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Diet of Red Drum (*Sciaenops ocellatus*) and Common Snook (*Centropomus undecimalis*) in Florida Bay and adjacent waters



(Final Report)

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by

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Introduction

Trophic relationships are fundamental to understanding how ecosystems operate. Change in these relationships can signal important transformations in ecosystem function. For instance, Pauly et al. (1998), Steneck (1998) and others have demonstrated that apex predators can have such profound influences on trophic systems that their loss can result in cascading trophic effects that reverberate throughout other links in the food web. Because portions of the Everglades have experienced substantial ecological fluxes in the past few decades--apparently due to anthropogenic influences (Boesch et al. 1993, Butler et al. 1995, Harwell 1997 and others)--there is a high level of interest in determining the extent to which these changes have been accompanied by similarly substantial changes in trophic structure. Several studies have already examined the importance of nutrients, algal population dynamics, and zooplankton consumption in the Florida Bay system of the Everglades in this regard (Boesch et al. 1993). Still, food habit studies are needed to generate empirical information for models, filling gaps in our knowledge about the ecology of the Florida Bay system (Browder et al. 1998).

In this study, we examine the dietary preferences of red drum (*Sciaenops ocellatus*) and snook (*Centropomus undecimalis*) in Florida Bay. Surprisingly little quantitative information exists on the diets of adults of these species despite the fact that they are top-level predators and that they are among the more popular species sought by recreational fishers in the inshore waters of Florida (Schmidt et al. 2000). Most of the trophic information available pertains to juvenile fish. This is in part due to interests throughout the state in determining their nursery grounds and in rearing these species in captivity either for direct market use or for stock enhancement. Ecological changes in Florida Bay warrant a closer evaluation (Boesch et al. 1993)

The objectives of this study were:

- to determine diets of red drum and snook in Florida Bay and adjacent waters based on stomach content analyses,
- to calculate indices of relative abundance of prey from stomachs of red drum and snook,
- to determine if there are temporal or spatial differences in diet of red drum and snook in Florida Bay.

Not a requirement of this grant, but because of the generosity of our colleagues in the Florida State University Department of Oceanography we were able to get information on stable isotope structure of the tissues of red drum and snook on a regional basis. Similarly, our colleagues from the Florida Marine Research Institute conducted otolith analyses, thus allowing us to look at size-at-age relationships for both red drum and snook, and gonad analyses for snook to determine sex.

Study Sites

The Everglades National Park (9,000 km^2) covers nearly the entire southern tip of the Florida peninsula (Loftus 2000) and has a high degree of habitat heterogeneity (Harwell 1997). The ENP managers define 6 recreational or guide fishing areas within its boundaries (Figure 1). Other regional classification schemes can be found in Costello et al. (1986) and McIvor et al. (1994). For the purposes of this report, Florida Bay represents Areas 1-5. Each area in this scheme represents an ecologically distinct fishing region encompassing rivers and primary water bodies. The Florida Bay lagoon is the largest water body within the park and the largest tropical estuary in North America. It contains over 800 square miles--2072 km^2--of marine bottom. Freshwater inflow from the Shark River Slough, the largest drainage in the estuary, flows into Whitewater Bay, around Cape Sable, and into the western part of Florida Bay (McIvor et al. 1994). The bay is shallow, with water depths ranging between 1.5 and 3.5 m.

The ecologically distinct zones, based on animal and plant communities, were first identified by Tabb et al. (1962) in their description of the ecology of northern Florida Bay and adjacent estuaries. Higman (1967) first defined the areas relative to Florida Bay sport fishing activity, relating environmental conditions with catch-per-unit effort. Rutherford et al. (1989) and Tilmant (1989) further described these zones as varying in " . . . topographical, hydrological, and biotic characteristics."

Area 1, which is the northern portion of Florida Bay, is characterized by having shallow waters, high turbidity, and high salinity due to evaporation and lack of tidal circulation (Tabb et al. 1962). Salinities fluctuate considerably in response to rainfall, however, as evidenced by relatively low values during periods of high rainfall between 1993 and 1996.

Areas 2 and 3 are offshore regions to the south and west of the Florida shoreline. Area 2 (southern Florida Bay) consists of marl banks covered with *Thalassia* whereas Area 3 (Cape Sable Region) consists of deep tidal channels with hard shell-gumbo marl bottoms and relatively stable (high) salinities. Seagrass (Thalassia) and clumps of red algae, including Dasya and Laurencia dominate submerged vegetation in this region.

Area 4, (Whitewater-Oyster Bays) just inshore of area 3, also has deep tidal channels, with shallow waters of generally lower salinity and lower species diversity than that of Florida Bay Areas 1-3. This is primarily due to freshwater inflow from the Shark River Slough. Bottom sediments consist of fine marl mud and shell, with locally heavy accumulations of peat. Shorelines are covered with mangroves and channels are a combination of benthic mud communities and oyster reef habitat. There is less submerged vegetation here than in other parts of Florida Bay, and the dominant species are *Halodule* and *Ruppia.* Pink shrimp are abundant.

Area 5, also influenced by the Shark River Slough, has numerous, deep, rocky channels interspersed with oyster reefs. There is little submerged vegetation, but what exists is dominated by red algae such as *Dasya* and *Gracilaris,* over sparse patches of *Halodule.* Although it appears on the map, no fish were collected from Area 6.

Methods

Fish collection

Fish in this study were collected primarily in Florida Bay (fishing areas 1 through 5) from May 1999 through September 2000. Collections were made in conjunction with the ENP fisheries harvest monitoring program (creel and guide logbook surveys). Details of the data collection and recording format can be found in Schmidt et al. (2000) and Tilmant (1989). All fishing was conducted by hook and line. Most (50-60%) of the non-guided recreational boats fishing in Florida Bay and the immediately adjacent estuaries (Cape Sable, Whitewater Bay, and Shark River areas) launch at the Flamingo boat ramp within ENP. An inventory of fishes from the ENP can be found in Loftus (2000).

During snook fishing season (September 1 - December 15, January 31 - June 1), we sampled all snook and red drum landed at Flamingo, FL, on weekends (all day Saturday and Sunday) for at least 3 weekends per month. During closed snook seasons (June 1 - August 30, December 15 - January 31), we sampled snook and red drum by hook and line with the help of professional guides. Site selection was based on historical records of catch from the ENP creel surveys.

The number of days sampling occurred is given in the following schedule. The number or days on which red drum were caught is separated from the number of days on which snook were caught. Dashed lines in the table indicate no sampling.

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total
1999 No. Days Sampled	---	---	---	---	12	7	9	8	8	6	7	6	63
Red drum	---	---	---	---	10	7	9	8	8	6	7	6	61
Snook	---	---	---	---	12	0	1	0	8	6	7	3	37
2000 Days Sampled	5	7	6	9	6	2	3	3	1	---	---	---	40
Red drum	5	6	6	6	2	0	1	3	1	---	---	---	24
Snook	0	5	4	8	6	0	3	3	0	---	---	---	29

All specimens were measured (centimeters standard and total lengths), weighed (kg), and the stomachs, gonads, and heads were removed and frozen for later analysis. Heads were dissected to remove otoliths for aging and muscle tissue samples for isotope analysis. Gonads and otoliths were shipped to the Florida Marine Research Institute, Florida Fish and Wildlife Conservation Commission, St. Petersburg, FL, for determination of age, sex, and reproductive condition. Muscle samples were sent to the FSU Department of Oceanography.

Stomach content analysis

Prey items in fish stomachs were identified to the lowest practicable taxon, enumerated, and weighed (blotted wet weight to the nearest 0.01 g). Cut bait and lures were

noted when observed in the stomach contents but were not included in analyses. Substances such as wood, leaves, detritus, and other obviously incidental non-dietary items were also excluded from analyses.

Dietary composition was evaluated by:

(1) frequency of occurrence = number of stomachs containing food items,

(2) count (N) = the number of prey in a specific prey category,

(3) wet weight of food items = the weight of all food items in a particular category,

(4) mean weight of food items = the average weight of a food item.

Food items were ranked in order of importance in the diet using an index of preponderance (I_p) after recommendations of Marshall and Elliot (1997). This index, which ranges between 0 and 1, allows the combination of the two most important determinants of dietary composition, frequency of occurrence and biomass.

$$I_p = (\%\ \text{occurrence})(\%\ \text{weight}) / \text{Sum}\ (\%\ \text{occurrence})(\%\ \text{weight}) \quad (1)$$

Indices of preponderance were also calculated for seasons and areas of capture to allow inspection of possible spatial and temporal differences in diet.

Niche breadth is a measure of resource specialization such that the smaller the niche breadth, the greater the specialization in diet. We calculated niche breadth for both red drum and snook using Levin's standardized niche breadth, Shannon-Wiener's niche breadth, and Smith's Measure of niche breadth, all standardized and expressed on a scale from 0 to 1.0. Levin's measure gives greater weight to abundant food items while Shannon-Wiener's give more weight to rare food items. Smith's measure is relatively insensitive to rare items.

Levin's standardized niche breadth measures the uniformity of distribution of individuals among different resource states, such that

$$B = Y^2/\Sigma p_j^{\,2}, \quad (2)$$

where, B = Levin's measure of niche breadth
p_j = fraction of items in the diet that are of food category j
N_j = Number of individuals found in or using resource state j
$Y = \Sigma N_j$ = Total number of individuals sampled.

One weakness of Levin's measure is the assumption that resources do not vary in abundance.

Shannon-Wiener evenness measure is,

$$H' = -\Sigma p_j \log p_j \quad (3)$$

where, H' = Shannon-Wiener measure of niche breadth
p_j = proportion of individuals found in or using food category j (j = 1, 2, 3,. . . . n)
n = Total number of resource states

and Smith's FT measure, which takes resource availability into account.

$$FT = \sum\left(\sqrt{p_j a_j}\right) \tag{4}$$

where FT = Smith's measure of niche breadth
p_j = proportion of individuals found in or using food category j
a_j = proportion resource j is of the total resources
n = Total number of possible resource states

Niche overlap was determined using Pianka's niche overlap measure (range = 0 to 1, with zero being no overlap and 1.0 being complete overlap). Pianka's measure is provides a symmetrical comparison between species such that the overlap between species A and species B is the same as the overlap between species B and species A.

$$O_{jk} = \frac{\sum_{i}^{n} p_{ij} p_{ik}}{\sqrt{\sum_{i}^{n} p_{ij}^2 \sum_{i}^{n} p_{ik}^2}} \tag{5}$$

where, O_{jk} = Pianka's measure of niche overlap
p_{ij} = Proportion resource *i* is of the total resources used by species *j*
p_{ik} = Proportion resource *i* is of the total resources used by species *k*
n = Total number of resource states.

Possible seasonal and areal differences in diet for each species were analyzed using both an index of preponderance (with the top ten dietary items determined for each season and for each area) and using Morisita's similarity index.

$$C_\lambda = \frac{2\,\Sigma X_{ij} X_{ik}}{(\lambda_1 + \lambda_2) N_j N_k} \tag{6}$$

We used X^2 analysis to investigate the seasonal and areal patterns in consumption of red drum and snook. Expected values were calculated for all dietary occurrence data, excluding empty stomachs. Observed occurrence data were then compared with expected data for each season and area and the interaction of season and area to determine where significant differences occurred. The significance level was set at 0.05.

Isotope analysis

Approximately 2 g wet weight of muscle tissue was dissected from each fish head. This tissue was subsequently analyzed for sulfur 34 ($\delta^{34}S$), carbon 13 ($\delta^{13}C$), and nitrogen 15 ($\delta^{15}N$). Samples were freeze-dried, ground and then pulverized in an ultrasonic device. Samples to be analyzed for carbon were acid-washed to remove inorganic carbon. Carbon and nitrogen analyses were conducted by Isotope Services, Los Alamos, New Mexico. Coastal Science Laboratories, Austin, Texas, conducted sulfur analyses. In these labs,

samples were combusted to CO_2, N_2, and SO_2, respectively. They were then purified cryogenically and run on a dual inlet mass spectrometer to determine the isotopic ratios. Error for C = 0.1 per mil, for N = 0.3 per mil, for S = 0.5 per mil.

Otolith analysis

All fish were aged using transverse sections of otoliths. Otoliths were sectioned through the core using a Buehler low-speed Isomet saw. Sections 350-500 μm thick were mounted on glass slides with Flo-texx clear mounting medium and read under a dissecting microscope (6-12 X) using transmitted light and a bright field.

Red drum.--Annuli were identified as narrow opaque bands that alternate with wider translucent bands. Annuli were generally easy to identify, but especially clear along the ventral margin of the sulcus acousticus. An annulus was considered complete when it was distinct along the ventral edge of the sulcus acousticus and at least faintly visible along the rest of section's proximal edge. Ages were assigned based on an arbitrary birthdate of January 1 (Jearld 1983).

Snook.--Annuli in snook otoliths are narrow concentric opaque bands, formed during the winter when growth slows, and alternating with faster-growing translucent zones that are formed each summer. Ages were assigned to each fish based on a June 1 birthdate because most snook have completed annulus formation by June 1, and because June corresponds to the approximate beginning of the snook spawning season (Taylor et al. 1998). All otoliths that had an annulus on the edge from fish captured between 1 December and 1 June were assigned an age of one less than the annulus count. Fish captured after 1 June and before 1 December were assigned ages equal to the annulus count. Observed ages have to be incremented to calibrate for variation in time of annulus deposition. Therefore, any otolith that has an annulus visible, only partially or otherwise, after 1 January until 31 May, is adjusted by reducing the observed count by one. Thus fish captures in May that have an annulus on the edge are one year younger than their observed ages. The same applies to fish captured in March or April.

Results

Because sample sizes for each region were relatively small, we pooled samples from areas 1W with 2W, 3E with 3W, and areas 4 and 5.

Red Drum Diet

Occurrences of organisms in the stomachs of red drum in Florida Bay are given in Table 1 and ranked in descending order of importance in the diet. Also given is the pooled number of food items (N), the total wet weight (in grams), and the mean wet weight of each prey item listed.

Pink shrimp were by far the most abundant food item and were second only to fish in terms of overall biomass in stomach contents, even though mean weight of individual shrimp was small (2.21 g). Prey items with the highest mean weights—grass porgy, pinfish, herring,

and sardines, were relatively rare in the diet. The only large items that occurred with any frequency were toadfish and blue crabs.

The percent occurrence and weight of each prey item within the diet of red drum is given in Table 2. Also given there is the index of preponderance (I_p), which combines frequency of occurrence and biomass, to estimate the relative importance of different food items in the diet. Using this measure, we found pink shrimp to be the single most important food item in the diet of red drum, although bony fish, blue crabs, xanthid crabs, and toadfish ranked relatively high. It is likely that the 6th ranked category '*Farfantepenaeus sp.*' is composed primarily of pink shrimp, which would increase further the importance of pink shrimp in the red drum diet. We cannot make this determination because there were insufficient body parts remaining in gut contents to interpret beyond the level of genus. Numerous other species occur in the diet, including bivalves, gastropods, polychaetes, and various small species of fish and decapods, but do so at very low frequencies (Table 2).

The information is also given following the Costello graphical method (after Costello 1990) (Figure 2). This method indicates the importance of prey in the diet by their position on the graph, with the more important prey items by either % occurrence or % weight being separated from the less important species. The graphical representation indicates the same thing that the preponderance table does. That is, that fish and pink shrimp make up the bulk of the diet while most dietary items (except toadfish and blue crabs) are consumed only rarely.

We evaluated seasonal differences in the occurrence, number, and weight of items in the diet of red drum (Table 3) as well as in the index of preponderance (I_p) (Table 4). Seven of the top ten food items—including pink shrimp, toadfish (*Opsanus beta*), bony fish, and xanthid crabs--are common to all seasons (Table 5), but are distributed somewhat differently in terms of their relative importance (Figure 3). We found significant seasonal differences in the frequency of occurrence of items in the diet of red drum, based on a Chi-Square analysis ($\alpha = .05$), with the greatest difference occurring in the fall. At that time, blue crabs occurred less frequently than expected while *Farfantepenaeus sp., Panopeus sp.* and xanthid crabs occurred at higher frequencies than expected, based on the time of year.

Spatial differences in the diet of red drum appear in Table 6 with index of preponderance, I_p, in Table 7 and the top ten red drum prey items in Table 8. Seven of the ten are common to all four regions, suggesting little regional variation in diet. As with the seasonal data, the regional data shows the dominance of pink shrimp in the diet. Blue crabs, bony fish and xanthid crabs are also important. Toadfish are also consistently important among regions.

Based on a Chi-Square analysis, it appears that the diet of fish from region 4 was significantly different from that of red drum in any of the other three areas. Occurring with lower frequency than expected in this region were pink shrimp, blue crabs, *Thalassia testudinum,* and *Halodule wrightii.* Occurring at higher frequencies than expected were *Alpheus heterochaelis, Eurypanopeus depressus*, and *Panopeus sp*.

We examined the interaction of season and area using a Chi-Square Analysis. There were no significant differences in the diet in spring or summer in any area. Although not significant at the .05 level ($\alpha = .06$), changes in the fall diet in area 1W may be biologically

significant. There was a higher than expected occurrence of penaeid shrimp in the diet. In the winter, the diet was significantly different only in area 4 ($\alpha = .04$). Blue crabs and pink shrimp were lower than expected while *Alpheus heterochaelis* and toadfish were higher than expected.

Snook Diet

The overall diet of snook in Florida Bay is given in Table 9. By far the most abundant food for snook is other fish, as determined by the preponderance of unidentified bony fish parts. These also represented the greatest biomass. Pink shrimp ranked second based on the number of stomachs in which pink shrimp were found and their biomass.

Relatively large fish--including mullet, red drum, leatherjacket, pinfish, and ariid catfish-- were found infrequently in snook stomachs. It is reasonable to assume that at least some of the unidentified bony fish parts derived from these species. None of the larger organisms were abundant in the diet of snook, although pinfish occurred relatively frequently.

The relative importance of snook food items, as indicated by I_p, is given in Table 10. Bony fish were by far the most important prey, followed by pink shrimp, pinfish, blue crab, and mojarra. The information is also given following the Costello graphical method (after Costello 1990) (Figure 4). The graphical representation indicates the same thing that the preponderance table does. That is, that snook are primarily piscivorous and that most other dietary items are consumed only rarely.

In Table 11, the seasonal distribution of number of individuals and percent occurrence of dietary items for snook is given. The seasonal variation in I_p for snook is given in Table 12. The top ten snook prey items for each season are listed in descending rank order of importance in Table 13. Three prey items of the top ten are common to all four seasons (indicated by asterisk in spring group) which suggests some seasonal dietary differences.

Table 14 gives regional differences in the number and percent occurrence, abundance and wet weight of items in the diet of snook, with the I_p values displayed in Table 15. The top ten red drum prey items for each region are listed in descending rank order of importance in Table 16. Two prey items of the top ten are common to all four regions (indicated by asterisk in the area 1W group) which suggests regional differences in dietary composition.

Based on Chi-Square Analysis, we found neither spatial, temporal, nor interacting differences in the diet of snook in the areas from which we obtained specimens.

