NOTES ON THE MARINE FLORA OF THE MARQUESAS KEYS, FLORIDA

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The marine flora of the Florida Keys is luxurient and dense in many areas. Voss and Voss (1955) reported that *Thalassia* occurs in almost unbroken dense matted beds from the Biscayne Bay region to the Dry Tortugas. Taylor (1928), studying the Dry Tortugas algae, found that this assemblage was tropical in nature. Taylor (1929) reported a total of 478 different algae for the State, with 28 more names which were not sufficiently well known to justify inclusion at that time. Most of the algae reported were found at the Dry Tortugas.

The algal and seagrass floras of Key West and the Dry Tortugas have been studied by various workers and is the best known for marine plants in Florida. However, reports on the flora at the Marquesas Keys seem to be lacking. Millspaugh (1907) gave detailed information concerning the physical description of the Marquesas Keys and the terrestrial vegetation. No information was included on the submerged marine flora. Small (1913), reporting on the flora of the Florida Keys, did not include the Marquesas Keys. Bowman (1917) studied *Rhizophora* physiology at the Marquesas Keys, but did not mention seagrasses or algae. Davis (1940) listed three species of algae from the Marquesas in his work on the mangroves (see species list).

The Marquesas Keys are situated approximately 15½ nautical miles west of Key West and 45 miles east of the Dry Tortugas. Davis (1942) stated that the Marquesas Keys are composed of ten main islands and form an ellipse extending along a northeast-southwest axis. According to him the elliptic shape is the result of the strongest combined action of wind-formed currents, the Florida countercurrent which flows westward along the southern margin of the islands, and the tidal currents. A northeast current results which accounts for the elliptic shape.

Davis (1942) noted that: " . . . the outer faces of the islands around the Marquesas atoll receive the strongest currents and

[1] Contribution No. 35 from The Fla. State Board of Cons. Marine Lab. Maritime Base, Bayboro Hrbr., St. Petersburg, Fla.

wave action, which cause the coarsest materials to pile up on these outer faces. Finer materials are deposited on the lee or inner faces of the islands . . . consequently the inner faces of the islands are mud flats covered by mangrove swamps".

This paper provides a starting point for the knowledge of the marine flora of the Marquesas Keys.

The author is indebted to Drs. R. F. Hutton and V. G. Springer, and Messrs. K. D. Woodburn and H. C. Morgan, Jr., for their aid in collecting and for their helpful observations in the field.

Fig. 1. Clumps of *Halimeda opuntia triloba* as found projecting out of water at spring slack low tide at the Marquesas Keys.

Discussion

This trip to the Marquesas Keys was made on 18 July 1959 during a period of full moon and spring tides. The water in all locations except station 6 was clear and transparent. Bottom details were clearly seen from the surface to the greatest depth at which observations were made, approximately 14 feet.

Station 1 was on the north side of Long Beach Key about one-half mile offshore. The depth varied from 3 to 5 feet on ebb tide. Very dense *Thalassia testudinum* was observed with leaves up to 1 foot long. *Syringodium filiforme* was seen in very sparse quantity interspersed in the *Thalassia*. Unattached *Dictyota divaricata* was present in abundance.

Fig. 2. Closeup of *Halimeda* clump to display density of growth. *Thalassia* leaves interspersed in the *Halimeda* growth.

The most detailed observations were made approximately one-half mile off the northwest tip of Long Beach Key, at station 2. The depth was 2 to 2½ feet on the ebb tide but fell to a depth of 6 inches on the slack low tide. The *Thalassia* growth in this area was so dense that a pushnet could not be operated effectively. *Diplanthera wrightii* was seen in very sparse quantity interspersed in the *Thalassia*. Woodburn (personal communication) reported that patches of *Diplanthera* were growing close to the shore of this key. Two species of *Penicillus* were conspicuous in this location. *Halimeda opuntia triloba* was extremely abundant in very large clumps. Many of these clumps were up to two feet long and nine

inches high, projecting out of water at the slack low spring tide (Figs. 1 and 2).

