

STUDIES OF TROPICAL AMERICAN FERNS—NO. 2.

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INTRODUCTION.

The following paper is in continuation of "Studies of tropical American ferns," of which the first number was published in volume 10^a of the Contributions from the U. S. National Herbarium, and is along the lines indicated in the introduction to that number.

NOTES UPON FERNS RECENTLY COLLECTED IN GUATEMALA BY BARON VON TÜRKHEIM, WITH DESCRIPTIONS OF SEVERAL NEW SPECIES.

At intervals during the past year and more the writer has examined with great interest a considerable number of well-prepared Guatemalan ferns, collected by Baron H. von Türkheim, mainly in the humid mountain region of Alta Verapaz. A large proportion of these, particularly of those first studied, were courteously forwarded for examination by Capt. John Donnell Smith, whose ferns, out of his entire herbarium presented to the Smithsonian Institution several years ago, have recently been incorporated in the U. S. National Herbarium. The other specimens, received directly from Baron von Türkheim, include a few not seen in Captain Smith's collection. Altogether, the plants are the most interesting series which it has been the writer's privilege to examine from any part of Central America, serving, as they do, to indicate a rather close relationship between the fern flora of eastern Guatemala and that of the similarly humid belt of eastern Mexico at mid-elevations—the latter a region not very adequately explored, at least for ferns, since Liebmann's time. Examples of this are found in the notable extension of range for *Diplazium ternatum*, known previously only from Oaxaca, Mexico, and in the additional material from Vera Cruz of several of the new species based upon Baron von Türkheim's specimens.

Another feature of interest is the rather large number of undescribed species now collected in the general region to which Baron von Türk-

^a Forming part 7 and including pages 473-508, plates 60 and 61. March 30, 1908.

heim has given so much careful exploration in years past; yet this need not surprise one who has even a slight knowledge of the country. During January, 1905, the writer, while engaged in economic work affording little time for collecting, passed a few days upon the southern and eastern borders of this region, traveling by water from Port Livingston to Panzos, thence overland to Sepacuité, Secanquim, Senahú and Actalá, in Alta Verapaz; thence by way of Purulhá out of the humid districts to the interior arid basin of Salamá. The greater part of Alta Verapaz is a rough mountainous region of intense humidity, largely covered, except in the neighborhood of coffee plantations and Indian villages, by extensive forests, offering the most ideal conditions for a luxuriant growth of ferns, both as to species and number of individuals. The fern flora will be found eventually to be scarcely if at all inferior to that of Jamaica, long regarded as one of the richest in America. A thorough and extended survey of this region, rather difficult of accomplishment owing to the long-continued rains which render the few trails at times almost or quite impassable, in connection with a similar exploration of Oaxaca and Vera Cruz at mid-elevations, is, so far as the ferns are concerned, perhaps the most desirable or even necessary fieldwork that can be undertaken at present in tropical North America.

As to the specimens here listed, Baron von Türckheim's labels invariably supply full data as to locality and altitude, and commonly as to habitat; but not infrequently the same number is given to specimens supposed to be of the same species collected at different times, even in different years; hence, to avoid error the date of collection is cited for each specimen listed below, in addition to the number and locality. These data pertain only to specimens in the U. S. National Herbarium. A few of the common species which were received under their proper name and a few others which offer no points of particular interest are omitted. Also, to obviate unnecessary duplication of data for those listed, the province is omitted in the case of Coban and Cubilquitz, both of these being in Alta Verapaz.^a All the numbers are of Baron von Türckheim's second series, as indicated by a roman II in each case.

MARATTIACEAE.

Danaea elliptica Sm.

II. 491. Foresta near Cubilquitz, altitude 350 meters, October, 1906.

A West Indian species, not reported from Mexico or Central America by Underwood.^b

^a Since the following list was prepared for publication an additional package of specimens has been received from Captain Smith. A large part of these are Hymenophyllaceae, which are not included in the following enumeration. There are besides several numbers indicated by Doctor Christ as representing undescribed species.

^b Bull. Torr. Club 29: 672. 1902.

Marattia weinmanniaefolia Liebm.

II. 2094. Near Coban, altitude 1,600 meters, January, 1908.

Agreeing perfectly with a type specimen of Liebmann's in the U. S. National Herbarium, collected in forests between Donaguia and Roayaga, Oaxaca, at an altitude of from 1,200 to 1,500 meters.

No. II. 2094 was distributed as *M. alata*.

SCHIZAEACEAE.**Lygodium** sp.

II. 1695. Above Panzal, Baja Verapaz, altitude 1,300 meters, April, 1907.

GLEICHENIACEAE.**Dicranopteris fulva** (Desv.) Underw. Bull. Torr. Club **34**: 255. 1907.

Mertensia fulva Desv. Mém. Soc. Linn. Paris **6**: 201. 1827.

II. 1313. Coban, altitude 1,350 meters, August, 1907.

Distributed as *Gleichenia pubescens* H. B. K.

CYATHEACEAE.**Alsophila bicrenata** (Liebm.) Fourn.

II. 1454. Forest near Cubilquitz, altitude 350 meters, October, 1906.

II. 2088. Coban, altitude 1,350 meters, January, 1908.

Dissimilar as these two numbers appear to be at first glance, there is little doubt that they are forms of the same species. They have been carefully compared with a type specimen of *bicrenata* in the National Herbarium, collected by Liebmann in Oaxaca. No. II. 2088 agrees with this rather more closely than does no. II. 1454, differing, however, in having the segments a little closer and the veins mostly several times forked. But these seem to be characters due to its lesser degree of fertility, for where it is fertile the veins are mostly once forked, as in the type specimen and in no. II. 1454. The presence of bullate scales upon the costæ and costulæ, apparently a variable character, is more pronounced in II. 2088, in which this number agrees perfectly with the type specimen.

Alsophila godmani Hook.

II. 1655. Coban, altitude 1,550 meters, March, 1907.

The present specimen, which is from the type locality, represents an uncommonly fertile state of the species, having 5 or 6 pairs of sori to each segment; otherwise it is like Captain Smith's no. 1007, which answers perfectly to the original description, having but a single pair of sori to each segment. No. 1007 is said to have come from Pansamalá, altitude 1,200 meters, August, 1886; but some of the specimens have the original label reading "Im Walde bei Coban; 4600'; Jan., 1888."

The species is apparently a variable one and must be studied in comparison with *A. bicrenata* (Liebm.) Fourn., or at least with the specimens passing under that name.

Alsophila salvinii Hook.

II. 2027. Mountain forests near Coban, altitude 1,600 meters, December, 1907.

Alsophila schiediana Presl.

II. 1455. Forests near Cubilquitz, altitude 350 meters, October, 1906. (Received under the name *Alsophila bicrenata* Fourn.)

Cibotium guatemalense Reich. f.

II. 2113. Río Frio, near Santa Cruz, Alta Verapaz, altitude 1,500 meters, February, 1908.

Captain Smith's no. 1505, collected at the same locality in April, 1889, is the same. Both were distributed as *Cibotium schiedii*.

Cyathea delicatula Maxon, sp. nov.*Alsophila delicatula* Maxon, in sched.

Trunk and stipe wanting; fronds relatively small, about 80 cm. broad, delicate, very deeply tripinnatifid; primary rachis unarmed, slight, the under surface greenish yellow, minutely puberulo-furfuraceous, glabrescent, the upper surface brownish olivaceous and very densely strigose with jointed beadlike closely appressed brownish hairs; pinnæ alternate, the largest 43 cm. long, 10 or 11 cm. broad, sessile, lanceolate, acuminate, comprising about 30 pairs of straight linear-lanceolate membranous spaced pinnules; secondary rachis delicate, flattened in drying, this and the costa of the pinnules very densely strigose above like the main rachis, minutely glandular-pubescent below; pinnules 5.5 to 6 cm. long, 7.5 to 9 mm. broad, cut nearly to the costa into about 20 pairs of narrowly oblong nearly straight unequally rounded or subacute segments; segments 4 to 5 mm. long, about 2 mm. broad at the middle, the sinuses acute, the margins lightly crenate-serrulate in the outer part, the costulae sparingly pubescent, bearing also numerous ovate acuminate bullate reddish brown scales; veins about 7 or 8 pairs to each segment, sometimes simple but mostly once forked at a slight angle, concealed, setulose; sori relatively large, 5 or 6 pairs, nearer the midvein than the margin, seated at the fork of the veins; indusium hyaline, very delicately membranous, bursting irregularly, evanescent, or the inferior portion subsistent as a shallow scale; receptacle small, slightly elevated, hirsute.

Type in the U. S. National Herbarium, no. 826192, collected at the summit between Tactic and Coban, Alta Verapaz, Guatemala, at an altitude of 2,000 meters, by Baron H. von Türckheim, no. II. 1629, February, 1907.

Cyathea delicatula, which is known only from the type collection, appears to be without any very close allies. The most noteworthy features are its very narrow elongate spaced pinnules and the copious bullate scales covering the costa of the segments.

Cyathea mexicana Schlecht.

II. 2108. Forest near Coban, altitude 1,200 meters, February, 1908.

Cyathea mexicana, known hitherto only from Mexico, is represented by a fair series in the National Herbarium. The pinnules are uniformly at right angles and are readily separable from the secondary rachis.

Cyathea tuerckheimii Maxon, sp. nov.

Trunk and stipe wanting; fronds apparently ample, at least 130 cm. broad, very deeply tripinnatifid; primary rachis yellowish brown below, very densely furfuraceous with minute deciduous yellowish brown scales and armed with numerous short (1 to 1.5 mm.) straight erect spines, tuberculate and glabrate with age; pinnæ 65 cm. long, 25 cm. broad, petiolate (1.5 cm. or more), lanceolate, acuminate, the secondary rachis spinescent, clothed like the primary rachis; pinnules 11 or 12 cm. long, 1.7 to 2 cm. broad above the base, about 28 to 30 pairs below the deeply serrate apex, short-petiolate (the lower ones 4 or 5 mm.), contiguous, narrowly lanceolate, attenuate, borne at a right angle or those toward the base slightly retrorse, all very deeply serrate (nearly to the costa); costa of the pinnules yellowish brown with a few minute short hairs and numerous very caducous glossy dark brown ovate-lanceolate attenuate erose scales about 2 mm. long; segments about 20 to 22 pairs, narrow, 10 to 12 mm. long, 3 to 3.5 mm. broad, falcate, the basal ones separate, the others somewhat dilatate and connected by a narrow wing, the margins simply crenate-serrate, revolute in drying, especially toward the subacute apex, the costules clothed similarly to the costæ, but the scales lighter in color (yellowish brown), triangular-ovate, long-acuminate, somewhat bullate, with a few stout curved septate whitish hairs intermixed; veins of the segments about 10 or 11 pairs, forked near the base, elevated, glabrate; sori large, yellowish, 6 to 9 pairs, occupying two-thirds or more of the segment, seated at the forking of the veins, the receptacles conspicuous; indusia membranous, rupturing irregularly, subsistent.

Type in the U. S. National Herbarium, no. 826195, collected near Coban, Alta Verapaz, Guatemala, altitude about 1,350 meters, by Baron H. von Türckheim, no. II. 1645, February, 1907. Other specimens as represented in the National Herbarium are: Baron von Türckheim's no. II. 2031, collected between Coban and Tactic, at an elevation of 2,000 meters, December, 1907; and no. 1238 of Captain Smith's distribution, collected near Coban by Baron von Türckheim in April, 1887, and distributed as *Cyathea arborea*. No. II. 2031 seems to be from the base of a frond and has the pinnæ fully 2.5 cm. petiolate.

The relationship of *C. tuerckheimii* is with the Costa Rican *C. subaspera* Christ. From this it differs in its narrowly lanceolate or even linear-lanceolate approximate pinnules (these never elongate-deltoid, as in *C. subaspera*), and in having the costa of the pinnules and segments densely scaly. *C. subaspera* in all its forms is well marked by its long-petiolate distant pinnules, which are only closely furfuraceous and never otherwise chaffy.

POLYPODIACEAE.

Tribe ACROSTICHEAE.

Elaphoglossum catharinae Underw. sp. nov. in herb.

Rhizome stoutish, 7 to 9 mm. in diameter, assurgent, clothed toward the summit with a few small sparingly denticulate linear-lanceolate long-attenuate yellowish brown scales; fronds rather numerous (10 to 14), loosely cespitose, 9 to 21 cm. long. Foliar fronds considerably exceeding the sporophylls; stipe slender, 3 to 8 cm. long, stramineous or somewhat greenish, reticulate, densely clothed with spreading yellowish brown scales, these linear-subulate from a broader base, the margins closely involute; lamina firmly membranaceous, linear-oblong, 8 to 15 cm. long, 1 to 2 cm. broad, abruptly acute at the base, the apex gradually attenuate, the surfaces and margins sparsely clothed like the stipe; veins distant, simple or rarely once forked, usually in the outer part, falling far short of the margin, the apices much enlarged. Sporophylls 7 to 12 cm. long; stipe 6 to 9 cm. long, similar to that of the foliar frond; lamina 2 to 3.5 cm. long, about 1 cm. broad, oblong-lanceolate, broadest above the abruptly acute base, acutish at the apex, with numerous linear-lanceolate glossy reddish brown minutely denticulate somewhat imbricate scales scattered over the lower surface among the sporangia.

Type in the U. S. National Herbarium, no. 50579, collected by Baron H. von Türckheim, from tree trunks at Pansamalá, Alta Verapaz, Guatemala, altitude 1,200 meters, in August, 1886, and distributed by Captain Smith as no. 1003. Baron von Türckheim's no. II. 1944, from Coban, Alta Verapaz, altitude 1,350 meters, August, 1905, is the same in less mature condition, the sporophylls not well developed and the foliar fronds rather young and more membranous than in the type. According to Doctor Underwood's notes, specimens of this species at Kew were collected at Chilasco, Guatemala, by Salvin and Godman.

Elaphoglossum guatemalense (Klotzsch) Moore.

II. 1859. Coban, altitude 1,350 meters, September, 1907. Epiphytic.

II. 1939. Coban, altitude 1,350 meters, August, 1907. Epiphytic.

The present specimens, referred here with some doubt, have both fertile and sterile fronds actually and relatively longer and narrower than in the typical form of the species. The blades of the sporophylls especially are of unusual length (20 cm.) and taper very gradually to an attenuate base. The stipes measure from 20 to 25 cm. in length.

Specimens from Cubilquitz, altitude 350 meters, collected by Baron von Türckheim (no. II. 890) and distributed by Captain Smith as no. 8635, are apparently more typical of the species.

Elaphoglossum hirtum (Sw.) C. Chr.

II. 1863. Near Coban, altitude 1,350 meters, August, 1907.

Elaphoglossum hookerianum Underw. nom. nov. in herb.

Acrostichum muscosum Jenman, Bull. Bot. Dept. Jamaica II. 5: 88. 1898 (excluding reference to Plum. *pl.* 126), not *A. muscosum* Sw., 1788.

Acrostichum muscosum β *latifolium* Hook. Sp. Fil. 5: 231. 1864.

II. 1862. Coban, altitude 1,350 meters, August, 1907.

The following additional numbers are in the U. S. National Herbarium:

JAMAICA: Various localities in the Blue Mountains, at altitudes of from 1,650 to 2,100 meters, on tree trunks of humid forested slopes, *W. Harris* 7518; *Underwood* 3212; *Maxon* 1302, 1454, 2667, 2696, 2715.

GUATEMALA: Trail from Senahú to Actalá, Alta Verapaz, on a fallen tree trunk, *Maxon & Hay* 3314.

This species was mistakenly described by Jenman under the name "*Acrostichum muscosum* Sw.," while the true *A. muscosum* of Swartz was described by him as *A. lepidotum* Willd., a South American species which apparently does not occur in Jamaica.^a

The Jamaican and Guatemalan plants are identical. One of the most characteristic features is the large, upright rhizome, which attains a height of 10 to 12 cm. and a diameter of 2 cm. The long linear acuminate reddish-brown slender scales of the rhizome, mentioned by Jenman, are oftentimes obscured by the mass of large spreading tawny scales of the stipes. Associated with the large spreading scales of the stipe is a series of smaller scales, these closely appressed. The upper surface of the lamina becomes glabrous with age.

Elaphoglossum longifolium (Jacq.) J. Sm.

II. 1860. Coban, altitude 1,350 meters, August, 1907. Epiphytic.

Elaphoglossum petiolatum (Sw.) Urban.

II. 1943, in part. Coban, altitude 1,350 meters, September, 1907.

II. 1945. Coban, altitude 1,350 meters, August, 1907.

II. 2386. Coban, altitude 1,350 meters, June, 1908.

These specimens accord well with a considerable series of the typical Jamaican plant in the U. S. National Herbarium: *Maxon* 1323, 2648, 2668, 2717, *Clute* 312, these from various localities in the Blue Mountains, at an altitude of from 1,650 to 1,800 meters.

The second portion of no. II. 1943 is *E. rubescens*.

Elaphoglossum rubescens (Kuhn) Christ.

II. 1503. Coban, altitude 1,350 meters, September, 1906.

II. 1941. Coban, altitude 1,350 meters, August, 1907.

II. 1946. Coban, altitude 1,350 meters, August, 1907.

II. 1943, in part. Coban, altitude 1,350 meters, September, 1907.

Known only from Guatemala; represented in the U. S. National Herbarium by the following additional numbers, all from Alta Verapaz:

Trail between Sepacuité and Secanquim, altitude 550 to 900 meters, rocky bank at border of forest, *Maxon & Hay* 3120; on a tree trunk, *Maxon & Hay* 3235.

Secoyoté, near Senahú, on a decayed stump, *Maxon & Hay* 3247.

In size, shape, and vestiture the series of specimens cited show a wide range of variation, due mostly to varying habitat, age, and degree of maturity.

Elaphoglossum tovarense (Mett.) Moore.

II. 1858. Coban, altitude 1,350 meters, July, 1907. Epiphytic.

II. 1940. Coban, altitude 1,350 meters, August, 1907. Epiphytic.

^a *Acrostichum muscosum* Sw. was founded on Plumier's plate 139, but this figure is cited wrongly by Jenman as representing *A. lepidotum* Willd. Plate 126, cited by Jenman as illustrating *A. muscosum*, had never before been associated with that name; it represents a Martinique plant showing some resemblance to *E. hookerianum*, but probably not the same.

The type is from Colombia, but Mexican specimens from Mirador and Orizaba are also mentioned in the original diagnosis. A specimen collected recently on the island of Margarita, off Venezuela, *Johnston* 146, is the same.

The name has definite standing only from 1869, when the first description was published.

Rhipidopteris peltata (Sw.) Schott.

II. 1022. Coban, altitude 1,350 meters, October, 1907. On tree trunks in forest.

Tribe VITTARIEAE.

Scoliosorus ensiformis (Hook.) Moore.

II. 1694. Panzal, Baja Verapaz, altitude 1,000 meters. Epiphytic in forest.

Regarded by Benedict,^a in his recent revision of the American species of *Antrophyum*, as constituting only a well-marked subgenus of *Antrophyum*; yet of very different appearance, and upon the several microscopic characters brought out (*i. e.*, spores diplanate, paraphyses present) differing from all the American species of *Antrophyum*.

Described originally from Mount Totontepeque, Mexico, and ranging from Mexico to Costa Rica. The synonymy is indicated by Benedict.

Vittaria filifolia Fée.

II. 1382. Coban, altitude 1,350 meters, November, 1907. Epiphytic, in forest.

II. 1689. Forests above Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

Both numbers have been determined by Mr. R. C. Benedict.

Tribe POLYPODIEAE.

Campyloneurum angustifolium (Sw.) Fée.

II. 2349. Coban, altitude 1,350 meters, May, 1908.

Campyloneurum tenuipes Maxon, sp. nov.

Fronds 4 or 5, erect, loosely clustered near the apex of the prostrate rhizome, very long-stipitate, 40 to 60 cm. long; rhizome woody, creeping, 10 to 20 cm. long, 8 to 10 mm. in diameter, copiously rooting below, above densely tuberculate, toward the apex thickly covered with spreading deltoid-lanceolate attenuate dark brown scales 5 to 7 mm. long; stipe relatively slender, 2 to 3 mm. in diameter, light brownish, glabrous, deeply sulcate along the ventral face, angled in drying, 18 to 25 cm. long; lamina firmly chartaceous, 25 to 40 cm. long, 5 to 7 cm. broad, linear-lanceolate, gradually narrowed to an acute or acuminate base, the apex very abruptly long-acuminate, the midvein slender, yellowish brown below and a little elevated, the margins repand-undulate, cartilaginous, minutely revolute; main veins 45 to 55 pairs, diverging at an angle of about 75 degrees, the middle ones 5 to 8 mm. apart, stramineous, subequally elevated upon both surfaces, slightly flexuous, extending almost to the margin; areoles 7 or 8, excepting the basal ones commonly divided by a median excurrent veinlet, this discontinuous or continuous with that of the next areole, 2 rows of minor areoles thus formed, each of them with a single small sorus dorsal upon the short included veinlet, the sori thus irregularly biserial between the main veins.

