

Three New Species of Ferns (Pteridophyta) from Mesoamerica

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Abstract

In this research three new species of ferns of the Polypodiales Order are described: *Ctenitis leonii* A. Rojas, *Elaphoglossum karinae* A. Rojas and *Pecluma celaquensis* A. Rojas. *Ctenitis leonii* is characterized by its apical stipe scales marginally erose to ciliate, blade surfaces with two types of hairs present in both surfaces, ones 0.7 - 1.5 mm long and not glandular, the others 0.3 - 0.5 mm long and glandular and indusia are absent. *Elaphoglossum karinae* differs from *Elaphoglossum dissitifrons* Mickel by shorter rhizome, longer and relatively narrower rhizome scales, they lanceolate to linear-lanceolate and blackish costal scales. *Pecluma celaquensis* is similar to *Polypodium martensii* Mett., but differs by its thinner rhizome, smaller rhizome scales and these with a crown of brown cilia at the attaching point, relatively shorter stipe with longer hairs and these commonly no glandular, scaly rachis and it with longer and denser hairs, inframedial sori and glabrous sporangia.

Keywords

Ctenitis, *Elaphoglossum*, Honduras, New Species, *Pecluma*, Polypodiales

1. Introduction

Although no research has been developed exclusively in Honduras to study the diversity of ferns; there are general studies and other isolated works that contribute to it, including:

Molina [1] published the first document where a detailed list of the vascular flora of Honduras, which also included the club mosses and ferns known at the time.

Moran & Riba [2] published the first volume of the Mesoamerican Flora, which refers to club mosses and ferns of the region, including Honduras.

Nelson *et al.* [3] showed to the public a database of ferns from Honduras, prepared by Gerrit Davidse of the Missouri Botanical Garden.

Nelson *et al.* [3] published “Hondurensis Plantarum Vascularium Catalogus, Pteridophyta”, in which 651 species of ferns and club mosses were included, compared with 339 published by Molina [1]. This represents an increase of 92% of the known pteridophytes from Honduras.

Hernández & Nelson [4] mentioned *Polypodium ursipes* Moritz ex C. Chr., a new record from Honduras.

The first study of vegetation from Celaque was presented by Hazlett [5]. Since then several studies have been conducted listings the flora of the region. Recently Piątek *et al.* [6] published “Ferns and Lycophytes of Celaque National Park, Honduras” which recorded a total of 59 genera and 166 species. However, Rojas [7], based in the same inventory site, discovered nine species were by first time recorded from Honduras and 35 species for the Celaque Mountains National Park (PNMC).

There is a great need to increase the knowledge of the club mosses and ferns in Honduras. This research in the PNMC was conducted in one of the least explored national parks in the country. Three new species were located here: *Ctenitis leonii* and *Pecluma celaquensis*, both endemic to Celaque and *Elaphoglossum karinae*, more broadly distributed in Mesoamerica.

2. Materials and Methods

The research was conducted at the Celaque Mountain National Park (PNMC) in Honduras and involved collecting specimens and revision of material at these herbaria: Universidad Nacional Autónoma de Honduras, Cyril Nelson Herbarium (TEFH) and Missouri Botanical Garden (MO). Fieldwork was conducted between the 25 and 30 of June 2012 and consisted of the travel paths of the main street, between the entrance to the park near the community of Villa Verde (1300 m over sea level) and the park visitor’s center (1400 m), and the path to Heaven between the visitor’s center and to the camp El Quetzal (2630 m) through the camp Don Thomas (1940 m), camp El Naranjo (2560 m) and turning off to Cerro Las Minas (2849 m), to complete an approximate distance of 12 km and returning. A total of 216 numbers and ferns club mosses representing nearly 170 species were collected.

The specimens were collected and preserved according to the method established by Lorea and Riba [8], and distributed to Museo Nacional de Costa Rica (CR), Escuela Nacional de Ciencias Forestales (HEH) and Universidad Nacional Autónoma de Honduras, Cyril Nelson herbarium (TEFH). Other specimens cited here are deposited in the following herbaria BM, CR, EAP, F, MEXU, MO, NY, TEFH, UC and US (acronyms following Thiers, [9]).

