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Source: American Fern Journal, 109(2) : 77-120

Published By: The American Fern Society

URL: <https://doi.org/10.1640/0002-8444-109.2.77>

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New Additions of Scaly Tree Ferns (Cyatheaceae) to the Flora of Colombia

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ABSTRACT.—As the result of ongoing studies of the fern flora of Colombia, we here present 14 taxa of the scaly tree ferns (Cyatheaceae) that are either new to science (*Cyathea andaquiensis*, *C. callejasii*, *C. cardenasii*, *C. catenata*, *C. coloradoana*, *C. kessleriana*, *C. pacis*, *C. pholidota*, *C. rengifoii*, *C. rodriguezii*, *C. tejedoris*, *C. toroi*) or newly recognized (*Cyathea boconensis*). For *Alsophila crassa*, the new name *C. clandestina* is chosen and an updated description is given.

KEY WORDS.—Andes, biogeography, conservation, Neotropics, South America

Colombia is one of the most diverse countries in South America regarding biotopes (Olson and Dinerstein, 1998), biogeographic regions (Sánchez-Cuervo *et al.*, 2012) and species richness (Kier *et al.*, 2009). Its fame for harboring the highest number of bird species has long been established (Hilty and Brown, 1986), and its top position for species richness of other taxonomic groups often predicted (Kier *et al.*, 2009). Since the recent solution of inner political conflicts that for the past 40 years had withheld scientific exploration of most rural parts (Sánchez-Cuervo and Aide, 2013), local and international scientists are gradually gaining access to the biodiversity of areas spared the detrimental impact of civilization, and discovering new species of sometimes strikingly distinctive appearances (Cuervo *et al.*, 2005; Defler, Bueno, and García, 2010; Lara *et al.*, 2012; Mantilla-Melluk and Baker, 2006; Moncada and Luecking, 2012; Roman-Valencia *et al.*, 2010; Vasco, 2006; Veneagas, González, and Puerta, 2012). This includes also samples of scaly tree ferns of the family Cyatheaceae unassignable to species (Rojas and Tejedor, 2016; Tejedor *et al.*, 2017). This still comes as a surprise because this showy plant group, like

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orchids or palms, has been frequently collected in this country since the first botanical explorations during the Spanish colonial era (Bonpland *et al.*, 1815; Humboldt and Bonpland, 1807; Karsten, 1856, 1860, 1869; Lack, 2003; Mutis, 1967) and was considered relatively well understood (Barrington, 1978; Murillo and Murillo, 2003; Tryon, 1976).

The scaly tree ferns have become a high priority focus for Colombian scientists because these conspicuous plants are listed as endangered in the index of CITES species (CITES, 2017) in order to restrict and control their trade. This protective measure is necessary because tree fern trunks of Cyatheaceae and Dicksoniaceae with their fibrous root mantle are locally used for making special flowerpots and substrates for epiphytic plants, such as orchids (Eleutério and Pérez-Salicrup, 2006). The few available demographic studies on tree ferns (Ramírez-Valencia, Sanín, and Álvarez-Mejía, 2009; Seiler, 1981, 1995) indicate that the preferably harvested species need about two decades to reach fertility and many more to develop a trunk that justifies harvesting. Adding the negative influence of general habitat deterioration by humans, many tree ferns are probably endangered in the wild but the exact status of their populations is currently unknown. For this reason, the Instituto Amazónico de Investigaciones Científica SINCHI under auspices of the Colombian Ministerio de Ambiente is conducting a nationwide assessment of the distribution and abundance of tree ferns in order to categorize their threats and make suggestions for location and extension of new protected areas. When SINCHI asked for our taxonomic expertise in order to accelerate this assessment, offering in return logistic help with collection permits and specimen export, we gladly accepted. Our main focus was on the re-collection of the known species for phylogenetic studies and the geographic assessment in Colombia, but with the combined fresh experience from the field and the Colombian herbaria, many taxa of tree ferns became easily recognizable that should be treated as proper species (Noben *et al.*, 2018). Here, we present the first taxonomic novelties in the genus *Cyathea*.

MATERIALS AND METHODS

We studied specimens in the largest Colombian herbaria: CAUP, COAH, COL, CUCV, FMB, HUA, JAUM, MEDEL, TULV, VALLE (Thiers, 2016). Other collections were consulted from AAU, B, BM, F, GOET, K, L, M, MO, P, STU, UC, US, W, and Z for types and comparative material. The authors took field trips to all ecoregions of Colombia, and type localities of species described from Colombia were visited as far as possible. Specimens of the authors' collections are mainly deposited at HUA and COAH, with duplicates deposited at BONN and Z. Terminology follows Lellinger (2002) and Lehnert (2011).

RESULTS & DISCUSSION

We here present 14 newly recognized species of the scaly tree ferns (Cyatheaceae), twelve are new to science (*Cyathea andaquiensis* Lehnert,

F.Giraldo & W.Rodríguez *sp.nov.*, *Cyathea callejasii* Lehnert, F.Giraldo & A.Tejedor *sp.nov.*, *Cyathea cardenasii* Lehnert, F.Giraldo & W.Rodríguez *sp.nov.*, *Cyathea catenata* Lehnert, F.Giraldo & W.Rodríguez *sp.nov.*, *Cyathea coloradoana* Lehnert, F.Giraldo & W.Rodríguez *sp.nov.*, *Cyathea kessleriana* Lehnert, F.Giraldo & A.Tejedor, *sp.nov.*, *Cyathea pacis* F.Giraldo, W.Rodríguez & A.Tejedor *sp.nov.*, *Cyathea pholidota* Lehnert, F.Giraldo & A.Tejedor, *sp.nov.*, *Cyathea rengifoii* Lehnert, F.Giraldo & A.Tejedor *sp.nov.*, *Cyathea rodriguezii* Lehnert & F.Giraldo, *sp.nov.*, *Cyathea tejedoris* Lehnert, F.Giraldo & W.Rodríguez, *sp.nov.*, and *Cyathea toroi* Lehnert, F.Giraldo & A.Tejedor *sp.nov.*) and two are reinstated (*Cyathea boconensis* H.Karst., *Cyathea clandestina* Lehnert, F.Giraldo & A.Tejedor *nom. nov.*).

In most of these species, we observed structures at the joints between rachises and costae that could represent foliar nectaries (White and Turner, 2012). These are found below the pneumathodes, if pneumathodes occur in the species, and are visible as differently colored parts of the epidermis, either as green, shiny areas in fresh material or darkened (sometimes also wrinkly) spots in dried material. We follow the interpretation of White and Turner (2012) and label them here as foliar nectaries, albeit tentatively, because we have not observed visiting ants or other insects in the field. Furthermore, it appears that these structures lose their function in older fronds, where they are often dried up, dull, and less visible compared to those on younger fronds.

Most of the newly recognized species occur either in the Chocó region (Provs. Chocó, Risaralda, Valle de Cauca) or in the northern part of the Colombian Cordilleras facing the Caribbean (Provs. Antioquia, Santander). All species treated here belong to *Cyathea* in the strict sense, and mostly to the clades of *C. divergens* and *C. gibbosa* sensu Korall *et al.* (2007) and Lehnert *et al.*, (unpubl. data).

TAXONOMIC TREATMENT

New Species

1. ***Cyathea andaquiensis*** Lehnert, F.Giraldo & W.Rodríguez, *sp. nov.* Type: COLOMBIA. Caquetá: Municipio Belén de Los Andaquies, Parque Natural Municipal Andaqui, cabeceras del Río Pescado 01°41'52.6"N, 75°54'15.9"W, 1608 m, 25 Jan 2017, *N. Castaño-A.*, *D. Cardenas*, *J. Betancur*, *A. Barona*, *N. Marin*, *E. Paky*, *J. Navarro*, *O. Cerquera*, *A. Valencia*, *M. Rojas*, *B. Rojas*, *D.J. Jaimes*, *L.C. Luna*, *H. Muñoz* & *D. Osorio* 8827 (holotype: COAH-96598/-96596/-96623!, isotype: COL-0004565525/-000456604/-000456856!). **Fig. 1.**

Trunks erect, to 1 m tall, 6–8 cm diam.; adventitious buds not reported. Petioles to 40 cm long, strongly aculeate, with prickles to 3 mm long, brown to dark brown; without adventitious (aphlebioid) pinnae at the petiole bases; scurf absent; petioles adaxially hairy down to their bases, abaxially hairy at least in upper parts, hairs to 2 mm long, catenate, flaccid, tortuous, whitish to pale brown; petiole scales lanceate, 18–25 × 2–3 mm, their tips straight, weakly

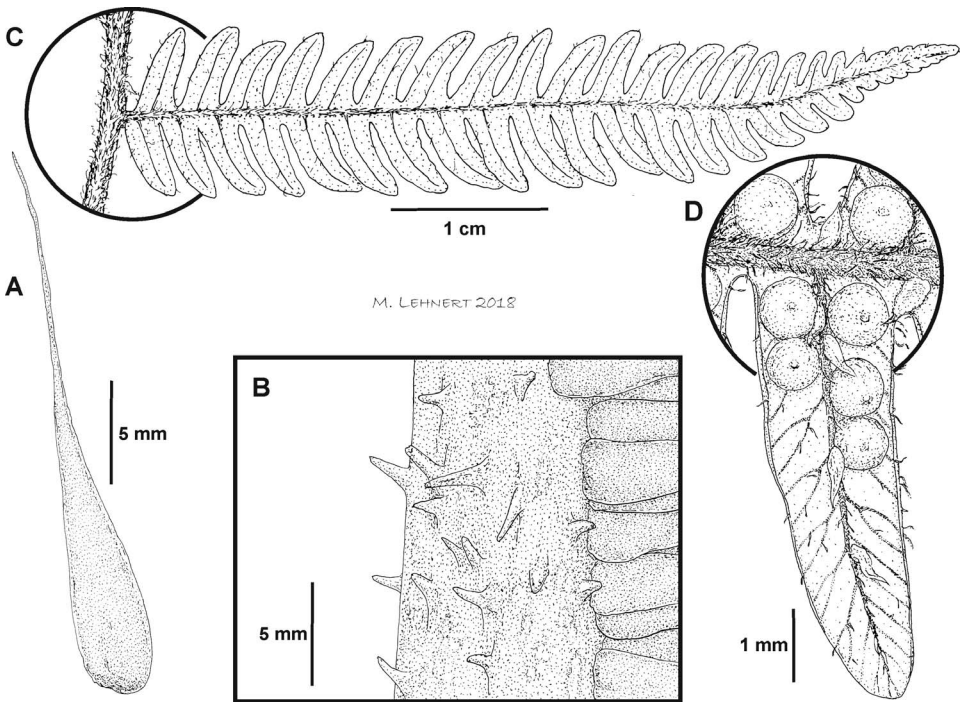


FIG. 1. *Cyathea andaquiensis*. A. Petiole scale. B. Petiole with scales. C. Pinnule, adaxially. D. Segment abaxially, showing the complete sphaeropteroid indusia (all drawn from *Colorado 651*, HUA).

twisted, lustrous, concolorous to weakly concordantly bicolorous, the brown to dark brown center transitioning into the brown to yellowish-brown margins. Fronds to 140 cm long, held \pm stiffly erect. Laminae to 100×40 cm, bipinnate-pinnatifid to -pinnatisect, chartaceous, widest at the middle, apices gradually reduced; dark green adaxially, blackish when dried, dull olive-green abaxially. Pinnae to 20 cm long, ca. 8–9 pairs per frond, sessile to subsessile with stalks to 0.5 cm, distally narrowly green alate between the segments. Frond axes (rachis, costae, costules) dark reddish brown, adaxially darker than abaxially, abundantly hairy, hairs to 2 mm long, tan to orange-brown, adaxially very dense, antrorsely curved to appressed, abaxially less dense, more spreading, abaxially also with flat linear-lanceate scales $2\text{--}12 \times 1\text{--}3$ mm, orange-brown or with whitish margins or bases, mainly in the axils of the axes; rachises abaxially aculeate, costae muricate, costules inermous; junctures of costae and rachises abaxially weakly swollen, each with a planar elliptic pneumathode to $3 \times 1\text{--}2$ mm, dark brown, inconspicuous, with blackened area below in dried specimens. Pinnules to $5.5 \times 1.0\text{--}1.2$ cm, sessile, mostly alternate, ca. 1 cm between the costules, linear-lanceate, cuneate to rounded at base, tapering from beyond the middle to acute to attenuate tips; segments to $6 \times 1.5\text{--}2.0$ mm, weakly ascending, weakly falcate towards the tip, with crenulate to subentire

margins and obtuse tips; with a small blackish elliptic pneumathode at the base of the costules; basal segments alternately placed, approximate, sinuses 0.5–1.0 mm wide, acute to obtuse; sterile and fertile pinnules identical. Veins adaxially with white to tan, erect, straight to curved, multicellular hairs 0.5–1.0 mm long, the longest ones on the midveins; abaxially with many white, tortuous multicellular hairs 0.5–1.0 mm long on and between the veins, sometimes on the veins intermixed with small appressed trichomidia to 0.2 mm long; costules and midveins abaxially yellowish to carneous, planar to weakly raised, with orange-brown to brown, flat squamules to 1.0 mm long with elongated tips and fimbriate to dissected margins, pale bullate squamules few distally on midveins; lateral veins flat, dark green to blackish; sterile veins forked or simple, fertile veins forked. Sori 0.6–0.8 mm diam., each with ca. 15 sporangia, \pm medial to subproximal, indusia sphaeropteroid with umbo, tan, translucent; receptacles globose, 0.2 mm diam, paraphyses few, hyaline, tan, of the same length as sporangia (0.3 mm). Spores not examined.

Etymology.—The epithet refers to the type locality in the Municipio de Belén de los Andaquies, to raise awareness of the threat of habitat destruction by illegal logging in that area.

Distribution and Habitat.—Southeastern Colombia (Caquetá) in wet montane forests at 1608 m.

Cyathea andaquiensis belongs to the group of sphaeropteroid-indusiate species of *Cyathea*, such as *C. squamipes* H.Karst. and *C. delgadii* Pohl ex Sternb., to which it bears some superficial resemblance. It stands out by its dense indument of pale soft flaccid hairs that form a woolly cover abaxially on costae and costules. In *C. delgadii* and *C. squamipes*, the hairs on costae and costules are less dense and mostly spreading or arching. The only sphaeropteroid-indusiate species that resemble *C. andaquiensis* regarding the dense soft hair are *C. harrisii* Underw. of Jamaica and Hispaniola and *C. chimaera* Lehnert & A.Tejedor of the Huancabamba region: *Cyathea harrisii* usually has larger pinnules with clear stalks to 4 mm, and *C. chimaera* has inermous petioles and rachises (vs. aculeate in *C. andaquiensis*), blunt pinnules (vs. attenuate) and reduced scale margins (vs. differentiated margins well-developed).

Little is known about the ecology of *Cyathea andaquiensis*. It occurred on a steep slope covered in wet forest with a canopy height of 16 m and an abundance of the palm *Dictyocaryum lamarckianum* H.Wendl. The presence of dense undergrowth suggests a relatively open forest structure. This would explain also the short trunk of the fertile plant of the type collection and the erect position of the fronds, which we reconstructed from the stiff, straight rachis and the acute insertion to the trunk, as indicated by the form of the petiole abscission layer.

2. *Cyathea callejasii* Lehnert, F.Giraldo & A.Tejedor, *sp. nov.* Type: COLOMBIA. Antioquia: Municipio Frontino, Vereda El Guayabo, Corregimiento Nutibara, 06°41'20.5"N, 76°12'59"W, 1720 m, 11 Feb 2016, *F. Giraldo, A.*



FIG. 2. *Cyathea callejasii* A. Habit, showing the exposed apex with colorful red scales, and the arching frond. B. Expanding crozier. C. Rachis of young frond abaxially, between lower pinnae, showing persisting scales and dense grayish scurf. D. Frond, adaxially; note the large patent basal pinnae. E. Segments, abaxially, with exindusiate sori, note the fine hairs on the costule (photos by F. Giraldo, corresponding specimen *Giraldo 3738A*, HUA).

Salino, E. Dominguez & I. Moura 3738A (holotype: HUA-202741/-202742/-202743!). **Fig. 2.**

Trunks to 3 m tall, 8–12 cm diam., without old petiole bases, densely covered with dark reddish brown scales with darker center, similar to petiole scales; apex not hidden between petiole bases, petioles inserted at a wide angle; trunk basally with adventitious buds, sprouting especially on decumbent trunks.

