

THE AMERICAN FERNS OF THE GROUP OF
DRYOPTERIS OPPOSITA CONTAINED IN
THE U. S. NATIONAL MUSEUM

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In a paper entitled "Revision of the American species of *Dryopteris* of the group of *D. opposita*,"¹ I presented recently a review of the American species of *Dryopteris* having free, simple veins and the bipinnate lamina narrowed downwards. There were mentioned in some detail 82 species, of which I had seen original specimens, or, in some few cases, specimens which could be regarded as typical. Those species of which I had seen no specimens were omitted, as I found it impossible to form an exact idea of these from descriptions alone. Mr. William R. Maxon, Assistant Curator in the U. S. National Museum, offered, however, to send me typical material of some of the species described by Jenman, and at the same time suggested that I examine critically the whole collection of this group in the U. S. National Herbarium, consisting largely of specimens gathered in Central America and the West Indies in recent years by several collectors. Inasmuch as many of the species included in my "Revision" had been treated on the basis of a few specimens, or even of a single specimen, I was anxious to study this material, but for different reasons, partly on account of Mr. Maxon's absence in the field, it did not reach me before my paper was in press. Upon his request I then undertook to work out a separate paper, dealing only with these specimens. Later on, Mr. Maxon sent me a large number of specimens from the John Donnell Smith Herbarium, a collection extraordinarily rich in Central American forms, presented by Captain Smith to the Smithsonian Institution, and now a part of the U. S. National Herbarium. I have thus had in these two lots about 425 specimens, representing practically all the material of this group in the National Herbarium, and in the following paper all of these which I could determine with accuracy are enumerated by locality, collector, and collector's number, with the exception only of the identical numbers enumerated from other herbaria previously, in my "Revision," these being omitted.

¹ Kgl. Danske Vidensk. Selsk. Skrifter, 7 Række, Naturvidensk. og Math. Afd. 4: 247-336 1907.

For the courtesy of the authorities of the U. S. National Museum and the kindness of Captain Smith in lending me these rich collections I wish here to express my most sincere thanks. I have studied these specimens with unusual satisfaction and pleasure, owing to their careful preparation and the detailed data of locality, altitude, and conditions of habitat, in which respect they very far surpass most of the material with which I had previously worked. I have on this account been able to gain a more exact idea of several species and of their distribution.

In the following paper 9 species are described as new, and 3 older species not mentioned in my "Revision" are included; thus, altogether, 94 American species of this narrow group are now dealt with by me. About a dozen more have been described by Jenman and Sodiro, but of these I have seen no specimens. Recently Dr. E. Rosenstock has described a new species of this group from Bolivia, and he sends me another apparently new species from Ecuador. The whole number of valid described species thus exceeds 100, but I have no doubt that the number will eventually prove to be considerably greater. In the vast amount of material examined by me are to be found not a few fragments which, I believe, belong to undescribed species. It is interesting to note that among the few species known from Bolivia at least 2 are new to science. From the Peruvian and other parts of the Andes very few specimens are seen, but it is probable that these regions possess a similar number of species to the Andes of Ecuador, Colombia, and Costa Rica, and that not a few will appear to be new.

I have in my "Revision" pointed out a remarkable difference between the species of southern Brazil and those of the Andes and the West Indies, the fern floras of the last two regions showing an intimate alliance. The rich collections of the U. S. National Herbarium show this alliance to be still closer than supposed. The occurrence of the Jamaican *D. Thomsoni* in Colombia (*D. Stuebelii*), of the West Indian *D. sancta* in Guatemala, and of the continental *D. rudis* in Jamaica are new examples of this relationship.

In the preceding table is shown the distribution of the species occurring north of Panama, as known to me. A "+" indicates that the species is found in the country or island indicated; "(+)" that it is recorded, but not surely in the true form; and an "*" that it is endemic or hitherto not found beyond.

In this table Costa Rica, Jamaica, and Guatemala figure as having the largest number of species; the other Central American republics are not so thoroughly explored as the two named, but will probably

be found to have a similar number of species. In Central America and Mexico together 26 species are found, of which number 16 are found south of Panama, 8 in the West Indies, and 7 thus far not found elsewhere. Only 3 Central American species, viz., *D. sancta*, *D. diplazioides*, and *D. Sprengelii*, are with certainty found east of Jamaica and Haiti. In the West Indies the continental element is strongest in Jamaica, with such species as *D. concinna*, *D. oligocarpa*, *D. panamensis*, *D. rudis*, *D. cheilanthoides*, and *D. Thomsoni*, which do not occur at all in the smaller islands. It is probable that most of these species are very old, as well in Jamaica as on the continent, but the possibility is not excluded that an exchange of species may have taken place by means of wind-blown spores, or may be taking place today. It will, therefore, always be impossible to decide definitely in what region a species has had its origin, but certainly Jamaica, like the Andine valleys, is an endemic center of a high order.

D. sancta and *D. delicatula* seem to be species of insular origin. The occurrence of the former in Guatemala gives us an example of a West Indian element in Central America. Another instance is found in the Central American *D. pseudosancta*, which has its nearest allies in the West Indies. On the other hand, such species as *D. opposita (vera)* and *D. Sprengelii*, both generally dispersed over all the smaller islands, are to me reduced insular, but specifically fixed, forms of species which have had their origin on the continent. More is said as to this in the treatment of these two species below.

GROUP OF *D. OLIGOCARPA*

Smaller species; pinnæ seldom more than 10 cm. long by 1.5 cm. broad; tertiary veins 3-10 to a side. Lamina gradually narrowed downwards, with 1-4 pairs of abbreviated pinnæ, rarely abruptly attenuate. Basal pair of segments not prolonged.

DRYOPTERIS CONCINNA (Willd.) Kuntze

(REVISION 271, No. 1, FIG. 2.)

I can not find out under what name Jenman may have described this species, which in its typical forms has been frequently collected in Jamaica in recent years. The species is very distinct in habit and pubescence, and especially in its uniformly setose sporangia.

JAMAICA: *Hart* 304. Tweedside, rocky bank in the open, 2,000 ft., *Maxon* 984. Second Breakfast Spring, grassy bank in the open, 2,000 ft., *Maxon* 989a. Shaded edge of Green River, *Maxon* 1501 (= *Under-*

wood 2566). Near Silver Hill Gap, on dryish bank, 3,500 ft., *Maxon* 1135 (= *Underwood* 2271).¹

CUBA: Josephina, north of Jaguey, Yateras, Oriente, about 575 meters, border of forest, *Maxon* 4100. Farallones of La Perla, north of Jaguey, 540-585 meters, moist bank at edge of rocky woods, *Maxon* 4409.

MEXICO: Córdoba, Vera Cruz, *Fink* 62.

GUATEMALA: Cengaguilla, Depart. Santa Rosa, 1,300 meters, *Heyde and Lux* (*Donnell Smith* 4681). Dueñas, *Salvin*. Coban, Depart. Alta Verapaz, 4,300 ft., *von Tuerckheim* (*Donnell Smith* 168 in part).

COSTA RICA: Juan Viñas, Reventazon Valley, 1,000 meters, on bank near road, *Cook and Doyle* 386. Vicinity of the River Tiriví, near San José, 1,100 meters, on shaded bank of river, *Maxon* 131.

D. concinna is known from the West Indies and the Andes from Mexico to Ecuador; it varies but little, mainly in texture. The following variety, connected with the type by intermediate forms, may be distinguished by its longer and broader pinnæ with subfalcate segments and often by its firmer texture; it is the most common form of the species in southern Mexico.

DRYOPTERIS CONCINNA ELONGATA (Fourn.) C. Chr.

(REVISION 272.)

MEXICO: Orizaba, 4,000 ft., *Seaton* 68. Córdoba, Vera Cruz, *Fink* 58.

DRYOPTERIS ARGENTINA (Hieron.) C. Chr.

(REVISION 273, No. 4.)

Only the following additional specimen has been seen:

BOLIVIA: Near La Paz, 10,000 ft., *Rusby* 421.

DRYOPTERIS OLIGOCARPA (H. B. Willd.) Kuntze

(REVISION 274, No. 5, FIG. 5.)

Under this name I unite provisionally a number of forms, which in size and habit differ considerably from each other, but in essential

¹ I collected most of my 1903 Jamaican plants in company with Prof. L. M. Underwood. Frequently material was divided between us at the time of collection and dried separately, Dr. Underwood giving his numbers to the series intended for the New York Botanical Garden and I my numbers to the plants for the U. S. National Museum. For convenience of reference I kept a record of such of Dr. Underwood's numbers as were thus exactly equivalent to my own. Except for a few scattering specimens Mr. Christensen has seen only my series; but as an aid to those who may have received Dr. Underwood's duplicates, his equivalent numbers are here cited in parentheses by Mr. Christensen, these being copied from my labels.—WILLIAM R. MAXON.

characters agree very well. Still, it is very probable that this *D. oligocarpha* is a collective species which includes several "elementary species," the limitations of which I am unable to define at present.

ST. KIRTS: Summit of Mt. Misery, *Britton and Cowell* 529.

HAITI: Without locality, *Jaeger*. (As the preceding rather doubtful.)

JAMAICA: Cuna Cuna Pass, on banks, *Fredholm* 3234. Swift River near Hope Bay, *Alex. Moore*. In the vicinity of Castleton, edge of Ginger River, *Maxon* 835.

