THE QUARTERLY JOURNAL OF THE
FLORIDA ACADEMY OF SCIENCES

VOL. 23 SEPTEMBER, 1960 NO. 3

ECOLOGY AND DISTRIBUTION OF MARINE ALGAE FOUND IN TAMPA BAY, BOCA CIEGA BAY AND AT TARPON SPRINGS, FLORIDA

RONALD C. PHILLIPS
Florida State Board of Conservation Marine Laboratory

Reprinted from
Quarterly Journal of the Florida Academy of Sciences
Vol. 23, No. 3, September, 1960

ECOLOGY AND DISTRIBUTION OF MARINE ALGAE FOUND IN TAMPA BAY, BOCA CIEGA BAY AND AT TARPON SPRINGS, FLORIDA

RONALD C. PHILLIPS
Florida State Board of Conservation Marine Laboratory[1]

INTRODUCTION

It is generally accepted that Tampa Bay lies in the subtropics but near the line of division between the subtropical and warm temperate zones of the Florida west coast. From my previous work (Phillips, 1960) on seagrasses in this area, I concluded that this applied to marine environments as well as to the terrestrial environments.

A study of marine algae was conducted at various stations in Tampa Bay, Boca Ciega Bay, and at Tarpon Springs on the Florida west coast from September, 1957, to April, 1959. Most intensive observations were made from December, 1957, in all three areas through December 1958, in Tampa Bay, through March, 1959, in Boca Ciega Bay, and through April, 1959, at Tarpon Springs. The study was considered important owing to the scattered nature of algal observations in this strategic area in previous years.

Tidal submergence and emergence, temperature, salinity, light, substratum, and degree of exposure of the locality were the major environmental variables considered.

Several authors listed algae from the Tampa Bay region: Earle (1956), Taylor (1936, 1954), and Hutton *et al.* (1956). All algae reported by these authors will be designated in the annotated list. Dr. Clark Rogerson of the New York Botanical Garden generously sent field notes made by Dr. M. A. Howe during a visit to Port Tampa in Tampa Bay on 22 November 1902 (personal communication). Several genera of algae listed will be treated in the discussion.

In this paper 195 taxa of algae are reported. Of these 186 taxa were found by me.

In the annotated list these terms are used: littoral (intertidal)

[1] Contribution No. 49 from The Fla. St. Bd. Cons. Mar. Lab. Bayboro Hrbr. St. Petersburg, Fla.

and upper infralittoral [depths from mean level of low tides downward to five to ten meters—Feldmann (1954)]. Summer as designated extends from June through August, autumn extends from September through November, winter from December through February, and spring from March through May. This grouping is arbitrary as environmental conditions of certain seasons extend into others, but this seasonal classification does provide a more thorough delineation of plant occurrence.

Acknowledgment is made to Messrs. Raymond Guess, General Agent, and A. B. Mann, Conservation Agent, for their help in collecting algae at Tarpon Springs. Sincere appreciation is accorded to Mr. George Goldie of Goldie's Fish Camp at Tarpon Springs and to the brothers Grant and Howard O'Neill, owners of the Skyway Boat Basin in Boca Ciega Bay, for permitting the use of their boat ramps. Acknowledgment is extended to Dr. V. G. Springer and Mr. K. D. Woodburn for data contributed to the paper. The encouragement and help of Mr. R. M. Ingle, Director of Research, and Dr. R. F. Hutton, Biologist-In-Charge, throughout the study is sincerely appreciated.

I am indebted to Dr. Wm. Randolph Taylor, University of Michigan, to Dr. H. J. Humm, Duke University, to Dr. P. C. Silva, University of Illinois, and to Dr. Francis Drouet, University of Arizona, for several algal identifications.

Methods and Materials

Nine stations were visited monthly, three each in Tampa Bay, Boca Ciega Bay, and at Tarpon Springs, to observe and collect the plants and to make hydrographic observations. The stations in Tampa Bay were chosen to conform to the salinity gradient existing in the Bay. Boca Ciega Bay stations were selected according to minimum water depth. At Tarpon Springs stations were chosen according to prevailing water depth and degree of wave exposure of the locality. Miscellaneous collections from all parts of Tampa Bay, Boca Ciega Bay, and Tarpon Springs are included in the data.

Water temperature was noted at the time of collection using a centigrade thermometer. Water was collected and brought to the laboratory in sealed jars for salinity determinations. All salinities

were taken from bottom samplings and were determined with a hydrometer type salinometer.

Water turbidity was not measured as bottom could usually be seen from the water surface at all stations except at Cats Point Bank and Pine Key in Boca Ciega Bay.

Tidal data, such as stage of tide (flood or ebb) and type of tide (neap or spring), was taken. Depth of water was recorded.

Collecting methods varied according to the situation. In the clear water surrounding the Anclote Keys at Tarpon Springs skin-diving was the most effective collection method. An aqualung was used in water 14-18 feet deep northwest of the Anclote Keys. In very shallow water collections were made by wading. In several areas a box type dredge was hauled along the bottom from a boat.

All plants collected in the field were preserved in a 10% solution of formaldehyde.

Plants collected are retained in the herbarium of the Florida State Board of Conservation Marine Laboratory.

Descriptions of Stations

Extensive descriptions of Tampa Bay, Boca Ciega Bay, and the Tarpon Springs area and the regularly visited stations are contained in Phillips (*op. cit.*). Some description of these areas will be included here. Location of regularly collected stations is given in Fig. 1.

Tampa Bay

Tampa Bay as defined in this paper does not include Boca Ciega Bay. It comprises Old Tampa Bay, Tampa Bay, and Hillsboro Bay. The following data was taken from Olson (1953): the total area of Tampa Bay was 319 square miles; the bottom areas under six feet of water were 92.5 square miles (approximately 20% of the bay); because the mean depth was 11 feet, he considered Tampa Bay as a shallow body of water; four important streams flow into Tampa Bay, but their discharge is probably a minor factor in the flushing of the bay; a salinity gradient was present in the bay.

According to the 1958 East Coast Tide Tables the mean tidal range at the Municipal pier in St. Petersburg is 1.4 feet, and the spring range is 1.6 feet. At the north end of Old Tampa Bay the mean range is 1.9 feet, and the spring range is 2.5 feet.

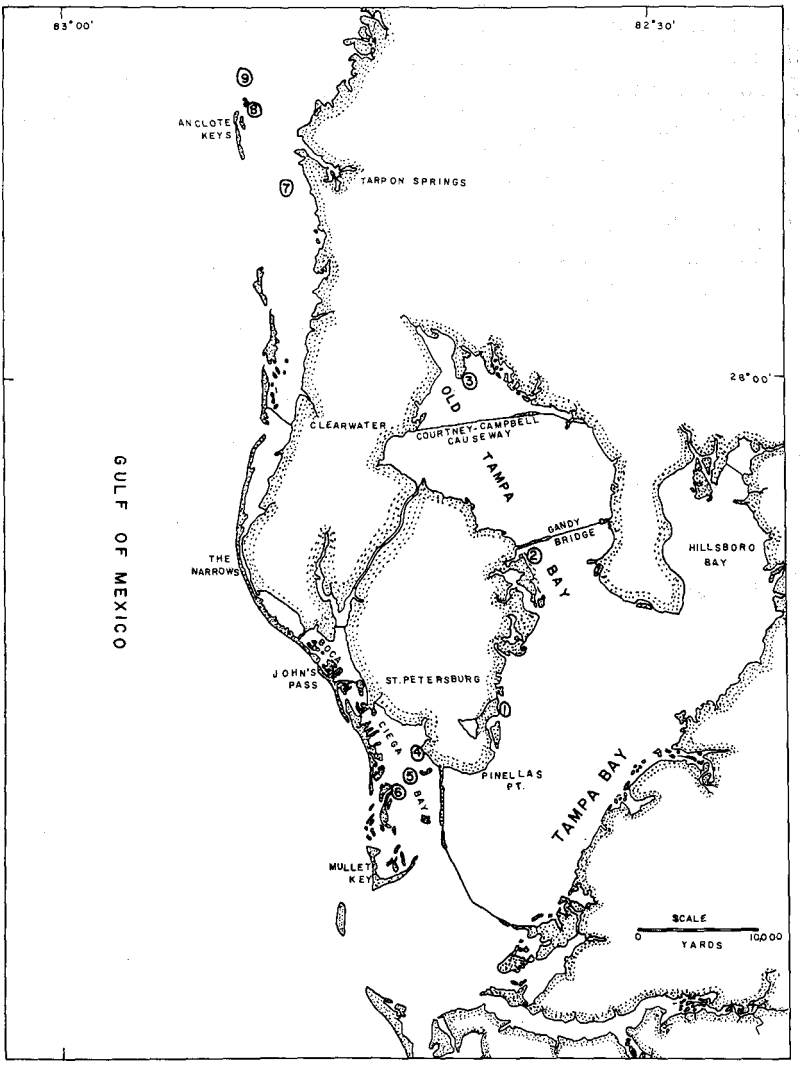

Fig. 1. Map of Tampa Bay area with location of regularly collected stations. 1. Beach Drive, SE; 2. Lower Gandy Flat; 3. Mobbly Bay; 4. Cats Point Bank; 5. Bird Key Middle Ground; 6. Pine Key; 7. Anclote Anchorage; 8. Southeast corner of North Anclote Key; 9. Flat north of North Anclote Key.

The substrates in Tampa Bay vary from a firm to soft muddy sand near shore on shallow flats to the soft mud in deeper water. Several of the very soft mud samples were collected from water 15-18 feet deep. Goodell and Gorsline (1959) concluded that generally speaking, over substantial areas of the bottom, Tampa Bay sediments were fairly uniform. Other unreported work indicates that a more detailed study would reveal differences, particularly in the deeper, less washed regions.

The water of Tampa Bay is relatively turbid, although bottom details were easily seen from the surface at the regularly visited stations. Bottom was not seen in any area in water deeper than six feet, but on 21 July 1943 Shoemaker (1954) recorded a Secchi disc reading of 3.7 meters in the spoil area just east of the Sunshine Skyway and south of the "Cut A" Channel. Turbidity is probably higher in summer than in winter owing to high precipitation in summer. It was noticed that water clarity was greater in winter than in summer. This aspect needs further study.

The following three stations were regularly visited each month for one year.

At Beach Drive, 17th.-19th. Ave., SE, in St. Petersburg, water depths on the deeper portions of the flat varied from six inches to three feet on the spring tides. Over most of the flat seagrass leaves and algae were exposed to the air on lowest spring low tides. After exposure bleaching and killing of leaves and algal portions exposed were observed. *Diplanthera wrightii* was extremely abundant on the flat, but was apparently replaced by *Ruppia maritima* during late winter and spring. *Thalassia testudinum* and *Syringodium filiforme* were limited to the portions of the flat not exposed at extreme low tides. Lowest observed water temperature (13.0°C.) occurred in February 1958, and the highest (34.5°C.) occurred in July and September, 1958. Observed mean salinity was 24.7 o/oo.

At Lower Gandy Flat water depths at high tide were usually three feet and as low as 18 inches at low tide. Seagrasses and algae were never observed exposed to the air. *Syringodium* was extremely abundant over the flat during the warmer months of the year. *Ruppia* and *Diplanthera* were relatively sparse on the flat as compared to *Syringodium* abundance. Lowest observed water temperature (12.5 °C.) occurred in February 1958, and the highest

(31.0 °C.) occurred in September 1958. Mean observed salinity was 23.1 o/oo.

Water depths on the shallow flats in Mobbly Bay varied from four feet at mean high tide to six inches at extremely low tide. Seagrass leaves and algae were never exposed to the air. *Syringodium* was abundant on the shallow flats, but was observed in lesser abundance in water six feet deep at mean low tide. *Diplanthera* was sparse here while *Ruppia* was slightly more abundant. East of the station on the north shore of Old Tampa Bay *Ruppia* was extremely dense. Lowest observed water temperature (7.0 °C.) occurred in February 1958, and the highest (31.0 °C.) occurred in September 1958. Mean observed salinity was 21.3 o/oo.

