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NEW SPECIES AND  
COMBINATIONS IN TROPICAL  
AMERICAN *POLYSTICHUM*  
(DRYOPTERIDACEAE)<sup>1</sup>

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ABSTRACT

A taxonomic history for the fern genus *Polystichum* in Latin America and an analysis of the important characters at the species level in the genus provide the context for the recognition of new and overlooked taxa. Three new species are described from Latin America, and a new combination is provided for a *Polystichum* species from the southern Andes.

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In the course of preparing a treatment of the genus *Polystichum* for the *Flora Mesoamericana*, I have discerned a set of new and neglected species from Central America and the northern Andes, which I report here. The species now included in the genus *Polystichum* have only once been included in a monograph (Mettenius, 1858); there has been no modern monographic work on the genus in the New World. An inquiry into species and speciation phenomena in Costa Rica (Barrington, 1985a, b; Barrington, et al., 1986) has led in turn to an inquiry into the significance of hybrids with respect to species concepts in the ferns (Bar-

rington et al., in press). I report here on the morphological characters important in distinguishing species of Latin American *Polystichum*. This review of characters provides the context for the descriptions of species, which make up the central contribution of this work.

TAXONOMIC HISTORY

The genus *Polystichum* Roth, terrestrial ferns characterized by fastigiate leaves with inequilateral leaf segments and peltate indusia (when present), is prominent and diverse in montane regions

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throughout the world. The generic name originates with Roth (1799), but it was K. B. Presl (1836) who first circumscribed the genus as it is now recognized. The most important influence on the taxonomic history of *Polystichum* was the treatment of W. J. Hooker (1862), in which most of the twice-pinnate taxa in the world were combined into one species. As a result, the morphological and taxonomic diversity of species was left unstudied by the otherwise productive taxonomists of the late nineteenth century. Christensen (1906) maintained Hooker's counterproductive species concept in *Polystichum*, which has perpetuated the tendency for taxonomists to ignore the diversity of twice-pinnate species. Christensen did recognize 41 forms, many of which were associated with names whose types represent distinct species.

Latin America and eastern Asia are the two centers of diversity for the genus *Polystichum*. Although the diversity and biology of species are well known in Asia (Tagawa, 1940; Daigobo, 1972), we know little about the genus in the New World tropics. Maxon (1909) was the first to recognize natural species in the American tropics, but his work was confined to the West Indies. Only recently (A. R. Smith, 1981; Stolze, 1981) has similar progress been made in defining the continental species. In the past few years, the extent of the taxonomic problem has become clear with the demonstration of extensive hybridization and allopolyploidy in the American tropics (Barrington, 1985a, b; Barrington et al., 1986). I reviewed the present taxonomic status of the genus *Polystichum* in Latin America (Barrington, 1985c).

#### MORPHOLOGY

The analysis leading to the descriptions of the new species provided here and the work on hybridization and polyploidy have revealed the most useful characters for delineating *Polystichum* species in Latin America. Since there has been no previous morphological review for the genus in the Neotropics, I provide an analysis of the important characters for *Polystichum*. I have also commented on ontogenetic and environmentally induced variation, which is unusually confusing in the genus.

#### INDUMENT

Indument in *Polystichum* consists entirely of scales and scale homologs (squamules and microscales); true hairs, bristles, and spines are absent, at least in Latin American species. The general form, texture, and frequency of scales are impor-

tant in delineating taxa of *Polystichum*. Particularly important are histological features of the scales: they may be conform (sensu Tryon, 1970) or they may have a margin of cells different in shape and orientation from the scale body. Scale color is important too, although variable with position on the plant and age of the plant. Tagawa (1940) contended that the smallest scales on the abaxial lamina surface (the microscales) are important in defining subgeneric groups in *Polystichum*. In Latin America, variation in microscales is extremely conservative, consistent with Tagawa's contention. Most species have the acicular microscales typical of sect. *Metapolystichum*.

I have followed Smith (1981) in describing the processes that arise from the edges of scales and squamules as cilia, although this is an oversimplification. In fact, scales and squamules bear a continuum of processes from cilia (long and delicate) to setae (short and stiff). I have chosen to call all of these processes cilia and use adjectives to describe their length and stiffness. The kinds and proportions of these cilia on the different scales and squamules are important taxonomic characters in *Polystichum*.

#### LAMINA

The dissection and texture of the lamina provide critical characters for distinguishing species of *Polystichum*, although they are phenotypically and ontogenetically variable. Particularly confusing is the tendency for older plants to have larger, more dissected leaves. Nevertheless, species can be circumscribed within the context of the ontogenetic variation encountered. In addition, the shape, angle of attachment, and revoluteness of leaf segments (pinnae and pinnules) are all important, although phenotypically variable (especially revoluteness). Development of the spinules (extensions of vein tips) varies among species. The complex interaction of ontogeny, environment, and genotype that shapes *Polystichum* leaves perhaps explains the recognition of large, poorly resolved taxa by both Hooker and Christensen.

