

A Preliminary Study of the Summer Feeding Habits of Juvenile Florida Pompano (*Trachinotus carolinus*) from Open and Protected Beaches of the Northeastern Gulf of Mexico

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ABSTRACT

Relatively little information is available on the feeding habits of the Florida pompano (*Trachinotus carolinus*) from the northeastern Gulf of Mexico. The productive shallow water habitats of coastal barrier islands in this region of the Gulf offer a diverse array of potential prey items for this commercially important fish. During July 2000 the digestive tracts of 78 juvenile pompano were collected from barrier island habitats in Mississippi (Horn, Ship, and Petit Bois Islands), Alabama (Dauphin Island), and West Florida (Santa Rosa Island), preserved, and examined for food items. Comparisons of the prey organisms found were made based on fish size and collection site (e.g. open beaches of the Gulf or the protected beaches of the bay/sound) from the four islands. Of the 78 juvenile pompano examined all but three contained identifiable food items, which represented at least 32 different prey items. Crustaceans, primarily juvenile mole crabs (*Emerita* spp.), were the dominant food items of the juvenile pompano. Mole crabs occurred at all but one of the eight collecting sites. Diet diversity was slightly higher for fish from open beach habitats than for fish from the protected beaches of the bay or sound sides of the islands [Mississippi Sound/ Mobile Bay/ Pensacola Bay]. Fish collected from the protected north sides of the islands fed on more estuarine organisms (e.g., *Neanthes succinea*, *Corophium louisianum*) than those fish examined from open beach Gulf habitats. Our preliminary data indicate that during the summer months, juvenile pompano are opportunistic feeders utilizing the most readily available food resources within the habitats they forage. Juvenile pompano from open beach habitats appear to feed on juveniles of prey species (*Donax* spp., *Emerita* spp.) known from the diet of adults.

KEY WORDS: Juvenile pompano, *Trachinotus carolinus*, feeding, Gulf of Mexico

INTRODUCTION

The Florida pompano, *Trachinotus carolinus* (Linnaeus), a member of the family Carangidae, is a common nearshore species ranging from Cape Cod to northeastern Brazil. Our study was designed to determine and compare the differences in prey selection of juvenile pompano (14 - 94 mm) from open and

protected beaches on four barrier islands in the northeastern Gulf of Mexico.

The Florida pompano, referred to here as "pompano," is an important food and game fish along the coast of the southeastern United States, with Florida having the largest commercial landings (Pattillo, et al. 1997). Most of the previous reports dealing with the biology of pompano has been summarized by Pattillo et al. (1997). Juvenile pompano are reported to be abundant in the surf zone (Gunter 1958, Bellinger and Avault 1971, Benson 1982). Both juveniles and adults are known to exhibit schooling behavior (Benson 1982)

Spawning takes place offshore in early spring to late summer and all life stages are free swimming (Pattillo et al. 1997). According to Ditty et al. (1988), pompano planktonic larvae are present in the Gulf of Mexico from May through August. The fish are considered juveniles when they reach a standard length (SL) of 7 mm. Juveniles arrive in the surf zone when they are about 10 - 15 mm total length and leave for deeper water when they reach 75 - 150 mm. Juveniles are found in the shallow water beaches of the northern Gulf from April to October, and they move south along the coast in response to colder winter temperatures (Pattillo et al. 1997).

Pompano occur in both in oceanic and estuarine waters and are reported to feed on benthic and epibenthic organisms (Armitage and Alevison 1980, Bellinger and Avault 1971, Fields 1962, Finucane 1969, Modde and Ross 1983). Juvenile pompano are known to exploit food sources in or adjacent to the swash zone of northern Gulf beaches (Modde and Ross 1983), however they are also reported to feed in peripheral estuarine habitats (Bellinger and Avault 1971, Finucane 1969). They have been reported to be diurnal feeders (Modde and Ross 1983, Pattillo et al. 1997), and adults have been reported to feed during the day primarily on benthic bivalves (Pattillo et al. 1997). The adults have well developed pharyngeal plates, which allow them to feed on hard-shelled items such as bivalves and mole crabs (Finucane 1969, Bellinger and Avault 1971). Juvenile pompano are opportunistic feeders that often utilize the surf zone to feed on prey items which become dislodged or disoriented by wave action and vulnerable to predation (Pattillo et al. 1997). The smaller fish feed on benthic and pelagic invertebrates including polychaetes, calanoid copepods, amphipods, gastropod larvae, and insects. Studies by Hildebrand and Schroeder (1928), Berry and Iverson (1967), and Bellinger and Avault (1971) indicated that the diversity of these food items decrease as the fish grows, probably indicating that adult fish are more selective in their choice of prey. Modde and Ross (1983) are the only authors to present information on the diet of pompano in the northeastern Gulf of Mexico (Horn Island, Mississippi), however, little detailed information on the specific identification of prey items was reported. The most extensive feeding study of juvenile pompano in the Gulf of Mexico was conducted by Bellinger and Avault (1971). Their study was based on the examination of 899 juvenile fish collected from two Louisiana beach sites west of the Mississippi River. However, with few exceptions, most of the food items were only identified to major taxonomic categories (e.g., class and order). Two

