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Seven new species, 13 new combinations, and one new name of Polypodiaceae from Bolivia

MICHAEL KESSLER & ALAN R. SMITH

ABSTRACT

KESSLER, M. & A. R. SMITH (2005). Seven new species, 13 new combinations, and one new name of Polypodiaceae from Bolivia. *Candollea* 60: 271-288. In English, English and Spanish abstracts.

Seven new species of *Polypodiaceae* are described from Bolivia: *Pecluma perpinnata* M. Kessler & A. R. Sm., *Pleopeltis appressa* M. Kessler & A. R. Sm., *Pl. disjuncta* M. Kessler & A. R. Sm., *Pl. intermedia* M. Kessler & A. R. Sm., *Polypodium concolorum* M. Kessler & A. R. Sm., *Po. intricatum* M. Kessler & A. R. Sm., and *Po. silvulae* M. Kessler & A. R. Sm. Further, three new combinations are proposed in *Pecluma*, and ten new combinations and one new name in *Pleopeltis*.

RESUMEN

KESSLER, M. & A. R. SMITH (2005). Siete nuevas especies, 13 nuevas combinaciones y un nuevo nombre de Polypodiaceae de Bolivia. *Candollea* 60: 271-288. En Inglés, resúmenes en Inglés y Español.

Describimos siete nuevas especies de *Polypodiaceae* de Bolivia: *Pecluma perpinnata* M. Kessler & A. R. Sm., *Pleopeltis appressa* M. Kessler & A. R. Sm., *Pl. disjuncta* M. Kessler & A. R. Sm., *Pl. intermedia* M. Kessler & A. R. Sm., *Polypodium concolorum* M. Kessler & A. R. Sm., *Po. intricatum* M. Kessler & A. R. Sm., and *Po. silvulae* M. Kessler & A. R. Sm. Adicionalmente, proponemos tres nuevas combinaciones en *Pecluma*, y diez nuevas combinaciones y un nuevo nombre en *Pleopeltis*.

KEY-WORDS: POLYPODIACEAE – *Pecluma* – *Pleopeltis* – *Polypodium* – Bolivia – Taxonomy – Tropical Andes

Introduction

During taxonomic work on a forthcoming guide to the ferns of Bolivia, we have recognized seven undescribed species in the family *Polypodiaceae*, which are here described. Recent molecular work on relationships in *Polypodiaceae* (SCHNEIDER & al., 2004; SMITH & al., unpubl. ms.) have firmly established that the relationships of most of the scaly neotropical species of *Polypodium* L. (e.g., groups treated by MAXON, 1916; DE LA SOTA, 1966) are with *Pleopeltis* Willd., and not with the type of *Polypodium* (*P. vulgare* L.) and related species. *Pleopeltis*, as redefined, is a large clade of about 75 Neotropical and a few African species bearing scales on the laminar tissue (between the veins, at least on the abaxial blade surface). The traditional circumscription of *Pleopeltis* included mostly simple-bladed species bearing peltate scales on the blade; however, the type of *Pleopeltis*, *P. angusta* Willd., has deeply pinnatisect blades, several hybrids are known between simple-bladed and more divided species (see MICKEL & SMITH, 2004: 467-475), and very

similar blade scales are known on pinnatifid or pinnatisect species of *Polypodium* s.lat., all factors making *Pleopeltis* and *Polypodium* s.lat., as historically defined, untenable. Some of the necessary combinations for Bolivian *Polypodium* in *Pleopeltis* have already been made (e.g., *Pleopeltis polypodioides* (L.) E. G. Andrews & Windham and *P. thyssanolepis* (Klotzsch) E. G. Andrews & Windham), but others are now necessary. For this reason, we here make ten new combinations and propose a new name for a taxon whose epithet is preoccupied at the species level in *Pleopeltis*. The new combinations in *Pleopeltis* are attributed solely to Smith, who has a revision of the limits of the genus in progress. We also describe a new species and propose three new combinations within *Pecluma* M. G. Price, raising taxa previously treated at varietal level (EVANS, 1969; PRICE, 1983; TRYON & STOLZE, 1993) to species level because we consider them to be as distinct as many currently accepted species within the genus.

1. *Pecluma perpinnata* M. Kessler & A. R. Sm., **spec. nova** (Fig. 1A-C)

Holotype: BOLIVIA. La Paz: Nor Yungas; P.N. Cotapata, Campamento "Pajonal", 16°14'S 67°52'W, 1800 m, 09.IX.2000, *Krömer 1499* (UC; iso-: GOET, LPB).

A Pecluma divaricata (E. Fourn.) Mickel & Beitel et *P. eurybase* var. *glabrescente* (Rosenst.) Lellinger *pinnis latioribus* (9-11.5 mm vs. 5-9 mm), *remotis, parce deflexis, marginibus inferioribus pinnarum in rhachidibus perpendicularibus differt.*

Plants epiphytic; **rhizomes** short-creeping, 6-9 mm in diameter, the scales 1-2 × 0.5-1 mm, reddish brown, lustrous, comose, entire; **petioles** to 30 cm × 3 mm, reddish brown, terete, glabrous or proximally with a few hairs resembling those of the rhizomes and distally with a few hairs resembling those of the rachises; **blades** to 80 × 15 cm, linear-lanceolate, remotely pinnate except sometimes near the apices, where then deeply pinnatisect, broadest about 1/4 from the bases, most pinnae slightly deflexed, lowermost pinnae strongly deflexed, 20-60% as long as the longest pinnae; **pinnae** 6-9 cm × 9-11.5 mm, 45-65 pairs, adnate, basiscopic margins perpendicular to rachises, acroscopic margins surcurrent, margins entire, apices rounded to attenuate; **rachises** reddish brown, terete, densely hairy, the hairs mixed, one type 0.05-0.15 mm long, catenate, patent, the other type ca. 0.5 mm long, acicular, erect, increasing in density toward the blade apices; **costae** similar to rachises but lacking or with very few ctenitoid hairs; **veins** free, mostly 2-forked; **indument** of blade surfaces lacking or abaxially of sparse hairs 0.2-0.5 mm, hairs appressed to spreading; **sori** in 1 row between the costae and margins, 12-18 pairs per pinna, arising from the end of the basalmost lateral veinlets; **sporangia** glabrous.

Distribution and habitat. – Locally fairly common in humid montane forests at 1200-2000 m in the departments of La Paz and Cochabamba, Bolivia.

Discussion. – This striking species of *Pecluma* is most closely related to *P. divaricata* (E. Fourn.) Mickel & Beitel and *P. eurybasis* var. *glabrescens* (Rosenst.) Lellinger, sharing the with them glabrous sporangia (sometimes hairy in *P. divaricata*), free veins, glabrous to sparsely short-hairy lower blade surfaces, and a mixture of sparse, acicular hairs ca. 0.5 mm long and shorter, catenate hairs on the rachises. *Pecluma perpinnata* differs from its two closest relatives in having remote, slightly deflexed pinna with the basiscopic margins perpendicular to the rachises, and broader pinnae (9-11.5 mm vs. 5-9 mm wide). Unlike most other species of *Pecluma*, the leaves are fully pinnate to the apices or nearly so (hence, the species epithet). Other species of *Pecluma* are pinnate at the blade base, but throughout most of the blades, the basiscopic pinna margins are decurrent on the rachises and the bases of adjacent pinnae are approximate or confluent. In *P. perpinnata*, the lowermost pinnae may be fairly long (ca. 50-60% the length of the longest pinnae) as in *P. divaricata* or more strongly reduced (20-50%) as in *P. eurybasis* (H. Christ) M. G. Price. The remote, broad, apically often rounded pinnae of *P. perpinnata* provide it with a distinctive habit reminiscent of species of *Nephrolepis* Schott.

Specimens examined. – **BOLIVIA. Cochabamba:** Ayopaya, Comunidad Pampa Grande, pkor el sendero a Carmen Pampa, 16°40'S 66°28'W, 1980 m, *Jimenez 1511* (LPB, UC); Carrasco, Km 143 antigua carretera Cochabamba a Villa Tunari, 17°07'S 65°34'W, 1300 m, *Kessler 7655* (LPB, UC), Km 136, 17°07'S 65°35'W, 1550 m, *Kessler 7877* (LPB, UC), *Kessler 7878* (LPB, UC), Km 145, 17°07'S 65°34'W, 1200 m, *Kessler 7968* (LPB, UC); Chapare, Territorio Indígena P.N. Isiboro-Sécure, Cordillera de Mosetenes, Laguna Carachupa, 16°14'S 66°25'W, 1350 m, *Kessler 13055* (LPB), 1400 m, *Kessler 13118* (LPB). **La Paz:** Caranavi, Serranía Bellavista, 37 km Caranavi a Sapecho, 15°40'S 67°29'W, 1500 m, *Kessler 11315* (LPB, UC); Nor Yungas, Estación Biológica de Tunquini, 16°14'S 67°52'W, 1850 m, *Bach 966* (LPB), 16°11'S 67°53'W, 1560 m, *Eberhardt 107* (LPB), 16°11'S 67°52'W, 1500 m, *Krömer 1263* (LPB), 1690 m, *Portugal 229* (LPB), 16°12'S 67°53'W, 1700 m, *Solomon 8827 pro parte* (MO, UC); Saavedra, Cerro Asunta Pata, entre Apolo y Charazani, 15°03'S 68°29'W, 1450 m, *Kessler 10247* (LPB, UC).

2. *Pleopeltis appressa* M. Kessler & A. R. Sm., *spec. nova* (Fig. 1D-G)

Holotype: **BOLIVIA. Santa Cruz:** Florida, P.N. Amboró, 8 km (by air) NE of Mairana, along trails and near ridgetop, 5.5 km N of Campamento “La Yunga” park station, 18°3.5'S 63°55'W, 2300 m, 30.III.2002, *Sundue 565* (UC; iso-: LPB, NY, USZ).

