CAULERPA PROLIFERA

vs SEAGRESSES

IN THE INDIAN RIVER LAGOON: A COMPARISON OF RELATIVE HABITAT VALUE

MAR 1988

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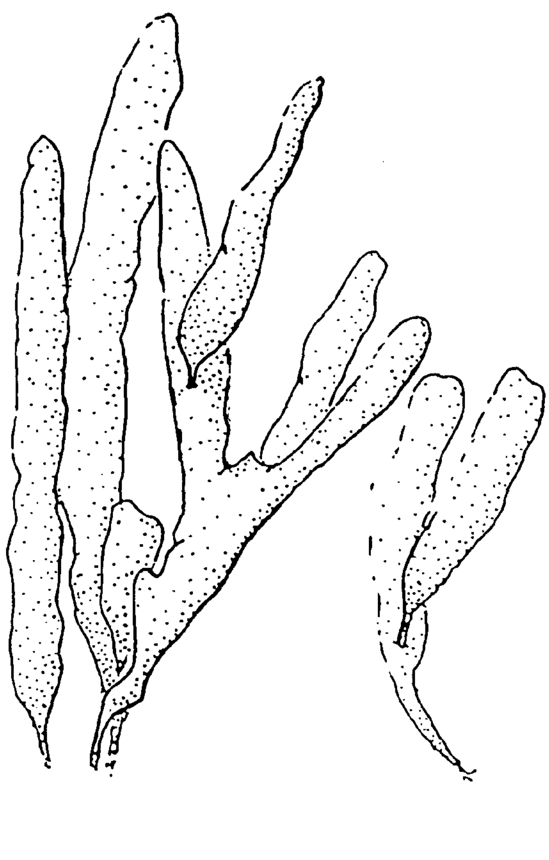

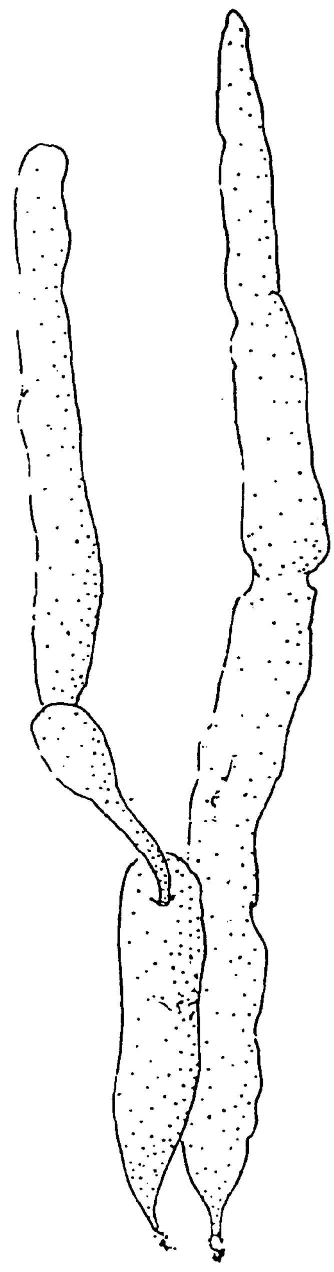

White, C.

I N T E R I M   R E P O R T

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MARCH 1988

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Caulerpa prolifera versus Seagrasses

in the Indian River lagoon:

A COMPARISON OF RELATIVE HABITAT VALUES

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ABSTRACT

The relative habitat value of an attached macroalage, *Caulerpa prolifera*, was compared with shallow water seagrass beds over a 12 month period. Benthic macroinvertebrates and fishes were sampled monthly from two areas within a subtropical, east-central Florida lagoon system (the Indian and Banana Rivers). In situ growth rate determinations were made on *C. prolifera* in shallow (<1m) and in deeper areas (~2m). Statistical analysis of benthic macroinvertebrate data for species numbers, diversity, richness, and evenness indicated that differences between *C. prolifera* and seagrasses in each lagoon system were slight, while differences between systems were conspicuous. Large differences were observed between *C. prolifera* and seagrass areas relative to fish numbers. This was attributed to the presence of the dominant fish species, *Lucania parva* in the seagrass areas. Growth rates of *C.prolifera* in shallow water were high. Total recovery of experimentally denuded areas occurred in less than four weeks during October and November. Catastrophic loss of *C. prolifera* coverage in the Indian River was documented during 1987. The major contributing factor was herbivory by the saccoglossan, *Elysia cauze*. Major losses of *C. prolifera* in the Banana River during 1987 and 1988 were caused by the synergistic effects of high temperatures in shallow areas of the system (< 0.5 m) that led to thermally induced loss of vegetation, and herbivory by *E. cauze*. *C. prolifera* appears to be slightly less valuable quantitatively than seagrass areas (faunal biomass), but was qualitatively equal to seagrass areas (numbers of species, sediment stabilizing characteristics, nutrient uptake, refuge zones for larval and juvenile organisms)

INTRODUCTION

The Indian River lagoon systems are shallow, eoline mixed, bar built estuarine type systems that extend approximately 240km along the east-central coast of Florida. The average depth is 1.5m with an approximate maximum depth of 3m. The dominant bottom feature is an unvegetated mixed sand/shell/mud sediment with a shallow profile. The nearshore areas are vegetated with large expanses of seagrasses. The temperature regime can be characterized as predominantly subtropical, but the lagoon fauna has constituents of both Subtropical and Carolinian biogeographical zones.

In shallow, estuarine type ecosystems such as found in the Indian and Banana Rivers, the seagrasses serve functions such as 1.) direct and indirect sources of nutrition, 2.) "sanctuaries" for larval and juvenile animals trying to avoid open-water predators by hiding in the dense grass blades, 3.) stabilizers of fine suspended organic and inorganic particulates that could otherwise cause high turbidities during heavy wave action, and 4.) habitats for an intense benthic and epi-benthic macroinvertebrate production that supports more economically important species (Bridges et al, 1978) . Decreases in the amount, or quality, of seagrass coverages affects the overall quality and productivity of the lagoons.

The dominant seagrass species in Brevard County are, in order of abundance, Cuban Shoalweed, *Halodule wrightii*, followed closely by Manatee Grass, *Syringodium filiforme*. Other species found are Star Grass, *Halophila engelmanni*, and Widgeon Grass, *Ruppia maritima*. Virnstein and Cairns (1986) and White (1987) documented the distribution and abundance of these and other species of macrophytes (collectively known as submerged aquatic vegetation, or SAV).

Personal observations of seagrass areas over time indicated attached macroalga, *Caulerpa* spp. (the dominant species was *C. prolifera*), were expanding into areas apparently denuded of seagrasses, and in some cases were moving into seagrass areas. This indicated that *C. prolifera* had the capacity to 'out-compete' seagrasses for space. *C. prolifera* attaches to the benthic sediments by the use of rhizomes, and in dense patches *C. prolifera* may mimics many of the functions attributed to seagrasses. It's root structures have the potential to serve as a sediment stabilizers, it's blades as points of attachment for epi-benthic macroinvertebrates, as do the seagrass blades, and in areas where *C. prolifera* coverages mimic seagrass coverages, the beds have the potential to act as a "sanctuary" for larval and juvenile organisms escaping open-water predators.

Caulerpa prolifera can be seen as an analogue to the seagrass, *Thallassia testudinum*. The blade widths and lengths approximate each other closely. White (1987) documented that *T.*

testudinum did not appear north of Sebastian Inlet in the lagoon system. We have theorized that *C. prolifera* could be providing the same functions north of the inlet that the seagrass *T. testudinum* provides south of the inlet because of its physical similarities to *T. testudinum.* Benthic macroinvertebrate data collected annually by Brevard County from a station located in a *C. prolifera* area over a ten year period showed diversities within the *C. prolifera* area often approached diversities found in seagrass areas (d>3.5).

Objectives:

The loss of seagrass areas may proceed at an accelerated pace as the entire water quality of the Indian and Banana Rivers continues to deteriorate due to increased cultural enrichment. If this is the case, and *C. prolifera* provides the similar functions as seagrasses, **and can grow in areas that have decreased water quality**, then a management plan must be implemented that would include elements that address levels of protection for *C. prolifera*, and possibly other macroalga. This study was initiated to determine what the "habitat value" of *C. prolifera* was in comparison with shallow water seagrasses. ***HABITAT VALUE*** in this case was defined in terms of utilitarian applications such as invertebrate and fish standing crop, nutrient sinks and growth rates.

During the investigation we fortuitously discovered a major controlling factor in the distribution and abundance of *C. prolifera* in the lagoon system . Intense herbivory by the saccoglossan, *Elysia cauze* caused a catastrophic decline of *C. prolifera* in both the Indian and Banana Rivers. We established feeding rates experimentally and also mapped the loss of *C. prolifera* as *E. cauze* rapidly consumed 80 to 90% of the available *C. prolifera* in the Indian River lagoon in less than a year.

METHODS

Benthic Macroinvertebrates:

Two areas were picked within the lagoon system for monitoring (Fig. 1). The Banana River area was established in water depths of less than 60cm. Two quadrats (100 by 50m) were marked in seagrass and *C. prolifera* sites. Vegetation densities averaged greater than 50% for each site. An effort was made to establish the experimental plots in monotypic stands of *Halodule wrightii* and *C. prolifera* adjacent to each other to minimize location differences, however, no areas were found that were one species. Most seagrass areas investigated for study typically were a mosaic of two or more seagrass and algae species. The areas finally selected for study contained *Halodule wrightii* as the dominant seagrass; the *C. prolifera* areas did approximate monotypic stands. The two quadrats in the Indian River were established in similar areas of vegetation densities, but we were unable to locate the experimental plots in similar water depths adjacent to each other. Water depth in the seagrass area was < 60cm, while the water depth in the *C. prolifera* area was approximately 100cm.

Invertebrate samples were taken monthly with a 15cm diameter PVC coring device. A 0.5mm mesh screen was placed over the top of the corer to prevent loss of organisms. Cores were taken to a depth of 15cm. Three cores were taken within each plot. Even though the plots met the overall design requirement of > 50% vegetation coverage, the plots exhibited patchy growth. To facilitate equal sampling the plots were divided into thirds and one core taken within each third. The core was taken in a location that met the requirement of > 50% vegetation coverage.

The cores were rough sieved in the field through a 0.5mm screened box, placed in plastic containers, and transported to the laboratory, where they were allowed to 'percolate' for several hours to allow tuberculous organisms to vacate their homes. The samples were fixed in 10% seawater-formalin, and later preserved in 95% ethanol. Rose bengal was added to the samples to enhance sorting. All organisms were enumerated and identified to the lowest taxon possible.

The results were compiled and subjected to diversity (d), richness (r) and evenness (e) analysis. Statistical analysis for differences between *C. prolifera* and seagrass areas included one-way ANOVA's of species numbers, number of individuals per species, d, r, and e, and Duncan's Multiple-Range Test for each comparison.

Physical water characterization of each area was determined for each site during the sampling, including sediment reduction-oxidation measurements. Long term data sets of the physiochemical environment near the sampling areas were obtained from the Brevard County, Office Of Natural Resources Management (see Fig. 1 for station locations) and three month moving average plots constructed.

Caulerpa prolifera Mapping:

The distribution and density of *C. prolifera* was estimated by direct diver observations using the techniques described by Virnstein and Cairns (1987) and White (1987). Divers were towed behind small boats along east-west transects from Turnbull Creek to the Pineda Causeway in the Indian River, and from Banana Creek to the Pineda Causeway in the Banana River. The information gathered during 1987 was compared with data collected in 1986 to determine what the migration rate of *C. prolifera* was in the Indian River.

Elysia cauze:

The first evidence of intense herbivory by *E. cauze* was documented in early November, 1986 near the mouth of Turnbull Creek at the head of the Indian River. Major patches of *C. prolifera* that had appeared healthy in October, 1986 showed complete loss of blades by November. Large numbers of *E. cauze* estimated at > 100 to 150 organisms per m2 were observed crawling over the remaining root structures.

Observations in the field were performed by divers. Densities of *C. prolifera* were determined using the method described by Virnstein (1986) and White (1987). Densities of *E. cauze* were established by placing a 0.5m aluminum quadrate over the area to be sampled and then gently agitating the *C. prolifera* and collecting the animals as they floated free. Direct counts of the animals as they crawled on the alga blades was difficult because the saccoglossan's green color blended with the color of *C. prolifera*. Areal loss of *C. prolifera* was estimated from previous field observations and maps (White, 1987). Estimates of migration directions and impacted area extensions were made by direct observation.

An effort was made to correlate field observations of *C. prolifera* lost over seven months with densities of *E. cauze.* Sections of undisturbed *C. prolifera* (approximately 9cm2) were removed complete with runners from areas in the field where no saccoglossans were observed, transported to the laboratory, and placed into 38 l aquaria. *C. prolifera* was allowed to acclimate to the conditions for several days. Salinity was maintained at ~ 24 o/oo and temperature at 20 C. The photo-period was maintained at 10 hours light and 14 dark. Mature *E. cauze* were introduced at 10, 15, 17 and 20 per aquaria. Observations were made every 24 hours and blades that were functionally destroyed removed and preserved in 5 to 7% formaldehyde. When the majority of the blades were consumed the experiment was terminated. A control with no *E. cauze* was established and allowed to run for the entire experimental length. All animals from the tanks were preserved after experiment termination. The leaves from each tank were then placed onto heavy duty paper and covered with translucent acetate with adhesive backing. The leaves were then xerographically photographed. After photographing, the leaves and paper were immersed in water to loosen the adhesive. The leaves were then removed and dried to a constant weight at 105 C.

The photographed leaves (Fig.s 2 and 3) were placed onto a digitizing pad (Highpad, Digitizer) and the outlines traced using a digitizing program (Computer Mathware). The data were archived in a Compac 286 computer for later analysis and retrieval. The program provided capabilities for both area and perimeter calculations, and the results were expressed as leaves destroyed per unit time versus total amount of leaf material available.

Fish:

Two areas were chosen for collection of fish, one in the Banana River and one in the Indian River. The areas were selected on the basis of percent vegetation coverage, proximity of *C. prolifera* and seagrass areas to each other, and comparable depths. Monthly samples were taken beginning in October, 1986 (N=3, total months = 12).

A 150m wide belt transect, partitioned into 33m quadrates, was established in the Banana river along the west shoreline between SR528 and the NASA Causeway (Fig. 4). Quadrate selection for sampling was done randomly. The growth pattern of *C. prolifera* in the Indian River did not allow successful application of the belt transect technique utilized in the Banana River, therefore permanent quadrates (100 x 300m) in dense *C. prolifera* and seagrass areas were established between SR528 and the NASA Causeway (Fig. 4). The areas were sampled monthly (N=12) for each vegetation type. Water temperature, depth, dissolved oxygen, pH, and salinity were taken each collection date.

An 11m bag seine (0.64cm mesh) was used to sample each site. The seine was pulled against a barrier net (6.1m minnow seine with a 0.32cm mesh). Once the respective nets were positioned correctly, individuals were positioned at the open ends to discourage fish from escaping in that direction the bag seine was pulled. When the bag seine contacted the barrier net the bag seine was lifted from the water by bringing the lead line up along the barrier net. The seine was pulled a distance of 11m (total area sampled = 22m2). All contents of the seine wings were worked down to the bag, and the fish separated from the debris using a piece of wire mesh placed just below the rim of a dip net. The fish, invertebrates and assorted debris were placed on the wire mesh and the material agitated gently. We found that both fish and invertebrates tended to swim for the bottom and sides of the dip net. This partitioned the fish and free epifaunal invertebrates in the dip net from the debris on the wire mesh.

Fish collections were also performed by employing a 1m2 throw net. The net was thrown haphazardly from the bow of a small boat by two individuals. The throw net was constructed of a aluminum frame 15cm deep with a 1.2m deep net (0.16cm mesh) clamped to the frame. The net had floats at the top to prevent fish escaping. Collections were made by throwing the net off the front of a small boat. The net was held open by placing stakes in each corner and the fish removed using a small square front dip net. Collections were made along a transect in the Banana River at four water depths, 1m, 0.75m, 0.50m, and 0.25m. Five throws were made at each depth.

Fish were fixed in 10% formalin and transferred to 70% ethanol after a week. All fish were identified to the lowest possible taxon, enumerated and measured (SL), except *Lucania parva*. Because large numbers of *Lucania parva* made measurement of all fish time consuming, an aliquot of sixteen randomly selected fish were measured.

Data were subjected to one-way ANOVA and Duncan's Multiple-Range tests. In addition, species diversity, richness and evenness calculations were performed.

RESULTS:

Physical Environment:

Monthly physiochemical monitoring from January, 1981 to December 1986 in the sample areas showed that the Banana River site mimiced closely what we have considered background conditions (Fig.s 5 - 11). Data collected from the Indian River over the same time period in the same basin as the sampling site demonstrated a significant difference for macronutrients between the background conditions (Station I-2) and sampling site concentrations (Station I-5b).

Physical water measurements taken within each sampling area showed that water depth in the Indian River was the only parameter that showed significant difference between *C. prolifera* and seagrass areas ($P<0.05$). There was no significant difference in the salinity, temperature, D.O. and pH. Salinity varied from 16o/oo in the Banana River to 33o/oo in the Indian River, temperature from 15.5oC to 31oC, D.O. from 2.0 to 20.0 mg/l in the Indian River and pH from 7.05 to 8.75 (Table 1).

Benthic Macroinvertebrates:

To date, data analyzed from the Banana River indicates that little numerical difference exist between seagrass areas and *C. prolifera* areas relative to diversities, richness and evenness (means of d = 2.2 and 2.4, r = 3.3 and 3.0, e = 0.48 and 0.56 respectively), nor were there statistically significant differences in species numbers (mean numbers of 24.5 and 21.6), and in individuals per species (mean of 1285 and 1091 respectively). The large variance observed in individual numbers made interpretation difficult.

