DRYOPTERIDACEAE

by

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Arachniodes, Ctenitis, Cyclodium, Cyclopeltis, Didymochlaena, Lastreopsis, Rumohra, Stigmatopteris, Tectaria, Triplophyllum have been contributed by A.R. Smith.

Olfersia, Polybotrya, Stigmatopteris have been contributed by R.C. Moran.

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KEY TO THE GENERA

1 Sporangia more or less covering the abaxial side of the fertile lamina; rhizome long-creeping; leaves dimorphic, 1-3-pinnate 2
Sporangia assembled in sori or at least in soral lines; rhizome short-creeping; leaves mono- or dimorphic 3

2 Veins joined by an intramarginal commissure; leaf apex similar to lateral pinnae; axes glabrous ..... *9. Olfersia*
Veins free; leaf apex pinnatifid; hairs generally present on the axes ..... *10. Polybotrya*

3 Sori elliptic to linear; veins mostly free 4
Sori approximately orbicular: veins various 6

4 Lamina bipinnate; pinnules dimidiate, articulate ..... 5. *Didymochlaena*
These characters not combined 5

5 Veins free ..... *6. Diplazium*
Veins anastomosing towards the margin ..... *7. Hemidictyum*

6 Lamina simply pinnate, the pinnae articulate to the rachis; sori of fully fertile pinnae 2- or 3-seriate between costa and margin ..... *4. Cyclopeltis*
Lamina more dissected or if simply pinnate, the pinnae not articulate 7

7 Lamina bearing reddish, articulate hairs at least on the adaxial side of the leaf axes; dissection/venation catadromous except for the basal (primary) pinnae 8
Lamina glabrous, or, if hairy, the hairs not reddish, articulate; architecture various 10

8 Veins anastomosing ..... *13. Tectaria*
Veins free 9

9 Rhizome slender, relatively long-creeping, the leaves not clustered; basal pinnae more or less strongly enlarged, the lamina triangular *14. Triplophyllum*
Rhizome short, erect; basal pinnae not enlarged, the lamina oblong ..... 2. *Ctenitis*

10 Primary rachis adaxially flat or convex ..... *13. Tectaria*
Primary rachis adaxially grooved 11

11 Rhizome long-creeping, usually epiphytic or epilithic ..... *11. Rumohra*
Rhizome short-creeping or erect, terrestrial 12

12 Dissection/venation catadromous or predominantly so; lamina hairless, pellucid-punctate ..... *12. Stigmatopteris*
Dissection anadromous or isodromous, or, if catadromous, the lamina hairy; lamina not pellucid-punctate 13

13 Division of lamina entire, crenate, or, if serrate, only so distally *3. Cyclodium*
Edge of lamina sharply serrate, dentate, or subaristate 14

14 Posterior edge of ultimate free or adnate divisions, as seen from the adaxial side, thickened at base and running into the lateral rachis ridge on its side ..... *8. Lastreopsis*
Posterior edge of ultimate free or adnate division, as seen from the adaxial side, not thickened at base nor running into the lateral ridge of the rachis groove ..... *1. Arachniodes*

1. **ARACHNIODES** Blume, Enum. Pl. Jav. 241. 1828.
Type: Arachniodes aspidioides Blume

Terrestrial or occasionally hemiepiphytic. Rhizome creeping to suberect, scaly. Lamina 3-6-pinnate, anadromous, the proximal pinnae often basiscopically developed; axes grooved adaxially, the grooves continuous from one axis to the next, groove glabrous or densely hairy; ultimate segments commonly acute or cuspidate at apex, or with several marginal teeth; veins free; laminar tissue commonly subcoriaceous to coriaceous, glabrous on both sides. Sori round; indusium round-reniform, with a narrow sinus; spores ellipsoidal, monolete, with a wrinkled perispore. n = 41.

Distribution: About 50 species, mostly in the Sino-Himalayan region, with a few in Africa and about 4 in the Neotropics.

Note: Generic circumscription of this genus relative to its closest relatives, *Polystichopsis* and *Maxonia*, needs further investigation. *Cyclodium* and perhaps *Lastreopsis* are probably also closely related.

KEY TO THE SPECIES

1 Adaxial grooves of lamina with dense, septate hairs; axes abaxially with dense, silky, thin, septate hairs to 1 mm long ..... *3. A. ochropteroides*
Adaxial grooves of lamina glabrous or sparsely hairy; axes lacking hairs abaxially 2

2 Rhizome creeping; ultimate segments rounded or acute at tip, adnate; lamina ovate-deltate, longer than wide ..... *2. A. macrostegia*
Rhizome suberect to erect; ultimate segments cuspidate at tip, stalked or sessile; lamina broadly deltate, about as wide as long ..... *1. A. denticulata*

1. **Arachniodes denticulata** (Sw.) Ching, Acta Bot. Sinica 10: 260. 1962. – *Polypodium denticulatum* Sw., Prodr. 134. 1788. – *Polystichum denticulatum* (Sw.) J. Smith, J. Bot. Hooker 4: 195. 1841. – *Dryopteris denticulata* (Sw.) Kuntze, Rev. Gen. Pl. 2: 812. 1891. – *Rumohra denticulata* (Sw.) Copel., Gen. Fil. 114. 1947. – *Byrsopteris denticulata* (Sw.) C. Morton, Amer. Fern J. 50. 152. 1960. Type: Jamaica, Swartz s.n. (holotype S).

Rhizome suberect, densely clothed with lustrous brown, lanceolate, 10-25 x 2 mm scales. Leaves 4(-5) pinnate; petiole ca. 50 cm long, stout, dark brown; lamina deltate-pentagonal, 20-40 x 20-40 cm; basal pinnae much the largest; ultimate pinnules ovate, 2-4 mm wide, veins forked into spinelike teeth; lamina glabrous except the rachis with minute hairlike scales. Sori near the tips of veins; indusia reddish brown, glabrous.

Distribution: Greater Antilles and Mexico to Brazil; in moist forest at 1000-2500 m. 2 collections from the Guyana at Roraima, Renz 14206, 14208 (both U not seen). Im Thurn 126, 169 (BM, K), 225 (K), McConnell & Quelch 622 (BM) are cited from Guyana, but these collections were collected on the Venezuelan side of the border in Edo. Bolívar, according to Steyermark (Taxon 30: 816-817. 1981).

2. **Arachniodes macrostegia** (Hook.) R. Tryon & Conant, Acta Amazonica 5: 29. 1975. – Nephrodium macrostegium Hook., Sp. Fil. 4: 148. 1862. – Dryopteris macrostegia (Hook.) Kuntze, Rev. Gen. Pl. 2: 813. 1891. Type: Brazil, Amazonas, from Rio Uaupes, Spruce 2245 (holotype K).

Rhizome short-creeping, 0.8-1.3 cm diam., densely clothed with glossy brown, lanceolate-linear, 10-20 x 0.5-0.9 mm scales. Leaves 50-110 cm long, with petiole equaling lamina; lamina 4-pinnate, deltate, 50 x 50 cm or more; acroscopic basal divisions of each order larger than the basiscopic ones; ultimate segments or lobes glabrous, costae pilose on one side with pluricellular hairs and also bearing minute capitate glands. Sori about medial; indusia reniform, sparsely ciliate.

Distribution: Jamaica, Panama and Colombia to Brazil; very rare in

tropical lowland forest at 100-800 m. Only 1 specimen from Mt. Roraima, Appun 959 (K). This collection was made on Venezuelan side.

3. **Arachniodes ochropteroides** (Baker) Lellinger, Amer. Fern J. 77: 101. 1987. – *Nephrodium ochropteroides Baker*, Ann. Bot. (London) 5: 325. 1891. – *Dryopteris ochropteroides* (Baker) C. Chr., Ind. Fil. 280. 1905. – *Polystichopsis ochropteroides* (Baker) C. Morton, Amer. Fern J. 50: 155. 1960. Type: Jamaica, Fox's Gap, Hart s.n. (holotype K not seen; isotype IJ not seen). Plate 1A

Rhizome creeping, ca. (0.5-)1 cm diam., sometimes climbing trees, densely clothed with glossy brown, linear-lanceolate scales (5-)10-20 mm long. Leaves commonly (45-)70-120 cm long, with petiole about equaling lamina; lamina (2-)4-pinnate-pinnatifid, ca. (25-)50 cm x (10-)25-50 cm; acroscopic divisions of each order slightly longer and wider than basiscopicones; proximal pinnae lanceolate to deltate, to (6-) 35 x (3-)20 cm; pinnules stalked to 10 mm, secondary pinnules also stalked; axes abaxially with silky septate hairs to 1 mm long, adaxially with similar but shorter hairs in the grooves; ultimate segments acute at apex. Indusia ca. 1 mm diam., reddish, with a glandular-ciliate margin.

Distribution: Jamaica, Panama, Colombia, Venezuela, Guyana and Surinam; uncommon in rain forest at lower and middle elevations, 350-650 m. 3 collections, only one seen, from the Guianas (GU:1; SU:2).

Specimens examined: Guyana: 1 mile below the Kaieteur Falls, Maguire 23434 (NY not seen, cited by Maxon & Morton in Maguire et al., 1948).
Surinam: Tafelberg, Maguire 24345 (MO; K not seen), 24503 (NY not seen, cited by Maxon & Morton in Maguire et al., 1948, and Kramer, 1978).

Note: The single collection seen from Surinam is much smaller than specimens from other parts of the range, and the smaller measurements in the description above are taken from this specimen. In pubescence, there seem to be no differences.

2. **CTENITIS** (C. Chr.) C. Chr. in Verdoorn, Man. Pterid. 544. 1938. – *Dryopteris* subg. *Ctenitis* C. Chr., Biol. Arb. til. E. Warming 77. 1911. Type: Aspidium ctenitis Link = Ctenitis distans (Brackenr.) Ching.

Terrestrial or epipetric. Rhizome short, suberect to erect, bearing dense

scales at apex. Leaves monomorphic; lamina pinnate-pinnatifid (ours) to 4-pinnate or more divided, typically catadromous; axes adaxially (and sometimes abaxially) with dense, articulate, reddish hairs, abaxially commonly with sparse to dense scales; veins free, simple or forked. Sori round, indusiate or exindusiate, indusia if present with a narrow sinus; spores ellipsoid, monolete. x = 41.

Distribution: Pantropical, with perhaps 150 species, about half of which are found in the Neotropics, but only 2 in the Guianas.

KEY TO THE SPECIES

1 Sori indusiate; pinnae incised nearly to costae ..... *1. C. falciculata*
Sori exindusiate; pinnae incised ca. halfway to costae ..... *2. C. refulgens*

1. **Ctenitis falciculata** (Raddi) Ching, Sunyatsenia 5: 250. 1940. – *Aspidium falciculatum* Raddi, Opusc. Sci. Bol. 3: 289. 1819. – *Dryopteris falciculata* (Raddi) Kuntze, Rev. Gen. Pl. 3(2): 378. 1898. Type: Brazil, Rio de Janeiro, collector ? Plate 1B

Aspidium schomburgkii Klotzsch, Linnaea 20: 369. 1847. Type: Guyana, Schomburgk 1167 (holotype B not seen).

Rhizome apex with dense brown scales 1-1.5 cm long. Leaves 50-75 cm long, with petioles ca. half the lamina length; lamina pinnate-pinnatifid; pinnae 8-10 x 1.5-2 cm, incised 4/5 or more to costa; segments 3-4 mm wide, oblique, subfalcate; proximal pinnae stalked 1-2 mm, distal ones sessile; veins 6-8 pairs per segment, proximal ones meeting margin well above the sinus; costae abaxially with brownish, lanceolate scales 1.5-2 mm long, base somewhat expanded. Sori with a tan, persistent, minutely glandular-ciliate indusium.

Distribution: Guyana and Brazil; montane rain forest, 500-1200 m.

Specimen examined: Guyana: Distr. Rupununi, S edge of Pakaraima Mts., Mt. Ureisha, above Tipuru village, Knapp & Mallet 2852 (UC).

2. **Ctenitis refulgens** (Klotzsch ex Mett.) C. Chr. ex Vareschi, Fl. Venez. 1: 404. 1969. – *Phegopteris refulgens* Klotzsch ex Mett., Ann. Sci. Nat. Bot., ser. 5. 2: 240. 1864. – *Dryopteris refulgens* (Klotzsch) C. Chr., Ind. Fil. 288.1905. Syntypes: Guyana, without loc., Ri. Schomburgk 1128, 1183 (B not seen). Plate 1C

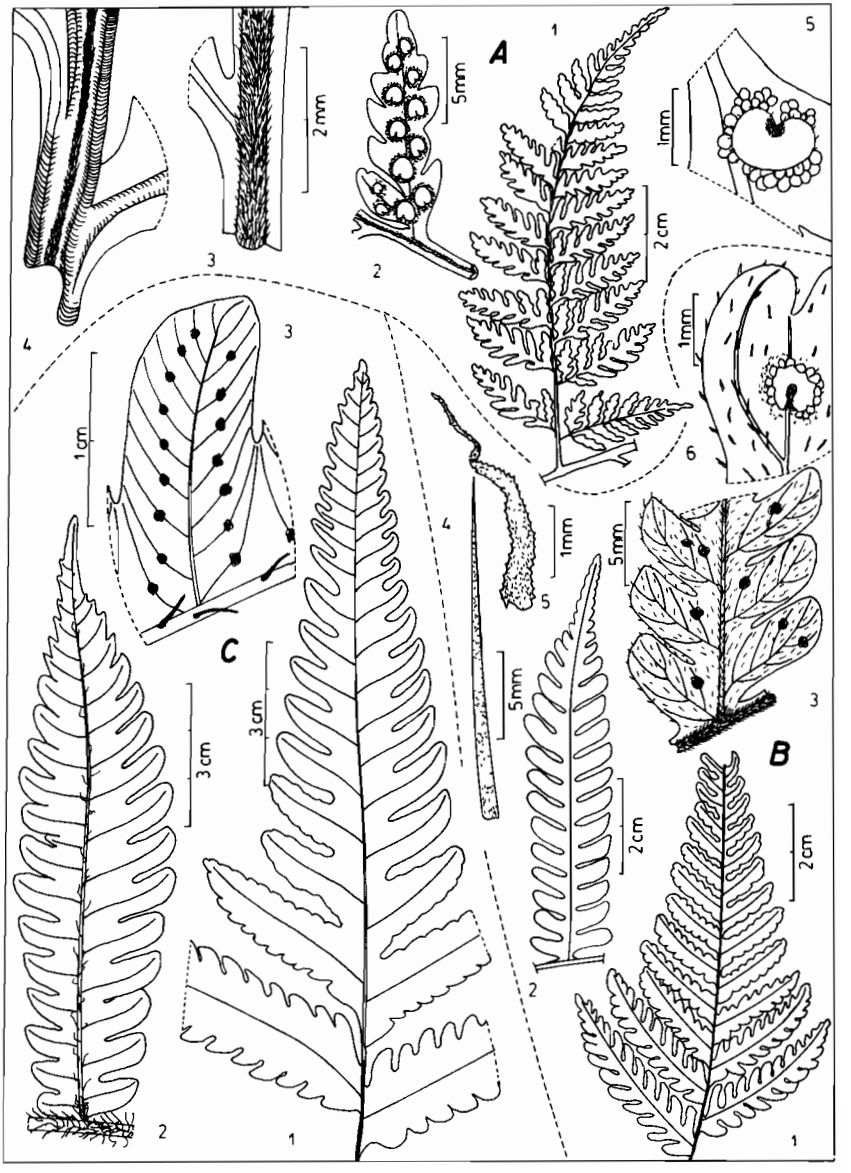

Plate 1. – A, *Arachniodes ochropteroides* (Baker) Lellinger: 1, pinnule; 2, ultimate segment; 3, hairs on axes below; 4, hairs on axes above; 5, indusium (Hartman 12484, UC). – B, *Ctenitis falciculata* (Raddi) Ching: 1, distal part of leaf; 2, median pinna; 3, ultimate segments; 4, rhizome scale; 5, rachis scale; 6, indusium (Knapp et Mallet 2852, UC). – C, C. *refulgens* (Klotzsch ex Mett.) C. Chr. ex Vareschi: 1, distal part of leaf (Cremers 9318, CAY); 2, Basal pinna (Oldeman T.543, CAY); 3, ultimate segment (Cremers 10492, CAY). Drawing by G. Cremers.

Rhizome apex with dense brown scales 1-2 cm long. Leaves 60-100 cm long, with petiole ca. 2/3 the lamina length; lamina pinnate-pinnatifid; rachis with spreading hairlike scales; pinnae 12-20 x 2.5-3.5(-4.5)cm, incised ca. halfway (1/3-2/3) to costa into bluntly rounded segments 5-7 mm wide; proximal pinnae short-stalked to 3 mm, distal pinnae sessile; costae abaxially with reddish brown to blackish, spreading, hairlike scales 2-3 mm long; veins 7-12 pairs per segment, proximal pair from adjacent segments and usually next pair running to sinus; appressed reddish glands 0.1 mm long on lamina abaxially. Exindusiate.

Distribution: Panama, Colombia to Guianas and Peru, Amazonian Brazil; 200-400 m, in lowland rain forest. 15 collections studied from the Guianas (GU:7; SU:1; FG:7).

Selected specimens: Guyana: Cabalibo, Corentyne R., Jenman 404 (K); Upper Demerara R., Jenman s.n. (NY).
Surinam: Tosokreek, near Brokobotokreek, Florschütz & Florschütz 477 (U not seen, cited by Kramer, 1978).
French Guiana : Inini R. en aval de Degrad Fourmi, Cremers 8791 (UC; BM, CAY, P, U, Z not seen); Saül, Mts. La Fumée, Boom & Mori 1588 (CAY; NY not seen).

3. **CYCLODIUM** C. Presl, Tent. Pterid. 85. 1836. – *Aspidium* sect. *Cyclodium* (C. Presl) Hook., Sp. Fil. 4: 36. 1862.
Lectotype: Aspidium confertum Kaulf. = Cyclodium meniscioides (Willd.) C. Presl var. meniscioides. Chosen by J. Smith, Hist. Fil. 203. 1875.

Terrestrial, epipetric, or hemiepiphytic. Rhizome short- to long-creeping, bearing linear-lanceolate scales. Leaves monomorphic to dimorphic; lamina pinnate (rarely simple) to 2-pinnate-pinnatifid, anadromous; rachis and costae adaxially grooved, the grooves more or less confluent; main axes usually with blunt, unicellular, 0.1-0.3 mm long hairs and brownish, hairlike scales; veins free to highly anastomosing. Sori round, with peltate or round-reniform indusia; spores ellipsoid, monolete. n = 41.

Distribution: Neotropical, with 10 species distributed from Trinidad and Panama south to Bolivia and northeastern Argentina, 6 in the Guianas.

KEY TO THE SPECIES

1 Veins regularly anastomosing; fronds monomorphous to strongly dimorphous 2
Veins all free; fronds monomorphous 5

2 Lamina with a confluent, pinnatifid apical segment; rhizome scales dark purple-brown ..... *6. C. varians*
Lamina with a more or less conform, entire or crenate apical segment; rhizome scales brown with often lighter margins 3

3 Lateral pinnae ovate-lanceolate, up to 11 x 2.3 cm; costae abaxially lacking scales; indusial margin entire; areoles 1- or 2-seriate ..... *1. C. akawaiorum*
Lateral pinnae elliptic, 10-25 x (2-)4-8 cm; costae below with narrow scales; indusial margin usually ciliate; areoles 3-7 seriate 4

4 Veins strongly raised adaxially; pinnae of sterile fronds overlapping ..... *4b. C. meniscioides* var. *rigidissimum*
Veins not strongly raised adaxially; pinnae distant, not overlapping ..... *4a. C. meniscioides* var. *meniscioides*

5 Pinnae linear-lanceolate, less than 1 cm wide, crenate- margined; rheophyte ..... *5. C. rheophilum*
Pinnae lanceolate, more than 1 cm wide, crenately lobed to pinnatifid 6

6 Scales several cells wide on costae abaxially; pinnae (15-) 20-30 pairs ..... *2. C. guianense*
Scales lacking on costae abaxially; pinnae 9-15(-24) pairs ..... *3. C. inerme*

1. **Cyclodium akawaiorum** A.R. Smith, Amer. Fern J. 76: 71, fig. 6. 1986. Type: Guyana, NW-facing slopes of Mt. Roraima, vicinity of Camp 6 near end of Waruma Trail, ca. 1 mi N of Prow, Warrington et al., K.E.R. 76 (holotype UC; isotype K). Plate 2A

Hemiepiphytic. Leaves dimorphic, the fertile ones narrower, with contracted pinnae; pinnae 6-14 pairs, these more or less gradually reduced distally, and a free terminal lanceolate segment; sterile pinnae to 10.5 x 2.3 cm, entire, proximal ones stalked to 5 mm; veins anastomosing to form 1 or 2 rows of areoles between costa and margin. Sori in 1 or 2 rows between costa and margin; indusia peltate, entire.

Distribution: Guyana and Edo. Bolívar, Venezuela; montane rain forest, 1000-1450 m. Only 2 specimens from Guyana: Mt. Roraima, Paikwa Trail, R.N. Persaud 110 (NY; BRG, K not seen); from same population as type, plants were grown at Kew under the number K.E.R. 1207 (Kew Accession 174-78-01565, K; 178-78-15565, UC).

