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Ferns of Rotuma Island, a Descriptive Manual¹

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INTRODUCTION

GEOGRAPHY

Rotuma Island lies in the tropical central Pacific Ocean at 12° 30' S. latitude 177° 05' E. longitude. It is an isolated volcanic island, not definitely assigned to any group or archipelago; but it is now a part of the British Crown Colony, Fiji, and is nearest to Vanua Levu of the Fiji Archipelago, about 300 miles to the southeast. To the north lie the Ellice Islands; to the east, the Wallis Islands and Samoa; to the west, the Santa Cruz Islands and the New Hebrides. Rotuma, which is situated at the point where Melanesia, Micronesia, and Polynesia meet, deserves close study. Nevertheless, to the present, its flora is unknown.

Rotuma is 9 miles long, east and west, and 2¾ miles wide. It has a main section, oblong-ovate in shape, 6¼ miles long and a smaller western section 1½ miles long, joined to the main island by a narrow sand spit on which is located the principal village, Motusa. The two upland sections are of rolling land culminating in numerous hills, many over 500 feet in height and the highest, Suelhof, is 840 feet high. There are wide valleys and streambeds, but no permanent streams. There is a good dirt road from Motusa (fig. 1, *a*) to the western end, and to the east there is a belt road that encircles the island keeping close to the shore. There are several off-shore islets: on the south,

¹ In this brief title, only the word ferns is used. However, the paper includes all Rotuman ferns and fern allies, that is, the Pteridophyta.

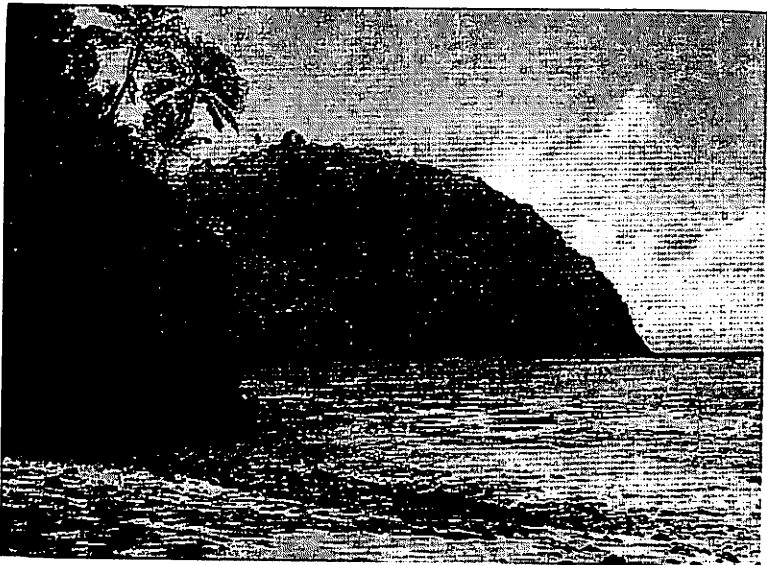


FIGURE 1.—a, looking southeast from Soloroa to Motusa on the isthmus and to Kongai hill, showing *Piper* sp. growing on coconut trunks; b, looking east from Pepjei Point to Solkope Island.

Solnahu and Solkope (420 feet high, shown in figure 1, *b*); on the west, Afnaha and Husia; on the northeast, Haua Meamea and Hauatia; and on the northwest, at a distance of 2 miles, is Uea (860 feet high), a steep cone-like mass, with sea cliffs on the north side. Still further west are Hatana, bare cloven rocks, and Hoffiua, a mere sand bank.

GEOLOGY

A shelving coral reef surrounds the south, east, and north sides, but to the northwest, it draws back and forms a barrier reef which is under 15 to 20 fathoms of water.

There are numerous lowland areas where the soil is beach coral sand or coral sandstone, and these are mapped by Gardiner (20, p. 3).² He reported olivine-dolerite from Kugoi [Kongai]; basalts from Tarasua Point, Savelei [Savlei] Point, Hoi, and Vavasse (opposite Solkope Island); and consolidated volcanic ash from Sol Kopi [Solkope Island], Howa [Haua Meamea Island], Kugoi [Kongai], Kiliga [Kilinga], and Sororoa [Soloroa].

The interior of the eastern and larger section has numerous conical hills 300 to 600 feet in height, most of them with a shallow crater, and formed of basalt or volcanic ash. Several of them are described in geologic detail by Gardiner (20, pp. 4-5).

Near the western end is the volcanic peak Soloroa (715 feet high) which has a precipitous northern slope of red tuff visible to passengers on vessels approaching the anchorage. This cliff is described as red sandstone in the United States Pacific Island Pilot (28, p. 431), but it seems to be tuff.

Rotuma is wholly volcanic. There are no very recent lavas, but many of the hills are still crateriform, and reaching the shore at Pepjei is a flow of aa basalt that, though forested, shows no perceptible soil on the lava rocks.

CLIMATE

The rainfall is ample and well-distributed. In the year 1937 it totaled 140.43 inches, with a smallest monthly amount of 5.58 inches in July and a largest monthly amount of 22.37 inches in February. The highest rainfall recorded in one day was 9.88 inches. The 21-year average annual rainfall from 1913 through 1933 was 141.52 inches.

² Numbers in parentheses refer to Bibliography, page 207.

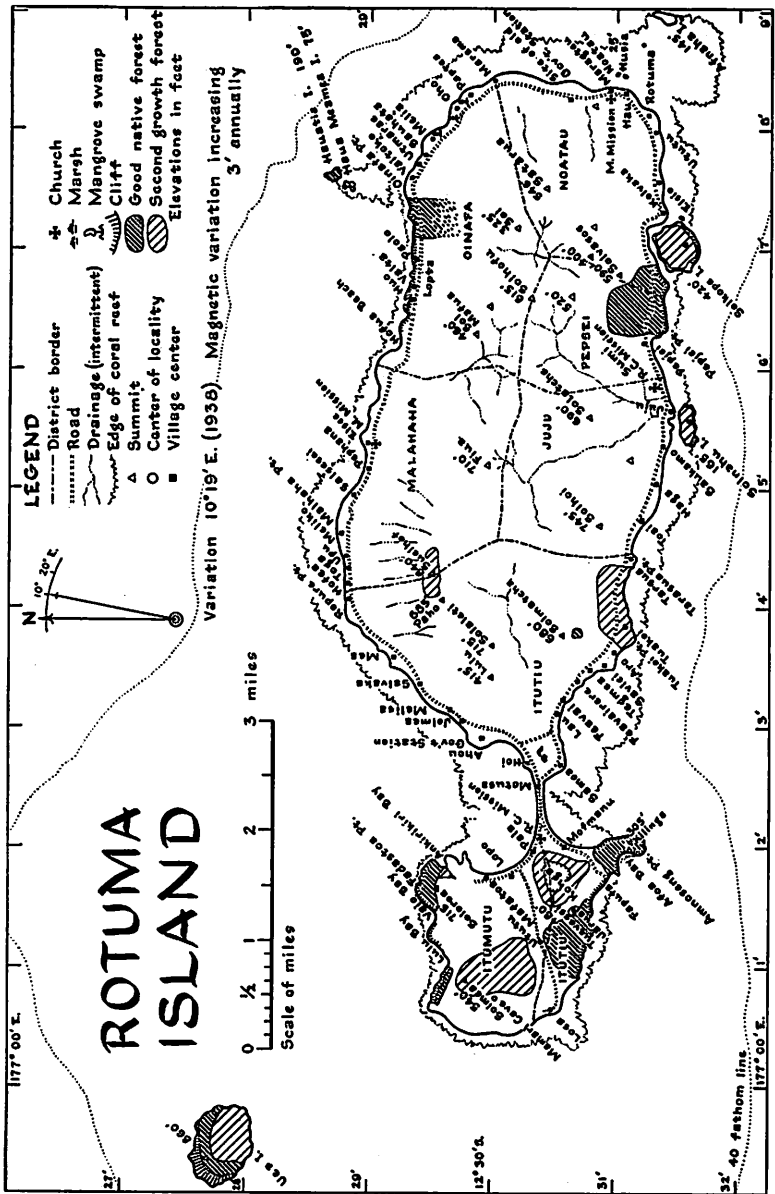


Figure 2.—Numbers in parentheses represent co-ordinates from the map, first, latitude in minutes and tenths; second, longitude:

Afnaha I. (31.4, 9); Eliso (31.3, 7.6); Fapufa (31, 1.7); Hatana I., west of Uea I.; Haua Meamea I. (28.9, 7.5); Hauatia I. (29.4, 7.7); Hofiua I., west of Uea I.; Hoi (30.3, 2.7); Huo (29.4, 6.6); Husia I. (31, 8.5); Itumutu Dist. (30, 1); Itutu Dist. (30.7, 1.1); Jarua (30.8, 1.4); Juju Dist. (30.5, 5.4); Kilinga (31.2, 2.1); Kongai (30.7, 1.7); Lasa (30.6, 0.7); Lulu Bay (29.7, 1.1); Mea (29.2, 3.6); Motusa (30.4, 2.5); Oinata Dist. (29.8, 7); Paho (29.7, 4); Pala (30.3, 2); Pepei (31.3, 6.2); Pepei Dist. (30.8, 0); Salsesci (28.9, 5); Salwaka (29.4, 3.3); Satarua (30.4, 17.5); Sawlei Pt. (30.9, 3.4); Salkope I. (31.6, 7); Solmaka (30.6, 3.8); Solomau I. (31.7, 5.5); Solorca (29.6, 1.7); Stielhof (29.6, 4.3); Sumi (31.3, 5.8); Tarasua Pt. (31.2, 4.3); Tucessi (30.6, 1.5); Uea I. (28, 59.5); Ututu (31.3, 8); Vaitoko (29.4, 7.6).

The temperature records for 1937 show the maximum as 90° F. and the minimum as 69° F.

Southeast trades prevail from April to December, but from January to March the winds shift to the north and northwest. The average wind force for 1937 was between 3 and 4 (Beaufort's Scale). The maximum force, rarely recorded, was 7.

DEFORESTATION

Like nearly all of the islands of the tropical Pacific, Rotuma was exploited for copra planting three or four generations ago. The native forest was cleared from all but a few small areas that total about 5 percent of the entire area. A slightly smaller area has recovered to form a second growth forest. These areas are shown on the map (fig. 2). Nearly all of the remaining area, more than 90 percent of the island, is planted with coconut trees as copra plantations. Many of these areas were little worked or tended, and it is possible that they may be reclaimed by the native forest.

The richest patches of native forest are at Kilinga, Pepjei, and least disturbed of all, the isolated islet of Uea. All of the areas of surviving native forest are on high, steep land or on rough basaltic lava flows nearly devoid of soil. Their unsuitability for agriculture is obviously the factor that has protected them.

FERN FLORA

Discounting one fern, *Adiantum Capillus-veneris*, which is present only as a rare, cultivated pot plant, there are on Rotuma 31 native species of ferns and fern allies. One of these species, *Angiopteris evecta*, is doubtfully native, but it is here tabulated with the others.

ECONOMIC USES

For food, only one species of fern is used. From the fronds of *Pteris pacifica* is made a decoction which is an ingredient in the starchy puddings made from arrowroot (*Tacca*). For medicine, as a poultice on boils, the natives extract and apply the pith of the stipes of *Pteris tripartita*. For the same use, the crushed herbage of *Tectaria dimorpha* is applied. For personal adornment, the fronds of *Pteris ensiformis* are made into garlands.

In former times the stalks and blades of certain ferns were used as strainers for liquids. Even today, at least four of the ferns—species of *Cyclosorus*, *Pteris*, and *Tectaria*—bear the common name *sakoto* (sieve) which indicates their use in aboriginal times.

VERNACULAR NAMES

Because of previous training and experience and interest in ethnobotany, the collector made every effort to learn and record the vernacular Rotuman names of all the plants. Through the help of the British Resident, A. E. Cornish, several native assistants well-versed in local natural history were employed. The principal assistant was Elia Pepoto, monitor, or assistant teacher, at the Motusa School. He knew the plants well and spoke English. For the first three days, the assistant was Taito. Others were also consulted, especially the father of Pepoto, who knew even the rare plant species.

Though its derivation is unexplained, the vernacular name *julia* seems fairly translated as fern. It is applied to numerous species. Most of the vernacular names obtained are also in Churchward's dictionary (10), but only identified as "a fern," a "pinnatifid fern," and so forth. It was noted, however, that under the word *julia*, he summarized four kinds of fern (10, p. 234). Three of these names were not recorded by the writer. Of these his *julia faksili* (fern, shelter from the rain) would be an apt name only for *Asplenium nidus*, if it be a fern name. The name here recorded for *A. nidus* is *kukulufi*.

Churchward also lists *julia fea* (the fern that is afraid). The writer suggests that this may be one name of *Mimosa pudica*, or sensitive plant, for which the recorded name is *aifeaefamori* (the plant that is afraid of people), a very similar and descriptive name.

Churchward lists *julia fū hap'esea* (fern, knee, to be one-sided), a name that seems improbable for any known Rotuman fern. The present writer also recorded the name *julia* for *Asparagus Sprengeri* and *Pilea microphylla*. From these applications, it is seen that in Rotuma the name *julia* is applied to many ferns, and to other small-leaved, fernlike plants, whether Monocotyledones or Dicotyledones. Hence, it is not safe to assume that the three unknown kinds of *julia* listed by Churchward are true ferns.

MORPHOLOGY AND ORTHOGRAPHY OF ROTUMAN NAMES

The writer makes no pretense at being a linguistic scholar, but he knows several languages and has recorded vernacular names and plant lore on numerous islands of Polynesia, Melanesia, and Micronesia. Up to now, the Rotuman words and language are the most difficult in his experience. This is not due to the inadequacy of the spelling as codified by the missionaries, for that difficulty was avoided by recording each word as it sounded to the hearer.

The most baffling feature was the fact that nearly every word has two shapes called "phases" by Hocart (21) and Churchward. Usually the complete phase ends in a vowel, and the shorter, or incomplete, phase is made by eliding the final vowel; but in some words the incomplete phase has a metathesis, or inversion, of sounds or syllables. Then, too, words may be simply abbreviated in speech or writing. Churchward explained (10, pp. 14-15) that the complete phase indicated a definite significance, the incomplete phase an indefinite one. Perhaps so, but the present collector was given both the complete and incomplete phases of the name of nearly every plant species, words which were usually nouns, given in response to the question, "What is the name of this particular plant?" Thus, a word may have several versions and it may be abbreviated. If an informant gives the name of an object, it may be either phase of the word. If asked to repeat it, almost invariably he will utter the other phase. This lack of fixity of words makes Rotuman a very difficult language. A naturalist hesitates before rejecting the latest recorded version of a language, but the native Rotumans have themselves rejected the system of Churchward (9, 10).

