Ferns of Viçosa, Minas Gerais State, Brazil: Polypodiaceae (Polypodiales, Filicopsida, Tracheophyta)

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ABSTRACT - (Ferns of Viçosa, Minas Gerais State, Brazil: Polypodiaceae (Polypodiales, Filicopsida, Tracheophyta). As part of an ongoing project treating the ferns and lycophytes from the region of Viçosa, MG, Brazil, we here present the taxonomic treatment of Polypodiaceae. We performed field expeditions in remaining forest patches and disturbed sites from 2012 to 2016. We also revised the Polypodiaceae collection of VIC herbarium. In the region of Viçosa, 19 species of Polypodiaceae occur: *Campyloneurum centrobrasilianum*, *C. decurrens*, *C. lapathifolium*, *C. phyllitidis*, *Cochlidium punctatum*, *Microgramma crispata*, *M. percussa*, *M. squamulosa*, *M. vacciniifolia*, *Niphidium crassifolium*, *Pecluma filicula*, *P. plumula*, *P. truncorum*, *Phlebodium areolatum*, *P. decumanum*, *Pleopeltis astrolepis*, *P. minima*, *Serpocaulon fraxinifolium*, and *S. menisciifolium*. Among them, six are endemic to the Atlantic Forest. During our search in VIC, we found an isotype of *Campyloneurum centrobrasilianum*. We present keys, descriptions, illustrations, examined materials, and comments of all taxa.
Keywords: epiphytic ferns, Flora, Pteridophyta, southeastern Brazil

RESUMO - (Samambaias de Viçosa, MG, Brasil: Polypodiaceae (Polypodiales, Filicopsida, Tracheophyta)). Como parte de um projeto em andamento que trata da Flora de samambaias e licófitas da região de Viçosa, MG, Brasil, é aqui apresentado o tratamento taxonômico de Polypodiaceae. Foram realizadas expedições de campo em remanescentes florestais e áreas alteradas, entre 2012 e 2016. Foi também revisada a coleção de Polypodiaceae do herbário VIC. Na região de Viçosa, 19 espécies de Polypodiaceae ocorrem: *Campyloneurum centrobrasilianum, C. decurrens*, *C. lapathifolium*, *C. phyllitidis*, *Cochlidium punctatum*, *Microgramma crispata*, *M. percussa*, *M. squamulosa*, *M. vacciniifolia*, *Niphidium crassifolium*, *Pecluma filicula*, *P. plumula*, *P. truncorum*, *Phlebodium areolatum*, *P. decumanum*, *Pleopeltis astrolepis*, *P. minima*, *Serpocaulon fraxinifolium* e *S. menisciifolium*. Dentre elas, seis são endêmica à Floresta Atlântica. Durante a estudo da coleção do VIC, foi encontrado um isótipo de *C. centrobrasilianum*. São apresentados chaves, descrições, ilustrações, materiais examinados e comentários de todos os táxons.
Palavras-chave: Flora, Pteridophyta, samambaias epífitas, sudeste do Brasil

Introduction

Polypodiaceae *sensu* Smith *et al.* (2008) is an extant, monophyletic family of ferns, including Polypodiaceae *s. str.* and some previous segregate families, such as Grammitidaceae and Platyceriaceae. It is one of the largest families of ferns, containing more than 50 genera, and more than 1,200 species (Tryon & Tryon 1982, Hennipman *et al.* 1990, Parris 1990, Smith *et al.* 2008). As a result of phylogenetic studies, many genera have been recently described or re-circumscribed (*e.g.*, Smith *et al.* 2006, Salino *et al.* 2008, Labiak *et al.* 2010, Hirai *et al.* 2011, Labiak 2011, Smith & Tejero-Díez 2014). In the Classification System of Smith *et al.* (2008), Polypodiaceae is included in Order Polypodiales, Class Polypodiopsida (= leptoesporangiate ferns), without a formal classification into Division (they named as "monilophytes"). In Kenrick & Crane (1997)'s Classification, it is included in Sub-Class Polypodiidae, Class Filicopsida, Infra-Division Moniliformopses, Sub-Division Euphyllophytina, Division Tracheophyta (no classification below the rank of Sub-Class).

Polypodiaceae is sub-cosmopolitan and mainly characterized by creeping stems covered with scales (often clathrate and peltate), fronds generally attached to phyllopodia (phyllopodia lost in the

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Grammitid lineage), veins commonly anastomosed, sori commonly abaxial and roundish, exindusiate, and hyaline or yellowish monolete spores (or greenish trilete in the Grammitids) (Tryon & Tryon 1982, Hennipman *et al.* 1990, Parris 1990, Smith *et al.* 2008).

In Brazil, 164 species of Polypodiaceae are known. This correspond to ca. 13% of Brazil's fern (and lycophyte) Flora. Among those 164 species, 72 (ca. 44%) are endemic to Brazil (Prado *et al.* 2015). In the last seven years, the studies on the Brazilian Polypodiaceae have led to recognition of new taxa, for example: *Micrograma microsoroides* Salino *et al.* and *Serpocaulon rex* Schwartsb. & A.R. Sm. were newly described, *S.* ×*pubescens* (Rosenst.) Schwartsb. & A.R. Sm. was regarded as a hybrid, and *Pleopeltis gyroflexa* (Christ) Schwartsb., *P. minima* (Bory) J. Prado & R.Y. Hirai, *S. articulatum* (C. Presl) Schwartsb. & A.R. Sm., *S. hirsutulum* (T. Moore) Schwartsb. & A.R. Sm., and *S. laetum* (C. Presl) Schwartsb. & A.R. Sm. were "resurrected" as valid species (Salino *et al.* 2008, Prado & Hirai 2010, Schwartsburd & Smith 2013, Schwartsburd 2014).

Although the State of Minas Gerais is currently known as the richest State of ferns and lycophytes in Brazil, harboring 657 species (Prado *et al.* 2015), it still lacks taxonomic works of Flora. The only ones treating Polypodiaceae are those of Christ (1900), Rolim & Salino (2008), and Arantes *et al.* (2010). We here aimed to identify and describe all species of Polypodiaceae from the region of Viçosa (Minas Gerais State, Brazil). This paper is part of an ongoing project dealing with the Flora of ferns and lycophytes from this region, organized by P.B. Schwartsburd. The other works dealing with ferns from there are the following: Copeland (1932), who described some new species of Cyatheaceae and Thelypteridaceae based on the collections of Y.E.J. Mexia; Schwartsburd *et al.* (2015), who resurrected a Copeland's name (*Cyathea mexiae* Copel.); Rabelo & Schwartsburd (2016), who treated Schizaeales, describing several new hybrids; and Miranda & Schwartsburd (2016), who treated Salviniales.

Material and methods

We performed field expeditions in the Municipality of Viçosa (Minas Gerais State, Brazil), in remaining forest patches (Estação de Pesquisa, Treinamento e Educação Ambiental Mata do Paraíso, Mata do Seu Nico, Recanto das Cigarras, and Horto Botânico), and disturbed sites, from 2012 to 2016. The exsiccates are incorporated in herbarium VIC, and some duplicates will be send to other herbaria (NY, RB, SP, etc.). The VIC collection of Polypodiaceae was also revised.

In the region of Viçosa, the remaining forest patches are classified as Semi-deciduous Seasonal Forest (IBGE 2012), and the local elevation ranges from ca. 600 to 900 m a.s.l. The Classification System adopted combines Kenrick & Crane (1997: table 7.1.) for the higher ranks, and Smith *et al.* (2008) for Order and lower ranks - the phytogeographic data and the adopted system will be further discussed in Schwartsburd *et al.* (unpubl. data). Family and generic descriptions are kept to a minimum, since they are widely available elsewhere; species description are detailed. Type information is presented only for the types present in VIC. Morphological terms follow Sota (1960) and Lellinger (2002). Reinaldo Pinto prepared the illustrations.

Results and Discussion

Diversity and Distribution - In the region of Viçosa, 19 species of Polypodiaceae occur. They are currently classified in eight genera:

Campyloneurum: *C. centrobrasilianum* Lellinger, *C. decurrens* C. Presl, *C. lapathifolium* (Poir.) Ching, and *C. phyllitidis* (L.) C. Presl.

Cochlidium: *C. punctatum* (Raddi) L.E. Bishop.

Micrograma: *M. crispata* (Fée) R.M. Tryon & A.F. Tryon, *M. percussa* (Cav.) de la Sota, *M. squamulosa* (Kaulf.) de la Sota, and *M. vacciniifolia* (Langsd. & Fisch.) Copel.

Niphidium: *N. crassifolium* (L.) Lellinger.

Pecluma: *P. filicula* (Kaulf.) M.G. Price, *P. plumula* (Willd.) M.G. Price, and *P. truncorum* (Lindm.) M.G. Price.

Phlebodium: *P. areolatum* (Willd.) J. Sm. and *P. decumanum* (Willd.) J. Sm.

Pleopeltis: *P. astrolepis* (Liebm.) E. Fourn. and *P. minima* (Bory) J. Prado & R.Y. Hirai.

Serpocaulon: *S. fraxinifolium* (Jacq.) A.R. Sm. and *S. menisciifolium* (Langsd. & Fisch.) A.R. Sm.

Among the 19 species, six are endemic to the Atlantic Forest, one is endemic to the Cerrado (Brazilian Savannah) and northern parts of the Atlantic Forest (*Campyloneurum centrobrasilianum*), three are widespread in South America, and nine are widespread in the Neotropics.