Type in the U. S. National Herbarium, no. 826269, collected from rocks in the forest near Coban, Alta Verapaz, Guatemala, altitude 1,350 meters, by Baron H. von Türckheim, no. II. 1952, September, 1907.

A remarkable species, combining to a considerable degree the characters of two very different groups. In venation it resembles *C. xalapense* of the same region rather closely, but differs widely in leaf form and especially in its long slender stipes, *C. xalapense* having short stipes and the lamina longer and narrower, gradually narrowed

^a Bull. Torr. Club 34: 445-458. 1907.

to an attenuate base, but at last abruptly cuneate; this last is one of the most distinctive marks of the species. In *C. tenuipes* the base of the lamina is evenly acute or acuminate to the end. In general leaf form and in its long slender stipes only, *C. tenuipes* resembles *C. sphenodes*, as understood by Doctor Christ, very closely; but from this it differs radically in venation and wholly in the characters of its rhizome, *C. sphenodes* having the areoles *not* divided by a secondary veinlet and the rhizome very slight (less than 2 mm. in diameter), sinuous and extensively creeping or climbing, essentially naked, and with the fronds widely spaced.

Campyloneurum xalapense Fée.

II. 1857. Coban, altitude 1,350 meters, June, 1907.

Goniophlebium acuminatum Fée, 11me Mém. Foug. 68. *pl. 19. f. 1.* 1866.

II. 1687. Panzal, Baja Verapaz, altitude 1,000 meters, April, 1907. Epiphytic.

The specimen referred here agrees well with Fée's plate and description. The tissue, though coriaceous, is uncommonly translucent; the veins are elevated. Known previously to the writer only from the West Indies, Guadeloupe, the type locality, and Jamaica (*Maxon 1022, 1918*).

Goniophlebium ciliatum (Willd.) J. Sm.; Hook. Gen. Fil. under *pl. 51.* 1840.

Polypodium ciliatum Willd. Sp. Pl. 5: 144. 1810.

II. 125. Cubilquitz, altitude 350 meters, July, 1907. Epiphytic.

Goniophlebium inaequale (Moore) J. Sm. Cult. Ferns 3. 1857.

Phlebodium inaequale Moore, Gard. Chron. 1855: 660. 1855, not *Polypodium inaequale* Ettingshausen, 1864, nor Fée, 1866.

Polypodium guatemalense Hook. Sp. Fil. 5: 29. 1863, not Klotzsch, 1855.

Polypodium lowei C. Chr. Ind. Fil. 326. 1905; 541. 1906.

II. 1827. Coban, altitude 1,350 meters, June, 1907. Epiphytic, in forest.

Known only from Guatemala, where it is not uncommon; usually listed under the invalid name *Polypodium guatemalense* Hook. If retained under *Polypodium*, Christensen's name must be adopted. The venation is peculiar and is illustrated by Moore, plate 58, figure 4. The plant is essentially a *Goniophlebium*, however; and Moore's name, though invalid under *Polypodium*, is available under the genus *Goniophlebium*.

Goniophlebium loriceum (L.) J. Sm.

II. 2037. Coban, altitude 1,350 meters, December, 1907. Epiphytic, in forest.

Goniophlebium sanctae-rosae Maxon, sp. nov.

Fronds several, close or scarcely 1 cm. apart, rigidly erect, 25 to 65 cm. long; rhizome very firm, short-creeping, prostrate, copiously rooting below, 5 or 6 mm. in diameter, the fronds borne upon very pronounced knob-like protuberances 3 to 4 mm. high, the whole rhizome very closely covered with persistent wholly appressed roundish or subovate dark rusty scales less than 1 mm. long, these attached at their large blackish centers, the lighter margins delicately and minutely fimbriate; stipes stout, 2 to 3 mm. in diameter, 8 to 28 cm. long, dark or light brown beneath a dense chaffy covering similar to that of the rhizome, the scales longer, often long-attenuate, copiously, deeply, and evenly fimbriate, the cilia approximate and wide-spreading; lamina 17 to 35 cm. long, 5.5 to 15 cm. broad, oblong to broadly oblong-lanceolate, not reduced at the base, the apex usually very abruptly reduced with a conform or elongate terminal pinna, or, rarely, gradually reduced, the uppermost pinnae 1 to 1.5 cm. long, the terminal segment nearly equal; rachis clothed below like the stipe, the scales mostly long-attenuate; pinnae 14 to 38 pairs, straight, horizontal or slightly ascending, linear, entire, 2.5 to 8 cm. long, 5 to 7 mm. broad (appearing narrower from the narrowly involute margins), slightly dilatate at the base, mostly a little surcurrent, the upper ones also decurrent, their bases adjoining, the lower ones distinct; up to 1 cm. apart, their bases unequal, invariably surcurrent, horizontally

excised below; pinnæ very densely covered below with appressed imbricate tawny scales, these very long-attenuate from a small subovate fimbriate darker-centered base, wholly concealing the leaf-tissue, above hoary with scattered whitish ciliate scales, these filiform from a deeply stellate roundish base; venation distinctly and typically goniophleboid, a single row of narrow oblique areoles upon either side of the slender blackish costa, deeply immersed and otherwise wholly concealed by the scales; sori small, inconspicuous, 20 to 30 or more pairs, inframedial, terminal upon the single included veinlets.

Type in the U. S. National Herbarium, no. 826189, collected from rocks and the trunks of oaks near Santa Rosa, Baja Verapaz, Guatemala, altitude about 1,600 meters, by Baron H. von Türckheim, no. II. 1607, December, 1906. Other specimens from the same locality sent later under the same number were gathered in March, 1908.

The present is only one of a considerable number of more or less closely allied tropical American species, several of them of rather wide distribution, and most of them commonly misunderstood. It is related to the Costa Rican *P. myriolepis* Christ, which has been most injudiciously reduced to *P. skinneri* Hook. The last, of which *P. bernouillii* Baker is a true synonym, was described and figured upon Guatemalan specimens and appears to extend only northward into Mexico. The distinctive characters of these and of several others, some of them as yet undescribed, will be indicated in the next paper of this series.

Phlebodium pulvinatum (Link) J. Sm.

II. 1881. Coban, altitude 1,350 meters, June, 1907.

Polypodium biauratum Maxon, sp. nov.

Fronde rigid, about 90 cm. long, borne about 1.5 cm. apart; rhizome reptant, 8 to 10 mm. thick, covered closely with small triangular-ovate centrally attached yellowish scales, these dark brown at the short apex; stipe stout, 33 to 37 cm. long, about 2.5 mm. in diameter, yellowish to yellowish brown, glabrescent; lamina elongate triangular-ovate, about 60 cm. long, 34 to 36 cm. broad in the lower half, comprising about 25 pairs of patent simple, mostly subopposite, linear-ligulate pinnæ; lowermost pinnæ subcordate at the base, mostly free at the inferior basal margin and overlapping the rachis, partially adnate at the superior basal margin, the middle pinnæ slightly longer, partially adnate below, wholly so above, the upper pinnæ gradually reduced, adnate and somewhat dilatate at the base, finally forming a deeply serrate elongate caudate apex about 1 cm. long; characteristic pinnæ of the lower third of the lamina 16 to 20 cm. long, 15 to 18 mm. broad, dull greenish, translucent, fragile, papyraceo-herbaceous, broadest in the basal third, tapering thence very gradually toward the somewhat attenuate subacute apex, at the base usually more or less constricted (especially below) with a small rounded auricle both above and below, the margins otherwise irregularly, but invariably crenate, ciliate; rachis and upper surface of the midveins conspicuously pubescent with very close-set light yellowish jointed glandular hairs, the midvein below less noticeably pubescent, the veins glabrate; sori uniserial, superficial, about 45 to 50 pairs, considerably nearer the margin than the midvein, borne at the extremity of the first anterior branch of the dark mostly twice or thrice forked oblique evident veins.

Type in the U. S. National Herbarium, no. 826213, collected in the forest between Purulhá and Panzal, Baja Verapaz, Guatemala, at an altitude of 1,500 meters, by Baron H. von Türckheim, no. II. 1688, April, 1907. Imperfect specimens collected in the District of Córdoba, State of Vera Cruz, Mexico, by Hugo Fink (no. 70), are apparently a smaller state of the same species.

Polypodium biauratum has the free venation of the true *Polypodiums*, yet shows considerable resemblance to the species described by Hooker as *P. (Goniophlebium) plectolepis*. From this it is distinguished readily not only by venation, but also by its adnate pinnæ and by having the sori borne much nearer to the margin than to the costa, this last being an unusual feature.

Polypodium christensenii Maxon, sp. nov.

Fronds large, 1 to 1.2 meters long, densely glandular-pubescent throughout, borne singly, 2.5 cm. apart; rhizome firm, creeping, 8 mm. in diameter, very thickly covered with spreading ferruginous scales, these most numerous at the base of the stipe, 9 to 14 mm. long, narrowly ovate to ovate, long-acuminate, attached near their base, the margins subentire, involute in the long-attenuate apical portion; stipe about 33 cm. long, stout, 3 to 4 mm. in diameter, dark brown, densely glandular-pubescent, the upper face deeply sulcate; lamina herbaceous, about 85 cm. long, 35 to 40 cm. broad at or just above the base, lanceolate-deltoid, once pinnate throughout, the pinnæ (about 35 pairs) whitish glandular-pubescent upon both surfaces, more conspicuously so upon the upper; basal pair of pinnæ deflexed, distant, 17 to 19 cm. long, 17 mm. broad in the middle, slightly narrowed toward the adnate base, tapering gradually in the outer part to a subacute apex, the margins irregularly crenulate-serrulate; succeeding pinnæ similar, at least their width apart, subopposite, horizontal, fully adnate, slightly longer than the basal or not, those of the upper two-thirds of the lamina very gradually shorter and a little closer, slightly dilatate, but neither surcurrent nor decurrent, the sinuses wide and obtuse, the apex of the lamina deeply pinnatifid almost to the end; rachis and costæ densely glandular-pubescent, the latter elevated below; veins free, 45 to 48 pairs, dark-colored, 4 or mostly 5-forked, the branches divergent, glandular-pubescent like the costa, the leaf tissue also minutely glandular-pubescent below; sori superficial, 40 to 45 pairs, large, borne mostly upon the first anterior branches, casually also upon the first posterior and second anterior branches, thus imperfectly uniserial, inframedial.

Type in the U. S. National Herbarium, no. 591558, collected in the mountains near Coban, Alta Verapaz, Guatemala, at an elevation of 1,600 meters, by Baron H. von Türckheim, no. II. 2179, in March, 1908. Specimens long ago distributed by Captain Smith under no. 3263c, from San Miguel Uspantán, Quiché, Guatemala, altitude 1,800 meters, are the same.

Related to *P. biauratum*, above described, from which it differs not a little in its differently shaped lamina and pinnæ, its more freely branched veins, its more general pubescence, its different margins, and its attenuate, spreading chaff. In general appearance and marked pilosity it suggests rather *P. macrodon* Hook. (*P. legionarium* Baker) of the same region, a species invariably with sessile, deeply and regularly incised pinnæ and a long conform terminal segment. *P. christensenii* is one of the most distinct and probably the largest species of the subgenus Eupolypodium, as commonly understood; it is named in honor of Mr. Carl Christensen, of Copenhagen, in grateful appreciation of numerous courtesies extended to the writer.

Polypodium cultratum Willd.

II. 2034. Between Tactic and Coban, Alta Verapaz, altitude 1,800 meters, December, 1907. Epiphytic.

Polypodium fallax Cham. & Schlecht.

II. 85. Cubilquitz, altitude 350 meters, July, 1907. Epiphytic.

Polypodium furfuraceum Schlecht. & Cham.

II. 31. Cubilquitz, altitude 350 meters, July, 1907.

Polypodium leucosticton Kunze.

II. 1397. Coban, altitude 1,350 meters, October, 1907.

The synonymy and range of variation of this species has recently been given at some length by Hieronymus,^a who cites numerous South American specimens. *Polypodium plebeium* variety *palmense* Christ.^b is the same, as shown by a specimen from the type locality: La Palma, Costa Rica, altitude 1,450–1,550 meters, Maxon 449.

So far as the writer knows, the species has not been known hitherto from Guatemala.

^a Engler's Bot. Jahrb. 34: 521, 522. 1904.

^b Bull. Herb. Boiss. II. 5: 4. 1905.

***Polypodium macrodon* Hook.**

II. 1686. Panzal, Baja Verapaz, altitude 1,000 meters, April, 1907.

II. 1929. Coban, altitude 1,350 meters, September, 1907.

The type of this species is from the vicinity of Coban, from which locality specimens have been examined by the writer.^a Considerable additional material has recently been received from Alta Verapaz.

***Polypodium minusculum* Maxon, sp. nov.**

A small epiphytic plant with about 6 entire rigid stipitate deflexed spongiose-coriaceous fronds, 6 to 9.5 cm. long; rhizome erect, 1 cm. or less high, about 3 mm. in diameter, the crown clothed with numerous lanceolate yellowish brown scales 2 to 2.5 cm. long; stipe dull brownish, slender, wiry, less than 0.5 mm. in diameter, 2 to 3.5 cm. long, arcuate, thickly clothed with erect spreading reddish castaneous hairs about 1 to 1.5 mm. long; lamina light or yellowish green, 4 to 6 cm. long, about 0.8 to 1 cm. broad, oblanceolate, tapering in both directions, the apex obtuse or subacute, the base acutely cuneate, both surfaces and the margins ciliate, the hairs like those of the stipe but frequently longer, those of the surface sometimes attaining a length of 2 mm.; margins entire or rarely somewhat sinuate; midvein concealed, flexuose; veins 15 to 20 pairs, 4 or 5 times forked, wholly concealed in the spongiose tissue, but easily apparent by transmitted light, the tissue then very translucent; sori superficial, orbicular or broadly oval, $\frac{1}{4}$ to nearly 1.5 mm. broad at maturity, borne usually at or near the end of both the superior and inferior basal branches (occasionally also upon the outer branches), thus disposed in two irregular lines, one on each side of the midvein and mostly nearer to this than to the margin.

Type in the U. S. National Herbarium, no. 579065, collected upon a tree trunk in mountains near Coban, Alta Verapaz, Guatemala, at an altitude of 1,600 meters, by Baron H. von Türckheim, no. II. 1987, November, 1907. Known only from this collection.

P. minusculum is a diminutive member of the group of *P. trifurcatum* and finds its nearest ally in the Jamaican *P. nesioticum*. From this it differs in its smaller stature, short oblanceolate laminae, more general hairy covering, nearly or quite entire margins, concealed midvein, and in several less obvious characters.

***Polypodium plebeium* Cham. & Schlecht.**

II. 1256. Coban, altitude 1,350 meters, June, 1907. Epiphytic.

***Polypodium polypodioides* (L.) A. S. Hitchc.**

II. 2135. Coban, altitude 1,350 meters, February, 1908.

II. 2213. Sasis, Alta Verapaz, altitude 1,000 meters, May, 1908.

***Polypodium productum* Maxon, sp. nov.**

A slender wiry plant, with numerous close-set very narrow elongate deeply arcuate simply pinnate fronds 20 to 35 cm. long; rhizome short-creeping, the apical portion exposed and thickly covered with numerous light brown iridescent lanceolate divergent scales 3 to 3.5 mm. long, the apices long-attenuate, filiform, fragile, the cells broad with greatly thickened blackish brown cell walls; stipe slender, about 0.5 mm. in diameter, 2 to 3.5 cm. long, dull light brownish, with a close hispid covering of jointed yellowish brown hairs, these mostly short, unequal, and irregularly spreading; lamina very narrow, strongly arcuate or sometimes recurved, 18 to 32 cm. long, 12 to 15 mm. broad, comprising about 90 to 100 or more pairs of membrano-coriaceous translucent spaced glabrous pinnæ, the 3 or 4 lowermost pairs evident only as very minute triangular prominences upon the dull blackish brown hispid or glabrous rachis, those above gradually (within a distance of 3 or 4 cm.) attaining the characteristic linear-oblong form, the upper pinnæ decreasing very gradually into a long regularly serrate

^a Contr. Nat. Herb. 8: 275. 1903.

produced apex; characteristic middle pinnae 7 to 9 mm. long, about 1.5 mm. broad, spaced their own width, forming an acute angle of about 45° with the rachis, straight, linear-oblong with entire slightly reflexed margins, at the apex obtuse (sometimes subacute in drying), at the base fully adnate, slightly dilatate both above and below, with obtuse sinuses, the rachis not alate; midvein dark, evident below, nearly straight, with about 6 pairs of acute simple greenish mostly soriferous veins, the clavate apices reaching the upper surface and there evident as reddish brown medial dots; sori superficial, about 6 pairs, distinct, small, slightly nearer the midvein than the margin, near the end of the veins; sporangia glabrous; paraphyses or intermixed hairs none.

Type in the U. S. National Herbarium, no. 579,036, collected from tree trunks in the forest near Coban, Alta Verapaz, Guatemala, at an altitude of 1,350 meters, by Baron H. von Türckheim (no. II. 1347, in part), November, 1907. Mixed with this are specimens of what appears to be a form of *Polypodium rigens* Maxon, a species reported hitherto only from Jamaica. This is distinguished readily by its stouter rhizome, its more conspicuous, larger, more abundant and straighter chaff, its stouter stipes, these covered with long stiff reddish hairs, its broader and relatively shorter laminae, usually long-caudate at the apex, and its opaque, broader, and more rounded pinnae, these borne nearly at right angles to the rachis and reduced more abruptly at the base of the lamina.

Polypodium productum is known also from Baron von Türckheim's no. 53, in part, distributed by Captain Smith, from the same locality. Mixed with it, however, are plants of *P. rigens*, mentioned above, and of another species even less closely allied to *P. productum*, and apparently undescribed.

In relationship *P. productum* stands somewhat apart. It is not, strictly, a member of the *pilosissimum* group, *P. pilosissimum* itself being a species little collected and not well understood. In size and general appearance *P. productum* bears a close resemblance to a species of an entirely different group, namely *P. jubiforme* Kaulf., from which it differs in its superficial sori, in its spaced, scarcely decurrent, and more fertile pinnae (the sori not confined to the outer portion), and in numerous more technical characters.

***Polypodium rigens* Maxon.**

II. 1347, in part. Coban, altitude 1,350 meters, November, 1907. Epiphytic.

Described originally from Jamaica and not hitherto reported from Central America.

***Polypodium suspensum* L.**

II. 2270. Coban, altitude 1,600 meters, May, 1908.

***Polypodium trichomanoides* L.**

II. 2383. Coban, altitude 1,350 meters, May, 1908.

***Xiphopteris serrulata* (Sw.) Kaulf.**

II. 1261. Coban, altitude 1,350 meters, November, 1907. Epiphytic.

Tribe PTERIDEAE.

***Adiantum capillus-veneris* L.**

II. 1681. Panzal, Baja Verapaz, altitude 1,000 meters, April, 1907. On rocks in small streams.

II. 2074. Under a waterfall between Tactic and Coban, Alta Verapaz, altitude 1,600 meters, December, 1907.

***Adiantum concinnum* H. & B.**

II. 2075. Near San Cristobal, Alta Verapaz, altitude 1,400 meters, in moist, shady situations, December, 1907.

***Adiantum dolosum* Kunze.**

II. 50. Cubilquitz, altitude 350 meters, July, 1907.

Adiantum flexuosum Hook.

II. 1191. Coban, altitude 1,350 meters, August, 1907; in crevices of rocks.

Received under the name *A. féei* Moore, a Mexican species from which it is quite distinct, as indicated by Christensen. Collected also on dryish banks in the region of pines and oaks near Purulhá, Baja Verapaz, Guatemala, *Maxon* 3371.

Bommeria pedata (Sw.) Fourn.

II. 2327. Patal, near Santa Rosa, Baja Verapaz, altitude 1,600 meters, July, 1908.

Cheilanthes farinosa Kaulf.

II. 1568. Near Tactic, Alta Verapaz, altitude 1,600 meters, February, 1908.

Histiopteris incisa (Thunb.) J. Sm.

II. 1535. Upon the height between Coban and Tactic, Alta Verapaz, altitude 2,000 meters, December, 1907, and March, 1908. Rare.

A widely distributed collective species, greatly in need of critical revision.

Pellaea intramarginalis (Kaulf.) J. Sm.

II. 2177. Near Santa Rosa, Baja Verapaz, altitude 1,600 meters, upon rocks, March, 1908.

Pteris deflexa Link.

II. 1560. Upon the height between Tactic and Coban, Alta Verapaz, altitude 2,000 meters, February, 1908.

Determined by Doctor Christ.