The Rotuman language, according to Churchward (9, p. 104; 10, p. 159), is largely unique, though having some resemblances, particularly in the vocabulary, to two Polynesian languages, Samoan and Tongan, and to a Melanesian language, Fijian. He holds that it has smaller Micronesian elements, but in addition an important unique Rotuman or aboriginal element unlike any of the others and peculiar to the Rotumans.

Adopted for use in this report are only the consonants used by Churchward: *f, g, h, j, k, l, m, n, p, r, s, t, v*, and the hamza (‘) to represent the glottal stop. The letter *j* is pronounced like the English *ch*. Hocart represented it as sounding like *tsh*, and Churchward (10,

p. 13) as *tch* in pitch. It would have been preferable to eliminate the letter *j* and replace it by *ch*, but *j* is so firmly established and so frequently used in Rotuman writing, on maps, and elsewhere, that it is better to make the concession and to continue to write it *j* (pronounced *ch*). The custom is to represent the nasal only by *g*, but here it will be phonetically spelled *ng*.

For vowels, the complicated modifications employed by Churchward are here rejected, on advice of residents and of natives of Rotuma. Instead is followed the system of Hocart (21), using simply the five vowels: *a, e, i, o, u*.

After recording the vernacular names, a conference on them was held with the Commissioner, several chiefs, and particularly with Leo, secretary in the Commissioner's Office. Each name was read to him, and, if necessary, the plant was described; then he wrote down the vernacular name in best Rotuman. Then the two versions were compared, discussed, and arbitrated. Thus, the vernacular names here used, usually in the complete phase, were recorded.

ENDEMIC AND INDIGENOUS SPECIES

There seems to be only one species truly endemic to Rotuma. *Cyclosorus rotumaensis* (fig. 3). At first there seemed to be another, *Tectaria dimorpha* (fig. 4), but since then other specimens have been seen from the Admiralty Islands.

Within a few hundred miles there are surrounding islands: to the north, the Ellice Islands; to the east, the Wallis and Samoan Islands; to the south and nearest of all, the Fijian Islands; and to the west, the Santa Cruz and New Hebrides Islands. It is not unexpected that most of the fern species of Rotuma are of wide distribution on the surrounding islands and across the tropical Pacific.

The north-south distribution is the least significant, since the island groups to the north contain only low, coral islands, and these support few ferns or none at all. There are high islands to the south and especially to the east and the west, and the records there are numerous in table 1. It should be mentioned that the floras of the Gilbert, Ellice, and Wallis Islands are almost unknown, and that of the New Hebrides only slightly known.

Table 1.—Distribution of the indigenous ferns of Rotuma

	ADMIRALTIES	SOLOMONS	NEW CALEDONIA	NEW HEBRIDES	KUSAIE	MARSHALLS	GILBERTS (TABITEUA)	ELLICE (FUNAFUTI)	FIJI	TONGA	NIUE	SAMOA	UVEA	DISTANT LOCALITIES
<i>Lycopodium carinatum</i>	×	×	×						×			×		Rarotonga, Australia, New Zealand, Melanesia, Malaysia, Philippines, Formosa, Malaya, India
<i>cernuum</i>	×	×	×	×	×				×	×		×	×	Rarotonga, Rapa, Tahiti, Marquesas, Hawaii, south-eastern U. S., West Indies, Cent. America, S. America, Australia, New Zealand, Melanesia, Carolines, Marianas, China, Japan, Malaya, Cochín-China, India, Ceylon, trop. Africa, New Guinea
<i>Hamiltonii</i>														Java, China, Indo-China, Ceylon, India
<i>Phlegmaria</i>	×	×		×	×				×		×	×		Tahiti, Marquesas, Mexico, New Guinea, Melanesia, Malaysia, Guam, Philippines, China, Cochín-China, Mauritius, India, Ceylon, Madagascar, west Africa
<i>Psilotum nudum</i>	×	×	×	×	×	×		×	×	×	×	×	×	Rarotonga, Manihiki, Tahiti, Makatea, Washington, Hawaii, Midway, Easter, Florida, trop. America, Australia, Lord Howe, Norfolk, New Zealand, Kermadecs, Carolines, Marianas, Malaysia, Philippines, Japan, India, Mauritius, Madagascar, Africa
<i>Ophioglossum pendulum</i>	×	×	×	×	×	×			×	×	×	×		Rarotonga, Australs, Society, Makatea, Australia, New Zealand, Melanesia, Marianas, Malaysia, Philippines, Malaya, Mascarenes, India, Ceylon, Madagascar, east Africa
<i>Angiopteris evecta</i> ³	×		×	×					×	×		×		Rarotonga, Australs
<i>Schizaea dichotoma</i>	×	×	×	×	×				×	×		×	×	Society, Australia, New Zealand, Guam, Philippines, Malaya, India, Madagascar
<i>Athyrium polyanthes</i>									×			×		Australs, Rapa, Tahiti
<i>Cyclosorus rotumaensis</i>														endemic
<i>unitus</i>	×	×							×			×		New Guinea, Marianas, Malaysia, Philippines, Mascarenes, India, Ceylon
<i>Lastrea Torresiana</i> ⁴					×				×			×		Rarotonga, Australs, Society, Hawaii, Java, Philippines, trop. Asia, Ceylon

³ Formerly this species was accepted as occurring as far west as Japan, India, and Africa. Here the treatment by Copeland is followed, restricting it to the region of western Melanesia and of Polynesia.

⁴ Only the specimens seen by the writer have been used in the table of distribution, as in this critical group the published records are considered unreliable. This species is also widespread in the New World, but it is presumably introduced there.

Table 1.—Distribution of the indigenous ferns of Rotuma—(Continued)

	ADMIRALTIES	SOLOMONS	NEW CALEDONIA	NEW HEBRIDES	KUSAIE	MARSHALLS	GILBERTS (TABITEUEA)	ELLICE (FUNAFUTI)	FIJI	TONGA	NIUE	SAMOA	UVEA	DISTANT LOCALITIES
<i>Tectaria dimorpha</i>	×													
<i>Stearnsii</i>														
<i>Asplenium falcatum</i>	×		×	×					×	×		×		Tahiti, New Zealand, Australia, Norfolk, New Guinea, Melanesia, Malaysia, Carolines, Marianas, Philippines, Mauritius, Madagascar, Africa
<i>nidus</i>	×	×	×	×	×	×		×	×	×	×	×		Tahiti, Marquesas, Tuamotus, Line Is., Hawaii, Australia, Micronesia, Malaysia, Formosa, Japan, India, Madagascar, Africa
<i>Blechnum orientale</i>	×		×	×	×		×	×	×	×		×		Australis, Rapa, Society, New Zealand, Australia, Melanesia, Carolines, Marianas, Malaysia, China, India, Ceylon
<i>Phymatodes Scolopendria</i>	×	×	×	×	×	×			×	×		×		Cook, Australis, Pitcairn, Society, Marquesas, Tuamotus, Mangareva, Flint, Line Is., Australia, New Zealand, Norfolk, Admiralty, New Guinea, Melanesia, Malaysia, Carolines, Marianas, Philippines, China, Formosa, Ryukyu, Mascarenes, Ceylon, Madagascar, Africa
<i>Antrophyum plantagineum</i>	×		×	×					×	×		×		Tahiti, New Guinea, Micronesia, Malaysia, Philippines, India, Ceylon
<i>Vittaria elongata</i>	×	×	×	×	×	×			×	×		×		Carolines, Marianas, trop. Asia
<i>Crepidopteris humilis</i>	×		×		×				×			×		New Guinea, Java, Sumatra, Philippines, Mauritius
<i>Gonocormus minutus</i>	×		×		×				×			×		Hawaii, Guam, Ceylon
<i>Microlepia scaberula</i>														Tahiti, Moorea
<i>Lindsaea ensifolia</i>	×		×						×			×		Australia, Carolines, Guam, Asia, Ceylon, Africa
<i>Davallia solida</i>	×	×	×	×	×				×	×	×	×		Cook, Australis, Rapa, Society, New Guinea, Carolines, Marianas, Java, Philippines, Formosa, India, Indian Ocean
<i>Nephrolepis biserrata</i>	×			×	×	×			×	×	×	×		Australia, Carolines, Marianas, India, Africa
<i>Pteris comans</i>		×		×					×	×		×		Polynesia, New Zealand, Tasmania, Australia
<i>ensiformis</i>	×	×	×	×					×	×		×		Polynesia to China and India
<i>pacifica</i>	×								×	×		×		New Guinea, Celebes, Malaya
<i>tripartita</i>	×	×	×	×	×	×			×	×	×	×		to Tahiti, Marquesas, Carolines, Guam, to Africa
<i>Acrostichum aureum</i>	×	×	×	×					×	×	×	×		pan-tropic, Carolines, Marianas

RELATIONSHIP OF THE FERN FLORA

From table 1, it can be seen that most of the species have a wide dispersal east and west. Of the 31 species, 25 have a broad east-west distribution; 3 occur only to the east; 2 only to the west. The single endemic species completes the total of 31. For *Tectaria Stearnsii* and *Microlepia scaberula*, Rotuma is the western limit, the eastern being Samoa and Tahiti, respectively. *Tectaria dimorpha* is known only from Rotuma and the Admiralty Islands. What is known of these three suggests a local origin, but they belong in genera of wide dispersal in the tropical Pacific, and do not alter the broad picture. Copeland's theory (18) that the Pacific ferns all were derived from Antarctica is a familiar one, and Copeland would also derive from there the bulk of the world's flowering plants. He pointed out earlier (15) the well-known occurrence of certain plant genera in South Africa, the southern end of South America, and New Zealand and concluded that they must have originated in and radiated from Antarctica. Then he indicated several fern groups with this southern occurrence. He summarized the distribution of the families or genera of ferns, emphasizing those that have species in the southern regions, and deduced that the remaining species of tropical or northern lands were migrating descendants from the southern ancestors. He concluded that 75 percent of the world's ferns have had this Antarctic ancestry, then raised the figure to 90 percent (18, p. 294). He stated that the existing and the fossil flora of Antarctica contained no ferns. Even the genus *Schizaea* with its great majority of southern species does not rest unchallenged as of Antarctic origin. Selling, in his detailed study of the living and fossil species of the genus (25, p. 98), indicated that the discovery of four Tertiary fossil species in Germany and one Quarternary species in the Hawaiian Islands implies more strongly a northern origin of the genus. With no certain evidence as to the point of origin of the ferns, one should not be dogmatic, but the writer is not convinced that the ferns must have originated in Antarctica and migrated by three one-way streets toward the tropics of America, the Pacific, and the Old World. Migration routes would seem to have been open in both or in many directions, and it does not seem to be established that the ferns and the flowering plants of the world came from Antarctica. On the contrary, the fern flora here studied seems by its relationship to be an Asiatic one. It is a small representation

of the stream of plant migrants stemming from Asia that have colonized the island stepping stones far into the tropical Pacific.

EXPLORATION AND PLANT COLLECTIONS

The only earlier plant collector to visit Rotuma was the missionary George Bennett, who made a brief visit in 1830. His plant collections were small and incidental and, so far as is known, included no ferns; nor did he mention any in his writings. His specimens were in the herbarium at Berlin and were, presumably, all or in large part destroyed in World War II.

Since Rotuma lies on the boundary between Melanesia, Micronesia, and Polynesia, and was unknown botanically, the writer projected an exploration of it. This was financed by a grant from the Carnegie Corporation. The writer made the trip alone in 1938, starting by steamer from Honolulu on May 30, from Suva, Fiji, by steamer on June 22, arriving at Rotuma on June 28. On August 30 he departed on the war sloop, H. M. S. *Wellington*, arriving at Lautoka, Fiji, September 3. On September 9 he sailed from Suva, arriving in Honolulu on the 16th.

General collections were made of the higher plants. The first set is in Bernice P. Bishop Museum, and nine duplicate sets will be distributed to important herbaria. Smaller collections were made of lower plants, insects, and terrestrial and marine mollusks.

The seven species of mosses collected by the writer are cited by Bartram (2, pp. 45-53), who lists them as six widely distributed species and one new endemic, *Vescicularia hamata* E. B. Bartr.

In the systematic account, the localities where the species were collected or observed are arranged in the following order: first those in the Itumutu District, followed by those in the districts of Itutiu, Malahaha, Oinafa, Juju, Pepsei, and Noatau, from west to east, and second from north to south; then the inshore islets from west to east; and finally distant Uea Island. Unless otherwise stated, all collections were made by the author. The citation of collections is done with utmost brevity, merely the locality, followed by a number which is the collection number of H. St. John.

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ner, Jr., of the University of Michigan kindly read the manuscript and made many helpful suggestions.

SYSTEMATIC ACCOUNT

The delimitation and the sequence of the families is largely that of Dickason (19). His system of fern families, though largely agreeing with that of Ching (5), seems the best documented, best keyed, and most carefully reasoned system of all the recent ones. Dickason included a key to the genera of Filicales of Burma, and also (19, pp. 104-106) gave a table of groups of families based on morphologic similarity, and in the text stated the distinctive characters of each group.

The more recent systems used by Holttum (22, 23) lack keys and follow largely the tentative and also undocumented scheme of Christensen (7). In "Genera Filicum" Copeland (17) omitted the fern allies, gave keys only to the families of the Filicales, and as to the knotty problem of the Polypodiaceae and its segregation gave little help. In 1940, Ching (5) divided the Polypodiaceae into 33 families. In 1941, Copeland (16) wrote a caustic review making very clear his preference for the single large family Polypodiaceae. That was his own view, but he said (16, p. 172), "Recognition of three families could clearly be sanctioned by principle. This might be so up to eight. Beyond that, the sanction must be by convenience, if there is any; and it seems to me inconvenient." Then suddenly, Copeland in his own 1947 publication (17) divided the old Polypodiaceae into 11 families, which after the short span of six years had become convenient.

Dickason's system of fern families is here followed except that the Angiopteridaceae is merged with the Marattiaceae, the Antrophyaceae with the Vittariaceae.

PTERIDOPHYTA

KEY TO FAMILIES OR GENERA

- A. Leaves or leaflike structures needle-like or scale-like, small in comparison to stem; sporangia axillary,
 - B. Sporangia 1-locular; leaves evident.....(Lycopodiaceae) *Lycopodium*.
 - B. Spores in 3-locular capsules; stems bearing merely bractlike structures(Psilotaceae) *Psilotum*.
- A. Leaves large in comparison to stem; sporangia on the blades
 - C. Massive, fleshy ferns; stipes with pair of large stipules.....
.....(Marattiaceae) *Angiopteris*.