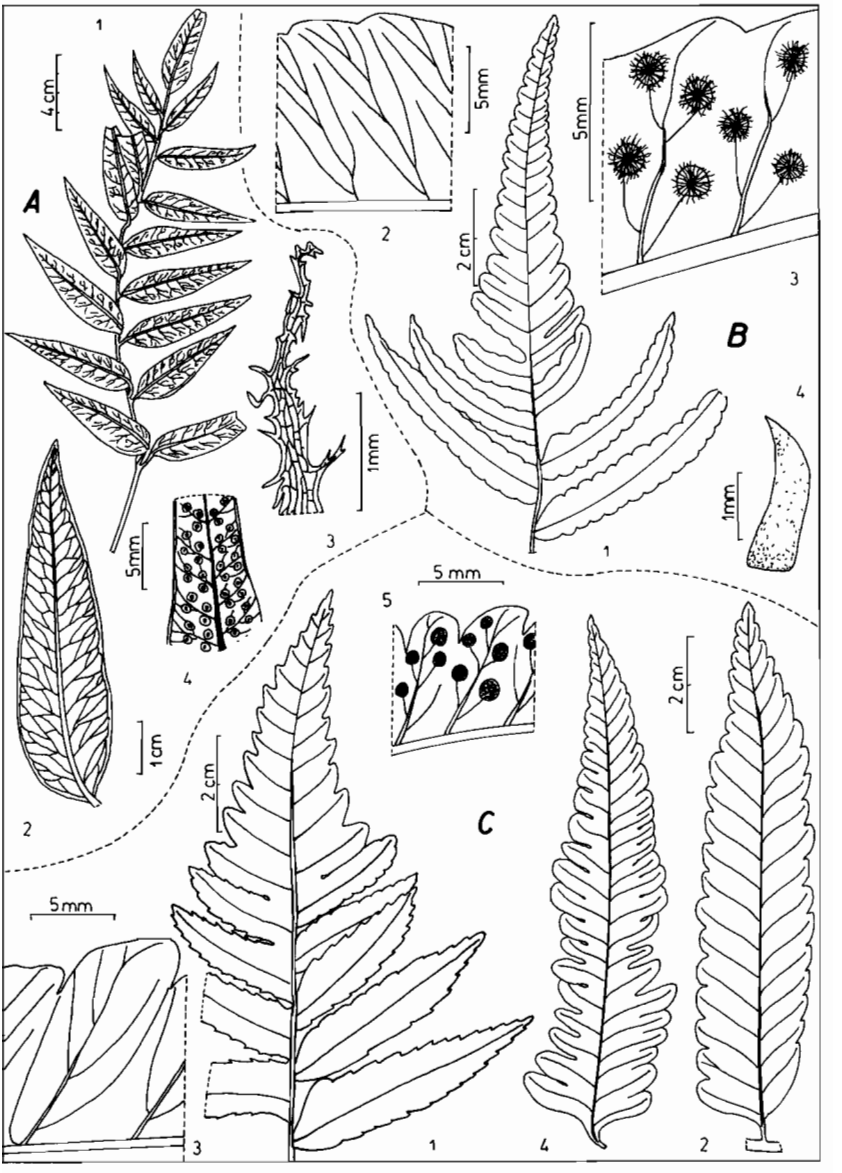

Plate 2. – A, *Cyclodium akawaiorum* A.R. Smith: 1, leaf; 2, sterile pinna; 3, apex of rhizome scale; 4, detail of fertile pinna (Persaud 110 in NY, after A.R. Smith, 1986, p. 72). – B, *C. guianense* (Klotzsch) v.d. Werff ex L.D. Gómez: 1, leaf apex; 2, detail of sterile pinna; 3, detail of fertile pinna; 4, petiole scale (Cremers 10063, CAY). – C, C. *inerme* (Fée) A.R. Smith: 1, apex of sterile leaf; 2, sterile pinna; 3, detail of sterile pinna (Cremers 10064, CAY); 4, fertile pinna; 5, detail of fertile pinna (Cremers 7828, CAY). Drawing by G. Cremers.

2. **Cyclodium guianense** (Klotzsch) van der Werff ex L.D. Gómez, Phytologia 60: 371. 1986. – *Aspidium guianense* Klotzsch, Linnaea 20: 364. 1847. – *Dryopteris guianensis* (Klotzsch) Posthumus, Ferns Surinam 51. 1928. – *Stigmatopteris guianensis* (Klotzsch) C. Chr., Ind. Fil. Suppl. 3: 174. 1934. Type: Guyana, Ri. Schomburgk 1157 (holotype B?; isotypes K, UC; P not seen). Plate 2B

Polypodium sancti-gabrieli Hook., Sp. Fil. 4: 233. 1862. – *Dryopteris sancti-gabrieli* (Hook.) Kuntze, Rev. Gen. Pl. 2: 813. 1891. – *Stigmatopteris sancti-gabrieli* (Hook.) C. Chr., Ind. Fil. Suppl. 3: 175. 1934. Type: Brazil, Amazonas, São Gabriel, Spruce 2153 (holotype K; isotypes BM, BR, G, P).

Terrestrial. Leaves monomorphic; pinnae (15-)20-30 pairs, gradually or subabruptly reduced to a confluent, pinnatifid apex; pinnae (8-)11-20(-24) x 1.3-2.5(-3.7) cm, incised 1/5 (rarely to 1/2) or less to costa; veins free, proximal pair from adjacent segments ending below sinus; costae abaxially with ovate, tan, 0.5-3 x 0.1-0.3 mm scales. Sori 2-4(-6) pairs per segment; indusia peltate, entire or slightly erose.

Distribution: Colombia, Trinidad, Venezuela, the Guianas and northern Brazil; understory in primary lowland rain forest, 0-800(-1200) m. 46 collections studied from the Guianas (GU:6; SU:15; FG:25).

Selected specimens: Guyana: Basin of Essequibo R., near mouth Onoro Cr., A.C. Smith 2745 (NY); Imoti Cr., Waini R., Beckett s.n. (K, NY).
Surinam: Bakhuis Mts., inter fl. Kabalebo & Coppename, Florschütz & Maas 2975 (GH, U, US); lower slopes of Frederiktop, 3.5 km SSE Julianatop, Irwin et al. 54923 (MO, NY).
French Guiana: Mts. Bakra, de Granville 4149 (CAY; P, U, Z not seen); Mt. Bellevue, Inini R., Cremers 9193 (UC; B, BR, CAY, G, MG, MO, P, U, Z not seen).

3. **Cyclodium inerme** (Fée) A.R. Smith, Amer. Fern J. 76: 82. 1986. – *Polystichum inerme* Fée, Gen. Fil. 281. 1852. Type: French Guiana, without loc., Leprieur 188, 1850 (Herb. Mougeot, not located; isotype P). Plate 2C

Polypodium subobliquatum Hook., Sp. Fil. 4: 240. 1862. – *Dryopteris subobliquata* (Hook.) Kuntze, Rev. Gen. Pl. 2: 813. 1891. Lectotype: Surinam, Hostmann 15 (hololectotype K; isolectotypes BM; P not seen). Chosen by Christensen, 1913.

Terrestrial. Leaves monomorphic; pinnae 9-15(-24) pairs, gradually reduced distally to a confluent shallowly pinnatifid apex; pinnae 4-15(-20)

x 1.2-3(-4) cm, incised 1/4-1/2(-2/3) to costa; veins free, proximal pairs from adjacent segments ending below or running to sinus; costae abaxially with a few scattered, hairlike, to 1 mm long scales. Sori to 6 pairs per segment; indusia peltate, entire or slightly erose.

Distribution: Eastern Venezuela, the Guianas and northeastern Brazil; understory in primary lowland rain forest, 0-700 m. 104 collections studied from the Guianas (GU:32; SU:31; FG:41).

Selected specimens: Guyana: Demerara R., Jenman 4213 (B, BM, K); without loc., A.C. Smith 2896 (F, GH, K, NY, U, US).
Surinam: Ricanau Mine near Moengo, Distr. Marowijne, Kramer & Hekking 3120 (GH, U, VEN); Brownsberg, Gonggrijp & Stahel BW 601 (US).
French Guiana: Mt. de la Trinité, Cremers 7411 (CAY; BR, P, Z not seen); Mt. de Kaw, Skog & Feuillet 7073 (CAY, US not seen).

4. **Cyclodium meniscioides** (Willd.) C. Presl, Tent. Pterid. 85, pl. 2, fig. 20. 1836. – *Aspidium meniscioides* Willd., Sp. Pl. 5(1): 218. 1810. – *Dryopteris meniscioides* (Willd.) Kuntze, non C. Chr. (1905), Rev. Gen. Pl. 2: 813. 1891 [as "menisciodes"]. – *Stigmatopteris meniscioides* (Willd.) Kramer in Kramer & van Donselaar, Koninkl. Nederl. Akad. Wetensch. Proc., Ser. C. 71: 521. 1968. Type: Brazil, Hoffmannsegg s.n. (B-Herb. Willd. 19737, microfiche UC).

4a. **Cyclodium meniscioides** (Willd.) C. Presl var. **meniscioides** Plate 3A

Aspidium confertum Kaulf., Enum. Fil. 232. 1824. – *Cyclodium confertum* (Kaulf.) C. Presl, Tent. Pterid. 85. 1836. – *Dryopteris meniscioides* (Willd.) Kuntze var. *conferta* (Kaulf.) C. Morton, Bull. Torrey Bot. Club 66: 50. 1939. Type: French Guiana, without loc., Richard s.n. (holotype LE?).

Terrestrial or low hemiepiphyte. Leaves monomorphic, or dimorphic with contracted fertile pinnae. Sterile lamina 1-pinnate, with 2-6 (-9) pairs of lateral pinnae and a more or less conform terminal segment (rarely blades simple); pinnae 10-25 x (2-)4-8 cm, entire to sinuate or crenate to deeply serrate; veins regularly anastomosing to form 4-7 areoles between costa and margin. Sori in 4-9 rows between costa and margin; indusia peltate, usually ciliate on margin.

Distribution: Venezuela, Trinidad, the Guianas, Brazil, Colombia to Bolivia, northeast Argentina and Paraguay; lowland rain forest, gallery forest, swamps, 0-700(-1150) m. 119 specimens studied from the Guianas (GU:57; SU:31; FG:31).

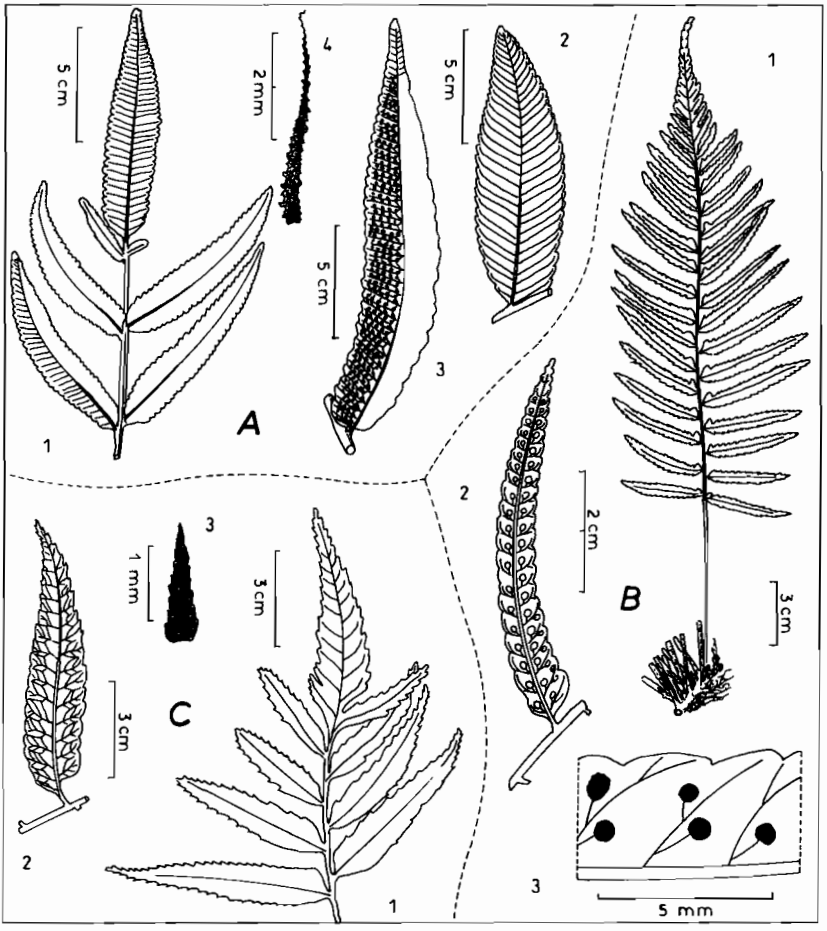

Plate 3. – A, *Cyclodium meniscioides* (Willd.) C. Presl var. *meniscioides*: 1, apex of fertile blade; 2, sterile pinna (Prance 59224, GH); 3, fertile pinna; 4, scale from rhizome apex (Hitchcock 17124, UC). – B, C. *rheophilum* A.R. Smith: 1, plant; 2, fertile pinna; 3, detail of fertile pinna (de Granville 2586, F). – C, *C. varians* (Fée) A.R. Smith: 1, apex of sterile blade; 2, sterile pinna; 3, rhizome scale. Drawing after Smith A.R., 1986, p. 72, and by G. Cremers.

Selected specimens: Guyana: Amakura R., Northwest Distr., de la Cruz 3488 (MO, UC; F, GH, NY, US not seen); Berbice, Ro. Schomburgk I 316 (BM, G, K).
Surinam: Nassau Mts., Lanjouw & Lindeman 2849 (U, US); Kaboeri, Corantijne R., Gonggrijp & Stahel BW 2642 (U).
French Guiana: inter Sommet Tabulaire and Massif des Emerillons, Cremers 6559 (CAY; P, Z not seen); E Saül, Saut Maïs, de Granville 3078 (CAY; P, Z not seen).

4b. **Cyclodium meniscioides** (Willd.) C. Presl var. **rigidissimum** (C. Chr.) A.R. Smith, Amer. Fern J. 76: 88. 1986. – *Cyclodium rigidissimum* C. Chr., Bot. Tidsskr. 25: 79. 1902. Type: Guyana ["Brazil", no doubt incorrect], without loc., Appun s.n. ["Glaziou 12374", probably a distribution number] (holotype C; isotypes G; P not seen).

Differing from var. *meniscioides* by its very rigid texture, more numerous, imbricate pinnae (15-16 pairs), raised veins, and distal pinnae more gradually reduced with lamina terminating in a more triangular apical segment that may be lobed at base.

Distribution: Known only from Guyana: E side of Waruma R., ca. 7.5 mi NNW of N prow of Mt. Roraima, vicinity of Camp 4, Waruma Trail, Warrington et al., K.E.R. 167 (K, UC); without loc., Appun 1176 (K); rain forest, ca. 500 m.

Note: A third variety, var. *paludosum* (C. Morton) A.R. Smith, is found in Colombia and Peru.

5. **Cyclodium rheophilum** A.R. Smith, Amer. Fern J. 76: 88, fig. 9A, B. 1986. Type: French Guiana, Upper Oyapock R., Mt. St. Marcel, S slope, de Granville 2586 (holotype F; isotypes CAY, Z). Plate 3B

Rheophyte. Leaves monomorphous; pinnae to 20 pairs, gradually shortened distally to a confluent, pinnatifid apex; pinnae to 9 x 0.5-0.7 cm, crenate along margin, inequilateral at base, auriculate acroscopically, cuneate basiscopically; veins free, 1-forked or with 1 or 2 pinnate branches. Sori confined to first acroscopic veinlet; indusia peltate, glandular on margin.

Distribution: Known only from the type; on exposed, flooded, moss-covered rocks, 260 m.

6. **Cyclodium varians** (Fée) A.R. Smith, Amer. Fern J. 76: 94. 1986. – *Nephrodium varians* Fée, Mém. Fam. Foug. 11: 88, pl. 24, fig. 2. 1866. – *Dryopteris varians* (Fée) Kuntze, Rev. Gen. Pl. 2: 814. 1891. – *Stigmatopteris varians* (Fée) Alston, Kew Bull. 1932: 309. 1932. Type: Trinidad, 1864, Germain s.n. (holotype P not seen). Plate 3C

Terrestrial or hemiepiphytic? Leaves somewhat dimorphous, the sterile ones shorter and with wider pinnae; pinnae 9-17 pairs and a subconform hastate terminal segment that tends to be lobed at base; fertile pinnae subentire to sinuate, crenate or shallowly lobed, (5-)10-15 x 0.8-1.5 (sterile to 2.5) cm; veins anastomosing to form 1 or 2 series of areoles between costa and margin. Sori in (1-)2-3 rows; indusia peltate, short-ciliate.

Distribution: Trinidad, Venezuela (Edo. Bolívar) and Guyana; lowland rain forest. Only 6 collections from Guyana.

Specimens examined: Essequibo R., Moraballi Cr., near Bartica, Richards 22 (BM, K); Mazaruni R., Jenman s.n., 1899 (K, NY, US); Macrourie Cr., Essequibo R., Jenman s.n., 1895 (NY); Essequibo, Appun 27 (B, BM, P, W); Malali, Demerara R., Jenman 6853 (GH; K not seen), s.n. (K, NY); Demerara, Parker s. n., 1830 (K).

Note: Several herbarium specimens suggest that hybridization occasionally takes place in *Cyclodium*. The primary area of sympatry, and thus the most likely area for hybridization to occur, is in the Guianas. Jenman s.n. (NY), Guyana, Pomeroon R., combines features of several species, particularly *C. varians, C. meniscioides* and *C. inerme*. The long-creeping rhizome suggests that it is a hemiepiphyte, and the pinna lobing is very irregular. Several collections from Malali, Guyana (Jenman s.n., NY) are also suggestive of hybridization. De la Cruz 2880 (F, GH, NY, UC), from Kamakusa, Guyana, is also very irregular in pinna lobing and may represent a hybrid between *C. meniscioides* and *C. varians*. All of these putative hybrids are apparently rare and are thus poorly known; all but one lack mature spores. Little more can be said about their origin and parentage until hybrid plants can be studied in the field or until cytological materials can be obtained.

4. **CYCLOPELTIS** J. Smith, Bot. Mag. 72: Comp. 36. 1846.
Type: Polypodium semicordatum Sw. = Cyclopeltis semicordata (Sw.) J. Smith.

Terrestrial. Rhizome thick, woody, densely scaly. Leaves monomorphic, fasciculate; petiole and rachis deciduously scaly; lamina 1-pinnate, pin-

nae numerous, lanceolate, entire to subentire, articulate and eventually deciduous; veins free or casually anastomosing. Sori round, dorsal or terminal on veins, in 1-4 rows on each side of costa; indusia peltate, caducous; spores ellipsoid, monolete. x = 41.

Distribution: Pantropical, ca. 6 species, one widespread in the Neotropics and five in southeast Asia, primarily at low elevations in wet forests.

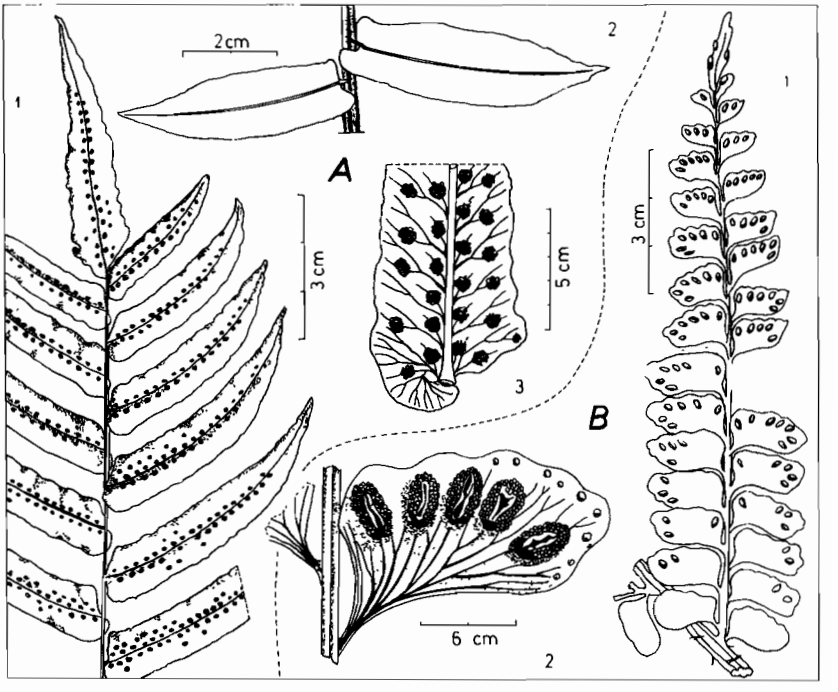

Plate 4. – A, *Cyclopeltis semicordata* (Sw.) J. Smith: 1, apex of leaf; 2, base of lamina; 3, base of fertile pinna (after Rovirosa, 1909, plate 32). – B, *Didymochlaena truncatula* (Sw.) J. Smith: 1, distal and basal parts of fertile pinna; 2, fertile pinnule (after Rovirosa, 1909, plate 31).

1. **Cyclopeltis semicordata (Sw.) J. Smith, Bot. Mag. 72: Comp. 36. 1846.** – *Polypodium semicordatum* Sw., Prodr. 132. 1788. – *Aspidium semicordatum* (Sw.) Sw., J. Bot. (Schrader) 1800(2): 31. "1801" [1802]. Type: Jamaica, Swartz s.n. (holotype S?; isotype B-Herb. Willd. 19742). Plate 4A

Rhizome erect to suberect, apex bearing dense, brown, linear-attenuate scales. Leaves 0.5-1.5 m long, petiole short, 1/4 the lamina length or less; lamina (40-)70-100 cm long, imparipinnate with apical segment like the lateral ones, proximal 2-5 pinna pairs somewhat shortened and deflexed; pinnae up to 45 pairs, 6-20 x 1-2 cm, sessile, strongly subcordate-auriculate at base, auricle basiscopic and overlying rachis; veins alternately 2-5-forked, 1-3 proximal branches soriferous near their base. Sori round, in 1-3 rows on both sides of costa.

Distribution: the Antilles and southern Mexico to Bolivia and the Guianas, Amazonian Brazil; low elevation rain forest, apparently rare in the Guianas (GU:2; SU:2; FG:2).