The specimens were mainly revised with the treatments of Ferns and Fern Allies of Guatemala [10], Mesoamerican Flora [2], the Pteridophytes of Mexico [11] and Flora de Nicaragua [12].

To ensure the correct application names, original type material or digital type images were examined as available (Jstor Global Plants (<http://plants.jstor.org/>)), and the new names were corroborated with International Plant Name Index

(<http://www.ipni.org/ipni/plantnamesearchpage.do>).

3. Results

3.1. New Species

3.1.1. *Ctenitis leonii* A. Rojas, sp. nov. (Figure 1)

TYPE: Honduras. Lempira: Gracias, Celaque Mountains National Park, main path, up to Río Arcagual and heading to Don Thomas camp, 14°33'32"N, 88°39'47"W, 1450 - 2100 m, 26 June 2012, A. Rojas *et al.* 9965 (holotype: CR; Isotypes: TEFH, EAP).

Diagnosis. This new species differs from *C. subdryopteris* (Christ) Lellinger by its apical stipe scales marginally erose to ciliate, blade surfaces with two types of hairs present in both surfaces, ones 0.7 - 1.5 mm long and no glandular, the others 0.3 - 0.5 mm long and glandular, and indusia absent.

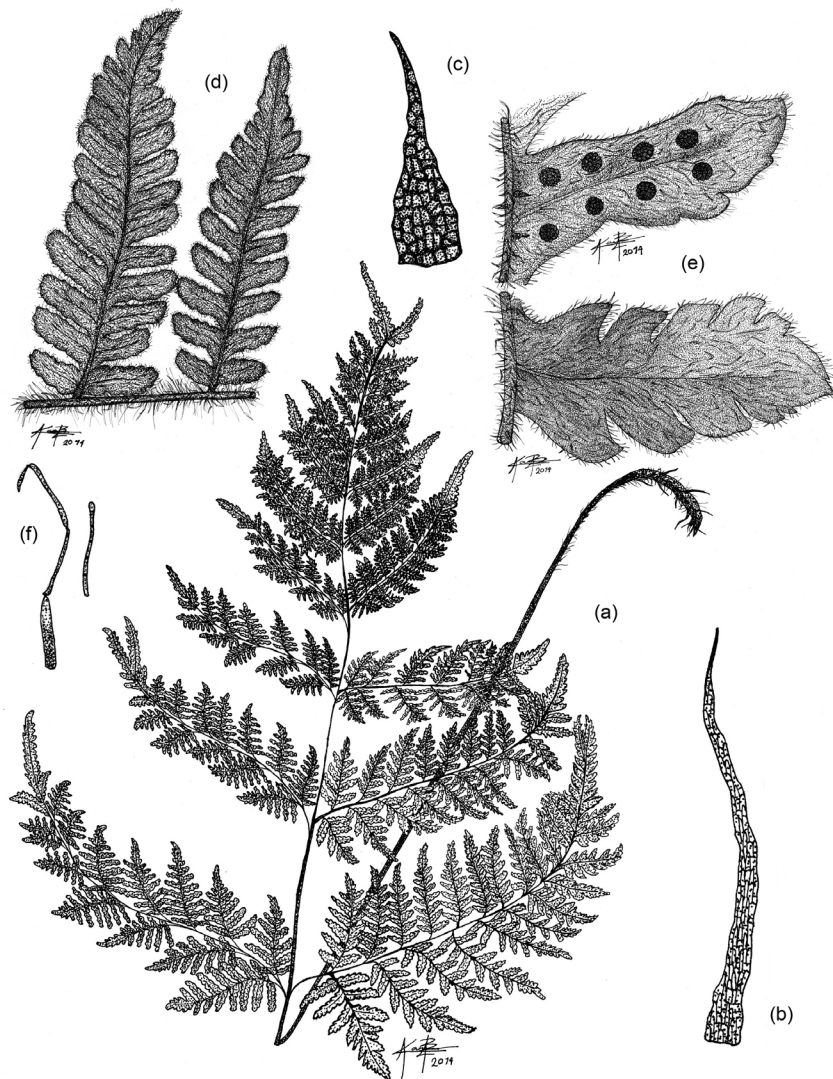


Figure 1. (a)-(f) *Ctenitis leonii* (A. Rojas *et al.* 9965, CR): (a) General aspect of type specimen; (b) Rhizome scale; (c) Costal scale; (d) Pinna detail; (e) Segments detail; (f) Abaxial blade hairs.