Type Informations - During our search in VIC, we uncovered an isotype of *Campyloneurum centrobrasilianum*

(Lellinger 1988). The type collection was made by J. G. Kuhlmann in the 1930's, during his travels in the region of Viçosa. This main collection was deposited in VIC, and duplicates were sent to other herbaria. The holotype was based on a duplicate at UC. Since there were still duplicates from VIC to be sent, we donated them to RB, SP, and UPCB. Thus, the updated nomenclatural paragraph for *C. centrobrasilianum* is the following:

Campyloneurum centrobrasilianum Lellinger, Amer. Fern J. 78(1): 16, figs. 2, 8. 1988. Type: BRAZIL. Minas Gerais: Viçosa, 29-XI-1935, *J.G. Kuhlmann s.n.* (holotype: US2542670, image!; isotypes: RB! [*ex* Herb. VIC1898], SP! [*ex* Herb. VIC1898], UPCB! [*ex* Herb. VIC1898], VIC! [1898]).

Taxonomic Treatment

Polypodiaceae

Plants epiphytic or rupestrial, rarely terrestrial. Stems short to long-creeping, dorsiventral, rarely massive, the scales basifix or peltate, clathrate or not. Fronds attached to phyllopodia (rarely not), monomorphic or dimorphic; laminae simple to pinnate, rarely more dissected; veins generally anastomosed, with or without included veinlets, rarely free; sori generally abaxial, generally roundish, rarely elongate to linear, or acrostichoid; paraphyses present or absent; indusia absent; spores hyaline or yellowish and monolete, or greenish trilete.

Key to genera of Polypodiaceae from Viçosa

1. Veins free
   2. Stems short-creeping with phyllopodia; laminae pectinate ……..……. *Pecluma*
   2. Stems erect, without phyllopodia; laminae simple ……..……..…… *Cochlidium*
1. Veins anastomosed
   3. Laminae simple
      4. Stems compact; veins anaxetum (irregularly anastomosed, main areoles with included areoles and free veins; figura 2m) ……..……..... *Niphidium*
      4. Stems short to long-creeping; veins other than anaxetum
         5. Sori in regular anastomosis (cyrtophleboid or goniophleboid), born at the tip of included veinlets
            6. Venation cyrtophleboid (*e.g.*, figura 1h) ……..……. *Campyloneurum* (in part)
            6. Venation goniophleboid (*e.g.*, figura 1b)
               7. Stem long-creeping; stems scales not clathrate; fronds dimorphic …… *Microgramma* (in part)
               7. Stem short-creeping; stems scales clathrate; fronds monomorphic .... *Campyloneurum* (*C. centrobrasilianum*)
         5. Sori born on several veins and/or areoles of irregular anastomosis
            8. Stem scales not clathrate; sori rounded, with adaxial impressions ……. *Microgramma* (in part)
            8. Stem scales clathrate; sori elongate, not leaving impressions ……..…….. *Pleopeltis* (*P. astrolepis*)
   3. Laminae pinnatifid or pinnate
      9. Laminae abaxially fully covered with scales (laminar tissue not visible) ….....……. *Pleopeltis* (*P. minima*)
      9. Laminae abaxially glabrous or with sparse scales (laminar tissue visible)
         10. Sori born on several veins and/or areoles, of irregular anastomosis ……...…..... *Phlebodium*
         10. Sori in regular anastomosis (cyrtophleboid or goniophleboid), born ate the tip of included veinlets
            11. Venation cyrtophleboid (*e.g*, figura 1f) ….....…. *Campyloneurum* (*C. decurrens*)
            11. Venation goniophleboid (*e.g.*, figura 4d) ...……..……. *Serpocaulon*

Campyloneurum C. Presl

Stems short to long-creeping, with phyllopodia; scales peltate, sub-clathrate or clathrate. Fronds monomorphic; laminae simple or rarely pinnate; veins anastomosed, cyrtophleboid or rarely goniophleboid; sori rounded, born on the tip of the included veinlets, not protected; paraphyses absent or rarely present.

Key to species of *Campyloneurum* from Viçosa:

1. Laminae pinnate ……..……..…….. *C. decurrens*
1. Laminae simple

2. Laminae to 1.5 cm in width; veins goniophleboid; sori in 1-2 series between costae and lamina margins …….. ..... *C. centrobrasilianum*
2. Laminae more than 1.5 cm in width; veins cyrtophleboid; sori in 2-6 series between costae and lamina margins
   3. Stems long-creeping; petioles absent; laminae 2.5-6 cm in width; sori restricted to the upper half of lamina ……. ..... *C. phyllitidis*
   3. Stems short-creeping; petioles 2-4 cm long; laminae 1.5-2.5 cm in width; sori along the whole lamina length ……... ..... *C. lapathifolium*

Campyloneurum centrobrasilianum Lellinger, Amer. Fern J. 78(1): 16, figs. 2, 8. 1988.
Figures 1a, b

Plants epiphytic. Stems short-creeping, 2-6 mm diam; scales peltate, triangular-acuminate, clathrate, reddish to light-brown, iridescent. Fronds (4.5-)40-60 cm long; *petioles* stramineous, 5-25 × 1-1.5 mm, flattened, abaxially and adaxially glabrous; laminae simple, linear, with revolute margins, (4-)38-58 × 0.5-1.3 cm, leathery; midribs glabrous abaxially and adaxially; veins anastomosed, goniophleboid, with one included veinlet, abaxially and adaxially glabrous; laminar tissue between the veins glabrous abaxially and adaxially; sori in 1-2 series between costae and lamina margins, along the whole lamina lenght; paraphyses absent.

Distribution: Endemic to the Cerrado (Brazilian Savannah) and the northern parts of the Brazilian Atlantic Forest (TO, MT, MS, GO, DF, BA, MG) (Lellinger 1988; Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, E.S.A.V., 29-XI-1935, *J.G. Kuhlmann s.n.* (RB, SP, UPCB, VIC1898 [isotypes]); Viçosa, E.S.A.V., 1935, *J.G. Kuhlmann s.n.* (VIC1868a).

Additional specimens examined: BRAZIL. Minas Gerais: Araponga, Parque Estadual da Serra do Brigadeiro, 1-XII-2003, *G.E. Valente & R.M.S.A. Meira 1419* (VIC); Alto Caparaó, Parque Nacional da Serra do Caparaó, 27-IX-1977, *M.P. Coons* 77-667 (VIC).

Campyloneurum centrobrasilianum belongs to the *C. angustifolium*-complex, which also includes *C. angustifolium* (Sw.) Fée, *C. austrobrasilianum* (Alston) de la Sota, and *C. aglaolepis* (Alston) de la Sota. *Campyloneurum centrobrasilianum* is the species occurring in central and central-eastern Brazil, and is characterized by the clathrate, reddish to light-brown, iridescent stem scales (Lellinger 1988). We uncovered some isotypes of *C. centrobrasilianum* (see above in Type informations). For differentiation with other taxa from Viçosa, see the comments of *C. decurrens* and *C. lapathifolium*.

Campyloneurum decurrens (Raddi) C. Presl, Tent. Pterid. 190. 1836 ≡ *Polypodium decurrens* Raddi, Opusc. Sci. 3: 287. 1819.
Figures 1e, f

Plants terrestrial or epiphytic. Stems short-creeping, 7-10 mm diam; scales peltate, roundish, sub-clathrate, reddish to light-brown, not iridescent. Fronds 60-70 cm long; petioles light to dark-brown, 25-35 cm × 3-6 mm, sulcate, abaxially and adaxially glabrous; laminae pinnate, ovate, with conform apex, 30-45 × 20-30 cm, herbaceous; *medial pinnae* elliptical-elongate, with cuspidate apex, with entire to slight wavy margins,10-20 × 3-5 cm; costae glabrous abaxially and adaxially; veins anastomosed, cyrtophleboid, with two or rarely one or three included veinlets, abaxially and adaxially glabrous; laminar tissue between the veins glabrous abaxially and adaxially; sori in 5-7 series between costae and lamina margins, along the whole pinna lenght; paraphyses absent.

Distribution: Uncertain, possibly endemic to Brazilian Atlantic Forest (BA, MG, ES, RJ, SP, PR) (Prado *et al.* 2015); cited also for Martinique, Venezuela, Colombia, and Peru by Sehnem (1970) and Lellinger (1988), but not confirmed by Leon (1993), Smith (1995), and Murillo-Pullido *et al.* (2008).

Specimens examined: BRAZIL. Minas Gerais: Canaã, Cachoeira Grande, 10-VIII-1986, *M.F. Vieira et al. 434* (VIC); Viçosa, Escola Superior de Agricultura e Veterinária, 22-VII-1930, *Y. Mexia 4892* (VIC); Viçosa, Mata do Sr. Nico, 29-VII-2009, *J. Prado & G.E. Valente 2017* (VIC); Viçosa, Sítio Bom Sucesso, 1-XI-2000, *G.E. Valente 593* (VIC); Viçosa, Mata do Seu Nico, 6-XI-2012, *P.B. Schwartsburd & E. Guatimosin 2619* (VIC).

