

SEASONAL ASPECT OF THE MARINE ALGAL FLORA OF ST. LUCIE INLET AND ADJACENT INDIAN RIVER, FLORIDA ¹

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Few published accounts of seasonal aspects of marine algae of the Florida lower east coast have appeared. Howe (1903) alluded to such a phenomenon by stating that the drift flora at Jupiter Inlet, approximately 30 miles south of St. Lucie Inlet, was most abundant and varied in autumn, probably in September.

Howe (*loc. cit.*) included Key West in one autumn collecting trip. Later (1909), in referring to a spring collecting trip to Key West, he mentioned that the spring flora was similar to that in autumn, except that the latter was more varied and abundant.

In connection with the present study four trips were made to the St. Lucie area (Fig. 1), two in autumn and two in spring, to determine possible seasonal changes of the flora: (1) 28 September-1 October 1957, (2) 25-27 March 1958, (3) 14-15 October 1958, and (4) 11-12 March 1959.

Fresh water was being released through the St. Lucie River from Lake Okeechobee during trips #1-#3. Amounts were: trip #1-7000 cubic feet per second; trip #2-4000 c.f.s.; trip #3—average of 1867 c.f.s. No water was being released during trip #4.

Stephenson and Stephenson (1950) stated that the intertidal biota of the Florida Keys was definitely tropical. Although St. Lucie Inlet is a considerable distance north of the keys, it does lie south of Cape Canaveral, at which point the same authors (1952) stated that intertidal marine life became a warm temperate assemblage. Pierson (1956) in a coastal climate study noted that the isotherm of 64.4°F. mean temperature for the coldest month is used as the line of demarcation by climatologists between subtropical and tropical climates. He observed that this line on the Florida east coast lies between Melbourne and Vero Beach, approximately 52 miles north of St. Lucie Inlet. After studying seasonal occurrence of

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the marine algae, it is concluded that the region under consideration in this paper is, aquatically speaking, in a subtropical zone.

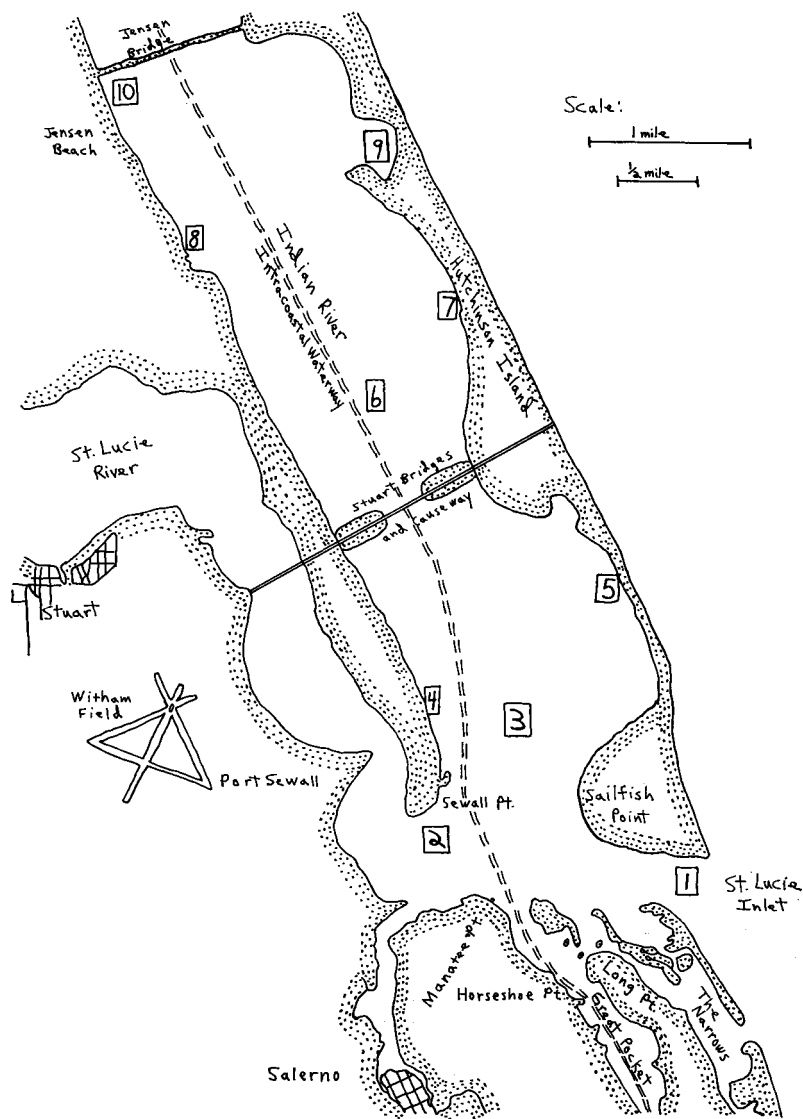


Figure 1. Map of area with station locations.

