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A preliminary list of the
algal flora of the Midway Islands

by

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Algal collections which have been reported from the Hawaiian Islands are largely based on materials collected from the more accessible and most heavily populated islands of Oahu, Maui, Molokai, Hawaii, and Kauai. However, collections have also been recorded from two of the lesser islands in the northwestern part of the Hawaiian chain: Laysan Island (Lemmermann, 1905) and Pearl and Hermes Reef (Howe, 1934). To the author's knowledge there have been no published reports of algae collected from the Midway Islands--two islands situated on one of the last atolls toward the northwestern end of the Hawaiian archipelago.

On a trip to the Midway Islands, January 12 through 16, 1962, Dr. Charles H. Lamoureux of the Botany Department, University of Hawaii, collected algae which had drifted onto several of the beaches of both islands after a storm. These algae are listed below.

The Midway Islands (177°25' W. Longitude and 28° 15' N. Latitude) are on an atoll located 1300 statute miles northwest of Honolulu, Hawaii. The diameter of this circular coral atoll is about 5 miles. Wide reefs jut out of the water on the northeast side. The two islands, Sand and Eastern, are situated in the lagoon inside but near the southern rim. Around the inside of the rim of the atoll is a wide margin of shallow water which drops off toward the center of the atoll into the depths of the lagoon.

Sand Island, the larger of the two islands, is one and a half miles in length along the north-south axis and a mile wide along the east-west axis. The island has a maximum elevation of 43 feet. Eastern Island, located about a mile and a half across the shallows to the east of Sand Island is relatively flat and triangular in shape. The longest of the three sides of the island is oriented in an east-west direction and is about one and a half miles long.

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The collection numbers cited are those of the catalogued serial listings of the specimens in the herbarium of Dr. Maxwell S. Doty, Botany Department, University of Hawaii. The material from Sand Island has the following numbers: 18725 to 18731, and 18739 to 18754; those specimens from Eastern Island have the numbers: 18704 to 18719, 18732 to 18738, and 18754 to 18762.

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CYANOPHYTA

Lyngbya majuscula Gomont, 1892: 151, pl. 3, figs. 3 & 4.

Collection numbers 18756, 18715, 18742B, and 18754F.

Masses of long intertwining filaments, 65 microns in diameter were frequently entangled with larger algae.

CHLOROPHYTA

Ulva sp.

Collection number 18719.

The specimens, too young for specific identification, were ovoid in shape, 1 to 2 cm in breadth.

Boodlea vanbosseae Reinbold in Weber van Bosse, 1913: 70, 12;
Dawson, 1956: 29, fig. 6.

Collection number 18761.

This was a thickly woven mass of filaments composed of cells 150 to 175 microns wide and 2 to 4 times as long. A main axis or axes could not be distinguished by the size of the filaments: They all had a uniform diameter. Frequently, the apical cell of the filament had developed into a long multicellular rhizoid of slender diameter and anastomosed with another filament through the production of a tenacular cell. The material agrees with that figured in Weber van Bosse (1913).

Boodlea sp.

Collection number 18755.

The material was matted more or less loosely and entangled with and connected with pieces of coral and Halimeda. Branching occurred at random with laterals cut off by a crosswall but not necessarily near the transverse wall of the parent cell. Frequently a lateral of indeterminate length was long and attenuated and had produced a terminal tenacular cell which adhered to another filament. The diameter of the major axis near the basal holdfast was 200 microns and that of the secondary axes above was 150 microns.

Microdictyon setchellianum Howe, 1934; Egerod, 1952: 366, pl. 33, fig. 6c-g.

Collection number 18719B.

This loose to compact clump, 1 cm across, was growing intertwined with Jania capillacea (18719J). The diameter of the cells was 450 microns with no prominent central axis.

Struvea anastomosans (Harvey) Picc. & Grun. ex Piccone, 1884a; Egerod, 1952: 359, pl. 31, fig. 4a-h.

Collection number 18709.

This specimen was growing on a small basalt stone.

Udotea javensis (Montagne) A. & E. S. Gepp, 1904; Taylor, 1950: 73.

Collection number 18706B.

