



PHYTOTAXA

385

A taxonomic monograph of the fern genus *Ctenitis* (Dryopteridaceae) in South America

RAQUEL STAUFFER VIVEROS¹, GERMINAL ROUHAN²
& ALEXANDRE SALINO¹

¹*Universidade Federal de Minas Gerais, Instituto de Ciências Biológicas, Departamento de Botânica,
Caixa Postal 486, 30123-970, Belo Horizonte, Minas Gerais, Brazil*

²*Muséum National d'Histoire Naturelle, UMR 7205 CNRS-MNHN-UPMC-EPHE, Institut de Systématique,
Evolution, Biodiversité - ISYEB, Sorbonne Universités, Herbar National, 16 rue Buffon,
CP 39, F-75231 Paris cedex, France
Email: raquel.s.viveros@gmail.com*



Magnolia Press
Auckland, New Zealand

RAQUEL STAUFFER VIVEROS, GERMINAL ROUHAN & ALEXANDRE SALINO
A taxonomic monograph of the fern genus *Ctenitis* (Dryopteridaceae) in South America
(*Phytotaxa* 335)

83 pp.; 30 cm.

23 January 2018

ISBN 978-1-77670-300-5 (paperback)

ISBN 978-1-77670-301-2 (Online edition)

FIRST PUBLISHED IN 2018 BY

Magnolia Press

P.O. Box 41-383

Auckland 1346

New Zealand

e-mail: magnolia@mapress.com

<http://www.mapress.com/j/pt/>

© 2018 Magnolia Press

All rights reserved.

No part of this publication may be reproduced, stored, transmitted or disseminated, in any form, or by any means, without prior written permission from the publisher, to whom all requests to reproduce copyright material should be directed in writing.

This authorization does not extend to any other kind of copying, by any means, in any form, and for any purpose other than private research use.

ISSN 1179-3155 (Print edition)

ISSN 1179-3163 (Online edition)

Abstract

Based on collections of 45 Herbaria in addition to newly collected specimens and some field observations, a taxonomic treatment for South American *Ctenitis* is provided, a hundred years after Christensen's monographs. Guided by morphological species concept, 26 taxa are recognized (23 species and three varieties). A key including all taxa is provided, and all species are fully morphologically described, with information on distribution and habitat. Brazil is the richest country with 22 taxa, of which 13 are endemic, restricted mainly to Atlantic Forest. Taxa occurring in the other South American countries are also widely distributed in Mesoamerica and West Indies, except *C. megalastriformis*, only known from Peru, and *C. refulgens* var. *peruviana*, recorded in Peru and Bolivia. We dealt with 163 names that apply to the South American species. In addition, we propose three new combinations, and designate 38 lectotypes and three neotypes.

Key words: Atlantic Forest, Brazil, ferns, Neotropics, taxonomy, typification

Introduction

The genus *Ctenitis* (Christensen 1911: 77) Christensen (1938: 544) is characterized by the presence of catenate trichomes (or well-named ctenitoid hairs) on adaxial surfaces of petioles, rachises and costae, by the vein tips slender and basal basicopic vein of distal pinnules or segments arising from costule (rarely from the costa; Viveros & Salino 2015, Viveros & Salino 2017). *Ctenitis* is distributed in the Old and New World wet tropics (Mickel & Smith 2004). The most recent estimate is ca. 125 species (PPG I 2016). In the Neotropics occur ca. 50 species (Viveros & Salino 2015), in Malesia, Holttum (1991) treated 28 species, in Asia through western Pacific, 43 species (Holttum 1985), while Dong & Christenhusz (2013) treated 10 species in China, and Duan *et al.* (2017) recognized 40 species in Africa and the Western Indian Ocean area (including Madagascar, Comoros and Mascarenes).

As a large and morphologically variable genus, several authors pointed out the need of taxonomic revision for *Ctenitis* (Stolze 1977, Smith 1981, Mickel & Beitel 1988, Stolze 1990, Tryon & Stolze 1991, Moran 1995, Mickel & Smith 2004). After Christensen's monographs for Neotropics (Christensen 1913a, 1920), more studies were carried out in Mesoamerica (concept in Moran & Riba 1995) than in the other New World regions, leaving more taxonomic problems for South American and some West Indies species. The latest works that dealt with *Ctenitis* in South America are mainly checklists (*e.g.* Legrand 1952, Brade 1972, Kramer 1978, Boggan *et al.* 1997, Peña-Chocarro *et al.* 1999, Márquez 2006, Funk *et al.* 2007, Salino & Ponce 2008, Murillo-Pulido *et al.* 2008, Sanín *et al.* 2008, Salino *et al.* 2009, Salino & Almeida 2010, Díaz *et al.* 2012), or about new combinations or new species (Salino & Morais 2003, Schwartsburd *et al.* 2007, Viveros & Salino 2015, Viveros & Salino 2017). Regional taxonomic treatments were provided only for Santa Catarina in southern Brazil (Sehnem 1979), Peru (Tryon & Stolze 1991) and for one Venezuelan region (Smith 1995), which treated few and widely distributed species. Therefore, the aim of this paper is to provide a taxonomic treatment for *Ctenitis* taxa that occur in South America.

Taxonomic history and phylogenetic position

Before 1938, Neotropical species of *Ctenitis* have been described and combined in *Polypodium* Linnaeus (1753: 1082), *Dryopteris* Adanson (1763: 20), *Polystichum* Roth (1799: 106), *Aspidium* Swartz (1801: 29), *Nephrodium* Marthe ex Michaux (1803: 266), *Cystopteris* Bernhardt (1806: 26), *Lastrea* Bory (1824: 588) and *Phegopteris* (Presl 1836: 179) Fée (1852a: 242). According to the most recent classifications of pteridophytes (Smith *et al.* 2006, Smith 2008, Christenhusz *et al.* 2011, PPG I 2016), those genera belong to different families. Once described, *Ctenitis* was recognized as a natural group as a subgenus of *Dryopteris* (Christensen 1911). The name of the subgenus is supposed to be inspired on the endemic Brazilian species *C. distans* (Brackenridge 1854: 192) Ching (1938: 277), whose oldest name is *Aspidium ctenitis* (Link 1833: 122). Christensen (1911), however, did not designate any type and cited only some species names. Christensen devoted himself to the study of *Dryopteris* in Neotropics (Christensen 1913a, 1920) and continued to treat *Ctenitis* as a subgenus in later works (Christensen 1932, 1936). In 1938 he elevated *Ctenitis* to the genus rank, but once again without designating a type species (Christensen 1938). In the same year, Ching (1938) treated for the first time the Old World species and then

designated *Aspidium ctenitis* as the type. Furthermore, Ching proposed the combination *C. distans* to such species, based on *Lastrea distans* Brack., the second oldest name of this taxon, once the epithet of *A. ctenitis* could not be used. Later, it seems that Ching (1940) has tried to change the type to *Polypodium submarginale* Langsdorff & Fischer (1810: 12) [= *C. submarginalis* (Langsd. & Fisch.) Ching (1940: 250)] and Holttum (1983, 1991) followed this change. However, the priority must be assigned to *A. ctenitis* (Art. 10.5 of ICN—McNeill *et al.* 2012).

When *Ctenitis* was elevated to a genus, it was placed in the subfamily Dryopteridoideae, in the family Polypodiaceae (Christensen 1938). Later, such subfamily were transferred to Dennstaedtiaceae (Holttum 1947). Crabbe *et al.* (1975) moved the genus to Aspleniaceae in the subfamily Tectarioideae. Pichi Sermolli (1977) considered it in Aspidiaceae (*nom. illeg.*), whose circumscription comprised the dryopteroids and tectarioids. Later some authors considered *Ctenitis* in Tectariaceae (Panigrahi 1986, Moran 1995) and others in Dryopteridaceae (Ching 1965, Tryon & Tryon 1982, Kramer *et al.* 1990). Until phylogenetic researches using molecular data confirmed *Ctenitis* in Dryopteridaceae (Hasebe *et al.* 1995, Smith *et al.* 2006, Schuettpelz & Pryer 2007, Liu *et al.* 2007a, 2007b, Wang *et al.* 2014, Liu *et al.* 2016, PPG I 2016).

Dryopteridaceae are the largest family of ferns (Smith *et al.* 2006, Zhang *et al.* 2013, PPG I 2016) and there are no known morphological synapomorphies (Moran *et al.* 2014). It is included in eupolypods I (Smith *et al.* 2006, 2008, Schuettpelz & Pryer 2007), which represents the suborder Polypodiineae (PPG I 2016), a group characterized by several vascular bundles in petiole with the two adaxial ones enlarged (Moran *et al.* 2014). In Dryopteridaceae there are 26 genera and ca. 2115 species (Zhang *et al.* 2013, PPG I 2016), of which more than 70% are in four genera: *Elaphoglossum* Schott ex Smith (1842: 148), *Polystichum*, *Dryopteris* and *Ctenitis* (Smith *et al.* 2006, Zhang *et al.* 2013, PPG I 2016), the latter three within the subfamily Dryopteridoideae (Liu 2016, PPG I 2016). However, such studies were conducted with few samples of *Ctenitis* species. Nevertheless, analyses with almost 40% of the species diversity supports *Ctenitis* as monophyletic (Hennequin *et al.* 2017), including the genera *Ataxipteris* Holttum (1984: 10) with two species in Asia (Dong 2008) and *Pseudotectaria* Tardieu-Blot (1955: 87) with eight species in Madagascar and Comoros (Rakotondrainibe 2010) (Liu *et al.* 2007a, 2007b, Wang *et al.* 2014, Liu *et al.* 2016, PPG I 2016, Duan *et al.* 2017), and one species formerly placed in *Heterogonium* Presl (1851: 502), endemic to Mauritius island (Duan *et al.* 2017, Hennequin *et al.* 2017).

Christensen (1913a, 1920) subdivided *Ctenitis* of tropical America into informal groups. In the first part of his *Dryopteris* monograph (Christensen 1913a), he treated the 1-pinnate-pinnatifid/pinnatisect species (which he called pinnatifid-bipinnatifid) and recognized three groups: the group *Dryopteris submarginalis* (Langsdorff & Fischer 1810: 12) Christensen (1906: 296) with 12 species, *D. lindenii* (Kuhn 1869: 116) Kuntze (1891: 813) with three and *D. platyloba* (Baker in Hooker & Baker 1868: 307) Christensen (1906: 285) with five. In the second part of *Dryopteris* monograph (Christensen 1920), he treated the 2–4-pinnate-pinnatifid species (termed by him the bipinnate decompound) and, as his knowledge increased, he updated such informal groups including more species and recognizing two more groups. So, he reorganized the subgenus *Ctenitis* into five groups: the same *D. submarginalis* (totaling 16 spp.), *D. hirta* (Swartz 1788: 133) Kuntze (1891: 813), composed of the species previously in the *D. lindenii* group and 12 more (totaling 15 spp.), *D. subincisa* (Willdenow 1810: 202) Urban (1903: 19), composed of the species previously in the *D. platyloba* group and 26 more (totaling 31 spp.), the new group *D. ampla* (Humb. & Bonpl. ex Willdenow 1810: 207) Ching (1940: 250) (five spp.), and the other new group *D. protensa* (Afzel. ex Swartz 1801: 36) Christensen (1906: 286) (one sp.). He did not justify the reason he changed the names of *D. lindenii* group to *D. hirta* and *D. platyloba* to *D. subincisa*. Perhaps because, while preparing the second part of his monograph (Christensen 1920), he realized that there were more 2–4-pinnate-pinnatifid species in both groups than 1-pinnate-pinnatifid/pinnatisect, and so, he preferred to rename the groups with decompound species, of widest distribution, that he considered the most representative. In his *Index Filicum Supplementum Tertium*, Christensen (1934) recognized such groups as sections: *Dryopteris* subg. *Ctenitis* sect. *Euctenitis* (*D. submarginalis*; *nom. illeg.* = sect. *Ctenitis*), sect. *Hirtae* (*D. hirta*), sect. *Subincisae* (*D. subincisa*), sect. *Amplae* (*D. ampla*) and sect. *Protensae* (*D. protensa*). However, he did not provide latin diagnoses. Although Christensen (1911, 1913a, 1920, 1938) has claimed *Ctenitis* as natural, two of his groups were later segregated. The *Dryopteris subincisa* group was elevated to the genus rank as *Megalastrum* Holttum (1986a: 161) and the *D. protensa* to the genus *Triplophyllum* Holttum (1986b: 238). Molecular phylogenetic results confirmed that these two genera are not even closely related to *Ctenitis* (Moran *et al.* 2014, Wang *et al.* 2014, Zhang *et al.* 2016, 2017, Liu *et al.* 2016): *Megalastrum*, at least, belongs to the same family (Dryopteridaceae), but *Triplophyllum* belongs to Tectariaceae. Ching (1938, 1940) also recognized groups within *Ctenitis*, treating two subgenera: *Ctenitis* subg. *Euctenitis* Ching

(1938: 280) (nom. illeg. = subg. *Ctenitis*) for American species and *Ctenitis* subg. *Dryopsis* Ching (1938: 280) for the Asian ones. Ito (1939) proposed more elaborate subdivisions for the Asian species without mentioning Ching's works. He described the sections "*Euctenitis*" and *Pseudoctenitis* Ito (1939: 83), including species of the subgenus *Dryopsis* in both. In addition, in sect. "*Euctenitis*", he maintained the American species and included some Asian ones, while species of different genera were gathered in the section *Pseudoctenitis*. Later, *Dryopsis* (Ching) Holttum & Edwards (1986: 179) was elevated to genus and Zhang (2012), based on molecular data (Zhang *et al.* 2012), recognized it as a section within *Dryopteris* subgenus *Erythrovariae* Fraser-Jenkins (1986: 195). Holttum (1985) proposed two informal groups for Asian-Pacific region: *C. subglandulosa* (Hance 1866: 253) Ching (1938: 302) and *C. eatonii* (Baker in Hooker & Baker 1868: 276) Ching (1938: 291), which were well retrieved in Hennequin *et al.* (2017), although they will need to be confirmed using an extended sampling.

In the Neotropics, the groups proposed by Christensen (1913a, 1920, 1934) that remain in *Ctenitis* are: *Dryopteris submarginalis*, *D. ampla* and the *D. hirta* group. Summed up, the first comprises mainly 1-pinnate-pinnatifid/pinnatisect species with non bullate costal scales, with more representatives in South America; the second is characterized by 2–4-pinnate-pinnatifid species with non bullate costal scales, with more representatives in Mesoamerica; and the third group, the 1-pinnate-pinnatifid/pinnatisect (= *D. lindenii* group) or 2–4-pinnate-pinnatifid species with bullate costal scales, mostly endemic to West Indies. Tindale (1965) provided Latin diagnoses and formalized the groups *D. hirta* and the *D. ampla* as sections: *Dryopteris* sect. *Hirtae* Tindale (1965: 252) and *Dryopteris* sect. *Amplae* Tindale (1965: 252), respectively. Stolze (1990) discussed important taxonomic characters of such groups and pointed the need to determine if they constitute natural divisions. Hennequin *et al.* (2017) showed that those three remaining groups were also rather well supported, although their sampling were currently too reduced to allow any further conclusion regarding the systematics of the Neotropical species.

Methods

Herbarium specimens, including types, were examined during visits and/or by loan from the following 45 herbaria: B, BHCB, BM, BR, C, CAS, CEPEC, COL, E, F, FCAB, FI, G, GH, HB, HUA, HUEFS, ICN, INPA, K, LE, MBM, MG, MO, NY, OUPR, P, PACA, PI, PMA, PR, PRC, QCA, QCNE, QPLS, R, RB, S, SJRP, SP, U, UC, UEC, UPCB and US (herbarium acronyms follow Thiers 2017). All type specimens examined are cited with an exclamation mark (!) after their corresponding barcode or accession number, distinguishing specimens from their images. When the type did not have neither barcode, nor accession number, then only the herbarium acronym was cited. Type specimens not examined, but whose existence is known from literature, are cited without exclamation mark. Some field trips were carried out in Atlantic Forest (coastal and inland of Brazil), Brazilian Amazonian Forest and Colombia specially to collect plants and observe morphological and ecological characters. Cited specimens were selected to represent the entire taxon range and are sorted by alphabetical order of countries and their states/provinces/departments. Distribution maps were based on several specimens in order to represent the range of occurrence. For this purpose, several geographic coordinates were estimated, when not provided on the labels. For the species to which we recognize varieties, the selected specimens examined, habitat and distribution notes are presented just for each variety. Some morphological features were illustrated with silhouettes (for lamina cutting and stem position) or line drawings (*e.g.* for details of indument). Spores were examined for almost all taxa (24 out of 26) at the Centro de Microscopia, Universidade Federal de Minas Gerais, using scanning electron microscopy (SEM). Spores were removed from herbarium fertile laminae, then transferred to aluminum stubs and sputter coated with gold, and finally imaged using a FEI Quanta 200F SEM with an accelerating voltage of 15 kV. The terminology used to describe the species is based on Radford (1986) and Lellinger (2002) for sporophytes and Tryon & Lugardon (1991) for the spores.

Results

Morphology

The characters here described were based on New World specimens.

Stems:—The stem of most *Ctenitis* species is erect or ascending, less frequently short-creeping (Fig. 01). They vary from 0.5 to 6.0 cm diameter, they are scaly, mainly at apex.

Leaves:—The leaves are monomorphic and fasciculate, rarely slightly dimorphic with fertile leaves narrower and longer than the sterile.

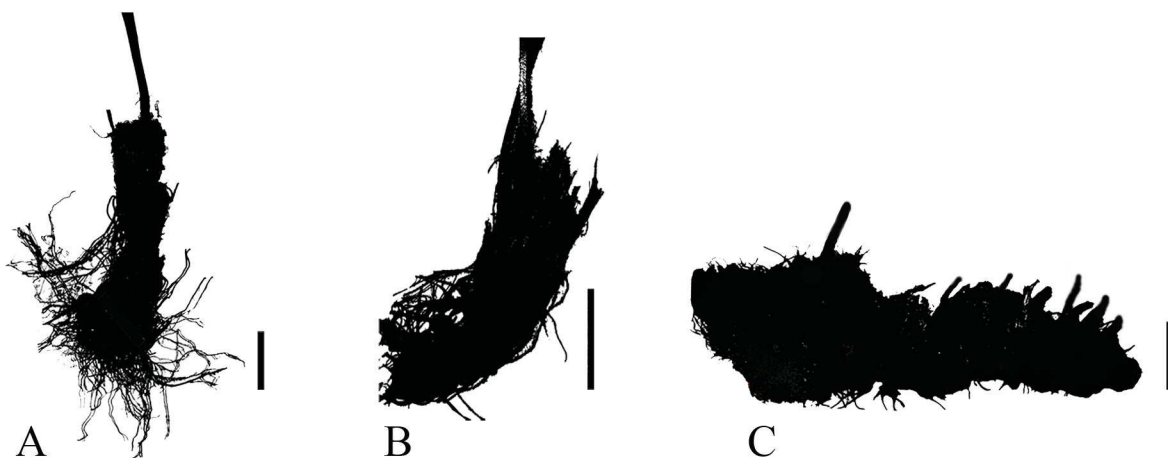


FIGURE 1. Stem of *Ctenitis* from South America. **A:** stem erect, from *C. microchlaena* (Rivero 720, UC). **B:** stem ascending, from *C. aspidioides* (Salino 4275, BHCB). **C:** stem short-creeping, from *C. submarginalis* var. *tenuifolia* (Salino 2215, BHCB). Scale bars = 3 cm.

Petioles:—The petioles are stramineous, castaneous or dark brown, usually darker at base, where they are scaly. Catenate trichomes are always present on adaxial surface. The number of vascular bundles of the South American species varies from 3 to 10. In some species, the number of vascular bundles is constant (*C. abyssii*, *C. bigarellae*, *C. christensenii*, *C. deflexa*, *C. falciculata*, *C. fenestralis*, *C. glandulosa*, *C. nervata*, *C. nigrovenia*, *C. refulgens*), but in other species the number varies (*C. anniesii*, *C. aspidioides*, *C. distans*, *C. eriocaulis*, *C. laetevirens*, *C. microchlaena*, *C. paranaensis* e *C. submarginalis*). Such variation can be linked to the petiole thickness. Thicker petioles have more bundles than the thinner ones (Fig. 02).

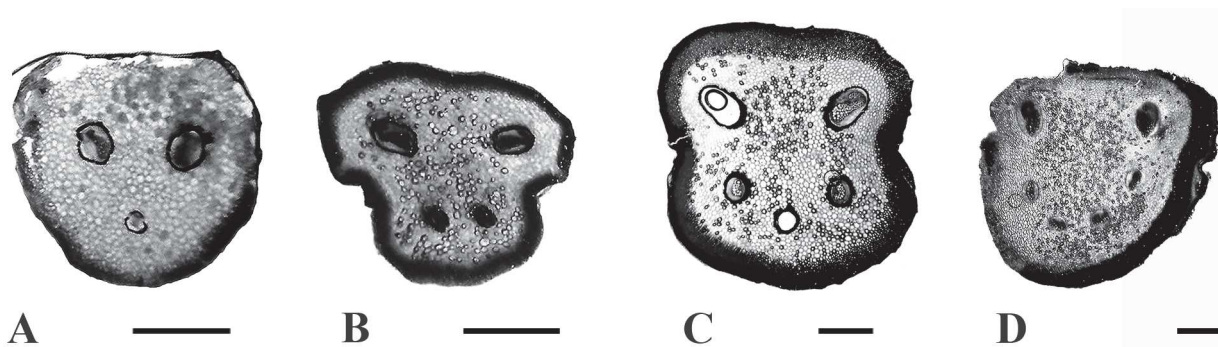


FIGURE 2. Transversal sections of petiole bases of four *Ctenitis* species from South America. **A:** *C. nigrovenia*, showing three vascular bundles (Salino 15212, BHCB). **B:** *C. christensenii*, showing four vascular bundles (Salino 13408, BHCB). **C:** *C. laetevirens*, showing five vascular bundles (Schimitt 561, BHCB). **D:** *C. nervata*, showing six vascular bundles (Almeida 1682, BHCB). Scale bars = 1 mm.

Laminae:—The laminae color and texture are not useful to distinguish the New World species. The laminae can vary from light green to dark green within a species. However, *C. aspidioides* and *C. nervata* laminae are usually dark green. Similarly, the texture of laminae varies, but it was overall considered as membranaceous for all species. The laminae which widths are up to 1/3 of length were called of linear-lanceolate; the ones which widths are up to 1/2 of length, of lanceolate; and the wider than 1/2 of length, of ovate or deltate (Radford 1986).

There are two lamina division patterns in the New World species: 1-pinnate-pinnatifid or 1-pinnate-pinnatisect (Fig. 03A) and 2–4-pinnate-pinnatifid (Fig. 03B–C). In this last, the basal pinnae are more developed basiscopically (their basiscopic pinnules are longer and wider than the acroscopic ones). In the 1-pinnate-pinnatifid/pinnatisect species, the basal pinnae are quite equally developed basiscopically and acroscopically.



FIGURE 3. Lamina dissection of *Ctenitis* from South America. **A:** lamina 1-pinnate-pinnatifid to 1-pinnate-pinnatisect (basally), rachis more or less straight, from *C. christensenii* (Salino 13408, BHCB, from Viveros & Salino 2015). **B:** lamina 2-pinnate-pinnatifid, rachis flexuous, from *C. flexuosa* (Luederwaldt 1890, UC). **C:** medial portion of a lamina 2-pinnate-pinnatifid, rachis more or less straight, from *C. ampla* (Humboldt s.n., B). Scale bars = 4 cm.



FIGURE 4. Lamina apices of *Ctenitis* from South America. **A:** apex conform, with two lateral pinnae, from *C. aspidioides* (Salino 4275, BHCB). **B:** apex subconform, with two lateral pinnae, from *C. aspidioides* (Salino 10228, BHCB). **C:** apex confluent, with two lateral pinnae, from *C. refulgens* (Fernandes 218, BHCB). Scale bars = 3 cm.

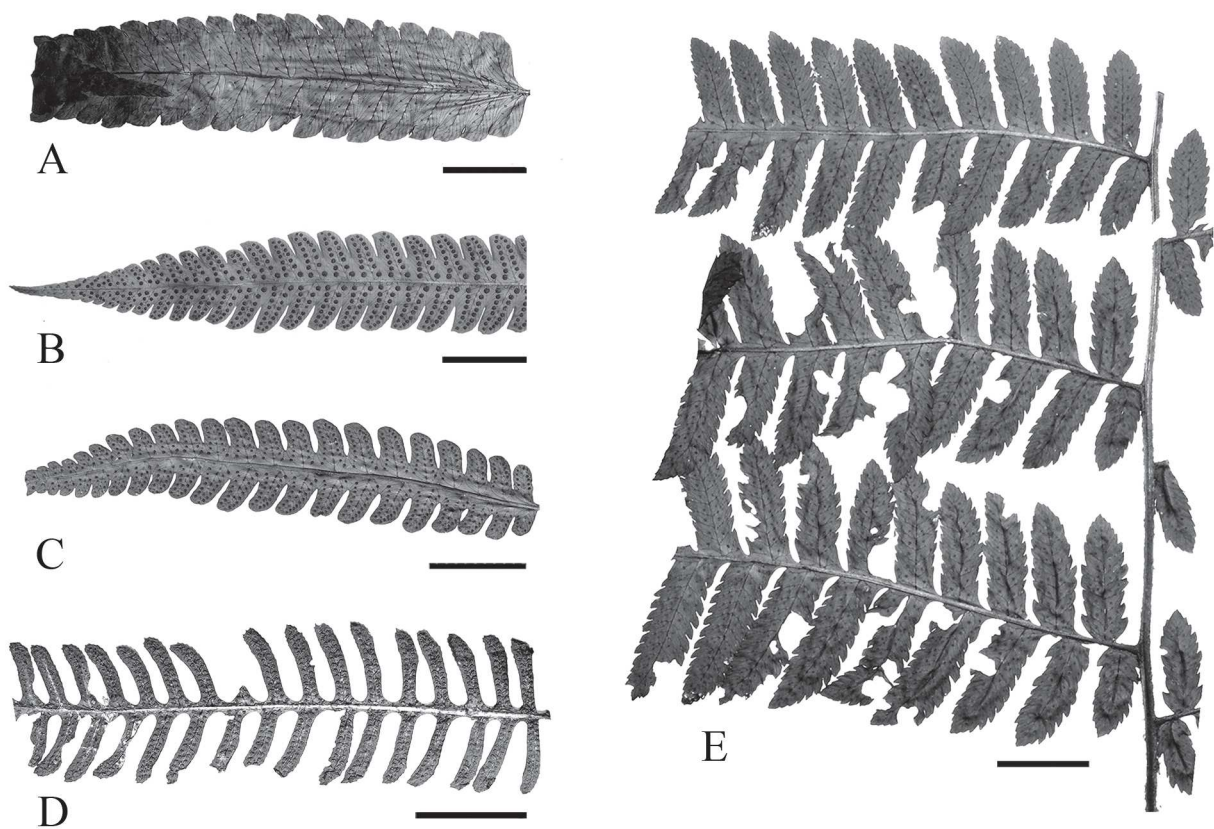


FIGURE 5. Pinna incision, relative to the distance between the segment apex and costa, of *Ctenitis* from South America. **A:** pinna incised ca. 1/4, from *C. refulgens* var. *peruviana* (Tuomisto 13392, UC). **B:** pinna incised ca. 1/2, from *C. refulgens* var. *refulgens* (Fernandes 218, BHCB). **C:** pinna incised ca. 2/3, from *C. aspidioides* (Pohl s.n., PRC). **D:** pinna incised more than 3/4, from *C. anniesii* (Jürgens 158, UC). **E:** three lateral pinnae, the top one incised mainly more than 3/4, but basally pinnatisect, the one below mainly pinnatisect, but basally pinnate, from *C. megalastriformis* (Tuomisto 13393, UC). All represent medial pinnae. Scale bars = 2 cm.

The laminae apices are confluent (Fig. 04C), except in *C. aspidioides*, which are conform or subconform (Fig. 04A–B).

Pinnae:—The basal pinnae are anadromous and the others are catadromous. About the incision, the pinnae can be pinnatifid, when incised from 1/4 of the distance between the segment apex and costa or to almost reaching the costa. Otherwise, the pinnae can be pinnatisect, when the incision reaches the costa. In the 1-pinnate-pinnatifid/pinnatisect species, the incision between the segment apex and costa can be 1/4, 1/3, 1/2, 2/3, 3/4 or more (Fig. 05A–E). For the 2–4-pinnate-pinnatifid species, the incision was calculated in pinnules, and it varies in the same proportions.

For the 1-pinnate-pinnatifid/pinnatisect species, the term “costa” was used for the main axe of a pinna and “costule” for the main axe of a pinnule. For the 2–4-pinnate-pinnatifid species, the main axe of a pinna was called “pinna-rachis”, the main axe of the ultimate segment was called “costule” and the main axe before costule was called “costa” (in penultimate segments). In those compound laminae species, the term “pinnule” was used as well for the first divisions of a pinna (in 2-pinnate-pinnatifid), or second (in 3-pinnate-pinnatifid) or third divisions (in 4-pinnate-pinnatifid).

Segments:—Was considered as segment, a portion of a pinna (in 1-pinnate-pinnatifid/pinnatisect species) or a pinnule (in 2–4-pinnate-pinnatifid) which is adnate and with a sinus connecting it to an adjacent segment. The segment apices can be rounded, acute, obtuse, apiculate or truncate, with or without catenate trichomes on margin. A single species can have more than one kind of segment apex, even in a single individual.

Veins:—The veins are free with slender tips, simple or furcate. They are usually furcate in large basal segments. The veins reach or not the margin. In most species of the New World the veins reach the margin. The basal ones from adjacent segments reach the margin at sinus or above the sinus. In *C. nervata* and *C. refulgens*, one of these basal veins ends before margin, but it is towards the sinus, or more than one pair of veins reaches the margin at sinus or somewhat above the sinus.

Indument:—Scales and trichomes compose *Ctenitis* indument. The density, shape and location of these structures are very important for species recognition. The scales are on axes, from stem to costule abaxially or even on the base of veins. Some species also have scales on costa adaxially. The scales on petiole bases are like those on stem, but longer, always lighter than the ones on distal portion of petiole and rachis. The scales on costa abaxially, on rachis and distal portion of petiole are similar. In some species there are also filiform and tortuous which differ from most other scales. Such scales were called “proscapes”, once they seem to be precursors of scales. This term was suggested by Moran (1986, 1987) for *Polybotrya* and *Olfersia* and discussed for *Ctenitis* by Stolze (1990). When present, the proscapes are on costule abaxially and sometimes also on the base of veins. In *C. flexuosa*, beyond of these locations, the proscapes are on petiole and rachis, tangled with the fimbriae of the other scales. In *C. fenestralis*, the proscapes are among sporangia.

The scales were classified as clathrate or subclathrate. The clathrate, its cell walls are thick, but lumens are translucent and colorless. While the subclathrate, although the cell walls are also thick, the lumens are colored, lighter than the cell walls. Three patterns of color were considered for the scales: light castaneous, castaneous and dark brown to blackish (Fig. 06A–C). About shape, the scales vary from linear to ovate. The margin can be entire, slightly denticulate or denticulate, with or without fimbriae. All scales are basifixed. The base can be cordate, truncate or rounded. On petiole, subtle scars remain when scales are removed.

About trichomes, there are four types that can be found in *Ctenitis* from the New World: catenate, glandular, bacilliform and filiform (Fig. 07A–D; Viveros & Salino 2015). The catenate trichomes are on adaxial surface of axes, from petiole to costa, they can also be or not on abaxial surface of the same axes and even on costule, vein and between veins of both surfaces, on segments margins and on indusia. The glandular trichomes can be on axes (petiole to veins) and between veins of both surfaces (but they are more common on abaxial), and on indusia. The bacilliform trichomes can be on costa, costule, veins and between veins of both surfaces (being more frequently on abaxial), and on indusia, never on petiole and rachis. Other authors called such trichomes as cylindrical glands (Holttum 1991; Tryon & Stolze 1991). The filiform trichomes are found in few species of the New World. When present, they are on or between veins of both surfaces, never on petiole, rachis or indusia.

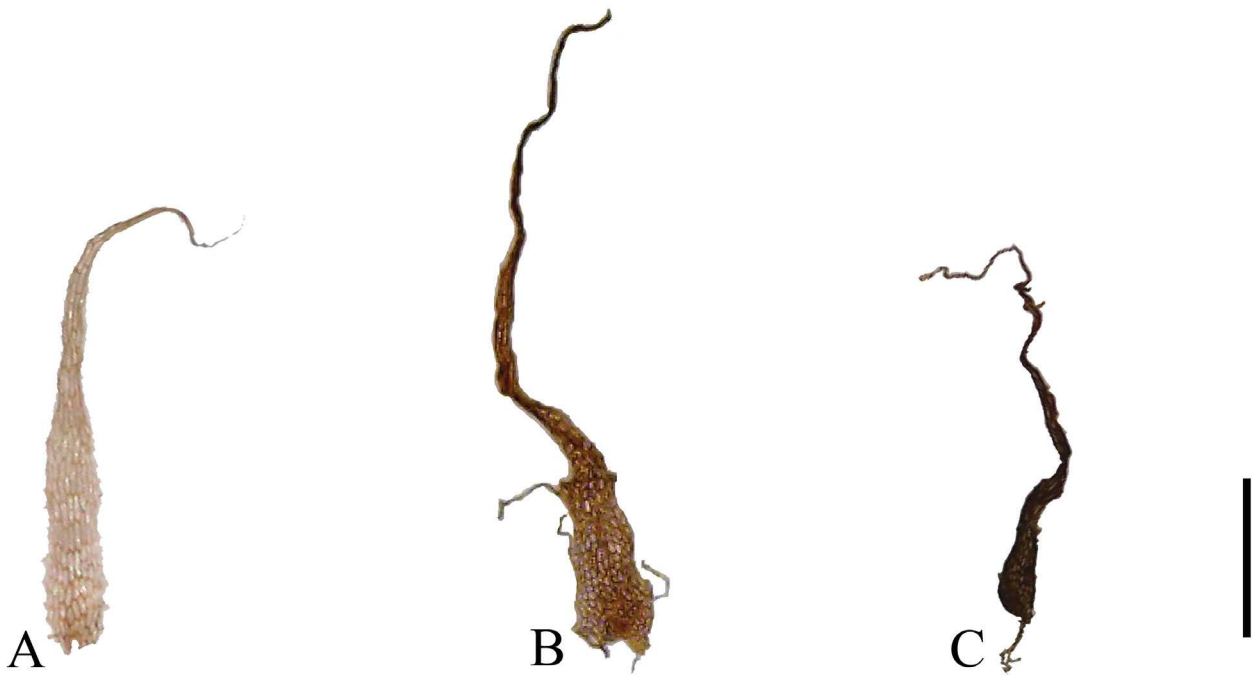


FIGURE 6. Scale colors of *Ctenitis* from South America. **A:** light castaneous scale, from *C. ampla* (Salino 3257, BHCB). **B:** castaneous scale, from *C. glandulosa* (Salino 13626, BHCB). **C:** dark brown to blackish scale, from *C. laetevirens* (Schimitt 561, BHCB). Scale bar = 1 mm.

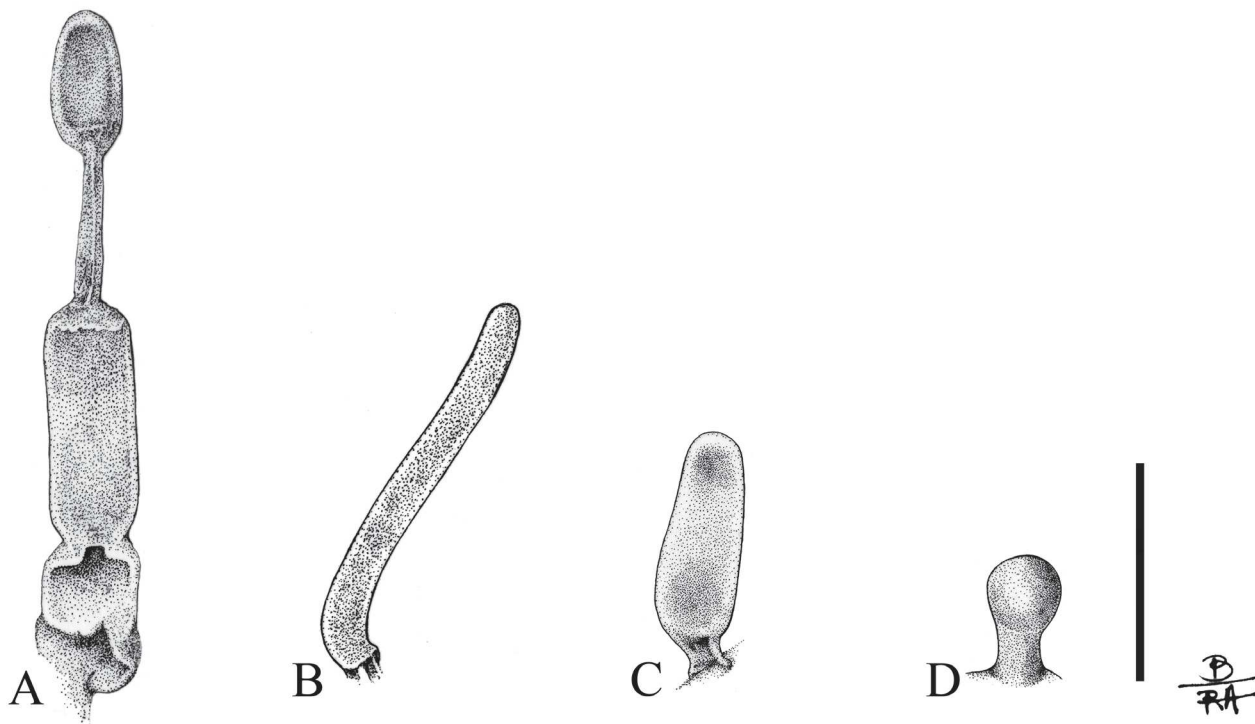


FIGURE 7. The four kinds of trichomes of *Ctenitis* from South America. **A:** catenate. **B:** filiform. **C:** bacilliform. **D:** glandular. All from *Ctenitis bigarellae* (Schwartzburd 565, BHCB). Scale bar = 0.1 mm.

Sori:—The sori are round, medial, supramedial or inframedial (Fig. 08A, C, F). The sporangia stalks are three cells thick (Fig. 08B), the capsules are glabrous, except in *C. ampla*, which contains sporangia with and without bacilliform trichomes (Fig. 08C–D). Indusia can be present or absent. When present they are round-reniform attached at sinus, with margin entire or ciliate. In some species, the indusia are large and consequently conspicuous. However, some specimens of other species, the indusia are reduced and hidden by sporangia, becoming inconspicuous.

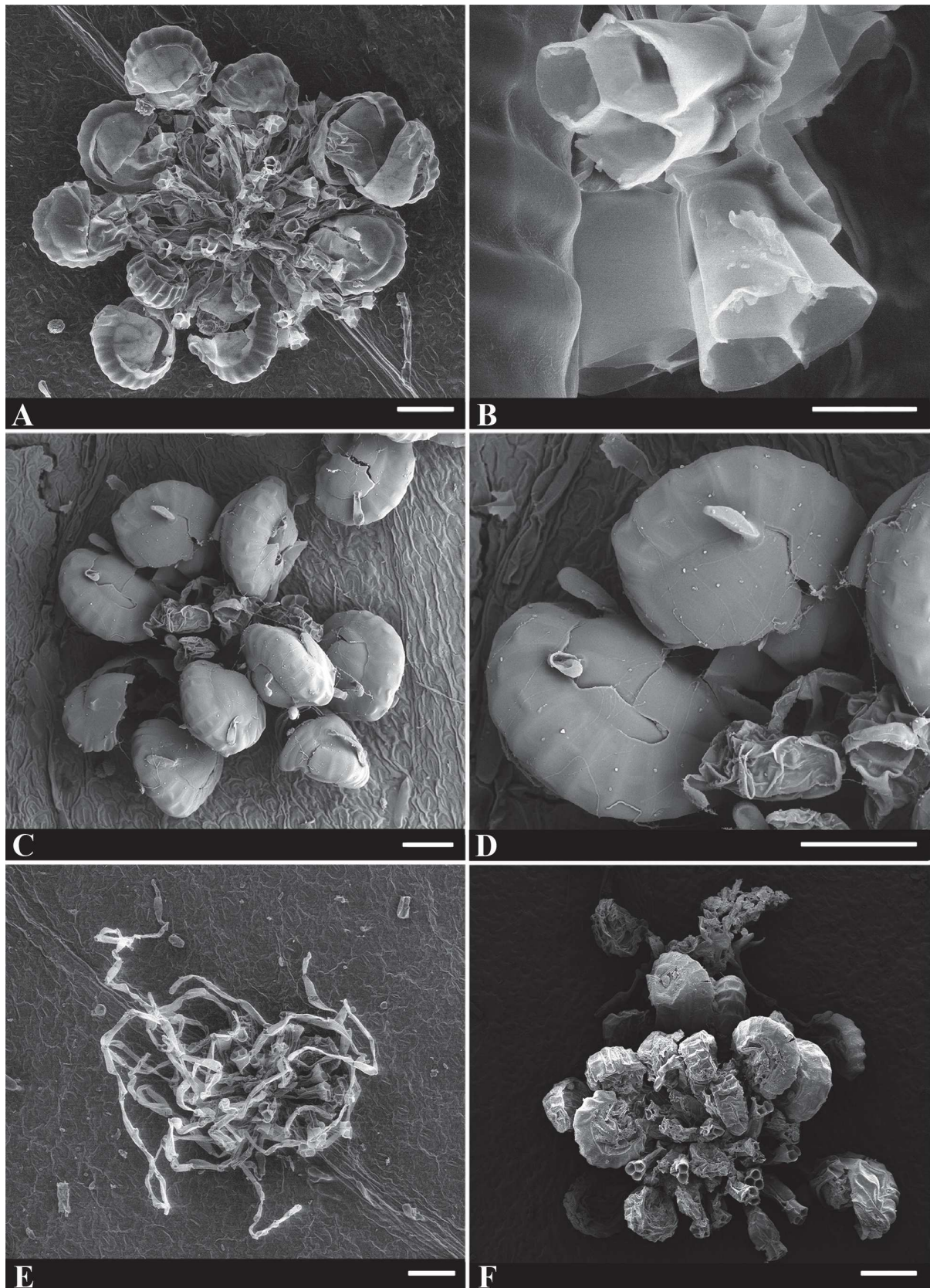


FIGURE 8. Some microscopic characters of the sori of *Ctenitis* from South America. **A:** sporangia without bacilliform trichomes on capsules. **B:** detail showing three rows of cells in the sporangium stalk. **C–D:** sporangia with bacilliform trichomes on capsules. **E:** sori with proscas among the sporangia. **F:** sori with abortive sporangia. A–B from *Ctenitis submarginalis* var. *tenuifolia* (Pietrobon 5015, BHCB), C–D from *C. ampla* (Stewart 960, MO), E from *C. fenestralis* (Salino 7285, BHCB), F from *C. laetevirens* (Schmitt 561, BHCB). Scale bars A, C–F= 100 μ m, B = 20 μ m.

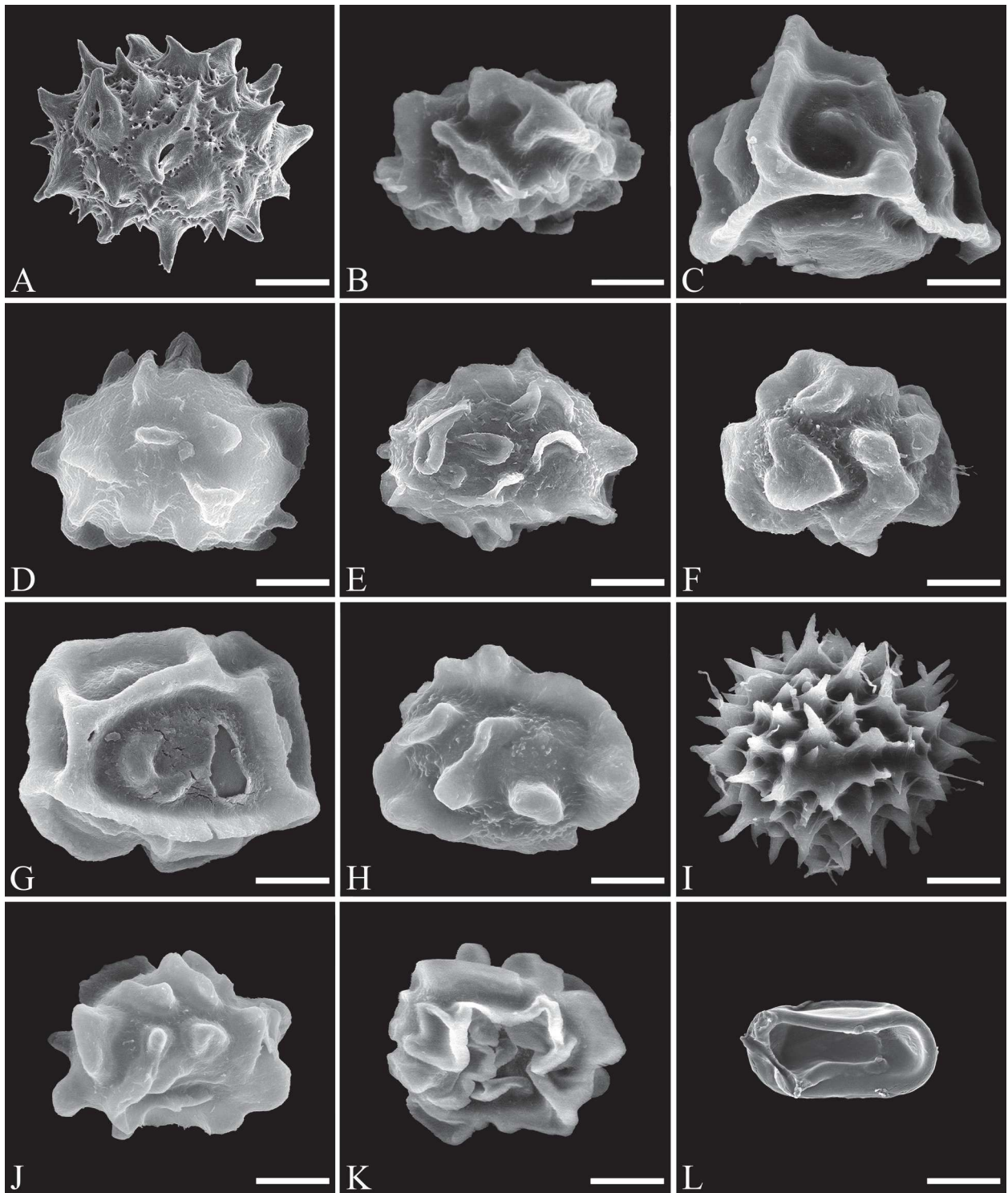


FIGURE 9. Spores of *Ctenitis* from South America. **A:** *C. ampla* (Salino 3257, BHCB). **B:** *C. anniesii* (Gasper 851, BHCB). **C:** *C. aspidioides* (Salino 8291, BHCB). **D:** *C. bigarellae* (Schwartzburd 565, BHCB, from Viveros & Salino 2015). **E:** *C. christensenii* (Salino 13408, BHCB, from Viveros & Salino 2015). **F:** *C. deflexa* (Salino 2383, BHCB). **G:** *C. distans* var. *distans* (Fontana 4996, BHCB). **H:** *C. distans* var. *isabellina* (Lombardi 6830, BHCB). **I:** *C. equestris* var. *equestris* (Copeland 20, UC). **J:** *C. eriocaulis* (Pietrobon 5007, BHCB). **K:** *C. falciculata* (Sampaio s.n. R, from Viveros & Salino 2015). **L:** *C. fenestralis* (Spannagel 174, NY). Scale bars = 10 μ m.

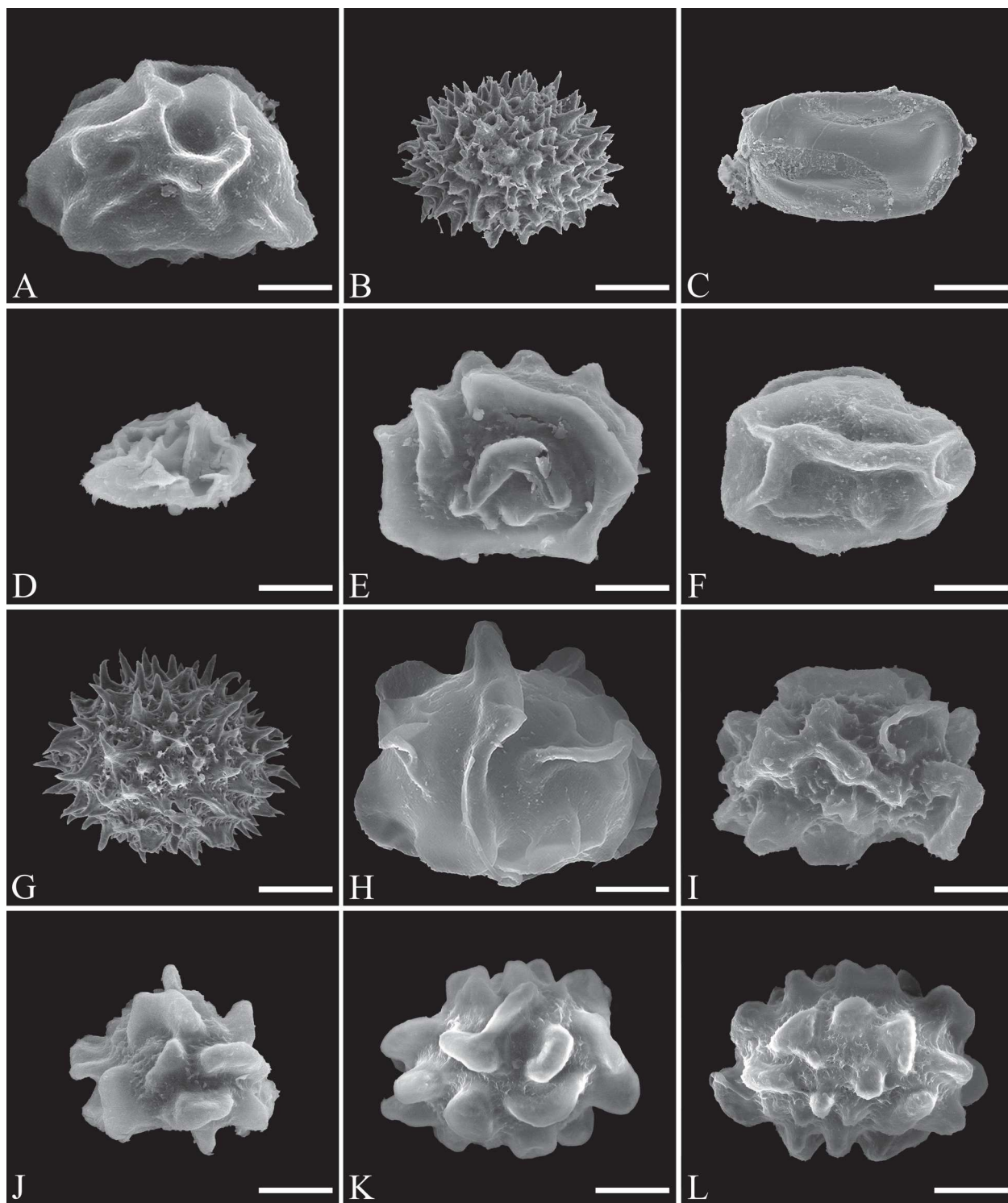


FIGURE 10. Spores of *Ctenitis* from South America. **A:** *C. glandulosa* (Salino 13626, BHCB, from Viveros & Salino 2015). **B:** *C. grisebachii* (Underwood 445, NY). **C:** *C. laetevirens* (Schimitt 561, BHCB). **D:** *C. megalastriformis* (Tuomisto 13393, UC). **E:** *C. microchlaena* (Mickel 2626, NY). **F:** *C. nervata* (Almeida 1682, BHCB). **G:** *C. nigrovenia* (Salino 15212, BHCB). **H:** *C. paranaensis* (Kozera 356, BHCB, from Viveros & Salino 2015). **I:** *C. refulgens* var. *refulgens* (Salino 15242, BHCB). **J:** *C. refulgens* var. *peruviana* (Schunke 5941, NY). **K:** *C. submarginalis* var. *submarginalis* (Verdi 1843, BHCB). **L:** *C. submarginalis* var. *tenuifolia* (Pietrobon 5015, BHCB). Scales bars = 10 μ m.

Spores:—The spores are ellipsoidal and monolete. The species from South America have two patterns of surface: echinate or with coarse folds and tubercles (Fig. 09, 10). Christensen (1920) examined only spores echinate of some 2–4-pinnate-pinnatifid species. Tryon & Tryon (1982) and Tryon & Lugardon (1991) recorded

also spores with folds and tubercles for other Neotropical species. Both patterns were also recorded for Paleotropical species (Holttum 1985). The species from South America with echinate spores are the 2–4-pinnate-pinnatifid (*C. ampla*, *C. equestris* and *C. grisebachii*), except *C. nigrovenia*. All the other species are 1-pinnate-pinnatifid/pinnatisect which spores are with coarse folds and tubercles.

