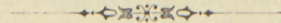


REVISION
OF
THE AMERICAN SPECIES OF DRYOPTERIS
OF THE GROUP OF *D. OPPOSITA*

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Within the very large genus of ferns *Dryopteris*, there is scarcely any group of species so difficult to unravel as the numerous forms allied to *D. opposita* and *D. Sprengelii*. Although several American species of that group were already described at an earlier period, BAKER in "*Synopsis Filicum*" (1874) enumerated and described hardly more than 10 species, passing in silence a long series of forms that older authors had considered to be good species. The consequence of this treatment in this, the most important handbook of systematic pteridology, has been that a greater part of these older, often good species have been forgotten or described again under new names. "*Synopsis Filicum*", is therefore in this as in many other points, partly to be blamed for the hitherto so chaotic synonymy of the ferns. It will there be necessary to submit most of the genera of ferns to a new and detailed revision, if we wish to succeed in getting a view of the different forms of ferns and of their geographical distribution. The material accumulated in the museums during recent years has been so considerably increased and the descriptive pteridological literature has grown to such an extent, without parallel perhaps in the whole botanical literature, the number of species described as new in recent years running up to more than half of the complete number of species in "*Synopsis Filicum*" (for instance in one year 1906 over 300 species were described), that it will be quite beyond the capacity of one man to prepare a modern "*Synopsis*". It is a work which must necessarily be distributed over many hands, and in recent times much has already been done. Not only have single groups been revised, for instance by CHRIST (*Elaphoglossum*), LINDMAN (*Didymoglossum*), UNDERWOOD (*Danaea*, *Stenochlaena* and others), HIERONYMUS (a group of *Polypodium*) and by myself (*Leptochilus*), but the fern floras of some countries have also been critically dealt with by CHRIST, HIERONYMUS, ROSENSTOCK and others. My work here is intended to be a link in the work of gaining a clearer and more modern idea of the classification and distribution of the ferns.

When preparing my "*Index Filicum*" I never felt how complicated the synonymy may be more than during the elaboration of the genus *Dryopteris*, and it became evident to me that something had to be done as soon as possible to unravel the chaos of names, which I found myself to a great extent compelled to refer as synonyms to the few species accepted in the "*Synopsis Filicum*". Still

at that time I could not venture to undertake the work myself, though after Dr. ROSENSTOCK of Gothá had sent me his Brazilian "*opposita*" forms for examination I felt inclined to make a trial. As further, the Museums of Berlin, Stockholm and Copenhagen and also Dr. CHRIST have on my request most kindly placed their large collections at my disposal, I obtained a material, which has probably never before been collected together. It includes more than 1200 specimens, amongst which are, a few excepted, type specimens of all the hitherto described species of the group of *D. opposita*. I really only want the species described by BAKER and a few described by JENMAN and SODIRO, as authentic specimens of most of the new species of these latter authors are found in Herb. Berol. and Herb. Christ.

For the great kindness shown me by the curators of these museums and the two pteridologists Dr. H. CHRIST and Dr. E. ROSENSTOCK I wish to express here my most sincere thanks. I must also thank Dr. E. BAYER, Curator of the "Museum des Königreiches Böhmen" of Prague for his kindness in sending me two type specimens of species described by PRESL. Lastly it is a special pleasure to thank Prof. HIERONYMUS, Berlin, and Prof. LINDMAN, Stockholm, for their help in different ways.

The limitation of the group of species I here take up for monographic treatment is somewhat difficult. Briefly, it includes those species of *Dryopteris* with free veins which have a "lamina bipinnatifida ad basin attenuata" and generally simple veins. This group passes gradually to the group, in which the typical species is *D. patens*. The species belonging to the latter, which also have a "lamina bipinnatifida venis liberis simplicibus", still differ partly by having non-reduced or only a little shortened lower pinnæ, but generally a pronounced deltoid lamina, partly in their having the basal pair of veins of a segment running out into the sinus itself between the segments, whereas in the *opposita* forms they reach the edge more or less above the sinus. *D. diplazioides* is here the only exception, but even in this species the ends of the two basal veins do not meet each other, whereas in the group of *D. patens* they often run together. Most often the species of the group of *D. patens* have also a larger, persistent and generally very hairy indusium, while the species allied to *D. opposita* are either exindusiate or furnished with a very small, deciduous indusium, just as the sori generally are small consisting only of a few loosely attached sporangia.

The group of *D. opposita*, according to the above given limitation, thus includes species of the old genera *Lastrea*, *Phegopteris* and *Leptogramma*. In working up these species it has become perfectly clear to me that *Phegopteris* may not only not be considered as a genus, which American pteridologists always maintain, but even not as a subgenus. The species of *Phegopteris* must be placed amongst the other species of *Eudryopteris*, as DIELS has already tried in "Die natürlichen Pflanzenfamilien", and which has been done by HIERONYMUS, CHRIST and ROSEN-

stock in their more recent papers. We may with CHRIST use the generic or subgeneric name of *Phegopteris* for a small group of species of characteristic habit, including our three European species and some others (*D. hexagonoptera* (Michx.) C. Chr., *D. oyamensis* (Bak.) C. Chr.), although I do not think that it will be natural to do so. The long series of species, which I have referred to § *Phegopteris* in my "*Index Filicum*", can however in no way be distinguished from *Eudryopteris* (*Lastrea*). The presence or absence of an indusium may possibly be a good character of a species, but will always be difficult to use; as character of a genus or group it is not available. To be able to decide whether a species is exindusiate or not, a close examination of the sori of the living plants from their earliest stages will in many cases be necessary, by studying dried material only this is impossible. In some of the species originally described as species of *Phegopteris*, I have found an indusium in the type specimens, in others, generally referred to *Lastrea*, I have only rarely or never seen an indusium.

Nor has the character: round or elongated sori, any value as character of a group, not to speak of genus; the species of *Leptogramma* must naturally be intercalated therefore amongst the species of *Eudryopteris*. A striking example of how unnatural is the separation into two genera is shown by *D. ptarmica*, which can hardly be considered anything but a form of the well known *Gymnogramma asplenioides* Sw. with round sori, which besides are furnished with a small indusium. The Brazilian form of *D. diplazioides* is rather a true *Phegopteris* with round sori, but nobody will deny that its nearest relative is the typical form of *D. diplazioides* with gymnogrammoid sori. Considering that the few species of *Leptogramma* with a downwards narrowing leaf are not to be distinguished in all their architecture, pubescence, venation, etc. from the ordinary forms of *Eudryopteris*, it seems to me very unnatural on account of this, even most variable character, to refer them to a separate genus, as UNDERWOOD¹ like J. SMITH formerly, has done, after METTENIUS had already united these species with *Phegopteris*. It would be far more natural to place these species side by side with the other species of *Eudryopteris*, which they are nearest to in the general structure of the leaf.

Should I now try in a few words to define the whole group, I would ascribe the following characters to it:

Species *Dryopteridis* lamina bipinnatifida ad basin attenuata, pinnis sessilibus, venis liberis, simplicibus vel raro furcatis, basalibus supra sinum marginem attingentibus, soris rotundis vel raro elongatis, exindusiatis vel indusio parvo instructo.

This group, the American species of which are here reviewed, is one of the most prolific in forms within the whole genus. It rivals in this respect the known genera of phanerogams *Hieracium*, *Taraxacum*, *Rubus*, *Euphrasia* and others, and is, like these genera, evidently at present in the most active development, which is shown not only by the great number of well defined, limited groups of forms,

¹ UNDERWOOD: Bull. Torrey Club 29, 1902, pag. 626.

which I here call "species", but also in the great power of variation of the latter in almost all possible directions. This variation within the same species has resulted in a great many forms, which may perhaps be ascribed to numerous mutations quickly following after each other and which in the most different manner pass into one another; I therefore find it of only small importance to give the single forms special names. This might be justified, if one was enabled to study the species and their forms in the field. By studying dried specimens alone one stands on unsafe ground, especially as most collectors give too little information as to the quality of the soil, the humidity, shade, etc., which might possibly explain to us in which direction the evolution proceeds, and to what degree the outer factors are of any significance to the variation. I have, therefore, as a rule desisted from establishing forms and varieties under a species, but have confined myself to indicating in what respects the species mostly vary.

In the following pages I have tried to define 82 species altogether, specimens of which I have seen; still I have no doubt that several more are to be found in tropical America. Of these 82 species, two (*D. ptarmica* and *D. aspidioides*) only doubtfully belong to the group, but are included here because they to a certain extent fall within the above given limitation, differing from all the other species however by having stalked pinnæ. The well known *D. deltoidea* (Sw.) O. Ktze. is not included, as it may upon the whole be placed very near to the group of *D. patens*, although its lower pinnæ are much reduced yet in a manner unknown within the group of *D. opposita*. More closely allied to this group are such species as *D. Leprieurii* (Hk.) O. Ktze and *D. decussata* (L.) Urban, but because of their having the lower pinnæ not at all reduced I have excluded them. With some others these species might be united into a little group connecting the group of *D. opposita* with that of *D. patens*.

In North America our group is represented by three species: *D. noveboracensis* (L.) A. Gray, *D. oregana* C. Chr. (*Aspidium nevadense* Eat.) and the also European *D. oreopteris* (Ehrh.) Maxon. These three as well as the somewhat more distant relatives *D. simulata* Dav. and *D. thelypteris* (L.) A. Gray, which stand rather outside the limits of the group, I have not included, as they are supposed to be so well known that they can hardly be confounded with other species.

In the Old World the group is represented by a long series of species, which to a great extent need revision. That any of them should be identical with the American species is not very probable. Still it is likely that in West Africa forms are to be found, which can only with great difficulty be distinguished from Brazilian ones. I have not had material, however, to undertake such a comparison, but I think that no described African species can be united with any known American one.

A grouping of such closely related species as are being dealt with here, is very difficult. If we have arrived at the conclusion that the characters ascribed to

Phegopteris and *Leptogramma* have indeed no value as characters of groups of really related species within *Eudryopteris*, still it becomes necessary to look for others, according to which it may be possible to group related forms in a natural manner. As we have not any safe base for a natural classification in the generative organs, we must seek in the vegetative organs especially the different architecture and structure of the leaf for available characters. It is, however, by no means easy to find such, as there is hardly a character which constantly reappears in even closely related species. By studying a long series of forms, however, it becomes possible to arrange the species in natural groups, the peculiarities of which are not in a single character but in a sum of common features, which is very difficult to express in words alone. That, for instance, *D. opposita* and *D. Sprengelii* each by itself represents a natural group is perfectly clear to me without its being possible to explain in a few words the characteristic difference between them. As, however, from practical reasons it would be desirable to give these groups distinctive marks, I shall here briefly mention two characters which are the basis for the main divisions in the following key; still one must always bear in mind that these two characters like all others are rather vague, though in most cases they will contribute to facilitating the right determination. The two characters are: (1) the number of veins in the segment, and (2) the reduction of the leaf towards its base.

Although the number of veins in a segment is of course partly dependent on its length, yet it is subject to other laws and must be a character inherited by the species, which is not subject to any great variation. It is particularly the distance between the veins themselves which is of importance, and one might possibly by minute measurements of these distances, determine how much they vary within the same species and thus point out an absolute specific character in contrast to other species; but such measurements, where we would have to count with fractions of millimeters, will in reality be difficult to carry out. It may be sufficient to state the length of the segment and the number of its veins, in which manner one can much more easily tell the density of the veins. As *D. tenerrima*, the segments of which are of about the same length as found in *D. Sprengelii*, has only 10 veins to a side, while *D. Sprengelii* has 16–18, and as the forms closely related to these species all show the same difference, it is natural to suppose, that the two species mentioned belong to two different groups, the separation of which is of older date than the separation of the single species of each group. This seems justify us in seeing a character in the number of veins, which may be used when dividing the species into larger natural groups. The distinguishing number 10 as used in the key, is, of course, somewhat arbitrary, and not all species of the two groups have more (or fewer) veins than 10¹.

¹ After having written the above I have seen that Copeland ("The comparative ecology of San Ramon Polypodiaceæ", Philippine Journ. of Science Section C. Botany, 2. Jan. 1907, pag. 47) has recently measured the distances between the veins of a number of Philippine ferns, and he has arrived at the

The reduction of the leaf downwards varies within the whole group from being nearly 0, as in *D. firma*, to the long and very gradually narrowed leaf of *D. opposita*. Some variation, especially in the number of reduced pinnæ, may be found also in the single species; on the other hand the kind of reduction is rather constant and, therefore, a good character of species. If this character, however, were to be extended to mark a group of species, it would be less valid, and it would be difficult by means of it to find out the relationship of species, even though several show a striking likeness as to the shape of lamina, which are otherwise closely allied. In practice, however, one may very well defend using the shape of the leaf as the first consideration, so much the more as some different types can be pointed out to which the great majority of species can be referred.

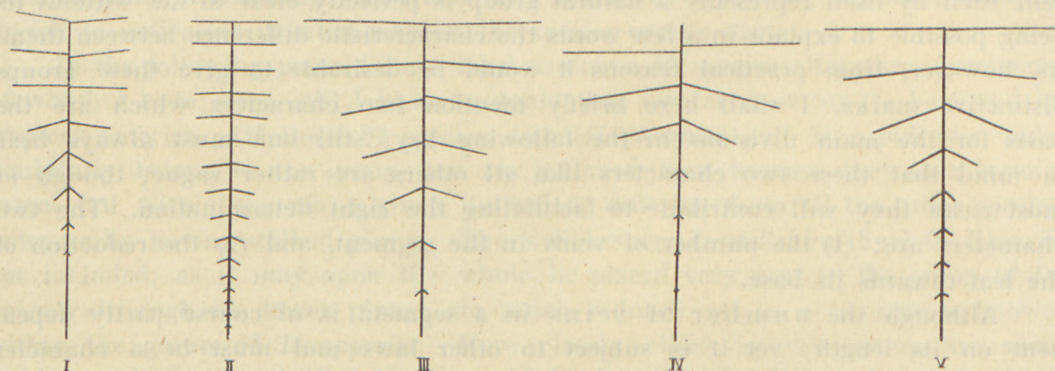


Fig. 1.

- I. Is the type of *D. oligocarpa* and related species. Here the leaf narrows gradually but rather shortly: there are rarely more than 4-5 pair of reduced pinnæ, of which the lowermost are auriculiform, though rarely very small. Stem proportionally long. The diagnostic phrase for this type is: lamina breve et gradatim attenuata.
- II. Is the type of *D. opposita* and its relatives. Here the leaf narrows almost from the middle very gradually through a great number of reduced pinnæ nearly to the base of the stem; the lowermost pinnæ auriculiform, often very small. — Lamina longe et gradatim attenuata.
- III. *D. pachyrachis* and others. Almost as type I, with only few — 3-4 — pair of shortened pinnæ, which, however, are very remote and the lowermost not far from the base of the stem, auriculiform. The leaf generally much broader than in the species of types I and II.
- IV. *D. Sprengelii*, *D. rudis* etc. The leaf below 1-2 pair of reflexed, somewhat shortened pinnæ suddenly narrows with 3-6, rarely more, pairs of auriculiform (the upper) or glanduliform pinnæ; the lower abortive pinnæ are reduced to small wart- or tubercle-shaped protuberances without parenchyma on the stem. — Lamina abrupte attenuata, pinnis infimis glanduliformibus.
- V. Here a few species, as *D. Moritziana*, *D. Mosenii*, *D. atrovirens*; as in type IV the leaf narrows suddenly, but the lower reduced pinnæ are auriculiform, often hastate or bipartite. — Lamina abrupte attenuata, pinnis infimis auriculiformibus.

result that species of arid habitat have generally denser veins than those of humid habitat. As I can hardly judge of the particular outer conditions under which the species examined by me grow, I cannot refuse to accept it, but I do not think it probable that there is a great difference in the growing-places of such species as *D. pachyrachis* and *D. supina* on one side and *D. Sprengelii* and *D. rudis* on the other.

I give in the accompanying schematic figures an illustration of the most common ways, in which the leaves are found to be narrowed. As even a very detailed diagnosis cannot confer a clear idea of the shape of the lamina, I have in the descriptions of the species referred to the schematic figure, with which the species dealt with best agrees.

A third character, which might be considered to be of some value for a classification of the species into groups, is the rhizome, if erect or creeping. By the term "creeping rhizome" two things, however, may be understood, which must be distinctly distinguished from each other, viz: (1) the long, horizontally creeping, often cord-like rhizome, which bears leaves at greater or shorter intervals, and (2) the short-creeping rhizome, which only bears leaves near its apex, where they are either fasciculated or only have very short intervals between. This latter form of the rhizome is a simple modification of the erect rhizome with fasciculated leaves, often, possibly, caused by the peculiar conditions of the growing-place, as it seems that some species with normally erect rhizome may vary in that direction. On the other hand the long, horizontally creeping rhizome is a peculiarity in some species, which can, therefore, only with difficulty be united with other species into groups of real relatives, even though they very much resemble species with an erect rhizome in the shape of the lamina. Many of these species with wide-creeping rhizomes show the peculiarity that they have most often a greater or less number of furcate veins, while species with erect or ascendent rhizomes nearly always have simple veins only. Whether this correlation can be explained by the fact that the creeping species generally grow in swampy or boggy ground (compare our *D. thelypteris*) may be doubted. It is a well-known fact that plants growing in swampy ground very often have proportionally large assimilating leaf-surfaces, and in connection herewith a more differentiated development of the veins, which will be reached here most easily by a simple furcation of the veins.

These creeping species of ferns belong to the group of *D. opposita*, which like the species related to *D. patens* is characterized by the veins being normally simple, quite different from the species of the group of *D. filix mas* with furcate veins in leaves of the equal size and habit; this different development of the veins in these groups is evidently an inherited peculiarity, of which an explanation is quite out of the question. We have before us here, however, a variation within the group of *D. opposita*, which seems to indicate a connection between the ecology of the species and the development of their veins. A thorough examination of these relations is much to be desired; it might give us an explanation of this correlation between creeping rhizome and furcate veins. Here I shall confine myself to state that it is the rule; it has the advantage that one to a certain extent can conclude from the venation to the shape of rhizome, especially when working with species from Southern Brazil.

Having thus mentioned those natural characters which can be used in grouping the species, I shall add some words on the characters which can most

easily be used for a rapid determination of the species. As mentioned above there is found an abundance of forms, which can be united naturally into smaller limited "groups of forms", which term I prefer to use here for what I have named and treated as "species" in the following pages. Many of these probably include several real species, which are now in process of developing into separate species, but owing to the lack of sufficient material cannot with certainty be recognized as such. Many of these groups of forms are well defined and easily recognizable, while others are only faintly characterized and pass gradually into others. Still I think I am right in separating groups of forms under a special name, when at least a couple of characters, constantly occurring together and by which the forms differ from related ones, can be pointed out, as I have done for instance in separating *D. pilosula* and *D. argentina* from *D. oligocarpa*.

The characters, which are of particular importance for the distinguishing of the species, are: (1) rhizome, (2) shape of lamina, (3) size, (4) number of veins, (5) pubescence, (6) texture, (7) position and shape of the sori, and (8) the sporangia. Of these I have above more explicitly mentioned the two first and the fourth, and it is evident that their importance for the recognition of species is essential.

The size of the leaf is, of course, very variable within the same species, especially as to its length, while the width or, in other words, the length of the middle pinnæ is somewhat more constant. Still the breadth of the pinnæ is of greater importance, as it rarely varies beyond $\frac{1}{2}$ centim.; in connection with this the number of veins is very nearly constant in segments of normal size. The length of the basal pair of segments, compared to the other, is also of considerable importance. In a great number of species the basal segments are of equal size, in *D. opposita* and its nearest allies they are either both or only one distinctly longer, and in some species (*D. rudis* and its relatives) they are, especially in the larger pinnæ, smaller, often even very small. It is remarkable that the length of the basal segments is in correlation to the reduction downwards of the leaf; the leaves of the types I and III (see schematic figures above) have nearly always equal-sized basal segments, leaves of type II nearly always enlarged, of type IV very often reduced basal segments — still exceptions from this general rule may be found.

As to the pubescence of the species, or in a wider sense, its covering of trichomes: hairs, scales and glands, there may be found within the species a great variation in the density of such coating, its kind seems, however, to be a very constant character. Most variable is the coating with glands on the under-surface of the leaf, many species occurring as densely or sparsely or even not glandulose forms. In some species, as *D. pachyrachis* and *D. Sprengelii*, the characteristic large, sessile glands are however an excellent diagnostic mark. The most constant is the presence or the lack of scales on stem and rachis. In the group taken as a whole scales occur only sparsely, still most species bear at the apex of the rhizome and at the base of the stem some few, often finely pubescent, deciduous scales. A thick cluster of scales at the base of the stem, as is seen in

several species of the group of *D. filix mas*, is found only in *D. tablaziensis*. Only in quite few species does the coating of scales extend along the whole length of the stem, in fewer the rachis is also scaly, and finally there is a few species having scales on the underside of the leaf (*D. velata*, *D. Funckii*, *D. Rosenstockii*).

The density of the hairiness of the leaf is very variable, as naturally expected, but on the other hand its kind is a good specific character, which is used to a considerable degree in the key below. Quite glabrous species scarcely exist, as there are nearly always hairs on the midrib of the pinnæ above, but there are some species, which apart from these are, practically speaking, glabrous throughout. The kinds of hairs which occur, may generally be referred to three types: (1) very short hairs, often only visible under a strong magnifying glass and with hook-shaped points (*pili hamati*), (2) long, mostly whitish or yellowish, soft hairs, and (3) stiff bristles (*setæ*). As a fourth kind may here be mentioned the stellate hairs, which are found in the two species *D. Cañadasii* and *D. Stübélii*.

In numerous species a marked difference in the pubescence of the under- and the upperside is found especially on the costæ, which are generally setose above with stiff, forward pointing, subappressed hairs, beneath (but not in all species) with soft, whitish, patent hairs. Some species are furnished on the upperside along the veins with solitary, stiff *setæ* (*D. columbiana*, *D. corazonensis*, and others), others have only *pili hamati* (e. g. *D. concinna*), others again all three kinds and then they have *pili hamati* on the parenchyma between the veins, while these and the midribs are furnished with long hairs. The most differentiated pubescence is found in *D. corazonensis*. In order to convince oneself of the kind of the pubescence of a species one must in most cases make use of the microscope.

The texture of the leaf varies considerably and is partly dependent on outer factors and the age of the leaf and is therefore not of great value as a mark of the species excepting the extreme forms: the very thin, almost transparent leaf and the rigid, coriaceous or chartaceous leaf.

The position on the vein of the sori is very constant within the species, therefore of great importance. More variable is their shape, of which I have spoken above; not rarely the sori — especially the basal ones — show as they grow old a tendency to elongation. Their equipment with an indusium should be a constant character, which, however, as already mentioned, is rather difficult to use within this group, most species of which have only a very small, early falling indusium. This is rarely quite glabrous, often glandulose and in many species more or less setose. In some species, as *D. Sprengelii*, *D. pachyrachis*, the indusium is not quite reniform as is otherwise the case in *Eudryopteris*, but oval, a peculiarity which induced FÉE to mark off the species showing this as a separate group *Oochlamys*.

Most species have glabrous, short-stalked sporangia. Only in three (*D. concinna*, *D. Stierii*, *D. firma*) are the sporangia furnished with some few *setæ*, which I have, however, recognized in all the numerous specimens examined, whereas in no other species have I ever found a setose sporangia.

In some species, especially belonging to the group of *D. Sprengelii*, a spongy protuberance is to be found at the bases of the pinnæ on the underside, which METTENIUS has called an aërophore. In dried specimens the aërophore may be squamiform, tuberculiform, circular or acute. It is generally found only with the larger pinnæ and is often very small. Its importance as specific character seems to me not always equally great; thus *D. opposita* is found both with and without aërophore. In other species, e. g. *D. limbata*, its presence and shape is a characteristic peculiarity.

I have found it necessary here to give a review of my experience of the value and stability of the single characters. As the question here is to divide old collective species into smaller species, a minute examination of all the organs of the plants would be needed, if one were to succeed in gaining an idea of the marks which are of essential value for characterizing the single species. The characters mentioned above have certainly all been used by modern pteridologists as CHRIST, HIERONYMUS and ROSENSTOCK, but a test of their value has not been attempted. On the other hand descriptions given by other authors (BAKER, FÉE) are, as a rule, made so briefly and do not at all mention many essential characters, so that in many cases it will be impossible from them alone to form an idea of the peculiarities of the species described. Even in the descriptions of authors as JENMAN and SODIRO, who have given detailed diagnoses of several, partly new species belonging to the group of *D. opposita*, one will very often look in vain for information on essential marks, thus if the leaf bears hairs both on the veins and on the parenchyma.

In the following pages I have tried in my descriptions to take into consideration all the characters, arranged in a form, having mainly made use of the excellent diagnoses given by Dr. ROSENSTOCK as a pattern. Besides the descriptions of the new species I have only given more detailed descriptions of such species, the original diagnosis of which does not give a clear idea of the species; under the remaining species I have confined myself to adding some notes as supplements to the original descriptions, especially such as may throw light upon the differences between the species and its relatives. It is, however, a very difficult, or rather impossible thing to characterize such closely allied species in words alone. I have, therefore, found it very necessary to accompany the descriptions by illustrations, which correctly show the habit and other characteristic peculiarities of the species. An illustration of those species which have already been well figured, was of course unnecessary. The parts figured here are a normal pinna with a part of the rachis, most often of an type specimen, natural size, drawn from a kind of nature-print, and two or more segments seen from the underside and twice magnified. In this manner it has been possible to give in a limited space an illustration of most of the characters of the species.

I have now only to add some words on the geographical distribution of the species. Most of the species belonging to the group here dealt with are

in the handbooks said to have wide ranges, e. g. "tropical America", "from the West-Indies to Chile", "from Mexico to Brazil"; etc. I find, however, that the area of most species is much more restricted, and perhaps all grow within limited regions only, beyond which the species does not go. The wide distribution of the species of the handbooks, is, of course, connected with the fact of the accepted species being collective species, each of which in my opinion consists of two or several good species, their right of being species depending not only on their specific characters but gaining besides considerably in force by the demonstration that these specific characters are in close relation to the geographical range.

The experiences I have gained by studying these species are in considerable contrast to the view, that the ferns in their geographical distribution differ from the flowering plants, the single fern-species being supposed not to be so closely confined to limited floras. This view, which may be traced to HOOKER-BAKER's manner of putting together related species in great collective species without attributing even the most different geographical area any importance, pteridologists, such as CHRIST and UNDERWOOD, have latterly proved to be absolutely inconsistent. Especially CHRIST has recently¹ strongly maintained that the ferns as a whole have the same geographical distribution as the phanerogams, and my researches of the limited group here dealt with have quite proved to me, that this view is the right one.

The two regions in tropical America, West-Indies-Andes and South Brazil, in the vegetation of which the ferns form an important feature, have a long series of species peculiar to each, perhaps without one species common to both. If I in the following pages have referred specimens from the West-Indies and Andes as well from Brazil to some species (*D. cheilanthoides*, *D. diplazioides*, *D. oligocarpa*, *D. opposita*, *D. pachyrachis*), this has been done with reservation, as will be learned from the remarks under these species. In these cases, namely, the Brazilian plants do not exactly agree with the andine ones, and even in some cases it might possibly be right to separate them out as belonging to distinct species. The connection between the floras of South Brazil and Andes-Antilles has apparently been interrupted a long time ago, but it is not longer than that the original ancestors have just reached to their separation into, so to speak, geographical subspecies, a separation, which in the aforesaid rare cases has proceeded so slightly that a specific separation is scarcely possible. In other respects the evolution in the two regions has taken a different direction. In the West-Indies and in the Andes from Mexico to Bolivia, the affinity of the floras is very intimate, as a great number of species are common to both regions, which is probably owing mainly to their proportionally late geological separation; in these regions the group, which I call the group of *D. Sprengelii*, has been subjected to an intensive development. The number of species belonging to this group is certainly considerably larger than the 18 species enumerated below. In South Brazil this group is only very sparsely represented, only *D. cheilanthoides* may properly be referred

¹) Denkschr. math.-nat. Klasse d. Kais. Akademie Wien 79; 1906.

here. The other species, *D. achalensis* and *D. siambonensis* — and perhaps *D. Glaziovii* — might form a peculiar little group, characterized by creeping rhizome and without close affinity to the andine species of the group of *D. Sprengelii*. On the other hand South Brazil and neighbouring countries are remarkably rich in species with a wide-creeping rhizome.

This difference between the fern flora of the Andes and South Brazil, so pronounced in a group of such closely related species, may also be observed within other groups of *Dryopteris* and other genera of ferns, and it will no doubt become more evident, when the andine flora has been more thoroughly explored. It will probably be proved that only a very small number of those species, now recorded from the whole tropical America, are common to the two regions.

All species are of terrestrial habitats, as far as known to me none are epiphytic; unfortunately the labels in rare cases inform us about that point. The most fitted growing-places appear to be the banks of rivers and lakes in well-shaded places; several of them are stated to grow in boggy ground. The great majority of species are of a marked mesophilous habit, and none of them grow at a very high level. In the Andes they occur most frequently at a height of 500—2000 m. Species of a more high-andine habit are *D. Funckii* and *D. caucaensis*, which grow in forests 3000—3500 m. above the sea-level. Otherwise I cannot give exact data regarding the vertical distribution of the single species.

I here enumerate the titles of some of the more important works, which — besides the handbooks — deal with several American species of the group of *D. opposita*, referring as to other books to the list of literature in my "*Index Filicum*".

- H. CHRIST: Primitivæ Floræ Costaricensis. Filices IV—V. Bull. L'Herb. Boiss. II. 6: 1906, pp. 57—58, 159—161; 7: 1907, pp. 262—263.
- Pteridophyta in Ergebnisse der botanischen Expedition der kaiserlichen Akademie der Wissenschaften nach Südbrasilien 1901. I. Band, herausgeg. von R. v. WETTSTEIN. — Denkschriften der math.-naturw. Klasse der kais. Akad. d. Wiss. Bd. LXXIX. Wien 1906.
- FÉE: Histoire des Fougères et des Lycopodiacées des Antilles. Onzième et dernier mémoire sur la famille des fougères. Paris 1866.
- Cryptogames vasculaires du Brésil. I—II. Paris 1869—1873.
- FOURNIER: Mexicanas plantas nuper a collectoribus expeditionis scientificæ allatas enumerandas curavit E. Fournier. Pars prima: Cryptogamia. Paris 1872.
- G. HIERONYMUS: Beiträge zur Kenntniss der Pteridophytenflora der Argentina und einiger Teile von Uruguay, Paraguay und Bolivien. — Engler's Bot. Jahrbücher 22, 1896.
- Plantae Lehmannianae in Guatemala, Columbia et Ecuador regionibus finitimis collectae Pteridophyta. Engler's Bot. Jahrbücher 34, 1904.
- Plantae Stübelianae. Pteridophyta, zweiter Teil. — Hedwigia 46, 1907, pp. 328—344.
- JENMAN: Synoptical list, with descriptions of the ferns and fern-allies. — Bulletin of the Bot. Department Jamaica. New series 3—4, 1896—1897.
- KLOTZSCH: Beiträge zu einer Flora der Aequinoctial Gegenden der neuen Welt. — Linnaea 20, 1847 p. 337.
- METTENIUS: Filices horti botanici Lipsiensis. Leipzig 1856.
- Ueber einige Farngattungen IV. Phegopteris und Aspidium. 1858.

- E. ROSENSTOCK: Beiträge zur Pteridophytenflora Südbrasilens. I—II. — Hedwigia 43, 1901; 46, 1906, pp. 120—128.
- A. SODIRO: Cryptogamae vasculares quitenses, adjectis speciebus in aliis provinciis ditionis Ecuadorensis hactenus detectis. Quiti 1893.

