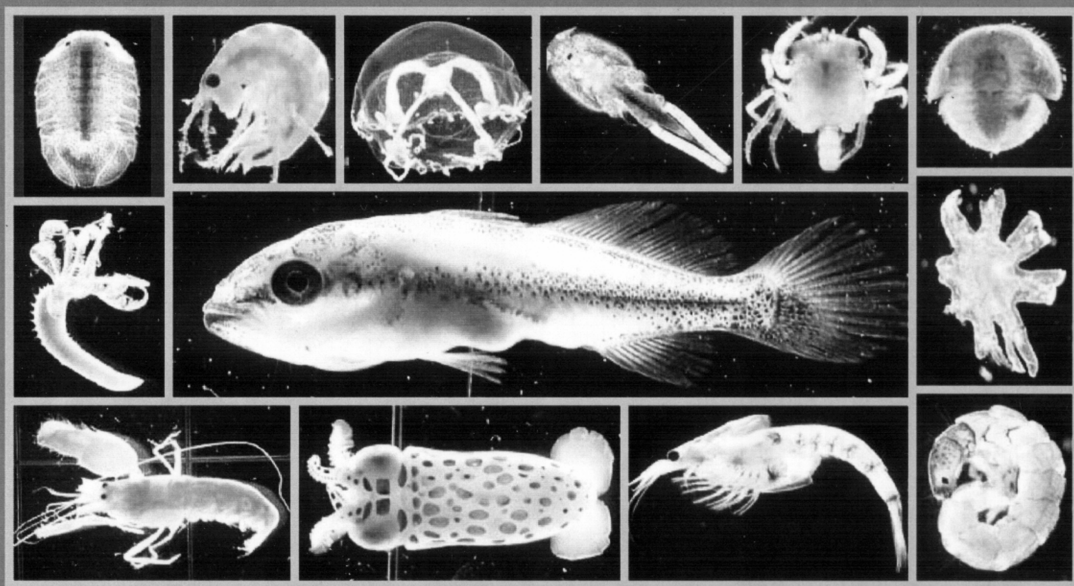
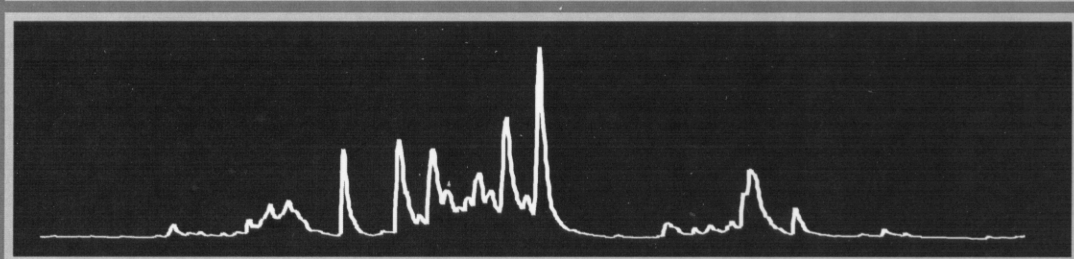
AN ASSESSMENT OF THE EFFECTS OF FRESHWATER INFLOWS ON FISH AND INVERTEBRATE HABITAT USE IN THE MANATEE-BRADEN ESTUARY





Prepared by

Ernst Peebles, Ph.D.
College of Marine Science
University of South Florida
140 Seventh Avenue South
St. Petersburg, Florida 33701-5016

Prepared for

The Southwest Florida Water Management District
2379 Broad Street
Brooksville, Florida 34609-6899

December 2002

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The Southwest Florida Water Management District
2379 Broad St., Brooksville, Florida 34609-6899
Project Manager: Michael S. Flannery

By

Ernst Peebles, Ph.D.
University of South Florida
College of Marine Science
140 Seventh Avenue South
St. Petersburg, Florida, 33701-5016

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TABLE OF CONTENTS

SUMMARY

Quantitative ecological criteria are needed to establish minimum flows and levels for rivers and streams within the Southwest Florida Water Management District (SWFWMD), as well as for the more general purpose of improving overall management of aquatic ecosystems. As part of the approach to obtaining these criteria, the impacts of managed freshwater inflows on downstream estuaries are being assessed. An 18-month study of freshwater inflow effects on habitat use by estuarine organisms in the tidal Manatee and Braden rivers was started in May 1997, using funds provided by SWFWMD. The study was based on collaborations among SWFWMD, the University of South Florida College of Marine Science, and the Florida Marine Research Institute of the Florida Fish and Wildlife Conservation Commission.

The general objective of the study was to identify patterns of estuarine habitat use and organism abundance under variable freshwater inflow conditions. Systematic monitoring was performed to develop a predictive capability for evaluating potential impacts of proposed freshwater withdrawals and, in the process, to contribute to baseline data. The predictive aspect involves development of regressions that describe variation in organism distribution and abundance as a function of natural variation in inflows and salinity. These regressions can be applied to any proposed alterations of freshwater inflows or salinity that fall within the range of natural variation documented during the data collection period.

For sampling purposes, the lengthwise axes of the tidal portions of the Manatee and Braden rivers were divided into seven and four zones, respectively. Monthly sampling of aquatic organisms implemented three gear types: a plankton net deployed in the channel during nighttime flood tides, seines deployed at the shoreline during the day under variable tide conditions, and trawls deployed in the channel during the day under variable tide conditions. Two plankton net tows, two seine hauls and one trawl were made each month in each zone. Salinity, water temperature, dissolved oxygen and pH measurements were taken in association with each gear deployment. Daily

freshwater inflow estimates for the Manatee/Braden estuary were derived by combining ungauged inflow estimates with gauged releases from Lake Manatee and Ward Lake.

A large body of descriptive habitat-use information was generated and is presented in tabular form. In general, observed habitat-use patterns were consistent with findings from other tidal rivers on Florida's west coast. However, the Manatee River below 18 km had faunal characteristics that were more embayment-like than most tidal rivers. The three gear types documented the distributions the egg, larval, juvenile and adult stages of estuarine-dependent, estuarine-resident, and freshwater fishes. *Estuarine-dependent* fishes are spawned at seaward locations and invade tidal rivers during the late larval or early juvenile stage, whereas *estuarine-resident* fishes are present within tidal rivers throughout their life cycles. The lower part of the Manatee River estuary is used as a spawning ground by a wide diversity of species, including such important species as the spotted seatrout, sand seatrout and bay anchovy. Other species moved into the Manatee-Braden estuary after being spawning farther seaward. Comparisons of life-stage-specific distributions demonstrated this landward ingression. For example, the mean salinity at capture for red drum decreased during development, starting at 16-21 psu during the larval stages and decreasing to 6 psu as this fish occupied its estuarine nursery habitat during the juvenile stage. Similar patterns of ingress were found for other estuarine-dependent species. Seine and trawl data indicated that juvenile snook, striped mullet and pink shrimp were common within the tidal river even though the eggs and early larvae of these species were not. The Braden River appeared to be particularly important as juvenile snook habitat.

In addition to collecting the early stages of coastal fishes, the plankton net collected large numbers of freshwater and estuarine invertebrate plankton and hyperbenthos, a group that consists of substrate-associated invertebrates that rise into the water column at night. These organisms are of particular interest because many serve as important prey for the estuarine-dependent fishes that seek out tidal rivers as nursery habitat. The survey data were used to develop regressions that describe shifts in fish and invertebrate distribution as inflow rates and salinities change. It was found that the distributions of more than 20 types of fishes and invertebrates shifted as freshwater inflows fluctuated, moving upstream during low-inflow periods and downstream during high-inflow periods. Some species appeared to be more reluctant to change position than others. There was, however, no strong indication that prey distributions were offset from fish nursery habitats by this distributional response to inflow. Another significant finding was that total numbers of organisms that serve as important prey in the fish nursery (opossum shrimps and grass shrimps) were reduced during low-inflow periods. Spawning, growth and juvenile survival rates for bay anchovies were also found to be reduced during low-inflow periods.

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

Rivers export nutrients, detritus and other productivity-promoting materials to the estuary and sea. Freshwater inflows also strongly influence the stratification and circulation of coastal waters, which in itself may have profound effects on the coastal ecosystem (Mann and Lazier 1996). Estuary-related fisheries constitute a very large portion of the total weight of the US fisheries yield (66% of finfish and shellfish harvest, Day et al. 1989; 82% of finfish harvest, Imperial et al. 1992). The contribution of estuary-related fisheries is consistently high among US states that border the Gulf of Mexico, where the estimates typically exceed 80% of the total weight of the catch (Day et al. 1989). Examples from around the world indicate that these high fisheries productivities are not guaranteed, however. In many locations, large amounts of fresh water have been diverted from estuaries to generate hydroelectric power or to provide water for agricultural and municipal use. Mann and Lazier (1996) reviewed cases where freshwater diversions were followed by the collapse of downstream fisheries in San Francisco Bay, the Nile River delta, James Bay, Canada, and at several inland seas in the former USSR. Sinha et al. (1996) documented a reversal of this trend where an increase in fisheries landings followed an increase in freshwater delivery to the coast.

In their study of declining fish populations around the world, Moyle and Leidy (1992) state "Evidence for serious declines in marine fishes is limited largely to estuarine fishes, reflecting their dependence on freshwater inflows." Fishery yields around the world are often positively correlated with freshwater discharge at the coast (Drinkwater 1986). These correlations are strongest when they are lagged by the age of the harvested animal. In south Florida, Browder (1985) correlated 14 years of pink shrimp landings with lagged water levels in the Everglades. Correlations between river discharge and fisheries harvests have also been identified for various locations in the northern and western Gulf of Mexico (Day et al. 1989). Surprisingly, discharge-harvest correlations sometimes extend to non-estuarine species. Sutcliffe (1972, 1973) reported lagged correlations between discharge of the St. Lawrence River and the harvest of non-estuarine species such as American lobster and haddock. In recognition of the potential complexities behind these correlations, Drinkwater (1986) advised that the effect of freshwater inflows be considered on a species-by-species basis.

Fresh water's influence on the coastal ecosystem extends beyond its immediate effects on fisheries. Because of the intricate nature of many food-web interactions, changes in the abundance of even a single species may be propagated along numerous pathways, some anticipated and some not, eventually causing potentially large changes in the abundance of birds, marine mammals and other groups of special concern (Christensen 1998, Okey and Pauly 1999). Mann and Lazier (1996) concluded "One lesson is clear: a major change in the circulation pattern of an estuary brought about by damming the freshwater flows, a tidal dam, or other engineering projects may well have far-reaching effects on the primary and secondary productivity of the system."

This project was conducted to support the establishment of minimum flows for the Manatee-Braden River estuarine system by the Southwest Florida Water Management District (SWFWMD). Minimum flows are defined in Florida Statutes (373.042) as "limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area." In establishing minimum flows for an estuarine system, the SWFWMD evaluates the effects of freshwater inflows on ecological resources and processes in the receiving estuary. The findings of this project will be used by the SWFWMD to evaluate the fish nursery function of the Manatee-Braden estuary in relation to freshwater inflows and to evaluate the potential effects of reductions of inflows due to withdrawals. It is not the purpose of this project to determine the level of effect that constitutes significant harm, as that determination will be made by the Governing Board of the Southwest Florida Water Management District.

1.1 Objectives

There were several objectives for this project. One was to produce a descriptive database that could serve as a baseline for comparison with future ecological change. These baseline data include information on water quality and physical habitat, and also provide seasonality records that identify the times of year when the risk of adverse impacts would be greatest for specific organisms.

Another objective was to develop regressions to model the responses of estuarine organisms to variations in freshwater inflows and salinity. The resulting models would then be available for evaluating the potential impacts of proposed freshwater management plans. These models were developed for both the early life stages of estuarine fishes and the invertebrate prey groups that sustain the young fishes while they occupy estuarine nursery habitats. Of particular interest was inflow's potential for offsetting these prey organisms upstream or downstream and away from any structural habitats used by juvenile fishes as nursery habitat.

1.2 Overview of Estuarine Dependence

The estuarine-dependent life history is characterized by habitat shifts that occur at predictable points in an organism's life cycle. These shifts involve an initial seaward-to-landward shift followed at some later point by a return seaward migration (Gunter 1961). In contrast, estuarine residents do not undergo predictable habitat shifts. Estuarine residents tend to be small species that do not contribute substantially to fisheries yields, yet they serve as important forage for wading birds, seabirds, and estuarine-dependent fishes. Estuarine-dependent fishes are of marine evolutionary origin and spawn either at sea or toward the seaward end of estuaries, generally in waters with salinities higher than 18 psu. In a typical estuarine-dependent life cycle, the young begin migrating landward at some point during the first few weeks of life, eventually congregating in estuarine "nursery" habitats. After spending a few months in these low-salinity habitats, the young gradually move back toward waters of higher salinity. In some estuarine-dependent species, the ingress of the young into low-salinity habitats is detectable during the organisms' larval stages, which are often planktonic. Other species invade the estuary at larger juvenile sizes and make their first appearance in seine or trawl catches. The process of invading the upper estuary is illustrated by Fig. 1.2.1.

While living at the seaward end of the estuary, fish larvae feed on small types of zooplankton such as the early stages of copepods (Houde and Lovdal 1984, Watson and Davis 1989, Peebles 1996, Flores-Coto 1998). Spawning in zooplankton-rich estuarine plume waters helps ensure that the larvae will encounter adequate prey densities (Govoni et al. 1983, Govoni and Chester 1990, Peebles et al. 1996, Peebles, 2002c). Peebles et al. (1996) demonstrated that as the estuarine plume shifts seaward in response to increasing freshwater inflows, spawning locations may shift seaward with it. Likewise, variation in spawning location from one coastal area to another can sometimes be explained by local variation in the position of the horizontal salinity gradient (Peebles 1987, Peebles and Tolley 1988). These differences in spawning location appear to have more to do with shifting prey distributions than shifting salinity, although salinity and prey distributions are often correlated (Peebles 2002c).

It is a general rule that fish diets change with age (Helfman 1978). In many species, the estuarine-dependent life cycle is driven by changes in prey requirements as the fishes grow larger (Marks and Conover 1993, Peebles 1996). Progressively larger prey organisms are included in the fishes' diets as the gapes of the fishes' mouths increase. Fish larvae living in the estuarine plume progress through various sizes of zooplankton prey and eventually undergo a dietary shift toward prey that is larger than that which is typically available in the coastal or estuarine plankton assemblage. For many species, this process entails a diet shift from planktonic copepods to bottom-dwelling organisms, notably mysids, amphipods and deposit-feeding invertebrates in general. In order to maximize the availability of this new, larger prey, the young fishes move landward to begin a period of residence in areas where these prey types are most abundant. The onset of this landward migration can be

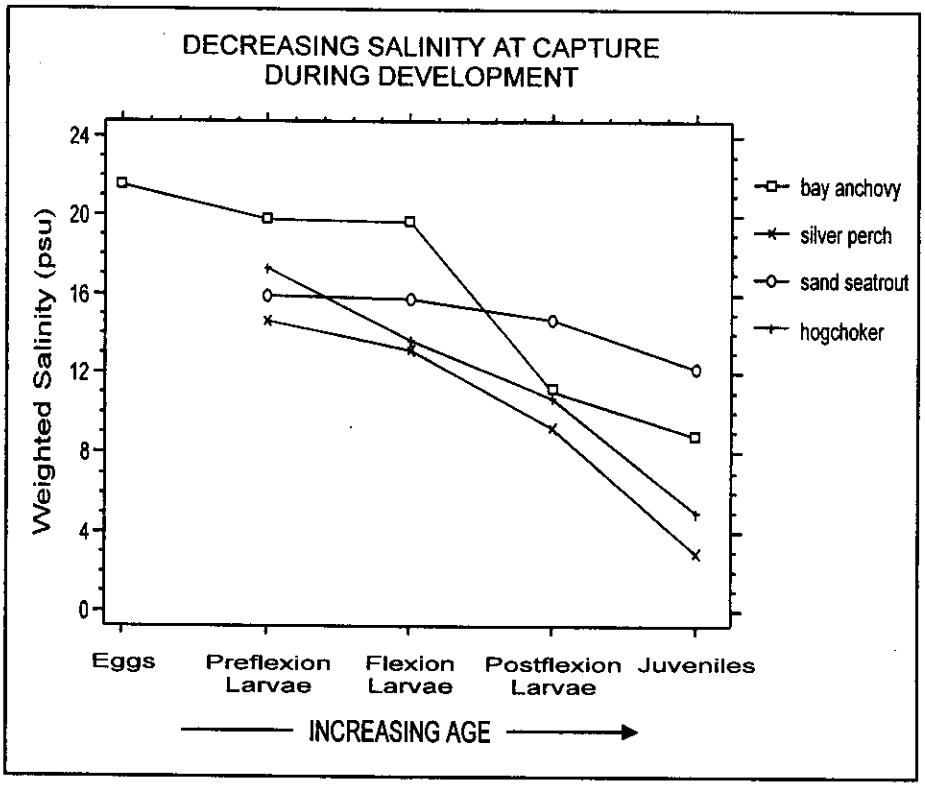

Fig. 1.2.1. Decreasing salinity at capture during development (Peebles 2002a, Table A2).

predicted by predator models that are applied to observed prey distributions (Peebles 1996).

Estuarine nursery habitats are often characterized by dark, organically enriched sediments that support large numbers of benthic, deposit-feeding and grazing invertebrates (Darnell 1961, McBee and Brehm 1982, Holland et al. 1987, Gaston and Nasci 1988). Freshwater inflows deliver organic matter directly to the nursery areas and also stimulate local phytoplankton blooms. The pulsed delivery of freshwater causes alternation between local wash-out and bloom, to which the internal dynamics of estuarine trophic relationships are coupled with variable efficiency (Flint 1985, Ingram et al. 1985, Odum et al. 1995, Livingston 1997, Mallin et al. 1999, Peebles 2002c). Although large-celled diatoms, which are prone to sedimentation, often dominate in the upper estuary (WAR and SDI 1995, Lehman 2000), most types of phytoplankton can settle to the bottom, including blue-green algae (Darnell 1961). A large proportion of coastal phytoplankton production ends up as surface deposits, providing an important energy source for both deposit-feeding fishes and fishes that consume deposit-feeding invertebrates (Darnell 1961, Townsend and Cammen 1988). In general, more phytoplankton is processed through detrital pathways than through grazing pathways (Mann 1988). Stable isotope studies tend to confirm the importance of phytoplankton (either suspended or deposited) and benthic algae to the production of fishes and invertebrates in estuaries (Haines 1976, Haines and Montague 1979, Hughes and Sherr 1983), whereas Boesch and Turner (1984) have argued that the most important role of estuarine vascular vegetation (saltmarsh grasses and seagrasses) is its function as a structural refuge from predation, a role that has been demonstrated experimentally on several occasions (Werner et al. 1983, Anderson 1984, Werner and Hall 1988). Although abundant, detritus from vascular plant sources tends to be lost to microbial respiration (Mann 1988). However, in the freshwater reaches of rivers and in oligotrophic coastal areas lacking substantial phytoplankton biomass, detritus from vascular plants is often an important energy source for coastal fishes and invertebrates (Mann 1988, Whitfield 1988).

While in the estuary, fishes such as menhaden directly consume phytoplankton or phytoplankton-enriched deposits (Hughes and Sherr 1983, Mann 1988). Postflexion-stage menhaden larvae invade tidal rivers from the seaward direction and subsequently metmorphose into juveniles. Friedland et al. (1996) found a remarkably strong coincidence between the distributions of juvenile menhaden and chlorophyll *a* concentrations in two North Carolina tidal rivers. They stated:

> The Neuse and Pamlico estuaries exhibit predictable patterns of phytoplankton distribution, a feature that can be generalized to other estuaries providing menhaden nursery habitat and that in part explains menhaden estuarine dependence. . . . We suggest that these enhanced phytoplankton zones are critical to the survival of post-metamorphic juvenile menhaden, and may have played a role in the evolution of the species' estuarine dependence.

Friedland et al. (1996) found that the phytoplankton/menhaden maxima moved upstream and downstream as freshwater inflows varied. Other estuarine-dependent species, such as mullet, have isotope ratios consistent with consumption of benthic macroalgae (Hughes and Sherr 1983, Mann 1988). Most fishes, however, are carnivorous, but retain the isotope ratios of their deposit-feeding or grazing prey.

In peninsular Florida and at other locations around the world, estuarine-dependent fishes and invertebrates use tidal-rivers as their principal nursery habitat. The juveniles of certain species congregate in remarkably small areas that constitute semi-confined focal points for watershed runoff (Peebles and Flannery 1992, Flannery et al. 2002). The potential for interference with the nursery function of these relatively rare habitats would appear to be large. The present study was designed to help measure this potential.

1.3 Report Organization

There are two companion reports that relate to tidal river surveys that were also conducted by the SWFWMD during the 1997-99 period: one report for the Alafia River

(Peebles 2002a) and another for the Peace River and Shell Creek (Peebles 2002b). The three reports share a common organizational structure, survey methodology and analytical approach. Much of the background information presented in the present report can also be found in the other two reports. A special study on the spawning response of the bay anchovy to freshwater inflows into the Manatee-Braden estuary was conducted during the same time period as these river surveys, and has been published separately (Peebles 2002c).

The three reports are designed to present enough information to allow future replication of the methodologies and analytical procedures by others. Many of the details that are provided in the Methods and Results and Discussion sections serve this purpose. However, the most basic of the findings are summarized in the Conclusions section with a minimum of biological jargon. These conclusions are put into context by sections 1.1 and 1.2 of this Introduction. Summary tables are located in an Appendix. These summary tables describe the database without interpretation, allowing other researchers to incorporate the findings into their own analyses.

2.0 METHODS

2.1 Study Area

The tidal portions of the Manatee and Braden rivers (Fig. 2.1.1) form a microtidal, drowned-river-valley estuary that connects to the Gulf of Mexico via Tampa Bay. At the mouth of the Manatee River, the mixed, mainly semi-diurnal tide has a <1.5 m range. The Manatee-Braden watershed covers an area of 937 km^2 (362 mi^2), of which 48% (454 km^2 or 175 mi^2) is gauged for streamflow by the US Geological Survey. The entire length of the Manatee River channel is 58 km.

The Braden River is the largest tributary in the Manatee River watershed, with a drainage basin of 212 km^2 (82 mi^2). The Braden River joins the Manatee River about 12 km upstream of the river mouth at Tampa Bay (Fig. 2.1.1). Saline water is usually restricted to the lowermost 32 km of the Manatee River channel, but can reach the dam on the Braden River during the spring dry season (April, May and early June). The entire channel of the Braden River and the Manatee River channel upstream of km 15 follow their natural courses. Below km 15 in the Manatee River, the channel has been dredged to 2-3 m for navigational use by small craft.

The shoreline of the Manatee River is urbanized in its lowermost reaches, switching to largely uninterrupted tidal wetland communities between kms 18 and 23. The northern shoreline is urbanized from the mouth of the river up to km 15 by the cities of Palmetto and Ellenton. The southern shoreline is urbanized up to km 13 by the City of Bradenton. Below km 18, the channel of the Manatee River is broad and open without any islands. Between kms 18 and 23, the river contains numerous islands that create a braided channel. A mixture of mangroves and salt marshes, dominated by black needlerush (*Juncus roemerianus*), occurs on these islands. Salt marshes are also common on the banks of the Manatee River in this same reach, gradually transforming in the upstream direction (above km 23) to floodplain forests dominated by bottomland hardwoods. Wetland communities in the Braden River are dominated by mangroves up to about km 5, above which the mangroves become gradually replaced by small areas of salt marsh and tidal floodplain forest. Oyster reefs are well developed in the lower 2 km of the Braden River.

Both rivers have instream impoundments on their main channels. Lake Manatee on the Manatee River is maintained by regulated dam releases, whereas Ward Lake on the Braden River is maintained behind a simple fixed-crest weir over which water flows. Withdrawals for public supply are obtained from both reservoirs. Lake Manatee is permitted to supply an average of 34 million gallons per day (mgd) and Ward Lake is permitted to supply and average of 6.95 mgd. Withdrawals from Lake Manatee have averaged about 29.1 mgd over the last 5 years, whereas withdrawals from Ward Lake have averaged only about 5.4 mgd over the same period. Expressed as cubic feet per second (cfs), these average withdrawals are equal to 45.1 cfs for Lake Manatee and 8.4 cfs for Ward Lake. No-flow conditions (<1 cfs) have occurred at the Lake Manatee dam on 73% of the days since streamflow records began in 1981, compared with 48% of days since Ward Lake records began in 1992.

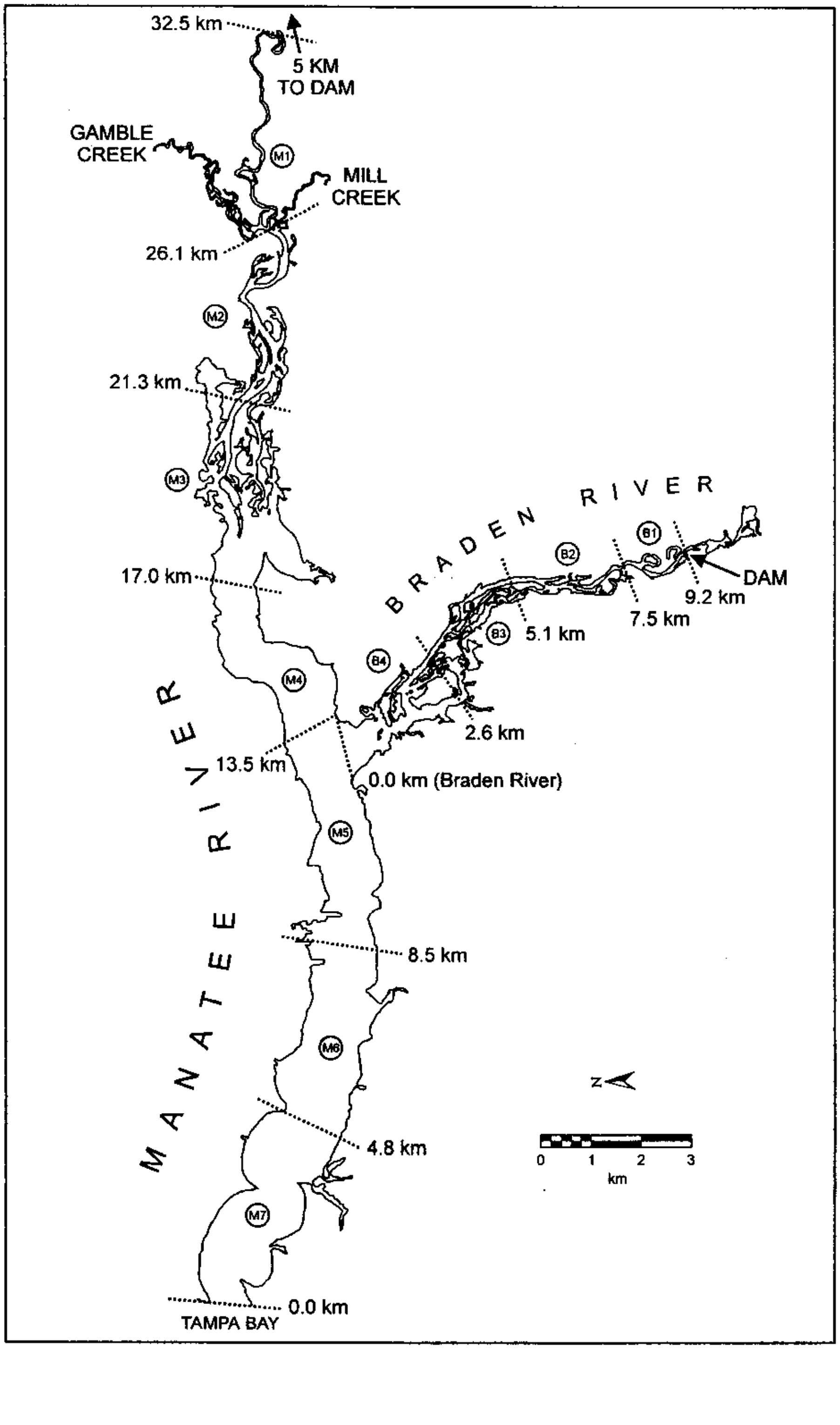

Fig. 2.1.1. Map of survey area. Sampling zones are numbered according to conventions used to label plankton samples (seine and trawl samples were not archived).

2.2 Survey Design

Three gear types were implemented to monitor organism distributions: a plankton net deployed during nighttime flood tides and a bag seine and otter trawl deployed during the day under variable tide stages. The plankton net surveys were conducted by the University of South Florida College of Marine Science, and the seine and trawl surveys were conducted by the Fisheries-Independent Monitoring Program of the Florida Marine Research Institute (Florida Fish and Wildlife Conservation Commission).

The small organisms collected at night by the plankton net represent a combination of the zooplankton and hyperbenthos communities. The term "zooplankton" includes all weakly swimming animals that suspend in the water column during one or more life stages. The distribution of such animals is largely subject to the motion of the waters in which they live. The term "hyperbenthos" applies to animals that are associated with the bottom but tend to suspend above it, rising higher into the water column at night or during certain times of year. The permanent hyperbenthos of estuaries (non-transient hyperbenthos) tends to be dominated by peracarid crustaceans, especially mysids and amphipods (Mees et al. 1993).

The faunal mixture that forms in the nighttime water column includes the planktonic eggs and larvae of fishes (ichthyoplankton). One of the most common reasons for using plankton nets to survey estuarine waters is to study ichthyoplankton. Although fish eggs and larvae are the intended focus of such studies, invertebrate plankton and hyperbenthos almost always dominate the samples numerically. The invertebrate catch largely consists of organisms that serve as important food for juvenile estuarine-dependent and estuarine fishes. In an effort to characterize the invertebrate catch more completely, all water-column animals collected by the plankton net were enumerated at a practical taxonomic level.

Seines and trawls were used to survey larger organisms that typically evade plankton nets. Generally speaking, the data from seine hauls document habitat use by shoreline-oriented organisms whereas the data from trawls document habitat use near the bottom of open channel areas. The dominant catch for both gear types is juvenile fishes, although the adults of smaller species are also commonly caught. The seines and trawls regularly collect a few of the larger macroinvertebrate species from tidal rivers, notably juvenile and adult blue crabs (*Callinectes sapidus*) and juvenile pink shrimp (*Farfantepenaeus duorarum*).

Monthly sampling was conducted for 17-18 months beginning in April 1997 (seine and trawl surveys) or May 1997 (plankton net surveys). Sampling stopped after the June 1998 collection (14-15 months after starting) and resumed for three months starting in April 1999. The latter three months of effort were added to increase the number of dry-season observations. The tidal portion of the Manatee River was divided into seven collection zones and the tidal Braden River was divided into four zones (Fig. 2.1.1, Tables 2.2.1 and 2.2.2). Within each zone, two plankton net tows, two seine hauls and one trawl were made each month, except in the uppermost zone of the Manatee River, where snags prevented trawl deployment.

Table 2.2.1. Distribution of samples from the Manatee River (April 1997-June 1999). Zone position is measured relative to the river mouth.

Zone (km)	Plankton	Seine	Trawl
0.0-4.8	34	34	17
4.8-8.5	34	33	18
8.5-13.5	34	34	17
13.5-17.0	34	34	16
17.0-21.3	34	34	18
21.3-26.1	34	34	17
26.1-32.5	34	51	0
Totals	238	254	103

Table 2.2.2. Distribution of samples from Braden River (April 1997-June 1999). Zone position is measured relative to the river mouth.

Zone (km)	Plankton	Seine	Trawl
0.0-2.6	34	33	16
2.6-5.1	34	34	17
5.1-7.5	34	34	17
7.5-9.2	34	34	17
Totals	136	135	67

The locations for seine and trawl deployment were randomly selected within each zone during each survey, whereas the plankton-net collections were made at fixed locations. The longitudinal position of each station was measured as the distance from the mouth of the tidal river, following the geometric centerline of the channel.

2.3 Plankton Net Specifications and Deployment

The plankton gear consisted of a 0.5 m mouth diameter, 500 µm mesh, conical (3:1) plankton net equipped with a 3-pt nylon bridle, a flow meter (General Oceanics model 2030R), a 1-liter plastic cod-end jar and a 9 kg (20 lb.) weight. The net was deployed between low slack and high slack tide, with sampling beginning within two hours after sunset and typically ending less than four hours later. Tow duration was 5 min, with tow time being divided equally among bottom, mid-water and surface depths. The boat towed the net along a nearly constant depth contour that was estimated to be close to the average cross-sectional depth for the local river reach. The fishing depth of the weighted net was controlled by adjusting the length of the tow line while using tachometer readings to maintain a constant line angle. The tow line was attached to a winch located on the gunnel near the transom. Placement of the winch in this location caused asymmetry in the steering of the boat, which caused propeller turbulence to be directed away from the towed net. Tow speed was approximately 1.3 m s^{-1}, resulting in a tow length of >400 m over water and a typical filtration of 70-80 m^3. Each month's combined tow length was about 20% of the total transect length in the Manatee River and 40% of the Braden River transect length. Upon retrieval of the net, the flowmeter reading was recorded and the contents of the net were rinsed into the cod-end jar using an electric wash-down pump and hose with an adjustable nozzle. The samples were preserved in 6-10% formalin in ambient saline.

When ctenophore (comb jelly) volumes exceeded the cod-end jar's capacity, volume indicators on the net panel seams were used to estimate the total volume of ctenophores in the net. If the total volume was <3.0 liters, only the material in the cod-end jar was preserved. If the total volume was >3.0 liters, a second cod-end jar was filled and preserved by ladling material from inside the net. Abundances of all organisms in the sample were later adjusted to reflect this subsampling method. The net was cleaned between surveys using an enzyme solution that dissolves organic deposits. Salinity, temperature, pH and dissolved oxygen were measured at one-meter intervals from surface to bottom after each plankton-net deployment.

2.4 Seine and Trawl Specifications and Deployment

The gear used in all seine collections was a 21.3 m center-bag seine with 3.2 mm mesh and leads spaced every 150 mm. To deploy the seine, the boat dropped off a member of the seine crew near the shoreline with one end of the seine, and the boat then payed out the net in a semicircle until the boat reached a second drop-off point near the shoreline. The lead line was retrieved simultaneously from both ends, with effort made to keep the lead line in contact with the bottom. This process forced the catch into the bag portion of the seine.

The 6.1 m otter trawl had 38 mm stretched mesh, a 3.2 mm mesh liner, and a tickler chain. It was towed in the channel for five minutes in either an arc or a straight line. Tow speed averaged 0.6 m s^{-1}, resulting in a typical tow length of about 180 m. Salinity, temperature, pH and dissolved oxygen were measured at the surface (seines) or at surface and bottom (trawls) in association with each gear deployment.

2.5 Plankton Sample Processing

All aquatic taxa collected by the plankton net were identified and counted, except for invertebrate eggs and organisms that were attached to debris (sessile stages of barnacles, bryozoans, sponges, tunicates and sessile coelenterates). During sorting, the data were entered directly into an electronic database via a macro-driven spreadsheet. Photomicrographs of representative specimens were compiled into a reference atlas that was used for quality-control purposes.

Most organisms collected by the plankton net fell within the size range of 0.5-50 mm. This size range spans three orders of magnitude, and includes mesoplankton, macroplankton, micronekton and analogous sizes of hyperbenthos. To prevent larger objects from visually obscuring smaller ones during sample processing, all samples were separated into two size fractions using stacked sieves with mesh openings of 4 mm and 250 µm. The >4 mm fraction primarily consisted of juvenile and adult fishes, large macroinvertebrates and large particulate organic matter. In most cases, the fishes and macroinvertebrates in the >4 mm fraction could be identified and enumerated without the aid of microscopes. When bay anchovy juveniles were encountered in high numbers (>300), the number present was estimated using either a Motoda box or, more commonly, by counting specimens in a weighed fraction.

A microscope magnification of 7-12× was used to enumerate organisms in the >250 µm fraction, with zoom magnifications as high as 90× being available for identifying individual specimens. The >250 µm fraction was usually sorted in two stages. In the first sorting stage, the entire sample was processed as 10-15 ml aliquots that were scanned in succession using a gridded petri dish. Only relatively uncommon taxa (n<50) were enumerated during this first stage. After the entire sample had been processed in this manner, the collective volume of the aliquots was recorded within a graduated mixing cylinder, the sample was inverted repeatedly, and then a single 40-60 ml aliquot was poured off. This volume usually represented about 12-50% of the entire sample volume, and was never less than 8% of the entire sample volume. The second sorting stage consisted of enumerating the relatively abundant taxa within this single aliquot. The second sorting stage was not required for all samples. The second stage was, however, sometimes extended to less abundant taxa (n<50) that were exceptionally small or were otherwise difficult to enumerate (e.g., some copepods, barnacle nauplii, and the larvacean *Oikopleura dioica*).

2.5.1 **Staging Conventions.** All fishes were classified according to developmental stage (Fig. 2.5.1), where

> **preflexion** larval stage = the period between hatching and notochord flexion; the tip of the straight notochord is the most distal osteological feature.
>
> **flexion** larval stage = the period during notochord flexion; the upturned notochord or urostyle is the most distal osteological feature.
>
> **postflexion** larval stage = the period between completion of flexion and the juvenile stage; the hypural bones are the most distal osteological feature.
>
> **metamorphic** stage (clupeid fishes) = the stage after postflexion stage during which body depth increases to adult proportions (ends at juvenile stage).
>
> **juvenile** stage = the period beginning with attainment of meristic characters and body shape comparable to adult fish and ending with sexual maturity.

Crab larvae were classified as zoea stage if they possessed rostral and dorsal or poterolateral spines. Shrimp larvae were classified as mysis stage until the uropods differentiated into exopods and endopods, after which they were classified as postlarvae until they reached the juvenile stage. The juvenile stage, which followed the megalops and postlarval stages, was characterized by resemblance to small (immature) adults. Under this system, the juvenile shrimp stage (e.g., for *Palaemonetes*) is equivalent to the postlarval designation used by some authors.

In many fish species, the juvenile stage is difficult to distinguish from other stages. At its lower limit, the juvenile stage may lack a clear developmental juncture that distinguishes it from the postflexion or metamorphic stage. Likewise, at its upper limit, more than one length at maturity may be reported for a single species or the reported length at maturity may differ between males and females. To avoid inconsistency in the staging process, length-based staging conventions were applied to the more common taxa. These staging conventions conform to stage designations reported by the U.S. Fish and Wildlife Service (e.g., Jones et al. 1978). The list below is comprehensive, representing the conventions that have been required to date by various surveys. Some of the species or stages in the list were not encountered during the surveys covered by this report.

Postflexion-juvenile transition (mm):	
Lucania parva	10
Menidia spp.	10
Eucinostomus spp.	10
Lagodon rhomboides	10
Bairdiella chrysoura	10
Cynoscion arenarius	10
Cynoscion nebulosus	10
Sciaenops ocellatus	10
Menticirrhus spp.	10
Leiostomus xanthurus	15
Orthopristis chrysoptera	15
Achirus lineatus	5
Trinectes maculatus	5
Gobiesox strumosus	5
Diapterus plumieri	10
Prionotus spp.	10
Symphurus plagiusa	10
Anchoa mitchilli	15
Sphoeroides spp.	10
Chilomycterus shoepfi	10
Lepomis spp.	10
Micropterus salmoides	10
Membras martinica	10
Chloroscombrus chrysurus	10
Hemicaranx amblyrhynchus	10
Micropogonias undulatus	15
Chaetodipterus faber	5

Juvenile-adult transition (mm):	
Anchoa mitchilli	30
Lucania parva	15
Gambusia holbrooki	15
Heterandria formosa	10
Menidia spp.	35
Eucinostomus spp.	50
Gobiosoma bosc	20
Gobiosoma robustum	20
Microgobius gulosus	20
Microgobius thalassinus	20
Gobiesox strumosus	35
Trinectes maculatus	35
Palaemonetes pugio (tot. length)	20
Membras martinica	50
Syngnathus spp.	80
Poecilia latipinna	30
Anchoa hepsetus	75

Metamorph-juvenile transition (mm):	
Brevoortia spp.	30
Dorosoma petenense	30

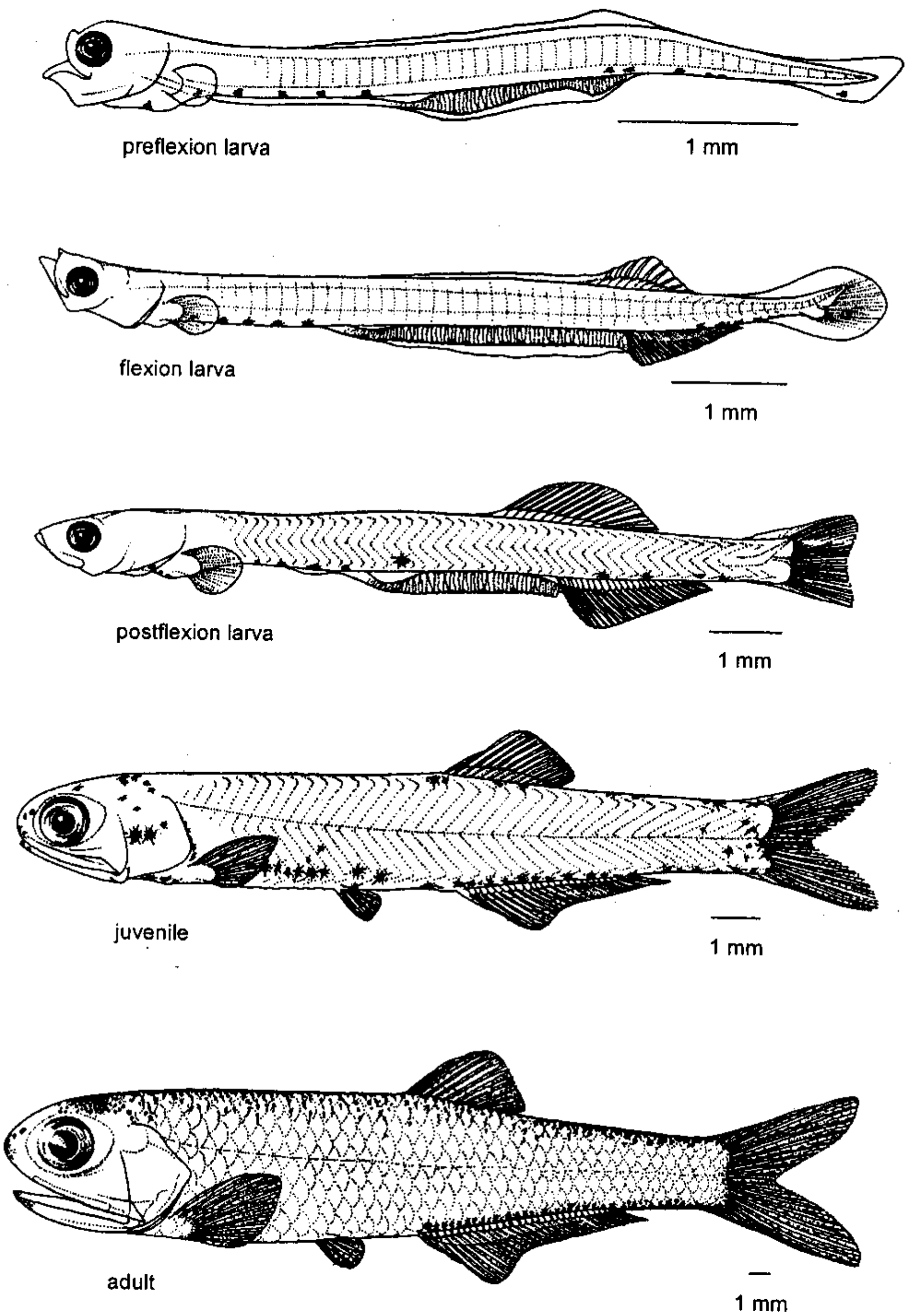

Fig. 2.5.1. Fish-stage designations, using the bay anchovy as an example. Specimens measured 4.6, 7.0, 10.5, 16 and 33 mm standard length.

2.6 Seine and Trawl Sample Processing

The contents of the seine bag were emptied into a bucket and transported to a culling table on the boat for sorting. The catch was identified at a practical taxonomic resolution (species level, in most cases). Each taxon was enumerated and measured. A maximum of 20 measurements were made per taxon, unless distinct cohorts were identifiable, in which case a maximum of 20 measurements were taken from each cohort. Whenever identification in the field was not certain, specimens were taken to the FMRI laboratory in St. Petersburg for identification. Trawl samples were processed in the same manner as seine samples.

2.7 Data Analysis

2.7.1 **Freshwater Inflow (*F*).** Freshwater inflows on collection dates, in cfs, were obtained for the tidal Manatee River by combining Lake Manatee gauged discharge (Manatee County), Ward Lake gauged discharge (USGS 02300042) and estimated inflows from Mill Creek, Gamble Creek, and a few small drainages that flow into the river directly below the dam. The latter estimates were obtained by multiplying gauged flow from the Manatee River near Myakka Head (USGS 02299950) by a factor of 1.23, which accounts for differences in watershed area between the Manatee River and the combined area of the Gamble Creek, Mill Creek and unnamed drainages. Inflows were not estimated for the localized, ungaged areas that occur downstream of the confluence of Gamble and Mill Creeks. Inflow into the tidal Braden River was represented solely by Ward Lake discharge.

2.7.2 **Isohaline Location (*I*).** Longitudinal isohaline location reflects the history of freshwater inflows into the tidal river as well as the recent effects of wind and tide. This parameter was used to complement same-day inflow in the investigation of organism responses to inflow. Because isohaline location was not measured directly, it was necessary to estimate it by interpolating between the salinity measurements that were associated with various gear deployments. In order to maximize the number of interpolations and minimize the number of extrapolations, the grand mean surface salinity was used as a reference isohaline for all collection dates. Salinity data from the fixed-station plankton survey indicated that the grand mean surface salinity of the Manatee River was near 12 psu during the study, and the corresponding value for the Braden River was near 8 psu. The locations of these surface isohalines (km from mouth) were therefore used as references. Their locations were estimated independently for all gears and all months. Twelve linear and nonlinear regression models were compared during the process of estimating isohaline location. A linear model was used unless another model resulted in a substantial improvement in fit.