The sporangia of specimens of *C. abyssi*, *C. aspidioides*, *C. fenestralis* and *C. laetevirens* are most dark, atrophied and abortive (Fig. 08F). The spores of *C. abyssi* were not seen, because this species is only known by the type collection and in which was not possible to observe any spore. Due to the abortive sporangia in some specimens of *C. aspidioides* and *C. fenestralis*, their spores were misshaped (Fig. 09L), but in other specimens, both sporangia and spores were apparently normal. In *C. laetevirens* no specimen with “normal” spores (Fig. 10C) were found. Undeveloped, aborted and misshaped spores are known in hybrids, what could indicate that such taxa are hybrid. However, we did not investigate this issue.

Diversity and ecology

We recognize 26 taxa of *Ctenitis* in South America, from which 23 species and three varieties. The distribution and richness in South America is shown in Fig. 11. Only seven taxa are not exclusive of South America: *C. ampla*, *C. equestris* var. *equestris*, *C. grisebachii*, *C. microchlaena*, *C. nigrovenia*, *C. refulgens* var. *refulgens* and *C. submarginalis* var. *submarginalis*. The taxa and their distribution are summarized at Tab. 01.

According to Salino & Almeida (2010), Brazil harbors 17 species, from which 10 are endemic. These data are here updated to 22 taxa (20 species and two varieties), from which 13 (11 species and two varieties) are endemic. Thus, Brazil is the main center of richness in South America, which endemic taxa are restricted to Atlantic Forest. The richest regions are mountainous and along the Atlantic coast. The taxa occurring in the other South American countries are also found widely distributed in Mesoamerica and West Indies, except *C. megalastriformis*, which is recorded only in Peru, and *C. refulgens* var. *peruviana*, recorded in Peru and Bolivia. *Ctenitis equestris* var. *equestris* and *C. grisebachii* are new records to South America, and *C. microchlaena* is new to Brazil. Chile is the only country that no records were found. All taxa are terrestrial and occur in wet and shaded forests. Some of them can also be epipetric (*C. bigarellae* and *C. christensenii*) in that kind of habitat or in sandstones formations.

TABLE 01. Taxa of *Ctenitis* in South America and their geographic distribution.

(SA = South America; MA = Mesoamerica; WI = West Indies; ARG = Argentina; BOL = Bolivia; BRA = Brazil; URU = Uruguay; PAR = Paraguay; PER = Peru; ECU = Ecuador; COL = Colombia; VEN = Venezuela; GUY = Guyana; SUR = Suriname; FGUI = French Guiana; * = endemic to Atlantic Forest).

Taxa	Distribution			
	SA	MA	WI	Countries of SA
1. <i>C. abyssi</i>	X			BRA*
2. <i>C. ampla</i>	X	X	X	ARG, BOL, BRA, COL, ECU, PER, VEN
3. <i>C. anniesii</i>	X			BRA*
4. <i>C. aspidioides</i>	X			BRA*
5. <i>C. bigarellae</i>	X			BRA
6. <i>C. christensenii</i>	X			BRA*
7. <i>C. deflexa</i>	X			BRA*
8.1. <i>C. distans</i> var. <i>distans</i>	X			BRA*
8.2. <i>C. distans</i> var. <i>isabellina</i>	X			BRA*
9. <i>C. equestris</i> var. <i>equestris</i>	X	X		COL, ECU, VEN
10. <i>C. eriocaulis</i>	X			BRA, PAR*
11. <i>C. falciculata</i>	X			BRA, GUY
12. <i>C. fenestralis</i>	X			BRA*
13. <i>C. flexuosa</i>	X			BRA*
14. <i>C. glandulosa</i>	X			BRA, GUY
15. <i>C. grisebachii</i>	X	X	X	ECU

...Continued on next page

TABLE 01. (Continued)

Taxa	Distribution			
	SA	MA	WI	Countries of SA
16. <i>C. laetevirens</i>	X			BRA*
17. <i>C. megalastriformis</i>	X			PER
18. <i>C. microchlaena</i>	X	X	X	BOL, BRA, COL, ECU, PER, VEN
19. <i>C. nervata</i>	X			BOL, BRA
20. <i>C. nigrovenia</i>	X	X	X	BOL, BRA, COL, PER, VEN
21. <i>C. paranaensis</i>	X			BRA*
22.1. <i>C. refulgens</i> var. <i>refulgens</i>	X	X	X	BOL, BRA, COL, ECU, FGUI, GUY, PER, SUR, VEN
22.2. <i>C. refulgens</i> var. <i>peruviana</i>	X			BOL, PER
23.1. <i>C. submarginalis</i> var. <i>submarginalis</i>	X	X	X	ARG, BOL, BRA, COL, ECU, PAR, PER, URU, VEN
23.2. <i>C. submarginalis</i> var. <i>tenuifolia</i>	X			BRA

Nomenclature

Altogether, we dealt with 163 names that apply to South American *Ctenitis* (Tab. 02). We present three new combinations and, for purposes of typification, we designate 38 lectotypes and three neotypes.

Other seven names we consider as uncertain application, due to unavailability of original material or if available, the types represent more than one taxon and their description does not allow us to know which.

TABLE 2. List of all names that apply to South American *Ctenitis*.

The numbers in parentheses refer to the taxa numbers assigned in the taxonomic treatment (see TABLE 01). Accepted names appear in bold. (^{LT} = lectotype designated here; ^{NT} = neotype designated here; both ^{LT} and ^{NT} assigned only for basionyms).

<i>Aspidium alsophilaceum</i> Kunze in Mett.	(4)
<i>Aspidium amaurolepis</i> Fée	(8.1 ^{LT})
<i>Aspidium amplum</i> (Humb. & Bonpl. ex Willd.) Mett.	(2)
<i>Aspidium basilare</i> Fée	(7 ^{LT})
<i>Aspidium bourgeau</i> Fourn.	(9 ^{LT})
<i>Aspidium caripense</i> (Humb. & Bonpl. ex Willd.) Mett.	(23.1)
<i>Aspidium caripense</i> (Humb. & Bonpl. ex Willd.) Mett. f. <i>macroloba</i> A. Braun	(23.1 ^{LT})
<i>Aspidium catocarpum</i> Kunze	(2 ^{NT})
<i>Aspidium chrysolobum</i> Link	(11)
<i>Aspidium ctenitis</i> Link	(8.1 ^{LT})
<i>Aspidium culcita</i> Christ	(2 ^{LT})
<i>Aspidium equestre</i> Kunze	(9 ^{LT})
<i>Aspidium eriocaulon</i> Fée	(10 ^{LT})
<i>Aspidium falciculatum</i> Raddi	(11)
<i>Aspidium flexuosum</i> Fée	(13 ^{LT})
<i>Aspidium furcatum</i> Klotzsch	(2 ^{LT})
<i>Aspidium isabellinum</i> Fée	(8.2 ^{LT})
<i>Aspidium karstenii</i> A. Braun	(18 ^{LT})
<i>Aspidium microchlaena</i> Fée	(18)
<i>Aspidium nemophilum</i> Kunze	(2 ^{NT})

...Continued on next page

TABLE 02. (Continued)

<i>Aspidium nervatum</i> Fée	(19)
<i>Aspidium obtusilobum</i> Fée	(18 ^{LT})
<i>Aspidium pedicellatum</i> Christ	(19)
<i>Aspidium raddianum</i> Mett.	(7)
<i>Aspidium sancti-pauli</i> Christ	(23.1 ^{LT})
<i>Aspidium scabriusculum</i> Davenp., <i>nom. illeg.</i>	(9 ^{LT})
<i>Aspidium schomburgkii</i> Klotzsch	(11)
<i>Aspidium schottianum</i> Kunze ex Hook. & Baker	(11)
<i>Aspidium sericeum</i> Fée	(11)
<i>Aspidium setosum</i> Klotzsch	(20 ^{LT})
<i>Aspidium tijucense</i> Fée	(4 ^{LT})
<i>Aspidium tonduzii</i> Christ	(20 ^{LT})
<i>Ctenitis abyssii</i> (Sehnm) Salino & P.O. Morais	(1)
<i>Ctenitis ampla</i> (Humb. & Bonpl. ex Willd.) Ching	(2)
<i>Ctenitis anniesii</i> (Rosenst.) Copel.	(3)
<i>Ctenitis aspidioides</i> (C. Presl) Copel.	(4)
<i>Ctenitis bigarellae</i> Schwartzb., Labiak & Salino	(5)
<i>Ctenitis catocarpa</i> (Kunze) Morton	(2)
<i>Ctenitis christensenii</i> R.S. Viveros & Salino	(6)
<i>Ctenitis deflexa</i> (Kaulf.) Copel.	(7)
<i>Ctenitis distans</i> (Brack.) Ching var. <i>distans</i>	(8.1)
<i>Ctenitis distans</i> (Brack.) Ching var. <i>isabellina</i> (Fée) R.S. Viveros & Salino, <i>comb. nov.</i>	(8.2)
<i>Ctenitis equestris</i> (Kunze) Ching var. <i>equestris</i>	(9)
<i>Ctenitis eriocaulis</i> (Fée) Alston	(10)
<i>Ctenitis falciculata</i> (Raddi) Ching	(11)
<i>Ctenitis fenestralis</i> (C. Chr.) Copel.	(12)
<i>Ctenitis flexuosa</i> (Fée) Copel.	(13)
<i>Ctenitis glandulosa</i> R.S. Viveros & Salino	(14)
<i>Ctenitis grisebachii</i> (Baker) Ching	(15)
<i>Ctenitis laetevirens</i> (Rosenst.) Salino & P.O. Morais	(16)
<i>Ctenitis megalastriformis</i> R.S. Viveros & Salino	(17)
<i>Ctenitis microchlaena</i> (Fée) Stolze in R.M. Tryon & Stolze	(18)
<i>Ctenitis molinae</i> Stolze	(15)
<i>Ctenitis nemophila</i> (Kunze) Ching	(2)
<i>Ctenitis nervata</i> (Fée) R.S. Viveros & Salino	(19)
<i>Ctenitis nigrovenia</i> (Christ) Copel.	(20)
<i>Ctenitis palatangana</i> (Hook.) Ching	(2)
<i>Ctenitis paranaensis</i> (C. Chr.) Lellinger	(21)
<i>Ctenitis pedicellata</i> (Christ) Copel.	(19)
<i>Ctenitis refulgens</i> (Klotzsch ex Mett.) C. Chr. ex Vareschi var. <i>peruviana</i> (C. Chr.) R.S. Viveros & Salino, <i>comb. nov.</i>	(22.2)
<i>Ctenitis refulgens</i> (Klotzsch ex Mett.) C. Chr. ex Vareschi var. <i>refulgens</i>	(22.1)

...Continued on next page

TABLE 02. (Continued)

<i>Ctenitis sloanei</i> (Poepp. Ex Spreng.) Morton	(2)
<i>Ctenitis sotoana</i> Rojas	(15)
<i>Ctenitis submarginalis</i> (Langsd. & Fisch.) Ching f. <i>caripense</i> (Humb. & Bonpl. ex Willd.) Lellinger	(23.1)
<i>Ctenitis submarginalis</i> (Langsd. & Fisch.) Ching var. <i>submarginalis</i>	(23.1)
<i>Ctenitis submarginalis</i> (Langsd. & Fisch.) Ching var. <i>tenuifolia</i> (C. Presl) R.S. Viveros & Salino, <i>comb. nov.</i>	(23.2)
<i>Ctenitis thelypteroides</i> A.R. Sm.	(20)
<i>Ctenitis tonduzii</i> (Christ) R.M. Tryon & A.F. Tryon	(20)
<i>Dryopteris abyssii</i> Sehnem	(1)
<i>Dryopteris alsophilacea</i> (Kunze) Kuntze	(4)
<i>Dryopteris anniesii</i> Rosenst.	(3)
<i>Dryopteris anniesii</i> Rosenst. var. <i>ottonis</i> Rosenst. ex C. Chr.	(3 ^{LT})
<i>Dryopteris bourgeauii</i> (E. Fourn.) C. Chr.	(9)
<i>Dryopteris camptocaulis</i> (Fée) C. Chr.	(13)
<i>Dryopteris catocarpa</i> (Kunze) Kuntze	(2)
<i>Dryopteris chrysoloba</i> (Link) Kuntze	(11)
<i>Dryopteris cirrhosa</i> (Schum.) Kuntze var. <i>eriocaulis</i> (Fée) C. Chr.	(10)
<i>Dryopteris collina</i> Christ	(23.1 ^{LT})
<i>Dryopteris ctenitis</i> (Link) Kuntze	(8.1)
<i>Dryopteris ctenitis</i> (Link) Kuntze f. <i>amaurolepis</i> (Fée) C. Chr.	(8.1)
<i>Dryopteris ctenitis</i> (Link) Kuntze f. <i>isabellina</i> (Fée) C. Chr.	(8.2)
<i>Dryopteris culcita</i> (Christ) C. Chr.	(2)
<i>Dryopteris davenportii</i> C. Chr.	(9)
<i>Dryopteris deflexa</i> (Kaulf.) C. Chr.	(7)
<i>Dryopteris deflexa</i> (Kaulf.) C. Chr. var. <i>aschersonii</i> Mett. ex C. Chr.	(7 ^{LT})
<i>Dryopteris equestris</i> (Kunze) C. Chr.	(9)
<i>Dryopteris eriocaulis</i> (Fée) Kuntze	(10)
<i>Dryopteris falciculata</i> (Raddi) Kuntze	(11)
<i>Dryopteris falciculata</i> (Raddi) Kuntze f. <i>glabrata</i> Hieron. ex C. Chr.	(21)
<i>Dryopteris falciculata</i> (Raddi) Kuntze f. <i>sericea</i> (Fée) C. Chr.	(11)
<i>Dryopteris falciculata</i> (Raddi) Kuntze var. <i>elongata</i> Rosenst.	(5)
<i>Dryopteris falciculata</i> (Raddi) Kuntze var. <i>paranaensis</i> C. Chr.	(21)
<i>Dryopteris fenestralis</i> C. Chr.	(12 ^{LT})
<i>Dryopteris fenestralis</i> C. Chr. var. <i>spannagelii</i> Rosenst. ex C. Chr.	(12 ^{LT})
<i>Dryopteris flexuosa</i> (Fée) Kuntze	(13)
<i>Dryopteris furcata</i> (Klotzsch) Kuntze	(2)
<i>Dryopteris grisebachii</i> (Baker) Kuntze	(15)
<i>Dryopteris huatuscensis</i> C. Chr.	(18)
<i>Dryopteris indecora</i> Rosenst.	(19)
<i>Dryopteris isabellina</i> (Fée) C. Chr.	(8.2)
<i>Dryopteris itatiaiensis</i> C. Chr.	(4)
<i>Dryopteris karstenii</i> (A. Braun) C. Chr.	(18)

...Continued on next page

TABLE 02. (Continued)

<i>Dryopteris laetevirens</i> Rosenst.	(16)
<i>Dryopteris lagerheimii</i> (Sodirol) C. Chr.	(23.1)
<i>Dryopteris microchlaena</i> (Fée) C. Chr.	(18)
<i>Dryopteris nemophila</i> (Kunze) C. Chr.	(2)
<i>Dryopteris nigrovenia</i> (Christ) C. Chr.	(20)
<i>Dryopteris palatanga</i> (Hook.) C. Chr.	(2)
<i>Dryopteris pedicellata</i> (Christ) C. Chr.	(19)
<i>Dryopteris refulgens</i> (Klotzsch ex Mett.) C. Chr.	(22.1)
<i>Dryopteris refulgens</i> (Klotzsch ex Mett.) C. Chr. var. <i>peruviana</i> C. Chr.	(22.2 ^{LT})
<i>Dryopteris sellowii</i> Hieron.	(23.1 ^{LT})
<i>Dryopteris sloanei</i> (Poepp. ex Spreng.) Kuntze	(2)
<i>Dryopteris soriloba</i> Christ	(23.1 ^{LT})
<i>Dryopteris submarginalis</i> (Langsd. & Fisch.) C. Chr.	(23.1)
<i>Dryopteris submarginalis</i> (Langsd. & Fisch.) C. Chr. f. <i>caripensis</i> (Humb. & Bonpl. ex Willd.) C. Chr.	(23.1)
<i>Dryopteris submarginalis</i> (Langsd. & Fisch.) C. Chr. f. <i>glaucescens</i> (Sodirol) C. Chr.	(23.1)
<i>Dryopteris submarginalis</i> (Langsd. & Fisch.) C. Chr. f. <i>tenuifolia</i> (C. Presl) C. Chr.	(23.2)
<i>Dryopteris submarginalis</i> (Langsd. & Fisch.) C. Chr. f. <i>vera</i> C. Chr., <i>nom. illeg.</i>	(23.1)
<i>Dryopteris submarginalis</i> (Langsd. & Fisch.) C. Chr. var. <i>lagerheimii</i> (Sodirol) C. Chr.	(23.1)
<i>Dryopteris submarginalis</i> (Langsd. & Fisch.) C. Chr. var. <i>tarapotensis</i> (Hook.) C. Chr.	(23.1)
<i>Dryopteris taimbensis</i> Sehnem, <i>nom. nud.</i>	(1)
<i>Dryopteris tenuifolia</i> (C. Presl) C. Chr., <i>nom. illeg.</i>	(23.2)
<i>Dryopteris tenuifolia</i> (C. Presl) Kuntze	(23.2)
<i>Dryopteris tonduzii</i> (Christ) C. Chr.	(20)
<i>Lastrea aspidioides</i> (C. Presl) C. Presl	(4)
<i>Lastrea ciliata</i> Liebm.	(9)
<i>Lastrea distans</i> Brack.	(8.1)
<i>Lastrea tenuifolia</i> C. Presl	(23.2)
<i>Nephrodium alsophilaceum</i> (Kunze in Mett.) Baker	(4)
<i>Nephrodium amplum</i> (Humb. & Bonpl. ex Willd.) Baker	(2)
<i>Nephrodium caripense</i> (Humb. & Bonpl. ex Willd.) Hook.	(23.1)
<i>Nephrodium chrysolobum</i> (Link) Fée	(11)
<i>Nephrodium crinitum</i> Sodirol var. <i>glaucescens</i> Sodirol	(23.1 ^{LT})
<i>Nephrodium ctenitis</i> (Link) Baker	(8.1)
<i>Nephrodium eriocaulon</i> (Fée) Baker	(10)
<i>Nephrodium flexuosum</i> (Fée) Baker	(13)
<i>Nephrodium grisebachii</i> Baker	(15 ^{LT})
<i>Nephrodium lagerheimii</i> Sodirol	(23.1 ^{LT})
<i>Nephrodium nigrovenium</i> Christ	(20)
<i>Nephrodium palatanganum</i> Hook.	(2)
<i>Nephrodium raddianum</i> (Mett.) Hook.	(7)
<i>Nephrodium ramentaceum</i> Baker, <i>nom. illeg.</i>	(10)
<i>Nephrodium refulgens</i> (Klotzsch ex Mett.) Diels	(22.1)

...Continued on next page

TABLE 02. (Continued)

<i>Nephrodium tarapotense</i> Hook.	(23.1)
<i>Nephrodium vestitum</i> (Raddi) Baker	(7)
<i>Phegopteris blanchetiana</i> Fée	(23.2 ^{LT})
<i>Phegopteris camptocaulon</i> Fée	(13 ^{LT})
<i>Phegopteris fluminensis</i> Fée	(7 ^{LT})
<i>Phegopteris oreopteridastrum</i> Fée	(23.2 ^{LT})
<i>Phegopteris refulgens</i> Klotzsch ex Mett.	(22.1 ^{LT})
<i>Phegopteris tricholepis</i> Fée	(22.1 ^{LT})
<i>Polypodium alsophiloides</i> Liebm.	(9)
<i>Polypodium amplum</i> Humb. & Bonpl. ex Willd.	(2)
<i>Polypodium aspidioides</i> C. Presl	(4 ^{LT})
<i>Polypodium caripense</i> Humb. & Bonpl. ex Willd.	(23.1)
<i>Polypodium ciliatum</i> C. Presl	(11)
<i>Polypodium deflexum</i> Kaulf.	(7 ^{NT})
<i>Polypodium paleaceum</i> Hook.	(2)
<i>Polypodium refulgens</i> (Klotzsch ex Mett.) Hook. & Baker	(22.1)
<i>Polypodium sloanei</i> Poepp. ex Spreng.	(2 ^{LT})
<i>Polypodium submarginale</i> Langsd. & Fisch.	(23.1 ^{LT})
<i>Polypodium vestitum</i> Raddi	(7)

Taxonomic treatment

Ctenitis (C. Chr.) C. Chr. *Dryopteris* subgen. *Ctenitis* C. Chr. Type (designated by Ching 1938):—*Ctenitis distans* (Brackenridge 1854: 192) Ching (1938: 277) [= *Aspidium ctenitis* Link (1833: 277)]

Terrestrial or less frequently epipetric; *stems* mostly erect or ascending, sometimes short-creeping, scaly, bearing old petiole bases and roots; *leaves* monomorphic, small to large, fasciculate; *petioles* stramineous, tan or brownish, darker towards base, densely scaly at base, less scaly towards apex, the scales usually clathrate or subclathrate; *laminae* membranaceous, 1-pinnate-pinnatifid to 4-pinnate-pinnatifid; *adaxial surface of main axes* (petiole to costa) with catenate trichomes; *rachises and costae abaxially* sparsely to densely scaly, the scales flattish or vaulted or bullate at base; *pinnae* anadromous for the basal ones, and catadromous for the more distal ones, with truncate to cuneate base; *veins* free, slender tips, simple or 1–3-forked in the ultimate segments; *sori* round, indusia round-reniform attached at sinus, large or sometimes small and inconspicuous or absent; *sporangia* with three rows of cells in the pedicel; *spores* monolete, ellipsoid, surface with coarse folds and large tubercles or with coarse irregular echinae; $x = 41$.

Etymology:—The name *Ctenitis* is taken from the Greek “*kteis*”, which means comb. The segments of a pinna suggest the teeth of a comb.

Key to the taxa of *Ctenitis* in South America

1. Laminae 2–4-pinnate-pinnatifid (Fig. 03C) at base and and medially..... 2
- Laminae 1-pinnate-pinnatifid/pinnatisect (Fig. 03A) at base and medially, to 2-pinnate-pinnatifid at base and 1-pinnate-pinnatifid medially (Fig. 05E)..... 5
2. Rachises flexuous (Fig. 03B), abaxially lanuginose with short to long-fimbriate scales, tangled among proscapes..... *C. flexuosa*
- Rachises more or less straight (Fig. 03C), abaxially not lanuginose, with entire or short-fimbriate scales, without proscapes..... 3

3.	Rachises and costae with scales stiff, patent or retrorse, linear or linear-lanceolate with truncate base (Fig. 19G)	
– <i>C. grisebachii</i>	
–	Rachises and costae with scales flaccid, ascending or appressed, lanceolate or ovate with cordate base (Figs. 12D, 17B)...	4
4.	Rachises and costae with scales dark brown to blackish, sometimes pale at edges, iridescent (Fig. 17B)	
– <i>C. equestris</i> var. <i>equestris</i>	
–	Rachises and costae with scales uniformly light castaneous or castaneous, not iridescent (Fig. 12D)	<i>C. ampla</i>
5.	Pinnae incised 1/4–2/3 of the distance between the segment apex and costa (Figs. 05A–C); basal veins from adjacent segments reach the margin at sinus (<i>e.g.</i> Figs. 13A; 22A; 24A)	6
–	Pinnae incised more than 2/3 (rarely ca. 1/2) of the distance between the segment apex and costa (<i>e.g.</i> Fig. 05D); basal veins from adjacent segments ending before the margin towards above the sinus or end at margin somewhat or well above the sinus (<i>e.g.</i> Figs. 05E; 12A; 13F).....	9
6.	Lamina apex conform (Fig. 04A) or subconform (Fig. 04 B); indusia present	<i>C. aspidioides</i>
–	Lamina apex confluent (pinnatifid with the most distal pinnae reduced and confluent to the rachis; Fig. 04C); indusia absent.....	7
7.	Petioles, rachises and costae abaxially with scales stiff, dark brown (Fig. 06C) or castaneous (Fig. 06B); abaxial laminar surface between veins glabrous; costa adaxially without scales	<i>C. nervata</i>
–	Petioles, rachises and costae abaxially with scales flaccid, light castaneous (Fig. 06A) or castaneous (Fig. 06B); abaxial laminar surface between veins with sparse bacilliform trichomes (Figs. 07C; 24B, D); costa adaxially with scales	8
8.	Pinnae incised 1/2–2/3 of the distance between the segment apex and costa (Figs. 05B–C); costa abaxially with linear scales (Figs. 24A–C)	<i>C. refulgens</i> var. <i>refulgens</i>
–	Pinnae incised 1/4–1/3 of the distance between the segment apex and costa (Fig. 05A); costa abaxially with lanceolate scales (Figs. 24 D–E).....	<i>C. refulgens</i> var. <i>peruviana</i>
9.	Indusia absent or small and inconspicuous	10
–	Indusia conspicuous	17
10.	Sori with a tuft of proscas among sporangia (Fig. 08E).....	<i>C. fenestralis</i>
–	Sori without a tuft of proscas among sporangia.....	11
11.	Rachis and costal scales ovate (Fig. 12B).....	<i>C. abyssii</i>
–	Rachis and costal scales linear (<i>e.g.</i> Figs. 12H; 13D), linear-lanceolate (<i>e.g.</i> Fig. 15E) or lanceolate (<i>e.g.</i> Fig. 13H).....	12
12.	Lamina 2-pinnate-pinnatifid basally, 1-pinnate-pinnatisect to 1-pinnate-pinnatifid medially (Fig. 05E); basal veins from adjacent segments end before margin, towards above the sinus (illustrated in Viveros & Salino 2017).....	
– <i>C. megalastriformis</i>	
–	Lamina 1-pinnate-pinnatisect to 1-pinnate-pinnatifid basally and medially; basal veins from adjacent segments reach the margin at sinus (<i>e.g.</i> Fig. 15D), or somewhat or well above the sinus (<i>e.g.</i> Fig. 15A; 17 C–D; 19A)	13
13.	Segments margin glabrous	14
–	Segments margin with catenate trichomes	15
14.	Abaxial laminar surface between veins glabrous (Fig. 21A).....	<i>C. laetevirens</i>
–	Abaxial laminar surface between veins with sparse bacilliform trichomes (Fig. 22C)	<i>C. nigrovenia</i>
15.	Rachis scales dark brown to blackish (Fig. 06C).....	<i>C. paranaensis</i>
–	Rachis scales castaneous (Fig. 06B) or light castaneous (Fig. 06A)	16
16.	Costal scales lanceolate with cordate base (Figs. 26A–B).....	<i>C. submarginalis</i> var. <i>submarginalis</i>
–	Costal scales linear or filiform with truncate or rounded base (Figs. 2C–D)	<i>C. submarginalis</i> var. <i>tenuifolia</i>
17.	Sori inframedial; costule abaxially with scales like the ones on costa, but shorter, at least basally (but with or without proscas).....	18
–	Sori medial or suprasedial; costule abaxially without scales like the ones on costa (but with or without proscas).....	22
18.	Stem short-creeping (Fig. 01C); rachis and costal scales abaxially with many short and long fimbriae along all margin, the ones on rachis dark brown with pale edges and the ones on costa uniformly light castaneous (Figs. 13G–H).....	<i>C. deflexa</i>
–	Stem erect (Fig. 01A) or ascending (Fig. 01B); rachis and costal scales abaxially with or without some short fimbriae at base and laterally, the ones on rachis uniformly light castaneous or uniformly dark brown to blackish, and the ones on costa uniformly light castaneous, or uniformly dark brown to blackish or mostly castaneous but dark brown to blackish towards apex	19
19.	Rachis scales light castaneous, entire (<i>e.g.</i> Figs. 17G; 21D) or slightly denticulate (<i>e.g.</i> Fig.19B)	20
–	Rachis scales dark brown to blackish, dentate, the teeth claw-shaped (<i>e.g.</i> Figs. 15B, C, E)	21
20.	Rachis and costa abaxially with scales lanceolate with cordate base, slightly denticulate (Fig. 12I)	<i>C. anniesii</i>
–	Rachis and costa abaxially with scales subulate, vaulted at base, entire (Fig. 17G)	<i>C. eriocaulis</i>
21.	Costa abaxially with scales mostly castaneous, clathrate, but dark brown to blackish towards apex; abaxial laminar surface between veins glabrous or with sparse bacilliform trichomes (Figs. 15A–B)	<i>C. distans</i> var. <i>distans</i>
–	Costa abaxially with scales dark brown to blackish, mostly subclathrate, dark brown to blackish; abaxial laminar surface between veins with sparse catenate trichomes (Figs 15C–D).....	<i>C. distans</i> var. <i>isabellina</i>
22.	Segments margin glabrous	<i>C. nigrovenia</i>
–	Segments margins with catenate trichomes	23

23. Rachis and costa abaxially with scales with many short and long fimbriae along all margin, the ones on rachis dark brown with pale edges and the ones on costa uniformly light castaneous (Figs. G–H)..... *C. deflexa*
 – Rachis and costal scales abaxially with or without some short fimbriae at base and laterally, the ones on rachis uniformly castaneous or uniformly dark brown to blackish, and the ones on costa uniformly castaneous, or uniformly dark brown to blackish..... 24
24. Adaxial laminar surface between veins with dense filiform trichomes (illustrated in Schwartzburd *et al.* 2007 and Viveros & Salino 2015)..... *C. bigarellae*
 – Adaxial laminar surface between veins glabrous or with sparse to dense catenate trichomes, sometimes also with sparse bacilliform and glandular trichomes..... 25
25. Segment apex apiculate..... 26
 – Segment apex acute, rounded, or obtuse..... 27
26. Costa abaxially with scales lanceolate with cordate base (Figs. 26A–B)..... *C. submarginalis* var. *submarginalis*
 – Costa abaxially with scales filiform with truncate or rounded base (Figs. 26 C–D)..... *C. submarginalis* var. *tenuifolia*
27. Petiole, rachis and costa abaxially with glandular trichomes; abaxial laminar surface between veins with glandular and bacilliform trichomes; indusia with glandular trichomes (Fig. 07D; illustrated in Viveros & Salino 2015)..... *C. glandulosa*
 – Petiole, rachis and costa abaxially without or rarely with glandular trichomes; abaxial laminar surface between veins glabrous or with catenate and bacilliform trichomes, or filiform trichomes and bacilliform trichomes, rarely glandular trichomes; indusia with bacilliform or catenate trichomes 28
28. Rachis scales dark brown to blackish (Fig. 06C); scales on costa abaxially lanceolate 29
 – Rachis scales castaneous (Fig. 06B); scales on costa abaxially linear-lanceolate 30
29. Rachis scales 1–2 mm long; costa and laminar surface between veins with dense catenate trichomes, sometimes also with bacilliform and glandular trichomes (adaxially and abaxially; illustrated in Viveros & Salino 2015)..... *C. falciculata*
 – Rachis scales 3–6 mm long; costa and laminar surface between veins with sparse catenate trichomes (adaxially and abaxially), sometimes also with bacilliform trichomes (abaxially), rarely glabrous (adaxially and abaxially; illustrated in Viveros & Salino 2015)..... *C. paranaensis*
30. (4) 7–11 pinnae pairs; adaxial laminar surface glabrous; plants from southeastern Brazil (illustrated in Viveros & Salino 2015)..... *C. christensenii*
 – 19–27 pinnae pairs; adaxial laminar surface with sparse to dense catenate trichomes; plants from Venezuela, Colombia, Ecuador, Peru, Bolivia and Brazilian Amazon..... *C. microchlaena*

1. *Ctenitis abyssi* (Sehnem) Salino & Morais (2003: 32). Figs. 12A–B, 14A. *Dryopteris abyssi* Sehnem (1979: 156). Type:—BRAZIL. Rio Grande do Sul: São Francisco de Paula, Taimbé, ad rupem in taimbé (canion), 700 m alt., Sehnem 6315 (holotype PACA 68772!).

Stems short-creeping, 2.4 cm diam., scales 9.2–12.4 × 0.9–1.3 mm, light castaneous, clathrate, lanceolate, entire, without fimbriae; *leaves* 43–50 cm long; *petioles* 21–22 cm × 1.2–2.6 mm, with 3 vascular bundles at base, brownish or tan, scales 1.8–4.9 × 0.7–1.2 mm, light castaneous, clathrate, not tangled on petiole base, becoming patent or ascending towards distal portion, mostly flattish, but vaulted at base, flaccid, ovate or lanceolate with slightly cordate base and filiform apex, entire, without fimbriae, sparse catenate trichomes abaxially, glandular trichomes absent; *laminae* 22–28 × 6.5–11 cm, width narrower than 1/3–1/2 of length, 1-pinnate-pinnatifid basally, medially and apically, lanceolate, apex confluent; *rachises* tan or stramineous, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, glandular trichomes absent; *pinnae* 11 pairs, the basal and medial ones stalked to 3.5 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 5.5–8.5 × 1.3–2.1 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments as long or longer than the next, apex attenuate; *adaxial pinnae axes* scales absent, catenate trichomes dense on costa, sparse on costule, rare on veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with sparse scales on costa, 2.4–2.8 × 0.6–0.7 mm, light castaneous, clathrate, ascending, vaulted at base, flaccid, ovate with cordate base and filiform apex, entire, without fimbriae, proscasles absent, catenate trichomes sparse on costa and costule, rare on veins, bacilliform trichomes absent, glandular trichomes sparse on costa and costule, rare on veins, filiform trichomes absent; *abaxial laminar surface between veins* with sparse glandular trichomes; *segments* 14–16 pairs, 2.3–3.0 mm wide, patent or subfalcate, repand or serrate towards apex, apex apiculate, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple or 1-forked at basal segments, 8–10 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* supramedial, indusia absent, *spores* not seen.

Habitat and distribution:—Epipetric. Endemic to southern Brazil (Rio Grande do Sul) in rainforest, at 700 m (Fig. 14A; Tab. 01).

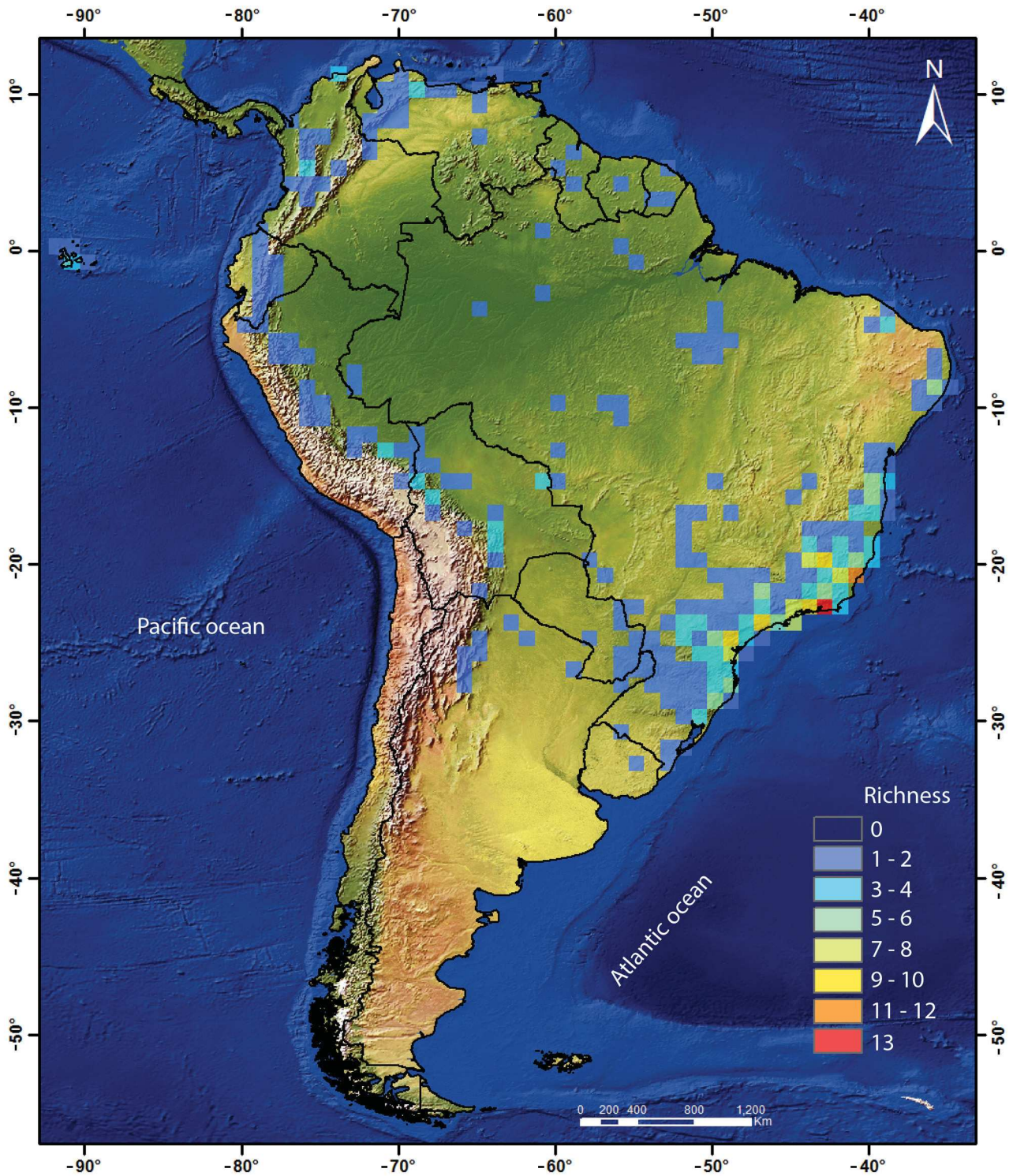


FIGURE 11. Distribution and richness of *Ctenitis* in South America.

Notes:—*Ctenitis abyssii* is similar to *C. nigrovenia* by lamina architecture and serrate segments. Nevertheless, it differs from *C. nigrovenia* by the short-creeping stem (Fig. 1C), segments margin with catenate trichomes (Fig. 7A, 12A) and the scales on costa abaxially light castaneous (Fig. 6A) and ovate (Figs. 12B). In opposition, *C. nigrovenia* stem is erect (Fig. 1A) or ascending (Fig. 1B), the segment margin is glabrous and the scales on costa abaxially are dark brown and linear-lanceolate. *Ctenitis abyssii* is endemic to southern Brazil and is known only from type collection, in Taimbé Cannon region (in Rio Grande do Sul state; Salino & Morais 2003), while *C. nigrovenia* is recorded in northern and central-west Brazilian states, further Venezuela, Colombia, Peru, Bolivia

and other countries of Mesoamerica and West Indies. *Ctenitis abyssii* is also illustrated in Salino & Morais (2003). The holotype of *Ctenis abyssii* was with dark sori, due to abortive sporangia, and no spores were seen.

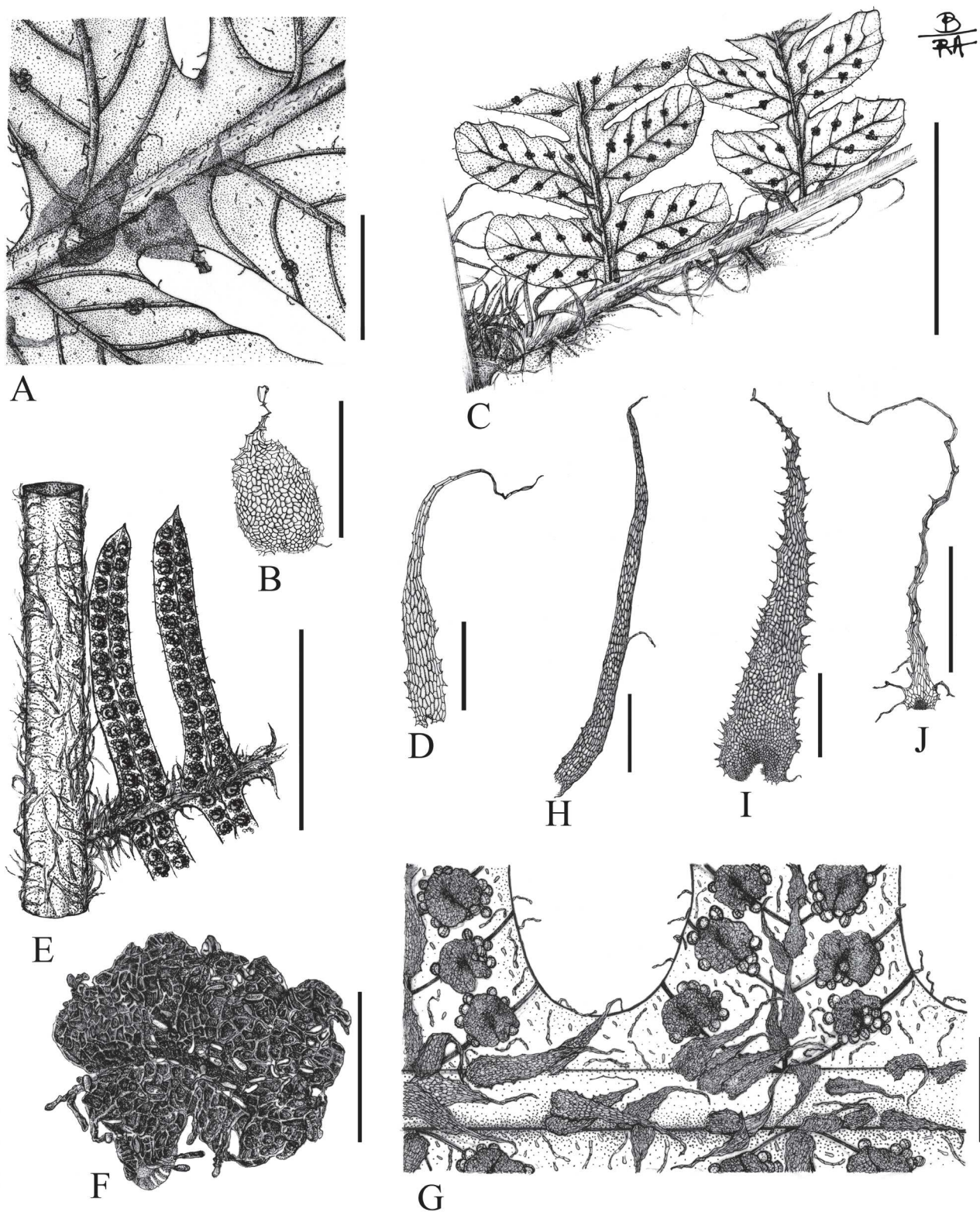


FIGURE 12. Some morphological characters of *Ctenitis* from South America. **A–B:** *C. abyssii* (Sehnem 6315, PACA). **A:** detail of abaxial surface of a medial pinna, showing indument **B:** abaxial costa scale (scale bar = 1 mm). **C–D:** *C. ampla* (Salino 3257, BHCB). **C:** abaxial surface of a portion of pinna rachis and two pinnules of medial pinnae. **D:** abaxial costa scale. **E–J:** *C. anniesii* (Gaspar 851, BHCB). **E:** abaxial surface of a portion of rachis and a medial pinna. **F:** sorus with indusium. **G:** detail of abaxial surface of a medial pinna, showing indument. **H:** petiole scale. **I:** abaxial costa scale. **J:** adaxial costa scale. Scale bars in A, B, D, G–J = 1 mm; C, E, = 1 cm; F = 0.5 mm.

Sehnm (1977) published the *nomen nudum* *Dryopteris taimbensis* and later he validly published the name *D. abyssii* to the species he referred in 1977 (Sehnm 1979).

2. *Ctenitis ampla* (Humb. & Bonpl. ex Willd.) Ching (1940: 250). Figs. 03C, 06A, 08C–D, 09A, 12C–D, 14B. *Polypodium amplum* Humboldt & Bonpland ex Willdenow (1810: 207). *Aspidium amplum* (Humb. & Bonpl. ex Willd.) Mettenius (1858: 74), *non* (Humb. & Bonpl. ex Willd.) Christ in Bommer & Christ (1896: 214), *nom. illeg.* *Nephrodium amplum* (Humb. & Bonpl. ex Willd.) Baker in Hooker & Baker (1868: 285). Type:—VENEZUELA. Caripe, *Humboldt s.n.* (holotype B–W-19722-010!).

Polypodium sloanei Poeppig ex Sprengel (1827: 59). *Dryopteris sloanei* (Poepp. ex Spreng.) Kuntze (1891: 813). *Ctenitis sloanei* (Poepp. ex Spreng.) Morton (1969: 66). Type:—CUBA. *Poeppig s.n.* (lectotype L, designated by Morton 1969, isolectotypes B 20 0052237!, B 20 0052238!, B 20 0052239!, B 20 0052240!, B 20 0052241!, B 20 0052242!, BM 000605200!, BR 0000006989132!, BR 0000006988487! E 00106040!, F 2009038!, HAL 86821 [image!], HBG, K 000590320!, NY 02006034!, P 00642684!, P 00642685!, P 00642686!, P 00642687!, P 00642688! US 00810676!).

Aspidium nemophilum Kunze (1834: 95). *Dryopteris nemophila* (Kunze) Christensen (1920: 57). *Ctenitis nemophila* (Kunze) Ching (1940: 250). Type:—PERU. Pampayaco. July 1829 (holotype LZ destroyed); neotype:—PERU. Huanuco: Muña, in dry woods, 23 May–04 June 1923, *Bryan 530* (F 1829440!, **designated here**).

Aspidium catocarpum Kunze (1834: 95). *Dryopteris catocarpa* (Kunze) Kuntze (1891: 812). *Ctenitis catocarpa* (Kunze) Morton (1951: 12). Type:—PERU. inter Cassipi et Papayaco (holotype LZ, destroyed); neotype:—PERU. San Martin: San Martin, 15 km E of Sharpaja on road to Chazuta, along Quebrada Chumia near Mal Paso Chumia on Rio Huallaga, tropical wet forest and second growth along stream, 76°10'W 06°36' S, 04 August 1986, *Knapp 7869* (MO 3698517!, **designated here**, isoneotype NY!).

Aspidium furcatum Klotzsch (1847: 371). *Dryopteris furcata* (Klotzsch) Kuntze (1891: 81). Type:—COLOMBIA. *Moritz 37* (lectotype BM 000937870!, **designated here**).

Polypodium paleaceum Hooker (1847: 166), *nom. illeg.*, *non* Borkhausen (1798: 20), *non* Powell ex Baker in Hooker & Baker (1874: 505). Type:—ECUADOR. Charles and James Islands, *Darwin s.n.* (lectotype CGE, designated by Porter 1980).

Nephrodium palatanganum Hooker (1862: 260). *Dryopteris palatangana* (Hooker) Christensen (1920: 56). *Ctenitis palatangana* (Hooker) Ching (1940: 250). Type:—ECUADOR. Palatanga. *Spruce 5256* (holotype K 000200145!).

Aspidium culcita Christ (1906: 54). *Dryopteris culcita* (Christ) Christensen (1913b: 31). Type:—COSTA RICA. *Wercklé s.n.* (lectotype P 00642689! **designated here**, isolectotypes BM 000937864!, MO 1638975!, US 00067014!).

Stems erect, 3.7–5.7 cm diam., scales 17.9–32.5 × 0.1–0.3 mm, light castaneous or castaneous, clathrate, linear, entire, without fimbriae; *leaves* 80–200 cm long; *petioles* 30–83 cm × 4.4–10.6 mm, with 6–10 vascular bundles at base, stramineous or tan, scales 7.21–25.34 × (0.12) 0.18–0.68 (1.54) mm, light castaneous or castaneous, clathrate, tangled at base, becoming ascending towards distal portion, flattish, flaccid, linear with truncate or slightly cordate base and filiform apex, entire, without fimbriae, catenate trichomes absent abaxially, sparse glandular trichomes or absent; *laminae* 50–117 × 40–120 cm, width wider than 2/3 of length or more, 3–4-pinnate-pinnatifid basally, 2–3-pinnate-pinnatifid medially and apically, deltate, apex confluent; *rachises* more or less straight, stramineous or tan, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 10–14 pairs, the basal ones stalked to 25.5 (51.2) mm long, the medial ones stalked to 15.3 mm long, the apical ones stalked to 7.2 mm long or sessile, basal pinnae basiscopically enlarged, the medial 32.5–44.5 × 10–18 cm, lanceolate, apex attenuate; *adaxial pinnae axes* with sparse or dense scales on pinna rachis 0.9–3.4 × 0.1–0.4 mm, stramineous or castaneous, lanceolate, catenate trichomes dense on pinna rachis and costa, sparse on costule, rare on veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous or with sparse catenate trichomes near margins; *abaxial pinnae axes* with scales sparse or dense on pinna rachis, costa and costule, (0.9) 1.3–4.3 (5.6) × 0.1–0.7 mm, light castaneous or castaneous, clathrate, patent or ascending, flattish or sometimes vaulted at base, flaccid, lanceolate with cordate base and filiform apex, entire or slightly denticulate, with or without some short fimbriae at base and laterally, catenate trichomes sparse on pinna rachis and costa, sometimes on costule and veins, bacilliform trichomes sparse on costa, costule and veins, glandular trichomes sparse or absent on pinna rachis, costa, costule and veins, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse catenate and bacilliform trichomes; *pinnules* 11–19 pairs,

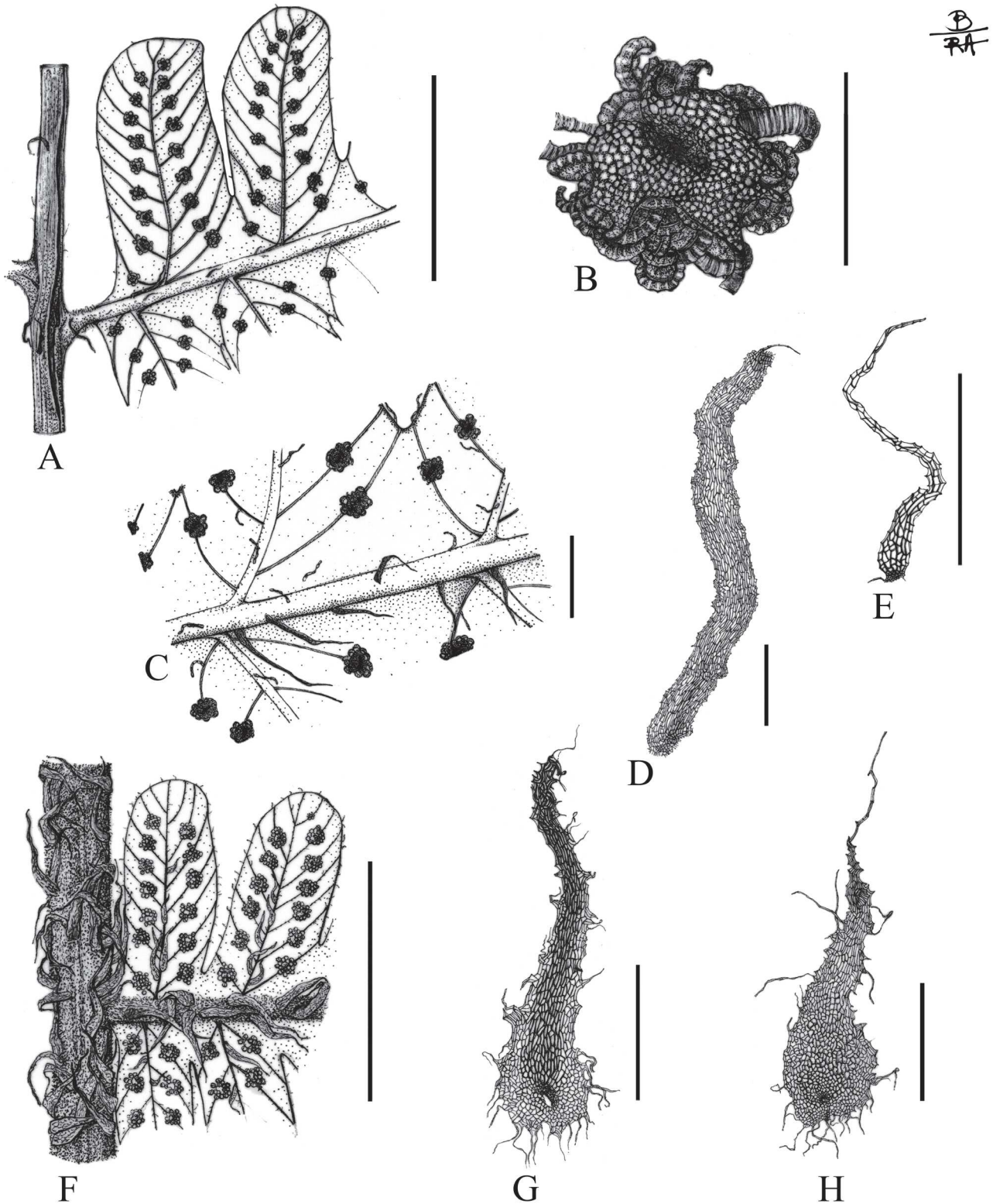


FIGURE 13. Some morphological characters of *Ctenitis* from South America. **A–E:** *Ctenitis aspidioides* (Salino 14908, BHCB). **A:** abaxial surface of a portion of rachis and two basal segments of a medial pinna. **B:** sorus with indusium. **C:** detail of abaxial surface of a medial pinna showing indument. **D:** petiole scale. **E:** abaxial costa scale. **F–H:** *C. deflexa* (Salino 2383, BHCB). **F:** abaxial surface of a portion of rachis and two basal segments of a medial pinna. **G:** rachis scale. **H:** abaxial costa scale. Scale bars in A = 1 cm; B = 0.5 mm, C–H = 1 mm.

the basal ones stalked to 9.1 mm long, the medial ones stalked to 4.3 mm long or sessile, the apical sessile, the medial 6.0–13.3 × 1.31–3.3 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, almost pinnatisect, pinnatisect basally, basal segments as long or longer than the next, apex attenuate or acute; *ultimate segments* 12–22 pairs, (1.7) 2.5–8.1 mm wide, entire or serrate, apex rounded or acute, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple or 1–2-forked, 6–9 pairs (before forking) per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* medial, indusia absent, or small and inconspicuous or large and conspicuous, entire, with bacilliform trichomes; *spores* with coarse, irregular echinae.

