Some Marine Algae of the Southern Marshall Islands[1]

E. YALE DAWSON[2]

NO RECORDS OF MARINE ALGAE from the southern atolls of the Marshall Islands have heretofore appeared in the literature. Indeed, our only account of the marine vegetation of this far-flung archipelago is that by W. R. Taylor (1950) dealing with Bikini and other northern atolls of the group.

A recent opportunity to visit several of these atolls with a field team under the leadership of Dr. Bruce W. Halstead resulted in the gathering of a considerable collection of algae from Kwajalein, Jaluit, and Majuro atolls[3]. To this has been added, through the kindness of Dr. M. S. Doty of the University of Hawaii, a large collection obtained by Mr. Leonard Horwitz on Arno Atoll[4].

These combined collections are so numerous that time has not yet permitted a study of all of the material. What is given here is an annotated list of those specimens which have been examined to date, exclusive of a number of apparently undescribed species and of certain other plants in need of more critical study. It is hoped that a second part may soon be added to complete this account.

As an aid to field workers who may not have a large algological library at their disposal, an attempt has been made to provide an illustration for each species of which one may not otherwise be at hand. Two handbooks are considered to be so readily available as to serve in conjunction with this paper, namely, Taylor's 1950 account mentioned above, and the writer's recent, fully illustrated treatment of the tropical marine algae of Viêt Nam which appeared in *Pacific Science* Vol. 8, No. 4, 1954. Thus, an illustration is presented here wherever one is not to be found for a given species in one or the other of these works. The style of presentation is the same as in the latter paper. I was aided in the preparation of the drawings by Mrs. Glennis Sayers Clements. The photographs were prepared by Mr. Royford George.

The specimens are cited here by field number preceded by "D." or "H." The former denotes the writer's collections which are deposited in his personal herbarium. The latter denotes those of Mr. Horwitz which are deposited in the Bernice P. Bishop Museum at Honolulu.

LIST OF STATIONS

The following station numbers are assigned arbitrarily and are not chronological. They serve to provide general locality information

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on the collections which are cited also by individual field number in the text.

Kwajalein Atoll

Sta. 1. North end of Kwajalein Island along the seaward side of the reef at low tide, Sept. 26, 27, 1954.

Sta. 2. Along the lagoon side of the reef in the vicinity of the first islet north of Kwajalein Island, in up to 1 m. of water at low tide, Sept. 27, 1954.

Sta. 3. Beach drift along seaward reef of north end of Kwajalein Island, Sept. 26, 1954.

Sta. 4. Beach drift along lagoon shore of west end of Kwajalein Island, Sept. 26, 1954.

Sta. 5. Reef at north end of Kwajalein Island at low tide, Oct. 12, 1954.

Majuro Atoll

Sta. 6. On the broad, seaward reef-flat of Uliga Island at low tide, Oct. 10, 12, 1954.

Sta. 7. Along the seaward coralline algal ridge of Uliga Island at low tide, Oct. 10, 1954.

Sta. 8. On the broad seaward reef flat at the northeast end of Dalap Island at low tide, Oct. 11, 1954.

Sta. 9. Narrow seaward reef at east end of Rairikku Island at low tide, Oct. 11, 1954.

Sta. 10. Narrow seaward reef at west end of Enierripu Island at low tide, Oct. 11, 1954.

Sta. 11. Lagoon side of Uliga Island opposite the staff dwellings, Oct. 10, 1954.

Jaluit Atoll

Sta. 12. Seaward edge of reef at Jabor, Jaluit Island, near the old meteorological station at low tide, Sept. 28, 1954.

Sta. 13. From 2–5 meter depths at Sydney Pier, Jaluit Island, Sept. 29, 1954.

Sta. 14. Beach drift along sea wall at Jabor, Jaluit Island, Oct. 2, 1954.

Sta. 15. Along the lagoon side of Kabenbock Island at low tide, Sept. 29, 1954.

Sta. 16. Along the ocean side of Kabenbock Island opposite the pass, mostly in the shelter of an old shipwreck, at low tide, Sept. 29, 1954.

Sta. 17. In 1–2 meter depths in the bombed out docking area at Jabor, Jaluit Island, at low tide, Sept. 30, 1954.

Sta. 18. Under edges of rocks at medium tide levels and above, lagoon side of Elizabeth Island near the pass, Oct. 1, 1954.

Sta. 19. Edge of the reef of Kabenbock Island along the pass in 1–2 meter depths at low tide, Oct. 3, 1954.

Sta. 20. Patch reef west of Sydney Pier in depths of 2–5 meters at low tide, Oct. 3, 1954.

Sta. 21. Seaward reef, Jaluit Island in vicinity of Jabor, at +2.0–3.0′ tide levels, Oct. 4, 1954.

Sta. 22. Lagoon side of Jaluit Island near Sydney Pier, at +2.0–4.0′ tide level, in shaded places under overhanging trees, Oct. 4, 1954.

Sta. 23. Enybor Island, a few hundred meters inside the channel, in 1–3 m. depths at low tide, Oct. 7, 1954.

Arno Atoll

The extensive collections of Mr. Leonard Horwitz at Arno Atoll as a member of the Pacific Science Board's 1951 coral atoll team, were made largely in the vicinity of Ine village on Ine Island along the south side of the atoll from late June until late August 1951. Inasmuch as the collection stations on Ine were very numerous they will not be itemized here but treated only as to "Ocean side" or "Lagoon side" of the island. Additional information may be obtained by consulting Mr. Horwitz' original field notebook, a microfilm copy of which is deposited with the Bernice P. Bishop Museum, Honolulu.

Sta. 24. Ocean side of Ine Island, June–August 1951.

Sta. 25. Lagoon side of Ine Island, June–August 1951.

Sta. 26. Ocean side of eastern tip of Tinak Island, August 5, 1951.

Sta. 27. Sandy bottom of lagoon flat off Malel Island, August 4, 1951.

Sta. 28. Lagoon shore of Eonëb-je Island, June–August 1951.

Sta. 29. Upper half of reef pavement of western end of Boki, August 18, 1951.

SYSTEMATIC LIST

Enteromorpha compressa (L.) Greville 1830: 180, pl. 18; Setchell and Gardner 1920: 251, pl. 14, figs. 7–8, pl. 16, fig. 3; Bliding 1948: 128, figs. 5–9. *Ulva compressa* Linnaeus 1755: 433 (Sweden)
Fig. 1

MAJURO ATOLL: D. 12769, Sta. 10. This is a short form but apparently typical, agreeing well with both the recent accounts cited above.

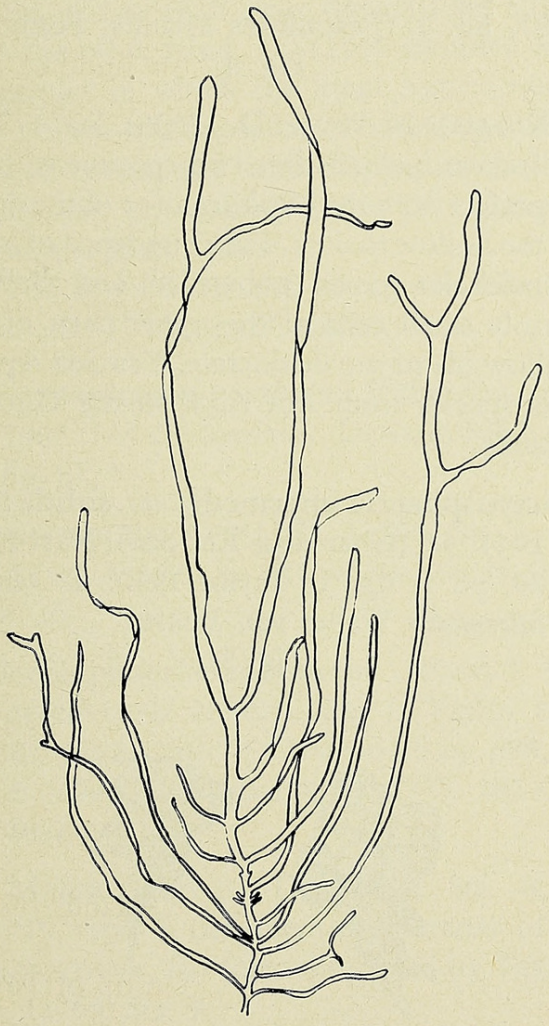

FIG. 1. *Enteromorpha compressa:* Habit sketch of a thallus, × 1.

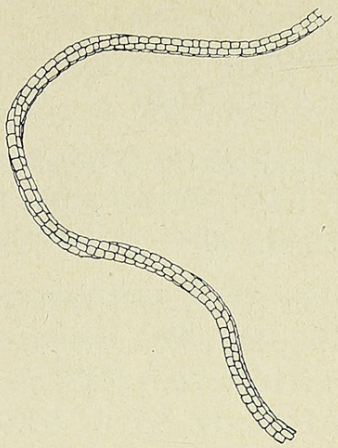

FIG. 2. *Enteromorpha ralfsii:* Part of a filament of D. 12658, × 50.

Enteromorpha kylinii Bliding 1948: 1, figs. 1–3 (West coast of Sweden); Dawson 1954: 384, fig. 5

KWAJALEIN ATOLL: D. 12658b, Sta. 5.
MAJURO ATOLL: D. 12728, 12740, Sta. 7.
JALUIT ATOLL: D. 13153a, Sta. 21. This material is small and short, but structurally agrees well with this species.

Enteromorpha ralfsii Harvey 1851: pl. 282 (Wales); Hamel 1931: 59, fig. 46d
Fig. 2

KWAJALEIN ATOLL: D. 12658, Sta. 5. The filaments of this material are capillary, essentially simple, about 40 μ in diameter, and composed of only 3 or 4 rows of cells.

Enteromorpha clathrata (Roth) J. Agardh 1883: 153; Bliding 1944: 331, figs. 5–7; Dawson 1954: 384, fig. 6d, e. *Conferva clathrata* Roth 1806: 175 (Baltic Sea)

JALUIT ATOLL: D. 13072, Sta. 15. This is Bliding's Typus II of this variable species. Uniseriate branches are abundant as in the Vietnamese material cited.
ARNO ATOLL: H. 9678, Sta. 25.

Halicystis pyriformis Levring 1941: 612, fig. 3 L–P (Juan Fernandez Islands); Dawson 1954: 388, Fig. 8a–c

JALUIT ATOLL: D. 13009, Sta. 12. These are in good agreement in all respects. The largest vesicles are 4 mm. high.

Valonia aegagropila C. Agardh 1822: 429 (Venice, Italy); Taylor 1950: 41; Dawson 1954: 388, fig. 8j

KWAJALEIN ATOLL: D. 12567, Sta. 1; D. 12626, Sta. 2; D. 12662, Sta. 5.

MAJURO ATOLL: D. 12747, Sta. 8.

ARNO ATOLL: H. 9333b, 9392a, Sta. 26; H. 9630, Sta. 24.

Valonia ventricosa J. Agardh 1887: 96 (St. Croix, Virgin Islands); Dawson 1954: 388, fig. 8e

KWAJALEIN ATOLL: D. 12609, Sta. 2.

JALUIT ATOLL: D. 13056, Sta. 13; D. 13124a, Sta. 19. Plants were abundant in these localities and often 5–6 cm. in diameter.

ARNO ATOLL: H. 9491a, Sta. 28. A few very small plants only 2–3 mm. high, but with the characteristic basal attachment cells.

Valonia utricularis (Roth) C. Agardh 1822: 431; Taylor 1950: 41. *Conferva utricularis* Roth 1797: 160, pl. 1, fig. 1 (Mediterranean Sea)

Fig. 3

JALUIT ATOLL: D. 13122, Sta. 19. The specimen is apparently typical, agreeing with Roth's original figures of dry specimens, poor as they are.

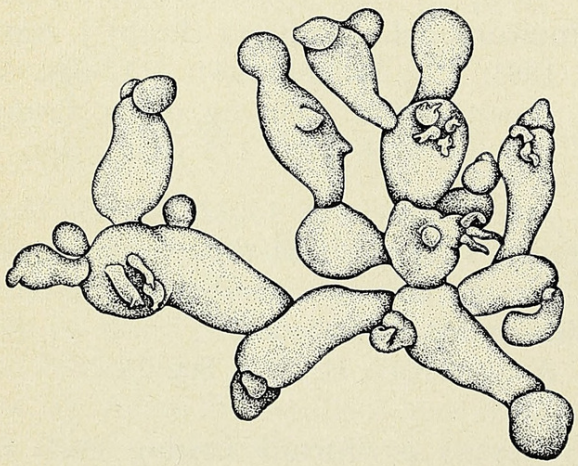

FIG. 3. *Valonia utricularis:* A plant of D. 13122 as seen from the under side, × 2.

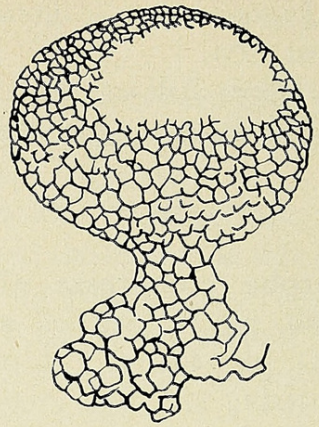

FIG. 4. *Dictyosphaeria bokotensis:* Reproduction of Yamada's original illustration of a specimen of the type collection, × 2.

Dictyosphaeria bokotensis Yamada 1925: 81, fig. 1 (Pescadores Islands, Formosa)

Fig. 4

KWAJALEIN ATOLL: D. 12596a, Sta. 1. This collection includes but two specimens, both imperfect from the breaking away of the dome of the hollow thallus. The abundance of long, intracellular spines (trabeculae) and the uniformly small cells of the upper parts of the hollow plants are distinctive. Yamada reports this species from Ant Atoll in the Caroline Islands.

Dictyosphaeria intermedia var. **solida** Nasr 1944: 32 (Ghardaqa, Red Sea); Nasr 1947: 29, pl. 1, fig. 1; Taylor 1950: 42 (as *D. intermedia* Weber van Bosse)

Fig. 5

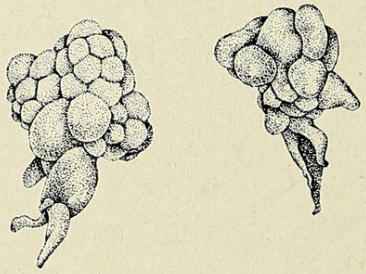

FIG. 5. *Dictyosphaeria intermedia* var. *solida:* Two young specimens from D. 12635, × 2.

KWAJALEIN ATOLL: D. 12635, Sta. 2; D. 12557, D. 12596, Sta. 1.

JALUIT ATOLL: D. 13017, Sta. 12.

ARNO ATOLL: H. 9390b, Sta. 26.

Young specimens of our collections correspond closely with Nasr's plant which came from a similar habitat "on the edges of dead corals in places exposed to strong waves and firmly adhering to the substratum by basal rhizoids." In most of the specimens of later stages an irregular development of cavernous invaginations takes place in the gregarious thalli, but hardly the development of a hollow structure in the sense of Weber van Bosse's type plants (1905: 143). Taylor does not speak of his northern Marshall Island specimens as being hollow, but that "it is not infrequent for the organization of the coenocyte into solid thalli to be irregular, even loose, and in such cases the cells are large." On the other hand, D. 12596 includes some examples in which the inner breakdown to the hollow condition has occurred, and which would correspond with *Dictyosphaeria intermedia* var. *intermedia* W. van B. Others are solid like Nasr's plant.

This is probably the plant redescribed by Yamada (1944*a*) as *D. mutica*.

Dictyosphaeria versluysii Weber van Bosse 1905: 144 (Indonesia); Dawson 1954: 388, fig. 8k, l

KWAJALEIN ATOLL: D. 12560, Sta. 1.

ARNO ATOLL: H. 9265a, Sta. 24; H. 9392, Sta. 26.

Dictyosphaeria cavernosa (Forsk.) Børgesen 1932: 2, pl. 1, fig. 1; Taylor 1950: 43, pl. 27, fig. 2; Dawson 1954: 388, fig. 8i. *Ulva cavernosa* Forskål 1775: 187 (Red Sea)

MAJURO ATOLL: D. 12687, Sta. 6; D. 12719, Sta. 6 (fragmentary material of the large, coarse, flat form illustrated by Taylor); D. 12764, Sta. 9.

JALUIT ATOLL: D. 13083, Sta. 16; D. 13104, Sta. 18.

ARNO ATOLL: H. 9343, Sta. 27; H. 9599b, Sta. 25; H. 9493a, sandy floor of lagoon reef off Matal-En. The large, flat form.

The majority of the specimens of these collections represent the small, hollow, reef-flat form which is almost identical with the Vietnamese plant illustrated by Dawson 1954.

Boodlea vanbosseae Reinbold 1905: 148 (Lucipara Island, Indonesia); Reinbold, in Weber van Bosse 1913: 70, fig. 12

Fig. 6

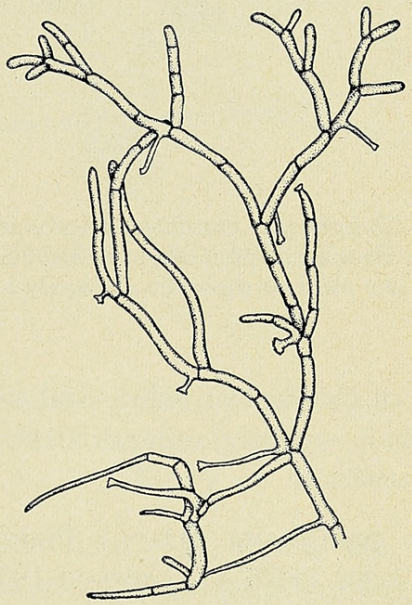

FIG. 6. *Boodlea vanbosseae:* Part of a plant teased out of a clump from H. 9330, showing the rhizoidal branches and fibulae, × 7.

ARNO ATOLL: H. 9330, H. 9372a, Sta. 26; H. 9343a, H. 9373b, H. 9374, Sta. 27. This material is manifestly like that described and illustrated by Reinbold. The filaments are 200–300 μ in diameter and are provided with abundant rhizoidal branches. The haptera, or fibulae, which may be frequent or rather few, arise directly from the ends of cells without the formation of a cross wall except in rare instances.