A Polypodio buchtienii H. Christ & Rosenst. *rhizomatibus parce applanatis, squamis rhizomatis adpressis* (vs. *squamellis minoribus* (0.2-1 mm vs. 0.4-1.5 mm longis) *laminarum inferiorum*) *rotundis lanceolatisque intermixtis* (vs. *lanceolatis dominantibus*) *pallide albidobrunneis in puncto distincto affixis* (vs. *maximam partem atrocibus cum marginibus pallidis angustis*) *differt.*

Plants epiphytic, less commonly terrestrial and saxicolous; **rhizomes** long-creeping, 1.5-2.5 mm in diameter, slightly flattened, densely scaly, the scales 3-4.5 × 0.2-0.4 mm, loosely appressed, linear-lanceolate, long-acuminate, erose, bicolorous, each with a thick, dark red-brown central stripe and thin, whitish to pale tan margins; **petioles** 3.5-18 cm × 0.6-1.2 mm, reddish brown, adaxially grooved, densely to moderately scaly, the scales 0.6-2 × 0.4-0.8 mm, loosely appressed, peltate-lanceolate, acuminate, subentire to erose, bicolorous, each with a thick, dark red-brown point of attachment and central stripe, and thin, whitish to pale tan margins; **blades** to 17 × 8 cm, deltate, broadest at the bases, pinnatisect; **pinnae** to 4.5 cm × 5 mm, 9-17 pairs, broadly adnate, straight to slightly curved-ascending, entire to sometimes lacerate, attenuate at the apices, most departing at ca. 80° from rachises, but basal 1-3 pairs perpendicular to rachises or slightly decurved, the sinuses broad and U-shaped; **rachises** reddish brown, adaxially sulcate, moderately scaly, the scales similar to those of the blade tissue; **costae** similar to rachises but flattened to terete; **veins** obscure due to thick blade texture; **adaxial blade surfaces** glabrous, **abaxial surfaces** moderately scaly, the scales 0.2-1 × 0.2-0.4 mm, appressed, circular to peltate-lanceolate, erose-denticulate, pale whitish brown with dark points of attachment; **sori** in 1 row between the costae and margins, 6-9 pairs per pinna.

Distribution and habitat. – Fairly common in semihumid Boliviano-Tucumano forests at 2000-2500 m from eastern Santa Cruz (ca. 17°30'S) southward through Chuquisaca to Tarija. To be expected in northwestern Argentina.

Discussion. – This species is probably most closely related to *Pleopeltis buchtienii* (H. Christ & Rosenst.) A. R. Sm. but differs in its appressed (vs. loosely arranged, spreading) rhizome scales, somewhat flattened rhizomes, and abaxial blade scales 0.2-1 mm long (vs. 0.4-1.5 mm) that are circular to lanceolate (vs. mostly lanceolate) and mostly pale whitish brown with a small, distinct dark point of attachment (vs. point of attachment and most of scale dark with only a narrow pale margin). The blade scales are thus quite similar to those of *Polypodium tweedianum* Hook., but that species has sharply bicolored rhizome scales with highly dissected, crispate, pale margins. On average, *P. appressa* appears to be somewhat smaller than *P. buchtienii*. *Pleopeltis appressa* occurs to the south of the range of *P. buchtienii* in the climatically and biogeographically distinct

Tucumano-Boliviano region of central and southern Bolivia and northwestern Argentina. Their allopatric distribution thus mirrors that of numerous other plant and animal species, e.g., the birds *Scytalopus simonsi* Chubb and *S. zimmeri* Bond & Meyer de Schauensee (KRABBE & SCHULENBERG, 1997), or the epiphytic cacti *Lepismium bolivianum* (Britton) Barthlott and *L. lorentzianum* (Griseb.) Barthlott (IBISCH & al., 2000). *Pleopeltis appressa* has not been found sympatrically with *P. buchtienii*, but overlaps in range and is often found alongside *P. tweedianum*.

Specimens examined. – **BOLIVIA. Chuquisaca:** Azurduy, NW Tarvita, 25 km a Icla, 19°65'S 64°34'W, 2500 m, *Kessler 4760* (AAU, LPB); Azurduy, Tarvita, 25 km a Sopachuy, 19°50'S 64°29'W, 2500 m, *Kessler 4765* (AAU, LPB); Azurduy, Tarvita, 32 km a Sopachuy, 19°40'S 64°28'W, 2050 m, *Kessler 4810* (AAU, LPB); Boeto, 5 km pasando Nuevo Mundo, 19°00'S 64°19'W, 2300 m, *Kessler 31 pro parte* (LPB, UC), *Kessler 62* (LPB, UC); Boeto, Nuevo Mundo, 1 km a Padilla, 18°59'S 64°18'W, 2100 m, *Kessler 5121* (LPB); Sud Cinti, camino entre campamento Rinconada del Bufete y la cumbre del Cerro Bufete, 20°50'S 64°22'W, 2000 m, *Serrano 1273* (UC). **Santa Cruz:** Caballero, Siberia, 17°50'S 64°44'W, 3000 m, *Nuñez 6* (USZ); Caballero, P.N. Amboró, Cerro Bravo, juntas del Río Alizar y Amparo, 17°57'S 64°24'W, 2000 m, *Vargas 1482* (MO, NY); Florida, El Fuerte, Samaipata, 18°12'S 63°50'W, 2000 m, *Ibisch 264.pi81* (LPB); Florida, P.N. Amboró, 7 km NNE by air from Mairana, 18°03'S 65°55'W, 2300 m, *Moran 5903* (UC); Florida, 3.7 km N of Campamento La Yunga ranger station of P.N. Amboró, 6.5 km (by air) NE of Mairana, 18°04'S 63°55'W, 2150 m, *Sundue 574* (LPB, NY, USZ); Valle Grande, Vallegrande 62 km a Masicurí, 18°42'S 63°56'W, 2200 m, *Kessler 5242* (AAU, LPB); Valle Grande, Loma Larga 6 km a Masicurí, 18°43'S 63°54'W, 2150 m, *Kessler 6333* (LPB, UC); 2 km a Vallegrande, 18°45'S 63°54'W, 2050 m, *Kessler 6391* (LPB, UC); Loma Larga 13 km a Vallegrande, 18°39'S 63°55'W, 2300 m, *Kessler 6491* (LPB, UC). **Tarija:** O'Connor, camino Tarija-Entre Rios, 21°25'S 64°29'W, 2300 m, *Ibisch 931255* (LPB).

3. *Pleopeltis disjuncta* M. Kessler & A. R. Sm., **spec. nova** (Fig. 2A-C)

Holotype: **BOLIVIA. La Paz:** J. Bautista Saavedra, 10 km de Camata hacia Apolo, 15°13'S 68°41'W, 1300 m, 24.VI.1997, *Kessler 10268* (UC; iso-: GOET, LPB).

A Polypodio furfuraceo Schltldl. & Cham. squamellis laminarum erosis breviter ciliatisque inferioribus, superioribus profunde dissectis abstans.

Plants epiphytic; **rhizomes** short-creeping, 4-8 mm in diameter, densely scaly, the scales 4-6 × 1-1.5 mm, spreading, ovate-lanceolate, acuminate, erose, whitish to pale tan; **petioles** to 5.5 cm × 1.5 mm, reddish brown, terete to marginate, densely scaly, the scales 0.8-3 × 0.5-1.2 mm, spreading, peltate-lanceolate, acuminate, erose, apically denticulate, whitish to pale tan, often with dark points of attachment, sometimes apically darkened along the margins; **blades** to 20 × 3 cm, linear-lanceolate, broadest in the middle, abruptly reduced at the bases, pinnatisect; **pinnae** to 1.8 cm × 3 mm, 20-30 pairs, broadly adnate, straight to slightly curved-ascending, entire, rounded to attenuate at the apices, most departing at ca. 70-80° from rachises, but basal 3-7 pairs at 90°, the sinuses broad and U-shaped; **rachises** reddish brown, adaxially sulcate, densely scaly, the scales similar to those of the blade tissue; **costae** similar to rachises but not sulcate; **veins** obscure due to thick blade texture; **blade surfaces** scaly, the scales adaxially 1-2 × 0.8-1 mm, dense, appressed, peltate-lanceolate, long-acuminate, erose to short-ciliate, whitish, often with dark points of attachment, abaxially and marginally 1-2.5 × 0.8-1.2 mm, appressed to marginally spreading, peltate-lanceolate, long-acuminate, ciliate, whitish to pale tan, often with dark points of attachment; **sori** in 1 row between the costae and margins, 8-12 pairs per pinna.

Distribution and habitat. – Locally common at 800-1500 m in drought-deciduous forests of rain-shadowed valleys in Cuzco, Peru (e.g., *Cook & Gilbert 1510*, US), and La Paz and Santa Cruz, Bolivia.

Discussion. – This species was treated for Peru as *Polypodium furfuraceum* Schldl. & Cham. by TRYON & STOLZE (1993). However, the Peruvian and Bolivian specimens differ from the Mexican and Mesoamerican specimens of this species in having erose to short-ciliate abaxial blade scales, and broader, less deeply dissected adaxial blade scales. On average, *P. disjuncta* has denser adaxial blade scales, and more loosely arranged abaxial blade scales that lack dark points of attachment. Most specimens of *P. furfuraceum* have densely matted abaxial blade surfaces with conspicuous black spots formed by the dark scale bases. The epithet *disjuncta* refers to the distribution of this species with respect to its putative closest relative, *P. furfuraceum*.