Selected specimens examined:—ARGENTINA. Salta: Rivadavia, Cabeceras del Santa María, 18 June 1944, *Willink 215* (GH); BOLIVIA. Beni: Moxos, Chimanes Forest, 260 m, 15°10' S, 66°37' W, 25 July 1990, *Fay & Fay 2810* (MO); Yacuma, campamento Campo Monos, bajando por el río Curiraba, 195 m, 14°38' S, 66°04' W, 17 November 1996, *Acebey 42* (UC); Chuquisaca: Hernando Siles, Área protegida municipal de Monteagudo, 1300 m, 19°48' S, 63°57' W, 8 June 2000, *Huaylla & Wendelberger 7* (UC); Luis Calvo, Comunidad Chuya Yaco, 1239 m, 19°45'12" S, 63°52'36" W, 20 October 2005, *Lliully et al. 476* (MO); Tomina, aprox. a 50 min. bajando de Abra Santa Cruz, 1345 m, 19°18'57.3" S, 64°05'15.1" W, 12 October 2004, *Gutiérrez 1011* (NY); La Paz: Abel Iturralde, Parque Nacional Madidi, campamento de guardaparques Sadiri, camino Sadiri-San José de Uchupiamonas, 740 m, 14°10' S, 67°55' W, 4 July 2004, *Jimenez 2561* (UC); Franz Tamayo, Parque Nacional Madidi, 282 m, 14°11'16" S, 68°20'04" W, 11 April 2002, *Paniagua 4226* (UC); Nor Yungas, Coroico (Polo-Polo bei Coroico), 16°11'38" S, 67°43'55" W, October 1912, *Buchtien* (UC); Santa Cruz: Florida, Localidad de Bella Vista, 1359 m, 18°16'06" S, 63°40'24" W Alt: 1359 m, 28 November 2008, *Calzadilla et al. 392* (MO); Sara, Cerro del Amboró, 1000 m, 17°43'56" S, 63°39'05" W Alt: 1000m, 19 October 1916, *Steinbach 2984* (GH); Vallegrande, 1200 m, 18°47' S, 63°51' W, 20 May 1996, *Kessler et al. 5926* (UC); Velasco, Serranía de Huanchaca, 200–300 m, 14°37' S, 60°42' W, 4 November 1991, *Foster 13694* (F); BRAZIL. Ceará: Pacatuba, Serra de Pacatuba, ca. 600 m, 03°58' S, 38°47' W, 22 July 1997, *Almeida-Neto & Meirelles 270* (HUEFS); Minas Gerais: Januária, Vale do Peruaçu, mata ciliar a caminho do janelão, 15°07'23" S, 44°13'34" W, 20 July 1997, *Salino 3257* (BHCB); COLOMBIA. Cundinamarca: Gachetá, En el Cementerio, 1750 m, 4°55'15" N, 73°36'48" W, 18 May 1974, *Acosta-Arteaga 403* (NY); Risaralda: Pereira, Hacienda Alejandría, 11 February 1990, *Silverstone-Sopkin et al. 5893* (UC); Santa Marta: Las Vegas Forest, 2500 f, 11°18'26" N, 73°59'11" W, March 1936, *Bennett 27* (F); Valle: El Cerrito, Hacienda El Hatico, 1000 m, 3°39' N, 76°19' W, 16 December 1994, *Silverstone-Sopkin & Paz 7162* (UC); ECUADOR. Andes, 1857, *Spruce 5256A* (NY); Cotopaxi: Quevedo-Latacunga road, km 46 from Quevedo, ca. 600 m, 00°55' S, 79°11' W, 1973, *Homl-Nielsen 2904* (UC); Galapagos: Santa Cruz island, 430 m, 3 February 1964, *Itow, S. 95* (CAS); Morona-Santiago, Morona, Cordillera de Cutucú, 600 m, 02°32' S, 77°54' W, 22 January 2002, *Palacios et al. 15792* (UC); Pichincha: Hotel Tinalandia, casi 25 km al este desde Sto. Domingo de los Colorados, Cordillera Occidental, 1000m, 8 January 1984, *Moran 3542* (NY); Tungurahua: Baños, Downhill, 1450 m, 1°24' S, 78°17' W, 8 July 1992, *Fay, & Fay 3568* (NY); PERU. Huánuco: Leoncio Prado, 1400 m, 6 June 1981, *Young & Sullivan 865* (F); Junín: Tarma, Valle del río Chanchamayo, 1500 m, 1918, *Esposto 671* (GH); Madre de Dios: Manu, Parque Nacional del Manu, 350 m, 11°50' S, 71°25' W, 10 August 1984, *Foster 9802* (F); Pasco: Oxapampa, Pozuzo, Parque Nacional Yanachanga-Chemillén, 1100 m, 10°10'58" S, 75°34'25" W, 23 July 2006, *Monteagudo et al. 12551* (MO); San Martín: Huallaga, Abajo de La Morada, 1900–2000 m, 6°57' S, 77°32' W, 10 August 1997, *Quipuscoa & Bardales 935* (F); VENEZUELA. Anzoátegui: 800–1000 m, 1 March 1945, *Steyermark 61279* (F); Aragua: Tovar, 1854, *Fendler 204* (GH); Lara: Torres, Via El Jabón, sitio denominado La Raya, 1500 m, 22 January 1985, *Rivero 86613* (UC); Margarita Island, 8 February 1901, *Miller & Johnston 169* (NY).

Habitat and distribution:—Terrestrial in rainforest in low or highlands, 0–2000 m. United States of America (Florida), Mesoamerica (Mexico, Honduras, Nicaragua, El Salvador, Costa Rica and Panama), West Indies (Cuba, Jamaica, Hispaniola and Trinidad) and South America (Brazil, Venezuela, Colombia, Ecuador, Peru, Bolivia and Argentina; Fig. 14B; Tab. 01).

Notes:—*Ctenitis ampla* is a 2–4-pinnate-pinnatifid species (Fig. 03C), similar to *C. equestris* var. *equestris*, *C. grisebachii* and other decomposed lamina species from Mesoamerica and West Indies. *Ctenitis ampla* and *C. equestris* var. *equestris* scales are flaccid, clathrate, flattish or vaulted with cordate base, with or without some short fimbriae at base and laterally, but the *C. ampla* ones are uniformly light castaneous or castaneous (Fig. 06A–B), while *C. equestris* scales are brownish with pale edges (Fig. 17B), often iridescent. *Ctenitis grisebachii* has stiff uniformly castaneous or brown, always flattish scales with truncate base and without fimbriae (Fig. 19G), the ones along petiole and rachis are usually retrorse.

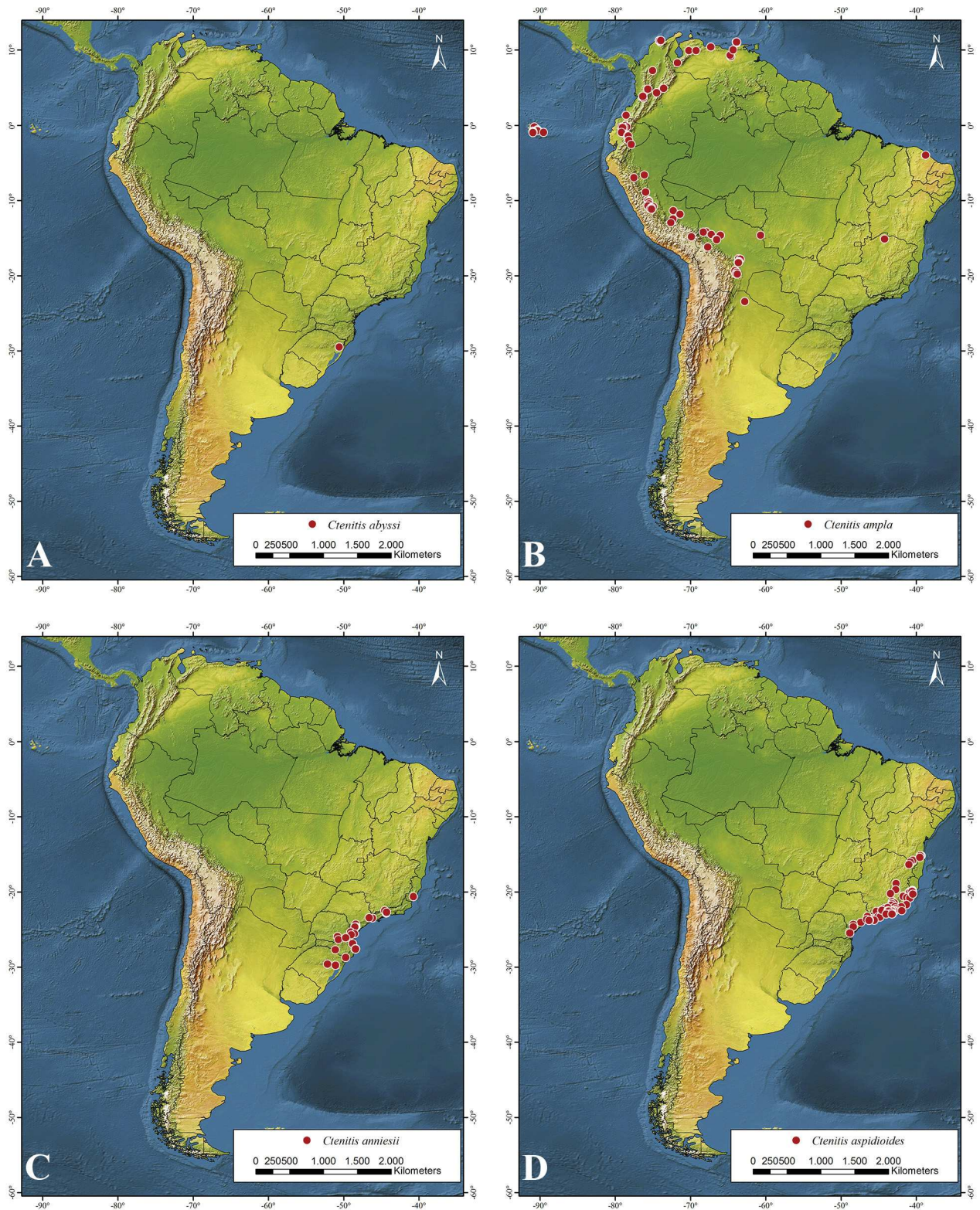


FIGURE 14. Distribution of four species of *Ctenitis* in South America. A: *C. abyssii*. B: *C. ampla*. C: *C. anniesii*. D: *C. aspidioides*.

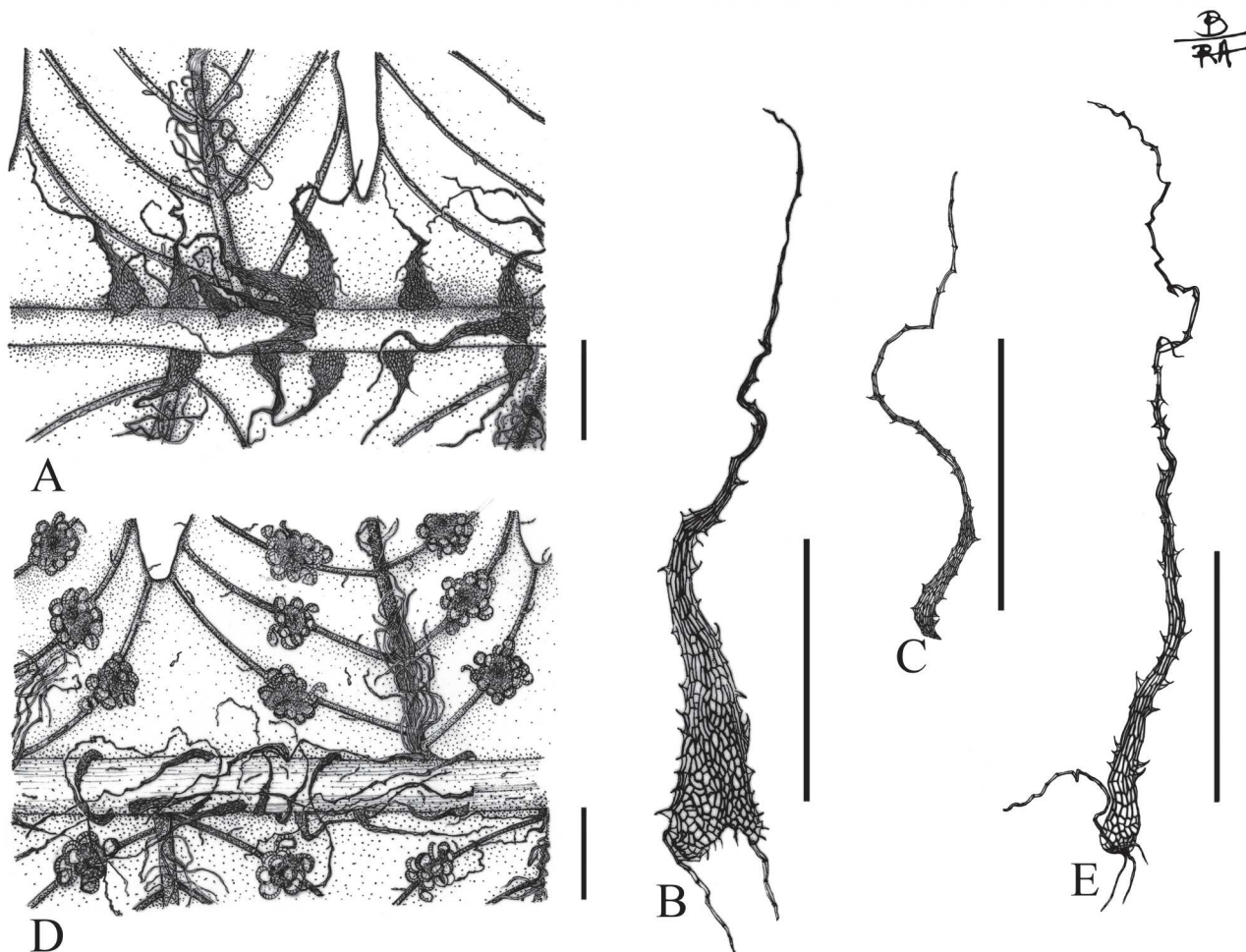


FIGURE 15. Some morphological characters of *Ctenitis* from South America. **A–C:** *Ctenitis distans* var. *distans* (Fontana 4996, BHCB). **A:** detail of abaxial surface of a medial pinna showing indument. **B:** abaxial costa scale. **C:** adaxial costa scale. **D–E:** *C. distans* var. *isabellina* (Lombardi 6830, BHCB). **D:** detail of abaxial surface of a medial pinna showing indument. **E:** abaxial costa scale. Scale bars = 1 mm.

Ctenitis ampla is morphologically variable and widely distributed. Because of that, some authors considered it as one of the species complex in *Ctenitis*, justifying the need of a revision and highlighting the importance of examination of all types and greater amount of materials from all its distribution range (Christensen 1920, Tryon & Stolze 1991). Christensen (1920), despite manifesting be in doubt, considered *C. sloanei* (*Dryopteris sloanei*) under *C. ampla* (*D. ampla*) and distinguished the Andean form as *D. nemophila*. Later, Morton (1969) pointed that *C. ampla* should be what Christensen (1920) referred as *D. nemophila*, distinguishing it from *D. sloanei* and proposing the new combination of it under *Ctenitis*. His major arguments were based on the holotype photograph of *Polypodium amplum* and on the collection Fendler 204 from Venezuela, which Christensen (1920) cited as *D. nemophila*. Since then, the specimens from United States, Mexico, Central America and West Indies were usually called *C. sloanei* and most specimens from South America were called *C. ampla*. The only and most recent taxonomic treatment that dealt with these supposed two species was Tryon & Stolze (1991) for flora of Peru. These authors also were uncertain about the application of both names or even if more taxa should be considered among this complex. Indeed, the Andean specimens, especially on high elevations from Peru and Bolivia, are the most similar to the holotype of *P. amplum* than to *P. sloanei*. They are quite larger and robust plants, the scales and the laminae are darker (castaneous), and the segments are wider and almost glabrous (less catenate trichomes at margin, less bacilliform trichomes on veins abaxially). Even with the reasoning attempts of Morton (1969) and Tryon & Stolze (1991) to distinguish *C. ampla* from *C. sloanei*, we consider only one variable species, under the name *C. ampla*. After analyzing numerous exsiccatæ from all known distribution range, we realized that several characters overlap, which render infeasible to distinguish two taxa. Such characters as the color of bacilliform

trichomes (reddish or yellowish), if they are few or many, the color of scales (castaneous or light castaneous) or how conspicuous the indusia are, or how wide are the segments. Furthermore, on specimens with or without (or inconspicuous) indusia from different regions, in only one sorus there are sporangia capsule glabrous or with one or more bacilliform trichomes (Figs. 08C–D), a feature seen only in this species among all the others *Ctenitis* from the New World. The spore surfaces of different “morphotypes” are also the same. Maybe the quite different morphology is result of different ploidy, what was not investigated in this work, but is certainly an interesting issue to explore.

Another name recognized by Christensen (1920) that we consider as a synonym of *C. ampla* is *Dryopteris palatangana*. Christensen (1920) was based only on the original material of *Nephrodium palatangamum*. We have examined some specimens from Ecuador, inclusive from Palatanga, and they are just less scaly plants, which scales are castaneous.

The specimens from Galapagos Islands are the smallest plants, consequently the segments are smaller and usually acute at apex, the scales are lighter and dense on axes, and there are dense yellowish bacilliform trichomes along throughout the veins abaxially. Some old collections with these features are identified as *Polypodium paleaceum*. The ones from Costa Rica and Panamá, as *Aspidium culcita*, are quite the same, but the laminae are darker and folded, probably due to preparation process.

In the original description of *Polypodium sloanei*, no type neither herbarium was indicated (Sprengel 1827). Later Kunze (1834) mentioned a material that was in “Herb. Poep. Kze”, which is currently LZ herbarium. After this, other authors cited the holotype of *P. sloanei* as destroyed in LZ and some isotypes in other herbaria (Tryon & Stolze 1991, Mickel & Smith 2004). Indeed, the material in LZ was destroyed during the Second World War. Morton (1969), however, did not mention a holotype, but an isotype in L. What Kunze did must be considered as an inadvertent lectotypification (Art. 9.9. of *ICN*—McNeill *et al.* 2012). Nonetheless, as the specimen in LZ was destroyed, the isotype cited by Morton (1969) must be considered as lectotype, and its several duplicates as isolectotypes.

Unfortunately, *Polypodium nemophilum* and *P. catocarpum*'s type materials were also in LZ, thus also destroyed. No other author resolved the typification. No specimens that could be original material of these names were found. Then we designate neotypes for them (Art. 9.16 of *ICN*—McNeill *et al.* 2012), that represent Christensen's morphology concept of *Dryopteris nemophila* (Christensen 1920), in our understanding, and they are from Peru, as the ones in original description.

We also propose the lectotypification of *Aspidium furcatum*, once no original material was found in B. Probably it must have been destroyed as other types of names described by Klotzsch. The sheet chosen for lectotype (Art. 9.12 of *ICN*—McNeill *et al.* 2012) is a fragment of the holotype. Such fragment is in BM, purchased from Christensen's herbarium.

For *Aspidium culcita*, as we have examined four sheets in different herbaria of the collection mentioned in its protologue (*Wercklé s.n.*), we designate as lectotype (Art. 9.12 of *ICN*—McNeill *et al.* 2012) the sheet in P, which is from Christ's herbarium, the author of this name.

3. *Ctenitis anniesii* (Rosenst.) Copeland (1947: 124). Figs. 05D, 09B, 12E–J, 14C. *Dryopteris anniesii* Rosenstock (1906: 118). Type:—BRAZIL. Rio Grande do Sul: Venâncio Aires, January 1904, *Jürgens & Stier 158* (lectotype S-R-1699!, designated by Christensen 1913a, isolectotypes ICN 015359!, R 000109499!, NY 00099430!, S-R-1699!, UC 441704!); remaining syntypes:—BRAZIL. Paraná: Villa Nova, Lucena Strabe, *Annies 42b* (UC 441705!, NY 00099432!); BRAZIL. Santa Catarina: Itapocú, *Haerchen s.n.* (Herb. Rosenstock, not found).

Dryopteris anniesii var. *ottonis* Rosenst. ex Christensen (1913a: 100), *syn. nov.* Type:—BRAZIL. Santa Catarina, *Müller s.n.* (lectotype S-R-1748!, **designated here**); remaining syntype:—BRAZIL. Santa Catarina, *Gerder 80a* (BM 000937857!).

Stems erect, 2.5–2.8 cm diam., scales 7.3–13.8 × 1.2–2.0 mm, light castaneous, clathrate, lanceolate, entire, with or without some short fimbriae at base and laterally; *leaves* 94.5–187.3 cm long; *petioles* 18.3–65.8 cm × 3.6–7.3 mm, with 6 or 7 vascular bundles at base, brownish or tan, scales 2.5–13.6 × 0.6–2.0 mm, light castaneous, clathrate, tangled on petiole base, becoming patent or ascending towards distal portion, flattish, flaccid, lanceolate with cordate base and filiform apex, entire or slightly denticulate, with or without some short fimbriae at base and laterally, catenate trichomes absent abaxially, sparse glandular trichomes; *laminae* 76.2–125 × 22.6–41 cm, width 1/4–1/2 of length, 1-pinnate-pinnatisect basally, 1-pinnate-pinnatisect or almost medially and apically, lanceolate

or linear-lanceolate, apex confluent; *rachises* tan or stramineous, scales like those on distal portion of petioles, sparse or absent catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 29–37 pairs, the basal and medial ones stalked to 5.2 mm long, the apical ones stalked to 1.5 mm long or sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 11.6–21.5 × 1.4–4.0 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments as long or longer than the next, apex attenuate; *adaxial pinnae axes* with sparse scales on costa, (1.5) 2.5–9.3 × 0.06–0.30 mm, light castaneous, filiform or linear-lanceolate, catenate trichomes dense on costa, sparse on costule, rare on veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with dense scales on costa and costule (basally), (0.9) 1.5–4.6 (6.8) × (0.2) 0.6–0.9 mm, light castaneous, clathrate, imbricate, flattish, flaccid, lanceolate with cordate base and filiform apex, denticulate, with or without some short fimbriae at base and laterally, proscapes to 1.5 mm long sparse on costule, catenate trichomes sparse on costa, costule and veins, bacilliform trichomes sparse on costa, costule and veins, glandular trichomes sparse on costa, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse catenate and bacilliform trichomes; *segments* 22–34 pairs, 1.6–4.2 mm wide, patent or subfalcate, entire or repand, generally broadest towards apex, apex acute or obtuse, margin with catenate trichomes, the distance from each other is somewhat the same width or wider than the segments width; *veins* simple, 10–20 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* inframedial, rarely medial, indusia conspicuous, ciliate, with bacilliform trichomes; *spores* with inflated folds and large tubercles.

Selected specimens examined:—BRAZIL. Espírito Santo: Alfredo Chaves, São Bento de Urânia, 900–1000 m, 19 October 2000, *Hatschbach et al.* 71426 (UC); Paraná: Adrianópolis, Parque Estadual das Lauráceas, 352 m, 24°40' S, 48°32' W, 12 December 2006, *Matos et al.* 1301 (CEPEC); Campina Grande do Sul, Rio Tucum, 25 March 1970, *Hatschbach* 24065 (UC); Ipiranga, 4 February 1904, *Dusén* 3625 (R); Morretes, Parque Estadual Pico do Marumbi, *Kozera & Kozera* 1228 (BHCB); Paranaguá, Serra do Mar, Estação Marumbi, 25 January 1925, *Frenzel s.n.* (RB); Rio de Janeiro: Rio Funil (perto do Estado de São Paulo), 08 November 1956, *Handro* 670 (US); Itatiaia, Nova Picada, 1100 m, 21 March 1942, *Brade* 17237 (RB); Rio Grande do Sul: São Leopoldo, 8 m, 1940, *Reitz* 98 (RB); Santa Catarina: Anita Garibaldi, 922 m, 13 April 1963, *Reitz et al.* 14773 (HB); Florianópolis, Itacorubi, 18 m, 26 February 1943, *Reitz* 275 (RB); Hammonia (currently Ibirama), June 1911, *Luederwaldt s.n.* (BHCB, R); Morro Grande, Floresta Ombrófila Densa, 28°42'36''S, 49°46'12''W, 311 m, 23 November 2009, *Verdi et al.* 3151 (BHCB); São Paulo: Bananal, Serra de Bocaina, Sertão do Rio Vermelho, 1200 m, 5 October 1929, *Brade & Duarte.* 20105 (RB); Mogi das Cruzes, Parque Natural Municipal da Serra do Itapeti, 880 m, 23°29'25''S, 46°11'38''W, 18 September 2005, *Dittrich et al.* 1365 (BHCB); Serra da Cantareira, 999 m, June 1913, *Brade* 6533 (HB).

Habitat and distribution:—Terrestrial. Endemic to Atlantic Forest, 100–1500 m in southeastern and southern Brazil (Fig. 14C; Tab. 01).

Notes:—*Ctenitis anniesii* can be recognized by the narrow segments (Figs. 05D, 12E), separated by a broad round sinus, somewhat the same width or wider than the segments width. This is one of the scaliest 1-pinnate-pinnatisect to 1-pinnate-pinnatifid South American species. The scales are dense on costa and costule abaxially and also easily seen on costa adaxially (Figs. 12E–J). *Ctenitis fenestralis* and *C. deflexa* are the most similar species to *C. anniesii*. The three species can be distinguished by the stem, indusium presence and position of fimbriae on rachis and costa scales. The stems of *C. anniesii* and *C. fenestralis* are erect (Fig. 01A) or ascending (Fig. 01B), while *C. deflexa* stem is short-creeping (Fig. 01C). The indusium of *C. anniesii* is large and conspicuous (Figs. 12F–G), while it is absent in *C. fenestralis*, which has in each sorus a tuft of many proscapes among sporangia (Figs. 08E), and in *C. deflexa*, the indusium is small, often inconspicuous (Fig. 13F). The rachis and costa scales of *C. anniesii* and *C. fenestralis* are with or without some short fimbriae at base and laterally, while *C. deflexa* scales are always with many short and long fimbriae throughout the margin (Figs. 13G–H).

Christensen (1913a) cited the collection *Annies* 89 (Dr. E. Rosenstock, Filices austrobrasilienses exsiccatae—n. 89), which is in many herbaria kept as the type of *Dryopteris anniesii*. However, this collection is not mentioned in the protologue, thus it may not be considered as a type, besides it must probably be an uncited original material (Art. 9.3 of *ICN*—McNeill *et al.* 2012).

The form that Christensen (1913a) called *Dryopteris anniesii* var. *ottonis* is a smaller and young plant, its segments are closer to each other, but the other characters are the same as the typical. For this name, Christensen (1913a) cited two collections (syntypes). Then we selected *Müller s.n.* in S, which is with a Rosenstock's herbarium stamp, to be the lectotype (Art. 9.12 of *ICN*—McNeill *et al.* 2012).

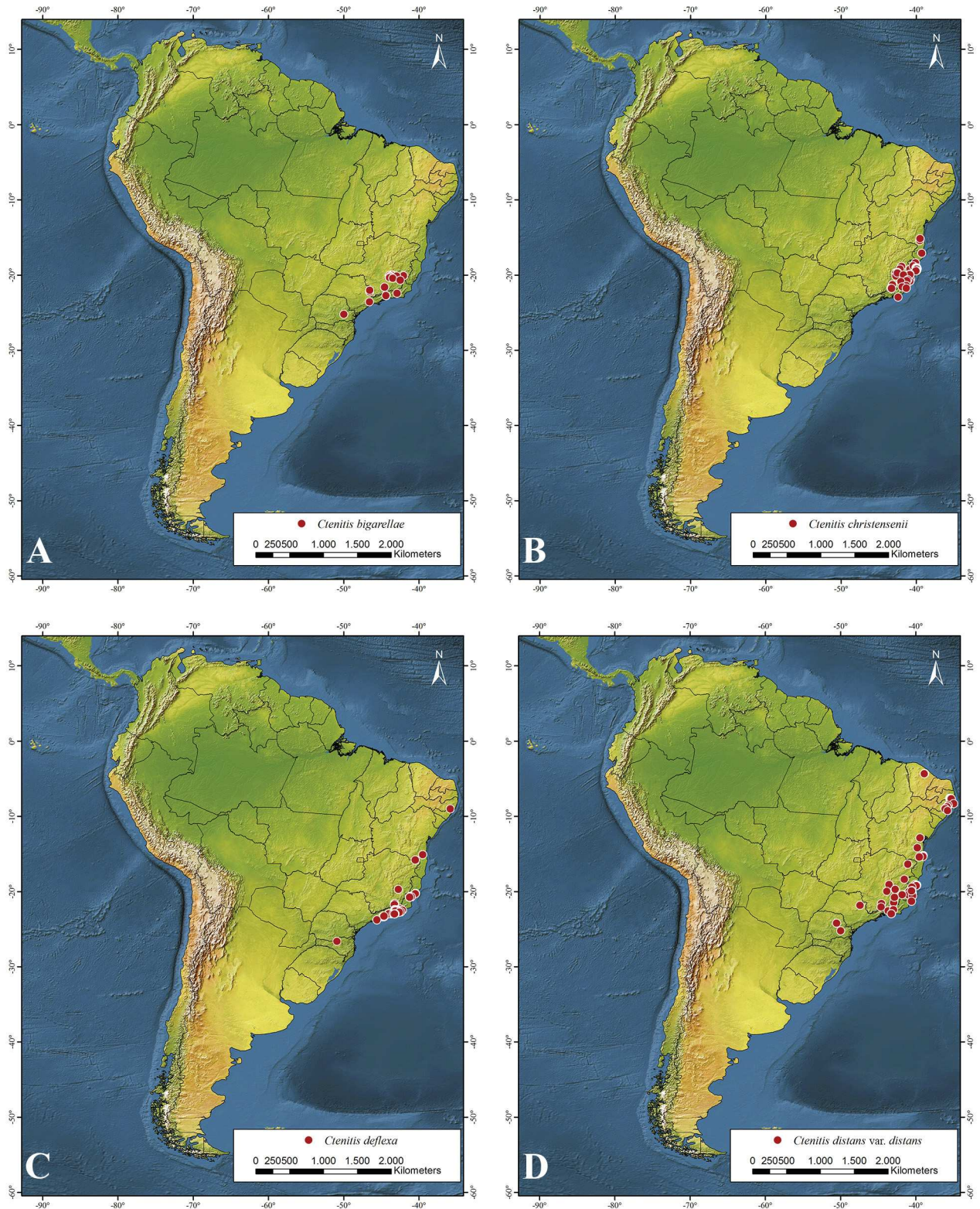


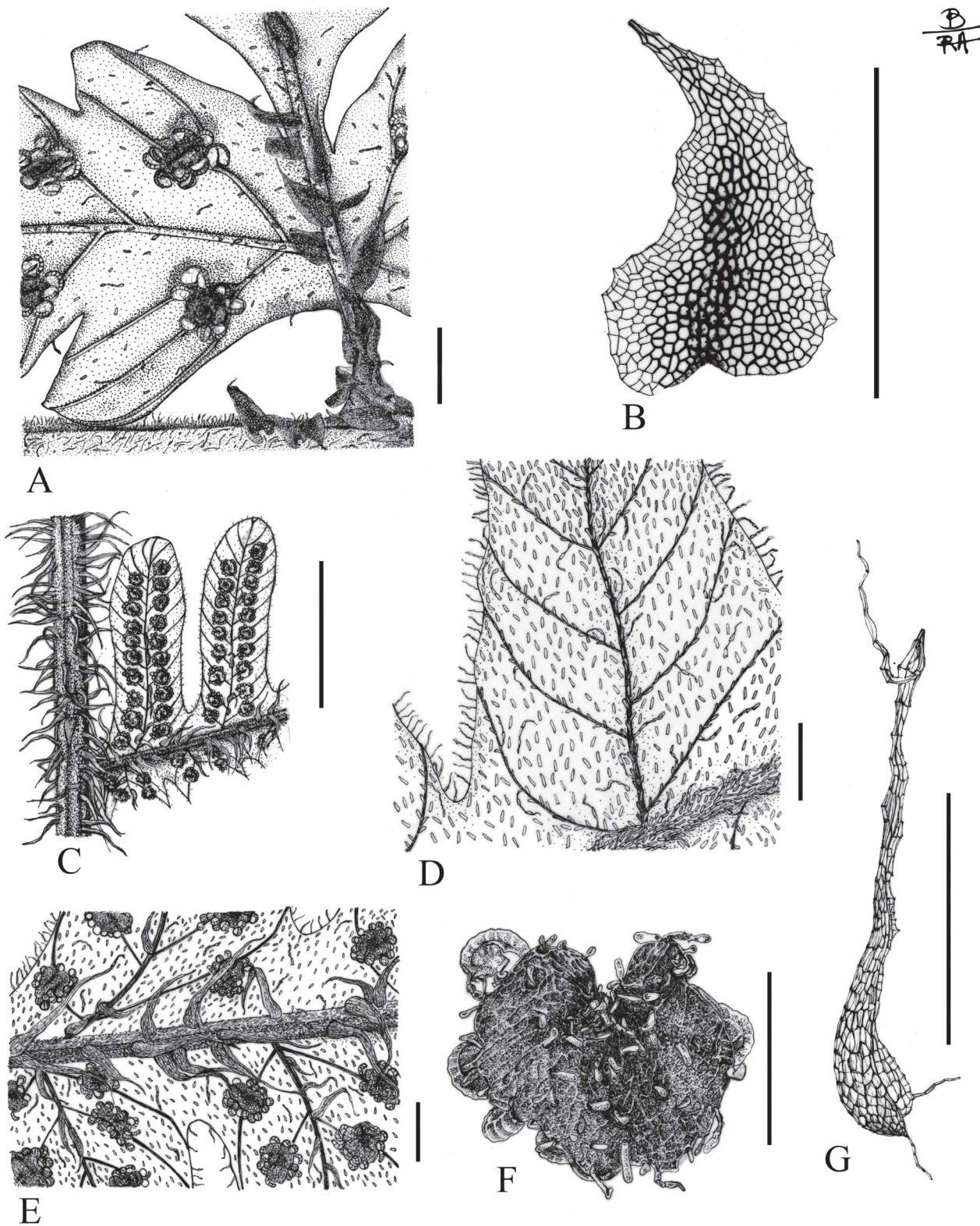
FIGURE 16. Distribution of four taxa of *Ctenitis* in South America. **A:** *C. bigarellae*. **B:** *C. christensenii*. **C:** *C. deflexa*. **D:** *C. distans* var. *distans*.

4. *Ctenitis aspidioides* (C. Presl) Copeland (1947: 124). Figs. 01B, 04A–B, 05C, 09C, 13A–E, 14D. *Polypodium aspidioides* Presl (1822: 170). *Lastrea aspidioides* (C. Presl) Presl (1849: 41). *Aspidium alsophilaceum* Kunze in Mettenius (1858: 90), *non Aspidium aspidioides* Schlechtendal (1825: 24). *Nephrodium alsophilaceum* (Kunze in Mett.) Baker (1870: 474). *Dryopteris alsophilacea* (Kunze in Mett.) Kuntze (1891: 812). Type:—BRAZIL. Rio de Janeiro, *Pohl s.n.* (lectotype PRC 405453!, **designated here**).

Aspidium tijucense Fée (1873: 102). *Dryopteris itatiaiensis* Christensen (1906: 272), *non Dryopteris tijucana* (Raddi 1819: 288) Christensen (1906: 298). Type:—BRAZIL. Rio de Janeiro: Itatiaia, *Glaziou 5262* (lectotype P 00639503!, **designated here**, islectotypes B 20 0052211!, P 00639502!, P 00167494!).

Stems erect or ascending, 1.5–2.3 cm diam., scales 6.1–11.2 × 0.3–1.1 mm, castaneous, subclathrate, lanceolate, entire or slightly denticulate, without fimbriae; *leaves* 37–113 cm long; *petioles* 13–57 cm × 2.4–3.2 mm, with 3 or 5 vascular bundles at base, tan or stramineous, scales 3.0–6.2 × 0.1–0.3 mm, castaneous or dark brown, subclathrate or clathrate, not tangled on petiole base, patent or ascending, flattish, flaccid, linear-lanceolate with truncate base and attenuate or filiform apex, entire or slightly denticulate, with or without some short fimbriae at base, sparse catenate trichomes abaxially, glandular trichomes absent; *laminae* 46.8–57 × 17–27.5 cm, width 1/3–1/2 of length, 1-pinnate-pinnatifid basally, medially and apically, lanceolate, apex conform or subconform; *rachises* tan or stramineous, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, glandular trichomes absent; *pinnae* 7–14 pairs, the basal and medial ones stalked to 6.4 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 8.7–15 × 2.2–3.2 cm, lanceolate, incised to 2/3 of the distance between the segment apex and costa, basal segments as long or a little shorter than the next, apex acuminate or attenuate; *adaxial pinnae axes* scales absent, catenate trichomes dense on costa, sparse on costule, rare on veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with sparse scales on costa, 1.3–2.5 × 0.6–0.2 mm, dark brown or castaneous, subclathrate or clathrate, ascending, flattish or twisted, stiff, linear or filiform with truncate base and filiform apex, slightly denticulate, without fimbriae, proscapes to 3.1 mm long sparse on costule, catenate trichomes sparse on costa, costule and veins, bacilliform trichomes absent, glandular trichomes absent, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse catenate trichomes; *segments* 15–18 pairs, 4.3–7.5 mm wide, patent or subfalcate, entire or repand, apex rounded, obtuse or acute, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple or 1-forked at basal segments, 7–10 pairs per segment, the basal ones from adjacent segments reach the margin at sinus; *sori* medial or inframedial, indusia conspicuous, entire or with a few little fimbriae, glabrous; *spores* with coarse folds.

Selected specimens examined:—BRAZIL. Bahia: Arataca, Serra do Peito de Moça, 700 m, 15°10'25" S, 39°20'30" W, 6 August 2006, *Labiak et al. 3675* (CEPEC); Camacan, RPPN Serra Bonita, 850 m, 15°23'30" S, 39°33'55" W, 30 March 2007, *Matos et al. 1332* (CEPEC); Jussari, RPPN Jussari, 12 December 2005, *Mynssen et al. 919* (CEPEC); Espírito Santo: Cariacica, Reserva Biológica Duas Bocas, 600 m, 20°17'29" S, 40°31'10" W, 15 February 2008, *Labiak et al. 4647* (RB); Santa Teresa, Nova Lombardia, Reserva Biológica Augusto Ruschi, 21 January 2003, *Krause & Pereira 83* (RB); Minas Gerais: Além Paraíba, Est. Benjamin Constant, 396 m, November 1933, *Campos Porto & Horta s.n.* (RB); Catas Altas, RPPN Serra do Caraça, Engenho, 20°07'S, 43°27'W, 900 m, 20 November 2004, *Mota et al. 77* (BHCB); Coronel Pacheco, Fazenda Argentina, 522 m, 9 May 1944, *Heringer 1371* (RB); Juiz de Fora, Poço D'Anta, 889 m, July 1902, *Schwacke 14791* (RB); Rio Pomba, 479 m, 28 June 1909, *Velloso s.n.* (OUPR); Descoberto, Reserva do Grama, 466 m, 15 June 2005, *Mynssen & Jascione 730* (RB); Rio Preto, Serra Negra, Fazenda Tiririca, 21 January 2006, *Souza et al. 114* (RB); Viçosa, Fazenda de Engenho, 720 m, 11 December 1930, *Mexia 5406* (R); Paraná: Morretes, Morro do Bicho, 25°27'02"S, 48°51'00"W, 34 m, 12 April 2010, *Salino & Almeida 14814* (BHCB); Rio de Janeiro: Barra do Piraí, 700–750 m, 4 March 1986, *Carauta & Fernandes 5270* (RB); Cachoeiras de Macacu, 24 m, 22°28'15" S, 42°45'26" W, 8 November 2009, *Baber & Wesenberg KB249* (RB); Campos dos Goytacazes, Morro do Itaoca, 20 m, 15 December 2009, *Mauad et al. 86* (RB); Duque de Caxias, Parque Natural Municipal da Taquara, 28 October 2006, *Jascione & Lima 763* (HB); Mangaratiba, Reserva Ecológica Rio das Pedras, 3 June 1997, *Mynssen 131* (RB); Serra do Itatiaia, 4–10 June 1913, *Tamandaré & Brade 21450* (HB); Teresópolis, Serra dos Órgãos, Rio Paquequer, 1267 m, August 1940, *Brade 16680* (RB); São Paulo: Iguape, May 1922, *Ruschi 8247* (R); Paranapiacaba, Serra de Paranapiacaba, June 1925, *Brade 21451* (HB); Serra de Itapetinga, 26 June 1914, *Brade 7399* (HB); Tapiraí, Reserva Votorantim, Complexo Juquiá, Trilha Boatudo, 24°02'14"S, 47°22'53"W, 425 m, 29 March 2013, *Salino et al. 15646* (BHCB).



$\frac{B}{RA}$

FIGURE 17. Some morphological characters of *Ctenitis* from South America. **A–B:** *Ctenitis equestris* (Breedlove 33659, CAS). **A:** abaxial surface of portion of pinnules and pinna rachis (scale bar = 1 cm). **B:** abaxial costa scale. **C–G:** *C. eriocaulis* (Pietrobon 5007, BHCB). **C:** abaxial surface of a portion of rachis and two basal segments of a medial pinna. **D:** adaxial surface of a portion of a segment. **E:** abaxial surface of a portion of a pinna. **F:** sorus with indusium. **G:** abaxial costa scale. Scale bars in A and C = 1cm; B, D, E, G = 1mm; F = 0.5 mm.

Habitat and distribution:—Terrestrial, endemic to Atlantic Forest, 30–1100 m, from northeastern to southern Brazil (Fig. 14D; Tab. 01). This species occurs either in lowlands and slopes of mountainous regions. However, it is more frequent in high elevations.

Notes:—*Ctenitis aspidioides* can be easily distinguished from other South American 1-pinnate-pinnatifid to 1-pinnate-pinnatisect species by the lamina apex conform (an apical pinna; Fig. 04A) or subconform (the apical pinna with a large adnate lobe; Fig. 04B). *Ctenitis aspidioides* is similar to *C. nervata* and also to *C. refulgens* var. *refulgens* by the incision of pinnae, which are 1/2–2/3 of the distance between the segment apex and costa (Figs. 05B–C), that are less incised than all the other South American species, and the basal veins from adjacent segments reach the margin at sinus. However, besides conform or subconform lamina apex of *C. aspidioides* versus the confluent lamina apex of *C. nervata* and *C. refulgens* var. *refulgens*, the scarce indument of *C. aspidioides* (Fig. 13A–E) is more similar to *C. nervata*. The scales on costa abaxially in *C. aspidioides* are castaneous or dark brown, linear or filiform, the *C. nervata* ones are dark brown and deltate or lanceolate, and the *C. refulgens* var. *refulgens* ones are light castaneous and linear. The sori of *C. aspidioides* are indusiate, but the *C. nervata* and *C. refulgens* are not. Several specimens of *C. aspidioides* were with dark sori, due to abortive sporangia (Fig. 08F), as well in *C. abyssi*, *C. fenestralis*, *C. laetevirens* and *C. nervata*. However, other specimens of *C. aspidioides* were with sporangia and spores (Fig. 9C) apparently viable.

Presl (1822) did not designate a type for *Polypodium aspidioides*, but an original material, with a label handwritten by Presl, is in PRC (Art. 9.3 of the ICN—McNeill *et al.* 2012). We here designate this specimen as lectotype of *P. aspidioides* and its later corresponding combinations, as well as one replacement name and its later corresponding combinations (Art. 9.3 and 9.12 of the ICN—McNeill *et al.* 2012).

Fée (1873) cited the collection *Glaziou 5262* for *Aspidium tijucense*, without specifying any herbarium. There are three sheets of this collection in P and one in B. We chose one of the sheets in P to be the lectotype (Art. 8.3, Rec. 8A.4, 9.2, 9.5, 9.11, 9.12, 40 Note 1) which has the original large label of Fée with his signature.

5. *Ctenitis bigarellae* Schwartsburd, Labiak & Salino (2007: 29). Figs. 07A–D, 09D, 16A. Type:—BRAZIL. Paraná: Ponta Grossa, Parque Estadual de Vila Velha, 1000 m, 25°13'S 49°59'W, 28 October 2005, *Schwartsburd 944 et al.* (holotype MBM 0323296, isotypes UC 1926872!, UPCB 54390).

Dryopteris falciculata (Raddi) Kuntze var. *elongata* Rosenstock (1915: 368). Type:—BRAZIL. São Paulo: Moóca, *Brade 5367* (lectotype S06-1045!, designated by Viveros & Salino 2015, isolectotypes GH 00020783!, HB 39019!, NY 0068853!, RB 00561482!, UC 441724!).

Stems erect or ascending, 1.0–2.9 cm diam., scales 2.0–5.3 × 0.4–0.9 mm, light castaneous, subclathrate, lanceolate, entire or ciliate, with or without some short fimbriae at base and laterally; *leaves* 32–100 cm long; *petioles* 19.5–46.5 cm × 1.3–2.1 mm, with 3 vascular bundles at base, brownish or tan, scales 1.8–4.0 × 0.3–0.6 mm, castaneous, subclathrate or clathrate, not tangled on petiole base, patent or ascending, flattish, flaccid, lanceolate with truncate base and attenuate apex, entire or ciliate, with or without some short fimbriae laterally, sparse catenate trichomes abaxially, sparse glandular trichomes; *laminae* 22–53 × 8–15 cm, width ca. 1/3 of length, rarely 1/2, 1-pinnate-pinnatisect basally, 1-pinnate-pinnatifid medially and apically, linear-lanceolate, apex confluent; *rachises* tan or stramineous, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 12–20 pairs, the basal and medial ones stalked to 2.4 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 3.5–11.7 × 1.3–3.6 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments as long as the next, apex attenuate apex; *adaxial pinnae axes* scales absent, catenate trichomes dense on costa, sparse on costule and veins, bacilliform trichomes absent; *adaxial laminar surface between veins* with dense filiform trichomes; *abaxial pinnae axes* with sparse scales on costa, 1.1–2.0 × 0.1–0.3 mm, castaneous, clathrate, ascending, flattish, flaccid, lanceolate with truncate or rounded base and attenuate or filiform apex, entire, with or without some short fimbriae at base, proscapes absent, catenate trichomes sparse on costa, costule and veins, bacilliform trichomes absent, glandular trichomes sparse on costa and costule, filiform trichomes sparse on costa, costule and veins; *abaxial laminar surface between veins* with sparse filiform trichomes and with or without sparse catenate trichomes; *segments* 12–15 pairs, 2.6–5.2 mm wide, patent or subfalcate, entire or crenate, apex rounded or obtuse, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple, rarely one vein forked on basal segments, 5–8 pairs per segment, the basal ones from adjacent segments

end at margin well above the sinus; *sori* supramedial, indusia conspicuous, ciliate, glabrous; *spores* with inflated folds and large tubercles.

Selected specimens examined:—BRAZIL. Minas Gerais: Andradas, Serra de Poços, 1320 m, 22°01'17" S, 46°33'50" W, 16 July 2007, *Salino et al. 12679* (BHCB); Araponga, Parque Estadual da Serra do Brigadeiro, 10 July 1999, *Salino 4893* (BHCB); Carrancas, Serra de Carrancas, 1270–1350 m, 21°36'17" S, 44°36'19" W, 19 June 2007, *Salino et al. 12342* (BHCB); Nova Lima, Estação Ecológica de Fechos, 20°03'58" S, 43°57'33" W, 11 July 2001, *Salino et al. 7150* (BHCB); Ouro Preto, Parque Estadual do Itacolomi, 1300 m, 2 June 2003, *Rolim et al. 38* (BHCB); Santa Bárbara, RPPN Santuário do Caraça, caminho para o Pico da Conceição, 20°06'13.9''S, 43°31'23.92''W, 1527 m, 26 August 2008, *Viveros et al. 22* (BHCB); Simonésia, RPPN Mata do Sossego, 1150–1600 m, 20°04'19" S, 42°04'13" W, 24 May 2006, *Salino et al. 11191* (BHCB); Rio de Janeiro: Rio de Janeiro, Gruta da Imprensa, 19 February 1960, *Duarte 5182* (RB); Teresópolis, 900 m, 17 October 1929, *Brade 9696* (R); São Paulo: Bananal, Sertão do Rio Vermelho, 21 May 1936, *Brade 15195* (RB).

Habitat and distribution:—Epipetric or terrestrial, in semideciduous forest and rainforest or on sandstones formations, 800–1600 m. Endemic to southeastern and southern Brazil (Viveros & Salino 2015; Fig. 16A; Tab. 01).

Notes:—*Ctenitis bigarellae* can be recognized by the hyaline filiform trichomes between veins on both surfaces, but more numerous adaxially, by the glandular trichomes on the petiole, rachis and costa abaxially, the indusia ciliate and glabrous, and by laminae width with ca. 1/3 of length. Such morphological characters are illustrated in Viveros & Salino (2015) and Schwartsburd *et al.* (2007). *Ctenitis bigarellae* is usually confused with *C. christensenii*, *C. falciculata*, *C. glandulosa* and *C. paranaensis*. The rachis scales of *C. bigarellae*, *C. christensenii* and *C. glandulosa* are castaneous, and the rachis scales of *C. falciculata* and *C. paranaensis* are dark brown to blackish. The laminar surface between veins adaxially can also distinguish *C. bigarellae* from those species. *Ctenitis christensenii* laminar surface between veins adaxially is glabrous, as well as some specimens of *C. paranaensis* and rare *C. glandulosa*. Abaxially on *C. paranaensis* there are sparse catenate and bacilliform trichomes, on *C. glandulosa* also these two kinds sparsely, plus glandular trichomes, while *C. falciculata* is always with dense catenate trichomes, sometimes also with sparse bacilliform and glandular trichomes.

6. *Ctenitis christensenii* R.S. Viveros & Salino (2015: 2). Figs. 02B, 03A, 09E, 16B. Type:—BRAZIL. Espírito Santo: Sooretama, Reserva Biológica de Sooretama, região da Lagoa do Macuco, 38 m, 19°01'36''S, 39°56'10''W, 15 May 2008, *Salino, Heringer, Dittrich & Viveros 13408* (holotype BHCB 026912!, isotype UC!, P!).

Stems erect or ascending, 0.8–1.6 cm diam., scales 1.0–7.0 × 0.1–0.6 mm, castaneous, subclathrate, linear-lanceolate, entire or slightly denticulate, without fimbriae; *leaves* (25) 30–87 cm long; *petioles* (11) 16–47 cm × 0.9–2.3 mm, with 4 vascular bundles at base, stramineous, scales 1.6–5.5 × 0.1–0.6 mm, castaneous, subclathrate, not tangled on petiole base, patent or ascending, flattish, flaccid, linear-lanceolate with truncate, rounded or slightly cordate base and filiform apex, entire or slightly denticulate, with some short fimbriae at base and laterally, sparse catenate trichomes abaxially, rare or absent glandular trichomes; *laminae* 14–40 × 9–18 cm, width ca. 1/2 of length or wider, 1-pinnate-pinnatisect basally, 1-pinnate-pinnatifid medially and apically, lanceolate or ovate, apex confluent; *rachises* stramineous, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, rare or absent glandular trichomes; *pinnae* (4) 7–11 pairs, the basal and medial ones stalked to 1.6 mm long or sessile, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 4.0–8.5 × 1.0–2.2 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments somewhat shorter than the next, apex attenuate or acuminate; *adaxial pinnae axes* scales absent, catenate trichomes dense on costa, sparse on costule and veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with sparse scales on costa, 0.5–1.8 × 0.05–0.20 mm, castaneous, subclathrate or clathrate, ascending, flattish, flaccid, linear-lanceolate with truncate or rounded base and filiform apex, entire or slightly denticulate, without fimbriae, proscapes to 0.6 mm long sparse on costa and costule, catenate trichomes sparse on costa, costule and veins, bacilliform trichomes sparse on costule and veins, glandular trichomes absent or rare on costa, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse filiform trichomes and bacilliform trichomes; *segments* 11–15 pairs, 3.2–5.8 mm wide, patent or subfalcate, entire or crenate, apex obtuse, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple, (3) 6–9 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* medial or supramedial, indusia conspicuous, entire, with bacilliform trichomes; *spores* with inflated folds and large tubercles.