The results from the Indian River showed the same pattern that was found in the Banana River. Little statistical difference was evident between *C. prolifera* and seagrass areas for the aforementioned tests. There were, however, highly significant differences in all the above parameters between the Indian and Banana Rivers! The results of the preliminary analysis indicated that for number of species large dissimilarities existed between the *C. prolifera* areas in both systems, and between the two seagrass areas ($P<0.0014$, Tables 1 - 4).

Within the Banana River, numerical species dominance (top 5) was divided between a single epifaunal polychaete, *Syllis (Typosyllis) alternata*, and a crustacean complex composed of a Tanaeid, *Hargeria rapax*, an assortment of tuberculous amphipods, and two isopods, *Erichsonella attenuata*, and *Cymodoce faxoni* (see Tables 5 -10 for system-phyla comparisons). Of the data analyzed to date, *S. alternata* routinely made up 30 to 35% of the sample from both seagrass and *C. prolifera* areas. This was followed closely by the Tanaeid, *H. rapax*, the Isopod, *E. attenuata*, and the amphipod complex. No consistent pattern in the relative position of the top assortment of crustaceans was conspicuous.

The species character within the Indian River was much more difficult to interpret for recognizable patterns. This may be due more to an inadequate database at this juncture. The top species included the usual assortment of amphipods and isopods, with a spattering of polychaetes, and a number of bivalve species.

In number of individuals per species, the Banana River was much more productive than the Indian River, while the Indian River had a more balanced allocation of individuals among species than the Banana River. When the water quality data were analyzed the Indian River in the area where we were sampling was significantly different from what we considered background (control) area conditions for the lagoon system (Fig.s 9 - 13). The difference between the Banana River area and the Indian River control site were minimal. The area in the Indian River that included the sampling sites was impacted by cultural enrichment connected with wastewater discharges, stormwater outfalls and increased shoreline development. The sites were, however, on the fringes of the impacted areas and not adversely effected to the point of greatly decreased environmental quality.

We have concluded that two possible functions were working at the Indian River site that allowed more species and better distribution of individuals per species. These were; 1. the increases in nutrient loadings increased plankton primary productivity (food), which led to higher number of species, and/or 2. that disturbance (e.g. DO sags, sudden increases in vegetation cover, etc) allowed greater niche utilization. Additional analysis of the remaining samples will hopefully give the needed information to accurately predict what the 'habitat value' of *C. prolifera* is.

Elysia cauze :

The amount of *C. prolifera* lost in seven months was estimated to be ~ 75% in the Indian River and 30% in the Banana River (Fig. 14). The loss in coverage was total in the effected northern Indian River areas; as of March, 1988, *C. prolifera* has started to re-establish itself in areas that were denuded in 1987. The areas that had very dense *C. prolifera* prior to infestation (>80% coverage) typically had *E. cauze* counts in excess of 100/m2 just before vegetation coverages decreased dramatically. Once *C. prolifera* was gone individuals were seen in large numbers on drift algae (primarily *Gracilaria spp.*), presumedly in an attempt to feed. This was very evident in areas where only a few small patches of *C. prolifera* existed, where previously the area had very dense coverages. In many instances, the small patches (~500cm2) left were nearly covered with saccoglossans.

Migration of *E. cauze* from effected areas to non-effected ones most likely occurred reproductively rather then by movement of individuals. Movement of individual *E. cauze* was observed in the field, however, individuals were primarily confined to crawling along the sediment surface from vegetation patch to vegetation patch rather then swimming actively. Occasionally individuals were seen floating with the currents. This phenomena was observed in the field and laboratory. Floating was affected by production of mucus strands that acted as parachutes steaming behind the animals, thus allowing the individual to migrate short distances with the current. No predation by fishes was observed during either crawling or floating migrations, however the number of fish per m2 had decreased markedly from when *C. prolifera* was present.

Data on browsing rates were not complete. Additional information will be provided in the final report.

Fish:

On April 12, 1987 total number of fish per meter squared in *C. prolifera* and seagrass were not significantly different in both rivers (see Table 12 for means and confidence intervals).

In the Banana River there was no significant difference between total number of fish/m2 in *C. prolifera* and seagrass on March 15, 1987 or May 8, 1987.

Total number of fish/m2 in seagrass beds of the two rivers showed significant difference on March 15, 1987 and April 12, 1987. A significant difference in total number of fish/m2 between the two rivers in *C. prolifera* was found on October 23, 1986. On the other collection dates there was no significant difference in total number of fish/m2 in *C. prolifera* or seagrass beds when the two rivers were compared.

Total numbers of fish were at a low on May 8, 1987 in the Indian River *C. prolifera* beds (mean = 0 .5 fish/m2). A high in total numbers of fish in *C. prolifera* beds of the Indian River was observed on October 23, 1986 (7.1 fish/m2). The high and low observation for Indian River seagrass beds were on December 19, 1986 (51.6 fish/m2) and April 12, 1987 (5.2 fish/m2) respectfully. In the *C. prolifera* beds of the Banana River high and low numbers of fish were recorded on May 8, 1987 (9.6 fish/m2) and October 26, 1986 (1.2 fish/m2) respectfully. In the seagrass beds of the Banana River a high of 51.9 fish/m2 on November 16, 1986 and a low of 1.8 fish/m2 on April 12, 1987 was observed.

It should be noted that *C. prolifera* in the Indian River in May was showing the detrimental effects of a saccoglossan browsing, but still had good blade densities. By the sampling time of the next month, June 12, 1987, the coverage was 0 %.

Discussion

The role that *Caulerpa prolifera* has assumed in the Indian River lagoon can not be demonstrated conclusively with the limited data analyzed. The additional information provided when the entire dataset is analyzed will allow a more credible explanation of *C. prolifera*'s "worth" to the lagoon ecosystem.

It was fortuitous that we were able to document the decline in *C. prolifera* coverage within the lagoon system during 1987. This allowed excellent before and after comparisons between *C. prolifera* and unvegetated bottoms. The contrasts relative to benthic macroinvertebrate and fish production were extreme, with the vegetated bottoms much more productive than unvegetated ones. The implication was that when larger food sources (standing stock of small invertebrates that act as food sources for juvenile fishes) were available with *C. prolifera*, the commercial and recreational fisheries were significantly enhanced. The fact that rapid declines in fish was observed with the deterioration of *Caulerpa prolifera* in the Indian River suggest that the algae was acting as an fish attractant. It should be noted that the blue crab industry had one of its best spring catches for 1987 in the northern Indian River judging by the number of observed crab pot floats (actual landings data are not available at this time) at a time when the *C. prolifera* coverage was at its maximum.

In addition, *C. prolifera* performed a number of other functions that seagrasses have performed. The dense blade growth in good beds slowed water currents, thereby allowing fine suspended materials to become trapped reducing turbidity levels and stabilizing the sediments. Excess nutrients were quickly locked into algae tissue thereby decreasing the amount of nutrients for planktonic growth. Plankton growth in the lagoon is a chronic problem that affects vegetation growth in the enriched portions of the system by decreasing light levels during bloom conditions. The algae was found growing in shallow areas that had no seagrass growth because of decreased light levels, and at depths where the dominant seagrass species were normally lacking. Thus, *C. prolifera* acted as an "gap filler" within impacted areas.

Although on the surface it appeared that *C. prolifera* acted as a positive agent for the lagoon system, it did show several weaknesses that seagrasses did not have. The first was the algae's intolerance of high temperatures and exposure to air. Seagrasses, particularly *Halodule wrightii* and *Thallassia testudinum* can apparently withstand higher temperatures and exposure to air for short periods without loss of root viability. Blade loss during short term catastrophic events was very apparent in seagrass areas, but the roots maintained their viability and produced new blades very quickly after conditions returned to normal. *C. prolifera* during these same events did not maintain root viability, and recovery of the algae to the denuded areas has not occurred to date.

The second "problem" with *C. prolifera* was that it can be subjected to intense cropping by a saccoglossans (*E. cauze*). Rapid shifts in macroinvertebrates and concomitant shifts in fish population structure caused by rapid growth and subsequent loss can be a destablizing factor in a already stressed lagoon system.

Most importantly, the relationships between valuable commercial and recreation fisheries were not investigated thoroughly. Even though the discernible "positive" impacts of *Caulerpa prolifera* far exceed the several identified negative points, the interactions of important species and algae growth may have an negative impact. As an speculative example, the spotted seatrout, *Cynosion nebulosus*, spawns over deeper, unvegetated areas in the lagoon. If the bottoms are covered with a dense growth of *C. prolifera*, does a decrease in spawn viability occur? Conversely, does the increase in vegetation provide increased sanctuaries and a increase in larval and juvenile survival?

There is a desperate need to discover these and other relationships to increase not only our scientific knowledge base of the lagoon, and its important commercial and recreational species, but also to give managers <u>real</u> information, beyond the routine monitoring information most programs yield, with which to make important economic decisions. If we are to invest large sums of money to "restore" the lagoon system, we need this type of basic information to implement the right programs.

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Figure 1. Area map of Indian River lagoon system in Brevard County. Water quality stations are indicated by black dots.

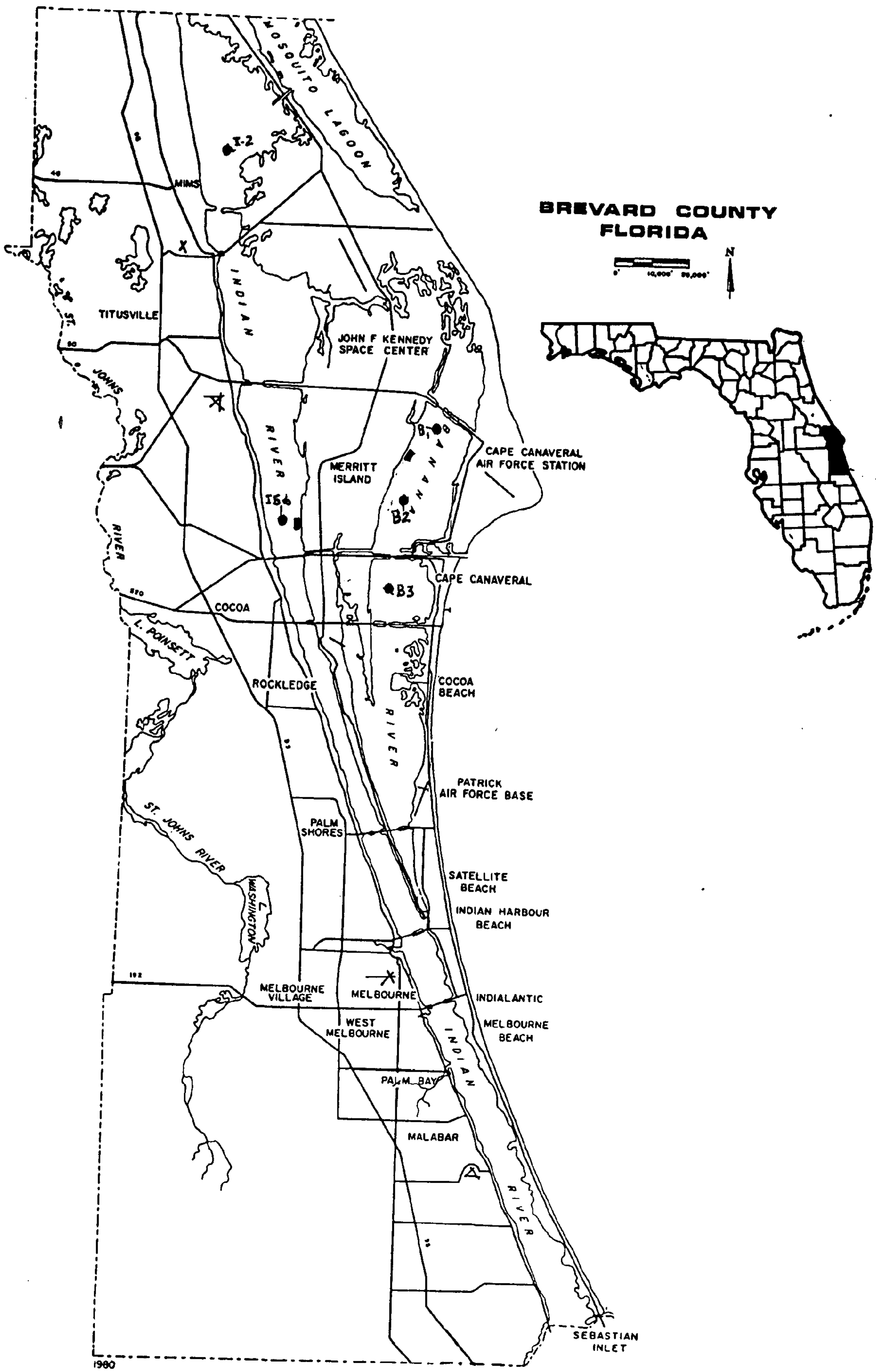
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Figure 2. Xerographic image of *Caulerpa prolifera* blades prior to herbivory by *Elysia cauze.* Outlines were traced with a digitizor, area and perimeter determined, and data archived in a microcomputer for analysis.

Figure 3. Xerographic image of *Caulerpa prolifera* after intense herbivory by *Elysia cauze*.

Figure 4. Fish sampling areas (black) for the Indian and Banana Rivers.

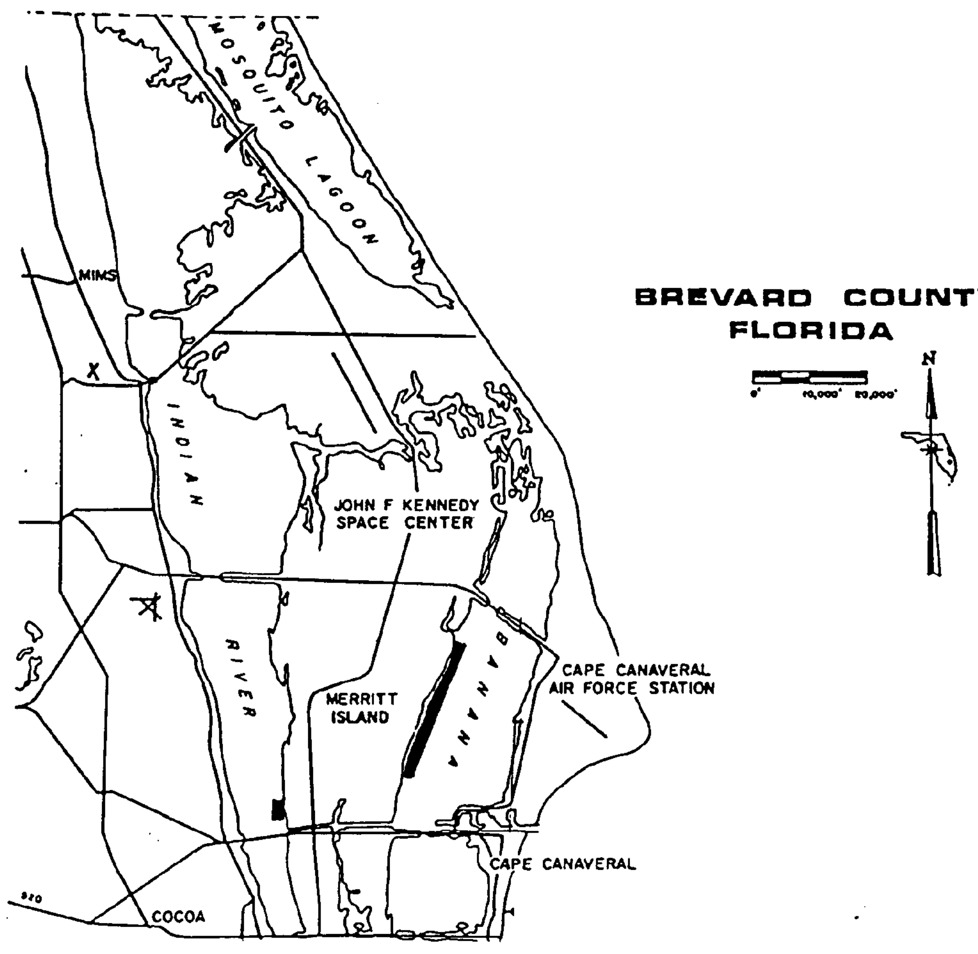
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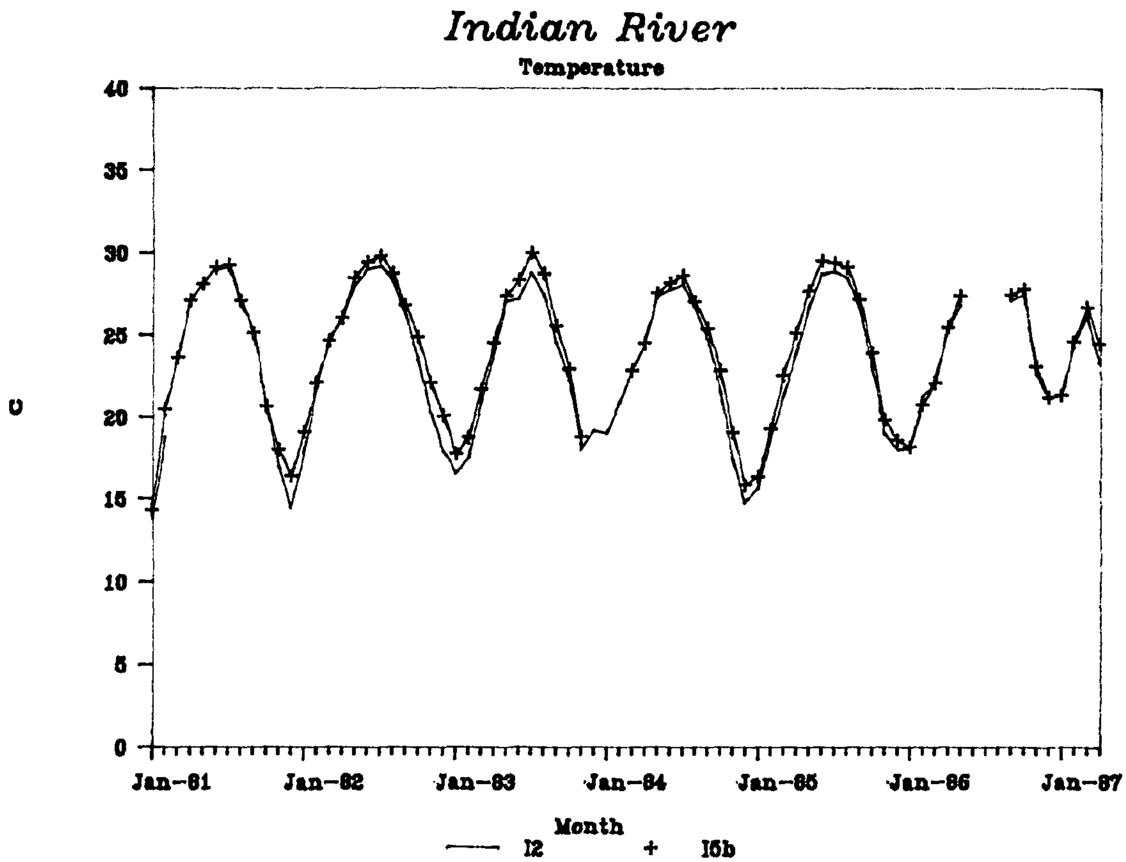
Figure 5. Graphs of temperature measurements from 1981 to 1987. Upper graph depicts the Indian River and the lower the Banana River. See Figure 1 for station locations.