Specimens examined. – **BOLIVIA. La Paz:** Caranavi, camino Caranavi-Palos Blancos, bajando por el camino del Km 19 hacia el puente sobre el Río Carrasco, 15°45'S 67°29'W, 870 m, *Jimenez 664* (LPB, UC); F. Tamayo, aprox. 15 kms río arriba de la Hacienda Ubito en trocha a Buena Vista, 14°24'S 68°27'W, 950 m, *Kessler 3954* (AAU, LPB); Río Bilipisa, 10 km NW Apolo, 14°36'S 68°27'W, 1100 m, *Kessler 11025* (LPB, UC); Inquisivi, Puente Alegre, área donde el camino Cajuta-Siquimirani cruza el Río Suri, 16°42'S 67°09'W, 1500 m, *Lewis 36906 pro parte* (LPB, MO); Lakachaka, 16°39'S 67°20'W, 1450 m, *Lewis 40368* (LPB, MO); Comunidad Khora-Charrupampa, cuenca del Río Miguillas, 16°40'S 67°20'W, 1340 m, *Salinas 2905* (LPB); Comunidad Khora, entre Samaipata y Charrupampa, a 22 km de Choquetanga, 16°40'S 67°20'W, 1420 m, *Salinas 2971* (LPB); Comunidad Khora-Lakachaka, 20 km de Choquetanga, 16°40'S 67°20'W, 1450 m, *Salinas 3045* (LPB); Comunidad Khora-Vilabarranco, 21 km de Choquetanga, 16°40'S 67°20'W, 1470 m, *Salinas 3105* (LPB); Muñecas, 9 km de Consata a Sorata, 15°22'S 68°31'W, 1300 m, *Kessler 4381* (LPB); Nor Yungas, por debajo de Yolosa, ca. 2 km arriba del embarcadero, 16°13'S 67°45'W, 1250 m, *Beck 18805* (LPB); 500 m al W de Yolosillas, 16°11'S 67°44'W, 1050 m, *Kessler 4296* (AAU, LPB), 16°12'S 67°44'W, 1300 m, *Kessler 5871* (AAU, LPB); Sud Yungas, Basin of Río Boopi, San Bartolomé near Calisaya, 800 m, *Krukoff 10233* (NY). **Santa Cruz:** Florida, Refugio Los Volcanes, 3 km NE Bermejo, 18°06'S 63°36'W, 1050 m, *Kessler 12262* (LPB, UC).

4. *Pleopeltis intermedia* M. Kessler & A. R. Sm., *spec. nova* (Fig. 2D-G)

Holotype: **BOLIVIA. La Paz:** Abel Iturralde, P.N. Madidi, camino de Tumupasa hacia San José cerca de la cumbre de la Serranía Mamuque, 14°09'S 67°55'W, 700 m, 09.VIII.2000, *Krömer 1415* (UC; iso-: GOET, LPB).

A Pleopeltis astrolepe (Liebm.) E. Fourn. *petiolibus longioribus teretibusque* (vs. *compressis contortisque*), *soris rotundis usque ovatis* (vs. *elongatis*), *foliis latioribus* (*sterilibus 1-2.8 cm* vs. *0.7-1.2 cm*), *squamellis rhizomatis majoribus* (*0.6-1.1 x 0.3-0.5 mm*) *differt*.

Plants epiphytic or occasionally saxicolous; **rhizomes** long-creeping, 0.8-1.5 mm in diameter, densely scaly, the scales 0.6-1.1 × 0.3-0.5 mm, ovate to oblong, bicolorous, the centers black, the edges reddish, the centers of the adaxial surfaces conspicuously hairy, the hairs 0.4-2 mm long, brown, often entirely obscuring the rhizomes and scales, or hairs deciduous; **leaves** 6-18 × 0.8-2.8 cm, fertile leaves usually somewhat narrower than the sterile ones, leaves spaced 1-4 cm apart along the rhizomes; **petioles** 0.5-4 cm long, ca. 1/5-1/4 of the leaf length, terete with narrow lateral wings 0.1 mm wide, castaneous, glabrous or sparsely scaly; **blades** linear-lanceolate to narrowly elliptic, attenuate at both ends, the margins entire, rarely sinuate; **abaxial surfaces** sparsely scaly, the scales 0.1-1 mm long, blackish with pale margins, orbicular or oblong, the apices rounded to acute, the margins denticulate; **adaxial surfaces** sparsely scaly, the scales similar to those of the abaxial surfaces but reduced, 0.05-0.4 mm long, and the margins erose; **veins** anastomosing, obscure; **sori** round to slightly elongate, up to 4 mm long, paraphysate, the paraphyses peltate, usually hidden by mature sporangia.

Distribution and habitat. – Common in humid and semihumid montane forests at 400-1800 (2500) m in the Bolivian departments of La Paz, Beni, Cochabamba, Santa Cruz, and Chuquisaca, south to about 19°S. Expected to occur in southern Peru.

Discussion. – This species is morphologically intermediate between the widespread species *Pleopeltis astrolepis* (Liebm.) E. Fourn. and *P. macrocarpa* (Willd.) Kaulf. Over most of their geographical ranges, *P. astrolepis* and *P. macrocarpa* are readily distinguished by a suite of characters. *Pleopeltis astrolepis* usually has short (<1/10 the total leaf length), flattened, twisted petioles, dark, rounded to ovate, long-ciliate, adaxially densely pubescent rhizome scales, smaller, more round blade scales, elongate sori, blackish costae, and generally smaller size. In contrast, *P. macrocarpa* has relatively longer (1/12-1/3 the total leaf length), terete petioles, bicolorous, lanceolate, erose to short-ciliate, adaxially usually glabrous rhizome scales, partly lanceolate blade scales up to 1.5 mm long, brown costae, and rounded to ovate sori. In Bolivia, these characters apparently break down and have led to considerable difficulties in the identification of most herbarium specimens. Closer examination of a large number of collections has revealed that typical *P. astrolepis* and *P. macrocarpa* are both uncommon species restricted to relatively low (400-1450 m) and high (1800-3050 m) elevations, respectively. Most collections of *Pleopeltis* from Bolivia belong to an intermediate undescribed species. It shares the dark, rounded, long-ciliate, adaxially pubescent rhizome scales, the scattered, relatively small, mostly circular blade scales, blackish costae, and the rather small size with *P. astrolepis*, and the long, terete petiole, and circular to ovate sori with *P. macrocarpa*. Relative to *P. astrolepis*, *P. intermedia* has broader leaves (sterile leaves 1-2.8 cm vs. 0.7-1.2 cm wide) and larger rhizome scales (0.6-1.1 × 0.3-0.5 mm vs. 0.2-0.6 × 0.2-0.3 mm).

Ecologically, *P. intermedia* is distinct from the other two species. It usually occurs at intermediate elevations (400-1800 m, rarely to 2500 m) and generally occupies more humid habitats (Fig. 3). It is widespread in the northern and central Bolivian Andes. In contrast, *P. astrolepis* has been collected only in semihumid habitats in the central Bolivian Andes, while *P. macrocarpa* occurs patchily in semihumid forests throughout the Bolivian Andes, avoiding more humid locations. All three species occur along an elevation gradient along the road from Vallegrande to Masicurí in central Bolivia (KESSLER & al., 2000). Here, *P. astrolepis* grows at 800-1450 m in semihumid forests dominated by leguminous trees, *P. intermedia* at 1450-1900 m in humid cloud forests, and *P. macrocarpa* from 1800-2300 m in semihumid forests dominated by *Podocarpus* and *Myrtaceae*. Where two species co-occur along this transect, no intergradation is apparent in the herbarium material.

Pleopeltis astrolepis is known to have diploid and tetraploid forms (HOOPER, 1994), while in Jamaica, WALKER (1973) distinguished five morphological and cytological types within *P. macrocarpa*. It is conceivable that different ploidy levels also occur among the different species of *Pleopeltis* in Bolivia. Given that *P. intermedia* is morphologically intermediate between the other two species, a hybrid origin of this species is possible.

Specimens examined. – **BOLIVIA. Beni:** Ballivián, Yucumo 12 km hacia Rurrenabaque, 1 km pasando el puente a Artagnan, entrando 10 km camino al pie de la Serranía Pilón Lajas, 15°14'S 67°05'W, 800 m, *Beck 24321* (LPB); 25 km from Yucumo on Yucumo-Quiquibey road, in the Pilón Lajas, 15°17'S 67°04'W, 950 m, *Fay & Fay 2735* (LPB, MO), *Fay & Fay 2746* (LPB, MO), *Fay & Fay 2780* (LPB, MO); Serranía Pilón Lajas, la cumbre del Pilón sobre la carratera Quiquibe-Yucumo, 30 km oeste de Yucumo, 15°14'S 67°04'W, 900 m, *Killeen 3618* (MO). **Cochabamba:** Carrasco, P.N. Carrasco, al S del Campamento Petrolero Ichoa, 17°23'S 64°24'W, 720 m, *Acebey A. 740* (LPB); P.N. Carrasco, 17°03'S 65°28'W, 420 m, *De Boer 1181 pro parte* (LPB); Km 137 antigua carretera Cochabamba a Villa Tunari, 17°07'S 65°35'W, 1500 m, *Kessler 7771* (LPB); Chapare, Antahuacana, Espíritu Santo, 750 m, *Buchtien 2156* (UC); Villa Tunari, 16°58'S 65°23'W, 400 m, *De Boer 1190* (LPB); camino Villa Tunari-Cochabamba, 55 km de Villa Tunari, 17°00'S 65°40'W, 1100 m, *Ibisch 930285* (LPB); Villa Tunari, terreno de El Puente, 16°58'S 66°34'W, 400 m, *Ibisch 931157* (LPB); Incachaca, 17°14'S 65°48'W, 2250 m, *Ibisch 940376* (LPB), *Ibisch 940407* (LPB); Km 151 antigua carretera Cochabamba a Villa Tunari, 17°05'S 65°34'W, 900 m, *Kessler 8099* (LPB, UC); Cavernas del Repechón, P.N. Carrasco, 17°02'S 65°26'W, 550 m, *Kessler 8341* (LPB, UC). **Chuquisaca:** Boeto, 18 km de Villa Serrano a Valle Grande, 18°57'S 64°20'W, 2500 m, *Moraes 1838b pro parte* (LPB). **La Paz:** Caranavi, camino Caranavi-Palos Blancos, a 6.6 km aprox. desde San Lorenzo a la Colonia San Juanito, 15°48'S

