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New or Interesting Ferns from Micronesia, Fiji, and Samoa

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The types of all new species here described are in the herbarium of Bernice P. Bishop Museum.

POLYPODIACEAE

Cyathea subbullata Copeland, species nova (fig. 1).

C. decurrenti (Hooker) Copeland affinis, squamulis subbullatis acutis albidis vel fulvescentibus infra costas pinnularum distincta; trunco 8 m. alto, 15 cm. crasso; pinnis usque ad 70 cm. longis, 30 cm. latis, tripinnatifidis, segmentis subbullatis (margine deflexa); aliter C. decurrenti omnino simile.

Viti Levu: Tholo East, mountains west of Matawailevu, alt. 600 m., August 14, 1937, *St. John 18304.*

This is a third species in the distinct group of *C. decurrens* of the Society Islands and *C. alata* (Fournier) Copeland of New Caledonia. It seems to be decidedly the largest species, with taller and much stouter trunk than *C. decurrens,* and the frond is larger as a whole and in all divisions. *C. decurrens* has effectively no persistent paleae on the frond. *C. alata* has a small but conspicuous pad of them at the nether base of each primary pinnule. *C. subbullata* bears them in fair abundance under the costae of the secondary pinnules. The Rarotongan plant reported as *C. decurrens* might be regarded as a fourth distinct species.

Cyathea truncata (Brackenridge) Copeland.

This species is more distinct than uniform. It is known in Fiji and Samoa; questionably, from as far west as Celebes. Several recent Fiji collections fit the original description and illustration more perfectly than does a Brackenridge specimen apparently from Samoa.

FIGURE 1.—*Cyathea subbullata* Copeland.

The secondary pinnules are distinct almost to the apex of the primary pinnules—that is, it is fully tripinnate; and the secondary pinnules, as a rule, are almost all contracted at the base, with a spur on the upper side, and many lower ones are distinctly stalked. The axes are dark throughout, and scaly with various ciliate paleae. A speci-

men from Viti Levu, Tholo East, Matawailevu, alt. 1,700 ft., St. John 18192, is aberrant in having lighter and less paleate axes, especially the minor ones, and all except the very lowest secondary pinnules completely adnate, and thus without spurs, but not connected. It seems too similar for specific separation. I do not know *Alsophila vitiensis.*

Dryopteris gongylodes (Schkuhr) O. K.

From Kusaie, Caroline Islands, Takamatsu 442 is typical. From Ponape, Takamatsu 899 is glabrous, but different in no other respect. The pubescence is variable on specimens from other lands, but, so far as our specimens show, always evident.

Tectaria crenata Cavanilles.

Caroline Islands: Kusaie, Mount Matante, *Takamatsu 520.*

Only one pair of intermediate lateral pinnae, and these 7 cm. in width. This might be regarded as a distinct species, but the width of the pinnae and their correlated fewness are the only distinguishing criteria. The margin is entire, but this is not unknown in *T. crenata.* Takamatsu 185, from Truk, has about three pairs of intermediate pinnae, up to 5 cm. wide, with the common sinuate margin.

Athyrium ponapense Copeland, species nova (fig. 2).

Rhizomate ignoto; stipite 40 cm. alto, 3 (prope laminam) ad 5 (basi) mm. crasso, inerme, basi paleis castaneis 10-12 mm. longis basi 1.5 mm. latis deinde contractis anguste linearibus debilibus setis concoloribus ciliatis immerso, sursum rhachique glabrescentibus sordide nigris; fronde 55 cm. alta, late ovata, tripinnatifida, glabra, herbacea, saturate viride inferne vix pallidiore; pinnis infimis 25-30 cm. longis, 15 cm. latis, acuminatis, stipitulis 3 cm. longis protensis, pinnis pinnulisque ubique contiguis; pinnulis majoribus 8 cm. longis, 2 cm. latis, acuminatis, basi truncatis, infimis brevi-pedicellatis, profunde pinnatifidis; segmentis contiguis, ellipticis, 10-12 mm. longis, 4 mm. latis, inciso-serratis; venulis usque ad 7-paribus, plerisque simplicibus; soris 5-6-paribus, inferioribus ad costam nullis ad marginem prolongatis, indusiis castaneis, angustis, infimis diplazioideis.

Caroline Islands: Ponape, Anapeng-pa, in shade, February 6, 1936, *Takamatsu 705.*

The axes are quite like those of *A. melanocaulon,* which also has ciliate (but black) paleae; there is no further resemblance. The group of *A. maximum* has similarly ciliate, but more or less black-bordered, paleae. Because of its deep green, compact foliage, *A. ponapense* is an exceptionally handsome fern.

