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The Seagrass Epiphytes of the Indian River, Florida I. Species List with Descriptions and Seasonal Occurrences

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Abstract

Forty-one species of algae occurred as epiphytes on the seagrasses *Halodule wrightii*, *Syringodium filiforme*, and *Thalassia testudinum* in the Indian River, Florida. Monthly collections were made at three stations and bi-monthly collections were made at two stations from December 1977 through December 1978. Species numbers and species abundance were generally highest in the winter and the spring when Rhodophyta and Phaeophyta were most abundant, and lowest during the late summer and early fall. Cyanophyta and Chlorophyta occurred relatively consistently throughout the year. The epiphytes are divided into three groups based on their seasonal pattern: 1) Year-round species, 2) winter-spring species, and 3) species of rare or irregular occurrence.

Introduction

The leaves of seagrasses serve as important sites on which macroalgae can settle (Phillips 1960a, Humm 1964, Ballantine and Humm 1975, Harlin 1975). The number of floristic studies dealing with macroalgal epiphytes on Florida seagrasses has been limited. Humm (1964) reported 113 species of epiphytic macroalgae occurring on *Thalassia testudinum* in Biscayne Bay and waters of the Miami area. Ballantine and Humm (1975) found 66 species of epiphytic algae on seagrasses in the Anclote River estuary. These epiphytes accounted for 65% of all the attached benthic macroalgae in that area. Phillips (1960a, 1960b, and 1961) examined the algal epiphytes on other algae and on seagrasses at several sites. He found 24 species of algal epiphytes in Crystal Bay (1960a), 54 in Tampa Bay, 71 in Boca Ciega Bay, 68 in Tarpon Springs (1960b), and 49 in the St. Lucie Inlet and adjacent Indian River (1961). Elsewhere in the southeastern United States Brauner (1975) identified 79 species of epiphytic macroalgae on *Zostera marina* Linnaeus in the vicinity of Beaufort, North Carolina.

The Indian River is a broad, shallow coastal lagoon which supports extensive seagrass growth. Seagrass leaves are the most abundant algal substratum in the Indian River (Eiseman 1975). Thompson (1978) mapped 150,000 ha of the southern Indian River from Merritt Island to St. Lucie Inlet. Seagrasses covered 2,776 ha of bottom. Six species of seagrass occur in the Indian River (Eiseman 1980): *Halodule wrightii* Ascherson, *Thalassia testudi-*

num Banks ex König et Sims, *Syringodium filiforme* Kützting, *Ruppia maritima* Linnaeus, *Halophila englemanni* Ascherson, and *Halophila johnsonii* Eiseman.

Seagrass epiphytes can contribute to the productivity of the system (Jones 1968), serve as a nutrient reservoir for seagrasses between growing seasons (Harlin 1975), supply food for grazers (Zimmerman, Gibson, and Harrington 1979), and provide a habitat for small animals. Since little information exists concerning this important group of algae, a seasonal study of the seagrass epiphytes was conducted in the Indian River, Florida. A species list, descriptions of the species as they occur in this habitat and summaries of the seasonal abundance are presented. Phenological and phytosociological analysis will be presented in a subsequent paper.

Stations

Five stations were chosen (Fig. 1). These stations represent a wide range of physico-chemical environments.

Station 1 – Haulover Cove— located on the north side of a spoil bank produced by Haulover Canal, is subject to great fluctuations in temperature and salinity over short periods of time. Temperature ranges from 11–34 °C, salinity from 20–46‰ and depth from 22–100 cm. This station is essentially unaffected by intrusion of outside water masses. Temperature and salinity vary primarily due to insolation, rainfall, and air temperature. Sparse populations of *Halodule wrightii* were found at

