

# STUDIES OF TROPICAL AMERICAN FERNS—NO. 7.

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## INTRODUCTION.

In the following paper are brought together additional results of the writer's studies of tropical American ferns, of which six installments have been published under the same title in earlier numbers of the Contributions, beginning with volume 10.

### THE NORTH AMERICAN SPECIES OF ALSOPHILA GROUPED WITH *A. ARMATA*.

The North American tree ferns of the genus *Alsophila* which are related to the species known usually as *A. armata* are limited by Hooker and Baker in the Synopsis Filicum to the following: *Alsophila ferox* Presl, which is said to be spread throughout the whole of tropical America; *A. armata* (Swartz) Presl, of similar distribution, *A. bicrenata* (Liebm.) Fourn. being cited at a synonym; *A. godmani* Hook., described as a new species from Guatemala; *A. mexicana* Mart., ascribed only to Mexico, with a short abridged description and a citation of Martius's excellent illustration; and, finally, *A. myosuroides* Liebm., with a brief paraphrase of Liebmann's description and the following remarkable comment: "The author seems to allude to an affinity with *Als. armata*, Pr. I possess copious specimens from Dr. Liebmann gathered in Mexico, and from the Copenhagen Garden, where it is cultivated, but, save in the caudate apices of the pinnules, it possesses scarcely any distinguishing characters."

Of the species just mentioned, *A. ferox* is universally regarded as valid, but under the name *A. microdonta* Desv.; *A. armata* (Swartz) Presl is likewise valid, though to be known as *A. swartziana*, under the American Code; *A. bicrenata*, confined to Mexico, is entirely valid and is so cited by Christensen; *A. godmani* is identical with *A. mexicana*, as should have been readily apparent from Martius's plate and critical notes; and *A. myosuroides* is an extremely well marked species since found to have a wide range in the lowlands from southern Mexico to Honduras and in western Cuba.

The list of valid species in this group has been increased by Christ, who about 15 years ago described *Alsophila stipularis*, *A. ichtyolepis*, and *A. acutidens*, all from Costa Rica. The last is very distinct, and is well described from three collections at a single locality. *Alsophila stipularis* also proves to be valid, although the original description, drawn from specimens lacking precise data, is short and comparative. *Alsophila ichtyolepis*, described from four collections, is almost completely synonymous with *A. stipularis*.

The present review is based upon studies carried out at intervals for several years past. One species, *A. scabriuscula*, has been described by the writer in the meantime from Guatemala and Mexico. Five are now described as new: *A. notabilis* and *A. nesiotica*, from Cocos Island, off the west coast of Costa Rica; *A. trichiata*, from Panama and Costa Rica; *A. pansamalana*, from Alta Verapaz; and *A. strigillosa*, which is apparently a very rare Cuban plant. Several of these are figured.

The group of *A. armata*, which is fairly well marked, is made up of species which, as is usually true in the tree ferns, have definite, rather restricted ranges and which to be well understood or properly described must be studied in comparison with each other. In addition to the gross characters common to the group they possess minute but distinctive differences in cutting and in the character and disposition of scales and hairy covering, whose value for purposes of classification may otherwise be overlooked.

The general characters hardly need extensive description. The blades are not quite tripinnate, the pinnules mostly being cut to about 1 mm. from the costa. The segments, which range from oblong to linear and from nearly straight to falcate, are thus joined at their dilatate base, the acutish, polygonal, or sometimes subquadrate sinuses often having a translucent yellowish callus at their middle. In cutting, the segments range from serrate or crenate-serrate to incised or even truly pinnatifid, and the margins of the various-sized teeth or lobes differ similarly, though not to the same degree. The branching of the veins shows great diversity, and in consequence the position of the sori with respect to the costule. Characters afforded by the paraphyses are both diverse and dependable.

In hairiness, the vascular parts, from the primary rachis to the ultimate veins, are remarkably constant for a given species. In some species the hairs of the primary rachis are at first so close-set as to cover the surface completely, and yet are so completely detergible with age, or upon abrasion, as to leave no trace whatever upon the lustrous surface, which is absolutely smooth to the touch. In others, with stiffer hairs, the surface of the rachis never becomes smooth to the touch, even at extreme age, but is invariably scabrous from the persistence of the inflated tuberculate bases of the hairs. Hairs of

the inflated septate type are common to the secondary rachises, costae, and costules of all (excepting *A. strigillosa*, in part), and differ greatly in abundance, color, length, rigidity, and thickness. Many of these differences are indicated in the key. *Alsophila microdonta* is the only included species with distinctly spiny secondary rachises.

## KEY TO SPECIES.

- Primary rachis strongly aculeate throughout; secondary rachis also aculeate, the spines slender, up to 5 mm. long. Paraphyses very numerous, flaccid, moniliform, persistent in a lax tuft.....1. *A. microdonta*.
- Primary rachis (no. 5 excepted) slightly, if at all, aculeate above the base; secondary rachis smooth or merely muricate.
- Costae and costules (of the fertile pinnae, at least) devoid of spreading septate hairs beneath, but together with the veins minutely and persistently strigillose.....2. *A. strigillosa*.
- Costae and costules hirsutulous to long-hirsute beneath with pale septate hairs, other pubescence present or lacking.
- Pinnules, all or several, distinctly stalked.
- Segments 20 to 30 pairs, oblique, linear to linear-oblong, acute, serrate; pinnules attenuate to caudate, mostly stalked....3. *A. myosuroides*.
- Segments about 15 pairs, spreading, oblong, obtuse or mucous, coarsely dentate; pinnules acute, only the lower ones stalked.
4. *A. notabilis*.
- Pinnules sessile.
- Primary rachis apparently glabrous, the few or minute hairs easily abraded, perfectly deciduous.
- Spines present on the primary rachis, acicular, up to 4 mm. long; pinnules 25 to 30 pairs; segments about 25 pairs, long-hirsute beneath upon the costule and the base of the veins....5. *A. pansamalana*.
- Spines absent, the primary rachis distantly muricate only; pinnules about 40 pairs; segments about 30 pairs, hirtellous beneath along the costule and the veins throughout.....6. *A. stipularis*.
- Primary rachis at first densely pubescent or hirsute with close-set septate hairs, at length invariably scabrous from their persistent inflated bases.
- Fertile segments truly pinnatifid; primary and secondary rachises with occasional large flat persistent white scales.....7. *A. mexicana*.
- Fertile segments crenate-serrate or crenate-dentate to serrately incised; rachises devoid of large white scales.
- Segments serrately incised.
- Pinnules 20 to 25 pairs, 7 to 11 cm. long; segments 18 to 20 pairs, narrowly oblong.....8. *A. acutidens*.
- Pinnules 30 to 35 pairs, 10 to 15 cm. long; segments 25 to 30 pairs, linear.....9. *A. scabriuscula*.
- Segments crenate-serrate or crenate-dentate.
- Costules and veins merely hirsute beneath, a strigillose under-covering wanting; paraphyses dark red, turgid, persistent.
10. *A. nesiotica*.
- Costules and veins densely strigillose beneath, also hirsute (except the veins of *A. bicrenata*); paraphyses hyaline, flaccid, mostly deciduous.

Segments copiously hispid above upon the costule, veins, and leaf tissue, nearly devoid of bullate scales beneath.

11. *A. trichiata*.

Segments glabrous above, or with a few spinous hairs along the costule, bearing numerous small white or pale yellow roundish scales beneath near the base of the veins.

Costules hirsute beneath, the veins devoid of long hairs; segments glabrous above-----12. *A. bicrenata*.

Costules and veins hirsute beneath; segments with a few spinous hairs above, these usually confined to the costule.

13. *A. swartziana*.

1. *Alsophila microdonta* Desv. Mém. Soc. Linn. Paris 6: 319. 1827.

*Polypodium microdonton* Desv. Ges. Naturf. Freund. Berlin Mag. 5: 319. 1811.

*Polypodium aculeatum* Raddi, Opusc. Sci. Bologna 3: 288. 1819; Pl. Bras. 1: 27. pl. 42. 1825. Not *P. aculeatum* L. 1753.

*Alsophila armata* Mart. Icon. Pl. Crypt. 72. pl. 28, 48. 1834. Not *A. armata* (Swartz) Presl, 1836.

*Alsophila ferox* Presl, Tent. Pter. 62. 1836.

Caudex erect, 1 to 5 meters high, slender, only a few cm. thick; fronds few, arcuate-spreading, 2 to 2.5 meters long; stipes up to 1 meter long, light brown, lustrous, glabrate, freely aculeate, the spines mostly distant, narrowly conical, curved, up to 1 cm. long; blades ovate-oblong, abruptly acuminate, up to 1.5 meters long and 1.2 meters broad, subtripinnate, the primary rachis brown or yellowish brown, armed with distant long pungent spines throughout; pinnae petiolate, narrowly oblong, acuminate, 30 to 60 cm. long, 10 to 25 cm. broad, the secondary rachis densely yellowish-strigose above, thinly and deciduously scurfy-hirtellous beneath and distantly aculeate, the spines subacicular, spreading or retrorse, up to 4 mm. long, dull stramineous; pinnules about 20 pairs, nearly horizontal, sessile or subsessile, linear-oblong or oblong-lanceolate, long-attenuate, 5 to 13 cm. long, 1.5 to 3 cm. broad, the costa densely yellowish-strigose above, beneath thinly scurfy-hirtellous and bearing a few very minute tawny bullate scales, these mostly caducous; segments about 23 pairs, membrano-herbaceous, linear, acutish, 8 to 18 mm. long, 2 to 4 (5) mm. broad, falcate, crenate-serrate or (beyond the middle) obliquely incised, the teeth or lobes obscurely dentate; costules distantly hispid above, thinly scurfy-hirtellous beneath; veins oblique, mostly once or twice forked, or in the large sterile parts pinnately branched, glabrate above, beneath deciduously mealy-puberulous; sori 6 to 11 pairs, small, adjacent; receptacle minute; paraphyses very numerous, pale, flaccid, moniliform, equaling the sporangia, persistent.

The present species, the type of which is doubtfully South American, occurs over a wide area on the continent, namely from Veracruz and Tabasco to Brazil and eastern Peru, mainly at low elevations near the coast, but is definitely known in the West Indies only from the Isle of Pines, Cuba. From the other species treated in the present paper it is at once distinguished by its closely scurfy-hirtellous or mealy-puberulous costae, costules, and veins beneath, and by its having both the primary and secondary rachis armed with slender, more or less retrorse, long, pungent spines. The name *Alsophila ferox* Presl, under which this species has commonly gone, is given as a transfer of *Cyathea ferox* Presl, often quoted as published in the *Deliciae Pragenses* (1822), but no such description occurs in that work. *Alsophila ferox* Presl

(1836) is properly published, however, by citation of synonyms.

The following specimens are in the National Herbarium:

CUBA: Isle of Pines, *Britton, Wilson & Selby* 14329.

VERACRUZ: Chinameca, *Orcutt* 3194 (three sheets). Coatzacoalcos, Isthmus of Tehuantepec, *C. L. Smith* 2095, as *A. armata* Presl.

TABASCO: Near Atasta, *Rovirosa* 48.

GUATEMALA: Puerto Barrios, border of swamp, *Maxon & Hay* 3058 (four sheets).

HONDURAS: San Pedro Sula, Dept. Santa Bárbara, alt. 180 meters, *Thieme* (J. D. Smith, no. 5638 in part), as *A. ferox* Presl.

COSTA RICA: Bords d'un ruisseau à Buenos Aires, *Pittier* 4847 in part, as *A. aculeata* J. Sm. Bords du Río General à Palmares, vallée du Diquís, alt. 500 meters, *Pittier* 12160, as *A. ferox* Presl. Without locality, *Werckle* (ex herb. Christ, as *A. ichtyolepis* Christ).

PANAMA: Without special locality, 1860, *Hayes* 2.

TRINIDAD: Without locality, *Fendler* 60, as *A. ferox* Presl; ex herb. Bot. Gard. Trinidad, 146, as *A. armata* Presl.

BRAZIL: Rio de Janeiro, 1851, *Anderson*; *Dusén* 1938. Near Pará, March, 1908, *Hernández*. Without locality, *Wilkes Exped.*

PERU: Near Tarapoto, *Spruce* 4726.

Of the two sheets of *Pittier* 4847 in the National Herbarium, one belongs to *A. trichiata* and one to *A. microdonta*. The mixed number perhaps explains Christ's citation of 4847 as *A. ferox*, following his description of *A. ichtyolepis*.

The Honduras material distributed by Captain Smith as no. 5638 is partly *A. microdonta* and partly *A. myosuroides* Liebm.

## 2. *Alsophila strigillosa* Maxon, sp. nov.

PLATE 11.

Caudex about 2.5 meters high; fronds several, spreading, 2.5 to 3.3 meters long; stipe 60 to 90 cm. long, freely armed on the lower side with narrowly conical pungent spines up to 4 mm. long, densely paleaceous on the inner side, the scales lance-attenuate to oblong-ovate, 1.5 to 2.5 cm. long, dirty white, thin but firm, erose; blade ovate, short-acuminate, subtripinnate, 2.4 to 2.7 meters long, about 1 meter broad, the primary rachis laxly yellowish-hirsute, aculeolate; pinnae about 20 pairs, sessile, the basal ones oblong-ovate, about 30 cm. long, the middle ones narrowly oblong, acuminate, about 50 cm. long, 18 cm. broad, the secondary rachis yellowish, thinly hirsute-strigose above, distantly muricate beneath and nearly glabrous; pinnules 23 to 28 pairs, approximate, spreading, sessile, linear-oblong, attenuate in the outer third, 7 to 10 cm. long, 1 to 1.5 cm. broad, subpinnatisect, the costa thinly hirsute-strigose above, minutely strigillose beneath and, in sterile specimens, very scantily hirsute; segments delicately herbaceous, about 22 pairs, close, narrowly oblong, subfalcate, rounded at the apex or distally acutish, biserrate, the costule bearing two to four stiff curved yellowish septate hairs above, beneath delicately strigillose (in sterile specimens sparsely hirsute also) and bearing several small whitish hair-tipped bullate scales; veins 9 to 11 pairs, mostly once forked below the middle, glabrous above, delicately strigillose beneath; sori 5 to 9 pairs, small, contiguous; receptacles capitate, laxly and scantily pilose.

Type in the herbarium of Yale University, Daniel C. Eaton Collection, consisting of four sheets said to have been collected at Nima-nima, eastern Cuba, December 3, 1859, by Charles Wright (no. 1062); distributed as *Alsophila aspera* and listed under this name by Eaton. A specimen of *Wright* 1062 in the Sauvalle Herbarium at Havana is identical, and there is in the Eaton Collection an additional Wright specimen without number ("Monte Verde; May; road to Palenque") which is apparently the same.

Underwood, recognizing the species as new, drew up a brief description based on three specimens of *Wright* 1062 at Kew (these without definite locality data), and referred to two sterile specimens of *Wright* 1062 in the Eaton Herbarium, the latter said to be from "Monte Verde, road to Palenque." He had apparently confused the data in his notes, for only the unnumbered Palenque specimen mentioned above is now to be found at Yale, this bearing his annotation, "The plant is represented at Kew by three sheets numbered 1062." There is no indication that the four Nima-nima sheets (two fertile and two sterile) were ever seen by him. Inasmuch also as the species name selected by Underwood has been used in *Cyathea* (now merged by Copeland and others with *Alsophila*), it seems best to assign a new name and describe the species on the basis of the excellent specimens first cited above.<sup>1</sup>

*Alsophila strigillosa* is well marked by the characters given in the key. In fertile specimens, whether young or old, the costae and costules are nearly devoid of long hairs beneath, showing only the closely appressed covering of minute, almost glandlike hairs which have suggested the specific name; but in sterile specimens the characteristic long, septate hairs of the group are distinctly noticeable, though never very abundant.

EXPLANATION OF PLATE 11.—*Alsophila strigillosa*. Section of a pinna of the type specimen. Natural size.

3. *Alsophila myosuroides* Liebm. Dansk. Vid. Selsk. Skrivt. V. 1: 236. 1849.

*Alsophila wrightii* Underw.; Maxon, Contr. U. S. Nat. Herb. 23: 45. 1920, as synonym.