- C. Not massive; stipules none,
 - D. Sporangia or sori borne in two rows on tip of stemlike specialized frond,
 - E. Sporangia subglobose, without annulus; sterile frond expanded, flat(Ophioglossaceae) *Ophioglossum*.
 - E. Sporangia in linear monangium with annulus; frond of filiform segments(Schizaeaceae) *Schizaea*.
 - D. Sporangia on expanded blades,
 - F. Blades membranous, only one cell thick.....*Hymenophyllaceae*.
 - F. Blades thicker, of several layers of cells,
 - G. Fronds simple, entire or nearly so,
 - H. Sori sunken in the longitudinally cleft margin of the frond(Vittariaceae) *Vittaria*.
 - H. Sori dorsal on the blade,
 - I. Sori fused elongate, on many of the veins; indusia none; veins reticulate.....(Vittariaceae) *Antrophyum*.
 - I. Sori oblique to the costa; indusia present, linear; veins free.....(Aspleniaceae) *Asplenium*.
 - G. Fronds pinnatifid or compound,
 - J. Sporangia crowded, covering dorsal surface of fertile frond, not separated into sori.....(Acrostichaceae) *Acrostichum*.
 - J. Sori distinct,
 - K. Sori dorsal (on the lower surface)
 - L. Sori elongate,
 - M. Sori parallel to costa or margin; indusium single, opening inward.....(Blechnaceae) *Blechnum*.
 - M. Sori oblique to costa,
 - N. Sori single on the veins, linear; scales clathrate.....(Aspleniaceae) *Asplenium*.
 - N. Innermost sori double, with an indusium on either side of the vein; scales not clathrate.....(Aspidiaceae) *Athyrium*.
 - L. Sori round, dorsal,
 - O. Indusia absent,
 - P. Fronds pinnatifid; veins reticulate.....(Polypodiaceae) *Phymatodes*.
 - P. Fronds bipinnate or decomposed; veins free.....(Aspidiaceae) *Lastrea*.
 - O. Indusia present,
 - Q. Veins all or some reticulate,
 - R. Vein areoles with free included veinlets.....(Aspidiaceae) *Tectaria*.
 - R. Vein areoles not including free veinlets.....(Aspidiaceae) *Cyclosorus*.
 - Q. Vein tips all free,
 - S. Indusium compressed tubular, largely immersed(Davalliaceae) *Davallia*.
 - S. Indusium not tubular and immersed,
 - T. Indusium attached at base and sides.....(Dennstaedtiaceae) *Microlepia*.
 - T. Indusium attached at base.....(Davalliaceae) *Nephrolepis*.

- K. Sori marginal; indusia present,
 V. Indusia marginal opening outward.....
(Lindsaeaceae) *Lindsaea*.
 V. Indusium formed of thin reflexed margin, opening inward,
 W. Sori on marginal vein connecting vein tips.....
(Pteridaceae) *Pteris*.
 W. Sori on veins along inside of indusium.....
(Adiantaceae) *Adiantum*.

LYCOPODIACEAE

KEY TO SPECIES OF LYCOPODIUM

- A. Fertile leaves (sporophylls) markedly different from the sterile, aggregated into distinct terminal spikes,
 B. Sterile leaves lanceolate, 2-5 mm. wide; spikes 5-15 cm. long, often forked; plant epiphytic.....*L. Phlegmaria*.
 B. Sterile leaves awl-shaped, 0.1-0.5 mm. wide; spikes 6-20 mm. long, simple.....*L. cernuum*.
 A. Fertile leaves not or not very different from the sterile ones,
 C. Leaves all alike, soft, translucent, the fertile not reduced to form an evident terminal spike.....*L. Hamiltonii*.
 C. Leaves firm, subcoriaceous, opaque, the fertile ones gradually reduced, forming evident, terminal spikes.....*L. carinatum*.

Lycopodium carinatum Desv. ex Poir., in Lam., Encycl. Bot. Suppl. 3: 555, 1813.

Urostachys carinatus (Desv.) Herter, Bot. Arch. 3: 15, 1923; Index Lycopod., 55, 1949.—Nessel, Bärlappgewächse, 179-180, 1939. (*Julia*)⁵

Epiphytic; tufted; stems pendent, 20-80 cm. long, simple or 2-3-times forked, closely covered by the 6-8 rows of ascending leaves; sterile leaves 10-15 mm. long, lance-awl-shaped, rigid, shiny; spikes 5-23 cm. long, 1.5-2 mm. in diameter; fertile leaves 2-3 mm. long, ovate or lance-ovate, concealing the orbicular sporangia.

Huo, 19,299; Pepjei, 19,479; Solnahu Island, 19,539. Also observed at Satarua, not common.

Lycopodium cernuum L., Sp. Pl. 2: 1,103, 1753. (*Julia*.)

Terrestrial: rhizomes creeping; branches 1-2.5 m. long; spreading, climbing, or erect, abundantly covered with ascending needle-like leaves, in many rows; leaves 2-3 mm. long, curved, rigid, sharp-pointed; fruiting spikes at tips of upper branches, recurved, greenish to yellowish; fertile leaves reduced, the base ovate, spiny fringed.

Jarua, 19,251; rare, said to occur only in this one place.

⁵ The vernacular name, in parentheses, follows the last reference in the synonymy throughout this paper.

Lycopodium Hamiltonii Spreng., in Linnaeus, Syst. Veg., ed. 16, 5: 429, 1829, under *L. obtusifolium*.

Lycopodium obtusifolium Hamilt. in Spreng., Linnaeus, Syst. Veg., ed. 16, 4(1): 20, 1827, not of (Beauv.) Sw. (1806).

Lycopodium aloifolium Hook. and Grev., Icon. Fil. 2: pl. 233, 1831.

Urostachys Hamiltonii (Spreng.) Herter ex Nessel, Bärlappgewächse, 68, 1939; Herter, Syst. Lycopod., 71, 1950 [1949].

Epiphyte; stems 5-30 cm. long, ascending, simple or 2-4-times forked; the shoots 12-22 mm. in diameter; leaves in 3-5 series, 6-12 mm. long, 1.8-3 mm. broad, linear-oblong, narrowed to both ends, the apex obtuse or subacute, midrib evident, margins entire, subcoriaceous to chartaceous, dull green, all similar; sporangia 0.5 mm. high, depressed reniform, scattered in axils on upper part of stem.

Huo, 19,295.

Rare, seen only once. About a dozen plants were collected, several fruiting, with stems up to 13 cm. in length. The habit of growth and the structure of the leaves are so different from the other species on the island that it is certainly distinct. It has not been recorded in any nearby part of the Pacific, the closest report being from Java, and that is not now accepted in the current book by Backer and Posthumus (1).

Lycopodium Phlegmaria L., Sp. Pl. 2: 1,101, 1753.

Urostachys Phlegmaria (L.) Herter., Bot. Arch. 3: 17, 1923; Ind. Lycopod., 74, 1949; Syst. Lycopod., 83, 1950 [1949].—Nessel, Bärlappgewächse, 215-216, 1939. (*Julia*).

Epiphytic; single or tufted; stems simple or few-forked, pendent, 15-90 cm. long; leaves 4-20 mm. long, in 6-8 rows, dark green, firm, rounded at base, numerous, abruptly differing from the fertile leaves of the spikes; fruiting spikes 5-15 cm. long, 1-1.5 mm. in diameter; fertile leaves 0.5-1 mm. long, triangular-ovate, entire, only partly covering the orbicular sporangia.

Huo, 19,298, moist woods. Rare, seen only once.

PSILOTACEAE

Psilotum nudum (L.) Griseb., Syst. Veg. Karab., 130, 1857.

Lycopodium nudum L., Sp. Pl. 2: 1,100, 1753.

Psilotum triquetrum Sw., Syn. Fil., 117, 1806.

Terrestrial or epiphytic; rhizome short creeping; stems erect, often crowded, 15-60 cm. tall, 1-3 mm. in diameter, nearly naked, sharply triangular; simple below, above forked, repeatedly so in the fruiting part; joints bearing only

minute scale-like structures; sporangia appearing axillary, 1-2 mm. in diameter, subglobose, 3-lobed.

Huo, 19,302.

Solnahu Island, 19,594. Rare; also observed at Kilinga and Satarua.

OPHIOGLOSSACEAE

Ophioglossum pendulum L., Sp. Pl., ed. 2, 2: 1,518, 1763. (*Repene*, ribbon.)

Rhizome short, erect, with a few inconspicuous scales; fronds tufted; sterile fronds 40-185 cm. in length, straplike, simple or 1-3-times forked, often deeply so, soft, weak, pendent, spiralling and twisting toward tip, at middle, vein networks 2.5-6.5 cm. long; fertile frond attached to the sterile $\frac{1}{3}$ way or more from base; stalk 1-10 cm. long; fertile spike 1.5-48 cm. long, linear; sporangia 0.8-3 mm. in diameter, fused in a row on each side.

Kilinga, 19,085, fronds pendent and spiraling; Huo, 19,309.

Fronds as long as 18.5 dm. were collected. The fern was only occasional, but it was also observed at the additional localities of Tuevessi, Paho, and Satarua.

MARATTIACEAE

Angiopteris evecta (Forst. f.) Hoffm., Soc. Reg. Gott., Comm. 12: 29, pl. 5, 1796.

Polypodium evectum Forst. f., Fl. Ins. Austral., Prodr., 81, 1786.
(*Mbalambala*.)

Massive terrestrial fern; caudex 0.5-1 m. tall, 2-5 dm. in diameter, fleshy, barrel-shaped, covered with old blackened stipules; stipules 8-11 cm. long, semiorbicular, black, the margins thin, the rest thick and fleshy, bearing especially near the margins small scales 1-2 mm. long, lanceolate, brown, ciliate, the stipules attached to both stipe and caudex; stipes about 150 cm. long, 4-5 cm. in diameter, smooth, drying brown; young croziers with a dense brown indument of close villosity and shaggy with scales 10-12 mm. long, lance-linear, attenuate; rhachis as much as 3 cm. in diameter, glabrate; blades 3-5.5 m. long, bipinnate; pinnae about 10 on a side, well-separated, the lower and median ones all well-developed, the median the largest, 120 cm. long, borne on a stalk 6 cm. long; costa with remnants of the brown hairy and scaly indument; pinnules about 36 on a side, alternate or subopposite, thick, somewhat fleshy, deep green, subequal, glabrous except for the minute scales below on costules and a few remote ones on the surface, the upper pinnules oblong-linear, the base rounded, the apex subacuminate, the margin crenulate, the lower and middle pinnules slightly the larger, 13-15 cm. long, 16-19 mm. wide, midrib prominent, lateral veins numerous, parallel, simple or forked, running to the margin, separated by so-called "recurrent veins" running from the margin part way in, the median pinnules with one acroscopic, the lower ones with both acroscopic and basispic basal lobes, the basispic the larger, 12-28 mm. long, lanceolate; synangia on the veins, 1 mm.

from the margin, of 9-15 ellipsoid sporangia partly fused or crowded in two rows, subtended by small, hidden, fringed scales; sporangia opening by an apical slit, perpendicular to the veins.

Paho, alt. 75 ft., 19,445.

This fern was seen only once, when a few plants were found in a broad valley, in wet, second growth woods, on the northwest slope halfway up Paho, which was one of the high hills in the border part of the island. From its occurrence the collector was inclined to think it indigenous, as it is in Fiji, Samoa, the Australs, and the Society Islands. On the contrary, the guide, Elia Pepoto, insisted that the plant had been introduced from Fiji, and that there was no Rotuman name for the plant. He said that his father had known the fern at this Paho locality for at least 50 years, but that he too thought it to be introduced. The vernacular name *mbalambala* is definitely Fijian; but in Fiji it is applied to very large ferns of the genera *Cyathea*, *Dryopteris*, and *Selaginella*. The usual names in Fiji for the species of *Angiopteris* are *ngalumaru* and *soo bi*. Hence the application of *mbalambala* to *Angiopteris* differs from the Fijian usage, though plant names of many Fijian tribes are unknown. Thus, whereas the natives considered the occurrence of *Angiopteris* in Rotuma adventive, it seemed to the collector—who had had previous experience with it in Fiji, the Society, and the Austral Islands—to be indigenous. Now, weighing the evidence, the writer feels less sure, and would class the fern in Rotuma as doubtfully indigenous. The natives made no special use of it. Its rarity in Rotuma may well be due to the nearly complete clearing of the land for coconut planting.

SCHIZAEACEAE

Schizaea dichotoma (L.) Sm., Acad. Turin, Mém. 5: 422, pl. 9, fig. 9, 1793.

Acrostichum dichotomum L., Sp. Pl. 2: 1,068, 1753.

Rhizome short, often erect, covered with brown, flattened, jointed hairs; plant glabrous; stipes few to several, 10-50 cm. tall, channeled; frond repeatedly forked into linear segments, fanlike, 7-22 cm. long, 1-2 mm. broad, flat; fertile spikes terminal, with two rows of 5-10 each, brown, hairy, linear pinnae 2-5 mm. long; sporangia minute.

Kilinga, 19,068; Tuevessi, 19,236. Common. Also observed on the main island at Solorua, Fapufa, Solmatcha, Pepjei, Satarua, and at Solnahu, Uea, and Solkope Islands.

ASPIDIACEAE

Athyrium polyanthes (Soland. ex Baker) Copel., B. P. Bishop Mus., Bull. 93: 44, 1932.

Diplazium falcatum Brack., U. S. Expl. Exped. 16: 143, 1854, not of Don (1825), or of Liebm. (1849).

Diplazium harpeodes Moore, Ind. Fil., 330, 1861.

Asplenium polyanthes Soland. ex Baker, Syn. Fil., ed. 2, 492, 1874.

Athyrium tripinnatifidum Copel., B. P. Bishop Mus., Bull. 59: 13, 54, 1929.

Diplazium polyanthos (Soland. ex Baker) C. Chr. ex E. and F. Br., B. P. Bishop Mus., Bull. 89: 55-57, 1931. (*Julia*.)

Large terrestrial fern; rhizome stout, erect, about 1 dm. tall, and 2 cm. in diameter, but in Fiji and Samoa reported to produce a caudex 5-7 dm. tall; scales 1-3 cm. long, 1-2 mm. wide, linear, attenuate, dark brown, ciliate; scales also on base of stipe; stipes 5-10 dm. long, slender, blackish below, dark reddish brown above; blade 50-90 cm. long, ovate-lanceolate, bipinnate-pinnatifid, thin and papery; rhachis smooth; pinnae alternate, about 7 on a side, the median ones 15-30 cm. long, 6-10 cm. wide, lanceolate, stalked, the lower ones somewhat reduced; the 8-12 pinnules 3-12 cm. long, 1.5-3 cm. wide, $\frac{1}{2}$ - to $\frac{3}{4}$ -pinnatifid, the lobes obliquely oblong, 2-4 mm. wide, with sharp denticulations including the vein ends, the veins of the lobes several, forked pinnate; sori straight, over the veins, the largest extending from midrib to near margin; lowest sori with double indusia, one facing in, one out, the others with the indusium of a single flap, usually opening inward.