2.7.3 **Organism Weighted Salinity (S_U).** The central salinity tendency for catch-per-unit-effort (CPUE) was calculated as

$$S_U = \frac{\Sigma(S \cdot U)}{\Sigma U} ,$$

where U is CPUE and S is salinity during deployment, which is a surface measurement for seine deployments, an average of surface and bottom for trawl deployments, and a water-column average for plankton-net deployments. Each seine and trawl deployment was treated as one unit of effort (i.e., U is number of individuals collected per seine or trawl deployment). In the case of the plankton catch, U is standardized against the water volume filtered by the plankton net (No. m^{-3}).

2.7.4 **Organism Total Number (*N*).** This calculation was restricted to the plankton-net catch. The total number of organisms in the tidal portion of the river was estimated by summing the products of mean organism density ($\overline{U}$, as No. m^{-3}) and tide-corrected water volume (*V*) within each volume zone

$$N = \Sigma(\overline{U} \cdot V) \ .$$

In the Manatee River, volumes corresponding to NGVD were calculated using recent bathymetric transect data and depth contours from NOAA chart 11417. Volume estimates for the upper Manatee River (above 17.9 km) provided by the SWFWMD were based on a salinity modeling study of the river performed by Camp, Dresser and McKee, Inc. (1995). The breakpoints between the river segments used to estimate volume and the river segments used as sampling zones in the present study did not always coincide. Therefore, in order to accommodate pre-defined volume segments, the boundary between sampling zones M3 and M4 was adjusted from 17.0 to 17.9 and the upper limit of zone M1 was adjusted from 32.5 to 33.0 km.

In 1993, CCI Environmental Services, Inc. conducted 117 bathymetric transects within the tidal Braden River and later produced contour plots from the transect data. These contour plots and contours and soundings from NOAA chart 11417 were digitized. A kriged grid (linear semivariogram model) was produced from the digitized records, and this grid was then double integrated to estimate volumes for 8 zones in the Braden River and for zones M4-M7 in the Manatee River (Surfer V. 7, Golden Software, Inc., Golden, CO). The four sampling zones in Braden River were each divided into two sections, creating eight volume zones that bracketed each of the eight plankton sampling locations. This was done to distribute the mathematical weight carried by individual zones. All volumes were adjusted to the water level at the time of collection using water-level recorders within the tidal Manatee and Braden rivers.

2.7.5 **Center of CPUE (km_U).** The central geographic tendency for CPUE was calculated as

$$km_U = \frac{\Sigma(km \cdot U)}{\Sigma U} ,$$

where *km* is distance from the river mouth. km_U is an alternative to the location of maximum abundance statistic (*Amax*) used by Peebles and Flannery (1992). *Amax* is the single location with the highest CPUE, whereas km_U identifies the central tendency in CPUE using data from all sampled locations.

2.7.6 **Inflow Response Regressions.** Regressions were performed between *N* and *F*, *N* and *I*, km_U and *F*, and km_U and *I*. *N* and *F* were ln-transformed prior to regression, which greatly improved normality. All regressions were limited to taxa that were encountered during a minimum of 10 surveys. Twelve linear and nonlinear regression models were evaluated for each taxon. Only those monthly seine and trawl surveys that were completed within three days were compared with *F*.

Organisms that shift position in response to changing inflow or isohaline location exhibit "dynamic response" to inflow. Conversely, organisms that stay in one area regardless of the inflow regime do not exhibit dynamic response. The latter behavior can be expected from organisms that favor fixed, structural habitat such as mangrove shorelines, marsh shorelines, seagrass beds or oyster reefs. An organism was considered to be responsive if the slope of the km_U-vs.-*F* regression was significantly different from zero ($p<0.05$).

2.7.7 **Data Limitations and Gear Biases.** All nets used to sample aquatic organisms are size selective. Small organisms pass through the meshes and large organisms evade the gear altogether. Intermediate-sized organisms are either fully retained or partially retained. When retention is partial, abundance becomes relative. However, temporal or spatial comparisons can still be made because, for a given deployment method and size of organism, the selection process can usually be assumed to have constant characteristics over space and time. The 500 µm plankton gear retains a wide range of organism sizes completely, yet it should be kept in mind that many estimates of organism density and total number are relative rather than absolute. Organism dimensions taken from Little Manatee River and Tampa Bay plankton samples (Peebles 1996) indicate that the following taxa will be collected selectively by 500 µm mesh: marine-derived cyclopoid copepods, cladocerans, most ostracods, harpacticoid copepods, cirriped nauplii and cypris larvae, the larvacean *Oikopleura dioica*, most decapod zoeae, and most adult calanoid copepods. Taxa that are more completely retained include: cumaceans, chaetognaths, insect larvae, fish eggs, most fish larvae and postlarvae, some juvenile fishes, gammaridean amphipods, decapod mysis larvae, most decapod megalopae, mysids, isopods, and the juveniles and adults of most shrimps. This partitioning represents a very general guide to the relative selectivities of commonly caught organisms.

The three types of gear deployments were each biased by time of day: the seines and trawls were only deployed during the day and the plankton nets were only deployed at night. The plankton nets were deployed during nighttime flood tides because larval fishes and invertebrates are generally more abundant in the water column at night (Colton et al. 1961, Temple and Fisher 1965, Williams and Bynum 1972, Wilkins and Lewis 1971, Fore and Baxter 1972, Hobson and Chess 1976, Alldredge and King 1985, Peebles 1987, Haney 1988, Lyczkowski-Shultz and Steen 1991, Olmi 1994) and during specific tide stages (Wilkins and Lewis 1971, King 1971, Peebles 1987, Olmi 1994, Morgan 1995a, 1995b). Organisms that selectively occupy the water column during flood tides tend to move upstream, and organisms that occupy the water column during all tidal stages tend to have little net horizontal movement other than that caused by net estuarine outflow (Cronin 1982, McCleave and Keckner 1982, Olmi 1994). The plankton catch was therefore biased toward organisms that were either invading the tidal rivers or were attempting to maintain position within the tidal rivers. This bias would tend to exclude the youngest larvae of some estuarine crabs, which are released at high tide to facilitate export downstream with the ebb tide (Morgan 1995a). However, as the young crabs undergo their return migrations at later larval stages, they become most available for collection during nighttime flood tides (Olmi 1994, Morgan 1995b).

2.7.8 **Bay anchovy growth rates.** As part of a special study that was unique to the Manatee-Braden estuary, samples of juvenile bay anchovies in the 15-25 mm range (standard length) were obtained for analysis of growth rate responses to freshwater inflow. Specimens were collected from the Manatee and Braden Rivers on a monthly basis from July through December, 1997. Collection methods were the same as those used during the plankton-net surveys, except 95% ethanol in de-ionized water was used as a preservative.

Preservation-related shrinkage was monitored by periodically measuring 10 individually preserved specimens with electronic calipers (accuracy ± 0.02 mm). The calipers were mounted in a fixed position relative to a glass stand that held individual specimens in a consistent position for measurement. Measurements were made from the tip of the snout to the distal edge of the hypural bones in the tail region of the fish. The hypural bones were made visible using transmitted light from a fiber-optic light source that was positioned behind the transparent measuring stand. To monitor shrinkage, the 10 specimens were measured 18 h after collection and at 48 h intervals thereafter for 14 d (total of 354 h). Measurements were taken again 28 months after collection.

Monthly age-length relationships were determined using specimens that had been in 95% ethanol for <14 d before being measured with the apparatus described above. Sagittal otoliths were removed, mounted in thermoplastic on a glass slide, and polished to the core using a succession of 220, 600, 800 and 2000-grit sandpapers. Final polishing was performed using 0.05μm gamma alumina in water, after which the otoliths were etched for 2-60 s in 0.1N HCl. Daily increments in each otolith were projected on a video monitor and counted three times. The three counts from an individual otolith usually varied by no more than one or two increments and never by more than 10% of the mean count. General procedures followed Secor et al. (1991).

Growth rate was regressed on length to describe the effects of metamorphosis (body deepening), which allowed this effect on apparent growth rate to be removed from further analyses. Residuals from this regression will be referred to as "residual growth rates." For comparison with inflows, the dates associated with individual residual growth rates were corrected for age differences in the catch using the formula

$$t_c = t - a + 40 \ ,$$

where t is date of collection, a is individual age (as total number of daily increments) and 40 shifts the hatching dates (t-a) forward to the mean age (in days) of the fish in the analysis (Sutcliffe 1973, Browder 1985). Multiple rates falling on individual dates were averaged.

3.0 RESULTS AND DISCUSSION

3.1 Streamflow Status During Survey Years, 1997-1999

Average monthly streamflow during winter and early spring was highly variable due to a series of rainy, El Niño-related cold fronts that passed through during late 1997 and early 1998 (Figs. 3.1.1a, 3.1.2a). These isolated events raised the three-year average streamflow for November through March to levels that were substantially higher than the long-term average for these months (Figs. 3.1.1b, 3.1.2b). The wet-season months of June through September were more comparable to the long-term average. When inflows during the surveys years were compared collectively with the long-term inflow distribution, the frequency distributions appeared to be similar except for generally lower frequencies of low-flow days during the survey years (Figs. 3.1.1c, 3.1.2c).

In summary, the surveys were primarily conducted during an unusually wet El Niño period. The three collections made during the spring dry season of 1999 were added to improve the representation of low-flow conditions in the database. Total freshwater inflow (*F*) is presented in Fig. 3.1.3. Differences between 3.1.3 and the single-gauge hydrographs are caused by combining inflows from various sources to estimate total estuarine inflow (see Section 2.7.1).

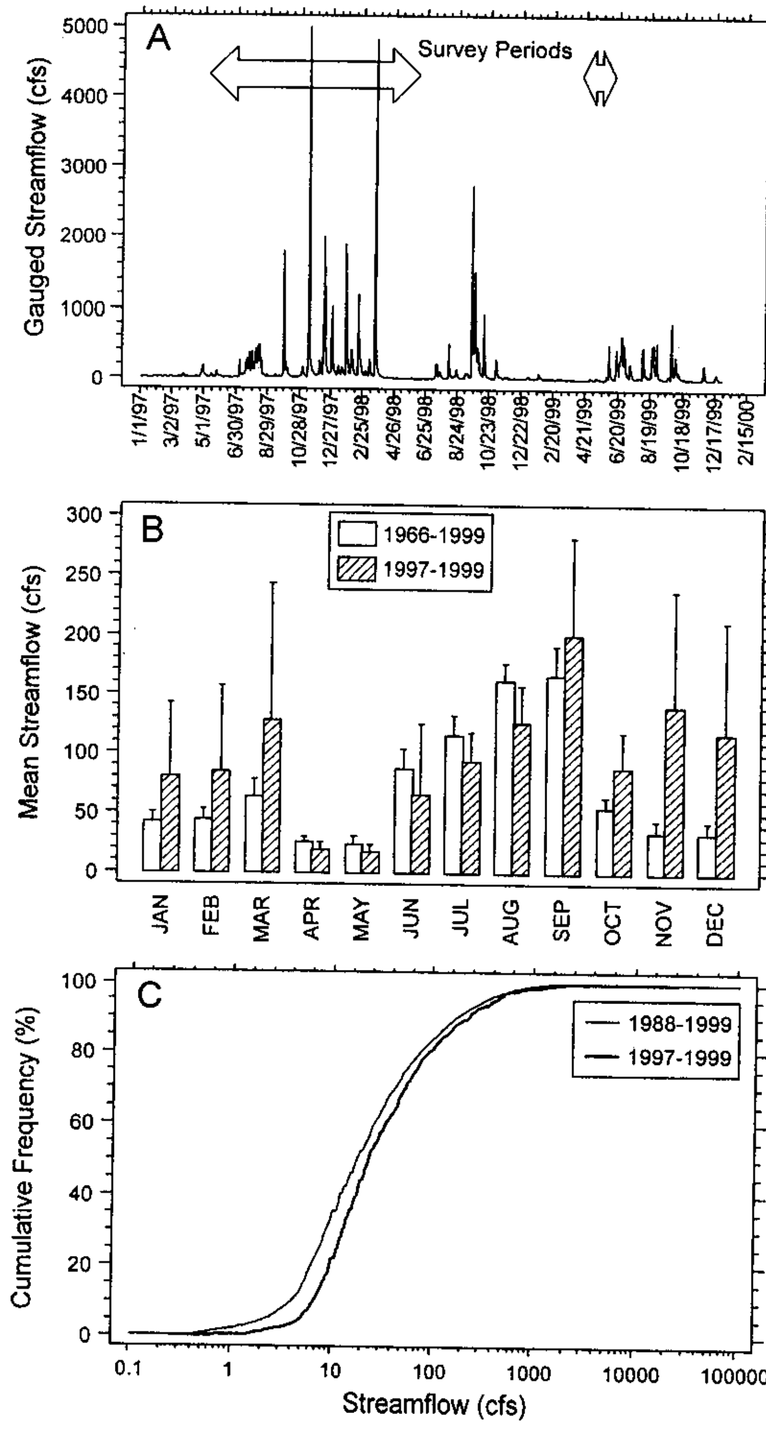

Fig. 3.1.1. Comparison of Manatee River historic streamflows with streamflows during survey years (1997-1999). All data are from the Manatee River near Myakka Head gauge (USGS 02299950), where (a) is the daily hydrograph, (b) compares the mean and standard error of monthly means, and (c) compares daily streamflow cumulative frequencies.

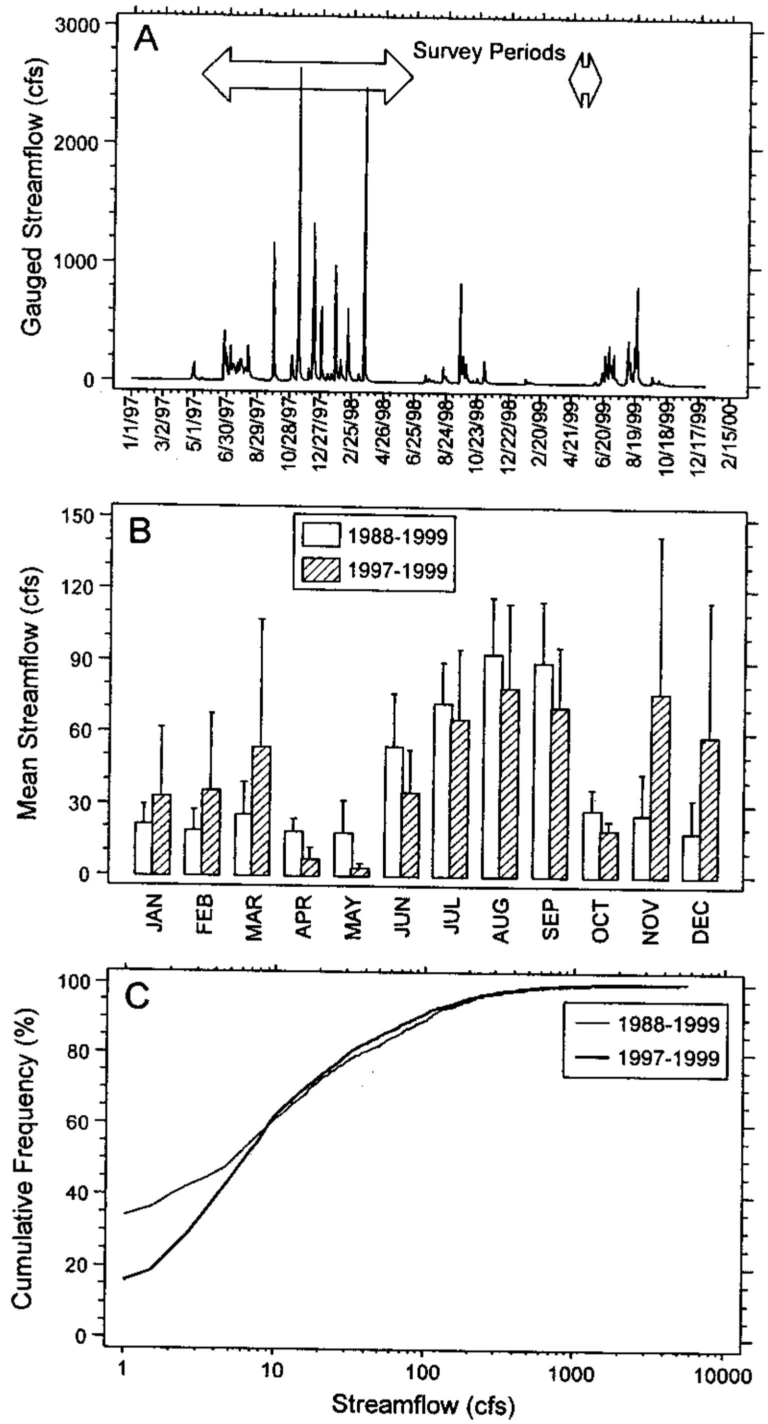

Fig. 3.1.2. Comparison of Braden River historic streamflows with streamflows during survey years (1997-1999). All data are from the Braden River near Lorraine gauge (USGS 02300032), where (a) is the daily hydrograph, (b) compares the mean and standard error of monthly means, and (c) compares daily streamflow cumulative frequencies.

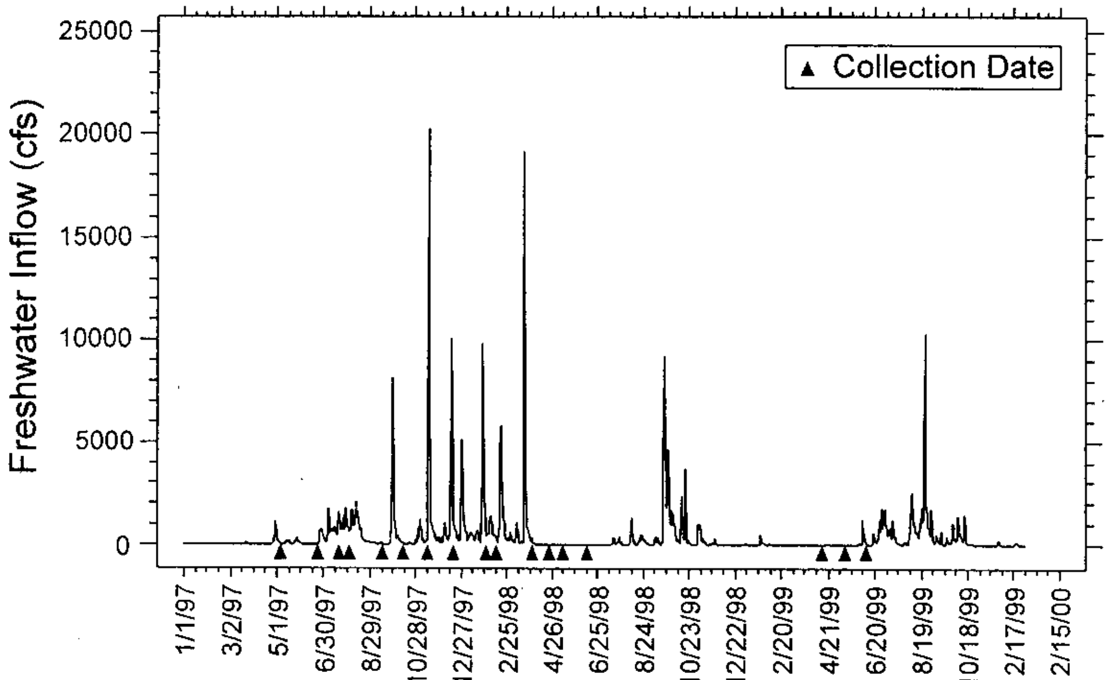

Fig. 3.1.3. Total gauged estuarine inflow (*F*).

3.3 Catch Composition

3.3.1 **Fishes.** All stages of the bay anchovy (*Anchoa mitchilli*) were dominant in the plankton-net fish catch (Tables A2 and A3). The vast majority of larvae identified as *Anchoa* spp. were probably *A. mitchilli*; other species of *Anchoa* were relatively uncommon at stages that could be identified to species level. Other abundant fishes in the plankton catch were: gobies of the genera *Gobiosoma* and *Microgobius*, menhaden (primarily *Brevoortia smithi*), frillfin goby (*Bathygobius soporator*), sand seatrout (*Cynoscion arenarius*), silversides (*Menidia* spp.), pinfish (*Lagodon rhomboides*), hogchoker (*Trinectes maculatus*) and silver perch (*Bairdiella chrysoura*). The gobies were second only to the bay anchovy in abundance. Adult gobies tend to be cryptic and can be difficult to sample effectively, but high larval densities reveal that gobies can be exceedingly abundant within tidal rivers.

The seine catch (Tables A4 and A5) was dominated by the bay anchovy, silversides, menhaden, pinfish, mojarras (*Eucinostomus* spp.), eastern mosquitofish (*Gambusia holbrooki*), spot (*Leiostomus xanthurus*) rainwater killifish (*Lucania parva*), and hogchoker. The trawl catch (Tables A6 and A7) was dominated by the bay anchovy, hogchoker, sand seatrout, silver perch, and pink shrimp (*Farfantepenaeus duorarum*).

3.3.2 **Invertebrates.** The plankton-net invertebrate catch was dominated by larval crabs (decapod zoeae), calanoid copepods, larval shrimps (decapod mysis larvae), mysids, the planktonic shrimp *Lucifer faxoni*, ctenophores and chaetognaths. Reservoir inhabitants such as phantom midge larvae (*Chaoborus punctipennis*) and freshwater cyclopoid copepods (primarily *Mesocyclops edax*) were abundant in discharges from the Ward Lake dam, whereas organisms such as the larvacean *Oikopleura dioica*, the cladoceran *Penilia avirostris*, the cumacean *Cyclaspis varians*, the copepods *Labidocera aestiva* and *Acartia tonsa*, chaetognaths, and *Lucifer faxoni* were most abundant in higher salinities near the mouth of the Manatee River and were rare in the reduced salinities that occurred in Braden River and the upper part of the tidal Manatee

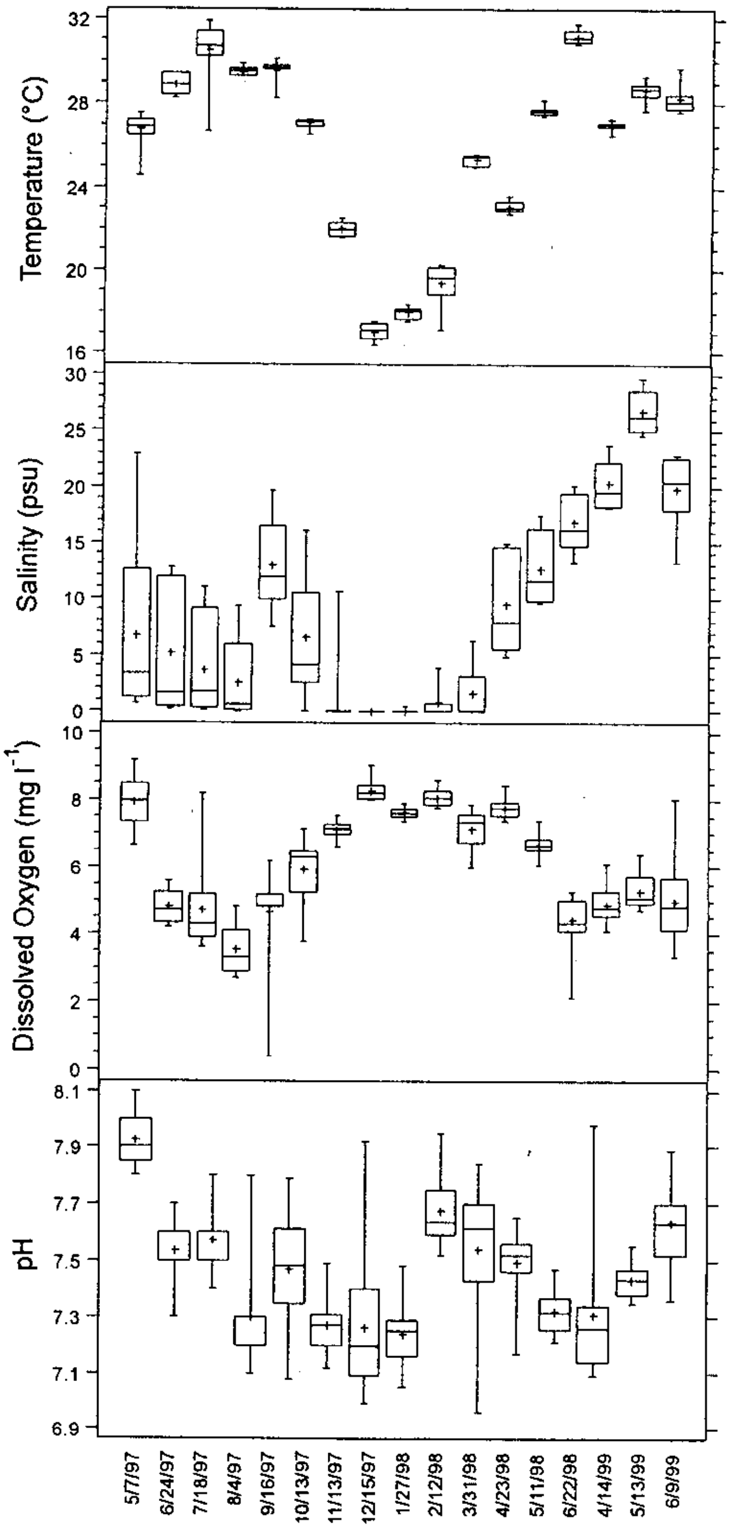

Fig. 3.2.1. Electronic meter data from the plankton-net surveys of the Braden River, where the cross identifies the mean, the horizontal line identifies the median, the box delimits the interquartile range, and the whiskers delimit the total range.

3.2 Physico-chemical Conditions

Summary statistics for the electronic meter data are presented in Table A1. Temperatures underwent seasonal variation within a typical range (Figs. 3.2.1, 3.2.2). Winters were not cold enough to cause fish kills during the survey period.

The high inflow El Niño period dramatically reduced salinities during winter and spring of 1998. This reduction was larger than the reduction caused by the 1997 summer rainy season (Figs. 3.2.1, 3.2.2).

Dissolved oxygen sometimes reached supersaturation levels in the lower Manatee River (Fig. 3.2.1). The highest concentrations were observed during spring and early summer and the lowest were observed toward the end of extended periods of elevated summertime inflow in 1997 and also after a period of sustained low inflows during spring (May 1999). Supersaturation is caused by phytoplankton blooms that occur when residence times are long (low inflows) and water clarity is high (see Mallin et al. 1999). Benthic hypoxia, on the other hand, tends to be most common when inflows are elevated, due in part to the isolation of bottom waters that occurs when strong vertical density stratification is present.

pH in the Manatee River also varied with inflow, being highest when salinities were high and lowest during periods of high inflow (Fig. 3.2.1). At all times, however, pH remained within a range that is considered to be safe for estuarine organisms.

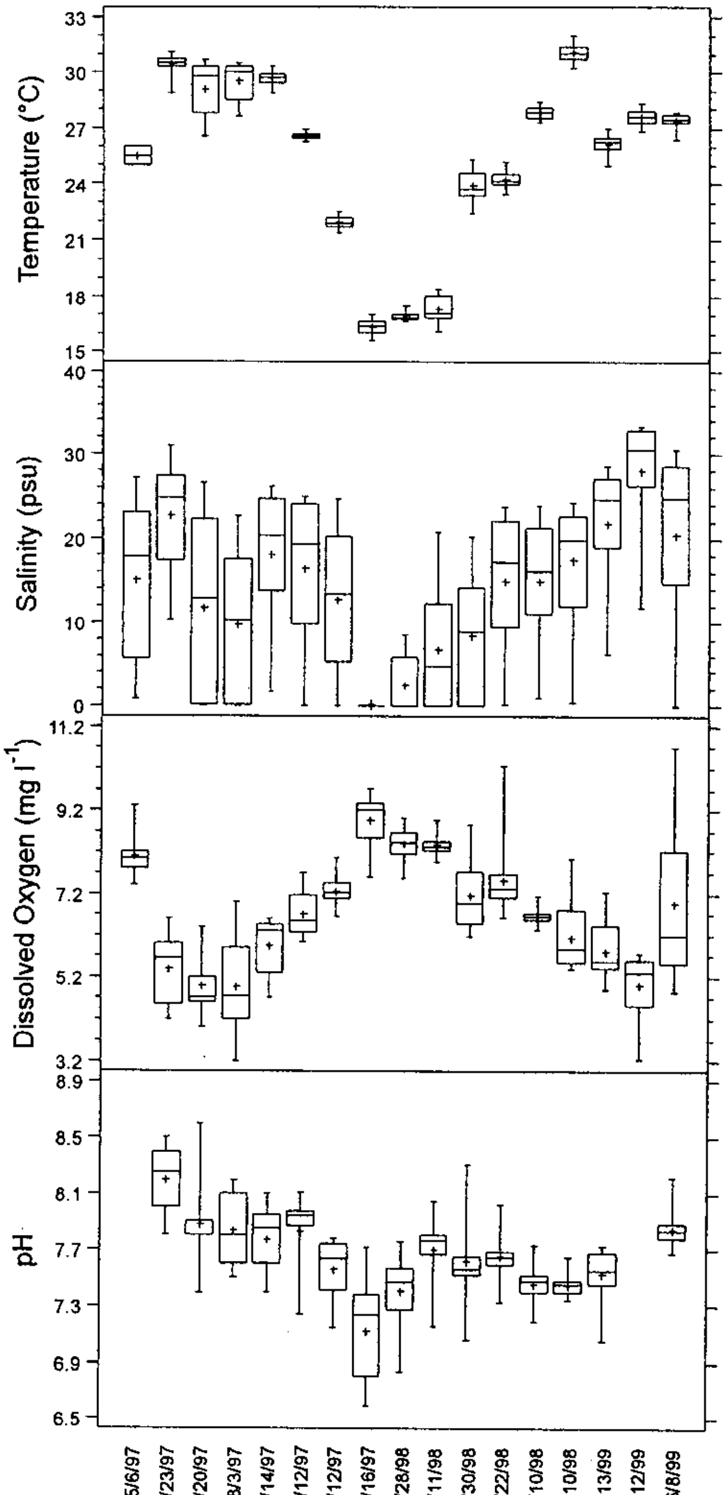

Fig. 3.2.1. Electronic meter data from the plankton-net surveys of the Manatee River, where the cross identifies the mean, the horizontal line identifies the median, the box delimits the interquartile range, and the whiskers delimit the total range.

River.

Gammaridean amphipods were abundant in the interiors of both the Braden River and the Manatee River. Mysids were also abundant in both systems, but had highest abundance near the confluence with the Braden River and also in the uppermost reaches of the survey area. Mysids and amphipods, which are very important prey for juvenile estuarine-dependent fishes, were encountered in a large proportion of samples, indicating that these prey were widely available during the surveys. The isopod catch was diverse, but was dominated by *Edotea triloba* (=*E. montosa*) and a juvenile cymothoid believed to be a species of *Lironeca*. The cumacean catch, which was dominated by *Cyclaspis varians*, was relatively high near the mouth of the Manatee River and also in the broad, open channel immediately downstream of the braided reaches. The blue crab (*Callinectes sapidus*) was caught in a large percentage of trawl deployments, and the pink shrimp (*Farfantepenaeus duorarum*) had relatively high abundances in the middle reaches the tidal Manatee River and in the lower reaches of the tidal Braden River.

3.4 Use of Area as Spawning Habitat

The eggs of the bay anchovy (*Anchoa mitchilli*), striped anchovy (*Anchoa hepsetus*), Atlantic thread herring (*Opisthonema oglinum*), scaled sardine (*Harengula jaguana*) and unidentified sciaenid fishes were collected from the survey area. Bay anchovy eggs outnumbered striped anchovy eggs by three orders of magnitude. The lower 8 km of the Manatee River is an important spawning ground for the bay anchovy (Peebles 2002c). Egg production there is proportionate to the abundance of certain types of zooplankton, such as calanoid copepods. Freshwater inflow and associated nutrient delivery stimulates copepod production and also creates density fronts (estuarine plume fronts) near the river mouth that serve to retain eggs within the zooplankton-rich spawning ground. Spawning appears to subside during protracted droughts, when zooplankton abundances decrease.

Many sciaenid eggs cannot be readily identified using visible characters. Those found in the lower tidal Manatee could have belonged to several species. Most of these eggs probably belonged to the sand seatrout (*Cynoscion arenarius*), silver perch (*Bairdiella chrysoura*), spotted seatrout (*C. nebulosus*) and kingfishes (*Menticirrhus* spp.), since the early larvae of these species were relatively abundant in the areas and salinities where the eggs were found. Because the seine and trawl samples yielded both southern kingfish (*Menticirrhus americanus*) and northern kingfish (*M. saxatilis*), the taxon *Menticirrhus* spp. may include both of these species. Any of the fishes listed in Table 3.4.1 may spawn within the lower Manatee River, with the exception of menhaden (*Brevoortia* spp.) and pinfish (*Lagodon rhomboides*).

Some fishes have eggs that are either adhesive or have filaments that entangle the eggs with submerged vegetation or other substrates. For species with such non-planktonic eggs, preflexion-stage larvae are usually the first developmental stage to be present in the water column. This is true for many of the estuarine-resident fishes including silversides (*Menidia* spp.), gobies, blennies, and skilletfish (*Gobiesox strumosus*). The gobies that are likely to spawn within the river include the naked goby (*Gobiosoma bosc*), the code goby (*G. robustum*), the green goby (*Microgobius thalassinus*), the clown goby (*M. gulosus*), the frillfin goby (*Bathygobius soporator*) and the taxon *Gobionellus* spp., which consists of the darter goby (*G. boleosoma*) and the emerald goby (*G. smaragdus*) in unknown proportions. Many killifishes (*Fundulus* spp.) are also estuarine-resident species that spawn within tidal rivers. Their adhesive eggs are spawned in shallow waters and hatch at a relatively advanced stage, the postflexion stage. The presence of postflexion-stage killifishes is therefore evidence of spawning near or within the tidal Manatee River. Small juveniles of live-bearing species such as the eastern mosquitofish (*Gambusia holbrooki*), sailfin molly (*Poecilia latiipinna*), lined seahorse (*Hippocampus erectus*), chain pipefish (*Syngnathus louisianae*), gulf pipefish (*S. scovelli*) and dusky pipefish (*S. floridae*) are also indications that the tidal river is serving as "spawning" habitat for these live-bearing species. A review of trends in spawning habitat among coastal fishes is presented by Peebles and Flannery (1992).

Table 3.4.1. Relative abundance of larval stages for non-freshwater fishes with a collection frequency >10 for the larval-stage aggregate, where Pre=preflexion (youngest larval stage), Flex=flexion stage (intermediate larval stage) and Post=postflexion (oldest larval stage). **X** identifies the most abundant stage and x indicates that the stage was present. Data from the Manatee River and Braden River are combined.

Taxon	Common Name	Pre	Flex	Post
Anchoa spp.	anchovies	**X**	x	x
Menidia spp.	silversides	**X**	x	x
Membras martinica	rough silverside	**X**	x	x
Prionotus spp.	searobins	**X**	x	x
Cynoscion arenarius	sand seatrout	**X**	x	x
Cynoscion nebulosus	spotted seatrout	**X**	x	x
Bathygobius soporator	frillfin goby	**X**	x	x
Gobiesox strumosus	skilletfish	**X**	**X**	x
Menticirrhus spp.	kingfishes	**X**	**X**	x
gobiids	gobies	**X**	**X**	x
Bairdiella chrysoura	silver perch	x	**X**	x
Achirus lineatus	lined sole	x	**X**	x
gerreids	mojarras	x	x	**X**
Chasmodes saburrae	Florida blenny	x	x	**X**
Trinectes maculatus	hogchoker	x	x	**X**
Archosargus probatocephalus	sheepshead		x	**X**
Sciaenops ocellatus	red drum		x	**X**
Brevoortia spp.	menhaden		x	**X**
Lagodon rhomboides	pinfish			**X**

3.5 Use of Area as Nursery Habitat

The estuarine-dependent pattern of habitat use is illustrated by Fig. 3.5.1. Much of the bay anchovy recruitment appeared to result from eggs spawned locally within the tidal river. The anchovies began moving into the interior of the tidal river during the postflexion larval stage and started to congregate there in its middle reaches. Congregation intensified upstream during the juvenile stage, which is evidenced by the increase in density (CPUE) relative to the postflexion stage. Bay anchovy postflexion larvae and juveniles also congregated within the interior of the Braden River (Table A12). As the Braden River and Manatee River groups began to mature, they began the move back toward open bay water (Fig. 3.5.1). The adult stage depicted in Fig. 3.5.1 is primarily composed of adults in the 30-60 mm range, whereas the largest specimens in Tampa Bay may range over 90 mm SL (R. E. Matheson, pers. comm.).

The pattern in Fig. 3.5.1 was repeated by a number of species, but often at a larger spatial scale that could not be fully resolved within the surveyed transect. The spawning grounds of many estuarine-dependent organisms were located seaward of the surveyed area, which caused a loss of resolution on the distribution of their egg and early larval stages. Nevertheless, the pattern in Fig. 3.5.1 can be detected for a few additional species by examining developmental trends in mean salinity at capture (S_u) in Table A2. S_u decreased during the development of grass shrimp (*Palaemonetes*), skilletfish, silver perch, sand seatrout, spotted seatrout, kingfishes, gobies (Gobiosoma and Microgobius) and the hogchoker.

Other species appear rather suddenly within the tidal river as migrating juveniles that end their migration within the interior of the tidal river, where they congregate. The assemblage of estuarine-dependent species that congregates within the tidal Manatee-Braden estuary during the juvenile stage includes the bay anchovy, yellowfin menhaden, gulf menhaden, pink shrimp, blue crab, ladyfish, snook, spotted seatrout, sand seatrout, red rum, southern kingfish, striped mullet and hogchoker (Tables A13-A16). All except for the blue crab, snook and striped mullet were detected as late-stage larvae entering the tidal river.

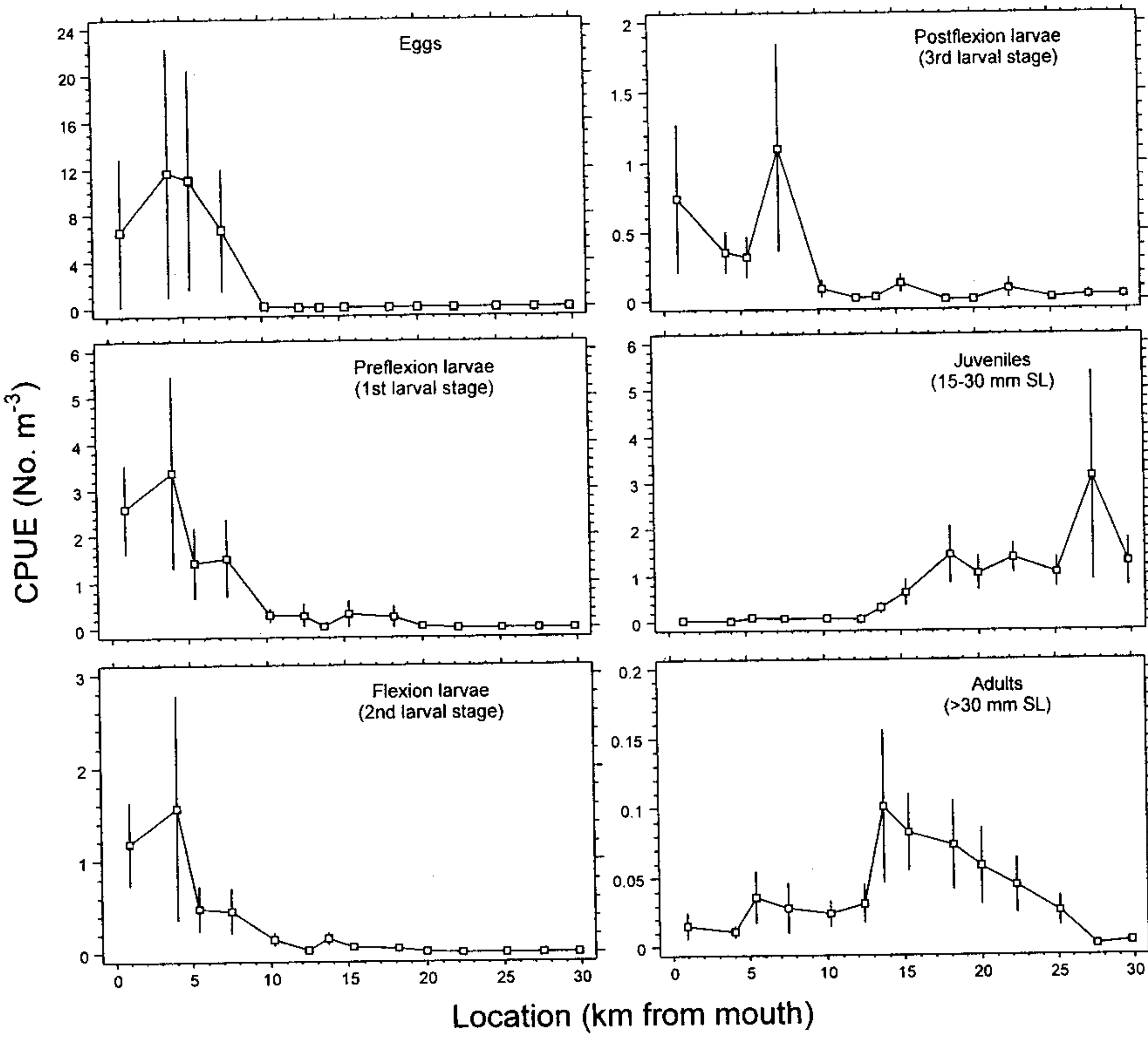

Fig. 3.5.1. Comparison of the distribution of successive life stages of the bay anchovy from the Manatee River (means with standard errors). The preflexion and flexion stages are likely to contain small proportions of striped anchovy larvae and possibly Cuban anchovy larvae.

Some of the fishes that use the Manatee River as nursery habitat are economically important (snook, sand seatrout, spotted seatrout, red drum), whereas others serve as important forage for economically important species (bay anchovy, menhaden, striped mullet). The characteristics of nursery habitat use by economically important fishes are presented in the following sections.

3.5.1 **Snook.** Snook are strongly estuarine dependent, which is evidenced by their conspicuously low abundance near islands in the Bahamas and Carribean that lack significant low-salinity habitat. In Florida, spawning takes place in high-salinity waters (>18 psu) near coastal inlets and at some locations inside larger embayments. Snook are known to congregate for spawning at nearby Bean Point (north end of Anna Maria Island), near or within Terra Ceia Bay, and at the spoil island offshore of Port Manatee. Behavior that appears to be spawning related has been observed at these locations, along with ripe and running females, but confirmation of spawning through the collection of early-stage larvae has been exceedingly difficult. The larvae associate with structure early in their development, which makes them difficult to collect with plankton nets. Despite extensive effort with plankton nets at a diversity of open-water habitats in Tampa Bay, McMichael et al. (1989) were unable to collect snook larvae even though their effort focused on the known spawning season. Larval snook <10 mm form small schools in the water column under old-growth red mangroves (Peters et al., unpublished manuscript). Tolley et al. (1987) used an epibenthic sled to collect 12 postflexion-stage snook larvae from areas adjacent to hardened shoreline in Naples Bay, Florida. Larval length and salinity at capture were negatively correlated, indicating that the larval snook were in the process of migrating upstream to low-salinity juvenile nursery habitats. McMichael et al. (1989) aged the Tolley et al. specimens, and the results indicated that the migration to low-salinity nursery habitats started within three weeks after hatching.

180 juvenile snook were collected during the seine and trawl surveys, with most (79%) coming from the Braden River, a location where Edwards (1990) also frequently encountered juvenile snook. In addition, juvenile snook were regularly encountered within the braided portion of the Manatee River, but they were rarely encountered at shorelines along the Manatee River's open, bay-like reaches. Random site selections in the tidal Manatee-Braden estuary yielded snook in about 18.5% of shoreline seine

deployments, but in only 0.02% of trawl deployments. During the juvenile stage, snook prefer low-energy waters that provide shade and underwater structure (submerged parts of emergent vegetation) throughout the tidal cycle. The 36 juvenile snook collected by seine from the Manatee River were centered at 3.6 psu and 20.8 km, and the 140 collected by seine from Braden River were found at an average of 3.3 psu and 6.2 km. All but one (99%) of the snook-yielding seine collections had no apparent bottom vegetation (SAV), with *Halodule* being present at the exception. All but one of these sites had shoreline vegetation, with the principal shoreline vegetation types being red mangrove (32%), *Juncus* (32%), and Brazilian pepper (8%). Bottom type was primarily mud (75%), with the remainder being primarily sand. The snook's nursery habitat in the Manatee-Braden estuary can be characterized as well protected shoreline with emergent vegetation and mud bottom at locations with strongly reduced salinities. This characterization agrees with observations made by McMichael et al. (1989).

3.5.2 **Sand seatrout.** The sand seatrout is strongly estuarine dependent. Informal hydrophone surveys (pers. obs.) conducted with R.G. Gilmore and K.M. Peters indicated that adults congregate in large schools (>100) and spawn over open bottom in nearshore waters, including the open waters of large embayments such as Tampa Bay. The larvae are planktonic and are readily collected from open water by plankton nets. Some spawning evidently took place within the lower Manatee River, as all larval stages were most abundant upstream of the river's mouth (Table A11). Upstream movement by postflexion larvae, which are primarily demersal, begins at an age of about two weeks (Peebles 1987, Flores-Coto 1998).

Juveniles were regularly encountered in shoreline seine deployments (7%), but were more frequently encountered in the channel, where they occurred in 42% of trawl deployments. An average of 0.5 individuals was collected per seine deployment, whereas an average of 12.6 individuals was collected per trawl deployment. Juvenile sand seatrout were encountered in trawl samples from throughout the survey area, with the highest encounter rates being from the upper reaches of the tidal Braden River. 70% of all sand seatrout collections (seine and trawl) were made over mud bottom. None of these locations were known to have SAV. Most shoreline collection sites were vegetated, but 18% were near seawall or rip-rap. There was no apparent preference for any particular shoreline type. Trawl collections were centered at 11.0 psu and 18.5 km in the Manatee River and at 12.7 psu and 2.8 km in the Braden River. The primary nursery habitat for sand seatrout in the Manatee-Braden estuary can be characterized as muddy bottomed areas of the river channel with reduced salinities.

