PTERIDOPHYTES OF THE SOCIETY ISLANDS

BY

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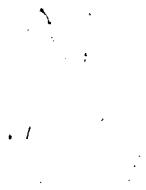

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Pteriodophytes of the Society Islands

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INTRODUCTION

The occasion for a study of the pteridophytes of the Society Islands has been provided by the collections of Mr. M. L. Grant, who as a Bishop Museum Fellow in Yale University spent most of the year 1930 in field work in Tahiti and visited nearly all the other islands during the final months of his trip. His collection numbers of pteridophytes total about 340. As the identification of this material required a study of the earlier records, I have been glad to accept the invitation of the Director of Bernice P. Bishop Museum to identify the other local collections in its possession and prepare a bulletin serving as a companion to that on the ferns of Fiji, published in 1929 by Bishop Museum as Bulletin 59.

This bulletin differs from that on Fiji in that it includes the Lycopodineae and excludes from the keys and the numbered species almost all species previously reported but wanting in our herbaria. In the bulletin on Fijian ferns are included and described about forty species which I had not seen from Fiji. Some of these are presumably not there. But the earlier enumeration and description of Fijian ferns, by Carruthers, was careful and competent; and the omission of species not seen would have involved the exclusion of a number of species actually growing and duly reported there, far greater than the number which may have been reported in error. This condition seems to be reversed in Tahiti.

In the Flore de la Polynésie Francaise of Drake del Castillo (1893), are described 142 species of ferns. My numbered list is only 146. Of Drake's 142 species, only 28 appear unchanged in name in my list—an awful example of the wreckage of names in our attempt at a stable (!) terminology, for his names were those in vogue only forty years ago. Of the other 114 species, at least 75 are in my enumeration with more or less changed names. Three are duplications in his list. This leaves 36, a full quarter of his list, unaccounted for. Some of these are surely in the Society Islands. For example, *Polypodium purpurascens* was described from Tahiti, and there is no reason to suspect that there was any mistake as to its origin. Others were to be expected in Tahiti, and the reports of their collection are presumably correct. I can believe this of half the 36

not in my enumeration, and suppose therefore that 164 ferns exist and have been discovered in the Society Islands. I mistrust the remaining 18 so strongly that I have been unwilling to risk the perpetuation of error by incorporating them. As practically all reports of the earlier collection of species not in the collection studied are mentioned in the natural places in this enumeration, with enough description to permit recognition if they are found again, the omission from the enumeration of the doubtful cases will not prove inconvenient, even when some of the excluded species are found again.

Comparing either the single islands or the archipelagoes they represent, the fern flora of Tahiti is materially poorer than that of Fiji. This may be due in minor part to the difference in area, incompletely offset by Tahiti's greater altitude. But the chief reason is that Tahiti is younger and lies farther out in the ocean, away from the source of immigrants. It is more essentially an oceanic island. In harmony with this fact, its endemism is more marked—30 per cent of the species being endemic in the Society Islands, 21.7 per cent in Fiji. This is in spite of the fact that Fiji is regarded as materially older than Tahiti in a geological sense.

While the general affinity of the Tahitian fern flora is to that of the fern-rich Malayan-Asiatic region, this is less true in degree of Tahiti than of Fiji. So far as there exists a Polynesia-Australia-Antarctica flora, in distinction to a Malayan flora, it is proportionally better represented in Tahiti than in Fiji—24 per cent as against 20.7 per cent of all ferns enumerated. If endemics be excluded from this comparison, the figures become 34.3 per cent and 26.5 per cent. Too much regard is not to be paid to these figures, however, for the endemic species are all in typically Malayan groups, and Fiji has more species in common with New Zealand than has Tahiti.

Of the flora regarded as immigrant from the west, 37 per cent of the Tahitian ferns range westward into Asia (this includes 11 pantropic species). The corresponding figure for Fiji is 40.6 per cent. These figures about balance the stronger "Polynesian" element in Tahiti. But of species ranging westward to the Sunda Islands but not to Asia, Fiji has 31, or 14.3 per cent, and Tahiti only 12, or 8.4 per cent. And of species ranging to but not beyond Papua, while Fiji surprised me by having only 6, Tahiti has a single 1. In summary, the species which range farthest west range also farthest east; exactly as was to be expected, whether the explanation be that these species are the oldest or the ablest migrants, or both.

To one familiar with the fern floras of the oriental Tropics, the most striking feature of that of Tahiti is the absence of many old friends. *Doodia, Balantium, Dicksonia,* and *Eugleichenia,* all subject to construction as of Austral affinity, are wanting. So, too, of the characteristic Malayan genera

which reach Fiji are *Acrophorus, Ithycaulon, Tapeinidium, Schizoloma, Syngramma, Coniogramme, Scyphularia, Dipteris, Drynaria,* and *Goniophlebium;* of still wider ranging genera, *Didymochlaena,* and, I suspect, *Pteridium.* With this imposing list of genera, disappear also a notable number of the commonest species, of which it will suffice to mention *Hymenophyllum australe, Dryopteris urophylla, Tectaria leuzeana, Athyrium esculentum, Asplenium amboinense, Stenochlaena palustris, Pteris vittata,* and *Adiantum diaphanum.*

PART I. NEW SPECIES

(Pteridophyta Nova Insularum Societarum)

Marattia cincta Copeland, species nova (pl. 1, *C*).

Stipulis 3 cm. longis, 6 cm. latis; pinnis usque ad 30 cm. longis, brevi-pedicellatis; pinnulis 15-paribus, apicale 7.5 cm. longa, 13 mm. lata, deorsum sensim usque ad infimas vix 2 cm. longas reductis, basi late cuneatis, acutis, acute serrulatis, linea marginale conspicua alba cartilaginea cinctis; venis patentibus haud horizontalibus, subconspicuis, plerisque simplicibus; soris fere marginalibus, pallidis, 2 mm. longis, vix contiguis, sporangiis ca. 6-paribus, indusio nullo. Adest etiam pinna substerilis longius pedicellata, pinnulis usque ad 2 cm. latis, inferioribus leviter reductis.

Raiatea, Puoretepo, altitude 500 meters, Grant no. 5203.

A relative of *M. salicina* (pl. 1, *A*), distinguished by smaller pinnules contracted at the base, acute rather than acuminate apices, smaller and more closely marginal sori, and the strongly developed cartilaginous border. The paleness of the sori may be a matter of age, but the spores of the specimen have begun to be discharged.

Marattia Grantii Copeland, species nova (pl. 1, *D*).

Stipite viride, rhachi fusca; pinna 65 cm. longa, stipitulo 10 cm. longo protensa; pinnulis ca. 10-paribus, usque ad 30 cm. longis, 45 cm. latis, pedicellis 3 mm. longis et crassis, basi late rotundatis, apice breviter acuminatis, obscure serrulatis, coriaceis; venis praestantibus, subhorizontalibus, plerisque furcatis, pallidis; soris fere marginalibus, ca. 4 mm. longis, sporangiis 12-17-paribus, magnis, indusio inviso.

Tahaa, Ohiri, altitude 450 meters, Grant no. 5172.

A relative of *M. salicina,* but most distinct in appearance, distinguished by form, texture, and venation, as well as by the few large pinnules.

Doubtfully referable to this species is a specimen from Huahine, Grant no. 5323, similar in shape of pinnules and in venation, but the largest pinnules 15 by 2.5 cm., and the sori smaller and submarginal. (See pl. 1, *B*.)

Trichomanes taeniatum Copeland, species nova (pl. 2).

T. dichotomo-digitatum, rhizomate gracillimo, vix 0.15 mm. crasso, stipiteque simile 2-3 cm. longo nigris pilis paucis debilibus caducis vestitis; fronde pendente flabelliforme, 2-3 cm. longa et lata, pluries dichotoma segmentis 15-45, sursum 1.5-2 mm. latis deorsum angustatis, integris vel rarius undulatis, setis nigris appressis ciliatis aliter glabris; involucris aut campanulatis aut brevi-tubulatis, ore integro late expanso, in herbario bilabiato.

Tahiti: Fautaua, below Diadem, altitude 970 meters, Grant no. 3561, type; Teahupoo, altitude 450 meters, on *Cyathea,* Grant no. 3881; Mahina, altitude 1,070 meters, Grant no. 4401. Borabora, Tarapaia, Grant no. 4981.

This is presumably the same species previously reported here as *T. digitatum* Swartz, a much smaller and simpler fern, from Mauritius.

The material studied is not uniform. The type collection and no. 3881 are bright-green, with narrow segments and tubular involucre. The collection from Mahina has broader and less numerous segments, is dark and turns darker, and has a campanulate involucre. I would be disposed to regard them as specifically distinct but that the collection from Borabora is between them, with broad segments and tubular involucre.

The group is represented in Samoa by a fern distributed as *T. digitatum*. Specimens in the Gray Herbarium, *I.* Powell, and in the United States National Herbarium, *I.* Whitmee, are too poor for critical identification.

Hymenophyllum gracilius Copeland, species nova (pl. 3).

Rhizomate gracile, vix 0.3 mm. crasso, glabrescente; stipite 1.5-2 cm. alto, nudo, sursum rhachique gracile saepe flexuosa angustissime alatis; fronde 8-16 cm. alta, minoribus anguste majoribus late lanceolatis, deorsum plerumque angustata; pinnis remotis, sessilibus, aut brevibus 5-10 mm. longis bis furcatis, aut usque ad 2 cm. longis lanceolatis cum pinnulis utroque latere 3 vel 4 superioribus simplicibus, medialibus furcatis, infimis acroscopicis bis furcatis; segmentis 2-4 mm. longis, ca. 0.6 mm. latis, integris; soris in parte superiore frondis segmenta omnia vel minora terminantibus, parvis, 1 mm. latis, deorsum anguste alatis, segmento infrasorale in cervicem 0.4 mm. latam constricto; involucro ad medium fisso, labiis integris, aut late rotundatis aut ad apices obscure angulatis; receptaculo valido clavato, ad basin sterile.

Tahiti, ridge to Aorai, altitude 1,750 meters, Grant no. 3766.

Nearly related to the local form of *H. dilatatum*, but with narrower wing and segments, and smaller sori with the segments conspicuously constricted below them; striking in appearance because of the remote pinnae and short segments. This may well be the fern reported by Brackenridge as *H. gracile* Bory.

Gleichenia tahitensis Copeland, species nova (pl. 4).

Rhizomate et deorsum stipite castaneis, 5 mm. crassis, paleis 5 mm. longis lanceolatis attenuatissimis atrocastaneis breviter ciliatis demum deciduis vestitis; fronde repetiter dichotoma, rachibus stramineis, rachi mediale e furca infima interdum prolongata, ramis dichotomis ubique pinnuliferis, ultimis 20-30 cm. longis, internodiis inferioribus 5-8 cm. longis; pinnulis fere horizontaliter patentibus, anguste linearibus, 2 mm. (apud raches 4 mm.) latis, superioribus contiguis, inferioribus paullo remotis et ala parva cartilaginea connexis, integris, acutis, papyraceis, superne glabris, inferne pallide pubescentibus, plerisque 5 cm. longis, basin versus frondis longioribus, infimis supra furcam infimam exterioribus in pinnas pinnatas usque ad 15 cm. longas stipulis G. linearis modo simulantes evolutis.

Tahiti, Orofena, altitude 1,150 meters, Grant no. 4239.

A very distinct member of the group of *G. flabellata*.

Cyathea Grantii Copeland, species nova (pl. 5; fig. 1).

Gregis C. affinis species rhachi paleacea distincta; apice trunci, stipite crasso, at rhachi paleis linearibus brunneis laetius nitentibus setis minutis ciliatis aut plerisque 1 cm. longis aut valde aciculatis et 2.5 cm. longis dense obtectis; rhachi in vetustate ultima subglabrescente et basibus palearum aspera, fulva; pedicello pinnae usque ad 10 cm.

longo, rhachi simile, pinna deinde 50-60 cm. longa, 25 cm. lata, abrupte acuminata, basi truncata; pinnulis imbricatis, infimis pedicellatis aliis sessilibus, recte patentibus, caudato-acuminatis, basi truncatis 2.5-3 cm. latis pinnatis, alibi subpinnatis, rhachilla superne setosa, inferne et furfuracea et deorsum squamulis amorphis dissectis et setiferis vestita sursum potius pallide setiferis; pinnulis (ii) rectis vel subfalcatis, obtusis, 4-5 mm. latis, plerisque integris, subcoriaceis, superne glabrescentibus inferne pilis adspersis; venulis plerumque bis furcatis (triramosis); soris costalibus, indusio tenue sed persistente.

Tahiti, Orofena, altitude about 1,100 meters, Grant no. 4245.

Whether or not *C. affinis* really occurs in Tahiti, and whether or not *C. Societarum* Baker is distinct from it, as to both of which I am in doubt, it seems clear that neither of them has a conspicuously scaly rachis. Drake (p. 267) does indeed say of *C. Societarum* "Rachis des frondes paléacé"; but Baker's original diagnosis reads "main rachis stramineous, rough, with raised points, and pinnae . . . with naked rachises." Drake may have had *C. Grantii.*

Dryopteris macrolepidota Copeland, species nova (pl. 7, *B*).

Rhizomate adscendente, 2-3 cm. crasso, basique stipitis paleis ferrugineis integris 3 cm. longis 3 mm. latis omnino immersis; stipite 4 cm. alto, 6 mm. crasso, facie ventrale trisulcato, ubique paleaceo paleis sursum decrescentibus sparsioribus; fronde 1 m. alta, 50 cm. lata, tripinnata rhachibus paleaceis paleis ad axes minores minutis sparsis nec ad costas carentibus; pinnis paucis, infimis 30 cm. longis stipitulis 25 mm. longis, tertiis 35 cm. longis stipitulis 15 mm. longis, 12-15 cm. latis, acuminatis; pinnulis infimis brevi-stipitulatis, sequentibus vix aequilongis, maximis 7.5 cm. longis, e basibus 25 mm. latis gradatim in apices serratas valde acuminatas angustatis; pinnulis (ii) infimis sessilibus aliis adnatis, apice rotundatis, 13 mm. longis, 6 mm. latis, infimis ad mediam laminam pinnatifide incisis, herbaceis, pallide viridibus; soris margini approximatis, indusio minuto, firmo, glabro, orbiculari-reniforme.

Tahiti, Orofena, altitude 800 meters, Grant no. 4228. Only one frond available for description.

Among local species very distinct because of the extremely scaly stipe and the frond broadest above the base.

Dryopteris Grantii Copeland, species nova (pl. 7, *C*).

Rhizomate breve, adscendente; stipitibus caespitosis, basibus fuscis paleis linearibus rigidis integris atrocastaneis vestitis, sursum brunneis, nudis, 40 cm. altis; fronde 120 cm. alta, utrinque angustata, bipinnatifida; pinnis infimis remotis ad 1 cm. reductis, medialibus oppositis, sessilibus, 20-25 cm. longis, 2 cm. latis, caudato-acuminatis, vix ad costam pinnatifidis sinubus rotundatis, herbaceis, costis superne setis obscuris semiappressis inferne venisque pilis albis 0.7 mm. longis adspersis; segmentis oblique positis, supra baseos dilatas 2 mm. latis, acutis vel obtusis, ciliatis; venulis 10-12-paribus, etiam piluliferis, ad vel supra mediam soriferis; indusio castaneo, amplo sed caduco, nudo.

Tahiti, below Diadem, altitude 980 meters, Grant no. 3602.

This should be the *Nephrodium Harveyi* of Drake, but the Fijian plant I suppose to represent that species has different pubescence, broader and closer segments, persistent indusia, and a creeping rhizome. I mistrust that a third species is responsible for reports of *Dryopteris Harveyi* in Samoa,

but our single specimen is incomplete. The near affinity of *D. Grantii* is to *D. verrucosa,* and, less immediately, to *D. immersa.*

Dryopteris mesocarpa Copeland, species nova (pl. 7, *A*).

Rhizomate adscendente, 8 mm. crasso; stipitibus approximatis, pede tuberculato nigris, sursum viridibus (sicco) triangularibus angulo ventrale profunde sulcatis, glabris, usque ad pedem cicatricibus remotis parvis maculatis; fronde 1 m. alta, 40 cm. lata, basi truncata, apice acuminata pinnatifida, alibi leviter bipinnatifida; pinnis horizontalibus, sessilibus, inferiorum basibus rotundatis superiorum truncatis, acuminatis, 2 cm. latis, medio ad costam pinnatim lobatis sinubus acutis, glabris vel minute puberulis, herbaceis; segmentis 5 mm. longis et latis, oblique triangularibus, obtusis vel subacutis, linea cartilaginea cinctis, margine acroscopica recta basiscopica arcuata; venulis ca. 10-paribus, quarum plerumque 5 (venis, non paribus) anastomosantibus et venam secondariam sinus deflexum versus dilatatam producentibus; soris multis, parvis, medialibus; indusio fusco, integro, nudo vel glabrescente.

Huahine, Matoereere, altitude 350 meters, Grant no. 5290.

This description is made from a single frond, careful study of which shows two indusia bearing one or two bristles each, but many naked ones. Even the secondary vein, characteristically more setose than the primary vein and commonly more so than the costa in the species of this group, is absolutely naked, as are accordingly almost all the sinuses, only a very few bearing one to three bristles each. While I have thought it best to draw the diagnosis strictly, it seems expedient, at least while so few specimens are known, to refer to this species Grant no. 3534, from Tahiti, Diadem camp, altitude 800 meters, although it is firmer in texture, and has the axes sparingly and the secondary veins more densely setose beneath, and setiferous indusia. The two specimens are alike in the angular stipes with scarlike traces of abortive pinnae, in dissection, and in the regularly arranged little sori. Whether they represent one plastic species or two related species must be uncertain until they are more fully collected and we know something about the plasticity of these plants under the influence of the environment. On the same ground, I am at present leaving a similar mixture of naked and setose specimens in *Dryopteris costata.*

Dryopteris subpectinata Copeland, species nova (pl. 7, *D*).

Rhizomate brevi-repente, 1 cm. crasso; stipitibus approximatis, angularibus, sulcatis, glabris, 70 cm. altis, sursum rudimentis 5 mm. longis pinnarum inter se 4-5 cm. remotis ornatis; fronde 1 m. alta, 35 cm. lata, apice integra 3.5 cm. longa, deinde 7 cm. pinnatifida, alibi pinnata, rhachi sursum pubescente; pinnis horizontalibus, 18 mm. latis, sessilibus basi truncatis, in caudas integras 2 cm. longas terminantibus, alibi ad vel paullo ultra mediam laminam pinnatifidis sinubus angustis, papyraceis, costis venis venulisque inferne setosis, lamina ubique minute glandulifera; segmentis 3 mm. latis, apice oblique truncatis, lateribus fere parallelis, ciliatis; venulis ca. 10-paribus, quorum 2 anastomosantibus; soris minutis, medialibus, indusiis pauci-setiferis, deciduis.

Tahiti, Diadem camp, altitude 800 meters, Grant no. 3537.

This seems to be the *Nephrodium haenkeanum* of Drake, but is no one

of the several species referred to that doubtful species by other authors. It is nearly related to *D. mesocarpa,* just described, and particularly to the specimen collected with this at the Diadem camp and provisionally referred to that species. The presence of a lamina on the abortive basal pinnae, and the narrower, longer segments seem to justify a specific distinction, but the affinity is certainly close.

Athyrium ellipticum Copeland, species nova (pl. 8).

Diplazium caudice adscendente, radices validas 2-3 mm. crassas nigro-fuscas emittente; stipitibus 30-40 cm. altis basi nigrescentibus ibidem paleis fuscis lanceolatis 5-6 mm. longis vestitis; fronde ca. 75 cm. alta, ovata, acuminata, apice pinnatifida, sub apice pinnata, deinde bipinnata, rhachi nuda; pinna ca. quarta supra basin utroque latere maxima, brevi-stipitulata, 25 cm. longa, 7.5 cm. lata, apice serrata acuminata, parte tertia pinnae distale pinnatifida, alibi pinnata; pinnulis infimis brevi-pedicellatis acutis fere ad mediam laminam incisis, aliis sessilibus vel adnatis, plerisque basi truncatis, acutis vel obtusis, serratis 3-4 cm. longis, 10-13 mm. latis, subcoriaceis, costis squamulis paucis brunneis deciduis donatis; soris diplazioides et asplenioideis, a costa medio ad marginem extensis, angustis, indusio fusco.

Tahiti, Diadem camp, altitude 800 meters, Grant no. 3539, type; Mount Aorai, Noha ravine, altitude 1,090 meters, Quayle no. 80; probably also Virao, altitude 250 meters, MacDaniels no. 1695, but this specimen immature.

Athyrium Grantii Copeland, species nova (pl. 9; fig. 2).

Rhizomate repente, 10-15 mm. crasso, nigro, basique stipitis paleis minutis fuscis caducis aspersis; stipite 90-120 cm. alto, rhachique castaneis, maculatis, asperulis; fronde 75-100 cm. alta, triangulari-ovata, quadripinnatifida; pinnis adscendentibus, magnis et deinde paucis, inferioribus 50 cm. longis, 20-25 cm. latis; pinnulis 13 cm. longis 3-3.5 cm. latis, valde acuminatis; pinnulis (ii) 18 mm. longis, 7 mm. latis, sessilibus vel adnatis, acutis, inferioribus oblique incisis, superioribus argute serratis, subcoriaceis, costa squamulis paucis deciduis ornata, aliter glabris; soris costalibus, brevibus, turgidis, indusio persistente denique lacero.

Tahiti, ridge to Aorai, altitude 1,200 meters, Grant no. 3743, type; Orofena, altitude 1,100 meters, Grant no. 4244.

This may be the *Asplenium umbrosum* of Drake, but is not near to *Athyrium australe,* the Polynesian and New Zealand component of that group. In the oblique position of the divisions of the frond, it resembles several Chinese species, but is quite distinct from its own neighbors.

Paesia tahitensis Copeland, species nova (pls. 10, 11).

P. divaricatissimae affinis minor, stipite 40 cm. alto, tuberculato, atrocastaneo; fronde ca. 60 cm. alta, late ovata, quadripinnata, rhachibus hic illuc anfractuosis, rugosulis; pinnulis (resp. segmentis) ultimis ca. 3 mm. longis, 2 mm. latis, apice (et interdum margine) recurva, coriaceis, inferne ad costam rugosulis aliter nudis; soris aut continuis aut interruptis, indusio exteriore firmo sed lacerato.

Tahiti, summit of Mount Aorai, altitude 2,200 meters, Grant no. 3802, type; Orofena, altitude 930 meters, Grant no. 4217; Pirae-Moua trail, Quayle.

This is presumably the plant reported from Tahiti in the past as *P. rugosula,* which it resembles in texture, color, and roughness; but it is more finely divided, not hairy, and more "anfractuose." It is distinguished from its local relative, *P. divaricatissima,* by its texture, roughness, color (brownish), and the form of both primary and secondary pinnules, which are shorter and relatively broad. I have tried to construe it as an edaphic form of *P. divaricatissima,* growing in exposed places, but not all of the differences seem to be explicable in that way.

Pteris deltea Agardh.

This species, long treated as a form or variety of *P. quadriaurita,* is much more distinct than any of the species more recently segregated by Hieronymus and would seem to have been reduced only because too little known. Although Tahitian ferns are represented by many collections, this appears for the first time in Grant's, his nos. 3571 and 3577. The specimens are larger than those previously described, with stipes fully 30 cm. tall and fronds 45 cm. long. The second pair of pinnae are bipinnate at the base, and the lowest pair have a number of pinnate or almost pinnate pinnules. They are distinguished from *P. quadriaurita* and segregates therefrom by maroon axes, more deeply cut pinnae, and narrow segments decurrent on the rachises, with or without a shoulder at the base. It may possibly be an hybrid of *P. pacifica* Hieronymus and *P. decussata.*

Humata huahinensis Copeland, species nova (pl. 12, *B*).

Rhizomate repente, 1.5 mm. crasso, paleis lanceolatis acuminatis appressis atro-castaneis anguste scarioso-marginatis obtecto; stipitibus remotis, usque ad 8 (plerisque 4) cm. altis deorsum paleis deciduis ornatis viridibus, sursum costisque nigris; fronde stipiti aequilonga, ovata, acuta, fere ad costam pectinata; segmentis infimis maximis, basiscopice auctis et plus minus profunde pinnatifidis, caeteris integris, 3 mm. latis, contiguis, obtusis, coriaceis, glabris; indusio oblique versus marginem aperto.

Huahine, Matoereere, altitude 380 meters, Grant no. 5295.

Obviously very near to the species known as *H. pectinata* (pl. 12, *C*), from which it is distinguished by pinnatifid instead of pinnate fronds, closer segments, somewhat elongate basal segments, black axes, and naked surface. In the closely placed segments, it deviates in the direction of *H. gaimardiana.* The affinity, however, is to the common Tahitian species, as shown especially by the position of the sori.

Humata melanophlebia Copeland, species nova (pl. 12, *A*).

H. huahinensi affinis major, segmentis remotioribus inciso-serratis distincta, stipite ca. 6 cm. alto, fronde 10-12 cm. longa, basi 7 cm. lata, vix ad costam validam nigram pinnata, sinubus inferioribus dilatatis, pinnis infimis maximis utroque latere sed praecipue basiscopice inciso-pectinatis, sequentibus 6 mm. latis, acutis, inciso-serratis, coriaceis, subglabris; soris minutis, indusio obliquo.

Tahaa, Ohiri, altitude 340 meters, Grant no. 5144.

Distinguished from the Tahitian species by the broad, acute, toothed medial segments and black axes; from *H. huahinensis* as already explained.

A distinct representative of this group seems to have evolved on each of the local islands. Eleven Tahitian collections in hand, some of them of many specimens, show no tendency toward the forms peculiar to the other islands. Like Huahine and Tahaa, Moorea and Borabora have each a characteristic representative, but, judging by the limited material in hand, these are less fixed in their peculiarities and are accordingly left without distinctive names.

Elaphoglossum Societarum Copeland, species nova (pl. 13).

Rhizomate brevi-repente, radicibus, basibus stipitum et paleis acicularibus castaneis profunde occulto; stipitibus confertis, ca. 10 cm. altis, 1 mm. crassis, paleis ferrugineis 4 mm. longis patentibus acicularibus basibus incrassatis vestitis; fronde sterile ca. 20 cm. longa, 2-4 cm. lata, acuminata, basi acuta, laete viride, sicca papyracea, superficiebus mox glabrescentibus, costa et margine paleis setiformibus deciduis ornatis; venis angulo ca. 45° excurrentibus, remotis, liberis, furcatis, apicibus incrassatis inconspicuis; fronde fertile usque ad 5 cm. longa et 2.5 cm. lata, elliptica.

Tahaa, Ohiri, altitude 380 meters, Grant no. 5156, type. Huahine, Matoereere, altitude 500 meters, Grant no. 5281.

Related to *E. samoense,* from which it is distinguished by comparative thinness and nakedness, commonly broader but more pointed sterile fronds, more remote and oblique veins, and the remarkably short and broad fertile frond.

Polypodium subcoriaceum Copeland, species nova (pl. 16).

Rhizomate paleis conspicuis duris late lanceolatis 1-1.5 mm. longis iridescentibus nigrescentibus vestito; frondibus congestis, subsessilibus, 5-8 cm. longis, vix 3 mm. latis, fere ad costam pinnatifidis, subcoriaceis glabris; segmentis oblique triangularibus, fertilibus instar sterilium sed poculato-concavis, soro magno superficiem segmenti fere complente.

Tahiti, south of Orofena (Orohena), on tree, altitude 1,500 meters, L. H. MacDaniels no. 1478.

So distinct from other known species in this region that its generic position is a matter of judgment. It is apparently very near to *Acrosorus,* more like it than like *Calymmodon* in texture and paleae. In size and aspect, to the naked eye, it is a typical enough *Calymmodon*; and the absence of folded fertile segments and some concavity of the latter are already known in *Calymmodon.* I believe it to be related to both genera, and accordingly that they are more nearly related than has heretofore seemed probable. *Acrosorus* occurs in Samoa, represented by the little-known *A. Reineckei,* which has the stature of its Malayan congeners.

Prosaptia pubipes Copeland, species nova.

P. contiguae, quacum olim confusa, affinis, paleis et pube stipitis facile distincta, rhizomate repente, 3-4 mm. crasso, paleis fuscis 3 mm. longis basi 1 mm. latis apice attenuatis setis concoloribus brevibus ciliatis deciduis vestito; stipite 5 cm. alto, 2 mm. crasso, fusco, sursum interrupte alato, pilis vix 0.2 mm. longis densissime velutino; fronde pinnata, segmentis contiguis, e basi fere 5 mm. lata sensim angustatis, subcaudatis; aliter cum P. contigua conforme.

Viti Levu, Nandarivatu, altitude 1,300 meters, Parks no. 20580, type in Herbarium of University of California, no. 351290; from the same region, Gillespie no. 3813; Naitarandamu, Gillespie no. 3320; Namosi, Parks no. 20198; Colo-i-Suva (on ground), Parks no. 20098, imperfectly fruiting and feebly toothed, but probably the same. Reported as common, and probably the basis of all reports of *P. contigua* from Fiji.

I describe this as new on the assumption that the real *P. contigua,* originally collected in Huahine (? Hooker, Species Filicum, vol. 1, p. 161, 1844-46), is represented by a number of collections from the Society Islands in hand. These have the rhizome clothed by a dense mass of persistent paleae 5-8 mm. long, ciliate with reddish bristles, the whole mass with a reddish hue until it fades with age, the stipe sparsely clothed with much longer hairs, fronds not quite pinnate, the segments separated by broader sinuses and holding their width, or even widening at the middle as a consequence of the spreading of the teeth. The lamina is lighter in color and thicker than that of the Fijian species. This is only the beginning of the discrimination of segregates from *P. contigua.* Of very many specimens in hand, only one from the Marquesas may be really identical with those from Tahiti. Next in resemblance are some collections from Mount Apo, in Mindanao, the flora of which has many details in common with Polynesia. Without specimens from any of the island groups north of the Equator, I feel unable to appraise this case—as one of identity or of affinity.

In the New Hebrides is a notably fine-toothed form, with pubescence on the stipes as dense as in *P. pubipes* but longer. New Caledonian specimens are quite diverse, but no one of them is clearly distinct from any from farther west.

Unless it be from Apo, we have no specimen from the Malayan region perfectly referable to either the Tahitian or the Fijian species. My present feeling is that in Malaya is one very common, very variable, and widespread species. It has a tenable specific name, if it is the *Davallia pectinata* of Blume, renamed *Davallia Blumei* by Mettenius without any description; but this is far from evident from Blume's diagnosis. He distinguished it by "soris submarginalibus," from his *D. lata* with "soris marginalibus," and *D. contigua* with "laciniis linearibus obtusis apice grosse dentatis et soro-

phoris." It is the last of these which is nameless, unless the first be the same.

Calymmodon orientalis Copeland, species nova (pl. 14, *A*; pl. 15, *A*).

C. cucullato affinis, rhizomate gracile paleis 2-3.5 mm. longis vestito; frondibus anguste linearibus, usque ad 12 cm. longis, 2.5-4 mm. latis, basi in stipitem alatam longe attenuatis; costa et margine pilis gracillimis inconspicuis brevibus plus minus deciduis sparsis; segmentis infimis unduliformibus, sequentibus oblique dentiformibus sursum (sensu frondis) truncatis, maximis sterilibus breviter oblongis vix 1.5 mm. latis apice rotundatis, ala angustissima connexis, haud approximatis, fertilibus obtusis, latioribus, et latissime adnatis.

Tahiti, Mahina, ridge to Aorai, Grant no. 3765.

This is much closer to the widespread *C. cucullatus* than is the previously known Polynesian representative of the genus, *C. latealatus*. From the narrow form of *C. cucullatus*—the form it resembles—it is distinguishable by smaller paleae, rather more and even more finely hairy fronds (at least when young), and the usually much longer attenuate bases, giving the appearance to the naked eye of stipes two to even four centimeters long.

Calymmodon Grantii Copeland, species nova (pl. 14, *B*; pl. 15, *B*).

Rhizomate breve paleis laete brunneis lanceolatis 2 mm. longis vestito; frondibus dense caespitosis subsessilibus, usque ad 10 cm. longis, 3 mm. latis, basi brevi-attenuatis ad alam angustam pinnatifidis; segmentis sterilibus oblongis apice rotundatis, 1 mm. latis, ciliatis, inter se plus minus latetudine ipsorum remotis, fertilibus pro genere paullo difformibus.

Tahiti, Mahina, Ahonu-tuauru, altitude 1,100 meters, Grant no. 4404.

