed, and keys are provided that cover the species in each country. New taxa described are *Fleischmannia hatschbachii*, *F. matogrosensis, F. microstemon* var *paniculata* from Brazil, *F. hassleri* from Paraguay and *F. neei* and *F. steinbachii* from Bolivia, and one new combination for a *F. prasiifolia* variety is provided. The additions bring the total known species of the genus to 102.

Keywords

Fleischmannia, Argentina, Bolivia, Brazil, Paraguay, new taxa

Introduction

Fleischmannia is a genus of annual to perennial, often scrambling, herbs in the tribe Eupatorieae concentrated in the Central America and the northern and central Andes. One species occurs in eastern North America and a few occur in eastern Brazil. Prior to the present study the genus contained 97 known species. Recent efforts to clarify the species of have concentrated on Mesoamerica (Robinson 2015), and northern and western South America (Robinson 2001, 2008). In these areas, the delimitation of species has proven more complicated than initially expected. Meanwhile, the study of the

genus from farther south in South America has been subjected to the lowest form of taxonomy, a process that I refer to as identification work. Some individual specimens have been put aside over the years and are now subjected to new studies in more detail. The species have again proven to be more complicated than expected. Even countries with few species such as Brazil and Paraguay have presented some difficulties, and Bolivia has many names in use without clear distinctions and many more recent collections that do not match any of the described species.

Materials and methods

Specimens used in the study were those accumulated over the last 150 years in the U.S. National Herbarium. Studies were restricted to use of the dissecting and compound microscopes.

Results

The species of *Fleischmannia* in southern and eastern South America are reviewed here by country starting with Argentina, Paraguay and then Brazil, based on material accumulated over the years at the U.S. National Herbarium (US). Treated last is Bolivia with its 12 species. In the process, new species are described and keys are provided.

Argentina

Only three species are credited to the country, none of them endemic. The three can be distinguished by the following key:

1 Erect plants with ascending branches spreading at less than 45° angles; heads in large corymbiform clusters ..... ***F. prasiifolia***

– Scrambling or leaning plants with branches spreading at 45–90° angles; inflorescence lax with long branches bearing small clusters of heads **2**

2 Pappus bristles ca. 30, mostly not contiguous; Andean plants ..... ***F. schickendantzii***

– Pappus bristles ca. 40, contiguous; plants of Paraná River system ..... ***F. dissolvens***

For the subscandent *F. dissolvens* (Baker) R.M. King & H. Rob. of northeastern Argentina, see the treatment of the Paraguay species, and for the more erect or sprawling Andean species, *F. prasiifolia* (Griseb.) R.M. King & H. Rob. and *F. schickendantzii* (Hieron.) R.M. King & H. Rob., see the treatment of the Bolivian species.

Paraguay

Two species have been collected in Paraguay. One previously only reported from Argentina and the other undescribed. The specimens of both species have previously been mostly mistakenly identified as *Fleischmannia prasiifolia* (Griseb.) R.M. King & H. Rob., a species now known not to be from Paraguay.

1 Plants subscandent or scrambling; branches spreading at 60–90° angles; leaf blades membranaceous, mostly glabrous between the veins, without glandular dots abaxially ..... ***F. dissolvens***

– Plants erect or leaning; branches ascending, spreading at less than 45° angles; leaf blades herbaceous, densely pubescent on both surfaces, with small glandular dots abaxially ..... ***F. hassleri***

***Fleischmannia dissolvens* (Baker) R.M. King & H Rob., Phytologia 19: 203. 1970.**

Eupatorium dissolvens Baker, Fl. bras. 6(2): 308. 1876. Type: Argentina. Entre Rios, Parana, *Christie 59* (holotype K).

Description. Scrambling perennial herb ca. 1 m tall, with branches widely spreading at 45–90° angles; stems pale to dark brown, terete, striated, hispid to stiffly puberulous. Leaves opposite; petioles slender, 0.5–2.0 cm long; leaf blades triangular, membraneous, mostly 3.0–5.5 cm long, 2.0–3.5 cm wide, widest near basal 5th, base obtusely cuneate, margins with 5–10 sharp teeth, apex narrowly acute to slightly acuminate, surfaces puberulous on larger veins, sparsely pilosulous to subglabrous between veins, without glandular dots or hairs; triplinervate from petiole, with main veins brownish. Inflorescence a lax panicle with elongate branches, heads in cymiform clusters at tips of elongate branches; most nodes with foliiform bracts 1.5–2.0 cm long; branches and peduncles densely puberulous, peduncles 3–13 mm long. Heads ca. 7 mm high, 5 mm wide; involucral bracts ca. 30 in 3–4 series, basal involucral bracts narrowly ovate to lanceolate, 2–3 mm long, puberulous outside, inner bracts narrowly oblong, with short-acute tips. Florets ca. 17 in a head; corollas violet. ca. 2.5 mm long, basal tube ca. 0.5 mm long, throat ca. 2.2 mm long, lobes ca. 0.6 mm long, narrowly triangular, with numerous monoseriate hairs outside; anther thecae ca. 0.9 mm long, apical appendage ca. 0.2 mm long; style branches slender. Achenes 2.2–2.7 mm long, slightly and narrowly paler on ribs, ribs setuliferous; pappus whitish, of ca. 40 slender contiguous bristles ca. 3 mm long.

Specimens seen. Paraguay: Guaira: Cordillera de Ybytyruzú, Cerro Acaté, secondary vegetation on base of mountain along southern side, 25°55'S, 56°15'W, 700 m, herb 1 m, flower pink, 17 Feb. 1989, *E. Zardini & R. Velásquez 11100* (FCQ, MO, US); Guaira: Cordillera de Ybytyruzú, road to Polilla, Cerro Acatí, forest, 25°55'S,

56°10'W, 800 m, shrub 1 m, 23 July 1989, *E. Zardini & R. Velásquez 13604* (FCQ, MO, US).

The species has previously been reported only from Entre Rios in Argentina. The Paraguay localities are farther up river.

***Fleischmannia hassleri* H. Rob., sp. nov.**
urn:lsid:ipni.org:names:77151273-1

Type. Paraguay: Centralis, in regione lacus Ypacaray, Feb. 1913, *Hassler, Plantae Paraguariensis 1913* (holotype US). (Figure 1)

Description. Erect or leaning subshrubs to 0.6–1.0 m tall, with internodes 3–5 cm long, longer distally; with branches ascending at less than 45° angles. Leaves opposite, petioles 5–10 mm long; leaf blades triangular with subtruncate to truncate bases, mostly 2–3 cm long, 1.0–1.8 cm wide, smaller at more distal nodes, with ca., 7 teeth on each margin, apex acute, densely puberulous on both surfaces, with numerous small glandular dots abaxially, triplinervate from narrow basal acumination, secondary veins strongly ascending. Inflorescence terminal on slender elongated stems and branches, cymiform with branches ending in small clusters of heads; peduncles 1–3 mm long, densely puberulous; capitula ca. 6 mm high, ca. 4 mm wide before spreading; involucral bracts ca. 22. 1.5–4.0 mm long, 1.0–1.2 mm wide, 1 or 2 basal involucral bracts short and oval, acute, puberulous outside, median and inner bracts stramineous, membranous with scarious margins and tips, blunt, with pair of large longitudinal veins and often weak 3rd or 4th veins; florets 17–20 in a capitulum; corollas purple, ca. 3 mm long, basal tube ca. 0.5 mm ling, throat ca. 2 mm long, lobes ca. 0.5 mm long; anther thecae ca. 1 mm long; style branches slender, achenes ca. 1.2 mm long, ribs slightly yellow when submature, smooth except for a few small scabrae; pappus whitish, ca. 3 mm long, with ca. 32 bristles, not broader near the base.

Paratypes: Paraguay. Villamein? common in thickets, *Jorgensen 54268* (US). Dept. Cordillera, Compañia Yoypó-jú, disturbed sandy soil, with sandstone outcrops, among herbs, grasses and bushes in abandoned quarry, edge of disturbed forest. 3 March 1985, *Bordas 3669* (US). Dept. Central, Nemby (Barrio Industrial, Segunda Etafa) in advancing disturbed forest, in clearings, leaning on other plants. 13 March 1986, *Bordas 3750* (US). Dept. Central, border Tavarory-Acosta ñu, creek, affluent of Paraguay River, gallery forest, 25°27'S, 57°32'W, 10 June 1993, *E. Zardini & V. Jara 36127* (AS, MO, US). Caaguazú, Feb. 1905, *Hassler 9069* (US).

Specimens have usually been determined in the past as *Fleischmannia prasiifolia* with which it shares many characteristics such as ascending branches, short peduncles in the inflorescence, purple color of the corollas and achenes with somewhat paler ribs. The new species differs by the smaller more densely pubescent leaves and smaller clusters of heads, and it occurs far to the east of the distribution of *F. prasiifolia* and at generally lower elevations. The presence of minute glandular dots on the abaxial leaf surfaces would also seem to be a distinction, but minute stipitate glands occur in *Fleischmannia prasiifolia* var. *glandulifera* as noted in the Bolivian treatment.

Figure 1. *Fleischmannia hassleri* H.Rob., holotype (US).

Brazil

Fleischmannia in Brazil has mostly been recognized as having three species, the widespread *F. microstemon* (Cass.) R.M. King & H. Rob., *F. remotifolia* (DC.) R.M. King & H. Rob. and *F. laxa* (Gardn.) R.M. King & H. Rob. The more southern species *F. laxicephala* (Cabrera) R.M. King & H. Rob. is a more recent addition, and two additional new species are added here from Mato Grosso and a newly validated variety from coastal Brazil. The six species and one variety are distinguished as follows:

1 Annual plants; with slender branches strongly ascending at less than 45° angles, often over-topping main axis **2**

– Perennial plants; with branches mostly spreading at 45–90° angles **3**

2 Peduncles puberulous, leaves obtuse to slightly acuminate; ribs of semimature achenes persistently pale ..... ***F. microstemon* var. *microstemon***

– Peduncles hispid with small stipitate glands, leaves with short abruptly acuminate tips; ribs of cypselae not persistently pale ..... ***F. microstemon* var. *paniculata***

3 Capitula in rather dense corymbiform clusters, style branches broadened apically; upper margins of inner involucral bracts often somewhat ruffled ..... ***F. remotifolia***

– Capitula laxly disposed, on peduncles often 5 mm long or more, style branches not broader distally; margins of involucral bracts not ruffled **4**

4 Pappus bristles broadened at base; peduncles densely puberulous ..... ***F. laxicephala***

– Pappus bristles not broadened at base, not or scarcely contiguous with each other; peduncles, hispid with stipitate glands or nearly glabrous **5**

5 Peduncles hispid with small stipitate glands; inner involucral bracts acute with narrow scarious borders; corollas usually lavender ..... ***F. laxa***

– Peduncles glabrous or subglabrous with sparse non-glandular hairs; inner involucral bracts with rounded or obtuse tips and broadly scarious borders; corollas white **6**

6 Leaf blades membranaceous, broadly ovate with sharply serrate margins, puberulous on veins and with scattered minute glandular dots abaxially ..... ***F. matogrossensis***

– Leaf blades subcoriaceous, narrowly ovate with scarcely serrate margins, surfaces pilosulous and without glandular dots ..... ***F. hatschbachii***

***Fleischmannia hatschbachii* H. Rob., sp. nov.**
urn:lsid:ipni.org:names:77151274-1

Type. Brazil: Mata Grosso, Ribeirão Claro (mun. Alto Araguaía), 17°15'46"S, 53°11'54"W; erva flor alva, orla da matinha as margens de corrego, 1 July 1974, *Hatschbach 34659* (holotype MBM, isotype US). (Figure 2)

Figure 2. *Fleischmannia hatschbachii* H.Rob., isotype (US).

Description. Erect herb 0.6–0.7 m tall, stems brownish, terete, striated when dry, hispid with small hairs. Leaves opposite, petioles 0.5–1.0 cm long, puberulous; blades ovate, 2.5–5.0 cm long, 1.0–1.8 cm wide, widest at basal 1/4or 1/3, base obtusely to acutely cuneate, margins bluntly subserrate with 4–6 teeth on each side, apex acute, or slightly blunt at tip, adaxial surface sparsely pilosulous; abaxial surface with prominent pale primary and secondary scabrid veins, areolae glabrous, without evident glandular dots, triplinervate from base with strongly ascending secondary veins. Inflorescence a lax panicle with mostly opposite branches spreading at mostly ca. 45° angles; mostly glabrous; main axis with foliiform bracts 0.6–2.0 cm long and 0.3–1.1 cm wide; branches filiform, peduncles 6–15 mm long, glabrous. Heads ca. 5 mm high, 3 mm wide; Involucral bracts ca. 25 in ca. 4 series, narrowly ovate to narrowly oblong, 1.0–3.5 mm long, 0.5–0.8 mm wide, with broadly scarious obtuse tips; florets ca. 17 in a head; corollas white, ca. 2.3 mm long, basal tube ca. 0.5 mm long, throat ca. 1.5 mm long, lobes ca. 0.5 mm long, with short monoseriate hairs on outer surface; anther thecae ca. 0.8 mm long; apical appendage ca. 0.3 mm long; style branches not broader at tips. Achenes submature, ca. 1.7 mm long. brownish, ribs slightly paler, setuliferous on ribs; pappus whitish, ca. 2 mm long, of ca. 25 slender scabridulous non-contiguous bristles.

Only the type collection is known.

Fleischmannia hatschbachii is one of two new species from Mato Grosso described here with slender glabrous or nearly glabrous branches of the inflorescence. This species and *F. matogrossensis*, nevertheless, differ too much in their leaves to be the same species. A third species with glabrous branches of the inflorescence is found farther west in Bolivia, *F. neei*. That differs by its less slender inflorescence branches, lavender corollas and its more glabrous leaf surfaces.

Fleischmannia laxa (Gardn.) R.M. King & H. Rob., Phytologia 19: 204. 1970

Eupatorium laxum Gardn., London J. Bot. 5: 476. 1846. Type: Brazil. Minas Gerais, In bushy places on the banks of the Rio Claro, June 1841, *Gardner 4856* (holotype BM, isotype US).

Description. Plants probably always perennial, scandent or scrambling stems, branches spreading at 65–80° angles. Leaves opposite; petioles 0.5–3.0 cm long; blade narrowly to broadly ovate, mostly 2–5 cm long, 1.5–4.0 cm wide, base obtuse to truncate, margins with 8–12 blunt teeth on each side, apex shortly acuminate, surfaces finely and densely hispidulous, abaxial surface paler, with scattered minute glandular dots; triplinervate from short basal acumination, major veins often pale. Inflorescence laxly branching; peduncles 5–25 mm long, hispid with stipitate glands; heads ca, 6 mm high, 4 mm wide; involucral bracts ca. 30 in ca. 4 series, 1–5 mm long, outer narrowly ovate, inner bracts narrowly oblong, inner bracts with green part reaching short-acute apices, scarious margins narrow. Florets ca. 17 in a head; corollas usually lavender or reddish, ca. 3 mm long, basal tube ca. 0.5 mm long, throat ca. 2 mm long, lobes ca.

0.5 mm long, without hairs outside; anther thecae ca. 0.8 mm long, apical appendage ca. 0.2 mm long; style branches slender. Achenes 1.5–1.8 mm long, not noticeably paler on ribs, setuliferous on ribs and sometimes on distal surfaces; pappus whitish, of ca. 20–23, slender non-contiguous bristles 2.5–2.8 mm long, not broadened at base, with dense fringe of setulae along margin of callus and between or on bases of bristles.

Specimens seen. Brazil: Distrito Federal: Côrrego Samambaia, near Taguatinga, ca. 20 km W of Brasília, elev. 1000 m, Gallery forest, subshrub ca. 1.5 m tall, heads pale lavender, 13 July 1966, *H.S. Erwin, J.W. Grear Jr.*, *R. Sousa & R. Reus dos Santos 18196* (NY, UB, US); Distrito Federal: Reserva Ecológica do IBGE. Planta bastante delgada, capítulos alvacententos, beira da mata das nascentes de córrego Taquara, 23 June 1983, *B.A.S. Pereira 587* (IBGE, US); Distrito Federal: Reserva Ecológica do IBGE, mata ciliar do córrego Roncador, 15°58'06"S, 47°53'43"W, erva ca. 1.2 m de altura, botão floral de cor verde, flores de cor rosa, 12 June 1989, *D. Alvarenga & F.C.A. Oliveira 298* (IBGE, US); Goiás: Alto Paraíso, rod. Para Nova Roma, Pedra Ruim, capítulos alvos, transição campo cerrado-rupestra, 13 June 1993, *G. & M. Hatschbach 59488 & Barbosa* (MBM, US); Minas Gerais: Est. ecologica UFMG-BHMG, mata, beira da trilha, 13 July 1990, *E. Tameirão Neto 85 & Glauco* (BHCB 22.876, US); Est. ecologica UFMG-BHMG, cerrado, escandente voluvel, 16 May 1990, *E.M. Santos 25 et alii* (UFMG, US); Minas Gerais: Parque Nacional Grande Sertão Veredas, margens do rio Mato Grande, 15°119'06"S, 45°59'09"W, erva, annual, approx. 60 cm compr., capitulos arroxeados, 29 Apr. 1999, *R. Rodrigues-da-Silva, T.S. Filgueras & F.C.A. Oliveira 259* (IBGE, US).

The obvious stipitate glands on the peduncles are distinctive. In Brazil, similar glands are seen elsewhere only in *Fleischmannia microstemon* var.*paniculatum* H.Rob. described below.

Fleischmannia laxicephala (Cabrera) R.M. King & H. Rob., Phytologia 19: 204. 170.

Eupatorium laxicephalum Cabrera, Sellowia 15: 196. 1963. Type: Brazil. Santa Catarina, (Mun. Lauro Müller), Ruderal, lower and middle slope of serra by Rio do Rastro, 20 km west of Lauro Müller, alt. 700–1000 m, 3-IV-1957. *L.B. Smith & R. Klein 12341* (holotype LP, isotype US).

Description. Shrubs with many opposite, woody branches spreading at ca, 45° angles; stems terete, glabrous. Leaves opposite, petioles slender, 0.5–1.2 cm long, blades 1.5–5.0 cm long, 0.5–2.5 cm wide, base truncate to short-acute, margins with numerous jagged teeth, apex narrowly acute to slightly attenuate, surfaces glabrous, triplinervate from slight acumination at petiole, main veins pale. Inflorescence rather diffuse, with single or few heads at tips of leafy branches, slender glabrous peduncles 5–15 mm long, heads ca. 6 mm high; involucral bracts ca. 30, with few lanceolate outer bracts 1.0–1.5 mm long, inner bracts narrowly oblong, to 4 mm long, with mucronate tips; florets ca. 17 in a head; corollas white, ca. 2 mm long, basal tube ca. 0.5 mm long, throat ca. 1

mm long, lobes ca. 0.5 mm long, without evident hairs outside; anther thecae ca. 0.8 mm long, apical appendage ca. 0.2 mm long, style branches slender. Achenes ca. 1.2 mm long, ribs not pale, sparsely setuliferous; pappus white, ca. 2 mm long, of ca. 30 barbellate bristles, obviously broadened and contiguous at base.

Additional specimens seen. Brazil, Santa Catarina. Mun. Lauro Müller, Rod. SC-438, Serra do Rio do Rastro, erva, de capítulos alvos, paredões rochosos, 1000 m, 7 Apr. 1991, *G. & M. Hatschbach 55312 & D. Guimarães*, (MBM, US); Mun Lauro Müller, Serra Rio do Rastro, capítulos alvos, paredões rochosos úmidos, 18 Apr. 1994, *G. Hatschbach 60640 & E. Barbosa* (MBM, US); Serra da Rocinha, alto (Mun. Timbé do Syl), ereta, capitulo alvo, paredão roschoso, 13 March 2005, *G, Hatschbach*, *E. Barbosa & E.F. Costa 79122* (MBM, US); Serra do Rio do Rastro (Mun. Lauro Müller), ereta 35 cm, flor alva, Paredão rochoso, alt. 1100–1200 m, 16 March 2005, *G. Hatschbach,I E. Barbosa & E.F. Costa 79218* (MBM, US); Serra do Rio do Rastro (Mun. Lauro Müller), arbusto, 80 cm, capitulo alvacento, encosta de paredão úmido, 16 Nov. 2008, *J.M. Silva,I J. Cordeiro*, *C.B. Poliquesi & J. Vaz 7194* (MBM, US).

The specimens seen are all woodier with more regular vegetative branching than most members of the genus *Fleischmannia*. This is only Brazilian species known with obviously broadened bases on the pappus bristles. The species is presently known only from Santa Catarina.

***Fleischmannia matogrossensis* H. Rob., sp. nov.**
urn:lsid:ipni.org:names:77151275-1

Type. BRAZIL: Mato Grosso, Area do Cindacta (Mun, Chapada dos Guimarães), 15°27'39"S, 55°45'W Apoiante, capitulo alvo, Orla da mata, 12 VIII 1997, *G. Hatschbach, A. Schinini & E. Barbosa 66769* (Holotype MBM, isotype US ; see Figure 3).

Description. Scrambling vines 2 or more meters long, stems brown, striated when dry, densely puberulous below, becoming sparsely pilosulous distally, glabrous in inflorescence. Leaves opposite, petioles 0.5–2.3 cm long, puberulous; blades membranous, broadly ovate, below inflorescence mostly 5–7 cm long, 3.0–4.5 cm wide, widest near basal 5th, base subtruncate, margins sharply toothed with 12–20 teeth on each side, apex usually gradually narrowly acuminate, adaxial surface subglabrous, abaxial surface concolorous, puberulous on primary and secondary veins, glabrous between, with scattered minute glandular dots, triplinervate from petiole. Inflorescence a lax pyramidal panicle with slender opposite branches spreading at 45–80° angles, main axis with foliiform bracts up to 3 cm long, with 5–8 serrations on each margin; branching laxly cymiform distally; peduncles filiform, mostly 8–12 mm long, glabrous. Heads ca. 6 mm high and 3–4 mm wide, with ca. 25 bracts in 4–5 series, mostly stramineous, outer bracts ovate, 1–2 mm long, inner bracts narrowly oblong to linear-oblong, to 4.5 mm long, 0.8–1.0 mm wide, with scarious margins and obtuse scarious tips; receptacle scarcely convex. Florets ca. 17 in a head; corollas white, ca. 2.5 mm long, basal tube ca. 0.5 mm long, throat ca. 1.5 mm long, lobes ca. 0.45 mm long; anther thecae ca. 0.8

Figure 3. *Fleischmannia matogrossensis* H.Rob., isotype (US).

mm long, apical appendage ca. 0.3 mm long. Achenes ca. 1.8 mm long, black at maturity, with short setulae on ribs; pappus white, ca. 2 mm long, with ca. 25 scabridulous bristles, scarcely broadened near base, not or scarcely contiguous.

The species is known only from the type collection. In general habit, the species seems closest to *Fleischmannia laxa*, but it has no stipitate glands on the branches of the inflorescence as seen in the latter species, the leaves are not densely hispidulous with margins more sharply toothed and the involucral bracts are less pointed with more broadly scarious margins.

Fleischmannia microstemon (Cass.) R.M. King & H. Rob., var. *microstemon*, Phytologia 19: 204. 1970.

Eupatorium microstemon Cass., Dict. Sci. Nat. 25: 432. 1822. Weed in Paris botanical Garden, *Cassini s.n.* (holotype P).

Eupatorium guadaloupense Spreng., Syst. Veg. 3: 414. 1826. Guadeloupe, *Bertero s.n.* (P?, TO?)

Eupatorium bimatrum Standl. & L.O. Williams, Ceiba 3: 64. 1952. Honduras, Morazán, El Zamorano, ca. 800 m, 18 Oct. 148, *Standley 13132* (holotype F).

Description. Erect annual herbs to 1 m tall, with slender, strongly ascending branches which often overtop the main axis; stems yellowish green to brown, puberulous. Leaves mostly opposite, alternate distally; petioles slender, usually 0.8–4.0 cm long; leaf blades membranaceous, broadly rhombic-ovate, mostly 2.0–3.7 cm long, 1.4–3.0 cm wide, base acuminate at petiole, margins crenate with 7–14 teeth on each side, apex usually short-acute, adaxially sparsely pilose, abaxially pilosulous on veins, with glandular dots; triplinervate from margins of basal acumination. Inflorescence lax cymose panicles with ascending branches, with many shorter lateral branches proximally; peduncles 2–7 mm long, slender typically puberulous. Heads ca. 4 mm high; involucral bracts 15–22 in 3–4 series, 1.5–3.8 mm long, outer narrowly acute, sparsely puberulous, inner bracts broad and mostly scarious at tip, apex apiculate. Florets 20–35 in a head; corollas lavender to white, 2.0–2.2 mm long, basal tube ca. 0.5 mm long, throat ca. 1.5 mm long, lobes ca. 0.2 mm long, without hairs outside; anther thecae ca. 0.7 mm long; style branches narrowly linear. Achenes 1.3–1.5 mm long, ribs persistently yellow, ribs and distal faces setuliferous; pappus white, of ca. 20 slender not or scarcely contiguous bristles ca. 2 mm long.

Fleischmannia microstemon var. *paniculata* H. Rob., var. nov.

Type. Brazil, Bahia, Ilhéus, ns área do CEPEC, Plants de 70 cm de altura, flores azuladas, invólucru verde, N.V. Cordão de Ouro, 21.10.1977, *T.S. Santos 3151* (holotype CEPEC, isotype US). (Figure 4).

Figure 4. *Fleischmannia microstemon* var. *paniculata* H.Rob., isotype (US).

?*Eupatorium paniculatum* Schrad., Ind. Sem. Hort. Acad. Gott. 2. 1832; Linnaea 8, Litt. 26. 1833, hom. illeg., non Miller 1768. Photo from G-DC. Herbarium seen.

With the habit of the typical variety, but differing by the rather abrupt short acuminatie tips on leaf blades, stipitate glands on the peduncles and branches of the inflorescence, and by the not or scarcely paler ribs on the submature achenes.

Paratypes. Brazil: Bahia, 1842, *Glocker no 18* (BM, US); Bahia, forests of the Rio Grongogy Basin, alt. 100–500 m, 1 Oct.–30 Nov. 1915, *H.M. Curran 147* (US); Paraiba do Norte, Areias; Escola de Agronomia do Nordeste, herva colluda em logares relativamente umidos, 9–3-1947, *J.de Moraes Vase 17* (RB, US); Pernambuco, Tapera, at wet shady border of a thicket, 26 July 1931, *D.B. Pickel s.n.* (LCU, US).

The variety is evidently restricted to areas near the coast of northestern Brazil. The locality in Bahia and the shape of the leaf blades as seen in the photograph of the G-DC specimen make it almost certain the Schrader nom. illeg. represents this same variety. While there is no nomenclatural requirement for perpetuating the Schrader name it has been decided to do so.

Fleischmannia remotifolia (DC.) R.M. King & H. Rob., Phytologia 19: 205. 1970

Fleischmannia remotifolium DC., Prodr. 5: 165. 1836.

Type. Brazil. Minas Geraes near Mariannum, *Vauthier 259* (lectotype G-DC).

Specimens are usually described as vines. Stems have branches usually spreading at ca. 90° angles. The leaves have mostly 9 to 14 blunt or sharp teeth on each margin, and vary from ovate with acute apices to narrowly ovate or lanceolate with narrowly acuminate apices. Inflorescence with elongate panicle with widely spreading branches, heads closely clustered at ends of branches; peduncles 2–6 mm long, puberulous. Heads ca. 7 mm high, 4–5 mm wide; involucral bracts ca. 22 in ca. 4 series; all bracts with acute to acuminate tips, 2–6 mm long, outer bracts narrowly ovate, inner bracts narrowly oblong. Corollas are rather consistently described as white, but sometimes lavender, ca. 3 mm long, basal tube ca. 0.5 mm long, throat ca. 2 mm long, lobes ca. 0.4 mm long, glabrous outside; anther thecae ca. 0.9 mm long, apical appendage ca. 0.25 mm long; style branches broadened distally. Achenes ca. 2 mm long, not paler on ribs, weakly setuliferous on ribs; pappus whitish, of ca. 35 bristles ca. 3 mm long, slightly broadened and contiguous at base, often detaching in groups.