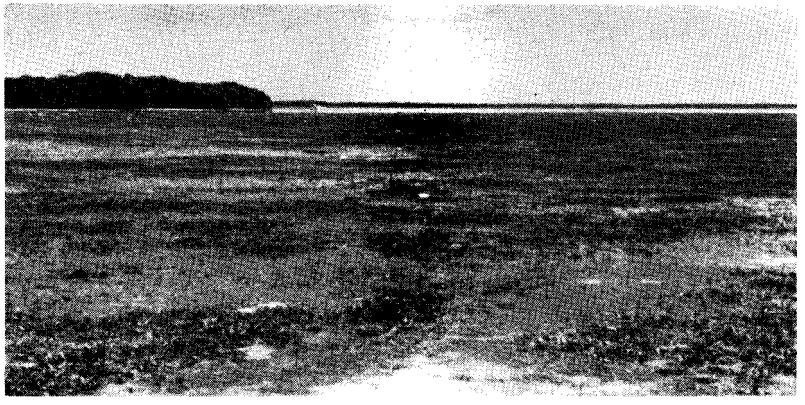

Fig. 3. Exposed flats at spring slack low tide. Taken ½ mile offshore at northwestern tip of Long Beach Key.

Fig. 4. Closeup of *Thalassia* leaves exposed to the air at slack low tide. *Halimeda* plants beneath leaves.

Close to shore, the bottom was exposed to air at slack low tide. Looking southeast from the area of station 2 vast exposed flats were seen (Fig. 3). At the station 6 inches of water was present, but *Thalassia* leaves were observed projecting out of water (Fig. 4).

The substrate at station 2 was composed of *Halimeda* segments (Fig. 5). A sparse amount of silt was present which emitted an odor suggestive of H_2S. An abundance of *Astrea* shells were interspersed among the segments. The living *Halimeda* was the obvious source of this bottom material. Probably, as the portions of the *Halimeda* left exposed at the spring slack low tides were killed, they were subsequently dislodged to the surrounding bottom. Wave action causing breakage of plants and natural death of segments are additional means of *Halimeda* accumulation on the bottom. This bottom was extremely coarse and loosely packed which made walking difficult. The author dug to a depth of 6 inches, 2 inches below the level of the *Thalassia* rhizomes, and encountered coarse *Halimeda* segments throughout. The depth to which these segments extended was not determined. The extremely dense

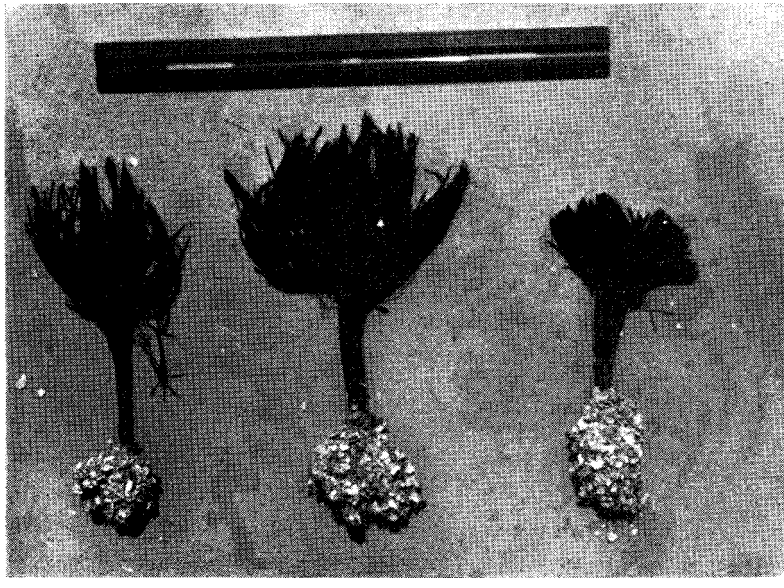

Fig. 5. Plants of *Penicillus dumetosus*. Notice is drawn to *Halimeda* segments bound by the rhizoid system. Taken to display character of bottom substrate.

growth of *Thalassia* on this type of bottom is interesting, and presents a striking contrast to the bottom types on which *Thalassia* has been observed by the author and others.

At station 3 the depth varied from 3 to 7 feet at slack low tide at a distance about 200 yards offshore. The bottom type was *Halimeda* segments and *Astrea* shells. Dense *Thalassia* growth was observed with occasional interspersed bare spots containing sparse amounts of *Penicillus dumetosus*. *Diplanthera* was observed in patches at the southwest tip of the keys.

The depth and bottom type for stations 4 and 5 were similar to that of station 3 except that very occasional exposed rock was seen in the area of station 4. *Thalassia* growth was dense. At station 4 the *Diplanthera* was more commonly seen than at station 3, and at station 5 it was not seen at all, but a few *Syringodium* patches were observed in 4 to 5 feet of water.

Station 6 was made in a channel on the inside of the keys. (See Fig. 6). This is one of the channels previously described by Davis (1942). The water was murky, with visibility limited to approximately 6 to 7 feet, while the depth of the channel was from 6 to 14 feet. *Thalassia* was observed growing in the channel to at least a depth of 6 feet.