To the following species, of which I have seen no authentic specimen, I have not been able from the descriptions alone to refer specimens examined by me. It is probable that some of these may prove identical with species described in the following pages, but I am almost sure that no species described by me as new will turn out to be one of these unknown species:

- Aspidium Fischeri* Mett. Aspid. 80, 1858; *Dryopteris* C. Chr. Ind. 266. — Brazil. — Judging from the description it is a very near ally of *D. ptarmica*, possibly only a form of this species.
- Aspidium pachyklamys* Fée, 11 mém. 77 tab. 21 fig. 2, 1866. — Guadeloupe, L'Herminier 1861. — Seems to be a form of *D. opposita*.
- Nephrodium Sprucei* Bak. Syn. Fil. 269, 1867; *Dryopteris* C. Chr. Ind. 294. — Ecuador, Spruce.
- Nephrodium longicaule* Bak. Journ. Bot. 1881: 205; Ic. plant. tab. 1658; *Dryopteris* C. Chr. Ind. 275. — Columbia, Province of Antioquia, Kalbreyer n. 1454.
- Nephrodium brachypodum* Bak. Trans. Linn. Soc. II. Bot. 2: 290, 1887; *Dryopteris* C. Chr. Ind. 255. — British Guiana, Mt. Roraima, im Thurn n. 225.
- Polypodium demeraranum* Bak. l. c. 290; *Dryopteris* C. Chr. Ind. 261. — British Guiana, Mt. Roraima, im Thurn n. 356.
- Polypodium roraimense* Bak. l. c. 291; *Dryopteris* C. Chr. Ind. 289. — British Guiana, Mt. Roraima, im Thurn n. 168.
- Polypodium Crossii* Bak. Ann. of Bot. 5: 455, 1891; *Dryopteris* C. Chr. Ind. 259. — Andes loxensis, Cross.

The following species described by SODIRO in Crypt. vasc. quit. 1893:

- Nephrodium brachypus* Sod. p. 228, *N. rigescens* Sod. p. 239, *N. conforme* Sod. p. 240, *N. elegantulum* Sod. p. 243, *N. semilunatum* Sod. p. 245, all from Ecuador.
- The following described by JENMAN in Bull. Dept. Jamaica 3 and 4, 1896—1897:

- Nephrodium basiattenuatum* Jenm. (3: 20), *N. caribaeum* Jenm. (3: 21), *N. crenulaeum* Jenm. (3: 68), *Polypodium Thomsoni* Jenm. (4: 130), all from Jamaica. *Polypodium pubescens* Jenm. (4: 128) is hardly identical with *P. pubescens* Raddi and probably a species unknown to me.

As it is of some importance to know where the examined specimens are to be found, I have, in order to state this, used the following abbreviations:

- HB. = Herbarium Musei botanici Berolinensis.
 HC. = Herbarium H. Christ, Basel.
 HH. = Herbarium Musei botanici Hauniensis.
 HR. = Herbarium E. Rosenstock, Gotha.
 HS. = Herbarium Holmiense (Herbarium Regnellianum and Riksmuseets Herbarium, Stockholm).

Clavis specierum.

1. Venae in segmento 3—10 jugae, raro plures. Lamina versus basin gradatim, raro abrupte attenuata.
2. Pinnae raro ultra 1 $\frac{1}{2}$ cm. latae, 10 cm. longae.

Sectio: oligocarpicae-oppositae.

3. Rhizoma erectum, raro breviter repens stipitibus fasciculatis. Venae indivisae, raro nonnullae furcatae.
4. Lamina versus basin breviter attenuata: pinnae reductae 1—4 jugae (Typus I). Segmenta basalia aequalia vel breviora, raro paulo longiora.

Subsectio: oligocarpicae.

5. Pinnae omnes sessiles. Sori rotundi.
6. Rachis esquamosa.
7. Rhizoma erectum ¹⁾.
8. Lamina herbacea vel membranacea.
9. Lamina \pm pilosa.
10. Sporangia setosa.
 11. Rachis ac costae dense et brevissime puberulae, pilis longis destitutae 1. *D. concinna*.
 11. Rachis pilis longis paucis instructa, lamina subglabra 2. *D. Stierii*.
10. Sporangia glabra.
 11. Rachis pilis longis patentibus instructa.
 12. Pili decidui, solitarii maxime ad raches et costas.
 13. Lamina tenuiter herbacea, pellucida. Venae interdum furcatae
3. *D. Lorentzii*.
 13. Lamina \pm firma 4. *D. argentina*.
(vide n. 15. *D. Lindigii*.)
12. Pili numerosi, persistentes.
 13. Indusium 0, vel cito evanescens, raro repertum.

¹⁾ Species, the rhizome of which I have not seen, are placed in this group.

14. Rachis pilis longis patentibus
± dense instructa . . 5. *D. oligocarpa*.
(vide et n. 3. *D. Lorentzii*.)
14. Rachis breviter ochraceo-tomen-
tosa
(vide n. 47. *D. utañagensis*.)
13. Indusium distinctum, setosum. Ra-
chis dense pilosa.
14. Stipites ad basin squamis spar-
sis vestiti vel esquamosi
6. *D. pilosula*.
14. Stipites ad basin squamis longis
brunneis densissime vestiti
7. *D. tablaziensis*.
11. Rachis brevissime puberula, pilis longis
destituta.
12. Lamina versus basin gradatim et bre-
viter attenuata.
13. Lamina subtus dense glandulosa,
faciebus subglabra 8. *D. Nockiana*.
13. Lamina eglandulosa.
14. Lamina ubique breviter pube-
scens.
15. Lamina supra ad venas setis
longis solitariis instructa
9. *D. columbiana*.
15. Pili venarum parenchyma-
tisque uniformes 10. *D. muzensis*.
14. Lamina inter venas glabra
11. *D. boqueronensis*.
12. Lamina versus basin abrupte attenuata.
13. Folia aequalia. Species andina
12. *D. lepidula*.
13. Folia subdimorpha. Species austro-
brasiliensis 13. *D. Lindmani*.
9. Lamina glaberrima vel solum supra ad costas
sparse setosa.
10. Sori margini approximati; 3-8 jugae pinnarum
inferiorum valde et abrupte reductae 14. *D. lustrata*.
10. Sori mediales. Pinnae inferiores gradatim reduc-
tae, infimae auriculiformes, trilobae 15. *D. Lindigii*.
8. Lamina coriacea vel chartacea.

9. Pinnae oppositae, inferiores reductae.
10. Lamina versus basin gradatim attenuata, pinnis infimis auriculiformibus; laciniae basales auctae 16. *D. Galanderi*.
10. Lamina abrupte reducta, pinnis inferioribus glanduliformibus. Laciniae basales aequales vel paulo abbreviatae 17. *D. laevigata*.
9. Pinnae alternae, auriculiformes vel glanduliformes nullae 18. *D. Pavoniana*.
7. Rhizoma breviter repens, apice adscendens, stipitibus fasciculatis. Species brasilienses.
8. Lamina inter venas glabra. Indusium subpersistens, glabrum 19. *D. rioverdensis*.
8. Lamina ubique pubescens. Indusium minimum, mox deciduum, setosum 20. *D. Regnelliana*.
6. Rachis \pm squamosa.
7. Squamae sparsae, acuminatae, brunneae 21. *D. caucaensis*.
7. Squamae numerosas, luteo-brunneae, glandulosae 22. *D. velata*.
5. Pinnae majores breviter petiolulatae.
6. Pinnae basi truncatae, saepe auriculatae. Sori elongati. Species andina 23. *D. aspidioides*.
6. Pinnae basi cuneatae. Sori elongati vel rotundi. Species brasiliensis 24. *D. ptarmica*.
4. Lamina versus basin longe et gradatim attenuata; pinnae reductae multijugae, stipites brevissimi (Typus II). Laciniae basales longiores et saepe latiores.

Subsectio: **oppositae**.

5. Rachis costaeque subtus esquamosae.
6. Venae supra non prominulae, indivisae.
7. Lamina, maxime ad rachin, \pm pubescens. Pinnae aequilaterales.
8. Lamina \pm firma, non tenuiter herbacea.
9. Laciniae breves, obtusae, venae 3—7.
10. Pinnae acuminatae, supra inter venas glaberrimae.
11. Sori margini approximati. Lamina firma, ad rachin costasque \pm pilosa, subtus dense glandulosa 25. *D. opposita*.
11. Sori mediales. Lamina herbacea, ad rachin costasque supra sparse pilosa, subtus sparse glandulosa 26. *D. riopardensis*.

10. Pinnae obtusae vel subacutae, supra inter venas brevissime puberula 27. *D. coarctata*.
9. Laciniae lineares, falcatae vel valde obliquae. Venae 7—9.
10. Lamina subtus dense glandulosa, versus basin sensim attenuata 28. *D. panamensis*.
10. Lamina subtus eglandulosa (v. n. 72. *D. scalaris*) versus basin abrupte attenuata 29. *D. silviensis*.
8. Lamina tenuiter herbacea. Species minores, antillanae.
9. Laciniae integrae vel leviter dentatae, marginibus planis 30. *D. delicatula*.
9. Laciniae inciso-crenatae, crenis revolutis 31. *D. physematioides*.
7. Lamina glabra vel subglabra, herbacea.
8. Pinnae (formae typicalis) inaequilaterales, majores fere ad costam incisae 32. *D. sancta*.
8. Pinnae aequilaterales (v. n. 26. *D. riopardensis*.)
6. Venae supra prominentes, interdum furcatae.
7. Lamina membranacea, ad venas glabra; pinnae distincte inaequilaterales 33. *D. consanguinea*.
7. Lamina coriacea, ad venas hirta, pinnae plerumque aequilaterales 34. *D. scalpturoides*.
5. Rachis costaeque subtus squamosae 35. *D. Funckii*.
3. Rhizoma horizontaliter repens, stipitibus remotis. Venae saepe furcatae.
4. Lamina coriacea. Pinnae reductae nullae vel 1-jugae. Sporangia setosa 36. *D. firma*.
4. Lamina membranacea vel subherbacea. Pinnae reductae 3—8 jugae. Sporangia glabra.
5. Rachis ac costae subtus esquamosae. Species austrobrasilenses.
6. Lamina inter venas glabra.
7. Lamina glaberrima. Pinnae ad 8 cm. longae, ad basin vix attenuatae 37. *D. Sanctae Catharinae*.
7. Lamina ciliata. Pinnae ad 18 cm. longae, ad basin sensim attenuatae 38. *D. Jürgensii*.
6. Lamina subtus inter venas pubescens.
7. Lamina versus basin abrupte attenuata 39. *D. Mosenii*.
7. Lamina versus basin gradatim attenuata.
8. Venae saepe furcatae. Pinnae deltoideo-elongatae.

9. Pinnae marginibus planis non revolutis, aequilaterales 40. *D. pseudomontana*.
 9. Pinnae marginibus \pm revolutis, saepe inaequilaterales 41. *D. rivularioides*.
 8. Venae indivisae. Pinnae lineari-lanceolatae
 42. *D. scariosa*.
 5. Rachis ac costae subtus sparse squamosae. Species andina
 43. *D. Rosenstockii*.
 2. Pinnae 2—5 cm. latae, 10—15 cm. longae, inferiores reductae 3—5 jugae, raro plures. Sori in sp. 58—61 oblongi.

Sectio: pachyrachis.

3. Sori omnes rotundi.
 4. Laciniae raro ultra 4 mm. lata. Stipes supra basin ac rachis sine squamis. Lamina \pm gradatim attenuata.
 5. Lamina inter venas glabra vel sparse pilosa.
 6. Lamina papyracea vel membranacea, non tenuiter herbacea.
 7. Pinnae solum pinnatifidae; laciniae plerumque integrae.
 8. Rachis glabra vel demum glabrata. Venae 7—9.
 9. Lamina subtus glandulis rubinis distinctis instructa.
 Sori mediales 44. *D. pachyrachis*.
 9. Lamina subtus eglandulosa. Sori margini approximati 45. *D. Hieronymusii*.
 8. Rachis dense pilosa. Venae 10—15. Lamina eglandulosa.
 9. Lamina papyracea vel subcoriacea. Sori mediales.
 10. Laciniae 4—5 mm. latae, patentes 46. *D. supina*.
 10. Laciniae 2 mm. latae, falcato-ligulatae
 47. *D. utaãagensis*.
 9. Lamina membranacea. Sori margini approximati
 (v. n. 70. *D. Christensenii* et n. 69. *D. lasiopteris*).
 7. Pinnae versus basin pinnatae, laciniae crenatae
 48. *D. atropurpurea*.
 6. Lamina tenuiter herbacea.
 7. Sori mediales. Rachis glabra.
 8. Indusium dense setosum 49. *D. palustris*.
 8. Indusium glabrum, glandulosum 50. *D. tenerrima*.
 7. Sori margini approximati. Rachis pubescens.
 8. Lamina subtus eglandulosa. Laciniae basales ceteris subaequales 51. *D. recumbens*.
 8. Lamina subtus glandulosa. Laciniae basales longiores 52. *D. amphioxypteris*.
 5. Lamina inter venas utrinque dense et brevissime puberula.

6. Indusium 0. Laciniae basales reductae 53. *D. rustica*.
6. Indusium setosum. Laciniae basales ceteris aequales
54. *D. atrorubens*.
4. Laciniae 5—7 mm. latae. Stipes ubique squamosus. Lamina
abrupte attenuata.
5. Rachis squamosa. Sori mediales 55. *D. Germaniana*.
5. Rachis squamosa.
6. Sori inframediales; lamina glabra. Pinnae inferiores auri-
culiformes. Rachis sparse squamosa 56. *D. Moritziana*.
6. Sori supramediales; lamina ubique breviter pubescens supra
ad venas setis longis intermixtis. Pinnae inferiores 1—2 cm.
longae et latae, lobatae. Rachis densius squamosa
57. *D. corazonensis*.
3. Sori basales semper \pm oblongi, ceteri interdum rotundi, saepe
lineares (*Leptogramma* auctt.).
4. Lamina gradatim attenuata.
5. Venae basales in sinum excurrentes. Lamina breviter atte-
nuata. Venae 6—7 58. *D. diplazioides*.
5. Venae basales supra sinum marginem attingentes. Lamina
longe et gradatim attenuata. Venae 10—15.
6. Sori mediales. Pinnae remotae. Venae 10—11 59. *D. consimilis*.
6. Sori supramediales. Pinnae contiguae. Venae 12—15
60. *D. heteroclita*.
4. Lamina abrupte attenuata. Venae 7—9, basales supra sinum
marginem attingentes 61. *D. atrovirens*.
1. Venae densae, in segmento 12—25.

Sectio: Sprengelii.

2. Species Argentinae et austrobrasilienses (v. etiam n. 82. *D. cheilanthoides*).
Rhizoma repens (*D. Glaziovii*?).
3. Pinnae aërophoro instructae. Venae 12—14, saepe furcatae. Lamina
glabra vel subglabra 62. *D. Glaziovii*.
3. Pinnae aërophoro destitutae. Venae 14—18, indivisae. Lamina
ad costas \pm pilosa.
4. Venae 14—16, pellucidae. Lamina tenuiter herbacea 63. *D. siambonensis*.
4. Venae 16—18. Lamina firma 64. *D. achalensis*.
2. Species andinae et antillanae. Rhizoma erectum. Pinnae in specie-
bus plurimis aërophoro instructae.
3. Lamina herbacea vel membranacea marginibus planis vel paulum
revolutis.
4. Pinnae inferiores 3—8 jugae abrupte reductae.
5. Rachis squamosa (vide n. 57. *D. corazonensis*.)

5. Rachis esquamosa; pinnae infimae minimae, saepe glanduliformes (Typus IV).
6. Laciniae integrae.
7. Rachis ac lamina subtus dense glandulosa non pilosa
65. *D. Sprengelii*.
7. Rachis et costae \pm pilosae.
8. Lamina subtus glandulosa.
9. Rachis sparse pubescens; pili longi, simplices
66. *D. Mercurii*.
9. Rachis pilis stellatis breviter cinereo-tomentosa
67. *D. Stübelii*.
8. Lamina subtus eglandulosa. Rachis dense pubescens.
9. Venae 16—20 jugae. Rachis pilis stellatis brevissime cinereo-tomentosa 68. *D. Canadasii*.
9. Venae 11—15 jugae. Rachis pilis simplicibus vestita.
10. Laciniae falcatae; venae 10—15. Rachis dense ochraceo-tomentosa 69. *D. lasiopteris*.
10. Laciniae patentes; venae 11—13. Rachis brevissime cinereo-pubescens 70. *D. Christensenii*.
6. Laciniae crenatae; sori in crenis positi 71. *D. limbata*.
4. Pinnae inferiores gradatim reductae, multijugae.
5. Sori rotundi 72. *D. scalaris*.
5. Sori oblongi vel lineares
(vide n. 59. *D. consimilis* et n. 60. *D. heteroclita*.)
3. Lamina coriacea vel chartacea marginibus \pm revolutis, ad basin abrupte attenuata.
4. Margines minus revoluti, soros non tegentes.
5. Venae distinctae; saepe utrinque prominulae.
6. Costae subtus pilis adpressis setosae. Lamina inter venas breviter pubescens. Venae prominulae.
7. Pinnae maximae ad 20 cm. longae. Lamina ubique densius setosa.
8. Laciniae approximatae sinibus acutis angustis separatae 73. *D. rudis*.
8. Laciniae patentes sinibus latis rotundis separatae
74. *D. Engelii*.
7. Pinnae maximae 10—15 cm. longae. Lamina costis costulisque densius setosis exceptis glabrescens
75. *D. nervosa*.
6. Costae subtus pilis mollibus patentibus hirtae. Lamina inter venas glabra. Venae vix prominulae.

7. Pinnae maximae 10–18 cm. longae horizontaliter divaricatae vel parum erecto-patentes, subtus ad costas costulasque solum sparse strigosa.
8. Venae 11–12 jugae. Lacinae obtusae. Pinnae vix ultra 10 cm. longae 76. *D. strigifera*.
8. Venae 14–15 jugae. Lacinae acutae. Pinnae ad 18 cm. longae 77. *D. Brausei*.
7. Pinnae maximae ad 30 cm. longae e medio pendulae, subtus ad costas venasque densius crispato-pilosae
78. *D. pterifolia*.
5. Venae immersae, indistinctae 79. *D. macradenia*.
4. Margines revoluti soros tegentes.
5. Lacinae crenatae crenis revolutis 80. *D. horrens*.
5. Lacinae integrae.
6. Margines revoluti dense ciliati. Lamina subtus eglandulosa. Lacinia basalis posterior non aucta 81. *D. mertensioides*.
6. Margines revoluti glabri vel sparse ciliati. Lamina subtus glandulosa. Lacinia basalis posterior aucta 81. *D. cheilanthoides*.
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Revision of the species.

1. *Dryopteris concinna* (Willd.) O. Ktze. Rev. Gen. Pl. 2: 812. 1891 — [Fig. 2].

Syn. *Polypodium concinnum* Willd. sp. 5: 201. 1810; *Phegopteris concinna* Fée, Gen. Fil. 243. 1852; *Aspidium concinnum* Mett. Fil. Lips. 89. 1856; *Lastrea concinna* Moore, Ind. 86. 1858; ? *Nephrodium concinnum* Bak. Syn. 268. 1867. — *Polypodium molliculum* Kze.; Link, Fil. sp. 130. 1841; *Aspidium molliculum* Mett. Fil. Lechl. I: 19. 1856; *Dryopteris mollicula* C. Chr. Ind. 278. 1905. — *Phegopteris adenchrysa* Fée, Gen. 245. 1852. — *Nephrodium stenophyllum* Sodiro, Recensio 44. 1883; Cr. vasc. quit. 229. 1893; *Dryopteris stenophylla* C. Chr. Ind. 294. 1905, non Hieron. Hedwigia 46: 334. 1907.

Type specimen from Venezuela: Caracas, leg. Bredemeyer, Herb. Willd. n. 19698 (HB!).

Specimens examined:

Guadeloupe: Père Duss n. 4030, 4055, 4056 (HC).

Jamaica: Mandeville, J. Day (HB) (= *Ph. adenchrysa* Fée, f. Hieronymus in Herb. Berol.).

Cuba: Arrogó de Pedro, Eggers n. 5280 (HC). — Monte Verde, Wright n. 1013 (HS).

Mexico: Misantla, Schiede n. 775 pt. (HB).

Guatemala: Los Verdes, 3500', Heyde & Lux ed. Donnell Smith n. 6286 (HB. HC).

Costa Rica: Cartago 4250', J. J. Cooper ed. Donnell Smith n. 6027 (HB. HC. HS). — Meseta, Alfaro n. 16861, 16870 (HC). — Navarro, 1400 m., Wercklé 1905 (HC) (= *Aspidium caucaense* Christ, Bull. Boiss. II. 6: 58. 1906, excl. var., non *Nephrodium caucaense* Hier.).

Venezuela: Caracas, Bredemeyer, Lansberg, Gollmer, Otto, Moritz n. 40 (HB. HC).

Ecuador, Fraser (HB); Sodiro (HC) (= *N. stenophyllum* Sod.).

Rhizomate suberecto, adscendente. Stipitibus versus basin nigrescentibus, squamis paucis tenuibus deciduis instructis, sursum griseis, interdum nitidis, glabris vel minute pubescentibus, in specim. majoribus usque ad 1½ dcm. longis. Lamina lanceolata, ad ½ m. longa, 15 cm. lata, membranacea, superne minute pubescente, subtus eglandulosa ad costas dense sed brevissime puberula, marginibus sparse ciliatis. Rachibus pilis longis destitutis, sed dense et brevissime brunneo-

pubescentibus. Pinnis inferioribus 4—6 jugis sensim reductis, imis minimis, mediis alternis, lineari-lanceolatis, 5—6 cm. longis, 1—1½ cm. latis, breviter acuminatis. Laciniis paulum obliquis, obtusis vel subacutis, basalibus aequalibus vel interdum paulum abbreviatis. Venis indivisis, 6—8 jugis. Soris supramedialibus, parvis. Indusiis in speciminibus plurimis non repertis, parvis, glandulis rubris nonnullis instructis. Sporangii setosis.

No species of this group has been so much misunderstood as *D. concinna*. Most authors have evidently been misled by the diagnosis in Syn. Fil., which does not at all agree with our plant. What BAKER may have meant by his *Nephr. concinnum* it is impossible to say; his description agrees best with *D. rivularioides*, but more probably it covers a number of different species. As the species occurs in Jamaica, one of JENMAN'S numerous species is certainly identical with *D. concinna*, but judging from his descriptions alone I cannot find out which it may be.

The species is one of the most easily recognizable from its long and rather narrow leaf, without long hairs but with the rachis and costæ beneath densely

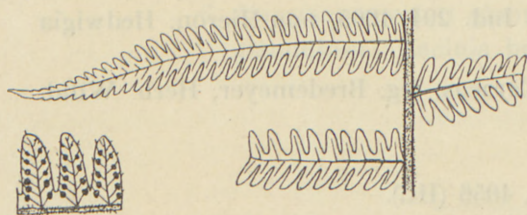


Fig. 2. *D. concinna* (Willd.) O. Ktze.
From the type specimen (Small form).

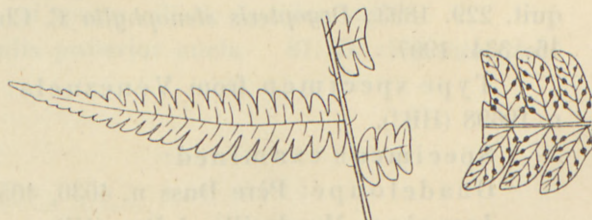


Fig. 3. *D. Stierii* (Ros.) C. Chr.
From the type specimen.

and very shortly pubescent and especially by its setose sporangia. Some forms recall *D. panamensis* in habit, but that species is always glandulose beneath, has long hairs and enlarged basal pinnae. From *D. oligocarpa* and allied species *D. concinna* is easily recognized by the above mentioned peculiarities.

To this species I refer as a variety:

Phegopteris elongata Fournier, Pl. Mex. 1: 87. 1872.

I have not seen the type specimen from Mexico: San Christobal pr. Orizaba leg. Bott n. 1442, but a specimen leg. Liebmann, Mexico: Colipa (HH) determined by FOURNIER as this form. With this agree Pringle n. 1984, Mexico: Sierra Madre near Monterey (HC), and Biolley n. 100, Costa Rica: San José 1169 m. (HC).

The var. *elongata* (Fourn.) agrees perfectly with the typical *D. concinna* in pubescence and in having setose sporangia, but it differs mainly in habit. The lamina is downwards subabruptly reduced with 5—6 pair of very small, auriculate pinnae. Segments closely-placed, more acute than in type, the basal ones sometimes lengthened; pinnae 1 dm. long by 2 cm. broad. In its broad leaf and pinnae it resembles *D. panamensis*.

2. *Dryopteris Stierii* (Ros.) C. Chr. Ind. 664. 1906 — [Fig. 3].

Syn. *Gymnogramme Stierii* Rosenstock, Festschrift Albert von Bamberg 64, Gotha 1905.

Type from Brazil: Prov. Rio Grande do Sul, S. Cruz, leg. A. Stier & C. Jürgens n. 175 (HR!).

A Brazilian representative of *D. concinna*, which it resembles in having setose sporangia and in its short, narrow pinnæ, but it is of a thinner texture, is considerably smaller and wants the characteristic short pubescence on the rachis of *D. concinna*; it is besides nearly quite glabrous. In texture and in its closely placed segments it somewhat resembles *D. Lorentzii*, but it is smaller, eglandulose and with all the veins simple. Dr. ROSENSTOCK referred it first to § *Leptogramma*, to which the species has no near affinity. The exindusiate sori can be a little elongated, but such subgymnogrammoid sori may be found in many species of true *Eudryopteris*, and the fact that the sporangia are pilose does not indicate any alliance with § *Leptogramma*, the most species of this group having glabrous sporangia.

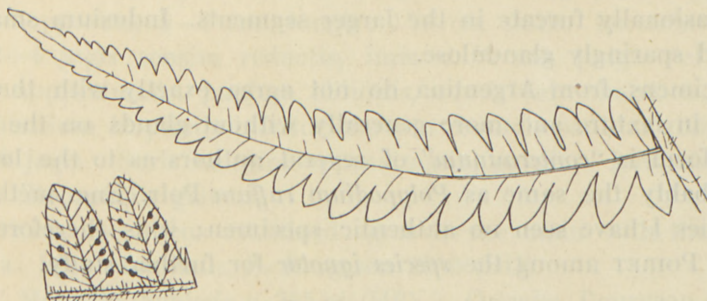


Fig. 4. *D. Lorentzii* (Hier.) C. Chr. From the type specimen.

3. *Dryopteris Lorentzii* (Hier.) C. Chr. Ind. 276. 1905 — [Fig. 4].

Syn. *Aspidium Lorentzii* Hieron. Engl. Jahrb. 22: 368. 1896.

Type specimen from Argentina: Las Peñas, leg. P. G. Lorentz n. 4 (HB!). Other specimens from the same country: Estancia S. Teodoro, Th. Stuckert n. 2351 (HC). — Sierra Chica de Córdoba, Hieronymus (HB).

Near to *D. argentina*, characterized by its closely placed and broad segments and by its very thin, nearly pellucid lamina. Veins 5–8, not rarely furcate. Indusium small, ciliate.

4. *Dryopteris argentina* (Hier.) C. Chr. Ind. 253. 1905.

Syn. *Aspidium argentinum* Hieron. Engl. Jahrb. 22: 367. 1896.

Type specimen from Argentina (HB!).

Specimens examined:

Argentina: Quebrada de Choya, F. Schickendantz n. 357 (HB) — prope San

Francisco, Galander (HB). — Cordillera de la Rioja, Hieronymus & Niederlein n. 342 (HB). — Sierra Achala, Galander (HB). — Sierra Famatina, Hieronymus & Niederlein n. 587 (HB). — Asochinga, Lorentz n. 3 (HB). — Estancia S. Teodoro, T. Stuckert n. 2168 (HC). — Tucuman, T. Stuckert n. 8152 (HC).

Peru: Lima, Dr. Meyen (HB). — Callao, F. Didrichsen n. 4396 (HH).

Chile: Valparaiso, F. Didrichsen n. 3308 (HH); Lindberg (HS); Bridges (HS); Bertero, Gay, Besser, Gaudichaud, Pöppig n. 263, Philippi n. 1092 (HB). — Paihuano, Philippi (HC). — Colehagua, Philippi (HC). — Santiago, Philippi (HB).

I consider this species to be a southern subspecies of *D. oligocarpa*, resembling it in size, habit and texture. It differs mainly by the following characters: Rhizome and the base of stipe destitute of scales or the stipe below furnished with some few thin, not hairy scales. Stipe short, stramineous, towards its base blackish. At first the lamina is sparingly hairy along rachis, costæ and veins, not densely pilose. The hairs are mostly solitarily placed and very deciduous, so that older plants may be quite glabrous. There are 4–6 pair of gradually reduced pinnæ, the lowermost very small and near the base of the stem. The underside is in some specimens densely glandulose, in others without glands. Veins 8–10, in some specimens occasionally furcate in the larger segments. Indusium small with a few long hairs and sparingly glandulose.

The specimens from Argentina do not agree exactly with the Chilene ones, being thinner in texture and more generally without glands on the under surface. The Chilene form is "*conterminum*" of several authors as to the locality of Chili, and it is probably the same as *Polypodium ruffum* Poir. Enc. méth. 5: 532. 1804, of which species I have seen no authentic specimen; it is therefore best to place the species of POIRET among the *species ignotæ* for further study.

5. *Dryopteris oligocarpa* (H. B. Willd.) O. Ktze. Rev. Gen. Pl. 3²: 378. 1898 — [Fig. 5].

Syn.: *Polypodium oligocarpum* Humb. & Bonpl.; Willd. sp. 5: 201. 1810; *Aspidium oligocarpum* H. B. K. Nov. Gen. et Sp. 1: 13. 1815; *Nephrodium oligocarpum* Desv. Mém. Soc. Linn. Paris 6: 256. 1827; *Lastrea oligocarpa* Moore, Ind. 86. 1858. — *Polypodium oligosorum* Kl. Linnaea 20: 387. 1847. — *Polypodium consanguineum* Klotzsch, l. c. — *Aspidium lasiesthes* Kze. Linnaea 23: 300. 1850.

Type from Venezuela: Cumana, leg. Humboldt, Herb. Willd. n. 19699 (part.) (HB!).

Under this name I unite a number of forms, which in general can easily be distinguished from allied species but are very difficult to characterize as good varieties or subspecies. It is probable that the Brazilian forms represent one or two good species different from the typical form from Venezuela-Mexico, but it has not been possible for me to find even one constant character, by which they can be separated from the type, although as a rule they have a somewhat different habit. The more southern forms from Chili and Argentina are more different, and I have considered it proper like Hieronymus to separate them out as a species: *D. argen-*

tina. It is quite wrong to unite, as BAKER does (in "Flora brasiliensis" and "Syn. Fil."), the whole series of forms with *D. opposita*, as that species belongs to a different type. The typical form of *D. oligocarpa*, as represented in Herb. Willd. n. 19699, may be characterized as follows:

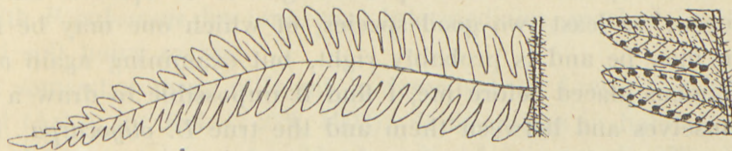


Fig. 5. *D. oligocarpa* (H. B. Willd.) O. Ktze. From the type specimen.

Rhizomate parvo, erecto, apice squamis brunneis, minute pubescentibus vestito. Stipitibus gracilibus, decidue hirtis, ad basin squamis paucis instructis. Lamina lanceolata, ad 4 dcm. longa, 1 dcm. lata, tenuiter membranacea, laete viridi, ubique \pm hirtis, maxime ad rachin et subtus ad costas, subtus eglandulosa vel in speciminibus nonnullis minute aureo-glandulosa et inter venas pilis hamatis brevissime puberula, ad basin breviter et gradatim attenuata (Typus I). Pinnis alternis vel suboppositis, 5–7 cm. longis, $1\frac{1}{2}$ cm. latis, lanceolatis, acuminatis, inferioribus 2–4 jugis sensim reductis, imis c. $\frac{1}{2}$ cm. longis vel auriculiformibus. Laciniis approximatis, paulum obliquis, acutis vel subobtusis, basalibus vix longioribus, interdum in pinnis inferioribus non reductis paulum abbreviatis. Venis indivisis, 6–8 jugis. Soris margini approximatis, parvis. Indusiis raro repertis, pubescentibus. Sporangiiis glabris.