Caudex 2 to 5 meters high, about 10 cm. thick, aculate at the summit; fronds several, spreading, 1.5 to 2.5 meters long; stipes 0.5 to 1 meter long, light brown, strongly paleaceous at the upper side of the darker arcuate base (the scales subpersistent, linear-attenuate, 2 to 3 cm. long, bright brown, glossy), everywhere minutely aculeate, muricate upward; blades ovate, abruptly acuminate, 1 to 2 meters long, up to 130 cm. broad, subtripinnate, the primary rachis light brown, muricate (aculeolate toward the base), thinly short-strigose, glabrescent; pinnae alternate, spreading, petiolate (up to 4 cm.), narrowly oblong, long-acuminate, 40 to 65 cm. long, 15 to 22 cm. broad, the secondary rachis tawny-strigose above, beneath light olivaceous, laxly short-hirtellous, glabrescent; pinnules 25 to 30 pairs, horizontal or spreading obliquely, mostly stalked (1 to 5 mm.), contiguous or slightly apart, linear-attenuate or oblong-linear and abruptly long-caudate, 8 to 12 cm. long, 1 to 2 cm. broad, the costa strigose above, hirtellous beneath and bearing a few subpersistent, flattish, long-ciliate, bright brown scales 1 mm. long or more; segments dull green, rigidly herbaceous, about 25 pairs, lightly joined at the base, linear, falcate, acutish, 7 to 12 mm. long, 1.5 to 3 mm. broad, the margins deeply crenate-serrate, often revolute, the costules glabrous above, pale-hirtellous beneath and bearing an occasional minute scale; veins oblique, mostly once-forked below the middle, glabrous above, slightly glandular-strigillose beneath; sori 7 to 10 pairs, slightly inframedial, the very numerous sporangia confluent; paraphyses numerous, flaccid, persistent.

Described by Liebmann upon material collected by himself in dense, wet forests in the subtropical region of Chinantla, Oaxaca, at an elevation of 600 to 1,200 meters, a specimen in the National Herbarium (received from Copenhagen) being marked as collected between Lacoba and Teotalcingo. This

<sup>1</sup> Besides the material mentioned there is a sheet of *Wright* 891 in the Eaton Herbarium, said to have been collected in eastern Cuba, 1856-57, which contains a pinna of *Cyathea arborca* and one of *Alsophila strigillosa*.



agrees well with the specimens cited below, these indicating a species of average variability considering the rather wide range, which includes the Isle of Pines and a large part of Pinar del Rio, Cuba, and, on the continent, the region from Vera Cruz to Chiapas, southward to British Honduras, eastern Guatemala, and Honduras. The species is usually found at an elevation of less than 200 meters. It is readily separated by the key characters.

The following specimens are in the National Herbarium:

OAXACA: Between Lacoba and Teotalcingo, alt. 600 to 900 meters, *Liebmann* (part of type).

VERACRUZ: Minatitlan, *J. G. Smith* 80. Chinameca, *Orcutt* 3195 (three sheets). Santa Lucrecia, Isthmus of Tehuantepec, *C. L. Smith* 2094, as *A. ferox*. Coatzacoalcos, Isthmus of Tehuantepec, *C. L. Smith* 2093, as *A. pruinata*. Jáltipan, *Goldman* 724.

CHIAPAS: Santo Domingo de Palenque, *C. & E. Seler* 5375 (436), as *A. ferox*.

BRITISH HONDURAS: Without locality, *ex herb. Jenman* (indicated by Jenman as a new species).

GUATEMALA: Los Amates, Dept. Izabal, *Kellerman* 5083.

HONDURAS: Río Permejo, Dept. Santa Bárbara, alt. 180 meters, *Thieme* (*J. D. Smith*, no. 5637), as *Cyathea arborea*. San Pedro Sula, Dept. Santa Bárbara, alt. 180 meters, *Thieme* (*J. D. Smith*, no. 5638 in part), as *A. ferox*. Trail from Point Triunfo to Elliott's plantation, *Wilson*, 434.

CUBA: Various localities in Pinar del Río Province, *Shafer* 11942, 12005; *Shafer & León* 13618; *Wilson* 9226; *Britton, Britton & Cowell* 9635, 9816; *Baker & Dimmock* 4849; *van Hermann* 724; *Britton, Britton & Gager* 7281; *Britton, Earle & Gager* 6750; *Britton, Britton, Earle & Gager* 6640; *Wright* 3969; *Palmer & Riley* 14, 136, 189, 198, 288, 644. Isle of Pines, *Palmer & Riley* 1038; *Curtiss* 346; *Britton, Britton & Wilson* 14790.

#### 4. *Alsophila notabilis* Maxon, sp. nov.

PLATE 12.

Arborescent; stipe not preserved; blade apparently small, about 75 cm. broad, subtripinnate, the primary rachis unarmed, brownish above, dull stramineous beneath, densely strigillose-hispidulous, at length glabrescent, scabrous from the persistent bases of the minute septate hairs; pinnae narrowly elliptic-oblong, short-acuminate, 35 to 40 cm. long, 9 to 11 cm. broad, slightly narrowed at the base, short-petiolate (about 1 cm.), the secondary rachis densely strigose-hispidulous above, beneath short-hirsute with stiff septate hairs, at length scabrous from their persistent inflated bases; pinnules about 25 pairs, approximate, spreading, articulate, sessile or the lower ones short-stalked (1 to 2 mm.), exactly linear-oblong, acute, 4.5 to 5.5 cm. long, 12 to 14 mm. broad, the costa clothed on both sides like the secondary rachis and bearing an occasional flat yellowish brown scale beneath at the base of the costules; segments herbaceous, about 15 pairs, lightly joined at the base, oblong, obtuse or mucous, nearly straight, coarsely and deeply dentate (the teeth subentire), glabrous above except for a few short oblique deciduous hairs upon the costule, very sparsely short-hirsute beneath upon the costule, elsewhere glabrous; veins 5 or 6 pairs, glabrous, mostly once forked about halfway to the margin, the sorus seated at the fork or below; sori 4 to 6 pairs, slightly inframedial, apart from the costule; receptacle small, low, rotund, the sporangia considerably exceeded by the numerous paraphyses, these lax, flattish, with broad thin-walled cells, tapering from near the base (here 2 to 5 cells broad), persistent.

Type in the U. S. National Herbarium, no. 579823, collected at Wafer Bay, Cocos Island, Costa Rica, June 16, 1898, by H. Pittier (no. 12355); distributed

as *Hemitelia platylepis* Hook. Besides a second sheet of the type collect on there is a specimen from the same locality collected in January, 1902, by Mr. Pittier (no. 16228).

A very strongly marked species, perhaps not strictly of the group under consideration. The character afforded by the broad attenuate paraphyses is especially noteworthy.

EXPLANATION OF PLATE 12.—*Alsophila notabilis*. Section of a pinna of the type specimen. Natural size.

5. *Alsophila pansamalana* Maxon, sp. nov.

Arborescent, the caudex presumably several meters high; fronds ample, the blade more than a meter broad, subtripinnate, the primary rachis stout (up to 1.5 cm. thick), buff or pale yellowish brown, glabrate, lustrous, armed with numerous nearly straight, acicular spines up to 4 mm. long; pinnae spreading (or the lower ones somewhat deflexed), narrowly oblong to ovate-oblong, abruptly short-acuminate, 50 to 70 cm. long, 20 to 25 cm. broad, the secondary rachis strigose above, thinly hirsute with pale septate hairs beneath, scabrous from their persistent bases; pinnules 25 to 30 pairs, approximate, spreading, sessile, linear to linear-oblong, long-acuminate, or attenuate in their outer third, 10 to 13 cm. long, 1.5 to 2.5 cm. broad, the costa thinly hirsute-strigose above, yellowish-hirsute beneath with long spreading septate hairs and delicately strigillose; segments herbaceous, about 25 pairs, linear to linear-oblong, acutish, 8 to 14 mm. long, 3 to 4 (5) mm. broad, falcate, inciso-serrate or (in sterile specimens) barely pinnatifid, the lobes serrulate if sterile, with 2 or 3 pairs of oblique pinnately arranged veinlets, usually bidentate if fertile, with a single pair of veinlets; segments glabrescent above, the costule and veins persistently strigillose beneath, the costule also freely yellowish-hirsute; segments bearing 1 to several pairs of minute roundish-ovate, bullate, yellowish scales toward the base; sori small, less than 1 mm. from the costule, the receptacle capitate, sparsely septate-pilose.

Type in the U. S. National Herbarium, no. 830495, collected near Pansamalá, Alta Verapaz, Guatemala, altitude about 1,150 meters, September, 1886, by H. von Türckheim (J. D. Smith, no. 1008); two additional specimens of the same number are at hand. Represented also by two collections from Cobán, Alta Verapaz, altitude 1,350 meters, both by von Türckheim, the first long ago distributed by C. Keck as no. 257, the second one distributed by von Türckheim as no. II. 2088. All the specimens were sent out as *A. armata*.

This species was indicated in manuscript by Underwood as doubtfully new, but under an inappropriate specific name. From *A. scabriuscula*, its closest relative, it is readily distinguished by its freely armed, *glabrous* primary rachis. Even with its hairy covering abraded as completely as possible, the primary rachis of *A. scabriuscula* is still noticeably rough from the persistent inflated bases of the close-set hairs.

6. *Alsophila stipularis* Christ, Bull. Herb. Boiss. II. 4: 958. 1904. PLATE 13.

*Alsophila ichtyolepis* Christ, Bull. Herb. Boiss. II. 6: 186. 1906, in greater part.

Arborescent, the caudex 3 to 12 meters high, stout, with conspicuous large elliptical scars; fronds spreading, 3 to 3.5 meters long; stipe yellowish brown, up to 80 cm. long, 2 to 3 cm. thick, glabrous, deciduously palaceous (the scales 3 to 5 cm. long, lance-attenuate with filiform tips, firm, dark brown, lustrous, with narrow whitish friable borders), distantly aculeolate, the spines less than 1 mm. long; blades ovate, abruptly acuminate, 2 to 3 meters long, up to 1.5 meters broad, subtripinnate, the primary rachis yellowish brown, distantly muricate toward the base, glabrous or nearly so, bearing large, oval, chitinous,



yellowish brown, scattering, caducous scales; pinnae numerous, sessile, the basal and lower ones opposite, strongly retrorse, about 60 cm. long, the middle ones opposite or nearly so, less retrorse, up to 80 cm. long and 30 cm. broad, oblong, acuminate, the stout secondary rachis yellowish brown, densely crispate-strigose above, beneath distantly muricate and at first retrorsely hirtellous, soon glabrate; pinnules about 40 pairs, sessile, horizontal, the basal ones (one or both) greatly reduced and overlying the primary rachis, the middle ones 10 to 15 cm. long, 1.3 to 3 cm. broad, linear-oblong to oblong-lanceolate, long-attenuate, the stout elevated costa strigose-hirsute above, beneath densely hirtellous; segments carnose-herbaceous (often discoloring), subglaucous beneath, about 30 pairs below the deeply serrate apex, linear, acutish, 7 to 16 mm. long, 1.5 to 2.5 mm. broad, falcate, deeply crenate-serrate (the teeth lightly serrate), joined at the slightly broader base, usually with a few short weak deciduous hairs above (along the costule and veins), hirtellous beneath upon the costule and veins and obscurely ciliate, a few deciduous yellowish or pale brown scales borne also upon the costule and the lower part of the veins; veins 12 to 16 pairs, once forked near the middle, or with 3 subequal branches; sori small, close, 10 to 14 pairs; receptacle capitate; paraphyses of curved inflated septate hairs, surpassing the sporangia.

Described originally from material collected in Costa Rica by Werckle, the precise locality and date not stated. Subsequently this species was collected in some quantity in Costa Rica and western Panama by the writer. These specimens agree very closely with a good Costa Rican specimen sent to the National Museum by Christ, and with fragments from five separate sheets under this cover in his herbarium, courteously forwarded by Prince Roland Bonaparte, all of these collected by Werckle. There is no doubt as to the identification and distinctness of *A. stipularis*.

Two years later, however, Christ described *A. ichtyolepis* from Costa Rica, citing four collections: *Tonduz* 12527, *Pittier* 9469, *Werckle* 57, and an unnumbered collection made by Werckle at Navarro. These specimens are of two species. The first cited, *Tonduz* 12527, as represented by two excellent sheets in the National Herbarium and by Christ's own specimen (as shown by a portion recently received from Prince Roland Bonaparte), is exactly *A. stipularis*. Agreeing with it also are specimens collected by Werckle, received long ago from Christ as *A. ichtyolepis*. The Pittier specimen (no. 9469) is widely different, however; it is described below as a new species, *A. trichiata*, and is there compared with *A. stipularis*. So far as can be seen it supplied only a single point in the description of *A. ichtyolepis*, which is thus in the main a redescription of *A. stipularis*.

As seen by the writer in Chiriquí and Costa Rica, *A. stipularis* is a stately plant of wet forested ravines and partly cleared slopes. In habit it resembles *A. swartziana*, but lacks much of the grace and beauty of that species.

The following specimens, besides the Werckle plants mentioned, are in the National Herbarium:

COSTA RICA: La Palma, alt. 1,450 to 1,550 meters, pasture land at edge of forest, *Maxon* 459; *Tonduz* 12527. Vicinity of Coliblanco, alt. 1,950 meters, on deforested slope, *Maxon* 302, 313. Region of San José, June, 1908, *Brade* 175.

PANAMA: Humid forest of the upper Caldera watershed, Holcomb's trail, above El Boquete, Chiriquí, alt. 1,650 to 1,925 meters, *Maxon* 5687.

EXPLANATION OF PLATE 13.—*Alsophila stipularis*. Section of a large pinna (*Maxon* 302). Natural size.

7. *Alsophila mexicana* Mart. Icon. Pl. Crypt. 70. pl. 45. 1834.

*Alsophila godmani* Hook. in Hook. & Baker, Syn. Fil. 36. 1866.

Caudex about 5 meters high; blades probably ovate, 2 meters long or more, at least 125 cm. broad, subtripinnate, the primary rachis yellowish brown, apparently not aculeolate, very densely long-hirsute (at length strongly scabrous from the persistent inflated bases of the hairs) and bearing large, broadly ovate, thin, white, subpersistent, scattering scales, these extending at intervals along the secondary rachises; larger pinnae opposite, petiolate (1 to 3.5 cm.), narrowly oblong, acuminate, 50 to 60 cm. long, 16 to 22 cm. broad, the secondary rachises clothed like the primary, strongly scabrous with age; pinnules contiguous or approximate, horizontal, sessile, about 30 pairs, linear-oblong, abruptly acuminate-attenuate, 8 to 11 cm. long, 1.5 to 2.3 cm. broad, the costa thinly strigose-hirsute above, conspicuously hirsute beneath with long coarse yellowish-white septate hairs, also paleaceous, a few of the scales large, flat, and caducous, the majority minute, ovate, strongly bullate, whitish, subpersistent; segments thin-herbaceous, dull yellowish green (often discoloring), subglaucous beneath, about 9 pairs, rather close, linear, subobtuse, slightly falcate, 8 to 13 mm. long, 2.5 to 4 mm. broad, narrowly short-decurrent, pinnatifid, the ovate-oblong lobes crenate-serrate, mostly with pinnate veins; costules and veins hispid above, beneath sparingly hirsute or hirtellous, the costules also distantly white-paleaceous; sori small, confined to the basal two-thirds of the segment, one or two borne basally upon each lobe; receptacle minute, globose; paraphyses very few, pale, inflated, scarcely exceeding the sporangia.

Founded on specimens collected by Karwinsky at San Pablo de Teoxomulco, Oaxaca, Mexico. A careful perusal of the description and beautifully detailed illustrations leaves no doubt that this is the same as *A. godmani*, later described by Hooker upon Guatemalan material collected by Salvin and Godman, near Cobán. The truly pinnatifid segments and the large white deciduous scales of the main rachises are unique among the species of this group.

The following specimens are in the National Herbarium:

CHIAPAS: Finca Irlanda, September, 1913, *Purpus* 6767 (sterile).

GUATEMALA: Pansamá, Alta Verapaz, alt. 1,200 meters, *Türckheim* (J. D. Smith, no. 1007), distributed as *A. bicrenata* (three sheets). Near Cobán, alt. 1,550 meters, *Türckheim* II. 1655. Above Trece Aguas, Alta Verapaz, alt. 900 meters, *Cook & Doyle* 23b.

8. *Alsophila acutidens* Christ, Bull. Herb. Boiss. II. 6: 186. 1906. PLATE 14.

*Alsophila leucolepis pubescens* Christ in Pittier, Prim. Fl. Costar. 3<sup>1</sup>: 42. 1901

Caudex undescribed; stipe about 2.5 cm. in diameter, yellowish brown, sulcate, closely pubescent, armed with distant straight conical blackish spines about 3 mm. long, paleaceous at the base, the scales large, lustrous, yellowish brown or lighter, with whitish scarious margins; blade probably ovate, at least 115 cm. broad, abruptly short-acuminate, the primary rachis similar to the stipe but aculeate only toward the base, brownish-puberulous, at length minutely scabrous; pinnae elongate-oblong, acuminate, 50 to 60 cm. long, 15 to 20 cm. broad, short-petiolate (1.5 cm.) to sessile, the secondary rachis strigose-hispid above with curved brownish hairs, beneath weakly griseous-hirsute; pinnules 20 to 25 pairs, approximate, sessile, elongate-oblong, acuminate-attenuate, 7 to 11 cm. long, 2 to 2.6 cm. broad, the costa densely hispid-strigose above, beneath short-hirsute with whitish hairs and bearing a few lance-ovate attenuate whitish bullate scales, these scattered but persistent; segments delicately herbaceous. 18 to 20 pairs, approximate, narrowly oblong, obtusish, 10 to 14 mm. long, 3 to 4 mm. broad, mostly separated by narrow acute sinuses (the basal segments sometimes apart), serrately incised, the teeth or lobes muticous, faintly bidentate; costules elevated, weakly strigose above, whitish-

hirtellous beneath and bearing an occasional minute white scale; veins 9 to 11 pairs, spreading, mostly once forked, yellowish-hispid above, laxly hirtellous beneath, the hairs extending to the leaf tissue on both sides; sori 7 to 9 pairs, small, nearly medial; receptacle depressed-globose; paraphyses numerous, flaccid, hyaline, surpassing the sporangia.