FIGURE 2.—*Athyrium ponapense* Copeland.

Tapeinidium amplum Copeland, species nova (fig. 3).

Rhizomate lignoso, 3-4 mm. crasso, et setis 1 mm. longis dilatatis et basibus setarum vestito; stipitibus proximis, usque ad 50 cm. altis, fuscis, deorsum setis atropurpureis 1.5 mm. longis vestitis; fronde 40-50 cm. alta, 25-30 cm. lata, basi tripinnata; pinnis infimis maximis, 15-20 cm. longis, acuminatis, pinnula infima usque ad 10 cm. longa pinnata pinnulis II inciso-serratis; pinnis medialibus ca. 15 cm. longis, 4 cm. latis, acuminatis, pinnulis infimis vix quam sequentibus majoribus, brevi-pedicellatis, pinnatifidis, acutis, basi cuneatis, glabris, papyraceis, segmentis oblanceolatis; soris minutis, indusio late obconico, rarissime ad marginem extenso.

Palau Islands: Kaiguru, April 15, 1936, in dark forest, *Takamatsu 1610*; Gurasumao, in forest, *Takamatsu 1572*, rare.

FIGURE 3.—*Tapeinidium amplum* Copeland.

The fronds are the most ample in the genus, and the sori probably the smallest. *T. tenuius* is more finely dissected, and *T. moluccanum* may be equally so. *T. lineare* (Cavanilles) C. Christensen has never been very completely described; it is noted as being a short fern, which *T. amplum,* conspicuously, is not.

Schizoloma Walkerae (Hooker) Kuhn.

Palau Islands: Marukiyoku, in open, moist place, *Takamatsu 1703,* common.

This is a remarkable extension of range, but the identity with Ceylon specimens, *1. Thwaites,* is complete.

Histiopteris sinuata (Brackenridge) J. Smith.

The dissection of the frond and the shape of the pinnules distinguish this species from *H. incisa* at sight, but the absence of stipule-like leaflets has afforded a more convenient diagnostic criterion. St.

FIGURE 4.—*Pteris macracantha* Copeland.

John 18300, from Viti Levu, Tholo East, now presents a plant having the characteristic fronds and pinnules of *H. sinuata,* but with small "stipules." Also, these are not quite wanting on Setchell and Parks 15060. Such plants might be hybrid, but more probably are atavistic, *H. incisa,* construed in the usual broad sense, being by easy presumption the parent species.

Pteris macracantha Copeland, species nova (fig. 4).

P. quadriauritae affinis; stipite 30-40 cm. alto, basi castaneo pilis 5-9 mm. longis linearibus rufo-castaneis vestito, sursum stramineo vel brunnescente, inerme, gracile; fronde ca. 40 cm. alta, 20 cm. lata, profunde bipinnatifida pinnis ca. 10-paribus, infimis pinnulis plerumque duo basiscopicis pinnis aliis similibus acutis; pinnis suprabasalibus sessilibus, ca. 12 cm. longis, 25-28 mm. latis, caudatis, fere ad costam pinnatifidis; segmentis usque ad 25-paribus, 15 mm. longis, basi 4 mm. latis, apice crenulatis vel mucronulatis, laete viridibus, herbaceis; venis ca. 11-paribus, supremis simplicibus, ceteris apud vel prope costulam furcatis; rhachi ad insertionem pinnae quaeque superne pulvino e spinulis minutis composito praedita; costa pinnae ad basin segmenti quique spina 2-2.5 mm. longa armata; costulis ad bases venularum spinas similes albidas gerentibus; soris fere ad sinus et apices elongatis.

Caroline Islands: Ponape, Anapeng-pa, in forest, February 6, 1936, *Takamatsu 744,* common.

In a group with species already named *armata* and *spinescens,* this is remarkable for the number and size of the spines on the leaves.

FIGURE 5.—*Calymmodon ponapensis* Copeland.

Calymmodon ponapensis Copeland, species nova (fig. 5).

C. cucullato affinis, paleis rhizomatis 5 mm. longis, 0.7 mm. latis, brunneis, apiculatis; stipitibus 5-10 mm. longis; fronde usque ad 17 cm. longa, 5 mm. lata, parte fertile aut aequilata aut paullo angustata, glabra, rhachi anguste nec inconspicue alata, segmentis obliquis, inter se 4 mm. remotis, 1.5 mm. latis, obtusis, herbaceis haud flaccidis, fertilibus rhachin versus non angustatis.