The following specimens examined agree in the main with the type:

Jamaica: Blue Mountain, F. Børgesen 1906 (HH).

Mexico: Misantla, Schiede n. 755 pt. (HB). — Orizaba, Bourgeau n. 2786 (HB). — Vallée de Córdoba, Bourgeau n. 1442 pt. (HH). — Mirador, Liebmann (HH, = *Polypodium concinnum* Liebm. Vid. Selsk. Skr. V. 1: 204).

Costa Rica: San José, 1169 m., P. Biolley n. 101 (HC).

Columbia: Cauca, Lehmann n. 2968 (HB), 3451 (HB. HC). — Porto Bello, Billberg n. 327, 330 (HS).

Venezuela: Tovar, Moritz n. 41, 114 (HB, = *P. consanguineum* Kl.) n. 41 a (HB, = *P. oligosorum* Kl.). — Caracas, Gollmer (HB). — Eggers n. 13182 (HH).

Ecuador: Quito, Hartweg n. 1511 (HH).

Bolivia, M. Bang n. 2320 (HB).

Aspidium lasiesthes Kze., described from a plant cultivated in Herb. Berol. (HB), is a common form, while *Polypodium consanguineum* Kl. differs in having more pairs of reduced pinnæ, in the basal segments being somewhat longer and in the somewhat revolute margins. The other specimens referred here vary but little, and they may be easily distinguished from the allied species, *D. concinna* and *D. columbiana*, by the rachis and costæ being densely covered with long hairs, from *D. concinna* also by its glabrous sporangia. Concerning the differences

between *D. oligocarpa* and its nearest allies *D. pilosula*, *D. argentina* and *D. Nockiana* see under these species.

The Brazilian forms which I now refer to *D. oligocarpa* are much more varying. I have had much correspondence with Dr. ROSENSTOCK on the right conception of these forms, and this keen pteridologist is of opinion that in Southern Brazil there occur at least two good species, of which one may be *D. oligocarpa*. His conception may be and is probably right, but examining again and again the numerous specimens placed before me, I find it impossible to draw a line between the forms themselves and between them and the true *D. oligocarpa*. I shall therefore confine myself to giving some remarks on the different forms.

Three names are applied to these forms from Southern Brazil:

1. *Polypodium retusum* Sw. Vet. Akad. Handl. 1817: 61; Lindman, Arkiv för Bot. 1: 227 tab. 10 fig. 11; *Dryopteris retusa* C. Chr. Index 288. 1905.

Type in HS leg. Freyrei!

2. *Polypodium pubescens* Raddi, Pl. Bras. 1: 23, tab. 34. 1825 (non L.).
3. *Aspidium Kaulfussii* Link, Hort. Berol. 2: 117. 1833(?); Mett. Fil. Lips. 90. 1856; ?*Nephrodium Kaulfussii* HK. sp. 4: 97. 1862; ?Bak. Syn. 268; *Dryopteris Kaulfussii* O. Ktze. Rev. Gen. pl. 2: 813. 1891.

This last, founded on a cultivated specimen, belongs no doubt here, at least it is the case with the specimen described by METTENIUS under this name (HB!), while it may be somewhat doubtful whether LINK's plant is the same. *Nephrodium Kaulfussii* Hk. & Bak. is from the description quite undeterminable. The character given in this: sori medial, does not agree with any form of the whole series.

Having no authentic specimen of *Pol. pubescens* Raddi it is, of course, impossible to say exactly, which form this name was applied to, but judging from RADDI's rather good figure his plant no doubt belongs here and is very nearly allied to *Pol. retusum* Sw., if not the same. Dr. ROSENSTOCK points out the following differences between the two forms: "Die Raddi'sche Pflanze ist etwas länger gestielt, ihre Lamina ist nach unten breiter als *P. retusum*, und die Segmente 2. O. sind an der Spitze nicht gestutzt, stehen auch etwas entfernter von einander als bei *retusum*" (ROSENSTOCK in litt.). On the other hand the character attributed by ROSENSTOCK (*Hedwigia* 46: 122. 1906) to his *D. retusa* (Sw.) var. *austrobrasiliensis*, which he believes identical with *D. pubescens* Raddi: "facie frondis inferiore pilis hamatis undique obsita a typo diversa", cannot be upheld, as the original *P. retusum* shows the same character to a less degree. But there is a conspicuous difference in the shape of the segments, which in *retusum* are obtuse (see LINDMAN's figure) in *pubescens* much more acute. Still it seems to me that this difference is only of minor importance, as I find a great variation in the specimens examined as to that character. With regard to the presence of glands on the underside of the lamina I find also a similar variation; while some specimens are very finely glandulose, as in *P. retusum*, others are densely glandulose and others again entirely eglandulose. Also the reduction of the leaf towards its base and pubescence of

rachis vary considerably. In the original specimen of *P. retusum* Sw. the rachis is densely furnished with patent, soft, whitish hairs, while *var. austrobrasiliensis* Ros. has its rachis densely pubescent with short hairs.

All things considered my opinion of these forms is: *Pol. pubescens* Raddi comes very near to the true *D. oligocarpa*; *P. retusum* Sw. is an extreme form, connected with *P. pubescens* by numerous intermediates, marked by its very obtuse segments and soft hairy rachis.

A form somewhat more different is described by LINDMAN as *Polypodium pubescens* Raddi (Arkiv för Bot. I: 228. 1903). It resembles in habit *D. Mosenii*, but it has an erect rhizome and is not suddenly reduced downwards. The basal segments of the lower pinnæ are considerably reduced, underside eglandulose. I provisionally consider this as a variety of *D. oligocarpa*, although it is probable that it represents a good species.

Minas Geraes: S. João d'El-Rei, leg. Lindman n. A. 111 (HS).

Some of the specimens mentioned by ROSENSTOCK, Hedwigia 46: 123 are also different, for instance Spannagel n. 95, while n. 97 seems to me to be the same as *P. retusum*.

Besides the specimens enumerated by ROSENSTOCK, l. c., under his *D. retusa var. austrobrasiliensis* I have examined the following:

In HC: Minas Geraes: Sta Rita de Ibitipoca, Schwacke n. 12337. — Arraial de Ibitipoca, 810 m., Schwacke n. 12314. — Serra de Lavras, Schwacke n. 12252. — Ouro Preto, Schwacke n. 12438, 13444, 13846, 14007; Gomes n. 309. — Minas, 1000 m., Schwacke n. 13525. — Mono de S. Sebastião, Silveira n. 2983.

In HB: Exp. Novara, leg. Ilinek n. 172. — Burchell n. 3706; Lindberg; Sellow; ?Glaziou n. 7306. Serra dos Orgaos, Vauthier.

In HH: Minas Geraes: Lagoa Santa, Warming.

In HS: Minas Geraes: Caldas, Regnell n. III. 1446 b. — Rio: Corcovado, Mosén n. 2698.

6. *Dryopteris pilosula* (Kl. & Karst.) Hieron. Hedwigia 46: 332. 1907.

Syn: *Aspidium pilosulum* Klotzsch & Karsten; Kunze, Linnaea 23: 229. 1850; Mett. Fil. Lips. 90. 1856; *Nephrodium pilosulum* Hk. sp. 4: 102. 1862. — *Aspidium strigosum* Christ, Bull. Soc. Bot. Belg. 35: 210. 1896 (non Willd.); *A. Alfarii* Christ, Bull. Boiss. II. 5: 259. 1905; *Dryopteris Alfarii* C. Chr. Ind. 251. 1905.

Type specimen in HB! from plants cultivated in Hort. Berol. and Hort. Lips., originally sent from Columbia.

Specimens examined:

Mexico: Chiapas, G. Münch n. 85 (HC).

Guatemala: Alta Vera Paz, Türckheim n. 168 (HC). — San Miquel Usphantán, Heyde & Lux ed. Donnell Smith n. 3245 (HB).

Costa Rica: J. J. Cooper ed. Donnell Smith n. 6027 (pt.) (HC). — Cartago, Pittier n. 1823 (HC = *A. Alfarii* Christ).

Venezuela, Moritz n. 41, 114 (HB = *Polypodium oligosorum* Klotzsch (pro parte).

Ecuador, Sodiro (HB. HC).

Peru, Lechler n. 2026 (HB).

Very near *D. oligocarpa* and, possibly, not specifically distinct; intermediate forms are not rarely found. The typical form of *D. pilosula* differs from *D. oligocarpa* by (1), the whole plant being densely hairy with long patent hairs, especially on rachis and costæ, and (2), the indusium being large, persistent and densely setose.

A specimen from Brazil: Minas Geraes, A. Silveira n. 354 (HC), determined as *D. pilosula* resembles it in pubescence, but seems to me to be a different, not described species.

Aspidium Navarrense Christ., Bull. Boiss. II: 6: 59. 1906. *Dryopteris Navarrensis* Christ, Bull. Boiss. II: 7, 1907 from Costa Rica: Navarro, Wercklé (HC), Santiago, Alfaro n. 16585 (HC) I provisionally refer as a variety to *D. pilosula*, differing mainly by its very small indusium; in habit and pubescence it fully agrees with the true *D. pilosula*.

7. *Dryopteris tablaziensis* Christ, Bull. L'Herb. Boiss. II. 7: 262.

1907 n. sp. — [Fig. 6].

Costa Rica: Tablazo, 1900 m., bords de l'eau, leg. P. Biolley IX. 1906, n. 67 pro parte (HC!). — La Palma, 1500 m. leg. Wercklé (HC).

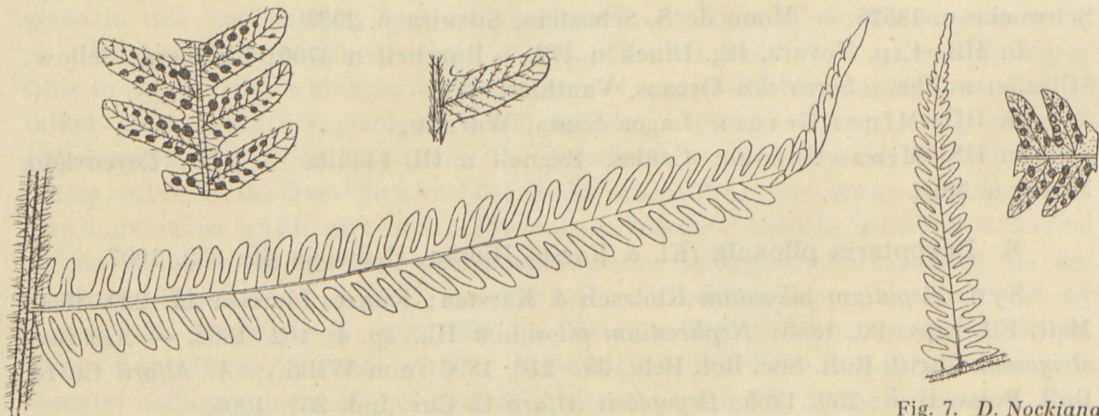


Fig. 6. *D. tablaziensis* Christ. The single segment shows the upperside.

Fig. 7. *D. Nockiana* (Jenm.) C. Chr. From Maxon n. 1879.

Eudryopteris rhizomate (?erecto); stipitibus ad pinnas infimas auriculiformes 6—8 cm. longis, fusco-stramineis, hirtis, ad basin squamis brunneis, glabris, 1 cm. vel ultra longis dense vestitis. Lamina late-lanceolata, 7—8 dcm. longa, 2—2½ dcm. lata, versus apicem pinnatifidum sensim attenuata, versus basin gradatim sed breviter decrescente (Typus III), rachi quadrangulari pilis rufo-brunneis patentibus densissime vestita, faciebus utrinque ad venas, costas costulasque pilis longis dense

instructa, membranacea vel subherbacea, colore brunnea, bipinnatifida. Pinnis 30—35 jugis, inferioribus oppositis vel suboppositis, superioribus alternis, sessilibus, $2\frac{1}{2}$ cm. inter se distantibus, horizontalibus, inferioribus 6—7 jugis subgradatim reductis, reflexis, imis minimis, auriculiformibus, medialibus maximis, lineari-lanceolatis, c. 12 cm. longis, $1\frac{1}{4}$ cm. latis, ad apicem acuminatum sensim attenuatis. Laciniis c. 30 jugis, oblongis, obtusis vel subacutis, obliquis nec falcatis, integris vel leviter repandis marginibus paulum revolutis, ala vix 1 mm lata connectis, sinus rotundis, basali anteriore ceteris aequali, posteriore saepe longiore et angustiore. Venis 7—8 jugis, indivisis, pellucidis. Soris supramedialibus; indusiis deciduis, dense setosis.

This species is only to be compared with *D. pilosula*, resembling it in pubescence, but its whole habit, its longer and broader lamina, brown colour, densely red-haired rachis, its very scaly base of the stipe and its deciduous indusium make it very different from all the species of this group.

8. *Dryopteris Nockiana* (Jenm.) C. Chr. Ind. 279. 1905 — [Fig. 7].

Syn. *Nephrodium Nockianum* Jenman, Journ. Bot. 1886: 270; Bull. Dept. Jamaica n. s. 3: 21. 1897.

Type specimen from Jamaica (non vidi). — A specimen from the same island: Mt. Diabolo, leg. W. R. Maxon n. 1879 (HC) and determined by Maxon as *D. Nockiana* agrees perfectly with Jenman's description. I have had some doubt whether this species is different from *D. panamensis*, but as it differs from that species in some essential characters I find it proper to let it stand as a distinct species.

D. panamensi valde similis, differt: stipitibus longioribus cum rachibus gracilioribus breviter pubescentibus, pilis longis destitutis. Pinnis alternis, $4\frac{1}{2}$ cm. longis, vix 1 cm. latis, supra ad costas venasque sparse pilosis, subtus dense glandulosa, glandulis aureis. Laciniis parum obliquis, nec falcatis, basalibus productis, posteriore auriculata. Venis 4—6 jugis. Soris supramedialibus. Indusiis magnis, persistentibus, setosis. Textura herbacea, lamina pellucida. — Etiam *D. oligocarpae* valde similis, a qua specie differt: lamina subtus dense glandulosa, indusiis persistentibus.

9. *Dryopteris columbiana* n. sp. — [Fig. 8].

Columbia: Santa Marta, leg. H. H. Smith n. 998 (HC).

Eudryopteris rhizomate?; stipitibus (in specim. incompletis) brevibus, vix 5 cm. longis, griseo-stramineis, minute pubescentibus. Lamina lanceolata, 5—6 dm. longa, medio c. 15 cm. lata, acuminata, versus basin subgradatim breviter attenuata, herbacea, laete-viridi, utrinque breviter puberula, ad costas utrinque longius hirta, supra ad costulas venasque ac ad marginem setis solitariis deciduis instructa, eglandulosa. Rachibus gracilibus, brevissime pubescentibus. Pinnis c. 20 jugis, inferioribus 5—6 jugis subgradatim reductis, c. 5 cm. inter se distantibus, infimis auriculiformibus, mediis c. 8 cm. longis, $1\frac{1}{2}$ cm. latis, distantibus ($2\frac{1}{2}$ cm.), alternis,

sessilibus, horizontalibus, lanceolatis, breviter acuminatis. Laciniis 20—25 jugis, ala 1 mm. lata connectis, subfalcatis, acutis vel subobtusis, versus apicem leviter crenatodentatis, basalibus aequalibus. Venis indivisis, 9—10 jugis. Soris margini magis quam costulae approximatis, parvis. Indusiis parvis, ciliatis, mox deciduis. Sporangiiis glabris.

Intermediate between *D. concinna* and *D. oligocarpa*. It resembles the former in habit and in the very short pubescence of rhachis, but the sporangia are glabrous and besides the very short hairs found throughout on the lamina, the veins on the upperside are furnished with solitary, longer and more rigid hairs. From *D. oligocarpa* it differs by the short pubescence of the rachis without long hairs, by the length of the lamina and by the distant pinnæ. It is no doubt this species METTENIUS has named *Aspidium socium* on the labels to some specimens in HB from Venezuela: Caracas, Moritz n. 36, Karsten & Moritz; the same form also from Trinidad, Fendler (HB). Unfortunately I had returned the specimens so-named, as I received *D. columbiana* from Dr. CHRIST.

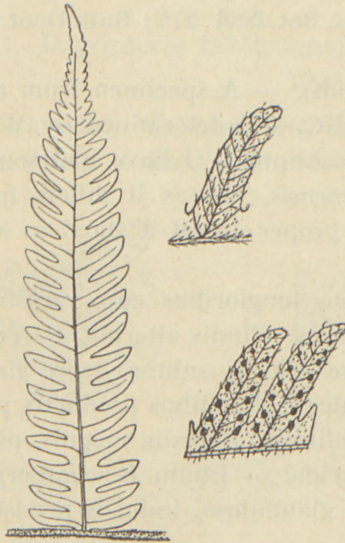


Fig. 8. *D. columbiana* C. Chr.

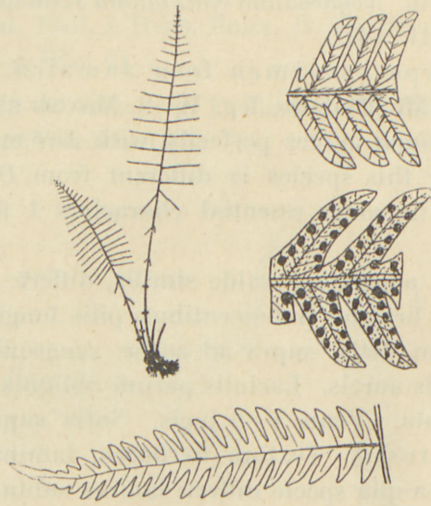


Fig. 9. *D. Lindmani* C. Chr.
Segments of fertile and sterile frond.

10. *Dryopteris muzensis* Hieron. Hedwigia 46: 331. tab. 4 fig. 6. 1907.

Type from Columbia: Muzo, leg. Stübel n. 555 (HB!).

Rhizome wanting. Very near *D. columbiana*, but texture firmer and without the long setæ on the veins above; segments sub-patent, obtuse, with a considerable space between them. Sori supramedial, exindusiate; sporangia glabrous.

11. *Dryopteris boqueronensis* Hieron. Hedwigia 46: 329. tab. 4 fig. 5. 1907.

Type from Columbia: Boqueron de Bogotá, leg. Stübel n. 453 (HB!).

Rhizome wanting. Resembling *D. columbiana* but sori medial, hairy only on the vascular parts, glabrous between the veins and the short hairs on the rachis patent. Sporangia glabrous.

12. *Dryopteris lepidula* Hieron. Hedwigia 46: 328 tab. 4 fig. 4. 1907.

Type from Columbia: Miraflores, 2700 m., leg. Stübel n. 332 (HB!).

Leaf abruptly narrowed downwards with 2 pair of very small, auriculiform pinnæ. Very like *D. concinna*, but the sporangia glabrous. Rhizome wanting.

13. *Dryopteris Lindmani* n. sp. — [Fig. 9].

Brasilia: Prov. S. Paulo, leg. Hj. Mosén, n. 4623 (HS!).

Eudryopteris rhizomate suberecto, 2 cm. crasso. Stipitibus fasciculatis, griseo-stramineis ad basin fusciscentibus, breviter pubescentibus et ad basin squamis brunneis, tenuibus, acuminatis instructis, foliorum sterilium 2—3 cm. longis (ad pinnas infimas auriculiformes), foliorum fertileium 7—10 cm. longis. Foliis subdimorphis: sterilibus brevius stipitatis, lamina 2—2½ dem. longa, c. 10 cm. lata, late-ovata, ad apicem pinnatifidum breviter acuminata, ad basin abrupte reducta; pinnis 2—3 jugis imis valde reductis, auriculiformibus, trilobis, c. 1 cm. inter se distantibus, superioribus 1—2 jugis paulum reductis, reflexis, ceteris approximatis, contiguis, horizontalibus, alternis vel suboppositis, sessilibus, oblongo-linearibus, breviter acuminatis, medialibus maximis, 5 cm. longa, 1 cm. lata. Laciniis numerosis approximatis — sinibus acutis, angustis — ala 1 mm. lata connectis, linearibus, paulum obliquis, integris, obtusis vel subacutis, vix ultra 1½ mm. latis, basalibus aequalibus vel paulo longioribus. — Lamina folii fertileis longius stipitata, 4½—5 dem. longa, c. 10 cm. lata, lanceolata ad apicem acuminatum sensim attenuata, versus basin abrupte reducta. Pinnis infimis 3—4 jugis auriculiformibus, 3—4 cm. inter se distantibus, superiore jugo paulum reducto, reflexo, superioribus horizontalibus, oppositis vel suboppositis, 2—2¼ cm. distantibus, sessilibus, acuminatis, lanceolatis, 5 cm. longis, medio 1¼—1½ cm. latis. Laciniis acutis, subfalcatis, basalibus interdum paulo brevioribus. — Rachibus gracilibus, dense sed brevissime pubescentibus. Faciebus ad costas costulasque magis ad venas utrinque sparse pilosis, costis subtus densius hirtis. Textura firmo-herbacea, colore folii sterileis gramineo-viridi, fertileis pallidiore. Venis 7—8 jugis, indivisis. Soris globosis, submarginalibus; indusio nullo.

This species somewhat resembles *D. oligocarpa* but very different by its suddenly narrowed lamina (about typus V). The subdimorphism described is, I think, no constant character; I find, namely, a few sori on the short leaves. The species is, however, well-marked by its closely-placed, narrow, linear segments. In the shape of the lamina it resembles *D. Mosenii*, which is a considerably larger species with creeping rhizome.

14. *Dryopteris lustrata* (Hier.) C. Chr. Ind. 276. 1905.

Syn. *Nephrodium lustratum* Hieron. Engl. Jahrb. 34: 443. 1904.

Type from Columbia, leg. Lehmann n. 557 (HB!). — Peru: Lima, Gaudichaud (HB).

In his excellent description the author says: "(pinnis) infimi paris auriculiformibus"; he has overlooked that below this pair two other pair of very small, nearly glanduliform, distant pinnæ are found. The specimen from Peru agrees very well with the original one, but it bears 8 pairs of auriculiform pinnæ. The species resembles in shape of lamina a member of the group of *D. Sprengelii*, but in size and number of veins (8—9) it shows affinity with *D. Lindigii*, *D. oligocarpa* and other species of this group.

15. *Dryopteris Lindigii* C. Chr. Ind. 275. 1905; Hieron. Hedwigia 46: 328. 1907.

Syn. *Nephrodium deflexum* Presl, Rel. Haenk. 1: 36 tab. 5 fig. 2. 1825; *Lastrea deflexa* Presl, Tent. 76. 1836; *Phegopteris deflexa* Mett. Ann. sc. nat. V. 2: 241. 1864; *Polypodium deflexum* Bak. Syn. 305. 1867 (non aliorum).

Type specimen from Peru, in montanis ad Huanocco leg. Haenke (Museum d. Kgr. Böhmen, Prag). Other specimens examined:

Columbia: Manzanos, 2500 m., Lindig n. 321 (HB).

Venezuela, Moritz n. 405 (HB), Lansberg (HB), Fendler n. 186 (HB).

Costa Rica: Cañas Gardas 1100 m., Pittier n. 10965 (= *Aspidium caucaense* (Hier.) Christ, Bull. Boiss. II. 6: 58. 1906, non Hier.) (HC).

In habit, size and texture this species comes very near to *D. oligocarpa*, but with the exception of the costæ, which are hairy above, it is nearly quite glabrous having only a few deciduous hairs on the rachis, costæ and veins. It has several (3—4) pairs of gradually reduced pinnæ, the lowermost being auriculiform, often trilobed.

Rhizome of the original specimen oblique, ca. 1 dem. long by 1 cm. thick, covered with numerous bases of stipes of old leaves and at the apex with a few brown, thin scales; the leaves fasciculated at its top. Stems slender, stramineous, towards their base blackish, glabrous or very sparingly pubescent, with a few thin scales at base. Pinnæ opposite, the lower non-reduced reflexed, articulated to the rachis. Basal segments not enlarged. Veins 4—6 to a side; sori medial or a little above the middle of the vein; indusium not seen.

The specimen from Costa Rica referred to was determined by CHRIST as *D. caucaensis*, which is a widely different species; it differs in habit very much from the normal form, having the outer half of the pinnæ pendent and their anterior segments reflexed and overlapping the posterior ones, in about the same manner as in *Lindsaya dubia* Spr., but in the essential characters I see no difference. A single leaf of Lindig n. 321 shows partly the same peculiarity, and I have no doubt that my determination is the right one.

Aspidium simplicissimum Christ, Bull. Boiss. II. 4: 959. 1904; *Dryopteris simplicissima* C. Chr. Ind. 293. 1905 from Costa Rica, Wercklé 1903 (HC!), in Bull. Boiss. II. 6: 58. 1906 by CHRIST referred to *D. caucaensis* as a variety, is to me a

form of *D. Lindigii* of a somewhat firmer texture, but the specimen is too incomplete for a certain identification with *D. Lindigii*.

16. *Dryopteris Galanderi* (Hier.) C. Chr. Ind. 267. 1905.

Syn. *Aspidium Galanderi* Hieron. Engl. Jahrb. 22: 369. 1896.

Type from Argentina: Sierra de la Estanzuela, leg. C. Galander (HB!).

Besides this rather incomplete specimen I refer here a plant from Brazil: Lagoa Santa, E. Warming (HH), from which I supplement the original diagnosis with the following:

Rhizomate adscendente, nudo, c. $3\frac{1}{2}$ cm. crasso. Stipitibus $1\frac{1}{2}$ dcm. longis, rigidis, stramineis, basi fuscescentibus, glabris, ad basin squamis nonnullis subrigidis, opacis, mox deciduis instructis. Lamina lanceolata, $5\frac{1}{2}$ — $6\frac{1}{2}$ dcm. longa, medio 15 cm. lata, coriacea. Pinnis inferioribus distantibus, 3—4 jugis reductis, infimis minimis, a jugo superiore 4 cm. remotis, omnibus exacte oppositis, subhorizontalibus, glabris vel denudatis, interdum sparse ciliatis, subtus sparse glandulosis. Laciniis basalibus majoribus. Venis 7—8 jugis, simplicibus vel in laciniis basalibus furcatis.

Very near *D. oligocarpa* and especially *D. argentina*, but distinguished by its coriaceous lamina and opposite pinnæ.

17. *Dryopteris laevigata* (Mett.) C. Chr. Index 273. 1905 — [Fig. 10].

Syn. *Phegopteris laevigata* Mett.; Kuhn, Linnæa 36: 112. 1869; *Polypodium laevigatum* Bak. Syn. Fil. 505 (non 348). 1874; *Polypodium Lechleri* Bak. Ann. of Bot. 5: 456. 1891.

Type from Peru: Tatanara, leg. Lechler n. 2628 (HB!).

Stem and rachis dark-purplish, shining, like the subcoriaceous lamina quite glabrous, 4 pair of distant ($3\frac{1}{2}$ cm.) glanduliform pinnæ, lowest pair of developed pinnæ scarcely abbreviated. Pinnæ opposite, $4\frac{1}{2}$ cm. long, $1\frac{1}{2}$ cm. broad with distinct circular aërophore. Segments few, somewhat oblique, obtuse, the edges somewhat revolute; veins 5—6 to a side; sori exindusiate, about medial. Developed lamina 40 cm. long.

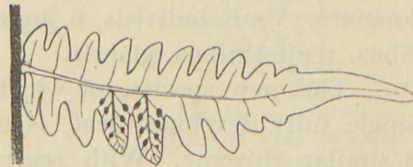


Fig. 10. *D. laevigata* (Mett.) C. Chr.
From the type specimen.

18. *Dryopteris Pavoniana* (Klotzsch) C. Chr. Ind. 283. 1905.

Syn. *Polypodium Pavonianum* Klotzsch, Linnæa 20: 386. 1847; *Phegopteris Pavoniana* Mett.; Kuhn, Linnæa 36: 112. 1869; *Nephrodium Pavonianum* Hieron. Engl. Jahrb. 34: 445. 1904.

Type from Peru, leg. Ruiz & Pavon n. 55 (HB!). — Further I refer here two specimens from Peru and Bolivia, Mandon n. 16 (HB).

This species is allied to *D. oligocarpa*, *D. argentina* and *D. Galanderi* distinguished

by its very coriaceous texture, long stem, no auriculiform, reduced pinnæ, and by its medial sori. The original specimen is incomplete wanting rhizome and stem, the others have an erect rhizome clothed with pubescent scales as in *D. oligocarpa*. Stem in length equal to or longer than lamina, this being 1—3 dcm. long by 3—8 cm. broad, its rachis and costæ beneath hairy, otherwise glabrous, with the base rounded, i. e. the lower pinnæ get gradually shorter, but are not very reduced and distant. Pinnæ alternate, rather close, the edges of the segments recurved. Veins simple, 6—7, prominent above. Sori medial, indusium not found. In the original specimen a tuberculiform aërophore is seen at the base of the larger pinnæ.

19. *Dryopteris rioverdensis* n. sp. — [Fig. 11].

Brasilia: Prov. Minas Geraes: Caldas. In ripa amnis Rio Verde ad rupes umbrosas, leg. Hj. Mosén ^{15/10} 1873, n. 2171 (HS!).

Eudryopteris rhizomate breviter repente, 1 cm. crasso. Stipitibus c. $\frac{1}{2}$ cm. remotis, gracilibus, 5—6 cm. longis, stramineis, brevissime pubescentibus, mox glabratis, ad basin squamis brunneis, acuminatis dense vestitis. Lamina 28 cm. longa, medio c. 10 cm. lata, ad apicem breviter acuminatum sensim decrescente, versus basin abrupte attenuata, herbacea, gramineo-viride, ciliata, utrinque ad costas breviter pubescentibus, inter venas glaberrima, eglandulosa, bipinnatifida. Rachibus stramineis, gracilibus, pubescentibus. Pinnis inferioribus 2 jugis minimis, auriculiformibus, inter se 3 cm. distantibus, superiore jugo reflexo 3 cm. longo, superioribus erecto-patentibus, alternis, lineari-lanceolatis, c. 6 cm. longis, $1\frac{1}{4}$ cm. latis, sessilibus, apice serrato acuto vel breviter acuminato excepto ad alam c. 1 mm. latam pinnatifidis. Laciniis approximatis, obliquis, obtusis, integris vel frequenter versus apicem leviter crenato-dentatis, basalibus aequalibus vel anteriore paulo longiore. Venis indivisis, 6 jugis. Soris supramedialibus, parvis. Indusiis persistentibus, reniformibus, glabris.

This new species, of which I have seen only a single specimen with only a single fully developed leaf, is in habit very different from the other species with a similar rhizome. With regard to the base of the leaf it somewhat resembles *D. Mosenii* and *D. Lindmani*, yet differs from both in pubescence and in its few reduced pinnæ, from the former moreover by its thin texture, fewer veins and glabrous indusium, from the latter, besides the different habit, by its persistent indusium.

20. *Dryopteris Regnelliana* n. sp. — [Fig. 12].

Brasilia. Minas Geraes, Caldas, leg. Regnell n. III. 1446 a (HS); Mosén n. 2165, 2167 (HS).

Eudryopteris rhizomate breviter repente apice adscendente, c. 1 cm. crasso. Stipitibus subremotis, decidue pubescentibus, ad basin squamis brunneis deciduis sparse instructis, griseis, 10—15 cm. longis. Lamina lanceolata, 7—8 dcm. longa,

c. $1\frac{1}{2}$ dem. vel ultra lata, versus apicem pinnatifidum acuminatum sensim decrecente, versus basin subgradatim attenuata, herbacea, pallide viride, ad rachin costasque utrinque pilosa, inter venas pilis hamatis brevissimis utrinque puberula, bipinnatifida. Pinnis alternis vel suboppositis, parum erectis, inferioribus subgradatim reductis, infimis 3-jugis auriculiformibus, 3–4 cm. inter se distantibus (Typus III), inframedialibus maximis, 7–9 cm. longis, $1\frac{1}{2}$ cm. latis, c. 2 cm. inter se distantibus, acuminatis, ad alam $1-1\frac{1}{2}$ mm. latam pinnatifidis. Laciniis c. 20-jugis, obliquis vel leviter falcatis, obtusis vel subacutis, integris, basalibus aequali-



Fig. 11. *D. rioverdensis*
C. Chr.