Description. Rhizome 5 - 10 mm in diameter, compact, ascending, scaly, the scales 7 - 10 × ca. 1 mm, linear, brown-gold, entire; fronds 118 - 140 cm long; stipe 55 - 65 cm long, strawish to brown basally, lustrous, very sparsely hairy at full length, densely only at the base, the scales 5 - 10 × 0.3 - 0.7 mm, linear, brown, no clathrate, entire, flaccid; dorsally with scales 0.5 - 1.5 × 0.2 - 0.5 mm, ovate to lanceolate, marginally erose to ciliate; blade 62 - 75 × 52 - 60 cm, ovate, 4-pinnate-pinnatifid at base, 3-pinnate-pinnatifid above the base, basally truncate, apically pinnatifid; rachis, costae and costules straw, sparsely hairy abaxially and densely hairy dorsally, the hairs 0.5 - 1 mm long, cateniform, hyaline in the center and brown-yellowish in the cells unions, moderate scaly dorsally and near the union between rachis, costae and costules, the scales 0.5 - 2 × 0.3 - 0.7 mm, ovate to linear-lanceolate, brown to dark brown, clathrate, appressed, marginally entire to erose; basal and medial pinnae 20 - 37 × 8 - 20 cm, lanceolate; basal pinnae markedly inequilateral, basiscopic pinnules up to double the size of the acroscopic ones, with peduncle 7 - 10 cm long; laminar tissue densely hairy in both surfaces, the hairs of the axes and veins 0.5 - 1.5 mm long, hyaline to light brown, appressed, cateniform, with brown-yellowish cells unions, the hairs of adaxial surface 0.3 - 1.2 mm long, appressed, cateniform, with reddish cells unions, the biggest ones with acute apex the smallest with glandular apex, the abaxial hairs similar to adaxial ones, but the hairs on costules and veins 0.7 - 1.5 mm long, and the hairs in laminar tissue commonly 0.2 - 0.5 mm long and with glandular apex, but mixed with long non glandular hairs; last segments 2 - 4 mm de broad, ciliate; veins 1 - 3 pairs per lobule, ending in the margins; sori rounded, medial, without indusia.

Etymology. The new species is dedicated to Misael León Carvajal, ex director of MAPANCE and now director of ICF, for financing the exploration in Parque Nacional Montañas de Celaque through MAPANCE-PROCELAQUE.

Distribution. Known only from Montañas de Celaque in Honduras at 1450 - 2100 m.

Observations. *Ctenitis leonii* differs from *C. subdryopteris* by its apical stipe scales marginally erose to ciliate (vs. entire), blade surfaces with two types of hairs present in both surfaces, ones 0.7 - 1.5 mm long and not glandular (vs. this type absent), the glandular ones 0.3 - 0.5 mm long (vs. 0.1 - 0.2 mm long) and present in both surfaces (vs. present only in abaxial surface), and indusia absent (vs. present) (**Figure 1**).

3.1.2. *Elaphoglossum karinae* A. Rojas, sp. nov. (**Figure 2**)

TYPE: Honduras. Lempira: Gracias, Celaque Mountains National Park, main path, between El Naranjo camp and the crossing of the path towards Las Minas hill, 14°32'36"N, 88°40'57"W, 2575 - 2700 m, 28 June 2012, *A. Rojas, R. Hernández & N. Cruz* 10066 (holotype: CR; Isotypes: EAP, TEFH).

Diagnoses. *Elaphoglossum karinae* differs from *E. dissitifrons* Mickel by its shorter rhizome, with longer and relatively narrower scales, these lanceolate to linear-lanceolate and blackish costal scales.