Pteris mexicana (Fée) Fourn.

II. 1235. Coban, altitude 1,350 meters, December, 1907.

Received as *P. pulchra* Schlecht.

Pteris orizabae Mart. & Gal.

II. 2109. Caucale, near Coban, altitude 1,200 meters, February, 1908.

Determined by Doctor Christ.

Trismeria trifoliata (L.) Fée.

II. 1277. Near Coban, altitude 1,350 meters, October, 1907.

Tribe ASPLENIEAE.

Asplenium cirrhatum Rich.; Willd. Sp. Pl. 5: 321. 1810.

II. 1675. Forests between Purulhá and Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

II. 2030. At the highest elevation between Coban and Tactic, altitude 2,000 meters, December, 1907.

II. 2211. Sasis, Alta Verapaz, altitude 1,100 meters, May, 1908.

The bipinnatifid and tripinnatifid forms of the variable species known usually under the Linnæan name *Asplenium rhizophorum*, recently discussed elsewhere by the writer.^a The typical simply pinnate form is from Guadeloupe.

Asplenium conquistum Underw. & Maxon; Christ, Bull. Herb. Boiss. II. 7: 270. 1907.

II. 1684. Epiphytic, in the forest above Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

This species is known from Jamaica, Guatemala, and Costa Rica. See Contr. Nat. Herb. 10: 488. 1908.

Asplenium erectum Bory.

II. 1853. Coban, altitude 1,350 meters, March, 1907.

^a Contr. Nat. Herb. 10: 490, 491. 1908.

Asplenium erosum L. Syst. Nat. ed. 10. 2: 1324. 1759.

II. 1208. Coban, altitude 1,350 meters, December, 1907.

The present specimens, received under the name *Asplenium auritum* Sw., represent one of the many forms usually referred to under the latter name. There can be no question that *Asplenium erosum*, the name given by Linnæus in 1759, is the earliest one applied to any form of this species.^a The later synonymy is much confused.

Asplenium falcinellum Maxon, sp. nov.

Fronds several (4 to 6), fasciculate, erect or arching, 75 cm. long (maximum), simply pinnate; rhizome suberect, slender, with a few spreading yellowish brown linear long-attenuate scales at the crown; stipe 18 to 21 cm. long, dull brownish, firm, stout, terete or slightly sulcate; lamina chartaceo-coriaceous, about 55 cm. long, 25 to 30 cm. broad, once pinnate, ovate, comprising about 12 pairs of distant slightly ascending subopposite pinnae and an enlarged conform terminal segment; pinnae lanceolate, varying from nearly straight to falcate, decidedly petiolate, the margins entire but subundulate in drying, all except the uppermost 3 or 4 pairs nearly equal in size and form, the lowermost the largest, these 15 to 17 cm. long, 2.5 to 3 cm. broad, at the base long-petiolate (about 5 mm.), acutely and subequally cuneate, in the outer portion attenuate; succeeding pinnae very gradually smaller, all petiolate, the ninth pair 13.5 cm. long, 2 cm. broad, the uppermost pair 9 cm. long, 1.5 cm. broad, the terminal segment conform, nearly 2 cm. broad, the lamina thus reduced rather abruptly toward the apex; sori about 15 to 19 pairs to each pinna, equidistant (2 to 3 mm.) from the margin and the midvein, 15 to 22 mm. long, straight or slightly curved, produced upon the successive anterior branches of the mostly thrice dichotomous veins; indusium elevated, firm, narrow, less than 1 mm. wide, persistent.

Type in the U. S. National Herbarium, no. 826251, collected near Cubilquitz, Alta Verapaz, Guatemala, altitude 350 meters, by Baron H. von Türckheim, no. II. 1910, August, 1907. A specimen collected by Baron von Türckheim (no. II. 857) at the same locality and distributed by Captain Smith under no. 8636 as *A. salicifolium*, is exactly the same. The species occurs also in Chiapas, Mexico, according to a specimen in the herbarium of the Missouri Botanical Garden, collected by J. N. Rovirosa.

A. falcinellum is a near ally of *A. integerrimum* Spreng., a West Indian species redescribed recently by the writer.^b From this it differs in its suberect rhizome, inconspicuous chaff, subterete wiry and noncarnose vascular parts, more numerous and spaced pinnae, harsher texture throughout, more numerous sori and nonalate rachis. *A. falcinellum* is said to be epiphytic.

Asplenium fragrans Sw.

II. 1311. Epiphytic, in forest near Coban, altitude 1,350 meters, July, 1907.

A finely dissected delicate lax form, not uncommon in Guatemala and very different from the typical Jamaican plant. Similar or reduced forms, mainly continental, are not infrequently determined under other names.

Asplenium monanthes L. Mant. 1: 130. 1767.

Asplenium monanthesum L.; Murray, Syst. Veg. 933. 1784.

II. 1642. Mountains between Tactic and Coban, altitude 1,800 meters, February, 1907.

The specimens under this number include the forms described and illustrated by Fée upon Mexican material as *Asplenium leptophyllum* and *A. galeottii*. These and others from distant regions, as shown by a very large series of specimens examined, appear to be but variously fertile states of a single polymorphic species of the widest distribution. *A. monanthes* was founded upon South African specimens.

Asplenium serra L. & F.

II. 2085. Coban, altitude 1,350 meters, December, 1907.

^a See Underwood, Bull. Torr. Club 33: 196. 1906.

^b Contr. Nat. Herb. 10: 477. 1908.

Asplenium serratum L.

II. 165. Cubilquitz, altitude 350 meters, July, 1907. Epiphytic.

Asplenium tuerckheimii Maxon, sp. nov.

Fronds few (3 or 4), 30 to 40 cm. long, long-stipitate, borne in a small crown; rhizome slender, erect or ascending, 2 to 4 cm. high, clothed with old stipe bases and bearing at the apex a few rigid lanceolate dark brown scales; stipe slight, arcuate or subflexuose, bilaterally compressed, greenish brown, lighter above, 16 to 25 cm. long; lamina once-pinnate, variable in shape, broadly oblong to orbicular, comprising 3 or 4 pairs of membranaceous subopposite pinnae nearly equal in size, the uppermost pair terminal upon the rachis, a terminal (single) pinna thus wanting; characteristic pinnae 8 to 10 cm. long, narrowly lanceolate, sessile, at the base narrowly and equally cuneate, falcate, broadest near or below the middle (about 1.5 cm. broad), unequally long-attenuate, the margins regularly crenate-serrate, the crenations long, shallow, somewhat appressed, entire or slightly indented in the middle; midvein stramineous, apparent upon both surfaces throughout; sori elongate, 5 to 8 mm. long, slightly curved, uniserial, about 9 to 12 pairs, equidistant, borne on the anterior branch of the mostly once-forked veins; indusia narrow, delicate, yellowish brown.

Type in the U. S. National Herbarium, no. 826200, collected in the forest at Panzál, Baja Verapaz, Guatemala, altitude 1,000 meters, by Baron H. von Tuerckheim, no. II. 1677, April, 1907. A second collection of this has since been made at Sasis, Alta Verapaz, 1,100 meters, May, 1908 (no. II. 2212).

The alliance of *A. tuerckheimii* is perhaps with *A. abscissum* Willd., though the relationship is by no means a close one. From this species it differs radically in its elongate long-attenuate spaced equal pinnae, regular and less deeply serrate margins, and especially in the usual absence of a terminal pinna—the uppermost pair of pinnae commonly surmounting the apex of the rachis, as in certain forms of *Danaea*. Some variation in this last particular is noted in two specimens from the District of Cordoba, State of Vera Cruz, Mexico (*H. Fink* 41 and 135), in the U. S. National Herbarium, which are otherwise the same; several of these bear an odd terminal pinna. No. 41 was distributed as *A. cultrifolium*.

Asplenium sp.

II. 1647. Coban, altitude 1,350 meters, February, 1907, and March, 1908.

Small plants closely allied to *Asplenium verecundum* Chapman,^a a Florida species which occurs also in Cuba, and the South American *A. divaricatum* Kunze, figured by Kunze^b some time after its original publication. In revising this group of closely allied species the Mexican forms listed by Fournier under the section *Caenopteris* must be considered. Sufficient material for this is lacking at present.

Athyrium achilleifolium (Mart. & Gal.) Fée.

II. 2198. Sasis, Alta Verapaz, altitude 1,100 meters, May, 1908.

Blechnum blechnoides (Lag.) C. Chr.

II. 1420. Forest near Cubilquitz, altitude 350 meters, September, 1906.

Diplazium plantaginifolium (L.) C. Chr.

II. 1431. Near Cubilquitz, altitude 350 meters, September, 1906.

Diplazium prominulum Maxon, sp. nov.

Fronds about 55 cm. long; stipes about 20 to 25 cm. long, stout, naked, yellowish, from an erect relatively slight rhizome 10 cm. or more high, this with age nearly naked as to chaff; lamina 30 to 35 cm. long, 15 to 18 cm. broad, exactly ovate, comprising about 10 to 12 pairs of lobed horizontal or slightly ascending pinnae, the lowermost

^a Bull. Torr. Club 33:193. 1906.

^b Die Farrnkr. 2:94. pl. 139. 1851.

opposite and petiolate, those above subopposite, finally alternate and sessile, the uppermost gradually and regularly reduced, adnate and decurrent, the apex of the frond acute and coarsely serrate; characteristic middle pinnæ similar to the lowermost but slightly longer, about 10 cm. long, 2.5 to 3.5 cm. broad, short-petiolate, oblong-lanceolate, nearly straight, at the base obtusely cuneate (usually) and lobed about one-half the distance to the midrib, the lobes triangular, rounded, slightly oblique, about 8 to 10 on either side, these gradually much shorter toward the apex, the margins of the outer portion of the pinnæ merely crenate-serrate, the apex subentire, acute; midvein of the pinnæ elevated, nearly 1 mm. broad, conspicuous, yellowish, with about 13 to 15 pairs of elevated freely branching yellowish veins; veinlets about 5 pairs to each of the veins of the lower and middle portions of the pinna, mostly simple, only the lowermost anterior one or two once-forked; sori strictly diplazioid, dark brown, elongate, the lowermost somewhat apart and longest, somewhat curved, the others shorter, all nearly equidistant (as to the length of the veins) or nearer the costa; indusia inconspicuous.

Type in the U. S. National Herbarium, no. 826206, collected in the forest between Purulhá and Panzál, Baja Verapaz, Guatemala, altitude 1,500 meters, by Baron H. von Türckheim, no. II. 1683, in April, 1907. No other specimens have been seen.

Diplazium prominulum is related to *D. subsilvaticum* Christ, *D. arboreum* (Willd.) Presl,^a *D. aemulum* Underw. & Maxon, and *D. werckleanum* Christ. It resembles rather closely the true *D. arboreum*, from which it differs in its ovate (not triangular-ovate), coriaceous (not membranous) fronds, its simply acute (not elongate or caudate) less deeply lobed pinnæ, and its stout yellowish flexuose rachis and prominent veins.

***Diplazium* ? *ternatum* Liebm.**

II. 1682. Forest above Panzal, Baja Verapaz, altitude 1,400 meters, April, 1907.

This is perhaps the most interesting fern of the collection. The type specimens are from Oaxaca, Mexico, and the species has been reported hitherto only from Mexico. The present specimens are truly ternate, but are very much larger and more deeply incised than those described by Liebmann and redescribed and figured by Hooker.^b

The species was described by Liebmann as a doubtful *Diplazium* and was placed by Hooker in his section *Anisogonium* of *Asplenium*. The venation is unique in that the lowermost superior branch (from many of the lowermost veins) being once forked the forks unite subsequently to form an elliptical areole, this wholly or partially fertile, the resulting vein fertile only near the areole, parallel to the other branches, and excurrent to the margin. The lateral branches are frequently soriferous in the middle of the pinnæ, the sori extending sometimes nearly to the margin. This is shown in Hooker's figure.

Hooker describes the sori as asplenioid along the veins that form the areole, but diplazioid along the vein resulting from their union. Liebmann refers to them as "simple or bilateral." The Guatemalan specimens are only sparingly fertile and show hardly any truly diplazioid sori; the areoles are from 11 to 17 mm. long and are produced equally in sterile and fertile fronds.

^a *DIPLAZIUM ARBOREUM* (Willd.) Presl, Tent. Pterid. 114. 1836.

Asplenium arboreum Willd. Sp. Pl. 5:320. 1810, not of recent authors.

Asplenium shepherdii Spreng. Nov. Act. 10:231. pl. 17. f. 5. 6. 1821.

Diplazium shepherdii Link, Hort. Berol. 2:70. 1833.

An examination of Willdenow's type specimen of *Asplenium arboreum* by Professor Underwood and a tracing of the same seen by the writer constitute the basis for joining the *A. arboreum* of Willdenow and *A. shepherdii* Spreng. Most of the specimens passing as *A. arboreum* are to be referred to *Diplazium semihastatum* (Kunze) C. Chr., a common West Indian species.

^b Second Cent. Ferns pl. 51. 1861.

Diplazium werckleanum Christ.

II. 1680. Panzal, Baja Verapaz, altitude 1,000 meters, in forest, April, 1907.

II. 1310. Near Coban, altitude 1,350 meters, February, 1908.

Both specimens were received under the name *A. verapax* Donn.-Sm.

Loxogramme salvinii (Hook.) Maxon.

Grammitis salvinii Hook. Second Cent. Ferns *pl.* 71. 1861.

Gymnogramme (*Selliguea*) *salvini* Hook. Sp. Fil. 5: 157. 1864.

II. 2378. Coban, altitude 1,600 meters, June, 1908. Epiphytic.

In addition to this the following specimens from Alta Verapaz are in the National Herbarium:

Pansamalá, altitude 1,140 meters, *von Türekheim* (*J. D. S.* 962). Trail between Sepacuité and Secanquim, altitude about 1,000 meters, on tree trunks in humid forest, *Maxon & Hay* 3262. Trail from Esperanza to Purulhá, depending from partially shaded rocks, *Maxon & Hay* 3359.

Christensen regards this as referable to Fée's *Selliguea mexicana* of earlier date (*Polypodium mexicanum* C. Chr.), but Fée's description and figure are far from applying to the Guatemalan plant. The two species are of interest as being the only representatives of an otherwise exclusively Old World genus. The nonarticulate fronds are sufficient to exclude them from *Polypodium*, even in its widest sense.

Stenochlaena latiuscula Maxon, *Contr. Nat. Herb.* 10: 502. 1908.

II. 1901. Epiphytic in forest near Cubilquitz, altitude 350 meters, August, 1907.

This species, the type of which is from Costa Rica, was known previously from Guatemala upon specimens distributed by Captain Smith under no. 1129. The present specimens have the fertile pinnae narrower and up to 15 cm. long.

Struthiopteris ensiformis (Liebm.) Broadhurst, in herb.

Lomaria ensiformis Liebm. Vid. Selsk. Skr. V. 1: 234. 1849.

Blechnum ensiformis C. Chr. Ind. Fil. 153. 1905.

II. 1693. Forests near Purulhá, Baja Verapaz, altitude 1,800 meters, April, 1907.

According to Christensen, known previously only from Mexico. The grounds for using the generic name *Struthiopteris* in this connection will be recapitulated by Miss Broadhurst in a forthcoming revision of the North American species usually placed under *Lomaria*.

Woodwardia spinulosa Mart. & Gal.

II. 1537. Mountains between Tactic and Coban, altitude 1,800 meters, December, 1907.

Tribe DRYOPTERIDEAE.

Dryopteris ampla (H. & B.) Kuntze.

II. 2118. Near Coban, altitude 1,350 meters, March, 1908.

Dryopteris formosa (Fée) Maxon.

Aspidium formosum Fée, Gen. Fil. 296. 1850–1852, in part.

II. 1678. Forest between Purulhá and Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

II. 1854. Mountain woods near Coban, altitude 1,600 meters, November, 1907.

The synonymy of the present species is much confused. The original *A. formosum* of Fée included two Mexican numbers and one from Cuba. Later, and upon the same specimens, Fée divided the species into two, separating the Cuban and one of the Mexican plants under the name *Aspidium jucundum*.^a Thus, by elimination, the name *formosum* attaches to the remaining Mexican plant, a species which ranges

^a Fée, 10me Mém. 41. *pl.* 42. *f.* 1. 1865.

southward to Costa Rica, as evidenced by the following specimens in the U. S. National Herbarium:

MEXICO: District of Cordoba, State of Vera Cruz, *Fink* 33a.

GUATEMALA: San Miguel Uspantán, Department of Quiché, altitude 1,800 meters, *Heyde & Lux* (*J. D. S.* 3243). Forest near Tactic, Alta Verapaz, *von Türckheim*, December, 1879 (without number).

COSTA RICA: Estrella, Province of Cartago, altitude 1,320 meters, *Cooper*. Mountains 5 miles south of Cartago, altitude about 1,800 meters, *Maxon* 515. Forêts de l'Achiote, volcan de Poas, altitude 2,200 meters, *Tonduz* 10698. Without exact locality, *Cooper*; *Werckle*.

With regard to the *Aspidium jucundum* of Fée mentioned above, it is not stated whether this was figured from the Cuban or the supposed Mexican element; presumably upon the Cuban, however, for the plate and description agree well with the Cuban plant described afterwards by Mettenius^a as *Aspidium cubense*, with Wright's no. 1099 as type, and no Mexican specimens similar to this have been seen. It may be noted that the alliance of these, as well as of Fée's *A. gracilipes* and *A. tenerum*, both Brazilian, is with *Dryopteris denticulata* (Sw.) Kuntze.

***Dryopteris lanceolata* (Baker) Kuntze.**

II. 839. Cubilquitz, altitude 350 meters, July, 1907.

II. 1620. Coban, altitude 1,350 meters, January, 1907.

II. 1621. Near Coban, altitude 1,600 meters, February, 1908.

The first two specimens cited above were distributed under the name *Nephrodium salvini* Baker. The species is known only from Guatemala. Other specimens, all from the province of Alta Verapaz, are:

Pansamalá, altitude 1,140 meters, *von Türckheim* (*J. D. S.* 626; distributed as *Nephrodium hirtum*; identification changed later to *N. salvini* Baker.).

Pansamalá, altitude 1,140 meters, *John Donnell Smith* 1563 (distributed as *N. salvini*). Cubilquitz, altitude 350 meters, *von Türckheim* (*J. D. S.* 8647). Senahú, *Cook & Griggs* 482.

***Dryopteris longicaudata* (Liebm.) Maxon.**

Polypodium longicaudatum Liebm. Vid. Selsk. Skr. V. 1: 209. 1849.

II. 1691. High forest near Purulhá, altitude 1,800 meters, April, 1907.

The specimens accord perfectly with Liebmann's very full description and agree also with the following in the U. S. National Herbarium:

MEXICO: District of Cordoba, State of Vera Cruz, *Fink* 67½.

GUATEMALA: Near the Finca Sepacuité, Alta Verapaz, *Cook & Griggs* 178; 613.

This species is of the group of *Dryopteris rotundata* (Willd.) C. Chr., a species founded upon Plumier's plate 38, representing a Martinique plant. To this are referred also by Christensen *Polypodium flavopunctatum* Kaulf., founded upon Martinique and Montserrat plants, and *Nephrodium imrayanum* Hook., originally from Dominica. All three were kept distinct by Hooker, yet are closely related, and perhaps are only extreme forms of a single highly variable species. The Mexican and Guatemalan plant is notable for the narrow and long-decurrent bases of the pinnæ, the rachis being alate throughout, only the lowermost pinnæ free and long-cuneate.

The sori are nonindusiate, and the veins are normally quite free. In the Fink specimen, however, the lowermost pair of veins is joined casually, the resulting vein sometimes irregularly short-excurrent.

***Dryopteris mollis* (Fée) Maxon.**

Goniopteris mollis Fée, Gen. Fil. 252. 1850-1852; Fée, Hist. Foug. Antill. 66. pl. 24. f. 1. 1866.

^a *Linnaea* 36: 108. 1869.

Polypodium ghiesbreghtii Linden, Cat. 18. 1858.

Polypodium crenatum β *ghiesbreghtii* Hook. Sp. Fil. 5: 3. 1864.

Dryopteris ghiesbreghtii C. Chr. Ind. Fil. 267. 1905.

II. 876. Cubilquitz, altitude 350 meters, July, 1907.

The *Goniopteris mollis* of Fée was founded upon Linden's no. 1499, from Tabasco, southern Mexico, and was figured by Fée several years later, at which time Fée mentioned having received a living plant from Amsterdam as "*Goniopteris ghiesbreghtii*" which he regarded as true *mollis*. Linden's plant also reached Hooker, who figured it in his Exotic Ferns, plate 84, 1859, merely as *Polypodium crenatum*. In 1864, however, Hooker recognized the Mexican plant as entitled to varietal rank, as noted above, citing Linden's no. 1499; and since then it has usually been regarded as a distinct species, mostly under the name *ghiesbreghtii*. Thus Baker recognized it in the Synopsis Filicum as distinct and later^a referred here Captain Smith's no. 1407 from Alta Verapaz.