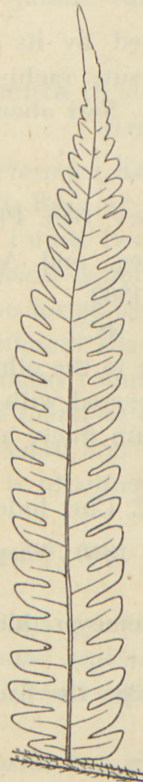


Fig. 12. *D. Regnelliana* C. Chr.

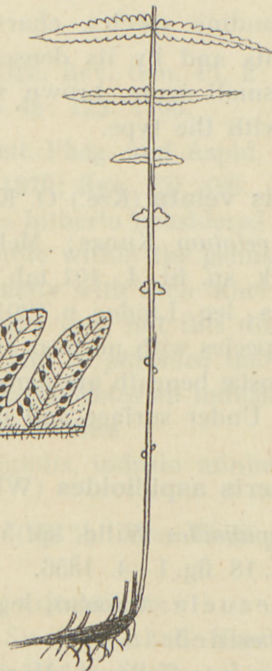
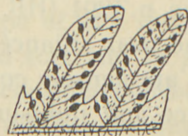


Fig. 13. *D. caucaensis*
(Hier.) C. Chr. From the
Costa Rican specimen.

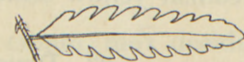
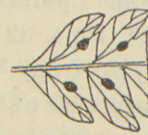


Fig. 14. *D. ptarmica*
(Kze.) O. Ktze. Wacket
n. 58.



bus vel anteriore saepe abbreviata. Venis 8–9 jugis, indivisis, basale anteriore in sinum excurrente, posteriore marginem supra sinum attingente. Soris parvis margini approximatis. Indusiis minimis, mox deciduis, setosis.

This species, for a long time considered a form of *D. diplazioides*, resembling it much in habit, is however distinctly different from that species by its short-creeping rhizome, more numerous and more reduced lower pinnæ, the upper pinnæ serrulate, not entire, more slender rachis, more deeply incised pinnæ, only the lower anterior vein reaching the sinus, sori very rarely a little elongated and furnished with a densely pilose indusium, still very small and difficult to find. —

I think the nearest species is *D. oligocarpa* (*Pol. retusum* Sw.), which differs in rhizome and has fewer reduced pinnæ.

21. *Dryopteris caucaensis* (Hier.) C. Chr. Ind. 257. 1905.

Syn. *Nephrodium caucaense* Hieron. Engl. Jahrb. 34: 444. 1904. — *Aspidium frigidum* Christ, Bull. L'Herb. Boiss. II. 6: 60. 1906.

Type from Columbia: Cauca, leg. Lehmann n. 3102 (HB!). Also leg. Schmidchen (HB). — Costa Rica: Le haut de volcan Turrialba, C. Werklé (HC) = *A. frigidum* Christ.

A very distinct andine species, characterized by its coriaceous texture, its broad (4 mm.) segments and by its densely hirsute rachis, which is throughout sparsely clothed with small acute, brown scales. Sori about medial. *A. frigidum* Christ agrees exactly with the type.

22. *Dryopteris velata* (Kze.) O. Ktze. Rev. Gen. Pl. 2: 814. 1891.

Syn. *Aspidium velatum* Kunze; Mett. Pheg. und Aspid. 79 n. 190. 1858; *Nephrodium velatum* Hk. sp. fil. 4: 101 tab. 247. 1862.

Type from Cuba, leg. Linden n. 1901 (HB. HC!).

A very peculiar species with no near alliance to the other species of the group. Rhizome, rachis and costæ beneath are densely covered with large, thin, glandulose, reddish yellow scales. Under surface and indusium finely and densely glandulose.

23. *Dryopteris aspidioides* (Willd.) C. Chr. Index 253. 1905.

Syn. *Ceterach aspidioides* Willd. sp. 5: 137. 1810; *Phegopteris aspidioides* Mett. Fil. Hort. Lips. 82 tab. 18 fig. 1—4. 1856.

Type from Venezuela: Caracas, leg. Bredemeyer, hb. Willd. n. 19581 (HB!).

Specimens examined:

Venezuela: Caracas, Gollmer, Moritz n. 36, Dr. Kosas, Lansberg, Buschel (HB). — Col. Tovar, Karsten, Gollmer (HB).

This species very well figured by METTENIUS and incorrectly united with the next species by HOOKER and BAKER is intermediate between *D. diplazioides* and *D. ptarmica*, differing from the former by its smaller size and by its short-stalked pinnæ, from the latter by its subtruncate and broader (1 cm.) pinnæ and by its only very sparingly squamose stem. Lamina sparsely pubescent throughout, the lower one or two pair of pinnæ somewhat reduced, the upper ones 4—5 cm. long, broadest at the base, in fully developed leaves incised about midway to the costa into obtuse or sometimes retuse, rather oblique lobes; veins 3—4 to a side, the lower ones running out from the midrib of the lobe about 1 mm. above its base; the anterior basal vein reaches the margin in sinus, the posterior one a little above. Sori placed a little above the middle of the vein, 1 mm. long. METTENIUS describes the sporangia as setose; in the majority of the specimens examined the sporangia

are, however, glabrous and only in a single specimen have I found a few sporangia with one or two hamate hairs.

The following variety is connected by intermediate forms with the type:

var. *subhastata* n. var.

Peru: Tarapoto, Spruce n. 3964 (HH. HB). — Loreto, E. Ule n. 6518 (HC). — St. Gavan, Lechler n. 2311 (HB).

Columbia, Lindig n. 53 (HB).

Venezuela: Caracas, E. Otto n. 596 (HB).

A typo differt: pinnis subhastatis, i. e. basi superiore auriculata, sursum integris.

24. *Dryopteris ptarmica* (Kze.) O. Ktze. Rev. Gen. Pl. 2: 813. 1891; Rosenstock, Hedwigia 46: 123. 1906.

Syn. *Aspidium Ptarmica* Kze.; Mett. Pheg. and Aspid. 80 n. 191. 1858; *Nephrodium Ptarmica* Bak. Fl. Bras. 1²: 479. 1870; Syn. Fil. 496.

Under this name I unite two forms hitherto considered as two different species; the older name *asplenioides* is not available within the genus. In size, habit, texture, pubescence etc. the two forms agree exactly with each other; the difference between them is mainly the different shape of the sori, but this difference is rather vague; *asplenioides* has often many round sori and in *ptarmica* the larger sori are generally somewhat elongated. I therefore consider *ptarmica* an indusiate form of *asplenioides*; the indusium is very small and difficult to find.

1. *ptarmica*: Soris plerumque rotundis, indusio minimo, ciliato, mox deciduo instructis — [Fig. 14].

Type from Brazil, leg. Sello (HB!); also from S. Paulo, leg. Wacket n. 58 (HR).

2. *asplenioides*: Soris \pm elongatis, exindusiatis.

Syn. *Gymnogramma asplenioides* Sw. Vet. Akad. Handl. 1817: 56 tab. 3 fig. 4; Bak. Syn. 376 (part.); *Ceterach aspidioides* Raddi, Pl. Bras. I: tab. 21. 1825 (non Willd.). etc. v. Ind. Fil. 253.

Type from Brazil, leg. Freyreis (HS!). Besides this I have seen numerous specimens from southern Brazil (for instance Glaziou n. 930, 1784. 5324, Mosén n. 2235 (HH)), all agreeing exactly with the type specimen.

The species is certainly a near ally of *D. aspidioides*, but its habit is different and it is probably confined to South-Brazil, while *D. aspidioides* is an andine species. It is smaller (pinnæ about 3 cm. long by 6—8 mm. broad) of thinner texture and darker colour, stipe squamose, pinnæ with cuneate base, incised $\frac{1}{3}$ — $\frac{1}{2}$ of the way down with very oblique lobes; veins about 3 to a side.

Polypodium saxicola Sw. Vet. Akad. Handl. 1817: 59 tab. 3 fig. 5 from Brazil, leg. Freyreis (HS!) is probably a form of this species. The original specimen is in poor condition and I cannot venture at present to unite it with *D. ptarmica*. SWARTZ' figure is not good. The sori, especially the basal ones, is oblong almost as in

asplenioides and the stem has a few scales, but it differs from typical *ptarmica* by its more rigid texture, the margins revolute, pinnæ auriculate at the upper base, upwards only crenate, not so deeply incised as in *ptarmica*. It much resembles *D. asplenioides* var. *subhastata* in habit.

25. *Dryopteris opposita* (Vahl) Urban, Symb. Antil. 4: 14. 1903.

Syn. *Polypodium oppositum* Vahl, Ecl. Amer. 3: 53. 1807; *Aspidium oppositum* Sw. Adnot. 67. 1829; Christ, Farnkr. 252. 1897; *Nephrodium oppositum* Diels, Nat. Pfl. 14: 172. 1899. *Aspidium conterminum* Willd. sp. 5: 249. 1810; *Nephrodium conterminum* Desv, Prod. 255. 1827; Bak. Syn. 268 (pt.); *Dryopteris contermina* O. Ktze. Rev. Gen. Pl. 2: 812. 1891. *Aspidium polyphyllum* Kaulf. Flora 1823¹: 362. *Polypodium Plumieri* Desv. Berl. Mag. 5: 316. 1811. *Aspidium strigosum* Fée, 11 mém. 78 tab. 22 fig. 2. 1866. *Aspidium Rivoirei* Fée, 11 mém. 76 tab. 21 fig. 3. 1866.

Var. *Polypodium rivulorum* Raddi, Pl. Bras. 1: 23 tab. 35. 1825; *Aspidium rivulorum* Link, Hort. Berol. 2: 119. 1833; Mett. Pheg. und Aspid. n. 193 (part.).

Type from Montserrat, leg. Ryan.

Specimens examined:

Martinique: Herb. Willd. n. 19698 (type of *A. conterminum*; HB); Sieber, Fl. Mart. n. 241 (= *A. polyphyllum* Klf.; HB); Hahn n. 23 (HB).

Guadeloupe: L'Herminier n. 153 (= *A. strigosum* Fée; HC); another specimen leg. L'Herminier is *A. Rivoirei* Fée (HB); Père Duss n. 220 (HC).

St. Vincent: Eggers n. 6753 (HC).

Grenada: Eggers n. 6028 (HC).

Montserrat: Ryan (HH, an type specimen?).

Puerto Rico: Sintenis n. 3977 (HB).

Cuba: Wright n. 820 pt. (HS).

Mexico: Colipa, Prov. Vera Cruz, Liebmann (HH). — Jalisco, Pringle n. 11794 (HC).

Costa Rica: Rio Virilla, Prov. San José, 3200', Donnell-Smith n. 5089 (HC). — Rio Turrialba, Prov. Cartago, 1600', Donnell-Smith n. 5087 (HC). — H. Pittier n. 10488 (HC).

Columbia: Lehmann n. 741 (HB), 4429, 5709 (HB. HC). — Lindig n. 354 (HB).

Venezuela: Borckel, Kosas, Preuss n. 1670 (HB).

Peru: S. Gavan, Lechler n. 2662 (HB). — Pöppig (HB).

Bolivia: Near Coroico, M. Bang n. 2316 (HH. HB).

Brasilia. A large number of specimens, especially from the southern provinces and all belonging to var. *rivulorum*.

The typical form is also recorded from Florida.

D. opposita is extensively misunderstood by most pteridologists, and the bundles in herbaria of specimens called "*conterminum*" include a mixture of widely different species. The species is recorded from all countries of tropical America, but it is in general impossible to say what the authors may have meant by their *conter-*

minum. The specimens from Chili and Argentina, which I have seen, belong to *D. argentina*.

The essential characters of *D. opposita* are: Rhizome erect with many fasciculated leaves. The leaf narrows very gradually through a large number of reduced pinnæ nearly to the base of the stem. Pinnæ opposite, horizontal, from a hastate base, i. e. the basal pair of segments are always enlarged, gradually tapering to the acuminate apex. Segments short, obtuse, with few (4—7) pair of simple veins. The underside in general glandulose, and the vascular parts more or less pilose. Texture firm, sometimes nearly coriaceous. To this species I refer a great many forms showing all the characters named above, but varying in size, texture, pubescence and the presence or want of an aërophore. Yet, the most different forms are connected by numerous transitional forms, and it seems to me rather impossible to distinguish good varieties, with exception of the var. *geraensis* described below. Looking again and again over the numerous specimens examined, I believe I am able to point out a somewhat constant difference between the West-Indian and the Brazilian plants, while the specimens from the continent outside Brazil are almost intermediate between the two extreme forms. As this difference covers a different geographical distribution, I find it right to separate out the Brazilian form as a variety. The two forms may be distinguished as follows.

1. *typica* (= *A. conterminum* Willd. = *A. polyphyllum* Klf.) — [Fig. 15]. Smaller than the next with the pinnæ longer and broader (6—10 cm. long by 1 cm. broad); texture thinner, the edges not revolute; no aërophore; segments oblong, obtuse, rather oblique. Underside densely glandulose; pubescence sparsely; 4—6 pair of veins.

2. var. *rivulorum* (Raddi) C. Chr. apud Rosenstock, *Hedwigia* 46: 120. 1906 — [Fig. 16]. Leaf upto 1 m. long, 7—10 cm. broad, more rigid with revolute edges. Pinnæ short, 3—4 cm., very acuminate, often with an aërophore at their base, costæ and veins more or less hairy. Segments short, nearly triangular, a little oblique, about 4 pair of veins.

This form very common in southern Brazil is no doubt *P. rivulorum* Raddi, RADDI's figure agreeing very well with it. METTENIUS considered RADDI's plant a distinct species, well characterized by the presence of an aërophore; but his *Aspidium rivulorum* includes the numerous forms which I now refer to *D. pachyrachis*, a species with only a few pair of reduced pinnæ. One often finds, however, in the larger specimens of this variety a distinct aërophore, and Prof. ROSENSTOCK, thinking that this character is accompanied by a nearly total want of hairs, has therefore named such forms var. *Mettenii* Ros. *Hedwigia* 46: 120. 1906. Still it has been impossible for me to find out constant characters by which the proposed variety can be determined.

A form distinguished by its size is var. *longissima* n. var.

Columbia: Santa Marta, leg. H. H. Smith n. 1008 (HC).

Lamina $1\frac{1}{4}$ m. longa, 2 dcm. vel ultra lata, pinnis maximis 11 cm. longis, 1 cm. latis, lineari-acuminatis; textura minus firma.

The following variety is very different, in habit very similar to small forms of var. *rivulorum*, but so unlike this in its few reduced pinnae, quite glabrous leaf and its inframedial sori, that it possibly represents a good species.

var. *geraensis* n. var.

Brazil: Minas Geraes, Caldas, in ripa aquaeductus, Hj. Mosén n. 4622 (HS). — Ibid. ad rivulum campi, Hj. Mosén n. 2153 (HS).

Varietas (vel potius subspecies) *D. oppositae*, habitu typo similis, differt: lamina 2— $2\frac{1}{2}$ dcm. longa, c. 7 cm. lata, glaberrima, pallida, firmo-herbacea, ad basin brevius attenuata; stipitibus 6—8 cm. longis, pinnis reductis paucis, 3—4 jugis, infimis hastatis nec auriculiformibus, mediis c. 4 cm. longis, 7—8 mm. latis, basi dilatatis et aërophoro parvo instructis, subtus dense glandulosis, glandulis aureis. Venis 3—5 jugis; soris costulae magis quam margini approximatis. Indusiis persistentibus, glandulosis.

26. *Dryopteris riopardensis* Rosenstock, Hedwigia 46: 121. 1906 — [Fig. 17].

Type from Brazil: Rio Grande do Sul, Rio Pardo, leg. Jürgens n. 282 (HR!).

Intermediate between *D. opposita* and *D. pachyrachis* var. *platyrachis*, differing from both in its thin texture, from the former also in pubescence, being nearly quite glabrous, in its long pinnae with very obtuse segments and in its medial sori, from the latter, though resembling it in pubescence, in the absence of the large red glands on the underside and in having more pair of reduced pinnae and a much shorter stem.

27. *Dryopteris coarctata* (Kze.) C. Chr. Ind. 258. 1905.

Syn. *Aspidium coarctatum* Kunze, Bot. Zeit. 1845: 287; Mett. Aspid. 77.

Type from Venezuela: Caracas, leg. Moritz n. 80 (HB!), also Fendler n. 177 (HB) and Eggers n. 13102 (HH).

Eudryopteris rhizomate erecto, nudo, radicibus numerosis ramosis instructo. Stipitibus dense fasciculatis, brevissimis, raro ad 2 cm. longis, rigidis, pubescentibus, ad basin squamis rufis, acuminatis, $\frac{1}{2}$ cm. longis instructis. Lamina oblanceolata, 2—3 dcm. longa, supra medium 3—4 cm. lata, versus apicem acuminatum breviter attenuata, versus basin longe et gradatim attenuata, membranacea, in siccitate fragillima, pallide viridi ad raches costasque utrinque pubescente, sparse ciliata, supra minute hirta, subtus dense et minute glandulosa, bipinnatifida. Pinnis approximatis, alternis vel suboppositis, horizontaliter patentibus, numerosis (30—40 jugis), multis (10—15 jugis) inferioribus gradatim reductis (Typus II), auriculiformibus vel triangulari-hastatis, infimis vix $\frac{1}{2}$ cm. remotis, maximis supramedialibus $1\frac{1}{2}$ — $2\frac{1}{2}$ cm. longis, $\frac{1}{2}$ cm. latis, oblongis, basi dilatata sessilibus, obtusis vel rotundatis vel interdum subacutis, apice crenato vel integro excepto pinnatifidis. Laciniis 6—8 jugis, ovato-oblongis, obtusis, integris, marginibus paulum revolutis, lacinia basali anteriore

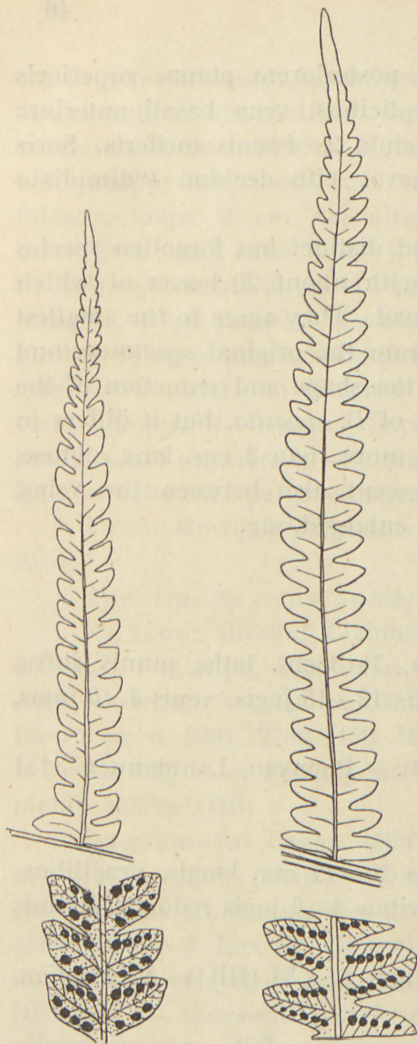


Fig. 15. *D. opposita* (Vahl) Urban, *typica*. Sieber n. 241.

Fig. 17. *D. riopar-densis* Ros.

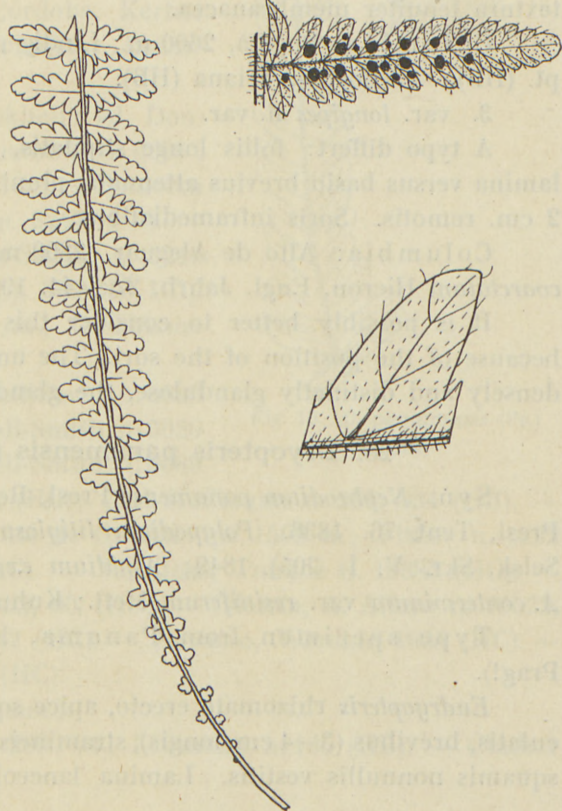
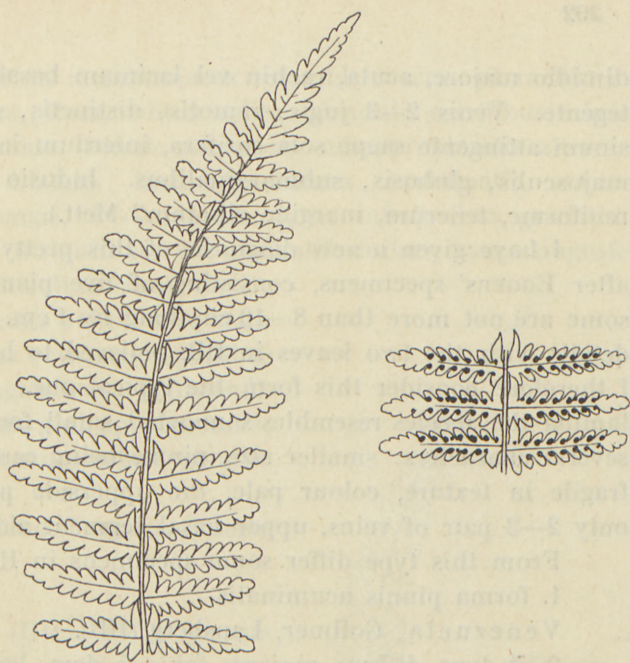


Fig. 18. *D. coarctata* (Kze.) C. Chr. Eggers n. 13102.

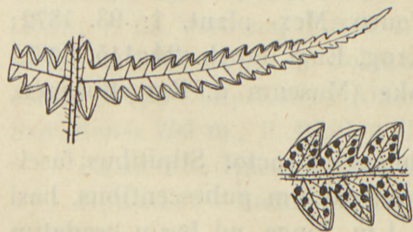


Fig. 16. *D. opposita* (Vahl) Urban var. *rivulorum* (Raddi) C. Chr.

dimidio majore, acuta, rachin vel laciniam basalem posteriorem pinnae superioris tegente. Venis 2—3 jugis, remotis, distinctis, simplicibus, vena basali anteriore sinum attingente saepe sola sorifera, interdum in lacinia 2—4 venis soriferis. Soris majusculis, globosis, submarginalibus. Indusio parvo, cito deciduo ("dimidiato reniforme, tenerum, margine ciliatum" Mett.).

I have given a new diagnosis of this pretty and distinct but forgotten species after EGGERS' specimens, consisting of five plants with about 20 leaves of which some are not more than 8—10 cm. long by 1 cm. broad. They agree to the smallest details with the two leaves in HB, believed to be from the original specimen, and I therefore consider this form the typical one. In the shape and reduction of the lamina the species resembles somewhat small forms of *D. opposita*, but it differs in several characters: smaller size, pinnæ being rarely more than 2 cm. long, obtuse, fragile in texture, colour pale, the upperside pubescent also between the veins, only 2—3 pair of veins, upper basal segment alone enlarged, etc.

From this type differ some specimens in HB.

1. forma pinnis acuminatis.

Venezuela, Gollmer, Lansberg (HB).

2. A typo differt: majore, foliis 5 dcm. longis, 7—8 cm. latis, pinnis infra-medialibus maximis, 4 cm. longis, 1 cm. latis, laciniis 12—15 jugis, venis 4—5 jugis, textura tenuiter membranacea.

Columbia: Bogotá, 2600 m., Lindig n. 75 (HB). — Popayan, Lehmann n. 3451 pt. (HB). — ?Bogotá, Triana (HB).

3. var. *longipes* n. var.

A typo differt: foliis longe stipitatis, stipitibus 10—12 cm. longis, gracilibus; lamina versus basin brevius attenuata, pinnis inferioribus 4—6 jugis reductis, infimis 2 cm. remotis. Soris inframedialibus.

Columbia: Alto de Aleguar, 2800 m., Lehmann n. XXI (HB = *Nephrodium coarctatum* Hieron. Engl. Jahrb. 22: 444. 1904).

It is possibly better to consider this variety a species of its own, especially because of the position of the sori. The underside of the lamina is extraordinarily densely and distinctly glandulose, the glands dull.

28. *Dryopteris panamensis* (Presl) C. Chr. — [Fig. 19].

Syn. *Nephrodium panamense* Presl, Rel. Haenk. 1: 15. 1825; *Lastrea panamensis* Presl, Tent. 76. 1836. *Polypodium litigiosum* Liebmann, Mexico Bregner 53 (Vid. Selsk. Skr. V. 1: 205). 1849; *Aspidium exsudans* Fourn. Mex. plant. 1: 93. 1872; *A. conterminum* var. *resiniferum* Mett.; Kuhn apud Krug, Engl. Jahrb. 24: 115. 1897.

Type specimen from Panama, leg. Haenke (Museum d. Kgr. Böhmen, Prag!).

Eudryopteris rhizomate erecto, apice squamis paucis instructo. Stipitibus fasciculatis, brevibus (3—4 cm. longis), stramineis, glabris vel paulum pubescentibus, basi squamis nonnullis vestitis. Lamina lanceolata, $\frac{1}{2}$ —1 m. longa, ad basin gradatim

sed breviter attenuata, gramineo-viridi, membranacea vel subherbacea, ad rachin et costas pilis albidis mollibus decidue pilosa, subtus ubique glandulis sessilibus rubris vel aureis dense instructa, bipinnatifida. Pinnis numerosis, subapproximatis alternis vel suboppositis, sessilibus basi dilatatis, lineari-lanceolatis, acuminatis, erecto-falcatis, saepe 10 cm. vel ultra longis, $1\frac{1}{4}$ — $1\frac{1}{2}$ cm. latis, inferioribus gradatim minoribus, imis inter se 3—4 cm. distantibus, vix auriculiformibus, saepe anguste linearibus, hastato-ligulatis. Laciniis linearibus, multo obliquis, saepe distincte falcatis, acutis vel obtusis, marginibus integris planis, raro paulum revolutis, basalibus (praesertim anteriore) distincte longioribus. Venis indivisis, obliquis, 7—9 jugis. Soris margini approximatis; indusiis cito evanescentibus, ovato-reniformibus, glandulosis et interdum parce ciliatis.

Area: Mexico-(?)Ecuador. Cuba, Jamaica, Puerto Rico.

Specimens examined:

Mexico: Mirador, Liebmann (HH = *Pol. litigiosum* Liebm.). — Colipa, Liebmann (HH). — Vallée de Córdoba, Bourgeau n. 1442 pt., 2356 (HB. HH). — Orizaba, Bourgeau n. 2361, 2786 (HB. HH). — Córdoba, Kerber n. 5 (HB. HC) — et alia leg. Sartorius, Schaffner, Lenormand, Müller (HB).

Guatemala: Coban 4300', v. Türkheim ed. Donnell-Smith, n. 168 (HB). — Volcan Tecuamburro 6000', Heyde & Lux ed. Donnell-Smith n. 4683 (HB). — Zamorra 5500', Heyde & Lux ed. Donnell-Smith n. 3247 (HB). — Santa Rosa, Heyde & Lux, ed. Donnell-Smith n. 3246 (HB. HC). — Bernoulli & Cario n. 235 (HC), 375 (HB. HC).

Honduras: San Pedro Sula, 800 m., C. Thieme ed. Donnell-Smith n. 5674 (HB. HC).

Costa Rica: Hajuelita 3000', Donnell-Smith n. 5090 (HB). — Cartago, J. J. Cooper ed. Donnell-Smith n. 6050 (HB. HC. HS). — Rio Virilla 3200', Donnell-Smith n. 5089 (HB). — San José 1179 m., Tripet n. 14 (HC); Carl Hoffmann n. 266, 834 (HB). — Terraba, Pittier n. 3558 (HB). — San José de Guadalupe 1500 m., Pittier n. 4892 (HC). — La Verbena, Pittier n. 8803 (HC). — San José, Tonduz n. 10885 (HC). — Pittier n. 7996 (HB). — Polakowsky n. 82, 90 (HB). — Meseta, A. Alfaro n. 16525, 16852 (HC). — Capelladas, Alfaro n. 17142 (HC). — Navarro, Wercklé 1905 (HC). — San Matéo 250 m., P. Biolley 1906 n. 2 (HC).

Panama, Haenke (Mus. Kgr. Böhmen).

Ecuador: Andes quitenses 1600—2000 m., Lehmann n. 135 (HB). — (Rather doubtful.)

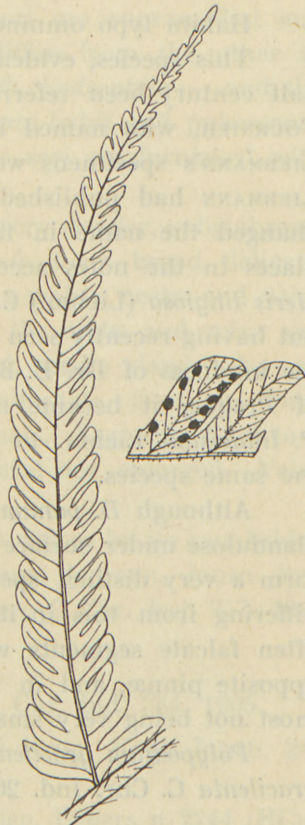


Fig. 19. *D. panamensis* (Pr.)
C. Chr.

Cuba: El Guama, Prov. Pinar del Rio, Wm. Palmer & Riley n. 137 (1900) (HH).
 Jamaica: Middleton, Stengel (HB). — Mt. Airy, W. R. Maxon n. 855 (HC). —
 Banks of Ginger River, W. R. Maxon n. 828 (HC).
 Puerto Rico, Balbis (HB).

var. *Gonzalezii* Christ n. var.

Mexico: Cerro de S. Felipe, Oaxaca 2000 m., Gonzalez X. 1900 (HC).

Habitu typo omnino similis, differt: lamina glaberrima, subtus eglandulosa.

This species, evidently very common in Central America, has during the last half century been referred to *D. opposita* by all pteridologists with exception of FOURNIER, who named it *Aspidium exsudans* (Liebm.), under which specific name LIEBMANN'S specimens were distributed. FOURNIER has, however, overlooked, that LIEBMANN had published the species as *Polypodium litigiosum*; probably he has changed the name in the proof, as the name "exsudans" is to be found in two places in the notes accompanying the diagnosis. I have called the species *Dryopteris litigiosa* (Liebm.) C. Chr. on the labels of the numerous specimens seen by me, but having recently seen the type specimen of *Nephrodium panamense* Presl through the kindness of Dr. E. BAYER, curator of the "Museum des Königreiches Böhmen" of Prague, it became necessary to change the name to *panamensis* and reduce *P. litigiosum* Liebm. to a mere synonym, because the plant of PRESL belongs to the same species.

Although *D. panamensis* resembles *D. opposita* in some respects, in its densely glandulose under surface and its enlarged basal segments, it is in its most developed form a very distinct species, in habit totally different from *D. opposita*, and also differing from this in its much longer and broader pinnæ, its much longer and often falcate segments with more veins, in its thinner texture, its rarely exactly opposite pinnæ, and in its proportionally few, distant reduced pinnæ, the lowermost not being very small, but as a rule ligulate.

Polypodium gracilentum Jenman, Bull. Dept. Jamaica 4: 129. 1897; *Dryopteris gracilenta* C. Chr. Ind. 268. 1905 seems to me ex descriptione to be this species.

29. *Dryopteris silviensis* Hieron. Hedwigia 46: 330 tab. 5 fig. 7. 1907.

