

# STUDIES OF TROPICAL AMERICAN FERNS—NO. 3.

By WILLIAM R. MAXON.

## INTRODUCTION.

The present paper is in continuation of two others published<sup>1</sup> under the same title, giving the results of various studies of tropical American ferns. With the accumulation of a large amount of herbarium material the work of revision offers less difficulty than heretofore; but there is still very great need of specimens from the wet forested regions of eastern and southern Mexico. That adequate botanical exploration may be carried on in these mountain districts is of the first importance, not only in the study of pteridophyta, but to a great extent of other groups as well.

## THE NORTH AMERICAN SPECIES OF HEMITELIA, SUBGENUS CNEMIDARIA.

The genus *Hemitelia* was founded by Robert Brown in 1810<sup>2</sup> upon three previously described species: *Cyathea multiflora*, *C. horrida*, and *C. capensis*. As pointed out by the writer in a recent paper,<sup>3</sup> the first of these, which has long been misidentified and now proves to be the species described later as *Hemitelia nigricans* Presl, has been generally accepted by writers on ferns as the type of the genus. All recent writers have agreed also that *H. multiflora* and *H. capensis*, at least, are congeneric. Presl, however, who was the first to divide the genus, restricted *Hemitelia* to the single species *H. capensis*, relegated *H. multiflora* to *Alsophila*, and established<sup>4</sup> the genus *Cnemidaria* to include *H. horrida* and several related species. The first species listed by him is "*Cnemidaria speciosa* (*Hemitelia speciosa* Kaulf, nec Willd.)" which, being figured by him, will stand as the type of his genus. In a later publication<sup>5</sup> Presl proposed a rather elaborate reclassification of the group which we

<sup>1</sup> Contr. Nat. Herb. 10<sup>7</sup>: 473-508. pls. 55, 56. Mar. 30, 1908. Contr. Nat. Herb. 13<sup>7</sup>: 1-43. pls. 1-9. June 30, 1909.

<sup>2</sup> Prodr. Fl. Nov. Holl. 158. 1810.

<sup>3</sup> Bull. Torrey Club 38: 545-550. pl. 35. 1911.

<sup>4</sup> Tent. Pterid. 56. 1836.

<sup>5</sup> Abh. Böhm. Ges. Wiss. V. 5: 349-356. 1848.



now call *Hemitelia*, basing his treatment mainly upon characters offered by supposed differences in the arrangement of the fibrovascular bundles of the stipe and upon venation. The genera recognized by him are: (1) *Hemitelia*, with two sections, *Notophoria* and *Euhemitelia*; (2) *Microstegnus*, founded on *Cyathea grandifolia* Willd., in part; (3) *Hemistegia* with six "species"; (4) *Actinophlebia*, with two species; and (5) *Cnemidaria*, which he restricted to the original type species, *C. speciosa*, the other species having been removed by him to *Actinophlebia* and *Hemistegia*. The results of his investigation can not be regarded as satisfactory from any point of view, the principal objections being that, despite his undoubted keenness of observation, the work abounds in error due apparently to a willingness to accept many published observations and citations of specimens without substantiating them, a marked tendency to overestimate the systematic value of trivial characters, a lack of sufficiently extensive and complete material, and a singularly inadequate conception of the requirements of nomenclature, especially as regards the use of species names. Here and there are found in it observations and distinctions of merit; but to attempt, in review, to distinguish these from the many fallacious statements of fact or to explain in detail the various taxonomic errors, would be no simple task nor lead to any very useful result. In the writer's opinion the genus *Hemitelia* should be of sufficiently wide extent to include all these "genera" of Presl. In fact, there is much to be said in support of Mr. Copeland's recent proposition<sup>1</sup> to unite *Hemitelia*, *Alsophila*, and *Cyathea* in a single genus. The writer prefers for the present, however, to retain the three genera in their traditional sense, partly from practical considerations. Adhering to this view it is possible to recognize two fairly distinct sections of *Hemitelia* in the American tropics; (1) *Euhemitelia* and (2) *Cnemidaria*; the first, embracing large species of truly arboreal growth, with mainly tripinnatifid fronds and narrow, often rather minute segments; the latter, plants which are scarcely arborescent, with ample, pinnate to bipinnatifid (or rarely tripinnatifid) fronds, the leafy parts broad and little dissected.

Professor Underwood, who had undertaken a study of this group, regarded *Cnemidaria* as a valid genus, its "typical members having a basal areole or arch formed by a union of veins rising from adjacent series of primary veins" of the pinnæ. But in about half of the species the veins are free, ordinarily. The indusium characters are, it is true, fairly constant for the species of *Cnemidaria*, but there is closer agreement in this particular between these and *H. multiflora* than there is between *H. multiflora* and some of its near relatives in *Euhemitelia*. Undoubtedly there is in habit and leaf shape a close

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<sup>1</sup> Philippine Journ. Sci. C. Bot. 3: 353. 1908.



general resemblance among the species of *Cnemidaria*, which stamps them as obviously related and as forming a natural group; but that there is any logical ground for setting these apart as a genus distinct from *Hemitelia* is not apparent.

As with most members of the *Cyatheaceae* there are serious difficulties to be met in a satisfactory delimitation of the species, mainly on account of their great size and the consequent incompleteness of herbarium material. Most collectors seem to have thought it of little importance to collect the different characteristic parts of the plants. Naturally several species have been redescribed under new names; and most of them have been very inadequately described, usually with scant attention to venation, which, however unsatisfactory it may be as a generic character in this group, yet seems to be fairly constant for the recognition of species. Latterly there has accumulated at Washington and New York a large amount of material which affords the main basis for the present paper. It would have been impossible, however, to bring the work to a satisfactory conclusion without the courteous assistance of the authorities of several European herbaria. Acknowledgments are therefore gratefully extended to the Director of the Royal Gardens, Kew; to Mr. A. B. Rendle, Keeper of the Herbarium, British Museum (Natural History); to Mr. Carl Christensen, of the Botanisk Museum, Copenhagen; to Prof. H. de Willdman, Curator, Jardin Botanique de l'Etat, Brussels; to Dr. H. Christ, Basel; to Dr. E. Rosenstock, Gotha; and especially to Prof. Dr. I. Urban, Assistant Director of the Royal Botanical Garden and Museum, Berlin.

From data and specimens thus made available, and with the help derived in several instances from Doctor Underwood's unpublished notes, it has been possible to bring to completion that which appeared at first an almost hopeless task. It has been found that, with ample material, definite lines of demarcation may be drawn about as sharply among the species of this group as in related genera of the *Cyatheaceae*. The segregation of the species, indeed, has offered far less difficulty than the purely taxonomic problem of reapplying several of the early names in their original sense and of indicating with certainty their later synonyms. That several of these names are now to be applied in a sense wholly or partly different from their employment by recent writers will occasion at most a slight and temporary confusion, since the species of this genus have been so illy defined in recent years and their limits so misunderstood and so persistently disregarded that there is, in fact, no recognized treatment of the group to be disturbed thereby. For the same reason a rather large proportion of the species here recognized must be described as new. Within the past 15 years but two species of the subgenus *Cnemidaria* have been described from North America as new, and one of these (*H. bullata*), from Grenada, proves to be synonymous with an early species. It is entirely probable



that additional species will be found, on the continent, from Mexico southward; and it is sincerely to be hoped that further collections may be made in the humid districts of eastern and southern Mexico to bring to light complete material of those known at present only from the original collections.

KEY TO THE NORTH AMERICAN SPECIES.<sup>1</sup>

Veins mostly free, only very rarely forming basal arches along the costa.

Pinnæ varying from entire or slightly repand to crenate.

Texture thin; veins not strongly elevated; sori extending half way to the midvein of the pinnæ..... 1. *H. speciosa*.

Texture coriaceous; veins strongly raised beneath; sori in submarginal lines on shallow scallops..... 2. *H. integrifolia*.

Pinnæ cut from one-third to completely to the costa.

Segments obtuse or distinctly rounded (rarely acute in no. 8).

Sori submarginal..... 3. *H. bella*.

Sori borne distinctly apart from the margin, varying from supramedial to inframedial.

Pinnæ pinnately cut about halfway to the costa; veins simple (those on the distal side of the segments usually so), or once-forked..... 4. *H. contigua*.

Pinnæ deeply pinnatifid, two-thirds or nearly to the costa; all but the outer veins of the segments once or twice-forked.

Segments oblong or deltoid-oblong, relatively broad; veins 10 to 14 pairs.

Pinnæ oblong-linear, 30 to 35 cm. long, 4 to 5.5 cm. broad, relatively short-acuminate; segments 10 to 12 mm. broad at the sinuses, strongly arcuate toward their apices..... 5. *H. pittieri*.

Pinnæ oblong-lanceolate, 18 to 25 cm. long, 3.2 to 3.8 cm. broad, the apex gradually long-acuminate; segments 7 to 9 mm. broad at the sinuses, slightly or not at all arcuate..... 6. *H. chiricana*.

Segments narrowly oblong; veins 14 to 23 pairs; pinnæ much more deeply pinnatifid.

Veins 14 to 17 pairs, the branches distant and divergent; sori medial. 7. *H. arachnoidea*.

Veins 19 to 23 pairs, the branches very close and diverging at a very acute angle; sori distinctly inframedial, crowded..... 8. *H. mutica*.

<sup>1</sup> For the sake of comparison or for the purpose of explaining taxonomic confusion there are included in the present treatment several species which are not known to occur in North America, including Panama.



Segments acute to long-acuminate or caudate.

Fronds relatively small, the pinnæ 4.5 cm. broad, or less; segments arcuate, abruptly acuminate-cuspidate; veins 12 to 14 pairs, mostly once-forked; sori supramedial to submarginal. . . . .

9. *H. apiculata*.

Fronds very much larger, the pinnæ 7 to 22 cm. broad; segments (or pinnules) long-acuminate to caudate; veins 16 to 18 pairs, twice to several times branched; sori medial or in a broad medial zone.

Segments 20 to 23 pairs, linear-oblong, long-acuminate, only the subcaudate apices conspicuously crenate-serrate; veins about 16 pairs, alternately 2 to 4-branched. . . . .

10. *H. subglabra*.

Segments about 28 pairs, deltoid-lanceolate, deeply crenate or crenately lobed, the apices usually linear-caudate, sharply serrate-crenate; veins about 20 pairs, with 4 to 8 pairs of mostly simple, pinnately arranged branches. . . . .

11. *H. grandis*.

Veins (basal) regularly united by a transverse veinlet, forming a single series of costal areoles.

Lamina bipinnate. . . . .

12. *H. petiolata*.

Lamina pinnate to very deeply bipinnatifid (or, as to largest pinnæ, bipinnate in no. 11).

Pinnæ subentire to serrate, crenate, or lobed not more than half way to the costa.

Margins lightly and remotely crenate-serrate; pinnæ decurrent. . . . .

13. *H. decurrens*.

Margins deeply crenate, crenate-serrate, or crenately lobed; pinnæ not decurrent.

Veins (excepting those joined to form basal arches) simple; pinnæ deeply crenate.

Major crenations 5 to 7 mm. broad at sinuses, short-apiculate distally; pinnæ 2.5 to 3 cm. broad. . . . .

14. *H. mexicana*.

Major crenations 6 to 12 mm. broad at sinuses, never apiculate; pinnæ 3 to 4.2 cm. broad.

Basal vein of each side joined to opposed basal vein of next crenation by a transverse veinlet, then produced and commonly joining the second vein of its own group; crenations 9 to 12 mm. broad at sinuses. . . . .

15. *H. lucida*.

Basal vein of each side similarly joined to opposed basal vein of adjacent crenation, the veins otherwise all free; crenations mostly 6 to 8 mm. broad at sinuses. . . . .

16. *H. guatemalensis*.

Veins mostly once-forked; pinnæ distinctly lobed one-third to one-half the distance to the costa. . . . .

17. *H. choricarpa*.



Pinnæ cut more than half-way or nearly to the costa.

Segments acuminate, usually very strongly so;  
pinnæ 6 to 26 cm. broad.

Costæ and costules conspicuously paleaceous,  
the scales whitish and numerous. . . . . 18. *H. grandifolia*.

Costæ and costules devoid of scales or, in very  
immature fronds, rarely bearing an  
occasional thin brownish caducous scale. 19. *H. horrida*.

Segments rounded or, if rarely subacute, at least  
never acuminate; pinnæ 2.5 to 5 cm. broad.

Costæ and costules bearing numerous slender  
lax white long-pointed scales. . . . . 20. *H. kohautiana*.

Costæ and costules bearing fewer, larger, and  
broader, subbullate or bullate, brown-  
ish scales. . . . . 21. *H. obtusa*.

**1. *Hemitelia speciosa* (H. & B.) Kaulf. Enum. Fil. 252. 1824.**

*Cyathea speciosa* H. & B.; Willd. Sp. Pl. 5:490. 1810.

*Hemitelia lindeni* Hook. Icon. Pl. pl. 706. 1848.

TYPE LOCALITY: Caripe, Venezuela, Humboldt.

DISTRIBUTION: Known only from Venezuela.

ILLUSTRATION: Hook. loc. cit. pl. 706 (as *H. lindeni*).

This species has been the subject of a great amount of misunderstanding. Kaulfuss was the first to transfer the name to *Hemitelia*; and there is, so far as his diagnosis is concerned, no reason for supposing *Hemitelia speciosa* Kaulf. to be anything more than a change of name for *Cyathea speciosa* H. & B.

Presl, however, in 1836, regarded *H. speciosa* Kaulf. as not only specifically but even generically different from the original *speciosa* of Humboldt and Bonpland. The latter he retained in *Cyathea*, as *Cyathea speciosa* H. & B.; the former he made the type of a new genus *Cnemidaria*, as *Cnemidaria speciosa* (Kaulf.) Presl [*"Hemitelia speciosa* Kaulf. nec Willd."]. In thus determining the identity of *Hemitelia speciosa* Kaulf. he seems to have been guided solely by herbarium material; for, as stated above, Kaulfuss's diagnosis applies well enough to the true *speciosa* H. & B. In fact, Kaulfuss's phrase "*Sori venis simplicibus patentibus apicem versus impositi*" seems almost certainly to apply to the Humboldt and Bonpland plant, rather than to that figured by Presl in figures 16 and 17,<sup>1</sup> as may readily be concluded by comparing these and Hooker's illustration of *H. lindeni* with Kaulfuss's diagnosis.

Kunze appears to have been reluctant to believe Kaulfuss in error, for he points out<sup>2</sup> with what care Kaulfuss was accustomed to compare his material with specimens in the Willdenow herbarium. Following a full discussion of the subject, however, he finally coincided in Presl's opinion, and described a new species, *Hemitelia subincisa*, basing it in part upon "*Hemitelia speciosa*, Kaulf." which Presl had called (as *Cnemidaria speciosa*) a misidentification of the Humboldt and Bonpland species. Further notes on *H. subincisa* will be given hereafter.<sup>3</sup>

The proper identification of *Cyathea speciosa* H. & B. was complicated further by Hooker, who published<sup>4</sup> under the name "*Hemitelia speciosa* Kaulf.," in 1844, an illustration of a wholly distinct (third) species. This, later in the same year, became the foundation of a new species, *Hemitelia integrifolia* Klotzsch,<sup>5</sup> which will be discussed in this paper under that name.<sup>6</sup> Having thus wrongly applied the name *speciosa* to a species other than the original Hooker subsequently (in 1848) redescribed the true *Cyathea speciosa* upon Venezuela plants collected by Linden (no. 663) under the name *Hemitelia lindeni*. His illustration of *H. lindeni* agrees in every particular

<sup>1</sup> Presl, Tent. Pterid. pl. 1. f. 16, 17.

<sup>2</sup> Bot. Zeit. 2:295. 1844.

<sup>3</sup> Page 49.

<sup>4</sup> Sp. Fil. 1: pl. 13 B.

<sup>5</sup> Linnaea 18:539. 1844.

<sup>6</sup> Page 31.



with the type specimens of *Cyathea speciosa* H. & B. in the Willdenow herbarium, as shown by an excellent photograph of these, forwarded by Doctor Urban. This fact, which seems never to have been pointed out, should be kept clearly in mind, as fixing beyond doubt the characters of cutting and venation in true *H. speciosa*.

The present species (under the name *H. lindeni* Hook.) was compared by Hooker with *H. integrifolia* Klotzsch (the "*H. speciosa*" of the species *Filicum*, plate 13 B), from which, writes Hooker, it "will be at once recognized as distinct \* \* \* by the deeply lobed, almost pinnatifid, margins of the pinnae, and by the different appearance of the fructifications," which, he adds, "constitute a broad band, occupying almost one-half of the portion between the margin and the costa"—in distinction to the submarginal line of sori and the crenate-sinuate margins of *H. integrifolia*. It may be noted that these are the very points of distinction enumerated by Klotzsch in criticising Hooker's earlier (1844) erroneous interpretation of *C. speciosa* H. & B. which led him to found the new species *H. integrifolia*.

**2. *Hemitelia integrifolia* Klotzsch, *Linnaea* 18: 539. 1844.**

*Hemitelia speciosa* Hook. Sp. Fil. 1: 28 (in part, excl. syn.) pl. 13 B. 1844, not *H. speciosa* (H. & B.) Kaulf. 1824.

TYPE LOCALITY: Near Caracas, Venezuela, *Otto* 671; *Moritz* 107.

DISTRIBUTION: Northern portions of Colombia and Venezuela.

ILLUSTRATIONS: Hook. *loc. cit.* pl. 13B; Hook. *Exot. Ferns* pl. 66 (both as *H. speciosa*).

Klotzsch in his original diagnosis of this species cites, as representing it, "*Hemitelia speciosa* Hook. Spec. Fil. t. XIII. B. excl. diagn. et syn." and adds: "Ab *Hemitelia speciosa* Hook. nec Kaulf. (*Cyathea speciosa* Humb. Bonpl. Willd. Kth. et Presl) differt: caudice bipedali, nec quadriorgyali, pinnis subintegrifidis, rigidis, nec profunde sinuatis tenuique membranaceis, venulis trifurcatis aut parce ramosis, sosis crebris, marginalibus, nec distantibus." A few years later<sup>1</sup> he called further attention to Hooker's error in applying the species name *speciosa* of Humboldt and Bonpland and pointed out again very carefully the characteristic points of difference, adding in conclusion that, if Hooker did indeed have before him pinnae of one of Humboldt's specimens from Caripe, he had nevertheless apparently drawn his figure from another plant.

At some time during the same year (1844) that Klotzsch published his first description of *H. integrifolia*, Kunze also published<sup>2</sup> upon Hooker's treatment of *Hemitelia*, which had recently appeared in volume 1 of the *Species Filicum*. His conclusions, in so far as they recognize "*Hemitelia speciosa*" of Hooker as the equivalent of *Cyathea speciosa* H. & B., are erroneous; but it should be noted also that Kunze subsequently<sup>3</sup> receded from this position, at least partially, and came later to regard *H. integrifolia* as truly distinct from *H. speciosa* (H. & B.). Mettenius<sup>4</sup> also recognized *H. integrifolia* as distinct and, following his description of it, cited Hooker's plate 13B. Nevertheless, Hooker in the *Synopsis Filicum* (1867) held to his previous erroneous treatment.

**3. *Hemitelia bella* Reichenb. f.; Mett. *Fil. Hort. Lips.* 110. 1856.**

TYPE LOCALITY: Caracas, Venezuela.

DISTRIBUTION: Venezuela.

Doctor Underwood's note on this species is as follows: "The only specimens seen are from material cultivated in the Botanical Garden at Leipzig, of which specimens may be found in the herbaria at New York, Kew, and Berlin, and probably elsewhere."

Excellent material from the same source has been received recently by the U. S. National Museum. Apparently the species is not known from North America.

<sup>1</sup> *Gartenzeit.* 20: 50, 51. 1852.

<sup>2</sup> *Bot. Zeit.* 2: 294-298. 1844.

<sup>3</sup> *Linnaea* 23: 310. 1850.

<sup>4</sup> *Fil. Hort. Lips.* 110. 1856.



**4. *Hemitelia contigua* (Underw.) Maxon, sp. nov.**

PLATE 18.

*Cnemidaria contigua* Underw. MS.

"Caudex ascending, then erect, 80 cm. long;" fronds 1.4 meters long, few; stipe slender, 20 cm. long, brown, very narrowly but deeply sulcate at either side of the upper surface, scantily and minutely puberulous, and bearing scattered brown ovate-lanceolate scales, the rachis similar and with a shallow dorsal groove; lamina about 120 cm. long, oblong-lanceolate from a rather abruptly narrowed base (5 cm. broad), 30 to 38 cm. broad near the middle, the apex acuminate; pinnæ opposite, about 37 pairs, subsessile (the short stout stalks 1 to 2 mm. long, often narrowly alate, especially at the upper side), the lowermost pair oblong, 2 to 2.5 cm. long, the next pair 6 cm. distant, 5 cm. long, linear-oblong, deeply crenate, those above rather abruptly larger, closer, and crenately lobed; middle pinnæ approximate or contiguous, 15 to 19 cm. long, 2.5 to 3.2 cm. broad, linear-oblong from an obliquely truncate slightly inequilateral base, pinnately cut about halfway to the costa, the apex gradually tapering, long-acuminate, the costæ elevated on both surfaces, broader below and bearing a few large membranous bright brown scales at the sides; lobes about 20 to 24 pairs, deltoid-oblong, 7 to 8 mm. broad at the broadly triangular sinuses, 7 to 10 mm. long, slightly falcate toward the rounded apex, entire or nearly so, the costules evident, bearing an occasional thin scale below; veins 9 or 10 pairs, free, prominent below, simple, or those of the proximal sides sometimes once-forked, the branches each soriferous; sori large, the uppermost ones near the costule, those below medial, the lower ones distinctly supra-medial, the series thus broadly  $\Lambda$ -shaped, the sori of the lobe proper equidistant from the margin; indusia pale brown; leaf tissue membranous, paler and decidedly lustrous below.

Type in the Underwood Fern Herbarium, New York Botanical Garden, collected in wet forest in mountains 5 miles south of Cartago, Costa Rica, altitude about 1,800 meters, May 12, 1906, by William R. Maxon (no. 523). This specimen consists of two sheets, comprising the lamina complete and a portion of the stipe.

Related to *H. chiricana*, from which it departs widely in its simpler venation, shorter and triangular-oblong lobes, darker scales, and especially in its greatly reduced lower pinnæ. The species is known only from the type collection.

