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The Group of *Adiantum gracile* in Brazil and Environs

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ABSTRACT.—The *Adiantum gracile* group of Brazil and adjacent Bolivia is a natural group distinguishable from *A. tetraphyllum* and related species. We provide a key to the group and describe two new Brazilian species belonging to the group, *A. cinnamomeum* and *A. dawsonii*.

Adiantum is a large and widespread genus in the tropics, numbering approximately 200 species in the Neotropics, 65 to 70 of them growing in South America. Brazil has about 50 species, about 75% of the total known for the continent.

No recent monograph or revision exists for *Adiantum* in the Neotropics, nor has a comprehensive subgeneric classification of the genus ever been developed. In preparing keys for floristic works, most authors have used as principal characters lamina venation (anastomosing vs. free) and shape of the ultimate divisions (roughly rounded and not dimidiate vs. more or less oblong and usually dimidiate). Secondary characters include lamina division (simple, pinnate, bipinnate, or decompose), pinnule attachment (sessile vs. pedicellate), ultimate division articulation (articulate or not), and lamina apex shape (conform vs. gradually attenuate).

The species with bipinnate laminae, a conform terminal pinna, and oblong and usually dimidiate pinnules may be placed together conveniently as the *A. tetraphyllum* group. Delimited in this broad manner, the group includes about a third of the Neotropical species of *Adiantum*. Most, if not all, of the species of this group lack evenly and finely serrate sterile lamina margins that seem to predominate in other groups.

Within the *A. tetraphyllum* Willd. group *sensu lato*, four groups can be fairly readily distinguished, principally on the basis of their rachis and lamina indument. These groups are not yet fully characterized, nor are their constituent species known with certainty due to several names for which we have yet seen any specimens. Three of these groups are large and widespread in the Neotropics, but one small group is nearly restricted to Brazil: *A. gracile* Fée and two new species.

The species of the *A. gracile* group differ from the other three groups in having more pinna pairs (5–7), more pinnules on a pinna (35–40 pairs), and pinnules that often are approximate or nearly so, narrower (2–4 mm wide) but

relatively longer, usually at least slightly lobed, and in lacking an obvious midrib, although they could be obscurely dimidiate. In addition, the larger scales on the abaxial surface of the pinnules, when present, are several cells wide and long-ciliate throughout, much like those of the rachises and costae. These scales are in contrast to those of *A. tetraphyllum* and its other allies, which are narrowed and sometimes even uniseriate distally. In the *A. gracile* group, the rachises are conspicuously covered with cinnamomeous, linear-lanceolate scales with long-ciliate margins and base, at least when young; these scales are most persistent in *A. cinnamomeum*.

KEY TO THE SPECIES OF THE *ADIANTUM GRACILE* GROUP

1. Pinnules abaxially glaucous, the scales few or none, but rather inconspicuous, yellowish, sessile glands often present; pseudindusia erose-ciliate at maturity, adaxially glabrous. Rhizome scales narrowly lanceate, dark to medium brown, sparingly denticulate. Medial pinnules ca. 2 times longer than wide, usually acute at the sterile apex, nearly round at the fertile apex 3. *A. dawsonii*
1. Pinnules abaxially not glaucous or glandular, always sparsely scaly; pseudindusia entire to erose, scarcely ciliate, adaxially glabrous or bearing toothed scales 2.
 - 2(1). Medial pinnules ca. 2 times longer than wide, obtuse to acute at the sterile apex, angular at the fertile apex; pseudindusia glabrous; rhizome scales medium to dark brown, entire 1. *A. gracile*
 - 2(1). Medial pinnules ca. 3 times longer than wide, acuminate to acute at the always sterile apex; pseudindusia bearing hairlike scales that are toothed at the base; rhizome scales dark brown to blackish, the margins sometimes slightly paler, always sparsely denticulate 2. *A. cinnamomeum*

1. *Adiantum gracile* Fée, Gen. Fil. 116. 1852. Fig. 1A, B.