Campyloneurum decurrens is the only species in Viçosa with pinnate laminae (figure 1e); the other *Campyloneurum* spp. have simple laminae (figures 1a, c, g). *Campyloneurum decurrens* may be confused with *Serpocaulon* spp., but they differ in the pattern

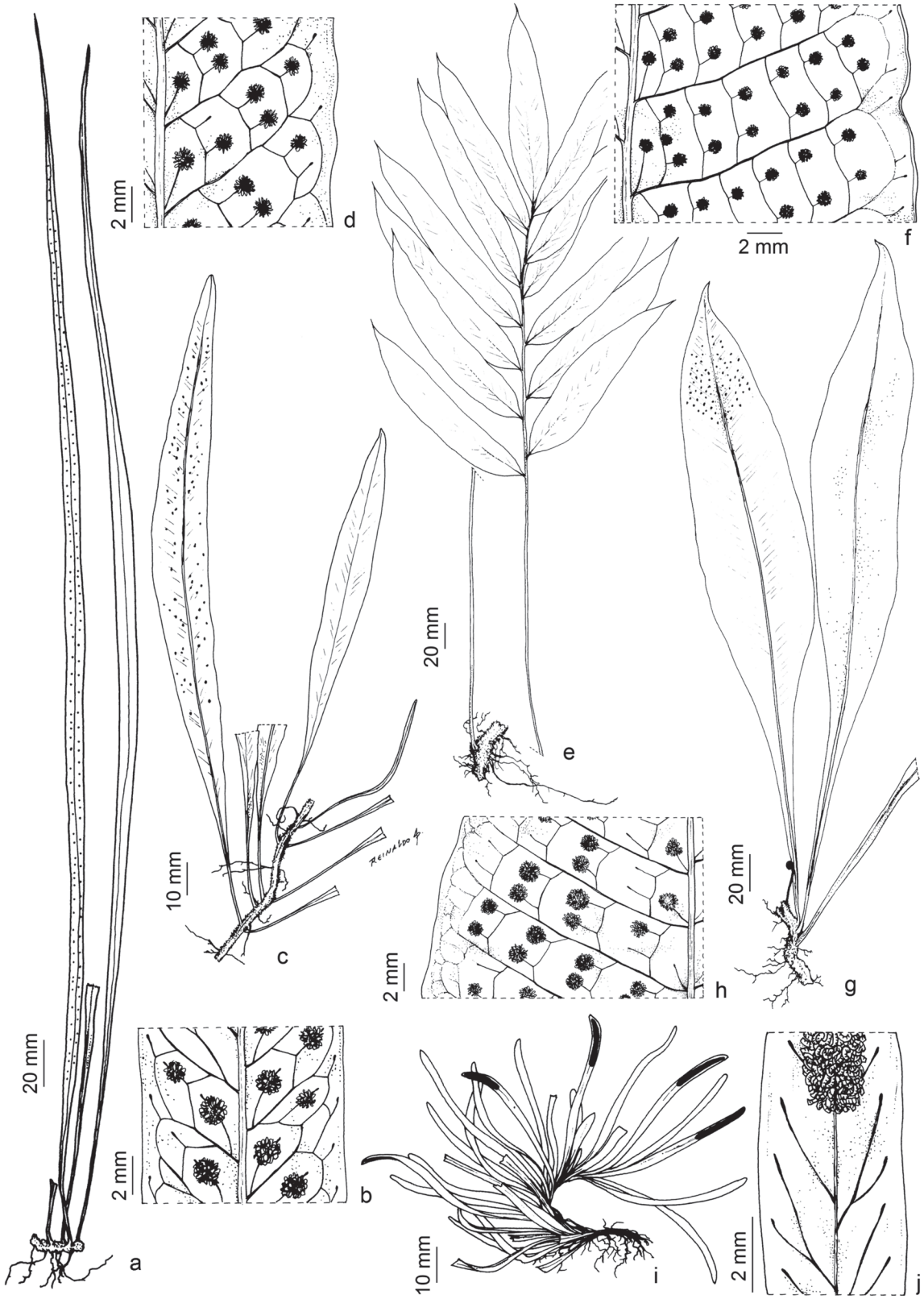

Figure 1. a. *Campyloneurum centrobrasilianum,* habit. b. *C. centrobrasilianum*, detail of veins and sori, abaxially. c. *C. lapathifolium,* habit. d. *C. lapathifolium*, detail of veins and sori, abaxially. e. *C. decurrens*, habit. f. *C. decurrens*, detail of veins and sori, abaxially. g. *C. phyllitidis,* habit. h. *C. phyllitidis*, detail of veins and sori, abaxially. i. *Cochlidium serrulatum,* habit. j. *Cochlidium serrulatum*, detail of veins and sori, abaxially.

of anastomose: cyrtophleboid in *C. decurrens* (figure 1f) and goniophleboid in *Serpocaulon* spp. (figures 4d, h).

Campyloneurum lapathifolium (Poir.) Ching, Sunyatsenia 5: 263. 1940 ≡ *Polypodium lapathifolium* Poir. *in* Lam., Encycl. [J. Lamarck *et al.*] 5: 514. 1804.

Figures 1c, d

Plants epiphytic or epipetric. Stems long-creeping, 2-4 mm diam; *scales* peltate, triangular-acuminate to lanceate-acuminate, clathrate, light to dark-brown, iridescent. Fronds 20-40 cm long; petioles stramineous to yellowish-green, 2-5 cm × 1-2 mm, sulcate, abaxially and adaxially glabrous; laminae simple, linear-elliptical with acuminate apex, with wavy margins, 18-35 × 1.5-2.5 cm, herbaceous; midribs glabrous abaxially and adaxially; veins anastomosed, cyrtophleboid, with two or rarely one included veinlets, abaxially and adaxially glabrous; laminar tissue between the veins glabrous abaxially and adaxially; *sori* in 2-4 series between costae and lamina margins, along the whole lamina lenght; paraphyses absent.

Distribution: Uncertain, probably endemic to the Brazilian Atlantic Forest (MG, ES, RJ, SP, PR, SC, RS) (Prado *et al.* 2015), plus Paraguay and northern Argentina; cited also for Peru and Bolivia by Lellinger (1988), but not confirmed by Leon (1993).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, 1930, *Y. Mexia 4243* (K, image!, RB, image!, VIC).

Additional specimens examined: BRAZIL. Minas Gerais: [Araponga], Fazenda da Serra, 3-IV-1930, *Y. Mexia 4656* (VIC); Carangola, Serra do Gramma, 28-II-1968, *J.G. Kuhlmam 124* (VIC). São Paulo: Santo André, Parque Natural Municipal Nascentes de Paranapiacaba, 26-IX-2009, *P.B. Schwartsburd et al. 2278* (VIC). Rio Grande do Sul: Santa Tereza, Linha Pederneira, 7-I-2012, *F. Gonzatti 301* (VIC).

Campyloneurum is a genus in need of a taxonomic revision. There are many species-complexes in the genus, and the morphological characters to differ species are not yet well understood. The works of Lellinger (1988), Leon (1993), and Vasques & Prado (2011) are very informative and helpful to identify the Brazilian species, but far from being sufficient.

Campyloneurum lapathifolium differs from *C. centrobrasilianum* by long-creeping stems (*vs.* short-creeping), herbaceous laminae (*vs.* leathery) which are 1.5-2.5 cm in width (*vs.* 0.5-1.3 cm), veins cyrtophleboid (*vs.* goniophleboid), and 2-4 series of sori between midribs and lamina margins (*vs.* 1-2 series) (figures 1c, d *vs.* 1a, b).

In addition, *Campyloneurum lapathifolium* differs from *C. phyllitidis* by long-creeping stems (*vs.* short-creeping), iridescent stem scales (*vs.* not iridescent), 2-5 cm long petioles (*vs.* petioles absent), laminae 1.5-2.5 cm in width (*vs.* 2.5-6 cm), 2-4 series of sori between costae and lamina margins (*vs.* 4-6 series), and the sori along the whole lamina length (*vs.* restricted to the upper half of lamina) (figures 1c, d *vs.* 1g, h).

Campyloneurum phyllitidis (L.) C. Presl, Tent. Pterid. 190. 1836 ≡ *Polypodium phyllitidis* L., Sp. Pl. 2: 1083. 1753.

Figures 1g, h

Plants epiphytic or epipetric. Stems short-creeping, 3-7 mm diam; scales peltate, lanceate to lanceolate, clathrate, dark-brown, not iridescent. Fronds 15-60 cm long; petioles absent; laminae simple, elliptical with long-attenuate base, and aristate apex, with wavy margins, 15-60 × 2.5-6 cm, herbaceous; midribs glabrous abaxially and adaxially; veins anastomosed, cyrtophleboid, with two or rarely one or three included veinlets, abaxially and adaxially glabrous; laminar tissue between the veins glabrous abaxially and adaxially; sori in 4-6 series between costae and lamina margins, restricted to the upper half of lamina; paraphyses absent.

Distribution: Widely distributed in the Neotropics, from Florida (U.S.A.) and Antilles to central Brazil and Bolivia (Leon 1993, Mickel & Smith 2004); Brazil (AC, AM, PA, RO, RR, TO, MA, CE, PE, BA, MT, GO, DF, MG) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, Fazenda Boa União, 2-VI-1925, *J.G. Kuhlmam s.n.* (VIC1885); Viçosa, Mata do Seu Nico, 15-XII-2014, *P.B. Schwartsburd et al. 3449* (VIC); [Visconde do Rio Branco], Retiro de Antonio Avelino, 13-XI-1930, *Y. Mexia 5298* (VIC).

Additional specimens examined: BRAZIL. Minas Gerais: Coronel Pacheco, Fazenda Argentina, 9-V-1944, *E.P. Heringer s.n.* (VIC12346); Parque Estadual do Vale do Rio Doce, 26-IX-1995, *V.V. Scudeller 120* (VIC).

For differentiation with the other *Campyloneurum* from Viçosa, see their respective comments.

Cochlidium Kaulf.

Stems erect to long-creeping, without phyllopodia; scales peltate, sub-clathrate. Fronds monomorphic, hemidimorphic or dimorphic; laminae simple, serreate or furcate; veins free, simple or furcate, rarely anastomosed without included veinlets; sori roundish to linear, segregate or confluent and forming coenosori, not protected; paraphyses absent.

