

(Ms. 7)

I. SPICILIGIUM FILICUM PHILIPPINENSIVM NOVARUM
AUT IMPERFECTE COGNITARUM

II. THE PHILIPPINE SPECIES OF DRYOPTERIS

By H. CHRIST

(Basel, Switzerland)

REPRINTED FROM

THE PHILIPPINE JOURNAL OF SCIENCE

Published by the Bureau of Science of the Philippine Government, Manila, P. I.

VOL. II, No. 2, SECTION C, BOTANY, JUNE, 1907

MANILA
BUREAU OF PRINTING
1907

**PREVIOUS PUBLICATIONS OF THE BUREAU OF GOVERNMENT
LABORATORIES.**

No. 1, 1902, *Biological Laboratory*.—Preliminary Report of the Appearance in the Philippine Islands of a Disease Clinically Resembling Glanders. By R. P. Strong, M. D.

No. 2, 1902, *Chemical Laboratory*.—The Preparation of Benzoyl-Acetyl Peroxide and Its Use as an Intestinal Antiseptic in Cholera and Dysentery. Preliminary Notes. By Paul C. Freer, M. D., Ph. D.

No. 3, 1903, *Biological Laboratory*.—A Preliminary Report on Trypanosomiasis of Horses in the Philippine Islands. By W. E. Musgrave, M. D., and Norman E. Williamson.

No. 4, 1903, *Serum Laboratory*.—Preliminary Report on the Study of Cattle and Carabaos in the Philippine Islands. By James W. Jobling, M. D.

No. 5, 1903, *Biological Laboratory*.—Trypanosoma and Trypanosomiasis, with Special Reference to Surra in the Philippine Islands. By W. E. Musgrave, M. D., and Moses T. Clegg.

No. 6, 1903.—New or Noteworthy Plants, I. The American Element in the Philippine Flora. By Elmer D. Merrill, Botanist. (Issued January 20, 1904.)

No. 7, 1903, *Chemical Laboratory*.—The Gutta Percha and Rubber of the Philippine Islands. By Penoyer L. Sherman, jr., Ph. D.

No. 8, 1903.—A Dictionary of the Plant Names of the Philippine Islands. By Elmer D. Merrill, Botanist.

No. 9, 1903, *Biological and Serum Laboratories*.—A Report on Hæmorrhagic Septicæmia in Animals in the Philippine Islands. By Paul G. Woolley, M. D., and J. W. Jobling, M. D.

No. 10, 1903, *Biological Laboratory*.—Two Cases of a Peculiar Form of Hand Infection (Due to an Organism Resembling the Koch-Weeks Bacillus). By John R. McDill, M. D., and Wm. B. Wherry, M. D.

No. 11, 1903, *Biological Laboratory*.—Entomological Division, Bulletin No. 1: Preliminary Bulletin on Insects of the Cacao. (Prepared Especially for the Benefit of Farmers.) By Charles S. Banks, Entomologist.

No. 12, 1903, *Biological Laboratory*.—Report on Some Pulmonary Lesions Produced by the Bacillus of Hæmorrhagic Septicæmia of Carabaos. By Paul G. Woolley, M. D.

No. 13, 1904, *Biological Laboratory*.—A Fatal Infection by a Hitherto Undescribed Chromogenic Bacterium: Bacillus Aureus Fætibus. By Maximilian Herzog, M. D.

No. 14, 1904.—*Serum Laboratory*: Texas Fever in the Philippine Islands and the Far East. By J. W. Jobling, M. D., and Paul G. Woolley, M. D. *Biological Laboratory*: Entomological Division, Bulletin No. 2: The Australian Tick (Boophilus Australis Fuller) in the Philippine Islands. By Charles S. Banks, Entomologist.

No. 15, 1904, *Biological and Serum Laboratories*.—Report on Bacillus Violaceus Manila: A Pathogenic Micro-Organism. By Paul G. Woolley, M. D.

No. 16, 1904, *Biological Laboratory*.—Protective Inoculation Against Asiatic Cholera: An Experimental Study. By Richard P. Strong, M. D.

No. 17, 1904.—New or Noteworthy Philippine Plants, II. By Elmer D. Merrill, Botanist.

No. 18, 1904, *Biological Laboratory*.—I. Amebas: Their Cultivation and Etiologic Significance. By W. E. Musgrave, M. D., and Moses T. Clegg. II. The Treatment of Intestinal Amœbiasis (Amœbic Dysentery) in the Tropics. By W. E. Musgrave, M. D.

No. 19, 1904, *Biological Laboratory*.—Some Observations on the Biology of the Cholera Spirillum. By W. B. Wherry, M. D.

No. 20, 1904.—*Biological Laboratory*: I. Does Latent or Dormant Plague Exist Where the Disease is Endemic? By Maximilian Herzog, M. D., and Charles B. Hare. *Serum Laboratory*: II. Broncho-Pneumonia of Cattle: Its Association with B. Bovisepticus. By Paul G. Woolley, M. D., and Walter Sorrell, D. V. S. III. Pinto (Paño Blanco). By Paul G. Woolley, M. D. *Chemical Laboratory*: IV. Notes on Analysis of the Water from the Manila Water Supply. By Charles L. Bliss, M. S. *Serum Laboratory*: V. Frambæsia: Its Occurrence in Natives in the Philippine Islands. By Paul G. Woolley, M. D.

No. 21, 1904, *Biological Laboratory*.—Some Questions Relating to the Virulence of Micro-Organisms with Particular Reference to Their Immunizing Powers. By Richard P. Strong, M. D.

No. 22, 1904, *Bureau of Government Laboratories*.—I. A Description of the New Buildings of the Bureau of Government Laboratories. By Paul C. Freer, M. D., Ph. D. II. A Catalogue of the Library of the Bureau of Government Laboratories. By Mary Polk, Librarian.

No. 23, 1904, *Biological Laboratory*.—Plague: Bacteriology, Morbid Anatomy, and Histopathology (Including a Consideration of Insects as Plague Carriers). By Maximilian Herzog, M. D.

No. 24, 1904, *Biological Laboratory*.—Glanders: Its Diagnosis and Prevention (Together with a Report on Two Cases of Human Glanders Occurring in Manila and Some Notes on the Bacteriology and Polymorphism of Bacterium Mallei). By William B. Wherry, M. D.

No. 25, 1904.—Birds from the Islands of Romblon, Sibuyan, and Cresta de Gallo. By Richard C. McGregor.

No. 26, 1904, *Biological Laboratory*.—The Clinical and Pathological Significance of Balantidium Coli. By Richard P. Strong, M. D.

No. 27, 1904.—A Review of the Identification of the Species Described in Blanco's Flora de Filipinas. By Elmer D. Merrill, Botanist.

No. 28, 1904.—I. The Polypodiaceæ of the Philippine Islands. II. Edible Philippine Fungi. By Edwin B. Copeland, Ph. D.

No. 29, 1904.—I. New or Noteworthy Philippine Plants, III. II. The Source of Manila Elemi. By Elmer D. Merrill, Botanist.

No. 30, 1905, *Chemical Laboratory*.—I. Autocatalytic Decomposition of Silver Oxide. II. Hydration in Solution. By Gilbert N. Lewis, Ph. D.

No. 31, 1905, *Biological Laboratory*.—I. Notes on a Case of Hæmatochyluria (Together with Some Observations on the Morphology of the Embryo Nematode, Filaria Nocturna). By William B. Wherry, M. D., and John R. McDill, M. D., Manila, P. I. II. A Search Into the Nitrate and Nitrite Content of Witte's "Peptone," with Special Reference to Its Influence on the Demonstration of the Indol and Cholera-Red Reactions. By William B. Wherry, M. D.

LIBRARY
NEW YORK
BOTANICAL
GARDEN

THE PHILIPPINE
JOURNAL OF SCIENCE

C. BOTANY

VOL. II

JUNE, 1907

No. 3

SPICILIGIUM FILICUM PHILIPPINENSIVM NOVARVM AVT
IMPERFECTE COGNITARVM.

By H. CHRIST.
(Basel, Switzerland.)

In the collections of Philippine ferns sent me by *Elmer D. Merrill*, Botanist, of the Bureau of Science, and by Dr. *E. B. Copeland*, which have increased in an unexpected manner since the year 1903, I have distinguished very many forms not considered by Dr. *Copeland* in his papers on Philippine ferns,¹ and which are not included in my two works on the fern flora of the Archipelago.²

At the request of Mr. *Merrill*, I have prepared a list for publication in THE PHILIPPINE JOURNAL OF SCIENCE, containing the diagnoses of those species that appear to me to be undescribed, and observations on others which for one reason or another are of special interest. I wish to express my sincere thanks to Messrs. *Loher*, *Copeland* and *Merrill* for having with great liberality supplied me with the rich material that has enabled me to undertake this work.

Cuming's collection is the basis of our knowledge of the pteridophyte flora of the Philippines, and of which *J. Smith*³ published a list of species, however, unfortunately, containing many almost *nomina nuda*.

¹ Ferns, in Perk. Frag. Fl. Philip. (1905) 175-194; Polypodiaceæ of the Philippine Islands, Govt. Lab. Publ. 28 (1905) 7-138; New Philippine Ferns. *This Journal* 1 (1906) Suppl. 143-166; New Philippine Ferns, II, l. c. 251-257; A New Polypodium and Two New Varieties, *Elmer's Leaflets Philip. Bot.* (1906) 78, 79.

² Filices Insularum Philippinarum, *Bull. Herb. Boiss.* 6 (1898) 127-154; 189-210; II. l. c. 6 (1906) 987-1011.

³ Enumeratio Filicum Philippinarum in *Lond. Journ. Bot.* 3 (1841) 392-422.

JUL 10 1914

Presl has described many of the species represented in *Cuming's* collection⁴ in a masterly manner, but perhaps has carried the separation of species a little too far in some cases, although his observations are very exact and his descriptions very clear. In working on Philippine ferns, it is always necessary to consult this work in determining whether or not a species has been described.

HYMENOPHYLLUM Smith.

1. *Hymenophyllum Merrillii* n. sp.

Leptocionium, ex affinitate *H. holochili* (v. d. B.) C. Chr., Javanici, caespitosum, minus, laciniis brevioribus, colore atrofusco, textura crassiore.

Rhizomate filiformi repente caespitoso, cum stipite rhachique pilis rufis brevibus parce vestito, stipite filiformi 3 cm. longo, fronde ovata acuminata versus basin attenuata 6 cm. longa, 2 cm. lata, bipinnatifida, pinnis confertis ca. 8 utrinque, cuneato-ovatis antice acutis sessilibus nec adnatis infimis petiolulatis 6 mm. latis profunde pinnatifidis, segmentis cuneato-obtusis 3 utrinque, profunde laciniatis, laciniis lanceolatis 2 mm. latis serrulato-dentatis planis, rhachi haud alata, soris infimae laciniae anteriori pinnarum insidentibus, pro pinna solitariis, 3 aut 4 utroque rhacheos latere, ovatis, 2.5 mm. longis, apice bivalvatis serrulatis, receptaculo crasso valde exserto. Colore atrofusco. Textura rigidiuscula.

LUZON, Province of Pampanga, Mount Arayat (3927 *Merrill*) October, 1904; Province of Bataan, Mount Mariveles (*Loher*) March, 1897, alt. 1,400 m.

2. *Hymenophyllum serrulatum* (*Presl*) C. Chr. Ind. 367 (*H. Smithii* Hook. Sp. Fil. 1: 97. Tab. 35 B).

A species peculiar in the section *Leptocionium* by the valves of the sori being entire or very slightly dentate. A large species with ovate fronds 13 cm. long, 7 cm. broad, the stipes 8 cm. long. It appears to be one of the most widely distributed species of the genus in the Philippines.

LUZON, Province of Bataan, Mount Mariveles (3233 *Merrill*) October, 1903; (165, 443, *Whitford*) May, July, 1904; (208 *Copeland*) January, 1904; Province of Tayabas, Mount Banajao (918 *Whitford*) October, 1904; Province of Rizal, Angilog (*Loher*) March, 1906. NEGROS, Mount Silay (1509 *Whitford*) May, 1906.

The same species has been found in Perak (leg. *Hose*); the plant reported from Celebes under this name is doubtful.

3. *Hymenophyllum thuidium* *Harringt.* in Journ. Linn. Soc. Bot. 16 (1877) 26; *Christ* in Schum. und Lauterb. Nachtr. Fl. Deutsch. Schutzgeb. Südsee 1: 34.

A large very elegant species, all the foliaceous parts finely crisped and at the same time dentate-aristate. Very diaphanous, the sori small, globose, dark brown, terminal, the valves entire. Stipe 6 cm. long; frond 10 cm. long, 5 cm. wide.

MINDANAO, San Ramon at 800 m. alt. (1751 *Copeland*) April, 1905; Mount Apo, at 1,800 m. alt. (1441 *Copeland*) October, 1905.

Very nearly the same species is found in the Bismark Mountains, German New Guinea, leg *Schlechter* 14030, which I have called *H. Bismarkianum*.

⁴ *Epimeliae botanicae* (1849).

4. **Hymenophyllum aculeatum** (v. d. Bosch Hym. Jav. Tab. 31, *Leptocionium*) Racib. Pter. Buitenz. 21.

LUZON, Province of Bataan, Mount Mariveles (209 *Copeland*) January, 1904; (3231 *Merrill*) October, 1903; Province of Tayabas, Mount Banajao (921 *Whitford*) October, 1904. MINDANAO, Province of Surigao (268 *Bolster*) March, 1906.

Identical with specimens from Mount Salak, Java, leg. *Raciborski*. It is the species enumerated in Bull. Herb. Boiss. 6: 141, as *H. Neesii*.

5. **Hymenophyllum campanulatum** n. sp.

Leptocionium. Habitu omnino *H. Tunbridgensis*, valvis integris, rhachi hispida.

Dense et late caespitosum, rhizomate tenui sed rigido ramosissimo, stipite rhachique nigris, pilis rigidis hispidis, stipite 1.5 cm. tenui, fronde 4 cm. longa 1 cm. lata bipinnatifida oblonga, basi et apice attenuata, pinnis ca. 6 utrinque arcuato-reflexis, alternis, 1 cm. longis, flabellato-partitis, laciniis 4 aut 5, linearibus, vix 1 mm. latis, parce aristato-serratis. Soris raris, prope basin costae positus, pedunculatis, campanulatis, valvis erecto-patentibus ovatis, 2 mm. longis. Textura rigidiuscula. Colore fusco.

NEGROS, Mount Silay (1549 *Whitford*) May, 1906, alt. 1,100 m.

6. **Hymenophyllum pycnocarpum** v. d. Bosch Hym. Jav. Tab. 37.

Laeve. Fronde ovata, tripinnatifida, rhachi alata, soris terminalibus paniculatis, valvis trigono-acutis.

LUZON, Province of Laguna, Mount Maquiling (*Loher*) January, 1890, January, 1906; Province of Tayabas, Mount Banajao (922 *Whitford*) October, 1904.

Hymenophyllum subdemissum Christ, Bull. Herb. Boiss. 6 (1898) 140, should be united with this species.

7. **Hymenophyllum Blumeianum** Sprengel, Syst. Veg. 4: 131.

LUZON, Province of Bataan, Mount Mariveles (3232 *Merrill*) October, 1903, the lanceolate form figured by Van den Bosch Hymen. Jav. Tab. 36, 2. *H. polyanthos* Christ (non Sw.) Bull. Herb. Boiss. 6 (1898) 139, should be referred here.

8. **Hymenophyllum paniculiflorum** Presl, Hymen. (1843) 32, 55.

A small plant recognizable by its large sori which are ovoid or globose, terminal and occupying all the segments at the summit of the frond.

LUZON, Province of Benguet, Mount Tonglon, 2,250 m. alt. (*Loher*) April, 1904. Identical with specimens from Java, leg. *Giesenhagen* and *Raciborski*, and with specimens from Japan, leg. *Faurie*.

I am now of the opinion that *H. discosum* Christ, Bull. Herb. Boiss. 6 (1898) 140, should be united with this species, although the sori are much broader and more round than those in the Javan plant, leg. *Giesenhagen*.

9. **Hymenophyllum demissum** (Forst.) Sw. in Schrad. Journ. 1800² (1801) 100.

LUZON, Province of Tayabas, Mount Banajao (*Loher*) February, 1906.

This plant is identical with the form found in New Zealand and Celebes, low, with small sori, the rachis winged only near the summit. *H. productum* Kze. Bot. Zeit. (1848) 305, Van den Bosch Hymen. Jav. Tab. 45, of Java, is a larger plant with triangular elongated valves and winged stipes.

10. *Hymenophyllum formosum* Brackenr. U. S. Explor. Exped. 16 (1854) 268. t. 32. f. 3.

MINDANAO, Mount Apo (1442 *Copeland*) October, 1904, alt. 1,800 m.; (340 *DeVore & Hoover*) May, 1903. Our plants match the form represented by *Tab. 47* Van den Bosch, Hymenophyllaceae Javanicae.

11. *Hymenophyllum Junghuhnii* Van den Bosch Hymen. Jav. 60. *Tab. 49*.

LUZON, District of Lepanto, Bagnen (1921 *Copeland*) November, 1905, alt. 1,950 m. MINDANAO, Province of Misamis, Mount Malindang (4638 *Mearns & Hutchinson*) May, 1906.

A form with very large sori and with broad segments.

The Philippine plants referred by various authors to *H. dilatatum* Sw., are referable to the two above species.

12. *Hymenophyllum australe* Willd. Sp. Pl. 5: 527.

LUZON, District of Lepanto, Mount Data (1873 *Copeland*) October, 1905; Province of Benguet, Mount Tonglon (*Loher*); (5053 *Curran*) August, 1906. MINDANAO, Mount Apo (324 *DeVore & Hoover*) May, 1903.

The Philippine form has very narrow segments and is very compound, quadri-pinnatifid. Under the lens the margins are very finely denticulate.

TRICHOMANES Linn.

13. *Trichomanes parvulum* Poir. in Lam. Encycl. 8: 46.

LUZON, Province of Bataan, Mount Mariveles (177 *Whitford*) May, 1904.

14. *Trichomanes diffusum* Blume, Enum. 225.

LUZON, Province of Laguna, Mount Maquiling (5137 *Merrill*) March, 1906, 300 m. alt. MINDANAO, Province of Zamboanga, San Ramon (1652 *Copeland*) April, 1905, 700 m. alt.

15. *Trichomanes nitidulum* Van den Bosch Hymen. Jav. 21.

LUZON, Province of Benguet, Baguio (6023 *Elmer*) March, 1904.

16. *Trichomanes rhomboideum* J. Sm. in Hook. Journ. Bot. 3: 417; Van den Bosch Hymen. Jav. *Tab. 24*.

LUZON, Province of Bataan, Mount Mariveles (3121 *Merrill*) October, 1903; (206 *Copeland*) January, 1904.

This form, of the *Cephalomanes* group which is richly developed in the Philippines, is distinguishable by its rounded pinnæ, its elongated aristate teeth and long sori.

17. *Trichomanes Javanicum* Blume, Enum. 224; Van den Bosch Hymen. Jav. *Tab. 22*.

LUZON, Province of Rizal, Mabacal (*Loher*) March, 1906; Province of Laguna, Mount Maquiling (*Loher*) January, 1906; Province of Bataan, Mount Mariveles (263, 513 *Whitford*) July, 1904; (2397 *Borden*) January, 1905; (2420 *Meyer*) January, 1905; (207 *Copeland*) February, 1904. NEGROS, Gimagaan River (1603 *Whitford*) March, 1906. PALAWAN (578 *Foxworthy*) April, 1906.

Common and widely distributed in the Philippines.

Var. *intercalatum* n. var.

Soris margini anteriori, apici saepeque parti superiori marginis posterioris impositis numerosis (12) longe exsertis campanulato-clavatis ore non dilatato, dentibus marginis posterioris elongatis aristatis conspicuis. Pinnis saepe dissectis.

LUZON, Province of Laguna, Mount Maquiling (*Loher*) January, 1906; Province of Rizal, Oriud (*Loher*) February, 1906; Province of Benguet, Sablan (6214 *Elmer*) April, 1904.

POLYSTICHUM Roth.

Polystichum, of the essentially Chinese group of *P. auriculatum*, is well represented in the Philippines. The first form known was *Phegopteris nervosa* Fée, Mem. 6. 13. Tab. 2. Fig. 4, which I do not hesitate to reduce as a variety of *Polystichum deltodon*. The rich Chinese material that I have at my disposition has convinced me that there are but slightly marked differences by which the Philippine plant can be distinguished.

18. *Polystichum deltodon* (Bak.) Diels in Nat. Pflanzenfam. 1⁴ (1899) 191. *Aspidium deltodon* Baker in Gard. Chron. 14: 494.

Var. *nervosum* (Fée Gen. 244; Mem. 6: 13. Tab. 2. Fig. 4, *Phegopteris*).

Differt a typo montis Ōmi, Chinae occid., leg. *Faber* 1045 statura majori, pinnis magis numerosis (usque ad 50 utrinque) minus acutis.

LUZON, Province of Bataan, Mount Mariveles (*Loher*) November, 1894, alt. 1,400 m.; Province of Benguet, Baguio (5916 *Elmer*) March, 1904.

19. *Polystichum Copelandi* n. sp.

Rhizomate caespitoso foliis fasciculatis, stipite tenui 2.5 cm. longo cum rhachi squamis subulatis nigris parce vestito, viridi, fronde lanceolato-linearari, basi non attenuata, acuminata, usque ad 20 cm. longa, 2 cm. lata, pinnata pinnis densissime imbricatis inferioribus deflexis ca. 50 utrinque rhombeo-acutiusculis marginibus parallelis 1 cm. longis basi fere 0.5 cm. latis, postice cuneatis, antice truncatis acute auriculatis, postice integris antice minute dentatis dentibus ca. 10 haud aristatis, nervis furcatis, soris postice deficientibus antice ca. 6, 1 mm. a margine remotis minutis uniseriatis rufis impressis, indusio minuto fugaci rotundo umbonato. Textura herbacea, faciebus calvis, colore flavoviridi, opaco.

LUZON, District of Bontoc, Sagada (1901 *Copeland*) November, 1905, alt. 1,600 m.

Very near the small group of *P. hecatopteron* Diels, and strongly resembling *P. Dielsii* Christ in Bull. Acad. Mans. (1906) 238, from which it differs in its smaller size, its short stipe, the pinnæ not obtuse but pointed, the teeth more pronounced and the sori less marginal.

20. *Polystichum obliquum* (Don) Moore Ind. (1858) 87. *Aspidium obliquum* Don Prodr. 3. *A. caespitosum* Wall. Cat. No. 367.

Var. *Luzonicum* n. var.

Stipite debili 17 cm. longo, fronde 25 cm. longa 5.5 cm. lata, pinnis imbricatis oblongo-rhomboideis 3 cm. longis basi 12 mm. latis acutis acute auriculatis, margine fere integro sed dentibus parvis deficientibus aristatis ciliato, soris biseriatis sed antice pluribus (ca. 10) medialibus minutis. Nervis occultis, textura herbacea, opaca.

LUZON, Province of Benguet, Trinidad (1812 *Copeland*) October, 1905, alt. 1,200 m.

Very close to the plant from China, India, Annam (leg. *Cadière*) and of Japan, but larger, the teeth very faint, scarcely visible but nevertheless aristate.

ASPIDIUM Swartz.

21. *Aspidium* (*Pleocnemia*) *Angilogense* Christ. in Bull. Herb. Boiss. II. 6 (1906) 1003.

I do not hesitate to refer here *Pleocnemia Cumingiana* Presl, Epim. Bot. 410, and regret that this specific name which has priority, is inappropriate in *Aspidium* because of the later use of the same specific name under *Aspidium* by several authors, Kunze, Sturm. In addition to the localities in Luzon cited by me in the original description of the species, Dr. Copeland has found it in Mindanao, San Ramon, April, 1905, No. 1698, alt. 600 m. He adds "Fronde 2 to 3 m. high, deltoid, stipe 2 m. high, stout, rhizome 10 to 20 cm. thick, ascending. Presl, without doubt after Cuming's notes says "arbor viginti-pedalis." In other characters I find our species to be very near *Nephrodium chrysotrichum* Baker from Samoa; Upolu, Apia leg. Betche 1880; Falwao leg. Reinecke 90, 94; Savai, leg. Reinecke 90b; Upolu, leg. Reinecke 94. The two collectors give the height of the Samoan plant as from 20 to 40 feet, with black trunks. It is certainly the largest arborescent fern outside of the *Cyatheaceae*.

22. *Aspidium profereoides* n. sp.

Fronde sterili longissime stipitata, stipite 45 cm. longa pennaey cygni crassitie cum rhachi castaneo sulcato opaca squamis subulatis 0.5 cm. longis setisque brunneis sparso vestito, fronde ultra 50 cm. longa 32 cm. lata deltoideo-oblonga pinnata parce bipinnatifida, pinnis infimis nec abbreviatis nec postice auctis caeteris aequalibus, pinnis remotis recte patentibus ca. 15 utrinque infra apicem acuminatum inciso-lobatum, sessilibus, 18 cm. longis 3.5 cm. latis lanceolatis acutis usque ad mediam laminam incis, ala utrinque 0.5 cm. lata et ultra, lobis angulo angusto obtuso separatis 12 mm. longis 1 cm. latis ovato-obtusis, ca. 18 utrinque, infimis aliquantum auctis et rhachin tegentibus, subintegris, nervis non prominentibus, in lobis pinnatis, 6 ad 8 utrinque, infimis areolam angulosam angustam secus costam, superioribus 1, 2 aut 3 areolas laterales secus costulam formantibus, ab areola costali ad sinum 3 aut 4 areolis intercalatis. Nervulis inclusis nullis. Textura flaccide herbacea, colore obscure viridi, opaco, faciebus imprimis costis furfuraceo-puberulis. Folio fertili sterili longiore; stipite 70 cm. et ultra, fronde 50 cm. longa, egregie contracta, pinnis valde remotis, 10 cm. longis, 2.5 cm. latis, ad alam angustam incis, lobis lineari-lanceolatis falcatis 4 mm. latis, soris 1.5 mm. latis rotundis mediis brunneis, indusio flaccido atrobrunneo mox corrugato sine dubio reniformi.

Aspidium excellens Blume Enum. 120 differt ex descriptione Presliana l. c. frondibus monomorphis, segmentis acutis.

MINDANAO, District of Davao, Todaya (1467A Copeland) October, 1904, alt. 1,205 m. "Rootstock short, erect" Copeland.

A marked species with nerves of *Proferea* Presl, Epim. 619, and pronounced dimorphism.

LEPTOCHILUS Kaulfuss.

23. *Leptochilus heteroclitus* (Presl) C. Chr. Ind. Fil. (1905) 11, 385.
Acrostichum flagelliferum Wall.

This species, widely distributed from British India, throughout Malaya, and in the Philippines especially, offers in the latter region a variability that approaches that of *Dryopteris canescens*. The apices of the sterile leaves are elongated into linear lash-like appendages which are proliferous and usually take root, the young plants emitting a fascicle of leaves entirely different from those of the adult ones. Often they are not simple linear leaves, with the lateral lobes more or less aborted, but frequently are singularly compound, enlarged and deeply incised. Often the little plants are fertile, and the fertile fronds offer irregularities analagous to the sterile ones. In other characters the differences are frequently strongly marked, and the various forms might readily be considered to represent distinct species. I have enumerated below the forms, that in my conception of this species, should be considered as varieties or subspecies, and although several of them have acquired a certain stability, certain characters are constant in all of them, showing their close relationship to *L. heteroclitus* and probable derivation from that species.

Var. *eurybasis* n. var.

Rhizomate repente, pennae anserinae crassitie, cum stipite basi squamis minutis dilute brunneis crispis sparso radicoso. Foliis sparsis sed appropinquatis, foliorum steriliium stipite 8 cm. longo flexuoso tenui griseo, fronde 13 cm. longo deltoideo-ovata, pinna terminali decurrente et cum pinna laterali proxima parva plus minus concreta, basi cuneata, acuminata, nec caudata nec prolifera, 8 cm. longa, 2.5 cm. lata oblonga parviloba, lobis 10 vel pluribus utrinque subrotundis 3 mm. latis acute denticulatis, pinnis lateralibus 3 aut 4 utrinque, mediis 3 cm. longis, 1 cm. latis cuneatis obtusis decurrentibus serrato-lobulatis, infimis valde postice auctis deltoideo-ovatis petiolatis nec decurrentibus, basi profunde incisis, caeterum serrato-lobatis. Nervis lateralibus rectis a costa ad marginem protensis 4 mm. distantibus, series plures areolarum valde irregulariarum, minores areolas nec nervulos liberos includentium continentibus. Colore atrato, textura herbacea, opaca. Foliorum fertiliium lamina aequilonga sed angustiore, pinna terminali 5 cm. longa lanceolata acuta profunde lobata decurrente, pinnis lateralibus 4 utrinque obtusis, 2.5 cm. longis, 1.5 cm. latis, ovatis sessilibus aut adnatis, sed pinnis infimis petiolatis auctis, parte terminali late cuneato-ovata lobata, pinnulis lateralibus similibus minoribus.