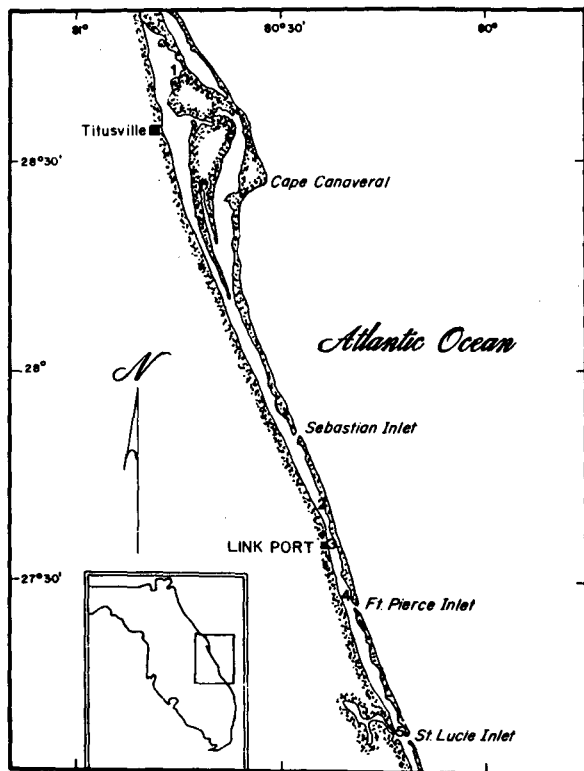


Fig. 1. Map of the Indian River region of Florida showing study sites.

this station during the sampling period, however *H. wrightii* and *Syringodium filiforme* were present before a major freeze in 1977.

Station 2 – Vero Beach – located on a mud flat south of the Vero Beach bridge on the eastern side of the Indian River. Water movement is minimal and depth extremely shallow. Temperature ranges from 11–32 °C, salinity from 13–36‰, and depth from 15–40 cm. Runoff of domestic waste from the Vero Beach sewage plant and adjacent dredge and fill sites is extensive. Sparse patches of short leaved *Thalassia testudinum*, *Halodule wrightii*, and occasionally *Syringodium filiforme* were found at this station.

Station 3 – Link Port – located on the north side of the north spoil finger of the Link Port Channel. This area is bordered by populations of red mangroves on the natural shoreline and by Australian pine on the spoil finger. This station is influenced by the tidal wedge from Ft. Pierce Inlet. Temperature ranges from 10–32 °C, salinity from 20–38‰ and depth from 30–60 cm. *Halodule wrightii*, *Syringodium filiforme*, and *Thalassia testudinum* occurred consistently.

Station 4 – Jim Island – a broad grass flat on the south side of North Bridge causeway in the city of Ft. Pierce. This station is adjacent to the Ft. Pierce Inlet and is sub-

ject to considerable hydrographic fluctuation (Benz, Eiseman, and Gallaher 1979). Clear high salinity oceanic water covers the area most of the time, but turbid low salinity water from Taylor Creek flows over the area on ebb tides. Temperature ranges from 12–29 °C, salinity from 25–37‰ and depth from 30–60 cm. *Halodule wrightii*, *Syringodium filiforme*, and *Thalassia testudinum* occurred consistently in this area.

Station 5 – St. Lucie – an extensive seagrass bed on the eastern side of the lagoon near St. Lucie Inlet. This area is subject to extremely clear water during high tide and extremely turbid water during low tide. Temperature ranges from 17–31 °C, salinity from 28–36‰ and depth from 31–65 cm. *Halodule wrightii* and *Syringodium filiforme* were consistently present. *Thalassia testudinum* was patchy.

Sampling Methods

Monthly samples were collected from December 1977 through December 1978 at stations 2, 3, and 4. Samples were collected every two months at stations 1 and 5. *Halodule wrightii*, *Syringodium filiforme*, and *Thalassia testudinum* were collected by breaking off one or two handfuls of seagrass leaves at the sediment surface. Leaves were placed into glass jars and preserved with 5% buffered formalin in seawater. It was statistically determined that 10 blades was a sufficient sample size, so 10 or more blades were examined for epiphytes from each jar. The blades were also soaked in a 6% HCl solution and remaining epiphytes were scraped onto microscope slides. Calcified forms and blue-green algae that would have otherwise been overlooked were identified with this method. Reproductive stage was noted and cover-abundance estimates were made for each species identified. Voucher specimens of all algae have been deposited in the Harbor Branch Foundation Herbarium (HBFH).

CYANOPHYTA

Nostoc commune Vaucher

Synonym: *Anabaena fertilissima* Rao

Trichomes solitary, bright green, commonly found entangled with each other or with *Microcoleus lyngbyaceus*. Cells spherical to compressed, 5–9 µm diam. Heterocysts cylindrical, 8–9 µm diam., akinites not seen. Most common from late spring through early fall, especially abundant during May. Not found at Haulover Cove.

Calothrix crustacea Schousboe et Thuret

Trichomes olive to dark green, cylindrical, appearing as tufts to 2 mm tall or forming cushions on the seagrasses, 6–20 µm diam. Cells one-third to one-half as long as broad, distal end of mature trichomes usually terminated by a few or many attenuated colorless cells. Heterocysts

basal or sometimes intercalary near the base, spherical or pyramidal, 9–14 μm diam. Sheath distinct, cylindrical, hyaline. Most common from January through June, occasional during the remainder of the year. Not found at Haulover Cove.