#### SORI AND SPORANGIA

The placement of the sorus relative to the vein tips is important in *Polystichum*, even though it is variable across a segment. Indusium presence or absence is an important character, although the indusium is sometimes deciduous in neotropical *Polystichum* species. In addition, the diameter, shape, and histology of the indusium vary among, but usually not within, species. Color is sometimes use-



ful but is variable with age. The design of the perispore is usually constant within species.

Color of the indument is a useful character in *Polystichum*, as in many ferns. The color names used in the descriptions here are the National Bureau of Standards color names as defined in *National Bureau of Standards Special Publication 440* (and its predecessor, *Circular 553*), evaluated by comparison of indument with the ISCC-NBS Color-Name Chart (a supplement to *NBS Special Publication 440*), which is a partial set of color chips representing the color centroid. I standardize color terminology in this way, rather than using the Ridgway-Dade terminology and standardization (Stearn, 1983), because those color names are much less familiar, and the color chips on which they are based are much harder to locate. Indument is variable and systematically useful in all three dimensions of the color centroid (hue, value, and chroma); it is also variable in these dimensions with position on the plant and age of the individual.

#### HYBRIDIZATION AND SPECIES DEFINITION

Hybrids between the new Costa Rican species described here and several other species were encountered during fieldwork. Several of these hybrids have been described elsewhere (Barrington, 1985a, b). All of them meet two criteria of hybridity: intermediacy and spore irregularity. Since all of the hybrids have irregular spores, they are probably sterile and hence provide evidence of species-level divergence between their progenitors (Barrington et al., in press). This evidence provides a first working hypothesis for species definition in tropical American *Polystichum* and the basis for recognizing the new species described here.

#### DESCRIPTIONS OF NEW SPECIES

***Polystichum concinnum*** Lellinger ex Barrington, sp. nov. TYPE: Costa Rica. San José: Villa Mills, S of Pan American Highway about one km E of Hotel La Georgina, ca. 3,100 m, 3 Jan. 1980, *D. S. Barrington 694* (holotype, GH; isotype, VT). Figure 1.

Filix grandis terrestris. Caudex erectus base ascendente. Squamae petiolorum anguste lanceolatae, coriaceae, badiae, pallidomarginatae, cilia proximalia squamarum petiolorum longa tenuiaque, distalia brevia, indurata, saepe processibus recurvatis unciformibus. Lamina 0.4–2.0+ m longa, bipinnata, indumento paginae rhachidis abaxialis constans e squamis lanceolatis umbrinis. Pinnae patentes attenuatae, pinnis medianis circa 7–18 cm longis. Pinnulae crenatae patentes fere planae

vix spinulosae circa 0.8 cm longae 0.4 cm latae, squamis minimis acicularibus, pallidibus. Sorus terminalis in ramo acroscopico venae locatus, indusio peltato circa 0.5–0.7 mm diametro.

Plant terrestrial, the spreading-ascendent leaves to 2 m long. Stem erect from an ascendent base, sometimes with weak lateral branches. Petiole with 8 vascular bundles, 2 large adaxial and 6 small abaxial; petiole scales narrow-lanceolate, coriaceous, conform, blackish red to dark reddish brown with sharply delimited narrow lighter borders, the color transition to border abrupt; the proximal cilia frequent, long and delicate, the distal cilia scattered, short, indurate, often with recurved hooklike processes. Petiole squamules unguiculate and deltate, wrinkled, very dark red with deep orange borders, with cilia scattered on the unguiculate squamules to dense on the deltate squamules. Lamina 0.4 to more than 2 m long, chartaceous, acuminate, 2-pinnate, abaxial rachis scales strong brown, ciliate and lanceolate to sparsely ciliate and unguiculate. Pinnae ca. 20–35 on each side of the rachis, attached at right angles to the rachis, attenuate, the median pinnae ca. 7–18 cm long, basal pinnae about  $\frac{1}{10}$  as long; pinna-rachis squamules strong brown, sparsely ciliate, lanceolate or rarely unguiculate. Pinnules ca. 10–25 on each side of the pinna rachis, attached at nearly right angles to the pinna rachis, flat, truncate at the base and obtuse to rounded, crenulate (the basal acroscopic pinnules of each pinna often pinnatisect above the auricle), weakly spinulose, about 0.8 cm long and 0.4 cm wide, the basal pinnules of each pinna abruptly shorter than the next distal pinnules; microscales of costules and veins acicular, pale, without glandular cells. Sorus terminal on an acroscopic vein branch, covered by a thin, peltate, casually deciduous indusium ca. 0.5–0.7 mm diam., the indusium flange of cubical to radially elongate, slightly sinuate cells organized into radial files, the indusium-flange margin a single row of narrow, radially elongate cells. Spores with a well-developed cristate perispore.