The species is subject to considerable variation in nearly all characters, depending mainly upon age and maturity. The sori are commonly rather small, perhaps only so with age, and slightly nearer to the midvein than to the vein excurrent from the point of union of the connivent veins. In this particular Fée's figure is better than Hooker's; but the margins are shown better by Hooker, and the lobes are not infrequently even more pronounced and irregular. The rachis and the under surface, even including the leaf tissue between the veins, are very densely villous, and the upper surface is somewhat scabrous with similar but stiffer hairs, these few and mostly confined to the veins. The pinnæ are subject to rather more variation in shape than in *D. poiteana* (Bory) Urban (the *Polypodium crenatum* of Swartz, Baker, and Jenman) and sometimes attain a considerable size, as in the present specimens of Baron von Türckheim's (30 cm. long, 6.5 cm. broad). They seem never to be bulbiferous at the base, as is usually the case in West Indian specimens of *D. poiteana*.

The following specimens have been examined:

MEXICO: Tabasco, *Linden* 1499 (a fragment).

GUATEMALA: Department of Alta Verapaz: Near the Finca Sepacuité, *Cook & Griggs* 281; 664. Near Secanquim, altitude 550 meters, *Maxon & Hay* 3132. Cubilquitz, altitude 350 meters, *von Türckheim* (*J. D. S.* 8648). Socolal, altitude 900 meters, *von Türckheim* (*J. D. S.* 1407). Chamiquin, altitude 360 meters, *von Türckheim* 550.

COSTA RICA: Without locality, *Werckle* (*ex herb. Christ*). Port Limon, at sea level, *Cook & Doyle* 419. Rio Hondo, Plains of Santa Clara, altitude 100 meters, *Cook & Doyle* 496.

Dryopteris paucipinnata (Donn. Sm.) Maxon.

Nephrodium fendleri var. *paucipinnatum* Donn. Sm. Bot. Gaz. 12: 134. 1887.

Dryopteris donnell-smithii Maxon, in sched.

Rhizome horizontally creeping or ascending, woody, about 1.5 cm. in diameter, bearing at the apex a thick tuft of lanceolate to ovate attenuate concolorous dark-brown scales 7 to 9 mm. in length; fronds 2 or 3, approximate, glabrous, long-stipitate, 100 to 115 cm. in length; stipes about 65 cm. long, irregularly sulcate, greenish stramineous, naked except for a few deciduous scales at the base; lamina 40 to 50 cm. long, about 25 cm. broad, comprising 5 or 6 pairs of falcate elongate ascending lateral pinnæ and a conform terminal pinna, all nearly equal in dimensions, the upper ones slightly smaller; pinnæ 20 to 25 cm. long, broadest (about 3 cm.) in the middle, narrowly lanceolate, falcate, obliquely pinnatifid about one-third (or slightly more) the distance to the costa, tapering gradually to a narrow entire long-caudate apex, at the base acutely, narrowly, and subequally long-cuneate, short-petiolate; main lobes of

^a Ann. Bot. 5: 460. 1891.

the pinnæ about 20 pairs, approximate, subfalcate, triangular-ovate, unequally sub-acute in drying, with 10 to 14 pairs of simple excurrent veinlets, the 4 or 5 lowermost pairs extending to the narrow sinus, there falsely connivent by a translucent membrane; sori large, borne toward the extremity of the once-soriferous veinlets, there confluent with age, forming a conspicuous submarginal band around the lobe and extending beyond the sinus nearly to the costa; indusia whitish, reniform, inconspicuous, greatly reduced but persistent.

Described originally by Captain Smith upon his numbers 767 and 667, collected by Baron H. von Türckheim in Alta Verapaz, Guatemala; of these no. 767 may be designated as the type. Captain Smith's no. 1556, from the same region, is the same. The best examples, however, are specimens collected by Baron von Türckheim during 1907 near Panzal, Baja Verapaz, Guatemala, and distributed as no. II. 1690.

Dryopteris paucipinnata is related to the South American *D. fendleri* (D. C. Eaton) Kuntze, founded on Fendler's no. 372, from Tovar, Venezuela. From this, as determined by an examination of the type specimens in the Eaton Herbarium, courteously lent by Professor Evans, it differs conspicuously in its very slender stramineous scarcely chaffy stipes and in its few spaced mostly alternate and narrowly long-cuneate pinnæ, these having the segments more acute and at a smaller angle to the midvein and the sori borne very much closer to the margin. The most striking feature lies in the scant and open appearance of the frond, this due to the distant pinnæ being greatly narrowed at the base. Superficially only, the plant has on this account considerable resemblance to *D. obliterated* (Sw.) C. Chr.

***Dryopteris radicans* (L.) Maxon, Contr. Nat. Herb. 10: 490, 491. 1908.**

II. 1679. Panzal, Baja Verapaz, altitude 1,200 meters, on rocks, April, 1907.

The synonymy of this species has recently been given in full by the writer (loc. cit.).

***Dryopteris pterifolia* (Mett.) Kuntze.**

II. 2181. Near Coban, altitude 1,350 meters, March, 1908.

Determined by Mr. Christensen, who will shortly publish upon it elsewhere.

***Dryopteris tuerckheimii* (Donn. Sm.) C. Chr.**

II. 1200. Coban, altitude 1,350 meters, January, 1907.

Known only from Guatemala; noteworthy for the dense paleaceous covering of the deeply channeled stipe and rachis.

***Olfersia cervina* (L.) Kunze.**

II. 418. Cubilquitz, altitude 350 meters, July, 1907.

Specimens collected in previous years by Baron von Türckheim at this same locality (*J. D. S.* 8044 and 8484), also *Cook & Doyle* 567 from Sepacuité, Alta Verapaz, and the only British Honduras specimen seen (leg. *Blaucaneaux*), agree in their very wide pinnæ and are rather different from the typical West Indian form.

***Phanerophlebia remotispora* Fourn.**

II. 1856. Coban, altitude 1,350 meters, June, 1907.

***Poikilopteris donnell-smithii* (Christ) Maxon.**

Gymnopteris donnell-smithii Christ, Bull. Herb. Boiss. II. 6: 289. 1906.

II. 1492. Cubilquitz, altitude 350 meters, August, 1907. Epiphytic.

The use of this generic name has been discussed by Doctor Underwood.^a

***Polybotrya caudata* Kunze.**

II. 148. Cubilquitz, altitude 350 meters, July, 1907.

Received as *P. osmundacea*. Doctor Christ has recently published upon the several related species of this genus.^b

^a Bull. Torr. Club 33: 603-605. 1907.

^b Bull. Herb. Boiss. II. 6: 166-168. 1906.

Polystichum sp.

II. 1692. Near Purulhá, Baja Verapaz, altitude 1,800 meters, April, 1907.

Polystichum sp.

II. 1696. Coban, altitude 1,350 meters, May, 1907.

This and the preceding number are of the variable and difficult group of *P. aculeatum*, of which there are many described forms in Mexico and the American Tropics generally. Except with very adequate material not now at hand, it is impossible, in the absence of type specimens of the earlier and often imperfectly described species, to distinguish these properly.

Tribe DAVALLIEAE.

Dennstaedtia adiantoides (H. & B.) Moore.

II. 424. Cubilquitz, altitude 350 meters, July, 1907.

Received as *Dennstaedtia apiifolia* (Hook.) Moore. Captain Smith's 8047 from the same locality is the same.

Dennstaedtia cicutaria (Sw.) Moore.

II. 2376. Coban, altitude 1,550 meters, June, 1908.

Dennstaedtia sp.

II. 1328. Coban, altitude 1,350 meters, November, 1907.

Received under the name *Hypolepis repens*. A species of *Dennstaedtia*, allied to *D. exaltata* (Kunze) Hieron. and probably undescribed. It is matched exactly by the following specimens in the U. S. National Herbarium, all from Mexico: District of Cordoba, Vera Cruz, II. Fink 14 (several sheets). Valley of Cordoba, February 24, 1866, Bourgeau 1941. Region of Orizaba, June 9, 1866, Bourgeau 2342.

The last number is cited by Lindman^a under *Dennstaedtia tenera*, a reference which seems to the writer incorrect.

Dictyoxiphium panamense Hook.

II. 54. Cubilquitz, altitude 350 meters, July, 1907.

Nephrolepis biserrata (Sw.) Schott.

II. 480. Cubilquitz, altitude 350 meters, July, 1907.

Saccaloma inaequale (Kunze) Mett.?

II. 2026. Forest near Coban, altitude 1,600 meters, November, 1907.

One of the forms included under this name; recently described as var. *dimorphum* Christ.

HYMENOPHYLLACEAE.

Hymenophyllum asplenioides Sw.

II. 1894. Near Coban, altitude 1,550 meters, August, 1907.

Hymenophyllum lanatum Fée.

II. 1938. Coban, altitude 1,350 meters, August, 1907.

Hymenophyllum microcarpum Desv.

II. 1984 and II. 1985. Near Coban, altitude 1,600 meters, November, 1907.

Hymenophyllum pannosum Christ.

II. 1569. At the highest elevation between Coban and Tactic, Alta Verapaz, altitude 2,000 meters, December, 1907.

II. 1936. Upon a tree trunk near San Juan de Chameleo, Alta Verapaz, altitude 1,800 meters, September, 1907.

Hymenophyllum polyanthos Sw.

II. 1903. Near Coban, altitude 1,350 meters, August, 1907.

^aArk. Bot. 1: 194. 1903.

Trichomanes capillaceum L. Sp. Pl. 2: 1099. 1753.

Trichomanes tenellum Hedw. Fil. Gen. & Sp. [text] pl. 3. f. 1. 1799.^a

Trichomanes trichoideum Sw. Schrad. Journ. Bot. 1800²: 98. 1801^b; Sw. Syn. Fil. 144. 1806; Hook. & Grev. Ic. Fil. 2: pl. 199. 1831.

Trichomanes trichoides Sw. Fl. Ind. Occ. 3: 1741. 1806.

Trichomanes angustissimum Presl, Abh. Böhm. Gesell. Wiss. V. 5: 333. 1848.

II. 1676. On trunks of *Alsophila* sp., in the forest between Purulhá and Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

A common species throughout a large part of tropical America, growing usually upon the trunks of tree ferns. The synonymy has recently been indicated somewhat imperfectly by Hieronymus,^c who adopts the name *T. trichoides* Sw., 1806, altogether disregarding *T. tenellum* Hedw., 1799, and citing *T. trichoideum* Sw. as from 1806 rather than 1801. The Linnæan name *capillaceum*, founded upon Plumier's plate 99, figure D, representing Santo Domingo plants, is regarded by Hieronymus as of too doubtful application to warrant its being adopted for the species accurately described later by Swartz. While it must be admitted that the figure of Plumier is incorrect in details, its general facies, together with the accompanying text, leaves little doubt as to its identity with the well known form. If, however, the Linnæan name *capillaceum* is to be discarded as too uncertain, the claim of *T. tenellum* must be considered. This is identical with *T. trichoideum* Sw., over which it has two years priority of publication.^b

The synonymy of the form figured by Schkuhr as *T. cuneiforme*, and including *T. schiedianum* C. Müll., is given in full by Hieronymus. This form is reduced to *T. capillaceum* by Christensen, perhaps rightly.

Trichomanes crispum L.

II. 1846. Coban, altitude 1,350 meters, May, 1907.

Trichomanes pyxidiferum L.

II. 1463. Near Cubilquitz, altitude 350 meters, October, 1906.

Trichomanes rigidum Sw.

II. 1685. On moist earth in forest above Panzal, Baja Verapaz, altitude 1,500 meters, April, 1907.

Distributed as *T. mandioccanum* Raddi.

Trichomanes rupestre (Raddi) v. d. B.

II. 354. Near Cubilquitz, altitude 350 meters, October, 1906.

EQUISETACEAE.

Equisetum giganteum L.?

II. 1990. Near Coban, altitude 1,350 meters, November, 1907.

LYCOPODIACEAE.

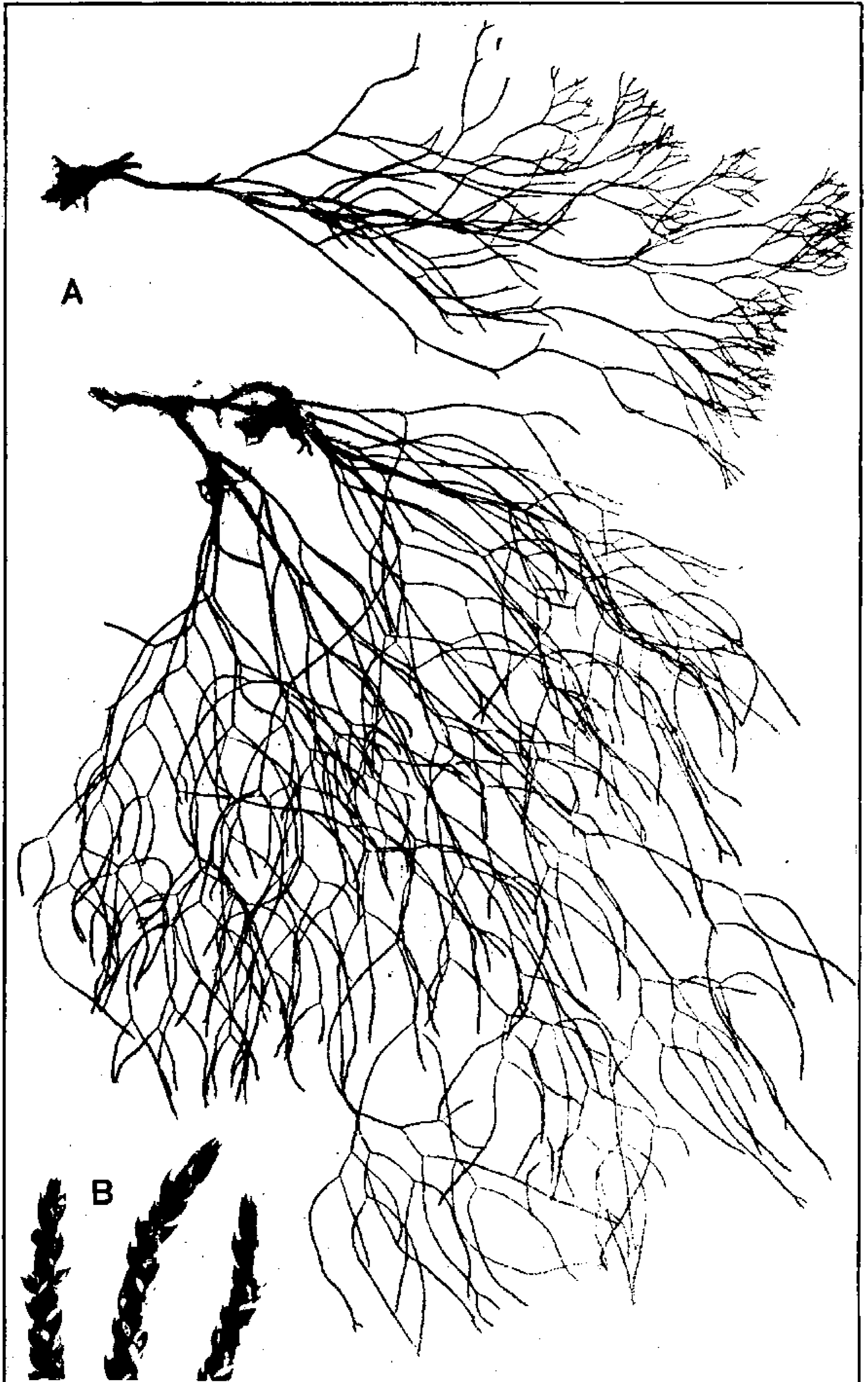
Lycopodium clavatum L.

II. 2095. In moist, shady situations near Coban, altitude 1,600 meters, March, 1908.

^a The copy of this work in the U. S. National Museum has the plates unnumbered, this plate being bound as the sixth in order.

^b At the end of the brief diagnosis of *T. trichoideum* in Schrader's Journal, Swartz, by a lapse of the pen, cites as a synonym, *T. pusillum*, his own species of 1788, which had been illustrated by Hedwig alongside *T. tenellum*. In the Synopsis Filicum, 1806, he attempted to "correct" the error by substituting, as a synonym of *T. trichoideum*, *T. tenellum*, which rather should supersede *T. trichoideum*, if the Linnæan name *capillaceum* is to be dropped.

^c Engler's Bot. Jahrb. 34: 424, 425. 1905.



LYCOPodium TUERCKHEIMII MAXON.

Lycopodium reflexum Lam.

II. 1355. Tactic, Alta Verapaz, altitude 1,600 meters, December, 1907.

Lycopodium tuerckheimii Maxon, sp. nov.

PLATE I.

Plants epiphytic, pendent, up to 38 cm. long, repeatedly dichotomous, the divisions widely divaricate, very slender, of nearly uniform thickness (1 to 1.5 mm.); leaves light or yellowish green, linear, subulate, appressed and strongly incurved, concave, about 6-ranked, those of the lower branches 3.5 to 4.5 mm. long, of the upper part gradually shorter and, with the gradual development of sporangia, broader at the base; strobiles scarcely or not interrupted, constituting the freely dichotomous terminal branchlets to a distance of 10 cm. or more; sporophylls of the ultimate branchlets crowded, rigid, achene-like, deltoid-ovate, acuminate, strongly carinate, about 1.3 mm. long, exceeding the sporangia only by the slender beak; sporangia orbicular, measuring about 9 mm. each way, at maturity invariably protruding beyond the margins of the sporophylls.

Type in the U. S. National Herbarium, no. 826246, collected upon tree trunks at an altitude of about 1,500 meters in the forest near Coban, Alta Verapaz, Guatemala, by Baron H. von Tuerckheim (no. II. 1864), January, 1908. Two earlier collections at the same locality, both by Baron von Tuerckheim, as represented by specimens in the National Herbarium, are: (1) Plants distributed by C. Keck under no. 208, and (2) others distributed by Captain Smith under no. 956B. The former are perfectly characteristic of the species and agree closely with the type collection; the latter represent a young state, but may safely be placed here. Both were under the name *L. verticillatum* var. *filiforme* Spring.

The alliance of *L. tuerckheimii* is with *L. pringlei* Underw. & Lloyd,^a a Mexican species recently described. From this it differs very constantly in its delicate slender parts, its very numerous and widely divaricate branches, and its slender cord-like usually uninterrupted strobiles, these being about one-half the diameter of those of *L. pringlei*.

EXPLANATION OF PLATE I.—Fig. a, the type specimen; b, fertile tips of same. Fig. a, scale about $\frac{1}{2}$; b, scale 3.

SELAGINELLACEAE.**Selaginella cuspidata** Link.

II. 1386. Tactic, altitude 1,600 meters, December, 1907.

Selaginella sp. ined., Hieron. in litt.

II. 2114. Near Coban, altitude 1,500 meters, February, 1908.

Selaginella bulbifera Baker.

II. 2036. Moist forests near Coban, altitude 1,400 meters, December, 1907.

Determined by Dr. G. Hieronymus.

THE BIPINNATE SPECIES OF CYATHEA.

During the course of field work in Cuba and Jamaica the writer has been fortunate in collecting all four of the undoubtedly bipinnate species of *Cyathea* previously described. As these have been and still are more or less misunderstood, one of them (*C. minor*) being referred even at present to a large tripinnate species, it has seemed desirable, in describing a new species of this alliance, to present a key by which these may be distinguished. Full descriptions will be published shortly in another connection.

^a Bull. Torr. Club 33: 109. 1906.

Cyathea nockii, of the high mountains of Jamaica, is at once the smallest and the most peculiar member of the genus. The short trunk never rises from the ground, and the coriaceous shining fronds, rarely more than a meter in length, resemble strikingly those of some coarse *Dryopteris* or *Polystichum*. This is the species which Mr. Baker has referred to *C. arborea*, a noble lowland species 5 to 12 meters high, with a wide-spreading crown of numerous fronds 2 to 4 meters long.

Cyathea balanocarpa and *C. pubescens* are also high mountain forms, with thick trunks attaining a height of from 3 to 12 meters, crowned with numerous erect or erect-arching fronds. *C. minor* is a Cuban species with a very slender caudex and few spreading fronds, these short-stipitate, the blade very greatly reduced at the base, the segments mostly adnate. Allied to the last, which is apparently rare, is the new species here described from Cuba, well marked by its short, horizontal, and mostly hypogean stem, long-stipitate fronds, and distinctly stalked segments. It is dedicated with pleasure to Mr. Theodore Brooks, of Guantanamo, Cuba, through whose courtesy and kindly help the writer was enabled to pass several weeks very profitably in 1907 in the region of the Yateras in eastern Cuba, an interesting territory best known from Wright's classic explorations of nearly fifty years ago and since then scarcely touched except by Baron Eggers.

