Biological Sciences

SPECIES COMPOSITION AND DISTRIBUTION OF SEAGRASS BEDS IN THE INDIAN RIVER LAGOON, FLORIDA

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ABSTRACT: *Six species of seagrasses are found in the Indian River with* Syringodium filiforme *and* Halodule wrightii *being the most abundant.* S. filiforme *exhibits a disjunct distribution within the study area. Drift algae accumulations, difficult to distinguish from grassbeds by aerial photoanalysis alone, are extensive in some locations and apparently play an important role in the River's total ecosystem. Over the last 30 yr the Indian River has not experienced major seagrass bed losses documented in other estuaries.*

ONE MAJOR recommendation of the 1973 International Seagrass Ecosystem Workshop (McRoy, 1973) was: "The productivity, standing crop, and distribution

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of seagrasses should be studied on a regional and global scale using aerial photography and satellite imagery coupled with field measurement". Following this recommendation, the Harbor Branch Foundation has undertaken aerial monitoring of seagrass beds as part of its Indian River Coastal Zone Study. This report documents the location, aerial coverage, and species composition of major seagrass beds within the southern half of the Indian River Lagoon system.

METHODS—On 2 April 1976 an aerial photographic record was made of the Indian River from Merritt Island to St. Lucie Inlet (Fig. 1). A photomosaic

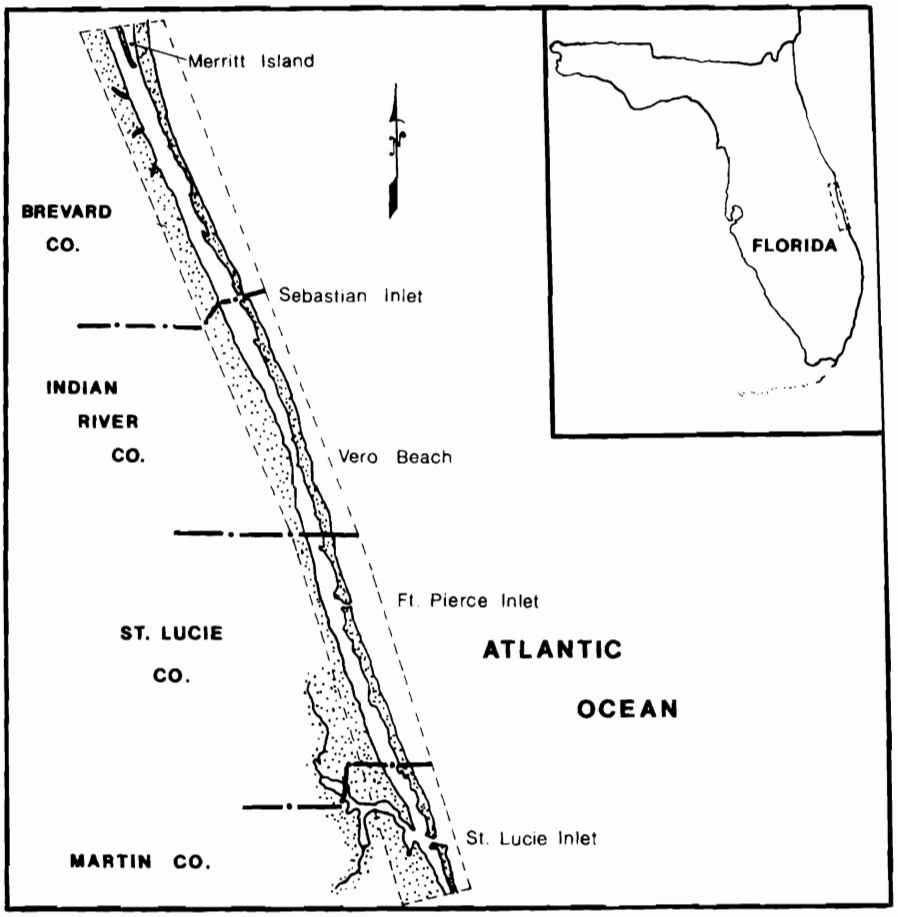

FIG. 1. The study area.

covering approximately 150,000 ha of river was constructed from the imagery. Maps of all shorelines and major seagrass beds were made from this mosaic. Aerial color transparencies and ground sampling verified map accuracy (Thompson, 1976). Scale on all imagery was 1:24000 or 1 cm = 240 m. A Wratten #3 filter was used with Kodak 2448 aerial color transparency film for the color imagery. Black and white imagery was obtained using Kodak 2405 aerial film without a filter.