Miscellaneous observations were taken at Lewis Island near the Beach Drive station, at Mermaid Point and in Papys Bayou near Lower Gandy Flat, at North Shore Drive in St. Petersburg, at Big Island Flat north of Lower Gandy Flat, in Hillsboro Bay, shoreline from Courtney-Campbell Causeway around Davis Island to Hillsboro Bay, at the southwest tip of Booth Point near Mobbly Bay, and in Cooper's Bayou near Mobbly Bay. The conditions found in these areas are similar to those of the regularly visited stations near them.

Boca Ciega Bay

Hutton *et al.* (*op. cit.*) described this bay as an elongate coastal lagoon, separated from the Gulf of Mexico by barrier islands and connected to it by several passes. Maximum extension was over 16 miles with an average width of about two miles. They found the average depth to be four feet.

The north to south boundaries, as given by Hutton *et al.* (*op. cit.*) and accepted by the author are: The Narrows at the north to a line from Pt. Pinellas to the northeast tip of Mullet Key and from the northwest tip of Mullet Key to the southern tip of Pass-a-Grille Beach.

No major streams flow into Boca Ciega Bay. South of Corey Causeway brackish water from Tampa Bay may exert the greatest influence in diluting sea water.

The mean tidal range, as given in the 1958 East Coast Tide Tables, at Pass-A-Grille is 1.3 feet, and the spring range is 1.7 feet.

At Gulfport the mean tidal range is 1.5 feet, and the spring range is 1.7 feet.

Substrates in the bay vary from firm to soft muddy sand. Persons wading on the latter type bottom would sink to knee depth.

A great amount of dredging and filling for creation of real estate has occurred in the bay north of Corey Causeway and on the west side of the bay near the barrier islands. The water is relatively turbid. Bottom details were difficult to see from the surface in four and one-half feet of water, and over soft oozy mud the water visibility is reduced (*cf.*, Cats Point Bank).

The three stations briefly described here were visited monthly for 16 months.

At Cats Point Bank depths varied from three feet at spring high tide to exposed conditions at extremely low spring tides. During exposure *Thalassia* and *Diplanthera* leaves and algae were subjected to air exposure. A bleaching and killing of exposed portions was later observed. The substrate was an extremely soft muddy sand which supported vast growth of *Thalassia* and *Diplanthera*. *Ruppia* appeared in late winter and spring of 1957-1958. Lowest observed water temperature (14.0 °C.) occurred in December 1957, and the highest (36.9 °C.) occurred in July 1958. The observed mean salinity was 31.1 o/oo.

Depths on Bird Key Middle Ground varied from three feet at spring high tide to exposed conditions at extremely low spring tides. Seagrass leaves and algae were exposed to the air at these times. The substrate was a firm muddy sand. *Thalassia* was abundant and dense over the flat. *Diplanthera* was abundant in localized patches. Lowest observed water temperature (16.0 °C.) occurred in March 1958, and the highest (33.5 °C.) occurred in June 1958. The observed mean salinity was 31.2 o/oo.

At Pine Key Station the depth ranged from three feet on spring high tide to seven inches on one extremely low spring tide. Plant exposure was never observed. The substrate was very soft but supported a dense carpet of *Diplanthera* with abundant *Thalassia* interspersed in localized areas. Lowest observed water temperature (20.0 °C.) occurred in December 1958, and the highest (30.5 °C.) occurred in September 1958. The observed mean salinity was 31.5 o/oo.

Miscellaneous observations are included from Egmont Key, Mullet Key, Tarpon Key, Pass-A-Grille Beach, Cabbage Key, Maximo Point near Cats Point Bank, Gulfport Beach, Bird Key, Boca Ciega Isle, and Pinellas Point. All these locations resemble the regularly visited stations sufficiently to exclude comment except for Egmont Key and Pass-A-Grille Beach.

Egmont Key is exposed to the open Gulf of Mexico, and thus the salinity is higher than that in the bay. The bottom is predominantly sand with a sparse algal flora, although abundant *Codium taylori* was collected on pilings near shore.

On the bay side at the extreme southern tip of Pass-A-Grille Beach concrete blocks were found at the base of the sea wall. Sediment was trapped on the blocks, and algal growth was dense on this substrate. The algal assemblage found here was not seen at any other locations regularly visited in Boca Ciega Bay. *Sargassum,* two species of *Caulerpa, Polysiphonia, Ceramium, Gracilaria, Centroceras, Ulva,* and several species of blue-green algae were very conspicuous and abundant. Possibly, such an assemblage would prevail if exposed rock were commonly found in other portions of Boca Ciega Bay; however, I feel that the proximity of this location to the influx of seawater from the Gulf aids the luxuriant algal growth.

Tarpon Springs

Most of the collecting was done around the Anclote Keys where the extremely clear water was relatively shallow with depths of three to 12 feet prevailing for many square miles. All areas were exposed to the open Gulf of Mexico.

The Anclote River is the only major stream discharging into the offshore water. Near the end of the study considerable dilution of the salt water was observed at the three stations. This dilution at exposed localities is perplexing, since the discharge from the Anclote River probably is not of sufficient magnitude to explain it. Possibly offshore fresh-water springs occur in the vicinity of the Anclote Keys.

The mean tidal range at the Anclote Keys is 2.1 feet, and the spring tidal range is 2.7 feet (East Coast Tide Tables, 1957).

The tidal currents are strong at maximum ebb and flood and seem to be strongest at the stations northwest of the Anclote River.

The substrates are uniformly of firm to moderately soft muddy sand in three to 12 feet of water. The softer substrates were found in shallower water, *e.g.*, three to six feet deep. Northwest of the Anclote Keys, about five and one-half to seven and one-half miles offshore in 14-18 feet depths, exposed rock was commonly found rising above the muddy, shelly sand substrate.

The following three stations were visited monthly for 17 months.

A station was regularly visited in the Anclote Anchorage where depths varied from seven feet on flood tide to four and one-half feet on spring low tide. *Thalassia* was extremely abundant with sparse occasional growths of *Diplanthera, Syringodium,* and *Halophila engelmannii* interspersed. Lowest observed water temperature (13.3 °C.) occurred in December 1958, and the highest (31.6 °C.) occurred in July 1958. Observed mean salinity was 28.4 o/oo.

At the southeast corner of North Anclote Key water depths varied from four feet at spring high tide to three inches at extremely low spring tides. *Thalassia,* which was extremely dense in this area, was subjected to leaf air exposure on the lowest tides. No algal exposure was noted. Close to shore *Diplanthera* was abundant. Lowest observed water temperature (13.0 °C.) occurred in December 1958, and the highest (31.1 °C.) occurred in July 1958. Observed mean salinity was 28.0 o/oo.

North of north Anclote Key algae were collected on a *Thalassia* covered flat where depths varied from five and one-half feet at spring high tide to two feet at extremely low spring tides. *Syringodium* and *Diplanthera* were sparse at this station. Lowest observed water temperature (13.3 °C.) occurred in December 1958, and the highest (31.9 °C.) occurred in July 1958. Observed mean salinity was 29.2 o/oo.

Miscellaneous stations were made at the mouth of the Anclote River where conditions approximated those at the southeast corner of North Anclote Key, at #4 flashing light approximately two miles north of Anclote Key in 12 feet of water but where the substrate and plants resembled those in shallower water, and in 14-18 feet of water northwest of Anclote Key where the seagrasses became sparse on bottoms with exposed rock.

Table I lists the water temperatures and salinities recorded at the time of collection at the stations regularly visited. These station abbreviations are used: in Tampa Bay—BD—Beach Drive,

TABLE I. WATER TEMPERATURE AND SALINITY DATA RECORDED AT STATIONS REGULARLY VISITED.

Tampa Bay

Station	Date	°C	o/oo	Station	Date	°C	o/oo	Station	Date	°C	o/oo
BD	10-XXV-57	23.3	24.3	LFG	9-XIX-57	28.3	20.9	MB	9-XIII-57	30.2	17.5
	10-XXVIII-57	21.5	23.5		11-VIII-57		21.5		12-XVII-57	13.0	19.6
	11-XXVI-57	21.3	26.5		12-XXX-57	18.0	23.4		1-XX-58	13.3	23.1
	12-IV-57	19.0	25.5		1-XVI-58	16.0	24.7		2-XIX-58	7.0	23.6
	1-III-58	16.0	23.8		2-XVII-58	12.5	24.4		3-XII-58	20.0	20.4
	2-XII-58	13.0	24.7		2-XXV-58	16.0	23.9		4-XXV-58	20.5	18.3
	2-XVII-58	13.7	25.5		3-X-58	22.0	22.1		5-VIII-58	23.5	21.5
	3-VI-58	19.0	20.9		4-XXI-58	22.5	22.5		6-IX-58	28.5	21.6
	4-VIII-58	17.0	22.5		5-VII-58	23.5	21.5		7-IX-58	29.4	21.7
	4-XII-58	27.0	22.0		6-IX-58	27.5	22.6		8-VI-58	28.6	21.7
	5-VI-58	27.5	23.1		7-IX-58	28.3	22.7		9-IX-58	31.0	21.2
	5-XIV-58	25.3	21.0		8-VI-58	28.6	23.8		10-XVI-58	25.5	22.4
	6-V-58	26.1	24.5		9-IX-58	31.0	22.2		12-XXIII-58	17.2	24.2
	7-VIII-58	34.5	25.5		10-XVI-58	25.5	24.3				
	8-V-58	30.2	26.9		11-XIII-58	22.6	23.6				
	9-VIII-58	34.5	31.7		12-XXIII-58	16.6	25.7				
	10-XVII-58	25.5	25.6								
	11-XII-58	21.5	27.1								
	12-IX-58	21.1	26.7								

TABLE I.—Continued

Boca Ciega Bay

Station	Date	°C	o/oo	Station	Date	°C	o/oo	Station	Date	°C	o/oo
CPB	11-V-57	23.5	29.5	BKMG	11-V-57	22.0	32.3	PK	5-V-58	25.5	32.4
	11-XI-57				3-XVII-58	16.0	30.8		5-XXII-58	29.3	
	12-XVI-57	14.0	32.0		4-XXIX-58	28.5	29.8		6-XXV-58	30.2	35.2
	1-XXIII-58	14.3	31.1		6-V-58	26.0	30.2		7-XXI-58	29.4	32.0
	2-XXIV-58	17.5	31.7		6-XI-58	33.5	32.9		8-XI-58	27.7	30.7
	3-XVII-58	17.0	28.1		7-XXI-58	32.2	30.9		9-X-58	30.5	29.9
	4-II-58	23.0	31.4		8-XI-58	28.3	30.8		10-VIII-58	26.6	33.4
	5-IX-58	25.5	31.0		8-XXI-58	29.7	31.5		11-XIII-58	22.2	29.8
	6-XXVII-58		33.2		9-X-58	30.5	28.9		12-X-58	20.0	31.1
	7-XXIV-58	36.9	32.0		9-XIX-58	30.2	30.2		1-XIV-59	20.0	31.5
		29.4									
	8-XXI-58	29.7	30.4		10-VIII-58	26.6	33.4		2-X-59	20.8	30.4
	9-XIX-58	32.2	30.1		10-XXVIII-58	24.4	33.7		3-XVI-59	20.2	30.6
	10-XXVIII-58	22.9	32.8		11-XIII-58	24.4	33.7				
	11-XIII-58	21.6	31.3		12-X-58	20.0	32.7				
	12-X-58	20.0	31.7		1-XIV-59	20.0	31.5				
	1-XIV-59	19.5	31.5		2-X-59	20.8	29.4				
	2-X-59	22.8	30.4		3-XVI-59	19.7	30.8				
	3-XVI-59	20.2	29.5		6-I-59	27.7	25.7				