In consideration of the well-known variability of *C. cucullatus,* which covers the frond form of both species here described, I have been reluctant to regard them as distinct. However, Grant's collections include a considerable number of specimens of each, and no frond of *C. Grantii* approaches any frond of *C. orientalis* in laxness. The smaller paleae—only about half as large on *C. Grantii*—seen to be uniformly distinctive. *C. Grantii* is also uniformly the more pubescent; but this difference can be observed between the compact and the lax forms of *C. cucullatus*.

Campium lonchophorum (Kunze) Copeland, combinatio nova.

Acrostichum lonchophorum Kunze: Die Farnkräuter, vol. 1, p. 5, Tab. 2, 1840.

Cyrtogonium palustre Brackenridge: U. S. Expl. Exped., vol. 16, p. 86, pl. 12, fig. 2, 1854.

Campium palustre (Brackenridge) Copeland: Philippine Jour. Sci., vol. 37, p. 371, 1928.

In a supplementary note, Kunze identified his plant with *Acrostichum repandulum* Blume. His figure, however, although very careless as to venation, shows well enough the distinctive form of the pinnules. Its subject

was "Auf Otaroha, Gruppe der Gesellschaftsinseln, von Herrn H. Cuming (No. 1416) gesammelt." It is common in Tahiti, Fiji, and Rarotonga, and probably in New Caledonia.

Though future collections may show that the plant described as *Campium samoense* Copeland (Philippine Jour. Sci., vol. 37, p. 372, pl. 19, 1929) is recognizable in the field and thus fit to be maintained as an entity, my present belief is that it was an aberrant individual, better regarded as a form of *C. lonchophorum.* In the Herbarium of the New York Botanical Garden are two (or more) sheets collected in Samoa by Powell, both better referred to *C. lonchophorum.* The species is now richly represented in the collections in California from Polynesia. If really and properly construed as one, it includes almost as wide a range of forms as I have included under *C. quoyanum.*

Selaginella Banksii Alston, species nova.

Species heterophylla e turma S. arbusculae (Kaulfuss) Spring, caulibus erectus, teretis, stramineis, robustis, rhizophoris basi gerentibus, in parte superiore ramosis, tripinnatis, foliis caulium basin versus homomorphis, reliquiis heteromorphis; foliis lateralibus obtusis vel subacutis inaequalateralibus, semi-facie superiore semi-lanceolata vel semi-elliptica, basi rotundata et ciliolata; semi-facie inferiore semi-oblanceolata, basi rotundata; foliis axillaribus lanceolatis, cilolatis; foliis intermediis late ellipticis, acuminatis, aristatis; strobilis subtetragonis, ramulorum apicibus singuli dispositis; bracteis homomorphis, vel juventute leviter heteromorphis.

Tahiti: Banks (typus in British Museum).

Species ex affinitate *S. Springii* (Gaudichaud) est, sed foliis leviter ciliolatis differt. *S. Springii* (Gaudichaud), quam in insulis sandvicensisibus detexit cl. Gaudichaud, folia lateralia margine superiore basin versus valde ciliata, sed apice fere integra habet.

PART II

FERN FLORA OF THE SOCIETY ISLANDS

The pteridophytes are those plants which have the tissues and tissue-systems characteristic of flowering plants, but do not produce flowers or seeds. They produce spores, each of which germinates and produces a small plant altogether unlike that which bore the spores, and is called a gametophyte because it in turn bears gametes or sexual cells. By the fusion of a male and a female gamete, a cell is produced which develops into an embryo, and through this into the familiar fern or other plant; this plant is called a sporophyte because it bears spores. The growth of the embryo is normally uninterrupted; whereas in flowering plants it is interrupted, in the seed. Not producing seeds, the propagation of pteridophytes is accomplished by the spores.

Leaves large, or at least large in proportion to the stem.....1. **Filicineae**
Leaves small, but functional; stems comparatively well developed, not jointed .....2. **Lycopodineae**
Leaves reduced to a whorl of scales and their function assumed by the jointed stems.....3. **Equisetineae**

The Equisetineae, comprising the single genus *Equisetum*, are unknown in the Society Islands. One species occurs in Polynesia, and may still be found there. They are commonly known as "horsetail."

FILICINEAE

This group includes all ferns. Among them, in the first two families, are the most nearly primitive existing vascular plants, that is, those most related to the liverworts, and through them to the algae; these are, at the same time, the ferns most related to the higher vascular plants. The great majority of ferns are a comparatively recently evolved group, not believed to be as old as the earliest seed-plants.

Key to Families:

Aquatic ferns with cruciform leaves.....VII. **Marsileaceae**
Huge ferns, with massive stems, with stipules.....II. **Marattiaceae**
Fronds neither cruciform nor with stipules
  Sporangia large, without annulus.....I. **Ophioglossaceae**
  Sporangia small, with annulus
    Lamina very thin, sori on ends of veins.....III. **Hymenophyllaceae**
    Lamina thick enough to have epidermis and other tissues
      Frond dichotomously or pseudodichotomously compound
        Sporangia or sori in specialized spikes.....IV. **Schizaeaceae**
        Sori dorsal, annulus transverse.....V. **Gleicheniaceae**
      Frond not dichotomous, annulus longitudinal.....VI. **Polypodiaceae**

I. OPHIOGLOSSACEAE

The families Ophioglossaceae and Marattiaceae constitute the eusporangiate ferns, the sporangium being formed from a group of subepidermal cells, becoming large enough for easy observation with the naked eye and opening by a longitudinal slit, but without any annulus. In the remaining families, leptosporangiate ferns, the sporangium is formed from a single epidermal cell and though visible is too small for study with the unaided eye. The Ophioglossaceae are ferns of small or moderate size, with the sporangia borne on a specialized fertile segment of the frond, destitute of green lamina, which arises from the upper side of the sterile blade, or below the blade from a common stipe. Of the three genera usually recognized, only *Ophioglossum* has been found in the Society Islands, though both others may exist there.

1. OPHIOGLOSSUM Linnaeus

Fronds normally simple and undivided except as to the distinction of fertile and sterile segments; sporangia in a single row on each side of the midrib; venation reticulate. A cosmopolitan genus, of 50 species.

Terrestrial, with short sterile segment
- Base of sterile segment cuneate ..... 1. **O. pedunculosum**
- Base of sterile segment cordate ..... 2. **O. reticulatum**

Epiphytic, with long sterile segment ..... 3. **O. pendulum**

1. O. pedunculosum Desvaux.

Stem small, tuberous, subterranean; stipe slender, 5-7 cm. tall; sterile blade ovate, 2.5-4 cm. long, base cuneate, midrib none, fleshy, glabrous, entire; fertile segment rising from the base of the sterile, its stipe once or twice the length of the sterile.

Tahiti, south side of Orofena (Orohena), on moist cliffs, altitude 1,400 meters, MacDaniels no. 1450.

This may be the plant cited by Drake as *O. nudicaule* Linnaeus.

Polynesia to New Zealand, India and Japan.

2. O. reticulatum Linnaeus.

Like *O. pedunculosum,* but the sterile blade cordate and correspondingly broader in outline.

Tahiti, Maire valley, Teahopu, altitude 10 meters, MacDaniels no. 1652.

Collected several times in the past.

Pantropic.

3. O. pendulum Linnaeus.

Fronds few in a cluster, pendent, up to 120 cm. long, 2-2.5 cm. wide, gradually narrowed toward the base, fleshy but drying thin, simple or forked, without a midrib but with several veins along the middle line, from which the fertile segment rises. A striking fern, not rare but nowhere common.

Tahiti, often collected, from sea level up to 1,100 meters altitude. Westward to Asia.

II. MARATTIACEAE

As represented in Polynesia, very large ferns with massive, globose stems on and in the ground; stipes clustered, each with a pair of large, fleshy stipules; fronds pinnately compound; sporangia in double rows, dorsal on frond and vein, each definite double row constituting a sorus, the sori in a definite longitudinal line between the costa and each margin, the sporangium opening by a longitudinal crack facing the middle line of the sorus.

Sporangia of each sorus contiguous but not fused.....1. **Angiopteris**
Sporangia fused together, forming "synangia".....2. **Marattia**

1. ANGIOPTERIS Hoffmann

Huge terrestrial ferns with bipinnate fronds and swollen pulvini at the bases of stipe and pinnae; distinguished from *Marattia* as shown in the key. An Old World genus of more than 70 supposed species, common from India to Polynesia.

Of the 60 species described in De Vriese's monograph of the genus, in 1853, this is the type locality of:

1.	A. evecta (Forster) Hoffmann	Forster in Societatis Insulis
4.	A. durvilleana De Vriese	D'Urville in Tahiti
11.	A. longifolia Greville et Hooker	Mathews in Pitcairn's and Society Islands
13.	A. acrocarpa De Vriese	Bidwill in Society Islands
17.	A cupreata De Vriese	Bidwill in Society Islands
27.	A. lasegueana De Vriese	Bidwill in Huahine
47.	A. brongniartiana De Vriese	Bidwill in Tahiti
55.	A. commutata Presl	Forster and Sprengel in Society Islands

To these has been added:

A. alata Nadeaud, collected in Tahiti by Nadeaud, and described as new because it seemed to differ from the common species, *A. evecta.*

Most of these "species" are known from single collections, all of which are fragmentary. They are distinguished in description, in considerable part, by such minutiae as characterize single fragments, but not whole plants—let alone species of plants. On the other hand, the reduction of all De Vriese's species to one, by Hooker and Baker, was a display of arbitrary ignorance. The material examined may be referred to the following species:

Recurrent veins conspicuous
  Caudate tips of pinnules sterile
    Stipe brown.....1. **A. evecta**
    Stipe bluish-white.....2. **A. lasegueana**
  Caudate tips soriferous.....3. **A. longifolia**
Recurrent veins inconspicuous.....4. **A. commutata**

1. **A. evecta** (Forster) Hoffmann.

Tahiti, Papeete, Brown no. 276; Faaa, altitude 1,135 feet, Grant no. 3512.

The pinnules of Brown's specimen are about 10 cm. long; Grant's, up to 15 cm.; and others up to 20 cm. have probably been referred correctly to this species. They are about 15 mm. wide, asymmetrically truncate at the base, with long, slender, serrate tips, elsewhere obscurely crenate, subcoriaceous, with a few slender scales, especially on the costa, beneath; recurrent veinlets evident from both surfaces; sori 1-1.3 mm. from the margin, 2 mm. long, commonly with about 7 pairs of sporangia.

As already noted, this is the type locality of the species, the type of the genus. Tahitian specimens are quite exactly matched from Samoa, Tonga, Fiji, and New Caledonia; less exactly, from Papua and Malaya. And under this name (improperly) are many specimens from as far away as India.

2. **A. lasegueana** De Vriese.

Stipe bluish-white, sparingly clothed with very narrow paleae 10-15 mm. long; venation conspicuous, dark; sori very close to the denticulate margin.

Huahine, Matoereere, altitude 1,360 feet, Grant no. 5305.

As described, from Huahine material, this species had pinnules 22 mm. wide (ours are 15 mm.), and was particularly characterized by whitish "papulae" on the surface. I find a very few white flakes, and wonder if this may depend upon the age. At any rate, the stipe of this specimen is distinctive, and I am indisposed to base another new species on a character not observed at all on the one previous collection from the same island.

Endemic.

3. **A. longifolia** Greville and Hooker.

Stipe dark-brown, smooth; pinnules pale-green, permanently (?) somewhat squamulose beneath; sori 1-1.5 mm. from the margin, present also on the tails of the pinnules, where they are small, separate, and marginal.

Tahiti, Puunui, Hitiaa, altitude 1,190 feet, Grant no. 4481. Borabora, Otemanu, altitude 1,285 feet, Grant no. 4942. Moorea, Putoa, altitude 1,240 feet, Grant no. 5370.

Rarotonga.

4. **A. commutata** Presl.

Tahiti, Papehue, Tilden no. 336; road to Papenoo, Setchell and Parks no. 7; Hitiaa, altitude 1,080, Grant no. 4482.

Miss Tilden's specimen is typical except that the sori have mostly 10, instead of mostly 14, sporangia, surely not a specific difference. The pinnae are shorter and relatively broader than in the other species. The Setchell and Parks specimen is larger, with up to 19 pairs of sporangia, and lax vena-

tion; it fits fairly well with the description of *A. brongniartiana,* which, I suppose, is this species. In the description of *A. brongniartiana,* De Vriese emphasized the irregular row of sori; but he avowedly never saw a fruiting specimen of *A. commutata.* Grant's specimen has narrow pinnules, but is immature.

Endemic, as far as certainly known.

A. acrocarpa is probably a synonym of *A. longifolia.* I do not guess at the remaining supposed species; but mistrust them, knowing that such differences in detail as have sometimes served for specific distinctions are such as actually occur on different parts of a single frond, and suspecting that greater differences may often be due entirely to the environment.

2. MARATTIA Swartz

Distinguished from *Angiopteris* by the fusion of the sporangia of each sorus into a solid block called a synangium, which opens by a split along the median line. A genus of more than forty species, better characterized than those of *Angiopteris,* in the Tropics of both hemispheres.

Pinnules commonly less than 20 mm. wide
- Base of pinnule truncate.....1. **M. salicina**
- Base of pinnule cuneate.....2. **M. cincta**

Pinnules more than 25 mm. wide.....3. **M. Grantii**

1. **M. salicina** Smith (pl. 1, *A*).

Stipules large (up to 5 cm. long and wide), scaly; stipe 3 cm. in diameter (dry), usually light brownish-green, slightly roughened, not scaly; pinnae up to at least 45 cm. long, connected with the rachis by a dark pulvinus, their rachises deciduously scaly; pinnules about 15 on a side and a similar terminal one, stalked, the distal ones up to 15 cm. long and 18 mm. wide, lower ones gradually moderately reduced, truncate or very broadly cuneate at the base, abruptly short-acuminate, finely serrulate, with an inconspicuous white margin; costa deciduously fibrillose; veins not very conspicuous, mostly simple, standing at not quite a right angle to the costa; sori brown, mostly about 0.5 mm. from the margin, the larger ones with 12-17 pairs of sporangia.

Tahiti, altitude 450 to 1,850 meters: Vesco (as *M. fraxinea*); Quayle no. 42; MacDaniels no. 1720; Grant nos. 3913, 4089, 4219, 4227, 4236.

Samoa, Norfolk, Rarotonga, New Zealand. The venation is closer in Tahitian specimens than in others.

2. **M. cincta** Copeland (pl. 1, *C*).

Stipule 3 cm. long and 6 cm. wide; pinnae up to 30 cm. long; pinnules up to 15 on a side, terminal one 7.5 cm. long, 13 mm. wide, basal ones sometimes dwindling to less than 2 cm. long, base broadly cuneate, the sides meeting at about a right angle, apex acute, finely serrate, with a conspicuous white marginal line; veins more oblique and more conspicuous than in *M. salicina,* mostly simple; sori practically marginal, pale, mostly with about 6 pairs of sporangia. A mostly sterile pinna has fewer and broader pinnules, the apical one 2 cm. wide.

Raiatea, Puorotepo, altitude 1,610 meters, Grant no. 5203.
Endemic.

3. **M. Grantii** Copeland (pl. 1, *D*).

Pinna 65 cm. long, long-stalked, with about 10 pinnules on a side; pinnules up to 30 cm. long and 4.5 cm. wide, on very stout pedicels, broadly rounded at the base, abruptly short-acuminate, obscurely serrulate, with inconspicuous border; veins very conspicuous, mostly forked; sori practically marginal, larger than in *M. salicina*, and with about as many sporangia.

Tahaa, Ohiri, altitude 1,515 feet, Grant no. 5172.
Endemic.

Possibly referable to this species is Grant no. 5323 (pl. 1, *B*) from Huahine, Matoereere, altitude 1,710 feet. It agrees in shape of pinnules and in venation; but the largest pinnules are 10 by 2.5 cm., and the sori are smaller and submarginal.

III. HYMENOPHYLLACEAE

Terrestrial and epiphytic, mostly tropical ferns, small or moderate in size, mostly so thin that there is no differentiation of foliar tissues, though the axes may be rigid; sori projecting from the margin or apices, surrounded by an involucre or indusium, which is funnel shaped or composed of two equal halves or valves.

Involucre broadly or narrowly funnel shaped.....1. **Trichomanes**
Involucre divided nearly or quite to the base into two halves.....2. **Hymenophyllum**

1. TRICHOMANES Linnaeus

A large and diversified genus of all moist tropical lands and ranging much farther, sufficiently described by the key character.

Rhizome creeping, filiform; small ferns
- Fronds peltate, minute.....1. **T. omphalodes**
- Fronds palmate or dichotomous
  - Not proliferous, very thin.....2. **T. taeniatum**
  - Stipe or rachis branched; thicker.....3. **T. parvulum**
- Fronds pinnatifid or pinnate
  - Neither hairy nor glaucous
    - With specialized margin, no false veins
      - Elongate marginal cells one row.....4. **T. endlicherianum**
      - Elongate marginal cells two rows.....5. **T. humile**
    - With submarginal false vein.....6. **T. bipunctatum**
  - Fronds hairy and often glaucous.....7. **T. pallidum**

Rhizome creeping or scandent, coarse
- Frond light-green, stipe not winged.....8. **T. caudatum**
- Frond blackish, stipe winged.....9. **T. maximum**

Caudex not creeping; fronds clustered
Fronds clear-green, thin
Segments nearly 1 mm. wide.....10. **T. polyanthum**
Segments less than 0.5 mm. wide.....11. **T. parviflorum**
Frond dark-green, harsh.....12. **T. dentatum**

1. **T. omphalodes** (Vieillard) C. Christensen.

A minute fern, the frond 1-1.5 cm. in diameter, the filiform rhizome growing usually along trunks and twigs, to which the peltate fronds are closely appressed.

Tahiti, Papehue river, on rocks, Setchell and Parks no. 5346; Papara valley, on rocks, Grant no. 3667. Huahine, Matoereere, altitude 1,260 feet, Grant no. 5296.

Westward to Java.

2. **T. taeniatum** Copeland (pl. 2).

Rhizome and stipe exceedingly slender, dark, bearing weak deciduous hairs; stipe 2-3 cm. long; frond pendent, fan-shaped, 2-3 cm. long and wide, 4-8-times dichotomous, the ultimate divisions sometimes more than 40, 1.5-2 mm. wide near the tip, narrower toward the base, the margin bearing appressed black bristles; sori bell-shaped or with a short cylindrical tube, the lip broadly expanded, appearing broadly two-lipped in herbarium specimens.

Tahiti, Grant nos. 3561, 3881, 4401. Borabora, altitude 450 to 1,070 meters, Grant no. 4981. Previously reported as *T. digitatum,* a related fern of Mauritius.

Endemic as far as known. A member of the group occurs in Samoa, but specimens available for study are too imperfect for exact determination.

3. **T. parvulum** Poiret.

A small epiphyte, with interlacing black rhizomes and similar stipes commonly 1-2.5 cm. long; fronds forming a mat, 1-3 cm. long, the smaller ones digitate, the larger ones tending toward pinnate in plan, the stipe or rachis sometimes branching—that is, behaving like a rhizome—and bearing part-fronds; ultimate segments oblong, about 1 mm. wide, entire, dark; involucre cylindrical, 1.5-2 mm. long, broadly winged, with round, expanded mouth.

Tahiti, Ronui, altitude 1,325 feet, on *Cyathea,* Grant no. 3882. Huahine, Matoereere, altitude 1,680 feet, on *Macaranga,* Grant no. 5282.

Throughout the Old World Tropics.

This represents the subgenus *Gonocormus,* of which many ill-defined species have been described. Typical *T. parvulum,* of the East African islands, is smaller and *supposed* not to be proliferous. *T. proliferum* Blume reported from Tahiti, probably by mistaken identification, is a Malayan form, more conspicuously proliferous, with less ample part-fronds. A small relative in Samoa and Fiji has been distinguished as *T. saxifragoides.*

4. T. endlicherianum Presl.

Stipe 2-3 cm. tall, narrowly winged; frond light-green, delicate, up to 10 cm. tall, lanceolate or ovate-lanceolate, tripinnatifid with narrowly winged axes, the marginal row of cells very long, thick-walled, with oblique ends; sori on the lower secondary and tertiary divisions of the frond, involucre cylindrical, with a broad wing and flatly expanded round mouth; receptacle far exserted.

Tahiti, Brackenridge, "in mountain forests, on trees," the type collection of *Trichomanes tenue*; not again collected.

Samoa, Fiji, Norfolk, New Zealand.

5. T. humile Forster.

T. concinnum Mettenius.

Very similar to the preceding species, but usually smaller, with the pinnae almost horizontal, a double row of elongate marginal cells, and sori usually restricted to the lowest acroscopic "pinnules."

Tahiti, many collections, on rocks and trunks. Borabora, Huahine, and Moorea, Grant.

Westward to Sumatra.

6. T. bipunctatum Poiret.

Stipe 2-4 cm. long; frond 5-10 cm. tall, dark-green, broadly lanceolate, bi- or tripinnatifid, rachis narrowly winged or the wing obsolete at the base; lamina with an almost unbroken false vein two rows of cells in from the margin; sori large, involucre elongate, winged, with two long-triangular lips.

Tahiti, many collections. Tahaa, Huahine, and Moorea, Grant. On wet rocks at moderate altitudes.

Local specimens are quite exactly like the typical plant, from Mauritius. More or less similar plants, referred to this species, are common throughout the Old World Tropics.

7. T. pallidum Blume.

An epiphyte, with hairy rhizome, and glabrescent wiry stipes 3-6 cm. long; frond 6-20 cm. long, pendent, lanceolate, hairy or eventually glabrescent, often with a whitish or bluish bloom, bi- or tripinnatifid with the divisions at an acute angle, thickened along the axes, and with a more or less evident marginal line; mouth of the involucre slightly dilated.

Tahiti, Ronui, altitude 3,190 feet, Grant no. 3929; Mahina, altitude 3,550 feet, Grant no. 4403; Borabora, altitude 1,960 feet, Grant no. 4918.

Westward to Ceylon.

This represents the subgenus *Pleuromanes,* or *Craspedoneuron,* in which, as in *Gonocormus,* the "species" seem to blend. The largest Tahitian plants represent *T. glauco-fuscum,* described probably from Huahine, and may at the same time be *T. savaiense* Lauterbach, of Samoa.

8. T. caudatum Brackenridge.

Rhizome creeping, 1.5 mm. thick; stipe slender, 5-7 cm. long; frond up to 30 cm. long, lanceolate, light-green, tripinnatifid, with linear or oblong segments 1 mm. wide, and no false veins, the tips of some or all pinnae long and slender; involucre elongate, narrowly winged, the mouth moderately dilated and obscurely two-lipped.

Tahiti, Brackenridge, the type collection; ridge between forks of Tautaua river, Setchell and Parks no. 538; Orofena, altitude 2,905 feet, Grant no. 4222. Reported from Moorea.

Rarotonga, Fiji, and New Caledonia.

9. T. maximum Blume.

Rhizome creeping, 2 mm. in diameter; stipes about 1 cm. apart, 8-15 cm. long; fronds 15-35 cm. tall, quadripinnatifid, but with few and narrow segments, giving the frond a very lax appearance, black when dry; main rachis very narrowly winged and secondary ones narrowly so except in the angles.

Tahiti, between Diadem and Marau, altitude 2,980 feet, Grant no. 3625. Huahine, Matoereere, altitude 1,490 feet, Grant no. 5278.

Westward to Sumatra and Siam.

10. T. polyanthum Hooker.

Caudex erect, and fronds therefore tufted; stipe 10 cm. tall, very stout, clothed, like the rachis, with reddish-brown bristles, or rough after the bristles fall; frond up to 55 cm. tall and 16 cm. wide, narrowed to both ends, quadripinnatifid, with segments hardly 1 mm. wide, the minor axes narrowly winged; involucre 2 mm. long, 1.6 mm. wide, with two broad, short lips. A very handsome fern.

Huahine, the type collection by Nightingale; Matoereere, altitude 1,740 feet, terrestrial, Grant no. 5325. Tahiti, Ronui, altitude 2,870 feet, Grant no. 3915.

The sori of the Tahitian specimen are smaller, but of the same shape and two-lipped. This is probably the species reported by Drake as *T. meifolium.* It resembles *T. bauerianum,* which has shorter sori, not at all two-lipped.

Endemic.

11. T. parviflorum Poiret.

Caudex erect or ascending, the tip immersed in maroon bristles; stipes clustered, about 10 cm. tall, slender, their bristles rather deciduous; fronds 10-14 cm. long, 4.5-6 cm. wide, narrowed to the apex, tri- or barely quadripinnatifid, the segments lying in the plane of the frond, linear, less than 0.5 mm. wide, the axes winged by a lamina about three cells wide; involucre short-cylindrical, the mouth truncate or slightly expanded; receptacle far exserted.

Tahiti, Mount Aorai trail, altitude 1,848 meters, MacDaniels no. 47.

Westward to Ceylon and Madagascar, rare. The local plant is *T. Asae Grayi* Van den Bosch, which has been construed as a synonym of *T. parviflorum.*

12. T. dentatum Van den Bosch.

Rhizome prostrate, suberect or erect, short and stout; stipes fascicled, bristly toward the base, up to 10 cm. long, terete like the lower part of the rachis; frond more or less 12 cm. long and 10 cm. wide, tripinnatifid, the lowest pinnae the largest, horizontal; pinnules cut on both sides to a broad, intact middle strip, into oblong segments which are toothed at and near their apices; texture firm, the stout, decurrent veins making up a large part of the pinnules; usually turning black in drying; involucres bent down out of the plane of the frond as they age, the lip dilated and commonly reflexed.

Tahiti, altitude 250 to 400 meters, Brackenridge, Quayle, MacDaniels no. 1661, Grant nos. 3887 and 4490. Reported also from Moorea.

Common in Rarotonga, Samoa, Fiji, and the New Hebrides.

In publishing this species, Van den Bosch began by citing *"T. rigidum* Brack. (non al.) in Wilk. expl. exped. XVI, p. 260"; and ended with: "Hab. Nova Caledonia (Isle of Pines), Cuming no. 7 (H. Berol.); Ins. Societatis (Tai'ti), Wilkes." As the Tahitian and New Caledonian ferns, though not quite identical, are enough alike to be one species, we are not concerned as to which is the type locality.

Immediately following *T. dentatum,* Van den Bosch (Hymenophyllaceas Novas . . . p. 183, 1861), published *T. cartilagineum,* this time beginning with the citation of a Brackenridge report from Fiji, but under "habitat" citing first a Tahitian collection of Vieillard and Pancher. I regard both of the Brackenridge collections as one species, and believe also that all Tahitian material in this immediate group is one species.

Brackenridge also reported from Tahiti what he called *T. anceps β.* His Fijian collection of this fern is the type collection of *T. intermedium* Van den Bosch. The two specimens in the United States National Herbarium are alike, but so absolutely alike that I suspect an error of label—that both came from Fiji. There is no other Tahitian collection of it.

2. HYMENOPHYLLUM Smith

Small ferns, typically epiphytic, in tropical woods which are damp without being dark; rhizomes creeping and very slender; fronds filmlike in thinness, pinnately compound in plan; sori terminal on the segments, the involucre deeply cleft into two halves or valves. A large pantropic genus, with a few species in cool countries.

Rachis not winged to the base.....1. **H. flabellatum**
Rachis winged throughout
  Sori terminal on pinnae and pinnules
    Wing evident; pinnae contiguous.....2. **H. dilatatum**
    Wing very narrow; segments short.....3. **H. gracilius**
  Sori on the shorter segments.....4. **H. formosum**

1. **H. flabellatum** De Labillardière.

Frond up to 30 cm. long, a third as wide, acuminate, tripinnatifid, the rachis winged in the upper part only; pinnules divided into segments on both sides, which are close enough together to give a flabellate appearance, naked; margin of frond and involucre entire.

Tahiti, Grant no. 4402. New here, and small, 10-15 cm. tall.
Polynesia, Australia, New Zealand.

2. **H. dilatatum** (Forster) Swartz.

As long as the preceding species and wider, rachis and a considerable part of the stipe winged; the pinnules less compact in their dissection, making the frond more open or lax; sori terminal on the segments of ordinary length, though not usually on the terminal segment of a pinna; involucres half immersed, split halfway down, the valves entire; receptacle club-shaped, stout, without sporangia on the lower part.

Tahiti, at altitudes from 350 to 1,350 meters, MacDaniels no. 1553; Grant nos. 3562, 3728, 4221, 4492.

The type was collected by Forster in "insulis maris pacifici," which sometimes means the Society Islands. In this instance, it probably does not; for Schkuhr, in Kryptogamische Gewächse, Plate 135, apparently from a Forster specimen, figured a large form, such as we have from New Zealand, Fiji, Papua, and elsewhere. All Tahitian specimens are small, not more than 15 cm. tall, and might be regarded as a distinct species.

3. **H. gracilius** Copeland (pl. 3).

Rhizome very slender, glabrescent; stipe about 2 cm. long, winged at the top, as is the rachis, with a wing so narrow that it is hardly visible without the lens; fronds 8-16 cm. tall, lanceolate; pinnae sessile, far apart, irregular in length, the longer ones about 2 cm. long, with narrowly winged axes and three or four pinnules on each side, of which the upper ones are simple, the medial ones forked, and the basal ones twice forked, the segments 2-4 mm. long, less than 1 mm. wide; sori terminal on all or the longer divisions of the upper part of the frond, about 1 mm. wide, narrowly winged at the base, and the segment just below the sorus commonly contracted to less than 0.5 mm. wide; indusium split half-way down or farther, its lips entire, broadly rounded or with an obtuse point; receptacle stout-club-shaped, apparently sterile at the base.

Tahiti, Grant no. 3766.
Endemic.

4. **H. formosum** Brackenridge.

Similar in aspect to *H. dilatatum*, but distinguished by the position of the sori, which are on short, nearly axillary segments, and thus far in from the outer contour of the frond, and by the receptacle, which is globose, without any sterile basal portion.

Tahiti, the type collection by Brackenridge, in mountain forests on trunks and rocks. South side of Orofena (Orohena), altitude 1,400 meters, on tree-fern trunks, MacDaniels no. 1554, is probably this species, but has small sori. It is a beautiful fern, reaching a length of more than 30 cm. Huahine, Grant no. 5326, is probably the same, but is sterile.

Range in doubt, as the common Malayan fern known by this name is probably distinct.

Other species of Hymenophyllum reported from Tahiti are:

H. tunbridgense Smith, listed by Drake, probably in error.

H. australe Willdenow, reported by Van den Bosch (Synopsis, p. 50) as collected here by Planchon and Vieillard. It is likely to be here, and may be recognized by the broad, crisped wing of the rachis, and the toothed lips of the involucre.

IV. SCHIZAEACEAE

Mostly tropical ferns, with terrestrial stems and erect or scandent fronds. The diagnostic character is a transverse annulus at or just below the apex of the sporangium. The sporangia are borne on contracted teeth or segments, at the apex of the frond in *Schizaea,* on the margins of the pinnules in *Lygodium.*

Fronds erect, grasslike or rushlike, small.....1. **Schizaea**
Rachis scandent, of indefinite length.....2. **Lygodium**

1. SCHIZAEA Smith

Small ferns, mostly tropical; the local representative with a flattened, dichotomously forking frond on a rushlike stipe, the sporangia borne on pinnately arranged spikes at the tips of the segments of the frond.

S. dichotoma (Linnaeus) Smith.

The unbranched stipe reaches a height of 30 cm. and the fanlike frond 10 cm.—its numerous branches usually narrowly linear.

Tahiti, as far as the data show, on ridges at altitudes from 300 to 900 meters, common, Tilden, Setchell and Parks, MacDaniels, Wilder, Grant.

Polynesia to Asia and Madagascar.

2. LYGODIUM Swartz

Rhizome underground; leaves with scandent, wiry rachis of indefinite growth, monopodial, the terminal bud aborting above each pair of pinnae, and the growth carried on by alternating pinnae of the successive pairs; foliar pinnae pinnate in the local species; sporangia produced on marginal spikes. Mostly tropical ferns, of very striking appearance; the "climbing ferns."

L. reticulatum Schkuhr.

Sterile pinnules mostly lanceolate, the fertile ones ovate to round; venation reticulate. Very variable in form of leaflets.

Tahiti, common up to at least 1,000 meters, Tilden, Quayle, Setchell and Parks, MacDaniels, Wilder, Grant. This is the type locality. Borabora, Otemanu, Grant no. 4972.

Polynesia to Australia.

V. GLEICHENIACEAE

Terrestrial ferns of all tropical and subtropical lands; sporangia dorsal, very few in each sorus, large enough to be counted with the hand lens, opening by a longitudinal slit; annulus transverse, at or just above the middle of the sporangium. Besides *Gleichenia,* the family includes *Stromatopteris,* a monotypic genus of New Caledonia with erect rhizome and pinnatifid fronds.