Fronde to 310 cm long, patent to arching, distally drooping. Petioles to 100 cm long, inermous or muricate with scattered prickles to 1 mm long, atropurpureous to blackish, matte, with dense scurf consisting of erect brown squamules to 1.0 mm long, some with dark brown teeth, with matted branched reddish brown hairs in basal half, grading into erect uniseriate hairs in distal half; petioles on each side with a discontinuous line of orange pneumathodes to 4.0×0.8 – 1.0 mm, scaly for most of its length, often up to lower pinnae. Petiole scales narrowly lanceate, 10 – 20×2 – 3 mm, shiny, discordantly bicolorous brown with lighter brown to yellowish margins, bases darkened, weakly cordate, pseudopeltately attached, apices attenuate, undulate but not twisted; differentiated margins fragile, often abraded, the cell rows strongly exerted, in scales of distal petiole parts margins pale with dark brown teeth. Laminae to 230×120 cm, ovate-elliptic, bipinnate-pinnatifid, firm chartaceous to subcoriaceous, matte, a rich dark green adaxially, paler abaxially; 10 – 12 pinna pairs, basal ones strongly reflexed, ca. $1/2$ the length of the longest pinnae; apices gradually reduced. Frond axes (rachises, costae & costules) inermous, dark brown to atropurpureous abaxially and adaxially, matte to weakly shiny, adaxially pubescent with reddish brown, antrorsely curved multicellular hairs to 1 mm long, abaxially with similar but mostly shorter, more spreading hairs (0.5 – 1.0 mm), becoming paler towards the costules; costae to 3.0 mm, junctures of costae and rachises abaxially weakly swollen, each with only one large, conspicuous, weakly protruding elliptic aerophore to 6.0×2.5 mm, pale brown, all junctures between the stronger axes with few linear-lanceate scales 6 – 12×0.5 – 2.0 mm. Pinnae to 60 cm long, \pm patent, stalked to 3.5 cm, alternate, inarticulate, distally distinctly green-alate, distal segments not decurrently adnate before ending in a pinnatifid apical section. Pinnules to 110×28 mm, stalked to 6 mm, inarticulate, 2–3 cm between the stalks, long-lanceate, bases truncate to weakly cordate, tips attenuate with crenulate margins; costules carneous to ochre or yellowish green on both sides, adaxially strongly prominent, ridged, densely hairy with tan to brown, antrorsely curved multicellular hairs to 1 mm long, abaxially weakly to strongly prominent, pubescent with pale brown hairs to 0.5 mm, also with flat, ovate-acuminate squamules to 2×0.5 – 1.0 mm, brown with paler, finely erose-denticulate margins with darker brown teeth; costules basally with one weakly raised pneumathode (to 2×1 mm), light brown, inconspicuous. Segments to 12×5 – 6 mm, sessile, adnate, patent to ascending, falcate, tips rounded to obtuse, proximal segments \pm opposite, \pm equal to following segments, never remote from each other; sinuses acute, to 1.0 mm wide, sometimes occluded; margins crenulate, not differently incised in proximal segments of a pinnule; veins protruding adaxially and abaxially, midveins adaxially ridged, dark stramineous to yellowish brown, veins ending shortly before the margins, adaxially widened, deep orange-brown, glabrous on both sides, abaxially without squamules; sterile and fertile veins simple or forked. Sori 1.0 – 1.2 mm diam., costal to subcostal, parallel to the midvein, in the fork or on the back of veins; indusia lacking; receptacles globose, 0.3 – 0.4 mm

diam., some subtended by a small, ephemeral reddish brown scale, paraphyses few to absent, straight, reddish, much shorter than the sporangia (0.2 mm long). Spores ca. 45 μm diam., pale brown *en masse*, tetrahedral-globose, exospore weakly verrucose, perispore baculate.

Etymology.—This species is dedicated to Colombian botanist Ricardo Callejas Posada (1954–), University of Antioquia, Medellín.

Distribution and Habitat.—Northwestern Colombia (Chocó) in wet montane forests at 1720 m.

Cyathea callejasii appears intermediate between *C. hemiepiphytica* R.C.Moran and *C. nodulifera* R.C.Moran, having the trunk morphology of the former (*i.e.*, slender, without old petiole bases, fronds inserted at an almost right angle) and the lamina morphology of the latter (*i.e.*, outline more elliptic with persisting scales in axils of frond axes). A dense persistent pubescence of straight reddish brown multicellular hairs abaxially on the frond axes and the bicolorous petioles scales with pale brown to yellowish margins and darkened marginal teeth clearly separate *C. callejasii* from *C. hemiepiphytica* (hairs present but glabrescent, scales \pm concolorous) and *C. nodulifera* (only squamules and appressed branched hairs, scales weakly bicolorous but margins never as pale as in *C. callejasii*, without darker teeth). In its appearance, *C. nodulifera* is very distinct from the other two species, developing only a short stout trunk covered in prickly petiole bases from which long ascending and distally arching fronds emerge. In comparison, *C. callejasii* and *C. hemiepiphytica* have slender trunks with well-spaced fronds and without old petioles. In *C. hemiepiphytica*, the fronds are \pm patent with laminae weakly arching; in *C. callejasii*, the fronds are similarly attached to the trunk but the laminae are generally larger and thus distally more drooping than in *C. hemiepiphytica*.

The intermediate morphology could suggest a hybrid origin of *Cyathea callejasii*, and it indeed occurs where the geographical ranges of *C. hemiepiphytica* (Chocó-Esmeraldas region of northern Ecuador and southern Colombia) and *C. nodulifera* (Costa Rica/Panama to central Chocó region of Colombia) may overlap. The elevation range of *Cyathea callejasii* at 1720 m overlaps with that of *C. hemiepiphytica* (1200–1950 m) but not with that of *C. nodulifera* (up to 1380 m in Colombia, only to 1000 m in Panama). Moreover, *C. callejasii* occurred at the type locality without the two putative parents, albeit only in a small population, and the spores are regularly shaped and of even size. We thus regard it as a regularly sexually reproducing species.

3. *Cyathea cardenasii* Lehnert, F.Giraldo & W.Rodríguez, *sp. nov.* Type: COLOMBIA. Antioquia: San Luis, Quebrada “La Cristalina”, 07°14'08.4"N 75°02'05.7"W, 680 m, 2 Feb 2015, *M. Lehnert 3028 with M. Kessler, W. Rodriguez, F. Giraldo* (holotype: HUA-198559/-198570/-198571!; isotypes: BONN!, Z!). **Fig. 3.**

Trunks to 4 m tall, 6–8 cm diam., covered with old prickly petiole bases, sometimes petiole bases rotting off in older trunk parts; epidermis densely

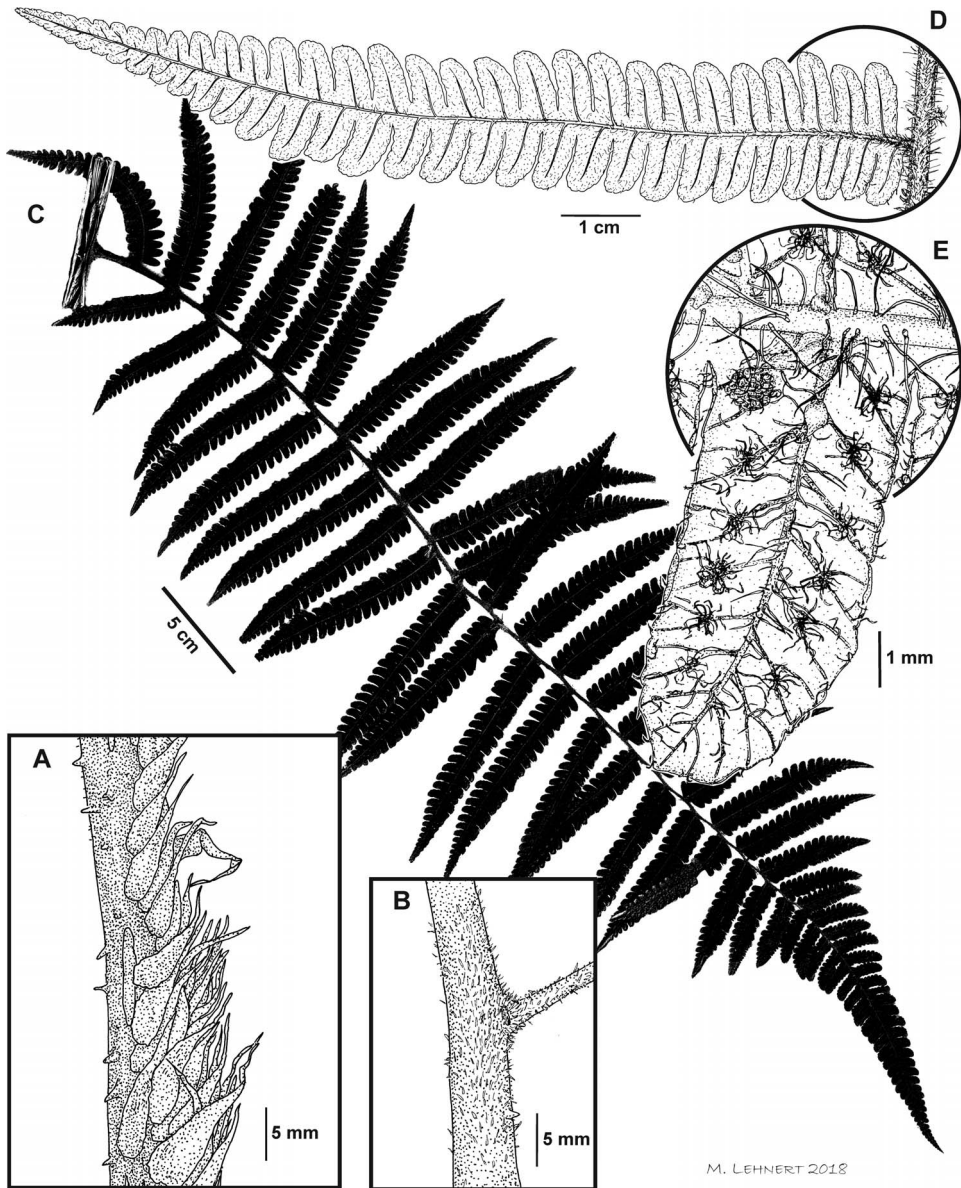


FIG. 3. *Cyathea cardenasii*. A. Petiole with scales. B. Juncture of rachis and costa abaxially, showing inconspicuous elliptic aerophore and indument of short hairs. C. Pinna. D. Pinnule, adaxially. E. Segment abaxially, most sori shown without sporangia, showing the long, contorted paraphyses (A, B from Callejas et al. 4200, COL; C–E from Lehnert 3028, BONN).

covered with brown, narrowly lanceate scales, similar to petiole scales; apices hidden between petiole bases; without adventitious buds. Fronds to 290 cm long, erect to arching. Petioles to 95 cm long, basally aculeate with prickles to 4 mm long, dark brown to atropurpureous, rarely blackish, weakly shiny, with sparse to abundant, easily abraded scurf consisting of appressed reddish brown trichomidia and branched hairs, rarely with some larger lanceate squamules to ca. 3.0×1.5 mm, orange-brown; with many multicellular hairs to 5 mm long; petioles on each side with a discontinuous line of lenticels to 15×1 mm, orange-brown in dried material. Petiole scales long-lanceate, $25\text{--}30 \times 3\text{--}6$ mm, rather thin-textured, bases cordate, basifixed to pseudopeltately attached, straight, apices long attenuate, strongly undulate and twisted; scales concolorous, auburn to orange-brown, differentiated margins persistent, the cell rows exerted, with short pale teeth. Laminae to $195 \times 140\text{--}150$ cm, bipinnate-pinnatifid, firm-chartaceous, matte, dark-green adaxially, often blackish when dried, dark olive-green abaxially; apices gradually reduced. Frond axes (rachises, costae, costules) inermous, or rachises sparsely muricate in proximal parts, brown to dark purpureous abaxially and adaxially; pubescent with whitish to tan multicellular hairs to 2(–3) mm long, antrorsely curved adaxially, abaxially spreading, persistent, leaving the epidermis rough if abraded; costae 1.5–2.0 mm wide; junctures of costae and rachises not swollen, abaxially often black when dried, each with 1–2 inconspicuous, planar to weakly protruding, elliptic aerophores, to 3.0×1.5 mm. Pinnae to 75 cm long, subsessile to stalked to 2.5 cm, 8–10 pairs per frond, patent to ascending, alternate, inarticulate, distally narrowly green-alate, with distal segments separately adnate before ending in a pinnatifid apical section; basal pinna pairs not much smaller than the medial pinnae, reflexed. Pinnules to 130×20 mm, sessile to subsessile (stalked to 1 mm), inarticulate, 1.2–2.8 cm between the stalks/costules, lanceate to linear-oblong, truncate to cuneate basally, long-acute to attenuate apically with serrate to crenulate margins; costules dark carneous to atropurpureous adaxially and abaxially, proximally often darker; adaxially strongly prominent, ridged, and densely hairy with whitish to tan, spreading to appressed, multicellular hairs to 1.5 mm long, abaxially weakly to strongly prominent, densely and persistently scurfy like the costules, with many erect, white hairs to 2.0 mm long, also with few tan to brown, flat to subbullate squamules to 2 mm long, with flat to subulate apices; costules basally without visible pneumathodes, blackened in dried specimens. Largest segments $9\text{--}12 \times 3\text{--}4$ mm, segments sessile, adnate, ascending, distally straight, tips obtuse, proximal segments alternate to subopposite, usually a bit shorter than the next segments, sometimes remote and then strongly crenate; sinuses acute to rectangular, to 1(–2) mm wide; margins crenulate to crenate; veins planar to weakly protruding adaxially and abaxially, dark carneous to atropurpureous or blackish, ending in the margins; veins adaxially and abaxially with many erect, white to yellowish white, multicellular hairs to 2 mm long on them, also along the margins and abaxially between the veins; midveins with few dark brown bullate squamules to 2.0×0.5 mm; sterile veins simple or forked, fertile

veins forked. Sori 1.0(–1.2) mm diam., medial, in the fork of veins; indusia lacking; receptacles globose, 0.2–0.3 mm diam., paraphyses numerous, tortuous but not entangled, ends free, tan to reddish brown, longer than the sporangia (ca. 0.6 mm long) and persisting in over-mature sori. Spores not examined.

Etymology.—The epithet honors our friend and colleague Dairon Cárdenas López (1957–), Instituto SINCHI, Bogotá.

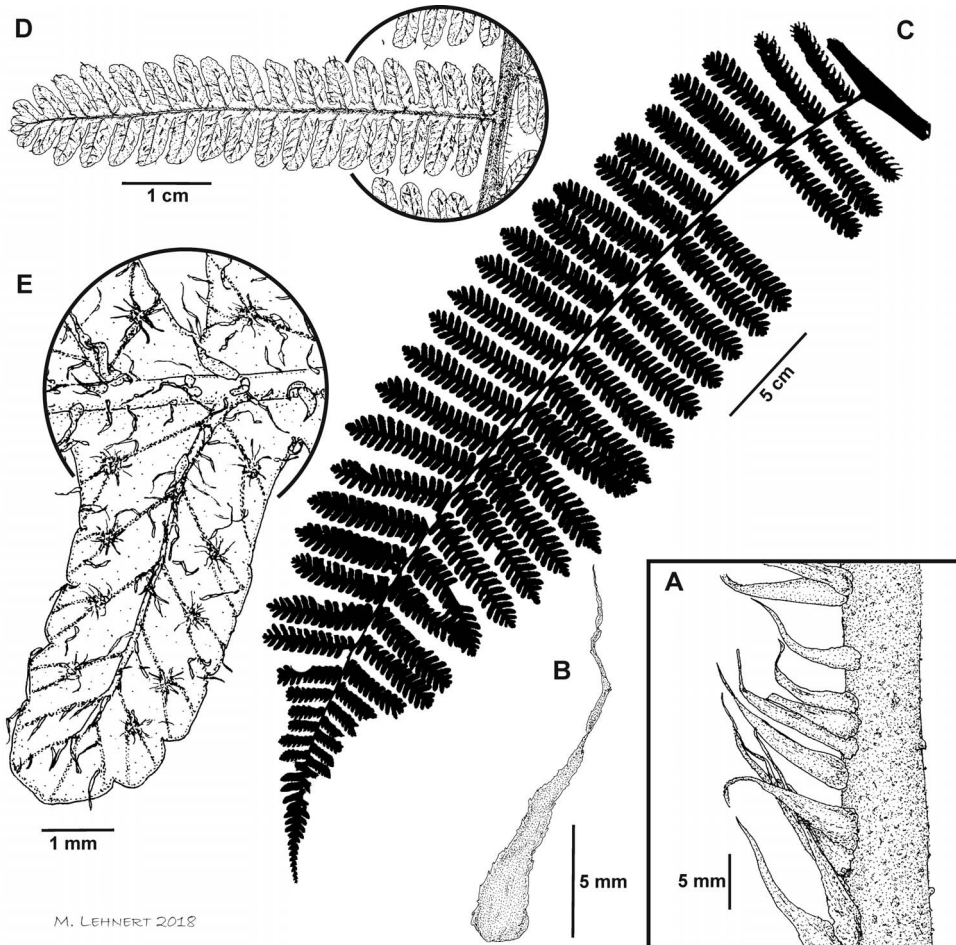
Distribution and Habitat.—Northern Colombia (Prov. Antioquia), in the understory in evergreen premontane forest at 680–1300 m.