Specimens seen. Brazil: Bahia: mun. Arataca, Serra das Lontras 9.0 km WNW of Itatinguí on Fazenda road, then on trail over mountain ridge to Dazenda Cairo, 15°11'53"S, 39°23'50"W, 530–630 m, disturbed southern Bahian moist forest, fallen liana, mostly leafless, involucre olive, heads white, 15 Sept. 2004, *W.W. Thomas, A.M. Amorim, J.G. Jardim, S. Sant'Ana & J.L. Paixão 14062* (NY, US). Bahia-Espirito-Santo: Vale do Rio Mucurí, ao lado de Rodovia BR 101, mata de terra firme, planta e 2 m de altura, capítulos brancos, involucro verde, 16 July 1968, *R.P. Belem, 3873* (CEPLAC, NY, US); Espirito Santo, Macuco, Reserva de Scoratama, mata alagadiça

de palmetto, ca.70 cm de alt,, ramos herbaceous e decumbentes, semi-umbrofila, capitulos roseo-cloros, 16 Aug. 1969, *D. Grew 5642* (RB, US); Espirito Santo: Rod. BR-262 (mun. Ihatiba, erva de flor alva, capoeira, local sombrio, úmido, 21 July 1982, *G. Hatschbach 45185 & C. Guimarães* (MBM, US); Espírito Santo, São Bento de Urâmia, rodovia para Castelinho (mun. Alfredo Chaves), apoiante, capítulos lilás, Orla da mata plubial de solo arenoso, alt. 900 m, 8 Oct. 1994, *G. & M. Hatschbach 61153 & S.M. Silva* (MBM, US); Espirito Santo: Reserva Florestal de Linhare, Linhares, km. 1.5, Aceiro com Ceolin, Vatzea periodicimente inundável, Rastejante, herbáceo, flor branco, exudação seiva, incolor, common name Arnica falsa, 29 July 1998, *D.A. Folli 3203* No. registro 5955 (CVRD, US); Minas Gerais: Caldas, 1845, *Widgren 187* S, US); Minas Gerais: 18 July 1862, *Regnell I232* (S, US); Minas Gerais: Agricultural College lands, Chacha Valley, tangle on overgrown eastern slope, scandent shrub 2.5 m high, with long branches, white flower, infrequent, 30 June 1930, *Ynes Mexia 4818* (US); Minas Gerais: Viscosa, Fazenda de Faziuma, forest on slope, in partial shade, alt. 700 m, suffrutescent, scandent, 1.5 m high, white flower with pungent fragrance, occasional. 8 Sept. 1930, *Ynes Mexia 4944* (US); Minas Gerais, Distrito Ilheu, Fazenda da Tabunha, trail to Capichava, in partial shade in cut-over woods, vine climbing 3 m high, flower white, agreeably pungent odor, alt. 210 m, 30 Aug. 1930, *Ynes Mexia 5019* (US); Rio de Janeiro: alt. 21 ft?, *Miers 3719* (BM, US); Minas Gerais: Mata, Serra do Curral, mun, de Belo Horizonte, pouco frequente, flores alvas, arbusto semiescandente, 25 July 1942, *M. Magalhães 3304* (SP, US); Minas Gerais: Parque Nacional do Cachoeira Bonita (Mun. Caparaó), erva 50 cm, capitulos alvos, matinha de alt. 1800 m, 15 June 1991, *G. & M. Hatschbach & D. Guimarães 55534* (MBM, US); São Paulo: (capital), on margin of a rivulet, white flowers, *B. Prokel 5333* (US); São Paulo, aguas de Lindois, semi-prostrada, á sombra da mata, á beira de córrego, corolas alvas, 17 Aug 1968, *W. Hoehne 6248* (SP, US)

This is the most common species of *Fleischmannia* in eastern Brazil. It is distinct from other Brazilian species by the more densely corymbiform inflorescence and broader style branches.

Bolivia

The understanding of *Fleischmannia* in Bolivia has been particularly bad, with most of the specimens misidentified. The key to the Bolivian species of *Eupatorium* by B.L. Robinson (1920), treated the species intermixed with other species that were included in *Eupatorium* at the time. It relied on characters such as number of flowers in the heads which are useful in other elements then known in *Eupatorium* but usually not in *Fleischmannia*. It was also based on extremely inadequate collecting, especially in southern Bolivia. The Robinson (1920) treatment did not include the Argentinian species, *Eupatorium prasiifolium* Griseb. and *E. schickendantzii* Hieron., which are now known to occur in southernmost Bolivia. Among material previously misidentified by the present author are specimens here described as two new species, and some other

individual collections have been seen that suggest still other undescribed species of the genus occur in Bolivia. Certainly, more collections of members of the genus in Bolivia is necessary.

Characteristics that seem more reliable at the species level in *Fleischmannia* are the habit of the plants, the angle of branching, the pubescence, density of the inflorescence, width of the style branch tips, the basic color of the corollas and the width of the bases of the pappus bristles.

Twelve species are known from the country including two that also occur in Argentina and the widely distributed *F. microstemon*. One species that has been credited to Bolivia, *F. marginata* (Poepp.) R.M. King & H. Rob. is actually found only the Dept. Junin in central Peru. The species cited in most previous studies such as Robinson (1920) as *Eupatorium pycnocephalum* Less. from southern Central America and South America are actually *Fleischmannia pratensis* (Klatt) R.M. King & H. Rob.

No material has been seen in this study that perfectly matches the descriptions of *Fleischmannia bridgesii, F. fiebrigii or F. tamboensis*. Their positions in the following key are based on descriptions by original authors, and B.L. Robinson (1920) plus a few specimens that may be *F. bridgesii* seen in this study.

The species of *Fleischmannia* now known from Bolivia are distinguished as follows:

1 Peduncles and often other parts of plants with stipitate glandular pubescence **2**

– Plants without stipitate glandular hairs **5**

2 Plants with branches strongly ascending, spreading at less than 45° angles, usually without reddish hairs; corollas lavender to reddish colored..... **3**

– Plants often scrambling or scandent with branches spreading at 45–90° angles, often with reddish hairs; corollas lavender to white **4**

3 Nearly erect plants with dense cover of minute stipitate glands on stems, leaves and peduncles; leaves acute; inflorescence with dense corymbiform clusters of many heads ..... ***F. prasiifolia* var. *glandulifera***

– Erect to recumbent plants covered with viscous stipitate glands; leaf tips mostly short acute or obtuse; inflorescence with loose clusters of few heads .. .. ***F. fiebrigii***

4 Leaves scabridulous on adaxial surface, scabrid on veins abaxially; corollas with the limb lilac..... ***F. tamboensis***

– Leaf blades covered with stipitate or viscid glandular hairs; corollas white..... ..... ***F. yungasensis***

5 Plants annual, with filiform and erratically bent ascending lateral branches spreading at less than 30° angles, some over-topping the primary stem .... ***F. microstemon***

– Perennial herbs, with branches, when present, well-developed, ascending to widely spreading, usually not over-topping the the primary stem..... **6**

6 Inflorescence with heads in large rather dense corymbiform to rounded or pyramidal clusters **7**

– Heads few or single at tips of elongate branches **10**
7 Corollas white ..... ***F. polopolensis***
– Corollas pink to lavender or purplish distally **8**
8 Involucral bracts mostly lanceolate; petioles short, less than 1/5 as long as leaf blade; material seen under this name without branches below inflorescence ... . ***F. bridgesii***
– Involucral bracts mostly oblong; petioles long and slender; with branches spreading at less than 30–60° angles **9**
9 Pappus bristles slender at base, often not contiguous; achenes with pale ribs .... ***F. prasiifolius***
– Pappus bristles broader at base, contiguous; achenes without pale ribs .... ***F. pratensis***
10 Heads with ca. 7 florets and 20 involucral bracts; leaves lanceolate; with few sharp teeth on margins; peduncles mostly over 2 cm long ..... ***F. soratae***
– Heads with 17–25 florets and 30 or more involucral bracts; Inflorescences terminating in widely spreading cymiform branches **11**
11 Peduncles and branches of inflorescence glabrous or subglabrous; corollas ca. 2 mm long; anther thecae ca. 0.5 mm long ..... ***F. neei***
– Peduncles and branches of inflorescence puberulous; corollas ca. 3 mm long; anther thecae 1–2 mm long **12**
12 Branching in inflorescence opposite to near ultimate nodes; peduncles 0.3–0.4 mm wide; inner involucral bracts obtuse or mucronate with rather broadly scarious tips; corolla lobes with styliform papillae on outer surface; achenes without noticeably paler ribs ..... ***F. steinbachii***
– Branching in inflorescence often subopposite or alternate at distal nodes; peduncles filiform, 0.1–0.2 mm wide; inner involucral bracts acute with narrowly scarious tips; corollas without hairs or styliform papillae on outer surface; achenes with pale ribs ..... ***F. schickendantzii***

Fleischmannia bridgesii (B.L. Rob.) R.M. King & H. Rob., Phytologia 19: 203. 1970

Eupatorium bridgesii B.L. Rob., Proc. Amer. Acad. 55: 7. 1919. Type: Bolivia, without specific locality, *Bridges s.n.* (holotype K, photo GH).

Description. Perennial herbs to 60 cm high; stems brownish to reddish-tinged, terete, densely pilosulous, without known branches but often with axillary fascicles. Leaves opposite, petioles, short, 4–7 mm long, a 5th as long as blade; leaf blade narrowly ovate, with pale main veins, Inflorescence rather dense, flattened corymbiform; branches strongly ascending, puberulous; peduncles 3–7 mm long, puberulous. Heads ca. 6 mm high and 4 mm wide; involucral bracts ca. 22, gradate, 1.5–5.0 mm long, described as lanceolate, attenuate, most specimens seen with bracts more oblong and less pointed, often reddish distally. Florets ca. 25 in a head; corollas pink, 3–4 mm long, basal tube

ca. 0.5 mm, throat 2–3 mm, lobes ca. 0.5 mm long, without evident hairs; anther thecae ca. 1 mm long, apical appendage ca. 0.25 mm long; style branches not broadened distally. Achenes ca. 2 mm long, with paler ribs, pappus setae white, ca. 27, 2.5–3.0 mm long, slender, scarcely contiguous.

Specimens seen that bear the name, have thin pale-green leaves with slightly paler abaxial surfaces and white main veins. The petioles in all four specimens are comparatively short, 1/5 the length of the blade or less. They are unbranched with flat-topped corymbiform inflorescences with strongly ascending inflorescence branches, and have at least the outer involucral bracts lanceolate. These specimens do not show the squarrose-spreading tips of the outer involucral bracts cited by Robinson (1920), but this characteristic is probably only a feature of an individual specimen. Such recurved tips have been seen in occasional specimens of other species as a result of something done during preparation.

Four different specimens seem to share these general characteristics. The one that seems to fit the concept best is from Bolivia: Cochabamba, 2–3 ft., 7, March 1920, *E.W.D. & Mary M. Holway 373* (US ex hb. Gray). Three additional specimens that have been determined as *F. bridgesii*, but differ from that species in some details, are Bolivia: Cochabamba, 2600 m, 1932, *Bro Julio II 263* (US); Bolivia: Dpto Chuquisaca, Prov, Azurduy, Azurduy-Icla, arbusto, flor lila, May 1981, *E.E.B. (ERTS) 313a* (LPB, US); Chuquisaca, Sucre, alt. 2700 m, herb, ca. 50 cm high, fls. pink, April 1933, *M. Cardenas 494* (US ex hb. Gray as *Eupatorium prasiifolium*. The latter three specimens have most involucral bracts with more obtuse and more extensive reddish puberulence on stems, branches of the inflorescence and involucral bracts. All four specimens seem to be snatchings from tops of plants, and the total habit and any vegetative branching is unknown.

***Fleischmannia fiebrigii* (Hieron.) H. Rob., comb. nov.**
urn:lsid:ipni.org:names:77151290-1

Eupatorium fiebrigii Hieron. in Urban, Bot. Jahrb. Syst. 40: 371. 1908. Type: Bolivia, Tarija, Prov. Arce, in fields near Camacho, alt. 2700 m, in arvis, 15 Dec. 1903, *Fiebrig 3528* (holotype B, destroyed. photo US).

Description. Perennial herbs ca. 0.6 m tall; stems pale whitish-green, striated, densely viscid glandular, glabrate; internodes to 7 cm long; branches spreading at ca. 30° angles. Leaves opposite; petiole 0.5–1.0 cm long, densely viscid-glandular; leaf blades membranaceous, pale green, broadly ovate, to 3.5 cm long, 2.5 cm wide, widest ca. 5 mm above base, base rounded to subcordate, margins crenate-serrate, each with 4–20 teeth, teeth mucronulate, apex short-acute to obtuse, surfaces with veins glandular-puberulous; triplinervate from petiole. Inflorescence with long leafy branches bearing small clusters of heads in corymbiform cymes, peduncles viscid glandular; involucral bracts 19–21, gradate, outer bracts ovate, ca. 2.5 mm long, inner bracts linear-lanceolate, with

tips often lavender, acutish, sparsely glanduliferous. Florets 20–25 in a head; corollas ca. 4 mm long, lilac, glabrous, lobes ca. 0.5 mm long, ovate-deltoid; style branches not or scarcely thickened distally. Achene ca. 1.75 mm long, angles yellowish-white, scabrous; pappus white, of ca. 20 slender bristles ca. 3 mm long, not contiguous.

The ascending branches, viscid glandular pubescence and lavender colored corollas should distinguish the species. No specimens have been seen matching this description. The strongly ascending branches indicate relationship to *F. prasiifolia*, and some specimens of *F. prasiifolia* placed in this study in the var. *glandulifera* also have glands. However, the specimens determined below as *F. prasiifolia* var. *glandulifera* have very minute glands, much denser clusters of heads in the inflorescence, have petioles of the leaves much shorter and tips of the leaves narrowly acute. Further collecting in southern Bolivia should discover new material of this species, and a neotype can be established.

***Fleischmannia microstemon* (Cass.) R.M. King & H. Rob., Phytologia 19: 204. 1970**

Eupatorium microstemon Cass., Dict. Sci. Nat. 25: 432. 1822. *Cassini s.n.* (holotype P).
Eupatorium guadaloupense Spreng., Syst. Veg. 3: 414. 1826. Guadeloupe, *Bertero s.n.* (P?, TO?).
Eupatorium bimatrum Standl. & L.O. Williams, Ceiba 3: 64. 1952. Honduras, Morazán, El Zamorano, ca. 800 m, 18 Oct. 148, *Standley 13132* (holotype F).

Note. See description in Brazilian treatment.

Specimens with typical obtuse to short-acute leaf shapes have been seen from higher elevations in La Paz. Specimens with more acuminate leaf tips has been seen from elevations of 500 m or less in Cochabamba and Santa Cruz.

***Fleischmannia neei* H. Rob., sp. nov.**
urn:lsid:ipni.org:names:77151276-1

Type. Bolivia: Santa Cruz, Prov. Florida, along road from Santa Cruz to Samaipata, gorge of Río Laja, 1 km W of bridge over Río Colorado in Bermejo, sandy areas along river, in semi-deciduous short forest, 18°08'S, 63°19'W, alt. 900 m, herb, heads light violet, 9 Aug 1987, *M. Nee 35613* (NY, US). (Figure 5).

Description. Erect to scrambling perennial herbs to 1.2 m tall, stems terete, scarcely striate when dry, weakly puberulous to glabrate or glabrous; branches spreading at ca. 45 to nearly 90° angles; leaves opposite; petioles slender, 0.3–1.7 cm long, finely puberulous; leaf blades ovate, 2.3–6.5 cm long, 1–3 cm wide, base broadly rounded, scarcely acuminate at petiole, margins of lower leaves with teeth often sharply acute, apex short to narrowly acute, adaxial surface mostly glabrous, slightly shiny, abaxial surface slightly paler, puberulous on larger veins, mostly glabrous between; triplinervate from base of blade, larger veins whitish. Inflorescence a lax pyramidal panicle with

mostly elongate, opposite, spreading branches, bearing small clusters of heads at tips; below and in inflorescence with small foliiform bracts on main axis; axis and branches of inflorescence glabrous or nearly so; peduncles 3–7 mm long, glabrous. Heads narrowly to broadly campanulate, 6 mm high, ca. 4 mm wide; involucral bracts ca. 25 in ca. 5 series, gradate,1–4 mm long, 0.3–1.0 mm wide, with narrowly scarious margins and apex, most basal bracts narrowly ovate, inner bracts oblong with obtuse apices, outer surfaces glabrous; florets ca. 17 in a head, corollas pale violet or pink, 2.0–2.3 mm long, basal tube ca. 0.4 mm long, throat 1.5–1.7 mm long, lobes ca. 0.3 mm long with few uniseriate hairs outside; anther thecae ca. 0.5 mm long, apical appendage ca. 0.15 mm long; style branches not broader distally. Achenes ca. 1.8 mm long, ribs sparsely setiferous above scabrid below, not or scarcely paler; pappus white, bristles ca., 30, ca. 2 mm long, not broader at base, not contiguous, fragile,

Paratypes: Bolivia: La Paz, Noryungas, Polo-Polo bei Coroico, alt. 1100 m, Oct-Nov 1912, *Otto Buchtien 3934* (US); La Paz, Prov. Nor Yungas, 4.5 km below Yolosa, then 0.7 km W on road to Río Huarinilla, 16°12'S, 67°45'W, elev. 1200 m, ford across Río Coroico, corollas lavender, 14 Nov 1982, *J.C. Solomon 8909* (MO, US); Santa Cruz, Prov. Ichilo, Parque Nacional Amboró, ca. 15 km (SE) up the Río Pitasama from the Río Surutú, moist tropical forest on lower montane slopes, sandstone, elev. 700 m, 17°44'S, 63°40'W, corollas pink, growing on dry, grassy cliff face, 28 Aug. 1985, *J.C. Solomon & S. Urcullo 14129* (MO, US); Santa Cruz, Prov. Florida, 10 km (by road) W of Bermejo, on road from Santa Cruz to Samaipata, brushy hillsides, grazed, with semi-evergreen forest, 18°09'S, 63°42'W, alt. 1150 m, 1 m tall, flowers pale violet. 6 Aug. 1987, *M. Nee & C. Coimbra S. 35527* (NY, frag. US); Santa Cruz, Prov. Florida, steep slopes with semi-deciduous forest, along nearly dry tributary to Río Bermejo, 1.5 km NW (upstream) from junction with Río Piojeras to form the Río Piraí, 18°11'S. 63°34'W, alt. 800 m, herbs to 1.2 m tall, leaves shiny above, buds only or a few pale lavender flowers, 13 July 1994, *M. Nee 45188* (NY, US); Santa Cruz, Prov. Florida, slopes of massive red sandstone along highway from Santa Cruz to Samaipata, 6.2 km (by road) from bridge over Río Laja, 18°09'S, 63°43'W., alt. 1230 m, herb, flowers light lavender, 12 July 1998, *M. Nee & D. Atha 50086* (NY, US).

Fleischmannia neei is most distinct among Bolivian members of the genus by the glabrous branches of the inflorescence. The *Buchtien* collection was annotated by Rusby as *Eupatorium polopolense* B.L. Robinson, probably because of the locality. Many of the other specimens were subsequently also given that name. Typical *Fleischmannia polopolensis* differs obviously in its large denser corymbiform inflorescence and its densely puberulous peduncles. Relationship of the new species might seem much closer to the newly described *F. steinbachii*, with which it cooccurs in Santa Cruz, but the latter again has densely puberulous peduncles, more pubescent leaf surfaces, and lacks larger acute teeth on the margins of the lower leaves. An additional distinction of the new species seems to be the shorter corollas and much shorter anther thecae.

The new species also resembles the newly described *F. hatschbachii* of Mato Grosso, Brazil, but that has thinner branches in the inflorescence, more pilosulous leaves and white corollas.

Figure 5. *Fleischmannia neei* H.Rob., holotype (US).

Fleischmannia polopolensis **(B.L. Rob.) R.M. King & H. Rob., Phytologia 19: 205. 1970**

Eupatorium polopolense B.L. Rob., Contrib. Gray Herb. 61: 10. 1920. Bolivia: La Paz. North Yungas, Polo-polo near Coroico, alt. 1100, m, *Buchtien 429* (holotype GH, isotypes NY, US).

Description. Perennial suffruticose herbs ca. 0.5 m tall; stems erect, terete, purplish or brownish, ca. 3 mm wide, glabrous; internodes to 10–13 cm long; branches ascending, leafy. Leaves opposite; petioles 6–13 mm long, slightly villous-puberulous; leaf blades membranaceous, ovate, 3.6–5.0 cm long, 1–2 cm wide, base rounded , slightly acuminate at petiole, margins sharply serrate with 9–18 teeth on each side 1.0–1.8 mm high, apex acuminate, both surfaces green, puberulous on veins, scarcely paler abaxially. Inflorecsnce with terminal corymbiform trifid cymes, mostly 3–5-headed, branches and peduncles, densely puberulous, non-glandulferous; peduncles short. Heads 7 mm high, 5 mm wide; involucre campanulate, with ca. 20 bracts in ca. 3 series, oval to oblong. Florets 24–30 in a head; corollas white, ca. 3 mm long, basal tube ca. 0.5 mm long, throat ca. 2 mm long, lobes ca. 0.5 mm long, hispidulous; anther thecae ca. 0.8 mm long, apical appendage ca. 0.15 mm long; style branches filiform-clavellate. Achenes ca. 1.6 mm long, black with paler ribs, ribs sparsely setuliferous; pappus white, of ca. 22 slender bristles, ca. 3 mm long, slightly broadened and scarcely contiguous at base.

Additional specimens. Bolivia: Cochabamba, Sailapata, Ayopaya, 2700 m, at wet soil, 1 m, Oct 1935, *Cárdenas 3271* (US); La Paz: Nordyungas, Polo-Polo bei Coroico, alt. 1100 m, region subtropical, Oct.-Nov. 1912, *O. Buchtien 3933* (GH, NY, US).

This species includes the material that B.L. Robinson (1920) treated under the name *Eupatorium marginatum* Poepp. The supposed difference in number of florets in the heads proves spurious. The specimens cited by B.L. Robinson, were all collected by Buchtien in the same locality and share all the same obvious details. The species now known as *Fleischmannia marginata* (Poepp.) R.M. King & H. Rob. does not occur in Bolivia, but is restricted to the area of Junin in central Peru (Robinson 2001). It is distinct in its thicker leaf blades with smooth glabrous adaxial surfaces,

Fleischmannia prasiifolia **(Griseb.) R.M. King & H. Rob., Phytologia 19: 205. 1970**

Eupatorium prasiifolium Griseb., Goett. Abh. 19: 119. 1874. Type: Argentina. Tucuman: in pratis alpinia pr. Cienega, 1873, *Lorentz 408* (holotype M).

Description. Erect to scrambling perennial herbs 30–100 cm tall, stems terete, striate, drying brownish, densely hirsutulous; branches ascending, spreading at less than 30° angles, internodes 4–12 cm long. Leaves opposite; petioles 0.1–1.2 cm long; leaf blades ovate, base obtuse to subtruncate, margins each with 5–8 usually blunt serrations, apex

usually narrowly acuminate, surfaces pilosulous, coarser on veins below; triplinervate from petiole, veins dark. Inflorescence of large dense clusters of heads at tips of leafy branches, branches puberulous; peduncles 2–4 mm long, densely puberulous. Heads ca. 5 mm high, 4–5 mm wide; involucral bracts ca. 30, gradate, 1.5–5.0 mm long, outer narrowly ovate, inner narrowly oblong, apices obtuse, often lavender tinged. Florets ca. 25–30 in a head; corollas reddish, ca. 3 mm long, basal tube ca. 0.7 mm long, throat ca. 1.5 mm long, lobes ca. 0.5 mm long, few or no short hairs outside; anther thecae ca. 0.8 mm long; style branches slightly broadened distally. Achenes ca. 2 mm long; with pale setuliferous ribs; pappus white, with ca. 40 bristles ca. 2 mm long, slightly broader and contiguous at base.

The most significant distinctions are the strongly ascending branches, the rather sparsely pilosulous adaxial surfaces of the leaves, the densely corymbiform clusters of numerous heads in the inflorescence, the lavender or reddish corollas and the pale ribs on the submature achenes.

Specimens seen. Bolivia: Tarija, Prov. Gran Chaco, Sanadita, 90–1.20 m de altura, flor lila, 8.8.1981, *R.E.(ERTS) 294* (LPB, MO); Tarija, Prov. Cercado, 54.9 km E of Tarija-Padcaya road, on road to Entre Rios, Elev. 2050 m, Moist shrubby vegetation, heavily disturbed, 21°29'S. 64°20'W, corollas pinkish-purple, 1 May 1983, *J.C. Solomon 10306* (MO, US); Prov. Cercado, 10 km NW of Tomatas (5 km N. of Tarija), on road through Erquis, elev. 2200 m, Angusturas de Erquis, isolated packet of moist shrubby vegetation, 21°28'S, 64°50'W, corollas purplish-pink, 9 May 1983, *J.C. Solomon 10601* (MO, US).

***Fleischmannia prasiifolia* var *glandulifera* (R.E. Fries) H. Rob., comb. nov.**
urn:lsid:ipni.org:names:77151291-1

Eupatorium prasiifolium var. glanduliferum R.E. Fries, Nova Acta Regiae Soc. Sci. Upsal. Ser. 4, 1, no. 1: 76. 1905. Type: Argentina, Jujuy, Yavi in fissuris rupium, ca. 3400 m, 1–2 Jan 1902, *R.E. Fries 770* (S, lectotype).

Note. With all the aspect of the typical variety, but with stems, surfaces of leaves and branches of inflorescence densely covered with minute stipitate glandular hairs.

Bolivia: Tarija: Prov. Cercado, cerca Tolomosa, suelo franco arcilloso, 1980 m, plano, flores lilas, arbusto, hasta 1.5 m, comuń, 5.5.86, *E. Bastiás 4254* (LPB, US); Prov. Arce, 39.9 km S of jct. of road to Entre Rios, on road to Pascaya, elev. 2100–2200 m, isolated pocket of *Podocarpus* forest with dry open thorn-scrub (*Acacia*, *Prosopis*) below. 21°54'S, 64°41'W., corollas bright pinkish-purple, dry open hillsides, 29 April 1983, *J.C. Solomon 10266* (MO, US); Prov. Cercado, camino a alto España 2400 m, suelo limo arenoso pH 5.2 Frec. Aislado, ca. 45 cm de alto, flor lila-rosada, 9.4.1988, *F. Ehrich 527* (LPB, US).

Fleischmannia pratensis **(Klatt) R.M. King & H. Rob., Phytologia 19: 205. 1970**

Eupatorium schiedeanum var. *tomentosum* Steetz in Seemann, Bot. Voy. Herald 146. 1854. Type: Panama: Chiriquí, Volcán Chiriquí, *Seemann 1138* (holotype BM, photos MO, US).

Eupatorium schiedeanum var. *capitatum* Steetz in Seemann, Bot. Voy. Herald 146. 1854. Type: Panama: Chiriguí, Volcán Chiriquí, *Seemann s.n.* (holotype BM, photos MO, US).

Eupatorium pratense Klatt in T. Durand & Pittier, Bull. Soc. Roy. Bot. Belgique 31: 193. 1892. Type: Costa Rica: Savanes Boruca, Dec. 1891, *Pittier 4756* (lectotype US).

Eupatorium pacacanum Klatt, Leopoldina, Bot. Beibl. 3. 1895. Type: Costa Rica: clairières du Rodea de Pacaca, 1–2 Jan, 1891, *Pittier 3324* (holotype BR, isotype GH).

Eupatorium roseum Klatt, Bull, Soc. Roy, Belgique 31: 194. 1892 [1903]. Type: Costa Rica: clairières du Rodea de Pacaca, 1–2 Jan, 1891, *Pittier 3324* (holotype BR, isotype GH).

Fleischmannia croatii R.M. King & H. Rob., Phytologia 28: 76. 1974. Type: Panama, Chiriquí, vicinity of Las Nubes, 4.3 km NW of Río Chiriquí, Viejo, W of Cerro Punta, 2200 m, *Croat 22300* (holotype MO).

Fleischmannia panamensis R.M. King & H. Rob., Phytologia 28: 80. 1974. Type: Panama, Coclé, near La Mesa, 11 Feb. 1971, *Croat 13354* (holotype MO).