Selected specimens examined:—BRAZIL. Bahia: Jussari, RPPN Serra do Teimoso, 15°09'15.8"S, 39°31'24.2"W, 2 October 2002, *Salino 8200* (BHCB); Espírito Santo: Cachoeiro do Itapemirim, Floresta Nacional de Pacotuba, 115 m, 20°44'19" S, 41°16'39" W, 27 October 2009, *Salino & Viveros 14573* (BHCB); Castelo, Parque Estadual Mata das Flores, 120 m, 20°36'49" S, 41°10'05" W, 24 June 2008, *Salino et al. 13469* (BHCB); Itarana, Jatiboca. Fazenda do Sr. Stur, 274 m, 19°57'30" S, 40°53'09" W, 26 August 2009, *Salino et al. 14476* (BHCB); Linhares, Floresta Nacional de Goytacazes, 15 m, 19°26'07" S, 40°04'26" W, 14 May 2008, *Salino et al. 13367* (BHCB); Nova Venécia, APA da Pedra do Elefante, Fazenda Neblina, 300 m, 18°47'13" S, 40°26'44" W, 15 January 2009, *Labiak et al. 5122* (RB); Pinheiros, Reserva Biológica do Córrego do Veado, 50 m, 18°22'13" S, 40°09'26" W, 9 June 2009, *Salino et al. 14281* (BHCB); Sooretama, Reserva Biológica de Sooretama, 20 m, 19°01'21"S, 39°58'28"W, 12 May 2008, *Salino et al. 13326* (BHCB); Minas Gerais: Governador Valadares, Campo de Sementes, 26 November 1941, *Magalhães 825* (BHCB); Juiz de Fora, Fazenda Boa Esperança, 29 September 1937, *Brade 15912* (RB); Marliéria, Parque Estadual do Rio Doce, 6 December 1996, *Salino 2856* (BHCB); São José do Mantimento, Margens do Rio José Pedro, 340 m, 19°59'08" S, 41°43'21" W, 5 September 2009, *Almeida et al. 2073* (BHCB); Sobralia, Fazenda Santa Luzia, 145–150 m, 19°12'34.2"S, 42°11'54.3"W, 7 September 2004, *Salino 9698* (BHCB); Tombos, Fazenda da Cachoeira, 10 July 1935, *Mello Barreto 1526* (RB); Rio Pomba, June 1909, *unknown, s.n.* (OUPR); Rio de Janeiro: Cambuci, Três Irmãos, 10 May 1949, *Almeida s.n.* (R); Campos dos Goytacazes, Morro do Coco, Mata da Solidão, 6 December 2005, *Mynssen et al. 875* (RB); Saquarema, 20 August 2014, *Bello et al. 113* (RB).

Habitat and distribution:—Terrestrial or rarely epipetric in semideciduous forest and rainforest, especially "tabuleiro" forest, 15–790 m. Endemic to northeastern and southeastern Brazil (Viveros & Salino 2015; Fig. 16B; Tab. 01).

Notes:—*Ctenitis christensenii* can be recognized mainly by its sparse castaneous linear-lanceolate scales on costa abaxially with truncate or rounded base, laminar surface between veins abaxially glabrous or with sparse bacilliform and filiform trichomes, adaxially glabrous, and indusia entire with bacilliform trichomes. Such morphological characters of *C. christensenii* and comparison notes with the most similar species (*C. bigarellae* and *C. paranaensis*) to it are in Viveros & Salino (2015). See also the notes about *C. bigarellae*.

7. *Ctenitis deflexa* (Kaulf.) Copeland (1947: 124). Figs. 09F, 13F–H, 16C. *Polypodium deflexum* Kaulfuss (1824: 114). *Dryopteris deflexa* (Kaulf.) Christensen (1906: 261). Type:—BRAZIL. Hab. in Brasilia, Mertens communicavit (no original material known); Rio de Janeiro: Rio de Janeiro, Parque Nacional da Tijuca, 22°56'48"S, 43°44'37"W, 726 m, 28 March 2012, *Mynssen et al. 1301* (neotype RB 00701377!, **designated here**).

Polypodium vestitum Raddi (1819: 288), *nom. illeg., non* Forster (1786: 82), *non* Hooker (1862: 271), *nom. illeg., non* Philipp in Iohow (1892: 995), *nom. illeg. Nephrodium vestitum* (Raddi) Baker in Hooker & Baker (1868: 265). *Aspidium raddianum* Mettenius (1858: 91), *non Aspidium vestitum* Swartz (1801: 37). *Nephrodium raddianum* (Mett.) Hooker (1862: 98). Type:—BRAZIL. Rio de Janeiro: Rio de Janeiro: "Invenitur in sylvis montis Corcovado", *Pohl s.n.* (lectotype PI! designated by Pichii Sermolii & Bizzari 2005).

Aspidium basilare Fée (1869: 135). Type:—BRAZIL. Rio de Janeiro, *Glaziou 2373* (lectotype P 00643972!, **designated here**, isolectotypes BR 0000006988357!, P 00643971!, P 01630479!).

Phegopteris fluminensis Fée (1869: 97). Type:—BRAZIL. Rio de Janeiro, *Glaziou 965* (lectotype P 00170004!, **designated here**, isolectotypes BR 0000013531638!, RB 00608023!).

Dryopteris deflexa (Kaulf.) C. Chr. var. *aschersonii* Mettenius ex Christensen (1913a: 99). Type:—BRAZIL. Espírito Santo. Minas Strasse, 1816, *Wied-Neuwied s.n.* (lectotype B 20 0054777!, **designated here**, isolectotypes B 20 0054778!, BM!).

Stems short-creeping, 1.7–2.8 cm diam., scales 2.4–3.1 × 0.6–1.2 mm, light castaneous, clathrate, lanceolate, slightly denticulate, with many short and long fimbriae along all margin; *leaves* 40–102 cm long; *petioles* 15–45 cm × 1.8–4.3 mm, with 4 vascular bundles at base, stramineous, scales 2.5–6.2 × 0.6–1.2 mm, dark brown with pale edges, clathrate, tangled on petiole base, becoming appressed towards distal portion, flattish, flaccid, lanceolate with cordate base and attenuate or filiform apex, slightly denticulate, with many short and long fimbriae along all margin, sparse catenate trichomes or absent abaxially, sparse glandular trichomes or absent; *laminae* 27–60 × 10.5–23.5 cm, width 1/3–1/2 of length, 1-pinnate-pinnatifid basally, medially and apically, lanceolate,

apex confluent; *rachises* stramineous, scales like those on distal portion of petioles, sparse to dense catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 13–18 pairs, the basal and medial ones stalked to 1.6 mm long, the apical ones sessile, basal pinnae basicopically and acropically somewhat equally developed, the medial 6–11 × 2.0–2.8 cm, lanceolate, incised 1/2–3/4 of the distance between the segment apex and costa, basal segments somewhat shorter than the next at basal pinnae, but longer at medial, apex acute; *adaxial pinnae axes* with sparse scales on costa, 1.2–1.6 × 0.12 mm, light castaneous, linear or linear-lanceolate, catenate trichomes dense on costa, sparse on costule, rare on veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with dense scales on costa and costule (basally), (0.9) 1.8–3.7 × (0.1) 0.3–0.8 mm, light castaneous, clathrate, imbricate, flattish, flaccid, ovate or lanceolate with cordate base and filiform apex, slightly denticulate, with many short and long fimbriae along all margin, proscapes to 0.9 mm long sparse on costule, catenate trichomes sparse on costa, bacilliform trichomes sparse on costa, costule and veins, glandular trichomes sparse on costa and sometimes also on costule, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse bacilliform trichomes; *segments* 11–17 pairs, 3.0–5.7 mm wide, patent or subfalcate, entire, repand or crenate towards apex, apex truncate, obtuse or acute, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple, 5–10 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* inframedial, indusia conspicuous or inconspicuous, entire, with bacilliform trichomes; *spores* with coarse folds and large tubercles.

Selected specimens examined:—BRAZIL. Alagoas: Ibateguara, Usina Serra Grande, Engenho Coimbra, Grota do Taquarí/Porcos, 390–415 m, 09°00'19"S, 35° 51'50.8"W, 10 February 2001, *Pietrobon & Santiago 4931* (BHCB); Bahia: Jussari, Fazenda Serra do Teimoso, Reserva Serra do Teimoso, 750–850 m, 15° 05'44"S, 39° 32'33"W, 15 March 2003, *Thomas et al. s.n.* (CEPEC); Espírito Santo: Cachoeiro do Itapemirim, Floresta Nacional de Pacotuba, Trilha das Árvores Centenárias, 115 m, 20°44'19"S, 41°16'39.4"W, 27 October 2009, *Salino & Viveros 14572* (BHCB); Cariacica, Reserva Biológica Duas Bocas, 600 m, 20°17'29" S, 40°31'10" W, 15 February 2008, *Labiak et al. 4633* (RB); Minas Gerais: Coronel Pacheco, Fazenda da Argentina, 450 m, 9 May 1944, *Heringer 1372* (RB); Distrito Ilhen, Fazenda da Tabunha, 210 m, 31 August 1930, *Y. Mexia 5028* (UC); Juiz de Fora, Fazenda Boa Esperança, 29 September 1937, *Brade 15909* (RB); Rio de Janeiro: Casimiro de Abreu, Morro de São João, 14 December 1998, *Damasceno 664* (RB); Mangaratiba, Reserva Ecológica Rio das Pedras, 19 October 1996, *Braga et al. 3606* (RB); Nova Friburgo, Estrada do Rio, 19 November 1922, *Kuhlmann 110* (RB); Paraty, Entrada da Rio-Santos para Paraty Mirim em direção ao Patrimônio, 8 May 1991, *Sylvestre, et al. 403* (RB); Petrópolis, Estrada Araras, *Spannagel 541* (HB); Rio Bonito, Entre a Mesa do Imperador e Alto da Boa Vista, October 1961, *Duarte 5754* (RB); Rio de Janeiro, Gávea Pequena, 18 August 1957, *Pabst 4299* (HB); Santa Catarina: Porto União, Pinheiral, 20 December 1956, *Smith & Reitz 8900* (US); São Paulo: Ubatuba, Parque Estadual da Serra do Mar, Núcleo Picinguaba, Trilha do Jatobá, 40 m, 23°20'25.8"S, 44°50'13.4"W, 02 May 2001, *Salino et al 6654* (BHCB).

Habitat and distribution:—Terrestrial, endemic to Atlantic Forest, 40–800 m, from northeastern to southern Brazil (Fig. 16C; Tab. 01).

Notes:—*Ctenitis deflexa* is recognized by its short-creeping stem (Fig. 01C) and by scales ovate or lanceolate with many short and long fimbriae along the whole margin (Figs. 13F–H). The scales on rachis are dark brown with pale edges (Fig. 13F), and the ones on costa and costule are uniformly light castaneous (Fig. 13H). *Ctenitis deflexa* is quite similar to *C. anniesii* and *C. fenestralis*. See notes about *C. anniesii* for further comparisons.

Kaulfuss (1824) did not indicate a type material for *Polypodium deflexum*; he just mentioned its habitat (Brazil), referring to Mertens personal communication. Christensen (1913a) interpreted “Mertens” as the type collection without mentioning herbarium and assumed that he had not seen such specimen. Thus, no type was designated to date since no extant original material was found (Art. 9.13 of *ICN—McNeill et al.* 2012). There is a possibility that such material has been destroyed, once some taxa described by Kaulfuss were based on specimens in LZ, which was destroyed during the Second World War. Notwithstanding, we agree with Christensen (1913a) that Kaulfuss description matches with *P. vestitum* (Raddi 1819), the earliest but illegitimate name to this species. Therefore, to typify the name traditionally used, we designate here a neotype (Art. 9.7 and 9.13 of *ICN—McNeill et al.* 2012) for *P. deflexum*. The sheet selected is a complete specimen, with the typical short-creeping stem and leaves, from Rio de Janeiro where this species is very common.

For *Aspidium basilare* and *Phegopteris fluminensis*, Fée (1869) did not designate holotypes or specified any herbaria for the collections cited. Thus, we designate lectotypes for such names (Rec. 9A, Art. 9.2, 9.11, 9.12 of

ICN—McNeill *et al.* 2012). The sheets chosen for each name are in P. The lectotype of *A. basilare* is with the original large label of Fée and his own signature, and the *P. fluminensis* is the only one in P with this name, which was from Glaziou's herbarium (later incorporated by P).

On the protologue of *Dryopteris deflexa* var. *aschersonii*, Christensen (1913a) cited the collection of Prinz zu Wied (*M. A. P. Wied-Neuwied*) in B. However, two sheets of this collection are in B (both with Christensen's identification label), and a fragment removed of one of them is in BM (purchased from Christensen's herbarium). About the ones in B, one is from "Principis Maximiliani de Wied" herbarium, and the other sheet seems to be sent by himself to B with some description notes. Besides these two sheets seems to be from a single specimen, they are not clearly labeled as such. Thereby, we selected the sheet with Wied-Neuwied notes as the lectotype (Art. 8.3, Rec. 8A.4, 9.2, 9.5, 9.11, 9.12, 40 Note 1 of ICN—McNeill *et al.* 2012).

8. *Ctenitis distans* (Brack.) Ching (1938: 277). *Lastrea distans* Brackenridge (1854: 192). Type:—BRAZIL. Rio de Janeiro, *Capt. Wilkes s.n.* (holotype US 00067060!).

Stems erect or ascending, 1.5–3.5 cm diam., scales 4.9–16.1 × 0.2–0.9 mm, light castaneous, clathrate or subclathrate, linear-lanceolate or lanceolate, entire, with or without some short fimbriae at base; *leaves* (34) 78–187 cm long; *petioles* (14) 28–71 cm × (1.7) 3.0–6.0 mm, with 4 or 6 vascular bundles at base, stramineous, scales 3.0–7.4 × 0.2–0.6 mm, light castaneous on petiole base, becoming dark brown to blackish on distal portion, clathrate, not tangled on petiole base, becoming appressed towards distal portion, flattish, flaccid, linear-lanceolate or lanceolate with cordate base and filiform apex, denticulate, with or without some short fimbriae at base and laterally, sparse or dense catenate trichomes abaxially, glandular trichomes absent; *laminae* (20) 50–116 × (14) 22–46 cm, width ca. 1/3–1/2 of length or wider, 1-pinnate-pinnatisect or 1-pinnate-pinnatifid basally, 1-pinnate-pinnatifid medially and apically, lanceolate or ovate, apex confluent; *rachises* stramineous, scales like those on distal portion of petioles, rare to dense catenate trichomes abaxially, glandular trichomes absent; *pinnae* 10–37 pairs, the basal and medial ones stalked to 6.7 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 7.5–22.5 × 1.8–4.6 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments somewhat shorter or as long the next, apex attenuate; *adaxial pinnae axes* with sparse scales on costa, 0.6–3.1 × 0.06–0.12 mm, dark brown to blackish, filiform, catenate trichomes dense on costa, sparse on costule, rare or sparse on veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with sparse to dense scales on costa and costule (basally), (0.6) 1.2–4.3 × 0.1–0.7 mm, mainly castaneous, but dark brown to blackish towards apex or uniformly dark brown or blackish, clathrate or subclathrate, ascending, sometimes imbricate, mostly flattish, but can be vaulted at base, flaccid, lanceolate or linear-lanceolate with cordate or rounded base and filiform apex, denticulate (the teeth claw-shaped), with or without some short fimbriae at base and laterally, proscasles 0.6–3.1 mm long sparse or absent on costule, catenate trichomes absent or sparse on costa, costule and veins, bacilliform trichomes absent or sparse on costule and veins, glandular trichomes absent, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse bacilliform trichomes, or sparse catenate trichomes; *segments* 19–27 pairs, 2.8–5.6 mm wide, patent or subfalcate, entire, repand or serrate towards apex, apex rounded or acute, margin with catenate trichomes, the distance from each other is the same width of the segments or narrower; *veins* simple, 7–15 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* inframedial, indusia conspicuous, entire or ciliate, with bacilliform trichomes; *spores* with coarse folds and large tubercles.

Notes:—The specimens of *C. distans* are usually large and can be recognized by the dark brown to blackish scales on rachis and, castaneous but dark brown to blackish towards apex on costa and costule abaxially, or uniformly dark brown to blackish. These scales are denticulate, which teeth are claw-shaped. *Ctenitis paranaensis* and *C. falciculata* also have dark brown to blackish scales on rachis, however, in these two species the scales are entire or slightly denticulate, and on pinnae abaxially the scales are only on costa, not on costule (but with or without proscasles), while in *C. distans* there are scales on costa and costule (at least basally). We recognize two varieties of this species: *C. distans* var. *distans* and *C. distans* var. *isabellina*, as follows.

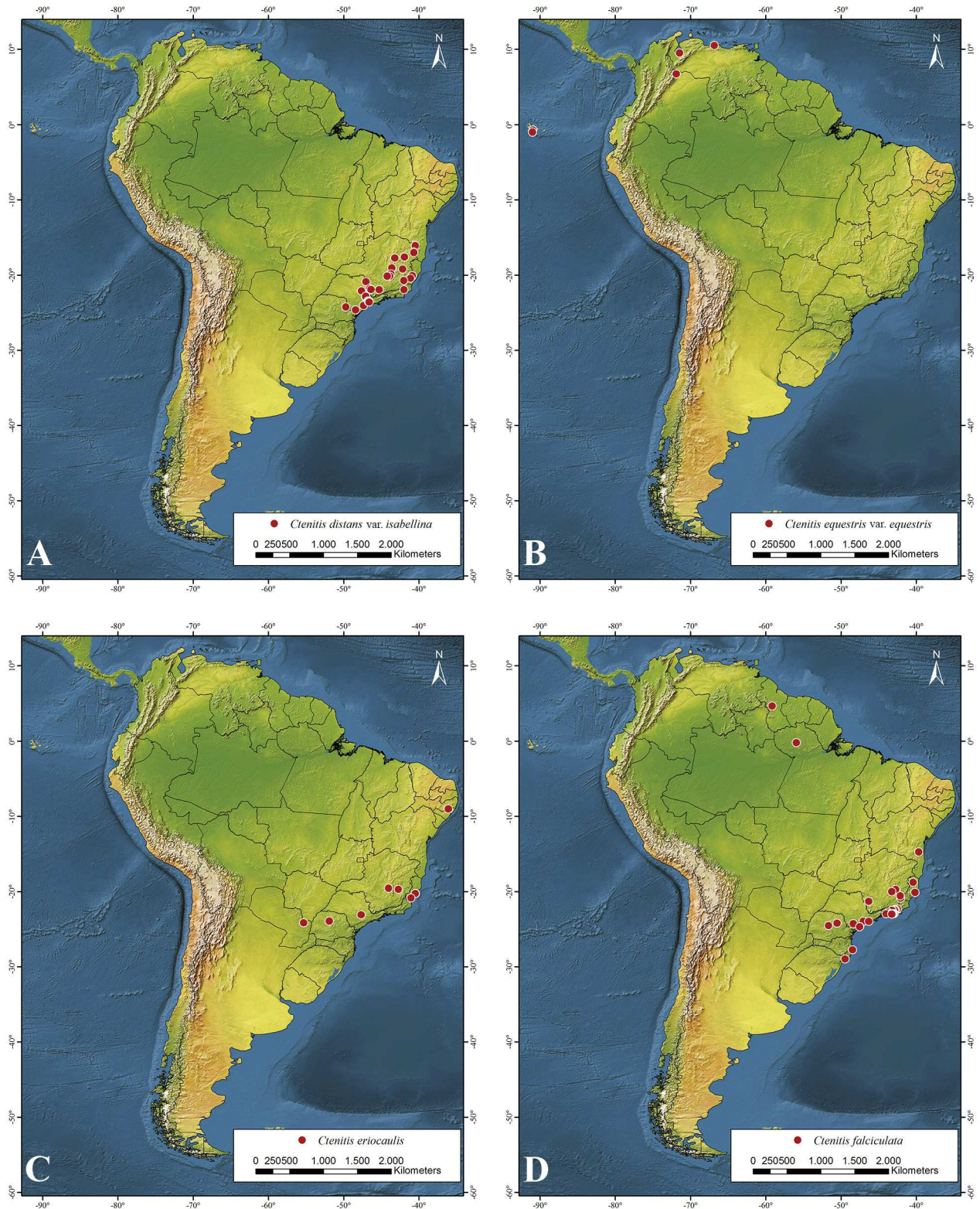


FIGURE 18. Distribution of four taxa of *Ctenitis* in South America. **A:** *C. distans* var. *isabellina*. **B:** *C. equestris* var. *equestris*. **C:** *C. eriocalis*. **D:** *C. falciculata*.

8.1. *Ctenitis distans* (Brack.) Ching (1938: 277) var. *distans*. Figs. 09G, 15A–C, 16D.

Aspidium ctenitis Link (1833: 122). *Nephrodium ctenitis* (Link) Baker in Hooker & Baker (1868: 265). *Dryopteris ctenitis* (Link) Kuntze (1891: 812). Type:—BRAZIL (from Brazil, cultivated in Hort. Berol.). *Unknown s.n.* (lectotype B 20 0054401!, **designated here**, isolectotypes B 20 0054400! BM 000937853!).

Aspidium amaurolepis Fée (1869: 137). *Dryopteris ctenitis* (Link) Kuntze f. *amaurolepis* (Fée) Christensen (1913a: 94). Type:—BRAZIL. Rio de Janeiro, *Glaziou 2370* (lectotype P00170066!, **designated here**, isolectotypes B 20 0067955!, K 000590326!, P 00170068!); remaining syntypes:—BRAZIL. Rio de Janeiro, *Glaziou 1680* (P 02141712!, P 00170065!, US 00067052!); *Glaziou 2371* (P 00170067!, not P 00170069!, P 02141714!); *Glaziou 2372* (BR 0000013531621!, P 00170070!, P 00170072!, S 14-32612!, not K 000590327!, P 00170071!, P 01567696!).

Selected specimens examined:—BRAZIL. Alagoas: São José da Lage, Usina Serra Grande, Mata Maria Maior, Mata do Pinto (área do Projeto Capivara), 380–507 m, 08°58'19.01"S, 36°06'36.05"W, 25 November 2001, *Pietrobon 5392* (BHCB); Bahia: Amargosa, Área de Duas Barras, 625 m, 14°09'66" S, 39°49'44" W 19 October 2007, *Paixão & Nascimento 1412* (HUEFS); Camacan, RPPN Serra Bonita, 700 m, 15°23'35"S, 39°33'53"W, 14 April 2007, *Matos et al. 1372* (NY); Santa Terezinha, Serra da Jibóia, 3 March 2001, *Nonato et al. 800* (HUEFS); Ceará: Baturité, Sítio Santa Clara, 900, 9 December 1937, *Eugenio 46* (RB); Espírito Santo: Santa Teresa, Reserva Biológica Augusto Ruschi, Trilha da Preguiça, 830–900 m, 19°54'58"S, 40°32'31"W, 3 December 2008, *Salino et al. 14055* (BHCB); Minas Gerais: Nova Lima, RPPN Mata do Jambreiro, 770 m, 19°58'41.9"S, 43°53'10.6"W, 17 September 2003, *Figueiredo et al. 45* (BHCB); Viçosa, Fazenda Faziuma, 700 m, 27 May 1930, *Mexia 4750* (F, GH, MO, NY, UC); Paraná: Telêmaco Borba, Parque Ecológico da Klabin, Trilha Ecológica, 850 m, 24°12'42"S, 50°33'26"W, 1 February 2005, *Sakagami 337 et al.* (BHCB); Pernambuco: Cabo de Santo Agostinho, Reserva de Gurjaú, 14 March 1991, *Fonseca et al. s.n.* (MO); Jaqueira, Usina Colônia, 652 m, 8°43'00" S, 35°50'20" W, 31 May 2001, *Lopes & Pietrobon 277* (RB); Timbaúba, Complexo da Serra do Mascarenhas, Usina Cruangi, Engenho Água Azul, ca. 304–394 m, 07°36'31.5"S, 35°22'42.9"W, 13 November 2000, *Pietrobon et al. 4650* (BHCB); Rio de Janeiro: Rio de Janeiro, Tijuca, 500–975 m, 31 March 1929, *Smith & Brade 2235* (GH); Petrópolis, próximo à Carangola, 910 m, 22°27'53"S, 43°10'02"W, 22 May 2010, *Heringer 469* (BHCB); São Paulo: Analândia, Salto do Rio Corumbataí, 25 June 1993, *Salino 1791* (BHCB).

Habitat and distribution:—Terrestrial, endemic to Atlantic Forest, 200–1200 m. Northeastern to southern Brazil (Fig. 16D; Tab. 01).

Notes:—In this typical variety the scales on costa abaxially are castaneous, but dark brown to blackish towards apex, distinctly clathrate, lanceolate, to 0.7 mm wide; catenate trichomes are absent on abaxial pinnae axes and laminar surface between veins glabrous or with sparse bacilliform trichomes (Figs. 15A–C). In opposition, *C. distans* var. *isabellina* scales that are on costa abaxially are quite uniformly dark brown to blackish, subclathrate, linear to linear-lanceolate, to 0.3 mm wide (Fig 15E); catenate trichomes are sparse on abaxial pinnae axes, as well on laminar surface between veins. Specimens of *C. distans* var. *distans* have 4 vascular bundles at petiole base (Fig. 02B), while *C. distans* var. *isabellina* have 6 (Fig. 02D). The vascular bundles at petiole base are an interesting feature to be more investigated in *Ctenitis*, once the number of them is not constant under the current genus circumscription and even not constant in some of the species.

Fée (1869) and Christensen (1913a) were aware of the distinction of those two taxa. Fée (1869) considered them as species (*Aspidium amaurolepis* and *A. isabellinum*) and Christensen (1913a) as form under a single species (*Dryopteris ctenitis* f. *amaurolepis* and *D. ctenitis* f. *isabellina*). Brade (1972) identified several herbarium sheets with these infraspecific names, although he has not recognized them in his treatment for *Dryopteris* in Brazil. Notwithstanding, after analyzing the types and several materials, we also recognize these taxa and, despite the differences we were able to diagnose, there is much overlap of characters between them, that seems unwise recognizing them as different species at this moment.

Link (1833), when describing *Aspidium ctenitis*, did not cite any specimen. Christensen (1913a) cited that the type was in B. Indeed, in B there are two sheets that certainly correspond to original material, once they are labeled with such name and with "H.B. Link". Probably they are from a single specimen, but this is not clearly labeled. Then, we chose as lectotype (Art. 8.3, Rec. 8A.4, Art. 9.2, 9.5, 9.11, 9.12, 40 Note 1 of the *ICN*—McNeill *et al.* 2012) the sheet with more pinnae. A fragment removed from one of these sheets is in BM (purchased from Christensen's herbarium). The plant from which the collection was made, was being cultivated in the Horto Berolinense, catalogued as from Brazil. As mentioned by Christensen (1913a) it seems to be an abnormal form. Its

basal pinna is more developed, pinnate at base (with pinnules proximally) and with segments (distally) serrate. Nevertheless, the other features are the same as the type material of *Lastrea distans* and most specimens of *Aspidium amaurolepis*.

The names *Aspidium amaurolepis* and *A. isabellinum* are based on *Glaziou's* collections. For *A. amaurolepis*, Fée (1869) cited *Glaziou 1680, 2370, 2371 and 2372* and for *A. isabellinum* only *Glaziou 2368*. By Fée's original descriptions, *A. amaurolepis* matches with the same taxon of *A. ctenitis* and *L. distans*, here recognized as the typical variety of *C. distans*, while *A. isabellinum*, corresponds to *C. distans* var. *isabellina* (here combined). However, there are several sheets of *Glaziou's* collections and some of them do not correspond to the taxon they supposed to be (see the headers 8.1. and 8.2.). Following the Art. 8.2, 8.3, 9.11, 9.12 and 9.14 of *ICN* (McNeill *et al.* 2012), we propose a lectotype for each name. For *A. amaurolepis* the sheet chosen is the one with entire petiole and a large portion of lamina, corresponding to *C. distans* var. *distans*. For *A. isabellinum*, we chose the sheet that corresponds to *C. distans* var. *isabellina* and is with the original Fée's label with his signature.

8.2. *Ctenitis distans* (Brack.) Ching var. *isabellina* (Fée) R.S. Viveros & Salino, *comb. nov., stat. nov.* Figs. 09H, 15D–E, 18A. *Aspidium isabellinum* Fée (1869: 137). *Dryopteris isabellina* (Fée) Christensen (1906: 272). *Dryopteris ctenitis* (Link.) Kuntze f. *isabellina* (Fée) Christensen (1913a: 94). Type:—BRAZIL. Rio de Janeiro, *Glaziou 2368* (lectotype P 00170017!, **designated here, isolectotypes B 20 0038358!, BM 000937854!, P 00643495!, not B 20 0054404!, K 000880597!, P 00170018!, P 01630476!, S 06-528!).**

Selected specimens examined:—BRAZIL. Espírito Santo: Estrada do Espírito Santo, 10 November 1946, *Brade et al. 8072* (RB); Minas Gerais: Carangola, Fazenda Boa Vista, 30 May 1989, *Salino et al. 820* (UEC); Caratinga, Estação ecológica de Caratinga (Fazenda Montes Claros), 6 September 1998, *Salino 4323* (BHCB); São Sebastião do Paraíso, Fazenda Calada, 16 April 1945, *Brade & Barbosa 17956* (RB); Paraná: Jaguariaíva, Serrinha, 18 November 1976, *Hatschbach 39235* (MBM, UC); Rio de Janeiro: Rio de Janeiro, Parque Nacional da Tijuca, 17 June 1967, *Suthers 88* (UC); Santa Maria Madalena, 1200 m 4 March 1934, *Lima & Brade 13137* (RB); São Paulo: Analândia, Serra do Cuscuzeiro, 25 October 1986, *Salino 32a* (UEC); Itapetinga, 26 June 1914, *Brade 7598* (UC); São Paulo, Reserva Florestal "Armando de Salles" USP, 12 September 1996, *Groppi Júnior 217* (NY); Tapiraí, Reserva Votorantin, Complexo Juquiá, Trilha Boatudo, 425 m, 24°02'14"S, 47°22'53"W, *Salino et al. 15640* (BHCB).

Habitat and distribution:—Terrestrial. Endemic to Atlantic Forest, 150–1100 m. Southeastern to southern Brazil (Fig. 18A; Tab. 01).

Notes:—This variety differs from the typical by dark brown to blackish among some castaneous scales on costa abaxially, which are linear or linear-lanceolate, to 0.3 mm wide and sparse catenate trichomes on costa, costule, veins and between veins abaxially (Figs. 15D–E). See the notes about *C. distans* var. *distans* for further information about morphology, differences between the varieties and typification.

9. *Ctenitis equestris* (Kunze) Ching (1940: 250) var. *equestris*. Figs. 09I, 17A–B, 18B. *Aspidium equestre* Kunze (1844: 347). *Dryopteris equestris* (Kunze) Christensen (1920: 54). Type:—MEXICO. *Leibold 42* (holotype LZ destroyed, lectotype B 20 0055411!, **designated here, isolectotype HBG).**

Polypodium alsophiloides Liebmann (1849: 208). Type:—MEXICO. Oaxaca: "Trapiche de la Concepcion", *Liebmann sn.* [Pl. Mex. 2406] (lectotype C designated by Smith 1981, isolectotype B 20 0055237!).

Lastrea ciliata Liebmann (1849: 273). Type:—MEXICO. Veracruz: Near S. Antonio Huatusco; 1450 ft, *Liebmann s.n.* [Pl. Mex. 2394, Fl. Mex. 199] (C—two sheets; US 00067013!).

Aspidium bourgeai Fournier (1872: 98) ("*bourgaei*"). *Dryopteris bourgeai* (E. Fourn.) Christensen (1906: 255). Type:—MEXICO. Veracruz: Vallée de Cordova, *Bourgeau 1839* (lectotype P00642730!, **designated here**, isolectotypes BM 000937868!, BR 000000698770!, K 000590296!, K 000590297!, LE!, MPU 15242 [image!], MPU 15243 [image!], P 00642729!, P 00642731!, US 00067006!, US 00067007!, MICH 1190030 [image!]).

Aspidium scabriusculum Davenport (1896: 255), *nom. illeg., non* Mettenius in Salomon (1883: 69). *Dryopteris davenportii* Christensen (1906: 260). Type:—MEXICO. Veracruz: Ravines above Orizaba, 6 February 1895, *Pringle 6132* (lectotype GH 00020486!, **designated here**, isolectotypes B 20 0055234!, BM 000788116!, CAS 0000779!, CM 0113 [image!]).

COLO 00348128 [image!], K 000590295!, F 0075886F!, F 0075887F!, GH 00967126!, GH 00967127!, GOET 008719 [image!], MEXU 01223467 [image!], MEXU 01223466 [image!], MEXU 01223465 [image!], MO 102952!, NDG 04227 [image!], NY 00149420!, NY 00149427!, P 00642725!, P 00642726!, P 00642727!, P 00642728!, PH 00004818 [image!], PR 4585!, S-P-8918!, UC 123306!, US 00067042!, VT UVMVT015729 [image!], WU 032301 [image!]).

Stems erect or ascending, 2.0–4.0 cm diam., scales 8.9–22.6 × 0.3–1.1 mm, light castaneous or castaneous, clathrate or subclathrate, linear, entire, without fimbriae; *leaves* 30–150 cm long; *petioles* 30–75 cm × 2.6–8.0 mm, with 5 vascular bundles at base, stramineous or tan, scales 5.55–15.81 × 0.43–1.50 mm, light castaneous or castaneous, clathrate, tangled at base, becoming ascending and imbricate towards distal portion, flattish, flaccid, linear with truncate base and filiform apex, entire, with or without some short fimbriae at base, sparse catenate trichomes abaxially, sparse glandular trichomes; *laminae* 25–80 × 30–90 cm, width wider than 1/2 of length, 3–4-pinnate-pinnatifid basally, 2–3-pinnate-pinnatifid medially and apically, deltate, apex confluent; *rachises* more or less straight, stramineous or tan, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 9–15 pairs, the basal ones stalked to 25.8 mm long, the medial ones stalked to 24.0 mm long, the apical ones stalked to 2.1 mm long, basal pinnae basiscopically enlarged, the medial (10.5) 17–50 × (4) 8.5–40 cm, lanceolate, apex attenuate or caudate; *adaxial pinnae axes* with sparse scales on pinna rachis 0.5–2.0 × 0.1–0.4 mm, brownish, somewhat iridescent, black-walled in middle with pale edges, lanceolate or ovate, catenate trichomes dense on pinna rachis and costa, sparse on costule and veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous or with sparse catenate trichomes; *abaxial pinnae axes* with scales sparse on pinna rachis and costa, rare on costule, 0.8–3.1 × 0.2–0.6 mm, dark brown to blackish, sometimes pale at edges, iridescent, clathrate, appressed or imbricate, flattish or sometimes vaulted at base, flaccid, lanceolate with cordate base and filiform or attenuate apex, entire or slightly denticulate, with or without some short fimbriae at base, catenate trichomes sparse or dense on costa, sparse or rare on costule and veins, bacilliform trichomes absent or sparse on costa, costule and veins, glandular trichomes sparse on pinna rachis, costa and costule, rare on veins, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse catenate and bacilliform trichomes near margins; *pinnules* 7–13 pairs, the basal ones stalked to 5.3 mm long, the medial ones stalked to 0.7–1.8 mm long, the apical sessile, the medial (2.3) 3.8–10.5 × (0.5) 1.1–3.3 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, almost pinnatisect, pinnatisect basally, basal segments as long or longer than the next, apex acute, attenuate or caudate; *ultimate segments* 8–14 pairs, 1.6–7.5 mm wide, entire, crenate or serrate, apex rounded or acute, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple or 1–3-forked, 6–9 pairs (before forking) per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* medial, conspicuous, entire, with bacilliform trichomes; *spores* with coarse, irregular echinae.

Selected specimens examined:—COLOMBIA. Santander: western slope of Mount Peña Blanca, near Charta, 2500–2600 m, 11 February 1927, *Killip & Smith 19276* (GH); ECUADOR. Galapagos: Albemarle Island, 27 August 1905, *Stewart 959* (NY); VENEZUELA. Distrito Federal: Cerro El Avila, Parque Nacional El Avilla, 1990 m, 10°32' N, 66°52' W 10 February 1992, *Meier 1641* (UC); Lara: Trujillo, Carache, via Cerro Gordo, 2100 m, 09°32' N, 70°09' W, 21 May 1987, *Rivero 1178* (UC).

Habitat and distribution:—Terrestrial in montane rainforests, 500–2600 m. Mesoamerica (Mexico, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama) and South America (Venezuela, Colombia and Ecuador—Galapagos; Fig. 18B; Tab. 01).

Notes:—Among the other 2–4-pinnate-pinnatifid (Fig. 03C) South American species, *C. equestris* var. *equestris* differs by its scales dark brown to blackish sometimes pale at edges and iridescent (Figs. 17A–B). This taxon is recorded for the first time in South America, through some herbaria specimens previously identified as *C. ampla*. Nonetheless, this taxon is widely distributed in Mesoamerica. The other variety under this species is *C. equestris* var. *erosa* (Stolze 1977: 41), which occurs in Mexico, Guatemala and Honduras.

The holotype indicated in the protologue of *Aspidium equestre* was in Römer's Herbarium, which was incorporated by LZ, and then destroyed during the Second World War. A duplicate with sample of stem and a complete lamina is in B (from Brehmer's Herbarium) and we designate it to be the lectotype (Art. 9.12 of ICN—McNeill *et al.* 2012). There is another in HBG (Mickel & Smith 2004), which we have not examined in hands.

Liebmann (1849) was unaware about the type material of *A. equestre* and described the same taxon as *Polypodium alsophiloides* and *Lastrea ciliata*, two morphological extremes, but still the same taxon.

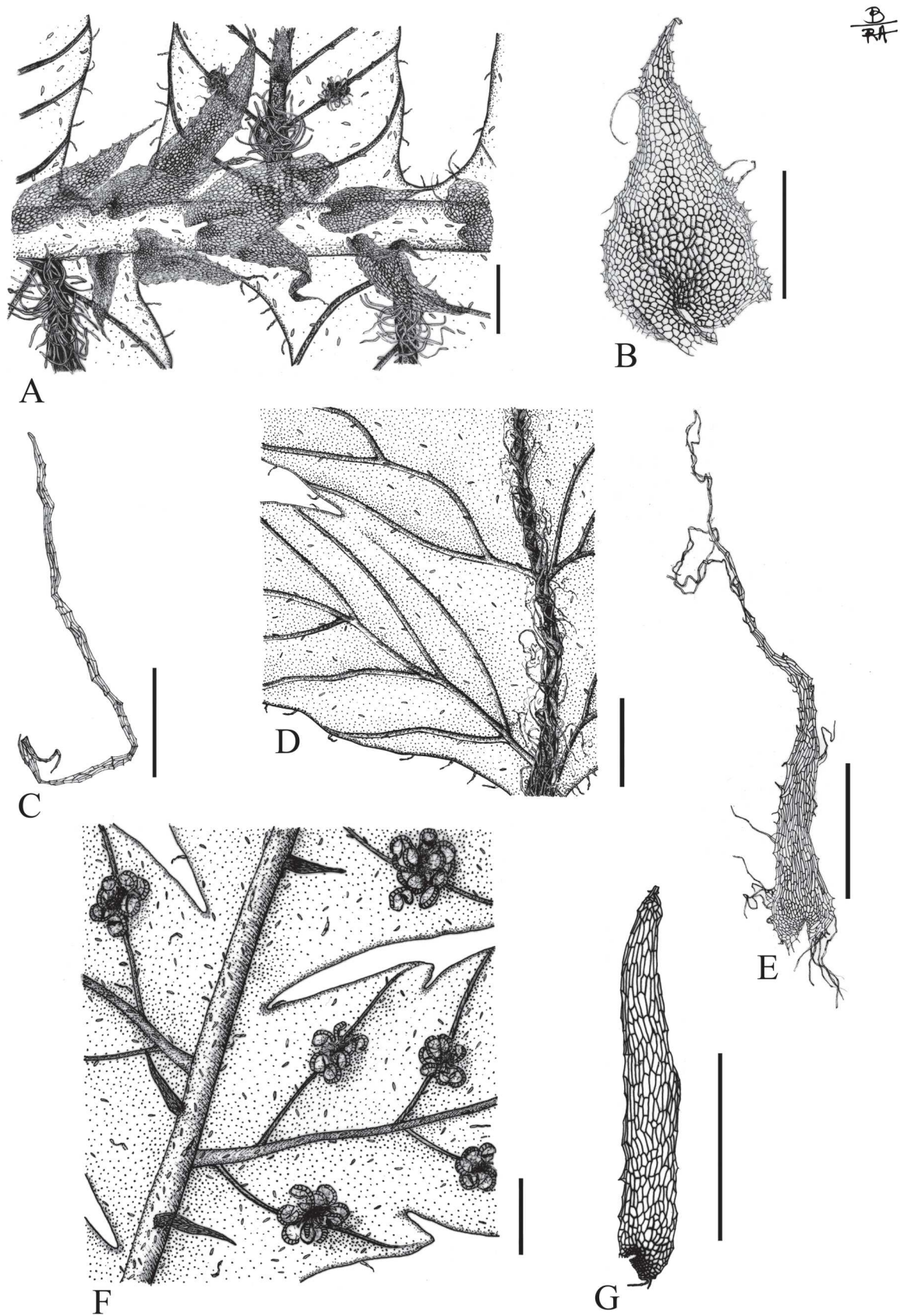


FIGURE 19. Some morphological characters of *Ctenitis* from South America. **A–C:** *Ctenitis fenestralis* (Salino 7285, BHCB). **A:** abaxial surface of a portion of a pinna. **B:** abaxial costa scale. **C:** adaxial costa scale. **D–E:** *C. flexuosa* (Luederwaldt 1890, UC). **D:** abaxial surface of a portion of pinnule. **E:** abaxial costa scale. **F–G:** *C. grisebachii* (Grayum 3707, MO). **F:** abaxial surface of a portion of pinnule. Scale bars = 1 mm.

Aspidium bourgeaui was described by Fournier (1872) as distinct from *A. equestre*, by subtle differences in segments size and form. As Fournier cited a gathering, *Bourgeau 1839*, without specifying any herbarium, and there are many duplicates of this collection in several herbaria, we selected one of the sheets in P, where Fournier worked, to be the lectotype (Art. 8.3, 9.2, 9.5, 9.11, 9.12 of ICN—McNeill *et al.* 2012). The sheet chosen contains a larger fragment of leaf than the others.

In the protologue of *Aspidium scabriusculum*, Davenport (1896) cited the collection *Pringle 6132*. Pringle's collections are widely spread in several herbaria. We found 26 herbarium sheets of *Pringle 6132*. Mickel & Smith (2004) cited the one in GH as the holotype and other herbaria for isotypes. Davenport worked in Harvard, however he did not indicate a holotype, nor specified a herbarium (Davenport 1896). For this reason, we designate here as lectotype the same sheet indicated as holotype by Mickel & Smith (2004), certainly examined by Davenport (see Art. 7.10, 9.2, 9 Note 6, 9.9, 9.11, 9.12, 9.19 and 40 Note 1 of ICN—McNeill *et al.* 2012).

10. *Ctenitis eriocaulis* (Fée) Alston (1960: 112). Figs. 09J, 17C–G, 18C. *Aspidium eriocaulon* Fée (1869: 136). *Nephrodium eriocaulon* (Fée) Baker in Hooker & Baker (1874: 495). *Dryopteris eriocaulis* (Fée) Kuntze (1891: 812). *Dryopteris cirrhosa* (Schumacher 1829: 231) Kuntze (1891: 812) var. *eriocaulis* (Fée) Christensen (1913a: 102). *Nephrodium ramentaceum* Baker (1870: 273), *nom. illeg.* Type:—BRAZIL. Rio de Janeiro, *Glaziou 2369* (lectotype P 00170023!, **designated here**, isolectotypes BR 000000698767!, BR 000000698834!, P 00170024!, P 00170025!, P 01573296!, P 01573297!, P 02141711!).

Stems erect or ascending, 2.6–3.5 cm diam., scales 7.0–19.8 × 0.2–0.5 mm, light castaneous, clathrate, linear, entire, without fimbriae; *leaves* 56.5–120 cm long; *petioles* 29–42 cm × 2.2–4.7 mm, with 4 or 6 vascular bundles at base, stramineous, scales (3.4) 7.6–12.8 × 0.4–1.2 mm, light castaneous, clathrate, not tangled on petiole base, patent or ascending, flattish, flaccid, linear with truncate base and filiform apex, entire, with or without some short fimbriae at base, sparse catenate trichomes abaxially, sparse glandular trichomes; *laminae* 27.5–78 × 18.5–25.7 cm, width 1/3–1/2 or length or wider, 1-pinnate-pinnatifid basally, medially and apically, lanceolate or ovate, apex confluent; *rachises* stramineous, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 11–27 pairs, the basal and medial ones stalked to 2.2 mm long or sessile, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 10.3–13.3 × 2.2–2.54 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments somewhat shorter than the next at basal pinnae, but longer at medial, apex attenuate or acute; *adaxial pinnae axes* scales absent, catenate trichomes dense on costa, sparse on costule and veins, bacilliform trichomes sparse on costule and veins; *adaxial laminar surface between veins* with sparse bacilliform and sometimes also catenate trichomes; *abaxial pinnae axes* with dense scales on costa and costule, (1.1) 1.8–9.3 × 0.3–0.6 mm, light castaneous, clathrate, patent or ascending, mostly flattish, but valted at base, flaccid, subulate with bulate base and filiform apex, entire, without fimbriae, proscasles absent, catenate trichomes sparse on costa, costule and veins, bacilliform trichomes sparse on costa, costule and veins, glandular trichomes sparse on costa and costule, filiform trichomes absent; *abaxial laminar surface between veins* dense bacilliform trichomes and sometimes also catenate trichomes; *segments* 20–26 pairs, 3.8–5.8 mm wide, patent or subfalcate, entire, repand or serrate towards apex, apex acute or apiculate, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple, 8–13 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* inframedial, indusia conspicuous, entire, with glandular and bacilliform trichomes, rarely also with catenate trichomes; *spores* with coarse folds and large tubercles.

Selected specimens examined:—BRAZIL. Alagoas: São José da Lage, Usina Serra Grande, Mata Maria Maior, Grota do Gereba, 380–471 m, ca. 08°59'27.3''S, 36°07'23.9''W, 02 June 2001, *Pietrobon 5333* (HB); Espírito Santo: Cachoeiro do Itapemirim, Fazenda Pedra Branca, 25 May 1949, *Brade 19896* (RB); Cariacica, Reserva Biológica de Duas Bocas, Represa Velha, 170 m, 20°15'31''S, 40°29'51''W, 11 June 2010, *Salino et al. 14873* (BHCB); Minas Gerais: Marliéria, Parque Estadual do Rio Doce, Estrada da Ponte Queimada, 29 May 2001, *Stehmann et al 2972* (BHCB); Paraná: Fênix, Parque Estadual de Vila Rica, 3 October 2008, *Pereira & Falleiros 343* (RB); São Paulo: Porto Ferreira, Parque Estadual Porto Ferreira, 20 August 1999, *Aurea & Sonia s.n.* (BHCB); PARAGUAY. Canendiyú: Mbaracayú Natural Reserve, around Jejui Mi, 100 m, 24°08'01''S, 55°31'41''W, 30 October 1998, *Zardini & Chaparro 49363* (UC).

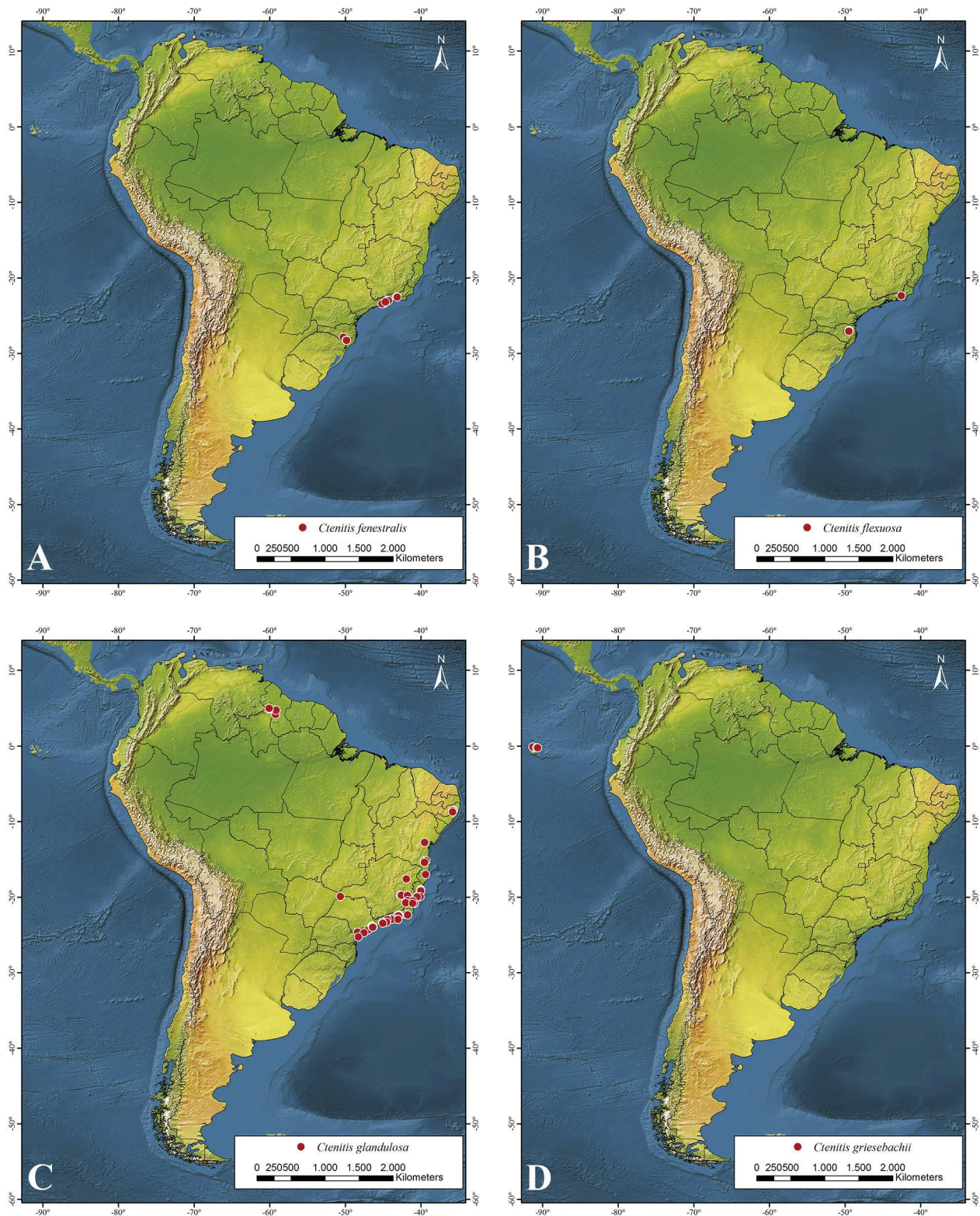


FIGURE 20. Distribution of four species of *Ctenitis* in South America. **A:** *C. fenestralis*. **B:** *C. flexuosa*. **C:** *C. glandulosa*. **D:** *C. griesebachii*.

Habitat and distribution:—Terrestrial. Endemic to Atlantic Forest, 0–900 m. Northeastern to southern Brazil and Paraguay (Fig. 18C; Tab. 01).