other relevant studies are those of Armitage and Alevizon (1980), who studied juvenile and adult fish from the east coast of central Florida, and Fields (1962) who examined juveniles from the coast of Georgia.

MATERIALS AND METHODS

Juvenile pompano were collected from four barrier islands along the coasts of Mississippi, Alabama, and West Florida (see Figure 1). In addition, a few adult specimens were collected using hook and line from West Ship Island to be used for comparison of diet with the juveniles. The seven collecting sites for juveniles were (1) the southwest tip of Horn Island, (2) north side of Horn Island (middle), (3) south side Horn Island (middle), (4) north Petit Bois Island, (5) north side of Dauphin Island, (6) south side of Dauphin Island, (7) north side of Santa Rosa Island, and (8) South Santa Rosa Island.

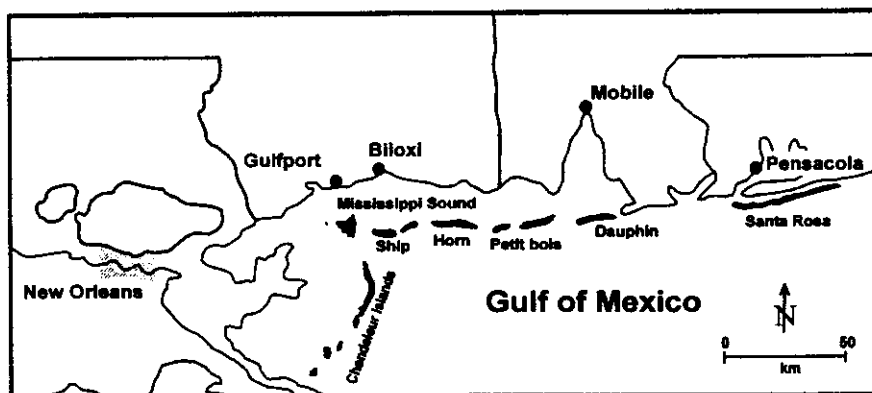


Figure 1. *Trachinotus carolinus* collection sites during June 2000.

The fish were collected with a 7 foot diameter cast net with $\frac{1}{2}$ inch mesh, a 10 foot diameter cast net with $\frac{3}{4}$ inch mesh, and a 20 foot seine. When feasible, a minimum of 10 fish from each collection site were collected and examined. The number of fish specimens from each station was taken by availability. The salinity, air, and water temperature were taken at each station. Once collected, the fish were preserved in 10% formalin on site, and after a minimum of six days they were transferred to 70% ethanol. In the laboratory, the standard length (SL) of each fish was recorded. The entire digestive tract of each fish was removed. Utilizing both dissecting and compound microscopes, prey items from the entire digestive tract were counted and identified to lowest possible taxon. To compensate for the large differences in size and number of each of the prey items,

the items were taken as a percentage of each fishes' total stomach contents. The percentage of prey items for each individual fish was calculated, the averages for all fish examined were combined, and this value was divided by the total number of fish examined. These percentages are reflected in Figures 2 - 10. All calculations, graphs, and tables were made using Microsoft Excel 2000. Fish with empty stomachs were not included in calculations of diet composition. The miscellaneous category encompasses all prey organisms that composed 2% or less of the diet.