Description. Erect to reclining perennial herbs or subshrubs, to 1.5 m tall; stems greenish to brown or reddish, densely puberulous to tomentellous; branches spreading at 25–90° angles. Leaves opposite; petioles slender to 3 cm long; leaf blades herbaceous, rhomboid to narrowly ovate, to 5.5 cm long, to 3.5 cm wide, base broadly acute to truncate, margins usually crenate-serrate with 6–12 teeth on each side, apex short-acute to scarcely acuminate, adaxially pilose to pilosulous, abaxially sparsely to rather densely pilosulous, puberulous on veins, with glandular dots; triplinervate from petiole. Inflorescence a broad laxly corymbiform panicle with densely corymbiform branches; peduncles 1–3 mm long, puberulous. Heads 5–6 mm high; involucral bracts 18–25 in 3–4 series, gradate, mostly short-acute, scarious margins narrow to rather broad distally. Florets 15–25 in a head; corollas lavender to white, 2.5–3.5 mm long, basal tube 0.5–1.0 mm long, throat 1.5–2.0 m long, lobes ca. 0.5 mm long, with short hairs outside, anther thecae 0.8–0.9 mm long, apical appendage ca. 0.25 mm long; style branches narrowly linear. Achenes 1.2–1.7 mm long, black with black ribs; setulae on ribs and distal faces; pappus white, of 20–30 scabrous contiguous bristles ca. 1.8–2.2 mm long.

Specimens seen. Bolivia, Tipuani—Valley: Hacienda Casana, Bobuach de Abhänge, 1400 mm, 31 July 1922, *O. Buchtien* 7554 (US); Bolivia: Cochabamba, Prov. Narciso Campero Leyes, 12 km al NW de Novillero a Santiago, 18°17'S, 65°16'W, 2500 m, Bosque semideciduo, disturbado de 7 m de altura, en quebrada, con *Anadenanthera*, hierba 0.30 m, flores violetas, 17 June 1995, *N. Kessler, J. Gonzales, K. Bach & S. Hohnwald 4613* (LPB, US); La Paz, Yungas, 6000 ft., 1885, *H.H. Rusby* 1608

(NY, US); La Paz, Abel Iturralde, along road between Tumupasa and San Jose de Uchupiamonas; NW of Tumupasa along slope leading up to Parque Nacional Madidi, 5.5–5.8 km above Jct to San Jose near Tumupasa, 15°45'S, 67°50'W, 830–850 m, 21 m tall, flowers lavender, 9 August 2000, *T. Croat, A.C. Acebey & T. Kroemer 84384* (MO, US); La Paz, Nor Yungas, Region von Compatá, Hacienda "El Choro", an Wagen zw. Gebürch, 1700 m, Wird 1 m hoch, Blüten helllila aurz-Weiss, 5 July 1930, *O. Buchtien 8209* (US); La Paz, Nor Yungas, 4.5 km below Yolosa, then 10 km W on road up the Río Huarinilla, 16°12'S, 67°50'W. 1450 m, heavily disturbed moist forest, mostly secondary growth, roadside; suffrutescent, 75 cm tall, flowers pale lavender, 19–20 Oct. 1983, *J.C. Solomon 8514* (MO, US); La Paz, Nor Yungas, en rente de Santa Rosa, Valle del Río Unduavi, 1530 m, arroyo cerco del camino; arbusto 1.2 m, flor lila, 5 9 1987, *E. Vargas & R. Seidel 457* (LPB, US); La Paz, Nor Yungas, Chairo, 16°13'S, 67°52'W, 1400 m ; restos de Bosque monte. ano, abierto con mucha *Inga adenophylla*; en la orilla alta de Río Huarinilla, hierba 1.8 m, flores moradas pequeñas, 19 June 1997, *St. S. Beck 23001* (LPB, US); La Paz, Sud Yungas, etwa 5 Fahrkilometer ah der Strade von Chulumani Richtung Ocobaya, ca. 1500 m, Bluten hellblau, 16 May 1988, *T. Feuerer & P. Franken 11741* (US).

This is what has been called *Eupatorium pycnocephalum* Less. by B.L. Robinson (1920). Also, *Vargas & Seidel 457* has been previously misidentified as *F. tamboensis* and *Beck 23001* has been misdetermined as *F. yungasensis*.

Fleischmannia schickendantzii (Hieron.) R.M. King & H. Rob., Phytologia 19: 205. 1970

Eupatorium schickendantzii Hieron., Bot. Jahrb. Syst. 22: 769. 1897. Type: Argentina. Catamarca, in der Quebrada (Schlucht) und auf der Cuesta de la Muschaca, Feb 1876, *Schickendantz 259* (holotype B, destroyed, photos GH, US).

Description. Erect or reclining herbs to 1.5 m tall; stems terete, striate, puberulous; internodes 5–12 cm long; branches spreading at 45–90° angles. Leaves opposite; petioles slender, 1.5–40 cm long, puberulous; leaf blades lanceolate to narrowly ovate, 4–9 cm long, 1.8–6.5 cm wide, obtuse at base, each margin with 5–11 sharp or crenate teeth, apex narrowly acute but not acuminate; surfaces sparsely pilosulous to nearly glabrous, puberulous on veins; triplinervate from petiole, main veins dark. Inflorescence lax, with elongate branches bearing groups of few heads at corymbiform cymose tips; peduncles 5–30 mm long, puberulous. Heads with involucres 4–5 mm high, 2.5–4.0 mm wide; involucral bracts 20–26 in 5–6 series, gradate, outer bracts 1.0–1.5 mm long, ovate-lanceolate, puberulous, middle bracts lanceolate, 2.5–3.0 mm long, usually acute, inner bracts linear-oblong, 4.0–4.5 mm long, glabrous. Florets 17–24 in a head; corollas lilac, ca. 3 mm long, basal tube 0.6 mm long, throat ca. 2 mm long, lobes ca. 0.4 mm long and wide, without hairs outside; anther thecae ca. 0.8 mm long; apical appendage ca. 0.25 mm long; style branches slender, scarcely broadened distally.

Achenes 2.0–2.5 mm long, ribs narrowly pale, setuliferous; pappus whitish, of ca. 30 slender bristles ca. 3 mm long, not contiguous at base.

Specimens seen from Bolivia. Tarija, Prov. O'Connor, 73.i km E of Tarija-Padcaya road, on road to Entre Rios (ca. 1 km below Narvaez), elev. 1700 m, moist subtropical forest with many Myrtaceae, *Podocarpus*, Legumes & abundant epiphytes, 21°25'S, 64°63'W, shrub, 1.5 m, forest understory, corollas very pale pink, 1–2 May 1983, *J.C. Solomon 10333* (MO, US); Tarija, Prov. Arce, 5 km S of Comunidad Guayavillas (28.3 km S of Padcaya) on road to Bermejo. Elev. 1800–1900 m, disturbed dry forest with isolated patches of *Podocarpus*, Myrtaceae in more moist places. 22°01'S, 64°39'W, corollas white, forest understory, 6 May 1983, *J.C. Solomon 10500* (MO, US); Tarija: Prov. Arce, valley of the Río Chillaguatas, below Rancho Nogalar on trail between Sidaras and Tariquia, 22°05'S, 64°25'W, elev. 1100 m, moist subtropical forest, corollas white, moist sand along river, young plant, 14–16 Oct, 1983, *J.C. Solomon 11254* (MO).

Fleischmannia soratae (B.L. Rob.) R.M. King & H. Rob., Phytologia 19: 206. 1970

Eupatorium soratae Sch.Bip. ex B.L. Rob., Contrib. Gray Herb. 61: 541. 1920. Type: Bolivia. La Paz: Prov. Larecaja, in woods of the temperate region in the valley of Challasuya, near Sorata, alt. 2700–2800 m, 8 Apr. 1858, *Mandon 251* (holotype NY, photos GH, US).

Description. Perennial herbs to 1 m tall; stems slender, flexuous, terete, glabrate, branches few. Leaves opposite; petioles flexuous, 3–8 mm long, puberulous with short purple-jointed hairs; leaf blades thin-membranaceous, 2.0–2.5 cm long, ca. 0.8 cm wide, narrowly ovate to lanceolate, base subcuneate, margins serrate with 3 or 4 blunt teeth on each side, apex scarcely acuminate, surfaces sparsely puberulous chiefly on veins; triplinervate from petiole, main veins whitish. Inflorescence a loose panicle with short-spreading mostly opposite branches, branches terminating in cymes with 5–14 heads; peduncles slender, ca. 1–3 mm long, puberulous. Heads ca. 6 mm high; involucral bracts 10–12 in 3–4 weakly gradate series, mucronate from rather obtuse tips, outer bracts short, ovate, intermediate bracts oblong, inner bracts oblong-linear. Florets 7–9 in a head; corollas apparently white, ca. 3 mm long, basal tube ca. 0.5 mm long, throat ca. 1.5 mm long, lobes ca, 0.4 mm long, slightly hispiduous outside; anther thecae ca. 1 mm long; apical appendages ca. 0.2 mm long; style branches not broadened distally. Achenes ca. 1.5 mm long, black with pale seemingly glabrous ribs; pappus white, with ca. 30 slightly non-contiguous bristles ca. 2.5 mm long.

The NY holotype has been seen, but no other specimens have been seen that seem to be the same species. This is apparently one of the few species of the genus that can be distinguished by the fewer involucral bracts and florets in the heads. The species was described as having heads with only about 10 involucral bracts and 7 florets.

***Fleischmannia steinbachii* H. Rob., sp. nov.**
urn:lsid:ipni.org:names:77151277-1

Type. Bolivia: Santa Cruz, Prov. Cercado de Santa Cruz, Angustura, alt. 550 m, hierba abundante – crecehasta 0.6 m de alto, terrano semiseco y arenoso – orilla camino, flores blanco con licero tinte rosa purpurino, 28 June 1966, *R.F. Steinbach 322* (holotype US). (Figure 6).

Description. Reclining herbs to 1 m tall, stems green to pale brown, terete, striated when dry, hirsute or hirsutulous. Leaves opposite; petioles 0.7–1.5 cm long densely puberulous; blades ovate, 2–4 cm long, 1.5–2.0 cm wide, base obtuse, margins serrulate with 5–9 blunt teeth, apex narrowly acute, adaxial surface pilosulous, abaxial surface essentially concolorous, pilosulous on and between veins, triplinervate from base, with main veins prominent, usually whitish. Inflorescence, a lax panicle with many pairs of elongate mostly opposite widely divaricating branches spreading at 60–90° angles, distally with cymiform branching, each bearing 2–8 heads, main axis and main branches with foliiform bracts 1.0–2.5 cm long, 0.3–1.2 cm wide; branches and peduncles densely puberulous, peduncles 4–20 mm long. Heads ca. 6 mm high, 4 mm wide; involucre of ca. 25 strongly gradate bracts 1.0–4.5 mm long, mostly ca. 1 mm wide, few at base acute at tips, most bracts broadly rounded at tip, with narrowly scarcious margins, glabrous and with prominent pair of longitudinal veins outside. Florets ca. 17 in a head; corollas pale bluish to reddish tinged, ca. 3 mm long, basal tube ca. 0.5 mm long, throat ca. 2 mm long, lobes ca. 0.5 mm long, with few slender styliform cells on outer surface; anther thecae ca. 1 mm long; style branches not broader distally. Achenes ca. 1.8 mm long, with narrow pale, setuliferous ribs; pappus white, ca. 3 mm long, of ca. 30 slender fragile, non-contiguous bristles.

Paratypes. Bolivia: Santa Cruz, Prov. Florida, 6.5 km (by road), 3 km (by air) NE of central square in Mairana on road to Yunga de Mairana, 18°06'S, 63°56'W, alt. 1800 m; near upper limit of dry woodland of *Schinopsis haenkeanaI, with some columnar cacti (Cereus cf. dayami*), beginning transition to more humid montane forest with *Clethra scabra*, *Lithtaea ternifolia*, etc., mostly turned into brushy pastures by cutting and burning, with *Baccharis* spp., *Dodonaea viscosa*, *Mimosa lepidota*. Weak, supported in shrub. Phyllaries green; flowers very pale violet, almost white, 9 May 1998, *M. Nee 49278* (NY, US); Dept. Santa Cruz, Prov. Florida: valley of Río Paredones, near Achiras Camping resort, on road to Paredones, 18°09'30"S, 63°49'W, alt. 1350–1400 m, grazed or brushy areas, dry forest and pastures; weak herb with stems 1 m long; flowers pale blue, 6 June 1998, *M. Nee 49614* (NY, US).

This new species would key in Robinson (1920) to what he called *Eupatorium tamboense* Hieron., and that is is where specimens may have been placed in the past. However, *Fleischmannia tambonsis* is described with reddish hairs and stipitate glands on the branches of the inflorescence. Some of the present paratypes have been identified in the past as *F. polopoloensis* and *F. schicktendanzii*. Of these the former differs by the denser more corymbiform inflorescence with white corollas. The latter differs by the more alternate distal branching of the mature plants, the more slender peduncles,

Figure 6. *Fleischmannia steinbachii* H.Rob., holotype (US).

the fewer and non-contiguous bristles of the pappus, and the lack of hairs or styliform papillae on the outer surfaces of the corolla lobes.

The styliform papillae on the outer surfaces of the corolla lobes have been seen in all three specimens placed in the species. The position of these papillae is one often occupied in other species by a few broader multicellular monoseriate hairs. Such styliform papillae have not been noticed in any other species in the genus, and this may prove a valuable distinguishing characteristic.

Fleischmannia tamboensis (Hieron.) R.M. King & H. Rob., Phytologia 19: 206. 1970

Eupatorium tamboense Hieron., Bot. Jahrb. Syst. 22: 770. 1897. Type: Bolivia. Tarija: an der Cuesta del Tambo, between El Tambo and Narvaëz, June 1873, *Lorentz & Hieronymus 888* (holotype B, destroyed, photos GH, US).

Description. Subshrub, erect, ca. 1 m tall; stems terete and glabrate below, upwardly with spreading purplish glandular pubescence, internodes to 10 cm long; branches spreading at 45–80° angles. Leaves opposite; petioles 0.5–1.5 cm long, with reddish glandular hairs; leaf blades membranaceous, rhomboid-ovate to ovate-lanceolate, to 5 cm long, to 2.2 cm wide near base, base rounded to shortly cuneate, margins each with 5–11 teeth, teeth 0.5–1.3 mm long, acute and mucronate, apex acute, adaxial surface scabridulous, abaxially scabrid on veins; triplinervaate from petiole. Inflorescence pyramidal, with slender branches ending in loose cymes; peduncles 5–6(-12) mm long, densely puberulous. Heads with involucres ca. 6 mm high, involucral bracts ca. 20–23, gradate in 5–6 series, outer ovate, ca. 1.5 mm wide, densely puberulent, greenish to purplish outside, inner bracts linear-lanceolate, to 4.5 mm long, ca. 0.8 mm wide, subacute. Florets 16–21 in a head; corollas lilac, ca. 3.2 mm long, lobes ca. 0.7 mm long and wide, short-triangular, anther thecae not seen. Achenes ca. 1.75 mm long, with ribs lighter-colored, sparsely setuliferous; pappus with ca. 20 tenuous noncontiguous bristles, ca. 3 mm long.

No specimens have been seen that match the description. The specimen that matches best is one cited by Robinson (1920) "Bolivia: La Paz, South Yungas, Sirupaya near Yanacachi, alt. 2100 m, *Buchtien 191 (300)* (NY, US)" distributed as *Eupatorium stipuliferum.* This specimen cited by Robinson has glands on the peduncles but no reddish hairs, and it is from La Paz, not Tarija. The other specimen cited by Robinson (1920) "Bolivia: Cochabamba, Río Juntas, alt. 900 m, April 1892, *Kuntze s.n.* (NY, US)." first annotated as *Eupatorium marginatum*, has densely puberulous but eglanduliferous peduncles without reddish hairs. This latter specimen remains unplaced at this time.

The species described after the Robinson 1920 treatment, *F. yungasensis* (B.L. Rob.) R.M. King & H. Rob. seems closest to *F. tamboensis* with its reddish hairs and stipitate glands, but it differs by its lower stems and leaves also being densely covered with stipitate glands and by its white corollas.

***Fleischmannia yungasensis* (B.L. Rob.) R.M. King & H. Rob., Phytologia 19: 206. 1970**

Eupatorium yungasense B.L. Rob., Contrib. Gray Herb. 104: 30. 1934. Type: Bolivia, Nor-Yungas, Millugnaya, alt. 1300 m, Dec 1917, *Buchtien 4407* (holotype GH; isotype US).

Description. Scandent or subscandent perennial herbs, with all but most distal branches spreading at 90° angles, nearly straight or curving toward apex of main stem; stems hirtellous with reddish hairs; internodes 10–15 cm long; internodes of branchlets 2-3 cm long. Leaves opposite, leaves of main branches with petioles 10–22 mm long, densely hirtellous; leaf blades deltoid, 3.5–4.5 cm long, 1.5–2.5 cm wide, widest in basal fifth, truncate with only slight acumination at petiole; ca. 8 or 10 teeth on each margin, apex narrowly acuminate, adaxial surface hispidulous with hairs reddish near margin and pale farther from margins, abaxially spreading hirtellous on main veins, between veins sparsely pilosulous, triplinervate with strongly ascending lateral veins from basal acumination; branchlet leaves with petioles 3–5 mm long, blades 1.5–2.0 cm long, 1.0–1.7cm wide, 5–7 teeth on each margin, apex weakly acuminate to acute, pubescence as in leaves. Inflorescence with small clusters of heads terminal on elongate main stems and branches, branches of inflorescence and peduncles densely hirtellous with reddish hairs and intermixed stipitate glands; peduncles 3–7 mm long; heads ca. 6 mm high, 3–4 mm wide; involucral bracts ca. 15, in ca. 4 series, 1.5–5.0 mm long, 1.0–1.2 mm wide, basal bracts ovate and acute, more herbaceous and densely pubescent, middle and inner bracts oblong, greenish to stramineous, with mostly 2 strong longitudinal veins, margins and tips scarious, apices obtuse. Florets ca. 15–17 in a head; corollas white. ca. 3.5 mm long, basal tube ca. 0.5 mm long, throat ca. 2.5 mm long, lobes ca. 0.5 mm long, with few hairs outside, anther thecae ca. 0.8 mm long, apical appendages ca. 0.25 mm long; style branches broadened distally to 0.3 mm wide. Achenes ca. 1.7 mm long, ribs scarcely pale, sparsely setuliferous; pappus ca. 3 mm long, of ca. 35 slender bristles not broader at base, not or scarcely contiguous.

Specimens seen. Bolivia: La Paz: Sud Yungas, Yanacachi, camino haxia la Chojlla a la derecho primer desvic, al borde del camino, hierba apoyandose – 1.5 cm, flores blancas, 2100m, Matorral, secondary vegetation, 7 9 1987, *E. Vargas & R. Seidel 490* (US, LPB). Bolivia. La Paz, Sud Yungas, Yanacachi, 1 km NNE de la Choilla, ladera de un arroyo, bosque bajo, 215- m.s.n.m. Trepadore colgante, 31 Oct. 1988, *Seidel 1354* (LPB, US). La Paz: Sud Yungas, bajo de Pariguaya, 16°40'S, 67°31'W, 2000 m, bosque seco, arrina del río; subarbusto, 1 m, altos, flores blancas, 30 April 1995, *St. S. Beck 22419* (LPB, US). La Paz: Inquisivi, 10 km al N de Inquisivi por el camino a Suri, al rededores del Puente sobre el Río Kato. Bosque seco con *Prosopis*, *Acacia*, *Schinopsis* y *Pereskia*, 16°48'S, 67°11'W, 2100–2200, semi-apoyante, hasta 2 m, corollas blancas, 12 march 1899, *J.C. Solomon & M. Nee 18151* (MO, US); La Paz: Inquisivi. On the slope W of the Río Khatu between the mouth of the Río Cambillua and the Río Jokho Pampa, ca. 5 km SW of Inquisivi. Mostly semi-decidous chapparal-like scrub, 16°55'S, 57°11'W, 2500–2700 m, on bank in dry woodlands. Leaves purple, flowers white. 17 Aug 1988, *Lewis 881098* (LPB, MO, US). La Paz: Inquisivi, Prov. "Huayra Pata"—Major ruin discovery of large

fortelezas, irrigation canals and mysterious foundations cover this ridge which is 2 km NE of the mouth of the Río Aguilani at Lakachaka, and 2 km S of the junction of the Río Mikhailpurhua and Río Aduada. 11 km N of Choquetanga. Area of ancient ruins which has been overgrazed, burned and generally raped into semi-barren grassland with some small shrubs. Collected bordering woodlands and mattorales. 15°39'S 67°20'W, vine-like, with opposite leaves, inflorescence without rays, white, leaves rather dry and curled when collected. Shrubby woodland, 19 Nov.1991, *M. Lewis 40569* (LPB, MO, US, Quime); La Paz: Inquisivi, comunidad Khora-Lakachaca, Cuenca del Río Miguillas, 20 km de Choquetanga, 16°30'S, 67°20'W, 1450 m, Bosque, de especies semideciduos, con varias Leguminosas-Mimosas vegetación sobre terrazas antiguas, Transecto 9, herbácea terrestre, flores blancas. 30 May 1994, *M. Salinas 3061* (LPB, US). La Paz: Inguisivi, Camillaya arriba del pueblo, 16°48'S, 67°12'W, 3400 m, restos bosque alto-montano, apoyandose, tallos pargos de 4 m, flores blancas, 29 Sept. 1997, *St. S. Beck 24350* (LPB, US).

Beck 24350, *Solomon & Nee 18152, & Salinas 3041* previously have been misidentified as *F. soratae*. The specimen *E. Vargas & R. Seidel 490* is evidently the apical part of a branch, with persisting primary branch leaves and a pyramidal inflorescence. The *Lewis* collections seen are evidently cut from median segments of the stems showing the consistently widely spreading branches and lacking main axis leaves.

The species is by all indications scandent, although it is probably more of a scrambling vine. The reddish pubescence is rather distinctive but according to descriptions also occurs in *Fleischmannia tamboensis* of Bolivia and such species as *F. cookii* (B.L. Rob.) R.M. King & H. Rob. and *F. rhodotephra* (B.L. Rob.) R.M. King & H. Rob. in Peru. *Fleischmannia tamboensis* may be closely related, with its indument of red and glandular hairs, but that is from southernmost Bolivia in Tarija, and was described by Hieronymus (1897), one of its collectors, as suffruticose to 4 m tall, and sparsely branched, with membranaceous leaves with upper surfaces "scabriusculis" and abaxial surfaces scabrid on the nerves, and with peduncles ca. 6 mm long. This latter habit agrees with the type photograph that has been seen.

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References

Hieronymus G (1897) Erster Beitrage zur Kenntnis der Siphonogamenflora der Argentina und der angrezzenden Lähder, besonders von Uruguay, Paraguay, Brasilien und Bolivia. Jahrb. Bot. Syst. 22: 672–798.

Robinson BL (1920) The Eupatoriums of Bolivia. Contr. Gray Herb. n.s. 61: 30–80.
Robinson H (2001) New species of *Fleischmannia* from Panama and Andean South America (Asteraceae: Eupatorieae). Proc. Biol. Soc. Wash. 114(2): 529–556.
Robinson H (2008) 190 (3). Compositae-Eupatorieae In: Harling G, Persson C (Eds) Flora of Ecuador no. 83: 1–349.
Robinson H (2015) Tribe Eupatorieae. In: Flora Mesoamerica, prepublication English version available on internet at http://www.tropicos.org/docs/meso/asteraceae.pdf?projectid=3&langid=66

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Novelties in *Selaginella* (Selaginellaceae – Lycopodiophyta), with emphasis on Brazilian species

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Abstract

In this paper, I describe five new species of *Selaginella* from Brazil (*S. nanuzae*, *S. neospringiana*, *S. pellucidopunctata*, *S. stomatoloma*, and *S. trygonoides*), compare them to morphologically similar species, and provide a preliminary conservation status assessment for each. The new species are illustrated with scanning electron photomicrographs of stem sections, leaves, and spores, when available. Also discussed in this paper are ten species, mainly from Brazil and with new distribution records, and the forthcoming resurrection of three species also occurring in Brazil. Three further non-native and presumed naturalized species are recognized in Brazil, and publication of one additional taxon is planned. Eighty-six *Selaginella* species are now known from Brazil and, of these, 80 are native (including 26 / 32.5%, endemic), and six are introduced. Brazil and Mexico have the second highest number of native *Selaginella* species in the Neotropics after Venezuela, which is estimated to have about 100. Of the newly documented species, *S. cabrerensis* is now known to occur in French Guiana, Brazil, and Bolivia, in addition to Colombia, and *S. arroyoana* and *S. chiquitana* are synonymized under it. Likewise, *S. potaroensis* is also recorded from Costa Rica and Brazil, and *S. seemannii* from Panama and Brazil. Finally, leaf marginal stomata are reported on the newly described species and their functionality is discussed under *S. stomatoloma*.

Resumen

En este artículo describo cinco nuevas especies de *Selaginella* de Brasil (*S. nanuzae*, *S. neospringiana*, *S. pellucidopunctata*, *S. stomatoloma* y *S. trygonoides*), las cuales comparo con especies morfológicamente similares y estimo, preliminarmente, su estado de conservación. Las nuevas especies las ilustro con fotomicrografías al microscopio electrónico de barrido de secciones de los tallos, hojas y esporas (cuando están disponibles). Diez especies adicionales son discutidas en este artículo con nuevos registros, mayormente

para Brasil, y la resurrección de otras tres también presentes en este país es anunciada. Tres especies introducidas y presuntamente naturalizadas adicionales son documentadas en Brasil, mientras que se anuncia la publicación próximamente de una especie nueva que también ocurre en este país. Por lo tanto, la ocurrencia de 86 especies de *Selaginella* en Brasil es conocida ahora, de las cuales 80 son nativas (26 de ellas o el 32.5% son endémicas) y seis son introducidas. Brasil y México tienen el segundo mayor número de especies nativas de *Selaginella* en el Neotrópico, después de Venezuela que se estima que posee unas 100. De las especies documentadas por primera vez, *S. cabrerensis* se reconoce que está distribuida en Guayana Francesa, Brasil y Bolivia, además de Colombia, y se consideran formalmente como sinónimo de ésta a *S. arroyoana* y a *S. chiquitana*. Adicionalmente, *S. potaroensis* es documentada en Costa Rica y Brasil, al igual que lo es *S. seemannii* en Panamá y Brasil. Finalmente, la presencia de estomas en los márgenes de las hojas se reporta en las cinco nuevas especies descritas y su funcionalidad se discute bajo *S. stomatoloma*.

Keywords
Deforestation, Endangered, lycophytes, Morro de Cubiçado, Serra do Mar

Palabras clave
Deforestación, En Peligro, licófitas, Morro de Cubiçado, Sierra del Mar

Introduction

In a recent paper, Valdespino et al. (2015) described seven new species of *Selaginella* from Brazil, raising the number of the known native species of that country to 58, and suggested that additional ones could be uncovered as further work in this genus continued. That prediction has proven accurate: Valdespino (2015a) has proposed *S. boomii* Valdespino, a new species widely distributed in South America, including Brazil. In addition, Goés-Neto et al. (2015) described *S. salinoi* Goés-Neto & G. Heringer, and Valdespino (2015b) published, *S. monticola* Valdespino. These two species are restricted to Brazil. As part of my revisionary work on Brazilian *Selaginella* initiated in 1992, studying collections in R and RB, I now describe five additional new heteromorphic species from Brazil: *S. nanuzae* Valdespino, *S. neospringiana* Valdespino, *S. pellucidopunctata* Valdespino, *S. stomatoloma* Valdespino, and *S. trygonoides* Valdespino. Moreover, 10 species are now recorded or confirmed for the first time mainly for that country: *S. beitelii* A.R. Sm., *S. cabrerensis* Hieron., *S. falcata* (P. Beauv.) Spring, *S. lechleri* Hieron., *S. microdonta* A.C. Sm., *S. potaroensis* Jenman, *S. seemannii* Baker, *S. umbrosa* Lem. ex Hieron., *S. vernicosa* Baker, and *S. wurdackii* Alston. Another species previously known to occur in Venezuela and just recently recognized in Brazil, included in Table 1 as *Selaginella* sp. A, will be described in the near future (Valdespino in prep.). Three species previously recorded from Brazil (i.e., *S. chromatophylla* Silveira, *S. deltoides* A. Braun [see also Valdespino in press], and *S. glazioviana* Hieron. [see discussion under *S. trygonoides*]), which were placed in synonymy by other authors (e.g., Alston et al. 1981), are in the midst of being reinstated in a separate paper (Valdespino, in prep.). Three non-native species are

Table 1. Checklist of *Selaginella* in Brazil [species included are documented by a single selected voucher for the country or by a published reference; Asterisk denotes endemic species].