Additional Specimens Examined (paratypes). COLOMBIA. Antioquia: Anorí, Refugio Bajo Cauca, Nechí, Finca El Cielo, Vereda Madre Seca, 6.4036111, -74.7605556, 780 m, *F. Giraldo 2534* (HUA, JAUM); Anorí, 7.2526000, -75.5176194, 800 m, *F. Giraldo 2543 A* (HUA, JAUM); Maceo, Vereda San Pedro, Finca San Pedro, 6.5825000, -75.0229167, 996 m, *O. Díaz 26* (HUA); Vereda San Pedro, Finca San Pedro, 6.9860111, -76.1190528, 970 m, Jun 2009, *P. Morales 337* (HUA); San Carlos, Corregimiento Alto Samaná, Vereda Miraflores, finca El Desespero, 6.0000000, -74.8333333, 750–890 m, *R. Callejas 8583* (HUA); Vereda La Rápida, escampadero Cantarrana, 1100 m, 18 Apr 2005, *J. Colorado 235* (HUA); San Luís, vía Medellín-Bogotá, Km 100–115, 7.1670000, -75.7336111, 1000–1300 m, 31 Mar 1987, *A.L. Arbelaéz 47* (HUA); 16 km SW de las partidas a San Luis, sobre la vía Medellín-Bogotá, Vereda La Josefina, 06°00'N, 74°50'W, 800 m, 26 Jun 1991, *R. Callejas et al. 4200* (COL); near Porcesito in valley of Río Medellín, 1100 m, 19 May 1946, *W.H. Hodge 6871* (COL, US); San Luis, Quebrada “La Cristalina”, 7.2356667, -75.0349083, 680 m, 2 Feb 2015, *M. Lehnert 3027 with M. Kessler, W. Rodríguez, F. Giraldo* (BONN, HUA, Z); San Rafael, Vereda. EL Charco, 1010–1200 m, 06°32'55"N, 75°08'19.3"W, Apr 1998, *J.A. Montes 353* (COL); Santo Domingo, Corregimiento Santiago, vertiente oriental de la Cordillera Central, 06°15'45"N, 75°01'55"W, 1789 m, 20 Jun 2014, *G. Restrepo 259* (HUA); Yolombó, Sector partidas Yolombó – Porce, 6.0833333, -74.8333333, 900–1200 m, *J. Colorado 378* (HUA).

Cyathea cardenasii differs from *C. lockwoodiana* (P.G.Windisch) Lellinger in having taller trunks to 4 m tall (vs. to 2.5 m tall in *C. lockwoodiana*), petiole scales 3–6 mm wide (vs. 1.5–3.0 mm wide), and paraphyses tortuous but not entangled ca. 0.6 mm long (vs. paraphyses heavily contorted and entangled, ca. 0.6–0.8 mm long). The paratypes *Callejas et al. 4200* and *Hodge 6871* were included under *C. lockwoodiana* in a previous treatment (Lehnert 2016).

Cyathea cardenasii differs from *C. margarita* Lehnert by sori more medial (vs. more marginal in *C. margarita*), hairs abaxially on axes and lamina to 2.0 mm long (vs. to 0.5 mm long), and petiole scales 25–30 × 3–6 mm (vs. 19 × 3.0–3.5 mm) concolorous orange-brown (vs. dark brown to castaneous with narrow, paler brown to whitish margins).

4. ***Cyathea catenata*** Lehnert, F.Giraldo & W.Rodríguez, *sp. nov.* Type: COLOMBIA. Valle de Cauca: Old road Dagua-San Buenaventura, 03°37.174'N, 76°55.744'W, 550 m, 09 Feb 2015, *M. Lehnert 3095 with F.*



M. LEHNERT 2018

FIG. 4. *Cyathea catenata*. A. Petiole with scales. B. Lager petiole scale. C- Pinna. D. Pinnule, adaxially. E. Segment abaxially, sori shown without sporangia, showing the relatively short paraphyses (from Lehnert 3095, BONN).

Giraldo & W. Rodriguez (holotype: HUA-202566/-202567/-202568!, isotype: BONN!). Fig. 4.

Trunks to 2 m tall, slender, 4–5 cm diam., not prickly, without old petiole bases; apices hidden by fascicles of petioles; without adventitious buds. Fronds to 200 cm long, patent to weakly arching from ascending petioles, larger fronds distally weakly drooping. Petioles to 60 cm long, inermous to weakly muricate, with widely spaced blunt prickles less than 1 mm long, epidermis dark stramineous to reddish brown, usually basally slightly darker, weakly shiny, scurf absent or very scarce near petiole base, consisting of appressed, tan to brown branched hairs and highly dissected squamules to 0.6 mm long; petioles scaly only in lower third, scales not reaching up to the

rachises. Petiole scales lanceate to linear-lanceate, to 15.0×2.0 – 3.5 mm, bases cordate or round, pseudopeltately to peltately attached, apices attenuate, straight or weakly falcate, flat; concordantly bicolorous to nearly concolorous, dark brown (atropurpureous to castaneous in backlight) with brown to yellowish margins; differentiated margins narrow, without setae, erose-dentate, fragile, often partially abraded. Laminae to 160×90 cm, broad-elliptic, bipinnate-pinnatifid, firm-herbaceous, dark green adaxially, pale gray-green abaxially; apex gradually reduced or a broad subconform section. Rachises inermous, weakly shiny, dark brown to purpureous abaxially and adaxially, rarely dark stramineous to ochre; adaxially densely hairy with white to tan, antrorsely curved multicellular hairs 1.0 – 1.5 mm long, abaxially and on the sides with thick spreading white to tan hairs (1.0)– 1.5 – 2.0 mm long, catenate in dried specimens, and with few small brown lanceate scales (to 1.0×0.5 mm), without scurf. Pinnae to 45 cm long, sessile to subsessile (appearing short-stalked to 1 cm when basal pinnules are missing), ca. 16 pairs per frond, weakly ascending, alternate, inarticulate, distally distinctly green-alate, distal segments weakly decurrently adnate before ending in a pinnatifid apical section; basal pinna pairs ca. $2/3$ the length of the medial pinnae, weakly reflexed. Costae to 1.5 mm wide, inermous or sparsely verrucate, dark brown to ochre abaxially, greenish to dark brown adaxially; with the same indument as on the rachises; junctures of costae and rachises often with dense scurf and some bullate squamules; junctures weakly swollen abaxially, each bearing a planar elliptic pneumathode to 2×1 mm, pale brown, with an adjacent conspicuous black spot in dried specimens (foliar nectary). Largest pinnules 52 – 78×11 – 17 mm, pinnules sessile, inarticulate, ca. 1.5 cm between the stalks/costules, linear-oblong to oblanceolate, bases cuneate to rounded, often inequilateral, apices round to obtuse, rarely broadly acuminate with crenate margins; costules dark carneous to blackish green adaxially and abaxially, strongly prominent and densely hairy adaxially with white, curved multicellular hairs to 1.5 mm long; abaxially planar or weakly prominent, with many erect, white, uniseriate multicellular hairs 1.0 – 1.5 –(2.0) mm long, some also between the veins, and few to many bullate pale to dark brown squamules to 1.0×0.5 mm, with entire margins and attenuate tips; costules basally without visible pneumathodes but with blackened area in dried specimens. Largest segments 7.0 – $8.0 \times (2.0)$ – 2.5 – 3.0 mm, segments ascending, straight to distally falcate, tips obtuse to rounded, sinuses acute to obtuse, 1.0 – 2.0 mm wide; proximal segments alternate to subopposite, \pm the same size as following segments, never remote from each other; margins shallowly to strongly crenate, not differently incised in proximal segments of a pinnule; veins planar on both sides or weakly protruding adaxially, brown to blackish, equally hairy on both sides with uniseriate multicellular, white to tan hairs 1.0 – 1.5 mm long, partially to wholly catenate in dried specimens, the same hairs abaxially also between the veins; midveins abaxially with few to many bullate brown squamules 1.0×0.5 mm, with entire margins and elongate tips; sterile veins simple or forked, fertile veins mostly forked. Sori 1.0 mm diam., medial to supramedial, parallel to the margins, in fork of veins; indusia

lacking; receptacles globose, 0.2–0.3 mm diam., not subtended by squamules, paraphyses numerous, pale brown to reddish brown, same length as sporangia (0.3–0.4 mm long). Spores not examined

Etymology.—The epithet refers to the white catenate hairs evident on the laminae of dried specimens.

Distribution and Habitat.—Only known from the southern Chocó region in Colombia (Depts. Valle de Cauca, Nariño) in ever-wet forests at 300–1000 m.

Additional Specimens Examined (Paratypes). COLOMBIA. Nariño: Nariño-Junin, 5 km en dirección a Barbacoas, 1000 m, 20 Dec 1972, *W. Hagemann & N. Leist 1731* (COL). Valle del Cauca: Buenaventura Municipio Bajo Anchicayá, 03°45'N, 76°50'W, 300 m, 19 Oct 1989, *A. Gentry & O. Rangel 68310* (COL, MO); *ibid.*, *A. Gentry & O. Rangel 68282* (COL, MO), *ibid.*, *A. Gentry & O. Rangel 68531* (COL, MO); *ibid.*, 20 Oct 1989, *A. Gentry & O. Rangel 68597A* (COL, MO), *ibid.*, 21 Oct 1989, *A. Gentry & O. Rangel 68634A* (COL, MO).

Cyathea catenata belongs to the group of *Cyathea tortuosa* R.C.Moran (Lehnert *et al.*, unpublished data), a group of slender-trunked understory species with shiny green laminae. It differs from other species in the group by hairs on both sides of the veins abundant, usually catenate, thick, whitish, and spreading. The other species in the group (*i.e.*, *C. darienensis* R.C.Moran, *C. tortuosa*, *C. schiedeana* (C.Presl) Domin, *C. wendlandii* (Kuhn) Domin) have hairs only sparsely present on the veins adaxially, and the hairs are usually not notably catenate, either because they are thick and turgid or much thinner and twisted in dried specimens. *Cyathea catenata* is very similar in appearance to *Cyathea tortuosa* R.C.Moran, with slender trunks 4–5 cm diam., concolorous appearing dark brown petiole scales and blunt-tipped pinnules. *Cyathea catenata* stands apart by its shallowly to strongly crenate segment margins (*vs.* \pm subentire in *C. tortuosa*) and the thicker, spreading hairs on the segments (*vs.* most hairs on segments tortuous, appressed in *C. tortuosa*), which are usually catenate in dried specimens. *Cyathea darienensis* differs in the same characters from *C. catenata* (*i.e.*, segments entire, less hairy, spreading hairs on segments not thick) and has more and larger dark brown bullate squamules on costules.

With its narrow crenate segments, *Cyathea catenata* resembles *C. lasiosora* (Kuhn) Domin of the Amazon basin but can be distinguished by persistent catenate hairs (*vs.* often glabrescent, with hairs turgid to collapsed but not catenate in *C. lasiosora*) and paraphyses not surpassing sporangia (*vs.* surpassing closed sporangia). Specimens of *C. catenata* may also be the basis for some erroneous records of *C. pilosissima* (Hook.) Domin, a species currently known only from the eastern Andean slopes of Peru, from the Chocó region (Lellinger, 1989). *Cyathea pilosissima* is distinguished by the spreading red hairs on the frond axes, the densely hairy petiole and the whitish petiole scale margins, which are characters absent in *C. catenata*.

Another similar species, herein described as *C. kessleriana*, differs from *C. catenata* by being larger, having more hairs on the laminae, and lacking scurf on the petioles. *Cyathea catenata* differs further in being equally hairy on both sides with uniseriate multicellular (*vs.* veins hairier abaxially than adaxially in

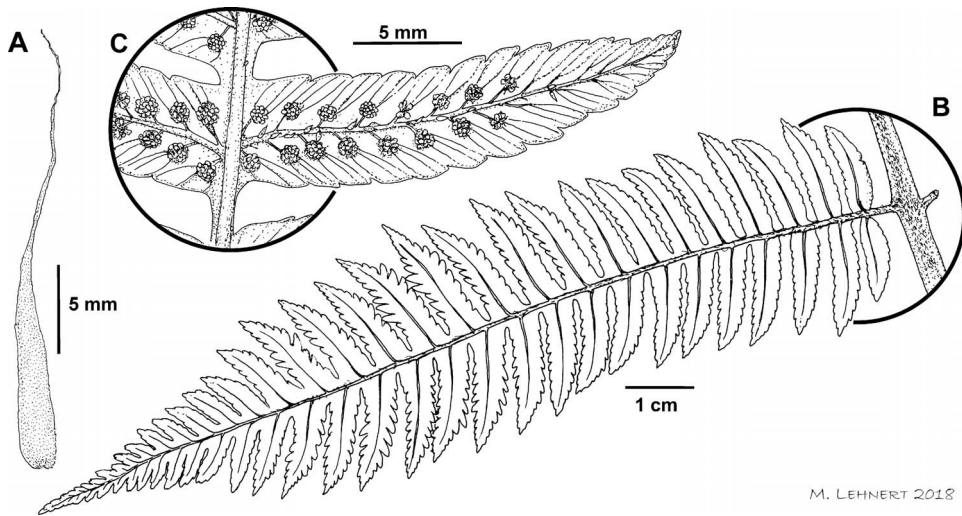


FIG. 5. *Cyathea coloradoana* A. Petiole scale. B. Pinnule, adaxially. C. Segment, fertile, abaxially (from *Colorado 651*, HUA).

C. kessleriana) and having slightly smaller segments with wider sinuses (segments to $8 \times (2.0\text{--}2.5\text{--}3.0\text{ mm})$, sinuses $1.0\text{--}2.0\text{ mm}$ wide in *C. catenata* vs. to $11 \times 3\text{--}4\text{ mm}$, sinuses $0.5\text{--}1.0(\text{--}2.0)\text{ mm}$ wide in *C. kessleriana*) and more strongly crenate margins.

Cyathea margarita is another relatively small exindusiate species from the Chocó-Esmeraldas region that may be found together with *C. catenata* and *C. kessleriana*, which can be easily distinguished by its pale brown to yellowish axes (vs. dark brown to atropurpureous in *C. catenata* and *C. kessleriana*), abundant short acicular hairs between the veins abaxially (vs. hairs absent or long and catenate), and sori notably positioned close to the margins (vs. \pm sori medial).

5. *Cyathea coloradoana* Lehnert, F.Giraldo & W.Rodríguez, *sp. nov.* Type: COLOMBIA. Antioquia: Municipio Anorí, Vereda Providencia, sector cerca al Puente de la Quebrada Providencia, $07^{\circ}20'54''\text{N}$, $75^{\circ}01'15''\text{W}$, 200 m, 14 Jun 2011, *J. Colorado & W. Uribe 651* (holotype: HUA-178335/-178336/-178337!). **Fig. 5.**

Trunks to 4 m tall, to 12 cm diam., otherwise unknown. Fronds to ca. 200 cm long. Petioles to 70 cm long, sparsely muricate to short-aculeate, dark brown, basally becoming darker, shiny, without scurf except for sparse appressed, tan to brown trichomidia near the base; basally with a discontinuous line of elliptic pneumathodes to $8 \times 1.5\text{--}2.0\text{ mm}$, dark brown in dried material; petioles scales restricted to proximal half of petioles. Petiole scales lanceate to linear-lanceate, $25 \times 2\text{ mm}$, bases weakly cordate, basifixed to pseudopeltately attached, apices elongate, twisted; concolorous dark brown to castaneous;

differentiated margins persistent, very narrow, reduced to a line of teeth in distal parts. Laminae to ca. 130×170 cm, bipinnate-pinnatifid to partially tripinnate, broadly ovate, herbaceous, dark green adaxially, pale gray-green abaxially; apices \pm abruptly reduced to subconform pinnate-pinnatifid sections. Rachises inermous, weakly shiny, dark brown abaxially and adaxially, without scales; in distal parts with antrorsely curved, white to tan multicellular hairs 0.5–0.8 mm long adaxially, abaxially glabrous, epidermis smooth. Largest pinnae to 90 cm long, stalked to 3 cm, pinnae patent to ascending, alternate, inarticulate, 7 pairs per frond, distally weakly green-ate, distal segments adnate before ending in a pinnatifid apical section; basal pinna pairs reflexed, stalked to 5 cm, ca. $1/2$ the size of the medial pinnae, with the proximal basiscopic pinnules reduced or missing. Costae to 3 mm wide, inermous, dark brown abaxially and adaxially, adaxially with antrorsely curved, uniseriate hairs (0.8–1.0 mm long), abaxially glabrous or with remnants of reddish brown scurf of appressed branched hairs; junctures not swollen, each bearing abaxially a dark brown planar, elliptic pneumathode to 3.0×1.5 mm, with a conspicuous black spot below (foliar nectary). Largest pinnules $135\text{--}152 \times 38\text{--}45$ mm, subsessile to stalked to 5 mm, 2.9–3.3 cm between stalks/costules, pinnules inarticulate, linear-oblong to lanceate, bases round to cuneate, apices long-acuminate to attenuate, with crenulate to serrulate margins; costules carneous to orange-brown adaxially and abaxially, adaxially strongly prominent, ridged, with many whitish to tan, antrorsely curved multicellular hairs to 0.5(–1.0) mm long; abaxially weakly to strongly prominent, glabrous or glabrescent with remnants of scurf, with few to many dark brown to castaneous scales to 1.0×0.5 mm, a mixture of larger flat lanceate ones with entire margins, bullate ones with filiform tip, and smaller flat lanceate scales with fimbriate margins; costules basally without visible pneumathodes, but often with a black spot abaxially in dried specimens. Largest segments $18\text{--}22 \times 5.0\text{--}7.5$ mm, segments elongate to long-deltate, patent to ascending, straight to distally weakly falcate, tips acute; proximal segments alternate to subopposite, notably smaller than following segments, sometimes remote from each other, then connected by a thin strand of green tissue; sinuses acute to rectangular, 1.5–2.0(–3.0) mm wide; margins serrulate, deeply so towards the tips of distal segments, in proximal segments of a pinnule identically incised; midveins strongly protruding, adaxially ridged, lateral veins planar on both sides or weakly protruding adaxially, green or brown, adaxially with few hairs on the midveins, abaxially without uniseriate hairs but with remnants of scurf (reddish brown branched hairs) and some bullate and flat squamules like on the costules; sterile veins simple or forked, fertile veins forked. Sori 0.8–1.0 mm diam., each with ca. 40 sporangia, medial to inframedial, parallel to margins, usually in fork of veins; indusia lacking; receptacles globose, ca. 0.2 mm diam., paraphyses many, reddish or pale brown, catenate, tortuous, slightly longer than the sporangia (0.5 mm long). Spores not examined.