Plants terrestrial. Rhizomes stout, short-creeping, ca. 4–5 mm in diam., scaly, the scales somewhat shiny, essentially concolorous, medium to dark brown, narrowly lanceate, entire. Fronds monomorphic, 2-pinnate, (30)60–100 cm long, the laminae (7)20–30 cm wide; stipes approximate, black, adaxially sulcate, scaly, the scales appressed throughout or sometimes distally patent, concolorous, cinnamomeous, 2–3 mm long, narrowly lanceate with a filiform apex, strongly denticulate proximally; rachises similar to the stipes and their indument similar; pinnae oblong-lanceate, slightly decreasing at the base, tapering at the apex, (7)15–22 cm long, 1.5–2.2 cm wide, the lateral pinnae (3)7–10 pairs, patent, alternate, the terminal pinna conform, 1–1.5 times longer than the subtending pinnae 0.67–1 times as long as the medial pinnae; indument of the costae like that of the stipes and rachises; pinnules 27–43 pairs, ca. 2 times longer than wide, chartaceous, free-veined, without an evident midrib, the proximal pairs reduced, somewhat rounded or triangular, the medial pairs dimidiate, oblong to somewhat tapering, the acroscopic base truncate, the sterile apex obtuse to acute, the sterile margin irregularly and distantly serrate, except at the pinnule apex, the fertile apex angular, the distal pinnules ca. 1/2 as long as the medial pinnules, the adaxial surface of the pinnules glabrous or sparsely scaly near the sori, the veins slightly prominulous, the idioblasts