67°28'W, 1190 m, *Jimenez 602* (LPB); Serranía Bellavista, 37 km Caranavi a Sapecho, 15°40'S 67°29'W, 1500 m, *Kessler 11306* (LPB, UC); F. Tamayo, P.N.-ANMI Madidi, senda Keara-Mojos, entre Lagunillas y Fuertecillos, sendero que baja hacia el río Tabakuni, 14°36'S 68°55'W, 1660 m, *Jimenez 1027* (LPB); Serranía de Chepite, Campamento Sísmico de Texaco, 15 km O del Río Tuichi, 14°20'S 68°04'W, 700 m, *Killeen 3788* (MO); Inquisivi, Puente Alegre, área donde el camino Cajuata-Siquimirani cruza el Río Suri, 1 km al SE de Cajuata, 16°42'S 67°09'W, 1500 m, *Lewis 36906 pro parte* (LPB, MO); Larecaja, Consata 7 km hacia Mapiri, 15°22'S 68°30'W, 1400 m, *Beck 4940* (LPB); Camino desde Sorata a Consata, 8 km, 15°15'S 68°30'W, 1400 m, *Sperling 5476* (LPB); Muñecas, Consata a Sorata, 9 km, 15°22'S 68°31'W, 1300 m, *Kessler 4382* (AAU, LPB), 15°24'S 68°31'W, 1200 m, *Kessler 4456* (AAU, LPB); Nor Yungas, Bajo Hornuni, P.N.-ANMI Cotapata, 16°13'S 67°53'W, 2000 m, *Beck 28454* (LPB); Vicinity of Sapecho, along road between Caranavi and Yucumo, 15°31'S 67°19'W, 600-850 m, *Croat 84313* (MO); Estación Biológica de Tunquini, 16°11'S 67°53'W, 1650 m, *Eberhardt 368* (LPB), 1500 m, *Krömer 1255* (LPB), 1650 m, *Krömer 1648* (LPB), 16°11'S 67°51'W, 1790 m, *Portugal 441* (LPB), 1800 m, *Portugal 557* (LPB); Arriba de Yolosillas, 16°12'S 67°44'W, 1250 m, *Kessler 4216* (AAU, LPB), 1100 m, *Kessler 4236* (AAU, LPB), 1300 m, *Kessler 5866* (LPB); 4.5 km below Yolosa, then 0.7 km W on road to Río Huarinilla, 16°12'S 67°45'W, 1200 m, *Solomon 8926* (LPB, MO); 1 km al O de Yolosa por el camino a Unduavi, 16°13'S 67°45'W, 1400 m, *Solomon 17380* (MO); Bautista Saavedra, Paujeyuyo, 15°02'S 68°27'W, 940 m, *Fuentes 6207* (LPB, MO), 15°02'S 68°29'W, 1450 m, *Kessler 9785* (LPB, UC), *Kessler 9822* (LPB, UC), 1050 m, *Kessler 9882* (LPB, UC), 1000 m, *Kessler 10024* (LPB, UC); Km 10 Camata a Apolo, 15°13'S 68°41'W, 1450 m, *Kessler 10316* (LPB, UC); Sud Yungas, 2 km al este de Chamaca, 16°14'S 67°14'W, 950 m, *Kessler 5834* (LPB); Alto Beni, Sapecho, Colonia Tarapacá, 15°32'S 67°21'W, 650 m, *Acebey 118* (LPB), 610 m, *Krömer 61* (LPB); Colonia Tupiza, 15°31'S 67°18'W, 700 m, *Krömer 171* (UC), 625 m, *Krömer 348* (LPB), 625 m, *Krömer 370* (LPB), *Krömer 413* (LPB); Alto Beni, Colonia Tupiza, 15°31'S 67°17'W, 750 m, *Krömer 465* (LPB); Alto Beni, Territorio Masetén, parcela V PIAF, 15°27'S 67°22'W, 1150 m, *Krömer 846* (LPB), 1200 m, *Krömer 1606* (LPB); Alto Beni, Concesión de San José de Popoy, 15°35'S 67°17'W, 600 m, *Seidel 2254* (LPB); La Paz: locality unknown, *Williams 1039* (NY). **Santa Cruz:** Florida, 132 km E of Comarapa, 117 km W of Santa Cruz on Hwy 4, 18°10'S 64°35'W, 1590 m, *Fay & Fay 2241* (LPB, MO); Refugio Los Volcanes, 3 km NE Bermejo, 18°06'S 63°36'W, 1050 m, *Kessler 12265* (LPB, UC); Highway from Bermejo to Samaipata, 7.2 km SW of bridge over Río Lajas, 18°09'S 63°43'W, 1260 m, *Nee 50461 pro parte* (NY); Ichilo, Campamento Macuñucú, P.N. Amboró, 17°44'S 63°35'W, 450 m, *Kessler 8597 pro parte* (LPB, UC), *Kessler 8645 pro parte* (LPB, UC), 500 m, *Nee 41913* (LPB, NY, USZ); P.N. Amboró, along Río Saguayo, 17°39'S 63°43'W, 400 m, *Nee 35932* (LPB, NY, UC); P.N. Amboró, ca. 15 km (SE) up the Río Pitasama from the Río Surutú, 17°44'S 63°40'W, 700 m, *Solomon 14156* (MO); Valle Grande, Loma Larga, 10 km a Masicurí, 18°47'S 63°52'W, 1450 m, *Kessler 6096* (LPB, UC), *Kessler 6098 pro parte* (LPB, UC), 1550 m, *Kessler 6124* (LPB, UC), *Kessler 6134* (LPB, UC), *Kessler 6153* (LPB, UC), *Kessler 6154* (LPB, UC), 18°46'S 63°54'W, 1900 m, *Kessler 6170 pro parte* (LPB).

5. *Polypodium concolorum* M. Kessler & A. R. Sm., **spec. nova** (Fig. 4A-E)

Holotype: BOLIVIA. La Paz: Nor Yungas, 2 km de Chuspipata a Coroico, 16°22'S 67°49'W, 2900 m, 17.IX.1997, *Kessler 11922* (UC; iso-: GOET, LPB).

Polypodium rhizomatibus longe repentibus petiolis remotis, squamis rhizomatis acuminatis, 4-7 mm longis, concoloribus brunneis, cum cellulis elongatis (2-5-plo longioribus quam latis), paginis glabris, soris utrinque costarum in linea singulare, segmentis falcatis praestans.

Plants epipetric and epiphytic; **rhizomes** long-creeping, 3-5 mm in diameter, densely scaly, the scales 4-7 × 1.5-2.5 mm, spreading, ovate-lanceolate, acuminate, entire, uniformly brown, cells clathrate, elongate (2-5 times longer than wide); **petioles** to 27 cm × 2 mm, brown, adaxially

sulcate, glabrous; **blades** to 55 × 18 cm, broadly lanceolate, broadest near the bases, pinnatisect, gradually tapering to short-caudate apical segments; **pinnae** to 10 cm × 9 mm, 30-40 pairs, adnate, sursumcurrent, not or only slightly decurrent, falcate, entire, rounded to attenuate at the apices, most departing at ca. 90° from rachises, but basal 3-7 pairs deflexed, the sinuses broad and U-shaped; **rachises** brown to stramineous, adaxially sulcate, glabrous; **costae** similar to rachises but not sulcate; **veins** areolate, each areole with a single excurrent, included veinlet, areoles forming 1 row between costae and margins, in mature leaves only the main veins departing from the costae easily visible, dark, the venation thus appearing open; **blade tissue** glabrous; **sori** borne on the ends of the included, obscure veinlets, in 1 row between the costae and margins, 14-18 pairs per pinna.

Distribution and habitat. – Locally fairly common in humid montane forests at 2400-3000 m in the departments of La Paz and Cochabamba, Bolivia.

Discussion. – This species is characterized by long, acuminate, concolorous, brown rhizome scales with elongate cells (2-5 times longer than wide), long-creeping rhizomes with well-spaced petioles, glabrous leaves, one row of sori between the costae and the margins, and falcate segments. It differs from *P. latipes* Langsd. & Fisch. by the larger, concolorous rhizome scales, and from *P. gilliesii* C. Chr. by the darker rhizome scales with more elongate cells, larger size, falcate pinnae, and flat leaves (*vs.* longitudinally folded in *P. gilliesii*).

Specimens examined. – **BOLIVIA. Cochabamba:** Ayopaya, Comunidad Pampa Grande, sendero a Incacasani Grande, 16°40'S 66°28'W, 2790 m, *Jimenez 1628* (LPB, UC); Carrasco, Km 108 antigua carretera Cochabamba a Villa Tunari, 17°09'S 65°38'W, 2950 m, *Kessler 6611* (GOET, LPB, UC), *Kessler 6643a* (LPB, UC); Km 113, 17°07'S 65°38'W, 2700 m, *Kessler 6856* (LPB, UC); Km 116, 17°08'S 65°38'W, 2400 m, *Kessler 7045* (LPB); Chapare, Tablas Monte, 17°10'S 65°55'W, 2670 m, *Rödl-Linder 8569* (LPB). **La Paz:** Nor Yungas, Estación Biológica de Tunquini, 16°12'S 67°54'W, 3000 m, *Bach 1810* (LPB), *Bach 1858* (LPB), 2800 m, *Bach 1891* (LPB), 2800 m, *Bach 1892* (LPB); Trocha al Valle de Coscapa, P.N. Cotapata, 16°12'S 67°53'W, 3000 m, *Kessler 11858* (GOET, LPB, UC).

6. *Polypodium intricatum* M. Kessler & A. R. Sm., **spec. nova** (Fig. 4F-I)

Holotype: **BOLIVIA. Cochabamba:** Ayopaya, Km 10 Cocapata a Cotacajes, 16°38'S 66°41'W, 3000 m, *Kessler 9429* (UC; iso-: LPB).