KEY TO THE SPECIES.

Caudex procumbent, short, 10 to 40 cm. long.

Fronds nearly or quite exstipitate; segments mostly adnate, coriaceous. 1. *C. nockii*.

Fronds long-stipitate; segments mostly short-stalked, chartaceous. 2. *C. brooksii*.

Caudex erect, elongate, 2 to 12 meters long.

Caudex slender, 2.5 to 3.5 cm. in diameter; lamina long-attenuate below. 3. *C. minor*.

Caudex stout, 8 to 20 cm. in diameter; lamina more abruptly reduced below.

Primary rachis pubescent or hirsute; segments close, adnate; costæ conspicuously pilose below. 4. *C. pubescens*.

Primary rachis furfuraceous; segments spaced, mostly auriculate; costæ both paleaceous and pilose. 5. *C. balanocarpa*.

1. *Cyathea nockii* Jenm. Journ. Bot. 17: 257. 1879.

TYPE LOCALITY: Bellevue, Jamaica, *Nock & Jenman*.

DISTRIBUTION: Confined to the Blue Mountains of Jamaica; not uncommon upon the steep forested slopes near Vinegar Hill, altitude, 1,000 to 1,200 meters (*Maxon* 2791); also below Cinchina.

2. *Cyathea brooksii* Maxon, sp. nov.

Caudex horizontal, mostly subterranean, about 40 cm. long, 3 cm. in diameter, emitting a few coarse cord-like roots below; fronds few (2 or 3), long-stipitate, erect-arching, 125 cm. or more long; stipe 35 to 40 cm. long, brownish, clothed at the base with a few linear-lanceolate opaque dark-brown scales less than 1 cm. long, above dull

yellowish brown, minutely furfuraceo-pubescent, sparingly fibrillose with long tortuous linear dark-brown scales, the rachis similarly fibrillose throughout; lamina lanceolate, fully bipinnate, about 90 cm. long, 30 to 38 cm. broad in the middle, tapering in both directions, the apex acute, the base somewhat reduced; pinnæ about 40 pairs, nearly horizontal, sessile, the middle ones alternate, about 2 cm. apart on each side, 17 to 19 cm. long, 2 to 2.5 cm. broad, the apex deeply serrate; lowermost pinnæ subopposite, 4 to 6 cm. apart, 6 to 8 cm. long, 1 to 1.3 cm. broad; secondary rachises with a few linear dark-brown light-margined scales toward the base, elsewhere with dark brownish stellate light-centered scales mingled with yellowish hairs; pinnules of the middle pinnæ 40 to 45 pairs, slightly oblique, free, mostly short-stalked, the upper ones constricted above the rounded base and unequally hastulate, the lower ones fully hastulate and cut to the costa, the basal divisions rounded and free; margins subentire, only the apex of the pinnule regularly crenate-serrate; costæ elevated, bearing stellate scales and hairs like those of the secondary rachis; veins 10 to 12 pairs, once forked near the base; sori 4 or 5 pairs, close to the costa; indusia dark reddish brown, subhemispheric, open, firm, persistent, the margins entire; receptacle large, capitate.

Type in the U. S. National Herbarium, no. 523240-523242, collected from the forested slopes of the Finca Las Gracias, Yateras, province of Oriente, Cuba; altitude about 500 meters, May 5, 1907, *Maxon* 4474. Known only from the specimens of this collection, the type consisting of a single frond, with a portion of the rhizome, mounted upon three sheets.

3. *Cyathea minor* D. C. Eaton, Mem. Amer. Acad. II. 8: 215. 1860.

TYPE LOCALITY: Monte Verde, Cuba, *Wright* 949.

DISTRIBUTION: Known only from the province of Oriente, Cuba, only the following seen, besides the type specimens: Santa Ana, about 6 miles north of Jaguey, Yateras, Oriente, altitude 600 to 625 meters, in a partially shaded ravine, April 23, 1907, *Maxon* 4134.

4. *Cyathea pubescens* Mett.; Kuhn, *Linnaea* 36: 164. 1869.

TYPE LOCALITY: Jamaica.

DISTRIBUTION: Common in the Blue Mountains of Jamaica, at altitudes of from 1,500 to 2,100 meters. Also in Porto Rico, upon the summit of El Yunque. Reported from Haiti.

5. *Cyathea balanocarpa* D. C. Eaton, Mem. Amer. Acad. II. 8: 215. 1860.

TYPE LOCALITY: Eastern Cuba, *Wright* 1063.

DISTRIBUTION: Known only from the province of Oriente, Cuba, on partially wooded mountain slopes; altitude, 1,000 to 1,200 meters.

Besides the type collection, only the following have been seen by the writer: Jiguarto Mountain, Sevilla estate, Sierra Maestra, altitude about 1,020 meters, September 18, 1906, *N. Taylor* 508; upper slopes and summit of the Gran Piedra, altitude about 1,200 meters, trunk 3 to 4.5 meters high, April 14, 1907, *Maxon* 4031.

A REVISION OF THE WEST INDIAN SPECIES OF POLYSTICHUM.

In his description of *Polystichum triangulum*, under plate 33 in his *Exotic Ferns*, Hooker remarks, with respect to variation in this genus, that it would be "no enviable task" to undertake the description of the exotic species. The remark is repeated at page 14 of the fourth volume of the *Species Filicum*; and surely no one who has attempted to deal with them on the basis of scant herbarium material alone will be inclined to dispute its aptness. Nevertheless, upon an acquaintance with the species in the field and the collection of

sufficient material for study and comparison, the difficulties in so far as the plants are concerned largely disappear, and the range of variation, great in some cases, rather slight in others, may be made out with tolerable accuracy.

This, at least, is true of the West Indian species, as observed by the writer in Cuba and Jamaica, and as represented by a large suite of specimens in the U. S. National Herbarium and the herbarium of the New York Botanical Garden. The difficulties are mostly in the matter of applying the early names, many of which were given originally to plates rather than to plants. The historic *P. triangulum* itself offers greater difficulties than any other, and even as now dealt with is probably not closely enough delimited, further material from Santo Domingo being necessary to a clearer understanding of the species.

The characters of the genus as a whole are too well known to require elaboration here, but several secondary features not commonly regarded as diagnostic may be pointed out, as these have seemed to the writer to be quite constant. These are: (1) The presence or absence of a proliferous bud upon the rachis; and (2) the position of this, whether (a) terminal at the truncate or retuse apex, (b) borne some distance below the foliose apex, or (c), as is often the case, at the end of a cirrhate or flagelliform prolongation of the rachis. The extension of the rachis into a whip-like tail serves to increase the chances of successful proliferation; and in general this tendency seems to be associable with a moist shady habitat. Such plants have an arching or even a pendent habit, are less fertile than those growing in drier or more exposed situations, and obviously depend more upon vegetative reproduction and less upon the dispersal of spores.^a Whatever may have been the cause of this correlation between habitat and form, the characters appear to be fixed and constant and the species amply distinct and recognizable. Thus no form of true *P. triangulum*, so far as the writer has observed, is proliferous, though this is a marked feature of several of its closest relatives.

The status of *P. heterolepis*, discussed below, is interesting from another point of view; that of a species apparently not re-collected in its typical form from the time of its discovery up to 1907. The *P. viviparum* of Fée is now found to be merely a young state of this strictly Cuban species and quite different from the Jamaican plant described as *viviparum* by Jenman and others. These and several others are here illustrated from photographs of the most typical

^a In the case of *P. rhizophorum* this is manifest in a strong tendency toward dimorphism, the fertile fronds being rigidly erect and usually very much smaller than the elongate and radicanter sterile ones.

specimens, with the idea of fixing more exactly than is possible by description alone the characteristic points of difference.

In conclusion, notes upon the several West Indian species to be excluded from this genus are presented.

The species as here treated may be separated by the following artificial key. The specimens listed are either in the U. S. National Herbarium or the herbarium of the New York Botanical Garden, unless otherwise stated.

KEY TO THE SPECIES.

- Rhizome sarmentose; fronds uniserial (§ RUMOHRA)..... 2. *P. adiantiforme*.
 Rhizome erect or ascending; fronds cespitose (§ EUPOLYSTICHUM).
 Lamina subentire to deeply pinnatifid.
 Lamina subentire, somewhat lobed at the base, the apex retuse..... 12. *P. plaschnickianum*.
 Lamina deeply pinnatifid below, the apex long-attenuate..... 16. *P. rhizophyllum*.
 Lamina once to thrice pinnate.
 Normally once pinnate only.
 Proliferous.
 Apex foliose, retuse..... 19. *P. underwoodii*.
 Apex naked, flagelliform.
 Lamina linear, elongate..... 9. *P. ilicifolium*.
 Lamina broader and shorter, lanceolate to linear-lanceolate.
 Fronds difform, the fertile conspicuously shorter and long-stipitate..... 15. *P. rhizophorum*.
 Fronds conform, of equal size.
 Pinnæ straight or nearly so, deeply crenate-lobulate, nonspinulose..... 7. *P. harrisii*.
 Pinnæ falcate, lightly crenate-serrate, spinulose..... 4. *P. decoratum*.
 Nonproliferous.
 Stipe and rachis rather dark, closely covered with persistent chaff..... 17. *P. struthionis*.
 Stipe and rachis light-colored; chaff scant, mostly deciduous.
 Lamina short, ovate to broadly ovate, long-stipitate..... 10. *P. longipes*.
 Lamina elongate, lanceolate to linear.
 Plants delicate; margins of pinnæ crenate-dentate..... 6. *P. guadeloupense*.
 Plants rigidly coriaceous; pinnæ variously spinulose-serrate..... 1. *P. triangulum*.
 More than simply pinnate.
 Nonproliferous.
 Pinnæ unequally trifoliolate, the terminal division narrow..... 18. *P. tridens*.
 Lamina tripinnate or quadripinnatifid..... 11. *P. muricatum*.

Proliferous.

Apex of lamina acute; bud borne upon the rachis, below the apex.

Rachis slender, straight; pinnæ lanceolate, the inferior basal pinnule greatly reduced..... 14. *P. polystichiformis*.

Rachis stout, flexuous; pinnæ elongate-triangular, the inferior basal pinnule scarcely reduced..... 13. *P. platyphyllum*.

Apex of lamina truncate; bud terminal.

Lamina ovate, tripinnatifid or tripinnate..... 3. *P. christiana*.

Lamina narrowly lanceolate, bipinnatifid to bipinnate.

Lamina chartaceo-coriaceous, bipinnate; pinnæ 35 to 40 pairs... 8. *P. heterolepis*.

Lamina extremely coriaceous, bipinnatifid, only the superior basal segment free; pinnæ 20 to 30 pairs..... 5. *P. dissimulans*.

1. *Polystichum triangulum* (L.) Fée, Gen. Fil. 279. 1850-1852.

Polypodium triangulum L. Sp. Pl. 2: 1088. 1753.

Aspidium triangulum Sw. Schrad. Journ. Bot. 1800²: 31. 1801.

Polypodium muricatum Sw. Prodr. 131. 1788, not L. 1753.

Polypodium echinatum Gmelin, Syst. Nat. 2²: 1309. 1791.

Aspidium mucronatum Sw. Schrad. Journ. Bot. 1800²: 30. 1801.

? *Aspidium trapezoides* Sw. Schrad. Journ. Bot. 1800²: 31. 1801.

Polystichum mucronatum Presl, Tent. Pterid. 83. 1836.

? *Polystichum cyphochlamys* Fée, Gen. Fil. 279. 1850-1852; 6me Mém. 20. pl. 3. f. 4. 1853.

? *Polystichum falcatum* Fée, Gen. Fil. 279. 1850-1852, not Diels, 1899.

Polystichum echinatum C. Chr. Ind. Fil. 83. 1905; 581. 1906.

The basis of the Linnæan *Polypodium triangulum* is the "*Trichomanes folio triangulo acutato*" of Petiver, illustrated at plate 1, figure 10. This is obviously redrawn from Plumier's plate 72, which represents a plant said to have come from Santo Domingo. The further names to be considered in fixing upon the limits and synonymy of this strictly West Indian species are as follows:

1. *Polypodium muricatum* Sw., 1788. Founded upon Sloane's plate 36, figures 4 and 5, these representing Jamaican plants, probably of different species. In publishing the name *mucronatum* to replace his homonym *muricatum*, Swartz in 1801 again cites these two figures. In 1806,^a however, he restricts his citation to figure 4 which thus may be held as typical of his species *mucronatum*. But figure 4 shows only a broad form of *P. triangulum*,^b and *mucronatum* will thus become a synonym of *triangulum*. Figure 5 is discussed under the next name following:

2. *Polypodium echinatum* Gmelin, 1791. The original description is brief, based upon Sloane's plate 36, figures 4 and 5, which, as noted above, probably represent different species. If typified arbitrarily by figure 4, *P. echinatum* is synonymous with *A. mucronatum* Sw. and must be written as a synonym of *P. triangulum*. The spinulose character shown in figure 4 is sufficient to indicate that this rather than figure 5

^a Fl. Ind. Occ. 3: 1649. 1806.

^b The strictly Jamaican species which Hooker mistakenly regarded as *mucronatum*, and which he figured under that name, is *P. struthionis*; see page 37.

furnished the basis for Gmelin's peculiarly descriptive specific name. Figure 5, indeed, shows a plant with crenate pinnae, which can not well be an example of this species; the only material seen which approaches it is a single sheet of poor specimens from the vicinity of Troy, Jamaica, altitude 450 to 660 meters, *Underwood* 2837. These are an abnormal state apparently and can not be referred definitely to any described species; they are perhaps nearest *triangulum*, but differ not only in form but in the soft ferruginous vestiture of the rhizome. Further collections may establish their claim to rank as a distinct species; in any event Gmelin's name can not possibly apply to them. In this connection may be noted Christensen's error in applying the name *echinatum* to the plant wrongly called *mucronatum* by Hooker. See under *P. struthionis*.

3. *Aspidium trapezoides* Sw., 1801. A name given by Swartz to West Indian plants, the diagnosis being short, unsatisfactory, and without reference to any published figure. The description is repeated at page 44 of the *Synopsis Filicum*, and is elaborated in the larger work of the same year^a with citation of Sloane's plate 36, figure 1. This figure represents a dwarf relatively broad-leaved Jamaican plant of a type certainly not very common in Jamaica but probably referable to *P. triangulum*. It is assuredly no form of "*P. viviparum*," as Christensen suggests with doubt; that is to say, no form of *P. heterolepis* nor of *P. dissimulans* of the present paper.

4. *Polystichum falcatum* Fée, 1850-1852. Described from Santo Domingo and best regarded as an extreme form of *P. triangulum*.

5. *Polystichum cyphochlamys* Fée, 1850-1852. Founded upon Cuban specimens collected by Linden (no. 2175), the precise locality not stated. It is presumably one of the complex of variable Cuban forms discussed below and retained for the present under *P. triangulum*.

Polystichum triangulum, even when restricted as in the present treatment, is an exceedingly variable species. The typical form of Plumier's plate 72 is possibly not very common in Santo Domingo, the few specimens seen from Haiti always showing broader fronds. Matching the plate best are certain Jamaican specimens (*Maxon* 1201, 1489, 1873, 1883, 1884, 1887, 2207, 2555, 2591, 2827, 2968; *Underwood* 1167, 1822, 2838). Among these some are narrower and some broader than indicated in plate 72. The narrower form is illustrated at plate 33 of Hooker's *Exotic Ferns* (1859), but the pinnae are almost invariably serrate-spinescent. Between these extremes of size in Jamaica there seems to be every intergradation, and there is a similar intergradation in various other characters directly associable with habitat; hence, far apart as are the extremes, there appears to be no sufficient reason for separating any of the forms specifically. The Cuban plants average much broader than the Jamaican and show far greater variation in cutting; some few of them agree closely with Haitian specimens collected by Nash and Taylor (nos. 1341 and 1352) which probably represent the *P. falcatum* of Fée. These last may, indeed, prove to be a distinct species, yet they seem to connect with the narrow form through the following Cuban series, all from the province of Oriente: *Maxon* 4243, 4260, 4267, 4459, 4461. *P. triangulum* as thus defined is not unlikely an aggregate, requiring to be restudied later with the aid of more abundant material from Santo Domingo. To attempt at present to distinguish by name the large number of supposed or probable intermediates even varietally or subspecifically would serve no useful purpose.

Jenman's description^b is excellent for the ordinary form, though the measurements are less than for many of the Cuban and Haitian specimens. The species, as here understood, is never proliferous.

Known from the islands of Santo Domingo, Cuba, and Jamaica. In Jamaica it is common in rocky situations at from 600 to 1,800 meters.

^a Fl. Ind. Occ. 3: 1647. 1806.

^b Bull. Bot. Dept. Jamaica II. 2: 296. 1895.

2. *Polystichum adiantiforme* (Forst.) J. Sm. Hist. Fil. 220. 1875.*Polypodium adiantiforme* Forst. Prodr. 82. 1786.*Polypodium coriaceum* Sw. Prodr. 133. 1788.*Aspidium coriaceum* Sw. Schrad. Journ. Bot. 1800²: 40. 1801.*Polystichum coriaceum* Schott, Gen. Fil. under plate 9. 1834.*Aspidium capense* Willd. Sp. Pl. 5: 267. 1810, not Sw. 1801.*Polystichum capense* J. Sm. Bot. Mag. 72: Comp. 35. 1846.*Rumohra aspidioides* Raddi, Op. Sci. Bologn. 3: 290. pl. 12. f. 1. 1819.*Aspidium discolor* Langsd. & Fisch. Ic. Fil. 16. pl. 18. 1810.*Polystichum discolor* Brack. U. S. Expl. Exped. 16: 207. 1854.

The type of *Polypodium adiantiforme* was from Polynesia; that of *Polypodium coriaceum* from Jamaica; of *Aspidium capense* from the Cape of Good Hope; of *Rumohra aspidioides* from Brazil; of *Aspidium discolor* from Brazil. If it be correct to associate these names for a single species, the range of that species is a most unusual one; yet the points of difference noted in the series at hand from South Africa, Mauritius, the West Indies, Bermuda, Brazil, New Zealand, and the Seychelles are such as appear not to warrant segregation.

The following specimens have been noted from the West Indies:

JAMAICA: Near Cedarhurst, altitude 600 meters, *Underwood* 1552. Near Troy, altitude 450 to 600 meters, *Underwood* 2867. Crown lands 4 miles west of Troy, altitude 750 meters, *Maxon* 2926. Hollymount, Mount Diablo, altitude 750 meters, *Maxon* 2227, 2229. Near Cinchona, altitude 1,500 meters, *Harris* 7599. The Red Hills, *Day*. Without locality, *Jenman*; *Hart* 252.

CUBA: *Wright* 999.

PORTO RICO: Near Cayey, *Sintenis* 2771. Mount Mandios, near Jayuya, *E. G. Britton & Marble* 956. Maricao, *Sintenis* 434. Sierra de Luquillo, *Eggers* 1341 (small specimens).

3. *Polystichum christiana*e (Jenman) Underw. & Maxon in herb. PLATE 2.*Aspidium christiana*e Jenman, Bull. Bot. Dept. Jamaica II. 2: 285. 1895.

Confined to Jamaica, where it is said by Jenman to be "common in woods on the Manchester mountains at 2,000 ft. altitude." The specimens studied by the writer are:

Vicinity of Hollymount, Mount Diablo, altitude about 750 meters, *Maxon* 1880, 1955, 2343. Mount Diablo, altitude 600 meters, *Underwood* 1891. Without locality, *Jenman*.

Jenman's description, which on the whole is good, applies to the maximum attained by this species in both size and cutting. The general resemblance to *D. mexicana* also is not exaggerated by him, though from the wide variation in cutting the similarity is more pronounced in some fronds than in others in which the pinnules and lobes are quite acute. The caducous indusia are really orbicular and centrally peltate in attachment, except for which and for its general chaffiness the plant might pass readily enough for a *Dryopteris*. The large chaffy bud terminating the truncate apex is a conspicuous and nearly constant feature.

Polypodium miser Heward,^a suggested by Jenman as a possible early synonym, is clearly not referable to this species but to *Dryopteris effusa* (Sw.) Urban, and the "*Polypodium effusum*" listed separately by Heward following *P. miser* was presumably a misidentification.

EXPLANATION OF PLATE 2.—Specimen from Hollymount, Jamaica, *Maxon* 1880. Scale about $\frac{1}{2}$.