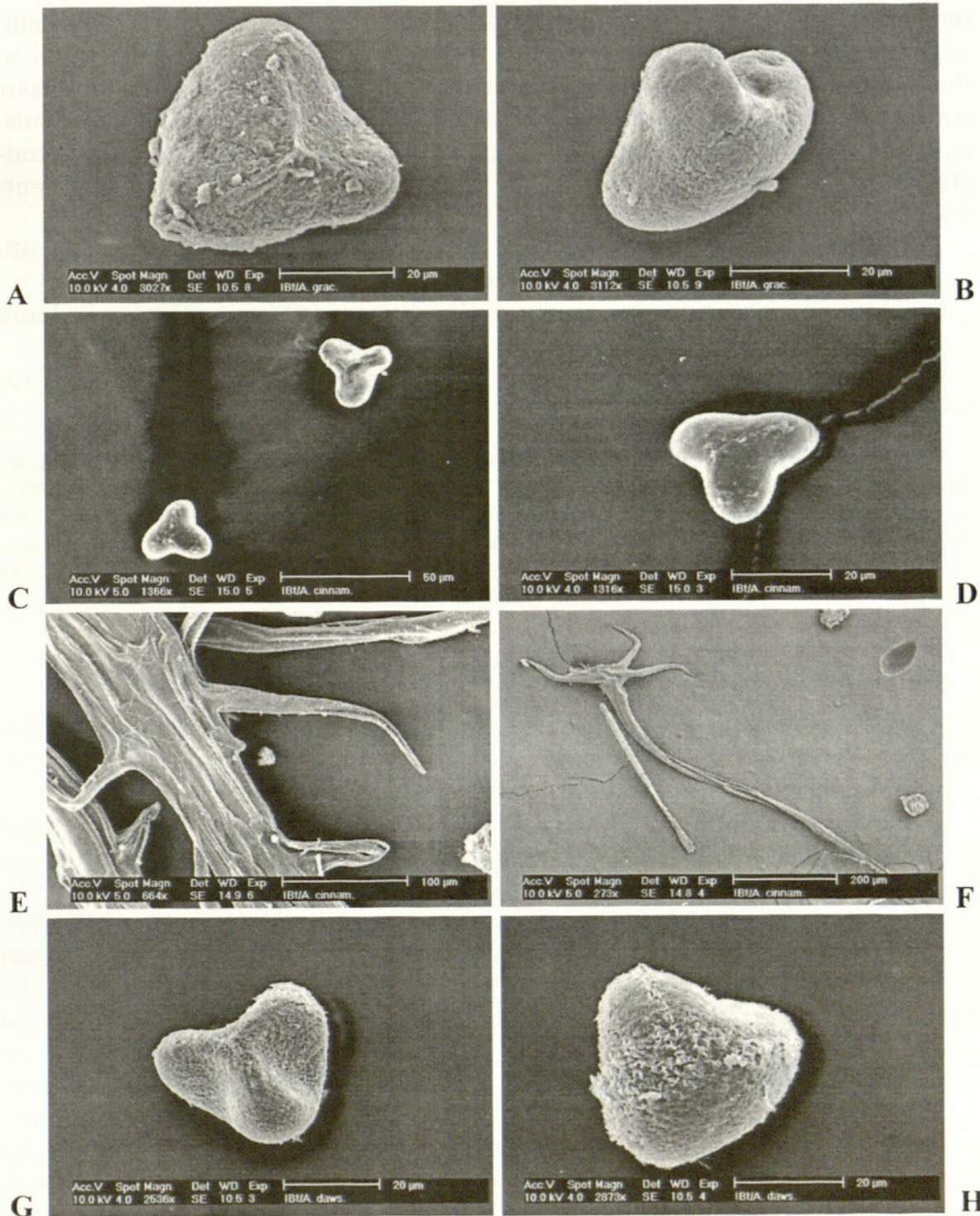


FIG. 1. Scanning electron micrographs of *Adiantum*. FIGS. 1A–B. Proximal and lateral/distal views of *A. gracile* spores (Salino 393, UEC). FIGS. 1C–D. Overall and distal views of *A. cinnamomeum* spores (MacFarland *et al.* 283, holotype US). FIGS. 1E–F. Suprabasal portion of a rachis scale and an pseudoindusial scale of *A. cinnamomeum* (MacFarland *et al.* 283, holotype US). FIGS. 1G–H. Proximal and distal views of *A. dawsonii* spores (Dawson 14868, holotype US).

inconspicuous or nearly so, the abaxial surface of the pinnules glabrescent, with patent, sparse, toothed scales ca. 0.5 mm long but otherwise similar to those of the stipes, glands absent, the veins slightly prominulous, the idioblasts conspicuous; *sori* oblong, up to 7 or 8 per pinnule; pseudindusia glabrous, entire to erose; spores trilete, 25–30 μm in equatorial diameter, tetrahedral-globose without prolonged angles, the surface rugulate with a thin, fragmenting outer layer, and so sometimes appearing finely cristate.

TYPE: Brazil: *sin. loc.*, *Claussen s.n.* (P, Morton photo 2596, photos GH, SP; possible isotype US1148302 [*Claussen 177 ex C*]).

DISTRIBUTION: Endemic to central Brazil (Mato Grosso, Distrito Federal, and Goiás).

HABITAT: Slopes and stream banks in cerrado and campo vegetation, at ca. 50–850 m elevation.

SPECIMENS EXAMINED: **BRAZIL: Mato Grosso:** Sararé, RADAMBRASIL, Serra de Pedra (S. Aguapei), 59°25'W, 16°10'S, *Pires & Santos 16572* (UEC); Chapada dos Guimarães, Vêu-da-Noiva, *Verardo 23668* (SP, UEC), same locality, *Salino 393*, 500 m (UEC), same locality, *Hatschbach 37628* (MBM, UC). **Goiás:** Ca. 1 km S of S. João de Aliança, ca. 850 m, *Irwin et al. 31972* (NY not seen, SP, US); Serra do Caiapó, 50 km S of Caiaponia, *Prance & Silva 59588* (GH, K, NY not seen, US). **Distrito Federal:** Brasília, *R. Windisch & Ghillány 253* (HB).

2. *Adiantum cinnamomeum* Lellinger & Prado, sp. nov. Figs. 1C–F, 2.