Type from Columbia: prope Silvia, leg. Stübel n. 140 part. (HB!).

Rhizome wanting. Leaf downwards suddenly narrowed with about 9 pairs of auriculiform or even glanduliform pinnæ. Sporangia glabrous.

30. *Dryopteris delicatula* (Fée) C. Chr.

Syn. *Phegopteris delicatula* Fée, 11 mém. 51 tab. 20 fig. 1 1866.

In HB and HC are to be found two specimens from Guadeloupe, leg. L'Hermier, determined by FÉE as *Phegopteris hydrophila* Fée, 11 mém. 56 tab. 13 fig. 3; a similar specimen from the same island was collected by Mazé n. 916 (HC). Comparing these specimens with FÉE'S figures and descriptions I find that they can not

be *Ph. hydrophila*, but that they agree very well with the figure of *Ph. delicatula*; about this species FÉE says: "aucune espèce connue n'a dans le port une pareille souplesse; elle est délicate dans toutes ses parties", and the specimens seen are remarkable for their delicate leaves and small size; *Ph. hydrophila* is, judging from the figure, a larger species with longer and more deeply incised pinnæ; it may however be doubted, if it is really distinct from *D. delicatula*. The two specimens leg. L'Herminier seen by me are namely not quite identical. The specimen in HC agrees exactly with the figure of *D. delicatula*; the sori are supramedial and the underside densely glandulose; the specimen in HB differs from the other in its sori being placed near the costa — as described for *Ph. hydrophila* — and the underside is very sparsely glandulose. Still in size, texture, habit and pubescence the two specimens agree very well. In both specimens the sori are furnished with a persistent, setose indusium.

Rhizome erect, densely fibrillose. Stems fasciculated, very slender, subglabrous, gray stramineous, rather short. Lamina about 3 cm. long, 5—6 cm. broad, delicate, gradually narrowed to both ends, rather densely hairy along rachis, costæ and veins above, the underside finely and shortly hairy both along the costæ and veins and on the parenchyma, and more or less glandulose with red, sessile glands. Lowest pinnæ gradually reduced, largest ones subopposite or alternate, 3—4 cm. long, 8—10 mm. broad at the middle, obtuse or shortly acuminate. Segments 6—8 to a side, obtuse with 1—2 obtuse teeth at apex, the upper basal one enlarged. Veins about 3 to a side.

The species is a near ally of *D. sancta*, from which it differs by its equal-sided pinnæ and pubescent under surface. *Nephrodium caribaeum* Jenman, Journ. Bot. 1886: 270; Bull. Dept. Jamaica 3: 21. 1896; *Dryopteris caribaea* C. Chr. Ind. 257. 1905 may be the same species.

31. *Dryopteris physematioides* (Kuhn & Christ) C. Chr. Ind. 284. 1905.

Syn. *Aspidium physematioides* Kuhn & Christ apud Krug, Engl. Jahrb. 24: 115. 1897.

Type from San Domingo: Valle nuevo, 2270 m., leg. Eggers n. 2244 (HC).

Not unlike *D. delicatula*, but less hairy and the segments somewhat incised with 2—3 lobes, which in the mature leaf are reflexed, the leaf resembling a *Cheilanthes*. Rachis, costæ, costulæ and margins furnished with some long, white hairs: the leaf otherwise glabrous and without glands; veins 4 to a side, sori medial, exindusiate. Shape of lamina agreeing with type II.

A rather doubtful species, founded on two leaves. In HB two specimens without indication of locality are found, which very much resemble this species but are furnished with a distinct, reniform, hairy indusium.

32. *Dryopteris sancta* (L.) O. Ktze. Rev. Gen. Pl. 2: 813. 1891.

Syn. *Acrostichum sanctum* L. Syst. Nat. ed. X. 2: 1320. 1759; *Polypodium sanc-*

tum Sw. Fl. Ind. occ. prod. 133. 1788; *Phegopteris sancta* Fée, Gen. Fil. 243. 1852; *Aspidium sanctum* Mett. Pheg. und Aspid. 76 n. 181. 1858; Christ, Farnkr. 252; *Nephrodium sanctum* Bak. Syn. Fil. 267. 1867; Jenman, Bull. Dept. Jamaica II. 3: 20. 1897. — *Phegopteris tenella* Fée, Gen. 243. 1852; 7 mém. 62 tab. 25, fig. 2. 1857.

This species, well-known from earlier times (Sloane tab. 49 fig. 2), is in its typical form easily recognizable by its small size — the whole plant being often only 10—15 cm. high — by its thin, but rather firm, glabrous grass-green leaf, which is often finely glandulose on the underside, and especially by its unequal-sided pinnæ, their lower side being very reduced and excepting the basal segment, which as a rule is quite free and somewhat lengthened, only a narrow serrature with very oblique teeth along the midrib of the pinnæ, while the upper segments are considerably longer and more patent; the upper basal segments is always much the largest and with the next following two or three often quite free and not rarely with lobed margins. I have seen no indusium.

Among others I have seen the following specimens of this typical form:

Jamaica, Swartz (HH). — Maxon n. 1829 (HH).

San Domingo: Barrabas, C. Raunkjær 1905 (HH).

Cuba: Arrog de Pedro, 500 m., Eggers n. 4885 (HC).

Puerto Rico, Sintenis n. 5828. 6581 (HC). Ventenat (HH).

Dominica, Eggers n. 456, 2780 (HC).

The species is also recorded from Guatemala and Ecuador (Sodirol).

A very different variety of this species, but connected with the type by numerous transitions, is:

var. *Balbisii* (Sprengel) — [Fig. 20].

Syn. *Polypodium Balbisii* Sprengel, Nova Acta 10: 228. 1821 (non *Dryopteris Balbisii* Urban; C. Chr. Ind. 253 = *D. Sprengelii*), according to identification by Prof. Hieronymus, and it also may be *Nephrodium sanctum* var. *magnum* Jenman, Bull. Dept. Jamaica 3: 20. 1906. In its most developed form this variety is very unlike the typical *D. sancta*. Leaf 3 dm. long, upto 10 cm. broad, bipinnate, the pinnæ with many pairs of free pinnulæ only connected with a very narrow wing to the midrib. The larger pinnæ are nearly equal-sided, while the smaller on the upper part of the leaf resemble the pinnæ of the typical form. The free pinnulæ linear, 1—1 $\frac{1}{4}$ cm. long, about 2 mm. broad with more than their own breadth between them, the anterior edge deeply serrate, the posterior one less incised or

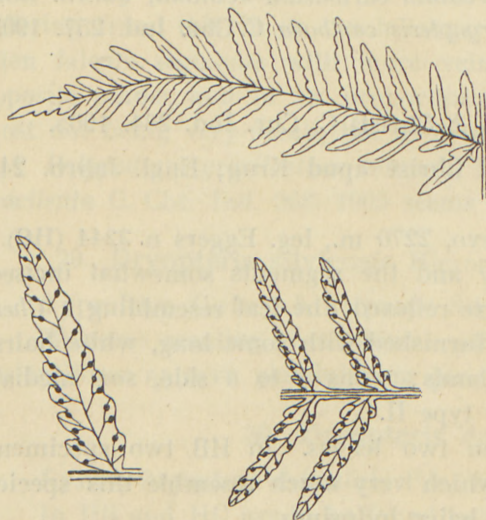


Fig. 20. *D. sancta* (L.) O. Ktze. var. *Balbisii* (Spr.).

linear, 1—1 $\frac{1}{4}$ cm. long, about 2 mm. broad with more than their own breadth between them, the anterior edge deeply serrate, the posterior one less incised or

nearly entire; basal segments deeply lobed at their base, the leaf thus being nearly tripinnatifid. Veins upto 10 to a side, the lower furcate in the teeth or in the larger lobes pinnate.

San Domingo: Rio Mameges, Eggers n. 2540 (HH). — Le Prenleloup n. 717 (HC).
Puerto Rico, Sintenis n. 403 (HC).

33. *Dryopteris consanguinea* (Fée) C. Chr.

Syn. *Aspidium consanguineum* Fée, 11 mém. 76 tab. 20 fig. 3.

Type from Guadeloupe, leg. L'Herminier (n. 10? HB).

Martinique, Père Duss (HB).

Dominica: in silvis prope Rorehill, Eggers n. 454 (HB. HC).

Trinidad, N. & G. Smith n. 1360 (HB).



Fig. 21. *D. consanguinea* (Fée) C. Chr.,
l. Père Duss.



Fig. 22. *D. sculpturoides*
(Fée) C. Chr. From the type
specimen.

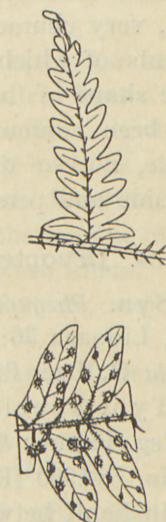


Fig. 23. *D. Funckii*
(Mett.) O. Ktze.
From the type
specimen.

Rhizomate lignoso, c. 1 cm. crasso, breviter repente, adscendente vel suberecto, apice squamis duris ovato-subulatis vestito. Stipitibus subfasciculatis, gracilibus, fusco-stramineis, basi fusciscentibus et sparse squamosis, glabris, superne sulcatis, ad 10 cm. longis. Lamina lanceolata, 5—7 dcm. longa, medio 12—14 cm. lata, versus apicem pinnatifidum decrescente, versus basin longe et gradatim attenuata (Typus II), submembranacea vel firme herbacea, rachibus et costis sulcatis superne sparse pubescentibus exceptis omnino glabra, sed subtus glandulosa, bipinnatifida. Pinnis

numerosis, 30 vel ultra, omnibus oppositis, erecto-patentibus, inferioribus gradatim reductis, infimis auriculiformibus, 4 cm. distantibus, inframedialibus maximis, 2 cm. remotis, 8 cm. longis, $1\frac{3}{4}$ cm. latis, sessilibus, lanceolatis, e medio versus apicem caudato-acuminatum attenuatis, inaequilateralibus, apice excepto ad alam 1 mm. latam pinnatifidis. Laciniis approximatis, obtusis, c. 4 mm. latis, integris vel leviter crenato-serratis, parum obliquis, posterioribus 6 mm., anterioribus 8 mm. longis, basalibus latioribus vix longioribus, anteriore rachin subtus tegente, posteriore interne auriculata auricula rachin supra tegente. Venis 8—9 jugis, indivisis vel in laciniis basalibus furcatis, superne prominulis. Soris fere marginalibus, parvis. Indusiis persistentibus, reniformibus, maturis subcoriaceis.

I have redescribed this species after the specimens from Martinique, leg. Père Duss, which exactly agree with FÉE's figure and which I take for the typical form. EGGERS' specimens are similar but smaller: Leaf 2—4 dcm. long, 6—9 cm. broad, largest pinnæ 5 cm. long, 1 cm. broad, the segments with only 3—5 pair of veins, otherwise it is typical. — It is one of the most well-marked species of the whole group, very characteristic by its unequal-sided, caudate-acuminate pinnæ, the basal segments of which imbricate the rachis as in *D. limbata*. It resembles *D. sancta* in the shape of the pinnæ with the shorter lower segments, and it has, probably, often been confounded with that species, from which it differs by its opposite, caudate, not so deeply incised pinnæ, by its prominent veins, more glandulose underside and persistent indusium.

34. *Dryopteris scalpturoides* (Fée) C. Chr. Ind. 291. 1905 — [Fig. 22].

Syn. *Phegopteris scalpturoides* Fée, 11 mém. 51. 1866. *Aspidium rigidulum* Mett.; Kuhn, Linnaea 36: 109. 1869; *Nephrodium rigidulum* Bak. Syn. 496. 1874; *Dryopteris rigidula* O. Ktze. Rev. Gen. Pl. 2: 813. 1891.

Type specimen from Cuba: Monte Verde, leg. Wright n. 820 (HB. HS!). Also leg. Palmer & Riley n. 195, in mountains near El Guama, Province of Pinar del Rio, $\frac{9}{13}$ 1900 (HH).

In habit between *D. opposita* and *D. panamensis*, in its coriaceous texture like *D. firma*, the typical form eglandulose on the under surface. Rhizome erect, the leaves spreading, shuttle-cock form, very short-stalked, and downwards gradually narrowed through many hastate-tripartite auricles (type II) almost as in *D. opposita*, upwards rather suddenly narrowed to the apex, broadest a little above the middle, hairy on rachis and the upperside, sparsely pubescent on costæ and veins beneath. Largest pinnæ about 6 cm. long by 1 cm broad, broadest at the middle, sometimes (as in the type specimen) unequal-sided, the middle lower segments being somewhat enlarged. Segments closely placed, rather oblique, the basal one the largest and the posterior basal one often with an auricle, which covers the upperside of the rachis. Veins 5—6, prominent on the upperside, the lowest or the two lowest posterior ones often furcate. Sori near the edge. Indusium reniform, setose.

The species is recorded from Jamaica by JENMAN (Bull. Dept. Jam. 3: 22. 1896,

Nephrodium rigidulum). His plant is evidently identical with the following variety, which does not exactly agree with the specimens from Cuba:

var. *jamaicensis* n. var.

Jamaica: Mt. Diabolo, 2000', L. M. Underwood n. 1826 (HC).

A typo differt: minus coriacea minus pubescenti vel rachi costisque superne exceptis subglabra, subtus dense glandulosa, glandulis aureis. Venis omnibus indivisis.

35. *Dryopteris Funckii* (Mett.) O. Ktze. Rev. Gen. Pl. 2; 812. 1891; Hieron. Hedwigia 46: 334 — [Fig. 23].

Syn: *Aspidium Funckii* Mett. Ann. sc. nat. V. 2: 246. 1864; *Nephrodium Funkii* (sic!) Bak. Syn. Fil. 496. 1874.

Type from Venezuela: Sierra Nevada, leg. Funck n. 502 (HB).

Columbia: Lehmann n. 6956 (HB).

An andine species, well-marked by its rather stiff, fragile texture, dark-green colour and especially by its scales.

Rhizome erect with many densely fasciculated leaves at its apex; the bases of the stipes are nearly quite hidden by a dense mass of long, thin, red-brown scales, Stem very short. Lamina c. 5 decm. long by 5 cm. broad at the middle, downwards very gradually narrowed with numerous reduced pinnæ, almost as in *D. opposita* (type II). Rachis rather strong, hairy and like costæ beneath furnished with black-brown, acuminate scales. The pinnæ of the lower half of the lamina reflexed, the lowermost very small with distances of about 1 cm. between them. Upper surface of the leaf pubescent, under one glabrous. 4—5 pair of veins; sori supra-medial with a distinct, setose indusium.

HIERONYMUS distinguishes 3 varieties from Columbia and Peru (Hedwigia 46: 335. 1907).

36. *Dryopteris firma* (Bak.) C. Chr. Ind. 266. 1905 — [Fig. 24].

Syn. *Nephrodium firmum* Baker; Jenman, Journ. Bot. 1879: 260; Bull. Dept. Jamaica n. s. 3: 68. 1896.

Type from Jamaica. A specimen in HB. leg. JENMAN is probably an authentic one; with it exactly agrees another specimen from the type locality: Blue Mountain Peak, 6—7000', leg. L. M. Underwood n. 1435 (HC).

A very distinct species, resembling *D. scalpturoides* in texture and in its prominent veins, but widely different in having a creeping rhizome, which is clothed at its top by a dense cluster of brown scales, in its setose sporangia, and especially in its leaf being only very slightly reduced towards the base or sometimes totally wanting reduced pinnæ. The lower pair of the larger pinnæ are somewhat shortened and reflexed and below them sometimes one pair of very small auriculiform pinnæ can be found. The lamina is glabrous with exception of the sparsely and shortly pubescent rachis and costæ above; the underside is

sometimes furnished with a few red-yellow glands. Pinnæ distinctly articulated to rachis, at their basal part often incised to rachis. Veins about 7, not rarely furcate, distinctly prominent on the upperside. Sori near the edge; indusium not found.

37. *Dryopteris Santae Catharinae* Rosenstock, Hedwigia 46: 126. 1906 — [Fig. 25].

Type from Brazil: Prov. S. Catharina, Joinville, leg. Stier n. 15 a (HR!); Lages, Spannagel n. 50 a (HR).

From the other creeping species easily recognizable by its almost quite glabrous leaf with very regularly incised pinnæ, the leaf in habit recalling large forms of *D. concinna*.

38. *Dryopteris Jürgensii* (Rosenst.) C. Chr. Ind. 663. 1906; Rosenst. Hedwigia 46: 126. 1906 — [Fig. 26].

Syn. *Nephrodium Jürgensii* Rosenstock, Festschrift Albert von Bamberg 63. Gotha 1905.

Type from Brazil: Rio Grande do Sul, Sta. Cruz 650 m., leg. C. Jürgens n. 198 (HR!).

Marked by its very long and narrow pinnæ (18 cm. long by $1\frac{1}{2}$ cm. broad), which are somewhat attenuated towards their base, and by the broad, open sinus between the segments. 8—9 pairs of simple veins. Sori close to the margin with a setose indusium.

33. *Dryopteris Mosenii* sp. nov. — [Fig. 27].

Brasilia: Prov. Minas Geraes: Caldas. In ripa uliginosa umbrosa amnis Rio Capivary, leg. Hj. Mosén ^{25/11} 1873 n. 2161 (HS!).

Eudryopteris rhizomate horizontaliter repente, apice adscendente, squamis parvis linearibus brunneis vestito. Stipitibus c. 1 cm. remotis, stramineis basi fusciscentibus, glabris, ad pinnas infimas $2\frac{1}{2}$ dcm. longis. Lamina c. 6 dcm. longa, infra medium $1\frac{1}{2}$ dcm. lata, ad apicem breviter acuminatum gradatim attenuata, versus basin abrupte reducta, firmo-herbacea, pallide viridi, supra ad costas albido-furfuracea, subtus ubique pilis hamatis albidis patentibus deciduis breviter hirta et glandulis pallidis ubique minute glandulosa, marginibus ciliatis, bipinnatifida. Rachibus quadrangularibus, stramineis, minute glandulosis et pilis albidis nonnullis deciduis instructis. Pinnis inferioribus 3—4 jugis valde reductis, bipartitis, 6 cm. inter se distantibus, oppositis, superiore jugo paulo reducto reflexo (Typus V), ceteris c. 20 jugis suboppositis vel sursum alternis, horizontalibus, sessilibus, lanceolatis, acutis 7—8 cm. longis, 2 cm. latis. Laciniis c. 20 jugis, approximatis, ala $1\frac{1}{2}$ mm. lata connectis, fere rectis, acutis, integris, basalibus vix auctis. Costis, costulis venisque stramineis utrinque prominentibus. Venis indivisis, 10—12 jugis, infima posteriore paulum supra sinum acutum angustum marginem attingente. Soris parvis, luteis, globosis, medialibus. Indusiis pallidis, ciliatis, glandulosis, mox deciduis.

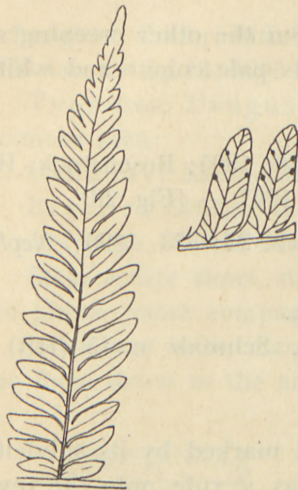


Fig. 24. *D. firma* (Bak.) C. Chr.
I. Jenman.



Fig. 25. *D. Santae Catharinae* Ros.

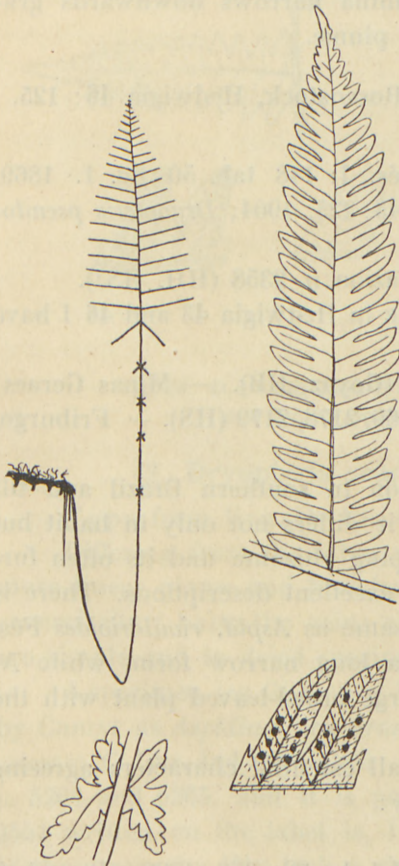


Fig. 27. *D. Mosenii* C. Chr.
Lower reduced pinnæ, nat. size.

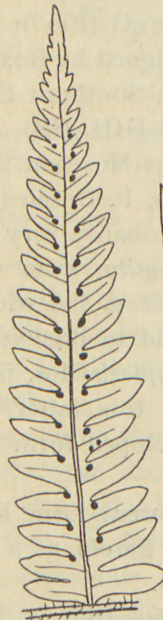


Fig. 28. *D. pseudomontana*
(Hier.) C. Chr. I. Jürgens.

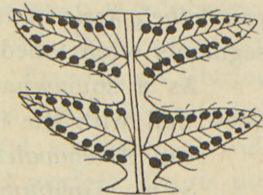
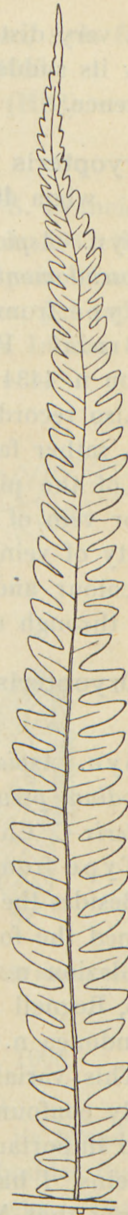


Fig. 26. *D. Jürgensii*
(Ros.) C. Chr.

A very distinct and pretty new species, differing from the other creeping species by its suddenly reduced bipartite lower pinnæ, by its pale colour and whitish pubescence.

40. *Dryopteris pseudomontana* (Hier.) C. Chr. Index 286. 1905; Rosenstock, Hedwigia 46: 126. 1906; Hieron. Hedwigia 46: 344. 1907 — [Fig. 28].

Syn. *Aspidium pseudomontanum* Hieron. Engl. Jahrb. 22: 373. 1896; *Nephrodium pseudomontanum* Rosenst. Hedwigia 43: 225. 1904.

Type from Argentina, leg. Niederlein n. 237 (HB).

Brazil: Prov. Rio Grande do Sul, Jürgens (HB), Schmalz n. 45 (HR). — ?Glaziou n. 4434 (HB. HC. HH. HS).

Also recorded from an island in the lake Titicaca.

A rather faintly characterized species, possibly best marked by its subdeltoid shape of the pinnæ. In the two specimens examined as a rule only the lowest anterior vein of the segment bears a sorus, while in the specimen leg. Glaziou the majority of veins are soriferous. This specimen differs also from the others by its dark colour and closely placed segments. The lamina narrows downwards gradually through upto 6 pairs of distant auriculiform pinnæ.

41. *Dryopteris rivularioides* (Fée) C. Chr. apud Rosenstock, Hedwigia 46: 125. 1906. — [Fig. 29].

Syn. *Aspidium rivularioides* Fée, Cr. vasc. Brés. 1: 148 tab. 50 fig. 1. 1869. *Nephrodium pseudothelypteris* Rosenstock, Hedwigia 43: 225. 1904; *Dryopteris pseudothelypteris* C. Chr. Ind. 286. 1905.

Type from Southern Brazil (Rio?); leg. Glaziou n. 2358 (HH. HS!).

Besides the specimens mentioned by ROSENSTOCK in Hedwigia 43 and 46 I have examined the following, all from Southern Brazil:

Glaziou n. 6966 (HS), 7266 (HH. HB), 22634 (Goyaz, HB). — Minas Geraes: Caldas, Regnell n. III. 1446 a (HS); Mosén n. 2166, 2169, 2178, 2179 (HS). — Friburgo, R. Mendonça n. 394 (HB). — Rio, P. Dusén (HC).

This variable species is probably very common in southern Brazil and till recently confounded with *D. opposita*, from which it differs not only in habit but also in important characters, as e. g. the wide-creeping rhizome and its often furcate veins. I have nothing to add to ROSENSTOCK's excellent descriptions. There is no doubt that *Nephr. pseudothelypteris* Ros. is the same as *Aspid. rivularioides* Fée. The original specimens seen of this latter show a long narrow form, while *N. pseudothelypteris* in its most developed form is a large broad-leaved plant with the segments often lobed.

As a somewhat more different form but in all essential characters agreeing very well with the type, I refer hereto as a variety:

var. *Arechavaletae* (Hieron.).

Syn. *Aspidium Arechavaletae* Hieron. Engl. Jahrb. 22: 370. 1896; *Dryopteris*

Arechavaletae C. Chr. Ind. 252. 1905. *Polypodium camporum* Lindman, Ark. för Bot. 1: 228 tab. 10 fig. 13. 1903; *Dryopteris camporum* C. Chr. Ind. 256. 1905.

Type from Uruguay: Montevideo, leg. Arechavaleta n. 419 (HB!). — Other specimens seen:

Uruguay: Santa Lucia, M. B. Berro n. 1258 (HC).

Brazil: Friburgo, R. Mendonça n. 849 (HB). — S. Catharina, S. Francisco, E. Ule n. 74 (HB). — Rio Grande do Sul, Cima da Serra, Lindman n. A. 1547 (HS).

Stem rather short, strong, rigid. Lamina smaller with many pair of auriculi-form pinnae, more compact and stiffer than the type. Both surfaces, yet especially the under one with many distinct, yellow glands. *P. camporum* Lindm. is the same form down to the smallest details.

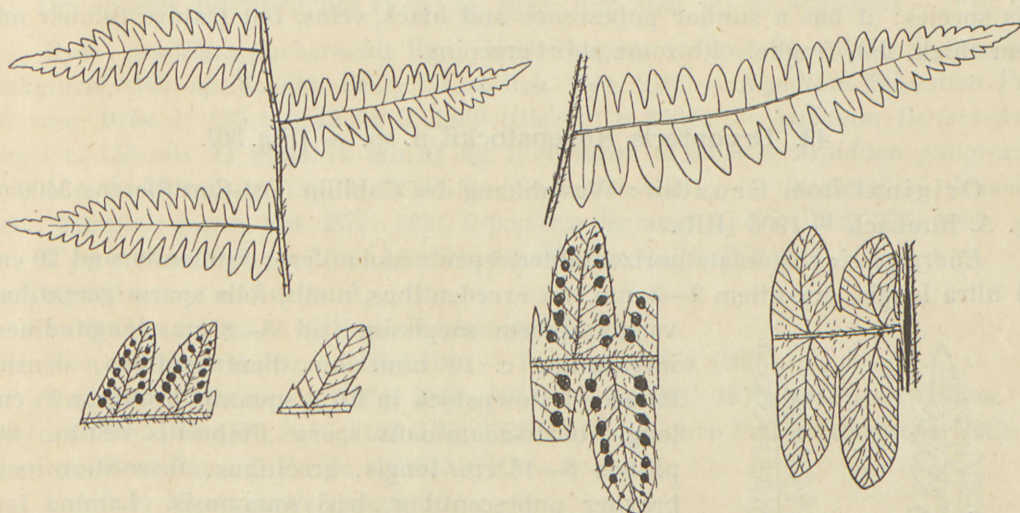


Fig. 29. *D. rivularioides* (Fée) C. Chr. from the type specimen (at the left hand) and forma *pseudothelypteris* (Ros.) from the type specimen.

42. *Dryopteris scariosa* Rosenstock, Hedwigia 46: 127. 1906.

Type from Brazil: Rio Grande do Sul, Jürgens n. 192 (HR!).

Differing from the other species with a creeping rhizome by its broader and more linear pinnae and broader segments and by its pubescence: besides the more general short hairs the veins above are furnished with long, stiff setae. The veins are simple and in dried specimens black.

A specimen leg. Glaziou n. 2551 resembling this species very much is determined by CHRIST as *Aspidium eriosorum* Fée, Cr. vasc. Brés. 2: 73 tab. 101. 1873; *Dryopteris eriosora* C. Chr. Ind. 263. 1905; Hieron. Hedwigia 46: 334. 1907, founded on Glaziou n. 5264 and 5265, and it is possible that his determination is right; the number 2551 written on the label is, I think, erroneous. As both that specimen as well as those seen by FÉE lack a rhizome the identification with *D. scariosa* Ros. is not

quite sure, although I believe that it was justified; FÉE's figure represents our species rather well and the specimen determined as *A. eriosorum* has also the characteristic solitary setæ on the veins above and black veins. It is prolific at the base of the upper pinnæ as well as another specimen from Minas Geraes: Barbacena, Excurs. Netto-Glaziou-Schwacke ^{21-24/6} 1874 (HB. HC), with doubt referred hereto. It has a persistent, sparsely setose indusium. Further I refer provisionally hereto a specimen from Minas Geraes: Caldas, G. A. Lindberg n. 553 (HB), and probably also Glaziou n. 4434 (HB). Without rhizome it will be very difficult to judge, if these specimens belong to *D. scariosa* or to *D. oligocarpa* (*Pol. retusum* Sw.), which species they resemble to the same extent, though considerably larger.

Aspidium oligocarpum var. *crassistipitatum* Hieron. Engl. Jahrb. 22: 367. 1896 from Argentina: Siambon, Lorentz n. 156, 251 (HB) is, probably, also a form of this species: it has a similar pubescence and black veins, but texture thinner and stem thick, flat, fragile. Rhizome short-creeping.

43. *Dryopteris Rosenstockii* n. sp. — [Fig. 30].

Original from Ecuador: Westabhang des Cubillin (Ost-Cordilleren) 3400 m. leg. A. Rimbach ^{III}/1906 (HR).

Eudryopteris rhizomate horizontaliter repente stolonifero; "stolonibus ad 20 cm. vel ultra longis, crassitiem 2—3 mm. vix excedentibus, nudis, folia sparsa gerentibus, versus apicem saepissime ad 5—8 cm. longitudinem incrassatis, c. 10 mm. hic diametentibus, densius foliaceis" (Rosenstock in litt.), squamis brunneis, $\frac{1}{2}$ cm. longis, ovato-acuminatis sparse fimbriatis vestito. Stipitibus 8—16 cm. longis, gracilibus, fusco-stramineis, breviter pubescentibus, basi squamosis. Lamina lanceolata, ad $3\frac{1}{2}$ dcm. longa, medio 7—10 cm. lata, ad apicem pinnatifidum breviter acuminatum sensim decrescente, versus basin gradatim sed breviter attenuata (Typus I), chartacea vel subcoriacea, supra ubique breviter pubescente, subtus costis costulisque sparse hispido-setosis exceptis glabra, sed subtus ad costas squamis brunneis, tenuibus, adpressis, 1 mm. longis, ovatis, acuminatis instructa, bipinnatifida. Rachibus trisulcatis, dense sed breviter pubescentibus et squamis perpaucis similibus vestitis. Pinnis numerosis, approximatis, alternis vel inferioribus suboppositis, horizontaliter divaricatis, 3—5 jugis inferioribus sensim reductis, reflexis, imis $\frac{1}{2}$ —2 cm. longis, mediis c. 4—6 cm. longis medio vix 1 cm. latis, sessilibus, lineari-lanceolatis, apice integro acutis, ad alam vix 1 mm. latam pinnatifidis. Laciniis c. 15 jugis, integris vel leviter repandis, apice obtusis vel sub-acutis, paulum obliquis, basalibus plerumque aequalibus, interdum paulum reductis.

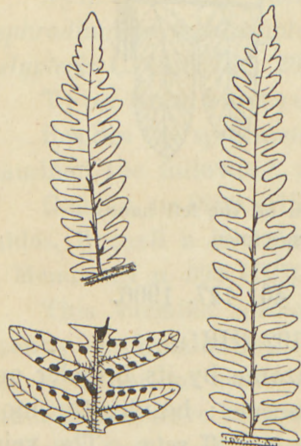


Fig. 30. *D. Rosenstockii* C. Chr.