MINDANAO, Lake Lanao, Camp Keithley (552 Mrs. *Clemens*) May, 1906, alt. 660 m.

Differing from the type by its aberrant fronds being in part bipinnate, deltoid at the enlarged base, posteriorly deeply incised; even the fertile fronds are sometimes bipinnate at the base.

Var. **Foxworthyi** n. var.

Pinna terminali lineari vel oblonga acuminata grosse dentata longe decurrente interdum radicante, pinnis duabus lateralibus rudimentariis minutis, 0.5 cm. aut ultra diametro, ellipticis aut rotundatis, pinna fertili terminali lineari-lanceolata duobus lobulis lateralibus ovatis suffulta. Planta vix 20 cm. alta.

LUZON, Province of Rizal, Bosoboso (68 *Foxworthy*) January, 1906.

Small, very narrow and very simple in comparison with the type, but closely related by the shoots developed along the upper parts of the leaves.

Var. **inconstans** (Copel. in Govt. Lab. Publ. 28 (1905) 43 pro specie).

In view of the fact that two varieties show a progressive intergradation between the type and the species described by *Copeland*, I have not hesitated to consider the latter as a variety of *Leptochilus heteroclitus*, a form still more reduced than the preceding, characterized by its very small size, the apices of the leaves often linear, the shoots very irregular. Var. *Foxworthyi* is almost exactly intermediate between the type and the variety *inconstans*.

LUZON, Province of Bataan, Lamao River (3128 *Merrill*) April, 1904; (251 *Copeland*) January, 1904; (1124 *Whitford*) March, 1905; Province of Rizal, Mabacal (*Loher*) March, 1906.

This variety seems to be rather widely distributed in the Philippines; I have specimens from Christmas Island (Straits Settlements) leg. *Ridley* that closely approach it.

Var. **Linnaeanus** (Fée *Acrost.* 87 pro specie).

I believe that this form can be reduced, with a sufficient degree of surety, as a variety of *Leptochilus heteroclitus*, as a derived form of that species, in spite of its uniformly elongated and very narrow leaves. Its texture, its nerves, although strongly simplified, its proliferous leaves and the strong resemblance of its offshoots to those of the normal form support this contention. We have then a series almost complete from the type, that seems to be always triphyllous in the Philippines, to the form with absolutely linear and undivided leaves.

LUZON, Province of Rizal, Manap River, near Montalban (*Loher*) 1892.

24. **Leptochilus diversifolius** Blume, Enum. 103 et Fil. Jav. Tab. 12.

MINDANAO, San Ramon (1543 *Copeland*) November, 1904, alt. 100 m.

Discovered by *Blume* in Java and generally confounded with *L. heteroclitus*, from which it is sufficiently distinct. Conf. *Raciborski* Pterid. Buitenz. 48.

ATHYRIUM Roth.

25. **Athyrium anisopteron** Christ, Ann. Acad. Mans. (1907).

LUZON, Province of Benguet, Mount Tonglon (*Loher*) 1894, alt. 2,250 m.; Pauai (1967 *Copeland*) November, 1905, alt. 2,150 m.

This is the plant that I have previously considered as *Aspidium Fauriei* var. *clatum* Christ,⁵ and which *Copeland*, MSS., referred to *Nephrodium*. *Makino*⁶ treats it with reason under *Athyrium*. After an examination of abundant material I have divided this species into several, the representative in the Philippines being *A. anisopteron*, a species of a Chinese group already known from Yunnan, leg. *Henry* et *P. Ducloux*.

⁵ *Bull. Herb. Boiss.* 6 (1898) 193.

⁶ *Bot. Mag. Tokyo* 17: 160.

26. *Athyrium nanum* n. sp.

Rhizomate obliquo brevi aut subrepente, foliis subfasciculatis paucis (3 ad 4) stipite tenui fusco squamulis tenuissimis setulosis rufobrunneis patentibus cum rhachi pubescente fere 0.5 ad 1 cm. longo, fronde lanceolata 6 cm. longa, 7 mm. lata in longam apicem pinnatifidum prolongata, fere usque ad basin alata et utrinque 5 aut 6 pinnis remotiusculis praedita, pinnis segmentisque erecto-patentibus, 2.5 ad 5 mm. altis superioribus basi aequalibus integris oblongis inferioribus inaequalibus antice auriculatis subcrenatis infimis inaequalibus crenato-lobatis, puberulis, nervis furcatis vix pinnatis, soris ca. 5 pro segmento, vix 1 mm. longis, ovatis, ochraceis, indusio lanceolato rarius aspidioideo reniformi. Colore laete virente, textura flaccide herbacea.

MINDANAO, Lake Lanao, Camp Keithley (656 Mrs. Clemens) July, 1906. .

The smallest species of the genus known, pinnatifid and in part only simply pinnate, distinguished by its rather strongly winged rachis.

27. *Athyrium drepanopteron* (Kze.) Moore. *Asplenium oxyphyllum* (Wall.) Hook. *Polypodium drepanopteron* Kze. Linnæa 23: 278, 318. *Lastrea eburnea* J. Sm. Bot. Mag. 72 (1846) Comp. 34.

LUZON, Province of Benguet, Baguio (6498 Elmer) June, 1904; found also by other American collectors.

A continental type extending from Japan to Yunnan and north India.

28. *Athyrium Benguetense* n. sp.

Rhizomate ut videtur repente aut obliquo tenui nigro, stipitibus approximatis paucis tenuibus stramineis 25 cm. et ultra longis, basi squamulis lanceolatis brunneis 2 mm. longis sparsis vestitis, rhachi et costa puberulis, planta aliter nuda, fronde caudato-acuminata lanceolata 30 cm. longa 9 cm. lata basi non attenuata bipinnatifida, pinnis patentibus sessilibus (costa straminea) remotis, infimis subdeflexis, ca. 25 infra apicem lobatum, 5 cm. longis 16 mm. latis lanceolato-acuminatis fere ad rhachin incis, segmentis subpectinatis ca. 18 utrinque 2.5 mm. latis, lineari-oblongis obtusiusculis subcrenatis aut integris, nervis 6 ad 8 utrinque simplicibus obliquis, soris mediis 6 ad 8 utrinque, rotundis vix 1 mm. latis ochraceis, indusio tenuissimo rotundo reniformi hyalino umbone obscure, mox evanido. Textura flaccida, colore atroviridi.

LUZON, District of Lepanto, Mount Data (Loher) February, 1894, 2,250 m. alt.; Province of Benguet, Pauai (1948 Copeland) November, 1905, alt. 2,150 m.

By its aspidioid sori a *Dryopteris*, but in all other respects a true *Athyrium*, very delicate and with segments almost entire.

29. *Athyrium Copelandi* n. sp.

Rhizomate ramoso breviter repente crassiusculo atrato, stipitibus plumbeo-stramineis basi squamis lanceolato-subulatis brunneis parce vestitis, supra cum rhachi furfuraceo-squamulosis, 9 cm. longis, fronde 14 cm. longa, 6 cm. lata oblonga, basi non attenuata longe acuminata, pinnis

ca. 15 utrinque (rhachi versus apicem alata) sessilibus superioribus adnatis et decurrentibus, falcatis, inferioribus remotis, grosse lobatis 3 cm. longis 1 cm. latis lobis ca. 6 utrinque infimis antice maximis, 4 cm. longis, 3 cm. latis, triangulari-ovatis, acutiusculis suberenatis, nervis in lobis pinnatis 3 ad 4 utrinque, obliquis, soris 2 ad 3 mm. longis 1 mm. latis, turgidis ovato-lanceolatis, omnino tectis, indusio leviter curvato, griseo, membranaceo, persistente, soris rufo-ochraceis. Textura coriacea, colore atrovirente subtus pallido, faciebus glabris.

. LUZON, District of Lepanto, Mount Data (1909 *Copeland*) November, 1905, alt. 1,700 m.

A small alpine species intermediate between *Athyrium acrostichoides* (Sw.) Diels and *Diplazium Japonicum* (Thunb.).

DIPLAZIUM Swartz.

30. *Diplazium bulbiferum* Brack. U. S. Expl. Exp. 16 (1854) 141. *Tab. 18. f. 1.*

Rhizomate pollicis crassitie, oblique erecto, radicibus nudis crassis et longis semi-supraterraneis suffulto, foliis fasciculatis sed paucis, stipitibus basi atratis squamisque subulatis nigris 0.5 cm. longis vestitis, superne raris setis nigris sparsis, 15 ad 25 cm. longis, tenuibus, fronde 20 ad 30 cm. longa, 13 cm. lata, ovato-oblonga apice pinnatifida-acuminata pinnata, ad basin apicis rhachi gemmifera et interdum vivipara, pinnis infimis aliquantum abbreviatis et deflexis, pinnis fere omnibus versus apicem usque egregie petiolatis, petiolo 3 ad 5 mm. longo, horizontali, pinnis 8 ad 10 utrinque infra apicem pinnatifidum, oblongis acutis nec caudatis ca. 4 cm. rarius magis longis 18 mm. latis basi inaequalibus postice cuneatis antice auriculato-truncatis grosse crenato-serratis lobulis brevibus raro ultra 3 mm. longis 3 ad 5 mm. latis decumbentibus, acutiusculis, nervis utrinque in lobulis pinnatis plerumque 2 aut 3 utroque costulae latere obliquis, soro plerumque duplici (diplazioideo) protenso 7 mm. longo brunneo anguste lineari nervulo anteriore imposito, soris irregularibus brevibus aliis nervulis insidentibus, indusio tenuissimo diaphano decolori. Textura herbacea, planta laevi, colore supra atroviridi, subtus pallido, opaco.

MINDANAO, Davao (701 *Copeland*) March, 1904: San Ramon (1678 *Copeland*) March, 1905; Lake Lanao, Camp Keithley (167, 252 Mrs. *Clemens*) February, 1906. LUZON, Province of Bataan, Mount Mariveles (6010 *Leiberg*) July, 1904; (234 *Whitford*) May, 1904; (238 *Copeland*) January, 1904.

A species of the *D. silvaticum* group, but smaller, proliferous, its pinnae distant, generally short, shortly pointed and long petioled, unequally auriculate, slightly lobed, one long sorus and some short ones on each lobe, very pale beneath. The specimen from San Ramon is very large with 16 pairs of pinnae 12 by 2 cm., and more deeply lobed than the others.

I think that the plant that I took for *D. silvaticum* Presl in my first paper on *Loher's* Philippine ferns,⁷ and of which I have not a specimen at hand, is

⁷ Bull. Herb. Boiss. 6: 153.

perhaps referable to the above species which seems to be widely distributed in the Philippines. *D. petiolare* Presl, Epim. 446, a species that I have not seen, differs, according to the description, in its linear pinnæ and pubescent rachis. *Diplazium silvaticum* is to me more and more a "collective species" worthy of being segregated into several distinct forms.

31. *Diplazium atratum* n. sp.

Stipite 25 cm. et ultra longo basi incrassato digiti diametro sulcato, ebeneo aut atroviolaceo, opaco uti tota planta, basi latero ventrali more cyathearum squamis subulatis 1.5 cm. longis nigris dense vestito, planta aliter subnuda aut minute furfuracea, fronde late deltoidea acuta 60 cm. et ultra longa basi 45 cm. et ultra lata, bipinnata, pinnis remotis petiolo 2 ad 3 cm. longo praeditis superioribus subsessilibus, recte patentibus, utrinque ca. 20, infimis haud reductis, usque ad 30 cm. longis, 10 cm. latis, longe acuminatis, basi attenuatis pinnulis ca. 20 infra apicem incisum ultra 1 cm. distantibus, recte patentibus inferioribus petiolulatis e basi lata lanceolato-acuminatis, ultra mediam laminam basique fere ad costam incisis, lobis ca. 15 utrinque porrectis 3 mm. longis trigonofalcatis acutis margine serrulato saepe reflexo pinnis superioribus pinnulis similibus, nervis 4 ad 7 utrinque obliquis crassis simplicibus, soris nervosa costa fere ad marginem segmentibus valde obliquis convexis atrobrunneis, linearibus simplicibus, indusio lineari coriaceo brunneo persistente. Fronde glabra, textura rigide, fere lignoso-coriacea, colore atrofusco, opaco.

PALAWAN, Victoria Peak (714, 683, 663 *Foxworthy*) March, 1906, alt. 600 to 1,100 m.

The plant with its hard woody texture and its dark color must be in sharp contrast to the surrounding vegetation. It is a very stiff coriaceous species with ample, deltoid, bipinnate fronds, the pinnæ petioled, the pinnules narrow and deeply incised, the lobes angular, narrow, their margins reflexed, the stipe and axial parts black, the frond itself blackish. The species has the general appearance of a *Dicksonia* or a *Cyathea*.

32. *Diplazium crenatoserratum* (Blume Enum. 177, *Asplenium*).

MINDANAO, San Ramon (1667 *Copeland*) March, 1905, alt. 650 m.

This species has not previously been reported from the Philippines; the above specimen matches material in my herbarium from Singapore leg. *Hose*, Java leg. *Lefebvre*, Borneo leg. *Grabowsky*, *Hose*, *Niewenhuis*, Celebes leg. *Sarasin* and Sumatra leg. *Schneider*.

33. *Diplazium Smithianum* (Baker) Diels Nat. Pflanzenfam. 1⁴ (1889) 228. *Asplenium Smithianum* Baker Syn. 245.

I am unable to distinguish from this species No. 2667 *Merrill* from Bosoboso, Rizal Province, Luzon, determined by *Copeland* as *D. dolichosorum* Copel. The type of *Copeland's* species is from MINDANAO and he does not mention the LUZON plant in his diagnosis. *Loher* has previously found *D. Smithianum* in LUZON, and I have specimens from Celebes, leg. *Sarasin*, *Koorders* and *Warburg* (No. 15314) and from New Guinea, *Sattelberg*, *Weinland*, 1890. It is also found in Ceylon.

ASPLENIUM Linn.

34. *Asplenium exiguum* Bedd. Ferns. S. Ind. t. 146.

LUZON, Province of Benguet, Adouay (1845 *Copeland*) October, 1905, alt. 900 m.; Baguio (4887, 4860 *Curran*) August, 1906.

An Asiatic type.

I have specimens from Simla leg. *Blanford*, Massuri leg. *Hope*, Bhotan leg. *Griffith* No. 2812, Yunnan leg. *Delavay* and from The Nilgiris, southern India, leg. *Gamble*. It has not been found in Japan.

35. *Asplenium Elmeri* n. sp.

Rhizomate brevi radicoso, squamis castaneis subulatis coronato stipitibus fasciculatis 7 ad 12 cm. longis cum rhachi atrorufis subintentibus, squamulis patentibus subulatis brunneis vestitis, rhachi in parte superiore sed infra apicem prolifera, fronde oblonga acuminata basi attenuata 20 cm. longa 6 ad 8 cm. lata, bipinnata sive tripinnatifida, pinnis petiolatis, 16 ad 20 utrinque recte patentibus remotiusculis breviter petiolatis, costa libera supra breviter alata, pinnis ovato-elongatis acuminatis apice grosse dentato lanceolato, pinnis 2 ad 3 cm. longis, 1.5 cm. latis remotis paucis 2 rarius 3 utrinque, petiolulatis ovato-cuneatis obtusis grosse dentatis 8 mm. longis 3 mm. latis, pinnula basali anteriore aucta et rhachi approximata, nervis in segmentis flabellato-furcatis, soris 2 aut 3 in segmento, lanceolatis 4 mm. latis atrobunneis indusio griseo angusto persistente. Colore opaco atroviridi, textura herbacea.

LUZON, Province of Benguet, Mount Santo Tomas (6538 *Elmer*) June, 1904: District of Lepanto, Mount Data (1858 *Copeland*) October, 1905.

Loher has found the same species previously on Mount Mariveles, Province of Bataan, LUZON, September, 1893, but his specimens are larger, 55 cm. tall. Very nearly the same species is found in Celebes (1322 *Sarasin*) November, 1895, but in *Sarasin's* plant the segments are longer and the rachis is also proliferous. A small species resembling *Asplenium cuneatum* Lam., and *A. praemorsum* Sw., which are frequently found in herbaria under the name *A. laserpitiifolium*, and sometimes under the name *A. contiguum*. A good species characterized by its stipe and rachis being covered with scales.

I no longer maintain as a Philippine species *Asplenium nitidum*, that I previously credited to LUZON.⁸ I have not seen from the Archipelago the large plant with long pinnules which are auricled and deeply incised such as is represented in Malacca, by specimens leg. *Ridley* and in Borneo, leg. *Niewenhuis*, etc.

36. *Asplenium praemorsum* Sw. Prodr. 130.

LUZON, Province of Benguet, Pauai (*Copeland*) November, 1905, alt. 2,200 m.

A small form with narrowly cuneiform segments previously found in Luzon by *Loher*.

37. *Asplenium truncatilobum* (Presl) *Tarachia truncatiloba* Presl Epim. (1849) 437. *Asplenium arayataense* Christ Mss.

LUZON, Province of Pampanga, Mount Arayat (3816, 3909 *Merrill*) May, October, 1904: Province of Laguna, Mount Maquiling (*Loher*) 1906: Province of Zambales, Mount Pinatubo (*Loher*) February, 1906: Province of Benguet, Adouay (1857c *Copeland*) October, 1905.

⁸ *Bull. Herb. Boiss.* (1898), 6, 153.

The specimens have been referred by the collectors with doubt, sometimes to *Asplenium hirtum* Kaulf., sometimes to *A. caudatum* Forst. They have more the appearance of *A. horridum* Kaulf., but differ from the latter in being smaller, with shorter pinnae, the lobes less numerous, truncate at the apices, and the stipe particularly villous. I believe that the specimens cited above are identical with the species clearly described by Presl.

38. *Asplenium horridum* Kaulf. Enum. 173.

MINDANAO, District of Davao, Mount Apo (319 *DeVore et Hoover*) 1903.

Very typical and agreeing with specimens from the Sunda Islands and Polynesia.

39. *Asplenium militare* Copel. in Philip. Journ. Sci. 1 (1906) Suppl. 254.

MINDANAO, District of Davao, Mount Apo (321 *DeVore et Hoover*) May, 1903; (1505 *Copeland*), 1,800 m. alt., a specimen with more deeply lobed pinnae.

A species remarkable for its resemblance to *Asplenium serra* Langsd. et Fisch., of tropical America, very large with broad lanceolate pinnae which are lobed and finely denticulate, the sori short and close to the costa.

40. *Asplenium cuneatum* Lam. Encycl. 2: 309.

This group, difficult everywhere, is particularly polymorphous in the Philippines. A form that can be admitted to the Philippine flora, without doubt, is the following:

Var. *tripinnatum* Fourn. Fil. Nov. Caledon. 307.

Tripinnatifidum, segmentis brevibus ovato-cuneatis.

MINDANAO, District of Davao, Mount Apo (318 *DeVore et Hoover*) May, 1903: Province of Zamboanga, San Ramon (1728 *Copeland*) April, 1904, alt. 600 m. LUZON, Province of Rizal, Montalban (*Loher*) March, 1906.

41. *Asplenium laserpitiifolium* Lam. Encycl. 2: 310.

This species in the young state is perhaps sometimes confused with the preceding, but *Fournier* l. c., indicates a good distinctive character. In *A. cuneatum* the sori are narrow, flabellate and reach to the border of the pinnae, while in *A. laserpitiifolium* they are convex and are confined to the middle of the pinnae.

LUZON, Province of Benguet, Baguio (6029 *Elmer*): Province of Bataan, Mount Mariveles (176 *Whitford*) May, 1904.

Var. *subvenustum* n. var.

This is a reduced form 30 to 45 cm. high with very much divided fronds and slender stipes, the pinnules 5 mm. long, sometimes longer, triangular, flabellate, the sori small, short, two or three on a pinnule, resembling *Adiantum venustum* Don. The specimens are not young plants, but appear to be full grown and constant in the above characters.

LUZON, Province of Rizal, Bosoboso (1097 *Ramos*) July, 1906; (80 *Foxworthy*) January, 1906: Province of Cavite, Mendez Nuñez (1037 *Mangubat*) August, 1906.

42. *Asplenium affine* Sw.; Schrad. Journ. 1800² (1801) 56.

After comparison with specimens from Bourbon and Africa, I admit to the Philippine flora as this species, a specimen with bipinnate fronds, the pinnules elongate-rhomboidal, 2 cm. long, unequal, irregularly dentate, slightly incised, the sori numerous, straight, narrow, elongated, and parallel. In texture this species is firmer than the preceding one.

MINDANAO, District of Davao, Todaya (1502 *Copeland*) October, 1904, alt. 725 m.

43. *Asplenium insititium* Brack. U. S. Explor. Exped. 161. *pl.* 22. *f.* 2.

Luzon, Province of Benguet, Baguio (6012 *Elmer*) March, 1904.

I have identified this plant after comparison with specimens from the Sandwich Islands, leg. *Hillebrand* and *Baldwin*, and from New Caledonia leg. *Franc*. It is the form that *Copeland* in his Polypodiaceæ of the Philippines, 84, supposes to be the variety *bipinnatifidum* of *A. contiguum* Kaulf., but it belongs evidently in the section with *A. cuneatum*.

STENOCHLAENA J. Sm.

The species of this genus often can not be determined with certainty without utilizing the characters shown by the secondary leaves. Unfortunately these secondary leaves are as yet imperfectly known in many species, for frequently when adult and soriferous leaves are found, the secondary leaves are not to be found, and without the three forms and without the certainty of their having come from the same plant it is often difficult if not impossible to identify these forms of *Stenochlaena* with trimorphous leaves.

*Underwood*⁹ separates the species of *Stenochlaena* of the Old World, which have the veins springing directly from the midrib, into two groups: 1, *Teratophyllum* with trimorphous leaves and with spiny naked rhizomes, and 2, *Lomariopsis* with rhizomes covered with scales but spineless. However, our knowledge of the last group is not sufficiently complete to determine whether or not the secondary leaves are present or lacking, but I am of the opinion that they are present, at least in some species.

From the Philippines I am able to record the following species:

44. *Stenochlaena aculeata* (Blume) Kunze Bot. Zeit. 6: 142. *Lomaria aculeata* Blume Enum. Pl. Jav. 205.

Luzon, Province of Rizal (*Loher*) March, 1906; (2695 *Ahern's collector*) conf. *Verhandl. Schweiz. Nat. Forsch. Gesellsch.* (1906) *Tab.* 8; Province of Benguet (6264 *Elmer*); northern Luzon (*Warburg*): MINDANAO, Mount Batangan (*Warburg*).

The secondary leaves of this plant agree very well with those figured by *Hooker* Sp. Fil. 1: 56. B, for *Davallia achilleaeifolia* Wall., which is cited by *Underwood* as a synonym of *S. aculeata*. I do not hesitate to identify with this species the form described by *Copeland* as *Asplenium epiphyticum* (*Perk. Frag. Fl. Philip.* (1905) 184), and Dr. *Copeland* himself admits in his Comparative Ecology of San Ramon Polypodiaceæ,¹⁰ that this plant is "apparently identical with occasional immature forms of *S. aculeata*." This form constitutes simply, as I have demonstrated in *Verhandl. Schweiz. Nat. Forsch. Ges.* (1906) *Tab.* 5, the metamorphosis of the secondary leaves to the adult ones, combined with asplenioid sori which appear on the metamorphosed leaves as a reminder of the origin of the genus, which is from the vicinity of *Asplenium*. I have a specimen from Dr. *Copeland* which has beside scolopendriiform leaves, a portion of the rhizome with spines and with tripinnate leaves similar to those figured by *Hooker* for *Davallia achilleaeifolia*.

Copeland found his *Asplenium epiphyticum* without the adult form of *Stenochlaena*, which shows that the species of *Stenochlaena* are not always normally developed, but remain sometimes in a stunted condition. An analagous case is found in the Philippines in *Leptochilus heteroclitus*.

⁹ *Bull. Torr. Bot. Club.* 33 (1906) 35.

¹⁰ *This Journal, Bot.* 2 (1907) 69.

MINDANAO, Surigao (260 *Bolster*); Davao (699 *Copeland*); San Ramon (1572 *Copeland*).

The same plant with simple leaves but with their bases cut into irregular pinnate segments has been called by Bory, *Scolopendrium Durvillei* (Kunze Schkuhr Suppl. *Tab. 5.*).

MINDANAO, Mount Batangan (14111 *Warburg*).

45. *Stenochlaena Williamsii* Underw. in Bull. Torr. Bot. Club. **33** (1906) 41.

LUZON, Province of Bataan, Lamao River (368 *Barnes*), det. *Copeland*.

The specimens agree well with the description of the species. The secondary leaves, which I presume belong with the specimens cited, but without being able to determine this point with certainty, differ from those of the preceding species in their linear, more elongated segments and with a tendency of the frond to become gradually larger and to present auricles at the anterior base of the pinnules, a point of union with *Asplenium* of the *cuneatum* group, conf. *Verhandl. Schweiz. Nat. Forsch. Gesell.* (1906) *Tab. 6.* The secondary leaves mentioned above are those of specimens from Mindanao (*Warburg*), Luzon (*Warburg*) and North Celebes, Bojong (15321 *Warburg*).

46. *Stenochlaena arthropteroides* Christ in Bull. Herb. Boiss. II. **6** (1906) 998.

LUZON, Province of Rizal, Montalban (*Loher*) January, 1906, a very similar form, but slightly larger from the Lamao River, Province of Bataan (85 *Barnes*).

This species is distinguished by its very unequal and crenulate pinnæ, one specimen with secondary leaves bearing also some adult leaves, which, although small, are strongly crenulate. The secondary leaves are rather large, 10 cm. long, 4 cm. wide, nearly sessile, tripinnatifid, the rachis reddish, flexuous, the pinnæ ovate, obtuse, 2 cm. long, 1 cm. wide; the pinnules serrate, cut into linear segments which are obtuse, often bi- or tri-furcate, 2 mm. long, 0.5 to 1 mm. wide, the color very dark green.

47. *Stenochlaena subtrifoliata* Copel. in Philip. Journ. Sci. **1** (1906) Suppl. 152.

MINDANAO, District of Zamboanga, San Ramon (1749 *Copeland*), alt. 750 m.

Judging from the above authentic specimen this is a very distinct species, characterized by the cartilaginous borders of the adult pinnæ.

48. *Stenochlaena palustris* (Burm.) Bedd. *Polypodium palustre* Burm. Fl. Ind. (1768) 234.

MINDANAO, Davao (532 *Copeland*).

The typical form, identical with specimens in my herbarium from Java, Ceylon, Himalaya and Samoa.

49. *Stenochlaena* sp.

This is the plant described by me in *Bull. Herb. Boiss.* II. **6** (1906) 997, and which approaches *S. Milnei* Underw. ex descr., but which it is impossible for me to identify specifically because fertile fronds are lacking.

DAVALLIA Sm.

50. *Davallia decurrens* Hook. Sp. Fil. **1**: 167. *t. 94 B.*

This species, found by *Cuming*, is cited by *Copeland* in his *Polypodiaceæ* of the Philippines 54, without exact locality. It appears to be rare. I have specimens from Montalban, Province of Rizal, LUZON, collected by *Loher* in March, 1906, that agree exactly with *Hooker's* figure, except that *Loher's* specimens are smaller, and have bi- to tri-pinnatifid fronds instead of tri- to quadri-pinnatifid ones.

51. *Davallia vestita* Blume Enum. (1828) 233.

LUZON, Province of Pampanga, Mount Arayat (3878 *Merrill*) May, 1904: Province of Tayabas, Mount Banajao (*Loher*) February, 1906. NEGROS, Mount Silay (1516 *Whitford*) May, 1906.

This species does not seem to be rare in the Philippines. The specimens are less scaly than those of Java and Celebes.

52. *Davallia pusilla* Mett. Ann. Sc. Nat. IV. 15 (1861) 79.

MINDANAO, Province of Zamboanga, San Ramon (1665 *Copeland*) 1905.

*Copeland*¹¹ has identified this number as *Humata parvula* J. Sm., but my specimen agrees exactly with specimens of *Davallia pusilla* from New Caledonia leg. *Franc.*

MICROLEPIA Presl.

53. *Microlepia Sablanensis* n. sp.