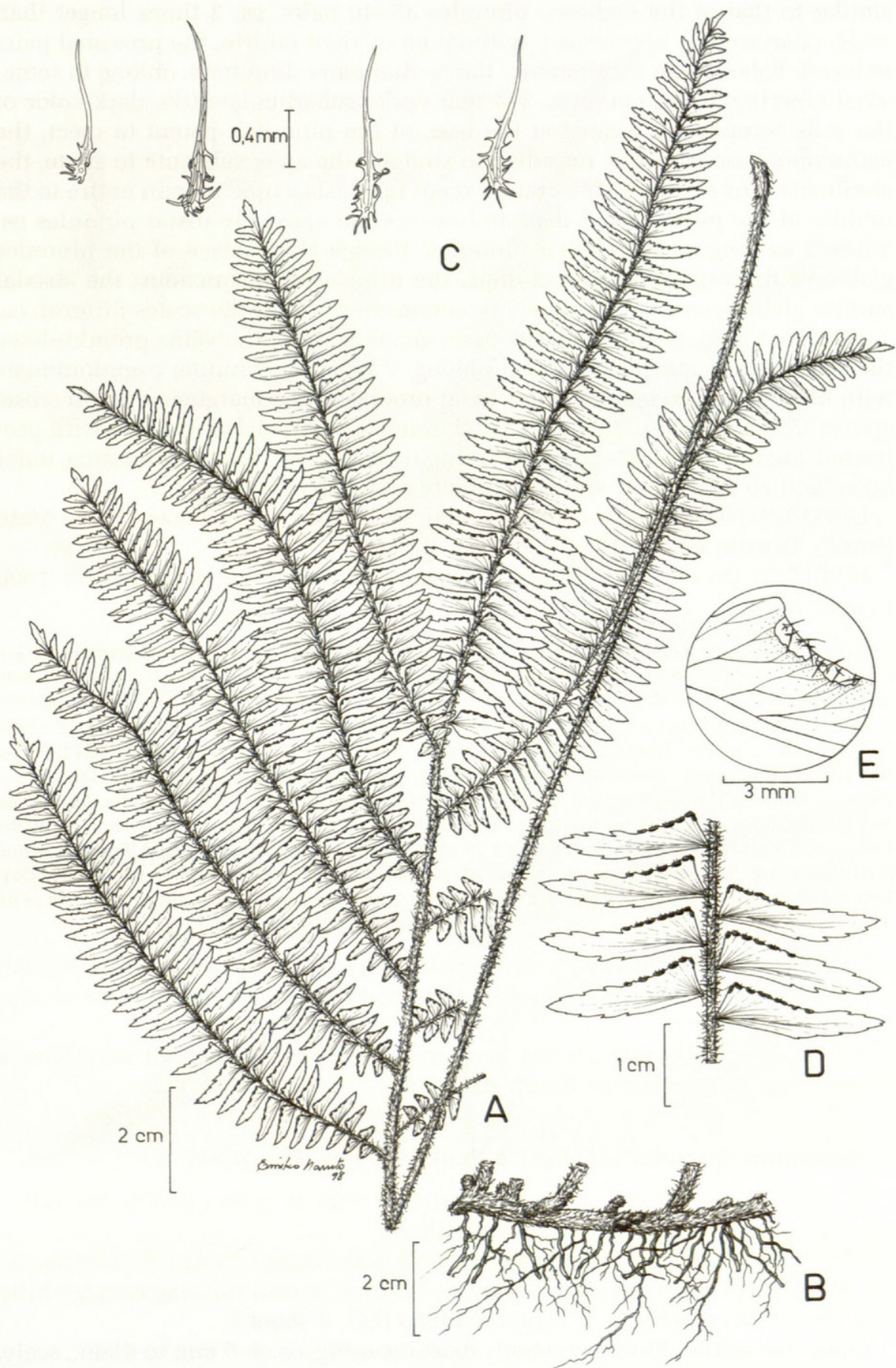
A specie *A. gracili* Fée paleis rhizomatis integris (vs. sparse denticulatis), pinnis 5–7 (vs. 8–10) jugatis patulis, pinnulis oblongis acuminatis, 3-plo (vs. 2-plo) longioribus quam latioribus differt.

TYPE: Brazil: Rondônia: 120 km SW of Pôrto Velho-Highway BR 364, 15 km W of Mibrasa, 9°10' S, 63°07'W, 29 May 1982, *McFarland et al. 283* (holotype US photo SP; isotypes BM, GH).