Soloroa, 19,216. Very rare, seen only once.

The treatment of this species differs from that of Copeland, who considered the Fijian specimens *Athyrium tripinnatifidum* Copel. (12, pp. 13, 54), and the Tahitian ones *A. polyanthes* (Soland.) Copel. Christensen (8, pp. 76-77) took a different view of the specific limits, but maintained two genera instead of one, accepting as *Diplazium* the species with straight sori on the veins, and as *Athyrium* those like *A. Filix-femina* with the sori curved or recurved and the tips crossing the veins. The last treatment by Copeland (17, pp. 147-148) is followed in retaining this species in *Athyrium*.

Genus *Cyclosorus*

KEY TO SPECIES

Veinlets with only lowest pair uniting; fronds dimorphic.....*C. rotumaensis*.
 Veinlets with 4-6 lower pairs uniting; fronds uniform.....*C. unitus*.

Cyclosorus rotumaensis, sp. nov. (fig. 3). (*Sakoto*, a strainer.)

Diagnosis typi: Filix grandis terrestris, rhizomatibus 1.5-2 dm. altis rectis 3 cm. diametro cum basibus rigidis griseis vel brunneis stipitorum marcescentibus obtectis inter quas radices verticales atri-brunneas filiformes exeunt, paleis rhizomatis brunneis, frondibus ad 10, *frondibus sterilibus* cum stipitibus 9-18 cm. longis molliter subadpressi-puberulentis, paleis subbasalibus brunneis deciduis remote capitati-glandulosi-ciliatis, paleis basilaribus ca. 6 mm. longis 2.5 mm. latis late lanceolati-deltaoideis, paleis subbasilaribus ca. 8 mm. longis 1.5 mm. latis anguste deltoideis longe attenuatis, rhachidibus omnino sparse puberulis cumulate in sulco superiore, laminis 60-79 cm. longis 26-37 cm. latis bipinnatifidis, herbaceis obscure viridibus in lineamento ovali sed apice acuminato et basi cuneata cum pinnis plurimis valde reductis, pinnis uni lateris 27-32 distinctis, iis terminalibus decurrentibus confluentibusque, pinnis inferioribus reductis uni lateris 3-6, pinnis medianis adscendentibus angulo 65° vel 75° ab rhachide, pinnis approximatis plus minusve imminentibus 18-24 cm. longis 22-27 mm. latis anguste oblongis in medio vel inframedio latissimis basis subtruncatis sessilibus sensim in apice attenuatis diminuentibus medio lobatis glabris, costis sparse adpressi-puberulis, segmentis ca. 70° divergentibus 5-6.5 mm. latis late oblongo-ovalibus, lobis oblique adscendentibus obtusis margine integro vel subsinuato inter apices subclavatos nervorum, nervulis 8-10-jugo basali cum propinquo connato et ad sinum continuando (rare maximis duobus jugis connatis), nervis lateralibus in margine terminantibus dum majoribus aliquis vel multis nervulis bifurcatis, *frondibus fertilibus* cum stipitibus 9-19 cm. longis molliter subadpressi-puberulis, paleis subbasalibus 3-7 mm. longis brunneis lanceolatis caducis, rhachis subadpressi-puberulis et capitato-glanduloso-puberulis pilis ad apices diminuentibus, laminis 93-128 cm. longis 28-38 cm. latis herbaceis obscure viridibus bipinnatifidis glabris in lineamento anguste elliptico, apice acuminato, basi longe cuneata cum pinnis valde reductis, pinnis uni lateris 37-46, apice uni lateris cum 18-19 pinnis reductis in apice acuminato confluentibus, pinnis basalibus reductis uni lateris 6-8, pinnis supra medianis maximis angulo 60° ad 80° ab rhachide divergentibus non attingentibus (pinnis principalibus inferioribus remotis nodis 2.5-3.5 cm. separentibus) 13-20 cm. longis 18-22 mm. latis anguste oblongis in medio latissimis ad basim paulum angustioribus ad apicem gracilem contractentibus dimidio lobatis glabris, costis parve subadpressi-puberulentis, segmentis pinnae ab costa angulo 70° divergentibus 4-5.5 mm. latis oblongis obtusis parve arcuatis marginibus integris vel subsinuatis projectentibus inter apices subclavatos nervularum, nervis segmentorum pinnatis nervulis lateralibus 5-7-jugis, nervula jugi inferiori cum eo segmenti proximi connato tunc ad sinum continua, nervulis alteris simplicibus distinctis in margine terminentibus, laminis soriferis extra apicem acuminatum et pinnae basales reducta, pinnis soriferis e basi ad apicem extra 1-2 cm., soris medianis in 1-5 nervulis e basi indusiis ca. 0.5 mm. diametro cordatis persistentibus membranaceis in centro albo-hirsutulis, sporangiis glabris.

Description of specimens examined: Large terrestrial fern; rhizome 1.5-2 dm. tall, 3 cm. in diameter, erect, covered with marcescent, rigid, gray to brown stipe bases and between these issuing abundant roots slender, string-like, dark

FIGURE 3.—*Cyclosorus rotumaensis*, from the type: a, base $\times 1/6$; b, fertile frond $\times 1$; c, fertile pinnae $\times 2$; d, sterile frond $\times 1$; e, sterile pinnae $\times 2$; f, sorus $\times 10$; g, old sorus $\times 10$; h, subbasal scales of stipe $\times 5$; i, basal scales of stipe $\times 5$; j, cells of basal scale $\times 50$.

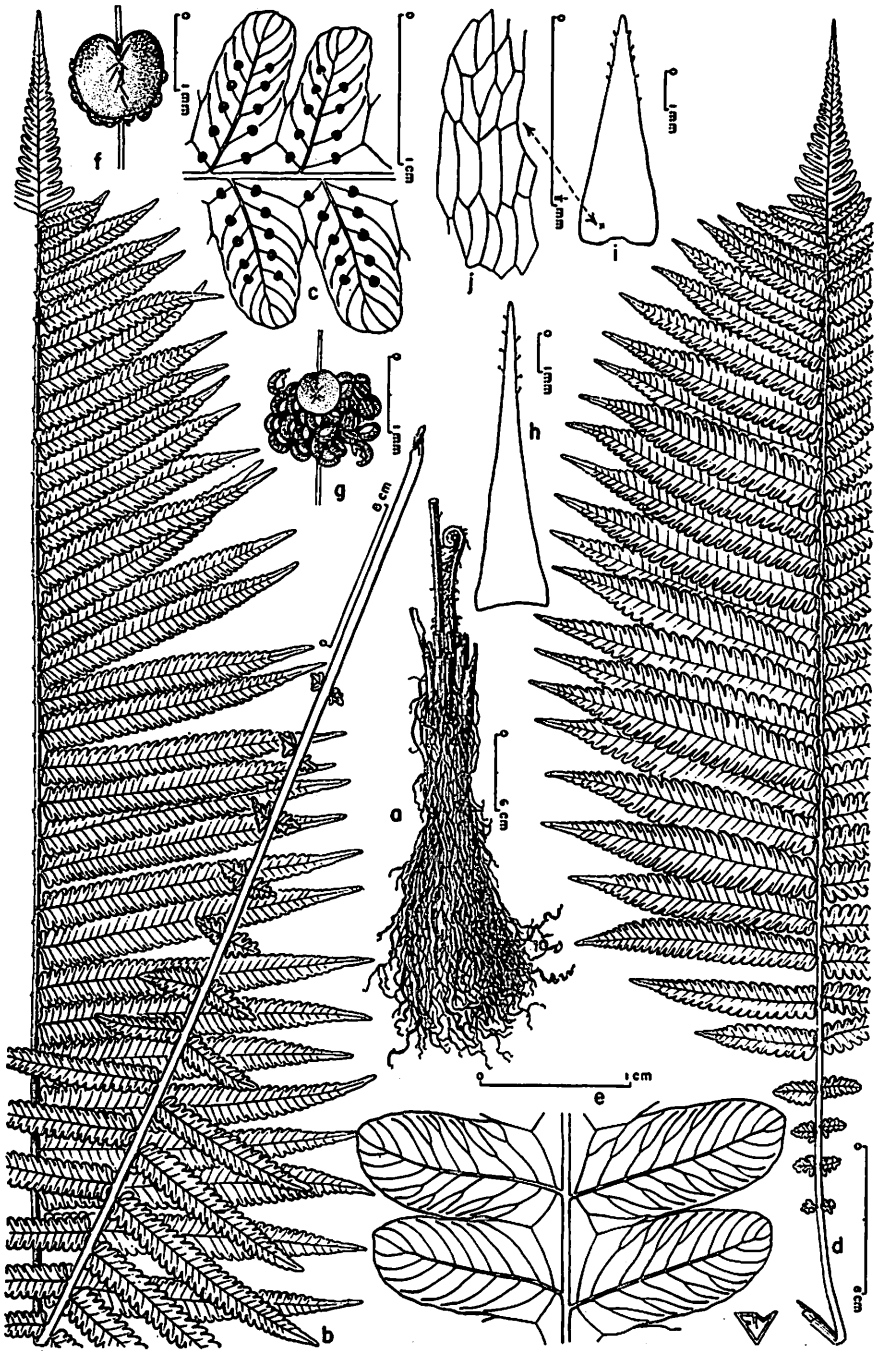


FIGURE 3

brown, descending vertically; scales of tip of rhizome caducous, similar to those of stipes; fronds about 10 per plant; *sterile fronds* with stipes 9-18 cm. long, softly subappressed puberulous; the brown scales subbasal, deciduous, sparsely capitate glandular ciliate, the basal ones about 6 mm. long and 2.5 mm. wide, broadly lance-deltoid, the subbasal ones about 8 mm. long and 1.5 mm. wide, narrowly deltoid and long attenuate; rhachis sparsely subappressed puberulous throughout and abundantly so in the upper groove; blades 60-79 cm. long, 26-37 cm. wide, herbaceous, dull green, in outline oval, but the tip acuminate, and the base cuneate by the several abruptly reduced lower pinnae, bipinnatifid; distinct pinnae 27-32 on a side and the apical 16-20 reduced and confluent and decurrent in the acuminate tip; reduced pinnae 3-6 on a side; median pinnae ascending at an angle of 65° to 75° approximate and somewhat overlapping, 18-24 cm. long, 22-27 mm. wide, narrowly oblong, broadest at the middle or a little below it, slightly narrowed toward the sessile, subtruncate base; gradually narrowed to the attenuate tip, lobed about ½ way, glabrous except for the sparsely appressed puberulous costa; segments diverging at about 70° from the costa, 5-6.5 mm. wide, broadly oblong oval, lobed ½ way, the free portion obliquely ascending, obtuse, the margin entire or subsinuate between the enlarged clavate veinlet tips terminating at the margin; veins of segments consisting of a midrib and 8-10 pairs of lateral veinlets, the lowest pair regularly connate with the corresponding ones from the adjacent pinnae, then running to the sinus (rarely in some of the largest fronds two pairs from each unite) the lateral veinlets sharply ascending, running directly to the margin, and on the larger divisions some or many of these bifurcate; *fertile fronds* with stipes 9-19 cm. long, softly subappressed puberulous, the scales subbasal, 3-7 mm. long, brown, lanceolate, caducous; rhachis subappressed puberulent and capitate glandular puberulous, the pubescence diminishing toward the apex; blades 93-128 cm. long, 28-38 cm. wide herbaceous, dull green, the lamina glabrous above and below, in outline narrowly elliptic, the tip abruptly acuminate, and the base gradually long cuneate by the strongly reduced basal pinnae, bipinnatifid; pinnae on a side distinct 37-46 and the apical on a side 18-19, reduced, decurrent and confluent in the acuminate tip; reduced pinnae 6-8 on a side; supra-median pinnae the largest, at a point slightly above the middle, these ascending at 60° to 80°, distinct and not touching (though the lower principal ones are remote), the nodes 2.5-3.5 cm. apart, 13-20 cm. long, 18-22 mm. wide, narrowly oblong, broadest at about the middle, slightly narrowed toward the base, narrowed to the slender tip, lobed almost ½ way, glabrous except for the subappressed sparsely puberulent costa; segments ascending at about 70° from the costa, 4-5.5 mm. wide, oblong, obtuse, the free part slightly obliquely ascending, the margin entire or slightly sinuate by gentle protrusions between the slightly clavate veinlet tips; veins of segments consisting of a midrib and 5-7 pairs of lateral veinlets, the lowest pair regularly connate with the corresponding ones from the adjacent pinnae, then running to the sinus, the remaining veinlets simple, sharply ascending, running directly to the margin; blade fertile except in acuminate apex and the reduced basal pinnae; pinnae fertile from base to within 1-2 cm. of the tip; divisions fruiting from the base, with 1-5 lateral veinlets soriferous; sori in two rows in the division, each sorus more than half way from the margin; indusium about 0.5 mm. in diameter, cordate, persistent, membranous, centrally white, glistening hirsutulous; sporangia glabrous.

Type: Rotuma Island, lat. 12° 30' S., long. 177° 05' E., Itumutu District, Pala, alt. 20 ft., moist alluvium under trees, rhizome erect, 2

dm. tall; plants with about 10 fronds, July 13, 1938, *Harold St. John 19,139* (fr.), BISHOP MUS.

Specimens examined: Rotuma Island, Uea Island, moist wooded slope, alt. 200 ft., tufted, Aug. 22, 1938, *St. John 19,657* (fr.).

The new *Cyclosorus rotumaensis* falls within the assemblage of species related to *C. truncata* (Poir.) Farw., which is a complex group of species not easily defined. However, the new one seems definitely distinct from the known species of this group. It is clearly most closely related to a Fijian species, *C. magnifica* (Copel.) Copel., which is distinguished by having the fronds presumably monomorphic; stipes 75-90 cm. long, scaleless; frond 120-200 cm. long; rhachis and costae hirsutulous above, without glandular hairs; larger inframedial and medial pinnae 25-30 cm. long, pinnatifid beyond the middle; segments of pinnae with 7-9 pairs of lateral veinlets; indusia naked. In contrast, *C. rotumaensis* has the fronds markedly dimorphic, stipes 9-19 cm. long with brown, lanceolate, caducous scales, fertile frond with blades 77-117 cm. long; rhachis soft, subappressed puberulent throughout, and capitate glandular puberulous; costa of pinnae sparsely soft puberulent or glabrate; larger medial pinnae 13-20 cm. long; pinnatifid almost to the middle; segments of pinnae with 5-7 pairs of lateral veinlets; indusia hirsute at center; sterile fronds with the divisions of pinnae having 8-10 pairs of lateral veinlets and on the larger ones some or many of these bifurcate.