Microcoleus lyngbyaceus (Kützinger) Crouan

Synonyms: *Lyngbya semiplena* (C. Agardh) J. Agardh
Lyngbya confervoides C. Agardh ex Gomont
Lyngbya majuscula (Dillwyn) Harvey

Plants attached or forming entangled masses, trichomes yellow-green, gray-green, red, or violet, cylindrical, straight or curving, 6–31 μm in diam., length indeterminate, cells much shorter than broad. Sheath hyaline, containing one or more trichomes. One of the most common epiphytes throughout the year, most abundant from late July through September.

Schizothrix arenaria (Berkeley) Gomont

Synonym: *Microcoleus chthonoplastes* (Mertens) Zanardini ex Gomont

Plant consisting of many trichomes twisted together in a cylindrical, hyaline sheath, sheath often branched. Trichomes light brown or dark green, cylindrical, cells constricted at cross walls, 5–7 μm diam., quadrate or slightly longer than broad. Rare, found only at Vero Beach, and Link Port.

CHLOROPHYTA

Ulotrichales

Chaetophoraceae

Ulva lens Crouan

Plant a radiating disk, 0.5–1 mm diam., 1–3 cell layers thick near center, monostromatic near margin. Cells elongate, rectangular, 3–7 μm diam. in the center, 7–15 μm long and 3–5 μm diam. near the margin, cells of the margin often forked. Present in small quantities throughout the year. Not found at Haulover Cove.

Ulvaceae

Enteromorpha intestinalis (Linnaeus) Link

Plants at first attached, later entangled among the seagrasses, tubular throughout, cylindrical, tapering slightly to the base, simple, often moderately contorted and constricted, to 12 cm long, 3 mm diam. Cells not in marked longitudinal rows, rounded to polygonal in shape, 10–17 (–34) μm diam. Found only in March at Link Port, but very abundant.

Enteromorpha lingulata J. Agardh

Plants cylindrical, hollow except near the base, most often abundantly branched near the base, but occasionally simple, to 6 mm tall, 1 mm diam. Cells rectangular,

in longitudinal rows, 12–26 μm long, 7–17 μm diam. Common during January and occasional from December through July. Not found at Haulover Cove or St. Lucie.

Enteromorpha plumosa Kützinger

Plants forming delicate tufts on the seagrasses, cylindrical, tubular, to 6 cm tall, 75–145 μm diam. Branching abundant, irregular or sometimes opposite, branches composed of one or a few series of cells ending with a long uniseriate tip, cells rectangular, in longitudinal rows, 10–37 μm long, 10–30 μm diam. Common throughout the year. Not found at Haulover Cove.

Percursaria percursa (C. Agardh) J. Agardh

Plants forming delicate tufts on the seagrasses, composed of 1–4 series of cells, to 5 mm tall, 37–62 μm diam., occasionally showing secondary ramification, branchlets usually opposite and uniseriate, 5–7 μm diam. Cells rectangular, 14–29 μm long, 17–22 μm diam. Occasional throughout the year. Not found at Haulover Cove or Vero Beach.

Note:

Percursaria percursa is described by Taylor (1960) as usually simple, however these plants were always abundantly branched. *P. percursa* is known primarily from cold water regions. The thick cell walls and largely biserial nature of these plants indicates their placement in the genus *Percursaria*, but they may represent an undescribed species.

Cladophorales

Cladophoraceae

Chaetomorpha brachygona Harvey

Plants of uniseriate filaments, bright green, cylindrical, unattached, entangled among seagrasses, to 6 cm long, 99–160 μm diam. Cells usually approximately as long as broad, occasionally to 3 diam. long, cell walls lamellate. Rare, found only at Vero Beach and Jim Island.

Chaetomorpha minima Collins et Hervey

Plants of uniseriate filaments, erect, bright green, cylindrical, attached by a discoid holdfast, to 4 mm long, 6–24 μm diam. Cells 2–5 diam. long, nodes occasionally slightly constricted, cell walls lamellate. Extremely common throughout the year, most abundant from September through December. Not found at Haulover Cove.

Cladophora vagabunda (Linnaeus) van den Hoek

Synonym: *Cladophora crystallina* (Roth) Kützinger

Plants pale green, soft, attached by a highly branched unicellular rhizoidal holdfast arising from the basal cell, to 4 cm long, 60–105 μm diam. Branching pseudodichotomous below, unilateral above, ultimate branchlets 19–25 μm diam., cells 4–10 times as long as broad. Common all year.