Cochlidium punctatum (Raddi) L.E. Bishop, Amer. Fern J. 68(3): 86. 1978 ≡ *Grammitis punctata* Raddi, Pl. Bras. Nov. Gen. 1: 11, t. 22 bis, figs. 1, 1A. 1825. Figures 1i, j

Plants epiphytic or epipetric. Stems erect, 2-4 mm diam; scales linear to lanceate, light-brown, sub-clathrate. Fronds hemi-dimorphic, the fertile with conduplicate apex, 1-7 cm long; petioles absent; laminae simple, linear, 1-7 cm × 2-4 mm, with entire margins; midribs glabrous abaxially and adaxially; veins free, forked, glabrous abaxially and adaxially; laminar tissue between the veins glabrous abaxially and adaxially; sori linear, confluent, forming coenosori in the lamina apex.

Distribution: Endemic to the Brazilian Atlantic Forest (BA, MG, ES, RJ, SP, PR, SC) (Labiak & Prado 2003; Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, E.S.A.V., 1935, *J.G. Kuhlmam s.n.* (VIC1868a).

Additional specimens examined: BRAZIL. Minas Gerais: Araponga, Parque Estadual da Serra do Brigadeiro, 20-III-2008, *J. Dias et al. s.n.* (VIC21570); Parque Estadual do Ibitipoca, 8-VII-2000, *G.E. Valente & A.F. da Silva 541* (VIC). São Paulo: Santo André, Parque Natural Municipal Nascentes de Paranapiacaba, 26-IX-2009, *P.B. Schwartsburd et al. 2277* (VIC). Paraná: Campina Grande do Sul, Parque Estadual Pico do Paraná, 30-IV-2007, *J.B.S. Pereira & J.S. Silva 19* (VIC).

Cochlidium punctatum has commonly been ascribed to family Grammitidaceae (*e.g.*, Labiak & Prado 2003). Nowadays, Grammitidaceae is included within Polypodiaceae (*sensu* Smith *et al.* 2008), and such plants are often named "grammitid ferns". *Cochlidium punctatum* is characterized by erect stems, without phyllopodia, hemi-dimorphic fronds, with conduplicate apex, and sori forming coenosori (figures 1i, j).

Micrograma C. Presl

Stems long-creeping, with phyllopodia; scales peltate, not clathrate. Fronds monomorphic or commonly dimorphic; laminae simple; veins anastomosed, commonly irregularly anastomosed, rarely goniophleboid; sori rounded, born on the tip of the included veinlets, or in the juction of several veins and/or areoles, not protected; paraphyses present.

Key to species of *Micrograma* from Viçosa:

1. Sterile fronds more than 10 cm long; veins irregularly anastomosed (the areoles with areoles and veinlets included); sori leaving adaxial impressions
   2. Fronds dimorphic; petioles absent …..... ..... *M. squamulosa*
   2. Fronds monomorphic; petioles conspicuous, 5-10 cm long ……..……. *M. percussa*
1. Sterile fronds to 10 cm long; veins goniophleboid (areoles with one included veinlet); sori not leaving impressions
   3. Fertile fronds 2.5-4 cm long; sterile fronds 1-4 cm long ……..…….. *M. vacciniifolia*
   3. Fertile fronds 4.5-10 cm long; sterile fronds 4.5-10 cm long ……..... *M. crispata*

Micrograma crispata (Fée) R.M. Tryon & A.F. Tryon, Thodora 84: 129. 1982 ≡ *Craspedaria crispata* Fée, Crypt. Vasc. Bresil 1: 119, t. 36, Fig. 2. 1869. Figures 2d-f

Plants epiphytic or epipetric. Stems long-creeping, 2-6 mm diam; scales peltate, lanceate to lanceolate, not clathrate, bicolorous, centrally reddish-brown to black, laterally light-brown, iridescent. Fronds dimorphic. Sterile fronds 4.5-10 cm long; petioles absent; laminae simple, elliptical to lanceolate, 4.5-10 × 0.3-0.6 cm; midribs glabrous abaxially and adaxially; veins goniophleboid, glabrous abaxially and adaxially; laminar tissue between the veins glabrous abaxially and adaxially. Fertile fronds 4.5-10 cm long; petioles absent; laminae simple, linear, 4.5-10 × 0.3-0.6 cm; midribs glabrous abaxially and adaxially; veins goniophleboid, glabrous abaxially and adaxially; laminar tissue between the veins glabrous abaxially and adaxially; sori born on the tip of the included veinlets, in one series between midribs and laminar margins, not leaving impressions.

Distribution: Endemic to the Brazilian Atlantic Forest (PE, AL, SE, BA, MG, ES, RJ, SP) (Prado *et al.* 2015; present paper).

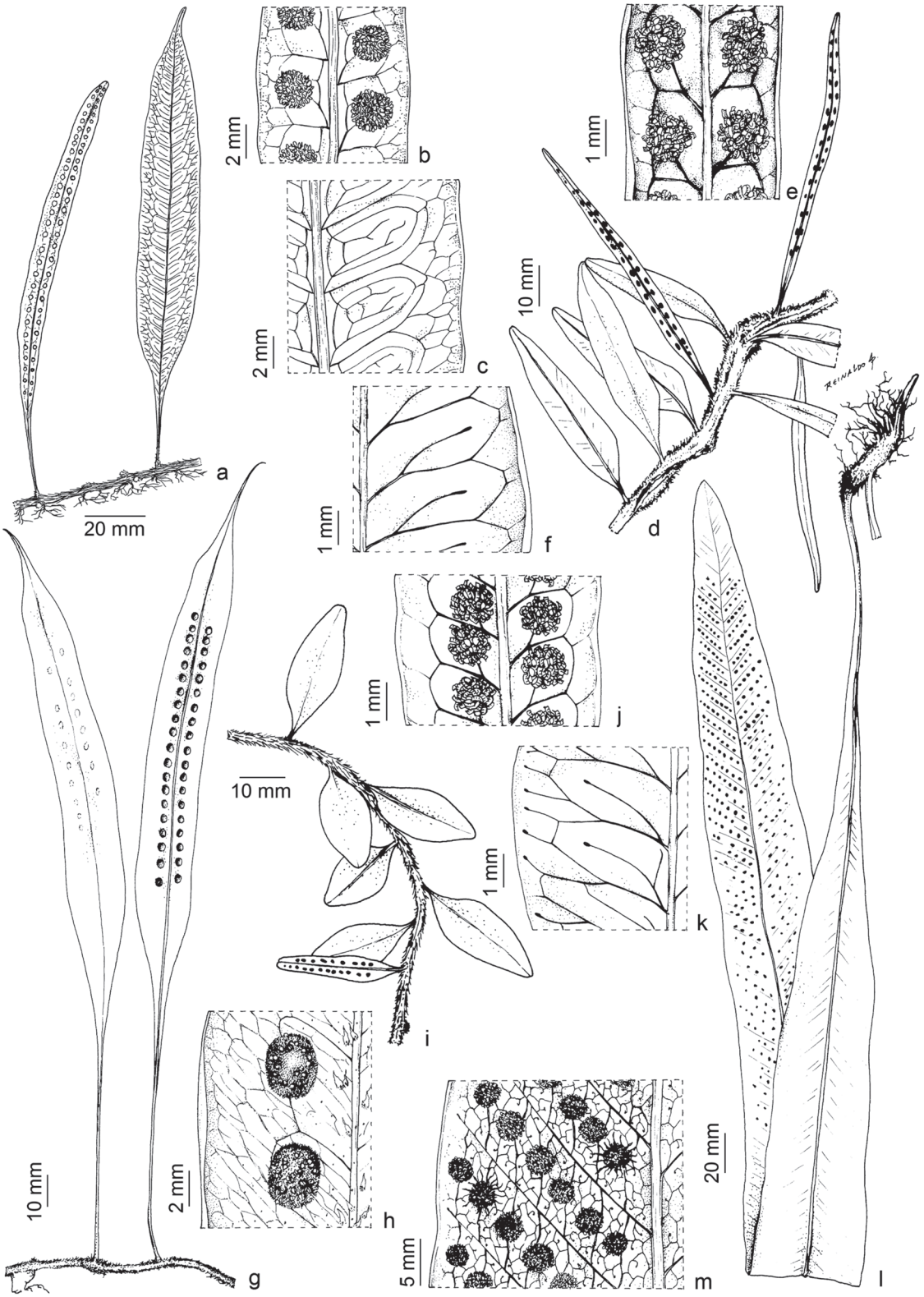

Figure 2. a. *Microgramma squamulosa*, habit. b. *M. squamulosa,* detail of veins and sori of a fertile frond, abaxially. c. *M. squamulosa*, detail of veins of a sterile frond, abaxially. d. *M. crispata,* habit. e. *M. crispata*, detail of veins and sori of a fertile frond, abaxially. f. *M. crispata*, detail of veins of a sterile frond, abaxially. g. *M. percussa,* habit. h. *M. percussa*, detail of veins and sori of a fertile frond, abaxially. i. *M. vacciniifolia,* habit. j. *M. vacciniifolia*, detail of veins and sori of a fertile frond, abaxially. k. *M. vacciniifolia*, detail of veins of a sterile frond, abaxially. l. *Niphidium crassifolium*, habit. m. *N. crassifolium*, detail of veins and sori of a fertile frond, abaxially.

Specimens examined: BRAZIL. Minas Gerais: Viçosa, E.S.A.V., 1931, *Y. Mexia 5172* (VIC).

Additional specimens examined: BRAZIL. Minas Gerais: Parque Estadual do Rio Doce, 24-X-1996, *D. Graçano 221*(VIC). São Paulo: Ilha dos Alcatrazes, 26-X-2011, *P.B. Schwartsburd & L. Rossi 2562* (VIC); Ilha dos Alcatrazes, 26-X-2011, *P.B. Schwartsburd & L. Rossi 2565* (VIC).