GLEICHENIA Smith

Rhizome creeping; fronds commonly of indefinite growth, pinnate, but the terminal bud aborting in most species above the first pair of pinnae, both of which alike either repeat this formation of a false dichotomy once or several times, or proceed to the formation of a pinnate or bipinnate laminar portion. *Gleichenia* thrives under isolation more intense than most ferns endure, and various species form dense thickets in open places, the dense tangle of stiff, hard stipes and rachises making them almost impenetrable.

A genus of more than 100 species, mostly tropical.

Fronds pectinate down to the third forking below the tips
- Without stipule-like outgrowths ..... 1. **G. Brackenridgei**
- With stipule-like leaflets above the lowest forking ..... 2. **G. tahitensis**

Fronds pectinate only above the ultimate forking ..... 3. **G. linearis**

Fronds bipinnatifid above the last forking ..... 4. **G. japonica**

1. G. Brackenridgei Fournier.

Ultimate branches (pinnae) 10-15 cm. long, 5-7 cm. wide; pinnules connected by a very narrow, scarious wing, widely divergent but not at a right angle, 2 mm. wide, subacute; the minor rachises bearing rufous scales and, like the nether surfaces, paler hairs. Pinnules are borne on the ultimate pinnae and the one or two preceding branches.

Tahiti, Mahina, altitude 2,874 feet, Grant no. 4395.

Fiji and New Caledonia. The Tahitian plant is reasonably like that from Fiji, but with much longer pinnules.

2. G. tahitensis Copeland (pl. 4).

Rhizome and base of stipe chestnut, clothed with dark-chestnut, ciliate, long-attenuate, narrow paleae, which falling leave them rough; frond three to five times dichotomous, all axes bearing pinnules, the ultimate branches up to 30 cm. long, the main axis sometimes continued above the lowest forking; axes straw-colored; pinnules stand-

ing out almost horizontally, the upper ones contiguous, lower ones not so close, and connected by a short and narrow cartilaginous wing, mostly about 5 cm. long, 2 mm. wide, widening at the base to 4 mm., acute, entire, thin but firm, glabrous above, with a short whitish pubescence beneath; the lower pinnules longer, even to 9 cm., and the lowest external ones, immediately above the lowest bifurcation, enlarged into pinnate leaflets 15 cm. long.

Tahiti, Orofena, altitude 3,870 feet, Grant no. 4239.
Endemic.

3. **G. linearis** (Burmann) Clarke.

Ultimate pinnae commonly up to 20 cm. long and 8 cm. wide; pinnules horizontal, 3-4 mm. wide, glabrous, light-green but not glaucous, confined to the ultimate pinnae except for the pair of stipule-like leaflets borne at or immediately below each forking of the rachis; the axial buds usually all suppressed, giving the frond as a whole the appearance responsible for the name by which the species was long known, *G. dichotoma;* sori distinct and separate, of 3-12 sporangia.

Common in open places.
Pantropic.

4. **G. japonica** Sprengel.

A very large fern, the stout stipe a meter or more tall, with a single pair of pinnae and a terminal bud clothed with foliaceous scales, or the axis prolonged and bearing other pairs of pinnae; pinnae 1-2 m. long, pinnate with the numerous pinnules standing at nearly a right angle; pinnules 10-15 cm. long, acuminate, deeply pinnatifid; segments standing at nearly a right angle, 10-12 mm. long, 2-3 mm. wide, obtuse, coriaceous, beneath glaucous, the costae hairy-paleaceous, and the lamina sparsely hairy.

Tahiti, Orofena, altitude 3,610 feet, Grant no. 3610. Huahine, Grant no. 5312. I cannot believe that this is as rare as the absence of previous reports would indicate.
Polynesia to Japan and India, common.

VI. POLYPODIACEAE

A very large family, growing wherever any ferns are found, exceedingly various. The diagnostic character is provided by the annulus, which is either longitudinal and interrupted by the pedicel, or, in a few genera regarded as primitive (*Cyathea, Dicksonia, Plagiogyria*), just oblique enough to pass by the pedicel. While the other families have conspicuous peculiarities, being small, old, uniform groups, this one includes ferns of every type—trees, vines, shrubs—as well as almost all typical and familiar ferns. It represents the present culmination of fern evolution.

KEY TO THE GENERA

Fronds simple, entire or nearly so
- Sporangia spread over the back of the frond, not in sori.....32. **Elaphoglossum**
- Sporangia covering the back of a linear apical segment.....30. **Hymenolepis**
- Sporangia in linear sori
  - Minute ferns with an axial sorus.....43. **Vaginularia**
  - Grasslike ferns with a sorus in each margin.....42. **Vittaria**
  - Sori following the veins irregularly.....41. **Antrophyum**
  - Sori oblique to the costa, exindusiate
    - Free included veinlets present in areolae.....39. **Selliguea**
    - Without free included veinlets.....37. **Loxogramme**
  - Sori oblique to costae, indusiate.....7. **Asplenium**
- Sori round or roundish
  - Indusia wanting
    - Fronds bearing peltate or stellate scales.....31. **Cyclophorus**
    - Without peltate or stellate scales
      - Veins reticulate.....38. **Microsorium**
      - Veins free.....35. **Grammitis**
  - Indusia present.....25. **Oleandra**

Fronds pinnatifid or compound
- Sporangia spread over the surface, not in sori
  - Sori on apical pinnae, other pinnae sterile.....21. **Acrostichum**
  - Sori on wholly fertile fronds, other fronds sterile
    - Not scandent, terrestrial, exindusiate.....40. **Campium**

      (Look out for Blechnum, with marginal indusium)
    - Scandent ferns
      - Margin of leaflets cartilaginous.....8. **Stenochlaena**
      - Margins not cartilaginous.....9. **Lomagramma**
- Sporangia in definite, dorsal, elongate sori
  - Sori strictly parallel to costae.....6. **Blechnum**
  - Sori oblique to costae
    - Sori all simple, never curved across vein.....7. **Asplenium**
    - Some sori double or bent across vein.....5. **Athyrium**
- Sporangia in round or roundish dorsal sori
  - Tree ferns, with large sporangia and oblique annulus.....1. **Cyathea**
  - Not really tree ferns, annulus not oblique
    - Without indusia
      - Fronds pinnatifid or pinnate
        - Veins reticulate.....38. **Microsorium**
        - Veins free
          - Fertile segment folded over sorus.....36. **Calymmodon**
          - Segments not folded.....33. **Polypodium**
      - Fronds bipinnatifid or decompound
        - Without free included veinlets.....2. **Dryopteris**
        - Free included veinlets present.....4. **Tectaria**
    - With indusia
      - Veins anastomosing, without free veinlets.....2. **Dryopteris**
      - Veins reticulate with free included veinlets.....4. **Tectaria**
      - Veins free, stipe not articulate

Pinnae not articulate to rachis
Indusium peltate ..... 3. **Polystichum**
Indusium reniform, fixed by sinus ..... 2. **Dryopteris**
Indusium fixed by base and sides ..... 12. **Microlepia**
Pinnae articulate to rachis ..... 10. **Nephrolepis**
Veins free, stipe articulate
Indusium fixed by base only
Frond coriaceous ..... 27. **Humata**
Frond not coriaceous ..... 29. **Arthropteris**
Indusium fixed by base and sides ..... 28. **Davallia**
Sporangia in marginal sori
Exindusiate
Frond pinnatifid or pinnae adnate by entire base ..... 34. **Prosaptia**
Frond more compound ..... 22. **Cheilanthes**
Indusium opening along or toward margin
At most bipinnate, pinnules dimidiate ..... 14. **Lindsaya**
More compound, leaflets cuneate ..... 13. **Sphenomeris**
More compound, leaflets not cuneate ..... 11. **Dennstaedtia**
(Look out for Davallia and Asplenium, with sori dorsal but indusium reaching the margin, and Prosaptia, with sorus so deeply immersed that it appears indusiate.)
Indusium formed by reflexed margin, opening away from margin
Fronds seriate on a creeping rhizome
Sori on tips of free veins ..... 16. **Hypolepis**
Sori on marginal vein connecting vein-tips
Veins free except at margin
Pinnae alternate ..... 17. **Paesia**
Lower pinnae opposite ..... 18. **Pteridium**
Venation reticulate ..... 19. **Histiopteris**
Fronds clustered
Sori on marginal vein connecting vein-tips ..... 20. **Pteris**
Sori on tips of free veins, not on indusium
Fronds thin, not deltoid ..... 22. **Cheilanthes**
Fronds coriaceous, deltoid ..... 23. **Doryopteris**
Sori on the inside of the indusium ..... 24. **Adiantum**

1. CYATHEA Smith

The typical tree ferns. Trunk stout and erect; leaves large, pinnately compound, the bases of the stipes clothed with broad scales; veins free, with the round sori on their backs or in the angles (not terminal and marginal); annulus oblique, not interrupted by the pedicel of the sporangium. A very large genus, almost wholly tropical.

Indusium evident and symmetrical
Main rachis rough but not scaly
Rachis of pinnules scaly and hairy ..... 1. **C. affinis**
Rachis of pinnules glabrescent ..... 2. **C. Societarum**
Main rachis scaly ..... 3. **C. Grantii**
Indusium open on the marginal side ..... 4. **C. tahitensis**
Indusium none or fugitive ..... 5. **C. decurrens**

1. **C. affinis** (Forster) Swartz.

Trunk 10 cm. or more thick, with crowded leaf-scars wider than long; stipe clothed at the base with dark-maroon, ciliate, linear-acicular paleae 15 mm. long; frond very large, tripinnate, main rachis buff or brown, rough with minute dark points; larger pinnae up to 50 cm. long, long-stalked (6 cm.), rachis glabrescent beneath, minutely roughish in the lower part, the lower pinnules deflexed; pinnules up to 10 cm. long, 2–3 cm. wide, very acute, the lower ones stalked, rachises sparsely puberulous and with a few ciliate scales, pinnate in the lower part, then deeply pinnatifid, with acute or obtuse serrulate segments; secondary pinnules adnate to rachis, 11-16 mm. long, 3-4 mm. wide, mostly obtuse, subfalcate, the lower and more fertile ones crenulate-pinnatifid in the lower part and contracted there, subcoriaceous, hairy beneath but glabrescent above, the costule beneath, especially among the sori, bearing dark-ciliate ovate squamules; veins mostly twice forked, sori costular, indusium thin but persistent.

Tahiti, Diadem camp, altitude 2,665 feet, Grant no. 3526. Moorea, Putoa, altitude 1,140 feet, Grant no. 5394.

Described from the Pacific islands (Swartz), and unknown elsewhere. This is not at all the same species known by the same name in Fiji, and I do not know which, if either, is named correctly. Forster did not see Fiji, but did collect in Tahiti, as well as in Tanna, Tonga, and elsewhere.

2. **C. Societarum** Baker.

Very similar to the preceding species, but described as having entire segments, naked rachises, and pilose main ribs.

Tahiti, Fautaua valley, Setchell and Parks, nos. 215, and Maara valley, 446; Hitiaa, Puunui, altitude 350 meters, Grant no. 4471.

Endemic.

3. **C. Grantii** Copeland (pl. 5; fig. 1).

Similar to the preceding two species but with more persistent scaly rachises, still more ample fronds, and less pubescent lamina.

Tahiti, Orofena, altitude 3,505 feet, Grant no. 4245.

Endemic.

4. **C. tahitensis** (Brackenridge) Copeland.

Trunk 5 cm. in diameter, black; stipe maroon, with a row of scars beneath each of the lateral angles, clothed at the base with shiny, tawny, sparsely or deciduously ciliate, linear-acicular scales 2 cm. long; frond large, tripinnate, axes maroon, smooth; large pinnae 45 cm. long, stalked (3 cm.), the lowest pinnules somewhat reduced, on stalks 4 mm. long; medial pinnules sessile, 7-9 cm. long, 18-20 mm. wide, short-caudate, pinnate at the base, then deeply pinnatifid, costae covered with small, broad, appressed, ciliate, lacerate and sometimes hairy scales; pinnules and segments about 2 mm. wide, straight or subfalcate, obtuse, entire or obscurely serrulate, the margin somewhat deflexed, coriaceous; veinlets mostly once forked, inconspicuous; sori almost covering the surface; indusium firm and persistent but incomplete, covering the sorus on the side toward the costa, but open on the side toward the margin.

Tahiti, Mount Aorai trail, Quayle no. 41; Papenoo, Ivafatautau, Grant no. 4178; Hitiaa, Puunui, Grant no. 4470; Tahaa, Ohiri, Grant no. 5155; Moorea, Putoa, Grant no. 5393. Huahine, Matoereere, Grant no. 5309. Altitudes 300 to 500 meters. From the ridge to Aorai, altitude 6,010 feet, Grant no. 3760, imperfectly fruiting, is possibly this species but may be *C. affinis*.

Endemic.

The four preceding species are nearly related, in spite of the distinctive indusium and narrower segments of *T. tahitensis*. As interpreted and described from the specimens in hand, *C. affinis* is easily distinguishable by the pinnatifid fertile bases of the secondary pinnules, and *C. Grantii* by the scaly rachis.

5. C. decurrens (Hooker) Copeland.

Trunk not tall, 4 cm. thick, its apex and the leaf-buds protected by hard, brown, lanceolate scales 1 cm. long, their margins thinner and paler, erose but not ciliate; frond tripinnate, thin, practically glabrous, bearing only a few scales and hairs while still coiled, rachises stramineous to brown; larger pinnae 50 cm. long, stalked (6 cm.), the lower pinnae deflexed and reduced; medial pinnules 10-12 cm. long, 3-3.5 cm. wide, subsessile, acuminate, pinnate at the base, the segments elsewhere connected by a narrow wing; secondary pinnules in turn pinnatifid well toward the costa, the upper segments (of the primary pinnules) merely deeply serrate; sori small, the indusium vestigial or wanting.

Tahiti, Orofena, Grant nos. 4232 and 4233. Paea, Vaipaipaea, Grant no. 4622. Raiatea, Vaiumete, Grant no. 5231. Altitudes 500 to 1,000 meters. Described from Nightingale's collection, probably from Huahine.

Rarotonga, New Caledonia.

2. DRYOPTERIS Adanson

Terrestrial ferns; rhizome scaly, erect or creeping, the stipes not articulate; fronds from simple, with pinnate venation, to several times pinnate; veins free in deeply bipinnatifid or more compound forms, in less dissected fronds mostly with the veinlets uniting regularly in pairs with an excurrent veinlet from the point of anastomosis; sori dorsal, round (with few exceptions), with reniform or round-reniform indusia or none. A very large (more than 1,000 known species) and diversified, but still natural genus; cosmopolitan; related to *Athyrium, Polystichum, Acrophorus, Tectaria,* etc., and in the other direction to *Cyathea.* Such groups as *Lastraea* (with indusia and free veins), *Phegopteris* (with free veins and no indusia), *Nephrodium* (with indusia and anastomosing veins), etc., however convenient in purely descriptive botany, cannot be used as genera thus characterized, because they do represent single lines of descent.

Veins free
- Lower pinnae broader than lanceolate
  - Minor rachises bearing entire scales or naked
    - Fronds bi- to tripinnate ..... 1. **D. decomposita**
    - Fronds at least quadripinnatifid
      - Pinnules borne at an angle near 45 degrees ..... 2. **D. davallioides**
      - Pinnules and segments at more nearly a right angle
        - Sori medial ..... 3. **D. sciaphila**
        - Sori near the margin
          - Stipe very scaly ..... 4. **D. macrolepidota**
          - Stipe naked except at base ..... 5. **D. dicksonioides**
  - Minor rachises bearing ciliate white scales ..... 6. **D. leucolepis**
  - Minor rachises hairy rather than scaly
    - Hairs conspicuous, white ..... 7. **D setigera**
    - Hairs inconspicuous, reddish ..... 8. **D. Drakei**
- Pinnae linear or lanceolate
  - Rachis dark, notably scaly ..... 9. **D. viscosa**
  - Rachis stramineous, slightly scaly
    - Pinnae broad at their bases ..... 10. **D. Grantii**
    - Lower pinnae narrowed at base ..... 11. **D. Brackenridgei**

Lowest veinlets uniting in pairs
- Stipe scaly at first and then rough ..... 12. **D. longissima**
- Stipe smooth or nearly so
  - Without reduced basal pinnae
    - Coriaceous in texture ..... 13. **D. gongylodes**
    - Herbaceous ..... 14. **D. mesocarpa**
  - Lowest pinnae moderately reduced and remote ..... 15. **D. invisa**
  - Lowest pinnae reduced to rudiments
    - Costae densely bristly beneath ..... 16. **D. subpectinata**
    - Costae minutely, persistently hairy ..... 17. **D. nymphalis**
    - Costae glabrescent, indusium wanting ..... 18. **D. costata**

1. **D. decomposita** (R. Brown) Kuntze.

Rhizome creeping or ascending, bearing some small brown-black scales; stipes approximate, chestnut or maroon, 30-40 cm. long, smooth and naked except near the base; frond 25-40 cm. long, broadly deltoid; lowest pinnae 25 cm. long, 20 cm. wide at the base, tripinnatifid at the base only, acuminate; coarser rachises minutely squamulose, minor ones and bases of costae puberulent; segments sharply toothed near the apex, herbaceous; sori small, midway between costa and margin, dorsal (well below the end) on a veinlet running to a sinus or a fine tooth occupying a sinus; indusium deciduous.

Tahiti, Diadem camp, altitude 2,665 feet, Grant no. 3541.

Polynesia to Tasmania.

2. **D. davallioides** (Brackenridge) Kuntze (pl. 6).

Stipe over 60 cm. tall, 5 mm. thick, with narrow dark-chestnut scales at the base, elsewhere smooth, terete, chestnut; frond correspondingly large, deltoid, brownish-green, quadripinnate, minor rachises sparsely beset with minute ovate scales and clavate unicellular hairs; tertiary pinnules borne at an acute angle, 1 cm. long, 3 mm. wide, sessile with cuneate base, acute, sharply incised; sori near the bases of the teeth, indusium reniform, firm, naked.

Tahiti, "in mountain forests," known only by the type collection of Brackenridge.

Endemic.

3. D. sciaphila Maxon.

Rhizome short-creeping, 2-3 cm. thick, immersed in ferruginous scales, which are 1.5-2.5 cm. long, less than 1 mm. wide, straight or crinkly, entire; stipe up to 75 cm. tall, brown, deeply grooved, beset with scales decreasing from those of the rhizóme at the base to 2 mm. long at the top; frond up to 65 cm. long, and nearly as broad at the base, quadripinnate when well developed, rachises everywhere bearing minute slender scales; ultimate pinnules sessile or adnate, at an angle of about 75 degrees, oblong, obtuse, incised or serrate, herbaceous; sori small, medial or nearer the costa; indusium thin, ciliate, deciduous.

Tahiti, Maara valley, Setchell and Parks nos. 444, type collection, and 414; Diadem camp, altitude 2,665 feet, Grant nos. 3536 and 3538. Papenoo, Farehape, altitude 825 feet, Grant no. 4069. Borabora, Otemanu, altitude 1,460 feet, Grant no. 4946. Huahine, Pipihaua, altitude 150 feet, Grant no. 5267. Moorea, Putoa, altitude 1,140 feet, Grant no. 5395.

Endemic.

4. D. macrolepidota Copeland (pl. 7, *B*).

Rhizome ascending, 2-3 cm. in diameter, immersed in paleae; stipes clustered, 40 cm. tall, 6 mm. thick, trisulcate on the ventral face, stramineous, the base immersed in ferruginous, squarrose paleae up to 3 cm. long and 3 mm. wide, which become less dense upward and dwindle to a length of 4-10 mm.; frond about a meter long and half as wide, tripinnate, axes everywhere paleate, the scales becoming minute and sparse on the finer rachises, but still present on the costae; main pinnae about 6 pairs, above which the frond is bipinnate; the third pair of pinnae the longest, 35 cm. long, on a stalk 1.5 cm. long, 12-15 cm. wide, acuminate; pinnules 7.5 cm. long, only the lowest stalked, narrowed from a base 2.5 cm. wide to a finely acuminate serrate apex, pinnate near the base; lowest secondary pinnules sessile, the others adnate, the lowest 13 mm. long, 6 mm. wide, with rounded apex, incised halfway to the costa, firm-herbaceous, light-green; sori near the margin; indusium round-reniform, minute but firm, naked.

Tahiti, Orofena, altitude 2,750 feet, Grant no. 4228, only one frond.

Endemic.

Tahiti is the type locality of *Dryopteris Lepinei* (Kuhn) Kuntze, like the preceding species in having submarginal sori and probably in the degree of dissection, but essentially different in being naked and in having deltoid pinnae.

5. D. dicksonioides (Mettenius) Copeland.

Phegoptenis dicksonioides Mettenius, Linnaea, vol. 36, p. 118, 1869.

Rhizome ascending, 1.5-2 cm. thick, the apex and stipe bases immersed in brown-black, firm, entire paleae about 13 mm. long and 1.5 mm. wide; stipe 80 cm. tall, tawny with dark spots, naked except at base; frond a meter long, ovate, acuminate, barely quadripinnate at the base; larger pinnae few, on stalks 1-2 cm. long, 40 cm. long, 15 cm. wide, acuminate, the third pair from the bottom slightly largest, broadest above or at the base; pinnules up to 10 cm. long and 4 cm. wide on stalks 2 mm. long, acuminate;

secondary pinnules subsessile or sessile and adnate, up to 1 cm. wide at the base, acute, only the lowest pinnate at the base, elsewhere deeply and somewhat obliquely pinnatifid; segments obtuse, the larger ones toothed or obscurely lobed, herbaceous, light or dark green; sori mostly one to each tooth, more or less marginal; indusium minute, ciliate, fugitive.

Tahiti, Papenoo valley, altitude 500 meters, Adamson no. 31; Papenoo, Tahinu, altitude 1,160 feet, Grant no. 4180; Orofena, altitude 3,620 feet, Grant no. 4261.

The identification is not positive. This is true of almost any large *Dryopteris* known only by description, but especially so when the description is notably imperfect. Mettenius did not have rhizome or stipe, did not know what part of the frond his fragment represented; also he placed it in his genus *Phegopteris* and then described its indusium. He cited Oahu material, besides the Tahitian type. Baker reduced it to *D. glabra* (Brackenridge) Kuntze, which our Tahitian specimens are not. Drake ignored this as a published species, but probably redescribed it as *Nephrodium Vescoi.*

6. D. leucolepis (Presl) Maxon.

Rhizome stout, ascending, its apex and the stipe bases buried in a mass of whitish or tawny, linear, crinkly paleae 2 cm. long, ciliate with white hairs; stipe a meter tall, rough after the paleae fall; frond a meter or more long, broadly ovate, quadripinnatifid, the axes bearing small, narrow, ciliate white paleae; secondary pinnules oblong, obtuse, the larger ones pinnatifid, thin-herbaceous; sori small, indusium minute, glandular-ciliate.

Tahiti, sea level to 600 meters altitude; Setchell and Parks nos. 19, 237; Grant nos. 4559, 4627. Meetia, Grant no. 4730. Borabora, Grant no. 5053. Huahine, Grant no. 5276.

Westward to the Philippines.

7. D. setigera (Blume) Kuntze.

Similar to the preceding, but commonly smaller, with brown, nonciliate basal scales, stipe nearly smooth, minor rachises bearing long, white hairs but no scales, and indusium fugacious.

Tahiti, Vesco, Setchell and Parks no. 277, MacDaniels no. 1694. Borabora, Grant nos. 5105, 5108. Moorea, Grant no. 5374. Altitudes up to 400 meters.

Polynesia to Japan and India; also running wild in Brazil and Florida.

8. D. Drakei C. Christensen.

Polypodium Vescoi Drake.

Described, evidently from an incomplete specimen, as a relative of the Hawaiian *D. unidentata,* with fronds 50-60 cm. long and 30-40 cm. broad, tripinnatifid, herbaceous, with minutely scaly rachis, puberulent lamina, and medial exindusiate sori, collected by Vesco and by Nadeaud in Tahiti, in valleys, altitude 800 to 900 meters. It may possibly be represented by Quayle

no. 94, from Mount Aorai, Noha ravine, altitude 1,090 meters, an incomplete specimen, which has the sori nearer the margin than to the costa, and bears rudimentary indusia which might easily be overlooked. It does resemble *D. unidentata,* and has no resemblance to any other Tahitian species of *Dryopteris.*

9. D. viscosa (J. Smith) Kuntze.

Caudex erect; stipes densely clustered, slender, 15-20 cm. tall, persistently brown-scaly at the base and deciduously so farther up, rachis and costae densely velvety; frond pinnate, with terminal and basal pinnae like the others; pinnae many, narrowly linear, long-attenuate to both ends and entire-caudate, obliquely pinnatifid beyond the middle, subcoriaceous, costae and costules sparsely and minutely hairy beneath, lamina naked; veinlets simple; indusia very sparsely ciliate—not entire and glabrous, as described. Easily recognizable by the shape of the pinnae.

Tahiti, ridge to Aorai, altitude 6,025 feet, Grant no. 3761.
Fiji, Mindanao, Borneo, Tonkin.

10. D. Grantii Copeland (pl. 7, *C*).

Rhizome stout, ascending, covered with stipe bases, which bear brown-black, rigid, linear paleae 1 cm. long; stipe 35 cm. tall, dark-brown near the base, lighter upward and, like the rachis, naked; frond 120 cm. long, narrowed to both ends, almost bipinnate, herbaceous; pinnae mostly opposite, sessile, medial ones 20-25 cm. long, 2 cm. wide, long-acuminate, pinnatifid almost to the costa, with rounded sinuses; costa sparsely beset above with half-appressed dark bristles, beneath, like the veins, bearing white hairs 0.7 mm. long; segments 2 mm. wide above the base, and usually separated by more than their own width, subfalcate, obtuse or acute, entire, ciliate; sori medial, superficial; indusium brown, at first covering the sorus, but fugacious, naked.

Tahiti, below Diadem, altitude 980 meters, Grant no. 3602.
Endemic.

11. D. brackenridgei (Mettenius) Kuntze.

Rhizome stout, apparently ascending; stipes 50-60 cm. long, brown or olive, with a few basal scales, the upper part and the rachis minutely hairy; frond as long as the stipe, basal pinnae not reduced, the terminal leaflet more or less like the others but without narrowed base; pinnae 15 cm. long, linear-lanceolate, caudate, the lower ones stalked, base rounded by extreme reduction of the lowest segments, pinnatifid almost to the costa into subfalcate, subacute, mostly entire, sparsely ciliate segments, lamina papyraceous, very minutely and sparsely hairy; veinlets simple, more than 15 pairs in the longest segments; sori small, closely costular. The numerous costular sori make this species easily recognizable.

Tahiti, the type locality, apparently common, ranging up to 800 meters altitude; Quayle, Setchell and Parks, MacDaniels, Grant. Huahine, Matoereere, altitude 1,140 feet, Grant no. 5292. Moorea, Putoa, altitude 1,230 feet, Grant no. 5401.
Fiji.

12. D. longissima (Brackenridge) Christensen.

"Trunk stout, erect, 2 to 3 feet in height," with the encasing stipe-bases and roots, more than a decimeter thick; stipe 150 cm. or more long, the base densely clothed with

shining, dark-chestnut, linear scales 2-3 cm. long, glabrescent upward and then muricate with black spinelets 0.5-1 mm. long—the bases of the fallen scales; frond 2 meters long and a meter wide, bipinnatifid, rachis like the stipe in the lower part, toward the apex sparsely clothed at first with acicular paleae 8 mm. long, left smooth as these fell, but with a sparse, minute pubescence; pinnae contiguous, almost horizontal, about 3-5 cm. wide, sessile, acuminate, pinnatifid to 4 mm. from the costa, with acute sinuses; segments closely placed, about 4 mm. wide, subfalcate, subcoriaceous, pubescent beneath; veinlets closely placed, simple, conspicuous on the upper surface, about two pairs anastomosing below the sinus; sori innumerable, near the costa, but finally almost covering the surface, exindusiate, sporangia naked.

Tahiti, the type locality; Fautaua valley (only one clump seen), Setchell and Parks no. 194; Papenoo, Mataiea ridge, altitude 2,585 feet, Grant no. 4094. Probably rare, as so large a fern must be conspicuous.

Endemic. The fern reported by Rosenstock (Hedwigia, vol. 56, p. 351, 1915), as variety *novoguineensis* is a distinct species, differing in the several respects noticed by Rosenstock and also having very different paleae on the stipe.

13. **D. gongylodes** (Schkuhr) Kuntze.

Rhizome long-creeping; stipes remote, up to 50 cm. tall, naked; frond as long, 20 cm. wide, abruptly contracted to a pinnatifid apex, shallowly bipinnatifid, coriaceous; pinnae up to 12 cm. long and 12 mm. wide, usually narrower, sessile, acuminate, pinnately lobed more or less halfway to the costa, the costules sparingly glandular beneath; one pair of veins regularly anastomosing; sori medial, eventually confluent; indusium irregularly toothed.

Tahiti, Setchell and Parks no. 98, Mahina, in moist meadows; Hitiaa, in roadside ditch, altitude 6 feet, Grant no. 4501.

Pantropic.

14. **D. mesocarpa** Copeland (pl. 7, *A*).

Rhizome ascending, 8 mm. thick; stipes approximate, tuberculate at the base, smooth and naked upward, triangular (as dried) and the ventral angle deeply grooved, 70 cm. tall; frond about a meter long, 40 cm. wide, with acuminate pinnatifid apex, elsewhere shallowly bipinnatifid, lowest pinnae not reduced, although scars on the stipe represent the places of completely abortive pinnae; pinnae almost horizontal, sessile, acuminate, 2 cm. wide, the lower rounded and the upper truncate at the base, thin-herbaceous, glabrous except for a few minute hairs, pinnately lobed about halfway to the costa; segments 5 mm. wide and long, subacute, the acroscopic side nearly straight and the basiscopic curved; veinlets about 10 pairs, of which usually 5 veinlets (2½ pairs) unite to form a false vein which widens to the sinus; sori numerous, medial, small; indusium dark-brown, naked.

Huahine, Matoereere, altitude 1,140 feet, Grant no. 5290. Probably also Tahiti, Diadem camp, altitude 2,665 feet, Grant no. 3534.

Endemic.

15. **D. invisa** (Forster) Kuntze.

Rhizome creeping; stipes remote, up to 40 cm. tall, minutely puberulent; frond up to 80 cm. tall and 30 cm. wide, with long pinnatifid acuminate apex, elsewhere pinnate, the lowest pinnae reduced and remote, not reduced to rudiments; pinnae up to 20 cm. long,

1.5 cm. wide, sessile, serrate toward the apex, elsewhere inciso-serrate one-third of the way to the costa, coriaceous, the costa and veins pubescent beneath; veinlets 8-10 pairs, of which 2 pairs and sometimes a fifth veinlet unite to form a strong secondary vein, which in large specimens produces a minute, rounded deflexed tooth in the sinus; indusia hairy.

Tahiti, Brown, Setchell and Parks nos. 9 and 16, Grant no. 4558; Meetia, Grant nos. 4710, 4705, 4737. Borabora, Grant no. 4875. Huahine, Grant nos. 5257, 5268.

Polynesia and New Zealand.

Drake reports *D. **unita*** (Linnaeus) Kuntze (as *Nephrodium **cucullatum*** Baker). It is like *D. **invisa*** in the wide-creeping rhizome and in general aspect, but has, among other distinctions, naked sori. It might be expected here, but is not in our collections.

16. D. subpectinata Copeland (pl. 7, *D*).

Rhizome creeping, 1 cm. thick; stipes approximate, 70 cm. tall to the first normal pinnae, but with remote abortive pinnae about 5 mm. long more than halfway down; angular, deeply sulcate, glabrous; frond a meter long, 35 cm. wide, with entire tip, 3.5 cm. long above a pinnatifid portion of 7 cm., elsewhere pinnate, upper part of rachis pubescent; pinnae almost horizontal, 18 mm. wide, sessile, truncate at base, with acuminate entire tips 2 cm. long, elsewhere pinnatifid to 3-4 mm. from the costa, with narrow sinuses, papyraceous, costa, main veins, and veinlets setose beneath; segments about 3 mm. wide, obliquely truncate, with nearly parallel sides; veinlets about 10 pairs, of which 2 pairs unite; sori medial, minute; indusium bearing a few deciduous bristles.

Tahiti, Diadem camp, altitude 800 meters, Grant no. 3537.

Endemic.

17. D. nymphalis (Forster) Copeland.

Stipes fascicled on an erect caudex; texture firm but not coriaceous; all axes hairy; lower pinnae distant and reduced (Schkuhr, who figured this from a Forster specimen, did not have the base); pinnae linear, acuminate, cut halfway to the costa into oblong, obtuse lobes, hairy on both surfaces; one or two pairs of anastomosing veinlets; sori medial, with hairy indusia.

Huahine, Matoereere, altitude 1,555 feet, Grant no. 5279.

New Zealand, Polynesia, Australia.