This small specimen was 3.5 mm high from rhizoid to apex with a stipe of 110 microns and with filaments of 55 microns diameter composing the monostromatic blade. The blade had a width of 1 mm; the individual filaments of the blade were constricted at irregular intervals above the dichotomies. The specimen was referred to this species because U. javensis has been commonly reported from Hawaiian waters. It is possible, however, that the alga might be a juvenile stage of a larger species of Udotea.

Codium arabicum Kuetzing, 1856; Egerod, 1952: 382, pl. 34, b. figs. 11-13.

Collection numbers 18741A and 18712B.

The thalli, 4 cm across, were flattened and closely appressed to the surface of coral fragments.

Codium edule Silva in Egerod, 1952: 392, pl. 35, b, fig. 18.

Collection numbers 18740B, 18759B, 18741B, 18712B, 18725C, and 18733.

The specimens all displayed the characteristic anastomosing between the dichotomous branches. The longest of the specimens was 10 cm. The branches were frequently anastomosed with the segments of Halimeda incrassata.

Codium reediae Silva in Egerod, 1952: 389, pl. 36, fig. 17.

Collection numbers 18740A, 18733A, 18725A, 18712A, and 18759A.

The collection included specimens of 15, 20, and 25 cm in length. The branching was freely dichotomous with no anastomosing between branches.

Halimeda discoidea Decaisne, 1842; Hillis, 1959: 352, pl. 2, fig. 5; pl. 5, fig. 11; pl. 6, fig. 11.

Collection number 18705.

A single sterile specimen about 8 cm high was identified. The size of the segments was quite variable in both width and length and they were lightly calcified with an average thickness of 1 to 1.4 mm. The largest segment was 2 x 1.25 cm. Two to 5 segments arose from the spical end of each lower segment. In surface view, the utricles were 5 to 7 sides and asymmetrically compact with no interutricular spaces. The outer surfaces appeared smooth with a diameter of 70 to 100 microns.

Halimeda incrassata (Ellis) Lamouroux, 1816; Hillis, 1959: 365, pl. 4, fig. 1-2; pl. 5, fig. 6, fig. 21-24.

Collection numbers 18707, 18747, 18738, and 18758.

The collections included fragments of larger thalli and one entire alga 6 cm in height. The segments were heavily calcified and of uniform size and shape, 4 to 7 mm in width and 4 mm high. In surface view, the utricles were round to slightly oval and measured 10 to 18 microns in diameter. The utricles were not appressed to each other and interutricular spaces were present. The branching was di- and trichotomous and in one plane.

PHAEOPHYTA

Ectocarpus indicus Sonder in Zollinger, 1854; Børgesen, 1941: 16, figs. 6-7.

Collection number 18762.

The fragmentary material was sterile but the method of branching was indicative of the species. The laterals arose from a central uniseriate filament with an acute adaxial angle between the lateral and central axis. The cells in the filaments were quite variable in length.

Sphacelaria sp.

Collection numbers 18746, 18754D, and 18703D.

All of the material, 8 mm high, was too young for certain specific identification. The propagules were knob-like and measured 100 microns long by 70 microns wide at the expanded apex, but it appeared that the divisions at the widened portion were not yet completed. At this stage of growth, the propagules could develop into either those of S. tribuloides or S. novae-hollandiae. Unilocular sporangia with a diameter of 40 microns were borne on short pedicels. The segments of cells composing the vegetative axes had a length and breadth of more or less equal dimensions.

Dictyota crenulata J. Agardh, 1847; Børgesen, 1914: 56, figs. 36-37.

Collection number 18734.

The fragmentary material had the distinct small crenulations along the margins which suggested that the 2 cm pieces could be placed in this taxon.

Dictyota divaricata Lamouroux, 1809; Taylor, 1928: 120.

Collection number 18754.

This single specimen measured 6 cm in length, 3 mm broad at the torn-off base, and 10 microns wide at the attenuated tips. The material was fertile and bore mature spherical oogonia 6 to 8 microns in diameter. These were not grouped into sori, although frequently in triads, but were generally evenly distributed toward the tip of the thallus. The reproductive structures were considered to be oogonial rather than sporangial because of the absence of the classical 'tetrasporic' divisions which are characteristic of the sporangia in this genus.

Zonaria sp.

Collection numbers 18729, 18745, and 18716.