*Distribution.* Endemic to high, wet forests of the Sierra Talamanca, Costa Rica and Panamá, 2,000–3,000 m, occasionally to 3,400 m in disturbed areas above treeline.

The affinity of this large, graceful species is with the large group of indusiate and two-pinnate species most diverse in southern Mexico. *Polystichum concinnum* is most similar to two Mexican species, *P. rachichlaena* Fée and *P. erythrosorum* A. R. Smith: all three are large indusiate, flat-leaved, two-pinnate species with crenate pinnules, and they are



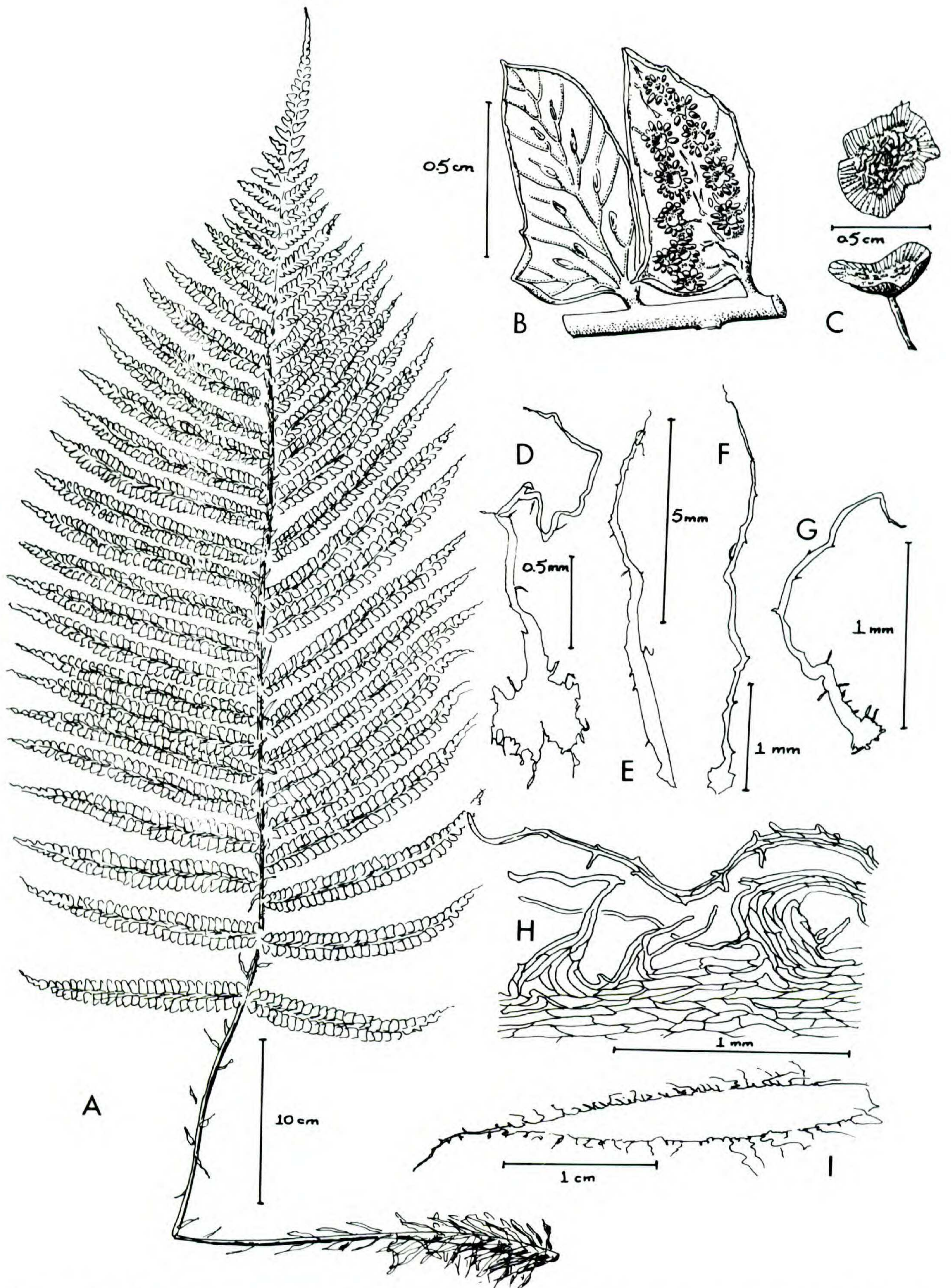


FIGURE 1. *Polystichum concinnum*. —A. Leaf. —B. Two pinnules, the left one with sori removed. —C. Indusium, from above (upper) and side. —D. Rachis scale. —E, F. Rachis squamules. —G. Pinna-rachis squamule. —H. Medial edge of petiole scale (below), petiole scale apex. —I. Petiole scale.