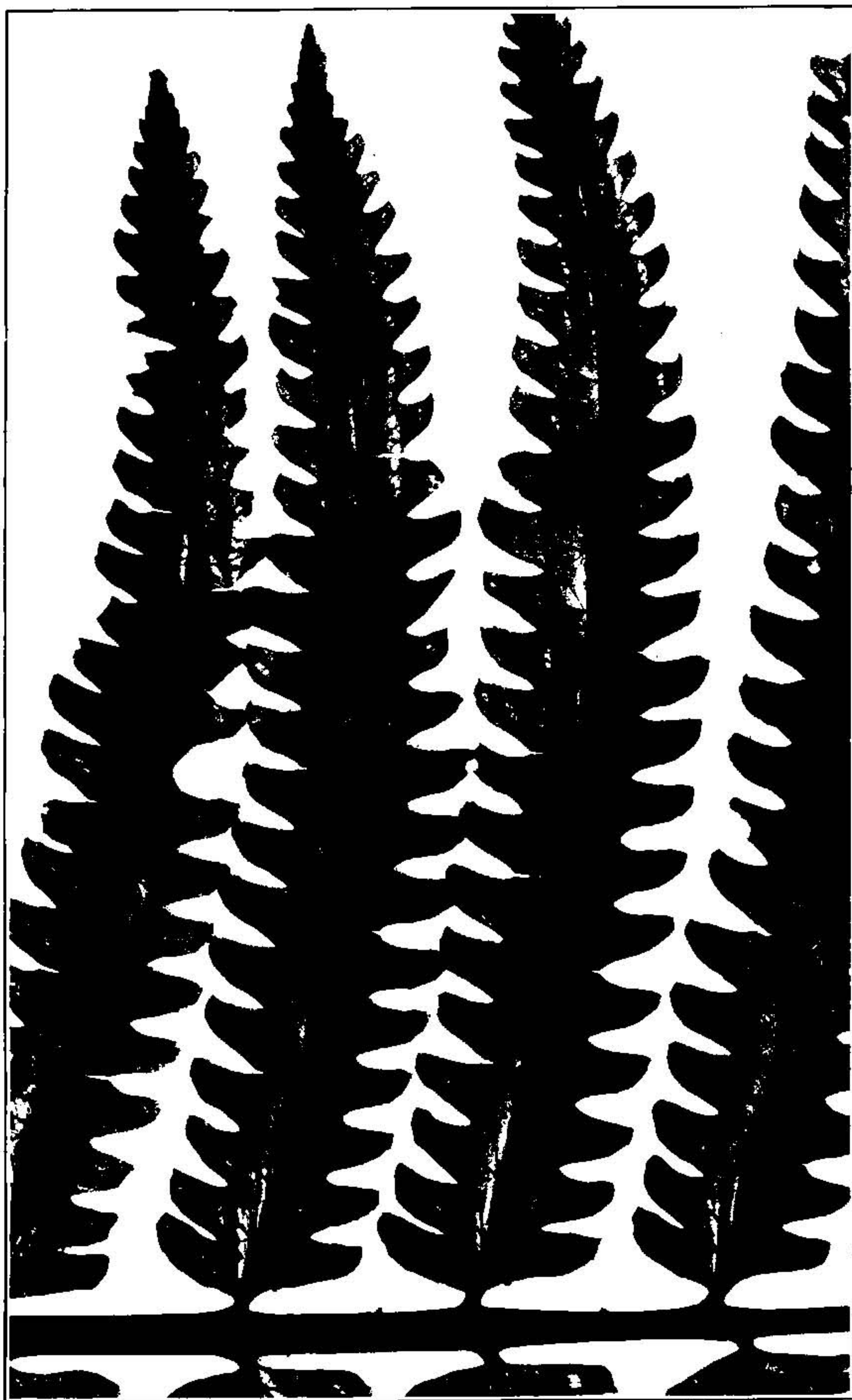
EXPLANATION OF PLATE 18.—Middle pinnæ of type specimen, *Maxon 523*. Natural size.

**5. *Hemitelia pittieri* Maxon, sp. nov.**

PLATE 19, a.

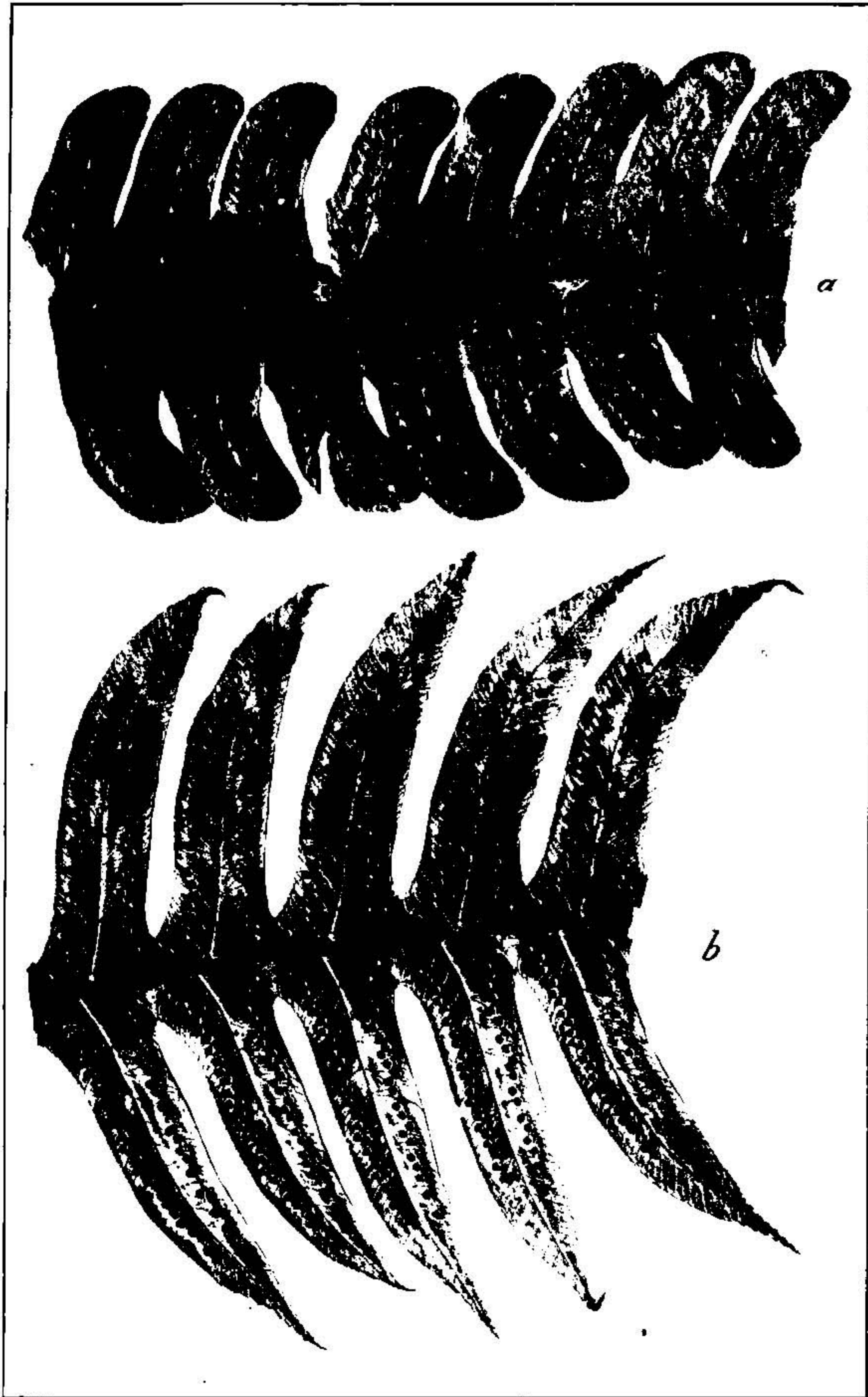
Caudex and stipe unknown; lamina apparently 1.5 meters long or more, 60 to 70 cm. broad, abruptly acuminate; rachis stoutish, stramineous, distantly muricate, canaliculate ventrally, closely and deciduously yellowish-furfuraceous and bearing an occasional dark-centered ovate scale with wide whitish erose-fimbriate margins; pinnæ ample, nearly alternate, inserted about 7 cm. apart on each side, oblong-linear, 30 to 35 cm. long, 4 to 5.5 cm. broad, spreading, sessile, not narrowed at the base, obliquely truncate at the upper side, rounded or subcordate at the lower, in the lower and middle part pinnatifid two-thirds the distance to the costa, the costal wing thus 8 to 10 mm. broad from sinus to costa, gradually broader toward the apex, the pinna there pinnatifid more than halfway to the costa except at the relatively short and deeply serrate acuminate apex; costæ elevated, lightly canaliculate and glabrous above, glabrescent below; segments about 21 to 25 pairs, oblong, 10 to 12 mm. broad at the sinuses, falcate, close, parallel, the sinuses acute, linear, 1 to 2 (or rarely 3) mm. broad, the margins sub-revolute, subentire or at the rounded apex obscurely crenate-dentate, the costules elevated, slender, strongly arcuate toward the apex, yellowish and glabrous above, glabrate below; veins almost invariably free, slender, elevated, 10 to 14 pairs, mostly once-forked near the base, the branches divergent, mostly soriferous near their middle; sori large, approximate, extending in an unbroken medial line from near the apex downward to a point on the costal wing much nearer to the costa than to the sinus, there meeting the sori of the adjoining segment and forming one end of a nearly perfect ellipse; indusium ample, membranous, semicircular in outline, commonly bilobed, the lobes





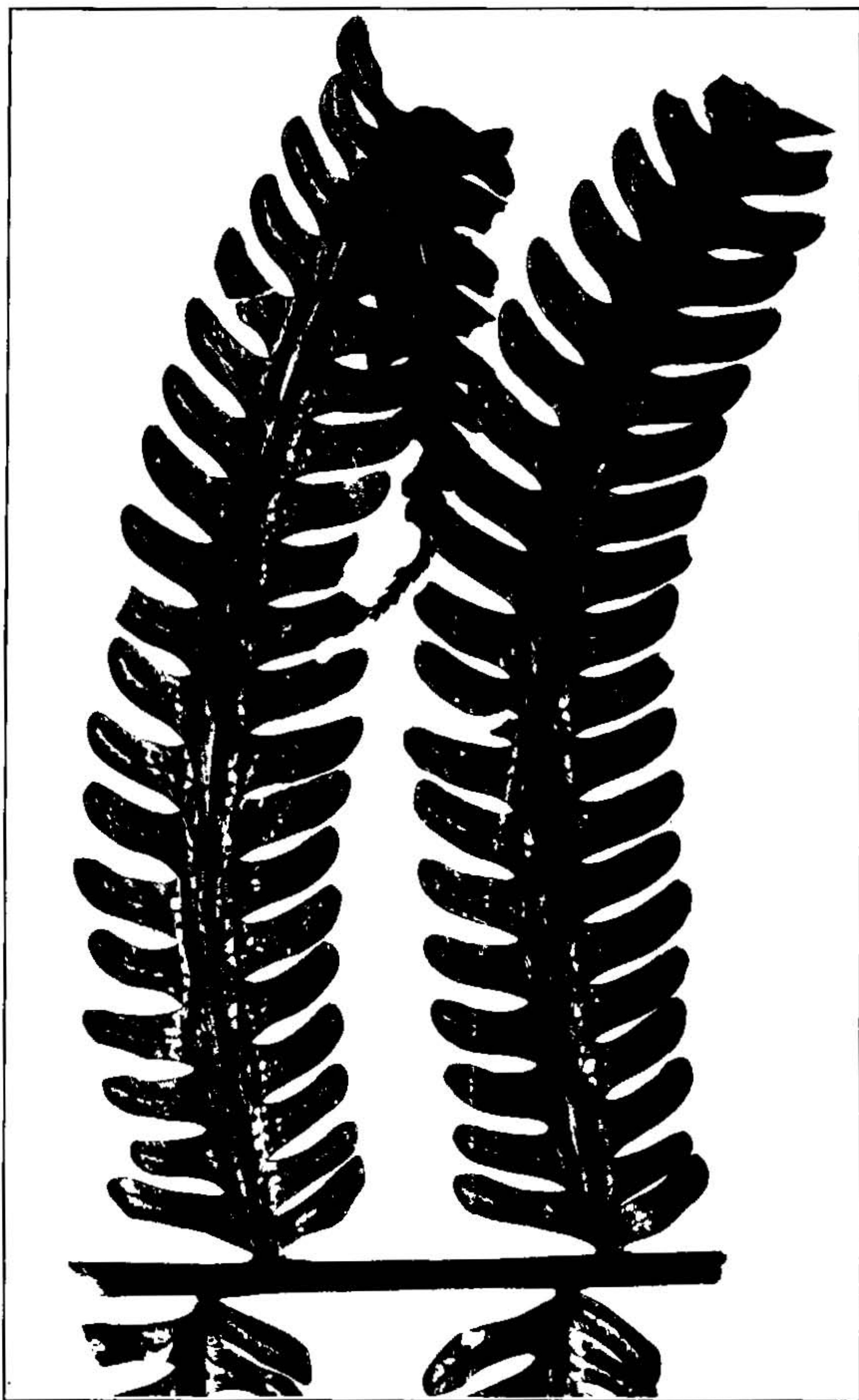
HEMITELIA CONTIGUA (UNDERW.) MAXON.





HEMITELIA PITTIERI MAXON AND H. SUBGLABRA (UNDERW.) MAXON.





HEMITELIA CHIRICANA MAXON.



spreading, papilionaceous; receptacle cylindric-globose, minutely squamulose-setose; leaf tissue membrano-herbaceous, dark green and somewhat lustrous above, much paler below.

Type in the U. S. National Herbarium, no. 830314, collected at Cañas Gordas, Valle de Agua Buena, Costa Rica, altitude 1,100 meters, February, 1897, by H. Pittier (no. 10969). Known only from this collection.

Not very closely related to any other of the free-veined species of this group, the shape and curvature of the segments being distinctive.

EXPLANATION OF PLATE 19.—Middle sections of typical pinnæ of the type specimens (a) of *Hemitelia pittieri*; (b) of *H. subglabra*. Both natural size.

### 6. *Hemitelia chiricana* Maxon, sp. nov.

PLATE 20.

Caudex slender, erect, about 20 cm. high, 2.5 to 3 cm. in diameter, radicose below, above sheathed with old fibrous stipe bases, paleaceous at the crown, the scales very firm, ovate-lanceolate, acuminate, about 8 mm. long, dark glossy brown (or with whitish margins), those of the lower stipe much thinner, yellowish brown or light brown, deltoid-ovate, subfalcate, more or less fimbriate; fronds 1 to 1.7 meters long; stipe relatively stout, 5 to 8 mm. in diameter, 20 to 35 cm. long, dull dark brownish, minutely tuberculate near the base, closely invested with a thin harsh subpersistent covering of light crispate hairs; lamina elliptic-oblong, abruptly acuminate, 80 to 145 cm. long, 35 to 45 cm. broad near the middle, 15 to 20 cm. broad at the base, deeply bipinnatifid, the rachis closely crispate-tomentulose; pinnæ 20 to 25 pairs, subopposite or (toward the apex) alternate, inserted 4 to 7 cm. apart on each side, oblong-lanceolate, the middle ones 18 to 25 cm. long, 3.2 to 3.8 cm. broad, straight or commonly decurved, usually not narrowed at the unequally truncate or slightly semicordate base, deeply pinnatifid to within 3 or 4 mm. of the costa in the basal part, a little less deeply outward, the costal wing 4 to 5 mm. broad on each side below the long-acuminate apex; basal pinnæ shorter and relatively broader, strongly deflexed, 10 to 13 cm. long; costæ strongly elevated on both sides, above canaliculate and glabrous, below much stouter, at first closely and scantily yellowish-pubescent and with a few deciduous broad flaccid whitish fimbriate scales at the sides; segments of the middle pinnæ about 25 pairs, oblong or (in fully fertile fronds) narrowly deltoid-oblong, obtuse, 7 to 9 mm. broad at the base, 5 to 7 mm. broad at the middle, falcate toward the apex, distinctly separated by rather narrow acute sinuses, or in partially fertile specimens much closer; margins slightly revolute, distantly serrulate (or appearing subentire) except at the lightly serrate-crenate apices; costules clothed below like the costæ, or the few scales at once caducous; veins free, evident, glabrous above, minutely furfuraceous below, 10 to 13 pairs, oblique, mostly once-forked nearer the costule than the margin, or the lower ones forked medially, the branches all rather close, oblique, not widely divergent; sori borne usually at the fork of the veins, or at the base of the anterior branch, or (in the case of the basal veins) upon each branch, mostly apart, the lower ones medial, those above closer to the costule, the ones at the apex nearly basal, thus forming a  $\Lambda$ -shaped line; indusium firmly membranous, dark brown, semicircular, entire to obtusely lobed; receptacle globose-capitate, closely setiferous; leaf tissue firmly herbaceous, very dark green above, conspicuously lighter below.

Type in the U. S. National Herbarium, nos. 675908–675910, comprising a frond and part of the rhizome of a plant collected in humid forest between the Alto de las Palmas and the top of the Cerro de la Horqueta, Chiriqui, Panama, altitude 2,100 to 2,268 meters, March 18, 1911, by William R. Maxon (no. 5519). Known only from the type locality, other specimens being *Maxon* 5521, with identical data.

This species stands about midway between *H. pittieri* and *H. contigua*. It may be separated readily from the former by the characters noted in the key. It is contrasted with *H. contigua* under the discussion of that species.

EXPLANATION OF PLATE 20.—Middle pinnæ of the type specimen, *Maxon* 5519. Natural size.



7. *Hemitelia arachnoidea* (Underw.) Maxon, sp. nov.PLATE 21, *a, b*.*Cnemidaria arachnoidea* Underw. MS.

Caudex not noted; fronds 2 to 3 meters long, spreading; stipes stout, about 85 cm. long, brownish green from a light castaneous base, armed with scattered stout conical introrse spines 2 to 3 mm. long, eventually tuberculate, and bearing occasional lightish scarious lanceolate scales (these dark-centered at their base), otherwise closely covered with a thin subpersistent whitish-arachnoid tomentum; rachis greenish, muricate, arachnoid-tomentulose; middle pinnae subopposite, spreading, spaced their own width or more (10 to 12 cm. apart at point of insertion), ligulate-lanceolate, 40 to 50 cm. long, 5 to 6.5 cm. broad, sessile, slightly falcate, at the middle and base pinnatifid nearly to the costa, gradually less deeply so below the acuminate crenate-serrulate apex; basal pinnae smaller, about 20 cm. long, 3 cm. broad, strongly deflexed; segments of middle pinnae about 30 pairs, linear-oblong, 2.5 to 3.5 cm. long, 10 to 12 mm. broad at the slightly dilatate base, a little narrower toward the rounded apex, the basal pair one-half the size of the second (or even vestigial), joined to them by a narrow costal wing about 1.5 mm. broad, this gradually broader outward, 4 to 5 mm. broad upon each side of the costa at the middle of the pinna; all the segments separated by narrow acutish sinuses; margins slightly revolute, subentire or obscurely crenulate; costae stout, elevated, stramineous, glabrous above, below minutely whitish arachnoid tomentulose and deciduously paleaceous, the scales flaccid, lanceolate to oblong-ovate 4 to 7 mm. long, minutely erose, dirty white, dark-centered at the base; costules prominent, yellowish and glabrous above, whitish-tomentulose below, the veins similar; veins free, oblique, about 14 to 17 pairs to the segment, the lower ones arcuate, these and the middle ones forked at the base, the branches divergent, distant, both usually soriferous midway to the margin, or often the anterior branch divaricately forked, with one or both divisions immediately soriferous; sori large, contiguous, forming a straight or slightly irregular heavy medial line nearly to the apex of the segment; indusia ample, 2 or 3 lobed; receptacle cylindrical-capitate, squamulose-pilose; leaf tissue rigidly herbaceous, lustrous upon both surfaces, dark green above, yellowish-green below.

Type in the U. S. National Herbarium, nos. 575819 and 575820, collected on wet slopes in partial shade, vicinity of La Palma, Costa Rica, altitude 1,450 to 1,550 meters, May 6 to 8, 1906, by William R. Maxon (no. 453).

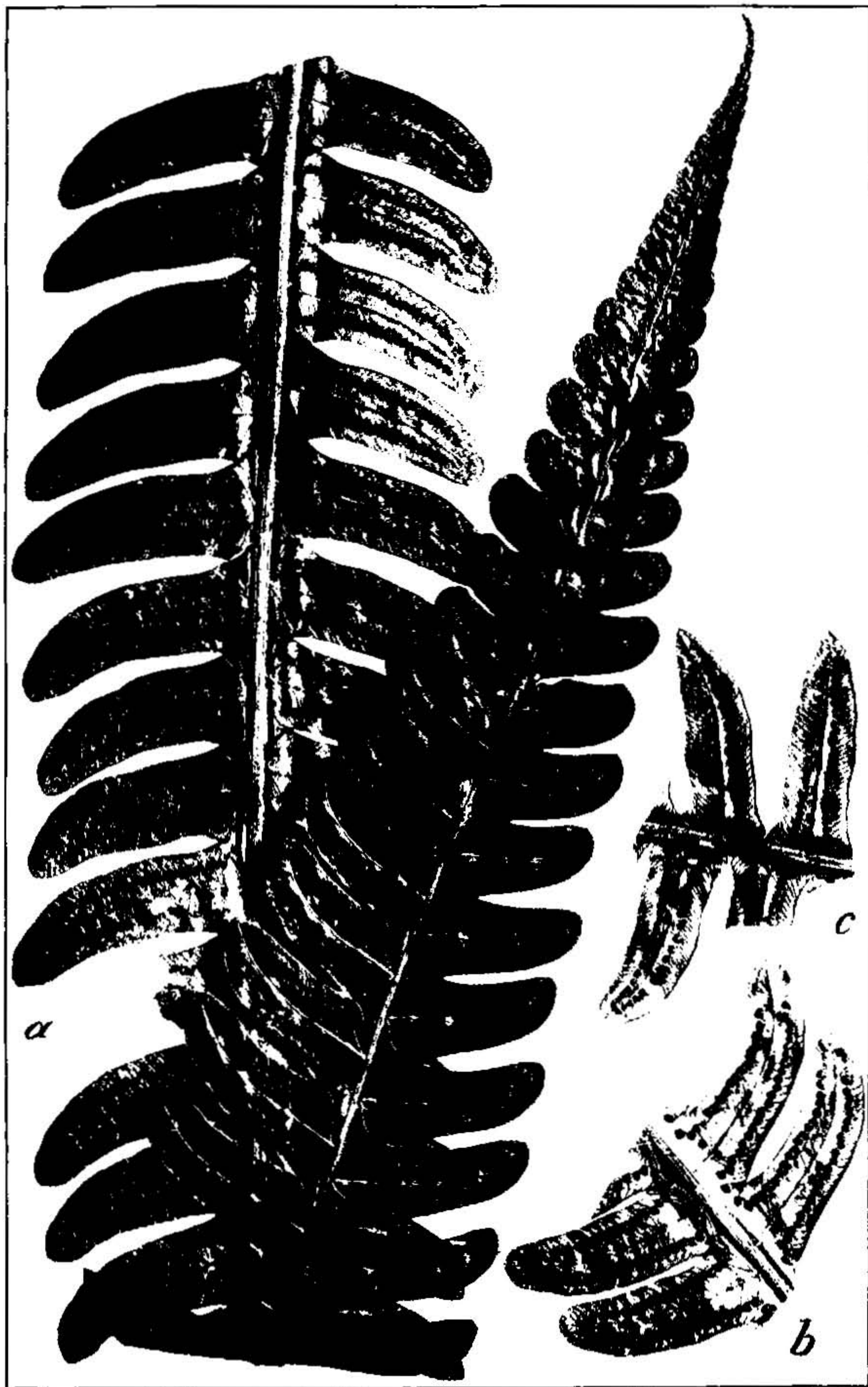
Allied to *H. mutica*, from which it differs in dimensions and in the characters enumerated in the key. Known only from the type collection.

EXPLANATION OF PLATE 21.—*a, b*, Portions of characteristic middle pinnae of the type specimen of *H. arachnoidea*; *c*, fragment from type of *H. mutica*, furnished by Doctor Christ. All natural size.