N°	***Selaginella* species**	**Voucher examined**	**Observation**
1	*S. alstonii* G. Heringer, Salino & Valdespino*	Minas Gerais: *Almeida et al. 533* (BHCB, PMA)	
2	*S. amazonica* Spring	Amazonas: *Luetzelburg 23646* (R)	
3	*S. anceps* (C. Presl) C. Presl	Acre: *Daly et al. 8139* (NY, MO)	
4	*S. applanata* A. Braun	Amazonas: *Prance et al. 14339* (F)	
5	*S. articulata* (Kunze) Spring	—	Hirai (2015)
6	*S. asperula* Spring	Acre: *Daly 7573* (NY)	
7	*S. bahiensis* Spring*	Bahia: *Thomas et al. 14086* (MO, NY)	
8	*S. blepharodella* Valdespino*	Bahia: *Moraes & van der Werff 2933* (MO, PMA, UC)	
9	*S. beitelii* A.R. Sm.	Amazonas: *Carvalho et al. 353* (PMA)	Newly reported
10	*S. boomii* Valdespino	Pará: *Plowman et al. 8563* (F, GH, MG, NY, US)	
11	*S. brevifolia* Baker	Amazonas: *Spruce 2547* (BM, BR, GH, E, G, K, OXF, P, RB, US)	
12	*S. breynii* Spring	Amapá: *Egler & Irwing 46420* (NY)	
13	*S. cabrerensis* Hieron.	Goiás: *Irwin et al. 15552* (NY)	Newly confirmed
14	*S. calceolata* Jermy & J.M. Rankin	Amazonas: *Spruce 2861* (G, GH, P, RB, W)	
15	*S. crinita* Valdespino*	Bahia: *Harley & Taylor 27048* (NY, PMA)	
16	*S. chromatophylla* Silveira*	Bahia: *Moraes & van der Werff 2861* (MO, PMA, UC)	To be resurrected
17	*S. coarctata* Spring	Amazonas: *Rosa & Lia 2339* (NY)	
18	*S. conduplicata* Spring	Amazonas: *Todzia et al. 2262* (NY)	
19	*S. contigua* Baker*	Rio de Janeiro: *Sylvestre et al. 1874* (NY)	
20	*S. convoluta* (Arn.) Spring	Rio de Janeiro: *Braga 7652* (NY)	
21	*S. decomposita* Spring*	Bahia: *Thomas et al. 14223* (NY)	
22	*S. deltoides* A. Braun	Amazonas: *Luetzelburg 23710* (M, R)	To be resurrected
23	*S. dendricola* Jenman	Amazonas: *Spruce 2535* (OXF, P)	
24	*S. epirrhizos* Spring	Amazonas: *Cid et al. 605* (NY)	
25	*S. erectifolia* Spring*	Rio de Janeiro: *Glaziou 2242* (B, BR, K, NY, P)	
26	*S. erythropus* (Mart.) Spring	Mato Grosso: *Windisch et al. 6758* (NY)	
27	*S. exaltata* (Kunze) Spring	Amazonas: *Prance et al. 7626* (NY)	
28	*S. falcata* (P. Beauv.) Spring	Amapá: *Bastos 2070* (RB)	Newly reported
29	*S. flagellata* Spring	Pará: *Sperling et al*, 5589 (NY)	
30	*S. flexuosa* Spring	Bahia: *Edwards 2431* (NY)	
31	*S. fragilis* A. Braun	Amazonas: *Ferreira et al. 7930* (NY)	
32	*S. glazioviana* Hieron.*	Rio de Janeiro: Glaziou 7280 (B, BM)	To be resurrected
33	*S. gynostachya* Valdespino	Pará: *Maciel & Pietrobom 1032* (MG, PMA)	
34	*S. haematodes* (Kunze) Spring	Rondônia: *Teixeira et al. 427* (NY)	
35	*S. homaliae* A. Braun	Amazonas: *Stevenson & Ramos 978b* (NY)	
36	*S. jungermannioides* (Gaudich.) Spring*	Rio de Janeiro: *Rose & Russell 20349* (NY)	
37	*S. kochii* Hieron.	Amazonas: *Alencar 327* (NY)	
38	*S. lechleri* Hieron.	Acre: *Jangoux et al. 85-104* (NY)	Newly reported

N°	*Selaginella* species	Voucher examined	Observation
39	*S. macrostachya* (Spring) Spring*	São Paulo: *Handro 2059* (NY)	
40	*S. marginata* (Humb. & Bonpl. ex Willd.) Spring	Brasilia, DF: *da Silva et al. 3532* (NY)	
41	*S. mendocae* Hieron.*	Rio de Janeiro: *Brade 11664* (R)	
42	*S. microdonta* A.C. Sm.	Amazonas: *Cavalcante 3056* (MG)	Newly reported
43	*S. microphylla* (Kunth) Spring	Rio Grande do Sul: *Vital & Buck 12194* (NY)	
44	*S. minima* Spring	Goiás: Anderso*n 7863* (K, NY)	
45	S. *monticola* Valdespino*	São Paulo: *Salino 2980* (PMA)	
46	*S. mucronata* G. Heringer, Salino & Valdespino*	Espírito Santo: *Salino et al. 13686* (BHCB, PMA)	
47	*S. mucugensis* Valdespino*	Bahia: *Giulietti et al. [CFCR 1430]* (NY, PMA)	
48	*S. muscosa* Spring	Rio de Janeiro: *Brade 17189* (BM, G, MG, MO, RB)	
49	*S. nanuzae* Valdespino*	São Paulo: *Salino et al. 7788* (PMA)	Newly described
50	*S. neospringiana* Valdespino*	Rio de Janeiro: *Glaziou 11723* (BM, C, P, PM, US)	Newly described
51	*S. palmiformis* Alston ex Crabbe & Jermy	Amazonas: *Campbell et al. P21811* (GH, K, MO, NY, R, S)	
52	*S. parkeri* (Hook. & Grev.) Spring	Acre: *Silveira et al. 1273* (NY)	
53	*S. pellucidopunctata* Valdespino*	Alagoas: *Oliveira 1094* (PMA, UFP)	Newly described
54	*S. porelloides* (Lam.) Spring	Mato Grosso: Anderson 9901 (AAU, F, NY, UC)	
55	*S. potaroensis* Jenman	Roraima: *Prance et al. 9995* (NY)	Newly reported
56	*S. producta* Baker	Bahia: *Thomas et al. 10610* (NY)	
57	*S. radiata* (Aubl.) Spring	Pará: *Sperling et al. 5715* (NY)	
58	*S. revoluta* Baker	Amazonas: *Maguire et al. 60296* (MO, NY)	
59	*S. salinoi* Goés-Neto & G. Heringer*	Espírito Santo: *Souza et al. 1462* (PMA)	
60	*S. saltuicola* Valdespino*	Mato Grosso: *Prance et al. 19126* (INPA, NY, PMA)	
61	*S. sandwithii* Alston	Amapá: *Irwin et al. 47416* (U, US).	
62	*S. seemannii* Baker	Roraima: *Edwards & Millikin 2541* (NY)	Newly reported
63	*S. sellowii* Hieron.	Rio Grande do Sul: *Leite 2381* (NY)	
64	*S. sematophylla* Valdespino, G. Heringer & Salino*	Minas Gerais: *Brade & Barbosa 17953* (BM, MO, NY, PMA, RB)	
65	*S. simplex* Baker	Goiás: *Anderson 8187* (NY)	
66	*S. stomatoloma* Valdespino*	Pará: *Almeida et al. 2518* (PMA)	Newly described
67	*S. suavis* (Spring) Spring	Espiritu Santo: *Mexia 4072* (MO)	
68	*S. sulcata* (Desv.) Spring ex Mart.	Rio de Janeiro: *Araujo & Carauta 1452* (NY)	
69	*S. tenella* (P. Beauv.) Spring	Mato Grosso: Lindman A3495 (B, S)	
70	S. *tenuissima* Fée*	Minas Gerais: *Vital & Buck 11544* (NY)	
71	*S. terezoana* Bautista	Roraima: *Terezo 32* (IAN)	
72	*S. trisulcata* Aspl.	Pará: *Prance & Pennington* (BM)	Alston et al. (1981: 320)
73	*S. trygonoides* Valdespino*	Minas Gerais: *Almeida et al. 1994* (PMA)	Newly described
74	*S. tuberculata* Spruce ex Baker	Amazonas: *Stevenson et al. 978a* (NY)	
75	*S. umbrosa* Lem. ex Hieron.	Paraná: *Sucre et al.* 9778 (RB)	Newly reported
76	*S. valida* Alston*	Paraná: *Matos & Schwartsburd 826* (NY)	

N°	***Selaginella* species**	**Voucher examined**	**Observation**
77	*S. vernicosa* Baker	Roraima: *Luetzelburg 21631* (R)	Newly reported
78	*S. vestiens* Baker*	Minas Gerais: *Mexia 5832* (CAS, GH, MICH, MO, S, U)	
79	*S. wurdackii* Alston	Roraima: *Carvalho et al. 233* (INPA, PMA)	Newly reported
80	*S.* sp. A.	Roraima: *Carvalho et al. 374* (INPA, PMA)	To be described by Valdespino with epithet "*psittacorrhincha*"
		Introduced species	
81	*S. braunii* Baker	Rio de Janeiro: *Winter 71* (NY, RB)	Newly reported (escape from cultivation at RB?)
82	*S. kraussiana* A. Braun	São Paulo: *Hoehne 222* (NY)	
83	*S. pallescens* (C. Presl) Spring	Santa Catharina: *Schmalz 148* (NY)	Newly reported (escape from cultivation?)
84	*S. plana* (Desv.) Hieron.	São Paulo: *Wells-Windisch*, 583 (HB-n.v.)	Hirai (2015)
85	*S. vogelii* Spring	Rio de Janeiro: *Engelmann 116* (NY)	
86	*S. willdenowii* (Desv.) Baker	Pará: *Killip & A.C. Smith 30345* (NY)	Newly reported

vouchered for the first time in Brazil: *S. braunii* Baker, *S. pallescens* (C. Presl) Spring, and *S. willdenowii* (Desv.) Baker. Of the newly recorded species, *S. cabrerensis* (with updated synonymy), *S. potaroensis*, and *S. seemannii* are also documented for other neotropical countries.

The novelties reported here increase the number of *Selaginella* species in Brazil to 86 (see Table 1), of which 80 are native and six are introduced and presumed naturalized. Among the native species, 26 are endemic (see taxa with an asterisk in Table 1). These statistics represent an increase of 44% and 35% in the number of *Selaginella* species recorded in Brazil over previous accounts by Alston et al. (1981) and Hirai (2015), respectively, and also increases the percentage of estimated endemic species from 27.2% (Prado and Hirai 2014) to 32.5%. After Venezuela, which is estimated to have ca. 100 species (Valdespino in press), Brazil (Table 1) and Mexico also with 80 native species (Mickel et al. 2004) have the second highest diversity of *Selaginella* in the Neotropics. With these new data, and based on information by Prado and Hirai (2014) for Brazilian lycophytes and ferns diversity, *Selaginella* is now the third most diverse genus and twelfth in endemism for that country.

Following Jermy's (1986, 1990) subgeneric classification, the newly described *Selaginella nanuzae*, *S. neospringiana*, *S. stomatoloma*, and *S. trygonoides* belong to subg. *Stachygynandrum* because their strobili are quadrangular and comprise monomorphic sporophylls, while *S. pellucidopunctata*, with dimorphic sporophylls, has dorsiventral strobili and is a member of subg. *Heterostachys*.

Material and methods

This study is based on examination of herbarium specimens from AAU, B, BHCB, BM, BR, C, CAS, COL, CR, E, F, G, GH, IAN, INPA, K, L, M, MG, MICH, MO, NY, OXF, P, PMA, RB, R, S, U, UC, UFP, US, W, and digitized images from B, BM, C, P, and UC (herbarium acronyms follow Thiers 2015). Further digitized *Selaginella* specimens from Brazil were consulted from RB (JBRJ 2015), Reflora (2015), and Species Link (2015) virtual herbaria. Additionally, stem sections and spore samples from selected specimens were viewed with Scanning Electron Microscope (SEM) to determine upper and lower surfaces of leaves and spore sculpturing patterns and diameter (when available). The SEM study and measurement of leaves was conducted following Valdespino et al. (2014, 2015). Spore sculpturing and leaf terminology follow Valdespino et al. (2015 and references therein). The raw SEM images were processed with Adobe Photoshop to make the background black, adjust brightness and contrast, and for assembly in multipart figures according to species. Figures are provided only for new species, although additional SEM digitized images were taken for comparison from some other species discussed.

Species descriptions are given only for new taxa and follow the order of characters and states used by Valdespino et al. (2015 and references therein). Entries for taxa newly recorded for Brazil and other countries are provided only for native species in a concise form, as most will be dealt with in separate papers, while non-native and yet unpublished ones are documented within Table 1 with herbarium vouchers examined or published references. Unique identifier numbers (usually barcode numbers) in square brackets were provided for type specimens when available.

Conservation statuses were assessed for only new taxa and follow the IUCN Red list Categories and Criteria version 3.1, second edition (IUCN 2012).

Taxonomy

***Selaginella nanuzae* Valdespino, sp. nov.**
urn:lsid:ipni.org:names:77151571-1
Figures 1, 2, 3

Diagnosis. *Selaginella nanuzae* differs from typical *S. contigua* Baker by its coriaceous (vs. chartaceous) leaves with the upper surfaces shiny and bumpy (vs. dull and smooth to slightly corrugate), the acroscopic margins of the lateral leaves and both margins of the median and axillary leaves broadly (vs. faintly) hyaline, median leaves with long-aristate (vs. acute to short-acuminate) apices, each arista 0.4–0.6 mm (vs. acumen 0.05–0.2 mm), midribs straight (vs. arcuate) with the outer bases auriculate (vs. lacking auricles) and bearing10–18 long-cilia (vs. outer bases ciliate with 2–5 cilia), and the lateral leaves 2.5–3.0 × 1.0–1.5 mm (vs. 7.0–10 × 2.0–2.7 mm).

Type. BRAZIL. São Paulo: [Mpio.] Ubatuba, Parque Estadual da Serra do Mar, Núcleo Picinguaba, trail to Pico Corcovado, 23°26'56.6"S, 45°11'35.8"W, 450 m, 1 Nov

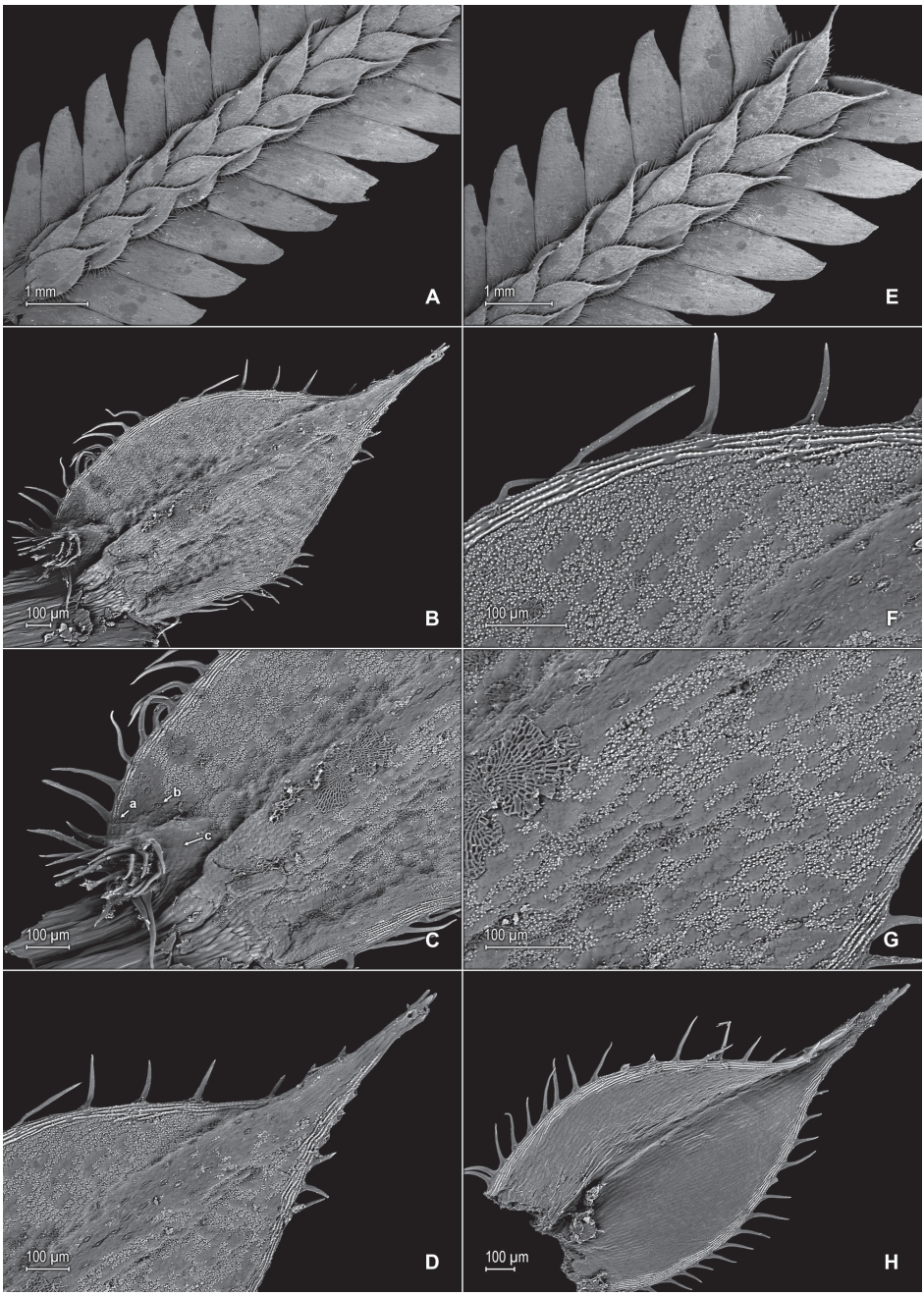

Figure 1. *Selaginella nanuzae* Valdespino. **A** Section of upper surface of stem **B** Upper surface of median leaf **C** Close-up of base and proximal portion of median leaf, upper surface; note marginal (a) and submarginal (b) stoma, and outer base tufted with long cilia (c) **D** Close-up of distal portion and apex of median leaf, upper surface **E** Section of upper surface of stem **F** Close-up of outer half of median leaf, upper surface **G** Close-up-of inner half of median leaf, upper surface **H** Lower surface of median leaf. **A–H** taken from the holotype, *Salino et al. 7788* (PMA).

2001, *A. Salino, V.A.O. Dittrich, P.O. Morais, F.A. Carvalho, L.C.R.S. Teixeira & A.M. Oliveira 7788* (holotype: PMA! [PMA103268]; isotype: BHCB [BHCB65041]-n.v.).

Description. *Plants* terrestrial. *Stems* decumbent to ascending or suberect, stramineous, 3–5 cm long, 0.5–1.0 mm diam., non-articulate, not flagelliform or stoloniferous, 2–3-branched. *Rhizophores* ventral or ventro-axillary, borne on proximal ½ of stems, stout, 0.5–1.0 mm diam. *Leaves* heteromorphic throughout, coriaceous, strongly imbricate, upper surfaces bumpy and green, lower surfaces corrugate to striate and silvery green. *Lateral leaves* ascending, ovate-oblong or ovate, 1.5–3.0 × 0.9–1.5 mm; bases rounded to semicordate, acroscopic bases strongly overlapping stems, basiscopic bases free from stems; acroscopic margins broadly hyaline in a band 5–10 cells wide with the cells elongate, straight-walled and papillate parallel to margins, papillae in 1 row over each cell lumen, long-ciliate along proximal ¾, otherwise denticulate distally, basiscopic margins greenish, comprising quadrangular, sinuate-walled, glabrous and papillate cells, long-ciliate along proximal ⅛, otherwise entire distally or denticulate on distal ⅛; apices falcate and acute or gradually tapering and acute, variously tipped by 1–3 teeth; upper surfaces comprising quadrangular or rounded, sinuate-walled cells (often difficult to distinguish because of waxy deposits), many of these covered by 6–40 papillae, without idioblasts or stomata, lower surfaces comprising elongate, sinuate-walled cells, with many of these papillate and idioblast-like on both side of the midribs (more so on acroscopic halves of the laminae), papillae in 1–3 rows (or rows not clearly distinguishable) over each cell lumen, with stomata in 2–5 rows along midribs and along distal ⅙ of basiscopic margins. *Median leaves* ascending, ovate to ovate-elliptic or orbicular, 1.2–1.8 × 0.6–1.2 mm; bases truncate or oblique with outer bases auriculate, auriculae tufted with 10–18 cilia; margins broadly hyaline in a band 2–8 cells wide, the cells elongate, straight-walled and papillate parallel to margins, papillae in 1 row over each cell lumen, long-ciliate throughout and more obviously so on outer margins (cilia on outer margins half to one time longer than the inner cilia); apices long-aristate, each arista ⅓–½ the length of the laminae (0.4–0.9 mm), variously tipped by 1–3 teeth; both surfaces without conspicuous idioblasts, upper surfaces comprising quadrangular, rectangular or rounded, sinuate-walled cells (often difficult to distinguish because of waxy deposits), many of these covered by 7–25 papillae, with stomata in 2–5 rows along distal ½ of the midribs, few on submarginal portion along proximal ⅕ of outer halves of the laminae, lower surfaces comprising elongate, sinuate-walled cells, without stomata. *Axillary leaves* ovate or ovate-lanceolate, 1.5–2.6 × 0.8–1.1 mm; bases rounded; margins broadly hyaline, long-ciliate along proximal ⅓, short-ciliate on central ⅓, otherwise dentate on distal ⅓; apices acute to broadly acute, variously tipped by 1–3 teeth; both surfaces as in lateral leaves. *Strobili* terminal on main stem and branch tips, loosely quadrangular, 0.4–1.6 cm. *Sporophylls* monomorphic, without a laminar flap, each with a strongly developed and seemingly glabrous keel along midribs, broadly ovate to ovate-deltate, 1.0–1.2 × 0.6–1.1 mm; bases truncate; margins broadly hyaline, dentate to short-ciliate; apices short-acuminate to cuspidate, each acumen (cusp) 0.1–0.2 mm, tipped by 1–3 teeth; *dorsal sporophylls* with upper surfaces green and cells as in median leaves, lower surfaces silvery green and comprising elongate, sinuate-walled cells; *ventral sporophylls* with both surfaces hyaline or greenish hyaline, comprising elongate, sinuate-

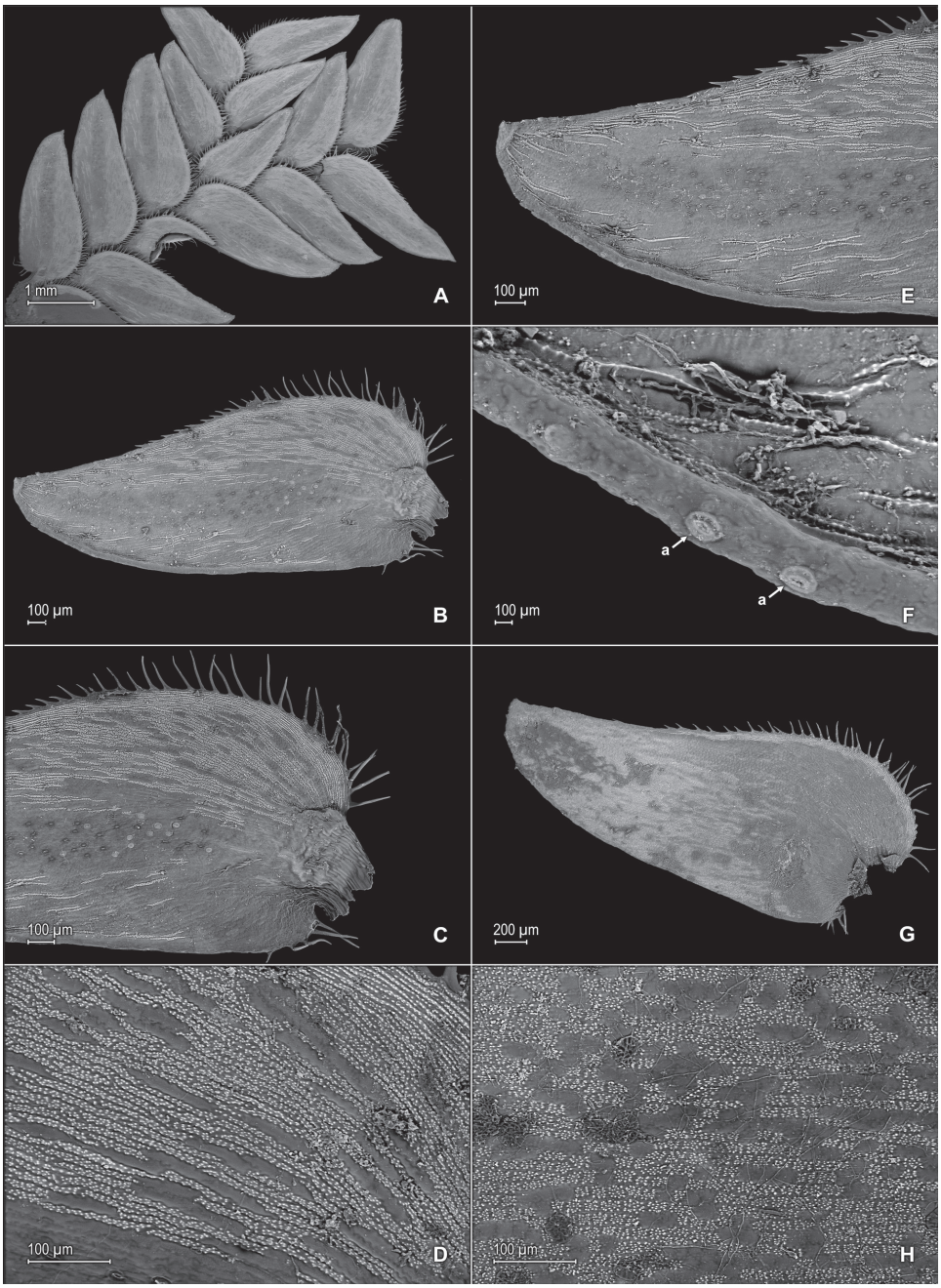

Figure 2. *Selaginella nanuzae* Valdespino. **A** Section of lower surface of stem **B** Lower surface of lateral leaf **C** Close-up of base and distal portion of lateral leaf, lower surface **D** Close-up of acroscopic half of lateral leaf near base, lower surface **E** Close-up of distal portion and apex of lateral leaf, lower surface **F** Close-up of portion of basiscopic margin of lateral leaf near apex, lower surface; note marginal stoma (a) **G** Upper surface of lateral leaf **H** Close-up of upper surface of lateral leaf. **A–H** taken from the holotype, *Salino et al. 7788* (PMA).