Plants terrestrial. Rhizomes stout, short-creeping, ca. 3 mm in diam. excluding the protuberances, scaly, the scales shiny, slightly bicolorous, dark brown to blackish, narrowly lanceate, the margins lighter and sparsely denticulate. Fronds erect, monomorphic, 2-pinnate, 35–65 cm long, the laminae 20–25 cm wide; stipes ca. 5 mm distant, black, adaxially sulcate, scaly, the scales appressed throughout or distally patent, concolorous, cinnamomeous, 4–5 mm long, linear-lanceate with a filiform apex, sometimes long-ciliate at the base, medially copiously toothed-ciliate; rachises more densely covered by scales than the stipes, the indument similar to that of the stipes; pinnae oblong-lanceolate, slightly decreasing at the base, tapering at the apex, 8–19 cm long, 2.0–3.5 cm wide, the lateral pinnae 5–7 pairs, patent, alternate, the terminal pinnae conform, 1–1.25 times longer than the subtending pinnae, ca. 1.33 times longer and wider than the medial pinnae, the indument of the costae

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FIG. 2. *Adiantum cinnamomeum*. FIG. 2A. Frond (*Steward et al. P20394*, US). FIG. 2B. Long-creeping rhizome (*MacFarland et al. 283*, US). FIG. 2C. Rachis scales (*MacFarland et al. 283*, US). FIGS. 2D–E. Abaxial surface of pinna and pseudindusia showing scales (*Irwin et al. 10180*, US).



similar to that of the rachises; pinnules 35–40 pairs, ca. 3 times longer than wide, chartaceous, free-veined, without an evident midrib, the proximal pairs reduced, flabellate to subrhombic, the medial pairs dimidiate, oblong to somewhat tapering, 0.5–2 cm long, 2–4 mm wide, subarticulate (the dark color of the stalk terminating almost at the base of the pinnule), patent to erect, the acroscopic base truncate, roundish to straight, the apex subacute to acute, the sterile margins serrate to biserrate, except the basioscopic margin entire to the middle of the pinnule and dentate towards the apex, the distal pinnules ca. 1/4–1/5 as long as the medial pinnules, the adaxial surface of the pinnules glabrous, the veins not prominulous, the idioblasts conspicuous, the abaxial surface glabrescent, with sparse, cinnamomeous scales, the scales filiform, ca. 1.0–1.5 mm long, pectinate at the base, glands absent, the veins prominulous, the idioblasts inconspicuous; sori oblong, 7 or 8 per pinnule; pseudoindusium with filiform scales, bearing short basal processes, the margins entire to erose; spores trilete, 25–30 μm in equatorial diameter, tetrahedral-globose with prolonged angles, the surface sparsely rugulate with a thin, fragmenting outer layer, and so sometimes appearing finely and sparsely cristate.

DISTRIBUTION: North-central Brazil (Rondônia, Amazonas, Pará, Mato Grosso, Distrito Federal).

HABITAT: On clay soil, in open canopy and dense understory, at 50–1000 m elevation.

PARATYPES.—**BRAZIL: Rondônia:** Pôrto Velho to Cuiabá Highway, vicinity of Santa Bárbara, 15 km E of Km. 1117, *Prance & Ramos 7157* (NY, UC). **Amazonas:** Manaus-Caracará Highway, Km. 160, *Steward et al. P20394* (BM, MO, NY, US); Manaus-Caracará Highway, Km. 185, *Prance et al. 22691* (MO, NY, US); Rio Javari between Estirão do Equador and Rio Javarizinho, *Prance et al. 24046* (NY, UC); Manaus, Rio Araras, SIDERAMA, *Loureiro et al. s.n.* (GH); Manaus, *Pivetta 254* (HRCB); Barra, Prov. Rio Negro, *Spruce s.n.* (GH, US). **Pará:** Município de Oriximiná, Rio Trombetas, estrada da Mineração Santa Patrícia, ramal 22, *Cid et al. 1441* (NY, US); Rio Jamundá, Município de Faro, São Jorge, *Black & Ledroux 50-10761* (HB). Mato Grosso: Vila Bela da Santíssima Trindade, Faz. Cabixi, junto ao Rio Cabixi, 13°S, 60°10'W, ca. 12 km da divisa com Rondônia, *Prado & Salino 8* (HB, SPF, UEC). **Distrito Federal:** Parque Municipal do Gama, *Irwin & Soderstrom 5884* (NY, US); *Irwin et al. 10180* (GH, K, MO, NY, US); Brasília, Reserva Ecológica do IBGE, *Heringer et al. 3767* (MBM).

Adiantum cinnamomeum is distinguished by its long, narrow pinnules that are acuminate to acute at the apex, presumably because the sori are always lateral.