8. *Hemitelia mutica* Christ, Bull. Soc. Bot. Genève II. 1: 233. 1909. PLATE 21, *c*.

Rhizome "arborescent" but presumably very short; stipe stout, about 45 cm. long, yellowish brown, bearing numerous short spines, these dilatate at the base, and a few ovate scales up to 4 mm. long, these with shining blackish brown rounded centers and delicate whitish fimbriate margins; lamina deltoid-oblong, about 1 meter long and 60 cm. broad, very deeply bipinnatifid, the rachis clothed with flaccid grayish appressed scales; pinnae spreading, about 15 pairs, the lower ones petiolulate, the middle ones sessile, those above broadly adnate and crenately lobed, the uppermost decurrent, crenate or subentire; characteristic lower or middle pinnae lanceolate-ligulate from a slightly narrower base, about 30 cm. long, 4.5 to 6 cm. broad, nearly straight, close, at the base and middle pinnatifid to within 2 or 3 mm. of the costa, beyond this the costal wing gradually broader, about 4 mm. broad on each side below the acuminate-caudate serrate apex; costae lightly sulcate and glabrous above, below very stout, yellowish brown, sparingly muricate, canaliculate, at the base deciduously paleaceous like the rachis, also lightly yellowish araneose-furfuraceous; segments 27 to 30 pairs, elongate-oblong, mostly falcate, 2 to 3 cm. long, 9 to 11 mm. broad at the





HEMITELIA ARACHNOIDEA (UNDERW.) MAXON AND H. MUTICA CHRIST.



dentally or perhaps subsequently, either by him or by Mr. Baker; and that Jürgensen's 873 must stand as the actual type of the species. Baker in the *Flora Brasiliensis*<sup>1</sup> later modified the description and cited Brazilian specimens (*Burchell* 2527 and *Glaziou* 2420) in addition to the Mexican plant. The writer has not seen the Burchell plant; but *Glaziou* 2420, of which the National Herbarium has a fragmentary specimen, is much larger than the Mexican plant and represents a species of no particularly close alliance to it. Unless the Burchell specimen is of the same species as the Mexican which is exceedingly unlikely), the range of *H. apiculata* must include at present only Mexico, where, as it appears, the species has not been re-collected since Jürgensen's time.

In several respects *H. apiculata* is unique, but especially in its pungent segments and in the position of the sori, the last a character which may be observed very well in plate 22.

EXPLANATION OF PLATE 22.—Type specimen, *Jürgensen* 873, in herb. Kew. At about two-thirds natural size.

10. *Hemitelia subglabra* (Underw.) Maxon, sp. nov.

PLATE 19, b.

*Cnemidaria subglabra* Underw. MS.

Caudex unknown; frond 2 to 3 meters long; stipes rather stout, 60 cm. or more long, olivaceous to pale brownish, scantily short-aculeolate, eventually tuberculate, very sparingly paleaceous, the scales with black centers and whitish erose margins; rachis similar, muricate toward the base, more or less deeply sulcate on all sides, scantily and deciduously paleaceous; pinnæ ample, subopposite, inserted 8 to 12 cm. apart on each side, oblong-lanceolate, 30 to 35 cm. long, 7 to 10 cm. broad, divergent, sessile or short-petiolate, slightly narrowed at the rounded inequilateral base, deeply and subequally pinnatifid to within 3 mm. of the costa in the basal part, the costal wing gradually broader outward, 5 to 6 mm. wide on each side below the acute or short-acuminate apex; costæ elevated on both surfaces, stout, glabrous and yellowish above, below closely invested with a minute whitish-arachnoid covering, soon glabrescent, toward the base bearing a few deciduous broad whitish darker centered coarsely erose flaccid scales; basal pinnæ shorter and narrower, about 20 cm. long, strongly deflexed, the segments more or less unequal; segments of middle pinnæ about 20 to 23 pairs, linear-oblong, long-acuminate, 12 to 15 mm. broad at the slightly dilatate base, 8 to 12 mm. broad at the middle, falcate toward the apex, separated by rather narrow acutish sinuses, the segments 3 to 6 mm. apart at their middle; margins plane or slightly revolute, subentire to lightly undulate-serrate, only the subcaudate apices conspicuously crenate-serrate; costules prominent, similar to the costæ, not paleaceous below; veins free, prominent, glabrous above, nearly so below, about 16 pairs below the apex of the segment, the lowermost one to three times forked (the basal branch strongly arcuate, extending to the sinus, soriferous about midway between the costa and sinus), those above mostly twice-forked near the base, oblique, the branches divergent, relatively distant, mostly soriferous (the middle one beyond the others), the large sori thus borne in an irregular nearly medial line falling short of the apex of the segment by 1 to 2 cm., the individual sori approximate but usually not continuous; indusium membranous, semicircular, ample, 2 or 3-parted, the lobes large, bullate, with irregular margins; receptacle globose-capitate, squamulose-pilose; leaf tissue as in *H. arachnoidea*.

Type in the U. S. National Herbarium, no. 575817, collected on a wet slope, in partial shade, vicinity of La Palma, Costa Rica, altitude 1,450 to 1,550 meters, May 6 to 8, 1906, by William R. Maxon (no. 451).

Known only from the interior mountain region of Costa Rica, at elevations of from 1,135 to 1,550 meters, but apparently common. The following additional specimens are in the National Herbarium:

COSTA RICA: Same data of locality as the type, *Maxon* 382. Forests of Juan Viñas, *Pittier* 1837. La Palma, *Tonduz* 12532; *Brade* 102.

<sup>1</sup> Baker in Mart. Fl. Bras. 1<sup>2</sup>: 312. 1870.





HEMITELIA APICULATA HOOK.



sinus, rather close, separated by narrow acute or acutish sinuses, the margins minutely revolute, subentire or toward the subobtuse or obtuse apices minutely but distinctly crenulate-serrate; costules elevated, glabrous above, below stouter and decidedly grayish to brownish furfuraceo-paleaceous at the base; veins free, 19 to 23 pairs to the segment, once-forked or one of the branches again forked, in the case of the lower veins the first fork close to the costule, the branches soriferous about halfway to the sinus; most of the veins forked about 1 mm. from the costule, the branches strongly elevated, very close, oblique, glabrous above, nearly so below, mostly soriferous at or just above the base; sori large, numerous, about 25 to 35 on each side of the costule, closely crowded, forming a dense usually uniserrate line much nearer to the costule than to the margin; indusium membranous, yellowish brown, semicircular, irregularly lobate-saccate, erose; receptacle globose, setiferous; leaf tissue herbaceous, dark green and sublustrous above, yellowish green and paler below.

*Hemitelia mutica*, which appears to be confined to Costa Rica, was founded by Christ upon several specimens, the first cited being from Turrialba, altitude 850 meters, collected by Wercklé. This, which is here figured from fragmentary specimens courteously forwarded by Doctor Christ, may stand as the type. The relationship is with *H. arachnoidea*.

EXPLANATION OF PLATE 21.—See p. 34.

9. *Hemitelia apiculata* Hook. in Hook. & Baker, Syn. Fil. 29. 1868. PLATE 22.

Rhizome, stipe, and length of lamina unknown; lamina 35 to 50 cm. broad, the pinnæ inserted 4 to 5 cm. apart, slightly ascending, opposite, sessile, narrowly oblong-lanceolate, not narrowed at the base, 18 to 30 cm. long, 2.5 to 4.5 cm. broad below the gradually long-acuminate apex, pinnatifid throughout from two-thirds to nearly four-fifths the distance to the costa, the costa stout, stramineous, prominent on both surfaces, glabrous above, essentially so below; segments 30 pairs or more, close, separated by very acute linear sinuses, slightly oblique, elongate-oblong, 7 to 9 mm. broad, distinctly but lightly falcate in the outer half, the apices acuminate and sharply aristate, the margins everywhere lightly revolute, distantly subserrulate, the yellowish costules glabrous and distinctly elevated upon both surfaces; inferior basal segments sometimes broader and coarsely incised upon the proximal margin; veins free, 12 to 14 pairs, oblique, distinct, elevated, glabrous, almost invariably once-forked near the base (or rarely again forked), each branch soriferous about two-thirds or three-fourths the distance to the margin or beyond, the sori forming a single line; sori rather small, apart; indusium small, narrow or broadly ovate, simple, cucullate, yellowish brown; receptacle cylindric-globose, short, setiferous; leaf tissue herbaceous, scarcely lustrous, much paler below.

TYPE LOCALITY: Mexico (Sierra San Pedro Nolasco, Talea, etc.), 1843-44, *C. Jürgensen* 873.

DISTRIBUTION: Apparently confined to Mexico; ascribed to Brazil in error.

Hooker's remark, following his description of this species in the Synopsis Filicum, is as follows: "Hab. Mexico and Brazil.—My specimen of 5 pairs of pinnæ, partially fertile, has very much the appearance of *H. (Euhemitelia) grandifolia*; but the lobes are submucronate and pungent at the apex, and the veins are everywhere quite free." The Mexican plant here referred to is Jürgensen's 873 (sometimes written 273), and plate 22 is from a photograph of Hooker's "specimen of 5 pinnæ," which is now in the Kew Herbarium. Doctor Underwood states (in MS.) that he was unable to find any Brazilian material under this name at Kew, but a memorandum from the Director of the Royal Gardens, dated January 1, 1910, contains the statement that "the species is represented at Kew by the following specimens only—Mexico, *Jürgensen* 273; Brazil *Burchell* 2527, *Glaziou* 2420."

From the foregoing it will be evident that Hooker's description was drawn with especial reference to Jürgensen's 873; that the Brazilian reference was included inci-



dentally or perhaps subsequently, either by him or by Mr. Baker; and that Jürgensen's 873 must stand as the actual type of the species. Baker in the *Flora Brasiliensis*<sup>1</sup> later modified the description and cited Brazilian specimens (*Burchell* 2527 and *Glaziou* 2420) in addition to the Mexican plant. The writer has not seen the Burchell plant; but *Glaziou* 2420, of which the National Herbarium has a fragmentary specimen, is much larger than the Mexican plant and represents a species of no particularly close alliance to it. Unless the Burchell specimen is of the same species as the Mexican which is exceedingly unlikely), the range of *H. apiculata* must include at present only Mexico, where, as it appears, the species has not been re-collected since Jürgensen's time.

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PLATE 19, b.

*Cnemidaria subglabra* Underw. MS.

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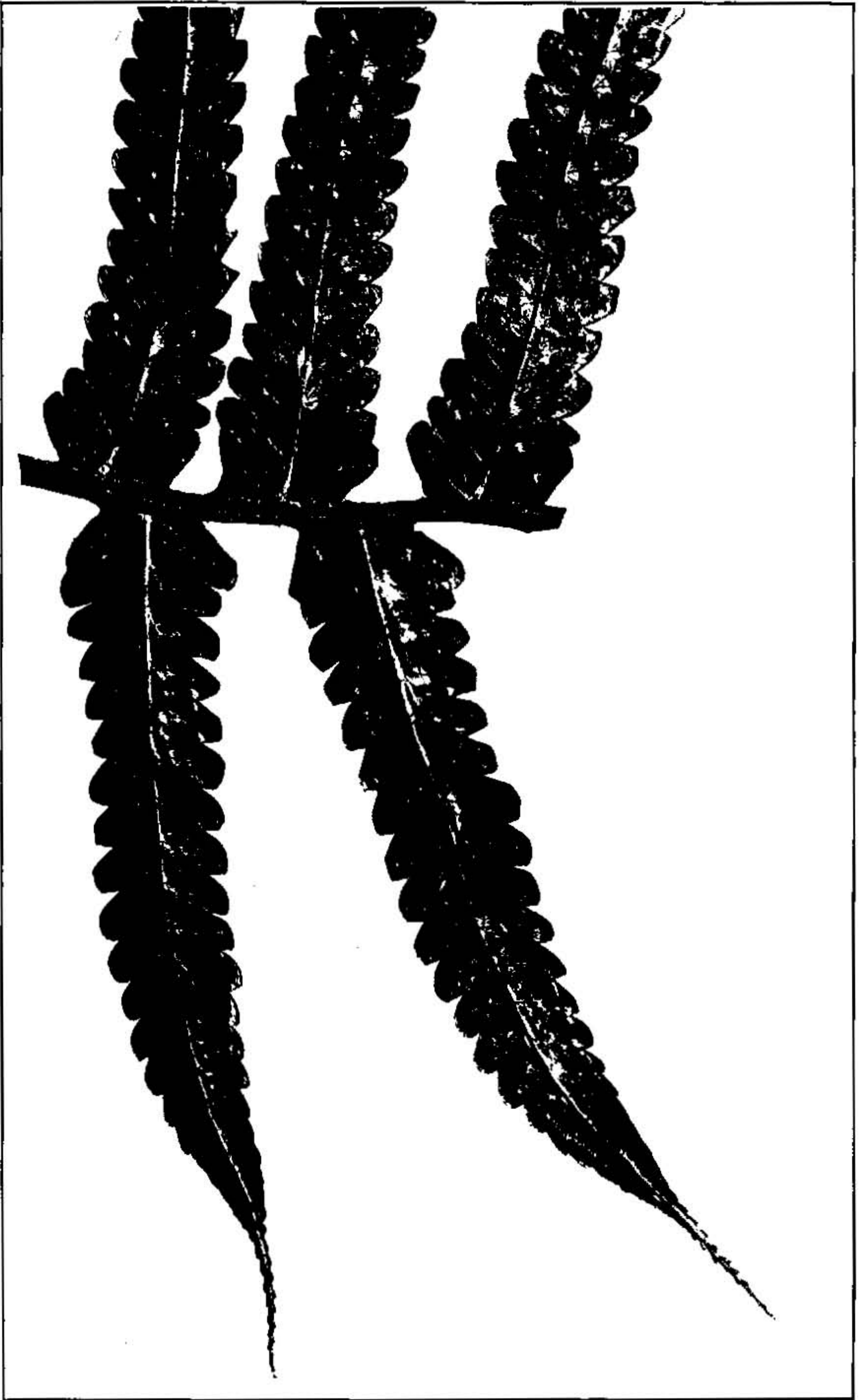
Type in the U. S. National Herbarium, no. 575817, collected on a wet slope, in partial shade, vicinity of La Palma, Costa Rica, altitude 1,450 to 1,550 meters, May 6 to 8, 1906, by William R. Maxon (no. 451).

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COSTA RICA: Same data of locality as the type, *Maxon* 382. Forests of Juan Viñas, *Pittier* 1837. La Palma, *Tonduz* 12532; *Brade* 102.

<sup>1</sup> Baker in Mart. Fl. Bras. 1<sup>2</sup>: 312. 1870.





HEMITELIA GRANDIS MAXON.



Superficially *H. subglabra* bears a certain resemblance to *H. horrida* of the West Indies, which, however, is not free-veined; hence Mr. Pittier's 1837 was so determined by Bommer. But there is no apparent reason for the previous determination of Tonduz' 12532 as *H. apiculata*, except that the species of this group as a whole have been greatly neglected and the few names applied very loosely. Brade's 102 bears the name *Hemitelia grandifolia* in Doctor Christ's hand. The species is apparently very distinct from other members of the genus and finds its nearest ally in *H. grandis*, from which it may be distinguished by the key characters.

EXPLANATION OF PLATE 19.—See p. 33.

11. *Hemitelia grandis* Maxon, sp. nov.

PLATE 23.

Caudex aborescent, ascending, about 75 cm. long; fronds wide-spreading, about 3 meters long; stipe stout, olivaceous to pale brown, freely short-aculeate on the convex lower side, sulcate above and bearing numerous lanceolate long-acuminate scales, 1.5 to 2 cm. long, with shining dark brown centers and whitish scarious margins; lamina very ample, 120 to 140 cm. broad at the middle, very deeply bipinnatifid or (as to the largest pinnæ) fully bipinnate, the rachis very stout, short-aculeolate, muricate upward or smoothish, deciduously and closely whitish-araneose, sparingly paleaceous; pinnæ sessile, mostly alternate, lanceolate, the larger middle ones 75 cm. long, 20 to 22 cm. broad from the middle nearly to the rounded slightly narrower base, in the basal third cut to the costa and upward nearly to the costa, the costal wing 1 to 2 mm. broad on each side at the middle of the pinna, 3 to 5 mm. broad on each side below the crenately lobed or ultimately crenate-serrate acuminate apex, the costa sulcate and glabrous above, below stout (2.5 to 3 mm. broad), convex, yellowish brown, smoothish, minutely and closely whitish-araneose and deciduously paleaceous toward the base, the scales ample, ovate, flaccid, dirty white, with darker bases; segments (or pinnules) of the larger pinnæ about 28 pairs, alternate, deltoid-lanceolate, falcate, the larger ones 10 to 11 cm. long, 2 to 2.3 cm. broad just above the obtusely cuneate adnate base, about 18 mm. broad at the middle (the inferior basal one about 6 cm. long), the sixth to the tenth pairs lightly decurrent, beyond this connected by a conspicuous costal wing; all but the uppermost pinnules deeply crenate or crenately lobed (the lobes or crenations about 4.5 to 6 mm. broad, mostly shorter than broad), gradually serrate-crenate toward the linear-caudate apex, the costules glabrous above, below whitish-araneose, glabrescent; veins all free, about 20 pairs, divergent, slightly elevated, glabrescent, with about 4 to 8 pairs of very oblique, mostly simple pinnately arranged branches, these appressed-setulose below and soriferous below their middle (or the upper ones soriferous close to the vein), the rather large sori thus borne in distinct but contiguous rounded-angular groups (comprising 4 to 8 pairs of sori each) in a nearly medial zone between the costule and the crenate margins; indusia very ample, membranous, 2 or 3-lobate, the lobes irregularly erose, spreading with age and shallow; receptacle elongate-capitate, setiferous; leaf tissue rigidly herbaceous, very dark green and lustrous above, sublustrous and much paler below.

Type in the U. S. National Herbarium, nos. 575746 and 575747 (comprising a large middle pinna in two sections), collected in a humid forest ravine, vicinity of Coliblanco, lower slopes of the volcano Turrialba, Costa Rica, altitude about 1,950 meters, April 30, 1906, by William R. Maxon (no. 307).

To be compared only with *H. subglabra*, from which it differs for the most part in those characters which would naturally be correlated with its much greater size. The pinnate arrangement of the ultimate veins is a noteworthy character. Additional Costa Rican specimens (without definite locality), collected by Wercklé, have been received from Doctor Christ under the names *H. horrida* and *H. apiculata*. The species was collected in Costa Rica also by J. J. Cooper and determined by Baker as *H. horrida*.

EXPLANATION OF PLATE 23.—Section from lower third of a large pinna of the type specimen. Natural size.



**12. *Hemitelia petiolata* Hook. Sp. Fil. 1: 31. 1844.**

TYPE LOCALITY: Isthmus of Panama, *Sinclair*.

DISTRIBUTION: Republic of Panama (several collectors); reported<sup>1</sup> also from the island of Gorgona, Colombia.

ILLUSTRATIONS: Hook. loc. cit. *pl.* 16.

Hooker's short description is supplemented by so excellent a plate that there is no need of here redescribing the species, particularly since it is not very closely allied to any other. The species was observed by the writer at several localities in the lowlands of the Isthmus of Panama and is probably an abundant species there. The following specimens are in the U. S. National Herbarium.

PANAMA: Near Bismark, *R. S. Williams* 512. Without definite locality, *Hayes* 7. Chagres, *Fendler* 417. Hilly forest around the Agua Clara Reservoir, near Gatun, Canal Zone, altitude 20 to 30 meters, *Maxon* 4645. Valley of the Masambi, on the road to Las Cascadas Plantation, Canal Zone, altitude 20 to 100 meters, *Maxon* 4684. Forest near Porto Bello, Province of Colon, altitude 5 to 200 meters, *Maxon* 5769.

**13. *Hemitelia decurrens* Liebm. Vid. Selsk. Skr. V. 1: 285. 1849.**

*Hemistegia decurrens* Fourn. Mex. Pl. 1: 135. 1872.

Caudex 30 cm. high, or less; fronds 1 meter or more long; stipe about 30 cm. long, armed with short spines toward the base, above (together with the rachis) arachnoid-pubescent, compressed, sulcate ventrally, narrowly membranaceo-alate laterally, with slender scattered whitish falcate scales, or those toward the base of the stipe broader, more rigid, and brownish margined; lamina ovate-lanceolate, about 75 cm. long, 20 to 23 cm. broad, simply pinnate; pinnæ about 20 pairs or fewer, subopposite or alternate, narrowly oblong-lanceolate, 12 to 15 cm. long, 2.5 to 3 cm. broad, straight or slightly falcate, the uppermost fully adnate and confluent, those below ascending, unequally cuneate, constricted, semiadnate and obliquely cuneate at the upper side, obtusely and abruptly constricted below and long-decurrent, a narrow decreasing foliaceous wing (1 to 4 mm. broad) extending downward upon each side of the rachis (above) to the pinna next below; characteristic middle pinna sessile, spreading, unequally and obtusely cuneate, the short petiolule distinctly foliaceo-marginate, the decurrent wing about 2 mm. broad at origin, narrowed downward; costæ elevated, yellowish, sparingly clothed toward the base below with whitish membranous, rounded or ovate, erose scales; margins remotely and lightly crenate-serrate, the teeth at the middle of the pinnæ about 6 to 8 mm. broad and 1 mm. long; main veins about 25 pairs or fewer, oblique, 5 to 9 mm. apart, elevated below, slender, with about 4 pairs of similar veinlets, the basal ones of adjacent groups joined by an obliquely transverse veinlet (forming a narrowly pentagonal elongate costal areole, cuneate proximally, much broader distally), then excurrent toward the margin, one or both extending to the minute sinus; other veinlets very oblique, nearly parallel, excurrent to the margin; sori few, occupying a slightly inframedial zone between the costa and the margin, in the partially infertile specimen at hand confined to the basal veinlets (above the areole and distant about 2 mm. from it) and the second pair of veinlets; indusium proximal, whitish, lobate, erose; leaf tissue rigidly membrano-herbaceous, lustrous above, pale below.

