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NOTES ON EASTERN PACIFIC INSULAR
MARINE ALGAE

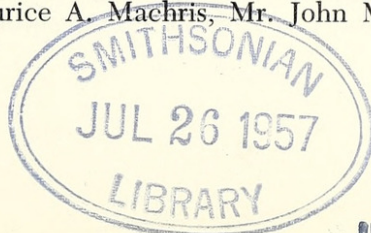
by E. YALE DAWSON¹

The following records are made from incidental collections from four widely separated, oceanic, insular areas of the far eastern Pacific, namely, the Galapagos Archipelago, Clipperton Island, San Benedicto Island, and the Alijos Rocks. Although the marine flora of the Galapagos Islands has been well documented by Taylor (1945) even the present small collection, obtained for the Los Angeles County Museum through the efforts of Mr. and Mrs. Maurice A. Machris², has revealed a number of species previously unreported there. The algae of Clipperton Island are known from the report by Taylor (1939) which treats mainly of fresh water species from the lagoon. The present material, provided by the Scripps Institution of Oceanography, consists only of a handful of reef turf, but quadruples the number of known marine species. San Benedicto Island's marine flora is known from the writer's report following the recent volcanic activity there (Dawson 1954). The present material, obtained by him on a California Department of Fish and Game cruise, supplements that of the first report. The Alijos Rocks, nearly 200 miles off Pacific Baja California, have remained botanically unknown. The writer, in two attempts to reach and obtain algal collections from these dangerous pinnacles, succeeded on one occasion in obtaining some detached specimens from the surf zone flora. The first comprehensive collections, however, were obtained in October, 1956, by aqua lung diver Conrad Limbaugh and submitted for study by the Scripps Institution.

Most of the specimens are cited here with the writer's serial number, since no numbers were assigned by the other collectors. The first set of

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²Expedition sponsored by Mr. and Mrs. Maurice A. Machris, Mr. John McNabb, Mr. Hal Roach, Jr., and Mr. Dwight Hirsh.



specimens, including most of the small species preserved in liquid, is deposited in the Herbarium of the Los Angeles County Museum. Second and third sets are in the herbaria of the University of California, Berkeley, and the Allan Hancock Foundation. The several Cyanophyta from Clipperton Island were identified by Francis Drouet and deposited in the Herbarium of the Chicago Natural History Museum.

1. The Galapagos Archipelago

Tagus Cove, Albemarle Island, February 17-18, 1957; collected from rocks at low tide by Paquita Machris and J. R. Northern³.

Ulva lobata (Kütz.) Setch. & Gard. 16292; 16302 These are very young specimens epiphytic on old *Padina*. They are probably the same as the *Ulva* reported as *U. fasciata* by Farlow (1902) collected at the same place and in the same month in 1899.

Entocladia viridis Reinke 16293b This plant, growing in the membrane of *Polysiphonia*, seems to be the same as the *E. polysiphoniae* Setch. & Gard. from the Gulf of California, but the distinctions from the widespread *E. viridis* are not clear. Not previously reported from the Galapagos Islands.

Cladophora perpusilla Skottsb. & Levr. 16275 Not previously reported from the Galapagos Islands, but known from widely separated areas in the Pacific: Juan Fernandez Islands (type), Revillagigedo Islands, Viêt Nam. The cells in the present material are somewhat shorter on the average than in the type; those in the Viêt Nam plant are somewhat longer.

Padina durvillaei Bory 16272; 16291

Dictyota dichotoma (Huds.) Lamx. 16294; 16298 Fertile, well-developed material. Not previously reported from the Galapagos.

Sargassum setifolium (Grunow) Setchell 16273; 16290; 16300

Sargassum pacificum Bory 16274; 16289; 16299

Dermatolithon pustulatum (Lamx.) Foslie 16276 This tetrasporic material on *Sargassum pacificum* and on *Padina durvillaei* has conceptacles 300-360 μ in diameter and hypothallus cells 40-70 μ long. Reported from Chatham Island on *Zonaria* by Piccone (1886).