Specimens examined: Guyana: Rupununi Distr., foothills of NW Kanuku Mts., near Moco-Moco village, Maas & Westra 3928 (MO; K not seen); NW slopes of Kanuku Mts., drainage of Moku-Moku Cr. (Takutu trib.), Smith 3542 (MO, NY; B, G, IAN, K, P, U, not seen).
Surinam: 20 km NE of Kabalebo airfield, Florschütz & Maas 2512 (U); Kwamakreek, Coppename R. trib., Stahel BW 4619 (U, US) [2 coll. cited by Kramer, 1978, not seen].
French Guiana: Cayenne, Leprieur s.n. (B not seen, cited by Posthumus, 1928); without loc., Mélinon 555 (P, US not seen).

5. **DIDYMOCHLAENA** Desv., Ges. Naturf. Freunde Berlin Mag. Neusten Entdeck. Gesammten Naturk. 5: 303. 1811.
Type: Didymochlaena sinuata Desv. = D. truncatula (Sw.) J. Smith.

Terrestrial; rhizome suberect to erect, scaly. Leaves monomorphic. Lamina 2-pinnate; pinnules subsessile, articulate, oblong, subdimidiate; veins free, forked, enlarged at submarginal apices. Sori terminal on veins, elliptic, somewhat impressed; indusia elliptic, rounded at distal end, cordate at base, fixed to vein along medial line; spores ellipsoid, with a wrinkled perispore. x = 41.

Distribution: Pantropical, monotypic; rain forests at low and middle elevations.

1. **Didymochlaena truncatula** (Sw.) J. Smith, J. Bot. (Hooker) 4: 196. 1841. – *Aspidium truncatulum* Sw., J. Bot. (Schrader) 1800 (2): 36. "1801" [1802]. Type: Java, collector not stated (holotype S?, not seen).
Plate 4B

Leaves commonly 1-2 m tall, with petiole shorter than lamina, densely scaly at base and with scattered scales upwards, scales to 3 cm long; rachis similarly scaly; lamina with up to 20 pairs of alternate, lateral pinnae and a more or less conform terminal one, mostly 15-25(-30) cm long, proximal pinnae somewhat shortened; architecture isodromous or a little anadromous; pinnules oblong, 1-2.5 x 0.5-1 cm, rounded or crenate at apex; laminar tissue more or less glabrous on both sides, dark green. Sori 3-7 per pinnule, along acroscopic side or 1 or 2 at tip of pinnules on basiscopic side, 2-3 x 1 mm.

Distribution: As with the range of the genus; in the Neotropics, from southern Mexico and the Antilles to Bolivia and Uruguay. In lower elevation rain forests, in the Guianas up to 600 m. 59 collections studied from the Guianas (GU:4; SU:14; FG:41).

Selected specimens: Guyana: Pakaraima Mts., Paruima Mission, Maas et al. 5605 (MO; K, P, U not seen); Takutu Cr. to Puruni R., Mazaruni R., Fanshawe 2059 (K, NY, US not seen, cited by Maxon & Morton in Maguire et al., 1948); Cuyuni R., Arawak Matope, Tutin 402 (K, U, US not seen).
Surinam: Ca. 14 km N of Lucie R., Irwin et al. 54728 (MO; BR not seen); Juliana Top, Maguire et al. 54372 (MO); Jodensavanne, Mapane kreek area (Suriname R.), Lindeman 3630 (MO; U not seen).
French Guiana: Pied du Mt. Galbao, Cr. Mana, de Granville 8483 (UC; B, CAY, NY, U, US, Z not seen); Saut Parare, Arataye R., Approuague R., Sastre 5593 (UC; CAY, NY, P, U not seen).

Note: In Jones (1987), this species is listed as a favorite among fern growers. It is named "Tree Maidenhair Fern".

6. **DIPLAZIUM** Swartz, J. Bot. (Schrader) 1800(2): 61. 1802.
Type: Asplenium plantagineum L. = Diplazium plantagineum (L.) Swartz = D. plantaginifolium (L.) Urban

Terrestrial. Rhizome creeping, ascending or erect, scaly at the apex. Leaves 1- to 4- pinnate; petiole not articulate; lamina of various texture, veins simple, the areoles, if any, without free included veinlets. Sori elliptic to linear; indusium lateral.

Distribution: This is a mostly pantropical genus of about 300 species. The American 100 or more species are distributed from Mexico through Central America, the Antilles to South America. The center of species diversity is in the Andes from Colombia to Bolivia.

Note: This genus is greatly in need of critical study. The identity and limits of its species are very poorly known on account of observed variations during the plants' growth, in different localities, and during their individual development. In the Guianas 10 species can be distinguished.

KEY TO THE SPECIES

1 Lamina pinnate to pinnate-pinnatifid 2
Lamina twice or more times pinnate 10

2 Pinnae entire or crenulate-lobulate 3
Pinnae pinnatilobate to pinnatisect 8

3 Leaf apex pinnatifid; veins pinnately branched 4
A conform terminal pinna present; veins parallel, simple or forked ..... *7. D. lechleri*

4 Veins in each pinna segment/lobe 2-4 to a side 7
Veins in each pinna segment/lobe 5 or more to a side 5

5 Veins in each pinna segment/lobe 5-7 per side; pinnae 8-15 to a side 6
Veins in each pinna segment/lobe 8-12 per side; pinnae 15-25 to a side ..... *9. D. striatum*

6 Pinnae usually crenate-lobulate in their basal part, serrate near apex, to 2 cm wide ..... *1. D. celtidifolium*
Pinnae subentire except at the serrate apex, over 2 cm wide *6. D. grandifolium*

7 Only the sorus on the basal anterior veinlet "double" ..... *1. D. celtidifolium*
Several sori, on both sides of the costule, "double" ..... *2. D. centripetale*

8 Pinna base strongly inequilateral ..... *3. D. cristatum*
Pinna base (sub)equilateral 9

9 A bud present in the axil of a distal pinna ..... *9. D. roraimense*
No such bud present ..... *10. D. striatum*

10 Tertiary divisions of lamina serrate-dentate to subentire; lamina chartaceous; sori linear 11
Tertiary divisions of lamina pinnatilobate to subpinnate; lamina herbaceous; sori oblong ..... *5. D. gracilescens*

11 Pinnules incised 1/3-1/2 their width; costa, costules and leaf tissue pubescent; architecture catadromous ..... *4. D. expansum*
Pinnules deeply incised to within 1 mm of costa; costa, costules and leaf tissue glabrous; architecture anadromous ..... *8. D. radicans*

1. **Diplazium celtidifolium** Kunze, Bot. Zeit. (Berlin): 285. 1845. – *Asplenium celtidifolium* (Kunze) Mett., Fil. Lips. 3: 75, t.12, f.3-4. 1856. – *Athyrium celtidifolium* (Kunze) Milde, Bot. Zeit. (Berlin): 353. 1870. Type: Venezuela, Linden 544 (BR, P, photo US; FI, VEN not seen). Plate 5A

Rhizome stout, 10-15 mm thick, erect or ascending, at the apex covered by dark brown scales of 8 x 2 mm. Leaves pinnate, 50-90 cm long; architecture isodromous or catadromous; petiole much shorter than the lamina, 15-40 cm, dark brown and scaly at the base or brownish green; lamina ovate, acuminate at the apex, attenuate at the base, with 8-15 pairs of alternate pinnae and a pinnatifid apex. Pinnae lanceolate, acuminate, rounded or truncate at the base, margin crenulate, the basal pinnae petiolulate, the distal pinnae sessile or adnate, glabrous, 5-12 x 2-2.5 cm; veins pinnately branched, generally 2-4 branches, up to 7 in the basal part of a lower pinna. Sori linear, 1-3 (-6) for each lobe; indusium entire.

Distribution: Antilles, Trinidad and tropical South America. Terrestrial in forests, mostly in the hills and mountains. 37 collections studied from the Guianas (SU:5; FG:32).

Selected specimens: Surinam: Mt. Bakhuis, inter Kabalebo and Coppename, Florschütz & Maas 3045 (GH, U); Emmaketen, Gonggrijp et Stahel BW 5806 (U, US); Lawa R., Cottica Mts., Versteeg 324 (BBS, U). French Guiana: Mt. de la Trinité, de Granville 6532 (CAY, NY, P, US, Z); Saül, Mt. Galbao, de Granville 8602 (B, BM, CAY, MG, NY, P, U, US, Z); Mts. Atachi Bakka, Cremers 10342 (B, CAY, G, NY, P, U, US, Z).

Note: According to A.R. Smith (1985) this species and *D. centripetale* are closely related, but the latter is distinguished by the absence of a rachis bud, thinner-textured lamina, lighter green blade colour, and more than only the basal pair of veins of each vein group soriferous.

2. **Diplazium centripetale** (Baker) Maxon, Sci. Surv. Porto Rico & Virgin Isl. 6: 441. 1926. – *Asplenium centripetale* Baker in Hook. et Baker, Syn. Fil. ed. 2: 490. 1874. Syntypes: Jamaica, Macfadyen s.n. and Purdie s.n.; Martinique, Bélanger s.n. (not seen) Plate 5B

Rhizome erect, massive, up to 30 cm long, covered by brown scales of 15 x 1.5 mm. Leaves pinnate, up to 200 cm long; architecture not very pronounced, varying; petiole much shorter than the lamina, to 60 cm, dark brown, scaly at the base; lamina oblong-lanceolate, 20-50 cm wide, pinnatifid and acuminate at the apex; pinnae lanceolate, acuminate at the

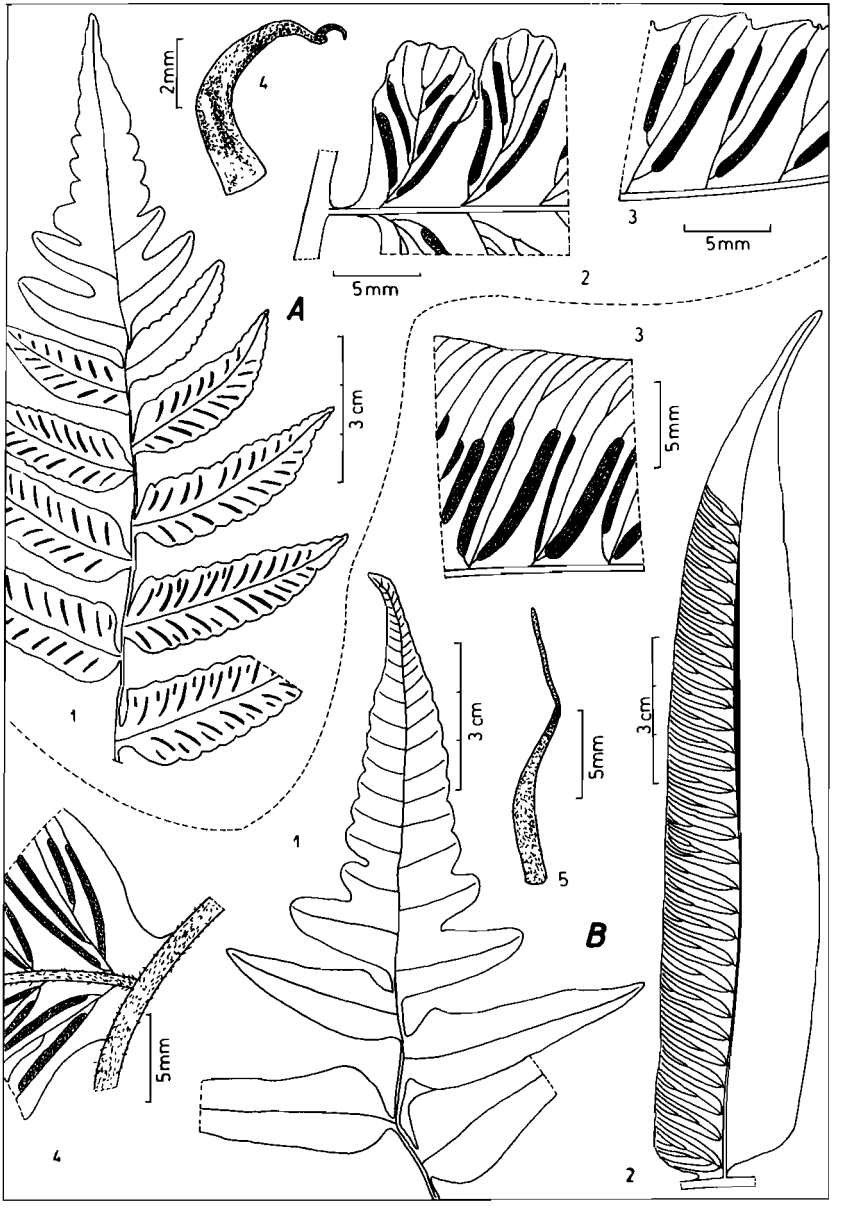

Plate 5. – A, *Diplazium celtidifolium* Kunze: 1, distal part of leaf; 2, base of basal pinna; 3, median portion of basal pinna; 4, petiole scale (Cremers 6476, CAY). – B, *D. centripetale* (Baker) Maxon: 1, leaf apex; 2, median pinna: 3, detail of fertile pinna; 4, basal portion of median pinna; 5, petiole scale (Warrington et al., K.E.R 143, K). Drawing by G. Cremers.

apex, rounded or truncate at the base, entire to sinuate, petiolulate, sessile or adnate in the distal part of the lamina, up to 20 x 3.5 cm; veins pinnately branched, generally with 2-4 branches. Sori linear along the basal 2/3 of the veins; indusium brown, fimbriate.

Distribution: Porto Rico, Jamaica, Hispaniola, Guadeloupe, Martinique, Trinidad, Venezuela and Guyana. Wet forest slopes, at middle and higher elevations (300 – 2000 m). 3 collections studied from Guyana: Mt. Roraima, Paikwa trail, R.N. Persaud 59 (BRG, K, NY, UC); Mt. Roraima, Warrington et al. [K.E.R.] 143 (K); slopes of Mt. Roraima, Hahn 5460 (NY).

3. **Diplazium cristatum** (Desr.) Alston, J. Bot. 74: 173. 1936. – *Meniscium cristatum* Desrousseaux in Lamarck, Encycl. Méth. Bot. 4: 94. 1797. Type: Martinique, Joseph Martin s.n. (holotype P-Herb Lamarck). Plate 6

Asplenium arboreum Willdenow, Sp. Pl. 5(1): 320. 1810. – *Diplazium arboreum* (Willd.) C. Presl, Tent. Pterid. 114. 1836. Type: Venezuela, Bredemeyer s.n. (holotype B-Herb. Willdenow 19892).
Asplenium shepherdii Sprengel, Nova Acta Acad. Caes. Leop.- Carol. 10: 231, t.17, figs. 5-6. 1821. – *Diplazium shepherdii* (Sprengel) Link, Fil. Hort. Berol. 2: 70. 1833. Type: Jamaica, H. Shepherd s.n., 1817 (isotype PH not seen; possibly authentic material in B not seen).

Rhizome erect or ascending, 12.5-20 mm thick, at the apex covered by blackish brown, acuminate, 6 mm long scales. Leaves few, pinnate, 50-85 cm long; petiole shorter than the lamina, 20-40 cm, brownish green, scaly at the base; lamina ovate or oblong, with 8-15 pairs of alternate, subopposite or opposite pinnae, the upper gradually reduced to a pinnatifid apex; pinnae lanceolate, subfalcate and acuminate at the apex, inequilateral at the base, margin variously crenate, lobate or pinnatifid, petiolulate or the upper ones sessile to adnate, glabrous; veins simple or once forked. Architecture anadromous. Sori linear, arcuate, solitary at the base of each lobe per crenate pinna, 4-8 in pinnatifid ones; indusium entire. n = 82 in Trinidad (Jermy & Walker 1985).

Distribution: Greater and Lesser Antilles, Trinidad, Mexico to northern Argentina and Paraguay. In forests. 38 collections studied from the Guianas (GU:5; SU:11; FG:22).

Selected specimens: Guyana: Kanuku Mts., Jenman s.n., December 1900 (BRG).
Surinam: Kabalebo R., Im Thurn s.n., September 1879 (K); Jenman 413

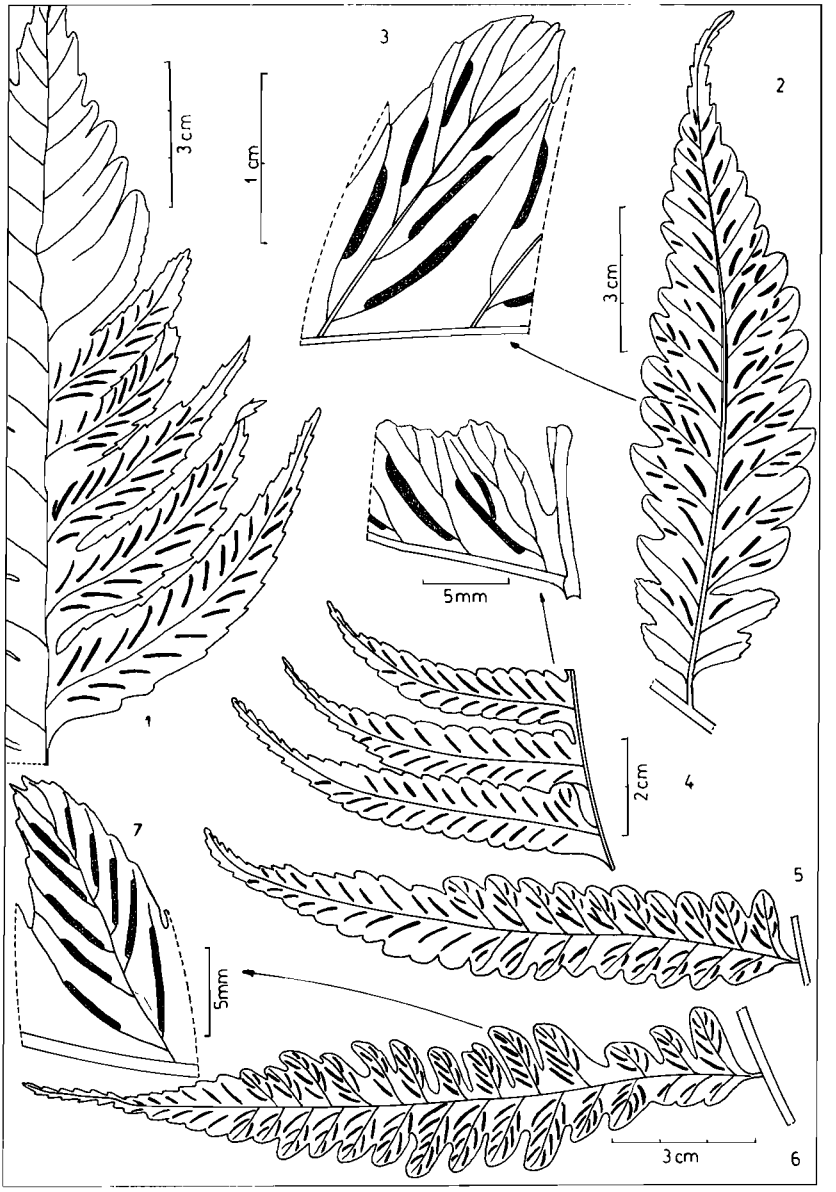

Plate 6. – *Diplazium cristatum* (Desr.) Alston: 1, distal part of leaf; 2, basal pinna; 3, detail of pinna (de Granville 1162, CAY); 4, distal pinnae; 5, median pinna; 6, pinna from basal part (all on the same leaf); 7, ultimate segment of basal pinna (Cremers 7975, CAY). Drawing by G. Cremers.

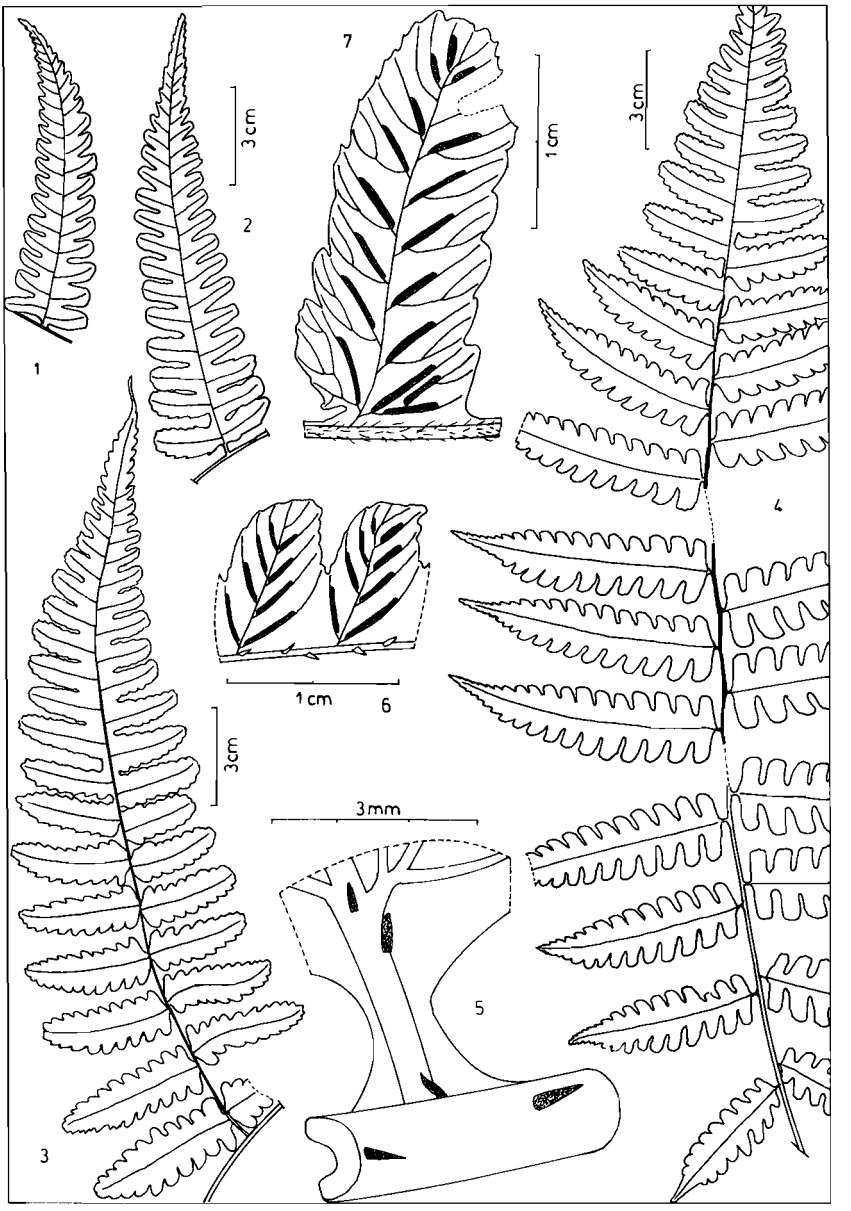

Plate 7. – *Diplazium expansum* Willd.: 1, distal pinna; 2, subdistal pinna; 3, median pinna; 4, basal pinna (Cremers 9143, CAY); 5, base of pinnule; 6, ultimate segments of median pinnule (de Granville 874, CAY); 7, ultimate segment of median pinnule. (Cremers 10220, CAY). Drawing by G. Cremers.