3.5.3 **Spotted seatrout.** Spotted seatrout are estuarine-dependent, but not to the same extent as snook or sand seatrout. Hydrophone surveys in the Tampa Bay area have indicated that adults spawn in small groups (<25) in moderate-to-high salinities (>18 psu) near the deeper parts of seagrass beds and also near piers and other manmade structures near shore (approx. 2-4 m depth). The planktonic early larvae are readily collected from open water by plankton net, but are usually present in much lower numbers than larvae of the sand seatrout (Peebles 1987, Peebles and Tolley 1988, McMichael and Peters 1989). The larvae become demersal by the postflexion stage and an age of approximately two weeks (Peebles and Tolley 1988). Early-stage preflexion and flexion larvae were present near the mouth of the Manatee River, suggesting that some spawning occurred very near or within the survey area (Table 3.4.1). The postflexion stage was the first stage to move into the interior of the tidal Manatee River (Table A11).

Juvenile spotted seatrout contrast with juvenile sand seatrout in preferring relatively shallow water away from deeper channels (McMichael and Peters 1989). Juveniles were encountered in 18% of shoreline seine deployments and in 13% of trawl deployments. Although these encounter rates were similar, the average number collected per seine deployment (0.85) was more than three times the average number collected per trawl deployment (0.26). Juvenile spotted seatrout were encountered throughout the survey area, with encounter rates in shoreline seine collections being highest in the Braden River. Spotted seatrout were frequently encountered over sand bottom (39% of seine and trawl collections), but more collections (55%) were made over mud. Most seine collection sites had vegetated shoreline, but 16% were adjacent to seawall or rip-rap. Mangroves (primarily red mangrove) were the most common dominant shoreline vegetation (30%) at the 70 seine sites that yielded juvenile spotted seatrout, with Juncus (23%) being the only other dominant vegetation type. 10% of the sites had SAV: 7% had *Halodule* and 3% had a mixture of *Thalassia* and *Halodule*.

Seine collections were centered at 14.0 psu and 14.3 km in the Manatee River and at 9.9 psu and 2.7 km in Braden River. Within the Manatee-Braden estuary, the primary nursery habitat can be characterized as vegetated shoreline with reduced salinities and either sand or mud bottom.

3.5.4 **Red drum.** Red drum are estuarine-dependent. In the Tampa Bay area, 72% of the 694 red drum larvae collected by Peters and McMichael (1987, regular stations) were collected from the open waters of lower Tampa Bay, whereas most juveniles were collected from backwaters and tidal rivers. In the present study, 34 red drum larvae were collected, which is a relatively large catch for a tidal river. Most larvae were in the postflexion stage, but eight were still in the flexion stage, reflecting the Manatee River's proximity to spawning sites in lower Tampa Bay.

Juvenile red drum were primarily associated with the shoreline, being collected in 17% of seine deployments and only 6% of trawl deployments. The seine catch averaged 1.4 per deployment compared with only 0.2 per trawl deployment. The majority of juvenile red drum were collected from the upstream half of the survey area; they were rarely encountered downstream of the mouth of the Braden River. As noted by Edwards (1990), juvenile red drum associate with shorelines having both narrow and broad intertidal zones, whereas juvenile snook tend to prefer shorelines with moderate-to-broad intertidal zones. Unlike snook, juvenile red drum were frequently encountered at shorelines along bay-like reaches of the Manatee River between the US 41 bridge and the braided section of channel. Positive seine collections were made over mud (82%) and sand (18%), primarily in association with vegetated shoreline (97%). Red mangroves (35%) and *Juncus* (26%) were the most common types of shoreline vegetation. Only 3% of the sites had SAV (*Halodule*). In the absence of SAV, Stunz et al. (2002) reported a preference by juvenile red drum for marsh edges in Galveston Bay, Texas. Vegetated shoreline appears to be important to the juvenile stage, but there is evidently considerable flexibility in the type of vegetation. Juvenile red drum were centered at 5.7 psu and 16.8 km in the Manatee River and at 4.1 psu and 2.7 km in the Braden River. The primary nursery habitat for red drum in the Manatee-Braden estuary can be characterized as vegetated shoreline with strongly reduced salinities and primarily mud bottom.

3.6 Seasonality

Species diversity tends to be highest near the mouth of tidal rivers due to an increased presence of marine-derived species, and also tends to be relatively high at the upstream end due to the presence of freshwater species. This tends to leave a low-diversity zone in the middle reaches of the tidal river (Merriner et al. 1976). Freshwater inflow and the seasonal arrival of young animals can shift this pattern downstream or upstream. Flemer et al. (1999) reported that the richness and abundance of infaunal organisms in the northern Gulf of Mexico and southeastern Atlantic tends to decline during summer after a spring peak.

The seasonal trend in the number of fish taxa collected by the plankton net was typical in that apparent species richness increased during spring and decreased during fall, creating a maximum during spring and early summer and a minimum during winter (Fig. 3.6.1). High inflows did not generally introduce very many types of freshwater fish larvae into the tidal river primarily because larval diversity in flowing fresh water tends to be very low. The reduced diversity during winter does not appear to have been caused by freshwater inflow because this same pattern has been observed in other tidal rivers during both wet and dry winters (Peebles 2002 a,b). The apparent richness of invertebrates caught by the plankton net also had minimum values during winter. This analysis was degraded somewhat by irregularity in the taxonomic resolution among invertebrate groups.

The seine and trawl data also identified a springtime increase in apparent richness, but the seine data did not exhibit a decline during fall. Part of the lack of strong seasonality in the seine and trawl catch is caused by the presence of older individuals. Older individuals may have been spawned during a distinct spawning season, but they remained within tidal-river nurseries for several months or longer, contributing to richness observations that were made long after their spawning season had ended. This process tends to increase the richness of seine and trawl collections made during fall and early winter.

Examples of seasonality for individual fish taxa are presented in Fig. 3.6.2. Fish spawning seasons are species-specific. For a given species, the seasonal range of the spawning season tends to become shorter at the more northerly locations within its geographic range, but the time of year when spawning takes place is otherwise consistent. Among species with long or year-round spawning seasons, local conditions have been observed to have a strong influence on egg production within the spawning season (Peebles 2002c). Local influences include seasonally anomalous water temperature, seasonal variation in the abundance of adult or larval prey, and seasonal variation in retention or transport of eggs and larvae after spawning. The latter processes (prey availability and retention and transport) are influenced by freshwater inflows to the coast.

Alteration of inflows would appear to have the lowest potential for estuarine impact during the period from December through February, which is the period when the fewest taxa were present. The highest potential for impact would appear to be from April to June, a time of year when naturally low inflows are coupled with increasing use of the estuary as nursery habitat. The potential for impact is species-specific. During fall, winter, and early spring, for example, there could be impact on red drum and menhaden because these fishes recruit to tidal river nursery habitats during fall and winter. Other species, such the bay anchovy, are present year-round. There is, therefore, no time of year when freshwater inflow management is free from potential impact on estuarine nursery habitat.

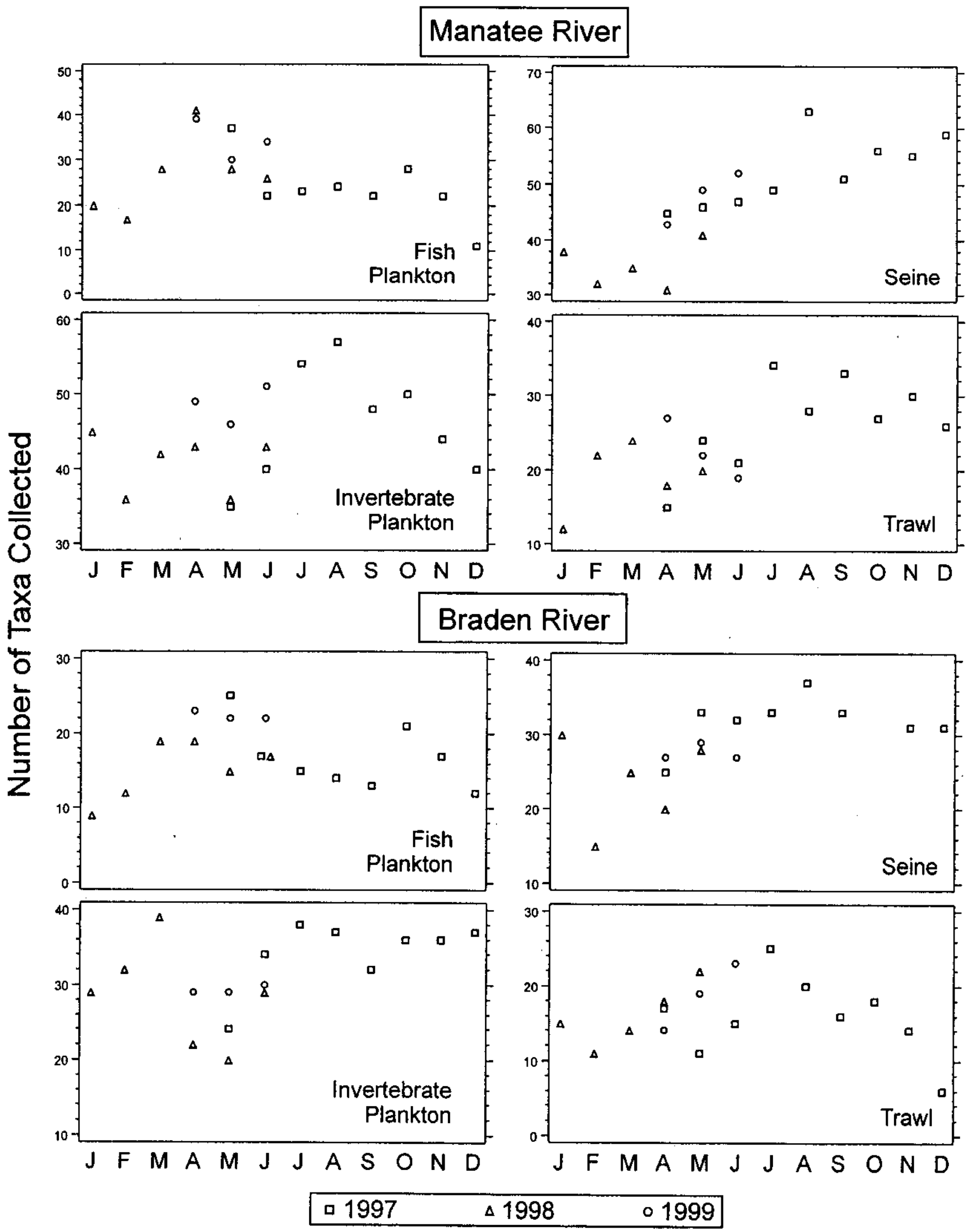

Fig. 3.6.1. Number of taxa collected per month.

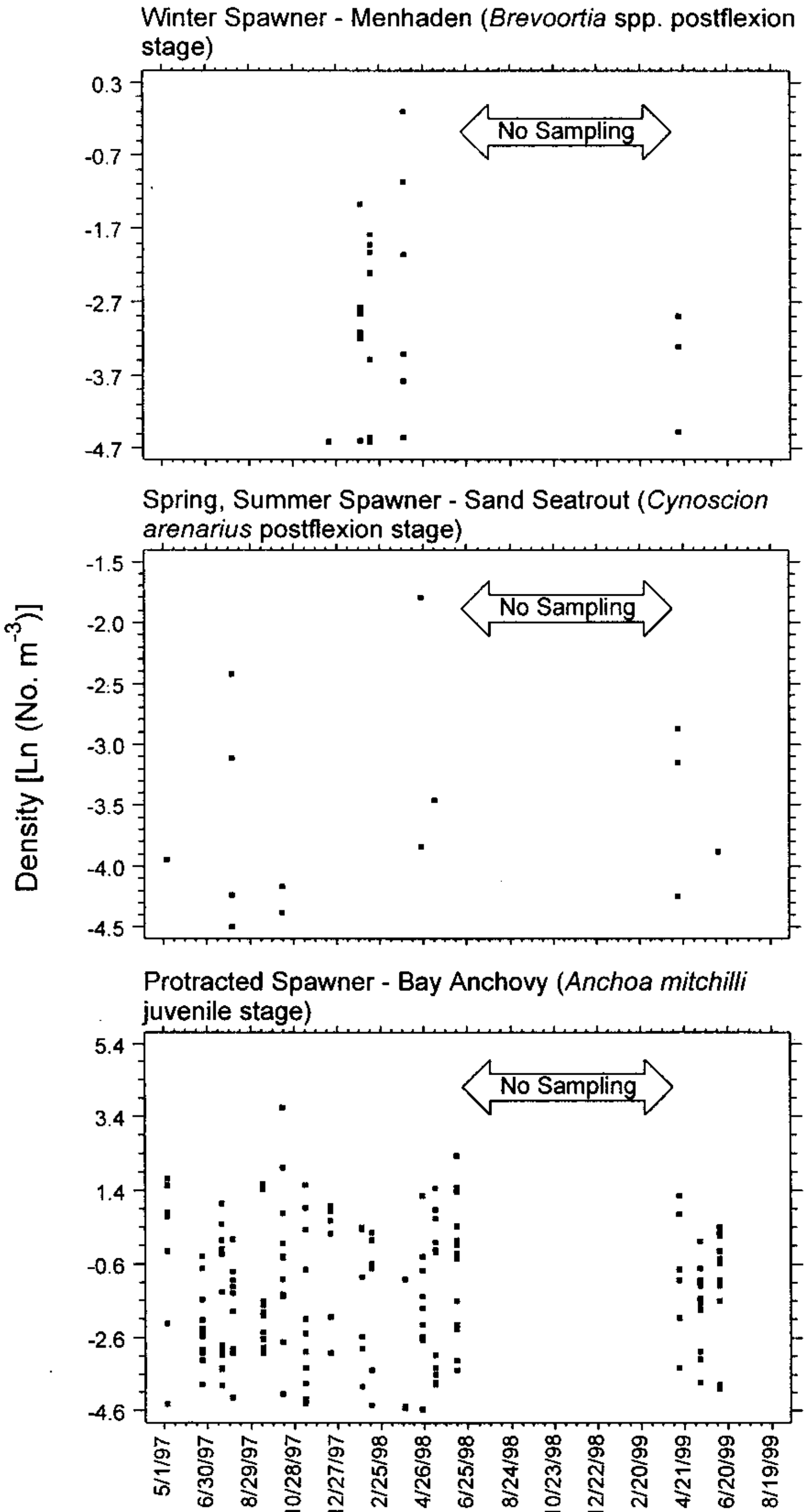

Fig. 3.6.2. Examples of species-specific seasonality in the Manatee River.

3.7 Distribution (km_U) Responses to Freshwater Inflow (Dynamic Response)

Many animals exhibit behaviors that allow them to regulate their position along the estuarine gradient. Regulation of position allows the animals to optimize the combination of food resources, physiological costs and predation risk. Young (1995) provided a review of the various dispersal and position-control mechanisms used by small aquatic organisms. Truly planktonic animals are less adept at controlling their position and are more easily swept away by the prevailing estuarine circulation. Others control position using tactic (directional) responses to cues that contain directional information (vector cues). These responses include vertical orientation to light (phototaxis) or gravity (geotaxis) and horizontal orientation to currents (rheotaxis). Kinetic (non-directional) responses are also used, including responses to changing pressure (barokinesis) for precise detection of depth or changes in tidal height, which can be monitored if the organism remains stationary on the bottom for a period of time. A number of animals have demonstrated motile responses to changes in salinity (halokinesis). Estuarine organisms may use combinations of these signals to selectively occupy tidal streams that will result in their rapid transport to a preferred habitat or food source. On the other hand, larger fishes and crustaceans may simply swim toward preferred habitats.

Estuarine and estuarine-dependent organisms that use selective tidal-stream transport or two-layered circulation are capable of repositioning themselves within the tidal river in a matter of hours or days. The monthly sampling frequency for describing changes in organism position is therefore not likely to reflect serial correlation, which would be caused if the sampling frequency was shorter than the time required for an organism to change position in the tidal river. In regressions of organism position against freshwater inflow or isohaline position, the Durbin-Watson statistic sometimes indicated that serial correlation was possible (Tables 3.7.1 and 3.7.2). This was primarily a detection of intra-seasonal consistency in an organism's position within the tidal river rather than being an indication of serial correlation. Organisms tended to be upstream during dry seasons and downstream during wet seasons (see sections 3.7.1

and 3.7.2), and because several consecutive surveys were conducted within wet or dry seasons, this pattern sometimes simulated serial correlation.

3.7.1 **km_U Responses to Inflow.** Gauged discharge from Ward Lake into the tidal Braden River was zero during 41% of the collection efforts. Due to the large number of zero observations for inflow, km_u was not regressed against inflow into this estuarine system. Instead, investigation of dynamic response within the tidal Braden River was limited to relationships with isohaline location (see Section 3.7.2).

In the tidal Manatee River, a linear model that used the natural logarithm of inflow (F) as the independent variable produced the best general fit for the dynamic response relationship with inflow. 75% of the 16 significant relationships had negative slopes, indicating that organisms generally moved downstream as F increased (Table 3.7.1). Strong responses were evident among both relatively strong swimmers, such as striped mullet, and relatively weak swimmers, such as the isopod *Edotea triloba*.

As an indicator of km_u, same-day inflow did not perform as well as isohaline location. Inflows into the tidal Manatee River varied on a very short time scale (Fig. 3.1.2). When the survey-period hydrograph was positively correlated with itself after a series of simulated time lags (a test for temporal independence among daily flows), significance was lost after only 5 days. This contrasts with inflows into the tidal Alafia and Peace Rivers, where the serial correlation (autocorrelation) persisted for nearly one month. The flashiness of the Manatee-Braden inflow makes same-day flows much less representative of conditions experienced over longer periods.

3.7.2 **km_U Responses to Isohaline Location.** A linear model produced the best general fit for this relationship; examples are provided in Fig. 3.7.1. 91% of the 33 significant relationships had positive slopes, indicating that organisms generally moved upstream as the reference isohaline moved upstream. The strongest responses rank near the bottom of Tables 3.7.2 and 3.7.3. As an index for predicting organism distribution, isohaline location was superior to F in both the total number of significant relationships produced and the mean amount of variation in km_U that was explained (r^2).

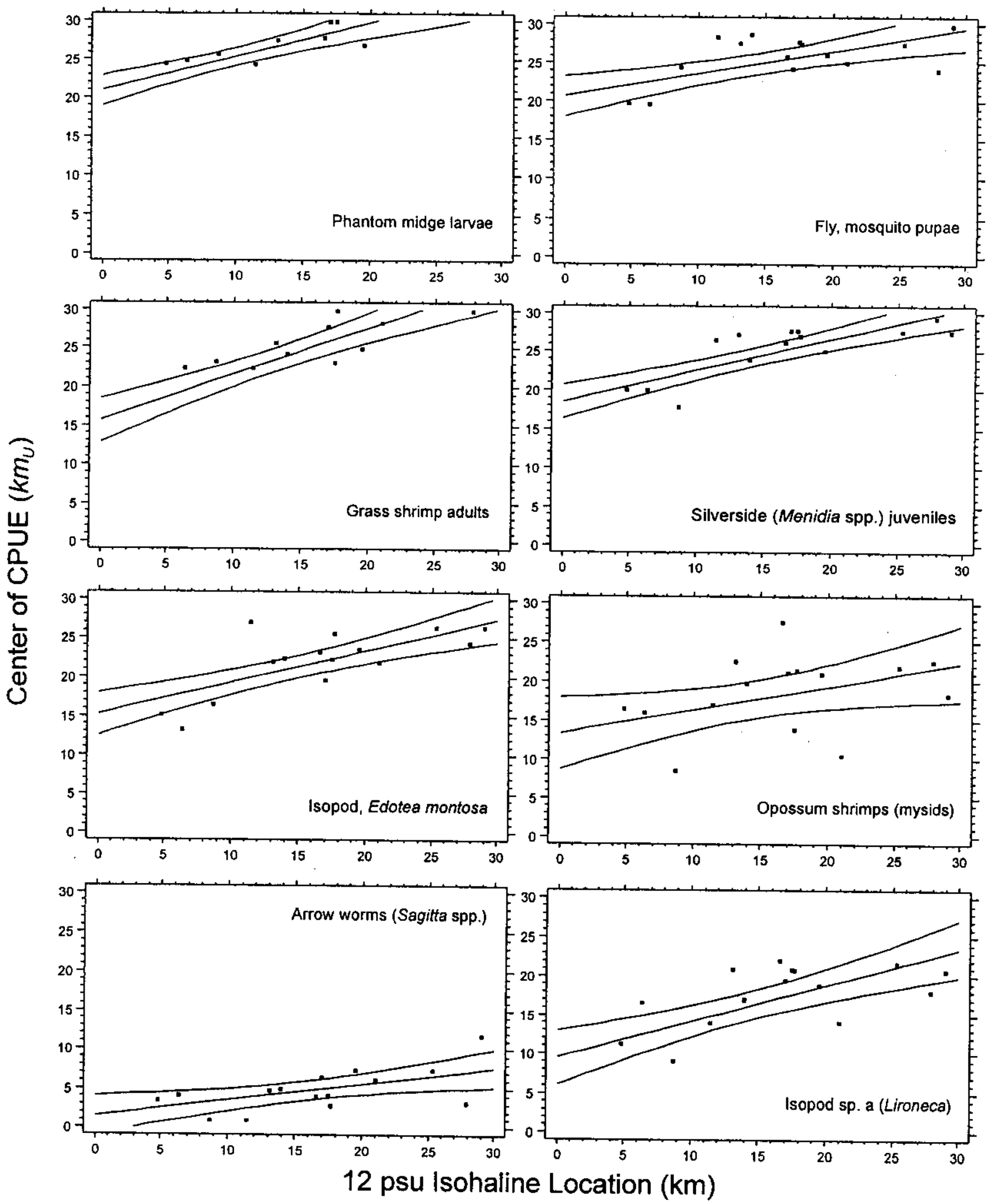

Fig. 3.7.1. Example regressions of organism location (km_U) vs. location of the 12 psu isohaline in the tidal Manatee River, with 95% confidence limits for estimated means (see Table 3.7.2).

Table 3.7.1. Organism distribution (km_U) responses to freshwater inflow ($\ln F$) into the tidal Manatee River, ranked by linear regression slope (b). Other regression statistics are sample size (n), intercept (a), slope probability (p) and fit (r^2, as %). *DW* identifies where serial correlation is possible (*x* indicates $p<0.05$ for Durbin-Watson statistic).

Gear	Taxon	Common Name	n	a	b	p	r^2	DW
seine	Mugil cephalus	striped mullet	10	33.949	-3.433	0.0040	67	
pktn. net	Palaemonetes pugio juveniles	daggerblade grass shrimp	16	27.501	-2.340	0.0451	26	x
pktn. net	branchiurans, Argulus spp.	fish lice	14	29.871	-2.032	0.0040	51	
pktn. net	cymothoid sp. a (Lironeca) juveniles	isopod	17	24.951	-1.995	0.0005	57	
pktn. net	Palaemonetes pugio adults	daggerblade grass shrimp	13	31.472	-1.754	0.0097	47	
pktn. net	Brevoortia spp. metamorphs	menhaden	10	31.863	-1.597	0.0049	65	
pktn. net	Menidia beryllina juveniles	inland silverside	16	31.015	-1.549	0.0006	58	
pktn. net	dipteran, Chaoborus punctipennis	phantom midge larvae	11	33.414	-1.521	0.0030	64	
pktn. net	Edotea triloba	isopod	17	26.747	-1.294	0.0128	35	
pktn. net	mysids, unidentified	opossum shrimps	17	23.115	-1.247	0.0455	24	
pktn. net	dipterans, pupae	flies, mosquitoes	17	29.219	-0.988	0.0232	30	
pktn. net	Trinectes maculatus juveniles	hogchoker	16	29.817	-0.842	0.0140	36	
pktn. net	polychaetes	sand worms, tube worms	17	4.266	1.434	0.0172	32	
pktn. net	Microgobius spp. flexion larvae	gobies	12	6.670	1.797	0.0407	36	
pktn. net	pelecypods	clams, mussels, oysters	17	6.138	2.096	0.0184	32	
trawl	Trinectes maculatus	hogchoker	10	5.333	2.769	0.0014	74	x

Table 3.7.2. Organism distribution (km_U) responses to the location of the 12 psu isohaline in the Manatee River, ranked by linear regression slope (*b*). Other regression statistics are sample size (*n*), intercept (*a*), slope probability (*p*) and fit (r^2, as %). *DW* identifies where serial correlation is possible (*x* indicates $p<0.05$ for Durbin-Watson statistic).

Gear	Taxon	Common Name	n	a	b	p	r^2	DW
pktn. net	pelecypods	clams, mussels, oysters	17	23.792	-0.588	0.0017	49	
pktn. net	Trinectes maculatus juveniles	hogchoker	16	23.670	0.172	0.0328	29	
pktn. net	chaetognaths, Sagitta spp.	arrow worms	16	1.563	0.199	0.0102	39	x
pktn. net	cumaceans	cumaceans	17	5.487	0.211	0.0458	24	
pktn. net	dipterans, pupae	flies, mosquitoes	17	20.655	0.294	0.0011	52	
pktn. net	mysids, unidentified	opossum shrimps	17	13.379	0.297	0.0333	27	
pktn. net	fish eggs, percomorph	sciaenid eggs (primarily)	14	-0.930	0.316	0.0034	53	
pktn. net	Brevoortia spp. metamorphs	menhaden	10	20.781	0.328	0.0024	70	x
pktn. net	Menidia spp. preflexion larvae	silversides	13	21.933	0.329	0.0025	58	
pktn. net	hirudinoideans	leeches	10	15.616	0.365	0.0247	49	
pktn. net	Edotea triloba	isopod	17	15.286	0.402	0.0001	66	
pktn. net	Menidia beryllina juveniles	inland silverside	16	18.514	0.404	0.0000	76	
pktn. net	dipteran, Chaoborus punctipennis	phantom midge larvae	11	20.958	0.439	0.0002	81	
pktn. net	tanaids, unidentified	tanaids	15	15.713	0.450	0.0370	29	
seine	Microgobius gulosus	clown goby	10	11.765	0.466	0.0103	58	
pktn. net	cymothoid sp.a. (Lironeca) juveniles	isopod	17	9.488	0.467	0.0002	61	x
pktn. net	branchiurans, Argulus spp.	fish lice	14	13.306	0.505	0.0006	64	
pktn. net	Syngnathus louisianae juveniles	chain pipefish	10	4.640	0.536	0.0088	60	
pktn. net	Palaemonetes pugio adults	daggerblade grass shrimp	13	15.620	0.598	0.0000	82	
pktn. net	Nemopsis sp.	hydromedusa	13	0.890	0.600	0.0205	40	x
pktn. net	Palaemonetes pugio juveniles	daggerblade grass shrimp	16	7.083	0.692	0.0065	42	x
seine	Mugil cephalus	striped mullet	10	5.195	0.809	0.0014	74	

Table 3.7.3. Organism distribution (km_U) responses to the location of the 8 psu isohaline in Braden River, ranked by linear regression slope (*b*). Other regression statistics are sample size (*n*), intercept (*a*), slope probability (*p*) and fit (r^2, as %). *DW* identifies where serial correlation is possible (*x* indicates $p<0.05$ for Durbin-Watson statistic).

Gear	Taxon	Common Name	n	a	b	p	r^2	DW
seine	Trinectes maculatus	hogchoker	10	7.318	-0.224	0.0337	45	
pktn. net	cumaceans	cumaceans	17	3.291	-0.187	0.0184	32	
pktn. net	amphipods, gammaridean	scuds, beachhoppers	17	3.419	0.153	0.0142	34	
pktn. net	branchiurans, Argulus spp.	fish lice	11	5.585	0.175	0.0261	44	
pktn. net	gobiid preflexion larvae	gobies	11	1.899	0.207	0.0441	38	
pktn. net	mysids, unidentified	opossum shrimps	17	3.111	0.214	0.0047	42	
pktn. net	Edotea triloba	isopod	17	3.947	0.264	0.0001	65	
pktn. net	Menidia beryllina juveniles	inland silverside	13	4.953	0.276	0.0000	91	x
seine	Menidia spp.	silversides	12	3.022	0.423	0.0004	73	x
pktn. net	Nemopsis sp.	hydromedusa	10	0.444	0.510	0.0350	45	
seine	Brevoortia spp.	menhaden	10	2.086	0.625	0.0074	61	

3.8 Abundance (*N*) Responses to Freshwater Inflow

After investigating the effects of freshwater inflows on the abundance or survival of a wide range of individual species within the San Francisco Bay estuary, a consensus was reached among approximately 30 participating estuarine scientists that optimal inflow rates did not exist (Kimmerer and Schubel 1994, Jassby et al. 1995). Instead, the data indicated that abundance and survival continued to increase as inflow rates increased.

Direct correlations between abundance and inflow are hampered by time lags between cause and effect. Still, when these correlations are found, they tend to demonstrate a positive relationship, with abundances being generally higher at higher inflow levels. In the present study, a number of significant relationships were found between organism number and indicators of freshwater inflow. The majority of these did not appear to be the result of serial correlation. In cases where the Durbin-Watson statistic suggested that serial correlation was possible, plots of residuals vs. order generally revealed no actual serial correlation. There would appear to be great potential for resampling the same organisms on consecutive monthly surveys, yet this potential is diminished by the short life spans of many organisms, the regular addition of new recruits to the river, the regular graduation of larger specimens from the size classes that are caught by the gear, and by variation in survival within the recruited size classes.

3.8.1 ***N* Responses to Inflow.** A linear model produced the best overall fit for this relationship when both terms were ln-transformed. Freshwater inflow tended to introduce freshwater animals into the tidal portion of the river from upstream freshwater reaches, increasing their numbers in the tidal river (Tables 3.7.1, 3.7.2 and 3.8.1). On the other hand, organisms that are characteristically most abundant near the mouths of tidal rivers (plume organisms) moved seaward during high-inflow periods, giving them a negative abundance correlation with inflow. This latter effect was noted for shrimp and hermit crab larvae, arrow worms, crab larvae, the larvacean *Oikopleura dioica*, early-stage anchovy larvae, cymothoid isopod juveniles, and calanoid copepods. The pattern of downstream shift by plume organisms during high-inflow periods has been observed within various tidal rivers on Florida's southwest coast (Rast et al. 1991, Peebles 2002a,b).

Given the instability of the inflow hydrograph and the generally poor performance of same-day inflow as an indicator (see Sections 3.7.1 and 3.8.2), monthly average inflow values were also investigated to determine if they would produce better relationships with N and km_u. F was averaged for the month prior to the month of collection, which served both to smooth the inflow data and to lag it backward across a time period that may be more relevant to some estuarine organisms, particularly the longer-lived ones. This produced a consistently worse fit with km_u than did same-day inflows, and did not generally improve relationships with N.

However, one possibly significant relationship did result from this analysis; the ratio of adult-to-juvenile bay anchovy abundance was found to be strongly and positively correlated with the averaged inflows (n=16, r=0.63, p=0.009). A positive correlation is unusual because the adults (>30 mm SL) typically leave tidal rivers during high-inflow periods, which encourages a *negative* correlation between inflow and the adult-to-juvenile ratio. In the Manatee River (and unlike the Peace and Alafia Rivers), the adults remained centered well inside the tidal river under all observed inflow conditions.

A series of 25 bay anchovy egg surveys of the lower Manatee River and adjacent Tampa Bay waters (Peebles 2002c) independently confirmed the adults' affinity for the river, which was maintained even when exceptionally high inflows had substantially reduced salinities. The relatively sedentary nature of the adults in the Manatee River may be related to the fact that the inflow volumes are ordinarily very small relative to the volume of the tidal river. In terms of residence time, the reach of river downstream of 18 km is bay-like. Dynamic responses were evident for a variety of plume organisms, but the ranges of the responses were narrow relative to the length of the tidal river, in keeping with long residence times (Fig. 3.7.1). Given the sedentary nature of the adult bay anchovy population in the Manatee River, the observed increase in the adult-to-juvenile ratio during high-inflow periods could be caused by increased survival to adulthood. The correlation between the ratio and mean inflow is significant by itself, but improves with the addition of a measure of inflow variability, which was represented in this case by the standard deviation of the previous month's daily inflows (Fig. 3.8.1). The coefficient for the variability term is negative, suggesting that reduced inflow variability improved survival. Additional observations would be required to confirm this trend.

3.8.2 ***N* Responses to Isohaline Location.** As with km_u, the number of significant relationships produced by regressions against isohaline position was larger than the number produced by regressions against *F* (Table 3.8.1 and 3.8.2). Organisms with negative slopes in Tables 3.8.2 and 3.8.3 are primarily freshwater organisms that increased in number as the reference isohaline moved downstream during periods of increased streamflow or dam release. Two exceptions in the Manatee River were mysids (opossum shrimps) and *Palaemontes pugio* (daggerblade grass shrimp), which are estuarine-resident organisms rather than freshwater organisms. Similar, positive abundance responses by mysids were observed in the tidal portions of the Alafia River, Peace River and Shell Creek (Peebles 2002a,b). The daggerblade grass shrimp demonstrated this response in the tidal Alafia River (Peebles 2002a). Because these two types of shrimp are exceptionally important as prey for the young snook, red drum, sand seatrout and spotted seatrout that use tidal rivers as nursery habitat (Peters and McMichael 1987, McMichael and Peters 1989, McMichael et al. 1989, Peebles 1996), their positive abundance response to inflow has strong implications for the fish nursery function of tidal rivers. It should be noted that some of the change in grass shrimp number could be attributed to dynamic response, as this species occasionally ranged upstream of the survey area during low-inflow periods (Fig. 3.7.1).

A variety of plume organisms decreased in number as the reference isohaline moved downstream (positive slopes in Table 3.8.2). This decrease was likely to be a localized phenomenon caused by movement out of the survey area. It is possible that total numbers of these organisms increased downstream of the survey area despite the local decrease.

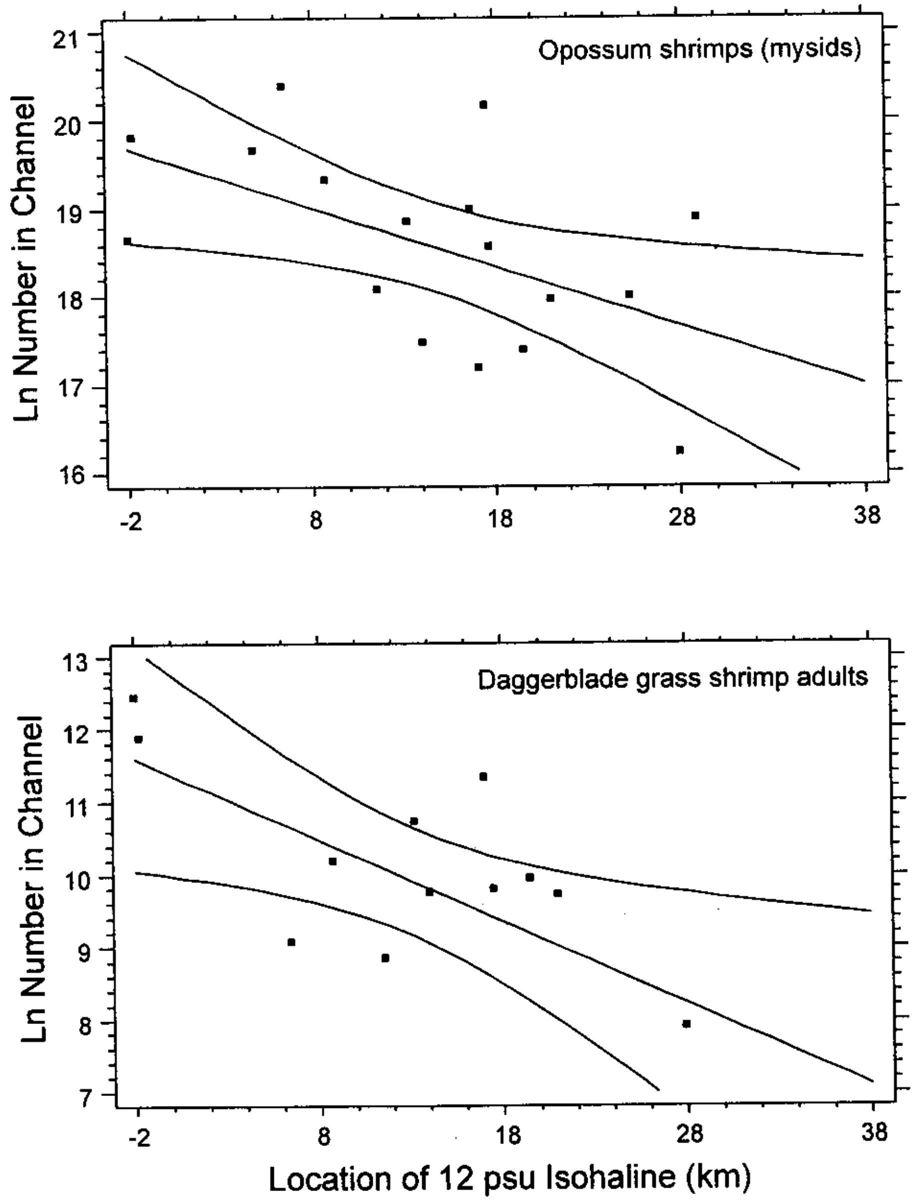

Fig. 3.8.1. Example regressions of organism number (ln *N*) vs. 12 psu isohaline location in the Manatee River, with 95% confidence limits for estimated means (see Table 3.8.2).

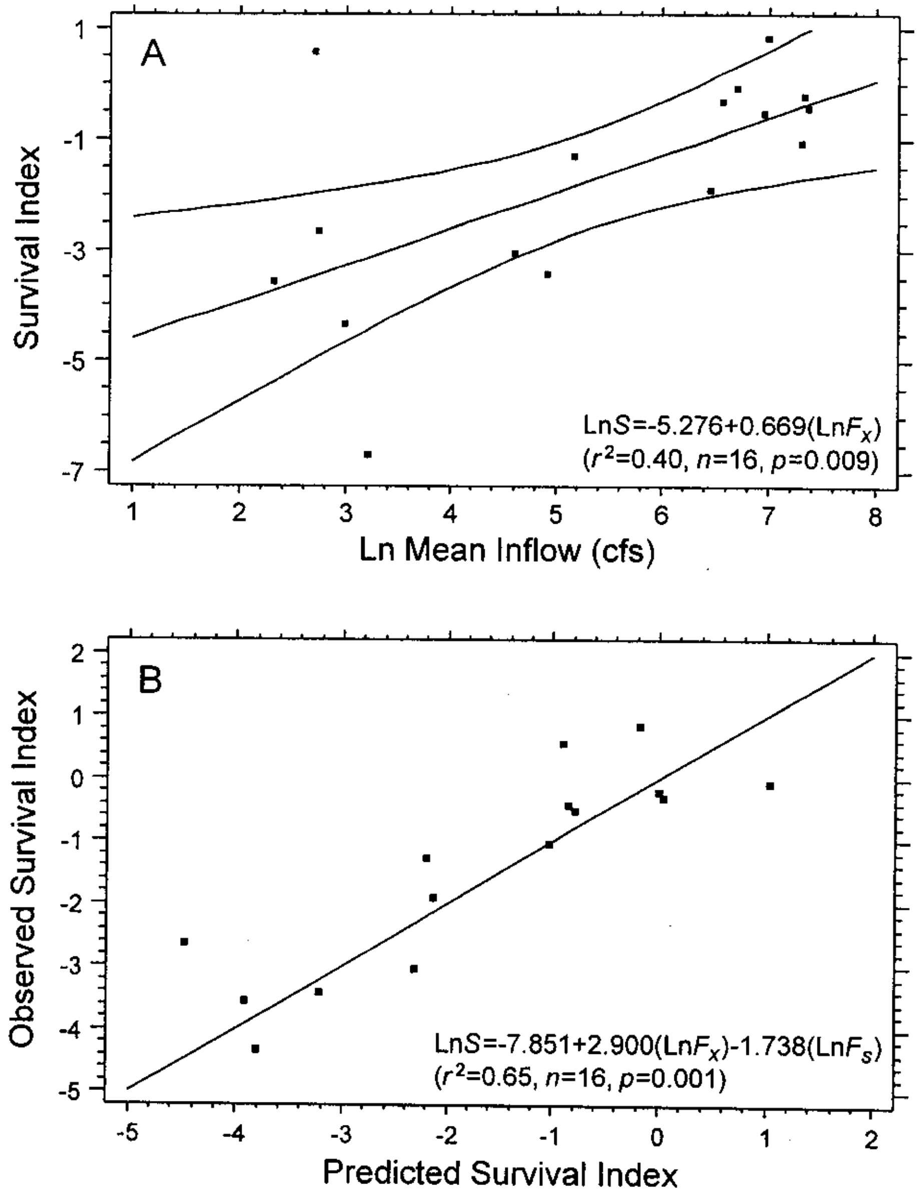

Fig. 3.8.2. (a) Regression of an index of bay anchovy survival (Ln*S*, the natural log of the ratio of adult number to juvenile number) against LnF_x, the natural log of the mean inflow (cfs) during the month prior to collection, with 95% confidence limits for predicted means, and (b) performance of a stepwise regression of Ln*S* against both LnF_x and LnF_s, the natural log of the standard deviation of the prior month's inflow.

Table 3.8.1. Abundance responses to freshwater inflow (ln *N* vs. ln *F*) into the tidal Manatee River, ranked by linear regression slope (*b*). Other regression statistics are sample size (*n*), intercept (*a*), slope probability (*p*) and fit (r^2, as %). *DW* identifies where serial correlation is possible (*x* indicates $p<0.05$ for Durbin-Watson statistic).

Gear	Taxon	Common Name	n	a	b	p	r^2	DW
pktn. net	decapod mysis larvae	shrimps and hermit crabs	17	24.342	-1.186	0.0002	61	x
pktn. net	chaetognaths, Sagitta spp.	arrow worms	16	22.488	-0.832	0.0039	46	
pktn. net	decapod megalopae	post-zoea crab larvae	16	20.322	-0.809	0.0094	39	
pktn. net	copepods calanoid	copepods	17	23.486	-0.755	0.0024	47	
pktn. net	appendicularian, Oikopleura dioica	larvacean	12	21.015	-0.704	0.0390	36	
pktn. net	Anchoa spp. preflexion larvae	anchovies	15	19.440	-0.644	0.0183	36	
pktn. net	cymothoid sp. a (Lironeca) juveniles	isopod	17	16.165	-0.282	0.0234	30	x
pktn. net	dipterans, chironomid larvae	midges	14	8.269	0.414	0.0212	37	
pktn. net	hirudinoideans	leeches	10	8.483	0.536	0.0292	47	
pktn. net	dipterans, pupae	flies, mosquitoes	17	7.479	0.907	0.0042	43	
pktn. net	dipteran, Chaoborus punctipennis	phantom midge larvae	11	5.579	1.119	0.0020	67	
pktn. net	copepods, freshwater cyclopoids	copepods	12	6.466	1.164	0.0048	57	

Table 3.8.2. Abundance responses (ln *N*) to the location of the 12 psu isohaline in the Manatee River, ranked by linear regression slope (*b*). Other regression statistics are sample size (*n*), intercept (*a*), slope probability (*p*) and fit (r^2, as %). *DW* identifies where serial correlation is possible (*x* indicates $p<0.05$ for Durbin-Watson statistic).

Gear	Taxon	Common Name	n	a	b	p	r^2	DW
pktn. net	dipteran, Chaoborus punctipennis	phantom midge larvae	11	13.857	-0.236	0.0241	45	
pktn. net	dipterans, pupae	flies, mosquitoes	17	14.636	-0.221	0.0014	50	
pktn. net	copepods, freshwater cyclopoids	copepods	12	14.877	-0.209	0.0191	44	
pktn. net	Palaemonetes pugio adults	daggerblade grass shrimp	13	11.373	-0.112	0.0184	41	x
pktn. net	dipterans, chironomid larvae	midges	14	11.503	-0.100	0.0149	40	
pktn. net	branchiurans, Argulus spp.	fish lice	14	12.349	-0.092	0.0395	31	
pktn. net	mysids, unidentified	opossum shrimps	17	19.548	-0.067	0.0236	30	
pktn. net	cymothoid sp. a (Lironeca) juveniles	isopod	17	13.636	0.090	0.0003	60	
pktn. net	isopods, sphaeromatid	isopods	16	9.853	0.100	0.0488	25	
pktn. net	gobiid flexion larvae	gobies	15	11.684	0.126	0.0073	44	
pktn. net	Anchoa spp. flexion larvae	anchovies	15	14.171	0.133	0.0340	30	
pktn. net	ostracods, unidentified	seed shrimps	15	12.598	0.155	0.0452	27	x
pktn. net	decapod zoeae	crab larvae	16	18.020	0.156	0.0075	41	
pktn. net	copepods, calanoid	copepods	17	17.792	0.166	0.0033	45	
pktn. net	Microgobius spp. postflexion larvae	gobies	14	12.069	0.169	0.0251	35	
pktn. net	Anchoa spp. preflexion larvae	anchovies	15	14.107	0.172	0.0045	48	
pktn. net	Anchoa mitchilli postflexion larvae	bay anchovy	15	12.526	0.179	0.0072	44	
pktn. net	Cynoscion arenarius preflexion larvae	sand seatrout	11	10.583	0.187	0.0189	48	
pktn. net	Microgobius spp. flexion larvae	gobies	12	10.723	0.196	0.0298	39	
pktn. net	appendicularian, Oikopleura dioica	larvacean	12	15.057	0.198	0.0029	60	
pktn. net	decapod megalopae	post-zoea crab larvae	16	13.358	0.232	0.0005	60	
pktn. net	chaetognaths, Sagitta spp.	arrow worms	16	15.424	0.233	0.0001	66	
pktn. net	decapod mysis larvae	shrimps and hermit crabs	17	14.833	0.300	0.0000	76	
pktn. net	Lucifer faxoni juveniles and adults	shrimp	15	12.433	0.357	0.0004	63	

Table 3.8.3. Abundance responses to the location of the 8 psu isohaline in Braden River, ranked by linear regression slope (*b*). Other regression statistics are sample size (*n*), intercept (*a*), slope probability (*p*) and fit (r^2, as %). *DW* identifies where serial correlation is possible (*x* indicates $p<0.05$ for Durbin-Watson statistic).