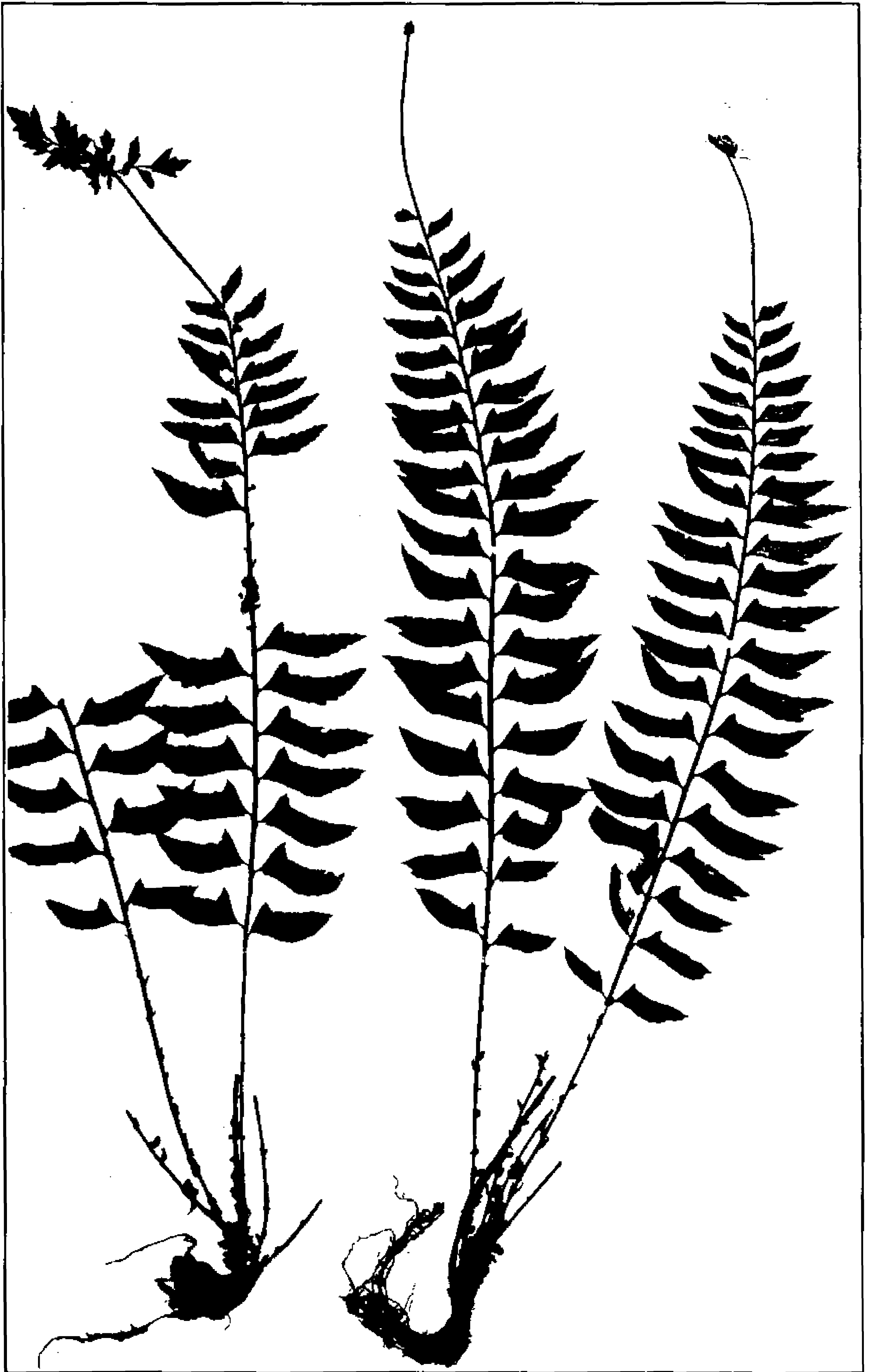
4. *Polystichum decoratum* Maxon, sp. nov. PLATE 3.

Plants laxly spreading or pendent, fronds 4 to 8, 35 to 45 cm. long, closely fasciculate, conform. Rhizome ascending, arcuate, slender, 2 to 4 cm. long, 5 to 7 mm. in diameter, with very long coarse fibrous roots, clothed at the crown with numerous

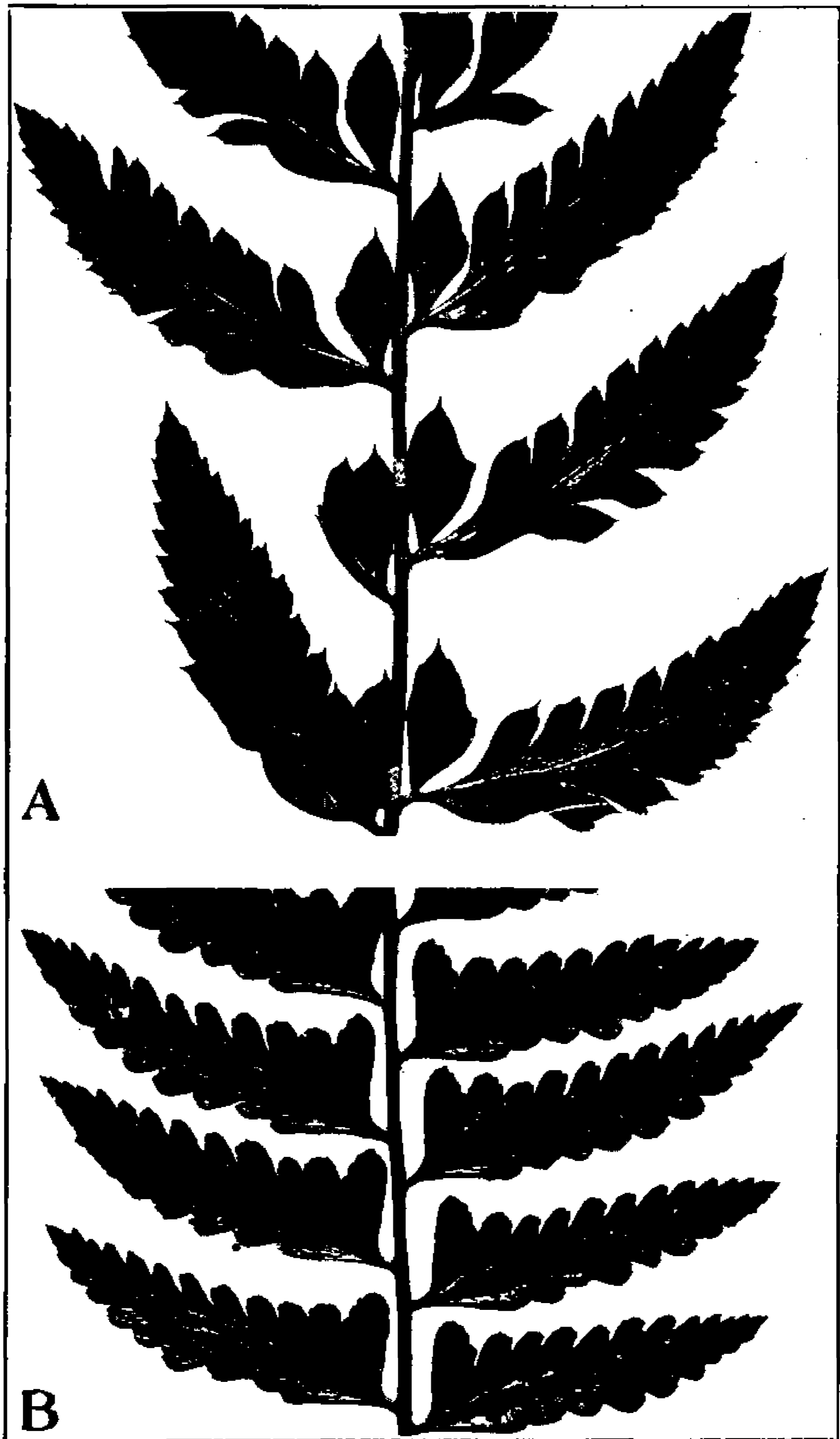
^a Mag. Nat. Hist. II. 2: 460. 1838. Type from Jamaica.



POLYSTICHUM CHRISTIANAE (JENMAN) UNDERW. & MAXON.



POLYSTICHUM DECORATUM MAXON.



A. *POLYSTICHUM DISSIMULANS* MAXON.
B. *POLYSTICHUM HARRISII* MAXON.

large light brown ovate scales 7 to 8 mm. long; stipe 10 to 15 cm. long, striate, light yellowish green, rather closely covered toward the base with large concolorous scales like those of the rhizome, these somewhat persistent, gradually narrower and reduced above; lamina 25 to 30 cm. long, 6 to 7 cm. broad, narrowly lanceolate, scarcely reduced below, the pinnæ subdistant or spaced about their own width, reduced gradually in the upper half to a length of about 1 cm., giving way abruptly to a stout naked flagelliform proliferous cauda 5 to 10 cm. long; characteristic middle pinnæ 3 to 4 cm. long, 7 to 8 mm. broad, falcate, at the base acutely cuneate, the lower margin widely excised, the upper sharply cuneate, auriculate, the margins otherwise rather noticeably crenate-serrate (sometimes doubly so), always most deeply in the outer half, the apex itself sharply acute; sori about 9 or 10 pairs, equidistant.

Type in the U. S. National Herbarium, no. 523612, collected on a rocky ledge in woods at the base of the Farallones of La Perla, near Monte Verde (north of Jaguey), Yateras, Oriente, Cuba, altitude about 540 meters, by William R. Maxon, no. 4408, May 2, 1907. Several sheets of this number which have been preserved show very slight variation.

P. decoratum is closest allied to the Jamaican *P. rhizophorum*, from which it differs mainly in its larger and conform fronds, its narrower, longer, and falcate pinnæ, and glabrous under surface. There appears to be not the slightest tendency toward the dimorphism so conspicuous in *P. rhizophorum*. The fronds are uniformly flagellate and proliferous, many bearing at the apex young plants from 2 to 3 cm. high.

Observed by the writer only at the one locality. Wright's no. 828 is, in part, the same (Y, N), this having been referred by Jenman in his description of *P. rhizophorum* as "near our plant." Eggers's no. 4919, from the vicinity of Jaguey, as represented by a specimen in the National Herbarium, is also identical.

EXPLANATION OF PLATE 3.—The type specimens. Scale about $\frac{1}{2}$.

5. *Polystichum dissimulans* Maxon, sp. nov.

PLATE 4, FIGURE A.

Aspidium viviparum Jenman, Bull. Bot. Dept. Jamaica II. 2: 267. 1895, in part, not *Polystichum viviparum* Fée, 1850-52.

Rhizome stout, erect, clothed with large, blackish glistening scales without and mostly lanceolate to linear flaccid rufous scales within; stipes stout, rigid, sulcate, stramineous, 13 to 26 cm. long, clothed sparingly at the base with large rufous scales and similar linear scales; lamina narrowly lanceolate, deeply bipinnatifid, 25 to 40 cm. long, 8 or 9 cm. broad, exceedingly coriaceous, comprising about 25 to 30 pairs of rigid divergent or somewhat ascending spinescent pinnæ; lowermost 3 or 4 pairs of pinnæ distant, nearly opposite, the succeeding pairs contiguous, similar in form but slightly narrower and longer, those toward the apex simply serrate, uniformly and gradually reduced in size to a somewhat elongate foliose apex terminating abruptly in a large viviparous bud; rachis stout, clothed with reduced fibrillose tawny deciduous scales; characteristic middle pinnæ 5 or 6 cm. long, 13 to 15 mm. broad at the middle, fully pinnate at the base, the superior basal segment largest, erect, free, unequally ovate, spinescent, the inferior basal segment similar but narrower, smaller and very oblique, the pinna otherwise deeply pinnatifid with oblique spinescent segments or sometimes only deeply serrate, the serrations sharply spinescent, the apex always acute and aristate; sori numerous, commonly biserial, the rows incomplete.

Type in the U. S. National Herbarium, no. 427751, collected on a wooded bank near the Green River, on the trail from Cinchona to Blue Mountain Peak, Jamaica, by William R. Maxon, no. 1491, April 22, 1903. *Underwood* 2560, in the herbarium of the New York Botanical Garden, has identical data. The following additional specimens may be cited:

JAMAICA: Chestervale, altitude 900 meters, *Underwood* 1178. Silver Hill, altitude 1,050 meters, *Harris* 7158. Without locality, *Jenman* (2 sheets). Without locality, *ex herb. Bot. Dept. Jamaica*. Without locality, *Hart* 176.

Polystichum dissimulans probably embraces most of the Jamaican material included by Jenman as typical of his "*Aspidium viviparum*," excluding the several subspecies recognized by him. It is about equally related to *P. triangulum* and the endemic Cuban *P. heterolepis*, though perhaps more closely allied to the latter. From *P. heterolepis* it differs in its chaff, its lesser subdivision and in mature states, its relatively broader pinnæ and especially in its exceedingly harsh coarse texture and long-spinescent segments. From any form of *P. triangulum* it is distinguished by its viviparous apex and regularly free-auriculate pinnæ. It is the most rigid of all the middle American species of *Polystichum*.

EXPLANATION OF PLATE 4, FIGURE A.—Middle portion of type specimen. Natural size.

6. ***Polystichum guadeloupense*** Fée, Ilme Mém. Foug. 74. pl. 19. f. 2. 1866.

This must be regarded as a very doubtful species. The type, collected by L'Hermier from rocks along the sea shore in some part of Guadeloupe, indicates, according to Fée's diagnosis and illustration, a species unique in the *triangulum* group in its sharply erose-dentate (scarcely spinulose) margins, in this character resembling young plants of *Stenochlaena kunzeana* (Presl.) Underw. A small specimen collected in Guadeloupe by Duss (no. 4343), in the herbarium of the New York Botanical Garden, is apparently the same. But this scarcely differs more from the Greater Antilles specimens of *P. triangulum* than the specimens of undoubted *triangulum* do among themselves, suggesting that it may be only a small delicate form of the well-known species. If it does attain a larger state in Guadeloupe it is strange that it should not have been collected by Duss. More complete collections in future may perhaps establish its claim to rank as a distinct species. It is so recognized by Christensen, whether or not on the basis of specimens actually examined the writer does not know.

7. ***Polystichum harrisii*** Maxon, nom. nov.

PLATE 4, FIGURE B.

Aspidium caudatum Jenman, Journ. Bot. 8: 260. 1879, not *A. caudatum* Sw. 1806, nor Sw. 1817.

Aspidium viviparum caudatum Jenman, Bull. Bot. Dept. Jamaica II. 2: 268. 1895.

Jenman's original description of this species is accurate, except that the under surfaces may be said to be very sparingly and minutely scaly, glabrescent instead of glabrous. The numerous large scales of the rhizome and lower stipe are membranous and of a rich brown color, never (in the specimens examined) blackish and glossy as in the various forms of *triangulum*.

Confined to Jamaica and said by Jenman to be "frequent in the western parishes, Manchester, Clarendon, etc., above 1,500 or 2,000 feet altitude."

JAMAICA: Vicinity of Troy, altitude 600 to 660 meters, in rocky forests, sometimes in clefts of rocks, Maxon 2848, 2862; Underwood 2963. Tyre (near Troy), Underwood 3309, 3310. Without locality, Jenman (4 sheets labeled *Aspidium caudatum*).

The name is given in honor of William Harris, esq., superintendent of Hope Gardens, Jamaica, in grateful acknowledgment of courtesies extended to the writer in many ways during his field work in Jamaica in 1903 and 1904.

The type, collected in 1878, is at Kew.

EXPLANATION OF PLATE 4, FIGURE B.—Middle portion of a specimen from Troy, Jamaica, Maxon 2848. Natural size.

8. ***Polystichum heterolepis*** Fée, Gen. Fil. 279. 1850-1852.

PLATE 5.

Polystichum viviparum Fée, Gen. Fil. 280. 1850-1852.

Aspidium viviparum Mett. Abhand. Senck. Nat. Gesell. 2: 328. 1858.

Fronde several, chartaceo-coriaceous, elongate (75 cm. long, maximum), long-stipitate, conform. Rhizome stout, woody, ascending, thickly covered with chaff of two kinds, the one linear, flaccid, fulvous, the other ovate, rigid, carinate, dark, lustrous, with fulvous borders; stipe 20 to 30 cm. long, light greenish brown, deeply canaliculate, rather closely covered with slender spreading fulvous scales (appressed



POLYSTICHUM HETEROLEPIS FEE.

with age) and a few larger lanceolate scales, these concolorous or often dark-centered, usually divergent; lamina glabrous above, below laxly paleaceous-pilose, bipinnate, 35 to 45 cm. long, very narrowly lanceolate, 10 to 13.5 cm. (maximum) broad at the middle, somewhat reduced below, the apical portion foliose throughout, narrow and long-attenuate, terminating in a large chaffy proliferous bud; pinnæ about 35 to 40 pairs, the lower ones subdistant, the others contiguous, all short-petiolate and divergent from the stout rachis, this very thickly beset with chaff like that of the upper stipe; characteristic large pinnæ 6.5 to 7 cm. long, narrowly lanceolate except for the greatly enlarged erect deeply auriculate superior basal pinnule, this 1.5 to 2 cm. long; pinnules about 9 or 10 pairs, rigidly aristate, all but the upper basal one unequally lanceolate-ovate or trapeziform-ovate, simple, oblique, cuneate, mostly petiolate, adnate and confluent only toward the serrate-spinescent apex of the pinna; nervation manifest above, nearly concealed below; sori large, numerous, about 10 upon the superior basal pinnule, the other pinnules bearing 4 to 6 each; indusia large, delicate, glabrous, deciduous.

CUBA: Near the summit of the Gran Piedra, Oriente, altitude about 1,100 meters, in partial shade, *Maxon* 4047, 4068.

The types of both *P. heterolepis* and *P. viviparum* were contained in Linden's no. 1742, from the present province of Oriente, Cuba. The original descriptions bring out different characters; but these are found to be common to the specimens of a large series collected by the writer (as cited above) which undoubtedly represent only a single species. Fée's separation into two "species" of the specimens collected by Linden under no. 1742 thus seems quite unwarranted, as the following data will show:

Polystichum heterolepis was described as having two kinds of scales upon the stipe and rachis, a character which, though true, is not obvious, owing to the usual abrasion of the larger dark scales; the slender concolorous fulvous scales commonly predominate. Further, no mention was made of the proliferous apex; but this was almost certainly due to imperfect material, for the fronds of the entire series of 4047 and 4068 are nearly without exception proliferous. The larger examples show well the special character mentioned by Fée: "inferiore [frondula] multo majore auriculata, rachim tectante;" by which is meant the superior basal pinnule which is greatly enlarged and lies along the rachis. The larger and mature specimens of the series are, as described above, bipinnate. Immature and smaller specimens quite accord with Fée's description and illustration of *P. viviparum*. Mettenius's description is excellent, but hardly applies to the most luxuriant development of the species as shown in plate 5, representing a section through the broader middle part of a large frond. The sori are readily abraded, leaving a slight depression in the frond.

Aspidium caudatum Jenman, referred by Christensen^a to the all-inclusive *P. viviparum* (in accordance with Jenman's treatment of the group), is not closely allied. It is the form here called *P. harrisi*.

EXPLANATION OF PLATE 5.—Middle portion of a specimen from the Gran Piedra, Cuba. *Maxon* 4047. Natural size.

9. *Polystichum ilicifolium* Fée, Gen. Fil. 279. 1850-1852; 6me Mém. 21. pl. 6. f. 4. 1853, not *Aspidium ilicifolium* Don, 1825, which is *Polystichum ilicifolium* Moore, 1858.

Polystichum aquifolium Underw. & Maxon, Bull. Torr. Club 29: 584. 1902.

The type of *Polystichum ilicifolium* Fée was from the province of Oriente (Santiago), Cuba (*Linden* 2193). Agreeing closely with this, as subsequently figured, are the following specimens, all from the same region:

CUBA: Vicinity of El Cobre, Oriente, *Pollard & Palmer* 420. Mountains, Upper Guama River, south slope of the Sierra Maestra, altitude 540 meters, *N. Taylor* 226. Valley of the Rio Bayamita, south slope of the Sierra Maestra, altitude 900 to 1,050 meters, *Maxon* 3921. Without locality, *Wright* 829.

^a Ind. Fil. 68. 1905.

The narrow and very long fronds (maximum 60 cm.) and subquadrangular long-
aristate pinnae are very characteristic of this species which is known only from Cuba.
The fronds of mature plants almost invariably bear young plants at the flagelliform
apex.

10. *Polystichum longipes* Maxon, sp. nov.

. PLATE 6.