Our one local collection has the pinnae more shallowly cut than is typical and usual elsewhere.

18. D. costata (Brackenridge) Maxon.

Caudex short, erect; stipes tufted, up to 50 cm. tall to the normal pinnae, but with rudimentary ones lower down; frond 75 cm. long, 30 cm. wide; pinnae nearly horizontal, sessile, narrowed from a cuneate-truncate base to a fine serrulate apex, obliquely pinnatifid more than halfway to the costa with acute sinuses, glabrescent except for the setose upper side of the costa; segments 3-4 mm. wide at the base, obtuse or acute; veinlets about 8 pairs, of which 2 pairs unite according to Brackenridge, but only 1 pair in our specimen; sori medial or supramedial, exindusiate.

Tahiti, bank of Punaruu river, Setchell and Parks no. 359.

Described from Fiji and at the same time accredited to Tahiti.

The specimen from Setchell and Parks was identified by Maxon, who has the Brackenridge originals, and conforms in essentials to the description. The basal pinnae dwindle gradually.

Grant no. 4068, from Farehape, altitude 835 feet, has likewise an erect caudex and exindusiate sori; but the base is abruptly contracted and the tips of the pinnules are entire; in the latter respect and not in the former it is like the New Zealand *D. pennigera,* to which *D. costata* has sometimes been reduced. The Grant specimen differs still from both in being setose beneath. Baker's confusion of *D. setosa* and *D. longissima,* followed by Drake, goes back to Hooker's mistake in identifying specimens of *D. longissima* as *D. costata.*

3. POLYSTICHUM Roth

Terrestrial or rarely epiphytic ferns, with erect or creeping scaly stems and non-articulate scaly stipes; fronds pinnately compound, the ultimate pinnules incised, with sharp-pointed teeth; veins free; sori dorsal, mostly with peltate indusia. A cosmopolitan genus, very near to *Dryopteris,* usually distinguishable by the finely pointed teeth.

Fronds deltoid.....1. **P. aristatum**
Lowest pinnae not enlarged.....**P. aculeatum**

1. P. aristatum (Forster) Presl.

Stipes approximate on a creeping rhizome, 30-60 cm. tall, clothed toward the base with very narrow, harsh, dark paleae; frond 30-50 cm. long, deltoid, pinnate at the apex, tripinnate at the base; pinnules or segments 10-15 mm. long, obliquely ovate-lanceolate, sharply incised, subcoriaceous, naked. Easily recognized by the creeping rhizome.

Tahiti, at altitudes up to 1,100 meters, many collections. This is perhaps the type locality.

West to Japan and Natal.

P. aculeatum (Linnaeus) Schott.

Stipes about 30 cm. long, clothed toward the base with large, broad, thin, brown paleae, which are smaller and paler on the upper part and reduced to fibrils on the minor axes; frond 50 cm. or more long, 25-30 cm. wide, tripinnate; pinnae numerous, lanceolate, the lowest not enlarged, thin in texture, with deciduously fibrillose lamina; sori very small; indusia thin, peltate, and reniform. A barely tripinnate form of this cosmopolitan collection of species.

Tahiti, not seen, but reported by Drake as collected by Nadeaud. It is to be expected here.

Cosmopolitan, in many forms or nearly related species.

4. TECTARIA Cavanilles

Terrestrial ferns, with stout, scaly, typically erect caudices; stipes clustered, scaly at the base, not articulate; fronds ample, simple or compound, usually more or less deltoid; venation irregularly recticulate, usually with free included veinlets in all directions; sori dorsal, round; indusia reniform or orbicular or wanting. Nearly 200 species, in the Tropics of both hemispheres.

Frond pinnatifid ..... 1. **T. decurrens**
Frond bipinnate
  Axes nearly black and shining ..... 2. **T. latifolia**
  Axes not ebeneous
    Veinlets anastomosing freely ..... 3. **T. tahitensis**
    Areolae at most one row ..... 4. **T. tenuifolia**

1. T. decurrens (Presl) Copeland.

Caudex stout, erect or suberect, bearing many coarse, brown roots and a cluster of fronds, the apex and the bases of the stipes clothed with firm lanceolate paleae 1 cm. long; stipe 30-70 cm. tall, broadly winged except near the base; frond 40-90 cm. long, ovate, pinnatifid, the lateral segments few and remote, connected by a broad wing on the rachis, lanceolate, commonly 3-5 cm. wide, acuminate or caudate, entire to coarsely crenate; main veins conspicuous, parallel; veinlets inconspicuous, forming a fine net, with free included veinlets; sori in a regular row on each side of each main vein, with conspicuous, persistent indusia.

Tahiti, Vaheria valley, MacDaniels no. 1300, and Papara, MacDaniels no. 1730; Maara valley, Setchell and Parks no. 442; Papara, Grant no. 3667; Vaiarava, Grant no. 3986; all at moderate altitudes.

West to Ceylon.

2. T. latifolia (Forster) Copeland.

Stipe black, shining, 30-60 cm. tall, clothed with narrow, brown paleae near the base; frond 50-80 cm. long, deltoid, with pinnatifid apex and a few pairs of ovate or lanceolate pinnae, of which the lowest are very large, and in well-grown specimens pinnate with one or a few stalked pinnules, thin, glabrous; sori small, irregularly scattered or in ill-defined rows.

Tahiti, Vaitaa, altitude 50 meters, Grant no. 4008.

This is probably the type locality. Forster stated no place of origin, nor was it shown on Schkuhr's specimen (Kryptogamische Gewächse, p. 19, pl. 24, 1809); but Swartz, who had Forster plants, ascribed it (Synopsis filicum, p. 39, 234, 1806) to *insulis maris pacifici,* which commonly means Tahiti.

Polynesia: common in Fiji. Ascribed also to Malaya.

3. T. tahitensis Maxon.

Very similar to the preceding species, but the axes brown instead of black. As *T. latifolia,* like many species of the genus, is very variable in

the development and dissection of the frond, and Schkuhr's figure, by which it has been known most authentically, represents an extreme of this variation, in the number of free pinnules and their narrowness, I mistrust the real distinctness of the two species. As compared with this figure (duplicated by some Fijian plants), most of the Fijian specimens, Grant's no. 4008 from Tahiti, and all specimens of *T. tahitensis* have fewer pinnules and more oblique pinnae and pinnules.

A Tahitian plant determined as (*T.*) *latifolia* by Brackenridge is construed as *T. tahitensis* by Maxon.

Tahiti, Setchell and Parks nos. 298 (type collection) and 557; Tilden no. 35B; Quayle no. 119; Grant nos. 3610 and 4457. Moorea, Grant no. 5369. The plant from Moorea shows a vestigial indusium.

Endemic.

4. T. tenuifolia (Mettenius, Kuhn) Maxon (fig. 3).

A little-known species, described without citation of a specimen and in ambiguous terms. I believe it to be represented by Quayle no. 92 from Mount Aorai, Noha ravine, altitude 1,090 meters, of which as of the type, a complete frond does not exist. It is distinguished among Tahitian species of the genus by the fact that the veinlets unite to form at most a single series of areolae along the main axes. The specimen in hand has a single free pinnule at the base of the largest pinna present; elsewhere, the axes of the pinnae bear wings which connect the lanceolate segments. This wing, on the largest pinna, is extended into a rounded tooth, served by a vein from the axis of the pinna, below each segment. Indusia not seen, but described by Mettenius as evident but small.

Endemic.

Nearly related are *T. Gaudichaudii* (Mettenius) Maxon, of Hawaii, and *T. Stearnsii* Maxon, of Samoa; also a New Hebrides plant which shades into *Dryopteris dissecta,* with all veinlets free.

In addition to the preceding species, there have been ascribed to Tahiti:

Aspidium hymenodes Mettenius, described from a collection by Vesco, and since reduced to *T. latifolia;* by description, it seems to me more likely to be a form of *T. tenuifolia.*

Aspidium repandum Willdenow, which should be *Tectaria crenata* Cavanilles. Brackenridge reported this from Los Baños in Luzon, where it occurs, and from Tahiti, where it is otherwise unknown.

5. ATHYRIUM Roth

Terrestrial ferns, with short-creeping to erect rhizomes, these and the non-articulate stipe bases clothed with paleae with thin cell walls and pigmented cell contents; sori elongate along the veins, the indusium typically bent across the vein at the upper end of the sorus, or on both sides of the vein, making the sori double. A large genus, world-wide in distribution,

distinguished from *Asplenium* by the paleae, the form of the sorus, and by internal structural characters; from *Dryopteris,* to which it is more nearly related, by the shape of the sorus. The indusial character is inconstant, many of the sori on most species being one-sided as in *Asplenium*; but the lowest acroscopic veinlet of each group usually has a double sorus, even though all the other sori are simple. In a very few species the indusium is wanting. Among the genera of this general alliance, absence of the indusium occurs in very many species of *Dryopteris* and *Tectaria,* rarely in *Polystichum* and *Athyrium,* never in *Asplenium.*

Veins free
- Rhizome slender, paleae pale-brown
  - Fronds about 15 cm. tall ..... 1. **A. Solanderi**
  - Fronds over 30 cm. tall ..... 2. **A. japonicum**
- Caudex stout, paleae dark; large ferns
  - Pinnules entire or toothed ..... 3. **A. ellipticum**
  - Pinnules deeply pinnatifid ..... 4. **A. polyanthes**
  - Lower pinnules pinnate ..... 5. **A. Grantii**

Veins anastomosing ..... 6. **A. javanicum**

1. A. Soland(e)ri (Carruthers) Copeland.

Diplazium Solandri Carruthers, Filices, in Seemann's Flora Vitiensis, p. 356, 1873.

Rhizome creeping, slender; stipes approximate, 4-8 cm. tall, slender, dark and chaffy at the base, mostly greenish upward; frond 7-15 cm. tall, lanceolate, acuminate, pinnatifid in the upper part, pinnate toward the base; largest pinnae usually a third of the way up, lanceolate, sessile, more or less auricled on the upper side, obtuse, serrate or incisco-serrate, thin-herbaceous; lowest acropetal sorus of each pinna usually double, the others simple or half-double.

Tahiti (the type locality), Vaita Valley, altitude 100 meters, MacDaniels no. 1660; south of Orofena (Orohena), altitude 1,400 meters, MacDaniels no. 1466; Toanoano Valley, altitude 175 feet, Grant no. 3870.

Endemic.

2. A. japonicum (Thunberg) Copeland.

Similar to the preceding species in the creeping rhizome, pale-brown paleae, and thinness, but larger and more divided. Frond, stipe included, 30-45 cm. tall; pinnae opposite, sessile, with truncate base, 4-8 cm. long, lanceolate, acuminate, deeply and regularly pinnatifid into oblong lobes; sori all or mostly simple.

Cited by Drake, who reduced to it *A. Solanderi, A. congruum,* and other species less nearly related. It is included here because possibly represented by Quayle no. 74, which is too incomplete for positive identification.

Japan to Java, and reported from New Guinea.

3. A. ellipticum Copeland (pl. 8).

Caudex more or less erect, with stout roots 2-3 cm. in diameter; stipes clustered, 30-40 cm. tall, clothed at the base with harsh, dark-brown, lanceolate paleae 6 mm. long; frond 65-80 cm. long, ovate, with pinnatifid apex, in most parts bipinnate; the third to

the fifth pinnae on each side the largest, about 25 cm. long and 7.5 cm. wide, with acuminate serrate apex, pinnatifid in the distal third, elsewhere pinnate, on stalks 10-15 mm. long, rachises naked; lowest pinnules stalked, acute, cut nearly halfway to the costa at the base, most of them merely serrate, sessile or adnate, with broad base and obtuse or acute apex, the largest 4 cm. long, 13 mm. wide, subcoriaceous, costae bearing a few small brown scales or glabrescent; sori double or simple, reaching from the costa halfway to the margin, indusium brown, very narrow.

Tahiti, Mount Aorai, Noha ravine, altitude 1,090 meters, Quayle no. 80; Diadem camp, altitude 800 meters, Grant no. 3539. Probably also Virao, altitude 250 meters, MacDaniels no. 1695, (immature).

Endemic.

4. **A. polyanthes** (Solander: Forster: Baker) Copeland.

Asplenium polyanthes Solander, in Forster's Prodromus, p. 93, 1786, *nomen;* Baker, Synopsis Filicum, 2d ed., p. 492, 1874.

Caudex stout, erect or ascending, its apex and the bases of the stipes covered with linear black paleae, 1-2.5 cm. long and up to 2 mm. wide at the base; stipe up to 70 cm. tall, sparsely tuberculate (from the raised points of insertion of the largest paleae) near the base, the upper part and rachis smooth and glabrescent; frond up to 90 cm. long, broadly ovate, deeply tripinnatifid except in the distal parts, the apices of frond, pinnae and pinnules acuminate and serrate; largest pinnae up to 40 cm. long, including stalks 5 cm. long, their larger pinnules over 10 cm. long on stalks 3 cm. long; segments up to 15 mm. long and 5 mm. wide, obliquely placed, obtuse, serrulate or nearly entire, thin-papyraceous; sori up to 8 on a side, parallel, linear, not reaching the margin, all except the lowest acropetal one asplenioid.

Like most large species of *Athyrium,* this is variable in its development, specimens less than half as large as described sometimes being freely fertile, with short-stalked pinnae, and sessile pinnules, shallowly pinnatifid, with at most four pairs of sori to the segment.

Tahiti, Tilden nos. 23 and 331; Brown no. 263; road to Fort Faa Rahi, Setchell and Parks no. 17, a small and merely bipinnatifid form; Fautaua valley, no. 202; Mount Aorai, Orange ravine, altitude 600 meters, Quayle no. 112; Papara, altitude 480 meters, MacDaniels no. 1721; Hitiaa, altitude 40 meters, Grant no. 4467. Meetia, Ternato, altitude 550 meters, Grant no. 4732, bipinnate. Borabora, Otemanu, altitude 400 meters, Grant no. 4940.

Endemic.

5. **A. Grantii** Copeland (pl. 9; fig. 2).

Rhizome creeping, 10-15 mm. in diameter, the small brown scales on it and on the stipe ephemeral; stipe 90-120 cm. tall, it and the rachis brown, slightly rough; frond 75-100 cm. long, deltoid-ovate, quadripinnatifid near the base; pinnae few, ascending, lower ones 50 cm. long, 25 cm. wide, stalked; secondary pinnules up to 18 mm. long and 7 mm. wide, sessile or adnate, acute, the lower ones obliquely incised, the upper ones sharply serrate, subcoriaceous, naked except for a few minute scales on the costae; sori mostly simple, oblong, closely costular; indusium firm and persistent but becoming lacerate.

Tahiti, ridge to Aorai, altitude 1,200 meters, Grant no. 3743; Orofena, altitude 1,100 meters, Grant no. 4244.

Endemic.

6. A. javanicum (Blume) Copeland.

Stipe up to 60 cm. tall, sparsely scaly near the base; frond longer, 25-30 cm. wide, glabrous; pinnae mostly sessile, broadly cuneate at the base, abruptly caudate, 15 cm. long, 4 cm. wide, entire or nearly so, remarkably thin, or slightly succulent and drying thin; veinlets uniting to form a mesh, the first areolae reaching halfway to the margin, with two or three irregular rows beyond them, and no distinct main veins; sori oblong, large, the indusia breaking irregularly, as well as opening on the side away from the vein.

Tahiti, Fautaua, altitude 800 meters, Grant no. 3620, and ridge to Aorai, altitude 1,200 meters, Grant no. 3745.

West to India.

6. BLECHNUM Linnaeus

Terrestrial ferns of moderate size, mostly with stout, erect caudices; stipes clustered, with basal scales like those of *Athyrium;* fronds pinnatifid or pinnate, all alike or the fertile contracted; sori long-linear, borne each on a special vein parallel and close to the costa, the indusium free on the costal side; veins free except for the soriferous ones. A large, cosmopolitan genus.

Fertile and sterile fronds alike.....1. **B. orientale**
Pinnae of fertile fronds contracted (*Lomaria*)
  Sterile pinnae adnate and decurrent.....2. **B. Patersoni**
  Sterile pinnate adnate, not decurrent
    Frond narrowed to the base.....3. **B. attenuatum**
    Lowest pinnae not reduced.....4. **B. vulcanicum**
  Sterile pinnae rounded at base.....5. **B. capense**

1. B. orientale Linnaeus.

A large fern, often growing a meter tall, with light-brown stipe and rachis, naked except for dark-brown scales at the base of the stipe; lowest pinnae reduced to mere auricles; the largest pinnae up to 30 cm. long, 15 mm. wide, free or partly adnate at the base, entire, coriaceous, each with a single pair of narrow sori extending from the base almost to the apex.

Tahiti, common from sea level up to 900 meters altitude.

West to Asia.

2. B. Patersoni (R. Brown) Mettenius.

Up to 60 cm. or more tall; stipes as long as the fronds, dark-maroon, with a few brown scales at the base, in the upper part bearing pinnae reduced to auricles 1-2 mm. "long" and several times as wide; pinnae up to 10 on a side and 16 cm. long, 2 cm. wide, acuminate, coriaceous, entire, the base adnate and dilated on the lower side; fertile pinnae remote, narrowly linear, the lowest stalked, the others adnate.

Tahiti, Vaihiria river, altitude 200 meters, Grant no. 4113.

New Zealand to India.

3. B. attenuatum (Swartz) Mettenius.

Caudex erect, short; stipe of sterile frond 10-25 cm. long, the upper part bearing very short and wide reduced pinnae, the lower part clothed with dark-brown linear-acicular scales 1-2 cm. long; frond 30-50 cm. long, narrowed rather abruptly toward both ends, pinnate nearly or quite to the rachis; middle pinnae 10 cm. long, up to 15 mm. wide at the base, thence narrowed gradually to the serrate tips, herbaceous, naked; fertile fronds longer stalked, with narrowly linear pinnae dilated or not at the base.

Tahiti, Vaita valley, MacDaniels no. 1713; Ronui, Grant no. 3893; Vaihiria river, Grant no. 4114; Moorea, Putoa, Grant no. 5392. Sea level to 350 meters altitude.

Mauritius, South Africa, Australia, Lord Howe Island.

The *Lomaria lanceolata* reported by Drake is probably a small form of *B. attenuatum*.

4. B. vulcanicum (Blume) Kuhn.

Caudex stout, prostrate or erect, densely covered with stipe-bases and linear-acicular dark paleae up to 25 mm. long; stipes of large specimens up to 50 cm. tall, stramineous, the lower part densely scaly, the scales finer and finally disappearing farther up, leaving the stipe rough when they fall; sterile frond up to 45 cm. long and 25 cm. wide, narrowed to the apex; lowest pinnae free, deflexed, auricled on the upper side, middle and upper pinnae wholly adnate; fertile frond with narrowly linear pinnae, abruptly widened at their broadly adnate bases.

Tahitian specimens are ciliate when young, but with the lamina and costae completely hairless, and thus unlike the typical *B. vulcanicum* of Java and Fiji. Here, as elsewhere, this is a remarkably plastic fern, varying greatly in size, texture, and scaliness. Grant no. 5218, from Raiatea, "on a wet ridge," altitude 1,970 feet, has sterile fronds 10 cm. long, on almost naked stipes 5-8 cm. long. It looks like a very distinct species, but is matched in these respects by specimens from exposed situations in Tasmania, Java, and Luzon.

Tahiti, reported as collected by Lépine and Nadeaud. Tahaa, Ohiri, Grant no. 5164. Raiatea, as already cited. Huahine, Matoereere, Grant no. 5320. Altitude 500 to 600 meters.

A similar glabrous form in Rarotonga. The typical hairy plant, New Zealand to Luzon, and in the Marquesas.

5. B. capense (Linnaeus) Schlechtendal.

A meter or more in height; sterile pinnae broadly rounded at the base, broader on the upper side, commonly 20 cm. long and 2.5 cm. broad, acuminate, hard-coriaceous, serrulate; fertile pinnae about 4 mm. wide, completely occupied by the sori.

Tahiti, common above 800 meters. Grant no. 3791 is from Aorai "in summit shrubs," altitude 6,700 feet.

Marquesas to Africa.

7. ASPLENIUM Linnaeus

Terrestrial and epiphytic ferns of moderate size, rhizome creeping, scandent or erect, the stipe not articulate; veins usually all free; sori elongate along the veins and on only one side indusiate. The affinity is not clear; close to *Athyrium* by the terms of the diagnosis. In case of difficulty, the most convenient invariable distinction is that the paleae of *Asplenium* have pigmented walls but hyaline lumen, whereas the lumen of the cells is pigmented in *Athyrium*. A very large genus, of world-wide distribution. Several groups of ill-defined species range over the Malayan-Polynesian region.

Fronds simple.....1. **A. Nidus**
Fronds pinnate, not bipinnatifid
  Pinnae few, the terminal one like others.....2. **A. obtusatum**
  Pinnae many, upper ones reduced
    Veins simple (except in auricle).....3. **A. tenerum**
    Some veins forked, very oblique.....4. **A. lobulatum**
Fronds deeply bipinnatifid
  Pinnae with a single deep incision.....4. **A. lobulatum**
  Divisions of pinnae more numerous
    Frond narrowed toward base.....5. **A. caudatum**
    Frond truncate at base.....6. **A. adiantoides**
Fronds bipinnate
  Stipes chaffy.....6. **A. adiantoides**
  Stipes naked except at base.....7. **A. acuminatum**
Fronds at least tripinnate
  Sori clearly dorsal
    Stipe chaffy.....6. **A. adiantoides**
    Stipe naked except at base.....8. **A. laserpitiifolium**
  Sori apparently marginal
    Sori elongate.....9. **A. shuttleworthianum**
    Sori short and wide.....10. **A. gibberosum**

1. **A. Nidus** Linnaeus.

Epiphytic; fronds effectively sessile, clustered on a short, stout, creeping rhizome, spreading in all directions, forming a great "nest," where a mass of debris collects, holds moisture, turns to humus, and is penetrated by the roots of the fern; fronds more or less a meter long and 15 cm. wide, obtuse or acute, coriaceous, narrower and brown toward the base, entire; venation close, the veins connected by a marginal vein, which is not always conspicuous; sori on the upper part of the frond, extending from the costa about halfway to the margin.

Tahiti, common below 300 meters altitude. Meetia, Grant no. 4675. If fine discrimination of species be attempted, two occur here, the commoner one with the sori not crowded and with broad indusia.

Old World Tropics.

2. **A. obtusatum** Forster.

Rhizome short and stout, immersed in lanceolate brown-black paleae; stipes up to 10 cm. long; fronds about as long, ovate, simply pinnate with apical pinna like the others, the rachis somewhat flattened; pinnae about 5 on a side, oblique at base, rounded

at apex, entire or serrate, subcoriaceous; sori in regular rows, reaching nearly to the margin, indusium pale.

Tahiti, Tautira, moist cliffs by sea, altitude 4 meters, MacDaniels no. 1717; Taapeha, in rock crevice, altitude 20 feet, Grant no. 4020.

New Zealand to Chile, Papua and Hawaii.

An exceedingly variable fern elsewhere. The description applies to the specimens cited. More ample forms, likely to have more numerous, acute, and even incised pinnae, may occur in more sheltered places.

3. A. tenerum Forster.

Terrestrial; caudex short, erect or suberect; stipes up to 20 cm. and fronds to 40 cm. long and 8 cm. wide, stipe and rachis pale-green, sparsely and deciduously scaly; apex pinnatifid; pinnae numerous but hardly contiguous, oblong, 1 cm. wide, short-stalked, with oblique base, truncate and sometimes auricled on the upper side, cuneate on the lower, broadly rounded at the apex, inciso-serrate with one vein in each tooth, light-green, herbaceous; veins simple; indusium pale and thin.

Tahiti, apparently common at altitudes from 200 to 800 meters. This is probably the type locality, as Schkuhr, from a Forster specimen, figured the form commonest here, with crenations deeper than are usual elsewhere. Moorea, Grant no. 5382.

Marquesas to Seychelles Islands.

Other simply pinnate species reported by Drake are *A. paleaceum* R. Brown, with narrow scaly fronds, and *A. unilaterale* Lamarck, with almost dimidiate pinnae. *A. unilaterale,* at least, was to be expected here.

4. A. lobulatum Mettenius.

This species was reported by Drake as collected in Tahiti by Nadeaud and by Collie. A fern collected in 1921, "no. 103," perhaps by Quayle, can be a simple form of it. It otherwise is known only in Hawaii. The Quayle (?) specimen is simply pinnate except for a single large, almost free lobe on the upper side of the bases of the lower pinnae. It is characterized by oblique pinnae, fleshy texture, lax venation, brownish color, and a tendency to bear a bud near the base of the apical leaflet. This comparatively simple form has been distinguished in Hawaii as *A. pseudocaudatum* Hillebrand. An older name for an indistinguishable Philippine fern is *A. Steerei* Harrington. *A. lobulatum* antedates both of these, and may include them. I suspect that they are all forms of *A. insiticium* Brackenridge, and am not sure that that is the first name it bore.

5. A. caudatum Forster

Rhizome stout, creeping or suberect, immersed in linear-acicular paleae up to 2 cm. long; stipe up to 45 cm. long, it and the rachis clothed with linear paleae; frond up to a meter or more in length, narrowed to both ends, pinnate; larger pinnae 10 cm. long, short-stalked (1-2 mm.), acuminate with coarsely toothed apex, base truncate on the

upper side and cuneate on the lower, obliquely incised more than half way to the costa into coarse lobes with entire sides and truncate, dentate apices, coriaceous, nether surface squamulose; veins leaving costa at a very acute angle, branching and curving out into the lobes; sori of poorly fruiting specimens in a row on each side of the costa and almost parallel to it, but in full fruit with two to several in each lobe and parallel to its sides. This is the type locality, as attested by Schkuhr.

Tahiti, several collections from Orofena and the Diadem, altitude 900 to 1,200 meters. Borabora, Tarapaia, altitude 600 meters, Grant No. 4985, a form with unusually deeply cut pinnae.

Credited with being pantropic. So far as represented by available material, the typical plant ranges from the New Hebrides to Hawaii, with forms somewhat aberrant common west to Asia.

Drake reports also *A. horridum* Kaulfuss, a species near to *A. caudatum*, distinguished by exceedingly scaly rachis; *A. falcatum* Lamarck, a species of similar appearance, but glabrous, with pinnae less cut, thinner but firm, with flabellate veins and sori; and *A. macrophyllum* Swartz, differing from *A. falcatum* in having much broader pinnae.

6. A. adiantoides Lamarck (not of Christensen, which is *A. falcatum* Lamarck).

A. praemorsum Swartz; *A. furcatum* Thunberg.

Rhizome short and stout and in Tahitian specimens erect or nearly so, covered with stipe-bases and small, narrow, brown or blackish paleae; stipes erect, 10-20 cm. long, more or less scaly, like the rachis, dark; frond 10-30 cm. long, lanceolate, typically bipinnate, lowest pinnae hardly reduced, short-stalked, lanceolate to ovate, acute, very oblique at the base; pinnules few, obliquely placed, cuneate, adnate, the larger ones incised at the apex, coriaceous, squamulose beneath.

Tahiti, ridge to Aorai, Quayle no. X and Grant no. 3787; Aorai, in summit shrubs, altitude 6,700 feet, Grant no. 3797.

To this I refer also: Quayle no. 45, Aorai trail, altitude 1,848 meters, and Grant no. 3758, ridge to Aorai, altitude 6,010 feet, tripinnate, and 50-90 cm. tall. Specimens from South Africa, the type source of *A. adiantoides*, *A. praemorsum*, and *A. furcatum*, are sometimes very nearly tripinnate; these large Tahitian specimens are quite typical in texture, scaliness, shape and position of segments, and in the few large sori, though more like *A. laserpitiifolium* in dissection.

Pantropic.

There is no choice but to adopt Lamarck's name for this species, letting *A. adiantoides* (Linnaeus) C. Christensen be known again by its long familiar name, *A. falcatum*.

7. A. acuminatum Hooker and Arnott.

Stipe 50 cm. tall, glabrescent, dark; frond 1 meter tall, lanceolate, acuminate, lowest pinnae remote and moderately reduced; medial pinnae short-stalked, 10 cm. long, 2 cm. wide, acuminate, pinnate, rachis inconspicuously scaly with dark, very narrow paleae branched at the base; pinnules mostly obliquely adnate and decurrent, ovate to obovate, toothed in the distal half, thin, green, with a few small, pronged paleae beneath.

Huahine, Matoereere, altitude 1,875 feet, Grant no. 5328.

Hawaii.

Not very distinct from some of the forms referred to *A. affine* Swartz.

8. A. laserpitiifolium Lamarck.

Normally on tree trunks; rhizome short, immersed in linear, bright reddish-brown paleae 1.5-2 cm. long; stipes clustered, 20-30 cm. long, brown-black, naked; fronds longer than the stipes, ovate, quadripinnate when well developed; ultimate pinnules cuneate-obovate, a scant centimeter long and half as wide, naked, clear-green, thin, flabellate-veined, each veinlet entering a tooth of the outer margin; sori 3-4 mm. long, remote from the outer margin. A very handsome fern.

Tahiti, Maara, Setchell and Parks no. 436; Orofena, altitude 2,410 feet, Grant no. 4213. Grant's specimen is peculiar in having the stipes seriate rather than clustered, and the paleae on the rhizome up to 3 cm. long.

West to the Seychelles.

9. A. shuttleworthianum Kunze.

A. multifidum Brackenridge.

A large fern, fronds 60-90 cm. long, 35 cm. wide, quadripinnate in the lower part, the segments about 1 mm. wide; sori about 2 mm. long, midway or subterminal on the segment, the indusium opening along the margin.

Tahiti, the type locality, collected by Brackenridge; Mount Aorai trail, leeward, altitude 1,848 meters, Quayle no. 43, in part.

Samoa, Fiji.

Apparently rare, here and in Fiji, as it is too beautiful a fern to escape frequent collection if at all common.

10. A. gibberosum (Forster) Mettenius.

Davallia foeniculacea Hooker; *A. stenolobum* C. Christensen.

Rhizome suberect, immersed in thin, iridescent-brown, lanceolate-aciculate, originally entire paleae, 1.5 cm. long; stipes clustered, 40-70 cm. long, mostly gray-green, deciduously squamulose; frond hardly as long as the stipe, broadly ovate, four or five times pinnate but the minor rachises winged, pale-green, subcoriaceous, with scattered, minute, ragged-branched squamulae; ultimate segments linear, one-nerved, with a riblike margin; sori lateral on the segments, some extended like a branch of the segment, usually exceeded by the hornlike distal part of the segment but this in some almost suppressed; indusium commonly about as wide as long (long meaning lengthwise of the segment) but sometimes twice as wide as long, altogether Davallioid in aspect.

Tahiti, probably the type locality, common and variable, altitude from sea level to above 5,000 feet. Borabora, Otemanu, altitude 1,170 feet, Grant no. 4930.

Polynesia.

Drake cites also *A. bulbiferum* Forster, as collected by Nadeaud. It is a relative of the two preceding species, but with more evidently dorsal sori, in New Zealand, Tasmania, and Australia, and well known in cultivation.

8. STENOCHLAENA J. Smith

Scandent ferns, with scaly rhizomes; stipes remote, not articulate; fronds pinnate, with the pinnae articulate to the rachis, dimorphous; veins all free, or with one obscure vein close and parallel to the costa, beyond which all are free; sporangia occupying the entire nether surface of the fertile pinnae, without distinction of sori and without indusia. Pantropic.

S. Setchellii Maxon.

Rhizome scandent, the apical region and the bases of the stipes densely scaly, but the scales deciduous; stipes remote, 20 cm. long; fronds 50-80 cm. long, simply pinnate; sterile pinnae all alike, short-stalked, 10-15 cm. long, 2-2.5 cm. wide, acuminate, base narrowly cuneate, entire, herbaceous; veins mostly simple, not crowded, ending in a very narrow cartilaginous border; fertile pinnae somewhat longer and narrowly linear.

Tahiti, Setchell and Parks no. 418; Maara valley, type collection; Toanoano valley, altitude 30 meters, Grant no. 3876, and Vaiaraia, Grant no. 3974; Vaita valley, altitude 200 meters, MacDaniels no. 1655, sterile. Moorea, Quayle no. 146.

Endemic.

9. LOMAGRAMMA J. Smith

Freely scandent ferns with scaly rhizome; fronds at least pinnate, the pinnae articulate to the rachis but not the stipe to the rhizome; venation reticulate, except when the ultimate pinnules are very small; fronds dimorphous, the fertile lamina only ample enough to bear the sporangia, which are naked and not in sori. A small genus in the Old World Tropics, closely related to at least a part of the species now included in Stenochlaena.

Veins free.....1. **L. wilkesiana**
Venation reticulate.....2. **L. lomarioides**

1. **L. wilkesiana** (Brackenridge) Copeland.