We are here making the first record of *Microgramma crispata* for the State of Minas Gerais (see Prado *et al.* 2015). *Microgramma crispata* is not very different from *M. vacciniifolia,* and they are probably conspecific. We consider them provisionally distinct, based specially on frond length; the stem scales did not show to be informative, as proposed by Tryon & Tryon (1982: 717). A taxonomic revision of *Microgramma* is needed, in order to elucidate the identity of these "two species". In the present conception, *Microgramma crispata* differs from *M. vacciniifolia* essentially by the characteristics presented in the key (see also figures 2d-f *vs.* 2i-k).

Microgramma percussa (Cav.) de la Sota, Physis Secc. C, Contr. Org. Terr. 44(106): 28. 1986 ≡ *Polypodium percussum* Cav., Descr. Pl. 243. 1801.
Figures 2g, h

Plants epiphytic or epipetric. Stems long-creeping, 2-3 mm diam; *scales* peltate, ovate to lanceolate, not clathrate, concolorous, light-brown, not iridescent. Fronds monomorphic, 20-32 cm long; petioles stramineous*,* 5-10 cm × 1-2 mm, sulcate, abaxially and adaxially with orbicular scales, peltate, centrally reddish-brown, laterally hyaline; laminae simple, elliptical, with attenuate bases and aristate apexes, 15-22 × 1.5-2.5 cm; midribs abaxially with orbicular scales and lanceolate scales, peltate, centrally reddish-brown, laterally hyaline, adaxially with sparse linear scales, hyaline; veins irregularly anastomosed, the areoles with areoles and veinlets included, abaxially with orbicular and lanceolate reddish-brown scales, adaxially with sparse hyaline linear scales; laminar tissue between the veins abaxially with orbicular and lanceolate reddish-brown scales, adaxially with sparse hyaline linear scales; sori irregularly born on primary and secondary areoles, in one series between midribs and laminar margins, leaving adaxial impressions.

Distribution: Widespread in the Neotropics (except in the Antilles and southern South America) (Mickel & Smith 2004); Brazil (all States, except for PI and SE) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, E.S.A.V., 1930, *Y. Mexia 5118* (VIC); Viçosa, E.S.A.V., *Y. Mexia 5238* (VIC); Viçosa, E.S.A.V., XI-1934, *J.G. Kuhlmam s.n.* (VIC1301); Viçosa, 23-VII-1977, *"Patrícia" s.n.* (VIC7993); Viçosa, *Campus* da UFV, 22-IV-1997, *G.E. Valente 282* (VIC); Viçosa, *Campus* UFV, XI-2013, *P.B. Schwartsburd & A. Gonçalves da Silva 2842* (VIC).

Additional specimens examined: BRAZIL. Minas Gerais: Parque Nacional da Serra do Caparaó, 27-IX-1977, *M.P. Coons et al. 77-663* (VIC). Rio de Janeiro: Itaipava, Hotel Pedra Bonita, 8-X-2000, *G.E. Valente & A.A. Azevedo 586* (VIC).

Microgramma percussa has commonly been ascribed to both *Microgramma* (*e.g.*, Mickel & Smith 2004) and *Pleopeltis* (*P. percussa* (Cav.) Hook. & Grev. - *e.g.*, Tryon & Tryon 1982), showing the fragile morphological limits between these two genera. On the other hand, the recent phylogenetic works on Polypodiaceae (Schneider *et al.* 2004, Otto *et al.* 2009) have asserted the position of *M. percussa* in *Microgramma*. Following the latest conceptions, this taxon differs from *Pleopeltis* spp. in having non clathrate stem scales (*vs.* sub-clathrate or clathrate) and paraphysate sori (*vs.* paraphyses absent).

Microgramma percussa differs from the other *Microgramma* species from Viçosa by monomorphic fronds (*vs.* dimorphic), and conspicuous petioles, 5-10 cm long (*vs.* petioles absent) (figures 2g, h *vs.* 2a-f, i-k).

Microgramma squamulosa (Kaulf.) de la Sota, Opera Lillo. 5: 59. 1961 ≡ *Polypodium squamulosum* Kaulf.. Enum. Fil. 89. 1824.
Figures 2a-c

Plants epiphytic or epipetric. Stems long-creeping, 2-4 mm diam; scales peltate, lanceolate, not clathrate, bicolorous, centrally brown, laterally hyaline, non iridescent, ciliate. Fronds dimorphic. Sterile fronds 10-16 cm long; petioles absent; laminae simple, elliptical to lanceolate, 10-16 × 1-2 cm; midribs abaxially with hyaline, ciliate, peltate scales, adaxially with hyaline, arachnoid scales; veins irregularly anastomosed, the areoles with areoles and veinlets included, abaxially and adaxially with scattered arachnoid scales; laminar tissue between the veins abaxially and adaxially with scattered arachnoid scales. Fertile fronds 10-15 cm long; petioles absent; laminae simple, linear, 10-15 × 0.5-1 cm, commonly with repand margins; midribs abaxially with hyaline,

ciliate, peltate scales, adaxially with hyaline, arachnoid scales; veins irregularly anastomosed, the areoles with areoles and veinlets included, abaxially and adaxially with scattered arachnoid scales; laminar tissue between the veins abaxially and adaxially with scattered arachnoid scales; sori born on the tip of the included aoreoles and/or veinlets, in one series between midribs and laminar margins, leaving adaxial impressions.

Distribution: Widespread in central and southern South America (Schwartsburd & Labiak 2007); Brazil (BA, MG, ES, RJ, SP, PR, SC, RS) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, UFV, Vila Giannetti, 16-VIII-2016, *P.B. Schwartsburd & N. Smith-Braga 3782* (UFV); Viçosa, UFV, Vila Giannetti, 4-XI-2016, *A. Gonçaves da Silva 15* (VIC).

Besides having dimorphic fronds, *Microgramma squamulosa* further differs from *M. percussa* by the absence of petioles (*vs.* petioles conspicuous, 5-10 cm long) (figures 2a-c *vs.* 2g-h). It also differs from *M. crispata* and *M. vacciniifolia* by larger sterile fronds, 10-16 cm long (*vs.* to 10 cm), and the irregularly anastomosed veins (*vs.* goniophleboid) (figures 2a-c *vs.* 2d-f, i-k).

Microgramma vacciniifolia (Langsdf. & Fisch.) Copel., Gen. Fil. [Copeland] 185. 1947 (as "*vaccinifolia*") ≡ *Polypodium vacciniifolium* Langsd. & Fisch., Pl. Voy. Russes Monde 8: t. 7. 1810.
Figures 2i-k

Plants epiphytic or epipetric. Stems long-creeping, 2-3 mm diam; scales peltate, lanceolate with aristate apices, with ciliate margins, not clathrate, bicolorous, centrally reddish-brown, laterally hyaline, non iridescent. Fronds dimorphic. Sterile fronds 1-4 cm long; petioles absent; laminae simple, ovate to lanceate, 1-4 × 0.8-1.5 cm; midribs abaxially glabrous or with sparse whitish arachnoid scales, adaxially glabrous; veins goniophleboid, abaxially glabrous or with sparse whitish arachnoid scales, adaxially glabrous; laminar tissue between the veins abaxially and adaxially glabrous. Fertile fronds 2.5-4 cm long; petioles absent; laminae simple, linear, 2.5-4 × 0.3-0.5 cm; midribs abaxially glabrous or with sparse whitish arachnoid scales, adaxially glabrous; veins goniophleboid, abaxially glabrous or with sparse whitish arachnoid scales, adaxially glabrous; laminar tissue between the veins abaxially and adaxially glabrous; sori born on the tip of the included veinlets, in one series between midribs and laminar margins, not leaving impressions.

Distribution: Widespread in South America, plus Great Antilles (Tryon & Stolze 1993); Brazil (MT, MS, CE, RN, PA, PE, AL, SE, BA, MG, ES, RJ, SP, PR, SC, RS) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, E.S.A.V., 11-IV-1935, *J.G. Kuhlmann s.n.* (VIC1897); Viçosa, Escola de Agricultura, 23-XII-1929, *Y. Mexia 4154* (VIC).

Additional specimens examined: BRAZIL. Bahia: Salvador, Itapoã, 30-VII-1998, *G.E. Valente 347* (VIC). Rio de Janeiro: Rio de Janeiro, Barra da Tijuca, 9-VII-1939, *A.C. Brade s.n.* (VIC3406). São Paulo: Ilha dos Alcatrazes, Saco do Funil, 25-X-2011, *P.B. Schwartsburd & L. Rossi 2551* (VIC); Ilha de Cabras, *s.d.*, *P.B. Schwartsburd & L. Rossi 2543* (VIC). Santa Catarina: Itapoá, Terreno do Sr. Mauro P. Schwartsburd, 28-XII-2012, *P.B. Schwartsburd & S. Ferreira da Silva 2655* (VIC).

See *Microgramma crispata, M. percussa,* and *M. squamulosa* for comparisons with this species.

Niphidium J. Sm.

Stems short-creeping or rarely long-creeping, with phyllopodia; scales peltate or rarely attached near base, sub-clathrate or clathrate. Fronds monomorphic; laminae simple; veins anaxetum, irregularly anastomosed, main areoles with included areoles and free veins; sori rounded, born irregularly on areoles and free veins, not protected; paraphyses present.

Niphidium crassifolium (L.) Lellinger, Amer. Fern J. 62: 106. 1972 [1973] ≡ *Polypodium crassifolium* L., Sp. Pl. 2: 1083. 1753.
Figures 2l, m

Plants terrestrial, epiphytic or epipetric. Stems short-creeping, 0.7-2 cm diam; scales attached near base, ovate to ovate-acuminate, sub-chlatrate to clathrate, dark-brown to blackish, not iridescent. Fronds 60-150 cm long; petioles brown, 3-12 cm × 5-10 mm, adaxially sulcate, abaxially and adaxially glabrous; laminae simple, linear-elliptical with long-attenuate base, with acute apex, with wavy margins, 57-140 × 4-9 cm, leathery; midribs glabrous abaxially and adaxially; veins anaxetum, irregularly anastomosed, main areoles with included areoles and

free veins abaxially and adaxially glabrous, adaxially ending in hydatodes; laminar tissue between the veins glabrous abaxially and adaxially; sori in 3-10 series between midribs and lamina margins, restricted to the upper third of lamina; paraphyses present.