Specimens of the following collections, all cited in the original publication, are in the National Herbarium:

COSTA RICA: Cañas Gordas, alt. 1,100 meters, February, 1897, *Pittier* 10981, 10989, 10992.

Most nearly related to *A. scabriuscula*, from which it differs not only in the key characters but also in its puberulous rather than densely hirsute primary rachis, its short-petiolate rather than sessile pinnae, and its laxly hirtellous rather than coarsely hirsute under surfaces, as well as in the shorter, more numerous, and more widely distributed hairs of the upper side of the segments.

EXPLANATION OF PLATE 14.—*Alsophila acutidens*. Section of a pinna of one of the original collections, *Pittier* 10992. Natural size.

9. *Alsophila scabriuscula* Maxon, Proc. Biol. Soc. Washington 32: 125. 1919.

This recently described species of Veracruz and eastern Guatemala is compared with *A. mexicana* and *A. bicrenata* at the place of publication. The following specimens have been examined:

GUATEMALA: Near Cubilquitz, Alta Verapaz, alt. 350 meters, *Türckheim* (J. D. Smith, no. 7806), type. Same locality, *Türckheim* II. 1454.

VERACRUZ: Near Córdoba, *Fink* 5. Orizaba, *Müller* 379 (determined by Mettenius as *A. aculeata* Klotzsch).

10. *Alsophila nesiotica* Maxon, sp. nov.

Caudex 3 to 12 meters high; stipe (incomplete) yellowish brown, sparingly aculeolate (the spines narrowly conical, blunt, about 1 mm. long) and everywhere scabrous from the persistent bases of the close-set spreading yellowish septate hairs; primary rachis similarly scabrous; pinnae sessile, oblong, abruptly short-acuminate, about 40 cm. long, 14 to 17 cm. broad, the secondary rachis copiously strigose-hirsute above, hirsute beneath with long pale septate hairs, scabrous from their persistent bases; pinnules about 25 pairs, slightly apart, spreading, sessile, long-acuminate (the tip attenuate), 7 to 9 cm. long, 1.4 to 1.7 cm. broad, subpinnatisect, the costa laxly strigose above, long-hirsute beneath with septate hairs and bearing occasional flat yellowish scales, these deciduous; segments papyraceo-herbaceous, about 23 pairs, narrowly oblong, acutish, 7 to 9 mm. long, 2 to 3 mm. broad, slightly falcate, serrately incised (the teeth sharply bidentate), bearing two to five spinous hairs along the costule above (otherwise glabrous), beneath sparingly yellowish-hirsute along the costule and veins and between the veins, minute hairs wanting; veins 9 or 10 pairs, oblique, mostly once forked; sori 2 to 6 pairs, slightly inframedial, small; receptacle capitate; paraphyses numerous, turgid, glandlike, vinaceous or darker, shorter than the sporangia.

Type in the U. S. National Herbarium, no. 578487, collected in forest, Wafer Valley, Cocos Island, Costa Rica, altitude 50 meters, January, 1902, by H. Pittier (no. 16229); distributed as *A. bicrenata*. A second sheet of the type collection is at hand, as also a specimen collected on Cocos Island in July, 1899, by Snodgrass and Heller (no. 964), distributed as *A. armata*.

A strongly marked species for this group, at once distinguished by its unique paraphyses.

11. *Alsophila trichiata* Maxon, sp. nov.

PLATE 15.

Caudex erect, 2 meters high or more, about 12 cm. thick toward the base; fronds about 3.5 meters long; stipe rufous-ochraceous, armed with scattering erect conical spines (2 to 4 mm. long), scabrous from the persistent inflated bases of short stiff crowded septate hairs; blades ovate, presumably about 2.5 meters long, about 1.4 meters broad at the base, nearly 2 meters broad at the middle, subtripinnate, the primary rachis invariably scabrous like the stipe, distantly aculeolate at the base, the spines about 1 mm. long; pinnae sessile, spreading (or the basal ones retrorse), narrowly oblong, acuminate, 50 to 90 cm. long, 16 to 26 cm. broad, the secondary rachis light brownish, densely strigose above, beneath long-hirsute (scabrous at length) and distantly muriccate; pinnules about 30 pairs, sessile, linear-lanceolate, attenuate-caudate, 8 to 13 cm. long, 1.2 to 1.9 cm. broad, the costa strigose-hispid above, beneath persistently hirsute with very long, delicate, curved or subflexuous, whitish, septate hairs; segments soft-herbaceous, dull green, about 30 pairs below the serrate-serrulate apex, linear to linear-oblong, acutish, 6 to 9 mm. long, 1 to 2 mm. broad, joined at the dilatate base, deeply but finely crenate-dentate (the teeth bidentate), strongly hispid above (the longer hairs confined to the costule and veins), copiously hirsute along the costule and veins beneath (shorter hairs extending along the surface to the widely revolute margins) and bearing a few fugaceous yellowish-brown scales toward the base of the costule; veins 10 to 12 pairs, strongly elevated, once forked near the base; sori 8 to 10 pairs, very small, seated at the fork of the veins, all densely confluent; receptacle small, globose; paraphyses few, lax, septate, scarcely exceeding the sporangia.

Type in the U. S. National Herbarium, no. 579215, collected near Cana, Panama, altitude 660 meters, June 3, 1908, by R. S. Williams (no. 928). This specimen consists of the basal half of a large pinna; the apical half is mounted on sheet no. 1,014,573.

The following additional specimens are in the National Herbarium:

COSTA RICA: Forêts de Tsâki, Talamanca, alt. 200 meters, *Tonduz* 9469 (cited by Christ as *A. ichtyolepis*). Bords d'un ruisseau à Buenos Aires, alt. 300 meters, *Tonduz* 4847 in part.

PANAMA: Bocas del Toro, *Hart* 13 (two sheets). Upper Juan Diaz River region, in deep ravines, *Killip* 2853 (three sheets).

This species is proposed as new only after a very critical study of the material above cited, in comparison with the original descriptions of *A. stipularis* and *A. ichtyolepis*, and type material of these from the herbarium of Prince Roland Bonaparte. Except for *Pittier* 9469, the material originally cited by Christ under *A. ichtyolepis* all pertains to *A. stipularis*, so far as can be ascertained. The description itself of *A. ichtyolepis* applies fully to *A. stipularis* with the exception of the armature ascribed to the stipe, this single character evidently having been drawn from *Pittier* 9469.

The relationship between *A. trichiata* and *A. stipularis* is not, however, particularly close, *A. trichiata* being well distinguished by its strongly scabrous rachises, conspicuously long-hirsute costae, costules, and veins, and soft-herbaceous segments, these strongly hispid above. In texture, habit, and most other particulars the two species are strongly at variance. *A. trichiata* is also a plant of comparatively low elevations, while *A. stipularis* is confined to the higher mountain regions. From its nearer relatives, *A. bicrenata*, *A. scabriuscula*, and *A. swartziana*, it is readily separable by the characters given in the key. The "stipular" character of dwarfed basal pinnules overlying the main rachis is common to several species of this group.

EXPLANATION OF PLATE 15.—*Alsophila trichiata*. Section of a pinna, type specimen. Natural size.

12. *Alsophila bicrenata* (Liebm.) Fourn. Mex. Pl. Crypt. 134. 1872.

*Cyathea bicrenata* Liebm. Dansk. Vid. Selsk. Skrivt. V. 1:289. 1849.

Caudex erect, 5 to 10 meters high, about 15 cm. thick; fronds 3 to 4 meters long; stipe stout, yellowish brown, muricate from persistent hair-bases, freely aculeate, the spines slenderly conical, pungent, up to 2.5 mm. long; blades ovate, 2 to 3 mm. long, subtripinnate, the primary rachis scabrous like the stipe, apparently not aculeate; pinnae sessile, spreading, oblong-lanceolate, acuminate, 50 to 60 cm. long, 14 to 20 cm. broad, the secondary rachis densely short-strigose above, at length scabrous beneath, the jointed septate hairs spreading or weakly retrorse, often with recurved tips; pinnules about 30 pairs, sessile, spreading or suboblique, linear-lanceolate, attenuate, 8 to 11 cm. long, 1 to 1.5 cm. broad, the costa freely hirsute beneath, the spreading or weakly curved yellowish hairs up to 3 mm. long; segments thin-herbaceous, dull green (often discoloring), about 25 pairs, narrowly oblong from a dilatate base, acutish, falcate, suboblique, 6 to 9 mm. long, 2 to 2.5 mm. broad, the margins revolute, deeply crenate-dentate, the teeth bidentate; costules glabrous above, minutely strigillose beneath, freely long-hirsute like the costa, and bearing numerous small, whitish or brownish-yellow, persistent bullate scales in the basal part; veins about 11 pairs, spreading, mostly once forked just beyond the middle, glabrous above, minutely strigillose beneath (long hairs wanting); sori 6 to 8 pairs, small, slightly inframedial; receptacles small, capitate; paraphyses few, griseous, exceeding the sporangia, deciduous.

Founded by Liebmann upon specimens collected by himself between Trapiche de la Concepcion and Totontepec, Oaxaca, at an altitude of 1,500 to 1,650 meters, and since ascribed a wide range in tropical America. In the key it falls next to *A. swartziana*, and this species and *A. mexicana* are probably its nearest relatives.

The following specimens are in the National Herbarium:

OAXACA: A pinna of the type collection, *Liebmann*.

VERACRUZ: Near Jalapa, alt. 1,200 meters, in wet ravines, *Pringle* 8174; distributed as *A. armata* (three sheets). Huatusco, May 28, 1857, *Mohr*.

Reported by Liebmann from the State of Puebla also.

13. *Alsophila swartziana* Mart. Icon. Pl. Crypt. 73. pl. 49. 1834. PLATE 16.

*Polypodium armatum* Swartz, Prodr. Veg. Ind. Occ. 134. 1788.

*Alsophila armata* Presl, Tent. Pter. 62. 1836. Not *A. armata* Mart. 1834.

Caudex erect, 8 to 15 meters high, about 15 cm. thick, copiously pale-chaffy at the apex; fronds 15 to 20, 2 to 3 meters long, spreading from an erect base; stipes very stout, green, succulent, freely armed with spines; blades ovate, short-acuminate, 2 to 2.5 meters long, about 1.2 meters broad, subtripinnate, the primary rachis stout (up to 2 cm. thick), distantly aculeolate (the spines erect, sharply conical, up to 2 mm. long) and densely hirsute with yellowish septate hairs, eventually scabrous; pinnae opposite, sessile, spreading (the lower ones deflexed), lance-oblong, acuminate, 30 to 65 cm. long, 12 to 24 cm. broad, the secondary rachis laxly strigose-hirsute above, beneath hirsute like the primary rachis but invariably unarmed; pinnules about 30 pairs, sessile, spreading, linear-oblong to deltoid-lanceolate, attenuate, 6 to 12 cm. long, 1 to 2.2 cm. broad, the costa laxly strigose above, beneath minutely strigillose and freely long-hirsute; segments delicately herbaceous, dull green above (often discoloring), subglaucous beneath, about 25 pairs, linear from a dilatate base, obtuse (or acutish in drying), falcate, suboblique, 6 to 12 mm. long, 2 to 3 mm. broad, the margins revolute in drying, crenate-serrate, the teeth bidentate;



costules with a few weak spinous hairs above, beneath minutely strigillose, long-hirsute, and bearing a few small persistent white bullate scales in the basal part; veins 9 to 12 pairs, once forked at a wide angle below the middle, glabrous above, beneath minutely strigillose and long-hirsute; sori 8 to 10 pairs, small, inframedial, confluent; receptacles capitate; paraphyses rather few, pale, exceeding the sporangia.

Described from the mountains of Jamaica and nearly confined to that island, there occurring rather commonly at altitudes from 600 to 1,600 meters. The following specimens have been examined:

JAMAICA: Morces Gap, alt. 1,500 meters, *Underwood* 1529. Foot of Catherine's Peak, alt. 1,500 meters, *Eggers* 3634. Near Bath, November, 1886, *Sherring*. Trail to New Haven Gap, above Cinchona, *Underwood* 3133. Road from Silver Hill Gap to Hardware Gap, alt. 900 to 1,200 meters, *Maxon & Killip* 1261. Without locality, *Hart*, 97.

CUBA: Monte Verde, May, 1865, *Wright* (without number, D. C. Eaton Herbarium).

This species is usually known as *Alsophila armata* (Swartz) Presl, a name which under the Vienna Code can be maintained. Presl's transfer of Swartz's name is, however, antedated two years by *A. armata* Mart., a new name assigned by Martius (with description and excellent illustration) to the plant with strongly aculeate primary and secondary rachises now known under the earlier name *A. microdonta* Desv. For the Jamaican plant of Swartz (*Polypodium armatum*) Martius proposed the new name *A. swartziana*, which under the so-called American Code must be taken up on the ground that the publication of *A. armata* Mart. 1834 (though this is a pure synonym of *A. microdonta* Desv., 1827) precludes use of the transferred name *A. armata* (Swartz) Presl, 1836.

Among North American species *A. swartziana* is nearest related to *A. bicrenata*, as indicated in the key. It has a close relative also in the Brazilian *A. hirta* Kaulf., which, together with the other South American species of this group, is in need of critical revision.

EXPLANATION OF PLATE 16.—*Alsophila swartziana*. Section of a pinna of medium size (*Underwood* 1529). Natural size.

### A SINGULAR NEW ALSOPHILA FROM PANAMA.

Among the plants gathered in Panama by American collectors in recent years is the following remarkable new species of *Alsophila*, subgenus *Trichopteris*. It differs from all the known species of that group in its simply pinnate blades.

*Alsophila williamsii* Maxon, sp. nov.

PLATE 17.

Trunk 2 meters high or more, 6 cm. in diameter; fronds several, spreading, 105 to 115 cm. long; stipe 25 to 35 cm. long, 4 to 7 mm. thick (the extreme basal part not seen), light brown, apparently unarmed, deeply trisulcate above, rounded beneath, deciduously puberulous, persistently paleaceous in the basal half or two-thirds, the scales ovate-oblong to deltoid-lanceolate, attenuate, 8 to 15 mm. long, firm, lustrous, subfalcate, subtortuous, yellowish white, concolorous or often with a broad median stripe of bright brown toward the apex, the margins denticulate, friable; blades oblong, 50 to 85 cm. long, 30 to 40 cm. broad, simply pinnate, the primary rachis similar to the stipe but not paleaceous, flexuous toward the apex; pinnae 15 to 20 pairs, spreading, distant,



alternate (or the lower ones subopposite), conspicuously jointed to the rachis upon slender stalks 7 to 12 mm. long, lance-linear from a nearly equilateral, broadly cuneate base, attenuate to subcaudate, 15 to 20 cm. long, 2.5 to 3.5 cm. broad, undulate or obscurely curvescent-serrate, the costa elevated and sulcate on both sides, glabrous; main veins about 35 pairs, spreading, elevated, mostly with 2 or 3 pairs of very oblique, pinnately arranged branches, the basal branches of adjacent groups commonly connected by a short transverse veinlet (forming semioctagonal costal areoles), all the branches excurrent quite to the distinctly callous margin, free or variously connivent, obscurely and sparingly glandular-strigillose beneath; sori in two irregular rows of groups on either side of the costa, the first row 4 to 5 mm. from the costa (the sori solitary on the basal branches, just above the connecting veinlet), the second row a little beyond the middle, composed of groups of 3 or 4 sori each, the sori invariably solitary upon the branches; receptacles broadly elliptical, very large (1 mm. long or more), pulvinate; paraphyses numerous, deciduous, dark, slender, subclavate. Leaf tissue carnose-coriaceous, discoloring in drying, dark brownish green above, brownish olivaceous beneath, sublustrous on both surfaces.

Type in the U. S. National Herbarium, no. 690117, collected in the mountains above Cana, Panama, at an altitude of about 1,800 meters, April 17 to June 8, 1908, by R. S. Williams (no. 850). Known also from a specimen collected on the east slope of Mount Pirri, Province of Panama, Panama, at an altitude of 1,350 meters, June 12, 1912, by E. A. Goldman (no. 1968).

EXPLANATION OF PLATE 17.—*Alsophila williamsii*. Portion of the type specimen. Natural size.