Gear	Taxon	Common Name	n	a	b	p	r²	DW
pktn. net	dipterans, pupae	flies, mosquitoes	13	11.466	-0.203	0.0064	51	
pktn. net	polychaetes	sand worms, tube worms	15	10.415	-0.128	0.0462	27	x
pktn. net	hirudinoideans	leeches	13	9.168	-0.086	0.0432	32	
pktn. net	Edotea triloba	isopod	17	12.286	0.136	0.0308	27	x
pktn. net	cymothoid sp. a (Lironeca) juveniles	isopod	17	11.291	0.197	0.0000	74	x
pktn. net	decapod zoeae	crab larvae	15	14.991	0.245	0.0164	37	
pktn. net	gobiid preflexion larvae	gobies	11	10.037	0.273	0.0136	51	
pktn. net	Gobiosoma spp. postflexion larvae	gobies	15	9.981	0.351	0.0015	55	
pktn. net	decapod megalopae	post-zoea crab larvae	14	11.474	0.405	0.0120	42	x

3.9 Inflow-Induced Predator-Prey Offsets

Many of the larger predatory fishes move landward during the late larval or early juvenile stages. As discussed in section 1.2, this migration coincides with the transition from small planktonic prey to larger prey types that are most abundant near estuarine headwaters. On Florida's west coast, this distinctive diet and habitat shift has been documented for a number of species, including snook (McMichael et al. 1989), red drum (Peters and McMichael 1987), and sand seatrout (Sheridan 1979, Peebles and Hopkins 1993). As prey organisms within tidal rivers shift their position in response to changing freshwater inflows, there is a possibility that the prey will become offset from the preferred structural habitat of their predators. Other predators shift with their prey, using their highly developed olfactory sense to locate prey concentrations (Gerking 1994).

Figure 3.9.1 compares monthly km_U values for three fish predators and their prey. Because each observation in the figure represents a single monthly survey, a maximum of 17 observations is possible for each histogram. For example, sand seatrout were collected during 13 of the 17 surveys, whereas mysids, amphipods, and bay anchovy juveniles were collected during all 17 surveys. Each month's collection is given equal weight in Fig. 3.9.1, regardless of the number of individuals collected, whereas the cumulative km_U values in Table A4 give each specimen equal weight. The three fish predators in Fig. 3.9.1 are estuarine-dependent species whose juvenile stages were repeatedly found to be most abundant within the tidal river rather than at the river mouth or in freshwater. Data for two principal prey types are presented for each predator, with the prey categories being representative of the predator length classes encountered in the seine or trawl collections.

The vast majority (82%) of red drum juveniles were in the 15-75 mm length class. Peters and McMichael (1987) examined the stomach contents of 460 red drum in this length range and found prey volumes to be strongly dominated by mysids and amphipods. Table 3.7.2 indicates that mysids exhibited dynamic response (as they do in most tidal rivers), but it is unclear whether red rum have a similar response. The juvenile red drum in the Manatee River were generally distributed in the same river reach as their mysid and amphipod prey (Fig. 3.9.1).

The sand seatrout catch was dominated (70%) by the 10-40 mm lengths that have a high mysid content in their diet (Sheridan 1979, Peebles and Hopkins 1993). Bay anchovies are an important secondary prey within this length range and become even more important at larger sizes (Darnell 1961, Sheridan 1979, Peebles and Hopkins 1993). In Fig. 3.9.1, sand seatrout appear to have had little offset from these two prey groups. In other tidal rivers, sand seatrout have been shown to exhibit dynamic response (Peebles 2002a,b), which would enable them to stay in the same river reach as their prey, even as prey distributions shift in response to changing inflow levels. A lack of affinity for structural habitat (e.g., shoreline vegetation) possibly gives this species more opportunity to associate directly with prey concentrations.

The cumulative km_U for snook was 20.8 km, which is within the braided portion of the Manatee River. Most of the snook collections (94%) involved juveniles >45 mm that had already switched from a mysid-dominated diet to one that is largely composed of daggerblade grass shrimp (*Palaemonetes pugio*) and a diversity of estuarine-resident and estuarine-dependent fishes, including the diamond killifish (*Adinia xenica*), bay anchovy (*Anchoa mitchilli*), menhaden (*Brevoortia* spp.), sheepshead minnow (*Cyprinodon variegatus*), striped killifish (*Fundulus majalis*), eastern mosquitofish (*Gambusia holbrooki*), rainwater killifish (*Lucania parva*), silversides (*Menidia* spp.), and sailfin molly (*Poecilia latipinna*)(McMichael et al. 1989). Dynamic response was not evident for juvenile snook, yet three known prey types did exhibit dynamic response (daggerblade grass shrimp, menhaden, and silversides, Table 3.7.2). While extrapolation of these responses suggests that these prey types could move upstream of the snook habitat during very low inflows, the distributions of snook and their prey generally coincided during the survey period (Fig. 3.9.1, Table A2).

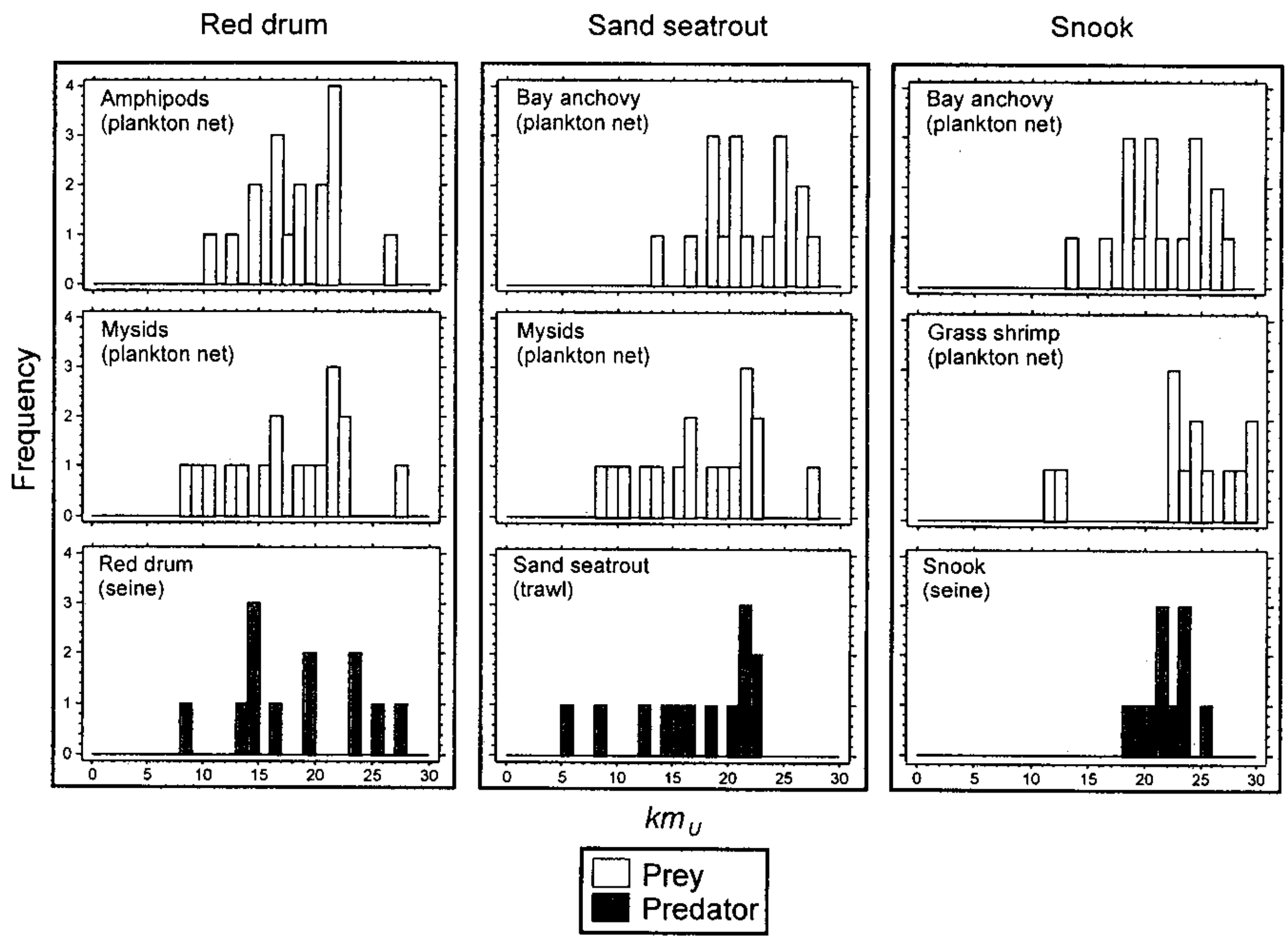

Fig. 3.9.1. Comparison of km_U frequencies among three fishes and their prey.

3.10 Bay Anchovy Growth Responses to Freshwater Inflow

Growth rate varied substantially as a function of age (Fig. 3.10.1), despite imitation of the analysis to a 10 mm length range. Within this rather narrow length range, metamorphosis caused growth-in-length rates to vary from >0.8 mm/d in younger specimens to <0.4 mm/d in older specimens. Without correction for age-related variation in growth-in-length, temporal comparisons among samples with even slightly different age structures would have been misleading.

Residual growth rates (rates that exclude the effects of metamorphosis) are compared with the inflow hydrograph in Fig. 3.10.2. There was good agreement between the timing of events in the hydrograph and apparent growth responses. Growth rates decreased during each of the three dry periods, with the extent of the decreases being roughly proportionate to the length of the dry period. Growth rates recovered after resumption of inflows in all cases. As the inflow events became larger and more closely spaced, growth rates increased to the highest levels observed.

Fish that spent their entire lives during dry periods had significantly slower growth rates (Table 3.10.1, Fig. 3.10.3). Fast growth is desirable because it reduces the time spent at small sizes, therein reducing predation risk. Growth and mortality rates are considered to be the primary determinants of habitat selection from the standpoint of both an individual's behavior and the selective forces that lead the evolution of life history patterns such as estuarine dependence (Werner et al. 1983, Rowe and Ludwig 1991, Peebles 1996).

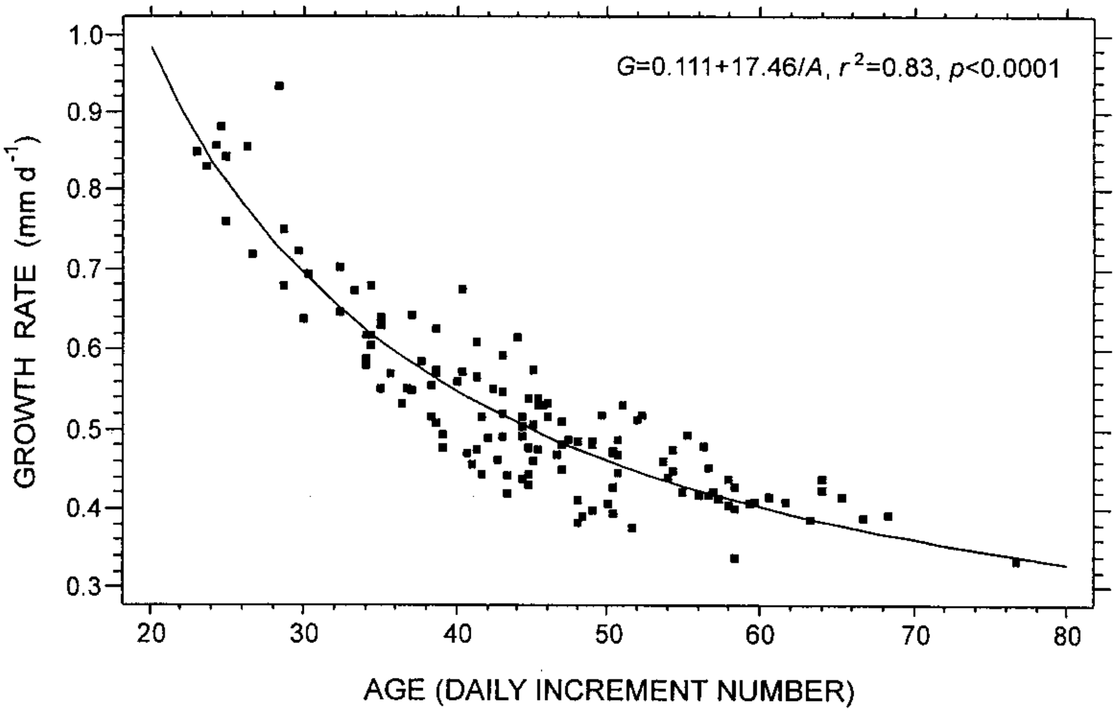

Fig. 3.10.1. Variation in the rate of growth-in-length at ages coinciding with metamorphosis (body deepening)

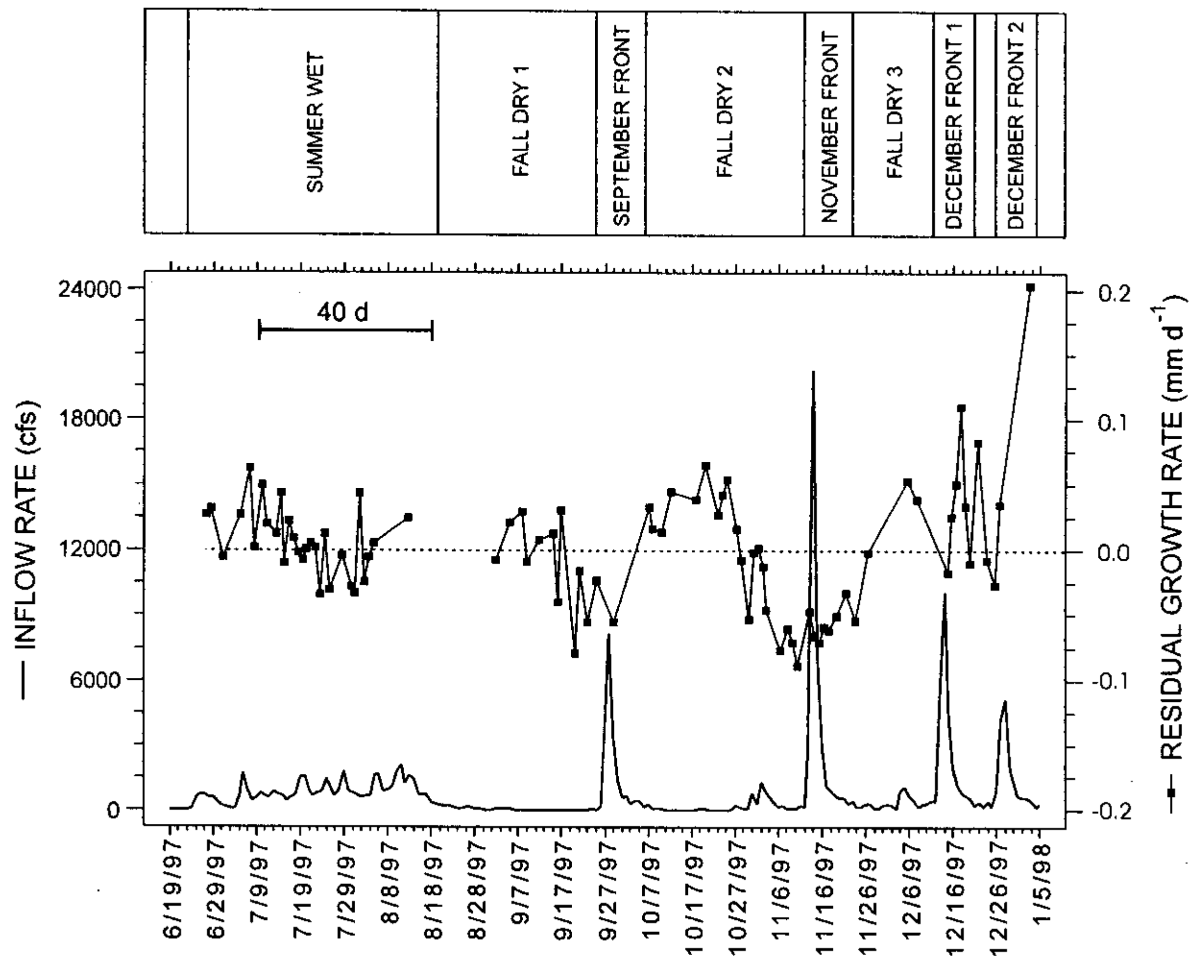

Figure 3.10.2. Temporal trends in total freshwater inflow and the residual growth rate of bay anchovy juveniles. Residual growth rates obtained from the regression in Fig. 3.10.1 were sequenced by hatching date and then lagged forward by 40 d, the mean age (number of daily growth increments) of the specimens in the analysis.

Table 3.10.1. Multiple range tests (95% Fisher's LSD) for residual growth rate by lifetime mean inflow rate. The vertical alignment of X's identifies statistical similarity and dissimilarity among inflow levels (see Fig. 3.10.3).

Lifetime Mean Inflow Rate (cfs)	Sample Size	Mean Residual Growth Rate (mm d^{-1})	Homogeneous Groups
200-299	19	-0.016	XXX
300-399	23	-0.009	X
400-499	17	-0.008	XXX
500-599	30	-0.016	XX
600-699	15	0.011	XXX
700-799	6	0.019	XX
>799	22	0.039	X

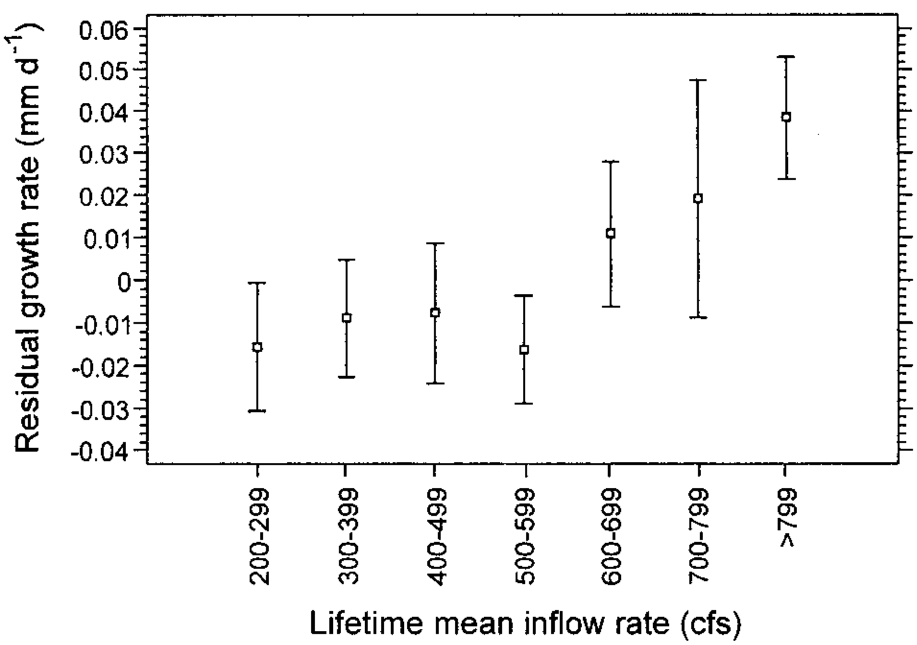

Fig. 3.10.3. Variation in residual growth rate (95% Fisher's LSD) as a function of exposure to different freshwater inflow levels

Preservation appeared to have a minimal effect on the observed variation in growth rate. Although soft tissues dehydrated under the osmotic pressure of 95% ethanol, an average *increase* of 2% was found in skeletal length after 14 d in this preservative. The lengthening of skeletal tissue continued to a maximum of 5% at some point between 14 d and 28 months, at which time additional measurements indicted that lengths had become stable. Because all specimens used in the growth analysis were measured within 14 d of capture, the effect of preservation on length would have been <2%. A 2% increase would result in an error in the mean growth rate (0.52 mm d^{-1}) of 0.01 mm d^{-1}, which is an order of magnitude less than the >0.2 mm d^{-1} (>30%) variation in mean growth rate that was sometimes observed among months. Individual growth rates were not correlated with water temperature (Pearson correlation, $p>0.05$).

4.0 CONCLUSIONS

4.1 Descriptive Observations

1). **Dominant Catch.** The fish assemblage collected by the plankton net was dominated by the bay anchovy, gobies (primarily *Gobiosoma* spp., *Microgobius* spp. and *Bathygobius soporator*), menhaden, sand seatrout, silver perch, pinfish, silversides (*Menidia* spp.) and hogchoker, and its invertebrate catch was dominated by larval crabs and shrimps, arrow worms, mysids, the planktonic shrimp *Lucifer faxoni*, and ctenophores. Water released by the Ward Lake dam was distinctive in having large numbers of phantom midge larvae (*Chaoborus punctipennis*) and freshwater cyclopoid copepods (primarily *Mesocyclops edax*). Higher salinities near the mouth of the Manatee River had their own distinctive assemblage consisting of such organisms as the larvacean *Oikopleura dioica*, chaetognaths, the cladoceran *Penilia avirostris*, the cumacean *Cyclaspis varians*, *Lucifer faxoni*, and the calanoid copepods *Acartia tonsa* and *Labidocera aestiva*. Shoreline seine collections were dominated by the bay anchovy, menhaden, silversides, pinfish, mojarras (*Eucinostomus* spp.), eastern mosquitofish, spot, rainwater killifish and the hogchoker. The trawl catch from the channel was dominated by the bay anchovy, sand seatrout, silver perch, and pink shrimp.

2.) **Use of Area as Spawning Habitat.** Fishes that spawned very near or within the lower Manatee River, as indicated by the presence of eggs or early-stage larvae, were the bay anchovy, striped anchovy, Atlantic thread herring, scaled sardine, silversides (*Menidia* spp.), rough silverside, killifishes (*Fundulus* spp.) searobins (*Prionotus* spp.), silver perch, sand seatrout, spotted seatrout, kingfishes (*Menticirrhus* spp.), mojarras (gerreids), blennies (primarily *Chasmodes saburrae*), several species of goby (primarily *Gobiosoma* spp. and *Microgobius* spp., but also *Bathygobius soporator*), skilletfish, lined sole and hogchoker. Live-bearers that release young into this area include the eastern mosquitofish, sailfin molly, lined seahorse, chain pipefish, gulf pipefish and dusky pipefish.

3.) **Use of Area as Nursery Habitat.** Estuarine-dependent fishes and invertebrates that congregated within the tidal river during the juvenile stage included the bay anchovy, yellowfin menhaden, gulf menhaden, ladyfish, snook, red drum, spotted seatrout, sand seatrout, southern kingfish, striped mullet, hogchoker, blue crab and pink shrimp. All of these organisms were detected as larvae entering the tidal river, except for the snook, striped mullet and blue crab. Using seine and trawl data, the juvenile nursery habitats for selected species were characterized as:

- **snook** - shoreline with emergent vegetation and mud bottom at locations with strongly reduced salinities
- **sand seatrout** - mud-bottomed areas of the open river channel with reduced salinities
- **spotted seatrout** - vegetated shoreline with either sand or mud bottom and reduced salinities
- **red drum** - vegetated shoreline with primarily mud bottom and strongly reduced salinities

4.) **Seasonality.** The number of fish taxa present in the plankton-net catch increased during spring and decreased during fall, being generally highest during spring and early summer and lowest during winter. Invertebrate richness in the plankton collections was also lowest during winter. As with the plankton data, a springtime increase in number of fish species was evident in the seine data. However, the fall decrease that was observed for larval fishes was not observed in the seine catch because older juveniles remained within the tidal river long after the larval recruitment for their species had diminished. The period from April to June would appear to have the highest potential for impact due to the coupling of naturally low inflows with increasing use of the estuary as nursery habitat. Some species, such as red drum and menhaden, spawn in fall or winter. There is therefore no time of year when the potential for impacting economically important species is absent.

4.2 Responses to Freshwater Inflow

1.) **Distribution Shifts.** Distribution responses to freshwater inflow were found for 16 taxa of fishes and invertebrates. Most of these taxa (75%) moved upstream with decreasing inflow. The location of reference isohalines served as superior indicators of organism position, producing 33 significant relationships, of which 91% indicated upstream movement as reference isohalines moved upstream. Although most of these responses had the same direction, the distributions of different organisms were staggered within the tidal river relative to each other, such that some were generally farther upstream than others.

2.) **Abundance and Survival Responses.** Positive and negative abundance responses to freshwater inflow were documented for 12 taxa of fishes and invertebrates in the Manatee River. All positive responses to high inflow were by freshwater organisms that shifted downstream during high-inflow periods, increasing their total numbers within the tidal river. Negative responses to inflow were found for high-salinity organisms that left the tidal rivers during high-inflow periods. As with the distribution shifts, reference isohaline location provided a superior indication of response to inflow, producing 24 abundance responses for the Manatee River and 9 responses for the Braden river. Positive abundance responses were found for mysids (opossum shrimps) and adult daggerblade grass shrimp, both of which serve as important prey for estuarine-dependent fishes in tidal river nursery habitats. Reduction in numbers of these organisms during low-inflow periods is very likely to reduce the carrying capacities of the Manatee River and Braden River for snook, red drum, sand seatrout, spotted seatrout and other species. High inflows were related to significant improvement in bay anchovy survival in the tidal-river nursery habitat.

3.) **Predator-Prey Offsets.** Inflow-induced movement of keystone prey groups relative to the fixed structural habitats preferred by certain fishes could possibly cause prey distributions to become offset upstream or downstream of their fish predators, reducing the carrying capacity of the tidal river for these fishes. Predator-prey offset was not evident during the survey period, although the potential would exist during drier periods, particularly for snook.

4.) **Bay Anchovy Growth Response.** Juvenile bay anchovies that had exposure to higher freshwater inflows grew faster than those with exposure to low inflows or droughts. This response was evident in time-series plots and in statistical tests.

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6.0 LIST OF SYMBOLS

CPUE	Catch-per-unit-effort, where catch is the number of individuals collected during a specified effort, which is the volume filtered by a plankton net or the effort associated with a standard seine or trawl deployment. In the case of the plankton net, *CPUE* and *density* (individuals per volume filtered) are identical. *CPUE* is alternately represented by the symbol *U*.
F	Freshwater inflow, in cubic feet per second (cfs), estimated from both gauged and ungauged flows.
I	The location of a reference isohaline, in km from the river's mouth. A numeric subscript identifies the value of the reference isohaline, in psu.
km_U	The central geographic tendency in *CPUE*, in km from the river's mouth. km_U is calculated as a *CPUE*-weighted mean location of capture, in km.
N	The estimated total number of individuals of a given taxon within the study area during a given survey, calculated by multiplying taxon density by the volume of water represented by the collections.
S	Salinity, in practical salinity units (psu).
SAV	Submerged aquatic vegetation (seagrasses)
S_U	The central tendency in a taxon's salinity distribution, calculated as the *CPUE*-weighted mean salinity at capture, in psu.
U	Alternate designation for *CPUE*.
V	The volume of water (m^3) in a sampling zone, corrected for water level at the time of sampling.

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APPENDIX A

DATA SUMMARY TABLES

Table A1. Electronic meter summary statistics during plankton net deployment. Mean depth is mean depth at deployment.

Location (km from mouth)	Mean Depth (m)	Salinity (psu)					Water Temperature (°C)					Dissolved Oxygen (mg/l)					pH				
		n	mean	std. dev.	min.	max.	*n*	mean	std. dev.	min.	max.	*n*	mean	std. dev.	min.	max.	*n*	mean	std. dev.	min.	max.
Manatee River																					
0.9	2.8	61	23.0	8.3	0.1	33.2	61	25.2	4.6	16.4	30.6	61	7.0	1.2	4.6	9.4	54	7.7	0.3	7.1	8.5
4.0	3.0	65	21.3	8.2	0.0	33.1	65	25.0	4.7	16.4	30.8	65	7.0	1.2	4.7	9.3	58	7.8	0.3	7.3	8.5
5.4	2.9	66	20.5	8.0	0.3	32.8	66	25.2	4.9	16.2	30.9	66	6.9	1.2	4.4	9.4	59	7.8	0.3	7.2	8.4
7.5	2.7	61	19.8	8.1	0.2	32.2	61	25.2	4.9	16.1	31.1	61	6.8	1.1	4.0	9.4	55	7.7	0.2	7.4	8.4
10.2	2.6	59	17.5	8.7	0.0	31.4	59	25.3	4.8	15.6	31.8	59	6.9	1.6	4.2	10.7	52	7.7	0.2	7.3	8.4
12.4	2.5	54	16.7	8.6	0.0	31.0	54	25.8	4.8	15.8	32.0	51	6.6	1.4	3.6	9.4	48	7.7	0.3	7.2	8.4
13.7	2.3	50	14.6	9.0	0.0	30.5	50	25.5	4.8	15.9	31.9	47	6.7	1.6	3.3	9.7	43	7.7	0.2	7.2	8.2
15.3	2.1	50	13.5	9.1	0.0	30.2	50	25.3	4.8	16.4	31.9	46	6.7	1.6	3.2	9.0	45	7.6	0.3	7.0	8.1
18.2	1.9	45	10.6	8.0	0.0	27.0	45	25.5	4.3	16.9	31.1	45	6.6	1.5	4.2	9.0	40	7.6	0.3	6.9	8.3
20.0	1.8	43	9.4	8.2	0.0	26.2	43	25.2	4.4	16.8	30.9	43	6.5	1.6	4.2	9.0	38	7.5	0.3	6.7	8.3
22.3	1.6	43	6.6	7.2	0.0	23.1	43	25.1	4.3	16.4	31.3	43	6.4	1.6	4.1	9.3	38	7.5	0.4	6.7	8.5
25.1	2.2	39	4.2	6.0	0.0	20.6	39	24.8	4.5	16.0	30.9	39	6.5	1.4	4.1	9.2	36	7.4	0.3	6.6	8.2
27.5	1.6	34	2.9	4.7	0.0	16.0	34	25.3	4.2	16.8	31.1	34	6.7	1.8	3.7	10.3	31	7.5	0.4	6.7	8.2
29.8	1.7	36	2.3	4.1	0.0	12.0	36	25.1	4.1	17.0	31.0	36	6.7	1.6	3.3	9.4	32	7.5	0.4	6.6	8.6
Braden River																					
0.3	1.8	46	13.4	8.1	0.0	29.7	46	26.3	4.6	16.7	31.9	46	6.1	1.5	2.9	8.6	42	7.5	0.3	7.0	8.0
1.2	1.4	31	12.2	8.7	0.0	29.7	31	26.1	4.5	16.4	31.5	31	5.9	1.7	2.8	9.1	27	7.5	0.2	7.2	7.9
2.6	1.7	46	9.9	8.8	0.0	27.8	46	26.0	4.2	16.8	31.2	46	5.9	1.6	2.7	8.4	42	7.5	0.2	7.2	8.0
4.0	1.6	27	7.0	8.0	0.0	26.6	27	25.9	4.3	16.7	30.9	27	6.0	1.7	3.1	8.3	25	7.5	0.2	7.1	8.0
5.1	1.5	36	7.0	8.4	0.0	26.3	36	25.8	4.3	17.1	30.9	36	6.2	1.6	3.3	8.8	32	7.4	0.3	7.0	8.1
6.6	1.6	38	6.6	8.0	0.0	25.4	38	25.6	4.4	17.2	31.2	38	6.2	1.5	4.0	9.0	34	7.4	0.2	7.1	8.1
8.0	1.8	43	6.4	8.3	0.0	25.3	43	25.3	4.5	17.5	31.0	43	6.3	1.5	3.3	8.4	38	7.4	0.2	7.0	8.0
8.6	1.7	40	5.7	7.5	0.0	24.7	40	25.3	4.6	17.1	31.4	40	6.3	2.1	0.4	9.2	36	7.5	0.3	7.0	8.0

Plankton-net catch statistics for the Manatee River (n=238). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./10^3 m^3)	Max CPUE (No./10^3 m^3)
Nemopsis sp.	hydromedusa	1,907	64	16.3	19.4	115.16	9339.38
Aurelia aurita	moon jellyfish	2	1	22.3	23.1	0.10	23.69
Mnemiopsis mccradyi	comb jelly, ctenophore	133,760	40	14.4	19.6	8321.44	146837.46
Beroe ovata	sea walnut, ctenophore	13	5	12.0	24.9	0.63	53.05
turbellarians	flatworms	5	5	8.0	15.7	0.24	13.81
nemerteans	ribbon worms	1	1	13.7	12.4	0.04	10.58
polychaetes	sand worms, tube worms	1,624	101	12.3	13.1	96.09	4339.54
oligochaetes	freshwater worms	108	24	21.4	3.0	5.04	173.79
hirudinoideans	leeches	159	27	22.4	6.4	7.70	583.71
Limulus polyphemus larvae	horsehoe crab	50	21	3.8	14.9	2.27	81.53
acari	water mites	18	12	24.1	0.0	0.75	32.88
pycnogonids	sea spiders	53	1	10.2	25.8	4.64	1104.07
coleopterans, curculionid adults	beetles	5	4	24.9	6.6	0.24	21.48
coleopterans, dytiscid larvae	predaceous diving beetles	6	3	24.9	0.2	0.24	26.53
coleopterans, dytiscid adults	predaceous diving beetles	7	6	24.9	0.0	0.30	20.71
coleopterans, elmid larvae	riffle beetles	6	6	26.7	0.0	0.25	11.03
coleopterans, elmid adults	riffle beetles	6	6	27.9	0.3	0.27	12.13
coleopterans, gyrinid adults	whirligig beetles	7	2	28.0	0.0	0.30	43.84
coleopterans, noterid adults	burrowing water beetles	7	6	23.5	0.4	0.29	18.64
coleopterans, scirtid larvae	marsh beetles	2	2	27.7	0.0	0.08	10.96
dipterans, pupae	flies, mosquitoes	6,516	74	20.6	0.6	306.97	36750.28
dipterans, ceratopogonid larvae	biting midges	2	2	28.6	0.0	0.09	11.78
dipteran, Chaoborus punctipennis larvae	phantom midge	1,732	60	24.0	0.1	71.36	6636.76
dipterans, chironomid larvae	midges	355	42	27.0	0.6	15.35	742.88
dipterans, simuliid larvae	black flies	11	3	29.2	0.0	0.50	86.18
ephemeropteran larvae	mayflies	182	26	26.9	0.0	8.00	848.22
ephemeropteran larvae, potamanthid	mayflies	4	4	24.2	0.0	0.17	10.77
heteropterans, corixid juveniles	water boatmen	9	7	25.9	0.2	0.39	21.95
heteropterans, corixid adults	water boatmen	12	9	27.5	0.2	0.55	48.54
heteropterans, gerrid adults	water striders	14	4	29.4	0.2	0.62	75.37
heteropterans, pleid adults	pygmy backswimmers	3	3	25.9	0.0	0.11	9.67
lepidopterans, pyralid larvae	aquatic caterpillars	2	2	28.6	0.0	0.09	11.78
neuropteran, Climacia spp. larvae	spongillaflies	1	1	29.8	0.0	0.05	10.96
odonates, anisopteran larvae	dragonflies	1	1	29.8	1.6	0.05	12.06
odonates, zygopteran larvae	damselflies	26	10	25.0	0.7	1.05	54.24
trichopteran larvae	caddisflies	31	15	25.9	0.0	1.37	51.65
cladocerans, daphniid	water fleas	9,382	38	23.6	0.0	402.73	13587.35
cladocerans, Bosminiopsis spp.	water fleas	719	8	13.3	0.0	29.39	2333.01
cladocerans, Ilyocryptus spp.	water fleas	16	9	21.2	0.4	0.68	46.90
cladocerans, Diaphanosoma spp.	water fleas	144	20	24.7	0.0	6.46	385.34
cladoceran, Penilia avirostris	water flea	36,529	26	2.2	27.6	2142.17	293449.40
cladocerans, Euryalona spp.	water fleas	2	2	28.7	0.0	0.09	10.77
cladoceran, Evadne tergestina	water flea	1,550	22	7.2	23.9	94.51	8604.55
ostracods, unidentified	seed shrimps	4,284	70	12.2	20.7	446.17	44768.14
branchiurans, Argulus spp.	fish lice	108	36	23.9	4.6	5.91	216.02
cirriped nauplius stage	barnacles	115,273	42	5.3	26.8	8800.81	316755.39
cirriped cypris stage	barnacles	91	9	2.6	27.4	5.62	909.31
copepods, calanoid	copepods	424,398	164	5.7	25.0	23928.22	518305.57
copepods, harpacticoid	copepods	22	4	16.9	4.9	0.84	129.11
copepods, freshwater cyclopoids	copepods	7,076	64	27.1	0.1	313.84	28876.58
Oithona spp.	copepods	640	9	3.4	20.7	37.95	2938.56
Monstrilla sp.	copepod	72	5	17.5	27.0	4.27	567.32
Caligus spp.	copepods	307	52	7.2	27.2	20.19	1215.67
stomatopod, Squilla empusa larvae	mantis shrimp	30	9	7.9	26.4	1.69	156.97
amphipods, gammaridean	scuds, beachhoppers	57,534	193	19.6	9.4	2799.04	92405.79
amphipods, caprellid	skeleton shrimps	12	4	15.1	10.3	0.89	173.79
cumaceans	cumaceans	84,019	141	11.7	22.4	5714.87	250412.11
isopods, unidentified	isopods	1	1	7.5	26.6	0.05	10.89
Cyathura polita	isopod	1,814	55	22.7	12.7	94.68	4922.58
Munna reynoldsi	isopod	1,083	17	11.4	25.3	56.92	10074.69
epicaridean larvae	isopods	111	5	11.0	27.1	7.99	1215.67
Probopyrus sp. (attached)	isopod	12	9	26.4	4.0	0.59	35.20

Plankton-net catch statistics for the Manatee River (n=238). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./10³ m³)	Max CPUE (No./10³ m³)
Anopsilana jonesi	isopod	7	6	19.6	6.2	0.30	17.69
cymothoid sp. a (Lironeca) juveniles	isopod	3,444	175	19.2	12.9	186.20	3802.97
Serolis mcgrayi	isopod	2	2	0.9	24.2	0.12	16.95
isopods, sphaeromatid	isopods	448	53	26.6	7.4	21.91	1203.84
Edotea triloba	isopod	47,413	123	23.4	6.0	2234.04	227834.43
Erichsonella attenuata	isopod	18	14	5.7	20.2	0.87	49.25
mysids, unidentified	opposum shrimps	179,115	206	19.8	5.7	8558.26	313095.47
tanaids, unidentified	tanaids	358	39	24.4	2.8	15.97	1095.76
decapod zoeae	crab larvae	883,287	187	12.9	22.1	61420.20	8001906.31
decapod mysis larvae	shrimps and hermit crabs	340,953	169	8.2	25.3	22345.21	471944.32
decapod megalopae	post-zoea crab larvae	32,192	145	9.4	23.2	1875.35	75258.65
penaeid postlarvae	penaeid shrimps	4	3	16.0	10.1	0.18	21.40
penaeid metamorphs	penaeid shrimps	376	55	11.5	17.9	26.17	924.04
Farfantepenaeus duorarum juveniles	pink shrimp	62	16	15.8	12.2	3.11	250.07
Rimapenaeus spp. juveniles	shrimps	1	1	0.9	24.1	0.06	13.30
sicyoniid juveniles	rock shrimps	3	2	2.1	20.5	0.16	22.81
Sicyonia laevigata juveniles	rock shrimp	1	1	4.0	23.0	0.04	10.53
Lucifer faxoni juveniles and adults	shrimp	148,622	84	4.2	29.5	10352.34	273737.76
Acetes americanus postlarvae	shrimp	1	1	5.4	27.0	0.06	14.04
Acetes americanus adults	shrimp	1	1	5.4	14.4	0.05	11.96
Palaemonetes spp. postlarvae	grass shrimp	1,872	40	17.7	20.7	108.13	7004.53
Palaemonetes pugio juveniles	daggerblade grass shrimp	331	69	16.1	14.6	20.36	669.93
Palaemonetes pugio adults	daggerblade grass shrimp	91	29	25.8	1.9	4.29	187.74
Periclimenes spp. postlarvae	shrimps	31	6	3.1	27.5	1.76	243.59
Periclimenes spp. juveniles	shrimps	63	8	5.8	21.5	4.55	485.12
Periclimenes spp. adults	shrimps	1	1	4.0	25.6	0.06	13.17
alphaeid postlarvae	snapping shrimps	93	12	2.8	25.5	5.70	487.17
alphaeid juveniles	snapping shrimps	22	6	3.9	23.6	1.95	207.91
Leptalpheus forceps juveniles	snapping shrimp	4	2	14.8	5.2	0.19	34.59
Tozeuma carolinense postlarvae	arrow shrimp	131	9	2.3	29.6	7.87	945.69
Tozeuma carolinense juveniles	arrow shrimp	24	2	2.1	24.8	2.41	346.52
Tozeuma carolinense adults	arrow shrimp	2	1	4.0	23.0	0.09	21.06
Ogyrides alphaerostris juveniles and adults	estuarine longeye shrimp	7	7	8.6	23.0	0.42	21.86
Upogebia spp. postlarvae	mud shrimps	409	23	6.6	27.1	25.56	1029.76
Upogebia spp. juveniles	mud shrimps	1	1	10.2	20.5	0.06	13.20
Upogebia affinis juveniles	coastal mud shrimp	192	2	7.5	32.2	15.52	3666.30
paguroid juveniles	hermit crabs	14	3	1.5	24.6	1.29	277.21
majid juveniles	spider crabs	2	1	0.9	25.8	0.09	21.19
Callinectes sapidus juveniles	blue crab	63	33	17.4	7.0	2.96	54.36
xanthid juveniles	mud crabs	11	8	16.1	10.0	0.57	34.43
xanthid adults	mud crabs	1	1	20.0	0.0	0.04	9.01
grapsid juveniles	crabs	3	1	7.5	21.2	0.15	36.61
pinnotherid postlarvae	pea crabs	8	4	4.7	27.2	0.44	57.31
pinnotherid juveniles	pea crabs	354	22	9.8	27.0	26.29	1354.23
Pinnotheres maculatus juveniles	squatter pea crab	3	2	1.8	28.1	0.17	28.66
pelecypods	clams, mussels, oysters	7,701	112	15.6	14.3	439.60	11557.35
gastropods, opisthobranch	sea slugs	15	11	10.7	20.5	0.75	47.98
gastropods, prosobranch	snails	46,560	147	9.9	22.7	2956.47	151617.21
Lolliguncula brevis juveniles	bay squid	23	12	8.2	27.0	1.53	169.51
ophiuroidean juveniles	brittlestars	87	5	1.0	26.0	6.18	1407.22
appendicularian, Oikopleura dioica	larvacean	20,748	43	3.0	27.0	1274.83	79330.98
Branchiostoma floridae	lancelet	10	7	1.9	24.9	0.56	50.86
chaetognaths, Sagitta spp.	arrow worms	132,022	100	7.1	26.8	8329.03	154265.30
Elops saurus postflexion larvae	ladyfish	4	2	18.2	1.9	0.19	33.94
Myrophis punctatus postflexion larvae	speckled worm eel	2	1	0.9	16.4	0.10	23.81
Myrophis punctatus juveniles	speckled worm eel	9	4	5.2	8.6	0.38	31.61
clupeid eggs	herrings	3	1	13.7	30.5	0.28	65.59
clupeid preflexion larvae	herrings	274	1	0.9	30.6	19.03	4530.04
clupeid flexion larvae	herrings	2	1	0.9	23.7	0.11	25.32
Brevoortia spp. flexion larvae	menhaden	1	1	20.0	0.0	0.04	10.52
Brevoortia spp. postflexion larvae	menhaden	254	26	19.0	0.8	11.45	893.86
Brevoortia spp. metamorphs	menhaden	1,853	33	25.5	3.3	90.52	4459.10