TABLE I.—Continued

Tarpon Springs

Station	Date	°C	o/oo	Station	Date	°C	o/oo	Station	Date	°C	o/oo
AA	5-XX-58	27.2	33.1	SE	12-V-57	16.0	28.1	FN	12-V-57	16.0	28.1
	7-II-58	30.4	35.4		3-V-58	17.0	28.4		12-XXXI-57	18.5	29.6
	7-XXX-58	31.6	34.2		5-XX-58	27.2			1-XXVIII-58	12.8	26.9
	9-II-58	31.1	30.9		7-II-58	30.4			3-V-58	15.5	32.2
	9-XXX-58	28.3	29.4		7-XXX-58	31.1	32.5		5-XX-58	27.2	34.6
	10-XXIX-58	19.7	25.0		9-II-58	30.8	32.5		7-II-58	30.7	35.4
	11-XXV-58	23.0	25.9		9-XXX-58	28.3	29.4		7-XXX-58	31.9	34.2
	12-XIX-58	13.3	24.4		10-XXIX-58	19.7	30.1		9-II-58	30.8	32.5
	1-XXVII-59	15.5	23.5		11-XXV-58	23.6	27.1		9-XXX-58	28.3	29.4
	2-XXV-59	21.1	28.6		12-XIX-58	13.0	20.9		10-XXIX-58	19.7	29.5
	3-XXXI-59	30.2	26.0		1-XXVII-59	15.8	24.0		11-XXV-58	23.0	27.6
	4-XXVIII-59	24.4	25.0		2-XXV-59	20.0	28.1		12-XIX-58	13.3	23.6
					3-XXXI-59	20.3	28.0		1-XXVII-59	14.1	24.2
					4-XXVIII-59	24.7	24.5		2-XXV-59	19.7	28.6
					5-XXVII-59	27.7	31.1		3-XXXI-59	20.3	26.0
									4-XXVIII-59	23.3	25.0
									5-XXVII-59	27.1	29.1

LGF—Lower Gandy Flat, MB—Mobbly Bay. In Boca Ciega Bay—CPB—Cats Point Bank, BKMG—Bird Key Middle Ground, PK—Pine Key. At Tarpon Springs—AA—between Pier and southern tip of Anclote Key in Anclote Anchorage, SE—southeast corner of North Anclote Key, FN—flat north of North Anclote Key.

These additional abbreviations are used in the annotated list: Tampa Bay—LI—Lewis Island; MP-T—Mermaid Point; PB—Papys Bayou; BIF—Big Island Flat; NSD—North Shore Drive, St. Petersburg; HB—Hillsboro Bay; HCPA—shoreline from Courtney-Campbell Causeway around Davis Island to Hillsboro Bay; SWTBP—southwest tip of Booth Point; CB—Cooper's Bayou. In Boca Ciega Bay—EK—Egmont Key; MK—Mullet Key; M—Tarpon Key; PAGB—Pass-A-Grille Beach; ECK—east of Cabbage Key; MP—Maximo Point; GB—Gulfport Beach; BK—Bird Key; BCI—Boca Ciega Isle; PP—Pinellas Point. At Tarpon Springs—MAR—mouth of Anclote River; #4FL—#4 flashing light; 0-14—approximately 5.5 nautical miles offshore in 14 feet of water; 0-18—approximately 7.5 nautical miles offshore, 18 feet deep.

Annotated List of Species

MYOXPHYCEAE

Anacystis aeruginosa Dr. & Daily. HB; winter 1958; on shells; upper infralittoral. [1]

Calothrix aeruginea Thur. BIF; autumn 1957; on *Spyridia filamentosa;* upper infralittoral. [1]

Calothrix confervicola (Roth) C.Ag. CB, MK, M, FN, AA; winter and spring 1958-1959; sparse to abundant on *Spyridia filamentosa, Ceramium diaphanum, Polysiphonia harveyi, Polysiphonia ferulacea,* and *Thalassia;* upper infralittoral.[2]

Calothrix pilosa Harv. LGF, CPB, BKMG, MK, #4FL; autumn and early winter 1958, more abundant in late autumn and early winter than in early autumn; sparse to very abundant on *Polysiphonia ramentacea, Spyridia filamentosa, Laurencia gemmifera, Thalassia;* littoral and upper infralittoral. [2]

Calothrix sp. BD; summer 1958; on *Ruppia;* littoral. [1]

Entophysalis conferta Dr. & Daily. BKMG; winter 1958; abundant on tunicates; littoral.

Entophysalis deusta Dr. & Daily. SE; winter 1958; very abundant on shells; littoral. [3]

---

[1] Attached taxa limited to Tampa Bay; [2] euryhaline taxa; [3] attached taxa limited to Tarpon Springs.

Lyngbya aestuarii (Mert.) Liebm. LGF, BIF, MB; autumn 1957; on *Spyridia filamentosa* and *Syringodium;* upper infralittoral. [1]

Lyngbya confervoides C.Ag. MB, CPB, EK, MP; summer and autumn 1957, 1958, more abundant in summer than in autumn; sparse to very abundant on *Thalassia, Syringodium* and bare sandy bottom; littoral and upper infralittoral.

Lyngbya gracilis (Menegh.)Rab. PK, 0-18; autumn 1958; sparse on *Thalassia and Padina vickersiae;* upper infralittoral.

Lyngbya majuscula Harv. CPB, BKMG, EK, MK, AA, MAR, #4FL; summer and autumn 1957, 1958, most abundant at end of summer; sparse to very abundant on muddy sand bottom, sand bottom, *Laurencia poitei, Laurencia gemmifera,* and floating; littoral and upper infralittoral.

Lyngbya meneghiniana (Kutz.)Gom. CPB, FN; winter 1958; rare to abundant on *Thalassia* and *Syringodium;* littoral and upper infralittoral.

Lyngbya mittsii Phillips. CPB, BKMG: winter 1958; sparse on *Thalassia;* littoral.

Lyngbya rosea Taylor. EK; summer 1958; abundant and entangled in *Polysiphonia subtilissima;* upper infralittoral.

Lyngbya semiplena (C.Ag.)J.Ag. BD: autumn 1958; abundant on twigs; littoral. [1]

Lyngbya sordida (Zanard.)Gom. PK, PAGB, FN, AA, SE; winter 1958; rare to very abundant on *Polysiphonia ferulacea, Polysiphonia denudata, Sargassum filipendula, Thalassia;* littoral and upper infralittoral.

Lyngbya thalassiae Phillips. AA, SE, 0-14; winter 1958-1959; sparse on *Thalassia* and *Caulerpa cupressoides;* littoral and upper infralittoral. [3]

Lyngbya sp. MP; summer 1958; abundant; upper infralittoral.

Mastigocoleus testarum Lagerheim. HB; winter 1958; on shells; upper infralittoral. [1]

Microcoleus chthonoplastes (Fl. Dan.)Thur. BD, LGF, BIF: autumn and winter 1957-1958; sparse on *Spyridia filamentosa* and entangled in epiphytes; littoral and upper infralittoral. [1]

Oscillatoria bonnemaisonii (Crouan)Gom. SE; spring 1959; very abundant on *Thalassia;* littoral. [2]

Oscillatoria corallinae (Kutz.)Gom. PAGB; winter 1958; abundant in muddy bottom; littoral.

Oscillatoria nigro-viridis Thwait. LGF; autumn 1958; very abundant on *Diplanthera;* upper infralittoral. [1]

Oscillatoria subuliformis (Thwait.)Gom. MB; winter 1958; entangled in *Spyridia filamentosa;* upper infralittoral. [1]

Oscillatoria tenuis C.Ag. var. *natans* (Kutz.)Gom. SE; spring 1959; sparse on *Thalassia;* littoral. [2]

Oscillatoria williamsii Drouet. SE, 0-18; spring and autumn 1958, 1959; sparse on *Thalassia;* littoral and upper infralittoral. [3]

Plectonema nostocorum Born. BKMG, FN; winter and spring 1958-1959; abundant on *Enteromorpha flexuosa* and *Thalassia*; littoral and upper infralittoral.

Schizothirx violacea Gard. AA; winter 1959; abundant on *Thalassia*; upper infralittoral. [3]

Spirulina subsalsa Oerstedt var. *oceanica* (Crouan)Gom. PAGB, FN; winter 1958-1959; sparse to abundant on *Thalassia* and in mud; littoral and upper infralittoral.

CHLOROPHYCEAE

Acetabularia crenulata Lamx. SE; late spring, summer, and autumn, found dead in early winter 1957, 1958; very abundant on shells; upper infralittoral; spores found in late autumn. [Reported also by Taylor (1936) and Earle (*op. cit.*) from Tarpon Springs.]. [3]

Acetabularia farlowii Solms. SE; autumn and early winter 1958; very abundant on shells; upper infralittoral; spores found in late autumn. [3]

Acetabularia pusilla (Howe) Collins. SE; early winter 1958; sparse on shells; upper infralittoral. [3]

Acetabularia sp. SE; spring 1958; one sporeling on *Thalassia*; upper infralittoral. [3]

Acicularia schenckii (Moebius)Solms. SE; early winter 1957; commonly found on shells; upper infralittoral. [3]

Anadyomene stellata (Wulf.)C.Ag. FN, AA, #4FL; found throughout the year 1957, 1958, 1959, most abundant in spring and summer; rare to abundant on *Digenia simplex* and shells; upper infralittoral. [3]

Batophora oerstedi J.Ag. FN, SE, 0-18; autumn, winter, spring 1957, 1958; rare to abundant on shells, wood, *Digenia simplex;* upper infralittoral; spores found in early winter. [Reported also by Taylor (1936) and by Earle (*op. cit.*) from Tarpon Springs]. [3]

Bryopsis hypnoides Lamx. PAGB; winter 1958; sparse on tunicates and detritus covered rocks; littoral.

Bryopsis pennata Lamx. MK in November, Pass-A-Grille in March on rocks, pilings, and shells. (Reported by Earle, *op. cit.*).

Caulerpa ashmeadii Harv. FN, AA, MAR, #4FL, 0-14, 0-18; found throughout the year 1957, 1958, 1959, at most stations it is most abundant during summer and autumn but sometimes very abundant in mild winters; sparse to very abundant on muddy sand bottom; upper infralittoral. [Reported also by Taylor (1936) and Earle (*op. cit.*) from Tarpon Springs]. [3]

Caulerpa crassifolia (C.Ag.)J.Ag. Piney Point, southwest end of Tampa Bay. [Reported by Taylor (1954) and by Earle (*op. cit.*) from MK in October and from St. Petersburg Beach in August on bottom.].

Caulerpa crassifolia (C.Ag.)J.Ag. fa. *mexicana* (Sonder)J.Ag. PAGB; winter 1958; very abundant on rock; upper infralittoral.

Caulerpa crassifolia (C.Ag.)J.Ag. fa. *typica* (Weber)Børgs. BKMG; autumn 1958; rare; floating.

Caulerpa cupressoides (West)C.Ag. var. *cupressoides*. 0-14; winter 1958; common on muddy sand bottom; upper infralittoral. [3]

Caulerpa prolifera (Forsskal)Lamx. AA; autumn and early winter 1958; sparse on muddy sand bottom; upper infralittoral. [Reported also by Taylor (1936) and by Earle (*op. cit.*) from HB and from MK in May on sandy, muddy, or rocky bottom.]. [2]

Caulerpa sertularioides (Gmel.)Howe. PAGB; winter 1958; very abundant on detritus covered rocks; littoral and upper infralittoral; plants dwarf in comparison to those found offshore in 35-60 feet deep. [Reported also by Earle (*op. cit.*) from Pass-A-Grille in November on sandy bottom along *Thalassia*.].