all confined to high-altitude forests. *Polystichum rachichlaena* is notable for the large size (over 1 mm diam.) and persistence of its indusia; it also has petiole scales virtually devoid of cilia. The lamina and sorus of *P. concinnum* are similar to those of *P. erythrosorum*, but the petiole scales of *P. erythrosorum* are broader, marginate, and strongly bicolorous (basally lustrous and black with brownish orange borders). In addition, the long, delicate cilia of *P. concinnum* are lacking in *P. erythrosorum*, and the small distal cilia are not dark and indurated as they are in *P. concinnum*. *Polystichum concinnum* is well represented in herbaria; it has been determined most often as either *Polystichum muricatum* (L.) Fée (which differs in having short petiole-scale cilia) or *Polystichum ordinatum* (Kunze) Liebm. (which differs in having narrow leaf bases and strongly bicolorous petiole scales with thick bases).

David B. Lellinger, of the United States National Herbarium, first distinguished *P. concinnum* and coined its species epithet.

Several chromosome counts of plants from the Talamanca range yielded  $n = 41$  pairs at meiosis I.

*Additional specimens examined.* COSTA RICA. CARTAGO: Villa Mills, 1 km N of Restaurant La Georgina, 30 May 1978, *Barrington 576* (GH, VT). SAN JOSÉ: Cerro Chirripó, SW slopes, along ridge trail from Canaan to summit, 8,500–10,000 ft., 22 & 27 Aug. 1967, *Evans, Lellinger & Bowers 73* (US). PANAMA. CHIRIQUÍ: Cuesta de Las Palmas, southern slope of Cerro de la Horqueta, 1,700–2,100 m, 18 Mar. 1911, *Maxon 5527* (US).

*Hybrids.* Hybrids between this species and the distinctive *P. speciosissimum* have been collected four times from roadcuts on the Pan-American Highway in the Sierra Talamanca area of Costa Rica (*Barrington 705, 1274, 1516*, VT; *W. D. Stevens 14317*, MO). Hybrids with the following species are discussed under that taxon.

***Polystichum talamancanum*** Barrington, sp. nov. TYPE: Costa Rica. Cartago: Cerro de la Muerte, roadcut 0.4 mi. W of highest point on Pan-American Highway, SE aspect, 3,330 m, 4 Jan. 1980, *D. S. Barrington 708* (holotype, GH; isotypes, CR, VT). Figure 2.

Filix terrestris. Rhizoma repens frondibus fasciculatis. Squamae petiolorum lanceolatae, plerumque papyraceae, luteofuscae, ciliis longis tenuibusque. Lamina foliorum fecundorum 12–70+ cm longa, rigide erecta in locis apricis, indumento paginae rhachidis abaxialis constanti e squamis longilanceolatis croceis. Pinnae ascendentes acuminatae vel breviter attenuatae, pinnae medianae circa 5–8 cm longae. Pinnulae patentes fere (70–80° e rhachidi), revolutissimae in locis apricis crescente, vix spinulosae, circa

0.8 cm longae, 0.4–0.5 cm latae, squamis minimis acicularibus pallidis. Sorus terminalis insidens ramo acroscopico venae, indusio genuino nullo vel spatulato, raro peltato, 0.05–0.07 mm lato.