Isotope analyses

Multiple stable isotope analyses for red drum were conducted on a regional basis (Figure 5). Analysis of sulfur 35 and carbon 13 indicate that fish collected in areas 3E and 2W were probably supported by a benthic (seagrass) community, while those from areas 4 and 1W were supported by a mangrove-dominated system. Fish collected in area 3W were intermediate. Analysis of nitrogen 15 and carbon 13 indicate that the trophic level for red drum remains relatively constant across all areas, assuming a similar $\delta^{15}N$ signature for primary producers in each.

Multiple stable isotope analyses for snook were also conducted on a regional basis (Figure 6). Analysis of sulfur 35 and carbon 13 indicated that fish collected in area 1W were apparently supported by a benthic (seagrass) community, while in all of the other zones the isotopic signature indicates a mixed mangrove-seagrass trophic base shifting strongly to a pelagic system (possibly indicating that in these areas fish are found in both the mangroves and seagrass beds as well as further offshore in a plankton dominated system. This pattern was not seen for red drum. Analysis of $\delta^{15}N$ and $\delta^{13}C$ indicate that the trophic level for snook remains relatively constant across all areas, assuming a similar $\delta^{15}N$ signature for primary producers in each. The $\delta^{15}N$ signature (and hence possibly the trophic position) is similar to that for red drum. These are all preliminary data and part of an ongoing study being conducted through FSU's Department of Oceanography by Lia Chasar and Jeffrey Chanton.

Estimates of niche breadth and niche overlap

We used an arbitrary cutoff point for percentage of a resource used by red drum and snook to determine the degree of niche breadth for each species. With a cutoff at 5 %, the most frequently used resources for red drum were pink shrimp, fish (based on unidentified bony parts), blue crab, penaeid shrimp, xanthid crabs, and the big-clawed snapping shrimp *Alpheus heterochaelis*. For snook at 5%, the 3 most frequently used resources were fish, pink shrimp, and unidentified penaeid shrimp. Levin's measure for both species indicated a much narrower niche breadth than did either the Shannon-Wiener or Smith measure.

Measures of Niche Breadth for Snook and Red Drum			
	Levin's	Shannon Wiener	Smith (95 % C. L.)
Red drum	0.302	0.790	0.800 (0.777 – 0.822)
Snook	0.151	0.723	0.797 (0.749 – 0.842)

Estimation of niche overlap between red drum and snook were:

Pianka's measure = 0.709 (Percentage = 59.1)
simplified Morisita's measure = 0.660
Horn's index = 0.788.

The percentage overlap is convenient because it is easy to interpret, i.e., it is the actual percentage of overlap. All but Morisita's estimate of overlap change some with sample size. With relatively large sample size, the curves tend to flatten.

All these measures show moderately broad overlap, but niche overlap should not be interpreted in terms of competition, as the relationship between the two is complex.

Length-weight, size-at-age, and distribution of sex.

The distributions of red drum size and age are given in Figure 7. We examined the length-weight relationship (Figure 8) and size at age (Figure 9). Although the ages ranged from 1 to 8 years old, the majority of fish landed were 2 to 3 years old. The sizes ranged from 40 to 67 cm TL, but the vast majority of fish were from 45 to 65 cm TL. Thus, some fish smaller than the lower regulatory size limit were captured. (Red drum are managed with a slot limit in Florida waters of 18 – 27 inches (45.7 to 68.6 cm).)

Figure 10 displays the frequency distributions of size (10a) and age (10b) of snook used in this study. We examined the length-weight relationship (Figure 11) and size-at-age (Figure 12). Snook ranged in age from 1 to 11 years. However, most of the fish caught were 3 to 6 years old (primarily 4 year old fish). Sizes ranged from 55 to 84 cm TL, with most of the fish caught ranging from 65 to 69 cm TL. This species is managed by slot limit and bag limit. The slot limit is 26-34 inches (66 to 86.4 cm TL).

Sex was determined for 71 snook specimens, of which 35 were female and 36 were male (Figure 13). Although this is a protandrous species, there was significant overlap in the size ranges of males and females examined in this study. Further, regression analysis indicated a significant sexual difference in their growth rates. Females appear to grow faster than do males (Figure 14).

Discussion

Both red drum and snook exhibit ontogenetic dietary shifts. Young red drum concentrate on amphipods and other small crustaceans whereas adults feed primarily on penaeid shrimp, crabs, and bottom-associated fish (Boothby and Avault 1971; Heffernan 1973, Yoekl 1966). Other items are found in the diet, such as echinoderms and mollusks (Overstreet and Heard 1978), but occur with far less frequency, indicating that they have diverse diets dominated by benthic organisms.

Small juvenile snook (5-20 mm) feed primarily on copepods and insect larvae and then switch to a piscivorous diet that includes *Gambusia affinis*, *Poecilia latipinna*, *Cyprinodon variegatus,* and other small fishes (Luzckovich et al. 1995, McMichael et al. 1989, Fore and Schmidt 1973, Harrington and Harrington 1961). Although adult snook are primarily piscivorous and feed on many species of fish (e.g., clupeids, engraulids, carangids, gerreids, and sciaenids), blue crabs (*Callinectes sapidus*) and pink shrimp (*Farfantepenaeus duorarum*) are often found in their diet (Fore and Schmidt 1973).

Red drum diet.— The seasonal and areal differences in diet we found for red drum could be due to differences in prey selection or differences in availability. It is very difficult to determine which of these factors is responsible for the observed differences in diet. In studies with red drum in other bay systems (e.g., Scharf and Schlicht 2000), the diet of red drum changed with seasonal changes in abundance of white shrimp. Thus, it is reasonable to assume that the red drum diet in Florida Bay somewhat reflects the abundance of potential prey in the places and times of feeding.

Fish caught from more northerly inshore regions differed from those caught in the southern part of Florida Bay, whether from inshore or offshore. Part of these differences may be due to the communities associated with different salinity regimes. Mangrove and oyster-reef communities dominate the more northern sites, whereas seagrass communities dominate more southerly sites. Thus lack of seagrass in northern sites is not due to seagrass die off. Further, the northwest coastal area is significantly influenced by freshwater input from the Shark River Slough, flowing through Whitewater Bay and out around Cape Sable. The area within Florida Bay is frequently influenced by hypersaline conditions particularly during droughts and during the dry season of December through May.

The relatively lower preponderance of pink shrimp in the diets of fish from area 4 is likely due to this difference. Although Whitewater Bay is one of the primary nursery habitats for pink shrimp and an important recruitment site for juveniles, pink shrimp tend to be more abundant in areas structured by *Thalassia* and *Halodule* (Sheridan 1996). A similar array of prey species dominated by pink shrimp was recorded during a diet investigation of adult red drum from the Florida Bay ENP creel survey, 1979-1980 (Schmidt, unpublished ENP data).

Occurring at higher frequencies than expected were species associated with oyster beds, including the snapping shrimp *Alpheus heterochaelis* (which burrows in oyster clumps and rubble), the mud crab *Eurypanopeus depressus* and other xanthid crabs in the genus *Panopeus*. Again, because of the preponderance of oyster reef in area 4 compared to other areas, abundance of these reef-associated species is to be expected. Also in the fall, blue crabs occurred less frequently than expected while *Farfantepenaeus sp., Panopeus sp.* and xanthid crabs occurred at higher frequencies than expected, based on the time of year.

Seasonal differences in the diet of red drum occurring in the fall can be explained for the most part as being associated with the fall and winter migrations of pink shrimp from estuarine nursery grounds inshore to offshore spawning grounds (e.g., Bielsa et al. 1983, Gitschlag 1986).

The isotopic patterns for red drum indicate spatial differentiation in the ultimate sources of primary production. That is, primary production associated either with mangroves or with seagrass. In a study by Fry et al. (1999), the isotopic patterns of pink shrimp collected from two adjacent bays in the Rookery Bay area of Florida reflected the dominant plant--either seagrass or mangrove--of the respective bay. Therefore, even though the prey items of red drum or snook might not differ from area to area (e.g., pink shrimp), the isotopic patterns of those predators reflect the ultimate food source (primary producers) of their prey, even though that primary production may have passed through several trophic levels. The implication from these isotopic patterns is that red drum do not frequently move from one habitat or area to another. If they did move regularly, the isotopic patterns would likely blend, because isotopically different food sources would be consumed to produce a single average pattern for the region

Red drum age.--Red drum are relatively long-lived fishes, with life expectancies ranging from 35 (for Florida, Murphy and Taylor 1991) to 56 years (for North Carolina, Ross et al. 1995). Fish we sampled ranged in age from 1 to 9 years. Because most fish mature by about age 3 (Ross et al. 1995), the sample from Florida Bay clearly concentrated on late stage juveniles and subadults, which is true for the entire recreational fishery for red drum in Florida Bay (Tilmant et al. 1989).

Snook diet.—Late juvenile and adult snook are primarily fish eaters (Marshall 1958, Harrington and Harrington 1961, Gilmore et al. 1983, McMichael et al. 1989, Aliaume et al. 1997). They also show clear propensity for fish in this Florida Bay study. Over 50% of the occurrences of prey in the diet are fish and nearly 85% of the biomass of the diet was fish. The other prey items that were important were primarily pink shrimp and blue crabs.

The snook diet was not as well resolved as that of red drum because fish prey digest very quickly and there are few hard parts to give clues as to the identification of the prey. Therefore we had to pool large portions of the snook diet into the category of unidentifiable fish parts. Comparatively, red drum prey mostly on crustaceans which have relatively indigestible and more easily identifiable exoskeletons. The lower resolution of the snook diet could be a factor in the lack of observed seasonal and areal dietary differentiation.

The stable isotope analyses of snook tissues gave patterns of seagrass-mangrove-pelagic isotopic signatures, with little areal differentiation. There are two possible explanations for this observation. Either snook move about within a wide variety of habitats, including mangrove, seagrass, and reef, where a variety of food types are encountered; or their movement is limited, but they encounter a diverse array of food types (mostly mobile fishes) derived from offshore and estuarine habitats. Simply put, either the snook move or their prey move about regularly. Snook are commonly observed on reefs, in mangroves and on seagrass habitats, but the regularity with which they move among these habitats is unknown. We know that the crustacean component of the diet is not highly mobile, but components of the fish prey could be. The top fish prey (Table 13) in the snook diet were a mix of highly mobile pelagic-feeding species such as *Oligoplites sauris* and clupeids, highly mobile

benthic-feeding species such as mullet and mojarras, and low mobility benthic-feeding species like pinfish and *Fundulus*. Thus, there is insufficient information to discern which of these two possibilities is most likely.

The oral and body morphology of adult snook and red drum give clues to their modes of predation. The mouth and body form of snook is that of a mid-water fish eater. The data presented in this study indicate that pink shrimp and blue crabs are abundant in the snook diet. Since both these prey are adept swimmers, it is likely that snook prey on them while they are swimming in the water column. Other dominant prey in the snook diet do not live directly on the bottom, but above it. In contrast, adult red drum have a bottom-associated body form, with a rounded dorsal aspect and a flattened ventral. They also have a relatively small mouth that is ventrally located and designed primarily for sucking prey off the bottom. Most of their prey live directly on the bottom, including xanthid crabs, spider crabs, snapping shrimp, toadfish and gobies.

It is unlikely that there is direct competition between red drum and snook. Even though there is a high degree of niche overlap (60%), particularly for pink shrimp and blue crabs, red drum and snook prey upon these species in spatially distinct ways. Pink shrimp and blue crabs buried in the sediment (the typical daytime pattern for pink shrimp) would be unavailable to snook, while being a prime target for red drum. Conversely, swimming shrimp and crabs would be readily available to snook, but not easily captured by red drum. This is a good example of why one cannot use niche overlap to imply competition without *a priori* knowledge of the behavioral ecology of the predators and their prey.

Snook size, age and sex.— Two unit stocks of snook have been identified in south Florida: one population on the Atlantic coast and the other on the Gulf coast with genetically based differences in size and growth (Tringali and Bert 1996). Florida Bay snook may comprise an immigrant adult population derived from one or both populations. We leave it to the ENP managers to evaluate the snook age and growth data presented here relative to this issue. Snook are protandrous fish, changing sex from male to female. Most male snook mature by the time they reach 5 years of age at sizes around 50 cm whereas most females mature by the time they reach 7 or 8 years of age at sizes around 700 cm (Peters et al. 1998). We found a differential growth rate between males and females. Presumably the selective advantage to enhanced growth following sex reversal is to rapidly increase fecundity, since fecundity increases exponentially with increased length.

Acknowledgements

In this work we relied on the help of a number of people. Gabriel A. Delgado (ENP) conducted creel sampling and obtained fish heads and gonads for analysis. Christopher P. Greene packed and shipped all specimens from Flamingo to Tallahassee. Maria Wise and Stacey Harter (Florida State University, Department of Biological Science) and Robert Allman (National Marine Fisheries Service, Panama City) assisted in the identification of stomach contents. Luiz Barbieri, Ron Taylor, and Michael Murphy (all from Florida Marine Research Institute) aged and sexed fish. Lia Chasar and Jeffrey Chanton (FSU, Department of Oceanography) conducted isotope analyses on muscle tissues. Todd Bevis (FSU) and John Brusher (National Marine Fisheries Service, Panama City) conducted field sampling during closed fishing seasons.

Literature Cited

Aliaume, C. , A. Zerbum J. M. Miller. 1997. Nursery habitat and diet of juvenile *Centropomus* species in Puerto Rico estuaries. Gulf of Mexico Science 2, 77-87.

Bielsa, L. M., W. H. Murdich, R. F Labisky. 1983. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (South Florida): Pink shrimp. Fish and Wildlife Service Coastal Ecology Group FWS/OBS-82/11.17. October 1983. 21 pp.

Boesch, D. F., N. E. Armstrong, J. E. Cloern, L. A. Deegan, R. D. Perkins, S. L. Williams. 1993. Deterioration of the Florida Bay ecosystem: an evaluation of the scientific evidence. Report to the Interagency Working Group on Florida Bay, Department of the interior, National Park Service, Washington, DC. 27 pp.

Boothby, R. N. and J. W. Avault. 1971. Food habits, length-weight relationship, and condition factor of the red drum, *Sciaenops ocellatus*, in southeastern Louisiana. Trans. Am. Fish. Soc. 100(2), 290-395.

Browder, J. A., A. M. Eklund, T. W. Schmidt, D. DeAngelis, and JH. S. Ault. 1998. Recommended research program (?) a trophic levels of Florida Bay. Florida Bay SCI Conf. Miami, FL

Butler, M. J., IV., J. H. Hunt, W. F. Herrnkind, M. J. Childress, R. Bertelsen, W. Sharp, T. Matthews, J. M. Field, H. G. Marshall. 1995. Cascading disturbances in Florida Bay, USA: cyanobacteria blooms, sponge mortality, and implications for juvenile spiny lobsters *Panulirus argus*. Marine Ecology Progress Series 129:119-125.

Clarke, J. R. and R. M. Warwick. 1994. Change in marine communities: an approach to statistical analysis and interpretation. Bourne Press Ltd., Bournemouth, UK.

Costello, M. J. 1990. Predator feeding strategy and prey importance: a new graphical analysis. Journal of Fish Biology 36:261-263.

Costello, T. J., D. M. Allen, J. H. Hudson. 1986. Distribution, seasonal abundance and ecology of juvenile northern pink shrimp, *Penaeus duorarum*, in the Florida Bay area. *NOAA Tech. Mem.,* NMFS-SEFC-161:1-84.

Fore, R. L., and T. W. Schmidt. 1973. Biology of juvenile and adult snook, *Centropomus undecimalis,* in the Ten Thousand Islands. *In:* Ecosystem analysis of the Big Cypress Swamp and Estuaries, pp. Xvi, 1-18. U. S. Atlanta, Georgia: Environmental Protection Agency Region IV, Publication Number EPA 904/9-74-002.

Fry, B., P. L. Mumford, M. B. Roblee. 1999. Stable isotope studies of pink shrimp (*Farfantepenaeus duorarum* Burkenroad) migrations on the southwestern Florida shelf. Bulletin of Marine Science, 65(2): 419-430.

Gilmore, R. G., C. J. Donohoe, D. W. Cooke. 1983. Observations on the distribution and biology of east-central Florida populations of the common snook, *Centropomus undecimalis* (Bloch). Fla. Sci. 46, 313-336.

Gitschlag, G. R. 1986. Movement of pink shrimp in relation to the Tortugas Sanctuary. North American Journal of Fisheries Management 6:328-338.

Harrington, R. W., Jr., and E. S. Harrington. 1961. Food selection among fishes invading a high subtropical salt marsh: from onset of flooding through the progress of a mosquito brood. Ecology 42(4), 646-666.

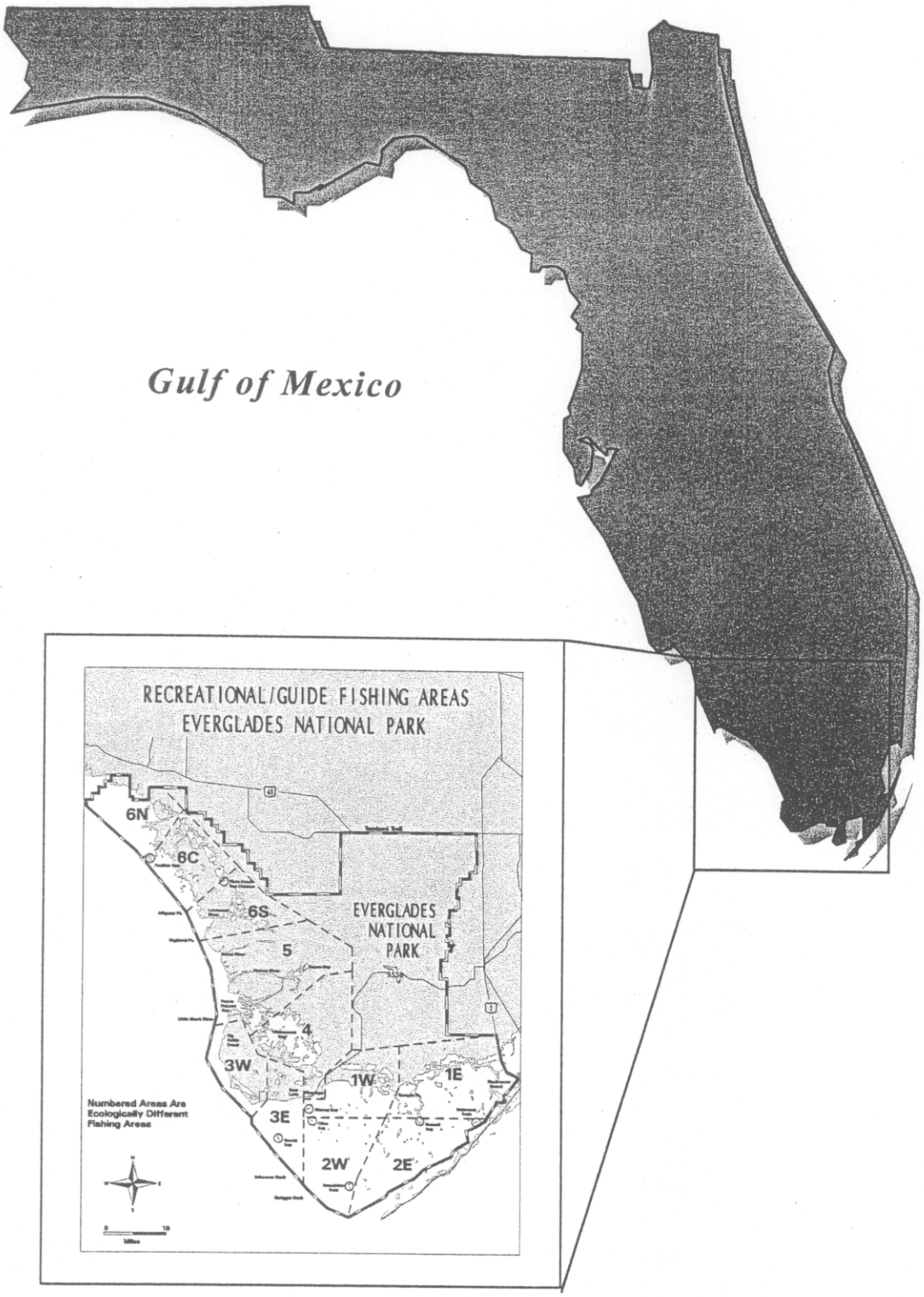
Harwell, M. A. 1997. Ecosystem management of South Florida: developing a shared vision of ecological and societal sustainability. Bioscience 47(8):499-512.