Sterile fronds about 40 cm. long, on fronds of half the same length, pinnate or bipinnate with sparsely or deciduously chaffy rachises; pinnae of pinnate fronds about 8 cm. long and 13 mm. wide, short-acuminate, the base cuneate on the lower side and truncate on the upper, subcoriaceous, glabrous, uniformly serrulate, without cartilaginous border; pinnae of bipinnate fronds somewhat larger, longer stalked, cut to a narrowly winged or wingless rachis into numerous uniform herbaceous pinnules about 13 mm. long and 4 mm. wide, with acute apex, obliquely cuneate, articulate base and serrate margin.

The polymorphism of this species, mentioned by several writers, is discussed by Maxon (Univ. California Pub. Botany, vol. 12, no. 2, p. 28, pls. 3 and 4, 1924). This is altogether too close to *Stenochlaena Setchellii* to be generically distinct; but, as *Stenochlaena* itself is in process of revision by Mr. Holtthum, this is not the time for a reassignment of species.

Tahiti, Brackenridge (teste Maxon, op. cit.); Mount Aorai, altitude 600 meters, Quayle no. 111, and, without stated locality no. 600; Setchell and Parks nos. 211, 294, 296, 315, 512; Brown no. 262; Grant nos. 4459 and 4613. Moorea, altitude, sea level up to 800 meters, Quayle no. 139.

Rarotonga and New Caledonia; similarly polymorphous in both.

2. L. lomarioides (Blume) J. Smith.

Larger than the preceding; fronds 75 cm. long on stipes up to 40 cm. long; pinnae 15 cm. long, 25 mm. wide, unequally truncate at the base, irregularly serrate toward the short-acuminate apex; membranaceous; veinlets anastomosing freely, without included veinlets; fertile fronds of local specimens not seen.

Tahiti, Faraura, altitude 145 feet, Grant no. 4458; reported by Drake as collected by Lépine and by Nadeaud. Moorea, Putoa, altitude 1,240 feet, Grant no. 5397.

West to Asia.

Tahitian specimens are not exactly identical with Malayan, being more naked and differently serrate.

10. NEPHROLEPIS Schott

Terrestrial and epiphytic ferns, with the stipes approximate or tufted on a short, woody, scaly rhizome, not articulate; fronds pinnate; pinnae oblique, articulate to the rachis and easily deciduous; veins free; sori round or reniform and dorsal, or marginal, or elongate along the margin, indusiate. A very natural genus, of less well-defined species, in both hemispheres.

Indusium broadly reniform.....1. **N. cordifolia**
Indusium circular or nearly so
  Sori near the margins.....2. **N. hirsutula**
  Sori not nearly marginal.....3. **N. biserrata**

1. N. cordifolia (Linnaeus) Presl.

Stem erect or suberect, but producing rhizomes by which it can spread; fronds 20-35 cm. long, linear; pinnae oblong, truncate and somewhat auricled on the upper side at the base, the apex broadly rounded, the fertile ones coarsely serrate-crenate; sori large, reaching almost from the costa to the margin, in a single regular row; indusium semiorbicular to deeply reniform, fastened by the broad base. None of these specimens bear tubercles.

Tahiti, below Diadem, altitude 2,870 feet, Grant no. 3568; Papenoo ridge, altitude 2,015 feet, Grant no. 4099.

Tropics and subtropics.

2. N. hirsutula (Forster) Presl.

Stipes clustered, 5-20 cm. tall, stout, bearing dark-brown and stramineous scales; fronds usually less than 40 cm. long and 9 cm. wide, lowest pinnae reduced or not, rachis scaly; pinnae sessile, the base broadly rounded on the lower side and more or less barbed on the upper, obtuse or acute, crenate, serrulate, or subentire, brownish, clothed beneath with lacerate or ciliate scales; sori round, near the margin, indusia persistent.

Tahiti, common at low and medium altitudes. Meetia, Quayle no. 1871; Grant nos. 4673 and 4720. Borabora, Grant no. 4870. Raiatea, Grant no. 5235.

Pantropic.

3. N. biserrata (Swartz) Schott.

Commonly larger than the preceding species, green, distinctly less scaly, the sori small, in a uniform row well away from the margin, and the pinnae broadly cuneate at the base on the upper side and not at all barbed. Intermediate forms, with the sori remote from the margin but with copious scales on the nether surface, may be hybrids.

Tahiti, apparently less abundant than *N. **hirsutula***. Meetia, Grant no. 4711. Tupai, Grant no. 4824. Huahine, Grant no. 5322.

Pantropic.

Grant no. 5109, from Borabora, Teanopea, on cave walls, altitude 1410 feet, is a sterile plant, with long frond, pinnae too thin, naked, and broad for reference to any local species; but these peculiarities may be due entirely to the habitat.

Bipinnate and other freak forms evolved in cultivation and usually referred collectively to *N. exaltata* are grown as ornamental plants in Papeete, as in all lands.

11. DENNSTAEDTIA Bernhardi

Rhizome creeping, clothed with dark, reddish bristles but never scaly; fronds large and decompound; sori marginal on the frond, terminal on the veins, with a half cup-shaped indusium attached by the base and sides, the margin commonly modified so as in effect to match the indusium and with it to form a whole cup. A genus of about 75 species, mostly tropical.

D. scandens (Blume) Moore.

Frond quadripinnate, of rather indefinite growth, the rachises armed with retrorse prickles by means of which it supports itself on other vegetation; pinnae and pinnules nearly opposite, pinnae up to 70 cm. long; ultimate pinnules sessile or adnate, 7-10 mm. long, 4-5 mm. wide, rounded at apex, inciso-crenate.

Tahiti, Mount Aorai, altitude 1,090 meters, Quayle no. 91; Orofena, altitude 2,638 feet, Grant no. 4225.

Malaya.

12. MICROLEPIA Presl

Rather large terrestrial ferns, with creeping, hairy or bristly rhizome, to which the stipes are not articulate; fronds at least bipinnate, pubescent but never scaly; veins free; sorus dorsal, indusium half cup-shaped, affixed by the base and sides. A genus of about 50 species, mostly tropical and oriental, very closely related to *Dennstaedtia*.

M. scaberula Mettenius.

Stipe up to 75 cm., and frond to a meter or more in height, tri- or quadripinnatifid, the minor rachises and, more sparsely, the costae clothed with brown hairs; secondary pinnules up to 2 cm. long and 8 mm. wide, sessile or adnate, oblique at the base, rounded

at the apex, incised more deeply and less obliquely on the acropetal side, thinly or firmly herbaceous; sori small, submarginal, on the sides of the larger segments or at the bases of the minor sinuses; indusium broadly cup-shaped, naked.

Tahiti, described from collections by Anderson and Vesco; Mount Aorai, Fern ravine, altitude 1,090 meters, Quayle no. 101; Papenoo, Tahinu, altitude 965 feet, Grant no. 4189. Moorea, Afareitu, altitude 70 meters, Quayle no. 144.

Endemic. Reported in error from Papua and New Britain.

Drake lists also *M. Speluncae,* a widespread species which might be here; but his description does not distinguish it, and it is not in our collections.

13. SPHENOMERIS Maxon

Terrestrial ferns of moderate size; rhizome creeping, clothed with small bristles; stipes approximate, not articulate; fronds erect (not scandent), decompound, naked, the ultimate divisions small, cuneate or cuneiform, with a sorus (or two) occupying the apex of each segment; indusium attached by the base and part of the sides. Species few, common in the oriental Tropics, and extending to those of America.

S. chusana (Linnaeus) Copeland.

Stipes 10-40 cm. tall, stramineous, or red, especially toward the base; frond 25-100 cm. tall, ovate, about four times pinnate, the exceedingly numerous ultimate divisions mostly about 5 mm. long and 1-1.5 mm. wide at the apex, with usually a single sorus.

Tahiti, common at middle altitudes. Raiatea, Grant no. 5230. Borabora, Grant no. 4977.

Polynesia to Madagascar and Japan.

14. LINDSAYA Dryander

Epiphytes and terrestrial ferns, mostly small; rhizome creeping, bearing small, reddish or dark paleae, which are mostly very narrow; stipes approximate or remote, not articulate; fronds pinnate or more compound, the pinnae or pinnules dimidiate (cut away on the lower side), thin, glabrous; veins free or reticulate; sori close to the margin, on the ends of free veins or on transverse anastomosing veins, in the latter case widened parallel to the margin. A large genus, of all warm lands, characterized in common with many species of *Adiantum* by the dimidiate leaflets and distinguished from these by the opening of the indusium on the side toward the margin.

Simply pinnate.....1. **L. macraeana**
Bipinnate.....2. **L. decomposita**

1. L. macraeana (Hooker and Walker-Arnott) Copeland.

Rhizome freely scandent, clothed with brown scales; fronds close or remote, on stipes 1-3 (or -5) cm. long, the fronds up to 40 cm. long and 3.5 cm. wide, narrowed

toward both ends, pinnate, with very many contiguous, short-stalked pinnae; pinnae strictly dimidiate, recurved or not so, rounded on the outer end, the upper and outer margins crenate, herbaceous; veins free except as two sometimes unite to bear a sorus; sori small, one to each lobule, well below the margin.

Tahiti, Orofena, altitude 2,215 feet, Grant no. 4205. Reported by Drake from Moorea.

Hawaii to Assam; common in the Malay region.

2. L. decomposita Willdenow.

Rhizome 2-3 mm. thick; stipes commonly 30 cm. or more tall; frond about as long as the stipe, bipinnate, with a terminal pinna like the lateral ones; pinnae subsessile, commonly 15 cm. long and 2 cm. wide, sometimes longer, acuminate, narrowed to the base; lowest pinnules flabellate, middle ones dimidiate, their upper and outer margins entire or slightly incised; veins sparingly anastomosing; sori several, or uniting to form a few or one, continuous along the upper and outer margin; indusium broad, but not reaching the margin. Our specimens are all bipinnate, with slender, acuminate pinnae.

Tahiti, common at middle altitudes, and variable.

Westward to Asia.

Lindsaya blumeana (Hooker) Kuhn was reported from Tahiti by Drake. It is bipinnate, with dissected pinnules, and probably the same species reported from Fiji as *L. tenuifolia.*

15. PITYROGRAMMA Link

Terrestrial ferns of moderate size, with short, scaly caudices and clustered, dark stipes; fronds pinnately compound, with a powdery coating on the nether surface; sporangia growing from the veins, in sori without definite length, and without indusium, finally covering the nether surface. A small genus of the American Tropics.

P. calomelanos (Linnaeus) Link.

This popular cultivated fern has run wild in Tahiti, and many places in the Orient. It has bipinnate fronds and acute pinnules; the powder is usually white.

Tahiti, Papenoo river, altitude 440 feet, Grant no. 4048.

16. HYPOLEPIS Bernhardi

Rather large terrestrial ferns, with stipes seriate on a slender, hairy, creeping rhizome; fronds several times pinnate; veins free; sori typically marginal, round, each protected by a modified, reflexed marginal lobe. A small, pantropic genus, related to *Dennstaedtia, Paesia,* and *Pteridium.*

H. tenuifolia (Forster) Bernhardi.

Stipe of well-developed plants more than a meter tall, and the frond still longer, broadly ovate, and three or four times pinnate, the axes and nether surface more or less

clothed with short, pale hairs; indusium broader than long, sometimes invisible when the sporangia are mature.

Tahiti, end of road to Fort Faa Rahi, Setchell and Parks no. 18; Orofena (Orohena), altitude 1,350 meters, MacDaniels no. 1551; Tautira, altitude 5 feet, Grant no. 4001. Moorea, Putoa, altitude 1,140 feet, Grant no. 5390.

New Zealand to China. The type locality is China.

This is a very variable species, if indeed it be one. Brackenridge distinguished his Tahitian specimen as a new species, *H. dissecta.* There are at least three forms of fairly different appearance in Tahiti, but in this instance I incline to agree with Hooker (Species Filicum, vol. 2, p. 61, 1851-58) in treating the diverse forms as a single species.

17. PAESIA St. Hilaire

Rhizome slender, creeping, hairy; stipes slender, maroon or sometimes reddish-stramineous, usually minutely rough; fronds several times pinnate, the leaflets of every order alternate, borne usually at a right angle or deflexed, the ultimate pinnules or segments very small, oblique, soriferous on the acropetal or on both sides; soriferous margins inflexed, the margin, after being bent in, changing to a thin, broad "false" or secondary indusium, the true or primary indusium underlying the sporangia. A small genus, in the Tropics and Southern Hemisphere.

Frond herbaceous.....1. **P. divaricatissima**
Frond coriaceous.....2. **P. tahitensis**

1. **P. divaricatissima** (Dryander: Baker) Copeland, combinatio nova.

Pteris divaricatissima Baker, Synopsis filicum, 2d ed., p. 163, 1874.
Cheilanthes divaricatissima Dryander, Mss., teste Baker.

Stipe up to 120 cm. or more tall, slender and erect, almost smooth, nearly black, shining; frond large, sprawling, it and the major pinnae perhaps of indefinite length, quadripinnate, rachises somewhat zigzag, almost smooth; ultimate pinnules 3-4 mm. long, 2-3 mm. wide, oblique at base and decurrent, the sterile margin deeply toothed, herbaceous, glabrous; both indusia very thin, with shallowly lacerate margin.

Tahiti, the type locality; Papenoo, Tahinu-Maroto, altitude 1,165 feet, Grant no. 4177.

Endemic.

2. **P. tahitensis** Copeland (pls. 10, 11).

Smaller than the preceding species, with rougher axes, manifest dark tubercles on the minor rachises and costae, smaller, coriaceous segments, and firmer outer indusium.

Tahiti, Pirae-Moua trail, Quayle no. X; summit of Aorai, altitude 6,700 feet, Grant no. 3802; Orofena, altitude 3,115 feet, Grant no. 4217, sterile.

Endemic.

18. PTERIDIUM (Gleditsch) Kuhn

Rhizome creeping underground, hairy; stipes stout, light-colored; fronds deltoid, tripinnate, the lower pinnae opposite, coriaceous, the utimate divisions elongate; sori protected by a continuous reflexed margin, the edge of which is modified as a "false" indusium; the true indusium, under the sorus, is often rudimentary. A genus usually construed as a of a single species, which is then the most widespread of ferns. Very near to *Paesia,* and sometimes combined with it.

P. aquilinum (Linnaeus) Kuhn.

The sole Tahitian record is that of Forster, who made here the type collection of *Pteris esculenta,* now usually reduced to *P. aquilinum.* If construed as distinct, it may range across the Malayan-Polynesian area. Forster reported it as a food plant, called *e-narre* by the Tahitians. Assuming that there was no mistake as to the source of his plant—for there is no question as to its identity—its absence from all later collections suggests that it does not beseem a wild plant to be edible.

19. HISTIOPTERIS (Agardh) J. Smith

Large terrestrial ferns, with the stipe remote on a creeping rhizome clothed with bristle-like paleae, the axes dark and polished; fronds bipinnate or more compound, deltoid and with the lowest pinnules stipule-like, or of indefinite growth in length, glabrous, pale beneath; venation reticulate; sori linear, continuous along the margin, and protected, as in *Pteris,* by a reflexed scarious outgrowth of the margin. Pantropic.

H. incisa (Thunberg) J. Smith.

Frond of moderate or great size, as the growth of the rachis has no definite limit; the pseudostipules at the bases of the pinnae are small and broad, and the lobes of the almost pinnate pinnules are broadly or narrowly triangular. This local form has been distinguished as *Pteris Moerenhoutii* or *P. moerenhouttiana.*

Tahiti, ridge to Aorai, altitude 2,500 feet, Grant no. 3730; Papenoo, Ivafatautau, altitude 1,400 feet, Grant no. 4192; Hitiaa, Puunui, altitude 1,280 feet, Grant no. 4476.

All warm countries.

20. PTERIS Linnaeus

Terrestrial ferns, with the stipes approximate or clustered on a short-creeping or suberect rhizome clothed with paleae; fronds pinnate or pedate in plan, once or more compound; veins free or anastomosing; sori marginal, elongate, protected by the modified, reflexed margin. A large genus, of world-wide occurrence.

Veins free
- Pinnae up to 15 cm. long ..... 1. **P. deltea**
- Larger pinnae over 30 cm. long ..... 2. **P. decussata**

Venation reticulate
- Segments up to 15 mm. long
  - Lowest pinnae tripinnatifid ..... 3. **P. tripartita**
  - Lowest pinnae bipinnatifid ..... 3a. **P. milneana**
- Larger segments over 30 mm. long ..... 4. **P. comans**

1. **P. deltea** Agardh.

Stipe 30-40 cm. tall, it and the rachis maroon, smooth; frond 30-40 cm. long, deltoid-ovate, acuminate, tripinnatifid at the base, pinnatifid at apex, elsewhere bipinnatifid; basal pinnules and medial pinnae cut very nearly to the axis into acute segments 1-2 cm. long, decurrent at the base, glabrous, dark, firm-herbaceous.

Tahiti, Diadem face, altitude 3,540 feet, Grant no. 3571; Fautaua, below Diadem, altitude 3,025 feet, Grant no. 3577.

Endemic.

P. tremula R. Brown has been reported in Tahiti; if present, it has been introduced, being popular in cultivation.

2. **P. decussata** J. Smith.

A very large fern, the stipe 60-100 cm. tall, 7 mm. in diameter, scaly in the lower part and roughened upward by scale-bases, dark-maroon and shining, as are all the axes: frond a meter long, with many pinnae, of which the lowest are up to 45 cm. long, cut hardly to the costa into segments 3-4 cm. long and 3-4 mm. wide above the dilated base, serrulate where sterile.

Tahiti, Tautira, Tarui, altitude 1,160 feet, Grant no. 3963; Papenoo, Tahinu, altitude 1,170 feet, Grant no. 4176.

Westward across Malaya.

The Tahitian plant is like that of Fiji, and not identical with that of the Philippines.

3. **P. tripartita** Swartz.

A large fern of moist lowlands the frond broadly deltoid or tripartite: the central of the three main parts is bipinnatifid, with numerous, mostly sessile, acuminate pinnae, pinnatifid to within 1 or 2 mm. of the costa into oblong lobes; the lateral main parts, or basal pinnae, are like the terminal one, or more commonly are forked near the base into two such bipinnatifid portions; costae of adjacent segments connected by a vein parallel to the costa of the pinna, the veinlets also anastomosing in the segments.

Tahiti, Fautaua valley, Tilden no. 85; road to Fort Faa Rahi, Setchell and Parks no. 20; Tipaerui, altitude 1,135 feet, Grant no. 3515.

Westward to Africa.

3a. **P. milneana** (Hooker) Baker.

Smaller than the preceding species, up to 50 cm. in height, as contrasted with 1-2 meters, and accordingly less divided. As to the plant in hand, I regard it as a small form of *P. tripartita*.

Tahiti, Vaiarava, altitude 105 feet, Grant no. 3976.

Solomon Islands, Fiji.

4. P. comans Forster.

A large, coarse fern; stipe stramineous to brown, 30-75 cm. tall, glabrescent; frond as long, deltoid-ovate, sparingly bipinnate; the intermediate pinnae up to 30 cm. long, stalked, consisting, beside the apex, of about ten pairs of alternate, lanceolate, acuminate segments, 1 cm. or more wide, connected by a wing which is broad above and disappears near the rachis, leaving the segments free (as pinnules); basal pinnae larger, with a few pinnatifid pinnules; veins anastomosing freely. The material in hand shows notably wide variation.

Tahiti, common, especially at lower altitudes. Borabora, Otemanu, altitude 1,285 feet, Grant no. 4939.

Polynesia to New Zealand and Tasmania.

Tahiti is also the type locality of *P. Nadeaudi* Drake, described from Nadeaud no. 129, and otherwise unknown, collected in Tearafau valley, altitude 1,000 meters. It is distinguished from *P. comans* and *P. tripartita* by having a prickly rachis.

21. ACROSTICHUM Linnaeus

A large fern growing in brackish swamps; caudex erect, stout but short; stipes clustered, stout, scaly at the base only; frond pinnate, pinnae alternate, stalked, commonly 15-20 cm. long, 5-6 cm. broad, mucronate, entire, coriaceous; venation finely reticulate, without free veinlets; a few apical pinnae fertile, their entire nether surface covered by a thick layer of deep-brown paraphyses and sporangia.

A. aureum Linnaeus.

Recognizable by the generic description.

Tahiti, Tilden, Quayle, Setchell and Parks, MacDaniels, and Grant.

Pantropic.

22. CHEILANTHES Swartz

Small terrestrial ferns, with clustered, dark, polished stipes and rachises; fronds pinnate to tripinnatifid, the lowest pinnae usually obliquely deltoid; veins free, enlarged at the marginal ends; sori on these enlarged apices, commonly confluent at maturity, often protected by a false indusium formed by the thin, reflexed margin. A world-wide genus, with centers of evolution in America and China.

Surfaces naked or nearly so.....1. **C. tenuifolia**
Surfaces hairy.....2. **C. hirsuta**

1. C. tenuifolia (Burmann) Swartz.

Stipes approximate on a creeping rhizome, 10-20 cm. tall, fibrillose-scaly near the base; frond 10-20 cm. or more long, one-fourth to three-fourths as wide, subdeltoid, small specimens bipinnate, large ones quadripinnatifid at the base, the segments 2-4 mm. long by half as wide, glabrous, or nearly so, and green, herbaceous to subcoriaceous; the reflexed margin feebly developed.

Borabora, Otemanu, altitude 1,740 feet, Grant no. 4976, small and somewhat hairy; Matahinaa, altitude 400 feet, Grant no. 5043, typical in form and slightly hairy.

New Zealand to India; sometimes construed to include American forms.

2. **C. hirsuta** (Poiret) Mettenius, *non* Link.
   Notholaena hirsuta Desvaux.
   N. pilosa Hooker et Arnott.

In the collection in hand, this species is distinguishable from *C. tenuifolia* by being decidedly hairy, and by the fact that the margin, although often reflexed over the sporangia, is not modified as an indusium. The two species are closely related, and their generic separation is not justifiable.

Tahiti, lower end of Punaruu valley, Setchell and Parks no. 75.

Westward to Asia.

23. DORYOPTERIS J. Smith

Small terrestrial ferns, with short stems; stipes fascicled, long, dark, polished, wiry, bearing narrow costate paleae near the base; fronds deltoid, lobed or sparingly compound, coriaceous; veins free or anastomosing, immersed; sori marginal, protected by a narrow, reflexed margin or (false) indusium. Commonest in the American Tropics.

D. concolor (Langsdorff and Fischer) Kuhn.

Small fronds are not quite compound. Larger ones (up to 7 cm. long and wide) have a pair of deeply cut basal pinnae, on most fronds adnate, the basal segments on the lower side large and again pinnatifid; and a symmetrical middle part, composed of a pair of pinnatifid intermediate segments, and a short, pinnatifid terminal one.

Tahiti, Missionary valley, Tilden no. 68; road to Fort Faa Rahi, Setchell and Parks no. 27; Punaruu valley, 73; and beyond Papenoo bridge, 279.

Pantropic.

24. ADIANTUM Linnaeus

Terrestrial ferns of moderate size, with dark, polished, fascicled stipes bearing at the base small, narrow, non-costate paleae; fronds pedate or pinnately compound; sori marginal, more or less round, the sporangia borne on and protected by reflexed lobes or (false) indusia, which thus open on the side away from the margin of the frond. A large genus, of world-wide distribution, many of its species notably handsome and favorites in cultivation.

Leaflets all flabellate.....1. **A. Capillus-Veneris**
Most leaflets dimidiate.....2. **A. hispidulum**

1. A. Capillus-Veneris Linnaeus.

A small fern, fronds simply pinnate, with a terminal pinna like the others or larger, or the lower pinnae again similarly pinnate; pinnules fan-shaped, the base broad or cuneate, the outer margin irregularly incised, glabrous, thin; sori small, with glabrous indusium.

Tahiti, on walls of main Maara cave, Setchell and Parks no. 333; the only Tahitian record.

Almost world-wide.

2. A. hispidulum Swartz.

Total height 25-40 cm., more than half of which is the stipe in most specimens, frond deltoid or pedate in plan, the large, unpaired basal pinnae bearing compound branches on the lower side; stipes persistently fibrillose-paleate; lowest pinnules flabellate, the others obliquely rhomboidal, harshly papyraceous, clothed with small, white hairs, sharply dentate on the outer margin; sori numerous, small, and round.

Tahiti, common at low and middle altitudes, often on rocks. Borabora, Anau, Tanaopea, altitude 1,410 feet, Grant no. 5104.

Westward to Africa.

Grant collected *A. Braunii* Mettenius, in cultivation. Other exotic species are likely to be brought in and to escape. *A. pulverulentum* Linnaeus was reported here by Guillemin.

25. OLEANDRA Cavanilles

Epiphytic or terrestrial and shrub- or vine-like ferns, with slender rhizomes covered with peltate scales, which, at least when young, have tips long drawn out; stipes articulate to pedicels on the rhizome; fronds simple and entire, slender, costate, with close, widely divergent free veins; sori dorsal on the veins, in one more or less definite row on each side of the costa; indusium persistent, in general reniform, fixed by a broad sinus, opening obliquely outward and toward the apex. Tropics of both hemispheres.

O. Sibbaldii Greville.

O. Whitmeei Baker.

Rhizome clothed with copious spreading, linear, entire, rusty-red paleae 1 cm. long, wide-spreading and sending down many filiform aerial roots; stipe and pedicel together 1.5-3.5 cm. long, jointed about the middle, scaly; frond up to 40 cm. long and 4 cm. wide, caudate, rather abruptly rounded at the base, beautifully ciliate and with a line of swollen vein-tips just inside the margin, thin in texture, the surfaces sparingly pubescent, the costa prominent beneath and bearing abundant horizontal, linear, pale paleae 4-5 mm. long; sori in an irregular row 2.5-4 mm. from the costa, often with a less perfect second row farther out; indusium round-reniform, pubescent in the middle.

Tahiti, the type locality, Aorai, altitude 1,090 meters, Quayle no. 61; Orofena (Orohena), altitude 1,200 meters, MacDaniels no. 1531; ridge to Aorai, altitude, 3,620 feet, Grant no. 3704; Papenoo, Mataiea ridge, altitude 2,700 feet, Grant no. 4095.

Marquesas, Samoa, Fiji, (Celebes?), Philippines.

26. LEUCOSTEGIA Presl

Terrestrial ferns with stout, creeping, scaly rhizomes, stramineous stipes articulate to projections of the rhizome, and ample glabrous decompound fronds; ultimate segments mostly cuneate; sori terminal on the veins, submarginal near the apex of the leaflets; indusium pale, firm, in the local species half cup-shaped, attached by base and sides. Two species in the oriental Tropics.

L. pallida (Mettenius) Copeland.

Stipe 60 cm. tall; frond as long, broadly ovate, about five times pinnate in the lower part; lowest pinnae 30 cm. long; ultimate pinnules up to 1 cm. long and 6 mm. wide, entire or with cleft apex, pale-green, firm-herbaceous.

Tahiti, Lake Vaihiria, altitude 1,700 feet, Grant no. 4109; Hitiaa, Teaipoe, altitude 1,090 feet, Grant no. 4477. New to Tahiti.

Samoa, Aneityum, New Guinea, Mindanao, Borneo.

27. HUMATA Cavanilles

Small epiphytic ferns, with scaly, creeping rhizomes, to which the stipes are articulate; fronds simple and broadly lanceolate, or pinnatifid, or in most species more than once pinnatifid or pinnate and deltoid in outline, coriaceous, smooth or scaly; veins free; sori dorsal, at the ends of veinlets; indusium conspicuous and persistent, transversely oblong or reniform, attached by the base only. The Malayan-Polynesian region; about 35 species.

Frond pectinate
- Sinuses broad at base
  - Rachis brown ..... 1. **H. pectinata**
  - Rachis black ..... 2. **H. melanophlebia**
- Sinus narrow, segments close ..... 3. **H. huahinensis**

Frond deltoid, bipinnatifid ..... 4. **H. Anderssonii**

1. **H. pectinata,** of Hooker and others (pl. 12, *C*).

Rhizome widely scandent, completely covered with dark appressed paleae; stipes about 10 cm. long, sparsely scaly, at least near the base; frond more or less as long as the stipe, half as wide as long, acuminate, regularly pinnatifid in the upper part to a winged rachis, and pinnate near the base; segments or pinnae about 3 mm. wide, not crowded, adnate, obtuse, entire or obscurely crenate, coriaceous, the nether surface bearing sparse scales which merge into hairs; the lowest pinnae hardly longer, but dilated, and pectinate on the lower or both sides; sori in close rows along both margins; indusium firm, opening obliquely toward the margin.

Tahiti, common at moderate altitudes; Setchell and Parks nos. 441, 518, 530; Wilder no. 323; MacDaniels nos. 1304, 1731; Grant nos. 3566, 3880, 3912, 4083, 4407. Huahine, Grant no. 5274, sterile. Borabora, Grant no. 4986. The foregoing specimens are reasonably uniform. Grant no. 5383,

from Moorea, is a freak plant, with a variety of fronds on a single rhizome, but a general tendency of the pinnae to be contracted at their bases. Grant no. 4936, from Borabora, has elongate, subfalcate pinnae.

Polynesia.

2. **H. melanophlebia** Copeland (pl. 12, *A*).

A larger relative of the preceding species, fronds 10-12 cm. long, 7 cm. wide at the base, the black rachis very narrowly winged, pinnae acute, the lowest enlarged, subpectinate on both sides but especially on the lower, middle pinnae inciso-serrate, not quite glabrous.

Tahaa, Ohiri, altitude 1,110 feet, Grant no. 5144.

Endemic.

3. **H. huahinensis** Copeland (pl. 12, *B*).

Similar to *H. pectinata*, but the axes of the frond black beneath, the frond not cut to its costa, the sinuses narrow, so that the segments are crowded, and the basal pinnae distinctly longer than the others.

Huahine, Grant no. 5295.

Endemic.

A Tahaa specimen, Grant no. 5144, has black axes and enlarged basal pinnae, dilated sinuses, and a number of inciso-serrate pinnae above the basal pair. Apparently each island has developed in this group a peculiar strain which might be construed as a distinct species.

4. **H. Anderssonii** Mettenius.

Stipe about 6 cm. long, clothed, like the rachis, with dark, acuminate, deciduous paleae; frond deltoid, up to 10 cm. long, fertile fronds likely to be more dissected and larger than the sterile, sometimes quadripinnatifid at the base; sterile pinnae and pinnules acute.

Tahiti, Fautaua, below Diadem, altitude 2,500 feet, Grant no. 3566; ridge to Aorai, altitude 3,990 feet, Grant no. 3709; Papenoo, Aua Pua, altitude 1,220 feet, Grant no. 4082; Mahina, Ahonu-tuauru, altitude 2,860 feet, Grant no. 4406.

Endemic.

Brackenridge reported from Tahiti *H. heterophylla* (Smith) Desvaux (as *H. ophioglossa Cavanilles*). It has simple fronds, the sterile lanceolate and entire, the fertile pinnatifid with broad, rounded segments.

28. DAVALLIA Smith

Epiphytic ferns of moderate size; rhizome wide-creeping, clothed with scales with peltate, persistent bases; stipes articulate; frond deltoid, compound and dissected, coriaceous; indusium firm and persistent, attached by the base and sides, opening toward and close to the margin. Throughout the Old World Tropics; about 40 species.

Indusium cylindrical, truncate.....1. **D. solida**
Indusium ovate, with free apex.....2. **D. epiphylla**

1. D. solida (Forster) Swartz.

Rhizome about 6 mm. in diameter, covered with the black bases of scales which lose the brown apices; stipe up to 25 cm. long; frond up to 45 cm. long but usually much smaller, deltoid, large specimens quadripinnatifid at base, small ones hardly bipinnatifid, brownish-green, glabrous, rigidly coriaceous, without false veins; indusium more than twice as long as broad, truncate, the sides attached throughout.

Tahiti, common at sea level and reaching 900 meters altitude, D'Urville, Tilden, Setchell and Parks, Whitney Expedition, Brown, MacDaniels, Grant. Tupai, altitude 3 feet, Grant no. 4823.

Westward to Burma.

2. D. epiphylla (Forster) Sprengel.

Stipe commonly 45 cm. long; frond equally long and as wide, quadripinnate in large forms, with the tertiary pinnules deeply cut, subcoriaceous, with false veins recurrent between the veinlets; fertile segments 2-pronged at the apex, the teeth flanking the sorus, which is so immersed as to be about equally prominent on the two surfaces; indusium ovate, attached by the lower part of the sides, but the upper part free and projecting beyond the margin.

Tahiti, common at lower altitudes and up to 1,000 meters. Huahine, Matoereere, altitude 1,875 feet, Grant no. 5350.

Polynesia.