Fronds 45 to 52 cm. long, nonproliferous, long-stipitate, stiff, coriaceous, probably
suberect in habit. Rhizome ascending, woody, stout, about 1 cm. or less in diameter,
the crown and stipe bases clothed with flaccid reddish brown scales, these lanceolate
to ovate, with tortuose linear fibrillose scales intermixed; stipes 20 to 30 cm. long,
stout, 1.5 to 2 mm. in diameter, light brown, very firm, terete, with a furrow along
the anterior face, sparingly fibrillose, glabrate with age; lamina relatively short and
broad, 15 to 22.5 cm. long, 8 to 12 cm. broad, ovate to very broadly ovate, acuminate,
the rachis and lower surface of the pinnae sparsely fibrillose, glabrate with age; pinnae
7 to 10 pairs, spreading, very coriaceous, hastate, subhastate, or even auriculate,
unequally cuneate or the upper base subtruncate, broadest near the base, otherwise
lanceolate, the margins undulate or lightly sinuose-crenate, the apices acute or some-
what attenuate; lowermost pinnae 5 to 7 cm. long, 1.5 to 2 cm. broad near the base,
petiolate, alternate or scarcely subopposite; pinnae immediately succeeding nearly of
the same size, alternate, distant; upper pinnae gradually smaller and closer, sessile,
in the sterile fronds reduced abruptly at the subcaudate acuminate apex, in the fertile
fronds decreasing more gradually, adnate; veins mostly 3 or 4 times branched, close,
evident as striations on the lower surface; sori in a single row upon each side of the
midvein, much nearer the margin than the midvein and extending nearly to the
petiole.

Type in the U. S. National Herbarium, no. 50221, collected in Cuba, without definite
locality, by Charles Wright, no. 3924. Specimens of the same number are in the
Gray Herbarium, the D. C. Eaton Herbarium, the Sauvalle Herbarium, and the
herbarium of the New York Botanical Garden.

The species is without any very close allies, standing rather apart from the other
members of the *triangulum* group. It was indicated by Eaton as doubtfully new.

EXPLANATION OF PLATE 6.—The type specimens. Scale about $\frac{1}{2}$.

11. *Polystichum muricatum* (L.) Fée, Gen. Fil. 278. 1850-1852.

Polypodium muricatum L. Sp. Pl. 2: 1093. 1753, not Sw. 1788.

Aspidium muricatum Willd. Sp. Pl. 5: 264. 1810.

The oldest binary name applied to any tropical American member of the *acu-
leatum* alliance is that of the *Polypodium muricatum* of Linnæus, a species estab-
lished upon Petiver's plate 1, figure 6, this in turn a small copy of Plumier's plate
39, representing a plant from Santo Domingo. This or very closely allied forms
from the North and South American tropics have since received many names, and
the later synonymy is very involved. For the purposes of the present paper it is
sufficient to point out the availability of the name *muricatum* for the plant of the
West Indies, which is abundantly distinct from *P. aculeatum*. Kuhn,^a in taking up
the Linnæan name for specimens from Santo Domingo, Cuba, Mexico, Costa Rica,
and several South American countries, adduces many supposed synonyms and dis-
cusses the group critically at some length. Much of this material probably belongs
to other species.

Polystichum muricatum is described briefly by Jenman,^b who states that it is
common in Jamaica "on the banks of streams in forests at 4,000 to 6,000 feet alti-
tude." Plumier's figure, though exaggerated as to spinescent pinnules, is excellent
as to size, proportions, and general appearance.

^a Abhand. Nat. Gesell. Halle 11: 33 et seq. 1869.

^b Bull. Bot. Dept. Jamaica II. 2: 270. 1895, as *A. aculeatum moritzianum* (Klotzsch).



POLYSTICHUM LONGIPES MAXON.

JAMAICA: Clyde River valley, altitude about 1,200 meters, *Underwood* 422, 2654, 2654b; *Maxon* 1604, 1604a. Without locality, *Gilbert* 30; *Hart* 30, 31, 32.

HAITI: Without locality, *Picarda* 658 (det. Kuhn).

12. ***Polystichum plaschnickianum*** (Kunze) Moore, Ind. Fil. 100. 1858.

Aspidium plaschnickianum Kunze, *Linnæa* 23: 239. 302. 1850.

The "most simple-fronded of all the *Polystichum* group," as Hooker remarked. It was described originally from cultivated specimens of uncertain origin, and is known at present only from Jamaica, where, according to Jenman, it is "common in forests and on shady wayside banks and rocks above 4,500 feet." Hooker's figure of it is creditable, but Jenman's description will be found rather more complete.^a

JAMAICA: Blue Mountain Peak, altitude 1,950 to 2,225 meters, *Underwood* 1448.

Highest slopes of John Crow Peak, altitude 1,650 to 1,800 meters, *Underwood* 707, 2443; *Maxon* 1320. Trail between Morces Gap (1,500 meters) and Vinegar Hill (1,185 meters), *Maxon* 1516; *Underwood* 1372, 2593; *Harris* 7343. Vicinity of Morces Gap, altitude 1,500 meters, *Maxon* 2768; *Underwood* 3136a; *Clute* 61. Near Cinchona, altitude 1,500 meters, *Harris* 7588. Without locality, *Hart* 12.

13. ***Polystichum platyphyllum*** (Willd.) Presl, Tent. Pterid. 84. 1836.

Aspidium platyphyllum Willd. Sp. Pl. 5: 255. 1810.

The type of this species was from Caracas, Venezuela, collected by Bredemeyer, and the species itself is not well represented in American herbaria. A single Jamaican specimen of Jenman's collecting (definite locality not given) in the herbarium of the New York Botanical Garden agrees essentially with South American material available for comparison and differs from any other West Indian specimen seen. The nearest ally is *P. polystichiformis*. *P. platyphyllum* is a coarser, stouter plant than this, with heavier stipe and flexuose rachis. The pinnae are elongate-triangular, broadest at the base, the inferior basal pinnule being scarcely at all reduced in comparison with the dwarfed long-cuneate lower basal pinnule of *P. polystichiformis*.

Known, in the West Indies, only from Jamaica.

14. ***Polystichum polystichiformis*** (Fée) Maxon.

Phegopteris polystichiformis Fée, Gen. Fil. 243. 1850-1852.

Polystichum tenue Gilbert, Fern Bull. 8: 63. 1900.

The *Phegopteris polystichiformis* of Fée was founded upon a plant collected by Linden (no. 1874) in the vicinity of Monte Libano, in the present province of Oriente, Cuba. The description, though not complete, indicates with reasonable certainty that Wright's no. 832, collected a few miles to the eastward at Monte Verde, is the same. This was listed by Sauvalle^b as *Polypodium polystichiforme* and by Eaton^c as *Phegopteris platyphylla* Mett. So far as the writer knows, the species has not been collected since in Cuba.

In 1900 Gilbert described a new species, *Polystichum tenue*, from Jamaica, as a segregate from the Jamaica forms included by Jenman under the name *Aspidium aculeatum*. This, as shown by a large series of specimens collected by Professor Underwood and the writer, agrees well with Wright's Cuban plant. The species has, apparently, a restricted range in Jamaica, all the specimens seen being from a single locality in the Blue Mountains.

In its lesser dimensions, smaller parts, and very delicate texture *P. polystichiformis* differs widely from *P. platyphyllum*, as Gilbert pointed out in the case of the Jamaican material. It is, apparently, confined to Cuba and Jamaica.

^a Bull. Bot. Dept. Jamaica II. 2: 197. 1895.

^b Sauvalle, Flora Cubana 214. 1868.

^c Mem. Am. Acad. II. 8: 207. 1863.

CUBA: Monte Verde, Oriente, *Wright* 832.

JAMAICA: Clyde River Valley (below Cinchona), altitude 900 to 1,200 meters, *Underwood* 428, 429, 430, 442, 2644, 2645, 2648, 2649; *Maxon* 1595, 1599; *Harris* 7161. Without exact locality, *Hart* 29, 32a.

15. *Polystichum rhizophorum* (Jenman) Maxon.

PLATE 7.

Aspidium viviparum rhizophorum Jenman, Bull. Bot. Dept. Jamaica II. 2: 268. 1895.

Plants of relatively small stature, fronds 20 to 35 cm. long, closely fasciculate, subdimorphous, the fertile ones usually erect and noncaudate, the sterile ones flagellate-radicant and mostly horizontally arching. Rhizome slight, usually 5 to 7 mm. in diameter, 2 to 2.5 cm. long, erect or ascending, clothed sparingly with dull light brownish ovate scales; stipe slight, sulcate or somewhat compressed, greenish, with noticeable scales at the base like those of the rhizome, otherwise glabrescent, in the sterile fronds measuring 1.5 to 11 cm. long (average about 4 cm.), in the fertile frond 7 to 12 cm. long (average 10 cm. or more); rachis compressed and very narrowly alate; lamina of the sterile frond 30 to 45 cm. long, 3.5 to 5.5 cm. broad, simply pinnate or rarely again deeply pinnatifid, narrowly lanceolate, subarcuate in drying, the pinnæ approximate or somewhat spaced, the upper ones reduced and giving way (sometimes abruptly) to a slender pliant radicant cauda 8 to 18 cm. long; lamina of the fertile frond linear-lanceolate, 15 to 25 cm. long (average near the minimum), about 2.5 cm. broad, usually erect and noncaudate, the pinnæ distant; pinnæ of both sterile and fertile fronds slightly scurfy below, subtriangular-trapeziform, auriculate at the upper base, the auricle subspinescent, the margins otherwise usually not spinescent but ranging from subentire to obliquely biserrate, the inferior margin widely excised at the base; sori 5 to 7 pairs to the pinna, rather nearer the midvein than the margin.

JAMAICA: Vicinity of Hollymount, Mount Diabolo, altitude about 750 meters, *Maxon* 1912, 1932, 2277, 2356; *Underwood* 3442. Without locality, *Jenman* (two sheets).

The present species, which seems to be confined to Jamaica, was described briefly by Jenman as a subspecies of the Jamaican "*viviparum*" (*P. dissimulans* sp. nov. of the present paper), to which species it appears to have no very near relationship. It has, according to Jenman, rather a wide distribution in Jamaica; but the writer has collected it at only one station (there, however, in quantity), where it shows unmistakably the characteristic form described by Jenman. It grows, at Hollymount, in firm rocky ground or in crevices of rocks, always in the humid forest. It was never observed to occupy the more open situations favorable to *P. triangulum*, which grew in the same general locality.

Jenman's comment on this form is in part as follows: "This resembles *Polypodium reptans* Sw. in habit, the fertile fronds being erect, devoid of a tail, as a rule, and with the petioles twice as long as those of the barren ones. In the latter the upper pinnæ become gradually more distant to the uppermost of all, terminating abruptly." The writer has seen only a slight approach toward the bipinnate form mentioned by Jenman.

The closest relationship of *P. rhizophorum* is with the Cuban form herein described as *P. decoratum* and is discussed under that species.

EXPLANATION OF PLATE 7.—Specimen from Hollymount, Jamaica, *Maxon* 1912. Scale about $\frac{1}{2}$.

16. *Polystichum rhizophyllum* (Sw.) Presl, Tent. Pterid. 82. 1836.

Polypodium rhizophyllum Sw. Prodr. 132. 1788.

Aspidium rhizophyllum Sw. Schrad. Journ. Bot. 1800²: 31. 1801.

Polystichum krugii Maxon, Proc. Biol. Soc. Washington 18: 215. 1905.

The present species was described originally from Jamaica and was figured later upon Jamaican specimens by Hooker and Greville.^a It has been attributed also to

^a Hook. & Grev. Ic. Fil. 1: pl. 59. 1829.



POLYSTICHUM RHIZOPHORUM (JENMAN) MAXON.



B

A

POLYSTICHUM STRUTHIONIS MAXON.

Cuba, Porto Rico, and Guadeloupe.^a The Porto Rican material, indicated by Kuhn as a distinct species under the manuscript name *Aspidium krugii*, has since been described by the writer as *Polystichum krugii*; and with this has been associated the Wright Cuban specimen. A reexamination of the whole series, however, fails to discover any stable characters by which the extremes of this variable species may be separated. The most conspicuous character of the Porto Rican plant lies in the greatly elongate linear caudate apex, as opposed to the broader and shorter apex of the Jamaican plant; but specimens intermediate in this and other characters occur, and it is evident that situation and exposure must play an important part in determining dimensions, form, and texture of individual plants. In Jamaica, according to Jenman, the species occurs "in well-drained stony woods, on rocks and bowlders up to 1,000 feet or more." It was not observed by the writer.

JAMAICA: "Near Kingston," Safford 9. Without locality, *ex herb. Bot. Dept. Jamaica*. Without locality, Purdie (E); Hart 181.

PORTO RICO: Near Cayey, Sintenis 2240, 2240c. On the Adjuntas road, 7 miles from Ponce, Heller 6095. Between Aibonito and Cayey, Mr. & Mrs. A. A. Heller 536. Near Utuado, Sintenis 6274b. Bairoa (Caguas), Goll 342.

CUBA: Ingenio Soledad, near Cienfuegos, Santa Clara, Pringle 106. In crevices of rocks, Los Portales de Guame, December 31, 1864, Wright, no. "F" (E).

17. **Polystichum struthionis** Maxon, nom. nov. PLATE 8.

Aspidium mucronatum Hook. Sp. Fil. 4: 9. pl. 216. 1862, not Sw. 1801.

Polystichum echinatum C. Chr. Ind. Fil. 83. 1905, not *Polypodium echinatum* Gmelin. 1791.

The present species is described fully by Hooker and by Jenman and is well figured by Hooker, on the basis of specimens from Jamaica, under the name *Aspidium mucronatum*. The true *mucronatum* of Swartz, however, is a form of *triangulum*, as stated on page 28, and *echinatum* is its equivalent. Schkuhr appears to have first misapplied the Swartzian name, figuring at the right of plate 29 C of his *Kryptogamische Gewächse* the species taken up later by Hooker under this name. Hooker's figure is much better than Schkuhr's, and neither shows any especial resemblance to Sloane's plate 36. figure 4, the prototype of *mucronatum* and *echinatum*. With a series of Jamaican plants at hand the misidentification is most obvious.

The species is, so far as definitely known, confined to Jamaica; the additional accredited range of Guadeloupe and Santo Domingo must be regarded as very doubtful, in view of the invariable misapplication of the name *mucronatum*. Dependence may be placed on Jenman's very full and accurate description, and Hooker's figure is unmistakable. The species shows no approach to any other. The deeply serrate form, mentioned by Jenman as bipinnatifid, was collected in Jamaica by the writer only once (no. 1614); it appeared to have been induced directly by the unusually open dry habitat.

JAMAICA: Highest slopes of John Crow Peak, altitude 1,650 to 1,800 meters, Underwood 2442; Maxon 1316. Vicinity of New Haven Gap, altitude about 1,650 meters, Maxon 2660. Near Whitfield Hall, Maxon 1470. Clyde River Valley, altitude 900 to 1,200 meters, Underwood 458, 2659; Maxon 1610, 1614. Near Mabess River, altitude about 1,200 meters, Harris 7596. Trail from Cinchona to Morces Gap, altitude 1,500 meters, Underwood 322, 1207. Quashi Hill, altitude 1,500 meters, Eggers 3763. Without locality, N. Wilson; Gilbert; Jenman; Hart 209.

EXPLANATION OF PLATE 8.—Fig. A, middle portion of an ordinary frond, Clyde River Valley, Jamaica, Underwood 458; B, middle portion of a large incised frond, same locality, Maxon 1614. Figures A, B, natural size.

18. **Polystichum tridens** (Moore) Fée, 11me Mém. 74. 1866.

Aspidium tridens Moore; Hook., Sp. Fil. 4: 15. pl. 215. 1862.

^a Engler's Bot. Jahrb. 24: 112. 1897. Guadeloupe specimen not seen by the writer.

Hooker's plate and description indicate well the excellent characters of the present species, which is confined to Jamaica. Only the following specimens have been studied, these showing the relatively slight variation mentioned by Hooker:

JAMAICA: Arntully, *Harris* 5952. Without locality, *Gilbert* 38; *Jenman*; *Purdie*; *N. Wilson*; *Hart* 28.

19. *Polystichum underwoodii* Maxon, sp. nov.

PLATE 9.

?*Aspidium triangulum latipinnum* Jenman, *Journ. Bot.* 17: 260. 1879; ?*Bull. Bot. Dept. Jamaica* II. 2: 269. 1895; not *Aspidium latipinna* Hance, 1873.

Fronde 40 to 50 cm. long, fasciculate, suberect or spreading, long-stipitate, tolerably stout, simply pinnate, proliferous. Rhizome stout, 1.5 to 2.5 cm. in diameter, suberect or decumbent, thickly clothed with imbricate lanceolate to narrowly ovate scales, some of these fulvous but most dark brown or blackish and shining; stipe 15 to 27 cm. long, canaliculate, stramineous, covered at the base with large scales similar to those of the rhizome, otherwise rather densely clothed with deciduous linear-lanceolate attenuate reddish brown scales; lamina very narrowly deltoid, 20 to 25 cm. long, 5 to 7 cm. broad, at the base, once pinnate, tapering very gradually to the pinnatifid or subentire elongate deeply retuse proliferous apex; pinnae 15 to 20 pairs, glabrous and dark green above, below lighter colored and minutely paleaceous-pilose, divergent, the lower ones their own width apart, subpetiolate, those above somewhat less spaced, sessile, the upper ones greatly reduced, adnate and joined by a narrow wing; lowermost pinnae 2.5 to 3.5 cm. long, 13 to 15 mm. broad, rhombic-ovate, the apex mucronate, the base unequally and rather obtusely cuneate; margins subentire or, less often, coarsely crenate, the crenations not spinescent; sori nearly medial, borne in two rows of about 8 each and an incomplete row at the superior base; indusia large, brownish, subpersistent.

Type in the U. S. National Herbarium, no. 521270, collected near the summit of Blue Mountain Peak, Jamaica, altitude 2,100 to 2,225 meters, by Lucien M. Underwood, no. 1441, February, 1905. Specimens collected by the writer at the same locality under no. 1428 represent the crenate form included in the description. These last are, in part, subauriculate, the basal crenation in a few cases extending nearly half way to the midvein of the pinna. *Harris* 7516, from Mount Hybla, altitude 1,200 meters, represents a smaller and less complete development of the species.

For his variety *latipinnum* Jenman cites only specimens from Arntully Gap, altitude 600 meters. His incomplete description accords well with the present diagnosis, but relatively few Jamaican ferns show so great an altitudinal range. Jenman's specimen of his variety *latipinnum* at the New York Botanical Garden is without definite locality data; it differs somewhat in its more regular and very broad pinnae and is not truly typical of the species as here defined on the basis of the Blue Mountain Peak plants.

Polystichum underwoodii is distinguished readily from all the other pinnate viviparous species by its nonflagelliform and deeply retuse apex.

EXPLANATION OF PLATE 9.—The type specimens. Scale about 7.

SPECIES EXCLUDENDAE.

ASPIDIUM CUBENSE Kuhn, *Linnaea* 36: 108. 1869.

Founded upon *Wright* 1099 from Cuba; transferred to *Nephrodium* by Baker (1874) and to *Dryopteris* by Kuntze (1891). From its indusia it is properly a *Dryopteris*, and is related to *D. denticulata*, which Diels follows John Smith in considering a *Polystichum*.

Aspidium jucundum Fée, as noted at page 18 of this paper, is probably an earlier name for *D. cubensis*.



POLYSTICHUM UNDERWOODII MAXON.

ASPIDIUM MELANOCHLAMYS Fée, Gen. Fil. 294. 1850-1852.

A Cuban species, founded upon *Linden* 1865, from Monte Libano, province of Santiago (Oriente); placed under *Polystichum* by Diels (1899), the synonymy indicated by Christensen. Known to the writer from the following specimens:

CUBA: Josephina, north of Jaguey, Yateras, province of Oriente, altitude about 575 meters, *Maxon* 4109; caverns of Thermopylæ and vicinity, Monte Libano, Oriente, altitude about 600 meters (the type locality), *Maxon* 4251.

A very peculiar species, allied to the Mexican *Dryopteris melanosticton*, and properly referred to *Dryopteris* by Kuntze (1891). Immature fronds show the indusia to be markedly bicolorous, orbicular, and uniformly with a very narrow sinus; the center is dark purplish brown, the margins abruptly paler.

ASPIDIUM VISCIDULUM Mett. Abhand. Senck. Nat. Gesell. 2: 322. 1858.

The synonymy of this species, the type of *Adenoderris*, is correctly given by Christensen, in accordance with a paper published by the writer several years ago.^a The relationship with *Polystichum* is not a very close one.

POLYPODIUM DENTICULATUM Sw. Prodr. 134. 1788.

Described originally from Jamaican specimens, the continental forms smaller and apparently constituting several poorly defined species. Like *D. cubensis*, it is in technical character of indusium a *Dryopteris*, as shown by an ample suite of Jamaican specimens. The synonymy is indicated by Christensen.

DICKSONIA APIIFOLIA Sw. Schrad. Journ. Bot. 1800²: 91. 1801, not of later authors.

