

CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY—NO. CXLIII

A REVISION OF THE GENUS DORYOPTERIS

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INTRODUCTION

DORYOPTERIS is one of the smaller genera of the tribe *Cheilan-thinae* of the *Polypodiaceae*. As defined in this treatment, it includes 26 species. These are terrestrial, usually growing in rather dry, rocky places. Some are extremely xeromorphic.

TAXONOMY

It has been difficult to establish reasonable generic lines. The characters of usual generic importance in the ferns behave very badly, as is customary in the *Cheilanthinae*. It has been possible definitely to exclude many species on the basis of the receptacular condition and other characters, and most of the species retained are obviously congeneric, but there are a few species that can neither be retained with full confidence nor definitely excluded. These species have been treated under *Doryopteris* traditionally, or in current treatments, and they are retained in the genus on the basis of convenience and because of our present inadequate knowledge of generic lines in the tribe. They are treated in section III—"Miscellaneous Species".

D. concolor shows a transition to the genus *Cheilanthes* (PL. 7B, FIG. 7). The fact that *Pellaea angulosa* (PL. 3E, FIG. 10) has a vascular commissure, although in other characters a true *Pellaea*, may indicate a close relation between that genus and certain species of *Doryopteris*.

The species treated in sections *Lytoneuron* and *Eudoryopteris* are clearly congeneric, even though a few species depart from the generic lines in one or two characters.

Most of the species are quite distinctive and offer no problem of interpretation. Other entities, however, of very local distribution, are distinct in only a few critical characters. These are, when definable, treated as species. On the basis of the clear-cut,

although relatively slight, differences a specific rather than a varietal interpretation is adopted.

PHYLOGENY

Phyletically, the genus represents the highest state of soral development in the tribe. A reasonable sequence can be traced from *Eunotholaena*, with short-stalked sporangia borne on the terminal half or fourth of the little-modified veins and lacking a modified margin-indusium, through *Cheilanthes*, with short-stalked sporangia borne on clavate or flabellate vein-ends and covered by a reflexed, either broken or continuous, hyaline margin, to *Doryopteris* with long-stalked sporangia borne on a continuous commissure connecting the vein-ends and covered by a continuous reflexed margin-indusium. The receptacle can be thought of as having moved toward the vein-ends, which were then correspondingly expanded, and finally to have spread laterally, the adjacent vein-ends connecting. The long-stalked sporangia of *Doryopteris* are probably a result of crowding in the sorus; they are rarely found in *Notholaena* when the sorus is more crowded than usual.

Although presumably derived from a Cheilanthoid stock, there is a possibility of a Pellaeoid source. *Pellaea angulosa*, as previously mentioned, has a vascular commissure. The evidence for parallel and convergent evolution of characters in the tribe is too great to allow any definite statements of relationships. They must be based on sums of characters rather than any individual character, no matter how important it may be in other groups. There is no certainty that sections *Lytoneuron* and *Eudoryopteris* are closely related nor that the species in section III are related to them.

Thus *Doryopteris*, as here treated, is not necessarily a natural genus. However, it is a convenient one and since the genera in the tribe have not yet been reasonably defined I believe it is best to put convenience first and the attempt at naturalness second. A natural classification can hardly be presented until the actual characters of all the species of the tribe are known. When the species have been placed in convenient, definable groups, it may then be possible to revise them and present a natural classification.

PHYTOGEOGRAPHY

Of the 26 species of *Dryopteris*, a single species is pantropical, 21 additional species grow in the New World, 2 (possibly 4, see Doubtful Species) in Madagascar, 1 in Malaysia and 1 in the Hawaiian Islands. All of the 22 New World species grow in Brazil and 12 of them are endemic to it. MAP 10 shows the distribution of the New World species (*D. concolor* is omitted because of definite doubt of its relationship) and the concentration of the number of species.¹

The combined map of the species possibly indicates the general route of migration of species with disrupted ranges, such as, *D. sagittifolia*, MAP 3, *D. varians*, MAP 4, *D. lomariacea*, MAP 7 and *D. nobilis*, MAP 8. The high concentration of species in the state of Rio de Janeiro suggests that the center of evolution and dispersal was in or near that region.

HISTORICAL ACCOUNT

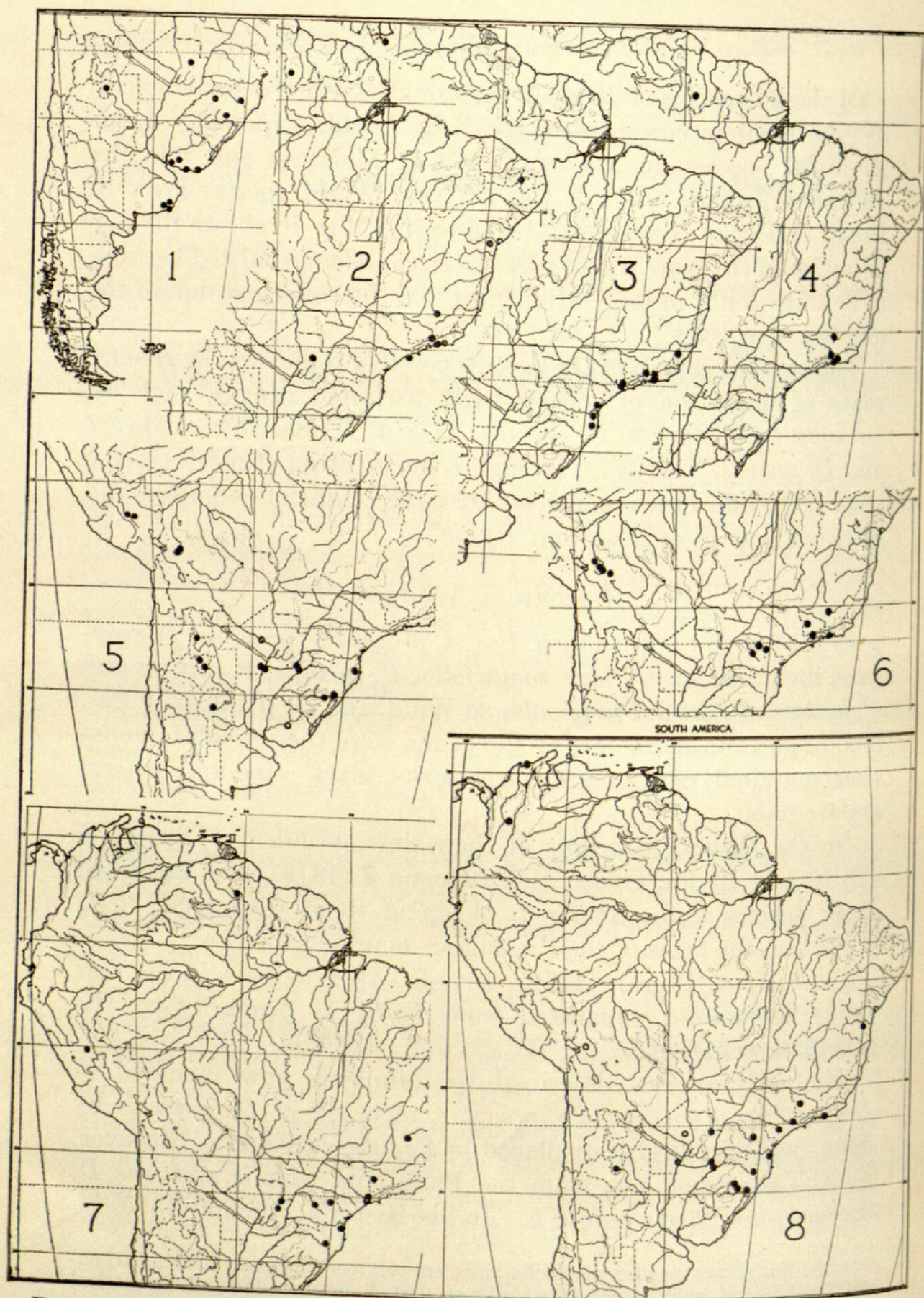
In 1841 John Smith, Journ. Bot. 4, proposed the genus *Doryopteris*, including in it *Pteris sagittifolia*, *P. varians*, *P. collina* and *P. hastata* of Raddi, *Pteris palmata* Willd. and *D. Wallichii* J. Sm. The important characters of the genus were the reticulate venation, marginal, continuous, linear sorus, black stipe and general pedate habit.

On the basis of concepts of their time, Willdenow, Sp. Pl. 5 (1810) and Raddi, Opusc. Sci. Bologna 3 (1819), had described these species under *Pteris* L., keeping them with true *Pteris* species on the basis of the continuous marginal sorus.

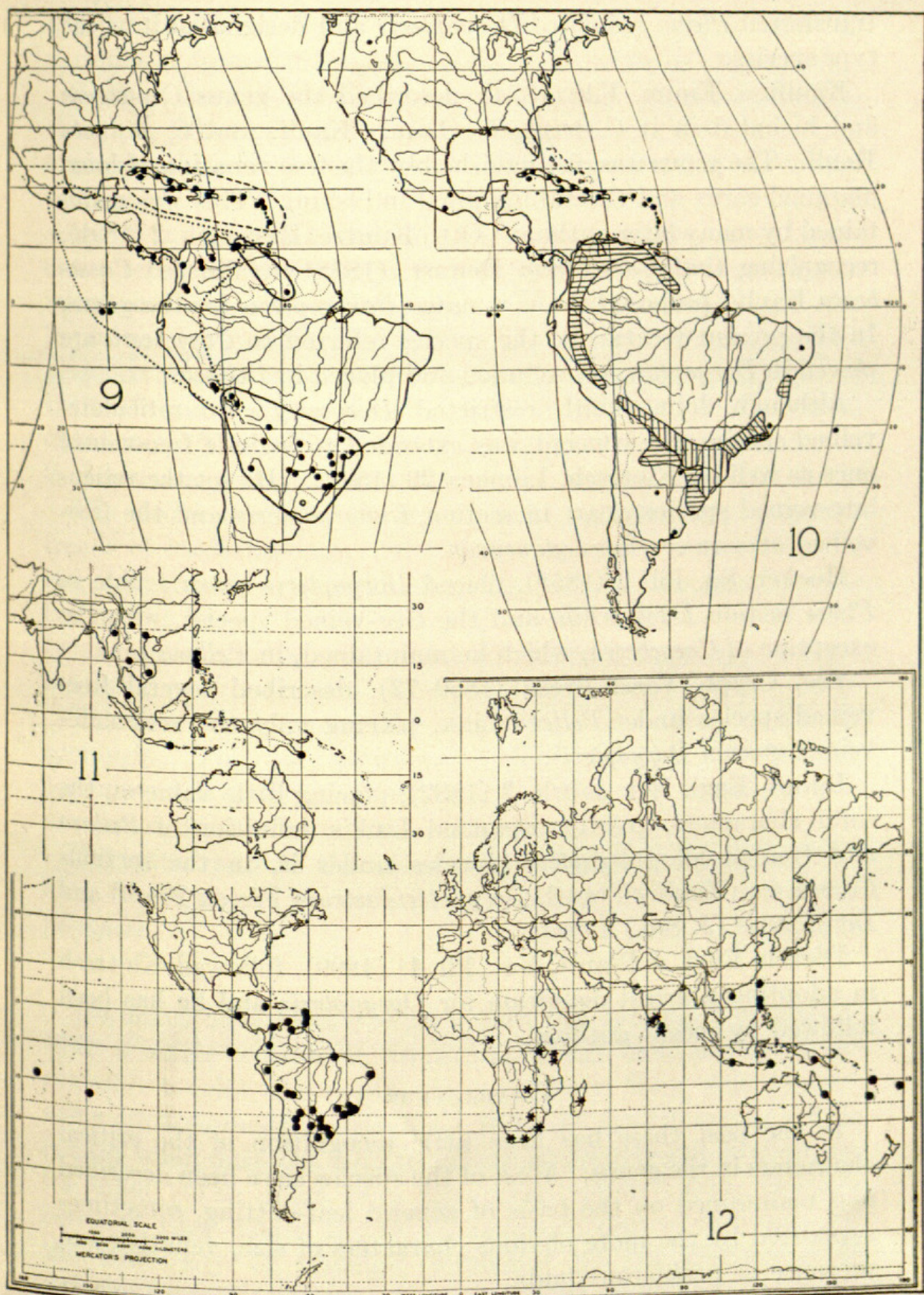
Presl, Tent. Pterid. (1836), included these species in his new genus *Litobrochia*, separated from *Pteris* L. primarily by the reticulate venation.

The only species described by Linnaeus now included in *Doryopteris*, *Pteris pedata*, was not included in *Doryopteris* by John Smith in 1841, but placed in *Cassebeera* Kaulf. However, Smith's specimen was from the Philippine Islands and was *D. concolor*, not *Pteris pedata* L. In his Historia Filicum (1875) he

¹ Shading shows number of species and varieties in each country, or, in Argentina and Brazil, each state. Dots, one species; horizontal lines, 2-4; vertical lines, 5-7; diagonal lines, 8-9; cross-hatched lines, 10-12.



Range of *DORYOPTERIS* *TRIPHYLLA*, MAP 1; *D. COLLINA*, MAP 2; *D. SAGITTIFOLIA*, MAP 3; *D. VARIANS*, MAP 4; *D. LORENTZII*, MAP 5; *D. CRENULANS*, MAP 6; *D. LOMARIAEACEA*, MAP 7; *D. NOBILIS*, MAP 8.



Ranges of varieties of *DORYOPTERIS PEDATA*, MAP 9 (broken line, *var. typica*; dotted line, *var. palmata*; solid line, *var. multipartita*). Range and concentration of species of the genus in America, MAP 10 (see p. 5 for explanation). Range of *D. ludens*, MAP 11. Varieties of *D. concolor*, MAP 12 (dots, *var. typica*; asterisks, *var. kirkii*).

transferred *Pteris pedata* to *Doryopteris* and designated it as the type species.

Kaulfuss, Enum. Fil. (1824), described the genus *Cassebeera* and included in it *C. triphylla* (Lam.) Kaulf. and *C. pinnata* Kaulf. The genus was distinguished by the free venation, oblong, marginal sorus and the submarginal indusium. This was maintained by many later authors. Otto Kuntze, Rev. Gen. 2 (1891), recognizing that *Cassebeeria* Dennst. (1818) invalidated *Cassebeera* Kaulf., proposed the new name *Bakeropteris* for the genus. In the present treatment, the species referred to *Cassebeera* are placed in *Doryopteris* or excluded and placed in *Pellaea*.

Although John Smith restricted *Doryopteris* to reticulate-veined species, the concept was extended to include free-veined ones as well by Klotzsch, Linnaea 20 (1847). He set the reticulate-veined species apart in section *Eudoryopteris* and the free-veined ones in section *Lytoneuron*.

Hooker, Sp. Fil. 2 (1858), placed *Doryopteris* sensu J. Sm. in *Pteris* section *Litobrochia*, and the free-veined species, with the exception of *Cassebeera*, which he maintained, in *Pellaea* Link.

Fée, Crypt. Vasc. Brésil (1869-72), described several free-veined species under *Pellaea* Link, placing only the reticulate-veined ones in *Doryopteris*.

Prantl, Engl. Bot. Jahrb. 3 (1882), placing little value on the soral characters, greatly expanded Link's definition of *Pellaea* and treated all *Doryopteris* species under it, in the sections *Cassebeera* (Kaulf.) Prantl, *Doryopteridastrum* Fée ex Prantl and *Doryopteris* (J. Sm.) Prantl.

Diels in Engl. & Prantl, Nat. Pfl. 1⁴ (1899), followed Klotzsch in adopting a broad definition for *Doryopteris* and he has been followed by recent authors.

CHARACTERS

In the past there has been little recognition of the critical characters in the genus. Most of the species have been described and maintained on the basis of general leaf-cutting, sometimes supported by the more obvious characters of size, venation and presence of proliferous buds.

Most of the species are quite variable in leaf-cutting and it

does not seem advisable to recognize these phases, even as varieties or forms, unless supported by additional characters.

Some of the best specific characters within the genus reside in the stipe: pubescent, glabrous or scaly; channeled, sulcate, wing-angled or plane on the upper side, or terete; smooth or verrucose; castaneous, atropurpureous or black: and in the number and shape of the vascular bundles. The margin of the sterile blade, entire or variously toothed, with or without hydathodes on the upper surface, and the characters of the vein-ends are also important. Venation, the sterile tips of the fertile segments, presence or absence of proliferous buds, the type of division of the blade and the type of scales on the frond-buds all afford good characters. The leaf-cutting naturally cannot be ignored but it is of secondary importance.

The character of the vascular bundles is taken from stipes of fronds of moderate size. The shape varies somewhat with the size of the frond; very small ones may have a terete bundle while larger ones have a U- or V-shaped bundle. In the species with two vascular bundles, very small fronds may have only a single bundle.

The term *soral line* is used to designate a continuous line of sporangia. This may represent a single sorus, if the vascular commissure is completely continuous, or it may represent two or more sori if the commissure is broken.

The outer wall of the spore is here called the *exospore*; the loose, outer covering, derived from tapetal tissue, is called the *perispore*.

MAPS

The maps have been compiled from the specimens examined. With a single exception, literature-records have not been included. A solid dot represents a specimen from that locality and a circle represents a specimen from the general region. This is used when only the country, state or department is given on the label. The maps used have been selected from Goode's Series of Base Maps, Henry M. Leppard, Editor, copyright by the University of Chicago, published by the University of Chicago Press.

ILLUSTRATIONS

The drawings of blades have been made by tracing the outline from the specimens. The drawings of sterile and fertile segments, showing venation and the receptacle, were traced from photomicrographs of cleared segments. The other drawings are free-hand. The three-dimensional drawings of part of the margin of a fertile segment are semi-diagrammatic. The receptacle is stippled and also indicated by a few sporangial stalks. The drawings are taken from fronds of middle age. In old fronds the pseudomargin and indusium are bent outward so that the indusium is nearly in the same plane as the blade.

MATERIALS

The study is based on about 1000 sheets of *Doryopteris* in the herbarium of the Brooklyn Botanic Garden (abbreviated B in the specimen-citations), the Copeland Herbarium (Copel.), the herbarium of the Field Museum of Natural History (F), the Gray Herbarium (G), the herbarium of the New York Botanical Garden (NY) and the United States National Herbarium (US). Also notes taken by Mr. C. A. Weatherby on type-specimens and authentic material at Kew, Paris and Geneva, and the excellent photographs by Mrs. C. A. Weatherby have been available. These have naturally proved invaluable in placing many names.

In order to study the receptacular condition in the genus, slides of cleared material of each species were prepared. The fertile segment is boiled in water or dilute KOH (or NaOH) a few minutes and then placed in a vial of dilute KOH. In one or a few days the material is sufficiently cleared and it is then washed and transferred to alcohol. In a few hours it is ready to be washed in absolute alcohol and then xylol. Any desirable dissection is then performed and the material mounted in clarite. Using a mica slide it can be placed in a packet on the herbarium sheet, available for easy consultation.

This valuable method of studying the material has yielded significant results. The individual xylem cells can be seen easily and thus the exact extent and development of the receptacle can be determined. This often is very different from the condition that would be deduced from an external examination.

ACKNOWLEDGMENTS

I wish to thank the curators of the above-mentioned herbaria for the generous loan of material and Mr. C. A. Weatherby for his unfailing help and encouragement during the course of this study.

SYSTEMATIC TREATMENT

DORYPTERIS J. Sm. Journ. Bot. **3**: 404. 1841, nomen nudum; **4**: 162. 1841; emend Kl. Linnaea **20**: 342. 1847. MAP 10.

Pteris L. Sp. Pl. **2**: 1075. 1753, in part. *Cassebeera* Kaulf. Enum. Fil. 216. 1824, in part, not *Cassebeeria* Dennst. Schlüss. Hort. malab. 35. 1818, a genus of the *Melastomaceae*. (Reference from Dalla Torre & Harms). *Litobrochia* Presl, Tent. Pterid. 148. 1836, in part. *Pteris* section *Litobrochia* (Presl) Hook. Sp. Fil. **2**: 207. 1858, in part. *Pellaea* Link emend. Prantl, Engl. Bot. Jahrb. **3**: 415. 1882, in part. *Allosorus* Bernh. emend O. Ktze. Rev. Gen. **2**: 804. 1891, in part. *Bakeropteris* O. Ktze. Rev. Gen. **2**: 807. 1891, in part, based on *Cassebeera* Kaulf. TYPE SPECIES: *Pteris pedata* L., chosen by J. Sm. Hist. Fil. 288. 1875.

Rhizome erect, suberect or decumbent: *stipe* with a *sclerotic* cortical layer, *usually black or atropurpureous*: *blades characteristically divided in a pedate manner* (as in PL. 5B, FIG. 6), entire or trilobate in some species and in small fronds of some species, large blades with the basal pinnae or primary segments larger than the second pair and lobed on the lower side with the inner lobe the longest, often also lobed on the upper side with the basal lobes much shorter than those on the lower side, palmately divided in *D. ornithopus* and *D. rediviva*, tending to be pinnate in *D. Kitchingii* and a phase of *D. decora* var. *typica*; venation areolate or free: *indusium formed by the greatly modified margin of the segments, continuous with the soral lines* and reflexed over the sporangia: *sori* (illustrated in each species) *marginal, or intramarginal* by reason of a pseudomargin, *continuous or contiguous* at maturity to form a more or less continuous soral line: *sporangia usually long-stalked* (with a stalk the length of the head or in *D. ornithopus* two to three times the length of the head), short-stalked in *D. paradoxa* and phases of *D. concolor* and *D. crenulans* (stalk half the length of the head or less): *receptacle a vascular commissure connecting all of the fertile vein-ends*, or in *D. paradoxa* and *D. concolor*, with transitions to discrete, fan-shaped receptacles terminating each fertile vein: spores tetrahedral-globose, yellow or brown, with a smooth (PL. 5A, FIG. 6) or slightly roughened, in *D. cordifolia* definitely sculptured, exospore and without a perispore, or rarely with a whitish, rugulose (PL. 6B, FIG. 5) or brown, rugose perispore (PL. 8B, FIG. 2).

The important characters of the genus are the dark, sclerotic stipe, pedate blades, continuous margin-indusium, continuous marginal soral lines, long-stalked sporangia and continuous vascular commissure. Certain species lack one or two of these characters but, with the possible exception of *D. concolor*, are naturally placed in *Doryopteris* by their other characters.

KEY TO THE SPECIES AND VARIETIES

- a. Venation free, single areolae present by rare exception (PL. 2A, FIG. 2) . . . b.
- b. Stipe channeled, sulcate or wing-angled on the upper side, at least toward the top (PL. 7A, FIG. 9; PL. 7B, FIG. 2) . . . c.
- c. Blade deeply pinnatifid, or if pinnate, the bases of the pinnae decurrent and forming wings along the rachis (PL. 7B, FIG. 6) . . . d.
- d. Sori contiguous at maturity, covered by a more or less continuous indusium . . . 22a. *D. concolor* var. *typica*, p. 54
- d. Sori discrete at maturity, covered by an indusial flap at the sinus (PL. 7B, FIG. 7) . . . 22b. *D. concolor* var. *Kirkii*, p. 56
- c. Blade pinnate, at least the lower pinnae not decurrent and not forming wings along the rachis (PL. 7A, FIG. 2) . . . 24. *D. Kitchingii*, p. 59
- b. Stipe terete or subterete . . . e.
- e. Fertile blade usually with numerous ultimate segments, the pinnae and primary segments surcurrent and, except the basal pair, also decurrent, the bases forming wings along the rachis that are broad at the top and bottom and narrowed in the middle (PL. 1B, FIG. 4; PL. 1D, FIG. 2) . . . f.
- f. Fertile blade highly divided with very numerous, small, deltoid to oblong ultimate segments, the inner lower segments on the basal pinnae or primary segments very deeply lobed (PL. 1D, FIG. 2) . . . 2. *D. itatiaiensis*, p. 17
- f. Fertile blade less divided, with several to numerous, mostly narrowly oblong to linear ultimate segments, the inner lower segments on the basal pinnae or primary segments often entire, or only pinnatifid (PL. 1B, FIG. 4) . . . 3. *D. crenulans*, p. 18
- e. Fertile blade entire or with 3-5 to several ultimate segments, the primary segments, if present, adnate, or slightly surcurrent and, except the basal pair, also decurrent, the bases forming wings along the rachis that are broad at the top and narrowed at the base or have nearly parallel sides (PL. 2A, FIG. 7; PL. 2C, FIG. 4) . . . g.
- g. Ultimate segments coarsely and remotely crenate (PL. 1C, FIGS. 9, 10) . . . 1. *D. triphylla*, p. 16
- g. Ultimate segments entire or very shallowly crenate . . . h.
- h. Fertile blade entire, oblong, not more than three times as long as broad, deeply cordate, or 3-lobed, the basal lobes reflexed (PL. 3A) . . . 12. *D. rufa*, p. 32
- h. Fertile blade usually 5- to several-lobed, if entire, narrowly oblong, eight or more times as long as broad, shallowly cordate, if 3-lobed, the basal lobes strongly ascending (PL. 2C, FIG. 1) . . . i.

- i. Stipe with one terete, U- or V-shaped vascular bundle at the base. . . . j.
 - j. Sporangia short-stalked; sori usually broken by the sinuses; fertile blade 1-5 cm. long. . . 4. *D. paradoxa*, p. 21
 - j. Sporangia long-stalked; sori continuous around the sinuses; fertile blade 5-10 cm. long
 - 11. *D. quinquelobata*, p. 30
- i. Stipe with two oval vascular bundles at the base. . . . k.¹
 - k. Stipe densely verrucose, rarely sparsely so. . . . l.
 - l. Stipe verrucose; sterile blades, excepting extremely small ones, with 5 or more lobes or ultimate segments, the basal primary segments not strongly ascending. . . . 5. *D. tijucana*, p. 23
 - l. Stipe usually verrucose with acute processes; sterile blades entire, or deeply 3-lobed and the lateral lobes strongly ascending (PL. 2C, FIGS. 6, 7). . . . 6. *D. subsimplex*, p. 24
 - k. Stipe smooth or slightly and irregularly roughened. . . . m.
 - m. Sporangia short-stalked; sori usually broken by the sinuses; fertile blade 1-5, rarely 7 cm. long. . . . 4. *D. paradoxa*, p. 21
 - m. Sporangia long-stalked; sori continuous around the sinuses; fertile blade rarely 5, usually 10-21 cm. long. . . . n.
 - n. Sterile blade coriaceous, the ultimate segments usually shallowly and remotely crenate or crenate, broadly rounded (PL. 2A, FIGS. 1, 5). . . . 7. *D. lomariacea*, p. 26
 - n. Sterile blade thin, the ultimate segments entire, acute or acuminate (PL. 2D, FIGS. 3, 5). . . . 8. *D. acutiloba*, p. 27
- a. Venation completely areolate, or rarely with areolae only along the midnerves of the segments (PL. 3B, FIG. 7; PL. 6C, FIGS. 3, 5; PL. 7C, FIG. 12). . . . o.
 - o. Hydathodes present on the upper surface of the margin of the sterile blade. . . . p.
 - p. Margin of the sterile blade with a broad red-brown or black sclerotic border. . . . 26. *D. cordifolia*, p. 62
 - p. Margin of the sterile blade with a whitish or brown cartilaginous border. . . . q.
 - q. Stipe wing-angled (PL. 7C, FIG. 8); base of rachis wing-angled or channeled on the upper side. . . . r.
 - r. Fertile blade pinnate-pinnatifid to bipinnate-pinnatifid, the basal pinnae usually equally lobed on the upper and lower sides, the ultimate segments usually linear (PL. 7C, FIG. 1). . . 23a. *D. decora* var. *typica*, p. 57
 - r. Fertile blade deeply bi- to quadripinnatifid, not pinnate, the basal primary segments much more strongly lobed on the lower side than on the upper, the ultimate segments deltoid to oblong-lanceolate (PL. 7C, FIG. 10). . . . 23b. *D. decora* var. *decipiens*, p. 58
 - q. Stipe terete to rarely wing-angled on the upper side; base of rachis flat or rounded on the upper side. . . . s.

¹ 9. *D. Rosenstockii*, PL. 3D, p. 28, belongs under this heading but having seen no specimens, I cannot key it out further.

- s. Vein-ends in the sterile blade mostly joined or about half free. 21. *D. rediviva*, p. 51
- s. Vein-ends in the sterile blade all, or nearly all, free (PL. 6C, FIG. 3) t.
- t. Sterile blade entire, oblong-lanceolate to broadly lanceolate, sagittate or cordate, the basal lobes quite short (PL. 4A, FIG. 2; PL. 8B, FIG. 1) u.
- u. Rhizome relatively short, compact; fertile blade usually the same as the sterile, rarely 5-lobed (PL. 4A, FIGS. 5, 6) 18. *D. sagittifolia*, p. 47
- u. Rhizome long, extensively creeping; fertile blade with 5 or more lobes (PL. 8B, FIGS. 5, 7, 11) 25. *D. ludens*, p. 60
- t. Sterile blade usually with three or more lobes, very rarely entire, orbicular and cordate or ovate-lanceolate and sagittate, the basal lobes long (PL. 6C, FIG. 8) v.
- v. Sterile tips of the fertile segments and tips of the sterile segments crenate or crenulate with ascending teeth w.
- w. Fertile blade with 5 lobes, the lateral ones at right angles to the terminal lobe and shorter than it, the basal ones reflexed and shorter than the lateral lobes (PL. 6A, FIG. 4) 17. $\times$ *D. hybrida*, p. 46
- w. Fertile blade usually with several lobes, rarely with 5 lobes, the lateral ones ascending and each with a lobe on the lower side, all of the lobes nearly of the same length (PL. 6C, FIGS. 4, 6, 7) 16. *D. nobilis*, p. 43
- v. Sterile tips of the fertile segments and tips of the sterile segments entire, or crenate or crenulate with spreading teeth x.
- x. Fertile and sterile blades with partially areolate venation, areolae few to many, mostly along the midnerves (PL. 4C, FIGS. 4, 7; PL. 4D, FIG. 2) y.
- y. Ultimate segments rounded or acute; blade pentagonal; free veins not especially long nor crowded (PL. 4C, FIG. 6) 13. *D. Lorentzii*, p. 34
- y. Ultimate segments apiculate; blade diamond-shaped; free veins long and crowded (PL. 4D, FIGS. 1, 3) 14. *D. Juergensii*, p. 35
- x. Fertile and sterile blades with completely areolate venation z.
- z. Proliferous buds present at the base of the blade (PL. 6B, FIGS. 3, 6) 15c. *D. pedata* var. *palmata*, p. 41
- z. Proliferous buds not present at the base of the blade aa.
- aa. Stipe usually wing-angled, sometimes sulcate on the upper side (PL. 5A, FIG. 9) 15a. *D. pedata* var. *typica*, p. 37
- aa. Stipe terete, subterete or plane on the upper side (PL. 5B, FIG. 3) bb.