Adiantum cinnamomeum has been found only in Brazil, but may have a wider range in Amazonian South America.

3. *Adiantum dawsonii* Lellinger & Prado, sp. nov. Fig. 1G–H, 3.

A specie *A. gracili* Fée pinnulis adaxialiter glaucis, paleis paucis vel nullis, glandulis rotundis sessilibus luteolis differt.

TYPE: Brazil: Goiás: Southern Serra Dourada region, 20 km E of Formoso, 48°50'W, 13°45'S, on banks and margins of small stream running through hilly cerrado, 16 May 1956, *E. Y. Dawson 14868* (US, 2 sheets).

Plants terrestrial. Rhizomes stout, short-creeping, ca. 4–5 mm in diam., scaly,

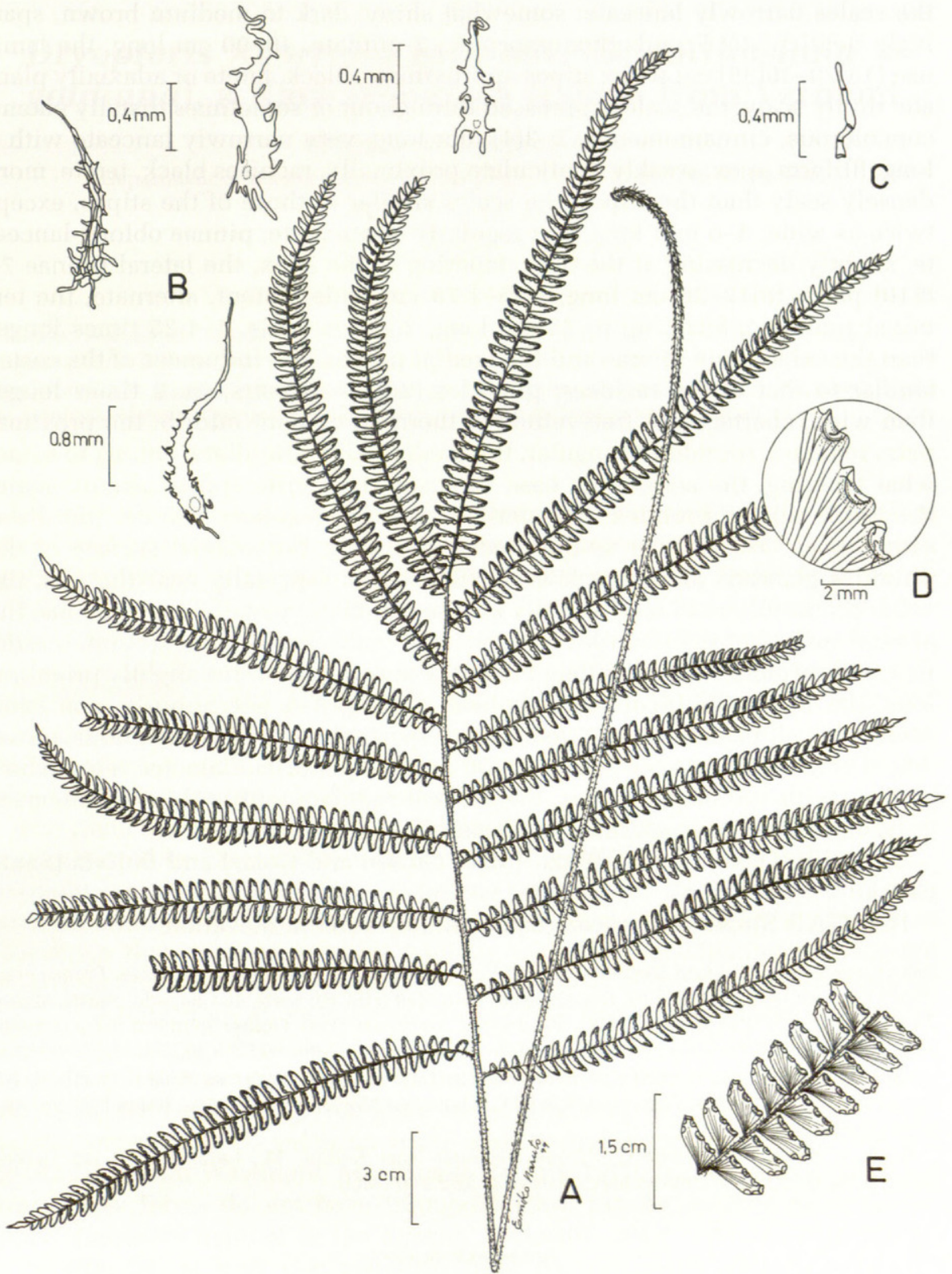


FIG. 3. *Adiantum dawsonii* (Dawson 14868, US2291503). FIG. 3A. Frond. FIG. 3B. Rachis scales. FIG. 3C. Pseudoindusial trichome. FIG. 3D. Pseudoindusia showing trichomes. FIG. 3E. Abaxial surface of pinnae.

the scales narrowly lanceate, somewhat shiny, dark to medium brown, sparingly denticulate. Fronds monomorphic, 2-pinnate, 40–90 cm long, the laminae (15)20–30(35) cm wide; stipes approximate, black, terete or adaxially planate, thinly scaly, the scales appressed throughout or sometimes distally patent, concolorous, cinnamomeous, 2–3(4) mm long, very narrowly lanceate with a long, filiform apex, weakly denticulate proximally; rachises black, terete, more densely scaly than the stipes, the scales similar to those of the stipes, except twice as wide, 3–6 mm long, and regularly denticulate; pinnae oblong-lanceate, slightly decreasing at the base, tapering at the apex, the lateral pinnae 7–8(10) pairs, (8)12–20 cm long, 1.25–1.75 cm wide, patent, alternate, the terminal pinna conform, up to 22 cm long, 2.25 cm wide, 1–1.25 times longer than the subtending pinnae and the medial pinnae, the indument of the costae similar to that of the rachises; pinnules (20)35–55 pairs, ca. 2 times longer than wide, chartaceous, free-veined without an evident midrib, the proximal pairs