Yamada (1925: 87) illustrates a plant from Formosa which shows great resemblance to this species and described it as *Cladophora montagnei* Kützing var. *radicans* Yamada. Although he shows none of the fibulae char-

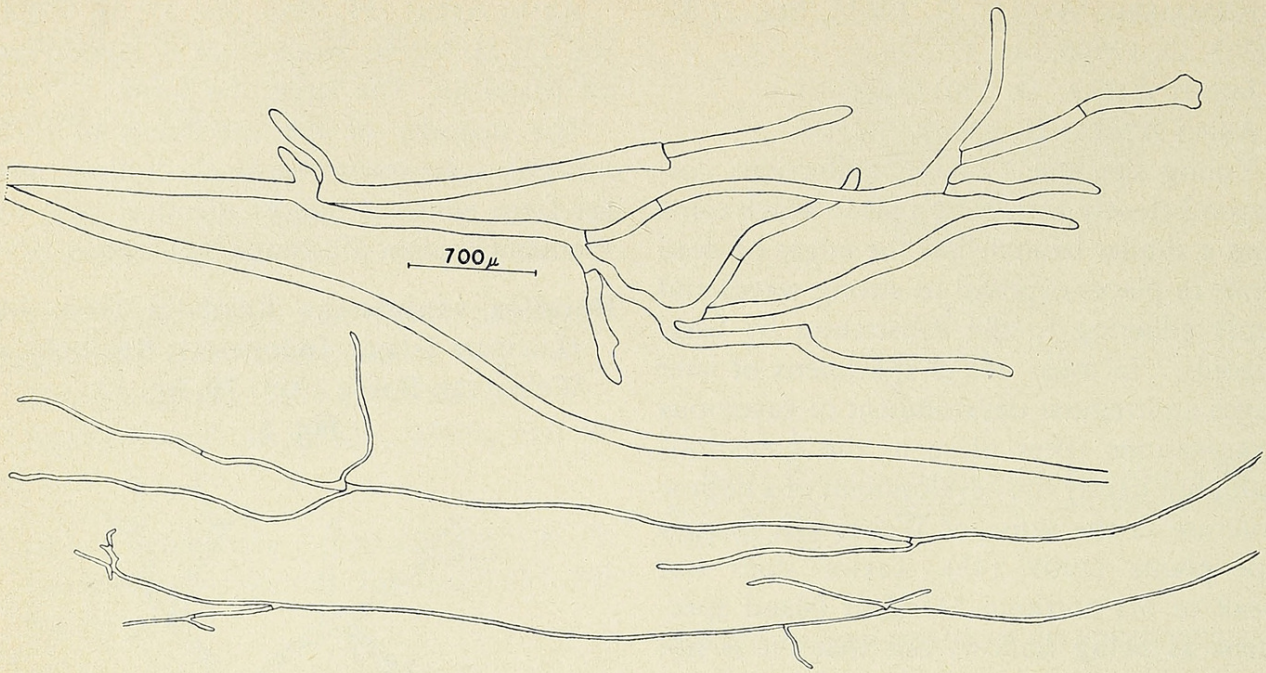

FIG. 7. *Cladophoropsis gracillima:* Reproduction of original illustration of plants of the type collection from Mexico. *a*, Terminal portion of a branched filament showing the manner of septation of branches; *b*, small portion of a skein-like plant to show the extremely long cells and infrequent branching, × 8.

acteristic of *Boodlea*, the habit, size, cell shape and rhizoids strongly suggest identity with *Boodlea vanbosseae*.

Boodlea composita (Harv.) Brand 1904: 187; Taylor 1950: 44; Dawson 1954: 390, fig. 9c, d. *Cladophora composita* Harvey 1834: 157 (Mauritius)

KWAJALEIN ATOLL: D. 12587, Sta. 1 (a slender form with ultimate branches only 70 μ or less in diameter; D. 12613, Sta. 2; D. 12649, Sta. 3; D. 12659, Sta. 4.

MAJURO ATOLL: D. 12698, 12701, Sta. 6.

JALUIT ATOLL: D. 13106, Sta. 18; D. 13139, Sta. 20.

ARNO ATOLL: H. 9493c, Sta. 28; H. 9581c, Sta. 25.

Struvea anastomosans (Harv.) Piccone and Grunow, ex Piccone 1884*a*: 20; Dawson 1954: 390, fig. 8g. *Cladophora ? anastomosans* Harvey 1859, pl. 101 (Fremantle, West Australia)

KWAJALEIN ATOLL: D. 12603, Sta. 2; D. 12671, Sta. 5.

JALUIT ATOLL: D. 13047, Sta. 13.

Cladophoropsis gracillima Dawson 1950*a*: 149, figs. 12–13 (Punta Palmilla, Baja California, Mexico)

Fig. 7

ARNO ATOLL: H. 9327, H. 9333a, Sta. 26. This material, with its very long cells and thick, stratified cell walls (often 10 μ or more) is identical with the type of this tropical Mexican species. The filaments are mostly 70–100 μ in diameter and remotely branched and septate except in the outer parts of some filaments which are septate much as shown in Dawson's figure reproduced above. This species has heretofore been known only from the type material.

Cladophoropsis sundanensis Reinbold 1905: 147 (Timor); Reinbold, in Weber van Bosse 1913: 77, fig. 18; Dawson, Aleem and Halstead 1955: 10

Fig. 8

KWAJALEIN ATOLL: D. 12593, Sta. 1.

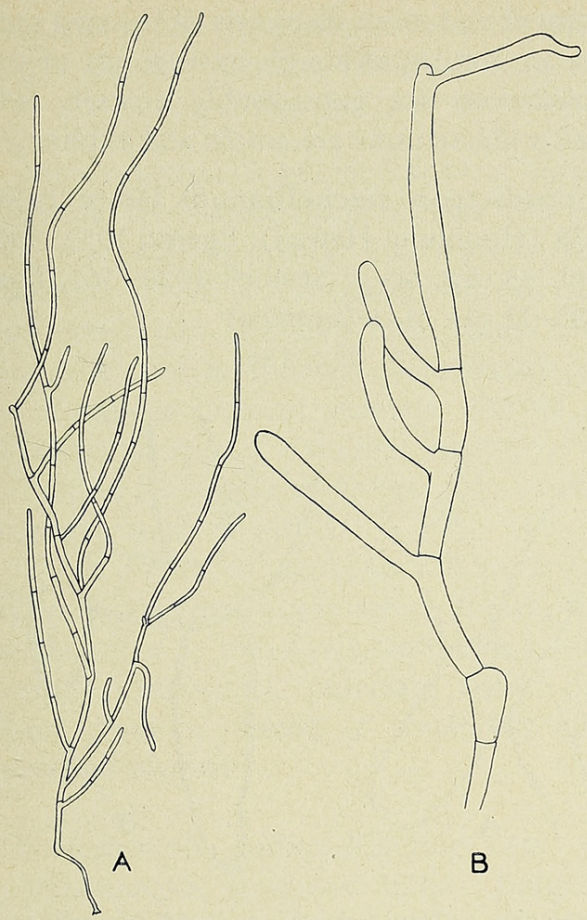

Fig. 8. *Cladophoropsis sundanensis: a*, Habit of part of a plant of D. 12712, × 7.5; *b*, detail of branching of part of a plant of D. 12593, × 20.

Majuro Atoll: D. 12699, 12711, Sta. 6; D. 12712, 12714, in abundant, large mats along the lagoon shore of Dalap Island. This slender, laxly branched form is most probably the same as the plant attributed to *Cladophoropsis zollingeri* by Taylor (1950). While the diameter of *C. sundanensis* ranges from about 60 to 130 μ, or sometimes to 175 μ, *C. zollingeri* is a coarser plant in which the type specimen according to Howe (1914) has filaments 215–315 μ in diameter.

Jaluit Atoll: D. 13012, Sta. 12.

Arno Atoll: H. 9490, Sta. 28. The filaments in these are mostly 80–90 μ in diameter; the occurrence of septa at the base of lateral branches is not infrequent, although in most instances the characteristic *Cladophoropsis* type of branching obtains.

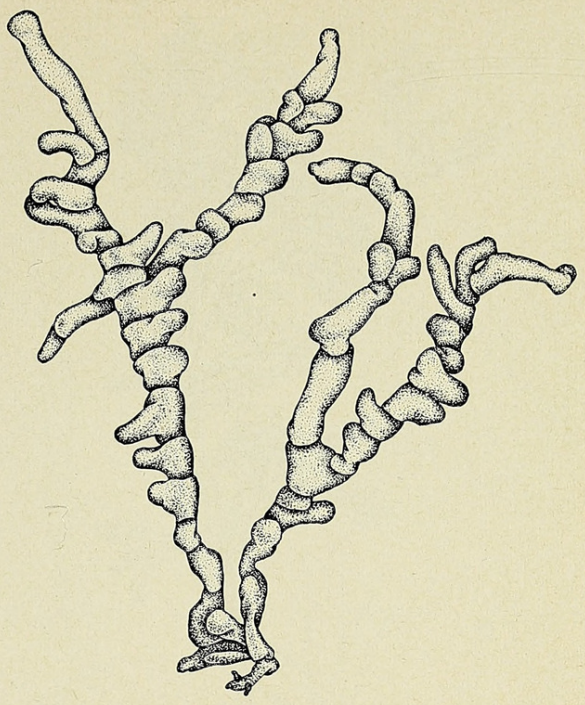

Fig. 9. *Siphonocladus rigidus:* Habit of a plant of D. 12574, × 5.

Siphonocladus rigidus Howe 1905*a*: 245, pls. 13–14 (Bahamas Islands)
Fig. 9

Kwajalein Atoll: D. 12574, Sta. 1. Although this material is somewhat depauperate, it is in excellent agreement with Howe's plant which heretofore has been recorded only from the Atlantic Caribbean region.

Arno Atoll: H. 9333d, Sta. 24; H. 9505, Sta. 28. These are more repent in habit than either Atlantic or Kwajalein specimens seen but hardly to be distinguished otherwise.

Anadyomene wrightii Gray 1866: 48, pl. 44, fig. 5 (Ryukyu Archipelago); Dawson 1954: 390, fig. 9e

Jaluit Atoll: D. 13105, Sta. 18. Most of these specimens from high intertidal rock clefts are dwarfish, but some are sufficiently well developed to show satisfactory comparison with Japanese and Vietnamese examples.

Arno Atoll: H. 9190, Sta. 24; H. 9491, Sta. 28. Small, but good, well developed material.

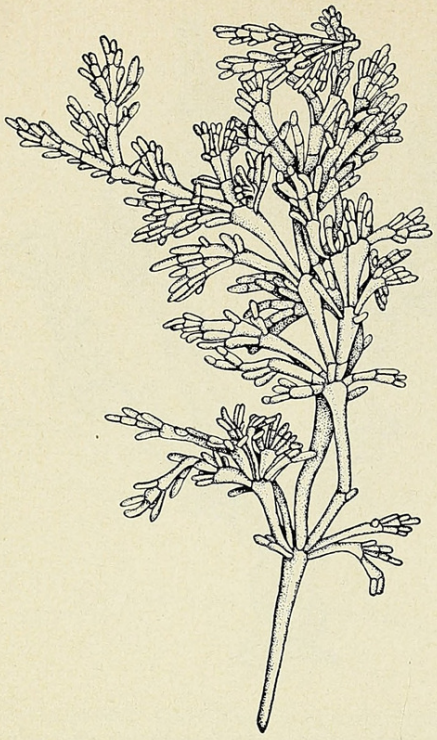

FIG. 10. *Rhipidiphyllon reticulatum:* Part of a plant from H. 9372b to show branching, × 12.5.

Rhipidiphyllon reticulatum (Askenasy) Heydrich 1894: 281, pl. 15, fig. 1; Taylor 1950: 47; Børgesen 1924: 251, figs. 3–4. *Anadyomene reticulata* Askenasy 1888: 5, pl. 2, fig. 7 (Dirk Harteg Isl., West Australia)

Fig. 10

ARNO ATOLL: H. 9372b, H. 9486, H. 9487a, Sta. 28; H. 9444a, Sta. 24.

Microdictyon okamurai Setchell 1929: 553, fig. 76–84 (Ryukyu Islands); Yamada 1934: 40, figs. 6–7; Taylor 1950: 46, pl. 27, fig. 1

Fig. 11*a*

KWAJALEIN ATOLL: D. 12551, Sta. 1; D. 12627, Sta. 2.

JALUIT ATOLL: D. 13101, Sta. 18.

ARNO ATOLL: H. 9592b, Sta. 25 (cell walls mostly under 7 μ); H. 9390a, Sta. 26.

The cell walls in this species are very thin, about 3–5 (6) μ thick, compared to *M. setchellianum* in which they are mostly over 10 μ thick, sometimes up to 16–20 μ. The segment and mesh diameters of the two species are similar, although some forms of *M. setchellianum* are considerably coarser. Setchell's illustrations are ample and explicit.

Microdictyon setchellianum Howe 1934: 38 (Honolulu, Hawaii); Egerod 1952: 366, pl. 33, fig. 6c–g; Setchell 1929: 561, figs. 85–92 (as *M. velleyanum*)

Fig. 11*b*

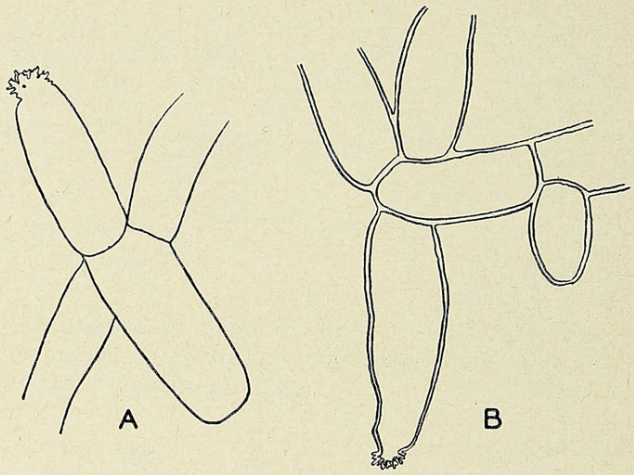

FIG. 11. *a, Microdictyon okamurai:* A few cells, one with fibula, showing the thin walls, × 38; *b, Microdictyon setchellianum:* A few cells, one with fibula, showing the thick walls, × 38.

ARNO ATOLL: H. 9372, Sta. 26; H. 9345a, Sta. 26 (cell walls mostly 7–10 μ thick); H. 9343b, Sta. 27; H. 9495, Sta. 28 (a very dark green, coarse form).

Microdictyon pseudohapteron Gepp and Gepp 1908: 165, pl. 22, figs. 1–4 (Western Indian Ocean); Setchell 1929: 549, figs. 71–75

Fig. 12

ARNO ATOLL: H. 9628a, Sta. 24. A single small tufted plant is present of this species, but is readily distinguished by its relatively delicate frond from the coarser *M. okamurai* and *M. setchellianum* of which the former grew in the same immediate locality. The filaments reach a maximum of somewhat less than 200 μ while the outer cells are only about 100 μ in diameter.

Rhizoclonium samoense Setchell 1924: 177, fig. 42 (Tutuila, Samoa)

Fig. 13*a*

JALUIT ATOLL: D. 13154, Sta. 22, at highest intertidal level under shade of trees with partial fresh-water influence. This material with filaments 45–70 μ in diameter is in close agreement with Setchell's plant which came from the same kind of habitat in Samoa and is of similar filament diameter (45–80 μ). Whether his species is really distinct from the widespread *R. tortuosum* (Dillw.) Kütz. seems, however, to be doubtful.

ARNO ATOLL: H. 9487, Sta. 28, from deep under an overhanging beach rock slab, may be the same as the above, although a more densely intertwined, pulvinate rather than fleecy mass is formed of somewhat more branched filaments.

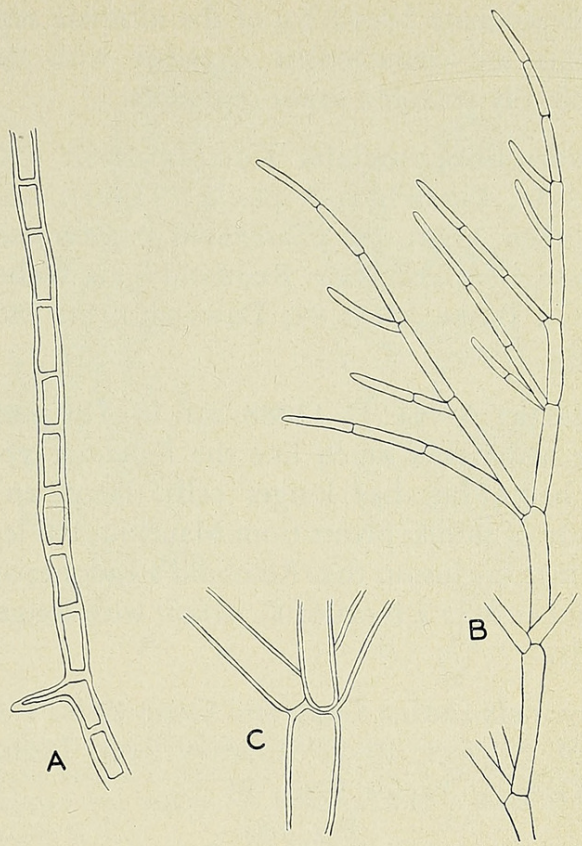

FIG. 13. *a*, *Rhizoclonium samoense:* A small part of a single filament from D. 13154, × 66. *b*, *c*, *Cladophora crystallina*, D. 12658: *b*, An upper part of a plant to show branching, × 50; *c*, a lower part of the same plant, × 50.

Chaetomorpha indica Kützing 1849: 376 (Tranquebar, southeast India); Børgesen 1935: 12, fig. 2; Dawson 1954: 386, fig. 6f, g

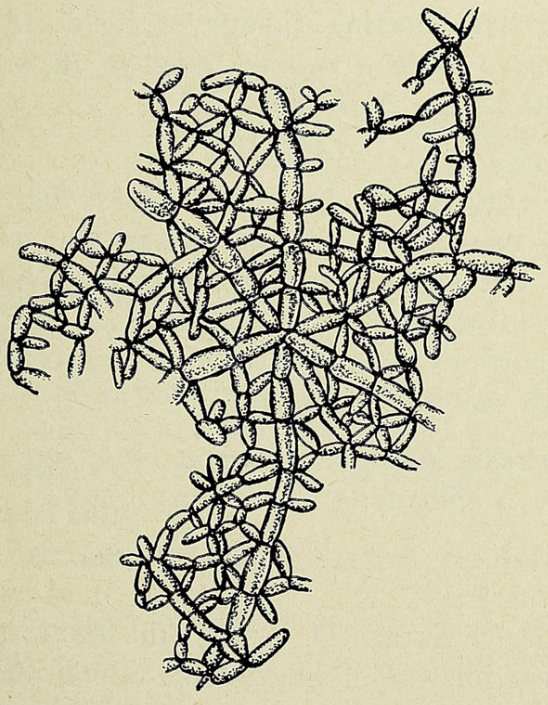

FIG. 12. *Microdictyon pseudohapteron:* Reproduction of original illustration of the Gepps' Indian Ocean type, × 8.

KWAJALEIN ATOLL: D. 12661, Sta. 5, in good agreement with both the Bombay and Viêt Nam plants cited above.

MAJURO ATOLL: D. 12745a, Sta. 8. This is apparently an entangled, partly free form of this species growing with *Cladophoropsis sundanensis*.

Cladophora crystallina (Roth) Kützing 1845: 213; Hamel 1929: 53, fig. 12B. *Conferva crystallina* Roth 1797: 196 (Baltic Sea)

Fig. 13*b*, *c*

KWAJALEIN ATOLL: D. 12658a, Sta. 5, mixed with *Enteromorpha kylinii* and *E. ralfsii*. With a diameter of about 110 μ below and ultimate branches of about 20 μ diameter, this corresponds excellently with Hamel's interpretation of this species although only about 2–3 cm. in height. The small diameter

and pectinate branching of the ultimate segments are characteristic together with the gradually enlarged lower segments.