(BRG); Brownskreek, Stahel et Gonggrijp BW 328 (U, US); Wilhelmina Mts., Julianatop, Schulz 10270 (BBS, GH, U).
French Guiana: Mt. Bellevue, Inini R., Cremers 8912 (B, BR, CAY, G, MG, MO, P, U, Z); Saül, Mt. Galbao, de Granville 8945 (B, BM, BR, CAY, G, MG, MO, NY, P, U, US, Z).

4. **Diplazium expansum** Willd., Sp. Pl. 5(1): 354. 1810. – *Asplenium expansum* (Willd.) C. Presl, Rel. Haenk. 1: 46. 1825. – *Athyrium expansum* (Willd.) Milde, Bot. Zeit. (Berlin) 27: 353. 1870, not T. Moore 1860. Type: Venezuela, Caracas, Bredemeyer (holotype B-Herb. Willdenow 19948). Plate 7

Diplazium ambiguum Raddi, Opusc. Sci. Bol. 3: 292. 1819. Type: Brazil.

Rhizome ascending to erect, 15-20 mm thick, at the apex covered by dark brown, lanceolate scales 12 x 2.5 mm. Leaves bipinnate or bipinnate-pinnatifid, 1-2 m long; architecture catadromous; petiole much shorter than the lamina, 20-80 cm, brown, scaly at the base; lamina ovate, long-acuminate, with 8-12 pairs of subopposite or alternate pinnae and a pinnatifid apex; rachis stramineous, with pluricellular hairs; pinnae lanceolate, 17-30 x 7-10 cm, with erect hairs, with 8-15 pairs of subopposite pinnules and a pinnatifid apex; pinnules on basal pinnae 10-12 x 3-4 cm, petiolulate, lanceolate, acuminate, pinnatifid; pinnules on apical pinnae 1.5-2.5 x 0.8-1 cm, sessile or adnate, ovate, obtuse, crenate; veins simple or forked. Sori linear at base of each lobe of ultimate segment; indusium erose.

Distribution: Greater Antilles, Guatemala to Brazil and Peru; in humid rocky ravines, by stream banks, in forests. 15 collections studied from French Guiana.

Selected specimens: French Guiana: Saül, Mt. Galbao, de Granville 8595 (B, CAY, NY, P, US, Z); Mt. Atachi-Bakka, Cremers 10220 (B, BR, CAY, FTG, G, HAMAB, INPA, MG, NY, P, SJPR, U, US, USM, Z).

5. **Diplazium gracilescens** (Mett.) C. Chr., Ind. Fil.: 233. 1905. – *Asplenium gracilescens* Mett., Ann. Sci. Nat., ser. 5. 2: 237. 1864. Syntypes: Colombia, Ocaña, Engel 250 (B, BM), Schlim 69 (B, G, K, P, US; L not seen). Plate 8

Rhizome erect, 10-15 mm thick, at the apex covered by dark brown, triangular scales of 4.5 x 2.5 mm. Leaves bipinnate to tripinnate-pin-

natifid, 80-200 cm long; architecture anadromous; petiole much shorter than the lamina, 30-50 cm long, papyraceous to brown, ribbed; lamina lanceolate, acuminate at the apex, with 12-20 pairs of subopposite pinnae and a pinnatifid apex; pinnae lanceolate, with numerous pinnate to pinnatifid, alternate pinnules and a pinnatifid apex, petiolulate or adnate; basal pinnules lanceolate, 3-4 x 1.2-1.8 cm, with 6-12 pairs of crenate ultimate segments; distal pinnules 0.5-2 x 0.3-0.7 cm, linear, acuminate, with 6-10 pairs of adnate ultimate segments; rachises I, II and III bearing pluricellular hairs like costa and costules; veins pinnately branched or forked in small ultimate segments. Sori linear, one per ultimate segment or lobe; indusium laciniate.

Distribution: Northern South America; in montane forests. 5 specimens studied from the Guianas (SU:1; FG:4).

Selected specimens: Surinam: Litani R. headwaters, Rombouts 875 (U, US).
French Guiana: Mt. Bellevue, Inini R., Cremers 9137 (B, BR, CAY, G, MG, MO, P, U, Z); Mt. Atachi-Bakka, Cremers 10138 (B, CAY, G, HAMAB, NY, P, SJPR, U, US, Z).

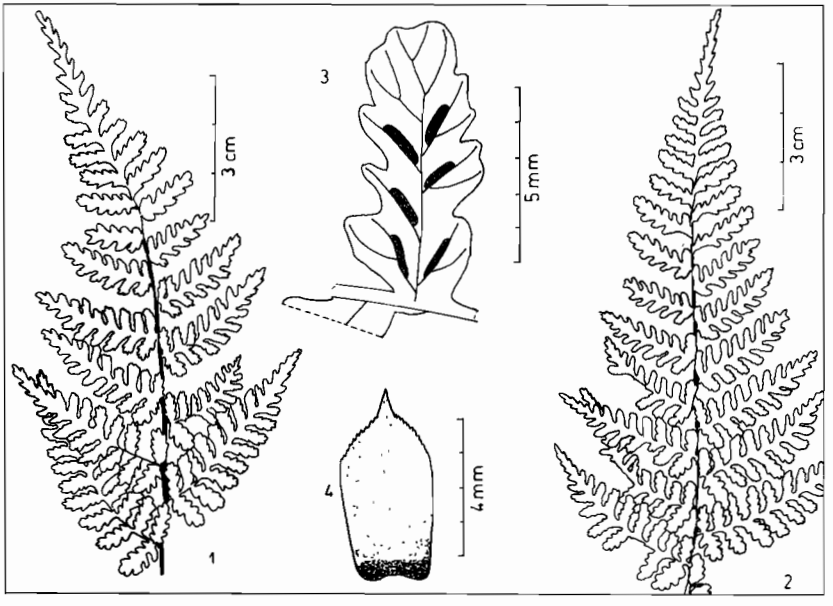

Plate 8. – *Diplazium gracilescens* (Mett.) C. Chr: 1, apex of leaf; 2, apex of median pinna; 3, detail; 4, basal petiole scale (Cremers 6359, CAY). Drawing by G. Cremers.

6. **Diplazium grandifolium** (Sw.) Sw., J. Bot. (Schrader) 1800(2): 62. 1801. – *Asplenium grandifolium* Sw., Prodr. 130. 1788. Type: Jamaica, Swartz s.n. (holotype S not seen; isotype B Herb. Willdenow 19946). Plate 9A

Rhizome erect or ascending, up to 15 cm long, scaly at apex; scales blackish, acuminate, 3-4 mm long. Leaves pinnate, ascending, 70-110 cm long; architecture isodromous or catadromous; petiole up to 40 cm long, canaliculate, green to blackish brown, scaly at base, scales 8 x 1.5 mm; lamina lanceolate to oblong, 50-80 x 20-35 cm, acuminate at the pinnatifid apex, glabrous; pinnae 8-15 pairs, alternate, lanceolate, 8-15 x 2-3 cm, acuminate at apex, truncate at base, subentire to slightly sinuate, veins pinnately branched, generally with 5-7 branches. Sori linear, unequal, up to 15 mm on the basal veins, 4-7 per lobe; indusium entire or minutely erose. n = 164 in Trinidad (Jermy & Walker 1985).

Distribution: Mexico, Central America, Antilles, Colombia, Ecuador, Venezuela, the Guianas and Brazil; in moist shaded forests. 7 collections studied from the Guianas (GU:1; FG:6).

Specimens examined: Guyana: Barima R., Jenman s.n., 1895 (BRG, NY).
French Guiana: Sommet Tabulaire, Cremers 6516 (CAY, P, Z); Saül, Mt. Galbao, de Granville 8602 (B, BM, CAY, MG, NY, P, U, US, Z), 8384 (B, CAY, MG, NY, P, U, US, Z); Saül, Mt. La Fumée, Boom & Mori 1571 (CAY, NY); W Marouini R., Roche Koutou, de Granville 9465 (B, CAY, INPA, NY, P, SJPR, U, US, Z); without loc., Leprieur s.n. (B).

7. **Diplazium lechleri** (Mett.) T. Moore, Ind. Fil. 141: 331. 1859. – *Asplenium lechleri* Mett., Fil. Lechl. 1: 16, pl. 2, 10. 1856. – *Athyrium lechleri* (Mett.) Milde, Bot. Zeit. (Berlin) 27: 353. 1870. Type: Peru, Puno, San Gavan, Lechler 2269a (holotype B; isotypes K, fragment NY; L not seen) Plate 9B

Rhizome erect or ascending, 15-20 mm thick, at the apex covered by dark brown, linear, 6 mm long scales. Leaves pinnate, 2 m long; architecture catadromous; petiole 1 m long, 5-16 mm in diameter, more or less glabrous, scaly at the base, scales triangular-linear, 6 x 1.5 mm; pinnae petiolulate (1 cm), upper sessile to adnate, coriaceous, lanceolate, acuminate, asymmetric at the base, entire or sinuate; veins simple or 1-forked, parallel. Sori linear; indusium entire.

Distribution: Costa Rica, Panama to Peru, Venezuela and the

Guianas, also Brazil; in montane rain forest, 400-1400 m elevation. 7 collections studied, 4 from the Guianas (GU:3; SU:1).

Specimens examined: Guyana: Essequibo R., Appun 15 (B, F, P), Appun 186 (K); Mt. Roraima, R.N. Persaud 67 (BRG, K, NY).
Surinam: Base of Tafelberg, Maguire 24303 (NY, U, US).

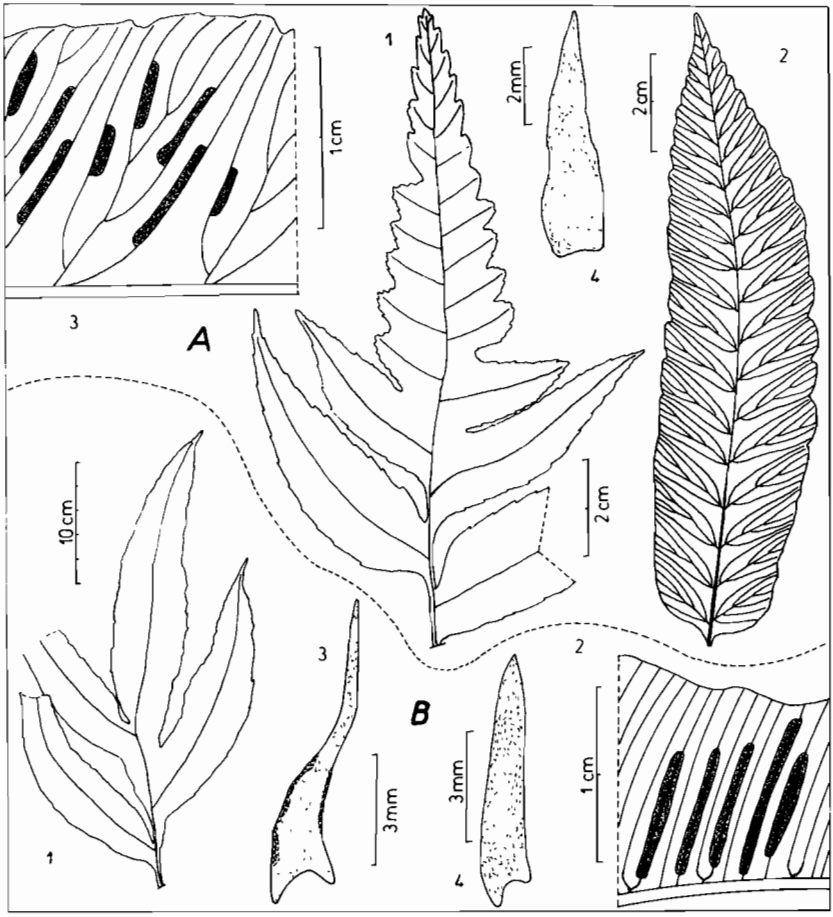

Plate 9. – A, *Diplazium grandifolium* (Sw.) Sw.: 1, apex of leaf; 2, median pinna; 3, ultimate segment of median pinna; 4, scale from petiole base (Cremers 6516, CAY). – B, *D. lechleri* (Mett.) T. Moore: 1, distal part of leaf; 2, detail of pinna; 3, rhizome scale; 4, petiole scale (R.N. Persaud 67, K). Drawing by G. Cremers.

8. **Diplazium radicans** Desv., Mém. Soc. Linn. Paris 6: 281. 1827. – *Asplenium radicans* Schkuhr, Kryptog. Gew. 70, pl. 76. 1809. non L. 1759. – *? Athyrium radicans* (Desv.) Milde, Bot. Zeit. (Berlin) 27: 354. 1870. Type: not specified. Plate 10A

Rhizome erect. Leaves bipinnate, 1.5 m long; architecture anadromous; petiole 40-50 cm long, castaneous to brown, canaliculate; basal part with triangular, dentate scales 6 x 1.5 mm; lamina lanceolate, 100 x 70 cm, with 6-10 pairs of subopposite pinnae; rachis and secondary rachises with 1-3 epiphyllous buds in the distal part of lamina, rootlets covered by reddish brown hairs; pinnae linear-lanceolate with long pinnatifid apex, pinnules 15-20 per side, alternate, petiolulate in the basal part, sessile and adnate in the distal part of the lamina; pinnules pinnatifid, deeply incised to within 1 mm of costa, glabrous, with 7-10 pairs of adnate ultimate segments, the larger ones 6-7 x 2-2.5 cm; ultimate segments quadrangular, obtuse, crenulate; costa, costules and leaf tissue glabrous; veins once forked. Sori linear, near the costules; indusium erose.

Distribution: Brazil and the Guianas; in forest. 4 collections studied from the Guianas (SU:1; FG:3).

Specimens examined: Surinam: Cottica R. near Lawa Mts., Versteeg 317 (BBS, U, US).
French Guiana: Sommet Tabulaire, Cremers 6342 (CAY, P, Z); 6519 (CAY, P, Z); Tumuc Humac, de Granville 1321 (CAY, Z).

9. **Diplazium roraimense** Cremers & Kramer, sp. nov. Type: Guyana, Mt. Roraima, Edwards [K.E.R.] 144 (holotype K; isotypes NY, U) Plate 11

D. roraimense differt *D. expansum* et *D. striatum* gemmis epiphyllis, pinnis longis profunde pinnatifidis et basibus subaequilateralibus, atque segmentis ultimis obtusis dentatisque.

Rhizome erect, bearing black, lanceolate, denticulate scales of 12 x 3 mm. Leaves pinnate-pinnatifid, 2 m long; architecture anadromous; petiole 75 cm, brown-green, canaliculate, scaly; lamina lanceolate, 120 x 55 cm, with numerous pairs of alternate pinnae and a pinnatifid apex; rachis scaly; bud in axil of distal pinnae; pinnae about 25 to a side, alternate or subopposite, linear-lanceolate, 9-30 x 2-5.5 cm, short-stalked, deeply pinnatifid, glabrous; ultimate segments rectangular, 4-8 mm wide, obtuse, shallowly dentate; veins 4 or 5 pairs per segment, once forked. Sori linear, 4-12 pairs per segment.

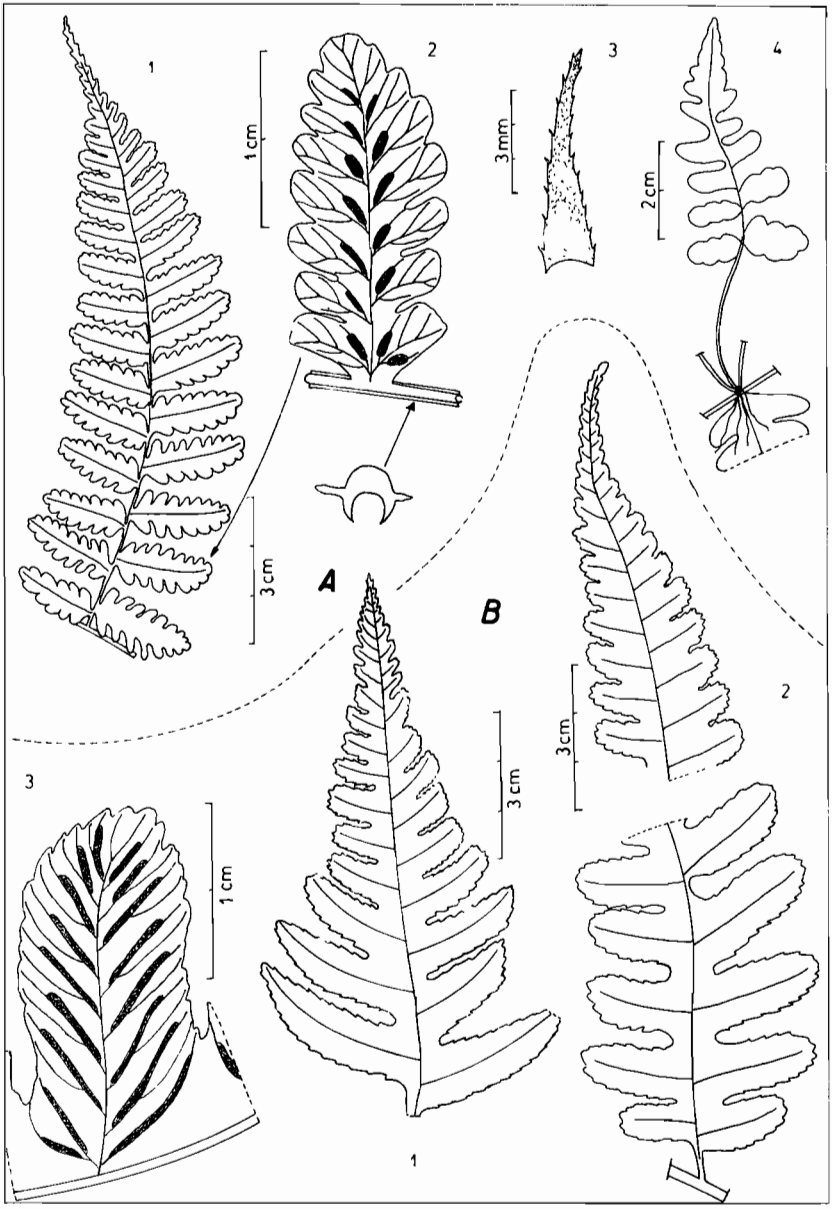

Plate 10. – A, *Diplazium radicans* Desv.: 1, pinna from distal part of leaf; 2, pinnule; 3, petiole scale (Cremers 6342, CAY); 4, juvenile plant from rachis bud. – B, *D. striatum* (L.) C. Presl: 1, apex of leaf; 2, base and apex of pinna; 3, ultimate segment (Jenman s.n., 1895, NY). Drawing by G. Cremers.

Specimens examined: Guyana: Mt. Roraima, R.N. Persaud 108 (BRG, K, UG).

Note: related to. *D. expansum* and *D. striatum*, but there the buds are lacking. The very long pinnae of *D. striatum* are not lobed to near the costa; the ultimate segments are obtuse and dentate, whereas they are quadrangular and scarcely dentate in the other species. According to R. Stolze (com. pers.) *D. roraimense* is related to *D. tungurahuae* (Sod.) C. Chr. in Peru; both species have proliferous rachis buds, but this last species is 2-pinnate. A monographic revision is necessary to resolve taxonomic problems.

10. **Diplazium striatum** (L.) C. Presl, Tent. Pter. 114. 1836. – *Asplenium striatum* L., Sp. Pl. 2: 1082. 1753. Type: Martinique, "bois de la Cabsterre", Plumier, Traité. Foug. Amér. t. 18-19. Plate 10B, 12A-B

Rhizome erect, up to 15 cm, occasionally 40 cm tall, bearing brown or blackish brown, lanceolate scales of 8 x 1-2 mm. Leaves pinnate, pinnate-pinnatifid (nearly 2-pinnate at base), in dense cluster, 60-150 x 22-50 cm; architecture isodromous or anadromous; petiole shorter than the lamina, 20-45 cm long, green, canaliculate, glabrous; rachis pale brown, glabrous; lamina lanceolate or obovate, 50-70 x 25-40 cm; pinnae 10-25 per side, 12-25 x 2-6 cm, alternate or subopposite, linear to lanceolate, with long pinnatifid apex, short-stalked to petiolulate, acuminate, obtuse or truncate at base, crenulate, glabrous; ultimate segments oblong or quadrangular, obtuse or rounded, entire or crenulate, 5-8 mm broad near the base; veins 3-12 pairs per segment, simple or 1-2-forked, glabrous. Sori linear, basal on veins, 4-6 or 10-12 per ultimate segment; indusium entire.

Distribution: Greater and Lesser Antilles, Trinidad, Mexico to Peru, Venezuela, Guianas; in moist shaded ravines. Rare in the Guianas (GU:1; FG:4).

Specimens examined: Guyana: Barima R., Jenman s.n., 1895 (BRG, E, NY).
French Guiana: Sommet Tabulaire, 650 m, Cremers 6517 (CAY, P, Z); 6518 (CAY, P, Z); 750 m, Cremers 6361 (CAY, P, Z); 600 m, de Granville 3618 (CAY).