Forster described two species, *Trichomanes epiphyllum* and *T. elatum,* both of which are now known as *Davallia.* Tahiti may be the type locality of either or both. According to Hooker (Species Filicum, vol. 1, p. 166, 1844-46), the Forster specimens in the Banksian herbarium are one species. Schkuhr depicted both from Forster specimens, and such differences as appear in his figures do not represent Forster's distinctions. The more discriminating attitude usual to-day does not let us follow Hooker in nearly all his combinations of species, but in this instance I am disposed to do so. The typical *D. elata* is the species in its usual full development, *D. epiphylla* having been a smaller, less dissected form; but *epiphylla* must be retained as the specific name, having priority.

29. ARTHROPTERIS J. Smith

Small epiphytic ferns, with slender, wide-scandent rhizome clothed with small, deciduous scales, on which the remote stipes are articulate to short stubs or phyllopodia; fronds pinnate; pinnae oblique, usually articulate to the rachis; veins free; sori dorsal on the pinnae, terminal on the veinlets, indusium round-reniform or wanting. A small genus of the Old World Tropics and farther south.

A. obliterata (R. Brown) J. Smith.

Stipes short; fronds 15-30 cm. long; pinnae subsessile, 15-30 mm. long, 5-8 mm. wide, rounded at the apex or acute, base cut away to the costa at the lower corner,

truncate and slightly auricled on the upper side, upper margin entire or slightly crenate; sori in a row midway or nearer to the margin than to the costa; indusium inconspicuous or persistent.

Tahiti, Maara valley, Setchell and Parks no. 428.

Westward to Africa.

30. HYMENOLEPIS Kaulfuss

Epiphytic ferns, with approximate stipes articulate to a short-creeping scaly rhizome; frond simple and elongate, entire, costate; veins immersed and inconspicuous, forming a net, with free included veinlets; sporangia without distinction of sori, covering the back of a distinct terminal segment, which is linear in Polynesian species, protected while young by the deflexed margin. Polynesia to Africa.

H. revoluta Blume.

Paleae entire or nearly so, with dark, thick cell-walls; stipe 3-6 cm. long; sterile frond or segment 15-30 cm. long, 1-2 cm. wide, attenuate at base and sterile apex, more abruptly narrowed to a neck at the base of the fertile segment, which is 5-15 cm. long, 2-3 mm. broad.

Tahiti, common at moderate altitudes. Moorea, Putoa, altitude 735 feet, Grant no. 5384.

New Caledonia to Annam. The very similar *H. mucronata* Fée is in Fiji, Rarotonga, and the Marquesas.

31. CYCLOPHORUS Desvaux

Epiphytic ferns, with slender, scaly, creeping rhizomes, articulate stipes, small, simple, coriaceous fronds, stellate scales or hairs, immersed reticulate venation, and no indusia. A large, natural genus, ranging from Malaya to Africa, Japan, and New Zealand, with two questionable American species.

Sori moderately large, in one or two irregular rows.....1. **C. blepharolepis**
Sori very large, in one regular row on each side of costa.....2. **C. macrocarpus**

1. C. blepharolepis Christensen.

Rhizome creeping widely, covered with scales with acuminate, ciliate, brown apices, which are deciduous, leaving the appressed black bases; stipes of sterile fronds about 2 cm., of fertile fronds 3-4 cm. tall; sterile fronds 5-8 cm. long, up to 1 cm. broad, fertile fronds 10-15 cm. long, 6-8 mm. broad, clothed with rather deciduous stellate scales with small black centers and white rays; sori up to 2 mm. wide, in one or two irregular rows, near the margin, in the upper part of the frond, sometimes crowded.

Tahiti, the type locality; very common at lower levels, and ranging up to about 1,200 meters. Meetia, R. H. Beck; Grant no. 4715. Borabora, Grant no. 4934. Moorea, Grant no. 5385.

Fiji.

2. **C. macrocarpus** (Hooker et Arnott) Copeland.

Sterile fronds commonly 7 cm. long and 15 mm. wide; fertile fronds somewhat longer and narrower; sori commonly 4 mm. wide, sometimes elongate and 6 mm. long. More nearly related to the preceding species than to the Malayan *C. angustatus*, with which it was long confused.

Tahiti, Whitney Expedition no. 2211. There are several earlier records. Polynesia.

The Society Islands are explicitly the type locality of *Cyclophorus acrostichoides* (Forster) Presl, *Polypodium acrostichoides* Forster (Prodromus, no. 434). For some reason this was regarded as questionable even before the failure of other collectors to find it would have attracted attention. Swartz, who amplified many of Forster's descriptions, seems likely to have done so in this case from Java specimens; and Schkuhr, who figured many Forster species, ignored this one. Hooker (Species Filicum, vol. 5, p. 44, 1863-64), cites Swartz as authority for the name, and questions its being Forster's plant. If it is not, the name must be given up. Of course, the failure of all later botanists to detect it here is not proof that Forster did not do so. My guess, however, is that his notes were in error, and that he collected it in Tanna, whence we have a recent collection of it.

It is not so easy to believe that he made the same mistake with *Pteridium aquilinum* (*Pteris esculenta*), to which, as an edible plant, he paid particular attention. Still, this may be the explanation of that case also. It occurs in Aneityum and probably in Tanna and is common in New Zealand.

32. ELAPHOGLOSSUM Schott

Terrestrial and epiphytic ferns, with short-creeping rhizomes and clustered fronds on non-articulate stipes; fronds simple and entire, firm to leathery, strongly costate, with inconspicuous free veins; fertile and sterile fronds distinct, the fertile mostly longer stalked and narrower, with the nether surface completely covered by sporangia, without any distinction of sori. A "genus" of perhaps 400 species, in the Tropics of both hemispheres, best developed in the Andes, fairly uniform in aspect, but polyphyletic.

The identification of the Polynesian species is very unsatisfactory. The collections have been very meager, except in Hawaii, and there is the utmost confusion in the application of the names of the Hawaiian species.

Veins free throughout
- Fronds naked or bearing bristles
  - Fronds bristly, fertile frond lanceolate ..... 1. **E. samoense**
  - Fronds glabrescent, fertile frond broader ..... 2. **E. Societarum**
- Fronds bearing minute scales ..... 3. **E. tahitense**

Veins connected at their tips ..... 4. **E. gorgoneum**

1. E. samoense Brackenridge.

Rhizome short and stout, deeply covered with roots, stipe-bases and chestnut acicular paleae; stipes clustered, about 10 cm. long (or less in small forms), beset with persistent, ferruginous, acicular paleae about 3 mm. long, with enlarged bases; sterile fronds up to 25 cm. long and 3 cm. wide, the apex acute or obtuse, the base broadly cuneate or rounded, brownish-green, subcoriaceous, the margin and costa beset with acicular paleae smaller and paler than those on the stipe, the surface similarly but more sparsely clothed; veins widely diverging, forked, ending in dots just within the margin; fertile fronds on a stipe (in Tahitian specimens) as long as that of the sterile or a little longer, but the frond itself not more than half as long and wide.

Tahiti, Orofena (Orohena), altitude 1,200 to 1,500 meters, MacDaniels nos. 1547 and 1549 and Grant no. 4263. Altitude accredited to Tahiti in Christ's monograph of the genus, page 109.

Samoa.

The Tahitian specimens fit the description except that Christ states that fertile fronds have a shorter stipe.

2. E. Societarum Copeland (pl. 13).

Similar to the preceding species, but the fronds thinner, green, and with glabrescent surfaces, the veins at a more acute angle, and the fertile frond relatively short and broad—up to 5 cm. long and 2.5 cm. broad.

Tahaa, Ohiri, altitude 1,260 feet, Grant no. 5156. Huahine, Matoereere, altitude 1,640 feet, Grant no. 5281.

Endemic.

3. E. tahitense Brackenridge.

Rhizome short-creeping, clothed with linear, ferruginous paleae; stipes close but not clustered, stout, brown, up to 10 cm. long (sterile frond) or 15 cm. long (fertile frond), clothed with fine, narrow scales which are deciduous except near the base; sterile frond up to 35 cm. long according to Brackenridge, but at most 25 cm. in our specimens, about 3 cm. wide, obtuse, with decurrent base, brownish-green, coriaceous, the surfaces bearing minute, scattered, ferruginous scales; costa prominent beneath; veins inconspicuous, free, without enlarged tips.

Tahiti, Ronui, altitude 980 feet, Grant no. 3888; Hitiaa, Puunui, altitude 1,025 feet, Grant no. 4498.

Endemic.

Besides this species, Drake lists *E. conforme,* as collected by the United States Exploring Expedition. I find no report of it by Brackenridge; and this is the only known local species near to *E. conforme.*

4. E. gorgoneum (Kaulfuss) Brackenridge.

Rhizome creeping, stout, densely covered with ferruginous, linear, crinkly paleae 10-15 mm. long; stipes near together, up to 25 cm. long, jointed 1 cm. above the rhizome; sterile frond up to 50 cm. long and 7 cm. wide, acute, narrowly cuneate at base, sparsely squamulose but becoming naked; veins connected at the tips; fertile frond somewhat shorter and narrower.

Tahiti, Orofena, (Orohena), in moss, MacDaniels no. 1482; Tautira, Tarui, altitude 860 feet, Grant no. 3983; Orofena, altitude 3,525 feet, Grant no. 4269; Hitiaa, Puunui, altitude 1,290 feet, Grant no. 4497. Borabora, Tarapaia, altitude 2,035 feet, Grant no. 4984. Tahaa, Ohiri, altitude 1,560 feet, Grant no. 5174.

Hawaii, Rarotonga.

Tahitian (and Rarotongan) specimens differ uniformly from any we have from Hawaii bearing this name, in that the former have the rhizome more deeply immersed in paleae. However, the original description reads, "Caudex paleis pollicaribus ferrugineis lineari-subulatis horrens."

33. POLYPODIUM Linnaeus

Small, mostly epiphytic ferns, with fronds articulate to a creeping rhizome, or with the stem shortened until it is effectively erect and the articulation then vestigial or obsolete; fronds pinnatifid, or simple pinnate with contiguous, adnate, entire pinnae, or rarely more dissected; veins free; sori round, exindusiate, not solitary on folded pinnae. A large and cosmopolitan genus, even as construed here.

Sori several on each segment.....1. **P. blechnoides**
Sorus one on each segment.....2. **P. subcoriaceum**

1. **P. blechnoides** (Greville) Hooker.

P. decorum Brackenridge, but not of most later authors.

Fronds densely clustered, short-stalked, up to 25 cm. long and 2 cm. wide, narrowed gradually to both ends, pinnate to a black rachis, coriaceous, naked except for a few minute hairs on the rachis; pinnae contiguous, adnate, obtuse, entire, 2-2.5 mm. wide; veins immersed; sori sunken, in oblong, obliquely placed receptacles, finally contiguous.

Raiatea is the type locality. Tahiti, Lake Vaheria Valley, altitude 150 meters, MacDaniels no. 305; Papenoo Valley, altitude 75 meters, MacDaniels no. 1504; Vaita Valley, altitude 300 meters, MacDaniels no. 1668. Tahaa, Ohiri, altitude 1,370 feet, Grant no. 5158. Raiatea, Vaiumete, altitude 1,690 feet, Grant no. 5239. Huahine, Matoereere, altitude 1,570 and 1,710 feet, Grant nos. 5310, 5340.

Westward across Malaya.

P. decorum Brackenridge is a later name of *P. blechnoides* (Greville) Hooker. This is so manifest from a comparison of Greville's and Brackenridge's figures that it is hard to see why *P. contiguum* Brackenridge rather than this species was chosen for reduction to Greville's species. Greville's type was from Raiatea, collected by Sibbold; Brackenridge's from Tahiti. We have identical recent collections from both.

P. contiguum Brackenridge was described from Fiji and is unknown in the Society Islands. This name not being tenable, J. Smith proposed

Cryptosorus Seemanni as a substitute. By present usage in generic names, it becomes **Polypodium Seemanni** (J. Smith, Bonplandia, vol. 9, p. 262, 1861).

Tahiti is the type locality of *P. purpurascens* Nadeaud, like the preceding in size and form, but the surfaces densely beset with minute black hairs, It occurs in Fiji also.

2. P. subcoriaceum Copeland (pl. 16).

Paleae broadly lanceolate, 1-1.5 mm. long, harsh, iridescent, turning black; frond subsessile, up to 8 cm. long and 3 mm. wide, very firm in texture, entirely naked; segments obliquely triangular, the fertile concave from the nether surface, with a sorus almost as large as the segments.

Tahiti, south of Orofena (Orohena), on tree, altitude 1,500 meters, MacDaniels no. 1478.

Endemic.

Drake cites also *P. tamariscinum* Kaulfuss, which is bi- or tripinnatifid with very small segments; common in Hawaii.

34. PROSAPTIA Presl

Rhizome short-creeping, scaly; stipes approximate, articulate; fronds pinnatifid or hardly pinnate, narrowed to both ends, the lamina glabrous, more or less coriaceous; veins immersed, free; sori immersed and the cavity overgrown by the tissue of the frond, so that the sori open by a marginal or submarginal pore. Small epiphytes of the Malay region, ranging to India and the Marquesas; related to *Polypodium*.

Sori occupying the apex and lateral teeth of the segments.....1. **P. contigua**
Sori hardly marginal on entire or crenate segments.....2. **P. subnuda**

1. P. contigua (Forster) Presl.

Rhizome short, ascending, immersed in lanceolate paleae 5-8 mm. long, which are ciliate with reddish bristles; stipes clustered, 1-4 cm. long, not very densely clothed with hairs about 0.5 mm. long; fronds about 30 cm. long and 3 cm. wide, narrowed to both ends, pectinate to the dark rachis; segments contiguous, 3-4 mm. wide at the base, thence immediately narrowed somewhat, and the sides then entire and parallel half of their length, a few salient teeth then present on each side, making the pinna wider there, coriaceous, almost naked; sori, one in each tooth, which it fills, open at the apex.

Type locality, the Society Islands, perhaps Huahine (Hooker, Species Filicum, vol. 1, p. 161, 1844-46). Tahiti, very common above 250 meters altitude and reaching the summit of Aorai.

Marquesas. Reported also westward across Malaya, but the Malayan plant is not quite the same.

2. P. subnuda (Mettenius) Copeland.

Polypodium subnudum Mettenius, Linnaea, vol. 36, p. 130, 1869.
Prosaptia Emersoni Brackenridge, non Hooker et Greville.

Nearly related to the preceding species, but cut not quite to the costa and the segments not toothed; the sori sunk in cavities opening toward the margin, beyond which the sporangia project.

Tahiti, the type locality, Setchell and Parks nos. 489, 523; MacDaniels nos. 1656, 1689; Grant no. 4085. Huahine, Grant no. 5300. Moorea, Grant no. 5400. Altitudes up to 600 meters.

Endemic.

35. GRAMMITIS Swartz

Small epiphytes with short, scaly rhizomes and clustered fronds, typically simple and entire but sometimes toothed or incised; veins free; sori dorsal, often moderately elongate, exindusiate. Less than 100 recognized species, in the Tropics of both hemispheres. Usually included in *Polypodium*. To avoid new synonyms, the names in *Polypodium* are left unchanged.

Sori in rows
- Stipes over 2 cm. long, hairy ..... 1. **P. subspathulatum**
- Stipes naked or obsolete
  - Fronds thin, glabrescent ..... 2. **P. trachycarpum**
  - Fronds coriaceous, ciliate ..... 3. **P. ligulatum**

Sori scattered ..... 4. **P. tahitense**

1. P. subspathulatum Brackenridge.

Rhizome short, clothed with ferruginous, lanceolate paleae about 3 mm. long; stipes clustered, dark, slender, 2-3 cm. long, clothed with dark horizontal bristles 1 mm. long; fronds 10-20 cm. long, 8-9 mm. wide, narrowed to both ends, coriaceous, sparsely ciliate and setose when young; sori in a regular row midway between the costa and each margin, moderately sunken, the cavities round or somewhat elongate; sporangia naked or bearing very short bristles. Brackenridge described short, broad sterile fronds, absent on all our specimens.

Tahiti, the type locality, Pirae-Moua Aorai trail, Quayle; south of Orofena (Orohena), altitude 1,500 meters, MacDaniels no. 1454; ridge to Aorai, altitude 3,950 feet, Grant no. 3750; Aorai, altitude 5,810 feet, Grant no. 3767; Ronui, altitude 3,145 feet, Grant no. 3927; Orofena, altitude 3,540 feet, Grant no. 4243.

Endemic.

2. P. trachycarpum Mettenius.

Fronds densely clustered, nearly sessile or on slender glabrescent stipes up to 1 cm. long, blades up to 18 cm. long and 7 mm. wide, attenuate to both ends, entire or wavy (in one specimen crenate), naked, firm-herbaceous and translucent; sori in broken rows nearer to the costa than to the margin, each near the base of the acropetal branch of a forked vein, superficial, round or somewhat elongate, the sporangia naked or some bearing very short bristles.

Tahiti, the type locality; Ronui, altitude 3,145 feet, Grant no. 3927 in part. Tahaa, Ohiri, altitude 1,240 feet, Grant no. 5182. Huahine, Matoereere, altitude 1,650 feet, Grant no. 5313.

Endemic.

3. P. ligulatum Baker.

In the Society Islands, a minute fern, with densely clustered stipes 0-5 mm. long and fronds up to 4 cm. long and 3 mm. wide, subcoriaceous; sori costular, almost superficial, round or elongate parallel to the costa; sporangia bearing long hairs. Our material, of many plants, is very variable, but surely represents a single species. The stipe, if present, is usually naked, rarely hairy, even on immature fronds. The surface is likewise usually glabrescent, but rarely remains setose. I am not sure of the identification, but at any rate it is near the Fijian species.

Raiatea, Teapootemehani, altitude 1,900 feet, Grant nos. 5224, 5237. Previously reported from Tahiti. Mixed with Grant no. 3927 is a *Grammitis* of similar small size but perhaps distinct, with persistently long-setose fronds but apparently naked sporangia.

Fiji, Samoa.

4. P. tahitense Christensen.

P. pleiosorum Mettenius.

Stipes crowded, about 1 cm. long, densely beset with reddish hairs nearly 1 mm. long; frond up to 18 cm. long and 15 mm. wide, entire or irregularly toothed, margins and surfaces persistently but sparsely setose, subcoriaceous; veins pinnately branched, the sori on the branches, irregularly scattered, round.

Tahiti, the type locality; south of Orofena (Orohena), altitude 1,400 meters, MacDaniels no. 1546; Ronui, altitude, 1,890 feet, Grant no. 3928; Ronui, altitude 3,145 feet, Grant no. 3927 in part; Orofena, altitude 3,540 feet, Grant no. 4250.

Endemic.

36. CALYMMODON Presl

Small epiphytic ferns, with densely congested, very short, non-articulate stipes; fronds pinnate or the rachis narrowly winged, very thin, commonly hairy, with one vein in each segment; sori, one on each segment in the upper part of the frond, exindusiate but protected by the folding of the segment. A small genus, best developed in Malaya, reaching west to Ceylon.

Frond lax, paleae over 2 mm. long ..... 1. **C. orientalis**
Frond compact, paleae under 2 mm. long ..... 2. **C. Grantii**

1. C. orientalis Copeland (pl. 14, *A*; pl. 15, *A*).

Rhizome slender, its paleae lanceolate, about 3.5 mm. long; fronds up to 12 cm. long, 2.5-4 mm. wide, attenuate downward and merging insensibly into the short stipe; segments obtuse, up to 1.5 mm. wide, usually separated by at least twice their own width, deciduously and very sparsely pilose.

Tahiti: Grant no. 3765, Mahina, ridge to Aorai, altitude 5,820 feet.

Endemic.

2. **C. Grantii** Copeland (pl. 14, *B*; pl. 15, *B*).

Rhizome short, its paleae at most 2 mm. long; fronds practically sessile, and with a short narrowed base; the segments commonly separated by less than their own width, persistently sparingly ciliate.

Tahiti: Grant no. 4404, Mahina, Ahonu-tuaruu, altitude 3,590 feet.
Endemic.

37. LOXOGRAMME (Blume) Presl

Epiphytic and terrestrial ferns, with short-creeping, scaly rhizome, to which the articulation of the stipe is usually vestigial; fronds simple and entire, glabrous, fleshy to coriaceous; veins oblique, immersed and inconspicuous, forking and anastomosing, but without free included veinlets; sori elongate along the main veins, straight and not forking, naked. Malaya and neighboring lands, with one supposed species in Mexico.

L. Parksii Copeland.

Fronds clustered, 25-35 cm. long, 2 cm. wide, sessile or short-stalked; costa rather prominent on both surfaces; veins oblique, overlapping, 1.5-2 cm. long.

Tahiti, Fautaua, altitude 800 meters, Quayle no. 203; south of Orofena (Orohena), altitude 1,200 meters, MacDaniels no. 1530; ridge to Aorai, altitude 4,058 feet, Grant no. 3751; Orofena, altitude 3,140 and 3,540 feet, Grant nos. 4215 and 4249.
Fiji.

38. MICROSORIUM Link

Typically epiphytes, usually of considerable size, with creeping, scaly rhizomes to which the stipes are jointed; fronds simple or pinnatifid, rarely pinnate, firm in texture, usually glabrous; veinlets anastomosing irregularly, with free included veinlets in the areolae; sori typically round, exindusiate. A large genus of the Old World Tropics, related to *Polypodium* and often included in it.

As more than one proper genus is still present in this group, as here defined, and as all our species have names in *Polypodium,* I retain these names for the species not already named in *Microsorium* or more likely to find an eventual place in still another genus (*Phymatodes*).

Fronds simple, sori superficial, very numerous.....1. **M. punctatum**
Fronds pinnatifid or lobed
  Sori superficial, not in regular rows.....3. **P. vitiense**
  Sori slightly immersed, not in regular rows.....2. **P. maximum**
  Sori sunken, in regular rows along the axes
    Sori in broad, shallow pits.....4. **P. Scolopendria**
    Sori in small, usually deeper pits.....5. **P. nigrescens**

1. **M. punctatum** (Linnaeus) Copeland.

Rhizome creeping, woody, clothed with dark-brown scales; fronds up to 90 cm. long and 8 cm. broad, but many much smaller, broadest above the middle, narrowed gradually to the acuminate apex, narrowed downward to a wing extending to the subsessile base, or the base of some, especially on old and well established specimens, somewhat dilated and nest-forming, coriaceous, glabrous; main veins evident, but venation otherwise inconspicuous; sori small, numerous, scattered.

Tahiti, common at low altitudes, Tilden, Quayle, Setchell and Parks, Grant.

West to Africa. The Polynesian plant is notably large.

2. **P. maximum** (Brackenridge) Hooker.

Rhizome creeping on rocks; stipe stout, up to 10 cm. long, above which it is broadly winged by the decurrent blade; fronds more than a meter tall, rarely merely wavy in outline, commonly with irregular lateral lobes 5-20 cm. long projecting from an undivided middle strip 8-10 cm. broad, sometimes more deeply pinnatifid; sori irregularly scattered but with a tendency to form rows parallel to the main veins, slightly sunken and their positions evident on the upper surface, variable in size, round or elongate in any direction.

Tahiti, road to Papenoo river, Setchell and Parks nos. 5, and lower end of Punaruu valley, 77; Punaruu plateau, altitude 2,200 feet, Grant no. 3612. Borabora, Otemanu, altitude 1,660 feet, Grant no. 4973.

Endemic.

Its instability in various respects, and the combination of characters suggest that this very remarkable fern is a hybrid of *M. punctatum* and a "Phymatodes," probably *Polypodium Scolopendria*.

3. **P. vitiense** Baker.

Rhizome creeping on the ground; stipes 10-25 cm. tall; fronds up to 50 cm. long, 30 cm. wide, with decurrent base, pinnatifid into lanceolate, acuminate, entire segments 18 cm. long, 2.5 cm. wide, herbaceous; sori small, superficial, scattered or irregularly seriate.

Tahiti: Tilden no. 387; Maara valley, Setchell and Parks no. 445; Lake Vaheria, altitude 650 meters, MacDaniels no. 1598; Toanoano valley, altitude 175 feet, Grant no. 3869; Vaiaraia, altitude 50 feet, Grant no. 3965.

Fiji, Rarotonga, Samoa.

4. **P. Scolopendria** Burmann.

P. phymatodes Linnaeus.

Rhizome wide-creeping, stout, glabrescent; stipe 5-40 cm. long; frond similarly variable in size, varying from simple and lanceolate and about 10 cm. long to 40 cm. long and pinnatifid with numerous lanceolate segments, entire in detail, glabrous, coriaceous; costae prominent, venation hardly visible; sori large, immersed, and prominent, with depressed center, from the upper surface, in single rows along the costae, or less often with other more remote sori.

Tahiti, a very common epiphyte at sea level and up to an altitude of 1,350 meters. Borabora, Grant no. 5107. Tupai, Grant no. 4822.

West across Africa.

5. P. nigrescens Blume.

A terrestrial or epiphytic fern, with stout, creeping rhizome matted roots and covered with dark scales while young; stipes 30-60 cm. tall, stout, erect, naked, articulate to a stub on the rhizome; fronds up to a meter tall, pinnatifid down to a broad or narrow wing into widely separated lanceolate segments, which may be 30 cm. long and 4 cm. wide, entire, acuminate, thin, glabrous; main veins conspicuous, forming a single row of large major areolae, each with one large, deeply immersed sorus in its middle, the sori projecting as a row of knobs from the upper surface; finer venation evident but not conspicuous.

Tahiti, common, ranging from the valleys to the summit of Aorai. Tahaa, Ohiri, altitude 1,400 feet, Grant no. 5160.

West to India.

Tahitian specimens are sometimes identified as *P. longissimum* Blume, a nearly related Malayan fern. I believe but one species of this group occurs here, and that *P. nigrescens* is the preferable name. It is quite variable in color, remoteness of segments, conspicuousness of venation, and depth of immersion of sori.

Polypodium accedens Blume was reported from Tahiti by Brackenridge (as *Drynaria acuminata*). It is an epiphyte with fronds about 6 cm. long, entire, with short-caudate apex, common farther west.

39. SELLIGUEA Bory

Typically epiphytes, with creeping, scaly rhizome, to which the stipes are articulated; frond simple and entire, leathery (in Polynesia), glabrous; veinlets anastomosing, with free included veinlets; sorus elongate, one between each pair of main veins or sometimes interrupted, exindusiate. A small genus, Polynesia to Asia.

S. féeioides Copeland.

An epiphyte with long-creeping rhizome clothed with linear-lanceolate, rusty-red, spreading paleae 5 mm. long, with peltate bases 1 mm. wide, immediately above which they narrow to 0.5 mm.; stipes slate-color, naked, rigid, sulcate, of the sterile frond 8-13 cm., of the fertile one 10-15 cm. tall; sterile frond about 16 by 7 cm., acute, broadly rounded at the base but some slightly decurrent and thus cuneate, rigidly coriaceous; main veins very conspicuous beneath, the cross-veins and ordinarily the finer venation very evident; fertile frond about 15 cm. long, 2-3 cm. wide, acuminate.

Tahiti, Aorai, altitude 4,220 feet to summit, Grant nos. 3736, 3772, 3805; Orofena, altitude 3,530 feet, Grant no. 4270. Huahine, Matoereere, altitude 1,875 feet, Grant no. 5330.

Fiji, New Hebrides.

40. CAMPIUM Presl

Terrestrial ferns, with creeping rhizome; fronds pinnate (in Polynesian species), venation reticulate with few or no included veinlets, the fertile fronds distinct, with less dissected pinnae, their backs covered by sporangia, which are not in distinct sori. A genus of fifty or sixty species, ranging from Polynesia across Africa.

C. lonchophorum (Kunze) Copeland.

Sterile frond pinnate, with pinnatifid apex, in many specimens attenuate, reaching the ground and taking root; pinnae 10 cm. long, 2-3 cm. wide in the middle, rather abruptly contracted below the acuminate tip, deeply cut into very oblique, oblong, toothed lobes, cuneate at the base; fertile pinnae 4-5 cm. long, entire or sinuate.

Tahiti, common, ranging from sea level to 900 meters altitude, Tilden, Quayle, Setchell and Parks, MacDaniels, Grant.

Polynesia.

41. ANTROPHYUM Kaulfuss

Epiphytic ferns, with densely matted, very scaly, creeping rhizomes, which, with their copious roots, make a water-holding pad or cushion; fronds of small or moderate size, not articulate to the rhizome, simple and typically entire, glabrous, fleshy or firm in texture, costate in the lower part; veins without distinction of main and secondary, parallel with the axis and spreading enough to serve the area of the frond, anastomosing to form large, elongate areolae without included veinlets; sori linear, on many or all veins except toward the base, exindusiate. A very natural pantropic genus, the species not properly definable by gross characters.

Sori hirsute, with filiform paraphyses
- Costa obsolete ..... 1. **A. reticulatum**
- Costa evident in lower part of frond ..... 2. **A. alatum**

Sori not hirsute
- Fronds decurrent to the base ..... 3. **A. strictum**
- Stipe not winged ..... 4. **A. plantagineum**

1. **A. reticulatum** (Forster) Kaulfuss.

Fronds very variable in size and form. A common middle form is 35 cm. long and 4 cm. wide, broadest three-quarters of the way up, acuminate, tapering downward to a very short flat stipe, or sessile, straight or curved, entire, subcoriaceous, glabrous except in the sori; sori in deep grooves along the veins, projecting on the upper surface, in full fruit reticulate like the veins, but often free or uniting downward only, the sporangia at first concealed by the abundant hairs. Extremely slender forms reach a length of 60 cm. with a width of 2 cm. At the other extreme are fronds 30 cm. long and 13 cm. wide. Broad forms are not rarely forked at or near the apex. As described here, this includes a considerable number of supposed species, distinct where they were described; but it is my impression, with 18 local collections and their duplicates in hand,

that all these forms are here connected by intermediates, and are a single species. Described from the Society Islands.

Tahiti, very common at lower levels, on rocks and trees. Borabora, Tepare, altitude 710 feet, Grant no. 4906. Moorea, Putoa, altitude 735 feet, Grant no. 5379.

Polynesia to Madagascar.

2. **A. alatum** Brackenridge.

In form like medium or moderately broad forms of *A. reticulatum*, distinguished in description by an evident costa in the lower part of the frond, and non-reticulate sori. A reasonably distinct species in some places, but not so here. At any rate, we have no specimen from Tahiti, the type locality, on which the costa is "very evident on the lower part of the frond for more than two-thirds of its length." This is true of some fronds from Borabora, Grant no. 4931; and a number of Tahitian specimens have an evident costa in the lower third, or even half, of some fronds, while it is altogether inconspicuous in other fronds of the same plants.

3. **A. strictum** Mettenius.

Rhizome clothed with conspicuous linear-acicular, toothed, gray-black scales; fronds up to 35 cm. long and 4 cm. wide, caudate or acuminate, decurrent almost or quite to the rhizome; costa evident in the lower half of the frond; sori simple or branched, but hardly reticulate; paraphyses branched, with enlarged heads.

Tahiti, Orofena (Orohena), altitude 1,400 meters, MacDaniels no. 1455; ridge to Aorai, altitude 3,950 feet, Grant no. 3749; Orofena, altitude 2,250 to 2,550 feet, Grant no. 4198, is probably a very small specimen of this species.

New Guinea.

4. **A. plantagineum** (Cavanilles) Kaulfuss.

Stipe up to 12 cm. long, not winged; frond longer or twice as long, 3-5 cm. wide, acute or acuminate, the base short-decurrent; costa usually evident near the base; sori branched, rarely free at both ends, or reticulate; paraphyses inconspicuous. I do not distinguish *A. Lessonii* Bory, which has been reported here.

Tahiti, very common up to 300 meters altitude. Huahine, Pipihaua, altitude 270 feet, Grant no. 5271.

Westward to India.

Grant nos. 4907 and 4927, from Borabora, altitude 710 feet and 1,110 feet, probably represent a distinct species, differing from *A. plantagineum* in having more conspicuous paleae and paraphyses and relatively broad fronds.

Brackenridge described from Tahiti *A. angustatum*, with very narrow stipitate fronds. It has been reduced to *A. plantagineum*. None of our specimens represents it.

42. VITTARIA Smith

Epiphytes, with short creeping rhizomes clothed with narrow, dark scales; fronds usually crowded, simple, entire, narrow and grasslike; venation usually inconspicuous; sori in or near the margins, in grooves, typically continuous the length of the upper part of the frond.

V. elongata Swartz.

On rocks and trees; fronds 25-100 cm. long, 5-13 mm. wide, stalked or sessile (that is, decurrent to the rhizome); sorus in a deep marginal groove. The local material is variable, but seems all to be one species.

Tahiti, common up to at least 300 meters altitude, Tilden, Quayle, Setchell and Parks, MacDaniels, Grant. Borabora, Otemanu, altitude 2,285 feet, Grant nos. 4937, 4938. Tahaa, Ohiri, altitude 1,240 and 1,560 feet, Grant nos. 5152, 5175. Huahine, Matoereere, altitude 1,140 feet, Grant no. 5289. The specimens from Tahaa might be distinguished as *V. zosterifolia* Bory, and that from Huahine as *V. rigida* Kaulfuss.