Tripinnata, ampla, rhachi opaca fulvostraminea, brevissime et molliter puberula, pinnis 35 cm. et ultra longis, 9 cm. latis, elongato-caudatis, breviter petiolatis basi vix abbreviatis, pinnulis pectinato-confertis numerosis (40 et ultra utrinque) recte patentibus, fere sessilibus, acuminatis, basi inaequali, segmento infimo anteriore aucto, libero, ad rhachim adpresso, ad rhachim incisus, segmentis ca. 20 utrinque confertis angulo angusto separatis oblongis, obtusis, 0.5 cm. longis, 2.5 mm. latis, inaequalibus, postice subintegris cuneatis, antice truncatis, crenatis, lobulis plerumque 3 minutis, nervis manifestis, in lobulis bi- aut tri-furcatis, soris minutis, 2 aut 3 plerumque antice in sinibus lobulorum positus, globosis, indusio inconspicuo semicupuliformi tenuissimo. Textura herbacea, costis nervisque subtus pilosis, facie superiore laevi, sed opaca, colore obscure viridi.

LUZON, Province of Benguet, Sablan (6231 *Elmer*) April, 1904.

Differing from *Microlepia speluncae* (L.) Moore in its larger fronds, finer pubescence, the pinnules more numerous, the segments smaller, less unequal and the denticulations finer.

DENNSTAEDTIA Bernh.

54. *Dennstaedtia Smithii* (Hook.) Moore Index. 308.

LUZON, Province of Bataan, Mount Mariveles (1133 *Whitford*) March, 1904: Province of Rizal (91 *Foxworthy*) January, 1906.

The specimens cited above agree exactly with the figure given by *Hooker*,¹² but a species very close to this, recently described by *Copeland*, seems to be more common and widely distributed. It is larger, more pubescent, and with the basal pinnule of the III order anteriorly very much augmented. It is:

55. *Dennstaedtia Williamsi* Copel. in Philip. Journ. Sci. 1 (1906) Suppl. 148, of which I had prepared the following diagnosis before learning that *Copeland* had already described the species.

Amplissima, quadripinnatifida, stipite 2 m. alto, 2.5 cm. diametro, tereti, rufo-testaceo, dense cum rhachi pilis strigosis patentibus 2.5 mm. longis fulvis tomentoso postea glabrata, frondibus 2 m. altis, fasciculatis

¹¹ *This Journal* 1 (1906) Suppl. 147.

¹² Sp. Fil. 1: t. 28 D.

(*Copeland*) pinnis petiolatis, 90 cm. longis, 30 cm. latis oblongis acuminatis basi haud attenuatis. Pinnulis ca. 35 utrinque, infimis remotis, reliquis approximatis, petiolulatis, infimis 16 cm. longis, basi 6 cm. latis, acuminatis, oblongis, antice basi valde auctis, i. e., pinnula^{III} 5 cm. longa lanceolata, rhachi adpressa et pinnularum^{II} proximam attingente et superante, basi pinnulae^{II} posteriore cuneata, pinnulis^{III} valde abbreviatis praedita. Pinnulis^{III} imbricato-confertis ca. 25 utrinque, lanceolato-obtusiusculis, basi inaequali antice aucta, brevissime petiolatis, 2 cm. longis, 0.5 cm. latis, usque ad costulam alatum incisus, segmentis ultimis oblongis obtusis inaequalibus antice crenatis 0.5 cm. longis, 2.5 mm. latis, costis nervisque adpresse rufo-pubescentibus, nervis in segmentis pinnatis furcatis manifestis, soris in sinu dentium positus, uno rarius pluribus pro segmento, marginalibus, 1 mm. diametro, globosus, brunneis, indusio superiore (marginali) manifesto deflexo, inferiore sporangiis conferto. Textura coriacea rigida, colore griseo-virente, opaco.

MINDANAO, Province of Zamboanga, San Ramon (1632 *Copeland*) February, 1905: District of Davao, Mount Batangan (14134 *Warburg*): Lake Lanao, Camp Keithley (375 Mrs. *Clemens*) March, 1906. LUZON, Province of Rizal, Mount Batay (*Loher*) April, 1905; Arambibi River (*Loher*) March.

56. *Dennstaedtia Hooveri* n. sp.

Amplissima, rhizomate repente, fronde 2 m. alta, subdeltoidea, quadripinnatifida, stipite 1.5 ad 2 m. (*Copeland*) rhachi digiti crassitie, cum costis costulisque pubescentia brevi strigosa rufa tecta, pinnis 60 cm. longis, 18 cm. latis breviter petiolatis basi vix attenuatis, acuminatis, pinnulis alternis approximatis petiolulatis, ca. 35 utrinque, e basi lata et antice aucta oblongis acutis, 9 cm. longis basi 3 cm. latis, costa haud alata, pinnulis^{III} ca. 18 utrinque, fere imbricato-confertis, ovato-obtusis inaequalibus, basi posteriori cuneatis, antice truncatoauctis 1 cm. longis, 0.5 cm. latis usque ad rhachin incisus, segmentis^{IV} 3 aut 4 utrinque, cuneato-oblongis obtusis, 3 mm. longis 2.5 mm. latis crenato-lobatis, iis pinnarum sterilium elongatis dentibus acutiusculis, nervis in segmentis pinnatis et furcatis, faciebus utrinque pilosis, pilis albidis tortuosis, soris 1 mm. latis rotundatis, uno rarius pluribus pro segmento, in dente obtuso brevi basilari posito, indusio tenuissimo mox evanido infero semicupuliformi membranaceo-griseo. Textura tenuiter herbacea, colore obscuro-viridi.

MINDANAO, District of Davao, Mount Apo (*DeVore & Hoover*) May, 1903: Province of Zamboanga, San Ramon (*Copeland*) May, 1905, alt. 850 m.

A species related to *D. flaccida* (Forst.) Bernh., of Samoa, characterized by its long and rather frequent villous hairs, the pinnules of the third order broad, irregularly parted and serrate-imbricate, and a rather pronounced dimorphism between the fertile and sterile fronds. Texture thin. Rachis and costae covered with a reddish pubescence. It is distinguished from *D. flaccida* by its lobes and pinnules being narrower and in its shorter pubescence, otherwise very similar to that species.

HEMIGRAMMA nov. gen.

Foliis rosulatis simplicibus aut irregulariter pinnatipartitis, dimorphis, soriferis contractis, nervatione sagenioidea, i. e., pinnata, inter nervos laterales multifarie areolata, nervulis liberis inclusis, soris lineatis ramosis nervos anastomosantes sequentibus, ipsisque irregulariter anastomosantibus et reticulatis.

57. **Hemigramma Zollingeri** (S. Kurz) *Hemionitis Zollingeri* S. Kurz in Journ. As. Soc. Beng. 39:² 90, t. 5.

I believe that some of the specimens on which Dr. Copeland based his new species, *Hemionitis gymnopteroidea*¹³ should be referred to *Hemigramma Zollingeri*. Copeland states that his species can be distinguished from *H. Zollingeri* by the copious free veinlets in the sterile frond. In my specimens of the species from Batavia, Java, ex Herb. Hort. Bot. Bogor., and from Celebes, leg. Sarasin, the veinlets are also very numerous, even as Kurz himself shows in the figure cited above; moreover the constantly contracted fertile fronds of *Hemionitis gymnopteroidea* are not a peculiarity of that species, as in my specimens from Montalban, leg. Loher, they are 1 cm. wide and present the oblique lozenge-shaped soriferous bodies as do the specimens from Java.

Var. **major** (Copel) *Hemionitis gymnopteroidea* forma *major* Copel. l. c.

Rhizomate crasso obliquo rudimentis stipitum tecto, foliis fasciculatis paucis (3 ad 4) stipitibus, basi incrassatis usque ad 16 cm. longis basi squamis subulato-setiformibus patentibus nigris usque ad 1 cm. longis dense barbato, caeterum parcius sparso, lamina sterili 20 ad 25 cm. longa saepe basi aequilata, interdum simplice ovato-acuminata medio 7 cm. lata repanda aut obtuse lobata, saepius profunde pinnatifida aut basi pinnata, valde irregulariter lobata, apice aucto et elongato usque ad 8 cm. lata, pinnis usque ad 3 utrinque, ovatis repandis acutis aut obtusis, pinnis basalibus saepe postice cordatis, omnibus ala plus minus lata junctis, fronde saepe decurrente, lamina fertili valde contracta, 8 cm. longa, 4 cm. lata, 2 pinnis utrinque 5 cm. longis 3 mm. latis et apice irregulariter lobato, nervis lateralibus 12 ad 15 utrinque pro pinna, patentibus, rectiusculis, manifestis, fere ad marginem protensis, ca. 5 areolas rectangulas includentibus, quae nervulorum reti nec non nervulis crebris liberis furcatis repletae sunt, pinnis soriferis irregularibus, sporangiorum nervulos sequentibus fulvis tectis. Textura herbacea membranacea, fere diaphana, colore laete virente, opaca.

LUZON, Province of Bataan, Lamao River (2124 Borden) December, 1904: Province of Rizal, Montalban (Loher) September, 1891. MINDANAO, Province of Zamboanga, San Ramon (1780 Copeland) May, 1905.

It does not form a nearly sessile rosette like the species, but the leaves are fascicled and stipitate and the sterile fronds, like the fertile ones, are pinnatifid and even pinnate. The size is much larger.

This form imitates strangely *Leptochilus latifolius* (Meyen) (*Gymnopteris taccaefolia* J. Sm.) in the protean variation of the fronds and in its habit. Normally to rate the large plant as a variety would not be comprehensible, from

¹³ Perk. Frag. Fl. Philip. (1905) 183.

the study of dried plants alone, without the evidence given by *Copeland*, and the absolute identity of the venation, tissue and its general structure. It is a striking example of the strange and luxuriant forms found in the Philippines.

Leptochilus latifolius is distinguishable from our plant by its firm texture, not diaphanous, its color, black when dry, its proliferous fronds and its areolæ supplied with a network of very irregular nerves.

Diels's procedure in placing *Hemionitis Zollingeri* in *Syngramme* is to me an unnatural arrangement. The ancestry of the plant is rather in the *Aspidiaceae*, analagous to *Stenosemia*, and accordingly the above new generic name is proposed for it.

CONIOGRAMME Fée.

58. *Coniogramme fraxinea* (Don.) Diels in Nat. Pflanzenfam. 1⁴ (1899) 262. *Diplazium fraxineum* Don Prodr. Fl. Nepal. (1825) 12.

This genus is in need of revision and contains a plurality of forms which doubtless can be studied with better results in the field than in the herbarium. In addition to the ordinary form with bi- to tri-pinnate fronds which are membranous and serrate, *Copeland*¹⁴ indicates, without name, another one that usually has entire and simply pinnate fronds. This latter form is very close to one found in China that I have described as the variety *spinulosa*¹⁵ but the Philippine form is larger and with nearly entire margins, and I call it:

Var. *Copelandi* n. var.

MINDANAO, Province of Zamboanga, San Ramon (1746 *Copeland*) April, 1905. LUZON, Province of Rizal, Mabacal (*Loher*) March, 1906. The same plant, but denticulate, has been found in Benguet Province, Baguio (6032 *Elmer*) March, 1904.

LINDSAYA Dry.

59. *Lindsaya falcata* Dry. Trans. Linn. Soc. 3 (1797) 41. t. 7. f. 2.

Negros, Gimagaan River (66 *Copeland*) January, 1904; (1568 *Whitford*) May, 1906.

The above specimens agree exactly with material from tropical America. It is rather remarkable that this species, like *Lindsaya lancea* (Linn.) Bedd., should be found in tropical America and again in the orient.

PTERIS Linn.

60. *Pteris quadriaurita* Retz. Obs. 6: 38.

Stipite cum rhachi plerumque glabro, stramineo, segmentis oblongis, basi conjunctis, nervis liberis, subtus manifestis, textura herbacea, colore laete virente.

LUZON, Province of Rizal (111 *Foxworthy*) January, 1906; Mabacal (*Loher*) March, 1906: Province of Zambales, Mount Pinatubo (*Loher*) February, 1906: Province of Bataan, Lamao River (239, 240 *Copeland*) February, 1904: Province of Union, Bauang (5619 *Elmer*) February, 1904.

The above specimens represent the typical form of this polymorphous species, being membranous in texture, the nerves manifest on the lower surface and not united, the segments oblong united at the base, the stipe and rachis generally smooth. The numerous derived forms of this group which are found in the Philippines can be grouped as follows:

¹⁴ *Govt. Lab. Publ.* 28 (1905) 67.

¹⁵ *Bull. Soc. Bot. France* (1905) 52,55.

61. *Pteris biaurita* Linn. Sp. Pl. (1753) 1076.

LUZON, Province of Benguet, Mount Tonglon (*Loher*); Buguias (1895 *Copeland*) October, 1905; Manila (*Usteri*) December, 1902. PALAWAN, (594 *Foxworthy*) April, 1906.

A subspecies resembling the typical form, but the nerves forming a costal areola which is sometimes narrow and difficult to find, sometimes rather large and distinct.

62. *Pteris Blumeana* Agardh Pterid. 22.

Stipite rhachique, saepe etiam costis, rufostramineis, castaneis aut atratis verrucis minutis asperis, segmentis linearibus basi plus minus liberis, numerosis, pectinato-confertis, nervis liberis subtus tenuibus minus manifestis, textura coriacea rigida, colore obscure viridi saepe glaucino.

MINDANAO, Lake Lanao, Camp Keithley (255 Mrs. *Clemens*) February, 1906; District of Davao, Mount Dagatpan (*Warburg*); Santa Cruz (254 *DeVore & Hoover*) April, 1903; Province of Zamboanga, San Ramon (1596, 1599 *Copeland*) January, 1905. LUZON, Province of Benguet, Sablan (6213 *Elmer*) April, 1904.

A subspecies with coriaceous texture, linear segments slightly or not at all united at the base, free veins which are very slender and scarcely visible above, its color dark and often somewhat glaucous, the stipe and rachis dark, reddish or blackish and somewhat verrucose. It is a Malayan form that I have also from Java, Tjibodas, leg. *Raciborski*, 1897; Perak, leg. *Ridley* No. 9543; Khasia, leg. Austen, det. *Clarke* "Var. *Khasiana*," and Yabim, near Limbang, German New Guinea, leg. *H. Zahn*, 1905. I believe it to be identical with *Pteris Blumeana* Agardh, as described by *Hooker*¹⁶ and by *Raciborski*.¹⁷

Var. *asperula* J. Sm. in Hook. Journ. Bot. 3 (1841) 405, et Hook. Sp. Fil. 3: 181, t. 135 A; var. *setigera* Hook. l. c.

Costis setulis albis 1.5 mm. longis superne regulariter ciliatis.

BASILAN (93 *DeVore & Hoover*) April, 1903. MINDANAO, Province of Zamboanga, San Ramon (1651 *Copeland*) February, 1905.

63. *Pteris Whitfordi* n. subsp. (*P. Whitfordi* Copel. in Philip. Journ. Sci. 1 (1906) Suppl. 255, pro specie).

A typo differt colore atroviridi, textura coriacea, segmentis angulo acuto erecto-patentibus usque ad costam separatis, sinu fere nullo, stipite valido, paleis brunneis 0.5 cm. longis lanceolatis basi vestito, planta magna 60 ad 70 cm. alta, nervis manifestis.

NEGROS, Gimagan River (1660 *Whitford*).

64. *Pteris parviloba* subsp.; Christ in Bull. Sci. Fr. et Belg. 28 (1898) 264. t. 12.

Statura gracili, stipite tenui, rufostramineo, scaberulo, fronde late deltoideo, pinnis infimis auctis et valde deflexis, segmentis confertis lineari-oblongis, brevibus, basi plerumque liberis, nervis tenuibus subtus

¹⁶ Sp. Fil. 3: 180.

¹⁷ Pterid. Buitenzorg 156.

manifestis, textura papyracea rigidiuscula, colore dilute ochraceo-viridi, soris et indusiis saepius angustissimis, facie superiore saepius setis rigidis scabra.

LUZON, Province of Bataan, Lamao River (241 *Copeland*) February, 1904; Province of Benguet, Baguio (5816 *Elmer*) March, 1904; Ambuklao (1827 *Copeland*) October, 1905; Province of Pampanga, Mount Arayat (3814 *Merrill*) May, 1904; Province of Rizal, Montalban (*Loher*) October, 1890, November, 1905; Angilog (*Loher*) March, 1906. PALAWAN (741, 662 *Foxworthy*) March, April, 1906.

A slender small form, the fronds rather short and broadly deltoid, the stipes rough, slender, tawny, the segments pectinate, free at the base, papyraceous, yellowish in color, the sori and indusia generally very slender. This form is often found strongly reduced in size, resembling *Pteris Grevilleana*. I have the same form from Sikkim "*Pteris aspericaulis* Wall." leg. Dr. *Jerdon*, and from Cao Bang, Tonkin, leg. Dr. *Billet*, 1906.

Var. **pluricaudata** (Copel. in Philip. Journ. Sci. 1 (1906) Suppl. 156, pro specie).

Fronde minuta 10 cm. longa et lata pedata pentagona, segmentis imbricatis vix 1 cm. longis.

LUZON, Province of Bataan, Mount Mariveles (3755 *Merrill*) January, 1904.

65. ***Pteris ensiformis*** Burm. Fl. Ind. 230, var. **permixta** n. var.

An insular form, characterized by the apex of the fertile frond being elongated into a linear caudiform appendage much exceeding the plant, furnished with irregular short obtuse horizontal lobes as in *P. heteromorpha*.

PANAY, Capiz (56 *Copeland*) January, 1904.

66. ***Pteris cretica*** Linn. var. **stenophylla** Hook. et Grev. Ic. Fil. (1829) t. 130. *P. digitata* Wall. Cat. 91.

LUZON, Province of Rizal (53 *Foxworthy*) January, 1906; District of Bontoc, Sagada (1903 *Copeland*) November, 1905, identical with specimens from India, Gharwal, Bhatta Massuri, leg. *Hope*; Sikkim, Tendong, leg. *Gamble*, No. 10340.

Pteris cretica is exceedingly variable in the Philippines, I have not seen from the Archipelago forms resembling those of Europe, but the above specimens match closely *P. stenophylla*, with 3 to several pinnæ at the summit of the frond, more or less fan-like, the tips elongated. Texture normal, firm, shining, light green.

67. ***Pteris intromissa*** n. subsp.

Differt a typo *P. creticae* pinnis et segmentis angustioribus magis decurrentibus, obscure aut plumbeo-viridibus fere glaucinis, opacis, textura tenuiter papyracea soro angustissimo, nervis tenuissimis suboccultis. Rhizomate brevi, radicoso, stipitibus fasciculatis, tenuibus rufo- aut fusco-stramineis opacis, fronde 30 cm. longa et lata, apice ternata, infra pinnata, pinnis oppositis, mediis simplicibus infimis profunde bi- aut tri-partitis, decurrentibus lineari-lanceolatis aut linearibus caudatis, 20 cm. longis, sterilibus 12 mm. fertilibus 6 mm. latis, sterilibus a basi ad apicem, fertilibus apice acute serratis, nervis tenuissimis parum manifestis, simplicibus aut fureatis, obliquis soro indusioque angustissimo

0.7 mm. lato. Textura tenuiter papyracea, colore opaco obscure viridi subglaucous.

MINDANAO, District of Davao (700 *Copeland*) March, 1904. LUZON, Province of Benguet, Sablan (6160 *Elmer*) April, 1904; Province of Rizal, Montalban (*Loher*) 1896; Province of Bataan, Lamao River (3122 *Merrill*) October, 1903.

The same species is found in China, Swatow, leg. *Henry*.

VITTARIA Sm.

68. *Vittaria Merrillii* n. sp.

Rhizomate pennae corvinae crassitie, horizontaliter et longe repente vix ramoso non caespitoso, setis tenuissimis 0.6 cm. longis erectis atrofuscus tecto, stipitibus remotis basi articulatis et setulosis, tenuibus, 1 mm. diametro pendentibus, flexuosis, 20 cm. longis, et tandem in laminam decurrentem sensim transeuntibus, fuscostramineis, lamina 60 cm. et ultra longa, 1 cm. usque ad 1.8 cm. lata lineari, acuminata sed saepe dilatata et irregulariter bi- ad quadrifida, lobis falcatis acutis 1.5 cm. longis, costa tenui saepe inconspicua, nervis valde elongato-obliquis tenuibus, seriebus 4 ad 5 utrinque, soro angustissimo, stricte marginali, indusio 0.7 mm. lato pallido tecto. Textura flaccida, colore dilute virente, opaco.

MINDANAO, District of Davao, Mount Apo (1516, 1192 *Copeland*) October, April, 1904, 1,200 to 1,550 m. alt.; Lake Lanao, Camp Keithley (104 Mrs. *Clemens*) January, 1906, alt. 660 m. MINDORO, Baco River (4044 *Merrill*) March, 1905, near sea level.

A species related to *Vittaria elongata* Sw., but with very slender and elongated stipes, the fronds very broad with a tendency to become enlarged and cleft at the apex, the rhizome elongated and running like that of *Polypodium*. The forking of the fronds reminds one of *Hecistopteris*, and of its affinity with *Vittaria* which *Goebel*, based on anatomical characters, has asserted.

69. *Vittaria pachystemma* n. sp.

Rhizomate repente more *Polypodii*, pennae anserinae crassitie, setulis crispatis raris nigris coronato, aliter nudo, stipitibus non fasciculatis sed approximatis basi articulatis cum costa rufostramineis, 6 cm. longis, 2 mm. et ultra latis, sensim in laminam transeuntibus, lamina 25 ad 30 cm. longa falcata lineari-lanceolata acuta nec longe acuminata 12 mm. lata, costa plana sed manifesta 1 mm. lata rufostraminea, soris angustissimis a basi laminae ad apicem continuis, submarginalibus, indusio vix 0.5 mm. lato pallido. Textura succulenta sicce coriacea, opaca, colore lurido-glaucina, planta nuda.

MINDANAO, Province of Zamboanga, San Ramon (1589 *Copeland*) January, 1905, alt. 500 m.

A species with succulent coriaceous opaque pointed falciform leaves and thick stipes.

70. *Vittaria Philippinensis* Christ in Bull. Herb. Boiss. II. 6 (1906) 1007.

I have a specimen, quite identical with this species, from the Liu Kiu Islands, Okinawa, *Matsumura* 213.

71. *Vittaria subcoriacea* n. sp.

Rhizomate uti videtur breviter repente, squamis tenuissimis setaceis nigrofuscis 0.5 cm. longis cum foliorum basi dense vestito, foliis fasciculatis (ca. 8) breviter stipitatis, i. e., lamina in stipitem 3 ad 5 cm. longam sensim decrescente, costa stipitis valida, lucida, castanea, sed in lamina sensim applanata minusque manifesta, fronde 55 cm. longa lineari 8 mm. lata acutiuscula, margine late (2 mm.) reflexo adpresso, in angulo sorum 1 mm. latium omnio tegente, soro margineque infra medium folium incipiente et ad apicem continuo, nervis facie superiore prominentibus fere longis simplicibus valde obliquis. Textura suberosa, folio sicco 1 mm. crasso, fragillimo, colore ad basin plantae atrocastaneo, supra ochraceo-viridi, facie minute rugulosa puberula.

PALAWAN, Victoria Peak (669 *Foxworthy*) March, 1906, alt. 1,100 m.

Characterized by being brittle succulent, thick, the costa very strong, shining below, flattened and not prominent above, the naked margins broadly reflexed, under which the soriferous line is completely hidden, nerves simple, long, very oblique.

PLEUROGRAMME (Bl.) Presl.

72. *Pleurogramme Loheriana* Christ in Bull. Herb. Boiss. II. 6 (1906) 1006.

LUZON, Province of Bataan, Mount Mariveles (1388 *Copeland*) August, 1904; (127 *Whitford*) May, 1904; District of Lepanto, Mount Data (1883 *Copeland*) November, 1905, a form with bifurcate pinnae. MINDANAO, Province of Zamboanga, San Ramon (1763 *Copeland*) May, 1905; Province of Misamis, Mount Malindang (4619 *Mearns & Hutchinson*) May, 1906.

It is related to *P. pusilla* (Blume), (*Vittaria falcata* Kze.) differing from that species in having the soriferous line sunk in an exactly marginal groove, that is to say, placed in the thick tissue of the leaf, so that it presents a border of sporangia emerging from the groove, while in *P. pusilla* the sori are arranged in an intramarginal groove that does not reach to the border of the frond.

ANTROPHYUM Kaulfuss.

73. *Antrophyum Clementis* n. sp.

Folio elongato-lanceolato caudato in apicem et in stipitem alatum sensim excurrente, cum stipite 30 cm. longa, medio latissima ibique 22 mm. lata, costa flava vix 8 cm. longa mox omnino desineute, areolis fere 2.5 cm. longis 2 mm. latis fere 12 in folii diametro, verticalibus, sori filiformibus atrobrunneis submarginalibus (seriebus fere tribus utrinque) folio medio sori destituto, longitudine valde irregulari, ab 0.5 cm. ad 7 cm. longis, verticalibus, haud conjunctis, 2 mm. distantibus non convexis sed sulco minimo faciei superioris respondentibus. Textura subdiaphana herbacea, colore smaragdino, folio margine tenuissimo hyalino circumdato.

MINDANAO, Lake Lanao, Camp Keithley (119 Mrs. *Clemens*) January, 1906, alt. 660 m.

Characterized by its frond when dry being light green, the stipe with decurrent margins, the costa ceasing at the base of the frond, the apex sharp and elongated, the tissue diaphanous, the sori vertical and not joined.

ELAPHOGLOSSUM Schott.

74. *Elaphoglossum Copelandi* n. sp.

Rhizomate repente lignoso, fere digiti minoris crassitie, nigro, setulis subulatis atrobrunneis parce vestito, stipitibus subarticulatis, approximatis nec fasciculatis basi atrofuscis squamis lanceolatis parvis brunneis sparsis, 25 cm. longis, rufostramineis, sulcatis, pennae corvinae crassitie, squamulis atratis fimbriato-laceratis vestitis, fronde sterili lanceolato-elongata usque ad 43 cm. longa, 2.5 cm. lata versus basin apicemque acutum attenuata nec decurrente, costa manifesta prominente rufa, nervis occultis horizontalibus 1 mm. distantibus ad marginem sensim protensis nec clavatis simplicibus aut basi furcatis. Textura chartacea firma, colore obscure brunneo, subnitente, facie superiore squamis sparsis notata, inferiore densius squamis vestita, margine costaque squamis majoribus valde fimbriatis cinnamomeis passim ciliata, squamis peltatis longe ciliato-fimbriatis ciliis numerosis (20 ad 30) squamis partim minoribus hyalinis nec coloratis partim majoribus cinnamomeis, i. e. cellulis nucleis rufo-fulvis impletis. Frondis fertilis stipite usque ad 40 cm. longa, lamina 35 cm. longa, 1 cm. lata lineari, latere superiore densissime squamoso, inferiore omnino sporangiis brunneis impleto.

MINDANAO, District of Davao, Mount Apo (1014, 1541 *Copeland*) April, October, 1904, alt. 1,800 m.

A large species related to *Elaphoglossum petiolatum* (Sw.). Scales large, peltate, deeply ciliate, some of them colorless, other larger and with dark brown centers.

75. *Elaphoglossum petiolatum* (Sw.) Urban Symb. Ant. 4 (1903) 61. *Acrostichum petiolatum* Sw. Prodr. (1788) 128; *A. viscosum* Sw.

LUZON, Province of Benguet, Baguio (6509 *Elmer*) June, 1904; (5125 *Curran*) August, 1906; Daklan (1838 *Copeland*) October, 1905.

A form with lacerate and fringed, reddish, very abundant scales, the fertile fronds 30 cm. long, the sterile ones 1.5 cm. wide.

Previously collected in the Philippines by *Cuming*, but not included by *Copeland* in his Polypodiaceæ of the Philippines.¹⁸

76. *Elaphoglossum laurifolium* (Thouars) Moore Ind. 16. *Acrostichum laurifolium* Thouars Fl. Trist. d'Acunha 31.

LUZON, District of Lepanto, Mount Data (1866 *Copeland*) October, 1905.

Differs from *E. latifolium* of tropical America by its long creeping rhizome, its distant long stipitate and sharply pointed leaves and its smaller size.

Ceylon through Malaya.

CYCLOPHORUS Desv.

77. *Cyclophorus Lingua* (Thunb.) Desv. Prodr. (1827) 224. *Acrostichum Lingua* Thunb. Fl. Jap. 330.

LUZON, Province of Benguet, Baguio (1816 *Copeland*) October, 1905. MINDANAO, Lake Lanao, Camp Keithley (118 Mrs. *Clemens*) January, 1906; District of Davao, Todaya (1303 *Copeland*) April, 1904.

¹⁸ Govt. Lab. Publ. 28 (1905).