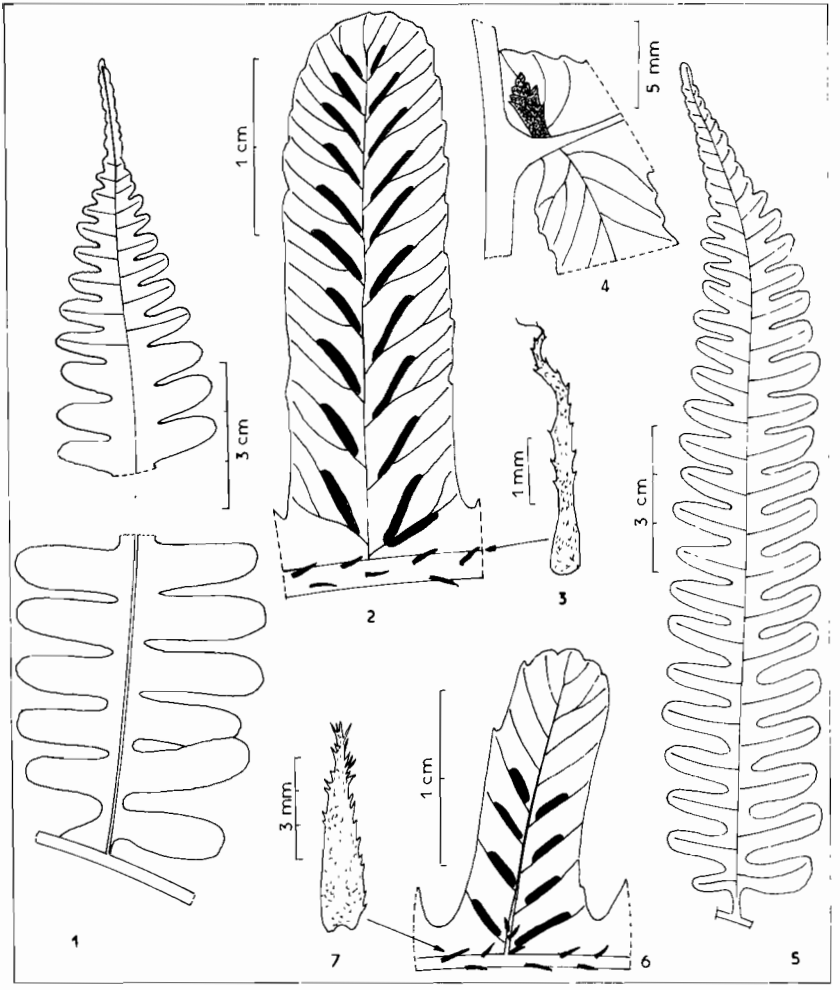

Plate 11. – *Diplazium roraimense* Cremers & Kramer: 1, apex and base of median pinna; 2, ultimate segment of median pinna; 3, scale from costa; 4, epiphyllous bud (KER 144, K); 5, median pinna; 6, ultimate segment of median pinna; 7, scale from costa of pinna (Persaud 108, K). Drawing by G. Cremers.

7. **HEMIDICTYUM** C. Presl, Tent. Pterid. 110. 1836.
Type: Asplenium marginatum L. = Hemidictyum marginatum (L.) C. Presl.

Distribution: Monotypic, distributed from Mexico through the Antilles to South America; from French Guiana, west to Colombia and south in the Andes to Bolivia; disjunct in southeastern Brazil from Bahia to Santa Catarina.

1. **Hemidictyum marginatum** (L.) C. Presl, Tent. Pter.: 111, Pl. 3, fig. 24. 1836. – *Asplenium marginatum* L., Sp. Pl. 2: 1082. 1753. – *Athyrium marginatum* (L.) Milde, Bot. Zeit. (Berlin) 27: 353. 1870. – *Diplazium marginatum* (L.) Diels in Engler et Prantl, Nat. Pflfam. 1, 4: 229. 1899.
Type: Petiver, Pter. Amer. t. 12, fig. 2, which is a transposed copy of part of t. 106 of Plumier's Traité. Foug. Amér., which in turn was based on material found by Plumier, perhaps at Morne de la Calebasse, Martinique. Plate 13A

Terrestrial; rhizome stout, erect, bearing brownish scales; leaves numerous, erect-arching, 2-3 m long or more; petiole half as long as the lamina, to 15-20 mm, stramineous, thick and scaly at the base; lamina oblong, 1-2 x 1 m, simply pinnate; pinnae numerous, opposite, in 10-18 pairs with conform terminal pinna, oblong, shortly acuminate, more or less cordate at the base, entire, bright green, papyraceous, 20-50 x 5-7 cm; veins parallel, catadromous, 1-forked near the base, areolate near the margin without included free veinlets. Sori linear, simple, on the main vein branches; indusium lateral. n = 31 in Trinidad (Jermy & Walker 1985).

Distribution: Southern Mexico, Central America, Greater Antilles, Tobago, Trinidad, Colombia to Brazil and Bolivia; in shaded wet forest. Not common. 104 collections studied, 17 from the Guianas (SU:3; FG:14).

Selected specimens: Surinam: Brownsberg, Tjon Lim Sang & v. d. Wiel 105 (Z); Brownskreek, Gonggrijp & Stahel BW 594 (U).
French Guiana: Mt. de la Trinité, de Granville 6543 (CAY, NY, P, U, Z); Saül, Mori & Pennington 18139 (CAY, MO, NY).

8. **LASTREOPSIS** Ching, Bull. Fan. Mem. Inst. Biol., Bot. Ser. (8)9: 157. 1938.
Type: Lastreopsis recedens (J. Smith ex T. Moore) Ching = L. tenera (R. Br.) Tindale.

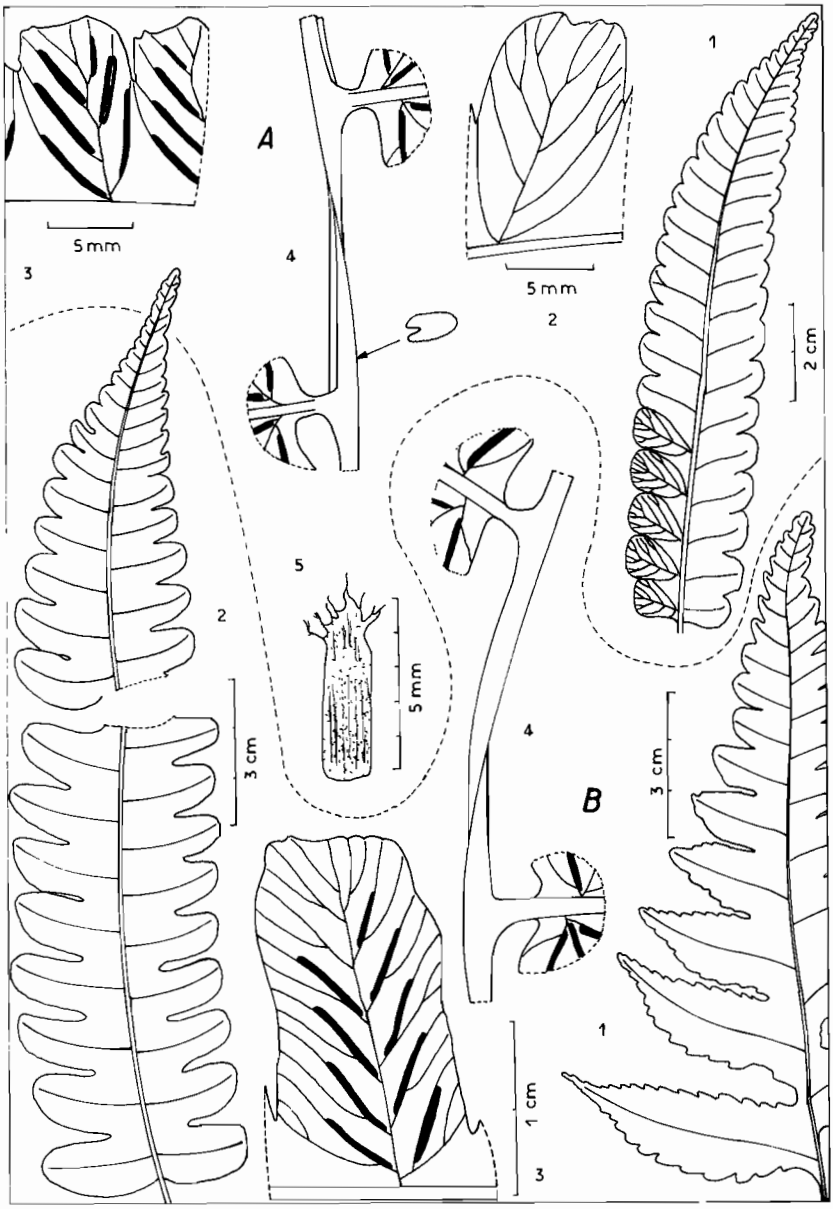

Plate 12. – A, *Diplazium striatum* (L.) C. Presl: 1, sterile median pinna; 2, ultimate segment of sterile median pinna; 3, ultimate segment of fertile median pinna; 4, rachis in distal part of leaf; 5, scale on the crozier (Cremers 6517, CAY). – B, *D. striatum* (L.) C. Presl: 1, distal part of leaf; 2, pinna; 3, ultimate segment; 4, rachis near middle of lamina (Cremers 6518, CAY). Drawing by G. Cremers.

Terrestrial. Rhizome creeping to erect. Leaves monomorphic; lamina (2-) 3-5-pinnate, heterodromous or catadromous; axes bordered adaxially by 2 prominent ridges, these ridges continuous with those of the next division and finally with the margin of the ultimate segments, intervening channel almost filled by a slightly raised medial portion and clothed with blunt, articulate, often reddish hairs; proximal pinnae strongly basiscopically developed; veins free; laminar tissue and veins abaxially with cylindrical, yellowish to reddish glands. Sori commonly round, indusiate or exindusiate, indusia if present with a narrow sinus; spores ellipsoid. n = 41.

Distribution: Pantropical, with ca. 35 species, centered in Australasia but seven in Africa and five in the Neotropics, only one with one variety found in the Guianas, one expected in W Guyana and a third that may eventually be found in the Guianas (see note).

KEY TO THE SPECIES

1 Axes abaxially with lanceolate, toothed scales; ultimate segments narrow .... *1. L. amplissima*
Axes abaxially with scattered, short, blunt hairs; ultimate segments lanceolate, toothed ..... *2. L. effusa*

1. **Lastreopsis amplissima** (C. Presl) Tindale, Victorian Naturalist 73: 185. 1957. – *Polystichum amplissimum* C. Presl, Tent. Pterid. 84. 1836 (nomen); Epimel. Bot. 58. 1849 [1851]. – *Nephrodium amplissimum* (C. Presl) Hook. ex Baker, Fl. Bras. 1(2): 985. 1870. – *Dryopteris amplissima* (C. Presl) Kuntze, Rev. Gen. Pl. 2: 812. 1891. Syntypes: Brazil, Serra d'Estrella, Beyrich s.n.: Brazil, sine loco, Sellow s.n. (isosyntype in B not seen).

Dryopteris amplissima (C. Presl) Kuntze var. *subeffusa* C. Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Afd., Ser. 8. 6: 112. 1920. Syntypes: Venezuela, Mt. Roraima, Im Thurn 354 (syntype US not seen), Ri. Schomburgk 1151 (syntype P not seen).

Rhizome erect. Lamina deltate, 50-100 cm long and nearly as wide, 4-5-pinnate; primary rachis stramineous, sparsely paleaceous; pinnae deltate, 30-40 x 25-30 cm, strongly basiscopically developed; acroscopic pinnules lanceolate-deltate, stalked; axes abaxially bearing several to often numerous lanceolate, toothed scales; ultimate segments lanceolate, subobtuse or subacute. Sori with subpersistent indusium.

Distribution: Venezuela, Brazil, Paraguay, Bolivia; specimens labeled as from Guyana are actually from the Venezuelan side of Mt. Roraima, Ri. Schomburgk 1151 (K, P), Appun 1108 (K).

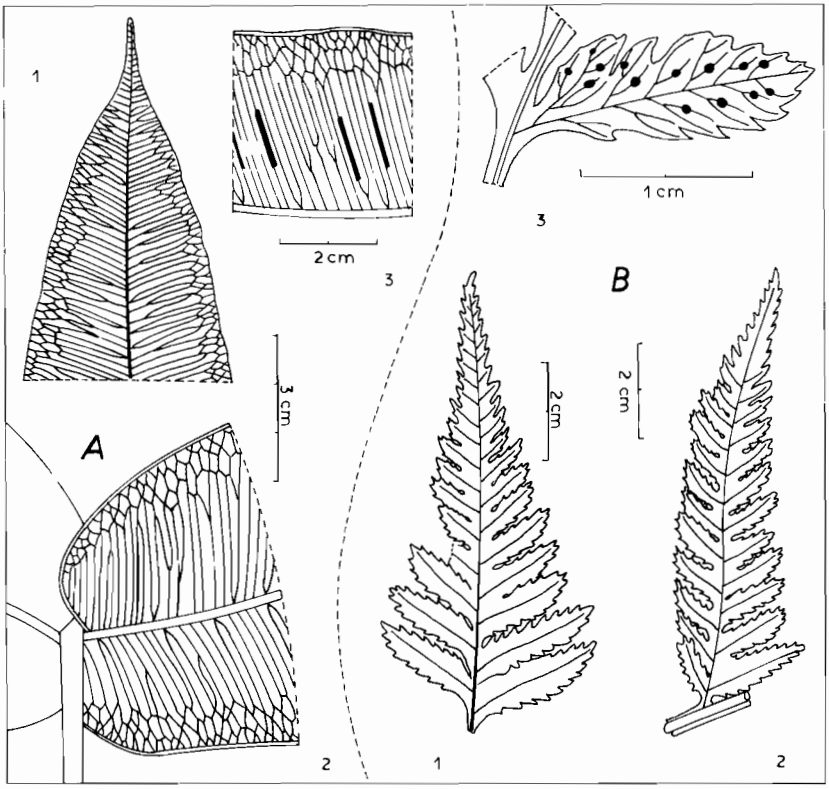

Plate 13. – A, *Hemidictyum marginatum* (L.) C. Presl: 1, apex of pinna; 2, base of pinna; 3, detail of fertile pinna (Billiet & Jadin 1689, CAY); – B, *Lastreopsis effusa* (Sw.) Tindale subsp. *divergens* (Willd.) Tindale: 1, apex of pinna; 2, pinnule; 3, fertile ultimate segment (Cremers 7878, CAY). Drawing by G. Cremers.

2. **Lastreopsis effusa** (Sw.) Tindale, Victorian Naturalist 73: 184. 1957. – *Polypodium effusum* Sw., Prodr. 134. 1788. – *Dryopteris effusa* (Sw.) Urban, Symb. Antill. 4:16. 1903. – *Parapolystichum effusum* (Sw.) Ching, Sunyatsenia 5: 239. 1940. – *Ctenitis effusa* (Sw.) Copel., Gen. Fil. 124. 1947. Lectotype (chosen by Tindale, 1965): Jamaica, Swartz s.n. (B-Herb. Willd. 19724; isolectotypes BR, UPS, not seen).

Leaves mostly 90-200 cm long; lamina deltate, mostly 40-100 cm long and nearly as wide, 3-5-pinnate, catadromous above the proximal pinnae; primary rachis usually with a scaly bud in the axil of a distal pinna; basal pinnae the largest, 25-50 cm long, strongly basiscopically developed; pinnules stalked; axes abaxially with scattered, short, blunt 0.1-0.3 mm long hairs. Sori exindusiate.

Distribution: Antilles and southern Mexico to Bolivia and southern Brazil; low elevation rain forests.

Note: According to Tindale (1965), the species comprises four subspecies. The most widely distributed one, and the only one to be found in the Guianas, is subsp. *divergens*.

2a. **Lastreopsis effusa** (Sw.) Tindale subsp. **divergens** (Willd.) Tindale, Contr. New South Wales Natl. Herb. 3: 299, pl. 21. 1965. – *Polypodium divergens* Willd. in Schkuhr, Kr. Gew. 27, pl. 26b. 1809. Type: Venezuela, Caracas, Bredemeyer s.n. (B-Herb. Willd. 19725, 3 sheets, microfiche seen at UC). Plate 13B

Distinguished from subsp. *effusa*, which occurs in the Greater Antilles, by the less numerous glands on the abaxial lamina and the pubescent axes (glabrous in subsp. *effusa*). From subsp. *dilatata*, which occurs in the Greater Antilles and southern Mexico to Ecuador, subsp. *divergens* differs by the dull grayish green, less dissected lamina (3-pinnate – 3-pinnate-pinnatifid), secondary pinnules with a broad, uncut center, and ultimate segments not so acute at the tip. Subsp. *confinis* in the Greater Antilles is even less dissected, usually 2-pinnate-pinnatifid.

Specimens examined: Guyana: Marudi Mts., along trail from Norman Mines camp to Locust Cr., Stoffers et al. 279 (B, CAY, MO, U); District Rupununi, S edge of Pakaraima Mts., Mt. Ureisha, summit ca. 5 hour walk above Tipuru village, Knapp & Mallet 2851 (MO); NW slopes of Kanuku Mts., drainage of Moku-Moku Cr., Takutu trib., Smith 3553 (GH, NY, not seen, cited by Tindale, 1965).
Surinam: Zuid R., 3 km above confluence with Lucie R., Irwin et al.

55904 (MO); Wilhelmina Mts., top 1280, Stahel BW 7158 (U); Upper Surinam R., Tresling 240 (U).
French Guiana: Saül, Mt. Boeuf Mort, de Granville 3151 (CAY); Paul Isnard, SO of Citron, foot of Mt. Décou-Décou, Cremers 7878 (CAY; BR, P, Z not seen).

Note: A third species, *Lastreopsis killipii* (C. Chr. & Maxon) Tindale (Victorian Naturalist 73: 185. 1957), may also occur in Guyana. A specimen of this species without locality (possibly from Guyana) or collector is in BRG. *Lastreopsis killipii* is similar to *L. amplissima* but has larger indusia 1-1.5 mm in diam. (vs. less than 1 mm), ovate ultimate segments (vs. linear), and scalier axes. Both species have been found in Terr. Amazonas, Venezuela.

9. **OLFERSIA** Raddi, Opusc. Sci. 3: 283. 1819.
Type: Osmunda cervina L. = Olfersia cervina (L.) Kunze

Stem short-creeping, the meristeles not readily seen in cross section, because each meristele is surrounded by whitish, parenchymatous cells of the ground tissue; scales golden, usually darkening upon drying, membranaceous, with denticulate margins. Leaves dimorphic; petiole base usually scaly; lamina pinnate with a conform apex similar to the lateral pinnae; veins numerous, long, fine, parallel, connected at their tips by a submarginal strand. Fertile leaves like a skeleton of the sterile leaves.

Distribution: A tropical American genus of two species: West Indies; southern Mexico to Bolivia, northern South America and southeastern Brazil. *O. alata* C. Sanchez & García Caluff occurs in Cuba.

1. **Olfersia cervina** (L.) Kunze, Flora 7: 312. 1824. – *Osmunda cervina* L., Sp. Pl. 1065. 1753. – *Acrostichum cervinum* (L.) Sw., Syn. Fil. 14. 1806. – *Polybotrya cervina* (L.) Kaulf., Enum. Fil. 55. 1824. Lectotype: Plumier, Traité Foug. Amer. pl. 154. 1705, illustrating a plant from Martinique. Chosen by Proctor, Fl. L. Antill. 2: 223. 1977. Plate 14

Stem primarily terrestrial, occasionally climbing; scales linear, golden-brown. Sterile lamina pinnate with a conform terminal pinna, thick, subcoriaceous, glabrous; pinnae ovate-lanceolate to lanceolate, 4-12 pairs, short-stalked, mostly (12.5)15-24(32.5) x (2.5)3-6(8.5) cm, entire, unequally tapering at base with the basiscopic side excavate; veins forking near or at the base, parallel, ca. 1 mm apart, connected by a submarginal connecting vein (this at times difficult to see in dried material). Fertile

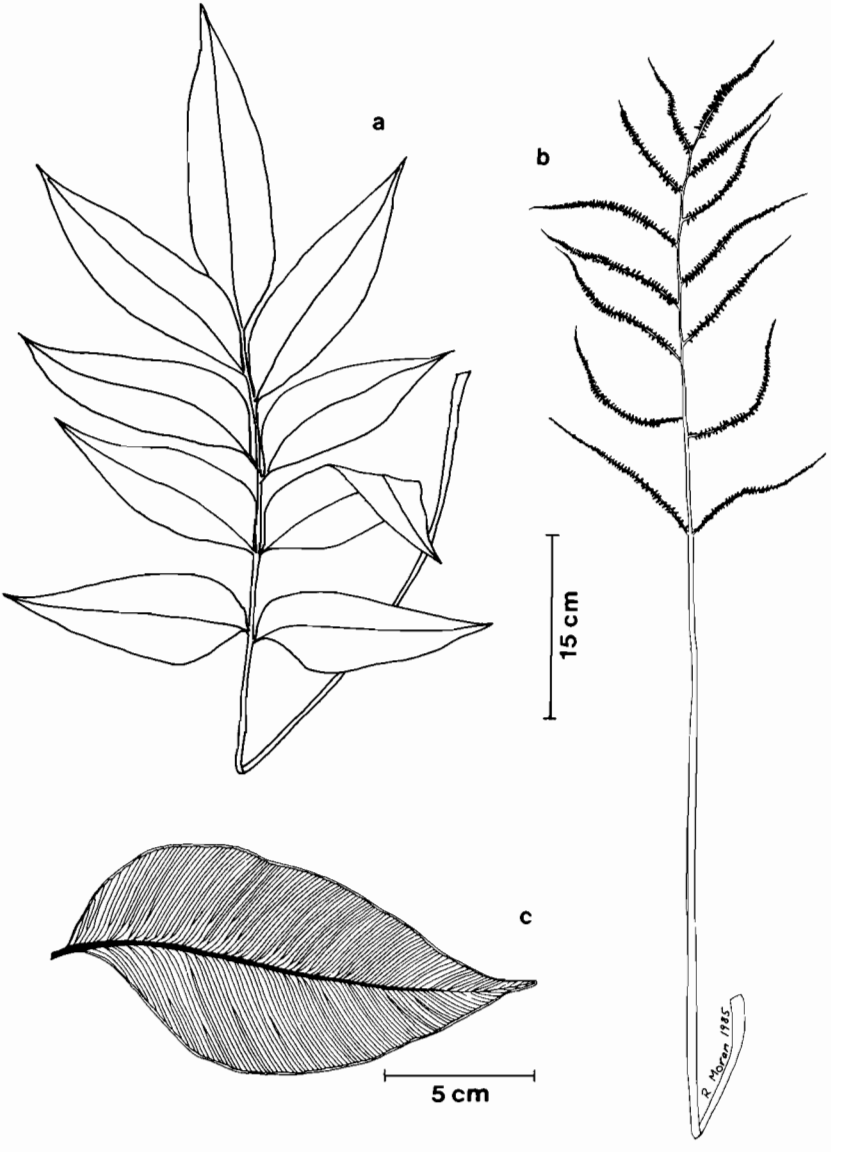

Plate 14. – *Olfersia cervina* (L.) Kunze: a, sterile leaf; b, fertile leaf; c, lateral sterile pinna (Moran 2184, F). Drawing by R.C. Moran.

leaves (1-)2-pinnate, produced freely on terrestrial as well as scandent stems, more erect than the sterile leaves and taller due to the lengthened petiole; petiole 40-85 cm long, soon withering after the spores are shed; pinnae linear, (6.5)10-17(19) x (0.5)0.7-1.5(2) cm; pinnules pectinately arranged, 0.5-1 x 0.1-0.3 cm; sori non-indusiate; sporangial stalks usually with gland-tipped hairs. n = 41.