Centroceras clavulatum var. *inerme* (Kütz.) Piccone 16293a

Floating at Tagus Cove, February 17, 1957; collected by J. R. Northern

Sargassum albemarlense Taylor 16297

In tide pools on Narborough Island opposite Tagus Cove, February 18, 1957; collected by Maurice A. Machris

Ulva lobata (Kütz.) Setch. & Gard. 16278 Very young material on *Padina*, apparently like numbers 16292 and 16302 above.

³Preparator, Los Angeles County Museum.

Cladophora sp. 16285 It has not been possible to place these small plants satisfactorily. They are less than 1 cm. high, in tufts on calcareous material, and have a tendency to inflated ends of the cells suggesting a relationship to *C. echinus* (Bias.) Kütz. The walls are thick, and some cells are given off in a manner like *Cladophoropsis*.

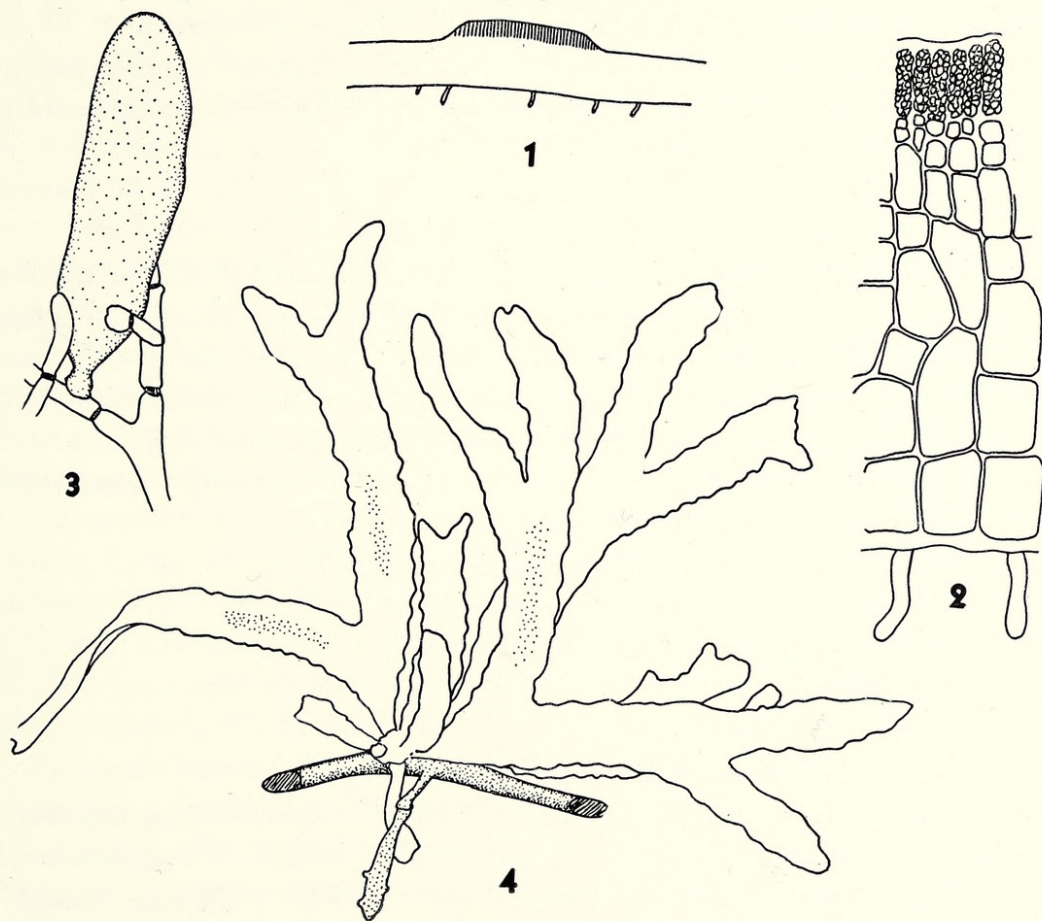
Padina durvillaei Bory 16277

Sphacelaria furcigera Kütz. 16283a Not previously reported from the Galapagos Islands.