In the color imagery the bottom could be resolved to 1.53 m water depth throughout most of the River, with good detail down to approximately 1.2 m. Resolution on black and white imagery exceeded 1.2 m in most locations.

Field sampling began in May and continued until mid-August of 1976. Eighty-one sites were investigated to verify submerged features seen in the photographs. Fifty-three additional stations located within mapped grassbeds were sampled. Plant species distribution and shoot abundance were measured by recording the species found at each meter mark along a 100 m transect line. Four such 100 m sampling transects, forming a square, were examined at each station yielding 400 data points per station.

Analysis of plant assemblages consisted of summing quantitative sampling records in blocks of 5 consecutive stations and applying community ordination procedures. Bray-Curtis (1957) similarity coefficients (C) were computed for each 5-station unit. Dissimilarity coefficients were computed as the difference between the similarity coefficient and a possible maximum value of one (1.00–C). In this ordination technique the x-axis length (L) is determined by the two most dissimilar assemblages. The y-axis length (L') is determined by the assemblage showing the poorest fit on the x-axis ordination. Once this Cartesian plane has been defined, all other assemblages receive Cartesian coordinates based on their dissimilarity values (Beals, 1960). The result is a 2 dimensional plot illustrating the relationship among assemblages.

RESULTS—Six species of seagrasses are reported from the Indian River Lagoon system: *Thalassia testudinum* Banks ex König and Sims, *Halodule wrightii* Ascherson, *Syringodium filiforme* Kützing, *Ruppia maritima* Linnaeus, *Halophila engelmanni* Ascherson, and one undescribed species of *Halophila* (Eiseman, 1975). The most common species are *Syringodium filiforme* and *Halodule wrightii*. *Thalassia testudinum* appeared in patches around St. Lucie Inlet and from Ft. Pierce Inlet to Vero Beach. All large concentrations of *Halophila* were near Ft. Pierce Inlet. *Ruppia maritima* was found only near Sebastian Inlet. Total floral coverage within the study area is 2,776 ha, or 2% of the River bottom (Table 1).

Between the Ft. Pierce Inlet and the southern tip of Merritt Island (Sta.

TABLE 1. Percent species composition and hectares of coverage of Indian River seagrasses.

Species	Percent composition	Hectare coverage
Thalassia testudinum	2.7	74.87
Halodule wrightii	46.2	1282.49
Syringodium filiforme	47.1	1307.18
Ruppia maritima	0.2	5.67
Halophila (all species)	3.0	83.37
Substrate attached algae[1]	0.8	22.26

[1]Drift and epiphytic algal populations were not quantified.

#21-50), *Syringodium filiforme* declined markedly from concentrations seen in other areas. From the southern tip of Merritt Island northward (Sta. #51-53), *S. filiforme* appeared again as numerically dominant in terms of numbers of erect shoots recorded (Fig. 2).