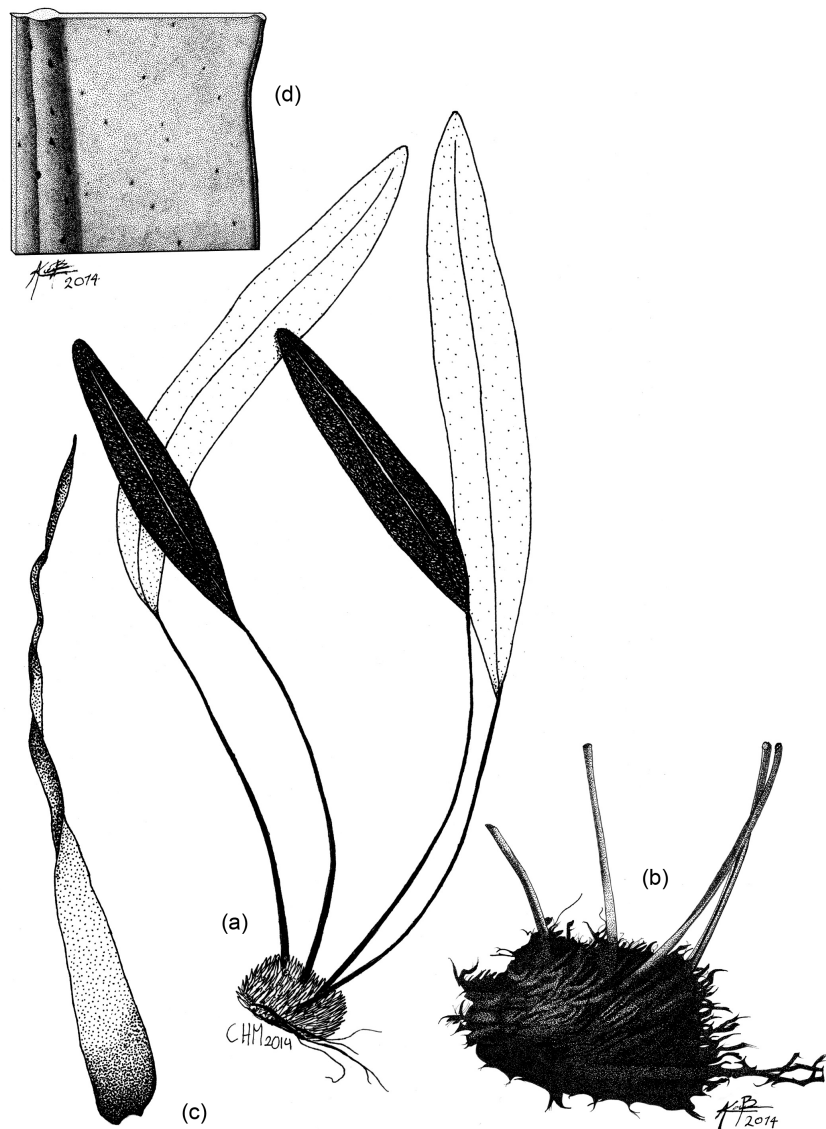


Figure 2. (a)-(d) *Elaphoglossum karinae* D. Breedlove & A Smith 31630, MEXU). (a) General aspect of representative specimen; (b) Rhizome; (c) Rhizome scale; (d) blade detail.

Description. Epiphytic; rhizome 2 - 3 mm in diameter, creeping, distance between fronds 2 - 5 (-10) mm; rhizome scales 5 - 10 × 1 - 2 mm, lanceolate, gold or with brown patches, peltate, flaccid, patent, marginally entire to short-ciliate; fronds 18 - 46 cm long; phyllopodia 7 - 15 mm long; stipe 5 - 23.5 cm long, 1/2 - 1/4 of the frond length, stramineous, scaly at least in the base, the scales 2 - 5 × ca. 1 mm, the basal ones marginally entire and elsewhere long-ciliate; blade 13 - 24 × (2.1-) 2.5 - 4.3 cm, elliptic, oblong-elliptic or oblanceolate, coriaceous, basally cuneate, apically obtuse to rounded; costa stramineous, scaly or glabrous, the scales 1 - 2 × ca. 0.5 mm, lanceolate, gold-brown to brown, sparse, marginally with lateral processes; laminar tissue glabrous on both surfaces; veins few evident; fertile fronds 13 - 37 cm long; stipe (3-) 10 - 20.5 cm long; blade 9.5 - 17 × 1.6 - 2.7 cm, elliptic to oblong, basally cuneate, apically