Old World Tropics.

43. VAGINULARIA Fée

Very small epiphytes, with the fronds densely tufted on slender, scaly, interwoven rhizomes; fronds simple and entire, exceedingly narrow, herbaceous or flaccid, naked; sori linear, immersed, single or interrupted, borne on a vein parallel and close to the costa. A genus of 4 recognized species. Polynesia to Ceylon.

V. paradoxa (Fée) Mettenius.

Monogramme paradoxa Beddome.

Fronds 8-25 cm. long, hardly more than 1 mm. wide, forming tufts which look like very narrow hanging grass.

Tahiti, Orofena, altitude 2,000 feet, Grant no. 4199.

Range of the genus.

VII. MARSILEACEAE

Aquatic ferns, with stems creeping on the mud, stipes rising to the surface, and floating or aerial leaves of four crosswise leaflets. The fertile fronds, usually unnoticed, are almost sessile on the stems, reduced to the size of small peas or smaller, and bearing spores of two kinds. This description applies particularly to our only local genus, *Marsilea*.

MARSILEA Linnaeus

A cosmopolitan genus of about 60 species.

Marsilea species.

Moorea, Haumi, at sea level, Grant no. 5412. A sterile specimen, not to be determined specifically in the absence of fruit.

Guillemin reported as "M. quadrifolia ?" a sterile collection by Bertero and Moerenhout, about 1834.

Baker (Fern Allies, p. 139) reported *M. polycarpa* Hooker and Greville from the Society Islands; it is otherwise known only from tropical America, whence it was described from Demerara. On page 146 of the same work, he reported sterile Tahitian material as perhaps *M. mutica,* a species otherwise known only from New Caledonia.

Azolla, a minute floating fern in this family, is likely still to be detected here.

LYCOPODINEAE

These plants are sometimes called collectively "club mosses," a name better restricted to the one genus *Lycopodium*. The spores are borne in large containers, the sporangia, which are borne in the axils of leaves.

Spores all of one kind
- Sporangia naked ..... I. **Lycopodiaceae**
- Sporangia in capsules ..... II. **Psilotaceae**

Spores of two kinds ..... III. **Selaginellaceae**

I. LYCOPODIACEAE

A single genus.

LYCOPODIUM Linnaeus

These are the typical club mosses. The local species are plants of some length. The sporangia in most of the local species are formed in the axes or at the base of more or less specialized leaves at the apices of branches of the stem, forming spikes.

Spore-bearing leaves not very different from others
- Coarse plants, shoots (including leaves) 10-20 mm. diameter ..... 1. **L. squarrosum**
- Slender plants, shoots 3-4 mm. diameter ..... 2. **L. Haeckelii**

Fertile leaves distinct, spikes conspicuous
- Stems not flattened
  - Leaves more than 2 mm. broad
    - Spikes about 3 mm. in diameter, angular ..... 3. **L. Ribourtii**
    - Spikes more slender
      - Leaves moderately firm, green ..... 4. **L. Phlegmaria**
      - Leaves rigid, brownish ..... 5. **L. phlegmarioides**
  - Leaves less than 1 mm. broad
    - Spikes 10-15 mm. long, not stalked ..... 6. **L. cernuum**
    - Spikes much longer, long-stalked ..... 7. **L. venustulum**
- Branches flattened ..... 8. **L. volubile**

1. **L. squarrosum** Forster.

An epiphyte, bearing clusters of a few pendent or spreading branches, 30-70 cm. long, 1-3 times forked, densely beset with spreading linear-lanceolate leaves 10-15 mm. long with attenuate apices. The leaves decrease in size toward the tips, and the fertile leaves are less spreading, but not otherwise specialized.

Tahiti, Fautaua, Setchell and Parks, no. 245; Toanoano valley, Grant no. 3866. The type locality is "Society Islands." It seems to be uncommon here, and known only on Tahiti.

The same form is not uncommon elsewhere in Polynesia, and westward at least to the New Hebrides. From New Caledonia westward to the Himalayas, a variety of nearly related forms, along with the typical one, are given this name.

2. **L. Haeckelii** Herter.

An epiphyte, with a cluster of very slender pendent branches, 2-4 times forked, 15-60 cm. long, densely beset with ascending or even somewhat appressed, straight, narrow, sharp leaves, 4 mm. long, rather more appressed toward the fertile apices. The branch sometimes grows on beyond the fertile apex, producing a sterile zone, and then another fertile one, so that fertile and sterile zones alternate.

Tahiti, ridge to Aorai, altitude 3,960 feet, Grant no. 3737; Ronui, altitude 3,600 feet, Grant no. 3910; Orofena, altitude 2,250 feet, Grant no. 4197; Mahina, altitude 3,600 feet, Grant no. 4411.

Described from a specimen in the Paris Museum collected by Ribourt in 1850. Described as beset with lichens, which is true of two of Grant's collections.

Endemic.

3. **L. Ribourtii** Herter.

An epiphyte, with a dense cluster of stout shoots, pendulous or suberect, once or twice forked, 15-30 cm. long without the spikes, 15 mm. in diameter, leaves included; leaves moderately spaced, more or less concealing the stem, erecto-patent, elliptical, acute, very firm, up to 10 mm. long and 4 mm. wide; spike long and square, mostly once forked, up to 20 cm. long, about 2-3 mm. thick, the fertile leaves strongly carinate, acute, curved upward, surpassing but incompletely concealing the sporangia.

Tahiti, Fautaua, below Diadem, altitude 3,040 feet, Grant no. 3552; ridge to Aorai, altitude 3,040 feet, Grant no. 3712; Vaiarava, altitude 50 feet, Grant no. 3979; Farehape, Papenoo, altitude 825 feet, Grant no. 4063; on the Pirae-Moua-Aorai trail, Quayle; south of Orofena (Orohena), common on trees, altitude 1,400 meters, MacDaniels no. 1472. Previously collected by Ribourt (the type collection) and Nadeaud.

Cook Islands, Rarotonga, Wilder no. 978.

4. **L. Phlegmaria** Linnaeus.

An epiphyte, forming a small cluster of long, stout, pendent or descending shoots, 2 or 3 times forked, 40-90 cm. long, 20-25 mm. wide, leaves included; stem 3-5 mm. in diameter at the base; leaves remote and reduced near the base, in the upper part borne in whorls of three or somewhat irregularly, not concealing the stem, ovate, 10-13 mm. long, 3-5 mm. wide, acute, broadly rounded at the base, moderately firm; spikes very sharply distinct from the vegetative branches bearing them, 5-10 cm. long, 1-1.5 mm. in diameter, 2 or 3 times forked, the broad fertile leaves more or less as long as the large sporangia which they do not conceal. A very showy plant.

Tahiti, Setchell and Parks, nos. 303, 434, 542; Papara valley, altitude 510 feet, Grant no. 3693; Toanoano valley, altitude 55 feet, Grant no. 3872. Repeatedly collected in the past. Grant no. 3551, Fautaua, below Diadem, altitude 3,040 feet, may be distinct. It has broader, stiffer, closer leaves, and stouter spikes.

Common from Polynesia to Africa and in cultivation.

5. L. phlegmarioides Gaudichaud.

An epiphyte, differing from *L. Phlegmaria* in having firmer stems, less disposed to hang downward, broader and firmer brownish-green leaves, and thicker spikes—2 mm. in diameter, the fertile leaves mostly shorter than the sporangia.

Tahiti, Fautaua, below Diadem, altitude 3,040 feet, Grant no. 3551; from the same region, Setchell and Parks no. 543.

Described from Rawak, in the Moluccas. Found also in the Loyalty Islands; and ascribed to "Polynesia" and "Malay and Polynesian Islands." The Fijian plants which have been distributed under this name, or as the variety *Seemanni* Baker, are probably *L. pseudo-phlegmaria* Kuhn; their leaves are thinner, clear-green, with obtuse apices.

L. phlegmarioides was described as having flattened shoots, the leaves of two of the four rows smaller than the others; some shoots of both of our Tahitian collections have this appearance, less marked than in Gaudichaud's figure.

6. L. cernuum Linnaeus.

Terrestrial, with a creeping rhizome, from which arise stems 50-100 cm. tall, 5-7 mm. in diameter including the leaves, simple in the lower part, forked and freely branching above, the distal branches often pendulous; leaves exceedingly many, dark-green, 2-3 mm. long, very narrow, spreading but curved upward and inward; spikes about 1 cm. long, 3-4 mm. thick, usually drooping, the fertile leaves broad at the base with attenuate apex, densely placed and mostly concealing the sporangia, ciliate, scarious, so that the spikes are at first whitish and later brown.

Common on Tahiti, collected by Tilden, MacDaniels, Quayle, Setchell and Parks, Grant, and several of the earlier collectors; not reported from the other islands, but probably present.

Pantropic and variable.

7. L. venustulum Gaudichaud.

Terrestrial, with stems trailing above the ground and sending out roots or rootlike branches running down to the ground, and branches which are weakly erect and freely branched; leaves like those of *L. cernuum*; spikes borne in clusters of one to four at the top of slender erect branches 10-25 cm. tall, sparsely clothed with reduced leaves, the spikes erect, 3-8 cm. long, 5-6 mm. thick, the fertile leaves with ovate base and long, fine tip, concealing the sporangia.

Tahiti, ridge to Aorai, altitude 3,425 feet, Grant no. 3721; also, several older collections.

Hawaii.

8. L. volubile Forster.

Terrestrial, with a slender, terete trailing stem, bearing erect or scandent freely branching branches, likewise terete, but the ultimate branches flattened, with scalelike leaves; the dorsal and ventral leaves closely appressed, those on the two margins strongly carinate, with prominent, sharp apices; the erect terete branches finally becoming slender, unbranched for perhaps 10 cm., and then forking about twice; spikes apical on these forks, erect, about 2 cm. long, 3-4 mm. thick including the sharp spreading tips of the fertile leaves.

Our many specimens are all from Tahiti, where every collector finds it. Grant no. 3792 is from the summit of Aorai, altitude 6,700 feet. The type locality is given by Forster merely as the group, conforming to the best usage of his time.

Marquesas to Sumatra.

II. PSILOTACEAE

The two genera of this small family are both found in Tahiti.

Stems unbranched, leaves obvious.....1. **Tmesipteris**
Stems repeatedly forked, leaves scalelike.....2. **Psilotum**

1. TMESIPTERIS Bernhardi

One well-defined species here and a few ill-defined ones elsewhere.

T. tannensis Bernhardi.

Epiphytic on the trunks of tree ferns; aerial stems 15-30 cm. long, naked near the base, elsewhere bearing numerous 2-ranked, sessile, lanceolate, mucronate, stiff foliage leaves 15-20 mm. long, widened above the base on the upper side; fertile leaves short-stalked, cleft nearly to the base, bearing a single capsule in the axil; capsule lozenge-shaped, 3-4 mm. long, 1.5 mm. thick, constricted in the middle.

Tahiti, found by most collectors in the tree-fern areas.

Marquesas to Australia and the Philippines.

2. PSILOTUM Swartz

Only two generally recognized species:

Branches triangular, very slender.....1. **P. nudum**
Branches flattened, linear.....2. **P. complanatum**

1. **P. nudum** (Linnaeus) Grisebach.

Terrestrial, but also common on the bases of coconut trunks; stems with unbranched bases 10-45 cm. long, 1-3 mm. thick, then repeatedly dichotomous, forming a tuft of slender angular branches, with occasional leaves reduced to toothlike scales, forked at the apex; capsules 3-lobed, about 1 mm. in diameter, in the axils of scales.

Often collected in Tahiti, from sea level up to 400 meters altitude; found by Grant in Tupai, Tahaa, Moorea, and Huahine.

Pantropic.

2. **P. complanatum** Swartz.

Epiphytic, sometimes at least, on tree ferns; commonly larger than the preceding species, the branches all flattened, 2-3.5 mm. wide; capsules about 2.5 mm. in diameter.

Tahiti, altitude 400 to 600 meters, collected by Quayle, MacDaniels, Setchell and Parks, and Grant. Borabora, Grant no. 4988.

Less commonly collected than *P. nudum,* but supposed also to be pantropic.

III. SELAGINELLACEAE

By A. H. G. Alston

Terrestrial or epiphytic, perennial or more rarely annual herbs; stems erect or prostrate, terete, angular or compressed, occasionally articulate; rhizophores springing from the stem or axils of the branches; branches alternate or dichotomous usually all in the same plane. Leaves numerous, unequal-sided, usually of two kinds arranged in two planes, those of the lower plane lateral, spreading, those of the upper plane superficial, erect, median. The leaves in the axils of the branches usually differ from the normal lateral leaves and are equal-sided. In certain species (none of this type is known from the Society Islands) the leaves are uniform and spirally arranged. Sporangia borne in sporophylls arranged in cones. Sporophylls uniform or dimorphic with the large sporophylls in the upper plane or very rarely in the lower plane. Sporangia axillary, with two valves. Spores of two kinds, megaspores and microspores, produced in separate sporangia (some species are reported to have either megaspores only or microspores only).

SELAGINELLA Beauvois

KEY

Bracts uniform or slightly dimorphic; stems erect, simple towards the base..**1. S. Banksii**
Bracts strongly dimorphic; stems prostrate or suberect, branched from the base
  Median leaves aristate; lateral leaves acute.....**2. S. Setchellii**
  Median leaves acuminate; lateral leaves obtuse.....**3. S. laxa**

1. Selaginella Banksii Alston, new species.

Stems about 25 cm. long, erect from a short, creeping base, terete, dull straw-colored; rhizophores confined to the base of the stem, rather stout; lower half usually simple, the upper tripinnate. Leaves uniform towards the base of the stem, strongly dimorphous in the upper part. Lateral leaves 2.5-6 mm. long, 1-3.5 mm. broad, obtuse or subacute, unequal-sided; costa prominent on both surfaces; upper half semilanceolate to semielliptic, rounded and ciliolate at base; lower half semioblanceolate to semilanceolate, rounded at base. Axillary leaves lanceolate, ciliolate. Median leaves broadly elliptic, acuminate, aristate, with outer margin auriculate at base. Cones subtetragonous, terminal on the branches, solitary. Bracts apparently slightly dimorphic when young.

Tahiti: Banks (type), Forster 314, Vesco, Collie, Barclay 3351, (British Museum!); Fautaua, below Diadem, 2,990 feet, Grant 3563 (University of California!); Orofena (Orohena), MacDaniels 1446 (Bishop Museum!); Maara valley, Setchell and Parks 429 (University of California, Bishop Museum!); Taapeha, Grant 4017 (University of California!). Moorea: Putoa, 1,140 feet, Grant 5391 (University of California!).

This species is closely allied to the Hawaiian *S. Springii* (Gaudichaud) Spring, but in that species the lateral leaves have a few large cilia towards the base and are almost entire at the apex, while the upper margin of the leaves of *S. Banksii* are entirely ciliolate throughout, the cilia getting shorter towards the apex. The Marquesan species *S. protracta* Warb, *S. Browneana* Schmidt, *S. Bishopiana* Schmidt and *S. Jonesii* Schmidt are all distinguished from this species by the strongly produced bases of the lateral leaves. It is probably the species recorded from Borabora by Bory and Spring as *S. arbuscula* (Kaulfuss) Spring.

2. Selaginella Setchellii O. C. Schmidt.

Stems up to 6 cm. long, matted, prostrate or suberect, rooting in the lower half, slender, pale straw-colored, branched from the base. Leaves dimorphous. Lateral leaves 1.5-2 mm. long, 0.75-1 mm. broad, costate, drying dark green above, pale below, subacute, unequal-sided; upper half semilanceolate, distantly denticulate at base, closely denticulate at apex; lower half semilinear-lanceolate, denticulate towards the apex. Axillary leaves linear-lanceolate. Median leaves elliptic-lanceolate, denticulate, acuminate, shortly aristate. Cones solitary, strongly dimorphic. Upper bracts spreading, linear-lanceolate, subacute. Lower bracts imbricate, lanceolate, aristate.

Tahiti: Fautaua valley, on shaded rocks, Setchell and Parks (Botanisches Museum, Berlin!, University of California!).

This species is most nearly allied to *S. sandvicensis* Baker, which is separated by its ovate median leaves.

3. Selaginella laxa Spring.

Stems up to 20 cm. long, freely branched from the base, prostrate or suberect, terete. Leaves always strongly dimorphous. Lateral leaves 1.5-2 mm. long, 1-1.25 mm. broad, spaced, costate, drying pale or dark green, rounded at apex, unequal-sided; upper half semiovate elliptic, denticulate throughout; lower half semioblong, denticulate. Axillary leaves broadly lanceolate. Median leaves broadly elliptic, acuminate, not aristate, margined, minutely denticulate. Cones solitary, strongly dimorphic. Upper bracts spreading linear-lanceolate, obtuse. Lower bracts imbricate, lanceolate, subacute.

Tahiti: Moerenhout (type not seen), Banks and Solander (British Museum), Setchell and Parks 197; Maara valley, Setchell and Parks 5238a (British Museum); Faa, 1,140 feet, Grant 3504. Borabora: Otemanu, 1,410 feet, Grant 4945, a large form.

I have seen no authentic material of this species and have therefore relied on Schmidt's identification of Setchell and Parks 197 (University of California Pub. Botany, vol. 12, p. 33, 1924).

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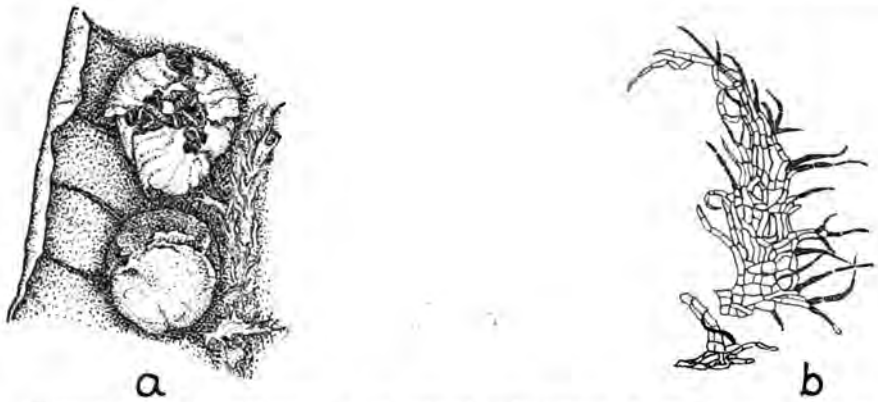


FIGURE 1.—*Cyathea Grantii*; *a*, sori closed and opening, × 20; *b*, palea of costa, × 50. [Drawings by Millicent Thompson.] (See also Plate 5.)

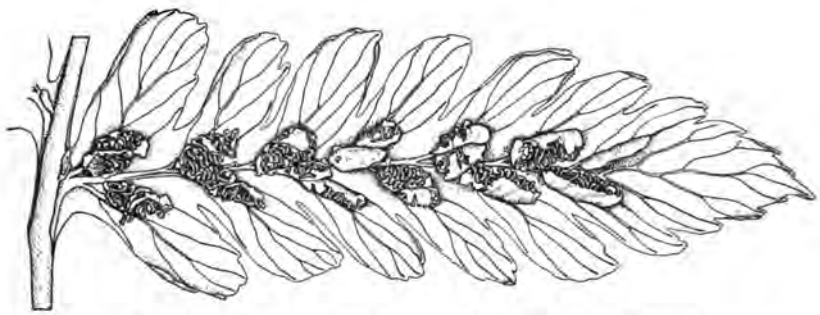


FIGURE 2.—*Athyrium Grantii*, pinnule, × 4 1/2. (See also Plate 9.)

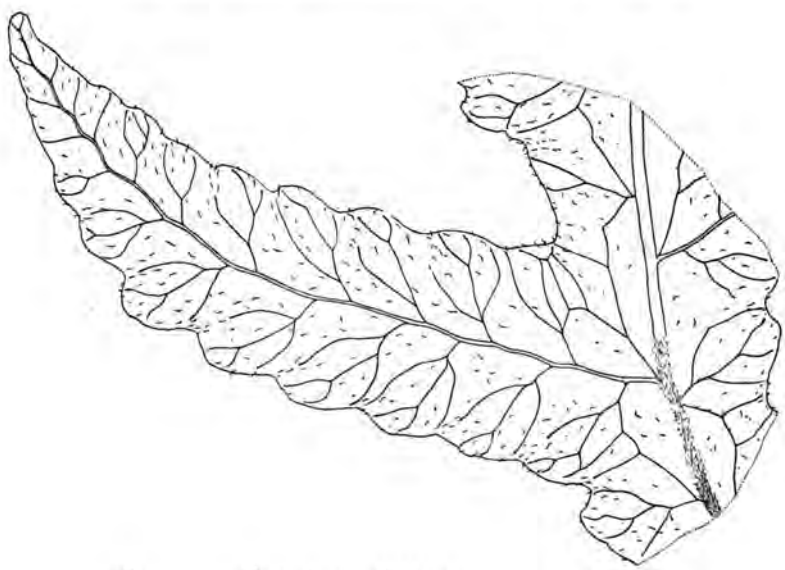
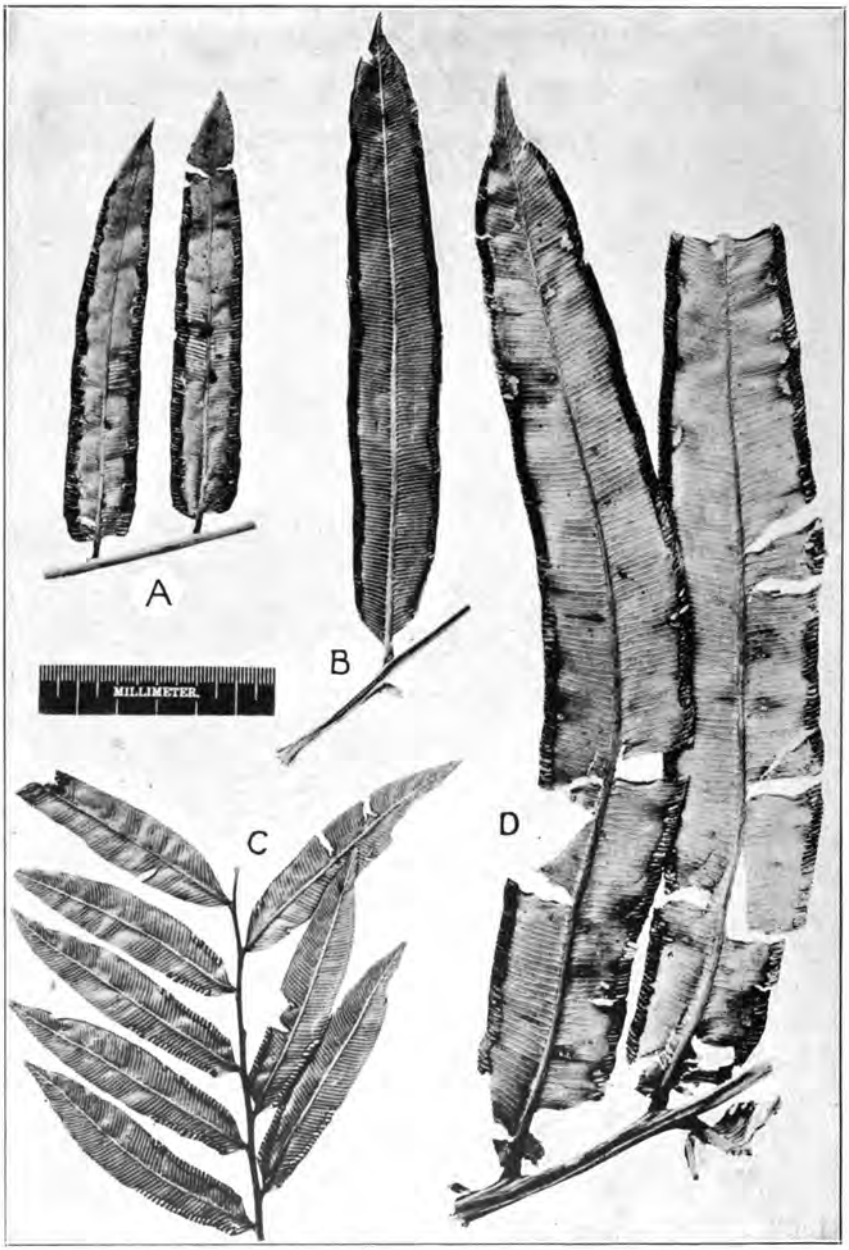
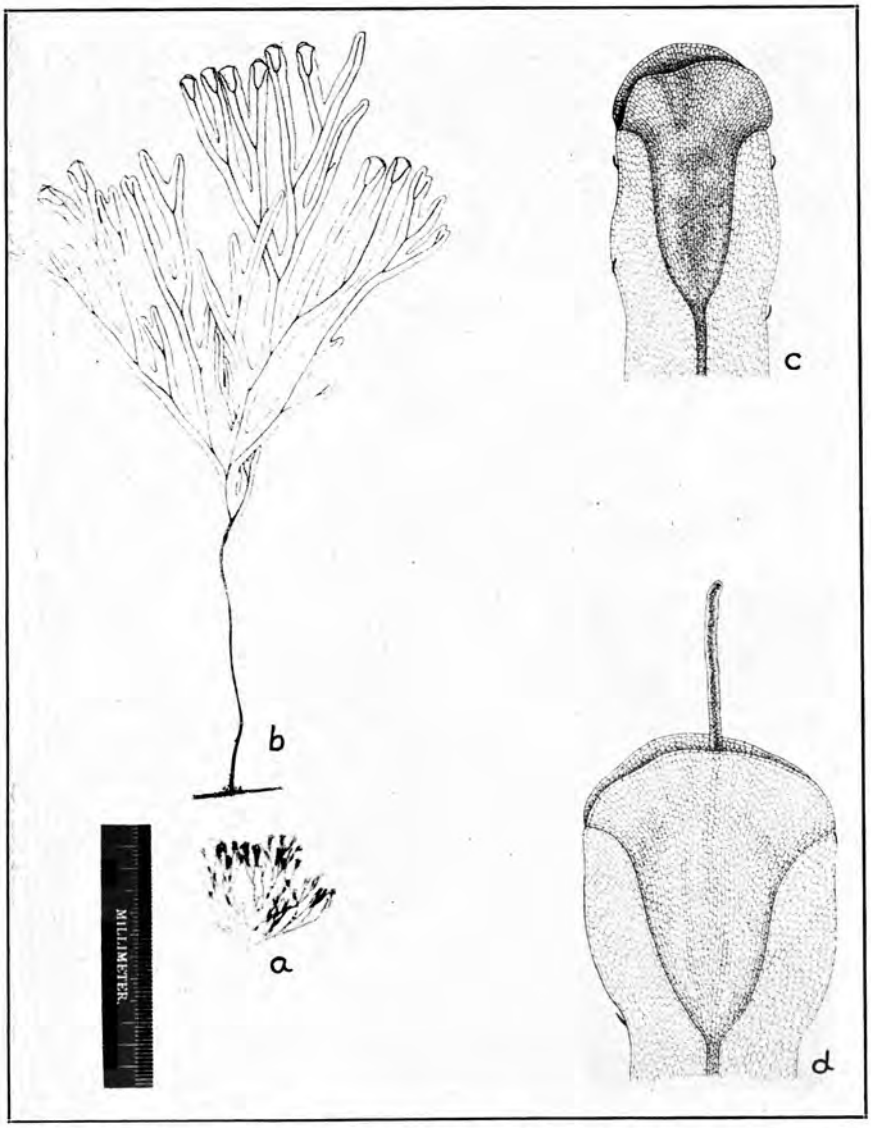


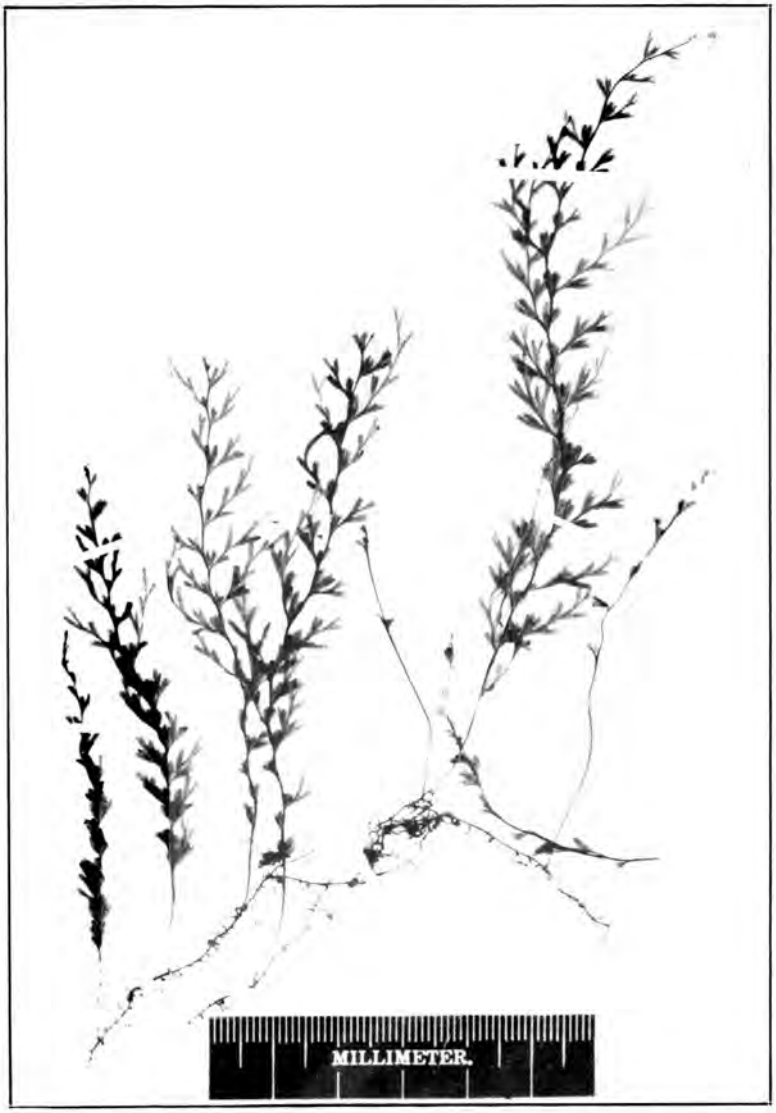
FIGURE 3.—*Tectaria tenuifolia*, showing venation, × 3.



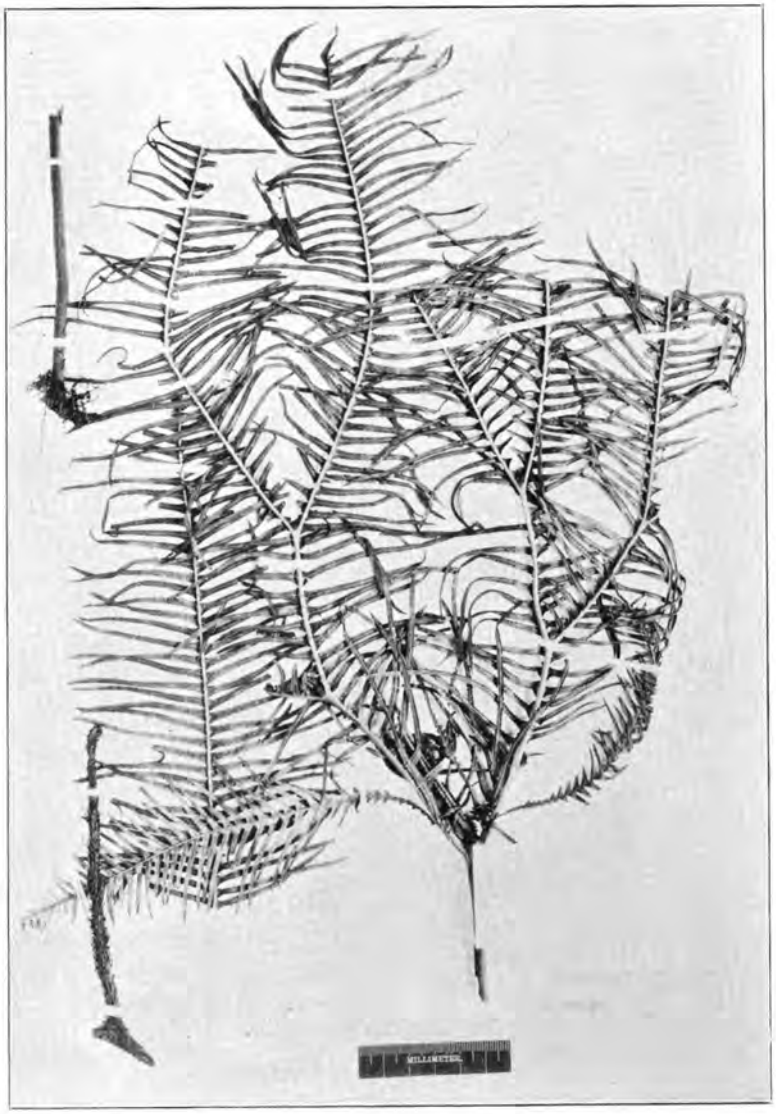
MARATTIA: *A*, M. SALICINA SMITH, PINNULES; *B*, GRANT NO. 5323, DOUBTFULLY M. GRANTII; *C*, M. CINCTA COPELAND, PART OF PINNA OF TYPE; *D*, M. GRANTII COPELAND, TWO PINNULES.