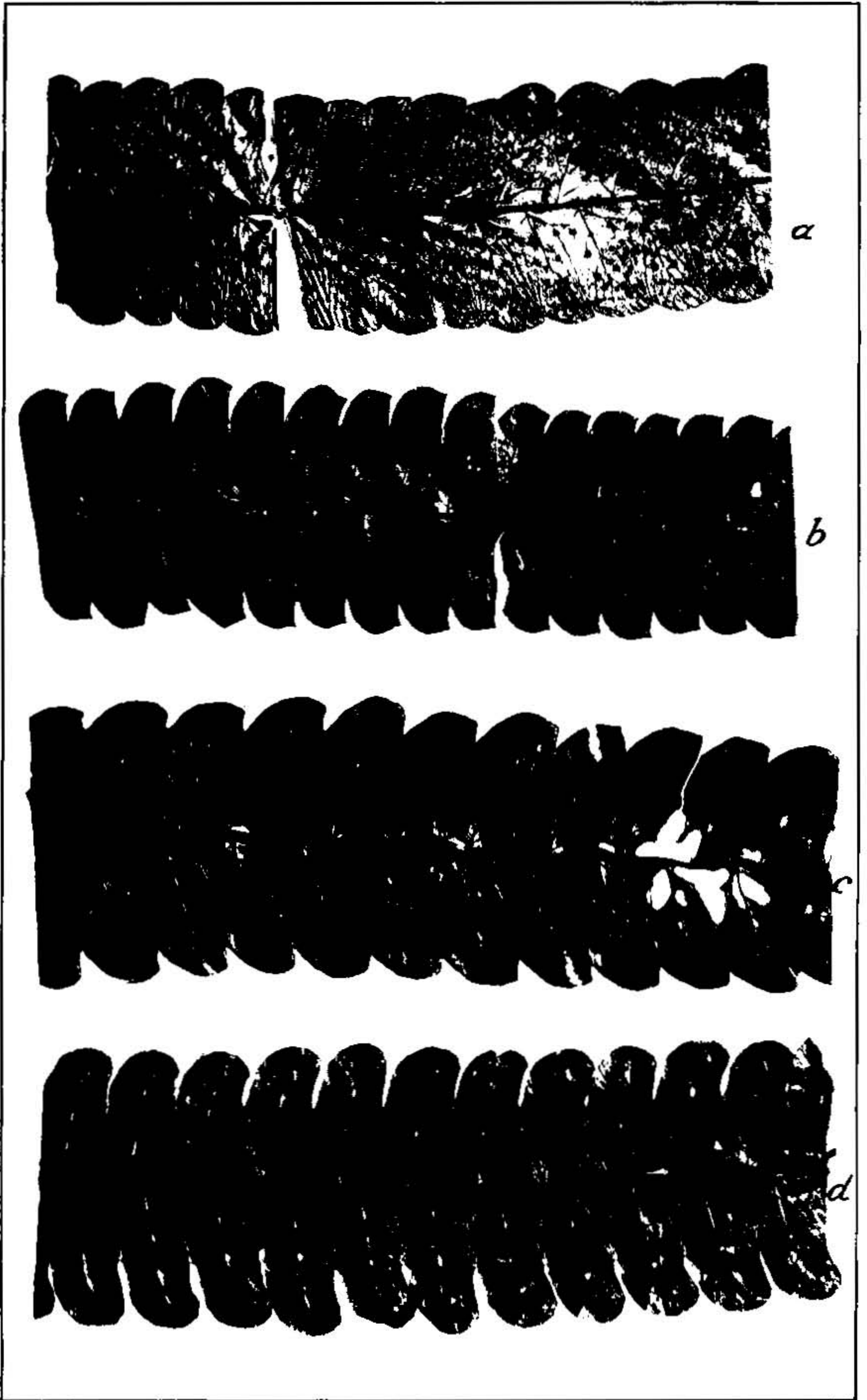
TYPE LOCALITY: Mountain forests near Lobani, District of Chinantla, Oaxaca, Mexico, altitude 900 to 1,050 meters, *Liebmann*.

DISTRIBUTION: Known only from Oaxaca.

The material at hand, which was received from Copenhagen, comprises a short section of the rachis, to which are attached the fourth pair of pinnæ. With this was sent by Mr. Christensen a sketch of the upper pinnæ showing the decurrent wings which extend along the rachis. It is sufficient to establish the validity of the species, which must be reckoned one of the most peculiar in the genus.

<sup>1</sup> Hook. & Baker, Syn. Fil. 28. 1868.





FOUR SPECIES OF HEMITELIA.



**14. *Hemitelia mexicana* Liebm.** Vid. Selsk. Skr. V. 1: 287. 1849. PLATE 24, b.*Hemistegia mexicana* Fourn. Mex. Pl. 1: 135. 1872.

Caudex about 30 cm. high; fronds 1.8 to 2.25 meters long; stipe 30 to 45 cm. long, squamulose, at length glabrescent, toward the base very minutely aculeolate; lamina broadly lanceolate, 1.5 to 1.8 meters long, 45 cm. or more broad, simply pinnate, acuminate; pinnæ numerous, alternate, oblique, linear, about 30 cm. long, 2.5 to 3 cm. broad, straight or slightly falcate, sessile, not narrowed at the inequilateral base, obliquely truncate at the upper side, rounded below, deeply crenate about one-third the distance to the costa at the base, about one-fourth the distance to the costa (or less) at the middle, only the outer fourth obliquely and broadly crenate-serrate, the apex appressed-serrulate; major crenations 3 to 5 mm. long, 5 to 7 mm. broad at the base, rounded-subtruncate, short-apiculate distally, the margins minutely revolute, entire; costæ elevated, greenish brown, glabrescent, a very few minute flattish yellowish scales subpersistent at the sides; main veins 50 pairs, nearly at right angles, 4 to 7 mm. apart, elevated, very slender, with 5 to 8 pairs of simple oblique arcuate veinlets, the basal of these usually joined by a transverse veinlet, then (one or both) excurrent to the sharply acute sinus, the other veinlets also extending to the margin, but mostly beyond the sinus; veins and veinlets minutely squamulose-setiferous; areoles relatively broad, ample, subhexagonal, broadest distally; sori 2 or 3 pairs to each group of veinlets, occupying a slightly inframedial zone between the costa and margin of the pinnæ; indusium light brown, semicircular or commonly suborbicular, crenately 3 to 6 lobed, the lobes repand-pateriform, reflexed; receptacle capitate, squamulose; leaf tissue membrano-herbaceous, dark shining green above, lighter below.

TYPE LOCALITY: Mountain forests near Cacolá (printed Cacoba, in error), District of Chinantla, Oaxaca, Mexico, altitude 750 to 900 meters, *Liebmann*.

DISTRIBUTION: Known definitely only from the original collection.

The above description is drawn partly from two middle pinnæ (with a portion of the rachis) of the type specimens, which have been received from the Botanisk Museum, Copenhagen, through the kindness of Mr. Carl Christensen; and partly from Liebmann's original diagnosis. The species is well marked and will probably be found not uncommon in the mountainous districts of Oaxaca at mid-elevations.

EXPLANATION OF PLATE 24.—Portions of characteristic pinnæ (a) of type specimen of *Hemitelia guatemalensis*; (b) of type specimen of *H. mexicana*; (c) from type collection of *H. lucida*; (d) of type specimen of *H. choricarpa*. All natural size.

**15. *Hemitelia lucida* (Fée) Maxon.**

PLATE 24, c.

*Hemistegia lucida* Fée, Gen. Fil. 351. 1850-52.

Caudex undescribed; stipe very stout, somewhat spiny, paleaceo-furfuraceous; lamina (estimated) about 2 meters long, apparently ovate-oblong, about 80 cm. broad near the middle, 40 cm. broad at the base; pinnæ numerous, divergent, the larger ones about 8 cm. apart on each side, ligulate-lanceolate, straight or upwardly falcate, up to 45 cm. long, 3.5 to 4.2 cm. broad, serrate to serrulate at the gradually tapering, long-acuminate apex, elsewhere crenate to crenately lobed; principal crenations or lobes 28 to 34 pairs, rounded, 9 to 12 mm. broad at the sinuses, less than one-half as long, rounded, directed forward and subrectangular at the distal border, the sinuses obliquely triangular, open and acute, the margins subentire, minutely revolute; costæ elevated, glabrous above, nearly glabrous below, there bearing a few minute deciduous dirty white scales; midveins (or costules) divergent from the costa, subopposite to alternate, 9 to 10 mm. apart on each side, elevated, glabrous upon both surfaces, discontinuous (*i. e.*, forked) at the apex of the lobes, below this nearly straight; veinlets 5 to 9 pairs, oblique, simple, the lowermost ones of adjacent crenations joined by a transverse veinlet (this distant 2 to 2.5 mm. from the costa), then immediately soriferous and produced, commonly joining the second oblique vein of the same group at a point about one-half the distance to the sinus (or beyond)



at an acute angle; third pair of veins usually free and excurrent to or above the sinus; succeeding veins free, closer, extending to the margin above the sinus; sori 4 to 9 pairs, large, the basal ones 3 to 4 mm. distant from the midvein and 2 to 3 mm. from the costa, those above gradually approaching the midvein, the uppermost basal upon the veinlets, the sori of each lobe or crenation thus borne in an elongate A-shaped line; indusium ample, irregularly repand-lobate, the lobes shallow and reflexed; receptacle relatively large, globose, squamulose-setiferous; leaf tissue membrano-herbaceous, dark green and shining above, much paler below.

**TYPE LOCALITY:** District of Chinantla, Oaxaca, Mexico, altitude about 2,000 meters.

**DISTRIBUTION:** Known only from the original collection, *Galeotti* 6537.

Fée's original diagnosis is very incomplete and has afforded scant data for the above redescription, which is based almost wholly upon material of the type collection forwarded to the U. S. National Museum from Brussels by Professor de Willeman. This species is obviously related to *H. guatemalensis*, but appears to differ constantly in its deeper crenations and the very frequent junction of the first and second veinlets of each group at an acute angle below the sinus.

**EXPLANATION OF PLATE 24.**—See p. 39.

**16. *Hemitelia guatemalensis* Maxon, sp. nov.**

PLATE 24, *a*.

Caudex and stipe wanting; lamina ample, presumably about 2 meters long, at least 60 cm. broad, the apex very abruptly short-acuminate, the rachis stout, 6 to 8 mm. broad, firm, compressed, narrowly canaliculate ventrally, brownish, closely grayish squamulose-pubescent; pinnæ alternate, spaced, divergent, falcate and decurved, ligulate-lanceolate, the larger ones about 32 cm. long, 3 to 3.5 cm. broad, sessile or stoutly short-petiolate, slightly narrowed at the unequally rounded subcordate base, or obtusely cuneate at the upper side, irregularly and obliquely crenate nearly throughout, only the apical fourth serrate, gradually serrulate at the long-acuminate apex; crenations 2 mm. or rarely 3 mm. long, 6 to 8 (casually 10) mm. broad at the base, rounded, acutish distally, the margins entire, closely revolute, the sinuses acute or acutish; costæ very stout, elevated upon both sides, below similar to the rachis, above (together with the veins, veinlets, and leaf tissue above) glabrous; main veins about 40 pairs, the venation (including areolation) otherwise similar to that of *H. mexicana*, except as to the number of veinlets (these 4 to 6 pairs to each group); sori 4 to 6 pairs, distinctly inframedial upon the veinlets; indusium light brown, irregularly semicircular, 2 or 3-lobate, the lobes pateriform; receptacle elongate-capitate, minutely squamulose-pubescent; leaf tissue rigidly membrano-herbaceous, light green and lucid above, very much paler below.

Type in the U. S. National Herbarium, no. 830363, collected in Guatemala by O. Salvin (without number), distributed from the Royal Gardens, Kew, as *H. subincisa*.

*Hemitelia guatemalensis* is to be compared with *H. mexicana* and *H. lucida*. Only the type specimens have been seen.

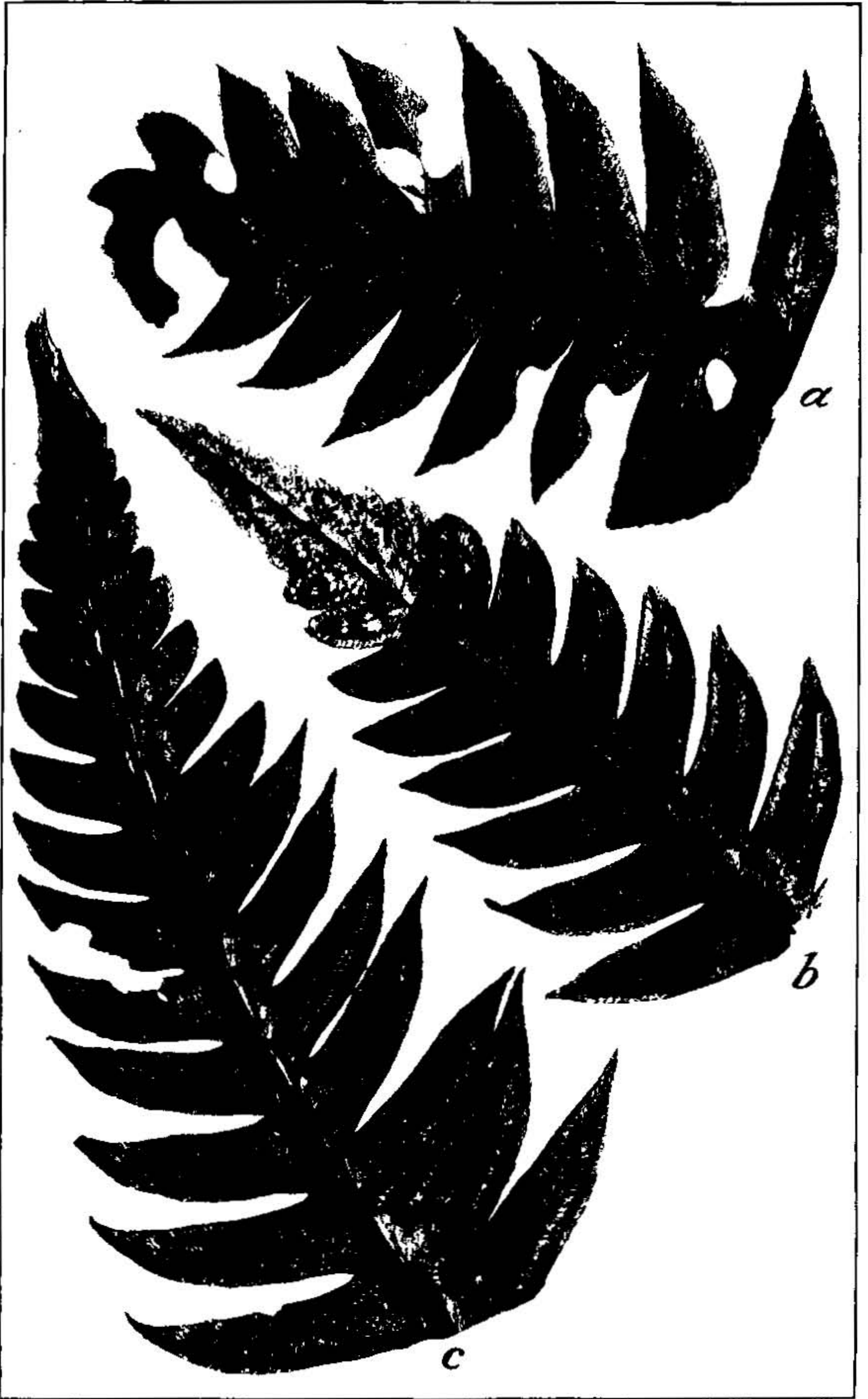
**EXPLANATION OF PLATE 24.**—See p. 39.

**17. *Hemitelia choricarpa* Maxon, sp. nov.**

PLATE 24, *d*.

Caudex and stipe wanting; lamina apparently about 1.5 meters long, 40 to 50 cm. broad, pinnate, acuminate, the rachis very firm, rather slender, yellowish brown, sharply bicarinate-sulcate and glabrous above, the under surface loosely crispatomentulose, the persistent whitish or yellowish hairs short and somewhat spreading; pinnæ subopposite to nearly alternate, 5 to 6 cm. apart on each side, oblong-linear, sessile, the upper ones ascending, obtusely and subequally cuneate or at the upper side slightly excavate; middle pinnæ divaricate or ascending, rounded-truncate or subcordate at the base, 27 to 32 cm. long, 3.5 to 4 cm. broad, pinnately lobed at the base about one-half the distance to the costa, above this (and nearly throughout) about two-fifths the distance to the costa, beyond this crenate, the acuminate-attenuate extremity obscurely serrulate; costæ conspicuously elevated on both surfaces, glabrous above,





HEMITELIA GRANDIFOLIA WILLD.



below crispate-tomentulose, glabrescent; major lobes about 27 to 32 pairs, subequal, 7 to 9 mm. broad at the base, obtuse, close, separated by narrow nearly closed sinuses, the margins slightly revolute, subentire, the costules elevated, arcuate toward the apex, glabrous above, glabrate below; veins 10 to 14 pairs to the lobe, oblique, the lowermost ones of adjacent segments joined by a transverse veinlet (forming a narrow elliptical areole), with 1 or 2 veinlets irregularly soriferous and excurrent to the sinus, there meeting the two basal veins, the other veins simple or mostly once-forked below the middle, soriferous at or below the fork or rarely (in the case of the lower veins) beyond the fork; sori distinctly apart, forming a slightly inframedial line extending from below the apex downward nearly to the costa, there joining the sori of the adjacent lobe at a point remote from the sinus, thus forming one end of a nearly perfect ellipse; indusium ample, membranous, semicircular in outline, 2 or 3-lobed, the lobes shallow, spreading, irregular; receptacle capitate, setiferous; leaf tissue membrano-herbaceous, dark and lustrous above, paler below.

Type in the U. S. National Herbarium, no. 830322; collected in forest near Buenos Aires, Costa Rica, February, 1892, by H. Pittier (no. 4835).

*Hemitelia choricarpa* is apparently confined to Costa Rica, the only other specimens seen being from Cañas Gordas, altitude 1,100 meters, March, 1897, Pittier 10966. The characters depended upon in the key to distinguish it from related species are diagnostic.

EXPLANATION OF PLATE 24.—See p. 39.

**18. *Hemitelia grandifolia* (Willd.) Spreng. Syst. Veg. 4: 125. 1827. PLATE 25.**

*Cyathea grandifolia* Willd. Sp. Pl. 5: 490. 1810.

*Hemitelia imrayana* Hook. Icon. Pl. 7: pl. 669. 1844.

*Hemitelia horrida imrayana* Hook. in Hook. & Baker, Syn. Fil. 28. 1868.

*Hemistegia willdenovii* Fée, Gen. Fil. 351. 1850-52.

*Microstegnus grandifolius* Presl, Abh. Böhm. Ges. Wiss. V. 5: 354. 1848.

*Hemistegia insignis* Fée, Mém. Foug. 11: 99. 1866.

*Hemitelia insignis* C. Chr. Index Fil. 349. 1905.

Caudex arborescent, erect, frequently 4 to 5 meters high, about 10 cm. in diameter, at the base (with its copious covering of brownish flexuous adventive roots) about 15 cm. in diameter, densely clothed at the summit with whitish lanceolate scales; fronds ascending, arching, up to 1.7 meters long, the stipes very stout, more or less imbricate, adnate or ascending close to the caudex, whitish-paleaceous at the base, eventually deciduous, leaving definite spaced quincuncially arranged elongate-oval scars; lamina ample, ovate, 1 to 1.25 meters long or more, 60 to 80 cm. broad, short-acuminate, the rachis very stout, yellowish brown, distantly muricate to smooth, convex or lightly sulcate on the lower side, on the upper side (at least in the lower part) deeply and narrowly sulcate, the ridges rounded, each similarly sulcate at the outer side; scales of the rachis deciduous, ovate or deltoid-ovate, long-acuminate, whitish, with a bright brown median stripe, finely crose; pinnae opposite or subopposite, the lowermost somewhat deflexed, ovate-lanceolate, about 25 cm. long; middle pinnae spreading, 8 to 10 cm. apart on each side, very narrowly deltoid-lanceolate to narrowly oblong-lanceolate, 30 to 40 cm. long, 6 to 11.5 cm. broad, sessile, scarcely or not at all reduced at the base, at the lower side strongly imbricate upon the rachis, close above, pinnatifid nearly to the costa, or the basal segments free, above this the segments connected by a narrow gradually increasing costal wing 2 to 4 mm. broad or finally about 4 to 6 mm. broad on each side below the crenate-serrate, ultimately biserrate, acuminate apex; costae very stout, yellowish brown to castaneous, glabrous above, below (especially toward the base) freely paleaceous, the scales similar to those of the rachis but smaller and relatively broader, the brownish median stripe often obsolete; segments adjacent or somewhat apart, 25 to 34 pairs, oblong-lanceolate, sometimes dilatate, the inferior basal one often reduced, inequilateral, and invariably



clasping the rachis, the others falcate or subfalcate, 3 to 6 cm. long, 12 to 16 mm. broad at the sinuses, slightly narrower above, the margins lightly revolute, obliquely crenate to deeply crenate-serrate (in very large specimens), crenate-serrulate at the acuminate to long-acuminate apex; costules elevated, bearing numerous small white bullate scales in the lower part below, otherwise glabrous; veins 15 to 20 pairs below the apex, minutely setulose, subpinnately forked (with about 2 to 4 pairs of branches) or 2 to 5-forked, the branches oblique, arcuate, soriferous toward their extremities; lowermost branches of basal veins of adjacent segments usually joined by a transverse veinlet, forming a narrowly elongate costal areole; basal branches of veins in the basal third of the segment also infrequently joined similarly, forming relatively broad costular areoles; sori rather small, biseriate and slightly supramedial, or in larger segments forming a continuous regular and deeply crenate line about 1 to 2 mm. distant from the margin; indusium bright brown, simple or 2 or 3-lobed, the margins uneven to lacerate; receptacle capitate to subcylindric, setose; leaf tissue firmly herbaceous, lustrous, often discolored in drying, dark above, much lighter below.

TYPE LOCALITY: Martinique (herb. Willd. 20167).

DISTRIBUTION: Apparently confined to the Lesser Antilles—Dominica, Martinique, Guadeloupe, Montserrat, and St. Kitts—at 300 to 1,200 meters elevation.

ILLUSTRATIONS: Hook. Icon. Pl. pl. 669 (as *Hemitelia imrayana*); Féc, loc. cit. pl. 26 (as *Hemistegia insignis*).

The following specimens are in the U. S. National Herbarium:

MARTINIQUE: Duss <sup>1</sup> 1605 (as *H. horrida*); Duss 4435 (as *Hemitelia* sp.); Duss 4605 (as *H. grandifolia*).

GADELOUPE: Duss 4154 (as *H. grandifolia*); Duss 4155 (as *H. horrida*); Duss 4449 (as *H. insignis*); Duss 4451, 4452 (as *Hemitelia* sp.).

DOMINICA: In forests, Laudat, Eggers 867; Laudat, Lloyd 263.

ST. KITTS: Forested slopes of Mount Misery, Britton & Cowell 510.

MONTSERRAT: Chauers Mountain, altitude 600 meters, Shafer 283. Without locality, Turner.

The taxonomic history of this species, which is rather complicated, is briefly as follows:

(1) *Grandifolia*. The species was first described as *Cyathea grandifolia* by Willdenow who cited Plumier's plate 20 and Petiver's plate 2, figure 10, and gave as the sole locality Martinique. If we are to interpret the species wholly upon the basis of the illustrations cited the name will apply to no other species than that described later by Kunze as *H. kohautiana*, the type of which (Sieber's 375, from Martinique) will be seen (Pl. 26) to agree closely with Plumier's plate 20, the latter also representing a Martinique plant. But there is in this instance a Willdenovian type specimen (herb. Willd., no. 20167) of the species *grandifolia*; and this, by a careful reading of the original description and especially of the part describing the acuminate segments, will be seen to have served for the really diagnostic features of the description. It seems far preferable, therefore, to give greater weight to the specimen than to the figures cited; and this even though a later writer, Presl, has confused the matter by stating <sup>2</sup> (by implication) that Willdenow's type was from Caracas, collected by Bredemeyer. The Willdenow specimen (no. 20167) shows no such data,<sup>3</sup> and there is far better reason to credit Willdenow's statement than Presl's. The other locality cited by Presl for his *Microstegnus grandifolius* is Mount Misery, St. Kitts, the specimen collected by Breutel. This the writer has not seen; but specimens collected on this

<sup>1</sup> The Duss numbers frequently embrace more than one species. The numbers here listed apply only to specimens in the National Herbarium.