Chaetomorpha brachygona Harv. LGF, CPB; spring 1958; sparse; floating. [1]

Chaetomorpha gracilis Kutz. BIF; autumn 1957; on *Spyridia filamentosa*; upper infralittoral. [1]

Chaetomorpha linum (Mull.)Kutz. MB; late summer 1958; very abundant; floating. [1]

Cladophora fascicularis (Mert.)Kutz. HB, PAGB; winter 1958; rare on detritus covered rocks and bryozoan; littoral and upper infralittoral.

Cladophora fuliginosa Kutz. CPB; autumn 1957; very abundant in clumps on muddy sand bottom; littoral.

Cladophora delicatula Mont. BIF; autumn 1957; on *Spyridia filamentosa*; upper infralittoral. [1]

Cladophora glaucescens (Griffiths)Harv. BD, BIF, CB, CPB, BKMG, FN; autumn and winter 1957-1958, most abundant in October; rare to very abundant on shells, *Thalassia, Diplanthera, Syringodium*; littoral and upper infralittoral. [2]

Cladophora luteola Harv. BD, LGF, CPB, BKMG, FN, AA, SE; autumn, winter, and early spring 1958-1959; rare to very abundant on *Thalassia, Diplanthera*; littoral and upper infralittoral. [2]

Cladophora sp. LGF, FN; autumn and spring 1957, 1959; on *Spyridia filamentosa* and *Thalassia*; upper infralittoral.

Cladophoropsis macromeres Taylor. 0-18; autumn 1958; rare, entangled in algae; upper infralittoral.

Cladophoropsis membranacea (C.Ag.)Børgs. [Reported by Taylor (1936) from Tarpon Springs.].

Codium decorticatum (Woodward)Howe. CPB; autumn 1957; rare; floating.

Codium taylori Silva. EK, PAGB; summer, autumn, and early winter 1958; common to abundant on pilings and rock; upper infralittoral. [Reported also by Earle (*op. cit.*) from MK in August on limestone rock.].

Derbesia vaucheriaeformis (Harv.)J.Ag. CPB; autumn 1958; very abundant on *Gracilaria verrucosa;* littoral.

Endoderme viride (Reinke)Lagerh. MK; found in and on *Sargassum, Polysiphonia,* and *Callithamnion;* January 1953. [Reported by Earle (*op. cit.*)].

Enteromorpha clathrata (Roth)Grev. BD; spring 1958; sparse on shells; littoral. [1]

Enteromorpha crinita (Roth)J.Ag. CPB, MK; winter 1958; sparse to abundant on shells; littoral and upper infralittoral.

Enteromorpha flexuosa (Wulf.)J.Ag. BD, LGF, BIF, MB, CPB, BKMG, PK, M, PAGB, MP, PP, SE; late autumn, winter, and spring (once found through summer at BD but in microscopic size) 1957, 1958, 1959; sparse to very abundant on shells, muddy sand bottom, *Diplanthera, Syringodium, Ruppia, Thalassia;* littoral and upper infralittoral; plants dwarfed in late spring as water warms after winter. [2]

Enteromorpha intestinalis (L.)Grev. BD, LGF, BIF, MB, CB, LI, SWTBP, PB, HCPA, CPB, BKMG, PAGB, MP, BCI; late autumn, winter, and spring 1957, 1958, 1959; sparse to very abundant on shells, rocks, tunicates, *Thalassia,* and muddy sand bottom, most abundant and luxuriant in winter; littoral and upper infralittoral. [Reported also by Earle (*op. cit.*) from the Courtney-Campbell Causeway].

Enteromorpha lingulata J.Ag. BD, LGF, BIF, CPB; winter and early spring 1957-1958; sparse to abundant on shells; littoral and upper infralittoral. [Reported also by Earle (*op. cit.*) from the Courtney-Campbell Causeway and by Taylor (1936) and Earle (*op. cit.*) from Tarpon Springs.]. [2]

Enteromorpha plumosa Kutz. BD, LGF, MB, CB, CPB, BKMG; autumn and winter 1957-1958; sparse to abundant on shells, *Thalassia, Diplanthera, Syringodium;* littoral and upper infralittoral; dwarf plants in early autumn.

Enteromorpha prolifera (Fl.Dan.)J.Ag. BD, LGF, MB, SWTBP, HB, CPB, BKMG, PK, MK, M, PAGB, MP, BK; autumn, winter, and spring 1957-1958, 1959; sparse to abundant on shells, *Thalassia, Diplanthera, Syringodium;* littoral and upper infralittoral; dwarf plants in early autumn and late spring and in Boca Ciega Bay. [Reported also by Earle (*op. cit.*) from MK on *Thalassia* and algae in November and by Hutton *et al.* (*op. cit.*) from Boca Ciega Bay].

Enteromorpha ramulosa (Smith)Hooker. BD, LGF, MB, LI, MP, FN; winter 1957-1958; sparse to very abundant on rocks, shells, *Thalassia, Diplanthera;* littoral and upperinfralittoral. [2]

Enteromorpha salina Kutz. BD, LGF, LI, HB, CPB, BKMG, PK, MK, M, FN; winter and spring 1958-1959; sparse to abundant on shells, *Thalassia, Syringodium, Polysiphonia ramentacea;* littoral and upper infralittoral. [2]

Enteromorpha sp. BD; winter 1957-1958; common to abundant on shells and *Diplanthera;* littoral. [1]

Epicladia flustrae Reinke. PAGB; winter 1958; abundant on tunicates; littoral.

Gomontia polyrhiza (Lagerh.)B. & F. HB, BKMG; winter 1958; sparse on tunicates, shells and in shells; littoral.

Halimeda tridens (E. & S.)Lamx. fa. *tripartita* (Barton)Collins. FN, AA, SE, MAR, #4FL, 0-14, 0-18; throughout the year 1957-1959; sparse to very abundant on muddy sand bottom, most abundant in late spring, summer, and autumn; upper infralittoral. [Reported also by Taylor (1936) and Earle (*op. cit.*) from Tarpon Springs.]. [3]

Monostroma latissima (Kutz.)Wittrock. Davis Causeway in Old Tampa Bay. [Reported by Earle (*op. cit.*)].

Penicillus capitatus Lamarck. FN, AA, SE, MAR, #4FL, 0-14, 0-18; throughout the year 1957-1959; sparse to very abundant on muddy sand bottom, usually most abundant in warmer months of the year but in mild winters no reduction in abundance is apparent; upper infralittoral. [Reported also by Taylor (1936) and Earle (*op. cit.*) from Tarpon Springs.]. [3]

Penicillus lamourouxii Decaisne. SE; spring and winter 1958; sparse on muddy sand bottom; upper infralittoral. [2]

Phaeophila dendroides (Crouan)Batters. MK, SE; winter and spring 1958-1959; sparse to abundant on *Thalassia* and in *Hypnea musciformis;* littoral and upper infralittoral.

Protoderma marinum Reinke. BD, CPB; late autumn and winter 1958; sparse on *Thalassia* and *Diplanthera;* littoral.

Rhizoclonium kerneri Stockmayer. BD, LGF, CPB; autumn and winter 1957-1958, 1959; sparse to abundant on *Diplanthera, Thalassia, Sargassum filipendula;* littoral.

Rhizoclonium kochianum Kutz. BD, LGF, BIF; autumn and winter 1957-1958; on *Spyridia filamentosa;* upper infralittoral. [Reported also by Earle (*op. cit.*) from Gandy Bridge, Tampa Bay.]. [1]

Rhizoclonium riparium (Roth)Harv. Gandy Bridge, Tampa Bay. [Reported by Earle (*op. cit.*)].

Udotea conglutinata (Sol.)Lamx. FN, AA, SE, MAR, #4FL, 0-14, 0-18; throughout the year 1957-1959, most abundant in late autumn, winter, and spring; sparse to abundant on muddy sand bottom; upper infralittoral. [3]

Ulva fasciata Delile. HB. [Reported by Taylor (1936) and by Earle (*op. cit.*)].

Ulva lactuca L. Piney Point, on south west end of Tampa Bay. [Reported by Taylor (1954)].

Ulva lactuca L. var. *latissima* (L.)DeCandolle. BD, MP-T, LGF, BIF, MB, PB, HCPA, CPB, PK, M, PAGB, MP, GB, PP; throughout the year 1957-1959; sparse to very abundant on shells; littoral and upper infralittoral; abundance seems to increase in spring with a large abundance in summer and autumn and a decrease in late autumn. [Reported also by Taylor (1936) from HB and by Hutton *et al.* (*op. cit.*) from Boca Ciega Bay].

Ulva lactuca L. var. *rigida* (C.Ag.)LeJolis. BD, MB, HB, PAGB; winter and early spring 1958; sparse to very abundant on shells and rock; littoral and upper infralittoral.

Ulvella lens Crouan. CPB, BKMG, AA; autumn and winter 1958-1959; rare to abundant on *Thalassia*, more abundant in winter; littoral and upper infralittoral.

PHAEOPHYCEAE

Dictyota cervicornis Kutz. MP, AA, 0-14, 0-18; summer, autumn, and early winter 1957, 1958; sparse to abundant on rock, unattached at MP; upper infralittoral. [Reported also by Hutton *et al* (*op. cit.*) from Boca Ciega Bay and by Taylor (1936) from Tarpon Springs].

Dictyota dentata Lamx. CPB; autumn 1957; sparse unattached.

Dictyota dichotoma (Huds.)Lamx. FN, SE; autumn and early winter 1957; sparse to abundant, unattached.

Dictyota linearis (L.)Grev. MP; autumn 1957; sparse, unattached.

Dictyota pardalis Kutz. sensu Børgs. 0-18; autumn 1958; rare on rock; upper infralittoral. [3]

Ectocarpus duchassaingianus Grun. CPB, BKMG, PK, PAGB; autumn and winter 1958-1959; sparse to very abundant on *Thalassia, Chondria leptocremon,* and bryozoan; littoral and upper infralittoral; pleurilocular gametangia present, at PK in January 1959 plants on *Thalassia* were sterile but were fruiting on *Chondria leptocremon* which was itself epiphytic on *Thalassia.*

Ectocarpus elachistaeformis Heydrich. BD, MB, CPB, BKMG; autumn, winter, and early spring 1958-1959; sparse to very abundant on *Thalassia, Syringodium, Spyridia filamentosa*; littoral and upper infralittoral.

Ectocarpus mitchellae Harv. BD, LGF, BIF, PB, CPB, BKMG, PK, PP; found throughout the year at BD but only in autumn, winter, and spring at all other stations 1957, 1958, 1959; mostly abundant to very abundant, sparse in late spring and summer, on *Thalassia, Diplanthera, Syringodium, Ruppia, Enteromorpha,* and shells; littoral and upper infralittoral; with pleurilocular gametangia.

Ectocarpus rallsiae Vick. BKMG; autumn 1958; very abundant on *Thalassia* and tunicates; littoral; unilocular sporangia and pleurilocular gametangia.

Ectocarpus siliculosus (Dillw.)Lyngbye. BD, HB, CPB; winter and spring 1958; sparse to very abundant on *Thalassia* and *Diplanthera,* much not attached at BD; littoral; unilocular sporangia and pleurilocular gametangia; became sparse at BD in spring but remained very abundant at CPB.

Ectocarpus sp. BD, LGF, BIF, M, MP; winter, spring, and summer 1957-1958; sparse to abundant on *Diplanthera, Ruppia,* and shells; littoral and upper infralittoral.

Eudesme zosterae (J.Ag.)Kylin. CPB, MK, BCI, FN; winter and spring 1957-1958, 1959; sparse to very abundant on *Thalassia,* sparse in Boca Ciega Bay; littoral and upper infralittoral; at FN found only near a bird guano collecting rack.

Myrionema strangulans Grev. BKMG, FN, AA, SE; winter and spring 1959; very abundant on *Thalassia*; littoral at BKMG, upper infralittoral at Tarpon Springs.