Note:

Plants with these dimensions correspond to *Cladophora delicatula* Montagne and *Cladophora crystallina* (Roth) Kützing sensu Taylor (1960)

Siphonales

Derbesiaceae

Derbesia vaucheriaeformis (Harvey) J. Agardh

Plants erect coenocytic filaments, attached by lobed holdfasts, to 4 mm tall, 37–74 μm diam. Branching regularly dichotomous and fastigate giving the plant a brushlike appearance, dichotomies successively more slender, ultimate branches sometimes less than 6 μm in diameter. Common at St. Lucie during June, present on rare occasions at other stations during the remainder of the year. Not found at Haulover Cove.

XANTHOPHYTA

Heterosiphonales

Vaucheriaceae

Vaucheria bermudensis Taylor et Bernatowicz

Plants of coenocytic filaments, entangled with other epiphytes on the seagrasses, to 4 mm tall, 19–43 μm diam. Simple or sparingly laterally or subdichotomously branched. Aplanosporangium clavate, 62 μm diam., 154 μm long. Antheridium terminal on branchlet, becoming displaced by upgrowth from below and appearing lateral, borne on one empty supporting cell, subfusiform, 93 μm diam., 421 μm long, with 2 lateral discharge pores. Rare, a few fragmentary plants found at Jim Island and Vero Beach.

PHAEOPHYTA

Ectocarpales

Ectocarpaceae

Ectocarpus siliculosus (Dillwyn) Lyngbye

Plants filamentous, brownish-yellow in color, at first attached, later entangled among the seagrasses, to 4.5 cm long, 37–74 μm diam. Cells usually approximately as long as broad, occasionally to two diam. long. Branching alternate or pseudodichotomous below, alternate or unilateral above, ultimate branches 5–8 μm diam., cells 2–5 diam. long. Plurilocular organs cylindrical, sessile or on short pedicels, usually terminated by a long hair, 186–310 μm long, 19–31 μm diam. Found only on *Halodule wrightii* at Vero Beach in December and January, but extremely abundant.

Giffordia mitchellae (Harvey) Hamel

Plants forming small tufts to luxuriant brownish masses on the seagrass, to 12 cm long, cells 31–50 μm diam., 1–3 diam. long. Branches alternate or unilateral, 12–25 μm diam., branchlets unilateral on the upper sides of branches, 6–12 μm diam., branches and branchlets often with long, hair-like tips. Plurilocular game-

tangia cylindrical, obtuse, sessile, 75–190 μm long, 16–25 μm diam. One of the most common and abundant epiphytes. Not found at Haulover Cove.

Giffordia rallsiae Vickers

Plants forming small tufts on the seagrasses, filamentous, attached by short rhizoids, to 8 mm tall. Branching sparse and irregular, branches often ending in long, colorless hairs. Cells 18–31 μm diam., variable in length from 1 to 5 diam. Plurilocular organs sessile or pedicellate, conical with attenuate tips, 37–50 μm diam., 74–142 μm long, single along the filament or in short series from the bases of the branches. Present in small quantities at Jim Island from March through July.

Sphacelariales

Sphacelariaceae

Sphacelaria furcigera Kützing

Plants forming stiff olive green tufts, filamentous, to 5 mm tall, 18–55 μm diam. Cells approximately as long as broad, often with 1–2 longitudinal divisions. Hairs present laterally throughout filament, 16–20 μm diam. Propagule biradiate, stalk slender, 18–25 μm diam. length of base approximately equal to length of arms, arm-span to 57 μm . Occasional throughout the year, most abundant in late summer and early fall. Present only at Link Port and Jim Island.

Dictyotales

Dictyotaceae

Dictyota dichotoma (Hudson) Lamouroux

Plants entangled among the seagrasses in large clumps, to 8 cm long. Branching regularly dichotomous, segments to 4 mm diam., decreasing little in width from base to apex, internodes to 2 cm long, angles of forking 14–45°. Found only on *Halodule wrightii* at Link Port in December 1977, but found in great abundance.

Chordariales

Myrionemataceae

Ascocyclus orbicularis Magnus

Plants forming crustose patches 1–3 mm diam. composed of radiating filaments, patches give rise to erect colorless hairs and paraphyses. Hairs 9–12 μm diam., to 2 mm tall, cell lengths increase from base to top of hair. Paraphyses sessile or on one celled stalks, at first ovate, later elongate, 7–10 μm diam., to 180 μm long. Uniseriate gametangia sessile or on one celled stalks, cylindrical or slightly clavate, 7–10 μm diam., 38–48 μm long. Found from January to May at the three southern stations.