Cladophora socialis Kützing 1849: 416; 1854, Tab. Phyc. 4: pl. 71 (Tahiti); Børgesen 1946: 28. *Cladophora patentiramea* var. *longiarticulata* Reinbold, in Weber van Bosse 1913: 84; Dawson 1954: 388, fig. 7e

JALUIT ATOLL: D. 13088, Sta. 16. The present material is much like the Kützing type in habit, but has longer cells. Børgesen's study of similar plants from Mauritius has led to his conclusion that Reinbold's Indonesian plant is only a form of *C. socialis* with longer cells.

Bryopsis indica Gepp and Gepp 1908: 169, pl. 22, figs. 10–11 (Coetivy Reef, Indian Ocean); Taylor 1950: 50

Fig. 14*a*

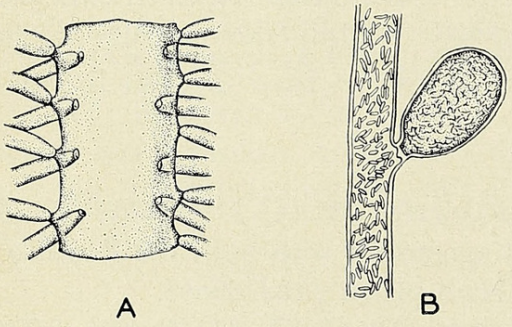

FIG. 14. *a*, *Bryopsis indica:* Reproduction of the Gepps' original illustration of a small portion of the type showing the double row of pinnae, × 37. *b*, *Derbesia ryukiuensis:* A single sporangium from H. 9520, × 187.

ARNO ATOLL: H. 9472, H. 9543, Sta. 24. These specimens agree well with this Indian Ocean species recently reported by Taylor from Eniwetok Atoll. They are symmetrically branched like the type, not secund near the tip as Taylor's. The double row of pinnae on either side is distinctive.

Bryopsis pennata Lamouroux 1809*a*: 134, pl. 3, fig. 1a, b (Antilles); Dawson 1954: 393, fig. 11b

KWAJALEIN ATOLL: D. 12602, Sta. 2 (with partly tetrastichous pinnae which are very long); D. 12667, Sta. 5.

MAJURO ATOLL: D. 12709, Sta. 6; D. 12715, lagoon shore of Enierippu Island in 2–5 ft. at low tide.

JALUIT ATOLL: D. 13052, Sta. 13; D. 13067, Sta. 15; D. 13127, Sta. 19; D.13153, Sta. 21.

ARNO ATOLL: H. 9176, H. 9219, H. 9260, Sta. 24.

Derbesia ryukyuensis Yamada and Tanaka 1938: 64, fig. 5 (Pinai, Yonakuni Island, Ryukyu Archipelago)

Fig. 14*b*

ARNO ATOLL: H. 9520, H. 9542, H. 9551, Sta. 24. This richly developed material from the reef drop-off is in very good agreement with the type as illustrated (l.c.), especially as to details of structure of the sporangia. The specimens are somewhat smaller throughout as to diameter of filaments (about 25 μ) and size of sporangia (about 80 μ long), but on the other hand some of them are much more extensively developed vegetatively, up to 7–9 cm. long and forming an entangled skein.

Derbesia marina (Lyngbye) Solier 1847: 158. *Vaucheria marina* Lyngbye 1819:79, pl. 22, fig. A (Denmark)

Fig. 15

JALUIT ATOLL: D. 13048, 13057, Sta. 13. This material is somewhat smaller than average, but is larger than the plants described as *Derbesia minima* Weber van Bosse. The shape, proportions and pedicellation of the sporangia agree well with *D. marina*.

Derbesia attenuata Dawson 1954: 390, fig. 9a, b (Nhatrang, Viêt Nam)

MAJURO ATOLL: D. 12685, Sta. 6; D. 12750, Sta. 8.

JALUIT ATOLL: D. 13146, Sta. 20; (a confusing mixture in which some of the plants seem to grade into a *Bryopsis*-like form).

ARNO ATOLL: H. 9165b, H. 9290a, Sta. 24. Material corresponding with the type has

recently been recognized at Isla Socorro, Mexico as well as at these several Marshall Island stations. It is suspected that it is not an autonomous species, but a stage in the development of some other green alga.

Caulerpa racemosa var. **macrophysa** (Kütz.) Taylor 1928: 101, pl. 12, fig. 3, pl. 13, fig. 9; Taylor 1950: 63; Dawson 1954: 393, fig. 10c. *Chauvinia macrophysa* Kützing 1857, Tab. Phyc. 7: 6, pl. 15 II (Central America)

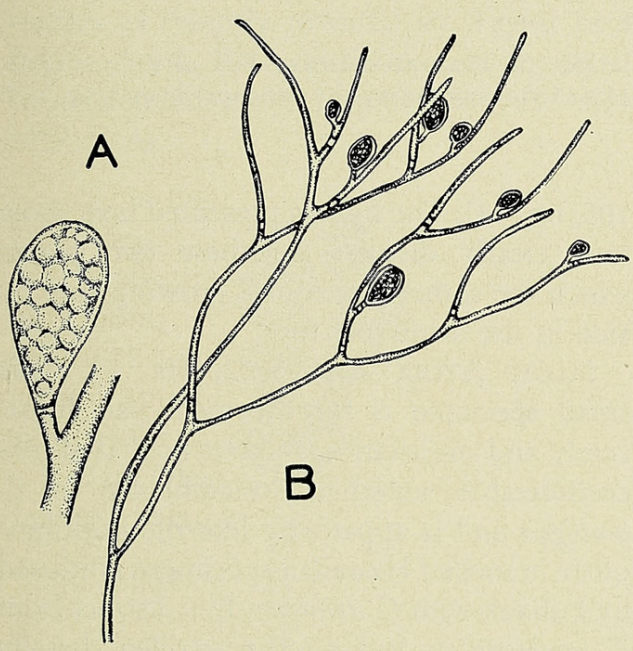

FIG. 15. *Derbesia marina: a*, Mature sporangium, × 300; *b*, habit of part of a fertile plant, × 17 (redrawn from Saunders).

JALUIT ATOLL: D. 13166, Sta. 23.
ARNO ATOLL: H. 9576b, Sta. 25.

Caulerpa racemosa var. **turbinata** (J. Ag.) Eubank 1946: 420, fig. 2o–q. *Caulerpa clavifera* var. *turbinata* J. Agardh 1837: 173 (Red Sea)

Fig. 16*a*

KWAJALEIN ATOLL: D. 12556, Sta. 1. These plants have ramuli of variable form on a single individual.

Caulerpa racemosa var. **peltata** (Lam.) Eubank 1946: 421, fig. 2r, s. *Caulerpa peltata* Lamouroux 1809*b*: 145; Taylor 1950: 65

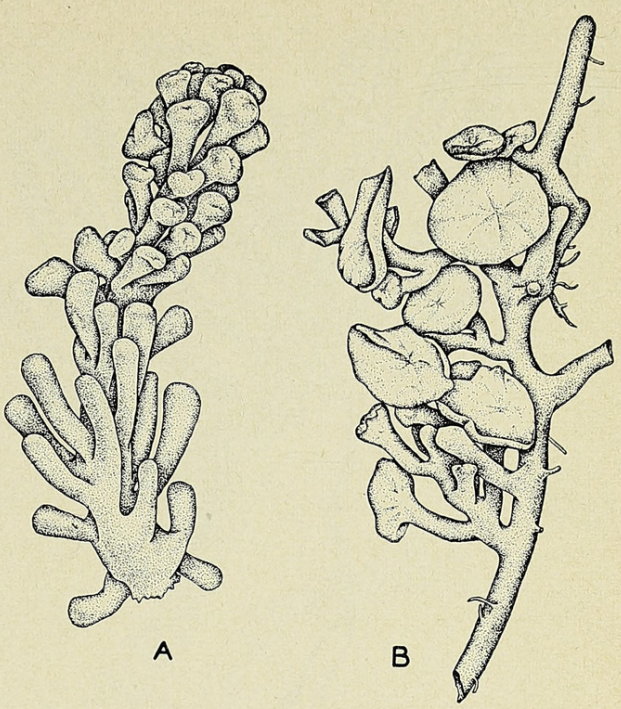

FIG. 16. *a*, *Caulerpa racemosa* var. *turbinata:* A small upper part of a plant of D. 12556, × 4; *b*, *Caulerpa racemosa* var. *peltata:* A small part of a plant of D. 13119, × 4.

Fig. 16*b*

KWAJALEIN ATOLL: D. 12562, Sta. 1; D. 12624, Sta. 2; D. 12675, Sta. 5.
MAJURO ATOLL: D. 12720, lagoon shore of Enierippu Island.
JALUIT ATOLL: D. 13029, Sta. 12; D. 13119, Sta. 19.
ARNO ATOLL: H. 9682, Sta. 25.

Caulerpa taxifolia (Vahl) C. Agardh 1822: 435; Yamada 1934: 67, figs. 36–37. *Fucus taxifolius* Vahl 1799: 36 (West Indies)

Fig. 17

ARNO ATOLL: H. 9684, Sta. 25. Rather dwarfish material but identical with Ryukyu specimens illustrated by Yamada.

Caulerpa vickersiae Børgesen 1911: 129 (Virgin Islands). Dawson 1954: 392, fig. 9f (as *C. ambigua* Okam.); Eubank 1946: 410, pl. 22, fig. 2a, b (as *C. ambigua*)

Fig. 18

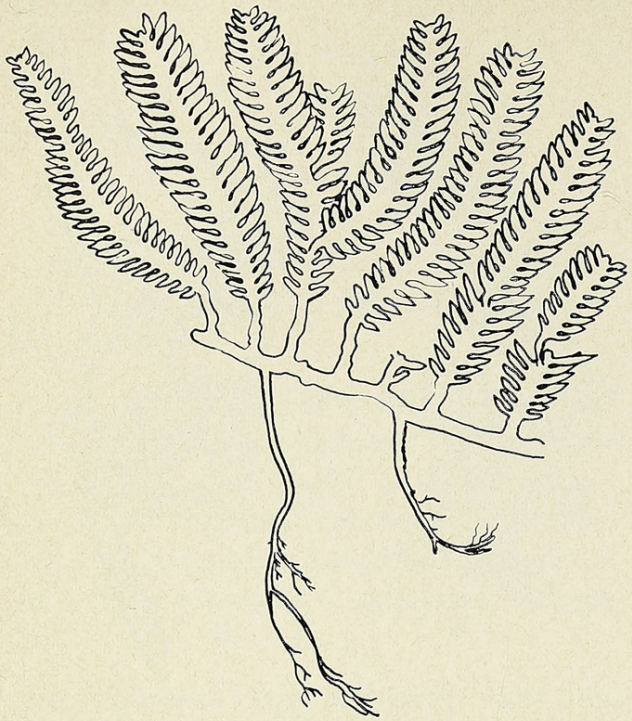

FIG. 17. *Caulerpa taxifolia:* Habit of part of a plant, × 1.5 (redrawn from Yamada).

FIG. 18. *Caulerpa vickersiae:* Part of a plant of D. 12564a showing the regular distichous branching, × 9.

KWAJALEIN ATOLL: D. 12564a, Sta. 1. These specimens are in full agreement with Børgesen's West Indian plant and with specimens from Viêt Nam reported under the name *C. ambigua*. The fortunate discovery in the reef turf on Kwajalein Island of specimens which match the original figures of Okamura's *C. ambigua* and which show such clear distinction from *C. vickersiae* growing in the same habitat, has led me to the following conclusions regarding these two names which have been discussed in recent years alternately by Eubank-Egerod and by Børgesen. Børgesen was right in his interpretation that Okamura had mixed two species in preparing his initial account of *C. ambigua* Okamura (1897: 4, pl. 1, figs. 3–12) and that his description and figures applied mainly to the one of these having basally contracted branches. This plant with basally contracted, multifarious branchlets, unlike those of *C. vickersiae* Børgesen, was maintained by Okamura as representative of his species up to the time of his death (see Okamura 1936: 105, fig. 54). The figures presented here show how clearly distinct are these two plants which are sometimes found growing side by side in the same reef turf.

JALUIT ATOLL: D. 13022, Sta. 12. This small specimen is for the most part bifurcately and multifariously branched. It shows considerable superficial resemblance to *C. ambigua* and is apparently like the multifariously branched Hawaiian specimens confused by Eubank with *C. ambigua*. It is distinct from *C. ambigua* in lacking the swollen, basally contracted branchlets and in being irregularly and incompletely multifarious.

Caulerpa ambigua Okamura 1897: 4, pl. 1, figs. 3–8, 11–12 (Ryukyu Islands); Okamura 1936: 105, fig. 54

Fig. 19

KWAJALEIN ATOLL: D. 12673a, Sta. 5. See comments above under *C. vickersiae*.

Caulerpa antoensis Yamada 1944*b*: 27, pl. 1, fig. 1 (Ant Atoll, near Ponape, Caroline Islands)

Fig. 20

MAJURO ATOLL: D. 12692, Sta. 6; D. 12725, Sta. 7. This material is identical with specimens seen by the writer from Saipan and probably is the same as that which Taylor

(1950: 55, pl. 28, fig. 2) has described from Rongelap Atoll as *Caulerpa arenicola*. Some of the specimens are more irregularly branched than others.

ARNO ATOLL: H. 9681a, Sta. 25.

Caulerpa elongata Weber van Bosse 1898: 271, pl. 21, figs. 5–6 (Macassar, Indonesia); Taylor 1950: 54, pl. 28, fig. 1, pl. 52, fig. 1

ARNO ATOLL: H. 9592, H. 9599f, H. 9601, Sta. 25. This is in full agreement with the species as recently reported by Taylor from Bikini Atoll. Both distichous and polystichous branching occur on the plants of these collections.

FIG. 19. *Caulerpa ambigua:* A plant of D. 12673a showing the multifarious branching and basally contracted branchlets, × 8.

Caulerpa verticillata J. Agardh 1847: 6 (Atlantic Mexico); Taylor 1950: 54; Dawson 1954: 392, fig. 10b

MAJURO ATOLL: D. 12783, Sta. 11.

ARNO ATOLL: H. 9059b, H. 9681, H. 9685, Sta. 25.

Caulerpa urvilliana Montagne 1845: 21 (Toud Island, Torres Straits ?); Taylor 1950: 60, pl. 31, fig. 1, pl. 32, fig. 1

Fig. 21

FIG. 20. *Caulerpa antoensis:* Part of a plant from D. 12692 showing many sand grains adhering to rhizoids, × 5.

KWAJALEIN ATOLL: D. 12595, Sta. 1; D. 12656, Sta. 4.

MAJURO ATOLL: D. 12696, Sta. 6.

ARNO ATOLL: H. 9581b, Sta. 25; H. 9373a, Sta. 27; H. 9493, Sta. 28; H. 9614a, Sta. 29.

The material of these collections is vari-

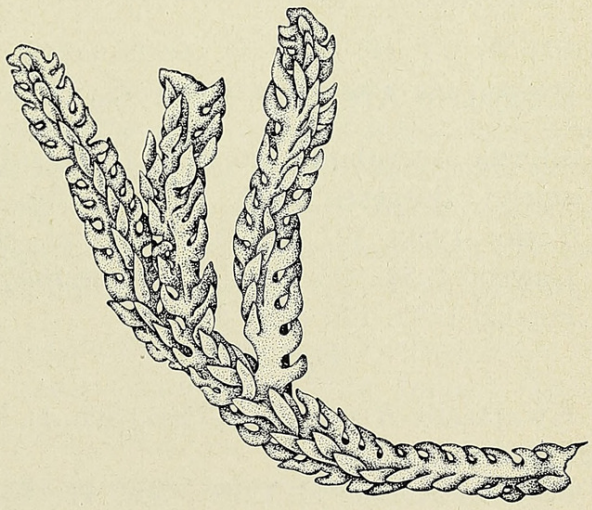

FIG. 21. *Caulerpa urvilliana* var. *urvilliana* f. *tristicha:* A small upper part of a plant of D. 12656, × 3.

able, some being dwarfish and depauperate while others are vegetatively well developed. The better developed ones correspond with what Taylor calls var. *typica* f. *tristicha* (J. Ag.) Weber van Bosse.

Caulerpa sertularioides (Gmelin) Howe 1905*b*: 576. *Fucus sertularioides* Gmelin 1768: 151, pl. 15, fig. 4 ("America")
Fig. 22

FIG. 22. *Caulerpa sertularioides:* Habit of a plant from D. 12655, × 1.5.

KWAJALEIN ATOLL: D. 12655, Sta. 4.

Caulerpa serrulata (Forsk.) J. Agardh, emend. Børgesen 1932: 5, pl. 1, fig. 2; Taylor 1950: 57, pl. 29, fig. 1, pl. 30; Dawson 1954: 393, fig. 10a. *Fucus serrulatus* Forskål 1775: 179 (Red Sea)
Fig. 23

KWAJALEIN ATOLL: D. 12563, Sta. 1; D. 12680, Sta. 5.

MAJURO ATOLL: D. 12785, Sta. 11. This material corresponds with the type variety of the species which Taylor has called *C. serrulata* var. *typica* f. *serrulata* (Weber van Bosse) Gilbert.

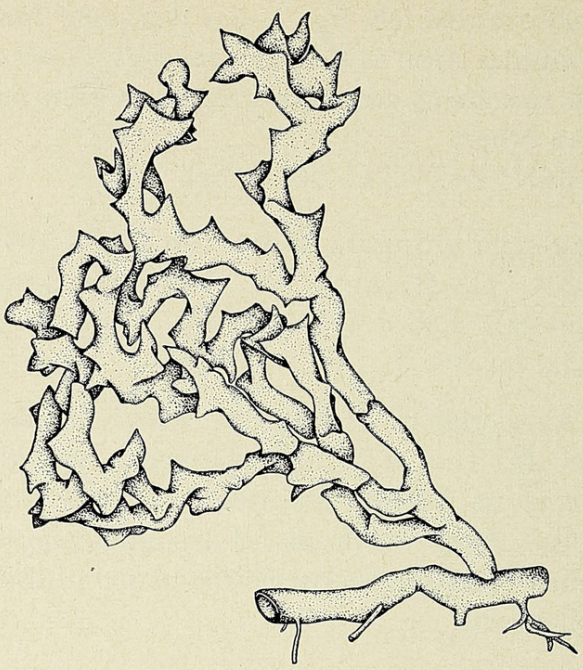

FIG. 23. *Caulerpa serrulata* var. *serrulata* f. *spiralis:* Part of a plant from H. 9225, × 3.5.

JALUIT ATOLL: D. 13064, Sta. 15; D. 13144, Sta. 21.

ARNO ATOLL: H. 9159, H. 9550, Sta. 24. These correspond with var. *boryana* (J. Ag.) Gilbert as reported and illustrated by Taylor (1950: 59, pl. 30, fig. 2). H. 9225, H. 9262, Sta. 24. These correspond with var. *typica* f. *spiralis* (Weber van Bosse) Gilbert as interpreted by Taylor in his text although the name "var. *typica* f. *angusta*" is employed in his key.

Codium arabicum Kützing[5] 1856, Tab. Phyc. 6: 35, pl. 100, fig. 2 (Tor, Sinai Peninsula, Gulf of Suez, Egypt)
Fig. 24

KWAJALEIN ATOLL: D. 12550, Sta. 1.