Polypodium rhizomatibus longe repentibus petiolis remotis, squamis rhizomatis 1-2.5 mm longis, ovato-peltatis bicoloris, paginis laminarum glabris, soris utrinque costae in linea singulare praestans.

Plants epiphytic and less commonly terrestrial; **rhizomes** long-creeping, 3-5 mm in diameter, densely scaly, the scales 1-2.5 × 0.7-1.5 mm, appressed, ovate, entire, peltate, bicolorous, the centers blackish with clathrate cells, the margins light brown with nonclathrate (and nonevident) cells; **petioles** to 15 cm × 2.5 mm, brown, adaxially sulcate, glabrous or basally with a few appressed scales, the scales similar to those of the rhizomes; **blades** to 45 × 13 cm, narrowly deltate, broadest about 1/3 from the bases, pinnatisect, gradually tapering to short-caudate apical segments; **pinnae** to 6.5 cm × 11 mm, 25-45 pairs, adnate, sursumcurrent, not or only slightly decurrent, entire, rounded to attenuate at the apices, the sinuses narrow and V-shaped; **rachises** brown to stramineous, adaxially sulcate, with scattered, appressed, septate (to ca. 10 cells), hyaline or light yellow-brown hairs to 0.2 mm; **costae** similar to rachises but not sulcate, often with hairs similar to the rachises; **veins** areolate, each areole with a single excurrent, included veinlet, areoles forming 1 row between costae and margins; **blade tissue** glabrous; **sori** borne on the apices of the included veinlets, in 1 row between the costae and margins, 14-17 pairs per pinna.

Distribution and habitat. – Common in humid montane forests at 1400–3400 m in Bolivia, north at least to Ecuador. Specimens cited as *Polypodium loriceum* L. for Peru by TRYON & STOLZE (1993), and for Ecuador by JØRGENSEN & LEON-YANEZ (1999) also belong to this species.

Discussion. – This species has long been included under *Polypodium loriceum* L. (e.g. by HENSEN, 1990; TRYON & STOLZE, 1993) but the material from Bolivia differs in several characters from plants from the West Indies, where the type of *P. loriceum* is from. *Polypodium loriceum* in the strict sense, as defined here, differs from *P. intricatum* in having much smaller (to 1 mm vs. 1–2.5 mm long), almost entirely black rhizome scales, lacking septate hairs on the rachises and costae, and often two rows of sori between the costae and pinna margins. It occurs in the West Indies (MORAN, 1995; MICKEL & SMITH, 2004) and perhaps in Venezuela, Colombia, and Mesoamerica north to Nicaragua (pers. obs.). Plants from Mexico to El Salvador, previously also included in *P. loriceum*, have recently been treated as *Polypodium falcaria* Kunze by MICKEL & SMITH (2004). Relative to *P. intricatum*, *P. falcaria* has larger, lanceolate, less firmly appressed rhizome scales (2.5–3 × 1–1.5 mm in *P. falcaria* vs. 1–2.5 × 0.7–1.5 mm in *P. intricatum*), larger leaves (to 85 × 25 cm vs. to 60 × 13 cm) with fewer, falcate pinnae (10–32 pairs vs. 25–45 pairs), and lacks the septate hairs on rachises and costae. *Polypodium intricatum* occurs in Bolivia, Peru, and Ecuador, and possibly further north in the Andes. The taxonomy of this species complex requires further study.

In Bolivia, *P. intricatum* is generally easily distinguished from most other species of *Polypodium* by its obtuse rhizome scales. It is most similar to *P. latipes* Langsd. & Fisch., which has narrower, acuminate rhizome scales, shorter leaves with fewer pinnae, and often somewhat constricted pinna bases.

Specimens examined. – **BOLIVIA. Cochabamba:** Ayopaya, Km 10 Cocapata a Cotacajes, 16°38'S 66°41'W, 2700 m, Kessler 9484 (LPB, UC); Carrasco, Sehuencas, pasando el puente sobre el Río Fuerte, 17°03'S 65°17'W, 2100 m, Ibisch 931110 (LPB), Ibisch 93111 (LPB), Ibisch 931703 (LPB), Ibisch 940059 (LPB), Ibisch 940178 (LPB); above Sehuencas, 17°31'S 65°16'W, 2350 m, Ståhl 5614 (AAU), Ståhl 5616 pro parte (AAU), Ståhl 5629 (AAU); en el camino de Comarapa hacia Siberia, 17°50'S 64°42'W, 3000 m, Jimenez 280 (LPB); Km 123 antigua carretera Cochabamba a Villa Tunari, 17°08'S 65°37'W, 2100 m, Kessler 7136 (LPB, UC); Km 130 antigua carretera Cochabamba-Villa Tunari, 17°07'S 65°36'W, 2000 m, Kessler 7216 (GOET, LPB, UC); 28 km al noroeste de Comarapa por el camino entre Santa Cruz y Cochabamba, 17°49'S 64°41'W, 2450 m, Solomon 15990 (MO); Chapare, Cochabamba 54 km hacia Villa Tunari, 17°12'S 65°53'W, 2750 m, Beck 1434 (LPB); Incachaca, 17°15'S 65°49'W, 2300 m, Ibisch 940423 (LPB), 2200 m, Ritter 2738 (LPB), 2300 m, Ritter 2738 (LPB), 2200 m, J. Steinbach 8879 (UC); Central Hidroeléctrica Corani, 61.4 km del camino Cochabamba-Chapare, 17°14'S 65°52'W, 2750 m, Kessler & Kelschebach 278 (GOET, LPB, UC). **La Paz:** F. Tamayo, P.N.-ANMI Madidi, sendero Keara-Mojos, 14°37'S 68°57'W, 2420 m, Jimenez 694 (LPB, UC); Larecaja, Okara, Río Tipuani, 7500 ft, Tate 920 (LPB, NY), Tate 950 (LPB, NY); Murillo, Zongo Valley, 16°04'S 68°01'W, 1390 m, Acebey 168 (LPB), 16°06'S 68°03'W, 1400 m, Beck 2811 (LPB), arriba de Jarca, 16°07'S 68°05'W, 2100 m, Beck 3592 (LPB); Zongo Valley, 1.6 km down the valley from Sainani, 16°07'S 68°05'W, 2100 m, Fay & Fay 2877 (LPB, MO, UC), Fay & Fay 2900 (LPB, MO), 0.6 km up valley from Sainani, 16°07'S 68°05'W, 2260 m, Fay & Fay 2910 (LPB, MO); 23.3 km below dam at Zongo, 16°10'S 68°09'W, 3000 m, Grifo 610 (MO, UC); Upper Valle de Zongo, 16°07'S 68°04'W, 2400 m, Solomon 5259 (MO, UC), 16°08'S 68°06'W, 2600 m, Solomon 8481 (MO, UC), 16°07'S 68°07'W, 2500 m, Solomon 11920 (MO, UC), 16°07'S 68°04'W, 2250 m, Solomon 17257 (LPB, MO, UC); Valle de Zongo, cerca a la entrada al Río Jacha Cruz, 16°06'S 68°04'W, 1500 m, Tanaka 43 (LPB); Coroico-Yolosa, subiendo el Río San Juan a 10 km, 16°10'S 67°44'W, 2100 m, Beck 7554 (LPB); along road between Unduavi and Chulumani, 12 km E of Unduavi, 16°22'S 67°48'W, 2700 m, Croat 51505 (LPB, MO); 15.4 km from Yolosa toward Chuspipata, 16°15'S 67°45'W, 1980 m, Fay & Fay 2166 (LPB, MO, UC), Fay & Fay 2167 (LPB, MO); 29.6 km from Yolosa toward Chuspipata, 16°16'S 67°49'W, 2900 m, Fay & Fay 2211 (LPB, MO); Km 5 Chuspipata a Coroico, 16°23'S 67°48'W, 2700 m, Kessler 12082 (LPB, UC); Estación Biológica

de Tunquini, Bajo Hornuni, 16°12'S 67°53'W, 2350 m, *Jimenez 415* (LPB, UC), 16°11'S 67°52'W, 1600 m, *Krömer 1259* (LPB, UC), 16°12'S 67°52'W, 1850 m, *Krömer 1478* (LPB, UC), 16°11'S 67°51'W, 1810 m, *Portugal 477* (LPB); camino Coroico-Trinidad, 9 km después del hospital de Coroico, 16°12'S 67°41'W, 1850 m, *Schmit 349* (LPB), *Schmit 365* (LPB, UC); Saavedra, Valle de Charazani, al E de Chullina, 15°10'S 68°53'W, 3400 m, *Feuerer 11528* (LPB); Sud Yungas, Chulumani, 2100 m, *Brooke 6568* (BM); Sirupaya, Yanacachi, 2300 m, *Buchtien s.n.* (UC); La Paz-Chulumani road, 12 km E of Chuspipata (77 km from La Paz), 16°15'S 67°10'W, 2260 m, *Fay & Fay 2472* (LPB, MO, UC). **Santa Cruz:** Caballero, P.N. Amboró, Cerro Bravo, ca. 10 map km N of Comarapa, 17°49'S 64°32'W, 2500 m, *Abbott 17050* (USZ); Serranía la Siberia, ca. 23 km de Comarapa, *Huaylla 520 pro parte* (USZ); P.N. Amboró, Cerro Bravo, juntas del Río Alizar y Amparo, 17°57'S 64°24'W, 2000 m, *Vargas 1480* (MO, NY); Florida, 7 km al NE de Mairana a lo largo del límite sur de la extensión del P.N. Amboró, 18°04'S 63°55'W, 2200 m, *Nee 40638* (LPB, NY); P.N. Amboró, 8 km (by air) NE of Mairana, 5.5 km N of Campamento "La Yunga" park station, 18°03.5'S 63°55'W, 2300 m, *Sundue 550* (LPB, NY, USZ).