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Brevoortia patronus juveniles	gulf menhaden	11	5	26.4	6.8	0.51	50.65
Brevoortia smithi juveniles	yellowfin menhaden	274	26	24.2	5.1	13.54	481.07
Dorosoma petenense preflexion larvae	threadfin shad	8	5	26.3	0.0	0.37	44.11
Dorosoma petenense metamorphs	threadfin shad	1	1	29.8	0.0	0.05	10.96
Dorosoma petenense juveniles	threadfin shad	6	5	25.7	2.1	0.29	23.47
Harengula jaguana eggs	scaled sardine	3	1	10.2	31.4	0.36	84.75
Harengula jaguana flexion larvae	scaled sardine	103	2	2.4	29.6	7.50	909.31
Harengula jaguana postflexion larvae	scaled sardine	5	1	0.9	23.7	0.27	63.31
Harengula jaguana metamorphs	scaled sardine	1	1	0.9	26.1	0.07	16.95
Opisthonema oglinum eggs	Atlantic thread herring	59	2	9.6	31.0	6.28	1356.07
Opisthonema oglinum flexion larvae	Atlantic thread herring	4	1	4.0	27.4	0.21	50.38
Opisthonema oglinum postflexion larvae	Atlantic thread herring	3	2	4.0	29.5	0.17	25.19
Sardinella aurita postflexion larvae	Spanish sardine	1	1	0.9	23.7	0.05	12.66
Anchoa spp. preflexion larvae	anchovies	13,521	75	5.1	24.2	720.64	35664.74
Anchoa spp. flexion larvae	anchovies	5,664	95	4.8	23.6	297.57	20703.68
Anchoa hepsetus eggs	striped anchovy	56	9	1.6	25.5	3.08	265.91
Anchoa hepsetus postflexion larvae	striped anchovy	27	10	6.6	25.0	1.61	188.94
Anchoa hepsetus juveniles	striped anchovy	7	5	5.7	25.0	0.37	34.69
Anchoa mitchilli eggs	bay anchovy	50,755	21	4.5	15.9	2563.86	182519.72
Anchoa mitchilli postflexion larvae	bay anchovy	3,355	104	6.9	24.8	212.09	10690.17
Anchoa mitchilli juveniles	bay anchovy	15,468	165	23.0	4.9	759.30	38767.64
Anchoa mitchilli adults	bay anchovy	835	96	15.0	9.8	38.07	961.89
Anchoa cubana adults	Cuban anchovy	2	2	4.1	6.4	0.08	10.19
Notropis spp. flexion larvae	minnows	1	1	29.8	0.0	0.05	12.13
Ameiurus catus juveniles	white catfish	11	6	28.2	0.1	0.48	32.88
Ictalurus punctatus juveniles	channel catfish	1	1	25.1	0.1	0.05	11.30
Synodus foetens postflexion larvae	inshore lizardfish	1	1	5.4	27.0	0.06	14.04
Gobiesox strumosus preflexion larvae	skilletfish	162	29	6.4	28.0	9.85	1029.76
Gobiesox strumosus flexion larvae	skilletfish	192	20	18.4	23.7	10.68	1713.78
Gobiesox strumosus postflexion larvae	skilletfish	140	21	19.1	15.2	6.99	465.97
Gobiesox strumosus juveniles	skilletfish	100	23	16.1	15.7	4.87	240.73
Hyporhamphus unifasciatus postflexion larvae	silverstripe halfbeak	3	2	5.4	22.6	0.14	20.80
Strongylura spp. postflexion larvae	needlefishes	4	4	25.1	5.2	0.18	11.39
Strongylura marina juveniles	Atlantic needlefish	2	2	23.7	6.8	0.09	11.15
Fundulus spp. postflexion larvae	killifishes	1	1	27.5	0.9	0.05	10.98
Lucania parva postflexion larvae	rainwater killifish	7	3	28.5	7.0	0.31	32.55
Lucania parva juveniles	rainwater killifish	143	12	28.9	10.8	6.96	996.80
Lucania parva adults	rainwater killifish	12	6	27.9	9.5	0.56	49.84
Gambusia holbrooki juveniles	eastern mosquitofish	11	10	26.9	0.3	0.48	18.08
Gambusia holbrooki adults	eastern mosquitofish	2	2	29.8	1.3	0.10	12.06
Poecilia latipinna juveniles	sailfin molly	6	4	27.9	0.3	0.28	35.20
Menidia spp. preflexion larvae	silversides	41	23	26.3	1.5	1.93	62.82
Menidia spp. flexion larvae	silversides	2	2	17.1	12.9	0.09	11.65
Menidia spp. postflexion larvae	silversides	5	5	25.7	3.7	0.23	12.28
Menidia beryllina juveniles	inland silverside	476	53	26.5	2.7	24.44	956.70
Menidia beryllina adults	inland silverside	8	7	22.3	4.0	0.40	21.10
Membras martinica preflexion larvae	rough silverside	6	4	6.2	21.9	0.28	31.20
Membras martinica flexion larvae	rough silverside	4	4	6.2	25.5	0.20	12.66
Membras martinica postflexion larvae	rough silverside	3	3	12.6	22.2	0.14	11.32
Labidesthes sicculus preflexion larvae	brook silverside	1	1	27.5	0.0	0.04	10.36
Fish eggs, percomorph	sciaenid eggs (primarily)	37,731	71	7.0	24.5	2352.22	111359.72
Hippocampus erectus juveniles	lined seahorse	8	6	4.4	22.7	0.40	25.32
Syngnathus floridae juveniles	dusky pipefish	3	2	2.9	24.0	0.15	22.42
Syngnathus louisianae juveniles	chain pipefish	33	22	12.5	17.0	1.66	36.61
Syngnathus scovelli juveniles	gulf pipefish	24	18	12.1	13.3	1.85	221.41
Prionotus spp. preflexion larvae	searobins	109	8	2.5	29.5	7.83	909.31
Prionotus spp. flexion larvae	searobins	8	4	1.4	26.5	0.50	84.77
Prionotus spp. postflexion larvae	searobins	2	2	1.8	24.3	0.14	23.10
Prionotus tribulus juveniles	bighead searobin	1	1	7.5	20.8	0.05	10.77
Lepomis spp. flexion larvae	sunfishes	2	1	22.3	0.1	0.08	18.64
Micropterus salmoides juveniles	largemouth bass	1	1	27.5	2.7	0.05	11.19
Pomoxis nigromaculatus preflexion larvae	black crappie	6	3	28.7	0.0	0.29	48.54

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Elassoma evergladei juveniles	Everglades pygmy sunfish	1	1	22.3	0.0	0.04	10.33
Elassoma evergladei adults	Everglades pygmy sunfish	1	1	20.0	0.0	0.04	9.01
Etheostoma fusiforme preflexion larvae	swamp darter	1	1	25.1	0.0	0.05	11.03
Etheostoma fusiforme flexion larvae	swamp darter	2	1	29.8	0.0	0.09	21.54
Etheostoma fusiforme postflexion larvae	swamp darter	1	1	29.8	0.0	0.05	10.77
Chloroscombrus chrysurus flexion larvae	Atlantic bumper	1	1	7.5	22.1	0.06	14.97
Chloroscombrus chrysurus juveniles	Atlantic bumper	3	3	10.6	18.9	0.13	11.38
Oligoplites saurus preflexion larvae	leatherjack	1	1	0.9	30.6	0.04	9.63
Oligoplites saurus juveniles	leatherjack	4	4	17.2	6.6	0.18	11.68
gerreid preflexion larvae	mojjaras	23	11	5.2	25.2	1.18	56.16
gerreid flexion larvae	mojjaras	22	7	6.5	25.9	1.09	84.23
gerreid postflexion larvae	mojjaras	5	4	23.4	8.8	0.33	34.89
Eucinostomus spp. postflexion larvae	mojarras	59	10	5.3	29.8	3.58	660.67
Eucinostomus spp. juveniles	mojarras	1	1	13.7	0.0	0.04	10.06
Eucinostomus gula adults	silver jenny	1	1	22.3	2.0	0.04	9.39
Orthopristis chrysoptera postflexion larvae	pigfish	7	4	4.2	15.0	0.34	30.57
Archosargus probatocephalus flexion larvae	sheepshead	3	1	0.9	23.7	0.16	37.99
Archosargus probatocephalus postflexion larva	sheepshead	14	8	3.5	24.6	0.71	50.65
Lagodon rhomboides postflexion larvae	pinfish	318	28	18.2	0.9	13.52	1287.08
Bairdiella chrysoura preflexion larvae	silver perch	157	12	4.3	30.6	9.11	1321.34
Bairdiella chrysoura flexion larvae	silver perch	300	32	6.6	25.4	18.25	1104.07
Bairdiella chrysoura postflexion larvae	silver perch	133	28	15.7	15.1	6.47	221.33
Bairdiella chrysoura juveniles	silver perch	27	15	21.7	11.7	1.48	94.16
Cynoscion arenarius preflexion larvae	sand seatrout	364	22	6.1	26.9	22.63	3104.63
Cynoscion arenarius flexion larvae	sand seatrout	77	23	8.2	21.1	3.83	182.51
Cynoscion arenarius postflexion larvae	sand seatrout	49	14	10.8	16.5	2.35	166.39
Cynoscion arenarius juveniles	sand seatrout	19	14	17.2	12.5	1.01	43.38
Cynoscion nebulosus preflexion larvae	spotted seatrout	88	15	4.2	29.8	5.16	660.67
Cynoscion nebulosus flexion larvae	spotted seatrout	67	18	4.4	24.7	3.83	210.58
Cynoscion nebulosus postflexion larvae	spotted seatrout	12	10	16.5	11.0	0.57	27.67
Cynoscion nebulosus juveniles	spotted seatrout	1	1	10.2	14.3	0.04	10.53
Leiostomus xanthurus postflexion larvae	spot	10	6	4.4	6.1	0.42	50.96
Leiostomus xanthurus juveniles	spot	7	7	15.1	0.6	0.30	11.09
Menticirrhus spp. preflexion larvae	kingfishes	31	14	4.5	25.7	1.75	126.35
Menticirrhus spp. flexion larvae	kingfishes	34	15	4.8	25.2	2.11	135.64
Menticirrhus spp. postflexion larvae	kingfishes	16	9	12.4	20.8	0.78	74.81
Menticirrhus americanus juveniles	southern kingfish	1	1	18.2	16.1	0.06	13.90
Pogonias cromis postflexion larvae	black drum	1	1	15.3	3.8	0.05	11.45
Sciaenops ocellatus flexion larvae	red drum	7	2	15.8	16.4	0.43	92.61
Sciaenops ocellatus postflexion larvae	red drum	12	6	6.9	21.1	0.88	115.51
Mugil cephalus juveniles	striped mullet	12	9	14.5	8.1	0.56	36.61
Astroscopus y-graecum preflexion larvae	southern stargazer	1	1	4.0	24.2	0.05	11.21
blenniid preflexion larvae	blennies	142	27	3.5	27.3	8.28	909.31
Chasmodes saburrae flexion larvae	Florida blenny	113	22	9.1	25.8	6.31	389.55
Chasmodes saburrae postflexion larvae	Florida blenny	206	20	8.8	26.3	14.14	1216.65
Hypsoblennius spp. flexion larvae	blennies	6	4	6.6	25.8	0.29	30.92
Hypsoblennius spp. postflexion larvae	blennies	3	3	5.0	27.0	0.16	14.33
Hypsoblennius spp. juveniles	blennies	1	1	0.9	28.3	0.06	14.33
Lupinoblennius nicholsi flexion larvae	highfin blenny	7	6	6.6	25.4	0.39	28.08
Lupinoblennius nicholsi postflexion larvae	highfin blenny	4	2	9.5	25.6	0.18	30.92
gobiid preflexion larvae	gobies	1,264	77	14.2	23.5	70.30	3994.87
gobiid flexion larvae	gobies	940	91	16.0	20.8	52.95	3491.53
Bathygobius soporator preflexion larvae	frillfin goby	500	34	7.6	27.4	35.74	1267.80
Bathygobius soporator flexion larvae	frillfin goby	200	13	9.6	26.7	14.69	1836.05
Bathygobius soporator postflexion larvae	frillfin goby	143	6	12.1	24.7	11.54	2170.80
Gobionellus boleosoma flexion larvae	darter goby	1	1	10.2	25.2	0.04	10.31
Gobionellus boleosoma postflexion larvae	darter goby	3	1	25.1	20.6	0.17	40.97
Gobiosoma spp. postflexion larvae	gobies	2,911	90	18.7	17.3	161.99	6203.96
Gobiosoma spp. juveniles	gobies	36	6	17.0	8.4	2.29	221.41
Gobiosoma bosc juveniles	naked goby	154	21	24.8	4.0	10.10	771.24
Gobiosoma bosc adults	naked goby	3	2	24.0	0.1	0.15	23.41
Gobiosoma robustum juveniles	code goby	19	8	22.3	15.6	1.06	109.25

Plankton-net catch statistics for the Manatee River (n=238). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./10^3 m^3)	Max CPUE (No./10^3 m^3)
Gobiosoma robustum adults	code goby	1	1	4.0	0.0	0.04	9.59
Microgobius spp. flexion larvae	gobies	792	82	11.1	22.3	46.10	1321.34
Microgobius spp. postflexion larvae	gobies	1,923	105	10.5	23.7	107.68	2458.38
Microgobius gulosus juveniles	clown goby	73	23	23.8	7.8	4.41	335.61
Microgobius gulosus adults	clown goby	2	2	20.5	15.4	0.09	11.84
Microgobius thalassinus juveniles	green goby	3	3	13.2	17.3	0.19	20.83
Microdesmus longipinnis preflexion larvae	pink wormfish	6	3	9.4	25.6	0.29	34.94
Microdesmus longipinnis flexion larvae	pink wormfish	5	2	11.6	24.9	0.23	34.94
Paralichthys spp. postflexion larvae	flounders	4	3	2.4	10.3	0.18	19.70
Achirus lineatus preflexion larvae	lined sole	76	7	5.1	28.0	4.86	1029.76
Achirus lineatus flexion larvae	lined sole	124	9	3.8	29.0	9.13	909.31
Achirus lineatus postflexion larvae	lined sole	7	4	2.0	25.2	0.42	50.86
Achirus lineatus juveniles	lined sole	3	3	15.8	19.0	0.19	19.51
Trinectes maculatus preflexion larvae	hogchoker	209	25	10.0	25.9	15.14	1216.65
Trinectes maculatus flexion larvae	hogchoker	45	25	8.4	20.8	2.50	135.64
Trinectes maculatus postflexion larvae	hogchoker	259	47	20.6	15.9	12.33	1134.64
Trinectes maculatus juveniles	hogchoker	318	51	25.0	2.6	15.39	723.11
Trinectes maculatus adults	hogchoker	10	5	22.6	1.4	0.48	70.23
Symphurus plagiusa postflexion larvae	blackcheek tonguefish	2	2	0.9	23.7	0.14	23.10
Monacanthus hispidus juveniles	planehead filefish	1	1	7.5	26.6	0.05	10.89
Sphoeroides spp. preflexion larvae	puffers	1	1	5.4	27.0	0.06	14.04
Sphoeroides nephelus juveniles	southern puffer	2	2	15.4	21.5	0.13	20.83
unidentified preflexion larvae	fish larvae	2	2	2.2	25.3	0.10	13.62
unidentified flexion larvae	fish larvae	1	1	4.0	24.2	0.05	11.21

Plankton-net catch statistics for the Braden River (n=136). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./10^3 m^3)	Max CPUE (No./10^3 m^3)
Nemopsis sp.	hydromedusa	1,640	37	5.1	20.4	183.32	9177.64
Mnemiopsis mccradyi	comb jelly, ctenophore	50,750	20	5.3	13.3	5205.91	97634.51
turbellarians	flatworms	1	1	0.3	0.0	0.07	10.13
polychaetes	sand worms, tube worms	420	54	4.1	3.1	36.81	588.95
oligochaetes	freshwater worms	83	24	5.4	0.3	6.77	164.67
hirudinoideans	leeches	74	31	3.7	6.4	5.96	70.48
acari	water mites	83	21	7.6	0.2	7.23	210.73
coleopterans, curculionid adults	beetles	1	1	8.0	24.9	0.08	10.42
coleopterans, dytiscid larvae	predaceous diving beetles	1	1	8.0	0.0	0.07	9.53
coleopterans, dytiscid adults	predaceous diving beetles	1	1	8.6	0.0	0.09	12.56
coleopterans, elmid larvae	riffle beetles	2	2	7.1	0.3	0.19	16.27
coleopterans, elmid adults	riffle beetles	14	8	6.8	0.1	1.11	55.92
coleopterans, gyrinid adults	whirligig beetles	1	1	5.1	0.0	0.08	10.43
coleopterans, haliplid larvae	crawling water beetles	1	1	8.0	0.0	0.08	10.48
coleopterans, haliplid adults	crawling water beetles	2	2	4.9	4.4	0.16	12.06
coleopterans, noterid larvae	burrowing water beetles	6	3	7.8	2.6	0.56	40.83
coleopterans, noterid adults	burrowing water beetles	2	2	5.6	1.2	0.16	11.89
dipterans, pupae	flies, mosquitoes	2,875	69	6.1	0.7	273.85	4666.21
dipteran, Chaoborus punctipennis larvae	phantom midge	37,350	60	7.5	0.3	3498.96	178528.41
dipterans, chironomid larvae	midges	240	44	7.1	1.1	25.45	1050.78
dipterans, tabanid larvae	deer flies	6	4	7.2	0.9	0.57	29.21
ephemeropteran larvae	mayflies	414	27	7.0	0.0	34.71	767.02
heteropterans, corixid adults	water boatmen	6	5	5.1	3.0	0.58	32.54
heteropterans, gerrid adults	water striders	1	1	5.1	0.3	0.09	11.57
heteropterans, pleid adults	pygmy backswimmers	1	1	2.6	0.0	0.08	10.23
lepidopterans, pyralid larvae	aquatic caterpillars	17	3	6.6	0.0	1.55	105.37
odonates, anisopteran larvae	dragonflies	13	3	7.6	0.0	1.77	131.35
odonates, zygopteran larvae	damselflies	58	21	7.0	0.2	5.37	210.73
trichopteran larvae	caddisflies	99	17	4.5	0.0	6.92	550.41
cladocerans, daphniid	water fleas	11,760	43	7.1	0.1	1085.88	40710.91
cladocerans, Bosminiopsis spp.	water fleas	509	13	7.6	0.0	44.30	3167.50
cladocerans, Ilyocryptus spp.	water fleas	1,891	14	7.6	0.1	204.96	11822.42
cladocerans, Diaphanosoma spp.	water fleas	3,579	26	7.6	0.0	302.39	11154.10
cladoceran, Penilia avirostris	water flea	19	2	8.0	2.2	1.29	165.01
cladocerans, Euryalona spp.	water fleas	1	1	8.0	0.0	0.08	10.48
cladoceran, Evadne tergestina	water flea	26	1	0.3	22.2	3.69	501.96
ostracods, unidentified	seed shrimps	1,741	51	3.0	12.8	168.88	3630.69
branchiurans, Argulus spp.	fish lice	51	27	6.5	13.0	4.56	64.61
cirriped nauplius stage	barnacles	39	2	1.2	22.5	4.08	545.15
cirriped cypris stage	barnacles	5	4	4.9	5.2	0.43	23.77
copepods, calanoid	copepods	9,400	68	3.2	13.9	909.44	38901.91
copepods, harpacticoid	copepods	11	5	7.0	0.0	0.90	56.90
copepods, freshwater cyclopoids	copepods	154,433	60	7.1	0.3	14629.32	499494.10
Oithona spp.	copepods	1	1	0.3	0.0	0.07	10.13
Monstrilla sp.	copepod	1,896	7	1.3	26.0	193.09	13513.87
Caligus spp.	copepods	52	9	1.4	21.4	5.20	545.15
stomatopod, Squilla empusa larvae	mantis shrimp	4	2	1.6	23.2	0.30	30.68
amphipods, gammaridean	scuds, beachhoppers	98,709	131	4.2	9.3	9641.26	432715.37
amphipods, caprellid	skeleton shrimps	3	1	4.0	0.3	0.39	52.86
cumaceans	cumaceans	16,920	63	1.1	25.0	1527.03	86471.57
Cyathura polita	isopod	166	26	5.4	19.7	14.27	430.10
Xenanthura brevitelson	isopod	1	1	2.6	10.4	0.09	11.58
Munna reynoldsi	isopod	5	3	3.9	1.8	0.43	22.67
Probopyrus sp. (attached)	isopod	14	7	6.9	8.9	1.23	40.88
Anopsilana jonesi	isopod	2	2	8.3	13.6	0.20	14.08
cymothoid sp. a (Lironeca) juveniles	isopod	2,165	94	5.9	15.0	202.20	2792.35
isopods, sphaeromatid	isopods	91	37	5.7	10.4	8.13	174.41
Edotea triloba	isopod	16,094	93	6.1	9.3	1437.77	47519.76
Erichsonella attenuata	isopod	5	4	2.8	17.2	0.41	19.36
mysids, unidentified	opposum shrimps	88,999	131	3.4	8.7	6935.82	77038.81
tanaids, unidentified	tanaids	81	20	2.7	15.2	6.93	386.97
decapod zoeae	crab larvae	145,916	96	3.4	15.3	12829.91	216185.98
decapod mysis larvae	shrimps and hermit crabs	88,495	89	2.3	12.2	7773.99	171786.19

Plankton-net catch statistics for the Braden River (n=136). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./10³ m³)	Max CPUE (No./10³ m³)
decapod megalopae	post-zoea crab larvae	12,840	71	2.5	19.4	1252.96	42447.29
penaeid metamorphs	penaeid shrimps	113	26	2.1	11.7	10.59	342.99
Farfantepenaeus duorarum juveniles	pink shrimp	54	14	4.3	9.0	5.05	172.31
Lucifer faxoni juveniles and adults	shrimp	17	7	5.9	7.5	1.38	64.59
Palaemonetes spp. postlarvae	grass shrimp	922	30	3.8	23.6	86.51	2855.64
Palaemonetes pugio juveniles	daggerblade grass shrimp	318	39	5.9	12.0	29.94	926.58
Palaemonetes pugio adults	daggerblade grass shrimp	84	26	6.0	3.9	6.94	139.93
Periclimenes spp. juveniles	shrimps	1	1	8.0	24.9	0.08	10.42
alphaeid postlarvae	snapping shrimps	2	1	2.6	19.0	0.20	26.74
Hippolyte zostericola juveniles	zostera shrimp	3	1	1.2	11.4	0.20	27.62
Upogebia spp. postlarvae	mud shrimps	8	4	1.1	20.0	0.74	50.23
Upogebia spp. juveniles	mud shrimps	2	2	2.1	7.8	0.15	10.59
Callinectes sapidus juveniles	blue crab	55	20	4.1	10.2	5.37	229.42
xanthid juveniles	mud crabs	21	10	2.5	6.3	2.32	145.78
grapsid juveniles	crabs	1	1	2.6	2.6	0.09	12.11
pinnotherid juveniles	pea crabs	1	1	0.3	20.2	0.09	12.56
pelecypods	clams, mussels, oysters	800	45	2.1	12.2	68.71	3127.41
gastropods, opisthobranch	sea slugs	98	5	3.9	25.7	11.17	1411.96
gastropods, prosobranch	snails	2,811	77	5.0	6.1	226.45	10592.83
Lolliguncula brevis juveniles	bay squid	1	1	4.0	20.5	0.10	14.24
appendicularian, Oikopleura dioica	larvacean	4,943	5	0.4	22.0	668.71	79830.96
chaetognaths, Sagitta spp.	arrow worms	6,788	31	1.3	24.8	716.45	31835.85
Lepisosteus platyrhincus juveniles	Florida gar	1	1	8.0	1.2	0.07	9.17
Elops saurus postflexion larvae	ladyfish	11	7	3.7	1.0	0.88	32.43
Myrophis punctatus juveniles	speckled worm eel	3	1	1.2	14.7	0.27	37.17
Brevoortia spp. postflexion larvae	menhaden	610	27	5.0	2.4	49.07	1125.93
Brevoortia spp. metamorphs	menhaden	2,107	33	5.5	2.7	174.34	8177.20
Brevoortia patronus juveniles	gulf menhaden	9	7	7.2	5.3	0.65	20.86
Brevoortia smithi juveniles	yellowfin menhaden	178	24	6.5	8.5	16.23	642.80
Dorosoma petenense preflexion larvae	threadfin shad	13	3	8.2	0.0	1.17	138.13
Dorosoma petenense flexion larvae	threadfin shad	3	2	6.0	0.5	0.36	36.03
Dorosoma petenense postflexion larvae	threadfin shad	1	1	8.6	0.2	0.09	12.47
Dorosoma petenense metamorphs	threadfin shad	1	1	8.6	1.2	0.10	12.97
Dorosoma petenense juveniles	threadfin shad	2	2	8.3	1.0	0.18	12.70
Anchoa spp. preflexion larvae	anchovies	35	11	2.1	14.9	2.87	117.06
Anchoa spp. flexion larvae	anchovies	127	38	3.7	10.7	10.88	289.28
Anchoa hepsetus postflexion larvae	striped anchovy	7	2	2.1	3.2	0.62	56.67
Anchoa mitchilli eggs	bay anchovy	3	1	5.1	7.9	0.46	62.57
Anchoa mitchilli postflexion larvae	bay anchovy	144	36	4.7	11.3	14.54	667.42
Anchoa mitchilli juveniles	bay anchovy	18,323	131	6.0	6.4	1569.29	14273.99
Anchoa mitchilli adults	bay anchovy	827	75	2.9	9.4	67.87	1123.55
Anchoa cubana juveniles	Cuban anchovy	1	1	4.0	26.6	0.12	15.86
Notemigonus crysoleucas flexion larvae	golden shiner	3	3	5.6	0.0	0.24	13.72
Notemigonus crysoleucas postflexion larvae	golden shiner	1	1	2.6	0.0	0.07	9.33
Notemigonus crysoleucas juveniles	golden shiner	1	1	8.0	0.0	0.10	13.17
Ameiurus catus juveniles	white catfish	1	1	8.6	5.5	0.08	11.40
Opsanus beta juveniles	gulf toadfish	2	1	5.1	26.3	0.15	20.98
Gobiesox strumosus preflexion larvae	skilletfish	61	11	3.7	24.3	6.49	698.05
Gobiesox strumosus flexion larvae	skilletfish	116	14	4.3	23.1	11.28	698.05
Gobiesox strumosus postflexion larvae	skilletfish	267	13	4.2	19.7	27.28	2576.44
Gobiesox strumosus juveniles	skilletfish	406	27	4.7	20.0	33.98	739.93
Strongylura marina juveniles	Atlantic needlefish	2	2	6.0	5.4	0.14	9.38
Strongylura marina adults	Atlantic needlefish	1	1	2.6	0.0	0.07	9.78
Fundulus spp. postflexion larvae	killifishes	2	2	5.8	2.5	0.13	9.32
Lucania parva juveniles	rainwater killifish	5	4	7.5	12.5	0.43	21.50
Lucania parva adults	rainwater killifish	1	1	8.6	1.0	0.08	10.43
Gambusia holbrooki juveniles	eastern mosquitofish	2	2	7.6	1.8	0.15	10.43
Gambusia holbrooki adults	eastern mosquitofish	2	2	8.3	0.1	0.19	13.17
Heterandria formosa adults	least killifish	1	1	2.6	0.0	0.07	9.78
Poecilia latipinna juveniles	sailfin molly	11	4	7.1	0.3	0.89	78.29
Fish eggs, atherinid	silversides	1	1	2.6	0.5	0.07	10.06
Menidia spp. preflexion larvae	silversides	25	14	3.6	3.6	2.06	43.35
Menidia spp. flexion larvae	silversides	2	2	6.6	18.9	0.16	10.77

Plankton-net catch statistics for the Braden River (n=136). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./10^3 m^3)	Max CPUE (No./10^3 m^3)
Menidia spp. postflexion larvae	silversides	6	3	5.6	16.9	0.45	31.25
Menidia beryllina juveniles	inland silverside	373	49	5.8	6.5	35.85	1126.27
Menidia beryllina adults	inland silverside	5	2	3.5	10.5	0.36	32.48
Membras martinica juveniles	rough silverside	2	2	8.3	3.6	0.15	11.40
Labidesthes sicculus preflexion larvae	brook silverside	1	1	8.6	0.0	0.12	16.05
Labidesthes sicculus juveniles	brook silverside	2	1	8.6	0.0	0.19	25.41
Fish eggs, percomorph	sciaenid eggs (primarily)	197	8	1.0	21.8	20.95	1621.09
Syngnathus louisianae juveniles	chain pipefish	13	9	3.7	12.1	1.14	42.67
Syngnathus louisianae adults	chain pipefish	1	1	4.0	2.7	0.07	9.68
Syngnathus scovelli juveniles	gulf pipefish	8	6	3.3	13.3	0.70	29.81
Lepomis spp. flexion larvae	sunfishes	3	2	8.2	0.3	0.24	20.71
Lepomis spp. postflexion larvae	sunfishes	12	4	7.1	0.4	1.20	48.81
Lepomis gulosus juveniles	warmouth	1	1	0.3	7.4	0.08	10.51
Lepomis macrochirus juveniles	bluegill	6	2	8.0	0.1	0.52	39.51
Micropterus salmoides flexion larvae	largemouth bass	1	1	5.1	0.7	0.13	18.02
Pomoxis nigromaculatus preflexion larvae	black crappie	1	1	5.1	0.0	0.06	7.88
Etheostoma fusiforme preflexion larvae	swamp darter	4	2	6.8	0.0	0.35	37.67
Etheostoma fusiforme flexion larvae	swamp darter	1	1	8.0	0.0	0.08	10.48
Etheostoma fusiforme postflexion larvae	swamp darter	2	2	8.3	0.0	0.17	12.70
Etheostoma fusiforme juveniles	swamp darter	1	1	8.6	0.0	0.12	16.05
Oligoplites saurus flexion larvae	leatherjack	1	1	2.6	8.0	0.07	9.28
Oligoplites saurus juveniles	leatherjack	5	5	5.8	12.6	0.45	14.28
gerreid flexion larvae	mojjaras	1	1	1.2	14.5	0.10	12.99
gerreid postflexion larvae	mojjaras	22	8	5.1	16.3	2.09	81.76
Eucinostomus spp. postflexion larvae	mojarras	1	1	0.3	15.0	0.08	11.03
Eucinostomus spp. juveniles	mojarras	2	2	2.0	13.4	0.16	11.71
Eucinostomus harengulus juveniles	tidewater mojarra	1	1	6.6	25.3	0.08	10.42
Archosargus probatocephalus postflexion larv;	sheepshead	37	6	5.1	8.3	4.12	333.71
Archosargus probatocephalus juveniles	sheepshead	1	1	5.1	19.5	0.08	10.42
Lagodon rhomboides postflexion larvae	pinfish	16	9	3.1	0.9	1.17	32.27
Bairdiella chrysoura flexion larvae	silver perch	18	10	1.9	14.9	1.51	58.53
Bairdiella chrysoura postflexion larvae	silver perch	106	29	4.0	18.8	8.99	265.01
Bairdiella chrysoura juveniles	silver perch	38	17	4.8	16.1	3.27	72.93
Cynoscion arenarius flexion larvae	sand seatrout	3	3	2.1	13.1	0.26	11.71
Cynoscion arenarius postflexion larvae	sand seatrout	4	2	2.8	11.1	0.43	34.46
Cynoscion arenarius juveniles	sand seatrout	12	10	2.5	11.6	1.17	28.56
Cynoscion nebulosus flexion larvae	spotted seatrout	6	4	2.6	11.4	0.52	34.46
Cynoscion nebulosus postflexion larvae	spotted seatrout	1	1	2.6	8.0	0.07	9.28
Cynoscion nebulosus juveniles	spotted seatrout	3	3	4.0	20.1	0.26	13.97
Leiostomus xanthurus juveniles	spot	7	2	0.7	0.3	0.45	32.27
Menticirrhus spp. preflexion larvae	kingfishes	1	1	0.3	6.2	0.08	10.84
Menticirrhus spp. flexion larvae	kingfishes	1	1	2.6	22.6	0.09	11.71
Pogonias cromis postflexion larvae	black drum	1	1	0.3	6.2	0.08	10.84
Sciaenops ocellatus flexion larvae	red drum	1	1	1.2	14.5	0.10	12.99
Sciaenops ocellatus postflexion larvae	red drum	14	3	1.1	13.6	1.18	88.22
Tilapia spp. juveniles	tilapias	1	1	8.6	0.2	0.09	12.47
Mugil cephalus juveniles	striped mullet	8	5	4.4	0.0	0.61	28.41
blenniid preflexion larvae	blennies	19	10	1.2	14.1	1.47	36.83
Chasmodes saburrae flexion larvae	Florida blenny	4	3	2.7	22.1	0.37	29.45
Chasmodes saburrae postflexion larvae	Florida blenny	32	5	0.5	22.3	4.18	501.96
gobiid preflexion larvae	gobies	1,087	48	3.5	20.1	93.62	3144.14
gobiid flexion larvae	gobies	1,000	63	3.9	19.4	85.25	2125.87
Bathygobius soporator preflexion larvae	frillfin goby	60	5	0.5	28.8	5.75	702.40
Bathygobius soporator postflexion larvae	frillfin goby	3	3	0.3	15.3	0.23	11.03
Gobiosoma spp. postflexion larvae	gobies	2,582	72	5.7	15.8	224.99	2990.97
Gobiosoma spp. juveniles	gobies	59	7	5.9	3.0	4.04	158.40
Gobiosoma bosc juveniles	naked goby	64	17	3.9	10.0	5.34	169.50
Gobiosoma bosc adults	naked goby	2	2	3.3	9.3	0.15	10.59
Gobiosoma robustum juveniles	code goby	45	11	6.7	20.8	4.12	145.90
Microgobius spp. flexion larvae	gobies	295	52	3.0	11.8	24.64	313.08
Microgobius spp. postflexion larvae	gobies	744	62	4.0	19.4	65.18	1510.58
Microgobius gulosus juveniles	clown goby	106	34	4.8	13.6	9.67	140.94
Microgobius gulosus adults	clown goby	10	9	3.9	11.9	0.92	30.06

Plankton-net catch statistics for the Braden River (n=136). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./10^3 m^3)	Max CPUE (No./10^3 m^3)
Achirus lineatus postflexion larvae	lined sole	3	1	2.6	22.6	0.26	35.12
Achirus lineatus juveniles	lined sole	2	1	1.2	18.0	0.17	22.77
Trinectes maculatus preflexion larvae	hogchoker	3	3	1.8	13.5	0.23	11.71
Trinectes maculatus flexion larvae	hogchoker	60	10	1.8	20.1	5.90	545.15
Trinectes maculatus postflexion larvae	hogchoker	139	34	3.8	12.0	12.62	209.51
Trinectes maculatus juveniles	hogchoker	245	34	6.4	9.6	22.58	640.43
Sphoeroides spp. flexion larvae	puffers	2	2	3.9	21.4	0.15	10.55
Sphoeroides nephelus juveniles	southern puffer	3	3	5.1	20.1	0.26	14.72
unidentified preflexion larvae	fish larvae	8	1	8.0	0.0	0.77	105.37
unidentified postflexion larvae	fish larvae	8	1	8.0	0.0	0.77	105.37
anuran larvae	tadpoles	2	2	5.1	1.4	0.15	11.63

Table A4, page 1 of 2

Seine catch statistics for the Manatee River (n=254). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./Seine)	Max CPUE (No./Seine)
Farfantepenaeus spp.	commercial shrimp	3	2	14.0	17.7	0.01	2
Farfantepenaeus duorarum	pink shrimp	545	70	7.6	20.7	2.15	94
Callinectes sapidus	blue crab	185	67	12.7	16.9	0.73	7
Dasyatis sabina	Atlantic stingray	30	16	9.4	25.0	0.12	6
Rhinoptera bonasus	cownose ray	2	2	17.5	27.8	0.01	1
Lepisosteus osseus	longnose gar	1	1	29.5	4.4	0.00	1
Lepisosteus platyrhincus	Florida gar	2	2	26.3	7.3	0.01	1
Elops saurus	ladyfish	6	3	17.9	12.7	0.02	3
Ophichthidae spp.		1	1	5.7	29.8	0.00	1
Brevoortia spp.		5,333	41	21.6	11.2	21.00	1,888
Dorosoma petenense	threadfin shad	3	2	31.9	0.3	0.01	2
Opisthonema oglinum	Atlantic thread herring	23	4	15.9	15.3	0.09	8
Harengula jaguana	scaled sardine	962	12	7.9	22.1	3.79	256
Anchoa spp.		182	2	11.4	24.4	0.72	172
Anchoa hepsetus	striped anchovy	1,640	43	15.3	21.0	6.46	460
Anchoa mitchilli	bay anchovy	85,767	112	17.0	20.1	337.67	15,360
Anchoa cubana	Cuban anchovy	68	3	20.9	21.0	0.27	43
Synodus foetens	inshore lizardfish	166	38	13.1	22.3	0.65	64
Notemigonus crysoleucas	golden shiner	2	1	31.9	0.1	0.01	2
Notropis spp.		24	5	30.6	0.3	0.09	11
Notropis maculatus	taillight shiner	2	2	31.9	0.2	0.01	1
Notropis petersoni	coastal shiner	35	7	30.8	0.1	0.14	14
Ictaluridae spp.		1	1	31.9	2.1	0.00	1
Ameiurus catus	white catfish	1	1	29.5	0.1	0.00	1
Ictalurus punctatus	channel catfish	1	1	20.2	1.1	0.00	1
Arius felis	hardhead catfish	4	2	20.0	9.1	0.02	3
Opsanus beta	gulf toadfish	7	5	17.3	8.0	0.03	3
Gobiesox strumosus	skilletfish	5	5	14.7	15.7	0.02	1
Urophycis floridana	southern hake	1	1	0.4	25.6	0.00	1
Strongylura spp.		107	38	9.3	24.7	0.42	8
Strongylura marina	Atlantic needlefish	5	3	12.5	19.8	0.02	2
Strongylura notata	redfin needlefish	119	39	4.8	24.7	0.47	40
Strongylura timucu	timucu	18	8	13.0	26.8	0.07	6
Cyprinodon variegatus	sheepshead minnow	403	40	23.2	4.2	1.59	60
Fundulus confluentus	marsh killifish	49	5	26.1	0.6	0.19	36
Fundulus majalis	striped killifish	1,030	56	13.3	10.2	4.06	224
Fundulus grandis	gulf killifish	294	38	18.4	6.2	1.16	51
Fundulus chrysotus	golden topminnow	4	1	26.0	0.2	0.02	4
Fundulus seminolis	seminole killifish	818	47	29.4	1.1	3.22	100
Lucania parva	rainwater killifish	2,497	57	28.1	1.8	9.83	252
Lucania goodei	bluefin killifish	2	1	15.5	0.2	0.01	2
Adinia xenica	diamond killifish	17	6	18.9	5.7	0.07	5
Floridichthys carpio	goldspotted killifish	266	18	3.9	27.5	1.05	96
Gambusia holbrooki	eastern mosquitofish	4,834	61	28.7	0.8	19.03	492
Poecilia latipinna	sailfin molly	2,187	51	26.8	1.4	8.61	492
Heterandria formosa	least killifish	14	6	30.0	0.2	0.06	6
Membras martinica	rough silverside	1,495	18	13.0	22.8	5.89	340
Menidia spp.		29,166	208	13.7	16.2	114.83	3,228
Labidesthes sicculus	brook silverside	96	11	30.3	0.2	0.38	23
Syngnathus floridae	dusky pipefish	7	6	2.2	29.2	0.03	2
Syngnathus louisianae	chain pipefish	36	23	7.7	25.6	0.14	4
Syngnathus scovelli	gulf pipefish	112	27	3.7	23.4	0.44	35
Hippocampus zosterae	dwarf seahorse	6	2	0.7	23.0	0.02	5
Prionotus scitulus	leopard searobin	26	13	5.6	25.2	0.10	4

Seine catch statistics for the Manatee River (n=254). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./Seine)	Max CPUE (No./Seine)
Prionotus tribulus	bighead searobin	10	7	5.5	20.1	0.04	2
Centropomus undecimalis	snook	36	21	20.8	3.6	0.14	6
Lepomis macrochirus	bluegill	153	15	17.5	0.2	0.60	111
Lepomis microlophus	redear sunfish	11	5	30.2	0.1	0.04	4
Lepomis punctatus	spotted sunfish	2	2	30.1	0.1	0.01	1
Micropterus salmoides	largemouth bass	22	14	30.5	0.7	0.09	3
Caranx hippos	crevalle jack	5	2	14.6	10.0	0.02	4
Caranx latus	horse-eye jack	1	1	10.6	13.9	0.00	1
Oligoplites saurus	leatherjacket	194	53	11.3	18.1	0.76	20
Trachinotus falcatus	permit	26	6	2.1	16.2	0.10	13
Lutjanus griseus	gray snapper	19	9	6.2	19.1	0.07	8
Lutjanus synagris	lane snapper	4	1	0.4	25.6	0.02	4
Eucinostomus spp.		4,895	146	13.2	12.1	19.27	752
Eucinostomus gula	silver jenny	1,417	79	5.1	23.4	5.58	354
Eucinostomus harengulus	tidewater mojarra	2,439	159	16.2	16.3	9.60	168
Diapterus plumieri	striped mojarra	128	34	19.1	7.6	0.50	16
Orthopristis chrysoptera	pigfish	213	28	4.8	27.7	0.84	69
Sparidae spp.		1	1	20.2	1.1	0.00	1
Lagodon rhomboides	pinfish	4,967	162	11.3	19.1	19.56	411
Archosargus probatocephalus	sheepshead	35	23	18.2	11.9	0.14	4
Diplodus holbrooki	spottail pinfish	11	2	24.3	1.1	0.04	10
Cynoscion nebulosus	spotted seatrout	200	41	14.3	14.0	0.79	35
Cynoscion arenarius	sand seatrout	90	22	21.5	9.2	0.35	24
Bairdiella chrysoura	silver perch	1,384	38	12.0	17.2	5.45	427
Leiostomus xanthurus	spot	3,594	70	8.3	15.7	14.15	573
Menticirrhus americanus	southern kingfish	34	9	17.1	14.8	0.13	16
Menticirrhus saxatilis	northern kingfish	31	13	6.7	23.4	0.12	8
Pogonias cromis	black drum	1	1	7.6	9.1	0.00	1
Sciaenops ocellatus	red drum	361	42	16.8	5.7	1.42	98
Chaetodipterus faber	Atlantic spadefish	14	7	9.0	22.4	0.06	5
Tilapia spp.		4	4	24.4	4.2	0.02	1
Mugil spp.		6	2	16.0	0.5	0.02	5
Mugil cephalus	striped mullet	1,158	53	16.8	8.3	4.56	164
Mugil curema	white mullet	50	12	10.4	16.1	0.20	16
Mugil gyrans	fantail mullet	413	21	6.7	15.4	1.63	143
Chasmodes saburrae	Florida blenny	54	11	2.2	23.7	0.21	23
Gobiosoma spp.		229	37	24.9	4.0	0.90	54
Gobiosoma bosc	naked goby	142	40	22.3	3.8	0.56	21
Gobiosoma robustum	code goby	77	19	8.3	19.5	0.30	26
Microgobius gulosus	clown goby	865	99	22.3	5.9	3.41	68
Microgobius thalassinus	green goby	3	2	9.5	20.3	0.01	2
Bathygobius soporator	frillfin goby	26	15	15.4	10.5	0.10	7
Paralichthys albigutta	gulf flounder	63	31	5.4	24.9	0.25	9
Trinectes maculatus	hogchoker	2,369	103	28.5	1.2	9.33	177
Achirus lineatus	lined sole	35	18	7.3	20.0	0.14	7
Symphurus plagiusa	blackcheek tonguefish	7	7	8.5	22.8	0.03	1
Monacanthus hispidus	planehead filefish	5	3	0.7	26.5	0.02	3
Sphoeroides nephelus	southern puffer	194	44	5.7	24.9	0.76	20
Chilomycterus schoepfi	striped burrfish	12	4	3.9	26.5	0.05	7

Seine catch statistics from the Braden River (n=135). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./Seine)	Max CPUE (No./Seine)
Farfantepenaeus duorarum	pink shrimp	168	38	3.2	13.1	1.24	21
Callinectes sapidus	blue crab	88	39	5.1	11.1	0.65	9
Dasyatis sabina	Atlantic stingray	1	1	7.2	2.7	0.01	1
Elops saurus	ladyfish	3	2	2.4	13.1	0.02	2
Brevoortia spp.		1,913	32	6.5	15.3	14.17	311
Dorosoma petenense	threadfin shad	100	2	9.1	0.0	0.74	99
Harengula jaguana	scaled sardine	54	4	0.7	22.7	0.40	48
Anchoa hepsetus	striped anchovy	234	18	2.9	18.7	1.73	91
Anchoa mitchilli	bay anchovy	113,731	83	6.8	17.9	842.45	42,368
Synodus foetens	inshore lizardfish	14	8	2.8	21.5	0.10	4
Notropis maculatus	taillight shiner	6	3	8.3	0.2	0.04	3
Gobiesox strumosus	skilletfish	9	7	3.8	6.7	0.07	3
Strongylura spp.		23	11	5.5	14.3	0.17	4
Strongylura marina	Atlantic needlefish	1	1	1.9	11.1	0.01	1
Strongylura notata	redfin needlefish	3	3	1.3	17.8	0.02	1
Strongylura timucu	timucu	2	2	0.8	15.4	0.01	1
Cyprinodon variegatus	sheepshead minnow	188	26	7.2	4.8	1.39	31
Fundulus spp.		1	1	7.2	0.5	0.01	1
Fundulus confluentus	marsh killifish	4	2	6.9	0.4	0.03	3
Fundulus majalis	striped killifish	203	5	1.1	12.7	1.50	88
Fundulus grandis	gulf killifish	234	30	5.7	4.2	1.73	28
Fundulus chrysotus	golden topminnow	5	1	9.1	0.2	0.04	5
Lucania parva	rainwater killifish	572	42	6.9	13.9	4.24	128
Lucania goodei	bluefin killifish	8	6	8.4	0.2	0.06	3
Adinia xenica	diamond killifish	7	3	6.6	0.5	0.05	5
Floridichthys carpio	goldspotted killifish	3	2	7.6	1.3	0.02	2
Jordanella floridae	flagfish	4	3	8.9	0.3	0.03	2
Gambusia holbrooki	eastern mosquitofish	1,789	33	8.2	0.4	13.25	482
Poecilia latipinna	sailfin molly	707	44	6.9	2.9	5.24	71
Heterandria formosa	least killifish	32	6	8.7	0.2	0.24	22
Membras martinica	rough silverside	15	5	2.5	23.9	0.11	9
Menidia spp.		14,365	122	5.6	12.6	106.41	776
Labidesthes sicculus	brook silverside	53	9	8.8	1.8	0.39	14
Syngnathus louisianae	chain pipefish	10	9	4.5	21.3	0.07	2
Syngnathus scovelli	gulf pipefish	34	19	5.8	13.6	0.25	5
Prionotus scitulus	leopard searobin	2	1	0.6	11.0	0.01	2
Prionotus tribulus	bighead searobin	1	1	1.9	29.2	0.01	1
Centropomus undecimalis	snook	140	51	6.2	3.3	1.04	15
Enneacanthus gloriosus	bluespotted sunfish	1	1	9.1	0.2	0.01	1
Lepomis macrochirus	bluegill	177	32	7.9	1.1	1.31	25
Lepomis microlophus	redear sunfish	12	4	8.9	0.2	0.09	6
Lepomis punctatus	spotted sunfish	3	3	8.9	0.2	0.02	1
Micropterus salmoides	largemouth bass	10	6	8.8	4.3	0.07	4
Caranx latus	horse-eye jack	1	1	0.6	11.0	0.01	1
Oligoplites saurus	leatherjacket	41	15	3.6	13.7	0.30	7
Lutjanus griseus	gray snapper	5	5	4.7	9.7	0.04	1
Eucinostomus spp.		2,496	98	3.4	11.3	18.49	267
Eucinostomus gula	silver jenny	198	14	1.2	18.7	1.47	40
Eucinostomus harengulus	tidewater mojarra	2,941	116	4.9	15.1	21.79	261
Diapterus plumieri	striped mojarra	214	30	3.9	4.9	1.59	60
Orthopristis chrysoptera	pigfish	6	4	2.2	21.9	0.04	3
Lagodon rhomboides	pinfish	2,790	107	4.7	13.9	20.67	245
Archosargus probatocephalus	sheepshead	31	17	4.5	18.2	0.23	4
Cynoscion nebulosus	spotted seatrout	132	29	2.7	9.9	0.98	20
Cynoscion arenarius	sand seatrout	91	6	2.1	5.8	0.67	32
Bairdiella chrysoura	silver perch	3,754	17	2.0	8.2	27.81	3,040