Sargassum pacificum Bory 16288

Peyssonelia rubra var. *orientalis* Weber van Bosse 16280 Not previously reported from the Galapagos Islands. The present material is antheridial. The sori consist of scattered, low, circular elevations 40-60 μ high and 1-2 mm. in diameter (Figs. 1-2).

Lithophyllum ? *trichotomum* (Heydr.) Lemoine 16287 Not previously reported from the Galapagos Islands.



Figs. 1-2. *Peyssonelia rubra* var. *orientalis* Weber van Bosse. Fig. 1. Diagrammatic representation of an antheridial sorus in vertical section, x 35. Fig. 2. Small portion of a vertical section through a plant bearing an antheridial sorus, x 217.

Fig. 3. *Botryocladia chaijeana* (Meneghini) Kylin. A plant from the Alijos Rocks attached to *Amphiroa*, x 5.

Fig. 4. *Callophyllis violacea* var. *epiphytica* Dawson. A small tetrasporangial plant from the Alijos Rocks growing on *Pterocladia*, x 5.

- Amphiroa annulata* Lemoine 16286 Reported in the Galapagos Islands only from the type dredged at James Bay, James Island. Known intertidally in Mexico.
- Jania capillacea* Harvey 16279b Not previously reported in the Galapagos Islands.
- Dermatolithon pustulatum* (Lamx.) Foslie 16284
- Hypnea cervicornis* J. Agardh 16279 Small entangled specimens.
- Ochtodes crockeri* Setch. & Gard. 16281; 16282 These two collections are very different in size. The latter consists of plants only 2 cm. tall which show a great similarity to Cuban specimens of *O. secundiramea* (Mont.) Howe. There is a tendency, however, to flattening and a fairly-well-marked development of the branching in one plane to an extent not observed in the Caribbean plants. In well-developed *O. crockeri* the large size and coarseness become readily distinctive.
- Ceramium serpens* Setch. & Gard. ? 16283b Sterile.
- Ceramium templetoni* Setch. & Gard. 16279a Fragments.
- Ceramium howellii* Setch. & Gard. 16278a. A small amount creeping on *Padina*. This is from near the type locality on the southeastern shore of Narborough Island.

2. Clipperton Island

Previous reports of marine reef algae from Clipperton Island consist of only four species: *Caulerpa racemosa* (Forsk.) J. Ag., *Jania capillacea* Harv.; *Dictyopteris delicatula* Lamx.; *Zonaria variegata* Lamx. The new collection by Limbaugh from the reef flat contains two of these and thirteen other species not heretofore reported from the seaward reefs. It consists largely of a mass of *Jania* mixed with *Chnoospora* and various smaller species as listed below.

- Entophysalis conferta* (Kütz.) Drouet & Daily
- Hydrocoleum comoides* (Harv.) seq. Gomont
- Hydrocoleum glutinosum* (Ag.) seq. Gomont
- Lyngbya infixa* Frémy
- Lyngbya guaymensis* Drouet
- Oscillatoria subuliformis* Kütz. seq. Gomont
- Ulva lobata* (Kütz.) Setch. & Gard. ? 16310 Very young material.
- Colpomenia sinuosa* (Roth) Derbes & Solièr 16311 Fragmentary.
- Dictyopteris repens* (Okamura) Börgesen 16308 This is probably the plant identified by Taylor as *Dictyopteris delicatula*, but to be distinguished by the lack of a delicate rib along the thallus margins.
- Focockiella variegata* (Lamx.) Papenfuss 16305 This is Taylor's *Zonaria variegata*.
- Chnoospora implexa* Hering ex. J. Ag. 16304 Not previously

known in the eastern Pacific.

Jania tenella Kütz 16303

Hypnea sp. 16312 Sterile fragments.

Polysiphonia ferulacea Suhr 16306 Diminutive specimens only
1-2 cm. tall from the *Jania* turf, but cystocarpic and tetrasporic.

Herposiphonia secunda (Ag.) Ambronn 16307

Ceramium serpens Setch. & Gard. ? 16309 The material is tetrasporic, but is too scant to make a positive distinction from the closely related *C. camouii* Dawson.