Etymology.—Named after Jhon Jairo Colorado (1965–), Colombian botanist and plant illustrator, collector of the type specimen.

Distribution and Habitat.—Known only from the type specimen, found in northern Colombia (Dept. Antioquia) in lowland rain forests at 200 m.

Cyathea coloradoana resembles *C. myosuroides* (Liebm.) Domin in scale color and structure (*i.e.*, the differentiated scale margin reduced to a row of marginal teeth at least near the scale tip), laminar indument (*i.e.*, veins abaxially densely hairy with spreading to antrorsely curved, white, multicellular hairs 0.5–0.8(–1.0) mm long, also with few to many dark brown to castaneous, flat, lanceate scales to 2×1 mm) and sori (*i.e.* exindusiate with long paraphyses). *Cyathea coloradoana* differs in having fewer pinnae (ca. 7 pairs per frond in *C. coloradoana* vs. 10–11 pairs in *C. myosuroides*) and larger pinnules ($135\text{--}152 \times 38\text{--}45$ mm vs. $85\text{--}115(–140) \times 18\text{--}20(–25)$ mm in *C. myosuroides*) with longer, conspicuously deeply serrate tips and softer laminar texture, and lacking long, multicellular, marginal cilia in the scales of the laminar indument. Regarding the laminar texture and the serrate segment margins, *C. coloradoana* resembles more *C. microdonta*. Again, *C. coloradoana* is larger in most parts of the frond (largest pinnules $135\text{--}152 \times 38\text{--}45$ mm in *C. coloradoana* vs. $55\text{--}115 \times 9\text{--}22$ mm in *C. microdonta*) but has narrower petiole scales (25×2 mm vs. $14\text{--}32 \times 2.5\text{--}4.5$ mm).

The slightly oblanceolate segments of *Cyathea coloradoana* with their distally more deeply incised margins are very conspicuous. We suspect that this is usually a sign of hybrid origin, as this rare feature is mainly known from the documented hybrids *C. \times hombersleyi* (Maxon) Stolze, *C. \times wilsonii* (Hook.) Domin, and further genetically confirmed hybrids that still wait formal recognition (Lehnert *et al.*, unpubl. data). We want to point out that this aspect needs further investigation but at the same time that we do not have any further evidence for a hybrid origin of *C. coloradoana*.

6. *Cyathea kessleriana* Lehnert, F. Giraldo & A. Tejedor, *sp. nov.* Type: COLOMBIA. Risaralda: Municipio Santa Cecilia, via que conduce desde Pueblo Rico a Santa Cecilia, al borde de la via principal, $05^{\circ}19'45.0''\text{N}$, $76^{\circ}10'23.72''\text{W}$, 300–700 m, F. Giraldo & A. Tejedor 3130 (holotype: HUA-201975/-201976/-201977!). **Fig. 6.**

Trunks to 3 m tall, erect, to 5 cm diam., without old petiole bases, no skirt of dead fronds; without adventitious buds. Fronds to 210 cm long, \pm patent to weakly arching. Petioles 27–45 cm long, sparsely aculeate with few prickles to 1 mm long, brown to dark brown, matte to weakly shiny, with easily abraded scurf consisting of appressed, light brown squamules, largely missing in older fronds; petioles basally with few light to orange-brown pneumathodes to 15×1.5 mm on each side, only scaly near petiole base. Petiole scales narrowly lanceate, $12\text{--}16 \times 2.0\text{--}3.5$ mm, shiny, concolorous dark brown or with lighter brown margins, bases cordate, pseudopeltately attached, apices long acute, straight to falcate, undulate or weakly twisted; differentiated margins narrow (ca. 0.2 mm wide), fragile, often abraded, the cell rows strongly exerted. Laminae to $165 \times 110\text{--}120$ cm, ovate, bipinnate-pinnatifid, firm herbaceous, matte, rich green adaxially, often blackish when dried, grayish green abaxially;

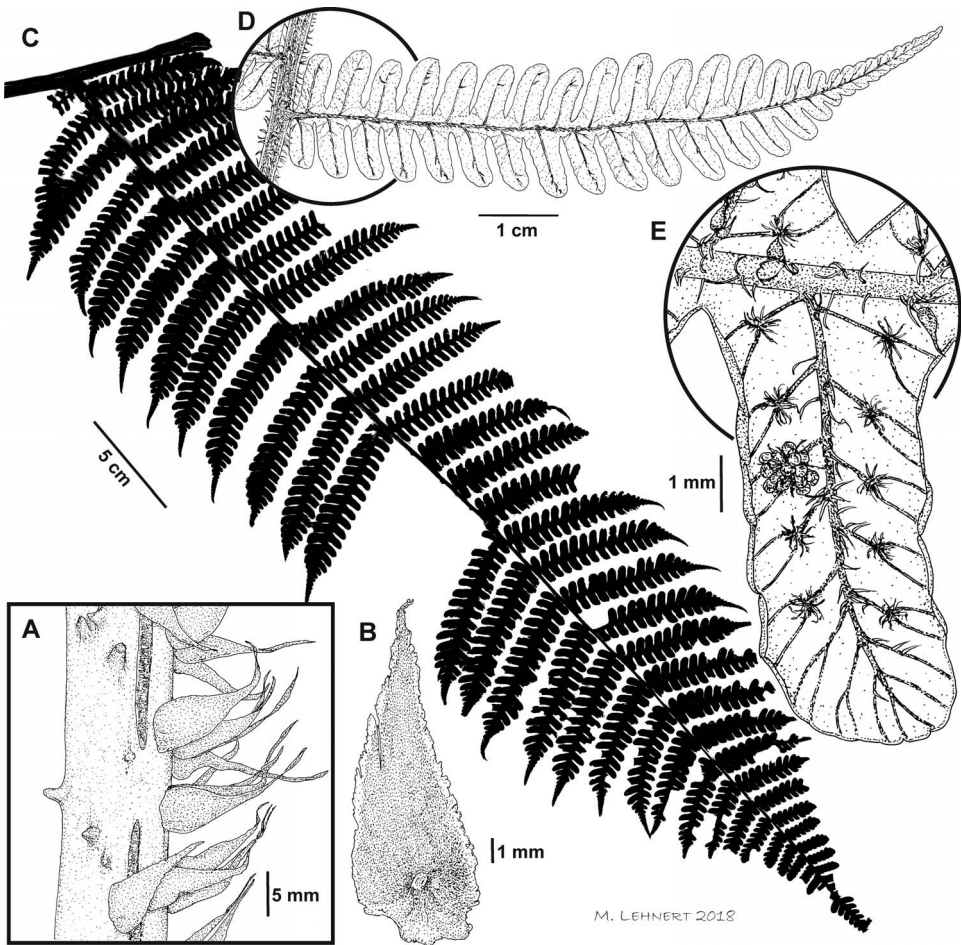


FIG. 6. *Cyathea kessleriana*. A. Petiole with scales, showing two pneumathodes. B. Petiole scale, showing point of peltate attachment. C. Pinna. D. Pinnule, adaxially. E. Segment abaxially, most sori shown without sporangia, showing the straight paraphyses (from *Giraldo 3130*, BONN).

apices abruptly reduced to broad subconform sections. Rachises inermous or proximally muricate, brown to dark brown abaxially and adaxially; adaxially with pale reddish brown, multicellular, antrorsely curved hairs 1.0–2.0 mm long, abaxially with similar persistent hairs but paler and spreading, their indurated bases leaving the cortex scabrous. Largest pinnae 55–60 cm long, pinnae patent to weakly ascending, mostly sessile, ca. 9 pairs per frond, alternate, inarticulate, distally narrowly green-alate, distal segments adnate before ending in a pinnatifid apical section; basal pinnae 1/2 the length of longest pinnae, stalked to 1 cm, patent to weakly reflexed. Costae to 3 mm wide, inermous, abaxially dark stramineous to yellowish brown, adaxially darker, adaxially with antrorsely curved to appressed, whitish to pale brown

uniseriate hairs 1.0–1.5 mm long, abaxially with many spreading white multicellular white hairs to 1.5(–2.0) mm long and few scattered brown to dark brown bullate squamules to 1.0×0.5 mm, with acuminate tips; junctures of costae and rachises abaxially weakly swollen, each with an inconspicuous, planar to weakly protruding elliptic pneumathode to 3.0×1.5 mm, with a dark brown to blackish spot below (foliar nectary). Largest pinnules 61–97 \times 11–18 mm, pinnules sessile, inarticulate, ca. 1.5–2.0(–2.5) cm between the costules, linear-oblong to oblanceate, bases truncate to cuneate, tips obtuse to broadly acute, in large plants also short-attenuate, with subentire to crenate margins, costules carneous to greenish brown on both sides, adaxially strongly prominent, ridged, abaxially weakly to strongly prominent, adaxially densely hairy with whitish to pale brown, curved to appressed, uniseriate hairs 1.0–1.5 mm long, abaxially with many stout white hairs 1.0–1.5 mm long and some scattered, weakly bullate, ovate-acuminate, dark brown squamules 1.0×0.5 mm, with entire margins and subulate to elongate tips; costules basally with small inconspicuous pneumathodes to 1.0×0.5 mm, area mostly black in dried specimens. Largest segments 7–11 \times 3–4 mm, sessile, adnate, patent to weakly ascending, distally straight to weakly falcate, tips obtuse to rounded, proximal segments alternate to subopposite, \pm the same size as following segments, never remote; sinuses acute to obtuse, 0.5–1.0(–2.0) mm wide; margins subentire to weakly crenate, near the tips also dentate or rarely deeply crenate, proximal segments with margins incised \pm symmetrically; veins planar adaxially and abaxially, greenish to blackish, ending in the margins; veins hairier abaxially than adaxially, with erect, tan to white uniseriate hairs (0.5–)1.0–1.5 mm long, thick, often catenate in dried specimens, adaxially hairs sparse on midveins, rare on lateral veins, abaxially numerous on midveins, thick, often catenate in dried specimens, fewer and thinner on lateral veins, also sparsely between the veins, here also sometimes with brown dots (unicellular trichomidia and bases of lost hairs); abaxially with few brown to dark brown, weakly to strongly bullate squamules to 1.0×0.5 mm; sterile veins simple or forked, fertile veins mostly forked. Sori 0.6–0.8 mm diam., medial to inframedial, parallel to the margins, in the fork of veins, mature dark orange-brown; indusia lacking; receptacles globose, 0.2–0.3 mm diam., not subtended by a scale, paraphyses numerous, straight, pale brown to reddish, of the same length as or shorter than the sporangia (0.3–0.4 mm long). Spores tetrathedral-globose, pale yellow, perispore not examined.

Etymology.—The epithet honors our friend and mentor, Michael Kessler (1967-), University of Zurich, Switzerland.

Distribution and Habitat.—Western Colombia (Depts. Chocó, Valle de Cauca) in wet montane forests at 300–1350 m.

Additional Specimens Examined (Paratypes). COLOMBIA. Chocó: Carmen de Atrato, al lado de la vía Ciudad Bolívar-Quibdó, 05°46'17.1N, 76°14'24.5"W, 1300 m, 12 Feb 2016, *F. Giraldo 3753* (HUA); San José del Palmar, Vereda La Badea, 920 m, 24 Jan 1983, *P. Franco 1835* (COL); *Ibid.*, Vereda Portachuelo, Fca. Barro Blanco, 1300 m, 15 Jan 1983, *Santiago Diaz 3602* (COL); *Ibid.*, Vereda Portachuelo, Hacienda Barro Blanco, 1350 m 15 Jan 1983, *P. Franco*

1319 (COL); N3vita, Vereda Curund3, margen izquierda del rio Ingar3, 550 m, 01 Dec 1983, P. Franco 1100 (COL). Valle de Cauca: Buenaventura, Municipio Bajo Anchicay3, Levantamiento, 03345'N, 76350'W, 300 m, A. Gentry, O. Rangel & curso Postgrado-Bot3nico 68531 (COL, MO).

Cyathea kessleriana is best described as a hairy version of *C. darienensis* with fewer bullate squamules. In direct comparison, *C. kessleriana* has segment margins notably more crenate than *C. darienensis*, veins with longer, thicker, and paler hairs (1.0–1.5 m long, whitish catenate in *C. kessleriana* vs. 0.5(–1.0) mm long, tan to brown in *C. darienensis*) and only some scattered weakly bullate dark brown squamules 1.0 × 0.5 mm (vs. squamules strongly bullate, frequent to abundant).

From *Cyathea catenata*, *C. kessleriana* differs in having fewer pinnae on average (ca. 9 pinna pairs per frond in *C. kessleriana* vs. to 16 pairs in *C. catenata*), being abaxially hairier than adaxially on the veins (vs. equally hairy on both sides), and having slightly larger segments with narrower sinuses (segments 7–12 × 3–4 mm, sinuses 0.5–1.0(–2.0) mm wide in *C. kessleriana* vs. segments to 8 × (2.0–)2.5–3.0 mm, sinuses 1.0–2.0 mm wide in *C. catenata*).

Cyathea kessleriana, like *C. catenata*, stands out within the *C. tortuosa* alliance by having scabrous axes due to the persisting strong hairs. The other species of this alliance (including *C. darienensis*, *C. tortuosa*, *C. schiedeana* and *C. wendlandii*) are either glabrous or have sparse, finer hairs that are not detectable by touch.