Indian River
Temperature
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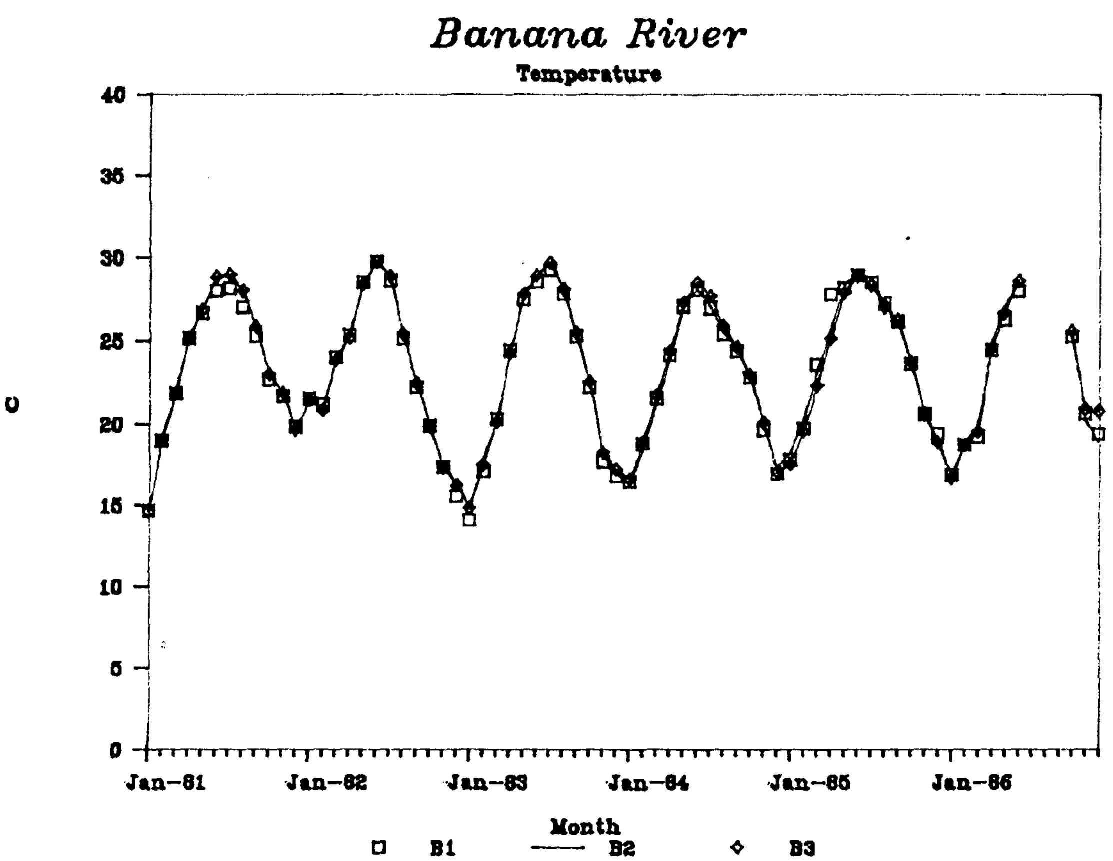
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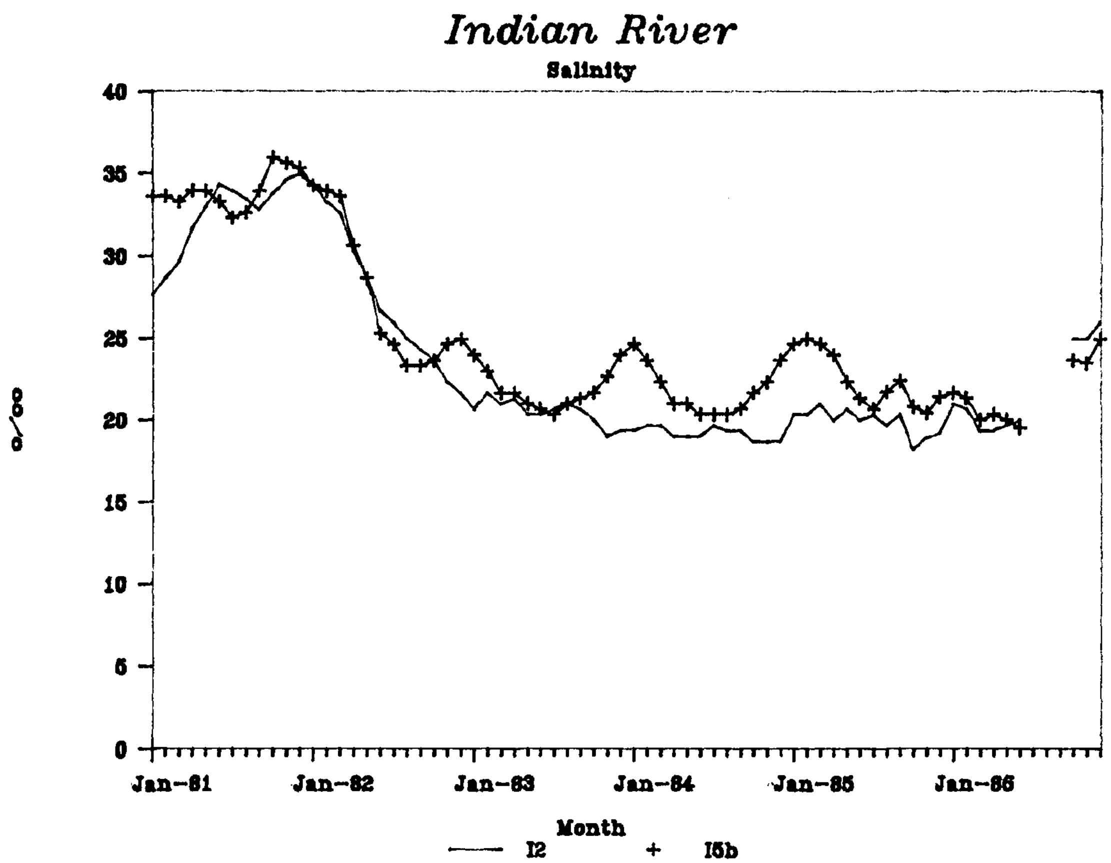
25
20
15
10
5
0
C
Jan-81
Jan-82
Jan-83
Jan-84
Jan-85
Jan-86
Month
B1
B2
B3

Figure 6. Graphs of salinity measurements from 1981 to 1987. Upper graph depicts the Indian River and the lower the Banana River. See Figure 1 for station locations.


Indian River
Salinity
40
35
30
25
20
15
10
5
0
o/oo
Jan-81
Jan-82
Jan-83
Jan-84
Jan-85
Jan-86
Month
I2
I5b

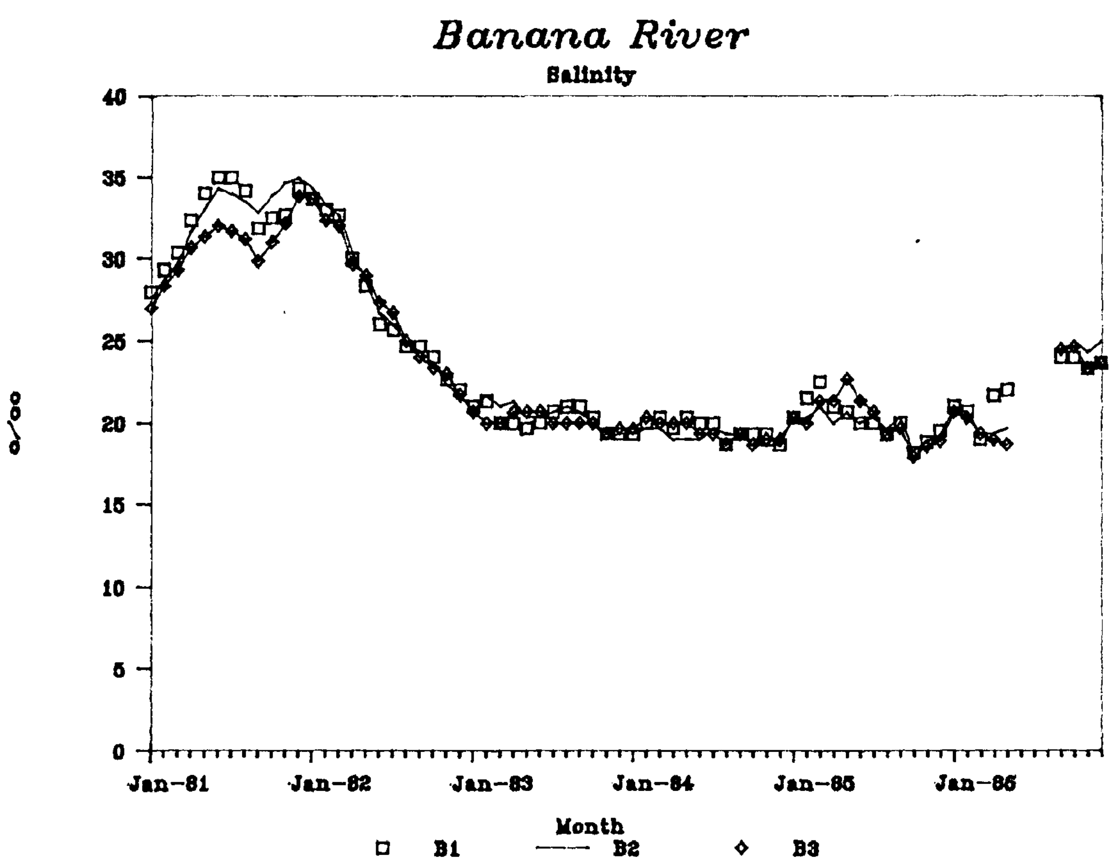
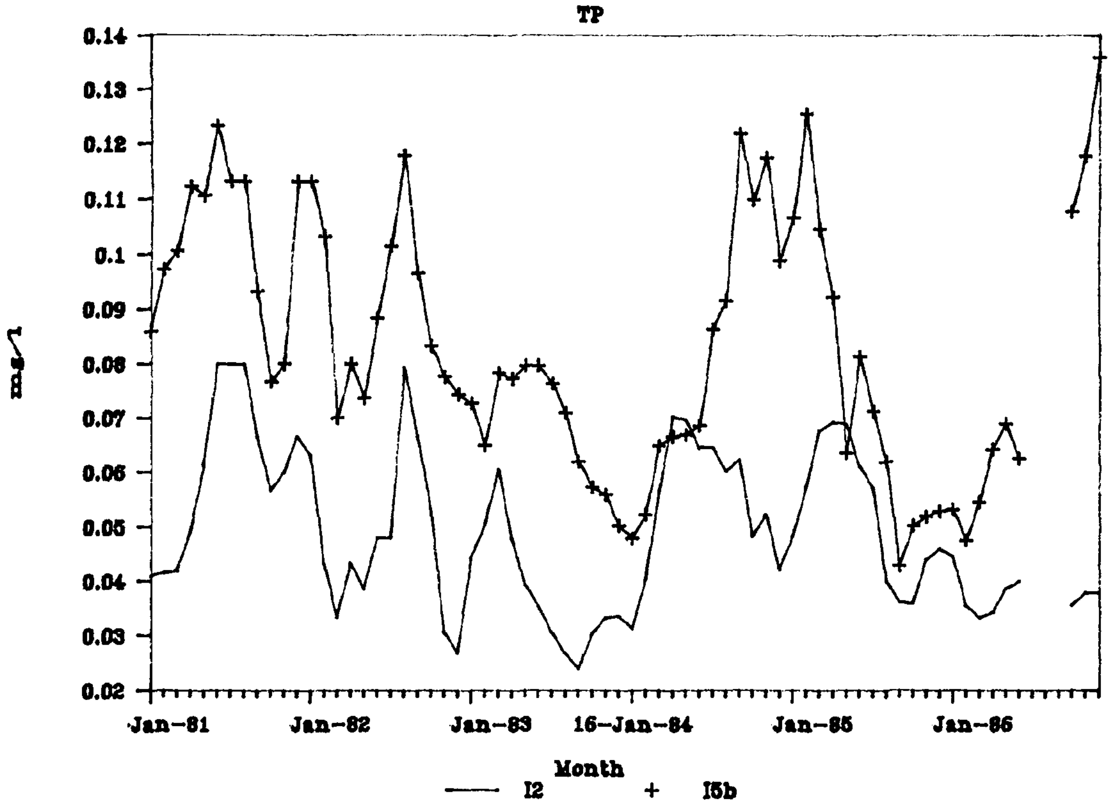

Banana River
Salinity
40
35
30
25
20
15
10
5
0
o/oo
Jan-81
Jan-82
Jan-83
Jan-84
Jan-85
Jan-86
Month
B1
B2
B3

Figure 7. Graphs of total phosphorus measurements from 1981 to 1987. Upper graph depicts the Indian River and the lower the Banana River. See Figure 1 for station locations.

Indian River



Banana River

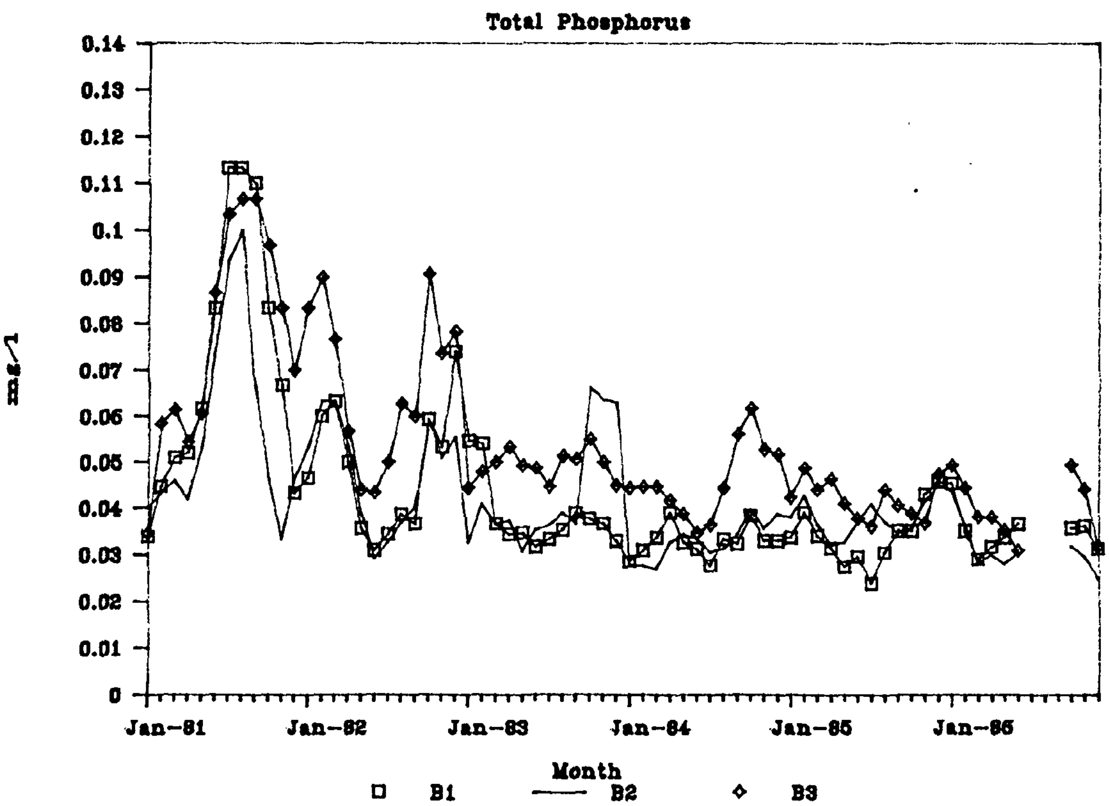
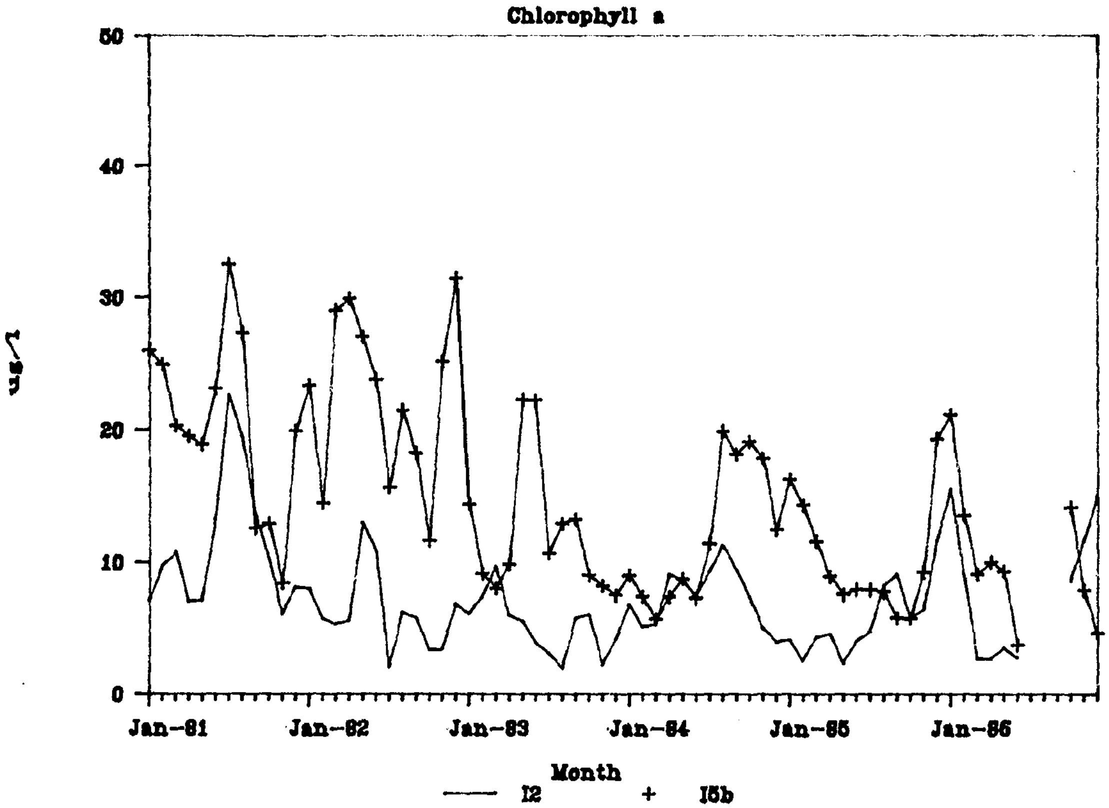


Figure 8. Graphs of chlorophyll a measurements from 1981 to 1987. Upper graph depicts the Indian River and the lower the Banana River. See Figure 1 for station locations.