Notes:—*Ctenitis eriocaulis* is very scaly and the most morphologically constant species among the 1-pinnate-pinnatifid to 1-pinnate-pinnatisect species from South America. It can be recognized by the petiole, rachis, costa

and costule abaxially with dense light castaneous and subulate scales, bacilliform and catenate trichomes on both laminar surface between veins and large indusia with bacilliform and glandular trichomes on them (Figs. 17C–G). The most similar species to *C. eriocaulis* is the West Indian *C. vellea* (Willdenow 1810: 255) Proctor (1950: 227), which scales on costa abaxially are perfectly bullate with a “pocket-shaped” base but the ones on petiole and rachis are lanceolate. Christensen (1913a) considered *C. eriocaulis* as *Dryopteris cirrhosa* var. *eriucaulis*, so secure he seemed to be that this Brazilian taxon was related to the African *C. cirrhosa* (Schumacher 1829: 231) Ching (1940: 250). Moran & Smith (2001) discussed the possible phylogeographic relationships between these two species. Meanwhile, Moran & Smith (2001) have not seen specimens of *C. eriocaulis* and could not comment Christensen’s observations. Hassler (1928) and Alston (1960) treated this species as different from *C. cirrhosa* and we agree with them. Hennequin *et al.* (2017) could not uphold the affinity between these two species. About the morphology of these two species, we can say that *C. eriocaulis* is much scallier than *C. cirrhosa*, its scales are light castaneous (as *C. vellea*) and longer than the filiform castaneous to brown scales of *C. cirrhosa*, which resembles *C. submarginalis* var. *tenuifolia*.

We designate here a lectotype for *Aspidium eriocaulon*, once Fée (1869) did not designate a holotype (Art. 9.2., 9.11., 9.12. of *ICN*—McNeill *et al.* 2012), neither later authors designated a lectotype and there are several syntypes spread in some herbaria (Art. 8.3., Recommendation 8A.4. of *ICN*—McNeill *et al.* 2012). The sheet chosen is in P with Fée’s original large label with his signature.

The name *Nephrodium ramentaceum* is illegitimate. Baker (1870) intended to describe a new species, but he cited *Glaziou 2369* for it, the same type collection of *A. eriocaulon* (Art. 6.4 and 52.1 of *ICN*—McNeill *et al.* 2012). Later Hooker & Baker (1874) corrected the name to *N. eriocaulon* and Christensen (1906, 1913a) considered *N. ramentaceum* as a synonym of this taxon.

11. *Ctenitis falciculata* (Raddi) Ching (1940: 250). Figs. 09K, 18D. *Aspidium falciculatum* Raddi (1819: 289). *Dryopteris falciculata* (Raddi) Kuntze (1893: 378). Type:—BRAZIL. Rio de Janeiro, *Raddi s.n.* (lectotype P!, designated by Viveros & Salino 2015, isolectotype FI!).

Polypodium ciliatum Presl (1822: 169). Type:—BRAZIL. Rio de Janeiro, *Pohl s.n.* (lectotype PRC! designated by Viveros & Salino 2015).

Aspidium chrysolobum Link (1833: 117). *Nephrodium chrysolobum* (Link) Fée (1852a: 305). *Dryopteris chrysoloba* (Link) Kuntze (1891: 812). Type:—BRAZIL. *Unknown s.n.* (lectotype B 20 0055482! designated by Viveros & Salino 2015).

Aspidium schomburgkii Klotzsch (1847: 369). Type:—GUYANA. *Schomburgk 1167* (holotype B 20 0055494!).

Aspidium schottianum Kunze ex Hooker & Baker (1868: 262). Type:—BRAZIL. Rio de Janeiro, *Schott s.n.* (lectotype PRC!, designated by Viveros & Salino 2015).

Aspidium sericeum Fée (1869: 144). *Dryopteris falciculata* f. *sericea* (Fée) Christensen (1913a: 92). Type:—BRAZIL. Rio de Janeiro, *Glaziou 1658* (lectotype P 00633646!, designated by Viveros & Salino 2015, isolectotypes P 00170029!, P 00633645!); remaining syntypes:—BRAZIL. Rio de Janeiro, *Glaziou 957* (P 00633644!, P 00633643!, P 02141715!, P 00170028!).

Stems erect or ascending, 1.2–2.0 cm diam., scales 3.7–6.80 × 0.6–1.2 mm, castaneous or dark brown, subclathrate, lanceolate, entire, with or without some short fimbriae at base; *leaves* (26) 46.1–92.5 cm long; *petioles* 11.3–41 cm × 0.8–2.8 mm, with 3 vascular bundles at base, stramineous, tan or brownish, scales 3.3–5.7 × 0.2–0.9 mm, dark brown to blackish, subclathrate, not tangled on petiole base, patent or ascending, flattish, flaccid, lanceolate with truncate or slightly cordate base and attenuate apex, entire or slightly denticulate, with or without some short fimbriae at base and laterally, dense catenate trichomes abaxially, sparse glandular trichomes or absent; *laminae* 14.7–51.5 × 9.5–23.4 cm, width ca. 1/2 of length, sometimes somewhat narrower or wider, 1-pinnate-pinnatisect or 1-pinnate-pinnatifid basally, 1-pinnate-pinnatifid medially and apically, lanceolate or ovate, apex confluent; *rachises* stramineous, tan or brownish, scales like those on distal portion of petioles, dense catenate trichomes abaxially, sparse or absent glandular trichomes; *pinnae* 6–16 pairs, the basal and medial ones stalked to 1.8 mm long or sessile, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 4.7–11 × 1.2–2.7 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and

costa, basal segments as long as the next, apex acute, attenuate or caudate; *adaxial pinnae axes* scales absent, catenate trichomes dense on costa, sparse on costula and veins, bacilliform trichomes sparse on costule and veins or absent; *adaxial laminar surface between veins* with sparse to dense catenate trichomes and sometimes also with bacilliform and glandular trichomes; *abaxial pinnae axes* with sparse scales on costa, 0.5–1.9 × 0.1–0.4 mm, dark brown to blackish or castaneous, clathrate, ascending, mostly flattish, but can be vaulted at base, flaccid, lanceolate with truncate or slightly cordate base and attenuate or filiform apex, entire, with or without some short fimbriae at base, proscapes absent, catenate trichomes dense on costa, sparse on costule and veins, bacilliform trichomes absent or sparse on costula and veins, glandular trichomes absent, filiform trichomes absent; *abaxial laminar surface between veins* with dense catenate trichomes, absent or sparse bacilliform trichomes, absent or rare glandular trichomes; *segments* 12–21 pairs, (2.5) 2.8–5.2 mm wide, patent or subfalcate, entire, repand or crenate, apex obtuse, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple, 5–10 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* medial or supramedial, indusia conspicuous, entire, with catenate trichomes, sometimes also with bacilliform trichomes; *spores* with coarse folds.

Selected specimens examined:—BRAZIL. Bahia: Almadina, Serra dos Sete Paus, 6 km de Almadina na estrada para Ibitupã, daí 7 km N para a comunidade de Sete Paus, na nascente do Rio Almada, 578 m, 14°44' S, 39°42' W, 19 July 2005, *Matos et al.* 712 (CEPEC); Espírito Santo: Jatiboca, 13 May 1946, *Brade et al. s.n.* (RB); Nova Venécia, APA da Pedra do Elefante, 221 m, 18°46'37" S, 40°26'38" W, 18 February 2008, *Labiak et al.* 4675 (RB); Serra, 19 July 1973, *Araújo & Peixoto* 305 (RB); Minas Gerais: Divino, Fazenda Fortaleza, 700 m, 20°33' S, 42°09' W, 21 June 1988, *Leoni & Lourenço* 288 (RB); Monte Belo, Fazenda Lagoa, 13 April 1983, *Vieira* 687 (RB); Novo Cruzeiro, Fazenda Araras, 17° 36' 47" S, 41° 57' 49.3" W, 754 m, 10 February 2004, *Stehmann et al.* 3646 (BHCB); Pará: Rio Cuminá, September 1928, *Sampaio s.n.* (R); Paraná: Manoel Ribas, 12 December 1973, *Hatschbach* 33493 (UC); São João do Triunfo, 15 October 1961, *Filho s.n.* (UPCB); Rio de Janeiro: Mangaratiba, Reserva Ecológica do Rio das Pedras, 19 October 1996, *Bovini et al.* 1088 (RB); Nova Friburgo, a caminho da Fazenda São João, 11 November 1976, *Windisch & Ghillany* 587 (HB); Petrópolis, March 1915, *Diajo* 338 (HB); Rio de Janeiro, Floresta da Tijuca, Complexo da Pedra da Gávea, Pico dos Quatro, 22° 00' 20" S, 43° 17' 18" W, 224 m, 11 January 2010, *Fraga et al.* 2830 (RB); Santa Catarina: Florianópolis, Armação do Sul, 100 m, 15 December 1947, *Sehnem* 3156 (RB); Meleiro-Araranguá, 1 February 1944, *Reitz* 1091 (RB); São Paulo: Santos, 1841, *Regnell* 48 (MO); Iguape, Morro das Pedras, 07 July 1916, *Brade* 7717 (UC).

Habitat and distribution:—Terrestrial in rainforest or semideciduous forest, 30–1270 m. Guyana and northern to southern Brazil (Viveros & Salino 2015; Fig. 18D; Tab. 01).

Notes:—*Ctenitis falciculata* is recognized mainly by its dark brown to blackish rachis scales and dense catenate trichomes on axes, laminar surface between veins and on indusia. Such characters are illustrated in Viveros & Salino (2015). Some specimens of *C. falciculata* can have also some yellowish bacilliform trichomes on indusia. The most similar species to *C. falciculata* is *C. paranaensis*, described originally as a variety under *C. falciculata* (*Dryopteris falciculata* var. *paranaensis*; Christensen 1913a). *Ctenitis paranaensis* differs from *C. falciculata* by sparse catenate trichomes on abaxial pinna axes and laminar surface between veins, or glabrous in some individuals (Viveros & Salino 2015). Furthermore, the indusia of *C. paranaensis* are usually inconspicuous and rachis scales are 3–6 mm long, while in *C. falciculata* the indusia are always conspicuous and the rachis scales are usually 1–2 mm long. The geographic distribution of *C. falciculata* is disjunct or reveals a collection gap, since the records are from Guyana and Pará (northern Brazil) and then the states of northeastern to and southern Brazil. However, we emphasize that the only record from Guyana we have examined is the type of *Aspidium schomburgkii*.

Mettenius (1858) treated this species as *A. chrysolobum*, citing the unpublished name *A. mucronatum* Beyrich (non *A. mucronatum* Swartz 1801: 30) as a synonym. Following Mettenius, Christensen (1913a) also cited *A. mucronatum* Beyrich as a synonym of *D. falciculata*, although it was never effectively published.

12. *Ctenitis fenestralis* (C. Chr.) Copeland (1947: 124). Figs. 08E, 09L, 19A–C, 20A. *Dryopteris fenestralis* Christensen (1913a: 100). Type:—BRAZIL. Rio de Janeiro: Petrópolis, Alto do Imperador, 21 March 1878, *Glaziou* 7026 (lectotype B 20 0055534!, **designated here**, isolectotypes B 20 0055535!, B 20 0055536!, BM 000937858!, K 000590329!, P 01608938!, P 01608939!, P 01608940!, P 01608941!).

Dryopteris fenestralis C. Chr. var. *spannagelii* Rosenstock ex Christensen (1913a: 101). Type:—BRAZIL. Santa Catarina: São Joaquim, *Spannagel 174* (lectotype P 00170046! **designated here**, isolectotypes NY 0099431!, S 05-11195!, UC 441706!).

Stems erect or ascending, 2.4–3.2 cm diam., scales 3.7–12.4 × 0.7–2.5 mm, light castaneous, clathrate, lanceolate, entire or slightly denticulate, with or without some short fimbriae at base and laterally; *leaves* 51.4–127 cm long; *petioles* 22.5–50.5 cm × 2.7–8.1 mm, with 5 vascular bundles at base, stramineous or brownish, scales 3.0–28.5 × (0.6) 0.9–1.9 mm, light castaneous, clathrate, tangled on petiole base, becoming imbricate towards distal portion, flattish, flaccid, ovate with cordate base and filiform apex, slightly denticulate, with some short fimbriae at base and laterally, catenate trichomes absent abaxially, glandular trichomes absent; *laminae* (28.9) 52.3–76.5 × (19.8) 22.5–32.0 cm, width 1/3–1/2 of length or wider, 1-pinnate-pinnatisect basally, 1-pinnate-pinnatisect or 1-pinnate-pinnatifid, almost pinnatisect medially and apically, lanceolate or ovate, apex confluent; *rachises* stramineous, scales like those on distal portion of petioles, catenate trichomes absent or sparse and hidden by scales abaxially, glandular trichomes absent; *pinnae* (10) 17–20 pairs, the basal and medial ones stalked to 6.4 mm long, the apical ones sessile, basal pinnae basiscopically and acropically somewhat equally developed, the medial (10.5) 12.6–18.0 × 2.3–3.5 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments somewhat shorter than the next at basal pinnae, but longer at medial, apex attenuate; *adaxial pinnae axes* with sparse scales on costa, 0.9–6.2 × 0.06–0.18 mm, castaneous, filiform, catenate trichomes dense on costa, sometimes sparse on costule, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with dense scales on costa and sparse on costule, sometimes also on veins, (1.2) 1.8–3.4 × (0.2) 0.4–1.1 mm, light castaneous, clathrate, ascending, sometimes imbricate, flattish, flaccid, ovate with cordate base and attenuate or filiform apex, slightly denticulate, with or without some short fimbriae at base and laterally, proscasles to 1.5 mm long sparse on costule, rare on veins, catenate trichomes sparse on costa and costule or absent, bacilliform trichomes sparse on costule and veins or absent, glandular trichomes absent, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse bacilliform trichomes; *segments* 25–31 pairs, (2.5) 3.2–5.0 mm wide, patent or subfalcate, serrate, apex acute, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple or 1-forked at basal segments, 10–16 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* inframedial, rarely almost medial or supramedial at small individuals, indusia absent, but with a tuft of proscasles among sporangia, *spores* aborted.

Selected specimens examined:—BRAZIL. Rio de Janeiro: Angra dos Reis, Serra do Mar, 800 m, 29 June 1935, *Brade 14938* (HB, RB); Magé, Parque Nacional da Serra dos Órgãos, Serra da Estrela, 22°32'56"S, 43°09'53"W, 900 m, 22 March 2010, *Engelmann & Thier 604* (RB); Paraty, APA Cairuçu, 900 m, 13 May 1991, *Sylvestre et al. 656* (RB); Santa Catarina: Lages, *Garboldi & Spannagel 33a*. (HB); São Joaquim, *Spannagel s.n.* (HB); São Paulo: Ubatuba, Parque Estadual da Serra do Mar, Núcleo Picinguaba, 350–400 m, 23°24'44.5"S, 45°10'11.9"W, 30 October 2001, *Salino et al. 7735* (BHCB).

Habitat and distribution:—Terrestrial, endemic to Atlantic Forest, 400–1350 m. Southeastern to southern Brazil (Fig. 20A; Tab. 01).

Notes:—*Ctenitis fenestralis* can be recognized by its sori without indusia, but with a tuft of proscasles among the sporangia (Fig. 08E). This species is also very scaly on axes abaxially, on costa, costule and sometimes on veins. The scales are light castaneous, ovate with base strongly cordate (deep sinus) and slightly denticulate with some fimbriae that tangled with many proscasles on costule (Figs. 19A–C). The most similar species to *C. fenestralis* are *C. deflexa* and *C. anniesii* (see corresponding notes for differences). Specimens of *C. fenestralis* were with dark sori, due to abortive sporangia and consequently it was not easy to find spores. When found, their spores were malformed (Fig. 09L).

In describing *Dryopteris fenestralis*, Christensen (1913a) indicated the collection *Glaziou 7026* in Herbarium Hauniense (C) and B. However, sheets of this collection are also in BM (a fragment purchased from Christensen's herbarium), K and P. Supported by Art. 9.2, 9.11, 9.12 of *ICN* (McNeill *et al.* 2012), we chose the one in B to be the lectotype, which is with a Christensen's handwritten label.

In the protologue of *D. fenestralis* var. *spannagelii*, Christensen (1913a) cited the collection *Spannagel 174* in Christ's and in Rosenstock's herbaria. In S there is one sheet of this collection with a stamp of Rosenstock's, however without a Christensen handwritten's label, and in P there is a sheet with a Christensen's label and a stamp of Christ's herbarium. We designate this last one as the lectotype (Art. 9.2, 9.5, 9.11, 9.12 of *ICN*—McNeill *et al.* 2012).

13. *Ctenitis flexuosa* (Fée) Copeland (1947: 124). Figs. 03B, 19D–E, 20B. *Aspidium flexuosum* Fée (1869: 138). *Nephrodium flexuosum* (Fée) Baker (1870: 483). *Dryopteris flexuosa* (Fée) Kuntze (1891: 812). Type:—BRAZIL. Rio de Janeiro, *Glaziou 2458* (lectotype P 00170047!, **designated here**, isolectotypes BR 000000696547!, P 00642721!, P 00170048!, P 01630464!, P 02141716!).

Phegopteris camptocaulon Fée (1873: 60). *Dryopteris camptocaulis* (Fée) Christensen (1906: 256). Type:—BRAZIL. Rio de Janeiro: Alto Macaé, *Glaziou 4668* (lectotype P 00170049!, **designated here**, isolectotypes B 20 0053216!, BM 001002002!, P 00170050!, P 00642718!, P 00642719!, P 00642720! R 36173!, RB 00842786!).

Stems not seen; *leaves* 82 cm long (or longer); *petioles* 48 cm (or longer) × 2.7 mm (or thicker), vascular bundles not seen, stramineous, scales 10.93–15.15 × 0.43–1.85 mm, stramineous, subclathrate, tangled throughout, twisted, flaccid, linear with truncate base and filiform apex, entire, with or without some or many short fimbriae at base and laterally, among dense proscasles providing a lanuginose aspect, sparse catenate trichomes abaxially, glandular trichomes absent; *laminae* 34 cm or longer × 21–ca. 68 cm, width wider than 1/2 of length, 2-pinnate-pinnatifid basally, 2-pinnate-pinnatifid medially, 1-pinnate-pinnatifid apically, ovate, apex confluent; *rachises* flexuous, stramineous, scales like those on distal portion of petioles, catenate trichomes absent abaxially, glandular trichomes absent; *pinnae* 6 pairs or more, the basal ones stalked to 21.2 mm long, the medial ones stalked to 7.13 mm long, the apical ones stalked to 2.0 mm long or sessile, basal pinnae basiscopically enlarged, the medial 12.8–33.14 × 4.9–14.2 cm, lanceolate, apex acute or attenuate; *adaxial pinnae axes* scales not seen, stramineous, catenate trichomes dense on pinna rachis and costa, sparse on costule and veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous or with sparse catenate trichomes; *abaxial pinnae axes* with scales dense on pinna rachis and costa, 3.1–3.7 × 0.4–0.7 mm, light castaneous, clathrate, tangled, flattish or twisted, flaccid, lanceolate with cordate base and filiform apex, dentate, with many long fimbriae at base and laterally, catenate trichomes sparse on pinna rachis and costa, bacilliform trichomes absent or sparse on costule and veins, glandular trichomes sparse on pinna rachis, costa and costule, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse bacilliform trichomes; *pinnules* 5–10 pairs, the basal ones stalked to 3.0 mm long, the medial ones stalked to 2.5 or sessile, the apical stalked to 2.0 or sessile, the medial 1.9–7.7 × 1.0–2.2 cm, lanceolate, incised 1/3–2/3 of the distance between segment apex and costa, basal segments longer than the next, apex rounded, acute or attenuate; *ultimate segments* 5–14 pairs, 2.4–6.8 mm wide, entire or repant, apex acute, rounded or truncate, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple or 1–forked, 4–11 pairs (before forked) per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* inframedial, indusia absent; *spores* not seen.

Selected specimens examined:—BRAZIL. Santa Catarina: Hammonia (Ibirama), 1912, *Luederwaldt 1890* (UC).

Habitat and distribution:—Terrestrial (probably). Brazil, recorded only to Rio de Janeiro and Santa Catarina (Fig. 20B; Tab. 01).

Notes:—*Ctenitis flexuosa* is a very distinct species in the Neotropics. It is the only 2-pinnate-pinnatifid with flexuous rachis (Fig. 03B). Moreover, its scales are light castaneous, lanceolate with many long fimbriae at base and laterally, which tangle with dense proscasles, providing a lanuginose aspect on the axes, mainly abaxially (Fig. 19D). *Ctenitis flexuosa* is a rare species, known only by type collections from Rio de Janeiro and curiously one collection from Santa Catarina. Although efforts have been made in Rio de Janeiro, at places where Glaziou passed by, this species was not found again over there and no other records from Santa Catarina as well. As the specimens have over a hundred years and on their labels there is no precise information about location, it is not possible to ensure where this species occurs or if it still exists at nature.

Fée (1869, 1873) described *Aspidium flexuosum* and *Phegopteris camptocaulon* without specifying either the holotype or the herbaria where the sheets were. For *A. flexuosum* Fée (1869) cited *Glaziou 2458* and for *P. camptocaulon* he cited *Glaziou 4668* (Fée 1873). Several sheets of both collections are in P and in other herbaria. Supported by Art. 8.3, 9.2, 9.5, 9.11, 9.12, 40 Note 1 of *ICN* (McNeill *et al.* 2012), we designate here a lectotype for each name. The sheets chosen are in P with Fée's original large label with his signature.

14. *Ctenitis glandulosa* R.S. Viveros & Salino (2015: 6). Figs. 06B, 10A, 20C. Type:—BRAZIL. Espírito Santo: Castelo, Parque Estadual de Forno Grande, 1300 m, 20°30'58"S, 41°05'20"W, 26 June 2008, *Salino, Heringer & Dittrich 13626* (holotype BHC 026911!; isotype UC!).

Stems erect or ascending, 1.0–2.2 cm diam., scales 3.0–11.0 × 0.1–1.5 mm, castaneous, sublathrate, lanceolate, entire or slightly denticulate, without fimbriae; *leaves* 58–104 cm long; *petioles* 19–45 cm × 1.8–3.6 mm, with 4 vascular bundles at base, brownish or tan, scales 3.3–13.0 × 0.1–1.5 mm, castaneous, sublathrate, tangled on petiole base, becoming patent or ascending towards distal portion, flattish, flaccid, lanceolate with cordate base and filiform apex, entire or slightly denticulate, with or without some short fimbriae at base and laterally, sparse catenate trichomes abaxially, sparse glandular trichomes; *laminae* 39–59 × 17–28 cm, width ca. 1/2 of its length, sometimes somewhat narrower or wider, 1-pinnate-pinnatisect basally, 1-pinnate-pinnatifid medially and apically, lanceolate, apex confluent; *rachises* brownish or tan, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 14–25 pairs, the basal and medial ones stalked 12.0 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 8.5–14.0 × 1.5–2.7 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments as long or longer than the next, apex acute or attenuate; *adaxial pinnae axes* scales absent, catenate trichomes dense on costa, sparse on costule and veins, bacilliform trichomes sparse on costule and veins; *adaxial laminar surface between veins* glabrous or with sparse catenate, bacilliform and glandular trichomes; *abaxial pinnae axes* with sparse scales on costa, 0.7–2.7 × 0.1–0.5 mm, castaneous, clathrate, ascending, mostly flattish, but can be vaulted at base, flaccid, lanceolate with cordate base and filiform apex, entire or slightly denticulate, without fimbriae, proscas to 1.0 mm long sparse on costa and costule, catenate trichomes sparse on costa, costule and veins, bacilliform trichomes sparse on costule and veins, glandular trichomes sparse on costa, costule and veins, filiform trichomes absent; *abaxial laminar surface between veins* with sparse catenate, bacilliform and glandular trichomes; *segments* 14–18 pairs, 2.8–5.3 mm wide, patent or subfalcate, entire to repand (smaller individuals) or crenate to serrate (larger individuals) towards apex, apex obtuse, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple or 1-forked at basal segments, 6–12 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* medial or suprasedial, indusia conspicuous, entire, with glandular trichomes; *spores* with coarse folds.

Selected specimens examined:—BRAZIL. Bahia: Arataca, Serra do Peito de Moça, 1000 m, 15°10'25" S, 39°20'30" W, 16 February 2006, *Matos et al. 988* (CEPEC, RB); Prado, Parque Nacional do Descobrimento, 50 m, 16°59'21" S, 39°23'17" W, 29 October 2002, *Salino & Jardim 8132* (BHC); Santa Teresinha, 750–800 m, 12°45' S, 39°32' W, 21 May 1985, *Noblick & Lemos 3745* (SJRP); Espírito Santo: Aracruz, Santa Cruz, July 1976, *Bariia 1156* (R); Cachoeiro de Itapemirim, Pedra Branca, 100 m, 16 May 1949, *Brade 19907* (RB); Ibitirama, Parque Nacional do Caparaó, 20°27'58" S, 41°44'22" W, 9 February 2011, *Souza et al. 1442* (BHC); São Mateus, Reserva Biológica de Sooretama, 30 m, 19°01'29" S, 40°02'30" W, 15 May 1977, *Martinelli 2062* (RB); Minas Gerais: Carangola, Fazenda Boa Vista, 30 May 1989, *Salino 818* (UEC); Distrito de Ilhéu, Fazenda da Tabunha, 16 November 1930, *Mexia 4960-a* (UC); Paraná: Guaraqueçaba, Morro do Rio das Pacas, 20 January 1993, *Prado et al. 482* (BHC); Pernambuco: Bonito, Mata da Colônia, 800 m, 08°30'14"S, 35°42'56"W, 25 September 2000, *Santiago et al. 241* (BHC); Jaqueira, Usina Colônia, Mata da Turbina, 545 m, 8°32'21" S, 35°50'22" W, 20 May 2002, *Lopes & Pietrobom 583* (RB); Rio de Janeiro: Macaé, Frade de Macahé, 17–21 June 1937, *Brade 15797* (RB); Mangaratiba, Reserva Ecológica Rio das Pedras, 29 September 1998, *Mynssen, C. 230* (RB); Paraty, Ponta Negra, 15 March 2006, *Bovini et al. 2540* (BHC); Teresópolis, Parque Nacional da Serra dos Órgãos, 22°29'14" S, 43°00'00" W, 22 October 2012, *Salino et al. 15514* (BHC); São Paulo: São Bernardo do Campo, Rio Grande, 17 November 1958, *Loefgren, s.n.* (NY); Praia Grande, 17 September 1898, *Loefgren 4677* (GH); São Luiz do Paraitinga, Parque Estadual da Serra do Mar, Núcleo de Santa Virgínia, trilha de Pau de Bala, 980 m, 23°19'22.8"S, 45°05'56.3"W, 22 June 2004, *Salino et al. 9598* (BHC); Ubatuba, ao lado da estrada que desce para o Cedro, 23°27'46" S, 45°03'37" W, 4 February 1996, *Salino 2534* (BHC); GUYANA. Region Potaro–Siparuni: Pakaraima Mountains, 04°54'N, 60°05'W, 1000 m, 26 January 1993, *Henkel et al. 994* (US); Rupununi: S edge of Pakaraima Mountains, 500–1200 m, 04°10'N, 59°15'W, 05 January 1982, *Knapp & Mallet 2852* (MO, UC).

Habitat and distribution:—Terrestrial, mainly in semideciduous and rainforests in mountainous areas, 30–1780 m. Guyana and northeastern to southeastern Brazil (Viveros & Salino 2015; Fig. 20C; Tab. 01).

Notes:—*Ctenitis glandulosa* can be recognized by glandular trichomes on petiole, rachis, costa (abaxially),

laminar surface (abaxially but sometimes also adaxially) and indusium. Such characters are illustrated in Viveros & Salino (2015). The presence of glandular trichomes on axes can confuse *C. glandulosa* with *C. bigarellae* and other similar species as *C. christensenii*, *C. falciculata* and *C. paranaensis* (Viveros & Salino 2015). *Ctenitis glandulosa* has a disjunct geographic distribution or a gap of collections. The specimens from Guyana are scallier, which scales are darker than the Brazilian specimens. See notes about *C. bigarellae* for further comparisons.

15. *Ctenitis grisebachii* (Baker) Ching (1940: 250). Figs. 10B, 19F–G, 20D. *Nephrodium grisebachii* Baker in Hooker & Baker (1868: 285). *Dryopteris grisebachii* (Baker) Kuntze (1891: 812). Type:—CUBA, 1859–1860, *Wright 1055* (lectotype K 000590311!, **designated here**, isolectotypes K 000590310!, K 000590312!, K 001096163!, K 001096164!, B 20 0052230!, B 20 0052231!, BM 000605204!, BM 000605205! BR 0000005798568!, BR 000000583942!, GH 00021049!, GH 00021050!, LE!, NY 02005973!, P 01381339!, PH 00019281 [image!], US 00067023!, YU 000802 [image!], YU 000803 [image!], YU 000804 [image!]).

Ctenitis molinae Stolze (1977: 40). Type:—GUATEMALA. Chimaltenango: slopes of Volcán Fuego, 20 September 1942, *Steyemark 52120* (holotype US 00067032!, US 00067033!, isotypes F 1161549!, F 1161550!, F 1161551!).

Ctenitis sotoana Rojas-Alvarado (2001: 468), *syn. nov.* Type:—COSTA RICA. Cartago: Paraíso, Cuenca del Río Reventazón, Orosí, Río Macho. Estación Biológica Río Macho y alrededores, 1550–1800 m, 3 December 1997, *Rojas 4163* (holotype INB 0002821838 [image!], isotypes CR, MO).

Stems erect or ascending, 1.5–3.4 cm diam., scales (6.1) 10.6–35.4 × (0.3) 0.8–1.5 mm, castaneous, subclathrate, linear-lanceolate, entire, without fimbriae; *leaves* 100–150 cm long; *petioles* 51–70 cm × 0.2–5.0 mm, with 7 vascular bundles at base, stramineous or tan, scales 13.74–18.71 × 0.24–0.80 mm, castaneous, subclathrate, not tangled, patent or retrorse, flattish, stiff, linear-lanceolate with truncate base and attenuate apex, entire, without fimbriae, catenate trichomes absent or sparse abaxially, sparse glandular trichomes; *laminae* 50–75 × 40–70 cm, width wider than 2/3 of length, 2–3-pinnate-pinnatifid basally, 2-pinnate-pinnatifid or 2-pinnate-pinnatisect medially and apically, deltate, apex confluent; *rachises* more or less straight, stramineous or tan, scales like those on distal portion of petioles, rare catenate trichomes abaxially, sparse or absent glandular trichomes; *pinnae* 10–15 pairs, the basal ones stalked to 65.0 mm long, the medial ones stalked to 19.0 mm long, the apical ones stalked to 5.0 or sessile, basal pinnae basiscopically enlarged, the medial 21–51 × 9–14 cm, lanceolate, apex attenuate; *adaxial pinnae axes* with sparse or absent scales on pinna rachis 1.2–2.2 × 0.2–1.5 mm, castaneous, linear, catenate trichomes dense on pinna rachis and costa, sparse on costule, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous or with sparse catenate trichomes; *abaxial pinnae axes* with scales sparse on pinna rachis and costa, 0.9–2.5 × 0.1–0.4 mm, castaneous, clathrate or subclathrate, patent or ascending, flattish, stiff, linear-lanceolate with truncate base and attenuate apex, entire, without fimbriae, catenate trichomes sparse on pinna rachis, costa, rare on costule and veins, bacilliform trichomes absent or sparse on pinna rachis, costa, costule and veins, glandular trichomes absent or very sparse on pinna rachis, costa and costule, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse catenate and bacilliform trichomes; *pinnules* 9–16 pairs, the basal ones stalked to 2.5 mm long, the medial ones stalked to 0.76 mm long or sessile, the apical sessile, the medial 5.0–9.0 × 1.4–2.5 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, almost pinnatisect, basal segments as long or longer than the next, apex attenuate or acute; *ultimate segments* 7–15 pairs, 2.6–5.7 mm wide, entire, crenate or serrate, apex acute or rounded, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple or 1-forked, 4–8 pairs (before forking) per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* medial or inframedial, indusia conspicuous, entire, with catenate and bacilliform trichomes; *spores* with coarse, irregular echinae.

Selected specimens examined:—ECUADOR. Galapagos: Isabela Island, E. rim of Vulcan Alcedo, 23 May 1974, *van der Werff 1209* (CAS); Galapagos: James Island, 1905–1906, *Stewart 958* (CAS).

Habitat and distribution:—Terrestrial in wet mountain forests, 1000–1950 m. Mesoamerica (Mexico, Guatemala, Honduras, Nicaragua, Costa Rica), West Indies (Cuba, Jamaica, Hispaniola) and South America (Ecuador—Galapagos; Fig. 20D; Tab. 01).

Notes:—*Ctenitis grisebachii* can be recognized by its scales on petiole, rachis and costa abaxially, which are not tangled, stiff, flattish, uniformly castaneous or brown, linear-lanceolate with truncate base, entire and without fimbriae (Figs. 19F–G). The scales on petiole and rachis are patent or retrorse, the indusium is large and

conspicuous with catenate and bacilliform trichomes. *Ctenitis grisebachii* is similar to *C. equestris* and *C. ampla* (see corresponding notes). Some old specimens from Galapagos Islands were identified as *C. ampla*, but they are *C. grisebachii*, and then firstly recorded to South America.

Baker described *Nephrodium grisebachii* (Hooker & Baker 1868) and indicated the collection *Wright 1055*. As usual for that time, Baker did not designate a holotype neither specified a herbarium. In K, where he worked, there are five sheets of that collection, only two of them with the name *N. grisebachii* written in Baker's handwriting. Beyond K, several sheets are spread in other herbaria. Christensen (1920) cited that K held the type, Proctor (1985) and Mickel & Smith (2004) indicated that what is in K consisted the holotype, and cited an isotype in US. However, the sheets in K are not clearly labelled as being part of a single specimen (Art. 8.3, 40 Note 1 of *ICN*—McNeill *et al.* 2012). Thereby there is no holotype but syntypes (Art. 9.5 of *ICN*—McNeill *et al.* 2012). Then, we designate here as lectotype (Art. 9.11 and 9.12 of *ICN*—McNeill *et al.* 2012) one specimen in K with a medial portion of a lamina and a label handwritten by Baker.

Ctenitis sotoana described by Rojas-Alvarado (2001) was based on collections from Costa Rica and Nicaragua. After examining images of holotype, paratype and sheets from Costa Rica and Nicaragua identified as *C. sotoana*, we concluded that it is not different from *C. grisebachii*. Its protologue also allow us to consider *C. sotoana* as a new synonym of *C. grisebachii*.

16. *Ctenitis laetevirens* (Rosenst.) Salino & Morais (2003: 34). Figs. 02C, 06C, 08F, 10C, 21A–B, 23A. *Dryopteris laetevirens* Rosenstock (1915: 368). Type:—BRAZIL. Santa Catarina: Hammonia (Ibirama), August 1910, *Lüderwaldt 1380* (lectotype SP! designated by Salino & Morais 2003, isolectotypes BM 000937872!, S05-11180!); remaining syntypes:—BRAZIL, Santa Catarina: Blumenau, *Haerchen 09* (S-R-1728!); *Haerchen 50* (UC!); *Goeden 50* (S 05-11179!).

Stems ascending, 0.9–1.8 cm diam., scales 5.8–11.6 × 0.3–0.7 mm, castaneous, subclathrate, linear-lanceolate, entire or slightly denticulate, with or without some short fimbriae laterally; *leaves* 49–108.5 cm long; *petioles* 26.5–50.5 cm × 1.8–4.5 mm, with 4 or 5 vascular bundles at base, stramineous, scales 3.3–9.3 × 0.2–0.7 mm, castaneous on petiole base, becoming dark brown to blackish on distal portion, clathrate or subclathrate, not tangled or somewhat tangled on petiole base, becoming appressed towards distal portion, flattish, stiff, linear-lanceolate with truncate or slightly cordate base and filiform apex, entire or slightly denticulate, with or without some short fimbriae laterally, catenate trichomes absent abaxially, glandular trichomes absent; *laminae* 22.5–58 × 14.2–26.5 cm, width 1/3–1/2 of length or wider, 1-pinnate-pinnatifid basally, medially and apically, lanceolate or ovate, apex confluent; *rachises* stramineous, scales like those on distal portion of petioles, sparse or absent catenate trichomes abaxially, glandular trichomes absent; *pinnae* 6–15 pairs, the basal and medial ones stalked to 5.1 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 8.7–16.0 × 1.7–3.2 cm, linear-lanceolate, incised 2/3–3/4 of the distance between the segment apex and costa, basal segments shorter on basal pinnae, shorter or as long on medial pinnae, apex attenuate; *adaxial pinnae axes* very sparse scales on costa, 0.7–2.2 × 0.06 mm, dark brown to blackish, filiform, catenate trichomes dense on costa, rare on costule, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with sparse scales on costa and sometimes also on costule, 1.2–3.1 × 0.06–0.2 mm, dark brown to blackish, clathrate, ascending, flattish or twisted, stiff, linear-lanceolate with truncate, rounded or slightly cordate base and filiform apex, entire or slightly denticulate, with some short fimbriae at base, proscapes to 0.6 mm long sparse on costule, catenate trichomes absent, bacilliform trichomes absent, glandular trichomes absent, filiform trichomes absent; *abaxial laminar surface between veins* glabrous; *segments* 13–17 pairs, 3.8–6.0 mm wide, patent or subfalcate, serrate towards apex, apex apiculate, margin glabrous, the distance from each other is narrower than segments width; *veins* simple, 6–11 pairs per segment, the basal ones from adjacent segments end at margin somewhat or well above the sinus; *sori* medial or supramedial, indusia absent; *spores* aborted.

Selected specimens examined:—BRAZIL. Santa Catarina: Blumenau, 1905, *Haerchen 50* (UC); Pouso Redondo, BR 470, próximo à Serra da Santa antes do Morro do Funil, 27°16'51"S, 50°04'03"W, 530 m, 07 April 2010, *Salino et al. 14724* (BHCB); Vitor Meireles, Pratinha, 06 November 2009, *Schimitt et al. 561* (BHCB).

Habitat and distribution:—Terrestrial. Endemic to Atlantic Forest, 0–550 m. Only in Santa Catarina state, in Brazil (Fig. 23A; Tab. 01).

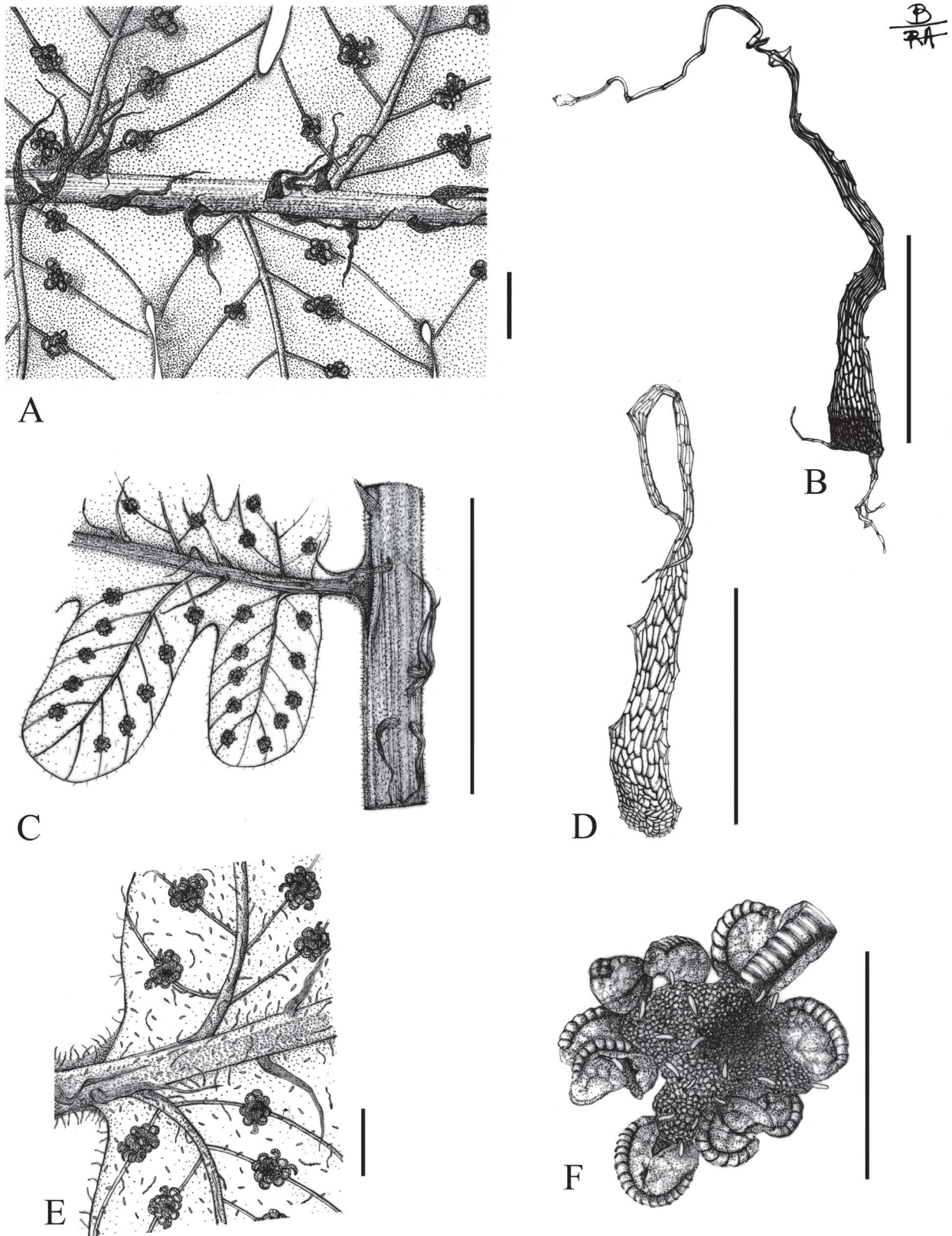


FIGURE 21. Some morphological characters of *Ctenitis* from South America. **A–B:** *Ctenitis laetevirens* (Schimitt 561, BHCB). **A:** abaxial surface of portion of pinna. **B:** abaxial costa scale. **C–F:** *Ctenitis microchlaena* (unknown s.n., UC). **C:** abaxial surface of a portion of rachis and two basal basiscopic segments of a medial pinna. **D:** abaxial costa scale. **E:** abaxial surface of a pinna, showing indument. **F:** sorus with indusium. Scale bars A, B, D e E = 1 mm; C = 1 cm; F = 0.5 mm

Notes:—*Ctenitis laetevirens* can be recognized by its scarce indument: sparse dark brown to blackish scales on costa abaxially, which are stiff, flattish or twisted and linear-lanceolate (Figs. 06C, 21B), without any kind of trichomes on abaxial pinnae axes (Fig. 21A), both laminar surfaces between veins and on segment's margins. *Ctenitis laetevirens* is similar to *C. nigrovenia*, because both, among the other 1-pinnate-pinnatifid to 1-pinnate-pinnatisect South American species, are the only which segments margin is glabrous. However, in *C. nigrovenia*, the abaxial laminar surface between veins is with bacilliform trichomes, and on the costa, costule and veins abaxially there are catenate and bacilliform trichomes, the sori usually with indusia, conspicuous, rarely inconspicuous with a tuft of bacilliform trichomes. Specimens of *C. laetevirens* are usually with dark sori, due to abortive sporangia (Fig. 08F) and consequently their spores are malformed (Fig. 10C). Some morphological characters of *C. laetevirens* are also illustrated in Salino & Morais (2003).

17. *Ctenitis megalastriformis* R.S. Viveros & Salino (2017: 317). Figs. 05E, 10D, 23B. Type:—PERU. Madre de Dios: Manu. Close to the village of Diamante, southern side of río Alto Madre de Dios. Primary rainforest on flat and clayey upland terrain, *Tuomisto 13393* (holotype UC 1787981!, UC 1787982!, UC 1787983!, isotype TUR 587076 [image!], TUR 587077 [image!], TUR 587078 [image!]).

Stems not seen; *leaves* 140 cm long; *petioles* 44.5 cm × 4.9 mm, with 5 vascular bundles at base, brownish, scales 7.9–10.5 × 0.3–0.4 mm, castaneous, clathrate, tangled on petiole base, becoming patent or ascending towards distal portion, flattish, flaccid, linear with truncate base and filiform apex, entire, without fimbriae, catenate trichomes absent abaxially, glandular trichomes absent; *laminae* 95.5 × 50.5 cm, wider than 1/2 of length, 2-pinnate-pinnatifid basally, 1-pinnate-pinnatisect medially, 1-pinnate-pinnatifid apically, ovate, apex confluent; *rachises* tan or stramineous, scales like those on distal portion of petioles, catenate trichomes absent abaxially, sparse glandular trichomes; *pinnae* 14 pairs, the basal and medial ones stalked to 18.0 mm long, the apical ones sessile, basal pinnae basiscopically and acropically somewhat equally developed, the medial 22 × 2.5 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments shorter than the next, apex attenuate; *adaxial pinnae axes* with sparse scales on costa, 1.5–1.7 × 0.1–0.2 mm, castaneous, lanceolate, catenate trichomes dense on costa and costule, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with sparse scales on costa and costule, 1.2–3.1 × 0.3–0.4 mm, castaneous, clathrate, ascending, flattish, flaccid, lanceolate with rounded base and filiform apex, entire or slightly denticulate, with or without some short fimbriae at base, proscas absent, catenate trichomes absent, bacilliform trichomes sparse on costa, costule and veins, glandular trichomes sparse on costa, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with rare bacilliform trichomes; *segments* 20–26 pairs, 8.3–11.6 mm wide, patent or subfalcate, serrate, apex acute, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* 1–3-forked, 12–13 pairs per segment (before forking), the basal ones from adjacent segments end before the margin, towards above the sinus; *sori* inframedial, indusia absent; *spores* with coarse folds.

Habitat and distribution:—Terrestrial in rainforest, about 150 m. Known only from Peru (Viveros & Salino 2017; Fig. 23B; Tab. 01).

Notes:—*Ctenitis megalastriformis* can be recognized by lamina 2-pinnate-pinnatifid basally (with distinct free, but adnate pinnules at base of basal pinnae, but along medial and apical portion of the basal pinnae it “becomes” pinnatisect to pinnatifid; Fig. 05E). However, it is 1-pinnate-pinnatisect medially and 1-pinnate-pinnatifid apically. The segments are serrate, the veins 1–3-forked, the basal ones, from adjacent segments end before margin, changing its direction brusquely towards above the sinus, the sori are inframedial and without indusia. The indument are scarce, either by scales or by trichomes. The scales are very sparse, castaneous and lanceolate, on abaxial pinnae axes there are some bacilliform trichomes on costa, costule and veins, some glandular trichomes on costa abaxially and the abaxial laminar surface between vein is glabrous or with rare bacilliform trichomes. Such morphological characters of *C. megalastriformis* are illustrated in Viveros & Salino (2017). The spores of this species (Fig. 10D) are much smaller than the other species treated here.

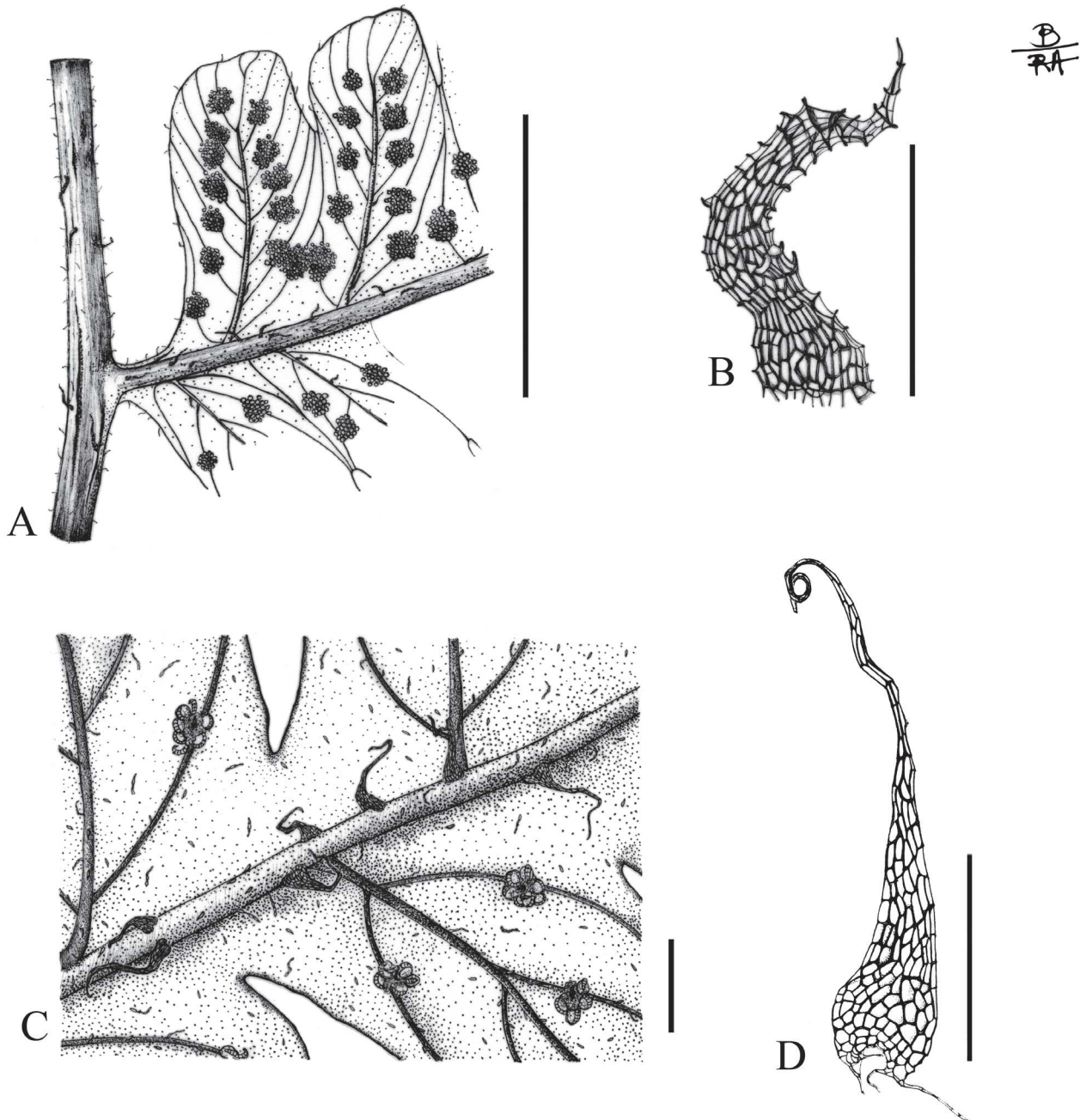


FIGURE 22. Some morphological characters of *Ctenitis* from South America. **A–B:** *C. nervata* (Almeida 1682, BHCB). **A:** abaxial surface of a portion of rachis and two basal segments of a medial pinna. **B:** abaxial costa scale. **C–D:** *C. nigrovenia* (Salino 15212, BHCB). **C:** abaxial surface of a pinna, showing indument. **D:** abaxial costa scale. Scale bars in A = 1 cm; B = 0.5 mm; C, D = 1 mm.

18. *Ctenitis microchlaena* (Fée) Stolze in Tryon & Stolze (1991: 09). Figs. 01A, 10E, 21C–F, 23C. *Aspidium microchlaena* Fée (1857: 102). *Dryopteris microchlaena* (Fée) Christensen (1906: 278). Type:—MEXICO. Orizaba, *Schaffner 459* (lectotype K 000590290! designated by Tryon & Stolze 1991).

Aspidium karstenii Braun (1858: app. 3). *Dryopteris karstenii* (Braun) Christensen (1913a: 98). Type:—“Unknown or unspecified Middle and South America”, probably VENEZUELA. February 1856, *Gollmer s.n.* (lectotype B 20 0058411!, **designated here**); remaining syntypes:—VENEZUELA. *Karsten & Moritz s.n.*, (GH 00112619!, K 000590336!); COLOMBIA. *Moritz 209* (BM 000937855!).

Aspidium obtusilobum Fée (1857: 105). *Dryopteris huatuscensis* Christensen (1906: 271), non *Dryopteris obtusiloba* (Baker in Hooker & Baker 1868: 284) Kuntze (1891: 813), non (Desvaux 1811: 357) Christensen (1906: 280), nom. illeg. Type:—MEXICO. Huatusco, *Schaffner 213* (lectotype RB 00609505!), **designated here**.