DESCRIPTION OF THE HABITAT

Extensive hydrographic data from the area are contained in Phillips and Ingle (1960).

Except for Intra-Coastal Waterway channels, which are approximately eight to 12 feet deep depending on the tide, Indian River is shallow, depths of three to six feet recorded over large areas. Many shallow flats were observed which supported growths of seagrasses, mainly *Diplanthera wrightii* and *Syringodium filiforme*.

Strong tidal currents flow into the area through St. Lucie Inlet. At station 1 a shelly sand substrate was observed devoid of plant growth. At station 2 and north of Sailfish Pt. in the Indian River the substrate was muddy sand which often supported dense growths of seagrasses.

Water temperatures are given here as they were recorded on the four trips. On trip 1 most temperatures ranged from 26.5°C. to 29.5°C. At station 3 two extreme water temperatures were observed, one being 36.0°C. and the other 42.0°C. Both extreme readings were made during mid-afternoon and during low tide in depths of one and one-half to two feet. On trip 2 water temperatures ranged from 18.5°C. to 24.0°C. One extreme morning reading of 13.5°C. was made at station 2. On trip 3 the temperature range was 23.6°C. to 28.1°C. Temperatures ranged from 21.6°C. to 23.0°C. on trip 4. Water temperatures on trip 3 were slightly cooler than those on trip 1 because they were made later in October than during the year previous. In other work in Tampa Bay I found that October was the month of water temperature decline after summer maxima (Phillips, 1960). Water temperatures were slightly warmer during trip 4 than during trip 2. This was a result of the relatively mild winter of 1958-59. The winter of 1957-1958 was severe with record low air temperatures recorded.

PLANT LIST

Because no measures were taken to quantitatively measure plants, any abundance data given here must of necessity be subjective. For relative comparison these terms will be used for abundance: extremely abundant, abundant, common, rare.

Station locations are found on Fig. 1.

MYXOPHYCEAE

- Anabaena* sp. Trip 1; entangled in algae; station 5.
- Calothrix confervicola* (Roth)C.Ag. Trip 4; rare; on *Diplanthera*; station 6.
- Calothrix pilosa* Harv. Trip 3; rare; on *Cladophora repens*; station 1.
- Hydrocoleum lyngbyaceum* Kutz. Trip 4; rare; on algae and *Diplanthera*; stations 3, 6, 7-8.
- Lyngbya confervoides* C.Ag. Trips 1 and 3; extremely abundant on trip 3 and rare on trip 1; occasionally epiphytic but most often found entangled in algae; stations 3, 8-9.
- Lyngbya majuscula* Harv. Trips 1, 3-4; rare on trips 1 and 3, abundant on trip 4; once found on *Diplanthera* but most often found entangled in algae or on bottom; stations 3, 8-9.
- Microcoleus chthonoplastes* (Fl.Dan.)Thur. Trips 1 and 3; rare; occasionally seen on seagrass leaves but most often found entangled in algae or on bottom; stations 1-3, 5-6, 8.
- Plectonema terebrans* B. & F. Trip 4; abundant; on algal encrustations; station 8.