MAJURO ATOLL: D. 12758, Sta. 9; D. 12775, Sta. 10.

JALUIT ATOLL: D. 13081, Sta. 16.

ARNO ATOLL: H. 9599a, Sta. 25.

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[5] This and all other *Codium* material cited here was determined by Dr. P. C. Silva.

Codium ovale Zanardini 1878: 37 (New Guinea)

Fig. 25

Kwajalein Atoll: D. 12598, Sta. 2.
Majuro Atoll: D. 12778, Sta. 11.

Codium geppii O. C. Schmidt 1923: 50, fig. 33 (Malaya); Dawson 1954: 395, fig. 13k

Fig. 26

Kwajalein Atoll: D. 12552, Sta. 1; D. 12606, Sta. 2. Dr. Silva, in a personal communication, says of these plants: "This material is certainly to be assigned to the *geppii* complex, but just where it fits into the picture I cannot say for the moment. It is closer to *C. edule* from Hawaii than to typical *geppii* from Indonesia; that is, the branches are thicker and less markedly divaricate than in typical *geppii*. It matches material from the Philippines and from Okinawa very nicely."
Majuro Atoll: D. 12733, Sta. 7; D. 12744, Sta. 8.
Jaluit Atoll: D. 13002, Sta. 12.

Pseudochlorodesmis furcellata (Zarnard.) Børgesen 1925: 78, figs. 30–34; Dawson 1954: 395, fig. 11c. *Bryopsis furcellata* Zanardini 1843: 60 (Adriatic Sea)

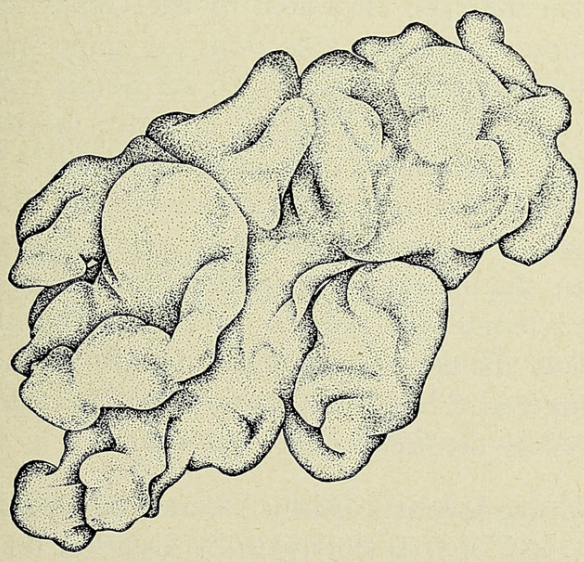

Fig. 24. *Codium arabicum:* Habit of a plant from D. 12758, × 1.5.

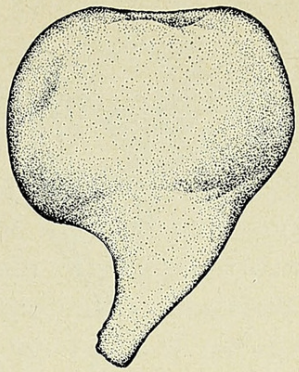

Fig. 25. *Codium ovale:* Habit of a plant from D. 12778, × 2.

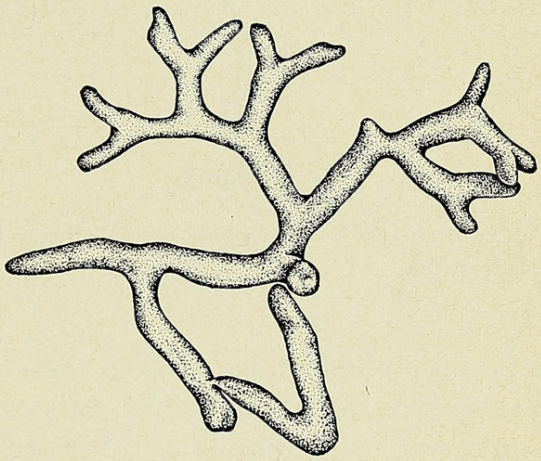

Fig. 26. *Codium geppii:* Habit of part of a plant from D. 12606, × 1.

Kwajalein Atoll: D. 12570a, Sta. 1.

Geppella mortensenii Børgesen 1940: 55, figs. 16–18 (Mauritius)

Fig. 27

Arno Atoll: H. 9462, Sta. 24; H. 9581g, Sta. 25. Several small plants are present in these collections of mixed small algae. They are somewhat less broadly flabellately developed than Børgesen's type, but otherwise are identical in size and structure with this species known heretofore only from Mauritius.

Avrainvillea nigricans Decaisne 1842: 108 (near Guadeloupe, West Indies); Taylor 1950: 69, pl. 34, fig. 2

Arno Atoll: H. 9576a, Sta. 25. Two poor, somewhat fragmentary specimens are in agreement with Taylor's material from Rongerik

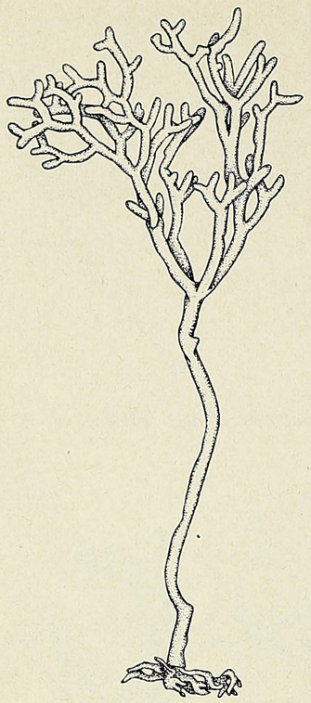

FIG. 27. *Geppella mortensenii:* Habit of a plant from H. 9462, × 10.

and Bikini atolls and assigned to this West Indian species with some doubt. In view of the occurrence of a number of other tropical species both in the Marshall Islands and the West Indies, this distribution does not seem extraordinary. In any case, the characters of the present materials do not suggest a distinction from this species as elaborately treated by A. and Ethel Gepp (1911).

Rhipilia orientalis A. and Ethel Gepp 1911: 57, figs. 134–136 (Borneo Bank); Taylor 1950: 72, pl. 36, fig. 1

ARNO ATOLL: H. 9185, H. 9167, Sta. 24. These fine specimens from the reef drop-off are in excellent agreement with those of the original account, even as to the thin, "translucent" character of some of the thalli. The thallus filaments are more slender in general, ranging from 18–30 μ, but the variation between and within specimens would suggest that this is an environmental response. Like Taylor's northern Marshall Island specimens, the tenacula vary from two–to four-pronged. Yamada (1944*a*) has described a species, *Rhipilia micronesica*, from Ant Atoll, Caroline Islands, basing its distinction from *R. orientalis* on more slender frond filaments (20–32 μ) and the tentacular processes occurring only in pairs. The variability of the present specimens in these respects suggests that Yamada's plants are probably essentially the same as some of ours and doubtfully distinct from *R. orientalis*. Examination of more material from the type locality will be necessary to settle this point.

Horwitz 9360, Sta. 25, seems to represent a large, heavier, greener form of *R. orientalis*. Although taken on the reef flat in full light, the plants are of size and color suggesting *R. diaphana* Taylor, a deep-water plant. The structure so corresponds with *R. orientalis* as to preclude assignment to one of the other species such as *R. tomentosa* or *R. tenaculosa*.

Udotea palmetta Decaisne 1842: 380, pl. 17, fig. 15 (Galega Island, Western Indian Ocean ?); A. and Ethel Gepp 1911: 122, figs. 10, 11, 54; Børgesen 1940: 59
Fig. 28

KWAJALEIN ATOLL: D. 12554, Sta. 1.
MAJURO ATOLL: D. 12743, Sta. 8.
ARNO ATOLL: H. 9576, H. 9599c, Sta. 25; H. 9340a, H. 9390e, Sta. 26.

Most of the specimens are much smaller than the type illustrated by the Gepps, but among the Arno collections are some specimens under H. 9576 which are almost identical in size with the type and also in satisfactory agreement on anatomical details.

From Taylor's (1950) discussion and illustrations of plants attributed to *U. indica* one gets the impression that they should instead be referred to *U. palmetta*, for he says "but the blade filament appendages are often much longer and less blunt [than in *U. indica* figured by the Gepps], never truncate."

Udotea javensis (Mont.) A. and Ethel Gepp 1904: 363; Taylor 1950: 73; Dawson 1954: 395, fig. 13 b, c. *Rhipidosiphon javensis* Montagne 1842: 15 (Java)

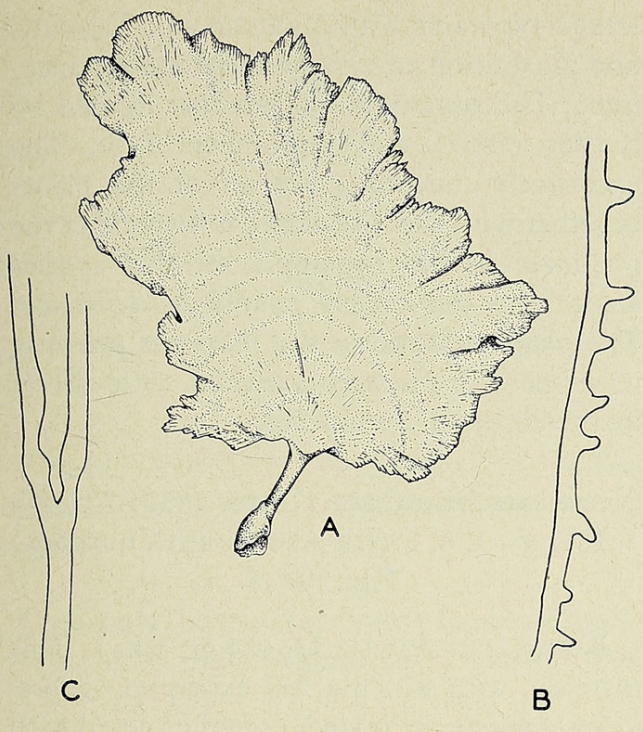

FIG. 28. *Udotea palmetta: a*, Habit of a relatively large plant from H. 9576, × 1; *b*, exposed part of a thallus filament showing the lateral appendages, × 114; *c*, part of an inner thallus filament showing a dichotomy, × 114.

MAJURO ATOLL: D. 12716, lagoon side of Enierippu Isl.; D. 12779, Sta. 11.

JALUIT ATOLL: D. 13046, Sta. 13.

Tydemannia expeditionis Weber van Bosse 1901:139 (Indonesia); Taylor 1950: 73, pl. 38, fig. 1; Srinivasan 1954: 247–255

JALUIT ATOLL: D. 13060, Sta. 13; D. 13123, D. 13128, Sta. 19 (includes a plant showing the flabellate form of the thallus); D. 13163, Sta. 23.

Halimeda fragilis Taylor 1950: 88, pl. 48, fig. 2 (Eniwetok Atoll, Marshall Islands)

ARNO ATOLL: H. 9160, Sta. 24; H. 9673, Sta. 25. These specimens from reef drop-offs are in full agreement with Taylor's account.

Halimeda monile (Solander) Lamouroux 1812: 186; Taylor 1950: 92, pl. 50, fig. 1. *Halimeda incrassata* f. *monilis* (Solander) Barton 1901: 27, pl. 4, fig. 40: Yamada 1941: 118, fig. 12. *Corallina monile* Solander 1786: 110, pl. 20, fig. c (Jamaica)

KWAJALEIN ATOLL: D. 12653, Sta. 4; D. 12670, Sta. 5.

MAJURO ATOLL: D. 12755, Sta. 8. This appears to be a short, much-branched, depauperate form of this plant resembling the Indonesian specimens illustrated by Barton (1901: pl. 4, fig. 44) as *H. incrassata* f. *pusilla*.

Halimeda cuneata f. **digitata** Barton 1901: 16, pl. 2, fig. 9 (Indonesia); Yamada 1941: 111, fig. 4.

Fig. 29

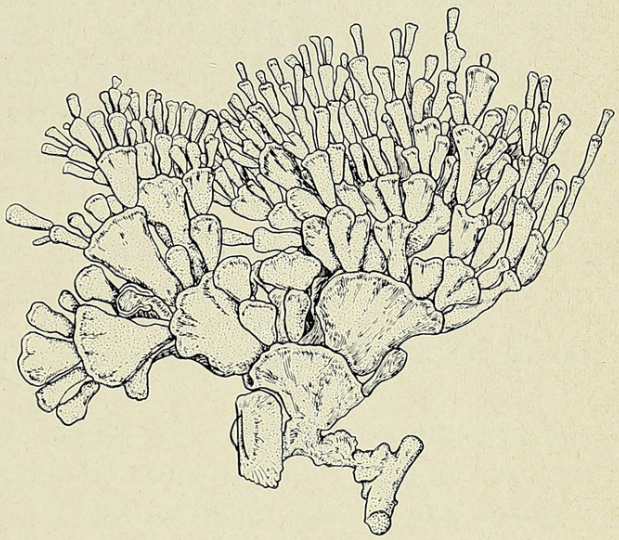

FIG. 29. *Halimeda cuneata* f. *digitata:* Habit of a plant, × 0.55 (redrawn from Yamada).

KWAJALEIN ATOLL: D. 12620, Sta. 2. Identical with the illustration of the type.

Halimeda stuposa Taylor 1950: 90, pl. 43, fig. 1, pl. 49, pl. 50, fig. 2 (Naen Island, Rongelap Atoll, Marshall Islands)

KWAJALEIN ATOLL: D. 12621, Sta. 2.

Halimeda opuntia (L.) Lamouroux 1816: 308; Taylor 1950: 80, pl. 39, fig. 1; Dawson 1954: 395, fig. 12. *Corallina opuntia* Linnaeus 1758: 805, in part (Mediterranean Sea)

KWAJALEIN ATOLL: D. 12619, Sta. 2.

JALUIT ATOLL: D. 13099, Sta. 13. An abundant form making large clumps in depths of 5 meters or more, but with quite delicate segments. D. 13112, Sta. 18. A coarser, distinctly ribbed form near what Taylor calls f. *hederacea*. D. 13124, Sta. 19. A form somewhat intermediate between f. *hederacea* and f. *minima*.

Halimeda gracilis Harvey, ex. J. G. Agardh 1887: 82 (Ceylon); Taylor 1950: 83, pl. 42

ARNO ATOLL: H. 9525x, H. 9545, Sta. 24. These specimens from the reef drop-off at depths of about 6 meters seem to be nearly identical with the forma *elegans* Yamada (1944*b*: 28, pl. 3) described from Palao, Caroline Islands. In 1941, previous to the 1944 validation with Latin, he gave a better figure, number 11 on page 117, together with a Japanese diagnosis.

Halimeda taenicola Taylor 1950: 86, pl. 46, fig. 1 (Rongerik Atoll, Marshall Islands)

JALUIT ATOLL: D. 13111, Sta. 18.

Neomeris mucosa Howe 1909: 84, pl. 1, fig. 5, pl. 5, figs. 1–14 (Bahamas Islands); Yamada and Tanaka 1938: 59, fig. 3

Fig. 30*c*

ARNO ATOLL: H. 9474, Sta. 28. This single clump of nine axes is in good habit agreement with Howe's photograph of the liquid-preserved type and with Yamada and Tanaka's fine illustration of a far western Pacific specimen. The sporangia are like that figured by Koster (1937) and reproduced here. The excessively mucous character of the plants together with the distinctive difference in the peduncle of the sporangia set this species apart from the closely related *N. bilimbata*. The plant is found in the Bahamas growing together with *Neomeris annulata*, as it also is in the Ryukyu Archipelago.

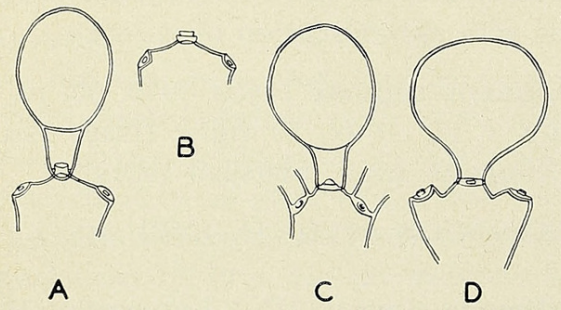

FIG. 30. *a*, *b*, *Neomeris bilimbata: a*, A sporangium; *b*, upper part of a primary branch from which the sporangium has fallen. *c*, *Neomeris mucosa:* A sporangium. *d*, *Neomeris vanbosseae:* A sporangium (all figures × 150, redrawn from Koster).

Neomeris bilimbata Koster 1937: 221, pl. 15, figs. 1, 4, 5 (Itu-Aba, South China Sea)

Fig. 30*a*, *b*

KWAJALEIN ATOLL: D. 12549, Sta. 1. This material, with which a few examples of *Neomeris annulata* are mixed, agrees in detail with the plant described by Koster. The distinctive differences between the sporangia of this species and of *N. vanbosseae* and *N. mucosa* are shown in her illustrations reproduced here. It would seem that the plants attributed by Taylor (1950) to *N. vanbosseae* may be of this species. He says they "were rather smaller in stature than those described by Howe and likewise differed slightly in many structural details."

JALUIT ATOLL: D. 13100, Sta. 18.

Neomeris annulata Dickie 1874: 198 (Mauritius); Egerod 1952: 400, pl. 40, text fig. 21a–l, 22a, c; Dawson 1954: 396, fig. 13e

KWAJALEIN ATOLL: D. 12549a, Sta. 1; D. 12679, Sta. 5.

MAJURO ATOLL: D. 12780, Sta. 11.

Acetabularia exigua Solms-Laubach 1895: 28, pl. 2, figs. 1, 4 ("Tropical eastern Asia, Macassar, Celebes")

Fig. 31

KWAJALEIN ATOLL: D. 12644, Sta. 2. This material is rather variable in ray number and shape, but is in satisfactory agreement with this species.

FIG. 31. *Acetabularia exigua:* Habit of a plant of D. 12644, × 10.

ARNO ATOLL: H. 9238a, Sta. 24. A few individuals growing with more numerous *A. moebii.*

Acetabularia moebii Solms-Laubach 1895: 30, pl., 4, fig. 1 (Mauritius); Dawson 1954: 397, fig. 13j

KWAJALEIN ATOLL: D. 12642, Sta. 2.
MAJURO ATOLL: A single individual examined but no specimen made.
JALUIT ATOLL: D. 13008, Sta. 12.
ARNO ATOLL: H. 9232, H. 9238, Sta. 24.

Ectocarpus indicus Sonder, in Zollinger 1854: 3 (Indonesia); Weber van Bosse 1913: 129, fig. 34; Børgesen 1941: 16, figs. 6–7; Taylor 1950: 95; 6–7. *E. duchassaignianus* Grunow 1867: 45, pl. 4, figs. a, b, c
Fig. 32

KWAJALEIN ATOLL: D. 12630, D. 12637, Sta. 2. This material is fertile and well developed. The irregular branching seems to be a criterion for distinguishing this plant from *E. mitchellae* in which the plurilocular sporangia are often similar. Vickers and Shaw's (1908) illustration of *E. duchassaignianus* (= *E. indicus*) shows this branching distinction well when compared with their figure of *E. guadeloupensis* (= *E. mitchellae*).