RESULTS

Seventy-eight juvenile pompano were collected from eight different barrier island collections sites during July 2000 (Table 1). The digestive tracts of only three fish, two from the north side of Santa Rosa Island (station 7) and one from the southwest tip of Horn Island (station 1) contained no food items. The digestive tracts of the 75 juvenile pompano containing food material yielded a total of 1046 recognizable prey organisms representing at least 32 different species of invertebrates and fish (Appendix A). The summer feeding habits of juvenile pompano prey composition varied with collection site. Figures 2 and 3 indicate the similarities and differences in the prey consumed by pompano from the north (protected beaches) and south (open Gulf beaches) sides of the barrier islands during our study. The diet of the fish collected on the north side was composed of 22 different prey items, the small burrowing isopod *Exosphearoma diminuta*, being the most abundant prey organism recovered (Figure 2). The diet of fish collected from the south sides of the islands was composed of 26 different prey items with *Emerita* spp. being the most abundant prey item (Figure 3).

Table 1. Location, date of collection, temperature, salinity, and number of juvenile pompano collected during July 2000

Site #	Collection Site	Date	Air Temp °C.	WaterTemp .°C	Sal. ‰	# of Fish
1	SW Tip of Horn Island	07/11/2000	34	32	33	16
2	North Horn Island (mid)	07/20/2000	31	32	34	10
3	South Horn Island (mid)	07/20/2000	34	26	35	10
4	North Petit Bois Island	07/07/2000	34	30	32	5
5	North Dauphin Island	07/23/2000	33	31	31	5
6	South Dauphin Island	07/23/2000	31	30	33	10
7	North Santa Rosa Island	07/24/2000	35	31	33	10
8	South Santa Rosa Island	07/24/2000	30	30	35	12

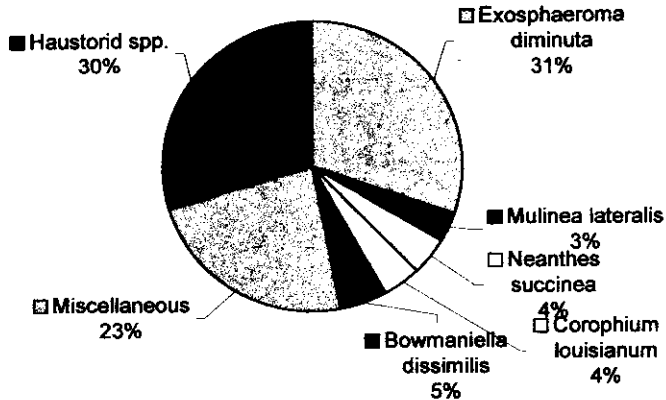


Figure 2. Important prey species recovered from 29 juvenile *Trachinotus carolinus* collected from the protected beaches, north sites of Horn, Petit Bois, Dauphin, and Santa Rosa Islands

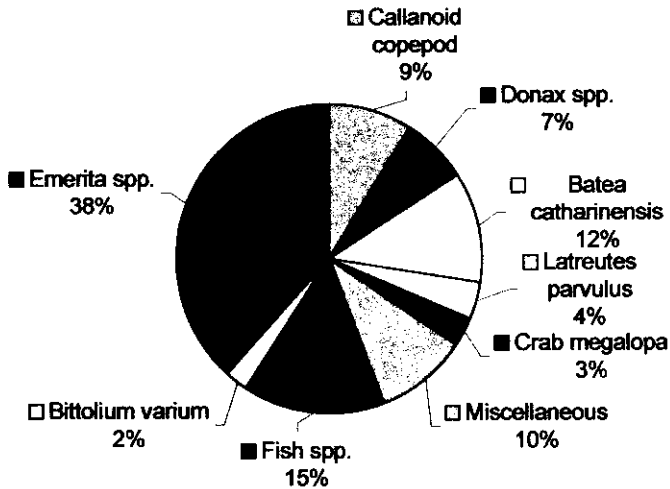


Figure 3. Important prey species recovered from 46 juvenile *Trachinotus carolinus* collected from the open beach, south sides of Horn, Petit Bois, Dauphin, and Santa Rosa Islands.

In general the food items identified during this study were indicative of shallow-water, sand dwelling organisms (Stations 1, 4, 6-8), however, there were notable exceptions (Stations 2,3,5). At Station 2, a protected beach area on the north side of Horn Island, the fish examined had been feeding in two different habitats, a protected sand beach and adjacent sea grass beds (*Halodule wrightii*). At this site a mixture of prey organisms, including sand beach species (*Emerita* spp. and *Exosphaeroma diminuta*), and grass bed forms (*Astryis* [= *Metrella*] *lunata* *Bittolium* [= *Bittium*] *varium*, *Hippolyte zostericola*), occurred in the diet of the fish examined.