- bb. Rhizome relatively short, compact.
 15b. *D. pedata* var. *multipartita*, p. 38
- bb. Rhizome long, extensively creeping
 25. *D. ludens*, p. 60
- o. Hydathodes not present on the upper surface of the margin of the sterile blade. . . . cc.
- cc. Margin of the sterile blade with a black sclerotic border (PL. 3B, FIG. 7) 10. *D. ornithopus*, p. 29
- cc. Margin of the sterile blade with a whitish or brown cartilaginous border. . . . dd.
- dd. Stipe black, terete. 20. *D. varians*, p. 50
- dd. Stipe castaneous or dark brown on the lower half, wing-angled on the upper side, at least on the upper fourth (PL. 4B, FIG. 3) 19. *D. collina*, p. 48

SECTION I.

²¹⁵⁶⁸ LYTONEURON Kl. Linnaea **20**: 343. 1847.

²¹⁵⁷⁰ *Pellaea* section *Doryopteridastrum* Fée, Crypt. Vasc. Brésil **1**: 42. 1869, nomen nudum; ex Prantl, Engl. Bot. Jahrb. **3**: 418, - ²¹⁵⁷¹ 1882.

Scales of the frond-buds usually *very long and narrow* (PL. 3B, FIG. 2) (long-lanceolate and attenuate in *D. itatiaiensis* and phases of *D. subsimplex* and *D. paradoxa*), entirely hyaline or often with a red-brown to blackish sclerotic central band and narrow, usually tawny, *hyaline margins*, occasionally entirely sclerotic or hyaline, entire or rather coarsely and remotely toothed; *the cells of the hyaline parts relatively long* (PL. 3B, FIG. 3) *mostly three or more times*, at least twice, *as long as broad* (*D. triphylla* is intermediate in scale-characters with this section and *Eudoryopteris*); *stipe naked or sometimes with scales* at the base and sometimes with *fibrils*, especially at the top and base, *not pubescent* (except in *D. Rosenstockii* and a phase of *D. subsimplex*), terete or subterete *with two nearly oval vascular bundles* at the base, excepting very small plants, or with one terete, U- or V-shaped vascular bundle at the base in *D. triphylla*, *D. quinquelobata* and a phase of *D. paradoxa*; *fertile and sterile blades* without proliferous buds, *with free venation*, or in *D. ornithopus*, with areolate venation; vein-ends nearly all free at the margin of the sterile blade, except in *D. ornithopus*; hydathodes present on the upper surface of the margin of the sterile blade, except in *D. ornithopus* and a phase of *D. triphylla*; spores usually without a perispore, the exospore smooth or minutely roughened, in *D. acutiloba* with a whitish rugulose perispore (as in PL. 6B, FIG. 5).

The species of this section form a natural group, with the exception of *D. triphylla* and possibly *D. ornithopus*. *D. triphylla* is intermediate in characters of the scales between sections *Lytoneuron* and *Eudoryopteris*. *D. ornithopus*, a very distinct

species, is placed here because of the two vascular bundles and the scales. The areolate venation is probably a derived character rather than indicating a relation to species of section *Eudoryopteris*. The section contrasts with *Eudoryopteris* in having many of the species based on fewer and less important characters. That is, in general the specific lines are closer.

1. DORYOPTERIS TRIPHYLLA (Lam.) Christ, Bull. Boiss. s. 2, 2: 546. 1902. PLATE 1C; MAP 1.

Adiantum triphyllum Lam. Encycl. 1: 41. 1783. TYPE: Buenos Aires, Argentina, Commerson, Paris, not seen, photo G, seen. *Cassebeera triphylla* (Lam.) Kaulf. Enum. Fil. 216. 1824. *Pteris triphylla* (Lam.) Mett. Fil. Hort. Bot. Lips. 55. 1856, not Baker 1870. *Pellaea triphylla* (Lam.) Prantl, Engl. Bot. Jahrb. 3: 418. 1882. *Bakeropteris triphylla* (Lam.) O. Ktze. Rev. Gen. 2: 808. 1891. *Cassebeera pedatifida* Christ in Schwacke, Pl. Nov. Mineiras 2: 25. 1900, ex char.; reference taken from C. Chr. Ind. Fil., description from Christ, Bull. Boiss. s. 2, 2: 546. 1902. TYPE and PARATYPE: Capivare, Brazil, Ule 2335, not seen; Ferromecco, Brazil, Kunert 29, not seen. *Doryopteris pedatifida* (Christ) Christ, Bull. Boiss. s. 2, 2: 546. 1902. *Doryopteris triphylla* var. *genuina* Hassl. Trab. Inst. Bot. Farm. Buenos Aires, no. 45: 54. 1928. *Doryopteris triphylla* var. *pedatifida* (Christ) Hassl. Trab. Inst. Bot. Farm. Buenos Aires, no. 45: 54. 1928.

Rhizome short, slender to moderately stout, compact to long and creeping: scales of the frond-buds and stipe ovate-lanceolate to long-lanceolate, acuminate or attenuate, with usually narrow, sometimes broad, light brown, hyaline margins, entire; the cells of the hyaline parts usually not much longer than broad, sometimes relatively long, at least twice as long as broad: stipe dark castaneous to dark red-brown, rarely atropurpureous, glabrous, smooth or sometimes slightly and irregularly roughened, with one terete, U- or V-shaped vascular bundle at the base: fertile and sterile blades similar to slightly dimorphic, without proliferous buds, coriaceous: sterile frond 2.5–8 cm. long; blade 0.5–3.5 cm. long, deeply pinnatifid to once pinnate, deltoid, hastate, with 3 ultimate segments, all of about the same length, the basal segments usually at right angles to the terminal one, or rarely pentagonal, with 5 ultimate segments, the lateral ones lobed on the lower side: ultimate segments ovate to ovate-lanceolate, acute or sometimes subapiculate, moderately deeply and remotely crenate or bicrenate; margin with a narrow whitish or brownish cartilaginous border; sinuses black and sclerotic; hydathodes present or absent on the upper surface: fertile frond 4–27 cm. long; blade 1–9 cm. long, deeply pinnatifid to tripinnatifid or pinnate-pinnatifid, deltoid

to pentagonal, with 3–9 ultimate segments: ultimate segments ovate to linear, rounded, acute or sometimes subapiculate, moderately deeply and remotely crenate or bicrenate; sinuses black and sclerotic; sterile tips short to moderately long, entire or crenate, with a whitish or brown cartilaginous border: soral lines broken by the sinuses.

Southern Brazil to Buenos Aires and Tucumán, Argentina.

Representative specimens: BRAZIL.—SANTA CATHARINA: Lages, 1921, *Spannagel* (NY); Lages, July, 1905, *Spannagel* (US); Lages, February, 1905, *Spannagel* 56 (NY). RIO GRANDE DO SUL: Santa Cruz, 1906, *Juergens* 122 (NY); Santa Cruz, 1906, *Juergens* (NY, US); Rio Alegre near Neu-Wurttemberg, August 12, 1904, *Bornmüller* 127 (G). URUGUAY: Colón-La Paz, Dept. Montevideo, May 25, 1925, *Herter* 15a (G, NY); Flores, April, 1937, *Rosengurtt* B 1527 (G, US); Maldonado, Cerro Pan de Azucar, May 18, 1937, *Rosengurtt* B 1844 (G, US); Conchillas, December 20, 1921, *Castellanos* 671 (G); Pan de Azucar, February 25, 1907, *Herter* 2077 (NY); Montevideo, April, 1836, *Gaudichaud* (NY); Montevideo, June, 1859, *Gilbert* 609 (US). PARAGUAY: Serra Pelada, July, 1931, *Jorgensen* 4609 (NY, US); Cerros de Paraguay, Cordillera Centralis, December, 1900, *Hassler* 6570 (G); 1885–1895, *Hassler* 1007 (NY). ARGENTINA.—BUENOS AIRES: Cerro la Peregrina, 20 km. north of Mar del Plata on road to Balcarce, December 11, 1938, *Eyerdam, Beetle & Grondona* 23649 (G); Tandil, November, 1892, *Kuntze* (NY); Loberia, February, 1918, *Alboff & Scala* 1 (G); Tandil, November, 1928, *Burkart* 2803 (G); Sierra Baja, Cerro Redondo, November 11, 1924, *Castellanos* (G); Sierras Balcarce, Cino Cerros, April, 1925, *Castellanos* (G). TUCUMÁN: Barrancas Coloradas, Dept. Capital, May, 1920, *Venturi* 807 (G, US).

This species is readily distinguished from the others of the section by the typically trifoliate blade with the segments rather deeply and remotely crenate and the black sclerotic sinuses. Also the scales are distinctive, being of a type intermediate between sections *Lytoneuron* and *Eudoryopteris*.

2. DORYOPTERIS ITATIAIENSIS (Fée) Christ, Bull. Boiss. s. 2, 2: 549. 1902. PLATE 1D.

Pellaea itatiaensis Fée, Crypt. Vasc. Brésil 2: 26, t. 88, fig. 1. 1872–73. TYPE: Itatiaia, Rio de Janeiro, Brazil, *Glaziou* 5348, probably at Rio de Janeiro, not seen, fragment "ex Fée" NY, seen. ISOTYPE: Paris, not seen, photo G, seen. *Pellaea lomariacea* (Kl.) Hook. var. *itatieiensis* (Fée) Prantl, Engl. Bot. Jahrb. 3: 425. 1882. *Pteris itatieiensis* (Fée) Syzsz. in Beck, Itin. Princ. Coburgi 2: 119. 1888. *Doryopteris lomariacea* Kl. var. *itatieiensis* (Fée) Luetzelb. Est. Bot. Nordéste 3: 248. 1923.

Rhizome moderately long, slender to moderately stout, creeping: *scales* of the frond-buds and stipe *long-lanceolate, attenuate*: *stipe* red-brown to atropurpureous, usually *densely and minutely verrucose*, sometimes only sparsely so, rarely smooth: *fertile and sterile blades slightly dimorphic*, moderately coriaceous: *sterile* frond 3.5–23 cm. long; *blade* 1–6.5 cm. long, deeply bi- or usually tripinnatifid, or sometimes pinnate-bipinnatifid, pentagonal, *with numerous ultimate segments*: ultimate segments oval to oblong, broadly rounded, usually entire, sometimes remotely crenate, the crenations rounded; margin with a whitish or brown cartilaginous border: *fertile* frond 10–32 cm. long; *blade* 3–6.5 cm. long, deeply tripinnatifid or sometimes pinnate-bipinnatifid, *with numerous ultimate segments*: *pinnae and primary segments surcurrent and*, except the basal pair, *also decurrent*, the bases of the primary segments *forming wings along the rachis that are broad at the top and bottom and narrowed in the middle*: ultimate segments deltoid to oblong, usually rounded, sometimes subacute, entire, or often some remotely crenate with rounded crenations, and often crenulate: *soral lines broken by the sinuses*.

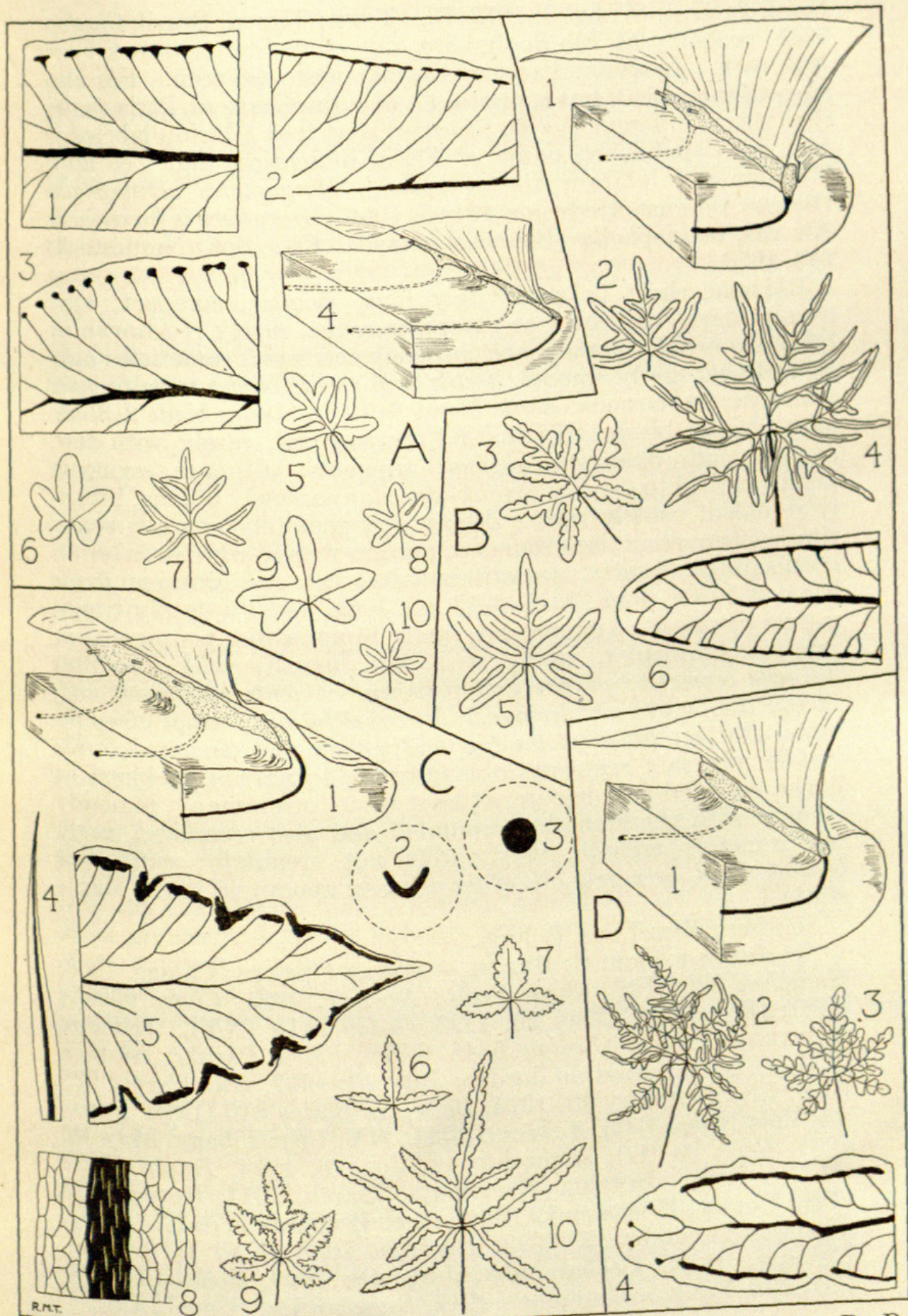
Mt. Itatiaya, Rio de Janeiro, Brazil.

Specimens examined: BRAZIL, RIO DE JANEIRO: *Glaziov* "5345" (NY); Mt. Itatiaya, January 8, 1929, *L. B. Smith* 1758 (G, NY, US); Serra do Itatiaya, May 5, 1902, *Dusén* 1135 (US); Itatiaya, June, 1903, *Brade* 10124 (NY); Vicinity of Itatiaya, July 26–30, 1915, *Rose & Russell* 20503 (US).

This species differs from *D. crenulans* in the slightly, rather than quite, dimorphic fertile and sterile blades and the more highly divided fertile blade with deltoid to oblong, rather than mostly narrowly oblong to linear ultimate segments. Also the scales are long-lanceolate and attenuate rather than very long and narrow. The two species differ from the others of the section by the highly divided blades with numerous ultimate segments and the peculiar wings on the rachis formed by the surcurrent and decurrent bases of the primary segments.

3. DORYOPTERIS CRENULANS (Fée) Christ in Schwacke, Pl. Nov. Mineiras 2: 26. 1900; reference taken from C. Chr. Ind. Fil.; also in Bull. Boiss. s. 2, 2: 549. 1902. PLATE 1B; MAP 6.

Pteris lomariacea (Kl.) Hook. & Baker var. *actinophylla* Baker in Martius, Fl. Brasil. 1²: 406, t. 60. 1870. TYPE and PARATYPE: "Prov. S. Paul", Brazil, *Burchell* 4731–5, Kew, not seen, G, seen; "Caldas prov. Minarum", Brazil, *Lindberg* 600, Kew, not seen, photo G, seen. *Pteris actinophylla* Kze. ex Baker in Martius, Fl. Brasil. 1²: 406. 1870, in synonym. *Pellaea crenulans* Fée, Crypt. Vasc.



I. A, *DORYOPTERIS PARADOXA*. B, *D. CRENULANS*. C, *D. TRIPHYLLA*. D, *D. ITATIAIENSIS*.

Brésil 2: 27, t. 87, fig. 3. 1872-73. TYPE: Tijuca, Brazil, Glaziou 5345, probably at Rio de Janeiro, not seen, fragment "ex Fée" NY, seen. ISOTYPE: Paris, not seen, photo G, seen. Fée also cites Glaziou 5343, but a photo, G, of a duplicate at Paris shows that this is different (= *D. tijuca*) and that Glaziou labeled it with an unpublished name of Fée's, indicating that Fée later distinguished it from *D. crenulans*. *Doryopteris actinophylla* (Baker) Rosenst. Hedwigia 46: 85. 1906. *Doryopteris lomariacea* Kl. var. *actinophylla* (Baker) Luetzelb. Est. Bot. Nordeste 3: 248. 1923.

Rhizome short to moderately long, slender, compact: *stipe* usually dark red-brown or atropurpureous, rarely red-brown or blackish, usually *densely and minutely verrucose*, sometimes only sparsely so, rarely smooth: *fertile and sterile blades* usually *quite dimorphic*, coriaceous: *sterile* frond 3-35 cm. long; *blade* 2-8 cm. long, deeply bi- or tripinnatifid, pentagonal, rarely with few, usually *with numerous ultimate segments*: ultimate segments hemispherical to usually oblong-ovate or narrowly oblong, broadly rounded, usually rather deeply and remotely crenate, sometimes entire; crenations rounded; margin with a whitish or brown cartilaginous border, sometimes black at the sinuses: *fertile* frond 9-50 cm. long; *blade* 2-13 cm. long, usually deeply tripinnatifid or pinnate-bipinnatifid, rarely bipinnatifid, pentagonal or rarely suborbicular, rarely with few, usually *with numerous ultimate segments*: *pinnae and primary segments* *surcurrent* and, except the basal pair, *decurrent*, the bases forming wings along the rachis that are broad at the top and bottom and narrowed in the middle: ultimate segments oblong-ovate to narrowly oblong or linear, rounded or subacute, at least some, often many, remotely crenate with the crenations rounded and also crenulate, rarely not remotely crenate, very rarely not crenulate: *soral lines* *broken by all, or nearly all, of the sinuses*: sporangia rarely short-stalked.

Southern Brazil and Bolivia.

Specimens examined: BRAZIL.—MINAS GERAES: Caldas, 1868, Henschen 329 (US); Ouro Preto, April 7, 1925, Chase 9369½ (US); Ouro Preto, May 28, 1923, Godoy 8419 (NY). (RIO DE JANEIRO): Tijuca, Glaziou 5345 (NY). S~O PAULO: Burchell 4731-5 (G); Campos do Jordão, July 23, 1927, Harshberger 928 (NY, US), February 12, 1924, Bailey & Bailey 810 (US). PARANÁ: Villa Nova, 1905, Annies (Copel., NY, US); Tibagy, May 10, 1934, Reiss 23 (G); Jaguarihyva, June 6, 1914, Dusén 15099 (G, NY, US). BOLIVIA: Samaipata, March, 1911, Herzog 1872 (US); Cortey, February 12, 1902, R. S. Williams 1176 (NY, US); Tipuani, December 2, 1922, Buchtien 7038 (NY, US); Prov. Chapare, Dept. Cochabamba, June 18, 1929, Steinbach 9856 (G); Nor-Yungas, December, 1917, Buchtien 799 (Copel., US).

This species is closely related to the preceding, *D. itatiaiensis*, and the differences are discussed in its treatment. It is also closely related to the next species, *D. paradoxa*. It differs from the latter in being larger; the fertile blade is usually considerably taller than the sterile and more divided, with relatively numerous ultimate segments rather than similar in size and division to the sterile and with relatively few segments; the wings along the rachis are broad at the top and bottom and narrowed in the middle rather than broad at the top and narrowed at the base; the stipe is usually densely and minutely verrucose rather than smooth; and the sporangia are long-stalked rather than short-stalked.

However, some specimens of *D. crenulans* show some transitions to *D. paradoxa*. *Annies*, Paraná, Brazil, has many of the sporangia with short stalks. *Annies* (Pl. 1B, fig. 5), *Steinbach* 9856, Bolivia, and *Williams* 1176, Bolivia, all have relatively small fertile blades that are similar to the sterile and have relatively few segments. Also a single fertile blade in *Williams* 1176 (NY), does not have the segments surcurrent. However, I am not considering these variations as critical because they are very rare and especially because all of them, with the exception of *Annies*, occur in Bolivia, far from the range of *D. paradoxa* and certainly do not represent true intermediates.

4. DORYOPTERIS PARADOXA (Fée) Christ, Bull. Boiss. s. 2, 2: 546. 1902. PLATE 1A.

Cassebeera paradoxa Fée, Mém. Fam. Foug. 7: 30, t. 20, fig. 2. 1857, as *Cassebeeria*. TYPE: Organ Mountains, Brazil, *Gardner* 5930, probably at Rio de Janeiro, not seen. ISOTYPE: NY, seen; Kew, not seen, photo G, seen. *Pellaea lomariacea* (Kl.) Hook. var. *columbina* Hook. Sp. Fil. 2: 133, t. 112 A. 1858. TYPE: Organ Mountains, Brazil, *Gardner* 5930, Kew, not seen, photo G, seen. *Pellaea columbina* (Hook.) Hook. & Baker, Syn. Fil. 146. 1867. *Pellaea columbina* var. *vestita* Hook. & Baker, Syn. Fil. 146. 1867. *Pellaea microphylla* Fée, Crypt. Vasc. Brésil 1: 43, t. 4, fig. 2. 1869, not Mett. ex Kuhn. TYPE and PARATYPE: Rio de Janeiro, Brazil, *Glaziov* 3158, 3159, probably at Rio de Janeiro, not seen. ISOTYPE: *Glaziov* 3158, Kew, not seen, photo G, seen. *Pellaea paradoxa* (Fée) Fée, Crypt. Vasc. Brésil 1: 43. 1869, not (R. Br.) Hook. Sp. Fil. 2: 135. 1858. *Pellaea Glaziovii* Baker var. *minor* Baker in Martius, Fl. Brasil. 1²: 595. 1870. TYPE and PARATYPE: Rio de Janeiro, Brazil, *Glaziov* 3158, 3159, Kew, not

seen, photo *Glaziou* 3158, G, seen. *Cheilanthes monticola* Mart. ex Prantl, Engl. Bot. Jahrb. **3**: 422. 1882, in synonym., not Gardn. ex Hook. 1842, acc. to Prantl. *Pellaea vestita* (Hook. & Baker) Prantl, Engl. Bot. Jahrb. **3**: 418. 1882. *Allosorus microphyllus* (Fée) O. Ktze. Rev. Gen. **2**: 806. 1891. *Pteris paradoxa* (Fée) Kuhn ex Schenck, Hedwigia **35**: 160. 1896. *Doryopteris columbina* (Hook.) Diels in Engl. & Prantl, Nat. Pfl. **14**: 269. 1899. *Doryopteris vestita* (Hook. & Baker) Diels in Engl. & Prantl, Nat. Pfl. **14**: 269. 1899. *Cassebeera microphylla* (Fée) Christ in Schwacke, Pl. Nov. Mineiras **2**: 25. 1900, reference from C. Chr. Ind. Fil. *Doryopteris microphylla* (Fée) Christ, Bull. Boiss. s. 2, **2**: 546. 1902. *Doryopteris Feei* Brade, Arch. Inst. Biol. Veg. Rio Janeiro **1**: 226, fig. 4 & t. 5. 1935. TYPE and PARATYPE: Serra do Itatiaia, Brazil, *Toledo & Brade* 6496; *Kuhlman* s. n., Rio de Janeiro, not seen. *Doryopteris Feei* f. *maior* Brade, Arch. Inst. Biol. Veg. Rio Janeiro **1**: 226. 1935. TYPE: Serra do Itatiaia, Brazil, *Campos-Porto* 184, Rio de Janeiro, not seen.

Rhizome short to moderately long, small, compact: *scales occasionally long-lanceolate, attenuate*: *stipe* red-brown to atropurpureous, *smooth*, with two oval, or one terete, U- or V-shaped vascular bundle at the base: *fertile and sterile blades usually similar*, sometimes moderately dimorphic, thin to moderately coriaceous: *sterile frond* 2–14 cm. long; *blade* 0.5–4 cm. long, obscurely 3-lobed and suborbicular to bipinnatifid, pentagonal, *with usually 5–7*, rarely numerous *ultimate segments*: *ultimate segments* suborbicular to oblong, rounded, entire or finely crenulate; margin with a broad and crisped or narrow, whitish or brown cartilaginous border: *fertile frond* 3–32 cm. long; *blade* 1–7 cm. long, deeply bipinnatifid or tripinnatifid, rarely pinnate-bipinnatifid, pentagonal to suborbicular, *with 5 to several*, rarely numerous *ultimate segments*: *pinnae and primary segments adnate or very slightly surcurrent and*, except the basal pair, *decurrent, the bases forming wings along the rachis that are broad at the top and narrowed at the base*: *ultimate segments* deltoid to narrowly oblong, rounded, entire or usually finely crenulate: *soral lines usually broken by the sinuses*: *sporangia short-stalked*: receptacle a continuous vascular commissure connecting the fertile vein-ends or with transitions to discrete, fan-shaped receptacles terminating the vein-ends.

Minas Geraes and Rio de Janeiro, Brazil.

Specimens examined: BRAZIL.—*Glaziou* 4392 (NY); *Glaziou*, "Pellaea microphylla Fée" (NY). MINAS GERAES: Serra do Caparaó, April 30–May 4, 1925, *Chase* 9705 (US); Ouro Preto, 1907, *Damazio* (NY, US). RIO DE JANEIRO: Theresopolis, 1929, *Brade* 9935 (NY); November, 1910, *Luetzelburg* 18916 (NY); Rio de Janeiro, *Gardner* 5930 (as to small plant) (NY); Serra dos

Orgãos, November, 1910, *Luetzelburg* 6643 (Copel.); Itatiaya, March, 1937, *Brade* 15513 (G); Itatiaya, June, 1930, *Brade* 10093 (NY); Vicinity of Itatiaya, July 26-30, 1915, *Rose & Russell* 20532 (G, US).

This species is closely related to *D. crenulans* and the differences are discussed under that species. The smooth stipe, small and similar fertile and sterile blades, soral lines broken by the sinuses and short-stalked sporangia separate it from the other species in the section. The receptacle is a nearly continuous vascular commissure (*Chase* 9705) or transitional (*Brade* 10093) to separate receptacles terminating the vein-ends (*Brade* 15513).

5. DORYOPTERIS TIJUCANA *Brade & Rosenst. Bol. Mus. Nac. Rio Janeiro* 7: 144, t. 9. 1931. LECTOTYPE: Rio de Janeiro, Brazil, *Brade* 8598, at Rio de Janeiro, not seen; ISOLECTOTYPE: NY, seen. PARATYPES: Rio de Janeiro, Brazil, *Brade* 8537, 8563, at Rio de Janeiro, not seen; ISOPARATYPE: *Brade* 8563, NY, seen. PLATE 2B.

Rhizome short, slender to moderately stout, compact: *stipe* atropurpureous to black, *densely and minutely verrucose*: fertile and sterile blades moderately dimorphic, coriaceous: *sterile* frond 2-28 cm. long; *blade* 1-15 cm. long, entire, orbicular and cordate, or deltoid and 3-lobed in small blades to deeply pinnatifid or usually bi- or tripinnatifid, pentagonal, with 5 to numerous ultimate segments, the *basal primary segments nearly at right angles to the rachis*: ultimate segments broadly ovate to oblong or oblong-lanceolate, rounded or rarely acute, sometimes entire, usually shallowly and remotely crenate or crenate; the crenations usually flat; margin with a whitish or brown cartilaginous border: *fertile* frond 9-66 cm. long; *blade* 3.5-17 cm. long, deeply bi- or usually tripinnatifid, pentagonal to suborbicular, with several to usually numerous ultimate segments: *primary segments only slightly surcurrent and, except the basal pair, decurrent, the bases forming wings along the rachis that are usually narrowed at the base or sometimes that have nearly parallel sides*: ultimate segments oblong-ovate to long-lanceolate, rarely linear, rounded or acute, entire: *soral lines continuous around the sinuses, or broken by the sinuses of the primary segments*.

Mts. Tijuca and Corcovado, Rio de Janeiro, Brazil.