This plant of temperate and southern China and of Japan, Liu Kiu Islands and Formosa, has been indicated by some authors as extending to British India, but the very rich material in my herbarium, following *Giesenhagen's* revision, does not show this range. The most southern specimens I have seen are from Annam, leg. *Cadière*, and Tonkin, leg. *Billet*. The species appears again in the Philippines with many other characteristic Chinese forms. That even the rare species of the Philippine flora are found to be widely distributed in the different islands of the Archipelago, as is the case with the present one, is some evidence as to the unity of the group.

S. splendens J. S.
Luzon: Rizal l. Bor
Morong l. Loher
Mindanao Davao
l. Copel. Surigao
l. Bolster. Lake
Kauso l. Clemens
503

POLYPODIUM Linn.

78. *Polypodium phyllomanes* Christ in Bull. Acad. Mans. (1902) 210, var. *ovatum* (Wall.) *P. ovatum* Wall; Hook. et Grey. Icon. Fil. (1827) t. 41.

LUZON, District of Lepanto, Mount Data (1908 *Copeland*) November, 1905, alt. 1,800, m.

This essentially Chinese type, widely distributed in China and extending into British India only in the high valleys of Bhootan, Khasia and Sikkim, appears again in the mountains of northern Luzon with many other characteristic Chinese plants. The specimens agree perfectly with the slightly elongated form of China.

79. *Polypodium hemionitideum* Wall. Cat. (1828) 284.

LUZON, Province of Benguet, Baguio (1907 *Barnes*) May to June, 1904, found previously in Luzon by *Warburg*.

A continental type, China, Yunnan, leg. *Henry*; Formosa, leg. *Faurie*, *Matsumura*; India, Khasia, leg. *Austin*, *Clarke*, *Blanford*; Sikkim, leg. *Jerdon*; also reported from the Nilgherries, southern India.

80. *Polypodium suboppositum* Christ in Bull. Herb. Boiss. II. 6 (1906) 995.

LUZON, District of Lepanto, Bagnen (1904 *Copeland*) November, 1905, the type from Mount Pinatubo, Province of Zambales, Luzon (*Loher*).

81. *Polypodium Sablanianum* n. sp.

I have previously treated the polymorphism of the *Microsorium*¹⁹ type of which the best known representative is *P. punctatum* (L.) Sw. The present new form, from its venation is almost exactly intermediate between *P. punctatum* Sw., and *P. myriocarpum* Mett. In the former, the lateral nerves are very regular, oblique, reaching the margin and inclosing 4 or 5 areolæ, which are elongated, rectangular, between the rachis and the margins; these areolæ are about equal, and the network of nerves is weak, inclosed in and more or less hidden by the fleshy tissue. In *P. myriocarpum* on the contrary, the lateral nerves do not reach the margin of the frond, and inclose only one large areola along the rachis and another narrower one between it and the margin, and the veins are strong and rather prominent. *P. Sablanianum* has an even more delicate texture than *P. myriocarpum*, and its nerves are slender, not prominent and form a single very large square areola, at the side of which is another very narrow obscure one. The plant is larger, 73 cm. long, 5.5 cm. wide, the apex of the frond long caudate, the base long decurrent, the stipe very short. Texture membranous, color bright green, the costa light yellow, shining, the fronds which appear to be solitary and not fasciated have undulate margins, the rhizome is climbing, brown, as thick as a goose quill, covered with stiff subulate dark brown 4 mm. long scales.

LUZON, Province of Benguet, Sablan (6142 *Elmer*) April, 1904.

¹⁹ Bull. Herb. Boiss. II. 6 (1906) 993.

82. *Polypodium flaccidum* n. sp. (*Phymatodes*.)

Rhizomate repente pennae anserinae crassitie, griseo-brunneo nec glauco, radicoso, stipitibus solitariis articulatis basi parvis setulis nigris praedito aut glabris, tenuibus, stramineis, 6 ad 8 cm. longis sed ob laminam longe decurrentem fere usque ad basin alatis, fronde 40 cm. longa 18 cm. lata, ovali, longe sensimque decurrente et lobo simplici caudato 18 cm. longo terminata, 4 aut 5 lobis lateralibus ala costali utrinque 13 mm. lata, lobis remotis 10 cm. longis, 1.5 cm. latis acutissime caudatis sinibus vastis rotundatis 2 ad 3 cm. latis interjectis, marginibus integris rhachi costisque stramineis manifestis, nervis lateralibus curvatis tenuissimis versus marginem evanidis, areas et areolas numerosis oblongis nervulos furcatis includentibus, soris irregulariter bi- aut triseriatis numerosis 1.5 mm. latis rotundatis fere planis ochraceis, facie superiore macula obscura vix impressa notatis, fovea marginata sorali deficiente. Textura flaccide papyracea, diaphana, colore dilute virente.

LUZON, Province of Rizal, Bosoboso (1087 *Ramos*) July, 1906.

A species near *P. phymatodes*, but distinguished by its long decurrent frond, thin and diaphanous texture and small irregular sori which are not immersed in pits.

83. *Polypodium palmatum* Blume Fil. Jav. 150.

*Copeland*²⁰ credits *Polypodium trifidum* Don to the Philippines, but as he presumes, i. e., all the specimens from the Archipelago are referable to *P. palmatum* Blume, also those that I have cited previously for *P. trifidum*.²¹ Typical *P. trifidum* is an essentially Chinese species which does not extend to Japan nor to the Malayan Archipelago.

84. *Polypodium productum* n. sp.

Rhizomate breviter repente radicoso squamis minutis 2 mm. longis setaceis sparso, foliis approximatis nudis 63 cm. longis in stipitem stramineum 10 cm. longum sensim decrescentibus longe et acute acuminatis, medio 1 ad 12. cm. versus apicem 4 mm. latis, costa prominente, straminea margine anguste revoluta, nervis occultis, soris 30 ad 50 utrinque marginalibus impressis versus apicem ultra marginem protrusis ovatis 4 mm. longis, 2 ad 3 mm. distantibus. Textura rigide coriacea, colore flavovirescente sublucido.

MINDANAO, Province of Zamboanga, San Ramon (1585 *Copeland*) January, 1905, alt. 175 m.

A species related to *P. longifolium* Mett., which is also found in the Archipelago, PALAWAN (631 *Foxworthy*) April, 1906, differing from the latter in its firm texture, pale color, shining, the fronds narrower and long acuminate at the apex, the margins inflexed and the sori much elongated. *P. longifolium* is broader, the apex not sharp, the texture less firm, opaque, dark brown when dry, the sori often more rounded.

²⁰ *Govt. Lab. Publ.* 28 (1905) 129.

²¹ *Bull. Herb. Boiss.* 6 (1898) 200.

GLEICHENIA Smith.

 (§ *Diplopterygium.*)

On examination of the Philippine forms of this group with the aid of survey given by *Presl*²² it is possible to distinguish the following forms:

85. *Gleichenia excelsa* J. Sm. in Hook. Journ. Bot. 3: 420, nomen nudum; Hook. Sp. Fil. 1: 5. *Tab. 4. B*; *Presl* l. c. 385.

LUZON, Province of Benguet, Baguio (6006 *Elmer*); (*Loher*) March, 1897.

This species is distributed from northern India to central China and Java. Shillong (*Clarke* 37478); Munipore (*Watt* 6139). Penang Hills (*Ridley*). Yunnan, Mengtze (*Henry* 9167); Moilim (*Egbert* 1897); Hongkong (*Faber* 1091); Ningpo Mountains (*Faber* 219). Java (*Schiffner*).

86. *Gleichenia glauca* (Thunbg. Fl. Jap. 338, *Polypodium*) Hook. Sp. Fil. 1: 4 (*Swartz* Syn. 164, 390, *Mertensia*).

LUZON, Province of Tayabas, Mount Banajao (*Loher*) February, 1906, alt. 2,250 m.

Identical with specimens from Japan except for a covering of reddish hairs along the costæ in young plants. The discovery of this species in the Philippines augments the number of species of the temperate regions of the East that extend to the highlands of the Philippines. It is on the whole rather a remarkable distribution, for in this group it is the only species found in Japan, while from China I know *Gleichenia excelsa*, *G. gigantea* Wall. (Yunnan, *Delavay*) and the following:

87. *Gleichenia laevissima* Christ in Bull. Acad. Mans. (1902) 268.

LUZON, Province of Benguet, Pauai (1954 *Copeland*), 2,000 m. alt.

Still another Chinese type, of which I have specimens from Yunnan (*Delavay*) and Lu Mount (*Faber*) August, 1897.

LYGODIUM Sw.

88. *Lygodium Basilanicum* n. sp.

Axibus ochreis tenuibus vix ultra 1 mm. crassis, pinnis petiolatis, petiolo 3 cm. longo angustissime alato, pinna ambitu semirotonda 12 cm. longa et lata, dichotoma, partibus petiolulatis (petiolo 0.5 cm. longo alato) pedatifidis, 3 aut 4-lobis, centro indiviso, 1 ad 2 cm. longo et lato, lobis patulis, 9 cm. longis, 6 mm. latis, linearibus acuminatis integris tenuissime marginatis, lobo basali deflexo, costis tenuissimis manifestis rufostramineis, nervis prominulis obliquis 2 aut 3-furcatis, confertis, lobis fertilibus medio aut infra medium subito usque ad alam 1 mm. latam contractis, sporophyllis pectinato-confertis, 2.5 mm. longis, 1 mm. latis, utrinque circa 8 sporangia gerentibus brunneis munitis. Textura coriacea nec papyracea, colore sicce brunneo, opaco.

BASILAN (28 *DeVore et Hoover*) April, 1903.

A small species of the *circinatum* group, differing from *L. circinatum* by its pinnae being dichotomous and with petioled pedately arranged pinnules, the segments not dimorphous but narrowed and bearing the sporophylls on the upper half. Dimensions of *L. Japonicum*.

²² *Epim. Bot.*, 384.

CYATHEA Sm.

89. *Cyathea rufopannosa* n. sp.

Stipite erecto arboreo, 2 m. alto aut altiore, anguloso, 3 cm. diametro, stipite digiti crassitie, cylindrico, 55 cm. alto, castaneo, basi verrucis numerosis brevibus sed huic inde pungentibus scaberrima et squamis 1.5 cm. longis lanceolatis acuminato-falcatis dure scariosis nec diaphanis lucidissimis castaneis tecta, undique cum rhachi et costis indumento furfuraceo fibrilloso spisso tecto, fronde late ovata usque ad 1.5 m. longa (*Copeland*) fere 60 cm. lata versus basin attenuata, rhachi digiti crassitie verrucis cabra rufotomentosa et setulis subulatis fibrillosa, pinnis remotis uti videtur ca. 15 utrinque, infra apicem pinnatisectum, infimis deflexis, mediis 37 cm. longis (infimis 22 cm. longis) 11 cm. latis, sessilibus, ad basin paulum attenuatis, acuminatis, pinnulis ca. 30 utrinque, approximatis 5.5 cm. longis 1.5 cm. latis lanceolatis acutiusculis nec caudatis, usque ad rhachim incis, segmentis pectinatis ca. 20 utrinque, ligulatis, obtusiusculis, crenulatis, infimis posterioribus dentatis, 5 mm. longis, 2 mm. latis parce setulosis, nervis furcatis ca. 8 utrinque, costis pinnularum subtus squamis lanceolatis rufis nec non squamulis bullatis umbonatis rufis dense obtectis, soris parvis paucis costae pinnulae approximatis ultra medium segmenti raro protensis, confertis rufis 1 mm. latis, indusio brunneo-rufo irregulariter confracto more *Amphicosmiae*. Textura herbacea, colore partium frondosarum lacte virente, partium axialium rufo-cinnamomeo.

MINDANAO, Province of Zamboanga, San Ramon (1730, 1735 *Copeland*) April, 1905, alt. 1,200 m.

A striking species, the base of the stipe with short sharp spines, the scales at the base of the stipe large, firm, shining, dark brown, the axial parts and even the costae covered with a dense fibrillous brick-red pubescence, the fronds tripinnatifid, the pinnules and segments serrate, the latter small, slightly dentate, the sori small, reddish, borne near the costa.

90. *Cyathea Loheri* Christ in Bull. Herb. Boiss. II. 6 (1906) 1007.

This species was discovered by *Loher* on Mount Banajao and on Mount Maquiling, LUZON. A form occurs on Mount Tonglon (Santo Tomas); that is sufficiently distinct to warrant being described as a variety.

Var. *Tonglonensis* n. var. -

Stipite rugoso et cicatricoso, squamis subulato-setaceis basi verrucosis flexuosis flaccidis atrobrunneis ultra 1 cm. longis patentibus, nec rigidis adpressis scarioso-argenteis tecto, costis densissime squamis bullatis brunneis tectis, segmentis minoribus dense pectinatis.

LUZON, Province of Benguet, Mount Tonglon (4991 *Curran*) August, 1906.

It is possible that *Alsophila lepifera* J. Sm. apud Hook. Sp. Fil. 1: 54, is the same as *Cyathea Loheri*, but the description of the former is too incomplete to verify this.

91. *Cyathea Negrosiana* n. sp.

Stipite digiti et basi fere pollicis crassitie, basi atro-, supra cum rhachi costisque rufo-castaneo, verrucis minutis creberrimis, scaberrimo, lucido, basi squamis subulato-setaceis flexuosis lucentibus atrofuscis 2 cm. longis dense vestito, ob pinnas abbreviatis inferiores valde descendentes solummodo 15 aut 20 cm. longo, fronde tripinnata ultra 1 m. longa 25 cm. lata, ovato-acuminata versus basin sensim attenuata, pinnis remotis, 10 ad 15 utrinque, erecto-patentibus mediis longissimis, 35 cm. longis, 14 cm. latis, caudato-acuminatis, sessilibus, versus basin non attenuatis, pinnulis remotiusculis, 1.5 cm. distantibus, sessilibus, ca. 20 utrinque infra apicem pinnatifidum, 7 cm. longis, acuminatis, 14 mm. latis, fere usque ad costam incisiss, segmentis approximatis falcato-lanceolatis, acutiusculis, 7 mm. longis, 2.5 mm. latis, obtuse crenulatis, costis costulisque dense squamulis ovatis bullatis rufo brunneis more *C. Loheri* vestitis, nervis basi furcatis, 8 aut 10 utrinque, soris costulis adpressis, 3 aut 5 utrinque minutis, indusio griseo-brunneo primum globulari nitidulo mox confRACTO, frustulis squamiformibus irregularibus receptaculum nigrum elevatum circumdantibus. Textura herbacea, colore atroviridi, opaco.

NEGROS, Mount Silay (1536 *Whitford*) May, 1906, alt. 1,000 m.

This species was determined by *Copeland* as *Cyathea Christii*, but it is distinguished from the latter by its axial parts being richly covered with furfuraceous scales, by the costae being covered with rounded inflated scales, by its membranous texture and very reduced size.

92. *Cyathea ferruginea* n. sp.

Stipite pennae cygni crassitie cum rhachi subnitido, anguloso, castaneo, floccoso-paleaceo sublaevi, pinnis 26 cm. longis, 11.5 cm. latis stipitatis ovato-acuminatis basi aliquantum attenuatis, i. e., pinnula infima abbreviata, costis pinnarum indumento floccoso paleaceo squamis rufis crispis e basi ovata subulatis crispulis patentibus rufis constituto tectis, pinnulis ca. 15 utrinque infra apicem lobatum, remotis, i. e., spatio 2 cm. lato separatis, lanceolatis, acutis nec caudatis sessilibus 6 cm. longis, 11 cm. latis, ad alam angustam incisiss, segmentis ca. 14 utrinque confertis, angulo fere nullo interjecto, falcatis acutiusculis aut obtusis, ovatis, 0.5 cm. longis, 3 mm. latis, minute crenulatis, costulis pinnularum supra puberulis subtus omnino squamis rufo-griseis ovatis adpressis acutis 2 mm. longis tectis, faceibus fere glabris, nervis 6 plerumque furcatis, soris mediis 4 aut 5 utrinque, cinnamomeis, vix 1 mm. latis, confluentibus, indusio fugaci vix conspicuo, frustulis cum squamulis mixtis. Textura herbacea, colore dilute viridi, opaco.

PALAWAN, Mount Pulgar (560 *Foxworthy*) March, 1906, alt. 1,150 m.

A small species 2 m. high, acaulescent according to *Foxworthy's* notes, growing just below the summit of the mountain on an exposed ridge in the mossy forest.

ALSOPHILA R. Br.

93. *Alsophila calocoma* n. sp.

Caudice arborescente, stipite ad basin coma densissima et pulcherrima squamarum scariosum argenteo-lucidarum pallidorum sed apice rufarum, e basi 3 mm. lata ovatorum, longe subulato caudatarum aristatarumque, usque ad 4 aut 5 cm. longarum ornato, aliter inermi, sed verrucis minutis rugoso, rhachi tuberculis verrucosis creberrimis rugosissimo, squamulisque furfuraceis sparsa rufo-ochracea, opaca, fronde tripinnatisecta, pinnis amplis 75 cm. longis, 25 cm. latis acuminato-caudatis petiolatis (petiolo 2 ad 3 cm. longo) pinnulis confertis 20 ad 30 utrinque infra apicem lobatum, fere sessilibus, 15 cm. longis, 2.5 cm. latis e basi lata lanceolato-acuminatis, infimis haud abbreviatis, supremis late adnatis et decurrentibus, costis rufo-brunneis tenuibus, cum costularum parte inferiore subtus serie squamularum candidarum lucidarum ovatarum adpressarum ciliatorum elegantissime vestitis, partibus foliaceis plantae laevibus, pinnulis usque ad costam incisissimis, segmentis falcato-ligulatis obtusiusculis aut acutiusculis, 11 mm. longis, 3 mm. latis, fere integris rarius crenulatis, pectinato-confertis, inferioribus liberis, i. e., basi spatio separatis et aliquantulum angustatis, ca. 35 utrinque, nervis ca. 12 tenuissimis furcatis saepe tri- sive pluries-furcatis, soris 8 ad 10 utrinque, mediis 1 mm. latis sese tangentibus nec confluentibus cinnamomeis globosis receptaculo minuto elevato nigro, textura flaccide herbacea, colore glauco-aut plumbeo-viridi, supra obscuro, subtus pallidiore.

LUZON, Province of Rizal, Mount Alabut (*Loher*) February, 1904, alt. 1,900 m.; Angilog (*Loher*) March, 1906; Province of Benguet, near Baguio (*Loher*) March, 1897.

A beautiful species characterized by the shining hairs on the stipe and the shining white or metallic scales on the under surface of the segments.

This is the species that I had previously identified²³ as *A. lepifera* J. Sm., but I am now convinced that it is a distinct species. The short description of *A. lepifera* J. Sm., given by *Hooker*²⁴ is quite insufficient from which to identify *Smith's* species, except that it appears to be near, if not identical with *A. tomentosa* (Blume), as *Christensen* supposes in his Index Filicum 44, or perhaps the same as *Cyathea Loheri* Christ. *A. calocoma* is distinguished from *A. latebrosa*, with which it shares the character of the costal and costular scales, by its whitish scales and by its basal segments being free and attenuate toward the base, as well as by the marked glaucescence of the frond. In *A. latebrosa* I have never observed the exceptionally long scales which are shining, silvery or somewhat golden in color and strongly pointed, 4 to 5 cm. in length, such as are found in *A. calocoma*. It is a delicate species with trifurcate nerves and a very rugose rachis.

Var. **congesta** (*Alsophila lepifera* var. *congesta* Christ in Bull. Herb. Boiss. 6 (1898) 137).

This variety is identical with the type in having the same very large basal, scarios, silvery, subulate, 5 cm. long scales which are 4 mm. wide below,

²³ Bull. Herb. Boiss. 6 (1898) 137.

²⁴ Sp. Fil. 1: 54.

yellowish rhachis which is very rough with small spines, small whitish costular scales, and the basal segments free, remote and narrowed below, but it is readily distinguishable from the type by its shorter narrower segments which are more falcate and more strongly serrate. The pinnules do not exceed 8 cm. in length. In general appearance quite different from the type, but having the same essential characters. It appears to be an alpine form of the species.

LUZON, Province of Rizal, Arambibi (*Loher*) March, 1903; Province of Benguet (6504 *Elmer*) June, 1904.

94. *Alsophila latebrosa* (Wall.) Hook. Sp. Fil. 1: 37.

The ordinary form of this species so common in India, the Malayan Peninsula, Java, Borneo, Celebes and Amboina (herb. *Christ*), is not known to me from the Philippines, where the species is represented by a form notably larger. It is the same as with *Alsophila contaminans*, which is represented in the Philippines by the large variety *Celebica*.

Var. *major* n. var.

Rhachi fulvo straminea, laevi aut minutissime furfuracea, pinnis ca. 28 utrinque infra apicem, 55 cm. longis, 18 cm. latis fere sessilibus oblongo-acuminatis, pinnulis confertis recte patentibus sessilibus 9 cm. longis, 2 cm. latis oblongo-caudatis, usque ad costam tenuiam nigram incisus, segmentis imbricato-confertis rotundato-obtusis rectis oblongis ca. 20 utrinque 1 cm. longis 2.5 mm. latis, crenulatis, nervis ca. 9 utrinque, tenuissimis basi furcatis saepe trifurcatis, costula squamulis rotundis peltato-umbilicatis 0.3 mm. latis flavis elegantissime vestitis, fronde caeterum glabra, tenuiter herbacea, colore obscure viridi subtus pallido, opaco.

MINDANAO, Province of Surigao (325 *Bolster*) May, 1906: District of Davao, Mount Batangan (*Warburg*).

The costular scales in *A. lepifera* are white, oval and larger than in the above variety.

DICKSONIA L.' Herit.

95. *Dicksonia Copelandi* n. sp.

Ampla, basi stipitis coma densa pilorum tenuissimorum 7 mm. longorum rufobrunneorum coperta, stipite plantae junioribus iisdem pilis vestito, rufostramineo, subnitente, pinnis deltoideo-acuminatis, petiolatis, 45 cm. longis 24 cm. basi latis inaequalibus, antice auctis, pinnulis^{II} ca. 20 utrinque confertis, inferioribus mediisque deltoideis, infimis 15 cm. longis 12 cm. latis petiolatis, acuminatis, pinnulis^{III} deltoideo-oblongis acuminatis ca. 12 utrinque, subinaequalibus, infimis 6 cm. longis 3 cm. latis, petiolulatis, pinnulis^{IV} infimis 1.5 cm. longis basi 8 mm. latis liberis oblongis acutis subinaequalibus profunde serratis, dentibus trigono-acutis mucronatis, nervis suboccultis in pinnulis^{IV} pinnatis furcatis, soris in dentibus terminalibus sed mucrone superatis, uno pro dente, praecipue antice positus, numerosis, brunneis 1 mm. latis globosis coriaceis irregulariter bivalvis. Textura coriacea, costis nervisque pilosis, facie superiore glabra subnitente, colore ochraceo-viridi.

LUZON, Province of Benguet, Baguio (*Loher*), March, 1897, alt. 1,400 m.; (6025 *Elmer*) March, 1904: District of Lepanto, Bagnen (1912 *Copeland*) November, 1905, alt. 2,000 m.

A species closely related to *D. straminea* Labill., but strongly pilose, larger, quadripinnatifid, the pinnae and pinnules broader and more strongly serrate, broadly deltoid, the pinnules of the third order broader the lobes shorter and broader. Resembling the South American *D. conifolia* Sw.

MARATTIA Smith.

All the Philippine forms of this genus that I have examined have been identified after the classification in the monograph of *DeVriese* and *Harting*, in which work the diagnoses are by no means comparative and in which the differences between related species are not noted. The number of species is so large and their characters so uniform that the distinctive characters of each species should have been emphasized. At any rate the group merits more attention than the successors to the two Dutch botanists have given it, for certainly the forms are very numerous and can not all be reduced to a single species. The morphological differences between young and adult fronds are very great, and the latter, even the fertile ones, frequently present characters that are ordinarily found only in young fronds. In diagnoses the adult parts only have been considered.

I have been able to elucidate here; with a fair degree of certainty, the following forms:

96. *Marattia sambucina* Blume. Enum. (1828) 256; *DeVriese* et *Harting* Monog. 6.

Textura firmiter chartacea, rhachi laevissima flava, pinnulis sessilibus basi acute cuneatis, acutis, adultis 7.5 raro 11 cm. longis, 1 ad 1.4 cm. latis, margine omnino dentatis, dentibus obliquis raro patentibus, synangiis 1.5 mm. a margine remotis 1.5 mm. longis non contiguis late ovatis, 6 ad 8-loculatis. Colore pallide viridi.

LUZON, Province of Benguet, Mount Tonglon (*Loher*) April, 1906; Baguio (*Loher*) January, 1893: Province of Union, Castilla (*Loher*) March, 1906.

This is the most widely distributed form, identical with specimens from Java leg. *Raciborski* and from Celebes leg. *Sarasin*. It is the form previously considered by me as *M. fraxinea*.²⁵

97. *Marattia silvatica* Blume Enum. (1828) 256; *DeVriese* et *Harting* Monog. 6. III. 25.

Firmiter chartacea, rhachi laevissima flava, pinnulis petiolulatis, basi acute cuneatis acutis, adultis 9 cm. longis 13 mm. latis, margine omnino dentatis, dentibus brevibus patentibus, synangiis fere marginalibus, fere contiguis, 2 mm. et ultra longis, oblongis, 12 ad 15-ocularibus. Colore pallido.

LUZON, Province of Benguet, Baguio (5833 *Elmer*) March, 1904.

98. *Marattia pellucida* Presl Suppl. Tent. Pterid. 10; *DeVriese* et *Harting* Monog. 6.

Herbacea, rhachi flava, laevissima, pinnulis petiolatis, basi abrupte cuneatis, apice abrupte acuminatis, adultis 10 cm. longis, 14 mm. latis,

²⁵ *Bull. Herb. Boiss.* 6 (1898) 207.

margine omnino dentatis, dentibus brevissimis apertis, synangiis 1 mm. a margine remotis non contiguis brevibus 1 mm. longis oblongis 8-ocularibus. Colore dilute viridi-plumbeo, nervis egregie pellucidis.

MINDANAO, District of Davao, Mount Apo (1455 *Copeland*) October, 1904, alt. 1,550 m.

99. *Marattia vestita* n. sp.

Ampla, caudicè 2.5 cm. crasso, opaco, rufobrunneo dense pustulis atque squamis ovatis flaccidis 1 cm. longis et 0.5 cm. latis minoribus et angustioribus mixtis scabro, rhachibus rufofuscis supremis ochraceo-rufis opacis et abunde cum costis squamis lanceolatis brunneis squamulisque fibrillosis vestitis, pinnis oblongis 70 cm. et ultra longis 30 cm. latis, petiolo 7 cm. longo praeditis, basi attenuatis, acuminatis, pinnulis petiolatis ca. 10 cm. remotis 20 cm. et ultra longis, 15 cm. latis basi attenuatis, pinnula terminali praeditis, pinnulis^{III} alternis valde (2.5 cm.) remotis basi articulatis infimis brevissime subpetiolulatis, basi acute cuneatis, acuminatis, 9 cm. longis, 12 mm. latis, lanceolatis, margine omnino dentatis, dentibus patentibus apertis, nervis conspicuis fere 2 mm. remotis nigris simplicibus, soris minutis remotis oblongis 1 mm. longis ochraceis 5-ocularibus subclausis. Textura firmiter sed tenuiter chartacea, colore supra obscure, infra pallide viridi, opaco.

MINDANAO, District of Davao, Mount Apo (1179 *Copeland*) April, 1904.

A species peculiar in its axial parts being not polished or shining but dull, dark colored, rough, and with numerous scales. The denticulation is very open and the synangia are smaller than in any other species known from the Archipelago.

100. *Marattia Ternatea* DeVriese et Harting Monog. 4. t. 3. 16.

Chartacea fere coriacea laevissima, pinnulis petiolulatis, petiolis squamulosis, planta caeterum glabra, rhachi ochraceo-plumbea, pinnulis basi cuneato-ovatis, acutis, lanceolatis, 12 ad 20 cm. longis, 2 ad 2.4 cm. latis, minute denticulatis et ob marginem inflexum fere integris, nervis valde remotis (ultra 2 mm.) ochraceis, synangiis remotis, oblongis, ultra 3 mm. longis, 15-ocularibus, 1.5 mm. a margine remotis. Colore supra obscure, infra palidissime viridi.

LUZON, Province of Bataan, Mount Mariveles (2082 *Borden*) September to December, 1904; (1116 *Whitford*) May, 1905.

In this species the pinnae are larger than in any other one known from the Archipelago, their borders in part nearly entire and in part dentate.

ANGIOPTERIS Hoffm.