7. *Cyathea pacis* F.Giraldo, W.Rodr3guez & A.Tejedor, *sp. nov.* Type: COLOMBIA. Antioquia: Mpio. Ituango, Vereda San Pablo del R3o Sucio, Finca Guasimal, Parque Nacional Natural Paramillo, cerca al Alto del Oso, quebrada Santa Barb3ra, (ca. 07320'51.14"N, 75352'08.11"W) 1750–1810 m, 15 May 2003, F. Giraldo, W. Rodr3guez & J. Colorado 2622 (holotype: HUA-202137/-202138/-202139!). **Fig. 7.**

Trunks to 2.5 m, straight, massive, 12 cm diam., with old petioles; densely covered with concolorous pale brown to stramineous scales like those on the petioles; apices hidden between petiole bases; without adventitious buds. Fronds to 310 cm long, arching on erect petioles, clustered at trunk apex, unfurling only one at a time. Petioles to 100 cm long, aculeate with prickles to 7 mm long, scattered and hidden between dense petiole scales; epidermis brown, matte, with scattered scurf of white lacerate flat lanceate squamules 1–2 mm long; hairs absent. Petiole scales thin-textured, lustrous, linear-lanceate, bases cordate, pseudopeltately to peltately attached, apices long tapering, twisted, larger scales to 50 × 2.5–3.5 mm, concolorous pale brown to weakly bicolorous with paler to white margins, smaller ones to 20 × 1.5–2.0 mm, mostly concolorous stramineous or with an apical brown central stripe, differentiated margins reduced to few or a single cell row, cell rows not exerted, entire or with few distant unicellular teeth; scales covering petiole densely and persistently, reaching up to most parts of the rachis. Laminae to 210 × 120 cm, ovate-elliptic, bipinnate with gradually reduced, inarticulate

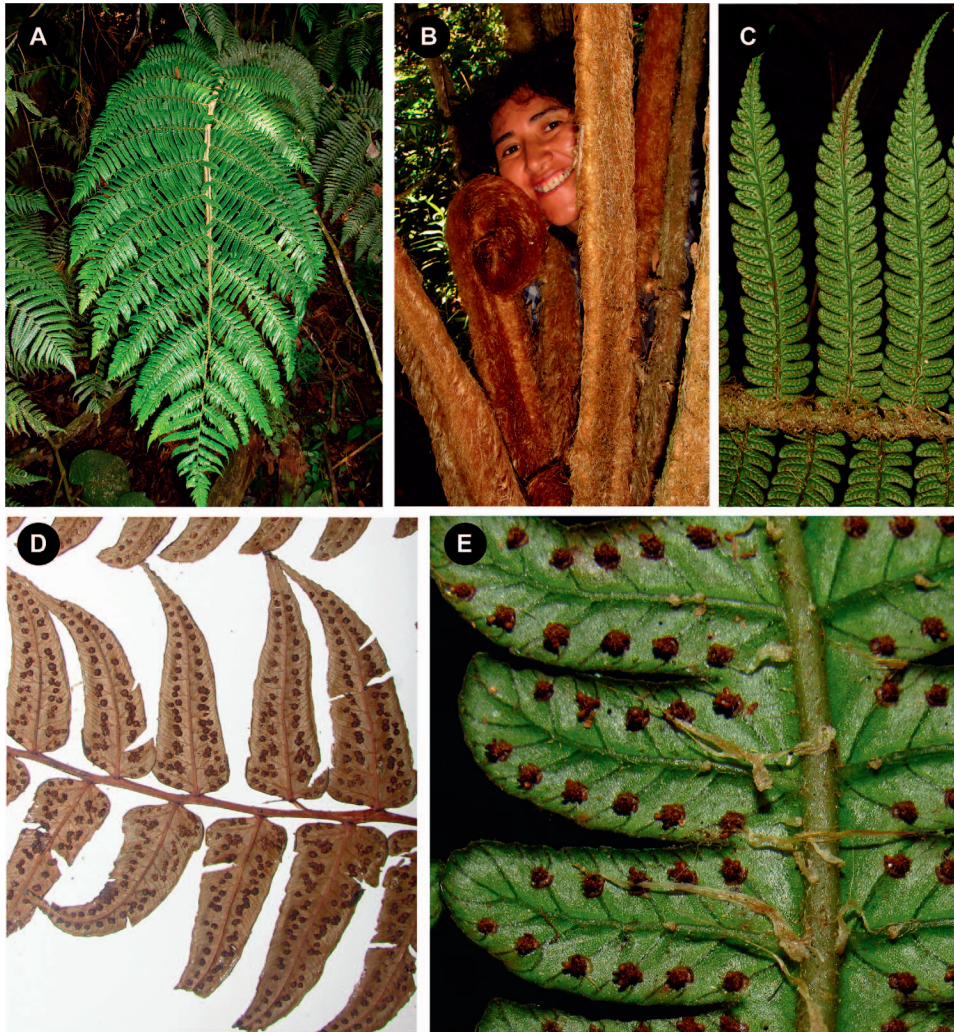


FIG. 7. *Cyathea pacis*. A. Habit, showing arching-drooping fronds. B. Apex with expanding crozier; with Gloria Calatayud. C. Larger pinnules abaxially, showing the persisting pale scales on the costa. D. Distal part of pinna abaxially, with entire pinnules (*Giraldo 2622*, HUA). E. Segments abaxially, with overmature sori, most sporangia missing; note the ascending hemitelioid indusia, best visible on the right side (photos by A. Tejedor).

apices in mature plants, subcoriaceous, adaxially shiny dark green (blackish when dried), abaxially matte olive-green. Rachises basally sparsely aculeate with scattered prickles to 0.4 mm long, brown to dark brown, adaxially often blackish and with few appressed trichomidia, multicellular hairs absent, on the sides and abaxially covered with lanceate scales similar to petiole scales, concolorous white to stramineous, some with brown basal spot and apical stripe, to 15×2 mm; rachises distally not green alate. Pinnae to 65 cm long,

alternate, patent to distally weakly ascending, inarticulate; only distally green-alate before ending in a pinnatifid apical section, distal segments free to adnate, not basally decurrent; basal pinnae ca. 1/3 the length of longest pinnae, reflexed. Costae to 3 mm wide, inermous, brown to dark brown, adaxially darker than abaxially; adaxially with appressed reddish brown multicellular hairs to 1 mm long, rather sparse, abaxially without hairs, basally with scaly indument like on the rachises; junctures of costae and rachises not or weakly swollen, each abaxially with a dark pneumathode $2-3 \times 1-2$ mm. Largest pinnules $155 \times 22-25$ mm, subsessile with stalks to 1(-2) mm, linear-lanceate, lobed 1/5 to 3/4 towards the costules, smaller ones sessile, lanceate with coarsely crenate to subentire margins, 2.0-2.6 cm between the stalks/costules, pinnules basally mostly truncate (larger ones weakly cordate, smaller ones weakly cuneate to rounded), basal lobes not covering the costae; apices attenuate to caudate with serrate margins; costules blackish brown to dark carneus, adaxially ridged and with few hairs (0.5-1.0 mm long), prominent and glabrous abaxially, basally without visible pneumathode, with a dark spot; lobes round to obtuse and weakly falcate, margins entire, weakly sinuous to widely and shallowly dentate; most veins differentiated into a prominent brown midvein and planar to weakly raised lateral veins, the basal ones arising from the midvein, connivent to sinuses or ending blindly below then, joined between the lobes by an anastomosing vein, few lateral veins also forming anastomoses; veins adaxially glabrous, abaxially lacking hairs but with appressed brown unicellular trichomidia, also between veins; sterile and fertile veins simple or forked. Sori 1.0-1.2 mm diam., medial to inframedial, \pm equidistant between midveins and margins in lower half of segment, slightly closer to midvein in upper half of segment, on the back of veins; indusia hemitelioid, brown, reaching 1/3-1/2 around the receptacles, arching, often split in two lobes at maturity; receptacles globose, 0.3-0.4 mm diam., paraphyses few, fragile, mostly absent, reddish brown, straight, shorter than the sporangia (0.2-0.3 mm). Spores not examined.

Etymology.—The specific epithet “of peace” reflects the hope of permanent peace in Colombia.

Distribution and Habitat.—Northern Colombia (Dept. Antioquia), in wet montane forests at 1750-1810 m.

Cyathea pacis is characterized by its dense pale petiole scales that reach up to the lower rachis and its almost entire pinnules in distal pinna parts. The species is similar in these aspects to *C. pilozana* M.T.Murillo & J.Murillo and *C. marginalis* (Klotzsch) Domin. *Cyathea pacis* differs from *C. pilozana* and *C. marginalis* in having the larger pinnules strongly pinnatifid (vs. never incised more than 1/5 towards the costules). *Cyathea pacis* and *C. pilozana* have hemitelioid indusia whereas *C. marginalis* is exindusiate.

Cyathea pacis is yet another example of a newly discovered species that bears a strange combination of characters known from several different species (like *C. chimaera* Lehnert & A.Tejedor). Superficially it resembles Neotropical species of *Sphaeropteris* by its large croziers covered in thin, papery scales. With its hemitelioid indusia and reduced petiole scale margins, it probably

belongs to the alliance of *Cyathea trillii* Domin (Lehnert 2011). These species are understory plants of mostly lower elevations and warmer climates, often occurring on sandstone and similarly nutrient-deficient soils. We do not have any information on the soil chemistry at the type locality, but the bedrocks could be late Cretaceous oceanic basalts, mylonitic schists or sedimentary rocks (Sillitoe and Perello, 2005).

8. *Cyathea pholidota* Lehnert, F.Giraldo & A.Tejedor, *sp. nov.* Type: COLOMBIA. Risaralda: Santa Cecilia, vía que conduce desde Pueblo Rico a Santa Cecilia, al borde de la vía principal, 05°19'45.0"N, 76°10'23.72"W, 2000–2160 m, 28 Jul 2015, *Giraldo F. 3132 with A. Tejedor* (holotype: HUA-202172/-202173/-202174!). **Fig. 8.**

Trunks 1.8 m tall, erect to decumbent, to 6 cm diam., without old petiole bases, epidermis shiny black, with groups of sunken orange–brown lenticels (ca. 4–6 × 3–4 mm) below the grayish brown elliptic frond scars; without adventitious buds. Fronds to 200 cm long, arching from erect to ascending petioles. Petioles to 40 cm long, inermous to verrucate, dark brown, matte to weakly shiny, with easily abraded scurf consisting of appressed, light brown dissected squamules and branched hairs, inconspicuous on similar colored epidermis; petioles basally without lenticels or not detectible in dried material; persistently scaly, especially along the margins, scales reaching up to most of the rachis and along the costae. Petiole scales narrowly lanceate, 10–25 × 3–4 mm, shiny, concordantly bicolorous to almost concolorous, brown to dark brown with lighter brown to yellowish white margins, bases cordate, pseudopeltately attached, apices long acute to attenuate, straight to falcate, undulate but not twisted; differentiated margins narrow (ca. 0.2 mm), fragile, often abraded, the cell rows strongly exerted. Laminae to 160 × 130 cm, ovate, bipinnate-pinnatifid, firm-herbaceous, matte, a rich green adaxially, blackish when dried, olive-green abaxially; apices abruptly reduced, ± conform. Rachises inermous, brown to dark brown abaxially and adaxially; adaxially in distal parts short-pubescent with reddish brown multicellular hairs to 1.0 mm long, abaxially with dark brown bullate squamules 0.5–1.0 mm long, hairs absent; larger brown lanceate scales persistent adaxially and along the sides, to 15 × 3–4 mm. Pinnae to 65 cm long, patent to weakly ascending, sessile, 7–8 pairs per frond, subopposite to alternate, inarticulate, narrowly green-alate for most of their length, alae in basal half turned upwards, in distal half patent and visible, distal segments simply adnate before ending in a pinnatifid apical section; basal pinna pairs 1/2 –1/3 of the length of the medial pinnae, with cuneate inequilateral bases (basiscopic pinnules absent), reflexed. Costae to 3.0 mm wide, inermous, dark brown on both sides, adaxially with brown, antrorsely curved to appressed, uniseriate hairs to 1 mm long, abaxially with many dark brown bullate squamules (0.4–0.6 mm long) with acuminate tips, with larger flat concolorous brown lanceate scales to 15 × 3 mm, hairs lacking; junctures of costae and rachises abaxially weakly swollen, each with an inconspicuous, planar to weakly protruding, elliptic pneumathode to 6 × 3

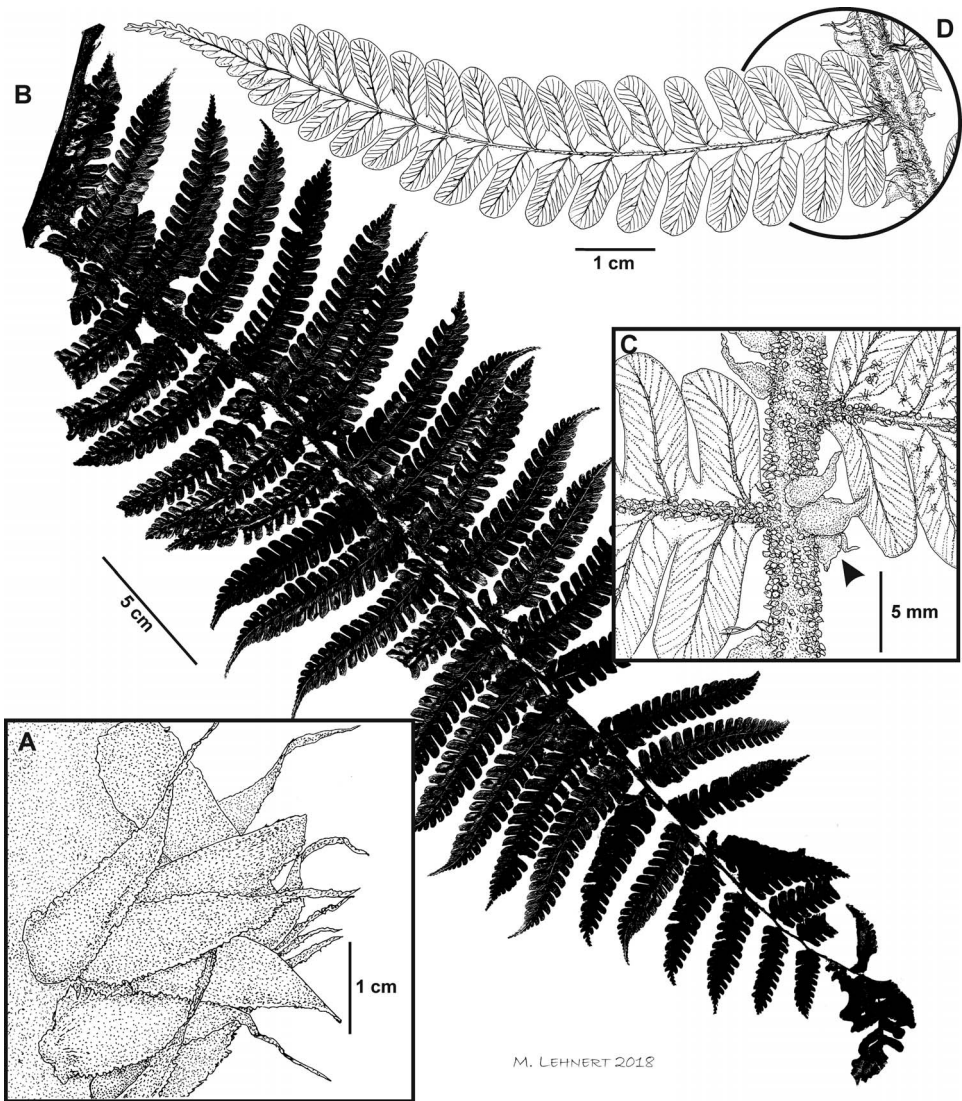


FIG. 8. *Cyathea pholidota*. A. Petiole with scales. B. Pinna. C. Costa and segments abaxially, most sori shown without sporangia; note the abundant bullate squamules on the costa, arrow points to larger persistent scales. D. Pinnule, adaxially (from *Giraldo 3132*, BONN).

mm, basally with a shiny black spot (foliar nectary). Pinnules to $90 \times 18\text{--}29$ mm, sessile, inarticulate, ca. 18–20 mm between costules, linear-oblong to lanceate, pinnatifid to basally pinnatisect or pinnate, bases truncate to cuneate, tips acute to attenuate (almost caudate in large pinnules) with crenate to serrate margins; costules grayish to greenish brown on both sides, adaxially strongly prominent, ridged, abaxially weakly to strongly prominent, adaxially moderately hairy with tan to brown, curved to appressed, uniseriate hairs 1.0–

1.5 mm long, abaxially without hairs, with many strongly bullate, ovate-acuminate, dark brown squamules with entire margins to 0.5 mm long, also some flat brown scales, these ovate (to ca. 1×1 mm) to broad-lanceate (to ca. 3×2 mm); costules basally without pneumathodes. Segments to 11.5×4.0 – 5.0 mm, \pm oblong, sessile, adnate, patent to ascending, distally straight to weakly falcate, tips obtuse to rounded, proximal segments alternate to subopposite, usually as large as the next segments, approximate; sinuses acute (obtuse to rectangular in pinnate parts), 0.5–1.0 mm wide; margins entire to subentire; veins weakly raised adaxially and abaxially (midveins more strongly), greenish to yellowish, ending in the margins, adaxially slightly widened at the tips; veins lacking hairs on both sides or midveins adaxially with single erect, tan to brown, uniseriate hairs 0.5(–1.0) mm long; abaxially with dark brown, weakly to strongly bullate squamules; sterile veins simple or forked, fertile veins mostly forked. Sori 0.8–1.0 mm diam., medial to inframedial, \pm equidistant between midveins and margins in lower half of segment, slightly closer to midvein in upper half of segment, in the fork of veins, mature dark orange-brown; indusia lacking; receptacles globose, 0.3–0.4 mm diam., not subtended by a scale, paraphyses numerous, straight, pale brown to reddish, of the same length or shorter than the sporangia (0.3–0.4 mm long). Spores not examined.

Etymology.—The epithet refers to the persistent, overlapping scales on petioles and frond axes, which resemble the tails of pangolins (order Pholidota, from Greek *φολιδότα* = scale-bearing).

Distribution and Habitat.—Western slopes of the Cordillera Occidental in Colombia (Depts. Chocó and Risaralda), in the understory of perhumid forests at 2000–2160 m.

Additional Specimens Examined (Paratypes). COLOMBIA. Chocó: San José del Palmar, Cerro del Torrá, (ca. $04^{\circ}48'N$, $76^{\circ}30'W$) 1940–2160 m, 1 Sep 1988, P.A. Silverstone-Sopkin 4939 (CUVC, F, MO).

Cyathea pholidota occurred in a large population at the type locality. It has relatively slender trunks without old petiole bases, showing a shiny black epidermis and reddish lenticels below the frond scars. With its abundant dark brown bullate squamules on the costules and costae, this species may be confused with *C. darienensis*, like was the paratype *Silverstone-Sopkin 4939*. *Cyathea pholidota* differs in having larger scales on the petioles (10 – 25×3 – 4 mm in *C. pholidota* vs. 10 – 12×2 – 3 mm in *C. darienensis*) that are usually also present and persistent along the rachises (vs. lacking here), and rachises and costae lacking hairs abaxially (vs. inconspicuous short, thin hairs present). *Cyathea pholidota* also has thicker trunks (6 cm diam. vs. 2–3 cm diam. in *C. darienensis*).