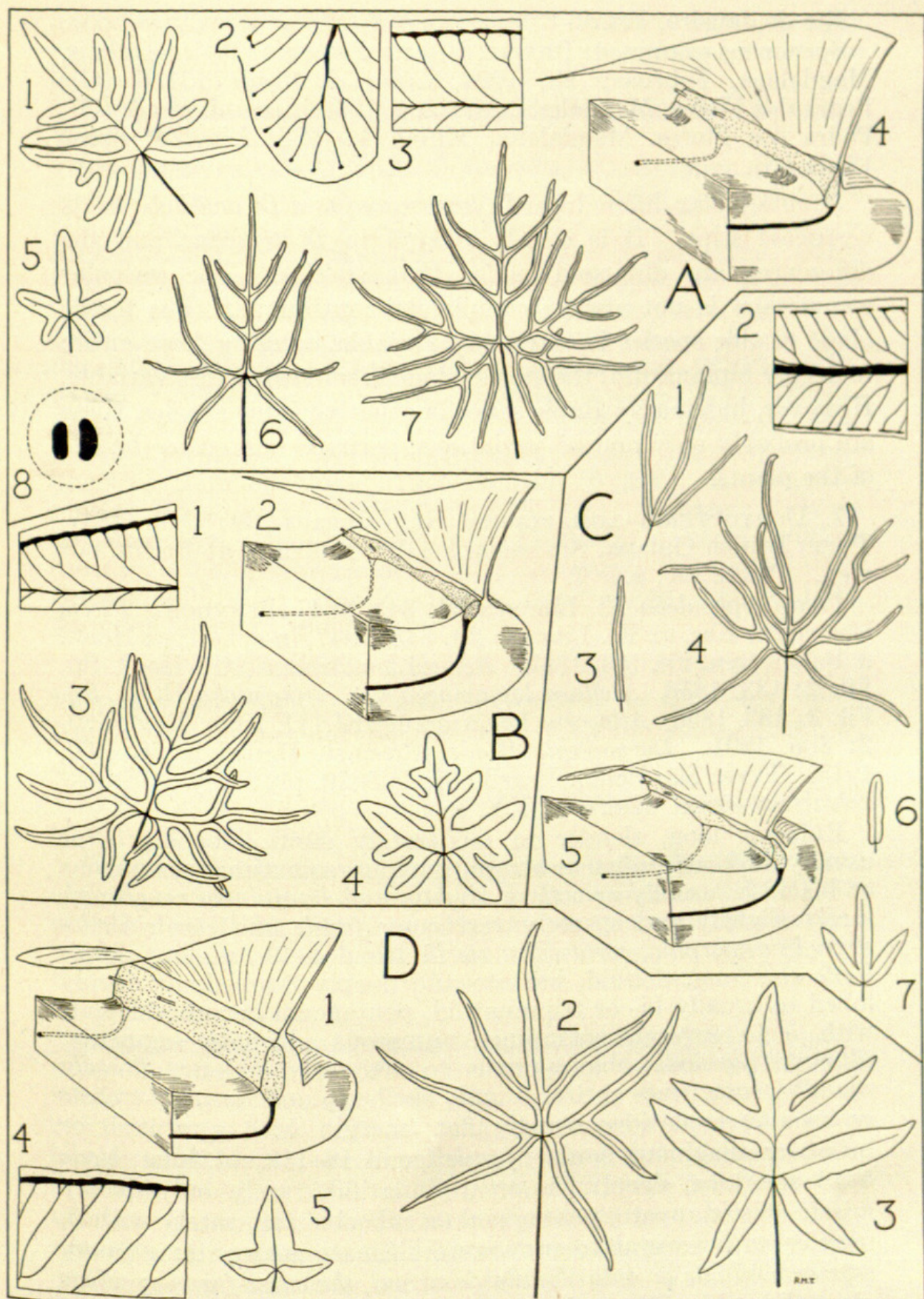
Specimens examined: BRAZIL, RIO DE JANEIRO: Tijuca, October, 1928, *Brade* 8598 (NY), June 14, 1933, *Brade* 12550 (G), November, 1928, *Brade* 8563 (NY); Corcovado, December, 1910, *Luetzelburg* 18927 (Copel., NY), November 17, 1928, *L. B. Smith* 1251 (G), March 6, 1924, *Bailey & Bailey* 752 (US), August 1887, *Ule* 257 (US), July 18, 1927, *Harshberger* 891 (US), July, 1915, *Rose & Russell* 21250 (US).

This species and *D. subsimplex* are apparently closely related and the densely and minutely verrucose stipe sets them apart from *D. lomariacea* and *D. acutiloba*. It differs from *D. subsimplex* in the construction of the sterile blade—this is more highly divided in *D. tijucana* and the basal primary segments are nearly at right angles to the rachis rather than strongly ascending. Also the stipe is truly verrucose rather than verrucose with acute processes.

6. *DORYOPTERIS SUBSIMPLEX* (Fée) Diels in Engl. & Prantl, Nat. Pfl. 14: 269. 1899. PLATE 2C.

Pellaea subsimplex Fée, Crypt. Vasc. Brésil 1: 44, t. 4, fig. 3. 1869. TYPE: Rio de Janeiro, Brazil, *Glaziou* 3160, probably at Rio de Janeiro, not seen. ISOTYPE: Paris, not seen, photo G, seen. *Pteris longula* Mett. ex Kuhn, Linnaea 36: 88. 1869. Organ Mountains, Brazil, no specimen cited. *Pteris triphylla* Baker in Martius, Fl. Brasil. 12: 596. 1870, not (Lam.) Mett. 1856. TYPE: Rio de Janeiro, Brazil, *Glaziou* 3160, probably at Kew, not seen. ISOTYPE: Paris, not seen, photo G, seen. *Doryopteris subsimplex* var. *magdalenensis* Brade, Arch. Inst. Biol. Veg. Rio Janeiro 2: 3. 1935. TYPE: Magdalena, Rio de Janeiro, Brazil, *Lima & Brade* 13130, at Rio de Janeiro, not seen. ISOTYPE: G, seen.

Rhizome short, slender to moderately stout, compact: scales occasionally long-lanceolate, attenuate: stipe dark red-brown to black, usually densely and minutely verrucose with acute processes, occasionally sparsely so, rarely spinulose or pubescent with short brown hairs: fertile and sterile blades similar to moderately dimorphic, coriaceous: sterile frond 3–27 cm. long; blade 1–7 cm. long, entire, strap-shaped or rarely linear and subcordate, or deeply 3-lobed, deltoid and hastate in small blades, usually diamond-shaped, the lateral lobes strongly ascending, a little more than half as long as the central lobe: ultimate segments broadly ovate to usually strap-shaped, rounded or usually rather abruptly acute, entire or shallowly and remotely crenate; margin with a whitish or brown cartilaginous border: fertile frond 15–38 cm. long; blade 5–11 cm. long, entire, linear and subcordate, or deeply (2–) 3–5-lobed, obovate or ovate, the lateral segments ascending, or deeply bipinnatifid, suborbicular, with numerous ultimate segments, the basal primary segments ascending: primary segments of the highly divided blades slightly surcurrent and, except the basal pair, decurrent, the bases forming wings along the rachis that are narrowed at the base: ultimate segments narrowly oblong to usually linear, subacute, entire: soral lines continuous around the sinuses, if present, or broken by the sinuses of the lower primary segments.



II. A, *DORYOPTERIS LOMARIACEA*. B, *D. TIJUCANA*. C, *D. SUBSIMPLEX*. D, *D. ACUTILOBA*.

Rio de Janeiro, Brazil.

Specimens examined: BRAZIL, RIO DE JANEIRO: Pedra Dubois, Magdalena, February 28, 1924, *Lima & Brade* 13130 (G); Pedra dos Flores, Magdalena, March 4, 1934, *Lima & Brade* (G); Pedra dos Flores, Magdalena, March 4, 1934, *Lima & Brade* 13131 (G).

D. subsimplex differs from *D. lomariacea* and *D. acutiloba* in its verrucose stipe. It is closely related to *D. tijucana* and the differences are discussed under that species. The vascular commissure is not always completely continuous. The fertile blade of this species is extremely variable, ranging from entire to deeply bipinnatifid; the sterile blade is somewhat less variable. However, judging by ample series in other variable species, these are probably only normal variations; perhaps related to the age of the plants.

7. DORYOPTERIS LOMARIACEA Kl. *Linnaea* **20**: 343. 1847. TYPE: British Guiana, *Schomburgk* 1197, probably at Berlin, not seen. PLATE 2A; MAP 7.

Pteris septemloba Kl. *Linnaea* **20**: 343. 1847, in synonym. *Pteris lomariacea* Kze. ex Kl. *Linnaea* **20**: 343. 1847, in synonym; ex Hook. & Baker, *Syn. Fil.* 164. 1867. *Pellaea lomariacea* (Kl.) Hook. *Sp. Fil.* **2**: 133. 1858. *Pellaea lomariacea* var. *septemloba* Hook. *Sp. Fil.* **2**: 133. 1858. *Allosorus lomariaceus* (Kl.) O. Ktze. *Rev. Gen.* **2**: 806. 1891. *Doryopteris Bradei* Rosenst. *Hedwigia* **56**: 360. 1915. TYPE: São Paulo, Brazil, *Brade* 5820, probably at Stockholm, not seen. ISOTYPE: NY, seen.

Rhizome long, slender to moderately stout, creeping: *stipe* usually dark red-brown or atropurpureous, sometimes castaneous or blackish, usually *smooth* or *slightly and irregularly roughened*, rarely slightly and sparsely verrucose: *fertile and sterile blades strongly dimorphic, coriaceous*: *sterile* frond 4–49 cm. long; *blade* 3–19 cm. long, deltoid, hastate and deeply 3-lobed, or deeply lobed to usually bi- or tripinnatifid, pentagonal or suborbicular, with 5 to several, sometimes numerous ultimate segments: *ultimate segments* oblong-ovate to narrowly oblong, *broadly rounded*, sometimes entire, *usually shallowly and remotely crenate or crenate*; crenations usually flat; margin with a whitish or brown cartilaginous border: *fertile* frond 18–118 cm. long; *blade* 5–18 cm. long, deeply bi- or tripinnatifid, rarely only deeply lobed, deltoid, ovate, pentagonal or suborbicular, rarely with 5, usually with several to numerous ultimate segments: *primary segments adnate or only slightly decurrent, the bases forming wings along the rachis with nearly parallel sides*: *ultimate segments usually*

linear, rarely narrowly oblong, rounded or rarely acute, usually entire, sometimes a few crenulate: *soral lines continuous around the sinuses*.

Southern Brazil and Paraguay; also Peru and Mt. Roraima, British Guiana.

Specimens examined: BRITISH GUIANA: Mt. Roraima, October-January, 1884-5 (U. S. Nat. Herb. no. 61614), *Schomburgk* 6 (US); "Basement" of Roraima, 1895, *Jenman* (NY); BRAZIL.—MINAS GERAES: Diamantina, December 27-30, 1929, *Chase* 10376 (G), April 28, 1931, *Mexia* 5705 (Copel., G, NY, US); Caldas, *Regnell* 329 (US). SÃO PAULO: Alto da Serra, March 16, 1913, *Brade* 5820 (NY), February 12, 1929, *L. B. Smith* 1856 (G, US); Ypiranga, June, 1906, *Luederwaldt* 21315 (NY). PARANÁ: Villa Nova, February, 1904, *Annies* (US); Incena, April, 1904, *Wialewski* 76 (NY); Jaruarahyva, May 14, 1914, *Dusén* 15016 (G). SANTA CATHARINA: Lages, 1921, *Spannagel* 6c (NY); Joinville, March, 1904, *Schmalz* 76 (NY). RIO GRANDE DO SUL: Ferromecco, 1889, *Kunert* 26 (US). PARAGUAY: Sierra de Maracayú, *Hassler* 5191 (G); Fluminis Y-acá (Cordillera centralis), 1900, *Hassler* 6846 (G); Caaguazú, February, 1905, *Hassler* 9035 (G). PERU: Eneñas, Dept. Junín, July 1, 1929, *Killip & Smith* 25709 (NY, US).

D. lomariacea and *D. acutiloba* are set off in the section by the smooth or only slightly roughened stipe and the soral lines which are continuous around the sinuses. The differences from *D. acutiloba* are discussed under that species.

8. DORYOPTERIS ACUTILOBA (Prantl) Diels in Engl. & Prantl, Nat. Pfl. 1⁴: 269. 1899. PLATE 2D.

Pellaea acutiloba Prantl, Engl. Bot. Jahrb. 3: 425. 1882. TYPE and PARATYPE: Rio de Janeiro, Brazil, *Glaziov* 2471, 7262, probably at Berlin, not seen. Having seen no material of either collection I am not choosing a type. The description agrees with the specimens distributed by Rosenstock as *Pellaea acutiloba* and *Doryopteris acutiloba*.

Rhizome short to moderately long, moderately stout, compact: *stipe* dark red-brown to atropurpureous, *smooth*: *fertile and sterile blades moderately dimorphic, relatively thin*: *sterile frond* 2-50 cm. long; *blade* 1-22 cm. long, entire, orbicular and cordate in very small blades, or rather deeply 3-lobed, deltoid and hastate, or deeply lobed to bipinnatifid, pentagonal, with 5 to numerous ultimate segments: *ultimate segments* deltoid to long-lanceolate, *usually acute*, sometimes acuminate, *entire*; margin with a whitish or brown cartilaginous border: *fertile frond* 40-60 cm. long; *blade* 11-21 cm. long, deeply bi- to tripinnatifid, pentagonal to

suborbicular, with 7 to numerous ultimate segments: *primary segments adnate or*, except the basal pair, *slightly decurrent, the bases forming wings along the rachis that are slightly narrowed at the base or have nearly parallel sides: ultimate segments lanceolate to linear*, rounded to acute, entire: *soral lines continuous around the sinuses*: spores with a whitish rugulose perispore.

Southern Brazil.

Specimens examined: BRAZIL: Alto Macahé, Rio de Janeiro, Glaziou 7263 (NY); Villa Nova, Paraná, February, 1905, Annies (Copel., NY, US); Palhoya Tagnara, Santa Catharina, September, 1909, Spannagel (NY).

D. acutiloba differs from *D. lomariacea* in its relatively thin sterile blade, entire ultimate segments and the much broader segments of the fertile blade. The spores with perispore are unique in the section.

9. DORYOPTERIS ROSENSTOCKII Brade, Bol. Mus. Nac. Rio Janeiro 7: 143, t. 8. 1931. TYPE: Rio de Janeiro, Brazil, Brade 9257, at Rio de Janeiro, not seen. PLATE 3D.

"Rhizoma breve, suberectum, vestitum paleis mollibus, lineariter lanceolatis, subdenticulatis, in apicem crispum piliformem excurrentibus, ad 8 mm. longis, 0.2 mm. latis. Petioli erecti, teretes, rufuli, pilis articulatis, mollibus ferrugineis canescentibus lanosi, denique glabrescentes, duobus fasciculis ovalibus praediti, in foliis sterilibus ad 40 cm., in fertilibus ad 75 cm. longi, 3-4 mm. crassi. Laminae basi cordatae, hastato-lanceolatae, tri- vel quinque-lobatae, subcoriaceae vel chartaceae, supra virides vel olivae, subtus pallidiores, glaberrimae, 20-40 cm. longae, 10-20 cm. latae. Segmenta unijuga, lateralibus sinu plus minus lato cum terminali connexis, e basi posteriore lobos singulos auricularios deorsum emittentia, in foliis sterilibus (et semifertilibus) horizontaliter patentia vel subincurvata, lanceolata, longe acuminata, margine leviter crenulata vel subintegra, ad 12 cm. longa, supra basim 2.5-3 cm. lata; in foliis sat fertilibus longiora et angustiora quam in sterilibus (ad 20 cm. longa, 2 cm. lata). Lobi basales foliorum sterilium ad 6 cm. longi, 2 cm. lati, imbricati et petiolum comitantes, fertilium longiores et angustiores, ad 15 cm. longi, 1.5 cm. lati, sinu lato interstincti. Segmentum terminale lateralibus conforme, sed integrum et paulo majus. Costae utrinque immersae, parenchymate ochraceo subtus obtectae. Nervi immersi vix conspicui, plerique furcati, apicibus superficialibus. Sori continui.

"Habitat in Brasiliae Statu Rio de Janeiro prope Teresopolim (Sete Quedas), 1500 m. supra mare, 19-IX-1929, leg. A. C. Brade, No. 9257. Herb. Mus. Nat., No. 21009."

I have not seen any material of this species. It is apparently a good species and distinguished by the pubescent stipe, the cutting of the blades and the large size of the fronds.

10. DORYOPTERIS ORNITHOPUS (Mett. ex Hook. & Baker) J. Sm. Hist. Fil. 289. 1875. PLATE 3B.

Pellaea lomariacea (Kl.) Hook. var. *digitato-palmata* Hook. Sp. Fil. 2: 133. 1858. TYPE: Diamond District, Brazil, *Gardner* 5298, Kew, not seen, photo G, seen. *Pteris ornithopus* Mett. ex Hook. & Baker, Syn. Fil. 166. 1867. LECTOTYPE: Diamond District, Brazil, *Gardner*, 5298, Kew, not seen, photo G, seen. PARATYPES: "*Burchell*, south of Brazil", Kew, not seen; *Caldas*, Minas Geraes, Brazil, *Lindberg* 600, Kew, not seen, photo G, seen. *Pteris cheirophylla* Kze. ex Baker in Martius, Fl. Brasil. 1²: 406. 1870, in synonym. *Pteris alcicornu* Kze. ex Baker in Martius, Fl. Brasil. 1²: 406. 1870, in synonym. *Pellaea alcicornis* Prantl, Engl. Bot. Jahrb. 3: 429. 1882. Based on *Pteris ornithopus* Mett. ex Hook. & Baker, epithet taken from *Pteris alcicornu* Kze. ex Baker. *Doryopteris alcicornis* (Prantl) Diels in Engl. & Prantl, Nat. Pfl. 1⁴: 270. 1899. *Doryopteris ornithopus* var. *pygmaea* Brade, Bol. Mus. Nac. Rio Janeiro 5: 95, t. 2, fig. 1. 1929. TYPE: Serra Dourada, Goyaz, Brazil, *Ule* 798 ex parte, Herb. Mus. Nac. Rio Janeiro, no. 18286, not seen.

Rhizome short to moderately long, moderately stout, compact: scales of the frond-buds and stipe *entire*: stipe usually atropurpureous or black, sometimes red-brown toward the base, *usually scaly with fibrils*, especially at the base, occasionally nearly naked, *smooth or slightly roughened by small longitudinal grooves*: fertile and sterile blades *palmately divided*, quite dimorphic, very coriaceous, with areolate venation: sterile frond 4–28 cm. long; blade 1.7–8 cm. long, pentagonal to suborbicular, shallowly to rather deeply 5–7-lobed, the central segments a little longer than the others: segments broadly ovate or deltoid to ovate-lanceolate, rounded, *entire*; margin with a black, sclerotic border; vein-ends mostly joined; *hydathodes not present on the upper surface*: fertile frond 7–45 cm. long; blade 3–17 cm. long, *usually orbicular or suborbicular*, sometimes pentagonal, deeply 5–9-lobed: segments oblong to linear, rounded or subacute, *entire*: soral lines continuous around the sinuses: stalks of the sporangia very long, usually two to three times the length of the head.

Goyaz, Minas Geraes and São Paulo, Brazil.

Specimens examined: BRAZIL.—MINAS GERAES: 1846, *Regnell* 1459 (US); Bello Horizonte, July 10, 1940, *Foster & Foster* 590 (US); São João d'El Rei, August 31, 1892, *Lindman* A137 (US). S~O PAULO: March 21, 1915, *Brade* (NY); Serra do Mar, *Edwak* (NY).

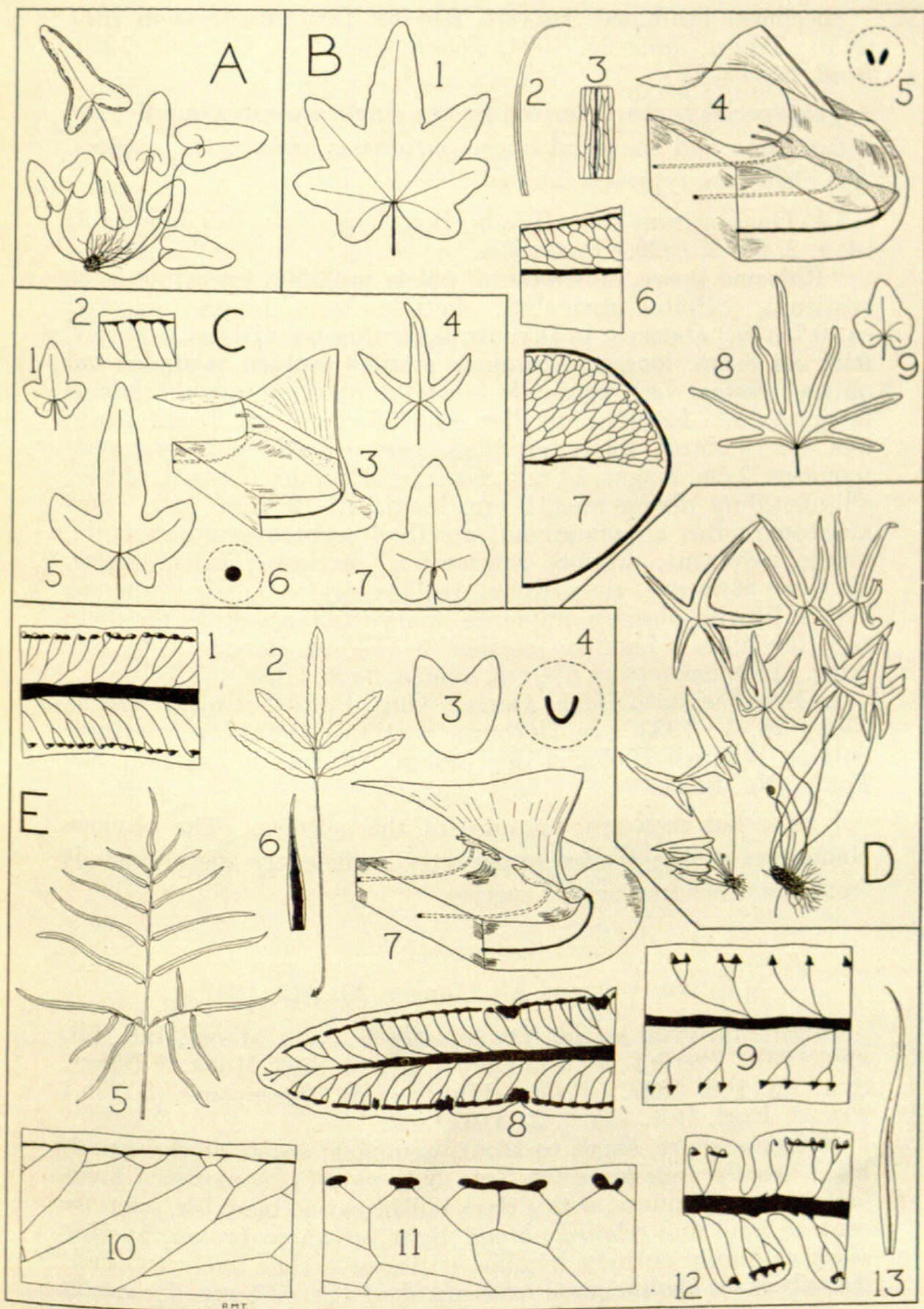
D. ornithopus is a very distinct species. The palmately divided, very coriaceous, areolate-veined blades, the black sclerotic border of the sterile blade and absence of hydathodes are distinctive characters. Although it has areolate venation, the two vascular bundles and the typical scales place it naturally in section *Lytoneuron*.

11. DORYOPTERIS QUINQUELOBATA (Fée) Diels in Engl. & Prantl, Nat. Pfl. 1⁴: 269. 1899. PLATE 3C.

Pellaea quinquelobata Fée, Crypt. Vasc. Brésil 1: 42, t. 10, fig. 1. 1869. TYPE: Rio de Janeiro, Brazil, *Glaziov* 2055, probably at Rio de Janeiro, not seen. ISOTYPE: Paris, not seen, photo G, seen. *Pellaea Glaziovii* Baker in Martius, Fl. Brasil. 1²: 595. 1870. TYPE: Rio de Janeiro, Brazil, *Glaziov* 2055, Kew, not seen. ISOTYPE: Paris, not seen, photo G, seen. *Pteris quinquelobata* (Fée) Baker, Ann. Bot. 5: 215. 1891. *Doryopteris Glaziovii* (Baker) Diels in Engl. & Prantl, Nat. Pfl. 1⁴: 269. 1899. *Doryopteris quinquelobata* var. *septemlobata* Brade, Bol. Mus. Nac. Rio Janeiro 5: 93, t. 1. 1929, ex char. TYPE: Tijuca, Rio de Janeiro, Brazil, *Brade* 8567, Rio de Janeiro, not seen. "Varietas statura multo majore insignis, ad 37 cm. alta. Laminae steriles 3-7 loborum, diametri 8-14 cm.; lobi, maxime terminalis et basales, acutiores quam in specie typica. Laminae fertiles pinnatifidae, bijugatae, lobis basalibus uno alterove lobo basiscopo instructis, lobis omnibus lanceolatis, acutis, 12-18 mm. latis. O exemplar unico distingue-se da especie typica principalmente pelo tamanho e a divisao mais complicada da lamina. Os outros caracteres indicam sem difficuldade *Doryopteris quinquelobata*." I am unable to place this variety. It may possibly be a distinct species. If it is *D. quinquelobata*, it is undoubtedly only a well developed phase and should not be formerly recognized. The following description does not include it.

Rhizome short, slender, compact: *stipe* atropurpureous or black, minutely verrucose or smooth, *with one* terete or U-shaped vascular bundle at the base: *fertile and sterile blades slightly dimorphic, relatively thin*: sterile frond 2-21 cm. long; blade 1-8 cm. long, *entire, orbicular and cordate to deltoid or long-pentagonal, shallowly 5-lobed*, the lateral lobes shorter than the central lobe: lobes broadly ovate to ovate-lanceolate, rounded, *entire*; margin with a whitish or brown cartilaginous border: *fertile* frond 7.5-25 cm. long; blade 5-10 cm. long, pentagonal to long-pentagonal, *moderately deeply 5-lobed*, the lateral lobes shorter than the central lobe: lobes broadly ovate to linear-lanceolate, rounded to acute, *entire*: soral lines continuous around the sinuses.

Rio de Janeiro, Brazil.



III. A, *DORYOPTERIS RUFA*. B, *D. ORNITHOPUS*. C, *D. QUINQUELOBATA*. D, *D. ROSENSTOCKII*. E, FIGS. 1-7, *PELLAEA CRENATA*; 8, *P. PINNATA*; 9, *P. RIEDELI*; 10, *P. ANGULOSA*; 11, *P. CRISPATULA*; 12, 13, *P. GLEICHENIODES*.

Specimens examined: BRAZIL, RIO DE JANEIRO: *Glaziou* 7011 (NY); Tijuca, June 25, 1904, *Dusén* 2530 (G), October, 1929. *Brade* 8634 (NY).

This species is characterized by the single vascular bundle, the entire lobes and the soral lines continuous around the sinuses. The blades are typically 5-lobed.

12. *DORYOPTERIS RUFA* Brade, Bol. Mus. Nac. Rio Janeiro 5: 94, t. 2, fig. 2. 1929. PLATE 3A.

"Rhizoma breve, suberectum, paleis mollibus linearibus rufis vestitum. Stipites fasciculati. Petiolus teres, tenuis (diametri ca. 0.7 mm.) ebeneus, in juventute atrofuscus, nitidus, glaberrimus, ad 8 cm. longus. Laminae steriles ambitu rotundae vel obtuse ovatae, basi profunde cordata, margine membranaceo, integerrimo. Laminae fertiles sagittiformes vel hastiformes; lobi omnes obtusi, lobus terminalis versus basim plus minus attenuatus, 3 cm. longus, 14 mm. latus; lobi basales obovati, obtusi, aliquantulum divergentes, 2 cm. longi, 10–12 mm. lati. Sori anastomosantes ad marginem, apicibus segmentorum exceptis; margo revolutus, abrupte attenuatus, scariosus, integerrimus. Laminae coriaceae, glaberrimae, pallide virides, costis immersis, nervis liberis, obscure immersis, nervorum apicibus distincte superficialibus. Laminae steriles 2–3½ cm. longae, 1½ cm. latae. Laminae fertiles 5½ cm. longae, 3 cm. latae.

In Brasiliae statu Minas Geraes (Ouro Preto). Coll. *Bruno de Godoy* 28. V. 1923. In Herbario Sectionis Botanicae et Agronomiae Instituti Biologici de 'Defesa Agricola e Animal', São Paulo, No. 8425."

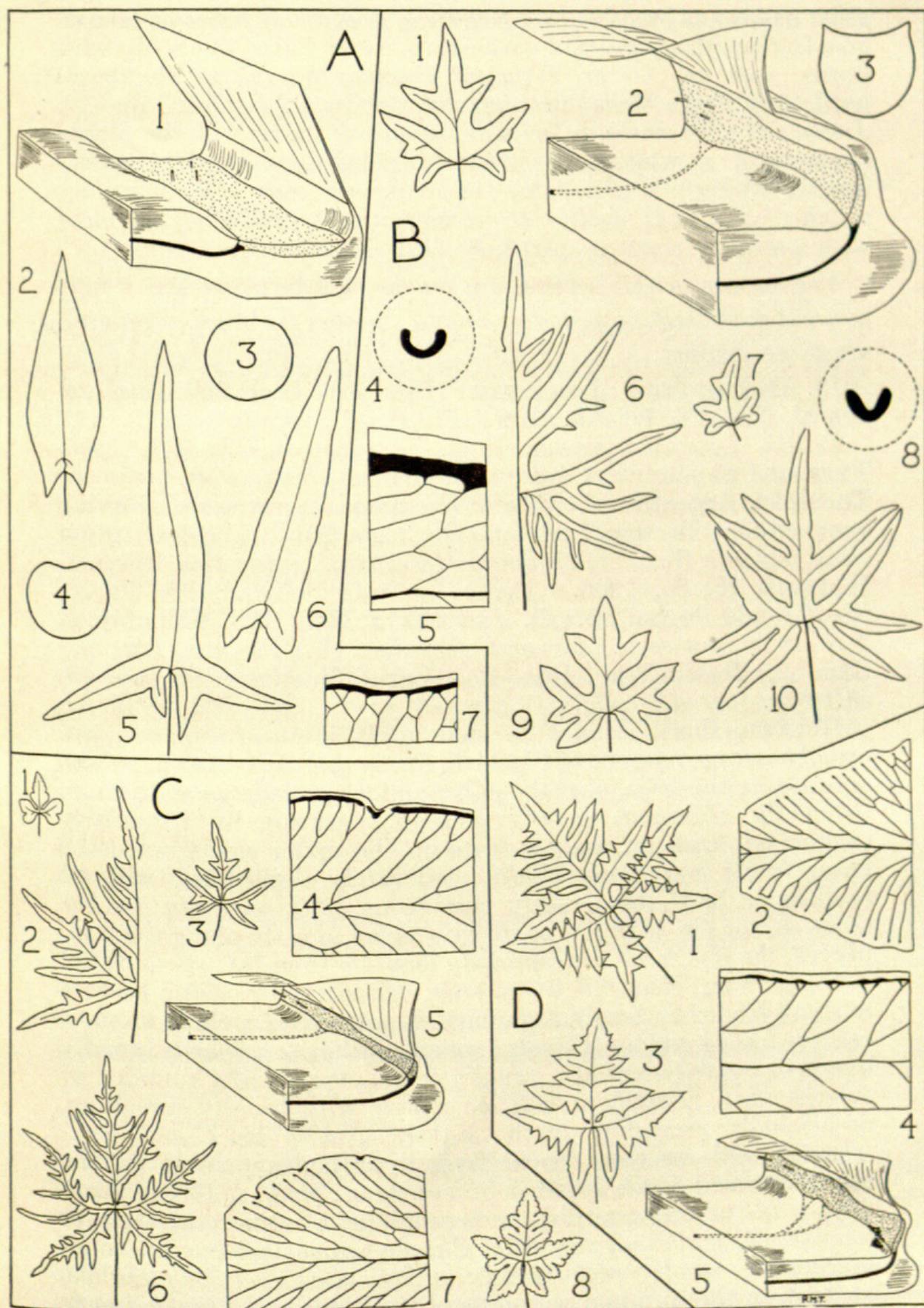
I have not seen any material of this species. The obvious characters of the blades apparently sufficiently distinguish it from the other free veined species.