Distribution: Widespread in the Neotropics (Mickel & Smith 2004); Brazil (all states, except for AP, RO, PI, RN, PB, SE) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, E.S.A.V., [1925-1926], *P.H. Rolfs s.n.* (VIC1276); Viçosa, UFV, estufas próximas ao Recanto das Cigarras, 22-IV-2015, *P.B. Schwartsburd et al. 3498* (VIC).

Additional specimens examined: BRAZIL. Minas Gerais: Araponga, Parque Estadual da Serra do Brigadeiro, Totem, 28-IV-2013, *P.B. Schwartsburd et al. 2726* (VIC); Carangola, Fazenda do Grama, 26-I-1930, *Y. Mexia 4227* (VIC). Paraná: Campina Grande do Sul, Parque Estadual do Pico do Paraná, Morro Camapuã, 20-XII-2008, *J.B.S. Pereira & F. Marinero 399* (VIC).

Niphidium crassifolium is easily characterized by its long, linear-elliptical, leathery laminae, 57-140 × 4-9 cm, and by anaxetum veins (irregularly anastomosed; main areoles with included areoles and free veins) (figures 2l, m). It is also common, in this species, the presence of whitish secretions on the hydatodes, and black fungi conidia within the sori.

Pecluma M.G. Price

Stems short or long-creeping, rarely ascending, with phyllopodia; scales basally attached, non-clathrate. Fronds monomorphic; petioles terete; laminae pectinate; veins free, simple to 1-4-furcate, rarely anastomosed only at segment bases (then, areoles without included veinlets); sori rounded, born on vein ends, unisseriate, not protected; paraphyses present.

Key to species of *Pecluma* from Viçosa:

1. Petioles and costae black ……..…..*P. plumula*
1. Petioles and costae brown
   2. Fronds less than 10 cm long; costae abaxially with cordate scales and sparse hairs ……..……..*P. filicula*
   2. Fronds more than 20 cm long; costae abaxially with hairs only ……..… *P. truncorum*

Pecluma filicula (Kaulf.) M.G. Price, Amer. Fern J. 73: 114. 1983 ≡ *Polypodium filicula* Kaulf., Enum. Fil. 275. 1824.

Figures 3e, f

Plants epiphytic or epipetric. Stems short-creeping, 1-3 mm diam; scales dark-brown. Fronds 6-10 cm long; petioles brown, abaxially and adaxially pubescent; laminae lanceolate, commonly curved, with attenuate base 5-8 × 1.5-2 cm; costae brown, abaxially with cordate scales and sparse hairs, adaxially with hairs; segments patent to slightly ascending; costules abaxially pubescent, adaxially glabrescent; veins free, simple or 1-furcate; laminar margins pubescent.

Distribution: Widespread in South America (Evans 1968); Brazil (MT, GO, DF, MG, ES, RJ, SP, PR, SC, RS) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Coimbra. Serra de São Geraldo, próximo a Rodovia Viçosa-Ubá, 9-X-1995, *G.E. Valente 135* (VIC).

Pecluma filicula is characterized by short frond sizes (6-10 × 1.5-2 cm), brown petioles and costae, costae abaxially with cordate scales, and simple veins (figures 3e, f). Althou Evans (1968) cited only simple veins in *P. filicula*, we also observed 1-furcate veins, especially in the sori (figure 3f).

Pecluma plumula (Humb. & Bonpl. *ex* Willd.) M.G. Price, Amer. Fern J. 73: 115. 1983 ≡ *Polypodium plumulum* Hunb. & Bonpl. *ex* Willd., Sp. Pl. 4, 5: 178. 1810.

Figures 3c, d

Plants epiphytic or epipetric. Stems ascending, 1-3 mm diam; scales brown. Fronds 20-60 cm long; petioles black, abaxially glabrous, adaxially pubescent; laminae linear, commonly curved, with attenuate base 17-50 × 2.5-5 cm; costae black, abaxially with triangular-acuminate scales and hairs, adaxially with hairs; segments patent to slightly ascending; costules abaxially with sparse hairs, adaxially glabrous; veins free, 1-forked; laminar margins pubescent.

Distribution: Widespread in the Neotropics (Mickel & Smith 2004); Brazil (AC, AM, PA, MT, MS, BA, MG, ES, RJ, SP, PR, SC) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Coimbra. Serra de São Geraldo, próximo a Rodovia Viçosa-Ubá, 9-X-1995, *G.E. Valente 133* (VIC); Coimbra. Serra de São Geraldo, próximo a Rodovia Viçosa-Ubá, 9-X-1995, *G.E. Valente 134* (VIC);

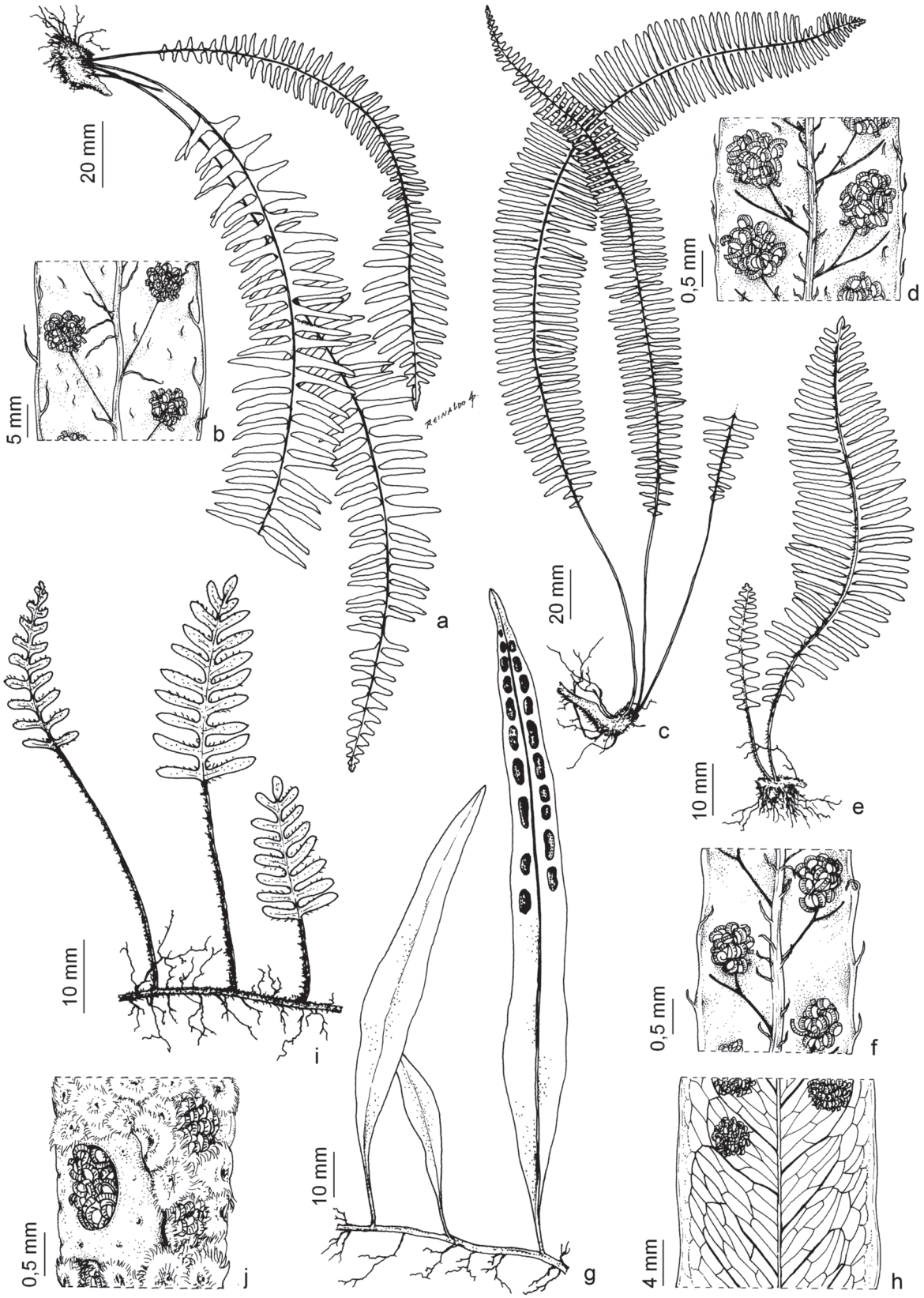

Figure 3. a. *Pecluma truncorum,* habit. b. *P. truncorum*, detail of veins and sori, abaxially. c. *P. plumula,* habit. d. *P. plumula*, detail of veins and sori, abaxially. e. *P. filicula*, habit. f. *P. filicula,* detail of veins and sori, abaxially. g. *Pleopeltis astrolepis*, habit. h. *Pleopeltis astrolepis*, detail of veins and sori, abaxially. i. *Pleopeltis minima,* habit. j. *Pleopeltis minima*, detail of laminar scales and sori, abaxially.

Viçosa, *Campus* UFV, horto, 20-VIII-1998, *G.E. Valente 349* (VIC); Viçosa, Varginha, 29-XI-1934, *J.G. Kuhlmann s.n.* (VIC1299); Viçosa, Varginha, 29-XI-1934, *J.G. Kuhlmann s.n.* (VIC1302).