Angiopteris offers in a still greater degree than *Marattia* the lack of palpable differential characters, and the differences between the various forms, quite distinct to the practiced eye, are difficult to diagnose properly. I believe it possible to distinguish the following species:

101. *Angiopteris cartilagidens* Christ in Bull. Herb. Boiss. 6 (1906) 207.

LUZON, Province of Benguet, Baguio (*Loher*), alt. 1,400 m.

One of the most sharply defined species, characterized by its dentation, texture and scales.

Endemic.

102. *Angiopteris similis* Presl in DeVriese et Harting Monog. Maratt. 17.

MINDANAO, Lake Lanao, Camp Keithley (115 Mrs. *Clemens*) January, 1906, alt. 660 m.

A species with thinly papyraceous texture, shining, pale green, the nerves recurrent, slender, slightly visible, the sori small, dark brown, close to the margin, the pinnules large, 18 cm. long, 21 mm. broad, the teeth prominent only at the sterile apices.

Java.

103. *Angiopteris angustifolia* Presl ex DeVriese et Harting Monog. Maratt. 18.

LUZON, Province of Bataan, Lamao River (3791 *Merrill*) January, 1904. NEGROS, Gimagan River (1659 *Whitford*) May, 1906. MINDANAO, Lake Lanao (Mrs. *Clemens*) April, 1906; Province of Surigao (240 *Bolster*) April, 1906; District of Davao, Todaya (1459 *Copeland*) October, 1904.

This seems to be the most widely distributed species in the Archipelago, and was first collected by *Cuming*. It is distributed from Annam, leg. *Cadière*, to Formosa, leg. *Faurie*, south to the Sunda Islands.

104. *Angiopteris caudata* DeVriese et Harting Monog. Maratt. 20.

LUZON, Province of Benguet, Mount Tonglon (*Loher*) April, 1906; Baguio (5126 *Curran*) August, 1906; (5930 *Elmer*) March, 1904; Province of Laguna, Mount Maquiling (*Loher*) June, 1906.

Pinnules strongly narrowed, the upper ones 8 mm. broad, very gradually narrowed into the long pointed apex. The pinnae resemble those of *Pteris longifolia* Linn.

105. *Angiopteris pruinosa* Kze. Schkuhr Suppl. 1: t. 91.

NEGROS, Gimagan River (1652 *Whitford*) May, 1906.

Fronds bluish white beneath quite similar in color to those of *Lomaria glauca* Blume.

CHRISTENSENIA Maxon.

106. *Christensenia Cumingiana* n. sp.

Omnium reliquarum formarum adhuc cognitarum minima, rhizomate crasso, brevi, carnoso, radicoso, foliis approximatis, junioribus subfasciculatis, stipite usque ad 14 cm. longo cum costis nervisque rufostramineo furfuraceo, fronde tam simplicis ovata breviter acuta basi subcordata 8 ad 13 cm. longa 3 ad 5 cm. lata, repanda aut grosse dentata, quam tripartita, pinna centrali late ovata 11 cm. longa 5 cm. lata acuta longe et anguste cuneata, lobato-repanda, pinnis lateralibus adnatis valde inaequalibus postice cordato-auctis, antice anguste cuneatis 9 cm. longis 3 cm. latis, nervis manifestis, ca. 10 utrinque, rectis patentibus interstitio ca. 1 cm. lato, facie superiore laevi inferiore albida, stomatibus rotundis dense tecta, laevi, synangiis vix 1.5 mm. latis (deciduis aut immaturis) brunneis inter nervos biseriatis, ca. 4 pro serie. Textura modice succulenta.

MINDANAO, Province of Zamboanga, San Ramon (*Copeland* s. n.) March, 1905, alt. 200 to 650 m.

All the other species of *Christensenia* (*Kaulfussia*) known to me have the lateral pinnæ rather strongly petioled. *DeVriese* and *Harting* have indicated in their Monograph of the Marattiaceae 14, that the *Kaulfussia* found by *Cuming* in the Philippines, which was considerably smaller than the other known forms, might perhaps prove to be a distinct species. In comparison with specimens from Assam, leg. *King*; Selangor, leg. *Ridley*; Java, leg. *Raciborski*, and Sumatra, leg. *Schneider*, the specimens from MINDANAO are very reduced. The fertile frond is often simple and when it is tripartite the lobes are joined at the base, not petiolate, and very unequal, whitish beneath.

BOTRYCHIUM Sw.

107. *Botrychium lanuginosum* Wall., var. *nanum* n. var.

LUZON, Province of Benguet, Bugias (1848 *Copeland*) October, 1905, alt. 1,550 m., with the large form.

Like our European *Botrychium* this large species has also a dwarfed form, about 17 cm. high, the fertile frond with its stipe about 10 cm. high.

SUPPLEMENT.

There are two forms hitherto confounded as *Aspidium coadunatum* Wall. or even as *A. cicutarium* Sw., which is a very different West Indian species. After a careful examination and comparison with other specimens of the Malayan and wider Asiatic area, I can indicate the following diagnostic points:

Aspidium coadunatum Wall. Cat. 377 non Hook. et Grev. Ic. Fil. 202. *Sagenia* J. Sm. Hook. Journ. Bot. 4: 184. Presl Epimel. 60.

Stipite rufo glaberrimo lucente, basi squamis ovatis acutis 0.5 cm. longis flaccidis brunneis sparso. Rachi laevi lucida flavido-rufa. Pinnulis ovato-lanceolatis acutis, lobis late ovatis obtusis sive subacutis. Faciebus pilis albidis brevibus pubescentibus, marginibus ciliatis. Nervis ad marginem protensis, nervulis luteo-brunneis tenuibus abunde anastomosantibus, nervulis inclusis clavatis frequentibus. Colore laete virente, textura diaphana. Indusio orbiculari-reniformi margine pallidiore.

LUZON, Bontoc, Sagada (1899 *Copeland*): Province of Rizal, Bosoboso (1033 *Ramos*).

A common species in tropical Asia.

Wynaad, Malabar, leg. *Bicknell*; Anamalays, Province of Madras, leg. *Beddome*; Mercara Coorg. 1,100–1,200 m., leg. *Richter*; Koon Beeling, Burma, leg. *Brandis*; Ceylon, leg. *Wall.*; Yunnan, leg. *Henry* 10341, 10354; Sze tchuen, Mount Omi, leg. *Wilson* 5376. Viti, Plewa River, leg. *Moore*; Tahiti, leg. *Radcond*.

Aspidium Malayense n. sp.

Stipite opaco vix subnitente brunneo, basi squamis ad 1 cm. longis lanceolato-subulatis rigidis atrobunneis, caeterum cum rachi squamis setaceis atratis plus minus dense vestita. Rachi fere opaca fusco-aut olivaceostraminea pinnulis lanceolato-angustatis caudatis, lobis acutis ovato-lanceolatis grosse dentatis. Faciebus fere laevibus nec ciliatis. Colore sicce griseo-aut atroviridi, textura opaca. Nervis lateralibus

ad marginem protensis, nervulis nigris crassis, solummodo secus costas anastomosantibus, nervulis inclusis clavatis raris aut nullis, parce indusio brunneo peltato.

LUZON, Laguna Province, Majayjay (*Loher*) 1891; Bataan Province, Lamao River (1959 *Borden*, 217, 1396 *Copeland*); northern Luzon (*Warburg*). MINDANAO, Todaya, Davao (1468 *Copeland*).

I have the same species from Malacca, Johor, leg. *Ridley* 10976; Singapore, leg. *Hose* (1894).

Aspidium melanorachis Bak. Journ. Bot. 1888. *Nephrodium*. 315 Sarawak, Borneo, leg. *Hose* is very near.

Differt squamis atropurpureis linearibus flaccidis flexuosis, rachis costisque atropurpureis, fronde ampliore, faciebus dense pubescentibus, sori magis numerosis, irregulariter sparsis nec stricte biseriatis, minoribus, indusio tenui griseo mox evanido, nervi valde anastomosantibus, nervulis inclusis multis.

Diplazium vestitum Presl Epimel. 87, 1849. Hook. Ic. II. 46.

By comparison with Hooker's figure of Cuming's specimen from Leyte, I have identified as this species the plant found by Loher at Mabacal and Angilog, Rizal Province, March, 1906. It is very much larger than the one represented by Hooker; but all the details correspond perfectly, especially the axial parts covered with scales and furfuraceous down. The lateral nerves and the sori converge in the sinus between two lobes, but they do not touch before the sinus. The stipe, which attains the size of a finger, is rough with small warty projections.

The same plant from Celebes leg. *Koorders* 16986.

~~I distinguish this from~~ the form which I have identified in Bull. Herb. Boiss. VI. 1906, 1001, with *D. Smithianum* (Bak.) Diels by the shorter sori, which touch somewhere before the sinus, by the rough scaly rachis armed like the costæ with sharp prickles, and by the more truncate lobes. I have this from Ceylon, leg. *Wall.* 38/275, from Celebes, Bojong, leg. *Warburg* 15314, *Sarasin* 108, and from New Guinea, Sattelberg, leg. *Weinland* 1890.

I must say that these two forms are exceedingly similar and appear almost like one specific type in the wider sense. *Diplazium dolichosorum* Copel.¹ is intermediate between *D. vestitum* Presl and *D. Smithianum*; the sori are those of the former, but the imperfect pubescent covering and the truncate lobes are as in the second.

¹ New Phil. Ferns, I. c., 151. f

THE PHILIPPINE SPECIES OF DRYOPTERIS.

By H. CHRIST.

(Basel, Switzerland.)

Some time ago Mr. *Elmer D. Merrill*, Botanist of the Bureau of Science, Manila, sent me all the Philippine material of the genus *Dryopteris* from the herbarium of that institution, in order to give me an opportunity to prepare a classified list of the species found in the Archipelago. The collection contains many of *Cuming's* plants, and a large number of specimens collected by the American botanists since the occupation of the Philippines by the United States. In addition to the above material I have also received from Dr. *E. B. Copeland* a notable collection, and Mr. *Loher* has had the kindness to furnish me with an additional and very interesting collection, supplementary to the one he sent me in 1897 and which was the basis of my work "*Filices Insularum Philippinarum.*"¹ Since the publication of the above paper some important works of Dr. *Copeland* have notably advanced our knowledge of the ferns of the Philippines. In his *Polypodiaceae* of the Philippine Islands,² Dr. *Copeland* admits 60 species of *Nephrodium*, compiling the descriptions of all the species credited to the Philippines, even of those species of which he had not seen specimens. In my present paper I have not attempted to account for all the species of the genus that have been credited to the Archipelago by various authors, but have considered only those of which specimens are before me. In a group so difficult as *Dryopteris* and so subject to diverse interpretation, it appears to me that the latter treatment is the surest, even if completeness is sacrificed.

I have limited *Dryopteris* in the sense of *Christensen's* Index Filicum; that is, excluding *Pleocnemia* and *Sagenia* and treating only *Lastrea* (including *Phegopteris*) and *Nephrodium* proper (including *Goniopteris*, *Mesochlaena* and *Meniscium*). As the Philippines are particularly rich in species and forms of *Dryopteris*, the task of treating all the species was sufficiently arduous. In regard to nomenclature I have followed *Christensen's* Index Filicum and accepted the generic name

¹ *Bull. Herb. Boiss.* 6 (1898) 127-154; 189-210.

² *Govt. Lab. Publ.* 28 (1906) 18-32.

Dryopteris, in spite of the sacrifice of personal opinions and in spite of being obliged to discard names that have been in constant use for a century and which are known to all botanists.

Nowhere else is the type of *Nephrodium* with anastomosing veins so diversified as in the Philippines. There are in the Philippines forms with very narrow pinnae, and some special characters are found in the species of this region more often than in those of other parts of the world. These characters are: Pinnae attenuated toward their bases, the lower ones deflexed, the pinnae degenerating into auricles at the base of the frond, sometimes abruptly, sometimes gradually. In other equatorial regions species with these characters are rather rare. In tropical America, *Dryopteris sagittata* (Sw.) is almost the only known species of the group where the frond is abruptly reduced at the base, the lower pinnae being represented by auricles, and *D. refracta* (Fisch. & Mey.) is one of the rare examples of a species with deflexed pinnae. The Malayan region offers the most frequent examples of species presenting the two last characters, for example *D. sagittifolia* (Blume) of Java, but even in the Malayan region such species do not approach in number those of the Philippines.

There is in the Philippines a tendency to "insular" reduced types which is rather interesting. These reduced types elsewhere are rare, and abnormal. The irregularity and reduction of the fronds and even the dimorphism of the fertile fronds is normal in *Dryopteris canescens* (Blume) as found in the Philippines, and *D. glandulosa* has analogous tendencies. These variations do not as yet appear to be constant, and they offer some subspecies and varieties of doubtful value, which are discussed later under the two above species. In the Archipelago moreover are analogous variations in other genera, for example the singularly stunted forms that are grouped under *Leptochilus heteroclitus* (Presl) (*Acrostichum flagelliferum* Wall.), and some species of *Pteris*, such as *P. ensiformis* Burm., and *P. heteromorpha* Fée. In the West Indies, Cuba, Jamaica, Porto Rico, Santo Domingo, etc., analogous insular forms are found in *Polystichum*, *Fadyenia*, *Sagenia* and especially in *Dryopteris reptans* (Gmel.) which there offer multiple reduced forms. I am sure that the very prolonged isolation of these archipelagoes plays some rôle in the occurrence of these variations, although it is not possible at present to specify just what this influence is.

The wonderful variations of *Dryopteris canescens*, which are found in other parts of Malaya (Celebes) only as rarities, but which are developed in the Philippines into a bewildering series of forms, appear to me to throw some new light on the "aberrant forms" of the old school of pteridologists. By the variations of *Dryopteris canescens*, which present an unbroken and insensible transition from a true *Nephrodium* to a plant entirely achrostichoid as to the sori, the affinity of

Leptochilus, *Gymnopteris*, *Polybotrya*, *Egenolfia*, *Stenosemia*, and *Cae-nopteris* with *Aspidium*, in a broad sense, appears to me to acquire a new support; and what is more, although perhaps in the cases where it has not yet been possible to find the aspidioid type of all acrostichoid plants, it is probable that the aspidioid type has not been preserved or that it has been so modified as to be unrecognizable. Be that as it may, for *Stenosemia* one must admit the immediate descent of *Pleocnemia membranifolia* (*Dictyopteris Chattagramica* Clarke) as *Beddome* has asserted.³ Likewise I now connect my *Gymnopteris Bonii*⁴ from Tonkin, directly with *Aspidium repandum* Willd. The contention that "Acrostichum" is only "Aspidium" with reduced fertile pinnae, appears to me to be better established than ever. Is this a step in advance in the development or a degeneration? The example of *Dryopteris canescens*, where the incontestable deformation of the pinnae both fertile and sterile, is accompanied by the acrostichoid formation as to the soriferous parts, appears to me to point strongly to the latter; that is to say, an aberration and weakening of the type, which one can scarcely call only teratological, because the influences that have caused the changes are unknown.

OBSERVATIONS.

1. In my *Filices Insularum Philippinarum*⁵ I have noted *Aspidium Fauriei* var. *elatus* Christ and *A. grammitoides*. Both belong in *Athyrium*, with aspidioid sori, as is the case with *Athyrium oxyphyllum* which is found in the Philippines with absolutely aspidioid sori.

2. In his *Polypodiaceae* of the Philippine Islands,⁶ Copeland includes *Nephrodium asperulum* (J. Sm.) Copel. The species was based on No. 63 Cuming, *Polypodium asperulum* J. Sm., and the specimen in the Herbarium of the Bureau of Science is to me *Microlepia speluncae* (Linn.) Moore, with submarginal sori.

3. Copeland⁷ admits *Nephrodium rugulosum* (Labill.) Copel., but to me the plant indicated is *Hypolepis*. Species of *Hypolepis* with the sori more or less intramarginal give rise to some doubt as to their proper disposition. There is a form in the Philippines which has a rhizome often, if not always, creeping, which is generally a good character of true *Hypolepis* and which indicates the relationship of that genus with *Pteridium*. This form was considered by me at first as *Dryopteris setigera* (Blume) O. Ktz., and later as *Aspidium vile* Kunze, of Java, with which it has a great resemblance. It has been collected on Mount Apo, Mindanao, by Copeland (No. 1462) October, 1904, and on Mount

³ Suppl. Ferns Brit. Ind. 48, 40.

⁴ Bull. Herb. Boiss. II 4: 610.

⁵ Bull. Herb. Boiss. 6 (1898) 193.

⁶ Govt. Lab. Publ. 28 (1905) 25.

⁷ L. c. 26.

Arayat, Luzon, by the *Bolster* (Nos. 79, 98.) The rhizome seems to be very slightly creeping, the sori are submarginal at the anterior base of the lobes and the texture of the plant is rather thin and not coriaceous as in specimens of *Aspidium vile* from Java leg. *Raciborski*. After examining the material at present available, I do not consider that this doubtful species can be referred with certainty to *Dryopteris*.

4. *Aspidium varium* Sw., is to me a *Polystichum*, and for this reason this Chinese type, which is also found in northern Luzon, is not considered in the following list:

DRYOPTERIS Adanson.

1. NEPHRODIUM (including *Mesochlaena*, *Goniopteris* and *Meniscium*).

1. **Dryopteris megaphylla** (Mett.) C. Chr. Ind. Fil. (1905) 277. *Aspidium megaphyllum* Mett. Ann. Lugd. Bat. 1 (1864) 233. *Aspidium pennigerum* Blume Enum. (1828) 153. *Nephrodium pennigerum* Bedd. Handb. (1892) 73.

Haud male quadrans cum specimine Javanico a *Raciborski* lecto et determinato, conf. *Raciborski* Pterid. Buitenz. 190, sed planta Mindanensis gaudet rhizomate erecto, radicibus multis simplicibus et stipitum fasciculorum basi oriundis suffulto, quum *Raciborski* plantae Javanicae rhizoma repens stipites que remotos attribuat. *Beddome* recte monet "Caudex erect."

MINDANAO, District of Davao, Todaya (1236 *Copeland*) April, 1904; Province of Zamboanga, San Ramon (*Copeland*) March, 1905.

Malaya.

2. **Dryopteris truncata** (Poir.) O. Ktze. Rev. Gen. Pl. 2 (1891) 814. *Polypodium truncatum* Poir. in Lam. Encycl. 5 (1804) 534.

Nervis 6 utrinque quorum 2 ad 3 junctis, lobis rotundatis aut convexe truncatis.

LUZON, Province of Laguna, Pagsanjan (1995b *Copeland*) February, 1906; Los Baños (*Alberto*) May, 1905; Province of Bataan, Mount Mariveles (391 *Topping*) May, 1904; Province of Benguet, Baguio (4948 *Curran*) August, 1906. MINDANAO, Province of Zamboanga, San Ramon (1674 *Copeland*) March, 1905. BASILAN (88 *DeVore & Hoover*) April, 1903.

Malaya.

3. **Dryopteris abrupta** (Blume) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Aspidium abruptum* Blume Enum. (1828) 154. *Nephrodium abruptum* Hook. Sp. Fil. 4 (1862) 77. t. 241. B.

Nervis utrinque quorum 4 aut 5 junctis, lobis horizontaliter aut concave truncatis, apice denticulatis.

MINDANAO, Province of Zamboanga, San Ramon (*Copeland*) February to March, 1905.

Malaya.

Scarcely more than a subspecies of the preceding.

4. **Dryopteris adenophora** C. Chr. Ind. Fil. (1905) 251. *Nephrodium hirsutum* J. Sm. in Hook. Journ. Bot. 3 (1841) 412; Hook. Sp. Fil. 4: 70. t. 140, non Don, nec Bory.

LUZON, Province of Bataan, Mount Mariveles (419 *Topping*) May, 1904; (1312 *Whitford*) January, 1905; Province of Tayabas, Mount Banajao (968 *Whitford*) October, 1904; Province of Zambales, Mount Pinatubo (*Loher*) February, 1906; MINDORO, Baco River (276 *McGregor*) May, 1905. NEGROS, Gimagaan River (1658 *Whitford*) May, 1906.

Philippines and Celebes.

5. *Dryopteris ferox* (Blume) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Aspidium ferox* Blume Enum. (1828) 153.

LUZON, without locality (172 *Cuming*) "*Goniopteris aspera* J. Sm. *Polypodium asperum* Roxb. in herb. Linn. Soc." *J. Smith* in Hook. Journ. Bot. 3 (1841) 396; Province of Benguet, Sablan (6232 *Elmer*) April, 1904; Baguio (320 *Topping*) January to February, 1903; Province of Cavite, Mendez Nuñez (1355 *Mangubat*) August, 1906. MINDORO, Baco River (237 *McGregor*) May, 1905. MINDANAO, Zamboanga (1578 *Copeland*) 1905; Lake Lanao, Camp Keithley (107a Mrs. *Clemens*) January, 1906.

Malaya.

Var. *calvescens* n. var.

Pustulis et setis axialibus fere evanidis.

MINDANAO, Province of Zamboanga, San Ramon (1721 *Copeland*) 1905, alt. 800 m.

6. *Dryopteris Todayensis* n. sp.

Rhizomate oblique erecto, supraterraneo, radicoso, paucos (ca. 3) stipites emittente, fere nudo, atrobrunneo, digiti crassitie. Stipite crasso fere digiti minoris, solido griseo-brunneo nudo aut paucis squamulis lanceolatis brunneis parce obsito, 40 cm. longo, fronde 70 cm. et ultra longa 20 cm. lata oblongo-acuminata pinnata, versus basin vix attenuata sed abrupte secus stipitem utroque latere in 8 ad 10 auriculas breves rudimentarias transeunte, rhachi brunneo-grisea puberula, pinnis confertis sessilibus 40 ad 55 utrinque, basi subcallosis tuncato-cuneatis subinaequalibus, caudato-acuminatis, 11 cm. longis basi 11 mm. latis usque ad mediam partem incisiss, ala utrinque 3 mm. lata relicta, lobis confertis ca. 45 utrinque lanceolato-acutis valde falcatis 3 mm. longis 2 mm. latis, nervis tenuibus non prominulis 7 ad 8 utrinque, areolam unam costalem formantibus, secundis in sinum acutum excurrentibus, caeteris liberis, facie inferiore puberula, superiore glabra, exceptis costulis costulisque adpresse pilosis, soris minutis, brunneis, mediis, indusio parvo reniformi brunneo integro puberulo. Textura flaccide herbacea, colore atroviridi. Differt a *D. truncata* lobis falcatis profundioribus, nervisque pluribus.

MINDANAO, District of Davao, Todaya, on the slopes of Mount Apo at 1,200 m. alt. (1463 *Copeland*) October, 1904. NEGROS, Gimagaan River (1658 *Whitford*) May, 1906.

A species of large size, the frond abruptly narrowed at the base, the stipe with numerous small auriculate pinnæ, the lobes narrow, the lower surface slightly pubescent, the nervules forming one costal areola, the sori very small, the color a very dark green. A similar plant, but the stipe without auricles, is represented by No. 607 *Copeland*, from Davao.

7. *Dryopteris Mindanaensis* n. sp.

Ampla, fronde deorsum non attenuata, undique puberula, uno duobusve nervis junctis, indusio ciliato, ab omnibus formis e vicinitate *D. parasiticae* etiam a *D. lalipinna* (Hance) magnitudine lobisque elongatis distinguenda indusio ciliato.

Rhizomate uti videtur repente aut valde obliquo, foliis remotis haud fasciculatis, stipite 30 cm. longo, rufo-plumbeo, pennae anserinae crassitie, uti tota plante brevissime puberulo, sulcato, basi squamis ovatis acuminatis $\frac{1}{3}$ cm. longis brunneis opacis vestito, fronde 70 cm. longa 40 cm. lata, ovato-acuminata in caudam longam incisam protracta, basi haud aut vix attenuata, pinnis utrinque ca. 28 infra apicem patentibus, modice approximatis, sessilibus, basi haud attenuatis, 20 cm. longis, 2.5 cm. latis caudato-acuminatis, usque ad mediam partem inter marginem et costam incisus, lobis ca. 45 ad 50 utrinque, pectinato-confertis, subfalcatis, obtusis sed mucronulatis, 7.5 mm. longis, 4.5 mm. latis, sinu fere nullo interjecto, costis nervisque stramineis, dense et albido-puberulis, nervis 10 ad 12 utrinque, simplicibus, costalibus aut etiam secundis junctis, soris 5 ad 8 utrinque, 1 mm. latis rotundis dilute brunneis, indusio flaccido, griseo, ciliato. Textura herbacea, colore lacte virente opaco.

MINDANAO, District of Davao (607 *Copeland*) 1904.

8. *Dryopteris invis*a (Forst.) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Polypodium invisum* Forst. Prodr. (1786) 81.

LUZON, Province of Benguet, Baguio (6573 *Elmer*) June, 1904. PALAWAN (Paragua) Point Separation (824 *Merrill*) February, 1903.

Polynesia.

A species still more pubescent than the preceding, and a third or one-half smaller, fronds somewhat abrupt below by the pinnae gradually becoming shorter, but without auricles, the pinnae somewhat distant, narrow, the lobes triangular, the texture more coriaceous, the color a light yellowish green. Nerves forming one areola, the sori larger, brownish, the sporangia hairy. I have identified the above specimens with this species after the description given by *Baker* in Synopsis Filicum 290 under *Nephrodium invisum* Carruth. *Copeland* in his Polypodiaceae of the Philippines, 30, accepts this species, and repeats *Baker's* description with a slight modification "sori in rows close to the midribs," while *Baker* says "sori midway between the midrib and edge," the latter being the case with our specimens. *Baker* also says "common in the Polynesian Islands." I have but one specimen from the Solomon Islands leg. *Betche*, which agrees well with the description, but in which the base of the frond is abrupt, not narrowed, and with one auricle on the stipe. A critical species.

9. *Dryopteris cucullata* (Blume) *Aspidium cucullatum* Blume Enum. (1828) 151. *Dryopteris unita* O. Ktze. Rev. Gen. Pl. 2 (1891) 811.

LUZON, without locality (254 *Cuming*) "*Nephrodium canescens* Presl—*Aspidium canescens* Wall." J. Sm. in Hook. Journ. Bot. 3 (1841) 411. Province of Rizal (2690 *Ahern's collector*) January to March, 1905: Province of Benguet, Twin Peaks (6468 *Elmer*) June, 1904: Province of Nueva Ecija, Carranglang (284 *Merrill*) May, 1902: Province of Tayabas, Atimonan (662 *Whitford*) August, 1904. CEBU (28, 29 *Barrow*) May, 1904. MINDANAO, Province of Zam-

boanga, (1575, 1575a, 1575b *Copeland*) 1905; District of Davao (390 *Copeland*) March, 1904; Santa Cruz (218 *DeVore & Hoover*) April, 1903; Mount Apo (378 *DeVore & Hoover*) May, 1903.

Malayan region to the Seychelles.

It is impossible for me to follow *Christensen's* Index in treating this species as *D. unita* and renewing the confusion that has existed for a long time regarding *Nephrodium unitum* R. Br. (= *Dryopteris gongyloides*). *Blume's* name is here accepted for the species. There is a limit even to the virtues of priority!

Var. **mucronata** (J. Sm.) *Nephrodium mucronatum* J. Sm. in Hook. Journ. Bot. 3 (1841) 412.

Inter typum et *N. callosum* (Bl.) intermedia. *N. cucullato* typico major, pinnis 2 em. et ultra latis, nervis utrinque plus minus 12, quorum 6 junctis, soris minutis submarginalibus, pinnis infimis versus basin angustatis, insertione pinnarum callosa, omnio puberula. *N. callosum* magnitudine et glabritie differt.

LUZON, without locality (182 *Cuming* nec 268). MINDANAO, Lake Lanao, Camp Keithley (107 Mrs. *Clemens*) January, 1906.

10. **Dryopteris arida** (Don) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Aspidium aridum* Don Prodr. Fl. Nepal. (1825) 4.

LUZON, Province of Nueva Ecija, Carranglang (283 *Merrill*) May, 1902; Province of Benguet, Trinidad (212 *Topping*) January, 1903. MINDORO, Baco (879 *Merrill*) April, 1903. MINDANAO, District of Davao, Davao (447,326 *Copeland*) March, 1904; Province of Zamboanga (1576 *Copeland*) 1905; Lake Lanao, Camp Keithley (Mrs. *Clemens*) January, 1906.

No. 279 *Cuming* "*Nephrodium mucronatum* J. Sm." appears to differ from this species in its pinnæ being more strongly hastate at the base and in being more strongly villous. *Dryopteris arida* of the Philippines is usually more strongly villous and the pinnæ are shorter and more distant than in the form found in India (Dehra Dun, leg. *Blanford*).

Malaya.

11. **Dryopteris gongyloides** (Schkuhr) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Aspidium* Schkuhr Krypt. 289. *Nephrodium unitum* R. Br.