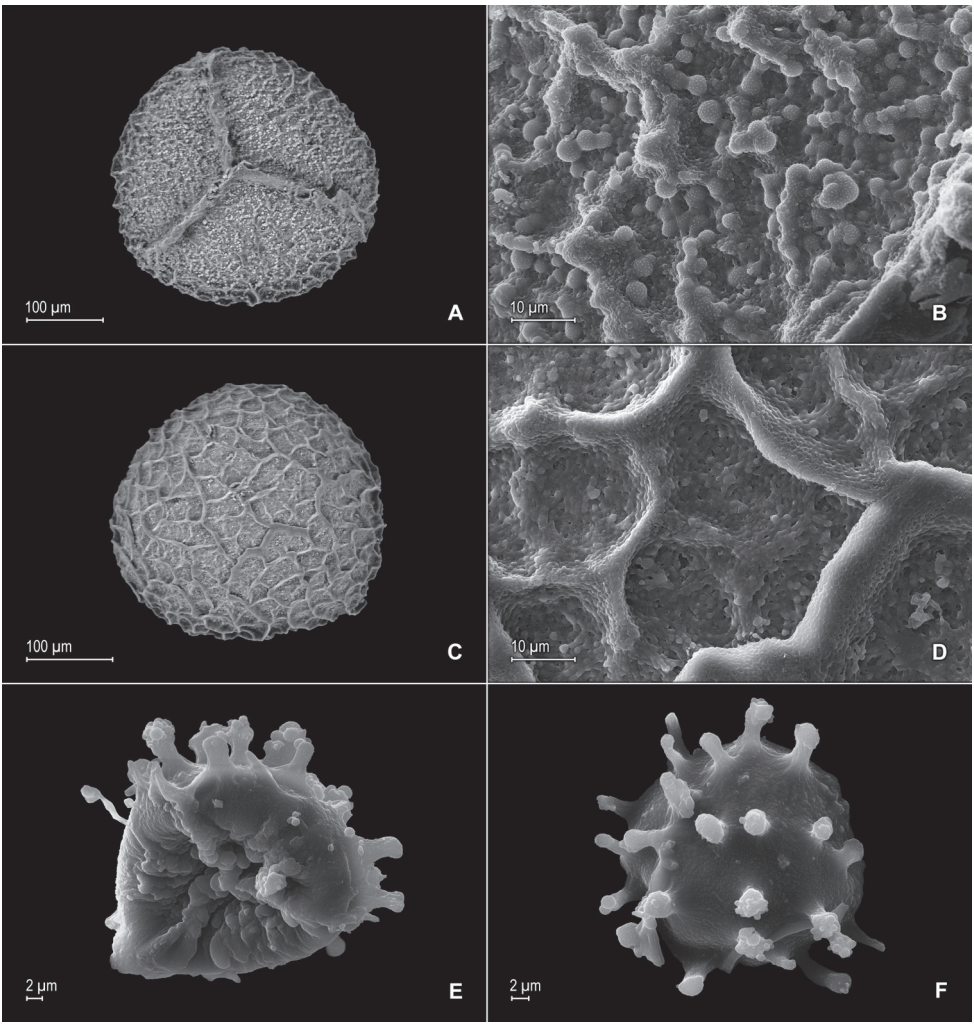

Figure 3. *Selaginella nanuzae* Valdespino. **A** Megaspore, proximal face **B** Close-up of megaspore, proximal face **C** Megaspore, distal face **D** Close-up of megaspore, distal face **E** Microspore, proximal face **F** Microspore, distal face. **A–F** taken from the holotype, *Salino et al. 7788* (PMA).

walled cells. *Megasporangia* in 2 ventral rows; *megaspores* yellow, rugulate-reticulate on proximal faces with verrucate, perforate, and echinulate microstructure, reticulate on distal faces with verrucate and perforate microstructure (Fig. 3A–D), 260–355 µm. *Microsporangia* in 2 dorsal rows; *microspores* orange, rugulate on proximal faces with echinulate microstructure, capitate or clavate on distal faces with each caput and the rest of the surface with echinulate microstructure (Fig. 3E, F), 25–30 µm.

Habitat and distribution. *Selaginella nanuzae* grows in dense premontane wet forests at 450 m in Atlantic forest vegetation. It is known only along the trail to Morro Corcovado in Parque Estadual da Serra do Mar, São Paulo.

Etymology. This species is named for Professor, Dra. Nanuza Luiza de Menezes, an outstanding Brazilian botanist, who has been instrumental in advancing botanical and conservation sciences in her country and, in the course of her career, has mentored new generations of botanists at the University of São Paulo. Through her involvement with the Latin American Botanical Association, in 1992, I attended a plant morphology and anatomy course with emphases in taxonomy and evolution at that University; this led to my first exposure to, and study of, Brazilian *Selaginella*.

Conservation status. *Selaginella nanuzae* was collected in a state park, where it may be adequately conserved. Nevertheless, given that there is large visitation along the trails of this park, particularly to ascend to Morro Corcovado where the only two known collections of the new taxa were made, and that some degree of deforestation occurs there, it is considered Vulnerable (VU).

Additional specimen examined (paratype). BRAZIL. **São Paulo**: Mpio. Ubatuba, Morro Corcovado, 8 Sep 1998, *Ribas & Dittrich 2729* (NY).

Discussion. *Selaginella nanuzae* is characterized by the upper surfaces of the leaves shiny (due to waxy deposits) and bumpy (Figs.1, 2), the median leaves long-aristate (Fig. 1A, B, E, F), the acroscopic margins of the lateral leaves (Fig. 2B–D, E, G) and both margins of the axillary and median leaves (Fig.1B–D, F–H) broadly hyaline, as well as the apices of the lateral leaves acute (Fig. 1A, E; Fig. 2A, B, E, G).

The two specimens cited here under *Selaginella nanuzae* were previously determined as *S. contigua*, which as currently circumscribed is a morphologically variable species needing additional study. *Selaginella nanuzae* differs from typical *S. contigua*, as lectotypified by Hirai and Prado (2000), by the characters given in the diagnosis. *Selaginella nanuzae* further differs from *S. contigua* by its ovate-oblong or ovate (vs. oblong) lateral leaves with the apices acute (vs. truncate or broadly obtuse), and ovate or ovate-lanceolate (vs. ovate-lanceolate) axillary leaves with rounded bases (vs. rounded to cordate). In addition, *S. nanuzae* has strongly imbricate leaves, while *S. contigua* has leaves that are usually distant.

***Selaginella neospringiana* Valdespino, sp. nov.**
urn:lsid:ipni.org:names:77151572-1
Figures 4, 5, 6

Diagnosis. *Selaginella neoespringiana* differs from *S. vestiens* Baker by the median leaves elliptic (vs. ovate or ovate-lanceolate), each 0.6–0.8 × 0.3–0.45 mm (vs. 0.9–2.0 × 0.4–1.0 mm) with bases rounded (vs. bases truncate or with the inner bases truncate and the outer bases auriculate or bases oblique), hyaline margins 10–30 μm (vs. 100–180 μm) wide and long-ciliate (vs. dentate to short-ciliate), each cilia 80–180 μm (vs. 40–50 μm), the lateral leaves ovate to ovate-elliptic (vs. ovate-deltate) with the upper surfaces glabrous (vs. with submarginal prickle- or tooth-like projections along basiscopic halves), the basiscopic margins entire on proximal ⅔ and denticulate along distal ⅓ (vs. dentate throughout), and sporophylls short-ciliate (vs. dentate).

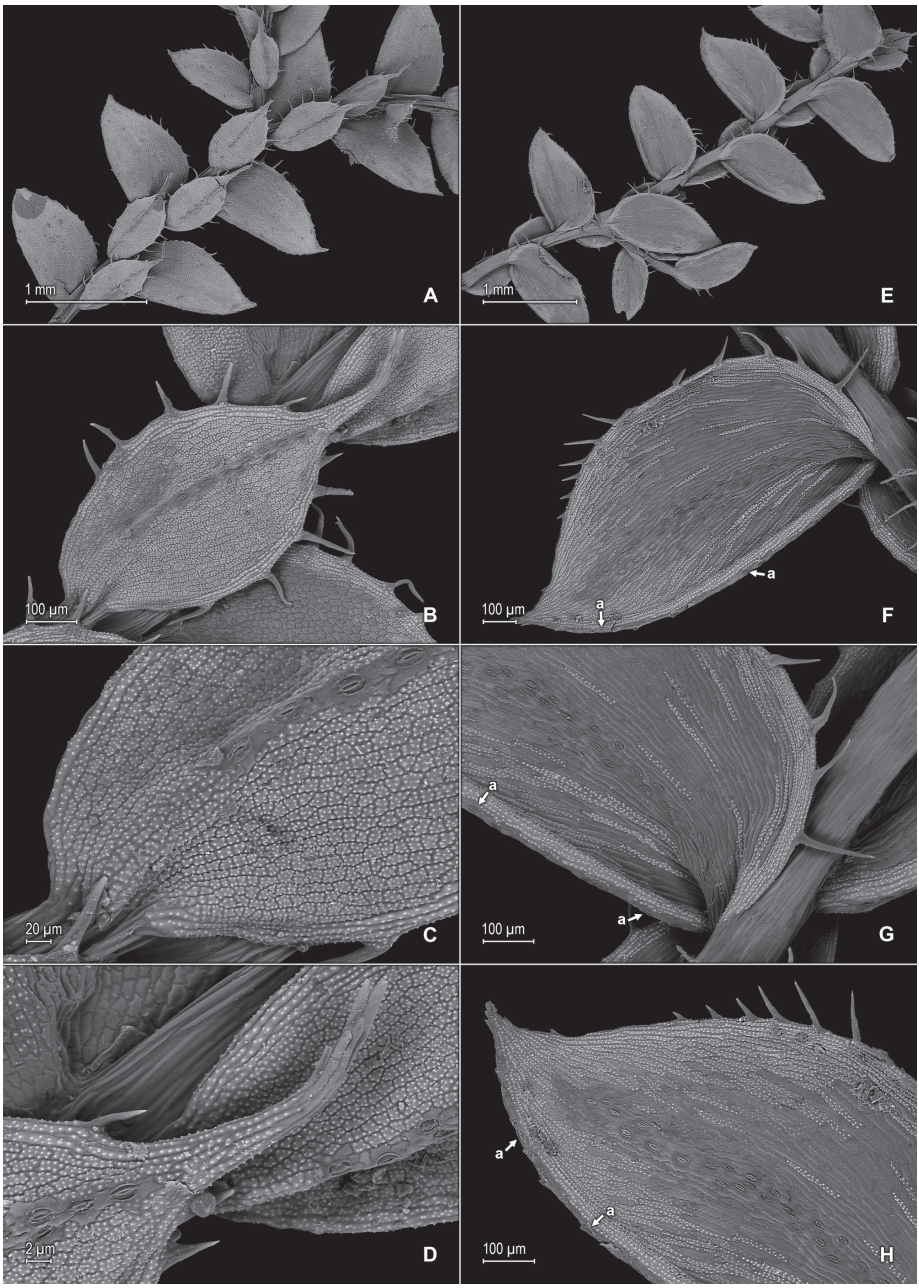

Figure 4. *Selaginella neospringiana* Valdespino. **A** Section of upper surface of stem **B** Upper surface of median leaf **C** Close-up of base and proximal portion of median leaf, upper surface **D** Close-up of distal portion and apex of median leaf, upper surface **E** Section of lower surface of stem **F** Lower surface of lateral leaf; note marginal stoma (a) **G** Close-up of proximal portion and base of lateral leaf, lower surface; note marginal stoma (a) on basiscopic margin and on outer margin of median leaf (far, lower right) **H** Close-up of distal portion and apex of lateral leaf, lower surface; note marginal stoma (a). **A–H** taken from the isotype, *Glaziou 11723* (PMA).

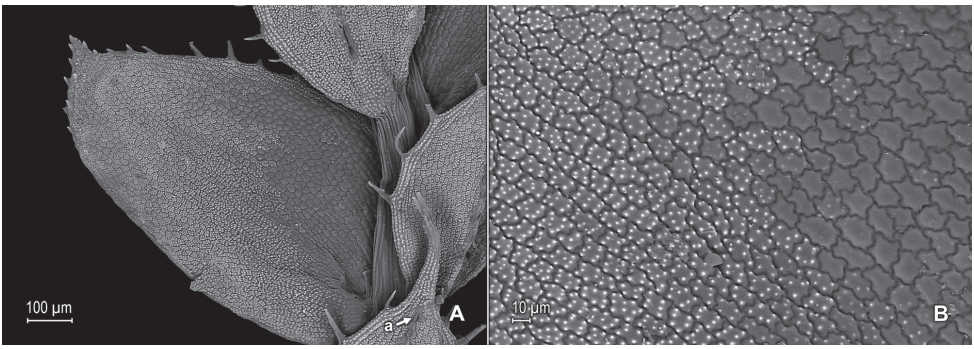

Figure 5. *Selaginella neospringiana* Valdespino. **A** Lateral leaf and portions of median leaves, upper surfaces; note papillae on cells lumen and stomata (a) along midrib of median leaf **B** Close-up of upper surface of lateral leaf; note papillae on cells lumen. **A–B** taken from the isotype, *Glaziou 11723* (PMA).

Type. BRAZIL. Rio de Janeiro: Petrópolis, Morro de Cubiçado, Gularte area, [ca. 1650 m], 7 Jul 1879, *A. Glaziou 11723* (holotype: C!; isotypes: BM!, P [P01282486]-image!, P [P01282487]-image!, PMA! [PMA103270], US!).

Description. *Plants* terrestrial (or epipetric?). *Stems* ascending to erect, stramineous, 3–5 cm long, 0.05–0.1 mm diam., non-articulate, flagelliform on branches, stoloniferous, 1- or 2-branched. *Rhizophores* axillary, borne on proximal ¼ of stems, filiform, 0.05 mm diam. *Leaves* heteromorphic throughout, membranaceous, both surfaces glabrous, upper surfaces green, lower surfaces silvery green. *Lateral leaves* spreading or slightly ascending, ovate to ovate-elliptic, 1.0–1.4 × 0.5–0.7 mm; bases rounded, acroscopic bases overlapping stems, basiscopic bases free from stems; acroscopic margins hyaline (more conspicuously so on lower surfaces), in a band 2–8 cells wide with the cells elongate, straight-walled and papillate parallel to margins, papillae in 1 or 2 rows over each cell lumen, long-ciliate throughout, basiscopic margins greenish or slightly hyaline in a band 1 or 2 cells wide with the cells rectangular, straight to sinuate-walled and papillate parallel to margins, papillae in 1–3 rows, long-ciliate throughout; apices cuspidate to short-acuminate, cusps 0.05 mm, variously tipped by 1–3 cilia; upper surfaces comprising quadrangular or rounded, sinuate-walled cells, many of these covered by 4–17 papillae, without idioblasts and with stomata along margins, lower surfaces comprising elongate, sinuate-walled cells, with few of these papillate and idioblast-like on both sides of the midribs, papillae in 2 rows over each cell lumen, with stomata in 2 rows along midribs. *Median leaves* distant, ascending, elliptic, 0.6–0.8 × 0.3–0.45 mm; bases rounded; margins hyaline in a band 2–6 cells wide, the cells elongate, straight-walled and papillate parallel to margins, papillae in 1 or 2 rows over each cell lumen, long-ciliate throughout; apices long-aristate, each arista 0.1–0.3 mm, denticulate distally on upper surfaces, tipped by 1 or 2 teeth; both surfaces without idioblasts, upper surfaces comprising quadrangular or rounded, sinuate-walled cells, many of these covered by 2–17 papillae, with stomata in 1 row along distal ¾ of the midribs and some along proximal ¼ of outer margins, lower surfaces comprising elongate, sinuate-walled cells, without stomata. *Axillary leaves* similar to lateral

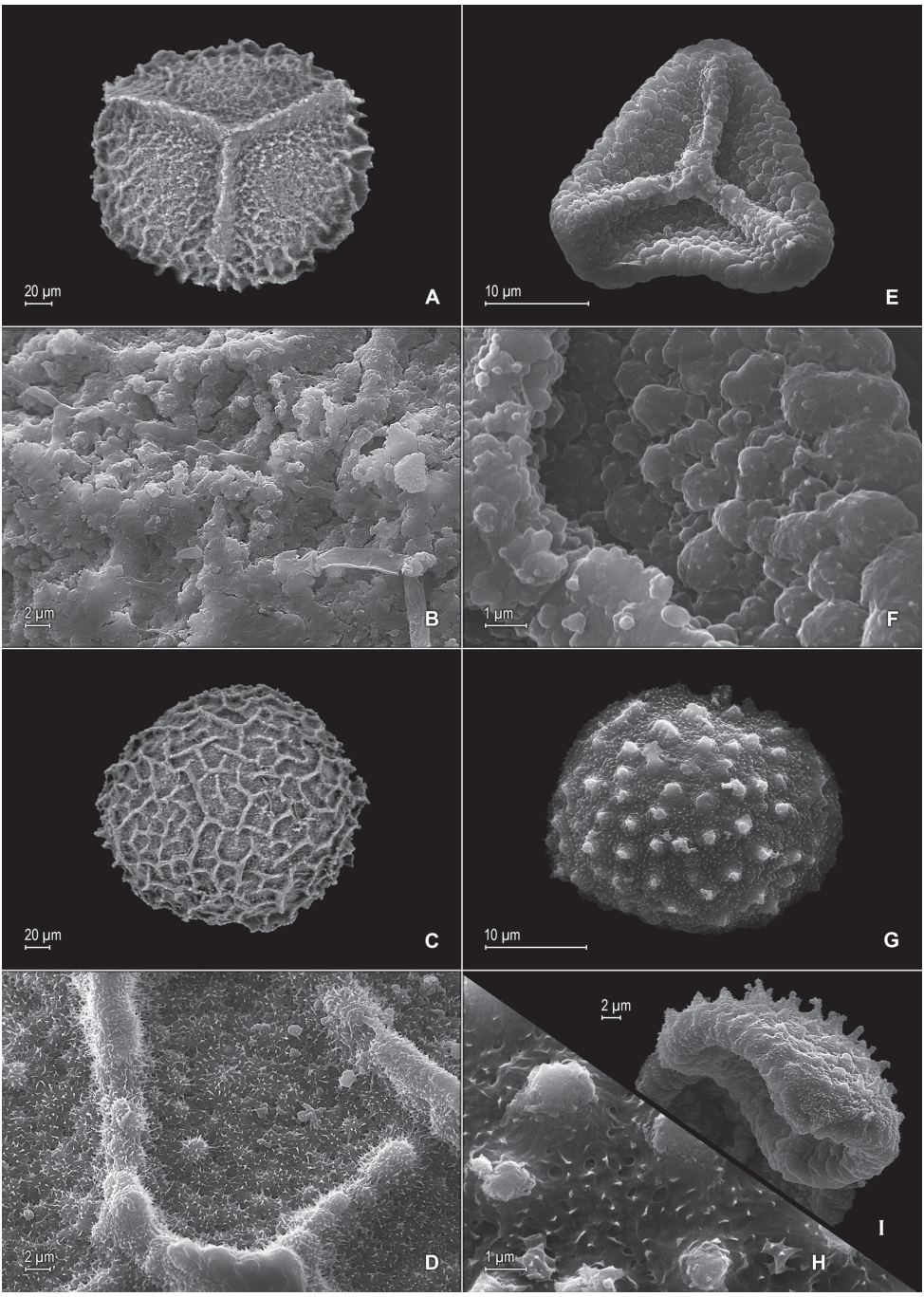

Figure 6. *Selaginella neospringiana* Valdespino. **A** Megaspore, proximal face **B** Close-up of megaspore, proximal face **C** Megaspore, distal face **D** Close-up of megaspore, distal face **E** Microspore, proximal face **F** Close-up of microspore, proximal face **G** Microspore, distal face **H** Close-up of microspore, distal face **I** Microspore, equatorial view. **A–I** taken from the isotype, *Glaziou 11723* (PMA).

leaves. *Strobili* terminal on branch tips, quadrangular, 1.0–1.2 mm. *Sporophylls* monomorphic or the ventral ones slightly shorter, ascending, without a laminar flap, each with a slightly developed and glabrous keel along midribs, ovate to ovate-lanceolate, 0.7–1.2 × 0.5–0.8 mm; bases rounded; margins hyaline (this more obviously so on dorsal sporophylls), short-ciliate; apices acuminate to short-aristate, each acumen (arista) 0.05–0.1 mm, tipped by 1 or 2 teeth; *dorsal sporophylls* with upper surfaces green and cells as in median leaves, except for the half that overlaps the ventral sporophylls where the surfaces are hyaline with elongate, papillate, and slightly sinuate-walled cells, lower surfaces silvery green and comprising elongate, sinuate-walled cells; *ventral sporophylls* with both surfaces hyaline, comprising elongate, sinuate-walled cells. *Megasporangia* in 2 ventral rows; *megaspores* yellow, rugulate-reticulate on proximal faces with a slightly developed equatorial flange and perforate microstructure, reticulate on distal faces with echinulate and perforate microstructure (Fig. 6A–D), 185–265 μm. *Microsporangia* in 2 dorsal rows; *microspores* orange, rugulate on proximal faces with echinulate microstructure, echinulate or baculate on distal faces with echinulate microstructure (Fig. 6E–I), 24–30 μm.

Habitat and distribution. *Selaginella neospringiana* is known only from the type collection made in Morro de Cubiçado, Petrópolis, Brazil. No information on the label exists as to its habitat, but in this region Campos de Altitude (highland fields or high-altitude fields) vegetation is common. The type collection was probably made at or around the peak of the Morro at ca. 1650 m and has some mosses associated with it; thus, *Selaginella neospringiana* may be terrestrial or epipetric.

Etymology. The specific epithet honors Anton Friedrich Spring (1814–1872), a German physician and botanist who is the author of the only worldwide monograph of *Selaginella*. Spring described many species and proposed the first major classification of this ancient lycophyte genus. His contribution to our knowledge of *Selaginella* was significant. Therefore, it is fitting that this species collected at high elevations bears his name.

Conservation status. As mentioned, *Selaginella neospringiana* is known only from the type collection made 135 years ago. It has apparently not been collected since, even though the area where it was gathered is visited by trekkers and adventurers. Taking this into account, this species is considered Endangered (En).

Discussion. Alston et al. (1981) cited the type of *Selaginella neospringiana* under *S. vestiens*, but as pointed out by Valdespino et al. (2015) they are morphologically different and can be separated by the characters discussed under the diagnosis.

***Selaginella pellucidopunctata* Valdespino, sp. nov.**
urn:lsid:ipni.org:names:77151573-1
Figures 7, 8, 9

Diagnosis. *Selaginella pellucidopunctata* differs from the similar *S. muscosa* Spring by its median leaves elliptic or ovate-lanceolate (vs. broadly ovate to cordate), lateral leaves with the upper surfaces with few submarginal prickle- or tooth-like projections on

basiscopic halves near basiscopic margins (vs. upper surfaces glabrous), with the acroscopic margins ciliate along proximal ½ (vs. denticulate throughout), axillary leaves ovate to broadly ovate (vs. broadly ovate or cordate), and megaspores deep yellow (vs. light yellow).

Type. BRAZIL. Alagoas: Mpio. Ibateguara, Engenho Coimbra, Grota do Vargão, [ca. 09°00'02"S, 35°51'12"W], [ca. 500 m], 12 Nov 2001, *M. Oliveira 1094* (holotype: UFP! [UFP 39685]; isotype: PMA! [PMA103269]).

Description. *Plants* terrestrial or epipetric. *Stems* ascending to erect, stramineous, 9–13 cm long, 0.4–0.7 mm diam., non-articulate, not flagelliform, shortly stoloniferous, 2–3-branched. *Rhizophores* axillary, borne on proximal ⅛–¼ of stems, filiform, 0.1–0.3 mm diam. *Leaves* heteromorphic throughout, membranaceous, both surfaces glabrous, upper surfaces green, lower surfaces silvery green. *Lateral leaves* spreading or slightly ascending, ovate to broadly ovate, 2.0–2.4 × 1.0–1.3 mm; bases rounded to almost semicordate, acroscopic bases strongly overlapping stems, basiscopic bases free from stems; acroscopic margins narrowly to broadly hyaline in a band 2–6 cells wide with the cells elongate, straight-walled and papillate parallel to margins, papillae in 1 row over each cell lumen, ciliate along proximal ½, otherwise dentate distally, basiscopic margins on upper surfaces greenish, comprising rounded or quadrangular, sinuate-walled cells, on lower surfaces narrowly to broadly hyaline in a band 2–4 cells wide with the cells as along acroscopic margins, denticulate throughout; apices acute to short-acuminate, each acumen 0.05–0.1 mm, variously tipped by 1–3 cilia; upper surfaces comprising rounded or quadrangular, sinuate-walled cells, some of these, particularly along submarginal and distal regions of the laminae, covered by 12–30 papillae, without idioblasts and with stomata along proximal ½ of basiscopic margins, lower surfaces comprising elongate, sinuate-walled cells, without conspicuous idioblasts (when viewed with stereomicroscope, EM) or these conspicuous (when viewed with SEM) and papillate on both sides of midribs, papillae in 1 or 2 rows over each cell lumen, with stomata in 2 or 3 rows along midribs and throughout acroscopic halves of the laminae. *Median leaves* distant, ascending, elliptic or ovate-lanceolate, 1.0–1.4 × 0.5–0.7 mm; bases rounded to slightly oblique; margins broadly hyaline in a band 1–7 cells wide, the cells elongate, straight-walled and papillate parallel to margins, papillae in 1 or 2 rows over each cell lumen, short-ciliate throughout or along proximal ⅔ and dentate distally or dentate throughout; apices long-aristate, each arista 0.5–0.7 mm, denticulate on upper surfaces, tipped by 1–3 cilia; both surfaces without idioblasts, upper surfaces comprising quadrangular or rounded, sinuate-walled cells, many of these covered by 7–20 papillae, with stomata in 4 rows along midribs, few stomata along proximal ¼ of outer margins, lower surfaces comprising elongate, sinuate-walled cells, without stomata. *Axillary leaves* similar to lateral leaves, except for both margins hyaline and long-ciliate along proximal ½, distally dentate. *Strobili* terminal on branch tips, dorsiventral, 0.2–1.0 cm. *Sporophylls* dimorphic; *dorsal sporophylls* spreading, with an adaxial laminar flap, each with a strongly developed and dentate keel along midribs, narrowly ovate to ovate-lanceolate, 1.5–1.8 × 0.5–0.7 mm; bases rounded; margins broadly hyaline, dentate to denticulate; apices acuminate, each acumen 0.1 or 0.2 mm with margins dentate and tipped by 2–4 teeth;

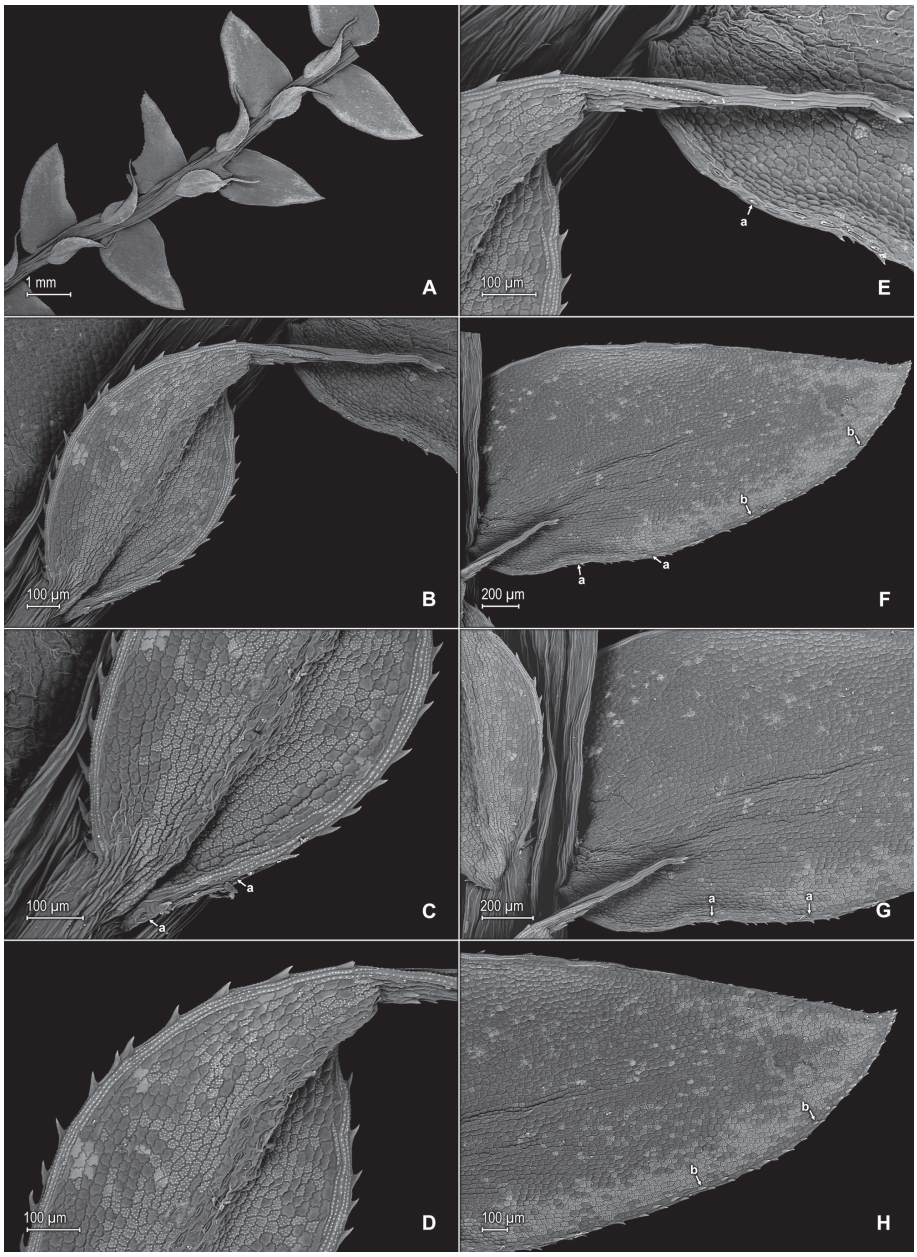

Figure 7. *Selaginella pellucidopunctata* Valdespino. **A** Section of upper surface of stem **B** Upper surface of median leaf **C** Close-up of base and proximal portion of median leaf, upper surface; note marginal stoma (a) on outer margin **D** Close-up of median leaf, distal region, upper surface **E** Close-up of apex of median leaf, upper and lower surfaces; note marginal stoma (a) on basiscopic margin of lateral leaf, upper surface **F** Upper surface of lateral leaf; note marginal stoma (a) on basiscopic margin and submarginal tooth (b) **G** Close-up of base and proximal portion of lateral leaf, upper surface; note marginal stoma (a) on basiscopic margin **H** Close-up of distal portion and apex of lateral leaf, upper surface; note submarginal tooth (b). **A–H** taken from the isotype, *Oliveira 1094* (PMA).