<sup>2</sup> Loc. cit., 354, in describing *Microstegnus grandifolius*.

<sup>3</sup> Professor Urban writes that it has merely the following locality data: "Habitat in America calidiore."



mountain by Britton and Cowell (no. 510, in 1901) are evidently not specifically different from the fragment of Willdenow's type (no. 20167) shown in plate 25, *a*; and there is, therefore, on grounds of geographic distribution a strong presumption that Presl was in error as to the origin of the Willdenow specimen.

Fée's change of name for the plant to *Hemistegia willdenovii* was made purely from a supposed nomenclatorial difficulty, arising from his desire to retain both *Microstegnus grandifolius* Presl and *Hemistegia grandifolia* Presl ("*Hemitelia grandifolia* Hook.") in the same genus; unfortunately he in error chose the true *grandifolia* for renaming.

(2) *Imrayana*. Described from Dominica by Hooker on plants collected by Doctor Imray. A specimen at hand from this island differs in no essential particular from more copious material from Guadeloupe and Martinique.

(3) *Insignis*. A name applied by Fée to specimens collected by l'Herminier in Guadeloupe. A considerable number of specimens from Guadeloupe and Martinique give us our best idea of this species. They are clearly of the same species as Willdenow's type.

*Hemitelia grandifolia* is sufficiently distinct from *H. kohautiana* and *H. obtusa* by the data given in the key. This has been made as full as possible for the purpose of pointing out very definitely the characters by which these species, which have so long been confounded by nearly every writer, may be adequately distinguished.

EXPLANATION OF PLATE 25.—*a*, Fragment from the type specimen, herb. Willdenow (no. 20167), from Martinique; *b*, tip of a small upper pinna of a Martinique specimen, *Duss* 1605; *c*, tip of a large lower pinna of a Guadeloupe specimen, *Duss* 4452.

**19. *Hemitelia horrida* (L.) R. Br.; Spreng. Syst. Veg. 125. 1827.**

*Polypodium horridum* L. Sp. Pl. 1092. 1753.

*Cyathea horrida* J. E. Smith, Mem. Acad. Turin 5: 416. 1793.

*Cyathea commutata* Spreng. Anleit. Kennt. Gewächse 3: 146. 1804 (excluding all reference to Plumier).

*Cnemidaria horrida* Presl, Tent. Pterid. 57. 1836.

*Actinophlebia horrida* Presl, Abh. Böhm. Ges. Wiss. V. 5: 356. 1848.

*Hemistegia horrida* Fée, Gen. Fil. 351. 1850-52.

*Hemitelia hookeri* Presl, Abh. Böhm. Ges. Wiss. V. 5: 350. 1848.

*Hemitelia hookeriana* Schlecht. Bot. Zeit. 14: 474. 1856.

?*Hemitelia acuminata* Karst.; Schlecht. Bot. Zeit. 14: 474. 1856.

*Hemitelia commutata* Schlecht. Bot. Zeit. 14: 474. 1856.

*Hemistegia repanda* Fée, Gen. Fil. 351. 1850-52; Mém. Foug. 11: 98. 1866.

TYPE LOCALITY: Near Port de Paix, Haiti, *Plumier*.

DISTRIBUTION: Santo Domingo, Jamaica, Cuba, Porto Rico, Costa Rica, and doubtfully Colombia.

ILLUSTRATIONS: *Plumier*, Traité Foug. pl. 8; *Spreng.* loc. cit. pl. 4. f. 32; *Hook.* Sp. Fil. 1: pl. 15; *Hook. & Bauer*, Gen. Fil. pl. 4.

A redescription of this species is scarcely necessary, inasmuch as it is common in the Greater Antilles and is doubtless well represented in all the larger herbaria. Scant material of *H. horrida* and a consequent failure to recognize the full extent of its variation were, however, responsible for a large amount of speculation and critical comment in earlier times. Thus, Presl in 1848 founded a new species, *Hemitelia hookeri*, (without description) upon plate 15 of Hooker's Species Filicum and plate 4 of his Genera Filicum, supposing these to illustrate a species distinct from *H. horrida*, whereas they represent a condition not infrequently observed in particularly robust individuals of that species. Presl cited also Venezuelan specimens collected by Linden (no. 1572); but if we regard his species as typified by plate 15, as seems proper, it becomes a straight synonym of *H. horrida*, whatever may be the identity of Linden's no. 1572.



Schlechtendal published<sup>1</sup> in 1856 a very elaborate analysis of "*H. horrida*," as understood by various writers and as evidenced by living specimens and the relatively small amount of herbarium material available. His conclusion was to recognize tentatively five specific forms as follows:

1. *Hemitelia horrida* R. Br. = *Polypodium horridum* Lin. Plum. Fil. p. 9. t. 8. Plum. Amer. p. 3. t. 4.
2. *Hemitelia commutata* = *Cyathea commutata* Spreng. Einleit. in d. Stud. d. krypt. Gew. S. 147. fig. 32. a. b.
3. *Hemitelia hookeriana* = *H. horrida* Hook. Spec. Filic. 1. p. 30. t. XV. excl. synonym.
4. *Hemitelia Imrayana* Hook. Ic. pl. t. 669. Sp. Filic. 1. p. 33.
5. *Hemitelia acuminata* Karsten in litt. = *H. horrida* hortorum et nonnull. auct."

He suggested, however, that a better knowledge of these in the future might result in their recognition merely as forms of a single highly variable species. As to the status of these it may now be said that: (1) Plumier's plate 8 (the type of *Polypodium horridum* L.) shows crudely but unmistakably the typical form of the West Indian plant known commonly as *Hemitelia horrida*; (2) *H. commutata* (Spreng.) Schlecht., leaving out all reference to Plumier's plate 14 and judging the species by Schlechtendal's own figure, is assuredly *H. horrida*; (3) *H. hookeriana* Schlecht. is only an extreme development of the ordinary West Indian *H. horrida*, matching perfectly certain material from Jamaica which apparently owes its form to unusually favorable conditions of growth; (4) *H. imrayana* Hook. is identical with *H. insignis* Fée, a Lesser Antilles species<sup>2</sup> which (see page 42) must be known under the still earlier name *H. grandifolia* (Willd.) Spreng.; and (5) *H. acuminata* Schlecht. must be regarded as doubtfully a synonym of *H. horrida*. The original specimens of *H. acuminata* (a name first applied by Klotzsch) are said to have been collected near Galipan, Colombia, by Moritz (no. 290) and were listed<sup>3</sup> as *H. horrida*. These and Valentini's Costa Rican specimens, mentioned by Schlechtendal,<sup>4</sup> have not been seen; but that *H. horrida* really occurs in Costa Rica is evident to the writer from an examination of the two Costa Rican collections listed below. There is no reason to suppose that the species may not extend also to Colombia. The presence of scales, mentioned by Schlechtendal, suggests some doubt as to the reference of *H. acuminata* to *H. horrida*, however; for in undoubted *H. horrida* the presence of any scales whatever, even in the most immature fronds, is exceedingly rare. Except for their very delicate, thin, and readily abraded whitish-tomentulose covering, the vascular parts of the pinnae are normally glabrous. Indeed, even the thin arachnoid covering is sometimes wholly wanting.

Fée's *Hemistegia repanda*, as redescribed some fourteen years after its original publication, is without much doubt also referable to *H. horrida*.

The following specimens are in the U. S. National Herbarium:

SANTO DOMINGO: Near Barahona, altitude 600 meters, von Türckheim 2707. Loma Isabel de Torre, altitude 600 meters, Eggers 2738. Without definite locality, Jaeger 203.

JAMAICA: Road to Mooretown, above Port Antonio, Underwood 3479. Near Castleton, Underwood 86. Near Port Antonio, Fredholm 3340. John Crow Mountains, Britton 3986; Harris & Britton 10697, 10709. Cuna Cuna Gap, altitude 750 meters, Clute 266. Second Breakfast Spring, near Tweedside, altitude 600 meters, Maxon 869. Wet rocky banks of stream and ravines in

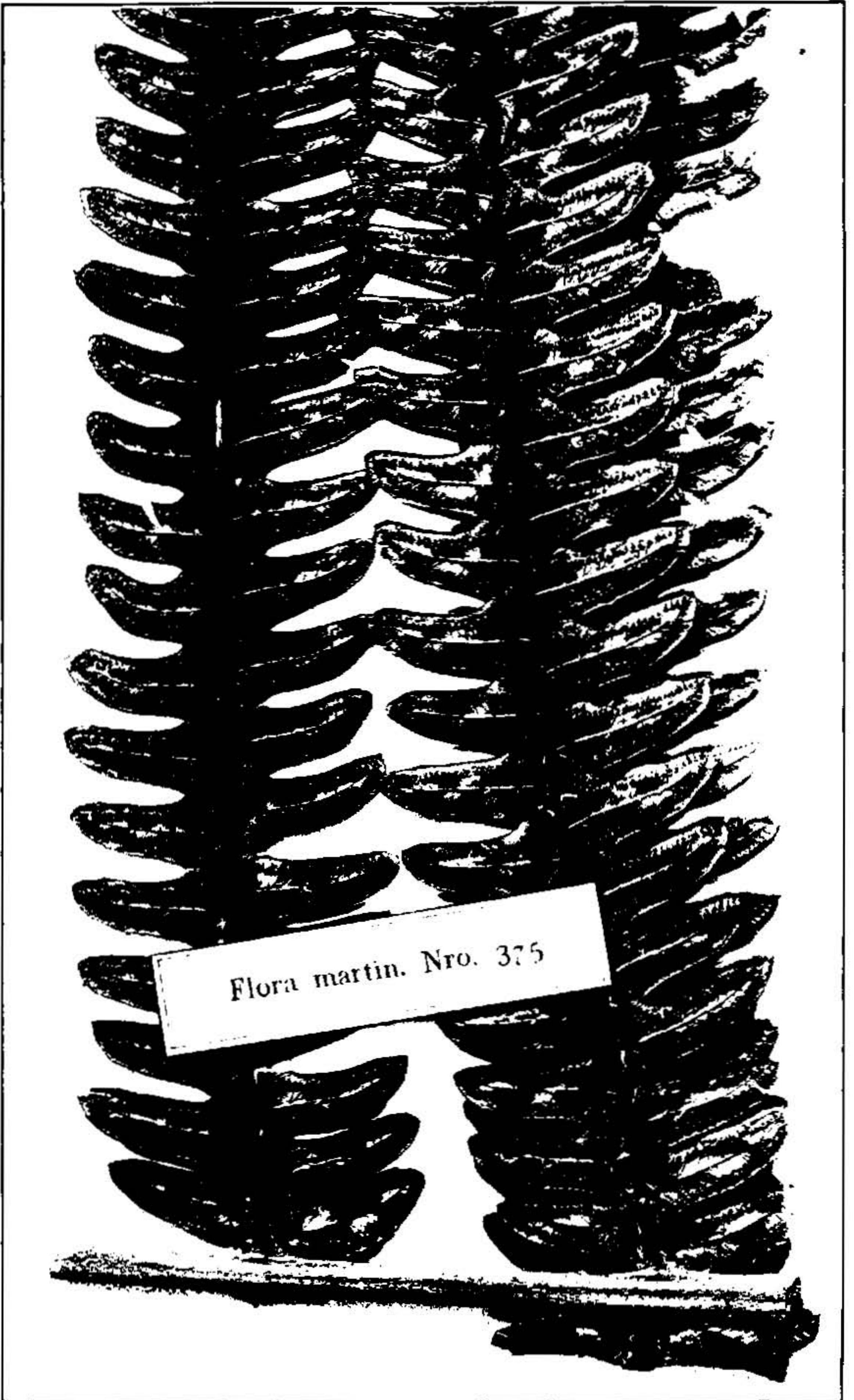
<sup>1</sup> Bot. Zeit. 14: 449-454; 465-475. 1856.

<sup>2</sup> Schlechtendal, in error, gives *H. imrayana* as from Santo Domingo, instead of from Dominica.

<sup>3</sup> Linnæa 20: 440. 1847.

<sup>4</sup> Bot. Zeit. 14: 465. 1856.





HEMITELIA KOHAUTIANA (PRESL) KUNZE



forest, Mansfield, altitude 300 to 500 meters, *Maxon* 2387, 2456. Without definite locality, *Hart* 174.

CUBA: Mountains near Taco Taco, *Baker* 3835. Arroyo Trinitario, Rio Negro, Trinidad Mountains, Santa Clara, altitude 550 meters, *Britton & Britton* 5187. El Yunque Mountain, near Baracoa, altitude 300 to 600 meters, *Underwood & Earle* 626; *Pollard & Palmer* 118, 154. Pinal de Santa Ana, Yateras, Oriente, altitude 800 meters, *Eggers* 5030. Upper slopes and summit of Gran Piedra, Oriente, altitude 900 to 1,200 meters, *Maxon* 4034. Josephina, north of Jaguey, Yateras, Oriente, altitude 575 meters, *Maxon* 4104. Santa Ana, about 6 miles north of Jaguey, Yateras, Oriente, altitude 600 to 625 meters, *Maxon* 4187. Monte Verde, Yateras, Oriente, altitude 575 meters, *Maxon* 4336. Without definite locality, *Wright* 888.

PORTO RICO: Maricao, *Sintenis* 417. Mount Jimenez, Sierra de Luquillo, *Sintenis* 1507. Cayey, in forests, *Sintenis* 2490b. Adjuntas, in forests of Mount Cienega, *Sintenis* 4168. Lares, in forest at Buenos Aires, *Sintenis* 6088. Road from Utuado to Lares, *Underwood & Griggs* 71. Hacienda Perla, north side of Sierra de Luquillo, altitude 150 meters, *Heller & Heller* 1043. Mount Morales, near Utuado, *Britton & Cowell* 831. Near Mayaguez, *Britton & Marble* 551; *Cowell* 581. Barranquitas, *Hioram* 277.

COSTA RICA: Banks of a stream near Santa Barbara, *Pittier* 1679. Alajuela, altitude 900 meters, *Alfaro* 108.

20. *Hemitelia kohautiana* (Presl) Kunze, Bot. Zeit. 2: 298. 1844. PLATE 26.

*Cnemidaria kohautiana* Presl, Tent. Pterid. 57. 1836, name and figure.

*Hemistegia kohautiana* Presl, Abh. Böhm. Ges. Wiss. V. 5: 355. 1848, name only.

*Hemistegia grandifolia* Presl, Abh. Böhm. Ges. Wiss. V. 5: 355. 1848, in part, as to Plumier reference, not *Hemitelia grandifolia* (Willd.) Spreng. 1827.

Low-arborescent, the caudex up to 1.4 meters long and closely covered (at least below) with long dark adventitious roots; fronds numerous; lamina ample, probably 1.5 meters long or more, about 60 cm. broad, deeply bipinnatifid, acuminate, the rachis stout, brownish-stramineous, deeply trisulcate above, lightly and obtusely sulcate below, conspicuously but deciduously paleaceous, the scales linear-lanceolate to elongate-deltoid, all very long-attenuate, finely erose-fimbriate, whitish, or the larger ones with a narrow bright brown median stripe; rachis also yellowish scabrid pilose below, very rough; pinnae opposite or nearly so, 5.5 to 7 cm. apart, very narrowly oblong-lanceolate, 30 to 33 cm. long, 4 to 5 cm. broad, spreading, sessile, not narrowed at the base, here slightly apart from the rachis at the upper side, subcordate below and either contiguous to the rachis or partially overlying it, deeply and almost equally pinnatifid throughout, the costal wing 4 to 5 mm. broad upon each side, scarcely broader below the crenate and ultimately serrulate acuminate apex; costae stout, yellowish brown, sulcate and glabrous above, below faintly canaliculate, 1 to 2 mm. broad, copiously clothed with spaced spreading scales similar to those of the rachis or relatively broader, falcate, subflexuous, whitish and without a median stripe; segments close, about 28 pairs, nearly oblong, slightly broadest at the base, 9 to 11.5 mm. broad at the very narrow and sharply acute sinuses, subfalcate, subentire in the lower half, faintly serrulate above the middle, sharply so at the rounded apex; costules elevated, glabrous above, copiously paleaceous below, the scales minute, whitish, bullate, ending in a capillary point; veins 13 to 16 pairs, elevated, mostly once-forked, the basal branch of each basal vein joined by a short transverse veinlet to the opposed basal branch of the basal vein of the adjacent segment, a narrowly elongate basal areole thus formed along the costule, all four branches excurrent to the sinus; second pair and succeeding veins mostly once-forked at or near the base (sometimes twice-forked), the branches rather close, oblique, soriferous beyond their middle; sori relatively small but contiguous, extending in a close subflexuous supramedial line from the apex downward to



a point on the costal wing usually about one-third the distance from costa to sinus, there meeting obtusely the sori of the adjacent segment; indusium membranous, yellowish brown, semicircular or dimidiate, subentire to deeply and irregularly crenate, repand, shallow; receptacle globose-capitate, setiferous; leaf tissue herbaceous, dark green and lustrous above, yellowish and much paler below.

TYPE LOCALITY: Martinique, *Sieber* (Fl. Mart. 375).

DISTRIBUTION: Mountains of Martinique and Guadeloupe, at from 500 to 1,480 meters elevation.

ILLUSTRATIONS: Plumier, *Traité Foug. pl. 26*; Petiver, *Pter. Amer. pl. 2. f. 10*; Presl, *Tent. Pterid. pl. 1. f. 18*; Hook. *Sp. Fil. 1: pl. 14 B* (as *H. grandifolia*).

Plumier's plate 26 above cited was mentioned by Willdenow as illustrating his *grandifolia*; but, as shown under the discussion of that species at page 42 *H. grandifolia* is preferably to be interpreted by means of the Willdenow type specimen, which is of the species known hitherto as *H. insignis* or *H. inrayana*.

On account of the white scales of the under surface, larger specimens of this species might be confounded with true *H. grandifolia*, except for the simpler venation and the obtuse or, at least, nonacuminate segments. Its white scales will at once distinguish it from *H. obtusa* which invariably has brown scales, and these of a very different character.

EXPLANATION OF PLATE 26.--From a photograph of a portion of *Sieber 375*, Martinique, the type collection. Natural size. (Specimen in herbarium of the Missouri Botanical Garden.)

**21. *Hemitelia obtusa* Kaulf. Enum. Fil. 252. 1824.**

*Cnemidaria obtusa* Presl, *Tent. Pterid. 57. 1836.*

*Hemistegia obtusa* Presl, *Abh. Böhm. Ges. Wiss. V. 5: 355. 1848.*

*Hemitelia bullata* Christ, *Bot. Jahrb. Engler 24: 81. 1897.*

Rhizome of mature individuals unknown, probably ascending or forming a short upright caudex; fronds apparently 2 to 2.5 meters long, the stipe stout, clothed at the base with bright yellowish brown linear-lanceolate long-acuminate scales, sharply short-acuminate, light castaneous to yellowish brown, muricate upwards, deciduously palaceous; lamina broadly oblong or ovate-oblong, apparently 1 to 1.5 meters long, 40 to 60 cm. broad, abruptly acuminate, bipinnatifid, the rachis stout, deeply sulcate and glabrescent above, below lightly and obtusely sulcate, smoothish, laxly yellowish-pubescent with long flexuous flaccid hairs; pinnae numerous, close, the lower ones deflexed; middle pinnae divergent, opposite or subopposite about 4 to 6 cm. apart, oblong-ligulate, 20 to 35 cm. long, 3 to 4 (rarely 4.5) cm. broad, not or scarcely narrower at the base, close to the rachis at the upper side, subcordate below and commonly overlying the rachis, sessile, straight or lightly falcate, gradually acuminate in the apical third or fourth, (the extreme apex sharply serrate,) pinnatifid two-thirds to three-fourths the distance to the costa, the costal wing about 3 to 5 mm. wide on each side or slightly broader toward the apex; costae glabrous and minutely but sharply sulcate above, below yellowish to brownish, stout, conspicuously elevated, at first freely clothed (at least toward the base) with shining subbullate ovate or oblong-ovate ferruginous or yellowish brown flaccid scales with lighter fibrillose margins, some of the scales persistent at the sides; segments about 24 to 30 pairs, oblong, lightly falcate, 9 to 12 mm. broad at the base, mostly close, the sinuses narrow and sharply acute, or broader in drying and acutish, the margins usually revolute, lightly crenate-serrate above the sinus, toward the apex crenate-dentate, the teeth not prolonged; costules sharply elevated, glabrous above, below obscurely setulose-glandular and bearing numerous small bullate brownish fibrillose scales; veins 13 to 16 pairs, elevated, glabrous above, minutely glandular-setulose below, once-forked, the basal one having its basal branch connected with a similar branch from the adjacent segment by a short transverse veinlet, the costal areole very narrowly elongate, all four branches extending to the sinus or to a point immediately above; second



pair and succeeding veins once-forked close to the sinus, the branches divergent, distant, soriferous above their middle; sori rather small, adjacent (sometimes contiguous with age), forming a distinctly supramedial line extending one-half to two-thirds the distance to the apex (rarely to the apex) and downward to a point on the costal wing about equidistant between the costa and the sinus; indusium grayish brown, semicircular or dimidiate, subentire to crenately lobed, shallow; receptacle globose, squamulose-setiferous; leaf tissue rigidly herbaceous, dark green above, lighter below, lustrous on both surfaces.

TYPE LOCALITY: "Habitat in Antilles."

DISTRIBUTION: Apparently confined to Grenada and St. Vincent.

The present species has been misidentified with nearly as much frequency as has *H. grandifolia* (and usually under that name), although Kaulfuss's description is definite enough. In addition to Kaulfuss's original plant Presl cites specimens collected by Guilding in St. Vincent, in which on the basis of material at hand he is probably correct. Grenada specimens collected by Eggers (no. 6035) were first determined by Christ as *H. grandifolia*, but were subsequently made the type of his new species *H. bullata*. They are perfectly typical examples of *H. obtusa*, as here understood. In leaf outline and venation *H. obtusa* resembles *H. kohautiana* rather closely; but it is strikingly different in its fewer and distinctly brownish scales of the under surface and in its almost nonpaleaceous, smoothish, and yellowish pubescent rachises.<sup>1</sup>

The following specimens have been examined:

ST. VINCENT: *H. H. & G. W. Smith* 854, 1715; *Eggers* 6731.

GRENADA: *Eggers* 6035; *Sherring; Broadway*.

#### DOUBTFUL SPECIES.

1. *HEMITELIA CRUCIATA* Desv. Mém. Soc. Linn. Paris 6: 320. 1827.

The original description is as follows:

"Pinnis oppositis, sessilibus, lineari-lanceolatis subacuminatis, patentibus, profunde crenatis: laciniis subimbricatis incurvis, obtusisque apici latere acutiusculis obscure denticulatis: costis rachique nudis; caudice arborescente?"

"Habitat in America calidiori. Media inter *H. grandifoliam* et *speciosam*."

An excellent photograph of the type specimen, which is preserved in the Muséum d'Histoire Naturelle at the Jardin des Plantes, Paris, indicates a species at least very closely allied to that here recognized under the name *H. spectabilis* Kunze. In the shape of its pinnæ and in venation the specimen appears to agree with the Trinidad plants here cited under *H. spectabilis* and to differ only in its subimbricate segments. Without a direct comparison of the specimen itself with *H. spectabilis* it appears inadvisable to substitute the earlier name; but it is more than likely that the two relate to phases of the same species. At any rate its relationship is clearly with *H. spectabilis*, as here understood.