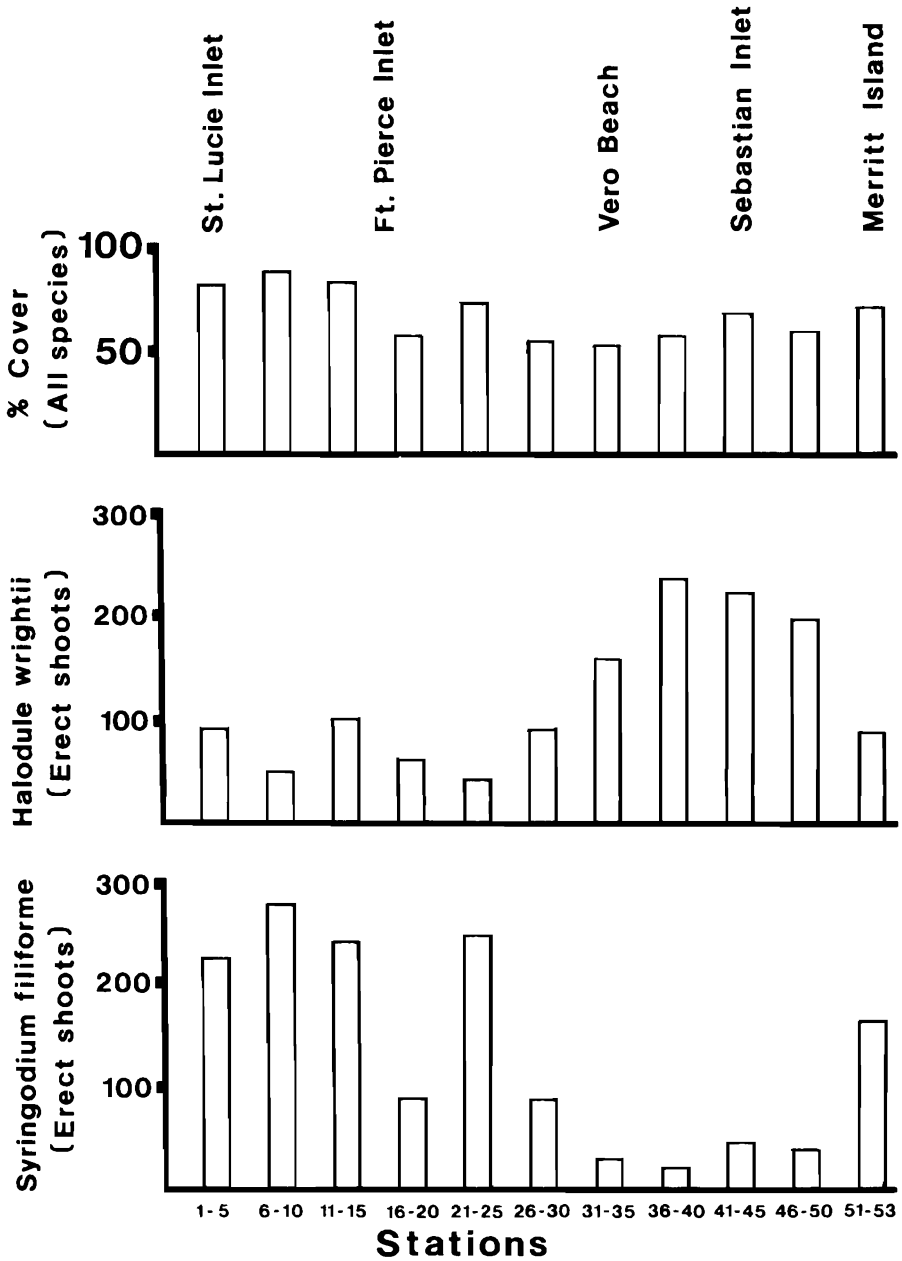

FIG. 2. Vegetative cover and the average number of erect shoots of *Syringodium filiforme* and *Halodule wrightii* per station related to station location within the Indian River.

Community ordination (Fig. 3) indicates a similarity between the seagrass beds around Merritt Island and those around St. Lucie. This similarity, as well as the numerical dominance of *Syringodium filiforme* at opposite ends of the