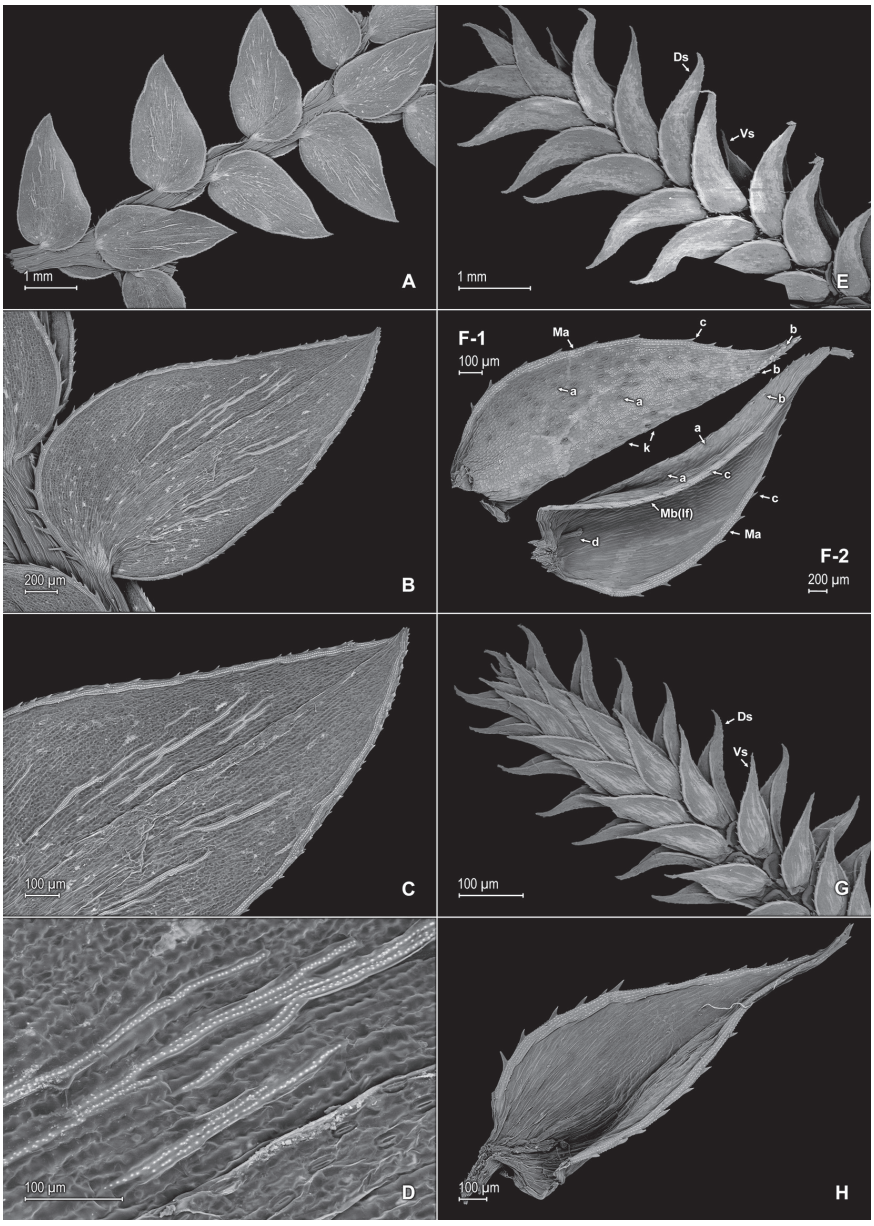

Figure 8. *Selaginella pellucidopunctata* Valdespino. **A** Section of lower surface of stem **B** Lower surface of lateral leaf **C** Close-up of distal portion and apex of lateral leaf, lower surface; note elongate, straight-walled, and papillate cells (idioblasts) **D** Close-up of lateral leaf, lower surface; note elongate, straight-walled, and papillate cells (idioblasts) **E** Strobilus, upper surface; note dorsal (Ds) and ventral (Vs) sporophyll **F** Dorsal sporophylls, adaxial- (F-1) and abaxial surfaces (F-2); note acroscopic margin (Ma) and basiscopic margin (Mb), this usually referred to as laminar flap (lf), stomata (a) throughout lamina and midrib, as well as tooth-like projections (b) on midrib and lamina, abaxial (upper) surface, marginal tooth projections (c), and ligule (d) **G** Strobilus, lower surface; note dorsal- (Ds) and ventral (Vs) sporophyll **H** Ventral sporophyll, adaxial (lower) surface. **A–H** taken from the isotype, *Oliveira 1094* (PMA).

upper surfaces green and cells as in median leaves, including many stomata, except for the half that overlaps the ventral sporophylls where the surfaces are hyaline with elongate, sinuate-walled cells, lower surfaces silvery green and comprising elongate, sinuate-walled cells; *ventral sporophylls* ascending, without a laminar flap, each with a slightly developed and dentate keel along midribs, ovate to ovate-lanceolate, 1.0–1.2 × 0.4–0.6 mm; bases rounded; margins broadly hyaline, dentate to denticulate; apices long-acuminate, each acumen 0.2 or 0.3 mm with margins dentate and tipped by 2–4 teeth; both surfaces hyaline, comprising elongate, straight-walled cells and papillate idioblasts. *Megasporangia* in 2 ventral rows; *megaspores* yellow, rugulate-reticulate on proximal faces with a prominent equatorial flange, reticulate on distal faces, with granulate-echinulate and perforate microstructure on both faces (Fig. 9A–D), 250–280 μm. *Microsporangia* in 2 dorsal rows; *microspores* orange, rugulate-echinulate on proximal faces, capitate on distal faces, with echinulate microstructure on both faces (Fig. 9E–H), 27–35 μm.

Habitat and distribution. *Selaginella pellucidopunctata* grows along stream banks or near bushes in flagstones of inselbergs in the Atlantic semi-deciduous forest vegetation at 300–650 m. It is known only from the states of Alagoas and Pernambuco in Brazil.

Etymology. The specific epithet is derived from the Latin *pellucidus*, meaning translucent, and *punctatus*, dotted; this alludes to many, conspicuous stomata on the greenish upper surfaces of dorsal sporophylls that resemble translucent dots.

Conservation status. Given that few collections are available, I cannot provide a definitive conservation status assessment of *Selaginella pellucidopunctata*. Nevertheless, this species occurs in one of the most critically endangered ecoregions of Brazil, the Atlantic Pernambuco interior forest of Northeaster, which is highly deforested with only five percent of the original vegetation present (WWF 2015). Therefore, *S. pellucidopunctata* is preliminarily considered Endangered (En).

Additional specimens examined (paratypes). BRAZIL. **Alagoas**: Mpio. Ibateguara, Usina Serra Grande, Engenho Coimbra, [ca. 09°00'02"S, 35°51'12"S], [ca. 500 m], 15 Oct 2003, *Pietrobom et al. 5637* (UFP, PMA); Mpio. São José da Lage, Usina Serra Grande, 08°59'42.4"S, 36°07'28.9"W, ca. 380–415 m, 8 Feb 2001, *Pietrobom & Santiago 4807* (UFP, PMA). **Pernambuco**: Mpio. Jaqueira, Usina, Colônia, 08°04'15"S, 35°50'13"W, ca. 650 m, 17 Oct 2001, *Lopes* & *Pietrobom 350* (RB-image, UFP-n.v.), 08°43'21.1"S, 35°50'22.1"W, ca. 545 m, 20 May 2002, *Lopes, 593* (RB-image, UFP-n.v.); Mpio. Timbaúba, Complexo da Serra do Mascarnhas, Usina Cruangi, Engenho Água Azul, ca. 07°36'31.5"S, 35°22'42.9"W, ca. 304–394 m, 13 Nov 2000, *Pietrobom et al. 4646* (UFP, PMA).

Discussion. Among Brazilian *Selaginellas*, *S. pellucidopunctata* most resembles *S. muscosa*. They differ most noticeably by the characters of the median leaf shape and the projections on the upper surfaces and margins of the lateral leaves, as discussed in the Diagnosis. In addition, the leaf surfaces of *S. pellucidopunctata*, when viewed with EM, seem to lack (vs. exhibit) conspicuous idioblasts. However, idioblasts are seen on SEM images of the lower surfaces of lateral leaves of *S. pellucidopunctata*.

One specimen, *Lopes* & *Pietrobom 350* at RB ([RB 375875]–image!) is identified as *Selaginella arenaria* Baker, a synonym of *S. brevifolia* Baker (Valdespino 2015c), which

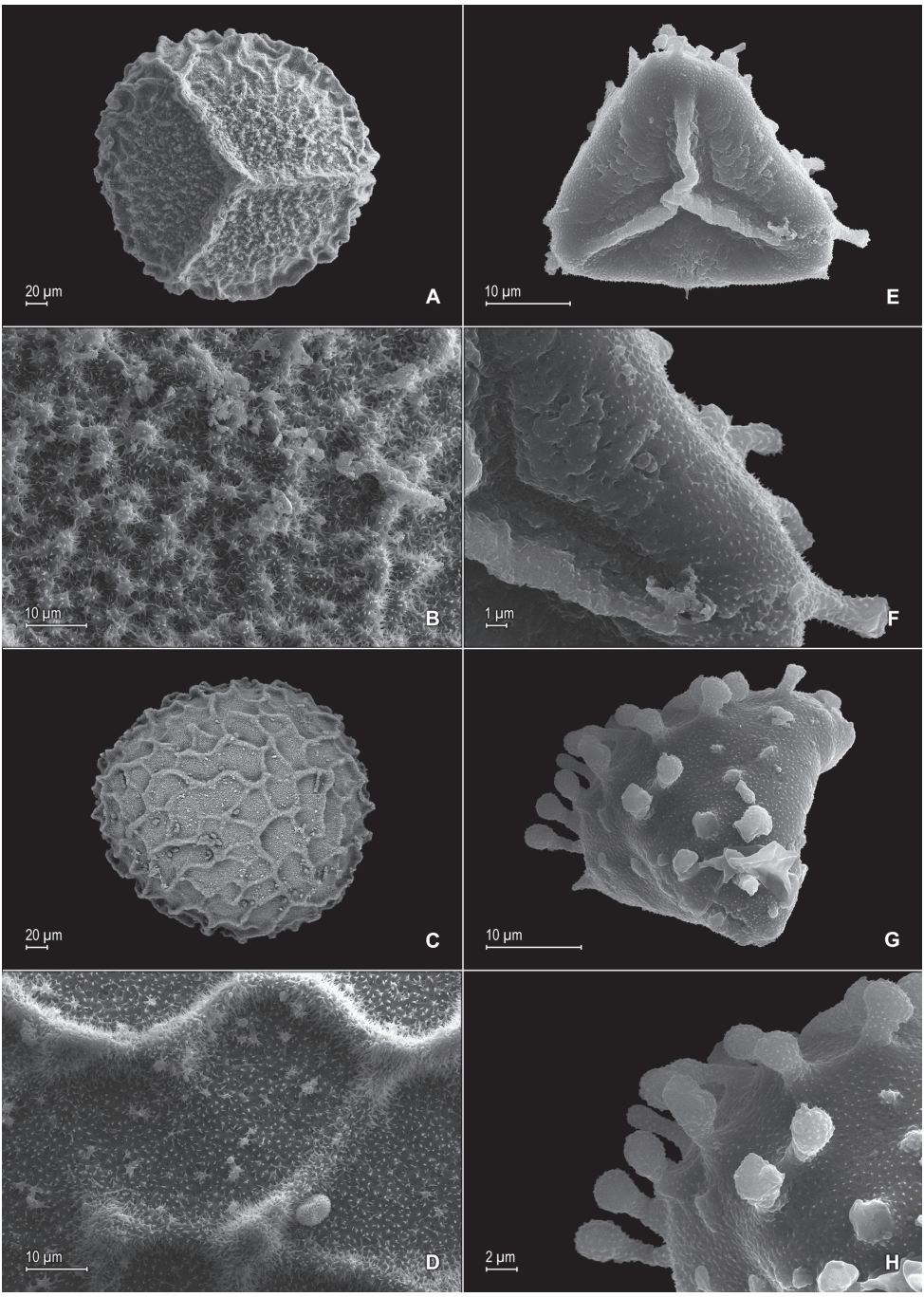

Figure 9. *Selaginella pellucidopunctata* Valdespino. **A** Megaspore, proximal face **B** Close-up of megaspore, proximal face **C** Megaspore, distal face **D** Close-up of megaspore, distal face **E** Microspore, proximal face **F** Close-up of microspore, proximal face **G** Microspore, distal face **H** Close-up of microspore, distal face. **A**–**H** taken from the isotype, *Oliveira 1094* (PMA).

is a species characterized by its lateral leaves with the upper surfaces hispidulous with prickle- or tooth-like projections usually found submarginally, marginally, and apically along the basiscopic halves of the laminae, and with conspicuous, straw-colored midribs. Another specimen, *Lopes 593* at RB ([RB 375877]-image!) is identified as *S. tenuissima* Fée, which is a creeping to prostrate species with usually cordate median leaves.

***Selaginella stomatoloma* Valdespino, sp. nov.**
urn:lsid:ipni.org:names:77151574-1
Figure 10

Diagnosis. *Selaginella stomatoloma* differs from the recently described *S. saltuicola* Valdespino by having the upper surfaces of the leaves with glabrous (vs. papillate) cells, the lateral leaf lower surfaces without (vs. with) papillate idioblasts and with marginal cells glabrous (vs. papillate), and acute (vs. rounded to broadly acute) apices, the median leaf margins comprising slightly elongate and glabrous (vs. strongly elongate and papillate) cells, these denticulate (vs. entire), with short-acuminate (vs. acute) apices, and upper surfaces with few submedial and submarginal stomata (vs. stomata throughout laminae).

Type. BRAZIL. Pará: Canaã dos Carajás, S11D, UTM-Zone 22M: 9293819 575625 [06°23'08"S, 50°18'58.24"W], 31 Aug 2010, *T.E. Almeida et al. 2518* (holotype: PMA! [PMA103369]; isotype: BHCB [BHCB142524]-n.v.).

Description. *Plants* epipetric. *Stems* decumbent to ascending, stramineous, 3–6 cm long, 0.2–0.5 mm diam., non-articulate, not flagelliform, stoloniferous, 1- or 2-branched. *Rhizophores* axillary, borne on proximal ¼–¾ of stems, filiform, 0.05 or 0.15 mm diam. *Leaves* heteromorphic throughout, membranaceous, both surfaces glabrous, upper surfaces green, lower surfaces silvery green. *Lateral leaves* spreading to ascending near branches and stem apices, ovate-elliptic to ovate-oblong, 1.5–2.0 × 0.8–0.9 mm; bases rounded, acroscopic bases slightly overlapping stems, basiscopic bases free from stems; margins greenish with the cells quadrangular, sinuate-walled, glabrous, mostly entire and denticulate near apices or denticulate throughout; apices acute and variously tipped by 1 or 2 teeth; both surfaces without idioblasts, upper surfaces comprising quadrangular to rounded, sinuate-walled, glabrous cells, with stomata submarginal, particularly on distal ½ and throughout margins, lower surfaces comprising elongate, sinuate-walled, glabrous cells, with stomata in 3–5 rows along midribs and throughout acroscopic halves of the laminae. *Median leaves* distant or imbricate near branches and stem apices, ascending, ovate-elliptic or elliptic, 0.7–1.1 × 0.3–0.6 mm; bases rounded to slightly oblique; margins greenish or narrowly hyaline in a band 2 or 3 cells wide, the cells slightly elongate, straight-walled and glabrous parallel to margins, denticulate throughout; apices short-acuminate, each acumen 0.05–1.05 mm, denticulate on upper surfaces, tipped by 1 or 2 teeth; both surfaces without idioblasts, upper surfaces comprising quadrangular to rounded, sinuate-walled, glabrous cells, with stomata in 1–3 rows along midribs, with a few submedial and submarginal

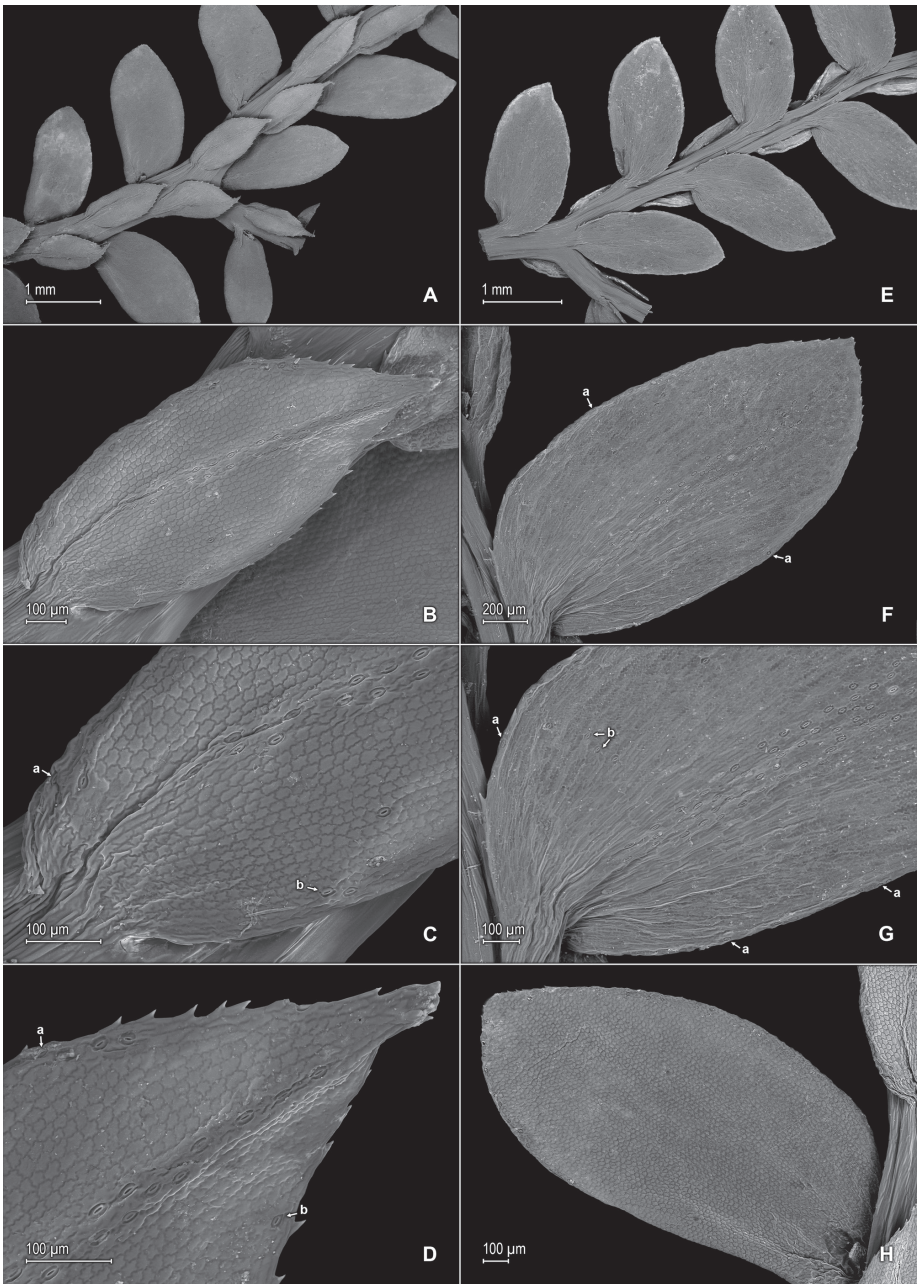

Figure 10. *Selaginella stomatoloma* Valdespino. **A** Section of upper surface of stem **B** Upper surface of median leaf **C** Close-up of base and proximal portion of median leaf, upper surface; note marginal (a) and submarginal stomata (b) **D** Close-up of proximal portion and apex of median leaf, upper surface; note marginal (a) and submarginal (b) stomata **E** Section of lower surface of stem **F** Lower surface of lateral leaf; note marginal stomata (a) **G** Close-up of base and proximal portion of lateral leaf, lower surface; note marginal (a) and submarginal (b) stomata **H** Upper surface of lateral leaf. **A–H** taken from the holotype, *Almeida et al. 2518* (PMA).

and throughout margins, lower surfaces comprising elongate, sinuate-walled cells, without stomata. *Axillary leaves* similar to lateral leaves. *Strobili* terminal on branch tips, quadrangular, 1.5–6.0 mm. *Sporophylls* monomorphic, without a laminar flap, each with a strongly developed and seemingly entire or denticulate keel along midribs, ovate or the ventral ones broadly ovate, 0.9–1.2 × 0.4–0.7 mm; bases rounded; margins narrowly hyaline (less so on ventral sporophylls), denticulate; apices acute to short-acuminate, each acumen 0.05–0.1 mm with margins dentate and tipped by 1–2 teeth; *dorsal sporophylls* with upper surfaces green and cells as in median leaves, including stomata, lower surfaces greenish and comprising elongate, sinuate-walled cells; *ventral sporophylls* with both surfaces greenish, comprising elongate, sinuate-walled cells. *Megasporangia* in 2 ventral rows or few and intermixed with microsporangia; *megaspores* yellow, mostly immature, rugulate-reticulate on proximal faces, reticulate on distal faces, microstructure not examined, ca. 200 μm. *Microsporangia* in 2 dorsal rows and on ventral rows or also in axil of median leaves immediately below strobili; *microspores* light orange, ornamentation and diameter not determined.

Habitat and distribution. *Selaginella stomatoloma* is an epipetric species known only from the state of Pará in Brazil. It grows in dense lowland to premontane wet forests, probably at 200–800 m.

Etymology. The specific epithet is derived from the Greek *stoma*, meaning mouth, and *loma*, fringe or border; together these refer to the many stomata found on leaf margins.

Conservation status. *Selaginella stomatoloma* is known only from three collections made in de Carajás National Forest, Brazil. This area is threatened by deforestation due to cattle ranching and large-scale mining (Pinheiro et al. 2012). Therefore, *S. stomatoloma* is considered Vulnerable (VU).

Additional specimens examined (paratypes). BRAZIL. **Pará**: Canaã dos Carajás, S11D, [ca. 06°23'08"S, 50°18'58.24"W], 23 May 2012, *Salino et al. 15284* (BHCB, PMA), 27 Aug 2012, *Salino et al. 15492* (BHCB, PMA).

Discussion. The minute plant size, stomata along leaf margins (Fig. 10), and microsporangia in the axils of the median leaves near the strobili are features that *Selaginella stomatoloma* shares with *S. saltuicola*. They differ, however, by the characters discussed in the diagnosis.

The presence of stomata along leaf margins seems to be a more common feature in *Selaginella* than previously realized. This distribution was shown to occur in several species by, for example, Harvey-Gibson (1897), Schulz et al. (2010), Youguang and Tan (2013), and Valdespino et al. (2015), and are described here in *S. nanuzae* (Fig. 1, 2), *S. neospringiana* (Fig. 4), *S. pellucidopunctata* (Fig. 7, 8), *S. stomatoloma* (Fig. 10), and *S. trygonoides* (Fig. 12), as well as being present on the outer margin of median leaves of *S. roraimensis* Baker (see Fig. 11C in Alston et al. 1981: 284, shown as *S. scintillata* Alston). Youguang and Tan (2013) hypothesized that leaf marginal stomata were non-functional; however, the widespread occurrence of this feature in morphologically distinct species from diverse regions of the world indicate the contrary, particularly when one considers their fundamental role in plant physiology. It seems evolutionarily inefficient for *Selaginella* to develop leaf marginal stomata (as well as on other parts

of the lamina), besides those along the midribs, if they were not active in playing key roles in plant photosynthesis. In the absence of experimental evidence to the contrary, they are here considered functional. Nevertheless, these competing explanations for the distribution and physiological importance of stomata on *Selaginella* highlight the need for detailed experimental studies, to address functional issues.

Selaginella trygonoides **Valdespino, sp. nov.**
urn:lsid:ipni.org:names:77151575-1
Figures 11, 12

Diagnosis. *Selaginella trygonoides* differs from the similar *S. glazioviana* Hieron. by having the upper surfaces of the leaves dull (vs. shiny due to thick waxy deposits covering cell walls), median leaf margins short-ciliate (vs. entire to denticulate) with the arista ½ (vs. usually ¼–⅓) the length of the lamina, and lateral leaves acuminate (vs. broadly acute to acute).

Type. BRAZIL. Minas Gerais: Serra do Azeite, Pocrane, 19°30'12"S, 41°37'47"W, 300 m, 1 Jun 2009, *T.E. Almeida, D.T. Souza & M.M.T. Cota 1994* (holotype: PMA! [PMA103371]; isotype: BHCB [BHCB130573]-n.v.).