7. *Polypodium silvulae* M. Kessler & A. R. Sm., **spec. nova** (Fig. 5)

Holotype: **BOLIVIA. La Paz:** Franz Tamayo, P.N.-ANMI Madidi, senda Keara-Mojos, Tambo Quemado, 14°41'S 68°58'W, 3600 m, 15.XI.2001, *Jimenez 1093* (LPB, fragment GOET).

A Polypodio eleutherophlebio (Fée) Mett. rhachidibus velutinis, squamisque rhizomatis latioribus brevioribusque discrepans.

Plants epiphytic; **rhizomes** long-creeping, 3.5-4 mm in diameter, surfaces waxy, glaucous, moderately scaly, the scales 2-4 × 1.5 mm, spreading, ovate-lanceolate, long-acuminate, with cordate bases, margins erose to finely denticulate, bicolorous, the centers dark brown with elongate, clathrate scales, the margins light brown with nonclathrate (and nonevident) cells; **petioles** to 10.5 cm × 1.2 mm, brown, adaxially sulcate, glabrous; **blades** to 22 × 8 cm, ovate-lanceolate, broadest about 1/3 from the bases, pinnatisect, gradually tapering to short-caudate apical segments; **pinnae** to 4 cm × 6 mm, 17-24 pairs, adnate, sursumcurrent, proximally not and distally slightly decurrent, straight, entire, apically rounded to attenuate, most departing at ca. 90° from rachises, but basal 1-2 pairs deflexed, the sinuses broad and V-shaped; **rachises** brown, adaxially sulcate, moderately hairy, the hairs 0.1-0.2 mm, pale, spreading; **costae** similar to rachises but not sulcate; **veins** areolate, each areole with a single excurrent, included veinlet, areoles forming 1 row between costae and margins; **blade tissue** and margins sparsely hairy, the hairs 0.1-0.3 mm, pale, appressed to spreading; **sori** borne on the apices of the included, obscure veinlets, in 1 row between the costae and margins, to 16 pairs per pinna.

Distribution and habitat. – Known from only two collections made in disturbed timberline forests dominated by *Weinmannia* sp. (*Cunoniaceae*) at 3400 m to 3600 m in the northern department of La Paz, Bolivia, near the border with Peru. The habitat of this species is highly fragmented and under strong human pressure from timber harvesting and uncontrolled burning (KESSLER, 2000, 2002; KESSLER & BECK, 2002). Furthermore, at both collecting localities *P. silvulae* appeared to be genuinely rare, with only one and two individuals encountered, respectively. It thus is likely that this species is threatened.

Discussion. – This beautiful species resembles *Polypodium eleutherophlebium* (Fée) Mett. (synonym: *P. wiesbaueri* Sodiro), from Costa Rica, Panama, Colombia, Ecuador, and Venezuela, in having large, scattered, acute, bicolorous rhizome scales, and glaucous rhizome surfaces. It differs, however, by its densely short-hairy rachises and broader, shorter rhizome scale cells. The limited material available further suggests that *P. silvulae* has narrower, more acute pinnae.

Specimens examined. – **BOLIVIA. La Paz:** J. Bautista Saavedra, 15 km de Charazani hacia Chullina, 15°10'S 68°53'W, 3400 m, *Kessler 10623* (LPB, UC).

New combinations

(Types or web images seen are indicated with an exclamation mark; others have not been seen).

Pectuma macedoi (Brade) M. Kessler & A. R. Sm., **comb. nova.** \equiv *Polypodium macedoi* Brade in Arch. Jard. Bot. Rio de Janeiro 11: 30. 1951.

Type: BRAZIL. Est. Minas Gerais: Ituiutaba, *Macedo 1098* (RB; iso-: GH, MO, NY!).

Range: Bolivia, southeastern Brazil.

Pectuma pilosa (A. M. Evans) M. Kessler & A. R. Sm., **stat. & comb. nov.** \equiv *Polypodium ptilodon* var. *pilosum* A. M. Evans in Ann. Missouri Bot. Gard. 55: 259. 1969.

Type: GUYANA. Demerara: Essequibo River, 1897, *Jenman s. n.* (NY!).

Range: Trinidad, Guyana, Venezuela, Peru, Bolivia, Brazil.

Pectuma robusta (Fée) M. Kessler & A. R. Sm., **comb. nova.** \equiv *Polypodium robustum* Fée, Crypt. Vasc. Brésil 1: 92. 1869.

Type: BRAZIL. Est. Rio de Janeiro: Angra dos Reis, *Glaziou 2407* (holo-: P; iso-: BR, C, S, US!).

Range: Peru, Bolivia, eastern Brazil, eastern Paraguay, northeastern Argentina.

Pleopeltis ballivianii (Rosenst.) A. R. Sm., **comb. nova.** \equiv *Polypodium ballivianii* Rosenst. in Repert. Spec. Nov. Regni Veg. 9: 344. 1911.

Type: BOLIVIA. Antahuacana: Espiritu Santo, 750 m, *Buchtien 2169* (holo-: S?; iso-: UC!, US).

Range: Bolivia.

Pleopeltis bombycina (Maxon) A. R. Sm., **comb. nova.** \equiv *Polypodium bombycinum* Maxon in Contr. U.S. Natl. Herb. 17: 592. 1916.

Type: COLOMBIA. Cali: Boqueron del Río Dagua, *Lehmann 7666* (holo-: US!; iso-: GH).

Range: Panama to Venezuela, Bolivia, and western Brazil (DE LA SOTA, 1966).

Pleopeltis buchtienii (H. Christ & Rosenst.) A. R. Sm., **comb. nova.** \equiv *Polypodium buchtienii* H. Christ & Rosenst. in Repert. Spec. Nov. Regni Veg. 5: 237. 1908.

Type: BOLIVIA. Unduavi: 3300 m, *Buchtien 880* (holo-: P?; iso-: US!).

Range: Venezuela and Colombia to Bolivia.

Pleopeltis fraseri (Kuhn) A. R. Sm., **comb. nova.** \equiv *Polypodium fraseri* Kuhn in Linnaea 36: 137. 1869.

Type: ECUADOR: *Fraser s. n.* (holo-: B!).

Range: Colombia and Venezuela to Bolivia.

Pleopeltis megalolepis (Maxon & C. V. Morton) A. R. Sm., **comb. nova.** \equiv *Polypodium megalolepis* Maxon & C. V. Morton in Bull. Torrey Bot. Club 66: 39. 1939.

Type: PERU. Dept. Cuzco: Lucumayo Valley, *Cook & Gilbert 1283* (holo-: US).

Range: Peru, Bolivia.

Pleopeltis polypodioides var. ***burchellii*** (Baker) A. R. Sm., **comb. nova.** \equiv *Polypodium incanum* var. *burchellii* Baker in Mart., Fl. Bras. 1(2): 526. 1870.

Type: BRAZIL. Goyaz: *Burchell 6998* (holo-: K; iso-: GH).

Range: South America.

Pleopeltis pycnocarpa (C. Chr.) A. R. Sm., **comb. nova.** \equiv *Polypodium pycnocarpum* C. Chr., Index Fil. 557. 1906. \equiv *Polypodium macrocarpum* C. Presl, Reliq. Haenk. 1: 23. 1825 [non Willd., 1810].

Type: PERU: *Haenke s. n.* (holo-: PR, fragm. NY!).

Range: Ecuador, Peru, Bolivia, northwestern Argentina.

Pleopeltis remota (Desv.) A. R. Sm., **comb. nova.** \equiv *Polypodium remotum* Desv. in Mém. Soc. Linn. Paris 6: 232. 1827.

Type: “America Calidiori”, Herb. *Desvaux s. n.* (holo-: P!, photo BM!).

Range: southern Mexico to Bolivia, Greater Antilles.

Pleopeltis stolzei A. R. Sm., **stat. & nom. nov.** \equiv *Pleopeltis macrocarpa* var. *laciniata* Stolze in Fieldiana, Bot. ser. 2, 32: 143. 1993 [non *Pleopeltis laciniata* (C. Presl) Bedd., 1892].

Type: PERU. **Dept. Huánuco:** Tingo María, hills above river, *Moran & Fernández 3681* (holo-: USM; iso-: F, MO).

Range: Ecuador, Peru, Bolivia.

Pleopeltis subvestita (Maxon) A. R. Sm., **comb. nova.** \equiv *Polypodium subvestitum* Maxon in Contr. U.S. Natl. Herb. 17: 566. 1916.

Type: BOLIVIA. **vic. La Paz:** 10,000 ft., *Bang 122* (holo-: US; iso-: NY!, UC!).

Range: central Peru to central Bolivia.

Pleopeltis tweediana (Hook.) A. R. Sm., **comb. nova.** \equiv *Polypodium tweedianum* Hook. in Icon. Pl.: tab. 86. 1837.

Type: ARGENTINA. **Tucumán:** Sierra de San Javier, *Tweedie s. n.* (holo-: K).

Range: central Bolivia to northwestern Argentina (MAXON, 1916).