### NOTES ON DICRANOPTERIS.

In determining the ferns out of several collections recently received from Trinidad, British Guiana, Brazil, and the Andean region of South America, several species of *Dicranopteris* which are of more than ordinary interest have been encountered. Notes on these, including the description of a new species from Trinidad, are given below. Also, a few additional species are transferred from *Gleichenia*, which is exclusively an Old World genus, in order that the names may be available for use in other connections. The writer is strongly of the opinion, previously expressed, that *Dicranopteris* itself is an aggregate of two or more valid genera.

*Dicranopteris affinis* (Mett.) Maxon.

*Gleichenia affinis* Mett.; Kuhn, *Linnaea* 36: 167. 1869.

Founded upon material collected at St. Gavan, Peru, by Lechler (no. 2265), and in its typical form apparently known heretofore only from Peru. The following specimen from Ecuador is at hand: Vicinity of Tablón de Oña, September 27, 1918, Rose, Pachano & Rose 23122.

*Dicranopteris brittonii* Maxon, sp. nov.

PLATE 18.

An ascending sparingly branched plant of medium size; rhizome not seen; primary leaf-axis (incomplete) light brown, 3 mm. thick, lustrous, deciduously paleaceous (the scales divaricate, dull castaneous, spinescent-ciliate), apparently bearing only a single pair of primary branches, the included bud dormant, 5 to 10 mm. long, the scales dark castaneous, thick, 2 to 3 mm. long, long-attenuate from a cordate-deltoid base, spinescent-ciliate; primary branches 30 to 40 cm. long, twice pseudodichotomous, the included buds invariably dormant (secondary or tertiary axes thus never developed); first internode of the branches

6 to 9 cm. long, naked, or bearing two or three minute segments at the inner base; second internodes 6 to 10 cm. long, intermittently pectinate, or completely pectinate except at the lower side near the base; pinnae diverging (like the internodes) at an angle of  $60^\circ$  or more, narrowly linear-lanceolate, 22 to 30 cm. long, 3 to 4 cm. broad, acuminate, pectinate, cut nearly to the rachis, the sinuses linear, narrowly acute; rachis of pinnae pruinose and (like all the internodes) persistently paleaceous beneath, the scales mostly spreading, similar to those of the buds but paler, thinner, and more freely spinescent-ciliate; segments 70 to 85 on each side, close, nearly linear, 1.5 to 2 cm. long, 4 mm. broad at the base, 3 mm. broad at the middle, narrowly obtuse, rigidly herbaceous, glabrous above, whitish-papillate beneath; margins entire, narrowly revolute; veins 20 to 26 pairs, elevated beneath, mostly once forked, these and the elevated costa very minutely and sparingly paleaceous, the scales mostly with three or four white flaccid hairlike divisions from a turgid vinaceous base, deciduous; leaf tissue glabrous; sori 3-5-sporangiate, slightly inframedial.

Type in the U. S. National Herbarium, no. 1,056,646, collected on a forested bank, Mount Tocuche, Trinidad, April 3 to 5, 1920, by N. L. Britton, T. E. Hazen, and Walter Mendelsohn (no. 1352). Additional material of this collection is in the Underwood Herbarium, New York Botanical Garden, and there is at hand a single specimen from Trinidad, distributed as no. 74 from the Trinidad Botanical Garden Herbarium.

*Dicranopteris brittonii* is most nearly allied to *D. palmata* (Schaffn.) Underw. and *D. mellifera* (Christ) Underw., the former a species of Veracruz, Alta Verapaz, Cuba, and Jamaica, the latter restricted to Costa Rica. *D. mellifera* is a much larger plant in every respect, with pinnae up to 6 cm. broad, segments with 25 to 35 pairs of veins, and lower surfaces (costae, veins, and leaf tissue) rather freely clothed with persistent hairlike stellate scales, these lacking the dark thick base seen in *D. brittonii*. *D. palmata* is more nearly related, but this is a plant with shorter, greenish or olivaceous internodes, ferruginous or light castaneous buds, bright green and scarcely revolute segments, immersed veins, and the capillary stellate scales of the under surface persistent and extending to the leaf tissue.

EXPLANATION OF PLATE 18.—*Dicranopteris brittonii*. A specimen of the type collection. One-half natural size.

***Dicranopteris gracilis* (Mart.) Maxon.**

*Mertensia gracilis* Mart. Icon. Pl. Crypt. 107. pl. 59. f. II. 1834.

*Gleichenia gracilis* Moore, Ind. Fil. 378. 1862.

Founded upon material collected in the mountains of southern Minas Geraes, Brazil. Apparently a little known species. Two sheets of *Regnell* III. 1491, from Minas Geraes, are referred here with doubt.

***Dicranopteris longipes* (Fée) Maxon.**

*Mertensia longipes* Fée, Crypt. Vasc. Brés. 2: 87. pl. 105 f. 2. 1872-73.

*Gleichenia longipes* Christ in Schwacke, Pl. Nov. Mineiras 2: 35. 1900.

Founded upon specimens from the Serra do Pica, Brazil, *Glaziou* 5235. Certainly a close ally of *D. pruinosa*, but lacking the strongly pruinose under surfaces of that. Besides a fragment of the type collection the following specimens are in the National Herbarium:

BRAZIL: Serra do Itatiaya, May 19, 1902, *Dusen* 153; July 26-30, 1915, *Rose & Russell* 21288.

***Dicranopteris longipinnata* (Hook.) Maxon.**

*Gleichenia longipinnata* Hook. Sp. Fil. 1: 9. 1844.

*Mertensia longipinnata* Klotzsch, Linnaea 18: 537. 1844.

Described from Surinam (*Hostmann* 238). A fragment of the original collection, received from Rosenstock, indicates a strongly marked species allied to *D. mellifera* (Christ) Underw., of Costa Rica. The scales of the segments are stellate, consisting wholly of a few long stiff ferruginous hairlike divisions, and extend rather freely quite to the margins. They are confined to the veins.

**Dicranopteris maritima** (Hieron.) Maxon.

*Gleichenia maritima* Hieron. Bot. Jahrb. Engler 34: 562. 1905.

Founded on two collections from Colombia (*Lechler* 742, 4432). The latter number (from the vicinity of Buenaventura), of which two excellent fruiting specimens are at hand, may be designated as the type.

**Dicranopteris nervosa** (Kaulf.) Maxon.

*Mertensia nervosa* Kaulf. Enum. Fil. 37. 1824.

*Gleichenia nervosa* Spreng. Syst. Veg. 4: 25. 1827.

An extremely variable species, including, according to Christensen's Index Filicum, *Mertensia beyrichiana* Sturm, *M. cinnamomea* Beyr., *M. latissima* Fée, and *M. neglecta* Sturm. The type is from the island of Santa Catharina, Brazil. In addition to a considerable number of specimens from the States of Paraná, Rio Grande do Sul, Santa Catharina, and Minas Geraes, Brazil, the following specimens are at hand:

BOLIVIA: Near Paraiso, alt. 1,800 meters, February 12, 1902, *Williams* 2904.

Cargadera, alt. 2,400 meters, July 29, 1902, *Williams* 1114.

**Dicranopteris nuda** (Moritz) Maxon.

*Mertensia nuda* Moritz; Reichardt, Denkschr. Akad. Wiss. Math. Naturw. (Wien) 17<sup>2</sup>: 28. pl. 1, f. 1-4. 1859.

*Gleichenia nuda* Moore, Ind. Fil. 380. 1862.

Founded upon specimens collected near Tovar, Venezuela, by Moritz (no. 452), a fragment of whose material is at hand. To this species is referred provisionally the following specimen:

COLOMBIA: Santa Marta, 1898-99, *H. H. Smith* 1116.

**Dicranopteris pennigera** (Mart.) Maxon.

*Mertensia pennigera* Mart. Icon. Pl. Crypt. 130. pl. 59. f. 1. 1834.

*Gleichenia pennigera* Moore, Ind. Fil. 381. 1862.

Described from material collected at several localities in the forested mountain region of the eastern part of Minas Geraes, Brazil, and apparently restricted to that country. *Glaziou* 15786, as represented in the U. S. National Herbarium, is very closely related, if not identical.

**Dicranopteris pruinosa** (Mart.) Maxon.

*Mertensia pruinosa* Mart. Icon. Pl. Crypt. 109. 1834.

*Mertensia subflabellata* Brack. in Wilkes, U. S. Expl. Exped. 16: 294. 1854.

*Gleichenia pruinosa* Mett. Ann. Mus. Bot. Lugd. Bat. 1: 49. 1863.

Founded upon specimens collected in the Province of Minas Geraes, Brazil, by Martius, an authentic portion of whose material is at hand. The relationship of this species would appear to be with the andine *Dicranopteris revoluta* (*Gleichenia revoluta* H. B. K.), to which species Fée reduced it. The following specimens, several of them originally determined as *G. longipes* Fée, are in the National Herbarium:

BRAZIL: Near Rio Janeiro, *Wilkes Exped.* (type of *G. subflabellata*).

Minas Geraes, June 23, 1857, *Regnell* II. 326 $\frac{1}{2}$  (two sheets). Minas Geraes, June 18, 1861, *Regnell* II. 326 $\frac{1}{2}$ . Santa Catharina, 1906, *Spannagel* (Rosenstock, no. 239; two sheets). Vitta Nova, Paraná, November, 1906, *Annie*s. Vicinity of Itatiaya, alt. 2,000 to 2,300 meters, July, 1915, *Rose & Russell* 21290.

**Dicranopteris remota** (Kaulf.) Maxon.*Mertensia remota* Kaulf. Enum. Fil. 39. 1824.*Gleichenia remota* Spreng. Syst. Veg. 4: 27. 1827.

Described from material collected on the island of St. Catherine, Brazil, by Chamisso. Aside from a fragmentary specimen from Ocaña, Colombia (*Schlim* 226), this species is represented in the National Herbarium by three recent collections from British Guiana: Vicinity of Potaro Landing, *Hitchcock* 17390; *Gleason* 263, 478.

**Dicranopteris rubiginosa** (Mett.) Maxon.*Gleichenia rubiginosa* Mett. Ann. Sci. Nat. V. Bot. 2: 267. 1864.

Founded on specimens collected at Puente Nacional, Colombia, altitude 1,600 meters, by Lindig (no. 71). Agreeing very closely with the type collection, as represented by a fragment received from Rosenstock, are two specimens collected near Medellín, Colombia, in 1911 by Father Charetier (nos. 41, 6 in part.) Fendler's no. 40, from Tovar, Venezuela, is apparently a luxuriant form of the same species, the pinnae measuring up to 30 cm. long and 3 to 4 cm. broad.

**Dicranopteris simplex** (Desv.) Maxon.*Mertensia simplex* Desv. Mém. Soc. Linn. Paris 6: 200. 1827.*Gleichenia simplex* Hook. Icon. Pl. 1: pl. 92. 1837.

This species, described from Peru and remarkable for being the only species of the genus with simple fronds, is represented in the National Herbarium by the following specimens:

PERU: Mountains east of Balsas, alt. 3,000 meters, May 22, 1912, *Osgood* 69.ECUADOR: Near Cañar, September 16, 1918, *Rose & Rose* 22772, 23970, 23971.Vicinity of Tablón de Oña, September 27, 1918, *Rose, Pachano & Rose* 23099.COLOMBIA: Locality data confused, *Stübel*.**Dicranopteris velata** (Kunze) Maxon.*Mertensia velata* Kunze, Linnaea 9: 15. 1834.*Gleichenia velata* Mett. Fil. Hort. Lips. 113. 1856.

Founded upon Peruvian specimens collected at Pampayaco in July, 1829, by Poeppig. Agreeing closely with the original description and with a fragmentary specimen of the type collection are the following:

COLOMBIA: Santa Marta, 1898-99, *H. H. Smith* 2590.BRITISH GUIANA: Mount Roraima, December 21, 1884, *Im Thurn* 343.**Dicranopteris yungensis** (Rosenst.) Maxon.*Gleichenia yungensis* Rosenst. Repert. Nov. Sp. Fedde 5: 228. 1908.

Founded upon large sterile specimens collected near Unduavi, northern Yungas, Bolivia, altitude 3,300 meters, February 12, 1907, by O. Buchtien (no. 902). A small specimen of the type collection is at hand. This species is hardly a member of the *bifida* group, as stated by Rosenstock, but is more nearly related to *D. rubiginosa*, *D. longipinnata*, *D. brittonii*, and allies, in which a tomentum is never formed upon the under surface of the segments. The following additional specimen, which in minute characters agrees closely with the type collection, is in the National Herbarium:

PERU: Machu Picchu, alt. 2,100 meters, May 22, 1915, *Cook & Gilbert* 865.**THE JAMAICAN SPECIES OF CHEILANTHES.**

Jenman, in his synoptical treatment of the ferns and fern allies of Jamaica, recognizes eight species of *Cheilanthès*, as follows:

*C. radiata*, *C. paupercula*, *C. pedata*, *C. reesii*, *C. micromera*, *C. microphylla*, *C. marginata*, and *C. tomentosa*. Of these the first four pertain to the genus *Adiantopsis* and are so listed by Christensen in the Index Filicum. The remaining four species belong to *Cheilanthes*, as the genus is still defined, but two prove to be undescribed. Descriptions of these and a key to the four Jamaican species are given herewith.

Blades broadly deltoid-ovate, subpentagonal, devoid of hairs and scales.

1. *C. harrisii*.

Blades of an elongate type, at least the rachises hairy or scaly.

Segments clothed on both surfaces with long tortuous spreading hairs.

2. *C. jamaicensis*.

Segments bearing minute scattered white turgid few-celled hairs.

Fronds ascending, the primary rachis slender, wiry, flexuous; blades deltoid-lanceolate, subtripinnate; indusia interrupted; leaf tissue membranous-herbaceous.

3. *C. microphylla*.

Fronds rigidly erect, the primary rachis stout, straight; blades oblong-lanceolate, bipinnate; indusia continuous; leaf tissue subcoriaceous.

4. *C. micromera*.

1. *Cheilanthes harrisii* Maxon, sp. nov.

Rhizome stout, erect or ascending, multicapital, the divisions close, elongate, 2 to 3 cm. thick (including the numerous imbricate stipe bases), copiously wiry-radiceous; scales densely appressed-imbricate, 3 to 4 cm. long, acicular, dark castaneous, rigid, strongly sclerotic, opaque, subdentate. Fronds several or many, erect, 20 to 38 cm. long; stipe 13 to 25 cm. long, stout (1 to 1.5 mm. thick), lightly flexuous, castaneous, sublustrous, naked, glabrous; blades broadly deltoid-ovate, subpentagonal, 8 to 15 cm. long, 7 to 12 cm. broad, tripinnate-pinnatifid, the rachises firm, castaneous; pinnae slightly oblique, the large basal ones strongly inequilateral, up to 7 cm. long and 4 cm. broad, with about 10 pairs of contiguous pinnules, the inferior basal ones deltoid-ovate, pinnate-pinnatifid; segments mostly fertile, oblique, subdistant, mostly simple, 3 to 5 mm. long, narrowly elliptical, their cuneate base as broad as the greenish-marginate ultimate rachises; sori small, intramarginal, laterally confluent, partially concealed by the reflexed indusiform margins, these yellowish brown, firm, modified but scarcely forming a proper indusium, undulate, subentire, continuous or interrupted, the smallest (monosorous) segments with the whole tip recurved. Leaf tissue elastico-coriaceous, dull green, minutely whitish-glandulose beneath.

Type in the U. S. National Herbarium, no. 1,010,751, collected "on rocky slopes, near the falls," Old England, below Cinchona, Jamaica, altitude 1,050 meters, February 28, 1919, by William Harris (no. 12902). Other specimens from the same locality are: *Harris* 12891, and, presumably, *Hart* 137, the latter marked as from "4,000 ft., on rocky banks."

*Cheilanthes harrisii* was described by Jenman as *C. marginata* H. B. K., but it is readily distinguished from that species by its elastico-coriaceous texture, by the complete absence of expanded, delicately membranous wings upon the rachises, and by its firm, entire indusiform margins, *C. marginata* having ample proper indusia, which are white, truly membranous, and conspicuously fimbriate-glandular.

2. *Cheilanthes jamaicensis* Maxon, sp. nov.

Rhizome short-creeping or decumbent, nodose, the divisions close, 1 to 2 cm. long, about 1 cm. in diameter, densely paleaceous; scales tufted, 3 to 4.5 mm.

long, about 0.5 mm. broad at the base, thence long-attenuate to the filiform tip, mostly falcate, lightly flexuous, tawny, mostly with a prominent, dark brown, glossy, sclerotic median stripe, or almost wholly sclerotic and opaque. Fronds several, close, laxly ascending, 10 to 35 cm. long; stipes slender, 5 to 20 cm. long, flexuous, purplish brown, sublustrous, copiously imbricate-paleaceous, the scales small, acicular, griseous, appressed or rigidly ascending; blades oblong-lanceolate to narrowly deltoid-ovate, long-acuminate, 5 to 15 cm. long, 2 to 5 cm. broad, tripinnate, the primary rachis clothed like the stipe; large pinnae about 10 pairs, spreading, approximate or (especially the several lower pairs) distant, mostly deltoid-oblong, acutish, the rachis clothed beneath with lax, ascending, acicular, tawny scales; tertiary segments 3 to 6 pairs, distant, spreading, minute, simple and obovate to oval from a narrowly cuneate base, or the larger ones ternately or (rarely) pinnately divided; segments (both surfaces) and minor rachises clothed with long, spreading, recurved, tortuous, glistening, yellowish, septate hairs, these stiff and coarse, more numerous beneath but only slightly entangled; margins of segments recurved, gradually modified to a thin, fragile, rather broad, whitish, indusiiform border nearly throughout, the numerous sporangia exposed at maturity. Leaf tissue delicately herbaceous, dull light green.