When collections were made at Station 3, an open Gulf beach site on the south side of Horn Island, a large patch of drift algae with associated crustaceans (*Batea catharinensis* and *Latreutes parvulus*) was present. These two crustaceans, which are not typical of open beach habitats, made up an important part of the food items for the fish examined from this site.

A third site (Station 5) on the north side of Dauphin Island was an atypical habitat for pompano. This site is adjacent to sand/silt beach with near by *Spartina* salt marshes and submerged obstructions. The diet of the five pompano from this site consisted of typical estuarine epibenthic and soft bottoms forms such as the polychaetes, *Neanthes succinea* and *Polydora* sp. and the crustaceans, *Corophium louisianum* and *Sphaeroma quadridentatum*. No typical sand beach forms (e.g., *Emerita* spp., *Exosphaeroma diminuta*) were observed.

Based on the size of fish, the prey data for the juvenile pompano was divided into four size classes (Figures 4 - 7) and prey composition of each size class was determined. In the first size class (SL 14 - 34 mm), 23 different diet items were identified with sphaeromatid isopods (*Exosphaeroma diminuta*) and haustoriid amphipods (*Haustorius jayneae* and *Lepidactylus* sp. A) being the major dietary components consumed. The next size class, SL 35 - 55 mm, contained 25 different food items with juvenile mole crabs, *Emerita* spp., and haustoriid amphipods comprising of the major part of the prey organisms identified.

The third size class, SL 56 - 76mm, consumed 27 different prey items, the major food organism being *Emerita* spp. Only 14 prey items made up the final size class, 77 - 94mm, with juvenile coquina clams, *Donax* spp., being an important prey species. The food organisms found in fish of this size class reflected that reported for adult pompano.

Figure 9 illustrates the numerical representation of the major prey items consumed by all the 74 juveniles examined with food items in their digestive tracts. The juvenile diet was comprised of mostly *Emerita* spp. (20%) and *Exosphaeroma diminuta* (12%).

During July 2000 we also collected and examined the digestive tracts of four adult fish (SL 375 - 421 mm) from an open beach site off Ship Island, Mississippi. The diet of these was comprised of only 5 different prey items with *Donax* spp. being the most abundant and important prey item (Figure 10). Except for the commensal crab, *Pinnixa beherae*, which is associated with the ghost shrimps (*Callichirus islegrande*), the other prey organisms observed

(*Gynocuna dalli*, *Ancinus depressus*, *Parahaustorius* sp.) are relatively small, sand dwelling species.

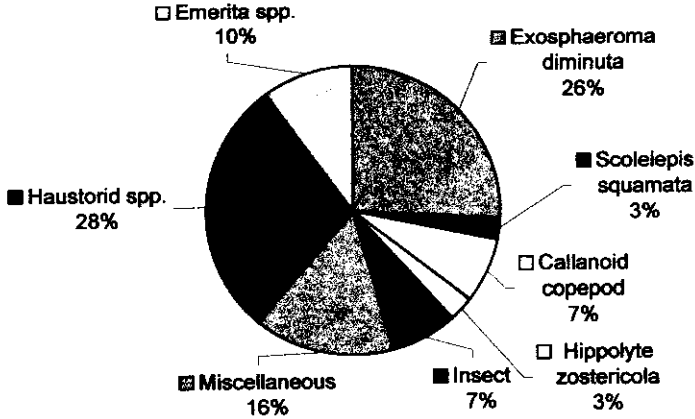


Figure 4. Total diet composition of 18 juvenile *Trachinotus carolinus*, SL 14 - 34 mm