2. *HEMISTEGIA ELEGANTISSIMA* Fée, Mém. Foug. 8: 110. 1857.

Founded upon a Mexican specimen collected by Linden, without number; not identified by the writer. The description, brief though it is, does not accord with any of the species here recognized.

<sup>1</sup> The plant figured by Hooker, Sp. Fil. 1: pl. 14 A. as *H. obtusa* is neither *H. obtusa* nor any species closely related to it. The illustration agrees exactly with the Trinidad material here taken up under the name *H. spectabilis*, but it does not show any secondary areoles (i. e., along the costules of the segments). This, however, is not a constant feature of that species and is only observed here and there. See under *H. spectabilis*.



3. *HEMITELIA MUNITA* (Willd.) Hook.; Kuhn, *Linnaea* **36**: 162. 1869.

*Cyathea munita* Willd.; Kaulf. Enum. Fil. 260. 1824, nomen nudum.

*Hemitelia munita* Hook. Sp. Fil. **1**: 32. 1844, nomen nudum.

*Hemistegia munita* Presl, Abh. Böhm. Ges. Wiss. V. **5**: 355. 1848.

The present species, based upon Willdenow's no. 20168, was not described until 1869, by Kuhn, although mentioned by several earlier writers under different names as indicated above. Through the kindness of Dr. I. Urban the writer has examined a small portion of Willdenow's specimen, which has as its type locality simply "America." It conforms well with Kuhn's description and represents either a valid species or a nearly sterile state of *H. obtusa* Kaulf.; probably the latter, although it is not matched exactly by other specimens. The scales are brownish, as in that species, but very few and minute; also, the segments are more deeply serrate and the sinuses much narrower than usual. It is, at least, closely allied to *H. obtusa*, and the type should be compared closely with undoubted specimens of that species.

4. *HEMITELIA SPECTABILIS* Kunze, *Linnaea* **21**: 233. 1848.

*Hemistegia spectabilis* Fée, Gen. Fil. 351. 1850-52.

*Actinophlebia obtusa* Presl, Abh. Böhm. Ges. Wiss. V. **5**: 356. 1848, not *Hemitelia obtusa* Kaulf. 1824.

TYPE LOCALITY: Surinam, *Kappler* 1771.

DISTRIBUTION: French and Dutch Guiana, Trinidad, and Venezuela, according to Kunze.

ILLUSTRATION: Hook. Sp. Fil. **1**: pl. 14A (as *H. obtusa*).

So far as can be ascertained this species, which is here identified with some uncertainty, is wholly South American, the Trinidad flora being considered as belonging to that continent. Kunze included in his concept of the species plants from several widely separated regions: Material collected in French Guiana by Leprieur and at first<sup>1</sup> referred doubtfully to *H. obtusa*; better specimens received later from Dutch Guiana and Trinidad; and, finally, material collected near Caracas by Linden and by Karsten. Mettenius<sup>2</sup> subsequently redescribed the species in full, citing it only from Dutch Guiana. Principally on the basis of the latter diagnosis, which does not conflict with that of Kunze, the name is here applied with reservation to the following material in the National Herbarium:

TRINIDAD: Without locality, *Fendler* 25 (4 sheets). Near Valencia, Nov., 1883, *Eggers* 1423. Without locality, *ex herb. Bot. Gard. Trinidad*, 195.

VENEZUELA: El Valle, Island of Margarita, August 16, 1901, *Miller & Johnston* 164. San Juan Mountain, Island of Margarita, altitude 500 meters, July 16, 1903, *Johnston* 191 (in part).

Whether or not these specimens actually pertain to *H. spectabilis*, they at least represent a species distinct from any of the North American flora, and one to which no other name appears to apply. They accord well with the descriptions by Kunze and Mettenius already mentioned. Hooker's figure cited above also agrees perfectly. It was probably drawn from Lockhart's Trinidad material mentioned by him.<sup>3</sup> (See under *H. obtusa*.)

According to Christensen's Index Filicum *Hemistegia spectabilis* Fée is an equivalent of *Hemitelia subincisa*. Fée published no description of it but cited the following synonymy: "*Hemithelia obtusa*, Hook., *fragm.*, \*non Klüss.; *Hemithelia* [Cnemidaria] *subincisa*, Kze." Thus, although he apparently did not intend it to be a transfer of *Hemitelia spectabilis* Kunze to the genus *Hemistegia* and, in fact, makes no reference to Kunze's species, it is nevertheless on the basis of Hooker's illustration a probable synonym of *Hemitelia spectabilis*.

<sup>1</sup> Bot. Zeit. **2**: 297. 1844.

<sup>2</sup> Fil. Hort. Lips. 111. 1854.

<sup>3</sup> This is substantiated by a recent letter from the Director of the Royal Gardens, Kew.



Presl's *Actinophlebia obtusa* was founded wholly upon Hooker's plate 14A which was clearly a misidentification of *H. obtusa* Kaulf., 1824. Hooker's figure, moreover, which is here regarded tentatively as typifying *H. spectabilis*, is itself one of the several original elements of Kunze's *H. subincisa*; but it can scarcely apply to that species as typified here on the basis of Pöppig's Peruvian plant. Kunze, in publishing *H. spectabilis*, writes: "Est quasi media inter meam *H. subincisam* et *H. obtusam*,"—with mention of his earlier (1844) reference of Hooker's plate 14A.

5. *HEMITELIA SUBINCISA* Kunze, Bot. Zeit. 2: 296. 1844.

*Cnemidaria speciosa* Presl, Tent. Pterid. 57. pl. 1. f. 16. 17. 1836, not *Cyathea speciosa* H. & B.; Willd. 1810.

*Hemistegia speciosa* Fée, Gen. Fil. 351. 1850-52.

TYPE LOCALITY: Peru, Pöppig.

DISTRIBUTION: Venezuela to northern Brazil and Peru (according to Underwood MS.).

ILLUSTRATION: Presl, loc. cit. pl. 1. f. 16. 17.

The ground taken by Kunze, in his long review<sup>1</sup> of Hooker's treatment of *Hemitelia* in the *Species Filicum*, for establishing *Hemitelia subincisa* is essentially that taken by Presl, both authors agreeing that Kaulfuss erred in his identification of *Cyathea speciosa* H. & B. (See under *H. speciosa*, page 30). But just what herbarium material Kaulfuss had in hand in transferring *Cyathea speciosa* H. & B. to *Hemitelia* can not be stated, nor can the source of Presl's information. In the Presl herbarium at Prague, however, is a specimen of "*Cnemidaria speciosa*" collected in Peru by Pöppig. This very likely not only formed the basis of Presl's figures 16 and 17, but is probably a plant of the same Pöppig number which gave Kunze many of the data for his new *H. subincisa*. A fragment in the Underwood Fern Herbarium does not agree with Presl's figure 16, but accords perfectly with figure 17. Possibly figures 16 and 17 belong to different individuals or different species. In any case, it seems desirable for present purposes to typify the species on figure 17, which apparently represents Pöppig's Peruvian plant as found in Presl's own herbarium. The Brazilian plant, as represented by Martius's figure,<sup>2</sup> seems to be the same.

Hooker's plate 14A, published as "*H. obtusa*" is also cited by Kunze for his *H. subincisa*; but it is drawn from a Trinidad specimen and represents a species distinct from *H. subincisa*, as the latter is typified in this paper. It is here regarded as representing *H. spectabilis*.

*Hemitelia subincisa* has been credited to Guatemala and other parts of tropical North America, but so far as can be ascertained it is altogether South American.

### FURTHER NOTES ON THE WEST INDIAN SPECIES OF POLYSTICHUM.

Since the writer's revision of the West Indian species of *Polystichum* in the last paper of this series (1909) considerable additional material has been received, some of it showing extension of ranges, as here recorded. The single new species to be described is rather closely related to *P. dissimulans*, yet offers differences which seem to be specific.

*Polystichum ambiguum* Maxon, sp. nov.

PLATE 27.

Fronde 4 or 5, laxly arching, 60 to 74 cm. long, long-stipitate (the stipe as long as the lamina or longer). Rhizome decumbent, about 5 cm. long, 1.5 cm. in diameter, woody, bearing numerous coarse freely branched roots, and sparingly clothed with thin dark to light brown oblong-lanceolate scales about 1 cm. long; stipes stoutish, 31 to 38

<sup>1</sup> Bot. Zeit. 2: 294-299. 1844.

<sup>2</sup> Icon. Pl. Crypt. pl. 48. f. 2.



cm. long, stramineous, subquadrangular, sulcate, bearing a few large flaccid yellowish brown scales near the base, elsewhere nearly glabrous, or with a few linear or fibrillose tortuous scales above, these extending along the rachis but readily deciduous; lamina narrowly ovate, deeply bipinnatifid nearly throughout, 29 to 36 cm. long, 10 to 17 cm. broad, comprising 15 to 17 pairs of spreading mostly falcate pinnæ; middle and lower pinnæ 6 to 8.5 cm. long, 1.5 to 2 cm. broad at the middle, subpinnate, strongly inæquilateral at the base, the superior basal segment much the largest, free, rhombic-ovate from an unequal narrowly cuneate base, the inferior one minute, free, the next 5 to 8 pairs narrowly to broadly rhombic-ovate, 8 to 12 mm. long, very oblique (the distal margin lying close to the narrowly alate secondary rachis), the apical segments much narrower, fully adnate and strongly decurrent, finally evident only as deep serrations at the acuminate apex; all the segments sharply acuminate but scarcely spinescent; apical pinnæ 1 to 2 cm. long, inserted 1 to 1.5 cm. apart; leaf tissue membranaceous, the under surfaces very sparingly and minutely fibrillose-paleaceous, mainly along the veins; rachis stout, very narrowly alate in the upper part, terminating in a large viviparous bud 1 to 2 cm. above the apical pinnæ; venation concealed, mostly flabellate, repeatedly dichotomous, the segments without definite midribs; sori large, irregularly biserial, the larger segments with 2 to 5 pairs.

Type in the U. S. National Herbarium, nos. 520201 and 520202, collected upon rocky slopes bordering humid forests in the immediate vicinity of Holly Mount, Mount Diabolo, Jamaica, altitude about 750 meters, May 25 to 27, 1904, by William R. Maxon (no. 2283).

The relationship of the present species is clearly with *P. dissimulans*. From this it differs mainly in the paler scales of the rhizome, in its different leaf shape, fewer pinnæ and minute inferior basal pinnules, in its flagelliform (and not foliose) apex, and in its sharply acuminate, rather than rigidly spinescent, segments. *P. dissimulans* is the most rigidly coriaceous of all the West Indian allies of *P. triangulum* while *P. ambiguum* has singularly flaccid fronds for a member of this group. *P. heterolepis*, though superficially resembling *P. ambiguum* to a certain extent, differs in nearly all essential details.

EXPLANATION OF PLATE 27. A middle section of the type specimen.

***Polystichum plaschnickianum* (Kunze) Moore.**

This species, known hitherto only from Jamaica, has been collected recently in Santo Domingo by von Türckheim (no. 3038). The specimens, which are typical, are from the vicinity of Constanza, altitude 1,350 meters.

***Polystichum polystichiforme* (Fée) Maxon.**

Known previously only from Cuba and Jamaica. Collected recently in Porto Rico by Brother Hioram, his specimens (no. 245) from Mount Torresilla, July, 1911.

***Polystichum triangulum* (L.) Fée.**

This species, mentioned in the last paper as inhabiting only Santo Domingo, Cuba, and Jamaica, occurs also in Guatemala. The record rests upon plants collected by von Türckheim near Coban, Alta Verapaz, altitude about 1,350 meters, on rocks, and distributed by Captain Smith as no. 851.

Specimens from the vicinity of Constanza, Santo Domingo, altitude 1,190 meters, February, 1910, von Türckheim 2933, distributed as *Polystichum triangulum* var. *ilicifolium* Fée are not *Polystichum ilicifolium* Fée. They are, rather, referable to *P. triangulum*, but represent an unusually spiny form of the species.

***Polystichum wrightii* (Baker) C. Chr. in herb.**

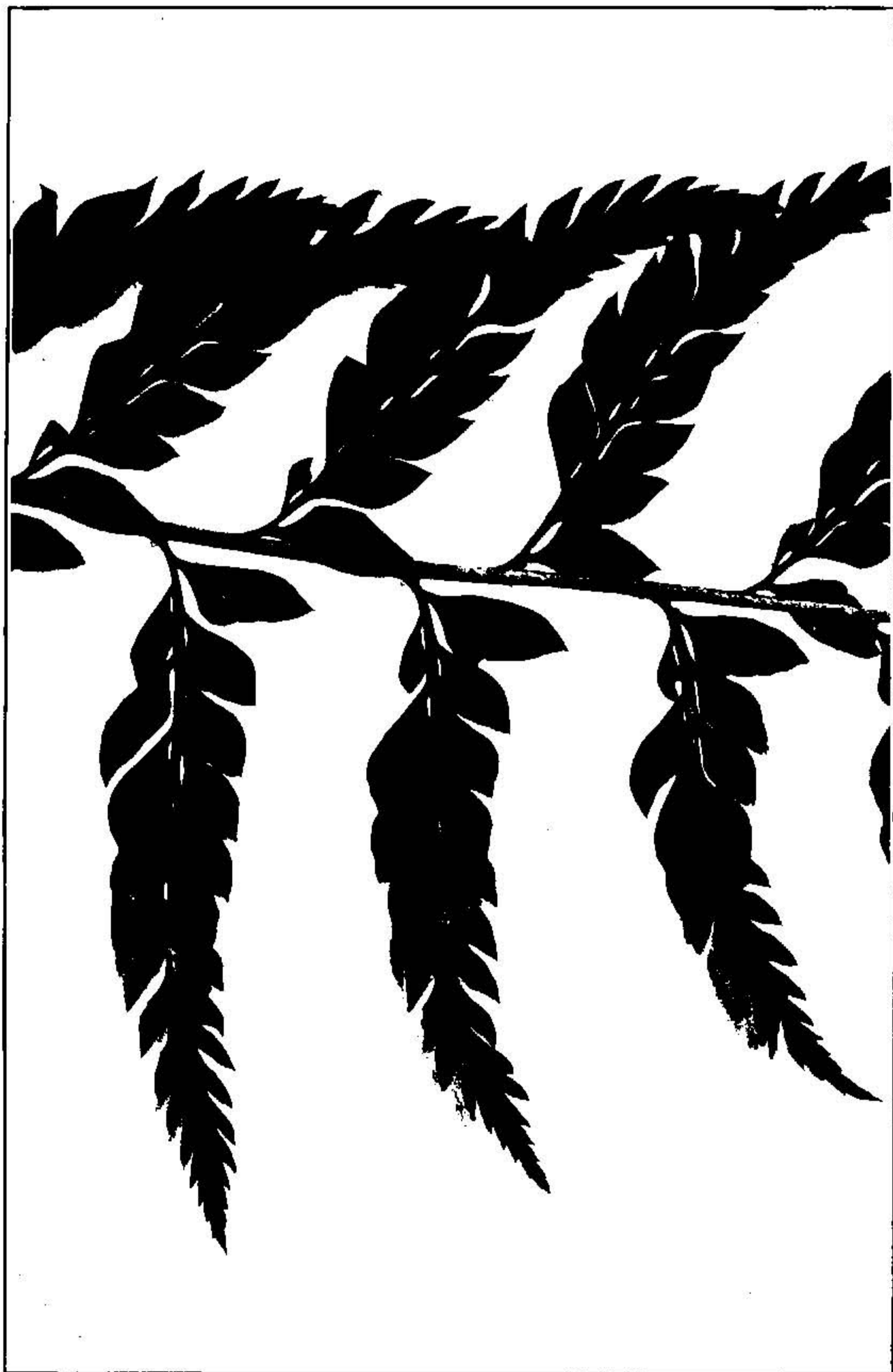
*Polypodium wrightii* Baker in Hook. & Baker, Syn. Fil. 304. 1867.

*Dryopteris sauvallei* C. Chr. Ind. Fil. 291. 1905.

*Polystichum longipes* Maxon, Contr. Nat. Herb. 13: 34. pl. 6. 1909.

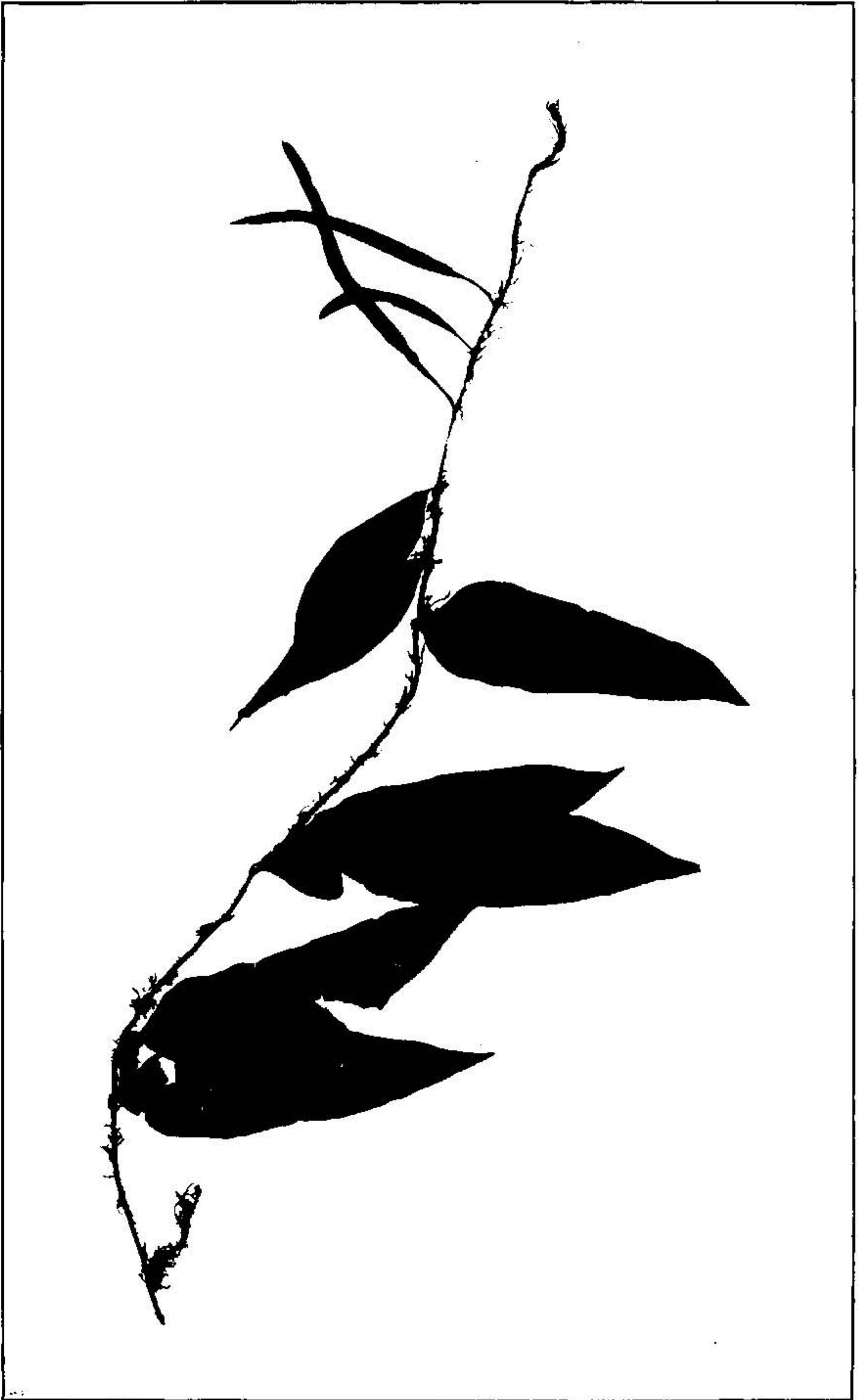
The above synonymy relates wholly to a Cuban species known only upon Wright's no. 3924. Baker, strangely enough, first described the species under his section





POLYSTICHUM AMBIGUUM MAXON.





*PTEROPSIS UNDERWOODIANA* MAXON.



"Euphegopteris" of Polypodium. Christensen, supposing it from this incomplete description and wrong generic position to be a Dryopteris, transferred it to that genus as *D. sauvallei*, the new species name being necessary in Dryopteris because of an earlier *D. wrightii* of Kuntze (1891). Subsequently he examined specimens at Stockholm, and noting their true affinity, called them *Polystichum wrightii*, a name which must take precedence over *P. longipes*, published in ignorance of Baker's diagnosis.

### THE AMERICAN SPECIES OF PTEROPSIS.

In publishing the new genus *Ananthacorus* several years ago<sup>1</sup> the writer indicated briefly the grounds upon which the generic name *Pteropsis* (Desvaux, 1827) should be taken up to replace *Drymoglossum* (Presl, 1836). Two species of this genus have been known previously from America, one from Ecuador, the other from Martinique. A third, from Costa Rica, was detected by Dr. L. M. Underwood in 1904, but apparently never named or described by him.

The three species are:

**1. *Pteropsis wiesbaurii* (Sodirol) Maxon.**

*Drymoglossum wiesbaurii* Sodirol, Vasc. Crypt. Quit. 419. 1893.

Known only from Ecuador, the type being from tree trunks along the Rio Chimbo, altitude 300 to 500 meters.

**2. *Pteropsis martinicensis* (Christ) Maxon.**

*Drymoglossum martinicense* Christ, Bot. Jahrb. Engler 24: 137. 1897.

Apparently confined to Martinique; the original specimens from trees and rocks near Vaucelin, *Duss* 250b.

**3. *Pteropsis underwoodiana* Maxon, sp. nov.**

PLATE 28.

Rhizome sarmentose, very slender, about 1 mm. in diameter, sparingly paleaceous, the scales subappressed, grayish, about 1 to 1.5 mm. long, linear-oblong to oblong-ovate, acute, minutely erose, membranous, with thin cell walls. Sterile fronds sessile, lanceolate, acuminate, 8 to 13 cm. long, 2.2 to 3.8 cm. broad above the broadly cuneate, usually equilateral base, strongly costate, the stramineous midvein and slender irregularly reticulate veins elevated and evident upon both sides throughout; leaf tissue firmly membrano-chartaceous, inconspicuously whitish-glandular above, bearing upon both surfaces numerous but distant minute punctiform ovate to suborbicular scales, these centrally peltate, with narrowly erose-fimbriate whitish margins. Fertile fronds 9 to 11 cm. long, short-stipitate, the stipe (1 to 1.5 cm. long) stout, appressed-paleaceous, the lamina linear, narrowly long-cuneate, 8 to 9 cm. long, 4 to 5 mm. broad; sporangia arising in a dense line about midway between the costa and margin, spreading to the margin and at maturity almost completely obscuring the costa below the short linear-cuspidate apex.

Type in the U. S. National Herbarium, no. 827444, collected near Suerre, Llanuras de Santa Clara, Costa Rica, altitude 300 meters, February, 1896, by John Donnell Smith, no. 6941; distributed as "*Acrostichum amygdalifolium* Mett." There are specimens of the same number in the Underwood Fern Herbarium, New York Botanical Garden.