Caroline Islands: Ponape, Mount Nan-a-lant, "on decomposed trees", *Takamatsu 1094.*

This species is distinguished from *C. cucullatus* by the more evidently winged rachis, very oblique segments, and absence of hairs; from *C. latealatus* by the less alate rachis, much larger paleae, and more remote segments. Although the segments are about 4 mm. apart, measuring along the rachis, and only 1.5 mm. broad, they are so obliquely placed that often only their own width may separate them.

Grammitis scleroglossoides Copeland, species nova (fig. 6).

Rhizomate brevirepente, paleis ferrugineis 4-5 mm. longis 0.6-0.8 mm. latis integris plerisque acutis occulto; stipitibus approximatis (subfasciculatis), 1 cm. longis, fuscis, pube brevissima castanea vestitis; fronde usque ad 17 cm. longa, 4-7 mm. lata, utrinque attenuata, integra, coriacea, olivaceo-viride, setis brevissimis atropurpureis aut solitariis aut geminatis perpaucis nisi inferne ad costam mox deciduis sparsa et ciliata; venis immersis, 2-3-ramosis, rarissime anastomosantibus; soris subcostalibus, approximatis et saepe imbricatis, leviter immersis, oblongis, 2-3 mm. longis, typice oblique positis, interdum curvatis, rarius costae parallelis et hic illuc confluentibus, sporangiis nudis.

Caroline Islands: Ponape, Mount Nan-a-lant, February 1936, *Takamatsu 1095.*

This is a typical enough *Grammitis,* but its affinity to *Scleroglossum* is unmistakable, shown by the sometimes geminate, minute and deciduous setae as well as by the sometimes parallel and confluent sori. In *Grammitis,* it is related to **G. pleurogrammoides** (Rosenstock, *Polypodium,* see Univ. Calif. Pub., **12**: 402, 1931) comb. nova, and **G. locellata** (Hooker, *Polypodium,* Jour. of Bot., **28**: 108, 1890), comb. nova, both of New Guinea, with sori more deeply immersed and, so far as known, always parallel to the costa.

Takamatsu's 1105, collected at the same time as 1095, is a mixture, two plants of *G. scleroglossoides* and one perfectly typical little *Scleroglossum sulcatum* (Kuhn) v. A. v. R.; the latter already reported from Ponape by Christensen (Dansk Botanisk Arkiv, **6**: 29, 1929). Also from Ponape, Tolomail, is Takamatsu's 948, typical *S. pusillum* (Blume) v. A. v. R. As to these two species of *Sclero-*

FIGURE 6.—*Grammitis scleroglossoides* Copeland.

glossum, they look very distinct, but their distribution justifies Christensen's conclusion (loc. cit., p. 28), "It is much more natural to suppose that *S. sulcatum* is a form of *S. pusillum* occurring here and there."

The discovery in Ponape of a *Grammitis* with evident affinity to *Scleroglossum* is not to be accepted as evidence that *Scleroglossum* originated here. In the tentative way in which such questions may first be answered, the region in which *Scleroglossum* evolved to generic distinctness seems to be New Guinea. The assumption that this evolution occurred somewhere, and from *Grammitis,* is positive on my part.

We have all assumed too long that the prevailing fern migration between Papua and Malaya has been eastward. There might have been no prevailing direction. But I am coming rather confidently to the opinion that there was a prevailing direction, and that it was

toward the west. This is an advance statement of a thesis I expect to present with due elaboration in the near future. It involves a far more fundamental correction of old prejudice as to the origin of fern floras, a prejudice we have all shared, perfectly voiced by Christensen (Dansk Botanisk Arkiv, **6**: 33, 1929).

> It can scarcely be denied that *Scleroglossum* is nearly related to *Cochlidium*, and considering the widely different geographical distribution of the two genera it seems reasonable to conclude that, like several other pairs of plant-genera, they are relics of an old (tertiary?) group of polypodioid ferns, which was widely distributed through all northern continents.

The two genera are related, in that both evolved from *Grammitis;* but one evolved in America, the other perhaps in Papua, perhaps farther south. *Grammitis* itself, the parent genus, is Antarctic in origin, and came independently into the American and the oriental tropics before Antarctica became a land unfit for ferns, but not necessarily as long ago as Cretaceous time. With so long a probably independent history, the generic distinctness of *Grammitis* and *Polypodium,* a genus which may be really northern in history, can hardly continue to be questioned.