CUBA: Upper slopes and summit of Gran Piedra, Oriente, 900 to 1,200 meters, moist shaded bank, *Maxon* 4041a.

MEXICO: Pedro Paulo, Territorio de Tepic, *Rose* 3330.

COSTA RICA: Juan Viñas, Reventazon Valley, 1,000 meters, on bank by road-side, *Cook and Doyle* 193.

DRYOPTERIS NAVARRENSIS Christ

Aspidium navarrense Christ, Bull. Herb. Boiss. II. 6: 160. 1906.

Dryopteris navarrensis Christ, Bull. Herb. Boiss. II. 7: 262. 1907.

COSTA RICA: Navarro, *Werckle*.

This species, which in my "Revision" I regarded as a variety of *D. pilosula*, may stand preferably as a distinct species, differing from *D. pilosula* by its exindusiate sori. The rachis, costæ, and veins are, especially beneath, clothed with long whitish patent hairs. Some specimens from Jamaica (*Hart* 304), distributed as *Nephrodium conterminum* var. *pubescens* Baker, agree almost exactly with the Costa Rican plants. Probably this is the species described as "*Polypodium pubescens* Raddi" by Jenman (Bull. Bot. Dept. Jamaica II. 4: 128. 1897).

DRYOPTERIS NOCKIANA (Jenman) C. Chr.

(REVISION 279, No. 8, FIG. 7 (small).)

In my "Revision" I have compared this species, endemic in Jamaica, to *D. panamensis* and *D. oligocarpha*. Having now seen numerous specimens, I find that the species very much resembles *D. concinna* in habit and pubescence, but that it can be distinguished at the first glance by its glandular under surface and by its densely setose, persistent indusia. As a rule the hairs of the rachis and midribs below are longer than those of *D. concinna*, but in some specimens one finds the characteristic minute pubescence of that species.

D. Nockiana, besides a type specimen from Jenman's herbarium, is represented in the U. S. National Herbarium by the following specimens from different localities in Jamaica, ranging vertically

from 600 to 1,500 meters: *Maxon* 998 (= *Underwood* 2132), 999 (= *Und.* 2134), 1407 (= *Und.* 2533), 1593 (= *Und.* 2643), 1879, 1146 (= *Und.* 2277), 2297, 2285; *Underwood* 110, 449, 1826; *Clute* 101.

DRYOPTERIS PIEDRENSIS C. Chr., sp. nov.

CUBA: Upper slopes and summit of Gran Piedra, Oriente 900 to 1,200 meters, *Maxon* 4041, type; U. S. National Herbarium, No. 522690.

Eudryopteris rhizomate erecto-obliquo, radicibus numerosis. Stipitibus fasciculatis, gracilibus, angulatis, stramineis, 15 cm. longis, minute hirtis, ad basin squamis paucis brunneis instructis. Lamina lanceolata, 50-60 cm. longa, 15 cm. lata, utrinque attenuata, firmo-membranacea vel papyracea, graminea, rachi tenui brevissime puberula, bipinnatifida. Pinnis 2.5-3 cm. inter se remotis, alternis, horizontalibus, sessilibus, inferioribus 3-5 jugis gradatim abbreviatis, infimis auriculiformibus hastatis, inframedialibus maximis, oblongo-lanceolatis, 7.5 cm. longis, 1.5 cm. latis, ad apicem serratum acuminatum sensim attenuatis, supra pilis microscopicis rigidis rudis, subtus ad costas costulasque brevissime puberulis et glandulis rubris sparse obtectis, ad alam vix 0.5 mm. latam pinnatifidis vel ad basin perfecte pinnatis. Laciniis ca. 20 jugis, basalibus aequalibus vel parum reductis, posteriori auricula interna instructa, superioribus obliquis vel subfalcatis, ca. 2 mm. latis, subacutis vel obtusis, marginibus integris vel leviter crenatis revolutis. Venis indivisis, 8-9 jugis, utrinque prominulis. Soris margini approximatis, parvis; indusiis minimis, mox deciduis, glandulosis, ciliatis. Sporangiiis glabris.

This species is in size, shape of the lamina, and pubescence, almost identical with *D. concinna*, but it differs from that species by (1) its glabrous sporangia, (2) its firm lamina with prominent veins and reflexed margins, which partly cover the sori. In these respects it may be compared to *D. scalpturoides*, which, however, is much more hairy and has many pairs of reduced pinnæ. The basal pair of segments is in the larger pinnæ quite free.

DRYOPTERIS COLUMBIANA C. Chr.

(REVISION 279, No. 9, FIG. 8.)

COLOMBIA: Cauca, *Lehmann* 2968.

I now prefer to refer here this number, determined previously by Hieronymus and myself as *D. oligocarpa*, from which it differs by its longer leaf and by the shorter pubescence of the rachis. Never-

theless, I have some doubt if my proposed species can be held distinct from *D. oligocarpha*.

DRYOPTERIS MUZENSIS Hieron.

(REVISION 280, No. 10.)

COLOMBIA: Hills of Miraflores above Palmira, Central Cordillera, 1,600 to 1,200 meters, *Pittier* 892.

This specimen is larger than the type (leaf 1 m. long by 22 cm. broad), but is otherwise typical. The main difference from *D. columbiana* is in the absence of long setæ on the veins above.

DRYOPTERIS VELATA (Kunze) Kuntze

(REVISION 286, No. 22.)

This, the most beautiful species of the group, was rediscovered in Cuba by Mr. Maxon in April, 1907. His specimens are from the shaded talus of limestone cliffs at the Caverns of Thermopylæ, Monte Libano, province of Oriente, altitude about 600 meters (No. 4238).

DRYOPTERIS ASPIDIOIDES SUBHASTATA C. Chr.

(REVISION 287, No. 23.)

COSTA RICA: Cañas Gordas, 1,100 meters, *Pittier* 10990.

[NOTE.—*Nephrodium brachypodum* Baker,¹ mentioned in my "Revision" as unknown to me, is represented in the U. S. National Herbarium by a specimen of the type collection (*in Thurn* 275, not 225 as quoted in my "Revision"). It probably does not belong to the group of *D. opposita*, but is rather an ally of the West Indian *D. sagittata* (Sw.) C. Chr. It is not unlike *D. ptarmica* but is smaller, with the pinnae sessile, entire or shallowly lobed, often auricled on both sides at the base, the short stipe and rachis clothed with small dark brown scales, the rachis and veins hairy.]

¹ *Nephrodium brachypodum* Baker, *Timehri* 5: 213. 1886; *Trans. Linn. Soc. II. Bot.* 2: 290. 1887.

Dryopteris brachypoda (Baker) C. Chr. *Index Fil.* 255. 1905.

GROUP OF *D. OPPOSITA*

The old collective species *Aspidium conterminum* Willd. included the species *D. opposita*, *D. coarctata*, *D. consanguinea*, and *D. panamensis*, as delimited in my "Revision." While the typical forms of *D. consanguinea* and *D. coarctata* are well marked from the allied species by their whole habit, the line of separation between *D. opposita* and *D. panamensis* is more difficult to define. The collection of these species in the U. S. National Herbarium is very rich in specimens from Central America, Jamaica, and Cuba. Sorting these specimens one can quickly take out the typical forms of the two species. It then appears that the specimens of true *D. opposita* are all from the Lesser Antilles, and those of *D. panamensis* from Jamaica, Cuba, and mainly Central America. Besides these remains a number of specimens, mostly from Mexico and Jamaica, which may as well be referred to *D. opposita* as to *D. panamensis*. The question, then, is whether these intermediate forms are to be considered as real, phylogenetic intermediates, connecting the two proposed species, which in this case ought to be united into one very variable species, or if they represent one or more additional species intermediate between the two. To solve this question a still larger number of specimens from more localities is necessary. I am inclined to believe that the whole series of forms includes at least three or four species, each of which varies considerably in different directions, especially in size; thus, the large forms of *D. opposita* very much resemble *D. panamensis*, and small forms of *D. panamensis* similarly resemble *D. opposita*. Such doubtful forms show some features easily seen by the experienced eye but described only with difficulty. It is evident that all forms are of the same phylogenetic origin; the richest development is reached in Central America, where *D. panamensis* rivals in size species of the group of *D. Sprengelii*, while *D. opposita* of the Lesser Antilles is an insular reduced form derived from the same ancestors. Using the modern terminology, it may be said that the series of forms includes a number of elementary species in the sense of de Vries, some of which seem to be fixed species, while others are at the present period in a state of quick evolution. A more remote derivative from the same ancestors is the common Brazilian form called *D. opposita* var. *rivulorum* (Raddi), which I now consider a distinct, fixed species. I shall here confine myself to pointing out some additional different forms, which I describe as varieties of the species adopted in my "Revision," to which species I refer the whole number of specimens.

DRYOPTERIS OPPOSITA (Vahl) Urban.

(REVISION 288, No. 25, FIG. 15.)

TYPICAL FORM: Rather small, the leaf narrowed downwards through a long row of gradually reduced pinnæ. Segments a little oblique, obtuse or with rounded apex, short, with 4 to 6 pairs of veins, the basal ones not much prolonged.

DOMINICA: Laudat, *F. E. Lloyd* 26.

ST. KITTS: Wingfield Estate, forest ravine, *Britton and Cowell* 446.

ST. VINCENT: Ad Calvary, in locis umbrosis, *Eggers* 6732.

GRENADA: *Sherring*.