Heffernan, T. L. 1973. Survey of adult red drum, *Scianeops ocellatus*. Coastal Fisheries Project Report 1973. Texas Parks and Wildlife.
Higman, J. B. 1967. Relationships between catch rates of sport fish and environmental conditions in Everglades National Park, Florida. Proc. Gulf and Carib. Fish. Inst. 19:129-140.
Jearld, A., Jr. 1983. Age determination. *In* Nielsen, L.A., and D.L. Johnson (eds.), Fisheries techniques, pp. 301-324. Am. Fish. Soc., Bethesda.
Loftus, W. F. 2000. Inventory of fishes of Everglades National Park. Florida Scient. 63(1):20-26.
Luczkovich, J. J., S. F. Norton, R. G. Gilmore, Jr. 1995. The influence of oral anatomy on prey selection during the ontogeny of two perocid fishes, *Lagodon rhomboides* and *Centropomus undecimalis.* Environ. Biol. Fish. 44, 79-95.
Marshall, A. R. 1958. A survey of the snook fishery of Florida with studies of the biology of the principal species *Centropomus undecimalis (*Bloch). Tech. Ser. Fla. Bd. Conserv. 22, 1-39.
Marshall, S., M. Elliott. 1997. A comparison of univariate and multivariate numerical and graphical techniques for determining inter- and intraspecific feeding relationships in estuarine fish. Journal of Fish biology 51 (3): 526-54.
McIvor, C. C., J. A. Ley, and R. D. Bjork. 1994. Changes in freshwater inflow from the Everglades to Florida Bay incoluding effects on biota and biotic processes: a review, pp. 117-146. *In:* Everglades. The Ecosystem and its Restoration. St. Lucie Press. Boca Raton, FL.
McMichael, R. H. Jr., K. M. Peters, and G. R. Parsons. 1989. Early life history of the snook, *Centropomus undecimalis,* in Tampa Bay, Florida. Northeast Gulf Science 10, 113-125.
Murphy, M., and R. G. Taylor. 1991. Direct validation of ages determined for adult red drums from otolith sections. Trans. Amer. Fish. Soc. 120:267-269.
Overstreet, R. M., and R. Heard. 1978. Food of the red drum *Scianeops ocellatus* from Mississippi Sound. Gulf Resource Report 6(2):131-135.
Pauly, D. *et al.* 1998. Fishing down marine food webs. *Science* 279, 860-863
Peters, K. M., R. E. Matheson, Jr., and R. G. Taylor. Reproduction and earlylife history of common snook, *Centropomus undecimalis* (Bloch), in florida. Bull. Mar. Sci. 62(2):509-529.
Ross, J. L., t. M. Steven, D. S. Vaughan. 1995. Age, growth, mortality, and reproductive biology of red drums in North Carolina waters. Trans. Am. Fish. Soc. 124:137-154
Rutherford, E. S., J. T. Tilmant, E. B. Thue, and T. W. Schmidt. 1989. Fishery harvest and population dynamics of gray snapper, *Lutjanus griseus* from Florida Bay and adjacent waters. Bull. Mar. Sci. 44:1 (139-154)
Steneck, R. S. 1998. Human influences on coastal ecosystems; does overfishing create trophic cascades? *Trends Ecol. Evol.* 13, 429-430
Scharf, F. S. and K. K. Schlicht. 2000. Feeding habitats of red drum (*Sciaenops ocellatus*) in Galviston Bay, TX: Seasonal diet variation and predator-prey size relationships. Estuaries 23(1):128-139.
Schmidt, T. W., G.A. Delgado, and J. Kalafarski. 2000. Annual Fisheries Report, Everglades National Park, South Florida Natural Resources Center. Homestead, FL. June, 2000
Sheridan, P. 1996. Forecasting the fishery for pink shrimp, *Penaeus duorarum*, on the Tortugas Grounds, Florida. Fishery Bulletin 94:743-755.

Tabb, D. C., D. L. Dubrow, R. B. Manning. 1962. The ecology of Florida Bay and adjacent estuaries. Fla. Bd. Conserv., Tech. Ser. 34:1-79.
Taylor, R. G., H. J. Grier, and J. A. Whittington. 1998. Spawning rhythms of common snook in Florida. Journal of Fish Biology 53:502-520.
Taylor, R. G., J. A. Whittington, H. J. Grier, and R. E. Crabtree. 2000. Age, growth, maturation, and protandric sex reversal in the common snook, *Centropomus undecimalis*, from south Florida waters. Fishery Bulletin 98:612-624.
Tilmant, J. T. 1989. A history and an overview of recent trends in the fisheries of Florida Bay. Bulletin of Marine Science 44:3-22.
Tilmant, J.T., E.S. Rutherford, and E.B. Thue. 1989. Fishery harvest and population dynamics of red drum, *Sciaenops ocellatus* in Florida Bay and adjacent waters. Bull. Mar. Sci. 44:1(126-138.
Tringali, M.D. and T.R. Bert. 1996. The genetic stock structure of common snook, *Centropomus undecimalis*. Canadian Journal of Fisheries and Aquatic Sciences 53:685-694
Yokel, R. 1966. A contribution to the biology and distribution of the red drum, *Scianeops ocellatus,* M. S. Thesis. University of Miami, Miami, FL. 160 pp.

Figures

Tables


Gulf of Mexico
RECREATIONAL/GUIDE FISHING AREAS
EVERGLADES NATIONAL PARK
6N
6C
6S
5
4
3W
1W
1E
3E
2W
2E
EVERGLADES NATIONAL PARK
Numbered Areas Are Ecologically Different Fishing Areas

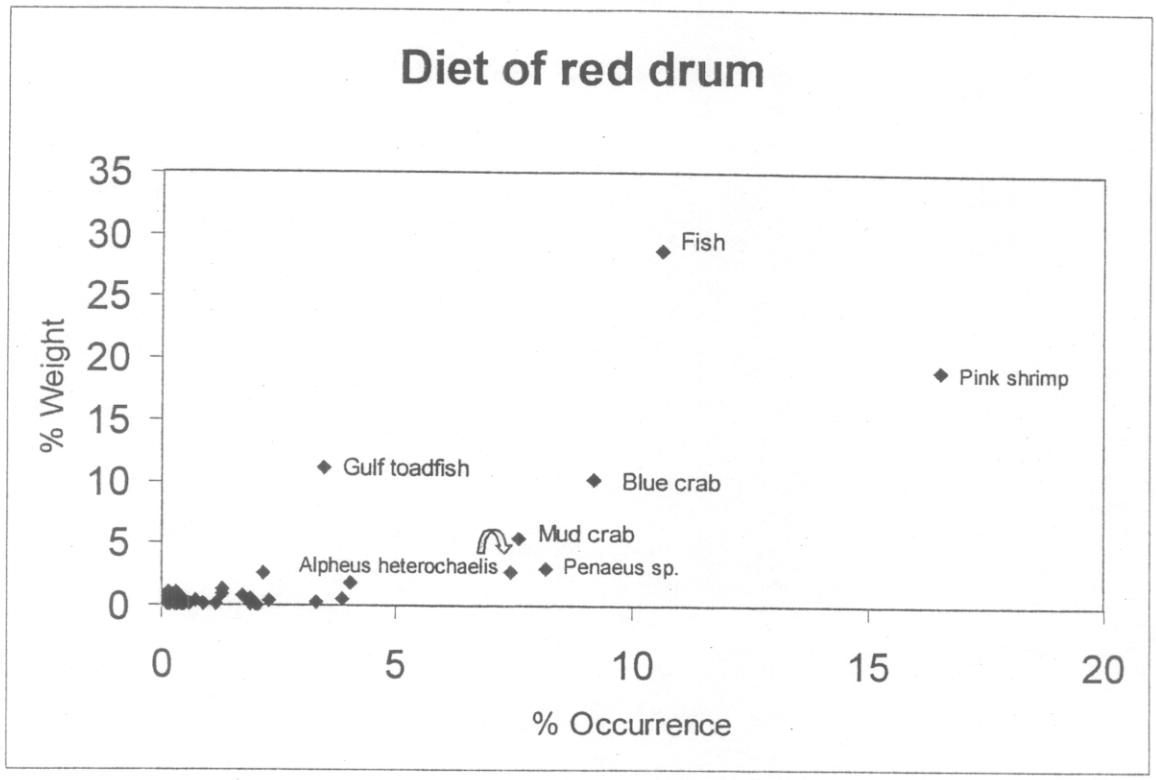


Figure 2. The importance of prey items in the diet of red drum *Sciaenops ocellatus* from the Everglades National Park, Florida Bay, as determined by the Costello analysis.

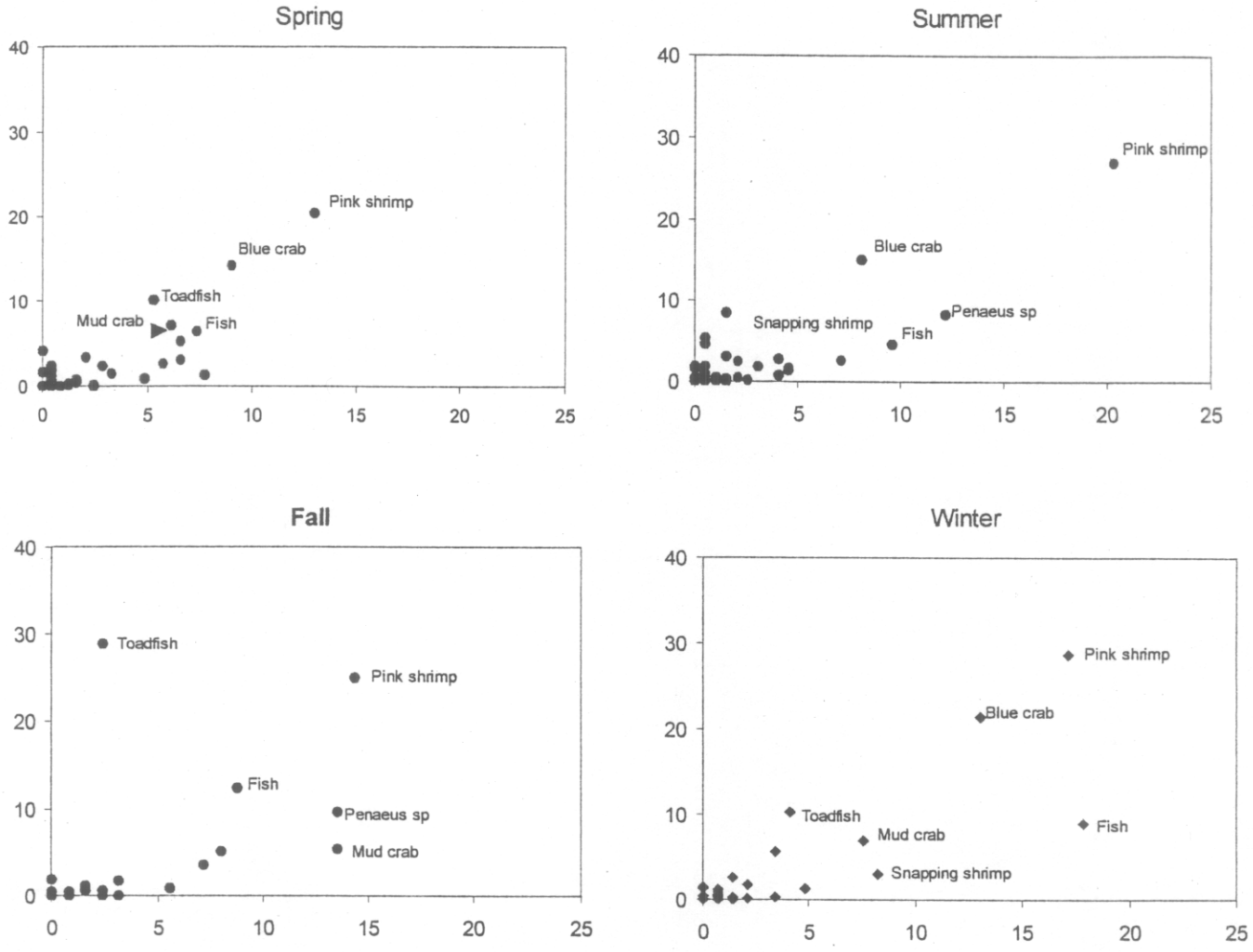


Figure 3. Seasonal comparison of the importance of prey items in the diet of red drum *Scianeops ocellatus* from the Everglades National Park, Florida Bay, as determined by the Costello analysis.

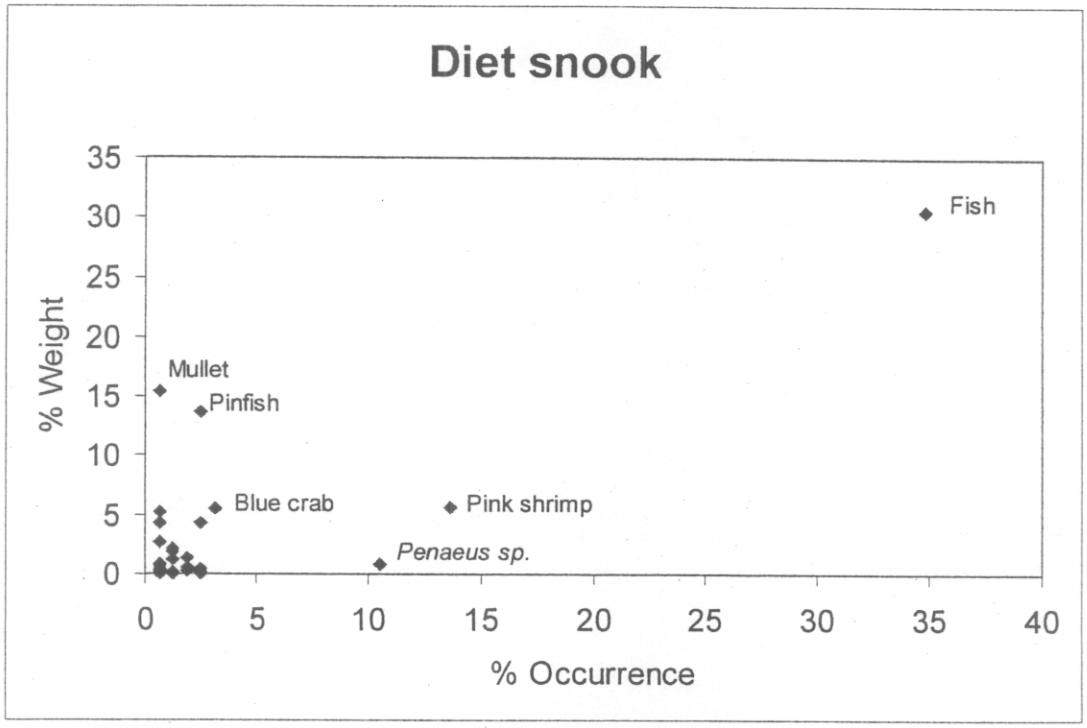


Figure 4. The importance of prey items in the diet of snook *Centropomus undecimalis* from the Everglades National Park, florida Bay, as determined by the Costello analysis.

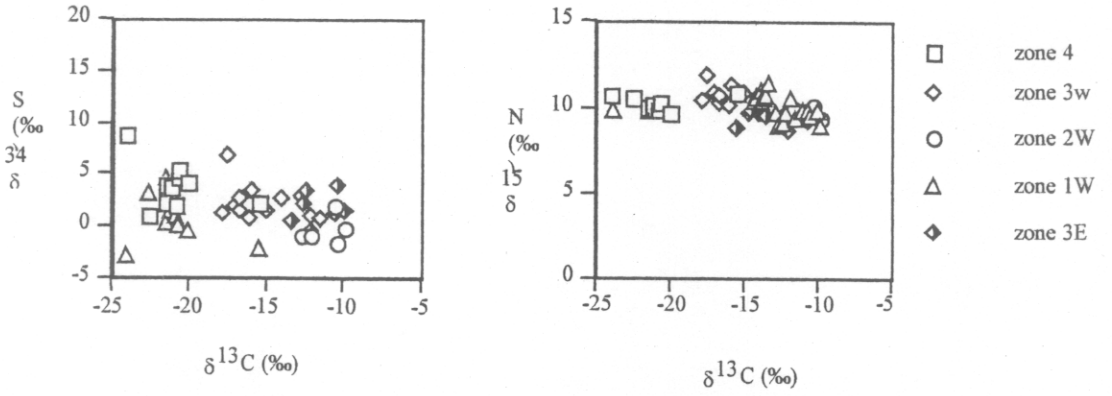


Figure 5. Regional differences in multiple stable isotope analysis for redfish (*Sciaenops ocellatus*) from the Everglades National Park, Florida Bay. (a) comparison of sulphur 34 ($\delta^{34}S$) and carbon 13 ($\delta^{13}C$). (b) comparison of nitrogen 15 ($\delta^{15}N$) and carbon 13 ($\delta^{13}C$).