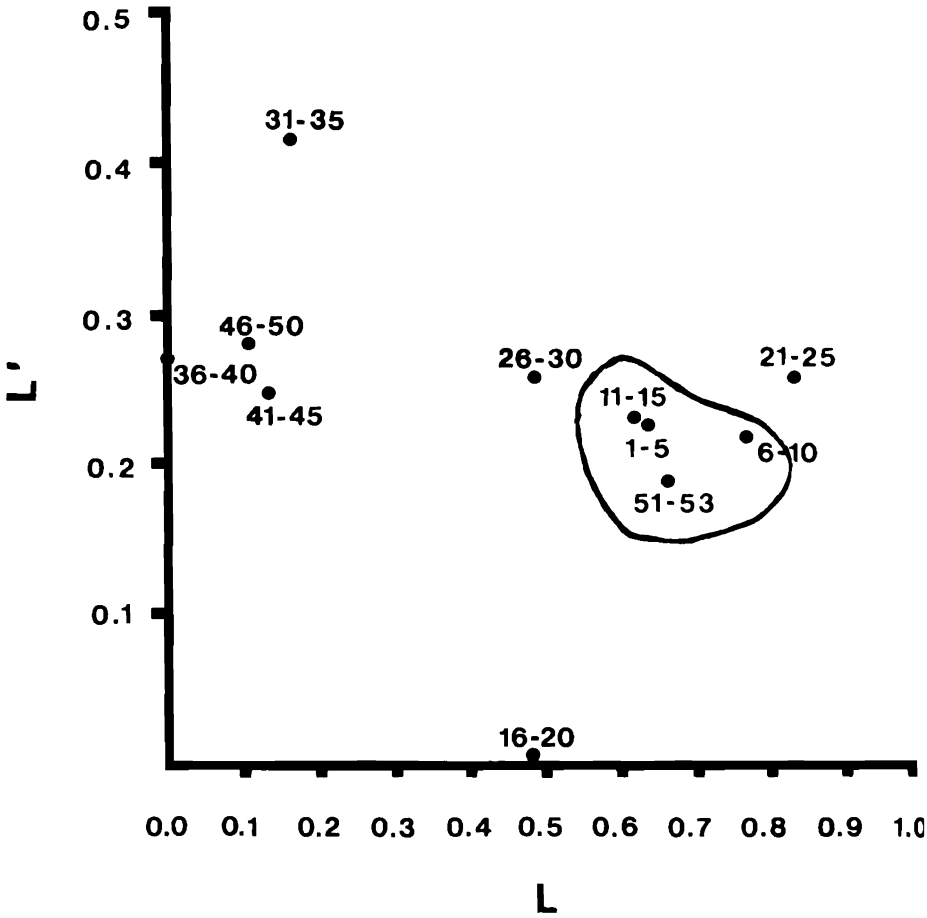

FIG. 3. Ordination plot of seagrass assemblages within the Indian River. Circled assemblages are dominated by *Syringodium filiforme*. Stations: 1-5, 6-10, 11-15 St. Lucie Inlet; 16-20, 26-30 Ft. Pierce Inlet; 31-35, 36-40 Vero Beach; 41-45, 46-50 Sebastian Inlet; 51-53 Merritt Island.

study area (Fig. 2), suggests that factors other than annual temperature regimes are responsible for the reduced abundance of S. *filiforme* between Ft. Pierce Inlet and Merritt Island.

South of Sebastian Inlet, aerial photo interpretation was complicated by large aggregations of drift algae. Selected areas south of Sebastian Inlet were re-photographed quarterly throughout 1976 to determine if measurable changes occurred in either the location or photographic appearance of these algal aggregations. Photographs and observations from these overflights confirmed that specific areas accumulate large quantities of drift algae, apparently as a result of

water circulation patterns and bottom topography. There appeared to be little change in either location, outline, or photographic appearance of these algal accumulations during subsequent overflights through November 1976. A winter survey flight (27 January 1977), however, showed considerable reduction in the quantity of drift algae.

DISCUSSION—Aerial photographs of the River dating back to 1945 were reviewed to determine trends in seagrass coverage. Although periodic dredging for landfill and to maintain the Intracoastal Waterway has altered bottom topography in localized areas of the Indian River, no major grassbed losses could be detected when we compared the 1945 and 1954 aerial photos to our 1976 series. Over the past 30 yr, the Indian River apparently has not experienced major seagrass bed destruction such as occurred in the Chesapeake Bay (Orth and Gordon, 1975), the North Atlantic (Rasmussen, 1973), or Biscayne Bay (Wanless, 1976).

Depth or light level related seagrass zonation at the southern and northern ends of the study area corresponds with descriptions of seagrass zonation by Phillips (1960) for Florida west coast estuaries. *Halodule wrightii* dominates the intertidal or littoral zone. *Syringodium filiforme* and *Thalassia testudinum* (when present) occur in the sublittoral zone, and occasionally *H. wrightii* appears again in the deep sublittoral (Eiseman, 1974). This pattern is not seen in middle sections of the study area because of the absence of *S. filiforme*.

Changes in ambient salinities and turbidities are reported to shift seagrass bed species composition ratios in relatively short periods of time (Zimmerman, et al., 1971). Between Ft. Pierce Inlet and Merritt Island several major drainage canals, creeks, and rivers drain fresh water from both the St. John's drainage basin and irrigated agricultural land into the lagoon. *Syringodium filiforme* grows successfully in salinities of less than 25°/₀₀ (McMillan and Moseley, 1967), but reduced light levels caused by tannins in the freshwater runoff may be responsible for the decline of *S. filiforme* in this area.

Submerged features are seen in 1945 and 1954 photographs in or near areas of present day drift algal accumulation. Assuming these features to be drift algal accumulation would indicate that drift algae has been a significant feature in the estuary for at least the last 30 yr. The extent and persistence of large drift algal accumulations documented by aerial photographs in the study supports the suggestion that the drift algal community is an important part of the total ecosystem in the Indian River (Eiseman and Benz, 1975; Gilmore, 1976).

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