CHLOROPHYCEAE

- Acetabularia farlowii* Solms-Laubach. Trip 4; one floating specimen; station 5.
- Boodileopsis pusilla* (Collins)Taylor, Joly, and Bernatowicz. Trips 1 and 3; rare; entangled in algae; stations 2-3.
- Bryopsis pennata* Lamx. var. *secunda* (Harv.)Collins and Hervey. Trip 4; rare; unattached; station 6.
- Caulerpa racemosa* (Forsskal)J.Ag. var. *occidentalis* (J.Ag.)Børgs. Trip 2; common; on coquina rock; just north of St. Lucie Inlet on ocean side of Hutchinson Island.
- Chaetomorpha aerea* (Dillw.)Kutz. Trip 1; common; on a shell; station 3.
- Chaetomorpha brachygona* Harv. Trips 1, 3, 4; rare; entangled in algae; stations 1-3, 5, 8.
- Chaetomorpha linum* (Mull.)Kutz. Trip 2; rare; unattached; station 5.
- Cladophora crispula* Vick. Trips 1, 3; rare on trip 1, extremely abundant on trip 3; unattached on trip 1, on bottom on trip 3; stations 3, 6.
- Cladophora fascicularis* (Mert.)Kutz. Trips 1, 2, 3, 4; rare to extremely abundant; unattached; stations 2, 6-10.
- Cladophora fuliginosa* Kutz. Trips 1, 2; rare to extremely abundant; unattached; stations 3, 6-10.
- Cladophora glaucescens* (Griff.)Harv. Trips 1, 2, 3; rare to abundant; on *Diplanthera*, *Hypnea musciformis*, on a shell, *Syringodium*; stations 1, 2, 3-5, 7-8.

- Cladophora luteola* Harv. Trips 1, 3, 4; rare to common; on *Diplanthera*, *Gracilaria verrucosa*, and entangled in algae; stations 2-4, 7, 9.
- Cladophora repens* (J.Ag.)Harv. Trip 3; rare; on *Sargassum polyceratum*; station 1.
- Codium decorticateum* (Woodward)Howe. Trip 4; floating; station 3.
- Codium repens* Crouan in Vickers. Trip 2; rare; on coquina rock; just north of St. Lucie Inlet on ocean side of island.
- Codium taylori* Silva. Trip 2; common; on coquina rock; just north of St. Lucie Inlet on ocean side of island.
- Enteromorpha clathrata* (Roth)J.Ag. Trip 2; abundant; on shells; station 7.
- Enteromorpha flexuosa* (Wulf.)J.Ag. Trip 2; rare to abundant; on shells; stations 2-4, 7-9, just north of St. Lucie Inlet on ocean side of island.
- Enteromorpha plumosa* Kutz. Trip 1; rare; on *Diplanthera* and *Vaucheria*.
- Enteromorpha prolifera* (Mull.)J.Ag. Trips 1, 2, 4; rare to abundant; on *Diplanthera* mostly; stations 1-4, 7-8.
- Enteromorpha salina* Kutz. Trips 3, 4; rare; on *Diplanthera*; station 3.
- Enteromorpha* sp. Trip 3; rare to abundant; on *Diplanthera*; stations 1, 3-4.
- Ernodesmus verticillata* (Kutz.) Børgs. Trips 3, 4; rare; once found on *Diplanthera*; stations 2, 5.
- Halimeda discoidea* Decaisne. Trip 2; common; on coquina rock; just north of St. Lucie Inlet on ocean side of island.
- Rhizoclonium kernerii* Stockmayer. Trips 1, 3; rare to abundant; most often found on *Diplanthera* and *Syringodium*; stations 1-4, 6-8, 10.
- Udotea flabellum* (E. & S.) Lamx. Trip 2; rare to abundant; on bottom; stations 3, 8, 10.
- Ulothrix flacca* (Dillw.) Thur. Trips 2, 3; rare; on *Diplanthera*; stations 3, 8.
- Ulva lactuca* L. Trips 3, 4; rare; on mangrove root; stations 4, 7.
- Ulva lactuca* L. var. *latissima* (L.) Decandolle. Trip 1; rare; unattached; station 9.
- Ulva lactuca* L. var. *rigida* (C. Ag.) LeJolis. Trip 2; on coquina rock; just north of St. Lucie Inlet on ocean side of island.

XANTHOPHYCEAE

- Vaucheria* sp. Trips 1, 2, 3, 4; rare to very abundant; on muddy bottoms; stations 3-5.

PHAEOPHYCEAE

- Dictyopteris delicatula* Lamx. Trips 2, 4; rare to very abundant; attached; stations 1, 2.