LUZON, without locality (259 *Cuming*) "*Nephrodium unitum* R. Br." J. Sm. in Hook. Journ. Bot. 3 (1841) 411; Province of Cagayan (133bis *Bolster*) July, 1905; Province of Nueva Ecija, Carranglang (283 *Merrill*) May, 1902; Province of Bataan, Mount Mariveles (1239 *Borden*) June, 1904. MINDANAO, Province of Zamboanga, San Ramon (*Copeland*) March, 1905.

Tropics of both hemispheres, as far north as Algeria.

12. **Dryopteris hispidula** (Dcne.) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Aspidium hispidulum* Dcne. Nouv. Ann. Mus. 3: 346.

LUZON, without locality (268 *Cuming* nec 182), "*Nephrodium mucronatum* J. Sm." in Hook. Journ. Bot. 3 (1841) 412.

Cum planta Borneensi a cl. *Niewenhuis* lecta exacte convenit, sed minus cum speciminibus aliter collectis.

A specimen from Baguio, Province of Benguet, LUZON (5108 *Curran*) August, 1906, appears to me to be intermediate between *Dryopteris basilaris* and *D. hispidula*.

Borneo and the Philippines; its other distribution in Malaya uncertain.

13. **Dryopteris basilaris** (Presl) C. Chr. Ind. Fil. (1905) 254. *Nephrodium basilare* Presl Epim. Bot. (1849) 258, nomen. *Nephrodium philippinense* Bak. Ann. Bot. 5 (1891) 327.

This species is one of the most distinct, most important and most widely distributed of the genus in the Philippines, and is characterized by *Baker* as follows:

"Rootstock and complete stipe not seen. Frond oblong-lanceolate, bipinnatifid, 2-3 ft. long, 1-1½ ft. broad, moderately firm, glabrous, rachis naked. Pinna lanceolate, acuminate, 8-9 in. long, ½ in. broad, cut down less than half way to the rachis into oblong erecto-patent lobes ⅓ in. broad, lower pinnae not dwarfed, veins simple, 8-9 jugate. Sori medial, indusium firm, glabrous, persistent. Near *arbuscula*, but lower pinnae not gradually dwarfed."

It was on specimens Nos. 10, 84 and 338 *Cuming* that *Baker* based his imperfect description, and of these I have before me a specimen of the second number. Based on this number, and the abundant material collected by the American botanists in the Philippines, the following detailed description is given:

Rhizomate obliquo suberecto valde radicoso crasso, foliis subfasciculatis (4 aut 5) stipite basi sulcato-dilatato, squamis subulatis usque ad 2 cm. longis brunneis e basi lanceolata filiformi-elongatis vestito, rufostamineo, glabro lucente, tereti, basi pennae cygni crassitie, 45 cm. longo, fronde usque ad 65 cm. longa, 20 cm. lata late ovata acuminata, pinnata, basi abrupte terminata, pinnis infimis haud abbreviatis, sed stipite utrinque 8 aut 10 auriculis obtusis rudimentariis remotis instructo, pinnis alternis erecto-patentibus numerosis sessilibus aut brevissime petiolatis, pinna terminali saepius valde elongata aut basi bifida, pinnis lateralibus approximatis, ca. 35 utrinque, 14 cm. longis, 1 cm. latis caudato-acuminatis lanceolato-linearibus, basi antiore recte truncata, posteriore semicordata, marginibus lobatis usque ad tertiam partem, lobis decumbentibus 3 mm. longis oblongis subobtusis, costis pallidis manifestis, nervis 5 ad 8 utrinque, infimis aream unam formantibus, soris minutis mediis 5 utrinque, indusio griseo persistente. Colore brunneo-viridi, textura subcoriacea rigidiusecula, planta glabra.

LUZON, without locality (84 *Cuming*) "*Nephrodium caudiculatum* Presl" J. Sm. in Hook. Journ. Bot. 3 (1841) 411: Province of Rizal, Antipolo (*Guerrero*) June, 1903: Province of Cagayan (163, 175 *Bolster*) August, 1905: Province of Bataan, Mount Mariveles (407 *Topping*) May, 1904; (6666 *Elmer*) November, 1904; (224, 225 *Copeland*) February, 1904; (371, 108 *Whitford*) June, 1904; (2554 *Merrill*) June, 1903: Province of Tayabas, Sampaloc (12759 *Warburg*): Province of Benguet, Baguio (4915, 4946 *Curran*) August, 1906: Province of Cavite, Mendez Nuñez (1304 *Mangubat*) August, 1906: Province of Isabel, Malunu (*Warburg*). MINDANAO, Davao (637 *Copeland*) March, 1904: Province of Zamboanga (1685 *Copeland*).

Widely distributed in the Philippines; endemic.

14. **Dryopteris Luzonica** n. sp.

A species, resembling the preceding, and like it widely distributed in Luzon, but well characterized by its very thin texture, bright green color, its pinnae horizontal, in rather remote pairs and dilated at the base, the lobes obtuse,

often truncate, the pinnae strongly elongated into a filiform apex, the apex of the frond rather pinnatifid and terminated by one pinna, the stipe having generally one or two pairs of auricles. I shall content myself with indicating here the characters by which it differs from *Dryopteris basilaris*:

Basi stipitis squamis destitutis aut minutis brevibus, stipite gracili sed pinnis infimis abbreviatis, et stipite auricula una, rarius pluribus instructa, flavostramineo, fronde acuminato apice pinnatifida minus abrupte terminata pinnis remotioribus inferioribus mediisque horizontalibus, oppositis, basi antice et postice dilatatis quasi utrinque stipulatis, lobis brevioribus apice truncato-obtusis sive abruptis et denticulatis, textura diaphano-tenui, nervis plerumque 5, soris ochraceis, indusio tenuissimo mox evanido, colore dilute smaragdino.

LUZON, Province of Rizal, Bosoboso (1083 *Ramos*) July, 1906; (89 *Foxworthy*) January, 1906; Antipolo (*Guerrero*) June, 1903; (*Loher*) March, 1906, March, 1893: Province of Bataan, Mount Mariveles (1239 *Borden*) June, 1904: Province of Cavite, Mendez Nuñez (1289, 1302 *Mangubat*) August, 1906: Province of Laguna, Los Baños (*Loher*) January, 1906; Mount Maquiling (*Loher*) January, 1906; Pagsanjan (1995a *Copeland*) February, 1906; (514 *Topping*) 1904: Province of Batangas, Mount Malarayat (2002 *Copeland*) February, 1906: Province of Cagayan (120 *Bolster*) July, 1905: Manila (*Rothdauscher*) 1897 in Herb. Monac: Province of Isabela, Malunu (11577 *Warburg*).

Var. **puberula** n. var.

Rhachi costis et nervis puberulis.

LUZON, Province of Cagayan, Tabug (175 *Bolster*) August, 1905.

Var. **polyotis** n. var.

Pinnis latioribus, basi 16 mm., brevius acuminatis, et stipite usque ad basin auriculis numerosis (ca. 20 utrinque) vestitis.

LUZON, Province of Rizal, Montalban (5064 *Merrill*) March, 1906. MINDANAO, Province of Zamboanga, San Ramon (1571 *Copeland*) December, 1904.

15. **Dryopteris parasitica** (Linn.) O. Ktze. Rev. Gen. Pl. 2 (1891) 811. *Polypodium parasiticum* Linn. Sp. Pl. (1753) 1090.

LUZON, without locality (83 *Cuming*) "*Nephrodium molle* R. Br." J. Sm. in Hook. Journ. Bot. 3 (1841) 412. Province of Rizal, Bosoboso (1084 *Ramos*) July, 1906: Province of Tayabas, Malicboi (*Ritchie*) May, 1903; Atimonan (8 *Gregory*) August, 1904: Province of Laguna, Pagsanjan, (1995 *Copeland*) February, 1906. MINDANAO, Province of Zamboanga (1605 *Copeland*) 1905: District of Davao (607 *Copeland*) March, 1904. PALAWAN (Paragua) Ewiig River (720 *Merrill*) February, 1903.

Tropics of both hemispheres.

Var. **falcatula** n. var.

Differt a typo pinnis inferioribus oppositis, refractis, basi antice stipulatis, segmentisque profundius incisus falcatis acutioribus, aliter typo conformis. An *Nephrodium molliusculum* Wall. Cat.?

MINDANAO, Province of Zamboanga (1677 *Copeland*) 1905.

16. *Dryopteris procurrens* (Mett.) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Aspidium procurrens* Mett. Ann. Lugd. Bat. 1: 231.

LUZON, Province of Laguna, Pagsanjan (1992 *Copeland*) February, 1903: Province of Rizal, Bosoboso (1094 *Ramos*) July, 1906: Province of Bataan, Mount Mariveles (226, 1389 *Copeland*) February, August, 1904. CULION (589 *Merrill*) December, 1902. MINDANAO, Province of Zamboanga (1693a *Copeland*).
Malaya.

From repeated examinations of material from the Philippines I have not been able to determine with certainty the form described by *Hooker*, Synopsis 292, as *Nephrodium latipinna*, as that species is represented by specimens from Hongkong and Tonkin (leg. *Cadière*).

17. *Dryopteris heterocarpa* (Blume) O. Kuntze Rev. Gen. Pl. 2 (1891) 813. *Polypodium heterocarpum* Blume Enum. (1828) 155.

LUZON, Province of Laguna, Mount Maquiling (2027 *Copeland*) March, 1906. Sunda Islands.

18. *Dryopteris canescens* (Blume) C. Chr. Ind. (1905) 256. *Polypodium canescens* Blume Enum. (1828) 158. *Gymnogramme canescens* Blume Fil. Jav. 93. t. 40. *Aspidium canescens* Christ. Ann. Jard. Bot. Buitenz. 15¹: 130.

The Philippines share with Celebes a plurality of forms of this species, interesting because of the numerous more or less "insular" forms into which it is divided. I refer the reader to what I have said regarding it in *Ann. Jard. Bot. Buitenzorg* l. c., where I have shown its affinity to the group containing *P. parasitica* of which it appears to be a weakly derived species, weakly derived because of its generally reduced dimensions, the indusium frequently lacking, and its sori irregular, but above all in the variation in the form of the fronds which present all forms of pinnae from those linear and elongated to those variously cut, lobed and dilated in a most bizarre manner, and finally in the dimorphism and narrowness of the fertile fronds which have much elongated stipes and the pinnae so narrowed that the sori lose their distinctness and form a mass which entirely covers the narrow fertile pinnae, in this latter respect resembling those of *Egenolfia appendiculata*.

In Celebes I have distinguished three forms—*nephrodiformis*, which is scarcely dimorphous; *gymnogrammoides*, with the fertile fronds somewhat reduced; and *acrostichoides* with the fertile pinnae narrowly linear. For the species as it occurs in the Philippines, this distinction does not suffice, and it is necessary to distinguish a large number of forms, some of which have acquired the value of subspecies, or perhaps in some cases, of species. These forms I characterize as follows:

Var. *lobatum* n. var.

Statura minore, stipite longiore (20 cm., frondis 20 cm.) pinnis minus numerosis, latioribus, lobis latioribus, paucioribus, profundioribus nervis flexuosis, interdum irregularibus, aream unam costalem formantibus, pubescentia sensiore grisea imprimis costas nervosque tegente, et soris indusiis carentibus, saepe irregulariter elongatis.

LUZON, Province of Rizal, Mabacal (*Loher*) March, 1906: Province of Benguet, Baguio (1866 *Copeland*) November, 1905.

Java, Celebes.

This variety more or less resembles the large form figured by *Blume* and approaches a small *D. parasitica*, but the stipe is relatively longer, 20 cm., the frond 20 cm., the pinnae less numerous, longer, the lobes longer and more numerous and more deeply divided, the nerves very undulating, forming one costal areola, pubescent.

Var. *degener* n. var.

Rhizomate elongato subrepente, pinnis ovatis saepe obovatis basi attenuatis, obtusissimis, obtuse crenato-lobatis, apice frondis elongato lato obtuse lobato, pinnis sterilibus brevius (6 cm.) fertilibus saepe longius (usque ad 25 cm.) stipitatis, pinnis fertilibus remotis, soris irregulariter sparsis plus minus rotundis. Tota planta a 20 cm. usque ad 42 cm. alta, textura crassiuscula, colore obscure fere atroviridi, pubescentia imprimis rhacheos densa, strigosa, brunnea.

LUZON, Province of Rizal, Angilog (*Loher*) February, 1906, the larger form; Montalban (*Loher*) March, 1906, the smaller form.

This is an accentuated variation of the normal form, the length of the merely lobed apex and the pinnæ, scarcely coarsely crenate, giving the plant a singular aspect.

Var. *subsimplificifolia* n. var.

Smaller, distinguished from the preceding by its one distinct terminal elongated pinna, nearly entire, and in the lateral pinnæ being very slightly developed and auricle-like.

LUZON, Province of Tayabas (Infanta) (784 *Whitford*) September, 1904.

19. *Dryopteris diversiloba* (Presl) n. subsp. *Nephrodium diversilobum* Presl Epim. (1849) 47; Mett. Aspid. 100. *Goniopteris asymmetrica* Fée Gen. 253.

Rhizomate debili, elongato, plus minus repente, stipitibus plus minus fasciculatis fere caespitosis aut subsolitariis, debilibus flexuosis 8 cm. longis, fronde oblonga 10 cm. longa, 7 cm. lata, pinnata, pinnis subpetiolatis rhombeis aut lata ovatis obtusis aut in apicem lanceolatum prolongatis 5 usque ad 7 utrinque 4 cm. longis, 2.5 cm. latis basi saepe attenuatis sive hastulatis aut subcordiformibus, crenatis, apice lobatis lobis valde irregularibus, brevibus et usque ad 2 aut 3 cm. longis, lanceolato-obtusis 2.5 mm. latis mixtis. Apice frondis saepe lato, valde elongato, lobato; pinnis fertilibus vix contractis, saepe apice solummodo sorifero, soris minutis exindusiatis numerosis irregulariter sparsis rariter seriatis saepe elongatis. Tota planta griseo pubescente, textura herbacea, colore dilute viridi-griseo.

LUZON, Province of Nueva Viscaya, Quiangan (162 *Merrill*) June, 1902: Province of Rizal, Mabacal (*Loher*) March, 1906; northern Luzon (11611 *Warburg*) 1888. NEGROS, Gimagaan River (83 *Copeland*) 1904. MINDANAO, Province of Zamboanga, San Ramon (1547, 1774, 1754 *Copeland*) November, 1904, April, May, 1905: Province of Misamis, Mount Malindang (4613, 4710 *Mearns & Hutchinson*) May, 1906: District of Davao (698 *Copeland*) March, 1904: Province of Surigao (252 *Bolster*) April, 1906.

Apparently common and widely distributed in the Philippines; endemic.

This is a form of the *D. canescens* group, but so accentuated, and at the same time so widely distributed (it should be one of the most common ferns in the Archipelago), that it should be recognized as a subspecies. A small plant, almost turf forming with elongated, weak and often running rhizomes, the fronds not, or but little dimorphous, the pinnæ few, short, broad, nearly square and very irregularly lobed, the lobes sometimes short and obtuse, sometimes greatly elongated. The specimens with the elongated pointed pinnæ have the appearance

of a sufficiently distinct species, but often the long and short pinnae are found on the same plant. The frond is often terminated by a single simple pinna, but sometimes it is pinnatifid. The pinnae are slightly petioled, somewhat hastate and slightly cordate at the base, slightly lobed toward the base, but nearly always with some strongly elongated and unequal lobes toward the apex which is abruptly truncate. The stipe is always slender and flexuous, about 8 cm. long, the frond about 10 cm. long, the lateral pinnae 5 to 7 on each side, 4 cm. long, 2.5 cm. wide, the terminal one 5 to 10 cm. long. The sori are small, very irregular, sometimes few, sometimes very numerous often occupying only the terminal part of the frond.

Var. **acrostichoides** (J. Sm.) *Nephrodium acrostichoides* J. Sm. in Hook. Journ. Bot. 3 (1841) 411; Christ Ann. Jard. Bot. Buitenz. 15¹ (1898) 130.

The sterile frond is more or less that of *D. diversiloba*, but the fertile frond is very long stipitate and the pinnae are strongly reduced in width, approaching those of *Gymnopteris* and *Egenolfia*. Two subvarieties are distinguishable:

Subvar. **rhombea**, n. subvar.

Frondis fertilis stipite debili flexuoso valde elongato, lamina 7 cm. longa, pinnis 5 utrinque, apice frondis elongato lobato acuminato, pinnis rhomboideo-lanceolatis usque ad linearibus, subpetiolatis, basi truncatis, obtusis, crenulatis, 8—4 mm. latis, soris confertis aut seriatis aut omnino confluentibus, areola una.

Sterile pinnae with the form of those of *D. diversiloba*, the frond with the stipe 12 cm. long, the fertile frond, including the stipe 25 cm. long, the stipe being about 18 cm. long.

LUZON, without locality (149 *Cuming*); Province of Rizal, Bosoboso (1084 *Ramos*) July, 1906: Province of Bataan, Mount Mariveles (3130 *Merrill*) October, 1903; (*Copland*) August, 1904; (6153 *Leiberg*) July, 1904: Province of Tayabas (Infanta) (784 *Whitford*) September, 1904. MINDANAO, District of Davao (503 *Copland*) March, 1904.

Philippines and Celebes.

Subvar. **lanceola** n. subvar.

Differt a praecedente pinnis sterilibus lanceolatis margine fere integris apice obtusis aut acutiusculis, apice frondis valde elongato fere caudato, areola una huic inde duabus.

LUZON, Province of Bataan, Mount Mariveles (250 *Copland*) January, 1904: Province of Rizal (140 *Foxworthy*) January, 1906. NEGROS, Gimagaan River (1600 *Whitford*) May, 1906. MINDANAO, Province of Zamboanga (*Copland*) 1905.

A specimen from San Ramon (*Copland*) April, 1905, offers the maximum reduction, the fertile pinnae being reduced to a width of 2 mm., and the sori accordingly having the appearance of a string of beads as is the case in specimens from Celebes leg. *Sarasin*.

20. **Dryopteris acromanes** n. sp.

Rhizomate brevi crasso radicoso, foliis fasciculatis, stipite rufo-aut plumbeo-stramineo, tenui, 15 ad 30 cm. longo, fere nudo, fronde oblongo-acuminata, 17 cm. longa, 9 cm. lata, pinnata, pinnis ca. 7 utrinque infra apiceme longatum lobatum, petiolulatis, basi lata truncata sed

pinnis infimis basi attenuatis et deflexis, haud abbreviatis, pinnis obovatis sive rhombeo-elongatis 4.5 cm. longis, 3 cm. latis versus apicem latissimis ad mediam laminam sive ultra incisus lobis ovatis rotundato-obtusis 3 cm. latis ca. 8 utrinque, versus apicem pinnae repente elongatis, fronde fertile conformi, nervis ca. 8 utrinque aream unam costalem formantibus, soris magnis brunneis rotundis ultra 1 mm. latis, in lobis submarginalibus (lamina media soris destituta) brunneis exindusiatis. Faciebus tenuissime puberulis, textura herbacea, colore obscure viridi.

LUZON, Province of Laguna, Mount Maquiling (*Loher*) April, 1906: Province of Rizal, Ampalit (*Loher*) April, 1906.

No. 51 *Cuming* "*Polypodium adfinc* Reinw." in Herb. Bureau of Science, approaches *Loher's* specimens cited above, except that the sori are not confined entirely to the lobes and are less marginal.

In many respects similar to *D. canescens* var. *lobatum*, but the accrescence of the pinnae toward the apex and the increasing length of the lobes toward the tips of the pinnae is more accentuated. The sori are large, marginal, bordering the lobes in a single series and the plant has not the harshness and grayish color that distinguishes *D. canescens*, so that the present form can hardly be referred to the preceding as a subspecies.

21. *Dryopteris xiphioides* n. sp.

Rhizomate obliquo repente, stipitibus debilibus valde approximatis numerosis aequilongis 30 cm. longis rufostamineis, fronde pinnata 20 cm. longa 11 cm. lata, late ovato-elongata, ad basin vix attenuata, pinna terminali 10 cm. longa basi aut libera aut pinnis lateralibus valde abbreviatis vicina sive connata, 13 mm. lata acuminata lanceolata crenata, pinnis lateralibus 4 aut 5 similibus sed haud ultra 7 cm. longis, nervis 3, rarius 4 omnibus junctis, soris paucis minutis exindusiatis, tota planta parce griseo pubescente, textura herbacea, colore griseo-viridi.

MINDANAO, Province of Zamboanga, San Ramon (*Copeland*, s. n.) April, 1905, alt. 800 m.

A species of the *D. canescens* group, remarkable by its very elongated falcate pinnae which are not reduced toward the base of the frond and but slightly lobed.

22. *Dryopteris Merrillii* n. sp.

Rhizomate erecto radicoso crasso, foliis fasciculatis numerosis, stipite rufostamineo flexuosa vix pennae corvinae crassitie basi squamulis minimis ruguloso aliter nudo (rachi facieque frondis parce puberulis) 18 ad 20 cm. longo, fronde ovato-oblonga acuminata, 20 ad 29 cm. longa, 12 cm. lata, apice elongato lobato, pinnata, pinnis confertis patentibus infimis interdum reductis et deflexis, egregie petiolulatis, falcato-lanceolatis, acutis, 6 cm. longis, 12 mm. latis, basi verticaliter truncata egregie hastata, antice plus minus aucta, pinnis dentato-serratis dentibus decumbentibus, nervis goniopteridis, pinnatis inter costam marginemque areas 4 ad 5 formantibus quaque area nervulum liberum porrectum includente. Fronde fertili longius stipitata, pinnis angustioribus magis remotis. Adsunt pinnae fertiles 6 mm. 5 mm. et 2 mm. latae! Sori confertis

4 ad 5 seriatis aut confluentibus minimis brunneis rotundis exindusiatis. Textura herbacea, colore laete virente.

PALAWAN (742, 862 *Foxworthy*) March, April, 1906. MINDANAO, Province of Surigao, Surigao (26 *Bolster*) March, 1906, the latter very small, about 23 cm. high, resembling a specimen from Borneo leg. *Ridley*, 1901.

This presents the appearance of a well-established species. It is large, fasciculate, with a definitely established dimorphism, and is readily recognizable by its numerous pectinate lanceolate pinnae, stipitate and manifestly hastate at the base, the nerves forming several areolae. In some respects it resembles *Egenolfia appendiculata* and might be mistaken for that species except that the bases of the pinnae are equal.

23. **Dryopteris Philippina** (Presl) C. Chr. Ind. Fil. (1905) 284. *Physcomatium philippinum* Presl Epim. (1849) 34. *Lastrea exigua* J. Sm. in Hook. Journ. Bot. 3 (1841) 412.

LUZON, without locality (251, 272 *Cuming*): Province of Rizal, Montalban (*Loher*) March, 1906. MINDANAO, Province of Zamboanga, San Ramon (1705 *Copeland*) 1905: Province of Surigao (307, 327 *Bolster*) May, June, 1906.

This is a reduced form of *D. Merrillii* with obtuse pinnae, more simple venation and the pinnae auriculate only anteriorly.

24. **Dryopteris microloncha** n. sp.

Nana, rhizomate crasso obliquo atrobrunneo radicoso, foliis numerosis fasciculatis, stipite raris squamulis brunneis sparso rufostamineo 2 ad 3 cm. longo tenui, rhachi straminea parce furfuracea, planta aliter nuda, fronde oblonga 16 ad 24 cm. longa, 4 ad 6 cm. lata acuminata et in longam cuspidem lobatam excurrentem versus basin sensim auriculis obtusis rotundatis, demum 5 aut 3 mm. longis et latis decrescente, pinnis ca. 12 utrinque, mediis 3 cm. longis, 0.5 cm. latis sessilibus e basi hastulata sive utrinque sed antice magis auriculata sensim acuminatis, vix ad tertiam laminae partem incisus, lobulis truncatis, nervis in lobulis parce pinnatis, infimis irregulariter junctis, soris numerosis minutis brunneis irregulariter triseriatis, undusio atrobrunneo orbiculari, persistente.

LEYTE (317 *Cuming*) "*Nephrodium caudiculatum* Presl" J. Sm. in Hook. Journ. Bot. 3 (1841) 411. LUZON, Province of Rizal (54 *Foxworthy*) January, 1906; Morong (1381 *Ramos*) August, 1906: Province of Cavite (1304 *Mangubat*) August, 1906.

A small plant resembling *D. Amboinensis* (Willd. Sp. Pl. 5: 228, *Aspidium*), but even smaller than that species, with numerous obtuse auricles on the stipe, narrow pinnae which are scarcely incised, and more numerous sori.

25. **Dryopteris polycarpa** (Blume) *Aspidium polycarpum* Blume Enum. (1828) 156. *Mesochlaena polycarpa* Bedd. Ferns Brit. Ind. Suppl. 13.

SAMAR (327 ? *Cuming*) 1836-40. The interrogation point concerns only the number in *Cuming's* series, and not the plant itself, the identity of which is incontestable.

I do not consider that the elongated sori and their arrangement in horizontal lines merits the generic separation of this form, as in all other respects it is a true *Nephrodium*.

Malaya.

26. *Dryopteris chamaeotaria* n. subsp.

Rhizomate subrepente, stipitibus approximatis, tenuibus, flexuosis, 10 ad 13 cm. longis, parce puberulis et squamis pallide fuscis subulatis sparsis, rufostramineis, fronde ovata 13 cm. longa 7 cm. lata, magna pinna libera ovato-acuminata basi grosse lobata 6 cm. longa 2 cm. lata terminata, 2 vel 3 pinnis lateralibus utrinque, alternis, petiolulatis, supremis adnatis, similibus sive valde reductis ovato- aut rhombeco-obtusis, nervis pinnatis, 4 areolas inter costam marginemque formantibus, soris fere 1 mm. latis rotundis, usque ad 5 pro lobo utroque costulae latere, uti videter exindusiatis, rhachibus faciebusque minute puberulis, textura herbacea, colore laete virente.

LUZON, Province of Bataan, Lamao River, Mount Mariveles (1369 *Whitford*) September, 1905; (387 *Topping*) May, 1904; (6970 *Elmer*) November, 1904.

A small deformed plant connected with the type of *D. Otaria*, analogous to the relationship between *D. diversiloba* and *D. canescens*, an insular reduced form with feeble characters.

27. *Dryopteris Otaria* (Kunze) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Aspidium Otaria* Kunze; Mett *Aspid.* 34. n. 73.

PALAWAN (764 *Merrill*) February, 1903.

Rare, but distributed across the Malayan region.

28. *Dryopteris Ramosii* n. sp.

Habitu cum *Meniscio triphylo* v. elato valde conveniens, pinnis valde remotis, paucis, fere integris, caudatis, gemmaque minuta axillari peculiaris. Planta debilis, textura tenui.

Rhizomate breviter repente crasso radicoso brunneo, foliis paucis approximatis, stipite flexuoso basi incrassato squamulis paucis brevibus sparso rufo-stramineo, ad basin pennae anserinae, porro vix corvinae crassitie, 35 usque ad 60 cm. longa, frondem multum superante; tota planta nuda; fronde 20 ad 35 cm. longa, oblonga, pinnata, pinnis valde remotis, 5 cm. distantibus, alternis, paucis, 1 ad 4 utrinque cum pinna terminali longe petiolata, pinnis erecto patentibus basi cuneatis, fere sessilibus, ovato-oblongis 12 ad 15 cm. longis, 3 cm. latis, longe et abrupte caudato acuminatis, margine subintegris aut repando-cuneatis, in axilla rhachiali saepe gemma rotunda minima praeditis, costulis manifestis sed tenuibus a costa ad marginem protensis 6 mm. separatis, nervis ca. 8 ad 10 utrinque, omnibus more *Meniscii* junctis et nervulos intermedios longitudinaliter junctos emittentibus, soris minutis, brunneis, rotundis, 7 aut 8 utroque costulae latere, costulae approximatis, indusio nullo. Textura herbacea aut papyracea, colore obscure viridi, subtus pallidiore. *D. otaria* longe recedit pinnis lobato-serratis, indusio etc:

LUZON, Province of Rizal (1792 *Ramos*). January, 1907. MINDORO, Mount Halcon (6093 *Merrill*) November, 1906.

29. *Dryopteris pteroides* (Retz.) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Polypodium pteroides* Retz. Obs. 6: 39.