SECTION II.

✓ *EUDORYOPTERIS* Kl. *Linnaea* 20: 342. 1847.

Litobrochia Presl section *Doryopteris* (J. Sm.) Moore, Ind. Fil. xlv. 1857. *Pteris* L. section *Doryopteris* (J. Sm.) Hook. & Baker, Syn. Fil. 166. 1867. *Pellaea* Link section *Doryopteris* (J. Sm.) Prantl, Engl. Bot. Jahrb. 3: 419. 1882.

Rhizome short, small to stout, compact: scales of the frond-buds usually ovate-lanceolate (PL. 5C, FIG. 7), sometimes long-lanceolate, attenuate, with a dark red-brown to blackish, sclerotic central band and relatively broad, light brown to brown, hyaline margins, rarely entirely hyaline, entire or rather finely toothed; the cells of the hyaline parts relatively short (PL. 5C, FIG. 1), mostly



IV. A, *DORYOPTERIS* *SAGITTIFOLIA*. B, *D. COLLINA*. C, *D. LORENTZII*. D, *D. JUERGENSII*.

about as long as broad to sometimes one and a half times as long as broad; stipe often pubescent with short brown hairs, not scaly with fibrils, with one U- or V-shaped vascular bundle at the base: fertile and sterile blades with areolate, or in *D. Lorentzii* and *D. Juergensii* with partially areolate, venation; margin of the sterile blade with a whitish or brown cartilaginous border: spores usually without a perispore, the exospore smooth or minutely roughened, or in *D. nobilis*, *D. rediviva* and *D. pedata* var. *palmata* with a whitish rugulose perispore (PL. 6B, FIG. 5).

The species of this section are not as clearly related as a unit as are those of section *Lytoneuron* and the specific lines, in general, are more distinct.

13. *DORYOPTERIS LORENTZII* (Hieron.) Diels in Engl. & Prantl, Nat. Pfl. 1⁴: 270. 1899. PLATE 4C; MAP 5.

Pellaea Lorentzii Hieron. Engl. Bot. Jahrb. 22: 392. 1896. TYPE and PARATYPE: Córdoba, Argentina, Lorentz 19, not seen; Tucumán, Argentina, Lorentz & Hieronymus, not seen. Having seen neither collection, I am not choosing a type. The description clearly places them. *Doryopteris Lorentzii* f. *interrupta* Rosenst. Hedwigia 46: 86. 1906. TYPE: Fazenda Soledad, Rio Pardo, Rio Grande do Sul, Brazil, Juergens & Stier 128, probably at Stockholm, not seen. *Doryopteris pedata* (L.) Fée var. *Lorentzii* (Hieron.) Hassl. Trab. Inst. Bot. Farm. Buenos Aires, no. 45: 54. 1928.

Rhizome short, slender to moderately stout, compact: stipe usually atropurpureous or blackish, rarely dark red-brown, naked, or scaly at the base, slightly pubescent, especially near the top, to nearly glabrous, usually smooth, occasionally irregularly roughened, terete or rarely sulcate on the upper side toward the base: fertile and sterile blades moderately dimorphic, without proliferous buds, moderately coriaceous, with partially areolate venation, that is, with few to many areolae, mostly along the mid-nerve, the free veins not especially long nor crowded: sterile frond 4–18 cm. long; blade 1.5–9 cm. long, deltoid, 3-lobed and hastate in small blades to deeply bipinnatifid, pentagonal, with numerous, more or less ascending ultimate segments: ultimate segments broadly ovate to ovate-lanceolate, usually acute, occasionally rounded or subapiculate, remotely crenate, or crenate with usually spreading, occasionally ascending teeth; sinuses usually black and semi-sclerotic; vein-ends nearly all free; hydathodes present on the upper surface: fertile frond 5–35 cm. long; blade 2–17 cm. long, deeply bi- or tripinnatifid, pentagonal, with numerous, more or less ascending ultimate segments: ultimate segments deltoid to long-lanceolate, usually acute, rarely subapiculate, remotely crenate, at least on the terminal segments of the blade and basal primary

segments; *sinuses usually black and semi-sclerotic*; sterile tips short to moderately long, entire or crenate: *soral lines broken by the sinuses*.

Southern Brazil to Córdoba, Argentina, and north to Bolivia and Peru.

Specimens examined: BRAZIL.—SANTA CATHARINA: Blumenau, August, 1911, *Luederwaldt* 1838 (US). RIO GRANDE DO SUL: Rio Pardo, 1906, *Juergens* (Copel., US), May 11, 1906, *Juergens* "128", certainly not as to type of *D. Juergensii* (NY); São Leopoldo, 1940, *Eugenio* 25 (NY), 1941, *Eugenio* 24 (NY); Ferromecco, 1889, *Kunert* 6 (US). URUGUAY: (U. S. Nat. Herb. no. 690844). PARAGUAY: Pilcomayo river, 1888–1890, *Morong* 170 (NY). ARGENTINA.—MISSIONES: San Ignacio, March 3, 1914, *Vattuone & Bianchi* 165 (US); Loreto, July, 1927, *Burkart* 1365 (G). (CORRIENTES): Corrientes, 1854, *E. Palmer* (US). FORMOSA: Monte Guayenlec, 1919, *Jorgensen* 3276 (G). CHACO: Colonia Benítez, October, 1934, *Schulz* 720 (G). (CÓRDOBA): Córdoba, December, 1891, *Kuntze* (NY). SALTA: Salta, July 26, 1940, *Maldonado* 402 (G). TUCUMÁN: Naranjal, Dept. Tafí, July 23, 1923, *Schreiter* 27/2229 (G); Dept. Tafí, February 28, 1921, *Venturi* 182 (US); Dept. Chicligasta, February 16, 1925, *Venturi* 6477 (US). BOLIVIA.—LA PAZ: Yungas, 1885, *Rusby* 112 (NY, US). NOR YUNGAS: December, 1917, *Buchtien* 797 (Copel.); Coroico to Rio Yolasa, December 5, 1935, *Mexia* 7799 (G, US); Polo-Polo, near Coroico, October–November, 1912, *Buchtien* 3397 (G, NY, US). SUR YUNGAS: November 17, 1906, *Buchtien* 473 (US); July, 1933, *Carder* 820 (G); Yrupana, August 18, 1921, *Cárdenas* 2108 (B, NY). PERU: Dist. Santa Ana, January, 1926, *Herrera* 871a (US); Santa Ana, June 25, 1915, *Cook & Gilbert* 1479 (US); Valle de Lares, February, 1928, *Herrera* 1635 (US).

D. Lorentzii differs from *D. Juergensii* in having the segments rounded or acute rather than apiculate, the free veins not especially long and crowded rather than long and crowded, the blade pentagonal rather than diamond-shaped and the segments ascending rather than mostly at right angles to the midnerve. The partially areolate venation separates both of these species from the others in the section.

14. DORYOPTERIS JUERGENSII Rosenst. Festschr. Alb. v. Bamberg, 58. 1905. TYPE and PARATYPE: Rio Grande do Sul, Brazil, *Juergens* 128, 169, probably at Stockholm, not seen. Rosenst. Fil. Brasil. exsicc., *Juergens* 126, labeled "*D. Juergensii* Ros. n. sp. Original", NY, seen. Not having seen the original collections, I have not chosen a type. PLATE 4D.

Rhizome short, slender, compact: *stipe* atropurpureous or blackish, sometimes brown toward the base, naked, or scaly at the base, glabrous, or very slightly pubescent, smooth, *terete* or *subterete*: *fertile and sterile blades similar*, without proliferous buds, *relatively thin, with partially areolate venation*, that is, few to many areolae, mostly along the midnerves, the free veins relatively long and crowded: *sterile* frond 11–20 cm. long; *blade* 6–8 cm. long, deeply bi- or tripinnatifid, *diamond-shaped*, rarely pentagonal, with numerous ultimate segments; most of the *segments at right angles to their midvein* and many overlapping: *ultimate segments* deltoid to ovate-lanceolate, *apiculate*, rarely acute, crenate or crenulate with usually spreading, occasionally ascending teeth, sometimes only slightly toothed; *sinuses often black and cartilaginous*; vein-ends nearly all free; hydathodes present on the upper surface: *fertile* frond 15–30 cm. long; *blade* 6–11 cm. long, deeply tripinnatifid, otherwise similar to the sterile: *ultimate segments* deltoid to lanceolate, *usually apiculate*, sometimes acute, entire or slightly crenulate; sterile tips moderately long, entire or shallowly crenate: *soral lines broken by all, or nearly all, of the sinuses*.

Rio Grande do Sul, Brazil.

Specimens examined: BRAZIL, RIO GRANDE DO SUL: Santa Amaro, 1904, *Juergens* 126 (NY); Serra da Coria, *Juergens* (US).

This species is closely related to *D. Lorentzii* and the differences are discussed under that species.

15. DORYOPTERIS PEDATA (L.) Fée, Mém. Fam. Foug. 5: 133. 1850–52. PLATE 5A, B; PLATE 6B; MAP 9.

Rhizome short, slender to stout, compact: *stipe* naked or scaly on the lower part, usually pubescent, especially at the top and on the upper side, rarely glabrate, usually smooth, occasionally irregularly roughened: *fertile and sterile blades moderately dimorphic*, moderately coriaceous: *ultimate segments of the sterile blade crenate or crenulate with spreading teeth*, rarely subentire; the tips similar, except in var. *palmata*, rarely with slightly ascending teeth; vein-ends nearly all free; hydathodes present on the upper surface; the sinuses occasionally rather obscurely black and cartilaginous: *ultimate segments of the fertile blade usually acute*, sometimes rounded or acuminate, usually entire, sometimes crenulate, very rarely remotely crenate toward the tips; *sterile tips usually short*, sometimes moderately long, *usually entire*, rarely crenate or crenulate with erect teeth: *soral lines usually broken by the sinuses*, occasionally continuous around some.

D. pedata is characterized by the completely areolate venation, the sterile blade with spreading teeth on the margin, the hyda-

thodes on the upper surface of the margin of the sterile blade, the free vein-ends in the sterile blade and the rather highly divided fertile blade.

This species contains three elements that have usually been considered to be of specific rank, but due to the fact that intermediates occur and that each can be separated by only a single critical character, although supported by strong tendencies of less important characters, it seems best to treat them as varieties. Each occupies a natural geographic area.

15a. DORYOPTERIS PEDATA var. **typica**. PLATE 5A.

Pteris pedata L. Sp. Pl. 2: 1075. 1753. TYPE: Sheet labeled "*Pt. pedata*" in Linnaeus' hand, Herb. Linn., not seen, photo G, US, seen. In 1753 Linnaeus included mention of a Siberian specimen (Hooker, Sp. Fil. 2: 77. 1858 refers this record to *Cheilanthes argentea*) but all of his references apply to the West Indian plant and his specimen, in the herbarium in 1753, is also the West Indian plant. *Litobrochia pedata* (L.) Presl, Tent. Pterid. 149. 1836. *Cassebeera pedata* (L.) J. Sm. Journ. Bot. 3: 404. 1841, not as to plant! *Pellaea pedata* (L.) Fée, Mém. Fam. Foug. 5: 130. 1850-52.

Stipe dark red-brown, atropurpureous or blackish, usually wing-angled, sometimes sulcate, at least on part of the upper side: fertile and sterile blades without proliferous buds: sterile frond 2-27 cm. long; blade 1-10 cm. long, entire, orbicular and cordate in very small blades, or long-deltoid, sagittate or cordate, 3-lobed, the central lobe long, or moderately deeply lobed to deeply bipinnatifid, long-pentagonal, with 7 to several ultimate segments, the basal primary segments often much longer than the second pair, the central shank often much longer than the basal primary segments: ultimate segments broadly ovate to long-deltoid, rounded or acute: fertile frond 8-50 cm. long; blade 5-21 cm. long, long-pentagonal or pentagonal, rarely deeply 5-lobed, the lateral segments much shorter than the central one and each with a shorter lobe on the lower side, usually deeply bi- or tripinnatifid, with 7 to numerous ultimate segments, the basal primary segments often much longer than the second pair, the central shank often much longer than the basal primary segments: ultimate segments deltoid to long-lanceolate or linear-lanceolate.

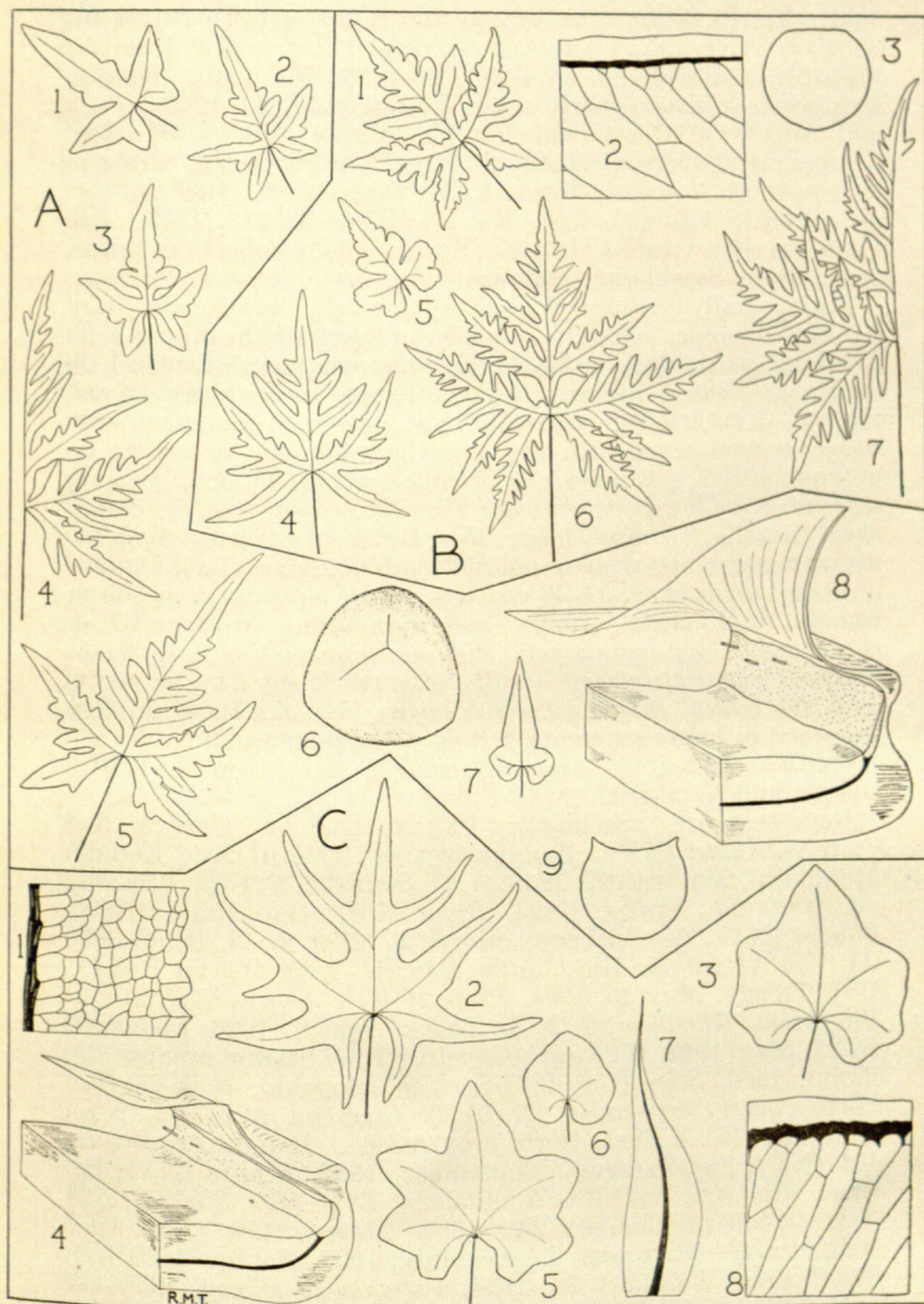
West Indies, Cuba to Martinique.

Representative specimens: CUBA.—PINAR DEL RIO: San Diego de los Baños, April 10, 1900, Palmer & Riley 507 (G, NY, US), August 31-September 3, 1910, Britton, Earle & Gager 6794 (NY, US); Sierra Caliente, August 15, 18, 1912, Shafer 13762 (NY, US). HAVANA: Loma de la Crampa, December 30, 1918,

León 8534 (NY). ISLE OF PINES: San Juan, March 15, 17, 1916, *Britton, Britton & Wilson* 15451 (G, NY, US). SANTA CLARA: Trinidad Mountains, June, 1941, *Howard* 5310 (G); Las Lagunas, Buenos Aires, December 5, 1928, *Jack* 6868 (NY, US); Pitajones, February 28, 1912, *Shafer* 12208 (Copel., NY, US). CAMAGUEY: Sierra Cubitas, February 19–21, 1909, *Shafer* 470 (G, NY, US). ORIENTE: La Perla, February 6–18, 1911, *Shafer* 8480 (NY, US); above Daiquiri, June 28–29, 1914, *Ekman* 1583 (G, NY); Yateras, May 5, 1907, *Maxon* 4467 (G, NY, US). JAMAICA: Gordontown, September, 1906, *A. Moore* (Copel., NY), March 12, 1900, *Clute* 301 (printed 182 and corrected) (G, NY, US); Chestervale, February 7, 1903, *Underwood* 1179 (NY, US); Portland, March 6, 1920, *Maxon & Killip* 797 (G, US). HISPANIOLA.—HAITI: Vicinity of Furcy, May 26–June 15, 1920, *Leonard* 4780 (G, NY, US); Tortue Island, December 28, 1928 to January 8, 1929, *Leonard & Leonard* 11516 (G, NY, US); Tortue, May 23, 1925, *Ekman* H4103 (NY, US). DOMINICAN REPUBLIC: District of Moncion, October 4, 1929, *Valeur* 222 (NY, US); Cotuy, January 28–February 7, 1922, *Abbott* 770 (G, NY, US); Polo, February 26–March 12, 1922, *Abbott* 1868 (G, US). PORTO RICO: Cayey, October 16, 1885, *Sintenis* 2193 (G, US); Vieques Island, February 18, 1914, *Shafer* 2949 (NY, US), February 26, 1914, *Shafer* 3041 (NY, US); near Utuado, March 19, 1906, *Britton & Marble* 1086 (NY, US). SAINT THOMAS: July 18, 1915, *Shoemaker* (NY, US); February 11–22, 1913, *Britton & Marble* 1237 (NY, US); November, 1880, *Eggers* (G); March 1–5, 1913, *Rose* 3190 (NY, US). ANTIGUA: Sugar Loaf Mountains, January 17, 1932, *Box* 226 (US); *Breutel*, "Underwood Herb." (NY). MONTSERRAT: February 6, 1907, *Shafer* 396 (NY, US); *Turner* (U. S. Nat. Herb. no. 428396). GUADELOUPE: 1897, *Duss* 4188 (US); 1895, *Duss* 4130 (NY); April 22, 1939, *Questel* 1076 (US); *L'Herminier* (G, US). MARTINIQUE: November, 1871, *Hahn* 1299 (G, US); 1884, *Duss* 1552 (NY, US); 1900, *Duss* 4584 (NY, US).

The typical variety differs from var. *palmata* in the lack of proliferous buds and the usually wing-angled stipe. The differences from var. *multipartita* are discussed under that variety.

15b. DORYOPTERIS PEDATA var. **multipartita** (Fée) n. comb. PLATE 5B. *Pteris pedata* γ Raddi, Opusc. Sci. Bologna 3: 293. 1819; Pl. Brasil. 1: t. 65, fig. 3. 1825. *Litobrochia Raddiana* Presl, Tent. Pterid. 149. 1836. Based on *Pteris pedata* γ Raddi. *Doryopteris Raddiana* (Presl) Fée, Mém. Fam. Foug. 5: 133. 1850–52. *Doryopteris Raddiana* var. *multipartita* Fée, Crypt. Vasc. Brésil 1: 45. 1869. TYPE: Rio de Janeiro, Brazil, *Glaziou* 1741, probably at Rio de Janeiro, not seen. ISOTYPE: Paris, not seen, photo G, seen. *Pellaea Raddiana* (Presl) Prantl, Engl. Bot.



V. A, *DORYOPTERIS PEDATA* var. *TYPICA*. B, Var. *MULTIPARTITA*. C, *D. REDIVIVA*.

Jahrb. **3**: 419. 1882. *Doryopteris Stierii* Rosenst. Hedwigia **46**: 86. 1906. TYPE: Rio Grande do Sul, Brazil, *Juergens & Stier* 124, probably at Stockholm, not seen. ISOTYPE: NY, seen. *Doryopteris pedata* f. *glaberrima* Rosenst. Hedwigia **46**: 86. 1906. TYPE and PARATYPE: Rio Grande do Sul, Brazil, *Matschinske* 29b, *Juergens & Stier* 26, probably at Stockholm, not seen. *Doryopteris pedata* f. *tomentosa* Rosenst. Hedwigia **46**: 86. 1906; as var. *tomentella* in Luetzelb. Est. Bot. Nordéste **3**: 248. 1923. São Paulo to Rio Grande do Sul, Brazil, seven collections cited, probably at Stockholm, not seen.

Stipe usually atropurpureous or blackish, occasionally dark red-brown, *terete*, *subterete*, or *plane* on part of the upper side: *fertile and sterile blades without proliferous buds*: *sterile* frond 11–28 cm. long; *blade* 4–13 cm. long, pentagonal or long-pentagonal, hastate, deeply lobed, *with 5 ultimate segments, the lateral ones rather short* and each with a lobe on the lower side, or usually bi- or tripinnatifid, *with numerous ultimate segments, the basal primary segments usually not much longer than the second pair, the central shank usually not much longer than the basal primary segments*: *ultimate segments* ovate or deltoid to oblong-lanceolate, rounded or acute: *fertile* frond 14–40 cm. long; *blade* 5–23 cm. long, bi- or usually tripinnatifid, rarely quadripinnatifid, pentagonal or occasionally long-pentagonal, *with numerous ultimate segments, the basal primary segments usually not much longer than the second pair, the central shank not much longer than the basal primary segments*: *ultimate segments* deltoid to long-lanceolate.

Southern Brazil to Argentina and Bolivia; also in British Guiana and Venezuela.

Representative specimens: VENEZUELA: La Guayra and Caracas, *Kuntze* (NY). BRITISH GUIANA: Takutu river, Kanuku Mountains, March 4–22, 1938, *A. C. Smith* 3295 (NY). BRAZIL.—SÃO PAULO: Iguape, 1923, *Brade* (US); Rio Grande, 1906, *Wacket* (NY); São Vicente, March 8, 1929, *L. B. Smith* 2085 (G, US). PARANÁ: Rio Grande, March, 1905, *Wacket* (Copel., US); Tibagy, May 15, 1934, *Reiss* 21 (G). SANTA CATHARINA: Blumenau, *Handhen* 26 (NY); Lages, August, 1906, *Spannagel* (NY); May, 1902, *W. Riegel* (Copel.). RIO GRANDE DO SUL: Rio Pardo, 1906, *Stier* (Copel., US); São Leopoldo, *Rick* 25 (G); Porto Alegre, September 22, 1892, *Lindman* A281 (G, NY). URUGUAY: (U. S. Nat. Herb. no. 690844). PARAGUAY: *Hassler* 494 (NY); Sud-Paraguay, September, 1892, *Kuntze* (NY); between Rio Apa and Rio Aquidaban, 1908–1909, *Fiebrig* 5226 (G); Caballero, January 20, 1899, *Morong* 170 (NY, US). ARGENTINA.—MISSIONES: Loreto, July, 1927, *Burkart* 1539 (G); San Ignacio, February 22, 1914, *Vattuone & Bianchi* 107, 119 (US). FORMOSA: Monte Guayenlec, 1919, *Jorgensen* 3277 (G,

US). CHACO: Colonia Benítez, July, 1934, *Schulz* 721 (G). SALTA: Tartagal, February 23, 1937, *West* 8410 (G). TUCUMÁN: Dept. Monteros, September 23, 1929, *Venturi* 9587 (G, US); San Pablo, July, 1913, *Hauman* 213 (G); Monte de Alpachiri, September 12, 1916, *Jorgensen* 1920 (G, US). BOLIVIA: Espia, August 8, 1921, *Rusby* 135 (US); Apolo, February 23, 1902, *R. S. Williams* 1175 (NY); San Juan, March 20, 1902, *R. S. Williams* 1174 (NY, US); Charagua, Oriente, April, 1934, *Cárdenas* 2658 (US).

The stipe, terete or plane on part of the front, separates this variety from var. *typica*, which has the stipe wing-angled or rarely sulcate on the front. Also the blade is usually pentagonal, that is the central shank is not much longer than the basal primary segments, while in var. *typica* the blade is usually long-pentagonal, the central shank being conspicuously long. Var. *multipartita* has the basal primary segments not much longer than the second pair, while in var. *typica* they are conspicuously longer. These distinctions tend to break down in Martinique and Guadeloupe. The differences from var. *palmata* are discussed under that variety.

15c. DORYOPTERIS PEDATA var. PALMATA (Willd.) [incorrectly attributed to J. Sm. by] Hicken, Rev. Mus. de la Plata **15**: 253. 1908. PLATE 6B.

Pteris palmata Willd. Sp. Pl. **5**: 357. 1810. TYPE: Caracas, Venezuela, *Bredemeyer*, Berlin, not seen, photo US, seen, rephoto G, NY, seen. *Doryopteris palmata* (Willd.) J. Sm. Journ. Bot. **4**: 163. 1841. *Litobrochia palmata* (Willd.) Moore, Ind. Fil. 342. 1862. *Pteris pedata* L. var. *palmata* (Willd.) Baker in Martius, Fl. Brasil. **12**: 408. 1870. *Pteris pedata* ♂ *gemmaipara* Sodiro, Anal. Univ. Quito **8**: 68. 1893; also Crypt. Vasc. Quito. 99. 1893. "Rio Guallabamba cerca de 'los Realés', Ecuador. *Doryopteris pedata* (L.) Fée ssp. *palmata* (Willd.) Hassl. Trab. Mus. Farm. Fac. Cienc. Med. Buenos Aires **21**: 20. 1909, as *Dryopteris*. *Doryopteris Mayoris* Rosenst. Mém. Soc. neuchateloise **5**: 51, t. 2, fig. 2. 1912. TYPE: Medellin, Columbia, *Mayor* 180, probably at Stockholm, not seen. ISOTYPE: US, seen, photo G, NY, seen. "*Doryopteris palmata* var. *argenteo-striata*" Hort. Ind. London. **2**: 524. 1930; Rev. Hort. Belge **31**: 12. 1905.

Stipe castaneous to blackish, usually plane on the upper side, at least on the lower half, rarely sulcate or subterete: fertile and sterile blades with proliferous buds at the base, very rarely absent on some blades of a plant, the scales similar to those of the frond-buds and stipe: sterile frond 2.5–37 cm. long; blade 1.5–14 cm.

long, deltoid, hastate and shallowly 3-lobed in small blades, or long-pentagonal, rather deeply 5-lobed, the lateral lobes shorter than the central one, or deeply bi- or tripinnatifid, pentagonal, with several ultimate segments: ultimate segments deltoid to ovate-lanceolate, rounded or acute, sometimes rather abruptly so: fertile frond 11–40 cm. long; blade 4–15 cm. long, usually pentagonal, sometimes orbicular or suborbicular, rarely deeply 5-lobed, all of the lobes about the same length, usually deeply bi- or tripinnatifid, with numerous ultimate segments: ultimate segments deltoid to linear: *spores with a whitish rugulose perispore.*

Mexico to Bolivia, Galapagos Islands and Venezuela.