The material was young. In cross-section the medulla consisted of one layer of large square cells. The cortex, both above and below, was also mostly monostromatic with evidence of ensuing periclinal divisions. On the ventral surface rhizoids were present.

RHODOPHYTA

Falkenbergia hillebrandii (Bornet) Falkenberg, 1901; Børgesen, 1910: 199, fig. 17; Feldmann & Feldmann, 1942: 89.

Collection number 18751.

This sterile material was epiphytic on segments of Halimeda incrassata. Fragments of this species were also commonly found with other small epiphytes.

Asparagopsis taxiformis (Delile) Coll. & Herv., 1917; Børgesen, 1915-1920: 352, figs. 347-351.

Collection numbers 18742 and 18714.

The specimens were 7 to 8 cm high with rhizoidal, creeping bases attached to segments of Halimeda incrassata. Club-shaped spermatangial stichidia, 700 microns long, were borne on lateral branchlets. These had a basal diameter of 74 microns and 225 microns at the apex.

Galaxaura cylindrica (Ell. & Soll.) Kjellmann, 1900: 64, pl. 8, figs. 34-42.

Collection numbers 18750 and 18736.

Two sterile specimens of 7 and 9 cm height were identified by Mr. Gavino Trono, Jr., Botany Department, University of Hawaii.

Hydrolithon reinboldii (W. v-B. & Foslie) Foslie, 1909; Weber van Bosse & Foslie, 1904: 49, fig. 21, pl. 10, fig. 1-6.

Collection numbers 18748 and 18749.

This coralline crust was growing on coral fragments. The hypothalial cells were 15 microns long and the perithallus was constructed of irregularly shaped cells. The specimens corresponded well with the description and figures in Weber van Bosse & Foslie (1904).

Jania capillacea Harvey, 1853; Dawson, 1953: 116.

Collection numbers 18712, 18719J, and 18735.

The small alga of 3 mm height was found frequently entangled with larger algae including Microdictyon setchellianum. The diameter of the dichotomously branching axes was 100 to 110 microns. The material was sterile.

Hypnea spinella (J. Ag.) Kuetzing. 1849; Børgesen, 1920: 384, fig. 369.

Collection numbers 18710 and 18757.

Several small clumps 2 to 4 cm in diameter and 1 cm high were identified. These clumps of intricately woven, terete axes with short spiny lateral branches frequently anastomosed with each other and with segments of Halimeda incrassata. The material was sterile.

Spyridia filamentosa (Wulf.) Harv. in Hooker, 1833; Taylor, 1928: 197, pl. 28, figs. 14-18.

Collection numbers 18760, 18737, 18728, and 18706.

The specimens varied in height from 2 to 8 cm and fragments were commonly extracted from other algae. Tetrahedral tetraspores were cut off by nodal corticating cells of the uniseriate laterals. The tetraspores, occurring 3 to 5 on a branchlet, tended to be borne on the adaxial surface although they were often produced laterally.

Centroceras clavulatum (Ag.) Montagne in Durieu, 1846; Taylor, 1950: 139.

Collection number 18763.

This material was epiphytic on segments of Halimeda incrassata and also commonly found on other algae.

Dasya pedicellata (C. Agardh) C. Agardh, 1824; Taylor, 1937: 326; Dawson, 1954: 451, fig. 56j.

Collection number 18743.

A single tetrasporic specimen 3.5 cm high, attached to a piece of coral, was identified as D. pedicellata by comparison with Dawson's collection (1954) of a short mature specimen of similar description which he placed in this taxon. The main axes were nude below but densely covered with branching monosiphonous laterals above. The lateral filaments had a diameter of 25 to 35 microns at the base and 5 to 7 microns at the tip. The juvenile stichidia were 230 to 250 microns in length, 80 to 90 microns wide, and lanceolate in shape. The tetraspores, the largest with a diameter of 25 to 30 microns, were not yet fully divided. With the exception of the small stature, this specimen agrees with the description given by Taylor (1937).

Taenioma perpusillum J. Agardh, 1863; Okamura, 1930: Icones 6,
pl. 264, figs. 17-19.

Collection numbers 18726, 18753, and 18750B.