TOBAGO: Ad Cremorin River, in sylvestribus humidis, *Eggers* 5850.

TRINIDAD: Without locality, *Fendler* 65; *Jenman*.

PORTO RICO: Clay bank, road from Guayama to Cayey, *Underwood and Griggs* 432. Cayey, ad rupes in flumine Morillos, *Sintenís* 2281.

I have seen no specimens exactly agreeing with this typical form either from the larger islands or from the continent. In Central America it apparently does not occur. The specimens in my "Revision" referred to *D. opposita* I now believe to belong to *D. panamensis*.

FORMS INTERMEDIATE BETWEEN *D. OPPOSITA* AND *D. PANAMENSIS*

JAMAICA: *Maxon* 802, 821, 996 (= *Underwood* 2130), 1000 (= *Und.* 2135), 1528 (= *Und.* 2601); *Hart* 128.

MEXICO: Without locality, *Kerber* 437.

FLORIDA: Miry hammock near Fort Meade, Polk Co., *J. Donnell Smith*, March, 1880.

These intermediate forms resemble in size and fewer reduced pinnæ *D. panamensis*, in their opposite pinnæ and short segments *D. opposita*; in general habit most of them agree very well with *D. panamensis*, to which species I am inclined to refer them. The specimen from Mexico belongs to the form named by Fournier¹ *Aspidium exsudans* var. *myriocarpum*; it is a form with linear pinnæ and short segments. The Florida plant is *Aspidium conterminum* var. *strigosum* of North American authors, believed to be identical with *A. strigosum* Fée from Guadeloupe, which, however, is true *opposita*. Jenman (as shown in letters to Capt. Donnell Smith) considered it to be *D. Sprengelii*, which indicates that Jenman quite misunderstood *D. Sprengelii*, as also his descriptions under that name show. The Florida fern is to me not essentially

¹ Mex. Pl. 1: 98. 1872.

different from the common *D. panamensis*, although some of the smaller leaves very much resemble *D. opposita*.

DRYOPTERIS PANAMENSIS (Presl) C. Chr.

(REVISION 292, No. 28, FIG. 19.)

Under this name I unite a wide range of forms. Presl's type of the species, collected in Panama by Hænke is, according to the original specimens in herb. Presl proper, a long and narrow form (leaf 7 to 8 dm. long by 5 to 8 cm. broad); the pinnae are scarcely 4 cm. long by 0.5 cm. broad, from a hastate base gradually tapering toward the acuminate apex; segments oblong, oblique, acute, with revolute edges. In my "Revision" I have referred this form to *D. opposita*, which it resembles in habit; still the segments are longer and narrower and the reduced pinna not auriculiform, as in true *D. opposita*. To this form belong the following specimens:

COSTA RICA: Rio Turrialba, Prov. Cartago, 1,600 ft., *J. Donnell Smith* 5087. Dans la forêt à Terraba, 260 meters, *Pittier* 3538. El General, *Pittier* 10488.

The form illustrated by fig. 19 in my "Revision" is the most developed of the species, and is very common in Central America. I have examined the following additional specimens:

COSTA RICA: Vicinity of Cartago, rocky border of stream, *Maxon* 32. Vicinity of the River Tiriví, near San José, 1,100 meters, on banks of shaded river, *Maxon* 132. San José, 1,160 meters, *P. Biolley*. Piedades près San Ramón, 1,000 to 1,100 meters, *Brenes* 14236. San Jose, *Pittier* 1067. Surubres près San Mateo, 200 meters, *Pittier* 4063. Cartago, *J. J. Cooper* (*Donnell Smith* 6027). Rio Reventazon, Prov. Cartago, 2,000 ft., *Donnell Smith* 5088.

SALVADOR: Prope San Salvador, *L. V. Velasco* (*Donnell Smith* 8890). Vicinity of Izalco, 400 to 600 meters, *Pittier* 1943.

GUATEMALA: Moran, Depart. Amatitlan, 1,205 meters, *Kellerman* 4874. Escuintla, 1,100 ft., *Donnell Smith* 2453, 2738. Pantaleon, Depart. Escuintla, 1,370 ft., *W. C. Shannon* (*Donnell Smith* 174). Without locality, *Heyde* 703, 729.

MEXICO: Without locality, *E. Kerber* 440.

CUBA: Valley of the Rio Bayamita, south slope of Sierra Maestra, among rocks in bed of river, *Maxon* 3964. El Guama, Prov. Pinar del Rio, in the bed of a mountain stream, among rocks, *Palmer and Riley* 158.

JAMAICA: *Maxon* 828, 832, 855, 1001 (= *Underwood* 2136), 1002 (= *Und.* 2137), 1107 (= *Und.* 2227), 1737 (= *Und.* 2695), 1743 (= *Und.* 2703), 1744 (= *Und.* 2704), 1745 (= *Und.* 2705), 1746 (= *Und.* 2706), 1757 (= *Und.* 2721), 2789; *Harris* 7377.

In Mexico the species is represented by two forms, of which the first differs from the common large form only in its rather small

size and less falcate segments. It is *Polypodium litigiosum* Liebmann and *Lastrea leiboldiana* Presl, according to the original specimens of these. The second form I name:

DRYOPTERIS PANAMENSIS PROXIMA C. Chr., var. nov.

Leaf with a very short stipe, reduced downwards as in typical *panamensis*, glandular beneath, almost wholly glabrous. Pinnæ about 10 cm. long, short-acuminate, the upper ones alternate; segments approximate, oblique, not falcate, oblong-triangular, acute, the basal ones equal sized or a little prolonged.

The type specimen of this was collected by H. Ross (no. 326) in Mexico: Cuernavaca ad riv. umbr. c. 150 m. (Herb. Munich) and was by me considered a distinct species. Another specimen, in the U. S. National Herbarium, also from Mexico, *Rose and Painter* 7320, from the vicinity of Guadalajara, State of Jalisco, is, however, evidently the same, but connects the type with *D. panamensis*; therefore I now prefer to give to these specimens the varietal name *proxima*, originally used as a specific name. Further specimens are: *Pringle* 1844, from wet places near Guadalajara, State of Jalisco, and probably *Pringle* 11794 from the same locality, Sept., 1903, which is a slender and more hairy form, in habit more resembling *D. opposita*.

By its almost completely glabrous leaf, short-pointed pinnæ, and closely placed oblong-triangular acute segments, this variety seems very different from true *D. panamensis*.

DRYOPTERIS LEUCOTHRIX C. Chr., sp. nov.

BOLIVIA: Near Yungas, 4,000 ft., *H. H. Rusby* 432, type; U. S. National Herbarium, No. 828993.

Eudryopteris rhizomate (?). Stipitibus 2-3 dm. longis, rigidis, angulatis, breviter crispato-pilosis, fusco-stramineis. Lamina lineari-lanceolata, 6-7 dm. longa, medio 16-18 cm. lata, versus basin longe et gradatim attenuata, submembranacea, crassiuscula, siccitate brunnea, rachi profunde sulcata molliter crispato-pilosa, bipinnatifida. Pinnis numerosis, oppositis vel sursum alternis, sessilibus, inferioribus 6-7 jugis gradatim reductis, infimis minimis, medialibus maximis, inter se 2 cm. remotis, linearibus, 8-9 cm. longis, 8-9 mm. latis, acuminatis, ubique (maxime ad costas) pilis albidis brevibus hirtis, ad alam vix 1 mm. latam pinnatifidis. Laciniis numerosis, recte patentibus, sinubus latis rotundis separatis, obtusis vel rotundatis, marginibus integris paulum revolutis, basalibus aequalibus. Venis simplicibus ca. 5 jugis indistinctis. Soris medialibus vel paulum inframedialibus; indusiis persistentibus, pilis albis valde pilosis.

This most distinct new species resembles in habit some forms of *D. opposita*, especially the variety *rivulorum* (Raddi); but it differs from that species as well as from all other species known to me by its rather peculiar indusia, which appear as a cluster of white hairs like white dots on the under side of the leaf. It is also remarkable for its long stem, its long and narrow leaf, and its linear pinnæ with patent round-pointed segments. Although the leaf has a long stem and equal-sized basal segments the species must be placed in my system between *D. opposita* and *D. riopardensis*.

DRYOPTERIS PSEUDOSANCTA C. Chr., sp. nov.

COSTA RICA: Rio Toro Amarillo, Llanuras de Santa Clara, 300 meters, *J. Donnell Smith* 6902, Apr., 1896, type; U. S. National Herbarium, No. 828991.

GUATEMALA: Rio Pinula, Depart. Santa Rosa, 4,000 ft., *Heyde and Lux* (*Donnell Smith* 4094).

Eudryopteris rhizomate erecto, breve. Stipitibus dense fasciculatis, tenuibus, brevissimis (2-3 cm.), basi fuscescentibus. Lamina lineari, usque ad 4.5 dm. longa, 5 cm. lata, ad basin longe et gradatim attenuata, tenuiter herbacea, obscure viridi, rachis tenui pilis patentibus mollibus sparse hirta, bipinnatifida. Pinnis subpatentibus, oppositis vel superioribus alternis, sessilibus, inferioribus (e medio laminae) sensim abbreviatis, infimis minimis trilobis, medialibus, inter se 1-1.5 cm. remotis, a basi lata versus apicem acutum sensim attenuatis, equilateralibus, 2 cm. longis, supra basin ca. 5 mm. latis, ad costas venasque utrinque sparse pilosis denique glabris, subtus sparse glandulosis, profunde serrato-lobatis vel pinnatifidis. Laciniis obliquis, acutis, basali anteriore producta. Venis 2-3 jugis, simplicibus. Soris medialibus, parvis; indusiis reniformibus, subpersistentibus, sparse ciliatis.