The genus *Cyclosorus* seems the correct assignment for *C. rotumaensis*, though the dimorphic fronds and glandular rhachis are unusual characters.

Cyclosorus unitus (L.) Ching, Fan Mem. Inst., Bull. 8: 192, 1938.

Polypodium unitum L., Syst. Nat., ed. 10, 2: 1,326, 1759.

Dryopteris unita (L.) Ktze., Rev. Gen. Pl. 2: 811, 1891.

Dryopteris arida sensu Copel., B. P. Bishop Mus., Bull. 59: 45, 1932; not of (Don) Ktze., Rev. Gen. Pl. 2: 812, 1891. (*Sakoto*, a strainer.)

Terrestrial: rhizome long running, naked, bearing remote fronds; stipes 10-15 cm. long, naked, but the apparent stipe (disregarding the much reduced lower pinnae) 45-60 cm. tall, drying pale brown; scales at base of stipe few, 3-4 mm. long, lance-linear, pale brown, membranous; blades 30-70 cm. long, 15-40 cm. wide, oval-lanceolate, bipinnatifid, the lowest normal pinnae almost the largest, the others below strikingly reduced; rhachis pilose; pinnae linear, tapering, 12-20 mm. wide, firm chartaceous, the base truncate, the margin incised $\frac{1}{4}$ to $\frac{1}{2}$ way, above remotely pilose and the midrib hirsutulous, below pilosulous on primary and secondary veins; veins of pinnules pinnate with

4-6 of lateral veinlets united with corresponding veinlets from the adjacent pinnule; sori in one lateral row on each side, on the veins, close to the margin; indusia none.

Motusa, 19,054; Solmatcha, 19,424.

A weedy species, but apparently indigenous, adapting itself readily to cut-over forest land or cultivated land. Also observed at Soloroa, Pala, Losa, Kongai, Fapufa, Kilinga, Salvaka, Huo, Vaitoko, Pepjei, Satarua, Elsio, Solkope Island, and Uea Island.

The classification here follows Tardieu-Blot and Christensen (27, p. 396) and Christensen (8, p. 92), thus placing this fern with the line of sori close to the margin in *Dryopteris* or *Cyclosorus unitus*. *C. aridus* (Don) Ching has the sori median. Hence, the specimens from Fiji referred by Copeland to *D. aridus* are reclassified as *C. unitus*.

Lastrea Torresiana (Gaud.) Moore, Ind. Fil., 106, 1858.

Polystichum Torresianum Gaud., Voy. Uranie, Bot., 333-334, 1828.

Lastrea tenericaulis (Hook.) Moore, Ind. Fil., 99, 1858.

Aspidium uliginosum Ktze., Linnaea 20: 6, 1847; not *Lastrea uliginosa* Newman, Phytol. 3: 679, 1849 (*L. cristata* × *spinulosæ*).

Polypodium tenericaule Hook., Kew Gard. Miscel. 9: 353, 1857.

Dryopteris setigera sensu Maxon (1923) for plant with scaleless rhachis, not of (Bl.) Ktze., Rev. Gen. Pl. 2: 813, 1891.

Dryopteris uliginosa (Ktze.) C. Chr., Ind. Fil., Suppl. 3: 100, 1934.

Thelypteris uliginosa (Ktze.) Ching, Fan Mem. Inst. Biol., Bull. 6: 342, 1936; not *L. uliginosa* Newman (1849).

Terrestrial fern; rhizome horizontal or oblique, 3-4 cm. long, 1-1.5 cm. in diameter, with numerous scales 10-15 mm. long, lance-linear, brown, attenuate, puberulent toward base, bearing the 4-6 clustered fronds; stipes 28-77 cm. long, the base with similar scales, but above smooth, shining and straw-colored; rhachis pilosulous in the upper groove, otherwise pale, smooth, and shining; blade 30-90 cm. long, 17-50 cm. wide, membranous, tripinnatifid, lance-triangular, the largest pinnae just above the base; distinct pinnae 14-17 on a side, supra-basal pinnae 4-12 cm. wide, lanceolate; costa pilosulous in upper groove, otherwise pale and shining; pinnules 6-13 mm. wide, narrowly lanceolate, the lower ones with the bases decurrent, the upper ones with the bases decurrent and confluent with the winged costa, parted 5/6 way, costules pilosulous above, below stiff setose; ultimate divisions elliptic-oblong, coarsely dentate, the veins pinnate with 5-7 pairs of lateral free veinlets; sori orbicular, on the lateral veinlets midway to the margin; indusium none.

Soloroa, 19,219; Uea 19,673

Maxon and Copeland have reported the indusia as minute and fugacious; but like Christensen, Tardieu-Blot, and Ching, the writer observes them to be absent in the material studied whether fresh or dried.

The classification and nomenclature of this species and the related ones is complicated. That by Ching (4, pp. 342-346) was consulted, but the species should now be placed in *Lastrea*. The early use of the name *Polypodium tenericaule* by Wallich was as a *nomen nudum*.

Genus *Tectaria*

KEY TO SPECIES

- Fronds uniform; blades bipinnate to tripinnatifid; veins free except for one row anastomosing adjacent to midribs of pinna and pinnule.....
*T. Stearnsii*.
 Fronds of two kinds; blades pinnate but lowest pair of pinnae deeply bipartite; veins all netted.....*T. dimorpha*.

Tectaria dimorpha, sp. nov. (fig. 4).

Diagnosis typi: Rhizomatis breve repentibus 4-10 cm. longis 10-15 mm. diametro sed basibus stipitorum marcescentibus obtectis ita 3-3.5 cm. diametro simulantibus apice assurgente, paleis 7-10 mm. longis 1-1.3 mm. latis linearilanceolatis firmis subnigri-castaneo-brunneis lucidis parve ad basem ciliatis sed apice longe acuminato glandulosi-hirsuti-fimbriato cum ciliis multicellularibus, cellulis paleae longitudinaliter oblongis parietibus subnigris crassis, stipitibus viridibus iis frondis sterilibus per 5-9 cm. ex base paleiferis praesertim ad basem, paleis eis rhizomatis similibus sed 10-14 mm. longis 0.5-1.3 mm. latis lanceolati-linearibus glandulosi-ciliatis vel fimbriatis superioribus minoribus, plantis 7-15-frondiferis, frondis dimorphis eis fertilibus paucis (1-2), *frondis sterilibus* cum stipitibus 35-61 cm. longis 4-6 mm. diametro in vivo viridibus in sicco brunnescentibus vel stramineis validis ad laterem sulcatis glabris lucidis base paleifero excludentibus, laminis sterilibus 57-66 cm. longis 30-50 cm. latis vere pinnatis ad partem majorem, rhachidibus glabris sublucidis, pinnis suboppositis eis uni lateris 4-9 cm. separatis, pinna infima 1 (-2 raro) unilobata (raro 2-4-lobata) lobis in forma similia et in magnitudine subaequalia, loba infima basiscopica vel acroscopica, pinnis mediis a rhachide 65° ad 80° divergentibus 25-31 cm. longis 3.5-5 cm. latis anguste oblongis ad basem cuneatam sessilem vel subsessilem deminuentibus ad apicem acutam deminuentibus manifeste arcuatis et ad apicem curvatis sed dimidiis partibus subaequalibus glabris firme chartaceis supra subnigri-viridibus infra viridibus marginibus integris sensim irregulariter subsinuatis, costis conspicuis infra costis conspicuis elevatisque, nervis lateralibus secundariis multis 50° ad 60° divergentibus porro parve arcuatis ad marginem subattingentibus tunc dissipantibus, nervis lateralibus tertiis omnibus anastomosantibus areolis 3-4 inter nervis secundariis, areolis 2-4 nervulis liberis continentibus, pinnis basilaribus suboppositis pinna media similibus aequalibusque lobis basilaribus subaequalibus lobis alteris si formantibus minoribus, apice frondis pinnatipartitis uni lateris 2-3 lobis cum loba terminale confluentibus, lobis pinnis mediis similibus sed paullo minoribus, partibus alatis angustioribus quam lobis,

frondibus fertilibus stipitibus sterili similibus sed 50-73 cm. longis basi per 10-16 cm. paleiferi, frondibus glabris sterili similibus sed minoribus angustioribusque 37-54 cm. longis 8-27 cm. latis, pinnis medianis simplicibus 10-18 cm. longis 15-20 mm. latis ad apicem basemque subito contractis chartaceis supra sparse capitati-glandulosi-puberulentis praesertim in locis supra soros editis infra capitati-glandulosi-puberulis marginibus breve sinuatis, nervulis tertiis omnibus anastomosantibus, areolis biseriatis inter nervas secundarias oblique ad marginem continuentibus, areolis cum una nervula libera ex angulo interiore costulae proximo, soris magnis manifestis regulariter 2-seriatis proximis parallelis costulae margine subattingentibus, indusiis 0.8-1.3 mm. diametro orbicularibus peltatis persistentibus capitati-glandulosi-puberulis margine integre, sporangiis glabris.

Description of all specimens examined: Rhizome short creeping, the apex assurgent, 4-10 cm. long, 10-15 mm. in diameter, but covered with the cartilaginous, marcescent stipe bases and thus appearing 3-3.5 cm. in diameter; the scales 7-10 mm. long, 1-1.3 mm. wide, linear-lanceolate, firm, dark chestnut brown, shining, sparsely ciliate toward base, while the long acuminate apical part is glandular hirsute fimbriate with multicellular hairs; the cells of the scale longitudinal, oblong, with dark, heavy wall; stipes green, those of the *sterile fronds* densely scaly at base and less so up to 5 or 9 cm. from base, the scales similar to those of rhizome, but 10-14 mm. long, 0.5-1.3 mm. wide, the upper ones smaller, lance-linear, glandular ciliate to fimbriate; plants bearing 7-15 erect fronds, these clearly dimorphic, the fertile ones few, only 1-2 per plant; sterile fronds with stipes 35-77 cm. long, 4-6 mm. in diameter, green when fresh, drying brownish or stramineous, strong, furrowed on the proximal side, glabrous, smooth and shining above the scaly base; blade of sterile frond 50-78 cm. long, 30-54 cm. wide, simply pinnate in the median and for the larger part of the blade, rhachis smooth, somewhat shiny; pinnae 4-9 cm. apart; the basal pinna on each side (rarely the 2 lower) deeply pinnately partite with usually one (occasionally with 2-4) lobes similar in shape and nearly as large as the main portion, the lowest or the first secondary lobe either basispicic or acrosopic; median pinnae subopposite, diverging at 65° to 80° from the rhachis, 25-37 cm. long, 3.5-5.7 cm. wide, narrowly oblong, tapered to the cuneate, sessile or subsessile base and the acute tip, the lower median pinnae on large fronds at the base with an acrosopic, semiobicular lobe, 3-16 mm. long, distinctly arcuate and upward curved, but the two halves subequal, glabrous, firm chartaceous, above dark shiny green, below green, the margin entire, not straight, rather irregularly subsinuate; the costa prominent, below the costa prominent and raised; secondary lateral veins numerous, diverging at 50° to 60°, slightly arching forward and running almost to the margin before diffusing, tertiary lateral veins completely anastomosing, 3-4 closed areoles wide between the secondary veins; ultimate vein areoles with 2-4 included "blind" veinlets; basal pinnae subopposite, equal and similar to the median, their basal lobes subequal, their upper lobes when present smaller; upper lobes 2-3 on each side confluent, with the decurrent terminal lobe forming a pinnately parted tip, these parts similar to and only slightly smaller than the median pinnae; the lower, decurrent parts much narrower than the lobes; *fertile fronds* with stipes similar to the sterile ones, but 50-73 cm. long, and the base scaly for 10-16 cm.; fertile fronds

FIGURE 4.—*Tectaria dimorpha*, from the type: a, base and fertile frond $\times 1/4$; b, venation of fertile pinna $\times 2$; c, sterile frond $\times 1/4$; d, venation of sterile pinnae $\times 1$; e, scale from lower part of fertile stipe $\times 2$; f, cells of stipe scale $\times 50$; g, sorus $\times 10$.



FIGURE 4

glabrous, similar in cutting to the sterile but smaller and narrower, 37-54 cm. long, 8-27 cm. wide, the median pinnae simple, 10-19 cm. long, 15-21 mm. wide, abruptly narrowed to base and apex, chartaceous, above sparsely capitate glandular puberulous, more so on the soral elevations, below capitate glandular puberulous, the margin short sinuate; tertiary veinlets all anastomosing, forming a double row of areoles between the secondary veins, running obliquely from costa toward the margin; each mesh with a single included blind, short veinlet arising from the lower angle nearest to costule; sori large and conspicuous, in 2 regular rows, close to and parallel to the costules, extending from the costule to the margin; indusia 0.8-1.3 mm. in diameter, orbicular, peltate, persistent, capitate glandular puberulous, the margin entire; sporangia glabrous.

Type: Rotuma Island, lat. 12° 30' S., long. 177° 05' E. Itutiu District, Kilinga, alt. 250 ft., moist woods on steep east slope, common, herbage crushed, used as a poultice on boils, July 4, 1938, *Harold St. John 19,038* (fr.), BISHOP MUS.

Specimens examined: Hauatia Island, alt. 75 ft., moist woods, tufted, Aug. 1, 1938, *St. John 19,410* (fr.); Solnahu Island, alt. 50 ft., moist wooded slope, terrestrial, tufted, Aug. 18, 1938, *St. John 19,533* (fr.); Solkope Island, alt. 250 ft., moist wooded slope, tufted, dimorphic, the fertile fronds few, Aug. 24, 1938, *St. John 19,718* (fr.); Uea Island, alt. 250 ft., steep wooded slope, tufted, Aug. 22, 1938, *St. John 19,672* (fr.).

Terrestrial, occasional, in the deeper, less disturbed woods; also observed at Kongai, Solmatcha, and Pepjei.

Admiralty Islands: Lou Island, growing on damp hillside along coast, fronds definitely dimorphous, Nov. 13, 16, 1945, *D. F. Grether and W. H. Wagner, Jr., 4,035* (fr.), CALIF.