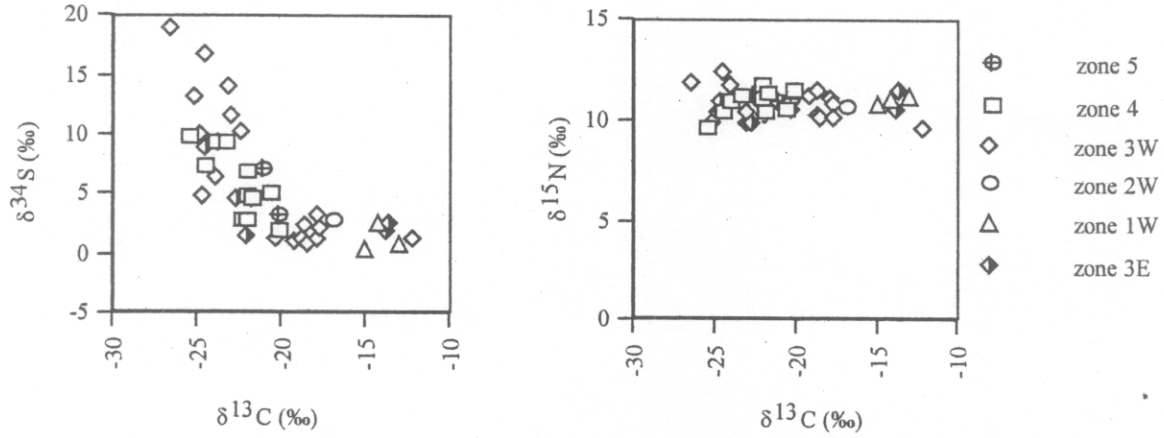
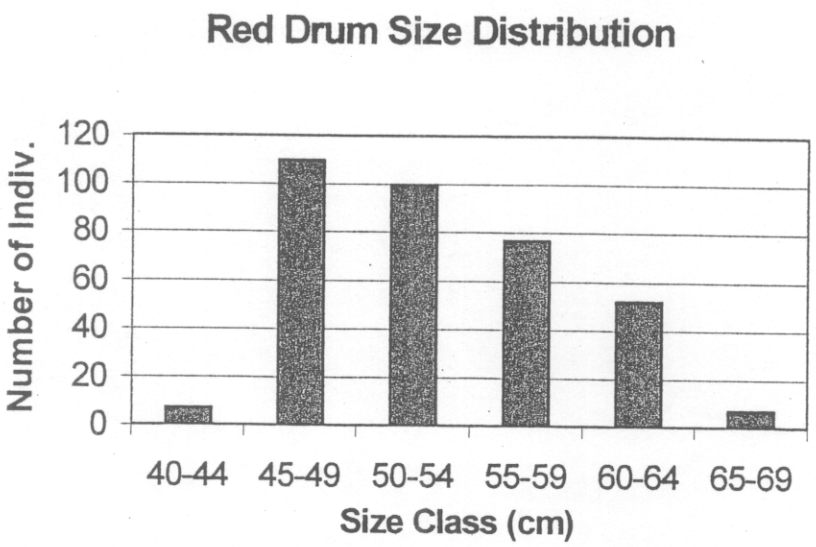


Figure 6. Regional differences in multiple stable isotope analysis for snook (*Centropomus undecimalis*) from the Everglades National Park, Florida Bay. (a) comparison of sulphur 34 ($\delta^{34}S$) and carbon 13 ($\delta^{13}C$). (b) comparison of nitrogen 15 ($\delta^{15}N$) and carbon 13 ($\delta^{13}C$).

A



B

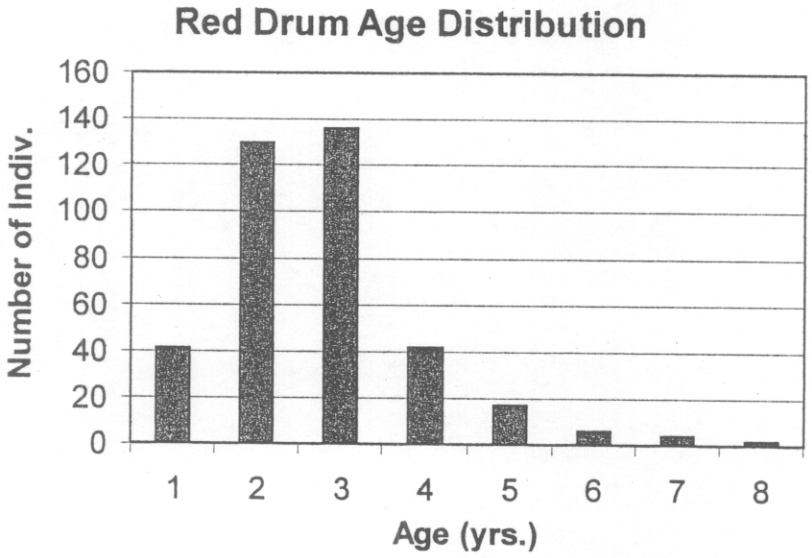


Figure 7. Frequency distributions of red drum *Scianeops ocellatus* collected from the Everglades National Park, Florida Bay, between May 1999 and August 2000, (a) size distribution (b) age distribution.

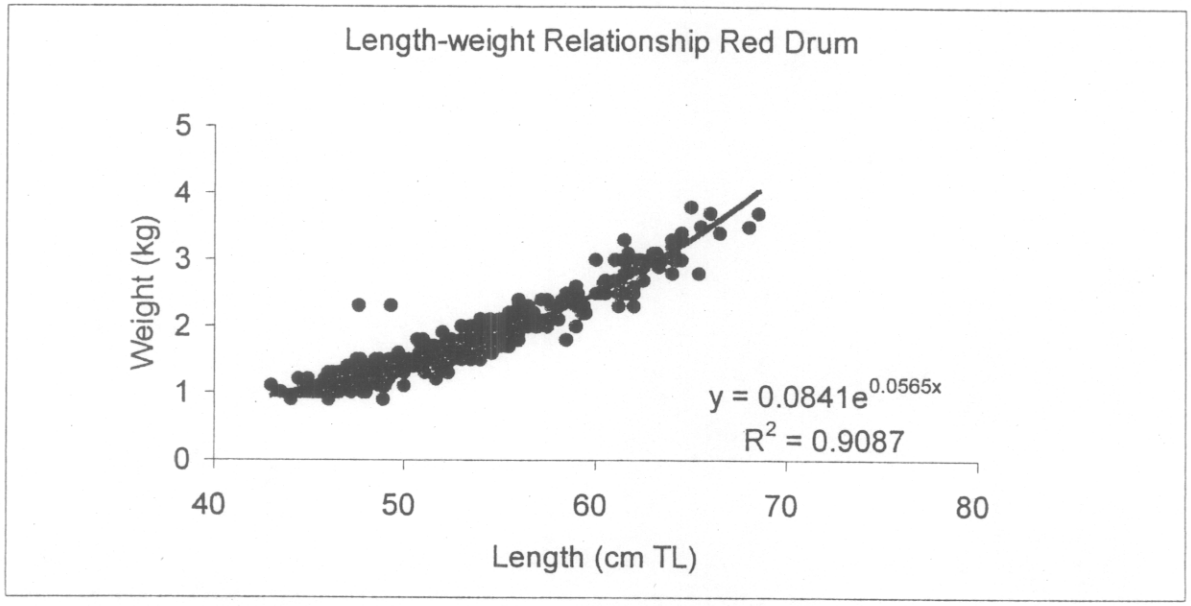


Figure 8. Length-weight relationship in red drum (*Sciaenops ocellatus*) for fish collected from the Everglades National Park between May 1999 and August 2000. N = 349.

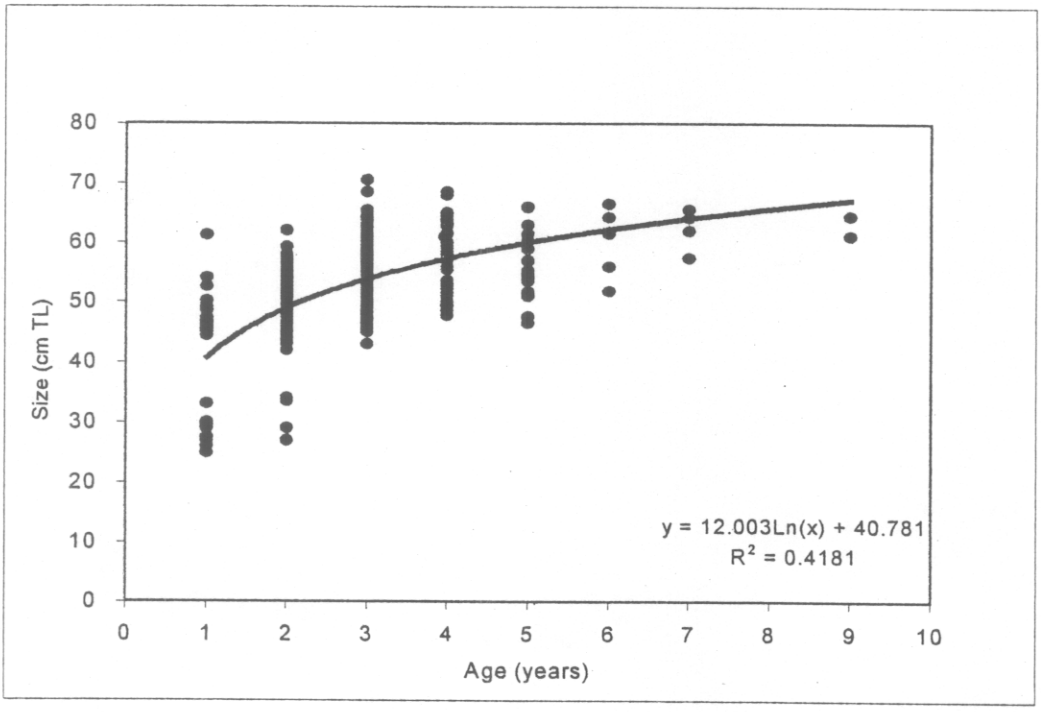
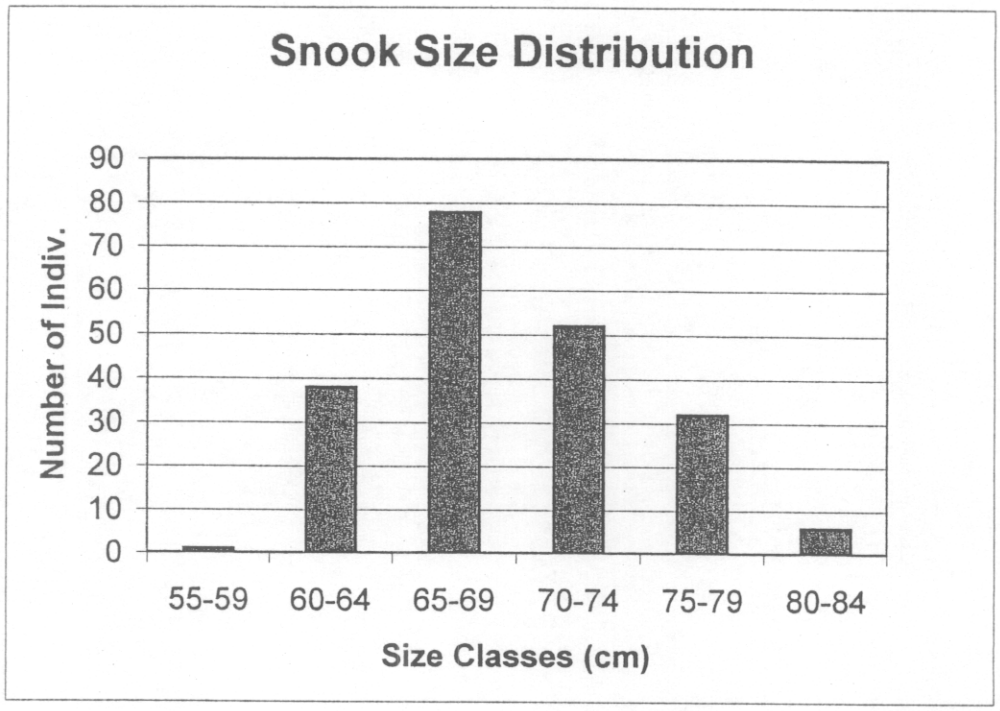


Figure 9. Size at age regression for red drum (*Sciaenops ocellatus*) for fish collected from the Everglades National Park between May 1999 and August 2000. N = 377.

A



B

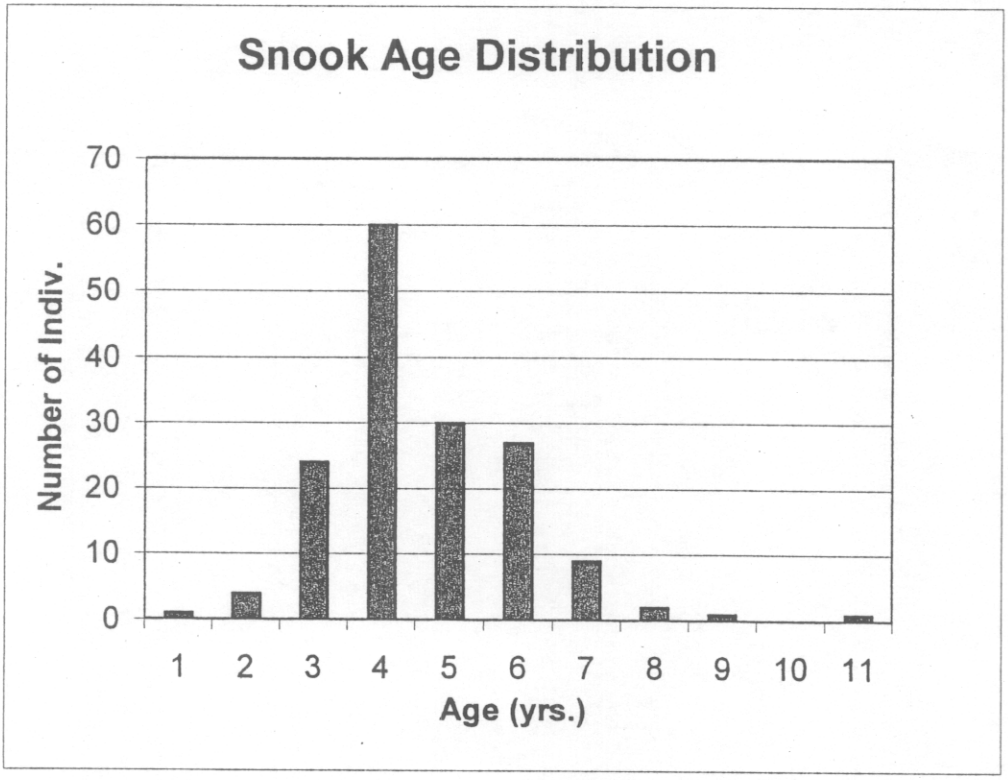


Figure 10. Frequency distributions of snook *Centropomus undecimalis* from the Everglades National Park, Florida Bay (a) size distribution; (b) age distribution.

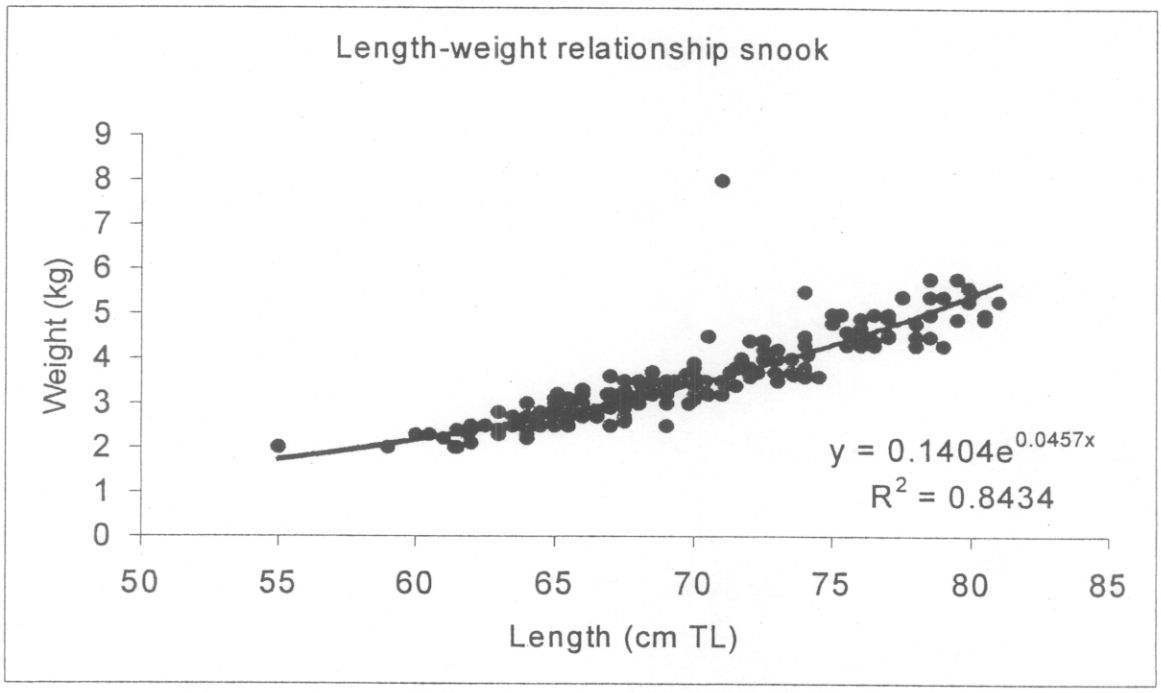


Figure 11. Length-weight relationship in snook (*Centropomus undecimalis*) for fish collected from the Everglades National Park between May 1999 and August 2000. N = 208.

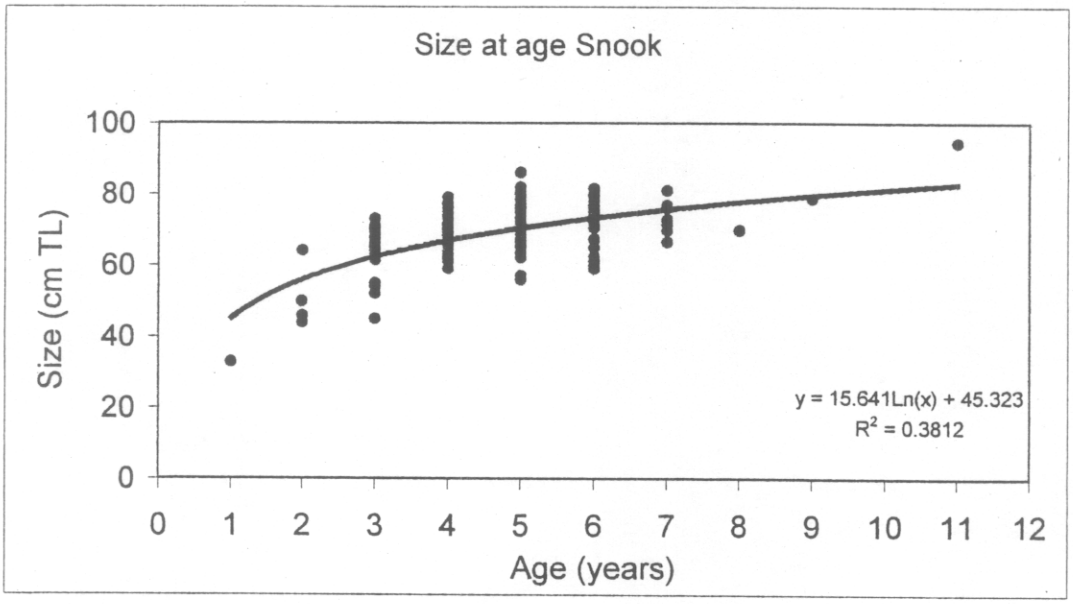


Figure 12. Size at age regression for snook (*Centropomus undecimalis*) for fish collected from the Everglades National Park between May 1999 and August 2000. N = 159.