MINDANAO (293 *Cuming*) "*Nephrodium Cumingii* J. Sm." in Hook. Journ. Bot. 3 (1841) 411: Lake Lanao (254 Mrs. *Clemens*) February, 1906; Province of Zamboanga (1604 *Copeland*) 1905; District of Davao (636 *Copeland*) March, 1904. BALABAC (420 *Mangubat*): MINDORO, Calapan (984 *Merrill*) April, 1903. CULION (487, 594 *Merrill*) December, 1902. LUZON, Province of Rizal, Montalban (*Loher*) March, 1906: Province of Pampanga, Mount Arayat (54 *Bolster*) March, 1905. PALAWAN (271 *Bermejos*) December, 1905.

Throughout the Malayan region.

30. *Dryopteris extensa* (Blume) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Aspidium extensum* Blume Enum. (1828) 156.

BALABAC (415 *Mangubat*) April, 1905. No. 391 *Cuming*, distributed in *Cuming's* Philippine series, was from MALACCA, fide J. Sm., Hook. Journ. Bot. 3 (1841) 411, sub *Nephrodium cumingii* J. Sm. It is referable to *Dryopteris extensa*.

Throughout the Malayan region.

31. *Dryopteris Bordenii* n. sp.

Rhizomate elongato obliquo crasso, radicoso, squamulis minutis lanceolatis crispis dilute brunneis sparso, foliis paucis subfasciculatis, stipite firmo usque ad 30 cm. longo, saepe brevior, plumbeo- aut castaneo-stramineo, puberulo auriculis parvis triangularibus subacutis saepe ad meros lobulos minimos aut ad callos reductis, circ. 10 utrinque, instructo, fronde ovata basi haud attenuata sed pinnis inferioribus valde deflexis, 25 usque ad 35 cm. longa, 15 ad 20 cm. lata, acuminata, pinnata, pinnis infra remotiusculis, supra confertis alternis, inferioribus ad basin valde attenuatis, acuminatis, lanceolatis, sessilibus, supremis, adnatis, ca. 15 utrinque infra apicem pinnatifidum recte patentibus, 10 cm. longis 16 mm. latis, basi truncatis, inferioribus attenuato-cuneatis, usque ad mediam laminae partem incisiss, ala 0.5 cm. lata relicta, lobis obliquis subfalcatis pectinato-confertis, sinu fere nullo interjecto, obtusis, integris, ca. 25 utrinque, 3 mm. longis, 2.5 mm. latis, nervis parum conspicuis, 7 utrinque, una area costali et secunda sinu applicata, rhachi faciebus costis costulisque breviter pubescentibus, soris mediis parvis atrobunneis, sporangiis laevibus, indusio minuto obscure griseo reformi mox evanido. Colore obscure viridi, opaco, textura herbacea.

LUZON, Province of Bataan, Lamao River, Mount Mariveles (1237 *Borden*) June, 1904; (6823 *Elmer*) November, 1904: Province of Rizal (66, 78 *Foxworthy*) January, 1906: Province of Pampanga, Mount Arayat (493 *Topping*) February, 1904: Province of Tayabas, Mount Banajao (*Loher*) February, 1906. PALAWAN (571 *Foxworthy*) April, 1906.

The frond has the configuration of that of *P. sagittaefolia*, the base of the frond being abrupt and the pinnae being replaced by reflexed and pointed auricles which occupy the stipe to the base. *D. Bordenii* however does not belong, like *D. sagittaefolia*, in the group with *D. parasitica*, not having hairy sporangia. The rhizome is oblique, elongated, the roots strong, the scales very small lanceolate and twisted.

32. *Dryopteris moulmeinensis* (Bedd.) C. Chr. Ind. Fil. (1905) 278. *Nephrodium moulmeinense* Bedd. Ferns Brit. Ind. Correct. (1870); Hooker Synopsis 503.

MINDORO, Baco River (997 *Merrill*) April, 1903. MINDANAO, Province of Zamboanga (1613 *Copeland*) 1905; San Ramon (*Copeland*) May, 1904: District of Davao, Todaya (1240 *Copeland*) April, 1904: Lake Lanao, Camp Keithley (117 Mrs. *Clemens*) January, 1906.

Throughout the Malayan Region.

33. *Dryopteris urophylla* (Wall.) C. Chr. Ind. Fil. (1905) 299. *Polypodium urophyllum* Wall. Cat. (1828) 229; Hook. Sp. Fil. 5: 9.

LUZON, Province of Bataan, Mount Mariveles (6090 *Leiberg*) July, 1904: Province of Laguna, Mount Maquiling (2025 *Copeland*) March, 1906. MINDANAO, Province of Surigao (223 *Bolster*) January, 1906: Lake Lanao, Camp Keithley (Mrs. *Clemens*) March, 1906: District of Davao (952 *Copeland*) April, 1904.

Widely distributed in Malaya.

Var. *pustulosa* Copel. MSS. pro specie.

"Nearest *N. moulmeinense*, from which it differs in the subhispid, rough-pustulous surface" *Copeland*.

LUZON, Province of Bataan, Lamao River (218 *Copeland*) February, 1904.

34. *Dryopteris cuspidata* (Blume) *Meniscium cuspidatum* Blume Fil. Jav. 102. t. 45.

MINDORO, Baco River (168 *McGregor*) April-May, 1905.

This is the typical form of *Blume's* species, of which I have identical material from Java, Tjipoes, leg. *Raciborski*, and from Perak, leg. *Hose*, and differs from the plant of northern India (*Meniscium longifrons* Wall.) in its fleshy-papyraceous texture, opaque, the areolæ less numerous (8 to 12, rarely more) more or less concealed under the membranous epidermis and not costellate and prominent. The proliferous shoots in the axils of the upper pinnae are also present in the Philippine plant, as indicated by *Blume* in the Javan form.

Christensen in his Index Filicum unites this species, although with doubt, with *Dryopteris urophylla*; however the proliferation in *Blume's* species, and the membranous epidermis covering and in part concealing the areolæ sharply distinguishes *D. cuspidata* from *D. urophylla*. *D. longifrons* differs in having a very smooth shining surface, the areolæ in strong relief, and in the form of its pinnae which are elongated and with their margins nearly parallel. In regard to the elongated sori, I have from Java a specimen with them nearly round. It goes without saying that diagnoses alone are of little value in indicating the differences in forms and the slight characters that distinguish these undivided species of *Dryopteris*; characters that strike the eye on examination of specimens are often difficult to express in words in this and parallel cases.

35. *Dryopteris glandulosa* (Blume) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Aspidium glandulosum* Blume Enum. (1828) 144.

LUZON, Province of Rizal, Bosoboso (964 *Ramos*) July, 1906; Mabacal (*Loher*) March, 1906: Province of Bataan, Mount Mariveles. (427 *Topping*) May, 1904. LEYTE (298 *Cuming*). MINDANAO, Province of Zamboanga (1718 *Copeland*).

Differing from the two preceding by its short erect rhizome which is not creeping. The villosity is slightly glandular.

Sunda Islands and eastern Malaya.

36. *Dryopteris lineata* (Blume) C. Chr. Ind. Fil. (1905) 275. *Aspidium lineatum* Blume Enum. (1828) 144.

MINDANAO, Province of Zamboanga, San Ramon (1218 *Copeland*) April, 1905, 700 m. alt.

Glabrous, the frond not reduced at the base. It has the appearance of *Cyclopettis semicordata*, but the pinnæ are less numerous, broader and not articulate.

Malayan region.

37. *Dryopteris Spenceri* (Copeland MSS, *Nephrodium*) n. sp.

Rhizomate elongato, radicoso, foliis paucis (3) stipite 20 ad 30 cm. longo rufostamineo, pennae anserinae crassitie, fronde 50 cm. et ultra longa 12 cm. lata, oblonga, pinnata, pinna magna basi saepe petiolata 12 cm. longa 3.5 cm. lata acuminata grosse lobata terminata, pinnis lateralibus sessilibus, oblongis, falcatis, breviter acuminatis, plus minus crenato-lobatis (lobis 5 mm. latis) 8 cm. longis, 2 cm. latis basi inaequalibus antice truncatis postice semicordato-rotundatis rhachimque tegentibus, et versus stipitem in auriculas breves trigonas numerosas (usque ad 10 utrinque) abeuntibus. Tota planta pube brevi griseo parce obsita, nervis manifestis prominulis, pinnarum lateralium ca. 6 utrinque 3 aut 4 areolas inter costam et marginem formantibus, nervis pinnae terminalis usque ad 12, saepe furcatis, et 10 areolas cum areolis aliquot lateralibus (more *Pleocnemiae*) formantibus, soris numerosis, 4 usque ad 10 utrinque, costulis approximatis saepe ovatis exindusiatis. Textura herbacea, colore laete virente.

MINDANAO, District of Davao, Todaya (1464 *Copeland*) October, 1904, alt. 800 m.; Sibulan River (981 *Copeland*) April, 1904. A plant from San Ramon, MINDANAO (*Copeland* s. n.) April, 1905, from about the same altitude as the above is distinguishable by its shorter and more numerous pinnæ.

A very large species of the group of *D. Stegnogramme* (*Gymnogramme aspidioides* Blume Fl. Jav. pl. 98.) but very different from that species in having a large terminal pinna instead of a pinnatifid apex, and with auricles descending along the stipe.

38. *Dryopteris simplicifolia* (J. Sm.). *Nephrodium simplicifolium* J. Sm. in Hook. Journ. Bot. 3 (1841) 411.

A reduced insular form of the *D. glandulosa* type. The plant small, the terminal pinna only developed, the lateral ones reduced to auricles.

LEYTE (315 *Cuming*). This is the plant figured by *Hooker* Sp. Fil. 1: 19. A sterile frond with the above specimen shows that it is a larger plant than figured and demonstrates clearly that the species is more especially a reduction of *D. Spenceri*. Specimens from San Ramon, MINDANAO (*Copeland*) February, April, 1905, have the nerves less pronounced, the terminal pinna narrower and the pubescence more grayish.

39. *Dryopteris prolifera* (Retz.) C. Chr. Ind. Fil. (1905) 286. *Hemionitis prolifera* Retz. Obs. 6: 38.

LUZON, Province of Cagayan (133 *Bolster*) July, 1905: Province of Tayabas, Lucena (616 *Whitford*) August, 1904: Without locality (168 *Cuming*).

Throughout the Malayan region to tropical Africa.

40. *Dryopteris rubida* (J. Sm.) O. Kuntze Rev. Gen. Pl. 2 (1891) 813. *Goniopteris rubida* J. Sm. in Hook. Journ. Bot. 3 (1841) 395; *Polypodium rubidum* Hook. Sp. Fil. 5: 12.

LUZON (415 *Cuming*): Province of Bataan, Mount Mariveles (272 *Whitford*) May, 1904. PALAWAN (675, 684 *Foxworthy*) March, April, 1906.

The base of the stipe, which is not described by *Hooker*, is as thick as one's finger, covered with subulate stiff dark brown scales 2 cm. long, and also pustular. Endemic to the Philippines.

41. *Dryopteris triphylla* (Sw.) C. Chr. Ind. Fil. (1905) 298. *Meniscium triphyllum* Sw. in Schrad. Journ. 1800²: 16.

LUZON (11609 *Warburg*). LEYTE (299 *Cuming*). NEGROS (76 *Copeland*); Gimagaan River (1606 *Whitford*) May, 1906.

Malayan region.

Var. *elata* n. var.

Majus, 60 cm. et ultra alta, pinnis saepius 5, remotis fere lanceolatis valde elongato-candatis, soris brevibus non junctis.

NEGROS, Gimagaan River (1608 *Whitford*) May, 1906. LUZON, Province of Rizal, Mabacal (*Loher*) March, 1906; Angilog (*Loher*) March, 1906.

II. LASTREA (including *Phegopteris*).

42. *Dryopteris Loheriana* (Christ) C. Chr. Ind. Fil. (1905) 275. *Aspidium Loherianum* Christ. in Bull. Herb. Boiss. 6 (1898) 191.

LUZON, Province of Rizal, Montalban (*Loher*) October, 1890; Mount Batay (*Loher*) April, 1905; Province of Laguna, Mount Maquiling (*Loher*) April, 1906; Province of Pampanga, Mount Arayat (3908 *Merrill*) October, 1904; District of Lepanto, Balili (1910b *Copeland*) November, 1905.

This species, which has all the appearances of a *Lastrea*, sometimes has the basal nerves joined.

Endemic to the Philippines.

43. *Dryopteris stenobasis* C. Chr. Ind. Fil. (1905) 294. *Lastrea attenuata* J. Sm. in Hook. Journ. Bot. 3 (1841) 412.

SAMAR (327 *Cuming*).

This species presents in the greatest degree the reduction of the lower pinnae, a character common to so many of the Philippine species. The position of the species, with its numerous nerves in the very narrow lobes, is uncertain and seems to approach *Nephrodium*. } } attenu
gradus

Endemic.

44. *Dryopteris orientalis* (Gmel.) C. Chr. Ind. Fil. (1905) 281. *Polypodium orientale* Gmel. Syst. 2: 1312.

Var. *Webbiana* (Hook.) *Nephrodium Webbianum* Hook. Sp. Fil. 4: 85.

Differs from *D. orientalis* (*Polypodium pectinatum* Forsk. and *Aspidium albopunctatum* Bory) in lacking the calcareous coating on the upper surface and the lobes more horizontal and more angular, but it is not more than a variety of the African species. It is found also in Amboina and the Viti Islands, and appears unexpectedly in the Philippines. The Island of Réunion is the intermediate place in its distribution.

MINDANAO, Province of Zamboanga, San Ramon (1712 *Copeland*) April, 1905, alt. 850 m.

Eastern Malayan region, rare and widely distributed.

45. *Dryopteris Beddomei* (Baker) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Nephrodium Beddomei* Baker Synopsis 267.

LUZON, Province of Benguet, Baguio (6491 *Elmer*) June, 1904; (331 *Topping*) January, 1903; (4941, 5089 *Curran*) August, 1906; (1818 *Copeland*) October, 1905; (Dr. *Pond*) March, 1904; Tilad (*Loher*) February, 1904: Mount Tonglon (5010 *Curran*) August, 1906.

British India, China and Malaya.

46. *Dryopteris immersa* (Blume) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Aspidium immersum* Blume Enum. (1828) 156.

LUZON (72 *Cuming*) "*Lastrea verrucosa* J. Sm." in Hook. Journ. Bot. 3 (1841) 412. MINDANAO, District of Davao (695 *Copeland*) March, 1904: Province of Zamboanga, San Ramon (1574 *Copeland*) December, 1904.

Malaya.

Var. *ligulata* (J. Sm.) *Lastrea ligulata* J. Sm. in Hook. Journ. Bot. 3 (1841) 412. *Aspidium ligulatum* Mett. Aspid. no. 213.

CEBU (343 *Cuming*) "*Lastrea ligulata* J. Sm." l. c.

In examining the above authentic specimen I find but slight differences between it and *D. immersa*. The rachis is atrovioleaceous rather than of a pale straw color such as is usually the case with the latter species.

47. *Dryopteris Motleyana* (Hook.) C. Chr. Ind. Fil. (1905) 278. *Nephrodium Motleyanum* Hook. Syn. 266.

NEGROS, Gimagaan River (93 *Copeland*) January, 1904; (1485 *Whitford*) May, 1906. MINDANAO, Province of Zamboanga, San Ramon (1713 *Copeland*) April, 1905. PALAWAN (541 *Foxworthy*) April, 1906.

Sunda Islands, and probably other islands in the Malayan region.

48. *Dryopteris Luerssenii* (Harringt.) C. Chr. Ind. (1905) 276. *Nephrodium Luerssenii* Harringt. in Journ. Linn. Soc. Bot. 16 (1877) 29.

Ab *Aspidium xylode* Kunze differt textura magis coriacea, segmentis acutioribus, ala costali latiore, soris costalibus mox faciem inferiorem segmenti impleatibus, basi frondis vix aut abrupte attenuata.

LUZON, Province of Benguet, Baguio (Dr. *Pond*) March, 1904; (181, 236, 214 *Topping*) January, February, 1903; (6514, 6515 *Elmer*) June, 1904: District of Lepanto (1910 *Copeland*) November, 1905.

Endemic to the Philippines.

49. *Dryopteris Foxii* (Copeland MSS. *Nephrodium*) n. sp.

I transcribe here the manuscript diagnosis of the author:

"Rhizomate breve repente vel adscendente, stipitibus confertis 5 ad 10 cm. altis, stramineis, glabris, facie superiore canaliculatis, fronde lanceolata 20 ad 30 cm. alta, 6 ad 9 cm. lata utrinque angustata, bipinnata, pinnis lanceolatis, acuminatis, adscendentibus, infimis remotis minutis, pinnulis inferioribus lineari-lanceolatis, 8 mm. longis, 1 ad 1.5 mm. latis, acutis, obscure dentatis, adnatis, remotis, sequentibus confluentibus demum in caudam subserrantam coadunatis, membranaceis, supra glabris, infra sparse pubescentibus, pilis albis, brevibus, venulis in pinnulis maximis plerumque utrinque 5, soris medialibus indusiis reniformibus glabris, subpersistentibus."

"A representative of the chiefly American group of *Nephrodium oppositum* (Sw.) Diels (*N. conterminum* Desv.) from which it differs mostly in the medial instead of submarginal sori. It is very common on rocky banks submerged during floods."

MINDANAO, District of Davao, Catalonan (940 *Copeland*) April, 1904; Davao (*Copeland*) April, 1904; Province of Zamboanga, San Ramon (1555 *Copeland*) December, 1904. LUZON, Province of Rizal, Bosoboso (1084 *Ramos*) July, 1906; Arambibi River (*Loher*) March, 1893; Montalban (*Loher*) 1906; Province of Batangas, Santo Tomas (2000 *Copeland*) February, 1906; Province of Benguet, Baguio (167, 258 *Topping*) January, 1903; Sablan (6178 *Elmer*) April, 1904; Baguio (5010 *Curran*) August, 1906; (6577 *Elmer*) June, 1904; Province of Cagayan (*Warburg*); (119 *Bolster*) July, 1905; Manila (*Rothdauscher*) 1879 in Herb. Monac; Province of Zambales, Pinatubo (*Loher*) February, 1906.

This species has been known to me for a long time, but was considered as *Lastrea ligulata* J. Sm. It is described here from the most common form—that is, rather small specimens—although sometimes it attains a size three times as large as is indicated in the diagnosis, and even larger. The plant can always be readily distinguished from *D. immersa* and *D. ligulata* (which to me are not specifically distinct) by its very sharp segments, which are cuneate and decurrent, and by its light green color and more firm texture. Its affinity is with *D. Koordersii* Christ.⁸ of Celebes, but that species is distinguishable by its very peculiar indusium which I have described as follows: "Indusio subgloboso lateraliter inhaerente duro crustato valde convexo brunneo nitido adiphano sorum margine deflexo (more *Matoniae*) tegente."

50. *Dryopteris quadriaurita* n. sp.

Rhizomate uti videtur obliquo coma squamarum subulatarum fere 1 cm. longarum rigidarum opacarum castanearum coronato, frondibus subsolitariis aut paucis, stipite 33 cm. longo nudo griseo-stramineo tereti pennae corvinae crassitie, fronde 35 cm. longa 24 cm. lata deltoideo-oblonga versus basia vix attenuata, pinnis ca. 15 utrinque infra apicem pinnatifidum sessilibus inferioribus oppositis, infimis declinatis, acuminatis 12 cm. longis, 2.5 cm. latis ad rhachim incis horizontalibus remotiusculis, pinnulis linearibus, sinu acuto interjecto, acutis, integris, 14 mm. longis, 3 mm. latis, inferioribus liberis, falcatis, infimis rhachi incumbentibus auctis incis stipulaceis, costis brevissime puberulis, cum costulis stramineis, nervis liberis simplicibus obliquis 8 ad 10 utrinque, sori impressis mediis minutis exindusiatis. Textura coriacea, rigida, colore laete virente.

MINDANAO, Province of Zamboanga, San Ramon (1714, 1713 *Copeland*) April, 1905, alt. 850 m.

A species with the appearance of *Pteris quadriaurita* Retz., the fronds not fasciculate, bipinnate, deltoid-oblong, the pinnæ cut to the costa and furnished at the base with incised stipules, the pinnules coriaceous, linear, their margins entire, the nerves simple, the sori small. It differs from *D. patens* in its narrow linear segments.

⁸ *Ann. Jard. Bot. Buitenz.* 15¹: 128.

51. **Dryopteris flaccida** (Blume) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Aspidium flaccidum* Blume Enum. (1828) 161.

LUZON, Province of Benguet, Baguio (157, 171 *Topping*) January, 1903.
Malaya.

52. **Dryopteris erubescens** (Wall.) C. Chr. Ind. Fil. (1905) 263. *Polypodium erubescens* Wall.

MINDANAO, Province of Zamboanga, San Ramon (1612 *Copeland*) January, 1905, at 75 m. alt.

Malaya.

53. **Dryopteris Metteniana** Hieronym. MSS. n. sp. sub *Nephrodium*. *Lastrea spectabilis* J. Sm. in Hook. Journ. Bot. 3 (1841) 412, sed *Aspidium spectabile* Blume Enum. 158 *D. syrmaticam* amplectitur.

Differt a *D. Syrmatico*, cui similis dente in sium loborum posito, amplitudine, pinnis fere sessilibus et pinnis basalibus postice egregie auctis bipinnatifidis, texture membranacea, colore atroviridi, soribus pluriseriatis.

Ampla, nuda, stipite plumbeo-stramineo valido, fronde 70 cm. longa 30 cm. lata ovata, acuminata, bi- et subtripinnatifida, pinnis patentibus remotis ca. 15 utrinque infra apicem pinnatifidum, inferioribus breviter petiolatis, reliquis sessilibus, versus basin postice attenuatis, ovato-oblongis supremis lanceolatis 18 cm. longis 4 cm. et ultra latis superioribus angustioribus caudato acuminatis, basi cuneato-truncatis subinaequalibus, usque ad mediam laminam incisus, lobis grossis sinu aperto rotundato separatis subfalcatis ovatis usque ad 3 cm. longis et 1 cm. latis serrato-crenatis acutiusculis, ca. 15 utrinque, dente in sinu posito, ca. 8 utrinque, pinnis infimis deorsum valde auctis, pinnula basali deflexa 7 cm. longa profunde lobata; costis costulisque prominentibus stramineis, nervis tenuibus bi-aut trifurcatis, liberis, soris mediis minutis brunneis, ramo anteriore basali nervulorum impositis saepe biseriatis, 6 aut 7 utrinque, indusio minimo rudimentario griseo. Textura tenuiter membranacea, colore atroviridi.

LUZON (13 *Cuming*) "*Lastrea spectabilis* J. Sm." in Hook. Journ. Bot. 3 (1841) 412. MINDANAO, Mount Batangan (*Warburg*) 1888. The same species is found in CELEBES, Maros Bantimurung, South Celebes (16586 *Warburg*); Takale Kadjo, 500 m. alt. (*Sarasin*) February, 1895.

54. **Dryopteris Syrmatica** (Willd.) O. Ktze. Rev. Gen. Pl. 2 (1891) 814. *Aspidium Syrmaticum* Willd. Sp. Pl. 5: 237.

Var. **petiolosa** n. var.

Pinnis longe petiolatis (petiolo 1 cm. et ultra) supremis solummodo subsessilibus, 16 cm. longis, 3.5 cm. latis, soris mediis minutis indusio griseo tectis. Rhizomate monente *Copeland* erecto terrestri.

LUZON (14 *Cuming*) "*Lastrea spectabilis* J. Sm." in Hook. Journ. Bot. 3 (1841) 412: Province of Laguna, Los Baños (*Alberto*) May, 1905. MINDANAO, Province of Zamboanga, San Ramon (736, 1581 *Copeland*) May, December, 1904: District of Davao (953, 928, 669 *Copeland*); Mount Batangan (14122 *Warburg*).

The Philippine plant is distinguishable from those of southern China (leg.

Henry) and India by its very long petioled pinnæ and smaller size. The same variety has been found on Christmas Island, Straits Settlements (leg. *Ridley*).

The type is widely distributed in Malaya.

55. *Dryopteris Sagenioides* (Mett.) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Aspidium Sagenioides* Mett. *Aspid.* 113, No. 269.

LEYTE (302 *Cuming*). MINDANAO, Lake Lanao, Camp Keithley (386 Mrs. *Clémens*) March, 1906: District of Davao, Todaya (1238 *Copeland*) April, 1904. Eastern Malaya.

56. *Dryopteris Boryana* (Willd.) C. Chr. Ind. Fil. (1905) 255. *Aspidium Boryanum* Willd. Sp. Pl. 5: 285.

Forma pinnulis ovatis ad tertiam aut quartam partem solummodo incis, aliter typica.

LUZON, District of Lepanto (1731 *Copeland*) November, 1905, alt. 2,000 m.

Widely distributed in the Malayan region, reaching to Japan.

57. *Dryopteris viscosa* (J. Sm.) O. Ktze. Rev. Gen. Pl. 2 (1891) 814. *Lastrea viscosa* J. Sm. in Hook. Journ. Bot. 3 (1841) 412.

Rhizomate crasso erecto semisupraterraneo stipitibus vetustis abunde oblecto nigricante, foliis valde numerosis dense fasciculatis, stipitibus rigidis penna corvinae crassitie 12 aut 20 cm. longis, cum rhachi pilis ochreo-griseis dense tomentosis et insuper squamis ovatis atrobrunneis 0.3 cm. longis vestitis, fronde 25 ad 35 cm. longa, 8 ad 12 cm. lata oblonga, acuminata, basi ob aliquot pinnae breviores attenuata, binipinnatifida, pinnis 6 cm. longis, 1.5 cm. latis breviter acuminatis patentibus, infimis deflexis, remotiusculis, 20 ad 25 utroque latere infra apicem lobatum, sessilibus, fere usque ad costam incis, segmentis oblongis obtusis angulo acuto separatis ca. 15 utrinque, subcrenatis, nervis 6 utrinque simplicibus, soris 1 mm. diametro, mediis rufobrunneis, indusio persistente convexo coriaceo brunneo, costis costulis et facie imprimis inferiore pilis rigidis albidis pubescentibus. Textura carnosula, colore sicce atrobrunneo, opaca.

MINDANAO, District of Davao, Mount Apo (1022, 1044 *Copeland*); (327 *DeVore & Hoover*) May, 1903. LUZON, Province of Bataan, Mount Mariveles (1105 *Whitford*) February, 1905.

Malacca (401 *Cuming*) in herb. Bureau of Science.

The affinity of this species is with *D. polylepis* (Fr. et Sav.) of China and Japan. It is characterized by its thick erect rhizome, its double villosity consisting of large blackish scales and grayish-yellow pubescence, its somewhat fleshy texture, and its very large brown persistent coriaceous indusia. It has the general appearance of a small member of the *filiæ mas* group, but its nerves are simple. An alpine form.

At isolated points from Perak, Malacca and Borneo.

58. *Dryopteris erythrosora* (Eaton) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Aspidium erythrosorum* Eaton in Parry, Narr. Exp. to China 2 (1856) 330.

LUZON, District of Lepanto, Bagnen (1929 *Copeland*) November, 1905, alt. 2,000 m.

This peculiarly Chinese and Japanese species was found previously in Luzon by *Loher* in 1894, Mount Tonglon, Province of Benguet, alt. 2,250 m. It is also found in Assam, leg. *Mann*.

59. **Dryopteris marginata** (Wall.) Clarke in Trans. Linn. Soc. 2: 521. *t.* 71. *Aspidium marginatum* Wall. Cat. (1828) 366.

LUZON, District of Lepanto, Mount Data (1906 *Copeland*) November, 1905, alt. 1,800 m.

A member of the group of *D. filix mas* sensu latiori.

The discovery of this essentially Chinese plant, also found in the Himalayan region in the Philippines, is significant of the continental influence in the flora of northern Luzon, indicated also by other ferns such as *Dryopteris varia*, *D. erythrosora* etc.

60. **Dryopteris hirtipes** (Blume) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Aspidium hirtipes* Blume Enum. (1828) 148.

LUZON, District of Lepanto, Mount Data (1887 *Copeland*) October, 1905: Province of Benguet, Baguio (6529 *Elmer*) June, 1904; (302, 303 *Topping*) January, 1903.

China and Malaya.

61. **Dryopteris filix mas** (Linn.) Schott Gen. Fil. *t.* 9. *Polypodium filix mas* Linn. Sp. Pl. (1753) 1090.

Var. **parallelogramma** (Kunze) *Aspidium parallelogrammum* Kunze Linnæa 13 (1839) 146.

LUZON, District of Lepanto, Mount Data (1875 *Copeland*) October, 1905, alt. 2,250 m.

The tropical variety of the European species, closest to the variety *paleacea* Moore; also in Celebes (leg. *Sarasin*).

Widely distributed in the Tropics of both hemispheres.

62. **Dryopteris heleopteroides** n. sp.