Type in the U. S. National Herbarium, no. 1,010,750, collected on rock ledges below Cinchona, Jamaica, February 28, 1919, by William Harris (no. 12905).

Other material at hand is as follows:

JAMAICA: Old England, alt. 1,050 meters, *Harris* 12892. Without locality, *Hart* 78, 271; ex herb. Bot. Dept. Jamaica, "J. P. 260."

This is apparently one of the rarer Jamaican ferns, though reported by Jenman<sup>2</sup> (as *C. tomentosa*) as locally abundant in the vicinity of Cinchona, at 1,500 meters altitude, "growing in spreading tufts on the surface and in the crevices of rocks which are well exposed."

Though obviously related to *C. tomentosa*, *C. jamaicensis* differs widely from that in its lax habit, in the complete absence of the long tawny hairs which thickly clothe the stipes and rachises of *C. tomentosa*, in having the leaf margins modified gradually to a thinnish indusiiform border (not abruptly constricted to a membranous proper indusium), and in the scarcely tomentose covering of the under surface of the segments. In most characters, save those of indusium structure, it is even less closely related to *C. catoni*. The characteristics of these two species and their ranges have recently been stated elsewhere.<sup>3</sup>

### 3. *Cheilanthes microphylla* Swartz, Syn. Fil. 127. 1806.

*Adiantum microphyllum* Swartz, Prodr. Veg. Ind. Occ. 135. 1788.

Jamaica is the type locality for *C. microphylla*, which is abundant on rocky banks all over the island, from sea level up to 1,500 meters. This species is found nearly throughout the West Indies, and on the continent extends from the southern United States to Honduras and perhaps southward. The South American material commonly so referred is partly *C. moritziana* Kunze. Another related species is *C. aemula* Maxon, of eastern Mexico.

### 4. *Cheilanthes micromera* Link, Hort. Berol. 2: 36. 1833.

Described from cultivated specimens, and since found to have a rather wide range in Mexico and to occur also in Hispaniola and in Jamaica, where it is of limited distribution near Cinchona, at 1,500 meters elevation (*Underwood* 262, *Hart* 35, *Maxon* 1572). Although sharply distinct from *C. microphylla* in

<sup>2</sup> Bull. Bot. Dept. Jamaica, no. 38. 6. 1892.

<sup>3</sup> Amer. Fern Journ. 9: 3, 4. 1919.



the West Indies, juvenile or depauperate Mexican specimens are not always readily distinguished. There are several forms involved in the continental *C. microphylla* complex, which should be worked out critically.

## TWO NEW SPECIES OF POLYSTICHUM FROM THE WEST INDIES.

Recent field work and the examination of material in the D. C. Eaton and Gray herbaria have brought to light two new species of *Polystichum* from Cuba and Jamaica, which may be described as follows:

***Polystichum deminuens* Maxon, sp. nov.**

PLATE 19.

Rhizome (incomplete) apparently small, ascending, sparingly paleaceous, the scales oblong-ovate, about 4 mm. long, yellowish brown, concolorous, concave, thin; fronds several, laxly ascending, conform, recurved and rooting at the tip, 30 to 42 cm. long; stipes relatively very short, 7 to 8 cm. long, stramineous, bisulcate anteriorly, deciduously paleaceous, the scales laxly ascending, lance-linear, fulvous, 3 to 4 mm. long; blades linear-attenuate, 28 to 34 cm. long, 3 to 3.7 cm. broad in the basal part, ending in a naked proliferous flagellum (3 to 8 cm. long), simply pinnate, the primary rachis similar to the stipe, sparingly paleaceous, the scales linear, tortuous or not; pinnae 17 to 29 pairs, slightly oblique, distant or subdistant, the basal ones broadly subhastate, nearly as broad as long, slightly inequilateral, the basal lobes short, mucronate but not spinescent; characteristic middle pinnae 1.5 to 2.5 cm. long, 7 to 10 mm. broad, short-stalked, oblong or narrowly ovate-oblong, acute, subfalcate from an inequilateral base, subauriculate above, the inner margin parallel to the rachis, the lower one arcuate; upper pinnae gradually reduced, subsessile, ovate-oblong to oval, the uppermost ones minute, obovate, long-decurrent; margins minutely repand-undulate in drying, not spinescent; leaf tissue herbaceous, the veins evident; both surfaces of the pinnae minutely fibrillose-paleaceous; sori 4 to 6 pairs, nearly medial; indusium irregularly erose-denticulate.

Type in the herbarium of Yale University, Daniel C. Eaton Collection, collected near Josephina, eastern Cuba, "in summo monte," November 4, 1859, by Charles Wright (no. 1057).

According to the writer's notes, an identical specimen of this number is in the Gray Herbarium. Since this description was written, also, a less perfect specimen of the same collection has been added to the National Herbarium.

Of the Cuban species of *Polystichum*, *P. deminuens* need be compared only with *P. machaerophyllum* Slosson, a plant which is similarly proliferous, but which differs widely in having the pinnae coriaceous (with obscure venation) and all strongly hastate, with the auricles and apex conspicuously spinescent or aristate.

EXPLANATION OF PLATE 19.—Type specimen of *Polystichum deminuens*, at slightly less than one-half natural size.

***Polystichum killipii* Maxon, sp. nov.**

PLATE 20.

Rhizome decurved, 3 to 6 cm. long, 1 to 1.5 cm. thick, woody, densely paleaceous at the tip, the scales linear to deltoid-lanceolate, 6 to 10 mm. long, straight or falcate, subentire, thin, ferruginous, concolorous or with a darker glossy median (chiefly basal) stripe; fronds several, laxly ascending, conform, not proliferous, 30 to 60 cm. long; stipes 7 to 20 cm. long, stramineous, bisulcate anteriorly, laxly paleaceous, the scales mostly minute, linear or filiform, the basal ones larger, oblong-lanceolate, concave; blades lanceolate to linear-lanceolate, acuminate, 23 to 40 cm. long, 5 to 8 (11) cm. broad in the basal

third, once-pinnate, the primary rachis similar to the stipe, minutely fibrillose-paleaceous; pinnae 15 to 25 pairs, mostly spreading, the basal ones one to three times their width apart, those above mostly adjacent (rarely subimbricate), variable in shape, linear to obliquely lance-oblong from an inequilateral auriculate base, 2.5 to 4 (5.5) cm. long, 8 to 13 (18) mm. broad, acute, mucronate, nearly straight, broadly serrate-crenate or obliquely lobed, the crenations or lobes often apiculate, the larger ones denticulate distally; basal auricles often rounded, those of the lowermost two or three pairs occasionally free or nearly so; upper pinnae rather abruptly reduced, semiadnate, the uppermost ones evident as oblique, broadly joined lobes of the foliose apex; leaf tissue rigidly chartaceous, the course of the veins evident in drying; pinnae freely fibrillose on both surfaces (the scales filiform, pale, minute) and minutely glandular-viscid; sori large, distant, borne in a single medial or supramedial line, or in groups of three to five in the larger lobes; indusium small, caducous, wanting or barely evident at early maturity of the sorus.

Type in the U. S. National Herbarium no. 1,045,780, collected about one mile below the railway station at Ipswich, St. Elizabeth, Jamaica, on a steep, partially shaded, rocky bank along the "Black River Road," April 1, 1920, by William R. Maxon and Ellsworth P. Killip (no. 1520). Specimens of this collection have been distributed to the New York Botanical Garden, the Gray Herbarium, the Field Museum, the University of Illinois, and the Herbarium of Prince Roland Bonaparte.

*Polystichum killipii* is related to *P. harrisii* Maxon, which is the common *Polystichum* of the Cockpit region of western Jamaica. That species differs constantly, however, in its darker rhizome scales and invariably flagelliform, proliferous blades, and in having the pinnae nonglandular and (at maturity) devoid of the filiform scales which, though minute and of a pale color, are a very noticeable feature of *P. killipii*. Scattered scales are present at first upon the under surface of the pinnae of *P. harrisii*, but they are substellate (the divisions terminating in dark distended cells) and are easily deciduous.

There is at hand also a specimen of *P. killipii* collected in the "Cockpit Country" near Troy, by Underwood (no. 2837), in May, 1903. This was discussed briefly by the writer in 1909<sup>4</sup> and at that time was regarded as perhaps representing a new species.

EXPLANATION OF PLATE 20.—Type specimen of *Polystichum killipii*. One-half natural size.

## ATALOPTERIS, A NEW GENUS OF DRYOPTEROID FERNS FROM THE WEST INDIES.

During his second visit to Jamaica, in 1904, the writer collected at Hollymount, on the slopes of historic Mount Diabolo, a small, strikingly peculiar, terrestrial fern (no. 2228) with wholly dimorphic fertile and sterile leaves, which later was found to be closely allied to a little known Cuban species collected long ago by Charles Wright (no. 1827), described as *Polybotrya aspidioides* Griseb. in 1866, and subsequently (1868) transferred to *Acrostichum* by Baker, who had not seen specimens. Although obviously congeneric, the two species had nothing in common with *Acrostichum* save their complete dimorphism, and were strongly at variance also from *Polybotrya*, under

<sup>4</sup> Contr. U. S. Nat. Herb. 13: 29.

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<sup>4</sup> Contr. U. S. Nat. Herb. 13: 29.

which genus the Cuban plant was provisionally listed by Christensen in the Index Filicum.

In view of their uncertain systematic position, both plants were sent (in 1909) to Christ, who in *Die Geographie der Farne* (1910) referred them to *Psomiocarpa*, listing (but not describing) the Jamaican plant as a new species, *P. maxoni*. The genus *Psomiocarpa* Presl (1849) was regarded as consisting of three species: *Psomiocarpa apiifolia* J. Smith, the Philippine prototype; *P. aspidioides* (Griseb.) Christ, of Cuba; and the Jamaican *P. maxoni* Christ. Christ's conclusions as to extending *Psomiocarpa* to include the West Indian species, together with a brief characterization of the genus and three included species, were embodied in a short paper, "On *Psomiocarpa*, a neglected genus of ferns," published in the Smithsonian Miscellaneous Collections in 1911.

Somewhat later, Christensen, in discussing the minute morphology of the subgenus *Otenitis* of *Dryopteris*, more particularly with respect to systematic status and relationship, wrote as follows:

*Otenitis* is not nearly related to the other subgenera of *Dryopteris* and in my opinion it is even not congeneric with them. On the other hand, it is intimately related to the genus *Psomiocarpa* Presl, recently restored by Christ, who referred to that genus two West Indian species, *Ps. aspidioides* (Griseb.) and *Ps. Maxoni* Christ. I know the first named of these species, which in habit, texture, colour, and pubescence is perfectly agreeing with *Otenitis*; by its contracted fertile frond it differs, however, so much that it naturally must be placed in a separate genus, which can be regarded as a derivate of *Otenitis*. *Psomiocarpa* was previously united with *Polybotrya*, which genus is more closely related to *Polystichum*.

It will be generally agreed that *Psomiocarpa* as understood by Christ forms no part of true *Polybotrya*, which is characterized by erembryoid vernation and large, coarse, leathery fronds. It seems clear also to the writer that the Philippine *Psomiocarpa apiifolia* is not truly congeneric with the two West Indian species. This conclusion is shared by Mr. Christensen, who at the time he published the remarks above quoted (1913) knew *P. apiifolia* only from description and illustration. A new genus for the accommodation of the West Indian plants may, therefore, be described as follows:

**Atalopteris** Maxon & C. Chr., gen. nov.

Small, terrestrial dryopteroid ferns of rocky forest ravines, of lax habit. Rhizomes woody, short, decurved, clothed at the apex with a tuft of rigid attenuate scales; fronds numerous, fasciculate, ascending, completely dimorphous, the vascular parts persistently paleaceous. Sterile blades oblong to broadly ovate, nearly bipinnate, the lower pinnae not basispic; veins free, oblique, nearly reaching the margin; rachis and under side of the costae spreading-paleaceous, the scales clathrate, lance-attenuate, hair-pointed, broadly attached at the thickened subcordate base, distantly glandular-cillolate or denticulate; costae, costules, and veins bearing scattering, closely appressed, pointed, several-celled, bicolorous hairs upon the upper side; leaf tissue thin-herbaceous, copi-



ously and minutely strigillose with thick uni-paucicellular glandular hairs upon both surfaces throughout, as upon all the vascular parts of the blade. Fertile blades one or two, nonfoliose, lanceolate or oblong, fully bipinnate; sori close or apart, subglobose, nonindusiate, borne laterally, a row upon either side of the elongate rachiform secondary divisions.

Species two. Type, *Polybotrya aspidioides* Griseb.

*Atalopteris* is most nearly related to *Psomiocarpa* Presl, which must be regarded as monotypic. Both genera are closely allied to the *Ctenitis* group of species still retained in *Dryopteris*, and both find their nearest allies in plants of their respective regions. Thus, *Psomiocarpa*, except in its free venation and consequently far greater dissection of the blade, agrees closely with the East Indian *Stenosemia* Presl, particularly in the suppression of scales and in the development of a copious covering of peculiar long, flattish, intestiniform hairs upon the rachis. In *Atalopteris*, on the other hand, persistent divaricate scales are present upon the rachis and the lower side of the costae in abundance, and these agree so closely with the prevailing type of *Ctenitis* scales as to require no special description. The presence or absence of scales of this specialized kind is of basic importance, systematically. Thus, although *Psomiocarpa*, *Stenosemia*, *Ctenitis*, and *Atalopteris* are perhaps of common ancestry, it is obvious that their more recent evolution has progressed along two distinct lines, and that *Atalopteris* is closely related to *Ctenitis*, while *Psomiocarpa* and *Stenosemia* are not. From *Ctenitis*, whether its species be regarded as constituting either a proper genus or a subgenus of *Dryopteris*, *Atalopteris* is sufficiently distinct, however, in its complete dimorphism, an exactly analogous case being that of *Mazonia*, segregated from *Dryopteris* by Christensen, which is phylogenetically close to *Polybotrya*.

In its minutely glandular-strigillose surfaces, also, *Atalopteris* is not unlike certain species of the subgenus *Ctenitis*; for example, *Dryopteris nigrovenia* (Christ) C. Chr., which bears a fair number of short, turgid, apparently "unicellular" glandular hairs\* in addition to long pluricellular ones. In the *Ctenitis* species showing this character such hairs are relatively inconspicuous, however, and are for the most part so readily abraded as to be barely evident at maturity. They are altogether lacking in *Psomiocarpa* and *Stenosemia*, but are a very conspicuous feature in *Atalopteris*. In the lax moniliform cilia of the segments, moreover, *Atalopteris* agrees with most species of *Ctenitis*, and in habit the resemblance to the smaller members of *Ctenitis* is close.

Taking all the characters together, therefore: If we admit *Psomiocarpa* and *Stenosemia* as distinct genera, partly on the basis of their dimorphism, and partly because of their minute characters, which show a wide departure from *Ctenitis*, we must place the West Indian plants in a separate new genus, since (1) their systematic agreement with *Psomiocarpa* is relatively remote and (2) their dimorphism is of generic importance in distinction from *Ctenitis*, with which group they are otherwise in very close relationship.

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\* Mr. Christensen, who has gone into the matter thoroughly, points out in a recent letter that these short, thick, glandular hairs which at first sight appear to be unicellular are not actually so; that they often show one or two constrictions, which may be due to contractions of the juice or to the presence of cell walls; that in some cases, at least, a cross wall near the base is clearly demonstrable; and that they are, in short, "glandular hairs with a cylindrical head." They are thus not to be confounded with the dry whitish hairs of the subgenera *Lastrea* and *Cyclosorus*, which are excrescences from a single epidermal cell and are truly unicellular, not being cut off by a cross wall.



The material of *Atalopteris* at hand is not wholly comparable as to maturity, and besides is not ample enough to permit a positive decision as to whether one or two species are represented. On the basis of the specimens now available the two forms are readily distinguished by the key given below. It may be, however, that these are merely states of a single variable species.

Fertile fronds much shorter than the sterile ones; blades of sterile fronds broadly ovate, abruptly short-acuminate, 20 to 25 cm. long, 12 to 15 cm. broad, the pinnules acuminate; segments 12 to 14 pairs, entire or nearly so, the veins (7 or 8 pairs) mostly simple; scales of the stipe and blade ferruginous, lax, with thin partition walls.....1. *A. aspidioides*.  
Fertile fronds greatly exceeding the sterile ones; blades of sterile fronds ovate-oblong, acuminate, 13 to 17 cm. long, 6 to 8 cm. broad, the pinnules obtuse; segments 7 or 8 pairs, irregularly dentate-serrate, the veins (5 or 6 pairs) mostly forked; scales of the stipe and blade reddish brown, rigid, with thickened partition walls .....2. *A. maxoni*.