Plant terrestrial, the rigidly erect leaves to 60 cm long. Rhizome short-creeping, with small lateral branches. Petiole with 2 large adaxial and 6 small abaxial vascular bundles; petiole scales lanceolate, herbaceous or rarely chartaceous, conform except at cilia, medially dark yellow-brown, the border similar or distally moderate olive-brown, the color transition to border gradual; the cilia proximally common, long, arising from broad bases of several cells  $\pm$  perpendicular to the scale axis, thin and delicate; petiole squamules unguiculate, strong brown,  $\pm$  flat, with broad and short cilia common at base. Lamina of fertile leaves 12 to 70+ cm long, rigidly erect (spreading-erect in shade), lanceolate, 2-pinnate; abaxial rachis scales narrow-lanceolate, uniformly medium to deep orange-yellow, with short cilia throughout and long cilia distally; abaxial rachis squamules like those of the petiole, deep orange, crumpled, the cilia well developed at squamule base. Pinnae about 40 on each side of the pinna rachis, attached at about a 40° angle to the rachis, acuminate to short-attenuate, the median pinnae ca. 5–8 cm long, basal pinnae  $\frac{1}{2}$ – $\frac{3}{10}$  as long; abaxial pinna-rachis squamules deep orange with long cilia at the base and scattered short cilia distally, the larger long-lanceolate, the smaller unguiculate. Pinnules ca. 11–14 on each side of the pinna rachis, attached at about a 70–80° angle to the pinna rachis, strongly revolute in sun (only the sides of the pinnules revolute, not the tips), barely revolute in shade, cuneate at base and acute-tipped, crenulate (the basal acroscopic pinnules of each pinna often pinatisect above the auricle), with spinules only at auricle and pinnule apex, ca. 0.7–0.9 cm long, 0.4–0.5 cm wide (wider at the well-developed auricle), the basal pinnules of a pinna about the same length as the more distal pinnules; microscales acicular, pale, without glandular cells. Sorus terminal (rarely subterminal) on an acroscopic vein branch, without true indusia or less commonly with a spatulate or rarely reniform to peltate indusium 0.05–0.07 mm diam., the spatulate indusia composed of a narrow proximal portion with cells elongate parallel to the axis and a broader distal portion with cells irregularly placed and shaped. Spores with a well-developed long-cristate perispore.

*Distribution.* Endemic to the subalpine rain-páramo areas and disturbed sites in the tropical