acute to obtuse; interesporangial scales absent.

Etymology. This species is dedicated to Ruth Karina Hernández Cibrian, pteridologist in Honduras, who collaborated with the Celaque expedition in 2012.

Distribution. Known from Mexico, Guatemala, Honduras and El Salvador at (1400–) 1900 - 3050 m.

Additional revised specimens (paratypes). MEXICO. Chiapas: Mpio. Chamula, NE slope of Zontehuitz near the summit, 9300 ft [=2835 m], *D. Breedlove* 7812 (F); Mpio. Tenejapa, NE side of the hill called Matsab, Paraje of Matsab, 9200 ft [=2804 m], *D. Breedlove* 15292 (F); SE side of Volcán Tacaná, above Talquian, 2200 m, 16 Jan 1973, *D. Breedlove & A. Smith* 31630 (MEXU); Mpio. Tenejapa, in the Paraje Matsab, 8900 ft [=2713 m], *A. Shilom* 694 (F). Oaxaca: Teotitlán, 2500 m, *C. Conzatti et al.* 2137 (MEXU); along road from Teotitlán del Camino to Hautla de Jiménez, 17.8 - 18.3 miles E of Teotitlán, 2300 - 2370 m, *T. Croat* 48214 (MO, NY, UC); Dist. Ixtlán, Sierra de Juárez, Km 90 of rute 175 Tuxtepeca-Oaxaca, SW of La Esperanza, 2035 m, *D. Lorence et al.* 3618 (MEXU, MO); Dist. Central, North slope of Cerro San Felipe, 7800 - 8400 ft [=2377 - 2560 m], *J. Mickel & R. Hellwig* 4034 (NY, UC); Dto. Teotitlán, 26 - 29 km NE of Teotitlán del Camino, vicinity of pass of Puerto Soledad, 7000 - 7400 ft [=2134 - 2256 m], *J. Mickel & R. Hellwig* 4152 (NY, UC); Dist. Mixes, SE shoulder of Cerro Zempoaltepetl, 8200 ft [=2500 m], *J. Mickel & S. Leonard* 4910 (NY, UC); Dist. Ixtlán, Cerro de Malacate, N of Capulalpan, ca. 8 km E of Ixtlán from 7600 - 10000 ft [=2316 - 3048 m] on NE side of Cerro, 8850 ft [=2697 m], *J. Mickel & S. Leonard* 5246 (NY, UC), *J. Mickel & S. Leonard* 5299 (NY, UC); Dist. Ixtlán, 56 km N of Ixtlán on Rte. 175, 7100 ft [=2164 m], *J. Mickel* 5593 (NY, UC); Teotitlan de Flores Magon, Raya San Geronimo, 4 km SE of Plan de Guadalupe, path to Mazatlán de Flores, 18° 10'N, 97° 01'W, 2800 m, *P. Tenorio & F. Tenorio* 18553 (MEXU).

GUATEMALA. Guatemala: Volcán Pacaya, above Las Calderas, 1800 - 2400 m, *P. Standley* 58487 (F, US). San Marcos: Volcán Tacaná, along Quebrada Canjulá, between Sibinal and Canjulá, 2200 - 2500 m, *J. Steyermark s.n.* (US). Zacapa: Sierra de Las Minas, between Loma El Picacho and Cerro de Monos, 2000 - 2600 m, *J. Steyermark* 42813 (GH).