Stems erect or ascending, 1.4–3.3 cm diam., scales 11.9–18.3 × (0.2) 0.6–1.2 mm, light castaneous or castaneous, sublathrate, linear, entire, without fimbriae; *leaves* 72–123 cm long; *petioles* 24–47 cm × 2.5–3.1 mm, with 4 or 5 vascular bundles at base, brownish, tan or stramineous, scales 3.1–8.1 × 0.2–0.7 mm, castaneous, sublathrate, tangled on petiole base, becoming patent or ascending towards distal portion, flattish, flaccid, linear with truncate base and filiform apex, entire or slightly denticulate, with or without some short fimbriae at base, sparse to dense catenate trichomes abaxially, glandular trichomes absent; *laminae* 48–76 × 15.5–21.5 cm, width ca. 1/3 of length or narrower, 1-pinnate-pinnatifid basally, medially and apically, linear-lanceolate, apex confluent; *rachises* brownish, tan or stramineous, scales like those on distal portion of petioles, sparse to dense catenate trichomes abaxially, glandular trichomes absent; *pinnae* 19–27 pairs, the basal and medial ones stalked to 3.3 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 6.5–13 × 1.3–2.2 cm, lanceolate, incised 2/3–3/4 or more of the distance between the segment apex and costa, basal segments as long or somewhat longer or shorter than the next, apex attenuate or acute; *adaxial pinnae axes* scales absent, catenate trichomes dense on costa, sparse on costule and veins, bacilliform trichomes absent; *adaxial laminar surface between veins* with sparse to dense catenate trichomes; *abaxial pinnae axes* with sparse scales on costa, 1.2–3.1 × 0.1–0.3 mm, castaneous, clathrate, ascending, flattish, flaccid, linear-lanceolate with truncate base and filiform apex, entire or slightly denticulate, with or without some short fimbriae at base, proscapes to 0.9 mm long sparse on costule or absent, catenate trichomes sparse to dense on costa, costule and veins, bacilliform trichomes sparse on costa and costule or absent, glandular trichomes absent, filiform trichomes absent; *abaxial laminar surface between veins* with dense catenate and sparse bacilliform trichomes; *segments* 13–18 pairs, 3.3–5.7 mm wide, patent or subfalcate, entire or crenate, apex rounded, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple, 6–10 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* medial or supramedial, indusia conspicuous, entire, with bacilliform trichomes; *spores* with coarse folds.

Selected specimens examined:—BOLIVIA. La Paz: Pedro Domingo Murillo, valle de Zongo, 16°06'S, 68°07'W, 2600 m, 19 March 1995, *Gonzales et al. 1893* (UC); Santa Cruz: Andrés Ibañez, entre los 530–1121 m, 17°54'11"S–17°53'42"S, 63°26'14"W–63°28'17"W, 2 June 2007, *Molina 215* (MO); Velasco, Parque Nacional Noel Kempff M., 900 m, 14°48' S, 60°23' W, 4 April 1993, *Arroyo et al. 220* (UC); BRAZIL. Amazonian Region, 30 April 1884, *Oyster s.n.* (P); COLOMBIA. Boyacá: Carretera Chiquinquirá a Pauna, 1700 m, 13 October 1967, *Mejía et al. 3567* (NY); Santa Marta, 1898, *Smith 2715* (NY); Valle: Yotoco, Corregimiento Jiguales, Finca La Camelia, 1450 m, 15 January 1985, *Wilson 879* (UC); ECUADOR. Morona-Santiago: Gualaquiza, 800 m, 3°26' S, 78°31' W, 31 July 1993, *Fay & Fay 4206* (NY); Zamora-Chinchi: between San Pablo and Nabija, 1465 m, 04°02'18"S, 78°47'52"W, 23 July 2004, *Croat 91981* (UC); PERU. Cajamarca: San Ignacio, Camacá, 1250–1800 m, 5°04' S, 78°55' W, 7 March 1997, *Campos & Corrales 3509* (NY); San Martín: Lamas, District Lamas, 01 October 1937, *Belshaw 3503* (NY); VENEZUELA. Barinas: Bolívar, 900 m, 8°48' N, 70°32' W, 19 November 1982, *Smith et al. 1367* (UC); Mérida, 2000 m, 1893, *Mocquerys s.n.* (F); Falcón: Sierra de San Luis, Montaña de Paraguariba, 1400 m, 23 May 1979, *Falcón 668* (UC); Lara: Palavecino, 500 m del sector urbanizado, 1300 m, 09°55'N, 69°17'W, 28 September 1984, *Rivero 720* (UC); Yaracuy: Límites Distrito Nirgua-Distrito San Felipe, 1000–1200 m, 10°14'00" N, 68°37'30", 24 March 2005, *Meier et al. 11342* (UC).

Habitat and distribution:—Terrestrial in mountain rainforest, 800–1500 m. Mesoamerica (Mexico, Honduras, Nicaragua and Costa Rica), West Indies (Hispaniola) and South America (Venezuela, Colombia, Ecuador, Peru, Brazil and Bolivia; Fig. 23C; Tab. 01).

Notes:—*Ctenitis microchlaena* is similar and commonly confused with *C. submarginalis*, differing from it by segment apex rounded, basal veins from adjacent segments end at margin well above the sinus, indusia always present and conspicuous, costa and abaxial laminar surface with dense catenate trichomes (Fig. 21C, E, F). While *C. submarginalis* segment apex is apiculate (Fig. 26A), the basal veins from adjacent segments usually end at margin or somewhat above the sinus, but sometimes well above the sinus, the indusia can be absent, small and inconspicuous or large and conspicuous (plants from Argentina, Paraguay, Uruguay and southern Brazil), with or without sparse catenate trichomes on costa and abaxial laminar surface. Generally, *C. microchlaena* is more pilose

than *C. submarginalis*, with catenate trichomes, which density is similar to *C. falciculata*. However, *C. falciculata* rachis scales are dark brown to blackish and to 2.1 mm long, while *C. microchlaena* rachis scales are castaneous and 2.4–5.0 mm long, and these two species are not sympatric.

Ctenitis microchlaena is firstly recorded to Brazil, based on two old collections. One in P (P01415555!) labeled as from Brazil, near to Amazonian river. Such sample is small, seems to be from a young plant and has the basal pinnae reduced, a feature that may be due to early development, also observed in some small specimens of *C. microchlaena* from Peru, Colombia and West Indies. The other collection is in F (*Luerssen s.n.*—F 2002990!), it is from a plant that was cultivated at Leipzig Botanical Garden, which origin reported on the label is Brazil, without further information.

Christensen (1913a) considered this taxon as *Dryopteris karstenii*, supposing that *A. microchlaena* (which type he has not seen) should be *D. submarginalis* (*C. submarginalis*). Later, dealing with pteridophytes from Hispaniola Christensen (1936) suggested that *D. karstenii* was a weakly marked species, perhaps better to be united with *D. submarginalis*. As already mentioned, these taxa are similar, but the differences pointed by some authors (Christensen 1913a, Tryon & Stolze 1991, Moran 1995, Mickel & Smith 2004) and observed by us are quite constant.

Fée (1857) described *Aspidium microchlaena* based on the collection *Schaffner 459* from Mexico. As we known, Fée did not designate a holotype neither specified a herbarium. Tryon & Stolze (1991) and Mickel & Smith (2004) presumed that the holotype was in P, but they informed that this collection was not found there, and these authors indicated an isotype in K. In fact, there is no *Schaffner 459* in P. Fournier, a French botanist, which worked in P, cited this collection as *A. microcarpon* (Fournier 1872). Probably, Fournier may have been the last to examine this material, or he cited it without examining. However, the only sheet of the collection cited by Fée (1857) is in K and this one may be the lectotype. As Tryon & Stolze (1991) were the first who reported that a supposed holotype was not found in P and cited an isotype in K, the lectotypification is attributed to them, although inadvertent (Art. 7.10, 9.9 and 9.19 of *ICN*—McNeill *et al.* 2012).

Braun (1858) described *Aspidium karstenii* based on a cultivated plant in Horto Berolinense, from spores of other plant collected in Venezuela by *Karsten & Moritz*. He also mentioned other syntypes: *Moritz 209* and *Gollmer s.n.* Christensen (1913a), Tryon & Stolze (1991) and Mickel & Smith (2004) cited that the type (or holotype) was *Karsten s.n.* in B, probably because most specimens studied by Braun are in B. The only sheet in B with a label handwritten by Braun as *A. karstenii* is *Gollmer s.n.* Considering all this, we decided to designate this *Gollmer s.n.* as the lectotype of *A. karstenii* (Art. 9.2, 9.5, 9.11, 9.12 of *ICN*—McNeill *et al.* 2012).

Fée described *Aspidium obtusilobum* and cited the collection *Schaffner 213*, at the same page of *A. microcarpon* (see “Names of Uncertain Application”), three pages after describing *A. microchlaena* (Fée 1857). Christensen did not see such material and treated *A. obtusilobum* as an unknown species. In addition he erroneously cited *Schaffner 105*, which corresponds to the page of its description not to the collecting number (Christensen 1913a). Smith (1981), Mickel & Beitel (1988) and Mickel & Smith (2004) followed Christensen’s error and presumed that the type should be in P, but it had not been found there. Indeed, in P there is no *Schaffner 105* or *213*, however there is a sheet of *Schaffner s.n.* (P00642678!) from Mexico without further information about the locality, on it is written “*Aspidium obtusilobum*”, but there is no Fée’s label. Smith (1981) and Mickel & Smith (2004) have already mentioned that such sheet could be a possible uncited original material. We found a sheet of *Schaffner 213* in RB, on its label is written “Mexique, Huatusco”, exactly as in the protologue. Some ferns specimens described by Fée once belonged to Pedro II, emperor of Brazil. After his death, they became property of M. Cosson in Paris and later were incorporated in P (Underwood 1905). Some specimens remained in Brazil at Jardim Botânico do Rio de Janeiro, where is the RB herbarium. Then, we designate the sheet in RB for lectotype. Mickel & Smith (2004) and the website *tropicos.org*, present the name *A. obtusilobum* Fée as an illegitimate name, due to the earlier homonym *A. obtusilobum* Willd., without referring any page to this supposed Willdenow’s name (Willdenow 1810). However, in Willdenow (1810) there is no such name. The most similar names in Willdenow (1810) are *A. obtusifolium* (page 231), *A. obtusatum* (241) and *A. obtusum* (254). Then, according to Art. 53.1 and 53.3 of *ICN* (McNeill *et al.* 2012) the name under Fée’s authoring is not illegitimate.

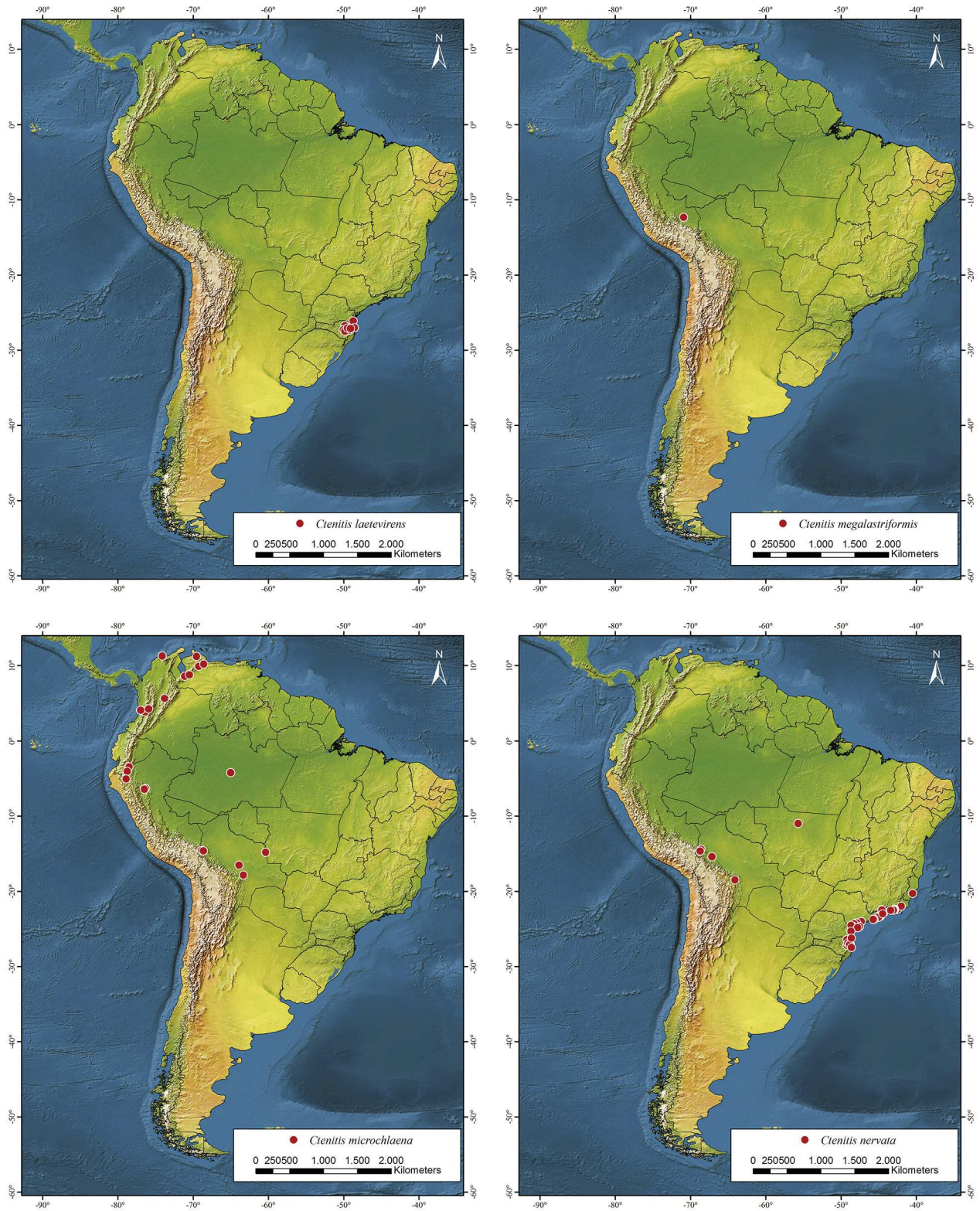


FIGURE 23. Distribution of four species of *Ctenitis* in South America. **A:** *C. laetevirens*. **B:** *C. megalastriformis*. **C:** *C. microchlaena*. **D:** *C. nervata*.

19. *Ctenitis nervata* (Fée) R.S. Viveros & Salino (2017: 320). Figs. 02D, 10F, 22A–B, 23D. *Aspidium nervatum* Fée (1869: 136). Type:—BRAZIL. Rio de Janeiro, *Glaziou 1764* (holotype P 00170061!).

Aspidium pedicellatum Christ (1908: 20). *Dryopteris pedicellata* (Christ) Christensen (1913a: 88). *Ctenitis pedicellata* (Christ) Copeland (1947: 124). Type:—BRAZIL. São Paulo, *Wettstein & Schiffner s.n.* (lectotype P 00170056! designated by Viveros & Salino 2017).

Dryopteris indecora Rosenstock (1906: 117). Type:—BRAZIL. Santa Catarina: Perabeiraba, *Stier s.n.* [Herb. Rosenstock 50] (lectotype S05-11103! designated by Viveros & Salino 2017); remaining syntypes:—BRAZIL Santa Catarina: Joinville, Estrada Dona Francisca, *Müller s.n.* [Herb. Rosenstock 112] (UC!, NY!). Blumenau, Passo Mansa, *Haerchen s.n.* [Herb. Rosenstock 95] (not found).

Stems erect or ascending, 1.2–2.2 cm diam., scales 3.3–12.4 × 0.9–1.4 mm, castaneous, subclathrate, lanceolate, entire, without fimbriae; *leaves* 52–110 cm long; *petioles* 28–42 cm × 4.1–5.0 mm, with 6 vascular bundles at base, brownish, scales 4.0–8.7 × 0.3–0.7 mm, dark brown to blackish, subclathrate, not tangled on petiole base, patent or ascending, flattish, stiff, lanceolate with truncate base and attenuate apex, entire, without fimbriae, sparse catenate trichomes abaxially, glandular trichomes absent; *laminae* 24–68 × 14–31 cm, width ca. 1/2 of length or wider, 1-pinnate-pinnatifid basally, medially and apically, lanceolate or ovate, apex confluent; *rachises* brownish, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, glandular trichomes absent; *pinnae* 8–16 pairs, the basal and medial ones stalked to 7.4 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 6.9–16 cm × 1.8–3.5 cm, lanceolate, incised 1/2–2/3 of the distance between the segment apex and costa, basal segments shorter than the next, apex acuminate; *adaxial pinnae axes* scales absent, catenate trichomes dense on costa, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with sparse scales on costa, 0.8–1.4 × 0.3–0.6 mm, castaneous or dark brown, clathrate, ascending, flattish or twisted, flaccid to stiff, deltate or lanceolate with cordate base and attenuate or filiform apex, entire or slightly denticulate, with or without some short fimbriae at base and laterally, proscapes to 1.9 mm long sparse on costule, rare on veins, catenate trichomes absent, bacilliform trichomes absent, glandular trichomes absent, filiform trichomes absent; *abaxial laminar surface between veins* glabrous; *segments* 17–21 pairs, 3.7–7.2 mm wide, patent or subfalcate, entire, apex truncate or obtuse, margin with catenate trichomes (almost glabrous), the distance from each other is narrower than segments width; *veins* simple, 6–10 pairs per segment, the basal ones from adjacent segments reach the margin at sinus, sometimes one vein reaches the margin at sinus and the other ends before the margin towards the sinus, or two pairs of basal veins reach the margin at sinus; *sori* medial or inframedial, indusia absent; *spores* with coarse folds.

Selected specimens examined:—BOLIVIA. La Paz: Franz Tamayo, Parque Nacional Madidi, sector Sumpulo, passando el río Mojos, entre Mojos y Pata, 976 m, 14°34'52"S, 68°46'34"W, 26 September 2009, *Alanes et al. 162* (UC); Pata, caminho hacia el N, 1470 m, 14°37'44"S, 68°40'19"W, 11 Nov 2003, *Fuentes & Paniagua 5920* (UC); Santa Cruz: Valle Grande, 12 km de Loma Larga a Masicuri, 1300 m, 18°47'S, 63°51'W, *Kessler 6071* (UC); BRAZIL. Espírito Santo: Cariacica, Reserva Biológica Duas Bocas, 600 m, 20°17'29" S, 40°31'10" W, 18 January 2009, *Labiak et al. 5175* (RB); Mato Grosso: Nova Canaã do Norte, Trilha do Rancho do Tião, 237 m, 10°58'15" S, 55°43'20" W, 10 July 2008, *Dias-Melo et al. 490* (RB); Paraná: Morretes, Estação Marumbi, 02 January 1986, *Kummrow & Cordeiro 2701* (UC); Rio de Janeiro: Angra dos Reis, Reserva Eletronuclear, Trilha Porã, 22°59'52" S, 44°28'36" W, 22 September 2004, *Mynssen & Bovini 693* (RB); Itatiaia, Parque Nacional do Itatiaia, 1000 m, 20°26'17" S, 44°36'43" W, 16 December 2008, *Damasceno & Costa 207* (RB); Miguel Pereira, Reserva Biológica do Tinguá, 789 m, 22°32'39"S, 43°26'01"W, 11 July 2007, *Sylvestre et al. 2077* (RB); Nova Friburgo, Distrito de Macaé de Cima, 950 m, 22°23'25"S, 42°29'40"W, 28 Oct 2012, *Salino et al. 15535* (BHCB); Rio de Janeiro, Reserva Biológica do Tinguá, 22°32'39" S, 43°26'01" W, 11 July 2007, *Sylvestre et al. 2077* (RB); Santa Maria Madalena, Águas Paradas, 2 March 1936, *Brade 1434* (RB); Santa Catarina: Biguaçu, 18 January 1945, *Reitz 1004* (RB); Blumenau, A.D. Hering, 26°54'11" S, 49°07'09" W, 21 April 2010, *Beckhauser 192* (RB); Brusque, ca. 27°06'S, 48°54'W, 35–135 m, 9 March 1952, *Smith & Reitz 6131* (RB); Itapocu, 4 September 1897, *Schwacke 12935* (RB); Joinville, 1906, *Müller 118a* (RB); São Paulo: Iguape, Rio Guaviranga, August 1921, *Brade 21448* (HB); Iporanga/Apiáí, Parque Estadual Turístico do Alto Ribeira, Núcleo Caboclos, 24°32'22"S, 48°41'36"W, 29 April 2012, *Mazziero et al. 1022* (RB); São Luíz do Paraitinga, Parque Estadual da Serra do Mar, Núcleo Santa Virgínia, Trilha da Pirapitinga, 900–950 m, 23°20'29"S, 45°08'48"W, 04 March 2001, *Salino et al. 6122* (BHCB).

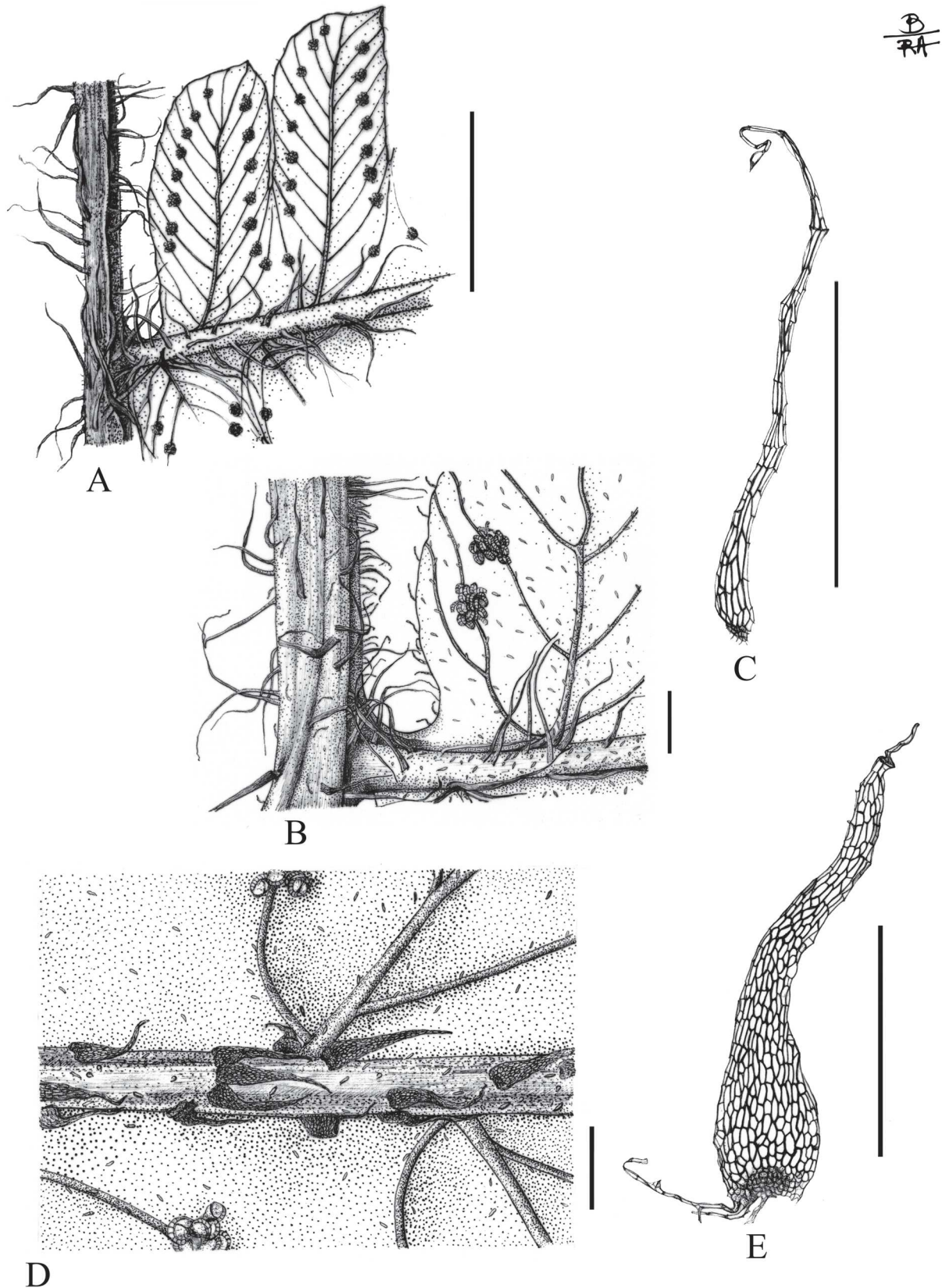


FIGURE 24. Some morphological characters of *Ctenitis* from South America. **A–C:** *Ctenitis refulgens* var. *refulgens* (Salino 15242, BHCB). **A:** abaxial surface of a portion of rachis and two basal segments of a medial pinna. **B:** abaxial surface of rachis, costa and segment, showing indument. **C:** abaxial costa scale. **D–E:** *C. refulgens* var. *peruviana* (Tuomisto, 13392 UC). **D:** abaxial surface of a portion of medial pinna, showing indument. **E:** abaxial costa scale. Scale bars in A = 1 cm, B–E = 1mm.

Habitat and distribution:—Terrestrial in rainforests, 35–1470 m. Bolivia, southeastern and southern Brazil (Viveros & Salino 2017; Fig. 23D; Tab. 01).

Notes:—*Ctenitis nervata* can be recognized by the pinnae incised ca. 1/2–2/3 of the distance between the segment apex and costa, sori without indusia and the veins are usually blackish. The basal ones from adjacent segments reach the margin at sinus, sometimes one vein reaches the margin at sinus and the other ends before margin towards the sinus, or two pairs of basal veins reach the margin at sinus (Figs. 22A). The indument of *C. nervata* is scarce, which resembles *C. aspidioides* (see corresponding notes for further differences). Several specimens of *C. nervata* were with dark sori, due to abortive sporangia (Fig. 08F) and consequently their spores were misshapen. However, in other specimens, the sporangia and spores seemed viable (Fig. 10F).

20. *Ctenitis nigrovenia* (Christ) Copeland (1947: 124). Figs. 02A, 10G, 22C–D, 25A. *Nephrodium nigrovenium* Christ in Donnell Smith (1895: 545). *Dryopteris nigrovenia* (Christ) Christensen (1906: 279). Type:—HONDURAS. Santa Bárbara: San Pedro Sula, September 1887, 1000 ft., *Thieme s.n.* [Herb. Donnell Smith 5646] (lectotype P 00642702! designated by Tryon & Stolze 1991, isolectotype US 00067035!).

Aspidium setosum Klotzsch (1847: 371), *nom. illeg., non* (Thunberg 1784: 337) Swartz (1801: 39), *non* Wallich (1828: 371), *nom. nud.* Type:—COLOMBIA. *Moritz 204* (lectotype P 01514077!, **designated here**, isolectotypes LE!, P 04021631!, P!, US 00067067!).

Aspidium tonduzii Christ (1901: 34). *Dryopteris tonduzii* (Christ) Christensen (1906: 664). *Ctenitis tonduzii* (Christ) Tryon & Tryon (1982a: 215). Type:—COSTA RICA: Forêt de Tuis, *Tonduz 11333* (lectotype P 00630760!, **designated here**, isolectotypes!, BM 000904585!, MO 122617!, P 00642673!, U 0007377!, US 00067047!, US 1100787!).

Ctenitis thelypteroides Smith (1975: 215). Type:—MEXICO. Chiapas: Las Margaritas, western side of Laguna Miramar, E of San Quintín, *Breedlove 33280* (holotype CAS 0001586!, isotypes CAS 0001585!, MEXU 00301602 [image!], NY 00179358!).

Stems erect, ascending or short-creeping, 0.9–3.3 cm diam., scales 2.1–8.0 × 0.4–1.5 mm, castaneous, subclathrate or clathrate, lanceolate, entire, without fimbriae; *leaves* 32–100 cm long; *petioles* 12–50 cm × 1.2–2.3 mm, with 3 vascular bundles at base, stramineous, scales 2.4–6.8 × 0.3–1.2 mm, castaneous on petiole base, becoming dark brown to blackish on distal portion, subclathrate or clathrate, tangled on petiole base, becoming patent or ascending towards distal portion, flattish, flaccid, lanceolate with truncate base and filiform apex, entire, with or without some short fimbriae at base, sparse catenate trichomes abaxially, sparse glandular trichomes; *laminae* 20–50 × 9.7–25.5 cm, width ca. 1/2 of length or somewhat wider, 1-pinnate-pinnatisect basally, 1-pinnate-pinnatisect or 1-pinnate-pinnatifid, almost pinnatisect medially and apically, lanceolate or ovate, apex confluent; *rachises* stramineous, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 7–16 pairs, the basal and medial ones stalked to 4.5 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial (5) 7–15 × 1.4–3 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments somewhat shorter than the next at basal pinnae, but longer at medial, apex attenuate; *adaxial pinnae axes* scales absent, catenate trichomes, dense on costa, sparse on costule, rare on veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with sparse scales on costa, 0.6–2.2 × 0.2–0.3 mm, dark brown, clathrate, ascending, mostly flattish, but can be vaulted at base, flaccid, linear-lanceolate with truncate or slightly cordate base and filiform apex, entire, with or without some short fimbriae at base, proscapes absent, catenate trichomes sparse on costa, costule and rare on veins, bacilliform trichomes sparse on costa, costule and veins, glandular trichomes absent, filiform trichomes absent; *abaxial laminar surface between veins* with sparse bacilliform trichomes; *segments* 13–19 pairs, 2.8–5.7 mm wide, patent or subfalcate, serrate towards apex, rarely entire, apex acute or apiculate, margin glabrous, the distance from each other is narrower than segments width; *veins* simple or 1-forked, 6–11 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* medial, inframedial or supramedial, indusia conspicuous or inconspicuous, entire, with bacilliform trichomes; *spores* coarsely echinate.

Selected specimens examined:—BOLIVIA. La Paz: Sud Yungas, Colonia Buena Vista, 11 August 1994, *Seidel & Vaquita, D. 7622* (UC); Santa Cruz: Florida, Refugio Los Volcanes, 1050 m, 18°06' S, 63°36' W, 3 October 1997, *Kessler et al. 12268* (UC); Velasco, Parque Nacional Noel Kempff Mercado, 700 m, 14°31'16" S,

60°44'14" W, 4 July 1996, *Peña-Chocarro et al.* 69 (NY); BRAZIL. Mato Grosso: Serra Ricardo Franco, 500 m, 15°S, 60°W, 15 December 1977, *Windisch* 1498 (UC); Pará: Canaã dos Carajás, Serra do Tarzan, 15 December 2012, *Salino* 15575 (BHCB); COLOMBIA. Magdalena: Santa Marta, 1898, *Smith* 2581 (MO, NY); Risaralda: Pereira, Hacienda Los Visos, 11 August 1991, *Silverstone-Sopkin & Arroyo* 6295 (MO, UC); PERU. Cusco: La Convención, Rio Manguriari, 2 February 1991, *Nuñez & Ortiz* 12760 (MO); San Martín: Hara, near Moyobamba, 04 June 1947, *Woytkowski s.n.* (UC); VENEZUELA. Barinas: Bolívar, 600 m, 28 July 1984, *Moran* 3717 (UC); Tovar, 1854, *Fendler* 194 (MO); Lara: Jiménez, Parque Nacional Yacambú, 620–740 m, 9°41' N, 69°30' W, 24 October 1982, *Davidse & Gonzáles* 71020 (MO); Portuguesa: Ospino, 900 m, 9°28'30" N, 69°28'40" W, 22 November 1990, *González & Stergios* 19 (UC); Zulia: Lagunillas, Cuenca del Embalse Burro Negro (Pueblo Viejo), 550–600 m, 10°25' N, 70°49' W, 1 April 1982, *Bunting et al.* 11168 (NY).

Habitat and distribution:—Terrestrial, less frequently epipetric, in mountain forests, 50–900 m. Mesoamerica (Mexico, Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica and Panama), West Indies (Trinidad) and South America (Venezuela, Colombia, Peru, Bolivia and Brazil; Fig. 25A; Tab. 01).

Notes:—*Ctenitis nigrovenia* is usually recognized by segments margin serrate and glabrous in a 1-pinnate-pinnatifid to 1-pinnate-pinnatisect lamina. Some specimens from Costa Rica and Mexico are smaller and because of that, the segments are repand or entire. These specimens have already been recognized as a distinct species, named *C. tonduzii*, but the microscopic characters are the same, for example bacilliform trichomes on costula, vein and between veins abaxially (Fig. 22C). Despite the absence of catenate trichomes on segments margin, the following further characters also contribute to recognized *C. nigrovenia*: scales on costa abaxially dark brown to blackish, indusia conspicuous with bacilliform trichomes, or inconspicuous and reduced, remaining a tuft of bacilliform trichomes. *Ctenitis nigrovenia* is like *C. abyssii* and *C. laetevirens* (see both for differences).

The collection cited in original description of *Nephrodium nigrovenium* is *Thieme* 5646 (Donnell Smith 1895). As usual at that time, no holotype was designated, neither a herbarium was specified. One sheet of this collection is in P and another is in US. The one in P has a stamp of Christ's Herbarium. Christensen (1913a) informed that the types were in Christ Herbarium and in US. The collections of Christ, the author of *N. nigrovenium*, were incorporated by the Roland Bonaparte's herbarium, which was incorporated by P. Tryon & Stolze (1991) cited "P?" for the holotype and US for an isotype. Then, we consider this an inadvertent lectotypification and an error to be correct to lectotype (Art. 7.10, 9.9, 9.19 of *ICN—McNeill et al.* 2012).

Aspidium setosum (Klotzsch 1847) is a later homonym, therefore illegitimate, but also susceptible to typification (Art. 7.5 of *ICN—McNeill et al.* 2012). Christensen (1913a) had already considered this name as a synonym of *Dryopteris nigrovenia*, and he attributed the collection *Moritz* 204 as from Tovar in Venezuela, not Colombia, as mentioned in the protologue. Moritz collected plants in Colombia and also in Venezuela, but the protologue and the herbarium sheets we found do not mention the locality "Tovar". Although Christensen (1913a) has cited this collection in B, Christ's Herbarium and S, only five sheets with the exact collecting number, written on them *A. setosum*, were found: three in P, one in LE and other with a pinna in US. The ones in P were incorporated from Luerssen-Weigel's Herbarium. They are certainly original material (Art. 9.3 of *ICN—McNeill et al.* 2012), and here we designate as lectotype (Art. 8.3, Rec. 8A.4, 9.2, 9.5, 9.11, 9.12 and 40 Note 1 of *ICN—McNeill et al.* 2012) a specimen in P with a pretty leaf.

Christ (1901) cited the collection *Tonduz* 11333 for *Aspidium tonduzii*. Sheets of this were found in four herbaria. Supported by Art. 8.3, Rec. 8A.4, Art. 9.5, 9.12 and 40 Note 1 of *ICN* (McNeill *et al.* 2012) we selected as lectotype one sheet in P, which is with Christ's Herbarium stamp. Christensen considered *A. tonduzii* as *Dryopteris tonduzii* differing it from *D. nigrovenia* mainly by the lamina lighter and glabrous between veins on both surfaces. The types are almost glabrous, but they do contain the same indument of *C. nigrovenia*.

Ctenitis thelypteroides (Smith 1975) were placed as synonym of *C. nigrovenia* by Stolze (1981). Moran (1995) said that *C. nigrovenia* was too variable and that more collections were needed to clarify if *C. thelypteroides* and *C. tonduzii* could be distinct from *C. nigrovenia*. Mickel and Smith (2004), however, still maintained *C. thelypteroides* as distinct, separating by the presence of indusia in opposition to an exindusiate sori in *C. nigrovenia*. However, the types of *C. nigrovenia* (*N. nigrovenium*) are indusiate. The types of *C. tonduzii* and *C. thelypteroides* are quite similar in leaf size and segments margin, which are not so perfectly serrate as the typical *C. nigrovenia*. Furthermore, after analyzing several specimens from South to Mesoamerica and West Indies, we agree with Stolze (1981) and recognize all these three names as the same taxon. Therefore, *C. nigrovenia* is a widely distributed species with consequently morphological variations that such overlapping characters make unfeasible to distinguish more than one species.

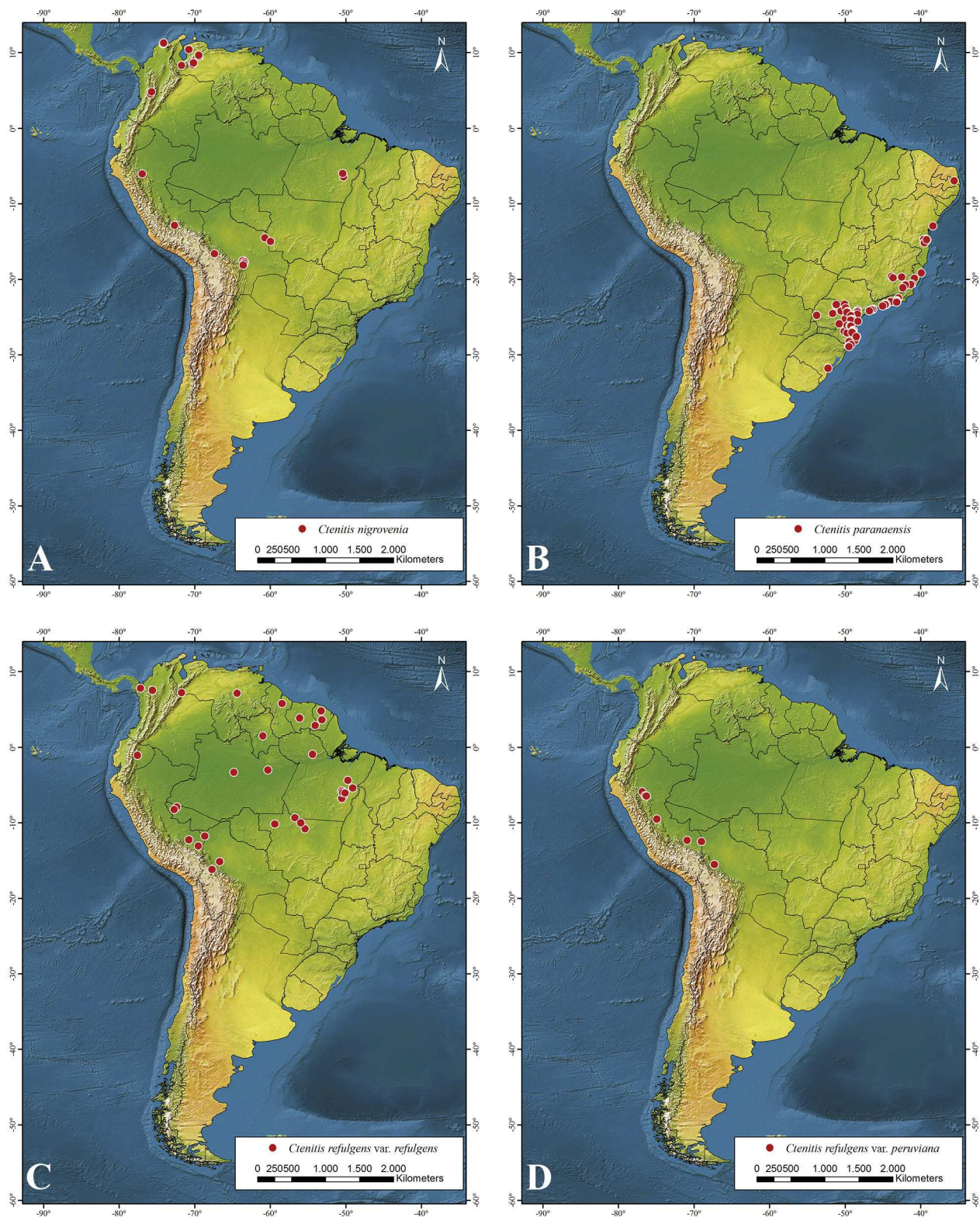


FIGURE 25. Distribution of four taxa of *Ctenitis* in South America. **A:** *C. nigrovenia*. **B:** *C. paranaensis*. **C:** *C. refulgens* var. *refulgens*. **D:** *C. refulgens* var. *peruviana*.

Christensen (1913a) presents the name *Aspidium deltoideum* Fournier (1872: 93), non (Swartz 1788: 133) Swartz (1801: 34), as a synonym of *Dryopteris nigrovenia*. However, Fournier did not intend to describe a new species, he just cited the name *A. deltoideum* of Swartz with the voucher *Bourgeau 1644* from Mexico. It is an

identification error of Fournier, such collection corresponds to *C. nigrovenia* and what Swartz (1801) referred is combined as *Cyclosorus deltoideus* (Sw.) Mazumdar & Mukhopadhyay (2013: 18).

21. *Ctenitis paranaensis* (C.Chr.) Lellinger (1984: 56). Figs. 10H, 25B. *Dryopteris falciculata* (Raddi) Kuntze var. *paranaensis* Christensen (1913a: 92). Type:—BRAZIL. Paraná: Vila Nova, Rio Negro, *Annie's s.n.* (Herb. Rosentock 79) (lectotype S 05-11193!, designated by Viveros & Salino 2015, isolectotypes B 20 0055524!, B 20 0055525!, BM 000555871!, CAS 0002327!, K 000880606!, MO 1857152!, P 01380677!, P 01380695!, P 00170045!, P 00642695!, P 00642696!, PR 519759!, PR 820273!, PR 820274!, R!, RB 36164!, S 05-11194!, S 06-478!, S-R-1718!, U 0180275!, UC 1193754!, US 0006701!).

Dryopteris falciculata (Raddi) Kuntze f. *glabrata* Hieronymus ex Christensen (1913a: 92). Type:—BRAZIL. Rio de Janeiro, *Glaziou 12288* (lectotype B 20 0055523!, designated by Viveros & Salino 2015, isolectotypes K 000954443!, K 000954454!, P 00170037!).

Stems erect or ascending, 1.6–3.0 cm diam., scales 8.6–12.4 × 0.3–0.4 mm, light castaneous, subclathrate, lanceolate, entire or slightly denticulate, with or without some short fimbriae at base and laterally; *leaves* 52.4–86.5 cm long; *petioles* 29.6–45 cm × 1.7–3.6 mm, with 4 or 6 vascular bundles at base, brownish, tan or stramineous, scales 4.4–9.3 × 0.3–0.7 mm, light castaneous on petiole base, becoming dark brown to blackish on distal portion, subclathrate or clathrate, tangled on petiole base, becoming patent or ascending towards distal portion, flattish, flaccid, lanceolate or linear-lanceolate with truncate base and attenuate or filiform apex, entire, with or without short fimbriae at base, sparse catenate trichomes abaxially, glandular trichomes absent or sparse; *laminae* 22.8–41.5 × 13.2–22 cm, width ca. 1/2 of its length or somewhat wider, 1-pinnate-pinnatisect basally, 1-pinnate-pinnatifid medially and apically, lanceolate or ovate, apex confluent; *rachises* brownish, tan or stramineous, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, rare or absent glandular trichomes; *pinnae* 11–14 pairs, the basal and medial ones stalked to 6.1 mm long, the apical ones stalked to 1.0 mm long or sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 7.2–11.5 × 1.9–2.8 cm, lanceolate, incised more than 3/4 of the distance between segment apex and costa, basal segments as long as the next, apex attenuate; *adaxial pinnae axes* scales absent or sparse (large individuals) on costa, to 0.6 × 0.06 mm, dark brown, filiform, catenate trichomes, dense on costa, sparse on costule and veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous or with sparse catenate trichomes; *abaxial pinnae axes* with sparse scales on costa, 1.5–3.4 × 0.1–0.4 mm, dark brown or castaneous, clathrate, mostly flattish, but can be vaulted at base, flaccid, lanceolate with rounded or cordate base and filiform apex, entire or slightly denticulate, with or without some short fimbriae at base, proscasles to 0.9 mm long sparse on costa and costule, catenate trichomes sparse on costa, costule and veins, bacilliform trichomes sparse or absent on costule and veins, glandular trichomes absent or sparse on costa, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse catenate and bacilliform trichomes; *segments* (10) 16–31 pairs, 3.0–6.8 mm wide, patent or subfalcate, entire or repand, apex obtuse, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple or 1-forked, 7–10 pairs per segment, the basal ones from adjacent segments end at margin well above the sinus; *sori* medial or supramedial, indusia conspicuous or inconspicuous, entire, with catenate and bacilliform trichomes; *spores* with inflated and coarse folds.

Selected specimens examined:—BRAZIL. Bahia: Ilhéus, km 22 da Rodovia Ilhéus–Itabuna, 29 June 1979, *Mori s.n.* (CEPEC); Jussari, RPPN Jussari, 12 December 2005, *Mynssen et al. 919* (NY, RB); Salvador, Parque de Pituaçu, 1 September 1997, *Guedes 5202* (CEPEC, MBM); Espírito Santo: Cachoeiro de Itapemirim, Burarama, Pedra da Ema, 8 August 2013, *Monteiro et al. 864* (RB); Jatiboca, 27 May 1946, *Brade et al. 847* (RB); Linhares, Reserva da Companhia Vale do Rio Doce, 22 m, 19°08'38" S, 39°55'14" W, 10 April 2006, *Paciencia et al. 2444* (RB); Minas Gerais: Carangola, Fazenda Boa Vista, 30 May 1989, *Salino 818* (BHCB, UEC); Lagoa Santa, *Damazio 425* (OUPR); Muriaé, área da Usina Hidrelétrica Cachoeira Encoberta, *Salino & Morais 4607* (BHCB); Parque Estadual do Rio Doce, 13 September 1997, *Salino & Melo 3410* (BHCB); Paraíba, 1887, *Goeldi s.n.* (P); Paraná: Cerro Azul, Serra Paranapiacaba, 20 December 1970, *Hatschbach & Guimarães 25583* (NY, UC, US); Jaguariá, 12 May 1914, *Dusén 14995* (MO); Londrina Parque Estadual Mata do Godoy, 15 December 1992, *Salino 1603* (UEC); Manoel Ribas, 12 December 1973, *Hatschbach 33493* (MBM, UC, US); Marechal Mallet, 1 January 1904, *Dusén 3068* (R); Paranaguá, Ilha do Mel, Morro Bento Alves, 11 October 1992, *Salino 1992* (BHCB); Santo Antônio da Platina, Fazenda Marimbondo, 20 September 1989, *Kramer & Dubs 10586* (F);

Toledo, 15 November 1963, *Pereira & Hatschbach 7911* (RB); Rio de Janeiro: Guapimirim, Parque Nacional da Serra dos Órgãos, 900 m, 22°27'58" S, 42°59'41" W, 7 November 2010, *Engelmann et al. RE1408* (RB); Mangaratiba, Reserva Ecológica Rio das Pedras, 19 October 1996, *Bovini et al. 1088* (BHCB); Niterói, Praia do Adam, 4 June 1939, *Brade 16116* (RB); Paraty, APA Cairuçu, 9 May 1991, *Sylvestre et al. 476* (RB); Rio de Janeiro, Morro Mundo Novo, 18 February 1994, *Braga 1063* (RB); Rio Grande do Sul: Pelotas, 29 May 1959, *Brauner & Sehnem 105* (F). Santa Catarina: Blumenau, Campus V - FURB, 79 m, 26°51'19" S, 49°02'58" W, 11 August 2009, *Gasper et al. 2236* (BHCB); Campo Alegre, Fragosos, 7 September 1951, *Hatschbach 2484* (RB); Florianópolis, Itacorubí, 26 February 1943, *Reitz 265* (RB, US); Meleiro-Araranguá, 13 October 1943, *Reitz 11* (RB); Orleans, 646 m, 28°15'37.00"S, 49°29'58.00" W, 22 May 2009, *Gasper & Verdi 2123* (BHCB); São Paulo: Iporanga, Parque Estadual Intervales, Base do Carmo, 530 m, 24°18'24" S, 48°24'45" W, 18 May 2003, *Salino et al. 8483* (BHCB); Itanhaém, Parque Estadual da Serra do Mar, 100–120 m, 24°09'59" S, 46°49'43" W, 17 April 2001, *Salino 6603* (BHCB); Ribeirão Grande, Bairro Boa Vista, 31 May 1997, *Silva & Kersten s.n.* (BHCB); Santos, 20 September 1915, *Rose & Russell 21122* (NY); São Paulo, Cidade Universitária, Mata da Reserva de CUASO, 22 April 1976, *Mendonças et al. s.n.* (BHCB); Ubatuba, Parque Estadual da Ilha de Anchieta, 7 February 1996, *Salino 2564* (BHCB).

Habitat and distribution:—Terrestrial. Endemic to Atlantic Forest, 5–1600 m. Northeastern to southern Brazil (Viveros & Salino 2015; Fig. 25B; Tab. 01).

Notes:—*Ctenitis paranaensis* can be recognized by rachis and costa abaxially with scales dark brown to blackish, entire or slightly denticulate, sparse catenate trichomes on abaxial costa and laminar surface between veins, and on the indusium, which is usually inconspicuous. The most similar species to *C. paranaensis* are *C. falciculata*, *C. distans* and *C. submarginalis*. See *C. falciculata* and *C. distans* notes for differences. Some morphological characters of *C. paranaensis* are illustrated in Viveros & Salino (2015). The scales of specimens from southern Bahia are more delicate and narrower, resembling *C. submarginalis* var. *tenuifolia*, except by the color (dark brown to blackish in *C. paranaensis* vs. light castaneous in *C. submarginalis* var. *tenuifolia*). Moreover, the petiole base of typical *C. paranaensis* has four vascular bundles, but the specimens from southern Bahia have six. Besides of that, the other characters fit well with other specimens under *C. paranaensis*.

22. *Ctenitis refulgens* (Klotzsch ex Mett.) Christensen ex Vareschi (1968: 404). *Phegopteris refulgens* Klotzsch ex Mettenius (1864: 240). *Polypodium refulgens* (Klotzsch ex Mett.) Hooker & Baker (1868: 307). *Nephrodium refulgens* (Klotzsch ex Mett.) Diels (1899: 170). *Dryopteris refulgens* (Klotzsch ex Mett.) Christensen (1906: 288). Type:—GUYANA. *Schomburgk 1183* (lectotype B 20 0064265!, **designated here**, isolectotype B 20 0064260!); remaining syntypes:—COLOMBIA. Chocó (New Granada), *Schott 07* (US 01105867!, US 01105866!); Magdalena, 100 m, *Lindig 382* (B 20 0064261!); Tolima: Monte Tolima, *Linden 1011* (not found).

Stems ascending or short-creeping, 1.7–3.0 cm diam., scales 4.0–11.1 × 0.2–0.6 mm, light castaneous, subclathrate, linear, entire, without fimbriae; *leaves* 48.5–121 cm long; *petioles* 15–54 cm × 2.0–6.0 mm, with 4 vascular bundles at base, stramineous or tan, scales 2.4–10.0 × 0.1–0.6 mm, light castaneous, subclathrate, tangled on petiole base, becoming patent or ascending towards distal portion, flattish, flaccid, linear with truncate base and filiform apex, entire, without fimbriae, sparse catenate trichomes abaxially, sparse glandular trichomes; *laminae* 33.5–67 × 21.5–35 cm, width 1/2–2/3 of length, 1-pinnate-pinnatifid basally, medially and apically, lanceolate or ovate, apex confluent; *rachises* stramineous or tan, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 7–15 pairs, the basal and medial ones stalked to 3.8 mm long or sessile, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 12.2–21.5 × 2.9–3.5 cm, lanceolate, incised ca. 1/2 (rarely to 2/3) of the distance between the segment apex and costa, basal segments as long or shorter than the next, apex attenuate; *adaxial pinnae axes* with sparse scales on costa, 1.8–3.1 × 0.06 mm, castaneous, filiform, catenate trichomes dense on costa, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous; *abaxial pinnae axes* with sparse scales on costa, 1.5–2.5 × 0.1–0.2 mm, castaneous or light castaneous, clathrate, patent or ascending, flattish or twisted, flaccid, linear with truncate or slightly cordate base and filiform apex, entire, with or without some short fimbriae at base and laterally, proscas absent, catenate trichomes absent or rare on costule, bacilliform trichomes sparse on costa, costule and veins, glandular trichomes sparse on costa, filiform trichomes absent; *abaxial laminar surface between veins* with sparse bacilliform trichomes; *segments* 16–23 pairs, 6.2–9.1 mm wide, patent or subfalcate, entire or repand, apex

obtuse, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple, 7–12 pairs per segment, the basal ones from adjacent segments reach the margin at sinus, sometimes one of these veins ends before the margin towards the sinus, the next one or two pairs of basal veins reach the margin somewhat above the sinus; *sori* medial or inframedial, indusia absent; *spores* with coarse folds and large tubercles.