1. *Atalopteris aspidioides* (Griseb.) Maxon & C. Chr.

*Polybotrya aspidioides* Griseb. Cat. Pl. Cub. 276. 1866.

*Acrostichum aspidoides* Baker, in Hook. & Baker, Syn. Fil. 414. 1868.

*Psomiocarpa aspidioides* Christ, Geogr. Farne 297. 1910.

Cuba. Apparently known only from the original collection, Wright 1827.

2. *Atalopteris maxoni* (Christ) C. Chr.

*Psomiocarpa maxoni* Christ, Geogr. Farne 224. 1910, *nomen nudum*; Smiths. Misc. Coll. 56<sup>2</sup>: 2. pl. 1; text fig. 1. 1911.

Jamaica. Type in the U. S. National Herbarium, no. 520143, collected at Hollymount, slopes of Mount Diabolo, altitude about 750 meters, on rock slopes of wet forested ravine, May 25 to 27, 1904, by William R. Maxon (no. 2228). This species, also, has not as yet been recollected.

### THREE NEW SPECIES OF DRYOPTERIS, SUBGENUS STIGMATOPTERIS.

The new genus *Stigmatopteris* was proposed by Christensen in 1909<sup>6</sup> for a small coherent group of tropical American ferns which had latterly been referred to *Dryopteris*, 12 species being recognized provisionally and figured. Several years later<sup>7</sup> the same author, in his extended treatment of the pinnatifid-bipinnatifid American species of *Dryopteris*, while still regarding *Stigmatopteris* as "a very natural genus (perhaps not even a member of the Dryopterideae)," gave it the rank of a subgenus of *Dryopteris*, at the same time extending its limits to include 17 species. These were divided between two sections: *Eustigmatopteris* with 14 species, and *Peltochlaena* with 3. More recently Christensen has added<sup>8</sup> 3 species to the section *Eustigmatopteris*, making 20 for the whole subgenus.

Though apparently still regarding *Stigmatopteris* as a valid genus and though listing its species under this generic name, Christensen

<sup>6</sup> Bot. Tidsskr. 29: 291-304, figs. 1-5. 1909.

<sup>7</sup> Dansk. Vid. Selsk. VII. Naturv. Afd. 10<sup>2</sup>: 53-282. 1913.

<sup>8</sup> Dansk. Vid. Selsk. VIII. Naturv. Afd. 6<sup>1</sup>: 1-132. 1920.

makes it one of the 11 subgenera of *Dryopteris*. Whatever its rank may be, the morphological characters of the group are admirably stated by him, and the limits of the highly variable species are for the most part well defined. In a few cases the results reached have not been satisfactory. It thus becomes necessary to recognize at least three additional species, all of the section *Eustigmatopteris*. Descriptions of these follow, with notes on relationship.

***Dryopteris nothochlaena* Maxon, sp. nov.**

Rhizome stout, erect, woody, with numerous very coarse, cordlike roots, paleaceous, the scales mostly lance-deltoid, hair-pointed, 8 to 14 mm. long, thin, seal brown, sublustrous, laxly and distantly long-fimbriate; fronds several, erect-spreading, 1.2 to 2 meters long; stipes 45 to 80 cm. long, 5 to 10 mm. thick, deeply sulcate anteriorly, light brown from a darker base, appressed-paleaceous, the scales similar to those of the rhizome, mostly deciduous with age; blades oblong-lanceolate, acuminate, 80 to 120 cm. long, 30 to 45 cm. broad, subbipinnate, the rachis similar to the stipe, deciduously paleaceous; pinnae about 25 pairs, spreading or laxly ascending, the lower pairs opposite or subopposite, short-stalked (2 to 5 mm.), and subdistant, the others subopposite or alternate, nearly sessile, contiguous, or subimbricate; characteristic middle pinnae linear or deltoid-linear from an inequilateral base, attenuate or subcaudate (the tip sharply serrate throughout), 15 to 23 cm. long, 2 to 5 cm. broad, pinnatifid to about 1 mm. from the elevated, distantly paleaceous costa; segments 25 to 30 pairs, oblique-spreading, narrowly joined by their decurrent bases (the proximal basal one invariably reduced, nearly or quite free), oblong-linear, distally acutish, 1 to 3 cm. long, 3 to 7 mm. broad, subfalcate, deeply serrate or in the outer part serrately incised, thin-herbaceous, coarsely glandular-punctate; costules minutely paleaceous beneath, the scales scattering, tawny or light brown, deeply bullate, ovate, attenuate to a filiform, sometimes cleft tip; veins usually 10 or 11 pairs, oblique, pellucid, simple or once forked less than half way to the margin, minutely paleaceous beneath like the costule; sori usually 5 or 6 pairs in the outer half of the segment (or sometimes all the veins fertile), inframedial, each subtended proximally by a deciduous scale, similar to those of the costules and veins.

Type in the U. S. National Herbarium, nos. 428048-50, comprising a single frond, collected near Cuna Cuna Pass, Jamaica, altitude 800 meters, on wet wooded slopes, May 1, 1903, by William R. Maxon (no. 1738).

The following additional specimens are in the National Herbarium:

JAMAICA: Mansfield and adjoining properties, near Bath, alt. 300 to 500 meters, *Maxon* 2388. Second Breakfast Spring, near Tweedside, alt. 600 meters, *Underwood* 1613. Lower slopes of Mount Moses, alt. 600 to 750 meters, *Maxon* 1071. Slopes above Tweedside, alt. 600 to 900 meters, *Maxon* 970. Seamen's Valley, alt. 150 to 250 meters, *Maxon & Killip* 7. Cuna Cuna trail, above Mattis River, alt. 300 to 500 meters, *Maxon & Killip* 169. Between Morces Gap and Vinegar Hill, alt. 1,175 to 1500 meters, *Maxon & Killip* 716. Without locality, *Hart* 200.

In Christensen's key this Jamaican plant runs to *D. ichtiosma* (Sod.) C. Chr., under which species it is mentioned with the comment that "the specimens seen agree, as to the essential characters, very well with the andine type, although they very much resemble *S. caudata* by their acute, oblique segments, which are toothed throughout." Nevertheless the specimens referred to (all from the National Herbarium) are labeled by Christensen as a variety, and as a matter

of fact their agreement with *D. ichtiosma*, beyond their having falsely indusiate sori and dwarfed proximal basal segments, is not at all close. *D. ichtiosma*, as represented in the National Herbarium by fragments and photographs of Sodiro 2617, from Ecuador, these courteously forwarded from the Herbarium of Prince Roland Bonaparte, is well marked by its spreading segments, broader sinuses, more numerous, spreading, evident veins (14 to 17 pairs), more rounded, less oblique teeth, and much smaller immersed glands, as also by the character of the scales of the costae, costules, and veins.

***Dryopteris hemiptera* Maxon, sp. nov.**

Rhizome not seen, presumably erect; fronds about 115 cm. long; stipe 55 cm. long, 3 to 6 mm. thick, pale brown from a darker base, deeply sulcate anteriorly, deciduously paleaceous, the scales mostly elongate, thin, light brown, laxly hair-pointed, distantly denticulate-fimbriate; blade broadly oblong, abruptly long-acuminate, 60 cm. long, 35 cm. broad at the middle, subbipinnate, the rachis similar to the stipe, with narrow lax subpersistent scales; main pinnae about 20 pairs, falcate, sessile, the two or three lower pairs spreading, distant (4 to 6 cm. apart in attachment), opposite, with the proximal basal segment dwarfed (6 to 8 mm. long) and nearly free; middle pinnae approximate, ascending, linear-lanceolate from an inequilateral base, long-attenuate (the subcaudate tips sharply serrate), 17 to 18 cm. long, 2.3 to 3 cm. broad, obliquely pinnatifid to about 1 or 1.5 mm. from the stout elevated costa, the inferior basal segment deltoid (about 6 mm. long, 4 mm. broad), nearly or quite free, arising from a narrow foliaceous wing short-decurrent upon the main rachis; intercalary segments upon the main rachis toward the apex of the blade similar, but with a broader decurrent base; main segments of the pinnae about 23 pairs, oblique, falcate, linear-oblong, submuticous or distally acute, 15 to 20 mm. long, 3.5 to 4 mm. broad, with narrowly obtuse sinuses, sharply low-serrate, thin-herbaceous, finely glandular-punctate; costules strongly elevated beneath, minutely paleaceous, the scales few, subpersistent, linear or filamentous, a few extending to the veins, these not at all bullate; veins 7 to 9 pairs, very oblique, elevated beneath, pellucid, mostly simple, arcuate; sori 4 to 6 pairs, supramedial, apparently not subtended by an indusiform scale.

Type in the U. S. National Herbarium, no. 50172, collected in eastern Cuba in 1859 or 1860 by Charles Wright (no. 1053).

This was placed by Christensen with the Jamaican element referred to *D. ichtiosma*, but was indicated as a "forma dubia." The specimen at hand is somewhat abraded, but is otherwise complete, and appears to indicate a clearly distinct species. In comparison with *D. nothochlaena* it is distinguished by its even more oblique, strongly falcate segments, their much lower and sharper teeth, and fewer, more prominent, mostly simple, arcuate veins, as also by the seeming absence of a false indusial scale. It is set apart from all its immediate allies by the presence of short-decurrent, horizontal, deltoid, intercalary segments upon the main rachis from the middle portion upward, a character which has suggested the specific name.\*

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\* Two fronds of the type collection have recently been examined at the Gray Herbarium. One of these is larger than the type specimen, the frond (complete) measuring 132 cm. long (the stipe 60 cm., the blade 72 cm.); a single detached pinna measures 4 cm. broad. They are in excellent condition and show no trace of indusial scales, in this as in other respects being sharply distinguished from *D. nothochlaena*.

**Dryopteris sordida** Maxon, sp. nov.

Rhizome not seen, presumably erect; fronds at least 110 cm. long; stipes about 45 cm. long, 7 mm. thick at the base, sulcate anteriorly, castaneous beneath, supersistently paleaceous, the scales subappressed, dull brown, thin, narrowly deltoid, denticulate at the attenuate apex; blades very broadly oblong, abruptly acuminate, about 65 cm. long, 40 cm. broad, pinnate-pinnatifid, the rachis similar to the stipe, subfurfuraceous from the remnants of the peltate scales; pinnae about 18 pairs, spreading, the lowermost 2 or 3 pairs sessile or short-stalked (1 to 3 mm.), those above mostly semiadnate below, the upper ones fully adnate and short-decurrent, but only the uppermost ones joined; characteristic middle pinnae linear from a strongly inequilateral base, attenuate (the tip deeply and sharply serrate), 20 to 22 cm. long, 2.5 to 3 cm. broad, obtusely pinnatifid two-thirds the distance to the costa, the costa stramineous, strongly elevated beneath and sparsely appressed-paleaceous, the scales pale brown, thin, lax, peltate, irregularly lobed; lobes about 25 pairs, the distal basal one elongate and parallel to the rachis, the proximal basal one short, oblique, and partially adnate to the rachis, most of the lobes spreading, broadly oblong (becoming more oblique and deltoid-oblong toward the tip), rounded or at most acutish, 5 to 6 mm. broad above the rather broad subobtuse sinuses, the fertile ones subentire, the sterile ones sharply serrate; costules bearing a few minute pale elongate scales beneath; veins 7 to 9 pairs, oblique-spreading, mostly simple, elevated beneath and nearly devoid of scales; sori 5 to 7 pairs, nearly medial, an indusiform scale wanting; leaf tissue dark green, membranous, finely pellucid-punctate with immersed glands.

Type in the U. S. National Herbarium, no. 826179, collected in forests near Cubilquitz, Alta Verapaz, Guatemala, altitude 350 meters, September, 1906, by H. von Türckheim (no. II. 1432). There is also a second identical sheet of the type collection. Specimens from Chiapas, collected by Purpus (no. 6870) in June, 1913, are referred here tentatively.

The type specimen of the present species is the plant mentioned by Christensen under *S. nephrodioides* as a form intermediate between that and *S. ichtiosma* and as perhaps representing a new species. The relationship to the latter species is certainly remote. From *D. nephrodioides*, as keyed and figured by Christensen, *D. sordida* differs notably in having the pinnae pinnatifid well below their middle, and in the less oblique, mostly obtuse segments (these never dentate) and more numerous veins, *D. nephrodioides* having only five or six pairs per segment.

**MISCELLANEOUS NOTES.****Polypodium furfuraceum** Schlecht. & Cham.

The range of this species, previously reported by the writer<sup>19</sup> as "common from Mexico to Panama, at 200 to 1,300 meters elevation, ascending casually to 1,750 meters," may now be extended to include Peru. The specimens referred to are from tree trunks in dry, open woods, Santa Ana, Peru, altitude about 900 meters, June 26, 1915, *Cook & Gilbert* 1510.

**Polypodium rosei** Maxon, *Contr. U. S. Nat. Herb.* 17: 594. 1916.

Known hitherto only from Morelos and Jalisco. The following additional specimens are at hand from several localities in the vicinity of Morelia, State of Michoacán, alt. 1,950 to 2,200 meters: *Arsène* 5171, 6528, 6780, 6800, 10666. Some of these are larger than the original specimens and have more numerous pinnae.

<sup>19</sup> *Contr. U. S. Nat. Herb.* 17: 561. 1916.

*Polypodium tweedianum* Hook. Icon. Pl. 1: pl. 86. 1837.

Described and figured originally on a plant from "woods of St. Xavier, Tucumán," Argentina, *Tweedie* (which apparently has been lost at Kew), and recently reidentified by the writer<sup>11</sup> on the basis of specimens from Pinos, near Tarija, Bolivia, *Fiebrig* 3265, which in gross characters agreed much more closely with the description and original illustration than did the various Andean plants usually so referred. Substantiating specimens are now at hand from northern Argentina, those collected in the andine foothill region of Esquina Grande, Province of Salta, altitude 2,400 meters, by Pedro Jorgensen (no. 1249) in 1915 and at Las Pavas (*Jorgensen* 52) in 1916. These appear identical with the *Fiebrig* plant.

*Cheilanthes wootoni* Maxon, Proc. Biol. Soc. Washington 31: 146. 1918.

A few fronds of this species were collected by the late Charles T. Druery in Sonora, between Nogales and Arispe, about 1895, and were transmitted by him with other ferns to the National Museum in 1905. This species is fairly common in Arizona and New Mexico and is known also from the vicinity of El Paso, Texas,<sup>12</sup> but has not hitherto been reported from Mexico.

*Pellaea formosa* (Liebm.) Maxon.

*Allosorus pulchellus* Mart. & Gal. Nouv. Mém. Acad. Sci. Brux. 15<sup>e</sup>: 47. pl. 10. f. 1. 1842. Not *A. pulchellus* Presl, 1836.

*Allosorus formosus* Liebm. Dansk. Vid. Selsk. Skrivt. V. 1: 220. 1849.

*Pellaea pulchella* Fée, Gen. Fil. 129. 1852.

The distinctions between this relatively coarse fern of southern and eastern Mexico and *P. microphylla* Mett., a rare and comparatively delicate plant of northern Mexico and the arid southwestern United States, have recently been well pointed out by Weatherby,<sup>13</sup> who figures both. A new name for the former species is, however, required under the American rules, *Allosorus pulchellus* of Martens and Galeotti (1842) being invalidated by Presl's earlier use of the same name. Fortunately, Liebmann's name is available.

The following specimens of *P. formosa* are in the U. S. National Herbarium:

CHIAPAS: Without locality, 1864-1870, *Ghiesbreght* 227.

OAXACA: Las Sedas, alt. 1,800 meters, *C. L. Smith* 2080.

PUEBLA: Near Tehuacán, *Rose, Painter & Rose* 10127. Tetele, alt. 2,170 meters. *Arsène* 7130.

SAN LUIS POTOSÍ: Minas de San Rafael, *Purpus* 4882a.

VERACRUZ: Escamella, region of Orizaba, *Bourgeau* 2894. Mount Orizaba, *Spence* 78. Huatusco, April, 1857, *Mohr*.

BAJA CALIFORNIA: San Cristóbal, 1899, *Münsch*.

*Pellaea lozani* Maxon, Contr. U. S. Nat. Herb. 10: 500. 1908.

The following additional specimens of this species have been observed:

GUERRERO: Río Balsas, August 26, 1910, *Orcutt* 4188.

FEDERAL DISTRICT: Lava beds near Eslava, alt. 2,400 meters, July 19, 1910, *Rusby* 368.

*Pityrogramma schizophylla* (Baker) Maxon.

*Gymnogramme schizophylla* Baker, Journ. Bot. Brit. & For. 15: 266. 1877.

*Anogramma schizophylla* Diels in Engl. & Prantl, Pflanzenfam. 1<sup>e</sup>: 258. 1899.