- Dictyota cervicornis* Kutz. Trips 3, 4; rare; unattached; stations 6-8, 10.
- Dictyota dentata* Lamx. Trip 1; rare; unattached; station 1.
- Dictyota dichotoma* (Huds.) Lamx. Trip 1; rare; unattached; station 6.
- Dictyota divaricata* Lamx. Trips 1, 4; rare; unattached; stations 8, 10.
- Dictyota* sp. Trips 1, 3; rare; unattached; station 5.
- Ectocarpus rhodoortonoides* Børgs. Trip 1; rare; on *Diplanthera*; station 8.
- Ectocarpus subcorymbosus* Farlow emend. Holden. Trips 1, 2, 3, 4; rare to abundant; most often found on *Diplanthera* and *Syringodium*; stations 2-8, 10.
- Ectocarpus* sp. Trips 1, 4; rare to extremely abundant; on algae and *Syringodium*; stations 2, 5, 8.
- Eudesme zosterae* (J.Ag.) Kylin. Trip 4; common; on *Thalassia*; near station 4.
- Giffordia mitchellae* (Harv.) Hamel. Trips 2, 4; common to extremely abundant, at times in large masses; most often found on leaves of *Diplanthera* and *Syringodium*; stations 2-9.
- Padina vickersiae* Hoyt. Trip 1; rare; unattached; station 3.
- Rosenvingea intricata* (J.Ag.) Børgs. Trip 3; common to abundant; on *Diplanthera*; stations 3, 5, 7.
- Sargassum hystrix* J.Ag. var. *buxifolium* (Chauvin) J.Ag. Trip 2; rare; on coquina rock; just north of St. Lucie Inlet on ocean side of Hutchinson Island.
- Sargassum natans* (L.) Meyen. Trip 1; rare; unattached; station 8.
- Sargassum polyceratum* Mont. Trip 3; rare; unattached; station 1.
- Spatoglossum schroederi* (Mert.) Kutz. Trip 2; extremely abundant; unattached; station 2.
- Sphacelaria furcigera* Kutz. Trips 2, 3, 4; rare to abundant on *Diplanthera*, *Syringodium*, *Sargassum polyceratum*; stations 1, 7, 10.
- Stypopodium zonale* (Lamx.) Papenf. Trip 2; rare; unattached; station 2.

RHODOPHYCEAE

- Acanthophora muscoides* (L.) Bory. Trips 1, 2, 3, 4; rare; unattached, but once found attached to worm tubes; stations 2-6, 10.
- Acanthophora spicifera* (Vahl) Børgs. Trips 1, 3; rare to abundant; unattached but once found on *Syringodium*; stations 2-4, 6, 8.
- Acrochaetium seriatum* Børgs. Trips 1, 2, 3, 4; rare to extremely abundant; most often found on *Diplanthera* and *Syringodium*; stations 1-4, 6-8, 10.
- Acrochaetium* sp. Trips 1, 3; rare; most often found on *Diplanthera* and *Syringodium*; stations 2, 8.

- Agardhiella tenera* (J. Ag.) Schmitz. Trips 1, 2, 3, 4; rare; unattached, once found on shells; stations 2-7, 10, just north of St. Lucie Inlet on ocean side of island.
- Botryocladia occidentalis* (Børgs.) Kylin. Trips 1, 3; rare; unattached; stations 1, 3, 5-6.
- Bryocladia cuspidata* (J. Ag.) DeToni. Trip 2; rare; unattached; station 2.
- Bryothamnion seaforthii* (Turn.) Kutz. Trips 1, 2, 3, 4; rare to extremely abundant; unattached; stations 1-6, 8-10.
- Bryothamnion triquetrum* (Gmel.) Howe. Trips 1, 3; rare; unattached; stations 3, 4.
- Centroceras clavulatum* (C.Ag.) Mont. Trips 2, 3, 4; rare; unattached; stations 3, 7, just north of St. Lucie Inlet on ocean side of island.
- Ceramium byssoideum* Harv. Trip 4; rare; on *Diplanthera*; station 1.
- Ceramium codii* (Richards) Feldmann-Mazoyer. Trip 3; common; on *Sargassum polyceratum*; station 1.
- Ceramium strictum* (Kutz.) Harv. Trip 4; rare; on *Codium decorticatum*; station 3.
- Ceramium tenuissimum* (Lyngbye) J. Ag. Trips 1, 3, 4; rare to extremely abundant; most often found on *Diplanthera* and *Syringodium*; stations 1-8.
- Ceramium* sp. Trip 1; rare; on *Bryothamnion seaforthii*; station 3.
- Chondria dasyphylla* (Wood.) C. Ag. Trip 2; common; on *Udotea flabellum*; station 3.
- Chondria floridana* (Collins) Howe. Trip 1; abundant to extremely abundant; unattached; stations 8, 10.
- Chondria littoralis* Harv. Trips 1, 4; rare; most often found unattached, once found on worm tubes; stations 6, 8, 10.
- Chondria* sp. Trip 4; rare; unattached; station 5.
- Corallina cubensis* (Mont.) Kutz. Trips 3, 4; rare; unattached; stations 8, 9.
- Crouania attenuata* (Bonne.) J. Ag. Trip 3; rare; on *Sargassum polyceratum*; station 1.
- Erythrotrichia carnea* (Dillw.) J. Ag. Trips 1, 2, 3, 4; rare to extremely abundant; most often found on *Diplanthera* and *Syringodium*; stations 1-5, 7-8, 10.
- Eucheuma isiforme* (C. Ag.) J. Ag. Trip 2; unattached; station 2.
- Fosliella lejolissii* (Rosanoff) Howe. Trips 1, 2, 4; rare to extremely abundant; on *Diplanthera* and *Syringodium*; stations 1, 4, 6, 8, 10.
- Gelidiella acerosa* (Forsskal) Feldmann & Hamel. Trips 3, 4; common to extremely abundant; found attached only once on worm tubes; stations 2, 6, 7, 9.