9. *Cyathea rengifo* Lehnert, F.Giraldo & A.Tejedor, *sp. nov.* Type: COLOMBIA. Antioquia: Municipio Yarumal, Vereda Alto de Ventana, via que conduce al corregimiento El Cedro, $07^{\circ}04'22''N$, $75^{\circ}26'23.9''W$, 1893 m, 20 Jul 2015, F. Giraldo, A. Tejedor, & A. Mejia 3122 (holotype: HUA-2012292/-2012293!, isotype: BONN!). **Fig. 9.**

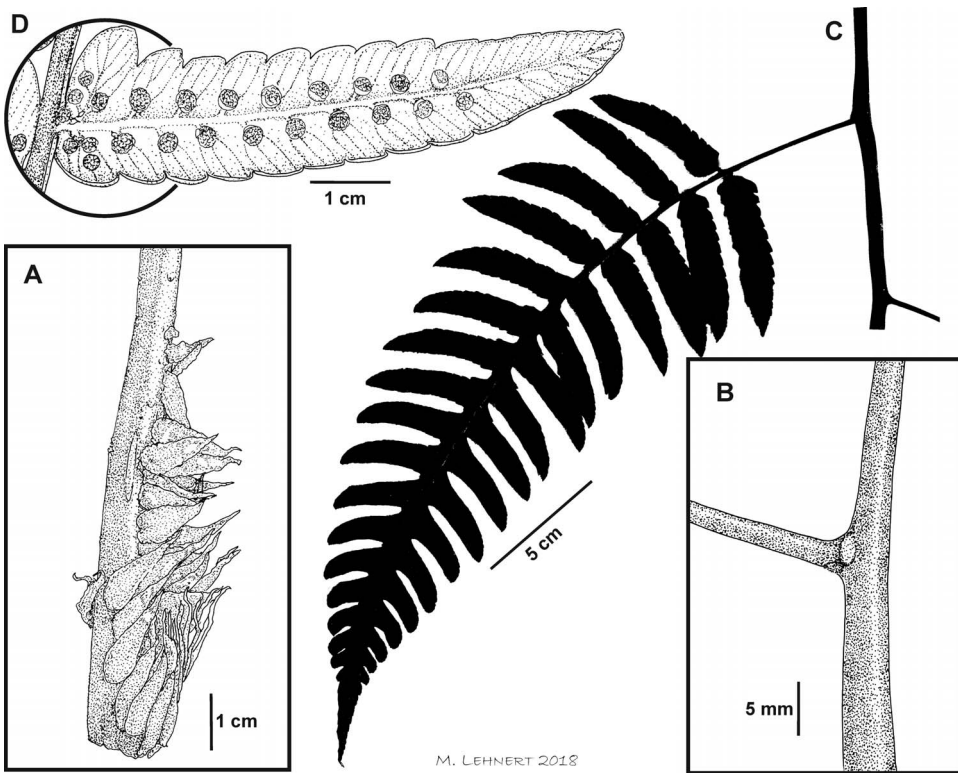


FIG. 9. *Cyathea rengifoii*. A. Petiole with scales. B. Junction between rachis and costa, showing glabrous shiny epidermis and pale pneumothode. C. Pinna. D. Pinnule, fertile, abaxially (from Giraldo et al. 3122, BONN).

Trunkless, rhizomes short-creeping, ca. 13 cm long, to 4 cm diam., covered in old petiole bases and adventitious roots; adventitious buds lacking. Fronds to 210 cm long, arching-drooping from erect to ascending petioles. Petioles to 73 cm long, inermous or sparsely verrucate, dark atropurpureous to black; petioles basally with two lines of large elliptic, pale brown lenticels to 7.0×1.0 – 2.5 mm; without adventitious (aphlebioid) pinnae at the bases; petiole scurf absent or few appressed lacerate brown squamules; larger scales restricted to base, soon caducous. Petiole scales broadly lanceate to ovate, 5–10(–12) \times 3–4 mm, shiny dark brown, concordantly bicolorous with very narrow, inconspicuous yellowish to pale brown margins, pseudopeltately attached, their tips straight. Laminae to 130 \times 70 cm, long-triangular, pinnate-pinnatifid to bipinnate, with truncate bases and gradually reduced, long tapering apices; chartaceous, glossy dark green adaxially, often blackish when dried, paler green abaxially, pinnae ca. 11 pairs per frond, alternate, not reduced towards base. Frond axes atrovinaceous to black on both sides, adaxially hairy only on costae and distal parts of rachises, hairs 0.5–1.0 mm long, tan to brown, axes abaxially completely glabrous or with few evanescent

hairs on rachises; insertions of costae into rachises not or weakly swollen, with one conspicuous pneumathode, pale brown, elliptic, ca. 3.0×1.5 mm, area below pneumathode wrinkled (foliar nectary). Largest pinnae $20\text{--}35 \times 8\text{--}10$ cm, broadly lanceate, pinnatifid to pinnate, basally \pm truncate, tapering from the middle to short attenuate tips, stalked to 4 cm, $3.0\text{--}4.5$ cm between the stalks, stalks inarticulate; segments (or pinnules) to $42 \times 8\text{--}12$ mm, free ones sessile to stalked to 1 mm, margins strongly crenate or lobed to $1/3$ towards the costules, basally auriculate, acroscopically pronounced, adnate segments basally decurrent into the costae, margins crenate to crenulate; segments (or pinnules) patent to weakly ascending with straight to falcate, acute tips; basal segments (or pinnules) usually alternate to subopposite; sinuses wide, acute to rectangular, to 5 mm wide; veins carneous to blackish, contiguous with the identically colored hyaline segment margins; each midvein insertion with the costae weakly raised, bearing a small elliptic pneumathode $0.2\text{--}0.3$ mm long; segments adaxially with few to many antrorsely curved multicellular hairs $0.5\text{--}1.0$ mm long only on the costules, abaxially no hairs on or between the veins, here only small orange-brown bullate squamules to 0.5 mm long and round to round-ovate flat scales $1.0\text{--}1.5$ mm diam., pseudopeltately attached with strongly cordate bases; sterile veins simple or forked, fertile veins forked once or twice. Sori $1.0\text{--}1.2$ mm diam., subproximal, in fork of veins, deep brown, indusia hemitelioid, brown, persistent, weakly arching, the margins worn off in over-mature sori, reaching $1/4\text{--}1/3$ around the receptacles, receptacle globose, to 0.5 mm diam., paraphyses few, straight to distally curved, brown to red, of the same length as or slightly longer than sporangia ($0.4\text{--}0.5$ mm). Spores tetrahedral, whitish to pale brown.

Etymology.—This species is dedicated to Jorge Wilson Rengifo Moscoso (1960–), dedicated technician in charge of collections at herbarium HUA, University of Antioquia, Medellín.

Distribution and Habitat.—Endemic to northern Colombia at ca. 1800–2000 m, in moist montane forests, growing on roadbanks and cliffs in partial shade.

Cyathea rengifo is best described as an indusiate version of *C. latevagans* (Baker) Domin with more strongly dissected laminae (laminae at least partially bipinnate, indusia hemitelioid in *C. rengifo* vs. laminae always pinnate-pinnatifid, indusia lacking in *C. latevagans*) as both species share a trunkless habit with overhanging to dangling fronds, shiny dark frond axes and round, pseudopeltately attached orange scales abaxially on the laminae.

Superficially, *Cyathea rengifo* looks like it might be of hybrid origin. It strongly resembles *C. latevagans*, which is found regularly in the area, but differs in features that lie not within the range of morphological variation typical of that species. Hybrids are documented in the family Cyatheaceae (e.g., Conant, 1975; Caluff, 2002a, b), and may be even fertile in the first generation, as is documented for Caribbean *Alsophila* (Conant and Cooper-Driver 1980). In other genera of Cyatheaceae, hybrids are sterile and produce mostly malformed spores (e.g., Caluff, 2002a). The spores of the only documented specimen of *C. rengifo* are regularly shaped and evenly sized, suggesting that it is not a sterile primary hybrid. Even if its status as a hybrid

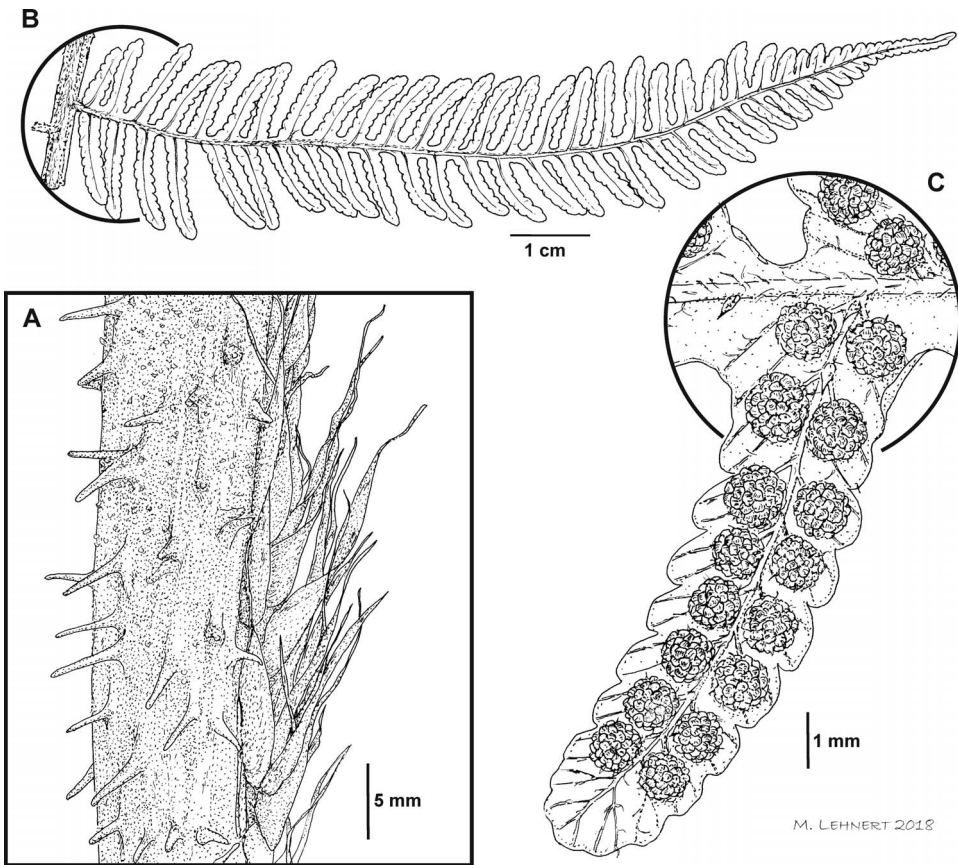


FIG. 10. *Cyathea rodriguezii*. A. Petiole with scales. B. Pinnule, adaxially. C. Segment, fertile, abaxially (from *Rivas 781*, HUA).

remains dubious, it is a distinct taxon that deserves a formal recognition for further scientific study. A similar case is the herein described *C. toroi* Lehnert, F.Giraldo & A. Tejedor, *sp.nov.*, which see for further discussion.

10. *Cyathea rodriguezii* Lehnert & F.Giraldo, *sp. nov.* Type: COLOMBIA. Antioquia: Caldas, Mun. Samana, margen derecha del Río Moro, sector La Mula, 05°33'48.1"N, 74°54'15.3"W, 550–650 m, Jul 2005, *A. Rivas 781* (holotype: HUA-149416/-149351!). **Fig. 10.**

Trunks to 6 m tall, to 10.5 cm diam., otherwise unknown; adventitious buds not reported. Fronds to 330 cm long. Petioles to 88 cm long, aculeate with many strong prickles to 8 mm long, brown to dark brown, matte; petioles basally covered with orange-brown scurf of small lanceate, flat to weakly bullate squamules to 2 mm long, with few orange-brown lenticels to 4×2 mm; scaly in basal half, persistent adaxially and along the sides. Petiole scales

narrowly lanceate, $10\text{--}12 \times 2.5\text{--}3.0$ mm, weakly shiny, weakly bicolorous, auburn to brown with golden brown to whitish margins, bases cordate, pseudopeltately attached, apices long-acute, straight to falcate, twisted; differentiated margins narrow, persistent, without setae or cilia. Laminae to $240 \times 125\text{--}150$ cm, bipinnate-pinnatifid, herbaceous, matte, dark green adaxially (olive-green in dried material), pale grayish green abaxially; apices not seen. Rachises ochre to brown abaxially and adaxially, weakly shiny, muricate to sparsely aculeate, with blunt prickles to 2 mm long; adaxially sparsely to densely pubescent with whitish to brown multicellular hairs to 1.0 mm long; abaxially with numerous white spreading, flaccid hairs 1.0–1.5 mm long, with remnants of pale scurf; scales absent. Largest pinnae to 64 cm long, sessile to stalked by 1 cm, ca. 16–20(–26?) pairs per frond, patent weakly ascending, alternate, inarticulate, distally not or only narrowly green-alate, distal segments decurrently adnate before ending in a pinnatifid apical section; basal pinna pairs not seen. Costae to 3 mm wide, dark stramineous to yellowish abaxially, darker brown adaxially, sparsely muricate, prickles 1 mm or less; with whitish, multicellular hairs 1.0–1.5 mm long, adaxially dense, appressed, abaxially sparse, spreading, and ephemeral; sometimes with remnants of scaly scurf; junctures of costae and rachises abaxially weakly swollen, each with a conspicuous, planar to weakly protruding, elliptic aerophore to 3.5×2.0 mm. Largest pinnules 120×35 mm, sessile to sessile with stalks to 0.5 mm, inarticulate, 2.5–3.0 cm between the stalks/costules, pinnules linear-oblong to lanceate, bases truncate to cuneate, tips short- to long-attenuate, with serrulate to crenulate margins; costules carneous to ochre on both sides, adaxially strongly prominent, ridged, abaxially weakly to strongly prominent, moderately to densely hairy with whitish to tan, multicellular hairs to 1.0(–1.5) mm long, adaxially curved to appressed, abaxially spreading; abaxially with flat brown squamules to 1.0×0.4 mm, pale brown to tan bullate squamules to 2×0.5 mm, ephemeral tortuous hyaline hairs to 0.6 mm long, and unicellular trichomidia; costules basally without visible pneumathodes. Segments to $15 \times 2.0\text{--}2.5$ mm, ascending, short ones straight, long ones distally falcate, tips acute to obtuse, proximal segments alternate to subopposite, as large as the next segments, often remote; sinuses acute to obtuse, to 1.0–2.5 mm wide; margins deeply crenulate; margins not differently incised in proximal segments of a pinnule; veins planar to weakly protruding adaxially and abaxially, dark stramineous to blackish, ending in the margins; veins adaxially sparsely to moderately hairy, abaxially abundantly hairs with erect, whitish, multicellular hairs 0.5–1.0 mm long, not between the veins; midveins abaxially with some whitish to pale brown, bullate squamules and some tortuous, appressed hairs; sterile veins simple or forked, fertile veins forked. Sori 0.8–1.0 mm diam., medial to supramedial, parallel to the midveins, filling out most of the segments, in the fork of veins, mature dark orange-brown; indusia lacking; receptacles globose, 0.2–0.3 mm diam., not subtended by a scale, paraphyses many, basally straight, brown to reddish, distal white, tortuous, longer than the sporangia (0.4–0.5 mm long). Spores not examined (not mature in available material).

Etymology.—The species is dedicated to our friend and colleague Wilson Rodríguez Duque (1957–), Instituto de Investigaciones Científicas Amazónicas-SINCHI, Bogotá.

Distribution and Habitat.—Northern Colombia, Depts. Antioquia and Santander, at 550– 1850 m.

Additional Specimen Examined (Paratype). COLOMBIA. Santander: Corregimiento de Virolín, adelante de Bogotácito, (ca. 06°04′19″N, 73°12′21″W) 1800–1850 m, 27 Nov 1978, S. Díaz-P. 1177 (COL).

The present specimens of *C. rodriguezii* are from stout plants with dimensions typical of *Cyathea conjugata* and allies, and the persistent pubescence on the axes combined with the deeply crenate segment margins of *C. rodriguezii* suggest a closer relationship to that group.

Cyathea rodriguezii differs from the wide-spread *C. microdonta* mainly in having larger laminae (to 240 × 125–150 cm with 16–20 pinna pairs in *C. rodriguezii* vs. 200 × 120 cm with 10–15 pairs in *C. microdonta*), being hairier abaxially on costules and veins (erect, whitish, multicellular hairs 0.5–1.0 mm long abundantly on veins vs. glabrous to sparsely hairy), and lacking long prickles on the frond axes (inermous, or with few short blunt prickles vs. needle-like prickles to 7 mm long). *Cyathea rodriguezii* probably also grows larger than *C. microdonta* (trunks to 6 m tall vs. trunks to 4 m, usually smaller) but has smaller petiole scales (10–12 × 2.5–3.0 mm vs. 14.0–32.0 × 2.5–4.5 mm). From our experience, *C. microdonta* has slender frond axes that have some weak luster; hairs if present abaxially are easily abraded and leave a smooth surface here. Furthermore, larger plants (> 1.5 m tall) of *C. microdonta* usually sprout small plants from the trunk base, forming small groups. This has not been reported for the specimens of *C. rodriguezii*, and is also unknown from *C. conjugata* and allies.