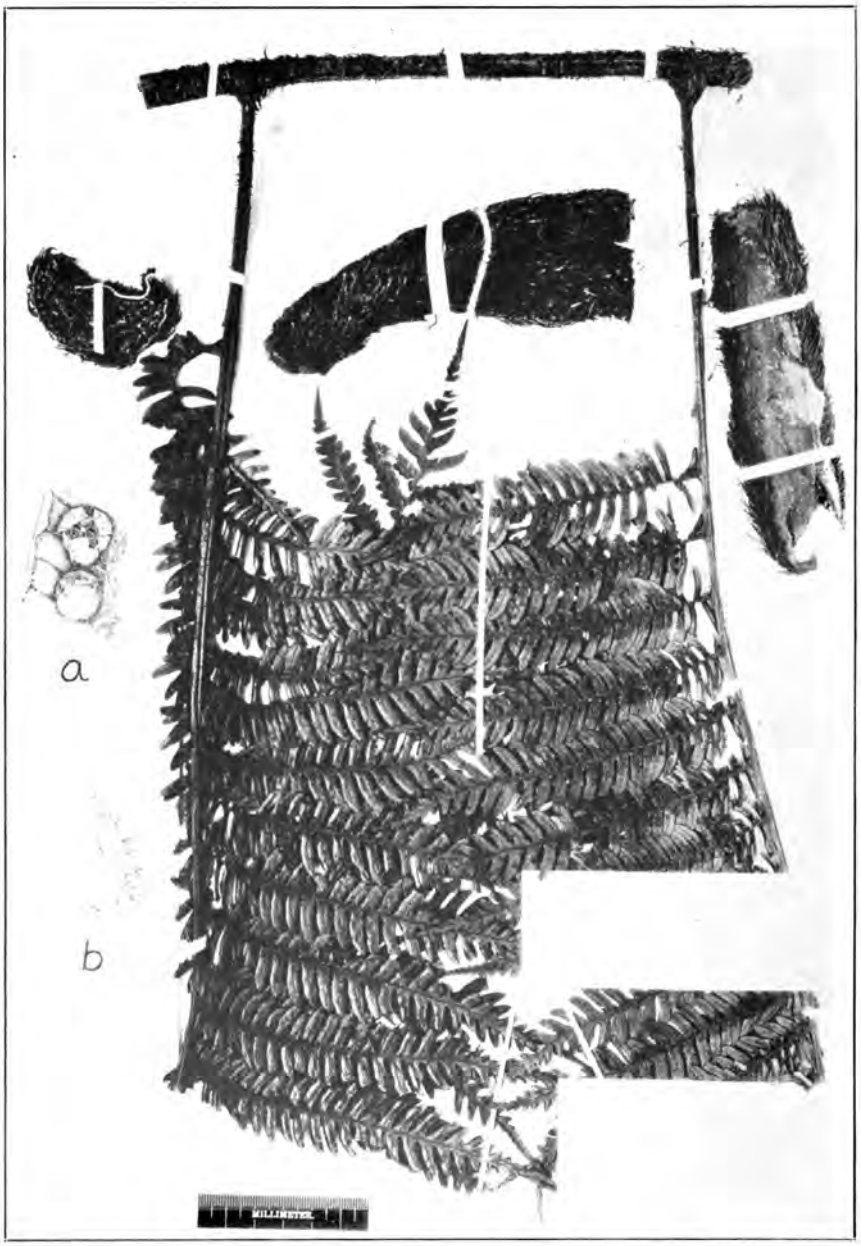
TRICHOMANES TAENIATUM COPELAND: *a*, FROND; *b*, FROND, × 2.5; *c*, FRUITING TIP, TYPE COLLECTION; *d*, FRUITING TIP, GRANT NO. 4401. [DRAWINGS BY PHYLLIS WRIGHTSON.]



HYMENOPHYLLUM GRACILIUS COPELAND. TYPE.

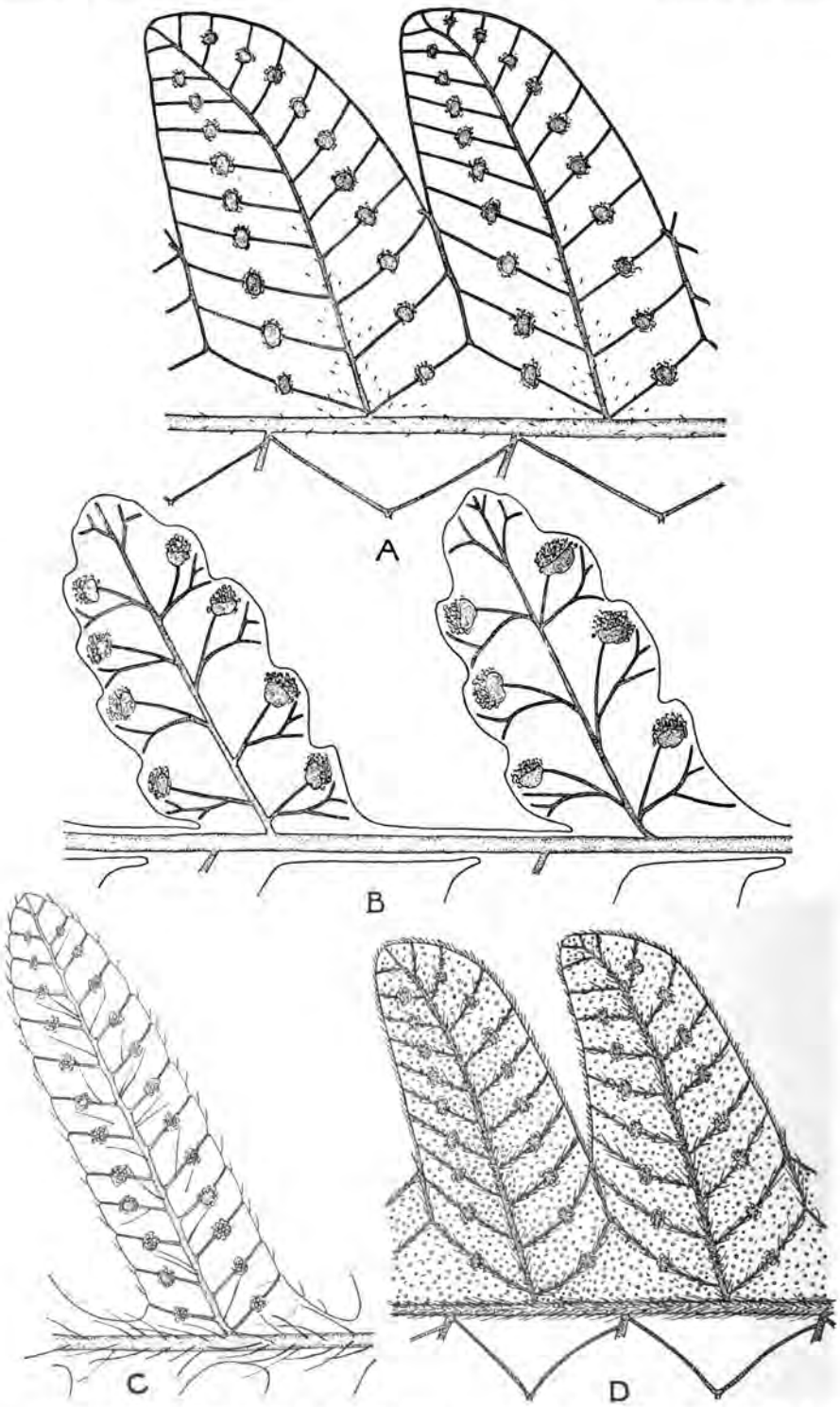


GLEICHENIA TAHITENSIS COPELAND.

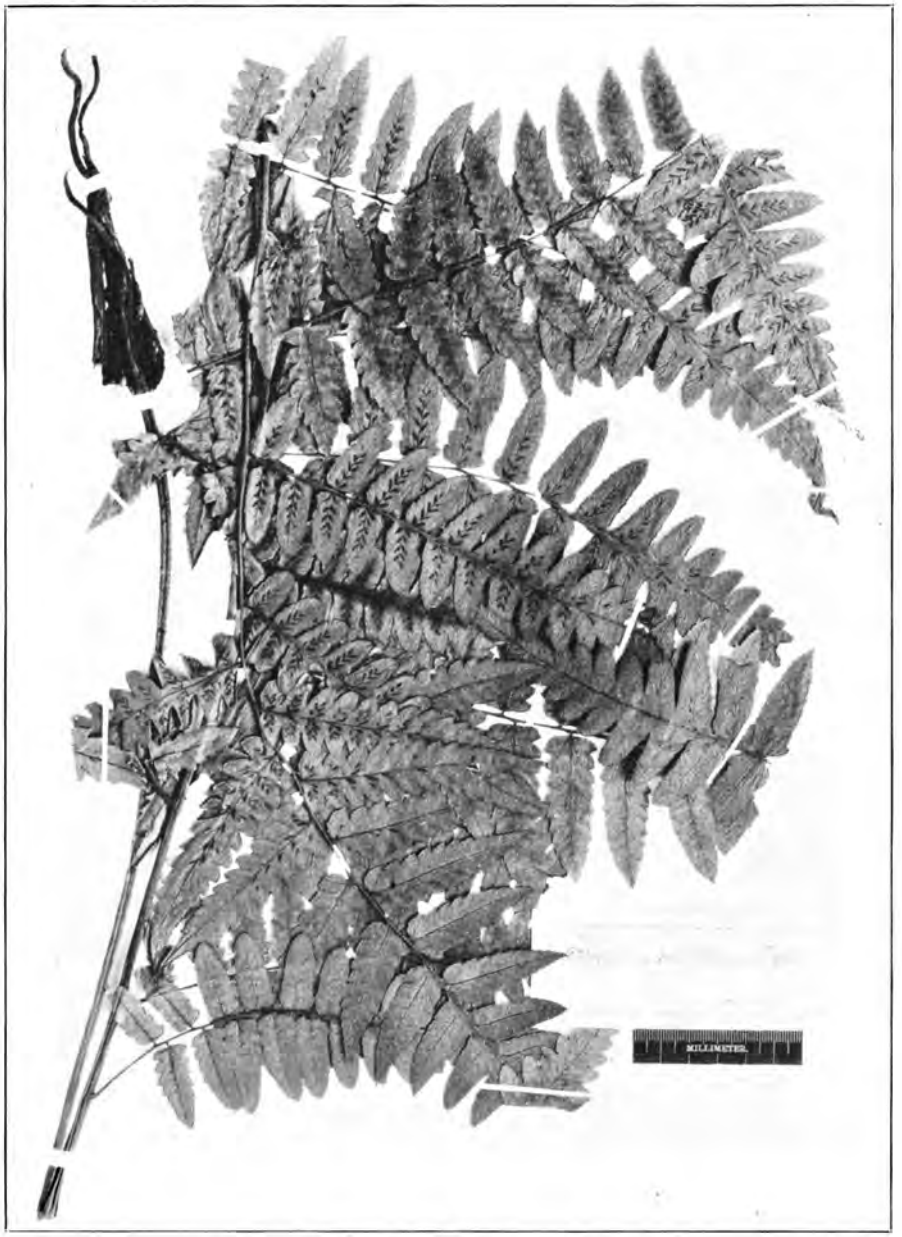


CYATHEA GRANTII COPELAND: HERBARIUM SHEET WITH TWO PINNAE, BASES OF STIPES, SECTION OF STIPE, AND ENLARGED SORI (*a*) AND COSTA (*b*). (SEE ALSO FIGURE 1.)

DRYOPTERIS DAVALLIOIDES (BRACKENRIDGE) KUNTZE. TYPE: *a*, ENLARGED PINNULE. (U. S. NATIONAL HERBARIUM.)



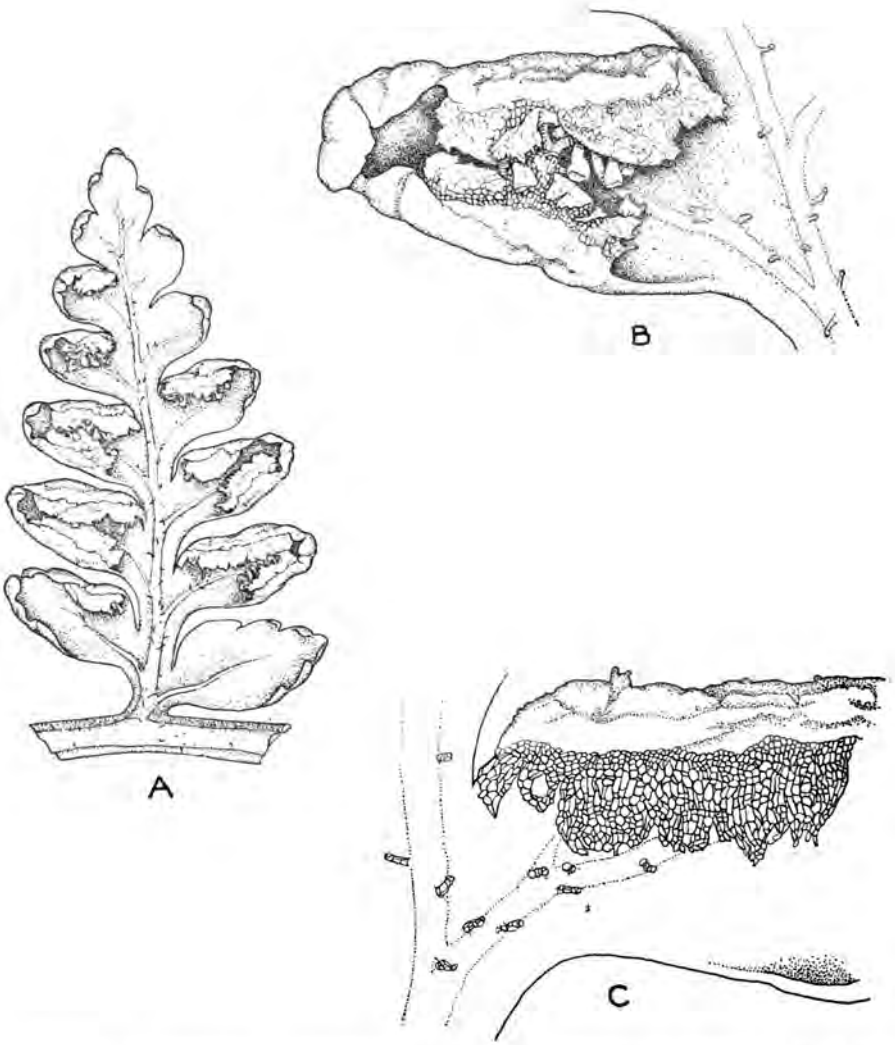
DRYOPTERIS, SEGMENTS OF PINNAE, × 5: *A*, D. MESOCARPA COPELAND; *B*, D. MACROLEPIDOTA COPELAND; *C*, D. GRANTII COPELAND; *D*, D. SUBPECTINATA COPELAND. [DRAWINGS BY H. S. YATES.]



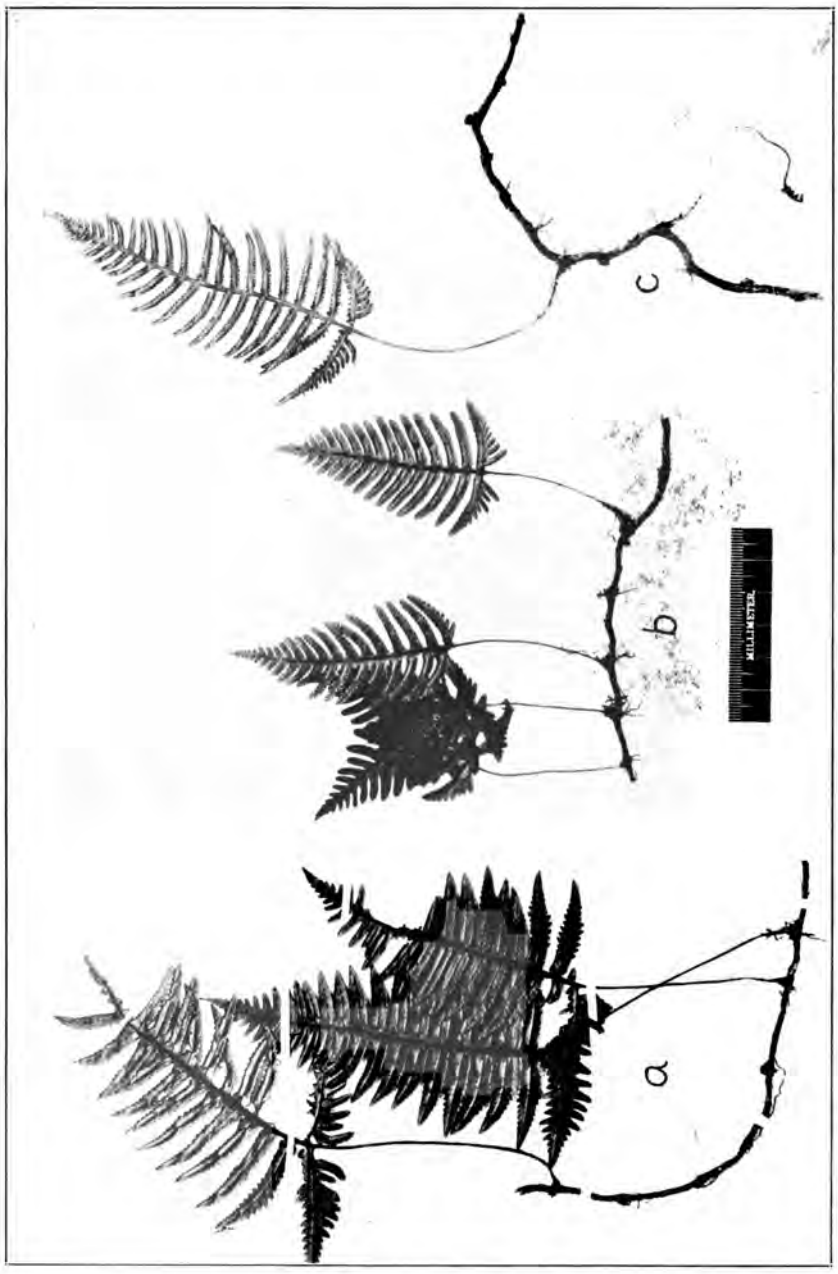
ATHYRIUM ELLIPTICUM COPELAND. TYPE.

ATHYRIUM GRANTII COPELAND. (SEE ALSO FIGURE 2.)

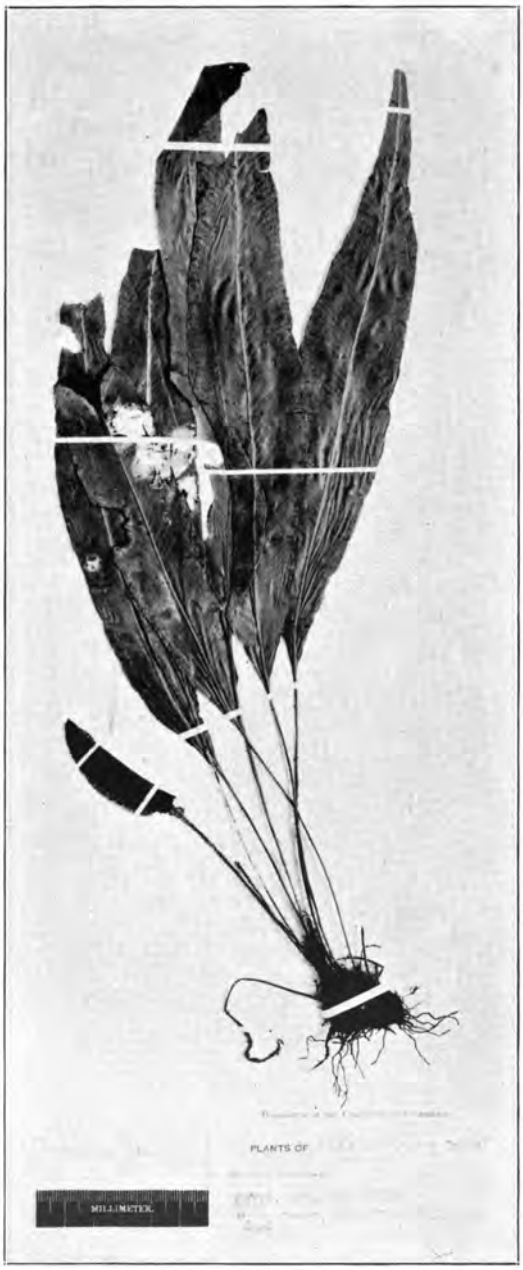
PAESIA TAHITENSIS COPELAND. (SEE ALSO PLATE 11.)

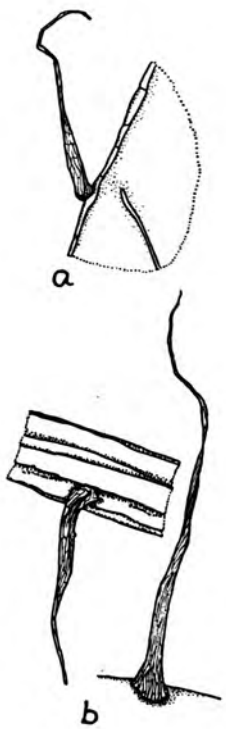


PAESIA TAHITENSIS: *A*, PINNULE, × 6 2/3; *B*, SEGMENT OF PINNULE, × 23 1/3; *C*, PART OF SEGMENT SHOWING INDUSION, × 35. [DRAWINGS BY MILLICENT THOMPSON.]

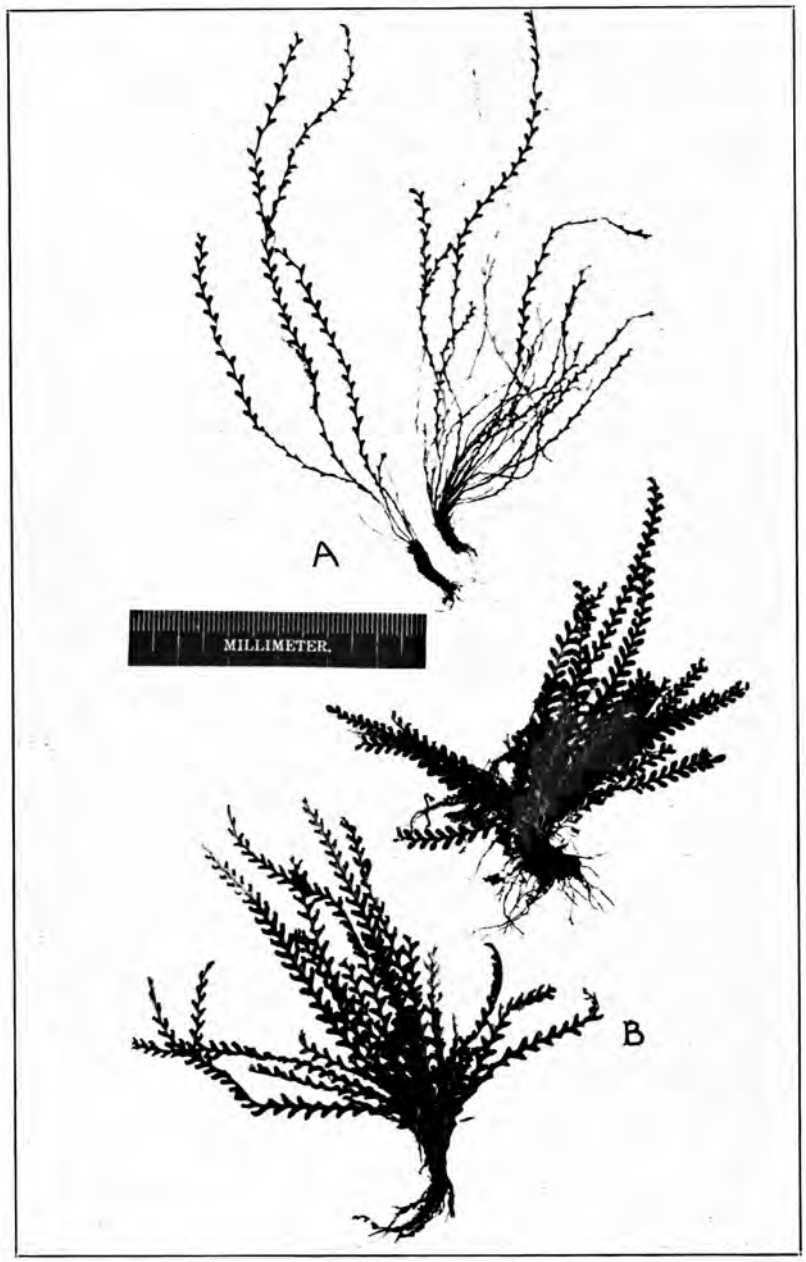


HUMATA: *a*, H. MELANOPHLEBIA COPELAND; *b*, H. HUAHINENSIS COPELAND; *c*, H. PECTINATA, OF HOOKER AND OTHERS.

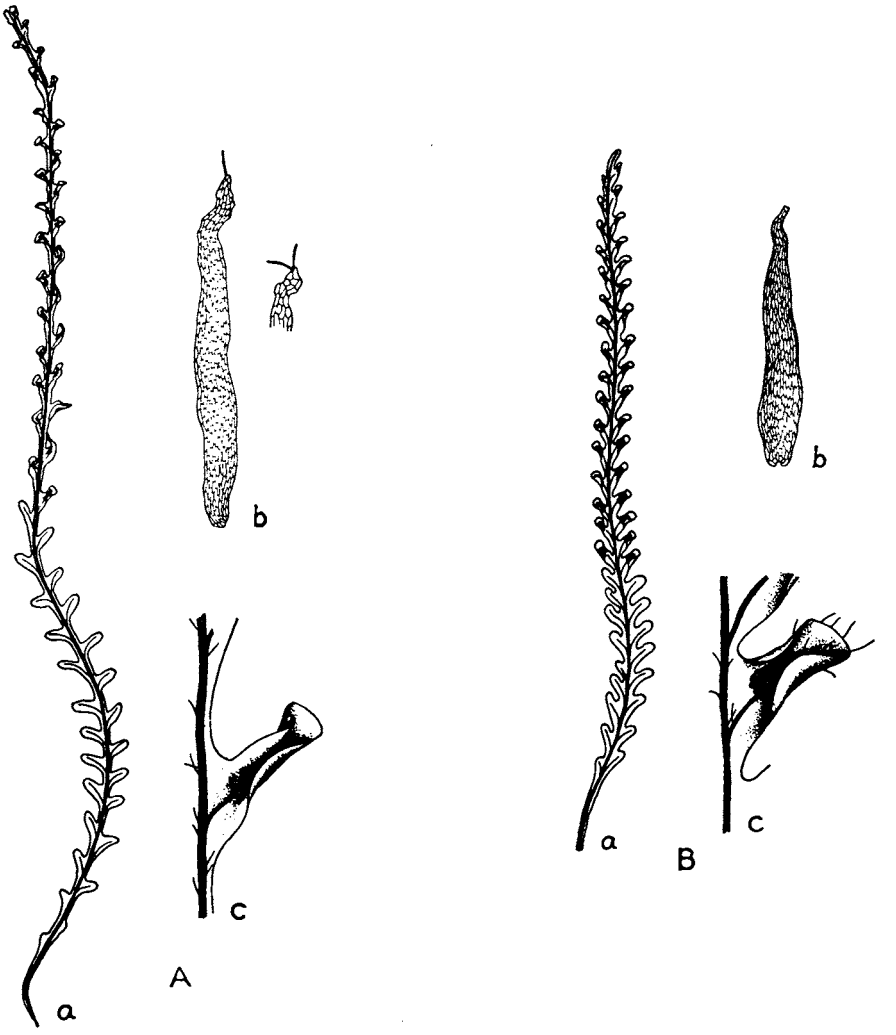




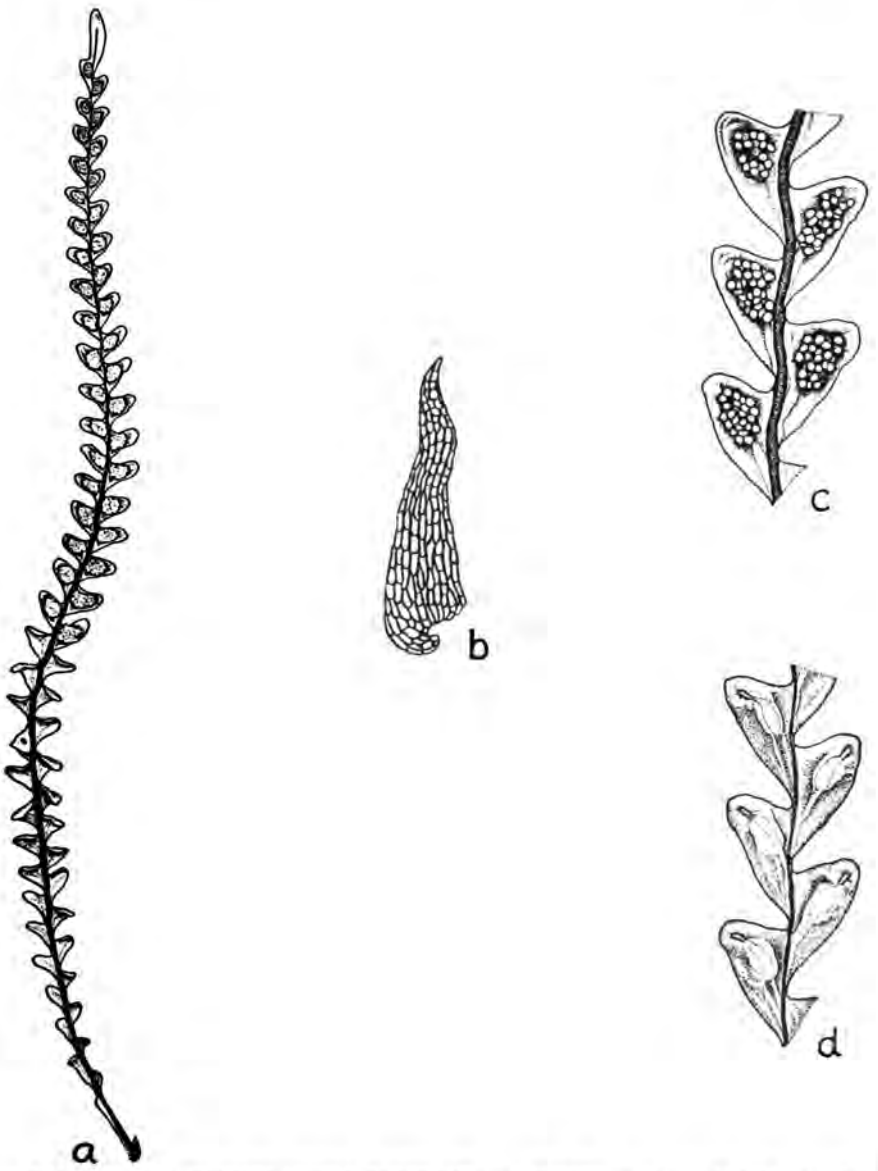
ELAPHOGLOSSUM SOCIETARUM: *a*, PALEA FROM MARGIN OF FROND, × 10; *b*, PALEAE FROM STIPE, × 10. [DRAWINGS BY MILLICENT THOMPSON.]



CALYMMODON: *A*, C. ORIENTALIS COPELAND. TYPE. *B*, C. GRANTII COPELAND. TYPE.



PARTS OF CALYMMODON. *A*, C. ORIENTALIS: *a*, FROND, × 1 1/4; *b*, PALEA, × 10; *c*, FERTILE SEGMENT, × 7 1/2. *B*, C. GRANTII: *a*, FROND, × 1 1/4; *b*, PALEA, × 15; *c*, FERTILE SEGMENT, × 7 1/2. [DRAWINGS BY MILLICENT THOMPSON.]



POLYPODIUM SUBCORIACEUM COPELAND: *a*, FROND, × 3; *b*, PALEA, × 27; *c*, FERTILE SEGMENTS VIEWED FROM BELOW, × 10; *d*, FERTILE SEGMENTS VIEWED FROM ABOVE, × 10.