Ectocarpus breviarticulatus J. Agardh 1847: 7 (Pacific southern Mexico); Dawson 1954: 398, fig. 14, a, b

MAJURO ATOLL: D. 12773, Sta. 10.
JALUIT ATOLL: D. 13089, Sta. 16.

Ectocarpus mitchellae Harvey 1852: 142, pl. 12G (Massachusetts, U. S. A.); Taylor 1950: 95; Dawson 1954: 400, fig. 14 c, d

MAJURO ATOLL: D. 12741, Sta. 7. Note the difference in branching from *E. indicus* as mentioned above.

Ralfsia expansa J. Agardh 1847: 7 (Vera Cruz, Mexico); Børgesen 1914: 189, figs. 146–148; Weber van Bosse 1913: 146, fig. 45
Fig. 33

KWAJALEIN ATOLL: D. 12681, Sta. 5. Although sterile, this material agrees structurally with the figures and descriptions cited above. The bilateral condition is prominent when specimens are cut in certain planes. The identification is tentative.

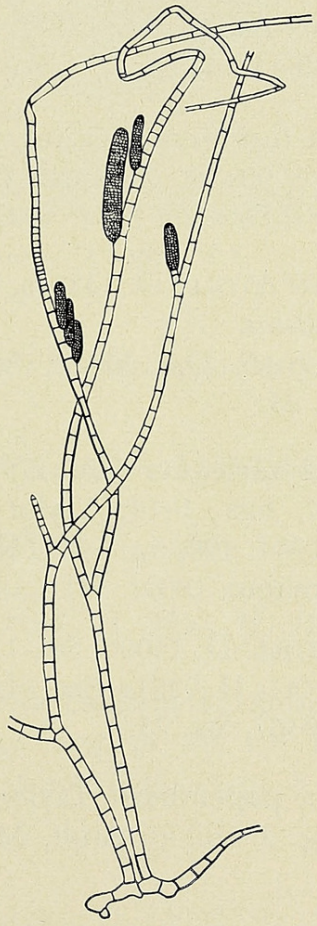

FIG. 32. *Ectocarpus indicus:* Habit of part of plant of Sonder's type collection, × 24 (redrawn from Weber van Bosse).

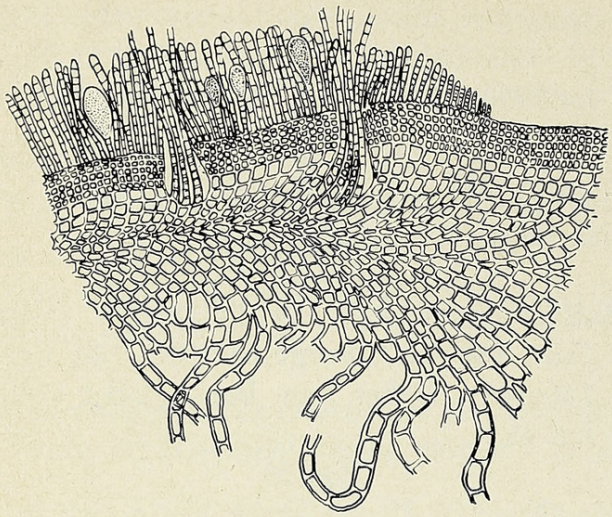

FIG. 33. *Ralfsia expansa:* Part of a transection of a fertile thallus, × 58 (redrawn from Weber van Bosse).

Sphacelaria tribuloides Meneghini 1840: 2, No. 6 (Dalmatia); Dawson 1954: 400, fig. 14i, j

KWAJALEIN ATOLL: D. 12577, D. 12588, Sta. 1; D. 12643, Sta. 3.

Sphacelaria furcigera Kützing 1855, Tab. Phyc. 5, pl. 90, fig. 2 (Karak Island, Persian Gulf); Dawson 1954: 400, fig. 14h

KWAJALEIN ATOLL: D. 12554a, Sta. 1, epiphytic on *Udotea*.

JALUIT ATOLL: D. 13044b, Sta. 13; D. 13172b, Sta. 23.

Pocockiella variegata (Lamx.) Papenfuss 1943: 467, figs. 1–14; Taylor 1950: 97; Dawson 1954: 400, fig. 14k. *Dictyota variegata* Lamouroux 1809*c*: 331 (Antilles)

JALUIT ATOLL: D. 13000, Sta. 12.

ARNO ATOLL: H. 9281a, Sta. 24; H. 9340b, Sta. 26; H. 9367, Sta. 25.

Pocockiella papenfussii Taylor 1950: 98, pl. 54, fig. 2 (Bikini Atoll, Marshall Islands)

ARNO ATOLL: H. 9267, H. 9284, Sta. 24. These include well-developed plants to 350 μ thick or more.

Padina commersonii Bory 1828: 114 (Ile de France); Taylor 1950: 100, pl. 54, fig. 1; Dawson 1954: 401, fig. 17

KWAJALEIN ATOLL: D. 12555, Sta. 1, young plants just out of the *Vaughaniella* stage.

MAJURO ATOLL: D. 12713, lagoon shore, Dalap Island; D. 12792, Sta. 11.

JALUIT ATOLL: D. 13033, sandy bottom of small boat landing at Jabor.

Dictyopteris repens (Okamura) Børgesen 1924: 265, fig. 13. *Haliseris repens* Okamura 1916: 8, pl. 1, figs. 7–18 (Truk, Caroline Islands)

Fig. 34

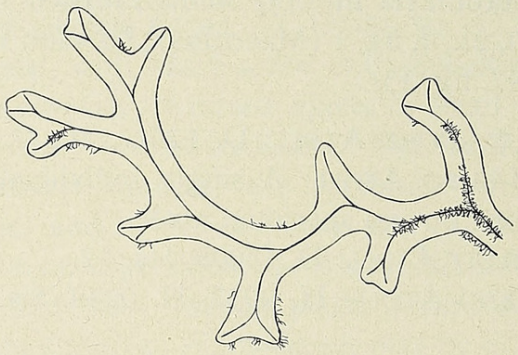

FIG. 34. *Dictyopteris repens:* Part of a plant of D. 13036 as seen from the under side showing rhizoids along the midrib and the margins, × 2.25.

JALUIT ATOLL: D. 13036, Sta. 13; D. 13147, Sta. 20.

ARNO ATOLL: H. 9260a, H. 9265, Sta. 24; H. 9581d, H. 9592c, Sta. 25.

Turbinaria trialata (J. Agardh) Kützing 1860, Tab. Phyc. 10: pl. 67, fig. 2; Yendo 1907: 43. *Turbinaria vulgaris* var. *trialata* J. Agardh 1848: 268 (tropical western Atlantic).

JALUIT ATOLL: D. 13062, Sta. 14.

Turbinaria ornata (Turn.) J. Agardh 1848: 266; Taylor 1950: 101, pl. 54, fig. 2, pl. 55, fig. 2; Dawson 1954: 405, fig. 21. *Fucus turbinatus* var. *ornatus* Turner 1808: 50, pl. 24, figs. c, d (type locality unknown)

KWAJALEIN ATOLL: D. 12654, Sta. 4.

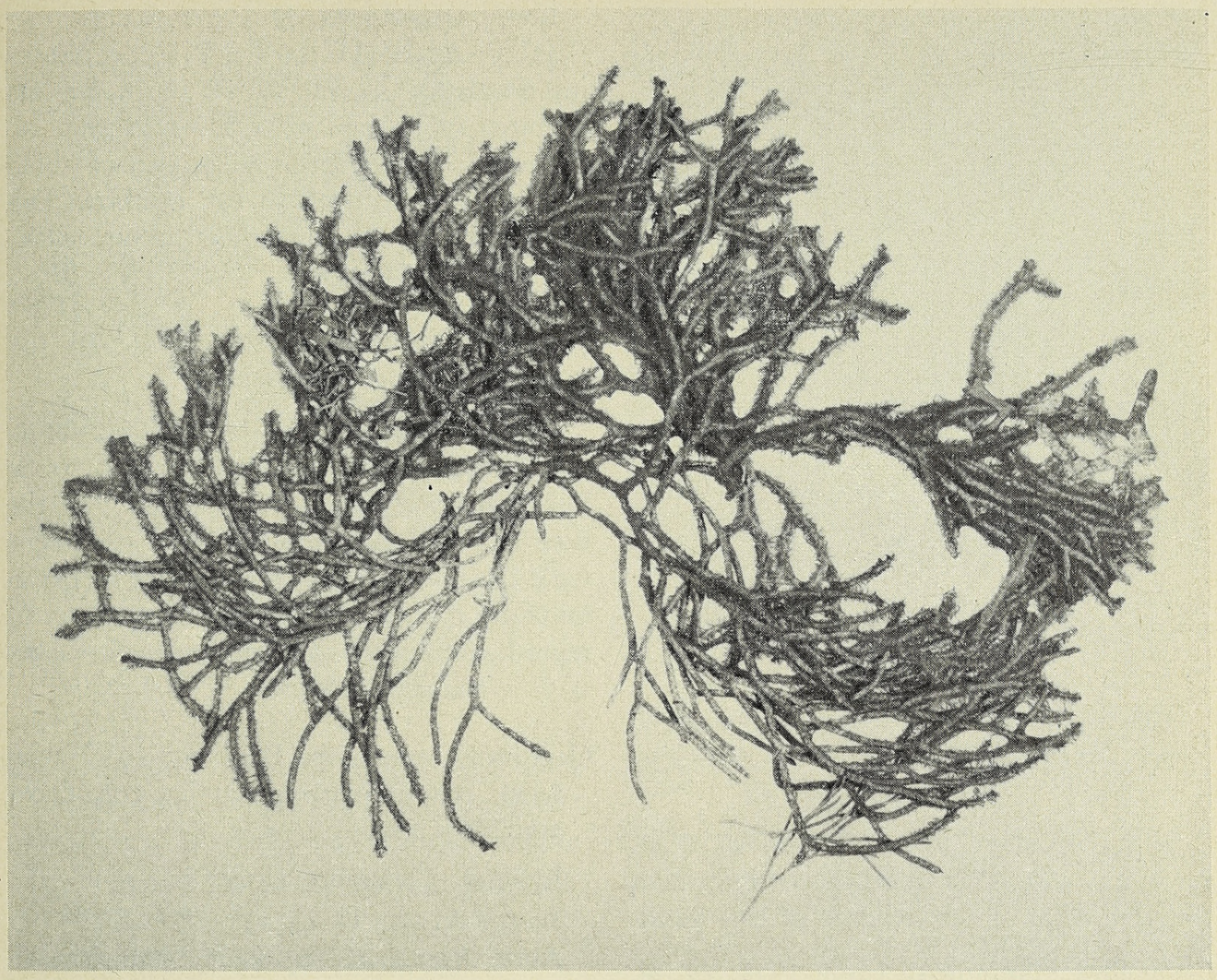

FIG. 35. *Galaxaura fasciculata:* Habit photo of a plant of D. 13098, × 1.

JALUIT ATOLL: D. 13125, Sta. 19.
ARNO ATOLL: H. 9470, Sta. 24.

Erythrotrichia carnea (Dillwyn) J. Agardh 1883: 15; Tanaka 1952: 14, fig. 7B–E; Taylor 1950: 117. *Conferva carnea* Dillwyn 1805: 54, pl. 84 (Wales)

KWAJALEIN ATOLL: D. 12558b, Sta. 1. These represent a quite slender form best referred to Tanaka's f. *tenuis*.
JALUIT ATOLL: D. 13073, Sta. 15.
ARNO ATOLL: H. 9205, H. 9534c, Sta. 24.

Falkenbergia hillebrandii (Bornet) Falkenberg = sporophyte generation of *Asparagopsis taxiformis* (Delile) Collins and Hervey; Feldmann and Feldmann 1942: 89; Dawson 1954: 414, fig. 25l. *Polysiphonia hillebrandii* Bornet, in Ardissone 1883: 376 (Italy)

KWAJALEIN ATOLL: D. 12564, D. 12591, Sta. 1.
JALUIT ATOLL: D. 13084, Sta. 16 (a rather coarse form).
ARNO ATOLL: H. 9358, H. 9598, Sta. 25.

Galaxaura fasciculata Kjellman 1900: 53, pl. 5, figs. 1–9, pl. 20, fig. 14 (Celebes Islands). Chou 1945: 44, pl. 2, fig. 2, pl. 8, fig. 1

Fig. 35

JALUIT ATOLL: D. 13098, Sta. 15.

Galaxaura acuminata Kjellman, in Butters 1911: 180 (Hawaii); Svedelius 1953: 63,

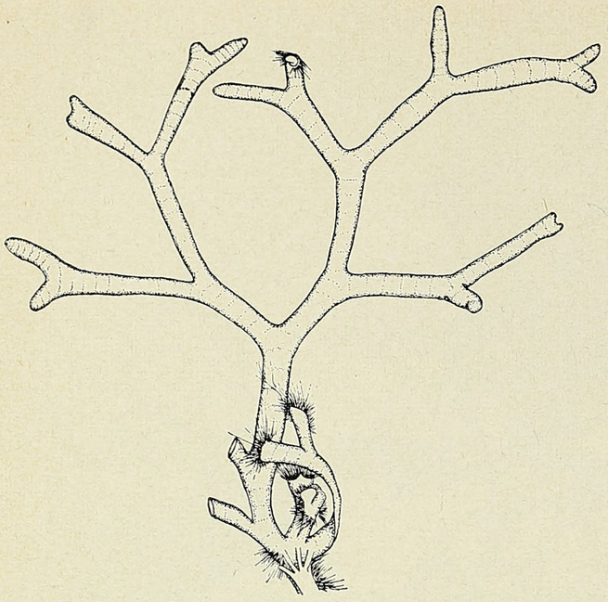

FIG. 36. *Galaxaura acuminata:* Habit of a small part of a plant of D. 13092, 1.5.

figs. 53–55, 57–60. Chou 1945: 51, pl. 5, figs. 13–19, pl. 9, fig. 1 (as *G. apiculata*) Fig. 36

JALUIT ATOLL: D. 13092, Sta. 17. This abundant material is in complete agreement with Svedelius' interpretation of this plant.

Galaxaura filamentosa Chou 1945: 39, pl. 1, figs. 1–6, pl. 6, fig. 1 (Revillagigedo Archipelago, Mexico); Dawson 1954: 419, fig. 30a

KWAJALEIN ATOLL: D. 12600, Sta. 2.

JALUIT ATOLL: D. 13082, Sta. 16; D. 13131, Sta. 19.

ARNO ATOLL: H. 9273, Sta. 24, a single small plant.

Actinotrichia fragilis (Forsk.) Børgesen 1932: 6, pl. 1, fig. 4; Dawson 1954: 416, fig. 28b. *Fucus fragilis* Forskål 1775: 190 (Red Sea)

JALUIT ATOLL: D. 13039, Sta. 13 (abundant at 5 meters and below); D. 13095, Sta. 17.

Gelidium pusillum (Stackh.) Le Jolis 1864: 139; Dawson 1954: 420, fig. 31a–c. *Fucus pusillus* Stackhouse 1801: 17, pl. 6 (England)

KWAJALEIN ATOLL: D. 12576, Sta. 1.

JALUIT ATOLL: D. 13038a, D. 13055 (creeping on *Amphiroa*), Sta. 13; D. 13078, Sta. 15.

ARNO ATOLL: H. 9224, H. 9230, Sta. 24.

Several different forms are present of which some may be referred to var. *conchicola* Piccone and Grunow and others to var. *minusculum* Weber van Bosse.

Gelidiella adnata Dawson 1954: 422, fig. 33f (Nhatrang, Viêt Nam)

ARNO ATOLL: H. 9213, H. 9246, H. 9467a, Sta. 24. These materials are apparently sterile but vegetatively are in agreement with the type and also with similar sterile specimens from Isla San Benedicto, Mexico. The determination is tentative awaiting comparison of reproduction with such similar small species as *G. stichidiospora* Dawson.

Gelidiella tenuissima Feldmann and Hamel 1936: 102 (Mediterranean France); Dawson 1954: 422, fig. 33e

MAJURO ATOLL: D. 12706, Sta. 6.

JALUIT ATOLL: D. 13153b, Sta. 21.

ARNO ATOLL: H. 9634b, H. 9640, Sta. 24.

Gelidiopsis intricata (Ag.) Vickers 1905: 61; Dawson 1954: 423, fig. 34a–d. *Sphaerococcus intricatus* C. Agardh 1822: 333 (Ravak Island)

MAJURO ATOLL: D. 12686, Sta. 6; D. 12793, Sta. 11.

JALUIT ATOLL: D. 13035 (sterile), D. 13040a (♂), Sta. 13.

ARNO ATOLL: H. 9634, Sta. 24, probably this, but very dwarfish.

Gelidopsis repens (Kützing) Schmitz 1895: 148; Weber van Bosse 1928: 425; Okamura 1931: 113. *Gelidium repens* Kützing 1868, Tab. Phyc. 18: 21, pl. 60a, b (New Caledonia)

Fig. 37

ARNO ATOLL: H. 9628, Sta. 24; H. 9346, Sta. 26.

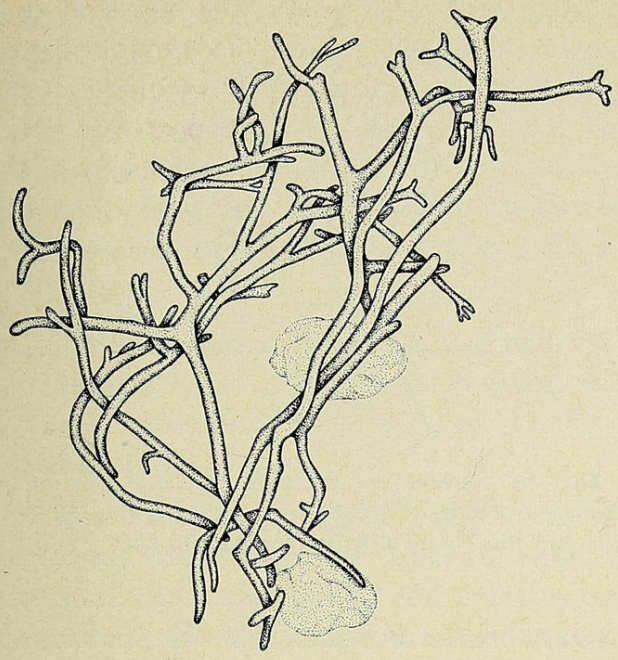

FIG. 37. *Gelidiopsis repens:* Habit of part of a plant of H. 9628 with attached sand grains, × 2.

Wurdemannia miniata (Lmk. and DC) Feldmann and Hamel 1934: 544, figs. 9–11; Dawson 1954: 424, fig. 35. *Fucus miniatus* Lamarck and De Candolle 1815: 6 (Mediterranean France)

KWAJALEIN ATOLL: D. 12578, Sta. 1.
MAJURO ATOLL: D. 12749a, Sta. 8.
JALUIT ATOLL: D. 13172e, Sta. 23.
ARNO ATOLL: H. 9375, Sta. 27 (typical material about 140 μ in diameter).