11. *Cyathea tejedoris* Lehnert, F. Giraldo & W. Rodríguez, *sp. nov.* Type: COLOMBIA. Nariño: Mun. Ricaurte, road between Ricaurte and Junín, 01°10.825′N, 78°06.899′W, 1200 m, 15 Feb 2015, M. Lehnert 3144 with W. Rodríguez, F. Giraldo & M. Kessler (holotype: HUA-198736/-198737/-198738/-198740!, isotypes: BONN!, Z!). **Figs. 11, 12.**

Trunks 0.2 m tall (ascending apex of short-prostrate rhizomes), to 10 cm diam., without old petiole bases, epidermis dark brown, densely covered in linear-lanceate scales, concolorous orange-brown, shiny; apices not hidden in fascicles of petioles; adventitious buds absent. Fronds to 690 cm long, arching from ± patent petioles, soon drooping, scrambling for most of their length. Petioles to 85 cm long, densely short aculeate, prickles 1–3 mm long, epidermis dark brown, weakly shiny, obscured by scurf of orange- to reddish brown lanceate scales with spreading white cilia. Petiole scales ca. 20–35 × 1 mm, linear-lanceolate, mostly curved near the base, ending in an undulate to twisted filiform tip, appearing concolorous orange- to reddish brown, with a narrow white margin with spreading cilia of various length, soon worn off in distal scale parts, more abundant and persistent near the base. Laminae ca. 600



FIG. 11. *Cyathea tejedoris*. A. Trunk, short and erect (ca. 10 cm diam.), excavated from organic debris in which it was growing; note young frond going off at an almost right angle; arrow on the right points to apex. B. Tip of expanding frond (ca. 4 cm diam.); the crozier has shorter and proportionally broader scales than the petiole; note fine white scurf in the coiled-up part. C. Entire frond (690 cm long), central pinnae damaged from extraction from shrubbery through which it was growing (photos from *Lehnert 3144*).

× 180 cm, bipinnate-pinnatifid to tripinnate, coriaceous, apices gradually reduced. Frond axes including pinnule stalks abaxially short-aculeate, prickles 1–2 mm long, medium to dark brown on both sides, often curved, mostly retrorsely, into a hooked tip; adaxially costules, costae, and distal parts of rachises with antrorsely curved multicellular hairs 1.0–1.5 mm long, tan to brown on rachises, white to tan on costules and costae, hairs lacking abaxially;

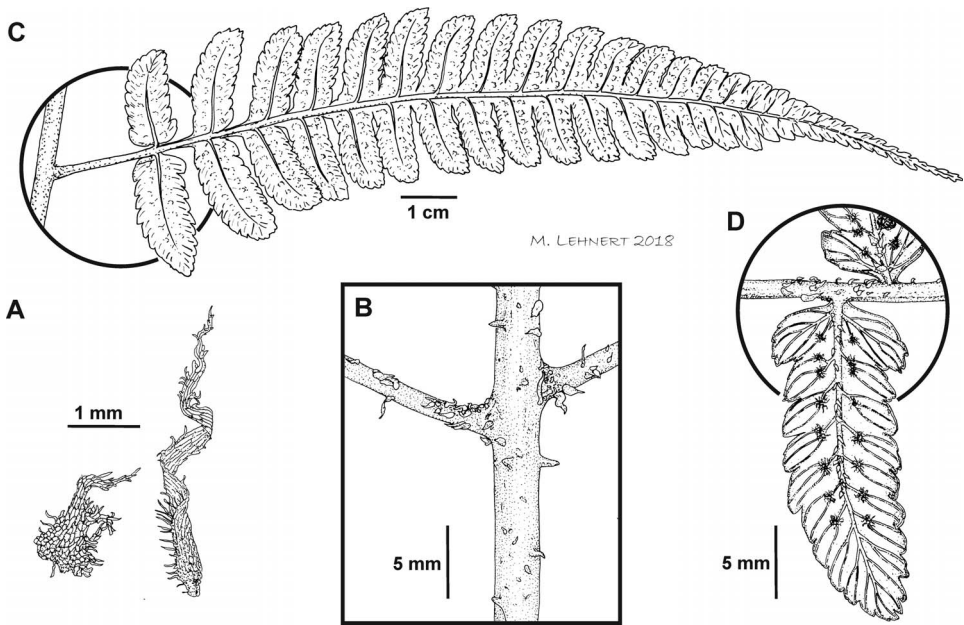


FIG. 12. *Cyathea tejedoris*. A. Smaller petiole scales; similar scales also persisting on frond axes. B. Rachis and costae, showing persisting smaller scales and the prickles on the rachis. C. Pinnule, adaxially. D. Segment, fertile, abaxially (from *Lehnert 3144*, BONN).

remnants of scurf (including some larger scales to ca. 10×2 mm) persisting in axils of rachis, costae and costules, otherwise costae abaxially with few flat lanceate scales, costules with few to many dark reddish brown to castaneous bullate squamules to 0.7×0.5 mm, with either subulate or flattened, lacerate tips; junctions of costae and rachises swollen, abaxially with 1–3 flat to weakly sunken, round to ellipsoid pneumathodes to 3.0×1.5 mm, intruding or embedded in darker spot ca. 5×3 mm (foliar nectary). Pinnae to 90 cm long, lanceate, alternate, \pm patent, 22–24 pairs per frond, stalked to 9.5 cm, basal ones \pm half the size of largest pinnae, weakly reflexed. Pinnules to 200×43 mm, long-triangular to lanceate, tapering from the base or below the middle to attenuate or caudate tips with serrate margins, most pinnules long-stalked to 3 cm with cordate bases, smaller ones sessile with rounded bases, all well-spaced (to 5 cm between pinnule stalks), not overlapping; segments to 25×10 mm, sessile and adnate except for the lower ones of large pinnules, these free, sessile to subsessile, lanceate with prominent basal lobes, grading from basally contracted to basally decurrent segments towards the pinnule tips, all weakly ascending and weakly falcate, their tips obtuse to short acute, sinuses to 8 mm wide, obtuse with \pm parallel sides, margins flat, sharply crenate along sinuses, serrulate at tips. Veins yellowish brown adaxially and darker brown abaxially; midveins strongly, lateral veins weakly protruding on both sides, midveins of largest segments adaxially with few multicellular hairs, otherwise veins

lacking hairs, midveins abaxially with few to many dark reddish brown to castaneous bullate squamules to 0.7×0.5 mm, with either subulate or flattened, lacerate tips, in larger segments also with few flat scales to 1.5×0.7 mm; sterile veins forked or simple, fertile veins forked 1–2(–3) times. Sori 1.2–1.5 mm diam., \pm medial, in fork of veins; indusia lacking; receptacles globose to elliptic, 0.4–0.5 mm in diameter; paraphyses numerous, laterally flattened with a thin subulate terminal cell, dark reddish brown, longer than the sporangia (0.5–0.6 mm). Spores not examined.

Etymology.—The specific epithet honors our friend and colleague Adrian Tejedor (1975–), who discovered the species. The family name is here treated as being already Latin, belonging to the consonantic declination (-or, gen. -oris).

Distribution and Habitat.—Southwestern Colombia (Chocó region) in wet lower montane forests at 1000–1200 m, growing on ridges with low open canopy and dense shrubby undergrowth.

Additional Specimen Examined (Paratype). COLOMBIA. Nariño: Junin, 5 km en dirección a Barbacoas, 1000 m, 12 Dec 1972, W. Hagemann & N. Leist 1728 (COL).

At first sight, *Cyathea tejedoris* resembles *C. gibbosa* H.Karst (previously known as *C. kalbreyeri* (Baker) Domin; Lehnert, 2014) by exceptionally long fronds, coriaceous laminae, long-stalked long-triangular pinnules and the narrow orange-brown petiole scales. Under closer inspection, however, the spiny axes and patent petiole bases distinguish *C. tejedoris*: in *C. gibbosa*, the axes are inermous and the petiole bases appressed to the trunk. In contrast to *C. tejedoris*, whose fronds scramble though the lower shrubby vegetation, *C. gibbosa* usually grows under a taller canopy, where its crossiers first grow up erectly until they find support on a higher tree branch, from where the hanging frond starts to unfurl completely. Because of the prickles on the petioles and axes, *C. tejedoris* may be confused with *Cyathea nodulifera* R.C.Moran, a potentially sympatric species (Moran, 1991), but differs from it in the long-scrambling fronds, the lack of trunks and the green epidermis of petioles and axes (vs. fronds upright and arching, trunks present, epidermis mostly dark brown to atropurpureous or black in *C. nodulifera*).

Cyathea tejedoris can be distinguished from further species with similarly long-stalked long-triangular pinnules either by the shape and color of the petiole scales (linear-lanceolate, shiny orange-brown with white marginal cilia in *C. tejedoris* vs. broader, darker and lacking cilia in *C. gracilis* Griseb. and *C. longipetiolulata* A.Rojas & A.Tejedor) or the absence of indusia (vs. present in *C. divergens* Kunze, *C. gracilis*, *C. longipetiolulata* and *C. meridensis* H.Karst.).

The long-scrambling fronds of *C. tejedoris* with relatively thin rachises, prickles with hooked tips along nearly the entire length of the axes abaxially, plus the short trunk with remotely set petiole bases and an apparently fast growing apex, all seem to be adaptations to life in scrubby vegetation where the fronds themselves have a partially climbing function. This new species is fairly abundant at the type locality. The plants were of various sizes, most of them fertile but none of them with a discernible trunk. The ascending tip of the

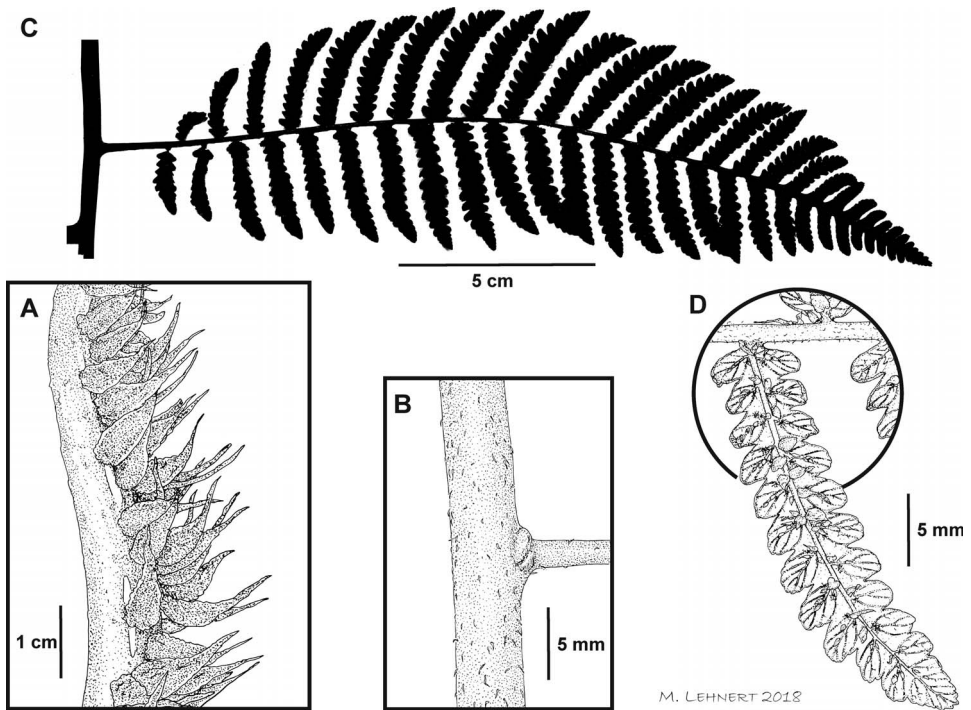


FIG. 13. *Cyathea toroi*. A. Petiole with scales, showing two white pneumathodes. B. Junction of rachis and costa, showing sparse hairy indument and pneumathode. C. Pinna. D. Pinnule, fertile, abaxially (from Giraldo 3127, BONN).

trunk (or rhizome) just elevates the apex with the crossiers over the thick organic litter. *Cyathea tejedoris* grows together with *C. hemiepiphytica* R.C.Moran and *C. brunnescens* (Barrington) R.C.Moran, two other endemics of the Chocó region (Moran, 1991). These two exindusiate species are easily distinguished from *C. tejedoris* by longer, ascending to erect trunks and much shorter fronds (<2 m long).

12. ***Cyathea toroi*** Lehnert, F.Giraldo & A. Tejedor, *sp. nov.* Type: COLOMBIA. Antioquia: Municipio Yarumal, Vereda Alto de Ventanas, via que conduce al corregimiento El Cedro, 07°04'22"N, 75°26'23.9"W, 1893 m, 20 Jul 2015, F. Giraldo 3127 with A. Tejedor, A. Mejia (holotype: HUA-202297/-202298/-202299!, isotype: BONN!). Fig. 13.

Trunks to 0.6 m tall, 9 cm diam., with persisting old petiole bases; trunk apices hidden in fascicles of petioles; adventitious buds lacking. Fronds to 305 cm long, arching from erect petioles, drooping from the middle. Petioles to 74 cm long, inermous to sparsely verrucate, atropurpleous, basally blackish, on each side with an interrupted line of white lenticels, each to 7×1 mm; scurf lacking; without adventitious (aphlebioid) pinnae at the petiole bases; petiole

scales only near base and easily shed, often missing in dried material. Petiole scales broad-lanceate to ovate-lanceate, $15\text{--}20 \times 2.5\text{--}3.5$ mm, their tips straight to falcate, almost concolorous to concordantly bicolorous, the dark brown to castaneous center grading into the orange-brown to yellowish margins, lustrous. Laminae to 230×55 cm, bipinnate-pinnatifid, herbaceous, widest at the middle, apices gradually reduced; dark green adaxially, blackish when dried, olive-green abaxially. Frond axes inermous, atropurpureous, hairs adaxially densely on costules and costae, sparsely to absent in most parts of rachises, hairs 0.5 mm long, tan to brown, antrorsely curved, abaxially glabrescent with few spreading white hairs to 1.5 mm long; flat orange-brown scales sparsely on costae, sparse to abundant on costules abaxially, scales lanceate (to 3×2 mm) and round-ovate (1.0–2.5 mm diam.); junctures of costae and rachises abaxially not or weakly swollen, each with a weakly raised, elliptic pneumathode to 3.0×1.5 mm, pale brown, basally with a black area (foliar nectary), appearing corrugated, often sunken in. Pinnae to 27 cm long, ca. 14–16 pairs per frond, alternate (basal ones also subopposite to opposite), stalked 2–3 cm, narrowly green-alate in distal half, the alae concave, the distal segments weakly decurrently adnate. Largest pinnules 33×8 mm, pinnules linear-oblong to weakly oblanceate, truncate to weakly rounded at base, tapering from beyond the middle to acute tips, sessile to stalked 1 mm, 8–11 mm between the stalks/costules, alternate; pinnules incised to $2/3$ towards the costules, ca. 1.5 mm distance below the sinuses; segments to 4×2 mm, patent to weakly ascending, weakly falcate towards their rounded to obtuse tips, with subentire to crenulate margins, sinuses 0.5–1.0 mm wide, acute, triangular, open. Veins glabrous adaxially except for few whitish, erect multicellular hairs to 1 mm long on the midveins; abaxially with scattered white hairs 0.5–1.0 mm long on veins and midveins, few also between the veins; midveins abaxially with orange-brown to auburn bullate squamules 0.5–1.0 mm long with rather short tips and entire margins, equally sized flat squamules with attenuate to caudate tips and lacerate margins; sterile and fertile veins simple, rarely forked. Sori ca. 0.8 mm diam., each with fewer than 20 sporangia, subproximal, on the back of veins; indusia absent; receptacles globose, 0.2–0.3 mm diam., sometimes subtended by a brown lacerate squamule; paraphyses often apically tufted, hyaline, tan to brown, of the same length or longer than sporangia (0.3–0.4 mm), the distal parts often broken off in over-mature sori and then shorter than sporangia. Spores not examined.

Etymology.—The species is dedicated to Juan Lázaro Toro Murillo (1966–), expert on Colombian ferns.

Distribution and Habitat.—Known only from the type locality in northern Colombia, Dept. Antioquia, at 1893 m.

Additional Specimen Examined (Paratype). COLOMBIA. Antioquia: Municipio Yarumal, Vereda Alto de Ventanas, via que conduce al corregimiento El Cedro, $07^{\circ}04'22''\text{N}$, $75^{\circ}26'23.9''\text{W}$, 1893 m, 21 Jul 2015, *F. Giraldo, A. Tejedor, & A. Mejía 3128* (HUA).