Representative specimens: MEXICO: Cordoba, Vera Cruz, July 26, 1935, *Fisher* 35361 (NY), 1908, *Spence* 24 (G); Potrero Viejo, Vera Cruz, February 27, 1938, *Copeland* (Copel.); Galeana, Guerrero, October 25, 1939, *Hinton* 14723 (G); *Kerber* "Pl. Mexicanae Exsicc. 98" (NY). COSTA RICA: El General, Prov. San José, July, 1936, *Skutch* 2746 (US); *Cooper* (U. S. Nat. Herb. no. 154209); Vicinity of Santiago, east of Cartago, April 20, 1906, *Maxon* 77 (NY, US); Reventazón, Prov. Cartago, April, 1901, *Alfaro* 8066 (G, US); Finca las Cóncavas, Prov. Cartago, December 7–8, 1925, *Standley* 41475 (US). PANAMÁ: Río Cañazas, Prov. Veraguas, February 8, 1937, *Allen* 193 (G, US). COLOMBIA.—NORTE DE SANTANDER: Vicinity of Chinácota, March 18, 1927, *Killip & Smith* 20788 (G, NY, US). SANTANDER: Río Suratá valley, January 2, 1927, *Killip & Smith* 16357 (G, NY, US); Vicinity of Suratá, January 4–10, 1927, *Killip & Smith* 16808 (G, NY, US). ANTIOQUIA: Bélen, December 24, 1930, *Archer* 1046 (US). VENEZUELA: Near Caracas, December 11, 1921, *Pittier* 9937 (G, NY, US), April 24, 1921, *Pittier* 9473 (NY, US), October, 1924, *Allart* 49 (NY, US); Tovar, 1854–5, *Fendler* 91 (G, US). ECUADOR, GALAPAGOS ISLANDS.—ALBEMARLE: Iguana Cove, March 17, 1905–1906, *Stewart* 1003 (G, US). JAMES: James Bay, January 3, 1905–1906, *Stewart* 1009, 1010 (G, US). INDEFATIGABLE: Academy Bay, April 1, 1930, *Svenson* 69 (B, US). CHARLES: October 9, 1905–1906, *Stewart* 1006 (US). CHATHAM: Wreck Bay, January 27, 1905–1906, *Stewart* 1004 (US). PERU: Torontoy, 1927, *Herrera* 1304 (US); Colpani, Urubamba valley, June 1, 1915, *Cook & Gilbert* 1062 (G, NY, US); Santa Rosa, Urubamba valley, July 9, 1915, *Cook & Gilbert* 1723 (US); Prov. Convención, Dist. Cuzco, January 10, 1940, *Vargas* 1705 (G). BOLIVIA: Espia, August 8, 1921, *Rusby* 135 (NY); Nor Yungas, December, 1917, *Buchtien* 797 (Copel., NY, US); Polo-Polo, near Coroica, Nor Yungas, October–November, 1912, *Buchtien* 3397 (US).

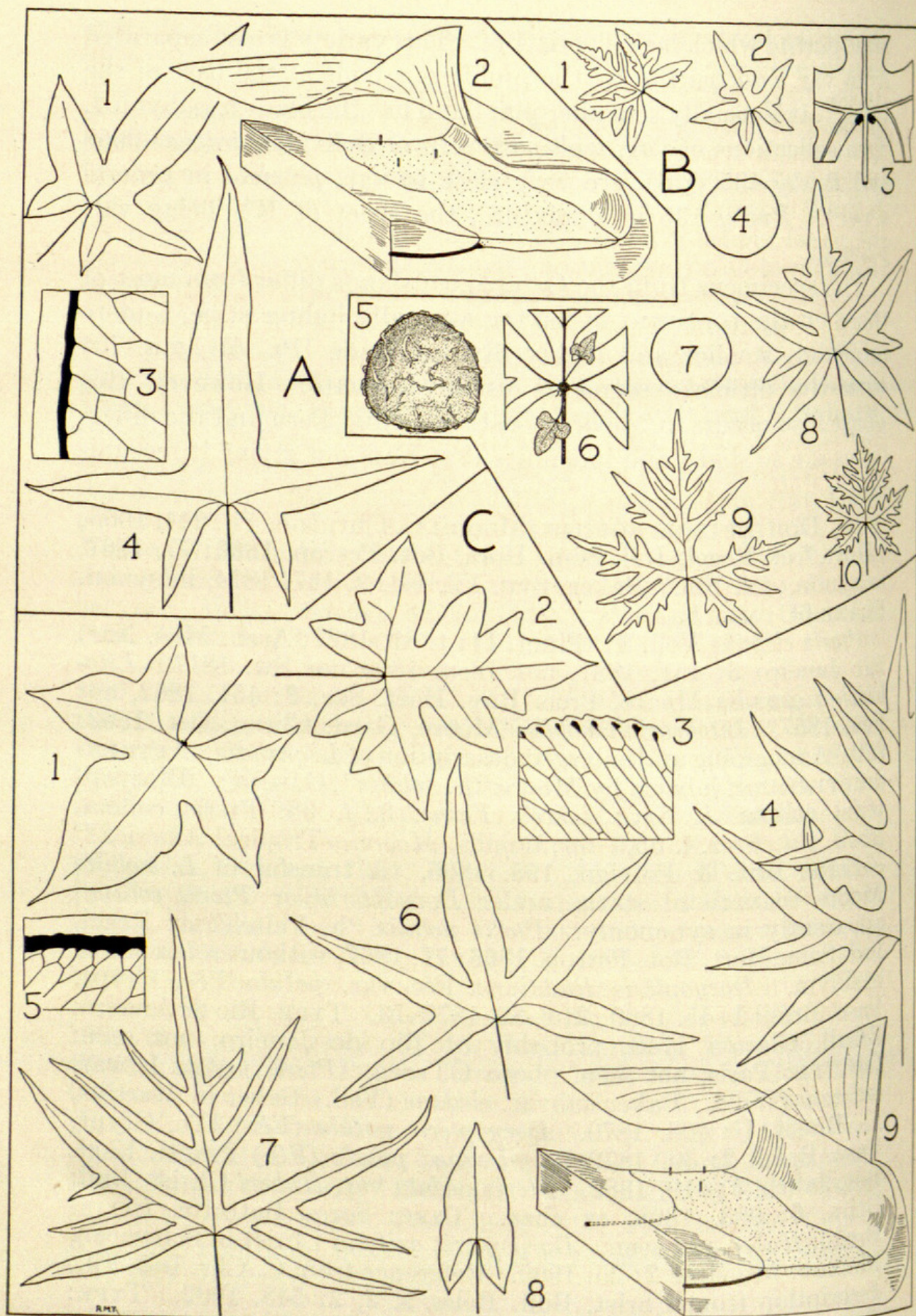
The spores with perispore differ from those of vars. *typica* and

multipartita which lack a perispore. This variety is also separated from var. *multipartita* by the proliferous buds at the base of the blade. It is usually a smaller plant and has the blade less divided. Two collections of var. *multipartita* from Bolivia, *Cárdenas* 2658 and *Rusby* 135 (US), are very close to var. *palmata* in general aspect. *Rusby* 135 is a mixture, the sheet at NY being var. *palmata*.

The specimens from the Galapagos Islands differ from most of those on the continent in having a usually lighter stipe, a more orbicular, smaller and highly divided blade (PL. 6B, FIG. 10) with the ultimate segments usually crenate. However, this phase also occurs in Mexico, Costa Rica and Peru and the differences are so slight and indefinite that I am not giving it recognition.

16. DORYOPTERIS NOBILIS (Moore) C. Chr. Ind. Fil. 244. 1905; "Hort." ex Regel, Ind. Sem. Hort. Bot. Petrop. 1866: 77. 1867, in synon.; "J. Sm." Baker, Syn. Fil. Ed. 2, 167. 1874, in synon. PLATE 6C; MAP 8.

Pteris elegans Vell. Fl. Flum. 11: t. 81. 1827; Arch. Mus. Nac. Rio Janeiro 5: 451. 1881, not Jacq. 1809 nor Sw. 1817. *Litobrochia grandis* Moore, Proc. Roy. Hort. Soc. 2: 451. 1862, not Fée, 1857. *Litobrochia nobilis* Moore, Gard. Chron. Oct. 1862: 932. A renaming and enlarged description of *L. grandis*. AUTHENTIC SPECIMEN: labeled by Moore "*L. nobilis*", G, seen. "D[oryopteris] **collina** J. Sm.; *Lowe's Ferns*, 3, t. 38. *Pteris collina*, *Radd. Fil. Bras. t. 65*,—var. *nobilis*, Moore.—Tropical America."—*Ferns Brit. & Foreign*, 195. 1866. A transfer of *L. nobilis* Moore to varietal status under *Doryopteris* or *Pteris collina*, apparently in synonymy. *Pteris nobilis* "h. Veitch" ex Regel, Ind. Sem. Hort. Bot. Petrop. 1866: 77. 1867, without reference or basynym. *Doryopteris Raddiana* Fée var. *patula* Fée, Crypt. Vasc. Brésil 1: 45. 1869; 2: t. 89. 1872–73. TYPE: Rio de Janeiro, Brazil, *Glaziou* 1740, probably at Rio de Janeiro, not seen. ISOTYPE: Paris, not seen, photo G, seen. *Pteris pedata* L. var. *palmata* (Willd.) Baker subvar. *elegans* (Vell.) Baker in Martius, Fl. Brasil. 1²: 408. 1870. *Doryopteris patula* (Fée) Fée, Crypt. Vasc. Brésil 2: 30. 1872–73. *Pellaea patula* (Fée) Prantl, Engl. Bot. Jahrb. 3: 419. 1882. *Pteris pedata* var. *Huberi* Christ, Bull. Boiss. 6: 993. 1898, ex char. TYPE: Serra Baturité, Ceará, Brazil, *Huber*, not seen. *Doryopteris arifolia* Christ in Schwacke, Pl. Nov. Mineiras 2: 25. 1900. Reference from C. Chr. Ind. Fil., description from Christ, Bull. Boiss. s. 2, 2: 548. 1902. TYPE: Ferromecco, Rio Grande do Sul, Brazil, *Kunert*, not seen. Prob-



VI. A, *DORYOPTERIS HYBRIDA*. B, *D. PEDATA* var. *PALMATA*. C, *D. NOBILIS*.

able ISOTYPE: same data, Kunert 6, US, seen, photo G, NY, seen. This is a mixed sheet. *Doryopteris elegans* (Vell.) Christ, Bull. Boiss. s. 2, 1: 429. 1901. *Doryopteris Huberi* Christ, Geogr. Farne, 312. 1912, without reference or basonym. *Pteris patula* (Fée) Lindm. Ark. f. Bot. 1: 210. 1903. *Doryopteris palmata* (Willd.) J. Sm. var. *elegans* (Vell.) Luetzelb. Est. Bot. Nordéste 3: 248. 1923. *Doryopteris patula* var. *latesinuata* Rosenst. Fedde Rep. Spec. Nov. 21: 346. 1925. TYPE: São Paulo, Brazil, Brade 7698, probably at Stockholm, not seen. ISOTYPE: G, NY, seen. *Doryopteris palmata* var. *patula* (Fée) [incorrectly attributed to C. Chr. by] Hassl. Trab. Inst. Bot. Farm. Buenos Aires, no. 45: 53. 1928. *Doryopteris pedata* var. *Huberi* (Christ) Brade, Rodriguesia 4: 297. 1940.

Rhizome short to moderately long, usually stout, compact: *stipe usually castaneous or red-brown*, rarely atropurpureous or blackish, naked, or rarely scaly at the base, usually nearly glabrous, sometimes pubescent, especially at the top and on the upper side, usually smooth, occasionally irregularly roughened, *plane or sulcate*, at least on part of the upper side, elsewhere terete or subterete: *fertile and sterile blades moderately to quite dimorphic, moderately coriaceous, usually with proliferous buds at the base*, the scales similar to those of the frond-buds but with a lighter central band: *sterile frond 4–65 cm. long; blade 2–27 cm. long*, entire, lanceolate or ovate-lanceolate and sagittate, or 3-lobed, deltoid and sagitto-hastate or hastate, the basal lobes rather long, sometimes nearly as long as the central lobe, or deeply lobed to moderately deeply bipinnatifid, pentagonal, with 5 to numerous ultimate segments: *ultimate segments deltoid-ovate to ovate-lanceolate, acute or acuminate, usually rather abruptly so, crenate or crenulate, usually with ascending*, rarely with spreading *teeth*, very rarely subentire; *tips crenate or crenulate with ascending teeth*; vein-ends nearly all free; hydathodes present on the upper surface: *fertile frond 15–80 cm. long; blade 8–30 cm. long*, pentagonal to suborbicular, rather deeply 5-lobed, the lateral lobes ascending and all about the same length or deeply bi- or tripinnatifid, with numerous ultimate segments: *ultimate segments deltoid to long-lanceolate, acute or acuminate, entire; sterile tips usually long*, rarely short, usually crenate or crenulate with ascending teeth, very rarely entire: *soral lines continuous around the sinuses: spores with a whitish, rugulose perispore*.

Brazil to northern Argentina and Bolivia; also in Colombia.

Representative specimens: COLOMBIA: Masinga Vieja, Santa Marta, August 1898–99, H. H. Smith 1085 (G, NY, US); Rio Pedras, Donama, Santa Marta, July, 1936, Bennett 61 (US); Armenia, vicinity of Medellin, November 1, 1927, Toro 762 (NY).

BRAZIL.—BAHIA: Rio Grongogy Basin, October 1–November 30, 1915, *Curran* 266 (G, US). MINAS GERAES: Caldas, January 22, 1864, *Henschen* 329x (US); May 6, 1845, *Regnell* 329 (US). (RIO DE JANEIRO): 1867–1868, *Webb* 56 (NY); Corcovado, 1891, *Rathburn* (US). SÃO PAULO: Morro das Pedras, 1926, *Brade* 7698 (G, NY); Pilar, October 4, 1902, *Gerdes* 74 (US); Cantareira, May, 1912, *Luederwaldt* (NY). PARANÁ: Ypiranga, March 9, 1935, *Reiss* 129 (G). SANTA CATHARINA: Lages, 1908, *Spannagel* (NY); Joinville, July 9, 1901, *Schmalz* 4 (NY). RIO GRANDE DO SUL: Santa Cruz, March, 1904, *Juergens* (Copel., US); Santo Angelo, January 19, 1893, *Lindman* A1019 (US); Trombudo, 1904, *Matschinske* (NY, US). PARAGUAY: El Chaco, September 13, 1893, *Lindman* A2077 (G, NY); Mbuveno, April 3, 1929, *Jorgensen* 4062 (G, NY, US); Sierra de Maracayú, *Hassler* 4372, 5701 (G); Rio Paraná, 1909–10, *Fiebrig* 5796 (G, US). ARGENTINA.—MISSIONES: Loreto, July, 1927, *Burkart* 1355, 1422 (G); San Ignacio, February 22, 1914, *Vattuone & Bianchi* 115 (US); Santa Ana, December, 1912, *Rodriguez* 130 (G). CHACO: General Vedia, January, 1935, *Schulz* 722 (G), September, 1937, *Meyer* 2352 (G). TUCUMÁN: Dept. Monteros, October 17, 1922, *Venturi* 9645 (G, US). BOLIVIA: May, 1911, *Herzog* 2143 (US).

D. nobilis is characterized by the long sterile tips of the fertile segments toothed with ascending teeth and the usual presence of proliferous buds at the base of the blade. It is the largest species of the section, the segments of the sterile blade are usually rather abruptly acute or acuminate and the stipe is usually rather light.

17. × *DORYOPTERIS HYBRIDA* Brade & Rosenst. Fedde Rep. Spec. Nov. **21**: 346. 1925. TYPE: São Paulo, Brazil, *Brade* 7697, probably at Stockholm, not seen. ISOTYPE: G, NY, seen. PLATE 6A.

Rhizome not seen: *stipe* atropurpureous, naked, glabrous or slightly pubescent, smooth, *terete*: *fertile and sterile blades slightly dimorphic, without proliferous buds*, moderately coriaceous: sterile frond and blade nearly as large as the fertile; *sterile blade rather deeply lobed, with 5 ultimate segments, the lateral ones long, but shorter than the central lobe, the basal ones reflexed and shorter than the laterals*: ultimate segments deltoid-ovate or ovate-lanceolate, acute or acuminate, sometimes rather abruptly so, usually crenate or crenulate with spreading or ascending teeth, sometimes subentire; *tips crenulate with ascending teeth*; vein-ends mostly free; hydathodes present on the upper surface: *fertile frond up to 65 cm. long; blade 12–35 cm. long, deeply lobed, deltoid or pentagonal, hastate, with 5 ultimate segments, the*

lateral ones long, but shorter than the central lobe, the basal reflexed and shorter than the laterals: ultimate segments deltoid-ovate to lanceolate, acute or acuminate, entire; sterile tips long, usually crenulate with ascending teeth, rarely subentire: soral lines continuous around the sinuses.

Known definitely only from the type locality, São Paulo, Brazil.

Specimens examined: Sheet labeled "*Pteris Alcyonis* Lindl., Hort. Bot. Lips. 1882" (NY). BRAZIL, SÃO PAULO: Morro das Pedras, September, 1917, Brade 7697 (G, NY).

Apparently a hybrid between *D. nobilis* and *D. sagittifolia*. Rosenstock says that Brade found it growing in the neighborhood of the two parent species and immediately considered it to be a hybrid of them.

The cutting of the fertile blade is intermediate between the two presumed parent species. The lateral segments are shorter than the central shank and the basal segments are shorter than the lateral ones. In *D. nobilis* 5-lobed blades have all of the lobes of nearly the same length (PL. 6C, FIG. 6) and in *D. sagittifolia* the rare 5-lobed phase has the lateral segments much shorter than the central shank and the basal lobes much shorter than the lateral ones (PL. 4A, FIG. 5).

18. DORYOPTERIS SAGITTIFOLIA (Raddi) J. Sm. Journ. Bot. **4**: 163. 1841. PLATE 4A; MAP 3.

Pteris sagittifolia Raddi, Opusc. Sci. Bologna **3**: 292. 1841; Pl. Brasil. **1**: t. 63, fig. 1. 1825. Mandioca, Brazil. The plate is taken as the TYPE, though there may be an actual type specimen at Bologna. *Pteris hastata* Raddi, Pl. Brasil. **1**: 43, t. 63, fig. 2. 1825. *Litobrochia sagittifolia* (Raddi) Presl, Tent. Pterid. 148. 1836. *Litobrochia hastata* (Raddi) Presl, Tent. Pterid. 148. 1836. *Doryopteris hastata* (Raddi) J. Sm. Journ. Bot. **4**: 163. 1841. "*Pteris hastifolia* Rddi. var." Kze. Linnaea **23**: 289. 1850, in synonym., apparently an error for "*hastata*". *Pteris sagittifolia* var. *sagittata* Hook. Sp. Fil. **2**: 207. 1858. *Pteris sagittifolia* var. *hastata* (Raddi) Hook. Sp. Fil. **2**: 208. 1858. *Pellaea sagittifolia* (Raddi) Prantl, Engl. Bot. Jahrb. **3**: 419. 1882.

Rhizome short, slender to moderately stout, compact: *stipe usually atropurpureous or blackish*, rarely red-brown, naked, or with a few scales at the base, glabrous, or rarely very slightly pubescent, usually smooth, occasionally irregularly roughened, *usually terete or subterete*, occasionally plane or broadly sulcate on the upper side: *fertile and sterile blades similar or slightly dimorphic*, without proliferous buds, moderately coriaceous: *sterile frond 8-28*

cm. long; *blade* 3.5–10 cm. long, *entire, oblong-lanceolate to broadly lanceolate, sagittate or cordate, the basal lobes quite short*: basal lobes rounded, acute or acuminate, sometimes abruptly so; margin of the blade usually entire, occasionally crenate with spreading or ascending teeth, or remotely crenate; vein-ends mostly free; hydathodes present on the upper surface: *fertile frond* 8–43 cm. long; *blade* 4.5–22 cm. long, *usually entire, oblong-lanceolate to long-lanceolate, sagittate, cordate or occasionally sagitto-hastate, the basal lobes much shorter than the central lobe, or rarely deeply 5-lobed, long-deltoid, hastate, the lateral lobes considerably shorter than the central lobe, the basal lobes much shorter than the laterals*: lobes or ultimate segments broadly ovate to long-lanceolate, rounded to acuminate, occasionally abruptly so, entire; sterile tips usually long, entire, or sometimes crenate or crenulate with spreading or ascending teeth: *soral lines continuous along the sides of the blade and around the sinuses, if present.*

Southern Brazil; isolated in Venezuela.

Representative specimens: VENEZUELA: Near Tovar, 1854–5, *Fendler* 366 (G). BRAZIL.—ESPIRITO SANTO: Serra da Caparaó: November 30, 1929, *Mexia* 4054 (G, US). RIO DE JANEIRO, Vicinity of Itatiaya, July 26–30, 1915, *Rose & Russell* 20590 (NY, US); Meio da Serra, April 7, 1929, *Smith & Brade* 2285 (G, US); Corcovado, November 28, 1928, *Smith & Vieira* 1375 (G, NY, US). SÃO PAULO: Toledo, 1904, *Ubricht* (US); Alto da Serra, 1906, *Wacket* (Copel., NY, US); Serra da Cantareira, June, 1913, *Brade* 6517 (NY). PARANÁ: Serra do Mar, Porto de Cima, July 11, 1914, *Dusén* 667a (G); Votha Grande, December 1, 1909, *Dusén* 8629 (G, NY, US). SANTA CATHARINA: Blumenau, April, 1888, *Ule* 138 (US); Joinville, November 29, 1901, *Schmalz* 130 (NY).

D. sagittifolia is easily recognized by the entire, lanceolate and sagittate fertile and sterile blades. The rare 5-lobed phase may be separated from $\times$ *D. hybrida* and *D. nobilis* as discussed under the former species. In technical characters it is apparently rather closely related to *D. nobilis*.

19. DORYOPTERIS COLLINA (Raddi) J. Sm. Journ. Bot. 4: 163. 1841. PLATE 4B; MAP 2.

Pteris collina Raddi, Opusc. Sci. Bologna 3: 292. 1819. TYPE: Rio de Janeiro, Brazil, *Raddi*, not seen. ISOTYPE: Geneva, not seen, photo G, seen. *Doryopteris euchlora* Kl. Linnaea 20: 342. 1847, ex char. TYPE: British Guiana, *Schomburgk* 798, not seen. *Pteris euchlora* Kze. ex Kl. Linnaea 20: 342. 1847, in synonym. *Pteris pedata* L. var. *collina* (Raddi) Baker in Martius, Fl. Brasil.

1²: 407. 1870. *Pellaea collina* (Raddi) Prantl, Engl. Bot. Jahrb. **3**: 419. 1882. *Doryopteris alcicornis* (Prantl) Diels var. *major* Christ, Bull. Boiss. s. 2, **3**: 614. 1903, nomen subnudum. TYPE: Paraguay, Hassler 6129, not seen. ISOTYPE: G, seen. *Doryopteris collina* f. *minor* [apparently incorrectly attributed to Rosenst. by] Luetzelb. Est. Bot. Nordéste **3**: 248. 1923, nomen nudum. *Doryopteris collina* f. *pygmaea* Brade, Bol. Mus. Nac. Rio Janeiro **5**: 95. 1929. TYPE: Herb. Mus. Nac. Rio Janeiro, no. 18643, not seen. *Doryopteris Campos-Portoi* Brade, Arch. Inst. Biol. Veg. Rio Janeiro **3**: 3, t. 5, figs. 2-5, t. 6, fig. 6. 1936. TYPE: Ilha Trindade, Brazil, *Campos Porto* 574, Rio de Janeiro, not seen.

Rhizome short to moderately long, moderately stout, compact: *stipe usually castaneous*, occasionally dark brown, sometimes the upper fourth atropurpureous or blackish, naked, or scaly on the lower part, pubescent, especially on the upper side, to nearly glabrous, usually smooth, occasionally slightly roughened by small longitudinal grooves, *wing-angled on the upper side, at least on the upper half or fourth: fertile and sterile blades moderately dimorphic*, without proliferous buds, coriaceous: *sterile* frond 3-23 cm. long; *blade* 0.7-6.5 cm. long, pentagonal or long-pentagonal, deeply 5-lobed, usually hastate, the lateral lobes shorter than the central one, or deeply bipinnatifid, with several ultimate segments: *ultimate segments* oblong-ovate to oblong-lanceolate, rounded or subacute, *entire; vein-ends mostly joined to mostly free; hydathodes not present on the upper surface: fertile* frond 6-45 cm. long; *blade* 2-15 cm. long, deeply bi- or tripinnatifid, usually pentagonal, sometimes suborbicular, rarely orbicular, with several to numerous ultimate segments: *ultimate segments* oblong-ovate to oblong-lanceolate, rarely linear, *entire; sterile tips short, entire: soral lines continuous around the sinuses.*

Brazil to Paraguay; also British Guiana and Ilha Trindade (20 S. Lat., 29 W. Long.).

Representative specimens: BRITISH GUIANA: Mount Iramaipkang, Kanuku Mountains, April 22, 1938, A. C. Smith 3655 (G, US). BRAZIL.—PARAHYBA: Serra do Patos, Luetzelburg 18926 (NY). BAHIA: Monte Cruzeiro, June 24, 25, 1915, Rose & Russell 20045 (US). MINAS GERAES: Bello Horizonte, July 10, 1940, Foster & Foster 593 (US); Paraisopolis, April 21, 1927, Hoehne (NY). RIO DE JANEIRO: Nitheroy, December 25, 1901, Dusén 152 (G, NY, US); Maricá, August 7, 1915, Rose & Russell 20740 (NY, US); Corcovado, July, 1915, Rose & Russell 21258 (NY, US); Mt. Itatiaya, December 31, 1928, L. B. Smith 1589 (G, NY, US), July 26-30, 1915, Rose & Russell 21491 (US); Itatiaya, June 4, 1913, Brade 6494 (NY); Vicinity of Itatiaya, July 26-30, 1915, Rose & Russell 20431 (NY, US). SÃO PAULO: Ilha das Alcatrazes, October, 1920, Luederwaldt (NY). PARA-

GUAY: Cerros de Tobaty, Cordillera centralis, September, 1900, Hassler 6129 (G); Armenia, January 16, 1900, Anisits 1938 (US).

D. collina is a distinctive species characterized by the wing-angled, castaneous or dark brown stipe and the absence of hydathodes on the upper surface of the sterile blade.

20. DORYOPTERIS VARIANS (Raddi) J. Sm. Journ. Bot. 4: 163. 1841. PLATE 8A; MAP 4.

Pteris varians Raddi, Opusc. Sci. Bologna 3: 292. 1819; Pl. Brasil. 1: t. 64. 1825. Corcovado, Rio de Janeiro, Brazil. The plate is taken as the TYPE. *Pteris hederacea* Presl, Delic. Prag. 1: 181. 1822. TYPE: Rio de Janeiro, Brazil, probably at Prague, not seen, probable fragment, "*Pteris hederacea* Presl, Rio Janeiro, Pohl, ex Presl", NY, seen. *Litobrochia varians* (Raddi) Presl, Tent. Pterid. 149. 1836. *Litobrochia hederacea* (Presl) Presl, Tent. Pterid. 149. 1836. *Pteris pedata* L. var. *hederacea* (Presl) Baker in Martius, Fl. Brasil. 1²: 408. 1870. *Pellaea hederacea* (Presl) Prantl, Engl. Bot. Jahrb. 3: 419. 1882. *Doryopteris hederacea* (Presl) Diels in Engl. & Prantl, Nat. Pfl. 1⁴: 270. 1899. *Doryopteris varians* f. *pluriloba* [apparently incorrectly attributed to Rosenst. by] Luetzelb. Est. Bot. Nordéste 3: 248. 1923, nomen nudum. *Doryopteris Branneri* Copel. Phil. Journ. Sci. 38: 148, t. 4. 1929. TYPE: Brazil, 1874, Branner, Herb. Copeland, seen. Sheet with same data, presumably an ISOTYPE, US, seen, photo G, NY, seen.

Rhizome short, moderately stout, compact: *stipe* black, naked, or scaly on the lower part, pubescent, especially at the top, to glabrous, usually slightly roughened by small longitudinal grooves, occasionally nearly smooth, *terete*: *fertile and sterile blades moderately to quite dimorphic*, without proliferous buds, coriaceous: *sterile* frond 3.5–14 cm. long; *blade* 1–4.5 cm. long, entire, orbicular and cordate in small blades to usually shallowly or moderately deeply lobed, pentagonal or long-pentagonal, with 5 to rarely 7 ultimate segments, usually hastate, the lateral segments slightly shorter than the terminal one: *ultimate segments* broadly deltoid to oblong-ovate, usually rounded, sometimes subacute, *entire*; *vein-ends* nearly all joined; *hydathodes* not present on the upper surface: *fertile* frond 10–40 cm. long; *blade* 4–16 cm. long, shallowly lobed to deeply tripinnatifid, pentagonal, with 5 to numerous ultimate segments: *ultimate segments* usually deltoid, sometimes lanceolate, rarely linear, rounded or subacute, entire; *sterile* tips short or nearly absent, entire: *soral lines* continuous around the sinuses.

Southern Brazil and British Guiana.

Specimens examined: BRITISH GUIANA: Kanuku Mountains, March 4–22, 1938, A. C. Smith 3296 (G, US). BRAZIL.—1874,

Branner (Copel. Herb. no. 230; U. S. Nat. Herb. no. 517444). MINAS GERAES: Ouro Preto, 1907, *Damazio* 1816 (NY). RIO DE JANEIRO: Near Rio de Janeiro, 1876, *James* (G); Tijuca, November, 1928, *Brade* 8564 (NY); Corcovado, July, 1915, *Rose & Russell* 21252 (NY, US), July, 1915, *Rose & Russell* 21258 (NY); Nova Cintra, July, 1887, *Ule* 254 (US), 1891, *Rathburn* (US); Federal District, March 23, 1929, *L. B. Smith* 2135 (G); Petropolis, 1928, *Brade* (NY); vicinity of Itatiaya, July 26–30, 1915, *Rose & Russell* 20431, 20606 (NY, US); Itamaraty, Organ Mountains, 1911, *Luetzelburg* 267 (NY, US); *Pohl* (NY).

The black, terete stipe separates this species from *D. collina*. The absence of hydathodes on the upper surface of the sterile blade distinguishes it from the other species of the section.

21. DORYOPTERIS REDIVIVA Fée, Crypt. Vasc. Brésil 2: 30, t. 89, fig. 1. 1872–73. Chosen over *D. angularis* Fée because of the better plate. TYPE: Tijuca, Rio de Janeiro, Brazil, *Glaziou* 5341, probably at Rio de Janeiro, not seen. ISOTYPE: Paris, not seen, photo G, seen. PLATE 5C.

Pteris palmata Willd. var. *lata* Hook. Gard. Ferns, t. 22 and text. 1862. *Pteris pedata* L. var. *palmata* (Willd.) Baker subvar. *lata* (Hook.) Baker in Martius, Fl. Brasil. 1²: 408. 1870. *Doryopteris angularis* Fée, Crypt. Vasc. Brésil 2: 29, t. 88, fig. 2. 1872–73. TYPE: Rio de Janeiro, Brazil, *Glaziou* 5340, probably at Rio de Janeiro, not seen. ISOTYPE: Paris, not seen, photo G, seen. *Doryopteris varians* (Raddi) J. Sm. var. *rediviva* (Fée) Luetzelb. Est. Bot. Nordeste 3: 249. 1923. *Doryopteris varians* var. *angularis* (Fée) Luetzelb. Est. Bot. Nordeste 3: 249. 1923.