Myriotrichia subcorymbosus (Holden in Collins)Blomquist. BD, LGF, BIF, MB, CPB, BKMG, GB, PK, MK, FN, AA, SE; found only in autumn, winter, and spring at all stations except at BD where it was found also in summer, 1957-1959; sparse to very abundant on *Thalassia, Diplanthera, Syringodium, Ruppia, Enteromorpha prolifera, Gracilaria verrucosa,* most abundant in late autumn, winter, and spring; littoral and upper infralittoral; pleurilocular gemetangia always found. [2]

Padina vickersiae Hoyt. 0-18; autumn 1958; sparse on rock; upper infralittoral. [3]

Rosenvingea intricata (J.Ag.)Borgs. BD, CPB, BKMG, PK, M, MP, FN, SE: winter and spring 1958-1959; sparse to very abundant on *Thalassia, Diplanthera,* and *Syringodium,* most abundant in winter. [2]

Sargassum filipendula C.Ag. LGF, PAGB, SE, 0-14; autumn, winter, and spring on rocks at PAGB and 0-14, unattached at all other stations; upper infralittoral. [2]

Sargassum polyceratium Mont. BD; winter 1958; rare, unattached.

Sargassum pteropleuron Grun. FN, AA, SE, MAR, #4FL; throughout the year 1957-1959; sparse to abundant, unattached. [Reported also by Taylor (1936) from Tarpon Springs].

Sphacelaria furcigera Kutz. BD, M, LGF, BIF; autumn and spring 1957, 1958; sparse to abundant on *Syringodium*; upper infralittoral; found with propagulae. [1]

RHODOPHYCEAE

Acanthophora muscoides (L.)Bory. BD, LGF, BIF, MB, CB, SWTBP, HCPA, CPB, BKMG, PK, M, ECK, MP; found throughout the year but most abundant in autumn and early winter, generally sparse in winter 1957-1959; sparse to abundant, usually unattached, occasionally on *Thalassia, Syringodium,* or worm tubes; littoral and upper infralittoral; at BD found with antheridia in October and with tetraspores in November. [Reported also by Hutton *et al* (*op. cit.*) from Boca Ciega Bay].

Acanthophora spicifera (Vahl)Børgs. LGF, BIF, MB, CB, M; autumn 1957; abundant, usually unattached, but once found on *Spyridia filamentosa*; upper infralittoral; antheridial at M in September.

Acrochaetium crassipes Børgs. CPB, PAGB; winter 1958-1959; sparse on *Thalassia* and *Ceramium tenuissimum*; littoral.

Acrochaetium flexuosum Vick. BD, LGF, MB, CB, CPB, PAGB; summer, autumn, and winter 1957-1958; rare to very abundant on *Thalassia, Diplanthera, Syringodium, Ruppia,* and a bryozoan; littoral and upper infralittoral; all with monospores.

Acrochaetium sagraeanum (Mont.)Born. PK; winter 1959; rare on *Thalassia*; upper infralittoral.

Acrochaetium sancti-thomae Børgs. CPB, BKMG; winter and early spring 1959; sparse on *Thalassia* and *Spyridia filamentosa;* littoral; with monospores at CPB in winter.

Acrochaetium sargassi Børgs. BD, LGF, PAGB; found throughout the year 1957-1958; abundant on *Diplanthera, Syringodium, Ruppia,* and on a bryozoan; littoral and upper infralittoral; monospores found at all stations.

Acrochaetium seriatum Børgs. BD, LGF, MB, PK, MK; found throughout the year 1958; sparse to very abundant on *Thalassia, Diplanthera, Syringodium,* and *Sargassum filipendula*; littoral and upper infralittoral; monospores found in spring at BD, MB, and MK, but in December at PK.

Acrochaetium sp. BD, LGF, BIF, MP; autumn, winter, and spring 1957-1958; sparse to abundant on *Diplanthera, Syringodium, and Spyridia filamentosa;* littoral and upper infralittoral.

Agardhiella ramosissima (Harv.)Kylin. FN; autumn 1958; very abundant, unattached; cystocarpic.

Agardhiella tenera (J.Ag.)Schmitz. BD, LGF, BIF, MB, NSD, SWTBP, HB, PB, CPB, MK, PAGB, MP; autumn, winter and spring 1957, 1958, 1959; sparse to very abundant, attached only at CPB and PAGB on shells and rocks; littoral; cystocarpic at PAGB in December 1958.

Bostrychia montagnei Harv. SE; winter 1958; rare on sponge skeleton; littoral. [3]

Bostrychia rivularis Harv. CB; autumn 1957; abundant on mangrove roots; littoral. [1]

Botryocladia occidentalis (Børgs.)Kylin. SE; winter 1957; rare, floating.

Callithamnion sp. EK; summer 1958; sparse on *Codium taylori;* upper infralittoral.

Centroceras clavulatum (C.Ag.)Mont. BD, LGF, MB, CPB, BKMG, PK, MK, PAGB, MP, GB, PP, FN, AA, SE, #4FL; found throughout the year 1957-1959, most abundant in winter and spring, found in bloom proportions at CPB, BKMG in February and March 1959; sparse to very abundant on *Thalassia, Diplanthera, Syringodium, Ruppia, Acanthophora muscoides, Gracilaria verrucosa, Enteromorpha ramulosa, Chondria littoralis, Polysiphonia ramentacea, Batophora oerstedi,* and on detritus covered rocks; littoral and upper infralittoral; tetrasporic at LGF in January and August 1958, at CPB in March 1958, and at SE in September 1958, antheridial at MB in April 1958 and at BKMG in October 1958, and cystocarpic at MB in May 1958 and at BKMG in October 1958. [Reported also by Taylor (1936) from HB]. [2]

Ceramium byssoideum Harv. BD, LGF, CPB, BKMG, PK, MK, M, SE, 0-18; autumn and early winter 1958; sparse to very abundant on *Thalassia, Diplanthera, Syringodium* and animal material; littoral and uper infralittoral. [2]

Ceramium codii (Richards)Mazoyer. FN, AA; winter 1958-1959; sparse on *Thalassia, Syringodium,* and *Halimeda tridens;* upper infralittoral. [3]

Ceramium deslongchampsii Chauvin. BD; autumn 1957; sparse on *Lomentaria baileyana;* littoral. [1]

Ceramium cruciatum Collins & Hervey. FN; spring 1959; sparse on *Thalassia*; upper infralittoral; tetrasporic. [3]

Ceramium diaphanum Roth. M; winter 1958; sparse on *Gracilaria verrucosa*; upper infralittoral.

Ceramium rubrum (Huds.)C.Ag. MB; autumn 1957; on *Syringodium;* upper infralittoral. [1]

Ceramium subtile J.Ag. BD, CPB, BKMG, PK, FN, AA, SE, 0-14, 0-18; autumn, winter, and spring 1958-1959; sparse to very abundant on *Thalassia, Syringodium, Diplanthera, Caulerpa ashmeadii, Halimeda tridens, Caulerpa cupressoides, Batophora oerstedi, Acetabularia farlowii, Laurencia gemmifera,* other algae; littoral and upper infralittoral; in bloom proportions at CPB in March, at BKMG and PK in December through March, tetrasporic at FN in April. [2]

Ceramium tenuissimum (Lyngbye)J.Ag. BD, LGF, BIF, SWTBP, BKMG, PK, EK, PAGB, FN, AA, SE, MAR, #4FL, 0-18; found throughout the year 1957-1959; sparse to very abundant on *Thalassia, Diplanthera, Syringodium, Ruppia, Acanthophora muscoides, Polysiphonia subtilissima, Caulerpa crassifolia, Laurencia poitei, Polysiphonia denudata, Polysiphonia ferulacea, Halimeda tridens, Caulerpa ashmeadii;* littoral and upper infralittoral; most abundant in autumn and early winter; antheridial at FN in March 1959 and cystocarpic at AA in December 1958 and at SE in November 1958. [Reported also by Hutton *et al* (*op. cit.*) from Boca Ciega Bay]. [2]

Ceramium tenuissimum (Lyngbye)J.Ag. var. *arachnoideum (C.Ag.)J.Ag.* FN, AA; spring 1959; abundant on *Thalassia;* upper infralittoral. [3]

Ceramium sp. EK, MP, #4FL; found in June 1958 at EK, February 1958 at MP, and in November 1957 at #4FL; sparse on *Thalassia, Syringodium,* and *Codium taylori*; upper infralittoral; tetrasporic at EK.

Champia parvula (C.Ag.)Harv. BD, LGF, BIF, MB, HB, CPB, MK, BK, BCI, PP, FN, SE, 0-14, 0-18; found throughout the year 1957-1959; sparse to abundant on *Thalassia, Diplanthera, Syringodium, Udotea conglutinata, Sargassum pteropleuron, Caulerpa cupressoides, Halimeda tridens, Laurencia gemmifera,* often unattached; littoral and upper infralittoral; tetrasporic at MP in March 1958, at SE in November 1958, at 0-14 in December 1958, and at 0-18 in September and November 1958, cystocarpic at MP in March 1958, at 0-14 in December 1958, and at 0-18 in September 1958. [2]

Chondria curvilineata Collins & Hervey. FN, AA, SE; April 1959; sparse to abundant on *Thalassia*; littoral and upper infralittoral; tetrasporic at AA and SE, cystocarpic at FN. [3]

Chondria dasyphylla (Wood.)C.Ag. MK, AA; spring 1958, 1959; sparse, unattached at MK but on *Thalassia* at AA; upper infralittoral; tetrasporic at MK.

Chondria leptocremon (Melville)DeToni. PK, PAGB, FN, AA, SE, 0-14; autumn, winter, and spring 1958-1959; sparse to very abundant on *Tha-*

lassia, Caulerpa crassifolia, Halimeda tridens, Caulerpa cupressoides, and on rock; littoral and upper infralittoral; tetrasporic at AA in September, October, February, and March 1958-1959 and at SE in March 1959; cystocarpic at PK in November 1958 and at AA in January and February 1958; antheridial at AA in October 1958.

Chondria littoralis Harv. MK, PP: spring 1958; sparse to abundant, unattached but once found on *Diplanthera* at MK; upper infralittoral.

Chondria sedifolia Harv. PK, MK; autumn and early winter 1958; very abundant on *Thalassia;* upper infralittoral; tetrasporic at MK, cystocarpic at PK.

Chondria tenuissima (Goodenough and Woodward)C.Ag. BIF, CPB; autumn and spring, 1957, 1958; unattached; cystocarpic at CPB in April 1958.

Chondria sp. SE; spring 1958; sparse on *Penicillus lamourouxii*; upper infralittoral. [3]

Corallina cubensis (Mont.)Kutz. emend. Borgs. 0-18; autumn 1958; abundant on *Digenia simplex;* upper infralittoral. [3]

Dasya pedicellata (C.Ag.)C.Ag. BD, MB; spring 1958; sparse, unattached; tetrasporic at BD in March 1958 and cystocarpic at BD in March 1958 and at MB in March 1958.

Digenia simplex (Wulf.)C.Ag. FN, AA, SE, #4FL, 0-18; throughout the year, often on *Thalassia* and on rock, but mostly unattached; upper infralittoral. [3]

Erythrotrichia carnea (Dillw.)J.Ag. BD, LGF, BIF, MB, CB, CPB, BKMG, PK, EK, M, PAGB, MP, GB, AA, SE, 0-18; throughout the year on *Thalassia, Diplanthera, Syringodium, Ruppia, Enteromorpha lingulata, Enteromorpha flexuosa, Cladophora luteola, Myriotrichia subcorymbosus, Gracilaria verrucosa, Polysiphonia macrocarpa, Spyridia filamentosa, Centroceras clavulatum, Polysiphonia havanensis, Polysiphonia ramentacea, Ceramium tenuissimum, Callithamnion* sp., *Lyngbya sordida,* on diatoms and bryozoan; littoral and upper infralittoral. [Reported also by Hutton *et al* (*op. cit.*) from Boca Ciega Bay]. [2]

Eucheuma gelidium (J.Ag.)J.Ag. [Reported by Taylor (1936) from Tarpon Springs].