3. San Benedicto Island, Mexico

The first and only collections reported to date from this island were obtained by the writer November 17-18, 1953. At that time a flora was just beginning to appear on the fresh lava from the December 1952 flow. Only nine species were detected after rather careful search of the area adjacent to the landing cove, and only seven of these were sufficiently mature to identify specifically.

On April 17, 1955, with the help of John E. Fitch, leader of cruise 55-Y-3 of the M/V YELLOWFIN a brief landing was made at the same locality as in 1953 and some samples of the algal cover on the new lava hastily obtained. An examination of these has shown a considerable amplification of the flora during the intervening seventeen months, but less than had been expected.

Of the nine species previously found, four were detected again, namely, *Herposiphonia tenella* (Ag.) Ambronn, *Ectocarpus mitchellae* Harv., *Grateloupia versicolor* var. *prostrata* Dawson, and *Enteromorpha* sp., now identified as *E. flexuosa* (Wulfen) J. Ag. In addition, eight other species were present: *Cladophora inserta* Dickie, forma (small plants 1 cm. tall); *Centroceras clavulatum* (Ag.) Mont.; *Ceramium sinicola* Setch. & Gard., *Lomentaria* sp. (aff. *L. hakodatensis* or *L. baileyi*); *Lithophyllum decipiens* (Foslie) Foslie; *Peyssonelia* sp; *Ralfsia* sp.; *Callithamnion marshallensis* Dawson? (possible a lax form of *C. paschalis* Börg. since the branching is quite regularly distichous.)

From a distance the *Lithophyllum* was the most conspicuous alga, showing as a pinkish color against the black lava in many places within tidal range. The remainder of the flora was not evident except at close hand and consisted of discontinuous, lighter and heavier carpets of very short plants, sometimes in pure stands, often mixed, but rarely more than about 1 cm. tall. *Enteromorpha*, *Centroceras*, *Ectocarpus*, *Herposiphonia* and *Lomentaria* occurred in quite extensive and dense colonies. The *Grateloupia* was occasional, as were *Peyssonelia* and *Ralfsia* which were evidently just becoming established. A conspicuous

epiphytic flora of diatoms occurred on much of the algal turf.

Collections from the undisturbed substrate at the north end of the island could not be obtained on this occasion because of rough seas, but in making the attempt, an area at the base of the western cliffs was found where quantities of floating pumice indicated a recent landslide into the sea. There, with the pumice, dislodged specimens of *Asparagopsis taxiformis* (Delile) Collins & Hervey were abundant, together with some *Dictyota divaricata* Lamx. Neither of these species had been found among the earlier collections.

4. Alijos Rocks, Mexico

No previous records of marine algae exist for the Alijos Rocks, lying at North Lat. $24^{\circ} 50'$, 180 miles west of Magdalena Island, Baja California, and consisting of three completely isolated, precipitous pinnacles arising from ocean depths of over 2000 fathoms. The nearest oceanic island to the north is Guadalupe, and to the south, Socorro. The rocks lie far beyond the influence of coastal upwelling along Baja California and surface water temperatures apparently range largely between 20 and 22° C. Surface temperatures on November 15, 1953 were about 21° C. in the vicinity of the rocks. Accordingly, upon the writer's visit in 1953 it was anticipated that a warm water flora, lacking members of the Laminariales, would be found there. Upon that occasion our ship was unable to approach closer than about 1500 yards because of large ocean swells that produced a gigantic surf breaking over the rocks and dashing spray almost to their tops. By using a skiff to move in closer and across a foam line it was possible to collect several species by dip net from those being torn loose by the pounding sea. These included *Macrocystis pyrifera* (L.) Ag. (12036), which was apparently dominant around the base of the rocks; *Egregia australis* Hollenberg ms. (12037); and the sea grass *Phyllospadix torreyi* S. Wats (12038). In addition, a floating specimen of *Cystoseira* was observed but not secured.

It was surprising to find these cool water elements, characteristic of the temperate shores of California, so far outside of their known geographical and temperature ranges. An explanation for this seems to be found in the violent agitation around the rocks. This causes exceptional aeration sufficient partly to compensate for the higher temperatures by providing adequate available metabolic gases, notwithstanding the lower solubilities in the warmer water. The marine flora in the vicinity of the surface, thus, shows a distinctly northern facies.