This species is a very near ally of *D. delicatula* (Fée) C. Chr., from Guadeloupe, but it has a longer and narrower leaf, a shorter stem and medial sori. From *D. sancta* it is more different by its equilateral pinnæ and long, narrow leaf.

DRYOPTERIS SANCTA (L.) Kuntze

(REVISION 295, No. 32, FIG. 20.)

This species includes a number of forms, some of them probably of local origin. It varies in size from the small Jamaican plants to the large var. *Balbisii* (Spreng.) C. Chr., and in pubescence from almost entirely glabrous (the typical form) to a condition in which the rachis and costa are often rather densely hairy above. It may

be mentioned here that while most of the Jamaican forms are nearly glabrous, the specimens from other islands, especially from Porto Rico and partly from Cuba are rather hairy, and that this pubescence is found both in the small, more typical forms and in the var. *Balbisii*. The specimen from Guatemala appears to be identical with the Jamaican type. In the numerous specimens seen the sori are apparently exindusiate.

The different forms may be arranged as follows:

A. SMALL FORMS, often only a few cm. high; pinnæ unequal-sided; stem very short.

1. var. *typica*. Leaf quite glabrous or rachis only finely pubescent.

JAMAICA: Various localities, *Maxon* 1468 (= *Underwood* 2481), 1496, 1559, 1829 (= *Und.* 2794), 1939, 2415, 2550, 2584 (large); *Underwood* 1430, 1908, 2492; *Clute* 252.

CUBA: *Wright* 814. Slopes and summit of El Yunque near Baracoa, *Pollard and Palmer* 125. Monte Verde, Yateras, Oriente, 575 meters, rocky bank of small stream in forest, *Maxon* 4313.

SANTO DOMINGO: In umbrosis ad Rio Mameges, 250 meters, *Eggers* 2780.

PORTO RICO: Road from Utuado to Arcibo, wet limestone rocks, *Underwood and Griggs* 822, 828.

GUATEMALA: Cubilquitz, Depart. Alta Verapaz, 350 meters, *von Tuerckheim* (*Donnell Smith* 8353).

2. var. *hirta* (Jenman) C. Chr.

Nephrodium sanctum var. *hirtum* Jenman, Bull. Bot. Dept. Jam. II. 3: 20, 1896.

Upper surface finely pubescent.

JAMAICA: Doll Wood, near Silver Hill Gap, 3,000 ft., wet shaded cliff, *Maxon* 1175. Blue Hole, *Fredholm* 3191.

3. var. *strigosa* C. Chr., var. nov.

Rachis and costa rather densely furnished with patent hairs; surfaces glabrous.

CUBA: Mountain slope, directly north of Jaguey, 420 to 500 meters, rocky bank by stream, *Maxon* 4142, type; U. S. National Herbarium, No. 522848. Josephina, north of Jaguey, Yateras, Oriente, 575 meters, bank by small stream at border of forest, *Maxon* 4096 (large form).

PORTO RICO: Eastern slope of the Luquillo Mts., 1,500 ft., *Heller* 4614. Sierra de Luquillo, in monte Jimenis, *Sintenis* 1753.

B. LARGE FORMS; largest pinnæ equal-sided, pinnate below; segments or pinnules long, linear; stem up to 10 cm. or more long.

1. var. *magna* (Jenman) C. Chr.

Nephrodium sanctum var. *magnum* Jenman, Bull. Bot. Dept. Jamaica II. 3: 20, 1896.

Segments entire, narrow, distant, as are the pinnæ; leaf quite glabrous.

JAMAICA: Vicinity of Hollymount, Mount Diabolo, 750 meters, rocky border of forest, *Maxon* 2239, 2269; *Underwood* 1781.

2. Segments or pinnules broader, crenate; pinnæ closer (habit of the leaf more compact). (var. *Balbisii* sensu lat.)

I. var. *portoricensis* (Kuhn) C. Chr.

Aspidium sanctum var. *portoricense* Kuhn, Engl. Bot. Jahrb. 24: 115. 1897.

Rachis and costa more or less hairy, as is also the upper surface in some specimens.

PORTO RICO: Maricao ad vias in monte Montoso, *Sintenis* 403. Utuado, in praeurtis ad Los Angeles, *Sintenis* 5956. In wet places beside stream, road from Utuado to Lares, *Underwood and Griggs* 60.

II. var. *Balbisii* (Spreng.) C. Chr. Revision 296, fig. 20.

Leaf quite glabrous.

CUBA: Los Caños ad Rio Seco, 200 meters, *Eggers* 4721.

JAMAICA: Road between Port Antonio and St. Margaret's Bay, *Underwood* 1712.

HAITI: Marmelade, 2,450 ft., *Nash and Taylor* 1229.

PORTO RICO: Prope Pepino ad Eneas, *Sintenis* 5828.

This last variety is the most developed form, and is very different, both in habit and size, from the small forms mentioned above.

I have tried above to arrange in a key the forms represented in the U. S. National Herbarium. The arrangement is, however, not a natural one. The order of evolution is, I believe, rather the following:

Series I: var. *typica*; var. *magna*; var. *Balbisii*.

Series II: var. *strigosa*; var. *portoricensis*.

The var. *hirta* is probably only a slight variety of the typical form.

DRYOPTERIS CONSANGUINEA (Fée) C. Chr.

(REVISION 297, No. 33, FIG. 21.)

The true form of this distinct species is not represented in the U. S. National Herbarium, but I find some specimens, which in most characters agree with it very well. I refer them to a new variety:

DRYOPTERIS CONSANGUINEA ÆQUALIS C. Chr., var. nov.

JAMAICA: Second Breakfast Spring, near Tweedside, 2,000 ft., open grassy bank, *Maxon* 997 (= *Underwood* 2131), type; U. S. National

Herbarium, No. 427229. Banks at the left of Moody's Gap, 4,000 ft., *Jenman*.

GRENADA: In sylvestribus umbrosis ad Mt. Filix, 1,500 ft., *Eggers* 6036.

Differs from the type by its equal-sided pinnæ with patent or a little oblique, oblong segments, which generally bear 3 or 4 obtuse teeth at the apex; veins not prominent.

This variety thus recedes from the type towards *D. opposita* and *D. panamensis*; it differs from these species like the typical form, by its distant pinnæ, by its only a little elongated basal segments, which at their inner side bear an auricle overlying the rachis, by its almost completely glabrous frond and by its caudate-acuminate pinnæ. The natural position of this species in my system must be next to *D. opposita*.

DRYOPTERIS SCALPTUROIDES (Fée) C. Chr.

(REVISION 298, No. 34, FIG. 22.)

JAMAICA: Moody's Gap, 3,000 ft., *Clute* 173. Vicinity of New Haven Gap, 1,650 meters, border of forest, *Maxon* 2659. Without special locality, 1,500 meters, *Hart* 128.

These three specimens belong to my variety *jamaicensis* (Revision 299), which differs from the Cuban type by the glandular under surface and less pubescent upper side of the lamina. While the specimens from Cuba have their upper side throughout coated with short, hamate hairs, such are rarely found in the Jamaican form, in which the veins above are furnished with more stiff setæ. These constant differences between the specimens from the two islands make it probable that the plants from Jamaica represent a distinct species. This variety can be mistaken for *D. Nockiana*; still, it is much more hairy and more firm, even coriaceous in texture.

DRYOPTERIS FIRMA (Baker) C. Chr.

(REVISION 299, No. 36, FIG. 24.)

JAMAICA: Slopes of Monkey Hill, 1,800 meters, forest ravine, *Maxon* 2730. At the summit of Blue Mountain Peak, at about 7,400 ft., dry path-edges, *Maxon* 1438 (= *Underwood* 2553).

These beautiful specimens show more fertile leaves, which are on longer stems than the sterile ones and richly soriferous. The young sori are furnished with a densely setose indusium, which sometimes bears one or two glistening yellow or red glands. The basal pair of segments in the larger pinnæ is prolonged as in *D. opposita*, or in the sterile leaves the upper basal segment is somewhat reduced. The

rhizome is horizontally creeping, ligneous, with numerous bases of old stipes, and densely clothed at the apex with finely pubescent, brown scales. By its slightly reduced, coriaceous lamina and its creeping rhizome *D. firma* is a most distinct species.

[NOTE.—*D. Pavoniana* (Kl.) C. Chr. must be placed next to *D. firma*. It has, as shown by a specimen from Ecuador, *Rimbach* 118, sent me by Dr. Rosenstock, a long, creeping rhizome.]

GROUP OF *D. PACHYRACHIS*

DRYOPTERIS PACHYRACHIS (Kunze) Kuntze

(REVISION 305, No. 44, FIG. 31.)

In my "Revision" I referred the Jamaican *Nephrodium Jenmani* Baker to *D. pachyrachis*, having seen only one specimen, which appeared to be almost exactly *D. pachyrachis*, but without the characteristic sessile red glands of the under side of the lamina. Having now seen additional specimens of *N. Jenmani*, the question of its identity with *D. pachyrachis* becomes more difficult. The specimens seen belong to two somewhat different forms:

(1) A more firm, nearly glabrous and eglandulose form, which in habit and pubescence agrees very well with true *D. pachyrachis* but differs from it, as mentioned, in the lack of glands. In its most developed state this form is considerably larger than the Brazilian forms of *D. pachyrachis* (*Aspidium platyrachis* Fée), much more resembling *D. tenerrima* (Fée) C. Chr. It is the typical *Jenmani*, as shown by type specimens in U. S. National Herbarium.