Eucheuma isiforme (C.Ag.)J.Ag. LGF, BIF; winter and spring 1958; sparse, unattached.

Fosliella farinosa (Lamx.)Howe. FN, AA, SE; autumn, winter and spring 1958-1959; very abundant on *Thalassia*; littoral and upper infralittoral; cystocarpic at FN in April 1959, at AA in March 1959; and at SE in December 1958. [3]

Fosliella lejolisii (Rosanoff)Howe. CPB, BKMG, PK, MK, MP, FN, AA, SE, #4FL, 0-18; autumn, winter, and spring 1957-1958, 1958-1959; abundant to very abundant on *Thalassia, Halophila engelmannii* and all algae found; littoral and upper infralittoral; cystocarpic at PK in October and December 1958, at FN in December 1958 and March 1959, at AA in

December 1958 and January, March, and April 1959, and at SE in April 1959.

Gelidiella acerosa (Førsskal)Feldmann & Hamel. BCI, MI; autumn 1955; very abundant, unattached. [Reported as *Geldium rigidum* by Hutton *et al.* (*op. cit.*)].

Gelidium corneum (Huds.)Lamx. LGF, GB; summer and autumn 1958; abundant on shells and piling; upper infralittoral.

Gelidium crinale (Turn.)Lamx. LGF; winter and summer 1958; sparse to abundant on *Sargassum filipendula* in winter, unattached in summer 1958. [Reported also by Taylor (1936) from HB].

Goniotrichum alsidii (Zanard.)Howe. BD, LGF, BIF, CPB, BKMG, PK, MK, M, PAGB, FN; autumn, winter, and spring 1957-1958, 1958-1959; sparse to very abundant on *Thalassia, Diplanthera, Syringodium, Ruppia, Gracilaria verrucosa, Hypnea cervicornis, Ceramium tenuissimum, Polysiphonia ramentacea, Ceramium subtile, Polysiphonia binneyi, Hypnea musciformis, Ceramium diaphanum, Polysiphonia denudata, Polysiphonia harveyi, Polysiphonia ferulacea, Ceramium cruciatum;* littoral and upper infralittoral. [2]

Grateloupia filicina (Wulf.)C.Ag. PAGB; winter 1958; rare on rock; upper infralittoral; cystocarpic.

Griffithsia globulifera Harv. FN, SE, #4FL, 0-14, 0-18; autumn, winter, and spring 1957, 1958-1959; sparse to abundant on *Thalassia, Polysiphonia denudata, Caulerpa cupressoides,* and *Halimeda tridens;* upper infralittoral; tetrasporic at 0-14 in December 1958, and cystocarpic at SE in November 1958 and #4FL in November 1957. [3]

Griffithsia tenuis C.Ag. FN, AA; late winter and spring 1959; sparse on *Thalassia;* upper infralittoral; tetrasporic at AA in April; antheridial at FN in February and March. [3]

Gracilaria blodgettii Harv. BD, LGF, MB, CPB, BKMG, MK, M, ECK, MP; autumn, winter, and spring 1957-1958; sparse to abundant, mostly unattached, some plants on shells at CPB.

Gracilaria damaecornis J.Ag. BD, LGF, NSD; autumn and winter 1957-1958; sparse, unattached; cystocarpic at BD in January 1958.

Gracilaria foliifera (Førsskal)Børgs. PAGB; early winter 1958; very abundant on rocks; upper infralittoral; some very small plants are cystocarpic, much larger plants are sterile.

Gracilaria verrucosa (Huds.)Papenf. BD, LGF, BIF, MB, CB, NSD, SWTBP, HB, PB, HCPA, MP-T, CPB, BKMG, PK, MK, M, ECK, MP, BCI, PP; found throughout the year 1957-1959; sparse to very abundant, only once found attached at BD where a few plants were on a shell; at certain times at the regularly collected stations in Tampa Bay and Boca Ciega Bay vast amounts of the species were found; tetrasporic at CB in September 1957. [Reported also by Taylor (1936) from HB, and by Taylor (1954) from Piney Pt., southwest end of Tampa Bay, and by Hutton *et al.* (*op. cit.*) from Boca Ciega Bay].

Gracilaria sp. BD; autumn 1957; rare, unattached.

Halymenia agardhii DeToni. 0-18; autumn 1958 sparse on rock; upper infralittoral. [3]

Herposiphonia secunda (C.Ag.)Ambronn. FN, AA; autumn and spring 1958, 1959; rare to very abundant 1958, 1959 on *Thalassia*; upper infralittoral; tetrasporic at AA in November 1958, cystocarpic at AA in October and November 1958 and in April 1959. [3]

Herposiphonia tenella (C.Ag.)Ambronn. CPB, BKMG, PK, MK, AA, SE; throughout the year 1958-1959; sparse to very abundant on *Thalassia, Polysiphonia ramentacea,* and on tunicates; littoral and upper infralittoral; most abundant in autumn and spring; tetrasporic at CPB in November 1958, cystocarpic at BKMG in October 1958.

Hildenbrandtia prototypus Nardo. 0-18; autumn 1958; very abundant on rocks; upper infralittoral; tetrasporic in September. [3]

Hypnea cervicornis J.Ag. BD, LGF, CB, CPB, BKMG, MK, M, MP; autumn, winter, and spring 1957, 1958, 1959; sparse to very abundant, found attached only at BKMG in February 1959; littoral; most abundant in spring. [Reported by Hutton *et al.* (*op. cit.*) from Boca Ciega Bay].

Hypnea cornuta (Lamx.)J.Ag. BD, BKMG; autumn, winter, and spring 1958, abundant, unattached.

Hypnea musciformis (Wulf.)Lamx. BD, MP-T, LGF, BIF, HB, PB, HCPA, CPB, BKMG, EK, MK, MP, GB, PP; found throughout the year 1957-1959; sparse to very abundant, unattached; tetrasporic at BD in December 1958; often hugh quantities of the species are found at stations at all times of the year, especially at BD; in winter the plant dwarfs and loses the hamate tips. [Reported also by Taylor (1954) from Piney Pt., southwest end of Tampa Bay, and by Hutton *et al.* (*op. cit.*) from Boca Ciega Bay].

Hypnea spinella (C.Ag.)Kutz. LGF, BIF, CPB, MP; autumn 1957; sparse, unattached.

Jania capillacea Harv. FN; spring 1958 and winter 1958-1959; sparse on *Thalassia, Syringodium,* and on a shell; upper infralittoral; cystocarpic in March and December 1958. [3]

Laurencia gemmifera Harv. FN, #4FL, 0-14, 0-18; autumn, winter, and spring 1958-1959; sparse to very abundant on *Thalassia* and rocks; upper infralittoral; most abundant in autumn; cystocarpic at 0-18 in November. [3]

Laurencia intricata Lamx. 0-18; autumn 1958; sparse on *Dictyota cervicornis*; upper infralittoral. [3]

Laurencia microcladia Kutz. FN; winter 1957, 1959; sparse on *Thalassia;* upper infralittoral; tetrasporic in February 1959. [3]

Laurencia papillosa (Førsskal)Grev. MK; spring 1958; sparse on *Thalassia*; upper infralittoral.

Laurencia poitei (Lamx.)Howe. MB, BKMG, ECK, FN, AA, SE, MAR, #4FL, 0-18; found throughout the year 1957-1959; sparse to very abundant on *Thalassia* at MB, some on *Thalassia* at FN and AA, and some on *Halimeda*

tridens at SE, some on rock at 0-18, mostly unattached; upper infralittoral; tetrasporic at FN in October 1957; tremendous abundance at all Tarpon Springs stations throughout the year except at 0-18. [Reported also by Taylor (1936) from Tarpon Springs]. [2]

Laurencia sp. SE; autumn 1958; sparse on *Sargassum filipendula;* upper infralittoral. [3]

Lomentaria baileyana (Harv.)Farlow. BD, CPB, BKMG, PK, MK, PAGB, ECK, MP, BK, PP, SE; found throughout the year 1957-1959; sparse to very abundant, mostly unattached, but occasionally on *Thalassia,* algae, tunicates, shells, and worm tubes; upper infralittoral; cystocarpic at BKMG in October 1958, cystocarpic at CPB in October 1958, and antheridial at BKMG in October 1958. [Reported by Hutton *et al. (op. cit.)* from Boca Ciega Bay]. [2]

Lophosiphonia bermudensis Collins & Hervey. CPB, BKMG; autumn 1958; very abundant on *Thalassia;* littoral; tetrasporic at BKMG in October 1958, cystocarpic at CPB in October 1958, and antheridial at BKMG in October 1958.

Lophosiphonia saccorhiza Collins & Hervey. FN, AA, SE; autumn, winter, and spring 1958-1959; sparse to very abundant on *Thalassia,* abundance seems to be indifferent to season of years; upper infralittoral; tetrasporic and antheridial at AA in October 1958. [3]

Melobesia membranacea (Esper)Lamx. FN; spring 1959; abundant on *Thalassia;* upper infralittoral; cystocarpic in April. [3]

Polysiphonia binneyi Harv. BKMG, PK, AA; winter and spring 1959; sparse on *Thalassia;* upper infralittoral.

Polysiphonia denudata (Dillw.)Kutz. BD, LGF, MB, HB, PAGB, SE, 0-14; winter, spring, and autumn 1958; sparse to very abundant on *Gracilaria verrucosa, Sargassum filipendula, Caulerpa cupressoides,* on shells and rocks, occasionally unattached; littoral and upper infralittoral; tetrasporic at BD in January, at MB in March and at HB in February, cystocarpic at SE in November. [2]

Polysiphonia ferulacea (Suhr.)J.Ag. BD, LGF, BIF, BKMG, FN, AA, SE; found throughout the year but mostly in autumn, winter, and spring 1957, 1958-1959; sparse to very abundant on *Thalassia, Diplanthera, Laurencia poitei,* and *Udotea conglutinata;* littoral and upper infralittoral; tetrasporic at LGF in November 1957, at BKMG in November 1958, at FN in November 1958, and April 1959, cystocarpic at BD in October 1957, at LGF in October 1958, at BIF in October 1957, and at AA in December 1958 and in April 1959; antheridial at AA in April 1959. [3]

Polysiphonia gorgoniae Harv. AA, MAR, #4FL, 0-18; autumn 1957, 1958; sparse on *Halimeda tridens, Sargassum pteropleuron,* and *Laurencia gemmifera;* upper infralittoral. [3]

Polysiphonia harveyi Bailey. FN; spring 1958; sparse, unattached. [3]

Polysiphonia havanensis Mont. CPB, BKMG; winter and spring 1958-1959; sparse on *Thalassia;* littoral.

Polysiphonia howei Hollenberg. CPB, FN, AA, SE, #4FL; found throughout the year 1958-1959; sparse to very abundant on *Thalassia* and *Penicillus lamourouxii*; littoral and upper infralittoral; tetrasporic at AA in March 1959, cystocarpic at FN in July 1959 and at AA in December 1958, antheridial at CPB in September 1958 and at FN in March 1959; abundance not seemingly related to season of year.

Polysiphonia macrocarpa Harv. LGF, CPB, BKMG, PK, FN, SE, #4FL, 0-18 autumn, winter, and spring 1957, 1958-1959; sparse on *Thalassia, Diplanthera, Batophora oerstedi, Caulerpa ashmeadii,* and *Digenia simplex;* littoral and upper infralittoral; tetrasporic at SE in December 1957, cystocarpic at CPB and PK in December 1958, at BKMG in October and November 1958, at #4FL in November 1957 and at 0-18 in November 1958. [2]

Polysiphonia ramentacea Harv. BD, LGF, PK, FN, AA; autumn, winter, and spring 1958-1959; sparse to abundant on *Thalassia, Diplanthera,* and *Syringodium;* upper infralittoral. [Reported also by Taylor (1936) from Tarpon Springs]. [2]

Polysiphonia subtilissima Mont. BD, BIF, EK; autumn 1957, spring, summer 1958; sparse to abundant on *Syringodium, Gracilaria verrucosa,* and *Wurdemannia miniata*; upper infralittoral; tetrasporic at BD in May 1958.