Chordariaceae

Cladosiphon occidentalis Kylin

Plants terete, soft, gelatinous, attached to seagrass by a small discoid holdfast, to 12 cm tall. Young plants

simple or sparsely irregularly branched, older plants abundantly irregularly branched, branches to 2 mm diam. Medullary filaments 56–100 μm diam., cortical filaments 6–9 μm diam. below, 12–15 μm diam. above. Long colorless hairs 5–15 μm diam. often present. Found from January through May, abundant during February and March at Link Port and Jim Island.

Striariaceae

Hummia onusta (Kützing) Fiore

Synonyms: *Myriotrichia subcorymbosa* (Holden)

Blomquist

Ectocarpus subcorymbosus Farlow emend
Holden

Alternate generation: *Stictyosiphon subsimplex* Holden

Plants filamentous, forming small tufts on the seagrasses, attached by a discoid base composed of laterally joined filaments, to 3 mm tall, cells 10–12 μm diam., 1.5–4 (– 5) diam. long. Branching abundant, opposite or alternate. Numerous lateral or terminal colorless hairs present. Plurilocular organs cylindrical, blunt tipped, lateral or terminal, single, clustered or opposite, sessile or on 1–3 celled pedicels, 50–93 μm long, 14–25 μm diam., with few longitudinal divisions. Very common throughout the year.

Stictyosiphon subsimplex Holden

Alternate generation: *Hummia onusta* (Kützing) Fiore

Plants light brown, terete, cylindrical, to 3 cm tall, 0.5 mm diam. Simple, or with a few short branches at the apex, surface covered with colorless hairs. Common from December through May except at Haulover Cove.

Punctariales

Punctariaceae

Rosenvingea intricata (J. Agardh) Børgesen

Plants inflated, golden brown, to 3 cm tall. Branching abundant, especially towards the apex, irregular, branches markedly narrower than main axes, often contorted. Colorless hairs scattered over entire plant. Uncommon. Not present at Haulover Cove or St. Lucie.

RHODOPHYTA

Bangiales

Bangiaceae

Erythrotrichia carnea (Dillwyn) J. Agardh

Plants bright red, filamentous, to 5 mm tall, 13–19 μm diam. Plants largely uniseriate, except for occasional development of longitudinal walls in wider parts of some filaments. Cells most often broader than long, but as much as 2 diam. long. Common throughout the year.

Goniotrichum alsidii (Zanardini) Howe

Plants rose red, filamentous, uniseriate, or with areas of 2–3 longitudinal cell rows, to 3 mm tall. Cells 22–31 μm diam. near the base, 10–15 μm diam. at the apex, spherical, compressed, or irregularly polyhedral, 3–12 μm long, 7–14 μm diam. Branching abundant, irregularly pseudodi- or trichotomous, false. Common throughout the year except at Haulover Cove.

Nemalionales

Acrochaetiaceae

Acrochaetium seriatum Børgesen

Plants tufted, attached by a basal disk of fused, creeping filaments from which erect filaments arise, to 1.5 mm tall. Cells 9–10 μm diam. below, 2–3 diam. long, 6–7 μm diam. above, 3–5 diam. long. Branching irregular, sparing near the base, more frequent and sometimes secund near the apex, upper branches often rebranched unilaterally. Cells contain a single plate-like chromatophore and large parietal pyrenoid. Monosporangia ovoid, sessile or on 1 (– 3) cell pedicels, 19–24 μm long, 10–12 μm diam., forming long secund series (occasionally scattered) on the upper side of younger branches. Monosporangia here are slightly larger than those reported by Børgesen (1916) and Taylor (1960). Common from December through May except at Haulover Cove. Monosporangia always present.

Audouinella saviara (Meneghini) Woelkerling

Synonym: *Acrochaetium sagraeanum* (Montagne)

Bornet

Plants caespitose, attached by a holdfast of fused creeping filaments from which erect filaments arise, to 0.7 mm tall, 7–10 μm diam. below, 5–6 μm diam. above. Cells 2–3 diam. long throughout, each containing a lobate parietal chromatophore and large pyrenoid. Branching irregular. Monosporangia sessile or on 1–2 (– 3) celled stalks, single or in pairs, scattered, opposite, or sometimes secund, ovoid, 19–22 (27) μm long, 11–14 μm diam. Deciduous unicellular hairs present on some plants from December through February. Common throughout the year at Vero Beach, Link Port, and Jim Island. Present at Haulover Cove. Monosporangia present all year.