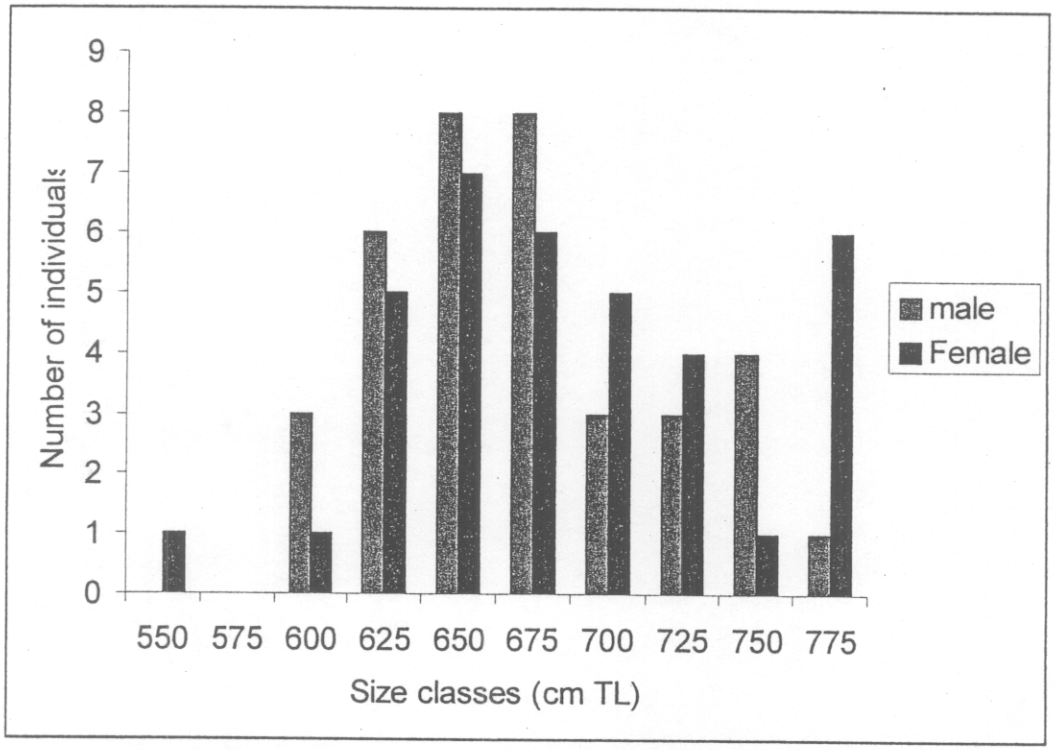


Figure 13. Frequency distribution of sex for snook (*Centropomus undecimalis*) caught in the recreational fishery of the Everglades National Park, Florida Bay. N = 72

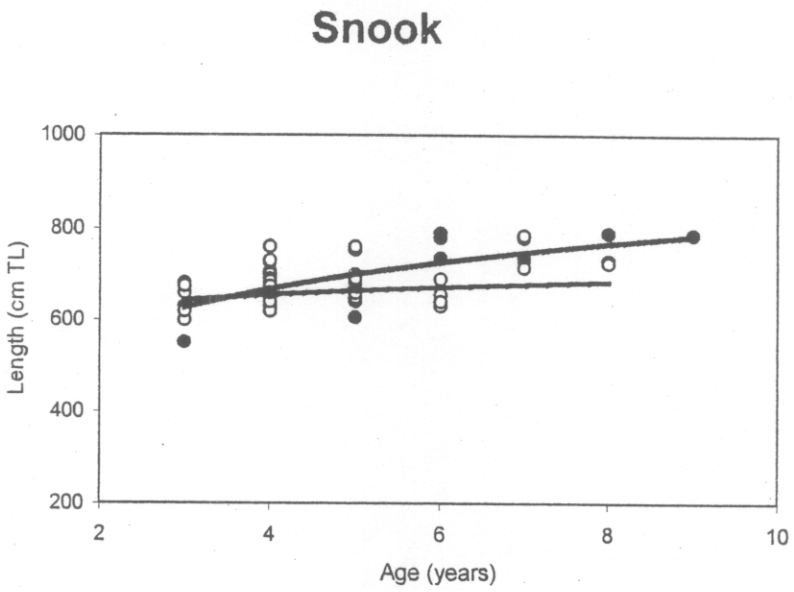


Figure 14. Regression of snook age and size by sex. Open circles = male (y_{male} = *41.229Ln(x) + 597.74*, r^2 = .008), solid circles = females. (y_{female} = *143.47Ln(x) + 469.21*, r^2 = 0.4699)

Table 1. Taxonomic list of the stomach contents of red drum (*Sciaenops ocellatus*) from the Everglades National Park, Florida Bay. Arranged in descending order based on the frequency of occurrence (=number of stomach containing a given type of item). Total number of stomachs analyzed = 383; total number of stomachs containing food = 308; total number of empty stomachs = 75. N = total number of individuals of a particular taxonomic group. Wt = total weight of individuals.

Scientific Name	Common Name	Occurrence in stomachs	N	Wt. (g)	Mean wt. (g)
Farfantepenaeus duorarum	Pink shrimp	115	280	617.95	2.21
Osteichthyes	Bony fish	74	108	927.6	2.05
Callinectes sapidus	Blue crab	64	92	329.35	3.7
Penaeus sp.	Penaeid shrimp	57	75	95.3	1.29
Xanthidae	Mud crab	53	97	174.55	1.96
Alpheus heterochaelis	Bigclaw snapping shrimp	52	128	88.85	0.81
Eurypanopeus depressus	Flatback mud crab	28	58	60	1.03
Alpheus sp.	Snapping shrimp	27	40	16.8	0.42
Opsanus beta	Gulf toadfish	24	44	359	8.16
Halodule wrightii	Shoal grass	23	23	10	0.48
Thalassia testudinum	Turtle grass	16	18	12	0.71
Decapoda	Decapod crustacean	15	28	84.3	3.51
Bivalvia	Bilvalve shell	14	14	1.2	0.11
Portunus sp.	Swimming crab	13	26	18.1	0.75
Portunidae	Swimming crab	12	15	26.8	1.79
Gastropoda	Snail	12	17	4.5	0.28
Panopeus sp.	Mud crab	9	20	30.2	2.01
Aspidochirotid sp.	Sea cucumber	9	12	42	3.5
Uca sp.	Fiddler crab	8	12	6.22	0.62
Majidae	Spider crab	6	6	3.65	0.91
Cyprinodon variegatus	Sheepshead minnow	5	8	11	1.38
Callinectes sp.	Swimming crab	4	4	4.9	1.23
Eurypanopeus sp.	Mud crab	3	5	13.7	2.74
Holothurian	Sea cucumber	3	4	12.8	3.2
Libinia dubia	Longnose spider crab	3	4	16.6	4.15
Neopanope packardii	Florida grassflat crab	3	5	7.4	1.48
Eel	Eel	3	6	12.4	2.07
Gobiidae	Goby	3	15	8.85	0.59
Syngnathus sp.	Pipefish	3	6	1.2	0.2
Ophichthidae	Snake eel	3	3	10.8	5.4
Callinectes ornatus	Shelligs	2	2	1.5	0.75
Gobiosoma robustum	Code goby	2	2	0.2	0.1
Harengula sp.	Herring	2	3	34.9	11.63
Gobisoma sp.	Goby	2	3	3.9	1.95
Hepatus epheliticus	Calico box crab	1	1	2.2	2.2
Hermit crab	Hermit crab	1	1	0.4	0.4
Limulus polyphemus	Horseshoe crab	1	1	0.1	0.1
Menippe nodifrons	Cuban stone crab	1	1	10.5	10.5
Panopeus occidentalis	Furrowed mud crab	1	1	6.7	6.7
Panopeus simpsoni	Oystershell mud crab	1	1	5.5	5.5
Petrolisthes galathinus	Banded porcelain crab	1	1	0.01	0.01
Polycheata	Polycheate worm	1	2	19.9	9.95
Portunus gibbesii	Iridescent swimming crab	1	1	3.7	3.7
Squilla sp.	Mantis shrimp	1	1	1.8	1.8
Terebra sp.	Auger snail	1	1	0.1	0.1
Eurypanopeus abbreviatus	Lobate mud crab	1	1	6.2	6.2
Persephona sp.	Purse crab	1	1	2.1	2.1
Ancylopsetta quadrocellata	Ocellated flounder	1	1	3.2	3.2

Calamus arctifrons	Grass porgy	1	1	19.5	19.5
Chilomycterus schoepfi	Striped burrfish	1	1	1.5	1.5
Clupeidae	Herring	1	1	15.4	15.4
Eucinostomus sp.	Mojarra	1	1	2.5	2.5
Gobiosoma bosc	Naked goby	1	1	0.2	0.2
Harengula jaguana	Scaled sardine	1	1	13.3	13.3
Lagodon rhomboides	Pinfish	1	1	16.9	16.9
Opisthonema oglinum	Atlantic thread herring	1	7	34.6	4.94
Poecilia latipinna	Sailfin molly	1	2	1.7	0.85
Ariidae	Sea catfish	1	1	2.8	2.8
Dormitator maculatus	Fat sleeper	1	4	8.2	2.05
Inedible items (e.g., detritus, wood)		15	21	9.9	0.5

Table 2. Index of preponderance (I_p) for dietary items found in the stomach contents of red drum (*Sciaenops ocellatus*) from the Everglades National Park, Florida Bay.

Scientific Name	Common Name	% Occurrence	% Wt.	Ip
Farfantepenaeus duorarum	Pink shrimp	16.50	19.15	0.3654
Osteichthyes	Bony fish	10.62	28.74	0.3530
Callinectes sapidus	Blue crab	9.18	10.20	0.1084
Xanthidae	Mud crab	7.60	5.41	0.0476
Opsanus beta	Gulf toadfish	3.44	11.12	0.0443
Penaeus sp.	Penaeid shrimp	8.18	2.95	0.0279
Alpheus heterochaelis	Bigclaw snapping shrimp	7.46	2.75	0.0238
Eurypanopeus depressus	Flatback mud crab	4.02	1.86	0.0086
Decapoda	Decapod crustacean	2.15	2.61	0.0065
Alpheus sp.	Snapping shrimp	3.87	0.52	0.0023
Aspidochirotid sp.	Sea cucumber	1.29	1.30	0.0019
Portunidae	Swimming crab	1.72	0.83	0.0017
Panopeus sp.	Mud crab	1.29	0.94	0.0014
Portunus sp.	Swimming crab	1.87	0.56	0.0012
Halodule wrightii	Shoal grass	3.30	0.31	0.0012
Thalassia testudinum	Turtle grass	2.30	0.37	0.0010
Harengula sp.	Herring	0.29	1.08	0.0004
Cyprinodon variegatus	Sheepshead minnow	0.72	0.34	0.0003
Gastropoda	Snail	1.72	0.14	0.0003
Libinia dubia	Longnose spider crab	0.43	0.51	0.0003
Uca sp.	Fiddler crab	1.15	0.19	0.0003
Eurypanopeus sp.	Mud crab	0.43	0.42	0.0002
Holothurian	Sea cucumber	0.43	0.40	0.0002
Eel	Eel	0.43	0.38	0.0002
Opisthonema oglinum	Atlantic thread herring	0.14	1.07	0.0002
Ophichthidae	Snake eel	0.43	0.33	0.0002
Gobiidae	Goby	0.43	0.27	0.0001
Neopanope packardii	Florida grassflat crab	0.43	0.23	0.0001
Majidae	Spider crab	0.86	0.11	0.0001
Polycheata	Polycheate worm	0.14	0.62	0.0001
Callinectes sp.	Crab	0.57	0.15	0.0001
Calamus arctifrons	Grass porgy	0.14	0.60	0.0001
Lagodon rhomboides	Pinfish	0.14	0.52	0.0001
Bivalvia	Bilvalve	2.01	0.04	0.0001
Clupeidae	Herring	0.14	0.48	0.0001
Harengula jaguana	Scaled sardine	0.14	0.41	0.0001
Menippe nodifrons	Cuban stone crab	0.14	0.33	0.0001
Dormitator maculatus	Fat sleeper	0.14	0.25	0.0000
Gobisoma sp.	Goby	0.29	0.12	0.0000
Panopeus occidentalis	Furrowed mud crab	0.14	0.21	0.0000
Eurypanopeus abbreviatus	Lobate mud crab	0.14	0.19	0.0000
Panopeus simpsoni	Oystershell mud crab	0.14	0.17	0.0000
Portunus gibbesii	Iridescent swimming crab	0.14	0.11	0.0000
Syngnathus sp.	Pipefish	0.43	0.04	0.0000
Ancylopsetta quadrocellata	Ocellated flounder	0.14	0.10	0.0000
Callinectes ornatus	Shelligs	0.29	0.05	0.0000
Ariidae	Sea catfish	0.14	0.09	0.0000
Eucinostomus sp.	Mojarra	0.14	0.08	0.0000
Hepatus epheliticus	Calico box crab	0.14	0.07	0.0000
Persephona sp.	Purse crab	0.14	0.07	0.0000

Squilla sp.	Mantis shrimp	0.14	0.06	0.0000
Poecilia latipinna	Sailfin molly	0.14	0.05	0.0000
Chilomycterus schoepfi	Striped burrfish	0.14	0.05	0.0000
Gobiosoma robustum	Code goby	0.29	0.01	0.0000
Hermit crab	Hermit crab	0.14	0.01	0.0000
Gobiosoma bosc	Naked goby	0.14	0.01	0.0000
Limulus polyphemus	Horseshoe crab	0.14	0.00	0.0000
Terebra sp.	Auger snail	0.14	0.00	0.0000
Petrolisthes galathinus	Banded porcelain crab	0.14	0.00	0.0000

Table 3. Seasonal distribution of occurrence, abundance, and wet weight by number and percent of items in the stomach contents of red drum (*Sciaenops ocellatus*) from the Everglades National Park, Florida Bay.

Scientific Name	Common Name	Spring						Summer						Fall						Winter					
		Occurrence		Abundance		Wet Weight		Occurrence		Abundance		Wet Weight		Occurrence		Abundance		Wet Weight		Occurrence		Abundance		Wet Weight	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Alpheus heterochaelis	Bigclaw snapping shrimp	16.00	6.48	29.00	6.68	26.85	3.15	14.00	7.07	25.00	9.33	9.20	2.55	10.00	7.94	53.00	20.54	30.80	5.17	12.00	8.22	21.00	8.24	20.90	3.04
Alpheus sp.	Snapping shrimp	19.00	7.69	31.00	7.14	11.30	1.33	4.00	2.02	5.00	1.87	1.50	0.42	3.00	2.38	3.00	1.16	3.70	0.62	1.00	0.68	1.00	0.39	0.30	0.04
Ancylopsetta quadrocellata	Ocellated flounder	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.37	3.20	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ariidae sp.	Sea catfish	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	0.41
Aspidochirotid sp.	Sea cucumber	5.00	2.02	8.00	1.84	28.30	3.32	3.00	1.52	3.00	1.12	11.30	3.14	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.68	1.00	0.39	2.40	0.35
Bivalvia	Bilvalve	6.00	2.43	6.00	1.38	0.60	0.07	5.00	2.53	7.00	2.61	0.40	0.11	3.00	2.38	3.00	1.16	0.20	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Calamus arctifrons	Grass porgy	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.37	19.50	5.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Callinectes ornatus	Shelligs	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.01	2.00	0.75	1.50	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Callinectes sapidus	Blue crab	22.00	8.91	31.00	7.14	121.80	14.29	16.00	8.08	16.00	5.97	54.10	15.02	7.00	5.56	9.00	3.49	5.50	0.92	19.00	13.01	35.00	13.73	146.55	21.31
Callinectes sp.	Crab	1.00	0.40	2.00	0.46	4.90	0.57	2.00	1.01	1.00	0.37	0.60	0.17	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.68	2.00	0.78	0.00	0.00
Chilomycterus schoepfi	Striped burrfish	1.00	0.40	1.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clupeidae	Herring	1.00	0.40	1.00	0.23	15.40	1.81	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	0.00	0.00	0.00	0.00	0.00
Cyprinodon variegatus	Sheepshead minnow	0.00	0.00	0.00	0.00	0.00	0.00	4.00	2.02	4.00	1.49	8.80	2.44	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.68	4.00	1.57	2.20	0.32
Decapoda	Crustacean	16.00	6.48	16.00	3.69	44.60	5.23	3.00	1.52	3.00	1.12	1.30	0.36	3.00	2.38	4.00	1.55	0.30	0.05	5.00	3.42	5.00	1.96	39.50	5.74
Dormitator maculatus	Fat sleeper	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	0.00	0.00	0.00	0.00	0.00	1.00	0.68	4.00	1.57	8.20	1.19
Eel	Eel	1.00	0.40	1.00	0.23	1.50	0.18	1.00	0.51	1.00	0.37	2.00	0.56	4.00	3.17	0.00	0.00	0.00	0.00	0.00	0.00	5.00	1.96	10.40	1.51
Eucinostomus sp.	Mojarra	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.42	0.00	0.00	0.00	0.00	0.00	0.00
Eurypanopeus abbreviatus	Lobate mud crab	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	0.00	0.00	0.00	0.00	0.00	1.00	0.68	1.00	0.39	6.20	0.90
Eurypanopeus depressus	Flatback mud crab	14.00	5.67	27.00	6.22	22.50	2.64	8.00	4.04	17.00	6.34	9.90	2.75	4.00	3.17	10.00	3.88	9.90	1.66	2.00	1.37	4.00	1.57	17.70	2.57
Eurypanopeus sp.	Mud crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	2.00	0.75	2.20	0.61	2.00	1.59	2.00	0.78	3.10	0.52	0.00	0.00	0.00	0.00	0.00	0.00
Gastropoda	Snail	6.00	2.43	6.00	1.38	1.30	0.15	2.00	1.01	2.00	0.75	0.20	0.06	0.00	0.00	0.00	0.00	0.00	0.00	5.00	3.42	7.00	2.75	2.30	0.33
Gobiidae	Goby	1.00	0.40	1.00	0.23	0.40	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.37	3.00	1.18	1.90	0.28
Gobiosoma bosc	Naked goby	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	0.00	0.00	0.00	0.00	0.00	1.00	0.68	1.00	0.39	0.20	0.03
Gobiosoma robustum	Code goby	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.37	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.68	1.00	0.39	0.10	0.01
Gobiosoma sp.	Goby	4.00	1.62	11.00	2.53	6.25	0.73	2.00	1.01	2.00	0.75	0.70	0.19	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.68	1.00	0.39	3.50	0.51
Halodule wrightii	Shoal grass	12.00	4.86	13.00	3.00	6.90	0.81	8.00	4.04	8.00	2.99	2.80	0.78	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.37	2.00	0.78	0.30	0.04
Harengula jaguana	Scaled sardine	0.00	0.00	0.00	0.00	13.30	1.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.68	1.00	0.39	0.00	0.00
Harengula sp.	Herring	0.00	0.00	0.00	0.00	34.90	4.09	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.79	2.00	0.78	0.00	0.00	1.00	0.68	1.00	0.39	0.00	0.00
Hepatus epheliticus	Calico box crab	1.00	0.40	1.00	0.23	2.20	0.26	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	0.00	0.00	0.00	0.00	0.00
Hermit crab	Hermit crab	1.00	0.40	1.00	0.23	0.40	0.05	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	0.00	0.00	0.00	0.00	0.00
Holothurian	Sea cucumber	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	3.00	1.12	6.80	1.89	2.00	1.59	1.00	0.39	6.00	1.01	0.00	0.00	0.00	0.00	0.00	0.00
Lagodon rhomboides	Pinfish	1.00	0.40	1.00	0.23	16.90	1.98	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	0.00	0.00	0.00	0.00	0.00
Libinia dubia	Longnose spider crab	2.00	0.81	3.00	0.69	0.00	0.00	1.00	0.51	1.00	0.37	16.60	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Limulus polyphemus	Horseshoe crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.37	0.10	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Majidae	Spider crab	1.00	0.40	1.00	0.23	0.60	0.07	1.00	0.51	1.00	0.37	0.00	0.00	3.00	2.38	3.00	1.16	0.15	0.03	1.00	0.68	1.00	0.39	2.90	0.42
Menippe nodifrons	Cuban stone crab	1.00	0.40	1.00	0.23	10.50	1.23	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	0.00	0.00	0.00	0.00	0.00
Neopanope packardii	Florida grassflat crab	1.00	0.40	1.00	0.23	5.70	0.67	0.00	0.00	0.00	0.00	1.70	0.47	1.00	0.79	3.00	1.16	0.00	0.00	1.00	0.68	1.00	0.39	0.00	0.00
Ophichthidae	Snake eel	0.00	0.00	0.00	0.00	0.00	0.00	3.00	1.52	3.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	10.80	1.81	0.00	0.00	0.00	0.00	0.00	0.00