(2) A very thin-leaved form with the under side densely glandulose and with the midribs of the segments, like the costæ, setose above. This form I referred (p. 311) to *D. Germaniana* as a new variety, var. *glandulosa*. I now think it best to consider it a form of *Jenmani*, resembling *D. Germaniana* in size but differing from that species in being glabrous between the veins above and in its fewer reduced pinnæ.

I dare not consider these two forms specifically different, nor separate them as a species distinct from *D. pachyrachis*. In general habit, texture, pubescence, number of veins, position of sori, shape of indusium they agree very well with the continental forms of *D. pachyrachis*. Still, I see clearly a difference between these West Indian forms and true *D. pachyrachis*, but it is impossible for me to point out even one character by which they may be distinguished from the continental form. However, should some other pteridolo-

gist prefer to let *D. Jenmani* stand as a distinct species I shall approve it.

1. Form without glands [*D. Jenmani* (Baker) C. Chr.].

ST. VINCENT: *H. H. and G. W. Smith* 855.

JAMAICA: Without special locality, *Jenman; Hart* 281a, 215. Latimer River, 4,000 ft., *Clute* 142. Vicinity of Morce's Gap, 1,500 meters, moist wooded slope, *Maxon* 2679.

2. Glandulose form [*D. Germaniana* var. *glandulosa* C. Chr., Revision 311].

JAMAICA: Near the summit of Blue Mountain Peak, 7,000 ft., steep moist wooded slope, *Maxon* 1404 (= *Underwood* 2529); moist woods, *Maxon* 1422 (= *Und.* 2540), 1422a; *Underwood* 1496.

DRYOPTERIS RORAIMENSIS (Baker) C. Chr.

Polypodium roraimense Baker, *Timhri* 5: 214. 1886; *Trans. Linn. Soc. II. Bot.* 2: 291. 1887.

Dryopteris roraimensis C. Chr. *Index Fil.* 289. 1905.

BRITISH GUIANA: Mount Roraima, upper slope, *in Thurn* 168 (type number).

A weakly characterized species, not unlike *D. pachyrachis* in essential characters, but having the under side of the lamina without glands, the segments oblique or subfalcate, obtuse, sori exindusiate, and the 3 or 4 pairs of lower pinnæ reflexed.

Leaf gradually and shortly attenuate downwards, with 2 or 3 pairs of reduced pinnæ, the lowermost about 1 cm. long. The whole leaf glabrous, except as to rachis and costæ, these setose above. Veins distant, 6 or 7 to a side, simple. Sori about medial or slightly supramedial, globose, superficial, exindusiate. Sporangia glabrous.

In the key to species given in my "Revision" (p. 267) this species must be placed between no. 44, *D. pachyrachis*, and no. 45, *D. Hieronymusii*. It differs from this latter mainly in its lower reflexed pinnæ and its more oblique or even subfalcate segments.

DRYOPTERIS RUSTICA (Fee) C. Chr.

(REVISION 310, No. 53.)

ST. VINCENT: *H. H. and G. W. Smith* 1130.

Agreeing very well with the type from Guadeloupe. Known also from Jamaica (*Nephrodium nimbatum* Jenm.).

DRYOPTERIS MELANOCHLÆNA C. Chr., sp. nov.

GUATEMALA: Coban, Depart. Alta Verapaz, 4,300 ft., *J. Donnell Smith* 168 in part, July, 1885, type; U. S. National Herbarium, no. 828982. (Besides the single leaf, which is the type specimen of our new species, this number contains a mixture of other species.)

Eudryopteris rhizomate (?). Stipitibus gracilibus, griseis, basi squamis nonnullis brunneis instructis, minute puberulis, 12 cm. longis. Lamina ad 6 dm. longa, 15 cm. lata, lanceolata, ad basin gradatim attenuata, firmo-herbacea, viridi, ubique pilis albescentibus minute puberula, rachibus costisque stramineis, bipinnatifida. Pinnis inferioribus fere e medio laminae gradatim abbreviatis, infimis auriculiformibus, medialibus maximis, patentibus, sessilibus, suboppositis, inter se 2.5 cm. remotis, oblongis, 8 cm. longis, 1.5-1.75 cm. latis, breviter acuminatis, ad alam 1 mm. latam pinnatifidis. Laciniis patentibus vel parum obliquis, 3 mm. latis, sinus subobtusis angustis separatis, obtusis vel subacutis, integris, basalibus aequalibus. Venis ca. 7 jugis, remotis, simplicibus. Soris margini approximatis, parvis; indusiis ebeneis, squamiformibus, persistentibus, pilis albidis nonnullis ciliatis. Sporangii glabris.

A very remarkable new species, resembling *D. rustica* in size, habit, and its uniform minute pubescence throughout, but differing from that species, as from all other species of the group, by its coal-black, scale-like indusia, ciliate with whitish hairs.

DRYOPTERIS GERMANIANA (Fée) C. Chr.

(REVISION 311, No. 55 (excl. var.).)

CUBA: Upper slopes and summit of Gran Piedra, Oriente, altitude 900 to 1,200 meters, moist shaded slope under tree-ferns, *Maxon* 4059.

An interesting discovery, as the species was previously known only from Guadeloupe. The specimen agrees exactly with the type. It resembles some forms of *D. pachyrachis* included under *Jenmani*, but it has a scaly stem, many pairs of reduced pinnæ, and the upper surface pubescent.

DRYOPTERIS DOMINICENSIS C. Chr., sp. nov.

DOMINICA: Mt. Diablotin, *F. E. Lloyd* 876, type; U. S. National Herbarium, No. 429322.

Eudryopteris rhizomate (?). Stipitibus 3 mm. crassis, 8-10 cm. longis, superne late sulcatis, ubique squamis brunneis crispatis dense vestitis. Lamina ovato-lanceolata, 4-5 dm. longis, ca. 18 cm. latis,

versus basin gradatim attenuata, versus apicem breviter acuminatum brevius attenuata, firmo-herbacea, obscure viridi, rachi grisea, pilis patentibus hirta et squamis brunneis crispatis (maxime in parte inferiore) squamosa, bipinnatifida. Pinnis ca. 20 utroque latere, inferioribus oppositis, 4-5 jugis sensim reductis, infimis 1 cm. longis et latis, superioribus alternis, sessilibus, maximis 8-10 cm. longis, 2 cm. latis, lineari-oblongis, versus apicem integrum breviter acuminatis, ad basin aerophoro magno acuto nigro instructis, supra ad costas late sulcatas ac inter vena^s pilis adpressis setosis, subtus ad costas costulasque pilis patentibus hirtis, ad alam 2 mm. vel ultra latam pinnatifidis. Laciniis approximatis, sinubus angustis acutis separatis, ca. 15 jugis, 4-5 cm. latis, patentibus vel paulum obliquis, obtusissimis, integris. Venis simplicibus, 6-7 jugis, distantibus. Soris parvis, medialibus; indusiis parvis, ciliatis, mox evanidis.

This new species stands next to *D. Germaniana*, but is considerably different in its scaly rachis, its differentiated pubescence, and its distinct, setose indusia. In the system adopted in my "Revision" the species must be placed between *D. Germaniana* and *D. Moritziana*.

DRYOPTERIS DEMERARANA (Baker) C. Chr.

Polypodium demeraranum Baker, *Timehri* 5:214. 1886; *Trans. Linn. Soc. II.* Bot. 2: 290. 1887.

Dryopteris demerarana C. Chr. *Index Fil.* 261. 1905.

BRITISH GUIANA: Mount Roraima, old Cath, *in Thurn* 356; (type number).

A species of the group of *D. pachyrachis*, but having the leaf more abruptly reduced below, about as in a species of the group of *D. Sprengelii*.

Reduced pinnæ about 4-jugate, at distances of 4-5 cm., auriculate-form. Stem at base with brown scales more than 1 cm. long, upwards like the rachis with a dense and coarse gray pubescence, intermixed with a few linear brown scales, especially along the rachis. Lower pinnæ subopposite, upper ones alternate, sessile, 10-12 cm. long by 2.5 cm. broad, thin, the upper side along the costæ densely setose, between the veins with fine, scattered, hamate hairs, the under side setose along the costæ and veins, almost glabrous between the veins. Segments slightly oblique, subacute or roundish at the apex, entire, 3.5-4 mm. broad, rather close, with subacute sinuses between; basal segments equal in size, or the upper one slightly reduced. Veins all simple. Sori exindusiate, near the edge. Sporangia glabrous.

In habit this species resembles *D. Leprieurii* (Hook.) Kuntze, but it can be distinguished by its reduced lower pinnæ, scaly rachis, and non-patent hairs. In the key to the species ("Revision," p. 268) it must be placed between no. 56, *D. Moritziana*, and no. 57, *D. corazonensis*; it is abundantly different from both.

DRYOPTERIS DIPLAZIOIDES (Desv.) Urban.

(REVISION 312, No. 58.)

To this species I refer with some doubt a specimen from

GUATEMALA: Near the Finca Sepacuté, Alta Verapaz, *Cook and Griggs* 177.