Rhizome short, moderately stout, compact: stipe black, naked, or scaly at the base, glabrous or rarely very slightly pubescent, slightly roughened by small longitudinal grooves, terete: fertile and sterile blades palmately divided, or large fertile blades divided in a pedate manner, usually quite dimorphic, with proliferous buds at the base, the scales similar to those of the frond-buds and stipe, rarely without buds, coriaceous: sterile frond 3–17 cm. long; blade 0.5–6 cm. long, entire, orbicular and cordate to shallowly 5–7 lobed: lobes broadly deltoid, rounded, entire; vein-ends mostly joined to about half free; hydathodes present on the upper surface: fertile frond 9–40 cm. long; blade 4–15 cm. long, moderately deeply lobed to rarely deeply bipinnatifid, pentagonal to sub-orbicular, with 5 to several ultimate segments: ultimate segments deltoid to long-lanceolate, rounded or subacute, entire; sterile tips short and entire, or absent: soral lines continuous around the sinuses: spores with a whitish rugulose perispore.

Southern Brazil.

Specimens examined: BRAZIL.—*Riedel* (G); (U. S. Nat. Herb. no. 61624). RIO DE JANEIRO: Vicinity of Rio de Janeiro, 1864–70, *Monroe* (G); Tijuca, *Brade* 8597 (NY); Therezopolis, September, 1929, *Brade* 9484 (NY); Serra da Estrella, April 5, 1910, *Luetzelburg* 18924 (Copel., NY); Organ Mountains, 1910, *Luetzelburg* 12916 (Copel.). SÃO PAULO: Alto da Serra, 1902, *Wacket* (NY); Serra do Mar, 1909, *Wacket* 45 (NY), June, 1914, *Brade* 7583 (NY), 1908, *Wacket* (US).

D. rediviva is characterized by the black, terete stipe, the palmately veined blades (except in very large fertile ones) with hydathodes on the upper surface of the sterile, the proliferous buds and the spores with perispore.

III. MISCELLANEOUS SPECIES

The scales of *D. Kitchingii*, *D. ludens* and *D. cordifolia* have a semi-sclerotic, not sclerotic, central band and this character excludes them from sections *Lytoneuron* and *Eudoryopteris*. All three are apparently rather highly derived and their relationships are not clear. They do not form a natural group by themselves.

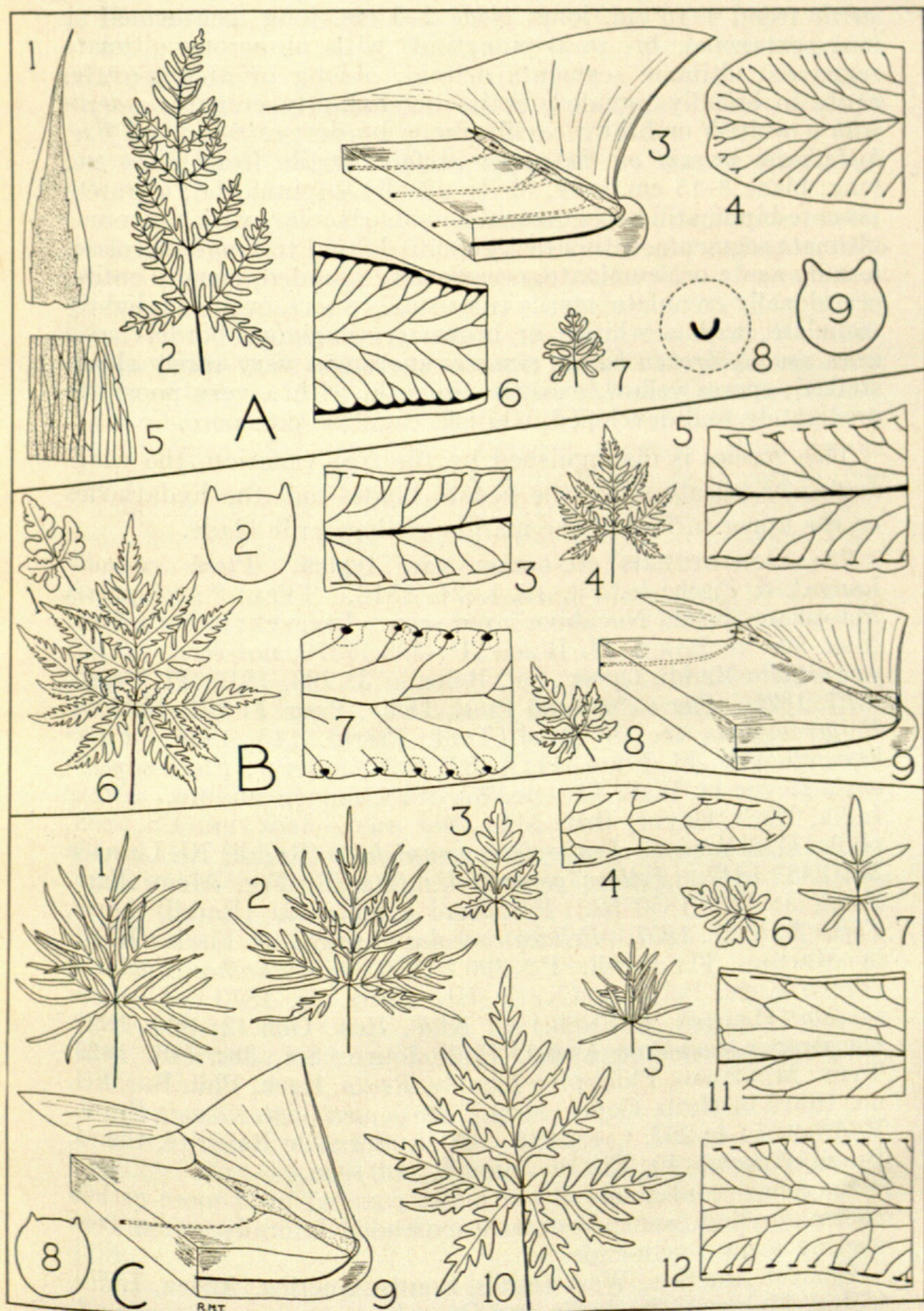
D. concolor has the scales of *Eudoryopteris* but it is free-veined. Also in var. *typica* the vascular commissure is only moderately developed and in var. *Kirkii* the soral condition is that of *Cheilanthes*.

D. decora would fit the characters of *Eudoryopteris* but it is placed here with *D. concolor* because it is undoubtedly closely related to that species and because it likewise has only a moderately developed vascular commissure.

Further study in related genera may clear up the relations of these five species and may indicate that one or more should be placed in another genus.

22. DORYOPTERIS CONCOLOR (Langsd. & Fisch.) Kuhn in v. d. Decken, Reisen in Ost-Afrika 3³: 19. 1879. PLATE 7B; MAP 12.

Rhizome moderately short, small to stout, compact: scales of the frond-buds and stipe as in section *Eudoryopteris*: stipe reddish brown to black, sometimes scaly, especially toward the base, glabrous or with a few short brown hairs, especially on the upper side, smooth or slightly irregularly roughened, usually wing-angled, sometimes sulcate, on the upper side, becoming plane or terete toward the base, with one U-shaped vascular bundle at the base: fertile and sterile blades similar, without proliferous buds, relatively thin to moderately coriaceous, with free venation:



VII. A, *DORYOPTERIS KITCHINGII*. B, *D. CONCOLOR*; FIGS. 1-6, 8-9, var. *TYPICA*; FIG. 7, var. *KIRKII*. C, *D. DECORA*; FIGS. 1, 4, 5, 7, 9, 11, 12, var. *TYPICA*; FIGS. 3, 6, 8, 10, var. *DECIPIENS*.

sterile frond 4–15 cm. long; blade 2–5 cm. long, pentagonal or long-pentagonal, bi- to tripinnatifid, with numerous ultimate segments: ultimate segments deltoid, oblong or oblong-ovate, acute to broadly rounded, entire or shallowly crenate; margin with a whitish or brown cartilaginous border; vein-ends all free; hydathodes present on the upper surface: fertile frond 5–34 cm. long; blade 3–15 cm. long, bi- to usually tripinnatifid, or rarely pinnate-bipinnatifid, pentagonal to suborbicular, with numerous ultimate segments: ultimate segments deltoid to long-lanceolate, usually acute or acuminate, occasionally rounded, usually entire, occasionally crenulate; sterile tips usually short, entire or slightly crenulate, with a whitish or brown cartilaginous border: soral lines usually broken by the sinuses: sporangia very rarely short-stalked: spores yellow, exospore smooth, with a very poorly to moderately well developed, whitish, rugulose perispore.

This species is distinguished by the free venation, the wing-angled or sulcate stipe, the pedate blades and the hydathodes on the upper surface of the margin of the sterile blade.

22a. *DORYOPTERIS CONCOLOR* var. **typica**. *Pteris concolor* Langsd. & Fisch. Ic. Fil. 19, t. 21. 1810. TYPE: "Archipelagi Marquesas; insula Nucahiva", not seen. ISOTYPE: in herb. Brit. Mus. acc. to Baker, Fl. Brasil. 1²: 396. 1870, not seen. *Pteris geraniifolia* Raddi, Opusc. Sci. Bologna 3: 293. 1819; Pl. Brasil. t. 67. 1825. *Pteris Pohliana* Presl, Delic. Prag. 1: 181. 1822. = *P. geraniifolia* acc. to Presl, Tent. Pterid. 145. 1836. *Pteris laciniata* Vell. Fl. Flum. 11: t. 89. 1827, not Sw. *Pteris mysurensis* Heyne ex Wall. List no. 87. 1828, nomen nudum. TYPE: India, Herb. Heyne, Brit. Mus., not seen. ISOTYPE: US, seen, photo, G, NY, seen. *Doryopteris geraniifolia* (Raddi) Kl. Linnaea 20: 343. 1847. *Pellaea geraniifolia* (Raddi) Fée, Mém. Fam. Foug. 5: 130. 1850–52. *Platyloma geraniifolia* (Raddi) Lowe, Ferns 3: t. 27. 1857. *Pellaea concolor* (Langsd. & Fisch.) Baker in Martius, Fl. Brasil. 1²: 396. 1870. *Cheilanthes Pohliana* (Presl) Keys. Polypod. Cyath. Hb. Bung. 25. 1873. *Allosorus concolor* (Langsd. & Fisch.) O. Ktze. Rev. Gen. 2: 806. 1891. *Doryopteris cuspidata* Copel. Phil. Journ. Sci. 38: 148. 1929. TYPE: Mindanao, Philippine Islands, Reillo, Herb. Phil. Bur. Sci. no. 16515 in Herb. Copel., seen. *Doryopteris baturitensis* Brade, Rodriguesia 4: 297, t. 1. 1940. TYPE: Serra de Baturité, Ceará, Brazil, Eugenio 40, Rio de Janeiro, not seen.

Sporangia contiguous at maturity, covered by a more or less continuous indusium; receptacle expanded laterally, often connecting several vein-ends.

Central America, West Indies, South America, Africa, India, China, Malaysia, Australia and Oceania.

Representative specimens:

CENTRAL AMERICA, EL SALVADOR: Izalco, July, 1923, *Calderón* 1713, 1714 (US).

WEST INDIES.—JAMAICA: Old Hope Copper Mine, *Hart* 94 (US); Gordontown, September, 1906, *A. Moore* (NY). GUADELOUPE: *Duss* (U. S. Nat. Herb. no. 524215). MARTINIQUE: *Duss* 1544 (NY). GRENADA: (NY).

SOUTH AMERICA.—COLOMBIA: Santa Marta, September, 1898–1901, *H. H. Smith* 1086 (G, NY, US); Tolima, *Lehmann* 6055 (US). BONAIRE (D. W. I.): *Boldingh* 7321 (NY). VENEZUELA: Between Caracas and La Guaira, October, 1916, *Rose* 21726 (G, NY, US); Curucutí (Federal District), February 20, 1920, *Pittier* 10220 (US). BRAZIL.—PARÁ: Pará (NY). PERNAMBUCO: Tápera, July 7, 1932, *Pickel* 39 (US). MINAS GERAES: Viçosa, November 3, 1930, *Mexia* 5246 (G, NY, US); Corinto, April 1, 1931, *Mexia* 5511 (G, US). RIO DE JANEIRO: Near Rio de Janeiro, October, 1887, *Ule* 358 (US); Monte de Cochrane, November 25, 1928, *L. B. Smith* 1334 (G). SÃO PAULO: Rio Grande, February, 1905, *Wacket* (Copel., NY, US); Loreno, June, 1926, *Sampaio* 16058 (NY). RIO GRANDE DO SUL: Rio Pardo, 1906, *Juergens* 10 (NY); Neu-Wurttemberg, March 20, 1904, *Bornmüller* 119 (G). URUGUAY: *Arechavaleta* 46 (US); Artigas, July 28, 1934, *Herter* 94701 (G). PARAGUAY: Cordillera do Altos, July 8, 1902, *Fiebrig* 12 (G, US); 1931, *Jorgensen* 4058 (NY, US). ARGENTINA.—MISSIONES: Posadas, November 18, 1907, *Ekman* 25 (NY); Loreto, July 26, 1931, *Moreau* (G). FORMOSA: Monte Guayenlec, *Jorgensen* 3276 (US). CHACO: Colonia Benítez, 1935, *Schulz* 720a (G); Napalpi, December, 1934, *Donat* 11 (G). SALTA: Dept. Orán, October 28, 1938, *Eyerdam & Beetle* 22711 (G); Cerro del Bemate, February 22, 1928, *Venturi* 5870 (US). TUCUMÁN: Rio Sali, Capital, February 7, 1921, *Venturi* 229 (US); Dept. Tafí, April 14, 1928, *Venturi* 6115 (US). BOLIVIA: Buena Vista, Santa Cruz, February 13, 1921, *Steinbach* 5288 (G, NY); near Asela, April 7, 1902, *R. S. Williams* 1173 (NY, US). PERU: Santa Ana, June 27, 1915, *Cook & Gilbert* 1553 (US); Prov. La Convención, Dept. Cuzco, May 12, 1936, *Mexia* 8053 (Copel., G, US). ECUADOR: James Island, Galapagos Islands, April 18, 1941, *Schmitt* 19 (G, US).

AFRICA: Natal, *Wood* (U. S. Nat. Herb. no. 1095675).

ASIA. INDIA: Pulney Hills, Madras, *Sauliere* 787 (US). CEYLON: *Hancock* 28 (US); *Ferguson* 41 (G). CHINA, HAINAN: December, 1878, *Hancock* 23 (G, US); Fan Yah, 1932–33, *Chun & Tsao* 44084 (G, NY). FORMOSA: September, 1906, *Nakahara* (US).

MALAYSIA. PHILIPPINE ISLANDS: Twin Peaks, Benguet, Northern Luzon, September 8, 1904, *R. S. Williams* 1503 (NY,

US); Luzon, *Cuming* 260 (G); Lutab, Benguet, Luzon, May, 1909, Copel. Pterid. Phil. Exsicc. 115 (Copel., NY, US). JAVA: 1898, *Raciborski* (US). TIMOR: 1882-3, *Forbes* 3837 (G). PAPUA (BRITISH NEW GUINEA): Rouna, May 26, 1935, *Carr* 12340 (NY); Rona, Laloki river, Central Division, April, 1933, *Brass* 3669 (NY).

AUSTRALIA: Mowbray river, North Queensland, January 22, 1932, *Brass* 1998 (US); Mount Julian, North Queensland, *Michael* 886 (G).

OCEANIA.—NEW CALEDONIA: *Franc* 357 (B, Copel., NY, US). NEW HEBRIDES: Wala, March, 1929, *Herre* 2 (NY). FIJI ISLANDS: Viti Levu, 1927, *Parks* 20487 (Copel., G, US); Levuka, Fiji, 1898, *Prince* (G, US). SAMOA: *Whitmee* 57 (G); Upolu, July 30, 1926, *Parks* 16425 (US). SOCIETY ISLANDS: Tevaitapu, Borabora, January 3, 1931, *Grant* 4926 (NY, US); Tahiti, May 21, 1922, *Setchell & Parks* 27 (G, US); Papeete, Tahiti, October, 1909, *Leland, Chase & Tilden* 68 (G, NY, US).

22b. DORYOPTERIS CONCOLOR var. KIRKII (Hook.) Fries, Wiss. Ergebn. Schwed. Rhodesia-Kongo Exp. 1¹: 4. 1914.

Cheilanthes Kirkii Hook. Second Cent. Ferns, t. 81. 1861. TYPE: Zambesi, Africa, *Kirk*, Kew, not seen, photo G, seen.

Sporangia discrete at maturity, sori discrete, covered by an indusial flap; receptacle fan-shaped.

Africa to India and Ceylon.

Representative specimens: AFRICA.—CAMEROON: 1897, *Zenker* 1459 (NY). UNION OF SOUTH AFRICA.—CAPE OF GOOD HOPE: King Williamstown, March, 1892, *Sim* 1578 (G); Cape Town (U. S. Nat. Herb. no. 61611). NATAL: Mapumulo, *Abraham* 4 (G, NY, US); Howick, February 18, 1895, *Schlechter* 6785 (NY, US). TRANSVAAL: Barberton, January, 1911, *Thorncroft* 115 (US); Pelindaba, Pretoria District, *Bottomley* 2071 (US). RHODESIA: Kafui, December 1, 1919, *Shantz* 451 (US). TANGANYIKA (GERMAN EAST AFRICA): Kilimanjaro, May, 1906, *Daubenberger* (Copel., US). UGANDA: Albert Nyanza, December 26, 1909, *Mearns* 2512 (US); Entebbe Road, October, 1931, *Hansford* 2295 (US). KENYA (BRITISH EAST AFRICA): Southeast of Narak, July 12, 1923, *Curtis* 737 (G); Loita Plains, July 12, 1923, *Curtis* 744a (G).

MADAGASCAR: Sambuano, 1925 (U. S. Nat. Herb. no. 1507508).

INDIA: Southern Hindustan, *Noyes* (U. S. Nat. Herb. no. 299616); Shevaroy Mountains, 1897-8, *Furrell* (US); Palni Hills, *Noyes* (G). CEYLON: *Beckett* 184 (G); *Thwaites* (G).

This is a remarkable variety differing from the typical in characters that would ordinarily be of generic importance. However, the two varieties are similar in all other characters and

intermediate conditions occur. In soral characters var. *Kirkii* is a *Cheilanthes*.

23. DORYOPTERIS DECORA Brack. U. S. Expl. Exp. **16**: 103, t. 13, fig. 1. 1854. TYPE: Hawaii, *Brackenridge*, U. S. Nat. Herb. no. 61616, seen, photo G, seen. ISOTYPE: NY, seen. PLATE 7C.

Rhizome short, usually stout, compact, or very compact and the stipes tufted: *scales of the frond-buds and stipe as in section Eudoryopteris: stipe dark castaneous to blackish*, usually naked, sometimes slightly scaly at the base, usually glabrous, occasionally very slightly pubescent, *smooth, wing-angled* on the upper side, with one U- or V-shaped vascular bundle at the base: *fertile and sterile blades* slightly to moderately dimorphic, without proliferous buds, relatively thin to moderately coriaceous, usually *with areolate venation*, sometimes with partially areolate venation, that is, with areolae only along the midnerves, sometimes the venation free toward the tips of the segments: *sterile* frond 3–16 cm. long; *blade* 1–7.5 cm. long, deeply lobed to bipinnatifid, deltoid to suborbicular, with 3 to several ultimate segments: ultimate segments oblong-ovate to strap-shaped, rounded or subacute, remotely crenate, or crenate with spreading or ascending teeth, sometimes subentire; *margin* with a whitish or brown cartilaginous border; *vein-ends* nearly all free; *hydathodes* present on the upper surface; fertile frond 3–45 cm. long; blade 2–16 cm. long, deeply bi- or quadripinnatifid to bipinnate-pinnatifid, ovate-lanceolate to orbicular, with several to numerous ultimate segments: ultimate segments deltoid to linear, rounded to acute, usually crenulate, sometimes entire: *soral lines* broken by the *sinuses*: spores yellow, exospore smooth, with a poorly developed whitish, rugulose perispore.

The important characters of this species are the wing-angled stipe and the highly divided, usually rather thin, fertile blade. The venation is often only partially areolate and the vascular commissure is often discontinuous.

23a. DORYOPTERIS DECORA var. **typica**. *Pteris decora* (Brack.) Hook. Sp. Fil. **2**: 210. 1858. *Litobrochia decora* (Brack.) Moore, Ind. Fil. 342. 1862.

Sterile blade pentagonal to suborbicular, the basal primary segments not lobed on the upper side: ultimate segments oblong-ovate to strap-shaped: fertile blade pedately divided, rarely tending to be pinnately divided, pinnate-pinnatifid to usually bipinnate-pinnatifid, ovate-lanceolate to orbicular, the basal pinnae larger than the second pair, sometimes only slightly so, lobed on the upper side with the basal lobes usually as long as

those on the lower side, sometimes considerably shorter: ultimate segments narrowly oblong to usually linear.

Hawaiian Islands.

Representative specimens: HAWAIIAN ISLANDS.—KAUAI: August 6, 1895, *Heller* 2654 (G, NY, US); Kaholuamanoa, September 2–9, 1895, *Heller* 1990 (G, NY); October 18, 1916, *Hitchcock* 15227 (US); Olokele canyon, August 10, 1924, *Topping* 2807 (NY). MOLOKAI: Kamalo gulch, June 29, 1928, *Degener* 9196 (NY). LANAI: *Hillebrand* (U. S. Nat. Herb. no. 816897). MAUI: Lahaina, December, 1887, *Safford* 882 (US); *E. Bailey* (B, NY). HAWAII: Hoopuloa, September, 1929, *Degener* 9197 (G, NY, US), August 2, 1911, *Forbes* 390H (NY); *Mann & Brigham* 253 (G, US).

The typical variety differs from var. *decipiens* in the pinnate rather than deeply pinnatifid fertile blade with the basal pinnae usually equally lobed on the upper and lower sides rather than strongly unequally lobed and the usually linear rather than oblong or deltoid ultimate segments.

23b. *DORYOPTERIS DECORA* var. ***decipiens*** (Hook.) n. comb.

Pteris decipiens Hook. Sp. Fil. 2: 209. 1858. TYPE: Oahu, Sandwich Islands, *Seemann*, Kew, not seen, photo *Seemann* 2240, G, seen. *Pteris Beecheyana* Hook. Sp. Fil. 2: 209. 1858, in synonym. *Litobrochia decipiens* (Hook.) Moore, Ind. Fil. 342. 1862. Reference and basonym not given but they can be traced through "*Doryopteris pedata*, Brack." *Doryopteris decipiens* (Hook.) J. Sm. Hist. Fil. 289. 1875.

Sterile blade deltoid to pentagonal, the basal primary segments sometimes lobed on the upper side: ultimate segments broadly ovate to narrowly oblong: fertile blade pedately divided, usually deeply tripinnatifid, occasionally bi- or quadripinnatifid, long-pentagonal to suborbicular, the basal primary segments larger than the second pair, usually lobed on the upper side with the basal lobes much shorter than those on the lower side: ultimate segments deltoid to narrowly oblong or oblong-lanceolate.

Hawaiian Islands.

Representative specimens: HAWAIIAN ISLANDS.—KAUAI: Nawiliwili, January 8, 1940, *Degener* 12673 (NY, US). OAHU: Honolulu, October 28, 1922, *Degener* 4159 (NY); Nuuanu, March 23, 1895, *Heller* 1990 (B, G, NY, US); Niu valley, June 4, 1932, *Topping* 3529 (NY, US); *Mann & Brigham* 136 (G, US); Kuliouau valley, June 23, 1935, *Degener, Park & Topping* 9928 (G, NY, US). MOLOKAI: Pohakunui gulch, May 6, 1928, *Degener* 9194 (G, NY, US); Waiahewahewa gulch, April 18, 1928, *Degener & Wiebke* 3587 (NY). LANAI: September 22, 1916,

Hitchcock 14698 (US). MAUI: *Remy* 38 (G); *E. Bailey* (NY); Near Haiku, August 5, 1927, *Wiebke & Topping* 3589 (NY, US).

This variety differs from *D. concolor* essentially only by the areolate venation and it seems undoubtedly to represent a development from that species.

Although conventionally maintained as a species, var. *decipiens* differs from var. *typica* only in characters of leaf-cutting and the two extremes are connected by frequent intermediates. Such intermediate specimens are: KAUAI: June 13, 1926, *Degener* 9198 (NY). OAHU: Kolekole Pass, May 1, 1932, *Degener* 9193 (NY, US); Waianae Range, April 12, 1932, *Yuncker* 3479 (US); Holpo Crater, February 15, 1910, *Forbes* 1452.0 (NY); Nuuanu valley, December, 1887, *Safford* 863 (US). MOLOKAI: Wawaia, June 27, 1928, *Degener* 9195 (NY).

24. DORYOPTERIS KITCHINGII (Baker) Bonap. ex C. Chr. Ind. Fil. Suppl. Prél. 13. 1917. PLATE 7A.

Pellaea Kitchingii Baker, Journ. Bot. 1880: 327. TYPE: Madagascar, *Kitching*, Kew, not seen, photo G, seen. *Allosorus Kitchingii* (Baker) O. Ktze. Rev. Gen. 2: 806. 1891.

Rhizome relatively long, moderately stout, creeping: scales of the frond-buds and stipe ovate-lanceolate, attenuate, entirely tawny and hyaline, or usually with a red-brown or dark red-brown, semi-sclerotic central band and relatively broad, tawny, hyaline margins, usually entire, sometimes obscurely toothed; the cells of the hyaline parts relatively long, mostly three or more times as long as broad: stipe castaneous to dark castaneous, usually naked, sometimes slightly scaly at the base and with a few fibrils at the top and base, glabrous, smooth, channeled or deeply sulcate on the upper side, with one U-shaped vascular bundle at the base: fertile and sterile blades elongate-pedately divided, tending to be pinnate, basal pinnae larger than the second pair, with the inner lobe on the lower side the longest, the basal lobes on the upper side much shorter than those on the lower side, slightly dimorphic, without proliferous buds, coriaceous, with free venations: sterile frond 14–18 cm. long; blade 3–5 cm. long, pinnate-pinnatifid to pinnate-bipinnatifid, deltoid to long-deltoid, with numerous ultimate segments: ultimate segments oblong-ovate to narrowly oblong, rounded, usually shallowly and remotely crenate, sometimes entire; margin with a whitish or brown cartilaginous border; vein-ends free; hydathodes not present on the upper surface: fertile frond 21–45 cm. long; blade 4–12 cm. long, pinnate-bipinnatifid to bipinnate-pinnatifid, deltoid to ovate-lanceolate: ultimate segments oblong-ovate to narrowly oblong, rounded,

entire; sterile tips very short or absent: *soral lines broken by the sinuses*: spores yellow, exospore smooth or minutely roughened, without a perispore.

Endemic to Madagascar.

Specimens examined: MADAGASCAR: April, 1881, *Hildebrandt* 4163 (F, US); November 25, 1912, *Viguier & Humbert* 1598 (F).

This species is quite distinct by reason of the channeled stipe, free venation, elongate-pedate blade and absence of hydathodes on the upper surface of the sterile blade.

25. *DORYOPTERIS LUDENS* (Wall. ex Hook.) J. Sm. Hist. Fil. 289. 1875. PLATE 8B; MAP 11.

Pteris ludens Wall. List no. 88. 1828, nomen nudum; ex Hook. Sp. Fil. 2: 210. 1858. TYPE: India, *Wallich* 88, Kew, not seen, photo G, seen. *Doryopteris Wallichii* J. Sm. Journ. Bot. 3: 404; 4: 163. 1841, nomen nudum. TYPE: Philippine Islands, *Cuming* 238, Kew, not seen. ISOTYPE: G, seen. *Litobrochia Smithii* Moore, Ind. Fil. 342. 1862, nomen nudum. Based on *D. Wallichii* J. Sm. *Litobrochia ludens* (Wall. ex Hook.) Bedd. Ferns Brit. India, t. 27. 1865. *Pellaea ludens* (Wall. ex Hook.) Prantl, Engl. Bot. Jahrb. 3: 419. 1882. *Doryopteris papuana* Copel. Phil. Journ. Sci. Bot. 6: 86. 1911. TYPE: Goodenough Bay, Papua, *King* 208, Herb. Copeland, seen.

Rhizome slender, elongate, extensively creeping: scales of the frond-buds and stipe ovate-lanceolate to long-lanceolate, acuminate or attenuate, entirely red-brown or blackish and semi-sclerotic, or usually with a red-brown to blackish, semi-sclerotic central band and narrow to moderately broad, brown or light brown, hyaline margins, usually remotely and rather coarsely toothed; the cells of the hyaline parts relatively long, mostly three or more times as long as broad: stipe usually atropurpureous or black, rarely dark brown, usually scaly with fibrils, rarely nearly naked, pubescent with moderately long, brown hairs, occasionally nearly glabrous, usually slightly roughened with small longitudinal grooves, sometimes smooth, terete, with one V-shaped vascular bundle at the base that is often flat or square on the bottom: fertile and sterile blades typically divided in a pedate manner, usually quite dimorphic, relatively thin to moderately coriaceous, with areolate venation: sterile frond 4–45 cm. long; blade 2–15 cm. long, quite variable, entire, ovate-lanceolate and sagittate, the basal lobes quite short, or shallowly to moderately deeply lobed, ovate-lanceolate to long-pentagonal, with 5 ultimate segments, often hastate, the lateral segments much shorter than the terminal one, or bipinnatifid, pentagonal, with several ultimate segments: ultimate segments broadly ovate to lanceolate, usually acuminate, often abruptly so, occasionally acute or rounded, usually entire, occasionally

rather irregularly crenate or crenulate; *margin with* a whitish or brown cartilaginous border; *vein-ends nearly all free*; *hydathodes present on the upper surface*: fertile frond 20–65 cm. long; blade 9–20 cm. long, long-pentagonal, pentagonal or suborbicular, deeply lobed, with 5 ultimate segments, the lateral segments much shorter than the terminal one, or deeply bi- or tripinnatifid, with numerous ultimate segments: ultimate segments deltoid-ovate to long-lanceolate, rounded, acute or acuminate, crenulate or entire; sterile tips usually long, entire or slightly crenate, with a whitish or brown cartilaginous border: *soral lines usually continuous around all of the sinuses*, rarely broken by the sinuses of some of the primary segments: *spores brown, exospore smooth, with a brown, rather coarsely rugose perispore*.