Grammitis ponapensis Copeland, species nova (fig. 7).

> Rhizomate breve, 2 mm. crasso, paleis castaneis 3-4 mm. longis linearibus pallide ciliatis dense immerso; stipitibus confertis, 2-5 cm. longis, rigidis, setis cinereis vel fulvis 0.2 mm. longis densissime velutinis; fronde usque ad 15 cm. longa et 11 mm. lata, utrinque angustata, integra, subcoriacea, pilis pallide fulvis 0.5-0.9 mm. longis dense ciliatis et ad facies ambas adspersis; venis 2-5-ramosis; soris typice (in evolutione plena plantae) irregulariter pluriseriatis, superficialibus, oblongis, sporangiis nudis.

Caroline Islands: Ponape, Tolomail, on tree trunks, February 1936, *Takamatsu 950.*

The most remarkable feature of this species is the diversity in shape and insertion of the sori. On about half of the fronds, construed as not representing the plants in full development, they are in single, regular subcostal rows, and then (a) completely occupying the short lowest acropetal branch, or (b) occupying the distal part of a branch not so extremely short, or (c) dorsal on a branch prolonged above the sorus. On wider, whether or not longer, fronds, they are pluriseriate, commonly on both acroscopic and basiscopic branches, and these fertile lower branches most often reduced, not extending beyond

the sori; but on the upper, and rarely on all branches, they are likely to be dorsal, the fertile branches extending nearly to the margin. In form, the sori vary from round to more than twice as long as wide.

FIGURE 7.—*Grammitis ponapensis* Copeland.

Grammitis Christophersenii Copeland, species nova (fig. 8).

Rhizomate breve, paleis fuscis 1 mm. longis ca. 6 cellulis latetudine vestito; stipitibus fasciculatis, vix 5 mm. longis, nigro-fuscis, validis, setis crassis atro-fuscis 0.2 mm. longis dense vestitis; fronde 5-7 cm. longa, utrinque angustata, subcoriacea, costa sparse margine densissime setis minutis crassis vestitis, faciebus glabrescentibus; venis furcatis, ramo basiscopico furcato, acroscopico simplice prope basin sorifero; soris magnis, costae approximatis, plerisque contiguis, orbicularibus, receptaculo subelongato, sporangiis setis quam iis stipitis marginisque longioribus munitis.

Samoa: Savaii, above Matavanu, alt. 800 m., "in medium wet forest", April 6, 1931, *Christophersen and Hume 2277,* in part.

The diversity and strict localization of the species of *Grammitis* may be shown nowhere better than in Samoa, where *Polypodium samoense* Baker, *P. savaiense* Baker, *P. graminellum* C. Christensen and *P. Whitmeei* have previously been described. No two of the five have any particular resemblance which might suggest a common local origin.

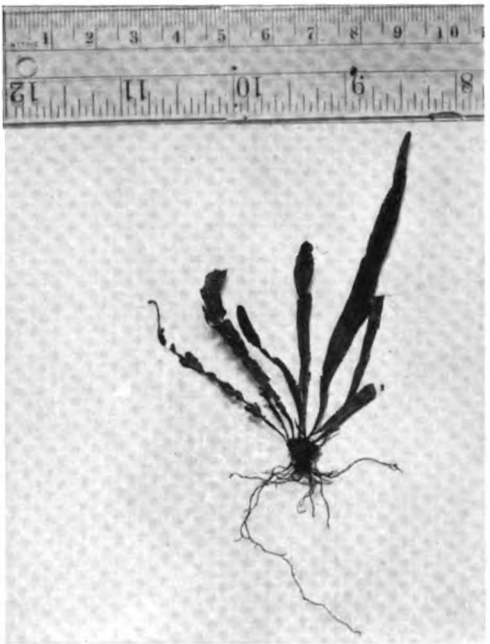

FIGURE 8.—*Grammitis Christophersenii* Copeland.

Goniophlebium ponapense Copeland, species nova (fig. 9).

Rhizomate nigro, 4 mm. crasso, paleis fusco-ferrugineis 3 mm. longis aciculari-attenuatis basibus dilatatis setiferis vestito; stipite laete castaneo, 45 cm. longo; fronde 50-60 cm. longa, 20-24 cm. lata; pinnis ca. 16-paribus, pedicellatis, ca. 12 cm. longis, 12-15 mm. latis, basi cuneatis, apice caudatis, inconspicue appresso-serrulatis, papyraceis, glabris; venis nigris, series 2 (rarius 3) areolarum includentibus; soris parvis et approximatis, superficialibus.