Hildenbrandia prototypus Nardo 1834: 675 (Adriatic Sea); Dawson 1954: 424, fig. 36a, b

JALUIT ATOLL: D. 13158, Sta. 22 (growing on broken glass).

Peyssonelia conchicola Piccone and Grunow, in Piccone 1884*b*: 317, pl. 7, figs. 5–8 (Massaua, Red Sea), Dawson 1953: 105, pl. 11, figs. 12–13
Fig. 38

KWAJALEIN ATOLL: D. 12682, Sta. 5. This material is in excellent correspondence with Dawson's interpretation of Mexican specimens.

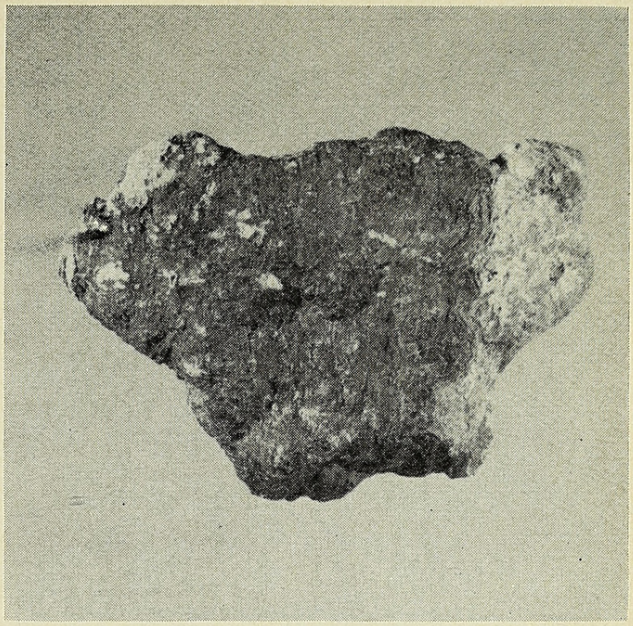

FIG. 38. *Peyssonelia conchicola:* Habit of a plant of D. 12682 growing on a coral rock fragment, × 1.

JALUIT ATOLL: D. 13080, Sta. 15; D. 13091, Sta. 17.

Peyssonelia rubra var. **orientalis** Weber van Bosse 1921: 270, figs. 86–89 (Indonesia); Taylor 1950: 121; Dawson 1953: 104, pl. 10, figs. 8, 9; Dawson 1954: 424, fig. 36c

KWAJALEIN ATOLL: D. 12614, D. 12622, Sta. 2; D. 12668, Sta. 3.
JALUIT ATOLL: D. 13006, Sta. 12; D. 13079, Sta. 15.
ARNO ATOLL: H. 9440, Sta. 24.

Cruoriella dubyi (Crouan and Crouan) Schmitz 1889: 20; Dawson 1953: 111, pl. 7, figs. 2–3. *Peyssonelia dubyi* Crouan and Crouan 1844: 367, pl. 11, figs. 6–10 (Atlantic France)
Fig. 39

KWAJALEIN ATOLL: D. 12584, D. 12585a, Sta. 1; D. 12682a, Sta. 5.

Heteroderma minutula Foslie 1904: 8 (southern Norway); Suneson 1943: 27, figs. 14, 15
Fig. 40

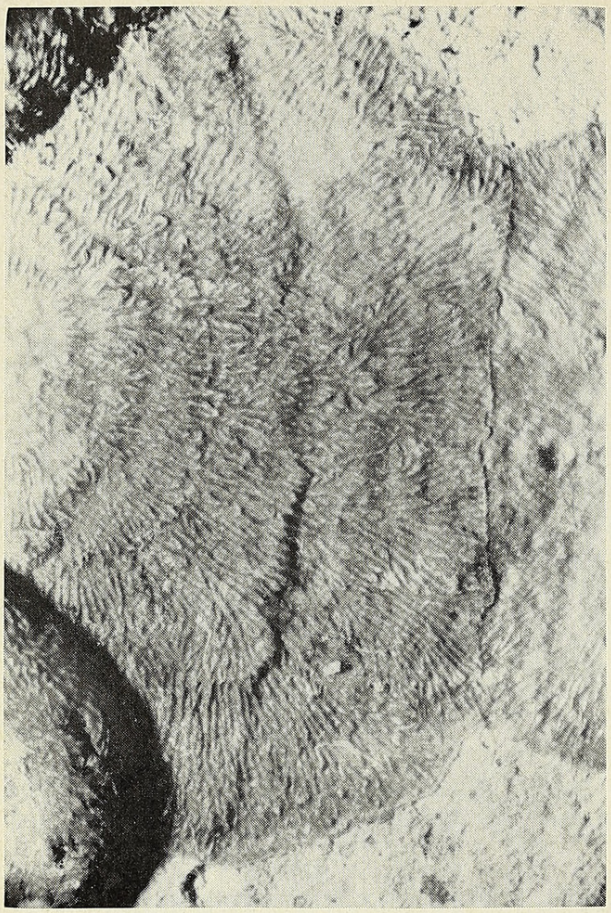

FIG. 39. *Cruoriella dubyi:* Habit of a well-developed thallus growing on a shell, showing the characteristic anastomosing ridges on the dry upper surface, × 6.5.

KWAJALEIN ATOLL: D. 12557a, Sta. 1, on the surface of *Dictyosphaeria intermedia* var. *solida*. This material agrees well in size, the presence of cortical (cap) cells, size of conceptacles, etc., with this species which, unlike similar *H. lejolisii*, commonly occurs as an epiphyte on algae. In some of the thalli the organization of the cell rows is rather loose, approaching the condition in f. *lacunosa* Foslie. The conceptacles are similar in size to those of *H. subtilissima*, being less than 100 μ in diameter. The distribution of this small plant is little known, and although it may be nearly cosmopolitan, has not heretofore been recorded in the Pacific.

ARNO ATOLL: H. 9390x, Sta. 24, growing on *Siphonocladus rigidus*, is very much like f. *lacunosa* as illustrated by Suneson except that the primary cell rows are composed of cells mostly twice as long as wide or more. Reproduction was not seen, but the absence of heterocysts and the presence of the cap cells points to relationship here.

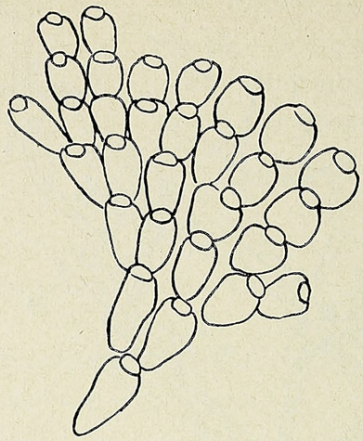

FIG. 40. *Heteroderma minutula:* A small part of a vegetative thallus (D. 12557a) showing the small cap cells and the absence of heterocysts, × 600.

Heteroderma subtilissima (Foslie) Foslie 1909: 56. *Melobesia subtilissima* Foslie, in Weber van Bosse and Foslie 1904: 55 (New Guinea)

Fig. 41

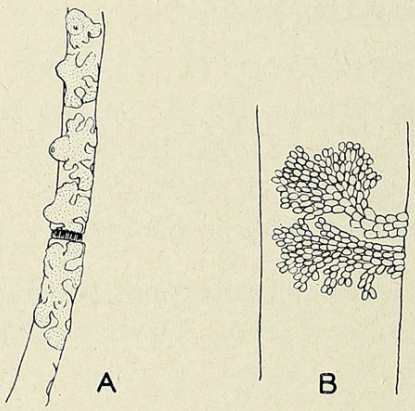

FIG. 41. *Heteroderma subtilissima: a*, Habit of fertile plants on a piece of *Jania* (D. 12558a), × 25; *b*, detail of the same showing arrangement of cells and absence of cap cells and heterocysts, × 85.

KWAJALEIN ATOLL: D. 12558a, Sta. 1, epiphytic on *Jania decussato-dichotoma*. These plants are exceedingly small and inconspicuous. Conceptacles are quite frequent, however, and aid in their recognition. Most of the conceptacles are somewhat larger than the 60 μ indicated by Foslie for the type, usually

ranging from 60 to 90 μ in outside diameter at the base, occasionally to 100 μ. No heterocysts are present nor are any cortical (cap) cells apparent in the material examined. This is in agreement with Foslie's original account of the species and marks a distinction from *H. minutula* in which the cortical cells are abundant.

Fosliella farinosa (Lamx.) Howe 1920: 587; Dawson 1954: 425, fig. 37c. *Melobesia farinosa* Lamouroux 1816: 315, pl. 12, fig. 3 (Europe)

JALUIT ATOLL: D. 13102, Sta. 18, on *Microdictyon*. Heterocysts are abundant and conspicuous, but inasmuch as conceptacles were not found for measurement, the distinction from closely related *F. paschalis* (Lemoine) Setch. and Gard. cannot be made here.

ARNO ATOLL: H. 9581e, Sta. 25, sterile plants on *Laurencia*.

Lithoporella pacifica (Heydr.) Foslie 1909: 59; Dawson 1954: 428, fig. 40b. *Melobesia pacifica* Heydrich 1901: 529 (Hawaii)

JALUIT ATOLL: D. 13058, Sta. 13; D. 13118, Sta. 19.

Jania micrarthrodia Lamouroux 1816: 271, pl. 9, fig. 5a, b (Australia). Taylor 1950: 134 (as *J. antennina* Kütz. prox.)

Fig. 42

ARNO ATOLL: H. 9371a, Sta. 24; H. 9390c, Sta. 26. These specimens are apparently like those Taylor reported from Eniwetok as *Jania antennina*. Womersley (1950) has recently reiterated the synonymy of *J. micrarthrodia* which includes both *J. antennina* Kütz. and *J. tenuissima* Sonder. In the Australian region the species seems generally to be epiphytic on large fleshy algae. The present specimens grew on branched lithothamnioids on the seaward reef ridge.

Jania capillacea Harvey 1853: 84 (Bahia Honda, Florida); Dawson 1954: 432, fig. 41a, b; Dawson 1953: 116, pl. 9, fig. 1; Taylor 1950: 133

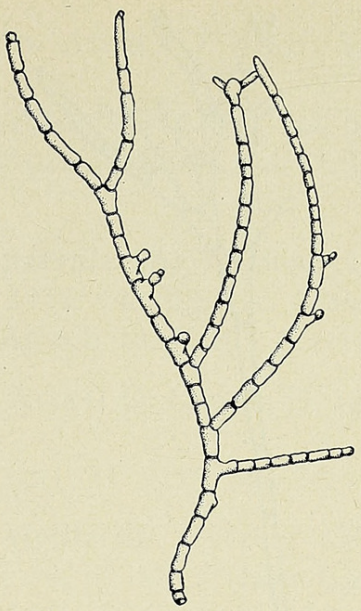

FIG. 42. *Jania micrarthrodia:* Branching and segmentation of part of H. 9371a, × 6.

KWAJALEIN ATOLL: D. 12559a, Sta. 1 (in part consisting of exceedingly slender plants ranging between 38 and 70 μ in diameter); D. 12604a, D. 12639, Sta. 2.

MAJURO ATOLL: D. 12776, Sta. 10.

JALUIT ATOLL: D. 13147a, Sta. 20; D. 13150a, Sta. 21.

ARNO ATOLL: H. 9203, H. 9274, Sta. 24.

Jania tenella Kützing 1858, Tab. Phyc. 8: 41, pl. 85, fig. 2; Dawson 1953: 120, pl. 9, fig. 3

Fig. 43

KWAJALEIN ATOLL: D. 12673, Sta. 5.

JALUIT ATOLL: D. 13013, Sta. 12; D. 13148, Sta. 14 (characteristic material with conceptacles).

Jania decussato-dichotoma (Yendo) 1905: 37. *Corallina decussato-dichotoma* Yendo 1902: 25, pl. 3, figs. 1–3, pl. 7, figs. 3–4 (southern Japan)

Fig. 44

KWAJALEIN ATOLL: D. 12558, Sta. 1. The segments are mostly 100 to 150 μ in diameter and are usually well distinguished in the algal turf from the much more slender *J. capillacea*

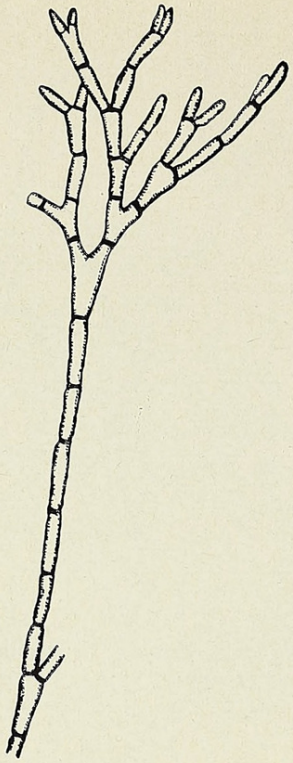

FIG. 43. *Jania tenella:* An isotype fragment from the Kützing collection in the Rijksherbarium, Leiden, × 18.

with which it often grows. Undoubtedly some of the plants attributed by Taylor (1950) to *Jania rubens* are referable here.

MAJURO ATOLL: D. 12697, Sta. 6. A very slender form 85 to 115 μ in diameter.

Amphiroa taylorii Dawson (prox.) 1953: 138, pl. 26, fig. 1 (Pacific Mexico)

MAJURO ATOLL: D. 12770, Sta. 10. This is a slender, sterile form with dizonal genicula. It is much like the type, but a little smaller and more branched. The branches are less crooked than in the type. Constrictions at the genicula are apparent only in dry material; the genicula are about the same diameter as the intergenicula when fresh. This plant is possibly distinct, but too close to *A. taylorii* to justify segregation on the basis of this single collection.

Amphiroa fragilissima (L.) Lamouroux 1816: 298; Dawson 1954: 430, fig. 40g, h. *Corallina fragilissima* Linnaeus 1767: 1305 (Carribbean Sea)

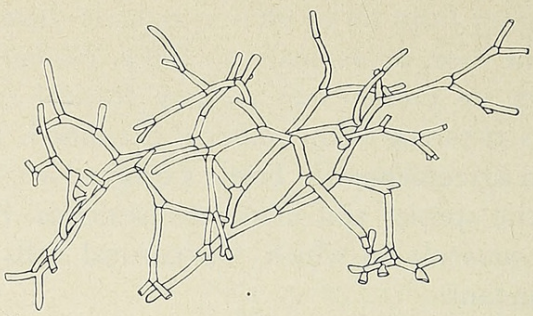

FIG. 44. *Jania decussato-dichotoma:* Part of a plant extracted from a dense clump (D. 12558) to show the decussate branching habit, × 5.

JALUIT ATOLL: D. 13043, D. 13051, Sta. 13; D. 13145, Sta. 20. These plants are for the most part representative of a variant of *A. fragilissima* near f. *cyathifera* (Lamk.) Weber van Bosse.

ARNO ATOLL: H. 9677, Sta. 25. Fertile and rather small from about 5 meters depth.

Amphiroa anastomosans Weber van Bosse, in Weber van Bosse and Foslie 1904: 91, pl. 14, figs. 3–4 (Borneo Bank, Indonesia)
Fig. 45

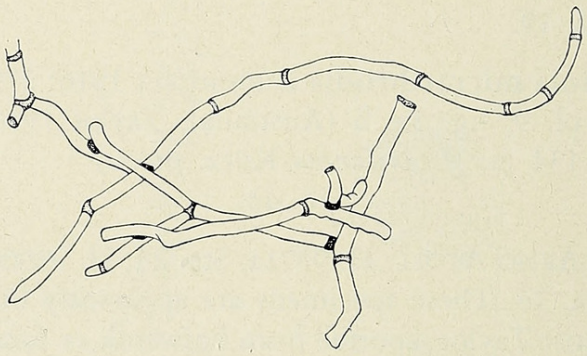

FIG. 45. *Amphiroa anastomosans:* A small part of a clump (H. 9527) showing frequent attachment of branches to each other by adherent discs, × 6.

ARNO ATOLL: H. 9527, Sta. 24. This material is somewhat larger and more laxly branched than the type illustrated by Weber van Bosse, but agrees closely in shape, proportions, dichotomous branching of the slightly contorted axes, and especially in the frequent anastomoses throughout the clumps. H. 9592e, Sta. 25.

Amphiroa foliacea Lamouroux 1824: 628, pl. 93, figs. 2–3 (Mariannas Islands); Dawson 1954: 430, fig. 40c

JALUIT ATOLL: D. 13038, Sta. 13. This material represents an exceptionally narrow form which agrees best with the East Indian forma *erecta* described by Weber van Bosse in 1904.

Hypnea pannosa J. Agardh 1847: 14 (Pacific Mexico); Tanaka 1941: 247, fig. 20; Taylor 1945: 277, pl. 71, fig. 2

Fig. 46

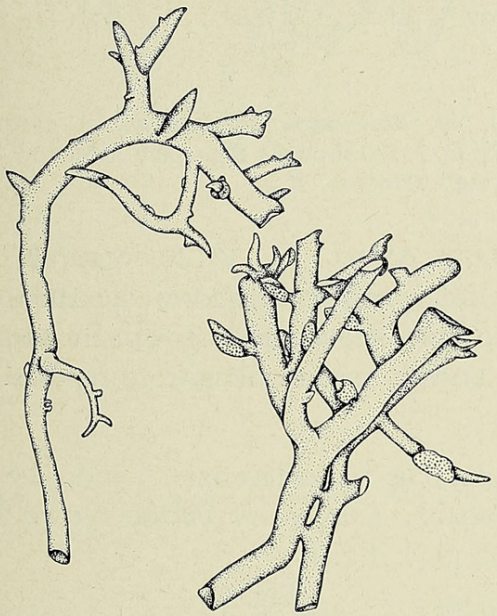

FIG. 46. *Hypnea pannosa:* Portions of two plants of D. 12734 showing tetrasporangial sori, × 5.

MAJURO ATOLL: D. 12734, Sta. 7.

JALUIT ATOLL: D. 13005, Sta. 12; D. 13090, Sta. 16.

ARNO ATOLL: H. 9266, H. 9273a, Sta. 24.

The specimens cited above are all smaller in dimensions than the coarser *H. nidulans*, but often have similar saddle-shaped nemathecia when the tetrasporangia are sharply confined to one side of a branch. Most of them are in good agreement with the type which has been seen.

Hypnea esperi Bory 1829: 157 (type locality uncertain); Dawson 1954: 436, fig. 46h–j

KWAJALEIN ATOLL: D. 12611, Sta. 2; D. 12664, Sta. 5.

MAJURO ATOLL: D. 12684, Sta. 6.

JALUIT ATOLL: D. 13096, Sta. 17; D. 13117, Sta. 19.

Champia parvula (Ag.) Harvey 1853: 76; Dawson 1954: 443, fig. 52c. *Chondria parvula* C. Agardh 1824: 207 (Cadiz, Spain)

MAJURO ATOLL: D. 12684b, D. 12695, Sta. 6.

ARNO ATOLL: H. 9255, Sta. 24.