DRYOPTERIS CONSIMILIS (Fée) C. Chr.

JAMAICA: Without locality, *Jenman*. Mt. Moses, *Harris* 1555. Mansfield, near Bath, 300 to 500 meters, moist shaded bank, *Maxon* 2370; at edge of woods, *Maxon* 1796 (= *Underwood* 2770); *Maxon* 1788 (= *Und.* 2765). Trail from Bath to Cuna Cuna Pass, 1,000 to 2,000 ft., on a wayside bank, *Maxon* 1723 (= *Und.* 2687). Near Tweedside, 2,000 ft., grassy bank in the open, *Maxon* 989. Vicinity of Hollymount, Mount Diabolo, about 750 meters, rocky ravine in humid forest, *Maxon* 2321.

DRYOPTERIS HETEROCLITA (Desv.) C. Chr.

Gymnogramme gracilis Hew. Mag. Nat. Hist. II. 2: 457. 1838.

JAMAICA: Without locality, *Jenman*. Vicinity of Cinchona, 1,500 meters, shaded bank by trail, *Maxon* 1196 (= *Underwood* 2336). At the base of Blue Mountain Peak, 6,000 to 7,000 ft., *Maxon* 1453 (= *Und.* 2469). Cinchona Plantation, 5,000 ft., *Underwood* 167. New Haven Gap, 5,600 ft., *Clute* 205.

My treatment in the "Revision" of these two closely allied species is unsatisfactory. The specimens enumerated above show more clearly the differences between the two species, which I point out in the following table. Figures 37 and 38 of my "Revision" both illustrate *D. consimilis*, although the latter in the position of the sori resembles *D. heteroclita*.

<i>D. consimilis</i>	<i>D. heteroclita</i>
Leaf 5-6 dm. long.	Leaf 8-10 dm. long.
Pinnæ 8-10 cm. long by 1.5-2 cm. broad.	Pinnæ 12-15 cm. long by 2.5 cm. broad.
Whole plant clothed with a dense and coarse gray pubescence, the under side sometimes with a few yellow glands.	Whole plant furnished with fewer but longer and stiffer hairs, sometimes subglabrous on the under side and always without glands.
Veins immersed, not very distinct, 10-12 to a side.	Veins raised above stramineous like the costæ, 10-15 to a side.
Sori distinctly oblong or linear about medial.	Sori short, sometimes nearly round, distinctly supramedial.

DRYOPTERIS ATROVIRENS C. Chr.

(REVISION 316, No. 61, FIG. 39.)

GUATEMALA: Trail between Sepacuité and Secanquim, Alta Verapaz, 1,000 meters, rocky bank in humid forest, *Maxon and Hay* 3281 (type number).

GROUP OF D. SPRENGELII

Tertiary veins close, 10-12 to a side, lamina in most species abruptly attenuate downwards, with several pairs of greatly reduced pinnæ, which appear as mere warts upon the stem. A distinct aërophore is often present at the base of the larger pinnæ. Most of the species belonging to this group are large, having leaves often more than 1 meter long.

DRYOPTERIS SPRENGELII (Kauf.) Kuntze

(REVISION 318, No. 65, FIG. 42.)

ST. THOMAS: Signal Hill, 1,400 ft., *Eggers* 32.

ST. KITTS: Molyneaux Estate, *Britton and Cowell* 312. Lambert Estate, *Britton and Cowell* 637.

DOMINICA: Soufrière, *Lloyd* 543.

ST. VINCENT: Mt. St. Andrews, 2,000 ft., in locis umbrosis inter herba, *Eggers* 6807. Chateau Belair, 1,000 ft., in sylvestribus umbrosis, *Eggers* 6843.

GRENADA: Without locality, *Murray and Elliott* 9; *Sherring*.

TOBAGO: In sylvestribus ad flumen Great Dog River, *Eggers* 5757.

TRINIDAD: *Fendler* 22.

PORTO RICO: Luquillo Mts., *Percy Wilson* 62; 255. Guayama Road, *Goll* 601. Quebrada Arriba, on rocky hillside, *Goll* 488. Road from Ponce to Adjuntas, *Underwood and Griggs* 764. Road from Utuado to Lares, *Underwood and Griggs* 108. San Juan, *Mr. and Mrs. A. A. Heller* 676. On the Adjuntas road, eight miles from Ponce, *Heller* 6137; 6346.

JAMAICA: Near Priestman's River, 75 to 300 meters, partially shaded moist bank, *Maxon* 2529; 2532. Swift River near Hope Bay, *Alex. Moore*.

The specimens enumerated above belong to typical *D. Sprengelii*, characterized by its almost hairless surfaces and rachis and its glandular under side. In the specimens from Jamaica, especially *Maxon* 2529, the upper side is, however, somewhat more hairy than in the plants from the smaller islands; thus, it is intermediate between the type and the Central American form. This has the upper side finely pubescent and the rachis somewhat hairy, as is the case in *D. Mercurii*; but it agrees very well with the type in habit. This form,

perhaps worth a name of its own, is represented by the following specimens:

GUATEMALA: Cuyuta, Depart. Escuintla, 200 ft., *Donnell Smith* 2457 (the locality in my "Revision" erroneously referred to Mexico).

NICARAGUA: Volcan Mombacho, *C. F. Baker* 2449.

COSTA RICA: Plains of San Carlos, 100 meters, on bank by road, *Cook and Doyle* 99. Cuesta de la Vieja, 300 meters, on bank by road, *Cook and Doyle* 101. Juan Viñas, Reventazon Valley, 1,000 meters, on bank by roadside, *Cook and Doyle* 195. Rio Reventazon, Prov. Cartago, *Donnell Smith* 5088.

I now refer to this more hairy form J. R. Johnston's no. 190 from the island of Margarita, Venezuela, listed in my "Revision" under *D. Mercurii*.

DRYOPTERIS STRUTHIOPTEROIDES C. Chr., sp. nov.

GUATEMALA: Concepcion, Depart. Escuintla, 1,200 ft., *J. Donnell Smith* 2459, March, 1890, type; U. S. National Herbarium, No. 829,013. Mazatenango, Depart. Suchitepéquez, *W. A. Kellermann* 4701.

Eudryopteris rhizomate (?). Stipitibus rigidis, stramineis, basi squamis brunneis deciduis sparse instructis, vix 10 cm. longis. Lamina ovato-lanceolata, ad 6-7 dm. longa, medio ad 2.5 dm. lata, versus basin sensim attenuata, ad apicem serratum breviter acuminata, gramineo-viridi, firmo herbacea, rachi straminea glaberrima, bipinnatifida. Pinnis numerosis, valde approximatis, 1 cm. remotis, inferioribus 3-4 jugis sensim abbreviatis, imis auriculiformibus, lobatis, ca. 1 cm. longis, medialibus maximis, linearibus, 10-13 cm. longis, 1.5 cm. latis, sessilibus (aerophoro nullo), subhorizontalibus, oppositis, apicibus serratis longe acuminatis, supra ad costas stramineas sparse setosis, utrinque inter venas sparse et minute puberulis denique glabris, ad alam vix 1 mm. latam pinnatifidis. Laciniis numerosis, valde approximatis, sinubus angustissimis acutis separatis, parum obliquis, integris, acutis, marginibus planis, basalibus aequalibus. Venis 10-11 jugis, indivisis. Soris parvis, luteis, submarginalibus; indusiis minimis, hyalinis, glabris, mox deciduis.

This new species can only be compared to *D. panamensis* and *D. Sprengelii*, from both of which it differs in its remarkably closely-placed overlapping pinnæ and segments, the leaf resembling the sterile frond of *Matteuccia struthiopteris*—hence the specific name. It resembles large forms of *D. panamensis* in general habit, especially in the base of the lamina, but it is considerably different in its almost glabrous and eglandulose lamina, in its not very oblique segments,

in its more numerous veins, and in having the sori placed very near to the margin. From *D. Sprengelii*, which it resembles in pubescence, size, and texture, it recedes by the absence of glanduliform abortive pinnæ and aërophore, by the position of the sori, by its fewer veins, etc. Still, I think it best to place the species next to *D. Sprengelii* in the "system," mainly because its veins are closer than in any species of the groups of *D. opposita* and *D. pachyrachis*.

DRYOPTERIS MERCURII (A. Br.) Hieron.

(REVISION No. 66, FIG. 43.)

This is most probably a large, more hairy continental form of *D. Sprengelii*, in its typical form very characteristic, the pinnæ 2-2.5 dm. long, thin, with numerous segments separated by open roundish sinuses, the rachis and costæ beneath furnished with long patent hairs and the upper side more densely pubescent. But it will be, I believe, impossible to draw a sharp line between the smaller forms and the continental form of *D. Sprengelii* mentioned above. Thus, we have here a series of forms which grow larger from the Lesser Antilles to Central America, the increase in size being associated with an increase of pubescence, exactly as was the case in *D. opposita*-*D. panamensis*. Also, we find here the intermediate forms in Jamaica. Provisionally, I find it best to let *D. Mercurii*, like *D. panamensis*, stand as a species.

COSTA RICA: Santo Domingo de Golfo Dulce, *Tonduz* 10023 (= *Donnell Smith* 7215 B); *Tonduz* 9885 (= *D. S.* 7218). Haie à Turrialba, *Pittier* 4087bis. Forêts de Tsâki, Talamanca, 200 meters, *Tonduz* 9461.