Rhizomate brevi radicoso crasso, foliis fasciculatis stipite basi incrassato brunneo squamis pallide brunneis diaphanis subulatis 0.5 cm. longis vestito, stipite rufostramineo, folii sterilis 6 cm. longo parce fibrilloso, planta aliter nuda, fronde deltoidea 16 cm. longa et fere aequalata, bipinnatifida, pinnis approximatis, ca. 10 infra apicem lobatum infimis maximis petiolulatis profunde ad alam angustam pinnatisectis, 8 cm. longis basi 3.5 cm. latis oblongis obtusis, segmentis ovato-rhombeis obtusis ca. 8 aut 10, infimis maximis 2 cm. longis 1 cm. latis obtusis grosse et irregulariter crenato-serrulatis, pinnis superioribus sessilibus et adnatis, grosse lobatis, lobis obtusis trigono-arcuatis, nervis inconspicuis in lobis pinnatis et furcatis, folia fertili longius (17 cm.) stipitata, fronde deltoidea 10 cm. longa, 7 cm. lata, pinnis ca. 8 utrinque, remotis, segmentis rhombo-obtusis, aequalibus, subintegris, 1 cm. longis, 0.5 cm. latis soris fere marginalibus, confertis, ca. 4 utrinque, ochraceis, 1 ad 2 mm. latis, indusio pallido reniformi bullato subpersistente. Textura subcoriacea, omnino *D. cochleatae* aut *D. chrycomae*, colore pallide viridi, opaco.

LUZON, Province of Benguet, Bued River (1837a *Copeland*) October, 1905, alt. 1,100 m.

The affinity of this species is with *D. filix mas*, and more particularly with *Nephrodium cochleatum* Don Prodr. Fl. Nepal. 6, by its dimorphism. The pinnae of the fertile fronds are much more reduced than those of the sterile ones. The

plant is small (always ?), with deltoid fronds, the sterile ones irregularly lobed. It has the appearance of the forma *Heleopteris* of *D. filix mas*. The presence of this member of the *filix mas* group augments the continental and temperate element in the mountains of northern Luzon, already known to be of considerable magnitude.

63. *Dryopteris Balabacensis* n. sp.

Ampla, stipite pennae anserinae crassitie, 55 cm. longo, angulosa, nuda uti tota planta, cum rhachibus rufocastanea sive rufostaminea, fronde tripinnata deltoidea 50 cm. longa et aequaliter aut latiore, basi tripartita, pinnis 8 ad 10 infra apicem pinnatifidam valde remotis (primo interstitio 14 cm. longo) petiolatis, petiolo infimarum pinnarum 5 cm. longo, pinnis infimis 30 cm. et ultra longis basi 25 cm. latis, deltoideis, postice acutis, pinnula infima posteriore 13.5 cm. longa et 7 cm. lata, pinnulis III incisulobatis, ovato-oblongis 2 cm. latis 4 ad 5 cm. longis obtuse lobatis, pinnis superioribus sessilibus oblongis acuminatis, ad basin usque ad costam incisus versus apicem lobatis, lobis extremis postice decurrentibus, oblongis acutiusculis, 8 mm. latis sinus acutis dentatis, dentibus decumbentibus, nervis in lobis pinnatis et bi- aut trifurcatis, manifestis. Textura coriacea, colore ochreo-viridi, nitidulo, costis rufostamineis faciebus glabris, soris minutis numerosis submarginalibus mediisve, indusio nigro coriaceo-carnoso reniformi mox convoluto persistente praeditis.

BALABAC (392 *Mangubat*) March to April, 1906. PALAWAN (698, 712, *Foxworthy*) March to April, 1906. SIBUYAN (25 *McGregor*) July, 1904.

This species belongs to the *D. sparsa* group but is larger than that species, its pinnae long stipitate, the base of the frond strongly tripartite, the basal pinnae usually large and compound like the rest of the frond, stipe glabrous, indusium fleshy, convolute, black. It has the appearance of *Sagenia*, but the nerves are not united.

64. *Dryopteris sparsa* (Don) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Nephrodium sparsum* Don. Prodr. Fl. Nepal. (1825) 6.

LUZON, Province of Benguet, Baguio (282 *Topping*) January, 1903. PALAWAN (672 *Foxworthy*) March to April, 1906. MINDANAO, Province of Zamboanga, San Ramon (1727 *Copeland*) April, 1905.

Widely distributed in tropical Asia.

65. *Dryopteris purpurascens* (Blume) *Nephrodium purpurascens* Blume Enum. 169; Mett. in Ann. Lugd. Bat. 1: 227; Raciborski Pter. Buitenz. 174, non Hook. Sp. Fil. 4. t. 262.

Differt a *D. sparso* squamis basalibus subulato-angustatis, fronde quadripinnatifida, pinnis infimis decompositis, magnitudine quadrupla. Icon. Hook. cit. est *D. sparsa*.

MINDORO, Mount Halcon (6101 *Merrill*) November, 1906.

The species is also known from Java.

66. *Dryopteris subarborea* (Bak.) C. Chr. Ind. Fil. (1905) 295. *Nephrodium subarboreum* Bak. in Journ. Linn. Soc. Bot. 24 (1887) 259. *N. megaphyllum* Bak. l. c. 22: 227. *N. incisum* Copel. Polypod. Philip. 26, non Hook. Sp. Fil. 4: 133 quod est *D. Boryana*.

MINDANAO, District of Davao, Mount Apo (1136 *Copeland*) April, 1904; (1614a *Copeland*) October, 1904, alt. 1,800 m. LUZON, Province of Benguet, Baguio (*Loher*) 1897, alt. 1,400 m.

The same species has been found in Borneo, Sarawak, leg. *Hose*, 1894; Batjan, leg. *Warburg*; Celebes, Lokon, leg. *Sarasin* No. 719, 1894.

It is related to *D. filix mas*, sensu latissimo, in spite of its extremely decomposed frond and large size. In authentic specimens from Sarawak the segments are almost entire, while in those from other localities they are strongly dentate.

67. *Dryopteris dissecta* (Forst.) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Polypodium dissectum* Forst. Prodr. 31.

LUZON, Province of Cavite, Mendez Nuñez (1297, 1311 *Mangubat*) August, 1906: Province of Laguna, Los Baños (*Loher*) January, 1906; Pagsanjan (513 *Topping*) 1904: Province of Bataan, Mount Mariveles (369 *Topping*) May, 1904; (198 *Whitford*) May, 1904: without locality (36, 244 *Cuming*) "*Lastrea membranifolia* J. Sm." in Hook Journ. Bot. 2 (1841) 412. MINDANAO, District of Davao, Mount Apo (1465a *Copeland*) October, 1904, alt. 1,200 m.

A plant with blackish hairs issuing from pustules.

Widely distributed in tropical Asia.

68. *Dryopteris obscura* (Fée) O. Ktze. Rev. Gen. Pl. 2 (1891) 812. *Phegopteris obscura* Fée Gen. Fil. 243; Christ, Bull. Herb. Boiss. 6 (1898) 196. t. 5.

LUZON, Province of Laguna, Mount Maquiling (*Loher*) January, 1906: Province of Zambales, Mount Pinatubo (*Loher*) February, 1906: Province of Rizal, Montalban (*Loher*) March, 1903: Manila (*Usteri*) February, 1903.

The same species is found in Annam, Quang Binh leg. *Cadière* 1894, Herb. Mus. Paris 91, 126.

69. *Dryopteris Preslii* (Bak.) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Nephrodium Preslii* Baker Syn. Fil. 272.

Baker's diagnosis is sufficiently clear to satisfactorily identify this plant. It is an insular dwarfed form that seems to be related to *D. obscura* from its general appearance, although smaller in all its parts.

BOHOL (354 *Cuming*) "*Lastrea spectabilis* J. Sm." in Hook. Journ. Bot. 3 (1841) 412. There has been an error, apparently, in copying the label, as *Lastrea spectabilis* J. Sm. = *Dryopteris Syrmatica*, our specimen being entirely different from the latter species. (*Baker* indicates No. 255 *Cuming* as the type of *Nephrodium Preslii*.)

Endemic.

70. *Dryopteris brunnea* (Wall.) C. Chr. Ind. Fil. (1905) 255. *Polypodium brunneum* Wall. Cat. (1828) 333. *P. distans* Don Prodr. Fl. Nepal. 2.

LUZON, Province of Benguet, Baguio (959 *Barnes*) May, June, 1904: District of Lepanto, Bagnen (1931 *Copeland*) November, 1905, alt. 2,000 m.

Widely distributed in tropical Asia.

71. *Dryopteris crenata* (Forsk.) O. Ktze. Rev. Gen. Pl. 2 (1891) 811. *Polypodium crenatum* Forsk. Fl. Aeg. Arab. 185.

LUZON, Province of Benguet, Twin Peaks (6480 *Elmer*) June, 1904; Baguio (6595 *Elmer*) June, 1904; Bugias (1851 *Copeland*) October, 1905: Province of Rizal, Montalban (*Loher*) October, 1903.

Widely distributed from China across tropical Asia; Cape Verde Islands.

72. *Dryopteris setigera* (Blume) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Cheilanthes setigera* Blume Enum. (1828) 138.

LUZON, without locality (1, 75, 412 *Cuming*) "*Polypodium trichodes* Reinw." J. Sm. in Hook. Journ. Bot. 3 (1841) 394: Province of Rizal (1084 *Ramos*) July, 1906; Antipolo (*Guerrero*) June, 1903; Tanay (2266 *Merrill*) May, 1903; (90 *Foxworthy*) January, 1906: Province of Cavite, Mendez Nuñez (1355 *Mangubat*) August, 1906: Province of Laguna, Cavinti (*Loher*) February, 1906: Province of Benguet, Daklan (1837 *Copeland*) October, 1905; Baguio (178 *Topping*) January, 1903. PALAWAN (282 *Bermejos*) January, 1906. MINDANAO, Province of Zamboanga (1614, 1691 *Copeland*) March, 1904: District of Davao (611 *Copeland*) March, 1904.

I have previously indicated⁹ some Philippine specimens as *Phegopteris ornata* (Wall.) Bedd., which *Loher* found at Montalban and on Mount Maquiling. They now appear to me to be strongly developed forms of *Dryopteris setigera*, and I can not identify the Philippine form with certainty with *D. ornata* as represented by specimens from Darjeeling (7465 *Gamble*) 1897.

Widely distributed in China and Malaya.

73. *Dryopteris setosa* (Presl) C. Chr. Ind. Fil. (1905) 292. *Lastrea setosa* Presl Epim. (1849) 40. *Polypodium setosum* Presl Rel. Haenk. 1: 27, non Sw. *Phegopteris hirta* Christ Bull. Herb. Boiss. 6: 195.

LUZON, Province of Rizal, near Montalban (*Loher*) 1897, in herb. Kew..

Endemic.

74. *Dryopteris intermedia* (Blume) O. Ktze. Rev. Gen. Pl. 2 (1891) 813. *Aspidium intermedium* Blume Enum. 161. *Dryopteris rhodolepis* C. Chr. Ind. Fil. (1905) 288, ex parte, nec Clarke Trans. Linn. Soc. 2: 526, *Nephrodium*.

LUZON, without locality (80, 151 *Cuming*) "*Lastrea propinqua* J. Sm." in Hook. Journ. Bot. 3 (1841) 412: Province of Bataan, Lamao River (1240, 1241 *Borden*) June, 1904; (199 *Whitford*) May, 1904; (363, 370 *Topping*) May, 1904. NEGROS, Gimagaan River (1605 *Whitford*) May, 1906. MINDANAO, Province of Zamboanga, San Ramon (1465c, 1765d, *Copeland*) April, 1905.

Widely distributed in tropical Asia.

Var. *Mannii* (Hope) *Lastrea Mannii* Hope in Journ. Bot. 28 (1890) 145.

Fronde facie fere *D. filicis maris Europae*, valde elongata oblonga bipinnatifida pinnis regulariter lobatis, lobis simplicibus, pinnis infimis solummodo bipinnatifidis et postice auctis.

MINDANAO, Province of Zamboanga, San Ramon (1588 *Copeland*) January, 1905; (1649 *Copeland*) February, 1905, alt. 500 m.

Assam, leg *Mann*.

Var. *microloba* n. var.

Stipite rhachique purpureis, pilis atrorubris patentibus densissime tectis, pinnulis minoribus 1.5 ad 2 cm. longis et 0.5 cm. latis, lobis confertis 6 utrinque, angustis 2 ad 4 mm. latis.

MINDANAO, Province of Zamboanga (1702 *Copeland*) 1905, alt. 850 m.

In general appearance quite different from the type.

⁹ *Bull. Herb. Boiss.* 6 (1898) 196.

75. *Dryopteris rhodolepis* (Clarke) *Nephrodium rhodolepis* Clarke in Trans. Linn. Soc. 2: 526. t. 72.

Major magisque composita quam *D. intermedia*, pilis atropurpureis basi pustulatis fere nullis sed squamis rufobrunneis subulatis, lanceolatis et ovatis mixtis, stipite rhachi costisque abunde vestitis.

LUZON, District of Lepanto, Bagnen (1920 *Copeland*) November, 1905. MINDANAO, Province of Zamboanga (1773 *Copeland*) 1905, alt. 1,000 m.

C. Christensen has erroneously identified *Dryopteris intermedia* (Bl.) with *D. rhodolepis* (Clarke) in his index Filicum, 288, as *Clarke* has expressed very clearly l. c. 527, distinctive characters of the latter, "primary, secondary and tertiary rachises with ovate acute subadpressed hyaline rose-mauve scales."

China and British India, Himalayan region.

76. *Dryopteris Copelandi* n. sp.

Differt a *D. intermedia* absentia pilorum atropurpureorum basi pustulorum, indumento squamato, fronde postice non aucta, pinnis angustis minoribus, segmentis minoribus denticulatis. Potius *D. spinulosae* quam *D. intermediae* appropinquanda. Rhizomate uti videtur obliquo pauca folia emittente, stipite pennae corvinae crassitie rufostamineo, 30 cm. longo, cum rhachi costisque abunde squamulis minimis, setiformibus strigillosis rufobrunneis oblecto nec non squamis ovatis obtusis 0.5 cm. et ultra longis et latis diaphanis dilute brunneis vestito, fronde deltoideo-oblonga 40 cm. longa 30 cm. lata tripinnata, pinnis ovato-oblongis inferioribus breviter petiolulatis remotis (infimo intervallo 7 cm.) acuminatis basi vix attenuatis, utrinque ca. 15 infra apicem, pinnis infimis postice vix auctis, pinnula basali posteriore sequente brevior, pinnulis ca. 15 utrinque, approximatis, 4 cm. longis, 1.5 cm. latis, valde regulariter fere usque ad costam pinnatis, segmentis ^{III} subinaequalibus, basi subdecurrentibus, rhombeo-oblongis 6 mm. longis 3 mm. latis obtusissimis, 10 utroque latere, regulariter dentatis, dentibus ca. 5 utrinque acutiusculis, nervis pinnatis, furcatis, soris rufobrunneis numerosis ca. 3 utrinque, exindusiatis, faciebus pilis albidis numerosis pubescentibus, textura flaccide herbacea, colore laete virente.

LUZON, District of Lepanto, Mount Data (1887 *Copeland*) October, 1905, alt. 2,250 m.

77. *Dryopteris Rizalensis* n. sp.

Rhizomate brevi crasso, squamarum rigidarum 1 cm. longarum setiformium brunnearum coma dense vestito. Stipitibus subfasciculatis pennae corvinae crassitie, sulcatis, 25 cm. longis atrocastaneis squamis setiformibus atropurpureis patentibus flexuosis 6 mm. longis dense vestitis, fronde 32 cm. longa, basi 20 cm. lata elongato-deltoidea, basi bipinnatifida caeterum pinnata, pinnis falcatis acutis 7 ad 8 utrinque infra apicem incisum, infimis petiolulatis remotis, basi postice auctis 12 cm. longis, 5 cm. latis deltoideo-elongatis, caeteris lanceolato-oblongis 10 cm. longis, 3.5 cm. latis, superioribus decurrenti-adnatis, ad basin profunde, supra ad

mediam et tertiam partem lobatis, costis omnibus late alatis, lobis obtusis subintegris, ca. 10 utrinque 1.5 ad 2 cm. longis 1 cm. latis, rachis costis nervisque squamulis brevibus setiformibus aut lanceolatis brunneis pubescentibus, nervis in lobis pinnatis furcatisque flexuosis, soris in lobis pluribus usque ad 6 utrinque medialibus minutis, 0.5 mm. latis, pallide fuscis, indusio reniformi flaccido griseo mox evanido. Textura herbacea, colore pallide virente.

MINDANAO, Province of Zamboanga, San Ramon (1649 *Copeland*) February, 1905: District of Davao, Mount Apo (1465b *Copeland*) October, 1904. A smaller form from Mabacal, Province of Rizal, LUZON (*Loher*) March, 1906.

The affinity of this species is with *Dryopteris intermedia* and *D. obscura*, but is less compound, the basal pinnæ being only bipinnatifid, the pinnæ and lobes broad.

SUPPLEMENT.

27a. *Dryopteris granulosa* (Presl) C. Chr. Ind. Fil. 269. *Polypodium granulatum* Presl Reliq. Haenk. 1. 24 t. 4 f. 2. 1825.

Differt a *D. otaria* (Kze. Mett.) pinnis crenato-dentatis nec profunde lobatis, dentibus integris nec spinuloso-serrulatis, nervis conspicuis fere omnibus junctis et nervulum-rectum sursum emittentibus, soris minutis exindusiatis. Facie rugosa. *D. otaria* differt pinnis lobatis, lobis aristato-ciliatis aut serratis, nervis magis abliquis inconspicuis, inferioribus solummodo junctis, soris majoribus manifeste indusiatis. Facie glabra.

PALAWAN (863 *Foxworthy*) May, 1906. BALABAC (413 *Mangubat*) March, 1906.

The same plant but larger from Indo-China leg. *P. Eberhardt*.



**PREVIOUS PUBLICATIONS OF THE BUREAU OF GOVERNMENT
LABORATORIES—Concluded.**

(Concluded from second page of cover.)

No. 32, 1905.—*Biological Laboratory*: I. Intestinal Hemorrhage as a Fatal Complication in Amebic Dysentery and Its Association with Liver Abscess. By Richard P. Strong, M. D. II. The Action of Various Chemical Substances upon Cultures of Amœbæ. By J. B. Thomas, M. D., Baguio, Benguet. *Biological and Serum Laboratories*: III. The Pathology of Intestinal Amœbiasis. By Paul G. Woolley, M. D., and W. E. Musgrave, M. D.

No. 33, 1905, *Biological Laboratory*.—Further Observations on Fibrin Thrombosis in the Glomerular and in Other Renal Vessels in Bubonic Plague. By Maximilian Herzog, M. D.

No. 34, 1905.—I. Birds from Mindoro and Small Adjacent Islands. II. Notes on Three Rare Luzon Birds. By Richard C. McGregor.

No. 35, 1905.—I. New or Noteworthy Philippine Plants, IV. II. Notes on Cuming's Philippine Plants in the Herbarium of the Bureau of Government Laboratories. III. Hackel, "Notes on Philippine Grasses." IV. Ridley, "Scitimineæ Philippinenses." V. Clarke, "Philippine Acanthaceæ." By Elmer D. Merrill, Botanist.

No. 36, 1905.—A Hand-List of the Birds of the Philippine Islands. By Richard C. McGregor and Dean C. Worcester.

The previous publications of the Bureau were given out as bulletins in serial number pertaining to the entire Bureau. These publications, if they are desired, can be obtained by applying to the librarian of the Bureau of Science, Manila, P. I., or to the Director of the Bureau of Science, Manila, P. I. Correspondents will confer a favor by returning to the Bureau any previous publications which they may have in duplicate, as a number of bulletins are now out of print.

**LIST OF PREVIOUS PUBLICATIONS OF THE MINING BUREAU (NOW DIVISION
OF MINES OF THE BUREAU OF SCIENCE).**

1890.—Descripción física, geológica y minera en bosquejo de la Isla de Panay por D. Enrique Abella y Casariego, Inspector General de Minas del Archipiélago.

1890.—Memoria descriptiva de los manantiales minero-medicinales de la Isla de Luzon, estudiados por la comisión compuesta de los Señores D. José Centano, Ingeniero de Minas y Vocal Presidente; D. Anacleto del Rosario y Sales, Vocal Farmacéutico, y D. José de Vera y Gómez, Vocal Médico.

1893.—Estudio Descriptivo de algunas manantiales minerales de Filipinas ejecutado por la comisión formada por D. Enrique Abella y Casariego, Inspector General de Minas, D. José de Vera y Gómez, Médico, y D. Anacleto del Rosario y Sales, Farmacéutico; precidido de un prólogo escrito por el Excmo. Sr. D. Angel de Avilés, Director General de Administración Civil.

1893.—Terremotos experimentados en la Isla de Luzón durante los meses de Marzo y Abril de 1892, especialmente desastrosos en Pangasinán, Unión y Benguet. Estudio ejecutado por D. Enrique Abella y Casariego, Inspector General de Minas del Archipiélago.

1901.—The Coal Measures of the Philippines. Charles H. Burritt.

1902.—Abstract of the Mining Laws (in force in the Philippines, 1902). Charles H. Burritt.

1902, *Bulletin No. 1*.—Platinum and Associated Rare Metals in Placer Formations. H. D. McCaskey, B. S.

1903.—Report of the Chief of the Mining Bureau of the Philippine Islands. Charles H. Burritt.

1903, *Bulletin No. 2*.—Complete List of Spanish Mining Claims Recorded in the Mining Bureau. Charles H. Burritt.

1903, *Bulletin No. 3*.—Report on a Geological Reconnaissance of the Iron Region of Angat, Bulacan. H. D. McCaskey, B. S.

1904.—Fifth Annual Report of the Mining Bureau. H. D. McCaskey.

1905.—Sixth Annual Report of the Chief of the Mining Bureau. H. D. McCaskey.

1905, *Bulletin No. 4*.—A Preliminary Reconnaissance of the Mancayan-Suyoc Mineral Region, Lepanto, P. I. A. J. Eveland, Geologist.

1905, *Bulletin No. 5*.—The Coal Deposits of Batan Island. Warren D. Smith, B. S., M. A., Geologist.

**LIST OF PREVIOUS PUBLICATIONS OF THE ETHNOLOGICAL SURVEY (NOW
DIVISION OF ETHNOLOGY, BUREAU OF SCIENCE).**

(For sale at Bureau of Printing.)

Vol. I.—The Bontoc Igorot, by Albert Ernest Jenks. Paper, ₱4.50; half Morocco, ₱7.

Vol. II, Part 1.—Negritos of Zambales, by William Allen Reed. Paper, ₱1.25; half Morocco, ₱3.75.

Vol. II, Part 2 and Part 3.—The Nabaloi Dialect, by Otto Scheerer. The Bataks of Palawan, by Edward Y. Miller. (Bound also in one volume with Part 1, Negritos of Zambales.) Paper, ₱1.25; half Morocco, ₱3.75. Combined half Morocco, ₱5.

Vol. III.—Relaciones Agustinianas de las razas del Norte de Luzon, by Perez. Not listed by Bureau of Printing.

Vol. IV, Part 1.—Studies in Moro History, Law, and Religion, by Najeeb M. Saleeby. Paper, ₱0.75; half Morocco, ₱3.25.

¹ The first four bulletins in the ornithological series were published by The Ethnological Survey under the title "Bulletins of the Philippine Museum." The other ornithological publications of the Government appeared as publications of the Bureau of Government Laboratories.

The Philippine Journal of Science

Edited by
PAUL C. FREER, M. D., Ph. D.

Co-editors:
RICHARD P. STRONG, Ph. B., M. D., E. D. MERRILL, M. S.

The "Philippine Journal of Science" is issued as follows:

Section A. General Science, \$2, United States currency, per year.

Section B. Medical Sciences, \$3, United States currency, per year.

Section C. Botany, \$2, United States currency, per year.

The entire "Journal" \$5, United States currency, per year.

Single numbers, 50 cents, United States currency.

Authors receive 100 copies of their paper free.

The numbers in each section will appear as rapidly as material is available. Each section will be separately paged and indexed. Subscriptions may be sent to the DIRECTOR OF PRINTING, Manila, P. I.

FOREIGN AGENTS:

THE MACMILLAN COMPANY, 64-66 Fifth Avenue, New York.

Messrs. WM. WESLEY & SON, 28 Essex Street, Strand, London, W. C.

Messrs. MAYER & MULLER, Prinz Louis Ferdinandstrasse 2, Berlin, N. W.

Messrs. KELLY & WALSH, LIMITED, 32 Raffles Place, Singapore, S. S.

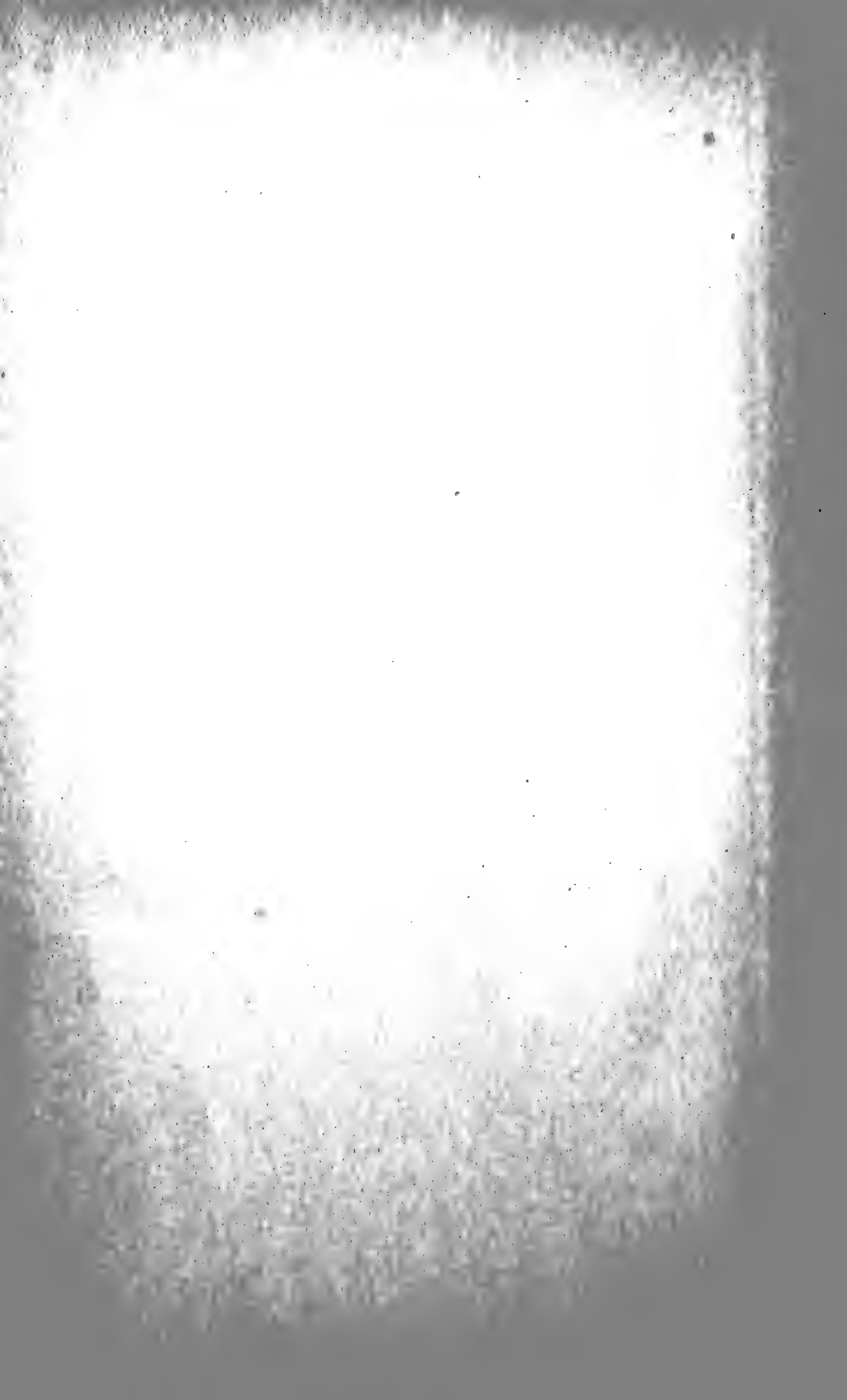
Messrs. A. M. & J. FERGUSON, 19 Baillie Street, Colombo, Ceylon.

Messrs. THACKER & CO., LIMITED, Bombay, India.

A limited number of complete copies of Volume I and Supplement to Volume I are still available for sale. Price of the complete volume, unbound, \$5, United States currency; of the Botanical Supplements, unbound, \$2.50, United States currency. Volume I was not divided into sections.

7248
1-K.









3 5185 00277 249