reduced, rounded-triangular, the medial pairs dimidiate, oblong to somewhat tapering, the acroscopic base truncate, the sterile apices usually acute, the fertile apices rounded, the sterile margins irregularly serrate, the distal pinnules ca. 1/3 as long as the medial pinnules, the adaxial surface of the pinnules glabrous or with a few hairlike scales, especially near the sori, the veins prominulous to only slightly so, the idioblasts usually conspicuous, the abaxial surface of the pinnules glaucous, the scales few or none, round, sessile, pale yellow glands often scattered over the surface, the veins slightly prominulous, the idioblasts inconspicuous; sori oblong, 3–5 per pinnule, one commonly apical; pseudoindusia glabrous or sparingly catenate-pilosulous, erose-ciliate at maturity; spores trilete, 25–30 μm in equatorial diameter, tetrahedral-globose with prolonged angles, the surface rugulate with a thin, fragmenting outer layer, and so sometimes appearing finely cristate.

DISTRIBUTION: Central Brazil (Mato Grosso and Goiás) and Bolivia (Santa Cruz).

HABITAT: Slopes and stream banks at 500–1300 m elevation.

PARATYPES.—**BRAZIL: Mato Grosso:** Gorge of Veu de Noiva, Chapada dos Guimarães, *Prance et al.* 19082 (NY not seen, R, UC, US), *Guarim Neto et al.* 459 (HRCB); Serra da Chapada, Buriti, *Malme Regn. Exped. I* 1712 (S not seen, US); *sin. loc.*, *H. Smith s.n.* (US). **Goiás:** Southern Serra Dourada region, 20 km E of Formoso, 48°50'W, 13°45'S, *E. Y. Dawson* 14869 (US); Chapada dos Veadeiros, 1 km E of Alto Paraíso on road to Nova Roma, ca. 1300 m, *W. R. Anderson* 6305 (GH, HB, K, NY not seen, US); Rio Areias, *Glaziou* 22636 (NY, P not seen Morton photo 2589a, fragm US); *sin. loc.*, *Glaziou* 15726 (UC, US).

BOLIVIA: Santa Cruz: Velasco, Parque Nacional Noel Kempff M., Campamento Las Gamas, 14°48'00"S, 60°23'00"W, 900 m elev., *Arroyo & Keil* 200 (MO).

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