Opisthonema oglinum	Atlantic thread herring	0.00	0.00	0.00	0.00	34.60	4.06	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.79	7.00	2.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Opsanus beta	Gulf toadfish	13.00	5.26	23.00	5.30	85.90	10.08	3.00	1.52	3.00	1.12	30.40	8.44	3.00	2.38	3.00	1.16	171.60	28.83	6.00	4.11	15.00	5.88	71.10	10.34
Osteichthyes	Bony fish	18.00	7.29	32.00	7.37	55.50	6.51	19.00	9.60	22.00	8.21	16.50	4.58	11.00	8.73	22.00	8.53	74.30	12.48	26.00	17.81	31.00	12.16	61.80	8.99
Panopeus occidentalis	Furrowed mud crab	1.00	0.40	1.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	6.70	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panopeus simpsoni	Oystershell mud crab	1.00	0.40	1.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	5.50	1.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panopeus sp.	Mud crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	7.14	18.00	6.98	21.60	3.63	0.00	0.00	2.00	0.78	8.60	1.25
Farfantepenaeus duorarum	Pink shrimp	32.00	12.96	110.00	25.35	174.35	20.46	40.00	20.20	69.00	25.75	97.20	26.99	18.00	14.29	41.00	15.89	149.10	25.05	25.00	17.12	60.00	23.53	197.30	28.69
Penaeus sp.	Penaeid shrimp	7.00	2.83	9.00	2.07	20.00	2.35	24.00	12.12	32.00	11.94	29.90	8.30	17.00	13.49	23.00	8.91	31.90	5.36	7.00	4.79	8.00	3.14	9.50	1.38
Persephona sp.	Purse crab	1.00	0.40	1.00	0.23	2.10	0.25	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	0.00	0.00	0.00	0.00	0.00
Petrolisthes galatinus	Barred porcelain crab	1.00	0.40	1.00	0.23	0.01	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	0.00	0.00	0.00	0.00	0.00	0.00
Poecilia latipinna	Sailfin molly	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Polycheata	Polycheate worm	1.00	0.40	2.00	0.46	19.90	2.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.68	2.00	0.78	1.70	0.25
Portunidae	Swimming crab	4.00	1.62	4.00	0.92	3.40	0.40	1.00	0.51	1.00	0.37	0.50	0.14	2.00	1.59	2.00	0.78	7.00	1.18	3.00	2.05	3.00	1.18	12.10	1.76
Portunus gibbesii	Iridescent swimming crab	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	0.00	0.00	0.00	0.00	0.00	1.00	0.68	1.00	0.39	3.70	0.54
Portunus sp.	Swimming crab	8.00	3.24	16.00	3.69	12.50	1.47	6.00	3.03	10.00	3.73	6.60	1.83	1.00	0.79	4.00	1.55	2.80	0.47	0.00	0.00	0.00	0.00	0.00	0.00
Squilla sp.	Mantis shrimp	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	0.00	0.00	0.00	0.00	0.00	1.00	0.68	1.00	0.39	1.80	0.26
Sygnathus sp.	Pipefish	3.00	1.21	6.00	1.38	1.20	0.14	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	0.00	0.00	0.00	0.00	0.00
Terebra sp.	Auger snail	1.00	0.40	1.00	0.23	0.10	0.01	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	0.00	0.00	0.00	0.00	0.00
Thalassia testudinum	Turtle grass	3.00	1.21	4.00	0.92	2.70	0.32	9.00	4.55	9.00	3.36	5.10	1.42	1.00	0.79	1.00	0.39	2.80	0.47	3.00	2.05	3.00	1.18	1.30	0.19
Uca sp.	Fiddler crab	3.00	1.21	4.00	0.92	0.70	0.08	0.00	0.00	0.00	0.00	0.00	0.00	3.00	2.38	4.00	1.55	3.50	0.59	2.00	1.37	4.00	1.57	2.02	0.29
Xanthidae	Mud crab	15.00	6.07	24.00	5.53	61.50	7.22	9.00	4.55	10.00	3.73	5.80	1.61	17.00	13.49	40.00	15.50	57.75	9.70	11.00	7.53	23.00	9.02	48.40	7.04
SUM		245.00	99.19	432.00	99.54	851.56	99.92	198.00	100.00	268.00	100.00	360.20	100.00	126.00	100.00	258.00	100.00	595.30	100.00	146.00	100.00	255.00	100.00	687.67	100.00
Debris and detritus	(e.g., wood, leaves)	9.00		13.00		4		8.00		2.00		2.1		1.00		3.00		1.2		3.00		3.00		2.6	
Lures and bait		1.00		2.00		28.4		0.00		0.00		0		1.00		1.00		18.7		1.00		1.00		1.9	
empty stomachs		7.00		7		7		33.00		33		33		27.00		27		27		8.00		8		8	

Table 4. Index of preponderance (Ip) determined seasonally for items in the stomach contents of red drum (*Sciaenops ocellatus*) from the Everglades National Park, Florida Bay.

Scientific Name	Common Name	Spring	Summer	Fall	Winter
Alpheus heterochaelis	Bigclaw snapping shrimp	0.0316	0.0202	0.0498	0.0230
Alpheus sp.	Snapping shrimp	0.0158	0.0009	0.0018	0.0000
Ancylopsetta quadrocellata	Ocellated flounder	0.0000	0.0005	0.0000	0.0000
Ariidae sp.	Sea catfish	0.0000	0.0000	0.0000	0.0000
Aspidochirotid sp.	Sea cucumber	0.0104	0.0053	0.0000	0.0002
Bivalvia	Bilvalve	0.0003	0.0003	0.0001	0.0000
Calamus arctifrons	Grass porgy	0.0000	0.0031	0.0000	0.0000
Callinectes ornatus	Shelligs	0.0000	0.0005	0.0000	0.0000
Callinectes sapidus	Blue crab	0.1973	0.1356	0.0062	0.2548
Callinectes sp.	Crab	0.0004	0.0002	0.0000	0.0000
Chilomycterus schoepfi	Striped burrfish	0.0000	0.0000	0.0000	0.0000
Clupeidae	Herring	0.0011	0.0000	0.0000	0.0000
Cyprinodon variegatus	Sheepshead minnow	0.0000	0.0055	0.0000	0.0002
Decapoda	Crustacean	0.0526	0.0006	0.0001	0.0181
Dormitator maculatus	Fat sleeper	0.0000	0.0000	0.0000	0.0008
Eel	Eel	0.0001	0.0003	0.0000	0.0000
Eucinostomus sp.	Mojarra	0.0000	0.0000	0.0000	0.0000
Eurypanopeus abbreviatus	Lobate mud crab	0.0000	0.0000	0.0000	0.0006
Eurypanopeus depressus	Flatback mud crab	0.0232	0.0124	0.0064	0.0032
Eurypanopeus sp.	Mud crab	0.0000	0.0003	0.0010	0.0000
Gastropoda	Snail	0.0006	0.0001	0.0000	0.0011
Gobiidae	Goby	0.0000	0.0000	0.0000	0.0003
Gobiosoma bosc	Naked goby	0.0000	0.0000	0.0000	0.0000
Gobiosoma robustum	Code goby	0.0000	0.0000	0.0000	0.0000
Gobiosoma sp.	Goby	0.0018	0.0002	0.0000	0.0003
Halodule wrightii	Shoal grass	0.0061	0.0035	0.0000	0.0001
Harengula jaguana	Scaled sardine	0.0000	0.0000	0.0000	0.0000
Harengula sp.	Herring	0.0000	0.0000	0.0000	0.0000
Hepatus epheliticus	Calico box crab	0.0002	0.0000	0.0000	0.0000
Hermit crab	Hermit crab	0.0000	0.0000	0.0000	0.0000
Holothurian	Sea cucumber	0.0000	0.0011	0.0019	0.0000
Lagodon rhomboides	Pinfish	0.0012	0.0000	0.0000	0.0000
Libinia dubia	Longnose spider crab	0.0000	0.0026	0.0000	0.0000
Limulus polyphemus	Horseshoe crab	0.0000	0.0000	0.0000	0.0000
Majidae	Spider crab	0.0000	0.0000	0.0001	0.0003
Menippe nodifrons	Cuban stone crab	0.0008	0.0000	0.0000	0.0000
Neopanope packardii	Florida grassflat crab	0.0004	0.0000	0.0000	0.0000
Ophichthidae	Snake eel	0.0000	0.0000	0.0000	0.0000
Opisthonema oglinum	Atlantic thread herring	0.0000	0.0000	0.0000	0.0000
Opsanus beta	Gulf toadfish	0.0822	0.0143	0.0833	0.0390
Osteichthyes	Bony fish	0.0736	0.0491	0.1322	0.1471
Panopeus occidentalis	Furrowed mud crab	0.0000	0.0000	0.0000	0.0000
Panopeus simpsoni	Oystershell mud crab	0.0000	0.0000	0.0000	0.0000
Panopeus sp.	Mud crab	0.0000	0.0000	0.0314	0.0000
Farfantepenaeus duorarum	Pink shrimp	0.4109	0.6092	0.4341	0.4514
Penaeus sp.	Penaeid shrimp	0.0103	0.1124	0.0877	0.0061
Persephona sp.	Purse crab	0.0002	0.0000	0.0000	0.0000
Petrolisthes galatinus	Barred porcelain crab	0.0000	0.0000	0.0000	0.0000
Poecilia latipinna	Sailfin molly	0.0000	0.0000	0.0000	0.0002
Polycheata	Polycheate worm	0.0015	0.0000	0.0000	0.0000

Portunidae	Swimming crab	0.0010	0.0001	0.0023	0.0033
Portunus gibbesii	Iridescent swimming crab	0.0000	0.0000	0.0000	0.0003
Portunus sp.	Swimming crab	0.0074	0.0062	0.0005	0.0000
Squilla sp.	Mantis shrimp	0.0000	0.0000	0.0000	0.0002
Sygnathus sp.	Pipefish	0.0003	0.0000	0.0000	0.0000
Terebra sp.	Auger snail	0.0000	0.0000	0.0000	0.0000
Thalassia testudinum	Turtle grass	0.0006	0.0072	0.0005	0.0004
Uca sp.	Fiddler crab	0.0002	0.0000	0.0017	0.0004
Xanthidae	Mud crab	0.0679	0.0082	0.1588	0.0487

Table 5. Top ten taxonomic categories in the diet of red drum (*Sciaenops ocellatus*) caught in the Everglades National Park, Florida Bay. Rank determined seasonally and given in descending order of preponderance. Items marked with an asterisk are common to all seasons.

Spring	Summer	Fall	Winter
*Farfantepenaeus duorarum**	*Farfantepenaeus duorarum*	*Farfantepenaeus duorarum*	*Farfantepenaeus duorarum*
*Callinectes sapidus**	*Callinectes sapidus*	Xanthidae	*Callinectes sapidus*
*Opsanus beta**	*Penaeus sp.*	Osteichthyes	Osteichthyes
Osteichthyes*	Osteichthyes	*Penaeus sp.*	Xanthidae
Xanthidae*	*Alpheus heterochaelis*	*Opsanus beta*	*Opsanus beta*
Decapoda	*Opsanus beta*	*Alpheus heterochaelis*	*Alpheus heterochaelis*
*Alpheus heterochaelis**	*Eurypanopeus depressus*	*Panopeus sp.*	Decapoda
*Eurypanopeus depressus**	Xanthidae	*Eurypanopeus depressus*	*Penaeus sp.*
Alpheus sp.	*Thalassia testudinum*	*Callinectes sapidus*	Portunidae
Aspidochirotid sp.	*Portunus sp.*	Portunidae	*Eurypanopeus depressus*

Table 6. Regional determination of number and percent occurrence, abundance, and wet weights of red drum dietary items

Scientific Name	Common Name	Area 1W						Area 3W						Area 4					
		Occurrence		Abundance		Wet Weight		Occurrence		Abundance		Wet Weight		Occurrence		Abundance		Wet Weight	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Alpheus heterochaelis	Bigclaw snapping shrimp	16.00	6.93	27.00	7.40	18.00	2.28	8.00	3.00	13.00	2.97	10.15	0.99	28.00	14.21	88.00	23.66	59.60	9.47
Alpheus sp.	Snapping shrimp	10.00	4.33	15.00	4.11	6.90	0.87	6.00	2.25	10.00	2.28	2.70	0.26	11.00	5.58	15.00	4.03	7.20	1.14
Ancylopsetta quadrocellata	Ocellated flounder	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	0.00	0.00	0.00	0.00	0.00
Ariidae sp.	Sea catfish	1.00	0.43	1.00	0.27	2.80	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aspidochirotid sp.	Sea cucumber	3.00	1.30	3.00	0.82	10.60	1.34	5.00	1.87	7.00	1.60	23.20	2.25	1.00	0.51	2.00	0.54	8.20	1.30
Bivalvia	Bilvalve	3.00	1.30	3.00	0.82	0.20	0.03	5.00	1.87	6.00	1.37	1.00	0.10	6.00	3.05	7.00	1.88	0.70	0.11
Calamus arctifrons	Grass porgy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.27	19.50	3.10
Callinectes ornatus	Shelligs	1.00	0.43	1.00	0.27	1.30	0.16	1.00	0.37	1.00	0.23	0.20	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Callinectes sapidus	Blue crab	20.00	8.66	22.00	6.03	123.50	15.65	36.00	13.48	58.00	13.24	171.75	16.68	5.00	2.54	6.00	1.61	17.40	2.76
Callinectes sp.	Crab	1.00	0.43	1.00	0.27	0.60	0.08	3.00	1.12	4.00	0.91	4.90	0.48	0.00	0.00	0.00	0.00	0.00	0.00
Chilomycterus schoepfi	Striped burrfish	1.00	0.43	1.00	0.27	1.50	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clupeidae	Herring	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.37	1.00	0.23	15.40	1.50	0.00	0.00	0.00	0.00	0.00	0.00
Cyprinodon variegatus	Sheepshead minnow	3.00	1.30	6.00	1.64	4.00	0.51	1.00	0.37	1.00	0.23	4.90	0.48	0.00	0.00	0.00	0.00	0.00	0.00
Decapoda	Decapod crustacean	11.00	4.76	11.00	3.01	0.00	0.00	10.00	3.75	11.00	2.51	0.00	0.00	5.00	2.54	6.00	1.61	8.20	1.30
Dormitator maculatus	Fat sleeper	0.00	0.00	0.00	0.00	32.80	4.16	0.00	0.00	0.00	0.00	52.00	5.05	1.00	0.51	4.00	1.08	0.90	0.14
Eel	Eel	1.00	0.43	2.00	0.55	1.90	0.24	4.00	1.50	5.00	1.14	5.50	0.53	0.00	0.00	0.00	0.00	0.00	0.00
Eucinostomus sp.	Mojarra	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.37	1.00	0.23	2.50	0.24	0.00	0.00	0.00	0.00	0.00	0.00
Eurypanopeus abbreviatus	Lobate mud crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.27	6.20	0.98
Eurypanopeus depressus	Flatback mud crab	7.00	3.03	10.00	2.74	15.00	1.90	6.00	2.25	9.00	2.05	14.80	1.44	13.00	6.60	37.00	9.95	28.30	4.50
Eurypanopeus sp.	Mud crab	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.75	3.00	0.68	5.30	0.51	1.00	0.51	1.00	0.27	0.00	0.00
Gastropoda	Snail	6.00	2.60	8.00	2.19	2.50	0.32	4.00	1.50	4.00	0.91	1.00	0.10	3.00	1.52	3.00	0.81	0.30	0.05
Gobidae	Goby	0.00	0.00	0.00	0.00	0.00	0.00	4.00	1.50	1.00	0.23	1.50	0.15	4.00	2.03	3.00	0.81	0.80	0.13
Gobiosoma bosc	Naked goby	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.27	0.20	0.03
Gobiosoma robustum	Code goby	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.02	2.00	0.54	0.20	0.03
Gobiosoma sp.	Goby	1.00	0.43	2.00	0.55	0.40	0.05	0.00	0.00	9.00	2.05	5.85	0.57	1.00	0.51	3.00	0.81	4.20	0.67
Halodule wrightii	Shoal grass	12.00	5.19	12.00	3.29	2.75	0.35	8.00	3.00	9.00	2.05	6.05	0.59	1.00	0.51	1.00	0.27	1.10	0.17
Harengula jaguana	Scaled sardine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.27	13.30	2.11
Harengula sp.	Herring	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.37	1.00	0.23	20.10	1.95	1.00	0.51	2.00	0.54	14.80	2.35
Hepatus epheliticus	Calico box crab	1.00	0.43	1.00	0.27	2.20	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hermit crab	Hermit crab	1.00	0.43	1.00	0.27	0.40	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Holothurian	Sea cucumber	3.00	1.30	4.00	1.10	12.80	1.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Lagodon rhomboides	Pinfish	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.37	1.00	0.23	16.90	1.64	0.00	0.00	0.00	0.00	0.00	0.00
Libinia dubia	Longnose spider crab	2.00	0.87	2.00	0.55	5.80	0.74	1.00	0.37	2.00	0.46	10.80	1.05	0.00	0.00	0.00	0.00	0.00	0.00
Limulus polyphemus	Horseshoe crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.37	1.00	0.23	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Majidae	Spider crab	1.00	0.43	1.00	0.27	0.60	0.08	3.00	1.12	3.00	0.68	2.90	0.28	2.00	1.02	2.00	0.54	0.15	0.02
Menippe nodifrons	Cuban stone crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.27	10.50	1.67
Neopanope packardii	Florida grassflat crab	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.75	4.00	0.91	7.30	0.71	1.00	0.51	1.00	0.27	0.10	0.02
Ophichthidae	Snake eel	1.00	0.43	1.00	0.27	4.60	0.58	2.00	0.75	2.00	0.46	6.20	0.60	0.00	0.00	0.00	0.00	0.00	0.00
Opisthonema oglinum	Atlantic thread herring	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	7.00	1.88	34.60	5.50
Opsanus beta	Gulf toadfish	8.00	3.46	9.00	2.47	47.30	5.99	7.00	2.62	10.00	2.28	226.50	21.99	10.00	5.08	25.00	6.72	87.60	13.92
Osteichthyes	Bony fish	18.00	7.79	26.00	7.12	69.00	8.74	29.00	10.86	37.00	8.45	62.60	6.08	26.00	13.20	44.00	11.83	73.20	11.63
Panopeus occidentalis	Furrowed mud crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.37	1.00	0.23	6.70	0.65	0.00	0.00	0.00	0.00	0.00	0.00
Panopeus simpsoni	Oystershell mud crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.37	1.00	0.23	5.50	0.53	0.00	0.00	0.00	0.00	0.00	0.00
Panopeus sp.	Mud crab	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.75	8.00	1.83	15.20	1.48	7.00	3.55	12.00	3.23	15.00	2.38
Penaeus duorarum	Pink shrimp	45.00	19.48	117.00	32.05	316.60	40.12	48.00	17.98	129.00	29.45	187.65	18.22	20.00	10.15	31.00	8.33	110.30	17.52
Penaeus sp.	Penaeid shrimp	19.00	8.23	24.00	6.58	40.20	5.09	22.00	8.24	28.00	6.39	27.40	2.66	13.00	6.60	17.00	4.57	23.30	3.70
Persephona sp.	Purse crab	1.00	0.43	1.00	0.27	2.10	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petrolisthes galatinus	Barred porcelain crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.27	0.01	0.00
Poecilia latipinna	Sailfin molly	1.00	0.43	2.00	0.55	1.70	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Polycheata	Polycheate worm	1.00	0.43	2.00	0.55	19.90	2.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portunidae	Swimming crab	4.00	1.73	4.00	1.10	6.10	0.77	4.00	1.50	4.00	0.91	15.20	1.48	2.00	1.02	2.00	0.54	1.70	0.27
Portunus gibbesii	Iridescent swimming crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.37	1.00	0.23	3.70	0.36	0.00	0.00	0.00	0.00	0.00	0.00
Portunussp.	Swimming crab	7.00	3.03	17.00	4.66	12.40	1.57	4.00	1.50	5.00	1.14	2.10	0.20	2.00	1.02	2.00	0.54	2.50	0.40
Squilla sp.	Mantis shrimp	1.00	0.43	1.00	0.27	1.80	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sygnatus sp.	Pipefish	2.00	0.87	5.00	1.37	0.60	0.08	1.00	0.37	1.00	0.23	0.60	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Terebra sp.	Auger snail	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.51	1.00	0.27	0.10	0.02
Thalassia testudinum	Turtle grass	11.00	4.76	12.00	3.29	11.00	1.39	3.00	1.12	3.00	0.68	0.60	0.06	1.00	0.51	1.00	0.27	0.20	0.03
Uca sp.	Fiddler crab	0.00	0.00	0.00	0.00	0.00	0.00	5.00	1.87	8.00	1.83	3.12	0.30	3.00	1.52	4.00	1.08	3.10	0.49
Xanthidae	Mud crab	7.00	3.03	10.00	2.74	9.20	1.17	23.00	8.61	35.00	7.99	80.10	7.78	19.00	9.64	37.00	9.95	76.05	12.08
Sum		231.00	100.00	365.00	100.00	789.05	100.00	267.00	100.00	438.00	100.00	1029.97	100.00	197.00	100.00	372.00	100.00	629.51	100.00
empty stomachs		32.00		32.00		32.00		24.00		23.00		23.00		15.00		15.00		15.00	
Debris and detritus	**wood, leaves, algae, etc.**			3.00		0.50				5.00		5.50				5.00		5.30	
Lures and bait		0.00		0.00		0.00		1.00		1.00		1.90		2.00		3.00		47.10	