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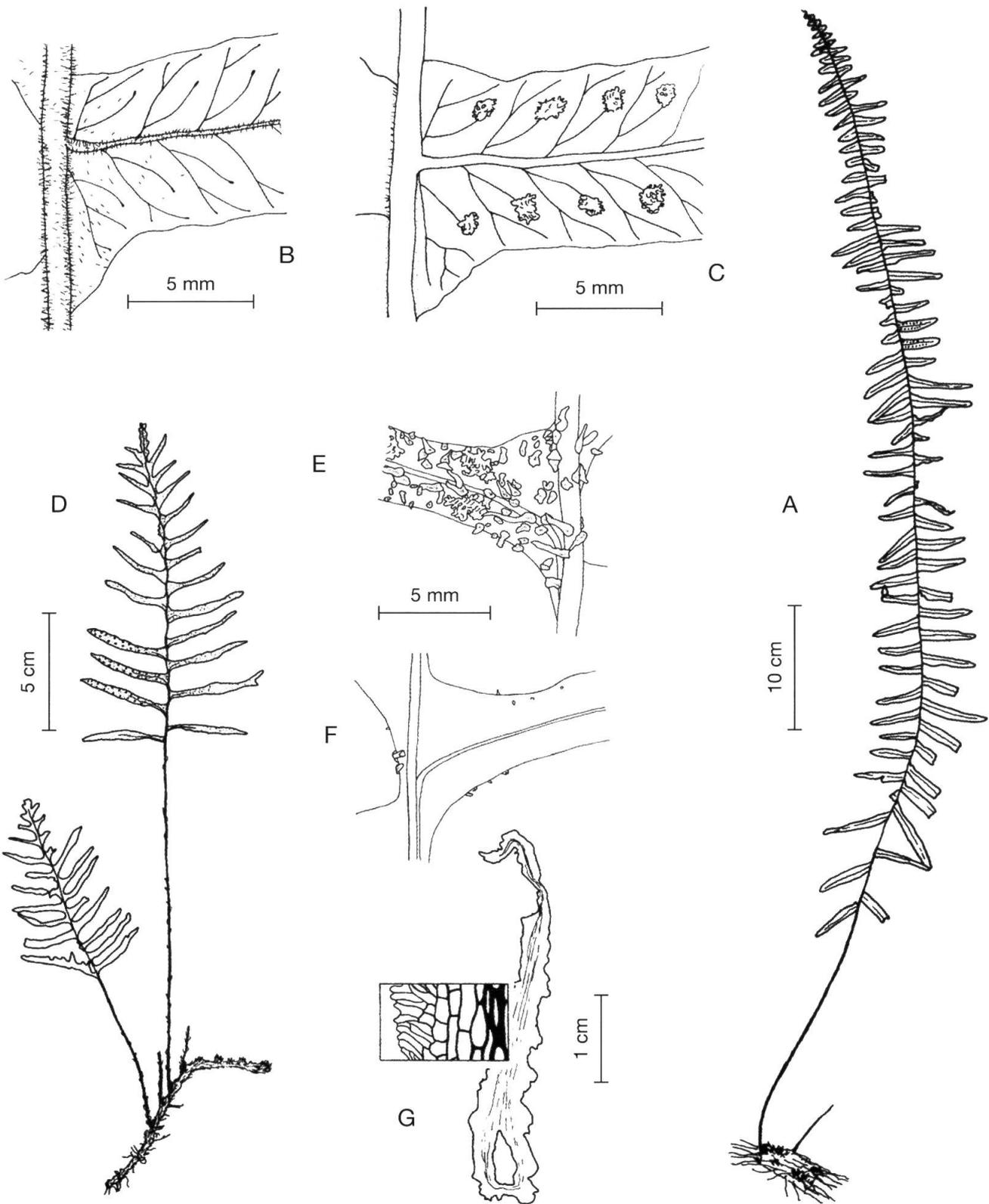


Fig. 1. – *Pechuma perpinnata* M. Kessler & A. R. Sm.: **A.** Habit; **B-C.** Adaxial and abaxial pinna bases with adjacent rachises. *Pleopeltis appressa* M. Kessler & A. R. Sm.: **D.** Habit; **E-F.** Abaxial and adaxial pinna bases with adjacent rachises; **G.** Rhizome scale with cell detail.

(Drawn by Ana Moguel)

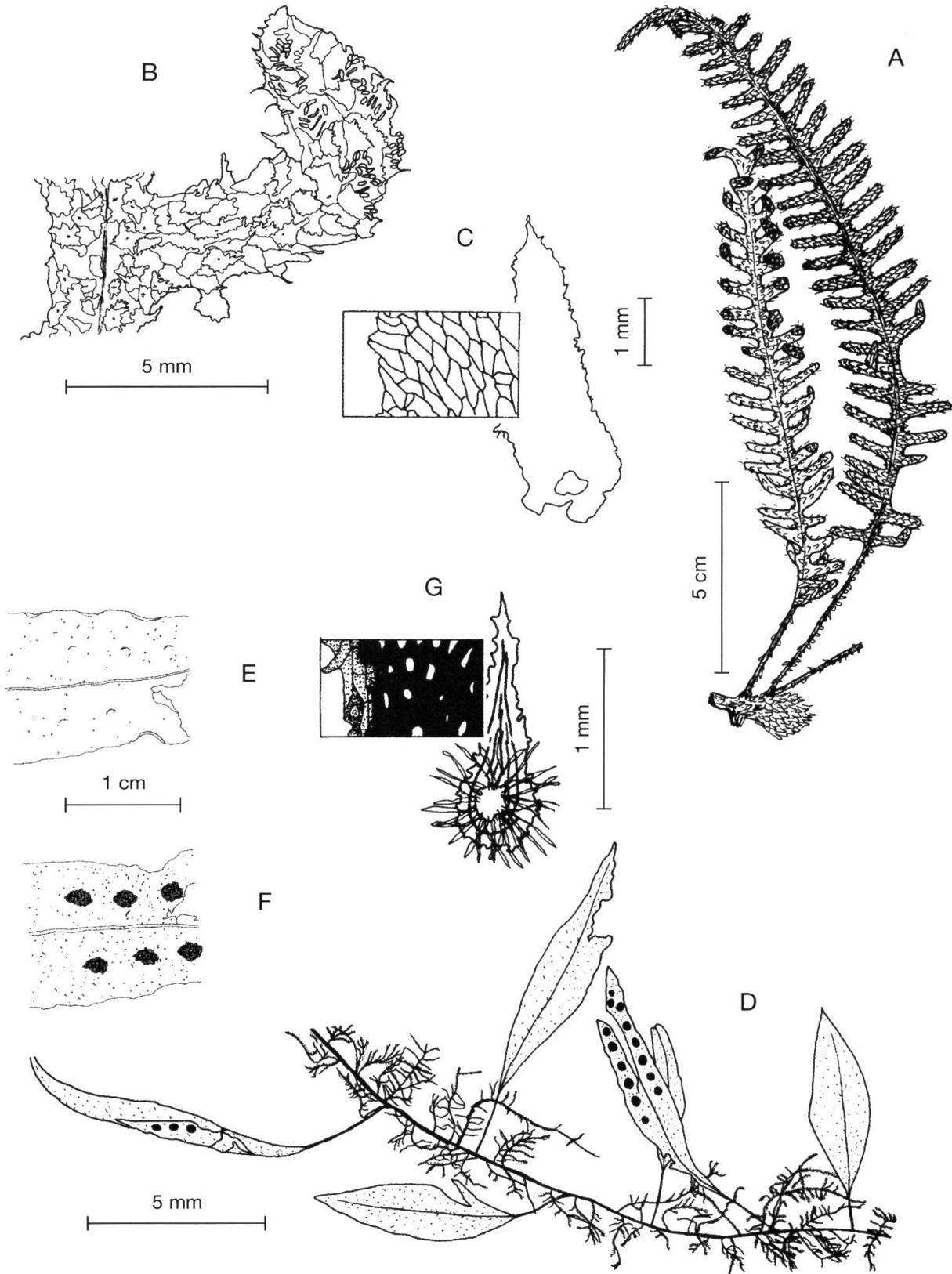


Fig. 2. – *Pleopeltis disjuncta* M. Kessler & A. R. Sm.: **A.** Habit; **B.** Pinna detail; **C.** Rhizome scale with cell detail. *Pleopeltis intermedia* M. Kessler & A. R. Sm.: **D.** Habit; **E-F.** Adaxial and abaxial pinna details; **G.** Rhizome scale with cell detail. (Drawn by Ana Moguel)