Description. *Plants* terrestrial or epipetric. *Stems* ascending to erect, stramineous, 3–5 cm long, 0.2–0.5 mm diam., non-articulate, not flagelliform or stoloniferous, 1- or 2-branched. *Rhizophores* axillary, borne on proximal ¼–½ of stems, filiform, 0.1 or 0.2 mm diam. *Leaves* heteromorphic throughout, chartaceous, both surfaces glabrous, upper surfaces green, lower surfaces silvery green. *Lateral leaves* spreading or ascending, ovate-deltate or ovate-elliptic, 1.5–2.2 × 0.8–1.1 mm; bases rounded, acroscopic bases strongly overlapping stems, basiscopic bases free from stems; acroscopic margins broadly hyaline in a band 2–6 cells wide with the cells elongate, straight-walled, and papillate parallel to margins, papillae in 1 row over each cell lumen, short-ciliate along proximal ½, otherwise dentate distally; basiscopic margins on upper surfaces greenish comprising quadrangular, sinuate-walled, glabrous and papillate cells, on lower surfaces broadly hyaline in a band 2–6 cells wide with the cells as along acroscopic margins, dentate to denticulate throughout; apices acuminate, each acumen 0.1 or 0.2 mm, variously tipped by 1–3 teeth; upper surfaces comprising rounded or quadrangular, sinuate-walled cells, some of these covered by 3–11 papillae, without idioblasts or stomata, lower surfaces comprising elongate, sinuate-walled cells, with few of these papillate and idioblast-like on both sides of the midribs, papillae in 1 row over each cell lumen, with stomata in 2 or 3 rows along midribs and throughout acroscopic half of the lamina. *Median leaves* imbricate or distant, ascending, broadly ovate-elliptic, 0.8–1.2 × 0.5–0.9 mm; bases rounded to slightly oblique; margins broadly hyaline in a band 3–7 cells wide, the cells elongate, straight-walled and papillate parallel to margins, papillae in 1 row over each cell lumen, short-ciliate throughout or along proximal ⅔ and dentate distally; apices long-aristate, each arista 0.4–0.6 mm, denticulate on upper surfaces, tipped by 1–3 teeth; both surfaces with-

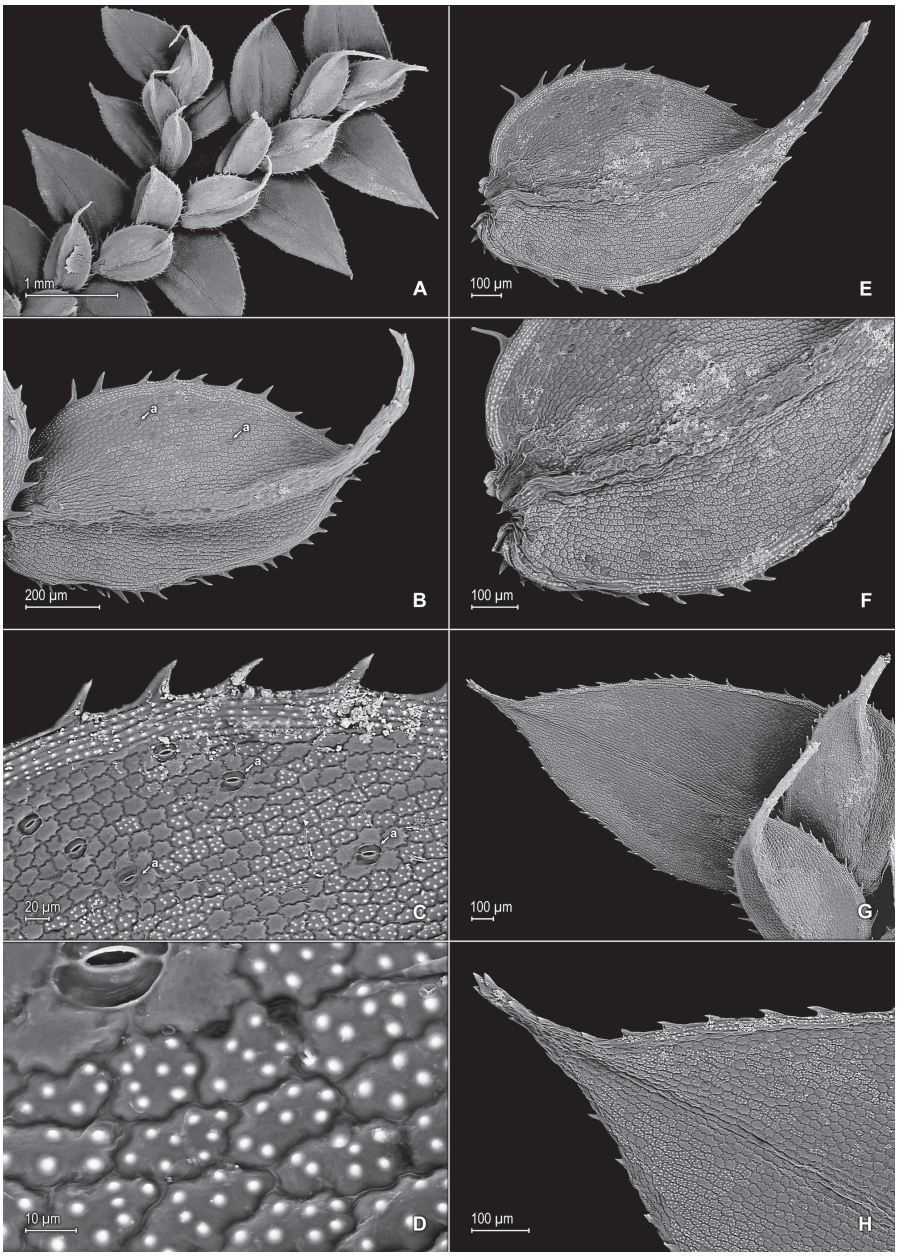

Figure 11. *Selaginella trygonoides* Valdespino. **A** Section of upper surface of stem **B** Upper surface of median leaf; note submarginal stomata (a) on inner half of the lamina **C** Close-up of inner margin of median leaf, upper surface; note submarginal stomata (a) **D** Close-up of median leaf upper surface; note papillae on cell lumen **E** Upper surface of median leaf; note submarginal stomata on inner half of the lamina **F** Close-up of base, portion of inner margin and inner half of lamina (note stomata), and portion of outer margin and outer half of lamina of median leaf, upper surface **G** Upper surface of lateral leaf and portion of median leaves, upper surface **H** Close-up of distal portion and apex of lateral leaf, upper surface. **A–H** taken from the holotype, *Almeida et al. 1994* (PMA).

out idioblasts, upper surfaces comprising rounded or quadrangular, sinuate-walled cells, many of these covered by 4–14 papillae, with stomata in 4 rows along midribs, few scattered throughout inner halves and on margins of outer halves of the laminae, lower surfaces comprising elongate, sinuate-walled cells, without stomata. *Axillary leaves* similar to lateral leaves, except for both margins hyaline and short-ciliate along proximal ½ and distally dentate. *Strobili* terminal on branch tips, loosely quadrangular, 0.5–1.0 cm. *Sporophylls* monomorphic to subdimorphic, without a laminar flap, each with a strongly developed and dentate keel along midribs, ovate to ovate-lanceolate, 0.9–1.2 × 0.4–0.6 mm; bases rounded; margins broadly hyaline (this more obviously so on dorsal sporophylls), short-ciliate or dentate on ventral sporophylls; apices acuminate to short-aristate, each acumen (arista) 0.2–0.4 mm with margins dentate and tipped by 1 or 2 teeth; *dorsal sporophylls* with upper surfaces green and cells as in median leaves, including stomata, lower surfaces silvery green and comprising elongate, sinuate-walled cells; *ventral sporophylls* with both surfaces hyaline, comprising elongate, sinuate-walled cells. *Megasporangia* in 2 ventral rows; *megaspores* yellow, mostly immature, rugulate-reticulate on proximal faces with a prominent equatorial flange, reticulate on distal faces, microstructure not determined, ca. 200 μm. *Microsporangia* in 2 dorsal rows; *microspores* light orange, ornamentation and microstructure not determined.

Habitat and distribution. *Selaginella trygonoides* is known only from the state of Minas Gerais, Brazil, where it may be endemic. It grows on creek banks in Gallery forests or Atlantic semi-deciduous forests vegetation at 185–300 m.

Etymology. The specific epithet is derived from the Latin "*trigon/trygonus*", meaning stingray; it alludes to the shape of the median leaf, which resembles these marine fish.

Conservation status. *Selaginella trygonoides* is known only from two collections made within or nearby populated areas; most likely it is subjected to anthropomorphic pressures. Thus, I tentatively consider it Vulnerable (VU).

Additional specimen examined (paratype). BRAZIL. **Minas Gerais**: Santa Rita do Itueto, Região da Cachoeira do Pontão, 19°24'52"S, 41°22'45"W, 185 m, 27 May 2009, *Almeida et al. 1960* (BHCB-n.v., PMA).

Discussion. *Selaginella trygonoides* is morphologically close to *S. glazioviana*, but it is distinguished from the latter by the characters of leaf surfaces and apex type, as well as median leaf marginal projections, as discussed in the diagnosis. In addition, *S. trygonoides* grows in lowland vegetation at 185–300 m, whereas *S. glazioviana* is found in montane vegetation at 900–1600 m. *Selaginella glazioviana* was thought to be conspecific with *S. erectifolia* Spring by Alston (1936), Reed (1965–1966), and Alston et al. (1981), but I consider these taxa to be distinct species (see discussion under *S. glazioviana*). *Selaginella trygonoides* differs from *S. erectifolia* by its lateral leaves ovate-deltate (vs. ovate) with the acroscopic margins short-ciliate along proximal ½ (vs. dentate) and apices acuminate (vs. acute), the median leaves with short-ciliate (vs. dentate) margins, apices long-aristate (vs. short-aristate) with each arista ½ (vs. ¼) the length of the lamina, the upper surface with (vs. lacking) stomata on the inner half of the leaf lamina and some cells with the lumen covered by 4–8 (vs. 14–25) papillae.

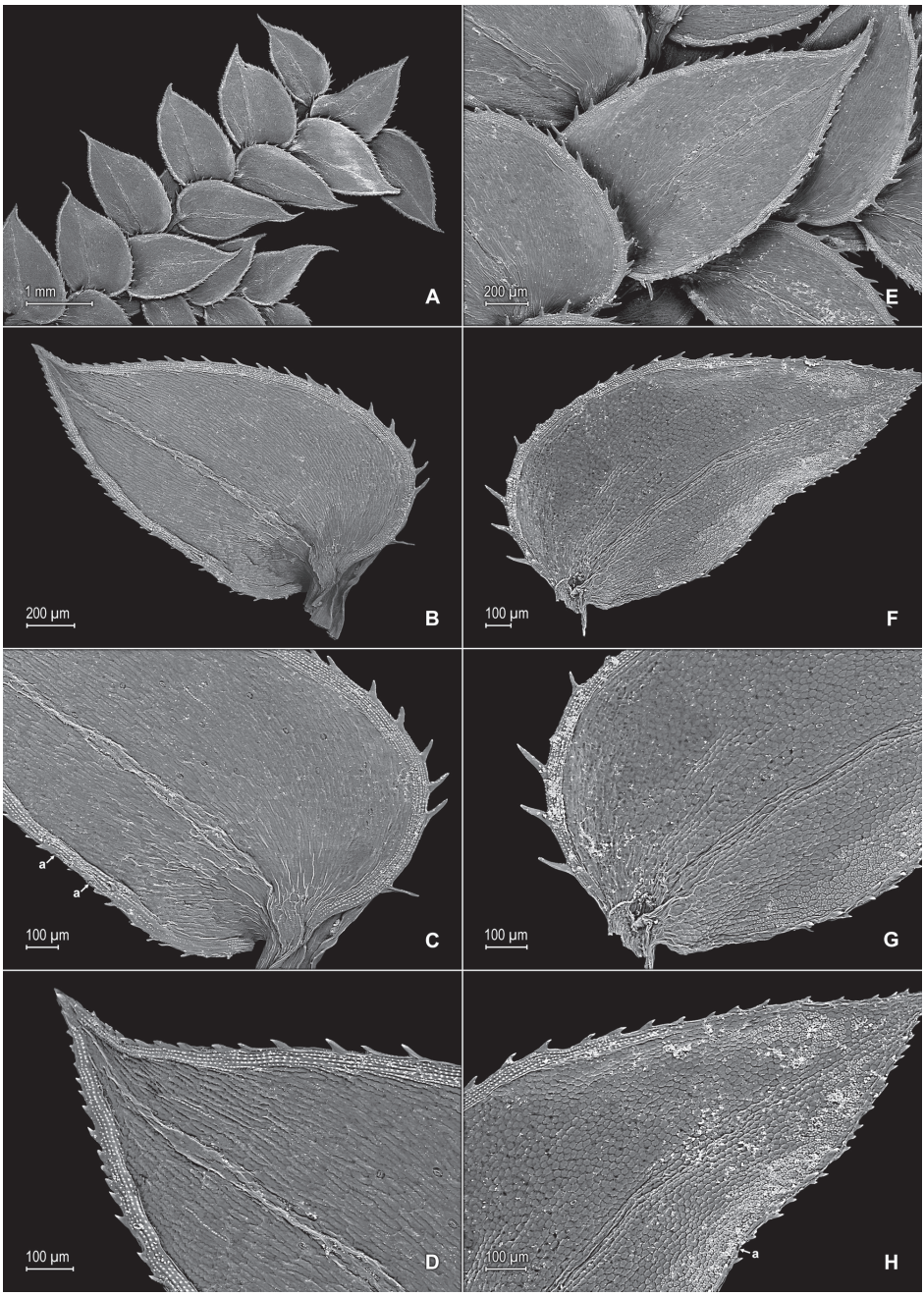

Figure 12. *Selaginella trygonoides* Valdespino. **A** Section of lower surface of stem **B** Lower surface of lateral leaf **C** Close-up of base and proximal portion of lateral leaf, lower surface; note marginal stomata (a) **D** Close-up of distal portion and apex of lateral leaf, lower surface **E** Lower surface of axillary leaf and portions of lateral leaves **F** Upper surface of lateral leaf **G** Close-up of base and proximal portion of lateral leaf, upper surface **H** Close-up of distal portion and apex of lateral leaf, upper surface; note marginal stoma (a). **A–H** taken from the holotype, *Almeida et al. 1994* (PMA).

Another collection, *Almeida & Souza 336* (PMA!), gathered in the same general locality of *Selaginella trygonoides*, is provisionally referred to *S. decomposita* Spring. This collection is similar to *S. trygonoides* in having lateral leaves acuminate and median leaves aristate; however it differs by its prostrate to ascending habit, stems to 3-branched, dorsal and ventro-axillary rhizophores, shiny leaves, median leaves dentate throughout with prominent outer bases, lateral leaves ovate-oblong to oblong, and axillary leaves ovate-lanceolate to ovate-elliptic.

New distribution records

Selaginella beitelii A.R. Sm.

Selaginella beitelii A.R. Sm., Ann. Missouri Bot. Gard. 77: 264. 1990. — Type. Venezuela. Amazonas: Cerro de la Neblina, Camp 7, 5.1 km NE Pico Phelps, along Caño Gardner, 01°50'40"N, 65°58'10"W, 1735 m, 30 Jan 1985, *J. Beitel 85079* (holotype: UC! [UC1551881]; isotype: NY! [NY00144076]).

Additional specimen examined. BRAZIL. **Amazonas**: São Gabriel da Cachoeira, Parque Nacional do Pico da Neblina, trail to Cachoeira Anta, between Camp Lajero and Marco 5 of the borderline between Brazil and Venezuela, 00°49'08"N, 65°58'01"W, 2272 m, 30 Dec 2004, *Carvalho et al. 353* (INPA-n.v., PMA).

Discussion. *Selaginella beitelii* was considered endemic to Sierra (Cerro) de la Neblina in Venezuela (Smith 1990). It is now known from the Brazilian side of this mountain. It is terrestrial or epiphytic and characterized by having axillary rhizophores, median leaves broadly ovate to semicordate with the outer base prominently lobed and the inner base oblique, the margins narrowly hyaline (more so on inner ones) and denticulate, and the lamina abruptly tapering towards the apex, the lateral leaves broadly ovate to semicordate with the acroscopic half almost twice as wide as the basiscopic half, the acroscopic margin narrowly hyaline to greenish, the basiscopic margin greenish, and both margins denticulate to entire.

Selaginella cabrerensis Hieron.

Selaginella cabrerensis Hieron., Hedwigia 43: 29. 1904. — Type. Colombia. Tolima: Río Cabrera, 500–1000 m, Jan 1886, *F.C. Lehmann 6406* (holotype: B! [B 20 0095103]; isotypes: K! [K000589282], US! [US00135715]).

Selaginella arroyoana M. Kessler & A.R. Sm., Edinburgh J. Bot. 63: 87. 2006. — Type: Bolivia. Depto. Santa Cruz: Prov. Velazco, Parque Nacional Noel Kempff M., Campamento Las Gamas, 14°48'11"S, 60°23'35"W, 900 m, 30 Mar 1993, *L. Arroyo & K. Keil, 202* (holotype: LPB-n.v.; isotypes: MO!, NY! [NY01104443], UC [UC 1613683]-image!, USZ-n.v.).

Selaginella chiquitana M. Kessler, A.R. Sm. & M. Lehnert, Edinburgh J. Bot. 63: 91. 2006. — Type: Bolivia. Depto. Santa Cruz: Prov. Chiquitos, Serranía de Santiagos, en la mesa de Arco de Piedra, 18°20'S, 59°35'W, 800 m, 23 Feb 2003, *M. Lehnert 642* (holotype: UC [UC 1717964]-image!; isotypes: GOET-n.v., LPB-n.v.).

Additional specimens examined. COLOMBIA. Cundinamarca: Pandi, 900 m, 9 Feb 1876, *André 1817* (BM, NY), Mpio. Pandi, near Río Sumapaz, 800 m, 27 Sep 1975, *Acosta-Arteaga 1020* (COL). **Meta**: Sierra de la Macarena, 900 m, 6 Feb 1950, *Philipson 2388* (BM, COL). **Tolima**: Chicoral, 450 m, 4 Mar 1949, *Haught 6333* (BM), near Río Coello, 13 May 1949, *Haught 6439* (BM); Valle de San Juan, near Minas del Sapo, 1400 m, 10 Jun 1966, *Echeverry 1303* (COL). **FRENCH GUIANA**. Extension nord-ouest des Petites Montagnes Tortue, 1 km S of RN 2 and 16.5 km WNW de Régina (Guyana), 04°20'N, 52°16'W, 90 m, 14 Mar 2006, *Boudrie 4177* (NY). **BOLIVIA**. **Depto. Santa Cruz**: Prov. Velazco, Parque Nacional Noel Kempff M., Campamento La Torre, 13°39'14"S, 60°49'50"W, 250 m, 21 Nov 1993, *Killen et al. 6200* (MO, UC), Serranía de Caparuch, 13°39'00"S, 60°54'00"W, 850 m, 21 Apr 1993, *Killen et al. 5433* (MO, UC). **BRAZIL**. **Goiás**: Mpio. Caldas Novas, Rodovia GO-413 (GO-15) Caldas Novas-Mazagão, ca. 18 km de Caldas Novas, margem do Rio, 17°44'S, 48°36'W, ca. 550 m, 23 Jan 1996, *Pietrobom 2648* (PMA, UFP); Côrrego Itaquera, ca. 30 km N of Formosa, 850 m, 2 May 1966, *Irwin et al. 15552* (NY); Mpio. of Pirenópolis, Parque Estadual da Serra dos Pireneus, 15°51'13"S, 48°51'30"W, 4 Feb 2011, *da Silva et al. 7295* (BHCB), ca. 15 km NE of Corumbá de Goiás, 1250–1300 m, 14 May 1973, *Anderson 10255* (NY), ca. 10 km NE of Corumbá de Goiás, Río Corumbá, 1050 m, 15 May 1973, *Anderson 10341* (K, NY, UC). **Mato Grosso**: ca. 5 km N of Barra do Garças, 500 m, 7 May 1973, *Anderson 9899* (NY); First Igarapé on road to Cuiaba, 600 m, 23 Oct 1973, *Prance et al. 19335* (NY, UC); Chapada dos Guimarães, 13 Feb 1975, *Hatschbach et al. 36114* (NY), Veu de Novia, 720 m, 25 Oct 1973, *Prance et al. 19392* (NY). **Mato Grosso do Sul**: Mpio. Costa Rica, Rodovia MS Cassilândia-Alto Araguaia, Povoado Laje, Rio Laje, [18°47'S, 54°14'W], 5 Sep 1993, *Rodrigues & Pietrobom 551* (PMA, UFP), 18°47'S, 54°14'W, ca. 715 m, 5 Sep 1993, *Rodrigues & Pietrobom 563* (PMA, UFP), Rodovia MS-306, Cachoeira no Rio Laje, 18°47'S, 54°13'W, 500 m, ca. 500 m, 20 Feb 1996, *Nonato et al. 262* (PMA, UFP); Mpio. Rio Verde do Mato Grosso, Rodovia Sete Quedas-Rio Negro, ca. 30 km da cidade, Fazenda Mirante, Cachoeira do Cervo, ca. 18°55'S, 54°53'W, ca 370 m, 7 Sep 1993, *Rodrigues & Pietrobom 660* (PMA, UFP), Serra Pimenteira, Cachoeira do Cervo, ca. 18°55'S, 54°53'W, ca. 400 m, 22 Feb 1994, *Rodrigues & Pietrobom 733* (PMA, UFP).

Discussion. Alston et al. (1981) considered *Selaginella cabrerensis* endemic to Colombia and Smith (1995), Cremers et al. (2007), and Mostacero (2008) recorded it in Venezuela. However, as already pointed out in Smith (1995), I consider specimens determined as such from Venezuela as a different taxon (i.e., *S. boomii*).

Kessler et al. (2006) considered *Selaginella cabrerensis* as a synonym of *S. xiphophylla* Baker and then described *S. arroyoana* M. Kessler & A.R. Sm. and *S. chiquitana* M. Kessler, A.R. Sm. & M. Lehnert from Bolivia. Later, Huaylla et al. (2010) synonymized *S. chiquitana* under *S. arroyoana*. Valdespino (2015c) suggested that *S. arroyoana* and *S. chiquitana* might be the same taxon as *S. cabrerensis*, and not conspecific with *S. xiphophylla*. After examining type material of all these taxa and SEM studies, I conclude that: a) *S. arroyoana* and *S. chiquitana* are conspecific with *S. cabrerensis*, which has nomenclatural priority; b) *S. cabrerensis* and *S. xiphophylla* are related but distinct taxa as advanced by Valdespino (1993, 2015c); and c) *S. cabrerensis* and *S. xiphophylla* and, at least, *S. densifolia* Spruce, *S. falcata*, and *S. kochii* Hieron., form a morphologically similar alliance (Valdespino 1993) here termed the "*Selaginella falcata* group". This group is currently under revision (Valdespino in prep.), and a preliminary key to distinguish them is provided below.

I conclude that *S. cabrerensis* is more widely distributed in South America than previously thought, occurring in French Guiana and of more widespread occurrence in Brazil (states of Goiás and Mato Grosso); it was previously known in Brazil only from Mato Grosso do Sul, where it was identified as *S. chiquitana* by Assis and Labiak (2009).

Preliminary key to species of the *Selaginella falcata* group

1 Median leaf apices acute to short-acuminate, if the latter each acumen less than ¼ the length of the lamina.

2 Lateral leaves strongly imbricate along main stem, the apices obtuse to truncate or broadly acute; median leaves margins hyaline, in a band 4–6 cells wide, the outer bases prominent with 1 or 2 cilia ..... ***S. densifolia***

2' Lateral leaves distant along main stem, the apices acute; median leaves margins hyaline, in a band 3 cells wide, the outer bases prominent and tufted with 2–5 cilia ..... ***S. cabrerensis***

1' Median leaf apices long-acuminate to aristate, each acumen or arista ¼–½ the length of the lamina.

3 Plants ascending to erect; lateral leaves dark brown to atropurpureus with oblique bases; rhizophores axillary to ventro-axillary and restricted to lower half of the stems ..... ***S. xiphophylla***

3' Plants creeping; lateral leaves golden-brown to green with subcordate to cordate bases; rhizophores ventro-axillary, borne throughout the stems.

4 Median leaf base subcordate; lateral leaves ovate-oblong, often strongly clasping the stems ..... ***S. kochii***

4' Median leaf base cordate; lateral leaves oblong-falcate, spreading and free from the stems ..... ***S. falcata***

***Selaginella chromatophylla* Silveira**

Selaginella chromatophylla Silveira, Bol. Commiss. Geogr. Geol. Minas Geraes 5: 124. 1898. — Type. Brazil. Minas Gerais: Serra do Papagaio, Nov 1897, *A. Silveira s.n., In Herb. Com. Geog. et Geol. Civitatis Minas Geraes No. 2604* (probable holotype: R! [as *Herb. Silveira No.152*, RB 179574]; isotypes: B! [B 20 0129405 (a)], B! [B 20 0129405 (b)]).

Selaginella chromatophylla var. *megasperma* Silveira, Bol. Commiss. Geogr. Geol. Minas Geraes 5: 125. 1898. — Type: Brazil. Minas Gerais: between Tiradentes and Casa da Pedra, Jun 1898, *A. Silveira s.n., In Herb. Com. Geog. et Geol. Civitatis Minas Geraes No. 2756* (probable holotype: R! [as *Herb. Silveira No.160*, RB 179581]: isotypes: B! [B 20 0129406 (a)], [B 20 0129406 (b)]).

Selaginella breuensis Silveira, Fl. Serras Mineiras 79. 1908. — Type: Brazil. Minas Gerais: Serra do Cipó, Morro do Bréu, Apr 1905, *A. Silveira s.n.* (probable holotype: R! [as *Herb. Silveira No. 395*, RB 179580]: isotype: P [P00573791]-image! [as *Herb. Silveira No. 395*]).

Additional specimens examined. BRAZIL. **Bahia**: Palmeiras, Serra dos Brejões, 21 Aug 2009, *Moraes & van der Werff 2861* (MO, PMA, UC). **Minas Gerais**: Cadeia do Espinhaço, Gouveia, near Gouveia-Curvelo, 15 km past Gouveia, Fazenda do Tigre, Córrego da Onça, 18°33'52.3"S, 43°48'22.7"W, 960 m, 17 Mar 2007, *Salino et al.* (BHCB-n.v., PMA); Mpio. Conselheiro Mata, Serra do Espinhaço, between Conselheiro Mata and Diamantina, off MG-220 near km 177, 18.28°S, 43.59°'W, 1290 m, 11 Jan 2010, *Prado et al. 2091* (MO, NY, SP-n.v.), off MG-220 near km 187, -18.27451 [18°16'28.23"]S, -43.71189 [43°42'42.80"]W, 1425 m, 11 Jan 2010, *Schuettpelz et al. 1378* (MO); São Gonçalo do Rio Preto, Parque Estadual do Rio Preto, Córrego das Équas, 18°08'43"S, 43°22'10"W, 8 Apr 200, *Salino et al 5214* (BHCB-n.v., NY); Mpio. Serro, Serra do Espinhaço, between Serro and Milho Verde, off of Estrada Real, ca. 10 km SE of Milho Verde and ca. 10 km NW of Serro, 18°53'S, 43°43'W, 1010 m, 14 Jan 2010, *Prado et al. 2100* (MO, NY, SP-n.v.). **Rio de Janeiro**: Frade de Macahé, 17–21 Jun 1937, *Brade 15824* (MO, RB).

Discussion. *Selaginella chromatophylla* was subsumed under *S. marginata* (Humb. & Bonpl. ex Willd.) Spring by Alston (1936), Reed (1965–1966), Alston et al. (1981), and Hirai and Prado (2000). As currently circumscribed, however, *S. marginata* is morphologically variable and ill-defined. My preliminary revisionary work on *S. marginata*, including SEM studies of leaves and spores, indicates it is a species complex (here termed the "*Selaginella marginata* complex") that could include, at least, five taxa (Valdespino in prep.). Among these, *S. chromatophylla* and *S. parviarticulata* Buck are very similar because of their small leaf size. *Selaginella chromatophylla* differs from the latter by its lateral and axillary leaves with peltate (vs. basally attached) bases, lateral leaves with acroscopic margins short-ciliate along proximal ½ (vs. entire), median leaves with the peltate auricles ciliate (vs. entire or almost so), and microspores gemmate or globular (vs. corrugate). It differs from typical *S. marginata* by its lateral

leaves broadly ovate-elliptic (vs. ovate-deltate) with the peltate auricles ⅙ (vs. ⅓–½) the length of the laminae, both halves of the laminae of equal width (vs. acroscopic halves wider than the basiscopic ones) with obtuse to broadly acute (vs. acuminate) apices, axillary leaves obovate-oblong (vs. ovate-deltate) with obtuse to broadly acute (vs. acuminate) apices, median leaves with acute (vs. long-acuminate) apices, and gemmate or globular (vs. echinulate) microspores. *Selaginella chromatophylla* differs further from the previously discussed *S. marginata* and *S. parviarticulata* by its stems usually branching in a zig-zag pattern.

The name *Selaginella chromatophylla* is provisionally used here for the taxon documented with specimens cited pending a full nomenclatural and taxonomic revision of the rest of the species in the "*Selaginella marginata* complex". Other names that could potentially apply to that taxon are *Selaginella excurrens* Spring and *S. distorta* (Spring) Spring, which if proven to be conspecific would both have priority over *S. chromatophylla*.

Selaginella deltoides A. Braun

Selaginella deltoides A. Braun, Ann. Sci. Nat. Bot. ser. 5, 3: 287. 1865. — Syntypes. Brazil. [Amazonas:] prope Panuré, ad Rio Uaupès, *R. Spruce 2532* (B! [B 20 0130962], B! [B 20 0095165 (b)], BM! [BM000905710], BR! [BR00000696525], CGE-n.v., GH! [GH00057068], K! [K000589188], NY-fragment! [NY00022868], OXF!, P! [P00559331], P [P00573927]-image!, RB! [RB 168990], W!); *R. Spruce 2535* (BM!, K!, P [P01244267]-image!, P! [P04026284]).

Selaginella trifurcata Baker, J. Bot. 21: 98. 1883. — Type: Brazil. [Amazonas:] Panuré, on the Rio Uaupès, *R. Spruce 2532* (holotype: K! [K000589188]; isotypes: B! [B 20 0095165 (b)], BM! [BM000905710], BR! [BR00000696525], CGE-n.v., GH! [GH00057067], NY-fragment! [NY00022868], OXF!, P! [P00559331], P! [P00573927]-image!, RB! [RB 168990], W!).