Distribution: from Mexico to Bolivia, Antilles, Venezuela, the Guianas and Brazil; rare in the Amazon Basin of Brazil; shaded forests, ravines, swamps, mostly terrestrial or on dead logs, occasionally climbing, 0-1200 m. Very numerous collections studied, 32 from the Guianas (GU:7; SU:6; FG:19).

Selected specimens: Guyana: region from Mt. Raywa, Jenman s.n. (NY); Cuyuni R., Arawak Matope, Tutin 380 (BM).
Surinam: Lely Mts., Lindeman, Stoffers et al. 465 (NY, U, Z); Brownsberg, Tjon Lim Sang & v.d. Wiel 51 (U, US).
French Guiana: Saül, Mt. Galbao, de Granville 8694 (CAY, NY, US, Z); Mts. Atachi-Bakka, Cremers 10321 (B, CAY, NY, P, U, US, Z).

10. **POLYBOTRYA** Willd., Sp. Pl., 5(1): 99. 1810.
Type: Polybotrya osmundacea Willd.

Soromanes Fée, Mém. Fam. Foug. 2 (Hist. Acrost.) 16. 1845.
Type: S. serratifolia Fée = Polybotrya serratifolia (Fée) Klotzsch

Hemiepiphytic (two species terrestrial). Stem long-creeping, 1-3 cm thick, densely scaly, in cross-section with 4-12 meristeles circularly arranged, each meristele surrounded by a dark sclerenchymatous sheath; scales various, often of diagnostic value for the species. Leaves dimorphic, the fertile ones being a skeletonized version of the sterile; petiole continuous with the stem, usually scaly at base; sterile lamina 1-pinnate (subgenus *Sorbifolia*) or 3-4-pinnate (subgenus *Polybotrya);* pinnae not articulate to the rachis; veins free in our species. Fertile leaves of hemiepiphytic species produced on the climbing stem, almost never terrestrially, smaller than the sterile leaves; sori distinct and round, coenosoric or acrostichoid; indusia absent. n = 41.

Distribution: 35 species, all neotropical; West Indies, southern Mexico to Bolivia and southern Brazil, 5 occur in the Guianas and one more is expected.

KEY TO THE SPECIES

1 Sterile leaves 1-pinnate; stem short-creeping, terrestrial 2
Sterile leaves 2-3-pinnate; stem long-creeping, hemiepiphytic 3

2 Medial pinnae 7-10 times longer than broad, abaxial surface often with white or light-brown, sessile, circular glands; pinnatifid apex of 3-7 pinna pairs with long-decurrent bases; stem scales shiny brown, mostly transparent and denticulate; spores 40-47 μm long ..... *6. P. sorbifolia*
Medial pinnae 5-7 times longer than broad, abaxial surface without glands; pinnatifid apex of 2 or 3 decurrent pinnae; stem scales dull brown, mostly opaque, with entire or subentire margins; spores mostly 52-56 μm long ..... *2. P. fractiserialis*

3 Pinnules of medial pinnae catadromic 5
Pinnules of medial pinnae anadromic 4

4 Fertile leaves botryoid, i.e., all ultimate soriferous segments round and discrete, not fusing to form linear sori ..... *5. P. sessilisora*
Fertile leaves coenosoric, i.e., some of the ultimate soriferous segments fusing to form an oblong to linear sorus ..... *4. P. osmundacea*

5 Stem scales dull brown, opaque, appressed, curved-thickened at base, with entire margins; ultimate acroscopic segments 3-12 mm wide; fertile pinnules caudate, the sori acrostichoid ..... *1. P. caudata*
Stem scales cream-colored to light brown, membranous, spreading to appressed, margins denticulate; ultimate segments 1-2 mm wide, with one vein; fertile pinnules botryoid, the sori discrete, round, stalked ..... *3. P. lechleriana*

1. **Polybotrya caudata** Kunze, Linnaea 9: 23. 1834. – *Olfersia caudata* (Kunze) Kunze, Linnaea 21: 206. 1848. – *Psomiocarpa caudata* (Kunze) C. Presl, Epim. Bot. 162. 1851. Type: Peru, Pampayaco, Poeppig 201, July 1829 (holotype B). Plate 15A

Polypodium adiantoides Aublet, Hist. Pl. Guiane Françoise 2: 962. 1795, nom. illeg., non Burm. 1768. Type: French Guiana, Aublet s.n. (holotype BM).

Hemiepiphytic. Stem 0.5-2.5 cm thick; scales linear-lanceolate to narrowly triangular, 8-20 x 1-2 mm, basally attached at thickened base, curved-appressed, dull brown, opaque, entire to denticulate. Sterile lamina 2-(3)-pinnate-pinnatifid, glabrous to pilose, hairs 0.2-1.5 mm long, acicular; pinnae 20-45(-60) x 7-20(-30) cm, subdeltate, stalked, acuminate, subequilateral, slightly more developed on the acroscopic side; pinnules slightly prolonged acroscopically, truncate or cordate at base, catadromically arranged in suprabasal pinnae; margins sparsely ciliate with hairs less than 0.2 mm long; rachis and costae glabrous or pubescent to various degrees, often densely so at the junctures in the cen-

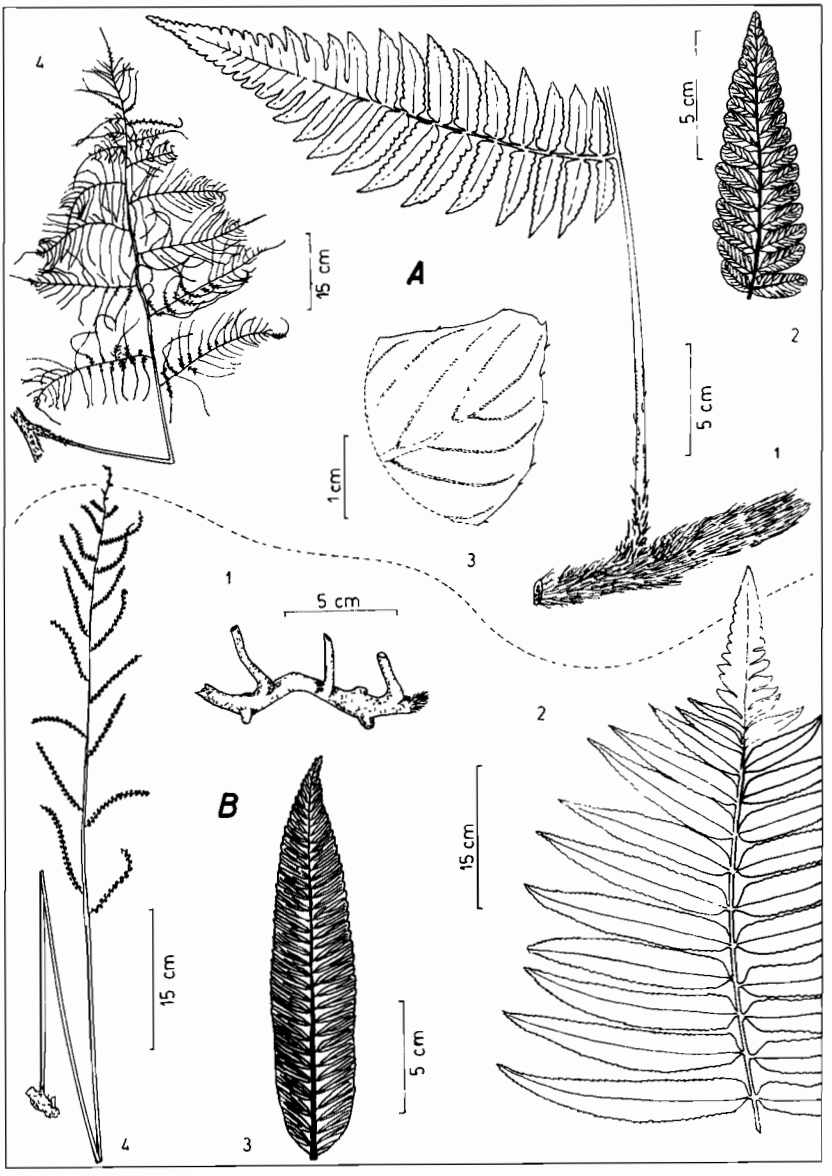

Plate 15. – A, *Polybotrya caudata* Kunze: 1, stem and base of leaf (Cremers 7369, CAY); 2, sterile pinnule; 3, leaf margin with minute cilia (Scamman 7156, GH); 4, fertile leaf (Moran 2186 in F). – B, *P. fractiserialis* (Baker) J. Smith: 1, stem (Tryon & Tryon 5221, GH); 2, sterile lamina; 3, sterile pinna (Moran 3536, F); 4, fertile leaf (C. Schunke 666, F). Drawing after R.C. Moran, 1987, p. 56-63.

tral adaxial groove. Fertile leaves 2-pinnate, but with some of the larger pinnules lobed at base; pinnae long-caudate, 4-8(11) x 0.5-1.5 cm, seemingly soriferous on both surfaces and the enlarged margin, the true (phylogenetic) adaxial surface a small, central, narrow green stripe.

Distribution: Southern Mexico to Bolivia; northern and western portions of the Amazon Basin; wet, shaded forests, mostly at low elevations, up to 1000 m. Very numerous collections studied, 68 from the Guianas (GU:18; SU:16; FG:34).

Selected specimens: Guyana: Essequibo R., Kamuni Cr., Maguire & Fanshawe 22855 (GH, K; NY; U); lower Cuyuni R., Sandwith 1561 (BM, K, U).
Surinam: S of Paramaribo, N of Zanderij, R. Tryon & Kramer 5611 (GH, MICH, NY); S of Julianatop, N of Lucie R., Irwin 55161 (MO, NY).
French Guiana: Upper Oyapock R., Trois Sauts, de Granville T.1143 (CAY, NY, P); ENE of Grand Croissant Mt., Cremers 8299 (B, BR, CAY, P, U, UC).

Note: The sterile leaves of *Polybotrya caudata* may resemble those of *P. osmundacea*; however those of *P. caudata* differ by their minutely ciliate margins.

2. **Polybotrya fractiserialis** (Baker) J. Smith, Hist. Fil. 133. 1875. – Acrostichum fractiseriale Baker, Syn. Fil. 414. 1868. Type: Peru, San Martín, in sylvis montis Campana, Spruce 4337 (holotype K, photos GH, US; isotypes B, MO). Plate 15B

Terrestrial. Stem short-creeping; scales dull brown, opaque, 0.3-0.9 x 8-17 mm, ascending, margins entire to more rarely denticulate. Sterile leaves to 140 cm tall; petiole equaling the lamina, stramineous; lamina slightly reduced or truncate at base, apex with one or two major basal lobes, merely crenate-lobulate above, abaxial surface glabrous or with scattered, less than 0.1 mm long, appressed, cylindrical, brown hairs; pinnae usually 9-15 pairs, linear to oblong, (11)15-25(28) x (2.1)2.5-4(4.5) cm, margins serrate, especially so towards the acuminate apex, base rounded to cuneate, with the acroscopic margin usually more oblique; veins numerous, fine, and in closely parallel pinnate groups, occasionally with a simple vein springing directly from the costa; fertile leaves 2-pinnate, usually taller than the sterile; pinnae linear, mostly 7-12(17) x 5-10(15); ultimate segments orbicular to oblong, 1-3 mm wide.

Distribution: Eastern slopes of the Andes in Ecuador, Peru and

Bolivia, the Guianas; terrestrial, on wooded talus slopes or rocky banks, mostly from 400-800 m. Numerous collections studied, 17 from the Guianas (GU:1; SU:6; FG:10).

Selected specimens: Guyana: Southern Pakaraima Mts., Kopinang Falls, Maguire et al. 46068A (NY).
Surinam: Brownsberg, Gonggrijp & Stahel BW 3300 (MO, U, US); S Julianatop, N Lucie R., Maguire et al. 54384 (MO, NY), Irwin et al. 54669 (NY), 54784 (F, MO, NY).
French Guiana: Sommet Tabulaire, de Granville 3674 (CAY, Z); Mt. Bellevue, Inini R., Cremers 8884 bis (CAY, F, P, U).

3. **Polybotrya lechleriana** Mett., Fil. Lechler. 1: 4, tab. 1, figs. 1-5. 1854. – *Acrostichum lechlerianum* (Mett.) Hook., Sp. Fil. 5: 246. 1864. Type: Peru, Puno, San Gavan, Lechler 2156 (lectotype B; isolectotypes BR, G, K, L, MPU; fragm. F, US). Plate 16A

Hemiepiphytic. Stem scales to 15 x 3 mm, dull cream to brown, thin, lanceolate, appressed to somewhat spreading, margins erose to subentire; sterile leaves pubescent throughout by 3-12-celled, 0.5-1.2 mm long, lax, spreading *Ctenitis*-hairs. Lamina finely divided, 3-(4)-pinnate-pinnatisect, lanceolate, pubescent on both surfaces, especially along the major axes and veins; petiole 1/3-1/2 as long as the lamina, stramineous; rachis and costae grooved, the groove truncated by the groove ridges of the next lower order; pinnae lanceolate to ovate, (7)10-15 x 3-7(12) cm; pinnules catadromic, oblong with subparallel sides, truncate at base, sessile, apex acute to rounded; ultimate segments with only one vein per segment, curved-ascending, 0.5-1 mm wide. Fertile leaves 3-4-pinnate, botryoid, pubescent, with hairs like those on the sterile leaf; ultimate segments round, 0.5-0.8 mm wide.

Distribution: Colombia to Bolivia, and Guyana; rich montane forests from (650)1000-1500m. In Guyana known from only two collections: Mt. Roraima, Waruma Trail, R.N. Persaud 114 (BRG, K, NY, U); Mt. Roraima, Paikwa trail, R.N. Persaud 60 (BRG, K, NY, U).

4. **Polybotrya osmundacea** Willd., Sp. Pl., 5(1): 99. 1810. – *Acrostichum osmundaceum* (Willd.) Hook., Sp. Fil. 5: 246. 1864. Type: Venezuela, Monagas, near Caripe, Humboldt 459 (holotype B, Herb. Willdenow 19507; photos F, GH). Plate 16B

Hemiepiphytic. Stem scales ascending or spreading, variable in color and

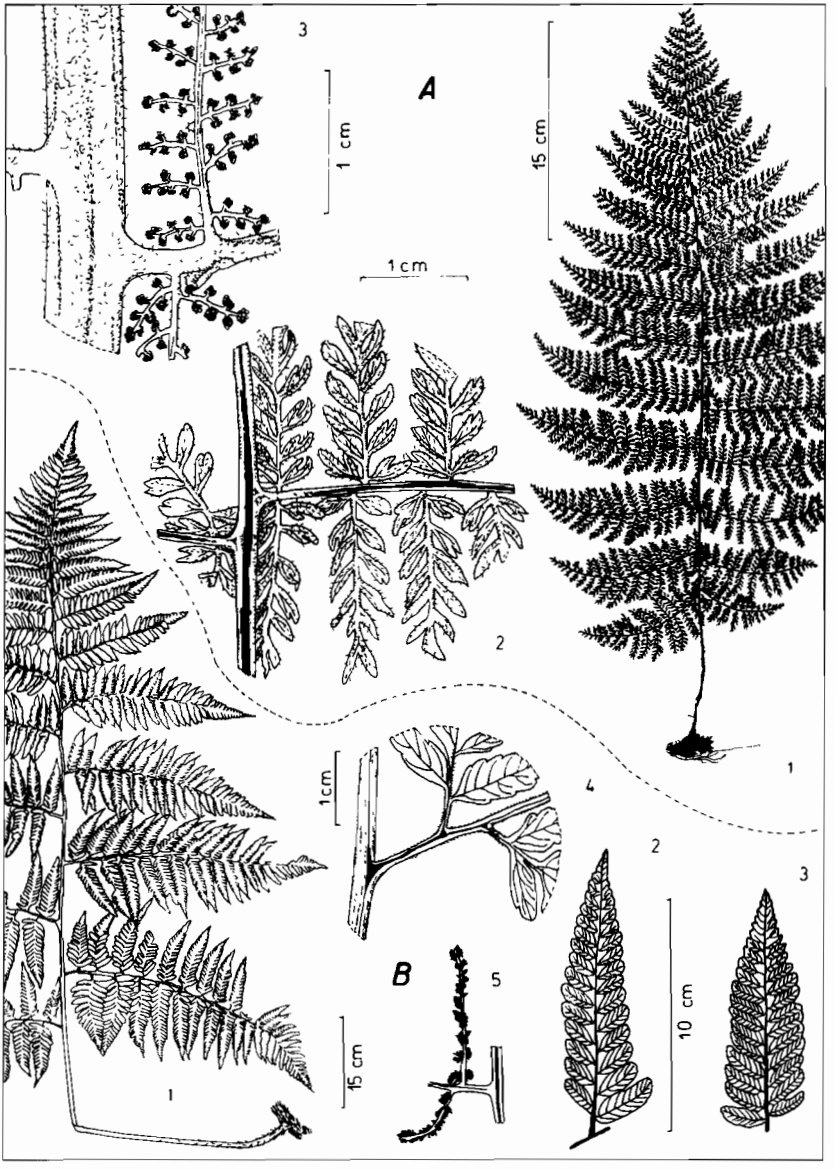

Plate 16. – A, *Polybotrya lechleriana* Mett.: 1, sterile leaf (Spruce 4744, P); 2, rachis-costa junction of sterile leaf; 3, rachis-costa junction of fertile leaf (Stübel 914, B). – B, *P. osmundacea* Willd.: 1, sterile leaf; 2,3, sterile pinnules; 4, rachis-costa junction of sterile leaf; 5, two basal pinnules of fertile pinna (1-3, Moran 2167, F; 2, Vareschi et Gessner 1875, VEN; 4, Moran 3592, F; 5, Killip & Smith 15341, US). Drawing after R.C. Moran, 1987, p. 73, 102.

texture, margin often denticulate or erose. Petiole 1/2 to as long as the lamina, scaly at base; lamina 2-3-pinnate, ovate to subtriangular, to 120 cm long, tissue essentially glabrous; pinnae 20-60 x 10-38 cm, ovate, pinnate throughout except at extreme apex; costae glabrous to short-pilose abaxially, with scattered brown, lanceolate scales intergrading with scraggy filamentous ones; pinnules 5-15 x 1-3 cm, subtriangular, with the basal acroscopic segment prolonged. Fertile leaves 3-pinnate (-pinnatifid); sori appearing as numerous tiny bunches.

Distribution: the West Indies, Guatemala to Bolivia and northern Brazil; wet, shaded forests from 0-1000 m. An extremely variable species. 8 collections studied from the Guianas (GU:2; FG:6).

Selected specimens: Guyana: Region of Mt. Raywa, Jenman s.n. (K, NY, U); Region of Mt. Russell, Jenman 2138 (BRG, K).
French Guiana: Sommet Tabulaire, zone centrale, about 40 km SE of Saül, de Granville 3685 (CAY, Z); Mts. Atachi Bakka, Cremers 10310 (B, CAY, G, HAMAB, NY, P, SJPR, U, US, USM, Z); Mt. Bellevue, Inini R., Cremers 8938 (B, BR, CAY, F, G, MG, MO, P, U, Z).

5. **Polybotrya sessilisora** R.C. Moran, Ill. Nat. Hist. Survey Bull. 34: 108. 1987. Type: Colombia, Vaupés, R. Vaupés, Mitú y alrededores, Schultes & Cabrera 13963 (holotype US; isotypes COL, GH). Plate 17A

Hemiepiphytic. Scales dark castaneous with lighter borders, 8-12 mm long, strongly denticulate margins. Sterile leaves up to 75 cm long; petiole 1/2 to as long as the lamina, scaly; lamina up to 3-pinnate-pinnatifid, deltate, coriaceous, glabrous; architecture anadromous; pinnae deltate, 17-36 x 7-16 cm; pinnules 3.5-10 x 1.2-3 cm, the basiscopic margin thickened, decurrent on the costa, the apex of the less-cut medial pinnules merely acute or obtuse; axes moderately to sparsely pubescent abaxially; grooves of axes continuous, pubescent, reddish, covered with dark, tortuous, denticulate scales like those of the petiole. Fertile leaves 3-pinnate; sori sessile, round, 1 mm long.