Cyathea toroi may be mistaken for a small plant of *C. lechleri* Mett. or *C. delgadii* but it differs by atropurpureous petioles and axes (vs. pale to dark

brown in *C. lechleri*, only petiole base blackish in *C. delgadii*), evanescent petiole scales (vs. scales persisting at least at petiole base in *C. lechleri* and *C. delgadii*), long-drooping fronds (vs. patent-arching), and lacking indusia (rarely some sori subtended by a small scale vs. indusia sphaeropteroid). From *C. rengifoii*, which is similar regarding size, shape, texture, and color of the fronds, it differs by most pinnae being sessile to subsessile (only lowest 2 or 3 pairs with stalks 2–3 cm long in *C. toroi* vs. almost all pinnae stalked, stalks to 4 cm long in *C. rengifoii*) and lacking indusia (vs. hemitelioid indusia present).

Regarding the drooping fronds, the shiny axes, and the round orange scales on the laminae, this taxon is similar to the trunkless exindusiate *Cyathea latevagans*. The latter species can be found frequently in the northern Andes, and also occurs close to the type locality of *C. toroi*. The distinctive shape of the pinnae of *C. toroi* (Fig. 13C) is reminiscent of documented hybrids in Cyatheaceae between species with pinnate-pinnatifid and bipinnate-pinnatifid fronds. A good example is *Cyathea* × *hombersleyi* from Trinidad (Caluff, 2002b), in which whole pinnae as well as most of the pinnules are slightly oblanceate, and also more strongly incised towards their respective tips (see representative specimen at <http://apps.kew.org/herbcat/>; barcode=K000589789). Aborted sporangia and malformed spores are generally indicators of hybrids in ferns. The available specimens of *C. toroi* had most sporangia and all spores shed, which may be interpreted as result of unproblematic regular sporulation. Hence we treat *C. toroi* as a natural species until the results of our ongoing molecular studies on the family may indicate otherwise.

Reinstated Species

- 13. *Cyathea boconensis*** H.Karst., *Linnaea* 28. 458. 1856; *Fl. Col.* 2: 171, t. 190. 1869. Type: VENEZUELA. Mérida: “Habitat ad pedem australis montis glacialis Meridensis altitudine 1000 m”, *H. Karsten s.n.* (B-20_0131345!, LE-00008027 [image!]). **Fig. 14.**

Trunks to 5 m tall, erect, to 25 cm diameter, without old petiole bases in large plants, variously persistent in smaller ones, trunk apices hidden in fascicles of petioles, sometimes with skirts of dead fronds if growing in dense understory; adventitious buds absent. Fronds 100–350 cm long, weakly arching, patent in large plants, ascending in small ones. Petioles to 76 cm long, muricate to short-aculeate, prickles to 2 mm long, epidermis dark stramineous to brown, basally reddish brown, weakly shiny, densely covered with persistent dark brown scurf consisting of erect lanceate squamules (≤ 1 mm) with crested tips and lacerate margins; without adventitious (aphlebioid) basal pinnae. Petiole scales narrowly lanceate, 25–36(–40) × 2–3 mm, with elongate, strongly twisted tips (3–4 times, especially when dried), brown to dark brown with somewhat paler margins, but never strongly bicolorous. Frond axes (rachises, costae, costules) inermous, or rachises basally sparsely muricate, yellowish brown to stramineous, with remnants of scurf consisting of pale brown lacerate squamules and branched hairs, in the axils also larger



FIG. 14. *Cyathea boconensis*. Background: Entire plant (strongly reduced). 1. Lower half of medial pinna, adaxially (1×). 2. Fertile pinnule, abaxially (1×). 3. Fertile segments, adaxially (4×). 4. Fertile segments, abaxially (4×). 5. Segment with two sori, transverse section (50×). 6. Crozier with scales removed, showing the prominent aereophores at the insertions of the costae (ca. 0.25×). 7. Scales from lamina (1×). 8. Scales from rachis (15×), with detail of tip of scale 9 (75×). 9. Scale from midvein of segment. 10. Scale from midvein of segment. 11-12. Pedicellate bullate squamules from veins. 13. Sporangia. Original illustration (Karsten 1869).

ribbon-like and lanceate scales, pale brown to 5 mm long; costae to 3.5 mm wide; antrorsely curved, brown hairs 0.5–1.0 mm long present adaxially only at distally, absent abaxially. Laminae to 270 × 120 cm, bipinnate-pinnatifid, broadly ovate, deep green and lustrous adaxially, paler and matte abaxially, apices gradually reduced. Pinnae to 60 cm long, stalked to 3 cm, alternate, ca. 13 pairs per frond; distally green-alate, the distal segments simply adnate to weakly decurrently adnate; basal pinnae ca. 2/3 the length of longest pinnae, weakly reflexed. Largest pinnules 10.0–12.5 × 1.8–2.1 cm, linear-lanceate to long-triangular, sessile or subsessile (stalked to 1 mm), bases truncate to weakly cuneate, never with auricles, tips long-acuminate to attenuate with crenulated margins; segments to 13 × 3.5–4.0 mm, ± oblong, weakly ascending, straight to weakly falcate distally, with crenulate to crenate margins and obtuse tips. Veins glabrous adaxially except for few scattered hairs (0.5–0.8 mm long) on midveins, abaxially moderately hairy with white erect to appressed hairs 0.4–0.8 mm long, few also between the veins, veins abaxially with some pale brown, shiny bullate squamules to 1.0 × 0.5 mm, inserted on short pedicel and with long, often filiform apex (non-pedicellate and flat squamules of equal size also present but less frequent); midveins may have ephemeral whitish to tan scurf, similar to scurf on costae and costules; sterile veins simple to forked, fertile veins forked. Sori (0.7–)1.0–1.2 mm diam., subproximal to inframedial, in fork of veins; indusia sphaeropteroid, with umbo, tan to brown, translucent, fragmenting, usually umbo missing at maturity, but cup-shaped part remaining; receptacles globose, 0.2–0.3 mm diam., paraphyses few, hyaline, tan to white, shorter than the sporangia (0.2–0.3 mm). Spores tetrahedral-globose, orange; perispore not examined.

Distribution and Habitat.—Northern Colombia (Depts. Boyacá and Santander) and Venezuela (Prov. Mérida) in lower to upper mountain forests at (1000)1500–3033 m.

Specimens Examined. COLOMBIA. Boyacá: Vereda La Chapa, Reserva Rogitama, 05°47'41.7"N, 73°27'23.6"W, 2400–2450 m, 03 Mar 2019, *Lehnert M. 3666* with *J. Pinto, F. Giraldo Gallego* (BONN, HUA, M), *ibid.*, 05°47'47.2"N 73°27'26.5"W, 2500 m, 04 Mar 2019, *Lehnert M. 3672* with *J. Pinto, F. Giraldo* (BONN, HUA, M). Santander: Limites entre Municipios Toná y Pie de Cuesta, bajando del Paramo de Berlín hacia el sector de La Nevera, 07°06'05"N, 72°59'29"W, 3033 m, 05 Jul 2015, *F. Giraldo, A. Tejedor, & A. Mejía 3076* (HUA-202043/-202044/-202045); Vereda Campamento, Finca of Mónica Macía, coming from Santa Elena, Boyacá, 05°58.265'N 73°08.952'W, 2720 m, 06 Mar 2019, *Lehnert M. 3695* with *J. Pinto, F. Giraldo Gallego* (BONN, HUA, M)

Cyathea boconensis is characterized by the combination of unique pedicellate bullate squamules abaxially on the veins and by short paraphyses. These characters were illustrated by Karsten (1869) and are not found in any other *Cyathea* species with sphaeropteroid indusia, a group that is most abundant and diverse in Andean forests. The illustrated type specimen (Karsten, 1869; Fig. 14) differs slightly in the documented indument (no hairs abaxially as in our specimen, but more of the larger scales persisting on the axes than in our plant) and significantly in the elevation (1000 m vs. 2450–

3033 m). All this may reflect the natural variation of the species. Regarding the elevation, it is likely that the true type locality may be situated a little higher: Mérida is located at a valley bottom at 1000–1200 m but the closest town named Bocono (ca. 8°33'40"N 71°16'49"W) lies at 1500–1600 m.

Cyathea boconensis was regarded as a dubious species (Lehnert, 2009) because no recent collections were available. The illustration (Karsten, 1869) without clear reference to the natural colors of the scaly indument could also represent a form of *C. patens* Mett. or *C. frondosa* H.Karst. The type fragment at B does not show the characteristic pedicels in the bullate squamules but short appressed hairs abaxially on the veins, two features that are in conflict with the illustrations. However, the sori in the type fragment are clearly remote from the midveins, as also seems to be the case in our specimen; due to the fragmented indusia, the midveins are now covered in our specimen but the insertion of the receptacles indicates a medial position. We assume that the Berlin material represents pinnules from the more distal parts of the fronds where the indument is usually less developed and more easily worn off. We had no chance to examine the ampler specimen at LE in order to decide if it would serve as the better lectotype. For the time being we regard *C. boconensis* sufficiently supported by Karsten's (1869) illustration and the existence of morphologically matching plants in the wild.

14. *Cyathea clandestina* Lehnert, F.Giraldo & A.Tejedor, *nom. nov.* for *Alsophila crassa* H.Karst., Fl. Columb. 2: 187, t. 199. 1869, not *Cyathea crassa* Maxon, Contr. U.S. Natl. Herb. 13: 40. 1909. *Trichipteris crassa* (H. Karst.) R.M.Tryon, Contr. Gray Herb. 200: 45. 1970. Type: VENEZUELA. Mérida: "Habitat silvas Merida humidus frigidus montium Meridensis altitudine 2000 m", 1859, *F. Engel s.n. (136)* (holotype: B_20_0000326!).
Fig. 15.

Trunks to 4 m tall, to 13 cm diam., without old petiole bases in large plants, variously persistent in smaller ones, trunk apices hidden in fascicles of petioles, usually with skirts of dead fronds below the crown; adventitious buds absent. Fronds 160–200 cm long, weakly arching. Petioles to 30 cm long, muricate to short-aculeate, prickles to 2 mm long, epidermis dark stramineous to brown, scurf relatively long lasting between prickles, in lower parts consisting of pale brown to whitish, erect squamules (≤ 1 mm) with crested to lacerate margins, grading in distal petiole parts into small well-spaced squamellae with small brown bodies and long twisted hyaline marginal cilia; without adventitious (aphlebioid) basal pinnae. Petiole scales narrowly lanceate, 25–50 \times 2.5–3.5 mm, with elongate, strongly twisted tips (3–4 times, especially when dried), brown to dark brown with paler brown to whitish margins, but never strongly bicolorous. Frond axes (rachises, costae, costules) inermous, or rachises basally sparsely muricate, yellowish brown to stramineous, with remnants of scurf consisting of pale brown lacerate squamules and branched hairs; costae to 3.5 mm wide; antrorsely curved, white hairs 0.5–1.0 mm long present adaxially throughout, absent abaxially.



FIG. 15. *Cyathea clandestina*. Background: Entire plant (strongly reduced); medial pinna (1×). 1. Fertile segment, abaxially (ca. 3×). 2. Sorus, longitudinal section, with paraphyses (ca. 50×). 3. Sporangia (ca. 50×). 4. Spores. Original illustration of *Alsophila crassa* (Karsten 1869).

Laminae to 170 × 100 cm, bipinnate-pinnatifid, ovate-elliptic, deep green and lustrous adaxially, paler and matte abaxially; apices gradually reduced. Pinnae to 50 cm long, subsessile to stalked to 1 cm, alternate, 10–12 pairs per frond; distally green-alate, the distal segments adnate, perpendicular to weakly decurrent; basal pinnae ca. 1/2 the length of longest pinnae, weakly reflexed, their proximal basiscopic pinnules usually not developed. Largest pinnules 8.5–10 × 1.4–2.1 cm, pinnules linear-lanceate to long-triangular, sessile or subsessile (stalked to 1 mm), to 15 mm between the costules/stalks, pinnule bases truncate to weakly rounded, never with auricles, tips long-acuminate to attenuate with crenulated margins; segments to 8 × 2.5–3.5 mm, ± oblong, weakly ascending, straight to weakly falcate distally, with crenulate to crenate margins and obtuse tips. Veins glabrous adaxially except for few scattered hairs (0.5–0.8 mm long) on midveins, abaxially moderately hairy with white erect to appressed hairs 0.4–0.8 mm long, few also between the veins; veins abaxially with some pale brown, matte flat squamules 0.5–1.5 × 0.5 mm with lacerate margins, few squamules also covering some sori, bullate squamules absent; sterile veins simple to forked, fertile veins forked. Sori (0.7–)1.0–1.2 mm diam., subproximal to inframedial, in fork of veins, with ca. 80–100 sporangia; exindusiate; receptacles globose, 0.3–0.4 mm diam., paraphyses few, hyaline, pale brown to white, slender, shorter than the sporangia (0.2–0.3 mm). Spores tetrahedral-globose, pale yellow; exospore verrucate, perispore not examined.

Etymology.—The name refers to the fact that species had been hidden (Latin, *clandestinus*) in the *nomina incertae sedis* because no complete specimens were available to researchers in the past (Barrington, 1978) and the species could not be verified to be distinct.

Distribution and Habitat.—Northern Colombia (Dept. Magdalena) and Venezuela (Prov. Mérida) in lower mountain forests at 1500–2000 m.

Specimens Examined. COLOMBIA. Magdalena: Santa Marta, Corregimiento Minca, camino que conduce al Cerro de San Lorenzo y Cerro Kenedy, 11°01'51"N, 74°01'23"W, 1500–1700 m, 26 Jun 2015, *F. Giraldo 3056* (BONN, HUA).

VENEZUELA. Mérida: Mérida, *H. Karsten s.n. (199)* (B?, LE-00008095 [image]).

It would appear that the Engel specimen labelled as holotype at Berlin could not be the type material of *Alsophila crassa* because it was collected in 1889, postdating the publication of the species by 20 years. We think, however, that the date on the label should read 1859 because it is visible that the first “8” has a different stroke than the following number. This would put the collection date during the period of Franz Engel’s travels in Venezuela and New Grenada (1857–1863), just after Hermann Karsten left in 1856.

The specimen in question has two more old handwritten labels besides the one stating “Venezuela, 1859, leg. Engel”. One says “136. *Alsophila crassa* spec. nov., *paleolatae* Mart. affine sed calva, Merida”, and the other one “indusii nullum vestigium, paraphyses elongatis indivisae”. The former could be an original label by Engel; it differs in handwriting from the other two. The

label information about the plant (*i.e.*, similar to *A. paleolata* Mart. [=*Cyathea phalerata* Mart.] but glabrous; no trace of indusium, with long undivided paraphyses) is repeated in Karsten's description, but not verbatim and without reference to Engel as collector.

Cyathea clandestina resembles several other Andean *Cyathea* species regarding the apparent lack of hairs on the lamina while having triangular, well-spaced pinnules. Some of these similar species can be easily separated by the presence of indusia that remain as large fragments, often bearing an umbo (*e.g.*, *C. divergens*, *C. meridensis*), or remaining at least as a small lacerate ring around the receptacle (*e.g.*, *C. boconensis*, *C. caracasana* (Klotzsch) Domin, *C. crenata* Christ, *C. cystolepis* H.Karst., *C. tungurahuae* Sodiro). *Cyathea caracasana* and *C. crenata* further differ in having scurf on petioles and laminae that appears castaneous en masse (actually consisting of bicolorous squamellae with dark teeth and pale brown bodies); *Cyathea crenata* also has some of the larger ovate flat laminar squamules bicolorous with castaneous center, white margins and dark brown teeth (*vs.* laminar squamules concolorous to weakly bicolorous without teeth in *C. clandestina*).

Cyathea clandestina grows in the same area and vegetation zones as *C. boconensis* and *C. farinosa* (H.Karst.) Domin (*syn.* *C. gibbosa* auct., non (Klotzsch) Domin; Lehnert, 2014); all three species seem to be restricted to the mountain ranges of northeastern Colombia and northern Venezuela. *Cyathea boconensis*, an indusiate species but otherwise very similar to *C. clandestina*, can be distinguished when sterile by its characteristic pedicellate bullate squamules on the segments abaxially (*vs.* no bullate squamules present in *C. clandestina*). *Cyathea farinosa*, which is also exindusiate, can be distinguished by weakly bullate, dark brown to castaneous squamules abaxially on costae and costules (*vs.* no bullate squamules present in *C. clandestina*), and relatively thick reddish paraphyses (*vs.* slender pale brown paraphyses).

ACKNOWLEDGEMENTS

The help received from the curators and staff of the herbaria COAH, COL, and HUA during our visits is greatly acknowledged. We extend our gratitude to Dairon Cárdenas and Luz Marina Mantilla of the Instituto SINCHI, Bogotá. We also thank Michael Kessler (Z) for his support. Field trips that contributed to our findings were financed through the German Science Foundation (DFG; grants LE 1826/4 & QU153/7) and the research project POPCORN (Using Population genomics, Phylogenetics, and Community Ecology for understanding Radiations in Neotropical mountains) funded by the Swiss National Fund (grant SNF-310030L_146906). We thank Chris Haufler, Robbin Moran and two anonymous reviewers for helpful comments on the manuscript.

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