Table 7. Index of preponderance (Ip) determined regionally for items in the stomach contents of red drum (*Sciaenops ocellatus*) from the Everglades National Park, Florida Bay.

Scientific Name	Common Name	area 1W	area 3W	area 4
Alpheus heterochaelis	Bigclaw snapping shrimp	0.0144	0.0037	0.1809
Alpheus sp.	Snapping shrimp	0.0034	0.0007	0.0086
Ancylopsetta quadrocellata	Ocellated flounder	0.0000	0.0000	0.0000
Ariidae sp.	Sea catfish	0.0001	0.0000	0.0000
Aspidochirotid sp.	Sea cucumber	0.0016	0.0053	0.0009
Bivalvia	Bilvalve	0.0000	0.0002	0.0005
Calamus arctifrons	Grass porgy	0.0000	0.0000	0.0021
Callinectes ornatus	Shelligs	0.0001	0.0000	0.0000
Callinectes sapidus	Blue crab	0.1232	0.2851	0.0094
Callinectes sp.	Crab	0.0000	0.0007	0.0000
Chilomycterus schoepfi	Striped burrfish	0.0001	0.0000	0.0000
Clupeidae	Herring	0.0000	0.0007	0.0000
Cyprinodon variegatus	Sheepshead minnow	0.0006	0.0002	0.0000
Decapoda	Decapod crustacean	0.0000	0.0000	0.0044
Dormitator maculatus	Fat sleeper	0.0000	0.0000	0.0001
Eel	Eel	0.0001	0.0010	0.0000
Eucinostomus sp.	Mojarra	0.0000	0.0001	0.0000
Eurypanopeus abbreviatus	Lobate mud crab	0.0000	0.0000	0.0007
Eurypanopeus depressus	Flatback mud crab	0.0052	0.0041	0.0399
Eurypanopeus sp.	Mud crab	0.0000	0.0005	0.0000
Gastropoda	Snail	0.0007	0.0002	0.0001
Gobiidae	Goby	0.0000	0.0003	0.0003
Gobiosoma bosc	Naked goby	0.0000	0.0000	0.0000
Gobiosoma robustum	Code goby	0.0000	0.0000	0.0000
Gobiosoma sp.	Goby	0.0000	0.0000	0.0005
Halodule wrightii	Shoal grass	0.0016	0.0022	0.0001
Harengula jaguana	Scaled sardine	0.0000	0.0000	0.0014
Harengula sp.	Herring	0.0000	0.0009	0.0016
Hepatus epheliticus	Calico box crab	0.0001	0.0000	0.0000
Hermit crab	Hermit crab	0.0000	0.0000	0.0000
Holothurian	Sea cucumber	0.0019	0.0000	0.0000
Lagodon rhomboides	Pinfish	0.0000	0.0008	0.0000
Libinia dubia	Longnose spider crab	0.0006	0.0005	0.0000
Limulus polyphemus	Horseshoe crab	0.0000	0.0000	0.0000
Majidae	Spider crab	0.0000	0.0004	0.0000
Menippe nodifrons	Cuban stone crab	0.0000	0.0000	0.0011
Neopanope packardii	Florida grassflat crab	0.0000	0.0007	0.0000
Ophichthidae	Snake eel	0.0002	0.0006	0.0000
Opisthonema oglinum	Atlantic thread herring	0.0000	0.0000	0.0038
Opsanus beta	Gulf toadfish	0.0189	0.0731	0.0950
Osteichthyes	Bony fish	0.0620	0.0837	0.2064
Panopeus occidentalis	Furrowed mud crab	0.0000	0.0003	0.0000
Panopeus simpsoni	Oystershell mud crab	0.0000	0.0003	0.0000
Panopeus sp.	Mud crab	0.0000	0.0014	0.0114
Farfanteenaeus duorarum	Pink shrimp	0.7107	0.4153	0.2392
Penaeus sp.	Penaeid shrimp	0.0381	0.0278	0.0328
Persephona sp.	Purse crab	0.0001	0.0000	0.0000
Petrolisthes galatinus	Barred porcelain crab	0.0000	0.0000	0.0000

Poecilia latipinna	Sailfin molly	0.0001	0.0000	0.0000
Polycheata	Polycheate worm	0.0010	0.0000	0.0000
Portunidae	Swimming crab	0.0012	0.0028	0.0004
Portunus gibbesii	Iridescent swimming crab	0.0000	0.0002	0.0000
Portunus sp.	Swimming crab	0.0043	0.0004	0.0005
Squilla sp.	Mantis shrimp	0.0001	0.0000	0.0000
Sygnathus sp.	Pipefish	0.0001	0.0000	0.0000
Terebra sp.	Auger snail	0.0000	0.0000	0.0000
Thalassia testudinum	Turtle grass	0.0060	0.0001	0.0000
Uca sp.	Fiddler crab	0.0000	0.0007	0.0010
Xanthidae	Mud crab	0.0032	0.0849	0.1567

Table 8. Top ten taxonomic categories in the diet of red drum (*Sciaenops ocellatus*) caught in the Everglades National Park, Florida Bay. Rank determined regionally and given in descending order of preponderance. Items marked with an asterisk are common to all seasons.

Area 1W	Area 3W	Area 4
*Farfantepenaeus duorarum**	*Farfantepenaeus duorarum*	*Farfantepenaeus duorarum*
*Callinectes sapidus**	*Callinectes sapidus*	Osteichthyes
Osteichthyes*	Xanthidae	*Alpheus heterochaelis*
*Penaeus sp.**	Osteichthyes	Xanthidae
*Opsanus beta**	*Opsanus beta*	*Opsanus beta*
*Alpheus heterochaelis**	*Penaeus sp.*	*Eurypanopeus depressus*
Thalassia testudinum	*Aspidochirotid sp.*	*Penaeus sp.*
*Eurypanopeus depressus**	*Eurypanopeus depressus*	*Panopeus sp.*
Portunus sp.	*Alpheus heterochaelis*	*Callinectes sapidus*
Alpheus sp.	Portunidae	*Alpheus sp.*

Table 9. Taxonomic list of the stomach contents of snook (*Centropomus undecimalis*) from the Everglades National Park, Florida Bay. Arranged in descending order based on the frequency of occurrence (=number of stomach containing a given type of item). Total number of stomachs analyzed = 244; total number of stomachs containing food = 115; total number of empty stomachs = 129. N = total number of individuals of a particular taxonomic group. Wt = total weight of individuals

Scientific Name	Common Name	Occurrence	N	Wt. (g)	Mean Wt.
Osteichthyes	Bony fish	56	73	468.5	6.6
Farfantepenaeus duorarum	Pink shrimp	22	38	86.1	2.33
Penaeus sp.	Penaeid shrimp	17	19	12.5	0.66
Callinectes sapidus	Blue crab	5	9	83.7	8.47
Lagodon rhomboides	Pinfish	4	5	210	42
Eucinostomus argenteus	Spotfin mojarra	4	11	66.3	6.19
Thalassia testudinum	Turtle grass	4	4	6.9	1.73
Bivalvia	Bilvalve	4	7	2.9	0.41
Halodule wrightii	Shoal grass	4	4	0.3	0.08
Eucinostomus sp.	Mojarra	3	3	20.3	6.77
Decapoda	Decapod crustaceans	3	3	9.1	3.03
Crassostrea virginica	Oyster shell	3	3	3.8	1.9
Portunidae	Swimming crab	3	3	4.1	1.32
Arius felis	Hardhead catfish	2	2	32.7	16.35
Clupeidae	Herring	2	3	28	9.33
Fundulus grandis	Gulf killifish	2	14	18.1	1.29
Alpheus sp.	Snapping shrimp	2	2	1.8	0.9
Shrimp	Shrimp	2	2	0.6	0.3
Gastropoda	Snail	2	3	0.7	0.23
Mugil cephalus	Striped mullet	1	2	236	118
Sciaenops ocellatus	Red drum	1	1	80.6	80.6
Oligoplites saurus	Leatherjacket	1	1	66.2	66.2
Mugil curema	White mullet	1	1	40.5	40.5
Bagre marinus	Gafftopsail catfish	1	1	12.5	12.5
Callinectes larvatus	Masked swimming crab	1	1	10.7	10.7
Cyprinodontidae	Killifish	1	1	5.5	5.5
Menippe mercenaria	Florida stone crab	1	1	4.9	4.9
Mithrax forceps	Red-ridged clinging crab	1	1	2.1	2.1
Opsanus beta	Gulf toadfish	1	1	1.8	1.8
Syringodium filiforme	Manatee grass	1	1	1.5	1.5
Fundulus sp.	Killifish	1	12	9.6	1.16
Uca minax	Redjointed fiddler crab	1	1	1.1	1.1
Uca sp.	Fiddler crab	1	1	1	1
Alpheus heterochaelis	Bigclaw snapping shrimp	1	2	1.3	0.65
Eurypanopeus depressus	Flatback mud crab	1	1	0.6	0.6
Xanthidae	Mud crab	1	1	0.1	0.1
Inedible items (e.g., leaves, wood)		6	8	5.4	0.68

Table 10. Index of preponderance (I_p) for dietary items found in the stomach contents of snook (*Centropomus undecimalis*) from the Everglades National Park, Florida Bay.

Scientific Name	Common Name	% Occurrence	% Wt.	Ip
Osteichthyes	Bony fish	34.78	30.57	0.8558
Farfantepenaeus duorarum	Pink shrimp	13.66	5.62	0.0618
Lagodon rhomboides	Pinfish	2.48	13.70	0.0274
Callinectes sapidus	Blue crab	3.11	5.46	0.0137
Eucinostomus argenteus	Spotfin mojarra	2.48	4.33	0.0087
Mugil cephalus	Striped mullet	0.62	15.40	0.0077
Penaeus sp.	Penaeid shrimp	10.56	0.82	0.0069
Sciaenops ocellatus	Red drum	0.62	5.26	0.0026
Oligoplites saurus	Leatherjacket	0.62	4.32	0.0022
Arius felis	Hardhead catfish	1.24	2.13	0.0021
Eucinostomus sp.	Mojarra	1.86	1.32	0.0020
Clupeidae	Herring	1.24	1.83	0.0018
Mugil curema	White mullet	0.62	2.64	0.0013
Fundulus grandis	Gulf killifish	1.24	1.18	0.0012
Thalassia testudinum	Turtle grass	2.48	0.45	0.0009
Decapoda	Decapod crustaceans	1.86	0.59	0.0009
Bagre marinus	Gafftopsail catfish	0.62	0.82	0.0004
Portunidae	Swimming crab	1.86	0.27	0.0004
Bivalvia	Bilvalve	2.48	0.19	0.0004
Crassostrea virginica	Oyster shell	1.86	0.25	0.0004
Callinectes larvatus	Masked swimming crab	0.62	0.70	0.0003
Fundulus sp.	Killifish	0.62	0.63	0.0003
Cyprinodontidae	Killifish	0.62	0.36	0.0002
Menippe mercenaria	Florida stone crab	0.62	0.32	0.0002
Alpheus sp.	Snapping shrimp	1.24	0.12	0.0001
Mithrax forceps	Red-ridged clinging crab	0.62	0.14	0.0001
Opsanus beta	Gulf toadfish	0.62	0.12	0.0001
Syringodium filiforme	Manatee grass	0.62	0.10	0.0000
Gastropoda	Snail	1.24	0.05	0.0000
Alpheus heterochaelis	Bigclaw snapping shrimp	0.62	0.08	0.0000
Halodule wrightii	Shoal grass	2.48	0.02	0.0000
Shrimp	Shrimp	1.24	0.04	0.0000
Uca minax	Redjointed fiddler crab	0.62	0.07	0.0000
Uca sp.	Fiddler crab	0.62	0.07	0.0000
Eurypanopeus depressus	Flatback mud crab	0.62	0.04	0.0000
Xanthidae	Mud crab	0.62	0.01	0.0000

Table 11. Seasonal distribution of occurrence, abundance, and wet weight (value and percentages) of items in the stomach contents of snook (*Centropomus undecimalis*) from the Everglades National Park, Florida Bay. Arranged in alphabetical order. Total number of stomachs analyzed = 244; total number of stomachs containing food = 115, total number of empty stomachs = 129.