Note:

Woelkerling (1973) reported that hairs were unknown for *Audouinella saviara*, however, due to the irregular occurrences of hairs in other species, it would seem they are of little taxonomic importance.

Cryptonemiales

Corallinaceae

Fosliella farinosa (Lamouroux) Howe

Plants forming whitish to rose-colored patches, 0.25–1 mm diam., or when abundant, encrusting the entire seagrass blade, mostly monostromatic, becoming 2–4

cell layers thick towards conceptacles. Cells 10–15 μm long, 5–12 μm diam. Colorless cells resembling trichocytes occasionally present, no hairs were observed. Tetrasporangial conceptacles 84–134 μm diam., convex, tetraspores zonate, 36–46 μm long, 19–31 μm diam. Common throughout the year. Tetraspores present all year.

Gigartinales

Hypneaceae

Hypnea spinella (C. Agardh) Kützing

Plants entangled among seagrasses, bushy, firm, terete, to 1.5 mm diam. Branching occurs in all planes, some branches similar to main axis, most short and spinelike, ultimate branches to 3 mm long, 0.5 mm diam. Present from December through May at Link Port and Jim Island, abundant January and February at Jim Island. No reproductive structures observed.

Rhodymeniales

Champiaceae

Champia parvula (C. Agardh) Harvey

Plants pinkish brown, firm, several unbranched erect filaments rise from each holdfast, to 3 mm tall, 400–550 μm diam. Cells cask-shaped, hollow, 1–1.5 diam. long. Large numbers of tetraspores occur in the segments, 25–30 μm diam. Cystocarps urceolate, sessile, 248–427 μm diam., 309–507 μm long, 2–4 present per filament. Observed only in December at St. Lucie in small quantities on *Halodule wrightii* and *Syringodium filiforme*. Tetraspores and cystocarps were present.

Note:

These plants were much reduced and unbranched

Ceramiales

Ceramiaceae

Aglaothamnion cordatum (Børgesen) Feldmann-Mazoyer

Synonym: *Callithamnion cordatum* Børgesen

Plants forming delicate rose-colored tufts on the seagrasses, ecorticate, however rhizoids descend from the bases of branches in the lowermost part of the plant, to 2 cm tall, 180 μm diam. Below cells approximately as long as broad, upwards cells become narrower and 3–4 times longer than broad. Branching alternate below, subdichotomous in the upper divisions, branchlets 6–10 μm diam., cells 5–8 diam. long except at the tips where they are 2–3 diam. long, hair tips often seen in the younger portions of the plant. Tetrasporangia tetrahedral, obovate to globose, 37–49 μm long, 24–43 μm diam., sessile on the upper side of branchlets. Present only at Jim Island, most abundant December and January. Tetraspores observed in January and November.

Anotrichium tenue (C. Agardh) Näegli

Synonym: *Griffithsia tenuis* C. Agardh

Plants rose red, basal filament decumbent, attached by rhizoids, to 2 cm tall, 111–235 μm diam. Branches erect, infrequent, arising from the basal portion of the axial cell. Cells cylindrical, 3–4 diam. in length throughout most of the filament, becoming shorter and more globose near the apex, young cells bear a whorl of deciduous trichoblasts. Tetrasporangia 2–3 μm diam., terminal on clavate one-celled stalks, verticillate at as many as eight successive nodes. Spermatangial clusters on 1–3 celled stalks at nodes in upper portion of filaments. Cystocarps lateral on swollen one-celled stalks, surrounded by incurved involucrel filaments. Found on occasions from January through October. Not found at Vero Beach or St. Lucie. Male plants observed in February and May, female plants in May, and tetrasporic plants in July.

Centroceras clavulatum (C. Agardh) Montagne

Plants of uniseriate filaments, corticated, cylindrical, stiff, brittle, dark purplish red, to 3 mm tall, 50–105 μm diam., internodes below 3–5 times as long as broad, above 0.5–1.5 times as long as broad, branching dichotomous or rarely trichotomous. Cystocarps subterminal, 46–240 μm diam., generally surrounded by small branches. Spermatangia in whorls around the nodes. Tetraspores verticillate at the nodes, 30–50 μm diam., subexserted. Most abundant in June, but present in small quantities throughout the year. Found only at St. Lucie and Jim Island. Female and male plants found in June and October, tetrasporic plants observed in June, October and December.