Indian River



Banana River

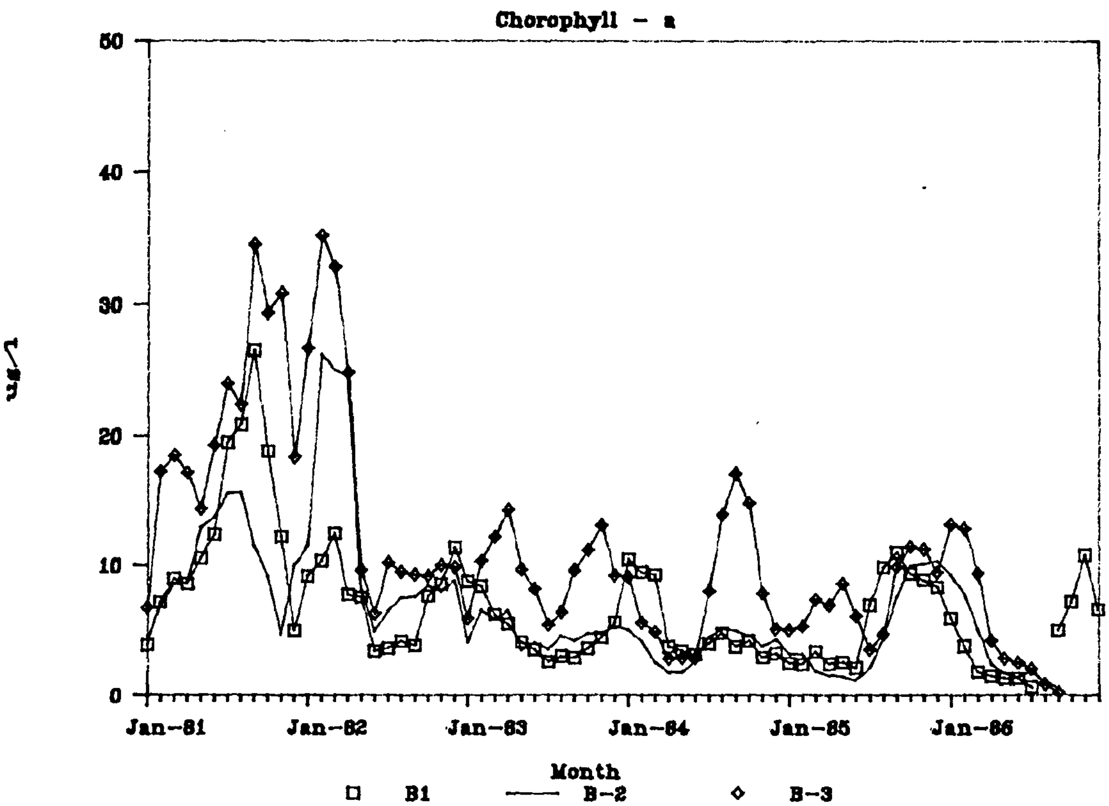
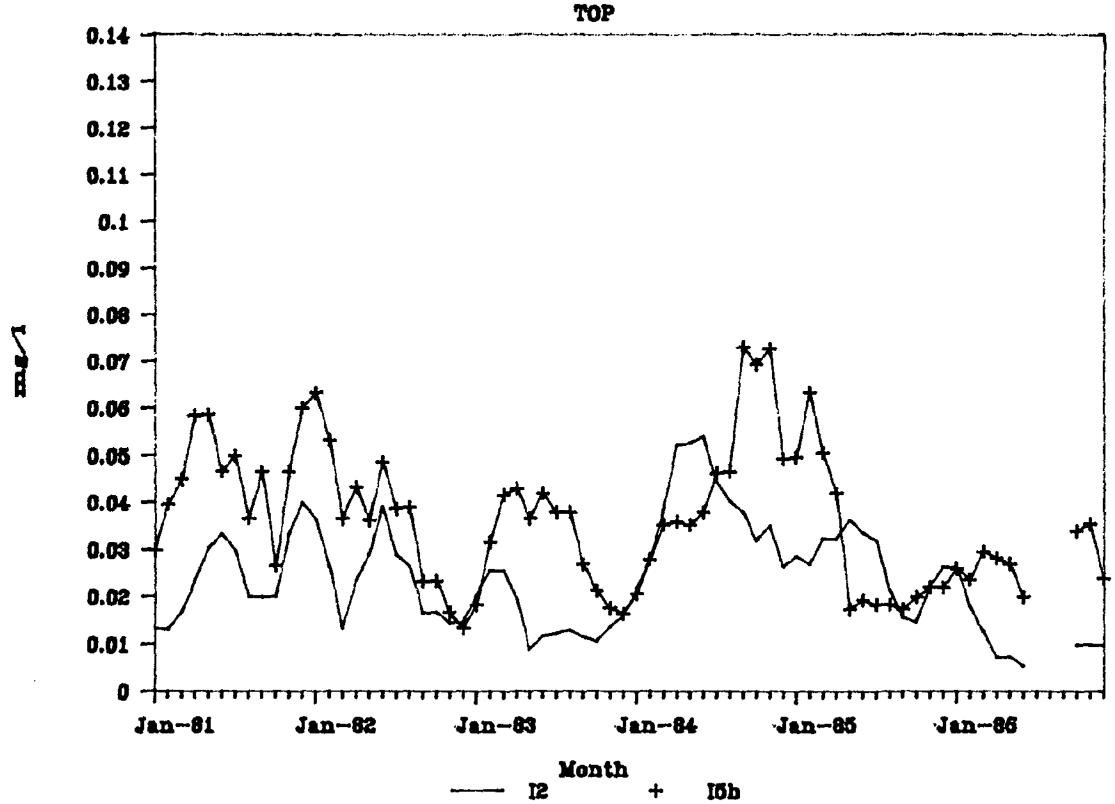


Figure 9. Graphs of total orthophosphorus measurements from 1981 to 1987. Upper graph depicts the Indian River and the lower the Banana River. See Figure 1 for station locations.

Indian River



Banana River

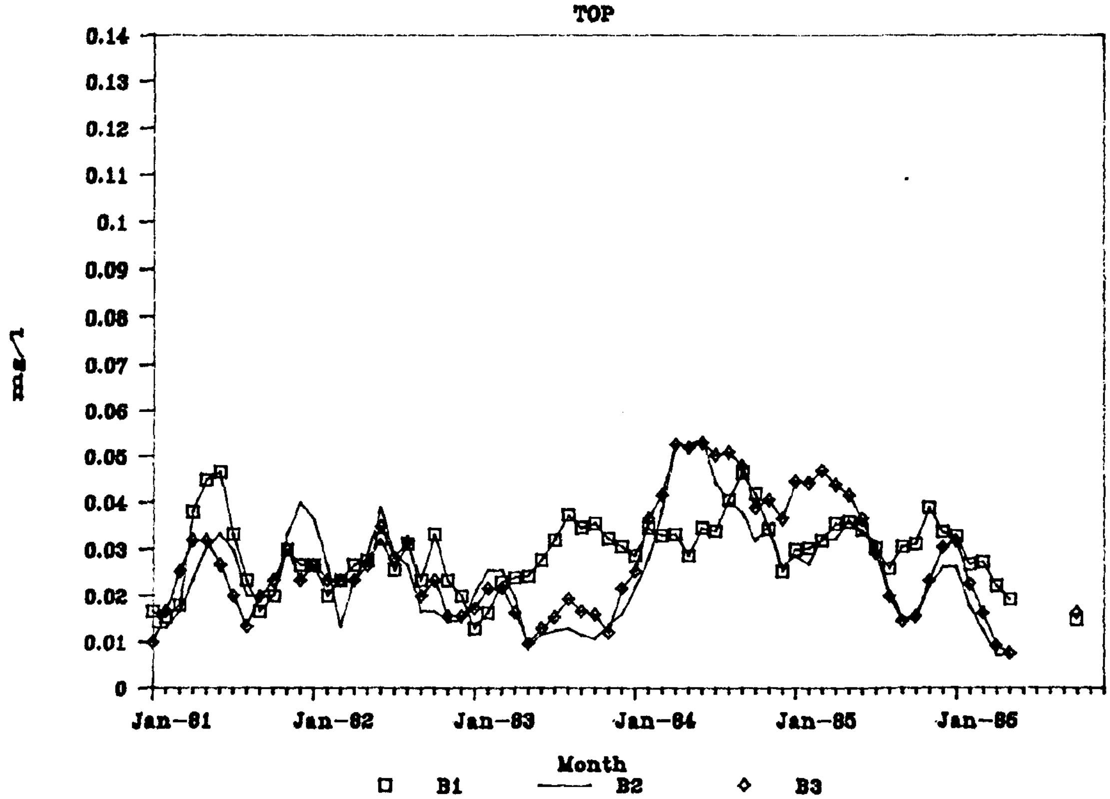
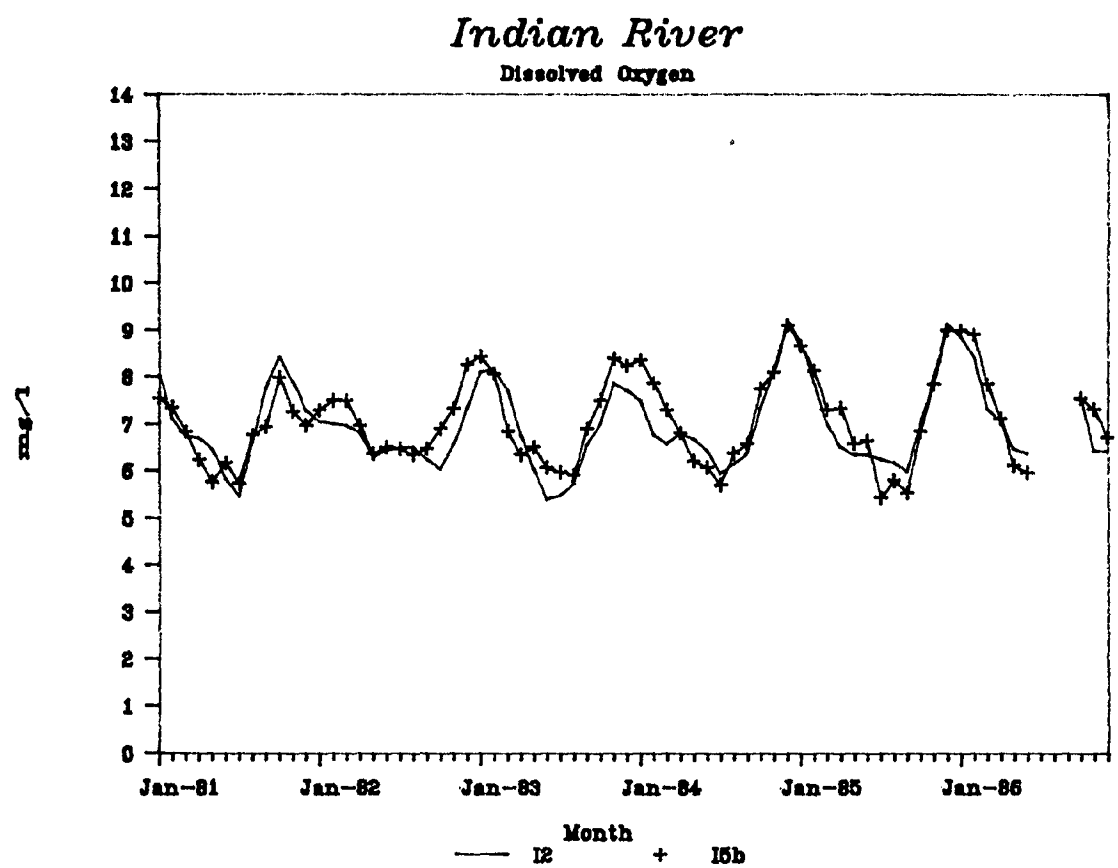


Figure 10. Graphs of dissolved oxygen measurements from 1981 to 1987. Upper graph depicts the Indian River and the lower the Banana River. See Figure 1 for station locations.


Indian River
Dissolved Oxygen
mg/l
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Jan-81
Jan-82
Jan-83
Jan-84
Jan-85
Jan-86
Month
I2
+ I5b

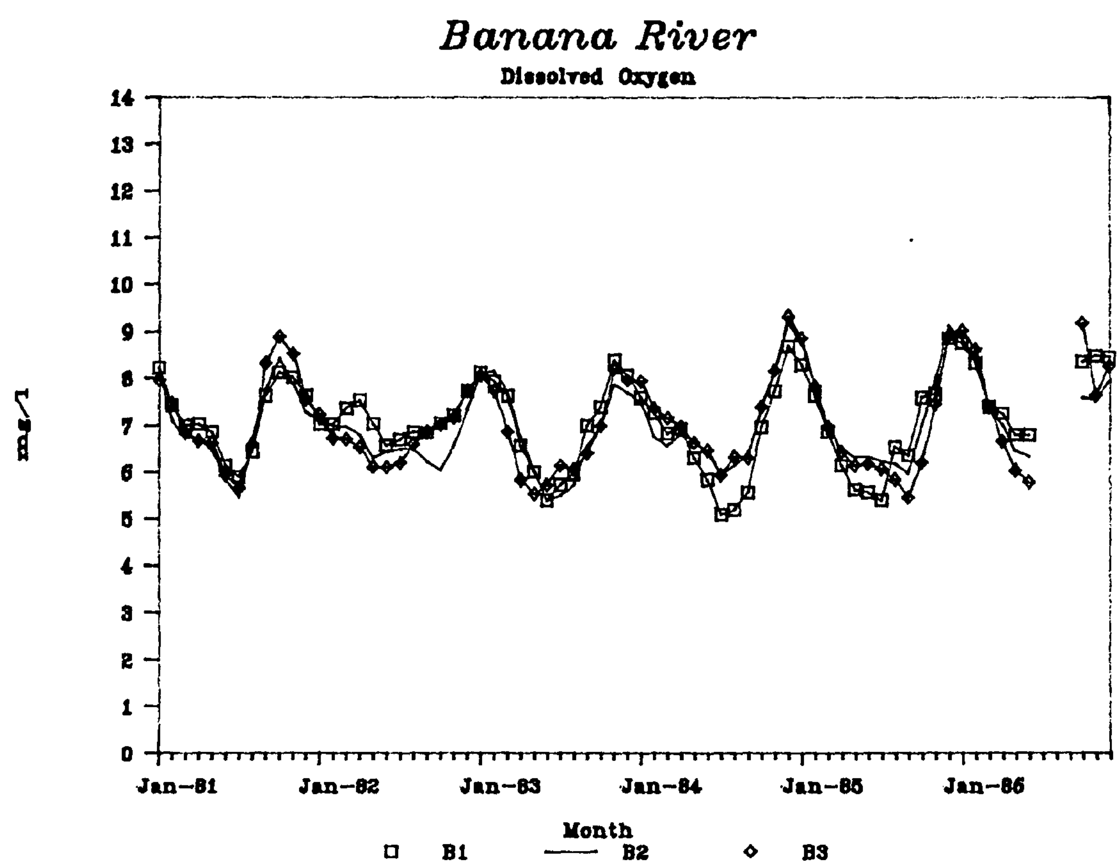
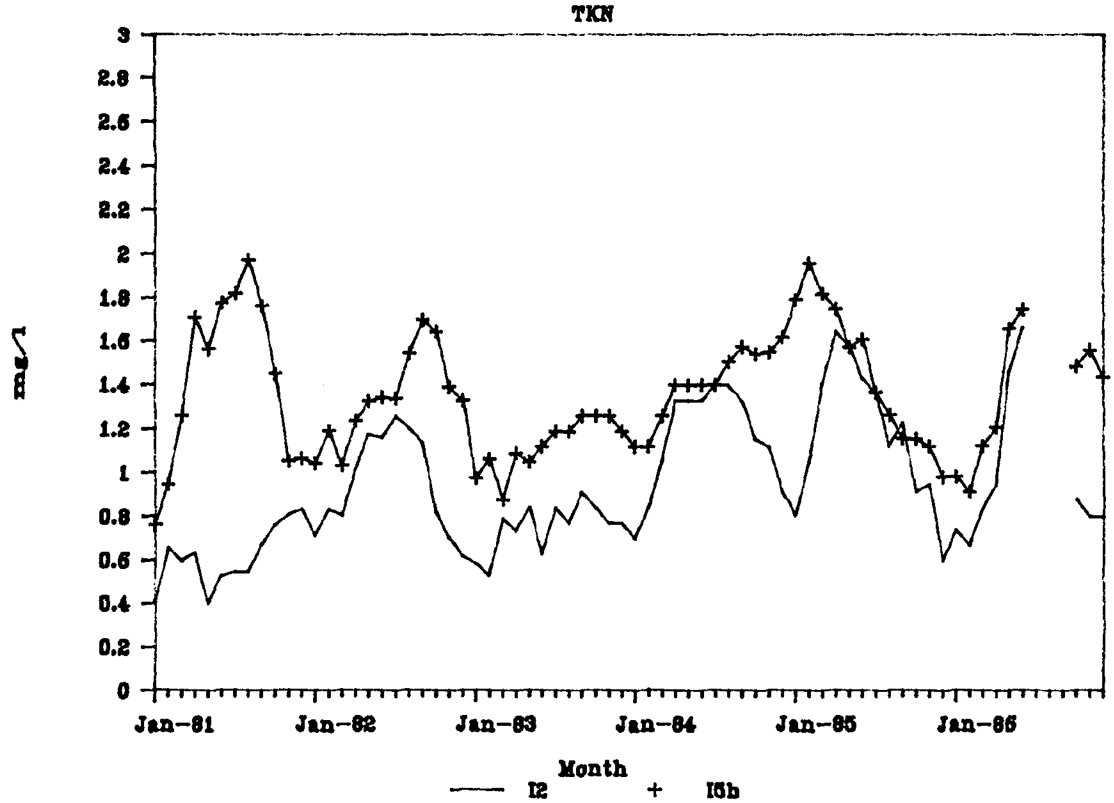