HONDURAS. Comayagua: San Juanillo, section of the Cordillera de Montecillos Biological Reserve, 9 Dec 1991, *T. Hawkins et al.* 121 (EAP); Montaña de San Juanillo, Cordillera de Montecillos Biological Reserve, path El Danto to Jesús de Otoro, 14° 30'N, 87° 53'W, 1900 m, 1 Mar 1991, *P. Hause & S. Aguilar* 846 (EAP, MO, TEFH). El Paraíso: Yuscacán, Cerro Monserrat, 2000 m, *A. Díaz* 180 (CR, UC); ibídem, *Zelaya* 129 (CR, MO, UC). La Paz: Maguore, 4 km NW of Guajiquiro, 14° 09'N, 87° 51'W, 2100 m, 24 May 1993, *R. Liesner* 26528 (EAP, MO, TEFH, UC). Lempira: Montaña de Celaque, SE portion of the massif, main peak just S of the Río Aragón, on plateau, 14° 32'30"N, 88° 41'00"W, 2670 m, 2670 m, 29 May 1991, *G. Davidse* 34878 (EAP, MO); Celaque National Park, along Río Arcágual, between visitor's center and dam (water intake for the town of Gracias), 7.5 km WSW of Gracias, 14° 34'N, 88° 39'W, 1400 m, 11 Nov 1991, *R.*

Moran 5515 (MO, UC); Celaque National Park, along Río Arcágual, upstream from base camp 2, 10.5 km WSW of the town of Gracias, 14°34'05"N, 88°41'05"W, 2500 m, 16 Nov 1991, *R. Moran* 5592 (EAP, MO, TEFH); Gracias, Celaque Mountains National Park, between Don Thomas and El Naranjo camps, 14°33'16"N, 88°40'15"W, 2100 - 2575 m, 27 Jun 2012, *A. Rojas et al.* 9982 (CR, EAP, TEFH). Santa Bárbara: Montaña Santa Bárbara, 2350 m, 7 Apr 1951, *R. Armour & A. Chable* 6123 (EAP); 7 km N of El Monchito, on the E slopes of Mt. Santa Bárbara, 14°55'N, 88°7'W, 2200 - 2500 m, 23 Nov 1991, *R. Moran* 5704 (EAP, MO, TEFH, UC).

EL SALVADOR. Bosque Montecristo, *R. Seiler* 657 (NY). Chalatenango: E side near summit of Eses Miles, 14°21'N, 89°09'W, 2500 m, *J. Tucker* 1071 (NY, UC, US). Santa Ana: Montecristo, 14°25'N, 89°22'W, 2100 - 2250 m, 27 Jan 1998, *G. Davidse et al.* 37290 (BM, MO); Montecristo, 2300 m, 23 May 1963, *A. Molina & A. Molina* 12659 (EAP).

Observations. *Elaphoglossum karinae* differs from *E. dissitifrons* by its shorter [fronds distant (0.2–) 0.5 - 1.0 cm vs. 0.8 - 1.7 cm] rhizome, longer [(4–) 7 - 12 mm long vs. 5 - 7 mm] and relatively narrower [1 - 2 (–3) mm vs. 1.5 - 3.0 mm] rhizome scales, which are lanceolate to linear-lanceolate (vs. ovate to ovate-lanceolate) and blackish (vs. yellowish-brown) costal scales (**Figure 2**).

3.1.3. *Pecluma celaquensis* A. Rojas, sp. nov. (Figure 3)

Type: Honduras. **Lempira:** Gracias, Celaque Mountains National Park, main path, between El Naranjo camp and the crossing of the path towards Las Minas hill, 14°32'36"N, 88°40'57"W, 2575 - 2700 m, 28 June 2012, *A. Rojas, R. Hernández & M. Stufkens* 10060 (Holotype: CR; Isotype: TEFH).

Diagnoses. *Pecluma celaquensis* A. Rojas differs from *Polypodium martensii* Mett. by its have thinner rhizome, smaller rhizome scales and these with a crown of brown cilia in the attaching point, relatively shorter stipe, relatively longer stipe hairs and they commonly not glandular, scaly rachis and it with longer and dense hairs, inframedial sori and glabrous sporangia.