Ceramium byssoideum Harvey

Plants of uniseriate filaments, forming delicate rose-colored tufts, to 2 mm tall, 60–111 μm diam., lower internodes 1.5–12 diam. long, usually 2–3 diam. long, above internodes often less than one diameter long. Nodal bands composed of 4 to 6 series, lower one to two rows generally having transversely arranged elongate cells, however, this arrangement often obscure. Branching regularly dichotomous, branches 37–80 μm diam. Cystocarps 118–180 μm diam., surrounded by short involucrel branchlets, on clavate segments composed of 2–5 cells. Spermatangia verticillate at nodes in upper portions of the plant. Tetraspores 1–2 at nodes, surrounded by nodal cortication, 26–62 μm diam. One of the most common and abundant epiphytes throughout the year. Female plants found in May and October, male plants in December and January, and tetrasporic plants in December, March, May and October.

Ceramium fastigiatum (Roth) Harvey

Plants of uniseriate filaments, forming bright red tufts, to 1 cm tall, nodes 90–130 μm diam., in older portions

of the plant, 56–162 μm long, internodes 87–136 μm diam., 1.5 to 5 diam. long. Branching regularly dichotomous, fastigiate above, apices erect or forcipate. Nodal bands composed of 4–6 cell rows, cells somewhat irregularly disposed, cells in the lowest row of intermediate size, those just above considerably larger, and those of the upper margin much smaller. Tetrasporangia emergent, covered by nodal cortication only at the base, 1 to 6 per node, 50–62 μm long, 36 to 38 μm diam. Found in small quantities from January through September at the two southern stations. Tetrasporic plants found in January and June.

Note:

The lengths of the internodes were not always as great as those reported by Taylor (1960) and Børgesen (1918), however, the nodal cortication and size of the tetrasporangia best fit *C. fastigiatum*

Spyridia filamentosa (Wulfen) Harvey

Plants filamentous, corticated by an alternating series of ovate cells at the nodes and elongate cells in the internodes, light brown to rose red in color, at first attached by a rhizoidal discoid holdfast, later free-floating and entangled among seagrasses, to 5 cm tall, 1.5 mm diam. Branching irregular, alternate, uniseriate branchlets 19–25 μm diam., segments 2–4 diam. long, terminated by a long attenuate spine. Occasional throughout the year. Found only at Jim Island and Link Port. Male plants observed in July.

Rhodomelaceae

Acanthophora spicifera (Vahl) Børgesen

Plants at first attached, later entangled among seagrasses, terete, firm, lavender to dark purple, to 20 cm tall, 1.5 mm diam. Branching irregular, sparing at the base, more frequent near the apex. Pericarps lateral, on short stalks subtended by a spine, urn-shaped, 780–1020 μm long, 520–910 μm diam. Present during most months of the year, abundant in December and January. Not found at Vero Beach. Female plants observed in June.

Chondria dasyphylla (Woodward) C. Agardh

Plants bushy, 2–4 (– 10) cm tall, 0.5–1 mm diam. Branching abundant, branches similar to main axis, to 350 μm diam., habit of each broadly pyramidal, branchlets club shaped, contracted at base, tips blunt or rounded, central portion bearing a conspicuous clump of trichoblasts. Cystocarps urceolate, lateral on branches and branchlets on short stalks, 495–705 μm long, 340–595 μm diam. Spermatangial clusters flat, oval to spherical 309–371 μm diam., on the upper ends of the branches and branchlets. Tetraspores 74–93 μm diam., formed in the branchlets at their distal ends. Found throughout the year, most common in May and June. Female plants

found in May and October, male plants in May, and tetrasporic plants in February, March, May, June, July and August.

Herposiphonia tenella (C. Agardh) Ambronn

Plants purplish-red, creeping, attached by unicellular rhizoids, to 1 cm tall, 55–105 μm diam., branchlets erect, composed of as many as 27 segments, 9–10 pericentral cells, 25–50 μm diam., to 1.5 mm tall, 1–2 tufts of trichoblasts at apex. Tetrasporangia 37–62 μm diam. Cystocarps urceolate, terminal on branchlets, 155–400 μm long, 124–310 μm diam. Spermatangial clusters 25–433 μm long, present among trichoblasts at apex of branchlets. Found throughout the year, abundant in June and July. Not found at Haulover Cove or Jim Island. Female plants found in July, male plants in June and July, tetrasporic plants in March, June and July.