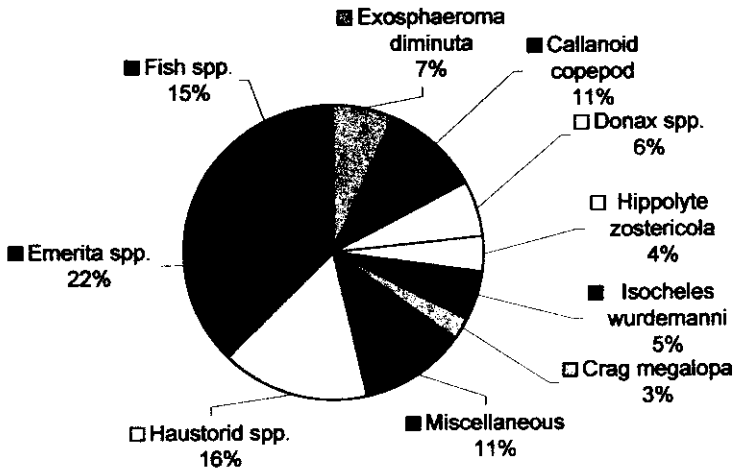


Figure 5. Total diet composition of 32 juvenile *Trachinotus carolinus*, SL 35 - 55 mm

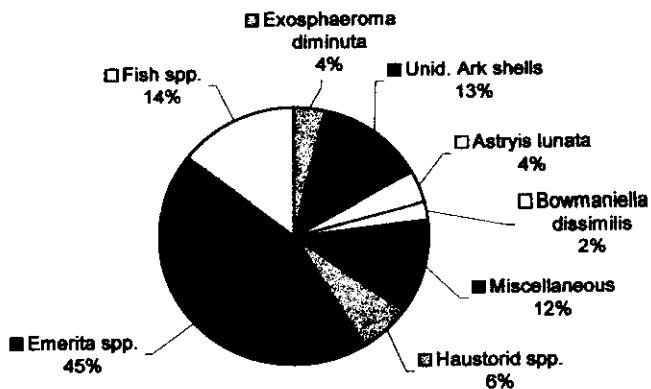


Figure 6. Total diet composition of 19 juvenile *Trachinotus carolinus*, SL 56 - 76 mm.

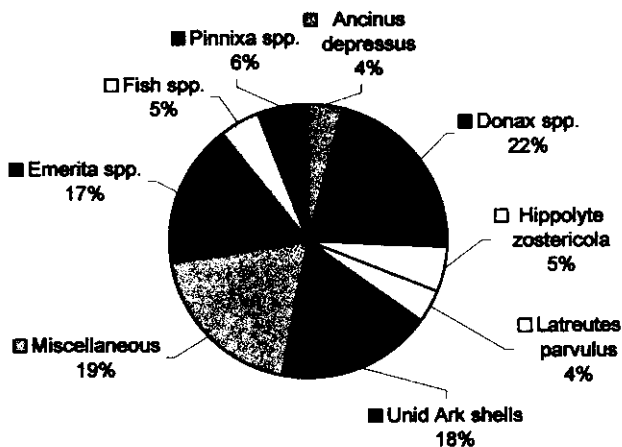


Figure 7. Total diet composition of five juvenile *Trachinotus carolinus*, SL 77 - 94 mm

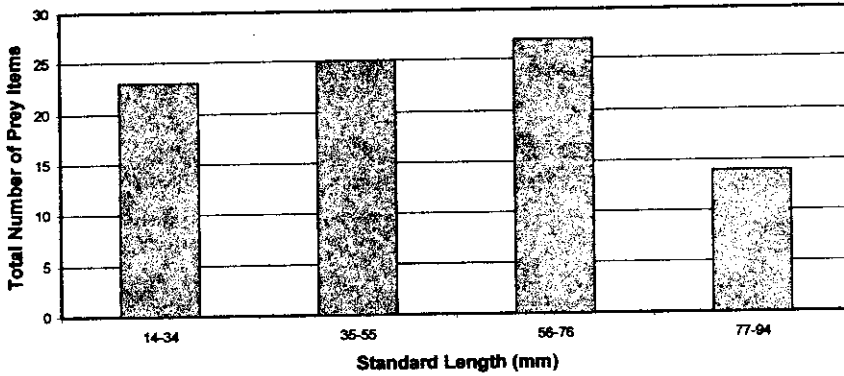


Figure 8. Total number of prey species found in the four juvenile size classes of *Trachinotus carolinus* collected from both protected and open beach sites on Horn, Petit Bois, Dauphin, and Santa Rosa Islands.