Venis pellucidis, indivisis, 5—7 jugis, utrinque prominentibus. Soris margini approximatis, exinvolucratis(?); sporangiis glabris.

This new species is most probably the plant mentioned by SODIRO under his *Nephrodium concinnum* (Crypt. vasc. quit. 233). It certainly resembles not a little *D. concinna* in habit, but it is widely different in its creeping rhizome, rigid texture, glabrous sporangia and especially in the presence of scales on rachis and costæ beneath. It is rather doubtful, if SODIRO's *Nephrodium concinnum* is the true *D. concinna*, as his *N. stenophyllum* is synonymous with it and he states that his *N. concinnum* has a creeping rhizome.

Amongst the other creeping species *D. Rosenstockii* mostly resembles *D. rivularioides*, but it differs in its scales, its simple, pellucid veins and firmer texture.

44. *Dryopteris pachyrachis* (Kze.) O. Ktze. Rev. Gen. Pl. 2: 813. 1891 — [Fig. 31].

Syn. *Aspidium pachyrachis* Kze.; Mett. Pheg. und Aspid. 83. 1858; *Nephrodium pachyrachis* Hk. sp. 4: 100. 1852; Hk. & Bak. Syn. 270. — *Aspidium helveolum* Fée, Cr. vasc. Brés. 1: 132 tab. 42 fig. 2. 1869 (Glaziou n. 2364). — *Aspidium Berteroanum* Fée, l. c. 133 (vix 11 mém. 77 tab. 22 fig. 1) (Glaziou n. 2365). — *Aspidium platyrachis* Fée, l. c. 2: 71 tab. 100 fig. 2. 1872—73 (Glaziou n. 5261). — *Nephrodium Jenmani* Bak.; Jenman, Journ. Bot. 1877: 263; *Dryopteris Jenmani* C. Chr. Ind. 272. 1905.

Type from Venezuela: Merida, leg. Moritz n. 409 (HB!).

Specimens examined:

Jamaica, Jenman (HB = *N. Jenmani* Bak.).

Venezuela, Moritz n. 409 (HB). — Fendler n. 472 (HB).

Brasilia, Glaziou n. 2364, 2365, 5261, 7951 (HH), 15764 (HB). — Caldas, H. Mosén n. 2151 (HS. HB), 2152, 2154 (HS), 2702 (HH). — Ouro Preto, Schwacke (HC). — Serro do Mar, Paraná, Dusén n. 3725 (HC).

I add to METTENIUS's description:

"Rhizoma crassum ascendens, subterraneum, 0,1 metro longum" (Mosén in sched.). Stipitibus crassis (c. 1 cm.), vix ultra 10 cm. longis, glabris, versus basin squamis deciduis instructis. Rachibus robustis, quadrangularibus, glandulosis. Lamina speciminis maximi 1 m. longa, medio 36 cm. lata, costis superne interdum sparse setosis exceptis glaberrima, sed subtus glandulis rubinis distinctis instructa, gramineo-vel pallide-viridi, membranacea vel papyracea. Pinnis ad basin aërophoro \pm distincto squamæforme vel subaculeiforme instructis, alternis, mediis ad 18 cm. longis, 2 cm. latis, a basi truncata versus apicem acuminatum sensim decrescentibus, inferioribus 4—5 cm. distantibus, gradatim reductis, infimis 1—2 cm. longis. Laciniis recte patentibus, obtusis vel subacutis, basalibus parum majoribus. Venis indivisis, 7—10 jugis. Soris medialibus. Indusiis ovato-reniformibus, persistentibus, glandulis rubinis distinctis instructis, raro sparse setosis.

This distinct species may be easily distinguished by its size and its nearly quite glabrous leaf with the characteristic large, wine-coloured, sessile glands on the under surface of the lamina. Such glands, however, seem to be absent in the

form called *Nephrodium Jenmani* Baker, which otherwise is typical. The young indusium is large, flat and distinctly oochlamyoid. The Brazilian specimens, referred to three different species by FÉE, differ only a very little from each other, and it has been impossible for me to find any constant character, by which they may be distinguished from the type. I, therefore, do not hesitate to unite them under a single

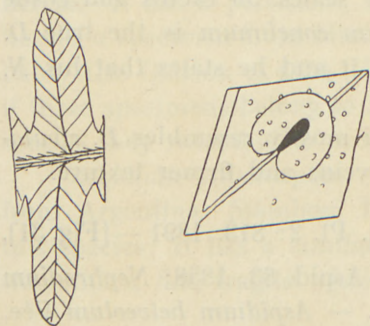


Fig. 31. *D. pachyrachis* (Kze.) O. Ktze.
forma *platyrachis* (Fée)
Two segments seen from the upper-
side ($\times 2$) and indusium.

species. As a rule it can be said that the common Brazilian form, described by FÉE as *Aspidium platyrachis*, is somewhat thinner in texture and has a somewhat more slender rachis. I call this form var. *platyrachis* (Fée). This form may sometimes be rather difficult to distinguish from large specimens of *D. opposita* var. *rivulorum*. This is, however, rarely quite glabrous, has opposite, shorter pinnæ, fewer veins, the basal segments both enlarged, many more pairs of reduced pinnæ, the lowermost being very small, and supramedial sori. With *D. Sprengelii* our species does not show any close alliance, though it has often been confounded with it. *D. Sprengelii* has lanceolate pinnæ, not tapering

gradually from the very base, and 15—18 pairs of veins.

To *D. pachyrachis* I refer the following forms, all agreeing with the type in essential characters.

var. *crassipes* (Sodiolo) C. Chr.

Syn. *Nephrodium crassipes* Sodiolo, Cr. vasc. quit. 234. 1893; *Dryopteris crassipes* C. Chr. Ind. 258. 1905.

Ecuador: Quito, leg. Sodiolo (HC).

A typo differt: rachi pubescente, lamina utrinque sparse hirta, ciliata, subtus eglandulosa; indusiis setosis.

var. *straminea* (Sodiolo) C. Chr.

Syn. *Nephrodium stramineum* Sodiolo, Recensio 43. 1883; Cr. vasc. quit. 239. 1893. Ecuador: Chimborazo, leg. Sodiolo (HC).

A typo differt: stipitibus ad 30 cm. longis, lamina herbacea, subtus eglandulosa, rachi pubescente.

This variety, according to SODIOLo furnished with a ciliate indusium, which is not found in the specimens examined, may possibly better be referred to *D. palustris*.

Allied to *D. pachyrachis* are two fragments in HB from Columbia: Manganos, Lindig n. 296 and Bogotá, Karsten, determined by METTENIUS as *A. pachyrachis*, but probably belonging to an undescribed species; provisionally I place them here as:

D. pachyrachis var. *bogotensis* n. var.

Lamina supra ubique—præsertim ad costas—hirta, subtus ad costas costulasque ac ad rachin pilis crispatis, albidis, deciduis instructa. Pinnis c. 2 dcm. longis,

3—3½ cm. latis, lanceolatis, aërophoro praeditis. Lacinia basali posteriore valde prolongata, sæpe inciso-dentata. Laciniis approximatis, c. 6 mm. latis, leviter falcatis. Venis 10—11 jugis indivisis, vel in lacinia basali furcatis. Soris medialibus. Indusiis persistentibus, glandulosis.

45. *Dryopteris Hieronymusii* n. sp.

Syn. *Dryopteris stenophylla* Hieron. Hedwigia 46: 334. 1907 (non *Nephrodium stenophyllum* Sod.).

Type from Columbia, Bogotá, leg. Stübel n. 4249 (HB!).

Eudryopteris rhizomate? stipite?; lamina ovato-lanceolata, 5 dcm. vel ultra longa, medio 2 dcm. lata, sursum in apicem breviter acuminatum sensim decrescente, versus basin gradatim et breviter attenuata (Typus II), membranacea, supra ad costas venasque pilis luteo-albidis deciduis sparse instructa, marginibus densius ciliatis, subtus fere glabra et eglandulosa, rachi sparse hirta, demum glabra, bipinnatifida. Pinnis inferioribus sensim abbreviatis, medialibus 10—12 cm. longis, 1¼—1½ cm. latis, sessilibus, linearibus, a basi truncata aërophoro parvo instructa in apicem acuminatum serratum sensim attenuatis ad alam 1 mm. latam pinnatifidis. Laciniis usque ad 30 jugis, subrectis vel parum obliquis, obtusis vel subacutis, integris, basi 3 mm. latis, sinus latis subrotundis separatis. Venis 7—8 jugis, indivisis, indistinctis. Soris majusculis, margini approximatis. Indusiis parvis, glabris, mox evanescentibus. Sporangiiis glabris.

This new species in general habit resembles very much *D. pachyrachis*, but differs from that species by its eglandulose under surface, submarginal sori and somewhat hairy upper surface. Prof. HIERONYMUS has referred the specimen to *Nephrodium stenophyllum* Sod., but this is, however, the true *D. concinna* and our species is widely different from it by its pubescence and glabrous sporangia. The hairs are very deciduous and the dried leaf seems without an exact examination to be quite glabrous.

46. *Dryopteris supina* (Sod.) C. Chr. Ind. 296. 1905; Hieron. Hedwigia 46: 332. 1907 — [Fig. 32].

Syn. *Nephrodium supinum* Sodiro, Cr. vasc. quit. 241. 1893; Hieron. Engl. Jahrb. 34: 444. 1904.

Type from Ecuador, leg. Sodiro (HC!). — Columbia, Lehmann n. 7724 (HB!).

In size and shape of lamina resembling *D. Sprengelii*, with 3—4 pair of distant auricles on the strong, furrowed stem, but it is in general more nearly allied to *D. pachyrachis* by its pinnæ tapering gradually from their base with patent, short, obtuse segments, separated by broad, open sinus. The basal pair of segments are reflexed

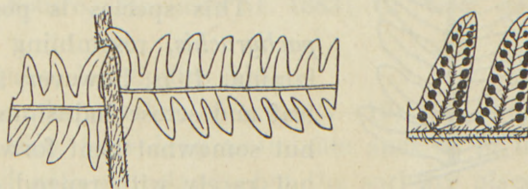


Fig. 32. *D. supina* (Sod.) C. Chr.

The basal pair of segments are reflexed

and embrace the rachis. A little aërophore is present. Rachis and costæ hairy, upperside else glabrous, while the underside is also pubescent on the midribs of the segments but eglandulose. 10—11 pairs of veins; sori nearly medial; indusium not seen. Texture firm, membranaceous or chartaceous or nearly coriaceous, the edges revolute:

var. *Biolleyi* Christ, Bull. Boiss. II. 7: 262: 1907.

Costa Rica: Tablazo 1900 m., leg. P. Biolley ^{IX}/1906 n. 68 (HC).

A typo differt: pinnis longioribus, maximis ad 15 cm. longis, 1½ cm. latis, planta tota fere omnino glabra, laciniis basalibus rachim non amplectentibus, sed anteriore saepe rachin superne tegente.



Fig. 33. *D. palustris* (Mett.) O. Ktze. Jürgens n. 107.

47. *Dryopteris utañagensis* Hieron. Hedwigia 46: 333. tab. 5 fig. 8. 1907.

Type from Ecuador: Utañag, leg. Stübel n. 809 (HB!).

Rhizome and stipe wanting. Its nearest ally is *D. supina*, differing by its narrow pinnæ and segments. Sporangia glabrous.

48. *Dryopteris atropurpurea* Hieron. Hedwigia 46: 342. tab. 6 fig. 15. 1907.

Type from Columbia: Huila, leg. Stübel n. 159 (HB!).

The most divided species of the whole group; the pinnæ towards their base are incised to costa and the segments throughout crenate.

49. *Dryopteris palustris* (Mett.) O. Ktze. Rev. Gen. Pl. 2: 813. 1891. Rosenstock, Hedwigia 46: 121. 1906 — [Fig. 33].

Syn. *Aspidium palustre* Mett. msc.: *Nephrodium palustre* Bak. Syn. Fil. 270. 1867.

Type from Brazil: Minas Geraes, Caldas, leg. Lindberg n. 633 (HB). — Other specimens: Caldas, Mosén n. 2177 (HS). — S. Catharina; Lages, Spannagel n. 104 (HR). — Blumenau, Haerchen n. 42 (HR). — Rio Grande do Sul, Jürgens n. 107, 183 (HR).

This species is possibly not specifically distinct from *D. pachyrachis*, resembling it in pubescence, size and shape of lamina. It is, however, as a rule to be distinguished by its thin leaf and setose indusium. The segments are not exactly patent, but somewhat bent forwards, often a little falcate, subacute and not rarely with repand edges. Underside and indusium are as a rule eglandulose, but both are in some specimens furnished with glands as in *D. pachyrachis*.

50. *Dryopteris tenerrima* (Fée) Rosenstock, *Hedwigia* 46: 122. 1906.

Syn. *Aspidium tenerrimum* Fée, *Cr. vasc. Brés.* 1: 134 tab. 43 fig. 1. 1869. — *Aspidium elatior* Fée, l. c. 132 tab. 42 fig. 3.

Type from Brazil: Rio, leg. Glaziou n. 1223, 2367 (HH!), also n. 2366 (HH = *A. elatior* Fée). Rio Grande do Sul, Jürgens & Stier n. 181, 184 (HR). This distinct species, incorrectly united by BAKER with *D. Sprengelii*, which belongs to a different group of species, is a near ally of *D. pachyrachis* and *D. palustris*, differing from both by its much broader pinnæ, from the former by its very thin texture.

Rhizome described as erect. Stem strong, ca. 15 cm. long. Lamina very thin, grassgreen, glabrous except on the costæ above, the underside with a few yellow glands. 2—3 pair of very reduced pinnæ; developed pinnæ with a distinct aërophore at their base. Segments with the half of their own breadth between them, acute, the larger ones often more or less incised-toothed and with furcate veins, the basal pair often a little shorter. Veins generally simple, 10—12 to a side, rather distant and few in proportion to the up to 2 cm. long segments. Sori about medial, rather small; indusium as a rule persistent, oochlamyoid, with a few yellow glands, else glabrous.

Aspidium elatior Fée is not at all different from *D. tenerrima*, judging from our fragmentary specimen and according to FÉE's figure, which exactly covers a pinna of Glaziou n. 1223 by FÉE himself referred to *D. tenerrima*. The difference in shape of lamina described by FÉE, *A. tenerrimum* having a "lamina pyramidata", while *A. elatior* is said to have "frondulis infimis remotis, abbreviatis", does not exist. The shape of the lamina of the two proposed species is that of type III.

A fragment in HC from Columbia: Santa Marta, H. H. Smith n. 997, agrees with *D. tenerrima* in nearly all its characters, yet its segments are obtusely rounded and much more closely placed with only 8—9 pairs of veins.

51. *Dryopteris recumbens* Rosenstock, *Hedwigia* 46: 123. 1906.

Type from Brazil: Rio Grande do Sul, leg. Jürgens n. 172, etc. vide ROSENSTOCK l. c.

Resembling *D. tenerrima* in texture and broad leaf but different in pubescence and position of the sori.

52. *Dryopteris amphioxypteris* (Sod.) C. Chr. *Ind.* 251. 1905.

Syn. *Nephrodium amphioxypteris* Sodiro, *Recensio* 51. 1883; *Cr. vasc. quit.* 230. 1893.

Type from Ecuador: Andes of Quito, leg. Sodiro (HC).

Resembles mostly *D. pachyrachis* in the number of veins (7—10) and in the pinnæ tapering gradually from a broad base to a long acuminate apex as in the underside of the lamina being furnished with red glands, but the sori are placed near the margin and the stipe is rather slender; texture thin, herbaceous. Rachis with deciduous soft hairs, costæ on both sides strigilose, the lamina otherwise

glabrous. The basal pair of segments considerably enlarged, often lobed-toothed, the upper ones toothed at their apex. Shape of lamina of type III.

53. *Dryopteris rustica* (Fée), C. Chr. Ind. 290. 1905.

Syn. *Phegopteris rustica* Fée, 11 mém. 55 tab. 13 fig. 1. 1866; *Polypodium rusticum* Bak. Syn. Fil. 306. 1867. *Nephrodium nimbatum* Jenman, Gard. Chron. III. 15: 264. 1894; Bull. Dept. Jamaica 3: 67. 1896; *Dryopteris nimbata* C. Chr. Ind. 279. 1905.

Type specimen from Guadeloupe, leg. L'Herminier (non vidi). Gathered in the same island by Mazé n. 188 (HC) and Père Duss (HB. HC). — Jamaica, Jenman (HB).

This species is very peculiar in its pubescence. The leaf is throughout — yet especially on rachis and costæ — densely furnished with very fine, hamate, gray hairs, nearly invisible to the naked eye. Stem up to 10 cm. long, provided at the base with deciduous scales. The lower 4—5 pair of pinnæ auriculiform, the following growing larger gradually to the middle of the lamina (the shape of lamina being intermediate between the types III and IV). Lamina up to 6 dcm. long by 2—2½ dcm. broad, grass-green, firmly herbaceous, segments 10—12 mm. long, c. 5 mm. broad, obtuse, with the half of their own breadth between them, the basal ones sometimes a little reduced. 7—9 veins; sori medial, apparently exindusiate in the specimens from Guadeloupe, often subelliptical.

The specimen from Jamaica, determined above as *D. rustica*, is no doubt *Neph. nimbatum* Jenm., agreeing exactly with JENMAN'S description. It resembles very closely the specimens from Guadeloupe, but it differs in having a small, ciliate indusium. Further I refer here *Phegopteris gracilis* (Herv.) var. *Guadalupensis* Fée, 11 mem. 56. 1866 from Guadeloupe, L'Herminier (HC); it only differs from the type by its sori sometimes being subgymnogrammoid; such sori may also, however, be found in typical forms. The species is really a very near ally of the species referred to § *Leptogramma*, *D. consimilis* and *D. heteroclita*, differing mainly by its very fine, nearly microscopical pubescence and its shorter sori.

54. *Dryopteris atrorubens* (Mett.) C. Chr. Ind. 253. 1905 — [Fig. 34].

Syn. *Aspidium atrorubens* Mett.; Kuhn, Linnaea 36: 112. 1869.

Type from Peru: St. Gavan, Lechler n. 2267 (HB!)

Resembles *D. rustica* in its minute pubescence, in the position of the sori, in colour and texture, but its sori are furnished with a distinct, setose indusium. Pinnæ upcurved from the middle, with a little aërophore at the base and articulated to the blackish, glossy, slender rachis, which is covered with short deciduous hairs. Segments acute, toothed at their upper third, with 10—11 pair of veins. The original specimen is very incomplete, wanting rhizome, stem and the basal part of the lamina; its systematic position, therefore, is rather doubtful.

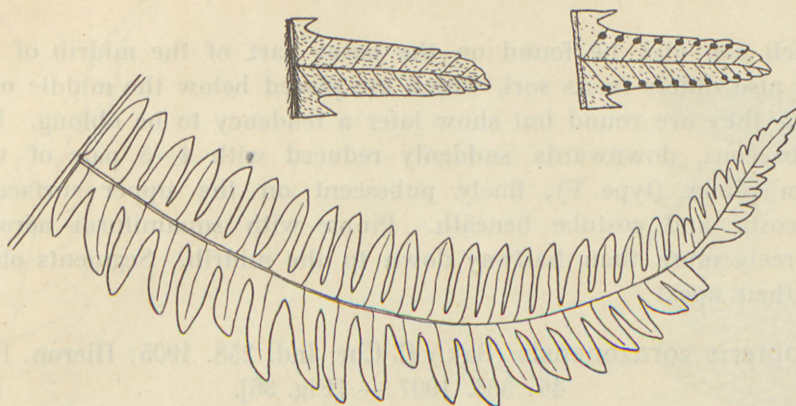


Fig. 34. *D. atrovuens* (Mett.) C. Chr. — A segment seen from both sides.

55. *Dryopteris Germaniana* (Fée) C. Chr. Ind. 267. 1905.

Syn. *Phegopteris Germaniana* Fée, 11 mém. 55 tab. 13 fig. 2. 1866; *Polypodium Germanianum* Bak. Syn. Fil. 306. 1867.

Type from Guadeloupe, leg. L'Herminier n. 118 (HB!). Gathered in the same island by Père Duss n. 4047, 4067 (HC "Terrestre, assez rare").

Ample. Stem 10 cm. long, robust, trisulcate with scales in the furrows. Lamina 1 m. long, pinnæ $1\frac{1}{2}$ —2 dm. long by 3 cm. broad, segments 6—7 mm. broad, close; lamina grass-green, herbaceous but firm, rachis and upperside finely and shortly pubescent, the underside nearly glabrous or sparsely hairy on costæ and veins; leaf narrowed suddenly downwards with about 10 pair of auriculiform pinnæ from 2 cm. to 1—2 mm. long (Type V). Distinct, acute aërophore. Basal segments not longer. Veins 7—10, simple; sori nearly medial, often subelliptical and furnished with a very small, hyaline, ciliate, very deciduous indusium.

Very near *D. Moritziana*, but sori medial and rachis without scales. Another instance of a *Phegopteris* with indusium.

var. *glandulosa* n. var.

Jamaica: Vicinity of New Haven Gap, c. 1650 m. W. R. Maxon n. 2693 (HC). — At the summit of Blue Mountain Peak, c. 7000', W. R. Maxon n. 1404 (HC).

A typo differt: lamina subtus dense glandulosa; pinnis auriculiformibus 2 jugis.

56. *Dryopteris Moritziana* Urban, Symb. Antill. 4: 21 nota. 1903 — [Fig. 35].

Syn. *Aspidium diplazioides* Moritz; Mett. Pheg. und Aspid. 83 n. 200. 1858; *Nephrodium diplazioides* Hk. sp. 4: 99. 1862; Bak. Syn. Fil. 270; *Dryopteris diplazioides* O. Ktze. Rev. Gen. Pl. 2: 812. 1891.

Type from Venezuela: Col. Tovar, leg. Moritz n. 408 (HB!).

In size and broad pinnæ resembling *D. Germaniana*, but its stem densely squamose and rachis nearly throughout furnished with brown, thin, somewhat crisped

scales, which can also be found on the basal part of the midrib of the pinnæ beneath; it also differs in its sori, which are placed below the middle of the vein; when young they are round but show later a tendency to be oblong. Leaf grass-green, herbaceous, downwards suddenly reduced with 4—5 pair of very small, auriculiform pinnæ (type V), finely pubescent on the upper surface, sparsely hairy on costæ and costulæ beneath. Pinnæ with squamiform aërophore and incised scarcely more than halfway down to the midrib. Segments obtuse, often toothed at their apex.

57. *Dryopteris corazonensis* (Bak.) C. Chr. Ind. 258. 1905; Hieron. Hedwigia 46: 336. 1907 — [Fig. 36].

Syn. *Nephrodium corazonense* Baker, Journ. Bot. 1877: 163; Sodiro, Crypt. vasc. quit. 238. 1893; *Aspidium Corazonense* Christ, Farnkr. 254. 1897.

Type from Ecuador: Corazon, leg. Sodiro (HC!). — Pichincha, Stübel n. 765 (HB).

A magnificent species. Resembles in habit *D. sagittifolia* (Bl.) O. Ktze. from Java, especially in its numerous (about 10) pairs of suddenly reduced pinnæ, which are 1—2 cm. long and broad and lobed. It comes next to *D. Moritziana* and *D. Germaniana*, differing from both in pubescence. Stem and rachis rather densely clothed with narrow, more than 1 cm. long, red-brown scales and densely and shortly pubescent. Pinnæ c. 20 cm. long by 2½ cm. broad, subopposite, on the upperside along costa densely setose, along the veins with solitary long setæ and between the veins densely and shortly pubescent with adpressed hairs; on the underside along costæ, costulæ and veins setose, between the veins with short, patent hairs. Pinnæ incised to a wing 3—4 mm. broad; segments closely placed, at base 5 mm. broad, entire, a little oblique, obtuse or subacute. Veins 10—12 (according to SODIRO 15). Sori a little above the middle of the vein; receptacle setose; indusium not found.

58. *Dryopteris diplazioides* (Desv.) Urban, Symb. Antill. 4: 21. 1903.

Syn. *Gymnogramma diplazioides* Desv. Mém. Soc. Linn. Paris 6: 214. 1827; Bak. Syn. 377; *Phegopteris diplazioides* Mett. Ann. sc. nat. V. 2: 241. 1864; *Leptogramma diplazioides* Und. Bull. Torr. Club 29: 626. 1902; *Nephrodium diplazioides* Hieron. Engl. Jahrb. 34: 445. 1904; *Gymnogramme polypodioides* Link, Hort. Berol. 2: 50. 1833 (non Spreng.); *Grammitis Linkiana* Presl, Tent. Pter. 209. 1836; *Leptogramma Linkiana* J. Sm. Journ. Bot. 4: 52. 1841; *Gymnogramme Linkiana* Kze. Linnaea 18: 310. 1844; *Phegopteris Linkiana* Mett. Fil. Lips. 82. 1856; Christ, Farnkr. 273; *Nephrodium Linkianum* Diels, Engl. u. Prantl, Nat. Pflanzenfam. 1⁴: 172. 1899; *Leptogramme rupestris* Klotzsch, Linnaea 20: 415. 1847; *Gymnogramme rupestris* Kze. Linnaea 23: 256. 1850. *Phegopteris rupestris* Mett. Fil. Lips. 82. 1856; *Dryopteris rupestris* C. Chr. Ind. 290. 1905. — *Phegopteris Duchassaingiana* Fée, 11 mém. 57 t. 14 fig. 3. 1866.

I have seen no authentic specimen of this species, recorded from most coun-

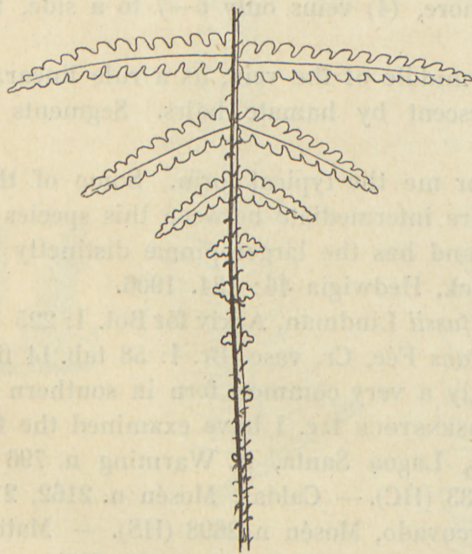
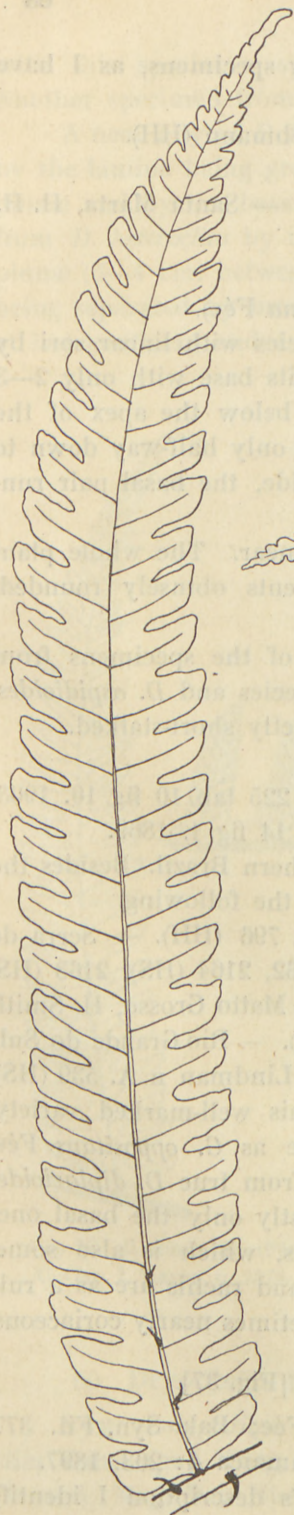


Fig. 35. *D. Moritziana* Urban.

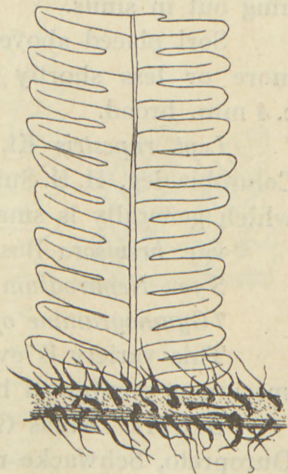
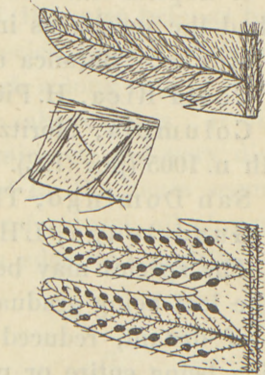


Fig. 36. *D. corazonensis* (Sod.)
C. Chr. Segments seen from the
upper- and underside, and a
fragment showing the pube-
scence of the upperside.

tries of tropical America. I refer hereto only following few specimens, as I have not had the specimens in HB and HS.

Mexico: Baranca de Jovo et Baranca de Mirador, Liebmann (HH).

Costa Rica, H. Pittier n. 323 (HC).

Columbia, Moritz n. 241 (HH = *Lept. rupestris* Kl.). — Santa Marta, H. H. Smith n. 1005 (pt.) (HC).

San Domingo, Thouin (HH).

Guadeloupe, L'Herminier (HC = *Ph. Duchassaingiana* Fée).

The species may be distinguished from the allied species with linear sori by (1) the leaf being gradually and shortly narrowed towards its base with only 2—3 pair of distant, reduced pinnæ, (2) more pairs of pinnæ below the apex of the lamina being entire or nearly so, (3) medial pinnæ incised only half-way down to the midrib, rarely a little more, (4) veins only 6—7 to a side, the basal pair running out in sinus.

Sori placed above the middle of the vein, as a rule linear. The whole plant more or less shortly pubescent by hamate hairs. Segments obtusely rounded, c. 4 mm. broad.

Lept. rupestris Kl. is for me the typical form. Some of the specimens from Columbia leg. H. H. Smith are intermediate between this species and *D. aspidioides*, which generally is smaller and has the larger pinnæ distinctly short-stalked.

var. *brevisora* Rosenstock, Hedwigia 46: 134. 1906.

Syn. *Nephrodium Kaulfussii* Lindman, Arkiv för Bot. 1: 225 tab. 10 fig. 10. 1903.

? *Gymnogramme oppositans* Fée, Cr. vasc. Br. 1: 58 tab. 14 fig. 1. 1869.

This variety is evidently a very common fern in southern Brazil. Besides the specimens mentioned by ROSENSTOCK l. c. I have examined the following.

Brazil: Minas Geraes, Lagoa Santa, E. Warming n. 796 (HH). — Serra de Ouropreto, Schwacke n. 10233 (HC). — Caldas, Mosén n. 2162, 2164 (HS), 2163 (HS. HH). — Rio de Janeiro, Corcovado, Mosén n. 2698 (HS). — Matto Grosso, H. Smith n. 99 (HC). — San Paulo, Campinas, A. E. Severin n. 23 (HS). — Rio Grande do Sul: Porto Alegre, Lindman n. A. 379 (HS). — Hamburger Berg, Lindman n. A. 539 (HS).

LINDMAN's figure cited above illustrates very well this well-marked variety, which most probably is a distinct species and the same as *G. oppositans* Fée, which name if so has priority. Besides the differences from true *D. diplazioides* mentioned by ROSENSTOCK: the nearly round sori — mostly only the basal ones a little elongated — and the leaf nearly always proliferous, which is also sometimes the case in the typical form, I may add, that stem and rachis are as a rule more robust and the texture of the lamina more firm, sometimes nearly coriaceous.

59. *Dryopteris consimilis* (Fée) C. Chr. — [Fig. 37].

Syn. *Gymnogramme gracilis* Hew. β *G. consimilis* Fée; Bak. Syn. Fil. 377. 1868; *Gymnogramme consimilis* Fée; Jenman, Bull. Dept. Jamaica 4: 203. 1897.

Type from Guadeloupe (non vidi). After JENMAN's description I identify

with this species a specimen from Jamaica, leg. W. R. Maxon n. 2370 (HC). Another specimen from Puerto Rico leg. Sintenis n. 4571 (HC) also belongs here.