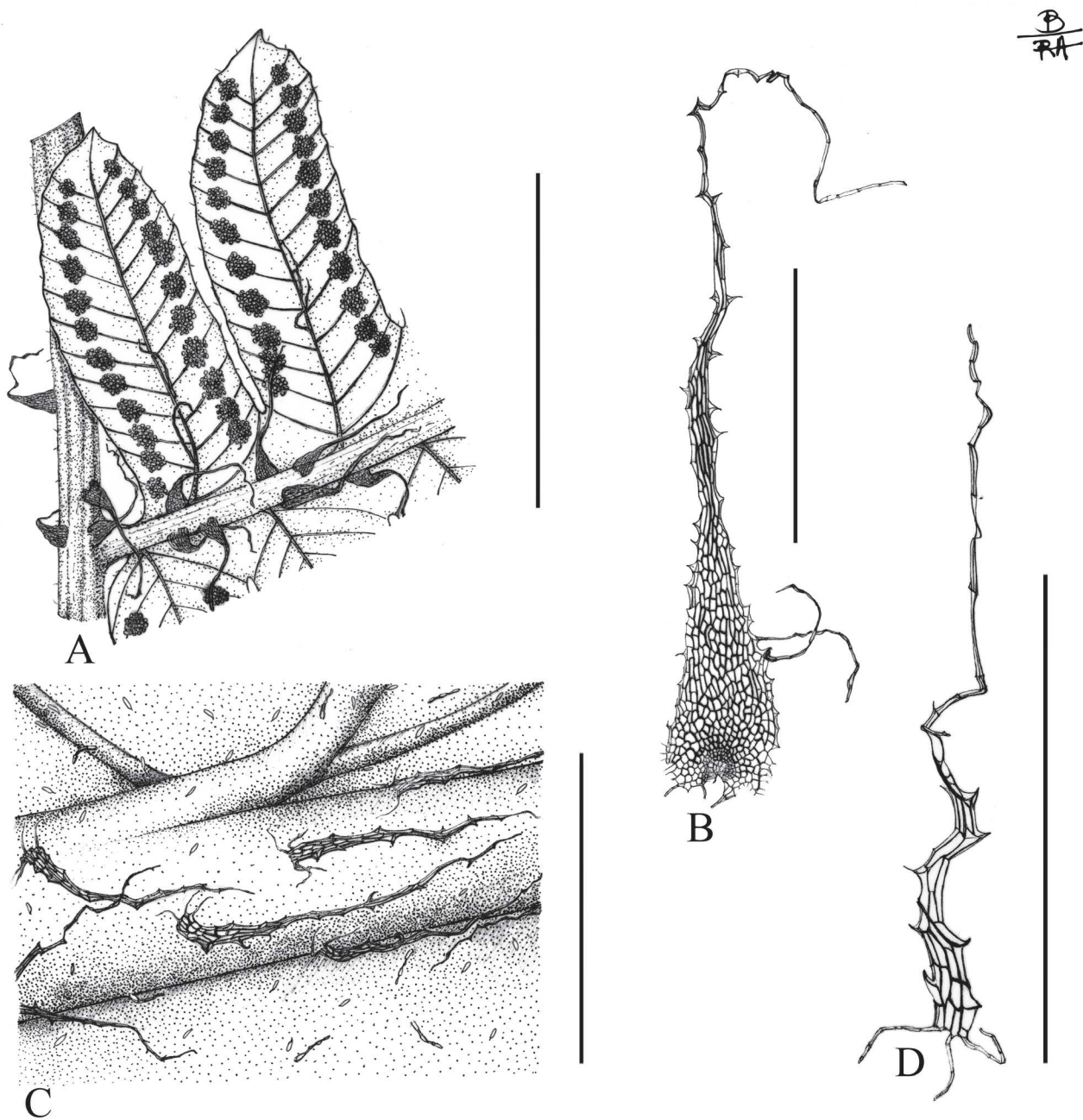


FIGURE 26. Some morphological characters of *Ctenitis* from South America. **A–B:** *Ctenitis submarginalis* var. *submarginalis* (Verdi 1843, BHCB). **A:** abaxial surface of a portion of rachis and two basal segments of a medial pinna. **B:** abaxial costa scale. **C–D:** *C. submarginalis* var. *tenuifolia* (Pietrobon 5015, BHCB). **C:** abaxial surface of a portion of medial pinna, showing indument. **D:** abaxial costa scale. Scale bars in A = 1 cm; B–D: = 1 mm.

Notes:—Christensen (1913a) proposed the recognition of two infraspecific taxa under *C. refulgens* (treated by him as *Dryopteris refulgens*). According to his descriptions it seemed that the variety *peruviana* were just smaller and younger plants from Peru. However, after analyzing numerous exsiccatae, it seems reasonable to recognize the two taxa, once larger specimens from Peru and Bolivia showed the same characters indicated by Christensen (1913a) to *D. refulgens* var. *peruviana*.

Mettenius (1864) cited four collections in the protologue of *Phegopteris refulgens*: *Linden 1011* (from Tolima, Colombia), *Lindig 382* (from Magdalena, Colombia), *Schott 7* (from Panama, currently Colombia in Chocó) and *Schomburgk 1183* (from Guyana). Christensen (1913a) erroneously cited as type the *Schomburgk 1128* (not cited in the protologue) and *Schomburgk 1183* (cited in the protologue). Lellinger (1977) did not consider or corrected the typification made by Christensen (1913a), and chose as lectotype *Schott 7* (two sheets in US), presuming that an isolectotype should be in B. Nonetheless, Tryon & Stolze (1991) and Moran (1995) attributed the lectotypification to Christensen (1913a), understanding that the lectotype should be *Schomburgk 1183* in B. Mickel & Smith (2004), however, gave credit to the lectotype chosen by Lellinger (1977), also presuming that a duplicate should be in B. In our visits to B, we did not find any *Schott 7*. According to Art. 7.10 and 9.19 of *ICN* (McNeill *et al.* 2012), the first typification proposed by Christensen has priority, as presumed by Tryon & Stolze (1991) and Moran (1995). Therefore, *Schomburgk 1183* in B must be considered as the lectotype (Art. 9.9 of *ICN*—McNeill *et al.* 2012), since the other collection cited by Christensen (1913a) was not cited in the protologue. There are, however, two sheets of that gathering in B. Both sheets may correspond to the same individual, but there is no label that clearly supports this hypothesis. Therefore, the two sheets must be considered as duplicates (Art. 8.3 of *ICN*—McNeill *et al.* 2012). This means that Christensen (1913a) conducted the first step lectotypification by citing the gathering *Schomburgk 1183*. Here we conduct the second-step lectotypification by designating the sheet B 20 0064265! as the lectotype.

22.1. *Ctenitis refulgens* (Klotzsch ex Mett.) C. Chr. ex Vareschi (1968: 404) var. *refulgens*. Figs. 05B, 10I, 24A–C, 25C.

Phegopteris tricholepis Fée (1869: 98). Type:—BRAZIL. Amazonas: Prope San Gabriel da Cachoeira, ad Rio Negro, brasiliæ borealis, *Spruce 2100* (lectotype P 00170060!, **designated here**, isolectotypes BR [AWH collection], K 000954421!, P 00170064!, P 01449837!, RB 00657603!).

Selected specimens examined:—BOLIVIA. Beni: Gral. Ballivián, ca. 33 km south of San Borja, along a logging track, 264 m, 15°09'S, 66°44'W, 27 June 2009, *Weigelt et al. 90254* (UC); La Paz: Nord Yungas, Polo–Polo bei Coroico, 1100 m, October–November 1912, *Buchtien 3409* (F); Pando: Manuripi, camino Cobja–Chivé, comunidad Holanda, entrando por el camino al puesto militar adelantando Dolores, antes de cruzar el río Manurimi, 230 m, 11°47'S, 68°42'W, 28 July 2003, *Jimenez 1954* (UC); BRAZIL. Acre: Cruzeiro do Sul, comunidade de Santa Luzia, 275 m, 07°53'45''S, 72°24'30''W, 10 December 2010, *Salino & Almeida 15004* (BHCB); Porto Walter, Igarapé Ouro Preto, 20 November 2001, *Croat 85538* (RB); Amazonas: Prope San Gabriel da Cachoeira, ad Rio Negro, brasiliæ borealis, *Spruce 2100* (RB); Tefé, northwest shore, 3°20'S, 64°50'W, 11–14 December 1982, *Plowman et al. 12497* (INPA); Mato Grosso: Alta Floresta, Assentamento Rural de Carlinda, 10°00' S, 56°00' W, 6 May 1986, *Windisch 4755* (UC); Aripuanã, Dardanelos, 28 September 1975, *Lisboa et al. 405* (INPA); Paranaíta, Propriedade do Sr. Nilo Weber, 9°20'34" S, 56°46'15" W, 18 July 2008, *Dias-Melo et al. 584* (RB); Pará: Canaã dos Carajás, Serra do Tarzan, 15 December 2012, *Salino 15575* (BHCB); Marabá, Serra Norte, 20 May 1982, *Secco et al. 291* (RB); Novo Repartimento, Zona de Preservação da Vida Silvestre, Base 3, 10 July 2008, *Fernandes 167* (RB); W bank of Rio Maicuru, 0°55' S, 54°26' W, 29 July 1981, *Strudwick et al. 3718* (F); Roraima: Caracará, Parque Nacional do Viruá, 01°29'25''S, 61°00'38''W, 13 October 2011, *Mota et al. 2351* (BHCB); COLOMBIA. Chocó: Río Sucio, Parque Nacional Natural Los Katíos, 290 m, 29 May 1976, *Forero et al. 1646* (MO); ECUADOR. Napo: Yasuní National Park, 200–300 m, 00°42'S, 76°29'W, 18 April 1997, *H. Tuomisto et al. 10676* (UC); Tena, Jatun Sacha Biological Station, 400 m, 1°04' S, 77°36' W, 9 December 1990, *Fay & Fay 2678* (UC); FRENCH GUIANA. Monts la Fumée, 200–400 m, 3°37' N, 53°12' W, 2 September 1982, *Boom & Mori 1588* (NY); Pentes exposées au nord, à 300 m au nord du camp Guyanor, à 1,3 Km de St Elie (Guyane), 4°49' N, 53°18' W, 31 July 1997, *Boudrie 2838* (UC); Roche Koutou–Bassin du Haut–Marouini, 165 m, 02°52'S, 54°04'W, 17 August 1987, *Granville et al. 9420* (UC); GUYANA. Demerara, Berbier River, 1897, *G. S. Jenman s.n.* (NY); PERU: Madre de Dios: Tambopata, Puerto Maldonado, 12°64' S, 69°33' W, 30 January 2006, *Chambi & Chambi 178* (NY); Manu, 10 km E from the mouth of Río Manu, northern bank of Río Madre de Dios, 300–400 m, 12°15'S, 70°48'W, 25 October 1998, *Tuomisto et al. 13397* (UC); SURINAME. Sipaliwini, Central Suriname Nature Reserve, vicinity of camp at southern base of the first peak in Eilerts de Haan mountain range ca. 6 km ENE of Kayserberg Airstrip, 250–350 m, 03°09'00''N, 56°27'30''W, 23 June 2003, *Herrera & Koemar 10044* (UC);

VENEZUELA. Apure: Paez, 25 km E of El Nula, 200 m, 07°14'N, 71°45'W, 1 July 1983, *van der Werff & Gonzáles 4678* (MO); Barinas: Pedraza, above El Agarrobo, 400m, 08°31'N, 70°35'W, 3 August 1983, *van der Werff & Ortiz 5808* (MO); Bolívar: Raul Leoni, 86 km al Este de San Francisco, 430 m, 06°09'N, 64°24'W, June 1989, *Delgado 254* (MO); Island Margarita, 8 February 1901, *Miller 169* (MO); Zulia: Bolívar, Cuenca del Embalse Burro Negro (Pueblo Viejo), 250–300 m, 5–8 August 1980, *G. S. Bunting 9577* (UC).

Habitat and distribution:—Terrestrial in rainforests, 100–900 m. Mesoamerica (Mexico, Belize, Guatemala, Honduras, Nicaragua, and Panama), West Indies (Trinidad) and South America (French Guiana, Suriname, Guyana, Venezuela, Colombia, Ecuador, Peru, Bolivia and Brazil; Fig. 25C; Tab. 01).

Notes:—The typical variety is recognized by pinnae incised 1/2–2/3 of the distance between segment apex and costa (Fig. 05B–C), and light castaneous and linear scales on costa abaxially. *Ctenitis refulgens* var. *refulgens* is similar to *C. nervata* and *C. aspidioides* (see corresponding notes) by pinnae incision, differing from both by light castaneous, which resemble *C. eriocaulis*, however not subulate, but linear (Figs. 24A–C). Furthermore, *C. eriocaulis* pinnae are incised more than 3/4, the indusia is present and the veins from adjacent segments reach the margin well above the sinus. In *C. refulgens* there are scales also on costa adaxially, while, in *C. nervata* and *C. aspidioides* there are not. Furthermore, one vein from adjacent segments can sometimes ends before margin towards the sinus, or the next one or two pairs reach the margin somewhat above the sinus.

Fée (1869) cited the collection *Spruce 2100* for *Phegopteris tricholepis*. No holotype or herbarium were specified. Sheets of this collection were found in P, BR, K, and RB. Supported by the Art. 8.3, Rec. 8A. 4, Art. 9.2, 9.5, 9.11, 9.12, 40 Note 1 of *ICN* (McNeill *et al.* 2012), we designate here for lectotype one of the sheets in P, which contains the most complete leaf sample.

22.2. *Ctenitis refulgens* (Klotzsch ex Mett.) C. Chr. ex Vareschi var. *peruviana* (C. Chr.) R.S. Viveros & Salino, comb. nov. Figs. 05A, 10J, 24D–E, 25D. *Dryopteris refulgens* (Klotzsch ex Mett.) Christensen (1906: 288) var. *peruviana* Christensen (1913a: 90). Type:—PERU. Prope Tabalosas inter urbem Moyobamba et fluvium Río Huallaga, *Stübel 1097* (lectotype B 20 0064268!, **designated here**); remaining syntypes:—PERU. Tarapoto, in Monte Guayrapurina, *Spruce 4712* (US 00513182!, isosyntype MO 255866!); PERU. San Martín: Tarapoto, in Monte Campaña, *Spruce 4657* (LD 1765418, B 20 0064269!, isosyntypes BM 000777157!, BM 000777156!, BR 0000013514594!, GH 00443892!, K 000200138!, K 000200139!, K!, P 00642693!).

Selected specimens examined:—BOLIVIA. La Paz: Sud Yungas, Alto Beni, Sapecho, Colonia Tarapaca, 610 m, 15°32'S, 67°21'W, 28 October 1997, *Krömer et al. 50* (UC); PERU. Huanuco: Pachitea, Puerto Inca, 350 m, 09°31'S, 74°58'W, 13 April 1982, *Smith 1299* (MO); Madre de Díos: Tambopata, Las Piedras. Cusco Amazónico, 200 m, 12°29' S, 69°03' W, 11 November 1991, *Timaná & Jaramillo 3136* (MO); Manu, close to the Village of Diamante, Southern side of Río Alto Madre de Díos, 400 m, 12°20'S, 70°57'W, 24 October 1998, *Tuomisto et al. 13392* (UC); San Martín: Lamas, Alonso Alvarado, San Juan de Pacayzapa, al leste del Puente (carretera a Moyobamba), 16 April 1973, *Schunke 5941* (F).

Habitat and distribution:—Terrestrial in rainforests, 230–1180 m. South America (Peru and Bolivia; Fig. 26D; Tab. 01).

Notes:—*Ctenitis refulgens* var. *peruviana* differs from the typical by the pinnae incision 1/4–1/3 of the distance between the segment apex and costa (Fig. 05A), and by darker (castaneous) and lanceolate scales on costa abaxially (Fig. 24D–E), once the typical is incised 1/2–2/3 and the costal scales abaxially are lighter (light castaneous) and linear.

When proposing this variety, Christensen (1913a) cited four syntypes: *Spruce 4657* (B, LD), *Spruce 4712* (US), *Stübel 1097* (B). This last we designate as lectotype (Art. 9.12 of *ICN*—McNeill *et al.* 2012).

23. *Ctenitis submarginalis* (Langsd. & Fisch.) Ching (1940: 250). *Polypodium submarginale* Langsdorff & Fischer (1810: 12). *Dryopteris submarginalis* (Langsd. & Fisch.) Christensen (1906: 296). Type:—BRAZIL. Santa Catarina: Insula de Santa Catarina, *Langsdorff s.n.* (lectotype LE 00000006 [image!], **designated here, isolectotypes LE 00000005 [image!], LE 00000007 [image!]).**

Stems erect, ascending or short-creeping, 2.0–5.5 cm diam., scales 10.0–30.0 × 0.5–1.5 mm, light castaneous, clathrate, lanceolate, entire or slightly denticulate, with or without some short fimbriae at base; *leaves* 70–175 cm

long; *petioles* (20) 30–80 cm × 3.0–5.5 mm, with 5 or 6 vascular bundles at base, stramineous or tan, scales 5.0–20.0 × 0.2–1.5 mm, light castaneous or castaneous, subclathrate or clathrate, tangled on petiole base, becoming patent or ascending towards distal portion, flattish, flaccid, linear or lanceolate with truncate or cordate base and filiform apex, entire or slightly denticulate, with or without some short fimbriae at base, catenate trichomes absent or sparse abaxially, glandular trichomes sparse; *laminae* 50–95 × 20–55 cm, width ca. 1/2 of length or wider, 1-pinnate-pinnatifid or 1-pinnate-pinnatisect basally, 1-pinnate-pinnatifid medially and apically, lanceolate or ovate, apex confluent; *rachises* stramineous, scales like those on distal portion of petioles, sparse catenate trichomes abaxially, sparse glandular trichomes; *pinnae* 15–25 pairs, the basal and medial ones stalked to 9 mm long, the apical ones sessile, basal pinnae basiscopically and acroscopically somewhat equally developed, the medial 10–30 × 1.5–5.0 cm, lanceolate, incised more than 3/4 of the distance between the segment apex and costa, basal segments shorter than the next at basal pinnae, but longer at the medial and apical pinnae, apex attenuate; *adaxial pinnae axes* with sparse scales on costa, 1.0–2.2 × 0.06 mm, light castaneous or castaneous, filiform, catenate trichomes, dense on costa, sparse on costule and veins, bacilliform trichomes absent; *adaxial laminar surface between veins* glabrous or with sparse catenate trichomes; *abaxial pinnae axes* with sparse scales on costa, 1.0–4.0 × 0.1–0.3 mm, light castaneous or castaneous, clathrate, ascending, mostly flattish, but can be vaulted at base, flaccid, lanceolate with cordate or rounded base and filiform apex, slightly denticulate, with some short fimbriae at base, proscapes to 0.7 mm long sparse on costule, catenate trichomes absent or sparse on costa, costule and veins, bacilliform trichomes sparse on costa, costule and veins, glandular trichomes absent or sparse on costa, filiform trichomes absent; *abaxial laminar surface between veins* glabrous or with sparse catenate and bacilliform trichomes; *segments* 15–26 pairs, 4.0–8.0 mm wide, patent or subfalcate, entire or serrulate, apex apiculate, margin with catenate trichomes, the distance from each other is narrower than segments width; *veins* simple, rarely 1-forked basally, 8–15 pairs per segment, the basal ones from adjacent segments reach the margin at sinus, or somewhat or well above it; *sori* medial or supramedial, indusia absent, or small and inconspicuous or large and conspicuous, entire, with bacilliform trichomes; *spores* with coarse folds and large tubercles.

Notes:—*Ctenitis submarginalis* is the most widely distributed species of *Ctenitis*, occurring in different forest formations at wide elevation range. Unsurprisingly, this leads great morphological variation. Christensen (1913a) proposed six infraspecific taxa under this species, based on geographic ranges and characters too variable and uncorrelated, which easily overlap when examining many materials from all Neotropics. As pointed out by Tryon & Stolze (1991), the characters used to distinguish those infraspecific taxa were subtle differences on shape of segments and number of their veins, if the indusia are present or absent, the sori position and the abaxial laminar surface between veins glabrous or glandular-pubescent. However, these characters can be variable on a single lamina or overlap among specimens from different areas. A constant character, which proves useful, is the shape of scales on costa abaxially. Based on this, we recognize two varieties: *C. submarginalis* var. *submarginalis* and *C. submarginalis* var. *tenuifolia*. In both, there is a tuft of light castaneous scales on petiole bases, the basal veins from adjacent segments usually end at margin or somewhat above the sinus, rarely well above the sinus and the segment apex is apiculate.

In the protologue of *Polypodium submarginale*, Langsdorff & Fischer (1810) did not indicate any material, just the habitat (“in Insula St. Catharinae Brasiliae meridionalis”). In LE there are three sheets of original material, which are not clearly labeled as being part of a single specimen. Then, some authors attributed the type as being in LE (e.g. Mickel & Smith 2004), or even considered them as holotype (e.g. Tryon & Stolze 1991), unaware that there is more than one sheet. The authors who treated this species in their works have not seen those original materials (Christensen 1913a, Stolze 1981, Mickel & Beitel 1988, Tryon & Stolze 1991, Mickel & Smith 2004). During the visit in LE (by the first author), those materials could not be located, but the corresponding images available in Jstor Global Plants website (plants.jstor.org) in addition to the protologue enable us to consider those sheets as *C. submarginalis* var. *submarginalis*. Consequently, we propose the sheet LE 00000006 to be the lectotype, because it is likely the one used for the illustration of *Polypodium submarginale* (Langsdorff & Fischer 1810, “tab. 13”).

23. 1. *Ctenitis submarginalis* (Langsd. & Fisch.) Ching (1940: 250) var. ***submarginalis***. Figs. 10K, 26A–B, 27A.

Polypodium caripense Humboldt & Bonpland ex Willdenow (1810: 202). *Aspidium caripense* (Humb. & Bonpl. ex Willd.) Mettenius (1856: 90). *Nephrodium caripense* (Humb. & Bonpl. ex Willd.) Hooker in Hooker & Baker (1868: 265). *Dryopteris submarginalis* (Langsd. & Fisch.) Christensen f. *caripensis* (Humb. & Bonpl. ex Willd.) Christensen (1913a:

97). *Ctenitis submarginalis* f. *caripense* (Humb. & Bonpl. ex Willd.) Lellinger (1977: 710). Type:—VENEZUELA. Cumaná, in umbrosis caripe, *Humboldt 428* (holotype B–W 19700 -01 1! and B–W 19700 -01 2!, not isotype P 00669174!).

Aspidium caripense (Humb. & Bonpl. ex Willd.) Mettenius f. *macroloba* Braun (1858: 02). Type:—BRAZIL. *Unknown s.n.* (lectotype B 20 0068013!, **designated here**, isolectotypes B 20 0068010!, B 20 0068011!, B 20 0068012!).

Nephrodium tarapotense Hooker (1862: 107). *Dryopteris submarginalis* (Langsd. & Fisch.) Christensen var. *tarapotensis* (Hook.) Christensen (1913a: 98). Type:—PERU. Tarapoto, in Monte Campaña, *Spruce 4016* (lectotype K 000200132! designated by Tryon & Stolze (1991), isolectotype P 01415576!); not isolectotypes:—in Monte Guayrapurina, *Spruce 4016* (K 000200163!, P 00642705!).

Nephrodium crinitum Sodiro var. *glaucescens* Sodiro (1893: 251). *Dryopteris submarginalis* (Langsd. & Fisch.) C. Chr. f. *glaucescens* (Sodiro) Christensen (1913a: 97). Type:—ECUADOR. *Sodiro s.n.* (lectotype S-R-1777!, **designated here**, isolectotypes BM!, US 00067058!).

Nephrodium lagerheimii Sodiro (1893: 252). *Dryopteris lagerheimii* (Sodiro) Christensen (1906: 273). *Dryopteris submarginalis* (Langsd. & Fisch.) C. Chr. var. *lagerheimii* (Sodiro) Christensen (1913a: 98). Type:—ECUADOR. *Lagerheim s.n.* (lectotype P 00642575!, **designated here**, isolectotypes C, P 00642674!, PH 00019282 [image!], SI 006581 [image!], SI 006582 [image!], S-R-1690!, UC 478166!, US 00067063!).

Dryopteris sellowii Hieronymus (1906: 324). Type:—BRAZIL. Estancia Victoriano, March 1823, *Sellow s.n.* (lectotype B 20 0067944!, **designated here**, isolectotypes B 20 0067941!); the other syntype is:—BRAZIL. Rio Grande do Sul: São Leopoldo, Hamburguer, *Stübel 1173* (B, not found).

Dryopteris collina Christ (1907: 922). Type:—PARAGUAY. In sylvis collis Cerro, *Hassler 513* (lectotype G 00349450!, **designated here**, isolectotype G 00307824 [image!]).

Dryopteris soriloba Christ (1909: 350). Type:—PARAGUAY. Sierra de Amambay, in altaplanitie et declivibus, *Rojas s.n.* (Herb. Hassler 10454) (lectotype P 00642677!, **designated here**, isolectotypes BM 000511872!, G 00307823, G 00349449, G 00436365, MPU 015234); not *Rojas s.n.* (Herb. Hassler 10154—BM 000511873!, P 00642676!).

Selected specimens examined:—ARGENTINA. Corrientes: Santo Tomé, Ea. Timbol, 28 February 1983, *Schinini et al. 23565* (UC). Jujuy: Santa Bárbara, Abra de Los Morteros, 1400 m, 27 March 1992, *Cabrera et al. 34853* (NY); Misiones: Leandro N Alem, 10 March 1969, *Krapovickas et al. 15096* (UC); Libertador General San Martín, Predio UNLP, 27°05' S, 54°56' W, 19 July 1998, *Biganzoli et al. 150* (MO); Puerto Iguazú, 11 May 1951, *Cabrera et al. 15* (MO); San Antonio, 12 May 1951, *Cabrera et al. 114* (RB); San Ignacio, Santo Pipó, 05 April 1950, *Schwarz 10367* (RB); San Pedro, Caraguatay (centro), 11 May 1949, *Montes 1668* (RB); Salta: Rosario de la Frontera, 900 m, 28 July 1929, *Venturi 9407* (US); Tucumán: Famaillá, Caspinchango, 20 September 1949, *Sas 144* (NY); Santa Fé: Chaco Santafesino, December 1905, *Venturi 239* (GH); BOLIVIA. Chuquisaca: Tomina, Llantoj, 1400 m, 19°18'57" S, 64°05'15" W, 12 October 2004, *Gutiérrez et al. 1017* (MO); La Paz: Franz Tamayo, Sumpulo, 1180 m, 14°34'20" S, 68°46'38" W, 7 July 2008, *Jimenez 5152* (UC); Nord Yungas, Coroico, 1100 m, October 1912, *Buchtien 3409* (US); Luis Calvo: Serranía del Ñaño, 1210 m, 19°29'47" S, 63°55'32" W, 4 October 2001, *Huaylla 375* (MO); Santa Cruz: Andrés Ibáñez, 840 m, 18°06' S, 63°30' W, 27 March 2002, *Sundue & Nee 527* (NY); Tarjita: Aniceto Arce Ruiz, Reserva Natural de Flora y Fauna Tariquia, 1540 m, 21°59' S, 64°32' W, 10 June 2004, *Jimenez & 2404* (NY). BRAZIL. Alagoas: São José da Lage, Usina Serra Grande, Mata Maria Maior, Grota da Geraba, 380–415 m, 12 February 2001, *Pietrobon & Santiago 5017* (BHCB); Ceará: Baturité, Sítio Caridade, 6 December 1937, *Eugenio 45* (RB); Mulungu, Serra de Baturité, 800 m, 4°18' S, 38°59' W, 28 February 1997, *Almeida Neto 104* (HB); Goiás: Nova América, 16 March 1978, *Gimontez s.n.* (RB); Mato Grosso: Caiapônia, Serra do Caiapó, 27 June 1966, *Irwin et al. 17872* (RB); La picada Guayra, August 1937, *Cullen s.n.* (RB); Mato Grosso do Sul: Bonito, Gruta do Lago Azul, 500–600 m, 21°08' S, 56°28' W, 04 August 1994, *da Silva & Rodrigues 1324* (HB); Minas Gerais: Juiz de Fora, Rio Peixe, 13 March 1980, *Krieger s.n.* (UEC); Monte Belo, Fazenda Lagoa, 19 January 1982, *Boom 275* (RB); Nova Lima, Estação Ecológica de Fechos, 20°03'57" S, 43°57'32.7" W, 11 July 2001, *Salino et al. 7166* (BHCB); Paraná: Capitão Leônidas Marques, Próximo ao Parque Nacional do Iguaçu, 15 August 2006, *Labiak & Ribas 3732* (RB); Cianorte, Forest Reserve of CMNP, 390 m, 2 April 1966, *Lindeman & Haas 859* (RB); Fênix, Parque Estadual de Vila Rica, 3 October 2008, *Pereira & Falleiros 338* (RB); Foz do Iguaçu, Parque Nacional do Iguaçu, Trilha da Represa, 185 m, 25°37'29.79" S, 54°28'05.48" W, 01 August

2010, *Viveros & Pastro 139* (BHCB); Laranjeiras do Sul, Barra Rio Sossego, 4 January 1975, *Hatschbach 35716* (HB); Lobato, Fazenda Remanso Irmãos Ferraz, 22 July 1962, *Gomes & Matos, 1035* (RB); Rio Branco do Sul, Serra do Votuvoru, 20 April 1974, *Hatschbach 34399* (UPCB); Rio Negro, 18 December 1950, *Frenzel s.n.* (RB); São Mateus do Sul, 20 February 1904, *Gämsly 8* (UC); Tomazina, Anhanguera, 2 September 1998, *Hatschbach et al. 68286* (RB); Toledo, 16 November 1963, *Pereira 7911* (HB); Turvo, Reserva Indígena de Guarapuava, 13 April 2002, *Silva & Poliquesi 3619* (RB); Rio de Janeiro: Duque de Caxias, Xerém, 22 March 1950, *Brade & Duarte 20266* (RB); Mangaratiba, Reserva Rio das Pedras, 6 January 2000, *Mynssen 300* (RB); Paraty, 11 May 1994, *Marquete 1777* (RB); Rio Bonito, Cachoeiras de Macacu, 25 m, 22°28'22" S, 42°45'39" W, 16 November 2009, *Baber & Wesenberg KB403* (RB); Rio Grande do Sul: Canguçu, 20 June 1968, *Cereni & Irgang s.n.* (ICN); Erechim, Esperança para Montenegro, 2 July 1949, *Rambo 42340* (RB); Esmeralda, Estação Ecológica Aracurí, 920 m, 18 September 1983, *Cestaro s.n.* (ICN); Nova Petrópolis, 13 June 1949, *Rambo 41961* (RB); Passo Fundo, 20 February 1942, *Mattos s.n.* (RB); Pelotas, 22 May 1959, *Brauner 88* (F); Santa Tereza, Linha Pederneira - Reserva Brum, 7 January 2012, *Gonzatti 297* (RB); São Leopoldo, Morro das Pedras, 10 m, *Dutra 479* (R); Santa Catarina: Araranguá, Morro do Meleiro, 18 November 1943, *Reitz s.n.* (US); Caçador, Rio dos Bugres, 900 m, 23 April 1962, *Reitz 12863* (HB); Catanduvas, 28 December 1963, *Reitz 16363* (HB); Curitiba: Ponte Alta do Sul, 900 m, 19 April 1962, *Reitz 12583* (HB); Itapiranga–Chapecó, 02 February 1951, *Reitz 3792* (RB); Mondaí, Linha Cascalho, 6 March 2009, *Verdi et al. 1754* (RB); Santo Amaro da Imperatriz, Vargem do Braço, *Spannagel 448* (US); São Miguel do Oeste, 1 March 1964, *Castellanos 24769* (HB); Xanxerê, 500–600 m, 25 December 1956, *Smith & Klein 9201* (R); São Paulo: Bady Bassitt, Fazenda Nossa Senhora de Fátima, 500–600 m, 20°55' S, 49°27' W, 11 March 1995, *Nonato 91* (HB); Iguape, Serra dos Itatins, March 1924, *Brade 8275* (RB); Monte Alto, Serra Anhumas, 630 m, 20°22' S, 48°28' W, 3 June 1995, *Pietrobon 1800* (HB); Teodoro Sampaio, Parque Estadual Morro do Diabo, 400–600 m, 22°32' S, 52°11' W, 13 January 1995, *Pietrobon 1519* (HB); COLOMBIA. Antioquia: Amagá, 25 November 1937, *Daniel 2221* (US); Magdalena: Santa Marta, *Regnell 2581* (S); Risaralda: Pereira, Hacienda Alejandría, km 6 carretera La Virgínia-Cerritos, extremo norteño de parte ancha del Valle del Río Cauca, 11 February 1990, *Silverstone-Sopkin 5893* (UC); ECUADOR. Imbabura: 955 m, 0°10'19" S, 78°37'55", 24 August 2004, *Croat & Ferry 93991* (UC); Tungurahua: Baños Canton, Rio Verde, 1550 m, 01°24' S, 78°17' W, 07 July 1992, *Fay & Fay 3557* (MO); Zamora-Chinchipe: Yantzaza Cantón, along road out of the town of Chuchumbleza, parallel to Zamora River, going south, 800 m, 03°31' S, 78°31' W, 8 February 1993, *Fay & Fay 4228* (UC); PARAGUAY. Alto Paraná: Hernandarias, Reserva Biológica Itabó, 23 May 1989, *Windisch 5468* (HB); Puerto Presidente Strossner (currently Ciudad del Este), km 12, Escuela Técnica Florestal, January–February 1982, *Casas & Molero 5629* (MO); Monumento Científico Moisés Bertoni, 25°39' S, 54°36' W, 21 July 1994, *Zardini & Florentin 40022* (UC); Amambay: Parque Nacional Cerro Corá, 18 September 1980, *Foster s.n.* (UC); Caaguazú: Guayaquí, between Coronel Oviedo and Caaguazú, route 2, km 158–159, 25°29' S, 56°11' W, 26 August 1993, *Zardini & Tilleria 37027* (UC); Caazapá: Tavaí, Cerro Tupasy, 250–400 m, 29 October 1988, *Soria 2421* (MO); Canindeyú: Mbaracayú Natural Reserve, 24° 08'00" S, 55° 31'41" W, 13 January 1998, *Zardini & Guerrero 47720* (MO); Guairá: San Pedro, 15 December 1988, *Soria 2931* (MO); Itapúa: El Tirol, 19.5 km by road NNE Encarnación, 13 October 1981, *Foster 81-13* (UC); Paraguari: Macizo Acahay, 500 m, 25°54' S, 57°09' W, 16 June 1988, *Zardini 4836* (MO, UC); PERU. Amazonas: Bongará, Sipabamba, 1300 m, 5 May 1981, *Young & Eisenberg 322* (UC); Cajamarca: San Ignacio, Distrito Huarango, San Martín- Quebrada Blanca, 900m, 5°19' S, 78°45' W, 15 May 1996, *Campos et al. 2720* (MO); San Martín: Huallaga, Saposoa, 1300–1350 m, 6°34'47" S, 77°23'06" 12 August 2000, *Quipuscoa et al. 2058* (F); Rioja, Aguas Verdes, 900 m, 5°40' S, 77°40' W, 2 April 2001, *van der Werff et al. 16614* (F); URUGUAY. Rivera: Rivera, 150–180 m, 1948, *Herter s.n.* (MO); Tacuarembó: Erosionsschluchten im rotem Sandstein mit Urwaldresten, 20 March 1913, *Ostern 6620* (S); Treinta y Tres: Isla Patrulla Quebrada de los Cuervos, March 1945, *Rosengurt 4826* (GH); VENEZUELA. Distrito Federal: Los Venados, south side of Pico Avila, just north of Caracas, 12 September 1961, *Tryon & Tryon 5726* (S); Tovar, 1854, *Fendler 197* (GH); Yaracuy: 850–990 m, 10°13'40" N, 68°37'00" 8 September 2001, *Meier 8665* (UC).

Habitat and distribution:—Terrestrial in wet forests, 50–1600 m. United States of America (Florida and Louisiana), Mesoamerica (Mexico, Guatemala, Honduras, Nicaragua, Costa Rica and Panama), West Indies (Hispaniola) and South America (Venezuela, Colombia, Ecuador, Peru, Bolivia, Paraguay, Argentina and Brazil; Fig. 27A; Tab. 01).

Notes:—The typical variety can be recognized by scales on costa abaxially lanceolate and with cordate base (Figs. 26A–B). Most specimens from Mesoamerica, West Indies and Andean countries are without indusia, or they

are small and inconspicuous. Nevertheless, most specimens from Paraguay, Argentina, Uruguay and southern Brazil have large and conspicuous indusia. The Andean specimens, from high elevations are usually larger and scallier plants, which scales can be darker than the most individuals from other Neotropical regions. The ploidy of individuals was not verified, and maybe differences of it can result such morphological variation.

Christensen (1913a) recognized the typical form of *C. submarginalis* as *Dryopteris submarginalis* f. *vera*, which does not constitute a validly published name (Art. 24.3 of ICN—McNeill *et al.* 2012). The other infraspecific taxa he considered were “f. *tenuifolia*” (here treated as *C. submarginalis* var. *tenuifolia*), “f. *caripensis*”, “f. *glaucescens*”, “var. *tarapotensis*” and “var. *lagerheimii*”, all these last ones are here considered as *C. submarginalis* var. *submarginalis*.

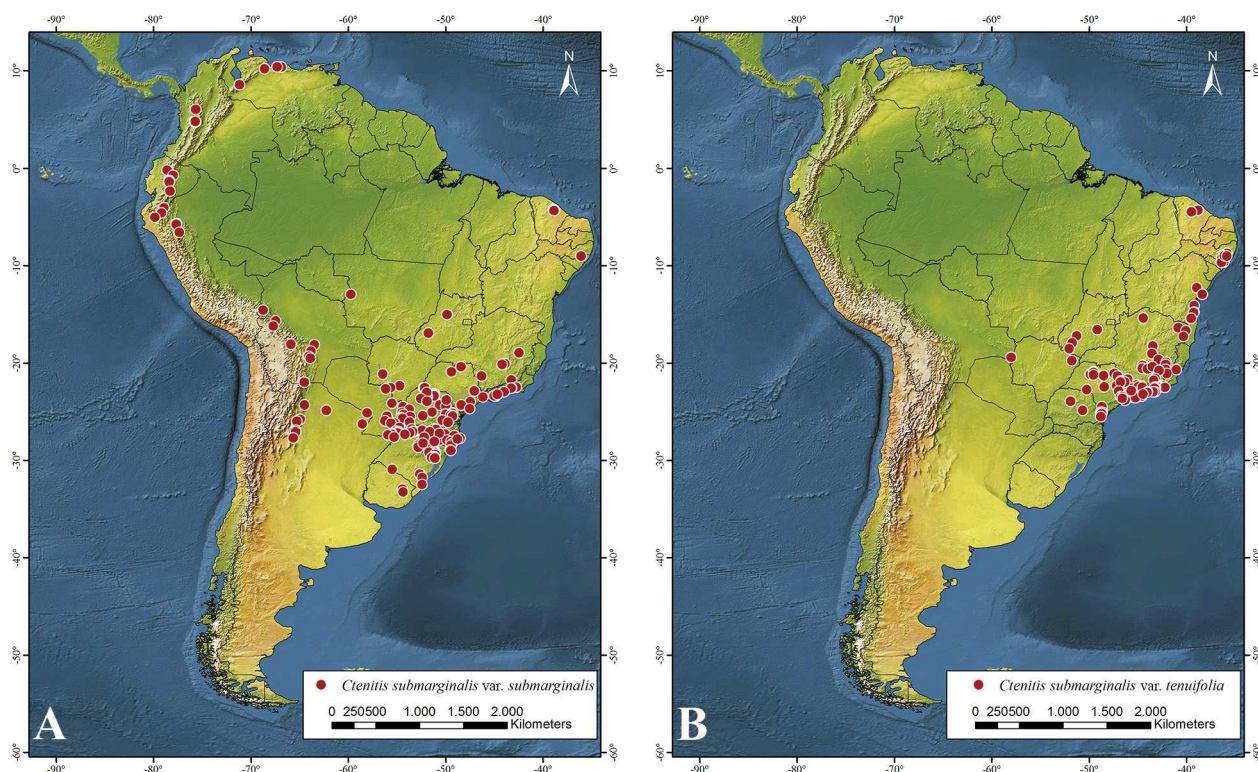


FIGURE 27. Distribution of two varieties of *C. submarginalis*. **A:** *C. submarginalis* var. *submarginalis*. **B:** *C. submarginalis* var. *tenuifolia*.

Willdenow (1810) did not cite any material when describing *Polypodium caripense*, just mentioned “habitat in America meridionali prope Caripe”. The original material consists of two sheets in B. Both correspond clearly to one single specimen, being one sheet the base of a lamina, at the top right is written “1a”, and the other sheet is the apical part of it, written “1b”. Both sheets are kept under one single cover, which label is written “Cryptogamia Filices, *Polypodium caripense*, frondibus bipinnatifidis integerrimis. Habitat Caripe”. Furthermore, only the sheet with the basal portion of lamina has the original label of Humboldt, a common practice when the specimen consists of more than one preparation kept together, but only the first is labeled. For this reason, those two sheets in B must be considered as the holotype (Art. 8.2, 8.3, Rec. 8A.4 of ICN—McNeill *et al.* 2012). Christensen (1913a) considered *P. caripense* as *Dryopteris submarginalis* f. *caripensis*, according to him this was an andine form, but occurring from Mexico to Venezuela. There is a sheet in P incorporated from Humboldt & Bonpland’s Herbarium, labeled as the collection 428. It consists of *C. ampla* and was probably erroneously labeled, then, must not be considered as an isotype.

Braun (1858) described *Aspidium caripense* f. *macroloba* based on a living plant cultivated in Horto Berolinense, originally from Brazil. There are four sheets of such original material in B not clearly labelled as being part of a single specimen (Art. 8.3 and 9.3 of ICN—McNeill *et al.* 2012). We designate as lectotype one sheet with the label handwritten by Braun. Christensen (1913a), considered this name under the “f. *tenuifolia*”, which

here we recognize as variety. However, all the original material of *A. caripense* f. *macroloba*, correspond, in our opinion, to *C. submarginalis* var. *submarginalis*.

Other one of the infraspecific taxon that Christensen (1913a) recognized in *Dryopteris submarginalis* was the other andine “f. *glaucescens*”, based on *Nephrodium crinitum* var. *glaucescens* (Sodiolo 1893). The examined original material of this name and other cited by Christensen (1913a) are densely covered with bacilliform trichomes between veins on both surfaces. The density of these or other kind of trichomes are quite variable in *C. submarginalis*. The abaxial surface is not glaucous as said by Sodiolo (1893) and Christensen (1913a), or somewhat lighter than the adaxial. Among the original material (Art. 9.3 of *ICN—McNeill et al.* 2012), we selected for lectotype (Art. 9.12 of *ICN—McNeill et al.* 2012) a herbarium sheet in S, which is the most complete sample.

Sodiolo (1893) also described *Nephrodium lagerheimii*, which Christensen (1913a) recognized as the andine form *Dryopteris submarginalis* f. *lagerheimii*. The original material and other from Andes at high elevations, are in general, the larger examined specimens, with larger, more numerous and somewhat darker scales. No holotype and no herbarium were specified in the protologue, some sheets of original material are in C, P, PH, S, SI and US (probably also in Q and QPLS). We selected a sheet in S as the lectotype (Art. 9.2, 9.5, 9.11, 9.12 of *ICN—McNeill et al.* 2012), the same was also seen, but not typified by Stolze (Tryon & Stolze 1991).

Hieronimus (1906) described *Dryopteris sellowii* based on *Stübel 1173* and *Sellow s.n.*, both from southern Brazil. Although no herbarium was specified, it is probable that those collections were in Hieronimus’s herbarium, which was incorporated by B. Christensen (1913a) cited *Stübel 1173* in B. However, no sheet with this information was found there, but two sheets of *Sellow s.n.* were, both with label handwritten “*Dryopteris sellowii* n. sp.” by Hieronimus. As lectotype (Art. 8.3, 9.2, 9.5, 9.11, 9.12 of *ICN—McNeill et al.* 2012), we chose the one with a small label written “Estancia Victoriano March 23”, as mentioned in the protologue.

Dryopteris collina was described by Christ (1907) based on the collection *Hassler 513* from Paraguay. Hassler collections are mainly in G, where are found two sheets of *Hassler 513* kept together, one is a leaf piece comprising the base of petiole to the middle of the lamina and the other is the middle to the apex. The first is with a photocopy of Hassler’s original label (obviously included much later) and with another from “Herbier Delessert”. The second sheet is with Hassler’s original label. So, the two sheets are otherwise not clearly labelled as being part of a single specimen, and should be interpreted as syntypes (Art. 8.3, 9.5 and 40 Note 1 of *ICN—McNeill et al.* 2012). Therefore, we designate here the sheet with the original label to be the lectotype.

Dryopteris soriloba, described by Christ (1909), was based on a collection in the Hassler’s herbarium, number 10454, collected in Paraguay by Rojas. Sheets of this collection are in BM, G, MPU and P. Christensen (1913a) cited this collection as type, in Christ’s and Roland Bonaparte’s herbaria. However, he starts his monograph informing that the material he examined from Christ’s herbarium were incorporated by Roland Bonaparte’s. This last, in turn, was incorporated by P. There are two sheets in P from Hassler’s herbarium written on the label “*Dryopteris soriloba* Christ”, “type” or “*spec. nov.*”. One sheet has the stamp of Roland Bonaparte and is the 10454 of Hassler, while the other has the stamp of Christ’s herbarium, but its number is 10154, a probable original material not cited in the protologue. This can be a mistake of Christensen (1913a), once we did not find a sheet of Christ’s with the correct Hassler’s number. Thus, we attribute the lectotypification of *Dryopteris soriloba* to Christensen (1913a), although inadvertent (Art. 7.10, 9.9, 9.19 of *ICN—McNeill et al.* 2012).

Dryopteris sellowii, *D. collina* and *D. soriloba* were considered by Christensen (1913a) as *D. submarginalis* f. *vera*, the typical form of this species. The three names are based on specimens from southern South America (Paraguay and the Brazilian state of Rio Grande do Sul) close to the type location of *C. submarginalis* var. *submarginalis* (the Brazilian state of Santa Catarina). The specimens from this area are somewhat morphologically constant.

23.2. *Ctenitis submarginalis* (Langsd. & Fisch.) Ching (1940: 250) var. ***tenuifolia*** (C. Presl) R.S. Viveros & Salino, *comb. nov., stat. nov.* Figs. 01C, 08A–B, 10L, 26C–D, 27B. *Lastrea tenuifolia* Presl (1849: 37). *Dryopteris submarginalis* (Langsd. & Fisch.) C. Chr. f. *tenuifolia* (C. Presl) Christensen (1913a: 96). Type:—BRAZIL. Rio de Janeiro, *Pohl s.n.* (lectotype PRC 454057! designated by Christensen 1913a, isolectotype BM!).

Phegopteris blanchetiana Fée (1952a: 245), *syn. nov.* Type:—BRAZIL. Bahia. *Blanchet 2928* (lectotype RB 006095041, **designated here**).

Phegopteris oreopteridastrum Fée (1869: 97). Type:—BRAZIL. Rio de Janeiro, Serra L’Estrella, *Glaziou 963* (lectotype RB

00543364!, **designated here**, isolectotypes C, P 00170062!, P 00170063!); remaining syntypes:—BRAZIL. Rio de Janeiro, Villa Rica, *Vauthier 585* (P 00637536!, P 00637537!, P 00637538!, P 01415551!).

Aspidium sancti-pauli Christ (1908: 21). Type:—BRAZIL. São Paulo: Prope Fazenda Bela Vista in S. Cruz ad flumen Rio Pardo, *Wettstein & Schiffner 2382* (lectotype P 00633040!, **designated here**).

Selected specimens examined:—BRAZIL. Alagoas: Ibateguara, Usina Serra Grande, Engenho Coimbra, Grota do Quirino, 390–450 m, 08°59'58.3''S, 35°52'14.7''W, 11 February 2001, *Pietrobon & Santiago 4990* (HB); São José da Lage, Usina Serra Grande, 380–507 m, 8°58'19" S, 36°06'36" W, 26 April 2002, *Pietrobon 5483* (HB); Ceará: Araripe, Base da Serra do Araripe, 08 August 1948, *Duarte 1347* (RB); Base da Serra do Araju, 8 August 1948, *Duarte 1347* (RB); Baturité, *Pereira s.n.* (US); Bahia: Camacan, Fazenda Serra Bonita, 835 m, 15°23'30''S, 39°33'55''W, 02 February 2005, *Matos et al. 264* (CEPEC); Feira de Santana, Fazenda Boa Vista - Serra de São José, 12°15' S, 38°58' W, 10 May 1984, *Noblick 3169* (MBM); Ilhéus, Centro de Pesquisas do Cacau, 28 October 1978, *Mori 1100* (CEPEC); Itabuna, Centro de Pesquisas do Cacau, 30 m, 14°45' S, 39°15' W, 10 January 1974, *Harley 15011* (CEPEC); Salvador, Parque de Pituacú, 1 September 1997, *Guedes 5202* (MBM); Espírito Santo: Domingos Martins, Parque Estadual da Pedra Azul, na trilha para as piscinas naturais, 1470 m, 20°24'08''S, 41°01'86''W, 5 December 2008, *Salino et al. 14120* (BHCB); Goiás: Aporé, Cachoeira do Corrente, 10 June 1993, *Pietrobon 868* (HB); Goiânia, December 1936, *Brade 15365* (RB); Serra do Caiapó, 900 m, 27 June 1966, *Irwin et al. 17872* (F, NY); Jataí, Queixada, Margem do Rio Corrente, 09 February 1950, *Macedo s.n.* (RB); Mato Grosso do Sul: Inocência, 400 m, 19°46'S, 51°48'W, 11 November 1995, *Lucca Jr. et al. 116* (HB); Minas Gerais: Caldas, Distrito de Pocinhos do Rio Verde, 1150–1200 m, 21°56' S, 46°23' W, 16 June 1995, *Pietrobon 1924* (HB); Coronel Pacheco, 420 m, 9 August 1944, *Heringer 1506* (RB); Ouro Preto, *Damazio, 442* (OUPR); Viçosa, Agricultural College Lands, 680 m, 27 May 1930, *Mexia 4753* (RB); Passa Quatro, 3 May 1948, *Brade 18940* (RB); Paraná: Fênix, Parque Estadual de Vila Rica do Espírito Santo, 350 m, 23°54'54''S, 51°57'13''W, 09 November 2004, *Labiak et al. 3451* (RB); Morretes, 26 March 1914, *Dusén 14732* (F); Rio Negro, Vila Nova, December 1904, *Annie 75* (RB); Pernambuco: Jaqueira, Usina Colônia, Mata do Ageró, 415 m, 08°44'27.4''S, 35°50'37.7''W, 18 October 2001, *Lopes & Pietrobon 391* (RB); Rio de Janeiro: Duque de Caxias, Xerém, 17 July 2003, *Lemos s.n.* (RB); Itatiaia, Serra do Itatiaia, 18 June 1930, *Brade 10065* (R); Mangaratiba, Reserva Ecológica Rio das Pedras, 19 October 1996, *Braga et al. 3606* (RB); Nova Friburgo, Morro do Porcelet, 1300 m, 19 July 1964, *Pabst 8138* (HB); Paraty, APA Cairuçu, Paraty-Mirim, 5–50 m, 23°01' S, 44°03' W, 7 March 1994, *Marquete 1481* (RB); Petrópolis, *Spannagel 250* (UC); Rio de Janeiro, Estrada da Vista Chinesa-Gávea, 8 May 1923, *Hurgel 35* (RB); Silva Jardim, Reserva Biológica de Poço das Antas, Trilha interpretativa do Projeto Mico Leão Dourado, 23 April 1997, *Sylvestre et al. 1269* (RB); São Paulo: Águas da Prata, Serra dos Poços, 850 m, 21°56' S, 46°48' W, 17 June 1995, *Pietrobon 2001* (HB); Campinas, Fazenda Sete Quedas, 20 November 1938, *Viegas & Santoro s.n.* (RB); Cássia dos Coqueiros, Cachoeira Itambé, Rio Boiadeiro, 950–1000 m, 21°20' S, 47°08' W, 10 February 1997, *Athayde 128* (HB); Corumbataí, Serra do Padre, 700 m, 29 July 1993, *Rodrigues 532* (HB); Mendonça, Fazenda Santa Maria, 21°12' S, 49°35' W, 21 December 1996, *Pietrobon 3868* (HB); Monte Alto, September 1995, *Lucca Júnior 52* (HB); São Paulo, Morro do Jaraguá, 1000 m, 22 December 1912, *Brade 5372* (HB).

Habitat and distribution:—Terrestrial. Endemic to Atlantic Forest, 200–1500 m. Northeastern to southern and central-west Brazil (Fig. 27B; Tab. 01).

Notes:—*Ctenitis submarginalis* var. *tenuifolia* differs from the typical variety by scales on costa abaxially filiform with truncate or rounded base (Figs. 26C–D). Like the typical, *C. submarginalis* var. *tenuifolia* is well represented in the herbaria and the presence of indusia is also an inconstant character. This taxon distribution is exclusively atlantic, sympatric with the typical variety, which is not only atlantic but widely distributed in the New World. Due to the sympatry, we recognized it under an infraspecific status.

The oldest name for this taxon is *Lastrea tenuifolia* described by Presl (1849). It was based on *Pohl s.n.* from Brazil. Mettenius (1858) and Christensen (1913b) confused it with *Aspidium alsophilaceum* (*C. aspidioides*), a name also based on a Pohl's collection. Later, Christensen (1913a) realized and corrected this mistake. He also cited that the original material was in Presl's herbarium. The collections of Presl's herbarium are currently in PR or PRC (Presl worked in both). Only one sheet of *Pohl s.n.* with the name *Lastrea tenuifolia* is in PRC, and then we attribute the lectotypification to Christensen (1913a), although not intentional (Art. 7.10, 9.9, 9.19 of ICN—McNeill *et al.* 2012). A fragment of it is in BM (purchased from Christensen's herbarium). There are three sheets of *Pohl 3789* in W (W 0055893, W 0055894, W 0055895) kept as type of *Lastrea tenuifolia* and they seem

to be parts of a single specimen from which fragments were also removed to compose the sheet in PRC. Then, their data may be more precise than what informed by Presl (1849) or, less probably, they are uncited original material.