Polysiphonia sp. BD, SWTBP; autumn and spring 1957, 1958; sparse on *Diplanthera* and *Lomentaria baileyana;* littoral and upper infralittoral. [1]

Rhabdonia ramosissima (Harv.)J.Ag. BD, BIF, 0-18; winter, spring, and autumn 1958; sparse, most unattached, once found at 0-18 on rock; upper infralittoral; cystocarpic at BD in March 1958.

Spyridia filamentosa (Wulf.)Harv. BD, MP-T, LGF, BIF, MB, CB, NSD, SWTBP, HB, HCPA, CPB, PK, MK, M, MP, GB, BK, PP, FN, AA, 0-18; found throughout the year 1957-1959; sparse to very abundant, mostly unattached but occasional plants found on *Thalassia, Diplanthera Syringodium, Ruppia, Gracilaria verrucosa, Caulerpa ashmeadii, Halimeda tridens,* and on shells; littoral and upper infralittoral; usually most abundant in warmer months, March through November, but occasionally very abundant at some stations in winter with mild conditions; at several stations (BD, LGF, MB, CPB, M, MP) vast amounts were found. [Reported also by Taylor (1936) from HB, and by Taylor (1954) from Piney Point, southwest end of Tampa Bay]. [2]

Wurdemannia miniata (Drap.)Feldmann & Hamel. EK; summer 1958; abundant on shells; upper infralittoral.

XANTHOPHYCEAE

Vaucheria sp. MB; autumn and winter 1957-1958; abundant on muddy sand bottom; upper infralittoral. [1]

Discussion

Seasonal distribution studies of all species listed were not possible because algal epiphytic studies of seagrass leaves were not initiated at all stations at the beginning of the work, and because several miscellaneous collections exhibited species records. However, the seasonal distribution of most species in the list represents data from adequate collecting at stations visited each month.

At all stations regularly visited seagrasses were dense. This growth influenced algae in several ways. First, seagrass leaves provide a solid base for epiphytic growth; second, large quantities of unattached algae often accumulate owing to the hindrance against tidal movement by the leaves; third, Codiaceous green algae are commonly found in areas with seagrasses, probably because of the soft muddy sand bottoms which usually obtain in areas of seagrass growth (this is exemplified at Tarpon Springs); and fourth, seagrasses provide a moderate amount of protection from severe wave or current action.

Noteworthy are the enormous amounts of unattached red and attached green algae often present at stations in Tampa Bay, Boca Ciega Bay, and at Tarpon Springs.

The following discussion presents this data along with the seasonal variation of the algae involved. The green algae encountered in abundance in Tampa Bay and Boca Ciega Bay were *Enteromorpha intestinalis* and *Ulva lactuca,* and the red algal species found so abundantly were: *Hypnea musciformis, Gracilaria verrucosa,* and *Spyridia filamentosa.* In April 1958 *Hypnea cornuta* was abundant on Bird Key Middle Ground, but this phenomenon was cursory. At Tarpon Springs, *Laurencia poitei* was extremely abundant and plants of several species of Codiaceae were abundant. Seagrass epiphytes often formed blooms, but no discussion will be made of this flora. A seasonal study of algal epiphytes on the seagrass leaves would be most profitable.

At Beach Drive *Hypnea musciformis* was relatively abundant throughout the year, but was least abundant in February and March 1958, and most abundant in April through July. The species was drastically reduced in August and September, and then became very abundant from October through December 1958. This species appeared to be dominant at this station. *Gracilaria verrucosa*

was least abundant in May and June 1958, and most abundant in March and April and from July through December 1958. The species was found throughout the year. *Spyridia filamentosa* was not found from November 1957 through March 1958. It appeared in sparse quantity in April 1958, but in July through September 1958 the quantity increased. Abundance reduced in October through the end of the study. *Ulva lactuca latissima* was found throughout the year, but except for the spring months, February through June 1958, when plant abundance was large, plants were sparse. *Enteromorpha intestinalis* was only abundant during the winter months, November 1957 through January 1958. Plants persisted through April and then disappeared. Abundant quantities again reappeared in December 1958. Individual algal species abundance varied, but during each month of the year at least one species was extremely abundant.

At Lower Gandy Flat *Hypnea musciformis* was abundant in December 1957 and January 1958. Plants then disappeared, but in June 1958 an immense quantity was found. Plants of this species were sparse after this month until the end of the study. *Gracilaria verrucosa* was found throughout the year, and except for July 1958, when abundance was reduced, was extremely abundant at all times. Of the algal species found on this flat *Gracilaria* was dominant. *Spyridia filamentosa* was found throughout the year and was sparse except during the months of April through July 1958 when vast quantities of plants were present. *Ulva* was only found from April through November 1958. From May through September abundance was immense. *Enteromorpha* was only found from November 1957 through March 1958, and was abundant only in February. During every month of the year one algal species was extremely abundant, even though individual species varied in abundance.

Hypnea musciformis was never found in Mobbly Bay. *Gracilaria verrucosa* was found throughout the year and was extremely abundant from December 1957 through May 1958. Sparse quantities obtained in June and July, but an enormous abundance was found in August 1958. After this month quantities were sparse. This species was dominant at the station. *Spyridia filamentosa* was found throughout the year except during October and November 1958. The species was extremely abundant from April through

August 1958. *Ulva lactuca* was sporadic in occurrence. It was sparsely found only in these months: February, March, August, September, and December 1958. *Enteromorpha intestinalis* was extremely abundant in December 1957 and January 1958, but diminished in abundance thereafter and finally disappeared in June 1958. One algal species was extremely abundant during each month of the year, except from September through December 1958, when, for some unexplained reason, all macroscopic algae became scarce.

At Cats Point Bank in Boca Ciega Bay *Hypnea musciformis* was only found in May 1958 and was rare. *Gracilaria verrucosa* was sporadic in occurrence, but was very abundant in May 1958. *Spyridia filamentosa,* excepting six months, was observed from November 1957 through March 1959. During April, May, June, July, September, October, and December 1958 and January 1959 immense quantities of the species was present. *Ulva lactuca latissima* was recorded every month from November 1957 through March 1959, except during December 1957, February and March 1958 and March 1959. In November 1957, January, April, May, September through December 1958, and January 1959, the species was very abundant. If any algal species was dominant at this station, *Ulva* probably was. *Enteromorpha intestinalis* was only recorded in April 1958, but was abundant.

Hypnea musciformis was only found in May, June, and December 1958 in 16 months of collecting at Bird Key Middle Ground, but was extremely abundant in May and June. *Gracilaria verrucosa* was only sparsely found on four collecting trips, in November 1957, March 1958, and January and February 1959. *Spyridia filamentosa* was very abundant in July 1958, but was never recorded on any other collecting trip. *Ulva lactuca latissima* was never recorded at this station. *Enteromorpha intestinalis* was recorded only in February 1959. No unattached macroscopic alga was dominant on the flat.

At Pine Key *Hypnea musciformis* and *Enteromorpha intestinalis* were not found from October 1958 through March 1959. The other three algal species were extremely sporadic in occurrence and never abundant. No unattached macroscopic alga was dominant at the station.

Of the three Boca Ciega Bay stations the most abundant quantities of macroscopic algae were found at Cats Point Bank. However, even the latter station does not begin to approximate the bottom algal coverage found at the Tampa Bay stations.

At Tarpon Springs algae different from Tampa Bay and Boca Ciega Bay were found. Except for *Laurencia poitei,* which was often found unattached and in enormous quantity, the most abundant macroscopic benthic algae were green algae of the Codiaceae and one species of *Caulerpa.* These species are: *Penicillus capitatus, Halimeda tridens tripartita, Udotea conglutinata,* and *Caulerpa ashmeadii.* The mass of algae so abundant in Tampa Bay and, to some extent, in Boca Ciega Bay consist of species different from those existing in the offshore areas of Tarpon Springs. It is interesting to note here that most algal species common to Boca Ciega Bay and Tarpon Springs were epiphytic forms.

At the station located in the Anclote Anchorage *Laurencia poitei* was only recorded on four trips from monthly visits from June 1958 through February 1960. *Penicillus capitatus* was present every month, and was usually sparse. *Halimeda* was present every month and was usually sparse, except for one increase in abundance in September 1958. After this month abundance declined. *Udotea* was not conspicuous at the station. It was sporadically observed, and was always sparse. *Caulerpa* was the dominant of the benthic algae. It was present every month and was always extremely abundant.

At the southeast corner of North Anclote Key the observations on benthic algae extended from December 1957 through December 1958. *Laurencia* was present every month and was extremely abundant from December through May, after which the plants became sparse. *Penicillus* was extremely abundant during the year, except for a slight decline in abundance in October and November. *Halimeda* and *Udotea* were very sparse and not conspicuous. *Caulerpa* was not found at this station. *Penicillus* was the dominant alga of these five species.

On the flat north of North Anclote Key *Laurencia* was always observed and in immense quantity from December 1957 through January 1959. This species was dominant at the station. *Penicillus, Halimeda,* and *Udotea* were occasionally abundant, but

usually were sparse. *Udotea* was most abundant during the winter months. *Caulerpa* was only found three times in sparse amounts.

TABLE II—TOTALS OF TAXA FOUND IN STUDY AREAS.

	Chlorophyceae	Phaeophyceae	Rhodophyceae	Myxophyceae	Total
Tampa Bay	29	9	36	12	86
Beach Drive	16	7	30	3	56
Lower Gandy Flat	14	5	26	4	39
Mobbly Bay	8	2	15	3	28
Boca Ciega Bay	32	14	51	14	111
Cats Point Bank	17	8	25	5	55
Bird Key Middle Ground	10	7	21	5	43
Pine Key	4	4	19	2	29
Tarpon Springs	24	10	47	14	95
Anclote Anchorage	8	4	23	5	40
SE corner of North Anclote Key	13	6	24	6	49
Flat north of North Anclote Key	11	6	29	5	51
0-14*	5	2	6	1	14
0-18**	6	3	18	2	29

*—based on one collection.

**—based on two collections.

Table II gives species composition of Tampa Bay, Boca Ciega Bay, and at Tarpon Springs. Those numbers appearing in the general column of Tampa Bay, etc., are the total taxa of each algal class found in Tampa Bay, Boca Ciega Bay, or at Tarpon Springs, all stations included. Table III contains a synopsis of the number of taxa found at each regularly collected station in a particular area and compares the three areas.

In Tampa Bay the number of species present at a station was reduced as one proceeded northward. This might be due to the salinity gradient. In Boca Ciega Bay Cats Point Bank produced

TABLE III.—TABULATION OF TAXA IN COLLECTING AREAS.