A near ally of *D. heteroclita* and it differs, like that species, from *D. diplazioides* by the lamina being gradually narrowed downwards through a long row of reduced pinnæ and by the basal pair of veins reaching the margin above sinus. It differs from *D. heteroclita* by its denser pubescence, the long-acuminated and very distant pinnæ (3—4 cm. between two pinnæ of the same side) and by the acute segments being separated by broad, open sinus. About 10 pair of veins, sori all elongated; at last confluent and ending about the same distance from edge and midrib.

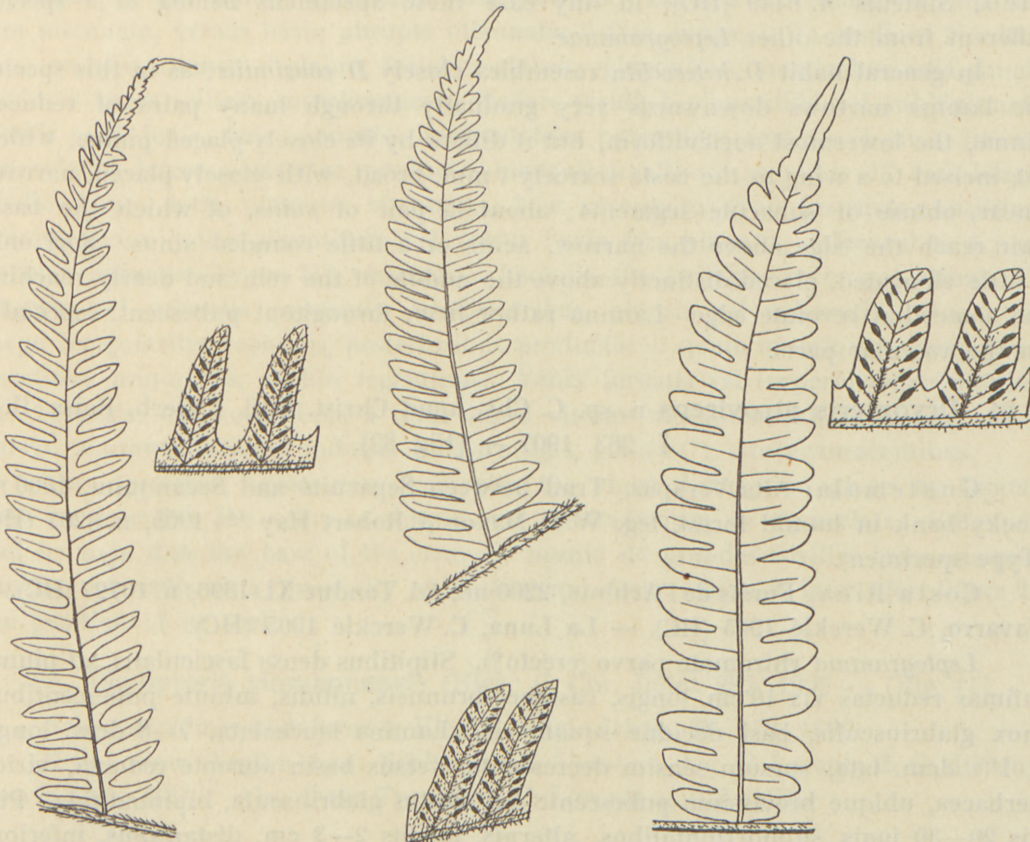


Fig. 37. *D. consimilis* (Fée)
C. Chr. l. Maxon n. 2370.

Fig. 38. *D. heteroclita*
(Desv.) C. Chr.
l. Maxon n. 989.

Fig. 39. *D. atrovirens* C. Chr.
l. Maxon n. 3281.

60. *Dryopteris heteroclita* (Desv.) C. Chr. Ind. 270. 1905 — [Fig. 38].

Syn. *Polypodium heteroclitum* Desv. Berl. Mag. 5: 318. 1811; *Phegopteris heteroclita* Kuhn apud Krug, Engl. Jahrb. 24: 133. 1897 (syn.). — *Gymnogramme gracilis* Heward, Mag. Nat. Hist. II. 2: 457. 1838; Bak. Syn. Fil. 377; Jenman, Bull. Dept.

Jamaica 4: 203. 1897; *Leptogramma gracilis* J. Sm. Journ. Bot. 4: 52. 1841; *Phegopteris gracilis* Mett. Pheg. und Aspid. 17 n. 27. 1858; *Grammitis Hewardii* Moore, Gard. Chr. 1856: 261 cum fig.; *Polypodium Hewardii* Griseb. Fl. br. W. Ind. 696. 1864.

The identification of *P. heteroclitum* Desv. with *G. gracilis* Hew. is attributed to KUHN, and although I have seen no proofs of the justification of this, still I prefer to follow the nomenclature of my Index in order not to create a new perhaps useless combination of names. I have seen no authentic specimen of this species, but according to the diagnoses given by METTENIUS and JENMAN I refer here a specimen from Jamaica, leg. W. R. Maxon n. 989 (HC) and another from Puerto Rico, Sintenis n. 6449 (HC); in any case these specimens belong to a species different from the other *Leptogrammae*.

In general habit *D. heteroclita* resembles closely *D. consimilis*; as in this species the lamina narrows downwards very gradually through many pairs of reduced pinnæ, the lowermost auriculiform, but it differs by its closely-placed pinnæ, which are incised to a wing to the costa scarcely 1 mm. broad, with closely-placed, narrow-linear, obtuse or subacute segments; about 12 pair of veins, of which the basal pair reach the edge above the narrow, acute or a little rounded sinus. Sori only a little elongated, placed distinctly above the middle of the vein and nearly reaching the somewhat revolute edge. Lamina rather firm, throughout pubescent, especially on the vascular parts.

61. *Dryopteris atrovirens* n. sp. C. Chr. apud Christ. Bull. L'Herb. Boiss. II. 7: 263. 1907 — [Fig. 39].

Guatemala: Alta Verapaz, Trail between Sepacuité and Secanquim, 1000 m. Rocky bank in humid forest, leg. W. R. Maxon & Robert Hay ¹⁴/₁ 1905, n. 3281 (HC) (Type specimen).

Costa Rica: Forêts de l'Achiote, 2200 m., Ad. Tonduz XI. 1896, n. 10727 (HC). — Navarro, C. Wercklé 1905 (HC). — La Luna, C. Wercklé 1905 (HC).

Leptogramma rhizomate parvo (erecto?). Stipitibus dense fasciculatis, ad pinnas infimas reductas vix 10 cm. longis, castaneo-brunneis, nitidis, minute pubescentibus, mox glabriusculis, basi decidue squamosis. Lamina lanceolata, 7—8 dcm. longa, c. 1¹/₂ dcm. lata, sursum sensim decrescente, versus basin abrupte reducta, viridi, herbacea, ubique brevissime pubescente vel subtus glabriuscula, bipinnatifida. Pinnis 20—30 jugis, subhorizontalibus, alternis, mediis 2—3 cm. distantibus, inferioribus 5—6 jugis abrupte valde reductis, auriculiformibus, infimis minimis (Typus V), mediis c. 10 cm. longis, 2 cm. latis, sessilibus, breviter acuminatis, ad alam 1—1¹/₂ mm. latam pinnatifidis. Laciniis 15—20 jugis, sinibus latis rotundis vel subacutis separatis, apice obtusis vel rotundatis, integris, basalibus (praesertim anteriore) plerumque abbreviatis, raro subaequalibus. Venis indivisis, 7—9 jugis, basalibus supra sinum marginem attingentibus. Soris omnibus oblongis, supramedialibus.

This new *Leptogramma* resembles not a little *D. consimilis* especially in its remote pinnæ and its broad, open sinus, but it differs from all species with oblong

sori, known to me, by its lamina being reduced very abruptly downwards. From *D. diplazioides*, which species it resembles in its obtuse rounded segments, it also differs by the basal veins running out to the edge above the sinus, and by its more deeply incised pinnae.

62. *Dryopteris Glaziovii* (Christ) C. Chr. Ind. Fil. 268. 1905 — [Fig. 40].

Syn. *Aspidium Glaziovii* Christ, Bull. L'Herb. Boiss. II. 2: 633. 1902.

Type from Brazil (loco non indicato), leg. Glaziou n. 5267 (HH!).

Eudryopteris rhizomate? (verisimiliter repente); stipitibus longis (in specimine incompletis), stramineis, glabris, superne sulcatis. Lamina lanceolata, sursum sensim attenuata, versus basin abrupte attenuata, 6 dcm. longa, infra medium $2\frac{1}{2}$ dcm. lata, rachi straminea et glabra, faciebus glabra, eglandulosa, marginibus setis paucis, deciduis sparse ciliata, membranacea, obscure viridi, bipinnatifida vel subbipinnata. Pinnis c. 25 jugis, fere oppositis, horizontaliter patentibus, remotis (4 cm.), lineari-lanceolatis, latere posteriore producto inaequilateralibus, maximis 12 cm. longis, medio 3 cm. latis, utrinque attenuatis, basi aërophoro ovali instructa sessilibus, breviter acuminatis, pinnatifidis vel versus basin fere pinnatis, inferioribus 4 jugis abrupte reductis (Typus IV), minimis. Laciniis 12—14 jugis, recte patentibus, ala angusta vel subnulla connectis, late-linearibus, obtusis vel subacutis, integris vel saepe irregulariter repandis, posterioribus productis $\frac{1}{3}$ quam anterioribus majoribus, basalibus minoribus, rachin tegentibus. Venis furcatis vel (superioribus) indivisis, 12—14 jugis, distinctis, imis 1 mm. supra sinum marginem attingentibus. Soris parvis, supramedialibus; indusiis reniformibus, glabris(?), cito evanescentibus.

Our specimen agrees very well with the short description given by CHRIST, only he describes the veins as simple and the indusium as "gris-clair, chiffonné", and he says that the base of the stem is "munie de grandes écailles brun opaque". Further he calls it a near ally of *D. limbata*, from which it *inter alia* differs by the position of its sori.

63. *Dryopteris siambonensis* (Hier.) C. Chr. Index 292. 1905 — [Fig. 41].

Syn. *Aspidium siambonense* Hieron. Engl. Jahrb. 22: 372. 1896.

Type from Argentina: Schlucht bei Siambon, leg. P. Lorentz & G. Hieronymus n. 795 (HB!). Also from Tucuman, P. Lorentz n. 916 (HB!).

64. *Dryopteris achalensis* (Hier.) C. Chr. Index 250. 1905.

Syn. *Aspidium achalense* Hieron. Engl. Jahrb. 22: 371. 1896.

Type from Argentina: Sierra Achala, leg. G. Hieronymus n. 636. 808 (HB!).

I place these two species in the group of *D. Sprengelii* because of their size and large number of veins, in *D. siambonensis* 12—14, in *D. achalensis* 14—16, but they differ from the other species of that group by their horizontally creeping rhizome and lack of an aërophore. *D. siambonensis* may be distinguished from the more firm, nearly papyraceous *D. achalensis* by its very thin slack lamina.

65. *Dryopteris Sprengelii* (Klf.) O. Ktze. Rev. Gen. Pl. 2: 813. 1891 — [Fig. 42].

Syn. *Aspidium Sprengelii* Kaulf. Flora 1823: 365: *Lastrea Sprengelii* Pr. Tent. 75. 136; *Nephrodium Sprengelii* Hk. sp. fil. 4: 94. 1862; *Dryopteris Balbisii* Urban, Symb. Antill. 4: 14. 1903; C. Chr. Ind. 253. 1905 (non *Polypodium Balbisii* Spreng. = *D. sancta*). — *Lastrea angustata* Pr. Pent. 75. 1836 (Sieber n. 188). — *Aspidium glanduliferum* Karsten; Klotzsch, Linnaea 20: 369. 1847 (Karsten n. 142). — *Aspidium Berteroanum* Fée, 11 mém. 77 tab. 21 fig. 3. 1866 (L'Herminier n. 155). — *Nephrodium Sherringii* Jenman, Journ. Bot. 1879: 261; Bull. Dept. Jamaica n. s. 3: 47. 1896.

Type specimen from Martinique, leg. Sieber, Fl. Mart. exsicc. n. 355 (HB!).

Specimens examined:

India occ. Cuba, prope Monte Verde, Wright n. 822 (HB). — Haïti, Dr. Weinland n. 32 (HB). — Jamaica, Wallingford 1875 (HB). — Puerto Rico: Maricao, Sintenis n. 410 (HC. HS). — St. Thomas: Signalhill, 500 m. Eggers n. 455 (HB. HC). — Guadeloupe, L'Herminier n. 155 (HB); Duchassaing (HB). — Dominica, Sieber n. 188 (HB). — Martinique, Sieber n. 355 (HB); Rivoire (HB); Isert (HH). — St. Lucia, H. B. Murray 1898 (HB). — St. Vincent, L. Guilding n. 741 (HB); Eggers n. 6732 (HC); H. H. & G. W. Smith (HC). — Trinidad, Day n. 353 (HB).

Mexico: Mirador, Liebmann (HH). — Tabasco, Linden n. 2494 (HB). — Esquintla, Cuyuta 200', Donnell-Smith n. 2457 (HB).

Guatemala: Majatenango, Bernoulli n. 443 (HB).

Costa Rica: Puerto Viejo, Pittier n. 7490 (HB. HC). — Meseta, 2200 m., Alfaro n. 16903 (HC).

Panama, W. Hillebrand (HB. HC).

Columbia, Karsten n. 142 (HB). — Santa Marta, H. H. Smith n. 2209 (HC).

Venezuela, Tovar, Moritz n. 40 (HB).

Ecuador: Quito, Sodiro (HC).

I have seen no specimen from Brazil, from which country the species has been recorded by several authors; the plants from Brazil called *Sprengelii* are either *D. tenerrima* or *D. cheilanthoides*.

D. Sprengelii is a very constant species, only somewhat varying in size, well-marked by the following characters: Rachis finely glandulose but nearly always without hairs. Upperside of the lamina sparsely and shortly pubescent, on the costæ strigilose, underside rather densely furnished with large, sessile, wine-coloured glands both along the costæ and on the parenchyma, but as a rule quite destitute of hairs; very rarely rachis and costæ beneath bear a few short hairs. Stem short, rarely more than 1½ dcm., rather strong. Lamina downwards rather abruptly narrowed (Type IV), the lower 5—6 pair of pinnæ very small, nearly glanduliform, distant. Pinnæ opposite, often nearly horizontal, the largest 10—15 cm. long by 1½—2½ cm. broad. Segments numerous, patent, linear, rather closely placed with acute sinuses between. Pinnæ are truly lanceolate, not gradually

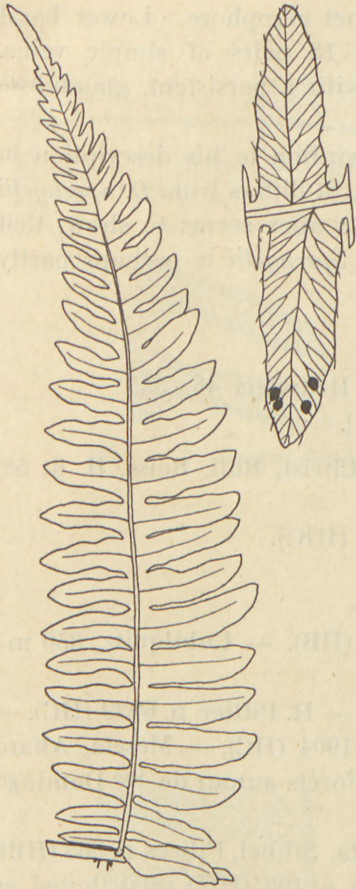


Fig. 40. *D. Glaziovii* (Christ) C. Chr.

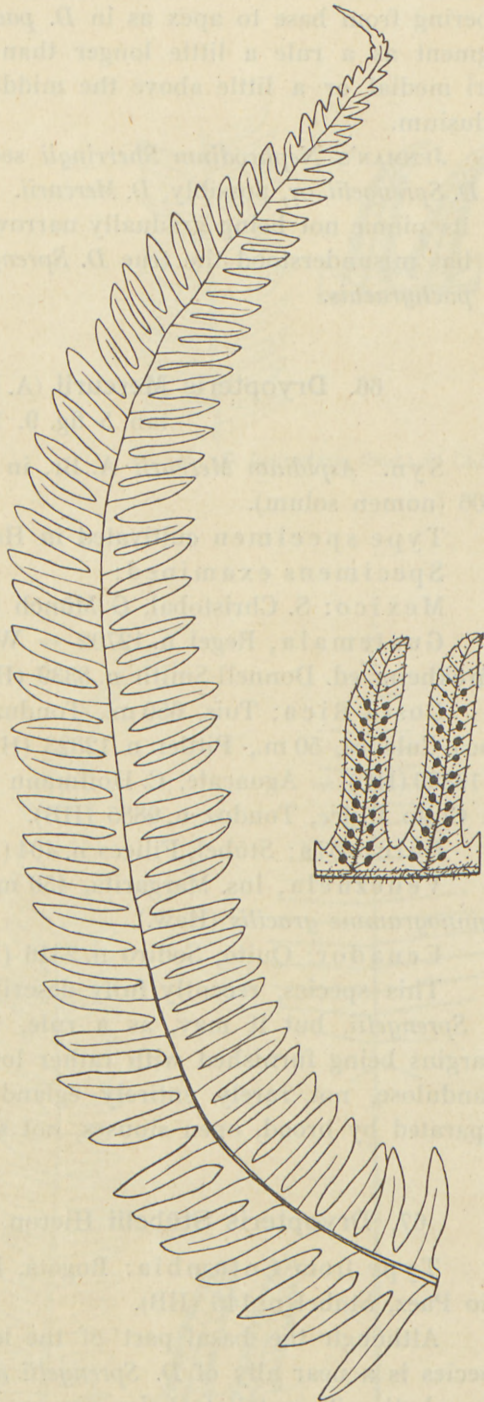


Fig. 41. *D. siambonensis* (Hier.) C. Chr.

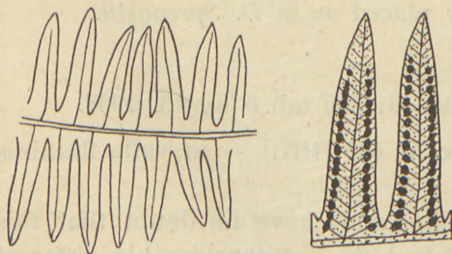


Fig. 42. *D. Sprengelii* (Klf.) O. Ktze.
From the type specimen.

tapering from base to apex as in *D. pachyrachis*. Distinct aërophore. Lower basal segment as a rule a little longer than the next. 15—18 pairs of simple veins. Sori medial or a little above the middle of the vein with a persistent, glandulose indusium.

JENMAN'S *Nephrodium Sherringii* seems to me according to his description to be *D. Sprengelii* or, possibly, *D. Mercurii*. His remark that it differs from *D. Sprengelii* by its pinnæ not being gradually narrowed from base to apex seems to show, that he has misunderstood the true *D. Sprengelii*. His *Neph. Sprengelii* is perhaps partly *D. pachyrachis*.

66. *Dryopteris Mercurii* (A. Br.) Hieron. in Hedwigia 46: 335
tab. 5 fig. 9. 1907 — [Fig. 43].

Syn. *Aspidium Mercurii* A. Br. in Herb. Berol.; Christ, Bull. Boiss. II. 6: 58. 1906 (nomen solum).

Type specimen cultivated in Hort. Berol. 1859 (HB!).

Specimens examined:

Mexico: S. Christobal, G. Münch (HC).

Guatemala, Regel n. 12702 = Warsewicz n. 89 (HB). — Cubilquitz, 350 m., Türeckheim ed. Donnell-Smith n. 8339 (HC).

Costa Rica: Tuis, 650 m., Tonduz n. 11332 (HC). — H. Pittier n. 6929 (HC). — Boca Culebra, 50 m., Pittier n. 12323 (HC). — Wercklé 1904 (HC). — Meseta, Alfaro n. 16899 (HC). — Aguacate, C. Hoffmann n. 724 (HB). — Forêts autour de S^{to} Domingo de Golfo Dulce, Tonduz n. 9885 (HB).

Columbia: Stübel, Filices n. 404 (HB). — Sta. Marta, Stübel, Filices n. 363 (HB).

Venezuela, Ins. Margarita, 450 m., J. R. Johnston n. 190 (HH) (distributed as *Gymnogramme gracilis* (Hew.).

Ecuador: Quito, Sodiro n. 2316 (HC).

This species, recently fully described by HIERONYMUS, is a very near ally of *D. Sprengelii*, but it may, as a rule, be distinguished by its rachis, costæ and margins being furnished with rather long hairs, its underside much more sparsely glandulose, not rarely entirely eglandulose. Texture very thin. The segments separated by broad, open sinuses, not so closely placed as in *D. Sprengelii*.

67. *Dryopteris Stübelii* Hieron. Hedwigia 46: 340 tab. 6 fig. 13. 1907.

Type from Columbia: Bogotá, leg. Stübel n. 439 (HB!) — in valle fluminis Rio Paez, Stübel n. 146 (HB).

Although the basal part of the leaf is unknown I have no doubt that this species is a near ally of *D. Sprengelii* and *D. Cañadasii*, but considerably different from both. The stellate hairs are, as in *D. Cañadasii*, confined to the rachis and costules beneath. Sori a little below the middle of the vein.

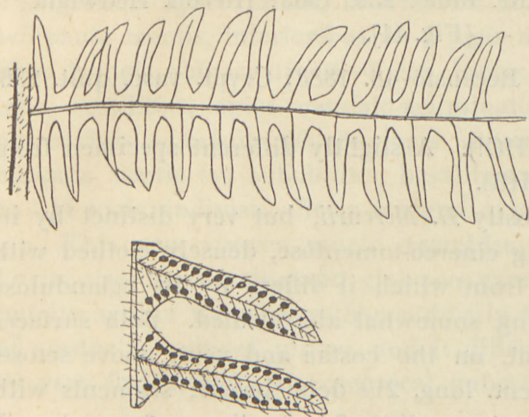


Fig. 43. *D. Mercurii* (Hier.) A. Br.

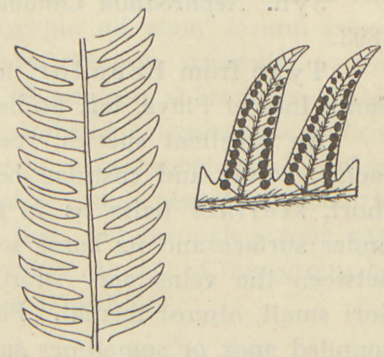


Fig. 45. *D. lasiopteris* (Sod.) C. Chr.

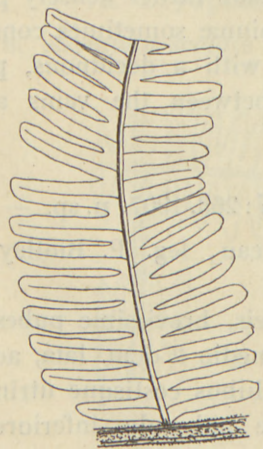
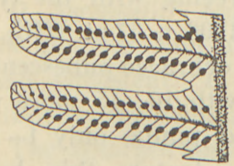


Fig. 44. *D. Cañadasii* (Sod.) C. Chr.

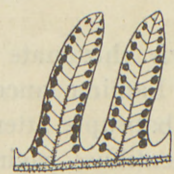
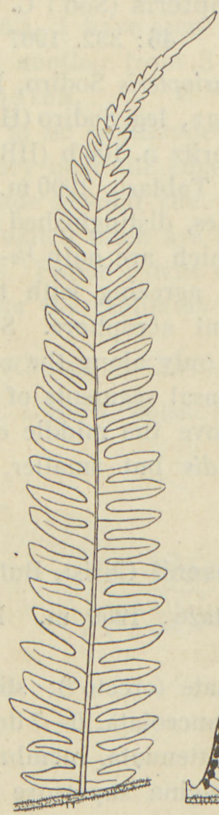
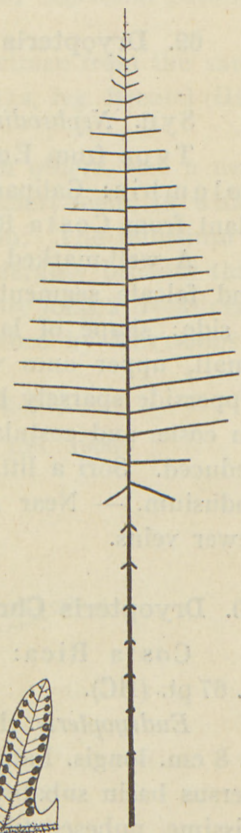


Fig. 46. *D. Christensenii* Christ.



68. *Dryopteris Cañadasii* (Sod.) C. Chr. Index 256. 1905: Hieron. Hedwigia 46: 339. 1907 — [Fig. 44].

Syn. *Nephrodium Cañadasii* Sodiro, Recensio 48. 1883; Crypt. vasc. quit. 236. 1893.

Type from Ecuador, leg. Sodiro (HC!). A slightly different specimen from Santa Ines et Playa, leg. Stübel n. 883 a (HB).

An excellent species, resembling mostly *D. Mercurii*, but very distinct by its rachis, costae and costulae beneath being cinereo-tomentose, densely clothed with short, stellate hairs as in *D. Stübelii*, from which it differs by its eglandulose under surface and its basal segments being somewhat abbreviated. Both surfaces between the veins very shortly pubescent, on the costae and veins above setose. Sori small, almost medial. Pinnæ $1\frac{1}{2}$ dcm. long, $2\frac{1}{2}$ dcm. broad; segments with rounded apex or sometimes subacute, patent or a little falcate, linear, 3 mm. broad. Veins 17—20 jugate.

Stübel's specimen differs from the type by its thinner pubescence, most hairs being simple.

69. *Dryopteris lasiopteris* (Sod.) C. Chr. Ind. 274. 1905; Hier. Hedwigia 46: 332. 1907 — [Fig. 45].

Syn. *Nephrodium lasiopteris* Sodiro, Recensio 45. 1883; Cr. vasc. quit. 242. 1893.

Type from Ecuador, leg. Sodiro (HC!). — I also refer here a specimen from Columbia: Galipan, Moritz n. 106 b (HB) and fully agreeing with the type is a plant from Costa Rica: Tablazo, 1900 m., P. Biolley IX/1906 n. 67 pt. (HC).

A well-marked species, distinguished by its densely ochraceo-pubescent rachis and falcate segments, which are only $\frac{1}{2}$ — $\frac{3}{4}$ cm. long with 10—15 close veins to a side; shape of lamina agreeing with type IV, reduced pinnæ only 1—3, very small, upper ones without aërophore. Stem very long; texture thin but firm. Upperside sparsely hairy only along the costæ, underside rather densely pubescent on costæ and costulae. Basal segments of the lower pinnæ sometimes considerably reduced. Sori a little above the middle of the vein with a deciduous, pubescent indusium. — Near *D. rudis* but smaller, glabrous between the veins and with fewer veins.

70. *Dryopteris Christensenii* Christ, Bull. Boiss. II. 7: 263. 1907. n. sp. — [Fig. 46].

Costa Rica: Tablazo, 1900 m. Bords de l'eau, leg. P. Biolley IX/1906. n. 67 pt. (HC).

Eudryopteris rhizomate (erecto?); stipitibus griseis, brevissime pubescentibus, c. 8 cm. longis. Lamina lanceolata, 6—7 dcm. longa, medio 2 dcm. lata, acuminata, versus basin subabrupte attenuata, membranacea, rachibus costisque utrinque brevissime pubescentibus, pagina superiore minutissime puberula, inferiore costulis puberulis exceptis glaberrima, eglandulosa, bipinnatifida. Pinnis 30—40 jugis,

superioribus approximatis, inferioribus $2\frac{1}{2}$ cm. remotis, suboppositis, horizontalibus vel paulo erectis, inferioribus 5—6 jugis abrupte reductis, auriculiformibus, sequentibus 2 jugis abbreviatis, 6—8 cm. longis, mediis maximis, c. 10 cm. longis, 2 cm. latis, sessilibus, apice caudato-acuminato integro excepto ad alam 1 mm. latam pinnatifidis. Laciniis 20—30 jugis, patentibus, sinus rotundis separatis, parum obliquis, acutis vel subobtusis, basalibus aequalibus vel paulum abbreviatis. Venis 11—14 jugis, indivisis. Soris margini approximatis, exindusiatis; sporangiis glabris.

This new species much resembles *D. concinna* in pubescence, but it differs by its size, more veins and glabrous sporangia. It also comes near to *D. scalaris*, but its lamina narrows rather suddenly towards its base, not through a long row of gradually reduced pinnæ, and it differs from the other species of this group by its very fine, nearly microscopical pubescence without long hairs.

71. *Dryopteris limbata* (Sw.) O. Ktze. Rev. Gen. Pl. 2: 813. 1891.

Syn. *Aspidium limbatum* Sw. Schrad. Journ. 1800²: 35. 1801; Syn. Fil. 50. 251. 1806; *Nephrodium limbatum* Desv. Mém. Soc. Linn. Paris 6: 260. 1827; Bak. Syn. Fil. 269; *Amauropelta Breutelii* Kunze, Farnkr. 1: 109 tab. 51. 1843; *Aspidium Breutelii* Mett. Pheg. und Aspid. 85 n. 204. 1858.

Type from Guadeloupe (non vidi). I have seen a specimen from the same island, leg. L'Herminier n. 168 (HB), and another from St. Kitts, leg. Breutel (HB). — JENMAN has found the species in Jamaica.

A very characteristic species, not to be confounded with others, still a near ally of *D. Sprengelii*. Sori are placed very near the edge on short teeth, in which the veins run out, and often they protrude beyond the margin. The indusium is large and persistent. In sterile pinnæ, which often are considerably broader than the fertile one, the veins are often furcate. Pinnæ 2 dcm. or more long, $2\frac{1}{2}$ — $3\frac{1}{4}$ cm. broad. The enlarged basal segments cover the rachis as described by METTENIUS.

72. *Dryopteris scalaris* (Christ) C. Chr. — [Fig. 47].

Syn. *Aspidium scalare* Christ, Bull. L'Herb. Boiss. II. 6: 159. 1906.

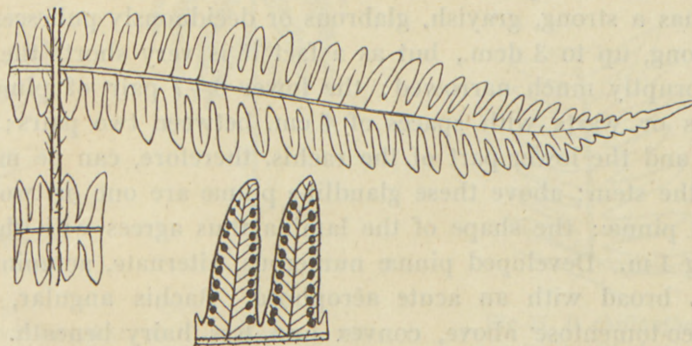


Fig. 47. *D. scalaris* (Christ) C. Chr. Donnell-Smith n. 8357.

Type from Guatemala: Cubilquit, leg. Türkheim ed Donnell-Smith n. 8357 (HC!).

Costa Rica: Valle del Rio Navarro, C. Wercklé (HC). — Cartago, H. Polakowsky n. 444 (HB). — San José, 1169 m., P. Biolley 1906 n. 104 (HC).

?Mexico: S. Christobal, L. Münch (HC).

In its most marked form this species from its habit can very well be distinguished from the others of this group, but I have seen several intermediate forms between it and *D. Mercurii*. The typical form is very characteristic by its leaf narrowing gradually through a long row of reduced pinnæ, the lowermost of which are auriculiform, and further by its very regularly placed, horizontal, as a rule opposite pinnæ, which are very finely pubescent but eglandulose on the underside; rachis sparsely furnished with deciduous, soft, whitish hairs. Veins only 10 to 12 to a side. Texture rather thin, but firm.

73. *Dryopteris rudis* (Kze.) C. Chr. Ind. 289. 1905; Hieron. Hedwigia 46: 336. 1907 — [Fig. 48].