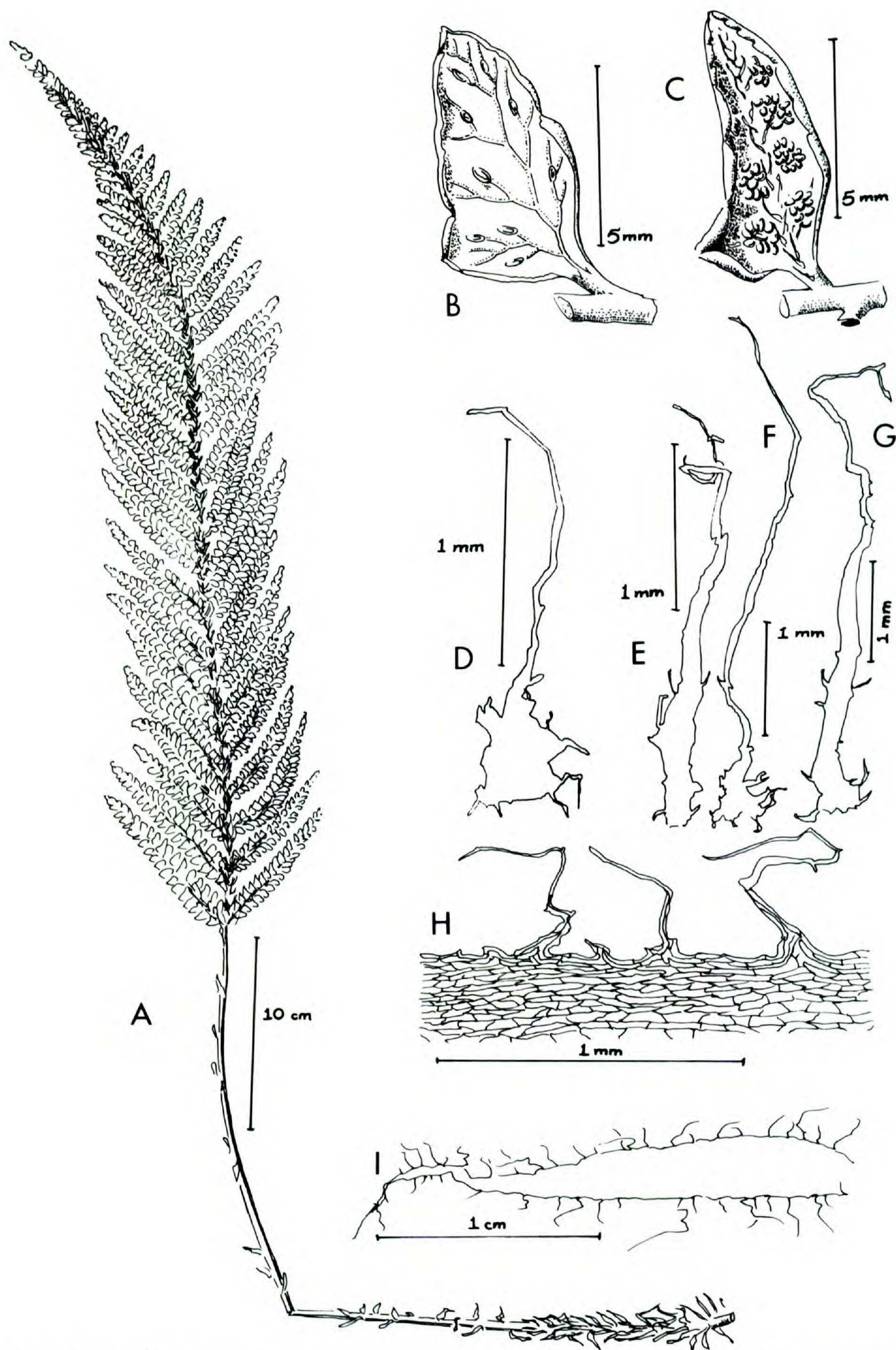


FIGURE 2. *Polystichum talamancanum*.—A. Leaf.—B. Pinnule of plant from shade site, sori removed.—C. Pinnule of plant from sunny site.—D. Petiole squamule.—E, F. Rachis squamules.—G. Pinna-rachis squamule.—H. Medial edge of petiole scale.—I. Petiole scale.

montane rainforest of Costa Rica and western Panamá, 3,000–3,500 m.

*Polystichum talamancanum* is the allotetraploid derivative of *P. concinnum* (described above)

and an unknown diploid species that is also a progenitor of Costa Rican plants of the widespread tetraploid *P. orbiculatum* (Desvaux) Gay (Barrington, 1985b; Barrington et al., 1986, and unpublished data). (*Polystichum orbiculatum* is the



correct name of the widespread Latin American alpine *Polystichum* commonly known as *Polystichum polyphyllum* (Presl) Presl.) *Polystichum talamancanum* is prominent in rock clefts and on roadbanks along the Pan-American Highway above treeline in Costa Rica. It tends to have more patent pinnae and flat pinnules in shade. The indusia are variously developed: some sporophytes never have indusia; others regularly produce spatulate indusia. This variation complicates discrimination of *P. concinnum*, *P. talamancanum*, and their backcross hybrid.

*Polystichum talamancanum*, endemic to the region above treeline in the Sierra Talamanca, may be confused with *Polystichum orbiculatum* and allied taxa. *Polystichum orbiculatum* in Costa Rica has flaccid petiole scales that are paler and more orange than those of *P. talamancanum* and has long, delicate cilia throughout. In addition, *P. orbiculatum* has apically as well as laterally revolute pinnules, and it is never indusiate, whereas *P. talamancanum* has pinnules that are revolute only laterally and sometimes has indusia.

In the Andes from Venezuela to Peru, an array of plants has been collected from those like *P. orbiculatum* in Costa Rica to plants much like *P. talamancanum*. The Andean plants most like *P. talamancanum* differ from it in lacking indusia and having broader, larger petiole scales with narrow white borders bearing short, stiff cilia; if they are hybrids, their progenitors differ from those of *P. talamancanum* and are best determined as *P. pycnolepis* (Kze. ex Kl.) Mett. The taxonomy and evolution of *P. orbiculatum* and its allies in the Andes is a complex and intriguing problem: the hybrid origin of *P. talamancanum* on the Sierra Talamanca is likely to be one part of a much broader, Andean set of evolutionary events, including the origin of *P. orbiculatum* and other high-altitude *Polystichum* species.

*Additional specimens examined.* COSTA RICA. CARTAGO: Cerro de la Muerte, Pan-American Highway, 5 km above Millsville (about 8 km above Nivel), Cordillera de Talamanca, 3,400–3,500 m, 25 July 1949, *Holm & Illis* 590 (MO). SAN JOSÉ: Cerro Asunción del Macizo de Buena Vista, 3,325 m, 31 July 1964, *Jiménez M.* 2235 (CR). PANAMA. CHIRIQUÍ: summit of Chiriquí Volcano, 3,374 m, 27 Feb. 1918, *Killip* 5459 (US).

*Hybrids.* *Polystichum talamancanum* hybridizes with three species on the Sierra Talamanca in Costa Rica, making recognition of the taxa involved difficult. It hybridizes with its diploid progenitor *P. concinnum* to yield a highly variable triploid backcross, reported by Barrington (1985b) as *P. muricatum* × *P. polyphyllum*. Representative specimens of this hybrid are *Barrington*

596, 719, and 1278 (all CR, GH, VT), all from Cerro de la Muerte, Costa Rica. In addition, sterile putative hybrids of *P. talamancanum* with *P. orbiculatum* (*Barrington* 1283, CR, GH, VT) and *P. speciosissimum* (*Barrington* 1500, CR, GH, VT) have been collected from disturbed sites above treeline in the Sierra de Talamanca.

***Polystichum bulbiferum* Barrington, sp. nov.**

TYPE: Ecuador. Prov. Zamora-Chinchipe: road Loja–Zamora, km 39, 1,600–1,650 m (79°04'W, 3°59'S), 21 April 1973, *L. Holm-Nielsen, S. Jeppesen, B. Løjtnant & B. Øllgaard* 4095 (holotype, AAU). Figure 3.

