

Some Marine Benthic Algae from Marcus Island, Bonin Islands¹

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Presented here is the first marine algal listing from Marcus Island based on collections made by Dr. John E. Randall, Hawaii Institute of Marine Biology, during August 30 to September 10, 1968. Heydrich (1894) and Okamura (1897) have previously reported on four and forty-five species, respectively, from islands in the Bonin Islands.

Marcus Island (24° 17' N. Lat., 153° 58' E. Long.) is an isolated low coral island situated about 530 kilometers east of the main Bonin Islands. The island is triangular in shape and surrounded by coral reefs which extend 50 to 150 meters seaward. It is 1.6 kilometers at the longest side and reaches a maximum height of about 10 meters above sea level.

The author acknowledges Dr. John E. Randall for the algal collection and certain information reported here and Dr. Francis Drouet for his determination of *Porphyrosiphon miniatus* (Hauck) Drouet. The first set of specimens are deposited in the University of Guam Herbarium and a duplicate set in the United States National Herbarium.

Habitats

Below is a listing of the major areas from which the algal collections were made. The specimen numbers are those of the author.

- RT# 2392 to 2418—In surge channel area, top of reef intermittently washed by sea and from a high spray pool. Reef edge on east side of island. Sept. 9, 1968.
- RT# 2419—On exposed reef edge wet by spray. West side of island. September 4, 1968.
- RT# 2420—On reef flat in half meter of water. North end of island. September 10, 1968.
- RT# 2421—On wave-washed outer reef edge. East side of island. September 10, 1968.
- RT# 2422 to 2441—On reef flat in about a meter of water. General collection around island. August 30 to September 10, 1968.

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Algae Listing

Cyanophyta

Anacystis dimidiata Drouet and Daily 1956: 221.

The cells, 30 to 40 μ in diameter, appear singly or paired in a thick gelatinous sheath.

Specimen examined: RT# 2434 (associated with *Schizothrix calcicola*).

Gomphosphaeria aponina Kützing 1836: 151; Drouet and Daily 1956: 98.

The pyriform cells, 4 to 5 μ in width, are arranged in a gelatinous matrix of definite shape.

Specimens examined: RT# 2422 (associated with *Schizothrix mexicana*), RT# 2434 (associated with *Schizothrix calcicola*).

Oscillatoria lutea C. Ag. 1824: 68; Drouet 1968: 185.

The filaments are 10 to 12 μ in diameter, with the individual cells about 2 to 3 μ long. The apical cell is truncate in shape and possesses a thick outer wall.

Specimens examined: RT# 2393, RT# 2398 (epiphytic on *Hyphae pannosa*), RT# 2414.

Schizothrix calcicola (Ag.) Gomont 1892: 307; Drouet 1968: 27.

The filaments, 1 to 1.5 μ in diameter, possess blunt apical cells and cells which are quadrat or a little longer than wide.

Specimens examined: RT# 2398 (loose filaments), RT# 2434 (forming solid hemispherical clumps on coral).

Schizothrix mexicana Gomont 1892: 304; Drouet 1968: 87.

The filaments, forming large spongy mats, possess an apical cell that is hemispherical to truncate in shape and are 3.5 to 6 μ in diameter. The cells are 0.5 to 1.5 times longer than wide.

Specimens examined: RT# 2422, RT# 2427, RT# 2438.

Porphyrosiphon miniatus (Hauck) Drouet 1968: 172.

The sinuous filaments are 2.5 to 3.0 μ in diameter with cells 3 to 5 times longer than the diameter. Most of the apical tips are attenuated. This rather rare species, determined by Dr. Francis Drouet, probably represents the first record from a Pacific island other than Japan.

Specimen examined: RT# 2420.

Spirulina subsalsa Oersted; Gomont 1892: 253; Drouet 1968: 16.

The small spiraled filaments are about 1 μ in diameter.

Specimens examined: RT# 2393 (associated with *Oscillatoria lutea*), RT# 2398 (associated with *Oscillatoria lutea*).