Syn. *Polypodium rude* Kunze, Linnaea 13: 133, 1839; Bak. Syn. 307. 1867; *Phegopteris rudis* Mett. Fil. Hort. Lips. 83. 1856. — ?*Polypodium ctenoides* Jenm. Bull. Dépt. Jamaica 4: 129. 1897; *Dryopteris ctenoides* C. Chr. Index 260. 1905, an *Polypodium ctenoides* Fée, 11 mém. 54 tab. 14 fig. 2. 1866? — On *Alsophila pilosa* Mart. & Gal. Foug. Mex. 78 tab. 42. 1842, by most authors referred to *D. rudis*, see under *D. pterifolia*.

Type from Mexico, leg. Schiede (non vidi).

Of this species I have seen a specimen, determined by Kunze, from Venezuela, prope Chacao, E. Otto n. 612 (HB), which I take for the true *D. rudis*: with it some specimens from Mexico, leg. Liebmann (HH.), agree very well.

D. rudis is a member of the group of *D. Sprengelii*, but very often misunderstood by the pteridologists, probably because BAKER in Syn. Fil. describes the species as having a lamina with the lowest pinnæ not reduced. It is the typical species of a long row of andine species, well-marked by their size and as a rule very hairy rachis and other vascular parts.

D. rudis has a strong, grayish, glabrous or deciduously pubescent stem, which apparently is long, up to 3 dcm., but as a fact it is very short, the lamina downwards being abruptly much narrowed; the lower 6—7 pair of pinnæ are reduced to mere glands or warts with spaces of 4 cm. between two pairs; they are very inconspicuous, and the lower part of the rachis, therefore, can be mistaken for the upper part of the stem; above these glandlike pinnæ are one or two pair of abbreviated, reflexed pinnæ; the shape of the lamina thus agrees with the typus IV, its length reaching 1 m. Developed pinnæ numerous, alternate, acuminate, 15—20 cm. long by 3 cm. broad with an acute aërophore. Rachis angular, trisulcate and densely ochraceo-tomentose above, convex and less hairy beneath. Both surfaces along the costæ and veins shortly hispidopilose, between the veins furnished with

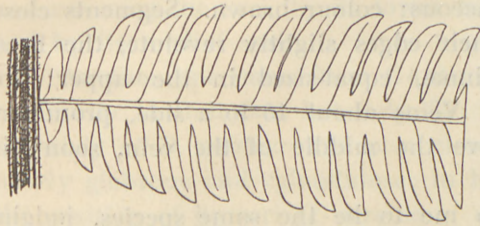


Fig. 48. *D. rudis* (Kze.) C. Chr. Otto n. 612.

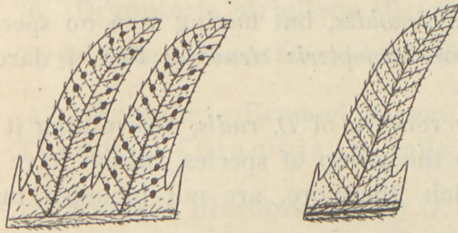


Fig. 49. *D. pterifolia* (Mett.) O. Ktze. Moritz n. 403.

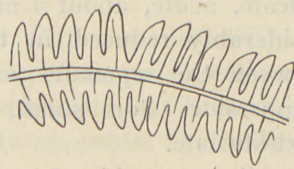
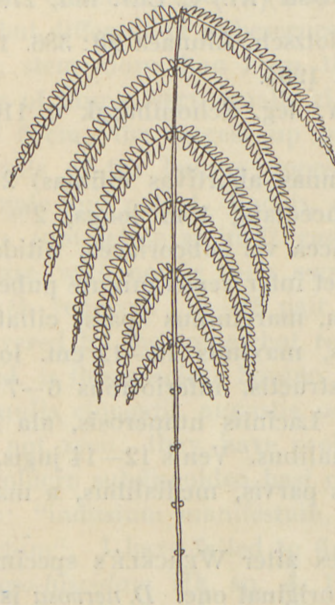


Fig. 50. *D. mertensioides* C. Chr.

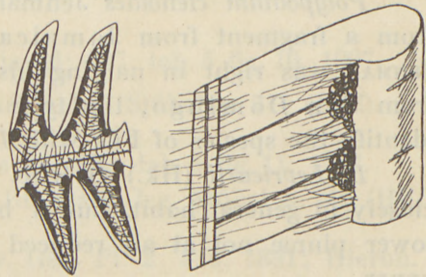
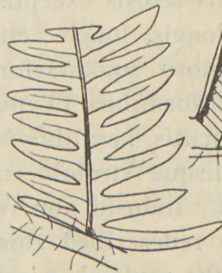
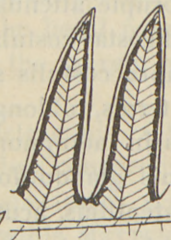
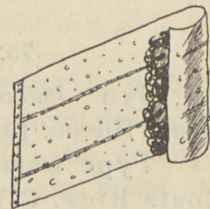
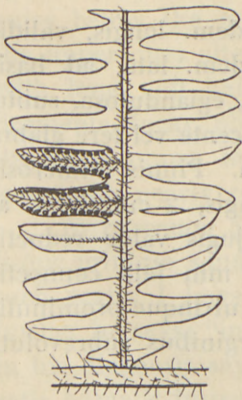


Fig. 51. *D. cheilanthoides* (Kze.) C. Chr.
Glaziou n. 15762.



scattered hamate hairs. Texture firm, chartaceous; colour brown. Segments close, a little falcate, acute, about 4 mm. broad, their edges slightly revolute, the basal pair considerably reduced in the lower pinnæ, equal-sized in the upper; the sinus between the segments acute narrow. Veins about 15 to a side, prominent on the upperside. Sori small, a little above the middle of the vein, soon dispersed, exindusiate.

Polypodium ctenoides Jenman seems to me to be the same species, judging from a fragment from Jamaica, leg. et det. Jenman (HB). It is probable that JENMAN was right in naming his plant *P. ctenoides*, but having seen no specimen from San Domingo, the type locality of *Ptegopteris ctenoides* Fée, I dare not identify the species of FÉE with *D. rudis*.

D. Leprieurii (Hk.) O. Ktze. is a near relative of *D. rudis*, resembling it very closely in general habit, but it belongs to the group of species, which have their lower pinnæ not at all reduced and which, therefore, are not included in this paper.

74. *Dryopteris Engelii* Hieron. Hedwigia 46: 339. tab. 6 fig. 12. 1907.

Type from Venezuela: Merida, leg. Engel n. 90 (HB!).

Doubtful if specifically different from *D. rudis*. It is to that species as *D. Mercurii* is to *D. Sprengelii*.

75. *Dryopteris nervosa* (Kl.) C. Chr. Ind. 279. 1905.

Syn. *Polypodium nervosum* Klotzsch, Linnaea 20: 386. 1847; *Nephrodium nervosum* Hieron. Engl. Jahrb. 34: 445. 1904.

Type from British Guiana, leg. Schomburgk n. 1165 (HB!). — Also in Costa Rica, C. Wercklé 1903 (HC).

Rhizomate? Stipitibus (ad pinnas abortivas infimas) 2 dcm. longis, validis, minute pubescentibus. Lamina lanceolata, 1 m. longa, 2½ dcm. lata, ad basin abrupte attenuata, rigide membranacea vel subcoriacea, nitida, eglandulosa, subtus ad costas costulasque hispido-setosa et inter venas minute pubescente vel fere glabra, supra costulis setosis exceptis glabra, marginibus sparse ciliata. Pinnis numerosis, alternis, oblongis, longe acuminatis, maximis 10—12 cm. longis, 2 cm. latis, ad basin aërophoro squamaeforme instructis, inferioribus 6—7 jugis valde reductis, imis glanduliformibus (Typus IV). Laciniis numerosis, ala 1 mm lata connectis, patentibus, acutis, basalibus subaequalibus. Venis 12—14 jugis, utrinque prominulis, costis costulisque stramineis. Soris parvis, medialibus, a marginibus subrevolutis non obtectis. Indusio non reperto.

I have redescribed this species after WERCKLÉ's specimen, which very well agrees with the somewhat imperfect original one. *D. nervosa* is intermediate between *D. rudis* and *D. cheilanthoides*, differing from the former by its narrower and not throughout setose leaf, from the latter by its margins not being much revolute

and covering the sori, by its lower basal segment not being longer than the others, and by its medial sori.

Another specimen from Costa Rica, leg. H. Pittier n. 1935 (HC), described by CHRIST in Bull. Soc. bot. Belg. 35: 213. 1896 as *Aspidium resino-foetidum* is either a variety of *D. nervosa* or a new closely allied species. Its leaf is very coriaceous, nearly glabrous and eglandulose; in habit it mostly resembles *D. cheilanthoides*, in the position of its sori *D. nervosa*.

76. *Dryopteris strigifera* Hieron. Hedwigia 46: 337. tab. 5 fig. 10. 1907.

Type from Columbia: Llanos de San Martin, leg. Stübel n. 711 (HB!).

77. *Dryopteris Brausei* Hieron. Hedwigia 46: 337. tab. 6 fig. 11. 1907.

Type from Columbia: in valle fluminis Rio Paez, leg. Stübel n. 145 (HB!).

78. *Dryopteris pterifolia* (Mett.) O. Ktze. Rev. Gen. Pl. 2: 813. 1891; Hieron. Hedwigia 46: 338. 1907 — [Fig. 49].

Syn. *Aspidium pterifolium* Mett.; Kuhn, Linnaea 36: 110. 1869; *Nephrodium pterifolium* Bak. Syn. Fil. 497. 1874. *Nephrodium retrorsum* Sodiro, Recensio 51. 1883; Crypt. vasc. quit. 244. 1893; *Dryopteris retrorsa* C. Chr. Index 288. 1905.

Type from Bolivia: leg. Mandon n. 15 (HB!).

I refer here the following specimens:

Venezuela, Tovar, Moritz n. 403 (HB).

Ecuador: Andes quitensis, Sodiro (HB).

Near *D. rudis*, but different in pubescence and very characteristic by its habit. Leaf 1—1½ m. long; stem more than 1 cm. thick at base with several dull scales. The lowest 3—4 pair of pinnæ very small, glanduliform (Type IV), the developed ones at distances of 6 cm., the largest up to 3 dm. long by 4 cm. broad; the pairs below the middle of the lamina opposite, pendent about from the middle, the upper ones alternate and patent. Rachis, costæ and veins rather densely hairy with long, soft hairs (not setose as in *D. rudis*). Large tuberculiform aërophore. Segments linear, obtuse, with nearly their own breadth between, the basal pair of the lower pinnæ much reduced. 15—18 pair of veins. Sori near the margin and sometimes nearly covered by the somewhat revolute margin.

N. retrorsum Sod. is this species. SODIRO says: "Rachibus subtetragonis rachilisque primum squamulis elongatis, angustis, ochraceis, mature deciduis conspersis"; such scales I have not seen; they have probably fallen in the specimens seen; further he says: "involucro subdiscoideo, basi retuso, caducissimo", while METTENIUS in his diagnosis says: "indusium manifestum, membranaceum, tenerum setis elongatis hamatis instructum". I have failed to find an indusium.

Nephrodium piloso-hispidum Hk. sp. 4: 105. 1862, by BAKER united with *D. rudis*, may be this species (see HIERONYMUS, Hedwigia 46: 339); if so, the name has priority. Further HIERONYMUS is of opinion (l. c. 338) that *Alsophila pilosa* Mart. &

Gal. Mém. Foug. Mex. 78 tab. 22. 1842 belongs to *D. pterifolia* rather than to *D. rudis*, and judging from the bad figure it agrees in pubescence better with the former. Still *D. pterifolia* is not found north of Panama, while *D. rudis* is a common species in Mexico, at least in the region (Mirador) where GALEOTTI found *A. pilosa*. (Conf. Liebmann: Mexicos Bregner, in Vid. Selsk. Skr. Kjøbenhavn V: I. 205. 1849). I, therefore, think it better to reduce *A. pilosa* to a synonym of *D. rudis*. A greater part of the figures in the work of MARTENS & GALEOTTI must for identification of species be critically used.

79. *Dryopteris macradenia* (Sod.) C. Chr. Ind. 276. 1905.

Syn. *Nephrodium macradenium* Sodiro, Recensio 47. 1883; Cr. vasc. quit. 242. 1893.

Type from Ecuador, leg. Sodiro (HC).

Ample. Stem 60—80 cm. long, more than 1 cm. thick, finely and deciduously hairy. Rachis like costæ and veins on both sides rather densely but very shortly pubescent, texture rigidly papyraceous, colour brown, 2—3 pairs of reduced, auriculate pinnæ, middle pinnæ 1½ dcm. long by 2 cm. broad, lanceolate with a large aërophore at their base. Segments close, patent, acute, the basal ones sometimes a little enlarged. Veins indistinct, about 15 to a side; sori near the margin; indusium not seen, according to SODIRO it is glandulose.

80. *Dryopteris horrens* Hieron. Hedwigia 46: 341 tab. 6 fig. 14. 1907.

Type from Ecuador: prope La Boca del Mundo Nuevo, 2600 m. leg. Stübel n. 338 (HB!).

A peculiar species. Only in the mature frond does the crenate revolute margin cover the sori.

81. *Dryopteris mertensioides* sp. nov. — [Fig. 50].

Costa Rica: Navarro, 1400 m., leg. C. Wercklé 1905 (HC).

Eudryopteris rhizomate? Stipitibus validis, 3—4 dcm. longis, superne bisulcatis, sparse pubescentibus, mox glabris, fusco-stramineis, ad basin fuscescentibus et squamis 1 dcm. longis, deciduis vestitis. Lamina lanceolata, 1 m. vel ultra longa, 2½—3 dcm. lata, ad basin abrupte attenuata, versus apicem acuminatum pinnatifidum sensim decrescente, coriacea, pallide viridi, supra glabra vel ad costas setis paucis sparse instructa subtus ad costas costulasque pilis longis albidis patentibus hirta, eglandulosa, marginibus pilis longis dense ciliatis, bipinnatifida; rachibus stramineis, sparse pubescentibus, mox glabratis. Pinnis numerosis, patentibus, subapproximatis, suboppositis, inferioribus 5—6 jugis valde reductis, infimis glanduliformibus (Typus IV), maximis 12—15 cm. longis, vix 2 cm. latis, lineari-oblongis, sessilibus, acuminatis, ad basin aërophoro squamis longis atro-brunneis, deciduis dense vestito instructis, inaequalibus. Laciniis numerosis, integris, patentibus ala 1 mm. lata connectis, anterioribus 8 mm. longis, posterioribus ad 12 mm. longis,

oblongis, acutis, marginibus dense fimbriato-ciliatis revolutis, basalibus subaequalibus. Venis indistinctis, 15—18 jugis, simplicibus. Soris parvis, margini approximatis, a marginibus revolutis fimbriatis obtectis. Indusiis non repertis.

This new species is intermediate between *D. cheilanthoides* and *D. nervosa*, resembling the former in texture and revolute edges, which cover the sori, and the latter in habit and small sori. It is, however, a very distinct new species, well characterized by its revolute edges, which are densely ciliate and recall the indusium of certain species of *Cheilanthos*. In its costæ and costulæ beneath being rather densely covered with soft hairs it resembles *D. pterifolia*. The aërophore is clothed with long, brown scales, which as a rule have fallen off in the mature leaf. In general habit the leaf resembles a branch of a species of *Gleichenia* § *Mertensia*, thence the name.

82. *Dryopteris cheilanthoides* (Kze.) C. Chr. Ind. 257. 1905 — [Fig. 51].

Syn. *Aspidium cheilanthoides* Kze. Linnaea 22: 378. 1849; Mett. Aspid. 84 n. 203. *Nephrodium resino-foetidum* Hk. sp. 4: 105. 1862; Bak. Syn. 269; *Aspidium resino-foetidum* Christ, Farnkr. d. Erde 253. 1897; *Dryopteris resino-foetida* O. Ktze. Rev. Gen. Pl. 2: 813. 1891.

Type from Brazil; leg. Regnell (non vidi).

“Caudex crassus brevis adscendens e terra apice exserens” (MosÉN in sched.). Stipitibus robustis ad 2 dcm. longis, stramineis vel brunneis basi fuscescentibus, versus basin squamis 1 cm. longis, brunneis, laxis, ovato-acuminatis instructis, sursum glabris, glandulosis. Lamina lanceolata, ad 1 m. longa, 2¹/₂—4 dcm. lata, utrinque decrescente, coriacea vel subcoriacea, bipinnatifida. Rachibus stramineis vel fuscis, glandulosis et pilis longis, albidis, deciduis plus minusve pilosis. Pinnis numerosis, c. 30 jugis, ad basin aërophoro prominente, acuto instructis, alternis vel suboppositis vel inferioribus saepe fere oppositis, basi truncata, dilatata sessilibus, lineari-oblongis, acuminatis, mediis ad 2 dcm. longis, 1¹/₂—2¹/₂ cm. latis, costis subtus pilis albidis, deciduis sparse pilosis exceptis glabris, sed subtus dense glandulosis, pectinato-pinnatifidis, inferioribus 3—4 jugis abrupte abbreviatis, infimis minimis, saepe glanduliformibus (Typus IV). Laciniis numerosis, acutis vel subobtusis, interdum leviter falcatis, marginibus integris revolutis, 1—2 cm. longis, — posterioribus saepe longioribus — 3 mm. latis, basale posteriore prolongata. Venis indivisis, densis, 12—18 jugis, omnibus soriferis. Soris submarginalibus, lineam continuam formantibus, a marginibus revolutis tectis. Indusiis persistentibus, glandulosis.

This species is probably the most distinct in the group. Even in very young fronds the margins are reflexed and adpressed to the under surface quite hiding the young undeveloped sori, and one can take such fronds for a *Pteris* or *Cheilanthos*, still the habit is that of a common *Lastrea*. — I have not seen the original specimen, but my plants from Brazil agree perfectly with the original diagnosis. It is no doubt this species, which BAKER in “Flora Brasiliensis” and other authors

have described or determined as *resino-foetidum*. I have examined the following specimens from Brazil: Minas Geraes: Lagoa Santa, Warming (HH). In this specimen two pair of sterile pinnæ are to be found, which are broader than the soriferous ones and with basicop segments enlarged and dentate. — Caldas, Mosén n. 2174 (HH. HS), n. 2175 (HS). — Ouro Preto, M. Gomes n. 3009 (HC). — Glaziou n. 15762, 15763 (HH). — Rio Grande do Sul: Passo Mansa, Haerchen (HR).

The following specimens from the Andes lack the long, white hairs on rachis and costæ beneath, characteristic of the plants from Brazil, otherwise they agree very well with them:

Venezuela: Caracas, Dr. Kosas (HB. HS).

Columbia: Ocaña, Schlim n. 494 (HB).

Costa Rica: Cartago, 2000–2200 m., Wercklé 1905 (HC). — San José, 1160 m., P. Biolley 1906 n. 25 (HC = var. *eglandulosa* C. Chr. Christ, Bull. Boiss. II. 7: 262. 1907).

Mexico, Schaffner, Karwinski (HB).

I have above reduced *Nephrodium resino-foetidum* to a mere synonym of *D. cheilanthoides*, and I have no doubt that I am right in doing so. I have only seen a few segments in Herb. Berol. of the type-specimen of *N. resino-foetidum* (Spruce n. 5302), which METTENIUS has named *Aspidium cheilanthoides* = *resino-foetidum* Hk. HOOKER describes the rachis as glabrous, as does METTENIUS in his description of *A. cheilanthoides*. The fact is, that the long, white hairs on the rachis and costæ in the specimens from Brazil are very deciduous and in old specimens mostly absent. In the specimens from Venezuela and Mexico, mentioned above, I find no hairs, and these are thus most probably true *resino-foetidum*, but I am sure that they in no way differ from the Brazilian form. JENMAN has found *resino-foetidum* in Jamaica, and he describes (Bull. Dept. Jamaica n. s. 3: 66. 1896) the rachis as “stramineous, puberulous”, quite as in most of our plants from South Brazil. A remarkable character for *resino-foetidum* is mentioned by HOOKER, who says, that “the recent plant had a peculiarly foetid-resinous smell”; most singularly JENMAN says (l. c), that the growing plant has “a delicious peach perfume” and further it has “densely viscid fronds and mucous stipites and caudex”. CHRIST says (Farnkräuter d. Erde 253): “Pflanze kahl, aber mit einer bräunlichen, nach Asphalt riechenden Substanz dünn überzogen”. This peculiarity so diversely described is not mentioned by Brazilian collectors; if true *D. cheilanthoides* agrees in this, the last doubt as to its identity with *resino-foetidum* is removed.

Another synonym of our species is without doubt *Aspidium decrescens* Kunze hb.; Mett. Aspid. 84 n. 202. 1858; *Dryopteris decrescens* O. Ktze. Rev. Gen. Pl. 2: 812. 1891: C. Chr. Ind. 261, from Venezuela, leg. Funck & Schlim n. 1229, of which I have seen a fragment in Herb. Mett. (HB). This is certainly not the same as *Nephrodium decrescens* Bak. Syn. 497 (Lindig n. 292). METTENIUS sees the differences between *decrescens* and *cheilanthoides* in the somewhat hairy frond with the lower pinnæ conspicuously reduced and the medial sori of the former. As to these characters the two first agree very well with good specimens of *D. cheilanthoides*,

and the third does not agree exactly with the original specimen, although the sori in a segment especially the basal are somewhat removed from the margin, at best described as supramedial, while in *D. cheilanthoides* they are placed closely to the sinus.

Nephrodium decrescens Bak. from Columbia: Bogotá, 2800 m., Lindig n. 292 (HB!), is a more different form, which I prefer to place here as a variety of *D. cheilanthoides*. It differs mainly from the type by its margins being not at all or only faintly revolute and not covering the sori. Indusium small, deciduous, glabrous or a little glandulose. Texture somewhat thinner. As this form is different from the original *A. decrescens* I call it

D. cheilanthoides (Kze.) var. *subplana*.

The Costa Rican specimens referred above to this species differ in being eglandulose. I have named that form var. *eglandulosa*, and it is shortly described in Bull. Boiss. 1907. 262.

APPENDIX.

As an appendix to the above revision I give here diagnoses of two new species, which do not belong to the group of *D. opposita*, although their lower pinnæ are somewhat reduced. In my opinion they belong to the group of *D. patens* and *D. parasitica*. Dr. H. CHRIST has kindly sent me the following diagnosis of *D. urens*, which I publish with pleasure here, because the species is furnished with burning hairs, a peculiarity unknown before within the class of *Pteridophyta*.

After having written the above and after having forwarded my manuscript to the printer I have received from Dr. ROSENSTOCK a diagnosis of a new species, *Dryopteris urens* Ros., from Uruguay, Punta Ballena, leg. Arechavaleta. Comparing his description with that of Dr. CHRIST published here I have no doubt, that ROSENSTOCK'S *D. urens* is quite the same species, and the name must then, of course, be attributed to him.

Dryopteris urens Rosenstock in Fedde: Repertorium 4: 5. 1907 — [Fig. 52 I].

Uruguay, lat. Atlant., prope Punta Ballenas in arenis humidis, leg. Mariano B. Berro 2. Jan. 1907 (HC).

Ampla, ultra 80 cent. longa, rhizomate stipite longo, 3 ad 4 mill. crasso, cum rachi luteo-viridi, pilis albidis flexuosis 1 mill. longis dense vestito, sicce anguloso. Fronde ovato-oblonga, 80 cent. longa, 20 cent. lata, acuminata, versus basin subito in auriculas aliquot oblongas acuminatas et laciniatas 3 cent. longas contracta, bipinnatisecta, pinnis inferioribus remotis oppositis, caeteris alternis et confertis, ca. 40 utrinque, erecto-patentibus, usque ad 17 cent. longis, 23 mill. latis, sessilibus, insertione subcallosa, ligulato-lanceolatis, acuminato-caudatis, basi subdilatatis, i. e. segmento anteriore aucto et interdum laciniatis, costa viridi subflexuosa basi 1 mill. crassa; pinnis ad basin usque ad costam, caeterum usque ad alam utrinque 1 aut $1\frac{1}{2}$ mm. latam incis. Segmentis ligulato-oblongis ca. 50 utrinque, pectinato-confertis, sinu acutissimo et fere nullo separatis, 1 cent. longis, basi $3\frac{1}{2}$ mill. latis, subfalcatis subacutis integris. Nervis inconspicuis liberis simplicibus 10 ad 12 utrinque, obliquis, marginem attingentibus, infimis saepe in sinum convergentibus. — Soris 8 ad 10 utrinque, mediis, spatium inter costulam marginemque occupantibus, contiguis nec confluentibus, rotundis 1 mill. latis dilute brunneis, indusio minuto mox evanido ciliato. Sporangiiis glabris. — Costis costulis

nervis faciebus margineque pilis albidis rigidis acutis (nec glanduligeris) patentibus dense vestitis et ciliatis. — Textura herbacea, colore laete sed dilute viridi, opaco.

Habitu *D. parasiticae* (L.) a qua differt nervis pluribus haud anastomosantibus, pinnis profundius incisus, segmentis angustioribus subfalcatis magis numerosis, pubescentia peculiari.

Ex epistola cl. inventoris planta apud incolas nota ob vim urticantem pilorum, ita ut faciei humanae incommodum fiat, si manibus contactu filicis inquinatis tangitur. (H. CHRIST scripsit.)

To the above diagnosis I shall add: Lamina subtus glandulis sessilibus aureis minutis sparse instructa.

The structure of the hairs does not differ from the hairs of allied species. — The species is a near ally of *D. parasitica* and *D. patens*, having a similar indusium and the lower veins running into the sinus. The base of the lamina judging from the diagnosis is somewhat reduced, or rather the lower pinnæ are somewhat abbreviated, but certainly not to the same extent as in most species of the group of *D. opposita*.

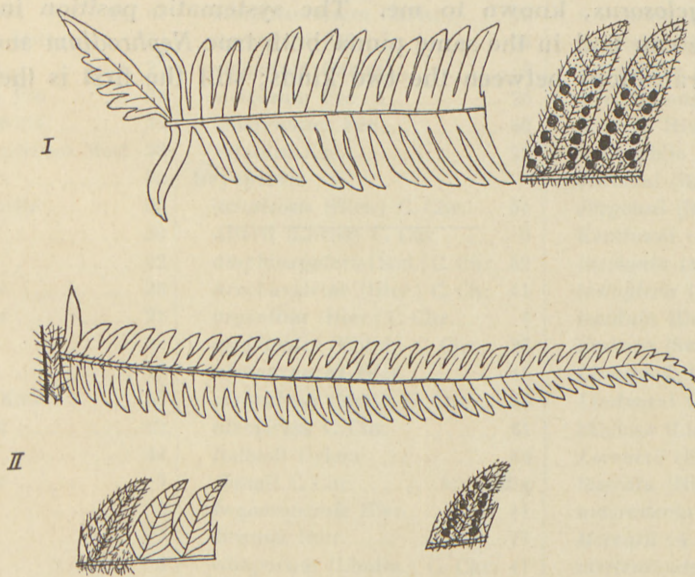


Fig. 52. I. *D. urens* Ros. — II. *D. Bangii* C. Chr.
The three segments show both the venation of *Lastrea* and of *Nephrodium*.

***Dryopteris Bangii* n. sp. — [Fig. 52 II].**

Bolivia: Near Coroica, Yungaz, leg. A. Miguel Bang $\frac{4}{7}$ 1894 n. 2321 (HH).

Dryopteris rhizomate repente, glabro, Stipitibus 2—3 cm. distantibus, c. 4 dcm. longis, ad $1\frac{1}{2}$ cm. crassis, fusco-stramineis basi nigrescentibus, superne trisulcatis, pubescentibus et ad basin squamis paucis, laxis, deciduis instructis. Lamina lan-
ceolata, $5\frac{1}{2}$ dcm. longa, infra medium $1\frac{1}{2}$ —2 dcm. lata, utrinque attenuata, acu-

minata vel ad apicem abrupte caudata, papyracea, obscure viridi, ubique dense et molliter pubescente, bipinnatifida. Rachi straminea, complanata, superne late sulcata, dense pilosa. Pinnis alternis, basi dilatata sessilibus, linearibus, versus apicem serratum breviter acuminatum attenuatis, maximis 8—9 cm. longis, 12—14 mm. latis, costis subtus prominulis convexis, superne complanatis, sulcatis; infimis abbreviatis, 3—4 cm. longis, fere oppositis, ad $4\frac{1}{2}$ cm. remotis. Laciniis 25—30 jugis, approximatis, falcatis, acutis, basi latioribus; lacinia basali anteriore dimidio majore. Venis indivisis, 8—10 jugis, infimis plerumque conniventibus vel anastomosantibus more subgen. *Eunephrodii* Syn. Fil., vel interdum liberis more subgen. *Lastreae* Syn. Fil., fere omnibus soriferis. Soris rubrescentibus supra medium venarum insidentibus. Indusiis reniformibus, persistentibus, rubris, pilosis.

The specimen was distributed "Ex Herbario Collegii Columbiae, a N. L. Britton et H. H. Rusly distributæ" as *Nephrodium conterminum* Desv., a species with not even the slightest alliance of course with our plant. It comes nearest to *D. parasitica* (L.), but it is much more hairy, much firmer in texture, has a much longer stem, a different colour and the whole aspect of the plant does not resemble any species of § *Cyclosorus*, known to me. The systematic position in the genus is doubtful, as one can find in the same pinna both true *Nephrodium* and true *Lastrea*-venation and transitions between the two kinds; still the first is the rule.

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(Names of accepted species in italics.)

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<i>scalaris</i> (Christ) C. Chr.	72	<i>deflexum</i> Pr.	15	<i>consanguineum</i> Kl.	5
<i>scalpturoides</i> (Fée) C. Chr.	34	<i>diplazioides</i> Hk.	56	<i>ctenoides</i> Jenm.	73
<i>scariosa</i> Ros.	42	<i>firmum</i> Bak.	36	<i>gracilentum</i> Jenm.	28
<i>siambonensis</i> (Hier.) C. Chr.	63	<i>Jenmani</i> Bak.	44	<i>heteroclitum</i> Desv.	60
<i>silviensis</i> Hier.	29	<i>Jürgensii</i> Ros.	38	<i>Hewardii</i> Gres.	60
<i>simplicissima</i> (Christ) C. Chr.	15	<i>Kaulfussii</i> Hk.	5	<i>Lechleri</i> Bak.	17
<i>Sprengelii</i> (Klf.) O. K.	65	<i>Kaulfussii</i> Lindm.	58	<i>litigiosum</i> Liebm.	28
<i>stenophylla</i> (Sod.) C. Chr.	1	<i>lasiopteris</i> Sod.	69	<i>molliculum</i> Kze.	1
<i>stenophylla</i> Hier.	45	<i>lustratum</i> Hier.	14	<i>nervosum</i> Kl.	75
<i>Stierii</i> (Ros.) C. Chr.	2	<i>macradenium</i> Sod.	79	<i>oligocarpum</i> Willd.	5
<i>strigifera</i> Hier.	76	<i>nimbatum</i> Jenm.	53	<i>oligosorum</i> Kl.	5, 6
<i>Stübelii</i> Hier.	67	<i>Nockianum</i> Jenm.	7	<i>oppositum</i> Vahl	25
<i>supina</i> (Sod.) C. Chr.	46	<i>pachyrachis</i> Bak.	44	<i>Pavonianum</i> Kl.	18
<i>tablaziensis</i> Christ	7	<i>panamensis</i> Pr.	28	<i>Plumieri</i> Desv.	25
<i>tenerima</i> (Fée) Ros.	50	<i>piloso-hispida</i> Hk.	78	<i>pubescens</i> Raddi	5
<i>urens</i> Ros. & Christ	appendix	<i>pseudo-thelypteris</i> Ros.	41	<i>retusum</i> Sw.	5
<i>utañagensis</i> Hier.	47	<i>resino-foetidum</i> Hk.	82	<i>rivulorum</i> Raddi	25
<i>velata</i> (Kze.) O. K.	22	<i>retrorsum</i> Sod.	78	<i>rude</i> Kze.	73
Grammitis		<i>rigidulum</i> Bak.	34	<i>ruffum</i> Poir.	4
<i>Hewardii</i> Moore	60	<i>Sherringii</i> Jenm.	65	<i>rusticum</i> Bak.	53
		<i>stenophyllum</i> Sod.	1	<i>saxicola</i> Sw.	24
		<i>stramineum</i> Sod.	44		