Burma, India and Yunnan, China to Java, Philippine Islands and Papua.

Representative specimens:

ASIA.—INDIA: Maymyo, Burma, October, 1915, *J. F. Smith* 89 (G). CHINA: Yuan-Ching, Yunnan, December 28, *Henry* 13325 (NY, US). FRENCH INDO-CHINA: Prov. Lang-Son, January, 1926, *Colani* 3450 (NY, US); Cochinchina, 186–, *Pierre* 5790 (Copel.). SIAM: Lad Bua Kao, near Korat, November 22, 1920, *Rock* 503 (US). FEDERATED MALAY STATES: Bukit Lagi, Perlis, November 16, 1929, *Corner & Henderson* 22815 (US).

MALAYSIA.—JAVA: Tenggor Mountains, Pogal, 1906, *Maupet* (US), 1909, *Maupet* (Copel., G); Pogal, February, 1910, *Moussel* 188 (G), July, 1909, *Moussel* 188 (US). PHILIPPINE ISLANDS, LUZON.—ILOCOS NORTE: Mount Nagapatan, August, 1918, *Ramos* 33245 (US). BENGUET: Twin Peaks, March 12, 1908, *Bartsch* 219 (US), September 8, 1904, *R. S. Williams* 1501 (NY, US), May, 1904, *Elmer* 6349 (NY, US). PANGASINAN: Mount San Isidro, Labrador, November, 1917, *Fénix* 30032 (NY, US); Umingan, April–June, 1914, *Otanes* 17677 (US). NUEVA ECIJA: Mount Umingan, August–September, 1916, *Ramos & Edano* 26293 (US). RIZAL: Montalban, December 1, 1907, *Topping* 857 (G, US); Wawa, August 13, 1908, *Topping* 1014 (G, US); Boso-boso, July, 1906, *Ramos* 1078 (Copel., NY, US). PAPUA (BRITISH NEW GUINEA): Near Rouna Falls, May 27, 1935, *Carr* 12372 (NY); Goodenough Bay, 1908, *King* 208 (Copel.); *King* 388 (Copel.).

As the name implies, this species is extremely variable in leaf-form. The slender, elongate rhizome separates it from all other areolate-veined species. The spores are characteristic. Its local distribution is apparently well correlated with calcareous rocks.

26. *DORYOPTERIS CORDIFOLIA* (Baker) Diels in Engl. & Prantl, Nat. Pfl. 1⁴: 270. 1899. PLATE 8C.

Pteris cordifolia Baker, Journ. Bot. 1891: 4. TYPE: Bé Kilus Mountains, Madagascar, J. T. Last, Kew, not seen, photo G, seen.

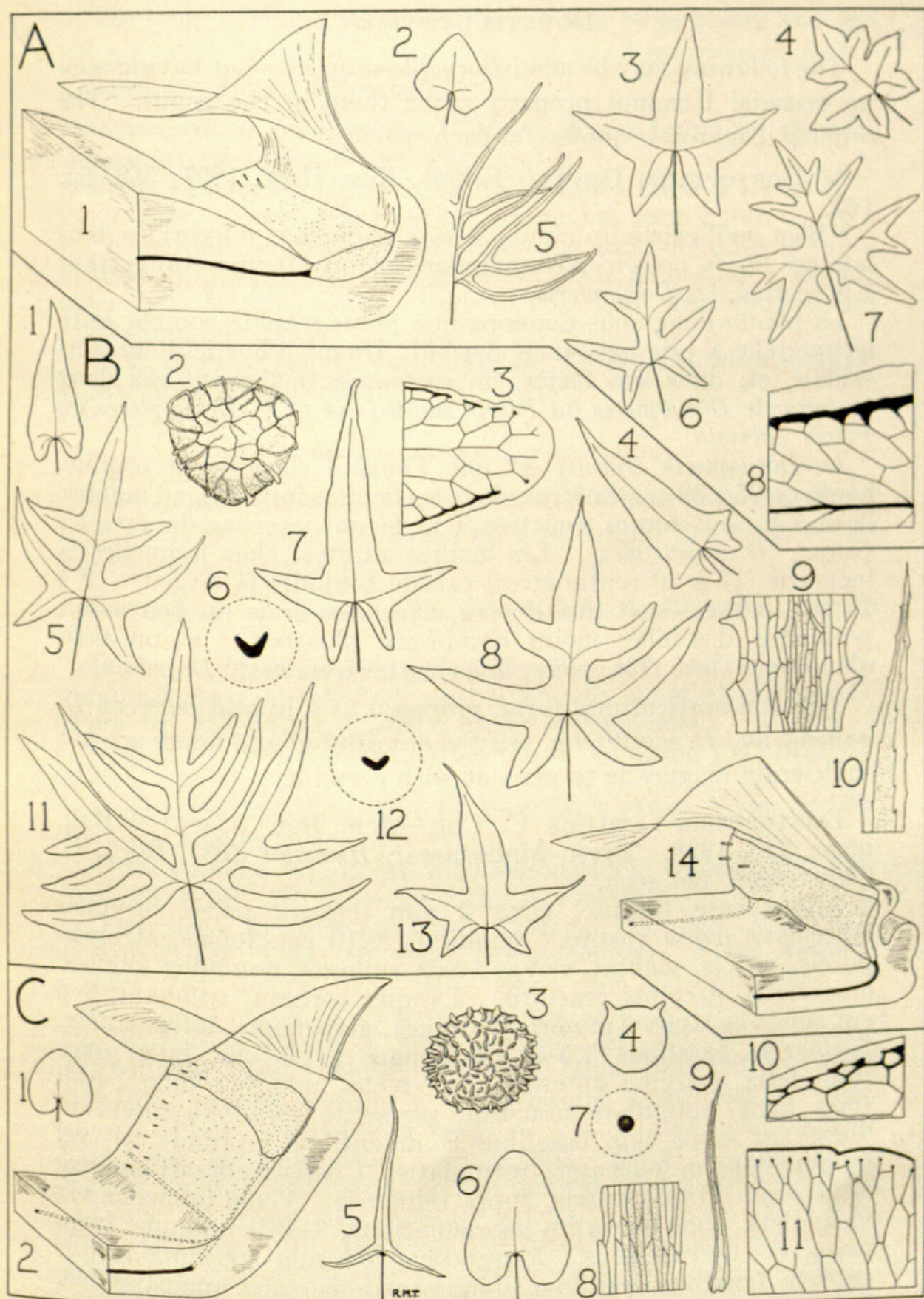
Rhizome short, slender, compact: scales of the frond-buds and stipe lanceolate to long-lanceolate, subattenuate, entirely red-brown and semi-sclerotic, or usually with a red-brown to blackish, semi-sclerotic central band and very narrow, light brown, hyaline margins; the cells of the hyaline parts relatively long, three or more times as long as broad: stipe castaneous to atropurpureous, naked, or with scales and fibrils, especially on the lower part, pubescent with short to moderately long, brown hairs (especially toward the top and on the upper side) to nearly glabrous, smooth, deeply sulcate on the upper side, with one terete vascular bundle at the base: fertile and sterile blades completely dimorphic, usually with proliferous buds at the base, the scales similar to those of the frond-buds and stipe, relatively thin, with areolate venation: sterile frond 2.5–25 cm. long; blade 1.2–13 cm. long, entire, orbicular to oblong-ovate, cordate; tip broadly rounded or acute; basal lobes rounded; margin entire, with a red-brown to black, sclerotic border; vein-ends nearly all free; hydathodes present on the upper surface: fertile frond 18–37 cm. long; blade 4–12 cm. long, deltoid, deeply 3-lobed, hastate, or the lateral lobes slightly reflexed: ultimate segments long-lanceolate to linear, acute or acuminate, entire; sterile tips moderately long, entire, with a whitish or brown cartilaginous border: soral lines continuous around the sinuses: spores yellow, exospore with small but definite short ridges, without a perispore.

Endemic to Madagascar.

Specimens examined: MADAGASCAR: Massif du Beampingaratra (Sud-Est), Vallée de la Maloto, October 31–November 1, 1928, Humbert 6258 (G, US).

The deeply sulcate stipe with a single terete vascular bundle, the thin, entire sterile blade with proliferous buds and a dark, sclerotic border, the 3-lobed fertile blade and the characteristic spores set this species off as unique. It is apparently a very highly derived type. The soral condition is subacrostichoid. Receptacular xylem is distributed, somewhat irregularly, along the outer areolae and the sporangia are borne throughout the soriferous band thus formed, both in relation to the xylem and on the leaf-tissue. This condition, incidentally, is almost identical with that of *Acrostichum praestantissimum* as figured by Bower.¹

¹ Bower, The Ferns 3: 58, figs. 621, 622. 1928.

VIII. A, *DORYOPTERIS VARIANS*. B, *D. LUDENS*. C, *D. CORDIFOLIA*.

DOUBTFUL SPECIES

The following may be good *Doryopteris* species but having seen no material I cannot properly place them in the genus. The original diagnosis is quoted for each species.

× *DORYOPTERIS DUVALII* Bellair, Rev. Hort. 1897: 563, fig. 168.

“Bien qu’il existe un nombre assez important d’hybrides dans le genre *Pteris*, nous n’en connaissons encore aucun se rapportant à la section des *Doryopteris*.

La plante dont nous donnons une photographie comble cette lacune; elle a pris naissance chez M. Duval, l’horticulteur versaillais, et, dans son faciès, on reconnaît facilement ses deux parents: le *Doryopteris* ou *Pteris sagittifolia* et le *Doryopteris* ou *Pteris palmata*.

Le *Doryopteris Duvalii* est une Fougère élégante et touffue, haute de 25 à 30 centimètres, dont les feuilles initiales, au nombre de 5 à 8, sont toutes sagittées à la façon de celles du premier parent (*D. sagittifolia*). Les feuilles adultes, chez lesquelles la longueur (15 à 20 centimètres) excède toujours la largeur (12 à 15 centimètres) sont multilobées, avec des sinus un peu moins profondes, des lobes moins nombreux, plus larges et un tissu d’une texture plus épaisse que chez les frondes du *D. palmata*.”

This is a horticultural form, proposed as a hybrid between *D. palmata* and *D. sagittifolia*, but the description and figure are not sufficiently diagnostic to place it with certainty.

DORYOPTERIS LATILOBA C. Chr. Arch. Bot. (Caen) 2 Bull. mens. 213. 1928. TYPE: Madagascar, *Humbert* 3195, Herb. C. Christensen, not seen.

“Rhizomate repente, circa 2 mm. crasso, paleis brunneis lanceolatis dense vestito. Stipitibus 8–10 cm. longis, atropurpureis, nitidis, glabris, versus basin squamis nonnullis anguste lanceolatis, deciduis praeditis. Lamina cordata, trilobata, 3–6 cm. longa et lata vel minori, chartacea, glaberrima, infra pallida. Segmentis basalibus 1.5–3 cm. longis 1–1.5 cm. latis apice rotundatis, margine anteriore fere recto, inferiore lobo basali (raro binis) rotundato praedito; segmento terminali interdum libero sed saepe cum basalibus confluentibus profunde tri- vel quinque-lobato, lobis apice rotundatis. Costis medianis laminae et lorum atropurpureis, supra immersis. Venis immersis vix visibilibus, libris curvatim ascendentibus, 3–4-dichotomis, intra marginem desinentibus. Marginibus foliorum steriliū leviter crenatis tenuibus, fertiliū ubique soriferis, soris angustissimis, indusiis membranaceis, pallidis, integris.”

The long, creeping rhizome, the pinnate large blades and the winged rachis indicate that this may be, as Christensen suggests,¹ a dwarf form of *D. Kitchingii*.

DORYOPTERIS PEDATOIDES (Desv.) Kuhn in v. d. Decken, *Reisen in Ost-Afrika* 3³: 63. 1879.

Pteris pedatoides Desv. *Mém. Soc. Linn. Paris* 6²: 293, t. 7, fig. 2. 1827. TYPE: Isle Bourbon, Paris, not seen, photo G, seen.

"Frondibus trilobatis: lobis sinuato-lobatis; nervibus in lobos evanescentibus; frond. fertilibus in lobos pinnatifidis: laciniis lanceolatis, sinubus acutis; stipite tereti, nitido, discolore (atrato) apici subpulverulento."

C. E. Bewsher (U. S. Nat. Herb. no. 816949), without locality, is probably this species.

DUBIOUS AND REJECTED NAMES

I am unable to place the following names. They are either improperly published, or based on a mixture of material, or are insufficiently described.

Doryopteris cordifolia J. Sm. *Journ. Bot.* 4: 163. 1841, nomen nudum.

Pteris polytoma Kze. *Linnaea* 23: 289, 322. 1850. Hort. no specimen cited; description not sufficiently detailed to place it. Hook. *Sp. Fil.* 2: 208, places it under *Pteris pedata*.

Doryopteris praealta Fée, *Mém. Fam. Foug.* 5: 133. 1850-52, nomen nudum.

Doryopteris trifoliata Bory ex Fée, *Mém. Fam. Foug.* 5: 133. 1850-52, nomen nudum.

Pteris palmata Willd. var. *angustiloba* Hook. *Gard. Ferns*, text for t. 22. 1862. No type cited; this is a mixture.

Doryopteris Alcyonis Linden "ex Regel," *Ind. Sem. Hort. Bot. Petrop. Suppl.* 1864: 10. 1865, nomen nudum. *Pteris Alcyonis* Linden "ex Regel", *Ind. Sem. Hort. Bot. Petrop.* 1865: 30. 1866, nomen nudum. "*Pteris Alcyonis* Lind. p. c. (Lind. cat.—*Pt. sagittifolia* Raddi β. *hastata* Hook. *Sp. Fil.* II. p. 208.—*Doryopteris* Hort." Regel, *Ind. Sem. Hort. Bot. Petrop.* 1866: 20. 1867, nomen nudum. "*D[oryopteris] sagittifolia*, J. Sm.; . . . *Pteris sagittifolia*, Radd. . . . *Litobrochia sagittifolia*,—var. *alcyonis*, *Gard. Chron.* 1863.—Brazil" J. Sm. *Ferns Brit. & Foreign*, 195. 1866, nomen nudum. *Litobrochia Alcyonis* (Linden "ex Regel") [incorrectly attributed to Presl by] Salom. *Nom. Gefässkr.* 217. 1883, as *Lithobrochia*, nomen nudum. As

¹ Christensen. *The Pteridophyta of Madagascar*, *Dansk Bot. Ark.* 7: 118. 1932.

far as I have been able to determine, the epithet *Alcyonis* has never been validly published. Linden might have done so but I have been unable to consult any of his catalogues of the proper years. A sheet of $\times$ *D. hybrida* labeled "*Pteris Alcyonis* Lindl. Hort. Bot. Lips. 1882" suggests that it may represent that species.

Pellaea hederacea (Presl) Prantl var. *anisoloba* Kze. ex Prantl, Engl. Bot. Jahrb. **3**: 429. 1882. No type cited; differs from Prantl's *P. hederacea* in the pubescent stipe but his species is such a mixture that the variety cannot be identified.

"*Pteris decipiens* Hook. β *P. Var. intermedia*" E. Bailey, Haw. Ferns 27. 1883.

Doryopteris Borbonica Christ, Denkschr. Ak. Wien **79**: 34. 1907, nomen nudum.

EXCLUDED SPECIES

The following species have been referred to *Doryopteris* or *Cassebeera* (an illegitimate name) and I am excluding them from *Doryopteris*. The species described under *Cassebeera* are included because that genus has often been considered to be closely related to the free-veined species of *Doryopteris*. In connection with *Cassebeera* I also discuss some closely related species.

Several species here referred to *Pellaea* may not belong there but until that genus is worked out it seems the best place to put them.

The species are arranged alphabetically under the name to be excluded. The basynym, if any, is given, the accepted name, if different from the basynym, and in some cases the name under another genus that might possibly be revived for the species. The accepted name is indicated by small capitals. The basis upon which I exclude the species is given, except in such a well-known case as *Cheilanthes argentea*.

The quotations are from Mr. C. A. Weatherby's notes on the type specimens.

I. SPECIES REFERRED TO CASSEBEERA AND SOME CLOSELY RELATED SPECIES.

The following species are apparently closely related and approach *Doryopteris* in having a fairly well developed vascular commissure. In *Pellaea pinnata* it is nearly always continuous.

However, they are alike in four characters which, I think, naturally exclude them from *Doryopteris* and indicate that at the

present time they can best be referred to *Pellaea*. These are: the deeply channeled stipe, rachis and costae of the pinnae, at least the stalk; the imparipinnate blade; the pinnate type of division of the blade with equilaterally, if at all, divided lower pinnae, or with subinequilaterally divided lower pinnae, but *not* approaching a pedate condition; and the brown, shallowly pitted spores with a whitish, rugulose perispore.

Cassebeera Kaulf. is illegitimate (see synonymy under *Doryopteris*) and the correct name for the genus, if maintained, is *Bakeropteris* O. Ktze.

1. *Cassebeera gleichenioides* Gardn. ex Hook. Ic. Pl. t. 507. 1843. TYPE: Diamond District, Brazil, *Gardner* 5295, Kew, not seen, photo G, seen. *Ormopteris gleichenioides* (Gardn. ex Hook.) J. Sm. Hist. Fil. 281. 1875. *Bakeropteris gleichenioides* (Gardn. ex Hook.) O. Ktze. Rev. Gen. 2: 808. 1891. *PELLAEA GLEICHENIOIDES* (Gardn. ex Hook.) Christ, Bull. Boiss. s. 2, 2: 545. 1902. PLATE 3E, FIGS. 12, 13.

Scales very long and narrow, usually entirely tawny, sometimes with a sclerotic, atropurpureous or blackish central band. Stipe, rachis and costae of pinnae channeled. Blade imparipinnate. Pinnae deeply pinnatifid, or once pinnate, the lower ones sometimes equilaterally bipinnate. Receptacle formed by the fan-shaped vein-ends that are usually expanded laterally to form a commissure between two to all of the vein-ends in a lobe. Sporangia short-stalked. Spores brown, slightly pitted, with a whitish, rugulose perispore.

2. *Cassebeera pinnata* Kaulf. Enum. Fil. 217, t. 1, fig. 11. 1824. *Cassebeera petiolata* Fée, Mém. Fam. Foug. 7: 30, t. 12, fig. 4. 1857, as *Cassebeeria*. On the basis of *Gardner* 3556 (US), one frond of which matches Fée's plate, I follow Baker, Fl. Brasil. 12: 394. 1870, in reducing this to *C. pinnata*. *PELLAEA PINNATA* (Kaulf.) Prantl, Engl. Bot. Jahrb. 3: 418, 1882. PLATE 3E, FIG. 8. *Bakeropteris pinnata* (Kaulf.) O. Ktze. Rev. Gen. 2: 808. 1891. *Bakeropteris petiolata* (Fée) O. Ktze. Rev. Gen. 2: 808. 1891.

Scales very long and narrow, usually entirely reddish-tawny, rarely with a sclerotic, atropurpureous central band. Stipe, rachis and stalks of pinnae channeled. Blade imparipinnate. Pinnae pinnatifid, the lower ones sometimes equilaterally pinnate-pinnatifid. Receptacle a vascular commissure that unites all, or nearly all, of the vein-ends in a lobe. Sporangia long-stalked. Spores brown, shallowly pitted, with a whitish, rugulose perispore.

3. *PELLAEA RIEDELI* Baker, Ann. Bot. **5**: 213. 1891. TYPE: Central Brazil, *Riedel*, Kew, not seen. PLATE 3E, FIG. 9.

Riedel, G, apparently is an ISOTYPE and the following description is drawn from it.

Scales very long and narrow, entirely reddish-tawny. Stipe, rachis and costae of pinnae channeled. Blade imparipinnate. Pinnae entire or usually equilaterally pinnate. Receptacle fan-shaped, narrow, or expanded laterally, sometimes so that a commissure is formed connecting two to several vein-ends. Sporangia medium to long-stalked. Spores brown, slightly pitted, with a whitish, rugulose perispore.

Note: *Pellaea Bongardiana* Baker in Martius, Fl. Brasil. **1**²: 397, t. 55, fig. 2. 1870.

Pellaea brasiliensis Baker, Engl. Bot. Jahrb. **17**: 522. 1893. TYPE: *Glaziou* 20158, not seen. ISOTYPE: Copenhagen, not seen, photo G, seen.

These two species are apparently very closely related to, if not synonymous with, *P. Riedelii*. They differ from the other species discussed, as does *P. Riedelii*, in the fully bipinnate blade and narrowly oblong to shortly linear, entire segments.

4. *PELLAEA crenata* n. sp. PLATE 3E, FIGS. 1-7.

Rhizomate brevi, crasso: paleis lanceolato-ovatis vel longe lanceolatis, attenuatis, atro-ferrugineo-brunneis vel nigris, duris, margine membranaceo, fulvo: stipitibus rhachibusque valde castaneis, glabris, profunde canaliculatis: lamina imparipinnata, glabra, coriacea; venis libris; pinnis pinnulisque non-articulatis: fronde sterili 4-15 cm. longa; lamina 2-6 cm. longa, pinnata, ovata; pinnis anguste oblongibus vel linearibus, leviter remoteque crenatis: fronde fertili 15-32 cm. longa; lamina 7-11 cm. longa, pinnata vel basi bipinnata, ovata vel deltoideo-ovata; segmentis anguste oblongibus vel linearibus, leviter remoteque crenatis vel plerumque integris: soris submarginalibus, maturitate contiguis: indusio aliquando lato, membranaceo, continuo vel regulariter ad crenationes majores interruptis, margine integro: sporangio longe pedicellato.

Rhizome short, moderately stout, compact: scales of the frond-buds lanceolate-ovate to long-lanceolate, attenuate, with a dark red-brown to blackish, sclerotic central band and tawny, hyaline margins, entire or sparingly toothed; cells of the hyaline margins mostly two or more times as long as broad: stipe and rachis dark castaneous, naked, or the stipe with a few scales at the base, glabrous, deeply channeled on the upper side, the stipe with one U- or V-shaped vascular bundle at the base: fertile and sterile blade pinnately divided, imparipinnate, similar, glabrous, coriaceous, with free venation; stalks of the pinnae deeply channeled on the upper side; pinnae and pinnules non-

articulate; basal pinnae subinequilaterally divided in well developed blades: sterile frond 4–15 cm. long; blade 2–6 cm. long, once pinnate, ovate, with 2–5 pinnae; pinnae narrowly oblong to linear, subacute, shallowly and remotely crenate; hydathodes not present at the margin on the upper surface: fertile frond 15–32 cm. long; blade 7–11 cm. long, once pinnate or usually bipinnate at the base, ovate to deltoid-ovate, with up to 12 pinnae; basal pinnae undivided or usually once pinnate, with 1–3 pinnules on the lower side only, or in larger fronds, with 1–2 slightly shorter pinnules on the upper side: segments narrowly oblong to linear, acute, shallowly and remotely crenate or mostly entire; margin strongly revolute: sori contiguous at maturity, the sporangia forming a more or less continuous submarginal line, sometimes regularly broken by the crenations: indusium moderately broad, continuous with the soral lines, membranous, entire: receptacle fan-shaped or roundish, often expanded laterally, sometimes connecting two vein-ends, occasionally several: sporangia long-stalked: spores tetrahedral-globose, brown, slightly pitted, with a whitish, rugulose perispore.

TYPE: Cerro do Cipo, 1400 m., Vaccaria north of Bello Horizonte, Minas Geraes, Brazil, July 12, 13, 1940, *Foster & Foster* 624 (US). ISOTYPE: (G).

Pellaea crenata is apparently most closely related to the species listed above, especially to *P. pinnata* and *P. Riedelii*. It differs from *P. gleichenioides*, *P. pinnata* and *P. Riedelii* in its relatively short and broad scales with a well developed, dark, sclerotic central band; and from *P. gleichenioides* also in its long-stalked sporangia. The cutting of the blade is also different and the species are compared in this character as follows.

In *P. Riedelii*, *P. Bongardiana* and *P. brasiliensis* the blade is fully bipinnate with the pinnules narrowly oblong to shortly linear and entire. In *P. crenata*, *P. pinnata* and *P. gleichenioides* the blade is once pinnate, or bipinnate at the base. The pinnules and undivided pinnae of *P. crenata* are narrowly oblong to linear and shallowly and remotely crenate or mostly entire; those of *P. pinnata* are similar but more deeply lobed, that is, deeply and remotely crenate; and those of *P. gleichenioides* are narrower and very deeply lobed, usually cut to the midnerve or costa so that the blade is technically bipinnate or tripinnate.

II. SPECIES REFERRED TO DORYOPTERIS

5. *Doryopteris argentea* (Gmel.) Christ, Bull. Boiss. s. 2, 2: 831. 1902. *Pteris argentea* Gmel. Nova Comm. Acad. Petr. 12: 519, t. 12, fig. 2. 1768. CHEILANTHES ARGENTEA (Gmel.) Kze. Linnaea 23: 242. 1850.

6. *Doryopteris articulata* (Kaulf. ex Spreng.) Fée, Mém. Fam. Foug. 5: 133. 1850-52. *Pteris articulata* Kaulf. ex Spreng. Syst. 4: 76. 1827. PELLAEA ANGULOSA (Bory ex Willd.) Baker, Syn. Fil. Ed. 2, 153. 1874. PLATE 3E, fig. 10. *Pteris angulosa* Bory ex Willd. Sp. Pl. 5: 377. 1810. Synonymy according to C. Chr. Dansk Bot. Ark. 7: 115. 1932.

Blade pinnate, with typical *Pellaea* type of division. Venation areolate. Sporangia long-stalked, borne on an almost perfectly continuous vascular commissure. Spores yellow, essentially smooth. (Webb 4, G).

7. *Doryopteris australiae* Bonap. Notes Ptérid. 4: 100. 1916. TYPE: Port Darwin, Australia, 1882, Tate, Paris, not seen, photo G, seen. PELLAEA or NOTHOLAENA.

"Sori elongate on the outer portion of the veins, reaching about half-way to the costa, but not half the length of the very oblique veins. Sporangia short-stalked."—C. A. W.

8. *Doryopteris crispatula* (Baker) C. Chr. Ind. Fil. 243. 1905. *Pellaea crispatula* Baker, Ann. Bot. 5: 215. 1891. TYPE: Rio de Janeiro, Brazil, Glaziov 14405, Kew, not seen, photo G, seen. ISOTYPE: US, seen. PLATE 3E, FIG. 11. The only material I have seen is the isotype and photograph of the type.

Blade simple, auricled at the base, thin. Venation areolate. Sori oblong, parallel to the margin, or roundish. Receptacles terminating free vein-ends (roundish) or on the outer walls of areolae (oblong). Sporangia short-stalked. Spores yellow-brown, with a whitish, rugulose perispore. See *D. lonchophora*.

9. *Doryopteris deltoidea* (Kze.) Diels in Engl. & Prantl, Nat. Pfl. 14: 269. 1899. CHEILANTHES DELTOIDEA Kze. Linnaea 10: 535. 1836.

Burchell 2033, G, which has cheilanthoid sori and short-stalked sporangia.

10. *Doryopteris Duclouxii* Christ, Bull. Acad. Géogr. Bot. Mans 1902: 231. CHEILANTHES DUCLOUXII (Christ) Ching, Ic. Fil. Sinicarum 3: t. 133. 1935.

Ching is undoubtedly correct in referring this to *Cheilanthes*. He cites *Cavalerie* 1212 and *Wilson* 5297; these are *Cheilanthes*, see *D. muralis* and *D. Veitchii*. It belongs to the *Cheilanthes argentea* complex.

11. *Doryopteris Fournieri* (Baker) C. Chr. Ind. Fil. 244. 1905. *PELLAEA FOURNIERI* Baker, Syn. Fil. Ed. 2, 476. 1874, based on *Pellaea flavescens* Fourn. Mex. Pl. 1: 119. 1872, not Fée, 1869. *Pellaea* according to C. Chr. Ind. Fil. Suppl. 3: 78. 1934.

12. *Doryopteris Harrisonae* (Jenm.) C. Chr. Ind. Fil. 244. 1905. *Pteris Harrisonae* Jenm. Gard. Chron. 1898: 414. TYPE: Kaie-teur Falls, British Guiana, *Jenman*, NY, seen.

The only material I have seen is the type. This is a single plant and in such poor and fragmentary condition I cannot place it. There are no completely fertile fronds.

13. *Doryopteris lonchophora* (Römer ex Mett.) J. Sm. Hist. Fil. 289. 1875. *Pteris lonchophora* Römer ex Mett. Cheil. 4, t. 3, figs. 1-3. 1859. *Heteropteris Doryopteris* Fée, Crypt. Vasc. Brésil 1: 123, t. 10, fig. 2. 1869. TYPE: Serra da Estrella, Rio de Janeiro, Brazil, *Glaziou* 939, probably at Rio de Janeiro, not seen, fragment "ex Fée", NY, seen. ISOTYPE: Paris, not seen, photo G, seen. Mettenius' description and figures apparently represent the same species described later by Fée.

Blade simple, auricled at the base, or hastate, the lateral lobes each with a lobe on the lower side, thin. Venation areolate. Sori oblong, parallel to the margin, or roundish. Receptacles terminating free vein-ends (roundish) or on the outer walls of areolae (oblong). Sporangia long-stalked. Spores yellow, with a whitish, rugulose perispore. (*Glaziou* 939).

This species and *D. crispatula* are certainly closely related. I think they should be excluded from *Doryopteris* on the basis of the receptacular condition. Also the thin blades and whitish, rugose spores, although included within the range of *Doryopteris*, are not at all typical of it. As noted, *D. crispatula* has short-stalked sporangia.

At the present time they cannot reasonably be included in any genus and perhaps a genus should be proposed for them. I hesitate to do this because I have only seen a single collection of each species and because a new name would be necessary since *Heteropteris* Fée cannot be revived. (*Heteropteris* Fée, Crypt. Vasc. Brésil 1: 123. 1869, not Fée, Dix. Congr. Sci. France 1: 178. 1843, nor HBK. Nov. Gen. Spec. Pl. 5: 163. 1822.)