- Gelidium corneum* (Huds.) Lamx. Trips 1, 2; rare; unattached; stations 2, 3.
- Gelidium crinale* (Turn.) Lamx. Trip 2; rare; on twigs; station 5.
- Gelidium pusillum* (Stackhouse) LeJolis. Trip 2; rare; on coquina rock; just north of St. Lucie Inlet on ocean side of island.
- Goniotrichum alsidii* (Zanard.) Howe. Trips 2, 3, 4; rare to extremely abundant; most often found on *Diplanthera* and *Syringodium*; stations 2-4, 5, 7.
- Gracilaria blodgettii* Harv. Trips 1, 2, 4; rare to extremely abundant; once found on a shell, but most often found unattached; stations 1, 2, 5-8, 10.
- Gracilaria bursa-pastoris* (Gmel.) Silva. Trip 1; rare; unattached; stations 2, 3, 6.
- Gracilaria cervicornis* (Turn.) J. Ag. Trip 1; rare; unattached; stations 3, 8.
- Gracilaria debilis* (Forsskal) Børgs. Trips 1, 2, 3; rare; unattached; stations 1-3, 6, 8.
- Gracilaria crassissima* Crouan ex. J. Ag. Trip 1; rare; unattached; station 6.
- Gracilaria cylindrica* Børgs. Trips 1, 2, 3, 4; rare to abundant; unattached; stations 1-3, 5, 6.
- Gracilaria damaecornis* J. Ag. Trip 1; rare; unattached; station 8.
- Gracilaria foliifera* (Forsskal) Børgs. Trips 1, 4; rare; unattached; stations 1-3, 6.
- Gracilaria verrucosa* (Huds.) Papenf. Trips 1, 2, 3, 4; rare to extremely abundant; all unattached except once found on a shell; stations 1-10.
- Gracilaria* sp. Trips 1, 2; rare; both unattached and on shells; stations 3, 8.
- Grateloupia flicina* (Wulf.) C. Ag. Trip 3; rare; unattached; station 7.
- Griffithsia globulifera* Harv. Trip 3; rare; on *Sargassum polyceratum*; station 1.
- Halymenia gelinaria* Collins and Howe. Trip 3; rare; unattached; station 5.
- Herposiphonia secunda* (C. Ag.) Ambronn. Trip 3; abundant; on *Sargassum polyceratum*; station 1.
- Hypnea cervicornis* J. Ag. Trip 1; rare to extremely abundant; unattached; stations 2, 3, 6, 8, 10.
- Hypnea cornuta* (Lamx.) J. Ag. Trips 3, 4; rare to abundant; unattached; stations 3, 5, 6.
- Hypnea musciformis* (Wulf.) Lamx. Trips 1, 2, 3, 4; rare to extremely abundant; unattached; stations 1-8, 10.
- Hypnea spinella* (C. Ag.) Kutz. Trip 1; rare; unattached; station 6.
- Jania adhaerens* Lamx. Trips 1, 2; rare; once found on *Syringodium*; stations 3, 8.
- Jania capillacea* Harv. Trip 4; rare; on shell; station 2.