One collection, *St. John 19,718*, from Solkope Island includes a fertile frond which differs from the usual, and its details were excluded from the description given above. The usual fertile fronds are distinctly smaller than the sterile and are completely fertile, each pinna being closely dotted with sori, covering the whole lower surface from base to tip. The frond in number 19,718 is as large, and the pinnae are as broad, as in the average sterile frond, being 71 cm. long, 34 cm. wide, the median pinnae 17-23 cm. long, 21-31 mm. wide, and the pinnae sterile below but fertile toward the tip from about the middle. Since this half-fertile frond is somewhat of a freak, it was not included in the formal description.

As no applicable published description has been found, the plants from Rotuma are here proposed as a new species. The specimen from the Admiralty Islands is a large one, but it matches nicely in details

the plants from Rotuma. Wagner (30, p. 48) stated that New Guinea plants also show dimorphism, but the material he saw has not been examined by the writer. A related, but undescribed, species was collected at Anapeng-pa, Ponape, *M. Takamatsu* 760. This collection in Bishop Museum consists of two detached, sterile fronds. They were studied by E. B. Copeland and annotated as *Tectaria* sp. In plan of cutting, and in a broad way, they resemble *T. dimorpha*. But they are larger and more massive, having the scales of the stipe base 18-23 mm. long, pale brown; the lowest pair of pinnae bipartite; median distinct pair of pinnae 1-0; principal pinnae 68-84 mm. wide; the two upper pairs of pinnae confluent with the terminal into a pinnately parted portion, the decurrent or confluent portions as wide as the lobes; the ultimate vein meshes with 1-4 included veinlets, the meshes in 4-6 irregular rows between the secondary veins. Since the specimens are incomplete, it is concurred that this material should be left unnamed. However, it is amply distinct from *T. dimorpha*.

The genus *Tectaria* was described early by Cavanilles, but it was resurrected and redefined by Underwood in 1906. The genus was soon accepted by Copeland, Christensen, Ching, and most other pteridologists. It is a segregate from *Aspidium*, or in a later sense, from *Dryopteris*, distinguished from the older genera by having the fronds of chartaceous texture, simple or compound, uniform, or at least not exceedingly dimorphic; some or all of the veinlets uniting in pairs, the veinlet meshes usually with free included veinlets; sori dorsal, round; indusia when present reniform or orbicular. Though most of the species have uniform fronds, species with evidently dimorphic fronds still are placed in *Tectaria*, as *T. suifolia* (Willd.) Copel. (Copeland, 11, p. 411) and *T. chattagramica* (C. B. Clarke) Ching (3, p. 35, pl. 14). Plants with strikingly dimorphic fronds have been set off as the genera *Luerssenia* and *Tectaridium*, but these both have the sterile fronds simple and also differ in the details of the sori and indusia. Recently Ching (5, pp. 251-252) summarized the differences between these genera, stating in his key that *Luerssenia* and *Tectaridium* have the "Leaves dimorphic" and that *Tectaria* has the "Leaves uniform." This is an oversimplification and overemphasis, not borne out by the plants concerned, for recent investigators seem to concur that *Tectaria* includes species with uniform as well as ones with moderately dimorphic fronds.

An extended search has not revealed any very closely related species of *Tectaria* on Fiji, Samoa, or any other adjacent island group.

Tectaria dimorpha is to be placed in the section *Tectaria* (*Eutectaria*), since it has peltate indusia.

The species appearing to be most similar to the new one is *T. Lobbi* (Hook.) Copel. from Borneo, which has the rhizome short, erect; stipes 10-30 cm. long; fronds apparently uniform; lowest pair of pinnae ternate or pinnately parted, with stalks 16-18 mm. long, the median distinct pinnae usually 1-2 pairs; terminal pinna distinct, 7.5-15 cm. long, 1-2 cm. broad; rhachis and costae densely pubescent above; veinlets anastomosing, with few free included veinlets; sori scattered irregularly. *T. dimorpha* has contrasting characters as follows: rhizome short creeping, the apex assurgent; fertile fronds with stipes 50-73 cm. long; lowest pair of pinnae with stalks 2-12 mm. long, the median distinct pinnae usually 3-4 pairs; terminal pinna confluent with 2-3 pairs of lateral ones, 7 cm. long, 9 mm. wide; rhachis and costa glabrous; areoles each with a single, free, included veinlet. Since *T. Lobbi* lacks the 2-rowed sori, its habitual resemblance may indicate a merely superficial, not a natural, close relationship.

Of the species on adjacent island groups, it appears that *T. decurrens* (Presl) Copel. is definitely a related species. It is distinguished by having the rhizome with leaf bases 1.5-2 cm. in diameter; fronds uniform; stipes winged, often to the base; blades simple, but pinnately partite, the parts connected by the rhachis winged to a width of 1.5-3 cm. and continuous with the winged stipe; the primary lobes 3-8 cm. wide, entire or the margin sinuate or somewhat lobed, areoles in about 4 irregular rows; indusia 1.5-2 mm. in diameter; indusium subpeltate, attached to an elongate asymmetric base. On the other hand, *T. dimorpha* has the rhizome with leaf bases 3-3.5 cm. in diameter; fronds dimorphic; all fronds with stipes wingless; blades pinnate, pinnatifid; pinnae of sterile fronds 3.5-5.7 cm. wide, entire; pinnae of fertile fronds with areoles in two rows between the secondary veins; indusia 0.8-1.3 mm. in diameter, peltate.

T. crenata Cav., described from the Mariana Islands, is also similar, but it differs from the new species by having the fronds homomorphic or but slightly dimorphic, and the margins wholly or in part coarsely crenate or even lacinate-crenate or sinuate repand. This species shows considerable variability in frond cutting, and the less crenate ones were described as *Aspidium repandum* Willd., *A. pachy-*

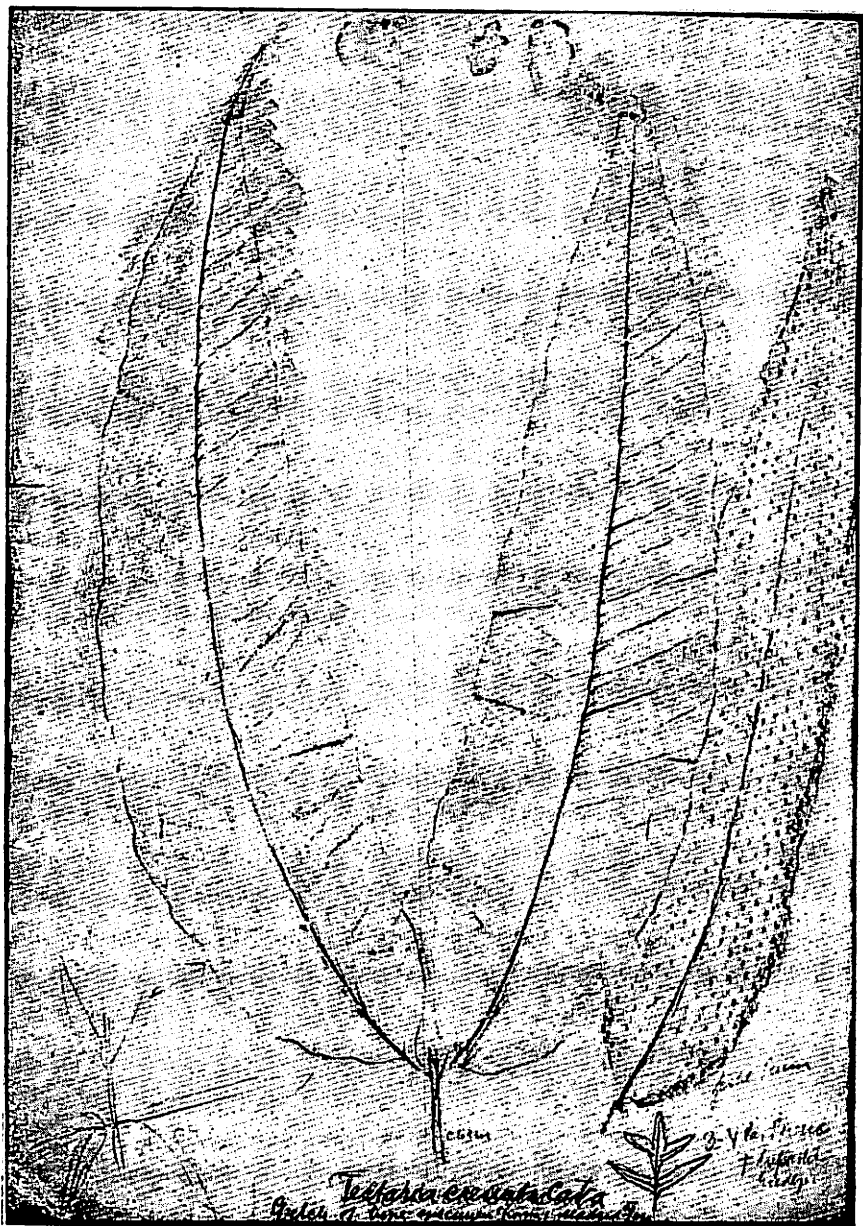


FIGURE 5.—*Tectaria crenata* Cav., type, islas Marianas, Née. From pencil rubbing by Carl Christensen, courtesy British Museum of Natural History.

phyllum Ktze., and *Sagenia platyphylla* J. Sm. (*plataphylla*, emended to *platyphylla* J. Sm. in 1866). These were reduced to the synonymy of *T. crenata* by Copeland (11, pp. 414-415), and Christensen concurred (6, pp. 14-15) when he reviewed the species published by Cavanilles and gave a concise description of the type of *T. crenata* Cav.

In the Leiden Rijksherbarium are two specimens from Java that resemble *T. dimorpha*. The first specimen is *Zollinger 1,669* consisting of a solitary sterile lamina without stipe. Though its pinnae are similar to those of *T. dimorpha*, the median ones differ in being opposite, confluent, and decurrent. The second is *G. H. de Vriese 203*, which contains a sterile lamina of lanceolate, entire, distinct pinnae; and a fertile lamina smaller, the median pinnae 22 mm. broad and subentire. Thus, in habit it resembles *T. dimorpha*, and though the two rows of sori are from the tips of included veinlets between each pair of lateral veins, the main branching of the veinlets instead of forming two single rows of polygonal meshes, forms several smaller intermediate sterile meshes. These are not found in *T. dimorpha*. Hence, these specimens may well remain in the *T. crenata* group, where they were placed in 1940 by A. G. L. Adelbert.

Recent collections from the Marianas, the type area of *T. crenata*, such as the ones from Guam (*Bryan 1,152, Grether 3, 358*) and from Saipan (*Hosokawa 8,024*), have larger, homomorphic fronds with coarsely irregularly crenate pinnae and very different venation. Photographs of *T. Haenkei* (Presl) Copel. (*Haenke in 1792*) show it to be identical with the above and to be classified as *T. crenata* Cav., as previously pointed out by Wagner (30, p. 61).

A prolonged search has been made for the type of *Tectaria crenata* Cav., which was collected on the "islas Marianas" by Don Luis Née and was deposited in Madrid. The present curator there has replied that the specimen is no longer to be found in their herbarium. The writer has personally made a wide search for it in many of the important herbaria of the world, and further inquiries have been made by letter; but no trace of the type or any isotype has been found. The original description was of good length, and luckily there is an account of it by C. Christensen, who studied it in Madrid in 1921 or on a subsequent loan from there. He discussed and re-described it (6, pp. 14-15). He also made a pencil rubbing of sterile and fertile pinnae and had a fragment of a fertile pinna or a clastotype. Copies of these were later obtained for the British Museum of

Natural History. Their Keeper of Botany, Mr. George Taylor, has permitted the publication of photographs of these in this paper (figs. 5, 6). Christensen indicated that the fronds were sub-dimorphous; the sterile fronds with pinnae 30 cm. long, 7 cm. wide, the margins slightly undulate-crenate, the base rotundate or very shortly cuneate; the fertile fronds with 3-4 pairs of lateral pinnae 25 cm. long, 5 cm. broad, and irregularly crenate. In contrast, the new *T. dimorpha* has the fronds markedly dimorphous; the sterile frond with pinnae 3-5.7 cm. wide, the margins entire, the base cuneate or sessile; the fertile fronds with about 8 pairs of lateral pinnae 10-19 cm. long, 1.5-2.1 cm. wide and entire. With such differences, the two appear to be distinct species.



FIGURE 6.—*Tectaria crenata* Cav., clastotype, portion of fertile pinna, courtesy British Museum of Natural History.

T. dimorpha is used medicinally, the herbage being crushed and used as a poultice on boils.

The name of the new species is taken from the Greek *dis*, twice, and *morphe*, shape; meaning of two shapes, in allusion to the different sterile and fertile fronds.

***Tectaria Stearnsii* Maxon, Biol. Soc. Wash., Proc. 36: 175-176, 1923.**
(*Sakoto*, strainer; *julia*.)

Terrestrial, tufted, rhizome short decumbent or erect, 2-20 cm. long, 2-3 cm. in diameter, mostly subterranean, densely covered with brown linear-lanceolate

scales; fronds 6-8; stipes 25-50 cm. long, dark brown, at base densely hirsute, and densely scaly, the scales 1-2 cm. long, linear, attenuate, firm, brown lustrous, glandular ciliate, hairs less frequent but present throughout stipe and rhachis; blade 35-80 cm. long, 30-60 cm. broad, deltoid ovate, herbaceous, subtripinnate at base, bipinnate above; main pinnae 7-9 pairs; pinnules deeply pinnatifid with oblong, obtuse lobes; veins netted only along the ribs, forking beyond, lacking included veinlets; midribs glandular puberulent; sori round, usually in 2 rows on pinnules, not marginal; indusia none.

Tuevessi, 19,137; Kilinga, 19,064; Solkopo Island, 19,719; Uea Island, 19,674.

Occasional, also observed at Soloroa and Paho. Previously known only from Samoa.

ASPLENIACEAE

KEY TO SPECIES OF ASPLENIUM

Blades simple, entire, sessile; plant usually epiphytic.....*A. nidus*.
Blades pinnate, the margin dentate, stalked; plant terrestrial.....*A. falcatum*.

***Asplenium falcatum* Lam., Encycl. Méth. Bot. 2: 306, 1786.**

Asplenium adiantoides (L.) C. Chr., Ind. Fil., 99, 1905, *sensu* Copel., B. P. Bishop Mus., Bull. 93: 49, 1932; non *Trichomanes adiantoides* L., Sp. Pl., 1,098, 1753. (*Sakoto*, a strainer.)