Description. Epiphytic, on trunks base of old trees; rhizome 3 - 5 mm in diameter, creeping; rhizome scales 2 - 3 × 0.5 - 1.5 mm, ovate to ovate-lanceolate, peltate, gold with dark brown attached point and with a crown of brown cilia just here, they 0.5 - 2 mm long, the scale margins erose to short ciliate; fronds 45 - 51.5 cm, nearby to 0.5 cm distant; stipe 6 - 7.5 cm long, 1/8 - 1/6 of the fronds size, brown, moderately lustrous, shortly and densely hairy, the hairs (0.5–) 1 - 1.5 mm long, brown, cateniform, crooked; lamina 39 - 44 × 8 - 13 cm, lanceolate, abruptly reduced at base and gradually reduced to a pinnatifid apex; rachis yellowish to brown, scaly and hairy, the scales (1.5–) 2.5 - 5 × (0.1–) 0.3 - 0.5 mm, sparse, the hairs (0.5–) 1 - 1.5 mm long, brown, cateniform, dense; pinnae linear-lanceolate to linear-deltate, sessile, broadly attached at base in 0.8 - 1.2 cm, the basal ones reduced to 0.8 cm long and separate between them to 0.5 cm, the medial ones enlarged to 6.4 cm, the basal ones sometimes with a acroscopic basal lobule and sometimes slightly decurrent on basicopic side; adaxial blade surface moderately hairy, the hairs 0.5 - 1 mm long, cateniform, hyaline, abaxial blade