Distribution: Northern Amazon Basin and Edo. Bolívar in Venezuela; in lowland forests. It is probably more common than the number of collections suggests.

Specimen examined: Brazil-Guyana boundary: Akarai Mountains, height of land between drainage of R. Mapuera (Trombetas trib.) and Shodikar Cr. (Essequibo trib.), A.C. Smith 2984 (GH, K, NY).

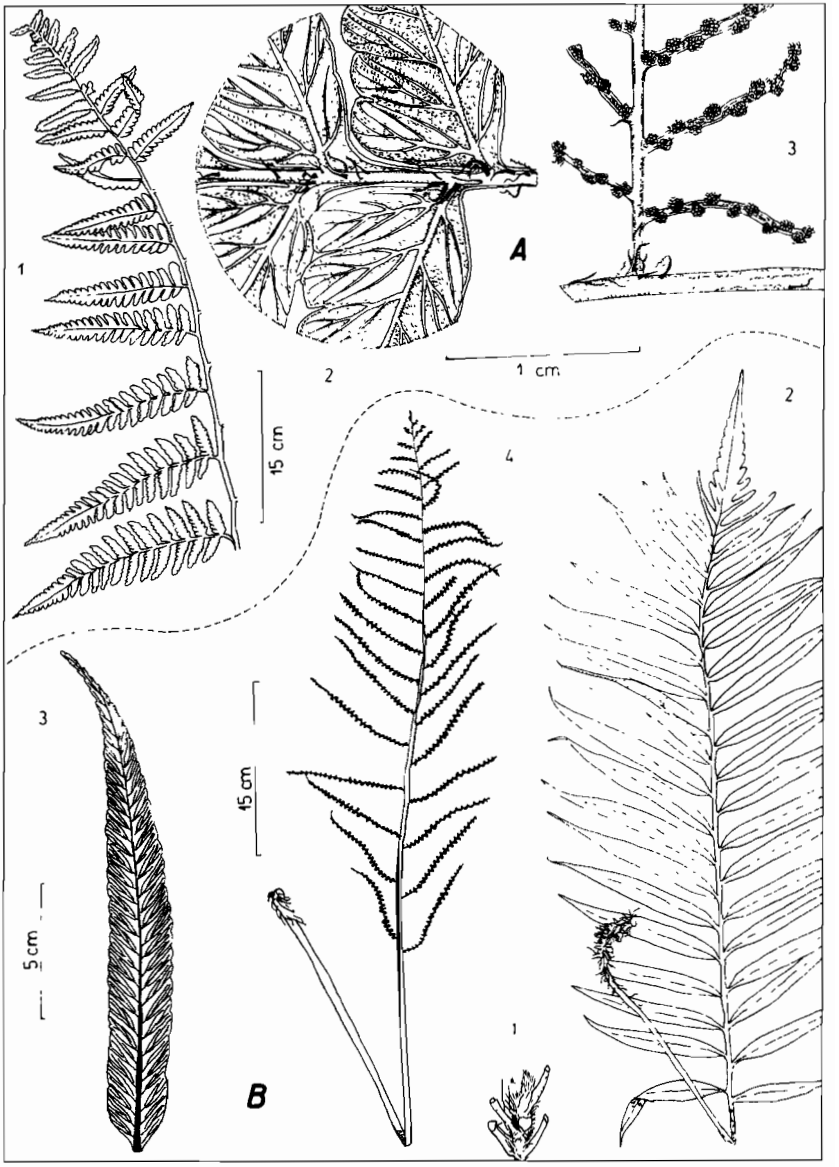

Plate 17. – A, *Polybotrya sessilisora* R.C. Moran: 1, distal half of sterile leaf; 2, abaxial surface of costa and pinnules; 3, fertile pinnule, abaxial view (1, 3, Schultes & Cabrera 13963, COL; 2, Prance et al. 15332, NY). – B, *P. sorbifolia* Kuhn: 1, stem; 2, sterile leaf; 3, sterile pinna; 4, fertile leaf (Moran 3145, F). Drawing after R.C. Moran, 1987, p. 55, 110.

6. **Polybotrya sorbifolia** Kuhn, Linnaea 36: 64. 1869. Based on *Acrostichum caenopteris* Hook. var. *salicifolium* Hook., Sp. Fil. 5: 257. 1864 and with same type. Type: Brazil, Pernambuco, Serra de Araripe, Gardner 1901 (K, fragm. NY; B). Plate 17B

Polybotrya salicifolia Lellinger, Amer. Fern J. 62: 54. 1972. Type: Colombia, Santander, between Carare and Magdalena R., Haught 1757 (holotype US; isotype BM).

Terrestrial. Scales shiny brown, 10-20 x 0.4-1 mm, membranaceous, spreading, denticulate. Sterile leaves 30-150 x 15-50 cm; petiole 15-50 cm long; lamina lanceolate, chartaceous, with 12-18 pinna pairs, apex abruptly acuminate, pinnatifid, the uppermost lobes with decurrent bases; pinnae lanceolate-acuminate, (7.3)10-22(25.5) x (0.7)1-3 (3.5) cm, petiolulate at the base and gradually becoming sessile with decurrent leaf base towards the apex, margins entire, crenate, or more commonly serrate at the apex, abaxial surface glabrous or with whitish to reddish, sessile glands. Fertile leaves pinnate-pinnatifid, lanceolate, 30-70 x 15-30 cm, apex abruptly acuminate; pinnae 4-15 x 1 cm, the ultimate segments round to oblong, 1-3 mm wide, giving the fertile pinnae a moniliform appearance.

Distribution: Costa Rica, Colombia, Venezuela, N and NE Brazil; terrestrial, along wet, shaded, rocky streambanks, 0-1200 m. Not yet known from the Guianas but expected to occur there.

11. **RUMOHRA** Raddi, Opusc. Sci. 3: 290, t. 12, f. 1. 1819.
Type: Rumohra aspidioides Raddi = R. adiantiformis (G. Forster) Ching.

Plants usually epiphytic, but also terrestrial or rupestral. Stem creeping, densely covered by scales and many roots; scales cordate or peltate at base. Leaves 2-pinnate-pinnatifid to 4-pinnate, few, monomorphic, anadromic, up to ca. 1 m long, spaced on the rhizome, glabrous or scaly, veins free. Sori borne on the veins or at vein-tips, covered by a peltate indusium. n = 41.

Distribution: A genus of two to six species occurring around the world in the Southern Hemisphere, only one rare in Guyana. Grows in open sandy soil, in shrubby areas, or in forest.

1. **Rumohra adiantiformis** (G. Forster) Ching, Sinensia 5: 70. 1934. – *Polypodium adiantiformе* G. Forster, Prodr. Fl. Ins. Austr. 82. 1786. – *Polystichum adiantiformе* (G. Forster) J. Smith, Hist. Fil. 220. 1875. Type: New Zealand, G. Forster s.n. (BM).

Epiphytic. Rhizome long-creeping, ca. 1.5 cm thick, covered by lanceolate, yellow-brown, entire scales, these 15 x 4 mm, with tortuous tip. Leaves variable in size, 20-150 cm long; lamina triangular, 15-90 x 10-75 cm; pinnae stalked, the basal ones much the largest; ultimate segments lanceolate to ovate, acute, with unequal base. Sori inframedial.

Distribution: Greater Antilles, Venezuela, South America, South Africa, islands of the Indian Ocean and Polynesia to New Zealand and Australia. Only one collection seen from the Guianas.

Specimens examined: Guyana: slopes below the base of Mt. Roraima, 1894, Jenman s.n. (BRG); without loc., Ri. Schomburgk 1151 (B not seen).

12. **STIGMATOPTERIS** C. Chr., Bot. Tidsskr. 29: 292. 1909. – *Dryopteris* subg. *Stigmatopteris* (C. Chr.) C. Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Afd., ser. 7. 10: 73. 1913.
Type: Polypodium flavopunctatum Kaulf. = Stigmatopteris rotundata (Willd.) C. Chr.

Terrestrial. Rhizome short-creeping to suberect. Leaves monomorphic. Lamina 1-pinnate (ours); pinnae tapered, increasingly adnate and decurrent in the distal part of the lamina, apices long-acuminate and distinctly serrate; lamina apex pinnatifid; architecture anadromous at base of lamina; rachis and costae adaxially grooved, the grooves more or less confluent pubescent within; axes abaxially commonly with linear to ovate, tan scales, acicular hairs lacking; veins free (ours) to anastomosing, ending in a clavate tip well short of the margin; laminar tissue relatively thin, herbaceous, with internal pellucid-punctate glands (best seen with transmitted light). Sori round to oblong, exindusiate. Spores ellipsoid, monolete. n = 41.

Distribution: Neotropical, with 24 species distributed from the Antilles and southern Mexico to Bolivia and southern Brazil.

KEY TO THE SPECIES

1 Pinnae confluent in the distal 1/2-1/3 of the lamina by a conspicuous, long-decurrent wing; pinna pairs 12-20 ..... *1. S. longicaudata*
Pinnae confluent in the distal 1/4-1/8 of the lamina, the bases short-decurrent; pinna pairs 18-32 ..... *2. S. rotundata*

1. **Stigmatopteris longicaudata** (Liebm.) C. Chr., Bot. Tidsskr. 29: 300. 1909. – *Polypodium longicaudatum* Liebm., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Afd., ser. 5, 1: 209. 1849. – *Dryopteris longicaudata* (Liebm.) Maxon, Contr. U.S. Natl. Herb. 13: 18. 1909. Type: Mexico, Veracruz, "Baranca de Huitamalco;" Liebmann s.n. (lectotype C; isolectotype K). Plate 18A

Leaves 80-140 cm long, petiole ca. 1/2 to equaling the lamina length; lamina pinnate; pinnae 14-20 x 2-2.5 cm, 12-20 to a side, linear to lanceolate, subentire to crenate to shallowly and obliquely lobed less than 1/4(-1/3) the way to costa; proximal pinnae subsessile to short-stalked, inequilateral, distal pinnae (1/2-1/3 of the lamina) confluent by a conspicuous long-decurrent wing; costae abaxially glabrous or with scattered linear to ovate scales; veins pinnately arranged, 3-6 pairs per group. Sori round.

Distribution: Mexico to French Guiana and Bolivia; this species is known in French Guiana from two specimens: Tumuc Humac, between Mitaraka and Toukouchipan, de Granville 1291 (CAY, P, Z); Tumuc Humac, SE of Mitaraka-Sud, de Granville 1434 (CAY, NY, P, Z).

2. **Stigmatopteris rotundata** (Willd.) C. Chr., Bot. Tidsskr. 29: 297, fig. 2. 1909. – *Aspidium rotundatum* Willd., Sp. Pl., 5(1): 247. 1810. – *Dryopteris rotundata* (Willd.) C. Chr., Ind. Fil. 289. 1905. Type: Plumier, Traité Foug. Amér. 29, t. 38, 1705, based on material from Martinique. Plate 18B

Leaves 75-150(-200) cm long, petiole ca. 1/3 to equaling the lamina length; lamina pinnate; pinnae 12-20(-25) x 1.5-3 cm, 18-32 to a side, crenate to shallowly and obliquely lobed less than 1/3(-1/2) the way to costa; proximal pinnae sessile to short-stalked, inequilateral, distal pinnae (1/4-1/8 of lamina) confluent with short-decurrent bases; costae abaxially glabrous or with scattered linear to ovate scales; veins pinnately arranged, 3 or 4 pairs per group. Sori round.

Distribution: the Lesser Antilles, Trinidad, eastern Venezuela, the Guianas; in lower montane forests, 350-750 m. 18 collections studied from the Guianas (GU:4; SU:1; FG:13).

Selected specimens: Guyana: Erengfaru, Maicwac R. along Santa Maria trail, Los 49a (K, NY); slopes of Mt. Eagle, Potaro R., Jenman s.n. (BRG, NY); without loc., Fanshawe 3835 (K, U).
Surinam: Litani R., Versteeg 315 (U, sole coll. cited by Kramer, 1978).
French Guiana: Mt. Bellevue, Inini R., Cremers 9113 (B, CAY, P, U, UC, Z), 9140 (CAY, P, U, UC, Z); Saül, Mt. Galbao, de Granville 8873 (B, BR, CAY, G, MG, MO, NY, P, U, US, Z).

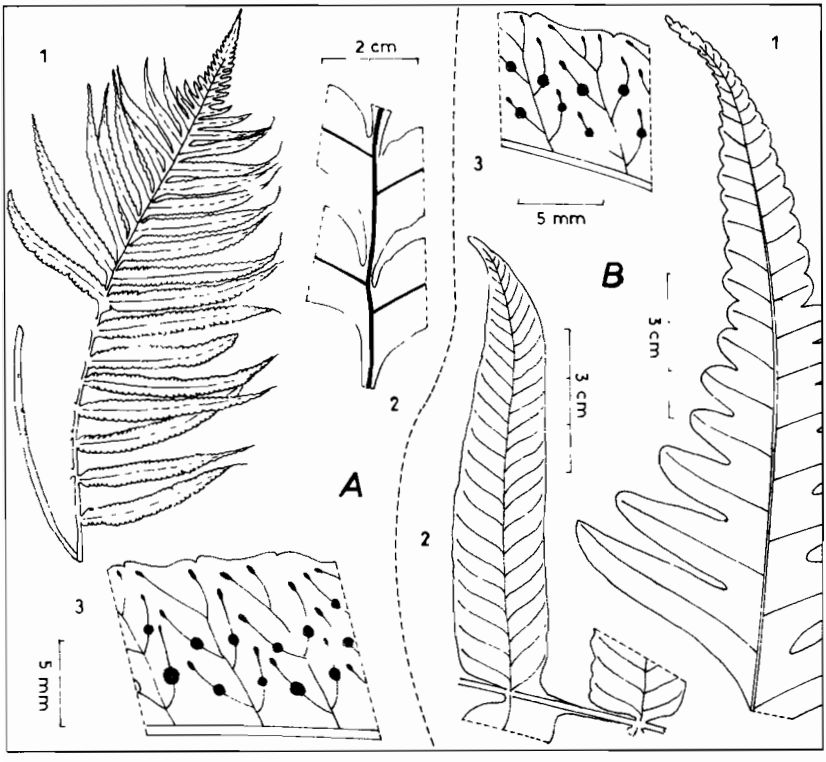

Plate 18. – A, *Stigmatopteris longicaudata* (Liebm.) C.Chr.: 1, leaf (after R.C. Moran, 1991, p. 892); 2, rachis and pinna bases; 3, part of fertile pinna (de Granville 1291, CAY). – B, *S. rotundata* (Willd.) C. Chr.: 1, distal part of leaf; 2, pinna from basal part of leaf; 3, detail of fertile pinna (de Granville 1291, CAY). Drawing in part by G. Cremers.

13. **TECTARIA** Cav., Anales Hist. Nat. 1: 115. 1799.
Type: Polypodium trifoliatum L. = Tectaria trifoliata (L.) Cav.

Terrestrial or epipetric. Rhizome usually stout, short-creeping to erect. Leaves monomorphic to dimorphic. Lamina simple to usually pinnatifid to pinnate or more divided; rachis and costae adaxially lacking grooves, bearing short reddish septate hairs; veins anastomosing (ours) to form pentagonal or hexagonal areoles, these often with included veinlets (ours), veins rarely free. Sori round to occasionally somewhat elongate, commonly with a reniform or peltate indusium, a few spp. exindusiate; spores ellipsoid, monolete. x = 40.

Distribution: Pantropical, with perhaps 200 species, with ca. 40 species in the New World, extending from Florida, the Antilles, and Mexico to Bolivia and Argentina; 5 occur in the Guianas.

KEY TO THE SPECIES

1 Lamina simple, elliptic, entire or sinuate ..... *3. T. plantaginea*
Lamina with at least one pair of free pinnae 2

2 Lamina 2-pinnate-pinnatifid at base ..... *5. T. trinitensis*
Lamina pinnate at base, the pinnae entire, repand, with a single basiscopic lobe, or occasionally few-lobed 3

3 Indusium peltate, orbicular ..... *1. T. heracleifolia*
Indusium reniform, with a narrow sinus, or lacking 4

4 Sori in two series parallel to costules; pinnae usually in (3-) 4-8 pairs ..... *2. T. incisa*
Sori irregularly arranged between costules, often coalescing and slightly elongate; lateral pinnae mostly 1 or 2(3) pairs ..... *4. T. trifoliata*

1. **Tectaria heracleifolia** (Willd.) Underw., Bull. Torrey Bot. Club 33: 200. 1906. – *Aspidium heracleifolium* Willd., Sp. Pl., 5(1): 217. 1810. Type: Based on Plumier's Traité Foug. Amér. pl. 147, 1705, illustrating a plant from Hispaniola. Plate 19A

Leaves mostly (12-)30-70 cm long, with petiole often longer than lamina; lamina simple to 1-pinnate, deltate; lateral pinnae 1 or 2 pairs (juvenile fronds merely cordate or trilobate), proximal pair the largest, long-stalked with a prominent basal basiscopic lobe. Sori in 2 rows between main lateral veins (costules); indusia persistent, peltate, 2-3.5 mm diam., at maturity thick and angled from the recurved margins.

Distribution: Florida, Antilles, and Mexico to Panama, Venezuela, Peru, Guyana and Surinam; lowland and montane rain forests, in many parts of the range on calcareous rocks.

Specimens examined: Guyana: Marudi Mts., along trail from Nor-Man Mines Camp to Locust Cr., Stoffers et al. 278 (CAY, MO; B, U not seen).
Surinam: Wilhelmina Mts., Julianatop, Schulz 10278 (U not seen, cited by Kramer, 1978).

Note: Jones (1987) used the common name "Halberd Fern", for this often grown species.

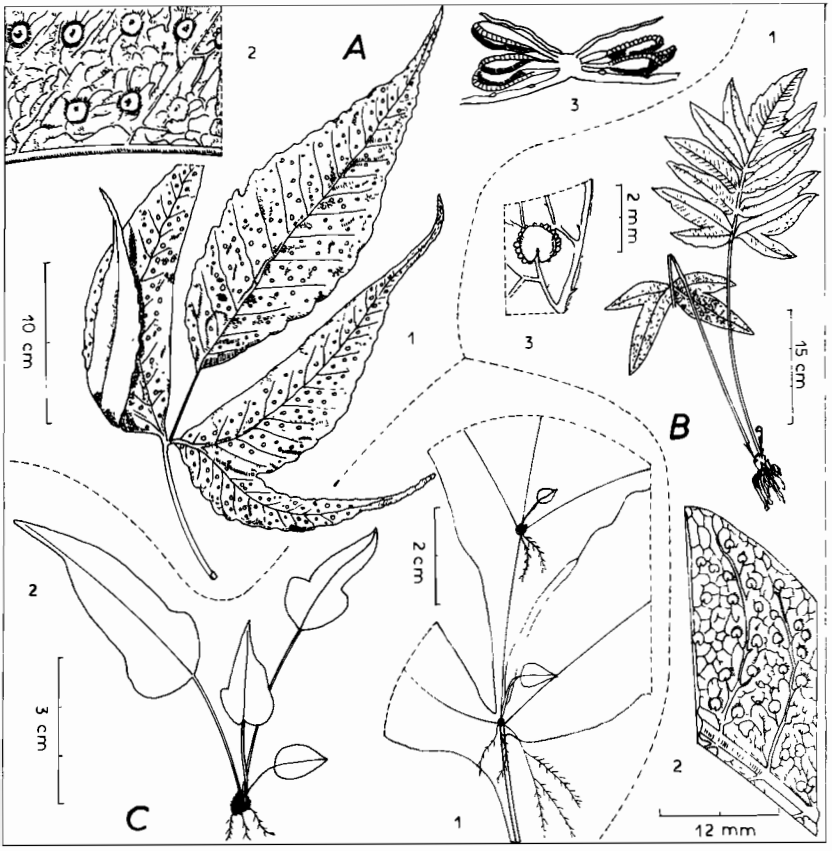

Plate 19. – A, *Tectaria heracleifolia* (Willd.) L. Underw.: 1, leaf; 2, detail of fertile pinna; 3, sorus in longitudinal section (after Rovirosa, 1909, plate 34). – B, *T. incisa* Cav. f. *incisa*: 1, plant; 2, details of fertile pinna, abaxial side; 3, sorus (after Proctor, 1985, p. 432). – C, f. *vivipara* (Jenman) C. Morton : 1, distal part of leaf with bulbils and plantlets adaxially on the axes (Feuillet 2435, CAY); 2, plantlet (Prevost 1704, CAY). Drawing in part by G. Cremers.

2. **Tectaria incisa** Cav., Descr. Pl. 249. 1802. Type: Puerto Rico, Ventenat s.n. (MA not seen).

2a. **Tectaria incisa** Cav. f. **incisa** Plate 19B

Aspidium martinicense Sprengel, Anleit. Kenntn. Gewächse 3: 133. 1804. – *Tectaria martinicensis* (Sprengel) Copel., Philipp. J. Sci., Bot. 2: 410. 1907. Type: Although attributed to Martinique by Sprengel, the material on which this name was based actually was collected in Santo Domingo (Hispaniola) by Poiteau (Morton, Amer. Fern J. 56: 129. 1966).
Aspidium macrophyllum Rudolphi, Bemerk. Geb. Naturg. 2: 103. 1805. – *Nephrodium macrophyllum* (Rudolphi) Baker. Type: A renaming of *A. martinicense* Sprengel because the correct source locality made the epithet "*martinicense*" inappropriate; Rudolphi had supplied Sprengel with his original specimen (Proctor, Ferns of Jamaica 431. 1985).