Banana River
Dissolved Oxygen
mg/l
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Jan-81
Jan-82
Jan-83
Jan-84
Jan-85
Jan-86
Month
B1
B2
B3

Figure 11. Graphs of TKN measurements from 1981 to 1987. Upper graph depicts the Indian River and the lower the Banana River. See Figure 1 for station locations.

Indian River



BANANA RIVER

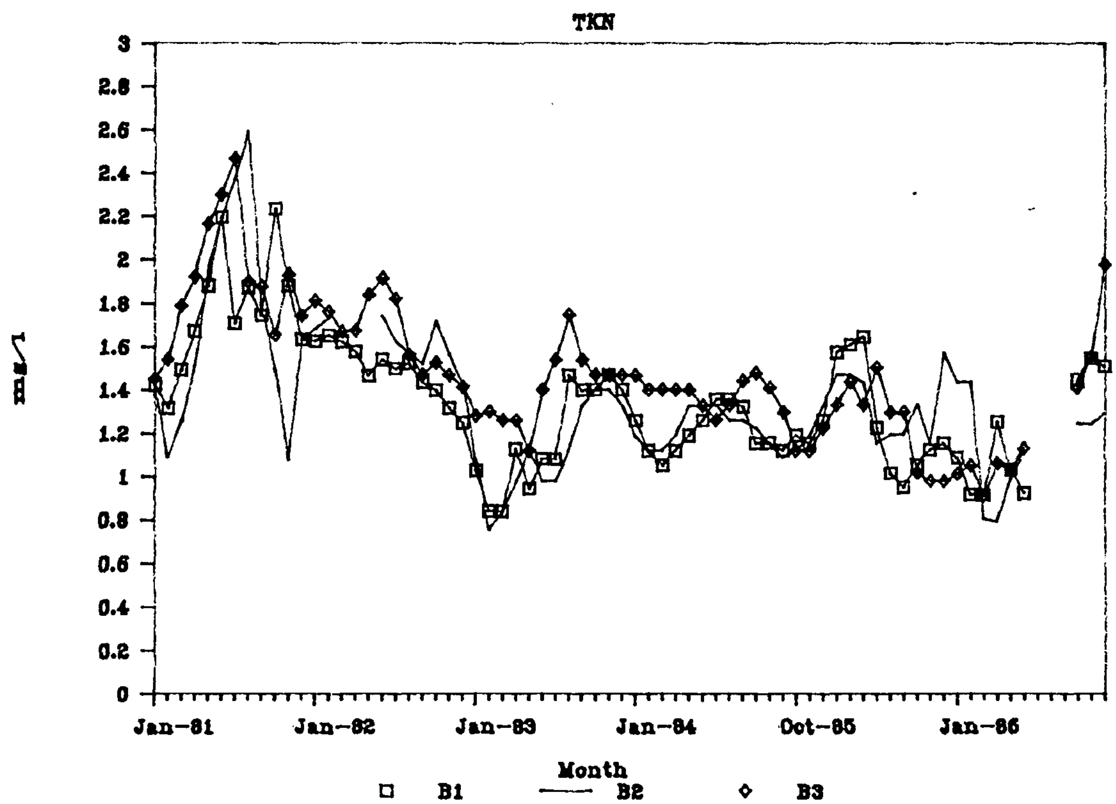
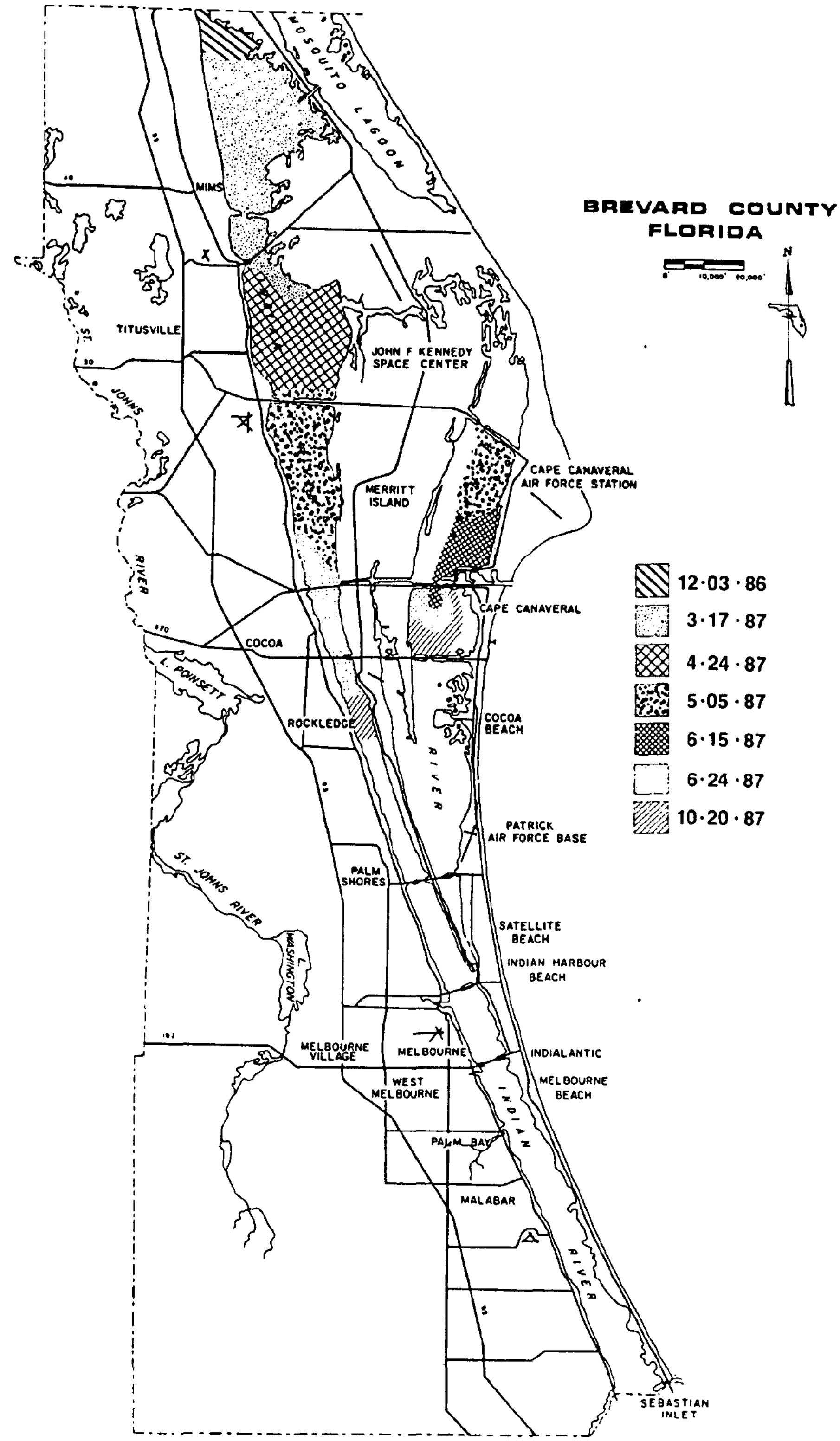


Figure 12. Map indicating southward migration of *Elysia cauze* and approximate areal coverage.



BREVARD COUNTY
FLORIDA
N
12·03·86
3·17·87
4·24·87
5·05·87
6·15·87
6·24·87
10·20·87
MOSQUITO LAGOON
MIMS
TITUSVILLE
ST. JOHNS
RIVER
JOHN F KENNEDY SPACE CENTER
MERRITT ISLAND
CAPE CANAVERAL AIR FORCE STATION
CAPE CANAVERAL
COCOA
L. POINSETT
ROCKLEDGE
COCOA BEACH
RIVER
PATRICK AIR FORCE BASE
PALM SHORES
ST. JOHNS RIVER
L. WASHINGTON
SATELLITE BEACH
INDIAN HARBOUR BEACH
MELBOURNE VILLAGE
MELBOURNE
INDIALANTIC
WEST MELBOURNE
MELBOURNE BEACH
INDIAN
PALM BAY
MALABAR
RIVER
SEBASTIAN INLET

Table 1. Physical measurements taken at each site (shallow water) during sampling.

BANANA RIVER CAULERPA PHYSICAL PARAMETERS

DATE	pH	D.O.	Temp.	DEPTH	sal
26-Oct-86		8.45	24.5	0.60	25
16-Nov-86	8.06	5.20	22.0	0.73	16
19-Dec-86	8.35	10.20	21.0	0.75	25
18-Jan-87	8.75	7.20	20.0	0.78	23
15-Feb-87	8.25	9.70	15.5	0.65	23
15-Mar-87	8.25	14.40	16.0	0.58	24
12-Apr-87	8.75	6.80	20.5	0.61	24
08-May-87	8.15	8.80	28.0	0.55	25
12-Jun-87	8.23	13.00	27.0	0.64	24
17-Jul-87	7.89	13.10	30.0	0.50	23
24-Aug-87	8.18		31.0	0.73	26
24-Sep-87	8.05	5.10	27.5	0.92	22
23-Nov-87	8.00	6.80	17.0	0.90	21

BANANA RIVER SEAGRASS PHYSICAL PARAMETERS

DATE	pH	D.O.	Temp.	DEPTH	sal
26-Oct-86		8.45	24.5	0.45	25
16-Nov-86	7.93	7.20	22.0	0.56	16
19-Dec-86	8.45	11.10	21.5	0.55	25
18-Jan-87	8.05	7.90	22.0	0.50	25
15-Feb-87	8.30	10.30	18.0	0.33	24
15-Mar-87	7.70	8.00	17.0	0.39	24
12-Apr-87	7.25	6.60	21.0	0.25	24
08-May-87	8.20	9.80	28.0	0.40	24
12-Jun-87	8.12	12.60	26.0	0.40	29
17-Jul-87	7.95	5.60	28.0	0.95	25
24-Aug-87	8.58		31.0	0.40	27
24-Sep-87	8.33	7.30	27.0	0.46	20
23-Nov-87	8.00	6.00	17.0	0.90	18

INDIAN RIVER CAULERPA PHYSICAL PARAMETERS

DATE	pH	D.O.	Temp.	DEPTH	sal
26-Oct-86		20.00	23.0	1.04	23
16-Nov-86	8.09	6.50	24.0	1.04	16
19-Dec-86	8.00	5.80	20.0	1.00	24
18-Jan-87	8.05	7.30	20.0	0.90	25
15-Feb-87	8.05	12.50	19.0	0.84	30
15-Mar-87	7.05	11.20	17.0	1.04	33
12-Apr-87	7.50	12.60	22.0	0.75	27
08-May-87	8.20	6.80	25.0	0.75	30
12-Jun-87	8.40	2.50	26.0	1.00	26
17-Jul-87	7.20	8.00	26.0	0.75	22
24-Aug-87	8.31	7.30	30.0	0.75	24
24-Sep-87	8.23	5.00	28.0	1.00	20

INDIAN RIVER SEAGRASS PHYSICAL PARAMETERS

DATE	pH	D.O.	Temp.	DEPTH	sal
26-Oct-86	8.30	12.40	26.0	0.46	21
16-Nov-86	8.23	6.10	25.0	1.07	15
19-Dec-86	8.15	8.00	21.5	0.57	24
18-Jan-87	7.95	8.40	23.0	0.50	24
15-Feb-87	7.15	12.20	19.0	0.33	29
15-Mar-87	8.40	13.80	21.5	0.37	32
12-Apr-87	8.00	13.20	24.5	0.47	26
08-May-87	8.20	8.40	26.0	0.50	29
12-Jun-87	8.24	13.40	29.5	0.50	27
17-Jul-87	7.45	10.80	26.0	0.50	19
24-Aug-87	8.16	2.00	29.0	0.55	24
24-Sep-87	8.35	9.10	28.0	0.57	20

Table 2. Seagrass species list and number of individuals of each species in the Banana River for October, 1986, January and May, 1987. List is a composite of three individual cores.

OCTOBER, 1986

Rank	Species	No. Ind.	%
1	Syllis (Typosyllis) alternata	367	46.28
2	Hargeria rapax	101	12.74
3	Erishsonella attenuata	44	5.55
4	Modulus modulus	42	5.30
5	Syllis (Typosyllis) sp1	40	5.04
6	Polydora ligni	33	4.16
7	Phascolion sp. 1	23	2.90
8	Capitella capatata	22	2.77
9	Prionospio heterobranchia	21	2.65
10	Cymodoce faxoni	17	2.14
11	Cymadusa compta	14	1.77
12	Grandidierella bonnieroides	14	1.77
13	Brachiodontes exhustus	9	1.13
14	Polydora ligni	9	1.13
15	Prunum carneum	7	.88
16	Parahesione luteola	6	.76
17	Haminoea elegans	6	.76
18	Haminoea succinea	4	.50
19	Nereid sp. 1	2	.25
20	Sebellid sp. 1	2	.25
21	Fabriciola trilobata	2	.25
22	Nemertia sp. 1	2	.25
23	Platyhelminthes sp. 2	1	.13
24	Asychis elongatus	1	.13
25	Gyptis brevipalpa	1	.13
26	Thyrax sp. 1	1	.13
27	Bulla striata	1	.13
28	Microspio c.f. pigmentata	1	.13

JANUARY , 1987

Rank	Species	No. Ind.	%
1	Syllis (Typosyllis) alternata	825	34.97
2	Erichsonella attenuata	508	21.53
3	Spirobis c.f. corrugatus	171	7.25
4	Hargeria rapax	146	6.19
5	Cymadusa compta	133	5.64
6	Cymodoce faxoni	125	5.30
7	Grandidierella bonnieroides	101	4.28
8	Polydora ligni	71	3.01
9	Serpula vermicularis granulosa	65	2.76

10	Fabriciola trilobata	62	2.63
11	Brachidontes exhustus	34	1.44
12	Nemertian sp. 1	24	1.02
13	Phascolion sp. 1	14	.59
14	Parapionsyllis c.f. longicirata	14	.59
15	Crustacean sp.1 (j)	8	.34
16	Aricidea fragilis	8	.34
17	Sabella microphthalma	7	.30
18	Prionospio heterobranchia	6	.25
19	Jasmineria c.f. bilobata	4	.17
20	Haminoea elegans	4	.17
21	Mogula sp. 1	4	.17
22	Podarke obscura	3	.13
23	Gyptus brevipalpa	3	.13
24	Copepoda sp. 1	3	.13
25	Isopod sp. 1	3	.13
26	Nemertian sp. 2	2	.08
27	Laevicardium sp. 1	1	.04
28	Mercenaria mercenaria	1	.04
29	Palaemontes pugio	1	.04
30	Marphysa sp. 1	1	.04
31	Cumacean sp. 1	1	.04
32	Amygadalum papyrium	1	.04
33	Branchioasychis americana	1	.04
34	Modulus modulus	1	.04
35	Hippolyte zostericola	1	.04
36	Eteone heteropoda	1	.04
37	Sabellidae sp. 1	1	.04

MAY , 1987

Rank	Species	No. Ind.	%
1	Syllis (Typosyllis) alternata	343	18.12
2	Erichsonella attenuata	234	12.36
3	Grandidierella bonnieroides	199	10.51
4	Hargeria rapax	174	9.19
5	Fabriciola trilobata	172	9.09
6	Spirobis c.f. corrugatus	165	8.72
7	Brachidontes exhustus	152	8.03
8	Cymodoce faxoni	114	6.02
9	Cymadusa compta	114	6.02
10	Actinnarid sp. 1	54	2.85
11	Amygadalum papyrium	27	1.43
12	Parapionsyllis longicirata	16	.85
13	Actinnarid sp. 2	14	.74
14	Nemertian sp. 1	12	.63
15	Sabella microphthalma	11	.58
16	Prionospio heterobranchia	10	.53
17	Crepidula fornicata	9	.48
18	Haminoea elegans	6	.32

19	Aricidea fragilis	6	.32
20	Capitella capitata	6	.32
21	Podarke sp. 1	5	.26
22	Modulus modulus	5	.26
23	Polydora ligni	5	.26
24	Opistobranch sp. 1	4	.21
25	Leitoscoloplos fragilis	4	.21
26	Podarke obscura	4	.21
27	Phascolion sp. 1	4	.21
28	Melita sp. 1	4	.21
29	Platyhelminth sp. 1	3	.16
30	Mercenaria mercenaria	2	.11
31	Copepod sp. 1	2	.11
32	Platynereis dumerilii	2	.11
33	Melita appendiculata	2	.11
34	Hesionidae sp. 1	1	.05
35	Diopatra cuprea	1	.05
36	Ampelisca sp. 1	1	.05
37	Ophiophragmus filograneus	1	.05
38	Laevicardium sp. 1	1	.05
39	Branchioasychis americana	1	.05
40	Clymenella torguata	1	.05
41	Marphysa sp. 1	1	.05
42	Tellina sp. 1	1	.05

Table 3. *Caulerpa prolifera* species list and number of individuals of each species in the Banana River for October, 1986, January and May, 1987. List is a composite of three individual cores.