Terrestrial (or epiphytic) tufted fern; rhizome erect, short, a few cm. in length, about 5 mm. in diameter, scales 8-10 mm. long, linear-lanceolate, dark brown, shining, the apex setose and pseudo-ciliate; stipes 8-35 cm. long, slender, reddish brown, scaly at base, and sparsely so to the tip and on the rhachis; blade pinnate, 20-45 cm. long, 11-15 cm. wide; pinnae 8-20 on a side, 4-10 cm. long, 12-22 mm. wide, narrowly oblong-lanceolate or lanceolate, and falcate, the apex acuminate, oblique at base, the upper side cuneate, the lower long cuneate, the margins sharply dentate or doubly so except near the base; veins ascending pinnate, simple or forked, free; sori following the oblique lateral veins, linear, variable in length, but the longer may approach the margin; indusia of thin pale flaps, opening inward or alternately inward and outward.

Fapufa, 19,111; Uea Island, 19,640.

Common in moist woods; also observed at Soloroa, Pala, Losa, Kongai, Kilinga, Motusa, Salvaka, Solmatcha, Huo, Vaitoko, Pepjei, and Satarua.

There have been diverging interpretations as to the specific name of this wide-ranging fern. Both Copeland and Christensen have published on it, and their opinions differ. Christensen in his final publication (8, p. 68) concluded that *Asplenium adiantoides* (L.) C. Chr. from Ceylon was a form of *A. macrophyllum* Sw. from India. Though the two species may merge, *A. macrophyllum* with pinnae 12-25 mm.

wide, and less cut, is generally maintained. In any case, the Polynesian, Melanesian, and Micronesian specimens agree with the characters of *A. falcatum*. None of the writings seen discuss the types, but Christensen had every opportunity to examine those of Swartz and Lamarck, and in his last publication he reversed his previous views, reducing one of his own combinations, doubtless with good reason. Hence, Christensen's views are followed and the name *A. falcatum* Lam. adopted.

Recently there has been a detailed study of the species in the affinity of *A. falcatum* by Skottsberg (26, pp. 79-105). He recognizes several species with variations. He accepts as the type the one from Mauritius Island with the pinnae linear-lanceolate, the apex long caudate, the base obliquely cuneate, and the margin inconspicuously denticulate. A second group which he calls "the *polyodon* type" has larger pinnae, obliquely lanceolate, attenuate to the tip, the base broadly obliquely cuneate, and the margin cut into shallow denticulate lobes. In our large collection (number 19,111), the smaller plants agree with his type I, or *A. falcatum*; the larger plants with his type II, or "*polyodon*." They grew intermingled and when collecting them in the field no difference was noted. It is of interest that Skottsberg decided that the transitions between these groups were too numerous and too complete and that he treated them all as one species, *A. falcatum* Lam. In review, there seems no reason to differ from his interpretation.

Asplenium nidus L., Sp. Pl., 1,079, 1753.

Neottopteris nidus (L.) J. Sm., Hooker's Jour. Bot. 3: 409, 1841.

(*Kukulufi*.)

Epiphytic on trees, or on fallen branches, or even persisting on the ground, huge, tufted fern, the clump of arching leaves forming a recess like a "bird's nest"; rhizome short, but on large old plants forming a base up to 1 m. long and 2 dm. in diameter, the scales 1.5-2 cm. long, linear-lanceolate, blackish and iridescent; blades sessile 30-200 cm. long, 5-34 cm. wide, oblanceolate, entire, thin for their size; veins simple or forked near base, running out at an obtuse angle, joining to the marginal vein; sori on apical half of blade, on the veins, linear, extending from or near to the midrib $\frac{1}{4}$ - $\frac{2}{3}$ way to margin; indusia simple narrow flaps opening toward tip of blade.

Kilinga, 19,097; Haua Meamea Island, 19,367; Solnahu Island, 19,605; Solkopo Island, 19,693.

Common in woods (fig. 7), and once found on basalt sea cliff; also observed at Lulu Bay, Soloroa, Pala, Losa, Kongai, Fapufa. Mo-

tusa, Salvaka, Solmatcha, Salsesei, Huo, Vaitoko, Pepjei, Satarua, Hautia Island, and Uea Island.

BLECHNACEAE

Blechnum orientale L. (by error as *B. occidentale* L., Sp. Pl., 1,077, 1753, corrected by Linnaeus himself in ed. 2, 2:1,535, 1763).
(*Julia roroa*, ill-smelling fern.)

Large terrestrial fern: caudex stout, repent or erect, up to 3 dm. in height, 6-8 cm. in diameter, the roots cordlike, brown, the rhizome apex with many

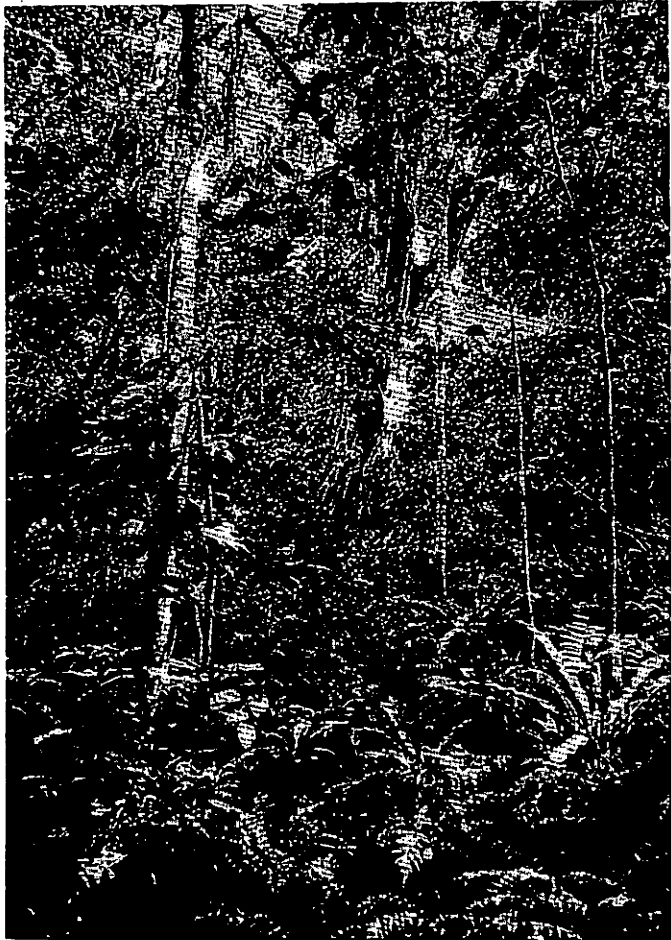


FIGURE 7.—Woods on nearly bare lava at Pepjei Point, showing terrestrial ferns *Nephrolepis biserrata* and *Asplenium nidus*.

linear-lanceolate, brown scales; stipes 10-120 cm. long, that is the apparent stipe, but actually it has reduced stubs or auricles of pinnae almost throughout, at base retaining the numerous scales 15-25 mm. long, narrowly lance-linear, brown, glandular ciliate, all proximal directed; blade 25-210 cm. long, 10-40 cm. broad, subcoriaceous, glabrous, pinnate, but terminal pinnae confluent or decurrent; pinnae 0.5-2 cm. wide, linear, tapering; sori 2, close to and parallel to the midrib, entrenched; indusia linear, opening inward.

Kongai, 19,157. Local and rare; seen only at this one locality.

POLYPODIACEAE

Phymatodes Scolopendria (Burm.) Ching, Inst. Bot. Nat. Acad. Peiping, Contrib. 2: 63, 1933.

Polypodium Phymatodes L., Mant., 306, 1771.

Polypodium Scolopendria Burm., Fl. Ind., 232, 1786.

Microsorium Scolopendria (Burm.) Copel., Univ. Calif., Pub. Bot. 16: 112, 1929. (*Seisei*.)

Epiphytic or terrestrial; rhizome creeping 4-10 mm. in diameter, the scales lanceolate, ciliate, at length deciduous; fronds erect, remote; stipes 5-75 cm. long, glossy; blade 20-90 cm. long, 15-60 cm. wide, almost leathery, oblong-lanceolate, deeply pinnatifid; veins anastomosing with free included veinlets; the several lobes ascending, linear to oblance-oblong; sori large, round or elliptic, sunken, usually in one row on each side, closer to the midrib than to the margin.

Motusa, 19,034; Haua Meamea Island, 19,387; Solnahu Island, 19,542; Uea Island, 19,668.

Abundant and widely distributed from the shore to the hilltops; also observed at Soloroa, Pala, Losa, Tuevessi, Fapufa, Kilinga, Salvaka, Solmatcha, Salsesei, Huo, Vaitoko, Pepjei, Satarua, and Elasio. (See figs. 8, 10.)

Copeland (17, p. 195) merges this group with *Microsorium*, but the treatment here preferred keeps *Phymatodes* apart and accords with the classification by Ching (5, p. 259) and by Dickason (19, p. 127).

VITTARIACEAE

Antrophyum plantagineum (Cav.) Kaulf., Enum. Fil., 197, 1824.

Hemionitis plantaginea Cav., Descr. Pl., 260, 1802.

Terrestrial here, though elsewhere often an epiphyte, tufted; rhizome 1-2 mm. in diameter, short, the scales 5-10 mm. long, linear, attenuate, dark brown, with many rigid cilia; stipe 3-15 cm. long, naked except at scaly base; blade 5-30 cm. long, 1.5-7.5 cm. wide, elliptic-oblongate, firm, entire, midrib evident only at base; sori linear, short or long, separate, forking or confluent, in troughs following the veins; indusia none; paraphyses minute and not evident.

Kilinga, 19,051.

Common in moist woods; also observed at Ututu, Pala, Losa,

Kongai, Fapufa, Motusa, Salvaka, Huo, Vaitoko, Pepjei, Satarua, Solnahu Island, Solkope Island, and Uea Island.

For family assignment, the classification used is that of Copeland (16, p. 170; 17, p. 223) and differs from that of Ching (5, p. 231) and Dickason (19, p. 129) who separate the genus in the family Antrophyaceae.

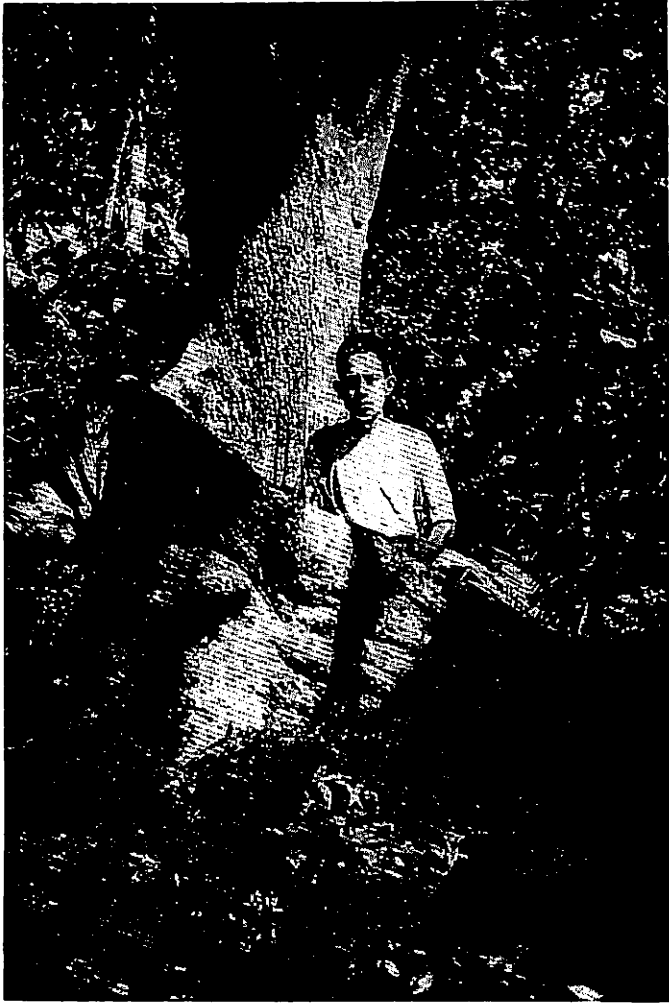


FIGURE 8.—The guide Aisake behind a buttress base of *Sterculia* sp. (*puak-vai*) tree in native forest at Kilinga, with *Phymatodes Scolopendria* in foreground.

Vittaria elongata Sw., Synop. Fil., 109, 302, 1806.

Tufted epiphyte; rhizomes short creeping, 2-3 mm. in diameter, covered with brown or black scales 5-10 mm. long, linear-lanceolate, drawn out into a long needle point which is entire or with a few pseudo-cilia; fronds 20-180 cm. long, 3-10 mm. broad, tapering to either end, leathery, the veins hidden; sori continuous in the margins of the frond, sunken in a cleft between two lips which are subequal.

Kilinga, 19,039, 19,056; Uea Island, 19,639.

Common epiphyte in woods. Also observed at Soloroa, Tuevessi, Pala, Fapufa, Motusa, Paho, Lulu, Solmatcha, Huo, Vaitoko, and Pepjei.

HYMENOPHYLLACEAE

KEY TO GENERA

- Fronds more than 2 cm. long, pinnately divided, the margins not thickened **Crepidopteris**.
 Fronds 0.5-1.5 cm. long, palmately cleft, the margins bounded by two rows of thick, longitudinal cells..... **Gonocormus**.

The generic classification followed in this family is that of Copeland (14). C. V. Morton (24) criticized and rejected this classification, arguing that the groups were based on characters that were artificial or of less than generic value. Traditionally, the family consisted of only two genera, *Hymenophyllum* and *Trichomanes*, but these genera had become heterogeneous, undefinable, and unwieldy. The 33 genera accepted by Copeland have more uniform and recognizable characters. They seem to represent definable units in a much better classification.

Crepidopteris humilis (Forst.) Copel., Philippine Jour. Sci. 67: 58, 1938.

Trichomanes humile Forst., Prodr., 12, 1786; see Copeland, Philippine Jour. Sci. 51: 164-167, pl. 12, 1933.

Crepidophyllum humile (Forst.) Reed, Am. Fern Jour. 38: 89, 1948. (*Lumusa*, caused by the rain.)

Elsewhere usually epiphytic, but here usually terrestrial; rhizomes creeping, threadlike; stipe glabrous, very short or up to 1 cm. in length; frond 2-8 cm. long, ovate to lanceolate, mostly bipinnatifid, the axes winged, bearing a few short, deciduous hairs; segments rather remote, linear, about 0.5-1 mm. wide, ascending, the margin heavy, bounded by two rows of thick longitudinal cells; involucre tubular or with funnellform orifice, 2 mm. long, borne in the axils; receptacle filiform, fragile, exserted, becoming as much as three times the length of the involucre.

Tuevessi, 19,239; Soloroa, 19,218; Uea Island, 19,645. Rare, seen only thrice.