Phegopteris blanchetiana was based on *Blanchet 2928* from Bahia state in Brazil (Fée 1852b). Christensen (1913a) included this name as an unknown species of *Ctenitis*. Such collection is in RB, but its label does not mention Bahia. In P there is a herbarium sheet (P00170082!), which on the label is written *P. blanchetiana*, *Blanchet* (without collecting number) and Bahia, so it seems to be at least an uncited original material. Both correspond to *C. submarginalis* var. *tenuifolia*. For lectotype, we designate the sheet in RB, which the collecting number matches with the protologue.

In the protologue of *Phegopteris oreopteridastrum*, Fée (1869) cited two collections: *Glaziou 963* and *Vauthier 585*. Christensen (1913a) has already recognized this name under *Dryopteris submarginalis* f. *tenuifolia* and cited *Glaziou 963* in Herbarium Hauniense (C), but without mentioning it as type. Then, we designate here a lectotype (Art. 9.12 of *ICN—McNeill et al.* 2012) for *P. oreopteridastrum*, the *Glaziou 963* in RB, which contains the large and original Fée's label with his signature, and the most complete sample.

When describing *Aspidium sancti-pauli*, Christ (1908) cited two localities. According to Art. 40 Note 2 of *ICN* (McNeill *et al.* 2012) this does not constitute a specimen or gathering. The two localities are: Serra São João and Bella Vista. One original material is in P (from Roland Bonaparte's herbarium) and on a label is written "São Paulo. Prope Fazenda Bella Vista in district Urbis S. Cruz ad flumen Rio Pardo. Ca. 500 m. s. m. VII.1901, *Wettstein & Schiffner*", a different smaller label is with the number 2382, and has a Christensen's identifying label from 1909. Other original material is in W (W 1905-0001039), on this there is a label written "São Paulo. In sylvaticis "Serra São João" prope Santos. VIII.1901, *Wettstein & Schiffner s.n.*", but without a Christensen's label. Certainly, they are the material to what Christ referred and both have a label with "*Aspidium Sancti Pauli n. sp.*" handwritten by Christ. Christensen (1913a) considered this name as synonym of his *D. submarginalis* f. *tenuifolia* and cited *Wettstein & Schiffner 1901* in Christ's herbarium and W. It seems that Christensen cited the collection year, not collecting number, but he was referring to those two specimens mentioned above. Then we designate here the sheet in P as the lectotype of *A. sancti-pauli* (Art. 9.12 of *ICN—McNeill et al.* 2012).

Names of Uncertain Application

Aspidium ameristonevron Fée (1857: 104). *Dryopteris ameristoneura* (Fée) Christensen (1906: 251).

Fée (1857) did not designate a type for this name and we did not find any specimen that we could ensure to be an uncited original material (Art. 9.3 of *ICN—McNeill et al.* 2012) in the herbaria where the American ferns which Fée described supposed to be. In the protologue, Fée (1857) presents only description and occurrence location (Cuba). Christensen (1906) considered this taxon as *Dryopteris*, designating the new combination *D. ameristoneura*. Later, Christensen (1920) considered his combination as synonymous of *D. grisebachii* (here treated as *C. grisebachii*). However, he cited *D. ameristoneura* not as a combination. Contradicting his previous work (Christensen 1906), he demonstrated to be uncertain about the application of the Fée's name, once he said that it was "probably not *A. ameristonevron* Fée". No uncited original material was found and the description of Fée is insufficient to diagnose which Cuban species he referred.

Aspidium caripense (Humb. & Bonpl. ex Willd.) Mett. f. *brachyloba* Braun (1858: 2).

The description of *Aspidium caripense* f. *brachyloba* was based on a living plant from Colombia, cultivated in Horto Berolinense. We expected to find any herbarium sheet that could be considered as original material in B, where Braun worked. However, nothing that could be assumed as such was found in B, neither in other herbaria visited. We just can not ensure that an original material of it is extant, otherwise this name should be considered invalid (Art. 8.4 of *ICN—McNeill et al.* 2012). Christensen (1913a) has considered it as a synonym of *Dryopteris submarginalis* f. *caripense*. Probably it could correspond to *C. submarginalis* var. *submarginalis*, but as we have not examined any original material, and it seems that no one exists, we are not able to state that.

Aspidium microcarpon Fée (1857: 105), *nom. illeg., non* Blume (1828: 142). Type:—MEXICO. Córdoba, *Schaffner 214* (not found).

Fée (1869) described three species of *Ctenitis* with laminae 1-pinnate-pinnatifid/pinnatisect based on Schaffner's collections from Mexico: *Aspidium microcarpon* (*Schaffner 214*), *A. obtusilobum* (*Schaffner 213*) and *A. microchlaena* (*Schaffner 459*). Smith (1981), Tryon & Stolze (1991) and Mickel & Smith (2004) presumed that such collections were supposed to be in P. However, none of the three is in P. Fournier (1872), a French botanist who worked in P, cited them and he seems to be the last who have seen such materials (if he really saw). Ferns specimens described by Fée once belonged to Dom Pedro II, emperor of Brazil, but after the death of this monarch, they became the property of M. Cosson in Paris and later incorporated in P (Underwood 1905). However, some Fée's specimens remained in Brazil at Jardim Botânico do Rio de Janeiro, where is the RB herbarium. For example, the lectotypes designated here for *Phegopteris blanchetiana* (synonym of *C. submarginalis* var. *tenuifolia*) and *A. obtusilobum* (synonym of *C. microchlaena*). *Schaffner 459* cited for *A. microchlaena* was found only in K, and we did not locate *Schaffner 214* for *A. microcarpon* in none of the herbaria we have consulted (see Methods). Furthermore, the identity of this specimen is doubtful; according to the protologue, it could be either *C. submarginalis* var. *submarginalis* (with or without indusia) or *C. microchlaena* (always with indusia). Fournier (1872) considered *A. microcarpon* as the same of *A. microchlaena*, but distinguished them from *A. obtusilobum*. Christensen (1913a) without having seen the types, pointed that *Dryopteris submarginalis* f. *caripensis* (here recognized as *C. submarginalis* var. *submarginalis*) corresponds to *A. microchlaena* and *A. microcarpon* as united by Fournier (1872) and treated *C. microchlaena* as *D. karstenii*. Probably guided by Fournier's ideas, Mickel & Smith (2004) also considered *A. microcarpon* as synonym of *C. microchlaena*. There is a sheet in P (P01415596!) with a label written *A. microcarpon*, collected by Schaffner but without collecting number, from Orizaba, Mexico, differing from the protologue which informs "prés de Córdoba". Maybe this could be an original material, however it is not with the usual Fée's original label. Such specimen is *C. submarginalis* var. *submarginalis*, while the ones of *A. microchlaena* and *A. obtusilobum* correspond to *C. microchlaena*. Furthermore, the sori of this specimen are without indusia, which conflicts with the protologue. In the absence of a non doubtful original material, we are unable to ensure what *Ctenitis* species *A. microcarpon* represents.

Nephrodium vestitum var. *squamigerum* Mett. ex Baker (1870: 474), *nom. illeg.* Type:—BRAZIL. *Raddi s.n.* (?), *Martius 324* (P00170015!, B); *Pohl s.n.* (?); *Milne s.n.* (?); *Bowie & Cunningham s.n.* (?); *Mac Gillivray s.n.* (?); *Glaziou 965* (P 00170004!, BR 0000013531638!, RB 00608023!), *2373* (P 00643972!, BR 0000006988357!, P 00643971!, P 01630479!), *2374* (P 00170005!, P 00642734!, P 01572335!); *Lindberg 557* (B 20 0054405!).

Baker (Hooker & Baker 1868) compared *Nephrodium vestitum* (here treated as synonym of *C. deflexa*) to another species, *Aspidium squamigerum*, attributed to Mettenius [not (Schlechtendal 1825: 23) Fée (1857: 104), not Mann (1868: 217)]. However, such name has never been published by Mettenius and it is not associated to a description or diagnosis by Baker (Hooker & Baker 1868). Therefore, it is not effectively published (Art. 38.1 of ICN—McNeill *et al.* 2012).

In Flora Brasiliensis, Baker (1870) validly published *Nephrodium vestitum* var. *squamigerum*, specifying that such taxon referred to what Mettenius marked as *A. squamigerum* on specimens at Hooker's Herbarium (currently in K). The types cited by Baker (1870) represent more than one taxon, e.g. *Martius 324*, *Glaziou 965*, *2373*, *2374* correspond to *C. deflexa*, but *Lindberg 557*, corresponds to *C. distans* var. *isabellina*. Although more materials correspond to *C. deflexa*, the description is ambiguous and consequently it is not possible to be sure about which specimen (s) it refers the most nearly among the types cited. Besides that, *Glaziou 965* was previously cited as type of *Phegopteris fluminensis* and *2373* of *Aspidium basilare* (Fée 1969), both names that are lectotypified here (see *C. deflexa* header and notes). Thus, *N. vestitum* var. *squamigerum* is an illegitimate name (Art. 52 of ICN—McNeill *et al.* 2012).

Rosenstock (1904) treated *Nephrodium squamigerum* (Rosenstock 1904: 224, not Hooker & Arnott 1841: 106) as a combination of a Mettenius's name, which could be *A. squamigerum*. For this, Rosenstock included the vouchers *Jürgens & Stier s.n.* (J.-St. = Rosenstock exsicc. 32), *Schmalz s.n.* (S. = Rosenstock exsicc. 43), and *Ulbricht s.n.* (U. = Rosenstock exsicc. 55). We have not seen such specimens, but the short description matches with *C. deflexa*.

Christensen (1913a) included as synonym of *Dryopteris ctenitis* (here, *C. distans*): *A. squamigerum* Mett. (referring to a note in Hooker & Baker 1868), *Nephrodium squamigerum* Rosenst. and *N. vestitum* var. *squamigerum* Baker (erroneously as *Nephrodium caripense* β *squamigerum*). He recognized the infraspecific ranks *D. ctenitis* f. *isabellina* (here as *C. distans* var. *isabellina*) and *D. ctenitis* f. *amaurolepis* (here as *C. distans* var. *distans*). This last form he indicated that coincided with *A. squamigerum* of Mettenius. Like us, Christensen treated some of the types cited by Baker (1970). *Lindberg 557* was cited by Christensen as *D. ctenitis* f. *isabellina* (to which we agree), and *Martius 324* as *D. ctenitis* f. *amaurolepis* (to which we disagree).

Summing up, *N. vestitum* var. *squamigerum* Mett. ex Baker was an attempt to interpret an unpublished name used by Mettenius and it is illegitimate due to its types were previously designated as types of other names. Even if it was an usable name, its types are composed of more than one taxon and the protologue does not allow knowing which specimen represents it better. Therefore, the application of this name remains uncertain.

Polypodium lachnopodium Smith (1846: 8).

Smith (1846) made an enumeration of the ferns cultivated in the Royal Botanic Garden Kew. Among them, he described *Polypodium lachnopodium* as a new species based on a specimen from Jamaica introduced by Mr. William Purdie in 1843. No type was designated in the protologue, no original material was found in K, neither in other herbaria we have visited. It seems that the description was based only on a living plant, and as such, it is not acceptable as type (Art. 8.4 of ICN—McNeill *et al.* 2012). However, we can not ensure if an extant original material exists. Even so, Christensen (1920) suggested *P. lachnopodium* as a synonym of *Dryopteris ampla* (*Ctenitis ampla*). Nonetheless, the original description has few information to distinguish *C. ampla* from another decomposed laminae species that occurs in Jamaica, *e.g.* *C. grisebachii* and *C. excelsa* (Desvaux 1827: 243) Proctor (1961: 34).

Final Considerations

The *Ctenitis* distribution in South America here presented was expected according to literature data. It differs from other fern genera, which richness and endemism are in Andean regions. The Brazilian Atlantic coast has the highest species richness, mainly in the southeast and south as stated by Tryon & Tryon (1982b) and the northeast must be included in this range. Nonetheless, even though the Brazilian Amazonia (north) and the central-west are known for low richness of ferns, more collection efforts must be done, because those regions are still poorly represented and far from research centers.

Other perspectives for studies about *Ctenitis* could include cytogenetics. Species widely distributed as *C. submarginalis* var. *submarginalis* and *C. ampla*, are also morphologically variable, which could reflect variation in ploidy. Other feature that seems to influence the morphological variation is the elevation. At higher habitats, the individuals are smaller, and the scales are darker than the ones in lowlands. This was observed in *C. ampla*, *C. falciculata*, *C. glandulosa*, *C. microchlaena* and *C. submarginalis* var. *submarginalis*.

Most specimens of *C. abyssii*, *C. aspidioides*, *C. fenestralis* and *C. laetevirens* were with spores misshapen. This can suggest those taxa are hybrids, or their spores are malformed due to another reason. The fact is that they can be morphologically recognized and if hybrids, their parentage were not established.

The number of vascular bundles is an interesting feature in the major clades of ferns (Smith *et al.* 2006), being constant in some families and genera. However, in *Ctenitis* this number is not constant. In South American *Ctenitis* it varies from 3–10. Why and how this evolved are remaining questions to be considered in evolutionary studies.

The recent *Ctenitis* phylogeny (Hennequin *et al.* 2017) sampled 10 of ca. 50 New World species (Viveros & Salino 2015) and so, much remains to be investigated, *e.g.* test the groups proposed by Christensen (1913a, 1920, 1934).

Aknowledgements

Our most sincere thanks to the curators and staff of the herbaria visited and those that lent a large amount of material. Special thanks to Alan R. Smith, Robbin C. Moran and Claudia Gonçalves for their assistance during the

visits; Belkiss R. Alméri for the line drawings; our colleagues, who accompanied us during fieldwork; Centro de Microscopia at the Universidade Federal de Minas Gerais; Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the scholarships given to R.S. Viveros; Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for the grants and financial support (especially to Re flora Program) given to A. Salino; Fundação Grupo Boticário de Proteção à Natureza for financial support for fieldwork; Marcelo Bueno for the richness map; Filipe S. de Souza for helping with distribution maps and images that allowed providing several illustrations; Sandra Knapp, Jefferson Prado, Jeferson M. Costa, Luís A.A. Góes-Neto and Elton L.M. de Assis for helpful comments and discussions about nomenclature; and finally, we thank João R. Stehmann, João A.N. Batista, Marcos E.G. Sobral, Vinícius A.O. Dittrich, Márcio R. Pietrobom, Adaisés S.M. da Silva and Claudine M. Mynssen for evaluating the doctoral thesis of the first author, from which this work is a result.

References

- Adanson, M. (1763) *Familles des plantes. II Partie*. Vincent, Paris, 640 pp.
- Alston, A.H. (1960) Some new species of ferns of South America. *Lilloa* 30: 107–112.
- Baker, J.G. (1870) Cyatheaceae et Polypodiaceae. In: Martius, K.F.P. & Eichler, A.G. (Eds.) *Flora Brasiliensis. Vol. 1, part 2*. Frid. Fleischer in Comm., Monachii & Lipsae (München & Leipzig), pp. 306–624.
- Bernhardi, J. (1806) Dritter Versuch einer Anordnung der Farrnkräuter. *Neues Journal für die Botanik* 1 (2): 1–50.
- Blume, C. (1828) *Enumeratio plantarum Javae et insularum adjacentium: minus cognitarum vel novarum ex herbariis Reivardtii, Kuhlîi, Hasseltii et Blumii*. J.W. van Leeuwen, Lugduni Batavorum (Leiden), 274 pp.
- Boggan, J., Funk, V., Kelloff, C., Hoff, M., Cremers, G. & Feuillet, C. (1997) *Checklist of the plants of the Guianas (Guyana, Surinam, French Guiana)*. 2nd ed. Smithsonian Institution, Washington, 238 pp.
- Bommer, J. & Christ, K.H.H. (1896) Filices. *Bulletin de la Société Royale de Botanique de Belgique* 35: 167–249.
- Borkhausen, M.B. (1798) Monographie der in der obern Grasschast Catzenelnbogen und der benachbarten Gegend einheimfchen, auch einiger anderer deutscher cryptogamischer Gewächse aus Linne's erster Ordnung der 24ften Klasse. *Archiv für die Botanik (by Johan Jacob Römer)* 1 (3): 1–36.
- Bory, J.B. (1824) *Dictionnaire D'Histoire Naturelle Vol. 6*. Rey et Gravier, Baudouin Frères, Paris, 593 pp.
- Brackenridge, W.D. (1854) *United States Exploring Expedition, Vol. 16, Botany, Cryptogamia, Filices*. C. Sherman, Philadelphia, 357 pp.
- Brade, A.C. (1972) O gênero “*Dryopteris*” (Pteridophyta) no Brasil e sua divisão taxonômica. *Bradea* 1 (22): 191–261.
- Braun, A.C.H. (1858) Appendix Plantarum Novarum et Minus Cognitarum in Horto Regio Botanico Berolinensi Coluntur. *Index Seminum in Horto Botanico Berolinensi Anno 1857 Collectorum 1857*: 1–3.
- Ching, R.C. (1938) A Revision of the Chinese and Sikkim-Himalayan *Dryopteris* with Reference to Some Species in the Neighbouring Regions. *Bulletin of the Fan Memorial Institute of Biology. Botanical Series* 8: 275–334.
- Ching, R.C. (1940) On a Natural Classification of the family “Polypodiaceae”. *Sunyatsenia* 5: 237–268.
- Christ, K.H.H. (1901) Filices, Equisetaceae, Lycopodiaceae, Selaginellaceae, Rhizocarpaceae. *Primitiae Florae Costaricensis* 3: 30–47.
- Christ, K.H.H. (1906) Primitie Florae Costaricensis Filices IV. *Bulletin de L'Herbier Boissier, 2me série* 4: 45–58.
- Christ, K.H.H. (1907) Fougères nouvelles ou peu connues. In Hassler (Plantae Paraguarienses). *Bulletin de L'Herbier Boissier, 2me série* 6: 922–928.
- Christ, K.H.H. (1908) Ergebnisse der botanischen Expedition der Kaiserlichen Akademie der Wissenschaften nach Südbrasilien 1901. Herausgegeben von R. v. Wettstein und V. Schiffner. I Band. Pteridophyta und Anthophyta, unter Mitwirkung zahlreicher Fachmänner herausgegeben von R. *Denkschriften der Kaiserlichen Akademie der Wissenschaften/ Mathematisch-Naturwissenschaftliche Klasse* 79: 7–57.
- Christ, K.H.H. (1909) Ex herbario Hassleriano: Novitates paraguariensis I. *Repertorium Novarum Specierum Regni Vegetabilis* 6: 341–352.
<https://doi.org/10.1002/fedr.19090062109>
- Christenhusz, M.J.M., Zhang, X.C. & Schneider, H. (2011) A linear sequence of extant families and genera of lycophytes and ferns. *Phytotaxa* 19: 7–54.
<https://doi.org/10.11646/phytotaxa.19.1.2>
- Christensen, C. (1906) *Index Filicum, sive, Enumeratio omnium generum specierumque Filicum et Hydropteridum ab anno 1753 ad finem anni 1905 descriptorum: adjectis, synonymis principalibus, area geographica, etc.* H. Hagerup, Hafniae (Copenhagen), 745 pp.
- Christensen, C. (1911) On a natural classification of the species of *Dryopteris*. In: Warming, J.E.B. & Rosenvinge, J.L.K. (Eds.) *Biologiske Arbejder tilegnede Eug. Warming*. H. Hagerup, Hafniae (Copenhagen), pp. 73–85.
- Christensen, C. (1913a) A monograph of the genus *Dryopteris*, Part I, the tropical american pinnatifid-bipinnatifid species. *Kongelige Danske Videnskabernes selskabs skrifter Naturvidenskabelige og Mathematisk Afdeling, ser. 7* 10: 55–282.
<https://doi.org/10.5962/bhl.title.41414>
- Christensen, C. (1913b) *Index Filicum Supplementum 1906–1912*. H. Hagerup, Hafniae (Copenhagen), 131 pp.
- Christensen, C. (1920) A monograph of the genus *Dryopteris*, Part II, the tropical american bipinnate decomposed species.

- Kongelige Danske Videnskabernes selskabs skrifter Naturvidenskabelige og Mathematisk Afdeling, ser. 8 6: 1–132.
- Christensen, C. (1936) The collection of pteridophyta made in Hispaniola by E. L. Ekman 1917 and 1924–1930. *Kungliga svenska Vetenskapsakademiens Handlingar*, ser. 3 16 (2): 1–93.
- Christensen, C. (1938) Filicinae. In: Verdoorn, F. (Ed.) *Manual of Pteridology*. M. Nijhoff, The Hague, pp. 522–550.
https://doi.org/10.1007/978-94-017-6111-6_20
- Copeland, E.B. (1947) *Genera Filicum - The Genera of Ferns*. Chronica Botanica Co., Waltham, 247 pp.
- Davenport, G.E. (1896) Filices Mexicanae. *The Botanical Gazette* 21: 253–274.
<https://doi.org/10.1086/327348>
- Desvaux, A.N. (1811) XXIII. Observations sur quelques nouveaux genres de fougères et sur plusieurs espèces nouvelles de la même famille. *Magazin für die Neuesten Entdeckungen in der Gesammten Naturkunde, Gesellschaft Naturforschender Freunde zu Berlin* 5: 295–330.
- Díaz, P.J., Guézou, A., Mauchamp, A. & Tye, A. (2012) CDF Checklist of Galapagos Ferns and related groups. In: Bungartz, F., Herrera, H., Jaramillo, P., Tirado, N., Jiménez-Uzcátegui, G., Ruiz, D., Guézou, A. & Ziemmeck, F. (Eds.) *Charles Darwin Foundation Galapagos Species Checklist* 208: 1–10.
- Diels, F.L.E. (1899) Polypodiaceae. In: Engler, A., Krause, K., Pilger, R.K.F. & Prantl, K.A.E. (Eds.) *Die Natürlichen Pflanzen Familien. I Teil Abteilung 4. V. von W. Engelmann*, Leipzig, pp. 139–339.
- Dong, S.Y. & Christenhusz, M.J.M. (2013) *Ctenitis*. In: Zhang, L.-B., Wu, S.G., Xiang, J.Y., Xing, F.W., He, H., Wang, F.G., Lu, S.G., Dong, S.Y., Barrington, D.S., Iwatsuki, K., Christenhusz, M.J.M., Mickel, J.T., Kato, M. & Gilbert, M.G. (Eds.) *Flora of China. Vol 2–3 (Lycopodiaceae through Polypodiaceae)*. Wu, Z.Y., Raven, P.H. & Hong, D.Y. (Eds.) Science Press; Missouri Botanical Garden Press, Beijing and Saint Louis, pp. 558–561.
- Donnell Smith, J. (1895) Undescribed Plants from Guatemala and other Central American Republics. XVI. *Botanical Gazette* 20: 538–546.
<https://doi.org/10.1086/327278>
- Duan, Y.-F., Hennequin, S., Rouhan, G., Bassuner, B. & Zhang, L.-B. (2017) A taxonomic revision of the fern genus *Ctenitis* (Dryopteridaceae) from Africa and the western Indian Ocean. *Annals of the Missouri Botanical Garden* 102 (1): 3–86.
<https://doi.org/10.3417/2016024>
- Fée, A.L.A. (1852a) *Genera Filicum. Exposition des genres de la famille des polypodiacées. Cinquième mémoire sur la famille des fougères*. J.B. Baillière & Fils; V. Masson & Fils; V. Berger-Levrault & Fils, Paris and Strasbourg, 387 pp.
- Fée, A.L.A. (1852b) Mémoires sur la famille des fougères. *Troisième mémoire (1851): histoire des Vittariées et des Pleurogrammées. Quatrième mémoire (1852): histoire des Antrophyées*. J.B. Baillière; V. Masson, Paris, 55 pp.
- Fée, A.L.A. (1857) *Iconographie des espèces nouvelle décrites ou énumérées dans le Genera Filicum et révision des publications antérieures relatives a la famille des fougères. Sixième, septième et huitième mémoires*. J.B. Baillière; V. Masson; V. Berger-Levrault & Fils, Paris and Strasbourg, 138 pp.
- Fée, A.L.A. (1869) *Cryptogames Vasculaires (fougères, lycopodiacées, hydroptéridées, équisétaées) du Brésil*. J.B. Baillière & Fils; V. Masson & Fils; V. Berger-Levrault & Fils, Paris and Strasbourg, 268 pp.
- Fée, A.L.A. (1873) *Cryptogames vasculaires (fougères, lycopodiacées, hydropteridées, équisétacées) du Brésil. 11e Partie: Supplément et Révision*. J.B. Baillière & Fils; V. Masson & Fils; Berger-Levrault & Cie, Paris and Nancy, 115 pp.
- Forster, J.G.A. (1786) *Florulae Insularum Australium Prodrromus*. Typis Joann. Christian Dietrich, Gottingae (Göttingen), 94 pp.
- Fournier, E.P.N. (1872) *Mexicanarum Plantarum Pars Prima*. Parisiis, Paris, 174 pp.
- Funk, V., Hollowell, T., Berry, P., Kelloff, C. & Alexander, S.N. (2007) 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: 1–584.
- Hasebe, M., Wolf, P.G., Pryer, K.M., Ueda, K., Ryosuke Sano, M.I., Gastoni, G.J., Yokoyama, J., Manhart, J.R., Murakami, N., Crane, E.H., Haufler, C.H. & Hauk, W.D. (1995) Fern Phylogeny Based on rbcL Nucleotide Sequences. *American Fern Journal* 85: 134–181.
<https://doi.org/10.2307/1547807>
- Hassler, E. (1928) Pteridophytorum paraguariensum et regianum argentinorum conspectus criticus. *Trabajos del Instituto de Botanica y Farmacologia* 45: 1–102.
- Hennequin, S., Rouhan, G., Salino, A., Duan, Y.-F., Lepeigneux, M.-C., Guillou, M., Ansell, S., Almeida, T.E., Zhang L.-B., Schneider, H. (2017) Global phylogeny and biogeography of the fern genus *Ctenitis* (Dryopteridaceae), with a focus on the Indian Ocean region. *Molecular Phylogenetics and Evolution* 112: 277–289.
- Hieronymus, G. (1906) Plantae Stübelianae. Pteridophyta. *Hedwigia* 46: 322–336.
- Holttun, R.E. (1947) A revised classification of Leptosporangiate ferns. *Journal of the Linnean Society of London, Botany* 53 (350): 123–158.
- Holttun, R.E. (1983) The fern genera *Tectaria*, *Heterogonium* and *Ctenitis* in the Mascarene Islands. *Kew Bulletin* 38 (1): 107–130.
<https://doi.org/10.2307/4107974>
- Holttun, R.E. (1984) Studies in the fern genera allied to *Tectaria*. III. *Aenigmopteris* and *Ataxipteris*, two new genera allied to *Tectaria* Cav., with comments on *Psomiocarpa* Presl. *Blumea* 30: 1–11.
- Holttun, R.E. (1985) Studies in the fern genera allied to *Tectaria* Cav. IV. The genus *Ctenitis* in Asia, Malesia and Western Pacific. *Blumea* 31: 1–38.
- Holttun, R.E. (1986a) Studies in the fern-genera allied to *Tectaria* Cav., 5. *Triplophyllum*, a new genus of Africa and America. *Kew Bulletin* 41: 237–260.

<https://doi.org/10.2307/4102928>

- Holttum, R.E. (1986b) Studies in the fern-genera allied to *Tectaria* Cav., 6. A conspectus of genera in the Old World regarded as related to *Tectaria*, with descriptions of two genera. *Gardens' Bulletin. Straits Settlements. Singapore* 39: 153–167.
- Holttum, R.E. (1991) *Flora Malesiana, Series II -Pteridophyta, Volume 2, part 1: Tectaria Group*. Rijksherbarium / Hortus Botanicus, Leiden, 132 pp.
- Hooker, J.D. (1847) IX. An Enumeration of the Plants of the Galapagos Archipelago; with Descriptions of those which are new. *Transactions of the Linnean Society of London* 20: 163–233.
<https://doi.org/10.1111/j.1096-3642.1846.tb00416.x>
- Hooker, W.J. (1862) *Species Filicum, Vol. 4*. W. Pamplin, London, 392 pp.
- Hooker, W.J. & Arnott, G.A.W. (1841) *Botany of Captain Beechey's Voyage*. H.G. Bohn, London, 485 pp.
- Hooker, W.J. & Baker, J.G. (1868) *Synopsis Filicum, or a Synopsis of All Known Ferns*. R. Hardwicke, London, 482 pp.
- Hooker, W.J. & Baker, J.G. (1874) *Synopsis Filicum, or a Synopsis of All Known Ferns*. 2nd ed. R. Hardwicke, London, 559 pp.
- Iohow, F. (1892) Los helechos de Juan Fernandez. *Anales de la Universidad de Chile* 82: 977–1004.
- Ito, H. (1939) *Ctenitis*. *Nova Flora Japonica* 4: 205–231.
- Kalfuss, G.F. (1824) *Enumeratio Filicum quas in Itinere circa Terram legit Cl. Adalbertus de Chamisso*. Sumtibus Caroli Cnobloch, Lipsiae (Leipzig), 300 pp.
- Klotzsch, J.F. (1847) Beiträge zu einer Flora der Aequinoctial-Gegenden der neuen Welt. *Linnaea* 20: 337–432.
- Kramer, K.U. (1978) The Pteridophytes of Suriname: An Enumeration with keys of the ferns and fern-allies. *Uitgavem Natuurw. Studekring Suriname Nederl. Antillen, Natuurhist Reeks* 93: 1–198.
- Kuhn, M. (1869) Reliquiae Mettenianae. *Linnaea* 36: 41–169.
- Kuntze, O. (1891) *Revisio Generum Plantarum. Vascularium omnium atque cellularium multarum secundum leges nomenclaturae internationales cum enumeratione Plantarum Exoticarum itinere mundi collectarum. Pars II*. A. Felix, Leipzig, 1011 pp.
- Kuntze, O. (1893) *Revisio Generum Plantarum. Secundum leges nomenclaturae internationales cum enumeratione plantarum exoticarum. Pars III*. A. Felix, Leipzig, 576 pp.
- Kunze, G. (1834) Synopsis Plantarum Cryptogamicarum ab Eduardo Poeppig in Cuba Insula et in America Meridionali Collectarum. *Linnaea* 9: 1–111.
- Kunze, G. (1844) Filices a Leiboldo in Mexico Lectae. *Linnaea* 18: 303–352.
- Labiak, P.H., Sundue, M., Rouhan, G., Hanks, J.G., Mickel, J.T. & Moran, R.C. (2014) Phylogeny and historical biogeography of the lastreopsid ferns (Dryopteridaceae). *American Journal of Botany* 101 (7): 1207–1228.
<https://doi.org/10.3732/ajb.1400071>
- Langsdorff, G.H. von & Fischer, F.E.L. von (1810) *Plantes recueillies pendant le voyage des Russes autour du monde*. J.G. Cotta, Tubingue (Tübingen), 26 pp.
- Legrand, D. (1952) Las especies de Dryopteris del Uruguay. *Comunicaciones Botánicas del Museo de Historia Natural de Montevideo* 2 (23): 1–27.
- Lellinger, D.B. (1977) Nomenclatural And Taxonomic Notes On The Pteridophytes of Costa-Rica Panama And Colombia Part 1. *Proceedings of The Biological Society of Washington* 89: 703–732.
- Lellinger, D.B. (1984) New Combinations and Some New Names in Ferns. *American Fern Journal* 74: 56–60.
<https://doi.org/10.2307/1546870>
- Lellinger, D.B. (2002) A Modern Multilingual Glossary for Taxonomic Pteridology. *Pteridologia* 3: 1–264.
<https://doi.org/10.5962/bhl.title.124209>
- Liebmann, F.M. (1849) Mexicos Bregner, en systematisk, kritisk, plantegeographisk Undersøgelse. *Kongelige Danske videnskabernes Selskabs Skrifter, Naturvidenskabeli Mathematisk Afdeling, ser. 5* 1: 151–322.
- Linnaeus, C. (1753) *Species Plantarum Vol. 2*. Impensis Laurentii Salvii, Holmiae, 1200 pp.
- Link, J.H.F. (1833) *Hortus Regius Botanicus Berolinensis, Tomus II*. G. Reimer, Berlin, 376 pp.
- Liu, H.M., Zhang, X., Chen, Z., Dong, S. & Qiu, Y. (2007a) Polyphyly of the fern family Tectariaceae sensu Ching: Insights from cpDNA sequence data. *Science in China, Series: Life Sciences* 50 (6): 789–798.
<https://doi.org/10.1007/s11427-007-0099-9>
- Liu, H.M., Zhang, X.C., Wang, W., Qiu, Y.L. & Chen, Z.D. (2007b) Molecular Phylogeny of the Fern Family Dryopteridaceae Inferred from Chloroplast rbc L and atp B Genes. *International Journal of Plant Sciences* 168 (9): 1311–1323.
<https://doi.org/10.1086/521710>
- Liu, H.M., Zhang, X.C., Wang, M.P., Shang, H., Zhou, S.L., Yan, Y.H., Wei, X.P., Xu, W. Bin & Schneider, H. (2016) Phylogenetic placement of the enigmatic fern genus *Trichoneuron* informs on the infra-familial relationship of Dryopteridaceae. *Plant Systematics and Evolution* 302: 1–14.
<https://doi.org/10.1007/s00606-015-1265-3>
- Mann, H. (1868) Enumeration of Hawaiian Plants. *Proceedings of the American Academy of Arts and Science* 7: 143–235.
- Márquez, G., Giudice, G.E. & Ponce, M.M. (2006) Pteridofitas de la Reserva “Valle del Arroyo Cuña Pirú” (Misiones, Argentina). *Darwiniana* 44: 108–126.
- Mazumdar, J. & Mukhopadhyay, R. (2013) Nomenclatural notes on some members of Thelypteridaceae. II. *Bionature* 33: 13–34.
- McNeill, J. (2014) Holotype specimens and type citations: General issues. *Taxon* 63: 1112–1113.
<https://doi.org/10.12705/635.7>
- McNeill, J., Barrie, F.R., Buck, W., Demoulin, V., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Marhold, K., Prado, J., Prud Homme Van Reine, W.F., Smith, G.F., Wiersema, J.H. & Turland, N.J. (2012) *International Code of*

- Nomenclature for algae, fungi, and plants (Melbourne Code)*. Regnum Vegetabile 154. Koelz Scientific Books, Königstein, Germany, 140 pp.
- Mettenius, G. (1856) *Filices Horti Botanici Lipsiensis. Die Farne des botanischen Gartens zu Leipzig*. Verlag von Leopold Voss., Leipzig, 135 pp.
- Mettenius, G.H. (1858) IV Phegopteris und Aspidium. *Über Einige Farngattungen* 1858: 1–136.
- Mettenius, G.H. (1864) Prodrum Florae Novo-Granatensis - Filices. In: Triana, J. & Planchon, J.-E. (Eds.) *Annales des Sciences Naturelles* 5: 193–434.
- Michaux, A. (1803) *Flora Boreali-Americana Vol. 2*. Levrault, Paris, 340 pp.
- Mickel, J.T. & Beitel, J.M. (1988) Pteridophyte flora of Oaxaca, Mexico. *Memoirs of the New York Botanical Garden* 46: 1–568.
- Mickel, J.T. & Smith, A.R. (2004) Pteridophytes of Mexico. *Memoirs of the New York Botanical Garden* 88: 1–1055.
- Moran, R.C. (1986) The Neotropical Fern Genus *Olfersia*. *American Fern Journal* 76 (4): 161–178.
<https://doi.org/10.2307/1547430>
- Moran, R.C. (1987) Monograph of the fern genus *Polybotrya* (Dryopteridaceae). *Illinois Natural History Survey Bulletin* 34: 1–138.
- Moran, R.C. (1995) *Ctenitis*. In: Moran, R.C. & Riba, R. (Eds.) *Psilotaceae a Salviniaceae*. Davidse, G., Sousa, M.S. & Knapp, S. (Eds.) *Flora Mesoamericana Volumen I*. Universidad Nacional Autónoma de México, Ciudad de México, pp. 196–200.
- Moran, R.C., Prado, J. & Sundue, M. (2014) *Megalastrum* (Dryopteridaceae) in Andean South America, Part I. *American Fern Journal* 104: 109–178.
<https://doi.org/10.1640/0002-8444-104.3.109>
- Moran, R.C. & Riba, R. (1995) Psilotaceae a Salviniaceae. In: Davidse, G., Sousa S., M. & Knapp, S. (Eds.) *Flora Mesoamericana Volumen I*. Universidad Nacional Autónoma de México, Ciudad de México, pp. 1–470.
- Moran, R.C. & Smith, A.R. (2001) Phytogeographic Relationships between Neotropical and African-Madagascan Pteridophytes. *Brittonia* 53: 304–351.
<https://doi.org/10.1007/BF02812704>
- Morton, C.V. (1951) Contributions to the Flora of Venezuela Botanical Exploration in Venezuela - I Pteridophyta. *Fieldiana Botany* 28: 7–16.
- Murillo-Pulido, M.T., Murillo-Aldana, J. & León-Parra, A. (2008) *Los pteridófitos de Colombia*. Instituto de Ciencias Naturales-Facultad de Ciencias, Universidad Nacional de Colombia, Bogotá, 533 pp.
- Peña-Chocarro, M.C., Jiménez, B., Marín, G. & Knapp, S. (1999) Checklist of the Pteridophytes of the Mbaracayú Forest Nature Reserve, Paraguay. *Fern Gazete* 15: 221–259.
- Pichi Sermolli, R.E.G. (1977) Tentamen Pteridophytorum genera in taxonomicum ordinem redigendi. *Webbia* 31 (2): 313–512.
<https://doi.org/10.1080/00837792.1977.10670077>
- Pichi Sermolli, R.E.G. & Bizzari, M.P. (2005) A Revision of Raddi's pteridological collections from Brazil (1817–1818). *Webbia* 60 (1): 1–393.
<https://doi.org/10.1080/00837792.2005.10739597>
- Porter, F.L.S. (1980) The vascular plants of Joseph Dalton Hooker's "An Enumeration of the plants of the Galápagos Archipelago; with descriptions of those which are new." *Botanical Journal of the Linnean Society* 81: 79–134.
<https://doi.org/10.1111/j.1095-8339.1980.tb00944.x>
- PPG I (2016) A community-derived classification for extant lycophytes and ferns - The Pteridophyte Phylogeny Group. *Journal of Systematics and Evolution* 54: 563–603.
<https://doi.org/10.1111/jse.12229>
- Presl, C. (1822) Plantarum Novarum Brasiliae, praesertim Filicum Linnei Diagnoses et Descriptiones. *Deliciae Pragenses, Historiam Naturalem spectantes* 1: 153–190.
<https://doi.org/10.5962/bhl.title.46467>
- Presl, C. (1836) *Tentamen Pteridographiae seu Genera Filicacearum praesertim juxta venarum decursum et distributionem exposita*. Typis Filiorum Theophili Haase, Pragae, 290 pp.
- Presl, C. (1849) *Epimeliae Botanicae*. Typis filiorum Amadei Haase, Pragae, 264 pp.
- Proctor, G.R. (1950) *Ctenitis vellea*, a Neglected West Indian Fern. *American Fern Journal* 40: 226–228.
<https://doi.org/10.2307/1545157>
- Proctor, G.R. (1961) Notes on Lesser Antilles ferns. *Rhodora* 63 (746): 31–35.
- Proctor, G.R. (1985) *Ferns of Jamaica. A Guide to the Pteridophytes*. British Museum (Natural History), London, 631 pp.
- Raddi, G. (1819) Synopsis Filicum Brasiliensium. *Opuscoli Scientifici Bologna* 3: 279–297.
- Radford, A.E. (1986) *Fundamentals of Plant Systematics*. Harper & Row, New York, 498 pp.
- Rojas-Alvarado, A. (2001) Ocho nuevas especies y nuevos ámbitos geográficos de helechos de la familia Tectariaceae (Filicales) en el Neotrópico. *Revista de Biología Tropical* 49: 467–487.
- Rosenstock, E. (1904) Beiträge zur Pteridophytenflora Südbrasilien. *Hedwigia* 43: 210–238.
- Rosenstock, E. (1906) Beiträge zur Pteridophytenflora Südbrasilien. *Hedwigia* 46: 57–167.
- Rosenstock, E. (1915) Filices brasilienses novae. *Hedwigia* 56: 355–371.
- Roth, A.W. (1799) *Tentamen Florae Germanicae vol. 3*. I.G. Müller, Leipzig, 579 pp.
- Salino, A. & Almeida, T.E. (2010) *Ctenitis*. In: Forzza, R.C., Baumgratz, J.F.A., Bicudo, C.E.M., Carvalho Jr., A.A., Costa, A., Costa, D.P. da, Hopkins, M., Leitman, P.M., Lohmann, L.G., Maia, L.C., Martinelli, G., Menezes, M., Morim, M.P., Coelho, M.A.N., Peixoto, A.L., Pirani, J.R., Prado, J., Queiroz, L.P., Souza, V.C., Stehmann, J.R., Sylvestre, L.S., Walter, B.M.T. & Zappi, D. (Eds.) *Lista de especies da Flora do Brasil. Vol. 1*. Jardim Botânico do Rio de Janeiro, Rio de Janeiro,

- pp. 531–532.
- Salino, A., Almeida, T.E. & Melo, L.C.N. (2009) Dryopteridaceae. In: Stehmann, J.R., Forzza, R.C., Salino, A., Sobral, M., Costa, D.P. da & Kamino, L.H.Y. (Eds.) *Plantas da Floresta Atlântica*. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Rio de Janeiro, pp. 88–91.
- Salino, A. & Morais, P.O. (2003) New combinations in the Tropical American *Ctenitis* (Tectariaceae). *American Fern Journal* 93: 32–35.
[https://doi.org/10.1640/0002-8444\(2003\)093\[0032:NCITTA\]2.0.CO;2](https://doi.org/10.1640/0002-8444(2003)093[0032:NCITTA]2.0.CO;2)
- Salino, A. & Ponce, M.M. (2008) Dryopteridaceae. In: Zuloaga, F.O., Morrone, O. & Belgrano, M.J. (Eds.) *Catálogo de las Plantas Vasculares del Cono Sur (Argentina, Sur de Brasil, Chile, Paraguay y Uruguay)*. Vol. 1. Pteridophyta, Gymnospermae, Monocotyledoneae. Monographs in Systematic Botany from the Missouri Botanical Garden, pp. 33–49.
- Salomon, C. (1883) *Nomenclator der Gefässkryptogamen oder alphabetische Aufzählung der Gattungen und Arten der bekannten Gefässkryptogamen mit ihren Synonymen u. ihrer geographischen Verbreitung*. H. Voigt, Leipzig, 408 pp.
- Sanín, D., Mejía, L.M.Á., Santa, J.C.M., Rubiano, N.C. & Ocampo, G.G. (2008) Monilofitos y licofitos de la cuenca del Río Chinchiná (Caldas, Colombia). Clave para géneros y catálogo de las especies. *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 32 (124): 331–352.
- Schlechtendal, D.F.L. (1825) *Adumbrationes Plantarum. Fasciculus II*. F. Dümmler, Berolini (Berlin), 24 pp.
- Schuettpelz, E. & Pryer, K.M. (2007) Fern phylogeny inferred from 400 leptosporangiate species and three plastid genes. *Taxon* 56: 1037–1050.
<https://doi.org/10.2307/25065903>
- Schumacher, H.C.F. (1829) Beskrivelse af guineiske Planter, som ere fundne af danske Botanikere, isaer af Etatsraad Thonning, ved Etatsraad. *Det Kongelige Danske Videnskabs Selskabs Skrifter* 4: 1–236.
- Schwartsburd, P.B., Labiak, P.H. & Salino, A. (2007) A new species of *Ctenitis* (Dryopteridaceae) from southern Brazil. *Brittonia* 59: 29–32.
[https://doi.org/10.1663/0007-196X\(2007\)59\[29:ANSOCD\]2.0.CO;2](https://doi.org/10.1663/0007-196X(2007)59[29:ANSOCD]2.0.CO;2)
- Sehnem, A. (1977) As filicíneas do sul do Brasil, sua distribuição geográfica, sua ecologia e suas rotas de migração. *Pesquisas Botânica* 31: 1–108.
- Sehnem, A. (1979) Aspidiáceas. In: Reitz, R. (Ed.) *Flora Illustrada Catarinense*. Herbário Barbosa Rodrigues, Itajaí, pp. 1–355.
- Smith, A.R. (1975) New ferns and new combinations of ferns from Chiapas, Mexico. *Proceedings of the California Academy of Sciences Fourth Series* 40 (8): 209–230.
- Smith, A.R. (1981) Pteridophytes. In: Breedlove, D.E. (Ed.) *Flora of Chiapas, Part 2*. California Academy of Sciences, San Francisco, pp. 1–370.
- Smith, A.R. (1995) *Ctenitis*. In: Steyermark, J.A., Berry, P.E. & Holst, B.K. (Eds.) *Flora of the Venezuelan Guayana*. Vol. 2. Pteridophytes, Spermatophytes: Acanthaceae-Araceae. Timber Press, Missouri Botanical Garden, Portland, St. Louis, pp. 80.
- Smith, A.R. (2008) Fern Classification. In: Ranker, T.A. & Raufler, C.H. (Eds.) *The biology and evolution of ferns and lycophytes*. Cambridge University Press, Cambridge, pp. 417–467.
<https://doi.org/10.1017/CBO9780511541827.017>
- Smith, A.R., Kessler, M. & Gonzales, J. (1999) New Records of pteridophytes from Bolivia and Brazil. *American Fern Journal* 89: 244–266.
<https://doi.org/10.2307/1547234>
- Smith, A.R., Pryer, K.M., Schuettpelz, E., Korall, P., Schneider, H. & Wolf, P.G. (2006) A classification for extant ferns. *Taxon* 55: 705–731.
<https://doi.org/10.2307/25065646>
- Smith, W.J. (1846) An enumeration of ferns cultivated in the Royal Gardens at Kew, in december 1845; with characters and observations on some of the genera and species. *Curtis's Botanical Magazine* 72: 7–39.
- Sodiño, A. (1893) *Cryptogamae Vasculares Quitenses*. Quito Typis Universitatis, Quito, 656 pp.
- Sprengel, K.P.J. (1827) *Systema vegetabilium*. Vol. 4, Pars I. Sumtibus Librariae Dieterichianae, Göttingae (Göttingen), 1002 pp.
- Stolze, R.G. (1977) New Taxa and Combinations of *Ctenitis* from Guatemala. *American Fern Journal* 67: 40–44.
<https://doi.org/10.2307/1545963>
- Stolze, R.G. (1981) Ferns and Fern Allies of Guatemala. Part II Polypodiaceae. *Fieldiana Botany, new series* 6: 1–522.
<https://doi.org/10.5962/bhl.title.2541>
- Stolze, R.G. (1990) Observations on *Ctenitis* (Dryopteridaceae) and Allied Genera in America. *Annals of the Missouri Botanical Garden* 77: 274–280.
<https://doi.org/10.2307/2399540>
- Swartz, O. (1788) *Genera & Species Plantarum Seu Prodromus Descriptionum Vegetabilium, Maximam Partem Incognitorum quae sub Itinere in Indiam Occidentalem*. Bibliopoliis Acad. M. Swederi., Holmiae, Upsaliae & Aboae, 152 pp.
- Swartz, O. (1801) Genera et Species Filicum. *Journal für die Botanik (Schrader)* 2: 1–136.
- Tardieu-Blot, M.L. (1955) Sur les Tectarioideae de Madagascar et des Mascareignes avec description d'un genre nouveau *Pseudotectaria*. *Notulae Systematicae* 15: 86–90.
- Thiers, B. (2017) [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. *New York Botanical Garden's Virtual Herbarium*. Available from: <http://sweetgum.nybg.org/science/ih/> (accessed 1 January 2018)

- Thunberg, C.P. (1784) *Flora Japonica*. Bibliopolio I.G. Mülleriano, Lipsiae (Leipzig), 418 pp.
- Tryon, A.F. & Lugardon, B. (1991) *Spores of the Pteridophyta. Surface, Wall Structure and Diversity Based on Electron Microscope Studies*. Springer-Verlag, New York, 648 pp.
- Tryon, R.M. & Stolze, R.G. (1991) Pteridophyta of Peru. Part IV. 17. Dryopteridaceae. *Fieldiana Botany, New Series* 27: 1–176.
<https://doi.org/10.5962/bhl.title.2540>
- Tryon, R.M. & Tryon, A.F. (1982a) Additional and nomenclatural notes on ferns. *Rhodora* 84: 125–130.
- Tryon, R.M. & Tryon, A.F. (1982b) *Ferns and allied plants with special reference to Tropical America*. Springer-Verlag, New York, 857 pp.
- Underwood, L.M. (1905) The early writers on ferns and their collections - IV. Presl, 1794–1852; John Smith, 1798–1888; Fée, 1789–1874; and Moore, 1821–1887. *Torreya* 5 (3): 37–41.
- Urban, I. (1903) *Symbolae Antillanae seu Fundamenta Florae Indiae Occidentalis Vol. 4*. Fratres Borntraeger, Lipsiae (Leipzig), 771 pp.
- Vareschi, V. (1968) Helechos. In: Lasser, T. (Ed.) *Flora de Venezuela. Vol. 1. Tomo 1: Lycopodiaceae - Aspidiaceae*. Instituto Botanico, Caracas, pp. 1–468.
- Viveros, R.S. & Salino, A. (2015) Two new species of *Ctenitis* (Dryopteridaceae) from South America and taxonomic notes on similar species. *Phytotaxa* 239: 1–16.
<https://doi.org/10.11646/phytotaxa.239.1.1>
- Viveros, R.S. & Salino, A. (2017) A new species and a new combination in *Ctenitis* (Dryopteridaceae) from South America. *Brittonia* in press
<https://doi.org/10.1007/s12228-017-9469-1>
- Wallich, N. (1828) *Numerical list of dried specimens of plants in the Museum of the Honl. East India Company /which have been supplied by Dr. Wallich, superintendent of the botanic garden at Calcutta*. East India Company Museum, London, 306 pp.
- Wang, F.-G., Barratt, S., Falcón, W., Fay, M.F., Lehtonen, S., Tuomisto, H., Xing, F.-W. & Christenhusz, M.J.M. (2014) On the monophyly of subfamily Tectarioideae (Polypodiaceae) and the phylogenetic placement of some associated fern genera. *Phytotaxa* 164: 1–16.
<https://doi.org/10.11646/phytotaxa.164.1.1>
- Willdenow, C.L. (1810) *5 Species Plantarum*. 4th ed. Impensis G. C. Nauk., Berlin, 542 pp.
- Zhang, L.B. (2012) Reducing the fern genus *Dryopsis* to *Dryopteris* and the systematics and nomenclature of *Dryopteris* subgenus *Erythrovariae* section *Dryopsis* (Dryopteridaceae). *Phytotaxa* 71: 17–27.
<https://doi.org/10.11646/phytotaxa.71.1.4>
- Zhang, L.-B., Wu, S.-G., Xiang, J.-Y., Xing, F.-W., He, H., Wang, F.-G., Lu, S.-G., Dong, S.-Y., Barrington, D.S., Iwatsuki, K., Christenhusz, M.J.M., Mickel, J.T., Kato, M. & Gilbert, M.G. (2013) Dryopteridaceae. In: Wu, Z.-Y., Raven, P.H. & Hong, D.-Y. (Eds.) *Flora of China, vol. 2–3*. Science Press, Beijing and Missouri Botanical Garden Press, Saint Louis, pp. 542–724.
- Zhang, L.-B., Zhang, L., Dong, S.-Y., Sessa, E.B., Gao, X.-F. & Ebihara, A. (2012) Molecular circumscription and major evolutionary lineages of the fern genus *Dryopteris* (Dryopteridaceae). *BMC Evolutionary Biology* 12: 1–15.
<https://doi.org/10.1186/1471-2148-12-180>
- Zhang, L., Schuettpelz, E., Rothfels, C., Zhou, X.-M., Gao, X.-F. & Zhang, L.-B. (2016) Circumscription and phylogeny of the fern family Tectariaceae based on plastid and nuclear markers, with the description of two new genera: *Draconopteris* and *Malaiifilix* (Tectariaceae). *Taxon* 65: 723–738.
<https://doi.org/10.12705/654.3>
- Zhang, L., Zhou, X.-M., Chen, D.-K., Schuettpelz, E., Knapp, R., Lu, N.T., Luong, T.T., Dang, M.T., Duan, Y.-F., He, H., Gao, X.-F. & Zhang, L.-B. (2017) A global phylogeny of the fern genus *Tectaria* (Tectariaceae: Polypodiales) based on plastid and nuclear markers identifies major evolutionary lineages and suggests repeated evolution of free venation from anastomosing venation. *Molecular Phylogenetics and Evolution* 114: 295–333.
<https://doi.org/10.1016/j.ympev.2017.05.020>