Filix terrestris. Rhizoma parvum, ascendens. Squamae petiolarum lanceolatae, papyraceae, emarginatae (conformes), umbrinae, ciliis longis tenuibusque. Lamina 0.3–0.4 m longa chartacea, acuminata, pinnata, abaxialiter bulbilo squamato prope apicem praedita; indumentum rhachidis paginae abaxialis constans e squamis parvis filiformibus fuscis. Pinnae patentes, planae, crenatae, falcatae, attenuatae, vix spinulosae; pinnae medianae circa 7 cm longae 1.5 cm latae, indumento rhachidis pinnae constanti e squamulis numerosis filiformibus fuscis sine ciliis, squamis minimis costularum venarumque acicularibus pallidis. Sorus abaxialis, in venis acroscopicis fasciculi venarum.

Plant terrestrial. Stem ca. 0.5 cm long, 1.0 cm diam., erect from an ascendent base. Petiole scales lanceolate, papyraceous, conform, light yellow-brown, petiole-scale cilia long and delicate; petiole squamules narrow-lanceolate, crumpled, pale orange-yellow, with abundant short cilia. Lamina 0.3–0.4 m long, chartaceous, acuminate, 1-pinnate, with a scale-covered bulbil abaxially near the distal end of the rachis; abaxial rachis scales filiform, deep brown, with very sparse short cilia. Pinnae ca. 15 on each side of the rachis and attached to it at right angles, flat, auriculate, falcate-attenuate, crenate (crenulate to entire above), weakly spinulose at auricle and pinna apex; the median pinnae ca. 7 cm long and 1.5 cm wide, the basal pinnae ca.  $\frac{1}{10}$  as long; pinna-rachis squamules abundant, dark brown, filiform, without cilia; microscales of costules and veins acicular, pale, without glandular cells. Sorus abaxial on an acroscopic vein branch, indusia absent. Spores with a well-developed folded perispore.

In its leaf dissection and pinna shape, *Polystichum bulbiferum* resembles the Madagascar species *P. kalambatitrense* Tard. and *P. maevaranense* Tard. Among New World polystichums, it is the only one-pinnate species with bulbils attached below the apex of the leaf. In contrast to the Madagascar species, it is exindusiate, as are all of the polystichums endemic to the northern Andes. The detection of a morphologically distinctive species such