14. *Doryopteris Mairei* Brause, Hedwigia 54: 206, t. 4, fig. J. 1914. TYPE: Yunnan, China, *R. P. Maire* 6502, Berlin, not seen. ISOTYPE: Herb. Copel., seen. Ceraceous indument beneath. Cheilanthoid sori. Sporangia short-stalked. A CHEILANTHES, probably of the *C. argentea* complex.

15. *Doryopteris Michellii* Christ, Bull. Acad. Géogr. Bot. Mans 1910: 14. TYPE: China, *Michel* 1018, Paris, not seen, photo G, seen.

White-farinose beneath. Sori "discrete on the somewhat transversely thickened vein-ends. Sporangia short-stalked."—C. A. W. Spores yellow, with a slightly roughened, whitish perispore. A CHEILANTHES, probably of the *C. argentea* complex.

16. *Doryopteris muralis* Christ, Bull. Acad. Géogr. Bot. Mans 1904: 111. TYPE: China, *Cavalerie* 1212, Paris, not seen, photo G, seen.

"Lower surface rather densely glandular, the glands of the type which secrete ceraceous indument, of which, however I find no trace. Sori on the suborbicular vein-ends. Sporangia short-stalked."—C. A. W. Spores yellow, with a slightly roughened, whitish perispore. A CHEILANTHES, probably of the *C. argentea* complex.

17. *Doryopteris phanerophlebia* (Baker) Diels in Engl. & Prantl, Nat. Pfl. 14: 269. 1899. *Pteris phanerophlebia* Baker, Journ. Bot. 1881: 367. ADIANTUM PHANEROPHLEBIUM (Baker) C. Chr. Dansk Bot. Ark. 7: 123, t. 49. 1932.

18. *Doryopteris pilosa* (Poir.) Kuhn in v. d. Decken, Reisen in Ost-Afrika 33: 63. 1879. *Pteris pilosa* Poir. in Lam. Encycl. 5: 717. 1804. TYPE: Bourbon, *Commerson*, Paris, not seen, photo G, seen. CHEILANTHES ? *C. heterophylla* Willd. ex Kaulf. Enum. Fil. 210. 1824.

Blade hairy and scaly. Spores rugose. "Sporangia long-stalked."—C. A. W. The type is sterile, data on the sporangia and spores were taken from *de l'Isle* 431, Paris.

19. *Doryopteris rigida* (Sw.) Diels in Engl. & Prantl, Nat. Pfl. 14: 269. 1899. *Pteris rigida* Sw. Syn. Fil. 104, 299. 1806. *Cheilopecton rigidum* (Sw.) Fée, Mém. Fam. Foug. 7: 34. 1857, as *Cheilopecton*. PELLAEA RIGIDA (Sw.) Hook. Sp. Fil. 2: 144. 1858.

Pellaeoid receptacle but sorus with only a few sporangia. Spores yellow, smooth.

20. *Doryopteris robusta* (Kze.) Diels in Engl. & Prantl, Nat. Pfl. 14: 269. 1899. *Allosorus robustus* Kze. Linnaea 10: 502. 1836. TYPE: Namaqua Land, South Africa, *Drège*, Herb. Kunze, not seen. ISOTYPE: NY, seen. CHEILANTHES **robusta** (Kze.), n. comb.

Sporangia short-stalked, 2-4 to a sorus. Receptacle fan-shaped or roundish. Stipe reddish brown. Spores yellow-brown, smooth. (*Drège*).

21. *Doryopteris Skinneri* (Hook.) C. Chr. Ind. Fil. 245. 1905. PELLAEA SKINNERI Hook. Sp. Fil. 2: 141, t. 118 B. 1858. TYPE: Guatemala, *Skinner*, Kew, not seen, photo G, seen.

Sori on the separate vein-ends. Receptacle fan-shaped and often somewhat laterally extended, rarely those of two adjacent

vein-ends joining. Sporangia short-stalked. Spores yellowish, somewhat rugose with a whitish and brown perispore. (*Pringle* 2586.)

22. *Doryopteris squamosa* (Hope & Wright) C. Chr. Ind. Fil. 245. 1905. *Pellaea squamosa* Hope & Wright, Journ. Linn. Soc. 35: 518. 1903. TYPE: Yunnan, China, *Henry* 13209, Kew, not seen, photo G, seen. CHEILANTHES HOPEANA C. Chr. Ind. Fil. Suppl. 18. 1913.

Blade described as scaly and white-farinose beneath. "Vein-ends not strongly dilated. Sporangia short-stalked."—C. A. W. Spores yellow with a whitish, rugulose perispore.

23. *Doryopteris tamburii* (Hook.) C. Chr. Acta Hort. Goth. 1: 86. 1924. *Pellaea tamburii* Hook. Sp. Fil. 2: 134, t. 129 A. 1858. TYPE: Tambur River, Nepal, India, *Hooker*, Kew, not seen, photo G, seen. CHEILANTHES TAMBURII (Hook.) Moore, Ind. Fil. 254. 1861.

Cheilanthoid sori. Sporangia short-stalked. Spores brown, minutely pitted. The type was identified by Christensen and Ching in 1930 as *Cheilanthes tamburii*.

24. *Doryopteris Veitchii* Christ, Bull. Acad. Géogr. Bot. Mans 1906: 134. TYPE: China, *Wilson* "5396", not seen, 5297 (not 5397), Paris, not seen, photo G, 5297, seen. CHEILANTHES VEITCHII (Christ) Ching ex C. Chr. Ind. Fil. Suppl. 3, 55. 1934.

White-farinose beneath. "Sori discrete on thickened vein-ends. Sporangia short-stalked."—C. A. W. Spores yellow, with a whitish, rugulose perispore. Belongs to the *Cheilanthes argentea* complex.

EXPLANATION OF PLATES

PLATE I. A. DORYOPTERIS PARADOXA: Fig. 1, fertile segment, $\times 6$, Rio de Janeiro, Brazil, *Brade* 10093; Fig. 2, fertile segment, $\times 6$, Minas Geraes, Brazil, *Chase* 9705; Fig. 3, fertile segment, $\times 5.5$, Rio de Janeiro, Brazil, *Brade* 15513; Fig. 4, part of fertile segment, $\times 24$, Minas Geraes, Brazil, *Chase* 9705; Fig. 5, sterile blade, $\times 0.35$, Minas Geraes, Brazil, *Damazio* (NY); Fig. 6, sterile blade, $\times 0.85$, Minas Geraes, Brazil, *Damazio* (US); Fig. 7, fertile blade, $\times 0.35$, Minas Geraes, Brazil, *Damazio* (US); Fig. 8, sterile blade, $\times 0.35$, Minas Geraes, Brazil, *Chase* 9705; Fig. 9, sterile blade, $\times 1.4$, Rio de Janeiro, Brazil, *Rose & Russell* 20532 (US); Fig. 10, fertile blade, $\times 0.35$, Minas Geraes, Brazil, *Chase* 9705.

B. D. CRENULANS: Fig. 1, part of fertile segment, $\times 24$, Paraná, Brazil, *Dusén* 15099 (G); Fig. 2, fertile blade, $\times 0.35$, Paraná, Brazil, *Anniés* (NY); Fig. 3, sterile blade, $\times 0.35$, Paraná, Brazil, *Reiss* 23; Fig. 4, fertile blade, $\times 0.35$, Bolivia, *Buchtien* 7038 (US); Fig. 5, sterile blade, $\times 0.35$, Paraná, Brazil, *Anniés* (NY); Fig. 6, fertile segment, $\times 4.5$, Paraná, Brazil, *Dusén* 15099 (G).

C. D. TRIPHYLLA: Fig. 1, part of fertile segment, $\times 28$, Paraguay, *Hassler* 6570; Fig. 2, vascular bundle near base of stipe, $\times 14$, Paraguay, *Hassler* 6570; Fig. 3, vascular bundle near base of stipe, $\times 26$, Uruguay, *Rosengurtt* B 1844 (G); Fig. 4, scale, $\times 12$, Paraguay, *Hassler* 6570; Fig. 5, fertile segment (sclerotic tissue at sinuses), $\times 5$, Paraguay, *Hassler* 6570; Fig. 6, fertile blade,

$\times 0.35$, Uruguay, *Rosengurtt* B 1844 (G); Fig. 7, sterile blade, $\times 0.7$, Uruguay, *Gilbert* 609; Fig. 8, part of scale near middle, $\times 70$, Paraguay, *Hassler* 6570; Fig. 9, sterile blade, $\times 0.35$, Paraguay, *Hassler* 6570; Fig. 10, fertile blade, $\times 0.35$, Paraguay, *Hassler* 6570.

D. D. *ITATIAIENSIS*: Fig. 1, part of fertile segment, $\times 24$, Rio de Janeiro, Brazil, *L. B. Smith* 1758 (G); Fig. 2, fertile blade, $\times 0.35$, Rio de Janeiro, Brazil, *L. B. Smith* 1758 (G); Fig. 3, sterile blade, $\times 0.35$, Rio de Janeiro, Brazil, *Dusén* 1135; Fig. 4, fertile segment, $\times 5.5$, Rio de Janeiro, Brazil, *L. B. Smith* 1758 (G).

PLATE II. A. *DORYOPTERIS LOMARIACEA*: Fig. 1, sterile blade, $\times 0.25$, Rio Grande do Sul, Brazil, *Kunert* 26; Fig. 2, sterile segment, $\times 4.5$, São Paulo, Brazil, *L. B. Smith* 1856 (G); Fig. 3, fertile segment, $\times 4$, São Paulo, Brazil, *L. B. Smith* 1856 (G); Fig. 4, part of fertile segment, $\times 25$, São Paulo, Brazil, *L. B. Smith* 1856 (G); Fig. 5, sterile blade, $\times 0.25$, Rio Grande do Sul, *Kunert* 26; Fig. 6, fertile blade, $\times 0.25$, Minas Geraes, Brazil, *Mexia* 5705 (US); Fig. 7, fertile blade, $\times 0.25$, São Paulo, Brazil, *L. B. Smith* 1856 (G); Fig. 8, vascular bundles near base of stipe, $\times 12$, São Paulo, Brazil, *L. B. Smith* 1856 (G).

B. D. *TIJUCANA*: Fig. 1, fertile segment, $\times 3.5$, Rio de Janeiro, Brazil, *L. B. Smith* 1251 (G); Fig. 2, part of fertile segment, $\times 23$, Rio de Janeiro, Brazil, *L. B. Smith* 1251 (G); Fig. 3, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Ule* 257; Fig. 4, sterile blade, $\times 0.25$, Rio de Janeiro, *Ule* 257.

C. D. *SUBSIMPLEX*: Fig. 1, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Lima & Brade* s. n.; Fig. 2, fertile segment, $\times 3.5$, Rio de Janeiro, Brazil, *Lima & Brade* 13131; Fig. 3, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Lima & Brade* 13131; Fig. 4, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Lima & Brade* 13130; Fig. 5, part of fertile segment, $\times 23$, Rio de Janeiro, Brazil, *Lima & Brade* 13131; Fig. 6, sterile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Lima & Brade* 13131; Fig. 7, sterile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Lima & Brade* 13130.

D. D. *ACUTILOBA*: Fig. 1, part of fertile segment, $\times 25$, Paraná, Brazil, *Annies* (NY); Fig. 2, fertile blade, $\times 0.25$, Paraná, Brazil, *Annies* (US); Fig. 3, sterile blade, $\times 0.25$, Paraná, Brazil, *Annies* (US); Fig. 4, fertile segment, $\times 5$, Paraná, Brazil, *Annies* (NY); Fig. 5, sterile blade, $\times 0.25$, Paraná, Brazil, *Annies* (US).

PLATE III. A. *DORYOPTERIS RUFA*: Plant, reduced, Minas Geraes, Brazil, *Godoy* 28 (Herb. Sect. Bot. Agron. Inst. Biol. Defesa Agric. Animal São Paulo), drawn from *Brade*, *Filices novae Brasilianae* I, Bol. Mus. Nac. Rio Janeiro 5: t. 2, fig. 2. 1929.

B. D. *ORNITHOPUS*: Fig. 1, sterile blade, $\times 0.3$, Minas Geraes, Brazil, *Lindman* A137; Fig. 2, scale, $\times 4$, São Paulo, Brazil, *Edwak*; Fig. 3, part of scale near middle, $\times 16$, São Paulo, Brazil, *Edwak*; Fig. 4, part of fertile segment, $\times 16$, Minas Geraes, Brazil, *Lindman* A137; Fig. 5, vascular bundles near base of stipe, $\times 7$, Minas Geraes, Brazil, *Lindman* A137; Fig. 6, fertile segment, $\times 3$, São Paulo, Brazil, *Edwak*; Fig. 7, sterile segment, $\times 2$, Minas Geraes, Brazil, *Lindman* A137; Fig. 8, fertile blade, $\times 0.3$, São Paulo, Brazil, *Brade*; Fig. 9, sterile blade, $\times 0.3$, Minas Geraes, Brazil, *Lindman* A137.

C. D. *QUINQUELOBATA*: Fig. 1, sterile blade, $\times 0.3$, Rio de Janeiro, Brazil, *Brade* 8634; Fig. 2, fertile segment, $\times 2$, Rio de Janeiro, Brazil, *Dusén* 2530; Fig. 3, part of fertile segment, $\times 16$, Rio de Janeiro, Brazil, *Dusén* 2530 and *Glaziou* 7011; Fig. 4, fertile blade, $\times 0.3$, Rio de Janeiro, Brazil, *Brade* 8634; Fig. 5, fertile blade, $\times 0.3$, Rio de Janeiro, Brazil, *Glaziou* 7011; Fig. 6, vascular bundle near base of stipe, $\times 11$, Rio de Janeiro, Brazil, *Dusén* 2530; Fig. 7, sterile blade, $\times 0.3$, Rio de Janeiro, Brazil, *Glaziou* 7011.

D. D. *ROSENSTOCKII*: Fertile and sterile plants, reduced, Rio de Janeiro, *Brade* 5297 (Herb. Mus. Nac. Rio Janeiro), drawn from *Brade & Rosenstock*, *Filices novae Brasilianae* II, Bol. Mus. Nac. Rio Janeiro 7: t. 8. 1931.

E. PELLAEA CRENATA: All from Minas Geraes, Brazil, *Foster & Foster* 624. Fig. 1, fertile segment, $\times 4$ (G); Fig. 2, sterile frond, $\times 0.3$ (US); Fig. 3, cross section of stipe half way to blade, $\times 8$ (US); Fig. 4, vascular bundle near base of stipe, $\times 8$ (US); Fig. 5, fertile blade, $\times 0.3$ (US); Fig. 6, scale, $\times 5.5$ (US); Fig. 7, part of fertile segment, $\times 20$ (G).

P. PINNATA: Fig. 8, fertile segment, $\times 5$, Minas Geraes, Brazil, *Chase* 9149 (US).

P. RIEDELI: Fig. 9, fertile segment (receptacle curves above the vein and back toward the midnerve), $\times 11$, Brazil, *Riedel* (G).

P. ANGULOSA: Fig. 10, fertile segment, $\times 7$, Madagascar, *Webb* 4 (G).

P. CRISPATULA: Fig. 11, fertile segment, $\times 7.5$, Rio de Janeiro, Brazil, *Glaziov* 14405 (US).

P. GLEICHENIOIDES: Fig. 12, fertile segment (receptacle curves above the vein and back toward the midnerve), $\times 6$, Minas Geraes, Brazil, *Mexia* 5814 (G); Fig. 13, scale, $\times 5.5$, Minas Geraes, Brazil, *Mexia* 5814 (G).

PLATE IV. A. DORYOPTERIS SAGITTIFOLIA: Fig. 1, part of fertile segment, $\times 24$, Paraná, Brazil, *Dusén* 8629 (NY); Fig. 2, sterile blade, $\times 0.25$, Paraná, Brazil, *Dusén* 667a; Fig. 3, cross section of stipe half way to blade, $\times 10$, Rio de Janeiro, Brazil, *Smith & Vieira* 1375 (G); Fig. 4, cross section of stipe half way to blade, $\times 13$, Paraná, Brazil, *Dusén* 667a; Fig. 5, fertile blade, $\times 0.25$, São Paulo, Brazil, *Brade* 6517; Fig. 6, fertile blade, $\times 0.25$, Paraná, Brazil, *Dusén* 8629 (NY); Fig. 7, fertile segment, $\times 2$, Rio de Janeiro, Brazil, *Smith & Vieira* 1375 (G).

B. D. COLLINA: Fig. 1, sterile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Rose & Russell* 20740 (NY); Fig. 2, part of fertile segment, $\times 28$, British Guiana, A. C. *Smith* 3655 (G); Fig. 3, cross section of stipe three-fourths way to blade, $\times 12$, Rio de Janeiro, Brazil, *Dusén* 152 (US); Fig. 4, vascular bundle near base of stipe, $\times 12$, British Guiana, A. C. *Smith* 3655 (G); Fig. 5, fertile segment, $\times 4.5$, Paraguay, *Hassler* 6129; Fig. 6, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, L. B. *Smith* 1589 (G); Fig. 7, sterile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Rose & Russell* 20740 (NY); Fig. 8, vascular bundle near base of stipe, $\times 8$, Paraguay, *Hassler* 6129; Fig. 9, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Dusén* 152 (US); Fig. 10, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Dusén* 152 (US).

C. D. LORENTZII: Fig. 1, sterile blade, $\times 0.25$, Peru, *Cook & Gilbert* 1479; Fig. 2, fertile blade, $\times 0.25$, Bolivia, *Buchtien* 3397 (US); Fig. 3, fertile blade, $\times 0.25$, Rio Grande do Sul, Brazil, *Eugenio* 24; Fig. 4, fertile segment (semi-sclerotic tissue at sinus), $\times 4.5$, Chaco, Argentina, *Schulz* 720; Fig. 5, part of fertile segment, $\times 21$, Chaco, Argentina, *Schulz* 720; Fig. 6, fertile blade, $\times 0.25$, Bolivia, *Buchtien* 473; Fig. 7, sterile segment, $\times 2.5$, Misiones, Argentina, *Vattuone & Bianchi* 165; Fig. 8, sterile blade, $\times 0.25$, Salta, Argentina, *Malonado* 402.

D. D. JUERGENSE: Fig. 1, fertile blade, $\times 0.25$, Rio Grande do Sul, Brazil, *Juergens* s. n.; Fig. 2, sterile segment, $\times 3.5$, Rio Grande do Sul, Brazil, *Juergens* s. n.; Fig. 3, sterile blade, $\times 0.25$, Rio Grande do Sul, Brazil, *Juergens* s. n.; Fig. 4, fertile segment, $\times 4.5$, Rio Grande do Sul, Brazil, *Juergens* s. n.; Fig. 5, part of fertile segment, $\times 21$, Rio Grande do Sul, Brazil, *Juergens* s. n.

PLATE V. A. DORYOPTERIS PEDATA var. TYPICA: Fig. 1, sterile blade, $\times 0.25$, Cuba, *Maxon* 4467 (NY); Fig. 2, fertile blade, $\times 0.25$, Jamaica, *Clute* 301 (NY); Fig. 3, sterile blade, $\times 0.25$, Jamaica, *Sherring* (US); Fig. 4, fertile blade, $\times 0.25$, Porto Rico, *Shafer* 3041 (US); Fig. 5, fertile blade, $\times 0.25$, Cuba, *Palmer & Riley* 507 (US); Fig. 6, spore, $\times 650$, Cuba, *Wright* 867 (G); Fig. 7, sterile blade, $\times 0.25$, Cuba, *Palmer & Riley* 507 (US); Fig. 8, part of fertile segment, $\times 30$, Porto Rico, *Shafer* 3041 (US); Fig. 9, cross section of stipe half way to blade, $\times 13$, Cuba, *Palmer & Riley* 507 (G).

B. D. PEDATA var. MULTIPARTITA: Fig. 1, sterile blade, $\times 0.25$, Rio Grande do Sul, Brazil, *Eugenio* 22 (NY); Fig. 2, fertile segment, $\times 5.5$, Tucumán,

Argentina, *Venturi* 9587 (G); Fig. 3, cross section of stipe half way to blade, $\times 10$, Chaco, Argentina, *Schulz* 721; Fig. 4, fertile blade, $\times 0.25$, Bolivia, *R. S. Williams* 1175; Fig. 5, sterile blade, $\times 0.25$, British Guiana, *A. C. Smith* 3295 (NY); Fig. 6, fertile blade, $\times 0.25$, Rio Grande do Sul, Brazil, *Lindman* A281 (NY); Fig. 7, fertile blade, $\times 0.25$, Paraná, Brazil, *Gonslyn* 39 (NY).

C. D. REDIVIVA: Fig. 1, part of scale near middle, $\times 50$, São Paulo, Brazil, *Wacket* (US); Fig. 2, fertile blade, $\times 0.25$, Brazil (U. S. Nat. Herb. 61624); Fig. 3, sterile blade, $\times 0.25$, Brazil (U. S. Nat. Herb. 61624); Fig. 4, part of fertile segment, $\times 26$, Rio de Janeiro, Brazil, *Brade* 8597; Fig. 5, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Brade* 8597; Fig. 6, sterile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Brade* 8597; Fig. 7, scale, $\times 9$, São Paulo, Brazil, *Wacket* (US); Fig. 8, fertile segment, $\times 4.5$, Rio de Janeiro, Brazil, *Brade* 9484.

PLATE VI. A. $\times$ DORYOPTERIS HYBRIDA: Fig. 1, sterile blade, $\times 0.2$, "Ex. hort. bot. Lips. 1882"; Fig. 2, part of fertile segment, $\times 27$, São Paulo, Brazil, *Brade* 7697 (G); Fig. 3, fertile segment, $\times 3.5$, São Paulo, Brazil, *Brade* 7697 (G); Fig. 4, fertile blade, $\times 0.2$, São Paulo, Brazil, *Brade* 7697 (NY).

B. D. PEDATA var. PALMATA: Fig. 1, sterile blade, $\times 0.2$, Peru, *Herrera* (US); Fig. 2, sterile blade, $\times 0.2$, Costa Rica, *Skutch* 2746; Fig. 3, proliferous buds at base of blade, $\times 0.8$, Colombia, *Killip & Smith* 16357 (G); Fig. 4, cross section of stipe half way to blade, $\times 11$, Costa Rica, *Skutch* 2746; Fig. 5, spore, $\times 430$, Colombia, *Killip & Smith* 16357 (G); Fig. 6, young plant from proliferous bud, $\times 0.3$, U. S. Bot. Gard. 1884 (U. S. Nat. Herb. 154812); Fig. 7, cross section of stipe half way to blade, $\times 8$, Bolivia, *Rusby* 135 (NY); Fig. 8, fertile blade, $\times 0.2$, Peru, *Vargas* 1705; Fig. 9, fertile blade, $\times 0.2$, Bolivia, *Rusby* 135 (NY); Fig. 10, fertile blade, $\times 0.2$, James Island, Galapagos Islands, Ecuador, *Stewart* 1010 (US).

C. D. NOBILIS: Fig. 1, sterile blade, $\times 0.2$, Paraguay, *Jorgensen* 4062 (G); Fig. 2, sterile blade, $\times 0.2$, Rio Grande do Sul, Brazil, *Eugenio* 26 (NY); Fig. 3, sterile segment, $\times 2$, Rio Grande do Sul, Brazil, *Eugenio* 26 (NY); Fig. 4, fertile blade, $\times 0.2$, Tucumán, Argentina, *Venturi* 9645 (G); Fig. 5, fertile segment, $\times 3$, Chaco, Argentina, *Schulz* 722; Fig. 6, fertile blade, $\times 0.2$, Rio Grande do Sul, Brazil, *Juergens* (U. S. Nat. Herb. 530675); Fig. 7, fertile blade, $\times 0.2$, Rio Grande do Sul, Brazil, *Juergens* (U. S. Nat. Herb. 530674); Fig. 8, sterile blade, $\times 0.2$, Rio Grande do Sul, Brazil, *Lindman* A1019; Fig. 9, part of fertile segment, $\times 27$, Chaco, Argentina, *Schulz* 722.

PLATE VII. A. DORYOPTERIS KITCHINGII: All from Madagascar, *Hildebrandt* 4163 (US). Fig. 1, scale, $\times 9$; Fig. 2, fertile blade, $\times 0.3$; Fig. 3, part of fertile segment, $\times 24$; Fig. 4, sterile segment, $\times 5$; Fig. 5, part of scale near middle, $\times 60$; Fig. 6, fertile segment, $\times 4.7$; Fig. 7, sterile blade, $\times 0.3$; Fig. 8, vascular bundle near base of stipe, $\times 7.5$; Fig. 9, cross section of stipe half way to blade, $\times 7.5$.

B. D. CONCOLOR var. TYPICA: Fig. 1, sterile blade, $\times 0.3$, Australia, *Michael* 886; Fig. 2, cross section of stipe half way to blade, $\times 20$, Peru, *Cook & Gilbert* 1512 (US); Fig. 3, fertile segment, $\times 4.7$, Pernambuco, Brazil, *Pickel* 2620 (US); Fig. 4, sterile blade, $\times 0.3$, Peru, *Vargas* 1709 (G); Fig. 5, fertile segment, $\times 6$, El Salvador, *Calderón* 1714; Fig. 6, fertile blade, $\times 0.3$, São Paulo, Brazil, *Wacket* (US); Fig. 8, fertile blade, $\times 0.3$, Australia, *Michael* 886; Fig. 9, part of fertile segment, $\times 25$, Bolivia, *Buchtien* s. n. (G).

D. CONCOLOR var. KIRKII: Fig. 7, fertile segment, indusia outlined in broken lines, receptacles curve over the veins and back toward the midnerve, $\times 4.5$, Kenya, Africa, *Curtis* 744a.

C. D. DECORA var. TYPICA: Fig. 1, fertile blade, $\times 0.3$, Hawaiian Islands, *Baldwin* 22 (U. S. Nat. Herb. 816929); Fig. 4, fertile segment, $\times 5$, Hawaii, *Mann & Brigham* 253 (G); Fig. 5, fertile blade, $\times 0.3$, Molokai, *Degener* 9196; Fig. 7, sterile blade, $\times 0.6$, Kauai, *Heller* 2654 (NY); Fig. 9, part of fertile segment, $\times 24$, Hawaii, *Mann & Brigham* 253 (G); Fig. 11, fertile segment, $\times 5$, Kauai, *Heller* 1990 (G); Fig. 12, fertile segment, $\times 5$, Hawaii, *Degener* 9197 (US).

D. DECORA var. *DECIPIENS*: Fig. 3, fertile blade, $\times 0.3$, Oahu, *Degener* 4159; Fig. 6, sterile blade, $\times 0.3$, Kauai, *Heller* 1990 (NY); Fig. 8, cross section of stipe half way to blade, $\times 12$, Oahu, *Degener* 4159; Fig. 10, fertile blade, $\times 0.3$, Oahu, *Degener* 4159.

Intermediate between var. *typica* and var. *decipiens*: Fig. 2, fertile blade, $\times 0.3$, Kauai, *Degener* 9198.

PLATE VIII. *A. DORYOPTERIS VARIANS*: Fig. 1, part of fertile segment, $\times 24$, British Guiana, *A. C. Smith* 3296 (G); Fig. 2, sterile blade, $\times 0.25$, Rio de Janeiro, Brazil, *James*; Fig. 3, fertile blade, $\times 0.25$, Minas Geraes, Brazil, *Damazio* 1861; Fig. 4, sterile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Brade* 8564; Fig. 5, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Brade* 8564; Fig. 6, fertile blade, $\times 0.25$, British Guiana, *A. C. Smith* 3296 (G); Fig. 7, fertile blade, $\times 0.25$, Rio de Janeiro, Brazil, *Brade* s. n.; Fig. 8, fertile segment, $\times 4$, British Guiana, *A. C. Smith* 3296 (G).

B. D. LUDENS: Fig. 1, sterile blade, $\times 0.25$, Philippine Islands, *R. S. Williams* 1501 (NY); Fig. 2, spore, $\times 490$, Philippine Islands, *Copeland* exsicc. 95 (G); Fig. 3, fertile segment, $\times 4$, Philippine Islands, *Topping* 1014 (G); Fig. 4, sterile blade, $\times 0.25$, Philippine Islands, *Topping* 1247 (US); Fig. 5, fertile blade, $\times 0.25$, Philippine Islands, *Copeland* exsicc. 95 (G); Fig. 6, vascular bundle near base of stipe, $\times 4.5$, Federated Malay States, *Corner & Henderson* 22815; Fig. 7, fertile blade, $\times 0.25$, Philippine Islands, *Copeland* exsicc. 95 (G); Fig. 8, sterile blade, $\times 0.25$, Java, *Mousset* 188; Fig. 9, part of scale near middle, $\times 60$, Yunnan, China, *Henry* 13325 (US); Fig. 10, scale, $\times 10$, Yunnan, China, *Henry* 13325 (US); Fig. 11, fertile blade, $\times 0.25$, Java, *Maupet* (G); Fig. 12, vascular bundle near base of stipe, $\times 6$, Java, *Mousset* 188; Fig. 13, sterile blade, $\times 0.25$, French Indo-China, *Colani* 3450 (US); Fig. 14, part of fertile segment, $\times 24$, Philippine Islands, *Topping* 1247 (US).

C. D. CORDIFOLIA: All from Madagascar, *Humbert* 6258. Fig. 1, sterile blade, $\times 0.25$ (U. S. Nat. Herb. 1718175); Fig. 2, part of fertile segment, $\times 16$ (U. S. Nat. Herb. 1718176); Fig. 3, spore, $\times 410$ (U. S. Nat. Herb. 1718175); Fig. 4, cross section of stipe half way to blade, $\times 9$ (G); Fig. 5, fertile blade, $\times 0.25$ (U. S. Nat. Herb. 1718175); Fig. 6, sterile blade, $\times 0.25$ (U. S. Nat. Herb. 1718176); Fig. 7, vascular bundle near base of stipe, $\times 8$ (G); Fig. 8, part of scale near middle, $\times 50$ (G); Fig. 9, scale, $\times 7$ (G); Fig. 10, fertile segment, $\times 2$ (U. S. Nat. Herb. 1718176); Fig. 11, sterile segment, $\times 2$ (U. S. Nat. Herb. 1718175).



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