- Jania rubens* (L.) Lamx. Trip 2; rare; unattached; station 2.
- Laurencia microcladia* Kutz. Trip 4; rare; unattached; station 8.
- Laurencia papillosa* (Forsskal) Grev. Trip 2; common; on coquina rock; just north of St. Lucie Inlet on ocean side of island.
- Laurencia poitei* (Lamx.) Howe. Trips 1, 2, 3; rare; most often found unattached but occasionally found on *Syringodium* and on coquina rock; stations 2, 4, 9, just north of St. Lucie Inlet on ocean side of island.
- Liagora ceranoides* Lamx. Trip 1; rare; unattached; station 8.
- Lomentaria baileyana* (Harv.) Farlow. Trips 3, 4; rare to extremely abundant; most often found unattached but once found on shells; stations 5-7.
- Lophosiphonia scopulorum* (Harv.) Womersley. Trip 3; rare; on *Diplanthera*; station 7.
- Mesothamnion caribaeum* Børgs. Trip 4; rare; on *Jania capillacea*; station 2.
- Polysiphonia binneyi* Harv. Trips 1, 2, 3, 4; rare to extremely abundant; most often found on *Diplanthera* and *Syringodium*; stations 1-8, 10.
- Polysiphonia havanensis* Mont. Trip 3; extremely abundant; on *Diplanthera*; stations 2-5, 7, 8, 10.
- Polysiphonia howei* Hollenberg. Trip 1; rare; on *Diplanthera*; station 8.
- Polysiphonia* sp. Trip 2; rare; on *Diplanthera*; stations 7, 8.
- Spyridia filamentosa* (Wulf.) Harv. Trips 2, 3, 4; rare to extremely abundant; most often found unattached, only once found on *Syringodium*; stations 5-8, 10.
- Wurdemannia miniata* (Drap.) Feldmann & Hamel. Trip 1; rare to abundant; unattached; stations 3, 9.

DISCUSSION

A total of 123 taxa of marine algae were found. Of this number eight were blue-green algae, 31 were green algae, one was a yellow-green, 20 were brown algae, and 63 were red algae. Of the total 49 taxa were epiphytes, of which 24 were red algae. *Diplanthera* and *Syringodium* leaves and *Sargassum* were the most important hosts of algal epiphytes.

Table I contains species composition for each trip. Twelve taxa were recorded on all four trips. Forty-three taxa were found only during autumn, and 35 taxa were found only during spring. Thirty-three additional taxa were found during both seasons, but not on all four collecting trips. Possibly collecting over many years would reveal less seasonal variation. Many of the algae which were

found only on the spring trips (*i.e.*, during cooler months) are found widely dispersed throughout the Caribbean tropics.

TABLE I
SPECIES COMPOSITION ON EACH TRIP

Trip No.	Blue-Green	Green	Brown	Red	Yellow-Green	Total
1	4	13	9	34	1	61
2	0	15	7	27	1	50
3	4	14	6	31	1	56
4	4	10	9	27	1	51
1, 2, 3, & 4	0	1	1	9	1	12

In comparing seasonal data from the Tampa Bay area with that from the present study area, I would point out the great increase in abundance of *Enteromorpha* in colder months. This applies only to *E. clathrata* and *E. flexuosa* which were abundant on trip 2. The winter of 1957-1958 (trip 2) was one of record cold, but the winter of 1958-1959 (trip 4) was relatively mild. These species were not found on the latter trip. In the Tampa Bay region a large abundance of *Enteromorpha* is a characteristic feature of the winter flora, and it probably was an indication of the severity of the 1957-1958 winter in the St. Lucie Inlet region.

Table II compiles the number of unattached and attached species on every trip in each algal class. On both autumn trips the number of unattached species was greater than the number of attached forms. This was more conspicuous on the first visit. High winds and turbulent water on the third trip possibly militated against collecting a greater number of unattached forms. This turbulent water would probably not greatly influence results on the number of attached species, for most of the attached flora were microscopic epiphytic plants on seagrass leaves. The number of attached species recorded on both spring collections was greater than unattached forms. This was more pronounced on trip 2.