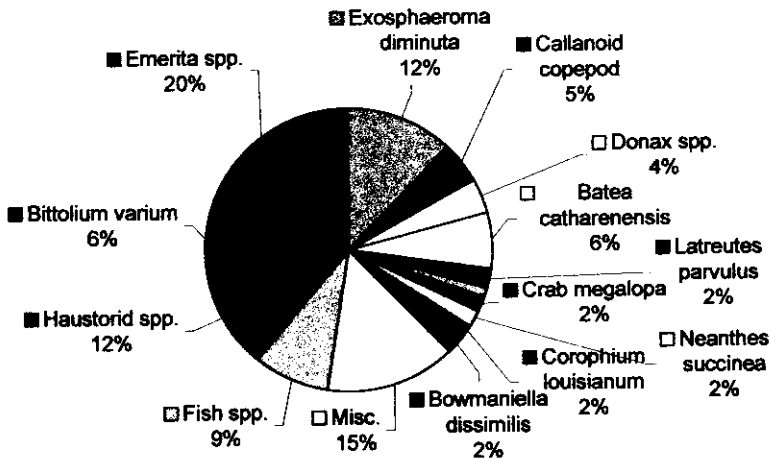


Figure 9. Major prey species comprising the diets of all size classes of juvenile *Trachinotus carolinus*, $n = 74$; sizes = 14 - 94 mm

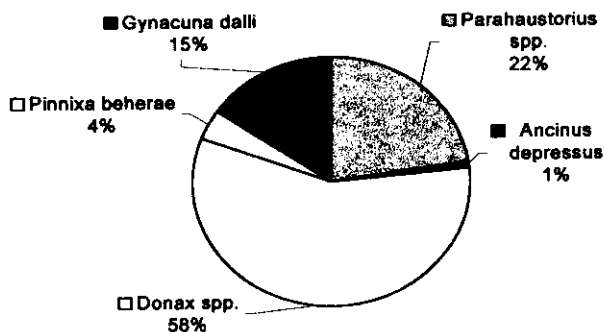


Figure 10. Total prey items recovered from four adult *Trachinotus carolinus*, SL 375 - 421 mm collected from the protected, north side of West Ship Island, Mississippi

DISCUSSION

These preliminary observations support earlier reports that juvenile pompano are opportunistic feeders (Pattillo et al.). Even though we examined a relatively limited number of fish collected during the month of July, our data indicate that pompano may feed on a greater variety of invertebrates than previously reported. In our study at least 32 dietary organisms were identified as distinct taxa. This included a variety of estuarine and grass bed organisms, such as *Neanthes succinea*, *Astryis lunata*, *Bittolium varium*, *Cymadusa compta*, *Corophium louisianum* and typical beach species, including juvenile *Donax* spp., *Ancinus depressus*, juvenile *Emerita* spp., *Exosphaeroma diminuta*, and haustoriid amphipods.

A review of the literature (see Pattillo et al. 1997) and the very limited observations made during our study, indicate that adult pompano in the northern Gulf of Mexico feed largely on the same types of prey as the juveniles (e.g., *Donax* sp., mole crabs, and haustoriids and *Harengula jaguana*), but focus their feeding efforts on the adult stages, whereas, smaller pompano feed on the juveniles of these prey species, plus a variety of smaller, more diverse food organisms. As in many other carnivorous fish species, it would be ecologically inefficient or not feasible for larger pompano to expend the energy required to consume the smaller more diverse organisms eaten by juveniles. Thus, there is a selective process to specialize on larger and more abundant prey. Hildebrand and Schroeder (1928), Berry and Iverson (1967), and Bellingier and Avault (1971),

have indicated that adult pompano are more selective in their choice of prey and have evolved strong pharyngeal teeth for crushing hard shells of *Donax* spp. These clams are considered one of the most, if not the single most, important food organisms in the diet of adult pompano (Patillo, et al. 1997). In contrast Finucane (1969a) stated that pompano feeding becomes more diversified as the fish moves toward adulthood. Based on our preliminary observations there was an increase in the variety of food organisms with an increase for fish in the 14 mm to 75 mm SL size range, but then an apparent decrease in diversity of prey organisms for fish in the 76 - 94 mm SL range (Figure 8). This may indicate that the older juveniles are becoming more selective as they reach adulthood; however, our observations, are only tentative because they are based on a small sample size of pompano with a SL greater than 75 mm.

There was a slightly greater diversity of prey items from fish collected at the open beach (Gulf) sites than those from the more protected north side sites, however, this could be an artifact of sampling. For example, presence of drift algae and its associated atypical beach fauna at Station 3 may have skewed our limited observations in this respect.