OCTOBER, 1986

Rank	Species	No. Ind.	%
1	Syllis (Typosyllis) sp. 1	617	36.84
2	Hargeria rapax	555	33.13
3	Polydora ligni	125	7.46
4	Grandidierella bonnieroides	71	4.24
5	Fabriciola trilobata	63	3.76
6	Cymadusa compta	46	2.75
7	Phascolion sp. 1	41	2.45
8	Prionospio heterobranchia	20	1.19
9	Erichsonella attenuata	17	1.01
10	Aricidea (Aedicira) sp. 1	13	.78
11	Modulus carchedonis	13	.78
12	Modiolus carchedonis	11	.66
13	Mellina maculata	11	.66
14	Ophiophragmus fliograneus	10	.60
15	Capitella capitata	10	.60
16	Brachidontes exhustus	8	.48
17	Branchioasychis americana	6	.36
18	Scolelepis sp. 1	6	.36
19	Haminoea elegans	4	.24
20	Prunum carneum	4	.24
21	Paranoidea(Aricidae) sp. 1	3	.18
22	Ampliosca abdita	3	.18
23	Leptosynapta sp. 1	2	.12
24	Ophellid sp 1	2	.12
25	Tellina candenna	2	.12
26	nemertia sp. 2	2	.12
27	Gyptus brevipalpa	1	.06
28	Nereid sp. 1	1	.06
29	Platy.(c.f. Euplurea) sp.1	1	.06
30	Cymothoidae paras. isopod	1	.06
31	Parahesione luteola	1	.06
32	actinnarid sp. 1	1	.06
33	Cymodoce faxoni	1	.06
34	Actinnarid sp. 2	1	.06
35	Diopatra cuprea	1	.06
36	Capitellid sp 1	1	.06

JANUARY, 1987

Rank	Species	No. Ind.	%
1	Syllis (Typosyllis) alternata	777	30.69
2	Hargeria rapax	401	15.84

3	Cymadusa compta	334	13.19
4	Grandidierella bonnieroides	333	13.15
5	Brachidontes exhustus	286	11.30
6	Fabriciola trilobata	195	7.70
7	Erichsonella attenuata	31	1.22
8	Skeneopsis c.f. planorbis	23	.91
9	Cymodoce faxoni	19	.75
10	Prionospio heterobranchia	17	.67
11	Nemertian sp. 2	15	.59
12	Platyhelminth sp. 1	15	.59
13	Jasmineria c.f. bilobata	10	.39
14	Amygadalum papyrium	9	.36
15	Gastropod sp. 1	8	.32
16	Aricidea fragilis	6	.24
17	Sabella microphthalma	6	.24
18	Amphicteis c.f. gunneri	4	.16
19	Podarke obscura	4	.16
20	Diopatra cuprea	4	.16
21	Prunum carneum	3	.12
22	Platynereis dumerilii	3	.12
23	Actinnarid sp. 1	3	.12
24	Ophiophragmus filograneus	2	.08
25	Polydora ligni	2	.08
26	Mogula sp. 1	2	.08
27	Crepidula fornicata	2	.08
28	Thyrax sp. 1	2	.08
29	Bivalve sp. 2	2	.08
30	Clymenella torguata	2	.08
31	Bulla c.f. sp. 1 (no shell)	2	.08
32	Laevicardium sp. 1	1	.04
33	Saccoglosan sp. 1	1	.04
34	Saggita sp.1	1	.04
35	Peloscolex sp.1	1	.04
36	Gyptus brevipalpa	1	.04
37	Melita appendiculata	1	.04
38	Mercenaria mercenaria	1	.04
39	Phascolion sp. 1	1	.04
40	Capitella capitata	1	.04
41	Branchioasychis americana	1	.04

MAY, 1987

Rank	Species	No. Ind.	%
1	Syllis (Typosyllis) alternata	791	27.52
2	Brachidontes exhustus	672	23.38
3	Fabriciola trilobata	522	18.16
4	Hargeria rapax	296	10.30
5	Cymadusa compta	117	4.07
6	Grandidierella bonnieroides	98	3.41
7	Actinnarid sp. 1	95	3.31
8	Erichsonella attenuata	78	2.71
9	Melita sp. 1	38	1.32

10	Nemertian sp. 1	31	1.08
11	Polydora ligni	24	.84
12	Amygadalum papyrium	22	.77
13	Sabella microphthalma	11	.38
14	Podarke obscura	8	.28
15	Melita appendiculata	7	.24
16	Cymodoce faxoni	6	.21
17	Notomastus latericeus	5	.17
18	Capitella capitata	5	.17
19	Aricidea fragilis	5	.17
20	Laevicardium sp. 1	4	.14
21	Amphicteis c.f. gunneri	4	.14
22	Platynereis dumerilii	4	.14
23	Prunum sp. 1	3	.10
24	Opistobranch sp. 1	3	.10
25	Platyhelminth sp. 1	3	.10
26	Crepidula fornicata	2	.07
27	Spirobis c.f. corrugatus	2	.07
28	Phascolion sp. 1	2	.07
29	Prionospio heterobranchia	2	.07
30	Actinnarid sp. 2	2	.07
31	Parapionsyllis longicirata	2	.07
32	Amphipod sp. 1 (sm juv)	1	.03
33	Nemertian sp. 2	1	.03
34	Saggita sp. 1	1	.03
35	Urosalpinx cinerea	1	.03
36	Prunum carneum	1	.03
37	Branchioasychis americana	1	.03
38	Thyrax sp. 1	1	.03
39	Ophiophragmus filograneus	1	.03
40	Gyptus brevipalpa	1	.03
41	Zoea sp. 1	1	.03

3	Cymadusa compta	334	13.19
4	Grandidierella bonnieroides	333	13.15
5	Brachidontes exhustus	286	11.30
6	Fabriciola trilobata	195	7.70
7	Erichsonella attenuata	31	1.22
8	Skeneopsis c.f. planorbis	23	.91
9	Cymodoce faxoni	19	.75
10	Prionospio heterobranchia	17	.67
11	Nemertian sp. 2	15	.59
12	Platyhelminth sp. 1	15	.59
13	Jasmineria c.f. bilobata	10	.39
14	Amygadalum papyrium	9	.36
15	Gastropod sp. 1	8	.32
16	Aricidea fragilis	6	.24
17	Sabella microphthalma	6	.24
18	Amphicteis c.f. gunneri	4	.16
19	Podarke obscura	4	.16
20	Diopatra cuprea	4	.16
21	Prunum carneum	3	.12
22	Platynereis dumerilii	3	.12
23	Actinnarid sp. 1	3	.12
24	Ophiophragmus filograneus	2	.08
25	Polydora ligni	2	.08
26	Mogula sp. 1	2	.08
27	Crepidula fornicata	2	.08
28	Thyrax sp. 1	2	.08
29	Bivalve sp. 2	2	.08
30	Clymenella torguata	2	.08
31	Bulla c.f. sp. 1 (no shell)	2	.08
32	Laevicardium sp. 1	1	.04
33	Saccoglosan sp. 1	1	.04
34	Saggita sp.1	1	.04
35	Peloscolex sp.1	1	.04
36	Gyptus brevipalpa	1	.04
37	Melita appendiculata	1	.04
38	Mercenaria mercenaria	1	.04
39	Phascolion sp. 1	1	.04
40	Capitella capitata	1	.04
41	Branchioasychis americana	1	.04

MAY, 1987

Rank	Species	No. Ind.	%
1	Syllis (Typosyllis) alternata	791	27.52
2	Brachidontes exhustus	672	23.38
3	Fabriciola trilobata	522	18.16
4	Hargeria rapax	296	10.30
5	Cymadusa compta	117	4.07
6	Grandidierella bonnieroides	98	3.41
7	Actinnarid sp. 1	95	3.31
8	Erichsonella attenuata	78	2.71
9	Melita sp. 1	38	1.32

10	Nemertian sp. 1	31	1.08
11	Polydora ligni	24	.84
12	Amygadalum papyrium	22	.77
13	Sabella microphthalma	11	.38
14	Podarke obscura	8	.28
15	Melita appendiculata	7	.24
16	Cymodoce faxoni	6	.21
17	Notomastus latericeus	5	.17
18	Capitella capitata	5	.17
19	Aricidea fragilis	5	.17
20	Laevicardium sp. 1	4	.14
21	Amphicteis c.f. gunneri	4	.14
22	Platynereis dumerilii	4	.14
23	Prunum sp. 1	3	.10
24	Opistobranch sp. 1	3	.10
25	Platyhelminth sp. 1	3	.10
26	Crepidula fornicata	2	.07
27	Spirobis c.f. corrugatus	2	.07
28	Phascolion sp. 1	2	.07
29	Prionospio heterobranchia	2	.07
30	Actinnarid sp. 2	2	.07
31	Parapionsyllis longicirata	2	.07
32	Amphipod sp. 1 (sm juv)	1	.03
33	Nemertian sp. 2	1	.03
34	Saggita sp. 1	1	.03
35	Urosalpinx cinerea	1	.03
36	Prunum carneum	1	.03
37	Branchioasychis americana	1	.03
38	Thyrax sp. 1	1	.03
39	Ophiophragmus filograneus	1	.03
40	Gyptus brevipalpa	1	.03
41	Zoea sp. 1	1	.03

Table 4. Seagrass species list and number of individuals of each species in the Indian River for October, 1986, January and May, 1987. List is a composite of three individual cores.

JANUARY, 1987

Rank	Species	No. Ind.	%
1	Tellina c.f. caribaea	145	13.51
2	Aricidea fragilis	136	12.67
3	Polydora ligni	131	12.21
4	Erichsonella attenuata	114	10.62
5	Ophiophragmus filograneus	76	7.08
6	Cymadusa compta	70	6.52
7	Crepidula fornicata	48	4.47
8	Leitoscoloplos fragilis	38	3.54
9	Capitella capitata	35	3.26
10	Spirobis c.f. corrugatus	35	3.26
11	Gyptus brevipalpa	28	2.61
12	Cymodoce faxoni	28	2.61
13	Hargeria rapax	27	2.52
14	Cymodoce faxoni	20	1.86
15	Eteone heteropoda	18	1.68
16	Amphicteis c.f. gunneri	16	1.49
17	Platynereis dumerilii	15	1.40
18	Parapionsyllis longicirata	15	1.40
19	Nemertian sp. 1	10	.93
20	Fabriciola trilobata	8	.75
21	Mediomastus californiensis	7	.65
22	Prionospio heterobranchia	7	.65
23	Podarke obscura	6	.56
24	Sabella microphthalma	5	.47
25	Ostracod sp.1	4	.37
26	Mogula sp. 1	4	.37
27	Lyonisa floridana	3	.28
28	Mitrella lunata	3	.28
29	Melinna maculata	2	.19
30	Cumacean sp. 1	2	.19
31	Neanthes succinea	1	.09
32	Platyhelminth sp. 1	1	.09
33	Amygdalum papyrium	1	.09
34	Mysid sp. 1	1	.09
35	Retusa candei	1	.09
36	Marphysa sp. 1	1	.09
37	Hippolyte zostericola	1	.09
38	Nemertian sp. 2	1	.09
39	Saccoglossan sp. 1	1	.09
40	Brachidontes exhustus	1	.09
41	Saggita sp. 1	1	.09
42	Cerithium muscarum	1	.09
43	Glycinde solitaria	1	.09

44	Nemertian sp. 3	1	.09
45	Marphysa sanquinea	1	.09
46	Mercenaria mercenaria	1	.09
47	Gemma c.f. gemma	1	.09

MAY, 1987

Rank	Species	No. Ind.	%
1	Clymenella torguata	445	23.54
2	Aricidea fragilis	227	12.01
3	Cymadusa compta	185	9.79
4	Erichsonella attenuata	127	6.72
5	Parapionsyllis longicirata	107	5.66
6	Hargeria rapax	94	4.97
7	Polydora ligni	92	4.87
8	Capitella capitata	73	3.86
9	Cymodoce faxoni	71	3.76
10	Ostracod sp. 1	54	2.86
11	Tellina c.f. caribaea	54	2.86
12	Ophiophragmus filograneus	37	1.96
13	Mediomastus californiensis	30	1.59
14	Nemertian sp. 1	30	1.59
15	Leitoscoloplos fragilis	25	1.32
16	Gyptus brevipalpa	24	1.27
17	Grandidierella bonnieroides	20	1.06
18	Ampelisca abdita	19	1.01
19	Chone americana	17	.90
20	Corophium ellisi	16	.85
21	Actinnarid sp. 1	15	.79
22	Lyonisa floridana	14	.74
23	Spirobis c.f. corrugatus	13	.69
24	Amphicteis c.f. gunneri	9	.48
25	Eteone heteropoda	9	.48
26	Scololepis squamata	8	.42
27	Cumacean sp. 1	7	.37
28	Glycinde solitaria	7	.37
29	Platynereis dumerilii	7	.37
30	Arenicola cristata	6	.32
31	Podarke obscura	6	.32
32	Copepod sp. 1	5	.26
33	Edotea trilobata	5	.26
34	Prionospio heterobranchia	5	.26
35	Saccoglosan sp. 1	5	.26
36	Actinnarid sp. 2	2	.11
37	Crepidula fornicata	2	.11
38	Haminoea elegans	2	.11
39	Holothurian sp. 1	2	.11
40	Nemertian sp. 2	2	.11

41	Sabella microphthalma	2	.11
42	Actinnarid sp. 3	1	.05
43	Amygadalum papyrium	1	.05
44	Brachidontes exhustus	1	.05
45	Diopatra cuprea	1	.05
46	Lumbrinereis sp. 1	1	.05
47	Palaemontes pugio	1	.05
48	Paracaprella tenuis	1	.05
49	Pectinnaria gouldii	1	.05
50	Platyhelminth sp. 1	1	.05
51	Syllis (Typosyllis) alternata	1	.05

Table 5. *Caulerpa prolifera* species list and number of individuals of each species in the Indian River for October, 1986, January and May, 1987. List is a composite of three individual cores.