Caroline Islands: Ponape, Tolotom, "on the top of the mountain", *Takamatsu 1045,* type; Tolomail, "on decomposed trees", *Takamatsu 946;* and "on high part of mountain", *Takamatsu 971,* the three collections very uniform.

Nearly related to *G. persicifolium* (Desvaux) Beddome, but the venation more compact, and the sori therefore closer, as well as conspicuously smaller.

Antrophyum subfalcatum Brackenridge.

A. Novae Caledoniae Hieronymus, Hedwigia **57**: 207, 1915.

Viti Levu: Tholo East, Matawailevu, Wainamo Creek, alt. 1,600 feet, *St. John 18186.*

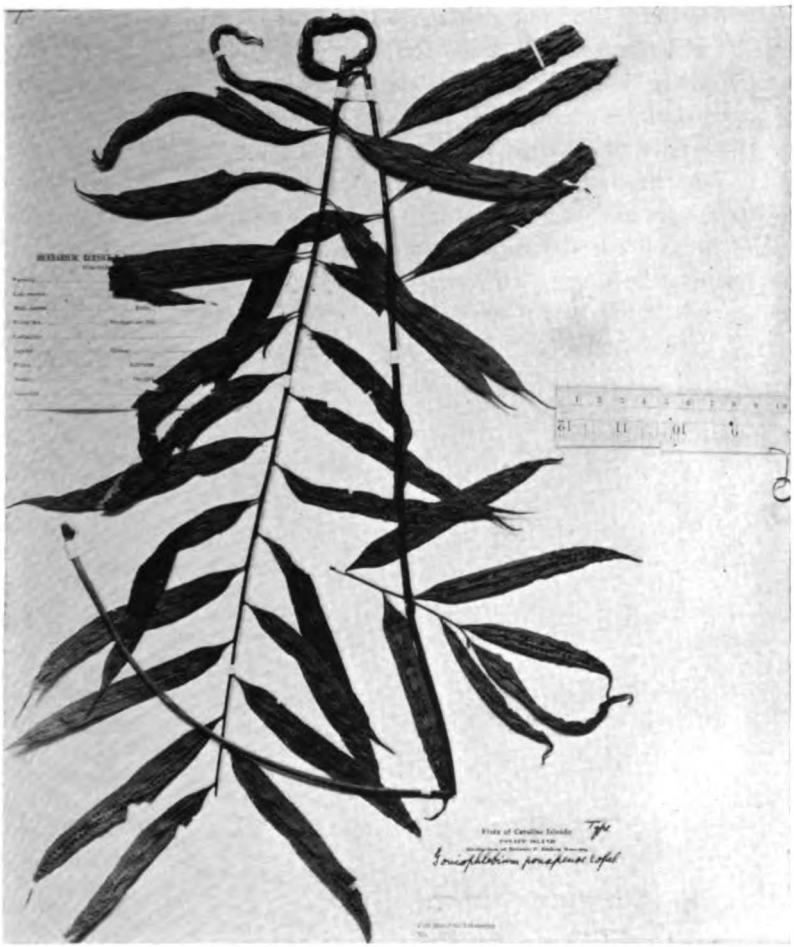

FIGURE 9.—*Goniophlebium ponapense* Copeland.

The collection consists of two plants of typical *A. subfalcatum,* and two plants with fronds mostly 12 mm. or more in width, and with imbricate sori in two or three rows on each side, specifically indistinguishable from *A. Novae Caledoniae,* not quite so robust, but well filling the gap between the two species as described.

A. Novae Caledoniae was based on specimens collected by Franc, Forêt de Saint-Louis, January 1907, distributed by Dr. Rosenstock as *Filices Novae Caledoniae* number 24. In the Bonati herbarium,

Franc 633 bears the same data as to place and date of collection, and Christ's identification as *A. subfalcatum,* which I regard as correct. It may not be doubted that these are the same collection, renumbered by Rosenstock. Pancher 595, collected in 1870 (in the herbarium of the University of California), was received from the Paris Museum as *A. subfalcatum.* The renumbering, and renaming (as *A. semicostatum* var. *latipes* Rosenstock) are understandable; but as much cannot be said for the subsequent publication of a fourth name for the Franc collection, *A. Francii* Rosenstock (Meded. Rijks Herb. Leiden, no. 31 : 3, 1917), with a citation of *A. Novae Caledoniae.*