Some of the juvenile pompano we examined had been feeding on small juvenile fish (*Anchoa* sp. and *Harengula jaguana*). Modde and Ross (1983) stated that prey volume of *Harengula jaguana*(=*H. pensacolae*) increased slightly with fish length. In our study, fish were part of the prey in all four size classes. In one instance, the stomach of a 42 mm (SL) pompano contained three fish that were between 20 and 24 mm in length. Notwithstanding, fish appear to be important dietary items because they are generally much larger than the other prey items consumed and supply more energy than the smaller crustaceans and molluscs.

FUTURE STUDIES

In the future we plan to conduct a much more extensive ontogenetic and temporal study beginning in the spring (April/May) when juvenile fish first arrive in the surf zone until they leave in the fall (October/November). Our study area will be expanded eastward to the southwestern Gulf coast of Florida and westward to eastern Louisiana.

In these subsequent collections, we will collect more juvenile and adult fish over a wider range of standard lengths to determine if the trend toward a less diverse diet in larger fish is supported.

Diurnal studies at one or more collecting sites in Mississippi, Alabama, or West Florida are planned to determine:

- i) When pompano are most actively feeding,
- ii) If there are changes in prey selection during different periods of the day,
- iii) If juveniles actively feed at night, and
- iv) Digestive elimination rates.

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APPENDIX A.

Taxonomic listing of the prey organisms recovered from the digestive tracts of 78 juvenile Florida pompano collected along the coasts of Alabama, Mississippi and West Florida during July 2000.

Phylum Annelida

Class Polychaeta

Family Nereidae

Neanthes succinea (Frey and Leukart, 1847)

Family Spionidae

Scolelepis squamata (O. F. Muller, 1806)

unidentified. remains

Phylum Mollusca

Class Gastropoda

Order Mesogastropoda

Family Cerithiidae

Bittolum varium (Pfeiffer, 1840)

Order Neogastropoda

Family Columbellidae

Astryis lunata (Say, 1826)

Class Bivalvia

Family Crassatellidae

Gynocuna dalli (Vanatta, 1904)

Family Donacidae

Donax texasianus Philippi, 1847*

Donax variabilis Say, 1822

Family Mactricidae

Mulinea lateralis (Say 1822)

unidentified . mollusc remains

Phylum Arthropoda

Subphylum Crustacea

Class Copepoda

Subclass Calanoidea

unidentified. sp. (spp?)

Class Malacostraca

Order Mysida

Family Mysidae

- Bowmaniella dissimilis* Coifman, 1939
- Order Tanaidacea
Family Kalliapseudidae
Kalliapseudes sp. A(undescribed)
- Order Isopoda
Family Sphaeromatidae
Ancinus depressus (Say, 1818)
Exosphaeroma diminuta Menzies and Frakenburg, 1965
Sphaeroma quadridentatum (Say, 1818)
- Order Amphipoda
Family Ampithoidae
Cymadusa compta (Smith, 1873)
- Family Bateidae
Batea catharinensis Muller, 1865
- Family Haustoriidae
Haustorius jayneae Foster and LeCroy, 1991
Lepidactylus sp. A
Parahaustorius sp. A
unidentified. Haustorid spp. remains
- Family Corophiidae
Corophium louisianum Shoemaker, 1934
- Family Hyalidae
Parhyale hawaiiensis (Dana, 1853)
- Order Decapoda
Family Penaeidae
penaeid sp. (small juv.)
- Infraorder Caridea
Family Hippolytidae
Hippolyte zostericola (Smith, 1873)
Latreutes parvulus (Stimpson, 1866)
unidentified. caridean remains
- Infraorder Anomura
Family Hippidae
Emerita talpoida Say, 1817
Emerita benedicti Schmitt, 1935
Emerita spp. (juvenile remains)
- Family Diogenidae
Isocheles wurdemanni Stimpson, 1862
- Family Porcellanidae
unidentified Porcellanid remains
- Infraorder Brachyura
Family Portunidae
unidentified small juveniles
- Family Pinnotheridae

Pinnixa behreae Manning and Felder, 1989

Pinnixa sp.

Phylum Chordata

Subphylum Vertebrata

Class Osteichthyes

Family Engraulidae

Anchoa sp. (juvs.)

Family Clupeidae

Harengula jaguana Poey, 1865 (juvs.)

* Small, juvenile *Donax texanius* were found but were very difficult to identify and were recorded with *D. variabilis* as *Donax*. spp