The American species may be distinguished by the following key:

Lamina of sterile fronds obovate, coriaceous, about 3 cm. long, 1 cm. broad, densely covered with minute appressed stellate scales; fertile fronds plicate. . . . . 2. *P. martinicensis*.

<sup>1</sup> Contr. Nat. Herb. 10: 486. 1908.



Lamina of sterile fronds lanceolate to oval-lanceolate, membranous or membrano-chartaceous, 2 to 4 times as large, one or both sides bearing minute scattered suborbicular to ovate scales; fertile fronds not plicate.

Fertile fronds 3 to 4 mm. broad, long-stipitate, the stipe 3 to 5 cm. long; sterile fronds oval-lanceolate, 6 to 9 cm. long; 2 to 3 cm. broad . . . . . 1. *P. wiesbaurii*.

Fertile fronds 4 to 5 mm. broad, short-stipitate, the stipe 1 to 1.5 cm. long; sterile fronds lanceolate, 8 to 13 cm. long; 2.2 to 3.8 cm. broad . . . . . 3. *P. underwoodiana*.

### TWO UNUSUAL FORMS OF DICRANOPTERIS.

Under the head of "Doubtful or Extralimital Species" the writer, in treating recently the North American species of *Dicranopteris*,<sup>1</sup> made mention of two peculiar forms as follows:

*Mertensia gleichenioides* Liebm. Vidensk. Selsk. Skr. V. 1: 296. 1849. (*Gleichenia liebmanni* Moore, Index Fil. 379. 1862.) A remarkable form, accurately described by Liebmann from specimens collected by him near Cuaba, Vera Cruz, Mexico, and apparently not since collected. In general appearance the specimens differ widely from the usual type of *Dicranopteris* in the direction of *Gleichenia*, but not in venation and other characters. In minute characters they appear to represent a species not otherwise known, but in gross morphology the plant is almost certainly atypical and possibly indicates a reversion toward a general ancestral form. Plants similar in form, but very different in vestiture, have been collected in Jamaica by Professor Underwood and the writer; these were growing with *D. bifida*, and from their minute characters must be reckoned a form of that species.

The present note is for the purpose of directing further attention to the peculiar morphology of these plants.

Plate 29 represents at about two-fifths natural size the Jamaican plants referred to (*Maxon* 936). They were collected by the writer in company with Prof. L. M. Underwood upon the dryish, brushy slopes of an abandoned coffee plantation, altitude about 750 meters, above Tweedside, which is near Mount Moses, in the Blue Mountains. Surrounding them upon all sides was a typical growth of the common tropical American species called *Dicranopteris fulva* (Desv.) by Doctor Underwood<sup>2</sup> and recently redescribed<sup>3</sup> by the writer under an earlier species name as *D. bifida* (Willd.) Maxon. The unusual interest attaching to these specimens was perhaps not fully appreciated at the time; at any rate nothing was noted beyond the fact that they covered an area of only a few square feet in the midst of normal *D. bifida*. Plants of similar form were not encountered elsewhere in Jamaica, although *D. bifida* is the commonest species of the genus at mid-elevations. In minute characters the specimens are evidently identical with ordinary *D. bifida*, which in its several forms is one of the most readily recognized species of the genus in North America, its

<sup>1</sup> N. Amer. Flora 16<sup>1</sup>: 53-63. 1909.

<sup>2</sup> N. Amer. Flora 16<sup>1</sup>: 60. 1909.

<sup>3</sup> Bull. Torrey Club 34: 255. 1907.





DICRANOPTERIS BIFIDA (WILLD.) MAXON.

(A monstrous form.)



segments being covered beneath by a rusty, usually dense, entangled tomentum, which, however, with age frequently becomes bleached and matted, or nearly disappears.

The peculiarity of the Jamaican form here figured consists mainly in its having its simple pinnæ very narrowly linear (3 to 5 mm. broad) and merely subentire to broadly crenate, instead of pectinate, as in the normal form. The veins, which are short, are once-forked, the branches either simple or one or both of them again forked. The sori are dorsal upon the veinlets, as in all species of *Dicranopteris*, instead of terminal, as in *Gleichenia*. A dull brownish rusty tomentum closely invests the under surface of the pinnæ throughout from the narrowly revolute margins to the rachis. The primary internodes which subtend the pinnæ are precisely like those of the normal fronds of the species (*Maxon 937*), which were collected at the same time and place, except that they have in several instances a crenate or crenately lobed wing on the *lower* side, as well as upon the upper. The presence or absence of reduced segments bordering the primary and secondary internodes of the lateral branches of *D. bifida* is, however, an unusually variable feature.

Of almost identical form, but of very different covering below, is the plant described by Liebmann as *Mertensia gleichenioides*, *Mertensia* being used by him as the equivalent of *Dicranopteris*, and the species name *gleichenioides* in allusion to the general resemblance which the plant offers to true Old World *Gleichenia*. The lightly but broadly crenate pinnæ are a little more slender than in the monstrous form from Jamaica, not exceeding 4 mm. in width, and the margins are for the most part strongly revolute. The rachises of the pinnæ are clothed below with delicately lacerate pale ferruginous scales, and the veinlets of the under surface are covered with minutely dissected subpersistent scales, their capillary divisions exceedingly delicate and in mass strongly suggesting a tomentum. The veins are mostly once-forked, each of the branches again once or twice forked, the veinlets thus subfasciculate, a group to each broad crenation.

That Liebmann's plants represent an abnormal state of some Mexican species, as the monstrous state here figured does of *D. bifida*, is entirely probable, but the writer is unable to identify it with any previously described. For a very careful sketch of the two specimens constituting Liebmann's type, and for a pair of pinnæ of the type, forwarded from the Botanisk Museum, Copenhagen, to the U. S. National Museum, the writer is indebted to the courtesy of Mr. Carl Christensen.

As to the significance of the peculiar form shown by these two collections of different species, speculation is perhaps idle; yet it seems not unlikely that they represent a reversion to a more generalized ancestral type, rather than a chance variation. And the supposition that they may, perhaps, be an atavistic expression is doubtless



strengthened by their separate occurrence in regions far apart. Minor variations in form, size, and vestiture of the segments, in the highly complex scheme of branching, and in the production of segments upon the internodes of the lateral branches—all of these being features observed commonly in the field—seem to indicate that the species of this genus are in a more or less unstable state; and this renders the more significant so pronounced a departure from the normal form. Members of this family are said to be difficult of cultivation, which, together with the usual incompleteness of herbarium material, may account for the scant attention they have received. Nevertheless, the group is one of the greatest interest and one which, in the writer's opinion, would well repay critical investigation of the living plants, more especially a comparative study of those species showing radically diverse methods of branching. Following such a study it is not unlikely that *Dicranopteris*, instead of being again merged in *Gleichenia*, will itself be subdivided into several genera.

#### THE AMERICAN SPECIES OF CIBOTIUM.

In working over *Cibotium* for the forthcoming second part of volume 16 (Pteridophyta) of the North American Flora, it has been found that the American species have, if anything, been more frequently misidentified than the Old World material of the genus. The main reason for this appears to be that no one has given the American species careful attention. Thus, Kuhn properly distinguished two new species, *C. guatemalense* and *C. wendlandi*, in 1869, but failed to point out that Hooker's illustration of "*Cibotium schiedei*," plate 30A of the *Species Filicum*, really pertained to one of these, *C. wendlandi*. The confusion attending the illustration of *C. regale*, itself a valid species, is explained farther on, under that species. As a matter of fact the material available at any one herbarium is probably scant; and the distinctive points of difference among the several species, if evident to individual students, have at least never been pointed out. Full descriptions of the four species already mentioned will appear shortly. In the meantime illustrations of these, with the notes here given by way of comparison, may be helpful. The *Cibotium horridum* of Liebmann is found not to belong to this genus or its tribe.

The genus *Cibotium* of Kaulfuss is often credited to his *Enumeratio Filicum* (1824). It was, however, published<sup>1</sup> four years earlier in a little pharmaceutical journal, the only file of which known to the writer is that in the Library of the Surgeon General, in the Army Medical Museum, Washington, D. C. The original description is as follows:

"Die Fruchthausen sind in gewölbten, an einem Punkte auf der Unterseite des Laubes befestigten, lederartigen Schleierchen eingeschlossen, die sich von oben

<sup>1</sup> Kaulfuss in Berl. Jahrb. Pharm. 21: 53. 1820.





CIBOTIUM SCHIEDEI SCHLECHT. & CHAM.



mit einem bleibenden, nach der Rippe der Lappchen zu sich neigenden Deckel öffnen. Nur Eine, wahrscheinlich baumförmige, Art, *Cibotium Chamissoi*, von der Südsee."

In America the genus is apparently restricted to the northern continent. The species may be distinguished by means of the following key:

## KEY TO THE SPECIES.

- Costæ glabrous or readily glabrescent; leaf tissue conspicuously ceraceo-pruinose below.
- Sori mostly distant or subdistant, usually extending beyond the margin in the plane of the segment..... 1. *C. schiedei*.
- Sori contiguous to imbricate, appearing dorsal, i. e., not extending beyond the margin.
- Lamina deeply tripinnatifid; veins 7 to 9 pairs to the segment; sori nearly parallel to the costule..... 2. *C. regale*.
- Lamina tripinnate or subtripinnate; veins 8 to 15 pairs to the segment; sori obviously oblique to the costule, closer..... 3. *C. guatemalense*.
- Costæ thickly invested with long persistent antrorse hairs; leaf tissue not obviously ceraceo-pruinose below..... 4. *C. wendlandi*.

1. *Cibotium schiedei* Schlecht. & Cham. Linnaea 5: 616. 1830. PLATE 30.

*Dicksonia schiedei* Baker in Hook. & Baker, Syn. Fil. 50. 1866.

TYPE LOCALITY: Hacienda de la Laguna, Mexico, *Schiede* 801.

DISTRIBUTION: Humid mountains of Oaxaca and Vera Cruz, at 600 to 1,200 meters elevation.

ILLUSTRATIONS: Presl, Tent. Pterid. pl. 11. f. 9.

*Cibotium schiedei*, which was the first species of this genus to be described from North America, is apparently confined to Mexico.<sup>1</sup> It has long been in cultivation and need not be confused with any other. The fertile segments, especially the larger ones, are manifestly dentate-crenate and contain only 6 to 8 pairs of veins, of which the fertile ones are almost invariably simple and the sterile ones usually once forked at a slight angle. The most distinctive feature lies in the distant or subdistant produced sori (2 to 7 pairs) which commonly extend outward in the plane of the lamina, but in a few instances (in extreme age) are bent back under the segment. This character, while helpful in distinguishing the species, is possibly not fundamental and is, no doubt, correlated directly with the thin, chartaceous leaf tissue. In all the other American species the sori are closer and have the appearance of being erect and dorsal, since the segments, on account of their coriaceous or at least herbaceous texture, have the margins strongly revolute at maturity or in drying.

The following specimens have been examined:

MEXICO: Hacienda de la Laguna, *Schiede* 801. San Francisco, Mirador, *Liebmann*. Orizaba, *Müller*. Cordoba, *Kerber* 90a; *Fink* 13; *Bourgeau* 2378. Barranca de Tenampa, Zacuapan, Vera Cruz, September, 1906, *C. A. Purpus* 1976. Zacuapan, Vera Cruz, November, 1908, *C. A. Purpus* 1976a. (Also numerous specimens from the Botanical Gardens of Kew, Berlin, and Leipsic.)

EXPLANATION OF PLATE 30.—*a*, Pinnule from a cultivated plant, *ex hort. Lips.*; *b*, portion of pinnule of type collection (*Schiede* 801), in Underwood Fern Herbarium; *c*, pinnule from very old specimen of *Purpus* 1976; *d-g*, *Purpus* 1976a, *d* representing one of the larger inferior pinnules, *e* and *f* two superior pinnules from near the base of the pinna (at a point opposite *d*), *g* a nearly sterile pinnule from near the middle of a pinna. Only *a* shows the upper surface. All are at natural size.

<sup>1</sup> Skinner's plant from Guatemala, referred here by Hooker, is *C. wendlandi*. See under that species, p. 57.



**2. *Cibotium regale*** Versch. & Lem. Ill. Hort. 15: under *pl.* 548. 1868. PLATE 31.

*Dicksonia regalis* Baker in Hook. & Baker, Syn. Fil. ed. 2. 461. 1874.

TYPE LOCALITY: Described from cultivated specimens collected in Mexico by Ghiesbreght, altitude 1,500 to 1,800 meters.

DISTRIBUTION: Chiapas, Mexico.

ILLUSTRATION: Ill. Hort. *pl.* 548, in part (colored figure; also fig. 5?).

The original description of this species states no exact locality for the specimens collected by Ghiesbreght, but gives the altitude as from 5,000 to 6,000 feet. Two large pinnæ of Ghiesbreght's collection in the D. C. Eaton herbarium, however, have the following data: "No. 351. Terre tempérée. Etat de Chiapas. Fougère arborescente. Tronc de 3 à 4 pieds de haut. Frondes de 5 à 6 metres de longueur. Croix au bord des ruisseaux. Juillet et Aout."; all but the number being apparently in Ghiesbreght's hand. Three pinnules of this, which is doubtless the type collection, are shown in plate 31 and will give an excellent idea of the species.<sup>1</sup>

*Cibotium regale* has nearly the form of *C. wendlandi*, but differs conspicuously in its acuminate (not aristate) segments, in having the costæ and costules very sparingly silky-pubescent below (the hairs long and very readily deciduous), and in having the under surface of the segments conspicuously pruinose (not greenish). In cutting it is quite dissimilar to *C. guatemalense*. It is more nearly related, perhaps, to *C. schiedei*, but differs in many respects, notably in its more numerous pinnules, greater size, different texture, revolute margins, and the different direction and position of the sori, and in having the veins of the sterile segments mostly two or three times forked, not mostly once forked.

EXPLANATION OF PLATE 31.—Three pinnules of Ghiesbreght 351, from Chiapas. Natural size.

**3. *Cibotium guatemalense*** Reichenb.; Kuhn, Linnaea 36: 152. 1869. PLATE 32, *f, g.*

*Dicksonia guatemalensis* Baker in Hook. & Baker, Syn. Fil. ed. 2. 461. 1874.

TYPE LOCALITY: Guatemala, *Wendland*.

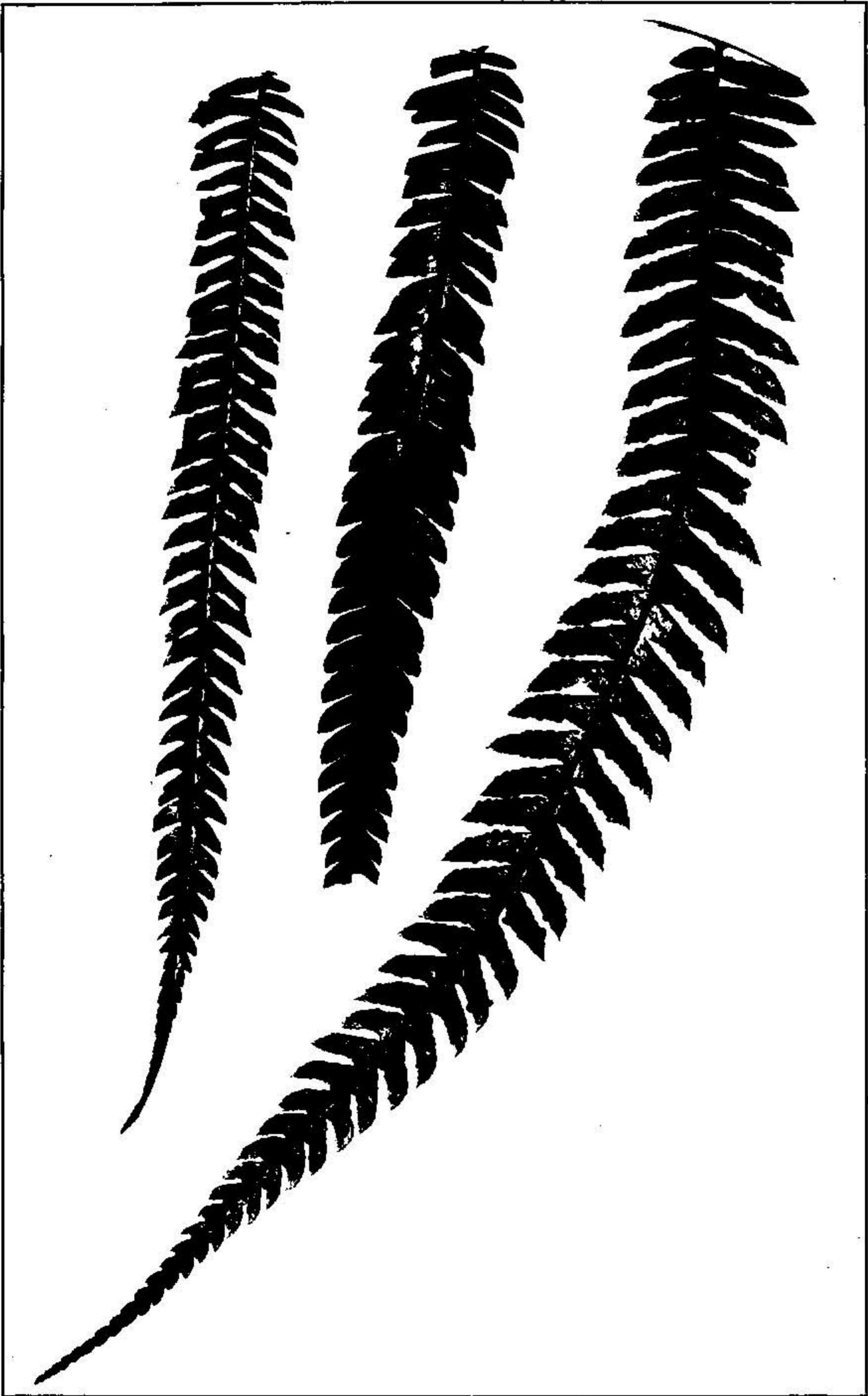
DISTRIBUTION: Apparently confined to the humid mountain region of eastern Guatemala, altitude 1,500 meters or less.

*Cibotium guatemalense* is readily distinguished from its allies by the key characters noted above. It has very large, nearly or quite tripinnate fronds, with both pinnæ and pinnules very much larger than those of *C. schiedei*, from which it differs conspicuously also in its imbricate, differently placed sori and its more numerous veins (8 to 15 pairs). The oblique position and crowding of the sori separate it immediately from *C. regale*.

The species has been reported from Costa Rica upon the basis of two different collections. The first of these (*Warscewicz* 43), according to a pinnule in the Underwood Fern Herbarium, indicates an undescribed species very closely allied to *C. wend-*

<sup>1</sup> An illustration is practically essential to a clear understanding of this species, owing to the very faulty original figures and the confusion existing between Lemaire's legends for the detailed drawings and his "explanation of the analytical figures." Figure 5 of plate 548 is presumably "fig. 1" of the "explanation," and probably is intended to represent Ghiesbreght's plant, as is stated. Figures 1, 2, 3, and 4 of plate 548 apparently represent the two "pennules" and "a, b, & c" mentioned in the "explanation," which are said to be redrawn from Hooker's plate 30A of the Species Filicum, and are obviously copied from that. A comparison of plate 548 with Hooker's plate 30A shows that the disagreement of the numbers which really appear on plate 548, with the letters and numbers of Lemaire's "explanation," is due to an error of the artist, who copied not only Hooker's detailed illustrations but also the identical numbers which accompanied them in the original! The drawing labeled 5 in plate 548 is, as mentioned above, doubtless meant for *C. regale*; but its resemblance to Hooker's figure (fig. 1 of *pl.* 548) is too close to offer any distinctive features whatever. It should be borne in mind also that the plant of Hooker's plate 30A is not *C. schiedei*, but *C. wendlandi*. (See under the latter species, p. 57.)





CIBOTIUM REGALE VERSCH. & LEM.





CIBOTIUM WENDLANDI METT. AND C. GUATEMALENSE REICHENB.



*landi*; it is, at any rate, not *C. guatemalense*. The second is of a plant collected by Wercklé and listed<sup>1</sup> by Christ as *Cibotium guatemalense*. Several specimens of this in the U. S. National Herbarium, received from Doctor Christ and so labeled in his hand, are *Dicksonia navarrensis* Christ. So far as can be ascertained, *C. guatemalense* is strictly confined to Guatemala.

The following specimens have been examined:

GUATEMALA: Santa Cruz, Alta Verapaz, altitude 1,380 meters, *John Donnell Smith* 1505 (5 sheets). Rio Frio, near Santa Cruz, Alta Verapaz, *von Türckheim* II. 2113 (4 sheets). Without locality, *Salvin & Godman* (ex herb. Kew).

4. *Cibotium wendlandi* Mett.; Kuhn, *Linnaea* 36: 151. 1869. PLATE 32, a-e.

*Dicksonia wendlandi* Baker, in Hook. & Baker, *Syn. Fil.* ed. 2. 460. 1874.

TYPE LOCALITY: Guatemala, *Wendland*.

DISTRIBUTION: Probably confined to Guatemala.

ILLUSTRATION: Hook. *Sp. Fil.* 1: pl. 30A (as *C. schiedei*).<sup>2</sup>

*Cibotium wendlandi* differs widely from the other American species of this genus in the persistent, appressed-hairy covering of the costæ and costules, and in its greenish under surfaces. A close examination, nevertheless, shows the underside of the leaf tissue to be very minutely papillate, though not pruinose.

Christ has reported<sup>3</sup> this species from Chiapas, Mexico, upon specimens collected by Munch, and has subsequently<sup>4</sup> given the further data: "El Zontehuitz, altitude 2,858 meters (*Munch* 104)." At the latter reference he lists also a "very similar" Costa Rican plant (*Tonduz* 10697) which, though referred to *C. wendlandi*, is said to "approach" *C. guatemalense*. This number (10697) is again mentioned<sup>5</sup> by him the following year, under *C. wendlandi*, as distinct from *C. guatemalense*; and again in 1907<sup>6</sup> (here incorrectly as no. 10797) as *C. wendlandi*, "distinguished from *C. guatemalense* by its hairy surface and greater dimensions." The plant in question (no. 10697) is represented by two excellent specimens in the U. S. National Herbarium, one of these received from Doctor Christ. It is not a *Cibotium*, but an apparently undescribed species of *Dicksonia*. Under the circumstances the Mexican record (*Munch* 104) must be considered as exceedingly doubtful, not only for the species *C. wendlandi* but for the genus *Cibotium* as well; the plant is probably a *Dicksonia*.

*Cibotium wendlandi* is apparently a species of the semiarid regions of the Pacific coast, which probably accounts for the denser vestiture of the leaf surfaces. The following specimens have been examined:

GUATEMALA: Without locality, *Skinner* 22 (ex herb. Kew); *Wendland* (ex herb. Berol.). Guatemala, Depart. Guatemala, altitude 1,350 meters, *John Donnell Smith* 2423 (4 sheets).<sup>7</sup>

EXPLANATION OF PLATE 32.—a-e, *Cibotium wendlandi*; a, fragment (from Kew) of Skinner's Guatemalan specimen; b, fragment (from Berlin) of Wendland's Guatemalan specimen (type collection); c-e, Guatemala, *John Donnell Smith* 2423, c being a small subapical pinnule, d and e the fifth pair from the base (inferior and superior, respectively); f, g, *Cibotium guatemalense*; f, Guatemala, *John Donnell Smith* 1505, a middle inferior pinnule; g, Guatemala, *von Türckheim* II. 2113, one of the larger superior pinnules.