Calothrix confervicola Ag.; Bornet and Flahault 1886: 349; Fan 1956: 169.

The middle portion of the filaments are 7 to 8 μ in diameter. A very distinct basal heterocyst is present.

Specimens examined: RT# 2400 (on coral), RT# 2412 (on coral), RT# 2434 (associated with *Schizothrix calcicola*).

Calothrix crustacea Thuret; Bornet and Flahault 1886: 359; Fan 1956: 172.

The filaments, 6 to 9 μ in diameter with cells quadrat or a little longer, possess both basal and intercalary heterocysts.

Specimens examined: RT# 2399, RT# 2417.

Chlorophyta

Enteromorpha clathrata (Roth) J. Ag. 1883: 153; Dawson 1954: 384.

The profusely branched thalli, up to 6 mm high, possess numerous uniseriate branches.

Specimen examined: RT# 2419.

Bryopsis indica Gepp and Gepp 1908: 169, pl. 22 (figs. 10-11); Taylor 1950: 50.

This species forms dark green tufts about 2.5 cm high. The double row of pinnae on each side of the central axis is very characteristic.

Specimens examined: RT# 2433, RT# 2439, RT# 2411.

Caulerpa racemosa (Forsskal) J. Ag. 1872: 35; Eubank 1946: 419, figs. 2q,r,t.

Both *v. turbinata* (J. Ag.) Eubank and *v. peltata* (Lamx.) Eubank are present in the collection. Preliminary observations in the field and aquarium have shown that *v. turbinata* may be just the immature form of *v. peltata*.

Specimens examined: RT# 2396 (adhering to coral fragments), RT# 2429, RT# 2431, RT# 2437.

Caulerpa serrulata v. typica (Weber van Bosse) Tseng 1936: 178.

The forms present fall between *f. lata* (Weber van Bosse) Tseng and *f. angusta* (Weber van Bosse) Eubank.

Specimens examined: RT# 2430, RT# 2432 (adhering to small coral fragments).

Acetabularia moebii Solms-Laubach 1895: 30, pl. 4 (fig. 1); Egerod 1952: 411, fig. 23i.

The specimens are about 5 mm high with the disk about 3 mm in diameter. Four to five hairs are present on each coronal knob.

Specimen examined: RT# 2416 (on coral).

Neomeris annulata Dickie 1874: 198; Howe 1909: 87.

The worm-like thalli, about 1 cm high, possess calcareous annular rows at the basal portion. The stipitate oblong gametangia are 150 to 175 μ in length and 75 to 95 μ wide.

Specimen examined: RT# 2423 (colony on a single piece of coral).

Boodlea vanbosseae Reinbold 1905: 148; Dawson 1956: 29.

The specimen, 1 cm high, appears as a brown spherical mass. The cells anastomose by means of long rhizoidal branches.

Specimen examined: RT# 2410.

Cladophoropsis gracillum Dawson 1950: 149, fig. 12-13.

The specimen grows in loose mats which are light green in color. The occasionally branched filaments are 75 to 125 μ in diameter and the length of the cells range from 10 to 60 times the diameter.

Specimen examined: RT# 2428.

Cladophora rudolphiana (Ag.) Harvey 1846-51: pl. 86; Sakai 1964: 38.

The specimens consist of gelatinous tufts, about 3 cm high, with the main axis about 75 μ in diameter forming dichotomous or trichotomous branches 25 to 50 μ in diameter. The cells of the main axis are about 7 to 11 times their diameter, while those of the secondary branches are about 5 to 7 times their diameter.

Specimen examined: RT# 2421.

Phaeophyta

Padina australis Hauck 1887: 44; Dawson 1957: 110, fig. 14a.

The distromatic thalli, up to 6 cm high and 75 to 90 μ thick, possess non-indusiate reproductive organs in concentric rows above every other hair line on the lower side.

Specimens examined: RT# 2406 (sterile), RT# 2426.