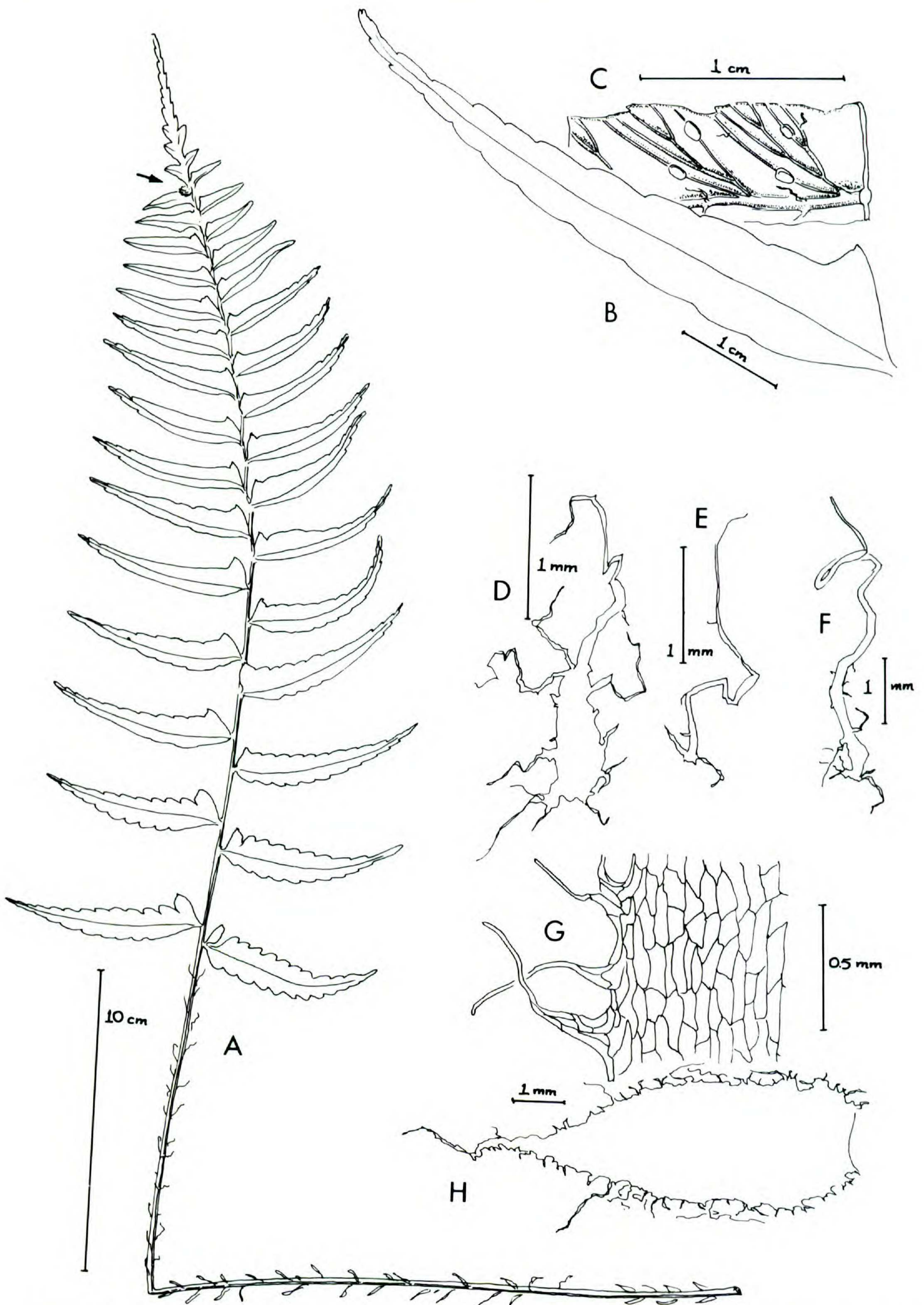


FIGURE 3. *Polystichum bulbiferum*. —A. Leaf with bulbil on rachis (at arrow). —B. Pinna outline. —C. Portion of pinna with sori removed. —D. Petiole squamule. —E, F. Rachis squamules. —G. Medial edge of petiole scale. —H. Petiole scale.



as *P. bulbiferum* only within the last 15 years suggests that major morphological trends in the diversity of the genus in Latin America may still be undocumented by collections, in spite of recent intensive work. This strongly suggests that maintaining substantial collecting programs in tropical forests between 2,000 and 4,000 m is a priority if we are to represent the morphological diversity in this and other genera adapted to the wet montane forests.

*Additional specimen examined.* ECUADOR. ZAMORA/CHINCHIPE: road between Loja and Zamora, ca. km 29–31, 2–4 km W of Sabanilla, 1,700–1,750 m, 1 Jan. 1979, *Luteyn, Lebrón-Luteyn & McAlpin 6634* (AAU).

#### NEW COMBINATION

***Polystichum subintegerrimum*** (Hooker & Arnott) Barrington, comb. nov. *Aspidium subintegerrimum* Hooker & Arnott, *The Botany of Captain Beechey's Voyage* 52. 1832. TYPE: Chile. Biobío: "Concepción" [Concepción], collector unknown (holotype, K).

This distinctive species has black, coriaceous petiole scales, and its two-pinnate leaves have widely spaced pinnae and widely spaced, coriaceous pinnules with auricles pinnatifid only in the basal pinnules of a pinna. It may be well represented in other herbaria besides GH. Some specimens from northern Peru reminiscent of *P. subintegerrimum* have browner petiole scales, more dissected and less coriaceous pinnules, and no indusia. These may be hybrids or a hybrid species including a Peruvian progenitor and *P. subintegerrimum*.

*Representative specimens:* CHILE. BIÓBÍO: Lonco (Concepción), 22 Sept. 1928, *Espinosa 1, 2, 5* (GH); Concepción, Nov. 1937, *F. Jaffuel 4014* (GH). LA ARAUCANIA (CAUTÍN): Depto. Victoria, along the road to Laguna Mallico, Salto de la Culebra and Laguna Verde, sandy places, 950–1,050 m, 15 Mar. 1939, *J. L. Morrison & R. Wagenknecht 17522* (GH). LOS LAGOS: Chiloe, Fuerte de Ahuí (Ancúd), Jan. 1929, *M. R. Espinosa 7* (GH); Chiloe, Ancúd, Apr. 1868, *R. O. Cunningham s.n.* (GH); Corral, 6 Oct. 1930, *H. Gunckel 2050* (GH); same locality, 16 Aug. 1930, *H. Gunckel 2082* (GH); Niebla, 13 Dec. 1931, *H. Gunckel 2865* (GH).

*Exindusiate specimens:* PERU. ANCÁSH: Depto. Yungáy, N side of first lake, Llanganuco, 11,500 ft., 30 July 1960, *S. G. E. Saunders 517* (F); 10 km NE of Yungáy, near Laguna Llanganuco, 3,450 m, 22 Oct. 1965, *Tryon & Tryon 6557* (GH).

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