Table A5, page 2 of 2

Seine catch statistics from the Braden River (n=135). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./Seine)	Max CPUE (No./Seine)
Leiostomus xanthurus	spot	1,364	48	4.3	12.5	10.10	128
Menticirrhus americanus	southern kingfish	1	1	1.5	7.3	0.01	1
Pogonias cromis	black drum	6	1	2.3	18.9	0.04	6
Sciaenops ocellatus	red drum	193	23	2.7	4.1	1.43	62
Tilapia spp.		4	4	6.6	6.4	0.03	1
Mugil cephalus	striped mullet	330	19	6.4	4.7	2.44	86
Mugil curema	white mullet	7	4	1.0	13.0	0.05	3
Mugil gyrans	fantail mullet	3	3	1.5	21.1	0.02	1
Chasmodes saburrae	Florida blenny	4	4	3.1	13.8	0.03	1
Gobiidae spp.		1	1	0.2	0.7	0.01	1
Gobionellus boleosoma	darter goby	1	1	3.1	8.3	0.01	1
Gobiosoma spp.		200	43	5.4	13.4	1.48	31
Gobiosoma bosc	naked goby	361	57	5.1	4.1	2.67	91
Gobiosoma robustum	code goby	14	7	5.4	4.5	0.10	5
Microgobius gulosus	clown goby	946	75	6.2	4.9	7.01	74
Microgobius thalassinus	green goby	1	1	1.9	6.8	0.01	1
Bathygobius soporator	frillfin goby	12	6	2.5	6.6	0.09	6
Paralichthys albigutta	gulf flounder	1	1	1.9	11.1	0.01	1
Trinectes maculatus	hogchoker	2,898	77	8.1	2.1	21.47	1,388
Achirus lineatus	lined sole	28	11	1.8	11.4	0.21	8
Symphurus plagiusa	blackcheek tonguefish	4	3	4.7	15.9	0.03	2
Sphoeroides nephelus	southern puffer	21	9	1.7	19.8	0.16	5

Table A6, page 1 of 2

Trawl catch statistics from the Manatee River (n=103). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./Trawl)	Max CPUE (No./Trawl)
Farfantepenaeus duorarum	pink shrimp	384	51	14.6	12.6	2.11	41
Callinectes sapidus	blue crab	192	62	14.0	12.0	1.05	15
Dasyatis sabina	Atlantic stingray	91	36	10.6	17.1	0.50	20
Dasyatis say	bluntnose stingray	1	1	4.4	28.0	0.01	1
Gymnura micrura	smooth butterfly ray	1	1	15.0	17.1	0.01	1
Lepisosteus osseus	longnose gar	2	2	14.6	12.3	0.01	1
Dorosoma petenense	threadfin shad	2	1	16.7	3.1	0.01	2
Opisthonema oglinum	Atlantic thread herring	8	1	13.1	3.8	0.04	8
Harengula jaguana	scaled sardine	2	2	4.4	30.0	0.01	1
Anchoa hepsetus	striped anchovy	25	7	12.8	23.2	0.14	11
Anchoa mitchilli	bay anchovy	7,513	43	19.5	3.5	41.28	2,832
Anchoa cubana	Cuban anchovy	20	2	11.8	30.4	0.11	17
Synodus foetens	inshore lizardfish	51	23	9.4	20.3	0.28	9
Ameiurus catus	white catfish	56	4	22.1	0.8	0.31	21
Ictalurus punctatus	channel catfish	4	3	24.5	0.4	0.02	2
Bagre marinus	gafftopsail catfish	13	10	12.9	13.6	0.07	3
Arius felis	hardhead catfish	380	19	9.7	18.4	2.09	72
Opsanus beta	gulf toadfish	5	5	10.5	13.9	0.03	1
Gobiesox strumosus	skilletfish	1	1	16.7	7.1	0.01	1
Urophycis floridana	southern hake	1	1	8.2	9.5	0.01	1
Poecilia latipinna	sailfin molly	1	1	23.7	0.3	0.01	1
Menidia spp.		1	1	21.6	0.2	0.01	1
Syngnathus louisianae	chain pipefish	4	4	11.2	21.7	0.02	1
Prionotus scitulus	leopard searobin	69	20	4.1	21.5	0.38	10
Prionotus tribulus	bighead searobin	14	6	5.5	5.4	0.08	5
Centropomus undecimalis	snook	1	1	21.6	21.1	0.01	1
Diplectrum formosum	sand perch	1	1	1.2	31.2	0.01	1
Lepomis macrochirus	bluegill	4	3	23.0	0.3	0.02	2
Pomoxis nigromaculatus	black crappie	4	2	23.9	0.4	0.02	2
Lutjanus griseus	gray snapper	2	2	22.3	0.5	0.01	1
Eucinostomus spp.		30	13	16.6	11.9	0.16	9
Eucinostomus gula	silver jenny	152	27	6.8	19.1	0.84	26
Eucinostomus harengulus	tidewater mojarra	51	19	14.5	8.2	0.28	6
Diapterus plumieri	striped mojarra	25	6	22.0	2.1	0.14	9
Orthopristis chrysoptera	pigfish	58	13	9.2	23.7	0.32	20
Lagodon rhomboides	pinfish	203	29	10.2	22.8	1.12	32
Archosargus probatocephalus	sheepshead	12	5	21.3	2.5	0.07	4
Sciaenidae spp.		1	1	5.7	0.9	0.01	1
Cynoscion nebulosus	spotted seatrout	15	9	12.8	9.3	0.08	5
Cynoscion arenarius	sand seatrout	1,732	40	18.5	11.0	9.52	354
Bairdiella chrysoura	silver perch	1,298	37	14.7	13.3	7.13	439
Leiostomus xanthurus	spot	111	23	13.8	11.0	0.61	16
Menticirrhus spp.		1	1	13.1	27.2	0.01	1
Menticirrhus americanus	southern kingfish	210	33	12.8	18.4	1.15	60
Menticirrhus saxatilis	northern kingfish	6	3	17.4	15.3	0.03	3
Pogonias cromis	black drum	2	2	16.3	10.0	0.01	1
Sciaenops ocellatus	red drum	11	5	19.5	3.3	0.06	4
Chaetodipterus faber	Atlantic spadefish	8	6	8.8	21.1	0.04	2
Chasmodes saburrae	Florida blenny	2	2	19.5	10.9	0.01	1
Gobiosoma spp.		23	5	15.8	7.1	0.13	18
Gobiosoma bosc	naked goby	14	7	21.2	3.7	0.08	5
Gobiosoma robustum	code goby	2	2	14.0	7.2	0.01	1
Microgobius gulosus	clown goby	137	17	19.2	4.9	0.75	25
Microgobius thalassinus	green goby	33	15	12.4	15.7	0.18	13

Trawl catch statistics from the Manatee River (n=103). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./Trawl)	Max CPUE (No./Trawl)
Etropus crossotus	fringed flounder	2	2	3.2	28.5	0.01	1
Paralichthys albigutta	gulf flounder	48	24	7.7	22.3	0.26	5
Ancylopsetta quadrocellata	ocellated flounder	2	2	4.4	30.0	0.01	1
Trinectes maculatus	hogchoker	1,823	51	23.3	1.4	10.02	972
Achirus lineatus	lined sole	2	2	12.8	23.6	0.01	1
Symphurus plagiusa	blackcheek tonguefish	59	22	7.6	19.1	0.32	8
Monacanthus hispidus	planehead filefish	6	2	2.2	31.1	0.03	5
Lactophrys quadricornis	scrawled cowfish	11	6	1.8	16.4	0.06	6
Sphoeroides nephelus	southern puffer	10	9	10.6	14.0	0.05	2
Chilomycterus schoepfi	striped burrfish	13	9	4.8	21.7	0.07	3
No fish		0	0			0.00	0

Table A7, page 1 of 1

Trawl catch statistics for the Braden River (n=67). Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*kmu* (km)	*Su* (psu)	Mean CPUE (No./Trawl)	Max CPUE (No./Trawl)
Farfantepenaeus duorarum	pink shrimp	371	27	3.2	8.1	5.54	115
Callinectes sapidus	blue crab	123	39	4.5	8.1	1.84	8
Dasyatis sabina	Atlantic stingray	16	10	2.0	13.0	0.24	3
Lepisosteus osseus	longnose gar	3	3	3.3	7.9	0.04	1
Elops saurus	ladyfish	3	2	8.9	19.3	0.04	2
Brevoortia spp.		28	2	4.4	2.2	0.42	27
Anchoa hepsetus	striped anchovy	2	2	4.7	25.8	0.03	1
Anchoa mitchilli	bay anchovy	6,759	39	6.1	1.9	100.88	2,697
Synodus foetens	inshore lizardfish	3	2	3.3	18.1	0.04	2
Ameiurus catus	white catfish	1	1	8.0	0.2	0.01	1
Arius felis	hardhead catfish	13	11	4.7	15.5	0.19	2
Opsanus beta	gulf toadfish	3	3	2.8	16.3	0.04	1
Gobiesox strumosus	skilletfish	2	2	7.2	21.1	0.03	1
Menidia spp.		1	1	6.7	11.5	0.01	1
Syngnathus louisianae	chain pipefish	2	2	4.6	21.2	0.03	1
Syngnathus scovelli	gulf pipefish	2	2	6.0	13.5	0.03	1
Prionotus scitulus	leopard searobin	1	1	1.0	13.1	0.01	1
Centropomus undecimalis	snook	3	2	8.1	0.3	0.04	2
Lepomis spp.		3	2	8.7	6.6	0.04	1
Lepomis macrochirus	bluegill	36	10	7.5	0.3	0.54	11
Lepomis microlophus	redear sunfish	2	1	8.9	0.2	0.03	2
Pomoxis nigromaculatus	black crappie	2	1	8.0	0.3	0.03	2
Oligoplites saurus	leatherjacket	1	1	2.7	10.2	0.01	1
Lutjanus griseus	gray snapper	2	2	4.9	2.8	0.03	1
Eucinostomus spp.		120	24	4.7	7.5	1.79	26
Eucinostomus gula	silver jenny	12	2	0.8	17.7	0.18	8
Eucinostomus harengulus	tidewater mojarra	80	24	3.9	5.0	1.19	10
Diapterus plumieri	striped mojarra	256	9	5.9	0.6	3.82	92
Orthopristis chrysoptera	pigfish	2	2	0.8	24.6	0.03	1
Lagodon rhomboides	pinfish	113	20	5.6	4.2	1.69	32
Archosargus probatocephalus	sheepshead	19	10	6.2	9.9	0.28	7
Cynoscion nebulosus	spotted seatrout	30	13	3.7	11.4	0.45	9
Cynoscion arenarius	sand seatrout	412	31	2.8	12.7	6.15	82
Bairdiella chrysoura	silver perch	135	16	6.0	11.3	2.01	42
Leiostomus xanthurus	spot	153	11	4.4	4.7	2.28	22
Menticirrhus spp.		1	1	0.2	27.0	0.01	1
Menticirrhus americanus	southern kingfish	133	14	1.5	15.0	1.99	67
Menticirrhus saxatilis	northern kingfish	1	1	1.5	28.9	0.01	1
Pogonias cromis	black drum	17	7	4.0	18.9	0.25	5
Sciaenops ocellatus	red drum	23	6	3.0	2.7	0.34	11
Chaetodipterus faber	Atlantic spadefish	3	1	3.1	24.0	0.04	3
Gobiosoma spp.		25	8	7.2	12.1	0.37	7
Gobiosoma bosc	naked goby	14	11	6.9	9.6	0.21	2
Gobiosoma robustum	code goby	4	1	1.0	13.1	0.06	4
Microgobius gulosus	clown goby	255	38	5.2	5.7	3.81	50
Microgobius thalassinus	green goby	9	4	1.2	12.2	0.13	6
Etropus crossotus	fringed flounder	1	1	0.2	20.2	0.01	1
Paralichthys albigutta	gulf flounder	6	4	1.0	16.5	0.09	3
Trinectes maculatus	hogchoker	618	36	7.0	2.1	9.22	105
Achirus lineatus	lined sole	1	1	0.6	17.1	0.01	1
Symphurus plagiusa	blackcheek tonguefish	9	3	1.6	16.5	0.13	6
Sphoeroides nephelus	southern puffer	6	5	1.8	14.6	0.09	2
No fish		0	0			0.00	0

Table A8. Page 1 of 8.

Plankton-net catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (22)	Feb (22)	Mar (22)	Apr (44)	May (66)	Jun (66)	Jul (22)	Aug (22)	Sep (22)	Oct (22)	Nov (22)	Dec (22)
Nemopsis sp.	hydromedusa				224	850	2283	13	14	148	4	11	
Aurelia aurita	moon jellyfish					2							
Mnemiopsis mccradyi	comb jelly, ctenophore				54010	20250	58300	17500	11100	23350			
Beroe ovata	sea walnut, ctenophore					3	10						
turbellarians	flatworms	1	1							1		2	1
nemerteans	ribbon worms											1	
polychaetes	sand worms, tube worms	335	285	69	61	224	615	49	29	104	30	184	59
oligochaetes	freshwater worms	62	13	6		34		17	5	5	4	1	44
hirudinoideans	leeches	17	10	2	10	8	69	74	25	6	3	1	8
Limulus polyphemus larvae	horsehoe crab	21	5		6	2	6	4	2				4
acari	water mites	5	2	24			16	11	16		2	17	8
pycnogonids	sea spiders						53						
coleopterans, curculionid adults	beetles					1	1			3		1	
coleopterans, dytiscid larvae	predaceous diving beetles	1							4				2
coleopterans, dytiscid adults	predaceous diving beetles	3		2									3
coleopterans, elmid larvae	riffle beetles	1	1	1			1	2	1		1		
coleopterans, elmid adults	riffle beetles	6		1			1	2	9	1			
coleopterans, gyrinid adults	whirligig beetles			1				3	4				
coleopterans, haliplid larvae	crawling water beetles												1
coleopterans, haliplid adults	crawling water beetles									1			1
coleopterans, noterid larvae	burrowing water beetles								4	2			
coleopterans, noterid adults	burrowing water beetles							5	2		1		1
coleopterans, scirtid larvae	marsh beetles							1	1				
dipterans, pupae	flies, mosquitoes	179	65	5827	132	58	1060	635	316	17	17	596	489
dipterans, ceratopogonid larvae	biting midges						1						1
dipteran, Chaoborus punctipennis larvae	phantom midge	319	135	294	44		29892	1753	1025	4	74	4602	940
dipterans, chironomid larvae	midges	101	12	19	36	17	24	100	95	13	2	102	74
dipterans, simuliid larvae	black flies	10											1
dipterans, tabanid larvae	deer flies			2					4				
ephemeropteran larvae	mayflies	185	6	11			2	93	42	1	1	34	221
ephemeropteran larvae, potamanthid	mayflies	2											2
heteropterans, corixid juveniles	water boatmen	2	1	1	2			2	1				
heteropterans, corixid adults	water boatmen		2	9	1	2	3	1					
heteropterans, gerrid adults	water striders					1	7		7				
heteropterans, pleid adults	pygmy backswimmers							1	1			1	1
lepidopterans, pyralid larvae	aquatic caterpillars											17	2
neuropteran, Climacia spp. larvae	spongillaflies								1				
odonates, anisopteran larvae	dragonflies									1		13	
odonates, zygopteran larvae	damselflies	8	1	4		10	12	8	10		1	20	10
trichopteran larvae	caddisflies	102	2	9			3		5				9

Table A8. Page 2 of 8.

Plankton-net catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (22)	Feb (22)	Mar (22)	Apr (44)	May (66)	Jun (66)	Jul (22)	Aug (22)	Sep (22)	Oct (22)	Nov (22)	Dec (22)
cladocerans, daphniid	water fleas	3901	152	1262			367	615	140		8	5670	9027
cladocerans, Bosminiopsis spp.	water fleas	347	5	121								8	747
cladocerans, Ilyocryptus spp.	water fleas	4	4	19				1251	76		17	535	1
cladocerans, Diaphanosoma spp.	water fleas	741	147	1434			3	4	4			58	1332
cladoceran, Penilia avirostris	water flea				25186	4783	1113			48	10	5408	
cladocerans, Euryalona spp.	water fleas	2											1
cladoceran, Evadne tergestina	water flea				52	959	501		24	38		2	
ostracods, unidentified	seed shrimps		6	1	123	2766	2333	231	273	41	182	62	7
branchiurans, Argulus spp.	fish lice	2	2	2	36	28	41	14	21	4	6	1	2
cirriped nauplius stage	barnacles		188	1365	2826	2744	84842			645	18299	4403	
cirriped cypris stage	barnacles	2		3		27	55				4	5	
copepods, calanoid	copepods	2713	3129	8695	175857	116691	78300	1187	360	5239	4934	35578	1115
copepods, harpacticoid	copepods	1	6	3		14		5					4
copepods, freshwater cyclopoids	copepods	4532	3533	15881	6	385	103238	6628	8400	2	111	12993	5800
Oithona spp.	copepods			413			217			3		7	1
Monstrilla sp.	copepod				5	1018	945						
Caligus spp.	copepods		5	5	26	134	149			8	24	8	
stomatopod, Squilla empusa larvae	mantis shrimp				13	20	1						
amphipods, gammaridean	scuds, beachhoppers	7746	1531	1904	71168	10696	33865	5363	2267	1768	8683	9298	1954
amphipods, caprellid	skeleton shrimps					9		3	1	1	1		
cumaceans	cumaceans	927	10668	237	11443	25882	47772	91	76	434	657	2661	91
isopods, unidentified	isopods				1								
Cyathura polita	isopod			6	988	654	139	75	4	13	19	69	13
Xenanthura brevitelson	isopod										1		
Munna reynoldsi	isopod		1	5	915	60	101					4	2
epicaridean larvae	isopods				3	66	42						
Probopyrus sp. (attached)	isopod					1	10		3	1	10		1
Anopsilana jonesi	isopod						2	3	2		1	1	
cymothoid sp. a (Lironeca) juveniles	isopod	13	16	44	889	1599	1973	249	93	357	210	157	9
Serolis mcgrayi	isopod								1	1			
isopods, sphaeromatid	isopods	4	2	2	200	128	49	18	27	31	37	34	7
Edotea triloba	isopod	51	136	20	51057	6083	2574	511	93	542	1691	719	30
Erichsonella attenuata	isopod	6			8	4	4				1		
mysids, unidentified	opposum shrimps	25313	20464	31409	67143	37680	45192	7400	7169	1389	4632	15699	4624
tanaids, unidentified	tanaids	28	3	5	4	285	28	51	19	5	5	4	2
decapod zoeae	crab larvae	43	3512	32185	146074	182753	632800	11498	4229	5740	6537	3832	
decapod mysis larvae	shrimps and hermit crabs	8	99	6407	67547	105827	204535	4895	17629	10274	10453	1772	2
decapod megalopae	post-zoea crab larvae	5	8	5	15343	7663	18942	231	210	1772	615	238	
penaeid postlarvae	penaeid shrimps											4	
penaeid metamorphs	penaeid shrimps	2				33	115	79	100	58	95	7	

Table A8. Page 3 of 8.

Plankton-net catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (22)	Feb (22)	Mar (22)	Apr (44)	May (66)	Jun (66)	Jul (22)	Aug (22)	Sep (22)	Oct (22)	Nov (22)	Dec (22)
Farfantepenaeus duorarum juveniles	pink shrimp				3	3		10	24	71	3	1	1
Rimapenaeus spp. juveniles	shrimps						1						
sicyoniid juveniles	rock shrimps								3				
Sicyonia laevigata juveniles	rock shrimp							1					
Lucifer faxoni juveniles and adults	shrimp		2	2	8384	56966	63479	339	28	831	12210	6398	
Acetes americanus postlarvae	shrimp				1								
Acetes americanus adults	shrimp			1									
Palaemonetes spp. postlarvae	grass shrimp	4		2	541	1145	1094				2	6	
Palaemonetes pugio juveniles	daggerblade grass shrimp	3		4	79	112	250	20	5	75	89	9	3
Palaemonetes pugio adults	daggerblade grass shrimp	2		1		22	15	1	14	21	74	18	7
Periclimenes spp. postlarvae	shrimps				30							1	
Periclimenes spp. juveniles	shrimps				32	1	1				30		
Periclimenes spp. adults	shrimps									1			
alphaeid postlarvae	snapping shrimps				35	44	2		1	2	10		1
alphaeid juveniles	snapping shrimps				6		1		1		14		
Leptalpheus forceps juveniles	snapping shrimp			4									
Hippolyte zostericola juveniles	zostera shrimp						3						
Tozeuma carolinense postlarvae	arrow shrimp				85	44						2	
Tozeuma carolinense juveniles	arrow shrimp										24		
Tozeuma carolinense adults	arrow shrimp							2					
Ogyrides alphaerostris juveniles and adults	estuarine longeye shrimp					1	4	1			1		
Upogebia spp. postlarvae	mud shrimps				45	100	129		5	135	3		
Upogebia spp. juveniles	mud shrimps						2				1		
Upogebia affinis juveniles	coastal mud shrimp				2	190							
paguroid juveniles	hermit crabs										14		
majid juveniles	spider crabs							2					
Callinectes sapidus juveniles	blue crab	21	6	2	40	8	16	9		7	3	2	4
xanthid juveniles	mud crabs	3		1		6	4	14	2				2
xanthid adults	mud crabs												1
grapsid juveniles	crabs					3		1					
pinnotherid postlarvae	pea crabs				8								
pinnotherid juveniles	pea crabs				1	114	216	1	10	13			
Pinnotheres maculatus juveniles	squatter pea crab				3								
pelecypods	clams, mussels, oysters	1540	1900	59	54	2053	877	68	109	501	609	541	190
gastropods, opisthobranch	sea slugs	1	1		9	90	5			3	3	1	
gastropods, prosobranch	snails	1105	590	89	1925	13936	25430	545	561	2839	1670	505	176
Lolliguncula brevis juveniles	bay squid				9	9	5	1					
ophiuroidean juveniles	brittlestars									85	2		
appendicularian, Oikopleura dioica	larvacean		16	671	7445	9095	6127			619	553	1165	
Branchiostoma floridae	lancelet						2	2	2	4			

Table A8. Page 4 of 8.

Plankton-net catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (22)	Feb (22)	Mar (22)	Apr (44)	May (66)	Jun (66)	Jul (22)	Aug (22)	Sep (22)	Oct (22)	Nov (22)	Dec (22)
chaetognaths, Sagitta spp.	arrow worms	8	137	156	16692	45521	64026	41	3027	2491	3546	3165	
Lepisosteus platyrhincus juveniles	Florida gar					1							
Elops saurus postflexion larvae	ladyfish	2		13									
Myrophis punctatus postflexion larvae	speckled worm eel		2										
Myrophis punctatus juveniles	speckled worm eel	6	3		3								
clupeid eggs	herrings					3							
clupeid preflexion larvae	herrings						274						
clupeid flexion larvae	herrings				2								
Brevoortia spp. flexion larvae	menhaden		1										
Brevoortia spp. postflexion larvae	menhaden	112	294	379	76	2							1
Brevoortia spp. metamorphs	menhaden	5	17	2300	1326	220	92						
Brevoortia patronus juveniles	gulf menhaden				7	12	1						
Brevoortia smithi juveniles	yellowfin menhaden		2		155	183	112						
Dorosoma petenense preflexion larvae	threadfin shad			20			1						
Dorosoma petenense flexion larvae	threadfin shad			1			2						
Dorosoma petenense postflexion larvae	threadfin shad						1						
Dorosoma petenense metamorphs	threadfin shad								1		1		
Dorosoma petenense juveniles	threadfin shad							1			5	1	1
Harengula jaguana eggs	scaled sardine					3							
Harengula jaguana flexion larvae	scaled sardine						103						
Harengula jaguana postflexion larvae	scaled sardine				5								
Harengula jaguana metamorphs	scaled sardine									1			
Opisthonema oglinum eggs	Atlantic thread herring				11	48							
Opisthonema oglinum flexion larvae	Atlantic thread herring				4								
Opisthonema oglinum postflexion larvae	Atlantic thread herring				2	1							
Sardinella aurita postflexion larvae	Spanish sardine				1								
Anchoa spp. preflexion larvae	anchovies	2	5	170	7698	2464	2442	26	64	424	261		
Anchoa spp. flexion larvae	anchovies		2	29	3138	926	659	148	117	517	250	5	
Anchoa hepsetus eggs	striped anchovy			1	34	21							
Anchoa hepsetus postflexion larvae	striped anchovy			9	17	3	3				2		
Anchoa hepsetus juveniles	striped anchovy				1	5	1						
Anchoa mitchilli eggs	bay anchovy			44538	4868	1349					3		
Anchoa mitchilli postflexion larvae	bay anchovy		3	13	1193	1034	341	40	77	312	476	10	
Anchoa mitchilli juveniles	bay anchovy	1756	3385	540	2490	5457	5078	2324	1204	1283	7303	1284	1687
Anchoa mitchilli adults	bay anchovy	207	208	43	190	87	71	7	68	112	298	237	134
Anchoa cubana juveniles	Cuban anchovy					1							
Anchoa cubana adults	Cuban anchovy	2											
Notemigonus crysoleucas flexion larvae	golden shiner	1											2
Notemigonus crysoleucas postflexion larvae	golden shiner	1											
Notemigonus crysoleucas juveniles	golden shiner											1	

Table A8. Page 5 of 8.

Plankton-net catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (22)	Feb (22)	Mar (22)	Apr (44)	May (66)	Jun (66)	Jul (22)	Aug (22)	Sep (22)	Oct (22)	Nov (22)	Dec (22)
Notropis spp. flexion larvae	minnows			1									
Ameiurus catus juveniles	white catfish				1	1	2	4	4				
Ictalurus punctatus juveniles	channel catfish								1				
Synodus foetens postflexion larvae	inshore lizardfish				1								
Opsanus beta juveniles	gulf toadfish					2							
Gobiesox strumosus preflexion larvae	skilletfish	2		2	36	105	69				5	4	
Gobiesox strumosus flexion larvae	skilletfish	1			62	242	2				1		
Gobiesox strumosus postflexion larvae	skilletfish			2	383	21	1						
Gobiesox strumosus juveniles	skilletfish				305	194	3					4	
Hyporhamphus unifasciatus postflexion larvae	silverstripe halfbeak				2	1							
Strongylura spp. postflexion larvae	needlefishes				2	1					1		
Strongylura marina juveniles	Atlantic needlefish			1	2	1							
Strongylura marina adults	Atlantic needlefish												1
Fundulus spp. postflexion larvae	killifishes				1	2							
Lucania parva postflexion larvae	rainwater killifish					7							
Lucania parva juveniles	rainwater killifish				3	139	1	3	1		1		
Lucania parva adults	rainwater killifish			1		10			1	1			
Gambusia holbrooki juveniles	eastern mosquitofish			1		5	2	1	3		1		
Gambusia holbrooki adults	eastern mosquitofish					1	1			1		1	
Heterandria formosa adults	least killifish												1
Poecilia latipinna juveniles	sailfin molly				1	5			8		3		
Fish eggs, atherinid	silversides		1										
Menidia spp. preflexion larvae	silversides	1	7	18	9	16	3	1	2	2	3	3	1
Menidia spp. flexion larvae	silversides			1	3								
Menidia spp. postflexion larvae	silversides			2	7	2							
Menidia beryllina juveniles	inland silverside	13	1	42	245	258	104	46	52	9	41	27	11
Menidia beryllina adults	inland silverside	4	1			1	4		3				
Membras martinica preflexion larvae	rough silverside				6								
Membras martinica flexion larvae	rough silverside				4								
Membras martinica postflexion larvae	rough silverside				3								
Membras martinica juveniles	rough silverside				1	1							
Labidesthes sicculus preflexion larvae	brook silverside	1	1										
Labidesthes sicculus juveniles	brook silverside												2
Fish eggs, percomorph	sciaenid eggs (primarily)			4258	4563	5632	22698	221	9	517	19	11	
Hippocampus erectus juveniles	lined seahorse				4	2					1	1	
Syngnathus floridae juveniles	dusky pipefish				1	2							
Syngnathus louisianae juveniles	chain pipefish	2	1	5	11	18	2		1	2	1	3	
Syngnathus louisianae adults	chain pipefish						1						
Syngnathus scovelli juveniles	gulf pipefish		5	3	1	14	5		1	1		1	1
Prionotus spp. preflexion larvae	searobins				1	1	104	1			1	1	

Table A8. Page 6 of 8.

Plankton-net catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (22)	Feb (22)	Mar (22)	Apr (44)	May (66)	Jun (66)	Jul (22)	Aug (22)	Sep (22)	Oct (22)	Nov (22)	Dec (22)
Prionotus spp. flexion larvae	searobins				1		1	1		5			
Prionotus spp. postflexion larvae	searobins				1						1		
Prionotus tribulus juveniles	bighead searobin				1								
Lepomis spp. flexion larvae	sunfishes						3	2					
Lepomis spp. postflexion larvae	sunfishes						12						
Lepomis gulosus juveniles	warmouth											1	
Lepomis macrochirus juveniles	bluegill						3					3	
Micropterus salmoides flexion larvae	largemouth bass						1						
Micropterus salmoides juveniles	largemouth bass					1							
Pomoxis nigromaculatus preflexion larvae	black crappie	1		6									
Elassoma evergladei juveniles	Everglades pygmy sunfish	1											
Elassoma evergladei adults	Everglades pygmy sunfish												1
Etheostoma fusiforme preflexion larvae	swamp darter			4									1
Etheostoma fusiforme flexion larvae	swamp darter	2											1
Etheostoma fusiforme postflexion larvae	swamp darter	1											2
Etheostoma fusiforme juveniles	swamp darter		1										
Chloroscombrus chrysurus flexion larvae	Atlantic bumper						1						
Chloroscombrus chrysurus juveniles	Atlantic bumper						1	2					
Oligoplites saurus preflexion larvae	leatherjack						1						
Oligoplites saurus flexion larvae	leatherjack					1							
Oligoplites saurus juveniles	leatherjack						5	2	2				
gerreid preflexion larvae	mojjaras				17	3	2					1	
gerreid flexion larvae	mojjaras				21		1				1		
gerreid postflexion larvae	mojjaras				1	2	23	1					
Eucinostomus spp. postflexion larvae	mojarras					47					5	8	
Eucinostomus spp. juveniles	mojarras						1					1	1
Eucinostomus gula adults	silver jenny					1							
Eucinostomus harengulus juveniles	tidewater mojarra					1							
Orthopristis chrysoptera postflexion larvae	pigfish	3		2	2								
Archosargus probatocephalus flexion larvae	sheepshead				3								
Archosargus probatocephalus postflexion larvae	sheepshead				51								
Archosargus probatocephalus juveniles	sheepshead				1								
Lagodon rhomboides postflexion larvae	pinfish	57	261	3									13
Bairdiella chrysoura preflexion larvae	silver perch				61	92	4						
Bairdiella chrysoura flexion larvae	silver perch			1	151	17	123	8	10	6	1		1
Bairdiella chrysoura postflexion larvae	silver perch				109	99	21	9	1				
Bairdiella chrysoura juveniles	silver perch				30	29	4	2					
Cynoscion arenarius preflexion larvae	sand seatrout		7	1	75	34	245	1	1				
Cynoscion arenarius flexion larvae	sand seatrout				45	1	5	2	18	8	1		
Cynoscion arenarius postflexion larvae	sand seatrout				27	3	2	1	15	3	2		

Table A8. Page 7 of 8.

Plankton-net catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (22)	Feb (22)	Mar (22)	Apr (44)	May (66)	Jun (66)	Jul (22)	Aug (22)	Sep (22)	Oct (22)	Nov (22)	Dec (22)
Cynoscion arenarius juveniles	sand seatrout				2	10	2	4	9	2	2		
Cynoscion nebulosus preflexion larvae	spotted seatrout				38	46	1		1	1	1		
Cynoscion nebulosus flexion larvae	spotted seatrout				39	7	3	1	6	16	1		
Cynoscion nebulosus postflexion larvae	spotted seatrout				2	8	1		2				
Cynoscion nebulosus juveniles	spotted seatrout					1	2	1					
Leiostomus xanthurus postflexion larvae	spot	10											
Leiostomus xanthurus juveniles	spot	11	3										
Menticirrhus spp. preflexion larvae	kingfishes		1	1	24	1	1			3	1		
Menticirrhus spp. flexion larvae	kingfishes				13	4	3	3	3	9			
Menticirrhus spp. postflexion larvae	kingfishes				10			1		1	4		
Menticirrhus americanus juveniles	southern kingfish						1						
Pogonias cromis postflexion larvae	black drum			2									
Sciaenops ocellatus flexion larvae	red drum										8		
Sciaenops ocellatus postflexion larvae	red drum										24	2	
Tilapia spp. juveniles	tilapias						1						
Mugil cephalus juveniles	striped mullet	11	3	1		5							
Astroscopus y-graecum preflexion larvae	southern stargazer					1							
blenniid preflexion larvae	blennies		1	5	65	13	65			8	1	2	1
Chasmodes saburrae flexion larvae	Florida blenny			1	65	37	4			9		1	
Chasmodes saburrae postflexion larvae	Florida blenny				81	16	141						
Hypsoblennius spp. flexion larvae	blennies				6								
Hypsoblennius spp. postflexion larvae	blennies				3								
Hypsoblennius spp. juveniles	blennies				1								
Lupinoblennius nicholsi flexion larvae	highfin blenny				5					1		1	
Lupinoblennius nicholsi postflexion larvae	highfin blenny				4								
gobiid preflexion larvae	gobies		1	58	200	1665	383	1	2	7	32	2	
gobiid flexion larvae	gobies	1	12	16	221	1215	311	56	23	76	9		
Bathygobius soporator preflexion larvae	frillfin goby			2	36	201	315			1	5		
Bathygobius soporator flexion larvae	frillfin goby				52	3	144					1	
Bathygobius soporator postflexion larvae	frillfin goby				53		90				1	2	
Gobionellus boleosoma flexion larvae	darter goby				1								
Gobionellus boleosoma postflexion larvae	darter goby					3							
Gobiosoma spp. postflexion larvae	gobies		1	2	908	2409	1904	110	32	9	103	15	
Gobiosoma spp. juveniles	gobies					91			2	1	1		
Gobiosoma bosc juveniles	naked goby	1				23	132	8	51			1	2
Gobiosoma bosc adults	naked goby					1	2		2				
Gobiosoma robustum juveniles	code goby					45	12	1	5		1		
Gobiosoma robustum adults	code goby												1
Microgobius spp. flexion larvae	gobies			56	225	313	326	13	51	49	54		
Microgobius spp. postflexion larvae	gobies		3		497	1045	934	12	93	35	35	13	

Table A8. Page 8 of 8.

Plankton-net catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (22)	Feb (22)	Mar (22)	Apr (44)	May (66)	Jun (66)	Jul (22)	Aug (22)	Sep (22)	Oct (22)	Nov (22)	Dec (22)
Microgobius gulosus juveniles	clown goby				11	38	108	18	2		2		
Microgobius gulosus adults	clown goby					4	5	1			1		1
Microgobius thalassinus juveniles	green goby						1		1		1		
Microdesmus longipinnis preflexion larvae	pink wormfish				6								
Microdesmus longipinnis flexion larvae	pink wormfish				5								
Paralichthys spp. postflexion larvae	flounders	3	1										
Achirus lineatus preflexion larvae	lined sole				4	3	67				2		
Achirus lineatus flexion larvae	lined sole				4	1	101			18			
Achirus lineatus postflexion larvae	lined sole				2		5			3			
Achirus lineatus juveniles	lined sole						2			3			
Trinectes maculatus preflexion larvae	hogchoker				11	62	119	3	1	13	3		
Trinectes maculatus flexion larvae	hogchoker				11	2	51	4	2	16	19		
Trinectes maculatus postflexion larvae	hogchoker				21	162	78	55	17	39	25	1	
Trinectes maculatus juveniles	hogchoker	2	2	2	2	31	184	23	168	16	98	34	1
Trinectes maculatus adults	hogchoker						3		7				
Symphurus plagiusa postflexion larvae	blackcheek tonguefish								1		1		
Monacanthus hispidus juveniles	planehead filefish				1								
Sphoeroides spp. preflexion larvae	puffers				1								
Sphoeroides spp. flexion larvae	puffers				2								
Sphoeroides nephelus juveniles	southern puffer				4		1						
unidentified preflexion larvae					1	1						8	
unidentified flexion larvae						1							
unidentified postflexion larvae												8	
anuran larvae	tadpoles					1						1	

Table A9. Page 1 of 4.

Seine catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (23)	Feb (23)	Mar (23)	Apr (68)	May (69)	Jun (46)	Jul (23)	Aug (23)	Sep (22)	Oct (23)	Nov (23)	Dec (23)
Farfantepenaeus spp.	commercial shrimp					3							
Farfantepenaeus duorarum	pink shrimp	1			55	34	81	42	88	73	209	25	105
Callinectes sapidus	blue crab	17	3	2	82	42	7	5	16	16	44	10	29
Dasyatis sabina	Atlantic stingray	1			6	8	11			1	3	1	
Rhinoptera bonasus	cownose ray					2							
Lepisosteus osseus	longnose gar						1						
Lepisosteus platyrhincus	Florida gar						1			1			
Elops saurus	ladyfish					2	3		3		1		
Ophichthidae spp.					1								
Brevoortia spp.			18	206	4134	1897	963	26	1		1		
Dorosoma petenense	threadfin shad						2			1			100
Opisthonema oglinum	Atlantic thread herring						8			9	6		
Harengula jaguana	scaled sardine				3		7	1	49	767		189	
Anchoa spp.							182						
Anchoa hepsetus	striped anchovy		3		181	1049	567	7	25	7	23	3	9
Anchoa mitchilli	bay anchovy	197	1771	8	122508	29461	12774	836	840	15545	5902	5446	4210
Anchoa cubana	Cuban anchovy				3	65							
Synodus foetens	inshore lizardfish				86	48	20	1	6			10	9
Notemigonus crysoleucas	golden shiner							2					
Notropis spp.						11			3	4	6		
Notropis maculatus	taillight shiner			1	4		1						2
Notropis petersoni	coastal shiner		4				5	1	15			2	8
Ictaluridae spp.							1						
Ameiurus catus	white catfish								1				
Ictalurus punctatus	channel catfish			1									
Arius felis	hardhead catfish										4		
Opsanus beta	gulf toadfish					1		2			3	1	
Gobiesox strumosus	skilletfish				1	2	2	1	3	1	2	2	
Urophycis floridana	southern hake												1
Strongylura spp.					32	75	19	2		2			
Strongylura marina	Atlantic needlefish			2		1	3						
Strongylura notata	redfin needlefish	4			12	9	18	7	19	3	46	3	1
Strongylura timucu	timucu		1			12	1			2	3		1
Cyprinodon variegatus	sheepshead minnow	94	14		24	89	87	50	96	35	44	18	40
Fundulus spp.		1											

Table A9. Page 2 of 4.

Seine catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (23)	Feb (23)	Mar (23)	Apr (68)	May (69)	Jun (46)	Jul (23)	Aug (23)	Sep (22)	Oct (23)	Nov (23)	Dec (23)
Fundulus confluentus	marsh killifish	3			2						36	11	1
Fundulus majalis	striped killifish	126	26	3	68	25	60	191	607	4	41	11	71
Fundulus grandis	gulf killifish	18	1		39	20	21	42	57	9	175	85	61
Fundulus chrysotus	golden topminnow										9		
Fundulus seminolis	seminole killifish	29	36	42	40	124	16	80	51	92	161	135	12
Lucania parva	rainwater killifish	168		9	500	561	411	275	194	383	244	244	80
Lucania goodei	bluefin killifish	1									3		6
Adinia xenica	diamond killifish	7				1			1		3	6	6
Floridichthys carpio	goldspotted killifish	25	1		137		60	2		1	1		42
Jordanella floridae	flagfish										3	1	
Gambusia holbrooki	eastern mosquitofish	207	21	224	911	417	50	75	181	431	1148	1490	1468
Poecilia latipinna	sailfin molly	45	2	7	254	220	79	83	185	182	1098	605	134
Heterandria formosa	least killifish			1	6	4			1		29	1	4
Membras martinica	rough silverside					304	1155	51					
Menidia spp.		1587	545	1266	5590	12694	7905	3408	3381	2159	2833	965	1198
Labidesthes sicculus	brook silverside	10	23	21	4	7			2	25	38		19
Syngnathus floridae	dusky pipefish				4				1	1			1
Syngnathus louisianae	chain pipefish				16	14	4	1	1		6	1	3
Syngnathus scovelli	gulf pipefish				21	11	25	5	9	4	13	17	41
Hippocampus zosterae	dwarf seahorse											1	5
Prionotus scitulus	leopard searobin					19	1		4			3	1
Prionotus tribulus	bighead searobin	2				2						1	6
Centropomus undecimalis	snook	26	11	7	14	10	7		5	14	49	24	9
Enneacanthus gloriosus	bluespotted sunfish										1		
Lepomis macrochirus	bluegill	15	10	11	11	15		8	23	5	35	8	189
Lepomis microlophus	redear sunfish			2					7	2	6	1	5
Lepomis punctatus	spotted sunfish		1	3							1		
Micropterus salmoides	largemouth bass	2		1	5	11	1	5	2	1	1	2	1
Caranx hippos	crevalle jack							1	4				
Caranx latus	horse-eye jack											2	
Oligoplites saurus	leatherjacket	1				2	51	92	31	39	16	3	
Trachinotus falcatus	permit								1	4	3	17	1
Lutjanus griseus	gray snapper	1		2	1		1		13		2	2	2
Lutjanus synagris	lane snapper												4
Eucinostomus spp.		770	272	241	726	172	961	249	1241	135	527	958	1139

Table A9. Page 3 of 4.

Seine catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (23)	Feb (23)	Mar (23)	Apr (68)	May (69)	Jun (46)	Jul (23)	Aug (23)	Sep (22)	Oct (23)	Nov (23)	Dec (23)
Eucinostomus gula	silver jenny	105	12	3	197	241	59	58	96	517	122	143	62
Eucinostomus harengulus	tidewater mojarra	95	55	71	1853	899	880	214	498	362	148	168	137
Diapterus plumieri	striped mojarra	6		4	14	10	18	41	139	25	53	27	5
Orthopristis chrysoptera	pigfish				21	152	21	10	14			1	
Sparidae spp.				1									
Lagodon rhomboides	pinfish	13	71	1108	3001	2266	485	239	349	109	67	38	11
Archosargus probatocephalus	sheepshead	1			6	29	11	5	4	1	6		3
Diplodus holbrooki	spottail pinfish				1								10
Cynoscion nebulosus	spotted seatrout					15	91	72	79	22	33	15	5
Cynoscion arenarius	sand seatrout				5	37	2	1	70	8	50	7	1
Bairdiella chrysoura	silver perch		1		58	480	206	10	3878	358	147		
Leiostomus xanthurus	spot	1067	1174	841	984	577	264	21	14	15	1		
Menticirrhus americanus	southern kingfish					12	2		18	1	2		
Menticirrhus saxatilis	northern kingfish	5	1	2	4	19							
Pogonias cromis	black drum		1			6							
Sciaenops ocellatus	red drum	39	25	10	13	11	2		4		72	323	55
Chaetodipterus faber	Atlantic spadefish					1	6	4	3				
Tilapia spp.		1			2	1	2				1		1
Mugil spp.												5	1
Mugil cephalus	striped mullet	70	290	188	692	111	99	11	5	1	7	3	11
Mugil curema	white mullet	21				8	5	21	1			1	
Mugil gyrans	fantail mullet	9	177	167	2	32	18		2	2	3	2	2
Chasmodes saburrae	Florida blenny	2			2	2	1	8	12			4	27
Gobiidae spp.													1
Gobionellus boleosoma	darter goby				1								
Gobiosoma spp.		4		7	4	22	278	23	34	7	39	7	4
Gobiosoma bosc	naked goby	10	1	15	14	24	31	45	178	20	64	44	57
Gobiosoma robustum	code goby			2	19	11		8	4	4	1	12	30
Microgobius gulosus	clown goby	27	4	8	40	252	302	207	461	183	238	46	43
Microgobius thalassinus	green goby				1				3				
Bathygobius soporator	frillfin goby	2		1	5	2	1	2	1		14	4	6
Paralichthys albigutta	gulf flounder	1	5	1	25	24	1	1	2	1	2		1
Trinectes maculatus	hogchoker	208	57	240	505	220	189	253	395	1645	741	242	572
Achirus lineatus	lined sole				1	2	9	5	13	10	1	4	18
Symphurus plagiusa	blackcheek tonguefish				1	1	4		1	2	1	1	

Table A9. Page 4 of 4.

Seine catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (23)	Feb (23)	Mar (23)	Apr (68)	May (69)	Jun (46)	Jul (23)	Aug (23)	Sep (22)	Oct (23)	Nov (23)	Dec (23)
Monacanthus hispidus	planehead filefish				1								4
Sphoeroides nephelus	southern puffer	8			19	103	24	1	1	1	5	27	26
Chilomycterus schoepfi	striped burrfish				1		2		2	7			

Table A10. Page 1 of 2.