Pocockiella variegata (Lamx.) Papenfuss 1943: 467, figs. 1-14.

The thalli are about 25 mm in width and 110 to 145 μ thick at the mid-portion.

Specimens examined: RT# 2403, 2435.

Rhodophyta

Jania capillacea Harvey 1853: 84; Dawson 1954: 432, figs. 41a,b.

The thalli are 50 to 100 μ in diameter with the branches forming either acute or obtuse angles.

Specimens examined: RT# 2401 (on coral), RT# 2405 (on coral), RT# 2441 (epiphytic on *Caulerpa serrulata*).

Jania ungulata Yendo 1954: 38; Dawson 1905: 40, fig. 40e.

The thalli are 100 to 150 μ in diameter and possess expanded terminal segments. It is with doubt that this species is listed here, since the expanded segments could very well represent the initial phase of a dichotomous branch formation of another species.

Specimens examined: RT# 2408 (on coral), RT# 2413 (on coral), RT# 2418 (on coral).

Hypnea pannosa J. Ag. 1852: 453; Tanaka 1941: 247, fig. 20.

The thallus forms compact clumps with branches 400 to 625 μ in diameter.

Specimens examined: RT# 2392.

Asparagopsis taxiformis (Delile) Collins and Hervey 1917: 117; Taylor 1960: 348, pl. 71 (fig. 4).

Both the gametophyte generation and the sporophyte generation, *Falkenbergia hillebrandii* (Bornet) Falkenberg, are included in the collections.

Specimens examined: RT# 2436 (gametophyte), RT# 2441 (sporophyte).

Polysiphonia sphaerocarpa Boerg. 1918: 271; Hollenberg 1968: 87.

The erect thalli, 75 to 150 μ in diameter, possess trichoblast or scar cells at every segment. The unicellular rhizoids are cut off from the pericentral cells.

Specimens examined: RT# 2394 (epiphytic on *Jania capillacea*), RT# 2407 (turf on coral piece).

Discussion

Twenty-five species (Cyanophyta—9, Chlorophyta—9, Phaeophyta—2, Rhodophyta—5) of marine benthic algae are reported for the first time from Marcus Island. Dr. Randall (personal communication) relates that the marine flora of Marcus Island was impoverished and partly attributed this to the large number of herbivorous fishes, i.e., Scaridae, Acanthuridae, Kyphosidae, that feed on the reef flats. The most dominant algae present on Marcus Island during this period were *Porphyrosiphon miniatus* (Hauck) Drouet, *Padina australis* Hauck, *Caulerpa*

racemosa (Forsskal) J. Ag., *Caulerpa serrulata* v. *typica* (Weber van Bosse) Tseng, and the solid clumped ecophene of *Schizothrix calcicola* (Ag.) Gomont.

The marine flora of this isolated island is of phytogeographic interest as a possible "stepping stone" for some of the present day marine organism found in Hawaii. The area is in the path of the warm Kuroshio Current that sweeps eastward from the eastern coast of the Asian mainland.

The presence of certain marine algae, i.e., *Sargassum*, *Dictyopteris*, and *Ulva*, on Marcus Island could have indicated the path of these genera to the Hawaiian Islands. Hawaii claims five species of *Sargassum*, five species of *Ulva* (Gilbert, 1965), and three species of *Dictyopteris*. However, none of these genera were found on Marcus Island, even though Dr. Randall made a special attempt to look for them. Johnston Island, the nearest island south of Hawaii, also lacks all three genera (Buggeln and Tsuda, 1969). Wake Island, situated a few degrees south but lying between Marcus Island and the Hawaiian Islands, is another isolated island of phytogeographic interest. Only three algal species (Schmidt, 1928) have been reported from this low island.

The absence of *Sargassum* on Marcus Island was expected since this genus seems to be more restricted to high islands (Doty, 1954). On the other hand, the absence of *Ulva* was surprising, since Okamura (1897) reported this genus from the other Bonin Islands.

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