A critical form is W. A. Kellerman's no. 4864 from Puerto Barrios, Guatemala; in pubescence exactly *D. Sprengelii*, in habit *D. Mercurii*.

DRYOPTERIS THOMSONII (Jenman) C. Chr.

(REVISION 320, No. 67, as *D. Stuebelii*)

Polypodium Thomsonii Jenman, Bull. Bot. Dept. Jamaica II. 4: 130. 1897.
Dryopteris Thomsonii C. Chr. Ind. Fil. 298. 1905.
Dryopteris Stuebelii Hieron. Hedwigia 46: 340. pl. 6. f. 13. 1907.

This species is given as unknown in my "Revision." In the U. S. National Herbarium there are, besides a type specimen from Jenman, several specimens from Jamaica, and it is rather surprising to find that the species is exactly identical with *D. Stuebelii* Hieron. from Colombia. Thus we here come upon a new illustration of the

close relationship existing between the fern-floras of Jamaica and the Andes.

I have only to add to the descriptions of Jenman and Hieronymus that the lamina narrows downwards very abruptly, as in *D. rudis*, with a few pairs of glanduliform warts, and that the stem is clothed throughout with thin, light brown scales. The species resembles in habit not a little *D. pterifolia*, but it is *inter alia* very distinct by its densely glandular under side and thin texture, and by its midribs and costules of the pinnæ being clothed beneath with short, crisped, stellate hairs.

JAMAICA: Near Vinegar Hill, 4,000 ft., *Harris* 7446; moist shaded bank, *Maxon* 1520. Vicinity of New Haven Gap, 1,650 meters, humid forest slope, *Maxon* 2693. At the base of Blue Mountain Peak, 6,000 ft., shaded edge of trail, *Maxon* 1442 (= *Underwood* 2465); *Maxon* 1442a.

DRYOPTERIS LIMBATA (Sw.) Kuntze

(REVISION 323, No. 71.)

ST. KITTS: Belmont Estate, forest ravine, *Britton and Coxwell* 397. Slopes of Mt. Misery, *Britton and Coxwell* 560.

By its toothed segments, with the sori in the teeth, different from all allied species.

DRYOPTERIS SCALARIS (Christ) C. Chr.

(REVISION 323, No. 72, FIG. 47.)

GUATEMALA: Vicinity of Secanquin, Alta Verapaz, 500 meters, partially shaded bank, *Maxon and Hay* 3193.

COSTA RICA: Vicinity of Santiago, on partially cleared slope, *Maxon* 122. Forêts de Tuis, 650 meters, *Toudou* 11332. Waldeck, près Madre de Dios, 50 meters, *Pittier* 10260 (in my "Revision" referred to *D. Mercurii*, but probably belonging here).

DRYOPTERIS RUSBYI C. Chr., sp. nov.

BOLIVIA: Near Yungas, 4,000 ft., *H. H. Rusby* 429, type; U. S. National Herbarium, No. 828981.

Eudryopteris rhizomate lignoso, obliquo vel breviter repente. Stipitibus 0.5-1 cm. inter se remotis, ad pinnas infimas abortivas 10-15 cm. longis, rigidis, sulcatis, basi squamis paucis praeditis, griseo-stramineis, ubique brevissime puberulis. Lamina 6 dm. vel ultra longa, 12-20 cm. lata, lanceolata, versus basin abrupte attenuata, membranacea, bipinnatifida. Rachis grisea, dense et minute puberula. Pinnis oppositis, horizontalibus, sessilibus, majoribus aërophoro praeditis, infimis 5-6 jugis valde reductis, glanduliformibus, pinnis

paris superioris 4 cm. longis reflexis, inframedialibus maximis, 7-9 cm. longis, ad 2 cm. latis, obtusis vel breviter acuminatis, apice integro vel serrato excepto ad alam 1.25 mm. latam pinnatifidis, utrinque ad costas costulasque dense setosis, supra inter venas minute pubescentibus, subtus glabriusculis. Laciniis 13-15 jugis, paulum obliquis, subobtusis vel subrotundatis, integris, 3 mm. latis, approximatis, sinibus angustis acutis separatis, basalibus reductis. Venis in laciniis majoribus 10-12 jugis, simplicibus, satis approximatis. Soris mediocribus fere medialibus, exindusiatis. Sporangii glabris.

This new species I refer to the group of *D. Sprengelii*, as it most resembles species of this group in its very abruptly reduced lamina below and in its rather close veins. It will stand in this group between *D. lasiopteris* and *D. Christensenii*, being intermediate between these species in pubescence, but distinguished by its opposite, horizontal pinnæ with rather broad, subpatent and subobtuse segments. Its rachis is not so tomentose as in *D. lasiopteris* and *D. rudis*; still not with the microscopical pubescence of *D. Christensenii*. The species could also be considered a member of the group of *D. pachyrachis*. It will then stand near *D. atrorubens*, from which it differs by its closer veins and gray puberulous rachis.

Allied to this species is another specimen from Bolivia, *Miguel Bang* 2320, which probably belongs to an undescribed species, but the specimen is too incomplete for a description. It resembles *D. Rusbyi* in pubescence of the rachis, but while the upper side is almost glabrous, except along the costæ, the under side is rather densely hairy throughout. The acute segments have up to 15 pairs of veins. The sori, which are small and covered by a setose indusium, are placed within the margin. The collector's number 2320 is cited in my "Revision" under *D. oligocarpa*, but *this* specimen does not belong to that species.

DRYOPTERIS RUDIS (Kunze) C. Chr.

(REVISION 324, No. 73, FIG. 48.)

- MEXICO: Sierra de Clavellines, State of Oaxaca, 9,000 ft., *Charles L. Smith* 2056. Cerro de San Felipe, 3,000 meters, *Gonzatti and González* 331. Wet mountain canyon above Cuernavaca, State of Morelos, 6,500 ft., *Pringle* 13773. Sierra Madre near Santa Teresa, Territorio de Tepic, *J. N. Rose* 2213.
- GUATEMALA: San Rafael, Zacatepequez, 6,500 ft., *Donnell Smith* 2732; 2461.
- COSTA RICA: Sabanilla de los Granados, 1,200 meters, *Alfaro* 16302. Vicinity of Coliblanco, about 1,950 meters, *Maxon* 267.

Polypodium ctenoides (Fée) Jenman from Jamaica I have supposed in my "Revision" to be this species, and the three specimens at hand (*Jenman; Hart* 343) confirm that opinion; I see no essential difference. *Maxon* 267 from Costa Rica is identical with the narrow-leaved form collected by Biolley (no. 67 in part) which in my "Revision" I referred to *D. lasiopteris* (Sod.) C. Chr. Also, I now consider this form to belong to the species of Sodiro, although this author describes *D. lasiopteris* as being indusiate, while our Costa Rican specimens are without indusia; but I cannot see any important difference between this form and ordinary *D. rudis*. It is almost glabrous above and has shorter pinnæ, while the most common form of *D. rudis* is setose throughout; probably *D. lasiopteris* (Sod.) C. Chr. must be reduced as a synonym of *D. rudis*.

Another synonym of *D. rudis* is *Aspidium subdecussatum* Christ,¹ as shown by the type specimen from Costa Rica, *Alfaro* 16556. It is glabrous between the veins upon both sides, and identical with the form which I have called *D. lasiopteris*.

D. rudis varies considerably in size and in density of pubescence. From *D. pterifolia* it can be distinguished by its acute segments and by its costæ being clothed beneath with antrorse (not patent) hairs.

A large variety, eventually a new species, is *Pringle* 8920, Mexico (State of Puebla, by brooks in pine forests, near Honey Station, 5,000 ft.). It has pinnæ 25 cm. long by 3.5 cm. broad.

Nephrodium tetragonum Presl² has been much misunderstood. It is, according to the type specimen in herb. Presl, not at all the same as *Nephrodium tetragonum* Hook (which is *Dryopteris pseudo-tetragona* Urban), but either *D. rudis* or a closely related species. The whole type specimen consists only of the upper half of a single leaf, and is therefore rather indeterminable.

DRYOPTERIS HEIMERI C. Chr.

I have recently described³ this Brazilian representative of *D. rudis*. The diagnosis and comments are here reprinted without change.

"*Eudryopteris* e turma *D. rudis* (Kze) C. Chr. rhizomate (erecto?) dense radicante. Stipitibus ad pinnas infimas abortivas c. 15 cm longis, fusco-stramineis, quadrangularibus, ubique brevissime hirtis, ad basin squamis nigro-brunneis ovato-acuminatis marginibus sparsim ciliatis subdense vestitis. Lamina lanceolata, ad 8 dm longa, medio 17—18 cm lata, ad apicem pinnati-

¹ *Aspidium subdecussatum* Christ, Bull. Herb. Boiss. II. 4: 960. 1904; *Dryopteris subdecussata* C. Chr. Ind. Fil. 295. 1905.

² Rel. Haenk. 1: 35. 1825.