Trawl catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (10)	Feb (10)	Mar (10)	Apr (30)	May (30)	Jun (20)	Jul (10)	Aug (10)	Sep (11)	Oct (10)	Nov (10)	Dec (9)
Farfantepenaeus duorarum	pink shrimp	2	3	1	32	42	56	326	85	103	69	26	10
Callinectes sapidus	blue crab	8	19	13	32	49	36	34	25	17	32	14	36
Dasyatis sabina	Atlantic stingray		2	14	20	6	8	4		29	4	15	5
Dasyatis say	bluntnose stingray									1			
Gymnura micrura	smooth butterfly ray									1			
Lepisosteus osseus	longnose gar			1	1		1	1		1			
Elops saurus	ladyfish			1		2							
Brevoortia spp.					28								
Dorosoma petenense	threadfin shad											2	
Opisthonema oglinum	Atlantic thread herring											8	
Harengula jaguana	scaled sardine				1					1			
Anchoa hepsetus	striped anchovy				2	15		4	1	5			
Anchoa mitchilli	bay anchovy	34	57	116	396	1177	12	1262	5406	284	1688	3787	53
Anchoa cubana	Cuban anchovy					20							
Synodus foetens	inshore lizardfish				8	20	10	3	1		2	9	1
Ameiurus catus	white catfish			53	2	1					1		
Ictalurus punctatus	channel catfish	2	1					1					
Bagre marinus	gafftopsail catfish				3	1			3	2	3	1	
Arius felis	hardhead catfish	2	38		8	4	2	2	73	240	18	1	5
Opsanus beta	gulf toadfish			1		4		1	1				1
Gobiesox strumosus	skilletfish					1	1	1					
Urophycis floridana	southern hake			1									
Poecilia latipinna	sailfin molly										1		
Menidia spp.						1			1				
Syngnathus louisianae	chain pipefish				1	5							
Syngnathus scovelli	gulf pipefish				1	1							
Prionotus scitulus	leopard searobin	2	1		3	6	18	4	8	10	4	4	10
Prionotus tribulus	bighead searobin			1		1		1				2	9
Centropomus undecimalis	snook				3				1				
Diplectrum formosum	sand perch						1						
Lepomis spp.				2	1								
Lepomis macrochirus	bluegill	1	2	3	4			6	1		23		
Lepomis microlophus	redear sunfish		2										
Pomoxis nigromaculatus	black crappie	1		3	2								
Oligoplites saurus	leatherjacket									1			
Lutjanus griseus	gray snapper							1	2		1		

Table A10. Page 2 of 2.

Trawl catch by month, Manatee and Braden rivers combined.

Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (10)	Feb (10)	Mar (10)	Apr (30)	May (30)	Jun (20)	Jul (10)	Aug (10)	Sep (11)	Oct (10)	Nov (10)	Dec (9)
Eucinostomus spp.		10		1	3	12	26	27	37	3	9	11	11
Eucinostomus gula	silver jenny	6	4		9	21	31	11		11	30	11	30
Eucinostomus harengulus	tidewater mojarra	5	8	2	15	13	1	14	28	15	15	5	10
Diapterus plumieri	striped mojarra	1	2		12			137	109	7	11	2	
Orthopristis chrysoptera	pigfish				8	24	8	6	13		1		
Lagodon rhomboides	pinfish	5	19	47	87	58	23	12	17	7	38		3
Archosargus probatocephalus	sheepshead	2		4	1	11	1	3	2	1	2	3	1
Sciaenidae spp.													1
Cynoscion nebulosus	spotted seatrout				3	1	9	17	3	2	6	3	1
Cynoscion arenarius	sand seatrout	3	2	1	165	611	97	295	240	540	103	78	9
Bairdiella chrysoura	silver perch	1	34	6	28	297	89	135	39	498	231	46	29
Leiostomus xanthurus	spot		26	63	48	36	4	7	56	20	3		1
Menticirrhus spp.					1		1						
Menticirrhus americanus	southern kingfish		1		30	23	36	94	10	128	3	17	1
Menticirrhus saxatilis	northern kingfish			1	1		5						
Pogonias cromis	black drum			1	6	4	4		3	1			
Sciaenops ocellatus	red drum		3		7				1		18	5	
Chaetodipterus faber	Atlantic spadefish				1		3	1		3	3		
Chasmodes saburrae	Florida blenny							1		1			
Gobiosoma spp.					1	2	18	19			3	3	2
Gobiosoma bosc	naked goby	2		1	3	4	2	9	3	1	2	1	
Gobiosoma robustum	code goby						1	4					1
Microgobius gulosus	clown goby	4	9	7	8	50	19	158	57	23	39	7	11
Microgobius thalassinus	green goby			2	6	2	2	8	3	14		3	2
Etropus crossotus	fringed flounder				1	1					1		
Paralichthys albigutta	gulf flounder	1	3	1	9	16	7	5	4	3	2	3	
Ancylopsetta quadrocellata	ocellated flounder				1					1			
Trinectes maculatus	hogchoker	18	30	27	31	41	47	1395	206	121	453	51	21
Achirus lineatus	lined sole						1			2			
Symphurus plagiusa	blackcheek tonguefish	3	5	5	4	3	4	7	2	24	1	7	3
Monacanthus hispidus	planehead filefish				1		5						
Lactophrys quadricornis	scrawled cowfish			1		1	1		1		1	6	
Sphoeroides nephelus	southern puffer	1	1		2	2	1	2	2	1		2	2
Chilomycterus schoepfi	striped burrfish			1		1	6	1		1		3	
No fish													

Table A11, page 1 of 6. Location specific plankton-net catch, Manatee River.

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

		Location (km from mouth)													
Description	Common Name	0.9	4.0	5.4	7.5	10.2	12.4	13.7	15.3	18.2	20.0	22.3	25.1	27.5	29.8
Nemopsis sp.	hydromedusa	107.39	28.41	16.31	89.99	126.90	42.82	14.98	99.12	627.97	212.54	81.57	117.51	37.38	9.34
Aurelia aurita	moon jellyfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.39	0.00	0.00	0.00
Mnemiopsis mccradyi	comb jelly, ctenophore	1133.46	1246.16	3834.84	5819.34	20726.40	20072.51	12707.18	18280.68	5713.56	13398.43	7795.09	5772.49	0.00	0.00
Beroe ovata	sea walnut, ctenophore	0.00	0.00	3.12	1.63	0.00	1.24	0.00	0.00	0.00	0.69	2.09	0.00	0.00	0.00
turbellarians	flatworms	0.00	1.59	0.00	0.62	0.00	0.00	1.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
nemerteans	ribbon worms	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00
polychaetes	sand worms, tube worms	254.02	67.44	37.32	103.94	18.30	57.69	339.97	156.59	55.99	39.54	67.50	114.44	25.60	6.95
oligochaetes	freshwater worms	0.00	0.00	0.00	0.00	0.57	0.00	0.56	14.77	12.28	7.58	6.66	15.66	7.97	4.55
hirudinoideans	leeches	0.00	0.00	0.00	0.00	0.57	0.00	1.16	0.65	45.56	3.79	11.73	4.71	37.73	1.91
Limulus polyphemus larvae	horsehoe crab	12.53	7.18	5.76	5.44	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
acari	water mites	0.00	0.00	0.00	0.00	0.00	0.58	0.59	0.57	0.00	0.62	2.21	1.23	1.56	3.18
pycnogonids	sea spiders	0.00	0.00	0.00	0.00	64.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
coleopterans, curculionid adults	beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.26	0.00	0.00	0.00	0.67	1.38
coleopterans, dytiscid larvae	predaceous diving beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00	1.14	1.56	0.00
coleopterans, dytiscid adults	predaceous diving beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.57	1.17	1.22	0.71
coleopterans, elmid larvae	riffle beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	1.17	0.59	1.26
coleopterans, elmid adults	riffle beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.52	2.69
coleopterans, gyrinid adults	whirligig beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56	0.00	2.58
coleopterans, noterid adults	burrowing water beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.55	1.10	0.52	0.52	0.64
coleopterans, scirtid larvae	marsh beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.64
dipterans, pupae	flies, mosquitoes	0.00	0.00	0.00	0.00	9.57	14.99	168.34	71.83	830.03	2213.65	367.30	194.79	160.95	266.18
dipterans, ceratopogonid larvae	biting midges	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.63
dipteran, Chaoborus punctipennis larvae	phantom midge	2.90	10.72	3.55	1.22	3.46	3.91	4.11	3.02	21.47	18.62	439.02	223.15	140.12	123.82
dipterans, chironomid larvae	midges	0.00	0.00	0.00	0.00	0.00	0.60	2.52	0.57	0.60	1.67	15.25	30.60	113.02	50.06
dipterans, simuliid larvae	black flies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.91	5.07
ephemeropteran larvae	mayflies	0.00	0.56	0.00	0.00	1.76	0.00	0.59	0.65	0.00	1.16	4.72	13.47	63.96	25.14
ephemeropteran larvae, potamanthid	mayflies	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.57	0.00	0.00	1.25
heteropterans, corixid juveniles	water boatmen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.58	1.63	1.29	1.35
heteropterans, corixid adults	water boatmen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	1.75	1.25	4.13
heteropterans, gerrid adults	water striders	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.70	7.01
heteropterans, pleid adults	pygmy backswimmers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.09	0.52	0.00
lepidopterans, pyralid larvae	aquatic caterpillars	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.61
neuropteran, Climacia spp. larvae	spongillaflies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64
odonates, anisopteran larvae	dragonflies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71
odonates, zygopteran larvae	damselflies	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.10	6.45	4.02	1.91
trichopteran larvae	caddisflies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.74	3.04	5.44	3.74	5.21
cladocerans, daphniid	water fleas	0.00	2.82	0.59	3.27	4.05	8.89	18.28	39.33	753.96	725.36	1311.54	1409.93	605.21	754.92
cladocerans, Bosminiopsis spp.	water fleas	0.00	0.56	0.00	63.73	11.76	111.62	137.24	49.59	0.00	0.00	32.81	4.19	0.00	0.00
cladocerans, Ilyocryptus spp.	water fleas	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.65	2.02	2.76	0.63	0.00	2.95	0.00
cladocerans, Diaphanosoma spp.	water fleas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70	5.13	30.77	22.91	17.52	11.43
cladoceran, Penilia avirostris	water flea	20971.51	4685.98	2450.81	1771.99	59.07	35.05	13.90	0.00	0.00	0.00	0.00	0.00	2.01	0.00
cladocerans, Euryalona spp.	water fleas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.63
cladoceran, Evadne tergestina	water flea	160.93	48.87	600.41	65.33	325.68	14.81	0.62	0.00	103.01	2.75	0.00	0.00	0.00	0.72
ostracods, unidentified	seed shrimps	252.64	105.29	354.19	385.08	219.20	899.22	2894.60	1101.15	22.73	0.62	1.13	0.00	9.84	0.63
branchiurans, Argulus spp.	fish lice	1.22	0.00	0.93	0.83	0.84	0.00	0.62	2.33	5.42	15.05	3.77	15.27	17.94	18.44
cirriped nauplius stage	barnacles	41654.77	26316.06	20259.52	16407.97	1232.74	57.88	11.06	17271.29	0.00	0.00	0.00	0.00	0.00	0.00
cirriped cypris stage	barnacles	53.49	1.48	21.83	0.00	0.00	0.00	0.62	0.00	0.66	0.61	0.00	0.00	0.00	0.00
copepods, calanoid	copepods	97623.17	73296.76	56811.22	51703.18	9610.66	8379.09	7094.83	10801.39	17510.48	912.85	517.07	132.68	365.50	236.26
copepods, harpacticoid	copepods	0.00	0.00	0.00	0.00	0.00	1.11	0.00	3.07	7.59	0.00	0.00	0.00	0.00	0.00
copepods, freshwater cyclopoids	copepods	5.10	2.89	2.90	23.62	49.81	61.96	5.83	12.39	8.50	126.63	340.49	301.45	1560.56	1891.67

Table A11, page 2 of 6. Location specific plankton-net catch, Manatee River.

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

		Location (km from mouth)													
Description	Common Name	0.9	4.0	5.4	7.5	10.2	12.4	13.7	15.3	18.2	20.0	22.3	25.1	27.5	29.8
Oithona spp.	copepods	332.35	96.64	36.59	24.63	0.00	0.00	4.36	2.34	34.34	0.00	0.00	0.00	0.00	0.00
Monstrilla sp.	copepod	0.00	0.00	0.00	0.00	13.29	0.00	0.00	0.00	12.36	33.37	0.00	0.00	0.70	0.00
Caligus spp.	copepods	31.73	23.48	58.33	85.75	68.27	5.27	2.62	3.19	0.73	0.69	0.00	0.00	0.59	2.05
stomatopod, Squilla empusa larvae	mantis shrimp	0.74	9.90	0.73	0.00	5.59	5.41	1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
amphipods, gammaridean	scuds, beachhoppers	788.35	443.05	900.74	324.49	1371.92	595.63	1896.24	1921.93	9632.42	4882.96	7514.93	3123.50	3667.64	2122.79
amphipods, caprellid	skeleton shrimps	0.00	0.00	0.00	0.83	0.00	0.00	0.00	10.22	1.39	0.00	0.00	0.00	0.00	0.00
cumaceans	cumaceans	8986.78	1023.28	3384.90	13617.07	390.99	12331.11	9772.68	15218.69	14985.09	248.20	29.48	12.61	5.33	1.98
isopods, unidentified	isopods	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cyathura polita	isopod	0.00	0.00	0.00	0.00	0.00	0.00	169.31	0.00	32.25	129.16	335.22	424.54	216.66	18.32
Munna reynoldsi	isopod	16.01	5.19	39.46	66.23	65.55	592.63	0.00	0.67	1.61	0.00	0.00	0.62	6.79	2.07
epicaridean larvae	isopods	0.00	0.00	0.83	72.79	0.00	0.00	3.86	0.00	34.34	0.00	0.00	0.00	0.00	0.00
Probopyrus sp. (attached)	isopod	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.61	2.14	3.80	1.23
Anopsilana jonesi	isopod	0.00	0.62	0.00	0.00	0.63	0.00	0.00	0.00	0.68	0.00	0.00	0.52	1.73	0.00
cymothoid sp. a (Lironeca) juveniles	isopod	32.54	48.46	37.27	45.65	97.84	110.45	190.63	285.33	362.02	263.85	401.91	524.54	131.82	74.52
Serolis mcgrayi	isopod	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
isopods, sphaeromatid	isopods	4.99	3.93	1.82	2.50	2.36	0.00	0.65	0.00	11.03	6.25	10.13	27.88	75.09	160.16
Edotea triloba	isopod	5.12	11.26	6.03	3.73	10.31	14.35	84.86	81.15	1651.34	1119.54	15335.53	10260.05	1193.97	1499.38
Erichsonella attenuata	isopod	3.55	3.49	1.51	0.64	0.78	1.30	0.00	0.00	0.85	0.00	0.00	0.00	0.00	0.00
mysids, unidentified	opposum shrimps	6072.47	1457.70	1415.12	2165.01	3170.98	1255.07	11518.82	13543.93	14578.67	9557.94	11460.03	13578.65	9897.51	20143.75
tanaids, unidentified	tanaids	4.19	3.51	7.60	5.79	0.00	1.23	0.56	0.58	9.81	1.40	58.16	0.71	28.93	101.07
decapod zoeae	crab larvae	62570.35	44146.77	30452.59	34360.90	27790.77	16367.36	486561.89	32970.23	29122.75	27074.65	33298.97	16802.45	11956.76	6406.42
decapod mysis larvae	shrimps and hermit crabs	60637.12	47346.90	42250.19	31996.96	17691.26	26266.18	35147.89	35422.99	9503.07	3740.65	1197.15	1054.32	470.47	107.82
decapod megalopae	post-zoea crab larvae	4149.18	6629.40	1618.35	2226.71	2140.68	577.99	686.56	3200.58	1682.03	2275.67	421.68	369.63	72.20	204.22
penaeid postlarvae	penaeid shrimps	0.00	0.00	0.00	0.00	0.00	0.00	0.62	1.26	0.00	0.61	0.00	0.00	0.00	0.00
penaeid metamorphs	penaeid shrimps	58.94	48.38	21.05	17.17	22.27	13.32	47.20	37.45	29.77	28.95	22.85	14.40	3.44	1.23
Farfantepenaeus duorarum juveniles	pink shrimp	10.73	0.87	2.55	3.25	0.72	0.00	1.43	0.50	0.73	2.53	3.38	0.71	14.71	1.42
Rimapenaeus spp. juveniles	shrimps	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
sicyoniid juveniles	rock shrimps	1.34	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sicyonia laevigata juveniles	rock shrimp	0.00	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lucifer faxoni juveniles and adults	shrimp	49525.90	33968.12	26845.26	28826.38	2901.86	856.30	1114.98	798.39	87.30	4.04	3.03	1.22	0.00	0.00
Acetes americanus postlarvae	shrimp	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acetes americanus adults	shrimp	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Palaemonetes spp. postlarvae	grass shrimp	9.63	20.58	8.58	53.42	9.97	129.58	77.12	188.42	457.68	352.10	68.63	54.93	57.57	25.64
Palaemonetes pugio juveniles	daggerblade grass shrimp	55.60	23.76	4.05	7.15	7.77	5.11	22.46	22.63	6.86	18.25	9.93	11.37	44.67	45.44
Palaemonetes pugio adults	daggerblade grass shrimp	1.17	0.00	0.00	0.54	0.00	0.00	0.00	0.00	0.73	0.53	11.68	11.27	18.21	15.92
Periclimenes spp. postlarvae	shrimps	15.22	0.59	4.95	3.20	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Periclimenes spp. juveniles	shrimps	29.32	13.37	1.22	9.50	0.00	0.00	0.00	0.00	0.60	6.07	3.56	0.00	0.00	0.00
Periclimenes spp. adults	shrimps	0.00	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
alphaeid postlarvae	snapping shrimps	47.27	24.19	0.61	0.83	4.99	0.00	1.29	0.58	0.00	0.00	0.00	0.00	0.00	0.00
alphaeid juveniles	snapping shrimps	13.68	7.43	1.65	0.00	0.00	4.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leptalpheus forceps juveniles	snapping shrimp	0.00	0.00	0.00	0.00	0.00	0.00	2.03	0.00	0.67	0.00	0.00	0.00	0.00	0.00
Tozeuma carolinense postlarvae	arrow shrimp	62.63	45.38	0.83	0.64	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tozeuma carolinense juveniles	arrow shrimp	20.38	13.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tozeuma carolinense adults	arrow shrimp	0.00	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ogyrides alphaerostris juveniles and adults	estuarine longeye shrimp	0.78	0.00	1.41	0.88	0.78	0.00	2.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upogebia spp. postlarvae	mud shrimps	44.36	57.44	115.62	68.24	3.82	8.16	60.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upogebia spp. juveniles	mud shrimps	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upogebia affinis juveniles	coastal mud shrimp	0.00	0.00	1.65	215.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
paguroid juveniles	hermit crabs	16.31	0.00	0.93	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
majid juveniles	spider crabs	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A11, page 3 of 6. Location specific plankton-net catch, Manatee River.

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

		Location (km from mouth)													
Description	Common Name	0.9	4.0	5.4	7.5	10.2	12.4	13.7	15.3	18.2	20.0	22.3	25.1	27.5	29.8
Callinectes sapidus juveniles	blue crab	0.62	3.34	0.67	3.85	0.57	1.73	2.87	3.51	6.73	5.69	2.09	1.25	5.29	3.20
xanthid juveniles	mud crabs	0.80	0.00	0.00	0.00	0.00	0.00	1.96	1.37	2.68	0.00	0.57	0.00	0.00	0.64
xanthid adults	mud crabs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00
grapsid juveniles	crabs	0.00	0.00	0.00	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pinnotherid postlarvae	pea crabs	3.37	0.00	0.83	0.64	0.00	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pinnotherid juveniles	pea crabs	6.15	5.95	89.42	56.78	71.11	66.49	0.65	71.57	0.00	0.00	0.00	0.00	0.00	0.00
Pinnotheres maculatus juveniles	squatter pea crab	1.69	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pelecypods	clams, mussels, oysters	135.72	987.83	517.43	672.13	11.25	19.05	789.44	134.71	405.66	191.51	559.38	583.42	765.48	381.38
gastropods, opisthobranch	sea slugs	0.84	0.74	1.50	1.25	0.00	0.69	2.05	2.82	0.60	0.00	0.00	0.00	0.00	0.00
gastropods, prosobranch	snails	9741.44	11008.18	3315.40	6350.91	219.44	61.40	57.88	302.07	373.39	615.67	463.33	357.43	3589.43	4934.66
Lolliguncula brevis juveniles	bay squid	0.62	4.97	3.23	0.00	10.71	0.00	0.63	1.23	0.00	0.00	0.00	0.00	0.00	0.00
ophiuroidean juveniles	brittlestars	84.14	0.77	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
appendicularian, Oikopleura dioica	larvacean	10966.25	2191.18	2470.08	1528.02	347.54	94.53	5.60	4.08	240.35	0.00	0.00	0.00	0.00	0.00
Branchiostoma floridae	lancelet	5.69	1.32	0.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
chaetognaths, Sagitta spp.	arrow worms	22629.80	27463.90	18147.58	14086.25	8019.80	1641.98	4978.96	11791.33	5131.88	2699.66	3.99	4.38	4.19	2.77
Elops saurus postflexion larvae	ladyfish	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
Myrophis punctatus postflexion larvae	speckled worm eel	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Myrophis punctatus juveniles	speckled worm eel	1.80	1.16	0.00	1.86	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00
clupeid eggs	herrings	0.00	0.00	0.00	0.00	0.00	0.00	3.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
clupeid preflexion larvae	herrings	266.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
clupeid flexion larvae	herrings	1.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brevoortia spp. flexion larvae	menhaden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00
Brevoortia spp. postflexion larvae	menhaden	2.40	0.00	0.00	0.62	0.59	15.60	4.56	5.77	31.53	64.89	19.89	11.69	0.67	2.17
Brevoortia spp. metamorphs	menhaden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	156.64	132.51	175.71	64.67	324.85	412.86
Brevoortia patronus juveniles	gulf menhaden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	3.74	0.00	2.84
Brevoortia smithi juveniles	yellowfin menhaden	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	15.17	13.19	55.81	57.69	22.39	24.11
Dorosoma petenense preflexion larvae	threadfin shad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	2.59	0.61	1.35
Dorosoma petenense metamorphs	threadfin shad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64
Dorosoma petenense juveniles	threadfin shad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.63	0.00	1.38	1.26
Harengula jaguana eggs	scaled sardine	0.00	0.00	0.00	0.00	4.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harengula jaguana flexion larvae	scaled sardine	53.49	51.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harengula jaguana postflexion larvae	scaled sardine	3.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harengula jaguana metamorphs	scaled sardine	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Opisthonema oglinum eggs	Atlantic thread herring	0.00	8.15	0.00	0.00	79.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Opisthonema oglinum flexion larvae	Atlantic thread herring	0.00	2.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Opisthonema oglinum postflexion larvae	Atlantic thread herring	0.00	2.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sardinella aurita postflexion larvae	Spanish sardine	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anchoa spp. preflexion larvae	anchovies	2584.47	3367.30	1420.07	1518.04	283.06	281.10	45.82	304.05	246.44	36.18	1.82	0.61	0.00	0.00
Anchoa spp. flexion larvae	anchovies	1182.50	1563.52	481.16	455.81	145.43	29.30	156.64	63.46	49.98	14.16	7.57	6.58	5.16	4.69
Anchoa hepsetus eggs	striped anchovy	35.03	5.78	1.65	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anchoa hepsetus postflexion larvae	striped anchovy	0.74	14.75	2.17	0.00	2.36	0.00	1.31	0.00	0.00	0.00	0.00	0.00	0.00	1.23
Anchoa hepsetus juveniles	striped anchovy	0.00	0.67	3.38	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anchoa mitchilli eggs	bay anchovy	6529.19	11609.80	10976.93	6671.67	102.35	2.77	0.00	0.00	0.00	1.33	0.00	0.00	0.00	0.00
Anchoa mitchilli postflexion larvae	bay anchovy	740.31	352.59	318.24	1100.80	86.42	18.41	23.68	124.35	10.90	8.96	87.93	20.48	38.75	37.46
Anchoa mitchilli juveniles	bay anchovy	40.45	26.12	100.39	70.70	84.99	65.96	304.53	635.64	1437.05	1038.45	1366.46	1056.71	3127.45	1275.30
Anchoa mitchilli adults	bay anchovy	15.30	10.69	35.94	28.21	23.59	30.92	100.84	82.31	72.94	57.88	44.06	25.55	1.26	3.56
Anchoa cubana adults	Cuban anchovy	0.60	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Notropis spp. flexion larvae	minnows	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71
Ameiurus catus juveniles	white catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.22	0.00	4.49
Ictalurus punctatus juveniles	channel catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00

Table A11, page 4 of 6. Location specific plankton-net catch, Manatee River.

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

		Location (km from mouth)													
Description	Common Name	0.9	4.0	5.4	7.5	10.2	12.4	13.7	15.3	18.2	20.0	22.3	25.1	27.5	29.8
Synodus foetens postflexion larvae	inshore lizardfish	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gobiesox strumosus preflexion larvae	skilletfish	2.43	39.46	65.53	5.01	8.15	8.17	3.17	3.30	1.15	1.49	0.00	0.00	0.00	0.00
Gobiesox strumosus flexion larvae	skilletfish	0.74	0.66	0.57	0.63	6.37	0.00	16.20	5.68	12.12	101.56	3.17	0.00	1.76	0.00
Gobiesox strumosus postflexion larvae	skilletfish	0.00	0.59	0.00	1.28	0.00	18.50	0.00	7.49	11.17	14.54	34.36	8.80	1.17	0.00
Gobiesox strumosus juveniles	skilletfish	1.22	1.84	1.47	4.43	3.64	4.04	1.37	12.36	13.52	17.36	6.31	0.66	0.00	0.00
Hyporhamphus unifasciatus postflexion larvae	silverstripe halfbeak	0.00	0.00	1.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Strongylura spp. postflexion larvae	needlefishes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.53	1.32	0.00
Strongylura marina juveniles	Atlantic needlefish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.66	0.00	0.00
Fundulus spp. postflexion larvae	killifishes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00
Lucania parva postflexion larvae	rainwater killifish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.37	1.91
Lucania parva juveniles	rainwater killifish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.35	5.32	18.99	70.76
Lucania parva adults	rainwater killifish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.66	3.01	3.57
Gambusia holbrooki juveniles	eastern mosquitofish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	2.38	1.83	1.92
Gambusia holbrooki adults	eastern mosquitofish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.35
Poecilia latipinna juveniles	sailfin molly	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	2.07	1.31
Menidia spp. preflexion larvae	silversides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.27	0.62	4.98	1.30	12.79	6.12
Menidia spp. flexion larvae	silversides	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00
Menidia spp. postflexion larvae	silversides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.63	0.00	0.61	1.36
Menidia beryllina juveniles	inland silverside	0.00	0.00	0.00	0.00	0.59	0.00	1.15	1.80	22.43	8.64	35.73	17.80	161.87	92.19
Menidia beryllina adults	inland silverside	0.00	0.00	0.00	0.00	0.59	0.00	0.65	0.00	0.00	1.85	0.00	0.00	0.61	1.87
Membras martinica preflexion larvae	rough silverside	0.84	0.59	1.84	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00
Membras martinica flexion larvae	rough silverside	0.74	0.74	0.00	0.64	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Membras martinica postflexion larvae	rough silverside	0.00	0.00	0.61	0.00	0.00	0.00	0.63	0.00	0.67	0.00	0.00	0.00	0.00	0.00
Labidesthes sicculus preflexion larvae	brook silverside	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.00
Fish eggs, percomorph	sciaenid eggs (primarily)	8462.88	6339.84	2983.40	1259.88	5624.62	162.62	6698.38	1204.44	194.21	0.75	0.00	0.00	0.00	0.00
Hippocampus erectus juveniles	lined seahorse	1.49	1.84	1.45	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Syngnathus floridae juveniles	dusky pipefish	0.74	1.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Syngnathus louisianae juveniles	chain pipefish	2.33	0.00	3.51	2.83	0.00	1.37	4.44	1.77	2.44	3.41	0.00	0.00	1.17	0.00
Syngnathus scovelli juveniles	gulf pipefish	1.64	1.28	2.14	0.00	2.51	1.24	14.36	0.67	0.00	0.75	0.55	0.00	0.69	0.00
Prionotus spp. preflexion larvae	searobins	55.57	51.57	2.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prionotus spp. flexion larvae	searobins	6.18	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prionotus spp. postflexion larvae	searobins	1.36	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prionotus tribulus juveniles	bighead searobin	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lepomis spp. flexion larvae	sunfishes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	0.00	0.00	0.00
Micropterus salmoides juveniles	largemouth bass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00
Pomoxis nigromaculatus preflexion larvae	black crappie	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.61	2.86
Elassoma evergladei juveniles	Everglades pygmy sunfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00
Elassoma evergladei adults	Everglades pygmy sunfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00
Etheostoma fusiforme preflexion larvae	swamp darter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00
Etheostoma fusiforme flexion larvae	swamp darter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.27
Etheostoma fusiforme postflexion larvae	swamp darter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63
Chloroscombrus chrysurus flexion larvae	Atlantic bumper	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloroscombrus chrysurus juveniles	Atlantic bumper	0.00	0.00	0.67	0.00	0.00	0.62	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Oligoplites saurus preflexion larvae	leatherjack	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oligoplites saurus juveniles	leatherjack	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.58	0.00	1.24	0.00	0.00	0.00	0.00
gerreid preflexion larvae	mojjaras	4.63	3.41	4.04	0.64	2.43	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gerreid flexion larvae	mojjaras	2.80	0.59	4.95	2.56	3.03	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gerreid postflexion larvae	mojjaras	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	1.17	2.05
Eucinostomus spp. postflexion larvae	mojarras	1.36	38.86	0.00	2.97	1.41	3.71	1.25	0.63	0.00	0.00	0.00	0.00	0.00	0.00
Eucinostomus spp. juveniles	mojarras	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A11, page 5 of 6. Location specific plankton-net catch, Manatee River.

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

		Location (km from mouth)													
Description	Common Name	0.9	4.0	5.4	7.5	10.2	12.4	13.7	15.3	18.2	20.0	22.3	25.1	27.5	29.8
Eucinostomus gula adults	silver jenny	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00
Orthopristis chrysoptera postflexion larvae	pigfish	3.48	0.00	0.00	0.00	0.00	0.63	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Archosargus probatocephalus flexion larvae	sheepshead	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Archosargus probatocephalus postflexion larva	sheepshead	4.67	1.33	2.05	1.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lagodon rhomboides postflexion larvae	pinfish	10.16	3.45	4.22	5.79	2.30	5.76	5.14	10.60	16.28	42.14	76.32	5.87	0.59	0.67
Bairdiella chrysoura preflexion larvae	silver perch	9.29	89.50	17.31	10.87	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bairdiella chrysoura flexion larvae	silver perch	75.30	19.46	33.07	27.09	74.75	4.11	9.60	4.45	3.38	2.99	1.29	0.00	0.00	0.00
Bairdiella chrysoura postflexion larvae	silver perch	2.43	0.59	9.18	5.07	1.23	3.43	14.19	4.54	24.66	15.38	3.06	1.78	4.27	0.73
Bairdiella chrysoura juveniles	silver perch	0.00	0.00	0.00	0.00	0.00	0.87	0.00	0.00	6.08	4.79	3.53	0.62	2.67	2.11
Cynoscion arenarius preflexion larvae	sand seatrout	50.09	18.71	200.34	12.13	1.27	0.00	0.00	0.00	34.34	0.00	0.00	0.00	0.00	0.00
Cynoscion arenarius flexion larvae	sand seatrout	5.86	4.45	13.18	10.87	5.08	1.37	7.18	2.89	1.31	0.75	0.73	0.00	0.00	0.00
Cynoscion arenarius postflexion larvae	sand seatrout	0.84	0.00	13.94	1.27	0.00	0.00	5.13	7.24	1.39	1.85	1.21	0.00	0.00	0.00
Cynoscion arenarius juveniles	sand seatrout	0.00	0.87	2.55	0.00	0.00	0.00	0.00	0.58	2.91	2.55	2.85	1.25	0.00	0.64
Cynoscion nebulosus preflexion larvae	spotted seatrout	6.64	52.61	10.54	1.27	0.00	0.00	0.65	0.00	0.54	0.00	0.00	0.00	0.00	0.00
Cynoscion nebulosus flexion larvae	spotted seatrout	22.28	8.86	15.27	0.83	1.82	0.00	2.71	0.58	0.54	0.75	0.00	0.00	0.00	0.00
Cynoscion nebulosus postflexion larvae	spotted seatrout	0.00	0.74	0.00	0.00	0.00	0.69	0.65	1.71	1.63	0.75	1.85	0.00	0.00	0.00
Cynoscion nebulosus juveniles	spotted seatrout	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leiostomus xanthurus postflexion larvae	spot	3.00	0.58	0.57	0.57	0.57	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leiostomus xanthurus juveniles	spot	0.00	0.00	0.00	0.00	0.57	0.58	0.56	1.26	0.60	0.62	0.00	0.00	0.00	0.00
Menticirrhus spp. preflexion larvae	kingfishes	6.16	6.55	8.66	1.27	1.21	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Menticirrhus spp. flexion larvae	kingfishes	15.22	0.62	3.59	2.11	5.59	0.00	1.96	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Menticirrhus spp. postflexion larvae	kingfishes	0.84	0.00	1.35	0.00	0.00	0.69	5.11	1.41	1.47	0.00	0.00	0.00	0.00	0.00
Menticirrhus americanus juveniles	southern kingfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	0.00	0.00
Pogonias cromis postflexion larvae	black drum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00
Sciaenops ocellatus flexion larvae	red drum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.45	0.00	0.63	0.00	0.00	0.00	0.00
Sciaenops ocellatus postflexion larvae	red drum	6.79	0.00	0.00	0.82	0.00	0.00	1.34	2.72	0.00	0.63	0.00	0.00	0.00	0.00
Mugil cephalus juveniles	striped mullet	0.00	0.00	0.71	2.15	0.00	0.58	0.56	1.31	0.58	0.61	0.00	0.65	0.00	0.64
Astroscopus y-graecum preflexion larvae	southern stargazer	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
blenniid preflexion larvae	blennies	63.69	19.58	12.19	11.56	5.62	0.69	0.00	0.67	1.21	0.75	0.00	0.00	0.00	0.00
Chasmodes saburrae flexion larvae	Florida blenny	16.11	9.43	19.27	5.15	3.78	6.79	2.56	2.29	22.91	0.00	0.00	0.00	0.00	0.00
Chasmodes saburrae postflexion larvae	Florida blenny	61.53	9.91	12.28	3.84	24.21	10.21	1.89	71.57	0.00	0.69	0.00	1.27	0.59	0.00
Hypsoblennius spp. flexion larvae	blennies	0.84	0.00	1.44	0.00	1.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hypsoblennius spp. postflexion larvae	blennies	0.84	0.00	0.83	0.00	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hypsoblennius spp. juveniles	blennies	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lupinoblennius nicholsi flexion larvae	highfin blenny	1.00	0.00	1.65	1.46	0.61	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lupinoblennius nicholsi postflexion larvae	highfin blenny	0.00	0.00	0.00	0.64	1.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gobiid preflexion larvae	gobies	32.30	243.63	33.24	31.63	22.92	7.81	22.67	4.08	240.71	248.71	41.51	14.49	17.09	23.46
gobiid flexion larvae	gobies	66.53	22.42	54.38	6.33	19.70	3.79	36.25	7.90	322.90	90.32	42.00	23.39	23.46	21.95
Bathygobius soporator preflexion larvae	frillfin goby	140.01	10.97	105.92	61.85	5.46	67.92	60.78	0.00	46.10	0.69	0.63	0.00	0.00	0.00
Bathygobius soporator flexion larvae	frillfin goby	1.64	2.96	5.67	109.28	20.62	4.80	60.15	0.00	0.00	0.00	0.61	0.00	0.00	0.00
Bathygobius soporator postflexion larvae	frillfin goby	0.00	0.00	0.79	0.00	24.86	134.55	0.62	0.00	0.00	0.00	0.71	0.00	0.00	0.00
Gobionellus boleosoma flexion larvae	darter goby	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gobionellus boleosoma postflexion larvae	darter goby	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.41	0.00	0.00
Gobiosoma spp. postflexion larvae	gobies	40.38	20.21	2.56	55.32	46.45	11.20	124.45	213.75	668.71	414.08	474.82	116.45	50.57	28.98
Gobiosoma spp. juveniles	gobies	0.00	0.77	0.00	0.00	0.00	0.00	13.02	0.00	8.14	6.73	2.76	0.00	0.00	0.64
Gobiosoma bosc juveniles	naked goby	0.00	0.00	0.00	0.00	1.23	0.00	0.00	1.23	4.09	5.73	58.23	22.92	6.23	41.67
Gobiosoma bosc adults	naked goby	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.38	0.00	0.70	0.00
Gobiosoma robustum juveniles	code goby	0.67	0.87	0.00	0.00	0.00	0.00	1.29	0.00	0.00	0.00	1.30	6.43	3.49	0.73
Gobiosoma robustum adults	code goby	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Microgobius spp. flexion larvae	gobies	59.28	190.01	13.76	15.34	31.52	77.27	71.82	5.66	97.15	15.43	21.63	20.28	18.33	7.97

Table A11, page 6 of 6. Location specific plankton-net catch, Manatee River.

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

Description	Common Name	0.9	4.0	5.4	7.5	10.2	12.4	13.7	15.3	18.2	20.0	22.3	25.1	27.5	29.8
		Location (km from mouth)													
Microgobius spp. postflexion larvae	gobies	164.70	317.55	137.28	110.67	97.80	151.44	35.71	70.41	192.61	166.37	26.76	8.14	15.13	13.01
Microgobius gulosus juveniles	clown goby	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00	4.06	11.14	18.27	3.26	20.91	3.40
Microgobius gulosus adults	clown goby	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.00	0.70	0.00	0.00	0.00
Microgobius thalassinus juveniles	green goby	0.00	0.00	0.00	0.00	1.23	0.86	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00
Microdesmus longipinnis preflexion larvae	pink wormfish	0.84	0.00	0.00	0.00	1.21	2.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Microdesmus longipinnis flexion larvae	pink wormfish	0.00	0.00	0.00	0.00	1.21	2.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paralichthys spp. postflexion larvae	flounders	1.30	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Achirus lineatus preflexion larvae	lined sole	3.46	1.98	62.01	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Achirus lineatus flexion larvae	lined sole	70.19	1.40	0.74	55.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Achirus lineatus postflexion larvae	lined sole	4.56	0.74	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Achirus lineatus juveniles	lined sole	0.00	0.00	0.62	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15	0.00
Trinectes maculatus preflexion larvae	hogchoker	17.53	4.69	47.72	2.94	64.95	0.00	0.00	73.38	0.00	0.75	0.00	0.00	0.00	0.00
Trinectes maculatus flexion larvae	hogchoker	10.07	2.88	3.96	3.63	2.16	2.48	2.77	3.20	0.00	0.75	2.45	0.61	0.00	0.00
Trinectes maculatus postflexion larvae	hogchoker	5.83	0.00	3.50	1.23	0.00	0.90	4.09	8.02	10.27	77.17	21.34	7.85	18.91	13.50
Trinectes maculatus juveniles	hogchoker	0.00	0.00	0.74	0.00	1.26	0.00	0.00	0.00	9.61	12.41	56.90	51.89	40.39	42.29
Trinectes maculatus adults	hogchoker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.31	4.13	0.61	0.70	0.00
Symphurus plagiusa postflexion larvae	blackcheek tonguefish	2.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Monacanthus hispidus juveniles	planehead filefish	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sphoeroides spp. preflexion larvae	puffers	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sphoeroides nephelus juveniles	southern puffer	0.00	0.00	0.00	0.00	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00
unidentified preflexion larvae	fish larvae	0.80	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
unidentified flexion larvae	fish larvae	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A12, page 1 of 6. Location specific plankton-net catch, Braden River.
Data are presented as mean number per 1,000 cubic meters.
Organisms are listed in phylogenetic order.

Description	Common Name	Location (km from mouth) 0.3	1.2	2.6	4.0	5.1	6.6	8.0	8.6
Nemopsis sp.	hydromedusa	151.23	344.31	128.00	86.46	23.18	26.01	148.89	558.53
Mnemiopsis mccradyi	comb jelly, ctenophore	2464.48	2972.31	2961.05	7624.74	9160.63	3488.55	3489.72	9485.81
turbellarians	flatworms	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
polychaetes	sand worms, tube worms	35.42	48.41	26.44	45.12	55.98	53.35	25.26	4.48
oligochaetes	freshwater worms	1.67	1.74	9.22	14.17	2.09	6.63	8.59	10.07
hirudinoideans	leeches	6.02	4.72	7.65	10.04	14.06	3.19	1.99	0.00
acari	water mites	0.60	1.92	0.58	0.83	2.45	4.14	27.19	20.11
coleopterans, curculionid adults	beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.00
coleopterans, dytiscid larvae	predaceous diving beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00
coleopterans, dytiscid adults	predaceous diving beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74
coleopterans, elmid larvae	riffle beetles	0.00	0.00	0.00	0.00	0.00	0.96	0.56	0.00
coleopterans, elmid adults	riffle beetles	0.00	0.00	0.00	0.00	1.61	4.92	1.46	0.86
coleopterans, gyrinid adults	whirligig beetles	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00
coleopterans, haliplid larvae	crawling water beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00
coleopterans, haliplid adults	crawling water beetles	0.00	0.58	0.00	0.00	0.00	0.00	0.71	0.00
coleopterans, noterid larvae	burrowing water beetles	0.00	0.00	0.00	0.00	0.00	0.66	3.82	0.00
coleopterans, noterid adults	burrowing water beetles	0.00	0.00	0.58	0.00	0.00	0.00	0.70	0.00
dipterans, pupae	flies, mosquitoes	76.95	125.26	84.96	99.37	554.61	457.72	298.67	493.28
dipteran, Chaoborus punctipennis larvae	phantom midge	3.61	42.19	136.40	485.09	3367.95	5398.15	6496.04	12062.27
dipterans, chironomid larvae	midges	1.83	5.80	2.92	15.15	17.64	34.41	44.33	81.54
dipterans, tabanid larvae	deer flies	0.64	0.00	0.00	0.00	0.00	0.00	2.23	1.72
ephemeropteran larvae	mayflies	2.86	2.87	7.45	35.65	18.72	48.13	50.00	111.97
heteropterans, corixid adults	water boatmen	0.64	0.00	0.64	0.70	0.00	1.91	0.00	0.74
heteropterans, gerrid adults	water striders	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00
heteropterans, pleid adults	pygmy backswimmers	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00
lepidopterans, pyralid larvae	aquatic caterpillars	0.00	0.00	0.00	0.00	5.47	0.72	6.20	0.00
odonates, anisopteran larvae	dragonflies	0.00	0.00	0.00	0.00	0.68	5.77	0.00	7.73
odonates, zygopteran larvae	damselflies	0.00	0.00	1.15	2.45	8.40	5.58	15.62	9.76
trichopteran larvae	caddisflies	0.00	1.14	4.02	34.01	7.44	5.60	0.56	2.64
cladocerans, daphniid	water fleas	80.03	117.69	613.30	484.12	564.21	729.53	3637.51	2460.66
cladocerans, Bosminiopsis spp.	water fleas	5.36	5.79	1.73	7.82	33.34	26.57	57.92	215.87
cladocerans, Ilyocryptus spp.	water fleas	0.00	0.58	0.00	1.22	3.88	745.46	256.41	632.12
cladocerans, Diaphanosoma spp.	water fleas	0.00	0.00	13.84	25.23	40.90	911.25	472.54	955.34
cladoceran, Penilia avirostris	water flea	0.00	0.00	0.00	0.00	0.00	0.00	10.34	0.00

Table A12, page 2 of 6. Location specific plankton-net catch, Braden River.
Data are presented as mean number per 1,000 cubic meters.
Organisms are listed in phylogenetic order.

Description	Common Name	Location (km from mouth) 0.3	1.2	2.6	4.0	5.1	6.6	8.0	8.6
cladocerans, Euryalona spp.	water fleas	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00
cladoceran, Evadne tergestina	water flea	29.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ostracods, unidentified	seed shrimps	318.28	446.72	117.45	18.01	185.58	63.62	91.21	110.14
branchiurans, Argulus spp.	fish lice	0.00	2.86	1.89	1.61	4.93	6.27	11.02	7.88
cirriped nauplius stage	barnacles	0.59	32.07	0.00	0.00	0.00	0.00	0.00	0.00
cirriped cypris stage	barnacles	0.00	0.58	0.68	0.74	0.00	0.00	1.40	0.00
copepods, calanoid	copepods	2921.49	914.95	494.11	262.38	241.69	1642.22	517.82	280.88
copepods, harpacticoid	copepods	0.00	0.00	0.00	0.00	1.11	3.35	1.89	0.84
copepods, freshwater cyclopoids	copepods	185.48	284.64	1531.40	1857.60	18620.24	33260.21	35722.32	25572.65
Oithona spp.	copepods	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Monstrilla sp.	copepod	41.32	1438.23	24.14	41.06	0.00	0.00	0.00	0.00
Caligus spp.	copepods	3.09	34.18	3.43	0.00	0.00	0.00	0.89	0.00
stomatopod, Squilla empusa larvae	mantis shrimp	0.00	1.80	0.61	0.00	0.00	0.00	0.00	0.00
amphipods, gammaridean	scuds, beachhoppers	4581.04	10184.33	11222.80	7813.26	28593.39	10659.04	3128.56	947.66
amphipods, caprellid	skeleton shrimps	0.00	0.00	0.00	3.11	0.00	0.00	0.00	0.00
cumaceans	cumaceans	4175.45	6880.36	607.27	481.17	38.02	13.08	19.31	1.60
Cyathura polita	isopod	2.01	10.29	2.80	2.28	47.04	40.18	9.60	0.00
Xenanthura brevitelson	isopod	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00
Munna reynoldsi	isopod	0.00	1.33	0.00	0.89	0.00	1.24	0.00	0.00
Probopyrus sp. (attached)	isopod	0.00	0.00	0.00	0.00	2.64	2.35	4.00	0.83
Anopsilana jonesi	isopod	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.83
cymothoid sp. a (Lironeca) juveniles	isopod	78.95	128.23	105.91	133.71	138.16	367.73	385.02	279.89
isopods, sphaeromatid	isopods	0.62	0.58	5.94	6.03	28.81	3.31	12.45	7.29
Edotea triloba	isopod	94.36	164.36	547.49	876.55	2891.99	3458.33	3157.29	311.81
Erichsonella attenuata	isopod	0.61	0.60	0.00	2.07	0.00	0.00	0.00	0.00
mysids, unidentified	opposum shrimps	12573.91	11055.77	7734.56	7583.76	2979.88	5282.35	4115.47	4160.85
tanaids, unidentified	tanaids	4.34	11.39	28.10	0.87	9.32	0.00	0.70	0.74
decapod zoeae	crab larvae	11062.56	25794.50	22489.06	16419.78	6897.85	8922.33	5666.70	5386.50
decapod mysis larvae	shrimps and hermit crabs	23783.32	10807.96	6951.04	10789.76	5474.70	2433.14	1565.40	386.60
decapod megalopae	post-zoea crab larvae	2217.01	3370.06	1438.05	1408.45	484.85	507.69	289.21	308.33
penaeid metamorphs	penaeid shrimps	29.54	20.70	13.99	10.26	5.05	0.64	4.53	0.00
Farfantepenaeus duorarum juveniles	pink shrimp	0.60	1.34	3.26	19.81	11.89	2.78	0.71	0.00
Lucifer faxoni juveniles and adults	shrimp	0.64	0.00	0.68	3.80	0.00	0.61	2.80	2.50
Palaemonetes spp. postlarvae	grass shrimp	71.42	55.82	119.91	226.92	122.26	53.62	29.58	12.53

Table A12, page 3 of 6. Location specific plankton-net catch, Braden River.