All the *Diplanthera* collected or seen had leaves only 8 to 10 inches long but were wide bladed, up to 2.5 mm. This is as wide as the author has ever seen *Diplanthera* leaves.

From observations it appeared that most of the bottom around the outside of the Marquesas Keys was composed of *Halimeda* segments. *Halimeda* grew in large clumps around the keys, both inside on mud flats and offshore, at least to the 3 to 7 foot depth at spring slack low tide. At the shore line of the keys the bottom was composed of finely ground *Halimeda* segments.

Shallow mud flats were found to be extensive on the inside of the Marquesas Keys. *Thalassia*, whose leaves were left exposed at the spring low tide, was extremely dense on these mud flats.

Thalassia was observed in depths of 12-14 feet where it became very sparse. The most abundant growths were found from the shallowest flats to water 7 feet deep at the spring slack low tide.

A great amount of leaf kill was observed on the *Thalassia* leaves in the area. This is probably related to the exposure on the spring slack low tides.

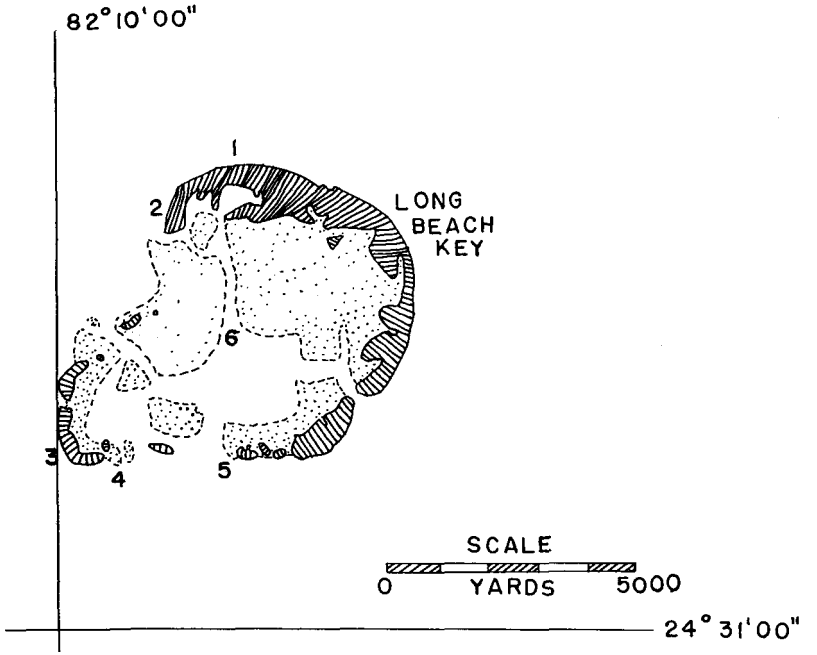

Fig. 6. Map of area with stations plotted. Shaded areas on inside of keys are shallow mud flats exposed at spring low tides.

A species list of the plants identified follows:

Seagrasses

Diplanthera wrightii Aschers.
Syringodium filiforme Kutz.
Thalassia testudinum Konig.

Algae—an asterisk designates an epiphytic plant.

Acetabularia crenulatum Lamx. (also reported by Davis, 1940).
Caulerpa cupressoides (West) C. Ag. (reported by Davis, 1940).
**C. cupressoides* (West) C. Ag. var. *typica* Weber.
**C. sertularioides* (Gmel.) Howe var. *brevipes* (J. Ag.) Sved.
Chaetomorpha gracilis Kutz.
**Cladophora delicatula* Mont.
Halimeda opuntia (L.) Lamx. var. *triloba* (Decaisne) Barton
Penicillus capitatus Lamarck
P. dumetosus (Lamx.) Blainville
**Phaeophila dendroides* (Crouan) Batters

Udotea flabellum (E. & S.) Howe
Dictyota divaricata Lamx.
**Centroceras clavulatum* (C. Ag.) Mont.
**Ceramium subtile* J. Ag.
**Chondria* sp.
**Fosliella farinosa* (Lamx.) Howe
Gracilaria cornea J. Ag. (reported by Davis, 1940).
Hypnea spinella (C. Ag.) Kutz.
Laurencia obtusa (Huds.) Lamx.
**Dichothrix fucicola* B. & F.
**Oscillatoria margaritifera* Kutz.
**O. nigro-viridis* Thwait.
**Plectonema nostocorum* Born.

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