The number of unattached species was greater on both autumn trips than on both trips in spring. Except for trip 4 attached species were more numerous in spring than in autumn. In all cases red algae constituted the greatest number of unattached forms in the total drift flora. In attached flora red algae were also most

TABLE II
COMPILATION OF ATTACHED AND UNATTACHED SPECIES

	Trip 1		Trip 2		Trip 3		Trip 4	
	Unatt.	Att.	Unatt.	Att.	Unatt.	Att.	Unatt.	Att.
<i>Blue-Green</i>	2	2	0	0	3	1	1	3
<i>Green</i>	6	7	3	12	5	9	5	5
<i>Brown</i>	6	3	2	5	3	3	2	7
<i>Red</i>	25	9	15	12	19	12	17	10
<i>Yellow-Green</i>	0	1	0	1	0	1	0	1
TOTAL	39	22	20	30	30	26	25	26

numerous, except during trip 2 when attached green algae were equal in numbers to attached red algae.

In comparing the flora of the area as found on trip 1 and on trip 3, it is seen that the number of unattached species was slightly greater on trip 1 than on trip 3, but in terms of biomass the drift flora was much greater on the first visit than during the visit in autumn 1958. In both years red algae constituted the greatest amount of unattached species. Attached flora of both autumnal seasons was approximately equal both in species numbers and in biomass.

In comparing the flora as found on both spring trips it is seen that, numerically speaking, the attached flora was approximately equal on both trips. This holds true also for the biomass of attached algae. On trip 4 unattached species were slightly greater in number than on trip 2 (spring 1958), but in biomass the algae were much more abundant on trip 4 than on trip 2. Red algae constituted the greatest percentage of unattached flora.

The first set of seasonal observations made (trip 1—autumn 1957; trip 2—spring 1958) revealed that quantity of drift or unattached algae was immense on the autumn trip and consisted of various species of *Gracilaria*, two species of *Hypnea*, *Cladophora fascicularis*, *Bryothamnion seaforthii*, *Acanthophora spicifera*, *Chondria floridana*, and *Sargassum natans*. In spring unattached species were reduced in number as well as abundance. In both these seasons a comparable number of attached taxa were found, that in spring being slightly greater. However, biomass of attached

algae was much greater in spring than in autumn. It should be pointed out here that biomass observations were limited to visual estimations.

During the second set of seasonal observations (trip 3—autumn 1958; trip 4—spring 1959) it was evident that climatic conditions were more mild. Much drift material was found in autumn, consisting of *Gracilaria verrucosa*, *Acanthophora muscoides*, *Hypnea cornuta*, *Gelidiella acerosa*, *Bryothamnion seaforthii*, and *Cladophora fascicularis*. However, sizable amounts of unattached algae were also found in spring, consisting of *Hypnea musciformis*, *Gracilaria blodgettii*, and *Gracilaria verrucosa*. These are fewer in number as compared with autumn 1958, but quantity was comparable. Red algal epiphytes were very abundant in spring 1959, much more so than in autumn 1958.

An opportunity was afforded to make observations during autumn and spring, 1957-1958, when fresh water discharges were heavy, and again in 1958-1959 when discharges were either very low or cut off. No deleterious effect was ever apparent on marine algae in the Indian River from fresh-water discharges through St. Lucie River. Water salinity was reduced at stations in the Indian River, especially during heavy discharges, but was not sufficient to adversely affect marine plants. An extreme reading was taken at station 2. On trip 1 salinity was less than 1.0 o/oo at this station, rose to 35.7 o/oo on trip 3, and was 27.7 o/oo on trip 4. Water discharges were very low on trip 3, and were shut off on trip 4. No adverse effects on marine plants were observed at station 2.

In conclusion it seems that the autumn algal flora at and near St. Lucie Inlet is abundant and varied, conspicuous in quantity of unattached species. The spring flora displayed a reduction in numbers of species, markedly so after severely cold winters, a reduction in abundance of unattached species (this phenomenon is less conspicuous during mild winters), but an increase in abundance of attached forms, particularly in epiphytic algae. In the cold winter and spring of 1957-1959 *Enteromorpha* flourished, but did not do so in the relatively mild winter of 1958-1959. The group displaying greatest reduction in species numbers in spring was red algae. Again, this was more conspicuous after the cold winter. After the mild winter amount of reduction in species num-

bers was slight, and abundance was as great when considering epiphytic red algae and unattached macroscopic algae.

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