OCTOBER, 1986

Rank	Species	No. Ind.	%
1	Crepidula fornicata	62	18.96
2	Cymadusa compta	32	9.79
3	Ophiophragmus filograneus	24	7.34
4	Cymodusa compta	23	7.03
5	Erichsonella attenuata	23	7.03
6	Polydora ligni	18	5.50
7	Hargeria rapax	17	5.20
8	Prunum carneum	14	4.28
9	Spirobis spirillum	14	4.28
10	Dioptra cuprea	11	3.36
11	Bulla striata	8	2.45
12	Gyptis brevipalpa	8	2.45
13	Cymodoce faxoni	7	2.14
14	Sabella microphthalma	7	2.14
15	Podarke obscura	6	1.83
16	Serpula vermicularis	6	1.83
17	Capitella capitata	6	1.83
18	Haminoea succinea	5	1.53
19	Exogone verugera	5	1.53
20	Grandidierella bonnieroides	5	1.53
21	Parahesione c.f. luteola	4	1.22
22	Mogula sp. 1	4	1.22
23	Prionospio heterobranchia	2	.61
24	Syllis (Typosyllis) alternata	2	.61
25	Modulas modulus	2	.61
26	Modulus carchedonius	2	.61
27	Ophiophragmus pulcher	2	.61
28	Nemertian sp. 2	1	.31
29	Spirobranchus sp. 1	1	.31
30	Melinlna maculata	1	.31
31	Palaemonetes pugio	1	.31
32	Marphysa sanqinea	1	.31
33	Melita appendiculata	1	.31
34	Actinnarid sp. 1	1	.31
35	Haminoea elegans	1	.31

JANUARY, 1987

Rank	Species	No. Ind.	%
1	Capitella capitata	469	29.66
2	Crepidula fornicata	250	15.81
3	Mogula sp. 1	121	7.65
4	Sabella microphthalma	82	5.19
5	Mediomastus californiensis	80	5.06
6	Spirobis c.f. corrugatus	80	5.06
7	Ophiophragmus filograneus	73	4.62
8	Parapionsyllis longicirata	54	3.42
9	Grandidierella bonnieroides	40	2.53
10	Cymadusa compta	36	2.28
11	Gyptus brevipalpa	34	2.15
12	Cymodoce faxoni	30	1.90
13	Streblospio benedicti	28	1.77
14	Platynereis dumerilii	24	1.52
15	Podarke obscura	24	1.52
16	Erichsonella attenuata	21	1.33
17	Melita appendiculata	20	1.27
18	Hargeria rapax	13	.82
19	Arenicola cristata	12	.76
20	Nemertian sp. 1	8	.51
21	Nemertian sp. 2	8	.51
22	Amygdalum papirium	7	.44
23	Platyhelminth sp. 1	6	.38
24	Modulus modulus	5	.32
25	Glycinde solitaria	5	.32
26	Prunum carneum	4	.25
27	Platyhelminth sp. 2	3	.19
28	Polydora ligni	3	.19
29	Corophium ellisi	3	.19
30	Eteone heteropoda	3	.19
31	Bulla striata	3	.19
32	Brachidontes exustus	3	.19
33	Diopatra cuprea	3	.19
34	Clymenella torquata	2	.13
35	Spionidae sp. 1	2	.13
36	Aonides sp. 1	2	.13
37	Actinnarid sp. 1	2	.13
38	Hippolyte zostericola	2	.13
39	Cumacean sp. 1	2	.13
40	Marphysa sp. 1	1	.06
41	Mercenaria mercenaria	1	.06
42	Leitoscoloplos fragilis	1	.06
43	Aricidea fragilis	1	.06
44	Haminoea elegans	1	.06
45	Erichthonius brasilliensis	1	.06
46	Cerithium muscarium	1	.06

47	Syllis (Typosyllis) sp. 1	1	.06
48	Nemertian sp. 3	1	.06
49	Triphora c.f. ornata	1	.06
50	Serpula vermicularis	1	.06
51	Mitrella lunata	1	.06
52	Pectinnaria gouldii	1	.06
53	Palaemontes pugio	1	.06

MAY, 1987

Rank	Species	No. Ind.	%
1	Cymadusa compta	442	32.79
2	Capitella capitata	166	12.31
3	Sabella microphthalma	161	11.94
4	Actinnarid sp. 1	85	6.31
5	Melita appendiculata	74	5.49
6	Spirobis c.f. corrugatus	67	4.97
7	Gyptus brevipalpa	33	2.45
8	Polydora ligni	31	2.30
9	Corophium ellisi	28	2.08
10	Ophiophragmus filograneus	28	2.08
11	Actinnarid sp. 2	25	1.85
12	Parapionsyllis longicirata	24	1.78
13	Elysia cauze	24	1.78
14	Podarke obscura	19	1.41
15	Cymodoce faxoni	16	1.19
16	Platynereis dumerilii	16	1.19
17	Crepidula fornicata	13	.96
18	Nemertian sp. 1	12	.89
19	Holothurian sp. 1	11	.82
20	Erichsonella attenuata	10	.74
21	Aricidea fragilis	5	.37
22	Mogula sp. 1	5	.37
23	Copepod sp. 1	4	.30
24	Hargeria rapax	4	.30
25	Arenicola cristata	4	.30
26	Glycinde solitaria	3	.22
27	Grandidierella bonnieroides	3	.22
28	Grandidierella bonnieroides	3	.22
29	Callipallene brevirostris	2	.15
30	Haminoea elegans	2	.15
31	Amygadalum papyrium	2	.15
32	Phascolion sp. 1	2	.15
33	Peloscolex sp. 1	2	.15
34	Saggita sp. 1	2	.15
35	Amphipod sp. 2	2	.15
36	Platyhelminth sp. 1	2	.15
37	Leitoscoloplos fragilis	1	.07
38	Gastropod sp. 1 (j)	1	.07
39	Chone americana	1	.07
40	Sabellidae sp. 1	1	.07
41	Mediomastus californiensis	1	.07

42	Paracaprella tenuis	1	.07
43	Prionospio heterobranchia	1	.07
44	Brachidontes exhustus	1	.07
45	Nassarius vibex	1	.07
46	Syllis (Typosyllis) alternata	1	.07
47	Clymenella sp. 1	1	.07
48	Terebellidae sp. 1	1	.07
49	Modulus modulus	1	.07
50	Rhithropanopeus harisii	1	.07
51	Cumacean sp. 1	1	.07
52	Tunicate sp. 1	1	.07

Table 6. Benthic macroinvertebrate (polychaetes) comparisons between seagrass and *Caulerpa prolifera* for the Banana River. P = rank relative to total cores taken in system, O = number of times observed in total cores analyzed, NO = number of individuals, and D = percent make-up within total number of cores analyzed

COMPARISONS BETWEEN SYSTEMS AND VEGETATION TYPES FOR POLYCHAETES AND OLIGOCHAETES

BANANA RIVER

TAXON	P	O	NO	D
SEAGRASS				
Syllis (Typosyllis) alternata	3.0	7	1054	20.46
Syllis (Typosyllis) sp. 1	2.1	1	165	19.57
Spirobis c.f. corrugatus	3.1	5	1827	9.91
Fabriciola trilobata	8.6	8	515	2.54
Polydora ligni	11.4	7	60	2.44
Prionospio heterobranchia	13.0	10	39	1.10
Parahesione luteola	9.1	1	4	0.64
Gyptus brevipalpa	17.1	3	4	0.51
Leitoscoloplos fragilis	21.1	1	2	0.44
Aricidea fragilis	16.4	4	14	0.41
Clymenella torguata	23.1	1	1	0.32
Parapionsyllis longicirata	16.4	4	22	0.30
Diopatra cuprea	27.1	1	1	0.28
Hesionidae sp. 1	20.1	1	1	0.22
Serpula vermicularis	4.1	1	65	0.20
Sabellidae sp. 1	24.1	1	1	0.20
Sabella microphthalma	14.6	4	16	0.18
Nereid sp. 1	13.1	1	2	0.10
Asychis elongatus	17.1	1	1	0.10
Platynereis dumerilii	22.1	1	1	0.10
Capitella capitata	12.8	3	27	0.10
Podarke obscura	18.6	4	7	0.08
Marphysa sp. 1	22.1	1	1	0.08
Jasmineria c.f. bilobata	12.1	1	4	0.07
Microspio pigmentata	16.1	1	1	0.07
Podarke sp. 1	13.1	1	5	0.04
Eteone heteropoda	18.1	1	1	0.04
TOTAL INDIVIDUALS			3841	

TAXON	P	O	NO	D
CAULERPA				
Thyrax sp. 1	15.1	1	2	58.38
Spirobis c.f. corrugatus	24.1	1	1	30.75
Syllis (Typosyllis) alternat	2.2	7	1710	15.21
Syllis (Typosyllis) sp. 1	1.1	2	351	14.16
Gyptus brevipalpa	18.8	3	3	6.47
Fabriciola trilobata	7.2	8	497	6.36
Prionospio heterobranchia	9.8	3	19	1.23
Parapionsyllis longicirata	20.1	2	2	1.08
Polydora ligni	8.4	6	141	1.05
Peloscolex sp.1	23.1	1	1	0.56
Sabella microphthalma	16.1	6	17	0.52
Paranoidea (Aricidae) sp. 1	9.1	1	3	0.40
Capitella capitata	14.9	6	16	0.39
Ophellidae sp 1	16.1	1	2	0.36
Scolelepis sp 1	17.1	1	2	0.36
Branchioasychis americana	15.7	5	9	0.30
Diopatra cuprea	17.1	2	2	0.20
Aricidea fragilis	16.1	3	8	0.19
Podarke obscura	17.4	3	4	0.10
Amphicteis c.f. gunneri	14.6	2	5	0.09
Platynereis dumerilii	17.6	4	6	0.08
Capitellid sp 1	19.1	1	1	0.06
Aricidea sp. 1	22.1	1	1	0.06
TOTAL INDIVIDUALS			2801	

Table 7. Benthic macroinvertebrate (polychaetes) comparisons between seagrass and *Caulerpa prolifera* for the Indian River. P = rank relative to total cores taken in system, O = number of times observed in total cores analyzed, NO = number of individuals, and D = percent make-up within total number of cores analyzed

COMPARISONS BETWEEN SYSTEMS AND VEGETATION TYPES FOR POLYCHAETES AND OLIGOCHAETES

INDIAN RIVER

TAXON	P	O	NO	D	TAXON	P	O	NO	D
SEAGRASS					CAULERPA				
Podarke obscura	23.4	4	8	8.73	Aonides sp. 1	20.1	1	2	0.66
Aricidea fragilis	3.1	5	297	5.63	Arenicola cristata	21.1	2	10	7.67
Clymenella torguata	5.9	5	419	4.33	Aricidea fragilis	19.6	2	4	0.18
Polydora ligni	7.9	5	204	3.67	Capitella capitata	4.7	7	586	9.68
Parapionsyllis longicirata	9.3	5	120	2.69	Chone americana	24.1	1	1	24.00
Prionospio heterobranchia	21.1	3	8	2.67	Clymenella torquata	25.1	1	2	10.11
Gyptus brevipalpa	13.5	5	41	2.44	Diopatra cuprea	13.1	2	11	1.58
Capitella capitata	8.3	5	91	2.43	Eteone heteropoda	28.6	2	2	3.25
Marphysa sp. 1	23.1	1	1	2.22	Exogone verugera	8.1	1	5	0.77
Diopatra cuprea	34.1	1	1	1.80	Glycinde solitaria	24.6	2	3	2.34
Scololepis squamata	23.1	1	3	1.68	Gyptus brevipalpa	9.1	6	71	2.97
Leitoscoloplos fragilis	11.1	5	53	1.45	Leitoscoloplos fragilis	29.1	1	1	1.12
Amphicteis c.f. gunneri	18.1	5	25	1.32	Marphysa sanquinea	15.1	1	1	0.29
Glycinde solitaria	27.8	3	4	1.24	Mediomastus californiensis	19.8	3	11	0.49
Platynereis dumerilii	20.6	4	13	1.18	Paracaprella tenuis	46.9	1	1	4.49
Spirobis c.f. corrugatus	15.3	5	45	1.11	Parapionsyllis longicirata	10.3	5	69	1.90
Mediomastus californiensis	15.1	3	23	0.93	Pectinnaria gouldii	30.1	1	1	0.17
Fabriciola trilobata	21.6	2	4	0.72	Pelosclex sp. 1	26.1	1	1	2.61
Lumbrinereis sp. 1	31.1	1	1	0.57	Platynereis dumerilii	13.7	5	32	1.02
Eteone heteropoda	19.6	4	16	0.54	Podarke obscura	13.1	7	39	1.21
Sabella microphthalma	26.6	4	6	0.51	Polydora ligni	8.5	5	48	2.88
Chone americana	20.1	2	13	0.45	Prionospio heterobranchia	25.1	1	1	25.37
Pectinnaria gouldii	32.1	1	1	0.27	Sabella microphthalma	10.2	8	222	1.83
Syllis(Typosyllis) alternata	28.1	1	1	0.27	Sabellidae sp. 1	25.1	1	1	0.48
Arenicola cristata	26.1	1	3	0.19	Serpula vermicularis	15.1	1	2	0.28
Neanthes succinea	24.1	1	1	0.16	Spionidae sp. 1	24.1	1	2	8.88
					Spirobis c.f. corrugatus	5.1	3	80	3.56
					Spirobranchus sp. 1	15.1	1	1	4.06
					Streblospio benedicti	13.6	2	14	0.98
					Syllis (Typosyllis) alternat	16.6	2	3	0.22
					Terebellidae sp. 1	21.1	1	1	0.10
TOTAL INDIVIDUALS			1402					1228	

Table 8. Benthic macroinvertebrate (crustaceans) comparisons between seagrass and *Caulerpa prolifera* for the Indian and Banana Rivers. P = rank relative to total cores taken in system, O = number of times observed in total cores analyzed, NO = number of individuals, and D = percent make-up within total number of cores analyzed

COMPARISONS BETWEEN SYSTEMS AND VEGETATION TYPES FOR CRUSTACEANS

INDIAN RIVER

TAXON	P	O	NO	D
SEAGRASS				
Erichsonella attenuata	3.6	6	241	9.10
Cymadusa compta	4.9	6	255	8.34
Cymodoce faxoni	6.1	4	119	5.62
Hargeria rapax	9.3	6	121	3.90
Ostracod sp. 1	12.1	4	58	2.70
Ampelisca abdita	18.8	20	19	1.01
Grandidierella bonnieroides	19.1	3	20	1.03
Corophium ellisi	19.6	2	16	1.27
Melinna maculata	22.1	1	2	1.14
Hippolyte zostericola	25.1	1	1	0.57
Mysid sp. 1	26.1	1	1	0.57
Cumacean sp. 1	26.8	3	9	0.52
Copepod sp. 1	29.1	2	5	0.40
Palaemonetes pugio	31.1	1	1	0.15
Edotea trilobata	31.1	3	5	0.27
TOTAL INDIVIDUALS			873	

INDIAN RIVER

TAXON	P	O	NO	D
CAULERPA				
Cymadusa compta	5.1	9	533	17.28
Erichsonella attenuata	13.1	9	54	3.13
Grandidierella bonnieroides	13.7	7	51	1.92
Melinna maculata	16.1	1	1	1.12
Hargeria rapax	16.2	8	34	2.29
Copepod sp. 1	17.1	1	4	0.66
Corophium ellisi	17.3	5	31	1.44
Cymodoce faxoni	17.5	8	53	1.78
Melita appendiculata	18.1	1	1	1.12
Callipallene brevirostris	21.1	2	2	0.33
unidentified amphipods	22.1	1	2	0.58
Palaemonetes pugio	22.6	2	2	0.57
Rhithropanopeus harisii	29.1	1	1	0.27
Amphipod sp. 2	29.6	2	2	0.27
Hippolyte zostericola	31.1	2	2	0.22
Cumacean sp. 1	32.8	3	3	0.25
Erichthonius brasilliensis	34.1	1	1	0.19
TOTAL INDIVIDUALS			777	

BANANA RIVER

SEAGRASS	P	O	NO	D
Hargeria rapax	1.3	10	4388	42.76
Erichsonella attenuata	4.1	10	801	6.75
Grandidierella bonnieroides	6.7	7	314	2.62
Cymodoce faxoni	6.7	10	324	2.71
Cymadusa compta	8.1	10	262	1.95
Crustacean sp.1 (j)	10.1	1	8	0.56
Melita appendiculata	18.6	2	6	0.13
Palaemonetes pugio	19.1	1	1	0.06
Hippolyte zostericola	20.1	1	1	0.06
Cumacean sp. 1	21.1	1	1	0.06
Copepod sp. 1	22.4	4	5	0.13
Ampelisca sp. 1	30.1	1	1	0.04
TOTAL			6112	

BANANA RIVER

CAULERPA	P	O	NO	D
Hargeria rapax	1.7	9	6850	48.46
Grandidierella bonnieroides	5.0	9	505	4.68
Cymadusa compta	5.3	10	536	4.39
Melinna maculata	6.1	1	8	2.23
Erichsonella attenuata	7.7	7	113	1.51
Melita appendiculata	13.9	4	46	0.71
Ampelisca abdita	12.1	1	3	0.30
Palaemonetes pugio	12.1	1	1	0.22
Cymodoce faxoni	14.1	8	27	0.22
Cymothoidae paras. isopod	19.1	1	1	0.10
Amphipod sp. 1 (sm juv)	28.1	1	1	0.05
Zoea sp. 1	29.1	1	1	0.05
TOTAL			8092	

Table 9. Benthic macroinvertebrate (mollusks) comparisons between seagrass and *Caulerpa prolifera* for the Indian and Banana Rivers. P = rank relative to total cores taken in system, O = number of times observed in total cores analyzed, NO = number of individuals, and D = percent make-up within total number of cores analyzed

COMPARISONS BETWEEN SYSTEMS AND VEGETATION TYPES FOR MOLLUSCA

INDIAN RIVER

TAXON	P	O	NO	D	TAXON	P	O	NO	D
SEAGRASS					CAULERPA				
BIVALVES					BIVALVES				
Tellina c.f. caribaea	6.7	6	199	8.09	Brachidontes exhustus	24.5	2	4	0.57
Lyonisa floridana	21.8	4	17	0.83	Mercenaria mercenaria	33.0	1	1	0.14
Gemma c.f. gemma	27.0	1	1	0.57					
Brachidontes exhustus	34.5	2	2	0.37					
Mercenaria mercenaria	28.0	1	1	0.20					
total			220		total			5	
GASTROPODS					GASTROPODS				
Mitrella lunata	22.0	1	3	0.59	Crepidula fornicata	8.9	9	325	11.50
Retusa candei	29.0	1	1	0.57	Haminoea succinea	7.0	1	5	4.20
Cerithium muscarum	27.0	1	1	0.20	Prunum carnieum	14.3	4	18	3.18
Haminoea elegans	35.0	2	2	0.16	Bulla striata	15.0	4	11	1.89
					Modulus modulus	20.0	6	10	0.89
					Haminoea elegans	27.0	3	4	0.45
					Gastropod sp. 1 (j)	33.0	1	1	0.27
					Cerithium muscarum	36.0	1	1	0.19
					Nassarius vibex	31.0	1	1	0.17
					Mitrella lunata	34.0	1	1	0.14
total			7		total			377	
TOTAL INDIVIDUALS			227		TOTAL INDIVIDUALS			382	

BANANA RIVER					BANANA RIVER				
SEAGRASS					CAULERPA				
BIVALVES					BIVALVES				
Amygdalum papyrium	14.8	4	28	0.71	Brachidontes exhustus	7.4	10	967	6.37
Mercenaria mercenaria	26.0	3	3	0.14	Amygdalum papyrium	13.5	6	31	0.35
Laevicardium sp. 1	29.5	2	2	0.06	Tellina candenna	21.0	2	2	0.21
Tellina sp. 1	32.0	1	1	0.04	Laevicardium sp. 1	21.0	3	5	0.09
					Bivalve spp.	24.0	1	1	0.06
total			34		total			1006	