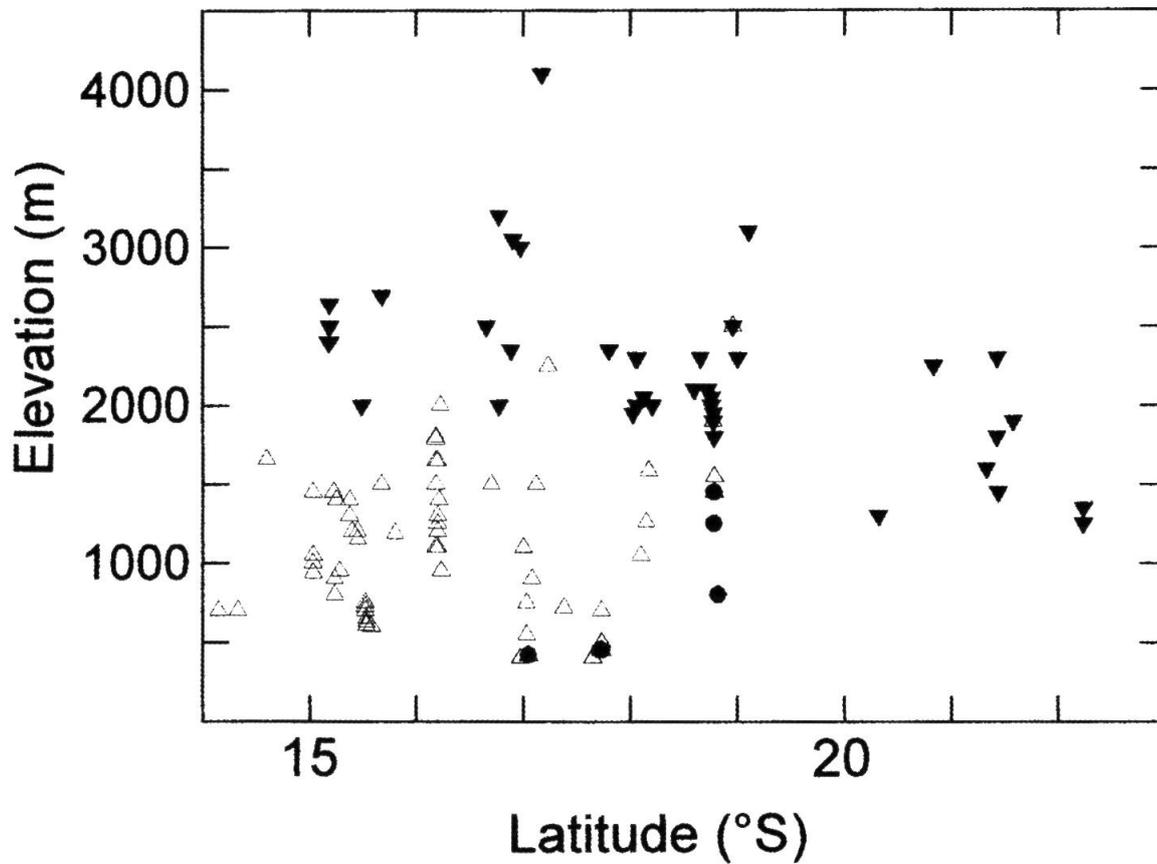


Fig. 3. – Elevational and latitudinal distributions of collections of *Pleopeltis astrolepis* (Liebm.) E. Fourn. (filled circles), *P. intermedia* M. Kessler & A. R. Sm. (open triangles), and *P. macrocarpa* (Willd.) Kaulf. (filled triangles) in the Bolivian Andes. Note that the different species occupy distinct ranges with limited overlap, and that *P. macrocarpa* is the only species south of 19°S, where it occupies a lower elevational range than further north.

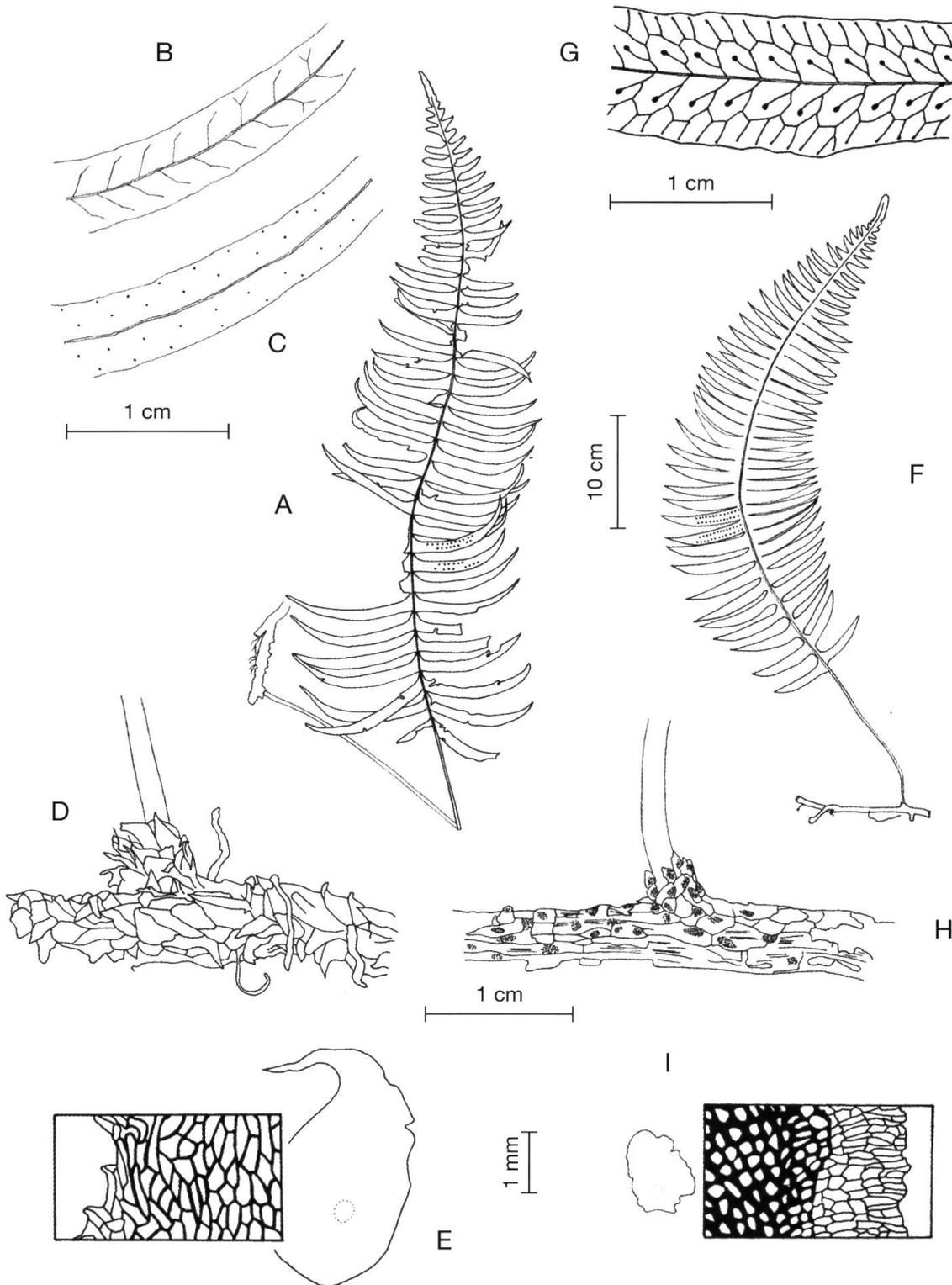


Fig. 4. – *Polypodium concolorum* M. Kessler & A. R. Sm.: **A.** Habit; **B-C.** Abaxial and adaxial pinna details; **D.** Rhizome; **E.** Rhizome scale with cell detail. *Polypodium intricatum* M. Kessler & A. R. Sm.: **F.** Habit; **G.** Abaxial pinna details; **H.** Rhizome; **I.** Rhizome scale with cell detail.

(Drawn by Ana Moguel)

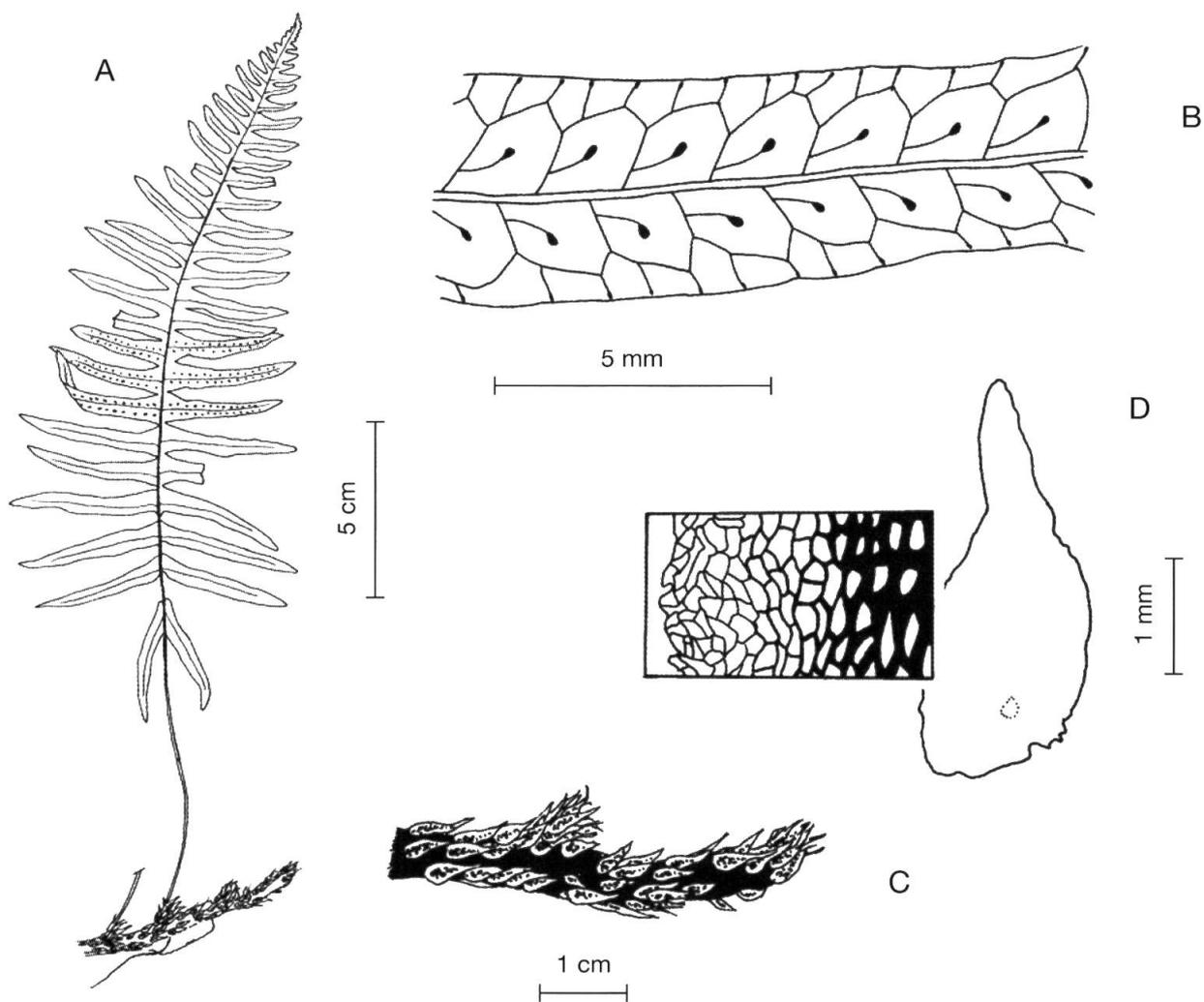


Fig. 5. – *Polypodium silvulae* M. Kessler & A. R. Sm.: **A.** Habit; **B.** Abaxial pinna details; **C.** Rhizome; **D.** Rhizome scale with cell detail.

(Drawn by Ana Moguel)