Champia vieillardii Kützing 1866, Tab. Phyc. 16: 14, pl. 37e, f (New Caledonia); Dawson 1954: 443, figs. 52e, 53

JALUIT ATOLL: D. 13011, Sta. 12. This is but a small fragmentary specimen, but nevertheless a distinctive record. The plant reported from Truk Atoll and illustrated by Okamura (1906: 10, figs. 7–8) as *Champia compressa* is most probably this species.

Chrysymenia kairnbackii Grunow, prox.

JALUIT ATOLL: D. 13010a, D. 13025, Sta. 12. Although they are very small, these correspond in habit with *C. kairnbackii* as illustrated by Yamada and Segawa 1953: 111, fig. 4 from Ponape, and clearly are unlike their *C. okamurai*. The few cystocarpic plants are much like Weber van Bosse's figures and description (1928: 469) but with fewer rhizoids below the cystocarp and with no rhizoids in the cavity. Whether these differences are significant must await the collection of more ample material and comparison with both Siboga specimens and Grunow's type.

Coelarthrum boergesenii Weber van Bosse 1928: 473, figs. 207–208 (Borneo Bank)

Fig. 47

ARNO ATOLL: H. 9623, Sta. 24. Only a single small example of this species is present, but it is in complete agreement in size, shape, structure and anastomoses of the branches with the Weber van Bosse plant. Our specimen came from the under surface of an

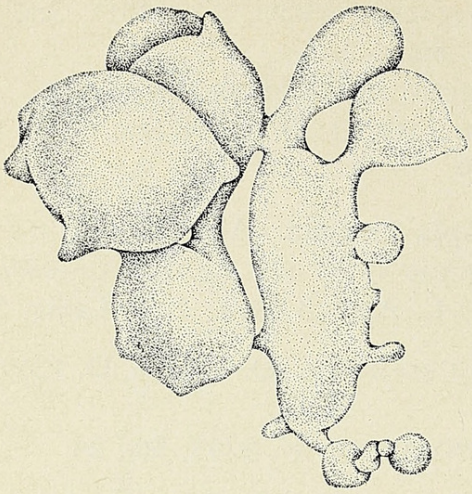

FIG. 47. *Coelarthrum boergesenii:* The entire specimen under H. 9623, × 6.

overhanging coral on the reef and agrees with her forma *minima* even as to having the "algue parasite filamenteus verte parmi les cellules de ses articles ou vésicules" as mentioned in the description of the type.

Botryocladia skottsbergii (Børgesen) Levring 1941: 645; G. Feldmann 1945: 55. *Chrysymenia skottsbergii* Børgesen 1924: 307, figs. 49–50 (Easter Island). *Botryocladia kuckuckii* (Weber van Bosse) Yamada and Tanaka 1938: 466, figs. 8–9; Taylor 1950: 135

Fig. 48

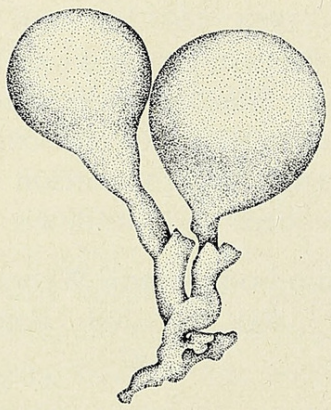

FIG. 48. *Botryocladia skottsbergii:* A small example from H. 9364, × 5.

ARNO ATOLL: H. 9384, Sta. 26; H. 9685b, Sta. 25.

Rhodymenia anastomosans Weber van Bosse 1926: 150, fig. 39 (Kei Islands, Doe-Roa, at 20 meters)

Fig. 49

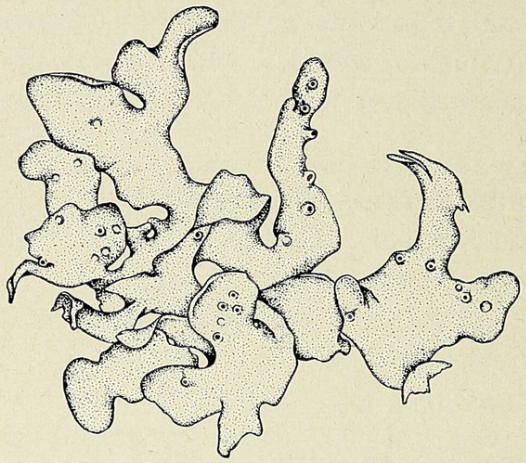

FIG. 49. *Rhodymenia anastomosans:* A cystocarpic plant of D. 13120 showing the repent habit and "anastomosing" branches, × 2.

JALUIT ATOLL: D. 13120, Sta. 19. Both antheridial and carposporic specimens are present and show good agreement with this little known species heretofore reported but once.

Lomentaria hakodatensis Yendo 1920: 6 (Japan). *Lomentaria sinensis* Howe 1924: 139, pl. 1, fig. 1

Fig. 50

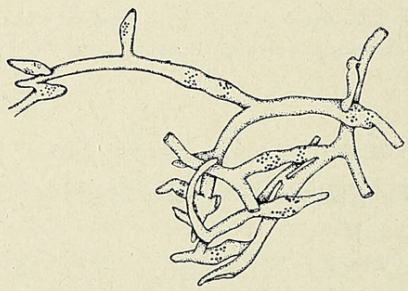

FIG. 50. *Lomentaria hakodatensis:* Part of a clumping tetrasporic example of D. 12616, × 5.

KWAJALEIN ATOLL: D. 12616, Sta. 2. This tetrasporic material is in excellent agreement with this species as known from China, Japan, and from Pacific Mexico.

JALUIT ATOLL: D. 13015, Sta. 12; D. 13165, Sta. 23. All tetrasporic.

Antithamnion lherminieri (Crouan and Crouan) Nasr 1941: 66, figs. 9–10. *Callithamnion lherminieri* Crouan and Crouan, in Mazé and Schramm 1870–77: 144. *Antithamnion antillanum* Børgesen 1915–20: 226, figs. 213–216

Fig. 51

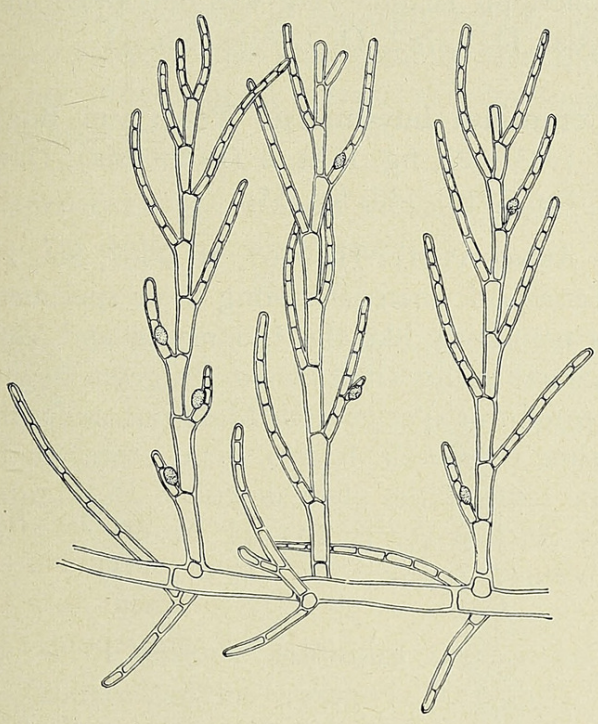

FIG. 51. *Antithamnion lherminieri:* Part of a plant of D. 13044a, × 100.

JALUIT ATOLL: D. 13044a, D. 13050b, Sta. 13; D. 13164, Sta. 23.

Ceramium gracillimum var. **byssoideum** (Harv.) G. Mazoyer 1938: 323; Dawson 1954: 448, fig. 55e, f. *Ceramium byssoideum* Harvey 1853: 218 (Key West, Florida); Taylor 1950: 138

KWAJALEIN ATOLL: D. 12554b, D. 12581, Sta. 1; D. 12599, Sta. 2; D. 12672, Sta. 5.

MAJURO ATOLL: D. 12720a, lagoon side, Enierippu Island; D. 12761, Sta. 9; D. 12791, Sta. 11.

JALUIT ATOLL: D. 13019, D. 13026, Sta. 12; D. 13049, Sta. 13; D. 13113, Sta. 19.

ARNO ATOLL: H. 9581f, Sta. 25.

The specimens of these many collections are variable. Some of them, such as D. 12599, have abundant gland cells and solitary sporangia which, standing alone, would distinguish them from the Pacific Mexican *Ceramium masonii* Dawson (1950*b*: 126, pl. 2, figs. 11–12). Others, however, such as D. 12672, show few or no gland cells and have whorled, involucrate sporangia as in *C. masonii*, suggesting that only a single, widespread, variable species is involved.

Ceramium mazatlanense Dawson 1950*b*: 130, pl. 2, figs. 14–15 (Mazatlán, Mexico); Dawson 1954: 448, fig. 55g–j

JALUIT ATOLL: D. 13027, Sta. 12. Agrees excellently with the tetrasporic type.

ARNO ATOLL: H. 9165a, H. 9627a, Sta. 24; H. 9588, Sta. 25.

Ceramium fimbriatum Setchell and Gardner 1924: 777, pl. 26, figs. 43, 44 (Gulf of California, Mexico); Dawson 1954: 446, fig. 55a

KWAJALEIN ATOLL: D. 12577, Sta. 1.

JALUIT ATOLL: D. 13110, Sta. 18. Only a small but distinctive bit noted.

Ceramium camouii Dawson 1944: 319, pl. 51, figs. 2–3 (Turner's Island, Gulf of California, Mexico); Dawson 1950b: 129

Fig. 52

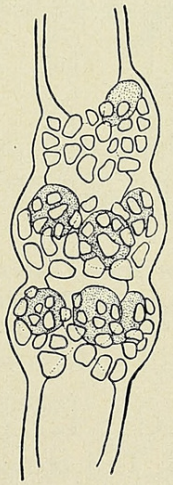

FIG. 52. *Ceramium camouii:* A small part of a tetrasporic axis of H. 9527a, showing the tumid nodal whorls, × 200.

ARNO ATOLL: H. 9527a, Sta. 24. A few branches of the specimens of this collection bear tetrasporangia in the characteristic strongly tumid whorls unlike the solitary ones of *C. serpens*. Vegetatively *C. camouii* and *C. serpens* are similar and may not readily be distinguished unless found in tetrasporic condition. This species has been reported from both tropical and subtropical areas on the coast of Pacific Mexico, but not heretofore in the central Pacific.

Ceramium serpens Setchell and Gardner 1924: 775, pl. 27, fig. 58 (Gulf of California, Mexico)

Fig. 53

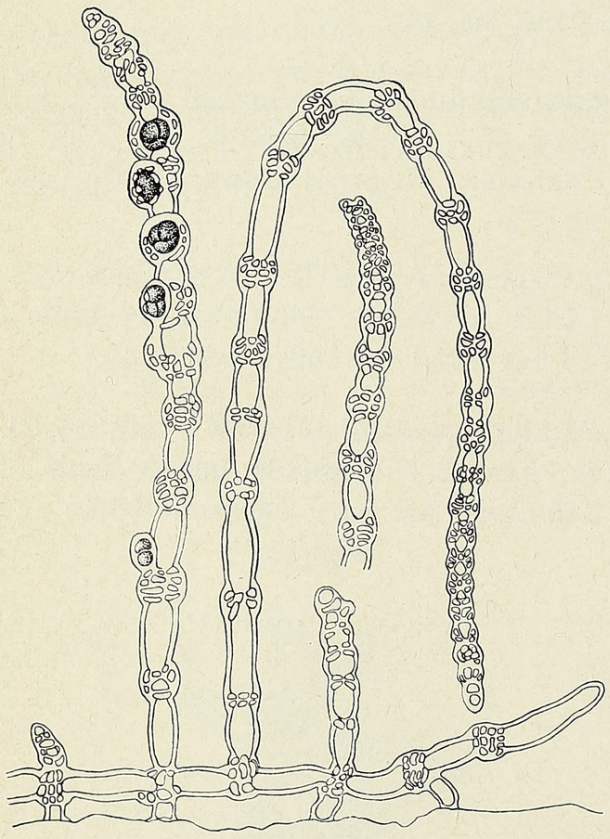

FIG. 53. *Ceramium serpens:* Part of a tetrasporic plant of the type collection, × 125 (redrawn from Setchell and Gardner).

MAJURO ATOLL: D. 12717a, lagoon side of Enierippu Island. This tetrasporic material is identical with the Mexican type.

JALUIT ATOLL: D. 13044, Sta. 13; D. 13074, Sta. 15.

ARNO ATOLL: H. 9246a, H. 9448a, Sta. 24.

Ceramium clarionense Setchell and Gardner 1930: 170, pl. 7, figs. 25–27 (Isla Clarión, Revillagigedo Archipelago, Mexico); Dawson 1954: 448, fig. 55k

MAJURO ATOLL: D. 12722, lagoon shore of Enierippu Island. Very well-developed material. D. 12782, D. 12791a, Sta. 11.

Ceramium huysmansii Weber van Bosse 1923: 322, fig. 115a, b (Indonesia); Dawson 1954: 446, fig. 55d

ARNO ATOLL: H. 9165, H. 9467, Sta. 24. Tetrasporic material among these specimens is manifestly like the Indonesian and Vietnamese plants cited above. Børgesen has reported this species from Mauritius under the name *Ceramiella*. It also seems clearly to be the same as the plant described and figured by Setchell (1926: 104, pl. 21, fig. 1–2) as *Bostrychia exigua*.

Centroceras minutum Yamada 1944a: 42 (Ant Atoll, Ponape, Caroline Islands)

Fig. 54

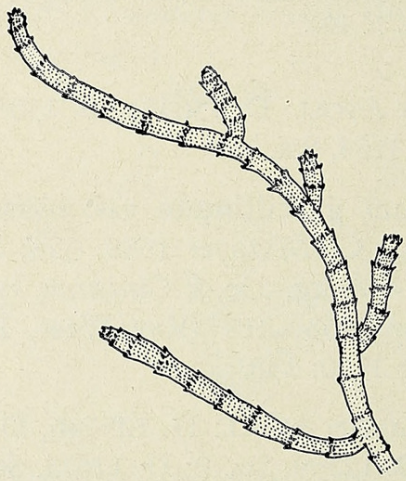

FIG. 54. *Centroceras minutum:* Habit of part of a creeping plant of H. 9611, × 10.

ARNO ATOLL: H. 9611, Sta. 29. This material of a small, creeping, irregularly branched, non-forcipate *Centroceras* agrees excellently with Yamada's description. Although it would

appear hazardous to recognize another *Centroceras* with a number of characters in common with the widespread and variable *C. clavulatum*, the habit and general lack of dichotomous branching do seem to distinguish this small plant. H. 9630, Sta. 24, represents quite abundant material creeping on *Valonia aegagropila* in company with *C. apiculatum*. Note that dichotomous branching is not infrequent in certain well-developed free branches.

Centroceras apiculatum Yamada 1944*a*: 42 (Ant Atoll, Caroline Islands)
Fig. 55

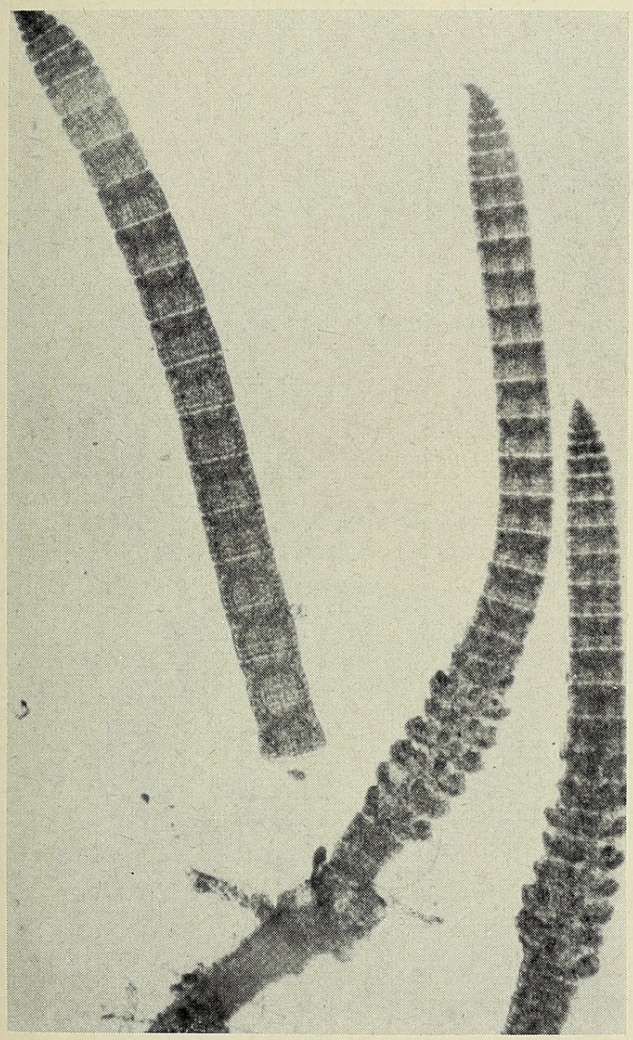

FIG. 55. *Centroceras apiculatum:* Terminal portions of a sterile axis and two tetrasporangial axes of H. 9543a, × 68.

ARNO ATOLL: H. 9284a, H. 9527b, H. 9543a, H. 9630b, Sta. 24. This material, part of which is tetrasporic, agrees in all respects with Yamada's description.

Centroceras clavulatum (Ag.) Montagne, in Durieu 1846: 140; Taylor 1950: 139; Dawson 1954: 446, fig. 54b. *Ceramium clavulatum* C. Agardh, in Kunth 1822: 2 (Peru)

KWAJALEIN ATOLL: D. 12578a, Sta. 1. This material is mostly of f. *inerme* (Kütz.) Piccone. D. 12604, D. 12636, Sta. 2; D. 12650, Sta. 3.

MAJURO ATOLL: D. 12693, Sta. 6; D. 12737, Sta. 7. This is f. *inerme* (Kütz.) Piccone. D. 12749, Sta. 8.

JALUIT ATOLL: D. 13034a, D. 13053, Sta. 13.

Crouania minutissima Yamada 1944*a*: 41 (Ant Atoll, near Ponape, Caroline Islands)
Fig. 56

FIG. 56. *Crouania minutissima:* Habit of a plant from H. 9585, × 20.

ARNO ATOLL: H. 9585, H. 9594a, Sta. 25. The abundant material of this beautiful little plant agrees excellently with the description given by Yamada of the type from nearby Ponape, except that the primary branchlets appear not to occur in groups of four at "every whorl." In the present specimens there appear often to be only three such primary

branchlets in a whorl. Such variation occurs also in the type species, *C. attenuata*.

Wrangelia argus (Mont.) Montagne 1856: 444; Dawson 1954: 444, fig. 54g. *Griffithsia argus* Montagne 1840*a*: 176, pl. 8, fig. 4 (Canary Islands)

MAJURO ATOLL: D. 12748, Sta. 8; D. 12774, Sta. 10.

ARNO ATOLL: H. 9592f, H. 9598f, H. 9600a, Sta. 25.

Spyridia filamentosa (Wulf.) Harvey, in Hooker 1833: 337; Taylor 1950: 139; Dawson 1954: 444, fig. 54i, j. *Fucus filamentosus* Wulfen 1803: 63 (Europe)

KWAJALEIN ATOLL: D. 12608, Sta. 2; D. 12665, Sta. 4.