Pecluma plumula is characterized by medium sized fronds (20-60 × 2.5-5 cm), black petioles and costae, costae abaxially with triangular-acuminate scales, and 1-forked veins (figures 3c, d). In Viçosa, *P. truncorum* is also medium sized. *Pecluma plumula* differs from *P. truncorum* by black petioles and costae (*vs.* brown), costae abaxially scales and hairs (*vs.* hairs only), patent or slightly ascending segments (*vs.* ascending), and 1-forked veins (*vs.* simple) (figures 3c, d *vs.* 3a, b).

Pecluma truncorum (Lindm.) M.G. Price, Amer. Fern J. 73: 115. 1983 ≡ *Polypodium truncorum* Lindm., Hedwigia 43: 309. 1904.
Figures 3a, b

Plants epiphytic. Stems short-creeping to ascending, 4-5 mm diam; scales brown. Fronds 20-40 cm long; petioles brown, abaxially and adaxially pilose; laminae linear-lanceolate, commonly curved, with attenuate base 17-35 × 2.5-4 cm; costae brown, abaxially and adaxially pilose, with hairs only; segments ascending; costules abaxially with sparse hairs, adaxially glabrescent; veins free, simple; laminar margins pubescent.

Distribution: Endemic to the Atlantic Forest (Brazil and northern Argentina) (Evans 1968); Brazil (BA, MG, ES, RJ, SP, PR, SC, RS) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, 1930, *Y. Mexia 5105* (VIC).

Additional specimens examined: BRAZIL. Minas Gerais: Araponga, P.E. Serra do Brigadeiro, Serra das Cabeças, Totem, 28-IV-2013, *P.B. Schwartsburd et al. 2729* (VIC); Distrito de Carangola, 29-I-1930, *Y. Mexia 4272* (VIC). São Paulo: Cantareira, VI-1913, *Toledo & A.C. Brade s.n.* (VIC3405). Paraná: Campina Grande do Sul, Parque Estadual Pico Paraná, Morro Camapuã, 20-XII-2008, *J.B.S. Pereira & F. Marinero 403* (VIC).

See comments of *Pecluma plumula* for differentiation.

Phlebodium (R. Br.) J. Sm.

Stems long-creeping, with phyllopodia; scales peltate, non-clathrate. Fronds monomorphic; petioles adaxially sulcate; laminae pinnatisect, commonly glaucous; veins irregularly anastomosed, the areoles with included aoreoles and veinlets; sori rounded, born on several veins, of irregular anastomosis, 1-7 seriate, not protected; paraphyses absent.

Key to species of *Phlebodium* from Viçosa:

1. Laminae glaucous; sori in one series between costules and laminar margins ……. *P. areolatum*
1. Laminae olive green; sori in 4-6 series between costules and laminar margins ..… *P. decumanum*

Phlebodium areolatum (Humb. & Bonpl. *ex* Willd.) J. Sm., J. Bot. (Hooker) 4: 59. 1841 ≡ *Polypodium areolatum* Humb. & Bonpl. *ex* Willd., Sp. Pl. ed. 4, 5(1): 172. 1810.
Figures 4a, b

Plants epiphytic or epipetric. Stems long-creeping, 7-10 mm diam; scales bicolorous, reddish-brown in the middle, hyaline in the margins, the margins ciliate. Fronds 30-75 cm long; petioles stramineous, abaxially and adaxially glabrous; laminae glaucous, ovate, with truncate bases, with conform apices, with 4-13 pairs of segments, 20-50 × 18-30 cm; costae abaxially and adaxially glabrous; segments 7-15 × 1-3.5 cm; costules abaxially and adaxially glabrous; veins irregularly anastomosed, abaxially and adaxially glabrous; laminar tissue between the veins abaxially and adaxially glabrous; laminar margins glabrous; sori in one series between costules and laminar margins, commonly in the wings between segments.

Distribution: Widely distributed in the Neotropics (Mickel & Smith 2004); Brasil (all States) (Prado *et al.* 2015)

Specimens examined: BRAZIL. Minas Gerais: Coimbra, 23-IX-1977, *"Patrícia" s.n.* (VIC7998); Viçosa, Jardim Botânico, 23-IX-1977, "*Patrícia" s.n.* (VIC7932); Viçosa, Jardim Botânico da UFV, 17-X-1977, *A. Júlio Filho s.n.* (VIC8008); Viçosa, Campus da UFV, Horto, 5-XI-1998, *G.E. Valente 367* (VIC); Viçosa, Horto Botânico, XI-2013, *P.B. Schwartsburd & A. Gonçalves da Silva 2841* (VIC).

Additional specimens examined: BRAZIL. Minas Gerais: Ouro Preto, Parque Estadual do Itacolomy, Trilha para o Pico do Itacolomy, 8-VI-2013, *P.B. Schwartsburd et al. 2808* (VIC).

According to Mickel & Smith (2004), *Phlebodium aureum* (L.) J. Sm. has 2-3 series of sori between

costules and laminar margins and is a fertile allotetraploid originated by crosses of *P. areolatum* and *P. decumanum*. Although *P. aureum* is quite common in Brazil, it does not occur in Viçosa.

Phlebodium decumanum (Willd.) J. Sm., J. Bot. (Hooker) 4: 59. 1841 ≡ *Polypodium decumanum* Willd., Sp. Pl. ed. 4, 5(1): 170. 1810.
Figures 4e, f

Plants epiphytic or epipetric. Stems long-creeping, 8-12 mm diam; scales bicolorous, reddish-brown in the middle, hyaline in the margins, the margins ciliate. Fronds 60-80 cm long; petioles light brown, abaxially and adaxially glabrous; laminae olive green, ovate, with truncate bases, with conform apices, with 5-10 pairs of segments, 40-55 × 25-40 cm; costae abaxially and adaxially glabrous; segments 8-20 × 2-5 cm; costules abaxially and adaxially glabrous; veins irregularly anastomosed, abaxially and adaxially glabrous; laminar tissue between the veins abaxially and adaxially glabrous; laminar margins glabrous; sori in 4-6 series between costules and laminar margins, commonly in the wings between segments.

Distribution: Widely distributed in the Neotropics (Mickel & Smith 2004); Brazil (all States) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, Universidade Federal de Viçosa, 22-IV-2015, *P.B. Schwartsburd et al. 3499* (VIC).

Pleopeltis Humb. & Bonpl. *ex* Willd.

Stems short to long-creeping, with phyllopodia; *scales* peltate, non clathrate or rarely clathrate, commonly comose. Fronds monomorphic or sub-dimorphic; laminae simple, pinnatifid, or 1-pinnate; veins irregularly anastomosed, the areoles with included areoles and veinlets; sori rounded, elongate, or rarely linear, born on several veins, of irregular anastomosis, generally protected by peltate scales; *paraphyses* absent.

Key to species of *Pleopeltis* from Viçosa:

1. Laminae simple, abaxially with sparse scales; sori elongate ……..…… *P. astrolepis*
1. Laminae 1-pinnate, fully covered by scales, abaxially; sori round ……..…….....…... *P. minima*

Pleopeltis astrolepis (Liebm.) E. Fourn., Mexic. Pl. 1: 87. 1872. ≡ *Polypodium astrolepis* Liebm., Mexic. Bregn. 185. 1849.
Figures 3g, h

Plants epiphytic. Stems long-creeping, 1-2 mm diam; scales non clathrate, dark brown, comose. Fronds monomorphic, 9-18 cm long; petioles short or absent, to 5 × 2 mm, dark brown to blackish, abaxially and adaxially glabrous; laminae lanceolate, 9-18 × 1-2 cm; *midribs* abaxially and adaxially sparsely scaly; veins irregularly anastomosed, abaxially and adaxially sparsely scaley; laminar tissue between the veins abaxially and adaxially sparsely scaly; laminar margins glabrous; sori in 1 series between midribs and laminar margins; soral scales present (especially in young fronds).

Distribution: Widely distributed in the Neotropics (Mickel & Smith 2004); Brazil (CE, PB, PE, AL, BA, GO, MG, ES, RJ, SP, PR, SC, RS) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Coimbra, 23-IX-1977, "*Patrícia*" *s.n.* (VIC7996); Viçosa, Campus da UFV, 29-I-1998, *G.E. Valente 308* (VIC); Viçosa, Estrada Viçosa-Coimbra, BR-120, 8-X-1998, *G.E. Valente 359* (VIC); Viçosa, *Campus* da UFV, 12-XI-1998, *G.E. Valente 368* (VIC); Viçosa, UFV, Av. Purdue, 2-VI-2014, *P.B. Schwartsburd & T. Lopes 3264* (VIC); Viçosa, UFV, Horto Botânico, 11/2013, *P.B. Schwartsburd & A. Gonçalves da Silva 2842* (VIC).

Pleopeltis astrolepis resembles *P. macrocarpa* (Bory *ex* Willd.) Kaulf. and *P. gyroflexa* (Christ) Schwartsb., two simple laminate species of *Pleopeltis* from the Atlantic Forest. Neither of them occur in Viçosa. *Pleopeltis astrolepis* differs from *P. macrocarpa* by short or absent petioles (*vs.* conspicuous), and elongate sori (*vs.* round) which do not leave adaxial impressions (*vs.* leaving impressions) (figures 3g, h). *Pleopeltis astrolepis* differs from *P. gyroflexa* also by short or absent petioles (*vs.* conspicuous), entire laminar margins (*vs.* sinuous), and sori protected by scales (*vs.* naked sori) (figures 3g, h) (Schwartsburd 2014).