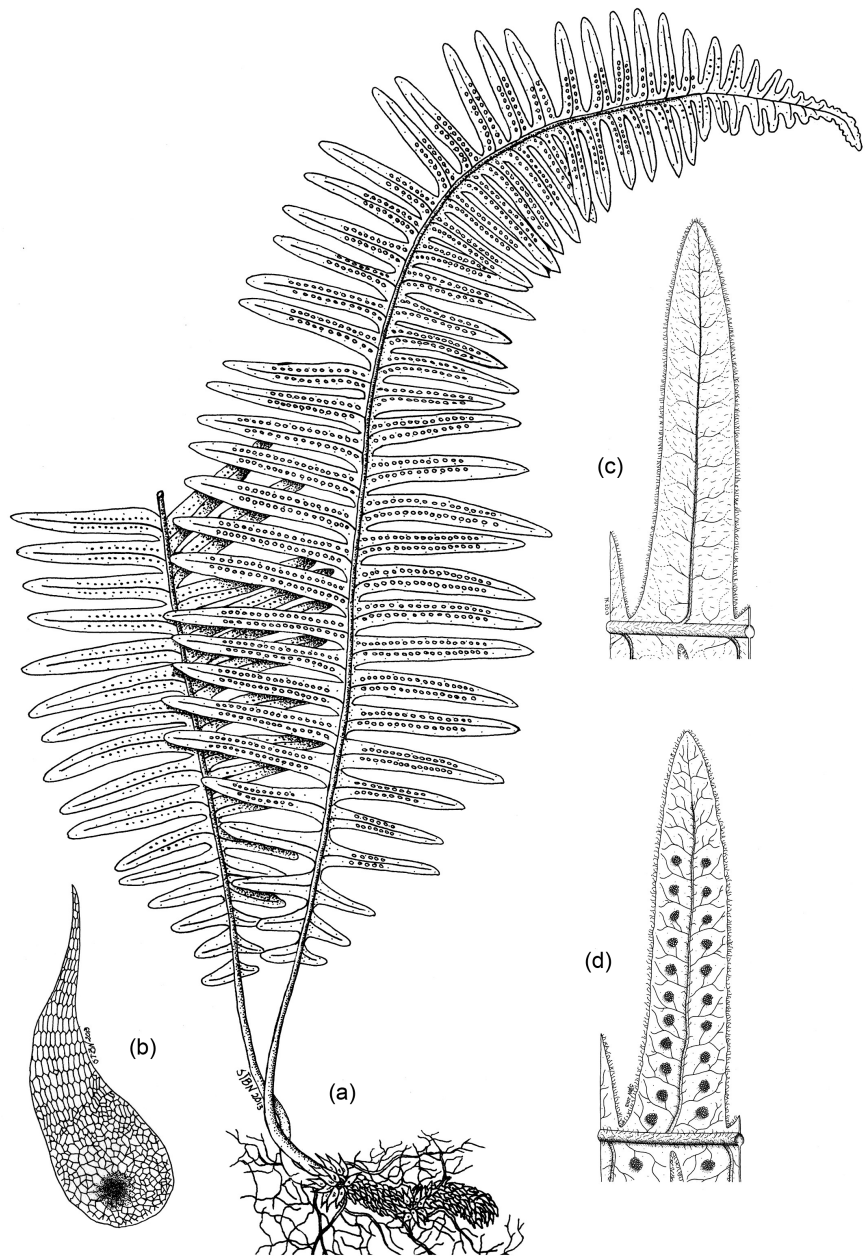


Figure 3. (a)-(d) *Pecluma celaquensis* (A. Rojas et al. 10060, CR). (a) General aspect of type specimen; (b) Rhizome scale; (c) Adaxial blade detail; (d) Abaxial blade detail.

hairs moderately dense over costae, sparsely hairy over the veins and very rare or absent on the blade surface, the costal hairs 1 - 1.5 mm long, the other ones 0.5 - 1 mm long, hairs similar to the adaxial ones, but in costae and veins are pale brown to hyaline with brown walls; blade margin entire to slightly undulate; sori round to slightly oblong, inframedial; sporangia glabrous.

Etymology. The specific epithet makes reference to the type locality.

Distribution. Known only from Montañas de Celaque in Honduras at 2575 - 2700 m.

Observations. *Pecluma celaquensis* is similar to *Polypodium martensii* Mett. in its peltate rhizome scales, blade form and laminar tissue hairy, but differs in

its thinner (2 - 3 mm in diameter vs. 7 - 10 mm) rhizome, smaller (2 - 3 × 0.5 - 1.5 mm vs. 10 - 12 × 3 mm) rhizome scales and they with a crown of brown cilia (vs. without it) in the attaching point, relatively shorter (1/8 - 1/6 of the fronds size vs. 1/6 - 1/4) stipe, relatively longer [(0.5-) 1 - 1.5 mm long vs. 0.8 mm] stipe hairs and these commonly not glandular (vs. always glandular), scaly (vs. no scaly) rachis and it with longer [(0.5-) 1 - 1.5 mm long vs. 0.1 mm] and dense (vs. rare) hairs and inframedial (vs. supramedial sori and glabrous (vs. setose) sporangia. Also it is similar to *Polypodium christensenii* Maxon in that it has a thin rhizome and blade hairs, but differs in its smaller (2 - 3 × 0.5 - 1.5 mm vs. 6 - 7 × 1 - 1.2 mm) rhizome scales and these with a crown of brown cilia (vs. without it) in the attaching point, shorter (45 - 51.5 cm vs. 65 - 120 cm) fronds, a relatively shorter (1/8 - 1/6 of the fronds size vs. 1/4 - 1/2) stipe, longer [(0.5-) 1 - 1.5 mm long vs. 0.1 mm] stipe hairs; entire to undulate (vs. crenulate-serrulate) blade margins and glabrous (vs. setose) sporangia (**Figure 3**).

Recent molecular evidence suggests that *Polypodium* s.l. is a polyphyletic assemblage, even if several segregate genera (e.g., *Microgramma* C. Presl, *Pecluma* M.G. Price, and *Campyloneurum* C. Presl) [13]. Schneider *et al.* [14] discovered that *Pecluma* is a genus related to *Phlebodium* (R. Br.) J. Sm. and also include several species of *Polypodium subpetiolatum* group. Although, the new species of *Pecluma* described here is more related to *Polypodium subpetiolatum* group, the species included promptly will be combined under the genus *Pecluma*, despite the fact that Moran [2] used the “*Polypodium dulce* group” (including the new species by definition).

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