MAJURO ATOLL: D. 12761a, Sta. 9; D. 12781, Sta. 11.

Spermothamnion saccorhiza (Setch. and Gard.) Feldmann-Mazoyer 1942: 16. *Pleonosporium saccorhiza* Setchell and Gardner 1930: 168, pl. 10, fig. 39 (on *Codium*, Isla Guadalupe, Mexico)

Fig. 57

KWAJALEIN ATOLL: D. 12571, Sta. 1; D. 12612, Sta. 2. Both on *Codium*.

Griffithsia tenuis C. Agardh 1828: 131 (Venice, Italy); Dawson 1954: 450, fig. 56e

JALUIT ATOLL: D. 13018b, Sta. 12; D. 13034, Sta. 13.

Griffithsia metcalfii Tseng 1942: 111, figs. 5–9 (Hainan, China); Dawson 1954: 450, fig. 56 k, l; Abbott 1946: 440, pl. 2, figs. 3–6

KWAJALEIN ATOLL: D. 12610, Sta. 2. This material is tetrasporic and agrees with Abbott's key and figures.

Martensia fragilis Harvey 1854: 145 (Ceylon); Svedelius 1908: 11, figs. 8, 10–28, pl. 1, figs. 1–10, pl. 2, figs. 6–10, pls. 3–4; Okamura 1916: 11

Fig. 58

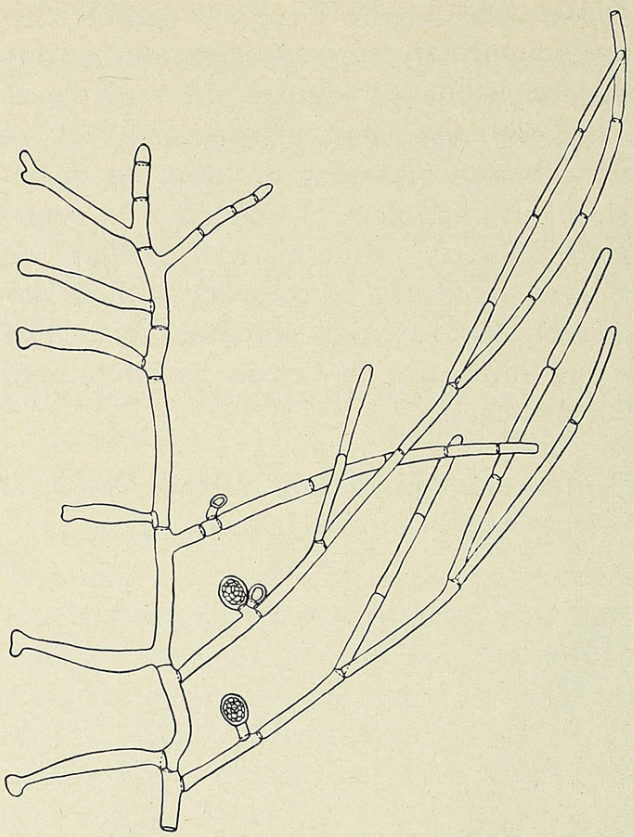

FIG. 57. *Spermothamnion saccorhiza:* Part of a plant of the type collection, × 37.5 (redrawn from Setchell and Gardner).

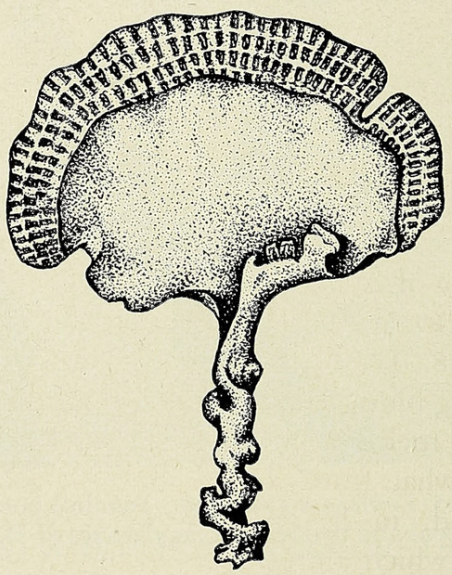

FIG. 58. *Martensia fragilis:* A young male plant showing early development of network, × 4 (redrawn from Svedelius).

ARNO ATOLL: H. 9059a, Sta. 25. Only a few fragmentary specimens are present, but in size, habit, and structure they appear to agree with this species which Okamura has reported from Truk Atoll.

Caloglossa adnata (Zanardini) De Toni 1900: 730; Dawson 1954: 451, fig. 58b. *Delesseria adnata* Zanardini 1872: 141, pl. 5B, figs. 1–3 (Sarawak, Borneo)

JALUIT ATOLL: D. 13084b, Sta. 16.

Caloglossa leprieurii (Montagne) J. Agardh 1876: 499; Taylor 1950: 140. *Delesseria leprieurii* Montagne 1840*b*: 196, pl. 5, fig. 1a–f (French Guiana)

Fig. 59

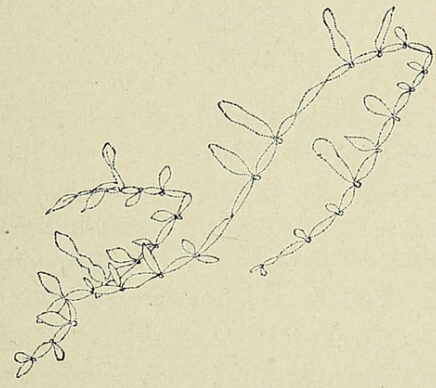

FIG. 59. *Caloglossa leprieurii* f. *pygmaea:* Habit of a plant of D. 12609a growing on *Valonia*, × 4.

KWAJALEIN ATOLL: D. 12609a, Sta. 2. These minute plants on the membrane of *Valonia* correspond with the f. *pygmaea* of Post 1936: 49.

JALUIT ATOLL: D. 13058a, Sta. 13. On the surface of *Lithoporella*.

ARNO ATOLL: H. 9628a, Sta. 24; H. 9489, Sta. 28. These minute plants were growing among blue-green algae on the under side of a flat rock on the lagoon reef. They differ somewhat from those under D. 12609a as figured, in having abundant stoloniferous parts which are very narrow, even subcylindrical in part, and erect parts which are longer and narrower. Because of the great variation known to exist in this widespread species of both marine and fresh water it seems well to assign the Arno material here.

Dictyurus purpurascens Bory, in Belanger and Bory 1846: 170, pl. 15, fig. 2 (Cape Comorin, Indian Ocean); Falkenberg 1901: 675, pl. 17, figs. 10–24; Svedelius and Nygren 1946: 3–32, pls. 1–2, figs. 1–18; Taylor 1950: 143, pl. 38, fig. 1

ARNO ATOLL: H. 9524, H. 9544, Sta. 24.

Heterosiphonia wurdemannii var. **laxa** Børgesen 1915–20: 326, fig. 327 (Virgin Islands); Taylor 1950: 140 (as *H. wurdemanni*)

Fig. 60

KWAJALEIN ATOLL: D. 12568a, Sta. 1.
JALUIT ATOLL: D. 13108a, Sta. 18.
ARNO ATOLL: H. 9166, H. 9203a, H. 9444, H. 9538, Sta. 24; H. 9507, Sta. 28.

Polysiphonia tongatensis Harvey, in Kützing 1864, Tab. Phyc. 14: 14, pl. 41 (Friendly Islands); Dawson 1954: 454, fig. 60d,e

JALUIT ATOLL: D. 13065a, D. 13075, Sta. 15. All reproductive phases present.

Polysiphonia coacta Tseng 1944: 71, pl. 2 (Hong Kong, China); Dawson 1954: 456, fig. 60g, h

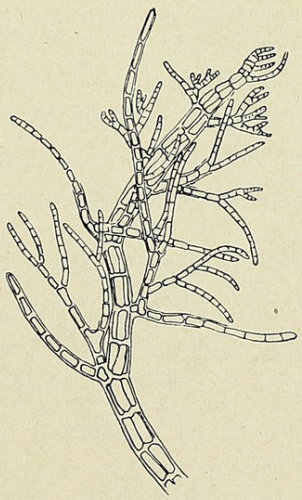

FIG. 60. *Heterosiphonia wurdemanni* var. *laxa:* An upper part of a plant of D. 12568a, to show the branching and arrangement of cells, × 25.

MAJURO ATOLL: D. 12729, Sta. 7.

ARNO ATOLL: H. 9534e, Sta. 24. The material in this mixture of turf algae is mostly 100–170 μ in diameter and in good agreement with this short-segmented Chinese species.

Polysiphonia subtillissima Montagne 1840*b*: 199 (French Guiana); Dawson 1954: 454, fig. 60c

ARNO ATOLL: H. 9514, Sta. 28. This material of a very slender species with four pericentral cells, few scar cells, and almost no trichoblasts seems to agree with similar material collected by the writer in Viêt Nam and referred to this species in accord with Tseng 1944.

Endosiphonia spinuligera Zanardini 1878: 35 (New Guinea); Falkenberg 1901: 571

Fig. 61

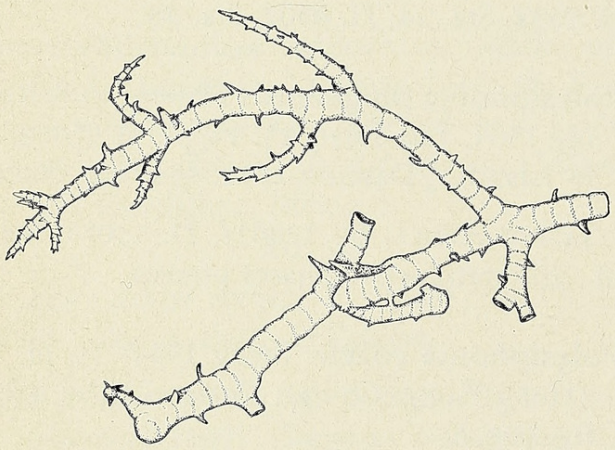

FIG. 61. *Endosiphonia spinuligera:* A small part of a plant of D. 13115, × 3.5.

JALUIT ATOLL: D. 13115, Sta. 19. These specimens seem to be in complete agreement with this species described from New Guinea.

Tolypiocladia calodictyon (Harv.) Silva 1952: 308. *Polysiphonia calodictyon* Harvey, ex Kützing 1864, Tab. Phyc. 14: 16, pl. 46, figs. a–c (Friendly Islands). Taylor 1950: 148, pl. 57, fig. 2 (as *Rochera calodictyon*)

Fig. 62

KWAJALEIN ATOLL: D. 12559, Sta. 1. Young, dwarfish material.

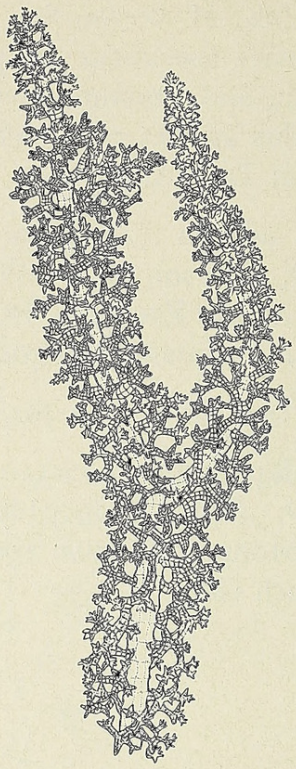

FIG. 62. *Tolypiocladia calodictyon:* A small upper part of a plant of H. 9243, × 6.5.

MAJURO ATOLL: D. 12784, Sta. 11.

JALUIT ATOLL: D. 13116, Sta. 19.

ARNO ATOLL: H. 9243, H. 9583, Sta. 25. Occurring in huge quantities over a large area in the sandy inner section of the lagoon reef.

Herposiphonia secunda (Ag.) Ambronn 1880: 197, pl. 4, figs. 8, 12; Howe 1920: 573, Børgesen 1930: 111, fig. 45. *Hutchinsia secunda* C. Agardh 1824: 149 (Mediterranean Sea)

Fig. 63

ARNO ATOLL: H. 9373c, Sta. 27; H. 9220, H. 9246b, H. 9258, H. 9290, Sta. 24. The plants of these collections agree with the species as interpreted by Howe (1920) who uses as a key character the fact that some of the nodes are regularly and wholly destitute of branches. The same is true of Børgesen's account. Taylor (1950: 148) reports a plant under this name from Rongelap Atoll, but his description does not agree with my specimens which have 7 to 8 pericentral cells in the main

axes, and do not have "erect branchlets at the three nodes between each two branch rudiments." His plants meet the usually accepted requirements for *H. tenella*.

Herposiphonia tenella (Ag.) Ambronn 1880: 197, pl. 4, figs. 9, 11, 13–16; Dawson 1954: 452, fig. 59a. *Hutchinsia tenella* C. Agardh 1828: 105 (Mediterranean Sea)

KWAJALEIN ATOLL: D. 12615, Sta. 2.

JALUIT ATOLL: D. 13050a, Sta. 13; D. 13103, Sta. 18; D. 13130, Sta. 19.

ARNO ATOLL: H. 9449a, H. 9534f, Sta. 24.

Lophosiphonia villum (J. Ag.) Setchell and Gardner 1903: 329; Hollenberg 1942: 535, figs. 11–13. *Polysiphonia villum* J. Agardh 1863: 941 (Tropical America)

Fig. 64

ARNO ATOLL: H. 9446, H. 9467b, Sta. 24. In these specimens the rhizoids are not cut off by a cross wall and are, thus, in agreement with the species as interpreted by Hollenberg and different from the superficially very similar *L. bermudensis*.

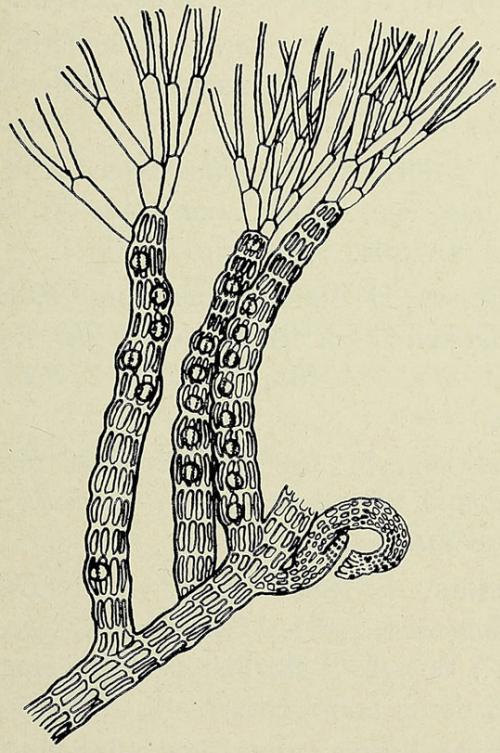

FIG. 63. *Herposiphonia secunda:* Part of a tetrasporic plant showing several segments lacking erect branchlets, × 50 (redrawn from Børgesen).

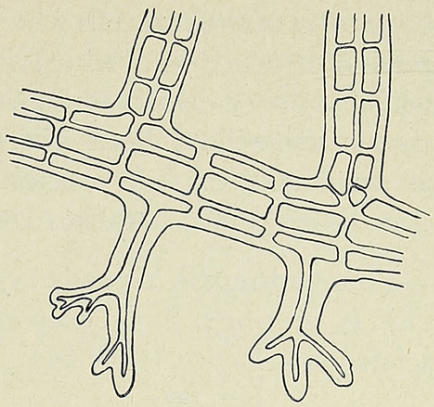

FIG. 64. *Lophosiphonia villum:* Part of a creeping basal filament showing the rhizoids which are not cut off by cross walls from the pericentral cells (H. 9446), × 150.

Lophosiphonia bermudensis Collins and Hervey 1917: 126, pl. 3, figs. 18–21 (Bermuda). Dawson 1954: 451, fig. 58f, g (as *L. villum*)

Fig. 65

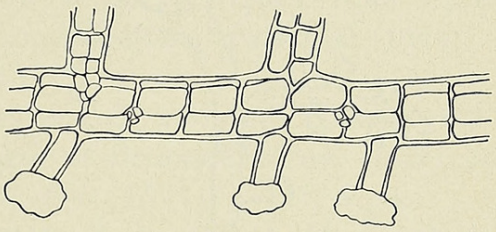

FIG. 65. *Lophosiphonia bermudensis:* A small part of a creeping basal filament showing the rhizoids distinctly cut off from the pericentral cells (H. 9598a), × 130.

KWAJALEIN ATOLL: D. 12580, Sta. 1.

JALUIT ATOLL: D. 13003, Sta. 12; D. 13041, Sta. 13; D. 13071a, D. 13073, Sta. 15; D. 13107, Sta. 18.

ARNO ATOLL: H. 9478, Sta. 28; H. 9598a, H. 9685c, Sta. 25.

The specimens cited above, of which some are in abundance and well-developed, as D. 13071a, have rhizoids conspicuously cut off by a cross wall unlike those of *L. villum*. If this character proves to be a distinctive and specific one as it now appears to be, it is probable that many of the tropical specimens referred to *L. villum* may actually belong to *L. bermudensis*. Although Collins and Hervey

made no mention of the scar cells which occur in ¼ spiral divergence and which in older axes are divided into 2–3 cells as shown in the figure above, these have been observed in typotype specimens of this species. These may in part develop into branches later.

Laurencia mariannensis Yamada 1931: 200, pl. 5, fig. b, text figs. F, G (Saipan, Mariannas Islands); Taylor 1950: 144

Fig. 66

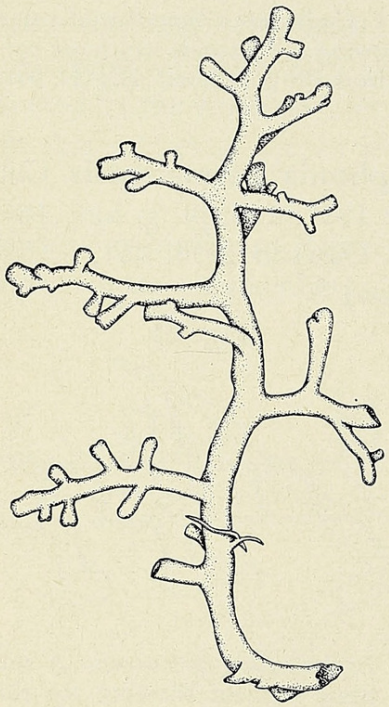

FIG. 66. *Laurencia mariannensis:* Habit of a small part of a plant of D. 12789, × 4.

MAJURO ATOLL: D. 12789, Sta. 11.

ARNO ATOLL: H. 9581, Sta. 25.

The projecting surface cells near the ends of the branches are a conspicuous and distinctive feature of this species.

Chondria repens Børgesen 1924: 300, fig. 40 (Easter Island); Dawson 1954: 460, fig. 62d, e

KWAJALEIN ATOLL: D. 12625, Sta. 2. This tetrasporic material which ranges from about 250 to 320 μ in diameter is somewhat more lax in habit than the Easter Island type as described and illustrated by Børgesen, but is otherwise very much the same. D. 12662a, Sta. 5.

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