Polysiphonia binneyi Harvey

Plants with 4 pericentral cells, forming rose to reddish-brown tufts on the seagrasses, juvenile plants erect, in mature plants erect filaments arise from somewhat decumbent bases, 0.5–2.5 cm tall, 68–380 μm diam., cells 1–2.5 diam. long. Branching abundant, alternate or pseudodichotomous below, alternate above, adventitious branchlets not uncommon. Trichoblasts present, not obscuring prominent apical cells, branches arising from the axils. Tetrasporangia 56–80 μm diam. Spermatangial branches elongate, 100–150 μm long, 25–37 μm diam., clustered at the tips of branches in the upper parts of the plant. Pericarps scattered, on short stalks, urn-shaped, 235–495 μm long, 192–420 μm diam. Male plants often smaller than female or tetrasporic plants. Plants of all three stages were present during most of the year. Common.

Discussion

Forty-one species of seagrass epiphytes were recorded from the Indian River: 4 Cyanophyta, 9 Chlorophyta, 1 Xanthophyta, 10 Phaeophyta, and 17 Rhodophyta. As many as 23 species were recorded during one collection (Jim Island, 12/5/77, on *S. filiforme*) and as few as zero (Haulover Cove, 2/15/78, on *H. wrightii*). Species number were generally highest in the winter and spring, and lowest in late summer and early fall. Species numbers of Cyanophyta and Chlorophyta were relatively consistent throughout the year. However, Rhodophyta and Phaeophyta were generally most numerous in the winter and spring. Species abundance generally followed the same seasonal pattern as species numbers. There was little difference in the numbers of species of seagrass epiphytes found on the various seagrasses

(*Halodule wrightii*, 40 species; *Syringodium filiforme*, 35 species; *Thalassia testudinum*, 34 species). Noticeably fewer species occurred at Haulover Cove than at the other collection sites (Haulover Cove, 11 species; Vero Beach, 26 species; Link Port, 33 species; Jim Island, 36 species; St. Lucie Inlet, 25 species). This was probably due to the sparse population of *Halodule wrightii* caused by a hard freeze in 1977, in addition to large amounts of fine silt and great fluctuations in temperature and salinity encountered in this area.

Six species of epiphytes showed station specificity: *Ectocarpus siliculosus* at Vero Beach, *Dictyota dichotoma* and *Enteromorpha intestinalis* at Link Port, *Aglaothamnion cordatum* and *Giffordia vallsiae* at Jim Island, and *Champia parvula* at St. Lucie.

The epiphytes can be divided into three groups based on their seasonal pattern (Tab. I): 1) Those that occurred all year, 2) those that occurred predominately in the winter and the spring, and 3) those that were of rare or irregular occurrence. Epiphytes were further divided into common (found in almost all collections) and occasional (not found in all collections) species. These results were similar to those of Humm (1964) in Biscayne Bay. Further phenological and phytosociological analyses will be presented in a subsequent paper.

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Tab. I. Seasonal patterns in seagrass epiphytes

Present All Year	Winter-Spring Annuals
Common	Common
<i>Audouinella saviana</i>	<i>Acrochaetium seriatum</i>
<i>Calothrix crustacea</i>	<i>Cladosiphon occidentalis</i>
<i>Ceramium byssoideum</i>	<i>Stictyosiphon subsimplex</i>
<i>Chaetomorpha minima</i>	
<i>Cladophora vagabunda</i>	Occasional
<i>Enteromorpha plumosa</i>	<i>Ascocyclus orbicularis</i>
<i>Erythrotrichia carnea</i>	<i>Enteromorpha linguata</i>
<i>Fostiella farinosa</i>	<i>Hypnea spinella</i>
<i>Giffordia mitchellae</i>	<i>Rosenvingea intricata</i>
<i>Hummia onusta</i>	
<i>Microcoleus lyngbyaceus</i>	
<i>Polysiphonia binneyi</i>	
Occasional	Rare
<i>Acanthophora spicifera</i>	<i>Ceramium fastigiatum</i>
<i>Aglaothamnion cordatum</i>	<i>Chaetomorpha brachygonia</i>
<i>Anotrichium tenue</i>	<i>Champia parvula</i>
<i>Centroceras clavulatum</i>	<i>Derbesia vaucheriaeformis</i>
<i>Chondria dasyphylla</i>	<i>Dictyota dichotoma</i>
<i>Goniotrichum alsidii</i>	<i>Ectocarpus siliculosus</i>
<i>Herposiphonia tenella</i>	<i>Enteromorpha intestinalis</i>
<i>Nostoc commune</i>	<i>Giffordia vallsiae</i>
<i>Percursaria percursa</i>	<i>Schizothrix arenaria</i>
<i>Sphacelaria furcigera</i>	<i>Vaucheria bermudensis</i>
<i>Spyridia filamentosa</i>	
<i>Ulveella lens</i>	

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