Leaves mostly 70-170 cm long, with petiole about equaling lamina; lamina pinnate, ovate-lanceolate; lateral pinnae (2-) 3-10 pairs, mostly 15-25 x 2.5-6 cm, proximal pair short-stalked, with a prominent basal basiscopic lobe, otherwise entire or repand. Sori in 2 rows between main lateral veins (costules); indusia persistent, reniform or with a sinus on proximal circular side, margins recurved at maturity.

Distribution: Antilles and southern Mexico to Bolivia, Brazil, and northern Argentina; lowland rain forest, 100-700 m. 28 collections studied from the Guianas (GU:4; SU:6; FG:18).

Selected specimens: Guyana: Berbice R., New Dageraad, Maas et al. 5422 (MO; K, U not seen).
Surinam: Upper Waamahpan Cr., de Granville 965 (CAY; P, U not seen).
French Guiana: Paul Isnard, foot of Mt. Decou-Decou, Cremers 7882 (CAY; BR, P, Z not seen); Mt. Bellevue, Inini R., Cremers 8785 (CAY; P, U, Z not seen).

2b. **Tectaria incisa** Cav. f. **vivipara** (Jenman) C. Morton, Amer. Fern J. 56: 131. 1966. – *Nephrodium macrophyllum* (Rudolphi) Baker var. *viviparum* Jenman, Bull. Dept. Jamaica 3: 238. 1896. Type: Guyana, Jenman s.n. (not seen). Plate 19C

A gemmiferous variant occurs nearly throughout the range of the species and is common in French Guiana. 29 collections studied from the Guianas (GU:5; SU:4; FG:20).

Selected specimens: Guyana: Marudi Mts., Mazoa Hill, near Nor-

Man Mines camp, Stoffers et al. 301 (MO; CAY, U not seen); Pomeroon R., Pomeroon Distr., de la Cruz 3119 (MO, UC); Upper Rupununi R., near Dadanawa, de la Cruz 1477 (MO, UC, US).
Surinam: Cr. Ouaremapann, trib. of Upper Litani, de Granville 953 (CAY; P not seen); area of Kabalebo Dam project, Distr. Nickerie, Lindeman & de Roon 868 (UC; BBS, CAY, U not seen), 894 (UC; BBS, U not seen).
French Guiana: upper Approuague R., Emerillon R., Oldeman T.179 (CAY, P not seen); upper Mana R., Bellevue, Cremers 7573 (CAY; P, Z not seen).

Note: It is uncertain whether this viviparous form is the same as the recently described *T. vivipara* Jermy & T. Walker (type from Trinidad), which was distinguished from *T. incisa* on the basis of its vivipary, diploid chromosome complement, and presence of hairs on the abaxial side of the costae. However, these are all characters that occur in some forms of typical *T. incisa*. Guianan specimens are about evenly divided between the two forms, with the fertile leaves tending to lack bulbils and the sterile leaves bearing bulbils or plantlets on the axes adaxially or in the axils of pinnae. Sterile leaves tend also to have entire pinnae, while fertile ones are often repand or sinuate. Guianan specimens are mostly glabrous on the costae abaxially, but a few have some short hairs, especially near the base. In the absence of consistent distinguishing characters between the two species, I prefer to recognize a single rather variable taxon.

3. **Tectaria plantaginea** (Jacq.) Maxon, Contr. U.S. Natl. Herb. 10: 494. 1908. – *Polypodium plantagineum* Jacq., Coll. Bot. 2: 104, t. 3, fig. 1. 1788. – *Aspidium plantagineum* (Jacq.) Griseb., Abh. Königl. Ges. Wiss. Göttingen 7: 286. 1857. Type: Martinique, Jacquin s.n. (specimen no longer extant?).

Leaves 20-60 cm long, with petioles laxly scaly, shorter than lamina; lamina dark green, glabrous, simple, oblong to oblanceolate or elliptic, 12-50 x (2-)4-8(-11) cm, entire to sinuate, decurrent proximally, apex usually emarginate and bearing a bud, this sometimes rooted and developing into a plantlet; rachis sparingly scaly. Sori more or less regularly biseriate between costules, round; indusia present (ours) or absent, commonly 2-4 mm diam., vaulted.

Distribution: Puerto Rico, Lesser Antilles, Trinidad, Tobago, Belize to Panama, Colombia to the Guianas, Peru and Brazil; terrestrial or epipetric in lowland and lower montane rain forests, 100-700 m.
All collections seen from the Guianas represent:

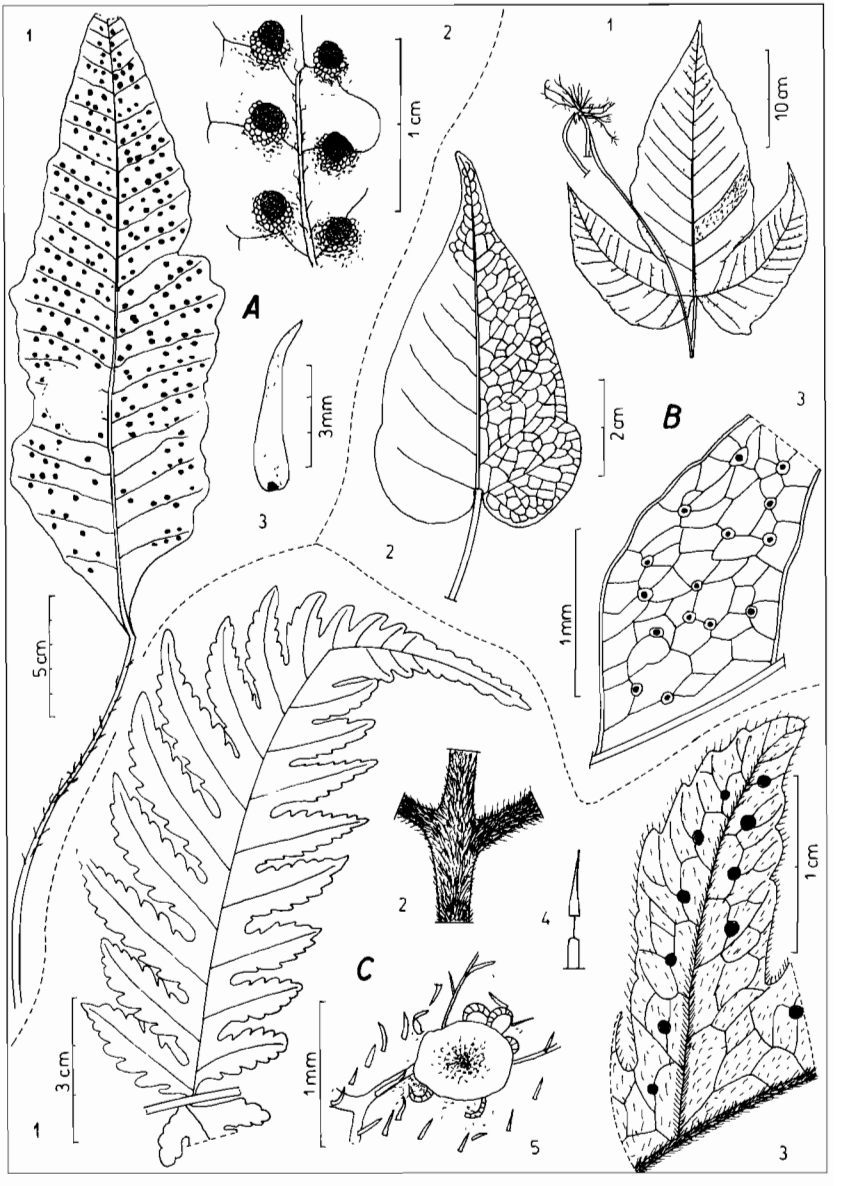

Plate 20. – A, *Tectaria plantaginea* (Jacq.) Maxon var. *macrocarpa* (Fée) C. Morton: 1, leaf; 2, part of fertile pinna; 3, petiole scale (Philippe 306, CAY). – B, *T. trifoliata* (L.) Cav.: 1, leaf (after Proctor, 1977, p. 238); 2, leaf of juvenile plant; 3, part of fertile lamina (Cremers 8116, CAY). – C, *T. trinitensis* Maxon: 1, pinnule; 2, rachis and basal part of pinna; 3, ultimate segment; 4, hair from costa; 5, sorus (A. Smith 860, UC). Drawing by G. Cremers.

3a. **Tectaria plantaginea** (Jacq.) Maxon var. **macrocarpa** (Fée) C. Morton, Amer. Fern J. 56: 123. 1966 – *Bathmium macrocarpum* Fée, Gen. Fil. 288. 1852. Type: French Guiana, Cayenne, Poiteau s.n. (not seen). Plate 20A

Bathmium sinuatum Fée, Gen. Fil. 288. 1852. Type: French Guiana, Leprieur s.n. (Herb. Mougeot, not seen).

Distinguished from var. *plantaginea* by the larger sori, large persistent indusium, and main lateral veins tending to be flexuous. Outside the Guianas, this variety has been found only in eastern Venezuela in Edo. Bolívar. 60 collections studied from the Guianas (GU:2; SU:11; FG:47).

Selected specimens: Guyana: Tukuti Cr. to Puruni R., Mazaruni R., Fanshawe 2123 [For. Dept. 4859] (BRG-FD).
Surinam: Nassau Mts., Marowijne R., Plateau A, Maguire et al. 40723 (MO); middle slopes of Frederik Top, 3 km SSE of Juliana Top, Irwin et al. 54991 (MO; BR not seen); S slopes of Juliana Top, 14 km N of Lucie R., Irwin et al. 54665 (MO; BR not seen).
French Guiana: Mt. Bellevue, Inini R., Cremers 8909 (MO; B, BR, CAY, G, MG, P, U, Z not seen); Saül, foot of Mt. Galbao, de Granville 8485 (CAY; B, BM, NY, MG, P, US, Z not seen).

4. **Tectaria trifoliata** (L.) Cav., Descr. Pl. 249. 1802. – *Polypodium trifoliatum* L., Sp. Pl. 2: 1087. 1753. Lectotype (chosen by Underwood, Bull. Torrey Bot. Club 33: 199. 1906): Plumier, Traité Foug. Amér. t. 148 (= Descr. Pl. Amer. t. 32), representing a plant from Martinique. Plate 20B

Aspidium plumieri C. Presl, Rel. Haenk. 1: 29. 1825. Lectotype: Plumier, Traité Foug. Amér., t.146, based on material from Haiti.

Leaves mostly 50-100(-150) cm long, with petiole longer than or about equaling lamina; lamina ternately lobed, or commonly pinnately 3-5(-7) foliolulate, pinnae up to 25 x 20 cm, proximal pinnae inequilateral, with a prominent basal basiscopic lobe or with two to few lobes, otherwise pinnae entire or repand. Sori irregularly arranged between main lateral veins, some often coalescing, varying from circular to lunate to elongate; indusia seemingly absent or reniform with a narrow sinus, short-ciliate, caducous.

Distribution: Greater Antilles except Jamaica, Lesser Antilles, Trinidad, Tobago, Venezuela and the Guianas; in lowland forest, 100-550 m. 42 collections studied from the Guianas (GU:4; SU:6; FG:32).

Selected specimens: Guyana: Mt. Ayanganna, upper Mazaruni Basin, Tillett et al. 44983 (MO; BM not seen); above Great Falls, Demerara R., Jenman s.n. (BRG).
Surinam: 3 km S of Juliana Top, 12 km N of Lucie R., Maguire et al. 54383 (MO; BR not seen); Augustus Falls, Tafelberg, Maguire 24768 (BM, NY, U, US not seen, cited by Maxon & Morton in Maguire et al., 1948).
French Guiana: Mt. Bellevue, Inini R., Cremers 8810 (UC; B, CAY, P, U, Z not seen); Saül, Mt. Galbao, de Granville 8484 (CAY; NY, Z not seen).

Note: None of the collections seen, even young ones, have the slightest trace of an indusium.

5. **Tectaria trinitensis** Maxon, Amer. Fern J. 20: 3. 1930. Type: Trinidad, St. Annes, Cascade Valley, Hombersley 326 (US, 2 sheets). Plate 20C

Leaves (40-)75-100 cm long, with petiole nearly equaling or exceeding the lamina length; lamina 25-45 cm long, 2-pinnate-pinnatifid at base, pinnate-pinnatifid distally, penultimate segments lobed up to ca. halfway to costule; lateral pinnae 3-6 pairs, 15-30 x 10-22 cm, proximal pairs stalked ca. 1.5-3 cm; lamina, costules and costae abaxially densely hairy with septate hairs, adaxially the lamina tissue with similar hairs. Indusia persistent, round-reniform, tan, ciliate.

Distribution: Trinidad, Venezuela, Guyana and Surinam; 500 m in rain forest.

Specimens examined: Guyana: Kanuku Mts., Collector ? H.24 (BRG).
Surinam: Lower slopes of Juliana Top, 14 km N of Lucie R., 500 m, Irwin et al. 54694 (MO; BR not seen).

Note: Allied to *T. mexicana* (Fée) C. Morton of Mexico and Central America, but more copiously hairy. 2 collections seen from the Guianas (GU:1; SU:1).

14. **TRIPLOPHYLLUM** Holttum, Kew Bull. 41: 239. 1986.
Type: Aspidium protensum Sw. = Triplophyllum protensum (Sw.) Holttum

Terrestrial or epipetric. Rhizome creeping, scaly at apex; petiole at base with lanceolate blackish scales, in cross-section with numerous round vascular bundles. Lamina 2-5-pinnate, often deltate-pentagonal; architec-

ture heterodromous; proximal pinnae usually basiscopically developed; ultimate segments asymmetric at their base, basiscopic sides cuneate; veins free (ours) or casually anastomosing; axes on both sides bearing numerous septate, often reddish hairs. Sori round, indusia round-reniform (ours), rarely lacking; spores bilateral, winged. x = 41.

Distribution: About 20 species, three or four in the New World, the remainder in Africa and neighboring islands.

Note: Formerly, the species were placed in *Dryopteris*, then *Ctenitis*, but the relationship may be closer to Tectaria (Kramer 1978, Holttum 1986).

KEY TO THE SPECIES

1 Proximal pinnae less than half as long as the lamina, little longer than the second pair of pinnae; indusia glabrous ..... *2. T. angustifolium*
Proximal pinnae more than half as long as lamina; indusia glabrous, glandular or hairy 2

2 Sori mostly apical on the veins, submarginal; lamina on both sides with spherical whitish or yellowish glands ..... *3. T. dicksonioides*
Sori not or infrequently apical on the veins, medial to supramedial; lamina on both sides lacking spherical glands ..... *4. T. funestum*

1. **Triplophyllum angustifolium** Holttum, Kew Bull. 41: 259. 1986. Type: French Guiana, Acarouany, Sagot 725 bis (holotype K; isotypes B, BM, P not seen). Plate 21A

Rhizome long-creeping, 1-2 mm diam. Lamina 9-30 cm, longer than wide; proximal pinnae a little less than half as long as the blade, 1-14 x 1-9 cm, their basiscopic pinnules less than twice as long as the acroscopic ones; free tertiary pinnules lacking; veins extending well beyond the sori; veins and laminar tissue glabrous on both sides. Indusia tan to brown, lacking glands and hairs.

Distribution: The Guianas, near sea level. 22 collections studied (GU:1; SU:1; FG:20).

Selected specimens: Guyana: Essequibo, Moraballi Cr., near Bartica, Richards 23 (BM, K).
Surinam: Paranam to Afobaka, crossing of Marechal kreek, Distr. Brokopondo, Kramer & Hekking 3156 (U).
French Guiana: Counana R., Degrad Limousin, de Granville 9168 (B,

Plate 21. – A, *Triplophyllum angustifolium* Holttum: 1, basal pinna; 2, ultimate segment; 3, rachis scale; 4, sorus (Cremers 9984, CAY). – B, *T. dicksonioides* (Fée) Holttum: 1, median pinnule; 2, apical part of pinnule; 3, ultimate segment; 4, rachis scale; 5, sorus (Cremers 6649, CAY). – C, *T. funestum* (Kunze) Holttum: 1, leaf apex; 2, median pinna; 3, ultimate segment; 4, rachis scale; 5, sorus (Cremers 5572, CAY). Drawing by G. Cremers.

CAY, MO, NY, P, US, Z); Cr. Gabaret, Oyapock R., Cremers 9853 (UC; CAY, P, US, Z not seen).

2. **Triplophyllum dicksonioides** (Fée) Holttum, Kew Bull. 41: 257. 1986. – *Aspidium dicksonioides* Fée, Crypt. Vasc. Brésil 1: 143, t. 49, f. 1. 1869. – *Dryopteris protensa* (Sw.) C. Chr. var. *dicksonioides* (Fée) C. Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Afd., ser. 8. 6: 93. 1920. Type: N Brazil, Rio Negro, Spruce (as Glaziou) 2129 (isotypes BM, G, K). Plate 21B

Rhizome creeping, 3-6 mm diam. Lamina 4-pinnate, to 50 cm long and about as wide, relatively thin-textured, slightly glaucous abaxially; proximal pinnae to 25 x 16 cm, with basiscopic pinnules strongly prolonged, basal one 3-4 times longer than acroscopic one; quaternary segments of proximal pinnae free or slightly adnate, entire or incised on acroscopic margin, usually rounded at apex; laminar tissue on both sides with spherical whitish or yellowish glands on laminar tissue and veins. Sori terminal or subterminal on the veins, always near margin; indusia brown, lacking hairs, sometimes glandular.

Distribution: French Guiana to Amazonian Colombia, northern Brazil, 0-700 m. 21 collections studied from the Guianas (GU:3; SU:6; FG:12).

Selected specimens: Guyana: Moraballi Cr., Essequibo R., A.C. Persaud 5333 (K); Essequibo R., Moraballi Cr., near Bartica, Richards 51 (K); Essequibo, Appun 178 (K).
Surinam: Wilhelmina Gebergte, 9 km N of Lucie R., 12 km W of Oost R., Maguire et al. 54230 (MO; BR not seen); Saramacca R. headwaters, vic. of Camp II, Maguire 24140 (K, U; NY, US not seen).
French Guiana: Mt. Bellevue, Inini R., Cremers 9155 (UC; CAY, P, U, Z not seen); Mts. La Fumée trail, E of Saül, Skog & Feuillet 7275 (CAY; NY not seen).

Note: Some specimens from French Guiana combine features of this species and *T. funestum*, e.g., de Granville 5276 (CAY), region of Paul Isnard, Mt. Lucifer; de Granville 2918 (CAY), Mt. de Kaw, Camp Caïman. It seems likely that hybridization is not uncommon.

3. **Triplophyllum funestum** (Kunze) Holttum, Kew Bull. 41: 255. 1986. – *Aspidium funestum* Kunze, Linnaea 9: 96. 1834. – *Dryopteris protensa* (Sw.) C. Chr. var. funesta (Kunze) C. Chr., Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Afd., ser. 8. 6: 91. 1920. – *Ctenitis protensa* (Sw.) Ching var. *funesta* (Kunze) Proctor, Rhodora 63: 34. 1968. Type: Brazil, ad Ega, Poeppig s.n. (LZ, destroyed). Plate 21C

Triplophyllum funestum (Kunze) Holttum var. *hirsutum* Holttum, Kew Bull. 4: 256. 1986. Type: Guyana, basin of Kuyuwini R., A.C. Smith 2540 (holotype K; isotypes G, MO, U).
Triplophyllum crassifolium Holttum, Kew Bull. 4: 257. 1986. Type: Surinam, Kabalebo, Bartikakreek, J. & P. Florschütz 2246 (holotype U).
Triplophyllum crassifolium Holttum var. caudatum Holttum, Kew Bull. 2: 258. 1986. Lectotype (chosen here): French Guiana, Plateau du Mahury, vic. of Lake Rorota, de Granville 940 (hololectotype U 387774; isolectotypes CAY-3 sheets, U 387773).

Rhizome creeping, 3-10 mm diam. Lamina 15-60 cm long and half to nearly as wide, or often somewhat wider than long, chartaceous to relatively thick-textured, 2-4-pinnate at the base; proximal pinnae 10-40 x 4-28 cm, with basiscopic pinnules strongly prolonged, basal one generally 2-4 times longer than acroscopic one; tertiary or quaternary segments of proximal pinnae free or adnate, entire or lobed, rounded to acutish at apex; veins and laminar tissue on both side glabrous or with cylindrical glands, rarely with spherical glands, sometimes with septate hairs. Sori medial or subterminal on the veins; indusia brown to blackish, frequently with some short glandular hairs on margin and surface.

Distribution: Costa Rica, Panama, Lesser Antilles, Puerto Rico to Bolivia, northern Brazil; Trinidad, the Guianas; 0-650 m. Terrestrial in rain forest, often common. 182 collections studied from the Guianas (GU:26; SU:20; FG:136).

Selected specimens: Guyana: Kanuku Mts., Jansen-Jacobs et al. 404 (MO; B, CAY, U, US not seen); Waini R., Northwest District, de la Cruz 3635 (UC; MO not seen).
Surinam: Zuid R., 3 km above confluence with Lucie R., Irwin et al. 55905 (MO); Jodensavanne-Mapanecreek area, Kramer & Hekking 2407 (U).
French Guiana: upper Approuague R., Oldeman T.150 (CAY, NY, P, U not seen); Mt. Bellevue, Inini R., Cremers 8787 (MO, UC; B, BM, BR, CAY, P, U, Z not seen).

Note: *Triplophyllum acutilobum* Holttum (Kew Bull. 41: 258. 1986) was distinguished by Holttum by its very large leaves, with proximal pinnae

more than 40 cm long, thin-textured lamina, and glabrous axes adaxially. Holttum cited two smaller specimens from Guyana (sine loco, im Thurn s.n., 1879; Essequibo R., Jenman s.n.) as possibly representing this species. I have seen neither the Guyanan specimens nor the type (from Amazonas, Brazil), but several specimens from southern Amazonas, Venezuela, agree in their glabrous adaxial midribs. Because the distinctness of *T. acutilobum* from *T. funestum* is questionable, I prefer to exclude *T. acutilobum* from the Guianan flora.

Cremers Georges, Kramer K.U., Moran R.C., Smith A.R. (1993)

Dryopteridaceae

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