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

Description	Common Name	0.3	1.2	2.6	4.0	5.1	6.6	8.0	8.6
		Location (km from mouth)							
Palaemonetes pugio juveniles	daggerblade grass shrimp	4.48	5.66	11.19	33.15	66.61	41.46	64.71	12.25
Palaemonetes pugio adults	daggerblade grass shrimp	0.60	0.00	4.95	5.64	14.35	12.59	9.87	7.48
Periclimenes spp. juveniles	shrimps	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.00
alphaeid postlarvae	snapping shrimps	0.00	0.00	1.57	0.00	0.00	0.00	0.00	0.00
Hippolyte zostericola juveniles	zostera shrimp	0.00	1.62	0.00	0.00	0.00	0.00	0.00	0.00
Upogebia spp. postlarvae	mud shrimps	2.95	1.59	1.38	0.00	0.00	0.00	0.00	0.00
Upogebia spp. juveniles	mud shrimps	0.62	0.00	0.00	0.57	0.00	0.00	0.00	0.00
Callinectes sapidus juveniles	blue crab	10.02	1.22	3.34	2.98	14.16	6.94	3.48	0.83
xanthid juveniles	mud crabs	0.47	10.93	3.56	0.00	1.70	0.00	1.08	0.83
grapsid juveniles	crabs	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00
pinnotherid juveniles	pea crabs	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pelecypods	clams, mussels, oysters	104.25	126.52	267.95	29.02	6.29	9.64	1.85	4.14
gastropods, opisthobranch	sea slugs	1.81	0.00	2.49	85.08	0.00	0.00	0.00	0.00
gastropods, prosobranch	snails	125.89	46.01	124.77	146.14	824.15	335.58	134.48	74.58
Lolliguncula brevis juveniles	bay squid	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.00
appendicularian, Oikopleura dioica	larvacean	4744.59	604.42	0.00	0.00	0.00	0.00	0.63	0.00
chaetognaths, Sagitta spp.	arrow worms	2629.70	1910.93	662.85	303.77	104.23	114.80	5.34	0.00
Lepisosteus platyrhincus juveniles	Florida gar	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.00
Elops saurus postflexion larvae	ladyfish	0.64	0.00	2.46	1.65	1.69	0.62	0.00	0.00
Myrophis punctatus juveniles	speckled worm eel	0.00	2.19	0.00	0.00	0.00	0.00	0.00	0.00
Brevoortia spp. postflexion larvae	menhaden	11.77	22.46	38.94	64.58	107.68	98.48	45.82	2.83
Brevoortia spp. metamorphs	menhaden	1.30	2.00	196.61	41.21	662.24	224.37	240.11	26.92
Brevoortia patronus juveniles	gulf menhaden	0.00	0.00	0.00	0.54	0.55	1.06	1.15	1.90
Brevoortia smithi juveniles	yellowfin menhaden	0.00	2.19	0.00	3.06	30.72	58.77	24.65	10.42
Dorosoma petenense preflexion larvae	threadfin shad	0.00	0.00	0.00	0.00	0.61	0.62	0.00	8.13
Dorosoma petenense flexion larvae	threadfin shad	0.00	0.00	0.00	0.00	2.12	0.00	0.00	0.74
Dorosoma petenense postflexion larvae	threadfin shad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73
Dorosoma petenense metamorphs	threadfin shad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76
Dorosoma petenense juveniles	threadfin shad	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.75
Anchoa spp. preflexion larvae	anchovies	7.14	1.54	11.66	0.74	1.23	0.00	0.63	0.00
Anchoa spp. flexion larvae	anchovies	17.74	11.19	12.92	10.84	6.69	19.74	5.30	2.66
Anchoa hepsetus postflexion larvae	striped anchovy	0.00	3.33	0.00	1.65	0.00	0.00	0.00	0.00
Anchoa mitchilli eggs	bay anchovy	0.00	0.00	0.00	0.00	3.68	0.00	0.00	0.00
Anchoa mitchilli postflexion larvae	bay anchovy	7.68	6.43	17.64	10.59	47.19	7.22	14.49	5.07

Table A12, page 4 of 6. Location specific plankton-net catch, Braden River. Data are presented as mean number per 1,000 cubic meters. Organisms are listed in phylogenetic order.

Description	Common Name	Location (km from mouth) 0.3	1.2	2.6	4.0	5.1	6.6	8.0	8.6
Anchoa mitchilli juveniles	bay anchovy	174.70	702.15	1287.08	1682.48	1617.49	1676.34	3270.23	2143.87
Anchoa mitchilli adults	bay anchovy	145.49	85.33	109.41	103.02	18.92	19.58	33.77	27.45
Anchoa cubana juveniles	Cuban anchovy	0.00	0.00	0.00	0.93	0.00	0.00	0.00	0.00
Notemigonus crysoleucas flexion larvae	golden shiner	0.00	0.00	0.00	0.81	0.46	0.00	0.62	0.00
Notemigonus crysoleucas postflexion larvae	golden shiner	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00
Notemigonus crysoleucas juveniles	golden shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.00
Ameiurus catus juveniles	white catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67
Opsanus beta juveniles	gulf toadfish	0.00	0.00	0.00	0.00	1.23	0.00	0.00	0.00
Gobiesox strumosus preflexion larvae	skilletfish	0.61	3.50	4.76	42.47	0.00	0.62	0.00	0.00
Gobiesox strumosus flexion larvae	skilletfish	0.00	2.08	8.46	57.19	9.22	11.99	0.61	0.67
Gobiesox strumosus postflexion larvae	skilletfish	1.22	2.47	11.10	152.49	37.40	12.40	1.16	0.00
Gobiesox strumosus juveniles	skilletfish	1.79	7.20	48.18	84.31	44.18	75.68	9.76	0.70
Strongylura marina juveniles	Atlantic needlefish	0.00	0.00	0.00	0.54	0.00	0.00	0.55	0.00
Strongylura marina adults	Atlantic needlefish	0.00	0.00	0.58	0.00	0.00	0.00	0.00	0.00
Fundulus spp. postflexion larvae	killifishes	0.00	0.00	0.00	0.00	0.55	0.53	0.00	0.00
Lucania parva juveniles	rainwater killifish	0.00	0.00	0.00	0.00	0.00	1.26	2.14	0.00
Lucania parva adults	rainwater killifish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61
Gambusia holbrooki juveniles	eastern mosquitofish	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.61
Gambusia holbrooki adults	eastern mosquitofish	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.73
Heterandria formosa adults	least killifish	0.00	0.00	0.58	0.00	0.00	0.00	0.00	0.00
Poecilia latipinna juveniles	sailfin molly	0.00	0.00	0.00	0.00	0.00	4.61	1.88	0.61
Fish eggs, atherinid	silversides	0.00	0.00	0.59	0.00	0.00	0.00	0.00	0.00
Menidia spp. preflexion larvae	silversides	2.55	0.67	5.13	3.08	2.48	1.18	0.66	0.74
Menidia spp. flexion larvae	silversides	0.00	0.00	0.00	0.00	0.61	0.00	0.63	0.00
Menidia spp. postflexion larvae	silversides	0.00	0.00	0.00	0.00	2.39	1.24	0.00	0.00
Menidia beryllina juveniles	inland silverside	2.86	4.94	19.43	30.57	99.62	53.98	42.05	33.31
Menidia beryllina adults	inland silverside	0.95	0.00	0.00	0.00	1.91	0.00	0.00	0.00
Membras martinica juveniles	rough silverside	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.67
Labidesthes sicculus preflexion larvae	brook silverside	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94
Labidesthes sicculus juveniles	brook silverside	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.49
Fish eggs, percomorph	sciaenid eggs (primarily)	64.24	98.41	0.00	0.00	2.31	0.00	2.61	0.00
Syngnathus louisianae juveniles	chain pipefish	1.83	2.68	1.31	0.00	0.00	0.00	2.51	0.76
Syngnathus louisianae adults	chain pipefish	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.00
Syngnathus scovelli juveniles	gulf pipefish	1.25	1.75	0.55	0.00	0.55	0.00	1.51	0.00

Table A12, page 5 of 6. Location specific plankton-net catch, Braden River.

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

Description	Common Name	0.3	1.2	2.6	4.0	5.1	6.6	8.0	8.6
		Location (km from mouth)							
Lepomis spp. flexion larvae	sunfishes	0.00	0.00	0.00	0.00	0.00	0.00	1.22	0.73
Lepomis spp. postflexion larvae	sunfishes	0.00	0.00	0.00	0.00	2.12	2.87	2.44	2.20
Lepomis gulosus juveniles	warmouth	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lepomis macrochirus juveniles	bluegill	0.00	0.00	0.00	0.00	0.00	0.00	4.15	0.00
Micropterus salmoides flexion larvae	largemouth bass	0.00	0.00	0.00	0.00	1.06	0.00	0.00	0.00
Pomoxis nigromaculatus preflexion larvae	black crappie	0.00	0.00	0.00	0.00	0.46	0.00	0.00	0.00
Etheostoma fusiforme preflexion larvae	swamp darter	0.60	0.00	0.00	0.00	0.00	0.00	0.00	2.22
Etheostoma fusiforme flexion larvae	swamp darter	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00
Etheostoma fusiforme postflexion larvae	swamp darter	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.75
Etheostoma fusiforme juveniles	swamp darter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94
Oligoplites saurus flexion larvae	leatherjack	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00
Oligoplites saurus juveniles	leatherjack	0.00	0.00	0.00	0.84	1.30	0.64	0.80	0.00
gerreid flexion larvae	mojjaras	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00
gerreid postflexion larvae	mojjaras	0.00	2.46	2.26	2.52	3.18	0.64	4.81	0.83
Eucinostomus spp. postflexion larvae	mojarras	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eucinostomus spp. juveniles	mojarras	0.00	0.58	0.69	0.00	0.00	0.00	0.00	0.00
Eucinostomus harengulus juveniles	tidewater mojarra	0.00	0.00	0.00	0.00	0.00	0.61	0.00	0.00
Archosargus probatocephalus postflexion larva	sheepshead	0.00	0.00	2.67	3.16	20.24	6.30	0.55	0.00
Archosargus probatocephalus juveniles	sheepshead	0.00	0.00	0.00	0.00	0.61	0.00	0.00	0.00
Lagodon rhomboides postflexion larvae	pinfish	3.07	1.82	0.59	0.83	1.24	0.00	1.80	0.00
Bairdiella chrysoura flexion larvae	silver perch	0.61	6.15	4.60	0.74	0.00	0.00	0.00	0.00
Bairdiella chrysoura postflexion larvae	silver perch	3.29	2.85	18.47	19.09	18.34	7.57	2.32	0.00
Bairdiella chrysoura juveniles	silver perch	0.00	0.00	3.85	9.19	7.22	4.58	0.63	0.70
Cynoscion arenarius flexion larvae	sand seatrout	0.00	0.67	1.37	0.00	0.00	0.00	0.00	0.00
Cynoscion arenarius postflexion larvae	sand seatrout	0.00	1.43	0.00	2.03	0.00	0.00	0.00	0.00
Cynoscion arenarius juveniles	sand seatrout	1.91	2.10	1.38	3.29	0.66	0.00	0.00	0.00
Cynoscion nebulosus flexion larvae	spotted seatrout	0.61	0.88	0.68	2.03	0.00	0.00	0.00	0.00
Cynoscion nebulosus postflexion larvae	spotted seatrout	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00
Cynoscion nebulosus juveniles	spotted seatrout	0.00	0.82	0.00	0.00	0.64	0.61	0.00	0.00
Leiostomus xanthurus juveniles	spot	1.90	1.67	0.00	0.00	0.00	0.00	0.00	0.00
Menticirrhus spp. preflexion larvae	kingfishes	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Menticirrhus spp. flexion larvae	kingfishes	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00
Pogonias cromis postflexion larvae	black drum	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sciaenops ocellatus flexion larvae	red drum	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00

Table A12, page 6 of 6. Location specific plankton-net catch, Braden River.
Data are presented as mean number per 1,000 cubic meters.
Organisms are listed in phylogenetic order.

Description	Common Name	Location (km from mouth) 0.3	1.2	2.6	4.0	5.1	6.6	8.0	8.6
Sciaenops ocellatus postflexion larvae	red drum	5.19	1.53	2.73	0.00	0.00	0.00	0.00	0.00
Tilapia spp. juveniles	tilapias	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73
Mugil cephalus juveniles	striped mullet	0.47	1.67	0.00	0.00	0.46	1.34	0.00	0.94
blenniid preflexion larvae	blennies	4.36	5.48	1.36	0.54	0.00	0.00	0.00	0.00
Chasmodes saburrae flexion larvae	Florida blenny	0.61	0.60	0.00	1.73	0.00	0.00	0.00	0.00
Chasmodes saburrae postflexion larvae	Florida blenny	30.13	1.80	0.61	0.87	0.00	0.00	0.00	0.00
gobiid preflexion larvae	gobies	15.70	119.61	291.35	144.39	61.35	99.29	12.52	4.76
gobiid flexion larvae	gobies	61.64	66.94	135.89	169.65	98.75	100.44	38.13	10.58
Bathygobius soporator preflexion larvae	frillfin goby	43.14	0.00	1.38	0.87	0.00	0.62	0.00	0.00
Bathygobius soporator postflexion larvae	frillfin goby	1.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gobiosoma spp. postflexion larvae	gobies	76.24	118.17	159.02	140.58	277.27	505.91	208.46	314.30
Gobiosoma spp. juveniles	gobies	0.00	0.00	4.37	1.09	9.32	9.82	7.71	0.00
Gobiosoma bosc juveniles	naked goby	4.30	1.64	9.97	11.07	10.05	4.16	1.55	0.00
Gobiosoma bosc adults	naked goby	0.00	0.00	0.62	0.54	0.00	0.00	0.00	0.00
Gobiosoma robustum juveniles	code goby	0.00	0.76	0.00	4.77	3.09	9.24	8.62	6.44
Microgobius spp. flexion larvae	gobies	37.21	41.41	46.94	22.66	23.80	10.49	5.65	8.93
Microgobius spp. postflexion larvae	gobies	70.75	19.12	103.49	106.35	127.75	57.65	14.28	22.07
Microgobius gulosus juveniles	clown goby	2.06	8.61	7.09	15.06	18.22	16.90	8.76	0.69
Microgobius gulosus adults	clown goby	0.00	1.43	1.20	1.11	2.98	0.64	0.00	0.00
Achirus lineatus postflexion larvae	lined sole	0.00	0.00	2.07	0.00	0.00	0.00	0.00	0.00
Achirus lineatus juveniles	lined sole	0.00	1.34	0.00	0.00	0.00	0.00	0.00	0.00
Trinectes maculatus preflexion larvae	hogchoker	0.61	0.00	1.23	0.00	0.00	0.00	0.00	0.00
Trinectes maculatus flexion larvae	hogchoker	0.64	36.65	4.12	2.77	1.79	1.20	0.00	0.00
Trinectes maculatus postflexion larvae	hogchoker	9.75	15.38	18.71	13.61	27.92	7.54	6.04	2.01
Trinectes maculatus juveniles	hogchoker	3.51	3.87	0.68	11.92	45.31	49.73	47.94	17.70
Sphoeroides spp. flexion larvae	puffers	0.00	0.60	0.00	0.00	0.00	0.62	0.00	0.00
Sphoeroides nephelus juveniles	southern puffer	0.00	0.00	0.00	0.87	0.61	0.62	0.00	0.00
unidentified preflexion larvae	fish larvae	0.00	0.00	0.00	0.00	0.00	0.00	6.20	0.00
unidentified postflexion larvae	fish larvae	0.00	0.00	0.00	0.00	0.00	0.00	6.20	0.00
anuran larvae	tadpoles	0.00	0.00	0.00	0.00	1.23	0.00	0.00	0.00

Table A13, page 1 of 2. Location-specific seine catch, Manatee River.

Data are presented as mean number per deployment.

Organisms are listed in phylogenetic order.

Scientific Name	Common Name	0.0-4.8	4.8-8.5	8.5-13.5	13.5-17.0	17.0-21.3	21.3-26.1	26.1-32.5
		Location (km from mouth)						
Farfantepenaeus spp.	commercial shrimp	0.00	0.00	0.00	0.09	0.00	0.00	0.00
Farfantepenaeus duorarum	pink shrimp	8.79	3.03	1.03	0.59	1.32	1.24	0.08
Callinectes sapidus	blue crab	1.38	1.21	0.32	0.47	0.62	0.91	0.37
Dasyatis sabina	Atlantic stingray	0.15	0.24	0.47	0.03	0.00	0.00	0.00
Rhinoptera bonasus	cownose ray	0.00	0.00	0.00	0.03	0.03	0.00	0.00
Lepisosteus osseus	longnose gar	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Lepisosteus platyrhincus	Florida gar	0.00	0.00	0.00	0.00	0.00	0.03	0.02
Elops saurus	ladyfish	0.00	0.00	0.00	0.09	0.06	0.03	0.00
Ophichthidae spp.		0.00	0.03	0.00	0.00	0.00	0.00	0.00
Brevoortia spp.		0.21	0.00	13.82	4.24	57.82	31.00	33.18
Dorosoma petenense	threadfin shad	0.00	0.00	0.00	0.00	0.00	0.00	0.06
Opisthonema oglinum	Atlantic thread herring	0.00	0.03	0.00	0.41	0.24	0.00	0.00
Harengula jaguana	scaled sardine	8.41	9.85	1.47	8.35	0.50	0.00	0.00
Anchoa spp.		0.00	0.00	5.35	0.00	0.00	0.00	0.00
Anchoa hepsetus	striped anchovy	0.06	1.45	13.97	18.18	11.82	1.15	1.10
Anchoa mitchilli	bay anchovy	465.94	9.15	78.71	436.41	382.53	796.50	235.73
Anchoa cubana	Cuban anchovy	0.00	0.00	0.65	0.00	0.09	1.26	0.00
Synodus foetens	inshore lizardfish	1.12	0.85	0.47	0.41	0.06	2.00	0.00
Notemigonus crysoleucas	golden shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Notropis spp.		0.00	0.00	0.00	0.00	0.00	0.00	0.47
Notropis maculatus	taillight shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Notropis petersoni	coastal shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.69
Ictaluridae spp.		0.00	0.00	0.00	0.00	0.00	0.00	0.02
Ameiurus catus	white catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Ictalurus punctatus	channel catfish	0.00	0.00	0.00	0.00	0.03	0.00	0.00
Arius felis	hardhead catfish	0.00	0.00	0.00	0.00	0.12	0.00	0.00
Opsanus beta	gulf toadfish	0.00	0.00	0.03	0.09	0.06	0.00	0.02
Gobiesox strumosus	skilletfish	0.00	0.00	0.06	0.03	0.06	0.00	0.00
Urophycis floridana	southern hake	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Strongylura spp.		1.00	0.88	0.47	0.24	0.50	0.03	0.04
Strongylura marina	Atlantic needlefish	0.00	0.06	0.00	0.03	0.06	0.00	0.00
Strongylura notata	redfin needlefish	2.35	0.73	0.35	0.09	0.00	0.00	0.00
Strongylura timucu	timucu	0.12	0.03	0.03	0.18	0.15	0.03	0.00
Cyprinodon variegatus	sheepshead minnow	0.15	0.45	0.18	0.12	2.32	3.06	3.73
Fundulus confluentus	marsh killifish	0.00	0.00	0.00	0.00	0.03	0.00	0.94
Fundulus majalis	striped killifish	2.71	2.73	3.32	14.38	6.91	0.18	0.10
Fundulus grandis	gulf killifish	0.12	1.61	0.29	0.62	2.76	2.41	0.59
Fundulus chrysotus	golden topminnow	0.00	0.00	0.00	0.00	0.00	0.00	0.08
Fundulus seminolis	seminole killifish	0.00	0.00	0.00	0.00	0.00	0.94	15.41
Lucania parva	rainwater killifish	0.06	0.00	0.00	0.00	1.26	9:59	41.69
Lucania goodei	bluefin killifish	0.00	0.00	0.00	0.06	0.00	0.00	0.00
Adinia xenica	diamond killifish	0.00	0.00	0.06	0.00	0.44	0.00	0.00
Floridichthys carpio	goldspotted killifish	5.47	2.12	0.00	0.00	0.00	0.03	0.18
Gambusia holbrooki	eastern mosquitofish	0.00	0.00	0.03	0.09	0.56	8.18	88.88
Poecilia latipinna	sailfin molly	0.00	0.03	0.03	0.00	0.76	12.15	34.24
Heterandria formosa	least killifish	0.00	0.00	0.00	0.00	0.03	0.00	0.25
Membras martinica	rough silverside	0.00	15.61	4.15	11.97	12.24	0.47	0.00
Menidia spp.		242.82	104.88	60.15	145.44	80.06	87.38	93.45
Labidesthes sicculus	brook silverside	0.00	0.00	0.00	0.00	0.00	0.00	1.88
Syngnathus floridae	dusky pipefish	0.18	0.03	0.00	0.00	0.00	0.00	0.00
Syngnathus louisianae	chain pipefish	0.41	0.30	0.18	0.09	0.06	0.03	0.00
Syngnathus scovelli	gulf pipefish	2.47	0.58	0.09	0.03	0.12	0.03	0.00
Hippocampus zosterae	dwarf seahorse	0.18	0.00	0.00	0.00	0.00	0.00	0.00
Prionotus scitulus	leopard searobin	0.32	0.30	0.12	0.03	0.00	0.00	0.00
Prionotus tribulus	bighead searobin	0.12	0.15	0.00	0.03	0.00	0.00	0.00
Centropomus undecimalis	snook	0.03	0.00	0.03	0.09	0.18	0.68	0.04

Table A13, page 2 of 2. Location-specific seine catch, Manatee River.
Data are presented as mean number per deployment.
Organisms are listed in phylogenetic order.

		Location (km from mouth)						
Scientific Name	Common Name	0.0-4.8	4.8-8.5	8.5-13.5	13.5-17.0	17.0-21.3	21.3-26.1	26.1-32.5
Lepomis macrochirus	bluegill	0.00	0.00	0.21	3.53	0.06	0.18	0.35
Lepomis microlophus	redear sunfish	0.00	0.00	0.00	0.00	0.00	0.00	0.22
Lepomis punctatus	spotted sunfish	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Micropterus salmoides	largemouth bass	0.00	0.00	0.00	0.00	0.00	0.00	0.43
Caranx hippos	crevalle jack	0.00	0.00	0.00	0.15	0.00	0.00	0.00
Caranx latus	horse-eye jack	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Oligoplites saurus	leatherjacket	0.97	0.85	1.56	1.56	0.41	0.29	0.06
Trachinotus falcatus	permit	0.76	0.00	0.00	0.00	0.00	0.00	0.00
Lutjanus griseus	gray snapper	0.41	0.00	0.00	0.03	0.09	0.03	0.00
Lutjanus synagris	lane snapper	0.12	0.00	0.00	0.00	0.00	0.00	0.00
Eucinostomus spp.		30.03	16.18	5.97	48.74	22.53	18.29	1.80
Eucinostomus gula	silver jenny	23.53	9.88	5.62	2.85	0.09	0.00	0.00
Eucinostomus harengulus	tidewater mojarra	6.85	6.42	6.38	20.15	11.06	14.44	4.41
Diapterus plumieri	striped mojarra	0.00	0.00	0.62	0.94	0.85	0.68	0.45
Orthopristis chrysoptera	pigfish	3.62	2.06	0.41	0.18	0.06	0.00	0.00
Sparidae spp.		0.00	0.00	0.00	0.00	0.03	0.00	0.00
Lagodon rhomboides	pinfish	65.47	15.97	4.50	7.06	15.53	23.53	9.67
Archosargus probatocephalus	sheepshead	0.18	0.06	0.06	0.12	0.15	0.24	0.16
Diplodus holbrooki	spottail pinfish	0.00	0.00	0.00	0.00	0.00	0.29	0.02
Cynoscion nebulosus	spotted seatrout	0.71	0.82	0.85	0.44	2.38	0.59	0.08
Cynoscion arenarius	sand seatrout	0.00	0.06	0.03	0.88	0.44	0.47	0.51
Bairdiella chrysoura	silver perch	9.74	7.45	0.21	14.91	1.18	6.74	0.47
Leiostomus xanthurus	spot	40.85	37.70	3.91	6.44	7.68	6.41	2.55
Menticirrhus americanus	southern kingfish	0.00	0.06	0.03	0.56	0.09	0.26	0.00
Menticirrhus saxatilis	northern kingfish	0.29	0.30	0.24	0.09	0.00	0.00	0.00
Pogonias cromis	black drum	0.00	0.03	0.00	0.00	0.00	0.00	0.00
Sciaenops ocellatus	red drum	0.03	0.48	0.74	5.35	2.68	0.82	0.35
Chaetodipterus faber	Atlantic spadefish	0.00	0.24	0.15	0.03	0.00	0.00	0.00
Tilapia spp.		0.00	0.00	0.03	0.00	0.00	0.00	0.06
Mugil spp.		0.00	0.00	0.03	0.00	0.15	0.00	0.00
Mugil cephalus	striped mullet	2.12	4.67	4.50	10.32	2.26	3.65	4.45
Mugil curema	white mullet	0.85	0.09	0.00	0.09	0.00	0.38	0.04
Mugil gyrans	fantail mullet	5.06	6.36	0.26	0.03	0.00	0.12	0.33
Chasmodes saburrae	Florida blenny	1.50	0.00	0.03	0.00	0.06	0.00	0.00
Gobiosoma spp.		0.15	0.30	0.12	0.06	0.65	1.24	2.82
Gobiosoma bosc	naked goby	0.00	0.18	0.06	0.29	1.41	0.29	1.29
Gobiosoma robustum	code goby	1.32	0.12	0.00	0.03	0.56	0.21	0.02
Microgobius gulosus	clown goby	0.44	0.36	1.00	0.97	4.32	12.09	4.18
Microgobius thalassinus	green goby	0.00	0.06	0.03	0.00	0.00	0.00	0.00
Bathygobius soporator	frillfin goby	0.03	0.00	0.21	0.12	0.41	0.00	0.00
Paralichthys albigutta	gulf flounder	1.03	0.55	0.15	0.15	0.00	0.00	0.00
Trinectes maculatus	hogchoker	0.00	0.03	0.21	0.38	4.88	6.88	38.20
Achirus lineatus	lined sole	0.47	0.30	0.06	0.09	0.06	0.06	0.00
Symphurus plagiusa	blackcheek tonguefish	0.03	0.09	0.09	0.00	0.00	0.00	0.00
Monacanthus hispidus	planehead filefish	0.15	0.00	0.00	0.00	0.00	0.00	0.00
Sphoeroides nephelus	southern puffer	2.44	2.48	0.41	0.44	0.00	0.00	0.00
Chilomycterus schoepfi	striped burrfish	0.29	0.00	0.00	0.00	0.06	0.00	0.00

Table A14, page 1 of 2. Location-specific seine catch, Braden River.
Data are presented as mean number per deployment.
Organisms are listed in phylogenetic order.

Scientific Name	Common Name	Location (km from mouth) 0.0-2.6	2.6-5.1	5.1-7.5	7.5-9.2
Farfantepenaeus duorarum	pink shrimp	1.88	2.41	0.35	0.35
Callinectes sapidus	blue crab	0.67	0.50	1.06	0.38
Dasyatis sabina	Atlantic stingray	0.00	0.00	0.03	0.00
Elops saurus	ladyfish	0.06	0.03	0.00	0.00
Brevoortia spp.		5.85	5.82	19.88	24.88
Dorosoma petenense	threadfin shad	0.00	0.00	0.03	2.91
Harengula jaguana	scaled sardine	1.55	0.00	0.00	0.09
Anchoa hepsetus	striped anchovy	1.79	4.97	0.12	0.06
Anchoa mitchilli	bay anchovy	169.21	536.62	882.71	1761.47
Synodus foetens	inshore lizardfish	0.33	0.00	0.09	0.00
Notropis maculatus	taillight shiner	0.00	0.00	0.06	0.12
Gobiesox strumosus	skilletfish	0.03	0.21	0.00	0.03
Strongylura spp.		0.18	0.09	0.21	0.21
Strongylura marina	Atlantic needlefish	0.03	0.00	0.00	0.00
Strongylura notata	redfin needlefish	0.06	0.03	0.00	0.00
Strongylura timucu	timucu	0.06	0.00	0.00	0.00
Cyprinodon variegatus	sheepshead minnow	0.00	0.26	3.53	1.74
Fundulus spp.		0.00	0.00	0.03	0.00
Fundulus confluentus	marsh killifish	0.00	0.00	0.12	0.00
Fundulus majalis	striped killifish	5.42	0.71	0.00	0.00
Fundulus grandis	gulf killifish	0.30	1.85	3.38	1.35
Fundulus chrysotus	golden topminnow	0.00	0.00	0.00	0.15
Lucania parva	rainwater killifish	0.39	0.85	9.21	6.38
Lucania goodei	bluefin killifish	0.00	0.00	0.06	0.18
Adinia xenica	diamond killifish	0.00	0.03	0.18	0.00
Floridichthys carpio	goldspotted killifish	0.00	0.00	0.06	0.03
Jordanella floridae	flagfish	0.00	0.00	0.00	0.12
Gambusia holbrooki	eastern mosquitofish	0.03	0.29	11.97	40.32
Poecilia latipinna	sailfin molly	1.03	3.79	5.35	10.65
Heterandria formosa	least killifish	0.00	0.00	0.15	0.79
Membras martinica	rough silverside	0.30	0.06	0.09	0.00
Menidia spp.		111.18	48.15	133.12	133.32
Labidesthes sicculus	brook silverside	0.00	0.00	0.15	1.41
Syngnathus louisianae	chain pipefish	0.06	0.15	0.06	0.03
Syngnathus scovelli	gulf pipefish	0.03	0.38	0.38	0.21
Prionotus scitulus	leopard searobin	0.06	0.00	0.00	0.00
Prionotus tribulus	bighead searobin	0.03	0.00	0.00	0.00
Centropomus undecimalis	snook	0.21	1.09	1.53	1.29
Enneacanthus gloriosus	bluespotted sunfish	0.00	0.00	0.00	0.03
Lepomis macrochirus	bluegill	0.00	0.18	2.12	2.91
Lepomis microlophus	redear sunfish	0.00	0.00	0.00	0.35
Lepomis punctatus	spotted sunfish	0.00	0.00	0.00	0.09
Micropterus salmoides	largemouth bass	0.00	0.00	0.00	0.29

Table A14, page 2 of 2. Location-specific seine catch, Braden River.
Data are presented as mean number per deployment.
Organisms are listed in phylogenetic order.

Scientific Name	Common Name	Location (km from mouth) 0.0-2.6	2.6-5.1	5.1-7.5	7.5-9.2
Caranx latus	horse-eye jack	0.03	0.00	0.00	0.00
Oligoplites saurus	leatherjacket	0.64	0.18	0.26	0.15
Lutjanus griseus	gray snapper	0.03	0.06	0.06	0.00
Eucinostomus spp.		33.00	23.47	9.35	8.56
Eucinostomus gula	silver jenny	5.67	0.32	0.00	0.00
Eucinostomus harengulus	tidewater mojarra	20.55	20.68	28.26	17.62
Diapterus plumieri	striped mojarra	2.42	1.76	1.59	0.59
Orthopristis chrysoptera	pigfish	0.12	0.06	0.00	0.00
Lagodon rhomboides	pinfish	24.67	22.76	21.15	14.21
Archosargus probatocephalus	sheepshead	0.27	0.32	0.15	0.18
Cynoscion nebulosus	spotted seatrout	2.36	0.88	0.59	0.12
Cynoscion arenarius	sand seatrout	1.94	0.76	0.03	0.00
Bairdiella chrysoura	silver perch	97.79	14.76	0.21	0.53
Leiostomus xanthurus	spot	13.21	14.74	7.71	4.85
Menticirrhus americanus	southern kingfish	0.03	0.00	0.00	0.00
Pogonias cromis	black drum	0.18	0.00	0.00	0.00
Sciaenops ocellatus	red drum	3.24	1.12	0.50	0.91
Tilapia spp.		0.03	0.00	0.03	0.06
Mugil cephalus	striped mullet	2.76	0.06	0.41	6.56
Mugil curema	white mullet	0.21	0.00	0.00	0.00
Mugil gyrans	fantail mullet	0.06	0.03	0.00	0.00
Chasmodes saburrae	Florida blenny	0.00	0.12	0.00	0.00
Gobiidae spp.		0.03	0.00	0.00	0.00
Gobionellus boleosoma	darter goby	0.00	0.03	0.00	0.00
Gobiosoma spp.		0.85	1.97	1.82	1.26
Gobiosoma bosc	naked goby	1.48	3.26	4.65	1.26
Gobiosoma robustum	code goby	0.03	0.21	0.03	0.15
Microgobius gulosus	clown goby	2.09	7.94	6.26	11.59
Microgobius thalassinus	green goby	0.03	0.00	0.00	0.00
Bathygobius soporator	frillfin goby	0.06	0.29	0.00	0.00
Paralichthys albigutta	gulf flounder	0.03	0.00	0.00	0.00
Trinectes maculatus	hogchoker	0.73	5.12	15.35	64.06
Achirus lineatus	lined sole	0.58	0.26	0.00	0.00
Symphurus plagiusa	blackcheek tonguefish	0.03	0.06	0.00	0.03
Sphoeroides nephelus	southern puffer	0.58	0.03	0.03	0.00

Table A15, page 1 of 2. Location-specific trawl catch, Manatee River.
Data are presented as mean number per deployment.
Organisms are listed in phylogenetic order.

		Location (km from mouth)					
Scientific Name	Common Name	0.0-4.8	4.8-8.5	8.5-13.5	13.5-17.0	17.0-21.3	21.3-26.1
Farfantepenaeus duorarum	pink shrimp	0.35	4.00	4.24	4.94	6.72	2.00
Callinectes sapidus	blue crab	0.53	2.39	2.18	2.19	2.33	1.53
Dasyatis sabina	Atlantic stingray	0.53	2.28	0.59	0.31	1.00	0.47
Dasyatis say	bluntnose stingray	0.06	0.00	0.00	0.00	0.00	0.00
Gymnura micrura	smooth butterfly ray	0.00	0.00	0.00	0.06	0.00	0.00
Lepisosteus osseus	longnose gar	0.00	0.00	0.06	0.00	0.06	0.00
Dorosoma petenense	threadfin shad	0.00	0.00	0.00	0.13	0.00	0.00
Opisthonema oglinum	Atlantic thread herring	0.00	0.00	0.47	0.00	0.00	0.00
Harengula jaguana	scaled sardine	0.12	0.00	0.00	0.00	0.00	0.00
Anchoa hepsetus	striped anchovy	0.35	0.00	0.12	1.06	0.00	0.00
Anchoa mitchilli	bay anchovy	2.12	19.33	13.94	60.94	58.89	285.71
Anchoa cubana	Cuban anchovy	0.00	0.11	1.06	0.00	0.00	0.00
Synodus foetens	inshore lizardfish	0.82	0.67	0.53	0.75	0.22	0.00
Ameiurus catus	white catfish	0.00	0.00	0.00	0.00	1.17	2.06
Ictalurus punctatus	channel catfish	0.00	0.00	0.00	0.00	0.00	0.24
Bagre marinus	gafftopsail catfish	0.06	0.11	0.12	0.38	0.06	0.06
Arius felis	hardhead catfish	0.41	9.06	7.35	4.50	0.67	0.06
Opsanus beta	gulf toadfish	0.00	0.11	0.12	0.06	0.00	0.00
Gobiesox strumosus	skilletfish	0.00	0.00	0.00	0.06	0.00	0.00
Urophycis floridana	southern hake	0.00	0.06	0.00	0.00	0.00	0.00
Poecilia latipinna	sailfin molly	0.00	0.00	0.00	0.00	0.00	0.06
Menidia spp.		0.00	0.00	0.00	0.00	0.00	0.06
Syngnathus louisianae	chain pipefish	0.12	0.00	0.00	0.06	0.06	0.00
Prionotus scitulus	leopard searobin	2.35	1.33	0.06	0.25	0.00	0.00
Prionotus tribulus	bighead searobin	0.24	0.44	0.06	0.06	0.00	0.00
Centropomus undecimalis	snook	0.00	0.00	0.00	0.00	0.00	0.06
Diplectrum formosum	sand perch	0.06	0.00	0.00	0.00	0.00	0.00
Lepomis macrochirus	bluegill	0.00	0.00	0.00	0.00	0.06	0.18
Pomoxis nigromaculatus	black crappie	0.00	0.00	0.00	0.00	0.00	0.24
Lutjanus griseus	gray snapper	0.00	0.00	0.00	0.00	0.06	0.06
Eucinostomus spp.		0.00	0.22	0.18	0.63	0.50	0.24
Eucinostomus gula	silver jenny	2.65	4.17	1.29	0.63	0.00	0.00
Eucinostomus harengulus	tidewater mojarra	0.35	0.56	0.18	0.56	0.83	0.47
Diapterus plumieri	striped mojarra	0.00	0.00	0.00	0.00	0.28	1.18
Orthopristis chrysoptera	pigfish	0.41	0.89	1.59	0.44	0.06	0.00
Lagodon rhomboides	pinfish	2.41	1.61	5.06	1.06	1.11	0.59
Archosargus probatocephalus	sheepshead	0.00	0.00	0.00	0.06	0.22	0.41
Sciaenidae spp.		0.00	0.06	0.00	0.00	0.00	0.00
Cynoscion nebulosus	spotted seatrout	0.00	0.22	0.12	0.50	0.06	0.00
Cynoscion arenarius	sand seatrout	2.47	14.28	2.00	8.88	24.78	47.71
Bairdiella chrysoura	silver perch	0.35	4.61	14.24	47.38	6.78	5.12
Leiostomus xanthurus	spot	0.41	1.61	1.00	1.31	0.72	1.41
Menticirrhus spp.		0.00	0.00	0.06	0.00	0.00	0.00
Menticirrhus americanus	southern kingfish	0.59	3.28	1.18	4.50	1.78	1.00
Menticirrhus saxatilis	northern kingfish	0.00	0.06	0.00	0.00	0.28	0.00
Pogonias cromis	black drum	0.00	0.00	0.06	0.00	0.06	0.00
Sciaenops ocellatus	red drum	0.00	0.00	0.00	0.13	0.28	0.24
Chaetodipterus faber	Atlantic spadefish	0.00	0.28	0.12	0.06	0.00	0.00
Chasmodes saburrae	Florida blenny	0.00	0.00	0.00	0.00	0.11	0.00
Gobiosoma spp.		0.12	0.00	0.00	1.13	0.11	0.06
Gobiosoma bosc	naked goby	0.00	0.00	0.06	0.00	0.39	0.35

Table A15, page 2 of 2. Location-specific trawl catch, Manatee River.
Data are presented as mean number per deployment.
Organisms are listed in phylogenetic order.

Scientific Name	Common Name	Location (km from mouth) 0.0-4.8	4.8-8.5	8.5-13.5	13.5-17.0	17.0-21.3	21.3-26.1
Gobiosoma robustum	code goby	0.00	0.06	0.00	0.00	0.00	0.06
Microgobius gulosus	clown goby	0.00	0.00	0.06	3.25	2.22	2.59
Microgobius thalassinus	green goby	0.00	0.17	1.41	0.25	0.11	0.00
Etropus crossotus	fringed flounder	0.12	0.00	0.00	0.00	0.00	0.00
Paralichthys albigutta	gulf flounder	0.41	1.61	0.41	0.25	0.06	0.00
Ancylopsetta quadrocellata	ocellated flounder	0.12	0.00	0.00	0.00	0.00	0.00
Trinectes maculatus	hogchoker	0.88	1.94	1.06	1.13	1.39	100.71
Achirus lineatus	lined sole	0.00	0.00	0.06	0.06	0.00	0.00
Symphurus plagiusa	blackcheek tonguefish	0.71	1.72	0.47	0.50	0.00	0.00
Monacanthus hispidus	planehead filefish	0.29	0.06	0.00	0.00	0.00	0.00
Lactophrys quadricornis	scrawled cowfish	0.59	0.06	0.00	0.00	0.00	0.00
Sphoeroides nephelus	southern puffer	0.18	0.11	0.06	0.06	0.11	0.06
Chilomycterus schoepfi	striped burrfish	0.47	0.11	0.12	0.06	0.00	0.00
No fish		0.00	0.00	0.00	0.00	0.00	0.00

Table A16, page 1 of 2. Location-specific trawl catch, Braden River.
Data are presented as mean number per deployment.
Organisms are listed in phylogenetic order.

Scientific Name	Common Name	Location (km from mouth) 0.0-2.6	2.6-5.1	5.1-7.5	7.5-9.2
Farfantepenaeus duorarum	pink shrimp	9.06	11.53	1.65	0.12
Callinectes sapidus	blue crab	2.31	1.53	2.06	1.47
Dasyatis sabina	Atlantic stingray	0.69	0.18	0.06	0.06
Lepisosteus osseus	longnose gar	0.06	0.06	0.06	0.00
Elops saurus	ladyfish	0.00	0.00	0.00	0.18
Brevoortia spp.		0.00	1.59	0.06	0.00
Anchoa hepsetus	striped anchovy	0.06	0.00	0.06	0.00
Anchoa mitchilli	bay anchovy	68.13	17.12	178.12	138.24
Synodus foetens	inshore lizardfish	0.06	0.12	0.00	0.00
Ameiurus catus	white catfish	0.00	0.00	0.00	0.06
Arius felis	hardhead catfish	0.25	0.18	0.24	0.12
Opsanus beta	gulf toadfish	0.13	0.00	0.06	0.00
Gobiesox strumosus	skilletfish	0.00	0.00	0.12	0.00
Menidia spp.		0.00	0.00	0.06	0.00
Syngnathus louisianae	chain pipefish	0.00	0.12	0.00	0.00
Syngnathus scovelli	gulf pipefish	0.00	0.06	0.00	0.06
Prionotus scitulus	leopard searobin	0.06	0.00	0.00	0.00
Centropomus undecimalis	snook	0.00	0.00	0.00	0.18
Lepomis spp.		0.00	0.00	0.00	0.18
Lepomis macrochirus	bluegill	0.00	0.12	0.88	1.12
Lepomis microlophus	redear sunfish	0.00	0.00	0.00	0.12
Pomoxis nigromaculatus	black crappie	0.00	0.00	0.00	0.12
Oligoplites saurus	leatherjacket	0.00	0.06	0.00	0.00
Lutjanus griseus	gray snapper	0.06	0.00	0.00	0.06
Eucinostomus spp.		0.94	4.18	1.53	0.47
Eucinostomus gula	silver jenny	0.75	0.00	0.00	0.00
Eucinostomus harengulus	tidewater mojarra	1.56	1.76	1.24	0.24
Diapterus plumieri	striped mojarra	0.00	3.82	10.71	0.53
Orthopristis chrysoptera	pigfish	0.13	0.00	0.00	0.00
Lagodon rhomboides	pinfish	0.88	2.76	1.24	1.82
Archosargus probatocephalus	sheepshead	0.13	0.18	0.65	0.18
Cynoscion nebulosus	spotted seatrout	0.88	0.41	0.47	0.06
Cynoscion arenarius	sand seatrout	14.56	4.76	4.29	1.47
Bairdiella chrysoura	silver perch	0.88	2.24	2.29	2.59
Leiostomus xanthurus	spot	3.25	1.53	2.71	1.71
Menticirrhus spp.		0.06	0.00	0.00	0.00
Menticirrhus americanus	southern kingfish	6.75	1.29	0.18	0.00
Menticirrhus saxatilis	northern kingfish	0.06	0.00	0.00	0.00
Pogonias cromis	black drum	0.63	0.06	0.12	0.24
Sciaenops ocellatus	red drum	0.75	0.59	0.06	0.00
Chaetodipterus faber	Atlantic spadefish	0.00	0.18	0.00	0.00
Gobiosoma spp.		0.00	0.12	0.76	0.59
Gobiosoma bosc	naked goby	0.00	0.06	0.59	0.18

Table A16, page 2 of 2. Location-specific trawl catch, Braden River.
Data are presented as mean number per deployment.
Organisms are listed in phylogenetic order.

Scientific Name	Common Name	Location (km from mouth) 0.0-2.6	2.6-5.1	5.1-7.5	7.5-9.2
Gobiosoma robustum	code goby	0.25	0.00	0.00	0.00
Microgobius gulosus	clown goby	1.06	7.59	5.35	1.06
Microgobius thalassinus	green goby	0.50	0.06	0.00	0.00
Etropus crossotus	fringed flounder	0.06	0.00	0.00	0.00
Paralichthys albigutta	gulf flounder	0.38	0.00	0.00	0.00
Trinectes maculatus	hogchoker	1.25	3.12	16.35	15.71
Achirus lineatus	lined sole	0.06	0.00	0.00	0.00
Symphurus plagiusa	blackcheek tonguefish	0.50	0.00	0.00	0.06
Sphoeroides nephelus	southern puffer	0.31	0.06	0.00	0.00
No fish		0.00	0.00	0.00	0.00