Pleopeltis minima (Bory) J. Prado & R.Y. Hirai, Amer. Fern J. 100(4): 191. 2010 [Apr 2011] ≡ *Marginaria minima* Bory, Dict. Class. Hist. Nat. [Bory] 10: 177. 1826.
Figures 3i, j

Plants epiphytic or epipetric. Stems long-creeping, 1-1.5 mm diam; scales sub-clathrate to clathrate, bicolorous, dark brown with hyaline margins, not comose. Fronds monomorphic, 4-7 cm long; petioles 2-3.5 cm × 1 mm , dark brown, abaxially and adaxially

fully covered by peltate scales; laminae 1-pinnate, lanceolate, 2-3.5 × 1-1.5 cm; rachises abaxially scaly, adaxially glabrous; costae abaxially scaly, adaxially glabrous; veins irregularly anastomosed, abaxially scaly, adaxially glabrous; laminar tissue between the veins abaxially scaly, adaxially glabrous; laminar margins glabrous; sori in 1 series between costae and laminar margins; soral scales present.

Distribution: Bolivia, Paraguay, Argentina, Uruguay, and Brazil (MG, ES, RJ, MS, SP, PR, SC, RS) (Prado & Hirai 2010; Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Coimbra, Serra de São Geraldo, 9-X-1995, *G.E. Valente 132* (VIC).

Pleopeltis minima is easily characterized by small sized fronds (4-7 cm long), 1-pinnate laminae, which are abaxially fully covered by peltate scales (figures 3i, j). For nomenclatural issues involving *P. minima* and related names see Prado & Hirai (2010).

Serpocaulon A.R. Sm. *in* A.R. Sm. *et al.*

Stems long-creeping, with phyllopodia; scales peltate, sub-clathrate or clathrate. Fronds monomorphic; petioles adaxially sulcate; laminae pinnatisect or 1-pinnate; veins generraly anastomosed, goniophleboid, the areoles with one included veinlet, or rarely free; sori rounded, born at the tip of the included veinlets, 1-6 seriate, not protected; paraphyses absent.

Key to species of *Serpocaulon* from Viçosa:

1. Laminae with less than 10 pairs of pinnae; medial pinnae acroscopically sessile; sori in 3-4 series between costae and laminar margins ……..…….……. *S. fraxinifolium*
1. Laminae with more than 15 (to 35) pairs of pinnae; medial pinnae acroscopically adnate to rachis; sori in 1-2 series between costae and laminar margins ……. *S. menisciifolium*

Serpocaulon fraxinifolium (Jacq.) A.R. Sm. *in* A.R. Sm. *et al.*, Taxon 55(4): 928. 2006 ≡ *Polypodium fraxinifolium* Jacq., Coll. 3: 187. 1789.
Figures 4c, d

Plants epiphytic or hemi-epiphytic. Stems 4-7 mm diam, not pruinose; scales sub-clathrate, blackish, slightly lighter in the margins. Fronds 30-60 cm long; petioles stramineous, abaxially and adaxially with minute glandular hairs or glabrescent; laminae 1-pinnate, ovate, with truncate bases, with conform apices, with 4-8(-10) pairs of pinnae, 20-40 × 15-30 cm; rachises abaxially and adaxially with minute glandular hairs or glabrescent; medial pinnae acroscopically and basiscopically sessile, 7-15 × 1.5-2.5 cm; costae abaxially and adaxially glabrous; veins goniophleboid, abaxially and adaxially glabrous; laminar tissue between the veins abaxially and adaxially glabrous; laminar margins glabrous; sori in 3-4 series between costae and laminar margins.

Distribution: Widely distributed in the Neotropics (Hensen 1990); Brazil (RR, PE, BA, GO, DF, MG, ES, RJ, SP, PR, SC) (Prado *et al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, 1930, *Y. Mexia 4234* (VIC); Viçosa, Fazenda da Aguada, 14-X-1930, *Y. Mexia 5170* (VIC); Viçosa, Fazenda da Aguada, 31-VII-1930, *Y. Mexia 4929* (VIC); Viçosa, Mata do Seu Nico, 1-IV-2002, *G.E. Valente 903* (VIC).

Serpocaulon menisciifolium (Langsd. & Fisch.) A.R. Sm. *in* A.R. Sm. *et al.* Taxon 55(4): 928. 2006, as "*meniscifolium*". *Polypodium menisciifolium* Langsd. & Fisch., Pl. Voy. Russes Monde 11, t. 11. 1810, as "*meniscifolium*".
Figures 4g, h

Plants epiphytic. Stems 6-8 mm diam, pruinose; scales sub-clathrate, bicolorous, centrally dark brown, hyaline in the margins. Fronds 50-70 cm long; petioles stramineous, abaxially and adaxially glabrous; laminae 1-pinnate, ovate-elongate, with truncate bases, with sub-conform apices, with 17-30(-35) pairs of pinnae, 40-50 × 20-25 cm; rachises abaxially pubescent and with sparse scales, adaxially pubescent, the hairs 2-3-celled; medial pinnae acroscopically adnate to the rachises, basiscopically sessile, 10-13 × 1-2 cm; costae abaxially and adaxially sparsely pubescent; veins goniophleboid, abaxially and adaxially with scattered hairs; laminar tissue between the veins abaxially and adaxially glabrous; laminar margins glabrous; sori in 1-2 series between costae and laminar margins.

Distribution: Endemic to the Brazilian Atlantic Forest (BA, MG, ES, RJ, SP, PR, SC, RS) (Hensen 1990; Prado *el al.* 2015).

Specimens examined: BRAZIL. Minas Gerais: Viçosa, Universidade Federal de Viçosa, 22-IV-2015, *P.B. Schwartsburd et al. 3500* (VIC).

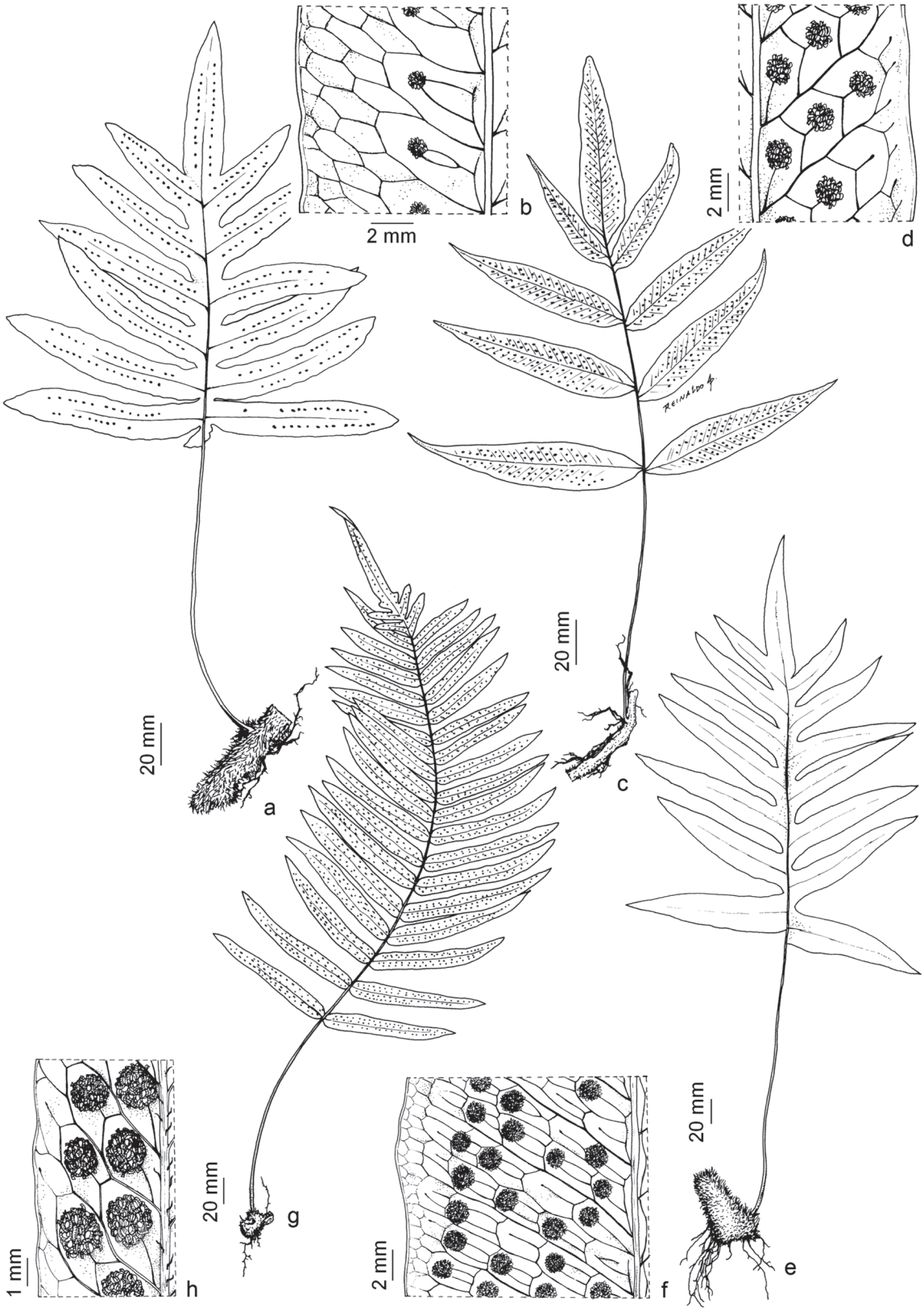

Figure 4. a. *Phlebodium areolatum*, habit. b. *P. areolatum*, detail of veins and sori, abaxially. c. *Serpocaulon fraxinifolium*, habit. d. *S. fraxinifolium,* detail of veins and sori, abaxially. e. *P. decumanum*, habit. f. *P. decumanum*, detail of veins and sori, abaxially. g. *S. menisciifolium*, habit. h. *S. menisciifolium*, detail of veins and sori, abaxially.

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