	Myxophyceae	Chlorophyceae	Phaeophyceae	Rhodophyceae
Tampa Bay				
No. of taxa found only at Beach Drive of the Tampa Bay stations	2	3	1	5
No. of taxa found only at Lower Gandy Flat of the Tampa Bay stations	2	3	1	3
No. of taxa found only at Mobbly Bay of the Tampa Bay stations	2	1	0	2
Total no. of taxa found only in Tampa Bay	9	10	2	9
No. of taxa found in Tampa Bay found also in Boca Ciega Bay but not at Tarpon Springs	1	11	4	16
No. of taxa found in Tampa Bay found also at Tarpon Springs but not in Boca Ciega Bay	0	1	0	1
No. of taxa found in all three areas	2	7	3	14
No. of taxa found in common at Beach Drive, Lower Gandy Flat, and Mobby Bay	0	6	1	12
No. of epiphytic taxa	8	15	7	24
Boca Ciega Bay				
No. of taxa found only at Cats Point Bank of the bay stations	1	7	2	2
No. of taxa found only at Bird Key Middle Ground of the bay stations	2	2	2	2
No. of taxa found only at Pine Key of the bay stations	1	0	0	1
Total no. of taxa found only in Boca Ciega Bay	5	12	4	14
No. of taxa found in the bay found also in Tampa Bay but not at Tarpon Springs	1	11	4	16
No. of taxa found in the bay found also at Tarpon Springs but not in Tampa Bay	6	2	3	7
No. of taxa found in all three areas	2	7	3	14
No. of taxa found in common at Cats Point Bank, Bird Key Middle Ground, and Pine Key	0	3	4	11
No. of epiphytic taxa	10	14	10	37

TABLE III—Continued

	Myxophyceae	Chlorophyceae	Phaeophyceae	Rhodophyceae
Tarpon Springs				
No. of taxa found only at the AA station of the Tarpon Springs stations	1	2	0	2
No. of taxa found only at the SE station of the Tarpon Springs stations	3	8	0	5
No. of taxa found only at the FN station of the Tarpon Springs stations	3	4	1	6
Total no. of taxa found only at Tarpon Springs	6	15	4	25
No. of taxa found at Tarpon Springs found also in Tampa Bay but not in Boca Ciega Bay	0	1	0	1
No. of taxa found at Tarpon Springs found also in Boca Ciega Bay but not in Tampa Bay	6	2	3	7
No. of taxa found in all three areas	2	7	3	14
No. of taxa found in common at the AA, SE, and FN stations	1	4	3	12
No. of epiphytic taxa	13	11	4	40

the greatest number of species of the regularly collected stations. Species characteristic of brackish waters (*e.g.*, Tampa Bay) were abundant at this station, *Enteromorpha* spp., *Ulva,* and *Gracilaria verrucosa.* The flat north of North Anclote Key was found with the greatest number of species at Tarpon Springs. At Tarpon Springs a tropical marine algal assemblage was found, characterized by *Penicillus, Halimeda, Udotea, Caulerpa, Acetabularia,* and *Batophora.* Reference to Table III will show that the number of taxa found in common with Tampa Bay was insignificant.

The areas northwest of Anclote Key in 14-18 feet of water should be more intensively collected. It was found that as rock was encountered the abundance of attached macroscopic red algae increased. At all stations in all areas the number of epiphytic species, especially on seagrass leaves, was great.

Of the 86 taxa of algae found in Tampa Bay, 30 were found only in Tampa Bay (35% of total listed flora). Fifty-four taxa were found as epiphytes. Thirty-two taxa were also found in Boca Ciega Bay but not at Tarpon Springs. Only two taxa were also found at Tarpon Springs that were not found in Boca Ciega Bay (*Cladophora* sp. and *Rhabdonia ramosissima*-drift in Tampa Bay). Twenty-six taxa were found in all three areas.

In Boca Ciega Bay 111 taxa of algae were found. Thirty-five taxa were limited to this bay (32% of total listed flora). Thirty-two taxa were found in common with Tampa Bay, while 18 taxa were found in common with Tarpon Springs. Twenty-six species were found in all three areas.

At Tarpon Springs 95 taxa were found. Of these 50 taxa were found only at Tarpon Springs (53% of total listed flora—significant figure). Only two forms were found in common with Tampa Bay, and 18 taxa were found in common with Boca Ciega Bay. Twenty-six taxa were found in all three areas.

In determining whether a species was stenohaline or euryhaline, I decided it was stenohaline if it was found only in a particular area and euryhaline if it was found in all three areas. If a plant was found only in Tampa Bay the indication was that it might be an obligate brackish water plant. If a species was found in Tampa Bay and Boca Ciega Bay but not at Tarpon Springs or in Boca Ciega Bay and in either of the other two areas no decision on the salinity tolerance was made.

Twenty-two attached taxa were found only in Tampa Bay and were designated as brackish water plants, 24 taxa were euryhaline, and 24 more taxa were found in Tampa Bay and Boca Ciega Bay but not at Tarpon Springs. The taxa not found attached were not considered in this discussion. Thirty-two attached taxa were found only in Boca Ciega Bay, 25 attached taxa were euryhaline, and 39 attached taxa were also found in either Tampa Bay or at Tarpon Springs. Forty-five attached taxa designated as stenohaline were restricted to Tarpon Springs, 25 attached taxa were euryhaline, and 17 additional attached taxa were found also in either Boca Ciega Bay or Tampa Bay. Further collecting could reveal differences.

It is concluded that Tampa Bay displays a typical brackish water flora, the number of marine species decreasing as the mean

salinity decreases. Despite the fact that a moderate number of species were limited to Boca Ciega Bay, most of the species found there were also found in one of the other two areas or in both, signifying that Boca Ciega Bay constitutes a transition between the brackish water estuarine condition found in Tampa Bay and the marine condition found at Tarpon Springs. Several species found in Tampa Bay which are typically marine species represented detached plants carried in by water currents. However, the large masses of unattached red algae found in the seagrass beds in Tampa Bay were not shifted by water currents (e.g., *Gracilaria verrucosa, Hypnea musciformis,* and *Spyridia filamentosa*).

It is noteworthy to state that nine of 16 taxa of green algae found at Beach Drive, SE, in Tampa Bay were forms of *Enteromorpha.* At Lower Gandy Flat, seven of 14 taxa of green algae were *Enteromorpha,* and at Mobbly Bay five of eight green algal taxa of green algae were *Enteromorpha.* At Beach Drive and Mobbly Bay two additional taxa of green algae were the two varieties of *Ulva lactuca.* These algae are indicative of an estuary or of brackish water.

It appears that a rigid seasonal control of the presence of species does not exist. Of the 86 taxa found in Tampa Bay, two were found only in summer. Sixty-six taxa were limited to some portion of autumn, winter, or spring. Fourteen taxa were found throughout the year. This indicates that the relative abundance of species during the hot summer months is quite low and that the highest number of species is found during autumn, winter, and spring or some portion of this period. This also indicates the relative mildness of the weather during the colder months.

Of the 111 taxa of plants found in Boca Ciega Bay most were found either during the winter or some portion of the autumn, winter, and spring (60 taxa). Seventeen taxa were found throughout the year. Twenty taxa were found during the three seasons of autumn, winter and spring. Only four taxa were restricted to the summer months. It is possible that the summer water temperatures of the shallow Tampa Bay and Boca Ciega Bay were sufficiently high to limit growth. One water temperature reading in five and one-half inches of water at Cats Point Bank in Boca Ciega Bay in July 1958 was 39.8°C. It is possible that algal growth may be curtailed when water temperatures exceed 30.0°C. This aspect requires critical study.

At Tarpon Springs the same seasonal picture obtained. No taxa were found only in summer. Eighteen taxa were found throughout the year. The data from Tarpon Springs also indicated that the greatest number of species were found during the autumn, winter, and spring or some portion of this period (55 taxa).

This discussion emphasizes the subtropical nature of the flora, and the relative mildness of winter.

According to Dr. Clark Rogerson (personal communication) Dr. Howe made these field notes from Port Tampa in Tampa Bay in 1902; *Acanthophora*—unattached, *Spyridia*—common in shallow water, *Ulva*—on stones in low littoral, *Enteromorpha* in low littoral, *Amphibia* (= *Bostrychia*) on mangrove shoots and on *Salsola* stems in littoral, *Caloglossa* on *Salsola* stems in littoral, *Chondria*—unattached, *Ceramion*—unattached, *Spirulina subsolsa*—on *Acanthophora*. Despite the fact that many of Dr. Howe's collections remain unidentified these sketchy field notes are interesting as these algae found back in 1902 were also found in Tampa Bay in this study. Also interesting is the observance of *Enteromorpha* and *Ulva* on 22 November 1902, for in my study *Enteromorpha*, particularly, was found to appear and proliferate in November. Evidently *Spyridia* was a conspicuous element of the flora at Port Tampa in 1902 as it was in the bay in 1957-1959. Dr. Howe's notice of *Caloglossa* is noteworthy, for I did not find the genus in my study [it is presumed that the species would be *Caloglossa leprieurii* (Mont.) J.Ag.].

Summary

Marine algae in Tampa Bay, Boca Ciega Bay, and at Tarpon Springs were studied on monthly visits from September, 1957, to April, 1959. One hundred and ninety-five taxa of algae are reported. Extensive seasonal data could not be obtained on all species listed as algal epiphytic studies of seagrass leaves were not initiated at the beginning of the study and because of the existence of sporadic miscellaneous collections.

Nine stations, three each in Tampa Bay, Boca Ciega Bay, and at Tarpon Springs, were visited monthly to collect and observe plants and to record hydrographic information, *e.g.*, water temperature, salinity, depth of water, stage and type of tide, water clarity, and substrate. The observed mean salinity at Beach Drive, SE, was 24.7 o/oo, was 23.1 o/oo at Lower Gandy Flat, and was 21.3

o/oo at Mobbly Bay in Tampa Bay. This gradient is believed to adversely influence marine algal growth. Table II displays a reduction of number of algal taxa from Beach Drive to Mobbly Bay.

Large masses of unattached red algae were found at most stations and often an abundance of attached green algae was found. In the bays *Hypnea musciformis, Gracilaria verrucosa,* and *Spyridia filamentosa* were abundant. At Tarpon Springs *Laurencia poitei* was plentiful. *Enteromorpha intestinalis* formed massive growths in Tampa Bay and at Cats Point Bank in winter and spring. At Tarpon Springs several species of Codiaceae were abundant. A high percentage of the flora in all three areas were epiphytic species.

Eighty-six taxa of algae were found in Tampa Bay, 111 taxa were recorded in Boca Ciega Bay, and 95 taxa were listed from Tarpon Springs. Of the Tampa Bay flora 35% was limited to that bay, 32% of the Boca Ciega Bay flora was restricted to that bay, while 52% of the Tarpon Springs flora was limited to that area.

It was concluded that Tampa Bay exhibited a brackish water flora, that Boca Ciega Bay displayed a flora transitional between Tampa Bay and the marine flora found at Tarpon Springs.

In all the areas the greatest number of species were found during autumn, winter, and spring or during some portion of this period.

Literature Cited

EARLE, S. A.

1956. Marine Chlorophyta of the upper west coast of Florida. Unpublished master's thesis. Duke University, Durham, North Carolina.

FELDMAN, J.

1954. Ecology of marine algae. Manual of Phycology. Ed. by G. M. Smith. Chronica Botanica Co., Waltham, Mass.

GOODELL, H. G., and D. S. GORSLINE

1959. Sedimentary textural analysis of Tampa Bay, Florida. Preliminary data report from the Sediment Research Laboratory. Dept. of Geology. Florida State University, Tallahassee. mimeo.

HUTTON, R. F., B. ELDRED, K. D. WOODBURN, and R. M. INGLE

1956. The ecology of Boca Ciega Bay with special reference to dredging and filling operations. Florida State Board of Conservation Marine Laboratory, St. Petersburg, Technical Series No. 21: 1-33.

OLSON, F. C. W.

1953. Tampa Bay studies. Report No. 1. Oceanographic Institute, Florida State University, Contribution No. 19: 1-27.

PHILLIPS, R. C.

1960. Observations on the ecology and distribution of the Florida seagrasses. Prof. Pap. Series, No. 2. Fla. St. Bd. Conserv. Mar. Lab. St. Petersburg.

SHOEMAKER, W. S.

1954. Light penetration in the Gulf of Mexico. Fish. Bull., U. S. 89: 139-141.

TAYLOR, W. R.

1936. Notes on algae from the tropical Atlantic Ocean, III. Papers Mich. Acad. Sci., Arts & Lett., 21: 199-207.

——. 1954. Distribution of marine algae in the Gulf of Mexico. Papers Mich. Acad. Sci., Arts & Lett., 39: 85-109.

U. S. Dept. Commerce, Coast and Geodetic Survey. 1957. Tide Tables (1958). East Coast, North and South America (Including Greenland). U. S. Govern. Print. Office.