*Psilogramme schizophylla* Underw. Bull. Torrey Club 29: 629. 1902.

Founded on specimens collected at Old England, Jamaica, by Miss Taylor and since found in one or two additional localities in Jamaica, as also in

<sup>11</sup> Contr. U. S. Nat. Herb. 17: 574, 575. pl. 39. 1916.

<sup>12</sup> Amer. Fern Journ. 9: 5. 1919.

<sup>13</sup> Amer. Fern Journ. 8: 104-109. pl. 5. 1918.



Haiti (*Leonard* 4772, 4774). Reported from Cuba by Christensen,<sup>14</sup> presumably from the erroneous reduction of *G. eggersii*. See under the next species.

***Pityrogramma eggersii*** (Christ) Maxon.

*Gymnogramme eggersii* Christ, Bull. Soc. Bot. Belg. 33<sup>2</sup>: 92. 1894.

*Anogramma eggersii* Christ; C. Chr. Ind. Fil. 58. 1905.

Founded on small specimens collected in forest near Jaguey, Oriente, Cuba, March, 1889, by Eggers (no. 4882a). This collection has not been seen by the writer. Agreeing with the description in most characters except those consequent upon the greater size and development of the plant, however, are the following specimens, in the herbarium of the New York Botanical Garden: Loma de la Gloria, Banao Mountains, Santa Clara Province, Cuba, altitude about 900 meters, July, 1918, *Leon & Roca* 7949, 7966, 7974, 8444. These show rather wide variation in dissection of the lamina, but scarcely more than is to be seen in *P. sulphurea* (Swartz) Maxon,<sup>15</sup> of the Greater Antilles.

This species is nearest related to *P. schizophylla*, to which (under *Gymnogramme*) it was reduced in 1897,<sup>16</sup> but from which it is amply distinct in its very long stipes (these dark brown and strongly sclerotic only toward the base), its pale brown to greenish or stramineous (not polished, dark brown) rachises, its longer, strongly oblique, and long-stalked pinnae, its much larger, narrowly long-cuneate, nondivaricate segments, and its more numerous, though scattered, wax glands beneath. These two species and the strongly ceraceous *P. sulphurea* are closely related, but form no more than a subgroup of *Pityrogramma*, since through the last-mentioned species and *P. chrysophylla* (Swartz) Link their affinity with the commoner, widespread species of the genus is readily apparent.

***Asplenium heterochroum*** Kunze.

In the writer's revision of *Asplenium trichomanes* and its American allies,<sup>17</sup> *A. heterochroum* was reported from Cuba, Florida, and Bermuda, with citation of numerous collections. This species occurs also in Porto Rico, the following specimens being at hand: Clefs of rocks, near Bayamon, *Underwood & Griggs* 858; Finca Besosa, Bayamon, *Hioram* 328; Hato Arriba, near Arecibo, *Britton & Cowell* 1985. Of these, the last are the largest and most characteristic.

At page 141 of the paper mentioned, Bermuda specimens are cited, through a typographical error, as collected by the writer. They were actually collected by Mr. Faxon.

***Dryopteris* (Meniscium) anceps** Maxon, nom. nov.

? *Heteroncuron meniscioides* Fée, Hist. Acrost. 93. pl. 55, f. 4. 1845.

*Acrostichum fendleri* Baker, Journ. Bot. Brit. & For. 25: 100. 1887.

*Leptochilus fendleri* C. Chr. Bot. Tidsskr. 26: 285. 1904.

In describing *Acrostichum fendleri*, on Fendler's no. 88, from Trinidad, Baker called attention to the fact that "the venation is strictly that of *Meniscium*, in which genus Eaton placed it."<sup>18</sup> The general form and venation of the sterile fronds are, indeed, in such complete agreement with the American species of

<sup>14</sup> Ind. Fil. 59. 1905,

<sup>15</sup> Contr. U. S. Nat. Herb. 17: 173. 1913.

<sup>16</sup> Bot. Jahrb. Engler 24: 134.

<sup>17</sup> Contr. U. S. Nat. Herb. 17: 134-153. 1913.

<sup>18</sup> In Christensen's Index Filicum the name *Meniscium fendleri* is ascribed to Eaton, Bot. Gaz. 3: 89. 1878, but this name is not given there or elsewhere, so far as the writer can find. In Eaton's second list of determinations of Fendler's Trinidad ferns (op. cit. 5: 121. 1880) no. 88 is listed as *Meniscium reticulatum* L.



Meniscium that there can be no doubt that it should be associated with them in the subgenus Meniscium of Dryopteris. In referring the plant to Acrostichum, section Gymnopteris, Baker appears to have been misled by the dimorphism of the fronds; but the tendency toward completely fertile and completely sterile fronds is seen in several other species of Meniscium, notably *D. angustifolia* (Willd.) Urban, though in none is it quite so pronounced as in the present species. The reduction and nearly complete suppression of excurrent veinlets in the fertile fronds is a conspicuous feature, but this also is merely an extreme example of a disposition observed in other species of the group. Stellate hairs have not been noted; the sporangia are conspicuously long-setose.

Fée's *Heteroneuron meniscioides*, founded on a fertile frond collected near Bahia, Brazil, by Blanchet, appears to be the same; but unfortunately both this name and the one given by Baker are preoccupied in Dryopteris, necessitating a new name, as above. Jenman, in publishing Baker's description, mentions the plant as occurring in Guiana, which gives the species an entirely natural range.

The following specimens are in the National Herbarium:

TRINIDAD: Type collection, *Fendler* 88 (four sheets). Near Brazil, in forest, *Britton, Britton & Freeman* 2142.

TOBAGO: Between Roxborough and Parlatuvier, in mountain forest; terrestrial; July 26, 1914, *Broadway* 4904.

*Dryopteris dissimulans* Maxon & C. Chr. Dansk. Vid. Selsk. VII. Naturv. Afd. 10<sup>2</sup>: 215. 1913.

This species, founded on *Eggers* 4958, from the vicinity of Jaguey, Oriente, Cuba, is now represented by several additional collections recently received by the National Herbarium:

CUBA: Arroyo de Manaca, Herradura, Trinidad Mountains, Santa Clara, alt. 320 meters, *Britton & Britton* 4994 in part (the balance of the number being *D. sagittata*). Las Ninfas, *Hioram* 1454 in part (mixed with *D. sagittata*), 1496 in part (mixed with *D. sagittata* and *D. cordata*), 1717.

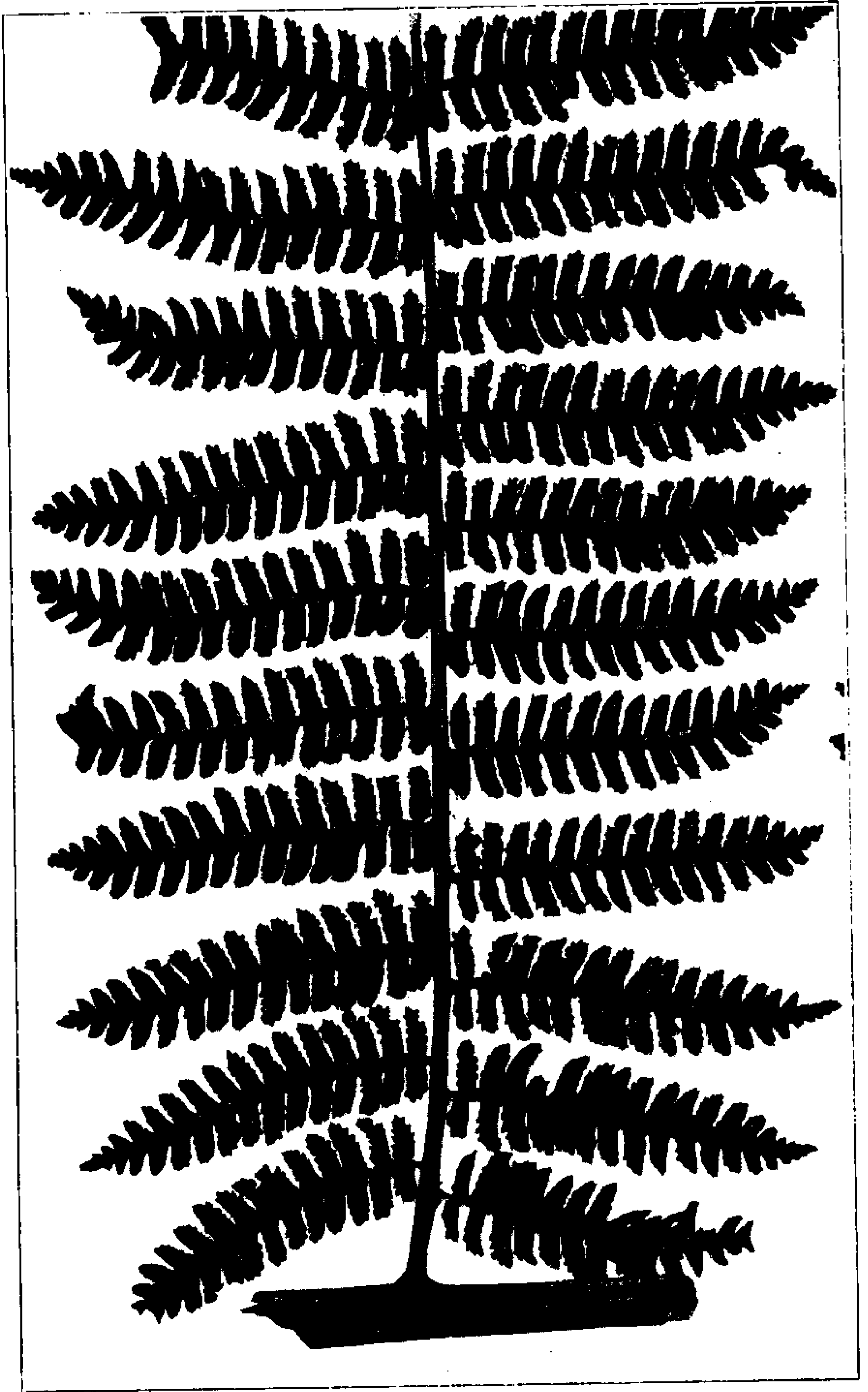
The further records of the close association of this plant with *D. sagittata* lend support to Mr. Christensen's suggestion as to its hybrid nature with *D. sagittata* one of its parents, especially since *D. scolopendrioides* (L.) Kuntze, the other suspected parent, was collected with it by Brother Hioram.

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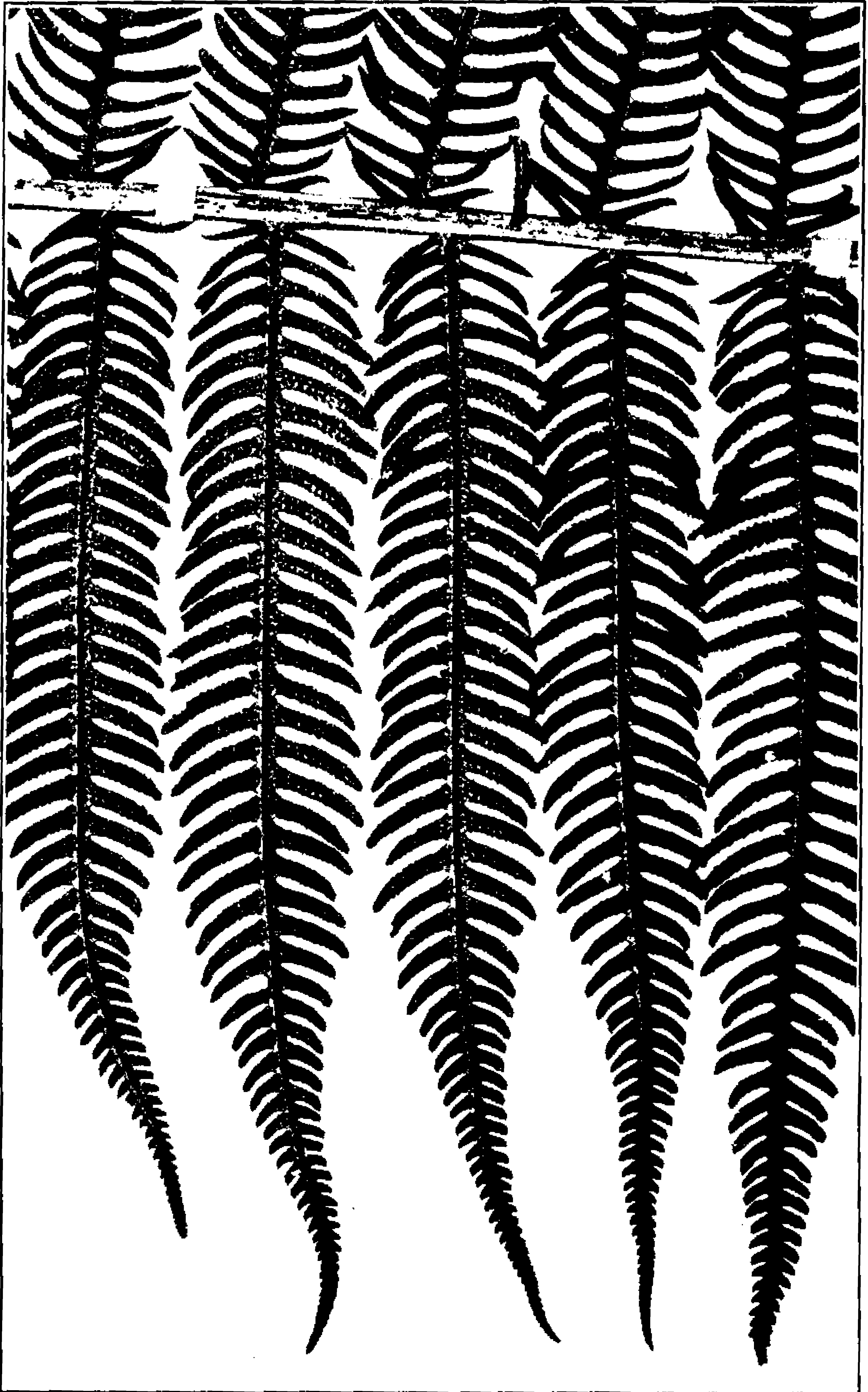
NOTE.—While this paper was in the printers' hands a letter was received from Mr. Christensen stating that *Atalopteris* occurs also in Haiti and that the specimen in question (collected by Ekman) tends to invalidate the supposed distinctions between *A. aspidioides* and *A. mazoni* (see p. 57). The writer hopes to examine and report upon this specimen later.



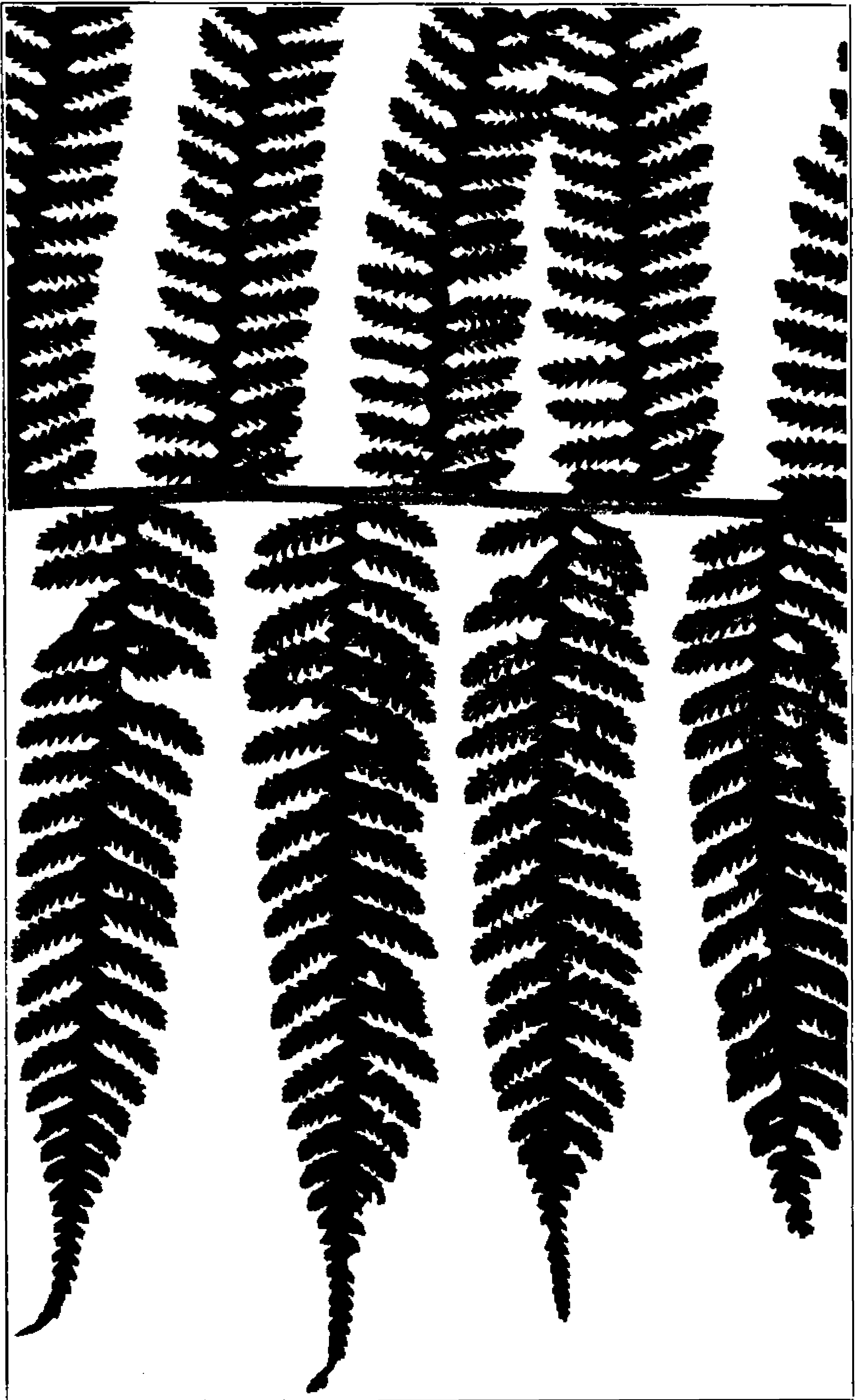
ALSOPHILA STRIGILLOSA MAXON.