The 1956 collections, hand picked by Conrad Limbaugh in depths of 25 to 90 feet, stand in marked contrast to those from the the surface

area mentioned above. Nine species of tropical character appear whose Pacific Coast distributions are not known to extend north of warm Guadalupe Island at North Lat. 29°, nor, except for local warm spots, along the cool Pacific shores of Baja California. Their presence at moderate depths in very clear water seems to indicate that below the surface region, influenced strongly by the extreme aeration, the normal effects of higher temperature are reflected by the presence of a prominent complement of warm water species. In the annotated list below, these warm water elements are marked with an asterisk.

Phyllospadix scouleri Hooker 16151 This was found unattached and presumably drifted down from a colony in the surf zone. It may be considered a fifth species known from the surface region.

Lyngbya gracilis Gomont 16157c

Codium setchellii Gardner 16161

**Pocockiella variegata* (Lamx.) Papenfuss 16168

Pterocladia pyramidale (Gardner) Dawson 16152 This plant was most abundant in the samples and in very luxuriant condition.

**Asparagopsis taxiformis* (Delile) Collins & Hervey 16160 Common in the samples.

**Liagora farinosa* Lamx. near var. *pinnatiramosa* Yamada 16170 Sterile.

Melobesia mediocris (Foslie) Setch. & Mason 16151a A few crusts on the detached *Phyllospadix scouleri*.

**Jania tenella* Kütz. 16168a

**Amphiroa crosslandii* Lemoine 16162

Plocamium pacificum Kylin 16159 Very small male plants only 2 cm. high, epiphytic on *Pterocladia*.

Binghamiella forkii (Dawson) Silva 16157 A rare species known previously only from two collections, at La Jolla, California, and at Punta Baja, Baja California.

Callophyllis violacea var. *epiphytica* Dawson 16156; 16169 These small, delicate plants do not at first suggest the genus *Callophyllis* although their structure identifies them here. Some are tetrasporic, but only 2-3 cm. tall. (Fig. 4)

Botryocladia chajjeana (Meneghini) Kylin 16163 The several tetrasporic plants are in good agreement with the account of Geneviève Feldmann (1945). The gland cells are in isolated groups of 3 or 4. This is the first record of this species in the Pacific. (Fig. 3)

Antithamnion breviramosus Dawson 16153a These are like the southern California type in overall size and habit, but have somewhat longer and more slender branches than the type.

**Crouania attenuata* (C. Ag.) J. Ag. 16172 Small male plants, to

- 2 cm. long, creeping on *Liagora* and on *Pterocladia*.
Ceramium zaca Setch. & Grad. 16154 Luxuriant tetrasporic and cystocarpic plants on *Pterocladia*.
Ceramium sinicola Setch. & Gard. var. *sinicola* 16155 Tetrasporic plants epiphytic on *Pterocladia*.
 **Ceramium clarionense* Setch. & Gard. 16165a Tetrasporic plants on *Codium*.
Ceramium camouii Dawson 16171 Tetrasporic plants creeping on *Liagora*. Note that all the involucres are not symmetrical.
Heterosiphonia erecta Gardner em. Setch & Gard. 16158;16164 Tetrasporic plants on *Pterocladia*.
 **Dasya pedicellata* (C. Ag.) C. Ag. 16165 Dwarf male plants only 2 cm. tall, epiphytic on *Codium*.
Branchioglossum woodii (J. Ag.) Kylin 16166 Tetrasporic.
Cryptopleura corallinara (Nott) Gardner 16157 Tetrasporic.
Polysiphonia mollis Hooker & Harvey 16161a According to Cribb (1956) this name represents an earlier designation of plants known in the central Pacific as *P. tongatensis* Harvey, and along the Pacific Coast of North America as *P. synderae* Kylin.
 **Chondria lancifolia* Okamura 16157a This material, although rather scant and small, agrees very well with this western Pacific species, especially as illustrated by Tseng (1945) from Hong Kong. It has not been reported previously from the American coasts.
Laurencia sp. aff. *L. spendens* Hollenberg 16157b Dwarfish.

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