GASTROPODS				
Modulus modulus	18.3	6	48	2.39
Bulla striata	11.0	1	1	0.67
Prunum carnium	12.3	3	7	0.48
Haminoea succinea	14.0	2	4	0.31
Crepidula fornicata	19.0	3	9	0.20
total			69	
MISCELLANEOUS				
Opistobranch sp. 1	22	2	4	0.09
total			4	
TOTAL INDIVIDUALS			107	

GASTROPODS				
Modulus modulus	8.7	3	25	1.67
Skeneopsis c.f. planorbis	16.5	2	23	0.57
Haminoea elegans	17.0	2	4	0.31
Prunum carnium	19.8	6	9	0.17
Urosalpinx cinerea	22.0	1	1	0.10
Crepidula fornicata	23.5	4	4	0.07
Bulla c.f. sp. 1 (no shell)	27.0	1	1	0.04
total			67	
MISCELLANEOUS				
Opistobranch sp. 1	15.0	1	3	0.17
total			3	
TOTAL INDIVIDUALS			1076	

Table 10. Benthic macroinvertebrate (echinoderms) comparisons between seagrass and *Caulerpa prolifera* for the Indian and Banana Rivers. P = rank relative to total cores taken in system, O = number of times observed in total cores analyzed, NO = number of individuals, and D = percent make-up within total number of cores analyzed

COMPARISONS BETWEEN SYSTEMS AND VEGETATION TYPES FOR ECHINODERMATA

INDIAN RIVER

TAXON	P	O	NO	D	TAXON	P	O	NO	D
Seagrass					Caulerpa				
Ophiophragmus filograneus	9	6	113	4.74	Ophiophragmus filograneus	9	9	125	4.71
					Ophiophragmus pulcher				

BANANA RIVER

Seagrass					Caulerpa				
Ophiophragmus filograneus	17	2	2	0.31	Ophiophragmus filograneus	15	7	18	0.47

COMPARISONS BETWEEN SYSTEMS AND VEGETATION TYPES FOR NEMERTIA

INDIAN RIVER

TAXON	P	O	NO	D	TAXON	P	O	NO	D
Seagrass					Caulerpa				
Nemertian sp. 2	29	2	3	0.29	Nemertian sp. 3	30	2	2	0.52
Nemertian sp. 3	30	1	1	0.26					

BANANA RIVER

Seagrass					Caulerpa				
Nemertina sp. 1	12	8	41	0.49	Nemertian sp. 1	11	6	45	0.48
Nemertian sp. 2	17	1	2	0.22	Nemertian sp. 2	21	3	4	0.25

Table 11. Benthic macroinvertebrate (miscellaneous phyla) comparisons between seagrass and *Caulerpa prolifera* for the Indian and Banana Rivers. P = rank relative to total cores taken in system, O = number of times observed in total cores analyzed, NO = number of individuals, and D = percent make-up within total number of cores analyzed

COMPARISONS BETWEEN SYSTEMS AND VEGETATION TYPES FOR MISCELLANEOUS PHYLA

TAXON	P	O	NO	D	TAXON	P	O	NO	D
INDIAN RIVER									
Seagrass					Caulerpa				
Platyhelminth sp. 1	34	2	2	0.18	Saggita sp. 1	23	1	2	0.53
Saccoglosan sp. 1	29	3	6	0.36	Phascolion sp. 1	28	2	2	0.22
					Tunicate sp. 1	28	1	1	0.27
BANANA RIVER									
Seagrass					Caulerpa				
Saggita sp. 1	11	1	1.00	0.34	Saggita sp. 1	25	2	2	0.08
Platyhelminth sp. 1	14	3	6	0.31	Platyhelminth sp. 1	20	6	16	0.15
Phascolion sp. 1	14	8	41	1.57	Saccoglosan sp. 1	26	1	1	0.06
					Phascolion sp. 1	15	6	44	1.24

Table 12. Means and 95% confidence intervals (n=3) for individual species, total numbers of fishes and total number of fishes/m^2 collected in the Banana and Indian Rivers.

NUMBERS OF FISH COLLECTED ON 10-26-86

SPECIES	COLLECTION FROM INDIAN RIVER SEAGRASS	COLLECTION FROM INDIAN RIVER CAULERPA	COLECTION FROM BANANA RIVER SEAGRASS	COLLECTION FROM BANANA RIVER CAULERPA
LUCANIA PARVA	1029.3 +/-328.75	180.7 +/-14.76	643.3 +/-282.67	40.0 +/-19.91
MICROGOBIUS GULOSUS	91.3 +/- 17.68	7.7 +/- 2.74	149.0 +/- 38.54	1.7 +/- 1.62
GOBIOSOMA ROBUSTUM	54.7 +/- 24.28	50.3 +/-13.65	0.7 +/- 0.90	0.3 +/- 0.45
SYNGNATHUS SCOVELLI	1.0 +/- 0.78	22.7 +/- 6.81	6.0 +/- 4.34	
BAIRDIELLA CHRYSOURA	4.0 +/- 3.57	0.3 +/- 0.45		
CYNOSCION NEBULOSUS		0.3 +/- 0.45	0.3 +/- 0.45	
FLORIDICHTHYS CARPIO	0.3 +/- 0.45		7.0 +/- 3.57	1.0 +/- 0.78
ACHIRUS LINEATUS			0.3 +/- 0.45	
HIPPOCAMPUS ZOSTERAE			0.3 +/- 0.45	0.3 +/- 0.45
MENIDIA PENINULA	13.7 +/- 12.87		194.0 +/- 88.65	
POECILIA LATIPINNA			0.3 +/- 0.45	
GAMBUSIA AFFINIS	0.3 +/- 0.45			
DIAPTERUS OLISTHOSTOMUS			0.7 +/- 0.90	
TOTALS	1194.7 +/-384.82	262.0 +/-14.10	1002.0 +/-352.46	43.3 +/-20.40
TOTALS/m2	32.1 +/- 10.36	7.1 +/- 0.38	27.0 +/- 9.49	1.2 +/- 0.55

NUMBERS OF FISH COLLECTED ON 11-16-86

SPECIES	COLLECTION FROM INDIAN RIVER SEAGRASS	COLLECTION FROM INDIAN RIVER CAULERPA	COLECTION FROM BANANA RIVER SEAGRASS	COLLECTION FROM BANANA RIVER CAULERPA
LUCANIA PARVA	1631.3 +/-227.17	78.3 +/-44.05	1775.0 +/-201.90	129.0 +/-82.50
MICROGOBIUS GULOSUS	162.3 +/-100.13	0.7 +/- 0.90	10.7 +/- 3.92	
GOBIOSOMA ROBUSTUM	57.3 +/- 14.88	40.7 +/-26.92	1.0 +/- 1.35	0.3 +/- 0.45
SYNGNATHUS SCOVELLI	21.0 +/- 1.56	16.3 +/- 8.55	10.0 +/- 2.06	
SYNGNATHUS LOUISIANAE			0.7 +/- 0.45	
BAIRDIELLA CHRYSOURA	1.7 +/- 0.45	0.3 +/- 0.45		0.3 +/- 0.45
FLORIDICHTHYS CARPIO	0.7 +/- 0.90		2.0 +/- 1.35	
HIPPOCAMPUS ZOSTERAE		8.3 +/- 5.85		
MENIDIA PENINULA	32.7 +/- 6.54	0.3 +/- 0.45	125.7 +/- 46.27	0.3 +/- 0.45
CHASMODES SABURRAE		1.7 +/- 0.45		
HYPORHAMPHUS UNIFASCIATUS		0.3 +/- 0.45		
OPSANUS TAU		0.3 +/- 0.45		0.3 +/- 0.45
HARENGULA JAGUANA				1.0 +/- 1.35
EUCINOSTOMUS GULA			1.3 +/- 1.80	
UNCERTAIN IDENTIFICATION			3.0 +/- 4.05	
TOTALS	1907.0 +/-321.04	147.3 +/-75.60	1929.3 +/-169.69	131.3 +/-80.66
TOTALS/m2	51.3 +/- 8.64	4.0 +/- 2.03	51.9 +/- 4.57	3.5 +/- 2.17

NUMBERS OF FISH COLLECTED ON 12-19-86

SPECIES	COLLECTION FROM INDIAN RIVER SEAGRASS	COLLECTION FROM INDIAN RIVER CAULERPA	COLECTION FROM BANANA RIVER SEAGRASS	COLLECTION FROM BANANA RIVER CAULERPA
LUCANIA PARVA	1590.3 +/-415.74	20.7 +/-13.10	1213.0 +/-179.43	186.0 +/-61.83
MICROGOBIUS GULOSUS	69.0 +/- 51.18	1.0 +/- 0.78	13.7 +/- 9.00	-------------------
GOBIOSOMA ROBUSTUM	181.3 +/-125.69	78.0 +/-56.15	7.7 +/- 6.35	1.3 +/- 1.19
SYNGNATHUS SCOVELLI	44.7 +/- 5.75	20.7 +/- 5.75	17.0 +/- 1.35	2.0 +/- 2.06
SYNGNATHUS LOUISIANAE	--------------------	0.7 +/- 0.45	0.7 +/- 0.90	-------------------
BAIRDIELLA CHRYSOURA	--------------------	-------------------	0.7 +/- 0.90	0.3 +/- 0.45
FLORIDICHTHYS CARPIO	--------------------	-------------------	5.0 +/- 0.78	0.7 +/- 0.45
EUCINOSTOMUS HARENGUS	--------------------	0.7 +/- 0.45	0.3 +/- 0.45	-------------------
HIPPOCAMPUS ZOSTERAE	2.7 +/- 1.19	4.3 +/- 2.38	--------------------	-------------------
MENIDIA PENINSULA	28.7 +/- 18.52	-------------------	73.7 +/- 51.72	-------------------
POECILIA LATIPINNA	--------------------	-------------------	33.7 +/- 19.23	0.3 +/- 0.45
HYPLEUROCHILUS GEMINATUS	--------------------	0.3 +/- 0.45	--------------------	-------------------
CHASMODES SABURRAE	0.3 +/- 0.45	-------------------	--------------------	-------------------
GOBIOSOX STRUMOSUS	--------------------	0.3 +/- 0.45	--------------------	-------------------
OPSANUS TAU	--------------------	0.3 +/- 0.45	--------------------	-------------------
EUCINOSTOMUS GULA	0.3 +/- 0.45	-------------------	--------------------	0.7 +/- 0.90
LAGODON RHOMBIODES	--------------------	-------------------	0.3 +/- 0.45	-------------------
EUCINOSTOMUS LEFROYI	--------------------	-------------------	22.0 +/- 15.18	-------------------
ACHIRUS LINEATUS	--------------------	-------------------	0.3 +/- 0.45	-------------------
UNCERTAIN IDENTIFICATION	--------------------	-------------------	--------------------	1.0 +/- 1.35
TOTALS	1917.3 +/-580.55	127.0 +/-68.39	1388.0 +/-204.35	192.3 +/-63.15
TOTALS/m2	51.6 +/- 15.62	3.4 +/- 1.84	37.4 +/- 5.50	5.2 +/- 1.70

NUMBERS OF FISH COLLECTED ON 3-15-87

SPECIES	COLLECTION FROM INDIAN RIVER SEAGRASS	COLLECTION FROM INDIAN RIVER CAULERPA	COLECTION FROM BANANA RIVER SEAGRASS	COLLECTION FROM BANANA RIVER CAULERPA
LUCANIA PARVA	1628.7 +/-136.41	21.0 +/- 5.89	95.7 +/-57.96	147.7 +/-68.46
MICROGOBIUS GULOSUS	41.3 +/- 8.00	-------------------	4.7 +/- 1.19	-------------------
GOBIOSOMA ROBUSTUM	40.7 +/- 6.35	25.3 +/-25.58	-------------------	0.7 +/- 0.90
SYNGNATHUS SCOVELLI	28.7 +/- 5.01	1.7 +/- 0.90	8.7 +/- 2.74	0.3 +/- 0.45
SYNGNATHUS LOUISIANAE	0.3 +/- 0.45	-------------------	-------------------	-------------------
BAIRDIELLA CHRYSOURA	0.3 +/- 0.45	-------------------	-------------------	-------------------
CYNOSCION NEBULOSUS	--------------------	-------------------	-------------------	-------------------
FLORIDICHTHYS CARPIO	3.0 +/- 2.34	-------------------	3.7 +/- 1.96	0.7 +/- 0.45
EUCINOSTOMUS LEFROYI	--------------------	-------------------	54.3 +/-33.83	-------------------
HIPPOCAMPUS ZOSTERAE	1.0 +/- 0.78	0.3 +/- 0.45	-------------------	-------------------
MENIDIA PENINULA	1.0 +/- 0.00	7.7 +/-10.35	5.3 +/- 1.19	11.0 +/-14.86
POECILIA LATIPINNA	5.7 +/- 7.65	-------------------	-------------------	-------------------
ACHIRUS LINEATUS	--------------------	-------------------	0.3 +/- 0.45	-------------------
MUGIL CEPHALUS	--------------------	-------------------	0.3 +/- 0.45	-------------------
CHASMODES SABURRAE	--------------------	0.3 +/- 0.45	-------------------	-------------------
STRONGYLURA NOTATA	--------------------	-------------------	0.3 +/- 0.45	-------------------
LAGODON RHOMBOIDES	3.7 +/- 1.19	-------------------	-------------------	-------------------
GAMBUSIA AFFINIS	0.7 +/- 0.45	-------------------	-------------------	-------------------
TOTALS	1755.0 +/-143.59	56.3 +/-42.67	173.3 +/-32.12	160.3 +/-71.85
TOTALS/m2	47.2 +/- 3.86	1.5 +/- 1.15	4.7 +/- 0.86	4.3 +/- 1.93

NUMBERS OF FISH COLLECTED ON 4-12-87

SPECIES	COLLECTION FROM INDIAN RIVER SEAGRASS	COLLECTION FROM INDIAN RIVER CAULERPA	COLECTION FROM BANANA RIVER SEAGRASS	COLLECTION FROM BANANA RIVER CAULERPA
LUCANIA PARVA	110.7 +/-48.33	109.0 +/-62.27	50.0 +/-21.20	55.3 +/- 8.69
MICROGOBIUS GULOSUS	5.7 +/- 2.38	-------------------	2.0 +/- 0.78	2.0 +/- 1.35
GOBIOSOMA ROBUSTUM	7.3 +/- 1.80	22.7 +/- 8.55	-------------------	1.7 +/- 1.19
SYNGNATHUS SCOVELLI	24.0 +/- 6.38	2.7 +/- 0.45	13.3 +/- 7.37	2.3 +/- 2.51
FLORIDICHTHYS CARPIO	0.7 +/- 0.45	-------------------	1.0 +/- 0.78	-------------------
GAMBUSIA AFFINIS	-------------------	-------------------	1.0 +/- 0.78	-------------------
HIPPOCAMPUS ZOSTERAE	0.3 +/- 0.45	-------------------	-------------------	0.3 +/- 0.45
MENIDIA PENINULA	43.3 +/-18.72	5.0 +/- 6.75	-------------------	17.0 +/- 4.87
POECILIA LATIPINNA	-------------------	-------------------	0.3 +/- 0.45	-------------------
ACHIRUS LINEATUS	-------------------	-------------------	-------------------	-------------------
DIAPTERUS OLISTHOSTOMUS	-------------------	-------------------	-------------------	-------------------
CHASMODES SABURRAE	-------------------	1.0 +/- 1.35	-------------------	-------------------
LAGODON RHOMBOIDES	0.3 +/- 0.45	7.7 +/- 3.68	-------------------	6.7 +/- 1.96
TOTALS	192.3 +/-38.45	148.0 +/-67.72	67.7 +/-21.17	85.3 +/-17.68
TOTALS/m2	5.2 +/- 1.03	4.0 +/- 1.82	1.8 +/- 0.57	2.3 +/- 0.48

NUMBERS OF FISH COLLECTED ON 5-8-87

SPECIES	COLLECTION FROM INDIAN RIVER SEAGRASS	COLLECTION FROM INDIAN RIVER CAULERPA	COLECTION FROM BANANA RIVER SEAGRASS	COLLECTION FROM BANANA RIVER CAULERPA
LUCANIA PARVA	297.0 +/-66.54	13.7 +/-14.59	185.7 +/-20.66	248.7 +/-211.06
MICROGOBIUS GULOSUS	3.3 +/- 2.38	-------------------	0.3 +/- 0.45	2.0 +/- 0.78
GOBIOSOMA ROBUSTUM	5.3 +/- 1.62	2.3 +/- 1.96	-------------------	1.0 +/- 1.35
SYNGNATHUS SCOVELLI	16.3 +/- 9.30	0.3 +/- 0.45	15.7 +/- 3.92	1.7 +/- 0.90
CYNOSCION NEBULOSUS	-------------------	0.3 +/- 0.45	-------------------	-------------------
FLORIDICHTHYS CARPIO	1.3 +/- 1.19	-------------------	-------------------	8.0 +/- 6.38
STRONGYLURA NOTATA	8.0 +/- 1.56	0.7 +/- 0.45	4.0 +/- 2.06	3.0 +/- 2.81
HIPPOCAMPUS ZOSTERAE	-------------------	-------------------	-------------------	0.3 +/- 0.45
MENIDIA PENINULA	55.3 +/-36.67	-------------------	18.3 +/-11.70	88.3 +/-114.60
POECILIA LATIPINNA	-------------------	-------------------	30.7 +/-41.41	-------------------
LAGODON RHOMBOIDES	0.7 +/- 0.90	0.3 +/- 0.45	0.7 +/- 0.90	2.7 +/- 2.95
GAMBUSIA AFFINIS	-------------------	-------------------	1.3 +/- 1.80	-------------------
EUCINOSTOMUS HARENGUS	1.0 +/- 1.35	-------------------	-------------------	1.3 +/- 1.80
TOTALS	388.3 +/-50.01	17.7 +/-17.99	256.7 +/-50.32	357.0 +/-176.73
TOTALS/m2	10.5 +/- 1.35	0.5 +/- 0.48	6.9 +/- 1.35	9.6 +/- 4.76