This alga was commonly mixed with the other small epiphytic algae and was easily recognized by its dorsi-ventral habit, terminal trichoblasts at the ends of the erect axes, and the single-celled rhizoid arising from a ventral pericentral cell with no crosswall separation. The diameter of the prostrate filament was 140 microns and the rhizoids, 45 microns. The material was sterile.

Herposiphonia tenella (C. Ag.) Ambronn, 1880: Børgesen, 1918: 286,
figs. 287-289.

Collection numbers 18730, 18707, and 18754A.

The creeping, prostrate portion of this small epiphyte gave rise to erect branches 1 mm in height at random intervals along the dorsal surface of the prostrate filaments; rhizoids were cut off from the apical end of the ventral pericentral cells of nearly every segment. The diameter of the prostrate portion was 125 microns and the erect, 60 to 85 microns. The alga was a common epiphyte among the collections of larger algae. No fertile material was found.

Polysiphonia sp.

Collection numbers 18713, 18750, and 18704.

These specimens were commonly found on coral fragments, segments of Halimeda, and mixed with other small algal epiphytes. Both the branching, prostrate system and the non-branching, erect filaments had 12 to 15 pericentral cells. The erect axes, born dorsally on the prostrate axes, were separated from each other by one or more segments with no apparent regularity. The pericentral cells were 50 microns long and 135 microns in diameter. Unicellular rhizoids were cut off by a crosswall and arose from the middle of the ventral pericentral cells of the prostrate axes. The tips of the rhizoids were either slightly branched or discoid. No fertile material was found.

Polysiphonia sp.

Collection number 18704A.

The erect axis, 6 mm high, was composed of segments of 4 pericentral cells; each pericentral cell measured 140 microns square. There were no prostrate portions, and the erect filament arose from a basal clump of rhizoids. Above one pericentral cell in each segment was a scar cell. These latter cells were arranged in a spiraling sequence on the thallus. This specimen agreed with one of Dr. G. J. Hollenberg's tentative species, in manuscript.

Polysiphonia sp.

Collection numbers 18727 and 18704.

An erect axis 7 mm long, with 4 pericentral cells was borne from a tuft of rhizoids at the base. The pericentral cells were 140 microns long and 70 microns wide. Prostrate portions were not apparent. Trichoblasts were present only at the tips of the branches with a scar cell present above one pericentral cell in every segment and ultimately arranged in spiral sequence on the thallus. There was little branching except for several major dichotomies. The material agreed with one of Dr. G. J. Hollenberg's tentative species, in manuscript.

Laurencia obtusa (Huds.) Lamouroux var. densa Yamada, 1931: 226, pl. 17, fig. c; Dawson, 1954: 458, fig. 61 H.

Collection numbers 18708 and 18732.

Densely entangled mats, 3 to 4 cm high were identified. All axes were approximately 1 mm in diameter and they were frequently anastomosed with Halimeda. The primary branches as well as the secondary laterals were given off in spiral succession, the latter were slightly tapered at the base and were up to 5 mm long. The cortical cells were approximately 30 to 40 microns wide and 50 to 60 microns long. The outer periclinal wall of the cortical cells was about 10 microns thick. Lenticular thickenings were common in the medullary cells. The material was sterile.

Laurencia parvipapillata Tseng. 1943b; Dawson, 1954: 458, fig. 61g.

Collection number 18754L.

This small alga, 1.75 cm long corresponded well with Dawson's figure (1954).

Chondria repens Børgesen, 1924; Tanaka, 1963: 66, fig. 4a-d.

Collection numbers 18754C and 18749A.

This material was common on small pieces of coral and was frequently anastomosed with fragments of Spyridia and Laurencia. This small alga had both a prostrate portion and an erect system, the latter having a height of 4 to 5 mm. The terete vegetative thallus had a nearly uniform diameter of 210 to 250 microns. Tetrahedral tetraspores 70 to 130 microns in diameter were scattered at the ends of erect, determinate branches. The tetrasporangial branches were broadly clavate when young and became less expanded when older. These mature branches had a diameter of 720 to 740 microns at the apex and 250 microns at the axil. Erect vegetative branches produced secondary laterals sparingly. In cross-section, the cortical cells were more or less the same size as the medullary cells, about 100 microns in diameter. The specimens agreed well with Tanaka's description (1963).

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