Christensen in his Index has recently pointed out that this is the earliest name for the plant usually known as *Aspidium ascendens* Heward (1838), both names having been applied originally to Jamaican plants. The species has been well characterized by Jenman and various other authors and has received at least one other specific name, having been described and illustrated upon Guatemalan specimens by Captain Smith in 1890 as *Nephrodium duale* Donn. Sm. It occurs also in Cuba. Moore (1858) regarded it as a *Polystichum*, in which he has been followed by Diels (1899); but however much it may resemble in habit certain species of *Polystichum*, notably *P. adiantiforme*, in the character of its indusium, it is technically a *Dryopteris*. In its habit and strongly dimorphous fronds it bears the closest resemblance to various *Polybotrya* species, the fertile fronds being mere skeletons in comparison with the sterile (foliar) ones. To avoid an excessive multiplication of generic names it may perhaps preferably remain under *Dryopteris*, but it ought at least to rank as a subgenus, for which the name *Peismapodium* is here proposed. The synonymy of *Dryopteris* (*Peismapodium*) *apiifolia* (Sw.) Kuntze is given in full by Christensen.

DESCRIPTIONS OF NEW SPECIES.

Asplenium palmeri Maxon, sp. nov.

Rhizome slight, 4 or 5 mm. in diameter, ascending, bearing a few thickened linear-lanceolate blackish scales (1.5 to 2 mm. long) with lighter margins; fronds 4 to 8 in number, cespitose, 8 to 20 cm. long (averaging about 12 cm.), spreading, commonly arcuate throughout, particularly in the apical portion; stipes 1 to 2.5 cm. long, slender, dull purplish black; lamina 7 to 17.5 cm. long, 9 to 18 mm. broad (averaging about 12 mm.), linear, 25 to 34-jugate, reduced gradually in both directions, the apex commonly naked, flagelliform (1.5 to 2.5 cm.) and radican, giving rise to a new plant by means of a terminal proliferous bud; characteristic middle pinnæ horizontal, 6 to 9 mm. long, 3 to 4 mm. broad, oblong, subauriculate or even subhastate, broadly and subequally cuneate, the margins regularly and conspicuously serrate; lower pinnæ shorter, hastate, very broadly cuneate, horizontal, the margins deeply and somewhat irregularly crenate-serrate, the lowermost pinnæ distant and frequently minute; sori medial, about 4 or 5 pairs to the pinna, confluent with age; indusia elliptical, firm, glabrous, the margin subentire.

^a *Adenoderris*, a valid genus of ferns. Bot. Gaz. 39: 366-369. 1905.

Type in the U. S. National Herbarium, no. 451192; collected on a shaded mountain side near Etzatlan, State of Jalisco, Mexico, October 2, 1903, by J. N. Rose and Joseph H. Painter (no. 7582). Other specimens examined are as follows:

MEXICO: Exact locality wanting, States of Coahuila and Nuevo Leon, February to October, 1880, *Edw. Palmer* 1435 (N).^a Southwestern Chihuahua, August to November, 1885, *Edw. Palmer* 117 (N, G). Baranca near Guadalajara, State of Jalisco, June, 1886, *Edw. Palmer* 79 (N, Y, M, E, G); *Rose & Painter* 7501 (N). Durango and vicinity, April to November, 1896, *Edw. Palmer* 555 (N, Y, M, G). Wet shady banks near Guadalajara, State of Jalisco, December 1, 1888, *Pringle* 1838 (N, M, E, P). Wet ledges, rocky hills near Chihuahua, State of Chihuahua, October, 1885, *Pringle* 444 (N, Y, M, E, G, P). Damp cool shade, Huchuerachi, State of Sonora, *C. E. Lloyd* 491 (N, G); altitude 1,200 meters, *Hartman* 319 (N, Y, G). Nacori, State of Sonora, altitude 1,725 meters, *Hartman* 293 (G). El Fortin, State of Oaxaca, altitude 1,600 meters, *Conzatti* 701 (G). Mountains near San Miguelito, San Luis Potosi, *Schaffner* 917 (E). Near Ixmiquilpan, State of Hidalgo, *Rose, Painter & Rose* 8931, 9051.

GUATEMALA: Coban, Department of Alta Verapaz, altitude 1,260 meters, September, 1885, *von Türckheim* 714 (Y). Department of Peten, *R. Walker* (J. D. S. 1154) (N).

The present species was first collected apparently by Dr. Edward Palmer, for whom the writer has had pleasure in naming it. Specimens collected subsequently by Dr. C. G. Pringle were listed by Mr. Davenport as *Asplenium trichomanes* var. *repens* Davenp., a new form ^b which Mr. Davenport thought possibly the same as the Cuban *A. heterochroum*, which had been reduced by Hooker and subsequent writers. From this, which in the light of recent collections must be regarded as a valid species, *A. palmeri* may be distinguished at once (as from all the species of this group) by its prolonged naked apex, which bears a proliferous bud at the apex, producing occasionally young plants up to 2.5 cm. in height. Nearly all the fronds are fertile; the pinnæ are somewhat coriaceous with the margins more or less inflexed, the marginal serrations sharply acute and distinct.

***Cyathea crassa* Maxon, sp. nov.**

Caudex erect, 3 to 8 meters high, spiny; stipe undescribed; rachis (at least in the upper part) castaneous, polished, glabrous; pinnæ dark green above, paler below, coriaceous, oblong to deltoid-lanceolate, 40 to 60 cm. long, 15 to 22 cm. broad, sessile, with about 16 to 20 pairs of pinnules below the abruptly acuminate apex, the secondary rachis brownish castaneous, glabrous and shining on the under surface, above deeply sulcate, minutely dark pilose, and with a few scattering minute castaneous stellate scales; pinnules contiguous or slightly apart, oblong to deltoid-oblong, 8 to 11.5 cm. long, 2 to 4 cm. broad at the base, sessile or essentially so, cut nearly or quite to the costa, the apex long-acuminate, serrate-crenate; segments 13 to 17 pairs, approximate or slightly apart, oblong, subfalcate, slightly oblique, obtuse, mostly adnate, the middle and lower ones decurrent, only the basal ones sessile, these the largest (up to 2 cm. long and 8 mm. broad), deeply inciso-pinnatifid (the lobes pinnately veined, sometimes with 2 basal sori), those above deeply inciso-crenate, the uppermost dentate-serrate; costæ, costulæ, veins and surfaces glabrous below; veins (excepting those of the basal segments) 1 to 3-forked, 6 to 8 pairs, mostly fertile; sori near the costule, large, distant; indusium castaneous, deeply hemispherical, rigidly coriaceous, per-

^a As in previous papers, E refers to the D. C. Eaton Herbarium, G to the Gray Herbarium, N to the U. S. National Herbarium, M to the Missouri Botanical Garden Herbarium, P to the C. G. Pringle Herbarium, and Y to the herbarium of the New York Botanical Garden (Underwood Herbarium).

^b Bull. Torr. Club 13: 130. 1888.

sistent, the margins even; receptacle capitate, somewhat hirsute, glabrescent, slightly included.

Type in the U. S. National Herbarium, no. 523876, collected in the forest upon Mount Izabel de la Torre, Santo Domingo, altitude 550 meters, *Eggers 2735c*.

The species is known to the writer only from this locality, a second number being *Eggers 2735*. It is not very closely related to any of the North American species with cup-shaped indusia and is well marked by its very broad, deeply and irregularly incised segments, and by its relatively few veins and large distant sori. The deltoid form of the pinnules is also characteristic and very unusual in species of this group. The data as to the caudex are taken from the label.

***Lycopodium underwoodianum* Maxon, sp. nov.**

A very delicate, slender, freely branched pendent epiphyte, attaining a length of more than 60 cm., the apical portion to a distance of 10 cm. or more sporangiate with little or no interruption, the sporophylls not reduced; stem very slender, 0.5 mm. in diameter, many times dichotomous, flexuose, sulcate, light or yellowish green except toward the base, here more or less reddish; leaves light green, adnate, obscurely 5-ranked, divergent, all nearly equal in size, linear, strongly falciform, 9 to 12 mm. long, 0.4 to 0.6 mm. broad, about 1 to 2.5 mm. apart, twisted at the base, the midvein medial, inconspicuous but visible on one surface nearly throughout, the margins perfectly entire; sporophylls exactly like the leaves; sporangia conspicuous, orbicular-reniform, about 1 mm. broad and long, greatly exceeding the linear sporophylls and equally slender stem.

Type in the U. S. National Herbarium, no. 575691, collected from a liane in the humid forest at the finca Coliblanco, at an estimated elevation of 1,950 meters, on the lower slopes of the volcano Turrialba, Costa Rica, by William R. Maxon (no. 213), April 30, 1906. Specimens of the same number are also in the herbarium of the New York Botanical Garden, in whose interest the collecting trip to Costa Rica was undertaken.

L. underwoodianum, though somewhat allied to *L. linifolium* and *L. jenmani*, is one of the most distinct and strikingly peculiar species of the genus thus far discovered in the American tropics. With *L. linifolium* it needs no comparison. From *L. jenmani*^a it differs wholly in its very slender stems, equal and subfiliform leaves, these with an inconspicuous median midvein, and in its loose diffuse habit. It is unusual for the extreme delicacy of all its parts. The stem is exceedingly slender and the leaves are strongly falciform and almost capillary. The growing plant, depending from a vine perhaps 15 feet from the ground, looked most like some delicate long pendent moss, and the resemblance of the dried specimens to certain lax forms of *Sphagnum* is pronounced.

***Pteris purdoniana* Maxon, sp. nov.**

FIGURE 1.

Fronde very large, 150 to 210 cm. long, simply pinnate, laxly arching, subfasciculate from a relatively slight decumbent or short-creeping rhizome; stipe 25 to 45 cm. long, stout, about 3.5 mm. in diameter, stramineous, villous-chaffy with numerous reduced spreading or retrorse fulvous scales, tuberculate with age; lamina 125 to 165 cm. long, 24 to 28 cm. broad, comprising about 60 or more pairs of linear-ligulate subfalcate distant pinnæ and a conform terminal segment; lower pinnæ very gradually reduced, the lowermost 2 to 4 pairs frequently vestigial, especially in the sterile fronds; characteristic middle pinnæ of fertile frond 12 to 15 cm. long, 8 or 9 mm. broad, at the base subtruncate or equally and very obtusely cuneate, falcate (especially toward the apex), the apex long-attenuate and finally serrulate; pinnæ of the sterile frond similar in shape but broader (up to 1.7 cm. broad), usually less falcate, with cartilaginous denticulate margins, the apex rather conspicuously denticulate-serrate, the base equally and obtusely cuneate; pinnæ uniformly articulate, inserted upon a con-

^a Bull. Torr. Club 33: 112, 1906.

spicuous mammiform basal protuberance; veins tolerably close, once-forked, evident upon the lower surface; sori continuous along both margins almost to the serrulate apex, the indusium nearly 1.5 mm. broad.

Type in the U. S. National Herbarium, nos. 520162, 520163, and 520164, these comprising a fertile frond and rhizome of a plant collected in the vicinity of Hollymount, Mount Diablo, Jamaica, altitude about 750 meters, by William R. Maxon (no. 2253), May 25 to 27, 1904; sheets no. 520165 and 520166 comprise a sterile frond with identical data. The plants grew at the border of the forest, depending gracefully from a bushy bank along the trail. Mr. Harris's no. 8882 and Dr. Underwood's no. 3458, both collected in this vicinity in 1905 and 1906, respectively, are the same.

In its vascular parts and chaffiness *P. purdoniana* resembles *P. longifolia*, of which very likely it is a derivative. It differs in a pronounced way, however, in its enormous lax arcuate fronds and especially in the falcate *articulate* pinnæ, as described. Except with great care the pinnæ are deciduous in drying, separating very readily

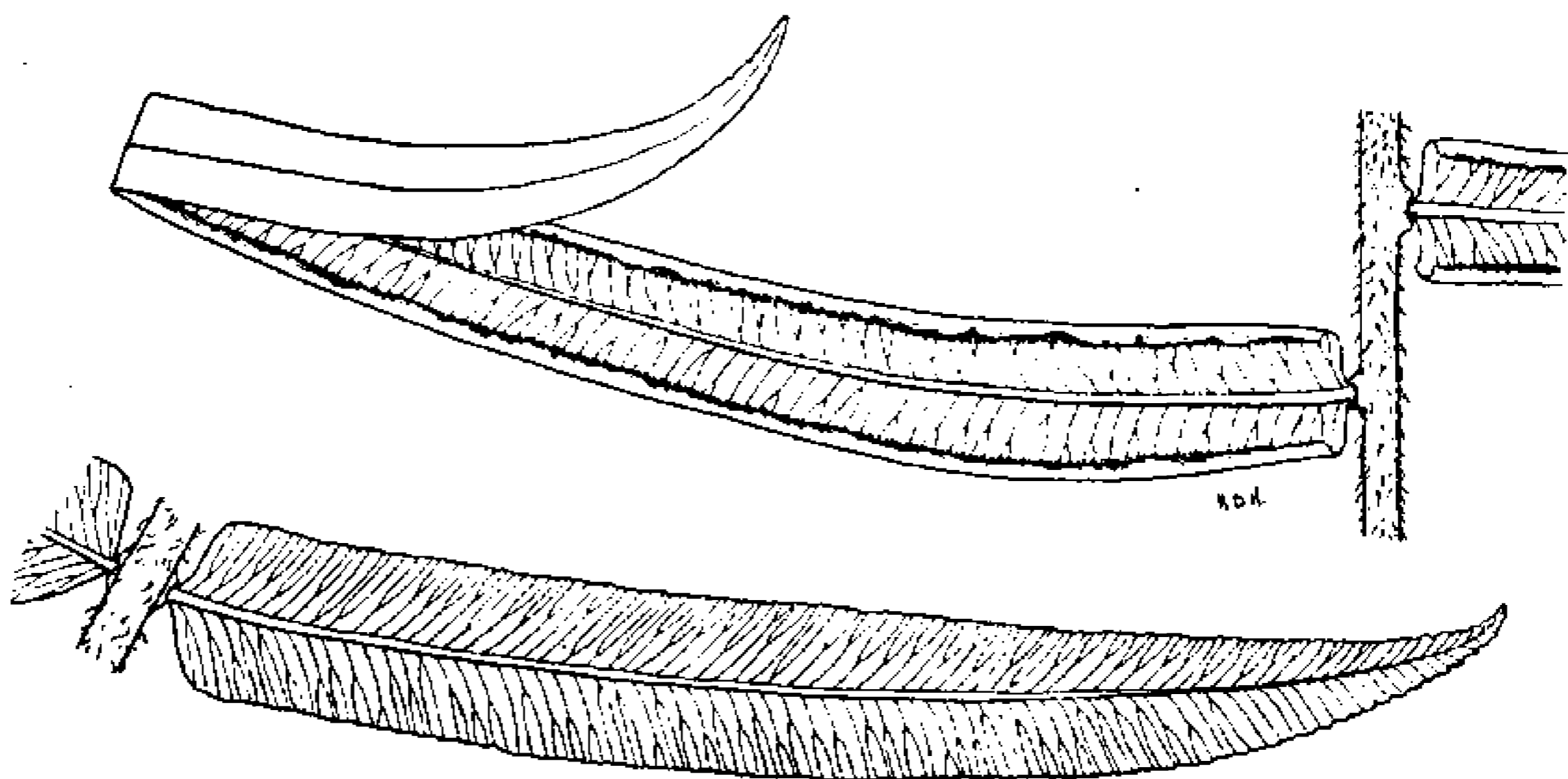


FIGURE 1.—*Pteris purdoniana*. Characteristic fertile and sterile pinnæ of type. Natural size.

at the point of insertion, as shown in the accompanying figure, which has been kindly furnished by Dr. H. D. House.

Named in honor of W. P. Purdon, esq., of Kingston, Jamaica, by whose kind permission the writer was enabled both in 1903 and 1904 to explore the vicinity of Mount Diablo, working from Hollymount, Mr. Purdon's country estate, as a base.

MISCELLANEOUS NOTES.

Elaphoglossum siliquoides (Jenm.) C. Chr. Ind. Fil. 315. 1905.

Acrostichum siliquoides Jenm. Journ. Bot. 19: 53. 1881.

This species, well described by Jenman upon Jamaican specimens and known previously only from that island, was collected at two localities in Alta Verapaz, Guatemala, by the writer in 1905: Above Sepacuite, on the trail to Panzos, *Maxon & Hay* 3109; Secoyoté, near Sepacuité, on rotten stumps, *Maxon & Hay* 3248. These agree perfectly with Jamaican specimens (*Maxon* 1921 and 2272), from Hollymount, altitude about 750 meters.

Polypodium fissidens Maxon, Contr. Nat. Herb. 8: 275. pl. 61. f. 4a. 4b. 1903.

This well-marked species, described originally from Chiapas, Mexico, may now be reported from Guatemala on the basis of Selers's no. 2365, collected in the Sierra Santa Elena, Department of Chimaltenango, at an elevation of 3,000 meters—the specimens received from Captain Smith.

Polypodium mitchellae Baker in Hemsl. Biol. Centr. Amer. 3: 664. 1885.

The original specimens of this species are from Orange Walk, British Honduras, Mrs. Mitchell. It has also been collected at Chontales, Nicaragua, by Tate (no. 406). Specimens of both these collections are at Kew and in the herbarium of the New York Botanical Garden.

The species may now be recorded also from the humid mountainous region of eastern Guatemala, on specimens collected from the trunks of forest trees near Secanquím, Alta Verapaz, at an altitude of about 450 meters, Maxon & Hay 3195 and 3213. It may be expected also in eastern Costa Rica, at low or middle elevations.

Polypodium senile Fée, 7me Mém. 60. pl. 25. f. 1. 1857.

A species apparently little understood, founded on Schlim's no. 364, from the province of Ocaña, New Granada. It is accredited to Colombia and Ecuador by Christensen, following Hieronymus;^a and it appears also to extend as far north as the volcanoes of Costa Rica, on the basis of specimens which the writer for several years took to represent an undescribed species. Comparison of this northern material, however, with Colombian specimens shows no differences warranting separation. From the whole variable series, but mainly from the more complete Costa Rican material, the following description is drawn:

Plants pendent, the fronds lax, subflexuose, narrow, from a very slight rhizome, this bearing a few setose fulvous scales intermingled with long whitish hairs; stipe and rachis exceedingly delicate, wiry, flexuose, covered with long whitish or pale yellowish hairs, these radiating also in great profusion from the sori and less abundantly from the tissue of the under surface of the pinnæ; lamina slender and narrow, 15 to 25 cm. long, 8 to 15 mm. wide, comprising from 30 to 50 pairs of pinnæ, these distant or their own width apart (rarely approximate); larger pinnæ of mature fronds 7 to 9 mm. long, 2.5 to 3.5 mm. broad, narrowly oblong or infrequently subovate with a rounded basal auricle, narrowed at the base, partially adnate or rarely sessile, the extent of adnation commonly about one-half the maximum width of the pinna, the margins entire or slightly sinuate; lower pinnæ gradually smaller, the lowermost 4 or 5 pairs vestigial, minute, 6 to 8 mm. apart; sori of characteristic pinnæ about 6 pairs, contiguous, strongly confluent with age, borne nearer to the midvein than to the margin at the extremity of the short subopposite simple blackish veinlets.

The following specimens have been examined:

COLOMBIA: Sierra del Libano, Santa Marta, altitude 1,650 meters, damp forest on a ridge, pendent from branches of trees, H. H. Smith 2230 (Y). Cerro de Onaca, Santa Marta, altitude 1,650 meters, on a tree, H. H. Smith 2437 (Y). Sierra del Libano, Santa Marta, altitude about 1,800 meters, damp forest, on trees, hanging from the branches and often hidden among mosses and Hymenophyllaceae, H. H. Smith 1035 (Y). Without special locality, Lindig (Y).

COSTA RICA: Volcan de Turrialba, altitude 2,600 to 2,800 meters, Pittier 13248 (J. D. S. 7497) (N). Forêts de l'Achiote, Volcan de Poas, altitude 2,200 meters, Tonduz 10706 (N). Forêts du Volcan du Barba, altitude 2,500 meters, Tonduz 1934 (N). Massif de l'Irazu, altitude about 2,000 meters, Tonduz 4180 (N). Without locality, Werckle, ex herb. Christ (N).

The Costa Rican specimens show a tendency to have the pinnæ more spaced and less adnate to the rachis than those from Colombia, the best development being represented by Mr. Pittier's no. 13248. Mr. H. H. Smith's no. 1035 is the most mature state of the Colombian specimens.

From *P. cultratum* the present species is readily distinguished by (1) its dark venation, the branches of the midvein being blackish (green in *P. cultratum*), (2) its spaced, less adnate, even sessile pinnæ, these not recurved, (3) its more copious hairy covering, this much lighter in color, and (4) its more slender vascular parts.

^a See Hieronymus in Engler's Bot. Jahrb. 34: 508. 1905.