³ Fedd., Repertarium 6: 380, 381. 1909.

fidum sensim attenuata, versus basin abrupte reducta, supra obscure viridi, nitida, subtus pallidior, submembranacea vel firmo-herbacea, bipinnatifida; rachi trisulcata breviter hispido-pilosa. Pinnis infimis 2—3-jugis tuberculiformibus, c. 8 cm inter se remotis, sequentibus 2—3-jugis auriculiformibus 4—5 cm inter se remotis, medialibus maximis, 10 cm longis, 2 cm latis, sessilibus aërophoro tuberculiformi instructis, a basi versus apicem breviter acuminatum sensim attenuatis, supra ad costa venasque sparsim et brevissime puberulis, subtus ad costas costulasque pilis fuscis brevibus dense setulosis ac ad costas paleis nonnullis nigro-brunneis minutis instructis, inter venas utrinque subglabra, ad alam 1 mm latam pinnatifidis. Laciniis approximatis, marginibus planis fere parallelis recte patentibus, obtusis, basalibus pinnarum inferiorum reductis. Venis simplicibus, 12—14-jugis, pellucidis, supra parum prominulis. Soris minimis, exindusiatis, paulo ultra mediam venulae partem sitis. Sporangii paucis, 2—3 setis robustis instructis.

“Hab. Brasilia, São Paulo, Campinas oppidum, leg. A. Heiner no. 540, 9. 9. 1905 (typus in Herbario Regnelliano, Stockholm).”

“Species nova distincta, a speciebus brasiliensibus adhuc detectis abunde diversa sed speciebus andinis nonnullis (*D. rudi*, *D. Engelii*) magis affinis. Magnitudine, pubescentia, textura, reductione laminae *D. rudi* C. Chr. similis, a qua specie valde recedit: sporangiis setosis, laciniis patentibus obtusis (nec falcatis nec acutis), stipitibus ad basin subdense paleaceis, costis subtus sparsim squamosis, pilis rachis brevioribus, pagina utraque inter venas subglabra, aliisque notis.”

DRYOPTERIS PITTIERI C. Chr., sp. nov.

COLOMBIA: Paramo de Buena Vista, Huila Group, Central Cordillera, upper forest zone, 3,100 meters, *H. Pittier* 1200, January, 1906, type; U. S. National Herbarium, No. 531395.

Eudryopteris rhizomate (?). Stipitibus (?). Lamina 1 m. vel ultra longa, 2-2.5 dm. lata, dure coriacea, rachi rigida griseo-straminea pilis brunneis crispis laxè dispositis dense hirta, bipinnatifida. Pinnis sessilibus, horizontalibus, oppositis, basi aërophoro instructis, 3 cm. inter se remotis, 12-14 cm. longis infra medium 2.25-2.5 cm. latis, utrinque attenuatis, supra costis sparse strigosis exceptis glaberrimis, infra ad costas costulasque pilis crispis brunneis subdense pilosis et ad partem inferiorem costarum squamis nonnullis angustis brunneis ciliatis vestitis, apice breviter caudato-acuminato excepto ad alam vix 1 mm. latam pinnatifidis. Laciniis numerosis, subpatentibus vel saepe subfalcatis, remotis (sinibus rotundis latis), integris, obtusis, marginibus ubique revolutis, basalibus perparvis. Venis simplicibus, ad 20 jugis, supra distinctis. Soris submedialibus, brunneis, exindusiatis. Sporangii glabris.

The species here described as new is founded upon an imperfect specimen without rhizome and stipe. Probably the leaf is narrowed downwards as in *D. rudis* and other allied species. Although the leaf very much resembles that of *D. Engelii* Hieron. in size, general

habit, and very coriaceous texture, it is, however, that of a new and very distinct species of high andine habit, distinguished by the glabrous upper surface, the scales along the lower part of the costæ beneath, and by the crisped, lax pubescence of the rachis and of the costæ and costules beneath.

DRYOPTERIS LANIPES C. Chr., sp. nov.

GUATEMALA: Pinula, Depart. Guatemala, 4,300 ft., *J. Donnell Smith* 2462, April, 1889, type; U. S. National Herbarium, No. 828979.

Eudryopteris rhizomate obliquo-erecto, 1 cm. crasso. Stipitibus fasciculatis, ad aurículas infimas ad 12 cm. longis, stramineis, pilis mollibus luteo-albidis patentibus ad 5 mm. longis densissime vestitis. Lamina lanceolata, 5-6 dm. longa, medio 15 cm. lata, ad basin subabrupte valde reducta, ad apicem serratum vel integrum breviter acuminata, subcoriacea vel papyracea, luteo-viridi, rachi straminea maxime ad basin pilis mollibus patentibus luteo-albidis dense vestita, bipinnatifida. Pinnis oppositis vel subalternis, sessilibus, inferioribus 3-4 jugis gradatim abbreviatis, infra has 3-4 jugis subito valde reductis auriculiformibus ca. 1 mm. longis et latis, medialibus maximis 8 cm. longis, 1.5 cm. latis, subfalcatis, utrinque glaberrimis vel subtus ad costas pilis longis nonnullis deciduis instructis, apice integro breviter acuminata excepto pinnatifidis, superioribus serratis vel integris. Laciniis approximatis, sinibus rotundis angustis separatis, integris, parum obliquis, acutis, 2.5 mm. latis, basalibus aequalibus vel posteriore paulo longiore. Venis distinctis, approximatis, ca. 10 jugis, simplicibus. Soris margini approximatis, parvis; indusiis deciduis, glabris. Sporangii glabris.

This new species is different from all known species by the peculiar lanose pubescence of the stem and lower part of the rachis. It is evidently a member of the *Sprengelii* group, although it is rather small and has few veins, which, however, are closely placed. In color it is not unlike typical *D. cheilanthoides* from Brazil. Remarkable also is the reduction of the lamina. Below the 3 or 4 pairs of gradually reduced pinnae is a similar number of suddenly reduced very small auricles, not glanduliform warts, as in certain species of the *Sprengelii* group. Further must be mentioned the nearly entire upper pinnae. The position of the species in my "system" must be before no. 76, *D. strigifera*.

To this species belongs, I have no doubt, as a forma *minor*, Donnell Smith's no. 2463, also from Guatemala (Department of Guatemala, 4800 ft.). It is quite identical in pubescence, but smaller (20

cm. by 6 cm.), with a very short stem and only 3 or 4 indistinct veins.

DRYOPTERIS PTERIFOLIA (Mett.) Kuntze

(REVISION 327, No. 78, FIG. 49.)

GUATEMALA: Pansamá, Depart. Alta Verapaz, 3,800 ft., *von Tuerckheim* (*J. Donnell Smith* 971); *Donnell Smith* 1551. Trail from Senahú to Actalá, Alta Verapaz, rocky bank at border of forest, *Maxon and Hay* 3311. Coban, 1350 meters, *von Tuerckheim* II, 2181.
 BOLIVIA: Yungas, 6,000 ft., *Rusby* 1885, *sine num.*

A large species with pinnæ up to 25 cm. long by 4 cm. broad, the costæ and costules clothed sparsely beneath with stiff, patent hairs. In my "Revision" I considered *Nephrodium retrorsum* Sodiro the most developed form of this species. It is, however, rather a variety with pendent pinnæ; none of the specimens listed above, although very large, show this peculiarity. The species is apparently exindusiate, and the sori show a tendency to elongation; the receptacles are setose.

In my "Revision" I have supposed that *Alsophila pilosa* Mart. and Gal. belongs to *D. rudis*, and not to *D. pterifolia*. The Guatemalan specimens listed above seem, however, to agree completely with the plate of Martens and Galeotti, and most probably Professor Hieronymus was right in regarding *A. pilosa* as a synonym of *D. pterifolia*.

This Central American form is a very large plant, and it may be doubted whether it is conspecific with true *D. pterifolia*, which was described from scanty material from Bolivia. Still, the Bolivian specimen listed above is to me not specifically distinct from the Central American form, although considerably smaller and more soft-hairy.

A further synonym of *D. pterifolia* is *Aspidium gleichenioides* Christ.¹ I omitted this form in my "Revision" because Dr. Christ described the lamina as "*basi vix attenuata*." However, an examination of the type specimen from Costa Rica, *Tonduz* 1935, shows at once that it belongs to the group of *D. opposita* and not to the group of *D. patens*, as Christ supposed, and, further, that it can scarcely be separated from *D. pterifolia*. The hairs of the costæ and costulæ beneath are somewhat more autrorse than in common *D. pterifolia*, but it agrees otherwise.

¹*Aspidium gleichenioides* Christ, Bull. Herb. Boiss. II, 4: 960. 1904; *Dryopteris gleichenioides* C. Chr. Ind. Fil. 268. 1905.

DROPTERIS CHEILANTHOIDES (Kunze) C. Chr.

(REVISION 329. No. 82, FIG. 51.)

JAMAICA: Without locality, *Jenman*; *Hart*. Near Hardware Gap, 4,000 ft., moist bank, *Maxon* 1104 (= *Underwood* 2220).GUATEMALA: San Rafael, Zacatepequez, 6,500 ft., *Donnell Smith* 2560.

I have now no doubt that the Jamaican specimens belong here; they agree in habit and other characters exactly with the type from Brazil, but recede a little by their small, fugacious indusia. The Guatemalan specimen has, on the contrary, very large indusia, but its pinnæ are more hairy along the costæ beneath than in the type. It seems to be without glands, thus belonging to my variety *eglandulosa*. An excellent mark for this species is the lower basal segment, which in the well-developed pinnæ is considerably longer than the other ones. Synonyms of this species are: *Nephrodium Sprengelii* var. *persicinum* *Jenman* (*Journ. Bot.* 17: 261. 1879) and *Lastrea grossa* *Presl* (*Epim. Bot.* 41. 1851).