Reed created the new name *Crepidophyllum*, stating that *Crepidopteris* Copel. was a later homonym. Actually, the name *Crepidopteris* Walp. was an error for *Crepidotropis* and, in any case, was published only in synonymy. Hence, *Crepidophyllum* Reed was superfluous and *Crepidopteris* Copel. is a legitimate name.

Gonocormus minutus (Bl.) v. d. Bosch, Hymenophyllaceae Javanicae, K. Akad. Wetensch. Amsterdam., Verhandl. 9 (6) : 7, pl. 3, 1861; see Copeland, Philippine Jour. Sci. 67: 57, 1938.

Trichomanes minutum Bl., Enum. Pl. Javae, 223, 1828.

Trichomanes saxifragoides Presl, Hymenophyllaceae, 16, 39, 1843.

Trichomanes parvulum of recent authors, not of Poir. in Lam., Encycl. Méth. Bot. 8: 64, 1808.

Epiphytic or on moist rocks; rhizome threadlike, creeping, hairy; stipes threadlike 5-20 mm. long; fronds fanlike, 3-15 mm. long, cleft about $\frac{2}{3}$ way into linear ascending segments 0.5-1 mm. wide, 1-nerved, with a few minute setae on the surface; involucre 1-1.5 mm. long, the cylindrical part immersed, the funnellform mouth exserted; receptacle filiform, slightly exserted.

Jarua, 19,242 (fr.). Rare, seen only once.

DENNSTAEDTIACEAE

Microlepia scaberula Mett. ex Kuhn, Linnaea 36: 148-149, 1869.

(*Julia*.)

Large terrestrial fern; rhizome horizontal or occasionally erect, 8-15 mm. in diameter, glabrous except for a few minute brown firmly appressed hairs; fronds 3-9 erect; stipe 50-75 cm. tall, somewhat hirsutulous, shining, brownish; blade 1-1.3 m. long, 3-4-pinnatifid, the minor rhachises and midribs brown pilosulous; larger pinnae 45-50 cm. long, 15 cm. wide, lanceolate, pinnules 6-20 mm. long, 3-8 mm. wide, obliquely oblong, obtuse, sessile or adnate, crenately incised, more deeply so on upper side; veins free, once or several times forked or a few simple; indusium terminal on veins, near to, but not on, the margin, half cup-shaped, attached at base and sides.

Soloroa, 19,217; Pala, 19,161; Kongai, 19,154.

Microlepia scaberula Mett. is accepted in the sense of Copeland (13, p. 53). He so identifies similar large ferns with smooth thick rhizomes from Tahiti. In the original description by Mettenius it was stated that the rhizome was missing, that the lamina was 1 foot long, and that the sorus was minute. Without study of the original specimens of this, collected on Tahiti by Andersson and by Vesco, it is not certain that the usage of Copeland is identical with that of the

original one by Mettenius; but for the time being, the interpretation of Copeland is followed. The plants of Rotuma and Tahiti differ from the ones of Samoa and Fiji, which are smaller, with slender bristly rhizomes. These are accepted as *M. speluncaea* (L.) Moore. Copeland (17, p. 51) places this genus in the Pteridaceae, but the placement in the Dennstaedtiaceae by Ching (5, p. 215) and by Dickason (19, p. 131) is preferred here.

LINDSAEACEAE

Lindsaea ensifolia Sw., in Schrad. Jour. Bot. 2 (1800): 77, 1801 (as *Lindsaya*, *vide* C. Chr.).

Schizoloma ensifolium (Sw.) J. Sm., Jour Bot. 3:414, 1841. (*Julia*.)

Terrestrial, herbaceous; rhizome 1-2 mm. in diameter, creeping, the scales 1-2 mm. long, lance-linear, brown; fronds one or few; stipes 8-40 cm. long, at base sparsely scaly, elsewhere smooth, shining; blade 10-40 cm. long, 3-10 cm. wide, pinnate; pinnae of juvenile fronds suborbicular to ovate, of adult fronds oblong to linear, 2-8 mm. wide, attenuate to the obtuse or acute tip, the base subcordate to cuneate, the upper side larger; venation with 1 (or 2) rows of netted veins next to the midrib, then simple or forked to the ends, these connected by fertile commissures just inside the margin; sori marginal, of two membranous lips opening outward, continuous.

Jarua, 19,252. Found only at this one spot, and said by the natives to occur only there.

Copeland (17, p. 53) places this genus in the Pteridaceae, but the classification of Ching (5, p. 216) and of Dickason (19, p. 131), placing it in the Lindsaeaceae (Lindsayaceae), is preferred here.

DAVALLIACEAE

Davallia solida (Forst. f.) Sw., in Schrad. Jour. Bot. 2 (1800): 87, 1801.

Trichomanes solidum Forst. f., Flor. Ins. Austral. Prodr., 86, 1786.

Commonly epiphytic, less commonly terrestrial; rhizomes 4-10 mm. in diameter, several dm. in length, sparsely forked, usually exposed on the trunk or ground surface, bearing prominent, round, naked scars where the fronds disjoin, densely covered with brown scales 6-12 cm. long, lance-linear, attenuate, ciliate, the base peltate and dilated; stipes 15-35 cm. tall, wiry, smooth; blade 15-50 cm. long and nearly as wide, triangular, tripinnatifid, subcoriaceous, smooth shiny, distinctly dimorphous, the sterile blades with fewer broader segments, the fertile with more numerous, narrower ones; pinnae decreasing upward, lanceolate; fertile pinnules lanceolate, serrate above, deeply incised below; veins several times forked, free; sori 1-1.5 mm. long, 0.5 mm. wide, on vein tips;

indusia tubular, buried, attached by the base and sides, barely protruding at the margin.

Jarua, 19,245; Solnahu Island, 19,540; Uea Island, 19,643.

Common epiphyte on bases of tree trunks in native forest or even on coconut trees in the plantations; also observed at Soloroa, Pala, Losa, Kongai, Motusa, Salvaka, Solmatcha, Huo, Vaitoko, Pepjei, Satarua, and Solkope Island.



FIGURE 9.—*Cyrtosperma Chamissonis*, *Nephrolepis biserrata*, and *Pandanus* sp. in fresh-water swamp at Jarua.

Nephrolepis biserrata (Sw.) Schott, Gen. Fil., pl. 3, 1834.

Aspidium biserratum Sw., Schrad. Jour. Bot. 2 (1800): 32, 1801.

(*Julia*.)

Tufted; rhizome short, creeping or erect, with brown lanceolate, fimbriate scales, stipes 10-50 cm. long, with similar scales, especially at base; blade 0.5-4 m. long, 15-40 cm. broad, oblong pinnate, somewhat fleshy; pinnae 1-2 cm. broad, the base somewhat rounded, sessile, the apex indeterminate, tapering; veins free, usually 1-2-times forked; sori rounded, on vein tips, in single row remote from margin; indusia cordate-orbicular, opening toward margin.

Ututu, 19,166; Motusa, 19,032; Haua Meamea Island, 19,386; Solnahu Island, 19,531.

Widely distributed, and abundant; also observed at Lulu, Soloroa, Losa, Tuevessi, Fapufa, Kilinga, Paho, Solmatcha, Salsesei, Huo,

Vaitoko, Pepjei, Satarua, Elsie, Hauatia Island, Solkope Island, and Uea Island. (See figures 7, 9, 10.)



FIGURE 10.—Forest on north side of Soloroa, showing in foreground *Nephrolepis biserrata* and *Phymatodes Scolopendria*.

PTERIDACEAE

KEY TO SPECIES OF PTERIS

- Fronde 3-partite; veins netted.....*P. tripartita*.
- Fronde pinnate in cutting,
 - Veins netted; fronds all similar.....*P. comans*.
 - Veins free, mostly forked,
 - Fronde alike; pinnules entire.....*P. pacifica*.
 - Fronde dimorphous, the fertile narrower; sterile pinnules serrulate....
.....*P. ensiformis*.

Pteris comans Forst. f., Fl. Ins. Austral., Prodr., 79, 1786. (*Julia*.)

Terrestrial; rhizome short, horizontal, 1.5-3 cm. in diameter, the scales of it and stipe base 1 cm. long, lance-linear, brown; stipes 30-75 cm. long, yellowish, smooth above; blade 30-130 cm. long, deltoid, bipinnate, chartaceous; pinnae 10-20 cm. long, lanceolate, the upper sessile and confluent, the lower stalked, cleft to within 5-8 mm. of the midrib; veins netted, with numerous polygonal meshes; pinnules 2.5-10 cm. long, oblong, obtuse or acute, serrulate; sorus continuous, of the thin reflexed leaf margin.

Solkope Island, 19,708. Very rare, seen only once, on the steep, conical, 420-foot island off the southern shore of Rotuma.

Pteris ensiformis Burm., Fl. Ind., 230, 1768. (*Sere, sir'ia*.)

Terrestrial, tufted herbaceous fern; rhizomes short creeping, 1-3 mm. in diameter, the scales 2 mm. long, linear-lanceolate, brown; fronds dimorphic; sterile fronds with stipes 5-40 cm. long, smooth, becoming straw-colored; blades 8-20 cm. long, 4-12 cm. wide, deltoid lanceolate, bipinnatifid, only the lower pinnae pinnatifid; pinnae or pinnules elliptic to obovate, serrate, 5-15 mm. wide; veins free, forking several times; fertile fronds with stipes 15-45 cm. long; blades with pinnae or pinnules (of the lower ones) 4-20 cm. long, 4-10 mm. wide, linear; sori continuous, marginal, formed of the revolute thin margin.

Kilinga 19,069, 19,044; Solnahu Island, 19,537; Solkope Island, 19,725.

Occasional in deeper woods or rock clefts, especially on the hills; observed at Soloroa, Motusa, Salsesei, Huo, Pepjei, and Satarua. The attractive fronds are used by the natives as ornaments.

Pteris pacifica Hieron., Hedwigia 55: 355, 1914. (*Sakoto*, strainer.)

Terrestrial; rhizome erect or short creeping, 1-2 cm. in diameter, the scales 3-5 mm. long, brown, linear, attenuate, glandular puberulous, also on the stipes, less so upward; stipes 20-60 cm. long, yellow to reddish, slender; blade 30-60 cm. long, 15-20 cm. wide, bipinnatifid but the lowest pair of pinnae also forked near the base; pinnae 1.5-2.5 cm. wide, narrowly oblong, acuminate, cleft to within 1 mm. of the midrib, with a bristle from the veinlet near the sinus, short-stalked or the upper sessile; veins free, forked near the base; pinnules 2-3 mm. wide, narrowly oblong, a little curved, obtuse, entire; indusium continuous, of the thin reflexed frond margin.

Kilinga, 19,075; Solnahu Island, 19,548; Solkope Island, 19,717; Uea Island, 19,675. Uncommon, seen only at and collected at the four localities cited.

The natives take the fronds, make a decoction in water, and use this in baking the native arrowroot (*Tacca*) puddings.

Pteris tripartita Sw., in Schrad. Jour. Bot. 2 (1800): 67, 1801. (*Julia ma'onnoa*, fern like a rooster's neck; *mbalambala*, Fijian name.)

Terrestrial, stout fern; caudex erect, up to 3 dm. tall, bearing many aerial

roots, and producing 4-7 fronds; stipes 30-145 cm. tall, up to 2 cm. in diameter, smooth, at first scurfy, brownish; blade 50-150 cm. long, 3-parted, the 2 lateral parts again 2-3 parted, the central part lacking major forkings, the parts of the frond bipinnatifid; the pinnae 7-25 cm. long, 1-3 cm. wide, lance-linear, attenuate, lobed to within 1-2 mm. of the midrib; pinnules sessile, numerous, arcuate-oblong, obtuse or acute; veins netted, the inner row of areoles parallel to the main midrib; sori mostly continuous, of the thin reflexed margin of the frond.

Kongai, 19,153; Solkope Island, 19,728. Local and infrequent, but also seen at Losa, Salvaka, Mea, Solmatcha, Salsesei, and Pepjei.

The natives use the pith of the stipes as a poultice on boils.

The recently imported Fijian name *mbalambala* for *P. tripartita* is now well established in Rotuma, though in Fiji it applies to a number of ferns in the genus *Cyathea*. In recent times most shipping and commerce has been with Fiji, and there are a number of Fijians living in Rotuma.

ADIANTACEAE

Adiantum Capillus-veneris L., Sp. Pl., 1,096, 1753.

Terrestrial, tufted with numerous fronds; rhizome 1-2 mm. in diameter, short creeping, the scales 2-3 mm. long, linear, tapering, brown; stipes 5-22 cm. long, wiry, smooth, shining, dark purple to blackish; blade 7-22 cm. long, 2-3-pinnate, the slender stalked pinnules 15-25 mm. long, mostly longer than broad, rhomboidal, or flabellate with the tip rounded, slightly or deeply palmately cleft; indusia one or few on each lobe, formed of the reflexed thin margin, oblong or sausage-shaped; sori attached to a vein on under side of the false indusium.

Sumi, 19,493. A cultivated ornamental, seen only in the garden of the Roman Catholic Mission. The placement in the family is in accord with the classifications of Ching (5, p. 230) and of Dickason (19, p. 134).

ACROSTICHACEAE

Acrostichum aureum L., Sp. Pl., 1,069, 1753.

Large terrestrial fern; caudex up to 7 dm. in height, woody, the scales 5-8 mm. long, lanceolate, dark brown; fronds numerous, forming clump; stipes 30-85 cm. long, strong, stiff, pale brown when dried, smooth except the base bears numerous scales 1.5-3 cm. long, elliptic, dark brown; blade 20-300 cm. long, pinnate, coriaceous; lower and middle pinnae sterile, elliptic or lance-elliptic, 15-45 cm. long, 2-7 cm. wide, entire; veins anastomosing in a fine network; upper pinnae fertile, having the whole lower surface (or the lowest of these with only the tip) covered with crowded sporangia and paraphyses, becoming dark brown.

Kilinga, 19,095; Hoi, 19,349; Solkope Island, 19,705; Uea Island, 19,661.

Found at several localities on the sea shore and in one fresh marsh (fig. 11) which may occasionally be flooded by the sea; also seen at Lulu Bay, Losa, Fapufa, Vaitoko, Pepjei, Hauatia Island, and Haua Meamea Island.



FIGURE 11.—*Acrostichum aureum* in fresh-water swamp at Hoi.

Most of the localities are on basalt sea cliffs or ledges at the shore. On those frequently soaked by salt spray, the fern is dwarfed, and not more than 30 to 60 cm. in height, while at the sites a little more remote and protected, it grows to larger size. Its largest development, to a height of 2 to 3 meters, was seen in the marsh at Hoi, which seemed fresh but may well get occasional salt floods.

The placement in the family is in accord with the classification of Ching (5, p. 254) and of Dickason (19, p. 135).

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