Scientific Name	Common Name	Spring						Summer						Fall						Winter					
		Occurrence		Abundance		Wet weight		Occurrence		Abundance		Wet weight		Occurrence		Abundance		Wet weight		Occurrence		Abundance		Wet weight	
		Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Alpheus heterochaelis	Bigclaw snapping shrim	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	0.00	0.00	0.00	0.00	0.00	1.00	4.35	2.00	5.41	1.30	0.29
Alpheus sp.	Snapping shrimp	1.00	1.23	0.20	0.04	0.20	0.04	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.13	1.00	1.61	1.60	0.38	0.00	0.00	0.00	0.00	0.00	0.00
Arius felis	Hardhead catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	6.25	2.00	3.23	32.70	7.77	0.00	0.00	0.00	0.00	0.00	0.00
Bagre marinus	Gafftopsail catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.13	1.00	1.61	12.50	2.97	0.00	0.00	0.00	0.00	0.00	0.00
Bivalvia	Bilvalve	3.00	3.70	1.40	0.28	1.40	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	4.35	1.00	2.70	1.50	0.33
Callinectes larvatus	Masked swimming crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.13	1.00	1.61	10.70	2.54	0.00	0.00	0.00	0.00	0.00	0.00
Callinectes sapidus	Blue crab	3.00	3.70	15.40	3.11	15.40	3.11	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.13	2.00	3.23	68.30	16.22	0.00	0.00	0.00	0.00	0.00	0.00
Clupeidae	Herring	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	0.00	0.00	0.00	0.00	0.00	2.00	8.70	3.00	8.11	28.00	6.17
Crassostrea virginica	Oyster shell	3.00	3.70	3.80	0.77	3.80	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	0.00	0.00	0.00	0.00	0.00	0.00
Cyprinodontidae	Killifish	1.00	1.23	5.50	1.11	5.50	1.11	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	0.00	0.00	0.00	0.00	0.00
Decapoda	Decapod crustaceans	3.00	3.70	9.10	1.84	9.10	1.84	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	0.00	0.00	0.00	0.00	0.00
Eucinostomus argenteu	Spotfin mojarra	3.00	3.70	52.40	10.57	52.40	10.57	1.00	5.88	2.00	10.00	13.90	9.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eucinostomus sp.	Mojarra	1.00	1.23	4.60	0.93	4.60	0.93	2.00	11.76	2.00	10.00	15.70	10.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eurypanopeus depressi	Flatback mud crab	1.00	1.23	0.60	0.12	0.60	0.12	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	0.00	0.00	0.00	0.00	0.00
Farfantepenaeus duora	Pink shrimp	15.00	18.52	71.50	14.42	71.50	14.42	1.00	5.88	1.00	5.00	0.70	0.46	3.00	9.38	6.00	9.68	8.30	1.97	3.00	13.04	7.00	18.92	5.60	1.23
Farfantepenaeus sp.	Penaeid shrimp	7.00	8.64	6.50	1.31	6.50	1.31	3.00	17.65	3.00	15.00	0.30	0.20	6.00	18.75	8.00	12.90	5.70	1.35	1.00	4.35	0.00	0.00	0.00	0.00
Fundulus grandis	Gulf killifish	1.00	1.23	6.90	1.39	6.90	1.39	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.13	13.00	20.97	11.20	2.66	0.00	0.00	0.00	0.00	0.00	0.00
Fundulus sp.	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	1.00	3.13	12.00	19.35	9.60	2.28	0.00	0.00	0.00	0.00	0.00	0.00
Gastropoda	Snail	0.00	0.00	0.00	0.00	0.00	0.00	1.00	5.88	1.00	5.00	0.20	0.13	1.00	3.13	2.00	3.23	0.50	0.12	0.00	0.00	0.00	0.00	0.00	0.00
Halodule wrightii	Shoal grass	3.00	3.70	0.30	0.06	0.30	0.06	1.00	5.88	1.00	5.00	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	0.00
Lagodon rhomboides	Pinfish	1.00	1.23	89.30	18.01	89.30	18.01	2.00	11.76	2.00	10.00	84.70	55.54	1.00	3.13	1.00	1.61	36.00	8.55	0.00	0.00	0.00	0.00	0.00	0.00
Menippe mercenaria	Florida stone crab	1.00	1.23	4.90	0.99	4.90	0.99	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	0.00	0.00	0.00	0.00	0.00
Mithrax forceps	Red-ridged clinging cra	1.00	1.23	2.10	0.42	2.10	0.42	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	0.00	0.00	0.00	0.00	0.00
Mugil cephalus	Striped mullet	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	0.00	0.00	0.00	0.00	0.00	1.00	4.35	2.00	5.41	236.00	51.99
Mugil curema	White mullet	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	0.00	0.00	0.00	0.00	0.00	1.00	4.35	1.00	2.70	40.50	8.92
Oligoplites saurus	Leatherjacket	1.00	1.23	66.20	13.35	66.20	13.35	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	0.00	0.00	0.00	0.00	0.00
Opsanus beta	Gulf toadfish	1.00	1.23	1.80	0.36	1.80	0.36	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	0.00	0.00	0.00	0.00	0.00
Osteichthyes	Bony fish	26.00	32.10	148.30	29.91	148.30	29.91	6.00	35.29	8.00	40.00	37.00	24.26	11.00	34.38	11.00	17.74	142.20	33.78	13.00	56.52	21.00	56.76	141.00	31.06
Portunidae	Swimming crab	2.00	2.47	3.00	0.60	3.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.13	1.00	1.61	1.10	0.26	0.00	0.00	0.00	0.00	0.00	0.00
Sciaenops ocellatus	Reddrum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.13	1.00	1.61	80.60	19.14	0.00	0.00	0.00	0.00	0.00	0.00
Shrimp	Shrimp	2.00	2.47	0.60	0.12	0.60	0.12	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	0.00	0.00	0.00	0.00	0.00
Syringodium filiforme	Manatee grass	1.00	1.23	1.50	0.30	1.50	0.30	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	0.00	0.00	0.00	0.00	0.00
Thalassia testudinum	Turtle grass	3.00	3.70	3.40	0.69	3.40	0.69	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.13	1.00	1.61	3.50	0.83	0.00	0.00	0.00	0.00	0.00	0.00
Uca minax	Redjointed fiddler crab	1.00	1.23	1.10	0.22	1.10	0.22	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	0.00	0.00	0.00	0.00	0.00
Uca sp.	Fiddler crab	1.00	1.23	1.00	0.20	1.00	0.20	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	0.00	0.00	0.00	0.00	0.00
Xanthidae	Mud crab	1.00	1.23	0.10	0.02	0.10	0.02	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	0.00	0.00	0.00	0.00	0.00
Sum		81.00	100.00	495.90	100.00	495.90	100.00	17.00	100.00	20.00	100.00	152.50	100.00	32.00	100.00	62.00	100.00	421.00	100.00	23.00	100.00	37.00	100.00	453.90	100.00
empty stomach		57.00		57.00		57.00		21.00		21.00		21.00		43.00		43.00		43.00		8.00		8.00		8.00	
Debris and detritus	(e.g., wood, leaves, alg	3.00		1.90		1.90		1.00		1.00		0.10		1.00		1.00		1.80		1.00		3.00		1.60	
Lures and bait		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 12. Index of preponderance (Ip) determined seasonally for items in the stomach contents of snook (*Centropomus undecimalis*) from the Everglades National Park, Florida Bay.

Scientific Name	Common Name	Spring	Summer	Fall	Winter
Alpheus heterochaelis	Bigclaw snapping shrimp	0.0000	0.0000	0.0000	0.0006
Alpheus sp.	Snapping shrimp	0.0000	0.0000	0.0008	0.0000
Arius felis	Hardhead catfish	0.0000	0.0000	0.0340	0.0000
Bagre marinus	Gafftopsail catfish	0.0000	0.0000	0.0065	0.0000
Bivalvia	Bilvalve shell	0.0008	0.0000	0.0000	0.0007
Callinectes larvatus	Masked swimming crab	0.0000	0.0000	0.0056	0.0000
Callinectes sapidus	Blue crab	0.0085	0.0000	0.0355	0.0000
Clupeidae	Herring	0.0000	0.0000	0.0000	0.0256
Cyprinodontidae	Killifish	0.0010	0.0000	0.0000	0.0000
Decapoda	Decapod crustaceans	0.0050	0.0000	0.0000	0.0000
Eucinostomus argenteus	Spotfin mojarra	0.0290	0.0317	0.0000	0.0000
Eucinostomus sp.	Mojarra	0.0008	0.0716	0.0000	0.0000
Eurypanopeus depressus	Flatback mud crab	0.0001	0.0000	0.0000	0.0000
Fundulus grandis	Gulf killifish	0.0013	0.0000	0.0058	0.0000
Fundulus sp.	Killifish	0.0000	0.0000	0.0050	0.0000
Gastropoda	Snail	0.0000	0.0005	0.0003	0.0000
Halodule wrightii	Shoal grass	0.0002	0.0000	0.0000	0.0000
Lagodon rhomboides	Pinfish	0.0165	0.3863	0.0187	0.0000
Menippe mercenaria	Florida stone crab	0.0009	0.0000	0.0000	0.0000
Mithrax forceps	Red-ridged clinging crab	0.0004	0.0000	0.0000	0.0000
Mugil cephalus	Striped mullet	0.0000	0.0000	0.0000	0.1080
Mugil curema	White mullet	0.0000	0.0000	0.0000	0.0185
Oligoplites saurus	Leatherjacket	0.0122	0.0000	0.0000	0.0000
Opsanus beta	Gulf toadfish	0.0003	0.0000	0.0000	0.0000
Osteichthyes	Bony fish	0.7109	0.5063	0.8129	0.8389
Oyster	Oyster shell	0.0021	0.0000	0.0000	0.0000
Penaeus duorarum	Pink shrimp	0.1977	0.0016	0.0129	0.0077
Penaeus sp.	Penaeid shrimp	0.0084	0.0021	0.0178	0.0000
Portunidae	Swimming crab	0.0011	0.0000	0.0006	0.0000
Sciaenops ocellatus	Reddrum	0.0000	0.0000	0.0419	0.0000
Shrimp	Shrimp	0.0002	0.0000	0.0000	0.0000
Syringodium filiforme	Manatee grass	0.0003	0.0000	0.0000	0.0000
Thalassea testudinum	Turtle grass	0.0019	0.0000	0.0018	0.0000
Uca minax	Redjointed fiddler crab	0.0002	0.0000	0.0000	0.0000
Uca sp.	Fiddler crab	0.0002	0.0000	0.0000	0.0000
Xanthidae	Mud crab	0.0000	0.0000	0.0000	0.0000

Table 13. Top ten taxonomic categories in the diet of snook (*Centropomus undecimalis*) caught in the Everglades National Park, Florida Bay. Rank determined seasonally and given in descending order of preponderance. Items marked with an asterisk are common to all seasons.

Spring	Summer	Fall	Winter
Osteichthyes*	Osteichthyes	Osteichthyes	Osteichthyes
*Farfantepenaeus duorarum**	*Lagodon rhomboides*	*Sciaenops ocellatus*	*Mugil cephalus*
Eucinostomus argenteus	*Eucinostomus sp.*	*Callinectes sapidus*	Clupeidae
Lagodon rhomboides	*Eucinostomus argenteus*	*Arius felis*	*Mugil curema*
Oligoplites saurus	*Penaeus sp.*	*Lagodon rhomboides*	*Farfantepenaeus duorarum*
*Callinectes sapidus**	*Farfantepenaeus duorarum*	*Penaeus sp.*	Bivalvia
Penaeus sp.	Gastropoda	*Farfantepenaeus duorarum*	*Alpheus heterochaelis*
Decapoda	*Oligoplites saurus*	*Bagre marinus*	*Sciaenops ocellatus*
Crassostrea virginica	*Callinectes sapidus*	*Fundulus grandis*	*Callinectes sapidus*
Thalassia testudinum	Decapoda	*Callinectes larvatus*	*Arius felis*

Table 14. Occurrence and percent seasonal occurrence of regional snook dietary items.

Scientific Name	Common Name	Area 1W						Area 3W						Area 4					
		Occurrence		Abundance		Wet Weight		Occurrence		Abundance		Wet Weight		Occurrence		Abundance		Wet Weight	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Alpheus heterochaelis	Bigclaw snapping shrimp	1.00	2.13	2.00	2.67	1.30	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alpheus sp.	Snapping shrimp	1.00	2.13	1.00	1.33	0.20	0.07	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.23	1.00	2.50	1.60	0.53
Arius felis	Hardhead catfish	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	12.60	1.33	1.00	3.23	1.00	2.50	20.10	6.67
Bagre marinus	Gafftopsail catfish	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	12.50	1.32	0.00	0.00	0.00	0.00	0.00	0.00
Bivalvia	Bilvalve	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.66	6.00	4.88	2.30	0.24	1.00	3.23	1.00	2.50	0.60	0.20
Callinectes larvatus	Masked swimming crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.23	1.00	2.50	10.70	3.55
Callinectes sapidus	Blue crab	1.00	2.13	2.00	2.67	3.40	1.21	1.00	1.22	1.00	0.81	0.10	0.01	2.00	6.45	6.00	15.00	80.20	26.62
Clupeidae	Herring	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.44	3.00	2.44	28.00	2.95	0.00	0.00	0.00	0.00	0.00	0.00
Cyprinodontidae	Killifish	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	5.55	0.58	0.00	0.00	0.00	0.00	0.00	0.00
Decapoda	Decapod crustacean	1.00	2.13	1.00	1.33	5.40	1.92	2.00	2.44	2.00	1.63	3.70	0.39	0.00	0.00	0.00	0.00	0.00	0.00
Eucinostomus argenteus	Spotfin mojarra	3.00	6.38	9.00	12.00	52.40	18.64	1.00	1.22	2.00	1.63	13.90	1.46	0.00	0.00	0.00	0.00	0.00	0.00
Eucinostomus sp.	Mojarra	1.00	2.13	1.00	1.33	4.60	1.64	2.00	2.44	2.00	1.63	15.70	1.65	0.00	0.00	0.00	0.00	0.00	0.00
Eurypanopeus depressus	Flatback mud crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	0.60	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Fundulus grandis	Gulf killifish	1.00	2.13	13.00	17.33	11.20	3.99	1.00	1.22	1.00	0.81	6.90	0.73	0.00	0.00	0.00	0.00	0.00	0.00
Fundulus sp.	Killifish	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	12.00	9.76	9.60	1.01	0.00	0.00	0.00	0.00	0.00	0.00
Gastropoda	Snail	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.44	3.00	2.44	0.70	0.07	0.00	0.00	0.00	0.00	0.00	0.00
Halodule wrightii	Shoal grass	1.00	2.13	1.00	1.33	0.05	0.02	3.00	3.66	3.00	2.44	0.25	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Lagodon rhomboides	Pinfish	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.66	4.00	3.25	174.00	18.31	1.00	3.23	1.00	2.50	36.00	11.95
Menippe mercenaria	Florida stone crab	1.00	2.13	1.00	1.33	4.90	1.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mithrax forceps	Red-ridged clinging crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.23	1.00	2.50	2.10	0.70
Mugil cephalus	Striped mullet	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	2.00	1.63	236.00	24.84	0.00	0.00	0.00	0.00	0.00	0.00
Mugil curema	White mullet	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	40.50	4.26	0.00	0.00	0.00	0.00	0.00	0.00
Oligoplites saurus	Leatherjacket	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	66.20	6.97	0.00	0.00	0.00	0.00	0.00	0.00
Opsanus beta	Gulf toadfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.23	1.00	2.50	1.80	0.60
Osteichthyes	Bony fish	13.00	27.66	15.00	20.00	64.80	23.06	32.00	39.02	46.00	37.40	274.60	28.90	11.00	35.48	12.00	30.00	129.10	42.85
Oyster	oyster shell	1.00	2.13	1.00	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	6.45	2.00	5.00	3.80	1.26
Farfantepenaeus duorarum	Pink shrimp	12.00	25.53	17.00	22.67	43.80	15.58	8.00	9.76	15.00	12.20	34.90	3.67	2.00	6.45	6.00	15.00	7.40	2.46
Penaeus sp.	Penaeid shrimp	6.00	12.77	7.00	9.33	4.10	1.46	5.00	6.10	6.00	4.88	1.60	0.17	6.00	19.35	6.00	15.00	6.80	2.26
Portunidae	Swimming crab	1.00	2.13	1.00	1.33	0.20	0.07	1.00	1.22	1.00	0.81	2.80	0.29	1.00	3.23	1.00	2.50	1.10	0.37
Sciaenops ocellatus	Reddrum	1.00	2.13	1.00	1.33	80.60	28.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shrimp	Shrimp	1.00	2.13	1.00	1.33	0.60	0.21	1.00	1.22	1.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Syringodium filiforme	Manatee grass	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	1.50	0.16	0.00	0.00	0.00	0.00	0.00	0.00
Thalassia testudinum	Turtle grass	1.00	2.13	1.00	1.33	3.50	1.25	3.00	3.66	3.00	2.44	3.40	0.36	0.00	0.00	0.00	0.00	0.00	0.00
Uca minax	Redjointed fiddler crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	1.10	0.12	0.00	0.00	0.00	0.00	0.00	0.00
Uca sp.	Fiddler crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	1.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00
Xanthidae	Mud crab	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.22	1.00	0.81	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Sum		47.00	100.00	75.00	100.00	281.05	100.00	82.00	100.00	123.00	100.00	950.10	100.00	31.00	100.00	40.00	100.00	301.30	100.00
empty stomach (2 isl. 3 no area)		28.00		28.00		28.00		64.00		64.00		64.00		32.00		32.00		32.00	
Debris and detritus	wood, leaves, algae, etc.	3.00		3.00		2.00		3.00		5.00		3.40		0.00		0.00		0.00	
Lures and bait		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	

Table 15. Index of preponderance (Ip) of regional snook dietary items.

Scientific Name	Common Name	Ip (area 1W)	Ip (area 3W)	Ip (area 4)
Alpheus heterochaelis	Bigclaw snapping shrimp	0.0008	0.0000	0.0000
Alpheus sp.	Snapping shrimp	0.0001	0.0000	0.0009
Arius felis	Hardhead catfish	0.0000	0.0012	0.0117
Bagre marinus	Gafftopsail catfish	0.0000	0.0012	0.0000
Bivalvia	Bilvalve	0.0000	0.0007	0.0003
Callinectes larvatus	Masked swimming crab	0.0000	0.0000	0.0062
Callinectes sapidus	Blue crab	0.0020	0.0000	0.0934
Clupeidae	Herring	0.0000	0.0055	0.0000
Cyprinodontidae	Killifish	0.0000	0.0005	0.0000
Decapoda	Decapod crustacean	0.0032	0.0007	0.0000
Eucinostomus argenteus	Spotfin mojarra	0.0944	0.0014	0.0000
Eucinostomus sp.	Mojarra	0.0028	0.0031	0.0000
Eurypanopeus depressus	Flatback mud crab	0.0000	0.0001	0.0000
Fundulus grandis	Gulf killifish	0.0067	0.0007	0.0000
Fundulus sp.	Killifish	0.0000	0.0009	0.0000
Gastropoda	Snail	0.0000	0.0001	0.0000
Halodule wrightii	Shoal grass	0.0000	0.0001	0.0000
Lagodon rhomboides	Pinfish	0.0000	0.0516	0.0210
Menippe mercenaria	Florida stone crab	0.0029	0.0000	0.0000
Mithrax forceps	Red-ridged clinging crab	0.0000	0.0000	0.0012
Mugil cephalus	Striped mullet	0.0000	0.0233	0.0000
Mugil curema	White mullet	0.0000	0.0040	0.0000
Oligoplites saurus	Leatherjacket	0.0000	0.0065	0.0000
Opsanus beta	Gulf toadfish	0.0000	0.0000	0.0010
Osteichthyes	Bony fish	0.5057	0.8682	0.8267
Oyster	oyster shell	0.0000	0.0000	0.0044
Penaeus duorarum	Pink shrimp	0.3155	0.0276	0.0086
Penaeus sp.	Penaeid shrimp	0.0148	0.0008	0.0238
Portunidae	Swimming crab	0.0001	0.0003	0.0006
Sciaenops ocellatus	Reddrum	0.0484	0.0000	0.0000
Shrimp	Shrimp	0.0004	0.0000	0.0000
Syringodium filiforme	Manatee grass	0.0000	0.0001	0.0000
Thalassia testudinum	Turtle grass	0.0021	0.0010	0.0000
Uca minax	Redjointed fiddler crab	0.0000	0.0001	0.0000
Uca sp.	Fiddler crab	0.0000	0.0001	0.0000
Xanthidae	Mud crab	0.0000	0.0000	0.0000

Table 16. Top ten items in snook diet determined on a regional basis. Listed in descending order of importance. Items marked with an asterisk are common to all areas.

Area 1W	Area 3W	Area 4
Osteichthyes*	Osteichthyes	Osteichthyes
*Farfantepenaeus duorarum**	*Lagodon rhomboides*	*Callinectes sapidus*
Eucinostomus argenteus	*Farfantepenaeus duorarum*	*Penaeus sp.*
Sciaenops ocellatus	*Mugil cephalus*	*Lagodon rhomboides*
Penaeus sp.	*Oligoplites saurus*	*Arius felis*
Fundulus grandis	Clupeidae	*Farfantepenaeus duorarum*
Decapoda	*Mugil curema*	*Callinectes larvatus*
Menippe mercenaria	*Eucinostomus sp.*	*Crassostrea virginica*
Eucinostomus sp.	*Eucinostomus argenteus*	*Mithrax forceps*
Thalassia testudinum	*Arius felis*	*Opsanus beta*

Table 17. Percent frequency of bait used by fishers.

Snook bait	% Frequency	Red drum bait	% Frequency
Shrimp	27.50	Shrimp	40.84
Artificial lures	30.00	Artificial lures	31.41
Pinfish	17.50	Artificial lure w/ shrimp	16.23
Artificial lures w/ shrimp	6.67	Pilchard	2.36
Mullet	5.83	Pinfish	2.36
Pilchard	5.83	Mullet	2.09
Undefined "bait"	3.33	Ladyfish	0.79
Mullet and Shrimp	2.50	Pilchard and Shrimp	0.79
Pinfish and shrimp	0.83	Pinfish and shrimp	0.79
		Undefined "bait"	0.52
		Herring	0.52
		Mullet and Shrimp	0.52
		mullet or pilchard	0.52
		Crab	0.26