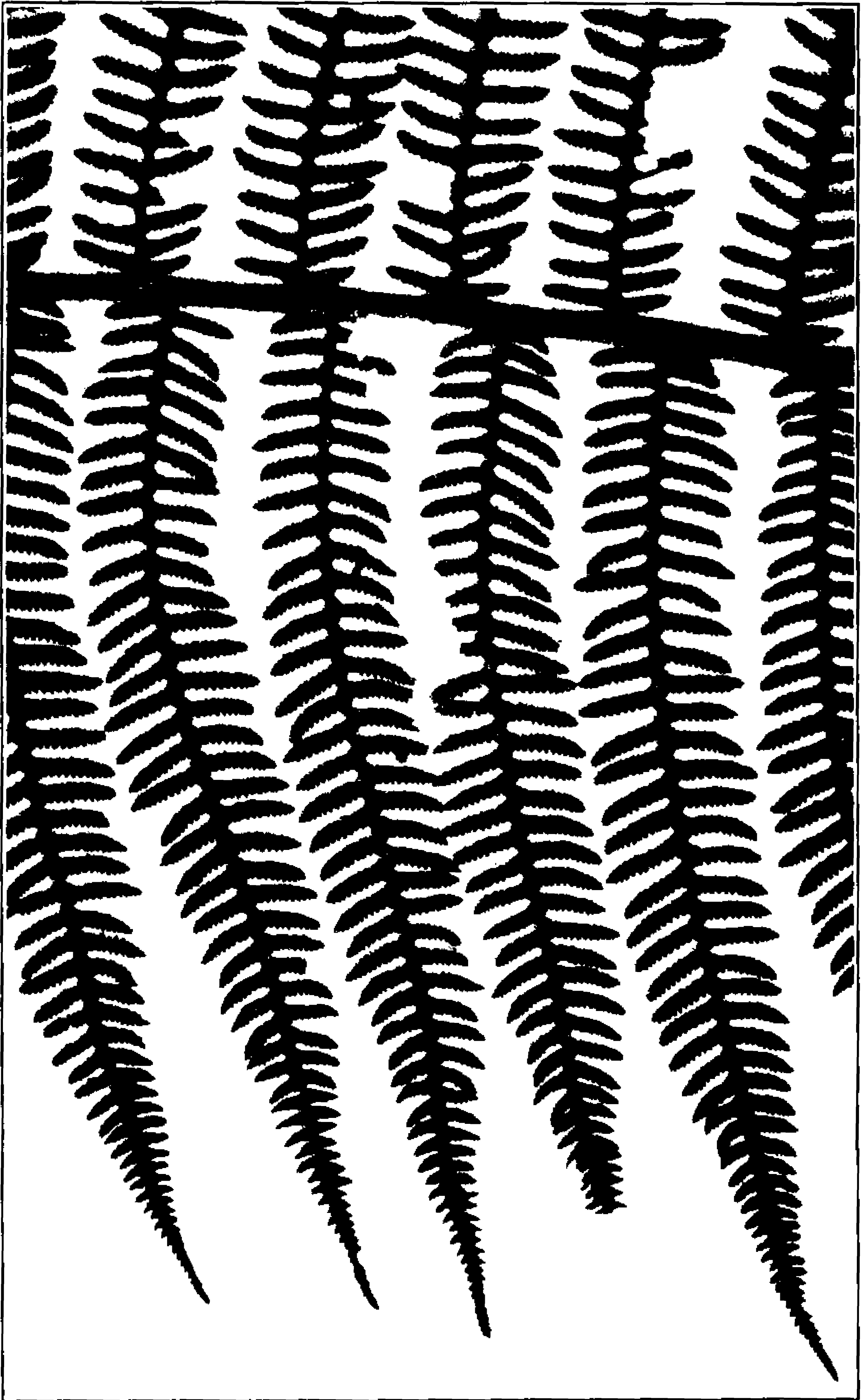
ALSOPHILA NOTABILIS MAXON.



*ALSOPHILA STIPULARIS* CHRIST.

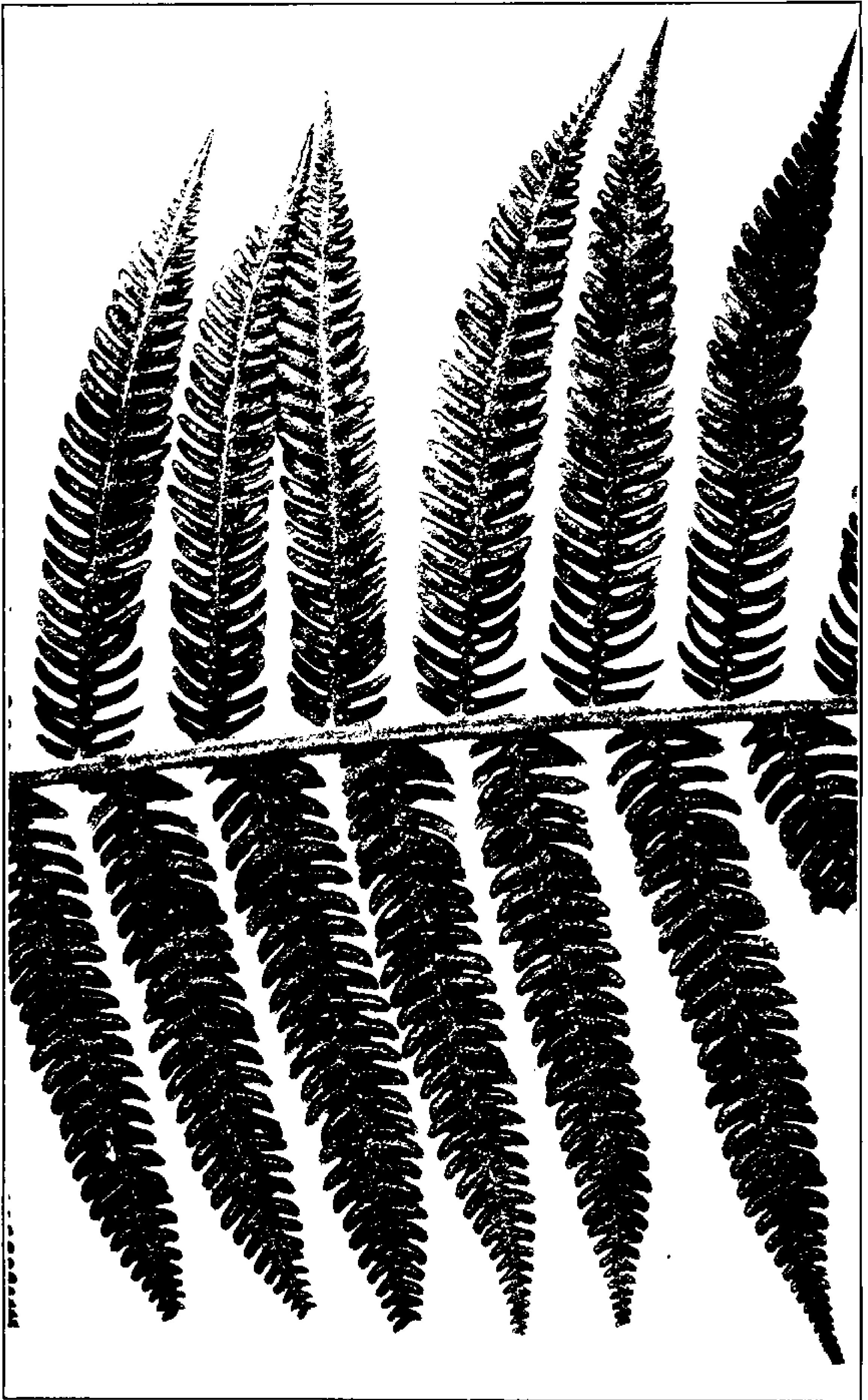


ALSOPHILA ACUTIDENS CHRIST.

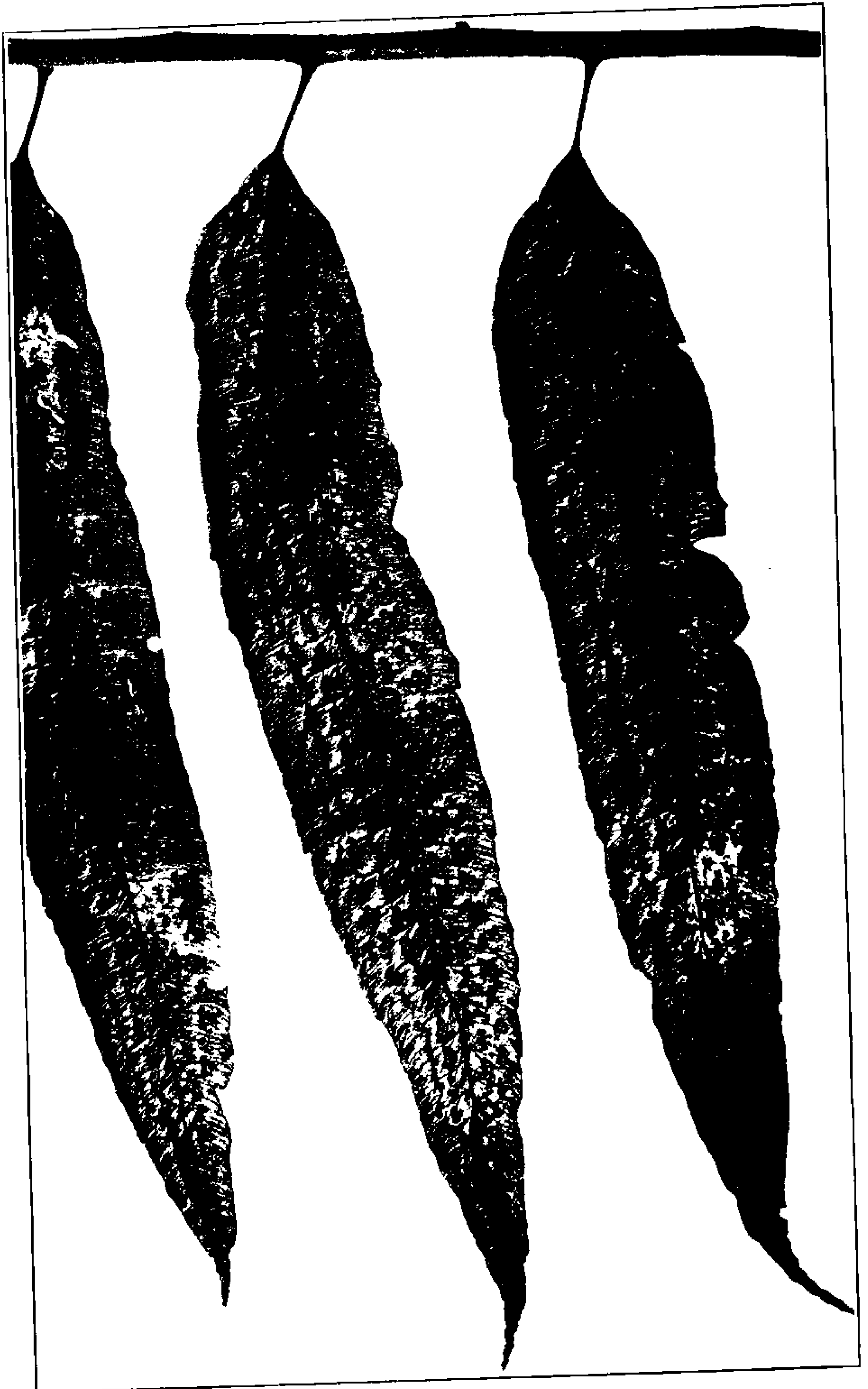


ALSOPHILA TRICHIATA MAXON.

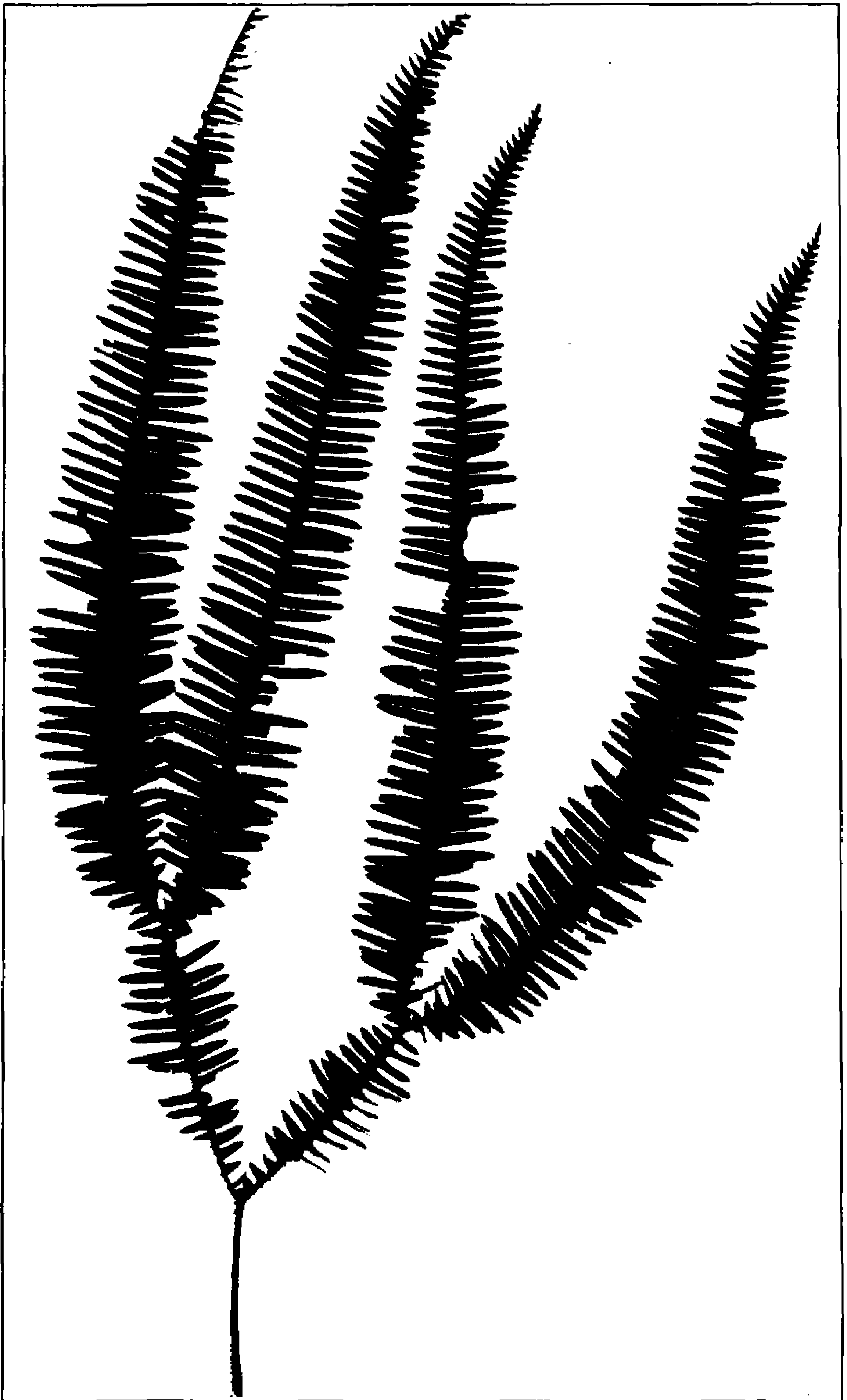




ALSOPHIA SWARTZIANA MART.



ALSOPHILA WILLIAMSI MAXON.



DICRANOPTERIS BRITTONII MAXON.



Field Notes, Wash. etc.

POLYSTICHUM DEMINUENS MAXON.



POLYSTICHUM KILLIPII MAXON.