All at natural size.

<sup>1</sup> Bull. Herb. Boiss. II. 5: 251. 1905.

<sup>2</sup> This illustration has such slight resemblance to *C. schiedei* that the writer wrote to Kew, asking the source of the material figured. The reply (May 2, 1910) states that the figure was probably drawn from Skinner's no. 22. A pinnule of this, forwarded at the same time, is *C. wendlandi*.

<sup>3</sup> Bull. Herb. Boiss. II. 5: 251. 1905.

<sup>4</sup> Loc. cit. II. 5: 734. 1905.

<sup>5</sup> Loc. cit. II. 6: 189. 1906.

<sup>6</sup> Loc. cit. II. 7: 273. 1907.

<sup>7</sup> Captain Smith states in a recent letter that the exact locality is a barranca or deep ravine bounding a little hacienda called Aceituno, not far outside Guatemala City.



## EXCLUDED SPECIES.

*CIBOTIUM HORRIDUM* Liebm. Vid. Selsk. Skr. V. 1: 279. 1849.

This species is represented in the U. S. National Herbarium by three pinnules and part of a secondary rachis of Liebmann's original material, forwarded from Copenhagen, and said to have been collected by Liebmann in June, 1842, "in sylva montana prope Teotalcingo, Chinantla, Dept. Oaxaca, alt. 4-5000'." The most cursory examination of the scales of the rachis shows them to be relatively short, rigid, spinescent-ciliate, 5 to 10 cells broad, and thus of a totally different type from those of *Cibotium*, which are capillary, flaccid, and only a single cell broad. Their agreement with scales of the secondary rachis of *Cyathea princeps* (Linden) E. Meyer is so close, and the secondary rachis and the pinnules agree so closely in every particular, that Liebmann's species must undoubtedly be written as a synonym of *Cyathea princeps* as recently redescribed by the writer.<sup>1</sup> Liebmann's specimens, according to his description and the fragments received, are sterile, as might be expected in young plants of a *Cyathea* attaining the great size of *C. princeps* and in plants of such small size as that attributed by Liebmann to *Cibotium horridum*.

## TWO NEW SPECIES OF NOTHOLAENA.

In a recent examination of the Mexican material of *Notholaena* in the U. S. National Herbarium the following two new species were detected:

***Notholaena leonina* Maxon, sp. nov.**

Fronde 4 to 8 in number, 4 to 11 cm. high, fasciculate. Rhizome relatively stout, creeping or ascending, 1 to 1.5 cm. long (incomplete), about 4 mm. in diameter, very thickly clothed with densely imbricate, lance-acuminate to linear-subulate, dark brown scales (2.5 to 3.5 mm. long) with yellowish brown borders, the margins distantly and delicately glandular-papillate (especially toward the apex), otherwise subentire; stipes 2.5 to 7 cm. long, very slender, blackish, terete, slightly scaly toward the base, the scales broader than those of the rhizome, ovate, long-acuminate, yellowish brown, concolorous or with darker tips; lamina deltoid to deltoid-oblong, acute or slightly produced, 2 to 4.5 cm. long, 1.7 to 3.5 cm. broad, bipinnate or rarely tripinnatifid in the basal part, simple above, the apex simply pinnatisect, the rachis similar to the stipe but lightly sulcate ventrally; major pinnæ 3 to 5 pairs (those above simple, linear-oblong to oblong), subopposite, inserted 7 to 12 mm. apart, the basal ones deltoid, with 2 to 4 pairs of spreading pinnules (or segments) below the usually trilobate apex, these elongate-oblong, simple and at least partly adnate, or the basal ones sessile and with 1 or 2 pairs of minute segments or lobes; pinnules or segments in general 1.5 to 2 mm. broad, flat, rigidly herbaceous, grayish green, together with the rachises densely ceraceo-papillate throughout; costæ of the segments wholly concealed above, evident below only toward the base; margins closely revolute about one-third the distance to the costa (or less at maturity), unchanged, only partially concealing the dark brown sporangia.

Type in the U. S. National Herbarium, no. 834605, collected near Monterey, State of Nuevo Leon, Mexico, February 17 to 26, 1880, by Dr. Edward Palmer (no. 1381); the specimens received from Capt. John Donnell Smith.

Known to the writer only from the type number, which apparently was not generally distributed to herbaria; at least it is wanting in the National Herbarium set received originally, and is not cited by Baker,<sup>2</sup> who does, however, list numbers 1382 and 1383 of the same collection as *N. pringlei*. Eaton<sup>3</sup> listed no. 1381 as *N. candida* Hook.

<sup>1</sup> N. Amer. Flora 16<sup>1</sup>: 78. 1909.

<sup>3</sup> Proc. Amer. Acad. 18: 185. 1883.

<sup>2</sup> Annals of Botany 5: 482. 1891.



The systematic position of *N. leonina* is next to *N. pringlei* Davenp. and *N. bryopoda* Maxon. From the former, which it resembles superficially, it differs in the delicately glandular-papillate (not coarsely and irregularly denticulate) tips of the rhizome scales, in its very slender terete blackish (not stout sulcate yellowish brown) stipes, in the lesser degree of subdivision of the lamina, and in its flat segments and less coriaceous leaf tissue. *N. pringlei* is usually much larger, and has shorter segments; and even in its younger states commonly has the lamina tripinnate in the lower part. The difference in color and thickness of the stipes is marked.

*Notholaena bryopoda* differs from both species in the complete absence of any ceraceous covering to the lamina, and in numerous other particulars.

***Notholaena rosei* Maxon, sp. nov.**

Fronds 6 to 8, rigidly erect, 30 to 48 cm. high, loosely fasciculate. Rhizome suberect, stout, multicapital, 1.5 to 3 cm. in diameter, 4 to 5 cm. long, densely paleaceous, freely radiceous, and bearing numerous imbricate stipe-bases of old fronds; scales of the rhizome closely imbricate, lance-acicular, 2 to 2.5 mm. long, very rigid, the center yellowish brown, the apex and sides lustrous blackish brown and strongly thickened, with a delicate lax yellowish white araneose-ciliate outer border; stipes stout, 1.5 to 2 mm. in diameter, 8 to 13 cm. long, brownish stramineous from a dull castaneous brownish flexuous base, subterete, lightly canaliculate along the anterior face, sparingly and deciduously scaly, densely puberulous with glandular-capitate hairs; lamina 20 to 35 cm. long, 7 to 10 cm. broad near the middle, lanceolate, acuminate, deeply tripinnatifid nearly throughout, the rachis similar to the stipe but with a conspicuous narrow ventral furrow; pinnæ few, distant, of a deltoid type, mostly inequilateral, ascending, stalked (1 to 3 mm.), the basal pair subopposite and reduced (about 2 cm. long), the second pair 5 to 6 cm. distant; middle pinnæ subopposite, 3 to 5 cm. apart, deltoid-ovate, 4 to 5 cm. long, 1.8 to 2.3 cm. broad, comprising about 8 to 10 pairs of distant subsessile to adnate pinnules below the pinnately lobed acuminate apex; larger pinnules oblong-acuminate to narrowly deltoid-oblong and subcaudate, 10 to 15 mm. long, 3 to 5 mm. broad, pinnatifid (often nearly to the midvein), the lobes about 4 to 6 pairs; upper pinnæ simply pinnate, 1 to 2 cm. apart; leaf tissue herbaceous, bright yellowish green and glabrous above, below densely white-ceraceous, partially concealing the costæ of the pinnules; margins yellowish, a very narrow border slightly metamorphosed and partly covering the sporangia before maturity, early thrust back; sporangia dark brown, relatively thick.

Type in the U. S. National Herbarium, no. 451280, collected on a rocky hillside near Chapala, State of Jalisco, Mexico, October 5, 1903, by J. N. Rose and J. H. Painter (no. 7665).

The only other specimens seen are very immature plants of no. 701 of Dr. Edward Palmer's 1886 collection, from the same place. These are mentioned by Davenport<sup>1</sup> as identical with Pringle's "2830," which is there described as *Notholaena lemmoni* var. *straminea* Davenport, var. nov. Mr. Pringle's type specimens ("2830"), which are said to have come from rocky hills near Guadalajara, Jalisco, December, 1888, have not been seen by the writer. They are not at the Gray Herbarium, nor at the Davenport Herbarium in Boston; moreover the number 2830 was given by Mr. Pringle (perhaps subsequently) to a flowering plant (*Asclepias mexicana*) which was actually distributed in his regular series. Judging from the brief description, *Palmer* 701 is the same as *Pringle* "2830," the type of var. *straminea*; but this is by no means certain. Possibly no. "2830" may be contained in the Pringle Herbarium. This is now the property of the University of Vermont and available for study only to investigators who will consult it in Burlington, Vt. Under the circumstances it seems advisable not to make up the varietal name for this species.

*Notholaena rosei* is so dissimilar in every respect from *N. lemmoni* that one wonders upon what common ground the comparison of relationship could have been instituted

<sup>1</sup> Garden and Forest 4: 519. 1891.



by Mr. Davenport. In general leaf shape only it resembles somewhat *N. rigida*, but the lamina is subtripinnate, instead of bipinnate. In most other characters, and particularly in its puberulous, dull stramineous (not lustrous dark castaneous) stipes and rachis, it is widely different. The rhizome and rhizome scales of the two species are wholly unlike. *N. rosei* appears to have no very near relatives.

### MISCELLANEOUS NOTES AND CHANGES OF NAME.

***Adiantopsis rupicola*** Maxon, Contr. Nat. Herb. 10: 485. 1908.

Two recent collections of this very distinct Cuban species may be reported, as follows:

Baños San Vicente, province of Pinar del Rio, September 12-16, 1910, *Britton, Britton & Gager* 7497; trail from Buenaventura to San Juan de Guacamalla, on rocky hillside, December 16, 1910, *P. Wilson* 9349.

***Cheilanthes aurea*** Baker in Hook. & Baker, Syn. Fil. ed. 2. 476. 1874.

TYPE LOCALITY: Matagua Valley, Guatemala, *Salvin & Godman*.

DISTRIBUTION: Apparently known only from Guatemala.

ILLUSTRATION: Hook. Icon. Pl. pl. 1637.

The original specimens have not been seen by the writer, but the following plant accords perfectly with the diagnosis and later plate:

Along the Rio Carracal, near Quetzaltepeque, Guatemala, altitude 1,000 meters (rare), 10, 7, 1882, *Lehmann* 1689. This number seems to have been omitted by Hieronymus from his report on this collection.

The specimen at hand, received from Captain Smith, was determined by Christ as *Cheilanthes microphylla* Sw.

***Cheiroglossa palmata*** (L.) Presl.

In addition to the illustrations for this species cited in the North American Flora<sup>1</sup> may be mentioned plate 4 of Hooker's *Icones Plantarum* (1837), which shows a small plant said to have come from the island of Bourbon, off the East African coast. In America the plant ranges from southern Florida throughout the West Indies to Mexico and Brazil. Its unusual distribution, which is common to a few other species of pteridophytes, is discussed by Doctor Christ in his recent work, *Die Geographie der Farne*, 1910.

***Dryopteris germaniana*** (Fée) C. Chr.

Christensen, in his second paper on the ferns of the group of *Dryopteris opposita*,<sup>2</sup> has extended the range of *D. germaniana* to Cuba, the species having been known previously only from Guadeloupe. Agreeing exactly with this Cuban specimen (*Maxon* 4059) is a plant received recently from Porto Rico, collected at Barranquitas, July, 1911, by Brother Hioram (no. 270).

***Goniophlebium eatoni*** (Baker) Maxon.

PLATE 33.

*Polypodium ghiesbreghtii* D. C. Eaton, Proc. Amer. Acad. 8: 618. 1873, not Linden, 1867.

*Polypodium eatoni* Baker, in Hook. & Baker, Syn. Fil. ed. 2. 511. 1874.

*Goniophlebium pringlei* Maxon, Proc. U. S. Nat. Mus. 27: 953. pl. 48. 1904.

An examination of the type specimens of *P. ghiesbreghtii* D. C. Eaton in the Eaton Herbarium, collected in Chiapas by Ghiesbreght (no. 273), shows them to be identical with *G. pringlei*, described several years ago upon specimens from the vicinity of Jalapa, Vera Cruz, *Pringle* 11855.

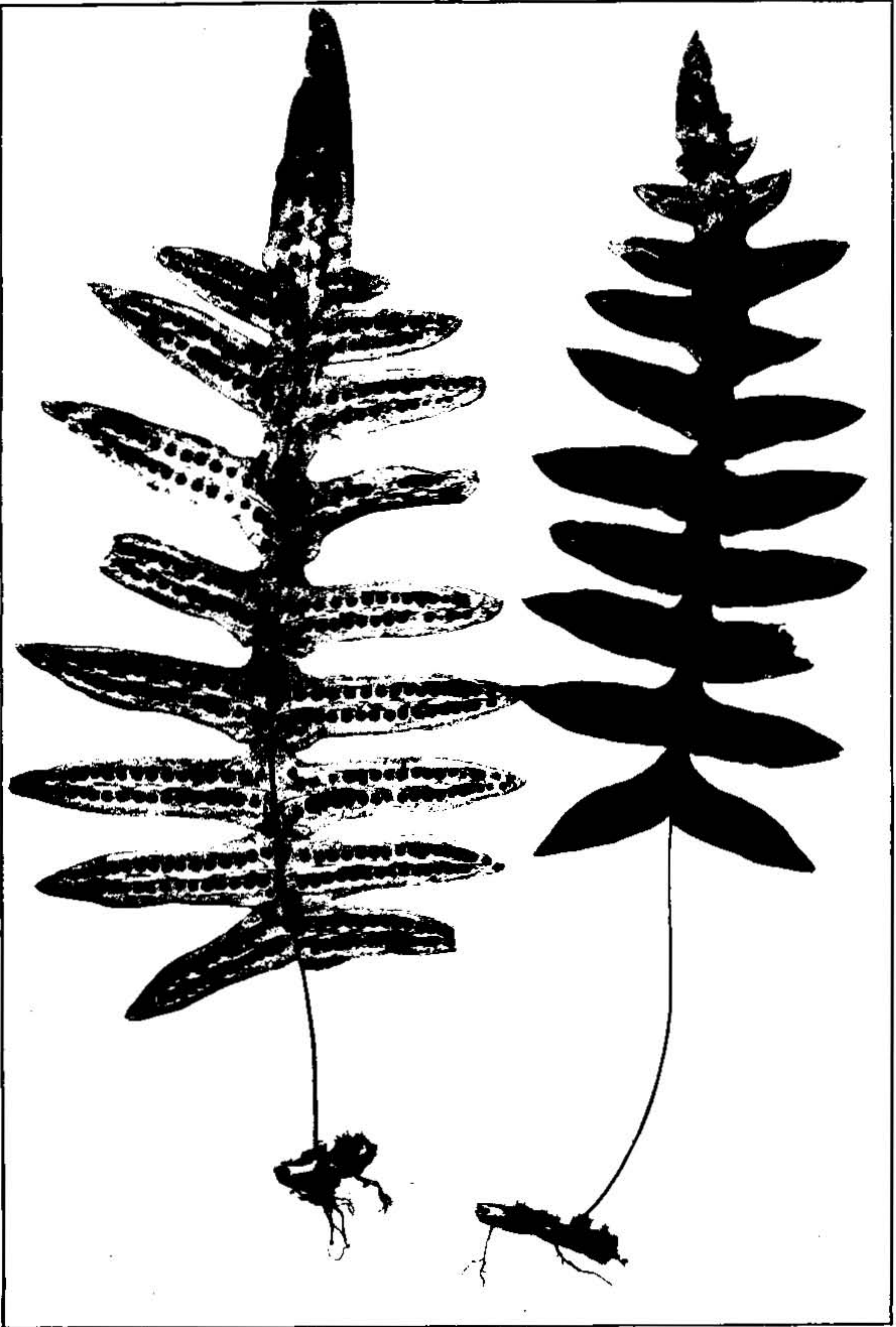
In publishing *G. pringlei* the writer commented upon the peculiar character of one or more pairs of the basal pinnæ, as follows:

"Two additional sheets in the United States National Herbarium differ in having the second pair of pinnæ like the first—that is, free and cordate-clasping at the base

<sup>1</sup> 16: 13. 1909.

<sup>2</sup> Smiths. Misc. Coll. 52: 365-396. 1909.





GONIOPHLEBIUM EATONI (BAKER) MAXON.





GONIOPHLEBIUM RHACHIPTERYGIUM (LIEBM.) MOORE.



below the midvein and fully adnate above, the adnate upper portion of the first pair overlapping the clasping base of the second, there being only a very slight connecting foliar wing along the rachis. In one of these (no. 460766), moreover, this condition occurs in the case of the third pair of pinnæ also, and the foliar wing becomes well developed only between the third and fourth pairs of pinnæ and between succeeding pinnæ. In all four sheets examined the superabundance of leafy tissue, which must have given a remarkable fluted appearance to the living fronds, is very noticeable."

One of the Ghiesbreght plants shows this peculiar condition so admirably that a photographic illustration is given herewith (pl. 33).

The species has been reported<sup>1</sup> by Doctor Christ also from Chiapas, the specimen collected by G. Munch.

**Goniophlebium rhachipterygium** (Liebm.) Moore, Index Fil. 396. 1862. PLATE 34.

*Polypodium rhachipterygium* Liebm. Vid. Selsk. Skr. V. 1: 191. 1849.

*Polypodium stenoloma* D. C. Eaton, Proc. Amer. Acad. 8: 618. 1873.

*Polypodium donnell-smithii* Christ, Bull. Herb. Boiss. II. 6: 291. 1906.

Doctor Christ has recently<sup>2</sup> pointed out the identity of *P. donnell-smithii*, described from Guatemalan specimens collected by von Türckheim (*Donnell Smith* 8823), with the earlier *P. stenoloma* D. C. Eaton, founded upon *Ghiesbreght* 386, from Chiapas, Mexico. A still earlier publication of the species is that by Liebmann, mentioned above, whose specimens came from Teotalcingo, Chinantla, Oaxaca, Mexico, June, 1842. A very complete sketch of these, together with a fragment, both sent by Mr. Christensen at the writer's request, leaves no doubt as to their identity with the plants described subsequently by Professor Eaton and by Doctor Christ.

The illustration presented herewith (pl. 34) is of the type specimens of *P. stenoloma* (herb. D. C. Eaton), showing the plants at about one-half natural size.

**Lycopodium dichaeoides** Maxon, Proc. Biol. Soc. Washington 18: 231. 1905.

Besides the two collections from Alta Verapaz originally mentioned, this species is known to the writer only upon Captain Smith's no. 958, collected at Pansamalá, Alta Verapaz, Guatemala, at about 1,200 meters elevation, by von Türckheim, in July, 1886. The species, though obviously related to *L. aqualoupianum*, is well marked by its short strobiles and its short, rigid, achene-like sporophylls.

**Notholaena rigida** Davenp.

The original specimens are from limestone ledges, Sierra de la Silla, Nuevo Leon, Mexico, May 31, 1889, *Pringle* 2599. The only other plants of this species seen by the writer are those collected near Victoria, Tamaulipas, Mexico, altitude 320 meters, February to April, 1907, by Dr. Edw. Palmer (no. 142). The species is strongly characterized by its lustrous, dark castaneous stipes and rachis and by its branched, ligneous rhizome, the latter closely invested with very rigid, opaque, blackish scales.

**Pellaea notabilis** Maxon, Contr. Nat. Herb. 10: 500. 1908.

A second record for this species rests upon two dwarfed fronds in the herbarium of the New York Botanical Garden. These were collected near San José, Tamaulipas, Mexico, altitude 600 to 1,100 meters, by Prof. James F. Kemp, of Columbia University, in 1902. They measure only 8 and 12 cm. high, respectively, and are thus much smaller than the original specimens, which are also from Tamaulipas.

**Polypodium duale** Maxon, nom. nov.

*Acrostichum serrulatum* Swartz, Prodr. Veg. Ind. Occ. 128. 1788.

*Polypodium serrulatum* Mett. Fil. Hort. Bot. Lips. 30. 1856, not Swartz, 1801.

The above change of name for the diminutive tropical fern described from Jamaica by Swartz in 1788 as *Acrostichum serrulatum* is made necessary by the use of the same

<sup>1</sup> Bull. Herb. Boiss. II. 7: 413. 1907.

<sup>2</sup> Bull. Soc. Bot. Genève 1: 220. 1909.



species name under *Polypodium* by Swartz (in 1801) for a plant now known as *Dryopteris serrulata*. The synonymy will be indicated in full in some notes on *Polypodium duale* and related species, to be published in the next paper of this series. Two other species names<sup>1</sup> subsequently applied are not valid under *Polypodium*.

***Polypodium heterotrichum* Baker.**

A rare species hitherto recorded, apparently, only from Jamaica, where it occurs on trees in the higher forested slopes of the Blue Mountains, at 2,100 meters. Specimens have been received recently from Barranca Trinidad, State of Hidalgo, Mexico, May 10, 1904 (*Pringle* 13494).

***Polypodium jenmani* Underw. nom. nov.**

"*Polypodium lasiolepis*" Jenman, Bull. Bot. Dept. Jamaica II. 4: 118. 1897, not Mett. 1869.

The Jamaican plant described by Jenman as "*Polypodium lasiolepis* Mett." is not very closely related to *P. lasiolepis* of the Lesser Antilles, which is itself (together with *P. grenadense* Jenman) apparently a synonym of *P. tenuiculum* Fée. Jenman's description is very complete. He compares the species with *P. pendulum* Swartz, pointing out, in part, that it differs from that species in its stronger rhizome, close and more decurrently adnate, ciliate segments, slightly hairy surface, terminal superficial sori, absence of glands, and different apex and base. He adds: "It is also erect in growth, and the veins and midrib of the pinnae are not raised on the upper side."

As a matter of fact, the relationship to *P. pendulum* is not very close, but that is a species very much misunderstood.

The following specimens of *P. jenmani* are in the National Herbarium:

JAMAICA: At base of tree, slopes above Tweedside, altitude about 900 meters, *Maxon* 961. On trees, near Mabess River, altitude 900 meters, *Maxon* 1535 (= *Underwood* 2606).

***Polypodium leptostomum* Fée, Mém. Foug. 7: 58. pl. 2. f. 2. 1857.**

?*Polypodium productum* Maxon, Contr. Nat. Herb. 13: 11. 1909, not Christ, 1907.

In assigning the name *P. productum* to a supposed new Guatemalan species in 1909 the writer overlooked the earlier use of this name for a Philippine species by Christ.<sup>2</sup> A new name for the Guatemalan plant does not appear necessary at present, however, inasmuch as it resembles very closely *P. leptostomum* Fée, founded upon plants from Orizaba (*W. Schaffner* 210) and may prove identical with it. Specimens of the type collection have not been seen by the writer.

<sup>1</sup> *Micropteris orientalis* Desv. Mém. Soc. Linn. Paris 6: 217. 1827, not *P. orientale* Gmel. 1791. *Xiphopteris extensa* Fée, Mém. Foug. 11: 14. 1866, not *P. extensum* Forst. 1786.

<sup>2</sup> Philippine Journ. Sci. C. Bot. 2: 178. 1907.