Additional specimens examined. BRAZIL. **Amazonas**: Jutica, 14 Nov 1928, *Luetzelburg 23710* (M, R), [Uaupés?], 16 Nov 1928, *Luetzelburg 23731* (M, R), 14 Nov 1928, *Luetzelburg 23735* (R).

Discussion. *Selaginella deltoides* is a much-confused species. Alston (1936) synonymized it under *S. dendricola* Jenman. Reed (1965–1966) treated *S. deltoides* as a valid species and, apparently, subsumed *S. trifurcata* under it. Later, Alston et al. (1981) synonymized *S. deltoides* and *S. trifurcata* under *S. muscosa*. Valdespino (1995) considered *S. deltoides* and *S. trifurcata* as conspecific but not the same species as, or closely related to, *S. muscosa*. In Alston et al. (1981: 298) a possible inadvertent lectotypification for *S. deltoides* and *S. trifurcata*, in the sense outlined by Prado et al. (2015), could be inferred. Furthermore, specimens of *Spruce 2535* at BR! and RB! [RB 168977] are mixed collections which I have determined as: a = *S. dendricola* and b = *S. calceolata* Jermy & Rankin, while the same collection at G! and P! [P04026284] is *S. dendricola*.

Another duplicate of *Spruce 2535* at P ([P01244267]-image!) was also determined by Cremers as *S. dendricola*. These nomenclatural and taxonomic matters will be further discussed in a separate paper (see comment about this under *S. glazioviana*).

Selaginella deltoides is characterized by its ovate-deltate lateral leaves, with midribs conspicuously hyaline and upper surfaces hispidulous with prickle- or tooth-like projections usually found submarginally, marginally, and apically along the basiscopic halves of the laminae, and median leaves orbiculate or broadly ovate-elliptic. *Selaginella deltoides*, along with a species currently being described with the epithet of *"aculeatifolia*" (Venezuela), *S. brevifolia* (Colombia, Venezuela, and Brazil), and *S. sandwithii* Alston (Guyana and French Guiana) form a closely related group of taxa referred as the "*Selaginella deltoides* group" (Valdespino in press).

Selaginella falcata (P. Beauv.) Spring

Selaginella falcata (P. Beauv.) Spring, Bull. Acad. Roy. Sci. Bruxelles 10: 225. 1843. — *Stachygynandrum falcatum* P. Beauv. Mag. Encycl. 9e Année, 5: 483. 1804. — Type. French Guiana. [without date or precise locality], [*A.?*] *Chastelein s.n.* (OXF-n.v.).

Additional specimens examined. BRAZIL. **Amapá**: Rio Pontanari, 03°45'N, 51°42'W, 31 Jul 1960, *Irwin et al. 47271* (NY, UC); 1956, *Bastos 70 [2070]* (RB), *Bastos 2070* (RB).

Discussion. In Alston et al (1981), *Selaginella falcata* was documented only in French Guiana; here its range is extended to include Brazil. This is a very distinct species because of its creeping to prostrate habit, ovate-deltate or deltate median leaves, large oblong, lateral leaves each 4–7.5 mm long, and main stem width (including lateral leaves) 8.0–15 mm. In Brazil, *S. falcata* may be confused with *S. mendocae* Hieron., because of their similar habit and stem width (including lateral leaves). However, the former differs from the latter by ovate-deltate or deltate (vs. orbiculate) median leaves, with both halves equal in width (vs. outer halves wider than inner ones), and leaf bases cordate (vs. bases oblique or inner ones truncate and outer bases lobed). Another species with similar median leaves as those of *S. falcata* is *S. kochii*. These two taxa are part of the *S. falcata* group and can be separated by the characters provided in the key under *S. cabrerensis*.

Selaginella glazioviana Hieron

Selaginella glazioviana Hieron., Hedwigia 43: 36. 1904. — Type. Brazil. [Rio de Janeiro: Nova Friburgo, Alto Macahé, chez les Crannin, 21 Jan 1874], *A. Glaziou 7280* (holotype: B! [B 20 0095195]; isotypes: BM-fragment! [BM000905698], P [P00559320]-image!, P [P00559321]-image!).

Additional specimens examined. BRAZIL. **Minas Gerais**: Serra do Espinhaço, Pico de Itacolomi, 3 km S of Ouro Preto, 1600 m, 1 Feb 1971, *Irwin et al. 29530* (F, K, NY), *29554* (K, NY); Ouro Preto, Chapada, 20°28'53.8"S, 43°33'03.6"W, 1100 m, 6 Nov 2006, *Salino & Salino 14999* (BHCB-n.v., PMA); Ouro Preto, São Bartolomeu, 20°15'34.44"S, 43°34'50.56"W, 1035 m, 13 Oct 2007, *Dittrich & Lobão 1499* (BHCB-n.v., PMA); Santa Bárbara, RPPN Capivari, along path to Cachoeira de Capivari, 20°07'57"S, 43°34'54"W, 1140 m, 12 Dec 2009, *Arruda & Filogonio 23* (BHCB-n.v., PMA), West portion of the RPPN, entrance to Fazenda do Zé Maria, 20°07'45"S, 43°35'50"W, 900 m, 1 May 2009, *Arruda et al. 127* (BHCB-n.v., PMA); Serra do Itacolomy, 1936, *Badini 316* (BM).

Discussion. Alston (1936), Reed (1965–1966), and Alston et al. (1981) included *Selaginella glazioviana* under *S. erectifolia*. I have studied type material of *S. erectifolia* (*Swainson s.n.*, holotype: K!) and its synonym *S. camptostachys* Fée (*Glaziou 2242*, holotype: P!; isotypes: B!, BR!, K!, NY-fragment!) and agree with Alston et al. (1981) that they are conspecific, but I consider *S. glazioviana* to be a different species. A full account of that finding, along with the formal resurrection of *S. deltoides* and *S. chromatophylla*, will be reported separately (Valdespino in prep). *Selaginella glazioviana* is morphologically close to *S. trygonoides*, described herein (see for comparison).

Selaginella lechleri Hieron

Selaginella lechleri Hieron., in Engler & Prantl, Nat. Pflanzenfam. 1 (4): 683. 1901. — Type. Peru. Puno: Near San Gaván, Jul 1854, *W. Lechler 2159* (lectotype: B! [B 20 0095276], designated by R. Tryon and Stolze (Fieldiana Bot. n.s. 34: 79. 1994); isolectotypes: BM-fragment! [BM000905693], K-fragment! [K001044504], P! [P00044863]), P [P00573771]-image!, P-fragment [P00573772]-image!.

Additional specimens examined. BRAZIL. **Acre**: Cruzeiro do Sul, Serra do Divisor, 07°26'53"S, 73°40'00"W, 13–14 Dic 2007, *Brasil et al. 315* (RB), Mâncio Lima, Parque Nacional da Serra do Divisor, Bacia do Alto Juruá, Río Moa, Parque Nacional da Serra do Divisor, 07°26'S, 73°39'41"W, 16 Jun 1996, *Silveira et al. 1364* (NY), Serra do Divisor, 07°27'13.4"S, 73°41'30"W, 240 m, 23 Aug 2008, *Fiaschi et al. 3387* (NY, RB), Serra deo Moa, 07°28'00"S, 73°37'27"W, 6 May 1996, *Daly et al. 8879* (NY), Faz. Arizona (30 min de canoa a motor rio abaixo da Serra do Moa), ca. 07°30'S, 73°40'W, 5–7 Oct 1985, *Jangoux et al. 85-104* (MG, NY). **Amazonas**: Benjamim Constant, Alto Solimões, 9 Sep 1962, *Duarte 6586* (RB); Rio Javari, 8 mi above mouth of Rio Curaçá, 26 Oct 1976, *Prance et al. 24131* (K, NY); Río Juruá, Fortaleza, Oct 1901, *Ule 6931* (L); Río Negro, between Manaus and São Gabriel, along BR 307, N of Igarapé Iá-Mirim, near Jerusalém, 00°20'N, 66°35'W, 17 Jul 1979, *Poole 2037* (MG, NY).

Discussion. *Selaginella lechleri* is known from Colombia and Peru (Alston et al. 1981). Additionally, Smith (1995) cited it in Costa Rica, Panama, Venezuela, and Bo-

livia, while Cremers et al. (2007) and Mostacero (2008) also cited it in Venezuela, and Tropicos (2015a) registered it from Ecuador. I believe that specimens from Costa Rica and Panama are most likely *S. anceps* (C. Presl) C. Presl, while those from Venezuela are best referred to another species. *Selaginella lechleri* is documented here to occur in the states of Acre and Amazonas, Brazil. It is characterized by its erect habit, lateral leaves with the basiscopic bases geniculate and usually glabrous, with the acroscopic margins short-ciliate along proximal ⅓ or dentate, otherwise sparsely denticulate to entire or serrate distally, and acuminate median leaves.

***Selaginella microdonta* A.C. Sm.**

Selaginella microdonta A.C. Sm., Bull. Torrey Bot. Club 58: 313. 1931. — Type. Venezuela. Amazonas: on slope of Ridge 24 and summit of Mount Duida, 1800 m, Aug 1928–Apr 1929, *G.H.H. Tate 509* (holotype: NY! [NY00144140]; isotypes: BM [BM000936552]-image!, US-fragment! [US00135732]).

Additional specimen examined. BRAZIL. **Amazonas**: Alto Río Negro, Cucui, Serra Tunui, 29 Apr 1975, *Cavalcante 3056* (MG).

Discussion. *Selaginella microdonta* was previously known only from Venezuela (Alston et al. 1981, Smith 1995, Cremers et al. 2007, Mostacero 2008); its range is now extended to include Brazil. This species is characterized by being a minute, creeping plant with coriaceous leaves, the median leaves ovate, ovate-deltate with oblique to rounded bases with the outer ones prominent. Furthermore, these leaves have prominent, often arcuate midribs (making the halves of the laminae unequal), serrate to serrulate margins, and acute apices; the lateral leaves are broadly ovate-elliptic with thickened margins, these denticulate to entire, and acute apices tipped by 1–3 teeth. In Brazil, *Selaginella microdonta* may be confused with *S. wurdackii*, from which it differs by its creeping habit and smaller median leaves with acute apices. According to Valdespino (1992), *S. microdonta* is morphologically related to *S. cardiophylla* Valdespino and *S. hemicardia* Valdespino. The possible interrelationships and distinguishing characters are further discussed in Valdespino (1992).

***Selaginella potaroensis* Jenman**

Selaginella potaroensis Jenman, Gard. Chron., ser. 3, 2: 154. 1887. — Type. Guyana. Essequibo: [ravines near the foot of the] Kaieteur Falls, [04°47’ 31.26"N, 58°58'29.21"W], [Sep 1881], *G.S. Jenman 1818* (lectotype: NY! [NY00144158], designated by Alston et al. (Bull. Brit. Mus. (Nat. Hist.), Bot. 9: 297. 1981); isolectotypes: BM [BM000634459]-image!, K! [K000589087]).

Additional specimens examined. COSTA RICA. **Heredia**: between Río Peje and Río Sardinalito, Atlantic slope of Volcán Barba, 10°17.5'N, 84°04.5'W, 700–750 m, 4 Apr 1986, *Grayum 6743* (MO); Parque Nacional Braulio Carrillo, transect between Volcán Barba and OET station La Selva, 600 m, 2003, *Kluge 2234* (PMA). **BRAZIL**. **Roraima**: Serra dos Surucucus, NE of Mission station, 02°42–47'N, 63°33–36'W, 1000–1400 m, 17 Feb 1969, *Prance et al. 9995 (NY).*

Discussion. *Selaginella potaroensis* was previously known to occur in Venezuela, Guyana, Suriname, and French Guiana (Alston et al. 1981, Smith 1995, Cremers et al. 2007). Its range is documented here northward to include Costa Rica (see Tropicos 2015b), and it is to be expected in Panama and Colombia. This species is also known from Brazil.

Selaginella potaroensis is a creeping plant characterized by having axillary rhizophores throughout the stems, membranaceous leaves, the median leaves semicordate to ovate with the outer half of the lamina almost twice as wide as the inner one, margins hyaline and denticulate with the outer margin convex and the inner one almost straight, laminae abruptly tapering into a long-acuminate apex with conspicuous stomata on the upper surface, the lateral leaves ovate-elliptic with minute submarginal teeth along the upper surfaces of basiscopic halves, and acute apices tipped by 1–3 teeth. The similarities and differences of *S. potaroensis* with *S. cardiophylla*, *S. hemicardia*, and *S. rhodostachya* Baker are discussed in Valdespino (1992).

Selaginella seemannii Baker

Selaginella seemannii Baker, J. Bot. 21: 244. 1883. — Type. Nueva Granada [Colombia]. Chocó: Cacagual [Island], 1848, *B.C. Seemann 1006* (holotype: K! [K000589106]; isotypes: B-fragment! [B 20 0095503], BM! [BM000936546]).

Selaginella barbacoasensis Hieron., Hedwigia 43: 46. 1904. — Type: Colombia. Nariño: Barbacoas, [03°54'04.16"N, 73°04'24.13"W], 6 Aug 1880, *F.C. Lehmann 89* (holotype: B! [B 20 0130329]; isotypes: BM! [BM000936545], G!).

Additional specimens examined. PANAMA. **Coclé**: Bosque cercano a Coclecito, 28 Mar 1989, *Galdames et al. 362* (PMA); Cerro Morenito cerca de Coclecito, 24.8 km desde la entrada de Llano Grande hacia Coclecito, 230 m, 10 Jan 1992, *Valdespino et al. 1357* (BM, CR, K, MO, NY, PMA, UC, US). **Veraguas**: Santa Fe, Parque Nacional Santa Fe, El "2", entrando por Guinea (Río Concepción), UTM Zone 17: 0963119N [8°42'46.68"N], 0501054E [80°59'25.50"W], 22 Jul 2008, *Hernández 989* (PMA). **BRAZIL**. **Roraima**: Boa Vista, Reserva Ecológica de Maracá, track to Santa Rosa, ca. 600 m E of main Estação buildings, ca. 80 m, 12 Mar 1987, *Edwards & Willikin 2541* (BM, NY).

Discussion. *Selaginella seemannii* is known to occur in Colombia, Guyana, Suriname, French Guiana, Ecuador, and Peru (Alston et al. 1981, Cremers et al. 2007). It is also found in Panama and Brazil (Valdespino 1995) and here is formally vouchered for those countries.

Selaginella seemannii is similar to and may be confused with *S. porelloides* (Lam.) Spring. *Selaginella seemannii* can be distinguished by its ovate (vs. semicordate) lateral leaves with the upper surfaces glabrous throughout (vs. pubescent near the basiscopic margins), obtuse (vs. narrowly obtuse to slightly acute) apices, lower leaf surfaces with obscure (vs. conspicuous) idioblasts, bases of median leaves oblique with an outer auricle (vs. cordate to rounded, non-auriculate), and bases of axillary leaves rounded (vs. usually cordate).

Selaginella umbrosa Lem. ex Hieron.

Selaginella umbrosa Lem. ex Hieron., in Engler & Prantl, Nat. Planzenfam. 1(4): 683. 1901. — Type. Guatemala. [exact locality and date unknown], *G.U. Skinner s.n* (K-n.v.).

Additional specimens examined. BRAZIL. **Roraima**: vicinity of Auaris, 04°03'N, 64°22'W, 760–800 m, 6 Feb 1969, *Prance et al. 9653* (NY, MG, P-image); Rio Catrimani, Ponto 12, 70 km N of Missão Catrimani, 13 Feb 1975, *Pires 15* (MG, RB); Rio Uraricoera, Canal Maracá, Cachoeira Menori, 03°16'N, 61°55'W, 24 Feb 1979, *Pires et al. 16789* (MG); SEMA Ecological Reserve, Ilha de Maracá, river near the Casa da Maracá, 11 May 1987, *Milliken 195* (BM-n.v., INPA, MIRR-n.v.). **Without precise locality**: Mountain from North of Brasil, s.d., s.col. *ex Herb. Gaillary* (P-image).

Discussion. *Selaginella umbrosa* occurs in Central America, Barbados, Colombia, Trinidad, and Tobago (Alston et al. 1981, Fraile 1995, Smith 1995, Cremers et al. 2007, Mostacero 2008), and Ecuador (Tropicos 2015a). It is here documented from Brazil, were it may be confused with *S. haematodes* (Kunze) Spring because of its red stems and leaves. As pointed out by Valdespino (1993), *S. umbrosa* differs from the latter by its lateral leaves with acroscopic margins ciliate, especially on proximal ½ (vs. obscurely serrulate to entire), and median leaves broadly ovate to ovate-lanceolate (vs. lanceolate to lanceolate-oblong), the bases with outer, ciliate auricles (vs. bases rounded to oblique without outer auricles).

Selaginella vernicosa Baker

Selaginella vernicosa Baker, Timehri 5: 220. 1886. — Type. Venezuela. Bolivar: SE slopes of Mount Roraima, "Our House", 1622 m, *E.F. im Thurn 226* (holotype: K! [K000589193]; isotype: US! [US00135747]).

Selaginella vernicosa var *oligoclada* Baker, Trans. Linn. Soc. Lond. Bot. 2: 295. 1887. — Type: Venezuela. Bolivar: SE slopes of Mount Roraima, "Our House", 1622 m, Dec 1884, *E.F. im Thurn 381* (holotype: K! [K000589194]; isotypes: BM! [BM001099755], US! [US 00135748]).

Additional specimens examined. BRAZIL. **Roraima**: 2300 m, Dec 1909, *Ule* 8492 (K, MO), 2850 m, Oct 1927, *Luetzelburg 21631* (R), *21639* (R).

Discussion. For a long time, *Selaginella vernicosa* was thought to occur only in Venezuela (Alston et al. 1981, Smith 1995), but Cremers et al. (2007) reported it recently from Guyana, a report that needs to be confirmed. Its range is also here documented in Brazil.

Selaginella vernicosa is most distinct by its ascending to erect habit, coriaceous, strongly imbricate and shiny leaves due to waxy deposits, the median leaves ovate to ovate-deltate with the midribs raised or prominent, with short-ciliate margins at least along proximal ⅔, otherwise dentate on distal ⅓, carinate, acute apices, lateral leaves ovate-deltate with acroscopic margins short-ciliate along proximal ½, otherwise dentate distally, and basiscopic margins ciliate along proximal ¼–½, otherwise entire distally with the apices entire or tipped by a tooth.

Selaginella wurdackii Alston

Selaginella wurdackii Alston, Bull. Brit. Mus. (Nat. Hist.), Bot. 9: 280. 1981. — Type. Venezuela. Bolivar: Chimantá Massif, Río Tirica, La Laja Base Camp, 485–490 m, *J.A. Steyermark & J.J. Wurdack 173* (holotype: BM [BM000936544]-image!; isotypes: F!, NY! [NY00144232 (a)], US! [US00433011]).

Additional specimens examined. VENEZUELA. **Bolivar**: near Salto de Pacairo, NE of Santa Teresita de Kavanayén, 1220 m, *Steyermark 60499* (BM-n.v., F). **BRAZIL**. **Amazonas**: São Gabriel da Cachoeira, Parque Nacional do Pico da Neblina, trail to Pico Neblina, between Camp Bebedouro Velho and Bebedouro Novo, 00°44'13"N, 65°57'14"W, 26 Dec 2004, *Carvalho et al. 233* (INPA-n.v., PMA).

Discussion. *Selaginella wurdackii* was previously known only from Venezuela (Alston et al. 1981, Smith 1995, Cremers et al. 2007, Mostacero 2008) and is reported here for the first time from Brazil. It is characterized by its ascending to erect habit with axillary rhizophores, median leaves ovate, narrowly ovate-deltate to ovate-lanceolate with prominent or keeled midribs that may be displaced (i.e., curved) to one side making the halves of the laminae unequal, leaf margins greenish to faintly hyaline, seemingly entire or denticulate along distal ½ and with long-acuminate to short-aristate apices, and lateral leaves ovate-elliptic with margins thickened and apices acute to short-acuminate.

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References

Alston AHG (1936) The Brazilian species of *Selaginella*. Feddes Repertorium Specierum Novarum Regni Vegetabilis 40: 303–319. doi: 10.1002/fedr.19360402005

Alston AHG, Jermy AC, Rankin JM (1981) The genus *Selaginella* in tropical South America. Bulletin of the British Museum (Natural History), Botany 9: 233–330.

Assis ELM de, Labiak PH (2009) Lycophyta da borda oeste do Pantanal, Mato Grosso do Sul, Brasil. Acta Botanica Brasilica 23: 703–712. doi: 10.1590/S0102-33062009000300009

Cremers G, Hickey RJ, Lellinger DB, Mickel JT, Moran RC, Øllgaard B, Smith AR (2007) Pteridophytes & allies. In: Funk V, Hollowell T, Berry P, Kelloff C, Alexander SN (Eds) Checklist of the plants of the Guiana Shield (Venezuela: Amazonas, Bolivar, Delta Amacuro; Guyana, Surinam, French Guiana). Contributions from the United States National Herbarium 55: 17–56.

Fraile ME (1995) 2. Especies no articuladas de *Selaginella*. In: Moran RC, Riba R (Vol. Eds) Vol. 1, Psilotaceae a Salviniaceae. In: Davidse G, Sousa M, Knapp S (Eds) Flora Mesoamericana. Universidad Nacional Autónoma de México, Instituto de Biología, Ciudad Universitaria, México, D.F., 29–42.

Goés-Neto LAA, Heringer G, Salino A (2015) *Selaginella salinoi* (Selaginellaceae), a new species from Brazil. Phytotaxa 224: 291–295. doi: 10.11646/phytotaxa.224.3.8

Harvey-Gibson RJ (1897) Contributions towards a knowledge of the anatomy of the genus *Selaginella* Spr. Part III. The leaf. Annals of Botany 11: 123–155.

Hirai RY (2015) Selaginellaceae. Lista de espécies da flora do Brasil, Jardim Botânico do Rio de Janeiro, Brazil. http://floradobrasil.jbrj.gov.br/jabot/floradobrasil/FB92047 [accessed 12.01.2015]

Hirai RY, Prado J (2000) Selaginellaceae Willk. no Estado de São Paulo, Brasil. Revista Brasileira de Botânica 23: 313–339. doi: 10.1590/S0100-84042000000300007

Huaylla H, Scotland RW, Wood JRI (2010) Further notes on a rare species of *Selaginella* (Pteridophyta – Selaginellaceae) from the Cerrados of eastern Bolivia. Edinburgh Journal of Botany 67: 69–73. doi: 10.1017/S0960428609990205

IUCN (2012) IUCN Red List Categories and Criteria, Version 3.1. Second edition. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, United Kingdom.

JBRJ (2015) JBRJ - Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Jabot - Banco de Dados da Flora Brasileira. http://www.jbrj.gov.br/jabot [accessed 19.07.2015]

Jermy AC (1986) Subgeneric names in *Selaginella*. Fern Gazette 13: 117–118.

Jermy AC (1990) Selaginellaceae. In: Kramer KU, Green PS (Eds) Pteridophytes and gymnosperms. Vol. I. In: Kubitzki K (Ed.) The families and genera of vascular plants. Springer, Berlin, 39–45. doi: 10.1007/978-3-662-02604-5_11

Kessler M, Smith AR, Lehnert M (2006) Four new species of *Selaginella* (Pteridophyta – Selaginellaceae) from Bolivia. Edinburgh Journal of Botany 63: 85–93. doi: 10.1017/S0960428606000321

Mickel JT, Smith AR, Valdespino IA (2004) *Selaginella*. In: Mickel JT, Smith AR, The pteridophytes of Mexico. Memoirs of the New York Botanical Garden 88: 550–602.

Mostacero J (2008) Selaginellaceae. In: Hokche O, Berry PE, Huber O (Eds) Nuevo catálogo de la flora vascular de Venezuela. Fundación Instituto Botánico de Venezuela, Caracas, 167–170.

Pinheiro LC, Bitar YOC, Galatti U, Neckel-Oliveira S, Costa MCS (2012) Amphibians from southeastern state of Pará: Carajás region, northern Brazil. Check List 8: 693–702.

Prado J, Hirai RY (2014) Biogeography of the Brazilian Atlantic Forest: Evidence from phylogenetic data sets and perspectives for fern and lycophyte studies. Fern Gazette 19: 241–257.

Prado J, Hirai RY, Moran RC (2015) [046–048] Proposals concerning inadvertent lectotypifications (and neotypifications). Taxon 64: 651. doi: 10.12705/643.29

Reed CF (1965–1966) Index Selaginellarum. Memórias da Sociedade Broteriana 18: 1–287.

Reflora (2015) Virtual Herbarium. http://www.herbariovirtualreflora.jbrj.gov.br/jabot/herbarioVirtual/ [accessed 19.07.2015]

Schulz C, Little DP, Stevenson DW, Bauer D, Moloney C, Stützel T (2010) An overview of the morphology, anatomy, and life cycle of a new model species: The lycophyte *Selaginella apoda* (L.) Spring. International Journal of Plant Sciences 171: 693–712. doi: 10.1086/654902

Smith AR (1990) Pteridophytes of the Venezuelan Guayana: New species. Annals of the Missouri Botanical Garden 77: 249–273. doi: 10.2307/2399539

Smith AR (1995) Selaginellaceae. In: Berry PE, Holst BK, Yatskievych K (Eds) Pteridophytes, Spermatophytes: Acanthaceae-Araceae, Vol. 2. In: Steyermark JA, Berry PE, Holst BK (Eds) Flora of the Venezuelan Guayana. Timber Press, Oregon, 296–314.

Species Link (2015) INCT - Virtual Herbarium of Flora and Fungi. http://inct.splink.org.br/index [accessed 19.07.2015]

Thiers B (2015, continuously updated) Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/ih/ [accessed 03.03.2015]

Tropicos® (2015a) Catalogue of vascular plants of Ecuador (W³CEC). Tropicos.org. Missouri Botanical Garden. http://www.tropicos.org/Name/26615023 [accessed 27.08.2015]

Tropicos® (2015b) Manual de plantas de Costa Rica. Tropicos.org. Missouri Botanical Garden. http://www.tropicos.org/Name/40034882 [accessed 27.08.2015]

Valdespino IA (1992) New species of *Selaginella* (Selaginellaceae) from the Guayana Highland of Venezuela. Brittonia 44: 199–207. doi: 10.2307/2806833

Valdespino IA (1993) Notes on neotropical *Selaginella* (Selaginellaceae), including new species from Panama. Brittonia 45: 315–327. doi: 10.2307/2807605

Valdespino IA (1995) A monographic revision of *Selaginella* P. Beauv. subgenus *Heterostachys* Baker in Central and South America. Doctoral Thesis. The City University of New York, New York, 405 pp.

Valdespino IA (2015a) *Selaginella boomii* (Selaginellaceae – Lycopodiophyta): A new and widely distributed spikemoss from South America. Brittonia 67: 328–335. doi: 10.1007/s12228-015-9398-9

Valdespino IA (2015b) Lectotypification of *Selaginella tenuissima* and *S. papagaiensis* (Selaginellaceae) with the description of *S. monticola*. Phytotaxa 233: 153–165. doi: 10.11646/phytotaxa.233.2.3

Valdespino IA (2015c) Two new species and a new record of *Selaginella* (Selaginellaceae) from Bolivia. Novon 24: 96–105. doi: 10.3417/2011022

Valdespino IA (in press) *Selaginella aculeatifolia* (Selaginellaceae – Lycopodiophyta), a new hispidulous species from the foothills of Cerro Neblina, Venezuela. Nordic Journal of Botany.

Valdespino IA, López C, Góes-Neto LAA (2014) Additions to Cuban *Selaginella* (Selaginellaceae). Phytotaxa 184: 235–244. doi: 10.11646/phytotaxa.184.4.4

Valdespino IA, Heringer G, Salino A, Góes-Neto LAA, Ceballos J (2015) Seven new species of *Selaginella* subg. *Stachygynandrum* (Selaginellaceae) from Brazil and new synonyms for the genus. PhytoKeys 50: 61–99. doi: 10.3897/phytokeys.50.4873

WWF (2015) World Wildlife Fund. Northern South America: Northeastern coastal and interior Brazil. https://www.worldwildlife.org/ecoregions/nt0152 [accessed 25.07.15]

Youguang Y, Tan BC (2013) The non-functional stomata on the leaf margin of *Selaginella*. Philippine Journal of Science 142: 245–248.